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Superfund Record of Decision:

William Dick Lagoons, PA

50272-101

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15. Supplementary Notes

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16. Abstract (Limit: 200 words)

The 4.4-acre William Dick Lagoons site is an inactive waste disposal site located in West Caln Township, Chester County, Pennsylvania. Land use in the area is predominantly residential, with a sparse population density. The majority of residents in the vicinity of the site use private wells as their drinking water supply. The site is located near Birch Run, a tributary of the West Branch of Brandywine Creek, which is used as a water source for populations as far as Wilmington, Delaware. From the late 1950s until 1970, Mr. William Dick used a series of onsite lagoons for the disposal of minor amounts of chemical residuals and final rinse waters from the interior cleaning of tank trailers owned by Chemical Leaman Tank Lines, Incorporated (CLTL). These tank trailers were used to transport various chemical products using petroleum, latex, and resins. In 1971, Mr. Dick, CLTL, and the State reached an agreement to close the lagoons after a violation of the Clean Streams Law and a vandal-inflicted breach in one of the berms resulted in the discharge of approximately 300,000 gallons of wastewater into a nearby creek, the death of 2,600 fish, and the closure of public water supplies in the vicinity. Any residual remaining in the bottom of the lagoons after drainage was buried by pushing the earthen berms into the lagoons, filling them with soil, and

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - William Dick Lagoons, PA
Second Remedial Action - Final
Contaminated Medium: soil
Key Contaminants: VOCs (PCE, TCE), other organics (PAHs, pesticides), metals (arsenic, chromium)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 82
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(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

planting a vegetative cover on the surface. In 1988, EPA sampled the former lagoon site and collected well water samples from several surrounding residences. These investigations revealed elevated levels of numerous organic compounds in the soil. In 1987, EPA required CLTL to install a fence around the site and point of entry. A 1991 ROD addressed final remedy for OU1 for the provision of an alternate water supply to more than 50 residences impacted by the site, carbon filtration units on homes where TCE concentrations were above 5 ug/l, and also provided for an interim remedy for OU2 consisting of pumping and treatment of ground water and a hydrogeologic study. In 1992, CLTL also performed a soil vapor extraction/bioremediation treatability study to determine the feasibility of using this technology to remove contaminants from the onsite soil. This ROD addresses the 2.2 acres covered by the lagoons and the remaining 2.2 acres, which served as a burrow area for soil used to construct the compacted earthen ridges or berms around the perimeter of the lagoons, as OU3. The primary contaminants of concern affecting the soil are VOCs, including PCE and TCE; other organics, including PAHs and pesticides; and metals, including arsenic and chromium.

The selected remedial action for this site includes determining the extent of soil contamination; excavating and treating approximately 24,000 yd^3 of contaminated soil onsite using thermal desorption; treating air emissions from the thermal desorption process using a control system consisting of a fabric filter for particulate removal, a wet scrubber for acidic gas conversion, and a carbon adsorption system for capturing the contaminants; managing and disposing of treatment residuals offsite; backfilling the treated soil in excavated areas; placing either a vegetative soil cover or multi-layer cap over the excavated areas; and implementing institutional controls, including deed restrictions. The estimated present worth cost for this remedial action ranges from $7,800,000 to $9,300,000, which includes an estimated annual O&M cost of $20,000 for 30 years.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific soil cleanup goals are based on either RCRA LDRs or a health-based risk level of 10^{-6} or less and include acenaphthene 31 mg/kg; anthracene 94 mg/kg; benzo(a)pyrene 7,300 mg/kg; bis(2-ethylhexyl)phthalate 266 mg/kg; chlorobenzene 5.7 mg/kg; chloroform 280 mg/kg; 4,4-DDE 7,250 mg/kg; 2,4-dichlorophenol 230 mg/kg; fluorene 49 mg/kg; fluoroanthrene 250 mg/kg; naphthalene 3,100 mg/kg; phenanthrene 94 mg/kg; PCE 1.2 mg/kg; 1,2,4-trichlorobenzene 61 mg/kg; and TCE 0.42 mg/kg.

RECORD OF DECISION
WILLIAM DICK LAGOONS SITE

DECLARATION

SITE NAME AND LOCATION

William Dick Lagoons Site
West Caln Township, Chester County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Operable Unit 3 of the William Dick Lagoons Site ("Site"), in West Caln Township, Pennsylvania, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for Operable Unit 3 at this Site. This decision is based on the Administrative Record for this site.

The Commonwealth of Pennsylvania has evaluated and commented on the alternatives presented in this Record of Decision and has initially agreed with the technical remedy selected. The official position of the Commonwealth of Pennsylvania will be documented in the Administrative Record for this Site upon receipt.

ASSESSMENT OF THE SITE

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

DESCRIPTION OF THE REMEDY

The remedy described in this Record of Decision is for Operable Unit 3 at the Site. This remedy addresses the principal threat at the Site.

Operable Unit 1 at this Site involves providing a water line to protect residents from contaminated private well water. Operable Unit 2 involves an interim remediation of the groundwater which includes measures to pump and treat the groundwater and further investigation of the hydrogeology. A Record of Decision for Operable Unit One and the interim groundwater remediation measure for Operable Unit Two was issued on June 28, 1991. A decision on the final groundwater remediation is intended for this Site at a later date.

The remedy selected for Operable Unit 3 will reduce the concentrations of hazardous substances in the Site soils so that leaching of contaminants into the groundwater will be minimized. Reduction of the volatile organic compounds and semi-volatile organic compounds in the soils is necessary in order the groundwater will not continue to be impacted above acceptable levels. In addition, the installation of a vegetative soil cover or multi-layer cap will prevent the surrounding community from exposure to Site-related contaminants through inhalation, ingestion, and dermal contact.

The selected remedy includes the following major components:

1. Determination of extent of soil contamination.

2. Excavation of contaminated soils and treatment of contaminated soils in an on-site thermal desorption unit.

3. Treatment of air emissions from the thermal desorption unit.

4. Management and off-site disposal of treatment residuals and wastewaters.

5. Backfilling of treated soils in the excavated areas and placement of a vegetative soil cover or multi-layer cap over such areas.

6. Operation and maintenance ("O&M") of the vegetative soil cover or multi-layer cap.

7. Institutional controls in the form of deed restrictions.

DECLARATION OF STATUTORY DETERMINATIONS

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

Subsequent actions are planned to more fully address the threats posed by the groundwater at this Site.

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

for Stanley L. Laskowski
Acting Regional Administrator
Region III

3-31-93
Date

WILLIAM DICK LAGOONS SITE
RECORD OF DECISION
OPERABLE UNIT 3
SOURCE OF CONTAMINATION

TABLE OF CONTENTS

I. Site Name, Location and Description

The William Dick Lagoons Site is located in West Caln Township, Chester County, Pennsylvania approximately 3.5 miles south-southeast of the Village of Honey Brook. The 4.4 acre Site is located within a larger 105-acre parcel of land and is situated in a rural wooded setting on the crest of a small ridge known as the Baron Hills. It is accessible via Telegraph Road, at approximately 2,500 feet west of Sandy Hill Road (see Figure 1). The nearest residence is located roughly 300 feet to the north and approximately thirty homes are within 1000 feet of the Site. Figures 1 and 5 provide a perspective of the site setting relative to proximal residencies.

The site currently appears as a sparsely vegetated field behind several residences located on the south side of Telegraph Road. The site is obscured from view by both the surrounding trees and its position at the crest of a hill. Land use surrounding the site is primarily residential, with a generally sparse population density. Housing development in West Caln Township is progressing relatively quickly and several new homes have been built since the commencement of site remedial investigative activities. The majority of the residences are single family dwellings with private wells and onsite septic systems. Several trailer parks and a campground exist within the vicinity of the site and two separate automobile junkyards are located just north of the site.

Much of the area extending outward from the near-site residences is actively farmed. Important crops include corn, wheat, oats, soy beans and hay. Dairy cattle are also raised within the surrounding countryside.

Two other Superfund sites are located within five miles of the site. The Blosenski Landfill is located approximately 1.7 miles to the southeast and the Welsh Road Landfill is roughly 5 miles to the northwest.

II. Site History and Enforcement Activities

Waste disposal activities at the Site were conducted by its former owner, Mr. William Dick, in the late 1950s through May 1970. Originally, the Site consisted of three unlined earthen lagoons or ponds that were used for the disposal of wastewater. The lagoons covered approximately 2.2 acres of the 4.4 acre Site; the remaining 2.2 acres served as a borrow area for soil used to construct the compacted earthen ridges or berms around the perimeter of the lagoons (see Figure 2).

The lagoons were used to dispose of final rinse waters from the interior cleaning of tank trailers owned by Chemical Leaman Tank Lines, Incorporated ("CLTL"). Trichloroethylene (TCE) was used to clean out the tank trailers. In addition, minor amounts of residual chemical products were occasionally disposed of in the lagoons. The tank trailers were used for transporting petroleum products, latex, and resins. Following the rinsing and cleaning of the tank trailers at CLTL's Downingtown, Pennsylvania facility, the rinse water was delivered to the lagoons by tanker approximately every three days for disposal. The information currently available to EPA indicates that all disposal activities at the Site were completed prior to the effective date of the regulations implementing the Resource Conservation and Recovery Act, November 19, 1980.

On April 26, 1970, 37 wild geese were shot at the site by the district game protector for humane reasons. The birds' feathers were coated with waste after the birds descended onto the lagoons. In May 1970, the Pennsylvania Department of Health (PADH) notified Mr. William Dick that the discharge from the lagoons to underground waters was a violation of the Clean Streams Law, the Act of June 22, 1937, P.L. 1987, as amended and ordered the lagoons closed. On June 7, 1970, vandals allegedly caused a breach in the berm of the second lagoon, resulting in the release of an estimated 300,000 gallons of wastewater that moved into Birch Run, a tributary of the West Branch of Brandywine Creek. The discharge caused the death of more than 2,600 fish and the closure of public water supplies which used the creek as a water source as far downstream as Wilmington, Delaware. Mr. William Dick was notified by PADH that the discharge into the into Birch Run violated the Clean Streams Law. A complaint was filed by the Commonwealth of Pennsylvania in the Court of Common Pleas, Dauphin County, Pennsylvania (Number 3072 Equity Docket, No.345 C.D. 1970)

In early 1971, per the agreement reached with PADH under the aforementioned complaint, CLTL and William Dick began work to close the lagoons. This activity included the addition of alum to the lagoon wastewater, and spray irrigation of the "treated" wastewater into the woods adjacent to the lagoons. Settled residue remaining in the bottom of the lagoons was buried by pushing the earthen berms into the lagoons. The lagoons were completely filled in with soil and a vegetative cover planted on the surface.

In April 1985, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, an EPA contractor performed a site sampling inspection of the former lagoon site and collected well water samples from several surrounding residences. This inspection was conducted in response to a 1981 CERCLA notification to EPA by CLTL which indicated that the former lagoons may contain hazardous substances. During the inspection, elevated levels of numerous organic compounds were detected in the soil samples collected from the former lagoon area. A few site-related compounds also were found in two residential wells.

In May 1987, additional sampling of 28 residential wells by EPA's Technical Assistance Team (TAT) found TCE to be the most prevalent organic compound, at the highest concentration, in groundwater. This volatile organic compound (VOC), a suspected carcinogen and common industrial solvent, was detected in two spring-fed water supplies and five wells. Following the completion of these follow-up evaluations, the Site was listed in July 1987 on the National Priorities List (NPL) of hazardous waste sites eligible for cleanup under Superfund.

On July 20, 1987, EPA informed CLTL of its potential responsibility regarding contamination at the site by issuing a special notice letter. On January 27, 1988, EPA and CLTL entered into an Administrative Order on Consent ("1988 Removal Order") which required CLTL to install a fence around the site, conduct at least yearly monitoring of residential wells (more frequent monitoring in some cases), and install point-of-entry treatment systems for home well water exceeding Maximum Contaminant Levels (MCLs). The fence was installed at the site in February 1988. The sampling and treatment unit requirements of the Consent Order will continue to be in effect until the waterline is constructed and is operating at the affected and potentially affected residences. At that time, the treatment units will be removed from the residences and CLTL will discontinue the residential well monitoring.

CLTL has supplied bottled water to all homes (approximately 34) in which TCE levels between 0 to 5 parts per billion (ppb) were detected in residential wells. The company has supplied bottled water under its own initiative; CLTL is not required to do so by EPA. To date, CLTL has installed point-of-entry carbon filtration units in the twelve homes where TCE concentrations in well water exceed EPA's MCL of 5 ppb.

On September 14, 1988, CLTL and EPA signed a second Administrative Order on Consent, requiring that a Remedial Investigation/Feasibility Study (RI/FS) be conducted. CLTL obtained the services of Environmental Resources Management ("ERM") for this work. The RI began in December 1988 and progressed throughout the Spring and Summer of 1989. Based upon data gaps identified by both EPA and ERM, a second shorter phase of RI work was initiated in October 1989. An interim RI report was submitted to EPA in December 1989. After EPA comments, a more detailed draft RI report, along with a draft FS report and Risk Assessment (RA), were submitted for EPA review on March 8, 1990. Following receipt of EPA comments, a Preliminary Final RI/RA/FS was submitted by CLTL on September 6, 1990.

On September 24, 1990, EPA informed the Rohm & Haas Company of Philadelphia, Pennsylvania of its potential responsibility regarding contamination at the site by issuing a general notice letter . This notification was based on information received on the company's past involvement at the site through interviews with former CLTL employees. Specifically, CLTL hauled Rohm & Haas product to Rohm & Haas' customers and then cleaned product residue from CLTL's tanker trucks and hauled it to the William Dick Lagoons Site.

On June 28, 1991, EPA issued a Record of Decision for Operable Units One and Two at the Site. The major components of the remedies selected included (1) with respect to an alternative water supply, providing an extension of the City of Coatesville Authority water line to at least 50 homes impacted or potentially impacted by the Site and, (2) with respect to the interim action for groundwater clean-up, performing a hydrogeological study aimed at determining the proper design of a groundwater remediation system, and pumping and treating the contaminated ground water to remove site-related contaminants for a limited time frame.

EPA deferred the decision regarding soil remediation (OU 3) until a Soil Vapor Extraction/Bioremediation (SVE/BIO) treatability study and Focused Feasibility Study was performed at the Site by CLTL.

After EPA issued the June 1991 ROD, CLTL entered into negotiations with EPA to implement the clean-up activities described in the ROD. These negotiations continued, without resolution, until March 1992. On June 30, 1992,, EPA issued an Administrative Order requiring the PRPs to undertake the remedies respecting alternate water supplies and interim groundwater studies and remediation defined in the ROD. The PRPs did not agree to comply with all of the terms of the order. Consequently, EPA hired a contractor to perform the design work for the water line, ground water investigation and interim groundwater remediation. Currently, EPA is reviewing the contractor's work plan for the pre-design groundwater investigation. The pre-design groundwater investigation needs to be performed prior to the completion of the design of the water line and groundwater pump and treat system.

In June 1991, EPA verbally approved CLTL's performance of a SVE/BIO treatability at the Site. In August 1991, EPA confirmed this approval in writing. The SVE/BIO treatability study was performed pursuant to Section 6.2.2 of the Final Remedial Site Operations Plan (RISOP) prepared by CLTL in November 1988. This RISOP was incorporated into the September 1988 RI/FS Consent Order between EPA and CLTL, as described in Section VIII(C) of this Order. CLTL submitted its workplan for the treatability study in February 1992. This workplan was disapproved by EPA in April 1992. CLTL submitted a revised workplan in June 1992. This workplan was subsequently disapproved by EPA. A second revision was submitted to EPA in August 1992. EPA verbally approved of this workplan in August 1992. Written approval was provided in September 1992.

CLTL (through its contractor) performed a SVE/BIO treatability study in former Lagoon #1 at the Site from August 1992 to November 1992 and submitted a Focused Feasibility Study which evaluated alternatives for remediating the soils at the Site. The purpose of this study was to determine the feasibility of using this technology to remove contamination from the soils on the Site.

In addition to this work, CLTL (through its contractor) also used several mathematical models to calculate the level of contamination that can remain in the soil without releasing contaminants to groundwater above levels acceptable to EPA. These soil clean-up levels were developed using a combination of the fate and transport mathematical models, HELP and PRZM, as well as a groundwater mixing zone model. Compounds which have been identified in the groundwater were used in the model. The groundwater concentration input data into this model was based on Maximum Contaminant Levels ("MCLs") and health-based drinking water concentrations. Health-based drinking water concentrations were established based on a carcinogenic risk of 10E-05 or 10E-04. A cancer risk of 10E-05 means that one additional person per 100,000 has a chance of contracting cancer given the relevant exposure scenario. The NCP directs hazardous substance responses for Sites presenting risks outside the established acceptable carcinogenic risk range for Superfund Sites of between 10E-06 (1 additional chance in one million) and 10E-04 (one additional chance in 10,000). EPA used a carcinogenic risk of either 10E-04 or 10E-05 as the basis for the health-based drinking water concentrations for chemicals without an MCL at this Site rather than use the more conservative 10E-06 carcinogenic risk values since the 10E-06 carcinogenic value for some compounds are below the contract required quantitation limit for the drinking water analytical technique, EPA Method 524.2. The contract required quantitation limit is the detection level required for a particular analytical method under EPA's Contract Laboratory Program (CLP). Use of either 10E-04 or 10E-05 carcinogenic risk is protective of human health since it falls within the EPA's acceptable risk range of 10E-06 to 10E-04.

For those chemicals without an MCL or with a health-based drinking water concentration greater that 10 ppb, a groundwater concentration of 10 ppb was used. The use of 10 ppb was based on the contract required quantitation limits as established under the Contract Laboratory Program (CLP) Statement of Work for Organics Analysis (CLP Document Number OLM01.1). The 10 ppb level was established in the focused feasibility study by CLTL in an attempt to conform to PADER's groundwater protection strategy, which, although not an applicable or relevant and appropriate regulation for this ROD, is a "To Be Considered" policy. Soil clean-up levels calculated on the assumption that a vegetative soil cover would be placed over the Site after soil treatment are listed in Table 1.

A vegetative soil cover is defined in this ROD as a layer of soil which will support the germination and propagation of vegetation and will provide dermal protection from the treated soils. The vegetated soil cover will not restrict the infiltration of rainwater or surface water through the soils.

According to the model, some of the compounds listed in Table 1 will degrade prior to reaching the groundwater and, therefore, no soil clean-up level was provided. However, if the contaminated soils are treated and placed back on-site, certain contaminants (i.e., those compounds related to F001-F005 wastes) will have to meet the treatment standards established by the Land Disposal Restrictions (LDR) listed at 40 CFR §268.43. The LDR levels for the relevant compounds are listed in Table 1. For the remaining compounds which are not F001-F005 wastes but do, according to the model, degrade before reaching the groundwater, EPA believes that it is appropriate to establish soil clean-up levels based on direct contact risks. These levels are also noted in Table 1. The groundwater concentrations used in the fate and transport models to calculate the soil clean-up levels are listed in Table 1 and are based on either MCLs, health-based concentrations under a drinking water exposure scenario or 10 ppb as described above.

Some of the soil clean-up levels that were calculated by the model exceeded the concentrations for a direct contact risk. The soil concentrations that need to be met so that the direct contact risk is acceptable to EPA are provided in Table 2. Attainment of the direct contact risk levels listed in this table are not required for this ROD, because placement of a cover or cap over the soils and implementation of institutional controls will prevent exposure to the soils through direct contact. However, if the values listed in Table 2 can be met during remedy implementation, deed restrictions on the property may be eliminated.

CLTL also calculated contamination levels that can remain in the soil with various types of caps proposed to be placed over the site to reduce infiltration of rain water. These soil clean-up values are described and summarized in the Appendix C of the Focused Feasibility Study, dated November 16, 1992. This document is located in the Administrative Record (AR300569-AR300597). The soil clean-up levels in this Appendix do not take MCLs or health-based drinking water concentrations into account, therefore, these values are considered preliminary by EPA.

The results of the SVE/BIO treatability study indicate that significant quantities of VOCs can be removed from the soils through SVE/BIO. Approximately 610 pounds of VOCs were removed during six weeks of continuous operation. Good subsurface air flow conditions were observed during the treatability study. After the six week treatability study, it could not be conclusively demonstrated that bioremediation ("BIO") could be effective in reducing the levels of VOCs and Semi-volatile organic compounds (SVOCs) in the soils at the William Dick Lagoons Site. During the RI and the treatability study, soil samples were taken in the former lagoon area. Thin layers of a black, sticky, fibrous (i.e., tar-like) substance were found at depths ranging from 2 to 6 feet in former Lagoon #1. Analysis of this layer showed that it contained the VOCs and SVOCs found in the soil. The impact of this layer on the operation of the SVE/BIO system was not analyzed during the treatability study. According to CLTL, an additional 6-12 month pilot study would be necessary during the remedial design to determine how this layer would affect SVE/BIO remediation. If this layer can not be remediated with SVE/BIO, CLTL proposed to excavate this material and treat it by either thermal desorption or incineration.

In addition to the thin layers of a black, sticky, fibrous substance, other materials were identified in the three former lagoons. These materials were classified as "spongy", "rubber-like", "dry, matted and latex-like" and were observed at depths ranging from 2 to 14 feet in all three lagoons. These materials could also impact a full-scale SVE/BIO remediation.

III. Highlights of Community Participation

In accordance with CERCLA Sections 113(k)(2)(B)(i-v) and 117, EPA instituted several measures to contact and correspond with residents in the community surrounding the William Dick Lagoons Site concerning Operable Unit 3. Following is a listing of the community relations efforts conducted by EPA:

June 1991- issued the Record of Decision for OU 1 and OU 2 to persons on the site mailing list site and government officials. This ROD discussed why the decision on remediating the soils at the site would be deferred.

July 1991- held a public meeting with interested individuals to describe the components of the Record of Decision for OU 1 and OU 2.

August 1992- issued a fact sheet to persons on the site mailing list and government officials describing the Soil Vapor Extraction/ Bioremediation treatability study.

January 1993 - issued the Proposed Plan for the site respecting OU 3 via press release, newspaper publication, and direct mailing to all individuals on the site mailing list; announced public meeting in February.

February 1993 - held public meeting with approximately 50 interested individuals to explain EPA's rationale for the proposed remedial alternatives presented in the January 25, 1993 Proposed Plan and to solicit comments on this Proposed Plan during the 30 day public comment period which was held from January 25, 1993 to February 24, 1993.

In addition, EPA has updated the information repository and administrative record, available for public review at the West Caln Township Building, with the reports relating to the Soil Vapor Extraction/ Bioremediation Treatability Study and the Focused Feasibility Study for OU 3. The index to the administrative record for OU 3 is attached to this Record of Decision in Appendix B.

A response to the comments received during the public comment period, including the public meeting, is included in the Responsiveness Summary, which is part of this Record of Decision and is attached in Appendix A.

IV. SCOPE AND ROLE OF OPERABLE UNIT 3

Based on the results of the Preliminary Final RI/FS, EPA has decided that remediation of the entire site can best be approached by considering the site as consisting of three separate "units". These units are:

(1) Residential Water Use (i.e., Alternate Water Supply)- which involves a remedy to protect residents from contaminated private well water

(2) Groundwater- which involves a remedy to remediate all or portions of the contaminated groundwater aquifer

(3) Source Control- which involves a remedy to clean up contaminated soils at the Site (contaminated soil is the media considered to be the "principal threat" at the Site per the definition of principal threat in the NCP 40 CFR Section 300.430(a)(1)(iii)).

A ROD was issued for Operable Unit 1 and for an interim action on Operable Unit 2 in June 1991.

Operable Unit 3 (Source Control) is being addressed by this ROD. The goal of this remedy is to clean soils to contaminant levels which, along with the installation of a vegetative soil cover or multi-layer cap (as defined in Section VII. of this ROD), are sufficient to ensure that any residual contaminants migrating or leaching to the groundwater will not exceed risk-based levels or Federal standards for drinking water. In addition, the vegetative soil cover or multi-layer cap will ensure against erosion and direct contact by the surrounding community and trespassers with site soils.

Reducing the source of contamination impacting the groundwater at the site will allow an effective final remedy for groundwater clean-up to be designed. The final remedy for the groundwater remediation (OU 2) will be outlined in a future ROD.

V. SUMMARY OF SITE CHARACTERISTICS

The purpose of the remedy under OU 3 is to address the soil contamination on-site so that it does not continue to impact groundwater above acceptable levels and so that any risks associated with direct contact with the soil are minimized. Therefore, this section of the ROD summarizes the site characteristics related to soils and groundwater as determined during the RI and the Soil Vapor Extraction/Bioremediation Treatability Study performed in Fall 1992. A detailed discussion of all site conditions can be found in the Preliminary Final RI (September 1990) and the Focused Feasibility Study (November 1992). The groundwater and soil findings are summarized below:

Geology and Groundwater:

- The site is located in the Honeybrook Uplift in an outcrop belt of a geological structure known as the Chickies Formation. It is situated on the crest of the Baron Hills Anticline in a fault block bounded by two normal faults to the north and south. (The Chickies is a white to light grey quartzite with interbedded phyllitic beds.) The site is located on a groundwater divide. The bedrock beneath the lagoons is highly weathered and forms a thick saprolite up to 100 feet thick. Although laboratory analysis indicates that the saprolite material is of low permeability, contaminants have migrated to the groundwater table (approximately 50 feet below the surface) through joints and fractures in the saprolite.

- Groundwater at the site, as determined by monitoring well sampling, is contaminated primarily by VOCs and, to a lesser extent in frequency and concentration, semi-volatile organic compounds (SVOCs). TCE is the predominant VOC (average concentration = 1200 ppb, maximum concentration = 16,000 ppb) and phenol is the predominant semi-VOC (average = 800 ppb, maximum = 14,000 ppb). Other compounds found less frequently and/or in lower concentrations include chloroform, benzene, acetone, 2-methylphenol, 4-methylphenol, isophorone and other organic compounds. Vinyl chloride was detected on only one occasion in one monitoring well during post-RI/FS sampling. Table 3 lists the maximum and average groundwater concentrations in onsite monitoring wells.

- The highest groundwater concentrations of organic chemicals are found in two of the thirteen monitoring wells installed at the site, wells MW-5D and MW-7D. The seven deeper monitoring wells (MW-1D, MW-3D, MW-5D, MW-7D, MW-9D, MW-11D and MW-20D) (110 to 397 feet deep) are generally more contaminated than the six shallow wells (MW-2S, MW-4S, MW-6S, MW-8S, MW-10S, MW-12S) (70 to 80 feet deep). All wells were installed in bedrock (See Figure 4). At well MW-20, the southwest corner of the site, groundwater was found to be contaminated down to a depth of 397 feet.

- The groundwater surrounding the Site, which is utilized by residents, is also characterized by low-level TCE concentrations. Of the approximately 130 residential wells sampled (See Figure 5), roughly 30 to 40 appear to have some site-related contamination. Of these 30 to 40, eleven have concentrations of TCE in the 5 to 15 ppb range (the MCL is 5 ppb) and one well contains TCE at levels from 20 to 280 ppb, dependent on the sampling season. Residential wells within a radius of the site are sampled at least once a year; those homes found to have a detectable level of TCE are sampled twice a year. The radius was established by CLTL and EPA under the Removal Order. Due to the number of homes within the radius of the site (1 mile south, 1/2 mile north) the sampling schedule is set up so that samples are collected from 20 to 25 home wells every quarter of the year.

- The results of the RI and four years of residential well sampling data indicate that TCE levels have not changed significantly at the edge of the contaminant plume where residential wells are generally located. Based on this information, the boundary of the groundwater area affected by site-related contaminants has been relatively well-defined (See Figure 6), although additional characterization work is needed.

- The regional groundwater flow at the Site appears to be toward the southeast. Three significant bedrock fracture features (two of which are faults) are believed to exist in the vicinity of the site. Each appears to provide pathways for contaminant migration to vary from the overall southeasterly flow direction and two may serve to partially block the flow of groundwater beyond the fractures. However, it seems that intersecting smaller fractures act as conduits for groundwater contamination to migrate beyond the three larger fractures, resulting in a rather complex flow pattern.

- Additional groundwater monitoring wells are needed and further studies are necessary to confirm the theory that groundwater flow is controlled by site geologic fractures, to determine the extent of groundwater flow to the north, and to determine the severity of contamination in the area generally south of the site.

Soil:

- Soils in the former lagoon area are contaminated by volatile organic compounds (VOCs), principally trichloroethene (TCE), which was used at one time to clean out chemical tank trailers disposing material at the site, and semi-VOCs, which appear to be primarily associated with fuel oil residues. Other than TCE, compounds found at significant levels in site soils are 2-butanone, toluene, styrene, xylenes, ethylbenzene, chlorobenzene, and tetrachloroethene (all VOCs); and several semi-VOCs, especially phenol, 1,2,4-trichlorobenzene, naphthalene and bis(2-ethylhexyl) phthalate. The pesticide DDE was also found in concentrations suggesting that it was disposed of at the site. Table 4 presents a listing of average and maximum concentrations of soil contaminants.

- Soils are heavily contaminated from a depth of about one foot below the surface down to approximately 20 feet, depending on site location. Former lagoon #1 is most heavily contaminated, with concentrations decreasing as one moves across the site to former lagoon #2 and lagoon #3. (See Figures 2 and 7) Because groundwater is contaminated, and the water table lies at approximately 50 feet below the site, low-level subsurface soil contamination exists as deep as 50 feet although a significant drop-off in levels occurs after approximately 20 feet (See Figure 8 and 9). Contamination of soils at and below the surface appears to be confined to the area of the three former lagoons.

- As a result of the reported occasional burning of floating oils on the surface of the lagoons, the RI included an analyses for dioxins in the soil (dioxins can be created from the burning of chlorinated phenols and hydrocarbons). Although dioxins were detected in the parts per trillion (ppt) range (See Table 5), the levels do not present an unacceptable risk and will not require remediation. EPA generally considers the potential need for remediation of dioxins when levels are found to exist in the ppb range or higher.

- Based on the results of RCRA Subtitle C 40 CFR §261.24 Toxicity Characteristic Leaching Procedure (TCLP) analyses of three of six soil boring samples, the soil/waste mixture at the site would be classified as characteristic hazardous waste under RCRA. In addition, based on EPA's understanding of the nature of the operations leading to the generation of waste materials disposed of at the site, EPA Region III has determined that the soil/waste mixture also would be classified as a land disposal restricted hazardous waste under the RCRA program (See CFR Part 268). The waste disposed at the site contains F001-F005 waste.

- The former spray irrigation and berm borrow areas (See Figure 7) only have minor levels of organic contamination which is not expected to present a direct contact risk. (See Table 6 for spray irrigation area sampling results.)

- Activities at the site does not appear to have caused inorganic contamination of site soils, although levels were occasionally above background concentrations. This finding is in agreement with EPA's understanding that only organic chemical rinsewaters and wastes were disposed of at the site.

- During the RI and the Soil Vapor Extraction/ Bioremediation treatability study, soil samples were taken in the former lagoon area. Thin layers of a black, sticky, fibrous substance were found at depths ranging from 2 to 6 feet in former Lagoon #1. Analysis of this layer showed that it contained the VOCs and SVOCs found in the soil. In addition to the thin layers of a black, sticky, fibrous substance, other materials were identified in the three former lagoons. These materials were classified as "spongy", "rubber-like", "dry, matted and latex-like" and were observed at depths ranging from 2 to 14 feet in all three lagoons.

VI. SUMMARY OF SITE RISKS

The baseline risk assessment (RA) provides the basis for taking remedial action and indicates the exposure pathways that need to be addressed by the remedial action The RA was performed for the Site in accordance with EPA guidelines. It involves assessing the toxicity or degree of hazard posed by substances found at the site by considering the levels at which these substances are present. The RA also entails describing the exposure routes by which humans and the environment could come into contact with these substances.

When estimating an individual's exposure to site substances, conservative assumptions regarding such factors as length of the exposure period, frequency of exposure, amount of skin exposed and/or quantity of substance ingested, are purposely used to ensure that the risk is not underestimated. After evaluation of the site data, an assessment of toxicological information and potential exposure is performed, followed by calculations of the risks posed. Separate calculations are made for those substances that can cause cancer and for those that can cause other, non-carcinogenic health effects. Risks to both childen and adults are presented.

A) <u>Contaminant Identification</u>

The initial phase of the RA involves reviewing all RI data and identifying the contaminants of potential concern found in all exposure media at the site for further risk evaluation. The exposure media include onsite soil, groundwater, surface water, springwater, fugitive dust and air emissions, and deer which might graze at the site. Identified contaminants are primarily chosen based on their relatively high toxicity, mobility, persistence and prevalence when compared to all contaminants present at the site. The chosen contaminants also provide a representative analysis of the potential risks at the site. Arithmetic average and maximum concentration levels of the chosen contaminants are utilized to develop most probable and maximum exposure scenarios in a later phase of the RA. A listing of the identified contaminants of concern or "indicator" contaminants appears in Table 7. Based on RI data, the selected contaminants represent 99% of the risk associated with each exposure scenario for each medium. Sources of uncertainty in selecting the indicator contaminants are discussed in the RA and in Section F, below.

B) <u>Exposure Assessment Summary</u>

The objectives of the exposure assessment are to identify potential exposures associated with the contaminants of concern at the site and to estimate the magnitude of these exposures.

Based on the site's environmental setting, the RA identified five potential populations which could be exposed to site contaminants. <u>Actual</u> exposure of these groups is currently severely limited however, due to controls implemented at the site to date. The "potential exposure pathways" for this site are:

- Use of groundwater (via private well) as a residential water supply by residents living in the area of estimated site-related impact. Exposure includes dermal contact with and ingestion of groundwater as well as inhalation of volatile organic chemicals released during showering and other activities.

- Dermal contact with and incidental ingestion of contaminated onsite soils by a casual trespasser.

- Ingestion of venison from deer that may graze onsite.

- Inhalation of volatile organic chemicals and fugitive dust released from on-site soils, and

- Recreational use of the ponds fed by spring #48 (a.k.a. the Baldwin Campground spring) (Figure 5). Exposure includes dermal contact with and incidental ingestion of water, as well as inhalation of volatiles released from the water.

- Hypothetical residential use of groundwater from the onsite monitoring wells installed during RI field work.

The rationale for the selection of these potential exposure pathways appears in Table 8. When calculating the risks associated with each of these pathways, the RA considers three age groups as potentially exposed: adults, children ages 6 to 12, and children ages 2 to 6. Table 9 provides additional information on exposure duration.

Actual quantification of potential exposure involves estimating exposure point concentrations and calculating potential intakes for each exposure pathway identified above. Exposure point concentrations (the contaminant concentration at the point at which the resident is exposed) were based on the arithmetic average and maximum values for each indicator chemical found in each medium at the site. To determine the concentration of VOCs released from onsite soils and the pond fed by Spring #48, and to determine the concentrations in fugitive dust released from onsite soils, air screening models were utilized. When estimating VOC concentrations released during showering with private residential well water, an inhalation dose equivalent to that experienced via ingestion of such water was assumed. Summaries of the average and maximum exposure point concentrations appear in Appendix D of this ROD.

In the calculation of potential intakes (how much and for how long one is exposed to the exposure point concentrations), the characteristics of the various exposure pathways must be defined. Important parameters include the frequency, duration, and degree of exposure as well as physiologic characteristics of the exposed population, such as body weight and skin surface area. Estimates of these parameters are based on EPA guidelines, recommendations found in the current literature, and professional judgment. The exposure assumptions used in calculating the potential intakes appear in Table 9.

Several assumptions were made regarding both the nature and extent of contamination present at the site as well as the behavior and characteristics of the populations potentially exposed to the contamination. These assumptions include use of the following: monitoring data to represent exposure concentrations across a medium; screening level models to represent exposure concentrations across a medium; single values for exposure parameters to characterize the behavior of an entire population over an extended period of time, and the intake calculations for the deer ingestion scenario, which should be considered semi-quantitative in light of the numerous assumptions required.

C) Toxicity Assessment Summary

This task requires the assessment of the intrinsic toxicological properties of the contaminants of potential concern. Both carcinogenic and non-carcinogenic effects from the indicator contaminants must be presented. A summary of toxicological information on all indicator compounds assessed for the site appears in Table 10. This table identifies those compounds which are considered potential carcinogens and those identified for non-carcinogenic effects. In some cases, compounds are evaluated for both types of effect. The acronyms used in Table 10 are defined as:

Cancer Potency Factors (CPFs) have been developed by EPA for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs are multiplied by the estimated intake of a potential carcinogen to provide a conservative estimate of the excess lifetime cancer risk associated with exposure at that intake level. CPFs are generally derived from human epidemiological studies or chronic animal bioassays.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs are estimates of daily exposure levels for humans, including sensitive individuals that are likely to be without an appreciable risk of adverse health effects. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g. to account for the use of animal data to predict effects on humans).

Carcinogenic Class refers to EPA's weight-of-evidence system for classifying chemicals suspected of being human carcinogens. The classes appearing on Table 10 are defined as Group A - human carcinogen; Group B1 - Probable human carcinogen based on limited human data; Group B2 - Probable human carcinogen based on sufficient evidence in animals but little or no evidence in humans; Group C - Possible human carcinogen; Group D - Not classified as to human carcinogenicity; Group E - Evidence of noncarcinogenicity for humans.

D) Risk Characterisation

The final task of the RA is to integrate the results of the Exposure Assessment and Toxicity Assessment to quantitatively estimate the potential risk associated with the six exposure pathways previously identified. Both carcinogenic and noncarcinogenic effects are considered.

Carcinogenic risk - Carcinogenic risk is calculated by multiplying the daily intake of each chemical, averaged over the years of exposure, by the appropriate CPF. Results are presented in probabilities expressed in scientific notation. A result of 1E-04 ($1x10^{-4}$) indicates that an individual has a one in ten thousand chance of developing cancer as a result of site-related exposure to that chemical under the specific exposure conditions at the site. Based on EPA policy, a risk exceeding the range of 1E-04 to 1E-06 is generally considered as exceeding the acceptable risk level.

The risk associated with exposure to a set of chemicals is estimated by adding the risks associated with exposure to each chemical. Several of the exposure scenarios at the site may involve more than one route of exposure. A summary of the results of the calculations for each age group under each exposure scenario, as well as a lifetime exposure scenario (calculated by adding the risk for each age group), is presented in Table 11. This table also provides a summation of risk associated with simultaneous exposure under multiple scenarios.

Noncarcinogenic Risk - Noncarcinogenic risk is determined by calculating the Hazard Index (HI). This number is found by dividing the daily intake by the appropriate RfD. The HI provides an estimate of the potential for toxic effects to develop as a result of exposure to a chemical or set of chemicals under the assumed conditions of exposure.

A HI less than one indicates that no toxic effects are expected to occur as a result of a given exposure, while a HI of greater than one indicates that there is a potential for an individual to experience adverse health effects as a result of a given exposure. Noncarcinogenic risk associated with exposure to a set of chemicals is conservatively estimated by adding the risks associated with exposure to each chemical. A summary of the results of the HI calculations for each age group under each exposure scenario, including a lifetime exposure scenario, appears in Table 12. A multiple exposure summation appears in this table.

E) **Environmental Risks**

During the RI, an ecological investigation of the surrounding site area was conducted to assess site-related impacts to the local flora and fauna. The objectives of this work were to:

1) characterize the terrestrial and wetland communities of the site and surrounding area,

2) identify the macroinvertebrate communities of the downgradient tributaries,

3) assess any site-related impacts on these various ecological communities.

Utilizing the data obtained from the above tasks, an ecological assessment of the site was conducted in a methodology similar to that described above for public health impact. After completion of the Exposure Assessment and Toxicity Assessment phases of the total ecological assessment, it was determined that RI analytical results of surrounding stream samples did not indicate an exposure of aquatic ecological receptors to site-related contaminants. In fact, the macroinvertbrate community in the streams surrounding the site were found to be diverse and healthy.

The only terrestrial receptors experiencing site-related impact would be those trespassing or residing directly on the 2.2 acre former lagoon area. The chain link fence around the site and the lack of an adequate food supply onsite acts to prevent surrounding wildlife from coming into direct contact with site soils. The vegetation surrounding the site appears quite healthy, and is not measurably affected by the site. Wildlife residing around the site is not expected to be impacted by the site contamination based on evaluation of the RI data, lack of access to the site, and the RA analysis of potential exposure to grazing deer. Due to past onsite dumping activities, onsite vegetation is quite sparse, resulting in the one measurable effect of the site to the local ecology.

Finally, although fringe, forested wetlands exist along the streams surrounding the site, they have been determined not to be impacted based on both visual inspection and the analytical results of stream surface water and sediment samples. Based on consultation with the appropriate State and Federal agencies, no threatened or endangered species are known to exist in the site area, save the occasional transient species.

F) Significant Sources of Uncertainty

The RA for the site is based on conservative assumptions regarding exposure and toxicity. In making estimates of potential exposure and resultant intake, an effort was made to select parameters that overestimate actual exposures, so that the resulting estimate of potential risk also overestimates the actual risk associated with site-related exposures. The assumptions made for this risk assessment are:

- an individual may be exposed to any of these exposure conditions over the course of a lifetime,

- an individual may be chronically exposed to concentrations of contaminants approaching the values used in the RA,

- an individual may be simultaneously exposed to multiple pathways of exposure over the period of a lifetime,

- deliberate overestimation of toxicity indices where questions exist about the actual toxicity or carcinogenicity of a substance or group of substances. (One exception to this conservative methodology is the RA's assumption that the risk associated with exposure to more than one toxicant is additive. In some cases, depending on the chemicals, risk may be greater than additive.)

Several limitations of the RA should also be noted:

- analytical results from only five surface soil samples were available to evaluate the exposure pathways associated with dermal contact, contaminant air releases/fugitive dust emissions, and ingestion of venison associated with deer grazing onsite;

- the method utilized during the RI to identify the depth interval of soil borings for sample analyses may or may not have excluded samples with higher concentrations of semivolatile organic compounds;

- the sampling data utilized in the RA for exposure via use of residential well water is solely comprised of volatile organic analytical results collected under the Consent Order between EPA and CLTL. For this reason, exposure of residents to other chemicals associated with site soils, such as semivolatile compounds and tentatively identified compounds (TICs), was not determined. Results from the one round of sampling of residential wells for semivolatile organic analyses were not used based on the limited data set for these compounds;

- the use of monitoring data, single concentration values, and screening level models (especially in the air and grazing deer exposure scenarios) all present a measure of uncertainty when estimating one's exposure to site contaminants;

- the RA is based on conditions of no action at the site. Protective measures instituted at the site, including the installation of a fence around the site and provision of point-of-entry carbon treatment units to homes with well water exceeding MCLs, results in risks considerably lower than that predicted in this RA.

G) <u>Conclusions of the Risk Assessment</u>

The results of the calculations performed in the RA using the aforementioned exposure routes indicate that the estimate of <u>most probable risk</u> associated with all routes of exposure, except the Hypothetical Residential Use of Monitoring Well (or "Onsite") Groundwater, is within EPA's range of acceptable risk. The estimate of <u>maximum or worst case risk</u> exceeds EPA's range for two exposure routes; (1) the Hypothetical Residential Use of Onsite Groundwater and (2) the more realistic and actual Residential Use of Offsite Groundwater.

Following is a condensed table of the <u>lifetime</u> carcinogenic risks calculated for each exposure scenario:

Table 13

Exposure Route	Most Probable	Worst Case
Residential Use of Offsite Groundwater	1×10^{-5}	3×10^{-4}*
Contact and Ingestion of Onsite Surface Soils	9×10^{-6}	2×10^{-5}
Deer Meat Ingestion	5×10^{-6}	1×10^{-5}
Recreational Use of Spring Water at Campground	3×10^{-8}	3×10^{-8}
Inhalation of Dust and Vapor from Onsite Soils	5×10^{-6}	1×10^{-5}
TOTAL OF ALL "CURRENT" EXPOSURES	3×10^{-5}	4×10^{-4}*
Hypothetical Residential Use of Monitoring Well Groundwater	1×10^{-3}*	2×10^{-2}*

* outside of EPA's acceptable risk range

A conservative approach to establishing the values listed above was used. The RA assumed that the site was not fenced, that point-of-use carbon systems were not in place, and that there is no vegetative soil cover over the former lagoon area. "Surface" soils are defined as soils from 0 to 2 feet below grade. Due to a lack of sufficient hydrogeologic data, the RA was not designed to predict the future risk associated with residential water use <u>if</u> the relatively highly contaminated groundwater below the site were to migrate to residential wells.

The exposure route, "Hypothetical Residential Use of Monitoring Well Groundwater", gives an indication of the carcinogenic risk which would be posed by use of groundwater directly below and adjacent to the site. It has not been determined when and if this contaminated groundwater, at or near to the concentration levels found below the site, could reach residential wells. Using a conservative approach to public health protection, EPA assumed that groundwater contaminant concentrations approaching the levels below the site would ultimately reach residential wells if either the pollutant source or contaminated groundwater is not contained or remediated.

In addition to carcinogenic risks, the RA calculated risks to humans of contracting non-carcinogenic health effects from substances associated with the site using the same identified exposure routes. The results of these calculations for non-carcinogenic health effects were below the EPA guideline of 1.0 for children and adults for all exposure scenarios except both the most probable and maximum Hypothetical Use of Onsite Groundwater scenarios. These results suggest that exposure to non-carcinogenic chemicals at the site is not anticipated to result in adverse health effects under the current conditions of exposure. As stated above, however, it implies that groundwater contaminants found at levels directly below and adjacent to the site could pose non-carcinogenic health effects to users. Therefore, if groundwater contaminant concentrations at or approaching these levels were to migrate to residences, non-carcinogenic health effects would be expected.

For the two groundwater exposure scenarios exceeding EPA's carcinogenic and noncarcinogenic guidelines (Residential Use of Offsite and Onsite Groundwater), TCE is the contaminant which poses the greatest carcinogenic risk and chloroform and tetrachloroethene pose the greatest noncarcinogenic risk.

Under the scenario Hypothetical Residential Use of Monitoring Well Groundwater, it should be emphasized that no one is currently using this water. This scenario presents the risk which could be posed if the site were left unaddreseed and the contaminant plume continued to spread.

From an environmental risk perspective, analyses of surface water and sediment samples near the William Dick Lagoons Site do not indicate that these media are currently measurably affected by site-related contamination. Further, except for that of the immediate area of the former lagoons, the assessment made of the local environment did not identify any potentially adverse effects of site-related contamination to the wellbeing of plants and animals. Thus, it appears that the Site has had no persistent adverse effect upon the surrounding ecosystem.

EPA has determined that 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.

VII. Description of Alternatives

The draft Focused Feasibility Study (FFS) discusses the alternatives evaluated for the soil and provides supporting information leading to alternative selection by EPA. EPA's comments to this draft document did not affect EPA's selection process but may effect the design and implementation of the remedy. Both the draft FFS and EPA's comments to the draft are included in the Administrative Record. The index for this administrative record is attached to this ROD in Appendix B.

CERCLA Section 121 requires that the alternative chosen in the ROD meet several criteria. The alternative must protect human health and the environment, be cost effective, and meet the requirements of environmental regulations. Permanent solutions to contamination problems should be developed wherever possible. These solutions should reduce the volume, toxicity, or mobility of the contaminants. Emphasis is also placed on treating the wastes at the Site, whenever possible, and on applying innovative technologies to clean up the contaminants.

The soil clean-up levels listed in Table 1 were used as a basis for the comparison of alternatives for this ROD. These levels were calculated based on the assumption that a vegetative soil cover would be placed over the site after treatment. A vegetative soil cover is defined in this ROD as a layer of soil which will support the germination and propagation of vegetation and will provide dermal protection from the treated soils. The vegetated soil cover will not restrict the infiltration of rainwater or surface water through the soils.

EPA's goal is to restore the site to a condition as close as possible to the pre-disposal conditions within a reasonable cost. Restoration of the site to a state similar to pre-disposal conditions may be achievable if the soil clean-up levels in Table 1 are met. These soil clean-up levels do not take into account the risk of direct contact with the soils for all of the compounds listed because the installation of a the vegetative soil cover and implementation of institutional controls, which are included as part of all of the alternatives listed below, will provide acceptable protection against direct contact with the subsurface soils. Although reducing contaminants in the soil to levels that do not pose an unacceptable direct contact risk is not a requirement of this ROD, if the treatment technology used in this remedy can remediate the soils to the direct contact risk levels provided in Table 2, the site could be used with unrestricted access. If the direct contact risk levels are not met by the remedy, than deed restrictions will need to be implemented so that the the treated soil at the site is not excavated or uncovered.

If the levels listed in Table 1 cannot be obtained by any of the treatment technologies listed below, than a multi-layer cap that will restrict-infiltration of water so that contaminants will not leach into groundwater above an acceptable level will be installed at the site. Therefore, for the remedy described in this ROD, the soil clean-up levels described in Table 1 may be refined during the Remedial Design by incorporating any information generated by any future treatability studies conducted at the Site. In addition, data generated during the hydrogeological study, which is expected to be completed during 1993, may be incorporated into the model to refine the soil clean-up levels to ensure compliance with the MCLs and health-based drinking water concentrations, as described in Section II.

The alternatives evaluated in this ROD for OU 3 are described below. The method and detail of the alternative evaluation differs from that presented in the FFS. Specifically, EPA arranged the separate SVE/BIO alternatives into one alternative and the separate thermal desorption alternatives into one alternative. The SVE/BIO alternative and the thermal desorption alternative described in this ROD outline all of the variations of alternatives in the FFS. In addition, although incineration was screened out of the detailed analysis of alternatives in the FFS, EPA has included it in its evaluation.

All of the costs and implementation times listed in this Proposed Plan are estimates.

The alternatives evaluated for Source Control - Operable Unit 3 are:

Alternative 1: No Action
Alternative 2: Capping
Alternative 3: SVE/BIO with Multi-layer Cap
Alternative 4: Thermal Desorption with Vegetative Soil Cover or Multi-layer Cap
Alternative 5: On-site Incineration with Vegetative Soil Cover

COMMON ELEMENTS: All of the alternatives which were considered, except for the No Action alternative, contain common elements. Prior to remedy implementation, alternatives 2 through 5 will require a minor amount of surface soil sampling in the former lagoon berm borrow area (Figure 2) to determine if a vegetative soil cover is appropriate in this area to limit direct contact with soils. Because only a limited number of surface soil samples were obtained during the RI from the former lagoon berm borrow area for evaluation of the direct contact exposure scenario, additional sampling is required. The remediation design work for Alternatives 2 through 5 will delineate those areas of the site requiring source control activities, specifically, the former lagoon area and those areas requiring only a vegetative soil cover. Based on the sampling performed, the subsurface soil in this area may require treatment as described in Alternatives 2 through 5. This treatment will be performed as part of this ROD.

Because a cap or cover would be installed in Alternatives 2 through 5, long term monitoring and maintenence will be required. The cap or cover shall (1) provide dermal protection from the treated soils; (2) support the germination and propagation of vegetative cover; and (3) compact well and be stable when dry. The cap or cover shall be maintained for 30 years.

Alternatives 4 and 5 require excavation of contaminated soils. Because of the high levels of VOCs in the soils, excavation will need to be performed under controlled conditions to reduce the risks to workers and nearby residents. The risks associated with the excavation will be determined during the remedial design phase. A preliminary risk assessment for the air emissions from excavation was performed by EPA's toxicologist. Air emission rates were calculated by personnel in EPA's Region III Air, Radiation, and Toxics Division. The air emission model report and the preliminary risk assessment are attached to this ROD in Appendix C. Results from this preliminary risk assessment indicate that the potential carcinogenic risk to a young child exposed to air emissions of TCE for 90 days, which is the predicted duration of soil remediation, is 2.77E-06. This is within the EPA's generally acceptable carcinogenic risk range of 1.0E-06 to 1.0E-04. These values are preliminary and may be refined during the remedial design. If calculations performed during the remedial design indicate an unacceptable risk, than the risk will be mitigated. Possible options for mitigating the risks include continued operation of the SVE system until VOC levels are reduced to an acceptable level, staging the excavation so that only a small amount of soil is excavated at a time, excavating during the winter months or containing the excavation process under a tent-type enclosure. In addition, appropriate monitoring will occur to ensure that any excavation emissions do not present a health threat.

Alternative 1: No Action

- Capital Cost: $0
- Annual Operation and Maintenance (O&M): $0
- Present Worth: $0
- Time to Implement: None

The NCP requires that the "no action" alternative be evaluated for each site unit in order to establish a baseline for comparison. Under this alternative, EPA would take no action with respect to the contaminated soils at the former lagoons. This approach would allow contaminants to continue to leach into the groundwater thereby preventing an effective groundwater remediation program. It would also permit access to the site which would increase the risk of direct contact with subsurface contaminated soils. Any future use of the site property which disturbs site soils would present an inhalation and direct contact threat.

The no action alternative is not protective of human health and the environment and, therefore, will not be considered further in this ROD.

Alternative 2: Capping

- Capital Cost: $500,000 to $850,000
- Annual O&M: $19,600 to $32,600
- Present Worth: $800,000 to $1,350,000
- Time to Implement: 14 months

This alternative involves multi-layer capping of the lagoon area soils. A multi-layer cap is defined in this ROD as an upper vegetative layer (topsoil) underlain by a drainage layer (sand) over a low permeability layer (i.e., natural soils, admixed soils, a synthetic liner or membrane, or any combination of these materials). The area to be capped is expected to be approximately 2.2 acres, although the actual extent of the cap will be determined during design. The total area of the cap will be somewhat larger than the area of contaminated soil to prevent any lateral infiltration of precipitation. The cap may need to extend over portions of the former lagoon borrow area as determined by the sampling described in the Common Elements section, above. The cap would be designed to conform to the substantive performance standards outlined in the Pennsylvania closure regulations set forth in 25 Pa. Code 265.110-.119 and the landfill closure regulations at 265.310 which are relavant and appropriate regulations..

Because the contaminated soil would not be removed or treated under this alternative, the soil clean-up levels listed in Table 1 would not be met. However, the cap would be designed to eliminate direct contact with the soils. The cap would also limit the amount of rainwater infiltration through the contaminated soils so that the leaching of contaminants from the soil to the groundwater is reduced to levels which would not result in groundwater contamination above MCLs or health-based levels.

The range in O&M costs reflects the use of either an "alternative" cap or a "RCRA" cap. CLTL defined a so-called "RCRA" cap in the focused feasibility study as an upper vegetative layer (topsoil) underlain by a drainage layer (sand) over a low permeability layer (i.e., natural soils, admixed soils, a synthetic liner, or any combination of these materials). The "alternative" cap, as defined by CLTL in the focused feasibility study, substitutes a synthetic membrane for the low permeability layer used in the "RCRA" cap definition, above. Using the mathematical models that were developed during the focused feasibility study, the specific cap structure will be determined during the remedial design.

Institutional controls (i.e., deed restrictions) would need to be implemented under this alternative so that access to the property is limited. The integrity of the cap would be maintained to ensure adequate protection against direct contact with the soils and infiltration of surface and rain water.

Alternative 3: SVE/BIO with a Multi-layer Cap

- Capital Cost: $1,700,000 to $4,100,000
- Annual O&M: $280,000
- Present Worth: $2,700,000 to $5,100,000
- Time to Implement: 33-35 months (+3-5 years of operation)

This alternative involves the in-situ treatment of approximately 24,000 cubic yards of site soil via Soil Vapor Extraction (SVE) and Bioremedition (BIO). This estimated volume was determined during the Focused Feasibility Study by assuming that the contaminated soil extends out to a distance halfway between each contaminated sample location and the closest "clean" boring. "Clean" borings are defined as those with chemical constituent levels below clean-up levels defined in Table 1. SVE consists of a network of air withdrawal (or vacuum) wells installed throughout the contaminated soils. The wells are connected to a vacuum pump system to provide continuous air flow through the soil, resulting in the removal or stripping (volatilization) of contaminants from the soil. SVE would be used in conjunction with bioremediation. BIO is the use of indigenous microorganisms to degrade the chemicals in the soils. The addition of air through the soil with the SVE would stimulate bacterial growth. The bioremediation could be enhanced with the addition of nutrients, such as nitrogen and phosphorous. This would be accomplished by spraying a water solution containing the nutrients over the area to be treated. The types of chemicals degraded depends on the types of organisms which are naturally occurring in the soil.

During the operation of this remedy, air emissions controls would be required to meet appropriate State and Federal hazardous waste and air standards. Any contaminants generated by these emissions controls would be disposed of off-site in accordance with Resource Conservation and Recovery Act (RCRA) requirements.

The SVE/BIO remedy would be concluded at the point in time when no significant reduction in VOC and SVOC soil concentrations result after continuous operation. A statistically valid confirmatory soil sampling program would be established during the remedial design to determine the endpoint of remediation.

Based on the results of the SVE/BIO treatability study conducted in August 1992 and SVE studies performed at similar sites, it is not anticipated that this technology can meet the soil clean-up levels listed in Table 1, which were based on installation of a vegetative soil cover over the area containing the treated soils once the soil has been remediated. Therefore, after completion of the SVE/BIO process, it is anticipated that a multi-layer cap (similar to the "alternative" or "RCRA" cap, as described in alternative 2), would have to be placed on the site. The cap would be designed to eliminate direct contact with the contaminants remaining in the soils. The cap would also limit the amount of rainwater infiltration through the remaining contaminated soils so that the leaching of contaminants from the soil to the groundwater is reduced to levels which do not exceed MCLs or health based levels. A final decision on the type of multi-layer cap would depend on the success in achieving the soil remediation goals. For costing purposes, an "alternative" cap, as described under alternative 2, is proposed. The cap would be designed to conform to substantive Pennsylvania closure regulations set forth in 25 Pa. Code 265.110-.119 and the landfill closure regulations at 265.310 which are relevant and appropriate regulations.

The results of the SVE/BIO treatability study indicate that significant quantities of VOCs can be removed from the soils. Approximately 610 pounds of VOCs were removed during the six week continuous operation of the treatability study. Good subsurface air flow conditions were observed during the treatability study. Because the treatability study was only operated for six weeks, it did not conclusively demonstrate that bioremediation could be effective in degrading the VOCs and SVOCs in the soils.

Even though the SVE/BIO treatability study showed that this technology removed large amounts of VOCs, it did not confirm that the soil cleanup criteria could be met, especially with respect to SVOCs. Because the lagoon soils are not uniform, it is possible that the air flow during SVE/BIO remediation would short-circuit throughout the subsurface. This short-circuiting may result in minimal treatment of subsurface areas which have a low permeability.

As described in the Site Characteristics section, thin layers of a black, sticky, fibrous substance and materials classified as "spongy", "rubber-like", "dry, matted and latex-like" were identified in the three former lagoons during the RI and treatability study. The impact of these layers on the operation of the SVE/BIO system was not analyzed during the treatability study. According to CLTL, an additional 6-12 month pilot study would be necessary during the remedial design to determine how this layer would affect SVE/BIO remediation. CLTL proposed that if this layer could not be remediated with SVE/BIO, this material should be excavated and treated by either thermal desorption or incineration. EPA agrees that additional studies would be necessary during the remedial design to determine the impact of these materials on the SVE/BIO remediation. These materials could adversely impact a full-scale SVE/BIO remediation. The type of cap installed under this alternative if thermal desorption or incineration of the tar-like material is necessary would be determined during the remedial design.

The range in costs listed above reflect the possible need for thermal treatment (either off-site incineration or on-site thermal desorption) of the tar-like layer identified in former lagoon area after operation of the SVE/BIO system. The need for thermal treatment of the tar-like layer and the type of thermal treatment required would be assessed during a pilot study conducted during the remedial design.

Institutional controls (i.e., deed restrictions) would be implemented under this alternative so that access to the property is limited. The integrity of the cap must be maintained to ensure adequate protection against direct contact with the soils and infiltration of surface and rain water.

Alternative 4: Thermal Desorption with Vegetative Soil Cover or Multi-layer Cap

- Capital Cost: $7,500,000 to $9,000,000
- Annual O&M: $20,000
- Present Worth: $7,800,000 to $9,300,000
- Time to Implement: 25 months

This alternative involves the excavation and treatment of approximately 24,000 cubic yards of site soil via thermal desorption. This estimated volume was determined during the Focused Feasibility Study by assuming that the contaminated soi extends out to a distance halfway between each contaminated sample location and the closest "clean" boring. "Clean" borings are defined as those with chemical constituent levels below cleanup levels defined in Table 1. Thermal desorption generally consists of a rotary dryer designed to accept contaminated soils which are then heated to a sufficient temperature to volatilize the contaminants from the soil into the air. The rotary dryer rotates to allow for proper mixing and the contaminated air stream is treated in a control system consisting of a fabric filter for particulate removal, a wet scrubber for acidic gas conversion, and a carbon adsorption system for capture of the contaminants. Excavation of contaminated soil and replacement of treated soil would be performed using conventional construction equipment. Soils would be stockpiled onsite before loading into the rotary dryer for treatment.

Based on the nature of the operations leading to the generation of the waste materials at the site, EPA Region III has determined that the contaminated soil, prior to treatment, either constitutes or must be managed as a hazardous waste bearing the hazardous waste identification numbers F001 through F005 under State and Federal law. EPA anticipates that following treatment, the soil will no longer "contain" hazardous wastes and thus need no longer be managed as a hazardous waste for purposes of Federal law. EPA also anticipates that for State law purposes, the levels of contaminants in the soils after treatment will be such that the soils may be "delisted" and no longer considered a hazardous waste under State law. (Any such "delisting" determination will be made by EPA in accordance with the substantive requirements of 25 Pa. Code Section 260.22, and the applicable requirements of CERCLA and the National Contingency Plan, 40 C.F.R. Part 300.). It is not expected that the treated soil will constitute "contaminated soil" for the purposes of PA's Residual Waste Management Regulations, 25 Pa. Code Ch. 287 **et. seq.**

After completion of the thermal desorption process and replacement of treated soils, a vegetative soil cover or multi-layer cap will be placed on the site. The cap or cover will be designed to eliminate direct contact with the any contaminants remaining in the soils. The thermal desorption system will be designed to reduce the levels of contaminants in the soil so that infiltration of rainwater through these soils will not leach contaminants into the groundwater above MCLs or health based levels, as describe in Section II. Soil levels which meet these criteria are listed in Table 1. A final decision on the type of cap or cover will depend on the success in achieving the soil remediation goals. If, during the thermal desorption treatability study, EPA determines that the soil clean-up levels listed in Table 1 are not achievable, a multi-layer cap (as described under Alternative 3) designed to limit the amount of rainwater and surface water infiltration through the contamination remaining in the soils so that the leaching of contaminants from the soil to the groundwater is reduced to MCLs or health based levels, will be installed.

The success in obtaining the soil remediation goals listed in Table 1 will be determined by performing a thermal desorption treatability study during the remedial design. The soil clean-up levels may need to be modified based on the results of the thermal desorption treatability study. Any such modification shall be made in accordance with the National Oil and Hazardous Substance Pollution Contingency Plan ("NCP"), 40 CRF Part 300, and applicable agency guidance.

For costing purposes for this ROD, an "alternative" cap, as described under Alternative 2, is proposed. It is possible, however, that thermal desorption could reduce the soil concentrations to a level which would require only a vegetative soil cover, as described in Table 1. If only a vegetative soil cover was required, the present worth cost of this remedy would be reduced by approximately $620,000.

As in Alternative 3, air emissions from the treatment operation would be controlled to meet appropriate State and Federal standards. Any emission control residues generated by the treatment system would be disposed of off-site in accordance with federal and state waste disposal requations. Any wastewaters generated by any treatment component of the thermal desorption system, including a scrubber, would be disposed of off-site in accordance with applicable or relevent and appropriate state and federal waste disposal regulations.

Wastewaters generated during the thermal desorption process would be stored on-site in containers or a tank and be disposed off-site in accordance with federal and/or state hazardous waste storage and disposal requirements. Treated off-gases would be released at the site after passage through an emissions control system and would be required to meet State and Federal air standards. Off-site disposal of treatment residuals, if any, will comply with federal and/or state hazardous waste disposal regulations. Operation of the incinerator, if required, would be comply with the standards set forth in PA Code 264.340 through 264.353.

As stated in the **Common Elements** section above, the excavation process will need to be controlled to reduce the risks to workers and nearby residents posed by the emission of VOCs. Appropriate monitoring will occur to ensure that any excavation emissions do not pose a health threat.

Based on thermal desorption remediation performed at similar sites with similar contamination, EPA believes that the thermal desorption unit will be able to process the tar-like materials found in the former lagoons. Because of the possibility that the tar-like layer cannot be treated by thermal desorption, EPA considered the possibility of off-site incineration of the tar-like layer to meet the soil clean-up goals. The range in costs listed above reflects the possible need for off-site incineration of the tar-like layer identified in the former lagoon area. The need for incineration of the tar-like layer will be assessed during the remedial design. If the thermal desorption treatability study indicates that off-site incineration of the tar-like material is necessary, the off-site incinerator must comply with all Federal and State applicable or relevent and appropriate requirements for the operation of an incinerator.

Depending on the soil clean-up level that is achieved at the Site, institutional controls (i.e., deed restrictions) may need to be implemented so that access to the property is limited. The integrity of the cap or vegetative soil cover must be maintained to ensure adequate protection against direct contact with the soils and infiltration of surface and rain water.

Alternative 5: Onsite Incineration With Vegetative Soil Cover

Estimated Capital Cost: $19,500,000
Estimated Annual O&M: $0
Estimated Present Worth: $19,500,000
Time to implement: 28-34 months

This alternative achieves source control by excavating an estimated 24,000 cubic yards or more of contaminated soil and incinerating it onsite. This estimated volume was determined during the Focused Feasibility Study by assuming that the contaminated soil extends out to a distance halfway between each contaminated sample location and the closest "clean" boring. "Clean" borings are defined as those with chemical constituent levels below cleanup levels defined in Table 1. Incineration, or thermal destruction, uses high temperature oxidation under controlled conditions to degrade soils containing organics into by-products that include carbon dioxide, water vapor, inert ash, and hydrogen chloride gas (if chlorinated organics are present in the soil). Soils would be stockpiled onsite before loading into the incinerator for treatment. Once all soils are incinerated, the remaining ash along with clean fill will be deposited onsite, graded and revegetated to restore the site to a natural condition.

EPA expects that the characterization and management of the residual ash under the State hazardous and residual waste regulations will be equivalent to that accorded the treated soil in Alternative 4. It is anticipated that the ash generated as a result of the incineration process will meet the soil clean-up levels listed in Table 1. After the ash and clean fill are deposited on site, a vegetative soil cover would be installed to eliminate direct contact with the any contaminants remaining in the soils. The incineration system will be designed to reduce the levels of contaminants in the soil so that infiltration of rainwater through these soils will not leach contaminants into the groundwater above MCLs or health based levels.

Wastewaters generated during the incineration process would be stored on-site in containers or a tank and be disposed off-site in accordance with federal and/or state hazardous waste storage and disposal requirements. Treated off-gases would be released at the site after passage through an emissions control system and would be required to meet State and Federal air standards. Off-site disposal of treatment residuals, if any, will comply with federal and/or state hazardous waste disposal regulations. Operation of the incinerator would be comply with the substantive standards set forth in PA Code 264.340 through

264.353.

As stated in the **Common Elements** section above, the excavation process will need to be controlled to reduce the risks to workers and nearby residents posed by the emission of VOCs. Appropriate monitoring will occur to ensure that any excavation emissions do not pose a health threat.

VIII. Summary of Comparative Analysis of Alternatives

Each of the remedial alternatives for this operable unit has been compared and evaluated with respect to the nine evaluation criteria in the NCP, 40 CFR Part 300.430(e)(9). The nine criteria are listed in Figure 3. The nine criteria are:

A. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether 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.

The "No Action" alternative is not protective of human health and the environment because the site would be open to public access and, therefore, the risk of exposure to VOCs via ingestion or dermal contact of subsurface soil, if excavated or uncovered, or inhalation of VOC vapors from the subsurface soil, if excavated or uncovered, would not be addressed. The "No Action" alternative would not prevent the continued leaching of contaminants from the soil to the groundwater. Therefore, the "No Action" alternative will not be considered further in this Proposed Plan.

Alternatives 2 through 5 would protect human health by reducing the leaching of contaminants from soil to groundwater. Installation of a vegetative soil cover or multi-layer cap and implementation of institutional controls under Alternatives 2 through 5 would provide additional protection against direct contact with the VOCs and SVOCs in the subsurface soil.

Alternatives 3, 4 and 5 would provide more protection of human health and the environment than Alternative 2 by not only preventing direct contact and reducing the level of contaminants leached to groundwater but by also reducing and controlling the risk of exposure to source contaminants through treatment of the soils in the former lagoons.

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

Section 121(d) of CERCLA requires that remedial actions at

CERCLA sites at least attain legally applicable or relevant and appropriate federal and State standards, requirements, criteria, and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, or other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental law or facility siting laws that specifically address hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA Site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental law or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location or circumstance at a CERCLA Site, address problems or situations sufficiently similar to those encountered at the CERCLA Site that their use is well suited to the particular Site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

ARARs may relate to the substances addressed by the remedial action (chemical-specific), to the location (location-specific), or the manner in which the remedial action is implemented (action-specific).

The Applicable and Relevant or Appropriate Requirements for the alternatives developed in this ROD are listed below.

Alternatives 2 through 5 would meet the respective ARARs for the Federal and State environmental laws for this action. The ARARs for this action and the alternatives which are affected by each alternative are described below.

EPA recognizes that under the Commonwealth of Pennsylvania's regulations governing remediation of groundwater contaminated by hazardous wastes, the standard for remediation is the achievement of background levels for such hazardous wastes (see 25 Pa. Code §264.100(a)(9). This standard is a State ARAR for CERCLA remedial actions requiring remediation of groundwater. Although the remedy selected in this ROD for Operable Unit 3 does not require the remediation of groundwater contamination, EPA recognizes that the cleanup levels selected for contaminated soils at the Site in this ROD may impact groundwater at the Site. At such time as a final groundwater remedy is selected for the Site, the State's groundwater remediation standard, if effective at that time, will be considered an ARAR which must be met by the remedy unless waived in accordance with Section 121(d)(4) of CERCLA, 42 U.S.C. (d)(4).

Chemical Specific ARARs

a. The Resource Conservation and Recovery Act (RCRA) regulations at 40 CFR Part 264 Subpart AA- Air Emission Standards for Process Vents is relevant and appropriate for Alternatives 3, 4, and 5 because the SVE, thermal desorption and incinertion have a stack vented to the atmosphere. The total organic emissions from all affected process vents at the Site are required to be below 1.4 kg/hr and 2800 kg/hr or reduce, by use of a control device total organic emissions from all affected process vents at the facility by 95 weight percent under this regulation.

b. The emissions from the treatment system must comply with the special permit requirements for sources located in or siginificantly impacting nonattainment areas set forth at Pa. Code §127.61-73. These requirements are applicable to Alternatives 3, 4, and 5.

c. The emissions from the treatment system must comply with the National Ambient Air Quality Standards (NAAQS) as implemented under the Pa. State Implementation Plan ("SIP"). This regulation, which deals with the release of volatile organic emissions, applies to this action because the site lies in an ozone non-attainment area. Alternatives 3, 4 and 5 must comply affected by this ARAR.

d. The emission standards set forth in 40 CFR Part 61, Subpart F and Subpart J which regulate vinyl chloride and benzene emissions under the Clean Air Act, Section 112, 42 U.S.C. §7412 and are known as National Emission Standards for Hazardous Air Pollutants (NESHAPs) are relevant and appropriate requirements for Alternatives 3, 4 and 5.

2. Location Specific ARARs: There are no location specific ARARs for this Operable Unit at the Site.

3. Action Specific ARARs:

a. The requirement in 25 PA Code §127.12(a)(5) that air emissions be reduced to the minimum obtainable levels through the use of best available technology (BAT), as defined in 25 PA Code Section 121.1, will apply to Alternatives 3, 4 and 5.

b. 25 PA Code §123.1, which prohibits the emission of fugitive air contaminants and regulates emissions during construction activities, is applicable to Alternatives 3, 4 and 5.

c. 25 PA Code §123.2, which prohibits the emission of fugitive air contaminants from crossing the facility's property line, is applicable to Alternatives 3, 4 and 5.

d. 25 PA Code §123.31, which prohibits the emission of malodorous air contaminants from crossing the property line, is applicable to Alternatives 3, 4 and 5.

e. 25 PA Code §123.41, which prohibits the emission of visible emissions of greater that 20% opacity, is applicable to Alternatives 3, 4 and 5.

f. RCRA regulations 25 Pa. Code §262.11 (a) and (b) (this section establishes standards for generators of hazardous waste and relates to hazardous waste determination), §262.20 (relating to manifesting requirements for off-site shipments of spent carbon or other hazardous wastes), and §262.30-33 (relating to pretransport requirements) are applicable to Alternatives 3, 4 and 5.

g. With respect to Alternative 2 and Alternative 3 (assuming the cleanup levels cannot be attained as part of that remedial alternative), the substantive closure requirements set forth at 25 PA. Code §§265.110-119 and the landfill closure requirements set forth at 25 Pa. Code §265.310 are relevant and appropriate; the groundwater monitoring requirements at 25 Pa. Code §§264.90-110 are relevant and appropriate. To the extent that the treated soils in Alternative 4 or residual ash in Alternative 5 constitute hazardous wastes, the requirements of 25 Pa. Code Sections 264.13-15 (General Facility Standards); 264.31, 37 (PPC Plan and Emergency Procedures); 264.90, .91, .97, and .98-.100 (Groundwater Monitoring); 264.111, .114, and .117-.119 (Closure and Postclosure); and 264.301, .302, .303, .305, .309, and .310 (Landfills) would be applicable to the design, construction and maintenance of the area into which the treated soils or residual ash are deposited. To the extent that the treated soils or residual ash are not hazardous wastes due to application of the "contained-in" rule under federal law and delisting under State law, they may nevertheless constitute "contaminanted soil" for the purposes of PA's Residual Waste Management Regulations. In that event, management of those wastes may be subject to the substantive requirements of Pennsylvania's residual waste regulations to the extent required under 25 Pa. Code Section 287.101(d).

h. With respect to Alternative 3, the container storage standards set forth at 25 Pa. Code §§264.171-180 and the substantive closure requirements set forth at 25 Pa. Code §§264.110-119 are applicable to the container storage of contaminants collected by the air emissions controls unless they are stored on-site in accordance with 25 Pa. Code §262.34; the regulations set forth at 25 Pa. Code §263.10-263.32 are applicable when the air emission control residues are transported off-site; if thermal desorption and/or incineration are utilized as part of this remedy, the ARARs set forth in paragraphs i. and j., infra, respectively, are applicable or relevant and appropriate, as indicated; the groundwater monitoring requirements at 25 Pa. Code 264.90-100 are relevant and appropriate.

i. With respect to Alternative 4, the container storage standards set forth at 25 Pa. Code §§264.171-180 and the closure requirements set forth at 25 Pa. Code §§264.110-119 are applicable to the container storage of contaminants collected by the air emissions controls unless they are stored on-site in accordance with 25 Pa. Code §262.34; the regulation set forth at 25 Pa. Code §263.10-263.32 are applicable when the air emission control residues are transported off-site; 40 CFR §264, Subpart X, is applicable to the operation, closure and post-closure care of the thermal desorption unit; the waste pile design, operation and closure requirements set forth at 25 Pa. Code §§264.250-.258 are applicable to the stockpile of excavated soil; the substantive closure and post-closure requirements set forth at 25 Pa. Code §§264.110-119 are applicable to the stockpile of excavated soil; the container management requirements at 25 Pa. Code §§264.171-180 or the tank standards at 25 Pa. Code §§264.190-199 are applicable to the on-site storage of wastewater dependent upon how the wastewaters are stored; the substantive closure and post-closure requirements set forth at 25 Pa. Code §264.110-119 are applicable to the closure of the units used to store wastewater unless the wastewater is stored on-site in accordance with 25 Pa. Code §262.34; the regulations set forth at 25 Pa. Code 263.10-263.32 are applicable when the wastewater is transported off-site; if off-site incineration of the tar-like material is necessary, the substantive standards of 25 Pa. Code §262 relating to generators of hazardous waste apply ot the tar-like material and the container or tank storage standards set forth at 25 Pa.

Code §264.171-180 and/or §264.190-.199 for storage of the tar-like material prior to transport for off-site incineration are applicable; the substantive requirements of 25 Pa. Code 265.373, .375, .377, and .381 are relevant and appropriate to the operation and closure of the thermal desorption unit (to the extent that such requirements are more stringent than those imposed by 40 CFR Part 264, Subpart X).

j. With respect to Alterative 5, the container storage standards set forth at 25 Pa. Code §§264.171-180 and the substantive closure requirements set forth at 25 Pa. Code §§264.110-119 are applicable to the container storage of contaminants collected by the air emissions controls unless they are stored on-site in accordance with 25 Pa. Code 262.34; the operation and closure standards for incinerators set forth at 25 Pa. Code 264.340-353 are applicable; the substantive general closure standards set forth at 25 Pa. Code 264.110-119 are applicable to the closure of the incinerator unit; the waste pile design, operation and closure requirements set forth at 25 Pa. Code §§264.250-258 are applicable to the stockpile of excavated soil; the container management requirements at 25 Pa. Code §§264.171-180 and/or the tank standards at 25 Pa. Code §§264.190-199 are applicable to the on-site storage of wastewater dependent upon how the wastewaters are stored; the substantive closure and post-closure requirements set forth at 25 Pa. Code §264.110-119 are applicable to the closure of the units used to store wastewater unless the wastewater is stored on-site in accordance with 25 Pa. Code §262.34; the regulations set forth at 25 Pa. Code 263.10-263.32 are applicable when the wastewater is transported off-site; the provisions of RCRA 3004(o)(1)(B), 42 U.S.C. §6244(o)(1)(B), and the regulations thereunder, minimum technology requirements, apply to operation of the incinerator.

k. DOT regulations 49 CFR Parts 107 (Hazardous Material Program Procedures) and 171.1-172.604 apply to Alternatives 3, 4, and 5 for the transport of hazardous materials.

l. The land disposal restrictions as described in RCRA 40 CFR Part 268 are applicable since the remedy involves the excavation and treatment of the soils and the replacement of treated soils which were "hazardous wastes" at the point of generation into a land disposal unit at the Site. The untreated soils contain F001-F005 hazardous wastes and, therefore, the treated soils or residual ash must meet, at a minimum, the concentration levels listed in 40 CFR Part 268.43. Because the soil clean-up levels for some of the chemicals listed in Table 1 are more stringent than the LDR levels, the levels listed in Table 1 shall be met prior to placement. For chemicals which do not have a calculated clean-up level as described in Table 1, the levels listed in 40 CFR Part 268.43 shall be met. Alternatives 4 and 5 are affected by this ARAR.

m. The provision of Section 121(a)(3) of CERCLA, 42 U.S.C. §9621(d)(3), apply to the off-site disposal of any hazardous substance under Alternatives 3, 4, and 5.

4. To Be Considered

a. The policies set forth in PADER's "Groundwater Protection Strategy", February 1992, and the MCLs, and risk-based drinking water concentrations are "to be considered" (TBC) in developing soil clean-up levels. Soil clean-up levels were developed using a combination of the fate and transport mathematical models, HELP and PRZM as well as a groundwater mixing zone model. The groundwater concentration input data into this model was based on MCLs and risk-based drinking water concentrations. For those chemicals without an MCL or with a risk-based drinking water concentration greater that 10 pppb, a groundwater concentration of 10 ppb was used. Soil clean-up TBCs are listed in Table 1. These levels may be refined during the Remedial Design by incorporating data generated during the hydrogeological study which is currently ongoing to ensure compliance with MCLs and risk-based drinking water concentrations. Alternatives 2, 3, 4, and 5 are affected by this TBC.

b. The policies set forth in EPA's "Revised Procedures for Planning and Implementing Off-Site Response Actions", (November 13, 1987) is a TBC for Alternatives 3, 4, and 5.

<u>C. Long-Term Effectiveness and Permanence</u>

Long-term effectiveness and permamence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once clean-up goals have been met.

Alternatives 2 through 5 require long-term maintenance of a vegetative soil cover or multi-layer cap. Because Alternative 5 would require only a vegetative soil cover, only routine mowing would be required. The cap installed under Alternative 2 would probably require the most maintenance because it would be the most complex cap. Not only would it require routine mowing but inspections and, possibly repairs, to the cap would be necessary. In addition, monitoring of surrounding wells may be necessary to confirm that the cap is operating effectively. Although it is not known what type of cap would be required for Alternatives 3 and 4, it is anticipated that the cap installed under Alternative 4 would be less complex than the cap for Alternative 3 and, therefore, may require less maintenance. Alternative 4 is expected to require a less complex cap than alternative 3 because more contaminants will be removed from the soil under Alternative 4. It is possible that only a vegetative soil cover would be required for Alternative 4.

The direct contact risk will be eliminated under Alternatives 2 through 5 because a vegetative soil cover or multi-layer cap will be installed. The risk associated with contaminant migration to groundwater would be virtually eliminated under Alternative 5 because the contaminants would be destroyed. If the cap was not installed or maintained properly, Alternative 2 would exhibit the highest risk of contaminant migration to groundwater because the contaminants would remain in the soil. If operation and maintenance was not implemented properly, the risk of contaminant migration to groundwater for Alternatives 3 would be greater than that for Alternative 4 because more contaminants are expected to remain in the subsurface under Alternative 3.

D. Reduction of toxicity, mobility, or volume of the contaminants through treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies a remedy may employ.

Alternatives 3, 4 and 5 are the only alternatives which would result in a reduction of the toxicity, mobility and volume of contaminants in the soil through treatment. Alternatives 3, 4, and 5 would reduce the level of VOCs in the soils. Alternatives 4 and 5 would also reduce the levels of SVOCs in the soil. Alternative 3 may reduce the levels of SVOCs in the soil, although the treatability study did not determine the effectiveness of this reduction. Alternative 5 destroys the contaminants in the immediate environment. Because previous studies have confirmed that thermal desorption can remove site-related VOCs and SVOCs, Alternative 4 is expected to be more effective than Alternative 3 in reducing the contaminants at the Site. Alternatives 3 and 4 would remove contaminants from the immediate environment, although disposal of the residual waste (i.e. spent carbon, pure product, wastewater, etc.) or destruction of the extracted contaminants in a safe and effective manner would be required. Alternative 2 would not reduce the toxicity, mobility or volume of the contaminants through treatment. Under Alternative 2, the contaminants will remain in the soil and a cap will be installed over the contamination.

E. Short Term Effectiveness

Short term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy until clean-up levels are achieved.

Alternative 4 could be implemented within 25 months of the ROD. This time frame includes a 6-month treatability study. Alternative 2 would take the shortest amount of time to implement (19 months). Alternative 3 would take the longest time to implement because a 6 to 12 month treatability study would be required prior to remedy implementation and an SVE/BIO operation and maintenance period of 3 years, or possibly more, is expected. Alternative 5 is expected to take 21 months to implement.

Alternative 2 would be the alternative least likely to impact the community, workers and the environment during construction and implementation because removal of hazardous substances would not occur. The short term risks associated with Alternatives 4 and 5 would be greater than Alternative 3 because these alternatives would involve the excavation of soils. If the excavation is implemented under controlled conditions and if worker safety procedures are properly adhered to, these risks would be minimal.

F. Implementability

Implementability is the technical and adminstrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

Alternatives 3, 4 and 5 would require initial testing of the treatment system operation and periodic sampling to ensure efficient operation of the treatment system.

Alternative 2 is the most easily implemented alternative because no treatment is required. The treatment technologies used in Alternatives 4 and 5 are well established and have been proven reliable at similar sites.

Although the soil vapor extraction portion of Alternative 3 has been proven at this Site and other Sites to remove significant quantities of VOCs, the heterogeneity of the soils at this Site could limit its effectiveness. "Tar-like", "spongy", and "latex" layers have been identified at various depths in the former lagoons. These layers could limit air flow through the soil. If additional studies show that these layers do reduce the effectiveness of the technology, these layers may need to be excavated and treated using a different technology, such as thermal desorption or incineration. Due to time constraints on the treatability study, bioremediation was not proven effective in the removal of SVOCs. These factors could delay and increase the difficulty in implementation of the remedy.

Services and materials are readily available for all alternatives.

G. Cost

Cost includes estimated capital and operation and maintenance costs as well as present worth costs.

This criteria examines the capital, annual O&M, and present worth costs for each alternative. These costs are presented in the Description of Alternatives section, above. The present worth cost for Alternative 4 is $7,300,000 to $9,000,000. The range provided takes into account the possibility of incineration of the tar-like layer. The lowest cost alternative is Alternative 2 at $800,000 to $1,350,000. The range takes into account the possibility of several types of caps. The present worth cost estimate for Alternative 3 is $2,700,000 to $5,100,000. The range provided takes into account the possibility of thermal desorption or incineration of the tar-like layer. The costs for Alternative 3 are based on a 3-year pilot operation. If an additional two years is necessary for operation, the present worth costs would be increased to $3,100,000 to $5,500,000. The highest cost is for Alternative 5 at $19,500,000.

Because the costs generated are only estimates (-30% to +50%) and are dependent on the type of cap required and the effectiveness of the technology used (which will be determined during the design phase), the difference in costs between Alternative 4 and Alternative 3 may not be significant.

F. State Acceptance

The Commonwealth of Pennsylvania has evaluated and commented on the alternatives presented in this ROD and has initially agreed with the technical remedy selected. The official position of the Commonwealth of Pennsylvania will be documented in the Adminstrative Record for this Site upon receipt.

G. Community Acceptance

Comments received from the public are specifically addressed in the Responsiveness Summary which is attached to this ROD in Appendix A.

Comments received from some community members, including 15 homeowners near the William Dick Lagoons Site and a local remediation contractor, indicate a preference for incineration. The 15 homeowners believe that only incineration can restore the the site to a condition close to its pre-disposal condition. EPA believes that thermal desorption provides acceptable protection of human health and the environment without the additional cost required by incineration.

One potentially responsible party (PRP) indicated a preference for use of soil vapor extraction/bioremediation in conjuction with thermal desorption. The PRP proposed excavating the soils to remove the tar-like materials. The tar-like materials would be treated by thermal desorption and the excavated soils would be treated above ground by SVE/BIO. The remaining contaminated soils in the subsurface would be treated in-situ by SVE/BIO. Given the random locations of the tar-like layers in the former lagoons, EPA believes that the technique used in this proposal may not indentify all of the heterogeneities in the subsurface. Therefore, this proposal may not adequately treat the soils so that only a vegetative soil cover is required over the treated material. In addition, this proposal may not treat the SVOCs to levels which will not impact groundwater above MCLs or health based levels. It is anticipated that this proposal will require a more complex cap (i.e., a multi-layer cap) than a vegatative soil cover. Therefore, the site will not be returned to a condition close to its pre-disposal condition.

IX. Selected Remedy and Performance Standards

A. General Description of the Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria and public comments, EPA has determined that Alternative 4 (Thermal Desorption with a Vegetative Soil Cover or Multi-layer Cap) is the most appropriate remedy for the William Dick Lagoons Site.

This remedy was selected to reduce the chemical concentrations in the soils so that leaching of contaminants into the groundwater will be minimized. Reduction of the source of contamination in the soils is necessary so that it does not continue to impact groundwater above MCLs or health based levels. The soil clean-up goals are listed in Table 1 and were calculated based on mathematical models developed during the Focused Feasibility Study. This alternative will also prevent exposure to the site-related chemicals through inhalation, ingestion, and dermal contact through the installation of a vegetative soil cover or multi-layer cap over the treated soils. Based on current information, Alternative 4 provides the best balance among the alternatives with respect to the nine criteria EPA uses to evaluate each alternative.

Under this alternative, prior to remedy implementation, a minor amount of surface soil sampling will be performed in the former lagoon berm borrow area (Figure 2) to determine if a vegetative soil cover is appropriate in this area to limit direct contact with soils. Because only a limited number of surface soil samples were obtained during the RI from the former lagoon borrow area for evaluation of the direct contact exposure scenario, additional sampling is required. The remediation design work for this alternative will delineate those areas of the site requiring source control activities, specifically the former lagoon area, and those areas requiring a vegetative soil cover.

This alternative involves the excavation and treatment of approximately 24,000 cubic yards of site soil via thermal desorption. This estimated volume was determined during the Focused Feasibility Study by assuming that the contaminated soi extends out to a distance halfway between each contaminated sample location and the closest "clean" boring. "Clean" borings are defined as those with chemical constituent levels below cleanup levels defined in Table 1.

Because of the high levels of VOCs in the soils, excavation shall be performed under controlled conditions to reduce the risks to workers and nearby residents. The risks associated with the excavation shall be determined during the remedial design phase. A preliminary risk assessment for the air emissions from excavation was performed by EPA's toxicologist. Air emission rates were calculated by personnel in EPA's Region III Air, Radiation, and Toxics Division. The air emission model report and the preliminary risk assessment are attached to this ROD in Appendix C. Results from this preliminary risk assessment indicate that the potential carcinogenic risk to a young child exposed to air emissions of TCE for 90 days, which is the predicted duration of soil remediation, is 2.77E-06. This is within the EPA's generally acceptable carcinogenic risk range of 1.0E-06 to 1.0E-04. These values are preliminary and may be refined during the remedial design. If calculations performed during the remedial design indicate an unacceptable risk, than the risk will be mitigated. Possible options for mitigating the risks include continued operation of the SVE system until VOC levels are reduced to an levels which do not pose a risk through inhalationfor excavation, staging the excavation so that only a small amount of soil is excavated at a time, excavating during the winter months or containing the excavation process under a tent-type enclosure. In addition, appropriate air monitoring will be performed on-site to ensure that any excavation emissions do not present a health threat.

Thermal desorption generally consists of a rotary dryer designed to accept contaminated soils which are then heated to a sufficient temperature to volatilize the contaminants from the soil into the air. The rotary dryer rotates to allow for proper mixing and the contaminated air stream is treated in a control system consisting of a fabric filter for particulate removal, a wet scrubber for acidic gas conversion, and a carbon adsorption system for capture of the contaminants. Excavation of contaminated soil and replacement of treated soil would be performed using conventional construction equipment. Soils would be stockpiled onsite before loading into the rotary dryer for treatment.

Based on the nature of the operations leading to the generation of the waste materials at the site, EPA Region III has determined that the contaminated soil, prior to treatment, constitutes a hazardous waste bearing the hazardous waste identification numbers F001 through F005 under State and Federal law. EPA anticipates that following treatment, the soil will no longer "contain" hazardous wastes and thus will cease to be a hazardous waste for purposes of Federal law. EPA also anticipates that for State law purposes, the levels of contaminants in the soils will be such that the soils may be "delisted" and no longer considered a State hazardous waste. (Any such "delisting" determination will be made by EPA in accordance with the substantive requirements of 25 Pa. Code Section 260.22, and the applicable requirements of CERCLA and the National Contingency Plan, 40 C.F.R. Part 300.) Nonetheless, the treated soils may still constitute "residual waste" under Pennsylvania law, and be subject to the substantive requirements of Pennsylvania's residual waste regulations to the extent required under 25 Pa. Code Section 287.101(d).

After completion of the thermal desorption process, a vegetative soil cover or multi-layer cap will be placed on the site. The cap or cover will be designed to eliminate direct contact with the any contaminants remaining in the soils. The thermal desorption system will be designed to reduce the levels of contaminants in the soil so that infiltration of rainwater through these soils will not leach contaminants into the groundwater above MCLs or health based levels, as describe in Section II. Soil levels which meet these criteria are listed in Table 1. A final decision on the type of cover or cap will depend on the success in achieving the soil remediation goals. The success in obtaining the soil remediation goals listed in Table 1 will be determined by performing a thermal desorption treatability study during the remedial design. The soil clean-up levels may need to be modified based on the results of the thermal desorption treatability study.

The soil clean-up levels, listed in Table 1, were developed using a combination of the fate and transport mathematical models, HELP and PRZM, as well as a groundwater mixing zone model. Compounds which have been identified in the groundwater were used in the model. The groundwater concentration input data into this model was based on Maximum Contaminant Levels ("MCLs") and health-based drinking water concentrations. Health-based drinking water concentrations were established based on a carcinogenic risk of 10E-05 or 10E-04. A cancer risk of 10E-05 means that one additional person per 100,000 has a chance of contracting cancer given the relevant exposure scenario. The NCP directs hazardous substance responses for Sites presenting risks outside the established acceptable carcinogenic risk range for Superfund Sites of between 10E-06 (1 additional chance in one million) and 10E-04 (one additional chance in 10,000). EPA used a carcinogenic risk of either 10E-04 or 10E-05 as the basis for the health-based drinking water concentrations for chemicals without an MCL at this Site rather than use the more conservative 10E-06 carcinogenic risk values since the 10E-06 carcinogenic value for some compounds are below the contract required quantitation limit for the drinking water analytical technique, EPA Method 524.2. The contract required quantitation limit is the detection level required for a particular analytical method under EPA's Contract Laboratory Program (CLP). Use of either 10E-04 or 10E-05 carcinogenic risk is protective of human health since it falls within the EPA's acceptable risk range of 10E-06 to 10E-04.

For those chemicals without an MCL or with a health-based drinking water concentration greater that 10 ppb, a groundwater concentration of 10 ppb was used. The use of 10 ppb was based on the contract required quantitation limits as established under the Contract Laboratory Program (CLP) Statement of Work for Organics Analysis (CLP Document Number OLM01.1). The 10 ppb level was established in the focused feasibility study by CLTL in an attempt to conform to PADER's groundwater protection strategy, which, although not an applicable or relevant and appropriate regulation for this ROD, is a "To Be Considered" policy. Soil clean-up levels calculated assuming that a vegetative soil cover would be placed over the Site after soil treatment are listed in Table 1.

According to the model, some of the compounds listed in Table 1 will degrade prior to reaching the groundwater and, therefore, no soil clean-up level was provided. However, if the contaminated soils are treated and placed back on-site, certain contaminants (i.e., those compounds related to F001-F005 wastes) which degrade before reaching the groundwater (as calculated by the model) nonetheless will have to meet the treatment standards established by the Land Disposal Restrictions (LDR) listed at 40 CFR §268.43. The LDR levels for the relevant compounds are listed in Table 1. Finally, for the remaining compounds which are not F001-F005 wastes but do, according to the model, degrade before reaching the groundwater, EPA believes that it is appropriate to establish soil clean-up levels based on direct contact risks. These levels are also noted in Table 1. The groundwater concentrations used in the fate and transport models to calculate the soil clean-up levels are listed in Table 1 and are based on either MCLs, health-based concentrations under a drinking water exposure scenario or 10 ppb as described above.

Some of the soil clean-up levels that were calculated by the model exceeded the concentrations for a direct contact risk. The soil concentrations that need to be met so that the direct contact risk is acceptable to EPA are provided in Table 2. Attainment of the direct contact risk levels listed in this table are not required for this ROD, because placement of a vegetative soil cover or multi-layer cap over the soils and implementation of institutional controls will prevent exposure to the soils through direct contact. However, if the values listed in Table 2 can be met during remedy implementation, deed restrictions on the property may be eliminated.

If, during the thermal desorption treatability study, EPA determines that the soil clean-up levels listed in Table 1 are not achievable, a multi-layer cap will be designed to limit the amount of rainwater and surface water infiltration through the contamination remaining in the soils so that the leaching of contaminants from the soil to the groundwater is reduced to MCLs or health based levels. A multi-layer cap is defined in this ROD as an upper vegetative layer (topsoil) underlain by a drainage layer (sand) over a low permeability layer (i.e. natural soils, admixed soils, a synthetic liner, or any combination of these materials). The final cap design will be determined during the remedial design. Because a cover or cap will be installed under the Selected Remedy, long term monitoring and maintenence for the operation and maintenence of the cover or cap will be required.

In addition, the treatability study to be performed during the remedial design will determine if the heterogeneities in the soil (i.e., the tar-like, fibrous, sticky, latex materials, etc.) requires additional treatment to meet the soil clean-up goals.

Depending on the soil clean-up level that is achieved at the Site, institutional controls, in the form of deed restrictions, may need to be implemented under so that access to the property is limited. The integrity of the cap or vegetative soil cover must be maintained to ensure adequate protection against direct contact with the soils and infiltration of surface and rain water.

B. Performance Standards

Determination of Extent of Soil Contamination: Prior to the design of the thermal desorption unit, additional soil sampling shall be performed in the former lagoon berm area, as well as the former lagoon area, to define the extent of soil contamination. Soil contamination shall be defined as levels of contamination which exceed the levels listed in Table 1. The number, location, and depth of these sampling points shall be subject to approval by EPA.

Excavation and Operation of the Thermal Desorption Unit: All soils containing chemicals above the concentrations listed in Table 1 shall be excavated, stockpiled, and remediated on-site by a thermal desorption treatment system. The soils shall be remediated to the concentration levels listed in Table 1. These levels may be refined during the Remedial Design by incorporating data generated during the hydrogeological study which is currently ongoing to ensure compliance with MCLs and health-based drinking water concentrations.

The thermal desorption unit shall comply with the regulations outlined in 40 CFR §264, Subpart X- Miscellaneous Units and the provisions of RCRA 3004(o) (42 U.S.C. §6244(o). The design, operation and closure and post-closure of the waste piles generated during the stockpiling of excavated soil shall comply with the substantive regulations set forth in 25 Pa. Code §§264.250-258, 25 Pa. Code §§264.110-119 and 25 Pa. Code §264.310. If off-site incineration of the tar-like material is necessary, such material shall be transported to and managed at an incinerator which satisfies applicable federal and state requirements for incinerators. The operation and closure of the thermal desorption unit shall comply with the substantive requirements of 25 Pa. Code 265.373, .375, .377, and .381 (to the extent that such requirements are more stringent than those imposed by 40 CRF Part 264, Supart X).

Prior to excavation, a risk assessment shall be performed to determine the risk associated with air emissions from the excavation process. Emissions from the excavation process shall not exceed a carcinogenic risk of 1×10^{-4}. If this level is exceeded, emission control measures shall be implemented to reduce emissions below this level. The emission control measures shall be subject to approval by EPA. In addition, an EPA-approved air monitoring program for the excavation of soils shall be established prior to remedial action.

Treatment of Air Emissions from the Thermal Desorption Unit: Contaminants in the effluent air from the thermal desorption unit shall be removed with a treatment unit, the specifications of which shall be determined during the remedial design and subject to EPA and PADER approval. The treatment unit(s) shall comply with the following ARARs which are performance standards: the Resource Conservation and Recovery Act (RCRA) regulations 40 CFR Part 264 Subpart AA- Air Emission Standards for Process Vents; the special permit requirements for sources locating in or siginificantly impacting nonattainment areas set forth at Pa. Code §127.61-73; the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (40 CFR §§ 50.1-3, 50.9, Appendix D, and Appendix H); 40 CFR Part 61, Subpart F and Subpart J which are requirements which regulate vinyl chloride and benzene emissions under the Clean Air Act, Section 112, 42 U.S.C. §7412 and are known as National Emission Standards for Hazardous Air Pollutants (NESHAPs); the requirement in 25 PA Code §127.12(a)(5) that air emission be reduced to the minimum obtainable levels through the use of best available technology (BAT), as defined in 25 PA Code Section 121.1; 25 PA Code §123.1, which prohibits the emission of fugitive air contaminants and regulates emissions during construction activities; 25 PA Code §123.2, which prohibits the emission of fugitive air contaminants from crossing the facility's property line; 25 PA Code §123.31, which prohibits the emission of malodorous air contaminants from crossing the property line; 25 PA Code §123.41, which prohibits the emission of visible emissions of greater that 20% opacity.

Management and Disposal of Treatment Residuals: The management and ultimate disposal of the treatment residuals shall be determined, subject to EPA approval, during the remedial design. Such management may entail treatment and/or disposal of carbon filters or contaminated water. In the event the treatment residuals are a hazardous waste, as determined by EPA, the following ARARS will apply as the Performance Standards. The on-site storage of wastewater shall comply with the container management regulations set forth in 25 Pa. Code §§264.171-180 or the tank standards at 25 Pa. Code §§264.190-199, dependent on how the wastewater is stored. The closure and post-closure of the waste water storage units shall comply with the requirements set forth at 25 Pa. Code §264.110-119 unless the wastewater is stored on-site in accordance with 25 Pa. Code §262.34. The transportation of wastewater off-site shall comply with the requirements of 25 Pa. Code §263.10-32. The container storage of contaminants collected by the air emissions control system shall comply with 25 Pa. Code §§264.171.180 and 25 Pa. Code §§264.110-119 unless the containers are stored on-site in accordance with 25 Pa. Code §262.34. The off-site transporation of the air emission control devices shall comply with 25 Pa. Code §263.10-32. The transport of hazardous materials shall comply with DOT regulations 49 CFR Parts 107 (Hazardous Program Procedures) and 171.1-172.604. The generation of hazardous waste on-site and the transporation of hazardous waste shall comply with 25 Pa. Code §262.11 (a) and (b), §262.20, and §262.30-33.

Backfilling of Treated Soils and Placement of a Vegetative Soil Cover or Multi-layer Cap: The treated soils shall be backfilled into excavated areas. The backfilling of treated soils shall comply with the Land Disposal Restriction regulations as described in 40 CFR Part 268. The untreated soils contain "hazardous wastes" in the F001-F005 category at the point of generation and, therefore, the treated soils must meet, at a minimum, the concentration levels listed in 40 CFR Part 268.43. Because the soil clean-up levels for some of the chemicals listed in Table 1 are more stringent than the LDR levels, the levels listed in Table 1 shall be met prior to placement. For chemicals which do not have a calculated clean-up level as described in Table 1, the levels listed in under the F001-F005 category in 40 CFR Part 268.43 shall be met.

Once the treated soils are placed on-site, a protective, vegetative soil cover will be placed over the backfilled area if the treatment levels in Table 1 are attained by the thermal desorption treatment. The vegetative soil cover shall: (1) provide dermal protection from the treated soils; (2) support the germination and propagation of vegetation; and (3) compact well and not crack excessively when dry. EPA anticipates that following treatment, the soil will no longer "contain" hazardous wastes and thus will cease to be a hazardous waste for purposes of Federal law. EPA also anticipates that for State law purposes, the levels of contaminants in the soils will be such that the soils may be "delisted" and no longer considered a State hazardous waste. (Any such "delisting" determination will be made by EPA in accordance with the substantive requirements of 25 Pa. Code Section 260.22, and the applicable requirements of CERCLA and the National Contingency Plan, 40 C.F.R. Part 300.) Nonetheless, the treated soils may still constitute "residual waste" under Pennsylvania law, and be subject to the substantive requirements of Pennsylvania's residual waste regulations to the extent required under 25 Pa. Code Section 287.101(d).

If, during the design of the thermal desorption unit, it is determined that the technology can not meet the soil clean-up levels outlined in Table 1, technology-based criteria shall be determined by EPA. Using the technology-based criteria as the treatment standards for the thermal desorption unit and the mathematical models developed in the Focused Feasibility Study, a suitable cap will be designed to reduce the leaching of contaminants into the groundwater to MCLs or health-based levels. The permeability of the cap will be determined with the model used to determine soil clean-up levels in the Focused Feasibility Study (and subsequent revisions) prepared for this Site.

The vegetative soil cover or multi-layer cap shall be maintained for 30 years. The vegetative soil cover or multi-layer cap design shall include a cost/benefit analysis for maximizing the biodiversity of the cover or cap. This analysis shall compare the capital and operation and maintenance costs of a conventional cap or cover (i.e. grass or similar vegetation) to the costs associated with a cap or cover which promotes biodiversiy on the site. This evaluation shall be used to allow EPA to determine the vegetation on the soil cover or cap.

Operation and Maintenance ("O&M"): The vegetative soil cover or multi-layer cap shall be given routine maintenance for at least 30 years to maintain the integrity and effectiveness of the final cover or cap, including making repairs to the cover or cap as necessary to correct cracks and the effects of settling, subsidence, erosion, etc. Natural vegetation (grasses and weeds) shall be maintained on the cover or cap. An O&M plan shall be developed, based on the type of cover or cap selected by EPA, and implemented. Because the selected alternative shall result in contaminants remaining on-site, 5-year Site reviews under Section 121(c) of CERCLA will be required.

Institutional Controls: If the soil clean-up levels listed in Table 2 are not achieved, deed restrictions shall be placed on the deed to the portion of the property that comprises the excavated and capped area. This is required to limit the use of this land and prevent excavation or construction on the capped and closed former lagoon area and any other area on-site which requires soil treatment or a cap so that threats to human health and the environment are minimized.

Worker Safety: During all Site work, Occupational Safety and Health Administration ("OSHA") standards set forth at 29 C.F.R. Parts 1910, 1926 and 1904 governing worker safety during hazardous waste operations, shall be complied with.

X. Statutory Determinations

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. Section 121 of CERCLA also requires that the selected remedial action comply with ARARs, be cost-effective, and utilize permanent treatment technologies to the maximum extent practicable. The following section discuss how the selected remedyfor the William Dick Lagoons Site meets these statutory requirements.

A. Protection of Human Health and the Environment

The Selected Remedy protects human health and the environment by reducing the level of contaminants in the soils at the Site which, in turn, reduces the leaching of contaminants into the groundwater beneath the Site. By reducing the source of contamination to the groundwater, a groundwater remediation system can be designed and installed to reduce the level of contaminants in groundwater to background levels or, if background levels are unattainable, to the maximum contaminant levels (MCLs) established under the Safe Drinking Water Act (SWDA).

Installation of a vegetative soil cover or multi-layer cap over the treated soil will prevent exposure to the site-related chemicals through inhalation, ingestion, and dermal contact.

Implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts. The remedial technologies employed in the selected remedy are proved to reduce the concentrations of the organic compounds identified on-site to acceptable levels.

B. Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)

Chemical Specific ARARs

a. The Resource Conservation and Recovery Act (RCRA) regulations 40 CFR Part 264 Subpart AA- Air Emission Standards for Process Vents is relevant and appropriate for the selected alternative because the SVE, thermal desorption and incinertion have a stack vented to atmosphere. The total organic emissions from all affected process vents at the Site are required to be below 1.4 kg/hr and 2800 kg/hr or reduce, by use of a control device total organic emissions from all affected process vents at the facility by 95 weight percent under this regulation.

b. The emissions from the treatment system must comply with the special permit requirements for sources locating in or siginificantly impacting nonattainment areas set forth at Pa. Code §127.61-73.

b. The emissions from the treatment system must comply with the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act (40 CFR §§ 50.1-3, 50.9, Appendix D, and Appendix H). This regulation, which deals with the release of volatile organic emissions, applies to this action because the site lies in an ozone non-attainment area.

c. 40 CFR Part 61, Subpart F and Subpart J are relavant and appropriate requirements which regulate vinyl chloride and benzene emissions under the Clean Air Act, Section 112, 42 U.S.C. §7412 and are known as National Emission Standards for Hazardous Air Pollutants (NESHAPs).

2. Location Specific ARARs: There are no location specific ARARs for this Operable Unit at the Site.

3. Action Specific ARARs:

a. The requirement in 25 PA Code §127.12(a)(5) that air emission be reduced to the minimum obtainable levels through the use of best available technology (BAT), as defined in 25 PA Code Section 121.1, will apply to the seltected alternative.

b. 25 PA Code §123.1, which prohibits the emission of fugitive air contaminants and regulates emissions during construction activities, is applicable to the selected alternative.

c. 25 PA Code §123.2, which prohibits the emission of fugitive air contaminants from crossing the facility's property line, is applicable to the selected alternative.

d. 25 PA Code §123.31, which prohibits the emission of malodorous air contaminants from crossing the property line, is applicable to the selected alternative.

e. 25 PA Code §123.41, which prohibits the emission of visible emissions of greater that 20% opacity, is applicable to the selected alternative.

f. RCRA regulations 25 Pa. Code §262.11 (a) and (b) (this section establishes standards for generators of hazardous waste and relates to hazardous waste determination), §262.20 (relating to manifesting requirements for off-site shipments of spent carbon or other hazardous wastes), and §262.30-.34 (relating to pretransport requirements) are applicable to the selected alternative.

g. To the extent that the treated soils constitute hazardous wastes, the requirements of 25 Pa. Code Sections 264.13-15 (General Facility Standards); 264.31, 37 (PPC Plan and Emergency Procedures); 264.90, .91, .97, and .98-.100 (Groundwater Monitoring); 264.111, .114, and .117-.119 (Closure and Postclosure); and 264.301, .302, .303, .305, .309, and .310 (Landfills) and regulations at 40 CFR Part 264, Subpart N which implement the minimum technological requirements for replacement of an existing landfill or surface impoundment unit set forth at 42 U.S.C. §6924(o) would be applicable to the design, construction and maintenance of the area into which the treated soils or residual ash are deposited. To the extent that the treated soils or residual ash are not hazardous wastes due to delisting, the management of those wastes may be subject to the substantive requirements of Pennsylvania's residual waste regulations to the extent required under 25 Pa. Code Section 287.101(d).

h. The container storage standards set forth at 25 Pa. Code §§264.171-180 and the substantive closure requirements set forth at 25 Pa. Code §§264.110-119 are applicable to the container storage of contaminants collected by the air emissions controls unless they are stored on-site in accordance with 25 Pa. Code §262.34; the regulation set forth at 25 Pa. Code §263.10-263.32 are applicable when the air emission controls are transported off-site; 40 CFR §264, Subpart X, is applicable to the operation, closure and post-closure care of the thermal desorption unit; the waste pile design, operation and closure requirements set forth at 25 Pa. Code §§264.250-258 are applicable to the stockpile of excavated soil; the substantive closure and post-closure requirements set forth at 25 Pa. Code §§264.110-119 and 25 Pa. Code §264.310 are applicable to the stockpile of excavated soil; the container management requirements at 25 Pa. Code §§264.171-180 or the tank standards at 25 Pa. Code §§264.190-199 are applicable to the on-site storage of wastewater dependent upon how the wastewaters are stored; the substantive closure and post-closure requirements set forth at 25 Pa. Code §264.110-119 are applicable to the closure of the units used to store wastewater unless the wastewater is stored on-site in accordance with 25 Pa. Code §262.34; the regulations set forth at 25 Pa. Code 263.10-263.32 are applicable when the wastewater is transported off-site; the substantive standards of 25 Pa. Code §262 relating to generators of hazardous waste apply ot the tar-like material and the container or tank storage standards set forth at 25 Pa. Code §264.171-180 and/or §264.190-.199 for storage of the tar-like material prior to transport for off-site incineration are applicable; the substantive requirements of 25 Pa. Code 265.373, 375, .377, and .381 are relevant and appropriate to the operation and closure of the thermal desorption unit (to the extent that such requirements are more stringent than those imposed by 40 CFR Part 264, Subpart X).

i. DOT regulations 49 CFR Parts 107 (Hazardous Material Program Procedures) and 171.1-172.604 apply to the selected alternative for the transport of hazardous materials.

j. The land disposal restrictions as described in 40 CFR Part 268 are applicable since the remedy involves the excavation and treatment of the soils and the placement of the treated soils back onto the Site. The untreated soils contain F001-F005 RCRA wastes and, therefore, must meet, at a minimum, the concentration levels listed in 40 CFR Part 268.43. Because the soil clean-up levels for some of the chemicals listed in Table 1 are more stringent than the LDR levels, the levels listed in Table 1 shall be met prior to placement. For chemicals which do not have a calculated clean-up level as described in Table 1, the levels listed in 40 CFR Part 268.43 shall be met.

k. The provisions of Section 121(a)(3) of CERCLA (42 U.S.C. §9621 (d)(3)) apply to the off-site disposal of any hazardous substance under the selected alternative.

4. To Be Considered

a. The policies set forth in PADER's "Groundwater Protection Strategy", February 1992, and the MCLs, and risk-based drinking water concentrations are "to be considered" (TBC) in developing soil clean-up levels. Soil clean-up levels were developed using a combination of the fate and transport mathematical models, HELP and PRZM as well as a groundwater mixing zone model. The groundwater concentration input data into this model was based on MCLs and risk-based drinking water concentrations. For those chemicals without an MCL or with a risk-based drinking water concentration greater that 10 pppb, a groundwater concentration of 10 ppb was used. Soil clean-up TBCs are listed in Table 1. These levels may be refined during the Remedial Design by incorporating data generated during the hydrogeological study which is currently ongoing to ensure compliance with MCLs and risk-based drinking water concentrations.

b. The policies set forth in EPA's "Revised Procedures for Planning and Implementing Off-Site Response Actions", (November 13, 1987) is a TBC for the selected alternative.

C. Cost-effectiveness

The selected remedy is cost-effective in providing overall protection in proportion to cost, and meets all other requirements of CERCLA. The NCP, 40 CFR Section 300.340(f)(ii)(D), requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria - protection of human health and the environment and compliance with ARARs - against three additional balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness. The selected remedy meets these criteria and provides for overall effectiveness in proportion to its cost. The estimated present worth cost for the selected remedy is $7,800,000-$9,000,000. The range of costs accounts for possible added treatment for the tar-like material and possible need for a more complex cap (i.e. a multi-layer cap) once treatment is complete. The type of cap and need for additional treatment will be determined during remedial design.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria. Of those alternatives evaluated that are protective of human health and the environment and meet ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term and short-term effectiveness and permanence, cost, implementability, reduction in toxicity, mobility and volume through treatment, State and community acceptance, and preference for treatment as a principal element.

Under the selected remedy, thermal desorption of the soils will provide a greater degree of reduction of toxicity, mobility, and volume than soley capping the contaminanted soils or using soil vapor extraction and bioremediation. Thermal desorption will provide similar long-term effectiveness and implementability to incineration, while reducing the toxicity, mobility and volume through treatment to acceptable levels, at a significant cost reduction. The State is supportive of the selected remedy.

Some members of the community requested that incineration be used at the site to restore the site to conditions as close to the pre-disposal conditions as possible. EPA believes that thermal desorption will reduce the risk associated with the soils on Site at an acceptable cost and that the added cost of incineration does not provide any additional protection benefits. In designing the thermal desorption system, EPA will attempt to reduce the levels in the soils to levels which would require only a vegetative soil cover, therefore, returning the site to conditions as close to the pre-disposal conditions as possible.

E. Preference for Treatment as a Principle Element

The selected remedy employs a treatment process which has been demonstrated to effectively reduce VOC and SVOC contamination at other Superfund sites. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

XI. Documentation of Significant Changes

The Proposed Plan for OU 3 for the William Dick Lagoons Sie was released for public comment in January 1993. The Proposed Plan identified Alternative 4 as the preferred alternative. EPA reviewed all written and oral comments submitted during the comment period. Upon review of these comments, it determined that the soil cleanup levels, as described in the Focused Feasibility Study, needed to be modified to conform with the health-based drinking water concentrations, Land Disposal Restrictions, and direct contact risks.

As described in Section II. of this ROD, preliminary soil cleanup goals were based on a mathematical model which calculated soil levels using specified groundwater concentrations. Although the PRP performing the focused feasibility study (FFS) did modify the soil cleanup levels to conform with existing MCLs, as required by EPA, the PRPs did not modify the soil cleanup levels to conform with health-based drinking water concentrations for compounds without MCLs or for compounds with health-based drinking water concentrations less than 10 ppb, as required by EPA.

EPA believes the model should incorporate health-based drinking water standards for compounds with health-based drinking water levels greater tha 10 ppb. Therefore, the soil clean-up levels were modified by EPA using health-based drinking water concentrations. Health-based drinking water concentrations were established based on a carcinogenic risk of 10E-05 or 10E-04. A cancer risk of 10E-05 means that one additional person per 100,000 has a chance of contracting cancer given the relevant exposure scenario. The NCP directs hazardous substance responses for Sites presenting risks outside the established acceptable carcinogenic risk range for Superfund Sites of between 10E-06 (1 additional chance in one million) and 10E-04 (one additional chance in 10,000). EPA used a carcinogenic risk of either 10E-04 or 10E-05 as the basis for the health-based drinking water concentrations for chemicals without an MCL at this Site rather than use the more conservative 10E-06 carcinogenic risk values since the 10E-06 carcinogenic value for some compounds are below the contract required quantitation limit for the drinking water analytical technique, EPA Method 524.2. The contract required quantitation limit is the detection level required for a particular analytical method under EPA's Contract Laboratory Program (CLP). Use of either 10E-04 or 10E-05 carcinogenic risk is protective of human health since it falls within the EPA's acceptable risk range of 10E-06 to 10E-04. (The 10 ppb level was established during the FFS by the PRP in an attempt to conform to PADER's groundwater protection strategy, which, although not an applicable or relevant and appropriate regulation for this ROD, is a "To Be Considered" policy.)

In addition, EPA modified the cleanup criteria for some compounds because of requirements under the Land Disposal Restrictions (LDRs). According to the model, some of the compounds listed in Table 1 will degrade prior to reaching the groundwater and, therefore, no soil clean-up level was provided. However, if the contaminated soils are treated and placed back on-site, certain contaminants (i.e. those compounds related to

F001-F005 wastes) which degrade before reaching the groundwater (as calculated by the model) will have to meet the treatment standards established by the LDR listed at 40 CFR §268.43. The LDR levels for the relevant compounds are listed in Table 1. Finally, for the remaining compounds which are not F001-F005 wastes but do, according to the model, degrade before reaching the groundwater, EPA believes that it is appropriate to establish soil clean-up levels based on direct contact risks. These levels are also noted in Table 1. The groundwater concentrations used in the fate and transport models to calculate the soil clean-up levels are listed in Table 1 and are based on either MCLs, health-based concentrations under a drinking water exposure scenario or 10 ppb as described above.

WILLIAM DICK LAGOONS
RECORD OF DECISION

TABLES 1 through 12

TABLE 1: SOIL CLEAN-UP LEVELS
(Based on a Vegetative Soil Cover)

Chemical	Soil Cleanup Levels (mg/kg)	Groundwater Concentration used in Model (ppb)
Volatile Organics		
benzene	3.7[2]	5
butanone (MEK)	36[2](NC)[1]	-
chlorobenzene	5.7[2](NC)[1]	-
chloroform	280[3](NC)[1]	-
1-2, dichloroethane	0.047	5
1-2, dichloroethene (total)	0.36	10
1-2, dichloropropane	0.17	5
ethylbenzene	1.7	10
4-methyl-2-pentanone (MIBK)	0.064	10
styrene	3.7	10
tetrachloroethane(PCE)	1.2	5
toluene	28[2](NC)[1]	-
1,1,1-trichloroethane	1	10
trichlorethene	0.42	5
xylene (total)	28[2](NC)[1]	-
methylene chloride	33[2]	-
Semivolatile Organics		
acenaphthenne	31	10
anthracene	94	10
benzo(a)anthracene	920	1.0

benzo(b)floranthene	740	2.0[4]
benzo(k)floranthene	740	2.0[4]
benzo(a)pyrene (BaP)	7300	2.0[4]
benzo(g,h,i)perylene	6050	5.5[4]
benzoic acid	310,000[3](NC)[1]	-
bis(2-chloroethyl)ether(BCEE)	0.01	1.2[5]
bis(2-ethylhexyl(phthalate(DEHP)	266	4
4-chloro-3-methylphenol	5.2	10
chrysene	390	3
disbenz(a,h)anthracene	6600	3
1,2-dichlorobenzene	6.2[2]	10
1,4-dichlorobenzene	11	10
4,4-DDE	7250	2.5[4]
2,4-dichlorophenol	230[3](NC)[1]	-
diethyl phthalate	0.95	10
2,4-dimethylphenol	0.82	10
fluoranthene	250	10
fluorene	49	10
indeno(1,2,3-c,d)pyrene	4400	4
isophorone	0.68	10
2-methylnaphthalene	57[3](NC)[1]	-
2-methylphenol(o-cresol)	5.6[2](NC)[1]	-
4-methylphenol(p-cresol)	3.2[2](NC)[1]	-
naphthalene	3100[3](NC)[1]	-
nitrobenzene	14[2]	-

phenanthrene	94	10
phenol	47000[3](NC)[1]	-
pyrene	250	10
1,2-4-trichlorobenzene	61	10

[1] (NC) Soil Clean up value not calculated by model; according to model compound degrades before reaching groundwater.

[2] Soil Clean up value based on Land Disposal Restrictions for F001-F005 wastes in mg/L (40 CFR 268.43).

[3] Soil clean up value based on either 1 x 10^{-6} cancer risk or a hazard quotient = 1 under a residential direct contact exposure scenario.

[4] Groundwater concentration based on a 1 x 10^{-5} cancer risk for a drinking water exposure scenario.

[5] Ground water concentration based on a 1 x 10^{-4} cancer risk for a drinking water exposure scenario.

Table 2
DIRECT CONTACT RISK CONCENTRATIONS

Volatile Organics	Direct Contact (mg/kg) Residential
benzene	59
2-butanone (MEK)	3900
chlorobenzene	1600
chloroform	280
1-2, dichloroethane	19
1-2, dichloroethene (total)	700
1-2, dichloropropane	25
ethylbenzene	7800
4-methyl-2-pentanone (MIBK)	3900
styrene	57
tetrachloroethane (PCE)	33
toluene	16000
1,1,1-trichloroethane	7000
trichloroethene (TCE)	150
xylene (total)	160,000
Semivolatile Organics	
acenaphthene	4700
anthracene	23000
benzo(a)anthracene	1.6
benzo(b)floranthene	1.9
benzo(k)floranthene	4.4

benzo(a)pyrene(BaP)	0.23
benzo(g,h,i)perylene	11
benzoic acid	310,000
bis(2-chloroethyl)ether (BCEE)	1.5
bis(2-ethylhexyl)phthalate(DEHP)	120
4- chloro-3-methylphenol	-
chrysene	-
dibenz(a,h)anthracene	0.21
1,2-dichlorobenzene	7000
1,4-dichlorobenzene	71
4,4-DDE	5
2,4-dichlorophenol	230
diethyl phthalate	63000
2,4-dimethylphenol	1600
fluoranthene	3100
fluorene	3100
indeno(1,2,3-c,d)pyrene	0.84
isophorone	1800
2-methylnaphthalene	-
2-methylphenol(o-cresol)	3900
4-methylphenol(p-cresol)	390
naphthalene	3100
phenanthrene	2300
phenol	47000
pyrene	2300
1,2-4-trichlorobenzene	780

TABLE 3

GROUND WATER QUALITY
WILLIAM DICK LAGOONS SITE

Compound	Maximum Concentration	Average Maximum*	Average Concentration	Frequency of Detection**
VOLATILES (µg/l)				
methylene chloride	36	36	3	1 of [illegible]
acetone	960	480	39	4 of 13
carbon disulfide	32J	17J	4	6 of 13
1,2-dichloroethene, (total)	210	153J	20	3 of 13
chloroform	560	487	39	8 of 13
1,2-dichloroethane	120	102J	11	3 of 13
2-butanone	350	207	16	3 of 13
1,2-dichloropropane	17J	9J	<1	1 of 13
trichloroethene	16,000	14,000	1,200	9 of 13
benzene	180	170J	14	5 of 13
4-methyl-2-pentanone	220	105J	13	3 of 13
tetrachloroethene	320	250J	19	2 of 13
toluene	510	430	35	3 of 13
chlorobenzene	32J	19J	2	2 of 13
ethylbenzene	46J	27J	2	2 of 13
total xylenes	160	127J	12	3 of 13
SEMIVOLATILES (µg/l)				
phenol	14,000	10,300	818	3 of 13
bis (2-chloroethyl) ether	24	17	2	2 of 13
2-chlorophenol	41	14	1	1 of 13
benzyl alcohol	19	17	1	1 of 13
2-methylphenol	300	217J	18	2 of 13
4-methylphenol	560	397J	32	3 of 13
isophorone	250	247	28	3 of 13
2,4-dimethylphenol	70	23	2	2 of 13
benzoic acid	480J	413J	32	3 of 13
2,4-dichlorophenol	46	30	3	2 of 13
1,2,4-trichlorobenzene	3J	1J	<1	1 of 13
naphthalene	58	35	3	2 of 13
4-chloro-3-methylphenol	21	7	<1	1 of 13
2-methylnapthalene	6J	3J	<1	1 of 13
dimethyl phthalate	7J	5J	<1	1 of 13
diethyl phthalate	4	3J	<1	2 of 13
bis(2-ethylhexyl)phthalate	170	98J	23	7 of 13

TABLE 4

LAGOON AND BERM AREA SOIL QUALITY
WILLIAM DICK LAGOONS SITE

Compound	Average Concentration	Maximum Concentration	Frequency of Detection*
VOLATILES (µg/kg)			
1,1-dichloroethane	137	3,700	1 of 27
1,2-dichloroethene, (total)	3,120	48,000	5 of 27
chloroform	179	4,100	4 of 27
1,2-dichloroethane	741	15,000	4 of 27
2-butanone	12,040	325,000J	1 of 27
1,1,1-trichloroethane	<1	5J	1 of 27
1,2-dichloropropane	<1	1J	1 of 27
trichloroethene	3,634,600	93,000,000	12 of 27
benzene	233	5,500J	2 of 24
4-methyl-2-pentanone	106	2,800J	2 of 27
tetrachloroethene	3,790	73,500J	8 of 27
toluene	118,100	2,500,000	12 of 27
chlorobenzene	4,320	64,000	12 of 27
ethylbenzene	16,800	200,000	14 of 27
styrene	11,700	217,500	4 of 27
total xylenes	258,200	5,500,000	12 of 28
SEMIVOLATILES (µg/kg)			
phenol	15,100	350,000J	10 of 27
1,4-dichlorobenzene	99	2,200J	4 of 27
1,2-dichlorobenzene	990	7,200J	10 of 27
2-methylphenol	1,650	36,000J	5 of 27
4-methylphenol	2,480	44,000J	8 of 27
nitrobenzene	63	3,400J	1 of 27
isophorone	1,390	31,000J	2 of 27
2,4-dimethylphenol	1,010	20,000J	3 of 27
benzoic acid	41	900J	2 of 27
2,4-dichlorophenol	1,810	38,000J	6 of 27
1,2,4-trichlorobenzene	63,600	1,300,000J	15 of 27
naphthalene	88,700	1,500,000J	15 of 27
4-chloroaniline	4,830	130,000J	2 of 27
hexachlorobutadiene	67	1,800J	1 of 27
4-chloro-3-methylphenol	133	3,300J	3 of 27
2-methylnaphthalene	21,000	220,000J	15 of 27
2,4,5-trichlorophenol	8	210J	1 of 27
2-chloronaphthalene	31	1,700J	1 of 27

GROUND WATER QUALITY
WILLIAM DICK LAGOONS SITE

Compound	Maximum Concentration	Average Maximum*	Average Concentration	Frequency of Detectic
METALS (dissolved) (μg/l)				
aluminum	1,430	1,430	164	3 of 12
barium	83.7	83.7	25.7	12 of 12
beryllium	1.6	1.6	0.1	1 of 12
calcium	5,280	5,280	1,875	9 of 9
cobalt	20.8	20.8	3.3	4 of 12
copper	14.4	14.4	3.9	2 of 5
iron	20,200	19,800	4,870	11 of [illegible]
lead	1	1	0.27	4 of [illegible]
magnesium	4,260	4,260	1,705	3 of 4
manganese	863	863	193	11 of 12
potassium	8,520	4,260	426	1 of 10
selenium	2.4	2.4	0.2	1 of 12
sodium	32,500	32,500	8,182	7 of 12
zinc	61.2	61.2	61.2	1 of 1
CONVENTIONAL PARAMETERS (mg/l)				
biochemical oxygen demand (BOD)	91	91	<15	12 of 12
total dissolved solids (TDS)	560	560	<85	12 of 12
nitrate	3.1	3.1	<1.3	12 of 12
alkalinity (as $CaCO_3$)	20	20	8.2	12 of 12
chloride	20	20	<5	12 of 12
hardness (as $CaCO_3$)	64	64	22	12 of 12
total organic carbon (TOC)	52	52	<8.4	12 of 12
pH***			5.6	

* Average maximum concentration is calculated when the maximum concentration is reported for a well from which two or more samples were taken. It is the average of the reported concentrations from this well.

** Out of a maximum of 13 wells for organics and 12 wells for metals; excludes from the total sample count those sample in which the analyte was detected in the blank.

*** From pump test on MW-20, October/November 1989.

Note: Pesticides/PCBs not detected in any wells.

J – Estimated concentration

LAGOON AND BERM AREA SOIL QUALITY
WILLIAM DICK LAGOONS SITE

Compound	Average Concentration	Maximum Concentration	Frequency of Detection*
METALS (cont'd) (mg/kg)			
cobalt	1.4	4.1	5 of 6
copper	19	40J	7 of 8
iron	7.960	18,000	27 of 27
lead	24	269J	27 of 27
magnesium	916	5,080	18 of 18
manganese	64	160	23 of 23
mercury	0.01	2.3	3 of 27
nickel	5.4	14	17 of 27
potassium	628	3.070	4 of 17
silver	0.1	1.7	2 of 27
sodium	38	644	1 of 17
vanadium	13	28J	27 of 27
zinc	52	253J	23 of 23

J - estimated concentration

* excludes from the total sample count those samples in which analyte was detected in the blank.

LAGOON AND BERM AREA SOIL QUALITY
WILLIAM DICK LAGOONS SITE

Compound	Average Concentration	Maximum Concentration	Frequency of Detection*
SEMIVOLATILES (cont'd) (µg/kg)			
dimethyl phthalate	11	590J	1 of 27
acenaphthylene	740	7.000J	8 of 27
acenapthene	3.970	47.000J	13 of 27
dibenzofuran	3.570	36.000J	13 of 27
diethyl phthalate	83	1.400J	2 of 27
fluorene	4.240	41.000J	13 of 27
N-nitrosodiphenylamine	734	5.300J	5 of 27
pentachlorophenol	2	54J	1 of 27
phenanthrene	16.500	280.000J	16 of 27
anthracene	1.830	13.000J	16 of 27
di-n-butylphthalate	5.910	32.000J	14 of 27
fluoranthene	8.360	200,000J	16 of 27
pyrene	6.020	120,000J	16 of 27
butylbenzylphthalate	11.300	78,000J	15 of 27
benzo (a) anthracene	1.860	30,000J	13 of 27
chrysene	2.130	29,000J	16 of 27
bis(2-ethylhexyl)phthalate	169.000	1.200.000J	22 of 27
di-n-octylphthalate	4,720	29,000J	15 of 27
benzo(b and/or k)fluoranthene	3,540	54,000J	15 of 27
benzo(a)pyrene	1,250	26,000J	11 of 27
indeno(1,2,3,c,d)pyrene	300	7,600J	5 of 27
dibenzo(a,h)anthracene	81	2,700J	3 of 27
benzo(g,h,i)perylene	300	8,000J	5 of 27
PESTICIDES/PCBs (µg/kg)			
heptachlor epoxide	6	150	1 of 27
4,4'-DDE	34,300	220,000	17 of 27
METALS (mg/kg)			
aluminum	8,040	15,100	27 of 27
arsenic	5.2	14J	27 of 27
barium	81	672J	27 of 27
beryllium	0.09	0.51	1 of 6
cadmium	0.04	1.1J	1 of 26
calcium	2,190	11,100	6 of 6
chromium	39	349J	26 of 27

TABLE 5

Dioxin Data Summary
William Dick Lagoons Site
West Cain Township, Chester County

ERM T.R. No.	23297	23298	23301	23299
Sample Location	D-Background	D-9 (2-4)	D-4 (0-2)	D-6 (2-4)
Sample Date	10/11/89	10/11/89	10/11/89	10/11/89
units	ug/Kg	ug/Kg	ug/Kg	ug/Kg
2,3,7,8-TCDD		*		
other TCDD			0.18	
2,3,7,8-TCDF			0.01	
other TCDF		0.06	0.19	0.035
2,3,7,8-PCDD				
other PCDD			0.01	
2,3,7,8-PCDF			0.008	
other PCDF			0.024	
2,3,7,8-HxCDD			0.05	
other HxCDD	0.008		0.27	
2,3,7,8-HxCDF			0.03	0.095
otherHxCDF			0.03	
2,3,7,8-HpCDD			0.37	
other HpCDD	0.05		0.42	
2,3,7,8-HpCDF			0.08	0.28
other HpCDF			0.01	
OCDD	5.9	3.6	4.1	
OCDF			0.18	2.4
2,3,7,8 TCDD equivalents	ug/Kg	ug/Kg	ug/Kg	ug/Kg
	0.007	0.0044	0.0248	0.0145

* These results are approximate only; matrix interference would not allow accurate quantitation.
Concentrations not detected at or above the method detection limit have not been reported.

TABLE 6

FORMER SPRAY IRRIGATION AREA SOIL QUALITY
WILLIAM DICK LAGOONS SITE

Compound	Average Concentration	Maximum Concentration	Frequency of Detection
VOLATILES			ND
SEMIVOLATILES (µg/kg)			
benzoic acid	45	360J	1 of 8
4-chloro-3-methylphenol	6	50J	1 of 8
pyrene	23	180J	1 of 8
bis(2-ethylhexyl)phthalate	20	160J	1 of 8
PESTICIDES/PCBs			ND
METALS (mg/kg)			
aluminum	10,645	14,500	8 of 8
arsenic	2.2	3.5	8 of 8
barium	39	46	8 of 8
beryllium	0.32	0.58	6 of 8
chromium	10	20	8 of 8
cobalt	2.7	4.3	7 of 8
iron	7,856	11,700	8 of 8
lead	8.6	15	8 of 8
magnesium	730	1,260	8 of 8
manganese	121	291	8 of 8
mercury	0.1	0.65	1 of 8
potassium	748	2,170	4 of 8
sodium	254	1,070	2 of 8
vanadium	15.5	21	8 of 8
zinc	31	38	8 of 8

J - estimated concentration
ND - not detected

TABLE 7

SUMMARY OF CHEMICALS OF CONCERN IN EACH MEDIUM

Off-Site Ground Water	Soil	On-Site Ground Water
1,2-dichloroethene (total)	chloroform	chloroform
1,2-dichloroethane	trichloroethene	1,2-dichloroethane
chloroform	tetrachloroethene	trichloroethene
1,1,1-trichloroethane	chlorobenzene	benzene
trichloroethene	1,2,4-trichlorobenzene	tetrachloroethene
tetrachloroethene	naphthalene	bis(2-chloroethyl)ether
chlorobenzene	phenanthrene	barium
dichlorobenzene(1,2)	fluoranthene	beryllium
dichlorobenzene(1,4)	bis(2-ethylhexyl)phthalate	manganese
1,1-dichloroethene	4,4'-DDE	bis(2-ethylhexyl)phthalate
1,1-dichloroethane	acenapthene	phenol
	fluorene	1,2-dichloroethene (total)
	benzo(a)pyrene equivalent	chlorobenzene
	anthracene	4-methylphenol (p-cresol)
	heptachlor epoxide	2,4-dichlorophenol
	2,4-dichlorophenol	
	arsenic	
	barium	
	chromium	
	manganese	
	vanadium	
	zinc	

TABLE 8

Exposure and Migration Pathways
William Dick Lagoons

Media	Source	Exposure Point	Exposure Route	Selected for Analysis
Ground water	Contaminated soil/leachate	drinking water aquifer	Dermal contact Ingestion Inhalation while showering	yes - residential wells nearby yes - residential wells nearby yes - residential wells nearby
Surface water	Discharge of contaminated ground water	Indian Spring Run, Birch Run	Dermal contact Ingestion-water Ingestion-fish	No - no significant contaminants detected No - no significant contaminants detected No - no significant contaminants detected
Sediments	Discharge of contaminated ground water	Indian Spring Run, Birch Run	Dermal contact Food chain bioaccumulation	No - no significant contaminants detected No - no significant contaminants detected
Air	Contaminated soil & dust	MEI	Inhalation of fugitive dust Inhalation of volatiles	Yes Yes
Surface soil	Contaminated soil	On site	Dermal contact Incidental ingestion	Yes Yes
Deer meat ingestion	Contaminated soil water	Off site	Ingestion	Yes

TABLE 9

STANDARD PARAMETERS FOR CALCULATION OF DOSAGE AND INTAKE
WILLIAM DICK LAGOONS SITE

		Adult	Child Age 6-12	Child Age 2-6
PHYSICAL CHARACTERISTICS				
Average Body Weight	(a)	70 kg	29 kg	16 kg
Average Skin Surface Area	(a)	18.150 cm2	10.470 cm2	6980 cm2
Average No. Yrs Exposure in 70 year Lifetime	(d)	58 yrs	6 yrs	4 yrs
ACTIVITY CHARACTERISTICS				
RESIDENTIAL USE OF GROUND WATER				
Amount of Water Ingested Daily	(b,e)	2 liters	2 liters	2 liters
Percentage of water from home supply	(e)	75%	75%	75%
Percentage of Skin Surface Area Immersed While Showering/Bathing	(d)	100%	100%	100%
Duration of Dermal Exposure	(d)	30 min/d	30 min/d	30 min/d
SOIL EXPOSURE				
Amount of Soil Ingested Incidentally	(d,e)	100 mg	100 mg	200 mg
Percentage of Skin Area Contacted by Soil Contact	(d)	20%	20%	20%
Skin Absorption Rate of Compounds in Soil	(c)	0.06	0.12	0.12
Frequency of Soil Contact	(d)	14 D/yr	38 D/yr	14 D/yr
VENISON INGESTION EXPOSURE				
Amount of Venison Ingested	(b,d)	112 g	112 g	58 g
Frequency of Ingestion	(d)	14 d/yr	14 d/yr	14 d/yr
INHALATION EXPOSURE				
Inhalation Rate	(b,d,e)	0.83 m3/hr	0.46 m3/hr	0.25 m3/hr
Absorption Rate of Inhaled Air	(d)	100%	100%	100%
Duration of Exposure (for MEI)	(d)	24 hr/d	24 hr/d	24 hr/d
Frequency of Exposure (for MEI)	(d)	365 d/yr	365 d/yr	365 d/yr
SWIMMING				
Percentage of Skin Area Contacted While Swimming	(e)	100%	100%	100%
Frequency of Swimming Event	(b)	7 D/yr	7 D/yr	—
Duration of Swimming Event	(b)	2.6 Hr/D	2.6 Hr/D	—
MATERIAL CHARACTERISTICS				
Dust Adherence	(b)	1.45 mg/cm2	1.45 mg/cm2	1.45 mg/cm2
Soil Matrix Effect	(c)	15%	15%	15%
Mass Flux Rate (water-based)	(e)	0.5 mg/cm2/hr	0.5 mg/cm2/hr	0.5 mg/cm2/hr

a - Anderson, E., Browne, N., Duletsky, S., Warn, T., "Development of Statistical Distributions or Ranges of Standard Factors Used in Exposure Assessments", PB 85-242667/AS, US EPA, Office of Health and Environmental Assessment, 1984.
b - Human Health Evaluation Manual
c - J.K. Hawley, "Assessment of Health Risk from Exposure to Contaminated Soil", Risk Analysis, Vol. 5, No. 4, 1985
d - ERM Staff Professional Judgement
e - Superfund Exposure Assessment Manual
f - Kimbrough R, Falk H, Stehr P, Fries G. 1984. "Health implications of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) contamination of residential soil", Journal of Toxicology and Environmental Health 14:47-93.

TABLE 10

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1.1.1-[illegible]	[illegible]	3.00E-01	NA	NA	NA	[illegible]
1.1-[illegible]	1.00E-01	1.00E-01	NA	[illegible]	[illegible]	[illegible]
1.1-[illegible]	[illegible]	NA	6.00E-01	[illegible]	C	[illegible]
1.2-[illegible]	NA	NA	[illegible]	[illegible]	[illegible]	[illegible]
1.2-[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
1.2-[illegible]	NA	NA	[illegible]	NA	[illegible]	[illegible]
2-[illegible]	[illegible]	NA	NA	NA	D	[illegible]
4-[illegible]-2-[illegible]	[illegible]	[illegible]	NA	NA	NA	[illegible]
[illegible]	NA	NA	[illegible]	[illegible]	A	[illegible]
[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
[illegible]	[illegible]-01	NA	NA	NA	NA	[illegible]
[illegible]	[illegible]	[illegible]	P	P	NA	[illegible]
[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]	[illegible]
cis-1.3-[illegible]	[illegible]	NA	NA	NA	[illegible]	[illegible]
[illegible]	[illegible]-01	NA	NA	NA	D	[illegible]
[illegible]	[illegible]-01	NA	P	P	NA	[illegible]
[illegible]	[illegible]	NA	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	3.[illegible]-01	P	NA	NA	D	[illegible]
[illegible]	[illegible]	P	NA	NA	D	[illegible]
trans-1.3-[illegible]	[illegible]	NA	NA	NA	[illegible]	[illegible]
[illegible]	P	NA	[illegible]	[illegible]	[illegible]	[illegible]
1.1.1-[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
1.1.2-[illegible]	[illegible]	NA	[illegible]	[illegible]	C	[illegible]
1.2.4-[illegible]	[illegible]	[illegible]	[illegible]	NA	D	[illegible]
1.2-[illegible]	[illegible]	[illegible]	[illegible]	NA	D	[illegible]
1.3-[illegible]	[illegible]	NA		NA	D	[illegible]
1.3-[illegible]	NA	NA		NA	NA	
1.3-[illegible]	[illegible]	NA	NA	NA	D	[illegible]
1.4-[illegible]	NA	7.00E-01	[illegible]	NA	[illegible]	[illegible]
2.4-[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
2.4-[illegible]	[illegible]	NA	NA	NA	NA	O
2-[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
2-[illegible]	4.[illegible]-01	NA	NA	NA	NA	O
2-[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
4-[illegible]-3-[illegible]	[illegible]	NA	NA	NA	NA	O
4-[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	NA	NA	1.[illegible]	NA	[illegible]	[illegible]/O
[illegible]	4.[illegible]	NA	NA	NA	NA	[illegible]
[illegible]	4.[illegible]-01	NA	NA	NA	NA	O
[illegible]	NA	NA	1.1[illegible]	1.1[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	NA	1.4[illegible]	NA	[illegible]	[illegible]
[illegible]	[illegible]-01	NA	NA	NA	C	[illegible]
di-n-[illegible]	1.[illegible]-01	NA	NA	NA	NA	[illegible]
di-n-[illegible]	[illegible]-01	NA	NA	NA	NA	O
[illegible]	4.[illegible]-01	NA	NA	NA	NA	O
[illegible]	[illegible]-01	NA	NA	NA	D	[illegible]/O
[illegible]	[illegible]-01	NA	NA	NA	NA	[illegible]
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	[illegible]-01	NA	4.[illegible] (P)	P	P	[illegible]
n-[illegible]	NA	NA	4.[illegible]	NA	[illegible]	[illegible]
[illegible]	4.[illegible]-01 (P)	NA	NA	NA	NA	HEAST
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	[illegible]-01	NA	NA	NA	NA	[illegible]
[illegible]	NA	NA	NA	NA	NA	
[illegible]	1.[illegible] (P)	NA	1.7[illegible]	[illegible]	A	[illegible]
[illegible]	[illegible]	1.[illegible] (P)	NA	NA	NA	[illegible]
[illegible]	[illegible]	NA	4.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	NA	NA	NA	NA	NA	
[illegible]	[illegible]	P	NA	4.1[illegible]	A	[illegible]
[illegible]	[illegible]	NA	NA	NA	NA	O
[illegible]	NA	NA	NA	NA	D	[illegible]
[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
[illegible]	NA	NA	NA	NA	NA	
[illegible]	NA	NA	NA	NA	[illegible]	
[illegible]	NA	NA	NA	NA	NA	
[illegible]	[illegible]	[illegible]-01	NA	NA	D	[illegible]
[illegible]	[illegible]	NA	NA	NA	NA	[illegible]
[illegible]	[illegible]	P	NA	NA	NA	[illegible]
[illegible]	NA	NA	NA	NA	NA	
[illegible]	[illegible]	1.[illegible]	NA	NA	NA	[illegible]
[illegible]	[illegible]	NA	NA	NA	D	[illegible]
[illegible]	NA	NA	NA	NA	NA	
[illegible]	7.[illegible]	NA	NA	NA	NA	[illegible]
[illegible]	[illegible]-01	NA	NA	NA	NA	[illegible]
2.3.7.8-TCDD equivalent	NA	NA	1.[illegible]	1.[illegible]	[illegible]	[illegible]
4.4'-DDE	[illegible]	NA	2.4[illegible]-01	NA	[illegible]	[illegible]
[illegible]	1.[illegible]	NA	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

P - [illegible]

[illegible]

[illegible]

[illegible]

NA - [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

TABLE 11

SUMMARY OF CARCINOGENIC RISK
William Dick Lagoons

POPULATION	Adult	Child 6-12	Child 2-6	Lifetime
POTENTIAL EXPOSURE SCENARIOS UNDER CURRENT CONDITIONS				
Off-Site Ground Water	7E-06 - 2E-04	2E-06 - 4E-05	2E-06 - 5E-05	1E-05 - 3E-04
On-Site Soils	5E-06 - 1E-05	3E-06 - 6E-06	2E-06 - 6E-06	9E-06 - 2E-05
Deer Meat Ingestion	4E-06 - 9E-06	9E-07 - 2E-06	6E-07 - 1E-06	5E-06 - 1E-05
Inhalation	4E-06 - 1E-05	6E-07 - 2E-06	4E-07 - 1E-06	5E-06 - 1E-05
Recreational Use of Spring #48	3E-08 - 3E-08	4E-09 - 5E-09	NA - NA	3E-08 - 3E-08
Total	2E-05 - 2E-04	6E-06 - 5E-05	5E-06 - 6E-05	3E-05 - 3E-04
HYPOTHETICAL EXPOSURE SCENARIO UNDER FUTURE USE CONDITIONS				
Hypothetical Use of On-Site Ground Water	*1E-03 - 1E-02*	2E-04 - 3E-03	3E-04 - 3E-03	*1E-03 - 2E-02*

NOTE: USEPA guidelines for evaluation of carcinogenic risk specify a target range of acceptable risk between 1 E-6 and 1 E-4. Values in italics indicate estimated potential risks which exceed this guideline.

TABLE 12

SUMMARY OF NONCARCINOGENIC HAZARD INDICES
William Dick Lagoons

POPULATION:	Adult	Child 6-12	Child 2-6
POTENTIAL EXPOSURE SCENARIOS UNDER CURRENT CONDITIONS			
Off-Site Ground Water	5E-03 - 1E-01	1E-02 - 3E-01	2E-02 - 5E-01
On-Site Soils	2E-02 - 5E-02	1E-01 - 3E-01	1E-01 - 3E-01
Deer Meat Ingestion	4E-02 - 1E-01	9E-02 - 3E-01	8E-02 - 3E-01
Inhalation	3E-03 - 8E-03	4E-03 - 1E-02	3E-03 - 1E-02
Recreational Use of Spring 046	6E-08 7E-08	9E-08 - 1E-08	NA - NA
Total	6E-02 - 3E-01	2E-01 - 9E-01	2E-01 - 8E-01
HYPOTHETICAL EXPOSURE SCENARIO UNDER FUTURE USE CONDITIONS			
Hypothetical Use of On-Site Ground Water	4E-01 - *6E+00*	1E+00 - *1E+01*	2E+00 - *2E+01*

NOTE: USEPA guidelines for evaluation of noncarcinogenic hazard indices specify a value of 1.0 for interpretation. Hazard indices which exceed 1.0 indicate that there is the potential for adverse health effects associated with the defined exposure conditions. Hazard indices greater than 1.0 are given in italics.