United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-93/237
September 1993

PB94-964109

EPA

Superfund
Record of Decision:

Reilly Tar & Chemical
(Indianapolis Plant), IN

50272-101

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15. Supplementary Notes

PB94-964109

16. Abstract (Limit: 200 words)

The 120-acre Reilly Tar & Chemical (Indianapolis Plant) site is a former coal tar refinery and creosote wood treatment plant located in Indianapolis, Indiana. Land use in the area is mixed residential, industrial, and commercial, and residences are located immediately adjacent to the eastern boundary of the site. The site is divided into the 40-acre Oak Park property, which contains the majority of the operating facilities, including above-ground storage tanks, distillation towers, and above-ground and underground utilities; and the 80-acre Maywood property, which contains operating facilities on its northern end. This site formerly was used for chemical processing and wood preserving activities and currently contains five former waste disposal areas. From 1921 to 1972, coal tar refinery and creosote wood treatment plants operated onsite. Beginning in 1941, several chemical plants were constructed and operated on the Oak Park property. In 1955, alpha picoline, a chemical manufactured onsite, was identified in nearby residential wells, and in 1964, three contaminants from the site were detected in offsite ground water samples and onsite surface water samples. In 1975, State investigations identified several onsite problems believed to be contributing to ground water contamination with organic chemicals, and further investigations, conducted in 1980, revealed various organic chemicals in soil. In

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Reilly Tar & Chemical (Indianapolis Plant), IN
Second Remedial Action
Contaminated Media: soil, sludge
Key Contaminants: VOCs (benzene, TCE, toluene, xylenes), other organics (PAHs)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 100
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

EPA/ROD/R05-93/237
Reilly Tar & Chemical (Indianapolis Plant), IN
Second Remedial Action

Abstract (Continued)

1987, an accidental spill of 60,000 gallons of waste fuel occurred at the Oak Park property. Some of the spilled fuel oil was recovered, and some of the contaminated soil was excavated. Investigations have identified five former waste disposal areas: the Lime Pond area, which received chemical process waste from 1953 until 1965; the Abandoned Railway Trench, which was filled in the 1960s with drums of coal tar enamel and foundry sand; the Former Sludge Treatment Pit, where wastewater sludge from the coal tar refinery and synthetic chemicals operations was dried from the 1950s until 1979; the Former Drainage Ditch, through which wastewater and stormwater were conveyed from the site to a sewer system; and the South Landfill and Fire Pond, where construction debris and various solid and semi-solid wastes, from the coal tar and the synthetic chemicals operations, were deposited. Site contamination was found to be related to the improper use and disposal of creosoting process wastes and substances used in manufacturing chemicals. In 1990, a RCRA facility investigation resulted in an interim measure to minimize risks to wildlife, by regrading and covering the eastern portion of the south landfill and placing plastic netting over the fire pond, which was completed in 1992. Also, in 1992, 149 drums were removed during field activities at the Lime Pond area, and an interim ROD was signed that addressed containment and treatment of contaminated ground water, as OU1. This ROD addresses the contaminated soil and sludge in the five disposal areas, as OU2. Future RODs are planned to address ground water and final source remediation at the site. The primary contaminants of concern affecting the soil and sludge are VOCs, including benzene, TCE, toluene, and xylenes; and other organics, including PAHs.

The selected remedial action for this site includes performing bench scale and pilot scale studies to define operational parameters and to assure the feasibility of cleanup goals; excavating contaminated soil from the Lime Pond Drum Removal Area, the Abandoned Railway Trench, the Former Drainage Ditch, and the Former Sludge Treatment Pit; treating the excavated soil onsite using low temperature thermal desorption, followed by carbon adsorption of the treatment residuals; sending condensate offsite for incineration and disposal; returning the treated soil to the excavation areas and placing a six inch soil cover over them; treating sludge from the Fire Pond at the South Landfill using onsite in-situ solidification, with carbon adsorption of any air emissions; performing a TCLP on the treated sludge to determine if it is characteristically hazardous; placing a multi-layer cap over the Fire Pond, if the solidified sludge is found to be hazardous; placing a soil cover over the Fire Pond and the remaining portions of the South Landfill; monitoring ground water and source areas; and implementing institutional controls, including deed restrictions and site access restrictions. The estimated present worth cost for this remedial action is $6,000,000, which includes an unspecified O&M cost for 30 years.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific surface and subsurface soil and sludge excavation and cleanup goals were not provided; however, risk-based target levels will ensure that the soil that is excavated, treated, and disposed of onsite, and that in-situ solidified sludge will demonstrate an incremental cancer risk below 10^{-6}.

Declaration for the Record of Decision
Reilly Tar & Chemical
CERCLA Areas Operable Unit

Site Name & Location

Reilly Tar & Chemical
Indianapolis, Indiana

Statement of Basis and Purpose

This decision document presents the selected remedial action for the CERCLA Areas operable unit at the Reilly Tar & Chemical Site (the Site) in Indianapolis, Indiana. This remedial action was selected in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The selection of this remedy is based on the Administrative Record for the Site.

The State of Indiana concurs with the selected remedy.

Assessment of the Site

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

Description of the Selected Remedy

This operable unit action is the second of four planned for the Site. It specifically outlines an action to address five on-site sources of soil and groundwater contamination, which have been determined by the Remedial Investigation to pose unacceptable risks to human health and the environment.

The major components of the selected remedy include:

- Excavation of soils at four of the CERCLA Areas, the Lime Pond Drum Removal Area, the Former Drainage Ditch, the Former Abandoned Railway Trench, and the Former Sludge Treatment Pit with treatment of the soils to achieve the cleanup standards listed in the ROD by low temperature thermal desorption. Treated soils will be replaced into the unit from where they were excavated and covered with six inches of soil and vegetated.

- Ultimate disposal of the condensate generated as a result of the thermal desorption process by off-site incineration.

- Treatment of sludge in the Fire Pond (a portion of the fifth CERCLA Area, the South Landfill) by in-situ solidification to meet the performance standards listed in the ROD. Following solidification, if the solidified sludge is RCRA characteristic, then a multi-layer cover will be placed over the Fire Pond. If the solidified sludge is no longer RCRA characteristic, then a soil cover will be placed over the Fire Pond.

- Placement of a soil cover over the remaining portions of the South Landfill.

- Groundwater and source area monitoring to ensure that the goals of this action are met.

Declaration

The selected remedy is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements for this operable unit action, is cost effective, and consistent with achieving a permanent remedy. This operable unit action fully addresses the statutory mandate for permanence and treatment to the maximum extent practicable. This action also satisfies the statutory preference for remedies that employ treatment that reduces the toxicity, mobility, or volume as a principal element. Subsequent actions at the site to address other threats posed by conditions at this site. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is the second of four operable unit actions at the site, review of this site and of this remedy will be continuing as EPA continues to develop other remedial alternatives for this site.

Sept. 30, 1993.
Date

Valdas V. Adamkus
Regional Administrator

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Evan Bayh
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September 30, 1993

Mr. Valdas Adamkus
Regional Administrator
U.S. Environmental Protection Agency
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Adamkus:

Re: Record of Decision
CERCLA Areas Operable Unit
Reilly Tar and Chemical Superfund Site
Indianapolis, Indiana

The Indiana Department of Environmental Management (IDEM) has reviewed the U.S. Environmental Protection Agency's Record of Decision (ROD) for the Reilly Tar and Chemical Site. The IDEM is in full concurrence with the major components of the selected second operable unit remedy for this site, which include by media:

- Soils: Treatment by Low Temperature Thermal Desorption for those hot spot soils identified in the Lime Pond, the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch. The treated soils will be replaced in the areas from where they were excavated, in accordance with the Corrective Action Management Unit regulations, and covered with six inches of soil and seeded. Treatment residuals will be treated offsite. A soil cover will be placed on the South Landfill area.

- Sludges: The sludge materials found in the South Landfill/Fire Pond will be treated by In-Situ Solidification and covered. After treatment the solidified mass will be tested to determine if it is RCRA characteristic. If so, the cover material will be a multi-layer cover; if it is not RCRA characteristic, a soil cover will be placed.

- Groundwater: It was determined that the design of the first operable unit remedy will encompass some extraction in the areas of the site identified to be contributing to groundwater contamination: Lime Pond drum removal area, the Former Sludge Treatment Pit, and the Abandoned Railway Trench. Therefore, additional source controls are not necessary at this time for groundwater.

We also agree that this action attains Federal and State requirements that are applicable, or relevant and appropriate to this second operable unit remedy. Because this action does not constitute the final remedy for the site, the statutory mandate for permanence and treatment to the maximum extent practicable will only be met partially by the treatment of "hot spots" identified in the Record of Decision. However, future operable units will fully address the threats posed by conditions at this site.

IDEM staff have been working closely with Region V staff in the selection of an appropriate second operable unit for the Reilly Tar and Chemical site and are satisfied that the selected alternative adequately addresses the immediate threats posed by the soil and sludge hot spots in the five CERCLA areas.

Please be assured that IDEM is committed to accomplish cleanup of all Indiana sites on the NPL and intends to fulfill all obligations required by law to achieve that goal.

Sincerely

Kathy Prosser

Kathy Prosser
Commissioner

KP:kd
cc: Krista Duncan, IDEM
Dion Novak, U.S. EPA, Region V

Decision Summary - CERCLA Areas Operable Unit
Reilly Tar and Chemical
Indianapolis, Indiana

Site Name, Location and Description

Reilly Tar and Chemical
Indianapolis, Indiana

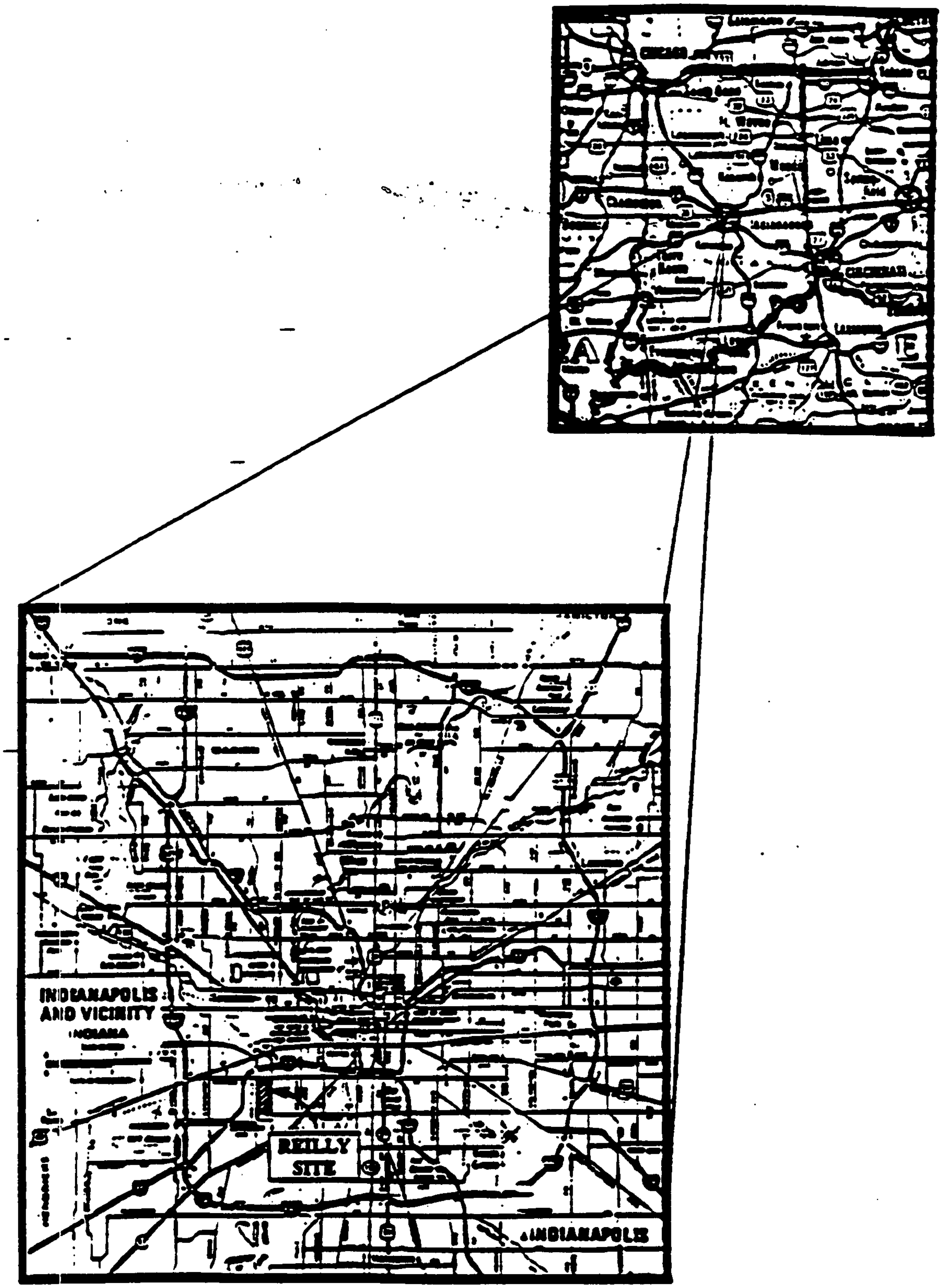
The Reilly Tar and Chemical site (the Site) is located at 1500 South Tibbs Avenue in the southwest quadrant of Indianapolis. Minnesota Street divides the 120 acre site into two parcels. The Oak Park property, occupying approximately 40 acres, is located north of Minnesota Street. The Maywood property occupies approximately 80 acres, and is located south of Minnesota Street (see Figures 1 and 2). The Oak Park property contains the majority of Reilly's operating facilities, including above-ground storage tanks, distillation towers, and above- and below-ground utilities. The Oak Park property also contains one area formerly used for disposal of hazardous wastes, the Lime Pond, a surface impoundment which received hazardous wastes. Drums containing hazardous wastes were also buried in the soils adjacent to the Lime Pond. The Maywood property contains operating facilities on its northern end. This property was formerly the site of chemical process and wood preserving activities and currently contains four other areas used in the past for hazardous waste disposal. These four former hazardous waste disposal areas include the Abandoned Railway Trench, the Former Sludge Treatment Pit, the Former Drainage Ditch, and the South Landfill/Fire Pond. The majority of the operating facility buildings are located north of Minnesota Street; approximately 75% of the Oak Park property is covered by buildings, pavement and above-ground tank farms. Approximately 20% of the Maywood property is covered by buildings, pavement and above-ground storage tanks. The remainder is primarily unpaved and vegetated.

The Reilly Tar site is surrounded by a mix of residential, industrial and commercial properties. Residential neighborhoods are located immediately adjacent to the eastern boundary (on the east side of Tibbs Avenue) of the Oak Park property. Two residences are also located abutting the northern property boundary near the Lime Pond in the northwest corner of the site. Commercial and industrial properties are located south and west of the site.

Site History and Enforcement Activities

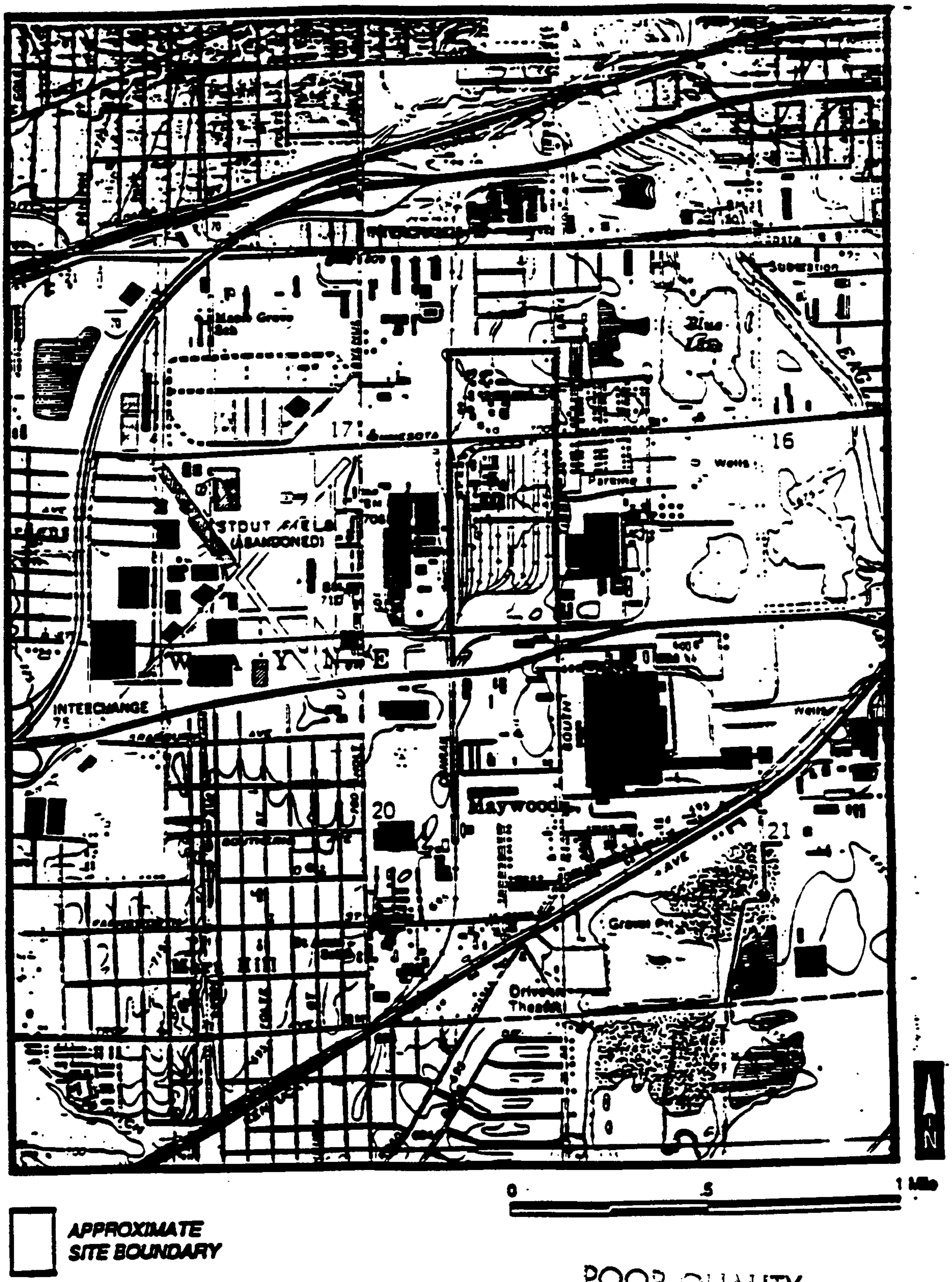
Industrial development of the Reilly site began in 1921 when the Republic Creosoting Company (which later became Reilly Tar & Chemical, which in turn became Reilly Industries, Inc.) started a coal tar refinery and a creosote wood treatment operation on the

FIGURE 1



POOR QUALITY
ORIGINAL

FIGURE 2



APPROXIMATE
SITE BOUNDARY

POOR QUALITY
ORIGINAL

Maywood property. On-site wood treatment operations occurred from 1921 until 1972. Beginning in 1941, several chemical plants were constructed and operated on the Oak Park property. Environmental problems at the site are related to the management and disposal of creosoting process wastes and to wastes associated with and substances used in the process of manufacturing custom synthesized specialty chemicals.

The earliest recorded complaint about odors and disposal practices at the site was in 1955, which referenced the fact that a chemical manufactured at Reilly (alpha picoline) had been found in nearby residential wells. In 1964, three contaminants from Reilly were detected in off-site ground-water samples and on-site surface-water samples. In 1975, State investigations revealed several on-site problems which were believed to have been contributing to ground- water contamination with organic chemicals. In 1980, an on-site soil sample collected by State personnel was found to contain various organic chemicals including toluene and trichloroethylene. In 1987, 60,000 gallons of waste fuel, containing primarily pyridine and pyridine derivatives, benzene, xylene, and toluene, was accidentally spilled on the Oak Park property. Some, but not all, of the fuel oil was recovered and some, but not all, of the contaminated soil was excavated by Reilly.

In 1984, Reilly Tar was listed on U.S. EPA's National Priorities List (NPL), a roster of the nation's worst hazardous waste sites, making it eligible for cleanup under the Superfund program. In 1987, the potentially responsible party (Reilly) agreed to conduct a remedial investigation (RI) to characterize the nature and extent of contamination at the site, and a feasibility study (FS) to evaluate and compare remedial alternatives according to the terms of an Administrative Order on Consent between the U.S. EPA and Reilly Tar & Chemical.

In 1989, Reilly Tar & Chemical changed their corporate name to Reilly Industries, Incorporated, under which they operate today.

In June, 1992, a Record of Decision was signed by the Regional Administrator for the first operable unit at the site, calling for a groundwater extraction/treatment/discharge system to be installed to contain the migration of groundwater contaminated by the site at the site boundary.

In September, 1992, Reilly agreed to incorporate RCRA corrective action requirements into existing site studies according to the terms of an amendment to the existing Administrative Order on Consent between the U.S. EPA and Reilly Tar & Chemical.

Highlights of Community Participation

Public participation requirements under CERCLA Sections 113 (k)(2)(B) and 117 were satisfied during the RI/FS process. U.S. EPA has been primarily responsible for conducting the community relations program for this Site, with the assistance of the Indiana Department of Environmental Management (IDEM). The following public participation activities, to comply with CERCLA, were conducted during the RI/FS.

- A Community Relations Plan was developed in August 1987 to assess the community's informational needs related to the Reilly site and to outline community relations activities to meet these needs. Residents and community officials were interviewed and their concerns were incorporated into this plan.

- A public information repository was established at the Indianapolis Public Library

- A mailing list of interested citizens, organizations, news media, and elected officials in local, county, State and Federal government was developed. Fact Sheets and other information regarding site activities were mailed periodically to all persons or entities on this mailing list. This mailing list was also updated from time to time as persons approached EPA for information about the site.

- A Fact Sheet was mailed to the public in August 1987, that announced a public meeting to discuss the upcoming Remedial Investigation and answer site related questions from the public.

- A public meeting on September 2, 1987, at the Indianapolis City-County Building announced the initiation of the Remedial Investigation and provided details about its conduct.

- A Fact Sheet was mailed to the public in Winter 1988, that announced the beginning of Phase 1 RI sampling and the release of the EPA approved Phase 1 RI workplan.

- A Fact Sheet was mailed to the public in Fall 1988, that summarized the findings of the Phase 1 investigation and provided a preview of proposed Phase 2 sampling activities.

- A Fact Sheet was mailed to the public in January 1990, that announced the findings of the Phase 2 investigation and provided a preview of proposed Phase 3 sampling activities.

- Two availability sessions were held on September 6, 1990, at the Stout Field School to discuss site progress and discuss results of completed sampling activities.

- A Fact Sheet was mailed to the public in August 1991, that summarized results of the completed Remedial Investigation. The EPA approved Remedial Investigation Report was also released at this time.

- A Fact Sheet was mailed to the public in January 1992, that summarized EPA's recommended remedial alternative in a proposed plan for the ground-water operable unit. The EPA approved Focused Feasibility Study was also released at that time. This fact sheet also announced a public comment period for the proposed remedial action and was accompanied by paid newspaper advertisements in the Indianapolis Star and the Indianapolis News.

- A Public Meeting was held on January 23, 1992, at the South Wayne Junior High School to present EPA's proposed plan for the ground-water operable unit and to receive formal public comment.

- Paid newspaper advertisements announced the RI public meeting, the availability sessions, and the FS and proposed plan public meetings.

- Periodic news releases announced results of studies at the site.

- A public comment period of thirty days was originally planned, running from January 16, 1992, to February 14, 1992. Based on a written request during the original comment period, the comment period was extended until March 31, 1992, for a total comment period of 76 days. The extension was announced by letter to the requestor and in a newspaper advertisement in the Indianapolis Star.

- A Record of Decision was signed by the Regional Administrator on June 30, 1992, for the groundwater operable unit.

- Two availability sessions were held on November 19, 1992, at the Stout Field School to discuss site progress and discuss results of completed sampling activities, including drum removal activities near the Lime Pond.

- Paid newspaper advertisements announced the availability sessions, and the FS and proposed plan public meetings.

- A Public Meeting was held on August 4, 1993, at the Indiana Government Center-South to present EPA's proposed plan for the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Areas operable unit and to receive formal public comment.

- A public comment period of thirty days for the CERCLA Areas proposed plan was originally planned, running from July 22, 1993, to August 22, 1993. Based on a written request during the original comment period, the comment period was extended until September 7, 1993, for a total comment period of 45 days. The extension was announced by letter to the requestor and in newspaper advertisements in the Indianapolis Star. The comment period was further extended until September 22, 1993, for a total comment period of 60 days. The extension was announced by phone and confirmed by letter to the requestor and announced to the general public by a newspaper advertisement in the Indianapolis Star.

A Responsiveness Summary addressing comments and questions received during the public comment period on the RI/FS and the proposed plan is included with this Record of Decision as Appendix A.

This Record of Decision presents the selected remedial action for the CERCLA Areas operable unit at the Reilly Tar and Chemical site in Indianapolis, Indiana. The term, "CERCLA Areas" in this context refers to five of the areas at the Reilly site where hazardous waste disposal took place on a regular basis in the past. These five areas, identified as the Lime Pond Area, the Former Drainage Ditch, the Former Sludge Treatment Pit, the Abandoned Railway Trench, and the South Landfill/Fire Pond, have all been investigated by the RI/FS process. This remedial action was chosen in accordance with CERCLA, as amended by SARA, and the National Contingency Plan. The decision for this operable unit at the site is based on the Administrative Record.

Scope and Role of the Operable Unit

As with many Superfund sites, the problems at the Site are complex. The Remedial Investigation (RI) investigated five distinct on-site source areas and ground water. The RI determined that ground water had been contaminated by the site and is migrating away from the site at levels that were determined by the site Risk Assessment to pose unacceptable threats to human health. The RI also determined that there was not a strong correlation between these five distinct source areas and ground water contamination. The first operable unit action was selected by EPA to stop further off-site migration of contaminated ground water, thus giving adequate time to study and remediate on-site source areas as well as to prevent the further contamination of area ground-water resources by contaminants migrating from the Reilly site.

This action represents the second operable unit at the site. The purpose of this operable unit is to remediate the five distinct on-site source areas that are contributing to contamination of both soils and groundwater. These areas were initially investigated in the RI. Additional on-site investigations conducted in late 1992 pursuant to the terms of the amended administrative order on consent further investigated the nature and extent of contamination associated with the five on-site source areas and determined that three of them, the Lime Pond drum removal area, the Abandoned Railway Trench and the Former

Sludge Pit, were contributing to groundwater contamination problems at the site.

This operable unit action is the second of several operable unit remedial actions to be taken at the Site. Subsequent actions will be taken to remediate other on-site source areas and potentially through cleanup of off-site ground-water resources already impacted by the site, so that the source(s) of ground-water contamination can be eliminated or contained. The Remedial Investigation identified an area on the Oak Park property that appears to be the principal source of ground-water contamination, primarily because the highest levels of contamination were found there. Additional characterization work for this area is being performed under a separate enforceable document to define the nature and extent of contamination there. This operable unit will be designed to be consistent with any and all potential future cleanup actions at the site.

Site Characteristics

The RI/FS was conducted to identify the types, quantities and locations of contaminants at the Site and to develop alternatives that best address these contamination problems. Because of the size and complexity of the Site, the RI was performed in three distinct phases. The first phase focused on sampling off-site commercial, industrial and residential wells to determine the presence of and extent of off-site contamination. The second phase concentrated on sampling activities to determine the extent of contamination on-site so that site contributions to areal contamination could be determined. The third phase concentrated on collecting additional on-site and off-site data to complete the investigatory picture so that a Feasibility Study could be started to address contamination problems. The nature and extent of actual or potential contamination related to the Site was determined by a series of field investigations, including:

- development of detailed information regarding historical site operations

- on-site geophysical surveys

- surface soil sampling, both onsite and offsite

- exploratory test-pit excavation and sampling

- installation and sampling of ground water monitoring wells, both onsite and offsite

- surface-water sampling, both onsite and offsite

- identification and sampling of existing ground

- water wells in the site vicinity

- installation and sampling of soil borings

- a surface-water drainage study

- a water-level monitoring program, both onsite and offsite

- identification of ground-water contamination sources within a one-mile radius of the Reilly site

- hydraulic conductivity testing and the performance of a short-term continuous water level monitoring program

- preparation of a site-wide human health and ecological risk assessment

Geology/Hydrogeology:

The Reilly site lies within the White River drainage basin, located approximately three miles to the east. Eagle Creek is an attendant tributary and flows in a southeasterly direction approximately 4000 feet to the east of the site. Topography in the site area is relatively flat with a gentle downward slope in an easterly direction. Other surface-water bodies in the site area include Blue Lake (a former gravel pit) located approximately 2000 feet northeast of the site, several small ponds or surface-water impoundments located 2000 to 4000 feet east of the site, and one surface-water impoundment located immediately southwest of the Maywood property (see Figure 2). The westernmost extension of Blue Lake has been filled in since 1979.

The sand and gravel deposits that underlie almost all of the White River drainage basin form the principal aquifer in the area. There are three industrial well fields located to the east of the site that have a reported combined pumping rate of 10 million gallons per day, or approximately 7000 gallons per minute (see Figure 2). In the vicinity of the site, upper and lower zones have been identified within the sand and gravel outwash aquifer. At some locations, especially directly underneath the site, these zones are separated by one or more till units which, because of their silt content, are less permeable layers and may impede flow vertically. The lack of a continuous fine grained unit and similar ground-water levels in shallow and deep wells suggest that the upper and lower zones of the outwash sand and gravel deposits are hydraulically connected and that the till units do not act as a barrier to contaminant flow in ground water.

Regional hydrogeologic data indicate that ground water in the unconsolidated material in the area of the Reilly site flows east towards Eagle Creek with a southerly component. Water level data from the RI indicate that ground-water flow is generally from the northwest to the southeast and that withdrawals from neighboring industrial production wells significantly impact the flow of ground water east of the site. Hydraulic conductivities for wells tested during the RI range from 10(-2) to 10(-3) centimeters per second. An average linear ground-water velocity of 0.68 feet per day was calculated for the area that is not influenced by the industrial pumping to the east of the site. An average linear ground-water velocity of 2.0 feet per day was calculated for the area that is influenced by the industrial pumping.

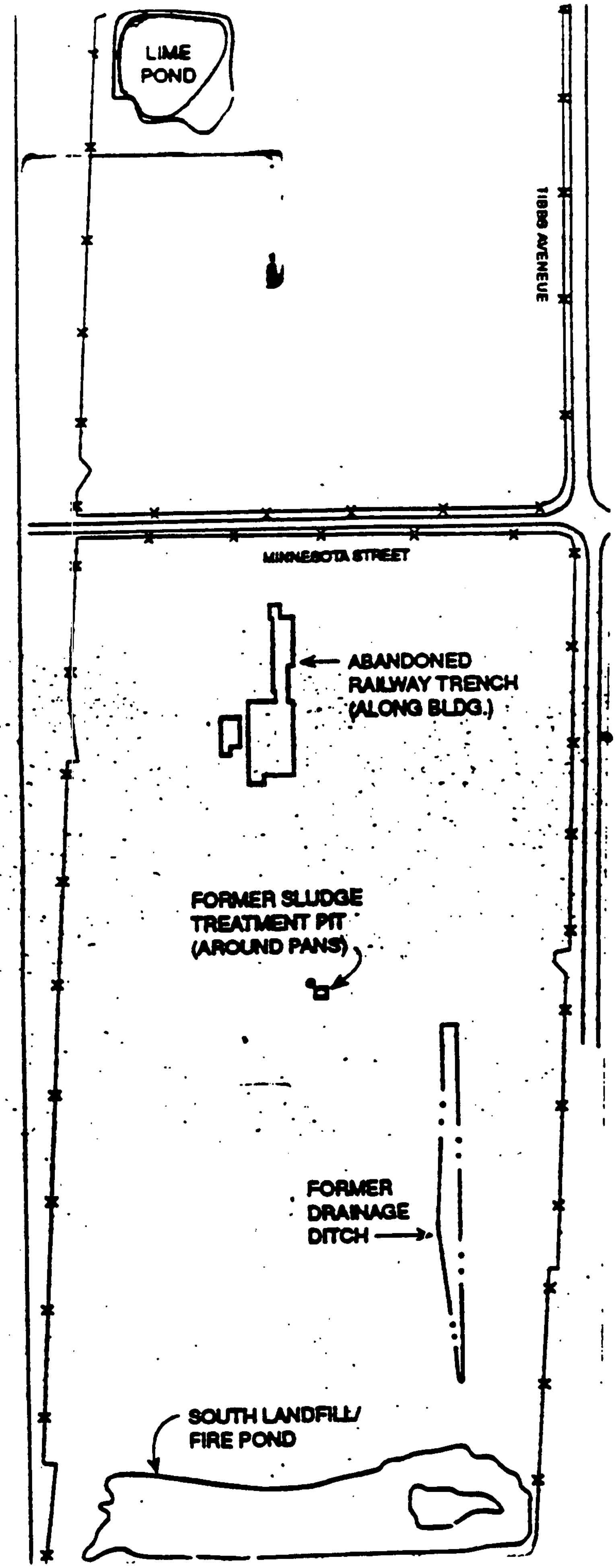
SOIL CONTAMINATION

A detailed analysis of past operations during Task 2 of the Remedial Investigation demonstrated that there are at least five former waste-disposal areas onsite. These five former waste-disposal areas were identified as potential source areas for both on-site and off-site contamination. These include the Lime Pond on the Oak Park property, the Abandoned Railway Trench on the northern portion of the Maywood property, the Former Sludge Treatment Pit on the northern portion of the Maywood property, the Drainage Ditch on the southern portion of the Maywood property and the South Landfill on the southern portion of the Maywood property (See Figure 3). This task also identified ground water as a primary area of investigation for the RI.

The **Lime Pond** was a lagoon constructed in 1953 to receive waste discharges from the first synthetic pyridine base processing unit constructed on the Oak Park property. Dimensions of the Lime Pond are approximately 350 feet by 350 feet. Until 1965, discharges from process areas on the Oak Park property went to the Lime Pond, which included solid material and sludge that had settled out of the waste water discharged there. Since 1965, when a connection to the city sewer was made, the Lime Pond has received only water from boiler blowdown from the boiler operations on the Oak Park property.

Buried drums were discovered during the RI soil borings at the Lime Pond. These drums were encountered at locations to the east and southeast of the lime pond during soil boring activities. A magnetometry survey was immediately conducted which highlighted several areas to the north and east of the lime pond where buried metallic debris such as drums may be located. A drum removal plan was prepared and its requirements were incorporated into the amended administrative order on consent signed in September, 1992. This plan called for the investigation of the areas identified by the magnetometer survey and if drums were unearthed, they were to be removed. A total of 149 drums were

FIGURE 3


LIME POND
TIBBS AVENEUE
MINNESOTA STREET
ABANDONED RAILWAY TRENCH (ALONG BLDG.)
FORMER SLUDGE TREATMENT PIT (AROUND PANS)
FORMER DRAINAGE DITCH
SOUTH LANDFILL/ FIRE POND

removed during field activities in November 1992. The area from where the drums were excavated is referred to as the Lime Pond Drum Removal area and is one of the areas addressed by this ROD.

Borings in the Lime Pond generally encountered lime sludge from the pond surface to a depth of four to seven feet. The Lime Pond contains on the order of 15,000 cubic yards of lime sludge generated from boiler blowdown (water used for cooling of boilers that does not come into contact with production of chemicals). This lime sludge generally contains less than one part per million total organics.

The soils to the north and east of the Lime Pond, in the Drum Removal Area, were found to be contaminated with volatile organics up to levels of approximately 5,522,000 parts per billion (ppb) and semi-volatile organics up to levels of approximately 9,870,000 ppb.

The **Abandoned Railway Trench** was used as an unloading and loading area for incoming rail shipments. The railroad tracks were depressed below ground level to facilitate these operations. During the 1960s, the use of the railway trench for loading and unloading purposes decreased and it was gradually filled in with drums of off-specification coal tar enamel. Foundry sand obtained from a variety of local industry was also used to complete the filling of the trench. It is estimated that the trench was approximately five feet deep by fifteen feet wide by 580 feet long based on Phase II investigations.

Test pits completed in the railway trench area revealed a sloping rail bed at a depth of approximately three feet at the south end of the trench and at a depth of approximately four feet at the north end. A surface layer of crushed stone was encountered at each test pit location and fill material consisting of black, brown or gray sand and gravel, foundry sand, coal cinders, coal tar wastes, wood debris and drums was found beneath. Soil contaminant concentrations in the trench sampling for volatile organics ranged to 656,000 ppb and for semi-volatile organics ranged to 126,020,000 ppb.

From the early 1950s until 1979, waste water sludge from the coal tar refinery and synthetic chemicals operations was dried by placing it in the **Former Sludge Treatment Pit**, located in the center of the Maywood property. The sludge pit was used for thickening sludge by evaporation prior to off-site disposal to landfills. The current RCRA-permitted sludge treatment area is located directly above the northern portion of this historical area. The dimensions of the original sludge pit, as reported in the RI, are 110 feet long by 20 feet wide by 4 feet deep.

Soil contaminant concentrations in the sludge pit sampling for volatile organics ranged to 202,900 ppb and for semi-volatiles ranged to 53,710,000 ppb.

From the beginning of site operations in 1921 until the mid 1970s, the southern portion of the Maywood property was used as a landfill, the **South Landfill**, for construction debris and soil. In addition, various solid and semi-solid wastes (tars, sludges, still bottoms, tank cleanings) from the coal tar and the synthetic chemicals operations were also deposited in this area. Coal refinery wastes deposited in the area included off-specification pitches, creosoted timbers, coal, and tank car sludges and waste water sludge from the Maywood American Petroleum Institute (API) separator. Wastes from the synthetic chemical operations were also deposited in the south landfill beginning in the 1960s. These wastes included waste water sludge from the API separator and distillation residues from various unit processes including vinylpyridine residue and 3-pyridine carbonitrile residue. Dimensions of the south landfill are approximately 1000 feet by 200 feet.

A dug well, or fire pond, was situated at the extreme southeast corner of the south landfill. This pond was reportedly dug by facility personnel for the purpose of providing a water supply for fire suppression. The dimensions of the fire pond were approximately 112 feet in diameter and 23 feet in depth. The fire pond dried up after a period of time, probably due to the increased industrial ground-water usage in the site vicinity. Limited data regarding the materials used to fill the dry dug well (reported to be tars, sludges, various chemical production residues, and foundry sand) were derived during the RI.

The estimated volume of fill material in the South Landfill is 34,000 cubic yards. Soil contaminant concentrations in the South Landfill sampling for volatile organics range to 197,300 ppb and for semi-volatiles range to 35,280,000 ppb. Field investigations in this area also identified both NAPLs (non-aqueous phase liquids) and DNAPLs (dense non-aqueous phase liquids) as present in the ground water in the form of oily sheen and distinct oil phases in ground-water samples.

A RCRA facility investigation in 1990 identified potential releases of hazardous constituents from surface water drainage from the South Landfill. An inspection by the Department of Fish and Wildlife on January 31, 1992 identified the fire pond sludges as imminently hazardous to wildlife. As a result, EPA directed Reilly to perform an interim measure at the South Landfill to minimize these risks until a final remedial action could be implemented. This interim measure consisted of regrading and covering the eastern portion of the landfill with six inches of clean soil, placement of plastic netting over the fire pond to prevent waterfowl from landing in this area, and construction of drainage controls to prevent runoff from this area from leaving the site. These activities were completed in April 1992.

Prior to 1970, waste water and storm water were conveyed from the API separator by the **Former Drainage Ditch** into the Raymond Street storm sewer, which then discharged directly to Eagle Creek. This water consisted of water separated from the raw tar, water decanted from the tar storage tanks, water separated from the oil-water, "wet-dry" in the refinery, blowdown water from the boiler operations, aqueous sodium sulfate from the extraction of tar acids and tar bases from the light and middle oils, and storm water entering the system due to natural drainage. Historically, the length of the ditch was 1220 feet, the width was between 15 and 50 feet, and the depth was approximately 8 feet.

Soil contaminant concentrations in the Former Drainage Ditch sampling for volatile organics range to 199,930 ppb and for semi-volatiles range to 117,120,000 ppb.

HOT SPOT DELINEATION

Further evaluation of the RI data by U.S. EPA determined that the soil contamination was present in discrete locations within the CERCLA Areas. These hot spots, if addressed, would significantly reduce the contaminant concentrations at the site as well as significantly reduce the risks posed by contributions to soil and groundwater contamination from these areas. All of the CERCLA Areas were reevaluated by U.S. EPA to develop hot spot volumes for treatment alternatives for soil cleanup; this reevaluation process yielded revised volumes for three of the areas, the Lime Pond Drum Removal Area, the Abandoned Railway Trench, and the Former Drainage Ditch, that were significantly lower than those presented in the Feasibility Study/Corrective Measures Study (FS/CMS), that represent the majority of the contamination associated with the CERCLA Area.

The revised volumes represent the most heavily contaminated soils in the unit rather than all the soil in the unit regardless of how contaminated it might be as was the case with the volumes presented in the FS/CMS. CERCLA Areas were evaluated by examining the results of the soil/sludge testing and the Toxicity Characteristic Leachate Procedure (TCLP) testing. The samples collected during the Remedial Investigation/RCRA Facility Investigation (RI/RFI) activities were evaluated to determine if the contaminant concentration for pyridines or carcinogenic PAHs exceeded the risk-based target cleanup levels (RBTCLs) presented in the FS, and if the TCLP results exceeded discharge criteria (Maximum Contaminant Levels (MCLs) for drinking water for benzene, pyridine and carcinogenic polynuclear aromatic hydrocarbons (CPAHs)).

The visual characteristics of the samples were compared and areas that appeared to contain the majority of contamination were identified for removal and treatment. The volume of soil to be removed was calculated and an estimate of the mass of contaminants to be treated was made. An estimate of the mass of contaminants to remain was also made for the volume to remain untreated. By comparing the two, the percentage of the total contaminant mass to be treated was estimated. The following summarizes this process for the three CERCLA Areas.

Abandoned Railway Trench: According to the FS/CMS, the railway trench is approximately 640 feet long by 17 feet wide. The railway trench is bordered by a wooden retaining wall on the north and on the east and by a concrete building foundation on the south. The FS/CMS extended the width of soil requiring remediation beyond the limits of the trench 5 feet to the east and to the west to include additional impacted soils. The depth requiring remediation was estimated to be 20 feet for the northern 490 feet (representing the depth to groundwater) and 4 feet for the remainder of the railway trench (representing the depth to just below the railbed). The volume of material requiring treatment was estimated in the FS/CMS to be 10,320 cubic yards.

The gross contamination is present in the original width of the railway trench (17 feet) to a depth of approximately 5 feet (to the bottom of the railbed). The gross contamination appears to end within test pit J-05 where the description of the soil above the railbed changes from dark brown-grey sand and clay to brown sand and gravel, trace cobbles, medium coarse sand. No samples were taken south of this transition point. The length of gross contamination considered in the revised volumes was 512 feet (compared to 640 feet estimated in the FS/CMS), because the contamination was not as laterally extensive to the south as originally estimated, using the criteria for identification of hot spots, as outlined below.

The results of the evaluation showed that a reduction in the amount of soil to be treated could be made, while keeping a high percentage of reduction in the amount of contamination removed. The FS/CMS identified 10,320 cubic yards of soil to be treated. The EPA evaluation determined an 82% reduction in that amount could be made to 1850 cubic yards to be treated. The percentage removal of contaminants found in the revised soil amount is as follows: 100% of the detected benzene; 99.9% of the detected pyridines; and 73.9% of the detected cPAHs.

The volume of soil to be treated encompasses 12 of the 15 samples where concentrations exceeded the industrial RBTCL (presented in the FS/CMS) and all four of the samples where the TCLP data showed exceedances of discharge criteria. This volume does not include soils outside of the wooden retaining wall, because they are part of the kickback area which is to be addressed in future actions, as is stated in the FS/CMS.

Former Drainage Ditch: The Former Drainage Ditch contains two apparently separate areas of contamination - a layer of cinders/tar/oily gravel that varies from about 1 to 1.5 feet thick, and an oily material that occurs within the original drainage ditches. The FS/CMS did not include remediation of the cinder/tar/oily gravel layer in the volume calculations. This layer is attributed to the kickback area in the FS/CMS. The volume estimated in the FS/CMS that requires remediation includes an area 35 foot wide by 4 feet thick along 660 feet of the west drainage channel and 50 feet along the east drainage channel. (3700 cubic yards). The total volume of contamination in the area of the drainage ditch, as presented in the FS/CMS, is approximately 5800 cubic yards.

The gross contamination (besides the cinders/tar/oily gravel layer) does appear to be centered on the west drainage channel. The width of the contaminated soil (visually identified as black clayey silt, black silty clay, black silt (oily), and black tar) varies from 5 to 12 feet wide according to the test pits. The revised volume of soil to be excavated and treated includes the material centered on the west drainage channel and the cinders/tar/oily gravel layer that covers the area.

The results of the evaluation showed that a reduction in the amount of soil to be treated could be made, while keeping a high percentage of reduction in the amount of contamination removed. The FS/CMS identified 5800 cubic yards of soil to be treated. The EPA evaluation determined an 66% reduction in that amount could be made to 1950 cubic yards to be treated. The percentage removal of contaminants found in the revised soil amount is as follows: 96.5% of the detected benzene; 99.6% of the detected pyridines; and 94.7% of the detected cPAHs.

The volume of soil to be treated encompasses 7 of the 8 samples where concentrations exceeded the industrial RBTCL and both samples where the TCLP data showed exceedances of discharge criteria.

Lime Pond Drum Removal Area: Waste materials were deposited north and east of the Lime Pond in what is referred to in the FS/CMS as the drum removal area. The wastes were originally assumed to have been deposited in trenches-two running north-south east of the lime pond and one running east-west north of the lime pond. The volume of waste associated with these trenches was estimated based on the results of a geophysical investigation.

The drums were located and removed as part of the Lime Pond drum removal project. Samples of the waste material around the drums were collected during the drum removal. The FS/CMS estimated the volume of waste material based on an "L" shaped area to the north and east of the lime pond. The depth of contaminated material was estimated to be 15 feet. Based on these assumptions, the volume of material requiring remediation was estimated in the FS/CMS to be 29,000 cubic yards.

In the revised volume calculations, it was assumed that the gross contamination is limited to the trenches. Analytical data is unavailable in the areas outside the drum removal excavation areas. While it is possible that gross contamination may exist outside of the trench areas, the volume of gross contamination is not anticipated to be significant. This assumption is based on the RI geophysical evaluation. The depth of gross contamination was estimated to be 10 feet. The test pits excavated during the Lime Pond drum removal project extended to depths from 4 to 12 feet below ground surface. Drums were encountered as deep as 6 feet below ground surface.

The revised volume of gross contamination is about 5400 cubic yards, about 19% of the volume calculated in the FS/CMS. No samples were collected and tested outside of the excavation areas, therefore no comparison of mass contamination to remain versus mass contamination to be treated can be performed. Some contamination may remain through the leaching of the waste material.

Former Sludge Treatment Pit: The Former Sludge Treatment Pit was reevaluated using the criteria mentioned above for determination of hot spot volumes. The volume presented in the FS/CMS (800 cubic yards) was found to be accurate for hot spot delineation at this area.

South Landfill/Fire Pond: The South Landfill/Fire Pond was reevaluated using the criteria mentioned above for determination of hot spot volumes. Due to the widespread contamination at this area, the absence of any discernable hot spot area, and the prohibitive volume of contaminated soils at this area, it was determined that the South Landfill/Fire Pond would not be included in the hot spot delineation. One area that was identified as a hot spot was the Fire Pond, which is the subject of remediation as a portion of this ROD.

The cost and volume estimates presented in the FS for the alternatives analysis are for hot spot soils in the source areas that will address the most contaminated portions of these areas. The term "hot spot soils" is defined as including, but not limited to, those soils which exhibit visible evidence of contamination, or which fail the Toxicity Characteristics Leaching Procedure (TCLP) test.

The FS estimated volumes of contaminated soil for each of the source areas. Further evaluation of the RI data showed that the soil contamination was concentrated in discrete locations within the source areas. These hot spots were found to be the greatest contributors to groundwater contamination. Over 90% of the soil contamination is present in these hot spot areas which comprise approximately 20% of the total volume presented in the FS. As a result, treating the hot spot soils, which constitute a small portion of the source areas, was also considered by EPA. Treatment alternatives presented in this ROD represent cleanup of those hot spot areas.

GROUND WATER CONTAMINATION

Benzene concentrations in the ground water range from below detection limits to 38,000 ppb, with the highest levels detected on the Oak Park property. Pyridine and pyridine derivative concentrations, which were summarized in the RI as total pyridine derivatives, were found in the ground water ranging from below detection limits to 305,405 ppb, with the highest levels detected on the south-central portion of the Oak Park property. Ammonia concentrations in the ground water ranged from 0.1 parts per million (ppm) to 53.3 ppm with concentrations greatest in the northwest portion of the Oak Park property (see Figures 4 , 5, and 6 for maps of contaminant plumes for benzene, pyridine and pyridine derivatives, and ammonia, respectively).

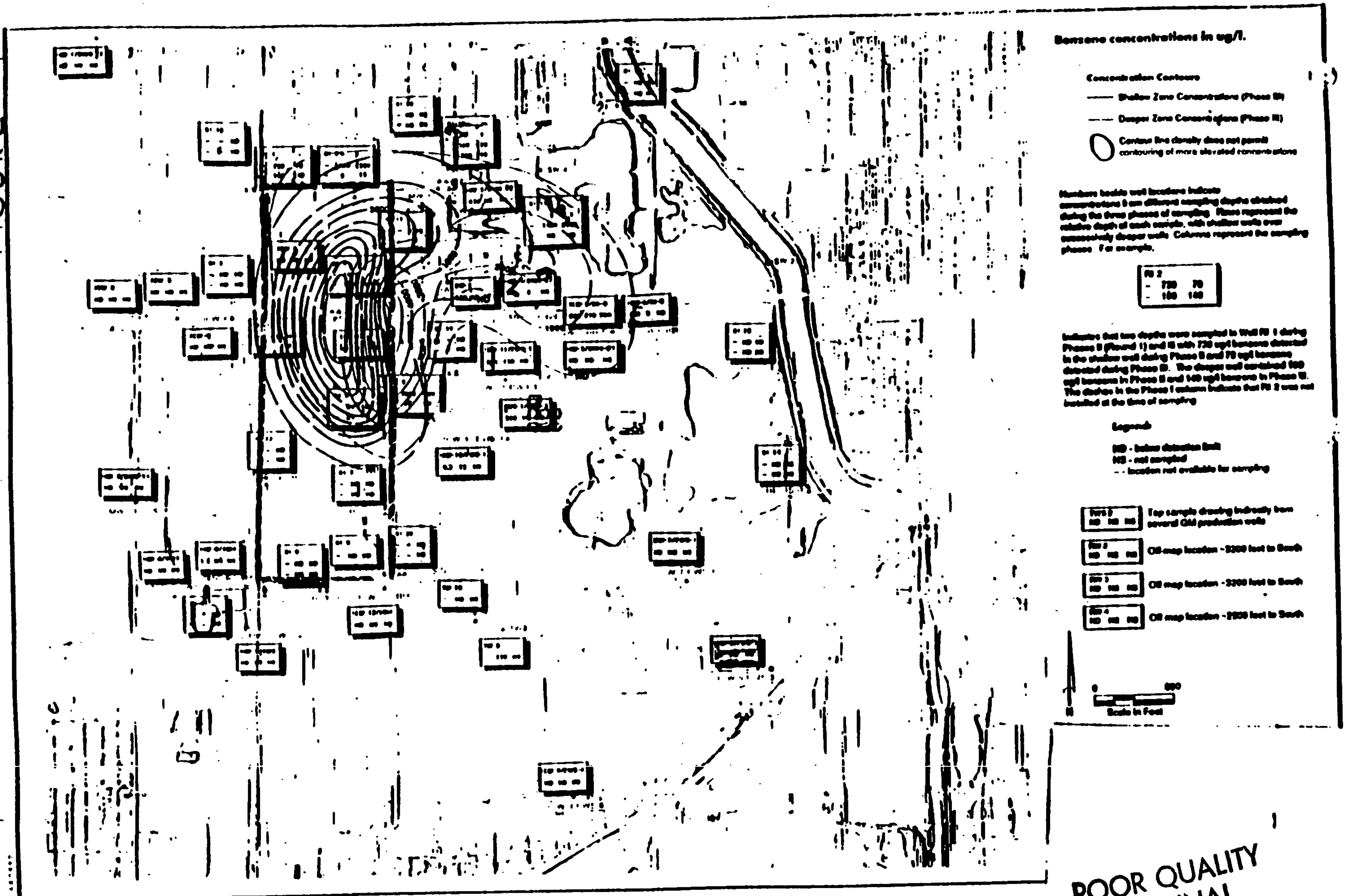
Additional groundwater samples collected as a part of the AAOC sampling activities showed that groundwater quality was significantly impacted downgradient of three of the CERCLA Areas: the Lime Pond Drum Removal Area, the Former Drainage Ditch, and the Former Sludge Treatment Pit. At these locations, benzene concentrations ranged from 1 ppb to 810 ppb, pyridine concentrations ranged from 41 ppb to 94,950 ppb, ammonia concentrations ranged to 64 ppm and PAH concentrations ranged from below detection limits to 11,760 ppb. These concentrations are greater than the cleanup levels selected for groundwater in the ROD for the first operable unit and demonstrate that these areas are adversely impacting groundwater quality.

SUMMARY OF SITE RISKS

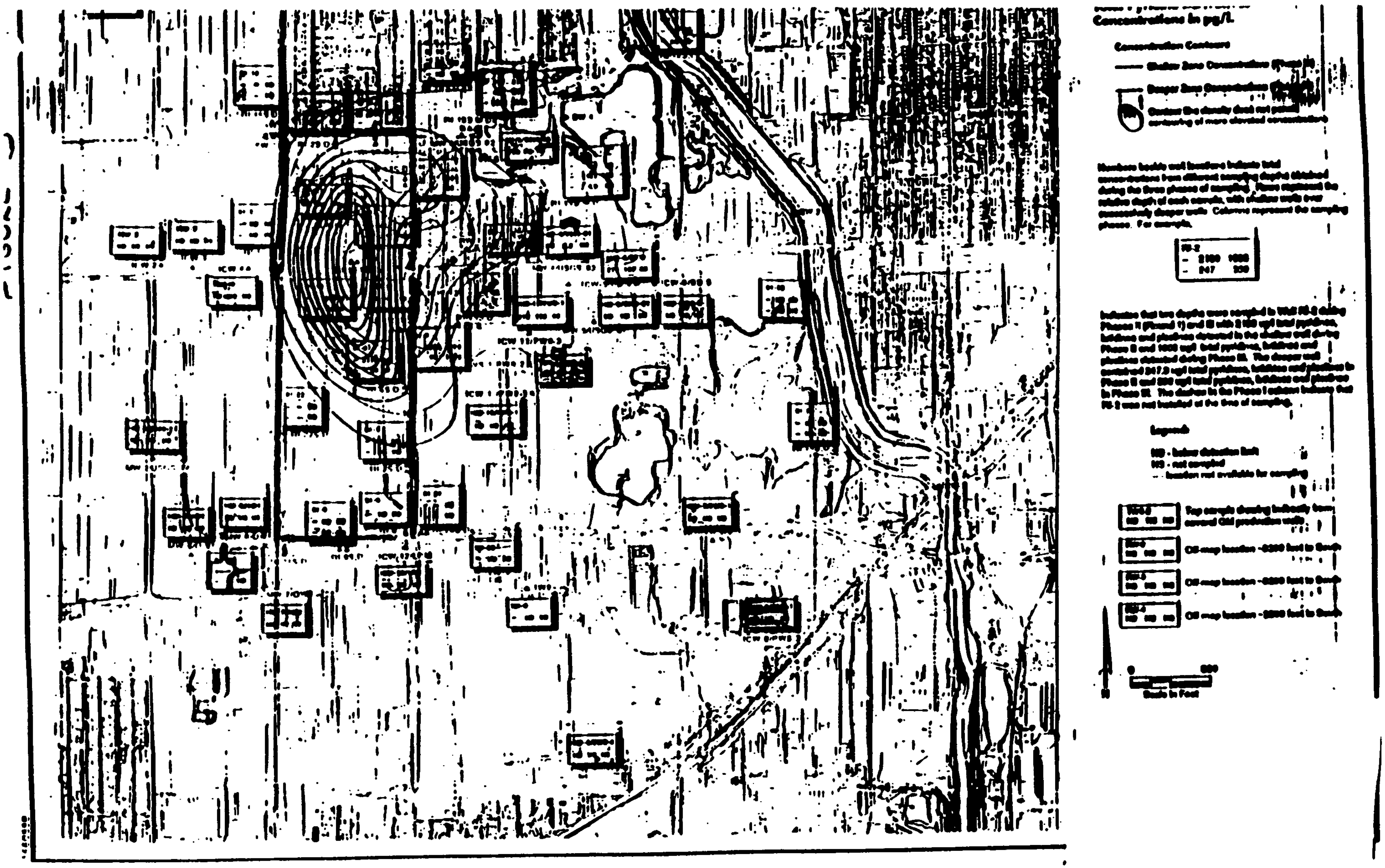
This Record of Decision is written for an operable unit action to address the five CERCLA areas within the site boundaries. The RI report includes a risk assessment, prepared by Reilly using the Risk Assessment Guidance for Superfund and approved by EPA as a portion of the RI report, that calculated the actual or potential risks to human health and the environment that may result from exposure to site contamination. Risks from exposure to contaminated groundwater were summarized in the ROD for the groundwater operable unit. Risks associated with exposure to contaminated soils and sludges are presented below.

The risk assessment determined that the majority of risks associated with exposure to soil contamination at the site were attributed to carcinogenic PAHs, pyridine and pyridine

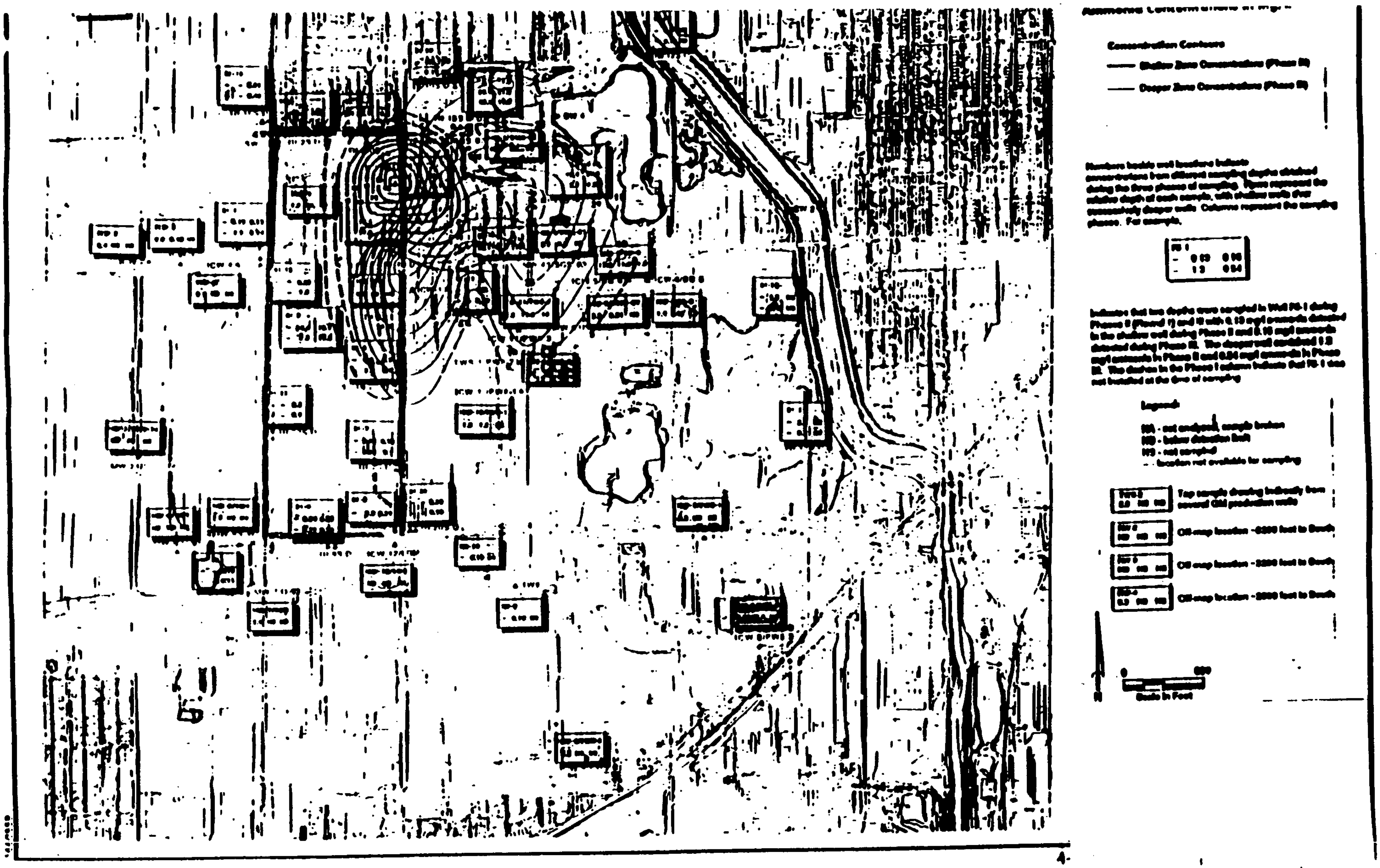
FIGURE 7



Benzene concentrations in ug/l.
Concentration Contours
Shallow Zone Concentrations (Phase III)
Deeper Zone Concentrations (Phase III)
Contour line density does not permit contouring of more elevated concentrations
Legend
ND - below detection limit
NS - not sampled
-- location not available for sampling
Scale in Feet



POOR QUALITY
ORIGINAL


Concentration Contours
Shallow Zone Concentrations (Phase II)
Deeper Zone Concentrations (Phase III)
Legend
Scale in Feet

derivatives and volatile organics, such as benzene. Other chemicals that were detected in site soils are also of concern, but were not found at the same frequency as these listed here. Concentrations of these chemicals in the groundwater have resulted in the calculation of unacceptable risks to human health and the environment posed by exposure.

Exposure Assessment

The exposure assessment conducted as a part of the RI concluded that several media are impacted by the contaminants at the site, and that there are several potential exposure routes for contamination. These routes of exposure were identified for both current and future scenarios (as is commonly done in EPA risk assessments) so that all potential pathways can be evaluated. The baseline risk assessment computed risks from exposure to these contaminants using the upper 95% confidence intervals of the arithmetic mean of the Phase II and III sampling data concentrations of the above contaminants. The use of the confidence intervals is suggested in the Risk Assessment Guidance for Superfund and represents a conservative step towards assessing risks associated with potential exposures. In some cases where sample results vary widely or sample size is small, these confidence intervals may exceed maximum detected concentrations.

Due to the proximity of the site to the surrounding neighborhood and major streets, and its size, the following potential receptors were identified in the risk assessment, and risks were computed for their exposure.

Under the current land-use scenario, on-site workers could potentially be exposed through **ingestion** and **dermal contact** with surface soils, and **inhalation** of surface-soil dust. Off-site neighborhood residents could potentially be exposed through **ingestion and dermal contact** with surface-soils from the Maywood property (primarily from site trespassers), **inhalation** of surface soil dust (migration of dust from the site), **ingestion and dermal contact** with surface soil from the Oak Park property (residents playing basketball at a court located in the northern portion of the site), and **ingestion and dermal contact** with on-site surface water (site trespassers contacting a transient area of ponded water). Off-site industrial workers could potentially be at risk through **exposure to volatilized contaminants** (local industrial usage of the ground water).

Under the future-use scenario, on-site workers could potentially be exposed through **ingestion and dermal contact** with surface soils (some workers can enter the area of the Maywood property), and **inhalation** of surface soil and dust (Maywood) and subsurface soils (all areas) (workers may be exposed to on-site dust generated during intrusive construction activities). Off-site neighborhood residents could potentially be exposed through **ingestion and dermal contact** with surface soils (site trespassers), **inhalation** of surface soil dust (Maywood) and subsurface (all areas) soils (wind blown dust from the site), and **ingestion and dermal contact** with surface soils from the Oak Park property (residents playing basketball), **ingestion and dermal contact** with on-site surface water (site trespassers). Construction workers could potentially be exposed through **ingestion and dermal contact** with surface and subsurface soils (industrial facility construction on the Maywood property). Future on-site residents (assuming that the site will be converted to this use in the future) could potentially be exposed through **ingestion and dermal contact** with surface soil (Maywood) and subsurface soil (all areas), **ingestion and dermal contact** with on-site surface water, and **inhalation** of surface dust (Maywood) and subsurface soil (all areas). Future off-site residents could be exposed through **ingestion and dermal contact** with ground water (if residents used wells for water supply for drinking and other household uses). Future off-site industrial workers could be at risk through **exposure** to volatilized contaminants from the ground water (industrial water usage).

Toxicity Assessment

Benzene is classified as a known human carcinogen (Class A) and has been associated with hematologic effects on humans as well as anemia (decreased red blood cells), leukopenia (decreased white blood cells), and thrombocytopenia (decreased platelets). Chronic exposure has been shown to cause pancytopenia (decrease in all circulating cells) and aplastic anemia (failure to manufacture blood cells). Exposure by inhalation has been shown to cause leukemia. Benzene has been shown to be a growth inhibitor in utero; however, it has not been shown to be teratogenic (causing birth defects). Animal studies have shown preliminary evidence of carcinogenicity; a link to leukemia via inhalation has also been suggested. Benzene has been shown to be nonmutagenic (not causing mutations); benzene oxide, the presumed initial metabolite of benzene, is mutagenic (causing mutations).

Limited data exists on the oral absorption of **pyridine**; data on the pulmonary and dermal absorption of the chemical was not located. Available evidence indicates that pyridine is well absorbed rapidly from the GI tract and is not expected to accumulate in the body. Available information from animal testing does not suggest that lethality is a human health concern for exposure to pyridine by inhalation or ingestion. The major human health concern is for liver damage, based on recent studies with laboratory rats. Other human health concerns include the potential for neurologic effects and kidney effects. Pyridine has been administered to mice and rats in order to evaluate the potential carcinogenicity of pyridine. The studies have concluded that pyridine did not produce increases in the incidence of tumors with respect to controls. EPA has decided that increased liver weight in female rats is the most sensitive toxic endpoint.

Ammonia has been shown to cause deleterious effects in acute exposures. Irritation of the eyes, nose, throat and chest are associated with exposure to ammonia. Ingestion can cause gastritis and corrosive esophagitis. Exposure to high concentrations of ammonia gas can cause pulmonary edema or death. Ammonia has also been shown to cause negative effects to the respiratory tract, labored breathing, eye irritation, inflammatory lung changes, and death to many animal species.

Trichloroethylene (TCE) is considered a probable carcinogen (Class B2) and is associated with central nervous system and renal system problems, liver damage, hepatic injury, and damage to other organs. Animal studies have indicated that TCE is fetotoxic but not teratogenic, producing primarily skeletal ossification anomalies, decreased fetal weight, and other effects consistent with delayed development.

Ethylbenzene is readily absorbed via inhalation, ingestion, and dermal exposure, both in humans and in animals. Ethylbenzene adversely affects the kidneys, lungs, adipose tissue, digestive tract, and liver. There is little information available on the toxicity of ethylbenzene in humans, although exposure to moderate to high concentrations causes irritation to the eyes, nose, and throat. Ethylbenzene is not mutagenic and has been assigned a Class D (not classified) carcinogenicity rating due to lack of data.

Toluene is primarily absorbed through the lung and gut, although it can also be absorbed through the skin. Toluene is metabolized extensively and is excreted in the urine as well as in expired air. Toluene adversely affects the central nervous system causing dizziness and unconsciousness. Toluene is not mutagenic or teratogenic, but there is some evidence that it causes adverse effects in laboratory animals.

Xylene is easily absorbed through inhalation and is transported in the blood. Exposure to xylene can produce effects ranging from irritation of the eyes, nose, and throat for acute doses, to central nervous system depression and cardiac arrest in chronic doses. Xylene has been found to be embryotoxic and teratogenic in laboratory animals and has been assigned a Class D (not classified) carcinogenicity rating by U.S. EPA.

Both the Integrated Risk Information System (IRIS-1989) and the Health Effects Assessment Summary Table (HEAST-1990) were used as sources for this contaminant toxicity data.

Polynuclear Aromatic Hydrocarbons (PAHs) are absorbed gastrointestinally. There is very limited information on human toxicity for PAH. No information is available concerning the possible teratogenicity of PAH in humans. From numerous epidemiological studies of humans (primarily occupational exposure), a clear association has been found between exposure to PAH containing materials and increased cancer risk. The following PAH have been classified as potentially carcinogenic - **Class B2**: benzo (a) pyrene; benzo (a) anthracene; dibenzo (a,h) anthracene; benzo (b) fluoranthene; benzo (k) fluoranthene; indeno (1,2,3-cd) pyrene; chrysene.

Risk Assessment

Carcinogenic risks described in the risk assessment for **exposure to contaminated soil** at the site were computed for several potential exposure scenarios (See Table 1). These include on-site worker (current risk - 6.1 x 10(-5)), off-site neighborhood resident (current risk - 1.7 x 10(-5)), on-site worker (future risk - 6.8 x 10(-5)), off-site neighborhood resident (future risk - 1.9 x 10(-5)), construction worker (future risk - 6.2 x 10(-5)), on-site resident (future risk - 1.1 x 10(-3)). The chemical class causing the majority of the estimated cancer risks were potentially carcinogenic PAH.

The non-carcinogenic risks associated with **exposure to contaminated soil** at the site were computed for the same exposure scenarios as were used for the carcinogenic risks. Generally, total Hazard Indices (HI) are used to calculate non carcinogenic risks and must be below a value of 1.0; otherwise CERCLA requires remedial action. Hazard Indices exceeded the 1.0 trigger for scenarios such as the construction worker (future non-carcinogenic risks - HI = 1.1), on-site resident (future non-carcinogenic risks - HI = 2.0) (See Table 2). The chemical class causing the majority of the estimated non-cancer risks were pyridine and pyridine derivatives.

The carcinogenic risks associated with exposure to benzene by **ground-water ingestion** were computed for several potential exposure scenarios (see Table 3). These include off-site resident (5.5 x 10(-4)), off-site industrial worker (current risk - 1.06 x 10(-6) for a quiescent scenario and 1.64 x 10(-5) for an aerated scenario (mixing of the water with associated volatilization of the benzene into the breathing space)), off-site industrial worker (future risk - using the upper 95 % confidence interval for the ground-water plume - 6.83 x 10(-4) for a quiescent scenario, and 7.35 x 10(-4) for an aerated scenario), and on-site resident (6 x 10(-4)).

The non-carcinogenic risks associated with exposure to pyridine, pyridine derivatives, and ammonia by **ingestion of ground water**, were computed for the same exposure scenarios as were used for the carcinogenic risks. Hazard Indices exceeded the 1.0 trigger

TABLE 6-37
SUMMARY TABLE - ON-SITE WORKER
CURRENT SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	On-Site Worker Potential Carcinogenic Risk Surface Soil Inhalation Southern Area Total	On-Site Worker Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area 1	On-Site Worker Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area 2	Total Potential Carcinogenic Risk To On-Site Worker
METAL:				
ARSENIC	9.8E-10	2.0E-09	2.9E-08	3.2E-08
CADMIUM	1.6E-10	NA	NA	1.6E-10
CHROMIUM VI	6.6E-10	NA	NA	6.6E-10
NICKEL	2.0E-10	NA	NA	2.0E-10
BNA:				
BIS(2-ETHYLHEXYL)PHTHALATE	1.4E-14	9.4E-13	6.5E-11	6.6E-11
PAH:				
B(a)P-TE	1.6E-07	2.3E-05	3.8E-05	6.1E-05
TOTAL:	1.6E-07	2.3E-05	3.8E-05	6.1E-05

Legend:
NA - Not Applicable

File Name: SUMCC1.WK1

05-Dec-90

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TABLE 6-38
SUMMARY TABLE - OFF-SITE RESIDENT
CURRENT SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Off-Site Resident Potential Carcinogenic Risk Soil Inhalation Southern Area Total	Trespassing Teen Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area Total	Trespassing Teen Potential Carcinogenic Risk On-Site Ingestion & Surface Water Contact Southern Area	Teen Playing Basketball-Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Northern Area	Total Potential Carcinogenic Risk To Off-Site Resident
METAL:					
ARSENIC	4.0E-09	2.9E-09	4.4E-09	3.0E-08	4.1E-08
CADMIUM	6.4E-10	NA	NA	NA	6.4E-10
CHROMIUM VI	2.7E-09	NA	NA	NA	2.7E-09
NICKEL	8.2E-10	NA	NA	NA	8.2E-10
VOC:					
STYRENE	NA	NA	2.3E-10	NA	2.3E-10
BNA:					
BIS(2-ETHYLHEXYL)PHTHALATE	5.6E-14	5.1E-12	NA	1.1E-10	1.2E-10
PAH:					
B(a)P-TE	6.3E-07	1.4E-05	NA	2.3E-06	1.7E-05
TOTAL:	6.4E-07	1.4E-05	4.6E-09	2.3E-06	1.7E-05

Legend:
NA - Not Applicable

File Name SUMCC2 WK1

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TABLE 6-39
SUMMARY TABLE - ON-SITE WORKER
FUTURE SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

CHEMICAL	On-Site Worker Potential Carcinogenic Risk Surface Soil Inhalation Southern Area Total	On-Site Worker Potential Carcinogenic Risk Subsurface Soil Inhalation Total Site	On-Site Worker Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area 1	On-Site Worker Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area 2	On-Site Worker Potential Carcinogenic Risk Subsurface Soil Ingestion & Dermal Contact Total Site	Total Potential Carcinogenic Risk For On-Site Worker
METALS:						
ARSENIC	9.8E-10	3.7E-11	2.0E-09	2.9E-08	1.2E-09	3.3E-08
CADMIUM	1.6E-10	3.7E-12	NA	NA	NA	1.6E-10
CHROMIUM VI	6.6E-10	2.7E-11	NA	NA	NA	6.9E-10
NICKEL	2.0E-10	9.2E-12	NA	NA	NA	2.1E-10
VOC:						
BENZENE	NA	5.1E-15	NA	NA	1.3E-10	1.3E-10
STYRENE	NA	3.1E-14	NA	NA	1.9E-09	1.9E-09
BNA:						
BIS(2-ETHYLHEXYL)PHTHALATE	1.4E-14	2.9E-13	9.4E-13	6.5E-11	1.2E-09	1.3E-09
HEXACHLOROBENZENE	NA	1.3E-12	NA	NA	2.0E-08	2.0E-08
PAH:						
B(a)P-TE	1.6E-07	6.4E-09	2.3E-05	3.8E-05	6.7E-06	6.8E-05
TOTAL:	1.6E-07	6.4E-09	2.3E-05	3.8E-05	6.8E-06	6.8E-05

Legend:
NA - Not Applicable

File Name: SUMCF1.WK1

05-Dec-90

TABLE 6-42
SUMMARY TABLE - HYPOTHETICAL ON-SITE RESIDENT
FUTURE SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	On-Site Resident Potential Carcinogenic Risk Surface Soil Inhalation Southern Area Total	On-Site Resident Potential Carcinogenic Risk Subsurface Soil Inhalation Total Site	On-Site Resident Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area Total	On-Site Resident Potential Carcinogenic Risk Subsurface Soil Ingestion & Dermal Contact Total Site	On-Site Resident Potential Carcinogenic Risk Surface Water Ingestion & Dermal Contact Southern Area	Total Potential Carcinogenic Risk For On-Site Resident
METALS:						
ARSENIC	7.9E-09	3.0E-10	2.0E-07	7.5E-09	2.3E-08	2.4E-07
CADMIUM	1.3E-09	3.0E-11	NA	NA	NA	1.3E-09
CHROMIUM VI	5.3E-09	2.2E-10	NA	NA	NA	5.5E-09
NICKEL	1.6E-09	7.4E-11	NA	NA	NA	1.7E-09
VOC:						
BENZENE	NA	4.1E-14	NA	8.2E-10	NA	8.2E-10
STYRENE	NA	2.5E-13	NA	1.2E-08	1.1E-09	1.3E-08
BNA:						
BIS(2-ETHYLHEXYL)PHTHALAT	1.1E-13	2.3E-12	3.6E-10	7.4E-09	NA	7.7E-09
HEXACHLOROBENZENE	NA	1.0E-11	NA	1.2E-07	NA	1.2E-07
PAH:						
B(a)P-TE	1.3E-06	5.1E-08	1.0E-03	4.2E-05	NA	1.1E-03
TOTAL:	1.3E-06	5.2E-08	1.0E-03	4.2E-05	2.5E-08	1.1E-03

Legend:
NA - Not Applicable
File Name: SUMCF3.WK1
05-Dec-90

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TABLE 6-41
SUMMARY TABLE - CONSTRUCTION WORKER
FUTURE SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Construction Worker Potential Carcinogenic Risk Surface Soil Inhalation Southern Area Total	Construction Worker Potential Carcinogenic Risk Subsurface Soil Inhalation Total Site	Construction Worker Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area Total	Construction Worker Potential Carcinogenic Risk Subsurface Soil Ingestion & Dermal Contact Total Site	Total Potential Carcinogenic Risk For Construction Worker
METALS:					
ARSENIC	1.0E-09	1.1E-09	5.4E-09	6.2E-09	1.4E-08
CADMIUM	1.6E-10	1.1E-10	NA	NA	2.8E-10
CHROMIUM VI	6.7E-10	8.4E-10	NA	NA	1.5E-09
NICKEL	2.1E-10	2.8E-10	NA	NA	4.9E-10
VOC:					
BENZENE	NA	1.6E-13	NA	6.5E-10	6.5E-10
STYRENE	NA	9.6E-13	NA	9.6E-09	9.6E-09
BNA:					
BIS(2-ETHYLHEXYL)PHTHALATE	1.4E-14	8.8E-12	9.8E-12	6.1E-09	6.1E-09
HEXACHLOROBENZENE	NA	4.0E-11	NA	9.9E-08	9.9E-08
PAH:					
B(a)P-TE	1.6E-07	2.0E-07	2.8E-05	3.4E-05	6.2E-05
TOTAL:	1.6E-07	2.0E-07	2.8E-05	3.4E-05	6.2E-05

Legend:
NA - Not Applicable.

File Name: SUMCF4.WK1

05 Dec-90

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TABLE 6-40
SUMMARY TABLE - OFF-SITE RESIDENT
FUTURE SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Off-Site Resident Potential Carcinogenic Risk Surface Soil Inhalation Southern Area Total	Off-Site Resident Potential Carcinogenic Risk Subsurface Soil Inhalation Total Site	Trespassing Teen Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Southern Area Total	Trespassing Teen Potential Carcinogenic Risk Subsurface Soil Inhalation Total Site	Trespassing Teen Potential Carcinogenic Risk Subsurface Soil Ingestion & Dermal Contact Total Site	Trespassing Teen Potential Carcinogenic Risk Surface Water Ingestion & Dermal Contact	Teen Playing Basketball - Potential Carcinogenic Risk Surface Soil Ingestion & Dermal Contact Northern Area	Total Potential Carcinogenic Risk For Off-Site Resident
METALS								
ARSENIC	4.0E-09	1.5E-10	2.9E-09	5.3E-12	4.1E-10	4.4E-19	3.0E-08	4.2E-08
CADMIUM	6.4E-10	1.5E-11	NA	5.3E-13	NA	NA	NA	6.6E-10
CHROMIUM VI	2.7E-09	1.1E-10	NA	3.9E-12	NA	NA	NA	2.8E-09
NICKEL	8.2E-10	3.7E-11	NA	1.3E-12	NA	NA	NA	8.6E-10
VOC								
BENZENE	NA	2.0E-14	NA	7.2E-16	4.0E-11	NA	NA	4.0E-11
STYRENE	NA	1.3E-11	NA	4.5E-15	6.0E-10	2.3E-10	NA	8.2E-10
BNA								
BIS(2-ETHYLHEXYL)PHTHALATE	5.4E-14	1.2E-12	5.1E-12	4.1E-14	3.9E-10	NA	1.1E-10	5.1E-10
HEXACHLOROBENZENE	NA	5.2E-12	NA	1.9E-11	6.1E-09	NA	NA	6.1E-09
PAH								
BaP-TE	6.3E-07	2.6E-08	1.4E-05	9.1E-10	2.1E-06	NA	2.3E-06	1.9E-05
TOTAL	6.4E-07	2.6E-08	1.4E-05	9.2E-10	2.1E-06	4.6E-10	2.3E-06	1.9E-05

Legend
NA - Not Applicable
File Name: SUMLE7.WK1
27-Mar-91

TABLE 6-47
SUMMARY TABLE - CONSTRUCTION WORKER
FUTURE SCENARIO - NONCARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Construction Worker Potential Hazard Index Surface Soil Inhalation Southern Area Total	Construction Worker Potential Hazard Index Subsurface Soil Inhalation Total Site	Construction Worker Potential Hazard Index Surface Soil Ingestion & Dermal Contact Southern Area Total	Construction Worker Potential Hazard Index Subsurface Soil Ingestion & Dermal Contact Total Site	Total Potential Hazard Index For Construction Worker
METAL:					
ARSENIC	2.1E-06	2.4E-06	2 2E-03	2.5E 03	4 7E 03
CADMIUM	1.2E-05	8.2E-06	3.0E-03	2 1E 03	5 1E 03
CHROMIUM III	2.6E-07	3.3E-07	1.9E-05	2 4E 05	4 4E 05
CHROMIUM VI	2.3E-06	1.0E-05	1 6E-04	2.0E 04	3 8E 04
LEAD	1.6E-04	2.0E-04	4.4E-02	5 6E-02	1 0E 01
MERCURY	1.7E-06	1.9E-06	8.3E-04	9.5E-04	1 8E 03
NICKEL	6.9E-07	8.8E-07	2.1E-03	2.9E-03	5 0E 03
VANADIUM	1.2E-05	NA	1.6E-03	NA	1 6E 03
VOC:					
ACETONE	NA	1.6E-08	NA	6 6E 05	6 6E 05
ETHYLBENZENE	NA	9.6E-09	NA	4 0E 05	4 0E 05
STYRENE	NA	2.7E-08	NA	1.1E 04	1 1E 04
TOLUENE	NA	3.5E-09	NA	3 0E 05	3 0E 05
TOTAL XYLENES	NA	3.5E-07	NA	9 7E 05	9 7E 05
BNA:					
BIS(2-ETHYLHEXYL)PHTHALATE	3 6E 09	2.2E-06	2.5E 06	1 5E 03	1 5E 03
DIBENZOFURAN	1.5E-07	9.1E-06	1.8E-04	1 1E 02	1 1E 02
HEXACHLOROBENZENE	NA	2.1E-06	NA	5 1E 03	5 1E 03
PENTACHLOROPHENOL	5.6E-08	3.3E-07	2.3E-04	1 4E 03	1 6E 03

Table 7
1 of 4

TABLE 6-47 (Continued)
SUMMARY TABLE - CONSTRUCTION WORKER
FUTURE SCENARIO - NONCARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Construction Worker Potential Hazard Index Surface Soil Inhalation Southern Area Total	Construction Worker Potential Hazard Index Subsurface Soil Inhalation Total Site	Construction Worker Potential Hazard Index Surface Soil Ingestion & Dermal Contact Southern Area Total	Construction Worker Potential Hazard Index Subsurface Soil Ingestion & Dermal Contact Total Site	Total Potential Hazard Index For Construction Worker
PAH:					
TOTAL CPAH	1.6E-05	2.5E-05	2.0E-02	3.1E-02	5.0E-02
ACENAPHTHENE	1.6E-07	6.7E-06	2.0E-04	8.3E-03	8.5E-03
ACENAPHTHYLENE	2.4E-07	1.2E-06	2.9E-04	1.5E-03	1.8E-03
ANTHRACENE	8.9E-08	1.3E-06	1.1E-04	1.6E-03	1.7E-03
BENZO(GHI)PERYLENE	1.7E-06	1.1E-06	2.1E-03	1.4E-03	3.5E-03
FLUORANTHENE	3.6E-06	1.5E-05	4.5E-03	1.8E-02	2.3E-02
FLUORENE	2.8E-07	1.3E-05	3.5E-04	1.6E-02	1.6E-02
1-METHYLNAPHTHALENE	4.8E-07	3.5E-05	5.9E-04	4.4E-02	4.4E-02
2-METHYLNAPHTHALENE	2.3E-06	7.2E-05	2.9E-03	8.9E-02	9.2E-02
NAPHTHALENE	1.4E-06	1.8E-04	1.7E-03	2.2E-01	2.2E-01
PHENANTHRENE	2.0E-06	3.8E-05	2.5E-03	4.7E-02	4.9E-02
PYRENE	4.9E-06	1.4E-05	6.0E-03	1.7E-02	2.3E-02
PYRIDINES:					
TOTAL PYRIDINES	2.1E-06	9.8E-05	8.6E-03	4.1E-01	4.2E-01
TOTAL:	0.00023	0.00074	0.10	0.99	1.1

Legend:
NA - Not Applicable
File Name: SUMNCF4.WK1
07-Dec-90

Table 6
(CONT
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TABLE 6-48
SUMMARY TABLE - HYPOTHETICAL ON-SITE RESIDENT
FUTURE SCENARIO - NONCARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	On-Site Resident Potential Hazard Index Surface Soil Inhalation Southern Area Total	On-Site Resident Potential Hazard Index Surface Soil Inhalation Total Site	On-Site Resident Potential Hazard Index Surface Soil Ingestion & Dermal Contact Southern Area Total	On-Site Resident Potential Hazard Index Subsurface Soil Ingestion & Dermal Contact Total Site	On-Site Resident Potential Hazard Index Surface Water Soil Ingestion & Dermal Contact Southern Area Total	Total Potential Hazard Index For On-Site Resident
METAL:						
ARSENIC	5.6E-07	6.3E-07	2.6E-03	3.0E-03	6.7E-04	6.3E-03
CADMIUM	3.1E-06	2.2E-06	3.7E-03	2.6E-03	NA	6.3E-03
CHROMIUM III	6.9E-08	8.6E-08	2.4E-05	3.0E-05	2.1E-06	5.7E-05
CHROMIUM VI	6.1E-07	2.7E-06	2.0E-04	2.6E-04	1.2E-05	4.8E-04
LEAD	4.2E-05	5.3E-05	5.5E-02	6.9E-02	4.0E-03	1.3E-01
MERCURY	4.4E-07	5.1E-07	1.0E-03	1.2E-03	NA	2.2E-03
NICKEL	1.8E-07	2.3E-07	2.7E-03	3.7E-03	9.0E-04	7.2E-03
VANADIUM	3.1E-06	NA	2.0E-03	NA	3.7E-04	2.4E-03
VOC:						
ACETONE	NA	4.2E-09	NA	8.3E-05	1.6E-04	2.5E-04
ETHYLBENZENE	NA	2.5E-09	NA	5.0E-05	NA	5.0E-05
STYRENE	NA	7.1E-09	NA	1.4E-04	9.6E-07	1.4E-04
TOLUENE	NA	9.2E-10	NA	3.8E-05	5.1E-05	8.9E-05
TOTAL XYLENES	NA	9.1E-08	NA	1.2E-04	2.6E-07	1.2E-04
BNA:						
BIS(2-ETHYLHEXYL)PHTHALATE	9.4E-10	5.8E-07	3.0E-06	1.8E-03	NA	1.8E-03
DIBENZOFURAN	3.9E-08	2.4E-06	2.3E-04	1.4E-02	NA	1.4E-02
HEXACHLOROBENZENE	NA	5.4E-07	NA	6.4E-03	NA	6.4E-03
PENTACHLOROPHENOL	1.5E-08	8.7E-08	2.9E-04	1.7E-03	NA	2.0E-03

Table (cont.)
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TABLE 6-48 (Continued)
SUMMARY TABLE - HYPOTHETICAL ON-SITE RESIDENT
FUTURE SCENARIO - NONCARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	On-Site Resident Potential Hazard Index Surface Soil Inhalation Southern Area Total	On-Site Resident Potential Hazard Index Surface Soil Inhalation Total Site	On-Site Resident Potential Hazard Index Surface Soil Ingestion & Dermal Contact Southern Area Total	On-Site Resident Potential Hazard Index Subsurface Soil Ingestion & Dermal Contact Total Site	On-Site Resident Potential Hazard Index Surface Water Soil Ingestion & Dermal Contact Southern Area Total	Total Potential Hazard Index For On-Site Resident
PAH:						
TOTAL CPAH	4.2E-06	6.5E-06	2.4E-02	3.8E-02	NA	6.3E-02
ACENAPHTHENE	4.3E-08	1.8E-06	2.5E-04	1.0E-02	NA	1.1E-02
ACENAPHTHYLENE	6.2E-08	3.1E-07	3.6E-04	1.8E-03	NA	2.2E-03
ANTHRACENE	2.3E-08	3.5E-07	1.4E-04	2.0E-03	NA	2.2E-03
BENZO(GHI)PERYLENE	4.5E-07	2.9E-07	2.7E-03	1.7E-03	NA	4.4E-03
FLUORANTHENE	9.5E-07	3.9E-06	5.6E-03	2.3E-02	NA	2.9E-02
FLUORENE	7.4E-08	3.3E-06	4.3E-04	1.9E-02	NA	2.0E-02
1-METHYLNAPHTHALENE	1.3E-07	9.3E-06	7.4E-04	5.4E-02	NA	5.5E-02
2-METHYLNAPHTHALENE	6.2E-07	1.9E-05	3.6E-03	1.1E-01	NA	1.2E-01
NAPHTHALENE	3.6E-07	4.7E-05	2.1E-03	2.8E-01	NA	2.8E-01
PHENANTHRENE	5.3E-07	9.9E-06	3.1E-03	5.8E-02	NA	6.1E-02
PYRENE	1.3E-06	3.6E-06	7.5E-03	2.1E-02	NA	2.9E-02
PYRIDINES:						
TOTAL PYRIDINES	5.4E-07	2.6E-05	1.1E-02	5.1E-01	6.5E-01	1.2E+00
TOTAL:	0.000059	0.00019	0.13	1.2	0.65	2.0

Legend:
NA - Not Applicable
File Name: $UMNCF3.WK1
06-Dec-90

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Summary of Site Risks
Groundwater

[illegible]	Hazard Index	Estimated Lifetime Cancer Risk
Future Offsite Resident ·· Drinking ·· Contact	247 (pyridine) 0.90	5.5×10^{-4} (benzene) 7.4×10^{-6} (benzene)
Current Offsite Industrial Worker ·· Inhalation	0.13-0.29	1.64×10^{-6} - 1.07×10^{-6}
Future Offsite Industrial Worker · Inhalation	277.01 - 279.25	7.35×10^{-4} - 6.84×10^{-4}

TABLE 6-34
SUMMARY TABLE - HYPOTHETICAL OFF-SITE RESIDENT
FUTURE SCENARIO - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Potential Carcinogenic Risk Due To Drinking Ground Water	Potential Carcinogenic Risk Due to Ground Water Contact
METALS:		
ARSENIC	5.1E-05	1.7E-07
VOC:		
BENZENE	4.9E-04	7.2E-06
CHLOROFORM	4.3E-07	1.4E-09
METHYLENE CHLORIDE	9.7E-07	4.0E-09
TRICHLOROETHENE	6.0E-07	8.8E-09
BNA:		
BIS(2-ETHYLHEXYL)PHTHALATE	1.7E-06	2.5E-08
PAH:		
B(a)P-TE	8.6E-07	1.4E-08
TOTAL:	5.5E-04	7.4E-06

File Name: SUMGC1.WK1

06-Dec-90

Table 5 (CONT.) 3 of 3

TABLE 6-36a
SUMMARY TABLE - OFF-SITE INDUSTRIAL WORKER
INHALATION OF VOLATILES DURING INDUSTRIAL GROUNDWATER USE
CURRENT AND FUTURE SCENARIOS - CARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

CURRENT SCENARIO:		
	Excess Lifetime Cancer Risk	
Compound	Quiescent Scenario	Aerated Scenario
BENZENE	1.06E-06	1.62E-05
TRICHLOROETHENE	1.04E-08	1.61E-07
TOTAL	1.07E-06	1.64E-05

FUTURE SCENARIO:		
	Excess Lifetime Cancer Risk	
Compound	Quiescent Scenario	Aerated Scenario
BENZENE	6.83E-04	7.34E-04
TRICHLOROETHENE	9.86E-07	1.09E-06
TOTAL	6.84E-04	7.35E-04

File Name: SUMGC2.WK1 03-Apr-91
R.N.: 1

for scenarios such as the off-site resident (HI=247), and off-site industrial worker (HI=277) (see Table 4). Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to human health, welfare, or the environment.

Description of Alternatives

During the Feasibility Study (FS), Reilly identified and evaluated a list of alternatives that could be used to address the threats and/or potential threats identified for the soil, sludge and ground water at the site. Reilly screened the list of alternatives based on criteria for effectiveness (i.e. protection of human health and the environment, reliability), implementability (i.e. technical feasibility, compliance with applicable State and Federal regulations), and relative costs (i.e. capital, operation and maintenance).

The alternatives were evaluated separately for soil contamination, for contamination associated with sludge at the South Landfill, and for groundwater contamination associated with each of the five source areas. Remedial alternatives were screened for each source area based on contaminant characteristics at that area.

As a result, some of the alternatives did not apply to all five source areas. This is particularly evident for the containment, or cover, alternatives, which would have to be combined in some manner for total site cleanup. The areas for which the alternative is applicable are listed under that particular alternative.

Following this initial screening, the list of alternatives was evaluated and only alternatives that met the nine criteria, listed below in the comparative analysis section, were submitted for detailed analysis.

SOIL CLEANUP

Seven alternatives were evaluated during the detailed analysis of alternatives in the FS (See Table 5). These included no action; soil cover; asphalt/concrete cover; multi-layer cover; excavation/soil washing/slurry bioremediation; low temperature thermal desorption; and incineration, as described below.

Alternative 1: No Action

Under this alternative, no remediation would occur and the site would remain in its present condition. The contaminated soils would not be addressed. This alternative would include existing fence maintenance, construction of access controls, periodic

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1of 2

TABLE 6-35
SUMMARY TABLE - HYPOTHETICAL OFF-SITE RESIDENT
FUTURE SCENARIO - NONCARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

COMPOUND	Potential Noncarcinogenic Risk Due To Drinking Ground Water	Potential Noncarcinogenic Risk Due to Ground Water Contact
METALS:		
ARSENIC	0.67	0.002
CADMIUM	0.13	0.004
CHROMIUM III	0.01	0.0002
CHROMIUM VI	0.06	0.002
LEAD	4.27	0.02
MERCURY	0.04	0.0004
NICKEL	NA	0.03
VANADIUM	0.79	0.01
VOC:		
CHLOROFORM	0.02	0.00005
1,2-DICHLOROETHENE	NA	0.00001
ETHYLBENZENE	0.03	0.0004
METHYLENE CHLORIDE	0.01	0.00002
TOLUENE	0.01	0.0002
TOTAL XYLENES	0.003	0.00004
BNA:		
BIS(2-ETHYLHEXYL)PHTHALATE	0.01	0.0002
PAH:		
TOTAL CPAH	0.00002	0.0000003
NAPHTHALENE	1.74	0.03
1-METHYLNAPHTHALENE	0.08	0.001
PYRIDINES:		
TOTAL PYRIDINES	239	0.81
AMMONIA	0.30	0.0010
TOTAL:	247	0.90

Legend:
NA - Not Applicable.

File Name: SUMGNC1.WK1
05-Dec-90

TABLE 6-36b
SUMMARY TABLE - OFF-SITE INDUSTRIAL WORKER
INHALATION OF VOLATILES DURING INDUSTRIAL GROUNDWATER USE
CURRENT AND FUTURE SCENARIOS - NONCARCINOGENIC RISK
HUMAN HEALTH EVALUATION
REILLY INDUSTRIES, INDIANAPOLIS, INDIANA

CURRENT SCENARIO:		
	Hazard Index	
Compound	Quiescent Scenario	Batch Turnover Scenario
AMMONIA	0.09	0.20
PYRIDINES	0.04	0.09
TOTAL	0.13	0.29

FUTURE SCENARIO:		
	Hazard Index	
Compound	Quiescent Scenario	Batch Turnover Scenario
AMMONIA	12.41	14.65
PYRIDINES	264.60	264.60
TOTAL	277.01	279.25

File Name: SUMGC2.WK1 03-Apr-91
R.N.: 2

TABLE 5

ALTERNATIVES ANALYZED FOR SOIL CLEANUP

ALTERNATIVE 1: NO ACTION

ALTERNATIVE 2: SOIL COVER

ALTERNATIVE 3: ASPHALT/ CONCRETE COVER

ALTERNATIVE 4: MULTI-LAYER COVER

ALTERNATIVE 5: EXCAVATION/ SOIL WASHING/ SLURRY BIOREMEDIATION

ALTERNATIVE 6: LOW TEMPERATURE THERMAL DESORPTION

ALTERNATIVE 7: INCINERATION

monitoring of the ground-water quality, and provide operation and maintenance at the five areas. Although this alternative does not address the contaminated soils, its inclusion in the detailed alternatives analysis is required by CERCLA as a baseline for comparison to the other alternatives developed. Costs associated with this alternative consist of periodic sampling and analysis of groundwater quality at the five CERCLA areas.

Future land use at the Former Sludge Pit, the Former Drainage Ditch, the Former Abandoned Railway Trench, and the South Landfill/Fire Pond would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Cost:	$910,000
Time to Implement:	none

Alternative 2: Soil Cover

A soil cover would be constructed over the soils at the Former Drainage Ditch and the South Landfill/Fire Pond. Prior to installation, any vegetation would be cleared, large debris at the surface would be removed, and the remaining material would then be compacted and graded. Following this site preparation, six inches of a gravel based material would be spread across the graded area. Once spread, the gravel would be covered with a six inch layer of topsoil and seeded to minimize erosion.

Future land use at the South Landfill/Fire Pond would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Cost	$ 1,766,000
Time to Implement:	6 weeks

Alternative 3: Asphalt/Concrete Cover

Under this alternative, an asphalt or concrete cover would be placed over the remediation areas at the Lime Pond, the Former Drainage Ditch, the Sludge Treatment Pit, and the Abandoned Railway Trench. Surface debris and vegetation would be removed and the areas would be graded prior to covering these areas. A thin layer of gravel would be placed over these areas prior to the placement of the asphalt or concrete covers.

Future land use at the Former Sludge Pit, the Former Drainage Ditch, and the Former Abandoned Railway Trench would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Costs:	$ 1,300,000
Time to Implement	6 weeks

Alternative 4: Multi-Layer Cover

Under this alternative, a multi-layer cover consisting of a sand bedding layer, a high density polyethylene geomembrane, a drainage layer, and a layer of loam would be placed over the Lime Pond. Surface debris and vegetation would be removed and the area graded prior to covering this area. This area would be extended to the south and west to cover the area where lime sludge is currently located.

Future land use at the South Landfill/Fire Pond would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Costs:	$ 550,000
Time to Implement	4 weeks

Alternative 5: Excavation/Soil Washing/Slurry Bioremediation

Under this alternative, soils at the Lime Pond drum removal area, the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch would be excavated and treated. Bioremediation would be preceded by soil washing to help to concentrate the contaminated silt and clay fractions of the waste. Water and acclimated, cultured bacteria would then be added to the soil mix and agitated, resulting in a soil slurry mixture. This mixture is then pumped through a series of biotreatment reactors where additional nutrients, bacteria, and air are utilized to treat the contaminated slurry. Treated soil would be replaced in the area from where it was excavated consistent with the promulgated Corrective Action Management Unit (CAMU) regulations regarding replacement of the treated soil.

Future land use at the Former Sludge Pit, the Former Drainage Ditch, and the Former Abandoned Railway Trench would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Costs:	$ 6,000,000
Time to Implement	60 months

Alternative 6: Low Temperature Thermal Desorption

Under this alternative, soils at the Lime Pond drum removal area, the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch would be excavated and treated. Thermal desorption units separate organic contaminants from soil by increasing the volatilization through heating. These treatment units typically consist of a chamber for heating the soils, a condensate collection system, and an off-gas treatment system. The organic contaminants are not directly destroyed but are separated from the soil as off-gases. The organic off-gases, as well as water removed from the soil are captured in the condensate treatment system. Additional treatment of the airstream by activated carbon is usually required. Treatment residuals could be destroyed in on-site boilers for which regulatory approval would be required, or sent off-site for treatment and disposal. Treated soil would be replaced in the area from where it was excavated consistent with the promulgated Corrective Action Management Unit (CAMU) regulations regarding replacement of the treated soil.

Future land use at the Former Sludge Pit, the Former Drainage Ditch, and the Former Abandoned Railway Trench would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Costs:	$ 4,000,000
Time to Implement	6-12 months

Alternative 7: Incineration

Under this alternative, soils at the Lime Pond drum removal area, the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch would be excavated and incinerated. The rotary kiln incinerator uses a primary combustion chamber which rotates about its long axis to cause a turbulent environment to treat materials. Materials to be treated are fed into a "hot" end of the incinerator along with the primary fuel and combustion air for the system. Gases produced from this process are passed through the "cold" end of the incinerator and generally into an afterburner or secondary combustion chamber. Treated soil residuals or bottom ashes also exit the incinerator via the stack. Flue gases then exit the incinerator via the stack. Treated soil would be replaced in the area from where it was excavated consistent with the promulgated Corrective Action Management Unit (CAMU) regulations regarding replacement of the treated soil.

Future land use at the Former Sludge Pit, the Former Drainage Ditch, the Former Abandoned Railway Trench, and the South Landfill/Fire Pond would be limited to industrial use by institutional controls consisting of deed restrictions.

Present Worth Costs:	$ 6,350,000
Time to Implement	6-9 months

SLUDGE CLEANUP

Three alternatives were evaluated during the detailed analysis of alternatives in the FS/CMS (see Table 6). These included no action; in-situ solidification; and incineration, as described below.

TABLE 6

ALTERNATIVES ANALYZED FOR SLUDGE CLEANUP (SOUTH LANDFILL)

ALTERNATIVE 1: NO ACTION

ALTERNATIVE 2: IN-SITU SOLIDIFICATION

ALTERNATIVE 3: INCINERATION

Alternative 1: No Action

Under this alternative, there would be no action taken for the sludge contamination at the South Landfill. This alternative would not reduce the threats to human health and the environment at the site. The inclusion of the no action alternative is required by law to give U.S. EPA a basis for comparison between remedial alternatives. Costs associated with this alternative consist of periodic sampling and analysis of groundwater quality at the five CERCLA areas. Future land use at the South Landfill/Fire Pond would be limited to industrial use by institutional controls, including deed restrictions.

Present Worth Costs:	$ 290,000
Time to Implement	Immediate

Alternative 2: In-Situ Solidification

Under this alternative, the sludge would be solidified in order to provide a stable foundation for a cover material and to prevent the sludge from seeping through or around a cover. Solidification would be accomplished through a large diameter auger. The mixing head is enclosed in a specially designed cylindrical hood which allows for the capture of air emissions from the mixing operation. As the augur head is advanced into the sludge, grout is injected into the sludge and blended into a solidified mass. Future land use at the South Landfill/Fire Pond would be limited to industrial use by institutional controls, including deed restrictions.

Present Worth Costs:	$ 800,000
Time to Implement	1.5 months

Alternative 3: Incineration

Under this alternative, which is similar to Alternative 7 for soil, sludge would be mixed with sand to facilitate excavation and incineration. Future land use at the South Landfill/Fire Pond would be limited to industrial use by institutional controls, including deed restrictions.

Present Worth Costs:	$ 8,600,000
Time to Implement	7.25 months

Summary of the Comparative Analysis of Alternatives for Soil Cleanup

The nine criteria used by U.S. EPA to evaluate remedial alternatives, as set forth in the NCP, 40 CFR Part 300.430, include: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; cost; state acceptance; and community acceptance. Based on evaluation of the alternatives with respect to these nine criteria, U.S. EPA has selected Alternative 6 - Low Temperature Thermal Desorption as the alternative for the soil cleanup under this operable unit remedy for this Site.

THRESHOLD CRITERIA

Protection of Human Health and the Environment

Addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternative 1 would not protect human health and the environment because it does not reduce risks associated with exposure to contaminated soils. Alternatives 2, 3 and 4 would reduce the threats to human health and the environment by placement of a cover material over the contaminated areas, however, they would not reduce the toxicity, mobility and volume of contaminants through treatment.

Pilot testing is needed before a final determination can be made regarding Alternative 5; however, it appears that Alternative 5 is less protective than Alternatives 6 or 7 due to potential longer treatment times which increase short term exposures. Alternatives 6 and 7 are the most protective because they offer the greatest reduction in toxicity and the greatest long term effectiveness and permanence.

Therefore, since it has been determined that Alternative 1 would not be protective of human health and the environment or meet ARARs, it will no longer be considered in the nine criteria evaluation. It appears that Alternative 5 may be able to meet ARARs, although further pilot testing is necessary before a final determination can be made. Alternatives 6 and 7 are functionally equivalent with respect to this threshold criterion, and are superior to Alternatives 2, 3 and 4 because of the contaminant reduction capabilities.

Compliance with ARARs

Addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver of those laws.

All of the alternatives are capable of meeting ARARs. ARARs for Alternatives 2, 3 and 4 are similar to one another and more easily met compared to the ex-situ technologies ARARs. These ARARs relate to health and safety, erosion control, dust emissions, and storm water discharge. ARARs for the ex-situ treatment alternatives 5, 6 and 7 include excavation-related requirements in addition to those specific to the treatment technology, including ARARs relative to the treatment, storage, transportation and disposal of hazardous waste. ARARs for Alternatives 5, 6 and 7 also include air emission requirements. However, pilot testing is needed to determine if Alternative 5 actually can meet ARARs. ARARs for Alternative 7 would be the most difficult to meet and would include compliance with the provisions of 40 CFR 264.34 Part O.

Therefore, it has been determined that Alternative 5 needs further testing to determine whether it can meet ARARs, while Alternatives 2, 3, 4, 6 and 7 are functionally equivalent with respect to this threshold criterion, because of their individual ability to meet the ARARs appropriate to each alternative.

BALANCING CRITERIA

Long Term Effectiveness

Addresses any expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup standards have been met.

Alternative 5 cannot be ranked relative to the other alternatives with respect to this criterion until further bench-scale and pilot-scale tests are performed, due to uncertainties associated with the distribution of oxygen and nutrients, soil heterogeneities, and reaction kinetics. Alternative 7 offers the greatest long term effectiveness and permanence, considering the ability of incineration to destroy the organic contaminants. Alternative 6 provides a slightly lower level of long term effectiveness and permanence when compared to Alternative 7. However, the condensate generated from the desorption process would be incinerated off-site, resulting in complete destruction of the organic contaminants in the soil. Alternative 5 has the potential of achieving contaminant destruction levels similar to Alternatives 6 and 7 but pilot testing is needed before a final determination can be made regarding this alternative.

Alternatives 2, 3 and 4 are capable of effectively controlling site risks over the long term; however, these alternatives would leave the contaminated soils in place without treatment. The long term effectiveness and permanence of these alternatives is entirely dependent on the durability and maintenance of the covers and caps.

Therefore, it has been determined that Alternatives 6 and 7 are functionally equivalent with respect to this balancing criterion, and are superior to Alternatives 2, 3, 4 and 5 because of the contaminant reduction capabilities.

Reduction of Toxicity, Mobility or Volume

Addresses the anticipated performance of the treatment technologies a remedy may employ.

Alternative 7 provides the greatest reduction in toxicity, mobility and volume. Alternative 7 provides for onsite, permanent destruction of contaminants. Alternative 6 provides a high degree of contaminant removal. Contaminants would be transferred from the soils to condensers or filter media. The toxic compounds would be recovered as toxic waste and would be disposed of offsite. Alternative 5 offers the potential for a high degree of contaminant removal, but treated soils may contain higher levels of residual contamination than Alternatives 6 or 7. However, pilot testing is needed before a final determination can be made regarding this alternative. Alternatives 2, 3 and 4 will not reduce the toxicity or volume of contaminants. Alternatives 3 and 4 may be effective at reducing the mobility of contaminants by reducing groundwater infiltration, although this reduction would not be achieved through treatment. Alternative 2 will have less of an impact on reducing contaminant mobility when compared to Alternatives 3 and 4.

Therefore, it has been determined that Alternatives 6 and 7 are functionally equivalent and are superior to Alternatives 2, 3, 4 and 5 with respect to this balancing criterion because of the contaminant reduction capabilities.

Short Term Effectiveness

Addresses the period of time needed to achieve protection and any negative effects on human health and the environment that may be posed during the construction and implementation period, until cleanup standards are achieved.

Alternatives 2, 3 and 4 result in higher short term exposures over no action as a result of workers being involved in grading and other activities at the source areas. The longest time to complete a containment alternative is six weeks.

Alternatives 5, 6 and 7 result in higher short term exposures when compared to the containment alternatives. Excavation of contaminated soil may release organic chemicals to the air. Excavation will take place over longer periods of time than for the containment alternatives, resulting in an increased potential for releases of chemicals to the air. There is also a potential for failure of the off-gas treatment system which may increase short term exposures to site contaminants. With proper maintenance and monitoring, the likelihood of equipment failure resulting in a significant release is low. Exposures to onsite and offsite receptors would be minimized by air emission controls, such as use of dust suppressants during material handling. Also, properly designed engineering controls will significantly limit the potential exposure to organic chemicals to on-site workers and off-site residents.

Pilot testing is needed to fully evaluate Alternative 5 with respect to this criterion while Alternatives 2, 3 and 4 result in the lowest risks in the short term. Alternatives 6 and 7, while potentially resulting in increased short term risk, will not significantly increase exposure risks in the short term with properly designed engineering and air emission controls and ongoing monitoring and maintenance.

Implementability

Addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed for a particular option to be put in place.

Alternatives 2, 3 and 4 are expected to be easy to implement. The necessary materials, equipment and specialists for each of the capping/cover alternatives are readily available. Alternative 6 is also readily implemented, except that bench and pilot scale tests are required to establish treatment parameters. Offsite disposal of hazardous wastes will have to be arranged. The necessary technologies, specialists and equipment are readily available. Alternative 7 can be implemented but will likely require higher levels of permitting and monitoring than Alternative 6. Alternative 5 may be the most difficult alternative to implement since the reliability of bioremediation for achieving the cleanup goals is uncertain, due to the uncertain treatment effectiveness and levels of contamination present at the site.

Therefore, further testing is required to determine the implementability of Alternative 5 and Alternatives 2, 3, 4, 6, and 7 are functionally equivalent with respect to this balancing criterion.

Cost

Included are capital costs, annual operation and maintenance costs (assuming a 30 year time period), and net present value of capital and operation and maintenance costs. The selected remedy must be cost effective.

The present worth costs of Alternatives 2, 3 and 4 are low, ranging from $160,000 for the asphalt/concrete cover on the Former Sludge Treatment Pit to $2,000,000 for a soil cover on the South Landfill, including groundwater monitoring costs. However, some combination of these containment alternatives would be necessary for total cleanup of the five CERCLA areas under this operable unit, while each of the treatment alternatives listed below represents total cleanup. Present worth costs for Alternative 5, 6 and 7 are higher than those for the containment alternatives, ranging from

$4,000,000 for Alternative 6 to $6,350,000 for Alternative 7.

Therefore, based on analysis of the costs associated with all of the alternatives analyzed in the FS, it appears that Alternative 6 has the lowest present worth cost for the treatment alternatives, and Alternative 4 has the lowest present worth cost for the containment alternatives. However, the containment alternatives would have to be combined in some manner so that total site cleanup can be achieved for all of the CERCLA areas.

MODIFYING CRITERIA

State Acceptance

Addresses whether or not the State agency agrees to or objects to any of the remedial alternatives, and considers State ARARs.

The Indiana Department of Environmental Management (IDEM) has been intimately involved with the Site throughout the RI/FS, has attended all technical progress meetings, has been provided opportunity to comment on technical decisions, and concurs with the selection of Alternative 6 as the selected remedy for this operable unit soil cleanup at the Site.

Community Acceptance

Addresses the public's general response to the remedial alternatives and proposed plan.

Throughout the RI/FS at the Site, community involvement has been moderate. U.S. EPA has been accessible and responsive to community concerns throughout the study. At the public meeting for the proposed plan, the majority of those in attendance, as well as the majority of those who submitted written comments regarding the proposed plan, were in favor of Alternative 6 as the most appropriate choice for the soil cleanup. Permanent contaminant destruction was the primary reason for the citizen support for this remedy.

In summation, Alternative 1 is unacceptable for protection of human health and the environment. Alternatives 2, 3 and 4 will provide protection from exposure to risks associated with contact with contaminated soils at the CERCLA areas but will not prevent their detrimental impacts on groundwater quality and its accompanying unacceptable risk. These alternatives will also not reduce the toxicity, mobility or volume of contaminants through treatment and will require that contamination be left in place. The long term permanence of these containment alternatives can also not be assured so that future risks associated with exposure to contaminated soil cannot be entirely prevented. Alternative 5 would require additional time for pilot studies, may not be effective, and has a similar present worth cost to Alternatives 6 and 7. Alternatives 6 and 7 may pose problems with short term effectiveness due to potential emissions or dust generated from excavation activities but these potential problems will be minimized with properly designed engineering controls and dust suppression technologies. Alternatives 6 and 7 permanently remove the contaminants from the soil, thus ensuring that risks associated with exposure to contaminated soil will be eliminated. Alternatives 6 and 7 offer similar levels of long term effectiveness and permanence and permanently reduce the toxicity, mobility and volume of contaminants through treatment. Alternative 7 is less implementable than Alternative 6 and is more costly. Therefore, the best balance among the seven alternatives is Alternative 6, Low Temperature Thermal Desorption.

EPA also evaluated the aforementioned seven alternatives for soil cleanup of the South Landfill. The Fire Pond cleanup is addressed under alternatives for sludge cleanup. Alternative 2 - Soil Cover -was selected for soil cleanup at the remainder of the South Landfill. As is highlighted in the discussion above regarding hot spot delineation, due to the widespread contamination at this area, the absence of any discernable hot spot area, and the prohibitive volume of contaminated soils at this area, it was determined that the South Landfill would not be included in the hot spot delineation.

As a result, it was determined that Alternatives 2, 3 and 4 were more effective in the short term, more easily implementable, and more cost effective than Alternatives 5, 6 and 7. Alternative 5 would require additional time for pilot studies, may not be effective, and has a similar present worth cost to Alternatives 6 and 7. Although Alternatives 2, 3 and 4 do not reduce the toxicity, mobility or volume of contaminants through treatment, as would Alternatives 6 and 7, they are more cost effective for cleanup of the South Landfill. Finally, Alternative 2 is more easily implemented than Alternatives 3 and 4 and has a greater effectiveness in the long and short term than Alternatives 3 and 4. Therefore, the best balance among the seven alternatives for South Landfill cleanup is Alternative 2, Soil Cover.

SELECTED REMEDY FOR SOIL CLEANUP

As was discussed in the previous section, EPA has selected Alternative 6 - Low Temperature Thermal Desorption as the appropriate soil cleanup remedy for the Reilly Tar and Chemical site. This alternative was selected because it is the most appropriate alternative for this operable unit action and is compatible with the final remedial alternatives anticipated for the Site, which will likely encompass additional source-area remediation.

The objective of this operable unit action is to remediate on-site source areas that are contributing to contamination of both soils and groundwater. The areas that will be addressed by the selection of this remedial action are the Lime Pond drum removal area, the Abandoned Railway Trench, the Former Drainage Ditch, and the Former Sludge Treatment Pit. The result of this action will be a reduction in the levels of on-site contamination and will maximize the performance of the groundwater extraction/treatment/discharge system that was detailed in the ROD for the groundwater operable unit at the site.

The FS contains a description of this alternative and a typical process flow chart for thermal desorption is outlined on Figure 7. Thermal desorption units separate organic contaminants from soil by increasing volatilization through heating. The units generally consist of a chamber for heating the soils, a condensate collection system and an off-gas treatment system. Operational temperatures and treatment times are tailored to the properties of the material being treated. Typically, temperatures range from 200 degrees F to 1000 degrees F and treatment times range from a few minutes to an hour. The organic contaminants are not directly destroyed but are separated from the soil as off-gases. The organic off-gases as well as water removed from the soil are primarily captured in the condensate treatment system. More volatile organics are captured in a media such as activated carbon or destroyed by incineration. Most systems also require a cyclone separator to reduce particulate emissions. Water, organics, and some particulates are carried away from the heated chamber by an inert carrier gas. Particulates are usually captured in a cyclone separator or liquid scrubber. Heat exchangers are generally used to condense the bulk of the organics. Additional treatment of the airstream by activated carbon is usually required. The condensed organics, contaminated carbon, and scrubber water would contain hazardous materials and would require additional treatment. It is possible that the condensed organics could be destroyed in on-site boilers. Approval of the U.S. EPA is required for additional treatment in on-site boilers.

Several different types of thermal desorption units are in development or are currently commercially available. A key aspect of the different designs is the method employed for heating the contaminated soil. Heating methods include indirect or direct fired rotary kilns, internally heated screw augurs and fluidized media. Factors such as soil properties, level of contamination and contaminants determine the type of unit to be used. Bench scale and pilot scale tests are required during remedial design to define operational parameters and to assure that cleanup goals can be met.

Risk Based Target Cleanup Levels (RBTCLs) are listed in Table 7. These were presented in the FS/CMS. These RBTCLs were used in the hot spot delineation process for determining the amount of soil to be excavated at each of the CERCLA areas. Soils at the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch will be treated to industrial cleanup standards as are highlighted with an asterisk on Table 7. Soils at the Lime

FIGURE 7

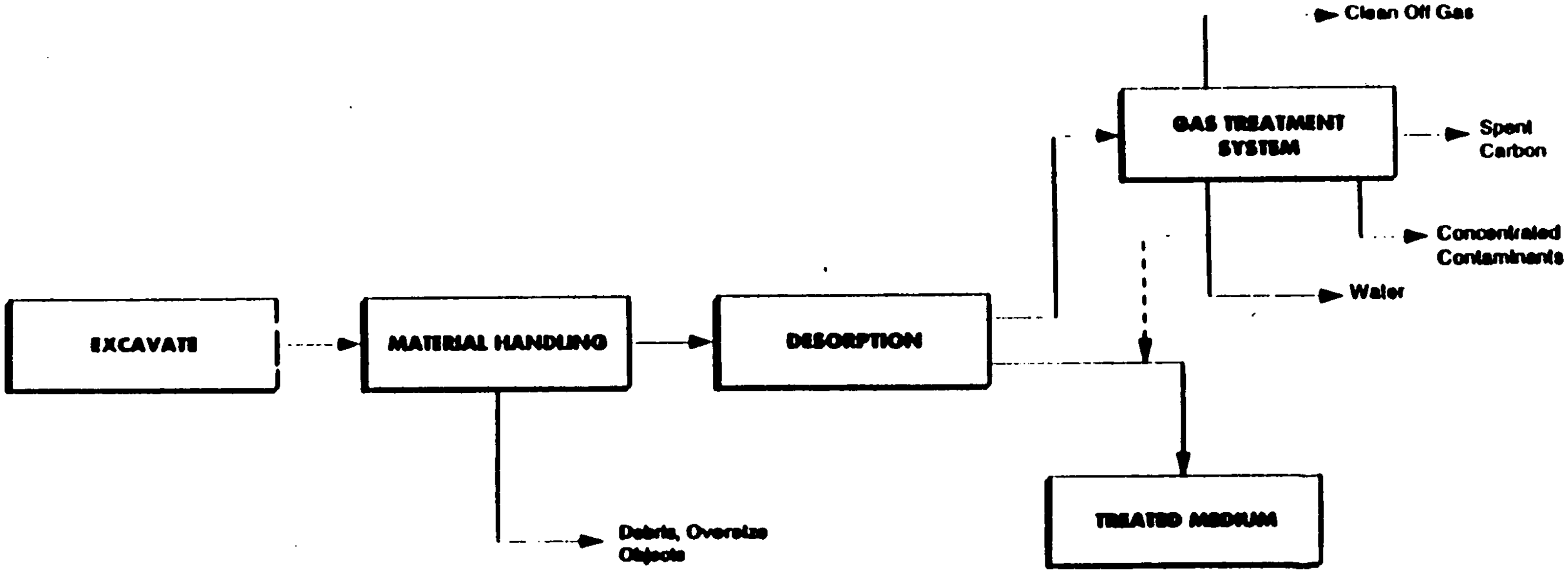

FIGURE 4.2-2
Thermal Description Process Flow
(Source, EPA Technical Bulletin, 1991)

TABLE 1.3-2
SUMMARY OF RISK-BASED TARGET CLEANUP LEVELS (RBTCLs) IN MG/KG FOR B(a)P TE IN SOIL ASSUMING INDUSTRIAL/COMMERCIAL SITE USE
REILLY INDUSTRIES, INDIANAPOLIS SITE

MEDIUM	SWMU	RECEPTOR	SCENARIO	B(a)P-TE RBTCLs for Industrial/Commercial Site Use		
				Target Risk = 10^-4	Target Risk = 10^-5	Target Risk = 10^-6
Surface Soil	South Landfill	On-Site Worker	RME	8000	800	80
		On-Site Worker	Worst Case	60	6	0.6
	Lime Pond Railway Trench Sludge Pit Drainage Ditch	On-Site Worker	RME	300	30	3
		On-Site Worker	Worst Case	60	6	* 0.6 *
	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	Construction Worker	RME	2000	200	20
		Off-Site Neighborhood Resident (Teen)	RME	2000	200	20
Subsurface Soil	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	On-Site Worker	RME	10,000	1000	100
		Construction Worker	RME	2000	200	* 20 *
		Off-Site Neighborhood Resident (Teen)	RME	15,000	1500	150

Notes:
B(a)P-TE - Benzo(a)Pyrene Toxic Equivalents.
RME - Reasonable Maximum Exposure.
SWMU - Solid Waste Management Unit.

TABLE 1.3.3
SUMMARY OF RISK-BASED TARGET CLEANUP LEVELS (RBTCLs) FOR PYRIDINES IN SOIL ASSUMING INDUSTRIAL/COMMERCIAL SITE USE
REILLY INDUSTRIES, INDIANAPOLIS SITE

MEDIUM	SWMU	RECEPTOR	SCENARIO	Pyridine RBTCLs for Industrial/Commercial Site Use (ppm) (Target HI = 1.0)
Surface Soil	South Landfill	On-Site Worker	RME	66,600
		On-Site Worker	Worst Case	570
	Lime Pond Railway Trench Sludge Pit Drainage Ditch	On-Site Worker	RME	2500
		On-Site Worker	Worst Case	570
	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	Construction Worker	RME	* 510 *
		Off-Site Neighborhood Resident (Teen)	RME	4200
Subsurface Soil	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	On-Site Worker	RME	2500
		Construction Worker	RME	510
		Off-Site Neighborhood Resident (Teen)	RME	4200

Notes:
RME - Reasonable Maximum Exposure.
SWMU - Solid Waste Management Unit.

Table 7 (Con
2 of

TABLE 1.3-2
SUMMARY OF RISK-BASED TARGET CLEANUP LEVELS (RBTCLs) IN MG/KG FOR B(a)P-TE IN SOIL ASSUMING RESIDENTIAL SITE USE
REILLY INDUSTRIES, INDIANAPOLIS SITE

MEDIUM	SWMU	RECEPTOR	SCENARIO	B(a)P-TE RBT Target Risk = 10^-4	Target Risk = 10^-5	Target Risk = 10^-6
Surface Soil	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	Hypothetical On-Site Resident	RME	40	4	0.4
		Hypothetical On-Site Resident	Worst Case	20	2	* 0.2 *
Subsurface Soil	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	Hypothetical On-Site Resident	RME	1500	150	* 15 *

Notes:
B(a)P-TE - Benzo(a)Pyrene Toxic Equivalents.
RME - Reasonable Maximum Exposure.
SWMU - Solid Waste Management Unit.

TABLE 1-3-5
SUMMARY OF RISK-BASED TARGET CLEANUP LEVELS (RBTCLs) FOR PYRIDINES IN SOIL ASSUMING RESIDENTIAL SITE USE
REILLY INDUSTRIES, INDIANAPOLIS SITE

MEDIUM	SWMU	RECEPTOR	SCENARIO	Pyridine RBTCLs for Residential Site Use (ppm) (Target HI = 1.0)
Surface Soil	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	Hypothetical On-Site Resident	RME	310
		Hypothetical On-Site Resident	Worst Case	150
Subsurface Soil	Lime Pond Railway Trench Sludge Pit Drainage Ditch South Landfill	Hypothetical On-Site Resident	RME	* 410 *

Notes:
RME - Reasonable Maximum Exposure.
SWMU - Solid Waste Management Unit.

Pond Drum Removal Area will be treated to residential cleanup standards, as are highlighted with an asterisk on Table 7.

Soil will be treated by low temperature thermal desorption to achieve the cleanup standards highlighted with an asterisk in Table 7. The levels that are highlighted on Table 7 represent the lowest values under a given set of assumptions and at a given risk level will result in conservative remediation goals that are protective of all of the receptors for which these levels were derived, and all receptors assumed to have equal of lesser exposures. In this manner, all potential exposures will be accounted for and risks minimized for all receptors. Both industrial and residential cleanup levels were highlighted for the following chemicals of concern: cPAHs (using the benzo(a) pyrene toxic equivalency factor recommended in the Risk Assessment Guidance for Superfund); and pyridines. The RBTCLs derived for surface soil should be applied to the top six inches of soil at the CERCLA areas. The RBTCLs derived for subsurface soil should be applied to material under the top six inches and above the shallowest water table in each of the CERCLA areas.

In order to ensure that applying the RBTCLs as a cleanup standard to these soils will not pose a residual threat to groundwater when the soils are placed back into the locations from which they were excavated, a performance based standard shall also be applied to the treated soils.

The treated soils shall be tested by the Toxicity Characteristic Leaching Procedure (TCLP), or a modification of this procedure if approved by EPA, and the leachate analyzed for the Contract Laboratory Program (CLP) Target Compound List (TCL) volatiles and semi-volatiles. The concentrations in the leachate shall not exceed the concentrations for those parameters listed in Table 8. The performance of the treatment system for soils shall be demonstrated during the remedial design of the low temperature thermal desorption unit(s). Periodic testing during the operation of the treatment system shall be conducted to ensure the performance of the treatment system. The performance standards shall be attained for the treatment of soils to ensure that residual leaching threats to groundwater from the treated soils are eliminated.

If at any time, any contaminants are present in the treated soils other than those above that exceed a 10(-6) cumulative lifetime cancer risk, or MCLs for carcinogens, whichever is more stringent; and MCLs, maximum contaminant level goals (MCLGs), or a hazard index of 1.0, whichever is more stringent, for non carcinogens, additional remedial work as determined by U.S. EPA shall be performed.

Treated soils will be replaced in the areas from where they are excavated and covered with six inches of soil and seeded. The

DISCHARGE CRITERIA
REILLY SITE. INDIANAPOLIS. INDIANA

CONTAMINENT	RECHARGE LIMIT[a] (μg/l)
Volatile Organic Compounds	
methylene chloride	5
acetone	-
chloroform	100
1-2-dichloroethane	5
2-butanone	-
bromodichloromethane	100
benzene	5
toluene	1000
ethylbenzene	700
total xylene	10,000
Pyridine Derivatives	
pyridine	35[c]
2-picoline	35
3 & 4-picoline	35
2,6-lutidine	35
2-ethylpyridine	35
2,4 & 2,5-lutidine	35
2,3-lutidine	35
3-ethylpyridine	35
4-ethylpyridine	35
3,5-lutidine	35
3,4-lutidine	35
2-methyl-5-ethylpyridine	35
2-methyl-3-ethylpyridine	35[c]

CONTAMINENT	RECHARGE LIMIT[a] (µg/l)
2-methyl-4-ethylpyridine	35[c]
Polynuclear Aromatic Hydrocarbons	
Naphthalene	-
1-methylnaphthalene	-
Metals	
Aluminum	-
Arsenic	50
Barium	1000[d]
Beryllium	1
Cadmium	10[d]
Chromium	50[d]
Cobalt	-
Copper	1,300
Lead	5
Mercury	1
Nickel	100
Selenium	10[d]
Silver	35
Vanadium	-
Zinc	-
Semi Volatiles	
2,4-dimethylphenol	-
Bis(2-ethylhexyl) phthalate	4,200
3 & 4-dimethylphenol	-
General Water Quality	(mg/l)
Ammonia - nitrogen	30
Nitrate - nitrogen	10

CONTAMINENT	RECHARGE LIMIT[a] (µg/l)
Kjeldahl - nitrogen	-
Nitrate - nitrogen	1
Nitrate + nitrite	10
Phosphorus[f]	1
Calcium	-
Iron[g]	1
Magnesium	-
Manganese	-
Potassium	-
Sodium	-
Hardness (as $CaCO_3$)	-
Chemical Oxygen Demand	-
Total Organic Carbon	-
Total Suspended Solids[f]	25 - 30
Biological Oxygen Demand[f]	25 - 30
Alkalinity	-
pH	6 - 9
Specific Conductivity (micromnos/cm)	1,200
Chlorides	250
Sulfates	250
Temperature	-

(a) Based on MCLs or other pertinant standard.
(b) Based on Reilly's existing permit for discharge to the Belmont POTW.
(c) Calculated assuming hazard index of 1.
(d) Supplied by IDEM by fax dated 9/6/91.
(e) Indianapolis City Sewer Ordinance.
(f) Clark, Viessman and Hammer, 1977.
(g) Supplied by EPA in letter dated 9/16/91.

Corrective Action Management Unit (CAMU) regulations allow the replacement of the treated soils into the units from where they were excavated. The five CERCLA areas are designated in this ROD as Corrective Action Management Units. This designation will result in the treatment of contaminated soils which will result in permanent reduction in the toxicity, mobility and volume of contamination at the CERCLA areas. Absent this designation, these areas may not have been treated and replaced, thus not achieving reduction in the toxicity, mobility and volume of contaminants at the site.

Treatment residuals from the low temperature thermal desorption process will be incinerated off-site, as is presented in the FS/CMS. This will result in complete destruction of the organic contaminants removed during the desorption process.

Samples collected outside of the excavation areas at the Lime Pond drum removal area, the Former Drainage Ditch, the Former Sludge Treatment Pit and the Former Abandoned Railway Trench would be tested using the already described criteria and if they fail, they could be added to the total. However, the potential for this to occur is low and should not significantly increase the volume required to be excavated as a result of the hot spot delineation criteria.

The point of compliance for this action only, will be the CERCLA Area boundaries, as is defined on Figure 3.

Future land use at the Lime Pond would be unrestricted. Because the soils at the Lime Pond are to be treated to residential cleanup levels, deed restrictions for this area are unnecessary. Residential cleanup levels were selected for this portion of the site because of the close proximity (<50 feet) to residential areas to the north of the site.

Future land use at the Former Sludge Pit, the Former Drainage Ditch, the Former Abandoned Railway Trench, and the South Landfill/Fire Pond would be limited to industrial use by institutional controls consisting of deed restrictions. These deed restrictions would be developed so that they could not be wiped out by rezoning efforts.

Access controls would be placed to restrict the potentially exposed population from entering these contaminated areas and, thereby, would prevent the associated exposures. The South Landfill is already fenced to prevent access; however, the other CERCLA Areas are in locations where vehicular traffic and industrial worker exposures are not prevented. Guardrails to restrict traffic and signs to identify potential hazards will be installed at the Abandoned Railway Trench and the Former Drainage Ditch areas. Fencing would be installed at the Former Sludge Treatment Pit. Additional fencing would be installed at the Lime Pond area.

Maintenance of all fences and guardrails would be required.

Summary of the Comparative Analysis of Alternatives for Sludge Cleanup

The nine criteria used by U.S. EPA to evaluate remedial alternatives, as set forth in the NCP, 40 CFR Part 300.430, include: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; cost; state acceptance; and community acceptance. Based on evaluation of the alternatives with respect to these nine criteria, U.S. EPA has selected Alternative 2 - In-Situ Solidification as the alternative for this operable unit remedy for this Site.

THRESHOLD CRITERIA

Protection of Human Health and the Environment

Addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Alternative 1 would not protect human health and the environment because it does not reduce risks associated with exposure to the contaminated sludge; however, it produces the lowest short term risks. Alternative 3, incineration, may be the most protective because it provides the greatest reduction in toxicity and the greatest long term effectiveness. However, this alternative also presents the greatest potential for short term exposures to onsite workers and offsite residents. When compared to Alternative 3, Alternative 2 provides a lower level of long term effectiveness and will not result in a reduction in contaminant toxicity. Alternative 2 does present significantly lower short term risks when compared to Alternative 3. If implemented, Alternative 2 would significantly reduce site risks by preventing direct exposure to the sludge.

Therefore, since it has been determined that Alternative 1 would not be protective of human health and the environment, it will no longer be considered in the nine criteria evaluation. Alternatives 2 and 3 have been determined to be functionally equivalent with respect to this threshold criteria.

Compliance with ARARs

Addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver of those laws.

All of the alternatives are capable of meeting ARARs. ARARs for Alternative 2 relate to health and safety, erosion control, and fugitive dust emissions and are more easily met compared with Alternative 3. ARARs for Alternative 3 would be the most restrictive and would include compliance with the provisions of 40 CFR Part O, as well as other ARARs relative to the treatment, storage, transportation and disposal of hazardous waste treatment residuals.

Therefore, it has been determined that Alternative 2 is functionally equivalent to Alternative 3 with respect to this threshold criteria, but there are cost and implementability problems in meeting ARARs for Alternative 3.

BALANCING CRITERIA

Long Term Effectiveness

Addresses any expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup standards have been met.

Alternative 3 provides the greatest long term effectiveness and permanence, considering the ability of incineration to destroy the organic contaminants of concern. Residual levels of organic contaminants in sludge following incineration are expected to be extremely low. Long term monitoring, maintenance and a five year review of the remediated site may not be necessary if this alternative is implemented. Alternative 2 is capable of effectively controlling site risks over the long term. However, the in-situ solidification process would not destroy the contaminants, they would be left in place. Long term monitoring, maintenance and a five year review of the site would probably be required.

Therefore, it has been determined that Alternative 3 is slightly better than Alternative 2 with respect to this balancing criterion.

Reduction of Toxicity, Mobility or Volume

Addresses the anticipated performance of the treatment technologies a remedy may employ.

Alternative 3 provides the greatest reduction in toxicity, mobility and volume and would result in permanent destruction of the contaminants. Alternative 2 will not reduce the toxicity or volume of contaminants. It would also be effective at reducing the mobility of contaminants by reducing groundwater infiltration, erosion, and airborne dust, although these reductions would not be achieved through treatment.

Therefore, it has been determined that Alternative 3 is superior to

Alternative 2 with respect to this balancing criterion.

Short Term Effectiveness

Addresses the period of time needed to achieve protection and any negative effects on human health and the environment that may be posed during the construction and implementation period, until cleanup standards are achieved.

Alternative 2 results in slightly higher short term exposures over no action as a result of workers being involved in the solidification process and other activities at the Fire Pond. Exposures to onsite and offsite receptors would be minimized by air emission controls on the solidification process, such as a cylindrical hood over the working area to capture air emissions, and the use of dust suppressants during material handling. The estimated time required to complete Alternative 2 is 6 weeks. Alternative 3 results in significantly higher short term exposures when compared to Alternative 2. Excavation of contaminated sludge will release volatile and semi-volatile chemicals to the air. Contaminants may also be released to the air on dust particles. Contaminants released to the air may impact onsite workers as well as the surrounding community. Additional short term exposures after excavation may result if the off-gas treatment equipment fails during operation. With proper maintenance and monitoring, the likelihood of equipment failure resulting in a significant release is low. The estimated time to complete Alternative 3 is 31 weeks.

Therefore, it has been determined that Alternative 2 is superior to Alternative 3 with respect to this balancing criterion.

Implementability

Addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed for a particular option to be put in place.

Alternative 2 is expected to be easy to implement. The necessary materials, equipment, and specialists are readily available. Debris in the Fire Pond could prevent advancement of the augurs and increase the difficulty of completing the in-situ solidification. Pilot tests to assure the success of Alternative 2 would be required. Alternative 3 would be the most difficult to implement. Bench and pilot scale tests are required to establish treatment parameters. Permits to operate may have to be obtained. Offsite disposal of hazardous waste residuals might have to be arranged. A significant amount of monitoring would be required, but the necessary technologies, specialists, and equipment are readily available.

Therefore, it has been determined that Alternative 2 is superior to

Alternative 3 with respect to this balancing criterion.

Cost

Included are capital costs, annual operation and maintenance costs (assuming a 30 year time period), and net present value of capital and operation and maintenance costs. The selected remedy must be cost effective.

Alternative 2 has a present worth cost of $800,000 (includes solidification and soil cover for the Fire Pond) and Alternative 3 has a present worth cost of $8,600,000.

MODIFYING CRITERIA

State Acceptance

Addresses whether or not the State agency agrees to or objects to any of the remedial alternatives, and considers State ARARs.

The Indiana Department of Environmental Management (IDEM) has been intimately involved with the Site throughout the RI/FS, has attended all technical progress meetings, has been provided opportunity to comment on technical decisions, and concurs with the selection of Alternative 2 as the selected remedy for this operable unit sludge cleanup at the Site.

Community Acceptance

Addresses the public's general response to the remedial alternatives and proposed plan.

Throughout the RI/FS at the Site, community involvement has been moderate. U.S. EPA has been accessible and responsive to community concerns throughout the study. At the public meeting, those in attendance, as well as those who submitted written comments regarding the proposed plan, were in favor of Alternative 2 as the most appropriate choice for the sludge cleanup.

In summation, Alternative 1 is unacceptable for protection of human health and the environment. Alternative 3 is superior to Alternative 2 with respect to long term effectiveness and permanence and reduction of toxicity, mobility and volume through treatment. Alternative 2 is superior to Alternative 3 with respect to short term effectiveness, implementability and cost effectiveness. Because the alternative selected for sludge cleanup at the Fire Pond will be combined with the alternative selected for soil cleanup at the South Landfill - Soil Cover, the long term effectiveness of Alternative will be increased. Therefore, the best balance among the three alternatives is Alternative 2 - In-Situ Solidification.

Selected Remedy for South Landfill/Fire Pond Sludge Cleanup

As was discussed in the previous section, EPA has selected Alternative 2 - In-Situ Solidification as the appropriate sludge cleanup remedy for the South Landfill/Fire Pond at the Reilly Tar and Chemical site. This alternative was selected because it is the most appropriate alternative for this operable unit action and is compatible with the final remedial alternatives anticipated for the Site, which will mainly encompass source-area remediation.

The FS contains a description of this alternative. The Fire Pond sludge requires treatment to provide a stable foundation for application of a cover, and to prevent the sludge from seeping through or around a cover. Bench-scale treatability tests were recently completed and indicate that the sludge can be effectively solidified using several different types of reagents and mixing ratios. The treatment produces an increase of approximately 25-30% in volume of the treated sludge, depending on the moisture and reagent contents.

Treatment of the Fire Pond sludge in-place could be accomplished by a method referred to as Shallow Soil Mixing (SSM). SSM can operate over depths from 0-30 feet in contaminated soils and sludges. Sludge must be treated to a maximum depth of less than 30 feet in the Fire Pond. SSM utilizes a crane-mounted drill attachment which turns a single-shaft, large-diameter augur that consists of two or more cutting edges and mixing blades. The single mixing augur, up to 12 feet in diameter, is driven by a high-torque turntable. the mixing head is enclosed in a specially designed cylindrical hood which allows for the capture of air emissions from the mixing operation. Air emissions would be treated by carbon adsorption to remove organic contaminants.

As the augur head is advanced into the sludge, grout is injected into the sludge at the pilot bit. The cutting edges and mixing blades blend the sludge and grout in-place with a shearing action. When the design depth is reached, the augur is raised to expose the mixing blades at the surface and then readvanced to the bottom depth to provide the necessary blending. As the augur blends the reagents and sludge, it creates a cylindrical column of treated material. Field tests would be required to verify that SSM is effective and implementable in the viscous Fire Pond sludge.

The SSM construction method consists of creating primary alternating columns which are allowed to set. A series of secondary columns are then installed which overlap the primary columns resulting in a continuous treatment of the sludge over the entire depth.

It is unlikely that the sludge in the Fire Pond would support the weight of the crane used for SSM. As a result, treatment of the sludge would have to be carefully staged. Treatment would progress inward from the edge of the Fire Pond, in a series of concentric rings or rows. Sludge at the edges of the Fire Pond would be treated first. After the treated mass cured and could support the weight of a crane, the treatment unit would be moved out onto the edge of the Fire Pond and the next concentric ring of sludge treated. Treatment would progress in this fashion until the entire Fire Pond was solidified. The presence of large debris such as drums or railroad ties may require the use of excavating equipment to remove the obstructions.

The Fire Pond sludge is a RCRA characteristic waste, characteristic for corrosivity. Solidification shall be performed on the sludge and shall result in a solidified mass that no longer exhibits RCRA characteristics. The solidified mass shall be tested using the TCLP test to determine if it is still RCRA characteristic for corrosivity. If the sludge still exhibits RCRA characteristics, then the cover material for the Fire Pond will be Alternative 4 - Multi Layer Cover. If the sludge no longer exhibits RCRA characteristics, then Alternative 2 - Soil Cover will be used for the cover material for the Fire Pond. Different solidification methods shall be investigated in a treatability study and one that results in a non-RCRA characteristic waste shall be preferred.

The point of compliance for this action only, will be the South Landfill boundary, as is defined on Figure 3.

<u>Documentation of Significant Changes</u>

EPA published a proposed plan for this operable unit action on July 22, 1993, that selected Alternative 3 - Groundwater Extraction/Treatment/Discharge for groundwater cleanup at the following three CERCLA Areas: the Lime Pond drum removal area, the Former Sludge Treatment Pit, and the Abandoned Railway Trench. This selection was based on data collected during supplemental field investigations conducted pursuant to the Amended Administrative Order on Consent. These investigations indicated that these three CERCLA Areas were contributing to the groundwater contamination problem at the site and that by addressing them, the performance of the groundwater extraction/treatment/discharge system selected in the ROD for the first operable unit at the site could be maximized.

However, during the public comment period, it was brought to the attention of EPA that the design of the first operable unit remedy, which is currently underway, would preclude the need for this additional source control component for groundwater. It appears that the design will encompass some extraction in areas of the site that will maximize the performance of the system, while also including some source control in the design. Therefore, it has been determined by U.S. EPA that the groundwater component of the remedies called for in the proposed plan are not necessary at this time and that the ongoing remedial design will accomplish the objectives as set forth in the proposed plan.

STATUTORY DETERMINATIONS

U.S. EPA's primary responsibility at Superfund Sites is to undertake remedial actions that protect human health and the environment. Section 121 of CERCLA has established several other statutory requirements and preferences. These include the requirement that the selected remedy, when completed, must comply with all applicable, relevant and appropriate requirements ("ARARs") imposed by Federal and State environmental laws, unless the invocation of a waiver is justified. The selected remedy must also provide overall effectiveness appropriate to its costs, and use permanent solutions and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable. Finally, the statute establishes a preference for remedies which employ treatment that significantly reduces the toxicity, mobility or volume of contaminants.

The selected remedy will satisfy the statutory requirements established in Section 121 of CERCLA, as amended by SARA, to protect human health and the environment, will comply with ARARs (or provide grounds for invoking a waiver), will provide overall effectiveness appropriate to its costs, and will use permanent solutions and alternate treatment technologies to the maximum extent practicable. The statutory preference for treatment is satisfied by that component of the selected remedy which requires treatment to remove hazardous substances from contaminated soils and further requires that those substances be destroyed through whatever method of final disposal is chosen for the treatment residuals. Furthermore, that component of the selected remedy which requires stabilization of the sludges will also satisfy the statutory preference for treatment as the stabilization process is expected to reduce the mobility of hazardous substances in the sludges while it is also expected that the process of stabilization may effectively render the sludges (currently characteristic wastes under RCRA) non-hazardous because the stabilized sludges may no longer exhibit the characteristic of corrosivity.

1. Protection of Human Health and the Environment

Implementation of the selected remedy will protect human health and the environment by reducing the risk of direct exposure to hazardous substances present in surface and subsurface soils and sludges at the site; the selected remedy will further protect human health and the environment by removing and destroying, or immobilizing sources of hazardous substances which have been identified as contributors to groundwater contamination at the site.

Adequate final covers for the source areas which are the subject of the selected remedy will reduce or eliminate any remaining risk of exposure to hazardous substances present in soil and sludges at the site, and will also reduce the rate of infiltration by which precipitation passes through any residual contamination. Institutional controls will also be imposed to restrict uses of the site to prevent exposure to any hazardous substances and contaminants in the soil and sludges. No unacceptable short-term risks will be caused by implementation of the remedy. Mitigative measures will be taken during remedy construction activities to minimize impacts of remedy implementation upon the surrounding community and environment. Ambient air monitoring will be conducted and appropriate safety measures will be taken during remedy implementation.

2. Compliance with ARARs

The selected remedy will comply with all identified applicable or relevant and appropriate federal requirements, and with those state requirements which are more stringent, unless a waiver is invoked pursuant to Section 121(d)(4)(B) of CERCLA. The ARARs for the selected remedy are listed below:

A. Federal ARARs

Chemical-Specific Requirements

Chemical-specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. Chemical-specific ARARs typically determine the standard for clean-up at a site.

Resource Conservation and Recovery Act (RCRA)

Although the RCRA hazardous waste in the source areas addressed by this remedy was placed in those units before the effective date of the requirements established by RCRA's implementing regulations, the facility is an operating RCRA facility engaged in the management of hazardous wastes; therefore, the RCRA statute and its implementing regulations are applicable for purposes of Corrective Action. As the soils and sludges at the source areas which are the subject of the selected remedy are highly contaminated by hazardous substances similar to RCRA hazardous substances which have been demonstrated to be contributing sources to groundwater contamination, the chemical-specific requirements of RCRA are also relevant and appropriate. 40 CFR 141 requires that ground water used as drinking water meet Maximum Contaminant Levels ("MCLs") for contaminants of concern.

Safe Drinking Water Act

40 CFR 141

Federal Drinking Water Standards promulgated under the Safe

Drinking Water Act ("SDWA") include both Maximum Contaminant Levels ("MCLs") and, to a certain extent, non-zero Maximum Contaminant Level Goals ("MCLGs"), that are applicable to municipal drinking water supplies servicing 25 or more people. At the Reilly Site, MCLs and MCLGs are not applicable, but are relevant and appropriate, because the unconfined aquifer below the site is a Class II aquifer which has been used in the past by residences bordering the site, and could potentially be used in the future as a drinking water source.

The National Contingency Plan ("NCP") at 40 CFR 300.430 (e) (2) (i) (B) provides that MCLGs established under the Safe Drinking Water Act that are set at levels above zero, shall be attained by remedial actions for ground waters that are current or potential sources of drinking water. The point of compliance for federal drinking water standards is at the boundary of the solidified/stabilized waste, because this is the point where humans could potentially be exposed to contaminated groundwater. Because the source areas addressed by this action will have final covers, the points of compliance for each unit addressed will be at the boundary of the final covers. Ground water monitoring wells may be installed at the points of compliance to ensure that the contribution to groundwater contamination from these source areas has ceased. Existing ground water wells in the aquifer will also be monitored, and additional wells may be drilled and monitored, if necessary.

Location-Specific Requirements

Location-specific ARARs are those requirements that derive from the physical nature of the site's location and features of the local geology and hydrogeology such as wetlands and floodplains.

The physical nature of the site's location does not implicate additional Applicable or Relevant and Appropriate regulations beyond those already identified as specific to the chemical composition of the hazardous substances addressed and those specific to the action required by the selected remedy.

Action-Specific Requirements

Resource Conservation and Recovery Act ("RCRA")

The Resource Conservation and Recovery Act (RCRA) is applicable at this entire site because the site is an operating RCRA facility. Contaminated soils and sludges at the source areas which will be addressed by the selected remedy are characteristic RCRA wastes, either because they exhibit the characteristic of corrosivity, or because they exhibit the characteristic of toxicity when tested using the Toxicity Characteristic Leaching Procedure (TCLP).

For Low Temperature Thermal Desorption

The selected remedy of excavation and treatment of contaminated soils at the Lime Pond Drum Removal Area, the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch will require compliance with action-specific ARARs related to excavation as well as those specific to the treatment technology. As the selected remedy requires that the treated soils be replaced in the units after treatment which achieves Risk Based Target Cleanup Levels (RBTCLs) (to residential levels in the case of the soils from the Lime Pond Drum Removal Area, to industrial levels in the case of soils from the other three source areas), the Land Disposal Restrictions of 40 CFR Part 268 are applicable to this specific component of the selected remedy.
However, the recently promulgated final regulation regarding the designation of Corrective Action Management Units (CAMUs) allows the Agency to designate these four source areas as CAMUs. This designation will allow the treated soil to be replaced in these units without violation of the Land Disposal Restrictions. U.S. EPA finds that this designation of these units as CAMUs will further the goals of the CERCLA statute by allowing for reduction of toxicity through treatment in a cost effective manner. Without this designation it might not be possible to achieve this goal. Accordingly, the Lime Pond Drum Removal Area, the Abandoned Railway Trench, the Former Sludge Treatment Pit, and the Former Drainage Ditch, are hereby designated as CAMUs for the purpose of receiving those remediation wastes which consist of soils treated to comply with the relevant RBTCL, as specified elsewhere in the Scope of Work which accompanies this Record of Decision. Those remediation wastes which consist of hazardous substances removed from soils through the treatment process are required to be disposed of by thermal destruction.

As the selected remedy requires that the hazardous substances removed from soils by treatment be destroyed through incineration, the regulatory standards applicable to the generation, storage, transport and disposal of hazardous waste are all applicable. These include the regulations specified below:

40 CFR Part 261: Identification and Listing of Hazardous Waste;

40 CFR Part 262: Standards Applicable to Generators of Hazardous Waste;

40 CFR Part 263: Standards Applicable to Transporters of Hazardous Waste;

40 CFR Part 264: Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.

The Low Temperature Thermal Desorption treatment units must comply with the standards set forth at 40 CFR 264, Subpart X-Miscellaneous Units.

For Stabilization of Sludges

The regulations applicable for excavation, and for particulate emissions resulting from such activity which have been set forth already elsewhere in this section will also be applicable to the stabilization component of the remedy selected for the South Landfill.

For Final Cover Components

The RCRA requirements related to the installation of final covers will be applicable for the installation of final covers for the source areas addressed in this Record of Decision. These requirements include, but are not necessarily limited to, the regulations specified below:

40 CFR 264.310

This regulation requires the installation of a final cover to provide long-term minimization of infiltration. This regulation also requires 30-year post-closure care and ground-water monitoring. The Regional Administrator may revise the length of post-closure care period pursuant to 40 CFR 264.117(a)(2)(i) if he finds that a reduced period is sufficient to protect human health and the environment; or extend the length of the post-closure care period pursuant to 40 CFR 264.117(a)(2)(ii) if he finds that the extended period is necessary to protect human health and the environment.

Although the RCRA hazardous waste in this landfill was placed before the effective date of the requirements, the facility is an operating RCRA facility engaged in the management of hazardous wastes and the RCRA statute and its implementing regulations are applicable for purposes of Corrective Action. The regulation cited above establishes standards for the final cover and requires compliance with the regulations which govern post closure care set forth at 40 CFR 264.117-120.

Post Closure Care

40 CFR 264.117(a)(1)

The requirements for post closure care set forth at 40 CFR 262.117 through 264.120 are appropriate at this site because of the presence of hazardous substances similar to RCRA hazardous wastes. This includes the requirement for maintenance and monitoring of the waste containment systems for thirty years.

40 CFR 264.117(c)

The remedy selected for this site requires U.S. EPA to restrict post-closure use of this property as necessary to prevent damage to the cover systems. Post closure use of the property must never be allowed to disturb the integrity of the cover, the liner, or any other component of the containment systems, or the function of the facility's monitoring systems, unless the Regional Administrator finds that the disturbance is necessary to the proposed use of the property and will not increase the potential hazard to human health and the environment, or the disturbance is necessary to reduce a threat to human health and the environment.

40 CFR 264.228(b)
40 CFR 264.310(b)

It will be necessary to prevent run-on and run-off from damaging the cover systems.

Closure with Waste in Place

40 CFR 264.228(a)(2)
40 CFR 264.258(b)

These regulations require the elimination of free liquids by removal or solidification, and the stabilization of remaining waste and waste residue to support cover.

Clean Air Act

ARARs specific to the treatment technology include air emission requirements.The Clean Air Act and the regulations cited below require that select types and quantities of air emissions be in compliance with regional air pollution control programs, approved State Implementation Plans ("SIP"s) and other appropriate federal air criteria, standards and emission limitations. These include the regulations specified below:

40 CFR 50 and 52

APC-19 (Approved February 16, 1987)[1]

325 IAC Article 5-1 (approved June 17, 1987)

325 IAC 6-4

325 IAC 8

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[1] The CERCLA statute does not require compliance with the procedural requirements of permit regulations, and permits need not be obtained for actions implemented on-site; however, compliance with the substantive requirements of such regulations is required.

In addition, the potential for air emissions from the Low Temperature Thermal Desorption treatment process will be monitored. If any air emissions were to result from these treatment units they may become subject to the National Emissions Standards for Hazardous Air Pollutants.

B. State ARARs

Identification of State of Indiana ARARs for the Remedial Action Addressing the CERCLA Source Areas at the Reilly Tar & Chemical Superfund Site

The FS identified the following statutory sections and regulations promulgated for the management of hazardous waste as ARARs for the site and for the specific actions represented by the components of the selected remedy.

329 IAC Article 3.1, Rules 1, 4, 6.

329 IAC Article 3.1, Rule 9.

329 IAC Article 3.1, Rule 7.

329 IAC Article 3.1, Rule 8.

Indiana Code Sections 8-2.1-18-36: Transportation of Hazardous Materials.

329 IAC Article 3.1, Rule 12.

325 IAC Article 8

326 IAC Article 2-1: Permit Review Rules[2] (for construction and use of LTTD treatment units)

326 IAC Article 5-1 (Opacity Standards)

326 IAC: Article 6-4, 6-5 Fugitive Dust Emissions Standards.

327 IAC Article 15, Rule 5: Storm Water Run-off Associated with Construction.

327 IAC Article 15, Rule 6: Stormwater Discharge Associated with Industrial Activity

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2 The CERCLA statute does not require compliance with the procedural requirements of permit regulations, and permits need not be obtained for actions implemented on-site; however, compliance with the substantive requirements of such regulations is required.

C. To Be Considered

The proposed rule for National Emission Standards for Hazardous Air Pollutants for Source Categories; Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry, 58 Fed. Reg. 11667 (February 26, 1993) is to be considered at this site in connection with the potential for the emission of hazardous organic air pollutants fron the Low Temperature Thermal Desorption treatment units.

3. Cost Effectiveness

Cost effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. Table 9 lists the costs associated with the implementation of the remedies.

The selected remedies for this site are cost effective because they provide the greatest overall effectiveness proportionate to their costs when compared to the other alternatives evaluated, the net present worth being $6,000,000. The estimated cost of the selected remedy is reasonable when compared with the other alternatives considered, and it assures a high degree of certainty that the remedy will be effective in the long-term, due to the significant reduction of the toxicity, mobility and volume of the contaminants achieved through treatment of the source material and the destruction of hazardous substances removed by the treatment process.

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

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner at this site. Of those alternatives that are protective of human health and the environment and that comply with ARARs, U.S. EPA has determined that the selected remedy provides the best balance in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants, short term effectiveness, implementability, and cost, taking into consideration State and community acceptance.

The excavation and treatment through Low Temperature Thermal Desorption of soils contaminated by hazardous substances with these soils being replaced in the units following treatment to risk-based levels; the stabilization of sludges at the South Landfill; the imposition of final covers at all five CERCLA source areas addressed by this remedy; together with restrictions to access at all of these areas including but not limited to institutional controls; will provide the most permanent solution practical, proportionate to the cost.

TABLE 4.5-7

Comparative Analysis - Soil and Sludge
Cost Effectiveness (Estimated Total Present Worth)

SWMU	Alternative 1 No Action	Alternative 2* Soil Cover	Alternative 3* Asphalt or Concrete Cover	Alternative 4* Multi-layer Cover	Alternative 5 Slurry Bioremediation	Alternative 6 Low-Temperature Thermal Desorption	Alternative 7 Incineration
Lime Pond	$250,000	Not applicable.	Asphalt $250,000 Concrete $260,000	$300,000	$18,000,000 *	$10,000,000 *	$13,000,000 *
Abandoned Railroad Trench	$100,000	Not applicable.	Asphalt $150,000 Concrete $150,000	Not applicable.	$5,500,000 *	$4,400,000 *	$5,400,000 *
Former Sludge Treatment Pit	$90,000	Not applicable.	Asphalt $80,000 Concrete $80,000	Not applicable	$1,000,000 *	$790,000 *	$1,700,000 *
Former Drainage Ditch	$180,000	$66,000	Asphalt $170,000 Concrete $170,000	Not applicable	$2,100,000 *	$1,600,000 *	$2,700,000 *
South Landfill	$290,000 (includes Fire Pond)	$1,700,000 (includes in-situ stabilization of Fire Pond Sludge)	Not applicable.	Not applicable	$19,000,000	$12,000,000	$15,000,000
Fire Pond		$800,000 for Fire Pond alone	Not applicable.	Not applicable.	Not applicable.	Not applicable	$8,600,000

*Groundwater monitoring costs are not included in costs of covers. Additional present worth costs for annual monitoring would be:

South Landfill/Fire Pond	$270,000
Former Drainage Ditch	$180,000
Lime Pond	$280,000
Abandoned Railroad Trench	$ 60,000
Former Sludge Treatment Pit	$ 80,000

* See Sectionson Hot Spot Delineation and Soil Cleanup for further refinement of these costs as they relate to hot spot cleanup

5. Preference for Treatment as a Principal Element

The statutory preference for selection of remedial actions in which treatment is a principal element is satisfied by the selection of Alternative 6 for soil cleanup and Alternative 2 for sludge cleanup. This operable unit action will permanently reduce the toxicity, mobility and volume of contamination at the five CERCLA areas through treatment of the soils and solidification of the Fire Pond sludge. These remedies, coupled with the groundwater extraction/treatment/discharge system selected for operable unit 1, will reduce risks at the site through treatment of principal threats at the site. Future operable unit remedial actions will address other principal threats at the site.

EPA and IDEM believe that the selected remedies satisfy the statutory requirements specified in Section 121 of SARA to protect human health and the environment, attain ARARs (or provide grounds for invoking a waiver), and utilize permanent solutions to the maximum extent practicable.