United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R07-88/014
September 1988

EPA

Superfund Record of Decision:

Arkansas City Dump, KS

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R07-88/014	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Arkansas City Dump, KS
First Remedial Action

5. Report Date 09/29/88

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered
800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 200-acre Arkansas City Dump site is located in the southwest section of Arkansas City, Cowley County, Kansas, and is bounded on the west and south by a levee that separates it from the Arkansas River. The site falls within the 100-year floodplain and includes a north waste area and a south waste area, both located in the central portion. Land use adjacent to the site is a mixture of crop and rangeland, and commercial and residential. Urban areas exist to the north and east of the site with residential areas bordering on the north and mixed residential and commercial areas on east. Approximately 60 residences are adjacent to the eastern boundary, and several businesses that employ about 100 to 150 people are located onsite. Ground water flows predominantly to either the southwest or southeast toward the Arkansas River due to a ground water divide that exists near the center of the site. Upgradient ground water is used for drinking purposes by Arkansas City as well as private residences. Downgradient, east and southeast of the site, private wells are used to provide water primarily for lawn and garden watering. The site was used as an oil refinery between 1916 and the mid-1920s. Residual acid sludge from the distillation process was disposed of in pits or on the ground predominantly in the north waste area. Subsequently, 160 acres were used as a municipal landfill, referred to as the Arkansas City Landfill. For
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Arkansas City Dump, KS
First Remedial Action
Contaminated Media: sludge
Key Contaminants: organics, PNAs

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 68
	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/R07-88/014
Arkansas City Dump, KS
First Remedial Action

16. ABSTRACT (continued)

over 50 years, alkaline sludge from Arkansas City's water treatment plant as well as municipal refuse and solid wastes were disposed into lime-sludge ponds located in the south waste area. Investigations conducted since 1980 by the Kansas Department of Health and Environment have determined that all media are contaminated with various organics and inorganics primarily from refining wastes. This contamination is a result of 1,300,000 ft^3 of acid sludge and between 500,000 to 1,000,000 gallons of residual oil product which has mixed with the subsurface soil predominantly between the north and south waste areas. The principal contributor of organic contaminants to the ground water, particularly polynuclear aromatic hydrocarbons (PAHs), appears to be the soil contaminated sediments in the subsurface. However, contaminants are not migrating offsite. This Record of Decision (ROD) addresses remediation of acid sludge in the north waste area; a subsequent ROD will address the oil-contaminated sediments and ground water contamination. The primary contaminants of concern in the acid sludge are organics including PAHs, and sulfuric acid.

The selected remedial action for the north waste area operable unit includes: in situ neutralization of the acid sludge followed by the installation of a soil cover; completion of a supplemental feasibility study addressing remedial alternatives for the subsequent operable unit; institutional controls including deed restrictions; and ground water monitoring.

RECORD OF DECISION

OPERABLE UNIT REMEDIAL ALTERNATIVE SELECTION

DECLARATION

Arkansas City Dump Site

Arkansas City, Kansas

Prepared By:

U.S. Environmental Protection Agency

Region VII

Kansas City, Kansas

September 1988

RECORD OF DECISION
OPERABLE UNIT REMEDIAL ALTERNATIVE SELECTION

SITE NAME AND LOCATION

Arkansas City Dump Site
Arkansas City, Kansas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Arkansas City Dump site in Arkansas City, Kansas, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site.

The State of Kansas has assisted in the development of this decision document and concurs on the selected remedy for Operable Unit One.

DESCRIPTION OF THE SELECTED REMEDY

The remedial action selected is part of a total remedial action; in particular, it is the first of two operable units for the site. This first operable unit addresses the principal threats at the north waste area posed to the public health and environment, in particular, the threat posed by the acid sludge presently located in the northern waste area of the site. The function of this operable unit is to neutralize the acid in the sludge waste and eliminate the potential for sulfur dioxide emissions. A soil cover will reduce the direct contact hazard associated with any organic compounds remaining in the north waste area after treatment. The second operable unit will address the oil-contaminated sediment and the ground water contamination.

The major components of the selected remedy include:

- In situ neutralization of the acid via circulating a solution of lime in water through the acid sludge waste, of approximately 47,000 tons.
- Covering the north waste area with soil after treatment is completed.
- Completion of a supplemental feasibility study to develop and evaluate appropriate remedial alternatives for the oil-contaminated sediments and the ground water contamination.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate and is cost-effective. However, this operable unit will invoke a waiver respecting requirements under the Federal and State drinking water regulations and the State's cleanup policy under the Kansas ground water contaminant cleanup target concentrations. The waiver provided by Section 121(d)(4) of CERCLA, as amended, is invoked regarding drinking water standards because this operable unit is only a part of the total remedial action which will attain all applicable or relevant and appropriate requirements. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes alternative technologies to the maximum extent practicable.

Morris Kay

MORRIS KAY
Regional Administrator

9-29-88
Date

RECORD OF DECISION

OPERABLE UNIT REMEDIAL ALTERNATIVE SELECTION

DECISION SUMMARY

Arkansas City Dump Site Superfund Site

Arkansas City, Kansas

Prepared By:

U.S. Environmental Protection Agency

Region VII

Kansas City, Kansas

September 1988

TABLE OF CONTENTS

Section		Page
1.0	Site Name, Location and Description	3
2.0	Site History and Enforcement Activities 2.1 Site History 2.2 Summary of Remedial Investigations 2.3 Summary of Enforcement Activities	7
3.0	Community Relations History	14
4.0	Scope and Role of Operable Unit One: Acid Sludge Waste in the North Waste Area	15
5.0	Summary of Site Characteristics 5.1 Types and Characteristics of Contaminants 5.1.1 Acid Sludge 5.1.2 Oil-contaminated Sediments 5.2 Quantities of Contaminants	16
6.0	Summary of Site Risks	20
7.0	Documentation of Significant Changes	22
8.0	Description of Alternatives	23
9.0	Summary of Comparative Analysis of Alternatives	31
10.0	The Selected Remedy	37
11.0	The Statutory Determinations 11.1 Protective of Human Health and the Environment 11.2 Attainment of Applicable or Relevant and Appropriate Requirements (ARARs) and To-Be-Considered Criteria (TBC) 11.3 Cost Effectiveness 11.4 Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable 11.5 Preference for Treatment as a Principal Element	38

TABLES

ATTACHMENTS
State Letter of Concurrence
Administrative Record Index

1.0 SITE NAME, LOCATION AND DESCRIPTION

The Arkansas City Dump site is located in Arkansas City, Cowley County, Kansas, about 3.5 miles north of the Kansas-Oklahoma state line (figure 1). The site is located in the southwest part of Arkansas City and is bounded on the west and south by a levee that follows the Arkansas River. The eastern boundary of the site is bounded by 8th Street. The northern boundary of the site is located just south of the railroad bed located between the levee on the west and 10th Street on the east (figure 2).

The site consists of approximately 200 acres and between 1916 and the mid-1920's was used as an oil refinery and subsequently as a landfill for more than 50 years. The refinery was initially called the Milliken Oil Refinery, but was later referred to as the Arkansas City Oil Refinery. After closure of the refinery (mid-1920's), the 160 acres on the site located south of Madison Street were used for disposal of municipal wastes. This area was referred to as the Arkansas City Landfill.

Located in the central area of this site is the City of Arkansas City's lime-sludge ponds. The city disposes of alkaline sludge generated from their water treatment plant. In the southern area of this site there is a lake, commonly referred to as the sand pit, that encompasses about 20 acres and is the result of its use as a borrow pit between the mid-1950's through the early 1970's.

Land use adjacent to the site is a mixture of crop and rangeland, and commercial and residential. Current land-use categories are shown in figure 3. Urban areas exist north and east of the site, with residential areas bordering on the north and mixed residential and commercial areas on the east. A park is located west of the site along the sandy river deposits. There are approximately 60 people that have houses directly adjacent to the eastern site boundary. There are several business that employ about 100 to 150 people located within the site boundaries, and approximately 25 percent of the 200 acres of land on the site is used for commercial purposes.

The entire site falls within the 100-year floodplain (Federal Emergency Management Agency, 1984).

The site is located within the Arkansas River Valley, which is characterized by extreme flatness and poorly developed surface drainage of the Arkansas River floodplain. In general, soil on the Arkansas City Dump site is very permeable and allows rapid infiltration by precipitation. Unconsolidated silt, clay, sand and gravel deposits form an extensive ground water aquifer parallel to the Arkansas River Valley. At the site, the unconsolidated deposits range from 30 to 50 feet thick. The gravel near the bedrock is generally less than 15 feet thick underneath most of the site. The depth of ground water ranges from 8 to 12 feet below the ground surface. The saturated

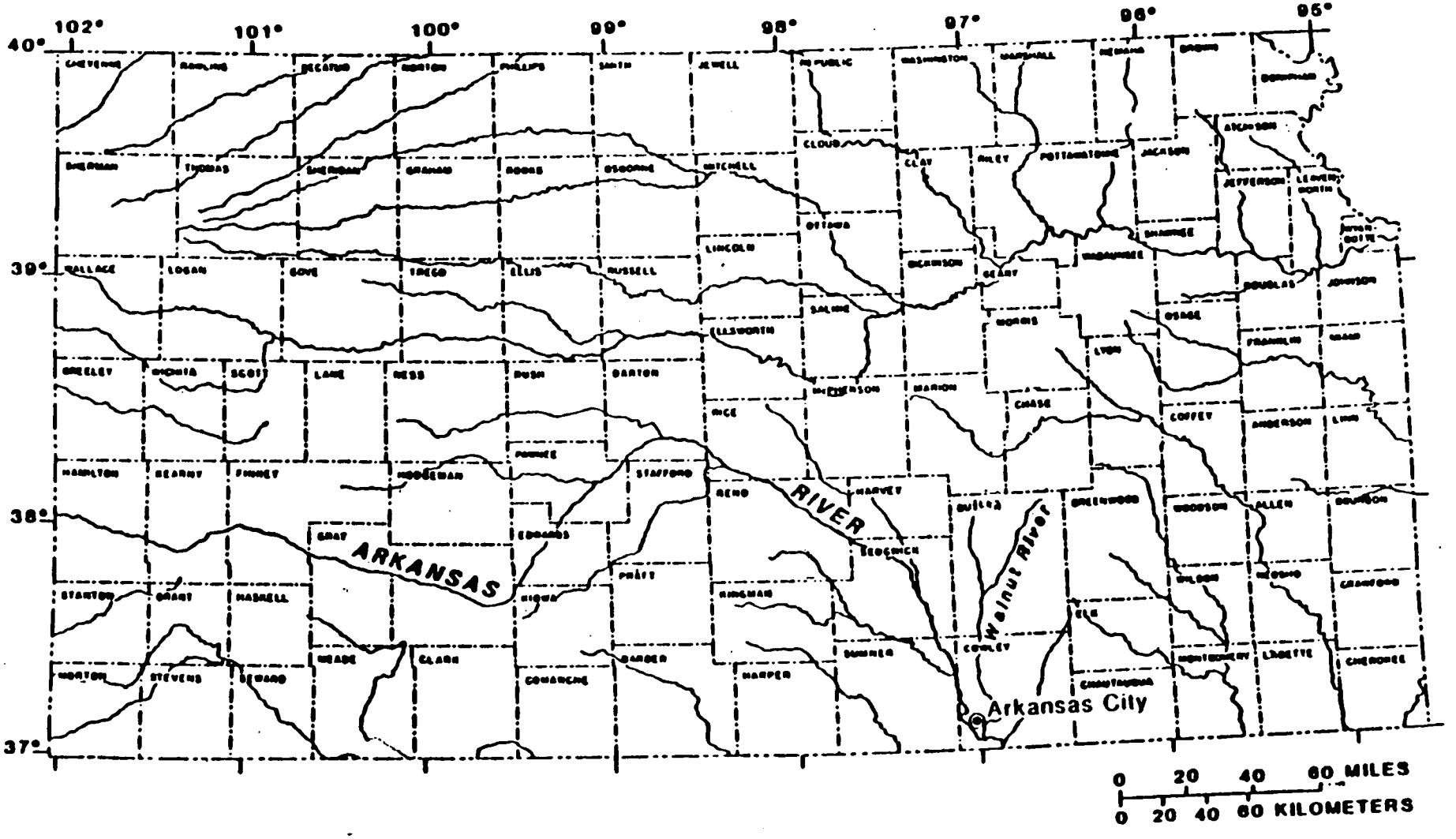

Figure 1.--Location of Arkansas City, Kansas.

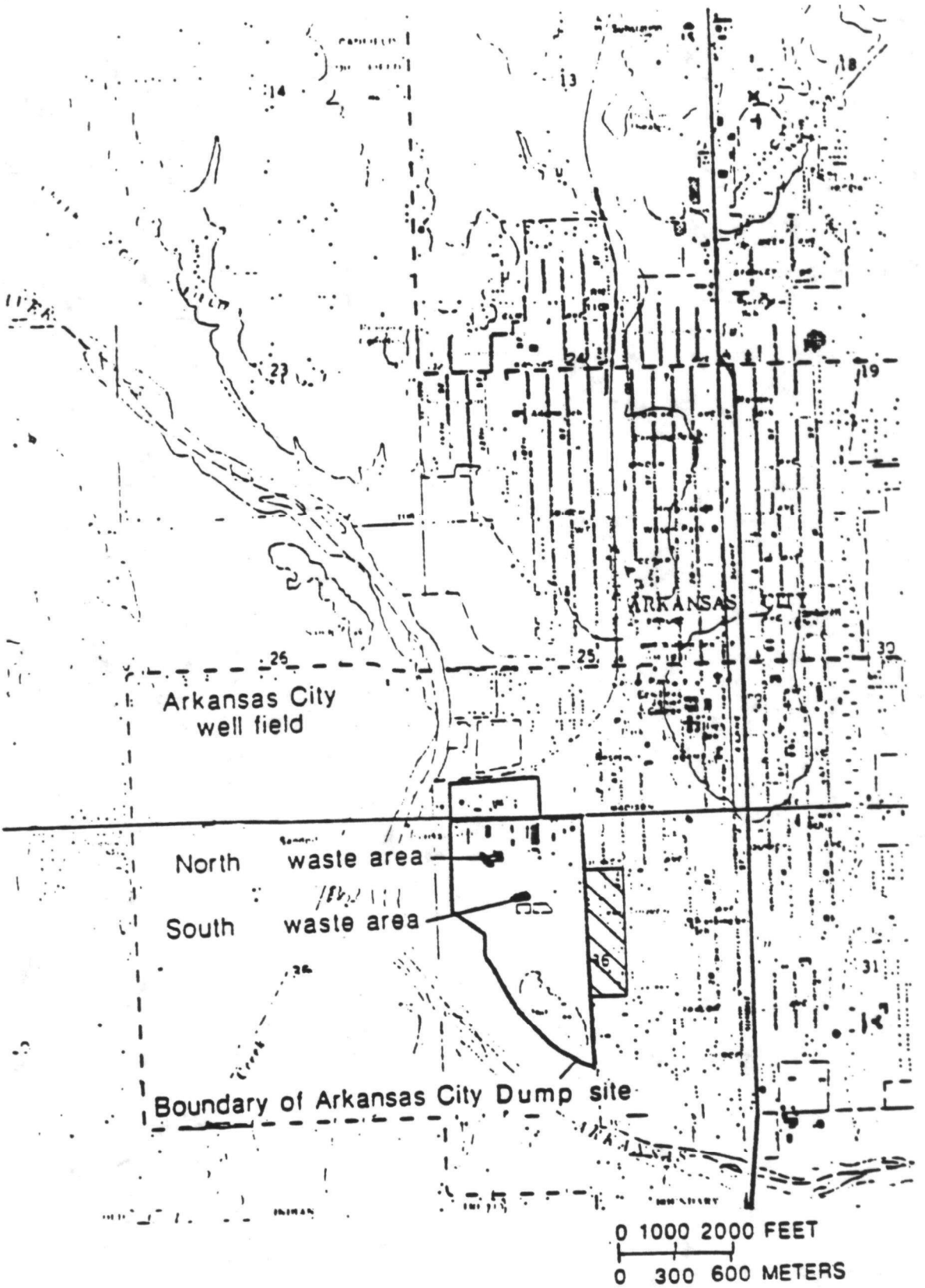

FIGURE 2--LOCATION OF ARKANSAS CITY DUMP SITE

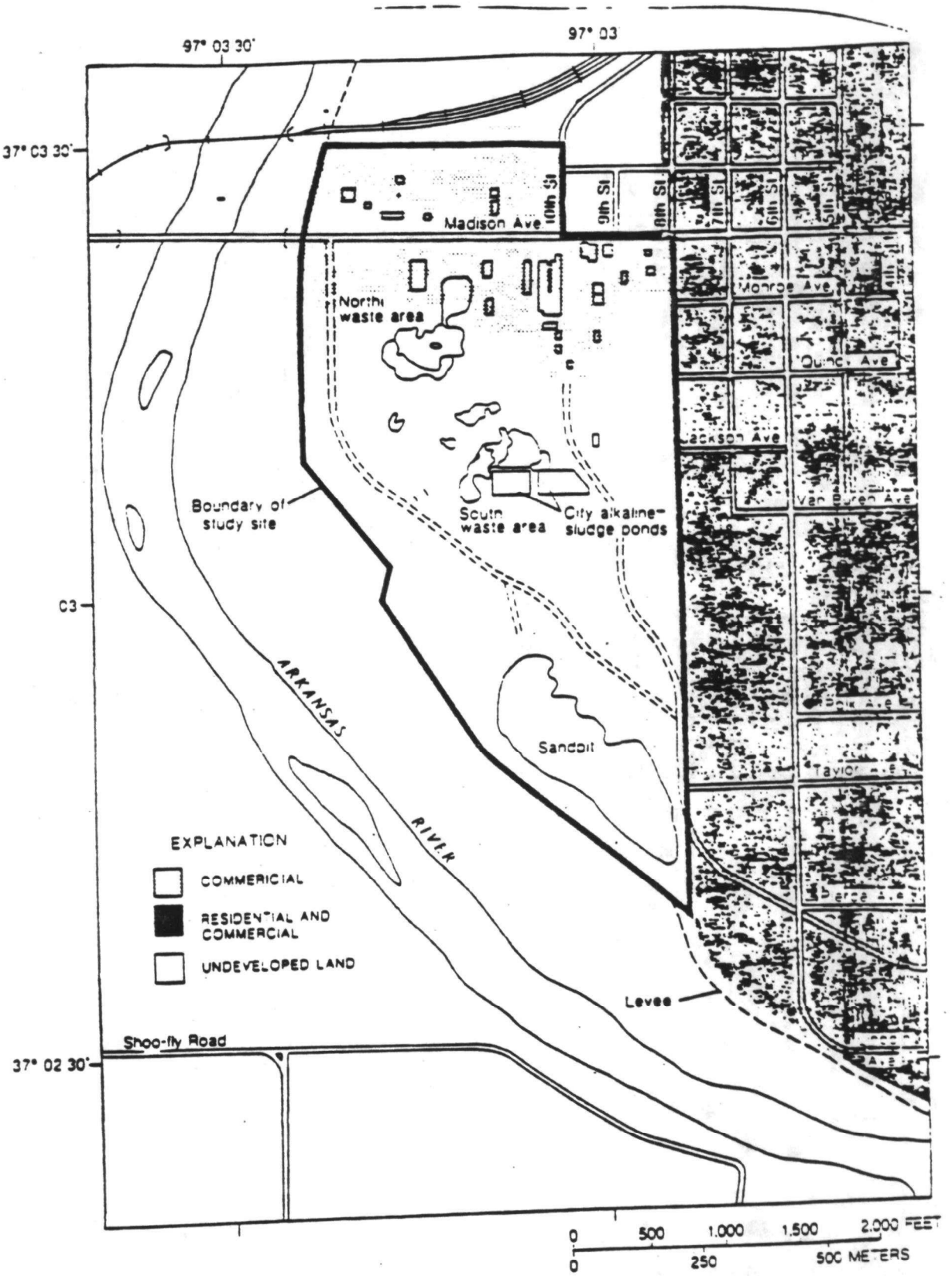

Figure 3 -- Land use on and adjacent to Arkansas City Dump site

thickness of the alluvial deposits ranges between 20 feet at the north end of the site to 40 feet at the south end (figure 4). Although the direction of ground water is variable, the principal flow direction on the Arkansas City Dump site throughout most of the year is towards the Arkansas River (figure 5). A ground water divide exists near the center of the site, and ground water west of the divide flows southwesterly toward the river, whereas ground water east of the divide flows southeasterly toward the river. The average velocity of ground water in the alluvial aquifer in the vicinity of the site is very rapid, the flow is estimated to range from 1 foot per day to more than 2 feet per day.

The City of Arkansas City owns and operates a city well field located north and west of site on the west side of the Arkansas River. The city supplies water to the majority of the city residents. North and one-quarter mile upgradient from the site, several residents use water from the alluvial deposits as their sole drinking water source. East and southeast of the site, which is downgradient, several residents have private wells. The ground water from these wells is used primarily for lawn and garden watering. The investigations indicates that contamination at detectable concentrations is not moving offsite and does not threaten these private wells. Also, there are no water supply wells located on the site.

The Cowley County Rural Water District No. 1 has a supply well field located about 0.75 mile southeast of the site on the south bank of the Arkansas River. The investigation indicates that contamination onsite is not moving under the Arkansas River and does not threaten this down gradient supply well.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 Site History

An oil refinery was located at the Arkansas City Dump site between 1916 and the mid-1920's. The refinery processed between 6,000 and 12,000 barrels of oil per day until destroyed by a fire and explosion in 1927. The refinery was initially called the Milliken Oil Refinery, but was later referred to as the Arkansas City Oil Refinery. The site was used as a landfill after closure of the refinery in the mid-1920's.

A major feature of the refining process used during the early 20th century was the treatment of each product fraction with sulfuric acid to effect separation of asphaltenes and paraffins, improve the color and remove resinous substances. The distillate products, such as gasoline, kerosene, and lubricating oils, were treated with sulfuric acid in an agitator. The product was pumped off the top, and the residual sludge, which was

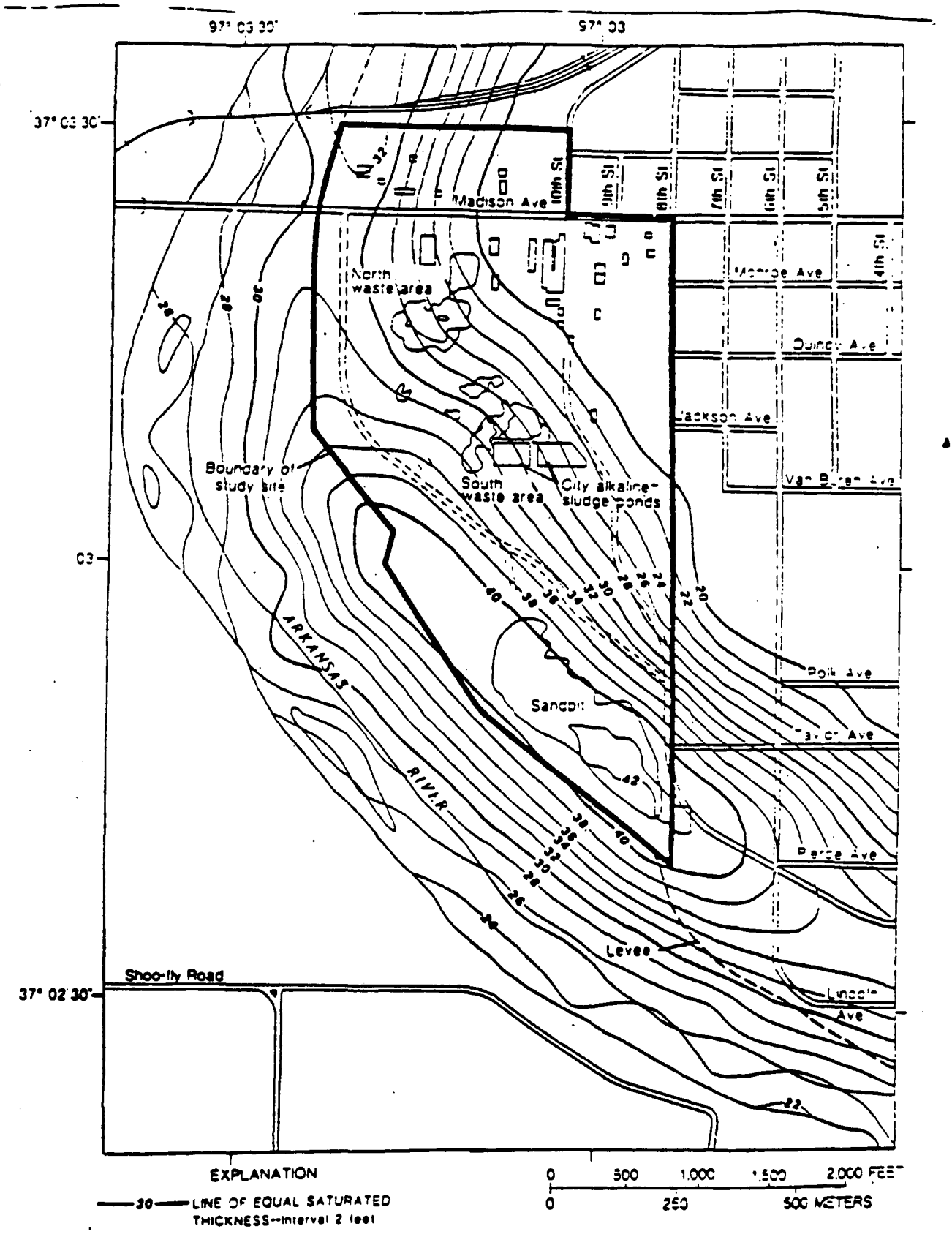

Figure 4 -- Saturated thickness of alluvial deposits on and adjacent to Arkansas City Dump site. June 1986

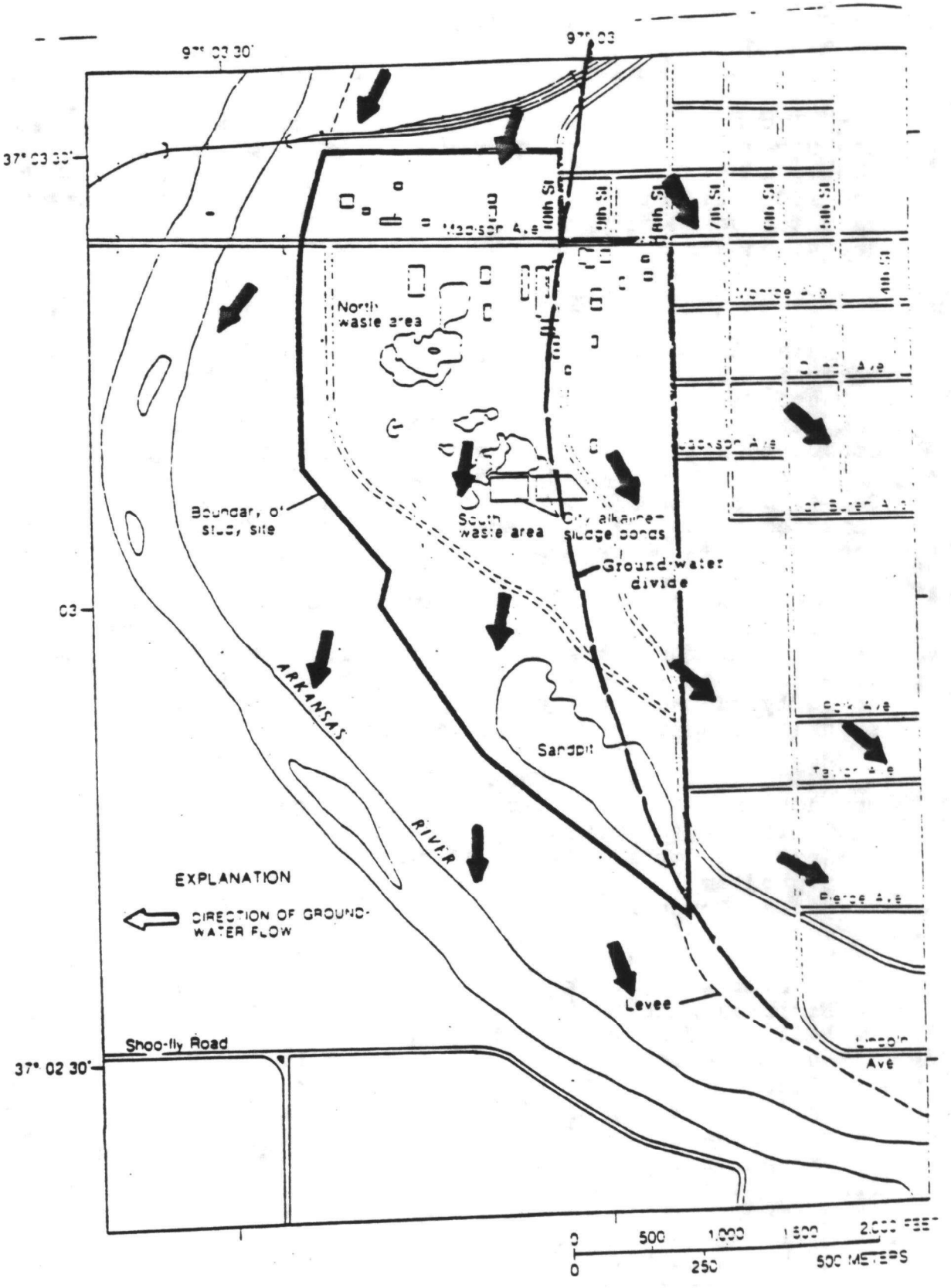

Figure 5 -- Direction of ground water flow on and adjacent to Arkansas City Dump site.

generally unmarketable during the early 1900's, was disposed in pits or on the ground. Acid sludge was produced at almost every step in the distillation process (figure 6).

The history of waste disposal practices on the site after the closure of the refinery was determined from historical aerial photographs. Based on aerial photographs, it appears that most of the 160 acres of the site located south of Madison Street was used for waste disposal. It is assumed that most of the waste deposited was municipal waste.

2.2 Summary of Remedial Investigation

The Arkansas City Dump site was first identified as a potential hazardous waste site in July 1979 by a field inspector for the Kansas Department of Health and Environment (KDHE). After the site was identified, the KDHE in cooperation with the EPA conducted a more detailed site investigation during the fall of 1980. In 1982 the KDHE received funds from EPA under the Resource Conservation and Recovery Act to conduct a remedial investigation referred to as Phase I-remedial investigation. The Arkansas City Dump site was placed on the National Priorities List in 1984.

The Phase I-remedial investigation provided enough data to ascertain that the site could pose potential hazards to health and the environment and documented localized contamination of water and soil. However, the available information was inadequate to fully characterize and delineate the principal waste sources so that remedial activities could be implemented.

In 1985, the KDHE entered into an agreement with the EPA to conduct an additional remedial investigation to provide data suitable for evaluating all significant health and environmental hazards and for selecting an appropriate remedial solution to site problems, as required by The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. Because of funding limitations, this remedial investigation was to be conducted in two parts, Phase IIA and Phase IIB. The Phase IIA report was submitted to KDHE in September 1986 and included preliminary information on the extent of contamination and an evaluation of public health and environmental impacts, as well as a general survey of remedial action alternatives that were considered for the Arkansas City Dump site. Because of questions regarding mobility of air and ground water contaminants offsite, as well as ecological impacts of the site, the subsequent Phase IIB-remedial investigation was begun in January 1987. The Phase IIB investigation also included the evaluation of alternatives to remediate the problems at this site.

The Phase I - remedial investigation conducted in 1982 confirmed that polynuclear aromatic (PNA) compounds, which are

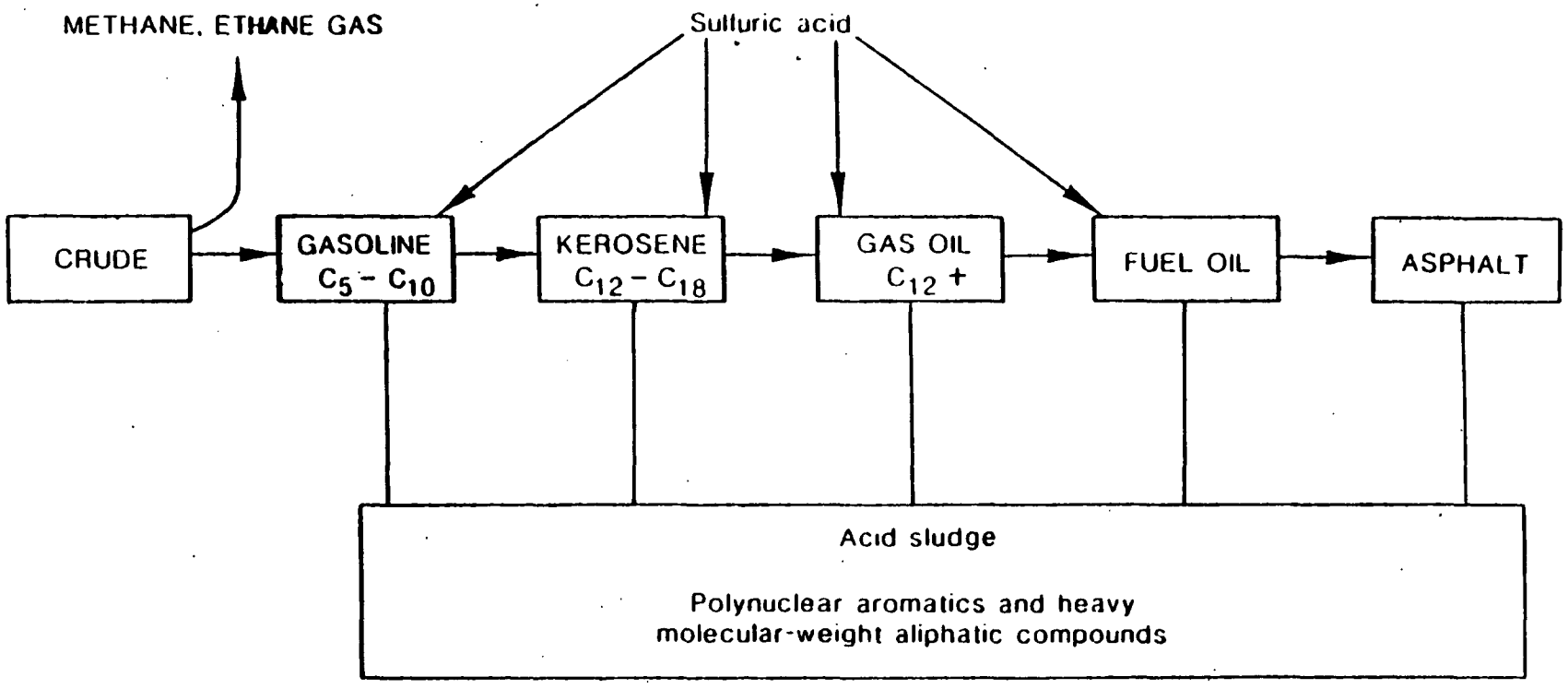

Figure 6 -- Generation of acid sludge by oil industry at the beginning of 20th Century.

known to be present in refinery wastes were leaching into the ground water, and trace amounts were detected in downgradient monitoring wells. However, because no drinking water wells existed downgradient of the site and no contamination was detected in the Arkansas River or in the adjacent sandpit, it was concluded that there was no immediate health hazard or environmental threat. Also it was determined that most of the volatile chemicals had dissipated, and there were no toxic gases or vapors emanating from the site.

The Phase IIA-remedial investigation conducted in 1985 and 1986 focused on: (1) identifying the principal contaminants and pathways of contamination that could pose hazards to public health or the environment; (2) characterizing the wastes and determining the quantities of waste present; (3) identifying and isolating principal contamination sources; and (4) determining the mobility characteristics of contaminants so that effective long-term remedial action may be implemented.

Surface water samples were collected from the ponds on the site and from the Arkansas River. Bottom sediment samples also were collected from all surface water bodies. Subsurface soil samples were collected during the installation of eleven monitoring wells and separate locations on and offsite. Samples were also collected from the acid sludge wastes areas.

Various organic and inorganic contaminants were detected in the soil, in sludge wastes onsite, in ground water flowing underneath the site, and in surface water and sediments on and adjacent to the site. In general, organic compounds, particularly PNA compounds, are the principal contaminants of health and environmental concern. These contaminants are thought to be from past oil-refinery operations at the site. PNA compounds, alkanes, and cycloalkanes are components of crude and refined oil. Oil-soaked soil, detected at most wells installed on the site, and acid sludge deposits located in the north waste area are the main sources of organic contaminants in the ground water and soil.

The Phase IIB-remedial investigation and feasibility study began in January 1987. The objectives of this remedial investigation were to better define the distribution of PNA and oil-contaminated soil; determine the presence of significant contaminants in waste and ground water that possibly were not detected during either the Phase I and Phase IIA-remedial investigations; provide data to confirm that contaminants are not migrating offsite in ground water at concentrations that would pose a significant health or environmental hazards; evaluate possible environmental and health impacts; determine the hazards associated with disturbing the acid sludge wastes; and to evaluate the alternatives for remediation activities at this site.

Distribution of PNA compounds and oil-contaminated soil was determined by augering 24 shallow boreholes on the site. Soil samples were collected from three points at all borehole locations--land surface, 5 feet below the land surface and at the water table (generally about 10 feet below land surface). After the samples were collected, the volatile organics were measured with a portable photoionization detector. Most boreholes onsite had oil-contaminated aquifer material that was encountered near the water table. These sediments were characterized as a gray, fine-grained sand that had an oily odor. The thickness of these sediments was generally a few feet in most boreholes. This oil is in residual saturation and is immobile.

Seven boreholes were augered to bedrock to collect information on depth to bedrock and to determine if contaminants could have moved at that depth. These boreholes were sampled at three points--the water table, at about 20 to 30 feet below land surface, and just above the bedrock surface. The bulk of the oil-contaminated sediments occurs at about 10 to 20 feet below the water table.

The presence of significant contaminants within the sludge was determined by collecting samples of sludge from the north waste area and oil and water from an existing monitoring well located in the north waste area. Twenty to 30 percent, by weight, of the acid sludge is sulfuric acid. Organic compounds in the sludge are composed primarily of aliphatic, polycyclic, aromatic, and heterocyclic compounds.

Confirming that contaminants were not migrating offsite was accomplished by installing and sampling 18 temporary wells placed between contaminant sources onsite and the Arkansas River. These wells were installed as six well custers, each containing three wells. Each well within a cluster was screened at a different level within the aquifer. Water samples also were collected from an offsite monitoring wells and a private supply well. The data results from the supply and monitoring wells sampled offsite indicated that the concentrations of PNA compounds did not exceed 1 part per billion (ppb).

Ground water samples were collected from monitoring wells to evaluate the vertical distribution of contaminants from the onsite waste source or sources to the Arkansas River. The data provided sufficient information to allow a conceptual explanation of what was occurring to the contaminants as they moved along the ground water flow paths.

The determination of possible additional sources of contaminants was accomplished using geophysical and coring techniques. Geophysical data were used extensively in characterizing the presence of wastes on the site. Data collected during the Phase IIA-remedial investigation were analyzed further during the Phase IIB-remedial investigation and various features were identified that suggested the presence of buried metallic

wastes or conductive fluids. In addition, small values of terrain conductivity were found to exist near the center of the site, suggesting the presence of significant quantities of a poorly conductive material, possibly oil.

An evaluation of ecological conditions was conducted. This investigation determined the extent of contamination within the onsite biota and identified the possible effects due to contamination. Information derived from these analyses were used to determine gross levels of ecological impact. Based on this work, the site does not have any detrimental environmental effects associated with chemical contamination on the site. Characteristics of the vegetation community and the composition, structure, and general health of the rodent communities onsite show no difference when compared to a reference site.

The assessment of air quality at the site was accomplished by placing test holes in the acid sludge and collecting air samples upwind and downwind of the acid sludge wastes. The major air quality hazard on the site are due to the presence of sulfur dioxide. Concentrations of about 175 parts per million (ppm) per hour were measured in air from boreholes installed in the north waste area.

2.3 Summary of Enforcement Activities

No negotiations with potentially responsible parties (PRP) have been conducted up to the present. However, a PRP search has been initiated.

It is anticipated that prior to the initiation of the remedial design, notice letters will be sent to the PRPs. Should the PRP decline to conduct remedial activities, EPA intends to provide funding for such activities contingent upon availability of funds, but will retain its right to seek cost recovery for all EPA-funded response actions from said PRPs.

3.0 COMMUNITY RELATIONS HISTORY

Community relations activities are conducted to ensure that the local public has input into the decisions about Superfund actions and is kept informed about the progress of those actions.

The community's interest in the site has been moderate. The Kansas Department of Health and Environment (KDHE) has been responsible for community relations. In February 1987, the KDHE held informal interviews with some city officials and with some of the local residents. The majority of these persons were aware that KDHE and EPA had been investigating the site. Several residents living near the site indicated that they were not concerned about the site.

No citizen inquiries have been made to local, State or Federal officials. The local newspaper, The Arkansas City Daily Traveler, presented several articles regarding activities at the site.

Section 117(a) of CERCLA provides that a notice and brief analysis of the Proposed Plan must be published, and that the Proposed Plan be made available to the public. For the Arkansas City Dump site, a notice and brief analysis of the Proposed Plan were published on September 2, 1988, in The Arkansas City Daily Traveler. The public notice provided a brief overview of the site and identified the lead agency (KDHE) and the support agency (EPA). The notice informed the public of its role in the decision-making process and provided information on the public comment period, the location of the information repositories and methods by which the public could submit oral and written comments. The notice also presented the preferred alternative and requested public comments on the alternative.

To provide the community with a reasonable opportunity to submit written and oral comments on the Proposed Plan, the Remedial Investigation (RI) reports and the Operable Unit Feasibilty Study (OUFS) report, the KDHE and EPA established a public comment period from September 2 through September 23, 1988. The KDHE and EPA also held on September 15, 1988, a public meeting in the community to present the Proposed Plan and the reports, answer questions and receive comments.

The Proposed Plan, the RI reports, the OUFS report and the Administrative Record file were made available for public review at the Arkansas City Public Library, 120 East 5th Street, Arkansas City, Kansas, at the Kansas Department of Health and Environment, Bureau of Environmental Remediation, Forbes Field, Topeka, Kansas and at the EPA Region VII Administrative Record Library in Kansas City, Kansas.

Prior to the beginning of the public comment period, KDHE and EPA met with the Arkansas City's City Manager. The City Manager was briefed on the Proposed Plan and the future response activities proposed at the site.

No significant comments were received by KDHE or EPA on the Proposed Plan, the preferred alternative or the Administrative Record file during the public comment period.

4.0 SCOPE AND ROLE OF OPERABLE UNIT ONE: ACID SLUDGE WASTE IN THE NORTH WASTE AREA

As with many Superfund sites, the problems at the Arkansas City Dump site are complex. As a result, KDHE has divided the work into two smaller units or phases, referred to as "operable units." An operable unit is a discrete part of a total remedial action for a site.

The operable units (OUs) at the Arkansas City Dump site will address the following:

- OU One: Acid sludge waste in the north waste area.
- OU Two: Oil-contaminated sediments and ground water contamination.

The feasibility study for Operable Unit Two is still under development. The oil-contaminated sediments appear to be the significant source of ground water contamination. The feasibility study for Operable Unit Two is expected to be completed in 1989.

The remedial investigations conducted at the Arkansas City Dump site have determined that the oil-contaminated sediments in the subsurface appear to be the principal contributor of organic contaminants to ground water. The principal organic ground water contaminants of concern are polynuclear aromatic compounds. However, even though ground water is contaminated onsite, organic and inorganic contaminants are not migrating offsite and the water onsite is not consumed by anyone.

The principal hazard associated with leaving the waste in the north waste area undisturbed is direct contact with the sulfuric acid in the sludge. If the acid sludge is excavated, sulfur dioxide gas concentrations may exceed the Occupational Safety and Health Administration standards on the site.

The operable unit presently under consideration at the Arkansas City Dump is Operable Unit One which addresses the acid sludge waste in the north waste area. The objective is to eliminate the threat of direct contact exposure to the acid in the sludge, to eliminate the threat which may be posed by the possible sulfur dioxide air emissions and reduce the threat of direct contact exposure to the organics in the sludge.

The overall strategy is to have Operable Unit One address the principal threat of direct contact hazard associated with the acid sludge now, while addressing the threat posed by the oil-contaminated sediments and the ground water contamination as Operable Unit Two and thereby completing the total remedial action for this site.

5.0 SUMMARY OF SITE CHARACTERISTICS

The findings of the remedial investigations were that the principal wastes on the site are: (1) Acid sludge associated with the oil refinery; (2) spilled oil product, which exists in the subsurface; and (3) municipal refuse and solid wastes. The location of each of the three principal waste types on the Arkansas City Dump site as shown in figure 7.

5.1 Types and Characteristics of Contaminants

5.1.1 Acid Sludge

Principal characteristics typically found in acid sludge are presented in Table 1. Unlike the sludge depicted in Table 1, acid sludge at the Arkansas City Dump site contains a significant amount of mineral matter (greater than 10 percent). Based on percolation tests conducted in July 1988, the sludge is quite permeable; estimates of permeability ranged from about 9 to 13 inches per minute. Twenty to 30 percent, by weight, of the acid sludge at the site is sulfuric acid. Organic compounds in the sludge are composed primarily of aliphatic, polycyclic, aromatic, and heterocyclic compounds. Based on an analysis of weathered sludge collected from the north waste area, about 30 percent of the number of organic compounds identified were polynuclear aromatic hydrocarbons (PNA), with the remaining 70 percent being various alkanes, cycloalkanes, and polar compounds. Concentrations of PNA compounds identified in sludge from the north waste area are shown in Table 2.

The sludge in the north waste area has a hardened "skin" on the surface of the wastes that extends 12 to 18 inches into the sludge. Samples of sludge collected below 18 inches were a semisolid mass that resembles fresh asphalt. Average thickness of sludge in the north waste area is about 9 feet. Sludge in the south waste area is relatively thin (2 feet or less) and appears to be entirely hardened. Sulfuric acid in this sludge apparently has been leached from the mass.

The principal water-soluble organic compounds identified in the sludge were napthalene, various methyl and dimethyl napthalene compounds, and phenanthrene. The data shown in Table 2 indicate that PNA concentrations in ground water flowing beneath the acid sludge were below the detection limit ascertainable with the analytical equipment. Based on these data, the sludge in the north waste area does not appear to be a significant source of PNA compounds in ground water.

The principal gas emanating from boreholes placed in the acid sludge in the north waste area is sulfur dioxide. Various fuel-related hydrocarbon gases were found to be emanating from the acid sludge waste; these gases are listed in Table 3. None of these gases were found in ambient air above the "skin" of the sludge in the north waste area.

The treatability study conducted as part of the Phase IIB-remedial investigation found no significant concentrations of PNA compounds in the sludge leachate with deionized water. In addition, no detectable concentrations of PNA compounds were found in filter water collected from a monitoring well screened below the water table beneath the sludge in the north waste area. Therefore, it has been determined that the acid sludge does not contribute significant concentrations of dissolved PNA compounds to ground water.

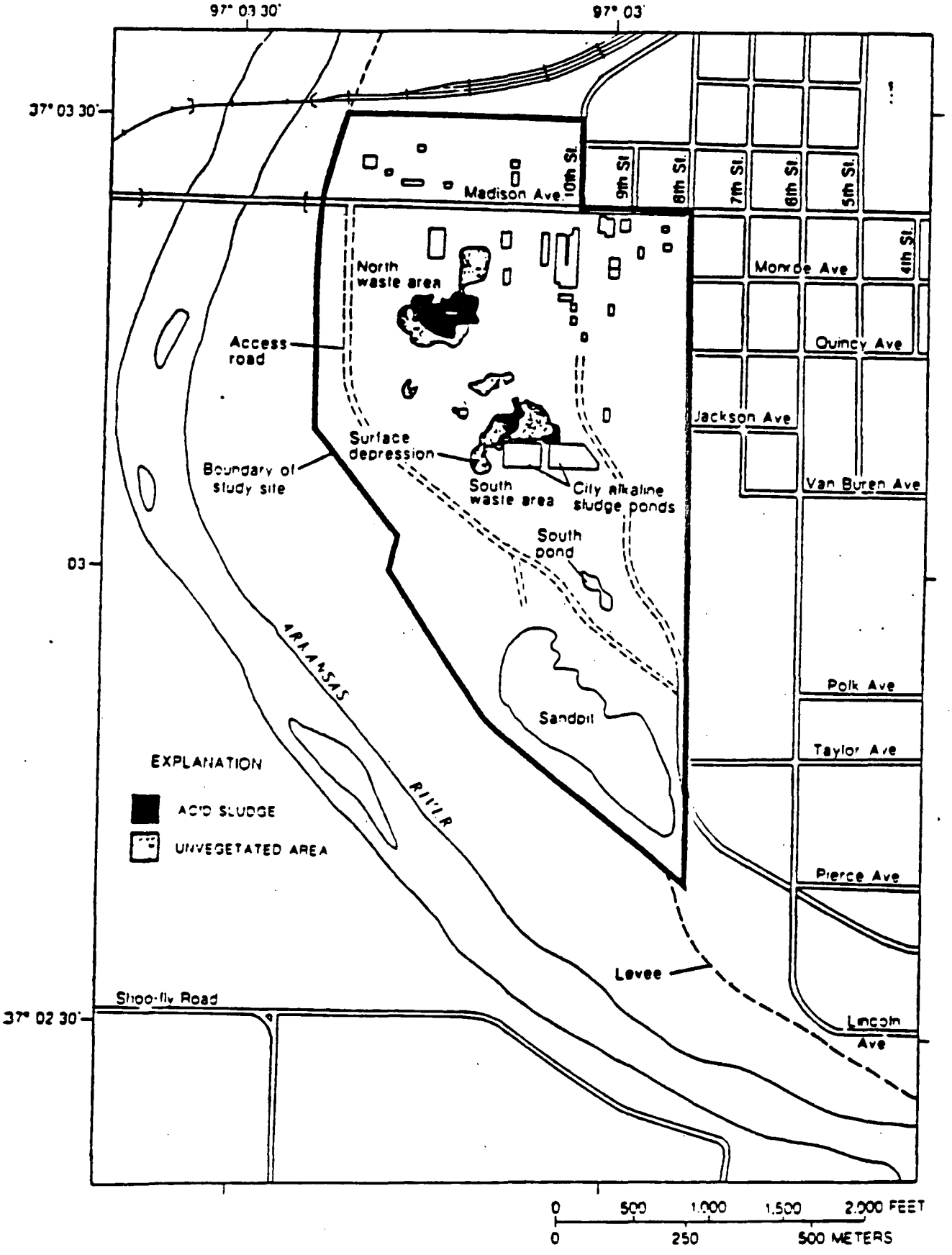

Figure 7 -- Principal features of Arkansas City Dump site.

5.1.2 Oil-Contaminated Sediments

Spillage and disposal of oil and oily wastes occurred over much of the Arkansas City Dump site. Oil-contaminated sediments were found during the course of drilling in many of the boreholes and wells onsite. Most boreholes onsite had oil-contaminated aquifer material that was encountered near the water table.

A few wells on the site had free-floating hydrocarbons at the water table. Information collected from well screenings suggest that oil was trapped below the water table in the subsurface in areas where the water table had lowered. When the water table recovered, the oil remained trapped in pore spaces of the sediment. This oil is immobile. The oil found had an odor similar to diesel fuel. Based on a chromatogram of oil collected from KDHE monitoring well No. 6, the oil on the site is composed predominantly of compounds having from 11 to 19 carbon atoms. Based on analyses of oil contaminated sediments collected from one of the most contaminated areas, alkanes, alkenes, and cycloalkanes compose 80 percent of compounds identified in the oil. About 20 percent of the number of compounds identified in the oil are composed of aromatic compounds, most of which were PNA compounds.

Oil-contaminated aquifer sediments at or beneath the water table have been determined to be the main source of ground water contaminants. A comparison of filtered water with an analysis of oil, indicates that the principal dissolved contaminants from this oil are soluble PNA compounds, such as napthalene and phenanthrene. Methyl napthalene and dimethylnapthalene were also detected at significant concentrations (see Table 2). However the largest concentrations of PNA compounds in filtered samples (the dissolved fraction) are only about 140 to 150 parts per billion (ug/L). It is assumed that the principal mobile component in ground water is the dissolved fraction.

Most of the light aromatic compounds, such as benzene, toluene and xylene, apparently have volatilized or have been flushed from these oily sediments by moving ground water. Large concentrations of volatile aliphatic compounds were detected in the sediment samples having free oil product. Concentrations of these volatile compounds, however, do occur at concentrations of less than 6 to 8 ug/L in water samples collected away from the contaminated oily sediments.

5.2 Quantities of Contaminants

Based on coring work conducted in 1986, a maximum volume of approximately 1,300,000 cubic feet of acid sludge waste is located on the site. About 95 percent of this material is located in the north waste area, with the remaining 5 percent located in the south waste area. Based on density estimates of the sludge, about 47,000 tons exist on the site.

The largest concentration of subsurface oil occurs near the center of the site in an area of about 9 acres. Although there are scattered occurrences of oil at several locations on the site, most oil is located between the north and south waste areas.

The bulk of the oil-contaminated sediments occurs at about 10 to 20 feet below the water table. The thickness of aquifer sediments contaminated with residual petroleum is estimated to range from 10 to more than 20 feet and is caused by smearing of oil product caused by the rise and fall of the water table.

It is estimated, based on an area of 9 acres, that there are approximately 500,000 gallons of residual oil product on the site. Because virtually all of the area between the north and south waste areas could contain pockets of oil in residual saturation, the total quantity of oil product on the site could be between 500,000 and 1,000,000 gallons.

No estimate was made for the volume of municipal wastes deposited at the site because this waste source does not appear to be a main contributor of contaminants to ground water on the site.

6.0 SUMMARY OF SITE RISKS

A baseline public health evaluation was conducted on the potential hazards associated with possible exposure to contaminants found at the site. A baseline public health evaluation is defined as an analysis of site conditions in the absence of remedial action. It is intended to provide an understanding of the nature of chemical releases from the site, the pathways of human exposure, the degree to which such releases violate applicable or relevant and appropriate environmental and public health requirements.

Contamination on the Arkansas City Dump site is primarily from refinery waste, acid sludge and oil-soaked soils. There are various media contaminated on this site. Soils are significantly contaminated by organic and elemental chemicals. Ground water is contaminated by a wide variety of chemicals. Surface water contained none of the organics, but many of the inorganics and elementals present in the ground water. There was evidence of air contamination, when drilling onsite resulted in release of gases from beneath the surface.

The analysis of surface water, ground water, soil and sludge samples yielded a list of 137 suspect compounds that were tentatively identified. A group of 57 positively identified chemicals were considered initially and then pared down to a final list of indicator chemicals to be considered for this public health evaluation. The list of indicator chemicals selected were considered representative of the highest risk chemicals at the site. The indicator chemicals used in the baseline public health evaluation are listed in Table 4.

Chemicals contaminating this site have the potential to move only from the soil, the ground water or the acid sludge deposits. Stability of surface soil and sludge, and the presence of site vegetation appear to prevent air contamination by fugitive particles. An exception to this may occur if the acid sludge deposits were disturbed. If this would occur, emissions of sulfur dioxide gases may result.

Human exposure at the Arkansas City Dump site is characterized by two populations. The greatest potential for exposure is in the work force of approximately 70 people employed by the various small businesses located on the site. The second group are those who intermittently gain access to the site and would experience infrequent, short-term exposures.

The major pathways of potential exposure to environmental releases are via inhalation, ingestion or direct contact. At this site, inhalation exposure is not an exposure route. Fugitive particle emissions were not significant and sampling for volatile emissions gave negative results.

Direct contact exposure is deemed to constitute a significant risk on this site. The north waste area contains 20 to 30 percent, by weight, of sulfuric acid and has a pH of less than 2. Direct contact by exposed skin would likely result in caustic burns.

The other route of exposure present at this site is that of ingestion of contaminated media. Ingestion of contaminated soil or sludge is not considered a likely event; nor is ingestion of surface water from the two surface containments on this site considered a likely source of exposure. Ingestion of ground water and dermal contact are considered significant routes of exposure on this site.

Aluminum and barium, present in ground water, pose oral toxicity hazards. Sulfuric acid, present in the acid sludge waste, poses a direct contact hazard. Because aluminum is poorly absorbed from the gut, the risk of toxicity from aluminum consumption via the ground water is not expected to pose a significant risk. Barium has been implicated in the increased incidence of heart disease from chronic consumption of water containing high levels. The concentration of barium found on site is too low to cause acute toxicity. However, a significant risk of heart disease from chronic exposure to barium by consumption of onsite contaminated ground water could result if the ground water were used for drinking.

There is a carcinogenic risk associated with this site. This risk is associated only with consumption of onsite ground water and is due to the presence of arsenic, beryllium and a mixture of polynuclear aromatic hydrocarbons (PNAs). Most onsite monitoring wells yielded water with concentrations that would produce a cancer risk greater than 1:1,000 if consumed by a 70-kilogram

adult over a 70-year lifetime. Levels of arsenic in most of the ground water wells on site exceeded the Kansas Action Level (KAL) and the EPA water quality criteria standard. Ingestion of arsenic produced a cancer risk of 3.6×10^{-6}. This a much greater value than the Kansas and EPA targets of 10^{-6}. Beryllium was found in three ground water wells onsite with a maximum concentration of 2 micrograms per liter (ug/l). The KAL for beryllium in ground water is 0.13 ug/l and the EPA recommended criteria for cancer risk of 10^{-6} is 3.7 nanograms per liter (ng/l). PNAs were found in most of the ground water samples analyzed onsite. Due to the large number of PNAs present in various mixtures, and because little or no health effects data are available for many of them, the mixture found onsite was considered as a summation of total PNAs. The total concentration of PNAs present was evaluated as if their health effects were the same as an identical concentration of benzo(a)pyrene, for which there are health effects data available. The maximum additive concentration of all PNAs detected in ground water would be 234 ug/l. The KAL for benzo(a)pyrene is 3 ng/l and the EPA recommended criteria for cancer risk of 10-6 is 2.8 ng/l. Thus, the total concentration of PNAs is much greater than the KAL and EPA criteria.

It must be emphasized, however, that the risk of cancer is present only if consumption of ground water from contaminated aquifers were to occur based on a 70-kilogram adult over a 70-year lifetime. At the present time there is no known consumption of onsite ground water, and consumption of offsite water poses no risk.

Environmental risks at the site are considered low. The low solubilities, sorption characteristics and biodegradability all tend to minimize environmental risks. Accumulation in plant material of the contaminants present is not expected to be significant, nor is entry into the food chain. Surface water contamination is not considered to pose a significant risk, nor is it a source for entry of contaminants into the food chain. Movement from the current deposits of contamination, the soil, the acid sludge and ground water is not considered likely, nor is impact on the environment from these sources.

In summary, the principal hazards posed by the Arkansas City Dump site is through direct contact with the sulfuric acid and organic compounds in the acid sludge waste and ingestion of the contaminated ground water onsite. If the sludge is left undisturbed, sulfur dioxide emissions from the site are not significant. Presently, there is no consumption of onsite ground water and consumption of offsite water poses no risk.

7.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The KDHE and the EPA presented the Proposed Plan to the community in a public meeting held September 15, 1988. The Proposed Plan as prepared was limited to the acid sludge waste in the north waste area and identified Alternative 8: Neutralization followed by Covering with Soil, as the preferred alternative for

Operable Unit One at the Arkansas City Dump site. There have been no significant changes made to the preferred alternative as a result of public comments.

8.0 Description of Alternatives

The objective of the Operable Unit Feasibility Study (OUFS) was to evaluate possible remedial action alternatives and to present detailed cost and environmental impact information on the most feasible remedial action alternatives appropriate for the acid sludge deposits at the Arkansas City Dump site.

During the evaluation of remedial alternatives, different processes were evaluated to control the risk of direct contact and to control the migration of the contaminants. Initially, eleven alternatives were evaluated and screened based on their general effectiveness, reliability, implementability, costs and safety. Table 5 summarizes the effectiveness, implementability, public health assessment and cost factors of the eleven alternatives.

Of the eleven options considered, eight of the alternatives were evaluated further. These alternatives involve technologies, which have been sufficiently developed so they can be quickly implemented. These alternatives ranged from no action to treating all the acid wastes to treating the ground water underneath the acid sludge. The following is a summary of the detailed analysis presented in the OUFS report dated September 1988. The eight alternatives are numbered to correspond with the numbers in the OUFS.

ALTERNATIVE 1: NO ACTION

The Superfund program requires that the "no action" alternative be considered at every site. This alternative does not provide for cleanup of the acid sludge waste. This alternative provides only for institutional actions, such as deed restrictions which would be taken to protect the public from the hazards associated with the north waste area. The environmental and public health risks would remain as they presently exist. The principal hazards associated with the north waste area is the contact hazard associated with acid in the sludge. Organic compounds are also contained in the sludge and are composed primarily of aliphatic, polycyclic, aromatic, and heterocyclic compounds. If the sludge is disturbed, the potential exists for the emission of large concentrations of sulfur dioxide onsite and offsite. The hazards associated with the acid sludge would remain if this alternative was implemented.

This alternative would require no time for implementation, and there would be no capital cost associated with the no action alternative.

Adoption of this alternative would require continuation of an ongoing sampling and analysis program by the Kansas Department of Health and Environment. This would include monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

This alternative does not satisfy the remedial action objectives which are to provide adequate protection for public health and the environment.

ALTERNATIVE 2: RESTRICT ACCESS

The restriction of access alternative would involve the installation of a 6-foot chain-link fence topped with three strands of barbed wire to surround the areas where human contact with the acid sludge provides a hazards. This would require the use of a fence and deed restrictions to prevent site entry and direct contact with the acid sludge waste.

The principal hazard associated with the acid sludge waste is the risk of direct contact with the acid in the sludge. Implementation of this alternative would reduce the risk of direct contact with the acid sludge, but would not eliminate such risk.

The hazard posed by the organic compounds contained in the sludge and the potential for the emission of large concentrations of sulfur dioxide onsite and offsite if the north waste area was disturbed would remain if this alternative was implemented.

This alternative does not satisfy the remedial action objectives which are to provide adequate protection for public health and the environment, because the toxicity of the acid in the sludge would remain.

This alternative would require only several months for implementation. The capital cost for this alternative is estimated to be $14,000.

Adoption of this alternative would require the adoption of an operation and maintenance program to ensure the integrity of the fence and the continuation of an ongoing sampling and analysis program. The Kansas Department of Health and Environment would be responsible for this program. This would include inspection of the fence and monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings on any part of the

site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

ALTERNATIVE 5: NEUTRALIZATION

This neutralization alternative would reduce the direct contact hazards and the potential for emissions of large concentrations of sulfur dioxide onsite and offsite if the north waste area was disturbed.

The principal hazard associated with the acid sludge waste is the contact hazard associated with acid in the sludge. Treatability studies conducted on the acid sludge demonstrated that neutralization of the acid sludge can be carried out with time. Experiments showed that 20 pounds of lime are needed to neutralize 100 pounds of acid sludge. Based on density estimates of the sludge, 47,000 tons exist in the north waste area. The quantity of lime required to neutralize the sulfuric acid is estimated to be 9,000 tons.

In situ neutralization of the acid sludge can be achieved by two treatment methods. The first method involves circulating a solution of lime in water through the acid sludge to neutralize the acid in the sludge. The second method involves using equipment designed to drill through the acid sludge and mix in dry lime as the hole is drilled.

The first method can be implemented by using a post-hole digger to drill holes 2 to 3 feet deep at a number of locations. The holes would be approximately 1 foot in diameter and 3 feet apart, with a rectangular grid of holes. The holes would be filled with a saturated solution of lime in water. Water would be pumped from wells at the edges of the sludge deposits so that the water is recirculated within the acid sludge deposit. The water would be pumped into a tank which contains lime. From the tank, the lime solution would flow by gravity through hoses or pipes into the holes . The pumping rate would be controlled so that the tank and the holes do not overflow. Based on percolation tests, the permeability of the acid sludge is approximately 60 inches per hour.

The second treatment method involves drilling holes and utilizing a new in-place soil-consolidation method to mix dry lime into the acid sludge as the hole is drilled. In-place soil-blending equipment with air pollution control for particulates and sulfur dioxide is available to minimize the health risk associated with the emissions from the acid sludge waste. Soil blending occurs in a cylinder that is 6 to 12 feet in diameter.

Implementation of these treatment methods would not completely reduce the organic contaminants in the acid sludge. Organic compounds are also contained in the sludge and are composed primarily of aliphatic, polycyclic, aromatic, and heterocyclic compounds. The more soluble organics would undergo

volatilization while the treatment process was being implemented.

Those organic compounds remaining in the north waste area are considered immobile.

This alternative would not completely satisfy the remedial action objectives which are to provide adequate protection for public health and the environment because direct contact with organic compounds on the surface of the sludge deposits could occur.

This alternative would require 5 to 8 months to implement depending on the selected treatment method. The capital costs for the liquid treatment method are estimated to be $788,000. The capital costs for the in-place soil-blending treatment method are estimated to be $2,080,000.

Adoption of this alternative would require continuation of an ongoing sampling and analysis program by the Kansas Department of Health and Environment. This would include monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

ALTERNATIVE 7: SOIL COVER

This alternative would involve covering the acid sludge waste with soil or a combination of soil and lime. The principal hazards associated with the acid sludge waste is the contact hazard associated with sulfuric acid in the sludge. Implementation of this alternative would significantly reduce the possibility of someone coming into contact with the acid sludge.

The direct contact hazards associated with the acid sludge waste from organic compounds contained in the sludge and the potential for the emission of large concentrations of sulfur dioxide onsite and offsite if the sludge was disturbed would be significantly reduced, but would not be eliminated.

This alternative would be implemented by spreading approximately 100 tons of lime on the surface of the acid sludge followed by the covering with 2 feet of soil cover. A native vegetation stand would be established on the soil cover. The spreading of lime would neutralize the top surface of the acid sludge. The soil cover would reduce infiltration through the north waste area.

This alternative would not completely satisfy the remedial action objectives which are to provide adequate protection for public health and the environment because sulfuric acid in the sludge remains. The possibility exists that the cover could be disturbed or degrade with time, and direct contact with the acid sludge could occur.

This alternative would take approximately 3 months to implement. The capital cost for this alternative is estimated to be $131,000.

Adoption of this alternative would require the adoption of an operation and maintenance to assure the integrity of the soil cover and the continuation of an ongoing sampling and analysis program. The Kansas Department of Health and Environment would be responsible for this program. This would include inspection of the soil cover and monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

ALTERNATIVE 8: NEUTRALIZATION FOLLOWED BY SOIL COVER

This alternative would implement the same in situ neutralization and soil cover as described in alternative 5 and alternative 7. This neutralization alternative would reduce the direct contact hazard and the potential for the emission of large concentrations of sulfur dioxide onsite and offsite if the north waste area were disturbed.

Implementation of this treatment method would not completely reduce the organic contaminants in the acid sludge. Organic compounds are also contained in the acid sludge waste and are composed primarily of aliphatic, polycyclic, aromatic, and heterocyclic compounds. The more soluble organics would undergo volatilization while the treatment process was being implemented. Those organic compounds remaining in the sludge are considered immobile.

This alternative would satisfy the remedial action objectives which are to provide adequate protection for public health and the environment because direct contact with organic compounds would be prevented by the soil cover.

This alternative would take approximately 6 to 8 months to implement. The capital costs for the wet neutralization along

with soil cover are estimated to be $919,000. The capital costs for the dry blending neutralization along with soil cover are estimated to be $2,211,000.

Adoption of this alternative would require the adoption of an operation and maintenance program to assure the integrity of the soil cover and the continuation of an ongoing sampling and analysis program. The Kansas Department of Health and Environment would be responsible for this program. This would include inspection of the soil cover and monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

ALTERNATIVE 9: SOIL COVER AND SEALING THROUGH SOLIDIFICATION

This alternative would involve covering the acid sludge with soil and the surface would be sealed using solidification technology. The principal hazards associated with the acid sludge waste is the contact hazard associated with sulfuric acid in the sludge. Implementation of this alternative would significantly reduce the possibility of someone coming into contact with the acid sludge.

The hazard associated with the sludge from the organic compounds contained in the sludge and the potential for the emission of large concentrations of sulfur dioxide onsite and offsite if the sludge was disturbed would be significantly reduced, but would not be eliminated.

This alternative would be implemented by covering with at least 2 feet of soil and placing the equivalent of concrete or other hardened surface on top of the acid sludge waste. The hardened surface would reduce the infiltration through the acid sludge deposits. The area could possibly be used as a parking lot, playground or for commercial activity.

This alternative would provide an extra margin of safety over the simple soil cover as describe in alternative 7. This alternative would not completely satisfy the remedial action objectives which are to provide adequate protection for public health and the environment because the majority of the sulfuric acid in the sludge remains. The possibility exists that the hardened surface could be disturbed or degrade with time, and then direct contact with acid sludge could occur.

This alternative would take approximately 3 to 5 months to implement. The capital cost for this alternative is estimated to be $328,000.

Adoption of this alternative would require the adoption of an operation and maintenance program to assure the integrity of the hardened surface and the continuation of an ongoing sampling and analysis program. The Kansas Department of Health and Environment could be responsible for the entire program. This would include inspection of the surface and monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings into any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

ALTERNATIVE 10: NEUTRALIZATION AND IMMOBILIZATION OF THE SURFACE LAYERS

This alternative would involve neutralizing the surface layer and then solidifying the surface. Implementation of this alternative would reduce the possibility of someone coming into contact with the acid sludge waste.

The direct contact hazard associated with the sludge from the organic compounds contained in the acid sludge waste and the potential for the emission of large concentrations of sulfur dioxide onsite and offsite if the sludge was disturbed would be reduced, but would not be eliminated.

This alternative would be implemented by spreading lime on the surface and then working the lime into the acid sludge waste with suitable equipment such as a Bomag blender which is similar in function to a roto tiller. The top 1 or 2 feet of acid sludge waste would be neutralized and then followed by solidification using fly ash, zeolite and a proprietary solidification-aiding reagent (URRICHEM). The treatability study performed on the acid sludge demonstrated that the acid sludge can be effectively treated with the URRICHEM stabilization-solidification process. This treatment method would involve the treatment of only 10% of the sludge. The hardened surface would reduce the infiltration through the north waste area. The area could possibly be used as a parking lot, playground or for commercial activity.

This alternative would provide an extra margin of safety over the simple soil cover as describe in alternative 7. This

alternative would not completely satisfy the remedial action objectives which are to provide adequate protection for public health and the environment because sulfuric acid remains in the majority of the north waste area. The possibility exists that the cover could be disturbed or degrade with time, and then direct contact with acid sludge could occur.

This alternative would take approximately 5 to 7 months to implement. The capital cost for this alternative is estimated to be $858,000.

Adoption of this alternative would require the adoption of an operation and maintenance program to assure the integrity of the solidified surface and the continuation of an ongoing sampling and analysis program. The Kansas Department of Health and Environment could be responsible for the entire program. This would include inspection of the solidified surface and monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

ALTERNATIVE 11: NEUTRALIZATION AND IMMOBILIZATION OF ALL OF THE ACID SLUDGE

This alternative would involve neutralization and immobilization of all the acid sludge. This alternative would eliminate direct contact hazards and sulfur dioxide emissions. Implementation of this treatment method would immobilize the organic contaminants in the acid sludge.

This alternative would involve either of two treatment methods. The first treatment method would involve the excavation of the acid sludge waste. Neutralization of the surface prior to the excavation would be required to prevent the release of sulfur dioxide emissions. Lime applied to the surface would be blended into the surface layer using suitable equipment. This layer then would be removed using a front-end loader or other suitable equipment. This process would be repeated as necessary. When the bottom of the acid sludge is located, the process of solidification of the neutralized sludge would be started. Fly ash, zeolites, and a proprietary solidification-aiding reagent (URRICHEM) would be mixed with the sludge to produce a solidified product. This material would be placed back into the excavated hole at the site.

The second treatment method would involve in-place soil-blending as described in alternative 5 and the addition of fly ash, zeolites, and a proprietary solidification-aiding reagent (URRICHEM) would be blended together with the sludge in a 6- to 12-foot cylinder. The volume expansion caused by added ingredients would require that some of the product be used either to elevate the area where the acid sludge waste is located or to fill some of the lower areas that are nearby.

These alternatives would take over 12 months to implement. The capital costs for the excavation of the acid sludge followed by solidification are estimated to be $9,846,000. The in-place dry blending neutralization and solidification are estimated to be $9,571,000.

Adoption of this alternative would not require the adoption of an operation and maintenance program or the continuation of an ongoing sampling and analysis program.

Deed restriction and other institutional controls would be required with this alternative. A deed restriction would prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of this alternative.

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

OVERALL PROTECTION. All of the alternatives with the exception of the no action alternative would provide adequate protection of human health and the environment. Alternative 1, which would allow site conditions to remain unchanged, would not be protective of human health and the environment. The potential for direct contact exposure to the acid sludge and the potential exposure to sulfur dioxide emissions from acid sludge deposits will remain. Alternatives 2, 7 and 9 protect human health, but they do not change the environmental state of the acid sludge.

For alternatives 1, 2, 7 and 9 the sludge remains acidic and the possibility of sulfur dioxide emissions if the sludge was excavated is not eliminated. Alternative 2 would reduce the risk of direct contact by restricting the access. Alternatives 7 and 9 would provide an environmentally acceptable surface condition at the site, but would not eliminate the possibility of sulfur dioxide emissions if the acid sludge waste was excavated. Alternative 7 would allow the site to support natural vegetation and some types of human activity. Alternative 9 would allow the surface to be used as a parking lot, playground or for commercial activity.

Alternatives 5, 8, 10 and 11 would all be protective of the public health and the environment. For these alternatives, the acid sludge would be neutralized; thereby, the direct contact threat would be eliminated or reduced with respect to the acid in the sludge. The sulfur dioxide emissions from the acid sludge

waste would be eliminated or reduced. Solidification in Alternatives 8, 10 and 11 would reduce the ability of infiltration through the north waste area to leach the contaminants.

Alternative 11 would be somewhat more protective than alternatives 5, 8 and 10 because it has the potential to reduce organic compounds by volatization in the sludge as a source of ground water contaminants. However, the ground water onsite is presently not used for drinking purposes, is not a present need and the acid sludge is not a significant contributor to onsite ground water contamination. Alternatives 8, 10 and 11 would allow the site to support natural vegetation and/or some type of human activity. Alternatives 5, 8, 10, and 11 have the potential to reduce concentrations of iron, manganese, sulfates and to increase the pH of ground water beneath the acid sludge. Alternatives 5, 8 and 11 would have a greater potential to reduce these contaminants because all the acid sludge, not just the top portion, would be neutralized.

Deed restrictions for all alternatives would be required to prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials upon completion of Operable Unit One.

COMPLIANCE WITH ARARs. Section 121(d) of The Comprehensive Environmental, Recovery, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), requires selection of a remedial action that is protective of human health and the environment. The EPA's approach to determining protectiveness involves risk assessment, considering applicable or relevant and appropriate (ARARs) requirements promulgated under Federal or State law and to-be-considered criteria (TBC).

ARARs (and TBCs necessary for protection) must be attained for hazardous substances, pollutants or contaminants remaining on site at the completion of the remedial action, unless a waiver of an ARAR is justified. Table 6 provides a list of the appropriate ARARs and TBCs for the site.

Alternatives 1, 2, 7, 9, and 10 would not be protective of human health and the environment because the acidic material would remain in the north waste area. Alternative 2 would be somewhat more protective than alternative 1 because the fence around the north waste area would restrict access. Alternatives 7, 9 and 10 would be somewhat more protective than alternative 2 because the risk of direct contact exposure with the acid sludge would be reduced or a portion of the acid sludge would be neutralized.

Alternatives 5, 8 and 11 would be protective of human health and the environment because these alternatives would neutralize all the acid sludge and, thereby, the direct contact risk.

Alternatives 1, 2 and 5 would not meet ARARs under the Resource Conservation and Recovery Act (RCRA) definition of a closure-in-place. Alternatives 7, 8, 9, 10 and 11 would meet ARARs under the RCRA definition of a hybrid closure. A hybrid closure or alternative approach to closure may occur where RCRA closure is not applicable but may be relevant and appropriate. This would be where residual contamination is above health-based levels and contamination does not pose a direct contact exposure threat or impact ground water.

Alternatives 5, 8, 10 and 11 would need to met ARARs for sulfur dioxide emissions while the neutralization process is being implemented. Disturbance or excavation of acid sludge waste may exceed the standard of sulfur dioxide for employees of onsite businesses or construction workers.

ARARs and TBCs would not be met for alternatives 1, 2, 7, 9 and 10 for the existing State and Federal drinking water standards. Alternatives 5, 8 and 11 have the potential to reduce the contaminants in ground water beneath the site. Alternative 11 is the only alternative that has the potential to significantly improve the ground water under the site with respect to organic and inorganic contaminants in the acid sludge.

Ground water underneath the site contains both organic and inorganic contaminants that exceed the acceptable concentrations for drinking water; however, this does not pose an immediate health hazard because water from wells onsite is not consumed by anyone and the contaminants are not migrating offsite. From the ground water data, it has been determined that the north waste area is not a major source of contaminants to the ground water. The principal contributors of organic and inorganic contaminates are the oil-contaminated sediments and the solid waste landfill area.

The CERCLA, as amended, provides that under certain circumstances an ARAR may be waived. These waivers apply only to meeting ARARs with respect to cleanup onsite.

CERCLA provides a waiver where the cleanup being proposed is only an interim measure. Specifically, CERCLA Section 121(d)(4)(A), as amended, provides that such waiver may be invoked if the remedial action selected will only be part of a total remedial action that will attain such levels or standards of control when completed.

Operable Unit One will invoke a waiver. The selected alternative (alternative 8) will not meet ARARs for the Federal and State drinking water standards or for the TBCs for the Kansas Groundwater Contaminant Cleanup Target Concentrations. However, Operable Unit One is an interim measure; and it is intended that the ARARs and TBCs will be attained in the final remedy (Operable Unit Two) upon completion.

LONG TERM EFFECTIVENESS. Long-term effectiveness and performance are evaluated with respect to the magnitude of residual risk, adequacy and reliability of controls over remaining waste and long-term management requirements.

Alternative 11 would provide the best long-term effectiveness because this alternative uses treatment and fixation technologies on the acid sludge waste. Alternative 11 would neutralize the acid in the sludge and the solidification process would immobilize the remaining organic compounds. Alternatives 5 and 8 would neutralize the acid in the sludge and provide long-term effectiveness because the direct contact hazard and the potential sulfur dioxide emissions would be eliminated.

Alternatives 7, 9 and 10 would employ a multimedia cap to reduce the potential for direct contact and for sulfur dioxide emissions. Leaching of organic compounds into the ground water will be reduced somewhat more with alternatives 9 and 10 because they would solidify the surface and provide a hardened surface. The cap in alternative 7 is effective at reducing risk from direct contact with the acid sludge, but in the long-term it is less reliable than solidifying the top surface. These alternatives have long-term ground water monitoring and cap maintenance requirements. These maintenance activities (mowing, revegatation, cap repair) are more critical for these alternatives since not all of the acid sludge are neutralized under the cap. Failure to detect a problem with the cap may result in direct contact exposure with the acid sludge, sulfur dioxide emissions and further degradation of the ground water through leachate production.

Alternative 2 is a reliable technology to reduce the direct contact hazards associated with the acid sludge. However, a fence is susceptible to vandalism and periodic inspection and repair would be required.

Alternative 1 would provide no long-term effectiveness in protecting human health and the environment. The contaminants that would remain onsite would diminish over time as a result of dispersion, adsorption, biodegradation, and volatilization. Ground water monitoring would still need to be implemented to monitor the migration of residual contamination.

Deed restrictions for all alternatives would be required to prohibit soil excavation and construction of buildings on any part of the site still containing hazardous material upon completion of Operable Unit One.

REDUCTION OF TOXICITY, MOBILITY OR VOLUME. Alternative 11 is the only alternative which would use treatment to reduce toxicity, mobility and volume of contaminants in the acid sludge. Alternatives 5, 8, and 10 would eliminate or reduce the toxicity and volume of contaminants in the acid sludge by neutralizing the acid in the sludge and the potential for sulfur dioxide

emissions. Alternatives 5 and 8 would eliminate the toxicity and volume of contaminants than alternative 10 because all the acid sludge, not just the top portion, would be neutralized.

Alternatives 7, 8, 9 and 10 would reduce the mobility of contaminants by reducing the infiltration of water into the sludge. Alternatives 1 and 2 will achieve no reduction of toxicity, mobility or volume of contaminants on the site.

SHORT-TERM EFFECTIVENESS. Adverse impacts to offsite residents from sulfur dioxide emissions would not be significant for any of the alternatives.

There are adverse impacts to employees of the onsite businesses and construction workers with some of the remedial alternatives. Alternatives 5, 8, 10 and 11 have the potential for releases of sulfur dioxide while the neutralization process is being implemented. The potential for the release of sulfur dioxide is somewhat greater for alternative 11 than for the other neutralization methods.

Protection to employees of the onsite businesses and construction workers would be accomplished by controlling the area of exposed surface and by applying lime to neutralize exposed surfaces as soon as they are disturbed. Construction workers implementing the cleanup would be required to wear protective equipment to prevent inhalation of sulfur dioxide.

Alternatives 5 and 8 would have an environmental risk associated with the movement of large quantities of water; but this would be controlled by designing the recirculation system to minimize movement of contaminated water to other locations. Because the ground water at the site is not used for any purpose, the environmental risks associated with circulation of the water are small.

The time required for implementation of any alternative would be short, except alternative 11. It is anticipated that over 12 months would be required to neutralize and solidify all the acid sludge waste in the north waste area.

There would be a short-term risk to construction workers when installing the fence in alternative 2.

All alternatives, with the exception of alternative 1, would minimize the short-term risks to construction workers by requiring proper clothing and safety equipment.

IMPLEMENTABILITY. The no action alternative can be readily implemented at the site. The existing ground water monitoring network would be utilized, and the program implemented within a short time. Alternatives 2 and 7 could also be implemented in a short time.

The technologies for alternatives 1, 2, 7 and 9 are well developed. Technologies for alternatives 5, 8, 10 and 11 are somewhat less developed, but knowledge is sufficient to implement the alternatives.

The treatability study performed during the Phase IIB remedial investigation demonstrated that neutralization of the acid sludge can be carried out with time. Based on permeability tests, the permeability of the acid sludge would allow Alternatives 5 and 8 to be implemented.

Alternatives 1, 2 and 7 are the simplest to construct and operate. A soil cover would be more difficult to construct than a fence because of the significant materials handling requirements. Periodic maintenance of the soil cover should ensure its reliability in the future.

Alternatives 5, 8, 9, 10 and 11 would be somewhat more difficult to construct and operate. In situ neutralization of the acid sludge would require some specialized equipment. Proper engineering design would be required to ensure that recirculation system or soil-blending equipment would work as intended. In-place soil-blending equipment would require air pollution controls for particulates and sulfur dioxide.

Alternative 11 is more complex to construct and operate. Treatment reagents and special handling equipment would be required to implement this remedy. The possibility exists that there would be scheduling delays due to treatment reagents not being shipped to the site in a timely manner.

COST. CERCLA requires the selection of the most cost-effective alternative that protects human health and the environment and meets other requirements of the law. The no action alternative which involves no capital cost, was considered in order to meet requirements of the law.

Capital costs include those expenditures required to implement a remedial action. The estimated total capital costs are shown in Table 7. Annual post-closure costs have been included in the present worth cost.

Alternative 8 (wet process) is the selected remedy because it is the most cost-effective alternative and is protective of human health and the environment and meets other requirements of the law.

SUPPORT AGENCY ACCEPTANCE indicates whether, based on its review of the Remedial Investigation reports, the Operable Unit Feasibility Study report and the Proposed Plan, the EPA concurs with, opposes, or has no comment on the selected alternative.

The EPA has reviewed the Proposed Plan, the Remedial Investigation reports, and the Operable Unit Feasibility Unit report and agrees with KDHE's preferred alternative presented in

the Proposed Plan for Operable Unit One. The EPA also invokes a waiver pursuant to Section 121 of CERCLA, as amended, to implement Operable Unit One.

COMMUNITY ACCEPTANCE reflects the community's apparent preferences or concerns about alternatives.

The Proposed Plan, the Remedial Investigation reports, the Operable Unit Feasibility Study report, and the Administrative Record file were made available for public review. Prior to the beginning of the public comment period, the KDHE and EPA met with the Arkansas City's City Manager. The City Manager was briefed on the Proposed Plan and the future response activities proposed at the Arkansas City Dump site. The KDHE and EPA received acceptance from the City Manager on the preferred alternative presented in the Proposed Plan.

The KDHE held a public meeting on September 15, 1988, in the community to present the Proposed Plan and the preferred alternative. There were no significant comments raised in opposition to the preferred alternative.

10.0 THE SELECTED REMEDY

The "Neutralization followed by Soil Cover" alternative has been selected for Operable Unit One at the Arkansas City Dump site. The EPA, in consultation with KDHE has determined that the acid in the sludge in the north waste area poses a significant direct contact threat to public health and the environment, and that therefore taking remedial measures is appropriate. This determination is primarily based on : (1) the Phase I-remedial investigation conducted by KDHE; (2) the Phase IIA and IIB-remedial investigations conducted under contract by the KDHE; (3) the public health evaluation conducted under contract by the KDHE; and (4) Health Consultation provided by the Agency for Toxics Substance and Disease Registry (ATSDR). It is also determined that a waiver for Operable Unit One will be invoked.

The selected alternative will neutralize the acid in the sludge (pH less than 2.0) and eliminate the potential for sulfur dioxide emissions. The soil cover will reduce the direct contact hazard associated with any organic compounds remaining in the north waste area after treatment.

As will be discussed in detail in Section 11 of this document, the selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, to-be-considered criteria, and is cost effective.

11.0 THE STATUTORY DETERMINATIONS

The selected remedy for Operable Unit One satisfies the requirements under Section 121 of The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as

amended by SARA. The remedy provides protection of public health and the environment, achieves applicable or relevant and appropriate requirements (ARARs) and is cost effective. Operable Unit One will invoke a waiver for appropriate ARARs with respect to the Safe Drinking Water Act, Clean Water Act and to-be-considered criteria (TBC) under the Kansas Groundwater Contaminant Cleanup Target Concentrations.

The selected remedy for Operable Unit One addresses only the direct contact hazards associated with the acid sludge waste in the north waste area.

Ground water underneath the site contains both organic and inorganic contaminants that exceed the acceptable concentrations for drinking water. However, the ground water does not pose an immediate health hazard because water from wells installed onsite during the remedial investigations is not consumed by anyone and the contaminants are not migrating offsite. Further, from the ground water data, it has been determined that the north waste area is not a major source of ground water contamination. The principal contributors of organic and inorganic contaminants are the oil-contaminated sediments and contaminants originating from the landfill.

CERCLA, as amended, provides that under certain circumstances ARARs may be waived. In section 121(d)(4)(a) of CERCLA, a waiver is provided where the cleanup being proposed is only part of a total remedial action that will attain ARARs when completed.

The KDHE proposed in the Proposed Plan a waiver for Operable Unit One because the preferred alternative (selected remedy) would not meet ARARs for the Federal and State drinking water regulations or the TBC for the Kansas Groundwater Contaminant Cleanup Targets. The EPA is invoking a waiver for Operable Unit One based on the determination that this is an interim measure for this site.

11.1 Protective of Human Health and the Environment

Both the health assessment conducted during the Phase IIB-remedial investigation and the ASTDR's Health Consultation concluded that the north waste area poses a direct contact hazard to human health and the environment.

The selected remedy will treat the acid in the sludge in the north waste area and eliminate the potential for sulfur dioxide emissions. The remedy would also use a soil cover to further reduce any direct contact hazard to remaining contaminants.

Deed restrictions and other institutional controls would prohibit soil excavation and construction of buildings on any part of the site still containing hazardous materials and would ensure that drinking water supply wells are not drilled into contaminated parts of the aquifer upon completion of Operable

Unit One.

The adoption of an operation and maintenance program would be required to assure the integrity of the soil cover and an ongoing sampling and analyses program would be necessary. The KDHE would be responsible for these programs. This would include inspection of the soil cover and monitoring of onsite wells and some offsite wells. Analytical results would be used to monitor future conditions and to assess the effectiveness of the remedy.

11.2 Attainment of Applicable or Relevant and Appropriate Requirements (ARARs) and To-Be-Considered Criteria (TBC)

Section 121(d) of CERCLA, as amended by SARA, requires that remedial actions comply with applicable or relevant and appropriate requirements or standards (ARARs) under Federal environmental or State environmental laws or facility siting laws and to-be-considered criteria (TBC). Table 8 provides a summary of ARARs and TBCs of the appropriate Federal and State environmental laws for the remedial actions at the north waste area.

The Safe Drinking Water Act (SWDA) and the Kansas Public Health-Chapter 65, Article 15 statutes have been identified as relevant and appropriate requirements for the selected remedy. The SWDA and Kansas State Statutes established primary drinking water standards, MCLs, which protect human health from the potential adverse effects of drinking water contaminants and established secondary drinking water standards, which protect human health from the specific contaminants that may affect the aesthetic qualities of drinking water. Primary and secondary drinking water standards are generally relevant and appropriate where the ground water is or may be used for drinking.

For the Arkansas City Dump site, the primary and secondary drinking water standards are relevant and appropriate where the ground water may be used for drinking water. Ground water under the north waste area had concentrations of iron, manganese, sulfate, and PNA compounds that were greater than existing State and Federal drinking water standards. The Arkansas River alluvial aquifer is considered a Class-II aquifer because it is a potential source of drinking in the vicinity of the site and is used for drinking water purposes elsewhere.

The policy of the KDHE is that cleanup of contaminated aquifers should be to target cleanup standards, as indicated in the "Ground Water Contaminant Cleanup Target Concentrations." The KDHE established this policy to remediate entire plumes of contamination in fresh and usable aquifers to comply with concentration levels which would meet the Kansas Notification Level or Alternative Kansas Notification Level. These KDHE standards have not yet been officially promulgated as official legal standards and are currently treated as guidelines or goals for cleanup.

For the Arkansas City Dump site, KDHE's ground water contaminant cleanup target concentrations are to-be-considered criteria for Operable Unit One. Ground water under the north waste area had concentrations of iron, manganese, sulfate, and PNA compounds that exceeded the Kansas Action Level. The Arkansas River alluvial aquifer is a Class-II aquifer which is defined by the State of Kansas as an aquifer having from 500 to 5,000 milligrams per liter dissolved solids concentration and is, therefore, a usable aquifer.

As previously discussed, the EPA is invoking a waiver under the Federal and State drinking water regulations for this selected remedy and will address the ARARs and the TBC requirements in Operable Unit Two.

The Resource Conservation and Recovery Act (RCRA) and the Kansas Public Health-Chapter 65, Article 31 statutes have been identified as relevant and appropriate requirements for the selected remedy. The criteria and limitations used to identify wastes as being hazardous or nonhazardous in the Federal and State environmental laws are relevant and appropriate to the selected remedy. The waste in the north waste area meets the three criteria as defined in the regulations.

The selected remedy will neutralize the acid in the sludge and will eliminate the potential for sulfur dioxide emissions. Under the Federal and State RCRA regulations if residuals remain that potentially pose a direct contact threat but do not pose a threat to ground water a hybrid closure, which consists of a cover to address the direct contact threat, may be used. The RCRA regulations on placement of a cap over waste designed and constructed to provide long-term minimization of liquids through the cap is relevant and appropriate to the selected remedy.

The Clean Air Act and the Kansas Public Health-Chapter 65, Article 19 statutes have been identified as being relevant and appropriate requirements for the selected remedy. The Clean Air Act is designed to protect and enhance the quality of the nation's air resources so as to protect the public health and welfare. The Kansas ambient air quality standards and air pollution control regulations are to protect and enhance the quality of the state's air resources so as to protect the public health and welfare.

The sulfur dioxide emissions could exceed the Federal standard of 365 mg/m^3 and the State standard of 13 ug/m^3, 24-hour average onsite if the hardened surface were removed. The in situ neutralization treatment process will be implemented to minimize this from occurring.

11.3 Cost Effectiveness

The selected remedy is the most cost-effective treatment alternative that protects human health and the environment and meets other requirements of the law.

The capital costs of the selected remedy (neutralization followed by a soil cover) are estimated to be $788,000. The annual operation and maintenance costs are estimated to be $3,000 per year.

Although the other treatment alternatives that were evaluated might in some cases afford a better overall effectiveness, such effectiveness is not proportional to their total costs. However, the selected remedy is cost-effective and protective of the public health and the environment.

The non-treatment alternatives that were evaluated do not afford the overall effectiveness that is required to address the direct contact hazards for the north waste area.

11.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The rationale for the remedy selection was judged to be the best balance among tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility or volume afforded through treatment, short-term effectiveness, implementability and cost, also weighing the statutory preference for treatment as a principal element.

The selected remedy provides overall protection of human health and the environment by addressing the principal threat of direct contact exposure from the north waste area and the potential exposure to sulfur dioxide emissions from the acid sludge deposits and effectively eliminates such risk of direct contact.

The selected remedy does not attain ARARs and TBCS for Federal and State drinking water standards; however, the acid waste sludge is not a major source of contaminants to the ground water and the organics remaining after treatment in the north waste area is considered to be immobile.

The selected remedy will reduce toxicity, mobility, and volume of contaminants in the acid sludge by neutralizing the acid in the sludge and the potential for sulfur dioxide emissions.

The treatability study performed during the Phase-IIB remedial investigation demonstrated that neutralization of the acid sludge can be implemented.

11.5 Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for remedies employing treatment that permanently and significantly reduce the toxicity, mobility or volume of hazardous substances.

The preference for treatment is satisfied by addressing the principal threat in the north waste area. The principal threat of direct contact exposure and the potential for sulfur dioxide emissions if the north waste area is disturbed is addressed by neutralizing the acid in the sludge.

The principal threat from the oil-contaminated soil and ground water will be addressed in future response activities at the Arkansas City Dump site.

Table 1. *Principal characteristics of acid sludge*

[Data from Abraham, 1918]

Color in mass	Black
Homogeneity to the eye at room temperature	Uniform
Homogeneity under microscope	Variable
Appearance surface-aged indoors 1 week	Bright
Fracture	Conchoidal
Lustre	Bright
Specific gravity at 77 °F	1.05-1.20
Odor on heating	Oily; similar to residual asphalt
Behavior on melting	Passes rapidly from the solid to liquid state
Volatile matter 500 °F in 4 hours	2-20 percent
Flash point	300-500 °F
Fixed carbon	5-30 percent
Solubility in carbon disulphide	95-100 percent
Nonmineral matter, insoluble	0-5 percent
Mineral matter	0-1 percent
Solubility at 88° naphtha	60-95 percent
Sulfur	5-10 percent
Oxygen	3-7 percent
Saturated hydrocarbons	Less than 10 percent

Table 2. *Concentrations of selected organic compounds in acid sludge, oil, ground water under path acid sludge, and ground water oil-contaminated sediments.*
[Values are in parts per billion]

Compound	Contaminant source				
	Acid sludge[1]	Ground water under acid Sludge	Oil	Ground water from oil-contaminated sediments	
		USGS MW7[2]	KDHE MW63	KDHE MW64	TW25
Anthracene	<10,000	<5	310,000	<5	<5
Benzo(a)anthracene	73,000	<5	320,000	<5	NQ
Benzo(b) fluoranthene	<10,000	<5	<100,000	<5	<5
Benzo(a)pyrene	120,000	<5	320,000	<5	<5
Benzo(k)fluoranthene	26,000	<5	<100,000	<5	<5
Chrysene	530,000	<5	530,000	<5	<5
Dibenzo(a,h)anthracene	<10,000	<5	<100,000	<5	NQ
Fluoranthene	<10,000	<5	<100,000	<5	<5
Fluorene	<10,000	<5	200,000	<5	<5
Napthalene	<10,000	<10	130,000	13	30
Methyl-Napthalene	NQ	<5	NQ	NQ	62
Dimethyl-napthalene	NQ	<5	NQ	NQ	39
Phenanthrene	20,000	<5	1,500,000	<5	8
Methyl-phenanthrene	NQ	<5	NQ	NQ	<5
Pyrene	15,000	<5	870,000		<5

Table 3 Fuel-related hydrocarbon gases identified in air from boreholes in acid sludge

Compound or gas	Maximum concentration (parts per billion)
Sulfur dioxide	>150,000
Benzene	140
Chlorobenzene	>100
1,2 dichloroethane	.6
1,3 dichloropropylene	>100
Ethylbenzene	>110
Methylene chloride	2.6
Tetrachloroethane	.5
1,1,2,2 tetrachloroethane	>68
Toluene	>120
1,1,1 trichloroethane	1.1

Table 4 The list of Indicator Chemicals, maximum concentrations, exposure media and exposure routes present at the Arkansas City dump site.

Indicator Chemical	Maximum Concentration		Exposure Media	Exposure Route
Aluminum	9300	µg/L	groundwater	oral
Ammonia	76	mg/L	groundwater	oral
Arsenic	84	µg/L	groundwater	oral
Barium	2000	µg/L	groundwater	oral
Beryllium	2	µg/L	groundwater	oral
DDD	0.02	µg/L	groundwater	oral
Iodide	4000	mg/L	groundwater	oral
Iron	24000	µg/L	groundwater	oral
Manganese	1600	µg/L	groundwater	oral
Sulfate	300	mg/L	groundwater	oral
Sulfuric acid	20	%	sludge	contact
PNAs	234	µg/L	groundwater	oral

Table 5 --Summary of remedial-action alternatives for the acid-sludge waste at the Arkansas City dump site evaluation.

Alternative	Effectiveness	Implementability	Public Health Evaluation	Estimated Cost
1. No Action	Very Poor. Does not meet $ARAR_1$.	Not applicable.	Contact health risk.	Low Cost
2. Restricted access	Fair. Lowest level of protection. Does not allow productive use of the property.	Excellent.	Potential for human contact remains.	Low Cost
3. Removal of material from site	Poor. There is no present hazard which justifies moving the acid sludge to a new location.	Poor.--Acid sludge cannot be moved safely.	Substantial risk.--The health risk to the public and the remediation ers is substantial.	Exceeds $1,000,000
4. Thermal processing	Poor short-term effectiveness. Good long-term effectiveness. Air pollution is a potential problem.	Poor.--Thermal-processing technology for acidic high-sulfur sludge is not well developed or reliable.	Some risk.--The risk associated with potential sulfur-dioxide emissions is a public-health concern.	Exceeds $10,000,000
5. Neutralization	Fair. Neutralization removes the contact hazard and the sulfur dioxide hazard. The surface of the site contains large concentrations of PNA compounds.	Good.--Several technologies exist for neutralization of acid sludge.	Small risk.--The potential risk associated with sulfur-dioxide emissions is very small. The risk associated with ground-water contamination offsite is very small.	Moderate. Less than $1,000,000

Table 5 .--Summary of remedial-action alternatives for the acid-sludge waste at the Arkansas City dump site evaluation.
--Continued

Alternative	Effectiveness	Implementability	Public-health evaluation	Estimated Cost
6. Biodegradation	Good. Neutralization followed by biodegradation is an effective treatment technology. Removes contact hazard and sulfur-dioxide hazard. Potential technology to restore ground water under the site.	Innovative.--Pilot scale study of biodegradation should precede full-scale study. Technology is developing rapidly. Technology may be cost effective and implementable within 5 to 10 years for this site.	Small risk. Risks associated with neutralization as described in Alternative 5. Little risk associated with biodegradation process.	Expensive. Cost exceeds $10,000,000 if hydrogen peroxide is used.
7. Covering with soil	Good. Meets goals of Objective 1. Removes danger of contact hazard.	Excellent.	Small risk. No risk associated with implementation. Potential risk associated with acid sludge is greatly reduced.	Inexpensive.
8. Neutralization followed by covering with soil	Very good. Removes contact danger of acid sludge. Removes danger of sulfur dioxide emissions. Provides good environment for natural biodegradation processes.	Good.	Small risk. Risks associated with neutralization process as described in alternative 5.	Moderate. Less than $1,000,000
9. Covering with soil and seal-	Very good. Removes contact danger of	Excellent. Technology is well developed.	Small risk. No risk associated with implementation. Potential	Inexpensive. More expen-

able 5. --Summary of remedial-action alternatives for the acid-sludge waste at the Arkansas City dump site evaluation. --Continued

lternative	Effectiveness	Implementability	Public Health Evaluation	Estimated Cost
ing through solidification	acid sludge. Provides high quality surface for constructive use of the property. Leaching of acid from the site is reduced relative to alternative 7.		risk associated with acid sludge is greatly reduced. Hardened surface reduces the probability of accidental penetration into the acid sludge.	sive than alternatives 2 and 7.
10. Neutralization and immobilization of surface layer of acid sludge	Very good. Removes contact danger of acid sludge. Provides hardened surface for constructive use of property. Leaching of acid from the site is reduced relative to alternative 7.	Good.--Technology is feasible based on laboratory studies.	Some risk. Risk associated with implementation is greater than alternative 9 because of the sulfur-dioxide emissions during the neutralization process. Potential risk associated with acid sludge is greatly reduced. Hardened surface reduces the probability of accidental penetration into the acid sludge.	Moderate. More expensive than alternative 9.
11. Neutralization and immobilization of all acid sludge	Excellent. Removes all hazards associated with acid sludge. Potential exists for restoration of groundwater under the site.	Good.--Technology is feasible based on laboratory studies.	Smallrisk. Risk associated with implementation because of sulfur dioxide emissions during the neutralization process. Health risk associated with acid sludge is eliminated by the treatment.	Expensive.

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site

Alternatives	ARAR[1]	Type of requirement	Description	Compliance on implementation?	Applicable or appropriate)[3]
(1) No Action	KCS	CS	Ground-watercontaminants	No	TBC
	FDS	CS	do.	No	RA
	RCRA	LS	Floodplain	Yes	RA
	RCRA	AS	Solid/hazardous waste storage	---	RA-s RA-f
	CWA	CS	Surface-water contaminants	Yes	RA
	NAAQS	CS	Air contaminants	Yes	RA
(2)Restricted access	KCS	CS	Ground-water contaminants	No	RA
	FDS	CS	do.	No	RA
	RCRA	LS	Flood plain	Yes	RA
	RCRA/State	AS	Solid hazardous-waste storage	---	RA-s RA-f
	CWA	CS	Surface-water contaminants	Yes	RA
	NAAQS	CS	Air contaminants	Yes	RA
(5)Neutralization	KCS	CS	Ground-water contaminants	Partial (pH)	TBC
	FDS	CS	do.	Partial (pH)	RA
	RCRA	LS	Flood plain	Yes	RA
	RCRA/State	AS	Solid hazardous-waste storage	--- RA-f	RA-s
	CWA	CS	Surface-water contaminants	Yes	RA

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR[1]	Type of requirement[2]	Description	Compliance on implementation?	Applicable or appropriate)[3]
(5) Neutralization--Continued	NAAQS	CS	Air contaminants	No (during response) Yes (after treatment)	RA
	Kansas water Appropriation Act	AS	Extraction of ground-water for treatment	---	RA
	RCRA	AS	TreatmentAclosure (40CFR Subpart K 264.220)	---	RA
		AS	Facility Standards (40 CFR Subpart B, 264.10)	---	RA
		AS	Ground-water monitoring (40 CFR Subpart F	---	RA
	OSHA	AS	Operational Standards for response personnel (20 CFR 1910)		A
(6) In-situ biological treatment	KCS	CS	Ground-water contaminants	Partial (pH)	TBC
	FDS	CS	do.	Partial (pH)	RA

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR[1]	Type of requirement[2]	Description	Compliance on implementation?	Applicable or appropriate)[3]
(6) In-situ biological treatment--continued	RCRA	LS	Flood plain	Yes	RA
	RCRA/State	AS	Solid hazardous waste storage	---	RA-s RA-f
	CWA	CS	Surface-water contaminants	Yes	RA
	NAAQS	CS	Air contaminant	No (during response) Yes (after treatment)	RA
	Kansas water Appropriation Act	AS	Extraction of ground water for treatment	---	A
	RCRA	AS	Treatment and closure (40CFR Subpart K 264.220)	---	RA
		AS	Facility standards (40 CFR Subpart B, 264.10)	---	RA
		AS	Ground-water monitoring (40 CFR Subpart F	---	RA
	OSHA	AS	Operational standards for response personnel (20 CFR 1910)		A

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR[1]	Type of requirement[2]	Description	Compliance on implementation?	Applicable or appropriate)[3]
(7) Covering with soil					
	KCS	CS	Ground-water contaminants	No	RA
	FDS	CS	do.	No	RA
	RCRA	LS	Floodplain	Yes	RA
	RCRA/State	AS	Solid/hazardous waste storage	--- RA-f	RA-s
	CWA	CS	SW contaminants	Yes	RA
	NAAQS	CS	Air contaminant	Yes	RA
	OSHA	AS	Operational Standards for response personnel (20 CFR 1910)		A
(8) Neutralization followed by soil cover					
	KCS	CS	Ground-water contaminants	Partial (pH)	TBC
	FDS	CS	do.	Partial (pH)	RA
	RCRA	LS	Floodplain	Yes	RA
	RCRA/State	AS	Solid hazardous-waste storage	---	RA-s RA-f

Table 6 .--Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR[1]	Type of requirement[2]	Description	Compliance on implementation?	Applicable or appropriate)[3]
(8) Neutralization followed by soil cover--Continued	CWA	CS	Surface-water contaminants	Yes	RA
	NAAQS	CS	Air contaminant	No (during response) Yes (after treatment)	RA
	Kansas water Appropriation Act	AS	Extraction of ground water for treatment	---	A
	RCRA	AS	Treatment and closure (40CFR Subpart K 264.220)	---	RA
		AS	Facility standards (40 CFR Subpart B, 264.10)	---	RA
		AS	Ground-water monitoring (40 CFR Subpart F	---	RA
	OSHA	AS	Operational standards for response personnel (20 CFR 1910)		A

Table 6 .--Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR1	Type of requirement2	Description	Compliance on implementation?	Applicable or appropriate)3
(9) Soil cover and solidification	KCS	CS	Ground-water contaminants	Partial (leachate reduction-pH, organics	TBC
	FDS	CS	do.	Partial (leachate reduction-pH,organics)	RA
	RCRA	LS	Flood plain	Yes	RA
	RCRA/State	AS	Solid hazardous-waste storage	---- RA-f	RA
	CWA	CS	Surface-water contaminants	Yes	A
	NAAQS	CS	Air contaminant	No (during response) Yes (after treatment)	A
	RCRA	AS	Treatment and closure (40CFR Subpart K 264.220)	---	RA
		AS	Facility standards (40 CFR Subpart 264.10)B,	---	RA

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR[1]	Type of requirement[2]	Description	Compliance on implementation?	Applicable or appropriate)[3]
(9) Soil cover and solidification--Continued		AS	Ground-water monitoring (40 CFR Subpart F	---	RA
	OSHA	AS	Operational standards for response personnel (20 CFR 1910)		A
(10)Neutralization and immobilization of surface layer	KCS	CS	Ground-water contaminants	Partial leachate reduction	TBC
	FDS	CS	do.	Partial leachate reduction	RA
	RCRA	LS	Flood plain	Yes	RA
	RCRA	CS	Solid hazardous-waste storage	---	TBC-s RA-f
	CWA	CS	Surface-water contaminants	Yes	RA
	NAAQS	CS	Air contaminant	No (onsite) during operation)	RA

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR1	Type of requirement2	Description	Compliance on implementation?	Applicable or appropriate)3
(10) Neutralization and immobilization of surface layer--continued			Air contaminant	Yes (after treatment)	RA
	RCRA	AS	Treatment and closure (40CFR Subpart K 264.220)	---	RA
		AS	Facility standards (40 CFR Subpart B, 264.10)	---	RA
		AS	Ground-water monitoring (40 CFR Subpart F)	---	RA
	OSHA	AS	Operational standards for response personnel (20 CFR 1910)		RA
(11) Neutralization and immobilization of all acid sludge					
	KCS	CS	Ground-water contaminants	Yes	TBC
	FDS	CS	do.	Yes	RA
	RCRA	LS	Flood plain	Yes	RA

Table 6 --Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR1	Type of requirement2	Description	Compliance on implementation?	Applicable or appropriate)3
(11) Neutralization and immobilization of all acid sludge--continued	RCRA/State	AS	Solid/hazardous waste storage	Yes (corrosivity eliminated)	A-s RA-f
	CWA	CS	Surface-water contaminants	Yes	A
	NAAQS	CS	Air contaminant	No (onsite during operation) Yes(after operation)	A
	RCRA	AS	Treatment and closure (40CFR Subpart K 264.220)	---	RA
		AS	Facility standards (40 CFR Subpart B, 264.10)	---	RA
		AS	Ground-water monitoring (40 CFR Subpart F)	---	RA
	OSHA	AS	Operational standards for response personnel (20 CFR 1910)		A

Table 6 .--Applicable, relevant and appropriate requirements (ARAR) for remedial-actions alternatives for acid sludge wastes at the Arkansas City dump site--Continued

Alternatives	ARAR1	Type of requirement2	Description	Compliance on implemen-tation?	Applicable or appropriate)3

1 KCS = Kansas Cleanup Standard (Kansas Department of Health and Environment, written commun., November 1987).
FDS = Federal secondary drinking water standard.
CWA = Clean Water Act (U.S. Environmental Protection Agency 1986).
NAAQS = National ambient air quality standards.

2 CS = Chemical specific regulation or standard.
AS = Action specific rgulation or standard.
LS = Location-specific regulation or standard.

3 A = Applicable.
RA= Relevant and appropriate.
-S = State regulations.

-F = Federal regulations.

TBC = To be considered

TABLE 7
SUMMARY OF ESTIMATED COSTS OF REMEDIAL ACTION
ALTERNATIVES FOR OPERABLE UNIT ONE: ACID SLUDGE WASTE

ALTERNATIVE	REMEDIAL ACTION TOTAL ESTIMATED	
	CAPITAL COST	PRESENT WORTH COST
1. NO ACTION	NONE	$ 28,000
2. RESTRICTED ACCESS	$ 14,000	$ 42,000
5. NEUTRALIZATION		
Wet process	$ 786,000	$ 816,000
Dry process	$ 2,080,000	$ 2,108,000
7. COVERING WITH SOIL	$ 131,000	$ 159,000
8. NEUTRALIZATION FOLLOWED BY COVERING WITH SOIL		
WET NEUTRALIZATION	$ 919,000	$ 947,000
DRY NEUTRAILZATION	$ 2,211,000	$ 2,239,000
9. COVERING WITH SOIL AND SEALING THROUGH SOLIDIFICATION	$ 328,000	$ 356,000
10. NEUTRALIZATION AND SOLIDIFICATION OF SURFACE LAYER	$ 858,000	$ 886,000
11. NEUTRALIZATION AND SOLIDIFICATION OF ACID SLUDGE		
EXCAVATION	$ 9,846,000	$ 9,874,000
IN-PLACE TREATMENT	$ 9,571,000	$ 9,599,000

TABLE 8
ARARS AND TBC INDENTIFIED FOR THE ARKANSAS CITY DUMP SITE

CITATION	REQUIREMENT	POTENTIAL ARAR or TBC DETERMINATION	ANALYSIS
FEDERAL REQUIREMENTS			
U.S. EPA RCRA REGULATIONS			
40 CFR 261	Identifies those wastes subject to regulation as hazardous waste.	Relevant and appropriate to all alternatives	The criteria and limitations used to identify wastes as being hazardous or nonhazardous in 40 CFR 261 are relevant and appropriate to all proposed cleanup actions at the Arkansas City Dump site. The wastes meets the three criteria as defined in 40 CFR 261.
40 CFR 264.18(b)	Facilities located within a 100-year flood plain must be designed, constructed, operated and maintained to avoid washout.	Applicable to alternative 11	The RCRA hazardous waste will be treated and disposed on site.
40 CFR 264.111	Placement of a cap over waste designed and constructed to provide long-term minimization of migration of liguids through the capped area.	Applicable to alternative 11	The RCRA hazardous waste will be treated and disposed on site for the purpose of leaving it behind after the remedy is complete.
		Relevant and appropriate to alternatives 7, 8, 9, 10 and 11	Hybrid approach to closure for waste left in place which does not pose a direct contract threat or impact ground water.
40 CFR 264.310	30-year post-closure care to ensure that site is maintained and monitored.	Applicable to alternative 11	The RCRA hazardous waste will be treated and disposed on site.
U.S. EPA SAFE DRINKING WATER ACT			
40 CFR 141	Drinking water regulation designed to protect human health from the potential adverse effects of drinking water contaminants.	Relevant and appropriate to all alternatives	The primary maximum contaminant levels set under the Safe Drinking Water Act for contaminants at this site are appropriate for Class II waters.
40 CFR 143	Drinking water regulations designed to protect human health from the specific contaminants that may affect the aesthetic qualities of drinking water.	Relevant and appropriate to all alternatives	The secondary maximum contaminant levels set under the Safe Drinking Water Act for contaminants at his site are appropriate for Class II waters.
S. EPA CLEAN WATER ACT			
40 CFR 122	Clean Water Act is to restore and maintain the chemical, physical, and biological intergrity of the nation's waters.	Relevant and appropriate to alternatives 5, 8 and 11	The water quality standards are based on Federal water quality criteria to protect existing and alternative use or uses of receiving waters.

CITATION	REQUIREMENT	POTENTIAL ARAR or TBC DETERMINATION	ANALYSIS
U.S. EPA CLEAN AIR ACT			
40 CFR 50	The Clean Air Act is to protect and enhance the quality of the nation's air resorces so as to protect the public health and welfare.	Relevant and appropriate to all alternatives	The sulfur dioxide emissions could exceed the 365 ug/m3 on site if the hardened surface were removed. This standard would need to be met if alternatives 5, 8, 10 and 11 were implemented.
U.S. DOL OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION			
29 CFR 1910	The regulations include operational standards for employee protection for workers engaged in hazardous waste operations.	Applicable for alternatives 5, 7, 9, 10 and 11	The sulfur dioxide emissions could be at levels that exceed occupational health and safety standards for workers engaged in hazardous waste operations.
STATE OF KANSAS REGULATIONS			
KANSAS PUBLIC HEALTH - CHAPTER 65			
65-3430	Identifies those wastes subject to regulation as hazardous waste.	Relevant and appropriate to all alternatives	The criteria and limitations used to identify wastes as being hazardous or nonhazardo in Chapter 65 are relevant and appropriate to all proposed cleanup actions at the Arkansas City Dump site. The wastes meets the three criteria as defined in 40 CFR 261.
Article 31	Facilities located within a 100-year flood plain must be designed, constructed, operated and maintained to avoid washout.	Applicable to alternative 11	The RCRA hazardous waste will be treated and disposed on site (Article 31 section 28-31-8).
	Placement of a cap over waste designed and constructed to provide long-term minimization of migration of liquids through the capped area.	Applicable to alternative 11	The RCRA hazardous waste will be treated and disposed on site for the purpose of leaving it behind after the remedy is complete (Article 31 section 28-31-8).
		Relevant and appropriate to alternatives 7, 8, 9, 10 and 11	Hybrid approach to closure for waste left in place which does not pose a direct contract threat or impact ground water (Article 31 section 28-31-8).
	30-year post-closure care to ensure that site is maintained and monitored.	Applicable to alternative 11	The RCRA hazardous waste will be treated and disposed on site (Article 31 section 28-31-8).
Article 15	Drinking water regulation designed to protect human health from the potential adverse effects of drinking water contaminants.	Relevant and appropriate to all alternatives	The maximum contaminant levels set under Article 15 at site are appropriate.

CITATION	REQUIREMENT	POTENTIAL ARAR or TBC DETERMINATION	ANALYSIS
Article 16	Surface water quality standards and water quality criteria for water protection to maintain and protect the public health and welfare or uses of surface water for agricultural water supply, aquatic life, domestic water supply, groundwater recharge, industrial water supply, and recreation.	Relevant to all alternatives	The water quality standards and criteria are based on the Federal Safe Drinking Water Act for contaminants at this site are appropriate for Class II waters and the Federal Clean Water Act to protect existing and alternative use or uses of receiving waters.
Article 19	The ambient air quality standards and air pollution contol regulations are to protect and enhance the quality of state's air resources so as to protect the public health and welfare.	Relevant and appropriate to all alternatives	The sulfur dioxide emissions could exceed the 13 ug/m3, 24-hour average on site if the hardened surface were removed. This standard would need to be met if alternatives 5, 8, 10 and 11 were implemented.
ANSAS GROUNDWATER CONTAMINANT CLEANUP TARGET CONCENTRATIONS			
MEMORANDUM, dated December 30, 1986	Entire plumes of contamination in fresh and usable aquifers will be remediated to comply with concentrations not to exceed the Kansas Notification Level (KNL) or or the Alternate Kansas Notification Level (AKNL) as applicable and appropriate for cleanup.	To Be Considered Material for all alternatives	The primary and secondary maximum contaminant levels set under the Kansas Surface Water Quality Standards for contaminants at this site are appropriate for Class II waters, but the groundwater contaminant cleanup target concentrations are not promulgated under State Law.

STATE OF KANSAS

DEPARTMENT OF HEALTH AND ENVIRONMENT
Forbes Field
Topeka, Kansas 66620-0001
Phone (913) 296-1500

Mike Hayden, *Governor*

Stanley C. Grant, Ph.D., *Secretary*
Gary K. Hulett, Ph.D., *Under Secretary*

September 26, 1988

Morris Kay
Regional Administrator
U. S. Environmental Protection
Agency -- Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

Dear Mr. Kay:

The Department has reviewed the proposed Record of Decision Declaration for the Arkansas City Dump Superfund site at Arkansas City, Kansas. The Agency concurs with alternative number 8 which was recommended by the Proposed Plan prepared for this site. The in-situ neutralization followed by soil cover combined with a restrictive covenant is agreeable with the public and the City of Arkansas City and is supported by this Agency.

The Department recommends that the U.S. Environmental Protection Agency initiate the appropriate procedures to complete the Record of Decision Declaration for Phase I of the Arkansas City Dump site.

Sincerely,

James A. Power, Jr., P.E.
Director
Division of Environment

JAP:cas

C - Ronald F. Hammerschmidt

ARKANSAS CITY DUMP
SUPERFUND SITE
ARKANSAS CITY, KANSAS

ADMINISTRATIVE RECORD INDEX

"administrative Record Index
not included."

U.S. ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-01-7351 (TES IV)
WORK ASSIGNMENT NO. 570

JULY 1988

RECORD OF DECISION

OPERABLE UNIT REMEDIAL ALTERNATIVE SELECTION

THE RESPONSIVENESS SUMMARY

ARKANSAS CITY DUMP SITE

ARKANSAS CITY, KANSAS

Prepared By:

U.S. Environmental Protection Agency

Region VII

Kansas City, Kansas

September 1988

RESPONSIVENESS SUMMARY
RECORD OF DECISION FOR
ARKANSAS CITY DUMP SITE
ARKANSAS CITY, KANSAS

This Responsiveness Summary presents KDHE's response to public comments received regarding the proposed remedial action for the first operable unit, the north waste area. No written comments were received during the public comment period however there were a few limited comments made during the public meeting which was held at 7:00 pm on September 15, 1988 in Arkansas City. The Responsiveness Summary is a component of the Record of Decision (ROD) package, which also includes the ROD declaration, ROD summary and index to the administrative record.

Introduction

On September 2, 1988 KDHE announced the Proposed Plan for the remediation of the first Operable Unit for the Arkansas City Dump site. Under the Proposed Plan the preferred remedial alternative would consist of the following actions:

- Neutralize the acid sludge by circulating a solution of lime in water through the acid sludge. The in situ neutralization will be implemented by installing a series of holes into which the lime solution will be introduced. The water used by this process will be pumped from the aquifer underlying the acid sludge to avoid creating a groundwater mound below the site.

- Cover the neutralized acid sludge with 100 tons of lime and install a 2 foot thick soil cover.

- A deed restriction would be established which would prohibit soil excavations and construction of buildings over the waste buried on site.

- An operation and maintenance program would be adopted to assure the integrity of the soil cover and provide an ongoing sampling and analysis program.

Public Participation

KDHE and EPA received no written comments during the public comment period regarding the Proposed Plan and Remedial Investigation/Feasibility Study for the Arkansas City Dump Superfund site.

A few limited comments were received at the September 15, 1988 public meeting. A list of those members of the general public who were present at the public meeting and their comments are as follows:

Hazardous
Information
US EPA Reg
Philadelphi

Curtis B. Freeland - City Manager - City of Arkansas City.

Mr. Freeland made no specific comments during the public meeting.

Albert Beach - R.R. 1, 1800 West Madison - Arkansas City, KS 67005

Mr. Beach expressed this displeasure regarding the quantity of tax dollars being spent on a site where he felt the expenditure was unnecessary. He explained that he lives on north side of Madison Avenue immediately next to the site and does not understand the concern regarding the site.

Mr. Beach was informed that the KDHE and EPA were obligated by superfund regulations to provide a solution which would eliminate the contact hazard and provide a permanent solution for the north waste area.

David R. Meyer - Ebasco Services Inc. - 143 Union Blvd. Ste. 1010 - Lakewood, Colorado 80228

Mr. Meyer indicated that he was interested in the site because his company performs remedial work. Mr. Meyer asked that his company be provided information when a contractor is being selected.

Jasper DeVore - Rt. 3 - Arkansas City, KS 67005

Mr. DeVore made no comments.