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December 1990

EPA

Superfund Record of Decision:

Whitmoyer Laboratories (Operable Unit 2), PA

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 22-acre Whitmoyer Laboratories site is an abandoned animal pharmaceutical manufacturing facility in Jackson Township, Lebanon County, Pennsylvania. Land use in the area is predominantly agricultural, and there are wetlands areas adjacent to the site. Part of the site lies within the 100-year floodplain of the Tulpehocken Creek-Union Canal, and an estimated 40 residences in the vicinity of the site use the 'erlying aquifer as their drinking water supply. From 1957 to 1964, Whitmoyer oratories, Inc., produced organic arsenicals onsite. In 1964, the new site owners, began storing concentrated wastes in an onsite concrete vault and, until 1971, conducted onsite pumping and treatment of ground water and ocean dumping of wastes. In 1977, sludge from ground water treatment was placed in onsite lagoons in the eastern area of the site. Between 1978 and 1982, the site changed ownership twice, and then in 1985, a RCRA site closure plan was filed. In 1986, EPA provided bottled water to residences with contaminated ground water. Onsite contamination of soil and ground water has resulted from a combination of poor housekeeping, poor disposal practices, and improper storage of hazardous materials. In 1986, arsenic contamination was detected in nearby residential wells by EPA. When the site was

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Whitmoyer Laboratories (Operable Unit 2), PA
Second Remedial Action
Contaminated Media: debris, sludge
Key Contaminants: VOCs (benzene, PCE, toluene, xylenes), other organics (phenols), metals (arsenic, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. [illegible]bility Statement	19. Security Class (This Report) None	21. No. of Pages 84
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A. ract (Continued)

abandoned in 1987, very little of the RCRA closure plan had been implemented. From 1988 to 1990, EPA removed the abandoned drums and laboratory wastes from the site. A 1989 Record of Decision (ROD) provided for offsite removal of concentrated liquids in abandoned tanks and process vessels as the first operable unit (OU1). This ROD addresses OU2, which includes remediation of chemical vault and lagoon wastes, out-dated products, miscellaneous chemicals and feedstocks, and contaminated site structures. A ROD for OU3 will addresses remediation of contaminated onsite soil and ground water. The primary contaminants of concern affecting the debris and sludge are VOCs including benzene, PCE, toluene, and xylenes; other organics including phenols; and metals including arsenic and lead.

The selected remedial action for this site includes excavating and incinerating onsite approximately 3000 cubic yards of high organic content vault wastes, and approximately 101 cubic yards of miscellaneous products and feedstocks, followed by cement/pozzolan-based fixation, and disposing of the residual ash offsite; treating approximately 1,500 cubic yards of low organic content vault wastes using fixation or a similar fixation process, followed by offsite disposal; excavating and incinerating onsite approximately 20 buried drums and 50 cubic yards of tank and process vessel residuals, followed by treating any residual ash using fixation, and offsite disposal of residuals; excavating approximately 24,000 cubic yards of arsenic-contaminated lagoon wastes with levels above 10,000 mg/kg, followed by fixation of the hazardous lagoons wastes; and disposing of residuals along with nonhazardous wastes and other products and feedstocks offsite; demolishing buildings, associated tanks, vessels, processing e[illegible]ment, and debris; incinerating onsite any combustible debris exhibiting the RCRA a[illegible]ic toxicity characteristic, followed by offsite disposal; coating and sealing noncombustible permeable demolition debris prior to offsite disposal; surface cleaning of noncombustible impermeable demolition debris, which exhibit the RCRA arsenic toxicity characteristic and contaminated onsite structures before offsite disposal; and offsite disposal or recycling of untreated unsalvaged demolition debris. The estimated present worth cost for this remedial action is $45,800,000. There are no O&M costs associated with this remedial action due to selection of offsite disposal for residuals.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific debris and surface water cleanup goals were not provided, but cleanup will be based on RCRA, CAA, CWA, and State standards.

RECORD OF DECISION
OPERABLE UNIT TWO
WHITMOYER LABORATORIES SITE

DECLARATION

SITE NAME AND LOCATION

Whitmoyer Laboratories Site
Lebanon County, Pennsylvania.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the second operable unit of the Whitmoyer Laboratories Site (Site) in Lebanon County, Pennsylvania. This remedy 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 is based on the Administrative Record for this Site.

The Commonwealth of Pennsylvania has not concurred with the selected remedy.

ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, based on the Administrative Record for this Site and, pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in "Summary of Site Risks," Section VI, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This operable unit (OU) is the second of three operable units for the Site. The remedial action for the first operable unit (OU One) at this Site involved remediation of hazardous concentrated liquids which were abandoned at the Site. The remedial action for the second operable unit (OU Two) addresses concentrated wastes abandoned in a concrete vault; concentrated wastes abandoned in two groups of lagoons; outdated products and miscellaneous chemicals abandoned in the buildings; and the buildings and related structures (tanks, process vessels etc.) located on the Site. These materials pose some of the principal threats at the Site. The third operable unit, (OU Three) will address soil and groundwater contamination at the Site and possible remediation thereof.

The U.S. Environmental Protection Agency (EPA) has selected the following Remedial Action for OU Two. This Remedial Action addresses the hazards posed in OU Two by treating the most contaminated materials, and disposing of treatment residuals and the materials contaminated at low levels offSite, such that the materials will not require any long-term onsite management.

The major components of the Selected Remedial Action are as follows:

* Excavation of the arsenic and organically-contaminated concrete vault-contents [(4,500 cubic yards (CY)], the approximately 20 buried drums located east of the vault, and an estimated 50 CY of residuals potentially present in the tanks and process vessels not addressed under OU One.

* Excavation of the approximately 24,000 CY of materials present in the lagoons having an arsenic content greater than 10,000 mg/kg (lagoon wastes).

* Removal of the approximately 101 CY of miscellaneous products/feedstocks from the buildings.

* Surface cleaning of contaminated Site structures.

* Remediation of dangerous conditions existing in buildings outside of the Building 1-7 complex.

* Demolition of the Building 1-7 complex and all tanks, vessels, piping, process equipment, and outdoor tank concrete dikes.

* Onsite incineration of the following: approximately 3,000 CY of high organic content wastes present in the vault; the contents of the approximately 20 buried drums; the estimated 50 CY of residuals potentially present in the tanks and process vessels not being addressed under OU One; and the miscellaneous products/feedstocks and combustible demolition debris exhibiting the RCRA arsenic toxicity characteristic. The remedy selected by EPA is incineration that meets all RCRA, NAAQS, and NESHAPS requirements and that is demonstrated to be safe during the remedial design phase of ROD implementation.

* Fixation of the incineration residuals and the approximately 1,500 CY of low organic content wastes present in the vault using a cement/pozzolan-based or other similar fixation process that provides equivalent protection.

* Fixation of the lagoon wastes exhibiting the RCRA arsenic toxicity characteristic using an iron-based or other similar fixation process that provides equivalent protection.

* Coating and sealing the noncombustible, permeable demolition debris exhibiting the RCRA arsenic toxicity characteristic.

* Surface cleaning the noncombustible, impermeable demolition debris exhibiting the RCRA arsenic toxicity characteristic.

* Salvaging nonhazardous demolition debris, as feasible.

* Disposal of the following in accordance with all applicable regulations: the treated wastes; the untreated (nonhazardous) lagoon wastes; the untreated (nonhazardous) miscellaneous products/feedstocks; and the untreated (nonhazardous) demolition debris that is not salvaged in offSite landfill(s).

The selected remedy is part of the long-term remediation of this Site and will be consistent with the final remedy.

STATUTORY DETERMINATIONS

The selected remedial action 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.

The Remedial Action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies which employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy for OU Two will not result in hazardous substances remaining onsite above health-based levels, a 5-year review under Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), will not apply to this action.

Edwin B. Erickson — 12/17/90
Edwin B. Erickson — Date
Regional Administrator

RECORD OF DECISION
WHITMOYER LABORATORIES SITE

DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

A. SITE NAME AND LOCATION

The Whitmoyer Laboratories Site (Site) is located on approximately 22 acres in Jackson Township, Lebanon County, Pennsylvania, about 1 mile southwest of the Borough of Myerstown (see Figures 1 and 2). The Site lies between the Union Canal of Tulpehocken Creek and the Conrail (Reading) Railroad. Fairlane Avenue forms the Site's eastern boundary, while Creamery Street adjoins the Site to the west.

A food storage warehouse is active in Building 18 on the Site. Land surrounding the Site is predominantly farmland, with scattered farmhouses. A Sterling Drug factory is located 2,000 feet east of the Site, while PJ Valves, a manufacturing plant, is located about 1,500 feet to the south. A large active limestone quarry, locally referred to as the Calcite Quarry, is located approximately 1.5 miles west of the Site.

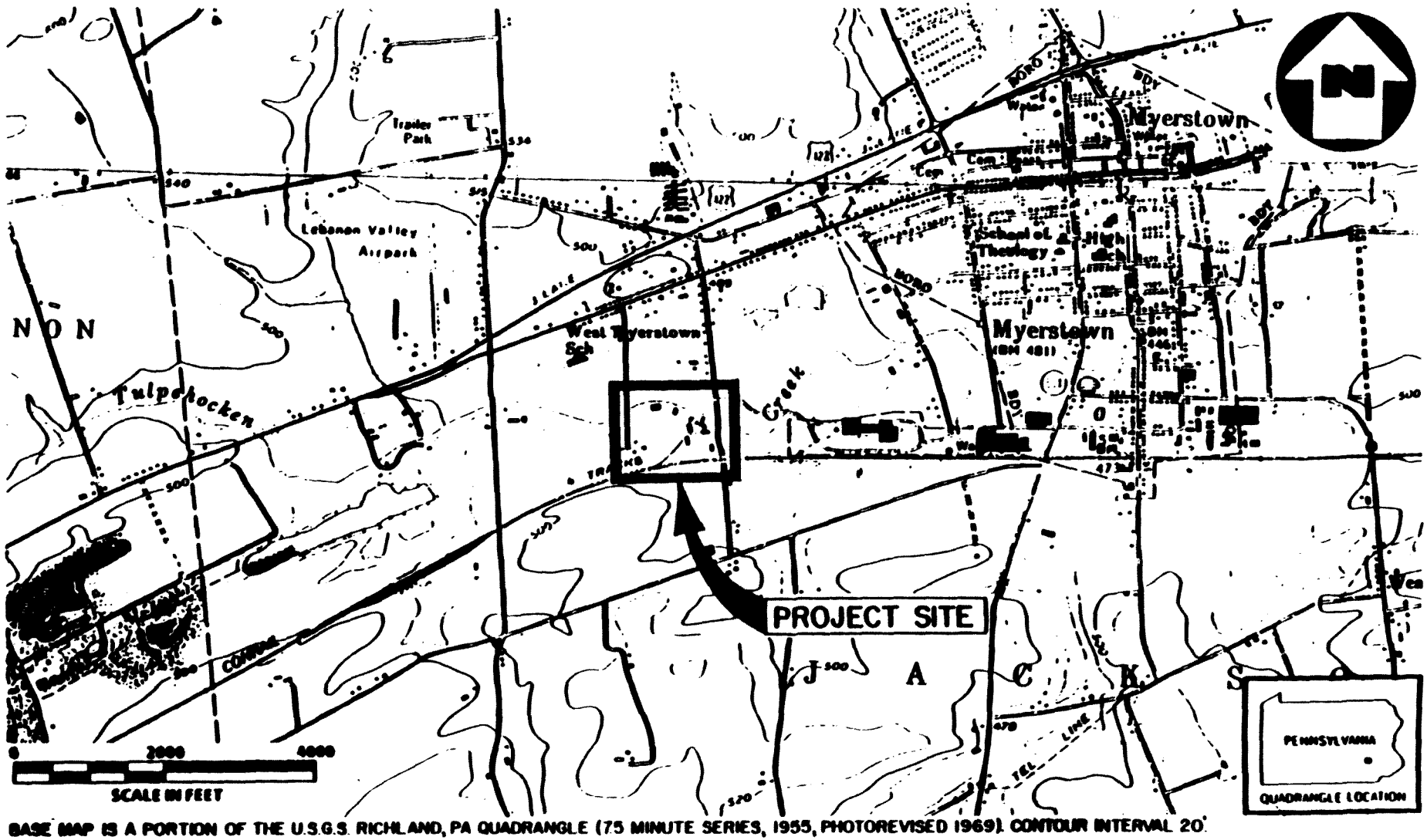
B. TOPOGRAPHY, SURFACE WATER, AND DRAINAGE

Topographic relief on the Site is moderate, varying in elevation from 493 feet in the southwest corner to 449 feet in the northeast corner. The entire Site drains to Tulpehocken Creek, with drainage being roughly perpendicular to the Creek axis. Portions of the Site are within the 100-year flood plain of Tulpehocken Creek-Union Canal.

The Union Canal branches from Tulpehocken Creek just west of the Site and rejoins the Creek near the Site's eastern boundary. Myerstown is the first downstream community, at a distance of approximately 3/4th of a mile. Tulpehocken Creek is a tributary to and joins the Schuylkill River near Reading, Pennsylvania. The Schuylkill River flows into the Delaware River, which eventually empties into the Atlantic Ocean. Tulpehocken Creek and the Schuylkill River serve as drinking water supplies and irrigation sources downstream of the Site. The headwaters of the section of Tulpehocken Creek which passes by the Site originate approximately 3 miles to the northwest.

C. GEOLOGY

The Whitmoyer Laboratories Site is located within the Lebanon Valley, part of the Great Valley portion of the Valley and Ridge Physiographic Province. The valley is a topographic expression of the underlying, relatively easily eroded carbonate bedrock units. The Site is underlain by carbonate bedrock of the Ontelaunee Formation, the youngest member of the Ordovician Age Beekmantown Group. A thin mantle of clayey residual soil overlies bedrock in the Site vicinity. Depths to bedrock in the Site's vicinity range from 0-19 feet, based on the Remedial



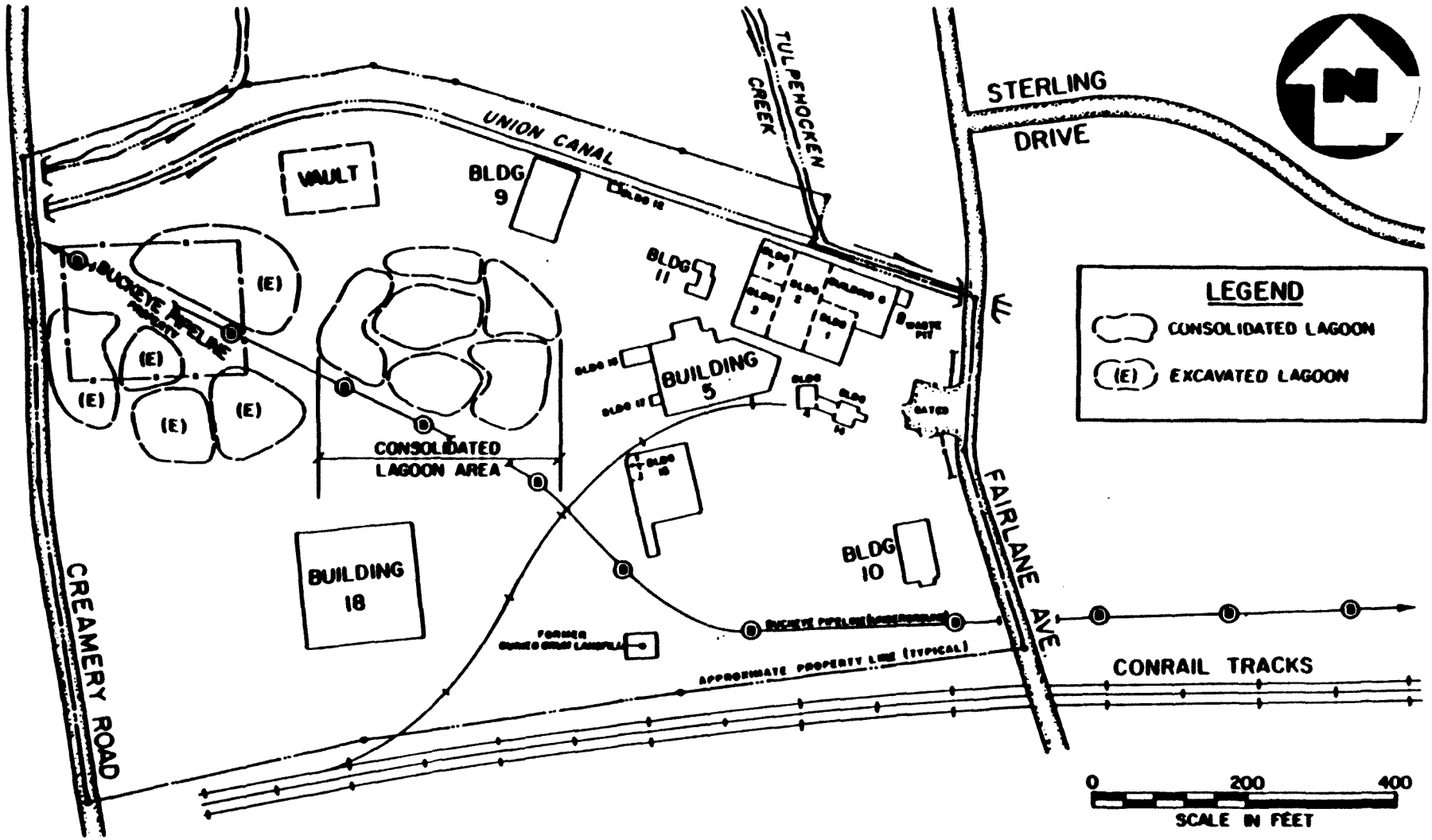
BASE MAP IS A PORTION OF THE U.S.G.S. RICHLAND, PA QUADRANGLE (7.5 MINUTE SERIES, 1955, PHOTOREVISED 1969). CONTOUR INTERVAL 20'

FIGURE 1

LOCATION MAP

WHITMOYER LABORATORIES SITE, LEBANON COUNTY, PA

NUS CORPORATION



SOURCE: GENERAL LAYOUT DRAWING, PREPAREDNESS, PREVENTION & CONTINGENCY PLAN, DEC. 22, 1982.

FIGURE 2

GENERAL ARRANGEMENT
WHITMOYER LABORATORIES SITE YERSTOWN, PA

NUS CORPORATION

Investigation (RI). The depth to bedrock is greatest in the vicinity of Tulpehocken Creek and the Union Canal. The Ontelaunee Formation is described in regional literature as a light to dark gray dolomite, which weathers to a dark grayish brown. The Ontelaunee Formation strikes N60°E to N80°E predominantly, with an overall dip to the SE of approximately 30°. In the Myerstown area, this formation is approximately 500 feet thick.

Soils in the area are primarily residual soils derived from weathering of the bedrock surface, with some alluvium adjacent to Tulpehocken Creek. Based on the RI, the soils consist predominantly of silt and clay. A thin veneer of organic-rich topsoil overlies the residual soils throughout much of the area. Fill material is present in several locations within the Site property boundaries.

D. HYDROGEOLOGY

The carbonate bedrock units underlying the Lebanon Valley form the major aquifer in the area. The various formations present, although differing somewhat in water-yielding capacity, are considered to form a single, large, heterogeneous, unconfined aquifer. The porosity of the carbonate aquifer is almost entirely secondary, with fractures enlarged through solution channeling forming the primary groundwater storage zones and migration pathways.

Groundwater flow directions in the region generally follow topography, then follow stream flow direction in valley bottoms. In the Site area, portions of the groundwater flow both in northeasterly and southeasterly directions, before generally following the course of the stream to the east-northeast. Depth to groundwater ranges from 2 to 21 feet below land surface at the Site.

Recharge to groundwater in the carbonate rock units is principally through precipitation infiltration, with additional recharge due to groundwater migration from adjacent rock units, and occasional surface water recharge during extended dry periods.

Groundwater beneath the Site is classified as a Class 2A aquifer, a current source of drinking water. The groundwater is also used for industrial water supplies. Approximately 40 residences in the Site vicinity have potable water supply wells tapping the aquifer. Twenty of these residences have been placed on bottled water by EPA due to contamination of their water supply from past Site activities. Large industrial users of groundwater include Sterling Drug, Inc., Quaker Alloy Casting Co., and P.J. Valves Company.

The Myerstown Water Authority (Authority) provides potable water to the residents of Myerstown. One of the Authority's reserve wells, No. 8, taps the bedrock aquifer underlying the Site. This well is utilized during periods of high demand. To date, contamination from the Site has not been detected in this well.

E. CLIMATOLOGY

The Whitmoyer Laboratories Site is located within the southeastern Piedmont Climatological Division of Pennsylvania. Second Mountain, which rises 1,500 feet along the north border, and South Mountain, which rises 1,000 feet along the southern border, form the Lebanon Valley,

in which the Site is located. The Lebanon Valley has a humid continental climate. Due to the valley's location, weather systems are typically modified before reaching Lebanon County. Weather extremes are most often the result of unusually strong weather systems.

The average annual precipitation at the Site is 42.3 inches. This precipitation is mostly evenly distributed throughout the year, with slightly less precipitation occurring in the winter. The average annual snowfall is 27 inches. Evaporation at the Site is 36.3 inches; thus, net precipitation is 6 inches.

In the summer, high temperatures are generally in the mid-80s and the lows near 60°F. During the winter the highs average in the upper 30s and the lows in the 20s. The prevailing wind is from the northwest in winter and from the west-southwest in summer.

F. POPULATION AND ENVIRONMENTAL RESOURCES

Lebanon County, according to the 1980 census, has a population of 109,829, and is classified by the Commonwealth of Pennsylvania as a "5th Class" county. The population of Myerstown in 1984 was 3,270. Populations of 1,296 and 4,683 reside within 1 and 3 miles of the Site, respectively.

Portions of Tulpehocken Creek (Creek) adjacent to the Site contain very small open water wetlands areas consisting of small pockets along the riverine system of the Creek and Union Canal. Floodplain forest wetlands exist starting approximately 3.5 miles downstream of the Site. The area has some habitat value, with opossum, raccoon, numerous fish, a water snake, and various songbirds observed during a 1986 EPA Site visit.

Tulpehocken Creek has been proposed for inclusion on the Commonwealth of Pennsylvania's scenic river system, with a "priority 1A status." This designation is for streams which "have the most urgent need for protection and immediate need for additional study," according to a Pennsylvania Department of Environmental Resources (PADER) official.

II. Site HISTORY AND ENFORCEMENT ACTIVITIES

A brief chronology of Site history and enforcement activities follows.

1900 Circa - An oil pipeline was constructed across the Site.
1934 - Whitmoyer Laboratories, Inc. (WLI) formed.
1957 - WLI begins production of organic arsenicals.
1964 - Rohm & Haas buys WLI. Concentrated wastes placed in a concrete vault. Groundwater pump-and-treat program initiated. Ocean dumping of wastes begins.
1971 - Groundwater pump-and-treat and ocean dumping program terminated.
1977 - Sludges from groundwater treatment consolidated in eastern lagoons.
1978 - Beecham Laboratories acquires WLI.
1982 - Stafford Laboratories, Inc. purchases WLI.

1984 - Stafford Laboratories, Inc. files for bankruptcy. Whitmoyer Laboratories Site proposed for the National Priority List (NPL).

1985 - WLI files a RCRA Closure Plan with PADER, and changes its RCRA status from a Treatment, Storage, or Disposal facility to a Generator facility.

1986 - Whitmoyer Laboratories Site finalized on the NPL. EPA begins providing bottled water to area residents with contaminated wells.

1987 - Stafford Laboratories, Inc. abandons facility, with very little, if any, of the RCRA Closure Plan implemented. EPA initiates the Remedial Investigation/Feasibility Study (RI/FS).

1988 - EPA initiates an emergency response to remove abandoned drums from the Site. This work continues into the summer of 1990.

1989 - EPA selects a remedy for the concentrated liquids operable unit. Abandoned laboratory wastes are packaged and disposed of by EPA. The Whitmoyer Laboratories Site RI Report is finalized. Clarence W. Whitmoyer, former president of WLI, dies. U.S. Department of Justice, on behalf of EPA, files claim against estate in Dade County, Florida. Special notice letters sent to PRPs for OU 1. PRPs decline to perform Remedial Action.

1990 January- The concentrated liquids (first) operable unit Remedial Design is completed.

1990 February- The Whitmoyer Laboratories Site FS which addresses the media making up the second operable unit is finalized. Two former Site owners, Rohm & Haas and SmithKline Beecham, propose to EPA a separate remedial alternative for the vault wastes, lagoon wastes, and miscellaneous products/feedstocks.

1990 May- The concentrated liquids Remedial Action commences.

1990 September- Rohm & Haas and SmithKline Beecham enter into consent order with EPA under which they will extend public water services to residents affected by the Site.

1990 September- Concentrated liquids remedial action completed.

III. COMMUNITY RELATIONS HISTORY

In accordance with Sections 113 and 117 of CERCLA, 42 U.S.C. §§ 9613 and 9617, EPA held a public comment period from April 16, 1990 through June 16, 1990 for the second operable unit Remedial Action (the subject of this Record of Decision) described in the Remedial Investigation (RI) and Feasibility Study (FS) Reports and Proposed Plan released in April 1990. A copy of the RI/FS and the proposed plan was sent to each PRP or their representative(s). The notice to the public of the comment period, of a public meeting, and of the availability of these documents was published in the Lebanon County Times on April 16, 1990. The RI and FS Reports and the Proposed Plan were made available to the public in the Administrative Record maintained in the EPA Region III office and at the Myerstown Public Library. A public meeting was held on April 24, 1990 to outline the Preferred Remedial Action and to accept comments from the attendees. A transcript of the public meeting was maintained in accordance with §117(a)(2) of CERCLA, U.S.C. § 9617(a)(2). Written comments, including some received after the close of the comment period, are addressed in the Responsiveness Summary which is attached.

All documents that form the basis for the selection of the remedial decisions contained in this Record of Decision are included in the Administrative Record for this Site and can be reviewed or referred to for additional information.

IV. SCOPE AND ROLE OF OPERABLE UNIT

As with many Superfund Sites, the problems at the Whitmoyer Laboratories Site are complex. As a result, EPA is addressing portions of the Site contamination using its emergency response authorities, whereas other portions are being addressed as a part of the remedial program.

A. EMERGENCY RESPONSE ACTIONS

The approximately 800 drums that were abandoned at the Site are being removed by EPA as an emergency response action. This action is nearly complete. The laboratory wastes and chemicals and production run samples abandoned at the Site were disposed as an emergency response action. A public water supply line extension to residences with contaminated wells is currently being designed and will be constructed as an emergency response action. While the line is being designed, affected residences are being supplied by EPA with bottled water.

B. REMEDIAL OPERABLE UNITS

EPA has divided the hazards at the Site into three operable units (OUs). These are as follows:

* OU One: Concentrated liquids abandoned in tanks and process vessels
* OU Two: Vault wastes, lagoon wastes, miscellaneous products/feedstocks, and Site structures
* OU Three: Contaminated soils and groundwater

EPA has already selected the cleanup remedy for OU One (the concentrated liquids) as described in the Record of Decision for this Site dated June, 1989. The concentrated liquids pose a principal threat at the Site, because of the potential for direct contact; tank/piping failure with subsequent contamination of Tulpehocken Creek; fire/explosion; and tank failure from flooding. This remediation was completed in September 1990.

The second OU, the OU addressed by this ROD, includes concentrated wastes abandoned in a concrete vault; concentrated wastes abandoned in two groups of lagoons; outdated products and miscellaneous chemicals abandoned in the buildings; and the buildings and related structures (tanks, process vessels, etc.) located on the Site. The November 1989 RI for the Site documents that these materials pose some of the principal threats to human health and the environment from the Site because of the following risks: possible ingestion or direct contact with the materials; contaminant migration from the materials into the underlying groundwater that is a source of drinking water for local residents; and contaminant migration to surface

water. The purpose of this action is to prevent current or future exposure to the contaminated materials and to reduce contaminant migration into groundwater and surface water.

The third OU will address contaminated groundwater and soils. For OU Three, a cleanup remedy has not yet been selected by EPA. A separate FS has been prepared to identify and evaluate remedial alternatives for contaminated soils and sediments. The results of the RI and two feasibility studies will be used to identify additional remediation activities which may be necessary for contaminated groundwater and soils. The third OU is currently proposed as the final response action for the Site. The proposed action for OU Two will be consistent with any future response action taken at the Site.

V. OPERABLE UNIT CHARACTERISTICS

Table 1 summarizes the Site materials to be remediated under OU Two. These materials are described as follows:

A. VAULT WASTES

The vault waste medium consists of approximately 1,500 cubic yards (CY) of calcium-arsenic sludge (lower vault waste) and 3,000 CY of various drummed organic/arsenic wastes and admixed soils (upper vault wastes) present in a concrete vault (see Figure 2). Also included in the upper vault waste classification are approximately 20 drums buried just east of the vault which are filled with approximately 5 CY of tar-like material that contains toxic organic chemicals, and an estimated 50 CY of residuals potentially present in the tanks and process vessels not being addressed under OU One.

The concentrations of arsenic in the upper and lower vault waste samples were measured to be about 12 and 15.7 percent, respectively. The total quantity of arsenic in the vault wastes is estimated at 2,000,000 lbs. The concentration of organics for the upper vault and lower vault waste samples were measured to be about 14 percent and 0.2 percent, respectively. The organics observed in the vault waste samples and quantity estimates are aniline (900,000 lbs), n-nitrosdiphenylamine (450,000 lbs), benzene/xylenes/phenol/n-nitrosodiphenylamine (1,100 lbs), and tetrachloroethene (<100 lbs). Cadmium is also present in the vault wastes in significant quantities. Arsenic, cadmium, aniline, benzene, tetrachloroethene (TCE), and n-nitrosodiphenylamine are classified by EPA as carcinogens; whereas arsenic, cadmium benzene, xylenes, PCE, and phenol are considered to be systemic toxicants.

The structural integrity of the vault is questionable. The vault is underlain by karstic, sinkhole-prone limestone. Because of their soluble nature, the vault contents pose an actual or potential threat to groundwater if no remediation occurs. Ingestion of and dermal contact with the wastes are also possible now and in the future if no remediation occurs.

B. LAGOON WASTES

The lagoon wastes consist of the iron-arsenic sludge and admixed soils which contain greater than 10,000 mg/kg (1 percent) arsenic. The lagoon wastes are located in the areas indicated

TABLE 1

QUANTIFICATION OF OPERABLE UNIT 2 MEDIA
WHITMOYER LABORATORIES SITE
LEBANON COUNTY, PENNSYLVANIA

Medium	Description	Volume	Areal Extent	Arsenic		Aniline		PCE		Other Contaminants Quantity
				Average Concentration	Quantity	Average Concentration	Quantity	Average Concentration	Quantity	
2	Upper vault waste	3,000 CY	0.24 acres	12%	1,200,000 lb.	9.2%	900,000 lb.	<1 mg/kg	<10 lb.	N 450,000 lb.
2	Lower vault waste	1,500 CY	0.24 acres	15.7%	783,000 lb.	0.2%	9,700 lb.	<1 mg/kg	<100 lb.	B,X,Ph,N 1,100 lb.
3	Lagoon wastes	24,000 CY	2.0 acres	2.5%	1,500,000 lb.	139 µg/kg	0 lb.	--	<1 lb.	P,B E,N(1) 700 lb.
4	Miscellaneous Products/feedstocks	66 CY 35 CY	--	EP Tox Non-haz.	--	----	--	--	--	--
6	Site structures	9,000 CY(3) 350,000 SF(4)	1.5 acres	(2)	(2)	(2)	(2)	(2)	(2)	Asbestos (2,000 LF of piping). BTEX residuals in USTs

-- Not believed to be significant or not applicable.

BTEX Benzene, Toluene, Ethylbenzene, Xylene.

N N-Nitrosodiphenylamine
B,X,Ph,N Benzene, Xylene, Phenol, n-nitrosodiphenylamine
P,BE,N Pentachlorophenol, Bis(2-ethlhexyl)phthalate, n-nitrosodiphenylamine

(1) Most prominent compounds observed, numerous other compounds were detected.
(2) Present but cannot be calculated.
(3) Building 1-7 complex, vault, tank dikes, piping, tanks, and process equipment.
(4) Surface area of contaminated site structures.

in Figure 2. These areas cover approximately 2.0 acres. The total estimated volume of lagoon wastes is 24,000 CY. The average arsenic content of the lagoon wastes is 2.5 percent; the lagoon wastes contain an estimated 1,500,000 lbs of arsenic. The most prominent organics measured in the lagoon waste samples are pentachlorophenol, bis(2-ethylhexyl)phthalate, and n-nitrosodiphenylamine at a summed average concentration of about 12 mg/kg. The total calculated quantity of organics in the lagoon wastes is about 700 lbs. Bis(2-ethylhexyl)phthalate is consider a carcinogen by EPA, whereas both pentachlorophenol and bis(2-ethylhexyl)phthalate are considered systemic toxicants. The lagoon wastes are underlain by karstic, sinkhole-prone limestone. Because of their somewhat soluble nature, the lagoon waste contaminants may continue to leach into groundwater and thereby pose an actual or potential threat to groundwater if left unremediated.

C. MISCELLANEOUS PRODUCTS/FEEDSTOCKS

The miscellaneous products/feedstocks medium consists of numerous drummed or bagged materials manufactured or routinely used by Whitmoyer Laboratories, Inc., which were abandoned inside the buildings at the Site. Based on sampling of portions of this medium, approximately 61 CY of these materials (mostly arsenic-contaminated corn meal) are believed to be RCRA characteristic hazardous wastes, while 35 CY are believed to be nonhazardous (about one-half being beef liver concentrate). Five CY of materials are presently unclassifiable; for this ROD, they will be considered as RCRA characteristic wastes because of arsenic toxicity.

Because of their diverse nature and small volume, the miscellaneous products were not chemically analyzed in detail. The primary contaminant of the hazardous wastes is believed to be arsenic. The 101 CY of miscellaneous products/feedstocks present current and future risks of ingestion, dermal contact, and groundwater and surface-water contamination if left unremediated.

D. SITE STRUCTURES

The Site structures medium consists of the production buildings, process equipment and piping, above-ground and underground tanks, and concrete dikes. All of the buildings onsite, with the exception of Buildings 10 and 18, were found to be contaminated with arsenic-containing dusts. The maximum dust-loading observed in wipe samples collected during the RI was 0.764 mg arsenic per square centimeter. Air within the buildings was sampled under quiescent conditions. Arsenic concentrations in air as high as 0.4 ug/m^3 were measured during the RI. Arsenic concentrations of the dust collected on the air filters were calculated to average 8,100 mg/kg. About 25,000 square feet (SF) of roof material, 58,000 SF of flooring and wall materials in Buildings 1, 2, 3, 6, and 7 (the Building 1-7 complex), and process equipment in the Building 1-7 complex are contaminated with arsenic. Some of these materials are so heavily contaminated with arsenic that they exhibit the RCRA characteristic of arsenic toxicity. Some of the materials that exhibit the arsenic toxicity characteristic also exhibit the cadmium toxicity characteristic. Simulated roof runoff collected during the RI contained as much as 9.4 mg/l arsenic. Other contaminated Site structures include tanks, process vessels, and related piping contaminated with concentrated liquids residuals; asbestos located in drums (4 CY) and on piping (2,800 linear feet) in the Building 1-7 complex; the vault concrete structure; and the outdoor tank concrete dikes.

If no remediation occurs, the arsenic-contaminated dusts present actual or potential future ingestion/inhalation threats. Precipitation contacting contaminated building materials can contaminate groundwater and surface water at present and in the future.

VI. SUMMARY OF SITE RISKS

The objective of this section is to estimate the potential for adverse health or environmental effects incurred by human or ecological receptors exposed to the materials making up OU Two under the exposure scenarios established in the RI Report for the Whitmoyer Laboratories Site. This section characterizes the potential noncarcinogenic, carcinogenic, and environmental risks associated with OU Two. EPA guidelines for the use of dose-additive models are used to combine the risks for individual chemicals to estimate cumulative risks for the mixtures found onsite, assuming the toxicological endpoints are the same. This section summarizes the risk assessment presented in the Whitmoyer Laboratories Site RI Report, which was finalized in November 1989.

A. HUMAN HEALTH RISKS

For human health risks, both carcinogenic risk and the potential for noncarcinogenic effects are presented. Carcinogenic risk is evaluated by determining the excess lifetime cancer risks (ELCRs) for actual or potentially exposed individuals. ELCRs are determined by multiplying the contaminant exposure dose with the cancer potency factor (cancer slope factor). These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An ELCR of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of Site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a Site.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogen Risk Assessment Verification Endeavor workgroup for estimating lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper bound estimate of the ELCR associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) [or the ratio of estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose (RfD)]. The HQ is also referred to as the Dose/RfD ratio. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of acceptable lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. 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 in humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic health effects to occur.

The following risk summary is presented by medium for the various OU Two media. Following the medium-by-medium summary, a discussion of the groundwater exposure pathway is presented since all of the OU Two media actually or potentially threaten groundwater.

1. Vault Wastes

The contaminant concentrations and exposure pathways for the vault wastes are briefly described above in Section V.A. above. The exposure pathways are groundwater consumption, dermal contact, and accidental ingestion. The groundwater pathway is discussed below. Potentially exposed individuals for the dermal contact and accidental ingestion pathways include Site trespassers who may access the vault wastes through portals in the side of the vault structure. A conservative accidental ingestion exposure scenario of 10 exposures over a 90-day period for a 45-kg child was assumed in the risk assessment. Based on this scenario, an HQ of 30 and an ELCR of 1.94×10^{-3} was calculated for the upper vault waste (based on sample results from tarry material in the upper vault), and an HQ of 38 and an ELCR of 2.45×10^{-3} was calculated for the lower vault sludge, for the arsenic contamination only. Thus, accidental ingestion of the waste by a receptor trespassing across the Site results in a HQ exceeding unity (i.e., adverse noncarcinogenic health effects are possible under the conditions of the risk assessment) and ELCRs in excess of 1×10^{-3} (i.e., under the conditions of the risk assessment, the carcinogenic risk is greater than the CERCLA acceptable ELCR of between 10^{-4} and 10^{-6}).

Organic chemical contamination is also present in the vault wastes. For example, the tar sample from the upper vault wastes contained 11% aniline. Concentrated aniline is acutely toxic to humans. Aniline penetrates the skin rapidly and induces methemoglobinemia in those persons sufficiently exposed. Death can result from a significant exposure. Aniline is also classified by EPA as a probable human carcinogen. Risk from accidental ingestion of organic contaminants in the vault wastes were not quantitatively assessed during the RI.

The potential for direct exposure to the vault wastes is expected to increase in the future because of the eventual deterioration of the wooden vault roof.

2. Lagoon Wastes

The lagoon wastes are covered by a soil cap. Although this soil is contaminated, arsenic concentrations do not exceed 10,000 mg/kg. Thus, the soil cap is not considered to be a part of the lagoon waste medium, but will be addressed in the ROD for OU Three. Since the lagoon

wastes are not present on the surface, there is no present dermal contact or accidental ingestion threat from these wastes. There is a potential for these exposures in the future if the wastes are not remediated and excavation occurs in the lagoon areas.

The primary exposure pathway for the lagoon wastes is the groundwater pathway. Precipitation infiltration through the lagoon wastes was modeled in the RI Report, using the Hydrologic Evaluation of Landfill Performance (HELP) model. For the eastern (consolidated) and western (excavated) lagoon areas, infiltration of 13.4 in/yr and 14.0 in/yr, were predicted by the model. This infiltration rate corresponds to a total percolation rate of 921 gallons per day, for the eastern lagoon area only. The groundwater pathway is discussed in more detail in Section VI.A.5 below.

3. Miscellaneous Products/Feedstocks

The miscellaneous products/feedstocks are presently housed in the Site buildings and are readily accessible to Site trespassers. These trespassers could be exposed via the dermal contact or accidental ingestion pathways. Because of the relatively small volumes and diverse natures of the miscellaneous products/feedstocks, a quantitative risk assessment for the dermal contact and accidental ingestion pathways was not conducted during the RI. However, much of the materials are known to be contaminated with arsenic in significant concentrations. (For example, some of the abandoned materials are pure arsanilic acid product.) Arsenic is a known human carcinogen. Exposure to arsenic in excess of existing standards/criteria (e.g., the arsenic reference dose) may also result in noncarcinogenic health effects in humans. Human trespassers may be adversely affected if exposed to these materials. Thus, the miscellaneous products/feedstocks pose an actual or potential threat to the health of human trespassers.

Many of the materials are known to exhibit the RCRA characteristic of arsenic toxicity. Thus, these materials could release substantial quantities of arsenic when contacted by precipitation. This could occur if the building conditions deteriorate further in the future, if no remediation occurs. Precipitation that has contacted the arsenic-contaminated miscellaneous products/feedstocks could run off and potentially contaminate groundwater and/or surface water. The surface-water pathway was not quantitatively analyzed. The groundwater pathway is discussed in further detail below.

4. Site Structures

As described in Section V, nearly all of the Site building interiors are coated with arsenic-contaminated dust. This dust presents an accidental ingestion threat to workers if they occupied the unremediated buildings in the future. This exposure pathway was modeled in the RI using two methods, Method 1 and Method 2. Method 1 assumes that the workers ingest 0.1 gram/day of dust at their workplace. Method 2 assumes the worker contacts the interior surfaces of the building, and subsequently ingests dust adhering to 59 cm^2 of the hand surface area (the inside surface area of the fingers and thumb). Both methods assume the workers are exposed for 250 days/year over a 40-year work period, and weigh 70 kilograms (kg).

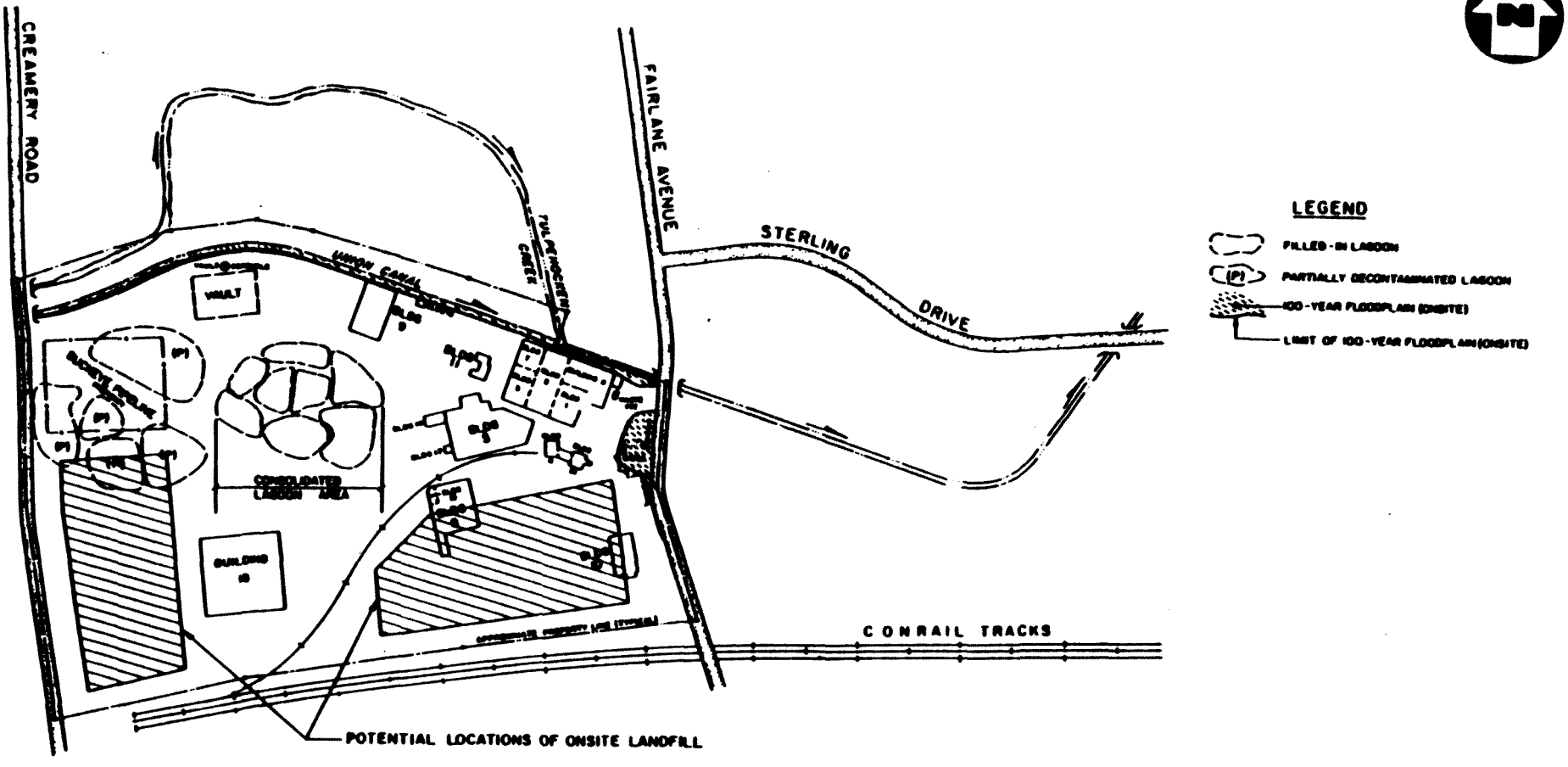


FIGURE 3

ONSITE LANDFILL - POTENTIAL LOCATIONS
WHITMOYER LABORATORIES SITE, MYERSTOWN, PA

NUS CORPORATION

Using the dust arsenic concentrations calculated from the building air data and Method 1, HQs ranging from 1 to 23 and ELCRs ranging from 2.34×10^{-2} to 1.4×10^{-3} were calculated (see Table 2). Using Method 2 and the RI building wipe sample data, HQs as high as 361 and ELCRs approaching unity were calculated (see Table 3). Thus, adverse noncarcinogenic health effects are possible and there is a significant excess lifetime cancer risk under the conditions of the risk assessment.

Elevated arsenic concentrations were measured in the building air under quiescent conditions during the RI. The building air presents an inhalation threat to workers employed in the buildings in the future if the buildings are not remediated. This exposure pathway was modeled in the RI risk assessment, assuming that the workers were exposed 8 hours/day, 250 days/year for 40 years. Other assumptions include a 1.3 m^3/hr breathing rate and a worker weight of 70 kg. Based on the RI air data, reasonable worst case scenario ELCRs as high as 1.15×10^{-3} were calculated (see Table 4). Thus, there is a significant excess lifetime cancer risk under the conditions of the risk assessment. Because there is no inhalation reference dose for arsenic, the RI did not calculate HQs for this exposure scenario.

Precipitation causing leaching of contaminants from the building materials and subsequently contaminating groundwater or surface water is a current and future exposure scenario. Roof runoff from a simulated precipitation event was collected and analyzed during the RI. Arsenic concentrations as high as 9.4 mg/l were measured in the runoff. This concentration is more than 100 times the Commonwealth of Pennsylvania water quality standard for Tulpehocken Creek at the Site of 50 ug/l arsenic and the Safe Drinking Water Act Maximum Contaminant Level of 50 ug/l arsenic, which is a relevant and appropriate regulation for groundwater. Building contaminant mobilization could increase in the future if building conditions deteriorate. Risk from direct exposure to contaminated building runoff was not quantitatively assessed. The groundwater pathway is further discussed below.

As much of the Building 1-7 complex and process equipment are wooden, there could be a potential contaminant release from a fire set by vandals. Arsenic is a metal that volatilizes at rather low temperatures. Also, building organic contaminants and their toxic byproducts could be released during a fire. Risk from this exposure pathway was not quantitatively assessed.

The building conditions have deteriorated since the Whitmoyer Laboratories plant was abandoned in 1987. Current unsafe conditions include corroded metal walkways and missing railings. Trespassers could be potentially harmed by these conditions.

The "Map of Flood-Prone Areas," published by the United States Geologic Survey, and the Flood Insurance Rate Map, published by Federal Emergency Management Agency, both show portions of the Building 1-7 complex to be in the 100-year floodplain (elevation 559 above Mean Sea Level, see Figure 3). Severe flooding could possibly mobilize contaminants present in the lower levels of the buildings (building materials and dusts), with a release of contaminants to the Tulpehocken Creek waters. This exposure pathway was not quantitatively assessed.

TABLE 2

HAZARD INDICES AND CANCER RISK LEVELS FOR
THE DUST INGESTION SCENARIO
WHITMOYER LABORATORIES SITE
LEBANON COUNTY, PENNSYLVANIA

Sampling Location	Dose/RfD Ratios	Estimated Excess Lifetime Cancer Risk
Building 2, First Floor	7	7×10^{-3}
Building 7, First Floor	1	1.4×10^{-3}
Building 9, First Floor	23/5	2.34×10^{-2}/ 5×10^{-3}

/ symbolizes duplicate

TABLE 3

HAZARD INDICES AND CANCER RISK LEVELS FOR ARSENIC CONTENT OF WIPE SAMPLES
COLLECTED WITHIN PROCESS BUILDINGS
WHITMOYER LABORATORIES SITE
LEBANON COUNTY, PENNSYLVANIA

HAZARD INDICES

Building Number	1st Floor			2nd Floor			3rd Floor		
	F	W	C	F	W	C	F	W	C
Building 1	1.97	0.7	ND	9.28	ND	0.93			
Building 2	33.6	ND	0.8	25	0.75	0.48			
Building 3	1.04	ND	2.1	4.5	7.0	0.7			
Building 4	4.64	ND							
Building 5	2.7	ND	ND	11.6	ND	ND	ND	1.04	3.1
Building 6	361.3*	33	14.2	36	1.16	0.5*		11	
Building 7	12.2	5.6	0.58						
Building 8	5.6	ND		1.57	ND	ND			
Building 9	9.7	0.49*	ND						
Building 10	ND	ND	ND	ND	ND	ND			
Building 11	1.04	ND	ND						
Building 18	ND	ND							

* Duplicates were averaged
Blanks spaces indicate that no analyses were performed.
F = Floor
W = Wall
C = Ceiling

TABLE 3
HAZARD INDICES AND CANCER RISK LEVELS FOR ARSENIC CONTENT OF WIPE SAMPLES COLLECTED WITHIN PROCESS BUILDINGS
WHITMOYER LABORATORIES SITE
LEBANON COUNTY, PENNSYLVANIA
PAGE TWO

CANCER RISK ESTIMATES

Building Number	1st Floor			2nd Floor			3rd Floor		
	F	W	C	F	W	C	F	W	C
Building 1	2.0×10^{-3}	7.1×10^{-4}	ND	9.5×10^{-3}	ND	9.5×10^{-4}			
Building 2	3.4×10^{-2}	ND	8.3×10^{-4}	2.6×10^{-2}	7.7×10^{-4}	5×10^{-4}			
Building 3	1.0×10^{-3}	ND	2.1×10^{-3}	4.5×10^{-3}	7.1×10^{-3}	7.1×10^{-4}			
Building 4	4.7×10^{-3}	ND							
Building 5	2.7×10^{-3}	ND	ND	1.2×10^{-2}	ND	ND	ND	1.1×10^{-3}	3.1×10^{-3}
Building 6	**	3.4×10^{-3}	1.5×10^{-2}	3.6×10^{-2}	1.2×10^{-3}	5×10^{-4}		1.1×10^{-2}	
Building 7	1.2×10^{-2}	5.7×10^{-3}	5.9×10^{-4}						
Building 8	5.7×10^{-3}	ND		1.6×10^{-3}	ND	ND			
Building 9	9.9×10^{-3}	5×10^{-4}*	ND						
Building 10	ND	ND	ND	ND	ND	ND			
Building 11	1.1×10^{-3}	ND	ND						
Building 18	ND	ND	ND						

* Duplicates were averaged
** Cancer risk approaches unity

F = Floor
W = Wall
C = Ceiling

TABLE 4

CANCER RISK LEVELS FOR ARSENIC CONTENT OF AIR WITHIN PROCESS BUILDINGS WHITMOYER LABORATORIES SITE LEBANON COUNTY, PENNSYLVANIA

Sampling Station	Estimated Excess[1] Lifetime Cancer Risk
Building 1, Second Floor	1.15×10^{-3}
Building 2, First Floor	5.76×10^{-4}
Building 7, First Floor	1.99×10^{-4}
Building 8, First Floor	5.29×10^{-4}
Building 9, First Floor	1.13×10^{-3}

[1] Maximum contaminant levels are evaluated

5. Groundwater

As identified in the RI, the groundwater at the Site and downgradient of the Site is highly contaminated. Peak concentrations of arsenic and other organics (e.g., tetrachloroethene) measured in the groundwater exceed Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) by a factor of about 3,000. ELCRs and HQs for the onsite/near-Site groundwater (residential use-reasonable worst case scenario) approach unity and exceed 6000, respectively. This scenario assumes residential use of the Site and consumption of the most contaminated groundwater at a rate of 2 liters/day for 70 years by a 70-kg adult. The risk data indicate potential adverse carcinogenic and noncarcinogenic effects under this exposure scenario.

The materials addressed in OU Two are likely to be contributing to the groundwater contamination and would continue to contaminate groundwater in the future if left unremediated. With time, as the buildings and vault structure continue to deteriorate, contaminant contributions to groundwater from the OU Two materials would likely increase.

B. ENVIRONMENTAL RISKS

Based on the aquatic biota survey and fish tissue sampling conducted during the RI, no evidence of impacts on the ecosystem from the Site was observed. Fish tissue arsenic concentrations were below 2 mg/kg, the method detection limit. Sensitive benthic species, e.g., stoneflies and mayflies, were found in downstream waters of Tulpehocken Creek. (There are no endangered species or natural resources of special concern in the vicinity of the Site.) Thus, contamination from the materials addressed in OU Two do not appear to be impacting the ecosystem currently. As the buildings and vault structure continue to deteriorate over time, contaminant contribution to surface water and sediment could potentially affect the ecosystem in the future if no remediation occurs.

In summary, actual or threatened releases of hazardous substances from the materials making up OU Two, if not addressed by implementing the response in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VII. DESCRIPTION AND COMPARISON OF ALTERNATIVES

Based on the RI risk assessment for the OU Two materials, EPA developed the following remedial action objectives to protect human health and the environment:

1. Prevent human exposure (dermal contact, ingestion, inhalation) to OU Two materials having contaminants in concentrations greater than carcinogenic (ELCR greater than 10^{-4} to 10^{-6}) and noncarcinogenic (Hazard Index greater than 1) risk-based levels.

2. Prevent human exposure (dermal contact, ingestion) to drainage from process buildings having contaminant concentrations greater than carcinogenic/noncarcinogenic risk-based levels (ELCR greater than 10^{-4} to 10^{-6}/Hazard Index greater than 1) risk-based levels.

3. Prevent migration (via leaching) of contaminants that would result in groundwater contamination in excess of MCLs (e.g., 50 ug/l arsenic and 5 ug/l PCE) and/or carcinogenic/noncarcinogenic risk-based cleanup levels (ELCR greater than 10^{-4} to 10^{-6}/Hazard Index greater than 1).

4. Prevent migration (via runoff, flooding, erosion) of contaminants that would result in surface-water contamination in excess of Pennsylvania Water Quality Standards (e.g., 50 ug/l arsenic), Federal Ambient Water Quality Criteria, and/or carcinogenic/noncarcinogenic risk-based cleanup levels.

5. Comply with chemical-specific, location-specific, and action-specific applicable or relevant and appropriate regulations (ARARs), including RCRA land disposal restrictions.

Based on data available in the RI and FS Reports, the following OU Two materials will need to be remediated to achieve the remedial action objectives:

* Vault Wastes - Estimated volume is 4,500 cubic yards.
* Lagoon Wastes - Estimated volume is 24,000 cubic yards.
* Miscellaneous Products/Feedstocks - Estimated volume is 101 cubic yards.
* Site Structures - Dust-contaminated areas. Estimated area is 350,000 square feet.
* Site Structures - Contaminated materials (Building 1-7 complex, vault structure, tank dikes, piping, tanks, and process equipment). Estimated volume is 5,000 cubic yards.

The Superfund process requires that the alternative chosen to clean up a hazardous waste Site 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 practicable. These solutions should reduce the volume, toxicity, or mobility of the contaminants. Emphasis is also placed on treating the wastes at the Site, whenever this is practicable, and on applying innovative technologies to clean up the contaminants.

EPA studied a variety of technologies to see if they were applicable for use on the vault wastes, lagoon wastes, miscellaneous products/feedstocks, and Site structures. The technologies determined to be most applicable to these materials were developed into remedial alternatives. Because of the different nature of each of the materials constituting OU Two, separate remedial alternatives for each waste class (medium) were developed. These alternatives are presented and discussed below. The remedial alternatives developed by the former Site owners and presented to the EPA are also described and discussed.

A. VAULT WASTES

Alternatives 1 through 5 for the vault wastes are numbered to correspond with the numbers in the FS Report. Alternative 6 is the alternative presented by the former Site owners prior to

issuance of the Proposed Plan for OU Two. Alternative 7 is a separate alternative proposed by the former owners in their comments on the Proposed Plan. The alternatives are the following:

* Alternative 1: No Action
* Alternative 2: Bulk Excavation/Landfill (Onsite)
* Alternative 3: Bulk Excavation/Fixation/Landfill (Onsite or Offsite)
* Alternative 4: Bulk Excavation/Incineration/Fixation/Landfill (Onsite or OffSite)
* Alternative 5: Bulk Excavation/Vitrification/Landfill (Onsite or OffSite)
* Alternative 6: On-Site Enhanced Solids Containment System
* Alternative 7: Bulk Excavation/Landfill (OffSite)

1. Alternative 1: NO ACTION

The Superfund Program requires that the "no action" alternative be evaluated at every Site to establish a baseline for comparison with the other alternatives. Under this alternative, EPA would take no actions other than annual groundwater monitoring around the vault and performing reviews every 5 years. There are no ARARs associated with this alternative. Alternative 1 would not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. While no capital costs would be incurred under this alternative, annual operation & maintenance (O&M) costs are estimated to be $7,100. This alternative has a present-worth cost of $109,000, and can be implemented immediately.

2. Alternative 2: BULK EXCAVATION/LANDFILL (ONSITE)

Under this alternative, the vault wastes would be excavated and placed in a new landfill located onsite. The landfill would be designed to meet or exceed RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate. RCRA standards are not applicable to Alternative 2 since the wastes are being consolidated within the same area of contamination. The Whitmoyer Laboratories Site is underlain by limestone (carbonate) bedrock. Studies by the Pennsylvania Topographic and Geologic Survey have shown that the limestone beneath the Site can be dissolved by infiltrating rainwater and groundwater passing through it. Over time, this dissolution could destabilize the overlying rock and soil, and cause them to cave in (sinkhole collapse). To provide protection against landfill failure, the landfill liner base would be designed to minimize threats posed by sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. Since the wastes would remain onsite, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in compliance with 40 CFR 264.117, and 5-year reviews would be conducted. The vault structure would be addressed under the Site structures medium. The vault waste excavation would be backfilled with soil and regraded. Alternative 2 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be relevant and appropriate. Alternative 2 would also not comply with the CERCLA preference for a remedy that employs

treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital cost of this alternative is $1,027,000, with annual O&M costs estimated to be $22,900. This alternative has a present-worth cost of $1,379,000. The estimated time to implement this alternative is approximately 24 months.

3. Alternative 3: BULK EXCAVATION/FIXATION/LANDFILL (ONSITE OR OFFSITE)

The major features of this alternative include excavation of the 4,500 cubic yards of vault wastes, onsite microencapsulation of the upper vault wastes, onsite cement/pozzolan-based fixation of the lower vault wastes, and landfilling of the treated wastes either onsite or offSite. The vault structure would be addressed under the Site structures medium. The vault waste excavation area would be backfilled with soil and regraded.

The 3000 CY of upper vault wastes would be microencapsulated in a solid matrix (e.g., asphalt) onsite in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). The microencapsulation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. The effectiveness of microencapsulation processes in treating the upper vault wastes is uncertain. A treatability study would be required prior to full-scale implementation to validate the proposed treatment. The specific type of microencapsulation process to be used would be determined in the Remedial Design phase through the treatability study, engineering design and analysis, and competitive bidding process. Because the upper vault wastes are a mixture of K101 wastes, K102 wastes, and arsenic characteristic wastes; some or all of the upper vault wastes also exhibit the toxicity characteristic for cadmium; and Alternative 3 constitutes treatment, RCRA Subtitle C is applicable. RCRA land disposal restriction treatment standards for these wastes are 5.0 mg/l arsenic (for arsenic characteristic (D004) wastes); 5.6 mg/l arsenic (for the listed wastes), as measured by the Extraction Procedure (EP) Toxicity Test or Toxicity Characteristic Leachate Procedure (TCLP); and 1.0 mg/l cadmium (as measured by the TCLP) for cadmium characteristic (D006) wastes. Treated K101 and K102 nonwastewaters must contain less than 14 mg/kg nitroaniline and 13 mg/kg ortho-nitrophenol, respectively, prior to land disposal to comply with RCRA land disposal restrictions (40 CFR Part 268). (A national capacity extension for arsenic characteristic nonwastewaters and K101 and K102 nonwastewaters is in effect until May 8, 1992.) All upper vault wastes exhibiting the toxicity characteristic for cadmium must meet the cadmium treatment standards, in addition to the treatment standards for the listed wastes and arsenic characteristic wastes. If effective, the microencapsulation process should achieve these treatment standards.

The lower vault wastes would be fixated onsite using a cement/pozzolan-based method or another similar fixation process that provides equivalent protection, in compliance with the requirements of RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). A treatability study was conducted using cement/lime-based fixation methods on the lower vault wastes during the RI/FS. This treatment reduced the arsenic leachability of the wastes by approximately 99.94% to 5.4 mg/l, as measured by the TCLP. This level is slightly lower than the applicable 5.6 mg/l arsenic RCRA land disposal restriction treatment standard for the lower vault wastes (K084 wastes). (A national capacity extension for K084 nonwastewaters is in effect until May 8, 1992.) The lower vault wastes are also characteristic (D006) wastes because of cadmium toxicity. The fixation process should achieve the D006 land disposal

restriction treatment standard. The exact fixation technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. The fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq.

Metal drums and other debris would be separated from the upper vault wastes prior to the treatment step to protect the processing equipment. These drums and debris would be cleaned and disposed in accordance with hazardous waste container regulations (40 CFR 261.7).

Specialized air pollution control equipment would be applied during the microencapsulation step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50).

The treated wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. The landfills would be designed in accordance with the applicable RCRA landfill standards (40 CFR Part 264, Subpart N). If the wastes were landfilled onsite, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in compliance with 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be applicable. The offsite landfill option would comply with all ARARs.

Alternative 3 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $10,700,000 and $15,900,000 for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $35,200. There are no annual O&M costs for the offSite landfill option. The estimated present-worth costs of this alternative are $11,300,000 and $15,900,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

4. Alternative 4: BULK EXCAVATION/INCINERATION/FIXATION/LANDFILL (ONSITE OR OFFSITE)

The major features of this alternative include excavation of the 4,500 cubic yards of vault wastes, onsite incineration of the wastes which will destroy the organics and leave the arsenic in a form amenable to fixation, fixation of the incineration residuals, and landfilling of the treated wastes either onsite or offSite. The vault structure would be addressed under the Site structures medium. The vault waste excavation would be backfilled with soil and regraded.

Prior to incineration, the upper vault materials would be subjected to grinding and crushing followed by screening to protect the other process equipment. The vault wastes would be incinerated onsite in accordance with RCRA 40 CFR Part 264, Subpart O standards. The specific type of incineration process (e.g., rotary kiln) would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. The incineration unit would be mobilized, operated, and closed according to the requirements of RCRA Part 264 Subpart O, 40 CFR 264.340 et seq. These requirements are applicable to the vault wastes (K084, K101, K102, and arsenic and cadmium characteristic wastes) because treatment and disposal of hazardous waste are occurring. Specific operating practices necessary to meet the performance objectives, including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions as required by Subpart O of RCRA, would be determined through a trial burn at the Site after the installation of the incineration unit. Specialized air pollution control equipment would be applied during the incineration step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) (40 CFR Part 61, Subpart N). Additionally, the vault wastes would be incinerated in the presence of the cement/pozzolan fixative agent(s). A treatability study for the lower vault wastes indicated that cement/lime presence inhibited arsenic volatilization during the thermal treatment step. The cement/pozzolan would later be hydrated during the fixation step.

The incineration residuals would be fixated onsite using a cement/pozzolan-based process or another similar fixation process that provides equivalent protection, in compliance with the requirements of RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). The exact cement/pozzolan-based fixation technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. The fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq.

A treatability study was conducted on the lower vault wastes during the RI/FS using incineration followed by cement/lime-based fixation methods. This treatment essentially destroyed all of the organics. The arsenic mobility of the wastes was reduced by approximately 99.98%. Thus, Alternative 4 would be expected to comply with the applicable arsenic-based RCRA land disposal restriction treatment standards at 40 CFR Part 268 for the vault wastes. The proposed treatment would also be expected to comply with cadmium-based treatment standards. RCRA land disposal restrictions (40 CFR Part 268) are applicable to the vault wastes because placement is occurring. (A national capacity extension for KO84, K101, K102 and arsenic characteristic nonwastewaters is in effect until May 8, 1992 - see 55 FR 22520.)

The treated wastes would be placed in either a new onsite landfill or an existing offsite landfill. Because of the treatment step, placement is occurring. The landfills would be designed in accordance with the applicable RCRA landfill standards (40 CFR Part 264, Subpart N). If the wastes were landfilled onsite, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction

of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be applicable. The offSite landfill option would comply with all ARARs.

Alternative 4 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $15,250,000 and $20,500,000 for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $24,900. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $15,630,000 and $20,500,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

5. Alternative 5: BULK EXCAVATION/VITRIFICATION/LANDFILL (Onsite OR OFFSite)

The major features of this alternative include excavation of the 4,500 cubic yards of vault wastes, mixing the vault wastes with soil or other Site wastes to dilute the organic content of the mixture to 5 percent, onsite vitrification of the wastes, and landfilling of the treated wastes either onsite or offSite. The vault structure would be addressed under the Site structures medium. The vault waste excavation would be backfilled with soil and regraded.

The 4,500 CY of vault wastes would be excavated and mixed onsite with soils or other materials with a low organic carbon content. Other Site wastes could be used if suitable. This mixing would occur to achieve a mixture organic carbon content of approximately 5 percent, the maximum content that existing vitrification equipment can handle. The mixture would be placed in an onsite trench and heated with electricity flowing through electrodes until the mixture formed a pool of molten glass. Organic contaminants would be destroyed during heating, whereas metal contaminants would become trapped in the glass during the subsequent cooling step. The vitrification would occur in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). These standards are applicable to the vault wastes (K084, K101, K102, and characteristic wastes) because treatment and disposal are occurring. The vitrification unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. A treatability study would be conducted prior to full-scale implementation to validate the proposed treatment. The specific operating parameters of the vitrification unit would be determined in the Remedial Design phase through the treatability study, engineering design and analysis, and competitive bidding process. Specialized air pollution control equipment would be applied during the vitrification step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) (40 CFR Part 61, Subpart N). Residuals from the air pollution control system would be vitrified in subsequent batches.

Essentially all of the organics in the vault wastes would be destroyed. The arsenic mobility of the wastes would be reduced by approximately 99.99%. Thus, Alternative 5 would be expected to comply with the applicable RCRA land disposal restriction treatment standards for the vault wastes. RCRA land disposal restrictions (40 CFR Part 268) are applicable to the vault wastes

because placement is occurring. (A national capacity extension for arsenic characteristic nonwastewaters and K084, K101, and K102 nonwastewaters is in effect until May 8, 1992.)

The vitrified wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. The landfills would be designed in accordance with the applicable RCRA landfill standards (40 CFR Part 264, Subpart N). If the wastes were landfilled onsite, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in compliance with 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be applicable. The offSite landfill option would comply with all ARARs.

Alternative 5 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $34,270,000 and $58,000,000 for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $35,200. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $34,800,000 and $58,000,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

6. Alternative 6: ON-SITE ENHANCED SOLIDS CONTAINMENT SYSTEM

Under the former owners' onsite containment proposal (Alternative 6), the vault wastes and structure would be excavated and placed in a new landfill constructed onsite and the excavation would be backfilled with soils excavated during construction of the landfill. The landfill would be designed to meet or exceed RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate. RCRA standards are not applicable to Alternative 6 since the wastes are being consolidated within the same area of contamination. To provide protection against sinkhole collapse and subsequent landfill failure, a foundation preparation program would be implemented prior to landfill construction. The program would consist of (1) geophysical surveying of the landfill area; (2) drilling exploration borings on a selected grid pattern and at any geophysical anomalies; (3) pressure grouting any voids discovered in the exploration borings; (4) removing any soil above bedrock and any easily removable rock and (5) placing aggregate in bedrock joint openings and above the bedrock surface. Deed restrictions prohibiting future uses would be placed on the landfill area. Since the wastes remain onsite, 5-year reviews would be conducted. Also, an unspecified maintenance and monitoring program would be implemented. Alternative 6 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be relevant and appropriate. Alternative 6 would also not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. Cost estimates were not provided in the former owners' proposal. Costs are likely to be slightly higher than the

estimated costs for Alternative 2. The estimated time to implement this alternative is approximately 18 months.

7. Alternative 7: BULK EXCAVATION/LANDFILL (OFFSITE)

Under this alternative, the vault wastes would be excavated and placed in an existing offSite RCRA Subtitle C (hazardous waste) landfill. The vault waste excavation would be backfilled with soil and regraded. The landfill would be designed to meet or exceed all RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be applicable. Because the vault wastes are a mixture of K084 wastes, K101 wastes, K102 wastes, and arsenic characteristic wastes; some or all of the vault wastes also exhibit the toxicity characteristic for cadmium; and Alternative 7 constitutes disposal (i.e., placement) under RCRA, RCRA Subtitle C is applicable. RCRA land disposal restriction treatment standards for these wastes are 5.0 mg/l arsenic (for arsenic characteristic (D004) wastes); 5.6 mg/l arsenic (for the listed wastes), as measured by the Extraction Procedure (EP) Toxicity Test or Toxicity Characteristic Leachate Procedure (TCLP); and 1.0 mg/l cadmium (as measured by the TCLP) for cadmium characteristic (D006) wastes. Treated K101 and K102 nonwastewaters must contain less than 14 mg/kg nitroaniline and 13 mg/kg ortho-nitrophenol, respectively, prior to land disposal to comply with RCRA land disposal restrictions (40 CFR Part 268). All vault wastes exhibiting the toxicity characteristic for cadmium must meet the cadmium treatment standards, in addition to the treatment standards for the listed wastes and arsenic characteristic wastes. (A national capacity extension for arsenic characteristic nonwastewaters and K101 and K102 nonwastewaters is in effect until May 8, 1992.) Alternative 7 would not comply with the D006 land disposal restrictions for the vault wastes. Alternative 7 would also not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element.

Detailed cost estimates were not provided in the former owners' proposal. Costs are likely to be somewhat higher than the estimated costs for Alternative 2. The estimated time to implement this alternative is approximately 6 to 9 months.

8. COMPARATIVE ANALYSIS OF ALTERNATIVES - VAULT WASTES

EPA's selected remedy for the vault wastes is cement fixation (Alternative 3) for the lower vault wastes, and incineration followed by fixation (Alternative 4) for the upper vault wastes. The treated wastes would be landfilled at an offSite hazardous waste disposal facility. This combination of alternatives will be referred to hereafter as the selected remedy for the vault wastes.

The seven vault-waste remedial action alternatives described above and the selected remedy were evaluated under the nine evaluation criteria in the NCP 40 CFR 300.430(e)(9) as set forth in "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA, October 1988), EPA Directive 9355.3-02 "Draft Guidance on Preparing Superfund Decision Documents: The Proposed Plan and Record of Decision," and "Guidance on Preparing Superfund Decision Documents: The Proposed Plan, The Record of Decision, Explanation of Significant Differences, and the Record of Decision Amendment" (EPA/540/6-89/007, July 1989

Interim Final). These nine criteria can be further categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria, as follows:

Threshold Criteria

* Overall protection of human health and the environment
* Compliance with applicable or relevant and appropriate requirements (ARARs)

Primary Balancing Criteria

* Long-term effectiveness
* Reduction of toxicity, mobility or volume through treatment
* Short-term effectiveness
* Implementability
* Cost

Modifying Criteria

* Community Acceptance
* State Acceptance

These evaluation criteria, which measure the overall feasibility and acceptability of the remedy, relate directly to requirements in Section 121 of CERCLA, 42 U.S.C. Section 9621. Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between alternatives. State and community acceptance are modifying criteria formally taken into account after public comment is received on the Proposed Plan. The evaluations are as follows:

Overall Protection of Human Health and the Environment. A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels under the established risk range posed by each exposure pathway at the Site.

If offSite landfill disposal is implemented, Alternatives 4 and 5 and the selected remedy would provide protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, or institutional controls. Alternatives 4 and 5 would be slightly more protective than the selected remedy since the minor amount of organic contamination in the lower vault wastes would also be destroyed during implementation of these alternatives. While there are risks associated with arsenic volatilization during the incineration or vitrification steps of Alternatives 4 and 5 and the selected remedy, these risks would be reduced to acceptable levels through the use of specialized air pollution control equipment. Alternative 3 with offSite landfill disposal would be somewhat less protective than the selected remedy since the organic contamination in the upper vault wastes would not be destroyed. Alternative 7 would be less protective of human health and the environment than the selected remedy since the wastes would not be treated to destroy the organic contaminants in the upper vault wastes and immobilize the arsenic in both the upper and lower vault wastes prior to offSite landfill disposal.

Alternatives 2 and 6 would be less protective of human health and the environment than the selected remedy since the wastes would not be treated to destroy the organic contaminants in the upper vault wastes and immobilize the arsenic in both the upper and lower vault wastes prior to onsite landfill disposal. The alternatives that include onsite landfilling (Alternatives 2 and 6, and the onsite landfill options for Alternatives 3, 4, and 5) would be less protective of human health and the environment than the selected remedy because of the potential of landfill failure from sinkhole formation or other causes. Onsite landfill failure could result in a substantial release of contaminants to groundwater.

The "no action" alternative is not protective of human health and the environment; therefore, it is not considered further in this analysis as an option for the vault wastes.

Compliance with Applicable or Relevant and Appropriate Requirements. Under §121(d) of CERCLA, 42 U.S.C. § 9621(d), and EPA guidance, remedial actions at CERCLA Sites must attain legally applicable or relevant and appropriate Federal and state environmental standards, requirements, criteria and limitations (which are collectively referred to as "ARARs"). Applicable requirements are those substantive environmental protection standards, requirements, criteria, or limitations promulgated under Federal or state law that specifically address hazardous material found at the Site, the remedial action to be implemented at the Site, the location of the Site, or other circumstances at the Site. Relevant and appropriate requirements are those substantive environmental protection standards, requirements, criteria or limitations which, while not applicable to the hazardous materials at the Site, the remedial action, the Site location, or other circumstances, nevertheless address problems or situations sufficiently similar to those encountered at the Site that their use is well suited to that Site.

The ARARs and nonpromulgated advisories and guidances issued by Federal, State, and local governments ("To-Be-Considered" material) for the vault remedial action are discussed below.

Alternatives 3, 4, and 5 and the selected remedy would meet the applicable or relevant and appropriate requirements (ARARs) of Federal and State laws if the treated wastes are landfilled offSite. Pennsylvania law does not allow construction of a hazardous waste landfill immediately above carbonate bedrock. Thus, the alternatives that include onsite landfilling (Alternatives 2 and 6, and the onsite landfill options for Alternatives 3, 4, and 5) would not comply with this ARAR. An ARAR waiver would be required to implement these alternatives. Alternatives 3, 4, and 5 and the selected remedy would be expected to comply with the RCRA land disposal restriction standards for the vault wastes (40 CFR Part 268). Alternative 7 would not comply with RCRA land disposal restrictions; an ARAR waiver would be required to implement this alternative. CERCLA establishes a preference for alternatives that incorporate treatment. Alternatives 2, 6, and 7 do not conform with this preference.

Long-term Effectiveness and Permanence. The long-term effectiveness and permanence criterion addresses the long-term protection of human health and the environment once remedial action cleanup goals have been achieved, and focuses on residual risk that will remain after completion of the remedial action.

The selected remedy would reduce the hazards posed by the vault wastes by destroying the organic compounds present in the upper vault wastes and fixating the wastes. The long-term risk of exposure to the treated wastes at the Whitmoyer Laboratories Site would be eliminated by placing the treated wastes in an offSite landfill.

With offSite landfill disposal, Alternatives 4 and 5 would be slightly more effective in the long term and permanent than the selected remedy since the minor amount of organic contamination in the lower vault wastes would also be destroyed. Alternative 3 with offSite landfill disposal would be slightly less protective than the selected remedy since the upper vault waste organic contamination would not be destroyed.

Alternatives 2 and 6 and the onsite landfill options of Alternatives 3, 4, and 5 would be less-effective in the long-term because of the potential for landfill failure. If deed restrictions are not effective, direct exposure to the wastes in the future could result from construction activities.

Alternatives 2, 6, and 7 do not include treatment of the vault's arsenic contamination to a less mobile state. Also, organic contaminants are not destroyed or immobilized under these alternatives. Thus, these alternatives are significantly less effective in the long term and less permanent.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment. This evaluation criterion addresses the degree to which a technology or remedial alternative reduces toxicity, mobility, or volume of hazardous substances. Section 121(b) of CERCLA, 42 U.S.C. §9621(b), establishes a preference for remedial actions that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances over remedial actions which will not result in such reduction.

Alternatives 3, 4, and 5 and the selected remedy would treat the wastes to reduce toxicity, mobility, or volume. The selected remedy would eliminate the toxicity of the organic contaminants in the upper vault wastes by thermal destruction, and would reduce the mobility of the arsenic in the wastes by fixation. Alternative 3 reduces the mobility of the organic and arsenic contaminants by microencapsulating the upper vault wastes and fixating the lower vault wastes. Alternatives 4 and 5 would eliminate the toxicity of the organic contaminants in the wastes by thermal destruction, and would reduce the mobility of arsenic by fixation in a cement matrix for Alternative 4 and encapsulation in a glass matrix for Alternative 5.

Alternatives 2, 6, and 7 achieve no reduction in toxicity, mobility, or volume. Disposal without treatment is the least preferred option under CERCLA.

Short-term Effectiveness. Short-term effectiveness addresses the period of time needed to achieve protection of human health and the environment and any adverse impacts that may be posed during the construction and operation period until cleanup goals are achieved.

The selected remedy could be implemented within an estimated 36 months from the date of this Record of Decision. All other alternatives would require an equal length of time, except Alternative 2, which would require 24 months for implementation; Alternative 6, which would require 18 months for implementation; and Alternative 7, which would require 6 to 9 months for implementation.

There is a potential risk associated with arsenic volatilization, under Alternatives 4 and 5 and the selected remedy. This risk would be reduced to acceptable levels by the use of specialized air pollution control equipment. Under the selected remedy, Alternative 7, and the offSite landfill disposal options of Alternatives 3, 4, and 5, there is some minor, short-term risk of exposure to the community during transportation of the treated wastes offSite. Only minimal, short-term risks are associated with Alternatives 2 and 6 and the onsite landfill disposal option of Alternative 3, if proper adherence to worker safety procedures occurs.

Implementability. The implementability criterion addresses the technical and administrative feasibility of a remedial alternative, including the availability of materials and services needed to implement the alternative.

The various alternatives have few associated administrative difficulties that could delay implementation. Permits would be required for the offSite disposal of treated or untreated wastes. To confirm the suitability of the technology, treatability studies would be required prior to implementation for Alternatives 3 and 5. For Alternatives 3, 4, and 5, and the selected remedy, treatment equipment and skilled workers are available but limited. The technology, equipment, and specialists required to implement Alternatives 2, 6, and 7 would be readily available. Since offSite disposal without treatment (Alternative 7) would not comply with RCRA land disposal restrictions (40 CFR Part 268), offSite landfill capacity may be unavailable. For all of the alternatives, monitoring of air and water during implementation would be required. For each alternative but Alternatives 2, 6, and 7, monitoring of the treated wastes would also be required. Long-term monitoring of landfill leachate and leak detection zones would be required for Alternatives 2 and 6, and the onsite landfill options of Alternatives 3, 4, and 5.

As microencapsulation (a component of Alternative 3) is a relatively new technology, limited data are available on the effectiveness of this process in immobilizing the arsenic and organic contaminants present in the upper vault wastes. Thus, microencapsulation of the upper vault wastes is less reliable than the other treatment-based alternatives of incineration followed by fixation, and vitrification.

Cost. CERCLA requires selection of a cost-effective remedy (not merely the lowest cost) that protects human health and the environment and meets the other requirements of the statute. Project costs include all construction and O&M costs incurred over the life of the project. An analysis of the present-worth cost for each alternative described in this Record of Decision has been completed. These costs are discussed in the alternative descriptions and below.

The present-worth cost of the selected remedy is $18,400,000. The lowest-cost alternative is Alternative 2 at $1,379,000. The highest cost alternative is Alternative 5 with offSite disposal at $58,000,000. The other FS alternative costs are presented in the alternative description sections. The former owners' proposals, Alternatives 6 and 7, do not include a cost estimate.

Costs for Alternatives 6 and 7 are likely to be slightly higher than the estimated costs for Alternative 2.

State Acceptance. The Commonwealth of Pennsylvania has not yet concurred in the selected remedy.

Community Acceptance. A public meeting on the Proposed Plan was held April 24, 1990 in Lebanon County, Pennsylvania. Comments received from the public during the comment period are referenced in the Responsiveness Summary attached to this Record of Decision.

B. LAGOON WASTES

Alternatives 1 through 6 for the lagoon wastes are numbered to correspond with the numbers in the FS Report. Alternative 7 is the alternative presented by the former Site owners. The alternatives are the following:

* Alternative 1: No Action
* Alternative 2: Bulk Excavation/Landfill
* Alternative 3: Bulk Excavation/Fixation/Landfill
* Alternative 4: Bulk Excavation/Incineration/Fixation/Landfill
* Alternative 5: In-situ Vitrification
* Alternative 6: Capping
* Alternative 7: On-Site Enhanced Solids Containment System

1. Alternative 1: NO ACTION

Under the Superfund program, the "no action" alternative is required to be evaluated at every Site to establish a baseline for comparison with the other alternatives. Under this alternative, EPA would take no actions other than annual groundwater monitoring around the lagoon Sites and performing reviews every 5 years. There are no ARARs associated with this alternative. Alternative 1 would not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. While no capital costs would be incurred under this alternative, annual operation & maintenance (O&M) costs are estimated to be $7,100. This alternative has a present-worth cost of $109,000, and can be implemented immediately.

2. Alternative 2: BULK EXCAVATION/LANDFILL

All 24,000 CY of lagoon wastes (containing greater than 1% arsenic) would be excavated and placed in either a new onsite landfill or in existing offSite landfill(s). The excavated area would be backfilled with soil and regraded. The petroleum products pipeline and pump station passing through the lagoon area may have to be abandoned or relocated during excavation.

The onsite landfill would be designed to meet or exceed all RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate for the onsite landfill option. RCRA standards are not applicable to the onsite landfill option of Alternative 2 since the wastes are being consolidated within the same area of contamination. For the onsite

landfill option, the landfill liner base would be designed to minimize threats posed by sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. Since the wastes would remain onsite, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap in accordance with 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option of Alternative 2 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be relevant and appropriate. RCRA land disposal restrictions (40 CFR Part 268) were not determined to be applicable for the lagoon wastes because placement is not occurring. EPA is undertaking a RCRA land disposal restriction rulemaking that will specifically apply to soil and debris. (The lagoon wastes will be primarily a sludge/soil mixture when excavated.) Until that rulemaking is completed, the CERCLA program will not consider RCRA land disposal restrictions to be relevant and appropriate to soil and debris that do not contain RCRA-regulated wastes.

Under the offSite landfill option, the lagoon wastes would be separated into two separate fractions. One fraction would consist of lagoon wastes which would be demonstrated to be nonhazardous under RCRA. This fraction would be disposed in an industrial (solid) waste landfill. The second fraction would be managed as hazardous waste. RCRA Subtitle C would be applicable to the offSite disposal of the wastes being managed as hazardous wastes since placement would be occurring. The offSite landfill option would comply with all ARARs if the lagoon wastes are landfilled by May 8, 1992. (There is a RCRA land disposal restriction capacity extension until this date - see 55 FR 22520.) If the lagoon wastes are directly landfilled offSite after this date, this action would not comply with the RCRA land disposal restrictions for characteristic wastes since some or all of the wastes would be expected to have TCLP and EP Toxicity leachate concentrations above 5.0 mg/l arsenic.

Both the onsite and offSite landfill options will comply with the relevant and appropriate NAAQS. Alternative 2 would not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $4,890,000 and $18,440,000, for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $22,900. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $5,375,000 and $18,440,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 24 months.

3. Alternative 3: BULK EXCAVATION/FIXATION/LANDFILL

The major features of this alternative include excavation of the 24,000 cubic yards of lagoon wastes (containing greater than 1% arsenic), segregation of the wastes into nonhazardous and hazardous fractions, onsite iron-based fixation of the hazardous fraction, and landfilling of the treated hazardous wastes and untreated nonhazardous wastes either onsite or offSite. The lagoon waste excavation would be backfilled with soil and regraded. The petroleum products pipeline and pump station passing through the lagoon area may have to be abandoned or relocated during excavation.

Following excavation, the lagoon wastes would be separated into hazardous and nonhazardous fractions. The nonhazardous fraction would consist of lagoon wastes which would be demonstrated to be nonhazardous in accordance with 40 CFR Part 261. This fraction would be disposed directly in an industrial (solid) waste landfill. The second fraction would be managed as hazardous waste.

The lagoon wastes being managed as hazardous wastes would be fixated onsite in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). The fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. A treatability study would be conducted prior to full-scale implementation to validate the proposed treatment. The specific operating parameters for the fixation process would be determined in the Remedial Design phase through the treatability study, engineering design and analysis, and the competitive bidding process. Because some of the lagoon wastes exhibit the RCRA characteristic of arsenic toxicity and Alternative 3 constitutes treatment, RCRA Subtitle C is applicable. The RCRA land disposal restriction treatment standard for these wastes is 5.0 mg/l arsenic, as measured by the EP Toxicity Test or TCLP. (A national capacity extension for these wastes is in effect until May 8, 1992.) The fixation process should achieve this treatment standard. The treated lagoon wastes should no longer be RCRA characteristic wastes; they would be considered residual wastes under Pennsylvania law (25 PA Code, Chapter 75). The untreated nonhazardous wastes would also be considered to be residual wastes.

The treated wastes and untreated nonhazardous wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and appropriate for the onsite landfill option because of the elevated arsenic concentration of the treated and untreated wastes and the potential for mismanagement. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with the relevant and appropriate 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are "to-be-considered" material (TBC). For the offSite disposal option, industrial (solid) waste management regulations would be applicable since all of the wastes being disposed would be nonhazardous. These ARARs should be met.

Alternative 3 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $10,500,000 and $22,900,000 for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $35,200. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $11,100,000 and $22,900,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

4. Alternative 4: BULK EXCAVATION/INCINERATION/FIXATION/LANDFILL

The major features of this alternative include excavation of the 24,000 cubic yards of lagoon wastes containing greater than 1% arsenic, segregation of the wastes into nonhazardous and hazardous fractions, onsite incineration of the hazardous fraction to destroy the organics present and to leave the arsenic in a form more amenable to cement/pozzolan-based fixation, fixation of the incineration residuals, and landfilling of the treated and untreated nonhazardous wastes either onsite or offSite. The lagoon waste excavation would be backfilled with soil and regraded. The petroleum products pipeline and pump station passing through the lagoon area may have to be abandoned or relocated during excavation.

Following excavation, the lagoon wastes would be separated into hazardous and nonhazardous fractions. The nonhazardous fraction would consist of lagoon wastes which would be demonstrated to be nonhazardous in accordance with 40 CFR Part 261. This fraction would be disposed directly in an industrial (solid) waste landfill. The second fraction would be managed as hazardous waste.

The lagoon wastes being managed as hazardous wastes would be incinerated onsite in accordance with RCRA Part 264, Subpart O standards. The specific type of incineration process (e.g., rotary kiln) would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. The incineration unit would be mobilized, operated, and closed according to the requirements of RCRA Subpart O, 40 CFR 264.340 et seq. These requirements are applicable to the lagoon wastes because some of the wastes exhibit the arsenic toxicity characteristic and treatment is occurring. Specific operating practices necessary to meet the performance objectives, including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions as required by Subpart O of RCRA, would be determined through a trial burn at the Site after the installation of the incineration unit. Specialized air pollution control equipment would be applied during the incineration step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and NESHAPS (40 CFR Part 61, Subpart N). The wastes would be incinerated in the presence of the cement/pozzolan fixative agent(s). The cement/pozzolan would later be hydrated during the fixation step.

The incineration residuals would be fixated onsite using a cement/pozzolan-based process or another similar fixation process that provides equivalent protection, in accordance with the requirements of RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). The exact fixation technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. The fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq.

A treatability study was conducted on the lagoon wastes during the RI/FS using incineration followed by cement/lime-based fixation methods. Based on the treatability study results, the arsenic mobility of the wastes should be reduced by approximately 82 percent. Thus, Alternative 4 would be expected to comply with the applicable 5.0 mg/l arsenic land disposal restriction treatment standard for the lagoon wastes. RCRA land disposal restrictions (40 CFR Part 268) are applicable to the lagoon wastes because placement is occurring. (A national

capacity extension for these wastes is in effect until May 8, 1992.) The treated lagoon wastes should no longer be RCRA characteristic wastes; they would be considered residual wastes under Pennsylvania law. The untreated nonhazardous wastes would also be considered residual wastes.

After treatment, the treated wastes and the untreated nonhazardous wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and appropriate for the onsite landfill option because of the elevated arsenic concentration of the lagoon wastes and the potential for mismanagement. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap in accordance with 40 CFR 264.117 "Post closure care and use of property", and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are TBC material. For the offSite disposal option, industrial (solid) waste management regulations would be applicable since the treated and untreated wastes would be nonhazardous. These ARARs should be met.

Alternative 4 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $60,570,000 and $80,700,000 for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $40,200. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $60,630,000 and $80,700,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

5. Alternative 5: IN-SITU VITRIFICATION

Under Alternative 5, the approximately 7,000 CY of lagoon wastes (containing greater than 1% arsenic) located in the western lagoon area would be excavated and mixed with the approximately 17,000 CY of lagoon wastes in the eastern lagoon area. The excavation would be backfilled with soil and regraded. The petroleum products pipeline and pump station passing through the lagoon area may have to be abandoned or relocated during excavation. The mixture would then be heated in place using electricity passing through electrodes until the mixture formed a pool of molten glass. The minor organic contaminants would be destroyed during heating, while the metal contaminants would become trapped in the glass during the subsequent cooling step. The vitrification would occur in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). These standards have been determined to be relevant and appropriate to the vitrification step because placement is not occurring prior to or during the treatment step. The vitrification unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. A treatability study would be conducted prior to full-scale implementation to validate the proposed

treatment. The specific operating parameters of the vitrification unit would be determined in the Remedial Design phase through the treatability study, engineering design and analysis, and the competitive bidding process. Specialized air pollution control equipment would be applied during the vitrification step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and NESHAPS (40 CFR Part 61, Subpart N). Residuals from the air pollution control system would be vitrified in subsequent batches.

The treated wastes would either be placed in an existing offSite landfill, or covered with a cap designed to meet the RCRA landfill closure requirements in 40 CFR 264.310. If the treated wastes were capped in place, a groundwater removal (drainage) system would be placed around the wastes to prevent groundwater contact with them. Also, deed restrictions would be placed on the disposal area and 5-year reviews would be conducted. Consistent with the relevant and appropriate requirements of 40 CFR 264.117, long-term O&M would be conducted to monitor the groundwater around the treated wastes and to ensure the integrity of the cap.

For the offSite disposal option, placement would occur during the disposal step. The arsenic mobility of the wastes would be reduced by approximately 90% during treatment. Thus, the vitrified wastes should be nonhazardous. (Alternative 5 would be expected to comply with the applicable 5.0 mg/l arsenic land disposal restriction treatment standard for the lagoon wastes.) Therefore, industrial (solid) waste management regulations would be applicable. These ARARs should be met.

Alternative 5 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $15,900,000 and $24,200,000 for the onsite disposal and offSite landfill options, respectively. Annual O&M costs for the onsite disposal option are estimated to be $28,100. There are no annual O&M costs for the offSite landfill option. The estimated present-worth costs of this alternative are $16,400,000 and $24,200,000 for the onsite disposal and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

6. Alternative 6: CAPPING

Under Alternative 6, the approximately 7,000 CY of lagoon wastes (containing greater than 1% arsenic) located in the western lagoon area would be excavated and placed on top of the approximately 17,000 CY of lagoon wastes in the eastern lagoon area. The excavation would be backfilled with soil and regraded. The petroleum products pipeline and pump station passing through the lagoon area may have to be abandoned or relocated during excavation. The consolidated wastes would be covered with a cap designed to meet the relevant and appropriate RCRA landfill closure requirements in 40 CFR 264.310. A groundwater removal (drainage) system would be placed around the wastes to prevent groundwater contact with them. Deed restrictions would be placed on the disposal area, and 5-year reviews would be conducted. Consistent with the relevant and appropriate requirements of 40 CFR 264.117, long-term O&M would be conducted to monitor the groundwater around the consolidated wastes and to ensure the integrity of the cap.

Alternative 6 would not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital cost of this alternative is $524,000. Annual O&M costs are estimated to be $31,400. The estimated present-worth cost of this alternative is $2,000,000. The estimated time to implement this alternative is approximately 18 months.

7. Alternative 7: ON-Site ENHANCED SOLIDS CONTAINMENT SYSTEM

Under the former owners' proposal (Alternative 7), the lagoon wastes containing greater than 2% arsenic would be excavated and placed in a new landfill constructed onsite and the excavation area would be backfilled with soils excavated during construction of the landfill. The landfill would be designed to meet or exceed RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate. RCRA standards are not applicable to Alternative 7 since the wastes are being consolidated within the same area of contamination. To provide protection against sinkhole collapse and subsequent landfill failure, a foundation preparation program would be implemented prior to landfill construction. The program would consist of (1) geophysical surveying of the landfill area; (2) drilling exploration borings on a selected grid pattern and at any geophysical anomalies; (3) pressure grouting any voids discovered in the exploration borings; (4) removing any soil above bedrock and any easily removable rock and (5) placing aggregate in bedrock joint openings and above the bedrock surface. Deed restrictions prohibiting future uses would be placed on the landfill area. Since the wastes remain onsite, 5-year reviews would be conducted. Also, an unspecified maintenance and monitoring program would be implemented. Alternative 7 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be relevant and appropriate. Alternative 7 would also not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. Cost estimates were not provided in the former owners' proposal. Costs are likely to be lower than the estimated costs for Alternative 2 since only lagoon wastes containing greater than 2% arsenic are being addressed. Alternative 2 (and the other alternatives) address all lagoon materials containing greater than 1% arsenic. The estimated time to implement this alternative is approximately 18 months.

8. COMPARATIVE ANALYSIS OF ALTERNATIVES - LAGOON WASTES

EPA's selected remedy for the lagoon waste is excavation of the approximately 24,000 CY or materials present in the lagoons having an arsenic content greater than 10,000 mg/kg, fixation of those lagoon wastes exhibiting the RCRA arsenic toxicity characteristic using an iron-based or other similar fixation process that provides equivalent protection, and offsite disposal of all lagoon wastes in accordance with all applicable regulations.

The seven lagoon waste remedial action alternatives described above were evaluated under the nine evaluation criteria in the NCP. The evaluations are as follows:

Overall Protection. The offSite disposal options of Alternatives 3, 4, and 5 would provide protection of human health and the environment by eliminating, reducing, or controlling risk

through treatment, engineering controls, or institutional controls. Alternatives 4 and 5 would be slightly more protective than Alternative 3 since the minor amounts of organics in the lagoon wastes being managed as hazardous wastes would be destroyed during implementation of these alternatives. Although there are risks associated with arsenic volatilization during the incineration or vitrification steps of Alternatives 4 and 5, these risks would be managed through the use of specialized air pollution control equipment.

Alternatives 2, 6, and 7 would be less protective of human health and the environment than Alternatives 3, 4, and 5 since the hazardous lagoon wastes would not be treated to immobilize the arsenic contamination. The alternatives that include onsite containment of the lagoon wastes (Alternatives 6 and 7, the onsite landfill options for Alternatives 2, 3, and 4, and the in-place capping option for Alternative 5) would be less protective of human health and the environment than the offSite disposal option of Alternatives 3, 4, and 5 because of the potential of containment system failure from sinkhole formation or other causes. Containment system failure could result in a substantial release of contaminants to groundwater.

The "no action" alternative is not protective of human health and the environment; therefore, it is not considered further in this analysis as an option for the lagoon wastes.

Compliance with ARARs. The offSite disposal options of Alternatives 3, 4, and 5 would meet their respective ARARs. Pennsylvania law does not allow construction of a hazardous waste landfill immediately above any carbonate bedrock (Title 25, Chapter 75.425). Thus, Alternative 7 and the onsite landfill option of Alternative 2 would not comply with this ARAR. The proposed Pennsylvania residual waste landfill regulations do not allow construction of a residual waste landfill immediately above any sinkhole-prone carbonate bedrock. Thus, the onsite landfill options of Alternatives 3 and 4 would not comply with this TBC. Alternatives 3, 4, and 5 would be expected to comply with applicable RCRA land disposal restriction standards. The offSite landfill option of Alternative 2 would not comply with the RCRA land disposal restriction standards if the lagoon wastes are not landfilled by May 8, 1992. (There is a RCRA land disposal restriction capacity extension until this date - see 55 FR 22520.) EPA is currently undertaking a RCRA land disposal restriction rulemaking that will specifically address soil and debris. This rulemaking may change the status of the RCRA land disposal restriction ARAR for the lagoon wastes. Alternatives 2, 6, and 7 would not comply with the CERCLA preference for treatment.

Long-term Effectiveness and Permanence. The offSite disposal option of Alternative 3 would reduce the hazards posed by the lagoon wastes by fixating the arsenic in the wastes being managed as hazardous waste and disposing the treated wastes and untreated nonhazardous wastes in an offSite landfill.

The offSite disposal options for Alternatives 4 and 5 would be slightly more protective than the Alternative 3 offSite disposal option since the minor organic contamination in the lagoon wastes being managed as hazardous waste would be destroyed.

The alternatives that include onsite containment of the lagoon wastes (Alternatives 6 and 7, the onsite landfill options for Alternatives 2, 3, and 4, and the in-place capping option for Alternative 5) would be less protective of human health and the environment than the offSite disposal

options because of the potential for the containment system to fail from sinkhole formation or other causes. The onsite containment system would require long-term maintenance, and portions of it might need to be replaced in the future. If deed restrictions are not effective, direct exposure to the wastes in the future could result from construction activities.

Alternative 6 and the in-place capping option of Alternative 5 are less protective than the other alternatives that include landfill disposal (Alternatives 2, 3, 4, and 7, and the offSite disposal option of Alternative 5) since the wastes would not be contained in a landfill.

Alternatives 2, 6, and 7 do not provide for treatment of the mobile arsenic contamination in the lagoon waste.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment. Alternatives 3, 4, and 5 would treat the wastes being managed as hazardous waste to reduce toxicity, mobility, or volume. Alternative 3 would reduce the mobility of the arsenic in these wastes by fixation with iron. Alternatives 4 and 5 would eliminate the toxicity of the organic contaminants in these wastes by thermal destruction, and would reduce the mobility of arsenic by fixation in a cement matrix for Alternative 4 and encapsulation in a glass matrix for Alternative 5.

No reduction in toxicity, mobility, or volume is realized for Alternatives 2, 6, and 7. Disposal without treatment is the least preferred option under CERCLA.

Short-term Effectiveness. Alternative 3, 4, and 5 could be implemented within an estimated 36 months from the date of this ROD. Alternative 2 would require 24 months for implementation, and Alternatives 6 and 7 would require 18 months for implementation.

There is a potential risk associated with arsenic volatilization under Alternatives 4 and 5. This risk would be managed through the use of specialized air pollution control equipment. There is some minor, short-term risk of exposure to the community during transportation of the wastes offSite under the offSite landfill disposal options of Alternatives 2, 3, 4, and 5. If worker safety procedures are properly followed, only minimal, short-term risks are associated with Alternatives 6 and 7 and the onsite landfill disposal options of Alternatives 2 and 3.

Implementability. The various alternatives have few associated administrative difficulties that could delay implementation. Permits would be required for the offSite disposal of the treated or untreated wastes. Treatability studies would be required prior to implementation of Alternatives 3 and 5, to confirm the suitability of the technology. For Alternatives 3, 4, and 5, treatment equipment and skilled workers would be available but limited. The technology, equipment, and specialists required to implement Alternatives 2, 6, and 7 would be readily available. For all of the alternatives, monitoring of air and water during implementation would be required. For Alternatives 3, 4, and 5, monitoring of the treated wastes would also be required. Long-term monitoring of landfill leachate and leak detection zones would be required for Alternative 7 and the onsite disposal options of Alternatives 2, 3, and 4.

Cost. The present-worth cost of the offSite disposal option of Alternative 3 for the lagoon wastes is $22,900,000. The lowest-cost alternative is Alternative 2 (onsite landfill option), at

$5,375,000. The highest cost alternative is Alternative 4 with offSite disposal, at $80,700,000. The other FS alternative costs are presented in the alternative description sections. The former owner's proposal, Alternative 7, does not include a cost estimate. Alternative 7 costs are likely to be somewhat lower than the estimated costs for Alternative 2.

State Acceptance. The Commonwealth of Pennsylvania has not yet concurred in the selected remedy.

Community Acceptance. A public meeting on the Proposed Plan was held April 24 in Lebanon County, Pennsylvania. Comments received from the public during the comment period are referenced in the Responsiveness Summary attached to this Record of Decision.

C. MISCELLANEOUS PRODUCTS/ FEEDSTOCKS

Alternatives 1 through 5 for the miscellaneous products/feedstocks are numbered to correspond with the alternative numbers in the FS Report. Alternative 6 is the alternative presented by the former Site owners. The alternatives are the following:

* Alternative 1: No Action
* Alternative 2: Bulk Excavation/Landfill
* Alternative 3: Bulk Excavation/Fixation/Landfill
* Alternative 4: Bulk Excavation/Incineration/Fixation/Landfill
* Alternative 5: Bulk Excavation/Vitrification/Landfill
* Alternative 6: On-Site Enhanced Solids Containment System

1. Alternative 1: NO ACTION

The "no action" alternative is required under the Superfund program at every Site, to establish a baseline for comparison with the other alternatives. Under this alternative, EPA would take no actions other than performing reviews every 5 years. Since the miscellaneous products/feedstocks were disposed of or abandoned after 1980, and some of the wastes exhibit the RCRA arsenic toxicity characteristic, those wastes exhibiting the characteristic are hazardous wastes and must be managed accordingly. "No action" does not comply with RCRA Subtitle C hazardous waste management regulations. Alternative 1 would also not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. While no capital costs would be incurred under this alternative, annual O&M costs are estimated to be $7,100. This alternative has an estimated present-worth cost of $109,000, and can be implemented immediately.

2. Alternative 2: BULK EXCAVATION/LANDFILL

The 101 CY of miscellaneous products/feedstocks would be excavated and segregated into hazardous and nonhazardous wastes. The nonhazardous wastes would be disposed in an offSite landfill legally able to accept these wastes. The hazardous wastes would be placed in either a new onsite landfill or an existing offSite RCRA Subtitle C landfill. Because of the relatively small volume of hazardous miscellaneous products/feedstocks, onsite disposal would only occur if an onsite landfill is constructed for another one of the Site's waste streams. The

onsite or offSite hazardous waste landfill would be designed to meet or exceed all RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate for the onsite landfill option and applicable for the offSite landfill option. RCRA landfill standards are not applicable to the onsite landfill option of Alternative 2 since the wastes would be consolidated within the same area of contamination.

For the onsite landfill option the landfill liner base would be engineered to minimize the threats posed by sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. If the wastes were landfilled onsite long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap in accordance with 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option of Alternative 2 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be relevant and appropriate. RCRA land disposal restrictions (40 CFR Part 268) were not determined to be applicable for the miscellaneous products/feedstocks because placement is not occurring.

RCRA Subtitle C is applicable for the hazardous miscellaneous products/feedstocks offSite landfill option since placement would be occurring. The offSite landfill option would comply with RCRA land disposal restrictions (40 CFR Part 268) if the hazardous miscellaneous products/feedstocks are landfilled by May 8, 1992. (There is a RCRA land disposal restriction capacity extension until this date - see 55 FR 22520.) If these wastes are directly landfilled offSite after this date, this action would not comply with the RCRA land disposal restrictions for characteristic wastes. The offSite landfill option would comply with all other RCRA Subtitle C ARARs.

Both the onsite and offSite landfill options are intended to comply with the relevant and appropriate NAAQS (40 CFR Part 50). Alternative 2 would not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital and present-worth costs of this alternative are $13,900 and $82,500, for the onsite and offSite landfill options, respectively. There are no annual O&M costs for the onsite and offSite landfill disposal options. (Estimated annual O&M costs for the onsite landfill option are contained in the cost estimates for the other wastes that the miscellaneous products/feedstocks would necessarily be disposed with.) The estimated time to implement this alternative is approximately 24 months.

3. Alternative 3: BULK EXCAVATION/FIXATION/LANDFILL

The 101 CY of miscellaneous products/feedstocks would be excavated and segregated into hazardous and nonhazardous wastes. The nonhazardous wastes would be disposed in an offSite landfill legally able to accept these wastes. The hazardous wastes would be fixated with cement/pozzolan-based or other similar materials, either onsite or offSite. Following fixation these wastes would be landfilled in either a new onsite landfill or an existing offSite landfill. Because of the relatively small volume of hazardous miscellaneous products/feedstocks, onsite disposal would only occur if an onsite landfill is constructed for another one of the Site's waste streams.

The hazardous miscellaneous products/feedstocks would be fixated in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). Because of the relatively small volume of hazardous miscellaneous products/feedstocks, onsite fixation of these wastes would only be implemented if onsite fixation is applied to one of the other Site waste streams. If onsite fixation occurs, the fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. The specific operating parameters for the fixation process would be determined in the Remedial Design phase through engineering design and analysis, and the competitive bidding process. Because Alternative 3 constitutes treatment, RCRA Subtitle C is applicable. The RCRA land disposal restriction treatment standard for the hazardous miscellaneous products/feedstocks is 5.0 mg/l arsenic, as measured by the EP Toxicity Test or TCLP. (A national capacity extension for these wastes is in effect until May 8, 1992.) The fixation process should achieve this treatment standard. Following treatment, the wastes should no longer be RCRA characteristic wastes; they would be considered residual wastes under Pennsylvania law (25 PA Code, Chapter 75). The untreated nonhazardous wastes would also be considered to be residual wastes.

ced in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. Onsite landfilling would only occur if a landfill is constructed onsite for another one of the Site's waste streams. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and appropriate for the onsite landfill option. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with the relevant and appropriate 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are TBC material. For the offSite disposal option, industrial (solid) waste management regulations would be applicable since the treated wastes would be nonhazardous. These ARARs should be met.

Alternative 3 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital and present-worth costs of this alternative are $50,900 and $271,000, for the onsite and offSite landfill options, respectively. There are no annual O&M costs for the onsite and offSite landfill disposal options. (Estimated annual O&M costs for the onsite landfill option are contained in the cost estimates for the other wastes that the treated miscellaneous products/feedstocks would necessarily be disposed with.) The estimated time to implement this alternative is approximately 36 months.

4. Alternative 4: BULK EXCAVATION/INCINERATION/FIXATION/LANDFILL

The 101 CY of miscellaneous products/feedstocks would be excavated and segregated into hazardous and nonhazardous wastes. The nonhazardous wastes would be disposed in an offSite landfill legally able to accept these wastes. The hazardous wastes would be incinerated

onsite or offSite, with the incinerator residuals being fixated with cement/pozzolan-based or other similar materials. Because of the relatively small volume of hazardous miscellaneous products/feedstocks, onsite incineration of the wastes would only be implemented if onsite incineration is implemented for the vault or lagoon wastes. After treatment, the treated wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the relatively small volume of hazardous miscellaneous products/feedstocks, onsite disposal would only occur if an onsite landfill is constructed for another one of the Site's waste streams.

The miscellaneous products/feedstocks would be incinerated to destroy the organic contaminants and to leave the metals in a form amenable to cement fixation, in accordance with RCRA 40 CFR Part 264, Subpart O standards. The specific type of incineration process (e.g., rotary kiln) would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. If onsite incineration occurs, the incineration unit would be mobilized, operated, and closed according to the requirements of RCRA Subpart O, 40 CFR 264.340, et seq. These requirements are applicable because the hazardous miscellaneous products/feedstocks are hazardous wastes. Specific operating practices necessary to meet the performance objectives, including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions as required by Subpart O of RCRA, would be determined through a trial burn at the Site after the installation of the incineration unit. Specialized air pollution control equipment would be applied during the incineration step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and NESHAPS (40 CFR Part 61, Subpart N).

The hazardous miscellaneous products/feedstocks would be incinerated in the presence of the cement/pozzolan-based fixative agent(s). A treatability study for the vault wastes indicated that cement/lime presence inhibited arsenic volatilization during the thermal treatment step. The cement/pozzolan would later be hydrated during the fixation step.

The incineration residuals would be fixated using cement/pozzolan-based or other similar methods, in accordance with the requirements of RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). The exact fixation technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. If onsite treatment occurs, both the incineration and fixation would take place onsite using mobile equipment. The onsite fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq.

Alternative 4 would be expected to comply with the applicable 5.0 mg/l arsenic land disposal restriction treatment standard for arsenic toxicity characteristic wastes. RCRA land disposal restrictions (40 CFR Part 268) are applicable to the wastes because placement is occurring. (A national capacity extension for these wastes is in effect until May 8, 1992.) Following treatment, the wastes should no longer be RCRA characteristic wastes; they would be considered residual wastes under Pennsylvania law.

After treatment, the treated wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and

appropriate for the onsite landfill option. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with the relevant and appropriate 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are TBC material. For the offSite disposal option, industrial (solid) waste management regulations would be applicable since the treated wastes would be nonhazardous. These ARARs should be met.

Alternative 4 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital and present-worth costs of this alternative are $291,000 and $371,000 for the onsite and offSite landfill options, respectively. There are no annual O&M costs for the onsite and offSite landfill disposal options. (Estimated annual O&M costs for the onsite landfill option are contained in the cost estimates for the other wastes that the treated miscellaneous products/feedstocks would necessarily be disposed with.) The estimated time to implement this alternative is approximately 36 months.

5. Alternative 5: BULK EXCAVATION/VITRIFICATION/LANDFILL

The 101 CY of miscellaneous products/feedstocks would be excavated and segregated into hazardous and nonhazardous wastes. The nonhazardous wastes would be placed in an offSite landfill legally able to accept these wastes. The hazardous wastes would be mixed with soil or other Site wastes to dilute the organic content of the mixture to 5 percent, and vitrified onsite. Mixing the miscellaneous products/feedstocks with other materials is necessary to dilute the overall organic content to a level that the vitrification equipment can handle. Because of the relatively small volume of hazardous miscellaneous products/feedstocks, vitrification would only be implemented if vitrification is implemented for another Site waste stream. The vitrified wastes would be placed in either a new onsite landfill or an existing offSite landfill. Onsite landfilling would only occur if a landfill is constructed onsite for another one of the Site's waste streams.

The hazardous miscellaneous products/feedstocks would be excavated and mixed onsite with soils or other materials with a low organic carbon content. Other Site wastes could be used if suitable. This mixing would occur to achieve a mixture organic carbon content of approximately 5 percent, the maximum content that existing vitrification equipment can handle. The mixture would be placed in an onsite trench and heated with electricity flowing through electrodes until the mixture formed a pool of molten glass. Organic contaminants would be destroyed during heating, whereas metal contaminants would become trapped in the glass during the subsequent cooling step. The vitrification would occur in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). These standards are applicable because treatment and disposal are occurring. The vitrification unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. The specific operating parameters of the vitrification unit would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process.

Specialized air pollution control equipment would be applied during the vitrification step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and NESHAPS (40 CFR Part 61, Subpart N). Residuals from the air pollution control system would be vitrified in subsequent batches.

Alternative 5 would be expected to comply with the applicable 5.0 mg/l arsenic land disposal restriction treatment standard for the hazardous miscellaneous products/feedstocks. RCRA land disposal restrictions (40 CFR Part 268) are applicable to these wastes because placement is occurring. (A national capacity extension for these wastes is in effect until May 8, 1992.) The treatment step should render the wastes nonhazardous.

The vitrified wastes would be placed in either a new onsite landfill or an existing offSite landfill. Because of the treatment step, placement is occurring. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and appropriate for the onsite landfill option. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with the relevant and appropriate 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are TBC material. For the offSite disposal option, industrial (solid) waste management regulations would be applicable since the treated wastes would be nonhazardous. These ARARs should be met.

Alternative 5 would comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital and present-worth costs of this alternative are $1,067,000 and $1,962,000 for the onsite and offSite landfill options, respectively. There are no annual O&M costs for the onsite and offSite landfill disposal options. (Estimated annual O&M costs for the onsite landfill option are contained in the cost estimates for the other wastes that the treated miscellaneous products/feedstocks would necessarily be disposed with.) The estimated time to implement this alternative is approximately 36 months.

6. Alternative 6: ON-SITE ENHANCED SOLIDS CONTAINMENT SYSTEM

Under the former owners' proposal (Alternative 6), the miscellaneous products/feedstocks would be excavated and placed in a new landfill constructed onsite. The landfill would be designed to meet or exceed RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate. RCRA standards are not applicable to Alternative 6 since the wastes are being consolidated within the same area of contamination. To provide protection against sinkhole collapse and subsequent landfill failure, a foundation preparation program would be implemented prior to landfill construction. The program would consist of (1) geophysical surveying of the landfill area; (2) drilling exploration borings on a selected grid pattern and at any geophysical anomalies; (3) pressure grouting any voids discovered in the exploration borings; (4) removing any soil above bedrock and any easily removable rock; and

(5) placing aggregate in bedrock joint openings and above the bedrock surface. Deed restrictions prohibiting future uses would be placed on the landfill area. Since the wastes remain onsite, 5-year reviews would be conducted. Also, an unspecified maintenance and monitoring program would be implemented. Alternative 6 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425, which prohibit the construction of a hazardous waste landfill over limestone or carbonate formations. These criteria have been determined to be relevant and appropriate. Alternative 6 would also not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. Cost estimates were not provided in the former owners' proposal. Costs are likely to be slightly higher than the estimated costs for Alternative 2. The estimated time to implement this alternative is approximately 18 months.

7. COMPARATIVE ANALYSIS OF ALTERNATIVES - MISCELLANEOUS PRODUCTS/FEEDSTOCKS

EPA's selected remedy for the miscellaneous products/feedstocks is Alternative 4, with the wastes exhibiting hazardous characteristics being incinerated onsite in a mobile incineration unit, followed by onsite fixation of the incinerator as and landfilling of the fixated wastes offiste. The nonhazardous miscellaneous feedstocks would be directly deposited in an offsite landfill.

The six miscellaneous products/feedstocks remedial action alternatives described above were evaluated under the nine evaluation criteria in the NCP. The evaluations are as follows:

Overall Protection. Alternatives 3, 4, and 5 would provide protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, or institutional controls. Alternatives 4 and 5 would be slightly more protective than Alternative 3 since Alternative 3 would not result in the destruction of organic contaminants in the hazardous miscellaneous products/feedstocks.

Alternatives 2 and 6 would be less protective of human health and the environment than Alternatives 3, 4, and 5 since the hazardous wastes would not be treated to immobilize the arsenic in the wastes.

The "no action" alternative is not protective of human health and the environment, and is not considered further in this analysis as an option for the miscellaneous products/feedstocks.

Compliance with ARARs. The offSite disposal options for Alternatives 3, 4, and 5 would meet their respective ARARs. Pennsylvania law does not allow construction of a hazardous waste landfill immediately above any carbonate bedrock. Thus, Alternative 6 and the onsite landfill option of Alternative 2 would not comply with this ARAR. The proposed Pennsylvania residual waste landfill regulations do not allow construction of a residual waste landfill immediately above any sinkhole-prone carbonate bedrock. Thus, the onsite landfill options of Alternatives 3, 4, and 5 would not comply with this TBC. Alternatives 3, 4, and 5 would be expected to comply with the applicable RCRA land disposal restriction standards for the miscellaneous products/feedstocks. The offSite landfill option of Alternative 2 would not comply with the

RCRA land disposal restriction standards if the hazardous miscellaneous products/feedstocks are not landfilled by May 8, 1992. (There is a RCRA land disposal restriction capacity extension until this date.) Alternatives 2 and 6 would not comply with the CERCLA preference for treatment.

Long-term Effectiveness and Permanence. The offSite disposal option of Alternative 4 would reduce the hazards posed by the hazardous miscellaneous products/feedstocks by thermally destroying the organic contaminants and fixating the metals in the incinerator ash. The long-term risk of exposure to the treated wastes and untreated nonhazardous wastes at the Whitmoyer Laboratories Site would be reduced by placing these wastes in an offSite landfill. Alternatives 4 and 5 would be slightly more protective than Alternative 3 since Alternative 3 would not result in any destruction of organic contaminants.

The alternatives that include onsite containment of the miscellaneous products/feedstocks (Alternative 6 and the onsite landfill options of Alternatives 2, 3, 4, and 5) would be less protective of human health and the environment than the offSite disposal options because of the potential for the onsite landfill to fail from sinkhole formation or other causes. The onsite landfill would require long-term maintenance, and portions of it might need to be replaced in the future. If deed restrictions are not effective, direct exposure to the wastes in the future could result from construction activities.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment. Alternatives 3, 4, and 5 would treat the hazardous wastes to reduce toxicity, mobility, or volume. Alternatives 4 and 5 would eliminate the toxicity of the organic contaminants in the hazardous wastes by thermal destruction. Alternatives 3 and 4 would reduce the mobility of the metals in the hazardous wastes by fixation in a cement matrix, whereas Alternative 5 would reduce the metals' mobility by encapsulation in a glass matrix.

No reduction in toxicity, mobility, or volume is realized for Alternatives 2 and 6. Disposal without treatment is the least preferred option under CERCLA.

Short-term Effectiveness. Alternatives 2 through 5 could be implemented within an estimated 24 months from the remedy selection date. Alternative 6 could be implemented in 18 months.

There is some minor, short-term risk of exposure to the community during transportation of the wastes offSite, under the offSite treatment options of Alternatives 3 and 4 and the offSite landfill disposal options of Alternatives 2, 3, 4, and 5. If worker safety procedures are properly followed, only minimal short-term risks are associated with Alternative 6 and the onsite landfill disposal option of Alternatives 2 through 5.

Implementability. The various alternatives have few associated administrative difficulties that could delay implementation. Permits would be required for the offSite disposal of the treated or untreated wastes. For Alternatives 3, 4, and 5, treatment equipment and skilled workers would be available but limited. The technology, equipment, and specialists required to implement Alternatives 2 and 6 would be readily available. For all of the alternatives, monitoring of air and water during implementation would be required. For Alternatives 3, 4, and 5, monitoring of the treated wastes would also be required. Long-term monitoring of landfill

leachate and leak detection zones would be required for Alternative 6 and the onsite landfill options of Alternatives 2, 3, 4, and 5.

Cost. The present-worth cost of the offSite disposal option of Alternative 4 is $371,000. The lowest-cost alternative is Alternative 2 (onsite landfill option) at $13,900. The highest cost alternative is Alternative 5 with offSite disposal, at $1,962,000. The other FS alternative costs are presented in the alternative description sections. The former owner's proposal, Alternative 6, does not include a cost estimate. Alternative 6 costs are likely to be slightly higher than the estimated costs for Alternative 2.

State Acceptance. The Commonwealth of Pennsylvania has not yet concurred in the selected remedy.

Community Acceptance. A public meeting on the Proposed Plan was held April 24 in Lebanon County, Pennsylvania. Comments received from the public during the comment period are referenced in the Responsiveness Summary attached to this Record of Decision.

D. Site STRUCTURES

The onsite containment program proposed by the former owners did not address the Site structures, with the sole exception of the vault structure. Under the former owner containment program, the vault structure would be placed in the on-Site enhanced solids containment system. Since the former owner containment program did not address the majority of contaminated Site structures, it will not be considered a Site structure remedial alternative, and will not be discussed further in the analysis of Site structure remedial alternatives.

The remedial alternatives for the Site structures are numbered to correspond with the alternative numbers in the FS Report. The alternatives are the following:

* Alternative 1: No Action
* Alternative 2: Demolition/Bulk Excavation, Surface Treatment/Landfill
* Alternative 3: Demolition/Bulk Excavation, Surface Treatment/Incineration/Landfill
* Alternative 4: Demolition/Bulk Excavation, Surface Treatment/Vitrification/Landfill

1. Alternative 1: NO ACTION

The "no action" alternative is required under the Superfund program at every Site, to establish a baseline for comparison with the other alternatives. Under this alternative, EPA would take no actions other than performing reviews every 5 years. Since hazardous wastes were treated in the Site buildings after 1980, the Site structures were abandoned after 1980, and some of the structures exhibit the RCRA arsenic and cadmium toxicity characteristics, RCRA Subpart G closure regulations (40 CFR 264.111) would be applicable to the structures. Also, since precipitation runoff from the Site structures is adding significant concentrations of contaminants to Tulpehocken Creek, Clean Water Act (CWA) direct discharge standards (40 CFR Part 122) are applicable. "No action" would not comply with the RCRA closure and CWA direct discharge regulations. Alternative 1 would also not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. While no

capital costs would be incurred under this alternative, annual operation & maintenance (O&M) costs are estimated to be $3,600. This alternative has a present-worth cost of $55,600, and can be implemented immediately.

2. Alternative 2: DEMOLITION/BULK EXCAVATION, SURFACE TREATMENT/LANDFILL

Under Alternative 2, all of the Site structures with surface contamination would be surface cleaned. Dangerous conditions existing in buildings outside of the Building 1-7 complex would be remediated. The Building 1-7 complex and all tanks, vessels, piping, process equipment and outdoor tank concrete dikes would be demolished and excavated. The demolition debris would be ground, crushed, screened, and magnetically separated, as appropriate; and segregated into nonhazardous and hazardous components. The nonhazardous components would be disposed in an onsite landfill or an offSite landfill legally able to accept the debris. The hazardous materials would be placed in either an onsite landfill or an offSite RCRA Subtitle C landfill.

The surface decontamination would be conducted in accordance with RCRA closure regulations for structures (40 CFR 264.114). The specific type of cleaning process used would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. Cleaning residuals would either be managed in an onsite groundwater treatment system, if constructed, or at an offSite facility legally able to accept the waste.

During demolition, downgradient air monitoring would be conducted to evaluate potential risks to the community. If necessary, remedial measures would be taken to control air releases. Since some of the Site structures contain asbestos, Occupational Safety and Health Administration (OSHA) construction standards (29 CFR 1926.58) would be applicable to the demolition.

For the onsite landfill option, the landfill would be designed to meet or exceed all RCRA landfill standards (40 CFR Part 264, Subpart N), which have been determined to be relevant and appropriate. RCRA standards are not applicable to the onsite landfill option of Alternative 2 since the hazardous materials are being consolidated within the same area of contamination. The landfill liner base would be designed to minimize threats posed by sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. Since the wastes would remain onsite, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option of Alternative 2 would not comply with the Pennsylvania hazardous waste facility siting criteria in Title 25, Chapter 75.425 for the hazardous Site structures, and the proposed Pennsylvania residual waste landfill siting criteria for the nonhazardous Site structures. These criteria prohibit the construction of a hazardous or residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria have been determined to be relevant and appropriate for the hazardous Site structures (the hazardous waste siting criteria are promulgated), and TBC material for the nonhazardous Site structures (the residual waste criteria are presently proposed). RCRA land disposal restrictions (40 CFR Part 268) were not determined to be applicable for the hazardous Site structure wastes because placement is not occurring. EPA is undertaking a RCRA land disposal restriction

rulemaking that will specifically apply to soil and debris. Until that rulemaking is completed, the CERCLA program does not consider RCRA land disposal restrictions to be relevant and appropriate to debris that does not contain RCRA-regulated wastes.

For the offSite disposal option, the hazardous Site structures would be disposed in a hazardous waste landfill, and the nonhazardous structures in an industrial (solid) waste landfill. The offSite landfill option would not comply with the RCRA land disposal restrictions for cadmium characteristic (D006) wastes. There is a RCRA land disposal restriction capacity extension for arsenic characteristic (D004) nonwastewaters until May 8, 1992

(55 FR 22520). If the materials exhibiting only the arsenic (and not the cadmium) toxicity characteristic are directly landfilled offSite before this date, this action would comply with the RCRA land disposal restrictions for arsenic characteristic wastes. EPA is currently undertaking a RCRA land disposal restriction rulemaking that will specifically address debris. This rulemaking may change the status of these RCRA land disposal restriction ARARs.

Alternative 2 is intended to comply with the applicable RCRA closure standards, OSHA asbestos standards, CWA direct discharge standards, and Federal Floodplains Management and Executive Order (E.O. 11988); and the relevant and appropriate NAAQS (40 CFR Part 50). Alternative 2 would not comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $2,000,000 and $4,000,000, for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $3,600. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $2,056,000 and $4,000,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 24 months.

3. Alternative 3: DEMOLITION/BULK EXCAVATION, SURFACE TREATMENT/INCINERATION/LANDFILL

Under Alternative 3, all of the Site structures with surface contamination would be surface cleaned. Dangerous conditions existing in buildings outside of the Building 1-7 complex would be remediated. The Building 1-7 complex and all tanks, vessels, piping, process equipment, and outdoor tank concrete dikes would be demolished and excavated. The demolition debris would be ground, crushed, screened, and magnetically separated, as appropriate; and segregated into nonhazardous and hazardous components. The nonhazardous components would either be disposed in an onsite landfill or an offSite landfill legally able to accept the debris, or salvaged. The hazardous materials would be divided into three groups: combustible materials (such as the wood flooring); impermeable materials (such as the steel tanks); and permeable materials (such as the concrete dikes). The combustible materials would be incinerated, with the ash being fixated with cement/pozzolan-based materials. The impermeable materials would be surface cleaned. The permeable materials would be coated and sealed to immobilize the contaminants. The treated wastes would be placed in either a new onsite landfill or an existing offSite landfill.

The surface decontamination would be conducted in accordance with RCRA closure regulations for structures (40 CFR 264.114). The specific type of cleaning process (e.g., steam or water

washing, or sandblasting) would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. Cleaning residuals would either be managed in an onsite groundwater treatment system, if constructed, or at an offSite facility legally able to accept the waste.

During demolition, downgradient air monitoring would be conducted to evaluate potential risks to the community. If necessary, remedial measures would be taken to control air releases. Since some of the Site structures contain asbestos, Occupational Safety and Health Administration (OSHA) construction standards (29 CFR 1926.58) would be applicable to the demolition.

The combustible hazardous Site structures would be incinerated onsite or offSite, with the incinerator residuals being fixated with cement/pozzolan-based or other similar materials. Because of the relatively small volume of combustible hazardous Site structures, onsite incineration of the wastes would only be implemented if onsite incineration is implemented for the vault or lagoon wastes. The combustible materials would be incinerated to destroy the organic contaminants and to leave the metals in a form amenable to cement fixation, in accordance with RCRA 40 CFR Part 264, Subpart O standards. The specific type of incineration process (e.g., rotary kiln) would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. If onsite incineration occurs, the incineration unit would be mobilized, operated, and closed according to the requirements of RCRA Subpart O, 40 CFR 264.340, et seq. These requirements are applicable because the hazardous combustible Site structures are hazardous wastes. Specific operating practices necessary to meet the performance objectives, including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions as required by Subpart O of RCRA, would be determined through a trial burn at the Site after the installation of the incineration unit. Specialized air pollution control equipment would be applied during the incineration step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and NESHAPS (40 CFR Part 61, Subpart N).

The incineration residuals would be fixated using cement/pozzolan-based or other similar methods, in accordance with the requirements of RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). The exact fixation technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. If onsite treatment occurs, both the incineration and fixation would take place onsite using mobile equipment. The onsite fixation unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq.

Coating and sealing would be considered appropriate for the concrete diking, concrete block walls and floors, and asbestos (during handling). The exact coating and sealing technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process.

Salvaging would consist of auctioning off decontaminated structures. Scrapped metal may also be sold to the steel industry for reuse.

Alternative 3 would be expected to comply with the applicable 5.0 mg/l arsenic and 1.0 mg/l cadmium RCRA land disposal restriction treatment standards for arsenic and cadmium toxicity characteristic wastes, respectively. RCRA land disposal restrictions (40 CFR Part 268) are applicable to the wastes because placement is occurring. (A national capacity extension for arsenic characteristic wastes is in effect until May 8, 1992.) Following treatment, the wastes should no longer be RCRA characteristic wastes; they would be considered residual wastes under Pennsylvania law (25 PA Code, Chapter 75).

The treated wastes and untreated nonhazardous wastes would be placed in either a new onsite landfill or an existing offSite landfill. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and appropriate for the onsite landfill option. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with the relevant and appropriate 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are TBC material. For the offSite disposal option, industrial (solid) waste management regulations would be applicable since the treated wastes would be nonhazardous. These ARARs should be met.

Alternative 3 is intended to comply with the applicable RCRA closure standards cited above, OSHA asbestos standards, CWA direct discharge standards, and Federal Floodplains Management and Executive Order (E.O. 11988); and the relevant and appropriate NAAQS. Alternative 3 would also comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $2,440,000 and $4,100,000, for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $3,600. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $2,500,000 and $4,100,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

4. Alternative 4: DEMOLITION/BULK EXCAVATION, SURFACE TREATMENT/VITRIFICATION/LANDFILL

Under Alternative 4, all of the Site structures with surface contamination would be surface cleaned. Dangerous conditions existing in buildings outside of the Building 1-7 complex would be remediated. The Building 1-7 complex and all tanks, vessels, piping, process equipment, and outdoor tank concrete dikes would be demolished and excavated. The demolition debris would be ground, crushed, screened, and magnetically separated, as appropriate; and segregated into nonhazardous and hazardous components. The nonhazardous components would either be disposed in an onsite landfill or an offSite landfill legally able to accept the debris, or salvaged. The hazardous materials would be divided into three groups: combustible materials (such as the wood flooring); impermeable materials (such as the steel tanks); and permeable materials (such as the concrete dikes). The combustible materials would be vitrified

onsite. The metal contaminants would become trapped in the glass during the subsequent cooling step. The impermeable materials would be surface cleaned. The permeable materials would be coated and sealed to immobilize the contaminants. The treated wastes would be placed in either a new onsite landfill or an existing offSite landfill.

The surface decontamination would be conducted in accordance with RCRA closure regulations for structures (40 CFR 264.114). The specific type of cleaning process used would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. Cleaning residuals would either be managed in an onsite groundwater treatment system, if constructed, or at an offSite facility legally able to accept the waste.

During demolition, downgradient air monitoring would be conducted to evaluate potential risks to the community. If necessary, remedial measures would be taken to control air releases. Since some of the Site structures contain asbestos, Occupational Safety and Health Administration (OSHA) construction standards (29 CFR 1926.58) would be applicable to the demolition.

The combustible hazardous Site structures would be mixed with soils or other materials with a low organic carbon content. Other Site wastes could be used if suitable. This mixing would occur to achieve a mixture organic carbon content of approximately 5 percent, the maximum content that existing vitrification equipment can handle. The mixture would be placed in a trench and heated with electricity flowing through electrodes until the mixture formed a pool of molten glass. Organic contaminants would be destroyed during heating, whereas metal contaminants would become trapped in the glass during the subsequent cooling step. The vitrification would occur in accordance with RCRA standards for miscellaneous treatment units (40 CFR Part 264, Subpart X). These standards are applicable to the hazardous combustible Site structures because treatment and disposal are occurring. The vitrification unit would be mobilized, operated, and closed according to the requirements of 40 CFR 264.600, et seq. The specific operating parameters of the vitrification unit would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. Specialized air pollution control equipment would be applied during the vitrification step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate NAAQS (40 CFR Part 50) and NESHAPS (40 CFR Part 61, Subpart N). Residuals from the air pollution control system would be vitrified in subsequent batches.

Coating and sealing would be considered appropriate for concrete and block walls and floors, and asbestos (during handling). The exact coating and sealing technique employed would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process.

Alternative 4 would be expected to comply with the applicable 5.0 mg/l arsenic and 1.0 mg/l cadmium RCRA land disposal restriction treatment standards for arsenic (D004) and cadmium (D006) toxicity characteristic wastes. RCRA land disposal restrictions (40 CFR Part 268) are applicable to the hazardous wastes because placement is occurring. (A national capacity extension for D004 nonwastewaters is in effect until May 8, 1992.) Following treatment, the

wastes should no longer be RCRA characteristic wastes; they would be considered residual wastes under Pennsylvania law (25 PA Code, Chapter 75).

The treated wastes and untreated nonhazardous wastes would be placed in either a new onsite landfill or an existing offSite landfill. If the wastes were landfilled onsite, the landfill would be designed in accordance with RCRA landfill standards (40 CFR Part 264, Subpart N). These standards have been determined to be relevant and appropriate for the onsite landfill option. For the onsite landfill option, the landfill base would be designed to minimize the threat of sinkhole collapse. Deed restrictions prohibiting future uses would be placed on the landfill area. In addition, long-term O&M would be conducted to monitor the groundwater around the landfill and to ensure the integrity of the cap, in accordance with the relevant and appropriate 40 CFR 264.117, and 5-year reviews would be conducted. The onsite landfill option would not comply with the proposed Pennsylvania residual waste landfill siting criteria, which prohibit the construction of a residual waste landfill over sinkhole-prone limestone or carbonate formations. These criteria are TBC material. For the offSite disposal option, industrial (solid) waste management regulations would be applicable since the treated wastes would be nonhazardous. These ARARs should be met.

Alternative 4 is intended to comply with the applicable RCRA closure standards cited above, OSHA asbestos standards, CWA direct discharge standards, and Federal Floodplains Management and Executive Order (E.O. 11988); and the relevant and appropriate NAAQS. Alternative 4 would also comply with the CERCLA preference for a remedy that employs treatment to reduce toxicity, mobility, or volume as a principal element. The estimated capital costs of this alternative are $5,490,000 and $7,400,000, for the onsite and offSite landfill options, respectively. Annual O&M costs for the onsite landfill option are estimated to be $3,600. There are no annual O&M costs for the offSite landfill disposal option. The estimated present-worth costs of this alternative are $5,500,000 and $7,400,000 for the onsite and offSite landfill options, respectively. The estimated time to implement this alternative is approximately 36 months.

5. COMPARATIVE ANALYSIS OF ALTERNATIVES - SITE STRUCTURES

EPA's selected remedy for the site structures is Alternative 3 with offsite disposal. All of the site structures with surface contamination would be surface cleaned. Dangerous conditions existing in buildings outside of the the Building 1-7 complex would be remediated. The Building 1-7 complex and all tanks, vessels, piping, and process equipment would be demolished and excavated. Nonhazardous debris would either be disposed in an offsite landfill, or salvaged. The hazardous materials would be treated by either incineration followed by fixation; surface cleaning; or coating and sealing. The treated wastes would be landfilled offsite.

The four Site structures remedial action alternatives described above were evaluated under the nine evaluation criteria in the NCP. The evaluations are as follows:

Overall Protection. Alternatives 3 and 4 would provide protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, or institutional controls.

Alternative 2 would be less protective of human health and the environment than Alternatives 3 and 4 since the hazardous wastes would not be treated to either destroy or immobilize the contaminants.

The remedial options that include onsite landfilling of the Site structures (the onsite landfill options for Alternatives 2, 3, and 4) would be less protective of human health and the environment than the offSite disposal options because of the potential of landfill failure from sinkhole formation or other causes. Landfill failure could result in a substantial release of contaminants to groundwater.

The "no action" alternative is not protective of human health and the environment, and is not considered further in this analysis as an option for the Site structures.

Compliance with ARARs. The offSite disposal option for Alternatives 3 and 4 would meet their respective ARARs. Pennsylvania law does not allow construction of a hazardous waste landfill immediately above any carbonate bedrock. Thus, the onsite landfill option of Alternative 2 would not comply with this ARAR. The proposed Pennsylvania residual waste landfill regulations do not allow construction of a residual waste landfill immediately above any sinkhole-prone carbonate bedrock. The onsite landfill options of Alternatives 3 and 4 would not comply with this TBC. Alternatives 3 and 4 would be expected to comply with the applicable RCRA land disposal restriction standards for the Site structures. The offSite landfill option of Alternative 2 would not comply with the RCRA land disposal restriction standards for D006 wastes. EPA is currently undertaking a RCRA land disposal restriction rulemaking that will specifically address debris. This rulemaking may change the status of the Site structures RCRA land disposal restriction ARAR. Alternative 2 would not comply with the CERCLA preference for treatment.

Long-term Effectiveness and Permanence. The offSite disposal option of Alternative 3 would reduce the hazards posed by the Site structures by surface cleaning Site structures having contaminated surface buildups; remedying dangerous conditions in the buildings; demolishing the most contaminated structures; thermally destroying the organic contaminants and fixating the metals in the demolished combustible materials; surface cleaning the demolished impermeable materials; and immobilizing the contaminants in the demolished permeable materials. The long-term risk of exposure to the treated wastes at the Whitmoyer Laboratories Site would be reduced by placing the wastes in an offSite landfill. Alternatives 3 and 4 would be more protective than Alternative 2 since the contaminants would either be destroyed or immobilized by treatment.

The alternatives that include onsite containment of the Site structures debris (the onsite landfill options of Alternatives 2, 3, and 4) would be less protective of human health and the environment than the alternatives with offSite disposal options because of the potential for the onsite landfill to fail from sinkhole formation or other causes. The onsite containment system would require long-term maintenance, and portions of it might need to be replaced in the future. If deed restrictions are not effective, direct exposure to the wastes in the future could result from construction activities.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment. Alternatives 3 and 4 would treat the hazardous debris to reduce toxicity, mobility, or volume. Alternatives 3 and 4 would eliminate the toxicity of the organic contaminants in the combustible materials by thermal destruction, and would reduce the mobility of the contaminants in the other hazardous Site structures using immobilization technologies. Alternative 3 would immobilize the metals in the combustible materials by fixating the incinerator ash, whereas Alternative 4 would reduce the mobility of the metals in the combustible materials by encapsulating them in a glass matrix.

No reduction in toxicity, mobility, or volume is realized for Alternative 2. Disposal without treatment is the least preferred option under CERCLA.

Short-term Effectiveness. All of the alternatives could be implemented within an estimated 24 months from the date of this ROD.

There is some minor, short-term risk of exposure to the community during transportation of the wastes offSite under the offSite incineration option of Alternative 3 and the offSite landfill disposal options of Alternatives 2, 3, and 4. If worker safety procedures are properly adhered to, only minimal, short-term risks are associated with the onsite landfill disposal options of the remedial alternatives.

Implementability. The various alternatives have few associated administrative difficulties that could delay implementation. Permits would be required for the offSite disposal of the treated or untreated wastes. For Alternatives 3 and 4, thermal treatment equipment and skilled workers would be available but limited. The technology, equipment, and specialists required to implement Alternative 2 would be readily available. For all of the alternatives, monitoring of air and water during implementation would be required. For Alternatives 3 and 4, monitoring of the treated wastes would also be required. Long-term monitoring of landfill leachate and leak detection zones would be required for the onsite landfill options of Alternatives 2, 3, and 4.

Cost. The present-worth cost of the offSite disposal option of Alternative 3 is estimated to be $4,100,000. The lowest-cost alternative is Alternative 2 (onsite landfill option) at $2,056,000. The highest cost alternative is Alternative 4 with offSite disposal, at $7,400,000. The other alternative cost estimates are presented in the alternative description sections.

State Acceptance. The Commonwealth of Pennsylvania has not yet concurred with the selected remedy.

Community Acceptance. A public meeting on the Proposed Plan was held April 24 in Lebanon County, Pennsylvania. Comments received from the public during the comment period are referenced in the Responsiveness Summary attached to this Record of Decision.

VIII. THE SELECTED REMEDY

Based upon consideration of information available for Operable Unit Two of the Whitmoyer Laboratories Site, including the documents available in the Administrative Record, an evaluation

of the risks currently posed by the Site, the requirements of CERCLA, the detailed evaluation of alternatives, and community input; both EPA and the Commonwealth of Pennsylvania have selected the following alternatives as the remedy to be implemented for the operable unit.

A. VAULT WASTES

Alternative 3 (cement/pozzolan-based fixation) for the lower vault wastes, and Alternative 4 (incineration followed by cement/pozzolan fixation) for the upper vault wastes. The wastes would be treated to comply with RCRA land disposal restrictions prior to being landfilled at an offSite hazardous waste disposal facility. The remedy for the upper vault wastes is incineration that meets all RCRA, NAAQS, and NESHAPS requirements and that is demonstrated to be safe during the remedial design phase of ROD implementation.

B. LAGOON WASTES

Alternative 3 (iron-based fixation), with the wastes ultimately being landfilled offSite at an intermediate (solid) waste disposal facility. The treatment would render the hazardous wastes nonhazardous.

C. MISCELLANEOUS PRODUCTS/FEEDSTOCKS

Alternative 4. Wastes exhibiting hazardous characteristics would be incinerated onsite in a mobile incineration unit, followed by cement/pozzolan-based fixation of the incinerator residuals. This treatment will render the treated wastes nonhazardous. The treated wastes and nonhazardous miscellaneous products/feedstocks would be disposed in an offSite intermediate (solid) waste disposal facility.

D. SITE STRUCTURES

Alternative 3, with the hazardous combustible Site structures being incinerated onsite and the treated wastes being landfilled offSite at an intermediate (solid) waste disposal facility. Treatment of the hazardous wastes would render them nonhazardous.

The estimated present-value cost of this selected remedy is $45,800,000; as follows:

Medium	Present-value Cost
Vault Wastes	$18,400,000
Lagoon Wastes	$22,900,000
Miscellaneous Products/Feedstocks	$371,000
Site Structures	$4,100,000
TOTAL COST	$45,800,000

The major components of the selected remedial action are as follows:

* Excavation of the concrete vault contents [(4,500 cubic yards (CY)], the approximately 20 buried drums located east of the vault, and an estimated 50 CY of residuals potentially present in the tanks and process vessels not being addressed under OU One.

* Excavation of the approximately 24,000 CY of materials present in the lagoons having an arsenic content greater than 10,000 mg/kg (lagoon wastes).

* Removal of the approximately 101 CY of miscellaneous products/feedstocks from the buildings.

* Surface cleaning of the Site structures with surface contamination.

* Remediation of dangerous conditions existing in buildings outside of the Building 1-7 complex.

* Demolition of the Building 1-7 complex and all tanks, vessels, piping, process equipment, and outdoor tank concrete dikes.

* Onsite incineration of the approximately 3,000 CY of high organic content wastes present in the vault; the contents of the approximately 20 buried drums; the estimated 50 CY of residuals potentially present in the tanks and process vessels not being addressed under OU One; and the miscellaneous products/feedstocks and combustible demolition debris exhibiting the RCRA arsenic toxicity characteristic. The remedy selected by EPA is incineration that meets all RCRA, NAAQS, and NESHAPS requirements and that is demonstrated to be safe during the remedial design phase of ROD implementation.

* Fixation of the incineration residuals and the approximately 1,500 CY of low organic content wastes present in the vault using a cement/pozzolan-based or other similar fixation process that provides equivalent protection.

* Fixation of the lagoon wastes exhibiting the RCRA arsenic toxicity characteristic using an iron-based or other similar fixation process that provides equivalent protection.

* Coating and sealing the noncombustible, permeable demolition debris exhibiting the RCRA arsenic toxicity characteristic.

* Surface cleaning the noncombustible, impermeable demolition debris exhibiting the RCRA arsenic toxicity characteristic.

* Salvaging nonhazardous demolition debris, as feasible.

* Disposal of the treated wastes; the untreated (nonhazardous) lagoon wastes; the untreated (nonhazardous) miscellaneous products/feedstocks; and the untreated (nonhazardous) demolition debris that is not salvaged in offSite landfill(s), in accordance with all applicable regulations.

These alternatives will significantly reduce or eliminate the actual and potential threats to public health and the environment posed by the OU Two materials, and are consistent with EPA's strategy for remediation of the Site.

IX. STATUTORY DETERMINATIONS

Under its legal authorities, EPA's primary responsibility at Superfund Sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this Site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is granted. The selected remedy also must be cost-effective and utilize treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes. The following sections discuss how the selected remedy for this Site meets these statutory requirements.

A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Based on the risk assessment developed for OU Two materials, actual or potential exposure pathways include groundwater consumption, dermal contact, accidental ingestion, and inhalation. Additionally, risks are presented by the potential for a fire at the Site and the unsafe conditions in the buildings onsite. The selected remedy addresses these risks (protects human health and the environment) by destroying the organic contamination in the upper vault wastes, hazardous miscellaneous products/feedstocks, and hazardous combustible Site structures; reducing the mobility of the arsenic in the incineration residuals and the lower vault wastes using a cement/pozzolan-based or other similar fixation process; reducing the mobility of the arsenic in the hazardous lagoon wastes using an iron-based or other similar fixation process; reducing the mobility of contaminants in the noncombustible, permeable demolition debris exhibiting the RCRA arsenic toxicity characteristic by coating and sealing these materials; removing contaminants from the noncombustible, impermeable demolition debris exhibiting the RCRA arsenic toxicity characteristic by surface cleaning; salvaging nonhazardous demolition debris, as feasible; disposal of the treated wastes, the untreated (nonhazardous) lagoon wastes, the untreated (nonhazardous) miscellaneous products/feedstocks, and the untreated (nonhazardous) demolition debris that is not salvaged in offSite landfill(s) to further reduce contaminant mobility and access to these materials; surface cleaning of the Site structures with surface contamination to eliminate ingestion/inhalation exposure; and remediation of dangerous conditions existing in buildings outside of the Building 1-7 complex to prevent accidents. Both carcinogenic and non-carcinogenic risks from the contaminant sources identified in this Record of Decision will be eliminated from this Site through the treatment/removal of those sources.

The selected remedy will not pose any unacceptable short-term risks or cross-media impacts to the Site, the workers, or the community. While there are risks associated with arsenic volatilization during the incineration, these risks would be reduced to acceptable levels through the use of specialized air pollution control equipment. Since metals cannot be destroyed, there will be some long-term risks associated with the metal (mostly arsenic and cadmium) contamination; however, the heavily-contaminated materials will be treated prior to disposal to reduce the mobility of the heavy metals, and the treated and untreated materials that are not salvaged will be placed into an offSite landfill for proper long-term management.

B. ATTAINMENT OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy will attain all applicable or relevant and appropriate requirements for the Site, the OU Two materials, and the actions that will be implemented. The major ARARs include the following:

* Action-Specific ARARs - RCRA Subtitle C closure requirements (40 CFR Part 264, Subpart G) will be met for the Site structures. Incineration of the upper vault wastes, hazardous miscellaneous products/feedstocks, and hazardous combustible Site structures will comply with RCRA Subtitle C incineration requirements (40 CFR Part 264, Subpart O). The incineration residuals, the lower vault wastes, and the hazardous lagoon wastes would be fixated in accordance with RCRA Subtitle C miscellaneous treatment unit standards (40 CFR Part 264, Subpart X). Materials transported offSite will meet the CERCLA offSite disposal policy and comply with Federal transportation regulations (40 CFR Parts 262 and 263; 49 CFR Parts 107 and 171-179) and Pennsylvania regulations (Title 25, Chapter 263) for material transport. During contaminated material demolition, excavation, and treatment, air monitoring will be performed to ensure that any air emissions comply with Clean Air Act (40 CFR Parts 50 and 61) and Pennsylvania air quality regulations (Title 25, Chapters 123, 127, and 131). Occupational Safety and Health Administration (OSHA) asbestos standards (29 CFR Part 1926) will be met during Site structure demolition. OSHA requirements (29 CFR Parts 1904, 1910, and 1926) will be met for workers engaged in remedial activities. Vault waste treatment will be monitored to ensure compliance with RCRA Subtitle C land disposal restrictions (40 CFR Part 268) prior to offSite transport and landfilling. Treatment of the wastes exhibiting the characteristic of arsenic toxicity (hazardous lagoon wastes, hazardous miscellaneous products/feedstocks, and hazardous Site structures) will be scrutinized to confirm that the treated waste is no longer hazardous, prior to disposal at an approved offSite facility. The offSite landfill accepting the treated vault wastes will comply with RCRA Subtitle C standards (40 CFR Part 264, Subpart N). The offSite landfill accepting the treated and untreated lagoon wastes, miscellaneous products/feedstocks, and Site structures will comply with RCRA Subtitle D and state industrial (solid) waste management regulations. Excavation activities will be in accordance with Pennsylvania requirements for erosion control (25 PA Code, Chapter 102).

* Chemical-Specific ARARs - RCRA Subtitle C and Commonwealth of Pennsylvania requirements for identification of listed and characteristic hazardous wastes (40 CFR Part 261 and 25 PA Code, Chapter 261, respectively) will be complied with during the remediation of OU Two materials. Air emissions during remedial activities will be monitored for compliance with Clean Air Act (40 CFR Parts 50 and 61) and Pennsylvania air quality regulations (25 PA Code, Chapters 123, 127, and 131). Clean Water Act (40 CFR Part 122) and Pennsylvania (25 PA Code, Chapter 92) direct discharge standards would be met by the Site structures remediation.

* Location-Specific ARARs - Remediation of the Site structures will be conducted in accordance with the Federal Floodplains Management and Executive Order (E.O. 11988).

* Other Criteria, Advisories, or Guidance to be Considered- In determining that incinerator arsenic emissions levels present acceptable carcinogenic and noncarcinogenic risks to the nearby community, EPA used advisory levels and guidelines that are "to-be-considered" for the remedial actions. These are:

  - EPA-established reference dose for arsenic
  - EPA-established carcinogenic potency factor for arsenic

The selected remedy satisfies the CERCLA preference for remedies that incorporate treatment as a principal component.

C. COST-EFFECTIVENESS

The estimated present worth cost of the selected remedy for OU Two is $45,800,000. EPA and the Commonwealth of Pennsylvania believe the selected remedy is cost-effective in mitigating the risks posed by the OU Two materials in a reasonable period of time (an estimated 36 months) and meets all other requirements of CERCLA. Because the majority of organic contaminants present in the OU Two materials will be destroyed, the metal contaminants in the RCRA-listed wastes (following treatment) and wastes exhibiting the arsenic and cadmium toxicity characteristics will be treated to reduce mobility, and the treated and untreated nonhazardous (low-level threat) wastes will be disposed in an appropriate landfill (or salvaged as appropriate), the selected remedy affords a high degree of long-term effectiveness and permanence. Although the no-action alternatives, the excavation/landfill alternatives, and the enhanced solids containment system alternative can be implemented at lower costs, these alternatives do not provide for permanent treatment and are not as effective in protecting human health and the environment. In addition, the no-action alternatives and the enhanced solids containment system alternative do not meet ARARs; the excavation/landfill alternatives with offSite disposal for the vault wastes and Site structures do not meet ARARs; and the excavation/landfill alternatives with offSite disposal will not meet ARARs after May 8, 1992 for the lagoon wastes and miscellaneous products/feedstocks.

D. PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By treating all of the OU Two materials that are considered listed hazardous wastes (following treatment by incineration and/or fixation) or exhibit the RCRA toxicity characteristic, the selected remedy addresses the principal threats posed by the OU Two materials through the use of treatment technologies. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

E. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE.

EPA and the Commonwealth of Pennsylvania have determined that the selected remedial action 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 the alternatives that are protective of human health and the environment and meet ARARs, EPA and the Commonwealth of Pennsylvania have determined that the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; implementability; short-term effectiveness; reduction in toxicity, mobility, or volume through treatment; state and community acceptance; and the CERCLA preference for treatment of the OU Two materials.

The selected remedy addresses the principal threats posed by the OU Two materials. The remedy is protective of human health and the environment, meets ARARs, incorporates treatment as a principal element; and is cost-effective. The major tradeoffs that provide the basis for the selection decision are implementability, cost, and short-term effectiveness. Because of the unproven nature of microencapsulation technology on the arsenic and organic contaminants in the upper vault wastes, the selected remedy is more reliable than alternative combinations that include microencapsulation of these wastes. The selected remedy is more cost effective than other alternative combinations that are protective, incorporate treatment, meet ARARs, and are equally reliable. There is less short-term risk associated with the selected remedy than for those alternative combinations that include thermal treatment (incineration or vitrification) of the lower vault wastes and/or the lagoon wastes. Therefore, the selected remedy was determined to be the most appropriate remedy for Operable Unit Two at the Whitmoyer Laboratories Site.

X. EXPLANATION OF SIGNIFICANT CHANGES

The Proposed Plan for Operable Unit Two at the Whitmoyer Laboratories Site was released for comment in April 1990. The Proposed Plan identified EPA's preferred alternative. EPA reviewed all of the comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

Appendix A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
OPERABLE UNIT TWO
WHITMOYER LABORATORIES SITE

Standard, Requirement, Criterion or Limitation	Citation	Description	Discussion
Chemical-Specific ARARs			
RCRA Hazardous Waste Identification	40 CFR Part 261	RCRA regulations for hazardous waste identification	All media
Hazardous Waste Identification	25 PA Code, Chapter 261	Pennsylvania regulations for hazardous waste identification	All media
Clean Air Act (CAA) Air Emissions	40 CFR Part 50	National Ambient Air Quality Standards	All media
CAA Air Emissions	40 CFR Part 61	National Emissions Standards for Hazardous Air Pollutants	Incineration and vitrification options only
Air Quality Regulations	25 PA Code, Chapters 123, 127 and 131	Pennsylvania air quality regulations	All media
Clean Water Act Discharge Standards	40 CFR Part 122	Clean Water Act standards for direct discharges	Site structures medium only
Direct discharge standards	25 PA Code, Chapter 92	Pennsylvania direct discharge standards	Site structures medium only
Location-Specific ARARs			
Federal Floodplains Management	Executive Order 11988	Federal floodplains management regulations	Site structures medium only

Appendix A
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
OPERABLE UNIT TWO
WHITMOYER LABORATORIES SITE
Page Two

Standard, Requirement, Criterion or Limitation	Citation	Description	Discussion
Action-Specific ARARs			
RCRA Structures Closure	40 CFR Part 264, Subpart G	RCRA regulations for closure of structures	Site structures medium only
RCRA Incineration	40 CFR Part 264 Subpart O	RCRA regulations for hazardous waste incinerators	Incineration options only
RCRA Miscellaneous Treatment	40 CFR Part 264, Subpart X	RCRA regulations for miscellaneous treatment units	Fixation and vitrification options
U.S. Department of Transportation (DOT) Waste Transportation	49 CFR Parts 107 and 171-179	DOT regulations for waste transport	All media
RCRA Hazardous Waste Transportation	40 CFR Parts 262 and 263	RCRA regulations for the transport of hazardous waste	All media
Waste Transportation	25 PA Code, Chapter 263	Pennsylvania regulations for waste transportation	All media
Occupational Safety and Health Administration (OSHA) Asbestos Management	29 CFR Part 1926	OSHA regulations for asbestos removal	Site structures medium only
OSHA Worker Protection	29 CFR Parts 1904, 1910, and 1926	OSHA regulations for the protection of workers	All media
RCRA Land Disposal Restrictions	40 CFR Part 268	RCRA restrictions on the land disposal of hazardous waste	All media
RCRA Hazardous Waste Landfill	40 CFR Part 264, Subpart N	RCRA requirements for solid waste landfills	All media

Standard, Requirement, Criterion or Limitation	Citation	Description	Discussion
Action-Specific ARARs (cont'd)			
RCRA Solid Waste Landfill	RCRA Subtitle D	RCRA requirements for solid waste landfills	All media except the vault medium
Solid Waste Management	25 PA Code, Chapter 25	Criteria for siting and operating landfills	All media
Erosion Control	25 PA Code, Chapter 102	Erosion control limits on excavation activities	All media
RCRA Landfill Closure and Post-Closure	40 CFR Part 264	RCRA regulations for landfill closure and post-closure	All media

RESPONSIVENESS SUMMARY
OPERABLE UNIT TWO
WHITMOYER LABORATORIES SITE
JACKSON TOWNSHIP, LEBANON COUNTY, PENNSYLVANIA

From April 16, 1990 through December 3, 1990, the U.S. Environmental Protection Agency (EPA) held a public comment period on the Proposed Plan and the Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit Two of the Whitmoyer Laboratories Site in Lebanon County, Pennsylvania. This responsiveness summary summarizes comments on the Proposed Plan and RI/FS pertinent to Operable Unit Two that were expressed by local officials, state officials, and other interested parties; and provides EPA responses to the comments.

This responsiveness summary is divided into the following sections:

* Overview
* Background on Community Involvement
* Summary of Comments Received during Public Comment Period and Agency Responses
* Remaining Concerns

A. OVERVIEW

At the time of the public comment period, EPA had already identified a preferred alternative for Operable Unit Two of the Whitmoyer Laboratories Site. EPA's recommended alternative addressed the vault wastes, lagoon waste, miscellaneous products/feedstocks, and structures at the site. The preferred alternative specified in the Record of Decision (ROD) for Operable Unit Two involves:

* surface cleaning of the site structures which have surface contamination;
* remediation of dangerous conditions existing in buildings outside of the Building 1-7 complex;
* demolition of the Building 1-7 complex and all tanks, vessels, piping, process equipment, and outdoor tank concrete dikes;
* incineration followed by fixation and offsite disposal for the upper vault wastes hazardous miscellaneous products/feedstocks, and hazardous combustible demolition debris;
* fixation of the lower vault wastes and hazardous lagoon wastes, followed by offsite disposal;

* coating and sealing the noncombustible, permeable hazardous demolition debris, followed by offsite disposal;

* surface cleaning the noncombustible, impermeable hazardous demolition debris, followed by offsite disposal;

* salvaging nonhazardous demolition debris, as feasible; and

* disposal of the nonhazardous miscellaneous products/feedstocks, the nonhazardous lagoon wastes, and the nonhazardous demolition debris that is not salvaged in offsite landfill(s).

The community did not submit any comments on the preferred alternative. The Jackson Township Board of Supervisors is opposed to the incineration of the upper vault wastes onsite. The present owner of a property that contains some of the lagoon wastes (Buckeye Pipe Line Company) questions EPA's recommendation of excavating, fixating, and disposing the lagoon wastes offsite. They also question the prudence and cost-effectiveness of onsite incineration of the upper vault wastes. The former site owners, Rohm & Haas and SmithKline Beecham, support the alternatives of excavating the Operable Unit Two materials and either placing them in a landfill onsite or hauling them offsite for landfill disposal. The onsite landfill proposed by the former owners would be designed to meet or exceed existing landfill requirements and would be constructed with multi-layer liners and caps. This alternative, however, does not meet Commonwealth of Pennsylvania siting requirements for either hazardous or residual waste landfills. No treatment of the wastes would occur under either of the alternatives preferred by the former owners.

B. BACKGROUND ON COMMUNITY INVOLVEMENT

There has been consistent community interest in the Whitmoyer Site since its proposal for listing in 1984. Public meetings continue to attract approximately 50-70 local residents as well as most major local media. In spite of this interest, however, there have been no attempts to organize any formal special interest groups to address the Site or apply for a Technical Assistance Grant.

Further, with respect to Operable Unit Two, there has been little community interest in the remedy proposed by EPA for that Operable Unit. Nonetheless, this responsiveness summary, in addition to responding to comments formally submitted, will also address issues raised by the community at the public meetings for Operable Unit Two.

While this appears to remain true for the local citizenry, concern of local officials over EPA's proposed plan for Operable Unit 2 has been more apparent. This is evident in some very precise questioning from local officials and a formal request for an extension of the public comment period. Much of this Responsiveness Summary addresses these concerns directly

C. SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Comments raised during the public comment period for Operable Unit Two of the Whitmoyer Laboratories Site are summarized below. EPA responses to the comments are provided. The comments are categorized by relevant topics.

Consideration of Offsite Landfilling Alternative

1. As noted above, the former Whitmoyer Laboratories, Inc. owners urged EPA to consider offsite disposal without treatment for the vault wastes, lagoon wastes, and miscellaneous products/feedstocks. They stated that offsite disposal without treatment was not included in the Feasibility Study (FS) alternatives.

   EPA Response: Offsite disposal without treatment was an FS alternative for the lagoon wastes, miscellaneous products/feedstocks, and site structures (in all cases, Alternative 2B). This alternative was considered in detail in the FS and was included in the Proposed Plan for public comment. In fact, the remedy selected by EPA for Operable Unit Two includes offsite disposal without treatment for all nonhazardous lagoon wastes and miscellaneous products/feedstocks, and the non-hazardous site structure demolition debris which is not salvaged.

   EPA did not develop in the FS the alternative of offsite disposal without treatment for the vault wastes, because, at the time of the FS report and Proposed Plan preparation, doing so would not comply with the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDRs), further set forth at 40 CFR Part 268, in effect at the time (i.e., would have been illegal). (The vault contains K084, K101, K102, D004, and D006 wastes). On May 8, 1990, EPA revised the LDRs to allow offsite landfilling of the vault wastes without treatment until August 8, 1990. After that time, landfilling without treatment of the vault wastes would again not comply with LDRs. Since offsite disposal of the vault wastes without treatment could not be completed prior to that date, this alternative does not comply with the applicable LDR regulations. EPA has determined that a waiver of this applicable regulation is not justified, as no treatment of the principal threats at the site would occur under this alternative and an acceptable method of treatment is available.

   EPA has also considered in detail the alternative of offsite disposal without treatment of the hazardous lagoon wastes, (D004 wastes), miscellaneous products/feedstocks, and site structures (D004 and D006 wastes). Offsite disposal of these wastes without treatment can legally occur until May 8, 1992. However, EPA has not selected this alternative as the remedy for these materials, because, unlike the selected remedy, which immobilizes the waste through fixation, thus preventing leaching, the owners alternative simply relocates the untreated wastes thus leaving them subject to leaching of hazardous materials. This potential for leaching and migration of the hazardous materials clearly makes the owner's alternative less effective in the long-term, and less permanent since this offsite alternative also does not comply with the CERCLA preference for treatment.

2. The former Whitmoyer Laboratories, Inc. owners commented that all of the lagoon wastes should be managed as if they are non hazardous wastes under RCRA, since some of the wastes are only marginally hazardous.

EPA Response: Wastes that exceed TCLP regulatory levels are RCRA Subtitle C "hazardous wastes" and must be managed pursuant to RCRA Subtitle C and related regulations. Wastes that do not exceed TCLP regulatory levels, and are not otherwise RCRA Subtitle C hazardous wastes do not have to comply with the aforesaid statute and regulations.

3. The former owners commented that the presence of cadmium in the upper vault wastes would not alter the applicability of the LDR national capacity variance for arsenical wastes to the upper vault wastes.

EPA Response: This comment is incorrect. Land disposal of the upper vault wastes is restricted after August 8, 1990, the day that cadmium LDRs took effect.

Consideration of the Onsite Enhanced Solids Containment System

4. The owner of the property which contains some of the lagoon wastes (Buckeye Pipe Line Co. L.P.) commented that placement of the untreated vault and lagoon wastes in the onsite enhanced solids containment system, as proposed by the former owners, is a technically satisfactory solution, particularly if clay is used instead of aggregate to fill cracks in the rock surface.

EPA Response: EPA gave serious consideration to the onsite enhanced solids containment system proposed by the former owners. While this alternative is less costly than the selected remedy, EPA believes that the selected remedy is cost-effective in mitigating the risks posed by the OU Two materials in a reasonable period of time (an estimated 36 months) and meets all other requirements of CERCLA. Because the majority of organic contaminants present in the OU Two materials will be destroyed under the selected alternative, the metal contaminants in the RCRA-listed wastes (following treatment) and wastes exhibiting the arsenic and cadmium toxicity characteristics will be treated to reduce mobility, and the treated and untreated nonhazardous (low-level threat) wastes will be disposed in an appropriate landfill (or salvaged, as appropriate), the selected remedy affords a high degree of long-term effectiveness and permanence. Although the enhanced solids containment system alternative can be implemented at a lower cost, this alternative is less protective of human health and the environment, is less effective in the long-term and is less permanent as it does not involve treatment of the principal threats posed by this operable unit; does not reduce toxicity, mobility, or volume through treatment; and does not comply with the CERCLA preference for treatment. In addition, the enhanced solids containment system alternative does not comply with the applicable Pennsylvania siting requirements. Given these considerations, the selected remedy was chosen by EPA instead of the onsite enhanced solids containment system alternative.

Roasting of the Upper Vault Material

5. The former owners commented that the use of roasting on the upper vault material will endanger human health and the environment. The Jackson Township Board of Supervisors and State Senator David J. Brightbill also expressed concerns about this possibility.

EPA Response: The remedy selected by EPA is a roasting that meets all RCRA, NAAQS, and NESHAPS requirements and that is demonstrated to be safe during the remedial design phase of ROD implementation. In response to the public concerns expressed about the risks of roasting, EPA refined its preliminary estimates of arsenic emissions and risks to human health from the roasting program. The results of this evaluation are presented in a technical memorandum entitled "Arsenic Volatilization, Capture, and Risks Resulting from Incineration of the Upper Vault Waste" (Ebasco Services Inc., September 1990), hereafter referred to as the upper vault waste incineration technical memorandum. (This document is available in the Myerstown Public Library.) This evaluation concluded that, under reasonable exposure scenarios, the incremental risks of contracting cancer because of the upper vault waste roasting program would be significantly less than 1 in 1,000,000. EPA believes that this is well within the range of carcinogenic risks which are protective of human health. Noncarcinogenic risks were also calculated to be well within the acceptable range. Thus, only minor, acceptable risks should result from the upper vault waste roasting program. Further, the ROD discusses performance standards for the roasting remedy which are designed to keep the risks at acceptable levels. More specifically, the ROD at page 29 states roasting would be performed in accordance with RCRA 40 CFR Part 264, Subpart O standards. The specific type of roasting process would be determined in the Remedial Design phase through engineering design and analysis and the competitive bidding process. The roasting unit would be mobilized, operated, and closed according to the requirements of RCRA, Part 264, Subpart O, 40 CFR 264.340 et seq. Specific operating practices necessary to meet the performance objectives, including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions for organic contaminants as required by Subpart O of RCRA would be determined through a trial burn of upper vault waste prior to any full scale roasting at the Site. Specialized air pollution control equipment would be applied during the roasting step to capture contaminants in the exhaust air and thus ensure compliance with the relevant and appropriate National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) (40 CFR Part 61, Subpart N).

EPA recognizes there are uncertainties associated with the upper vault waste roasting program. For this reason, EPA plans to conduct test burns at a pilot-scale testing facility (possibly the EPA Incineration Research Facility in Arkansas) and trial burns using the full-scale roaster (incinerator) prior to start-up of the remediation. Only if the results of these tests confirm that roasting of the upper vault wastes can be conducted while adequately protecting human health and the environment will EPA proceed with the full-scale roasting program.

6. The former owners commented that the "test burn" necessary for design of the upper vault waste roasting system would be conducted at the Whitmoyer Site.

EPA Response: This "test burn" will likely be conducted at an offsite research facility such as the EPA Incineration Research Facility in Arkansas.

7. The former owners commented that the risk assessment methodology used in EPA's refined assessment of the risks associated with upper vault waste roasting (as presented in the upper vault waste incineration technical memorandum) is contrary to standard Superfund methodology. If different assumptions were utilized in the exposure scenarios, very significant risks to human health from the proposed roasting may have been predicted by the assessment.

EPA Response: The methodology used in the refined assessment of risks associated with upper vault waste roasting is consistent with current EPA guidance, as expressed in "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (interim final)" (EPA, December, 1989).

Furthermore, the refined risk assessment included many conservative assumptions. For example, the risk was calculated assuming a person resided at the point of maximum stack fallout, even though the modeling showed this point to be in an open field. Also, the cancer risk calculations use a cancer potency factor for arsenic which has been conservatively derived by EPA, so that it would be very unlikely that the estimated cancer risk from an exposure would be underestimated. Given conservative assumptions such as these inherent in the refined risk assessment methodology, it is unlikely that the risk to the community from roasting of the upper vault wastes is underpredicted by the refined assessment.

The remedy selected by EPA is a roasting that meets all RCRA, NAAQS, and NESHAPS requirements and that is demonstrated to be safe during the remedial design phase of ROD implementation. Consequently, concerns raised about the safety of roasting do not pertain to the safety of EPA's selected remedy, as that remedy, by its owns terms is safe; concerns raised about the safety of roasting, rather, pertain to the feasibility of implementing EPA's selected remedy. Although the former owners have criticized the refined risk assessment, they have not demonstrated that implementation of EPA's selected remedy is infeasible. EPA believes that it has sufficient information at this time to believe that implementation of its roasting remedy will be feasible. The refined risk assessment is only one component of that information.

Additionally, EPA believes that the 12 inch soil mixing zone used in the risk assessment for the incineration option is not unreasonable given the potentially soluble nature of the fallout constituents.

8. The former owners commented that roasting would increase the toxicity of the treated wastes by converting any organic arsenic compounds in the wastes to more toxic inorganic arsenic compounds.

EPA Response: The particular organic arsenic species, if any, in the upper vault wastes have not been identified. It is possible that the organic compounds present are more toxic than inorganic arsenic.

Even though organic arsenic forms will likely be converted to inorganic arsenic under the selected remedy, the advantages of the selected remedy (e.g., destruction of organic contaminants and immobilization of arsenic) far outweigh this potential drawback.

9. The former owners (in "Comments of the Whitmoyer Laboratories Private Study Group on the NUS/Ebasco Final Technical Memorandum Regarding Arsenic Volatilization, Capture, and Risk," Environ, December 1990) commented that a lower arsenic inhalation absorption factor was used in the upper vault waste incineration technical memorandum risk assessment than in the FS risk assessment, with no technical basis for making this "arbitrary" reduction. The result of this reduction is to reduce the estimated level of inhalation risk.

EPA Response: The risk assessment presented in the upper vault waste incineration technical memorandum utilized the most recently available inhalation absorption factor (EPA Integrated Risk Information System, September 1990). This absorption factor was also recognized by the former owners in their document "Comments on Risk Assessment Issues for Operable Unit 3 of the Whitmoyer Laboratories Site", Karch and Associates, Inc., September 1990.

10. The former owners commented that the estimate presented in the FS report and the upper vault waste incineration technical memorandum that the average arsenic content of the upper vault waste is 12% is not supported by the existing data, and that a 21% concentration may be more accurate.

EPA Response: The EPA estimate of a 12% arsenic concentration was derived by considering all available information. It appears that one of the data points used by the former owners in their calculations is an outlier. This sample result (75% arsenic) could only be obtained if either metallic arsenic or pure arsenic trioxide was present in the vault. These substances were not known to be used or generated at the Site. Thus, the true arsenic concentration for this particular sample is likely to be much lower. Also, the upper vault contains significant quantities of soil. During the 1964-65 cleanup, soils with concentrations as low as 0.3% arsenic were placed in the vault. Given this information, EPA believes its estimate is reasonable.

11. The former owners commented that the estimate presented in the upper vault waste incineration technical memorandum that only 5% of the arsenic placed into the upper vault waste incinerator would volatilize lacks a solid scientific foundation.

EPA Response: This estimate was derived using all available scientific data. While no treatability data were directly collected regarding volatilization of arsenic during roasting of the upper vault wastes, there is sufficient evidence that calcium addition prior to roasting will likely result in 5% or less of the arsenic volatilizing. Calcium addition during roasting tests conducted as a part of the lower vault waste treatability study inhibited

arsenic volatilization; between 0 and 9.2% of the arsenic volatilized during the tests. These results were achieved despite the fact that the lower vault waste sample submitted for treatability testing purposely contained some still bottom wastes from the upper vault, to present a worst-case treatment scenario. Five percent volatilization was selected as a conservative assumption, since better results were achieved during the testing, even though no optimization attempts to minimize arsenic volatilization were made.

The five percent assumption is also supported by results achieved at other similar settings. Only between 2% and 7% of the arsenic present in the feed volatilized during incineration of sludge in a mobile incinerator at Denney Farms, Missouri ("The Fate of Heavy Metals in EPA's Mobile Incineration System", J. P. Stumbar et al., September 1989, presented at the 1989 International Symposium on Combustion in Industrial Furnaces and Boilers). Incineration testwork on arsenic-contaminated soil from the Baird and McGuire Superfund Site indicated that the addition of excess calcium inhibited arsenic volatilization ("Pilot-Scale Incineration of Arsenic-Contaminated Soil from the Baird and McGuire Superfund Site", EPA, May 1990). No attempt to optimize retention of arsenic in the ash was made, however. (Robert Mournighan, EPA-ORD. See "Summary of Whitmoyer Laboratories Meeting of November 30, 1990" (EPA memo)). Incineration testwork conducted by the EPA Incineration Research Facility on a synthetic waste mixture containing arsenic and other metals in a clay matrix revealed that between only 3.2% and 11.2% of the arsenic present in the feed (normalized data) volatilized during incineration ("The Behavior of Arsenic in a Rotary Kiln Incinerator", R. C. Thurnau, August 1990, presented at the 21st Annual Meeting of The Fine Particle Society, American Institute of Chemical Engineers). In these last two studies, it was noted that arsenic volatilization increased with increasing temperature. The proposed upper vault waste roaster (incinerator) will operate at relatively low temperatures (around 600^{o}C to 700^{o}C). Finally, research conducted at the Montana College of Mineral Science and Technology showed that calcium addition led to high arsenic retentions (better than 97%) during high-temperature smelting operations. Formation of relatively insoluble calcium arsenate during this work was confirmed by x-ray diffraction ("Fixation of Arsenic in Copper Smelter Flue Dust", A. K. Mehta, Master's thesis).

A more precise arsenic volatilization rate will be obtained during the remedial design phase of ROD implementation, during the test burns of the upper vault waste. This information will be used by EPA in its decision whether to proceed with implementation of the roasting remedy, which, as noted above, requires the roasting to be performed safely and in compliance with all RCRA, NAAQS, and NESHAPS requirements.

12. In their comments, the former owners stated that cement/lime addition to the vault wastes prior to roasting was not contemplated in the Proposed Plan.

EPA Response: This is not the case. Cement/lime addition to the upper vault wastes prior to roasting was a part of the preferred alternative suggested in the Proposed Plan and is a portion of the selected remedy.

13. The former owners questioned whether calcium could be effectively mixed with the upper vault waste prior to introduction into the roaster (incinerator).

EPA Response: EPA believes that excess calcium could be effectively mixed with the waste using conventional materials handling equipment (e.g., a pug mill). The exact mixing system to be used will be identified during the Remedial Design and through the competitive bidding process. If necessary, the tarry still bottoms present in the upper vault waste could be preheated to reduce their viscosity prior to mixing.

14. The former owners commented that the absence of existing calcium-arsenic compounds in the upper vault waste as compared with the lower vault waste may lead to significant arsenic volatilization.

EPA Response: EPA believes that adding calcium (cement and/or lime) to the upper vault wastes prior to roasting in excess of stoichiometric requirements will result in the inhibition of arsenic volatilization. This belief will be confirmed during test burns and trial burns to be conducted prior to the start-up of full-scale remediation.

15. The former owners commented that the EPA estimate of 99.3 percent arsenic removal in air pollution control devices is unsupported. EPA acknowledged that there is no known air pollution control device for capturing arsenic particulate emissions in a 1986 Record of Decision for the Pepper's Steel Superfund Site. The FS report stated that vapor-phase arsenic is not captured by any known air pollution control equipment. The arsenic removal efficiency data cited by EPA in their upper vault waste incineration technical memorandum are marketing predictions with little scientific or technical basis. Available data indicate that removal efficiencies for volatilized arsenic are in the 85% range.

EPA Response: EPA believes that there are several effective techniques for capturing arsenic particulate emissions, including electrostatic precipitators, baghouses, high efficiency particulate filters, and packed tower absorbers. The FS did not state that vapor-phase arsenic is not captured by any known air pollution control equipment. Vapor-phase arsenic can be removed from exhaust gases using several types of air pollution control equipment (e.g., packed tower absorbers).

The arsenic removal efficiency data cited by EPA in the upper vault waste incineration technical memorandum consisted of measurements made in pilot-scale incineration units, full-scale fixed-base incineration units, full-scale mobile incineration units, and operating copper smelters. The data from the full-scale units were developed during trial burns subject to regulatory scrutiny. These data are believed to be valid and demonstrate that arsenic removals of 99.3% or greater in air pollution control devices are achievable.

The 85% removal data cited by the former owners was from tests conducted on soils from the Baird and McGuire Superfund Site. In these tests only a one-stage ionizing wet scrubber was used for pollution control, and no attempts to optimize operation of this device were made. (Robert Mournighan, EPA-ORD. See "Summary of Whitmoyer Laboratories Meeting of November 30, 1990" (EPA memo)). For comparison, the

Chemical Waste management Port Arthur incinerator used a four-stage air pollution control device. During implementation of the upper vault waste roasting remedy, the air pollution control system will likely contain more stages than the system used for the Baird and McGuire study, in order to achieve the targeted arsenic removal efficiencies. If additional stages need to be added to standard mobile incinerator pollution control systems to meet the removal targets, this will be done.

16. The former owners commented that it appears that vendor information supplied by Ogden Environmental Services, Inc. (as cited in the upper vault waste incineration technical memorandum) is the basis for the 99.3% arsenic removal efficiency estimate. Furthermore, the calculation used to derive the 99.3% removal estimate contains an important error.

EPA Response: This estimate is based on all of the arsenic removal data cited in the upper vault waste incineration technical memorandum, and not just the Ogden information. In fact, the 99.3% arsenic removal efficiency was presented to Ogden initially as the preliminary upper removal target (see Appendix 1 of the upper vault waste incineration technical memorandum).

EPA agrees that the calculation presented on page 5 of Appendix 1 of the upper vault waste incineration technical memorandum regarding Ogden's baghouse removal efficiency is incorrect. The calculated 86% removal only applies to particulate arsenic. Using the same calculations and assumptions presented in the memorandum, the correct arsenic removal percentage is 98.2%. This indicates that if the assumptions are correct, the Ogden system is used to conduct the roasting, and a 99.3% arsenic removal efficiency is targeted, Ogden would have to demonstrate a higher removal efficiency using their suggested air pollution control devices than reported, or they would have to add on additional air pollution control devices to meet the target.

17. The former owners commented arsenic removal efficiencies at Whitmoyer may be much different than historical arsenic removal efficiencies measured from other operating incinerator air pollution control devices, since the feed arsenic concentration will be much higher.

EPA Response: While it is true that other historical data were obtained from the incineration of wastes with lower arsenic concentrations, arsenic removal efficiencies are not expected to be substantially different. (R. E. Mournighan, "Comments on PRP Presentation on Whitmoyer Superfund Site 11/2/90 at Region III Office). For example copper smelters typically have elevated arsenic concentrations in their feed, and their removal efficiencies are comparable with incineration data. The effectiveness of the air pollution control system will be verified during test burns and trial burns prior to start-up of the full-scale upper vault waste remediation.

18. The former owners commented that, for many of the studies cited by EPA, a mass balance was not obtained, and that the arsenic not accounted for may have been emitted as a vapor. If this is the case, and arsenic emissions are much higher than

reported, the risks due to roasting may be underpredicted by the upper vault waste incineration technical memorandum.

EPA Response: For incineration studies, closure of a mass balance within ±20% is considered good. In evaluating the studies, EPA believes the arsenic not accounted for is present within the incineration system as a coating on the walls, and did not escape as a vapor. The efficiency of the arsenic vapor measurement system was verified during quality assurance/quality control tests run during the studies. (Robert Mournighan, EPA-ORD. See "Summary of Whitmoyer Laboratories Meeting of November 30, 1990" (EPA memo)). Therefore, EPA believes the use of normalized data from these studies is appropriate.

19. The former owners implied in their comments that the FS predicted 15,300 pounds of arsenic would be released into the air during roasting of the vault wastes.

EPA Response: The FS did not predict that 15,300 pounds of air would be released into the air during roasting. Rather, this worst-case estimate was generated to demonstrate that substantial quantities of arsenic could be released into the atmosphere if the air pollution control system was improperly designed or operated. In their reanalysis of the risks posed by upper vault waste roasting, EPA calculated a likely arsenic release estimate of 400 pounds (see the upper vault waste incineration technical memorandum).

20. The former owners commented that the FS stated that the use of an air pollution control system such as that in use in the New Consort Plant "may not be achievable [at the Whitmoyer site] using available technology" (FS, pg. 4-21).

EPA Response: The former owner comment is a misquote. The FS did not indicate that use of the New Consort Plant system "may not be achievable"; rather, the FS stated that a 70°F offgas temperature may not be achievable. If the New Consort plant design is determined to be the optimal air pollution control system for roasting of the upper vault wastes, use of that system is readily achievable.

21. The former owners implied that a system identical to the New Consort air pollution control system will be used at Whitmoyer during the roasting of the upper vault, and commented that safe operation of this system is very unlikely.

EPA Response: The New Consort system was only cited in the FS as an example of an air pollution control system that could be used at Whitmoyer to reduce air emissions to acceptable levels; it is not described as the system that EPA will use. The exact air pollution controls system to be used at the Whitmoyer Laboratories Site will be determined during the Remedial Design for the vault waste remediation. That system will be designed to meet the performance standards discussed in response #5 above. Any system chosen will be tested in a trial burn to ensure safe operation at the Site, and subsequent operation will be monitored to maintain the performance standards specified above.

22. The former owners commented that products of incomplete comburstion (PICs) generated during roasting could present a significant risk to human health and the environment.

EPA Response: Current EPA regulatory guidance recommends that all hazardous waste incinerators be required to operate at carbon monoxide levels below 100 parts per million volume on a 1-hour average. This guidance will be followed at the Whitmoyer Laboratories Site. All evidence compiled to date by EPA indicates that PIC emissions will not pose a significant health risk when carbon monoxide emissions are below this level ("Guidance on PIC Controls for Hazardous Waste Incinerators", EPA, April 1989).

23. The former owners commented that roasting of the upper vault wastes will likely result in the formation and release of highly toxic byproducts, including arsine gas and nitrogen oxides. According to the former owners, the upper vault waste incineration technical memorandum underestimates nitrogen oxides emissions by at least fifty times.

EPA Response: Although it is possible that arsine gas may form as an intermediate at some point in the combustion (roasting) reaction, it is unlikely that significant concentrations would escape the highly turbulent oxidizing atmosphere of the incinerator's secondary combustion chamber.

Nitrogen oxides are produced by all combustion processes. Emissions from a well operated incinerator consist almost exclusively of nitric oxide (NO) and nitrogen dioxide (NO_2). Although these compounds do cause adverse health effects at relatively high concentrations, it is misleading to characterize them as "highly toxic". No adverse health effects from nitrogen oxides would be expected from the roasting of the upper vault wastes.

Overall, nitrogen oxides treatment requirements are risk- and ARAR-driven. Without any nitrogen oxides treatment, the modeled maximum quarterly concentrations for nitrogen oxides is 17 ug/m^3. This figure is much less than the comparable annual average nitrogen oxides standard of 100 ug/m^3 under the Clean Air Act.

Air pollution control devices utilized for arsenic removal (e.g., packed tower absorbers) would also be expected to remove the majority of nitrogen oxides volatilized during the roasting step. The ability of wet scrubbers to remove nitrogen oxides will be evaluated during the test and trial burns. If determined necessary, other nitrogen oxides air pollution control devices (e.g., catalytic systems) can be considered.

24. The former owners commented that the FS report and the upper vault waste incineration technical memorandum did not address the potentially high sodium content of the waste. If high concentrations of sodium are present in the upper vault wastes, the tendency of sodium to "glassify" could result in reduced arsenic removal efficiencies in the air pollution control devices, resulting in higher arsenic emissions than predicted.

EPA Response: While glassification (slagging) problems are possible, there are several factors particular to the Whitmoyer roasting (incineration) remedy which indicate that this

is not a concern. The first and most important factor is that slagging and volatilization are temperature dependent. The temperature to be employed in the primary chamber during roasting of the upper vault wastes would be approximately 600°C to 700°C. This temperature is lower than those typically employed in the incinerators (800°C plus) where slagging problems have been noted in the past. Thus, slagging-related problems may not emerge at the lower temperatures present in the roasting unit. A second factor is that the operating timeframe of the roasting unit is relatively short (approximately 90 days). Thus, slagging, which typically is a long-term concern, may not present a problem over such a short timeframe. Ongoing monitoring will be used to detect there is any decrease in arsenic removal efficiency (from slagging or other causes). Since slagging-induced degradation (if any) would be slow, corrective actions, such as equipment cleaning or replacement, could readily be implemented. The proposed test burn and trial burn will be used to identify if slagging is a concern; and, if it is, corrective measures to address it.

25. The former owners commented that the stack height used in the FS to estimate risk to the offsite community from roasting (65 meters) is questionable, and does not conform with Good Engineering Practice.

EPA Response: Good Engineering Practice (55 FR 17862) designates that a maximum acceptable stack height should be the greater of: (1) 65 meters; or (2) the height of a nearby structure plus 1.5 times the lesser dimension of the height or width of the nearby structure, to avoid significant adverse aerodynamic effects. Since the greater of these two terms at Whitmoyer is 65 meters, 65 meters was used in the air emissions modeling. The actual stack height to be used will be determined during the Remedial Design.

26. The former owners commented that some of the modeling assumptions used in estimating the atmospheric dispersion and deposition of arsenic emitted from the stack during the proposed roasting, including the validity of the Industrial Source Complex (ISC) model itself, were faulty, and therefore EPA's modeling effort may significantly underpredict the risk. For example, in the upper vault waste incineration technical memorandum, EPA assumed two mean particle diameters, 0.5 microns and 2.0 microns, without apparent scientific basis. Similarly the degree of reflection by particles settling from the atmosphere are unsupported, and wet deposition of both particulate matter and vapors was not considered.

EPA Response: The ISC model is a generally accepted model for evaluating incinerator emissions in flat or rolling terrain such is present at Whitmoyer. For example, EPA recently used this model for the evaluation of metals emissions from incinerators located on flat or rolling terrain, in connection with the EPA-proposed standards for restricting these emissions (55 FR 17862).

EPA revised the ISC model assumptions presented in the FS report to more accurately estimate the likely fate of stack emissions. For example, the revised air modeling effort was conducted separately with two different particle sizes, 0.5 microns and 2 microns. Historically, metals emissions from high-temperature devices such as incinerators have

been measured to be around the range of 0.5 microns to 2.0 microns (Air Pollution, H.W. Parker, P.E., Prentis Hall Inc., 1977). The degree of reflection by settling particles is calculated directly by the ISC model. Also, 5 years of meteorological data were used in the refined modeling effort. The effects of wet deposition on the overall deposition rates of arsenic have not been demonstrated to be significant. EPA protocols do not recommend adjustment of the ISC model for wet deposition. For the expected particle diameters of arsenic exiting the incinerator stack (0.5 to 2.0 microns), there is evidence that the effects of wet deposition are negligible ("On the Effect of Electric Charge on the Scavenging of Aerosol Particles by Clouds and Small Raindrops," P. K. Wang et al. Journal of Atmospheric Sciences, 35:1735-1743, as cited in "Incorporation of Wet Deposition in the Industrial Source Complex Model", C. R. Bowman, Jr. et al., APCA 1987 Annual Meeting). In summary, EPA believes its ISC modeling assumptions presented in the upper vault waste incineration technical memorandum are appropriate for site conditions and the anticipated roaster operating conditions.

27. The former owners commented that there are no treatability data supporting the cement fixation treatment of the upper vault incinerator ash, and that this treatment may actually increase the amount of arsenic leaching out of this waste.

EPA Response: While no treatability data were directly collected regarding fixation of the incinerator ash from the upper vault wastes, there is sufficient evidence supporting selection of this technology for remediation. Treatability data from three disparate Whitmoyer Laboratories Site waste streams (the lower vault wastes, the lagoon sludges, and contaminated soils) all showed cement fixation to effectively fixate these substances' incinerator ash, when the wastes were incinerated (roasted) in the presence of cement. Treated waste Toxicity Characteristic Leachate Procedure (TCLP) leachate arsenic concentrations were significantly lower than the TCLP arsenic concentrations measured for untreated samples. These results were achieved despite the fact that the lower vault waste sample submitted for treatability testing purposely contained some still bottom wastes from the upper vault, to present a worst-case treatment scenario. (It is likely that portions of the upper vault waste will unavoidably be mixed with the lower vault wastes during the excavation step.) Thus, there is evidence that cement fixation will be effective in the fixation of the upper vault waste incinerator ash.

28. The former owners commented that large amounts of arsenic will leach out of the cement-fixated waste if there is any exposure to atmospheric conditions.

EPA Response: The RI/FS treatability data indicate that small quantities of arsenic may be released from the cement-fixated wastes over extended periods (e.g., 1000 years) if open exposure of these wastes to atmospheric carbon dioxide and acid rain is permitted. However, this possibility will be precluded by placement of the treated waste in a hazardous waste landfill in a manner that should not expose the treated wastes to substantial quantities of atmospheric carbon dioxide or acid rain.

29. The former owners commented that the limited availability of mobile incinerators will result in delays for the proposed treatment of the upper vault wastes.

EPA Response: While minor delays are possible, these will not have a significant effect on overall remediation of the site. The actual operation of the incinerator is expected to be only 90 to 120 days and will therefore be able to be scheduled in such a way as to minimize any impacts on site remediation should any delays materialize.

30. The owner of much of the land containing the lagoon wastes commented that the volume of materials to be incinerated is too small to be economical.

EPA Response: It is unclear what the commentator means by "economical." The ROD discusses the cost-effectiveness of the selected remedy. In addition, "Thermal Remediation Industry - Markets * Technologies * Companies," Cudahy and Eicher, Pollution Engineering, November 1989, justifies cost-effective use of incinerators at sites having volumes of material to be incinerated similar to the upper vault waste roasting volume (6,000 cubic yards).

Cement Fixation of the Lower Vault Material

31. The former owners commented that the selected remedy makes no sense, since the volume of the lower vault wastes is vastly increased following treatment and the same end result (landfilling) would be reached without treatment.

EPA Response: The fixation of arsenic will not increase the volume of arsenic; however, the volume of the fixated material will increase by the amount of fixative agent. The effects of the fixation, however, will be to reduce the leaching of arsenic. The offsite landfilling of untreated arsenic would not reduce the leaching of arsenic at the landfill. The selected remedy reduces the mobility of the treated wastes by approximately 99.4%, complies with the CERCLA preference for treatment, and is significantly more protective of human health and the environment because of the immobilization of arsenic. As the former owners pointed out in their submittal entitled "Performance Evaluation of EPA's Preferred Alternative and ERM's Proposed Enhanced Containment System for the Whitmoyer Laboratories Site", hazardous waste landfills are prone to leakage. Leakage of leachate from the untreated lower vault waste would present a significant risk to human health and the environment. Therefore, the end results are clearly different. In addition, the RCRA LDR's prohibit (subject to any capacity extension) the offsite landfilling of untreated arsenic wastes.

32. The former owners commented that the 5.4 mg/l arsenic leaching result for the treated sample that is used as the FS basis for reduction in mobility calculations and demonstration of compliance with LDRs is greater than the RCRA toxicity characteristic level of 5.0 mg/l, necessitating disposal of the treated waste in a hazardous waste landfill.

EPA Response: While it is true that the particular result cited is greater than 5.0 mg/l arsenic, the result shows that the proposed treatment can achieve a 99.94 % reduction in arsenic mobility and comply with the pertinent LDRs. Optimization of the treatment process during the remedial design may result in treated waste leachate results less than 5.0 mg/l arsenic. (No proprietary fixation reagents were utilized in the RI/FS treatability study. Use of these reagents could lower treatment costs, result in a reduced volume of treated wastes, and increase the reduction in mobility.) Regardless of whether the treated wastes' leachate concentration exceeds 5.0 mg/l or not, the treated material must be placed in a hazardous waste landfill, since the lower vault waste is a RCRA-listed waste. EPA has determined that delisting of the lower vault waste following treatment is unwarranted, since, following treatment, the material would still contain approximately 3% arsenic.

33. The former owners commented that cement fixation treatment of the lower vault is based upon inadequate sampling, inadequate treatability studies, and inconsistent data. For example, the sample submitted for treatability testing indicated that the lower vault waste is heterogeneous.

EPA Response: EPA believes that the treatability study is adequate, that the sampling for the study was adequate, and that the data were consistent. The purpose of the study was to determine whether cement fixation of arsenic in the lower vault would reduce the leaching of arsenic compared to the leaching of untreated arsenic. To test the effect of fixation on the arsenic in the lower vault, EPA purposely created a worst-case sample by mixing some upper vault still bottom wastes with the lower vault wastes. Nonetheless, the fixation satisfactorily reduced the leaching of arsenic in the fixated sample. EPA believes that the results will apply to all lower vault wastes as former employees of Whitmoyer Laboratories report that the lower vault waste is relatively homogeneous. In addition, further optimization of the treatment process will occur during the remedial design phase of the project.

34. The former owners commented that significant quantities of arsenic leached out of the cement-fixated lower vault waste treatability sample during curing, potentially invalidating the data.

EPA Response: The former owner conclusion is based on the fact that more arsenic leached out of the treated sample following 5 days of curing than leached out after 28 days of curing. This just shows that until the curing is complete, leaching will occur that exceeds TCLP levels. Once curing has been completed, treatability studies show that TCLP limits will not be exceeded.

35. The former owners commented that the treated material is very unstable at varying pHs citing certain treatability study results.

EPA Response: The former owners compared the arsenic removed in two different extraction procedures. One was a single stage TCLP extraction, the other the sum of the arsenic removed in three distilled water extractions. The difference in results is due

to analytical variability and the different extraction procedures used, rather than instability of the fixated wastes.

Iron Fixation of the Lagoon Wastes

36. The former owners commented that all of the lagoon wastes should not be treated if only some of the wastes are hazardous.

EPA Response: EPA agrees. In its selected remedy for the lagoon wastes, EPA modified its preferred alternative to show that any excavated lagoon wastes that are shown to be non-hazardous using RCRA-approved procedures may be directly landfilled offsite, with no treatment being required. (It is uncertain what portion of the lagoon wastes will be deemed non-hazardous following excavation, since mixing the lagoon wastes with soils, which will likely occur during the excavation process, may cause the entire mixture to become hazardous. Also, it may be more economical to manage marginally non-hazardous lagoon sludges as hazardous wastes than to statistically verify that they are nonhazardous.)

37. The former owners commented that selection of the iron fixation remedy for the lagoon wastes is insupportable.

EPA Response: While no iron fixation treatability data for the lagoon wastes were generated during the RI/FS, treatability data generated for the site soils and the successful application of iron fixation technology at other sites support the selection of this remedy. The viability of the selected remedy will be confirmed during bench-scale optimization studies to be conducted during the remedial design for the lagoon wastes.

38. The former owners and the owner of much of the land containing the lagoon wastes commented that there is sufficient iron present in the lagoon materials for the arsenic to be bound in iron-arsenic compounds, and that the iron fixation treatment is unnecessary.

EPA Response: While the lagoon materials have a significant iron content, some or all of these materials presently have leachable arsenic concentrations high enough for them to be considered RCRA "toxic characteristic" hazardous wastes. Therefore such "toxic characteristic" hazardous wastes will require additional iron-based fixation before disposal to comply with the Remedial Action objectives to treat principal threats. Excavated materials that do not manifest the RCRA Subtitle C characteristic for toxicity will not be fixated.

39. The former owners commented that iron fixation treatment will not provide any measurable reduction in arsenic mobility, and makes no sense.

EPA Response: RI/FS soils treatability data indicate that iron fixation will reduce the arsenic leachability of the soils by greater than 90%. Significant, measurable reductions in the arsenic leachability of the lagoon wastes are also expected. Additionally, the

selected remedy of iron fixation treatment will comply with RCRA LDRs and conform with the CERCLA preference for treatment. EPA believes that this is the best means to assure protection of human health and the environment.

40. The former owners commented that EPA selected samples for TCLP analysis based on the results of sampling and analysis for total arsenic, and, that the results were therefore biased.

EPA Response: The selective sampling protocols cited by the former owners (i.e., submitting only the most contaminated samples for TCLP analysis) were not followed by EPA. Samples for TCLP analysis were selected at the same time that samples for other analyses (including arsenic) were selected, without any available information on the samples' level of contamination. By sampling without related information, EPA does not believe that any sampling bias existed.

41. The former owners commented that simplifying assumptions used in estimating the volume of lagoon materials resulted in inaccurate volume estimates for the lagoon wastes.

EPA Response: EPA believes that any assumptions used in the RI/FS to estimate the volume of lagoon materials is generally reliable as an estimate of the volume. EPA's belief rests on historical data as to the nature and extent of the lagoons and additional information gained from sampling during the Remedial Investigation. Further, the remedy selected for the lagoon waste is health based and depended on response technology rather than on volume.

42. The owner of much of the land containing the lagoon wastes commented that the RI/FS inadequately considered the expense associated with excavation near the pipeline and pump station.

EPA Response: EPA believes the remediation cost estimate for such excavation is reasonably accurate. EPA addressed what it believes are the cost items related to that excavation. The owners have not identified any additional cost items or provided information that shows EPA estimates to be inaccurate. A more refined cost estimate will be prepared during the remedial design.

43. The former owners commented that lagoon wastes should be considered to be those wastes containing greater than 2% arsenic, rather than greater than 1% arsenic as specified in the FS.

EPA Response: The 1% arsenic level was selected based on the RI results. Specifically, many of the samples containing between 1% and 2% arsenic in the lagoon areas had visible iron-arsenic sludge. Since this sludge likely was responsible for the majority of the arsenic in these samples, EPA feels it is appropriate to classify this material as lagoon waste (as opposed to contaminated soils). EPA retained this definition in the selected remedy.

Treatment of the Miscellaneous Products/Feedstocks

44. The former owners commented that the proposed treatment of the miscellaneous products/feedstocks is not justified.

EPA Response: Only those materials considered RCRA hazardous wastes will be treated. Treatment of the material is necessary to achieve the LDR treatment standard of 5.0 mg/l arsenic prior to landfilling. While regulations in the Land Disposal Restrictions do permit avoidance of the prohibitions, until May 8, 1992, on disposal of such untreated wastes, those exceptions are not health-based. The ROD remedy is health based and is intended to be protective of health and the environment. Protectiveness in this instance means complying with the prohibition. In additions, the proposed treatment significantly reduces the mobility of the metal contaminants, destroys the organic contaminants, treats the principal threat posed by the miscellaneous products/feedstocks, and complies with CERCLA preference for treatment. In addition, the proposed treatment significantly reduces the mobility of the metal contaminants, destroys the organic contaminants, treats the principal threat posed by the miscellaneous products/feedstocks, complies with CERCLA preference for treatment, and is protective of public health and the environment.

45. The former owners commented that incineration of the miscellaneous products/feedstocks will contribute to an unacceptable risk to human health and the environment.

EPA Response: See response #5 above.

Demolition of the Site Structures

46. The former owners commented that remediation of the site structures is unnecessary and is likely to increase the risks to human health and the environment. Since the building material samples come from interior building locations that are not exposed to water or solvents, these materials are not likely to leach arsenic under normal conditions.

EPA Response: Remediation of the site structures is necessary. Runoff from the building roofs exceeds EPA's characteristic hazardous waste concentrations, and either infiltrates into the groundwater or enters Tulpehocken Creek. Under present conditions, large quantities of rainfall leak through the roofs. This rainfall contacts the contaminants inside the buildings and is collected in a sump. Water in this sump typically contains 400 mg/l arsenic, which is well in excess of the RCRA characteristic hazardous waste criterion of 5 mg/l. This water must be periodically remediated, or the sump will overflow. If the buildings were occupied without cleanup, building contaminants would threaten the workers via the inhalation and ingestion pathways. Additionally, future

building uses would mobilize the contaminants (e.g., from floor cleaning). Dangerous conditions within the buildings present risks to future building users and trespassers, if left unremediated. Also, a fire in the buildings could release large quantities of contaminants into the environment.

47. The former owners commented that results from air sampling within the buildings do not exceed Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) standards for arsenic. Thus, remediation of the site structures based on these air sampling results is not warranted.

EPA Response: While the air sampling results may show arsenic concentrations in air to be below OSHA standards and NIOSH recommended levels, the baseline risk assessment in the FS performed for the Site considered the air sampling results and concluded that an unacceptable excess lifetime cancer risk existed for persons occupying and working in the buildings. The remedy selected for remediation of the site structures, by eliminating the source of the unacceptable risk, eliminates the risk.

48. The former owners commented that remediation of asbestos in the buildings is unwarranted, since it is not currently friable.

EPA Response: While the asbestos is not currently friable, due to exposure to the elements and continued cycles of freezing and thawing, wetting and drying it would likely become friable over time. Friable asbestos presents risks to building occupants

49. The former owners commented that isolated areas of contamination within the Building 1-7 complex should be remediated, rather than demolition of the entire building complex. Contaminated wood materials could be removed, and contaminated concrete could be coated and sealed in place. New roofs could be constructed on top of the existing roofs, to preclude precipitation contact with the existing building roofs and building interiors.

EPA Response: EPA believes it is more cost effective to demolish the entire Building 1-7 complex. It would be extremely difficult and less cost-effective to remove all of the heavily contaminated building materials (e.g., wooden floors) from the Building 1-7 complex while maintaining the integrity of the building structure. Additionally, the selected remedy is much more effective in the long-term and permanent.

50. The former owners commented that neither the FS nor the Proposed Plan explain how hazardous site structures materials will be segregated from nonhazardous materials during remediation, or which exact procedure will be used for coating and sealing hazardous noncombustible permeable site structures.

EPA Response: Details such as these will be addressed during the remedial design

51. The former owners commented that neither the FS nor Proposed Plan addresses how contaminated water generated during the site structures remediation will be managed.

EPA Response: If moderate pressure water is used for surface cleaning (sandblasting is another option), this water could be treated in either an onsite groundwater treatment system (if constructed), in a temporary onsite treatment system, or at a permitted offsite facility (see p. 4-90 of the FS). These options will be considered and completely evaluated during Remedial Design.

52. The former owners commented that demolition of the Building 1-7 complex would result in significant releases of fugitive dusts.

EPA Response: Fugitive dust emissions during demolition are expected to be minor. Contaminated dusts inside the buildings will be collected during the surface cleaning program taking place prior to demolition. If necessary, air pollution controls, such as wetting the building materials, will also be utilized to minimize fugitive dust releases.

General

53. Buckeye Pipe Line Company L.P. commented that there are no reports or suggestions that any of Buckeye's operations have ever caused or contributed to contamination of the site.

EPA Response: The liability of potentially responsible parties will be determined in the future.

54. The former owners commented that the failure to collect arsenic speciation data during the RI made the risk assessment and FS of limited value. The risk assessment assumption that all arsenic detected is inorganic arsenic may lead to a substantial overestimation of risk. Also, the potential effectiveness of various treatment schemes could be affected by the arsenic form.

EPA Response: During RI/FS scoping, the former owners commented that all analyses for valences of arsenic (speciation) should be eliminated. ("Technical Assessment of the Need for Immediate Removal of Vault/Lagoon Contents at Whitmoyer Laboratories Site" January 1987). This comment was incorporated into the RI.

In general, organic arsenic compounds are less toxic than inorganic forms of arsenic. There are exceptions to this rule, however. Presently, there are inadequate toxicology data to determine the carcinogenic potential for organic arsenic compounds.

Assuming that a substantial percentage of the arsenic contamination detected during the RI is organic arsenic, the risk analysis based on the assumption that all arsenic present at the site is inorganic may have overestimated the noncarcinogenic and carcinogenic risks calculated for the site. For example, assuming that the percentage of organic arsenic is 50 percent and assuming that organic arsenic is one-tenth as

potent a carcinogen as inorganic arsenic, the predicted excess lifetime cancer risk would be approximately one-half the risk assuming 100 percent inorganic arsenic. However, given the very high arsenic concentrations measured at Whitmoyer, the assumption that organic arsenic is prominent at the site does little to alter the overall conclusion that the Operable Unit 2 materials present substantial noncarcinogenic and carcinogenic risks, and require remediation. The assumption of 100 percent inorganic arsenic adds a measure of conservatism to the risk assessment, and did not affect EPA's selection of the remedy for Operable Unit 2.

Nearly all of the remedial decisions reached by EPA for Operable Unit Two are supported by treatability studies. Thus, treatment using the selected remedies has been shown to be effective for the forms of arsenic present at the site on a bench-scale.

55. The former owners commented that the failure to use efficient screening technologies during the RI led to increased number of sample locations, an extended RI schedule, and increased project costs. For example, geophysics could have detected drum burial area BA-2, rather than its unexpected discovery during the RI.

EPA Response: In this comment, the former owners imply that too many samples were collected. In other portions of their comments, the former owners comment that insufficient numbers of samples were collected for the vault wastes, lagoon wastes, soils, and groundwater.

There are several alternate investigatory approaches that can be utilized during an RI. EPA focussed its RI by having an extensive screening program, including an extended review of historical documents, interviews with former employees, a review of historical air photos, a fracture trace analysis, and an evaluation of existing wells for RI usability. Based on the extensive database developed from the review of historical documents and interviews with former employees, use of geophysics was evaluated and eliminated as a cost-reduction step.

56. The former owners provided numerous comments on the soils and groundwater media study.

EPA Response: Comments related to the soils and groundwater media will be addressed in the Responsiveness Summary for Operable Unit 3.

D. REMAINING CONCERNS

An issue that EPA was unable to address during remedial planning activities was how much of the cleanup will be paid by potentially responsible parties. EPA has not received offers to pay for these costs to date; however, as parties agree to pay costs, and/or conduct work at the site, or do so in response to enforcement actions, EPA will make public that information