United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R07-89/032
September 1989

EPA

Superfund Record of Decision:

Doepke Disposal (Holliday), KS

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R07-89/032	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Doepke Disposal (Holliday), KS
First Remedial Action - Final

5. Report Date
09/21/89

6.

7. Author(s)

8. Performing Organization Rept. No

9. Performing Orgainization 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 Doepke Disposal (Holliday) site is an inactive industrial- waste landfill located east of Holliday, Johnson County, Kansas. The 80-acre site is within 500 feet of the Kansas River and lies upstream of the well field and Kansas River water intakes that supply water to approximately 200,000 county residents. Additional features bordering the site include an inactive landfill and an active landfill. During the 1950s and early 1960s the site was used as a landfill for residential refuse. In 1963 Doepke Disposal Service, Inc. leased the property and operated a commercial and industrial waste landfill until 1970, when the State shut down the operation. Materials such as fiberglass, fiberglas resins, paint sludges, spent solvents, metal sludges, soaps, and pesticides were reportedly disposed of at the landfill. In 1966 fire debris and up to 374 drums of solvents and organochlorine and organophosphate pesticides were disposed of at the site as a result of a fire at a Kansas City chemical plant. Initially wastes and residues brought to the site were burned, however, in the late 1960s burning operations ceased and solid wastes were buried onsite and liquids were disposed of in two surface impoundments. In 1977 rock material excavated during the construction of an interstate was dumped onsite and in some cases over the deposited waste. The current owner uses portions of the site for storage of clay, crushed shales, and crushed limestone. The primary contaminants of concern (See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision - Doepke Disposal (Holliday), KS
First Remedial Action - Final
Contaminated Media: soil, gw, sw
Key Contaminants: VOCs (benzene, toluene, xylenes), organics (PAHs, pesticides, PCBs), metals (chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 79
	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

16. Abstract (continued)

affecting the soil and ground water are VOCs including benzene, toluene, and xylene; other organics including PAHs, PCBs, and pesticides, and metals including chromium and lead.

The selected remedial action for this site includes removal and offsite treatment of approximately 96,000 gallons of liquids currently ponded underground in former surface impoundments; construction of a multilayer cap over the majority of the waste disposal area; collection of ground water seepage and offsite treatment at a POTW, as necessary; ground water monitoring; and implementation of deed and access restrictions. The estimated present worth cost for this remedial action is $5,970,000, which includes an estimated annual O&M cost of $107,000 for 30 years.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Doepke Disposal (Holliday) Site
Johnson County, Kansas

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Doepke Disposal (Holliday) site, Johnson County, Kansas, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record file for the site.

The State of Kansas concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The selected response action addresses all identified remedial action objectives. This action reduces the threat of direct contact with waste materials, and eliminates the potential for future contamination of offsite ground water and surface water.

The major components of the selected remedy include:

- Removal and offsite treatment of contaminated liquids currently ponded underground in the former surface impoundment area; and

- Construction of an impermeable multi-layer cap over the majority of the waste disposal area; and

- Collection and, if necessary, offsite treatment of significant ground water seepage; and

- Extended ground water monitoring to evaluate the effectiveness of the remedy; and

- Deed and access restrictions; and

- If necessary, the response action will be modified to include partial ground water controls. These controls would include construction of a clay cutoff wall, and extraction and offsite treatment of collected ground water.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. However, the selected remedy does not involve treatment of the majority of the contaminants at the site; and therefore, the remedy does not satisfy the statutory preference for remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants is a principal element. The remedy includes treatment of a discrete portion of the liquids contained in the source area; however, most sources will remain untreated. The large extent of the landfill, the heterogeneity of the wastes, and the fact that there are no identifiable hot spots that represent the major sources of contamination preclude a remedy in which contaminants could be excavated and treated effectively.

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

Morris Kay
Regional Administrator
Region VII

9-21-89
Date

ROD Decision Summary
Doepke Disposal (Holliday) Site
Johnson County, Kansas

Site Name, Location, and Description

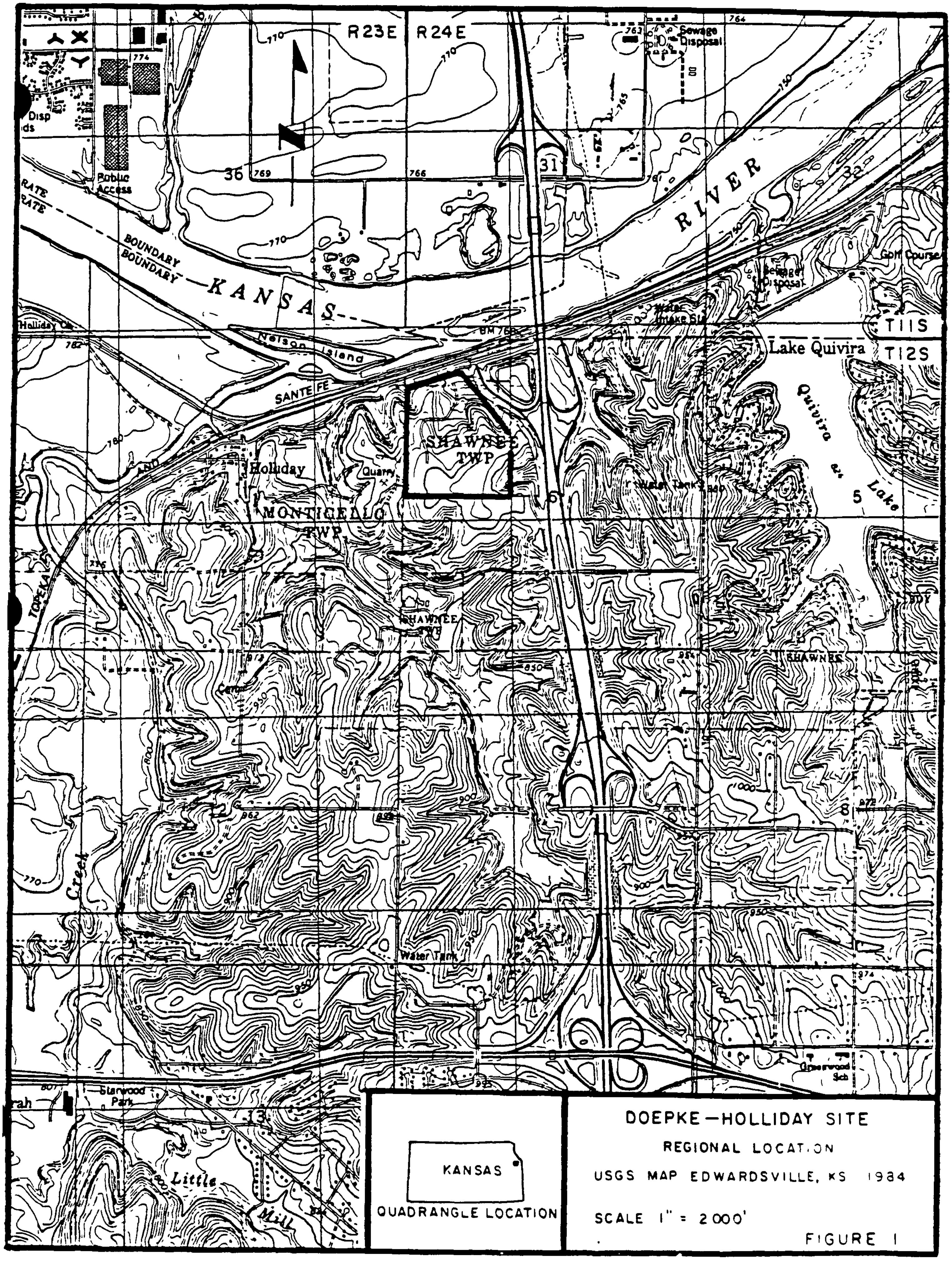
The Doepke Disposal (Holliday) Superfund site, hereafter called the Doepke-Holliday site or the site, lies approximately 3/4 mile east of the town of Holliday, Kansas and one mile west of Lake Quivera. The site is approximately 500 feet south of the Kansas River, and 2,700 feet upstream of the alluvial well field and Kansas River water intake for the Johnson County Water District Number 1, which supplies drinking water for approximately 200,000 persons. See Figure 1 for regional location.

The Doepke-Holliday site is located on the southern bluffs of the Kansas River Valley, at the intersection of Holliday Drive and Interstate 435, in Johnson County, Kansas. As seen on Figure 2, which represents the site as it exists today, the site is bounded by Holliday Drive to the north, Interstate 435 to the east, the inactive Overland Park Landfill to the south, and the active Johnson County Landfill to the west.

The site is an inactive industrial waste landfill situated on the upland area of an 80.3 acre property. An active entrance road to the adjacent Johnson County Landfill crosses the site. The highest natural point of the site is 975 feet above mean sea level (msl), and is on a ridge located along the southern boundary. The site slopes from this high point north towards the river with a total drop in relief of approximately 175 feet.

The major topographic feature of the site during active landfill operations was a deep ravine that extended from the center of the site northward towards the Kansas River. The present topography of the site is substantially altered from the active landfill topography. The ravine has since been filled with landfill wastes and later with rock rubble resulting from the construction of Interstate 435.

Deffenbaugh Industries, Inc., the current owner of the site, has established a crushed shale storage pile on the south side of the site. The shale pile rises about 50 feet above the surrounding area, and is positioned over the area where two surface impoundments were once located during the later years of site operation.



DOEPKE—HOLLIDAY SITE

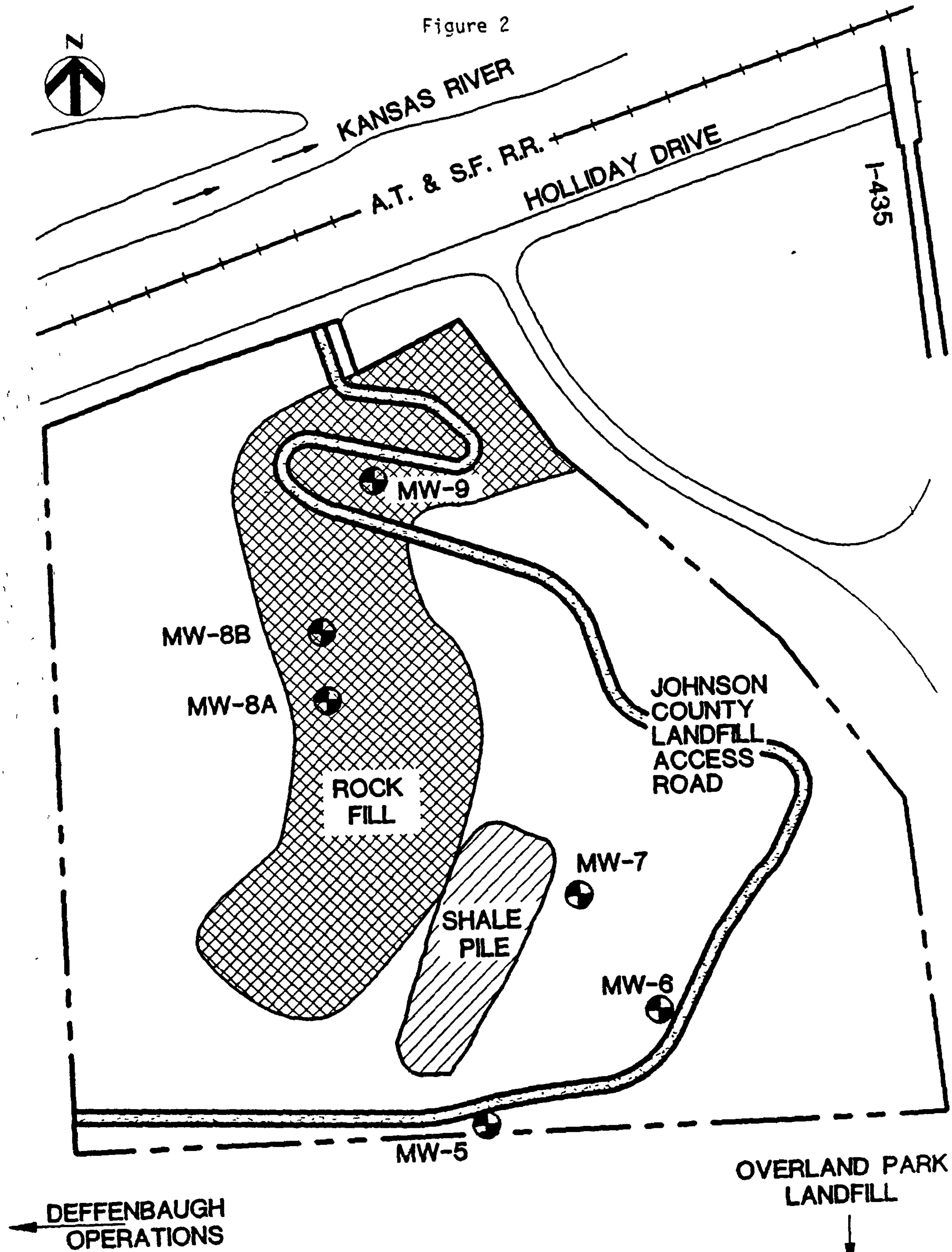
REGIONAL LOCATION

USGS MAP EDWARDSVILLE, KS 1984

SCALE 1" = 2000'

FIGURE 1

Figure 2



DOEPKE-HOLLIDAY SITE

Site History and Enforcement Activities

The land or portions thereof, now being called the Doepke-Holliday site, was used for residential trash disposal during the 1950s and early 1960s. Following accepted practice for that time, all trash was burned.

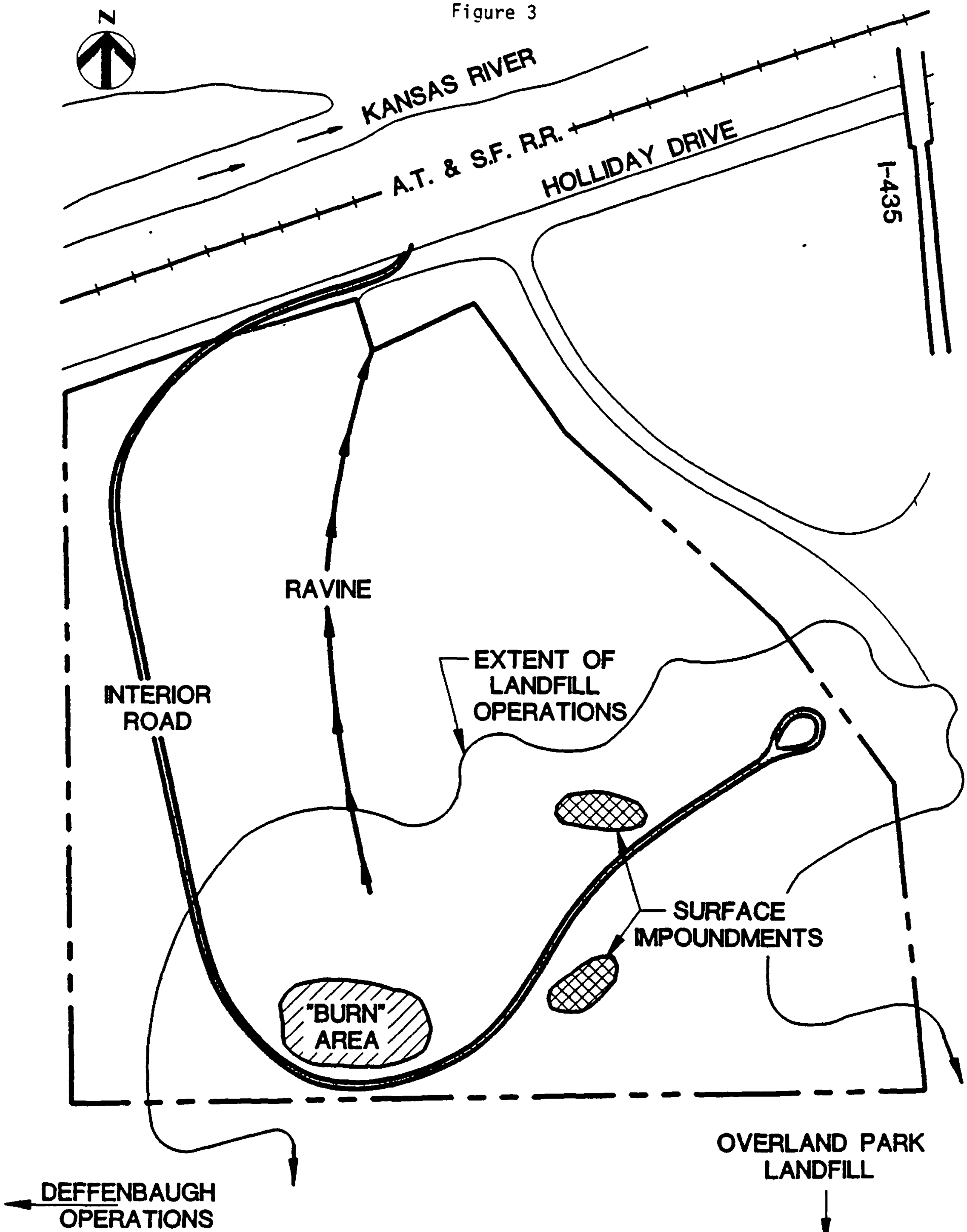
The City of Overland Park operated a landfill (now inactive) to the south of the Doepke-Holliday site. This landfill received residential and commercial trash during the late 1950s and early 1960s. Interpretation of aerial photographs from this time period indicates that operations of this landfill extended onto the present day Doepke-Holliday site.

In 1963, Mr. A. W. Doepke leased the property now called the Doepke-Holliday site for the purpose of operating a landfill. The Doepke Disposal Service, Inc. operated a commercial and industrial waste landfill on the site until 1970. Figure 3 depicts the active landfill. The landfill reportedly received a variety of materials including, but not limited to, fiberglass and fiberglass resins, paint sludges, spent solvents, metal tailings, soaps and pesticides. In addition, the site reportedly received fire debris and up to 374 drums in 1966 as the result of a fire at the Thompson-Hayward chemical plant on Greystone Avenue in Kansas City, Kansas. The drums were said to have contained various solvents and organochlorine and organophosphate pesticides.

Initially, wastes were burned, and the residues from the burning were disposed of in the closed end of the ravine on the southern portion of the site. In the late 1960s, burning operations were discontinued. At this point, solid wastes were buried on site, and liquids were disposed of in two surface impoundments. These surface impoundments sometimes overflowed during heavy rains, discharging the contents of the impoundments onto adjoining land and into the Kansas River. At the direction of the Kansas Department of Health and Environment (KDHE) and the Johnson County Health Department, waste disposal operation ceased in 1970.

Beginning in late 1977, rock materials excavated during construction of Interstate 435 were dumped on the site. These excavated materials were placed in the ravine on the site, and were dumped directly over portions of the site where wastes had been deposited.

Figure 3



DOEPKE-HOLLIDAY SITE

The current owner of the Doepke-Holliday property, Deffenbaugh Industries, Inc. (Deffenbaugh), operates the Johnson County sanitary landfill located on separate property to the west and southwest of the site. Deffenbaugh uses portions of the site for storage of clay, crushed shale, and crushed limestone which are used in Deffenbaugh's disposal operations at the Johnson County Landfill. Also, Deffenbaugh's scale house and access road for the Johnson County Landfill are located on the site. In addition, Deffenbaugh conducts some other aspects of its business at the site, including storage and management of portable toilets and dismantling of underground storage tanks removed from other locations.

The Doepke-Holliday site was placed on the National Priorities List (NPL) in December 1982. Between 1981 and 1986, the EPA conducted several limited investigations and assessments of the site. Pursuant to an Administrative Order on Consent of December 17, 1987, as amended on November 10, 1988, Deffenbaugh Industries, Inc., conducted a Remedial Investigation and Feasibility Study (RI/FS) of the site under the guidance and oversight of the EPA. Other potentially responsible parties (PRPs) have been advised of their potential liability for response costs; however, special notice procedures pursuant to section 122(e) of CERCLA have not been initiated.

Highlights of Community Participation

The RI/FS reports and Proposed Plan for the Doepke-Holliday site were released to the public in August 1989. These documents were made available to the public as part of the administrative record maintained at the EPA, Region VII office, and at the Johnson County Public Library in Merriam, Kansas. The notice of availability for these documents was published in the Overland Park Sun and other Sun newspapers on August 4, 1989. A public comment period was held from August 4, 1989 through August 25, 1989. In addition, a public meeting was held on August 16, 1989. At this meeting, representatives of the EPA answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is a part of this Record of Decision.

Summary of Site Characteristics

A variety of site investigations have been conducted at the site since 1981. The most recent and the most comprehensive has been the RI/FS conducted by Deffenbaugh Industries under the guidance and oversight of the EPA. The RI/FS was conducted to identify the types, quantities, and locations of contaminants, and to develop alternatives for solving the problems they present. The results of the RI show a range of contamination problems involving surface soil, subsurface soil, ground water and ground water seeps containing varying levels of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PNAs), pesticides, polychlorinated biphenols (PCBs) and heavy metals. Summary discussions of the findings of the RI/FS are in this and subsequent sections of the ROD Decision Summary. The Remedial Investigation, Public Health Assessment and Feasibility Study reports should be consulted for more in-depth information.

Hydrology

The Kansas River (approximate elevation of 740 feet msl) and the 100-year flood stage (approximate elevation of 766 feet msl) are 40 to 60 feet lower than the lowest point on the north boundary of the Doepke-Holliday site. Most surface and subsurface drainage from the site eventually flows to the Kansas River.

Most of the surface runoff at the site flows toward the north through erosional channels and existing stream channels. Several rock and concrete drainageways were installed along the north and east sides of the site when the I-435/Holliday Drive interchange was constructed. These drainageways channel surface runoff and ground water seepage from the site into a culvert at the northeast corner of the site and then northward into the Kansas River.

Geology

Surface materials on the site consist primarily of fill materials placed there during and subsequent to disposal operations. Logs from monitoring the wells and trenches dug at the site show that these fill materials consist of sandstone and limestone rubble, crushed shales, and clays. The thickness of the fill materials varies greatly. Excluding the shale stockpile, the thickest fill occurs in the ravine where it is over 40 feet deep. Very few natural soil materials remain onsite.

The rock strata at the site lies horizontally and consists of a series of alternating Pennsylvanian age limestone and shale units of the Kansas City Group and a small portion of the Lansing Group. Over 150 feet of the Lansing and Kansas City Groups are freshly exposed along the road-cuts on the east and north sides the site. Figure 4 shows a generalized cross section of the site from north to south along the buried ravine.

Hydrogeology

Jointing is visibly present in the limestones at the site and may also be present in the shales, although jointing is better developed in the limestones than in the shales. There is also evidence that the limestone joints have been subject to solution activity. The presence of shallow ground water flow along these joints is evidenced by the presence of many ground water seeps on the exposed rock faces at the site. Most of the seeps at the site occur at the contact point between a limestone unit and an underlying shale units. Infiltrating surface water flows along the joints in the limestone until it encounters the less permeable shale unit. The infiltrate then flows laterally until it reaches either an outcrop or a fracture or joint in the shale. If the water reaches an outcrop, it emerges as a seep; if it reaches a joint or fracture it may migrate into the next lower unit.

Ground Water Contamination

Waste disposal occurred on the topographically highest portion of the site. The uppermost bedrock unit in this area is a limestone member of the Plattsburg Formation. This remnant of the Plattsburg Formation is also the uppermost water bearing unit at the site, and direct infiltration from the source areas has contaminated the ground water. This unit is of small extent, and is not a source of drinking water. The potential for vertical migration of contaminated ground water to underlying units is limited by the presence of several intervening low permeability shale units. Lateral migration of contaminated ground water in any direction results primarily in nearby surface discharge, because the lateral extent of this unit is very small. Therefore, the degree of hydraulic communication between contaminated ground water and offsite ground water systems is very limited.

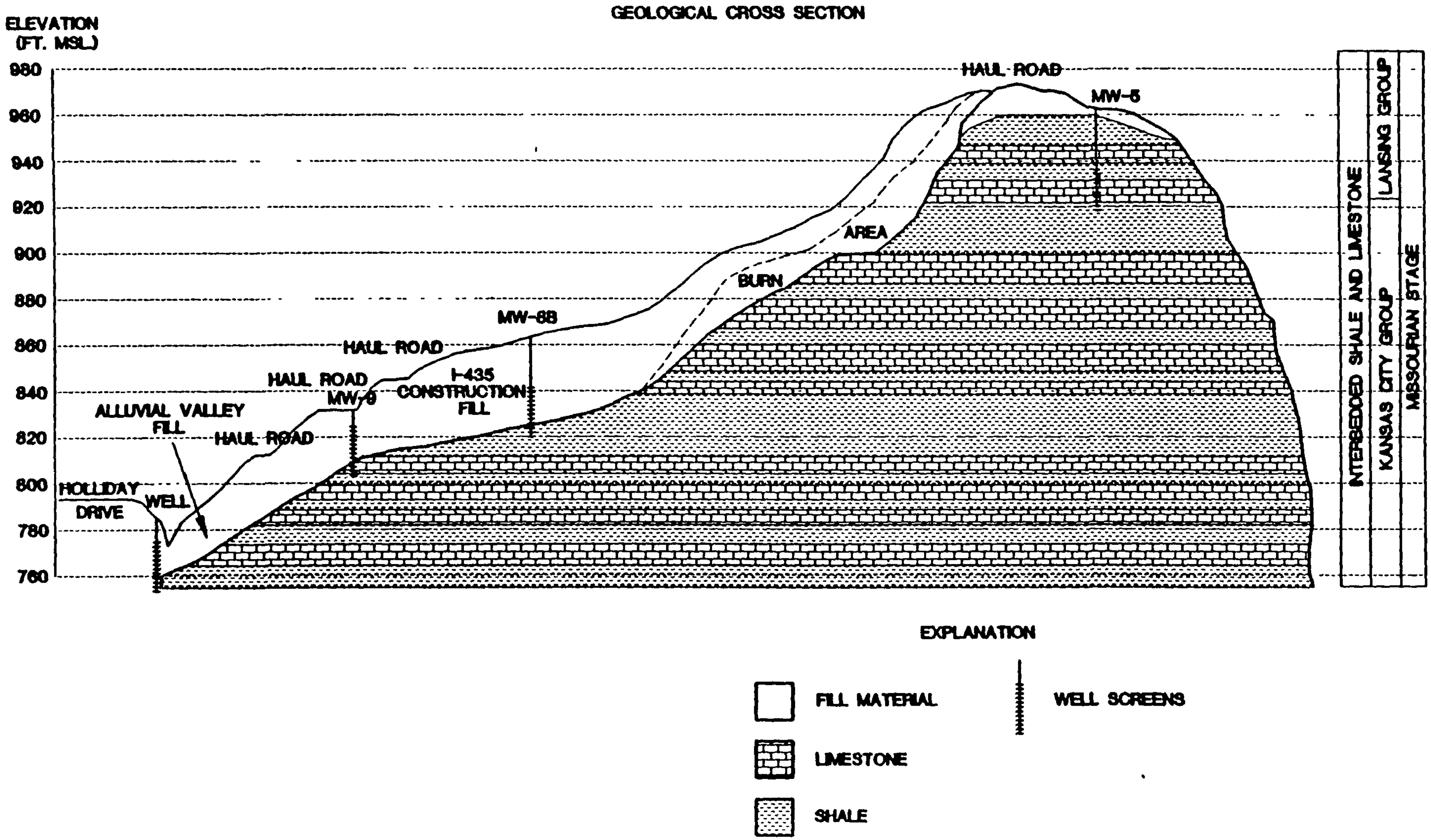

GEOLOGICAL CROSS SECTION
ELEVATION
(FT. MSL)
980
960
940
920
900
880
860
840
820
800
780
760
HOLLIDAY
DRIVE
WELL
ALLUVIAL VALLEY
FILL
HAUL ROAD
HAUL ROAD
MW-9
HAUL ROAD
I-435
CONSTRUCTION
FILL
MW-6B
BURN
AREA
HAUL ROAD
MW-5
INTERBEDDED SHALE AND LIMESTONE
LANSING GROUP
KANSAS CITY GROUP
MISSOURIAN STAGE
EXPLANATION
FILL MATERIAL
LIMESTONE
SHALE
WELL SCREENS

Figure 4

Analytical results from onsite monitoring wells indicate that shallow ground water contains a wide variety of contaminants including volatile organic compounds (VOCs), semi-volatile organics, pesticides and heavy metals in a range of concentrations. See Table 1 for a summary of analyses. The majority of the organic ground water contaminants were found at concentrations less than 500 micrograms per liter (ug/l). Several VOCs were found in excess of 500 ug/l including benzene (up to 890 ug/l), toluene (up to 4,130 ug/l), ethylbenzene (up to 13,400 ug/l), and xylenes (up to 459,000 ug/l).

Analytical results from ground water seeps that occur at the perimeter of the site indicate that the seeps contain fewer contaminants at smaller concentrations than the shallow ground water that occurs near the source. See Table 2 for a summary of analyses. Organic contaminants were found in most samples to be at concentrations less than 20 ug/l.

Soils/Wastes

The RI also included subsurface sampling of soils and/or waste materials in the former disposal areas. Trenches were dug in the area of the surface impoundments and in the burn area at the top of the ravine. A variety of waste materials were encountered including oily liquids and sludges, asphalts, crushed drums, fiberglass, fiberglass resins, tires, charred debris, and reagent bottles.

The large extent, inaccessability, and heterogeneous nature of the wastes make it impractical to characterize the source area with a high level of confidence. However, analyses of soil/waste samples from trenches in the waste disposal zones indicates the area is contaminated with polycyclic aromatic hydrocarbons (PAHs), phthalates, VOCs, and, to a lesser degree, pesticides/PCBs and heavy metals. See Table 3 for a summary of analyses. Those PAHs detected at concentrations greater than 100,000 micrograms per kilogram (ug/kg) include fluorene, phenanthrene, anthracene, and 2-methylnapthalene. The VOCs that occurred the most often and in the highest concentrations were ethylbenzene (up to 624,000 ug/kg) and xylenes (up to 3,360,000 ug/kg). PCBs were found at concentrations up to 370,000 ug/kg. Heavy metals which occured at elevated concentrations (greater than 10 times background) include chromium, copper, lead, mercury, and zinc.

TABLE 1
DOEPKE-HOLLIDAY SITE
SUMMARY OF ORGANIC CHEMICAL ANALYSES FOR
GROUND WATER SAMPLES**

SEMI-VOLATILES	CONCENTRATION (ug/l)
Phenol	13
Benzoic Acid	150
Naphthalene	150
4-Chloroaniline	62
Diethylphthalate	350
Pentachlorophenol	152
Di-N-Butylphthalate	20
1,2-Dichlorobenzene	14
2,4-Dimethylphenol	33
Isophorone	18
Dibenzofuran	3
Fluorene	4
Acenaphthene	5
VOLATILES	
Chlorobenzene	63
Chloroethane	18
1,1-Dichloroethene	51
1,1-Dichloroethane	32
Benzene	890
4-Methyl-2-Pentanone	296
2-Hexanone	15
Toluene	4130
Ethyl Benzene	13400
Total Xylenes	459000
Trichloroethene	57
PESTICIDES/PCBs	
Alpha-BHC	0.80
Gamma-BHC	3.80
Aldrin	0.34
Heptachlor Epoxide	2.10
Endosulfan I	2.80
4,4'-DDE	0.55
Endosulfan II	0.32
Endrin Aldehyde	0.35
Endosulfan Sulfate	0.34
Chlordane	5.40
Beta-BHC	0.21
Delta-BHC	0.66
4,4'-DDD	0.10
4,4'-DDT	0.10
Heptachlor	0.50
Dieldrin	0.10

** Values shown are maximum concentration detected.

TABLE 2
DOEPKE-HOLLIDAY SITE
SUMMARY OF ORGANIC CHEMICAL ANALYSES FOR
SEEP WATER SAMPLES**

Semi Volatiles	Concentration (ug/l)
1,2-Dichlorobenzene	14
Di-N-Butylphthalate	710
Bis(2-Ethyl Hexyl)Phthalate	22
Volatiles	
4-Methyl-2-Pentanone	10.0
Vinyl Acetate	10.5
Methylene Chloride	5.7
1,1-Dichloroethene	5.5
1,2-Dichloroethane	10.0
Trans 1,2-Dichloroethene	5.0
Dichloromethane	5.7
Pesticides/PCBs	
Chlordane	1.0
Beta-BHC	0.2
Alpha-BHC	0.1
Delta-BHC	0.7
Endosulfan I	0.1
Endosulfan Sulfate	0.5
4,4'-DDD	0.1
4,4'-DDT	0.1
Dieldrin	0.1
Heptachlor	0.5
Heptachlor Epoxide	0.1

** Values shown are maximum concentration detected.

TABLE 3
DOEPKE-HOLLIDAY SITE
SUMMARY OF CHEMICAL ANALYSES FOR
SOIL/WASTE SAMPLES**

SEMIVOLATILES	CONCENTRATION (ug/kg)
1,4-Dichlorobenzene	6200
1,2-Dichlorobenzene	670
Naphthalene	30000
2-Methylnaphthalene	275000
Acenaphthene	7610
Diethylphthalate	61800
4-Chlorophenyl Phenyl Ether	748
Fluorene	161000
Phenanthrene	650000
Anthracene	292000
Di-N-Buyhlphthalate	3200
Fluoranthene	77000
Pyrene	58000
Butyl Benzyl Phthalate	11000
Benzo(a)anthracene	31400
Bis(2-ethylhexyl)phthalate	26000
Chrysene	36200
Benzo(b)fluoranthene	45000
Benzo(k)fluoranthene	44000
Benzo(a)pyrene	37100
Indeno(1,2,3-cd)pyrene	18000
Dibenzo(a,h) anthracene	7000
Benzo(g,h,i)perylene	15000
Dibenzofuran	5830
N-Nitrosodiphenylamine	2360
4-Chloroaniline	28800
Acenaphthylene	2440
VOLATILES	
Methylene Chloride	60900
Acetone	129000
1,1-Dichloroethene	118
Trichloroethene	48
Benzene	350
4-Methyl-2-pentanone	37500
Toluene	3910
Chlorobenzene	53
Ethyl Benzene	624000
Total Xylenes	3360000
1,2-Dichloroethene	306
2-Hexanone	29800
2-Butanone	32
Tetrachloroethene	24

TABLE 3 (Continued)

PESTICIDES/PCBs	(ug/kg)
Alpha-BHC	12
Beta-BHC	38
Delta-BHC	10
Aldrin	960
4,4'-DDE	6600
4,4'-DDD	4400
4,4'-DDT	7800
Endosulfan Sulfate	16
Chlorodane	300
Endosulfan II	68
Aroclor-1242	3200
Aroclor-1248	370000
Aroclor-1254	17000
Aroclor-1260	1100

METALS	(mg/kg)
Aluminum	22900
Antimony	14
Arsenic	22
Barium	1300
Berylium	3
Cadmium	7
Calcium	70000
Chromium	1400
Cobalt	22
Copper	1500
Iron	150000
Lead	800
Magnesium	8900
Manganese	1400
Mercury	7
Nickel	78
Potassium	4000
Silver	16
Sodium	3690
Vanadium	102
Zinc	1400
Cyanide	36
Boron	1110

** Values shown are maximum concentration detected

Summary of Site Risks

Human Health Risks

A Public Health Assessment (PHA) was performed as part of the RI/FS process. The PHA defines the types and extent of public health hazards posed by actual or potential exposure to hazardous materials in the environmental media at the site. It analyzes site conditions and the potential risks to human health assuming no cleanup action is taken.

As discussed in the previous section, analytical results from the RI indicate that organic and inorganic chemical substances occur at varying concentrations within all of the environmental media sampled. Surface and subsurface soils at the site are contaminated with PAHs, phthalates, VOCs, pesticides, PCBs, and heavy metals. Note that much of the site has been covered with clean fill materials. As would be expected, the highest concentrations generally occur below the surface in the former waste disposal areas. Shallow ground water contains varying levels of VOCs, semi-volatile organics, pesticides, and heavy metals. Chemicals were also found in ground water seeps which discharge to the surface at the perimeter of the site, but at generally lower concentrations.

More than 60 different chemicals have been detected in the environmental media at the site. For purposes of conducting the PHA, a smaller group of representative or indicator chemicals was selected to characterize the site risks. The indicator chemicals were selected on the basis of concentration, prevalence, the likelihood of human exposure in consideration of site-specific conditions, toxicity, and mobility or persistence in the environment. See Table 4 for the measured indicator chemical concentrations.

Two present worker exposure scenarios and two hypothetical exposure scenarios were studied in detail:

- Workers in the portable commodes division exposed to contaminated surface soils by the inhalation, dermal, and ingestion exposure routes.

- Onsite driver exposure to surface soil via inhalation of contaminated dust.

- A child trespasser exposed to surface soil by the inhalation, ingestion, and dermal routes.

TABLE 4
MEASURED INDICATOR CHEMICAL CONCENTRATIONS IN ENVIRONMENTAL MEDIA

Indicator Chemical	Concentration Mean	Conservative Upper Bound	Maximum
Surface Soil (mg/kg)			
1. 1,1-Dichloroethylene	ND	ND	ND
2. Xylene	9.611	27.00	27.00
3. Benzene	ND	ND	ND
4. Benzo[a]pyrene	3.831	4.99	4.99
5. Bis(2-ethylhexyl)phthalate	6.804	10.177	21.00
6. Aroclor 1248	0.111	0.22	0.22
Aroclor 1254	0.079	0.079	0.12
Aroclor 1260	0.393	0.468	1.43
7. alpha-HCCH	ND	ND	ND
8. Lead	135.0	135.0	400
9. Chromium	585.0	585.0	1,400.0
Ground Water (mg/L)			
1. 1,1-Dichloroethylene	0.0054	0.006	0.0064
2. Xylene	65.403	109.001	459.0000
3. Benzene	0.0118	0.0388	0.0453
4. Benzo[a]pyrene	ND	ND	ND
5. Bis(2-ethylhexyl)phthalate	ND	ND	ND
6. Aroclor 1248	ND	ND	ND
Aroclor 1254	ND	ND	ND
Aroclor 1260	ND	ND	ND
7. alpha-HCCH	0.00027	0.00061	0.0008
8. Lead	0.0108	0.0243	0.030
9. Chromium	0.0168	0.0236	0.059

TABLE 4 (continued)
MEASURED INDICATOR CHEMICAL CONCENTRATIONS
IN ENVIRONMENTAL MEDIA

Indicator Chemical	Concentration (mg/L) Mean	Conservative Upper Bound	Maximum
Seep Water (mg/L)			
1. 1,1-Dichloroethylene	0.0051	0.0054	0.0055
2. Xylene	ND	ND	ND
3. Benzene	ND	ND	ND
4. Benzo[a]pyrene	ND	ND	ND
5. Bis(2-ethylhexyl)phthalate	0.0113	0.022	0.022
6. Aroclor 1248	ND	ND	ND
Aroclor 1254	ND	ND	ND
Aroclor 1260	ND	ND	ND
7. alpha-HCCH	0.000062	0.000077	0.0001
8. Lead	0.0017	0.0017	0.0017
9. Chromium	ND	ND	ND

ND - Not detected

Mean - Average of all site data including the detection limits of non-detectable compounds

Conservative Upper Bound - Average of only the detectable compounds

Maximum - The highest concentration reported

- Potential future site usage scenario assuming full-time onsite worker exposure to surface soils from the inhalation, ingestion, and dermal contact routes.

The present worker exposure scenario only includes those mowing vegetation, handling portable toilets, and cutting apart tanks within the confines of the disposal area. This scenario assumes an exposure frequency of 180 days/year for 40 years.

The driver exposure scenario was developed to estimate the risks to workers not directly engaged in activities within the disposal area but who are working in the vicinity of the disposal area. These workers would be exposed through inhalation and/or ingestion of fugitve dust only.

The trespasser exposure scenario assumes that a trespasser between the ages of 12-18 years visits the site 28 days per year for 7 years.

Lastly, the worker exposure scenario under future site usage was used to represent health risks at the site assuming that future site use involved construction/excavation activities.

Exposure to offsite populations is not considered significant, because the amounts of chemicals released into the air through volatilization or the generation of fugitive dust is small due to the fact that most of the former disposal areas are covered with clean soils, clays, shales and/or rock debris. Much of this area is also vegetated. The small generation rate combined with exponential dilution of chemicals with distance from the source make it very unlikely that any offsite populations will be significantly exposed. Exposure via ingestion of contaminated water is not considered in this assessment, because the contaminated ground water is not a source of drinking water, and contaminants are not migrating offsite in large enough concentrations to impact water quality in the Kansas River. Potential usage of the contaminated ground water as a drinking water source is not considered a possibility, because the contaminated ground water unit is shallow, of limited extent, and does not possess sufficient yield (less than 1 gpm) to provide enough water for this use.

All chemicals are toxic at some dose; thus, the key issue in risk assessment is not establishing toxicity itself, but rather in defining the levels of exposure which cause undesirable effects.

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

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of 1E-6 indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specified exposure conditions at the site.

Risk estimates were derived using three different data sets representing:

1. Average exposure conditions,
2. Conservative upper bound exposure conditions, and
3. Maximum possible exposure conditions.

Average exposure conditions are represented by mean concentration values which were calculated using the average of all site data including the detection limits of non-detectable compounds. Conservative upper-bound conditions are represented by the mean of all concentration values above detection limits. Maximum exposure conditions are represented by the highest concentrations reported.

The quantified carcinogenic risks for each exposure scenario outlined above are presented in Tables 5-1 through 5-4.

For assessment of the non-carcinogenic effects of the indicator chemicals, a hazard index approach was used. Briefly, the hazard index approach compares the average daily intake for each indicator chemical for each population to a published acceptable intake for chronic exposure (AIC). The EPA derived acceptable intake values for chronic exposure are calculated from human epidemiological studies or animal studies to which uncertainty factors have been applied to account for the use of animal data to predict effects on humans. These values represent the highest chronic exposure level not causing adverse effects [i.e., no observable adverse effect level (NOAEL)]. To assess the overall potential for non-carcinogenic effects from multiple chemicals using the hazard index, the ratio of the daily exposure (DE) to the acceptable intake for chronic exposure (AIC) is summed. This approach assumes multiple sub-threshold exposures can result in an adverse effect if the magnitude of the hazard index is greater than one. Conversely, if the hazard index is less than one, the chemicals are not considered to represent a human health concern.

Non-carcinogenic hazards for each exposure scenario are presented in Tables 5-5 through 5-8.

The following conclusions regarding site hazards can be made based on the data presented in the PHA and RI reports:

1. Contaminants are not migrating offsite in large enough concentrations to impact water quality in the Kansas River. Most measured concentrations of chemicals in seep water and offsite drainage are below federal maximum contaminant levels (MCLs) and Kansas action levels (KALs). These data minimize the human health concern regarding the ingestion of these discharges from the Kansas River or the Johnson County Water District No. 1 intake. Site discharges mixing with the Kansas River would lower the concentration many thousands of times below the already low concentrations detected (See RI report). This does not preclude the possibility that offsite migration could become significant in the future, and contaminant tranport studies indicate that this potential exists.

2. The summation of non-carcinogenic hazard indices is less than one for each exposure scenario studied. Therefore, the indicator chemicals do not represent a human health concern when only non-carcinogenic effects are considered.

3. The site currently poses no significant carcinogenic risks to onsite workers or the casual trespasser who are exposed to contaminated surface soils by the inhalation, dermal contact, and ingestion exposure routes. Note that these scenarios assume contact with surface soils only, and that waste materials in the sub-surface remain undisturbed.

Table 5-1

Estimation of Lifetime Cancer Risks to Workers On Site Posed by Inhalation, Dermal, and Ingestion Exposure to Potentially Carcinogenic Indicator Chemicals Present in Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical		Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
A.	Inhalation							
1	1,1-DCE	ND	ND	ND	1.2	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	1.38E-09	1.80E-09	1.80E-09	6.1	8.41E-09	1.10E-08	1.10E-08
4	DEHP	2.45E-09	3.66E-09	7.56E-09	0.000684	1.68E-12	2.51E-12	5.17E-12
5	Aroclor 1248	4.00E-11	7.92E-11	7.92E-11	7.7	3.08E-10	6.10E-10	6.10E-10
6	Aroclor 1254	2.84E-11	2.84E-11	4.32E-11	7.7	2.19E-10	2.19E-10	3.33E-10
7	Aroclor 1260	1.41E-10	1.68E-10	5.15E-10	7.7	1.09E-09	1.30E-09	3.96E-09
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	2.11E-07	2.11E-07	5.04E-07	41	8.63E-06	8.63E-06	2 07E-05
					Sub-total	8.64E-06	8.65E-06	2.07E-05
B.	Dermal							
1	1,1-DCE	ND	ND	ND	0.6	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	1.67E-07	2.18E-07	2.18E-07	11.5	1.93E-06	2.51E-06	2.51E-06
4	DEHP	2.97E-07	4.45E-07	9.18E-07	0.000684	2.03E-10	3.04E-10	6.28E-10
5	Aroclor 1248	4.85E-09	9.61E-09	9.61E-09	7.7	3.74E-08	7.40E-08	7.40E-08
6	Aroclor 1254	3.45E-09	3.45E-09	5.24E-09	7.7	2.66E-08	2.66E-08	4.04E-08
7	Aroclor 1260	1.72E-08	2.05E-08	6.25E-08	7.7	1.32E-07	1.57E-07	4.81E-07
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	2.56E-05	2.56E-05	6.12E-05	NA	---	---	---
					Sub-total	2.12E-06	2.77E-06	3.10E-06

Table 5-1 continued

Indicator Chemical	Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
C. Ingestion							
1 1,1-DCE	ND	ND	ND	0.6	---	---	---
2 Benzene	ND	ND	ND	0.029	---	---	---
3 B[a]P	3.85E-07	5.02E-07	5.02E-07	11.5	4.43E-06	5.77E-06	5.77E-06
4 DEHP	6.84E-07	1.02E-06	2.11E-06	0.000684	4.68E-10	7.00E-10	1.45E-09
5 Aroclor 1248	1.12E-08	2.21E-08	2.21E-08	7.7	8.60E-08	1.70E-07	1.70E-07
6 Aroclor 1254	7.95E-09	7.95E-09	1.21E-08	7.7	6.12E-08	6.12E-08	9.30E-08
7 Aroclor 1260	3.95E-08	4.71E-08	1.44E-07	7.7	3.04E-07	3.63E-07	1.11E-06
8 alpha-HCCH	ND	ND	ND	11	---	---	---
9 Chromium	5.89E-05	5.89E-05	1.41E-04	NA	---	---	---
				Sub-total	4.88E-06	6.37E-06	7.15E-06
				Total	1.56E-05	1.78E-05	3.10E-05

*The inhalation, dermal, and ingestion daily exposure in mg/kg/day was calculated by multiplying 0.00036, 0.0437, and 0.1006 mg/kg body weight/day respectively, of soil times the corresponding concentration of the chemical in soil. These doses are based on a body weight of 70 kg.

§Cancer potency factors are from the Superfund Public Health Evaluation Manual (1986) with updates from EPA's Carcinogenic Assessment Group (CAG)

†Lifetime cancer risks are calculated by multiplying the daily intake by the cancer potency factor.

Mean- average of all site data including the detection limits of non-detectable compounds

Conservative Upper Bound - average of only the detectable compounds

Maximum - the highest concentration reported.

ND = not detected

NA = Not applicable

Table 5-2

Estimation of Lifetime Cancer Risks to the Hypothetical Trespasser Posed by Inhalation, Dermal, and Ingestion Exposure to Potentially Carcinogenic Indicator Chemicals Present in Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical		Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
A.	Inhalation							
1	1,1-DCE	ND	ND	ND	1.2	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	7.66E-11	9.98E-11	9.98E-11	6.1	4.67E-10	6.09E-10	6.09E-10
4	DEHP	1.36E-10	2.04E-10	4.20E-10	0.000684	9.31E-14	1.39E-13	2.87E-13
5	Aroclor 1248	2.22E-12	4.40E-12	4.40E-12	7.7	1.71E-11	3.39E-11	3.39E-11
6	Aroclor 1254	1.58E-12	1.58E-12	2.40E-12	7.7	1.22E-11	1.22E-11	1.85E-11
7	Aroclor 1260	7.86E-12	9.36E-12	2.86E-11	7.7	6.05E-11	7.21E-11	2.20E-10
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	1.17E-08	1.17E-08	2.80E-08	41	4.80E-07	4.80E-07	1.15E-06
					Sub-total	4.80E-07	4.80E-07	1.15E-06
B.	Dermal							
1	1,1-DCE	ND	ND	ND	0.6	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	1.15E-08	1.50E-08	1.50E-08	11.5	1.32E-07	1.72E-07	1.72E-07
4	DEHP	2.04E-08	3.05E-08	6.30E-08	0.000684	1.40E-11	2.09E-11	4.31E-11
5	Aroclor 1248	3.33E-10	6.60E-10	6.60E-10	7.7	2.56E-09	5.08E-09	5.08E-09
6	Aroclor 1254	2.37E-10	2.37E-10	3.60E-10	7.7	1.82E-09	1.82E-09	2.77E-09
7	Aroclor 1260	1.18E-09	1.40E-09	4.29E-09	7.7	9.08E-09	1.08E-08	3.30E-08
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	1.76E-06	1.76E-06	4.20E-06	NA	---	---	---
					Sub-total	1.46E-07	1.90E-07	2.13E-07

Table 5-2 continued

Indicator Chemical	Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
C. Ingestion							
1 1,1-DCE	ND	ND	ND	0.6	---	---	---
2 Benzene	ND	ND	ND	0.029	---	---	---
3 B[a]P	2.11E-08	2.74E-08	2.74E-08	11.5	2.42E-07	3.16E-07	3.16E-07
4 DEHP	3.74E-08	5.60E-08	1.16E-07	0.000684	2.56E-11	3.83E-11	7.90E-11
5 Aroclor 1248	6.11E-10	1.21E-09	1.21E-09	7.7	4.70E-09	9.32E-09	9.32E-09
6 Aroclor 1254	4.35E-10	4.35E-10	6.60E-10	7.7	3.35E-09	3.35E-09	5 08E-09
7 Aroclor 1260	2.16E-09	2.57E-09	7.87E-09	7.7	1.66E-08	1.98E-08	6 06E-08
8 alpha-HCCH	ND	ND	ND	11	---	---	---
9 Chromium	3.22E-06	3.22E-06	7.70E-06	NA	---	---	---
				Sub-total	2.67E-07	3.48E-07	3.91E-07
				Total	8.93E-07	1.02E-06	1.75E-06

*The inhalation, dermal, and ingestion daily exposure in mg/kg/day was calculated by multiplying 0.00002, 0.003, and 0.0055 mg/kg body weight/day respectively, of soil times the corresponding concentration of the chemical in soil. These doses are based on a body weight of 70 kg.

§Cancer potency factors are from the Superfund Public Health Evaluation Manual (1986) with updates from EPA's Carcinogenic Assessment Group (CAG)

†Lifetime cancer risks are calculated by multiplying the daily intake by the cancer potency factor.

Mean- average of all site data including the detection limits of non-detectable compounds

Conservative Upper Bound - average of only the detectable compounds

Maximum - the highest concentration reported.

ND = not detected

NA = not applicable

Table 5-3

Estimation of Lifetime Cancer Risks to the Drivers Traversing the Site Posed by Inhalation Exposure to Potentially Carcinogenic Indicator Chemicals Present in Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical		Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
A. Inhalation								
1	1,1-DCE	ND	ND	ND	1.2	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	1.15E-09	1.50E-09	1.50E-09	6.1	7.01E-09	9.13E-09	9.13E-09
4	DEHP	2.04E-09	3.05E-09	6.30E-09	0.000684	1.40E-12	2.09E-12	4 31E-12
5	Aroclor 1248	3.33E-11	6.60E-11	6.60E-11	7.7	2.56E-10	5.08E-10	5 08E-10
6	Aroclor 1254	2.37E-11	2.37E-11	3.60E-11	7.7	1.82E-10	1.82E-10	2 77E-10
7	Aroclor 1260	1.18E-10	1.40E-10	4.29E-10	7.7	9.08E-10	1.08E-09	3 30E-09
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	1.76E-07	1.76E-07	4.20E-07	41	7.20E-06	7.20E-06	1 72E-05
					Total	**7.20E-06**	**7.21E-06**	1.72E-05

*The inhalation daily exposure in mg/kg/day was calculated by multiplying 0.0003 mg/kg body weight/day of soil times the corresponding concentration of the chemical in soil. These doses are based on a body weight of 70 kg.

§Cancer potency factors are from the Superfund Public Health Evaluation Manual (1986) with updates from EPA's Carcinogenic Assessment Group (CAG)

†Lifetime cancer risks are calculated by multiplying the daily intake by the cancer potency factor.

Mean- average of all site data including the detection limits of non-detectable compounds

Conservative Upper Bound - average of only the detectable compounds

Maximum - the highest concentration reported.

ND = not detected

NA = not applicable

Table 5-4

Estimation of Lifetime Cancer Risks Under Future Site Usage: Worker Exposure Scenario Assuming Inhalation, Dermal, and Ingestion Exposure to Potentially Carcinogenic Indicator Chemicals Present in Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical		Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
A.	**Inhalation**							
1	1,1-DCE	ND	ND	ND	1.2	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	1.46E-08	1.90E-08	1.90E-08	6.1	8.88E-08	1.16E-07	1.16E-07
4	DEHP	2.59E-08	3.87E-08	7.98E-08	0.000684	1.77E-11	2.65E-11	5.46E-11
5	Aroclor 1248	4.22E-10	8.36E-10	8.36E-10	7.7	3.25E-09	6.44E-09	6 44E-09
6	Aroclor 1254	3.00E-10	3.00E-10	4.56E-10	7.7	2.31E-09	2.31E-09	3.51E-09
7	Aroclor 1260	1.49E-09	1.78E-09	5.43E-09	7.7	1.15E-08	1.37E-08	4.18E-08
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	2.22E-06	2.22E-06	5.32E-06	41	9.11E-05	9.11E-05	2.18E-04
					Sub-total	**9.12E-05**	**9.13E-05**	**2.18E-04**
B.	**Dermal**							
1	1,1-DCE	ND	ND	ND	0.6	---	---	---
2	Benzene	ND	ND	ND	0.029	---	---	---
3	B[a]P	2.18E-07	2.84E-07	2.84E-07	11.5	2.51E-06	3.27E-06	3.27E-06
4	DEHP	3.87E-07	5.79E-07	1.19E-06	0.000684	2.65E-10	3.96E-10	8.17E-10
5	Aroclor 1248	6.32E-09	1.25E-08	1.25E-08	7.7	4.86E-08	9.64E-08	9.64E-08
6	Aroclor 1254	4.50E-09	4.50E-09	6.83E-09	7.7	3.46E-08	3.46E-08	5.26E-08
7	Aroclor 1260	2.24E-08	2.66E-08	8.14E-08	7.7	1.72E-07	2.05E-07	6 27E-07
8	alpha-HCCH	ND	ND	ND	11	---	---	---
9	Chromium	3.33E-05	3.33E-05	7.97E-05	NA	---	---	---
					Sub-total	**2.76E-06**	**3.60E-06**	**4.04E-06**

Table 5-4 continued

Indicator Chemical	Daily Exposure* (mg/kg/day) Mean	Cons.	Max.	Cancer Pot. Factor§	Lifetime Cancer† Risk Mean	Cons.	Max.
C. Ingestion							
1 1,1-DCE	ND	ND	ND	0.6	---	---	---
2 Benzene	ND	ND	ND	0.029	---	---	---
3 B[a]P	5.01E-07	6.53E-07	6.53E-07	11.5	5.76E-06	7.51E-06	7.51E-06
4 DEHP	8.90E-07	1.33E-06	2.75E-06	0.000684	6.09E-10	9.11E-10	1.88E-09
5 Aroclor 1248	1.45E-08	2.88E-08	2.88E-08	7.7	1.12E-07	2.22E-07	2.22E-07
6 Aroclor 1254	1.03E-08	1.03E-08	1.57E-08	7.7	7.96E-08	7.96E-08	1.21E-07
7 Aroclor 1260	5.14E-08	6.12E-08	1.87E-07	7.7	3.96E-07	4.71E-07	1.44E-06
8 alpha-HCCH	ND	ND	ND	11	---	---	---
9 Chromium	ND	ND	ND	NA	---	---	---
				Sub-total	6.35E-06	8.28E-06	9.29E-06
				Total	1.00E-04	1.03E-04	2.31E-04

*The inhalation, dermal, and ingestion daily exposure in mg/kg/day was calculated by multiplying 0.0038, 0.0569, and 0.1308 mg/kg body weight/day respectively, of soil times the corresponding concentration of the chemical in soil. These doses are based on a body weight of 70 kg.

§Cancer potency factors are from the Superfund Public Health Evaluation Manual (1986) with updates from EPA's Carcinogenic Assessment Group (CAG)

†Lifetime cancer risks are calculated by multiplying the daily intake by the cancer potency factor.

Mean- average of all site data including the detection limits of non-detectable compounds.

Conservative Upper Bound - average of only the detectable compounds

Maximum - the highest concentration reported.

ND = not detected

NA = not applicable

Table 5-5

Summary of Lifetime Non-Cancer Hazard to Workers On Site From Inhalation, Dermal, and Ingestion Exposure to Site Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical	Daily Exposure (DE) Mean	Daily Exposure (DE) Cons.	Daily Exposure (DE) Max.	AIC	DE:AIC Ratio* Mean	DE:AIC Ratio* Cons.	DE:AIC Ratio* Max.
Inhalation Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	2.45E-09	3.66E-09	7.56E-09	2.00E-02	1.22E-07	1.83E-07	3.78E-07
3 Chromium	2.11E-07	2.11E-07	5.04E-07	5.00E-03	4.21E-05	4.21E-05	1.01E-04
4 Lead	4.86E-08	4.86E-08	1.44E-07	4.30E-03	1.13E-05	1.13E-05	3.35E-05
5 Xylene	3.46E-09	9.72E-09	9.72E-09	4.00E-01	8.65E-09	2.43E-08	2.43E-08
				Sub-total	5.36E-05	5.36E-05	1.35E-04
Dermal Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	2.97E-07	4.45E-07	9.18E-07	2.00E-02	1.49E-05	2.22E-05	4.59E-05
3 Chromium	2.56E-05	2.56E-05	6.12E-05	5.00E-03	5.11E-03	5.11E-03	1.22E-02
4 Lead	5.90E-06	5.90E-06	1.75E-05	1.40E-03	4.21E-03	4.21E-03	1.25E-02
5 Xylene	4.20E-07	1.18E-06	1.18E-06	2.00E+00	2.10E-07	5.90E-07	5.90E-07
				Sub-total	9.34E-03	9.35E-03	2.48E-02
Ingestion Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	6.84E-07	1.02E-06	2.11E-06	2.00E-02	3.42E-05	5.12E-05	1.06E-04
3 Chromium	5.89E-05	5.89E-05	1.41E-04	5.00E-03	1.18E-02	1.18E-02	2.82E-02
4 Lead	1.36E-05	1.36E-05	4.02E-05	1.40E-03	9.70E-03	9.70E-03	2.87E-02
5 Xylene	9.67E-07	2.72E-06	2.72E-06	2.00E+00	4.83E-07	1.36E-06	1.36E-06
				Sub-total	2.15E-02	2.15E-02	5 70E-02
				Total †	3.09E-02	3.09E-02	8.19E-02

*A hazard index greater than one for a specific indicator chemical indicates a potential human health risk. For multiple exposures, the hazard index can exceed one if the chemicals do not induce the same effect by the same mechanism. AIC = Acceptable Intake Chronic (mg/kg/day) are reference doses in the SPHEM. For 1,1-DCE, DEHP, and chromium, AICs by the inhalation route were unavailable and the AIC by the oral route was applied for purposes of comparison. ND = not detected, †Combined non-cancer hazards were calculated by summing the dermal, inhalation and ingestion DE:AIC ratios.

Table 5-6
Estimation of Lifetime Non-Cancer Hazards to the Child Trespasser Due to Dermal, Inhalation, and Ingestion Exposure to Site Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical	Daily Exposure (DE) Mean	Cons.	Max.	AIC	DE:AIC Ratio* Mean	Cons.	Max.
Inhalation Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	1.77E-09	2.65E-09	5.46E-09	2.00E-02	8.85E-08	1.32E-07	2.73E-07
3 Chromium	1.52E-07	1.52E-07	3.64E-07	5.00E-03	3.04E-05	3.04E-05	7.28E-05
4 Lead	3.51E-08	3.51E-08	1.04E-07	4.30E-03	8.16E-06	8.16E-06	2.42E-05
5 Xylene	2.50E-09	7.02E-09	7.02E-09	4.00E-01	6.25E-09	1.76E-08	1.76E-08
				Sub-total	3.87E-05	3.87E-05	9.73E-05
Dermal Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	2.59E-07	3.87E-07	7.98E-07	2.00E-02	1.29E-05	1.93E-05	3.99E-05
3 Chromium	2.22E-05	2.22E-05	5.32E-05	5.00E-03	4.45E-03	4.45E-03	1.06E-02
4 Lead	5.13E-06	5.13E-06	1.52E-05	1.40E-03	3.66E-03	3.66E-03	1.09E-02
5 Xylene	3.65E-07	1.03E-06	1.03E-06	2.00E+00	1.83E-07	5.13E-07	5.13E-07
				Sub-total	8.12E-03	8.13E-03	2 15E-02
Ingestion Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	4.69E-07	7.02E-07	1.45E-06	2.00E-02	2.35E-05	3.51E-05	7.25E-05
3 Chromium	4.04E-05	4.04E-05	9.66E-05	5.00E-03	8.07E-03	8.07E-03	1.93E-02
4 Lead	9.32E-06	9.32E-06	2.76E-05	1.40E-03	6.65E-03	6.65E-03	1.97E-02
5 Xylene	6.63E-07	1.86E-06	1.86E-06	2.00E+00	3.32E-07	9.32E-07	9.32E-07
				Sub-total	1.48E-02	1.48E-02	3.91E-02
				Total †	2.30E-02	2.30E-02	6.07E-02

*A hazard index greater than one for a specific indicator chemical indicates a potential human health risk. For multiple exposures, the hazard index can exceed one if the chemicals do not induce the same effect by the same mechanism. AIC = Acceptable Intake Chronic (mg/kg/day) are published reference doses in the SPHEM. For 1,1-DCE, DEHP, and chromium, AICs by the inhalation route were unavailable and the AIC by the oral route was applied for purposes of comparison. †Combined non-cancer hazards were calculated by summing the dermal, inhalation and ingestion DE:AIC ratios.

Table 5-7

Estimation of Lifetime Non-Cancer Hazards to Drivers Traversing the Site Due to Inhalation Exposure to Site Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator		Daily Exposure (DE)			AIC	DE:AIC Ratio*		
Chemical		Mean	Cons.	Max.		Mean	Cons.	Max.
Inhalation Exposure								
1.	1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2	DEHP	2.04E-09	3.05E-09	6.30E-09	2.00E-02	1.02E-07	1.53E-07	3.15E-07
3	Chromium	1.76E-07	1.76E-07	4.20E-07	5.00E-03	3.51E-05	3.51E-05	8.40E-05
4	Lead	4.05E-08	4.05E-08	1.20E-07	4.30E-03	9.42E-06	9.42E-06	2.79E-05
5	Xylene	2.88E-09	8.10E-09	8.10E-09	4.00E-01	7.21E-09	2.03E-08	2.03E-08
					Sub-total	4.46E-05	4.47E-05	1.12E-04
					Total †	4.46E-05	4.47E-05	1.12E-04

*A hazard index greater than one for a specific indicator chemical indicates a potential human health risk. For multiple exposures, the hazard index can exceed one if the chemicals do not induce the same effect by the same mechanism. AIC = Acceptable Intake Chronic (mg/kg/day) are published reference doses in the SPHEM. For 1,1-DCE, DEHP, and chromium, AICs by the inhalation route were unavailable and the AIC by the oral route was applied for purposes of comparison. †Combined non-cancer hazards were calculated by summing the dermal, inhalation and ingestion DE:AIC ratios.

Table 5-8
Estimation of Lifetime Non-Cancer Hazards Under the Hypothetical Future Site Usage Scenario: Worker Exposure Due to Dermal, Inhalation, and Ingestion Exposure to Site Surface Soil Using Mean, Conservative Upper Bound, and Maximum Concentrations

Indicator Chemical	Daily Exposure (DE) Mean	Cons.	Max.	AIC	DE:AIC Ratio* Mean	Cons.	Max.
Inhalation Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	2.59E-08	3.87E-08	7.98E-08	2.00E-02	1.29E-06	1.93E-06	3.99E-06
3 Chromium	2.22E-06	2.22E-06	5.32E-06	5.00E-03	4.45E-04	4.45E-04	1.06E-03
4 Lead	5.13E-07	5.13E-07	1.52E-06	4.30E-03	1.19E-04	1.19E-04	3.53E-04
5 Xylene	3.65E-08	1.03E-07	1.03E-07	4.00E-01	9.13E-08	2.57E-07	2.57E-07
				Sub-total	5.65E-04	5.66E-04	1.42E-03
Dermal Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	3.87E-07	5.79E-07	1.19E-06	2.00E-02	1.94E-05	2.90E-05	5.97E-05
3 Chromium	3.33E-05	3.33E-05	7.97E-05	5.00E-03	6.66E-03	6.66E-03	1.59E-02
4 Lead	7.68E-06	7.68E-06	2.28E-05	1.40E-03	5.49E-03	5.49E-03	1.63E-02
5 Xylene	5.47E-07	1.54E-06	1.54E-06	2.00E+00	2.73E-07	7.68E-07	7.68E-07
				Sub-total	1.22E-02	1.22E-02	3.22E-02
Ingestion Exposure							
1. 1,1-DCE	ND	ND	ND	9.00E-03	---	---	---
2 DEHP	8.90E-07	1.33E-06	2.75E-06	2.00E-02	4.45E-05	6.66E-05	1.37E-04
3 Chromium	7.65E-05	7.65E-05	1.83E-04	5.00E-03	1.53E-02	1.53E-02	3.66E-02
4 Lead	1.77E-05	1.77E-05	5.23E-05	1.40E-03	1.26E-02	1.26E-02	3.74E-02
5 Xylene	1.26E-06	3.53E-06	3.53E-06	2.00E+00	6.29E-07	1.77E-06	1.77E-06
				Sub-total	2.80E-02	2.80E-02	7.41E-02
				Total †	**4.08E-02**	**4.08E-02**	1.08E-01

*A hazard index greater than one for a specific indicator chemical indicates a potential human health risk. For multiple exposures, the hazard index can exceed one if the chemicals do not induce the same effect by the same mechanism. AIC = Acceptable Intake Chronic (mg/kg/day) are published reference doses in the SPHEM. For 1,1-DCE, DEHP, and chromium, AICs by the inhalation route were unavailable and the AIC by the oral route was applied for purposes of comparison. †Combined non-cancer hazards were calculated by summing the dermal, inhalation and ingestion DE:AIC ratios.

4. Analysis of the potential future site use scenario indicates that the site may, if no cleanup action is performed, present a significant carcinogenic risk to a full-time worker engaged in construction activities over a long period of time.

It should be noted that the future use scenario does not account for two factors which may have caused the risks to be underestimated. 1) Risk calculations are made using surface soil concentrations, and typical construction/excavation activities would likely result in contact with soils/wastes in the subsurface where contaminant concentrations are greater. 2) Volatile concentrations are not significant in the surface soils and therefore were not considered a significant factor in the evaluation of site hazards. However, there are significant levels in soils and wastes at various depths below the surface, which could pose a hazard to someone engaged in excavation activities from a sudden as well as a chronic exposure standpoint.

Also, under a construction/excavation scenario, transport of onsite contaminants to offsite areas by water or airborne transport mechanisms could become significant.

Environmental Risks

The site is adjacent to a sanitary landfill and industrial complex with controlled access and such sufficient activity that the potential for utilization as a terrestrial ecosystem is very limited. Currently less than five acres of the 80.3 acre site has been left undisturbed. Vegetative cover over the landfill is greater than 50% and has occurred naturally since site closure so phytotoxic effects are not evident. Forested areas occur near the site, and numerous animals have been observed onsite including deer, rabbits, racoons, and oppossums.

Contaminants occur in seep water and offsite drainage at very low levels, and in most cases below ambient water quality criteria for protection of freshwater aquatic life. Therefore, offsite migration is not expected to have an impact on water quality in the Kansas River, particularly since the volume of offsite drainage is relatively small. However, there is the potential for offsite migration to become significant in the future.

According to the Kansas Biological Survey, there are no records of threatened or endangered species on the site. Within a 5 mile radius of the site, two species of fish have been recorded and are currently listed by the U.S. Fish and Wildlife Services (USFWS) as candidate species. One species of snake has been recorded and is protected by the State of Kansas as a threatened species. The bald eagle, a regular winter visitor to the Kansas River, is listed by both the USFWS and the State of Kansas as an endangered species.

Under current conditions, no adverse impacts are identified for the general terrestrial or aquatic ecosystems; and therefore, there is no indication that threatened or endangered species will be adversely affected. In the event that offsite migration were to increase, this assessment would have to be reevaluated.

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

Role and Scope of the Response Action

As required by the National Contingency Plan, the general goal and objective of the response action is to effectively mitigate and minimize damage to and provide adequate protection of public health and the environment. The specific goals and objectives of the response action for the Doepke-Holliday site are as follows:

1. Reduce or eliminate the threat of direct contact, ingestion, or inhalation of particulates containing benzene, xylenes, PCBs, 1,1-dichloroethylene, alpha-hexachlorocyclohexane, bis(2-ethyl hexyl)phthalate, benzo(a)pyrene, lead, chromium, and other contaminants contained in soil and solids buried at the site. Also, reduce the potential for inhalation of volatilized organics such as benzene, 1,1-dichloroethylene, and xylenes.

2. Prevent future contamination of ground water migrating through contaminated soils and buried wastes to seeps, alluvium wells, and the Kansas River with resultant leaching of contaminants, such as the compounds of PCBs, benzene, xylenes, alpha-hexachlorocyclohexane, 1,1-dichloroethylene, bis(2-ethyl hexyl)phthalate, benzo(a)pyrene, lead, chromium, and other contaminants.

3. Reduce or eliminate the potential for transport of onsite contaminants to offsite areas by water or airborne transport mechanisms.

4. Prevent the potential for offsite exposure to unacceptable levels of ground water and soil/waste contaminants.

These goals and objectives can be accomplished by full or partial removal of wastes from the site, full or partial treatment of the wastes, and/or full or partial containment of wastes.

Description of Alternatives

The response action alternatives considered for implementation at the Doepke-Holliday site are outlined below. The alternatives were developed from a wide range of potentially applicable technologies that were screened for applicability to response objectives and site characteristics.

- Alternative 1: No Action;
- Alternative 2: Capping;
- Alternative 3: Capping and Partial Source Removal;
- Alternative 4: Capping and Partial Ground Water Control;
- Alternative 5: Capping, Partial Source Removal, and Partial Ground Water Control; and
- Alternative 6: Complete Excavation and Offsite Disposal.

All of the alternatives except "No Action" would include (a) additional investigations or activities to establish the northern, western, and southern extent of contaminated soils and buried wastes, (b) additional investigations to evaluate the vertical extent of contaminated ground water on the Doepke-Holliday property and the southern extent of contaminated ground water, and (c) extended ground water monitoring to evaluate the effectiveness of the response actions.

Alternative 1 - No Action:

The NCP and the Superfund process requires that the "No Action" alternative be considered at every site. This alternative provides a baseline for comparison. Under this alternative, no further action would be taken to control contamination associated with the site.

Alternative 2 - Capping:

The major features of the capping alternative consist of investigations to establish the lateral extent of the waste disposal area, installation of an impermeable multi-layer cap over the majority of the waste disposal area, site security barriers, land use restrictions, and extended ground water monitoring of existing and new monitoring wells.

The site will be capped with a final cover designed and constructed to provide long-term minimization of the migration of liquids through the capped area. The cap will also be designed and constructed to promote drainage and minimize erosion of the cover. Long-term operation and maintenance (O&M) will be conducted to monitor the ground water around the landfill, and to ensure the integrity of the cap.

It is anticipated that installation of the impermeable cap will reduce infiltration through the disposal area to the point that concentrations of contaminants in seep water discharges will drop significantly. Since the majority of the ground water discharge originates as precipitation, it is likely that many of the ground water seeps will not continue to flow. Also, the capping alternative should eliminate all health risks posed by direct contact with the waste disposal areas.

The estimated construction cost of this remedy is $4,130,000, with annual O&M costs estimated to be $72,000. The estimated time to implement this remedy and to meet the cleanup goals is 16 to 20 months.

Alternative 3 - Capping and Partial Source Removal:

The major components of this response action are the same as for alternative 2. Additionally, approximately 96,000 gallons of liquids currently ponded below grade in the former surface impoundment area will be evaluated for removal. The liquid will be collected by either pumping or other conventional dewatering techniques and containerized. The liquid will then be transported to an offsite permitted facility for treatment and disposal.

This alternative also includes short-term collection and offsite treatment, as necessary, of significant ground water seepage. The major offsite discharge (referred to as seep no. 1 in the RI/FS reports) will be collected and pumped to a holding tank. The water will be analyzed and, if necessary, taken to an offsite permitted facility for treatment prior to release.

The estimated construction cost of this remedy is $4,330,000, with annual O&M costs estimated to be $107,000. The estimated time to implement this remedy and to meet the cleanup goals is approximately 28 to 32 months.

Alternative 4 - Capping and partial ground water control:

This response action includes the components of alternative 2 with the addition of partial ground water control measures. These measures would include a clay cutoff wall constructed through the Interstate 435 construction fill to native bedrock in the former ravine area on the site. A ground water collection and extraction system would be installed to remove contaminated ground water intercepted by the clay cutoff wall. The collected ground water would be temporarily stored onsite, and then periodically transported offsite to a permitted treatment facility.

The estimated construction cost of this remedy is $5,110,000, with annual O&M costs estimated to be $109,000. The estimated time to implement this remedy and to meet the cleanup goals is approximately 28 to 32 months.

Alternative 5 - Capping, Partial Ground Water Control and Partial Source Removal:

Alternative 5 is a combination of the features of Alternatives 3 and 4. The response action includes the components of Alternative 2, plus the partial source removal measures of Alternative 3 and the partial ground water control measures of Alternative 4.

The estimated construction cost of this remedy is $5,230,000, with annual O&M costs estimated to be $109,000. The estimated time to implement this remedy and to meet the cleanup goals is approximately 30 to 34 months.

Alternative 6 - Complete Excavation and Offsite Disposal:

This alternative proposes complete excavation of the disposal areas, transportation, and disposal at appropriate offsite permitted facilities. Approximately 318,000 cubic yards of materials will need to be excavated and disposed of. The nature of the bulk of these materials is largely unknown. Therefore, the most effective methods of excavation, treatment and disposal have not been defined.

After the wastes have been excavated, the area will be backfilled with waste rock fill and graded. In additon, sedimentation and erosion controls and surface water diversions will be required during the remediation period. Ground water will be monitored for 5 years to demonstrate the effectiveness of the alternative.

Implementation of this alternative would significantly reduce contaminant migration through removal of the source materials. Removal of the source materials would also eliminate the potential for exposure to hazardous substances through direct contact.

The estimated construction cost of this remedy is $110,780,000, with annual O&M costs estimated to be $32,000. The estimated time to implement this remedy and to meet the cleanup goals is approximately 24 to 26 months.

Summary of the Comparative Analysis of Alternatives

The alternative selected by this ROD is Alternative 3: Capping and Partial Source Removal. This section provides the basis for determining that the selected alternative provides the best balance of tradeoffs with respect to the nine evaluation criteria. Further information on this alternative is provided in the following section, The Selected Remedy.

Threshold Criteria:

Overall Protection. Alternatives 2 and 3 would be approximately equal in their ability to protect offsite water quality by reducing to a minimum the amount of precipitation that can come into contact with the contaminant sources. In addition, the source contaminants would be contained in a manner to prevent humans from contact.

Alternatives 4 and 5 would provide some additional protection for offsite water quality by intercepting a primary pathway for offsite ground water migration. This would further aid in preventing potential deterioration of offsite water quality. Alternatives 4 and 5 would protect against direct contact with source contaminants in the same manner as Alternatives 2 and 3.

The source removal component of Alternatives 3 and 5 would further enhance the protection of offsite water quality.

Ultimately, Alternative 6 would provide the greatest overall protection of human health and the environment through complete removal of all source contaminants to permitted facilities for treatment and/or disposal. However, the risks associated with excavation activities and the extensive truck traffic required for removal could be significant over the short term.

In summary, Alternative 2 would provide sufficient overall protection of human health and the environment. Alternatives 3 and 4 would offer slightly better protection through two different approaches to contaminant control: Alternative 3 through partial source removal, and Alternative 4 through interception of already contaminated ground water. Alternative 5 would combine all of these protective measures. Alternative 6 would offer the greatest overall protection through removal of all source materials; however, the short term risks associated with implementation of this alternative could be significant.

Compliance with ARARs. All alternatives except "No Action" would meet all applicable or relevant and appropriate requirements of Federal and State of Kansas environmental laws. No waiver of any ARARs would need to be invoked under any of the action alternatives.

Chemical-specific ARARs: CERCLA Section 121 states that remedial actions shall attain Federal Water Quality Criteria (FWQC) where they are relevant and appropriate under the circumstances of the release or threatened release. FWQC for the protection of aquatic life are considered relevant and appropriate to ground water seeps discharging to the Kansas River. Water Quality Standards promulgated by the State of Kansas (KWQS) are also considered relevant and appropriate to the ground water discharges. In addition, the State of Kansas has established Kansas Action Levels and Alternate Kansas Action Levels (KALs/AKALs) which are guidelines for ground water cleanup. AKALs apply to alluvial aquifers and/or specific aquifers which surface through springs or seeps to become contributors to the surface waters of the State. AKALs are "to be considered" (TBC) relevant to the circumstances of this release. The most stringent of these standards and guidelines, for a particular contaminant, will be applied to the ground water seeps to determine compliance.

These standards and guidelines are currently being met by most contaminants in the ground water seep discharges at the perimeter of the site. It is anticipated that the capping remedy of Alternative 2, by reducing infiltration through the source areas, would reduce contaminant concentrations in these seeps to levels well below ARARs and TBCs, in addition to significantly reducing the volume of seepage.

Alternatives 3 and 4, through two different approaches to contaminant control, would provide additional assurances that contaminant-specific ARARs would be met. Implementation of Alternative 5 would combine these additional assurances.

Implementation of Alternative 6 would eliminate the potential for further leaching of contaminants through removal of the source materials; therefore, this alternative would provide the greatest reduction in offsite migration and, the greatest assurance that contaminant-specific ARARs would be met.

Location-specific ARARs: None were found to be either applicable or relevant and appropriate to the Doepke-Holliday site. The site is not in a flood plain, and none of the alternatives should interfere with wetlands or critical habitats.

Action-specific ARARs: Site closure under Alternatives 2 through 5 will comply with all action-specific ARARs. The facility ceased operation in November 1979 prior to the effective date of RCRA (November 19, 1980), and these alternatives do not involve placement/disposal of RCRA-regulated waste; therefore, the RCRA Subtitle C closure standards are not applicable. However, the standards have been determined to be relevant and appropriate to the types of wastes being managed and the circumstances of the release. Closure of the area will comply with appropriate portions of the RCRA regulations affecting landfill closure. Specifically, the site wiil be capped with a final cover designed and constructed to provide long-term minimization of the migration of liquids through the capped area, and to maintain its integrity over time while functioning with minimum maintenance (40 CFR §§264.111, 264.228, 264.258, and 264.310)

In addition, the cap will be designed and constructed to promote drainage and minimize erosion of the cover. Consistent with the requirements of 40 CFR §264.117, long-term operation and maintenance (O&M) will be conducted to monitor the ground water around the landfill, and to ensure the integrity of the cap.

The RCRA minimum technology requirements are not applicable to the capping alternatives, because the remedy does not involve a new RCRA unit, a lateral expansion of an existing unit, or a replacement unit. In addition, these requirements are not considered relevant and appropriate, because the wastes are widely dispersed and not contained in a RCRA-type unit.

The partial source removal component of Alternative 3 involves removal of liquids and transport to an offsite permitted treatment facility. The liquid will be analyzed to determine whether it requires pretreatment at a permitted RCRA facility prior to discharge to a publically owned treatment works (POTW).

Similarly, the seepage collection component of Alternative 3 and the ground water control component of Alternative 4 involve transport of contaminated water to an offsite permitted treatment facility. Collected water will be periodically analyzed, and if contaminant levels exceed the chemical-specific ARARs and TBCs described above, the contaminated water will be transported to a POTW for treatment prior to discharge. If the contaminant levels exceed the pretreatment criteria for wastewater discharge to a POTW, the contaminated water would be treated at a permitted RCRA facility prior to discharge to a POTW; however, it is not expected that this situation will occur.

Alternative 6 will require permitted facilities which can accept over 300,000 cubic yards of wastes and soils. The nature of the bulk of these wastes is largely unknown; and therefore, the most effective methods of treatment and disposal have not been defined. It is expected that the volume and heterogeneity of the wastes will make a workable approach to treatment and disposal of these wastes difficult to design.

Alternative 6 is likely to involve the excavation and placement of RCRA-regulated hazardous waste; therefore, the RCRA land disposal regulations (LDRs) are applicable requirements.

This alternative is also likely to involve the excavation and placement of wastes containing hazardous substances, where those substances are not RCRA-regulated waste; in this case, the RCRA LDRs are not applicable requirements. The EPA is undertaking a LDR rulemaking that will specifically apply to soil and debris.

Until that rulemaking is completed, the CERCLA program will not consider LDRs to be relevant and appropriate to soil and debris that do not contain RCRA-regulated waste.

Some materials may be classified as RCRA regulated wastes, while other materials may not. Similarly, LDRs may apply to some wastes and not others. Classifications will be dependant on the nature of waste characterization. It is anticipated that consistent application of ARARs will pose significant difficulties.

Primary Balancing Criteria:

Long-Term Effectiveness and Permanence. Alternatives 2, 3, 4, and 5 offer similar levels of long-term effectiveness and permanence; although, Alternatives 3, and 4 offer an enhancement of long-term effectiveness over Alternative 2 through partial removal of contaminants, thereby slightly reducing the potential for offsite migration of contaminants. Alternative 5 would provide both partial source removal and ground water collection, thereby offering the combined reductions in contaminant migration offered by Alternatives 3 and 4. Alternative 6 would provide complete removal of contaminant sources; and therefore, would offer the most reliable and permanent long-term remediation.

Long-term controls for Alternatives 2 and 3 would include cap maintenance, continued ground water and seeps monitoring, and land use and access restrictions. Alternatives 4 and 5 would require these same long-term controls in addition to maintenance of the ground water controls. Alternative 6 would require ground water and seeps monitoring for only five years. In addition, Alternatives 3, 5, and 6 would require the availability of a permitted facility for removed waste disposal, and Alternatives 4 and 5 require continued availability of a permitted facility to treat intercepted ground water.

In summary, Alternative 6 would provide the greatest long-term effectiveness and permanence, and require the least long-term controls. Alternatives 2, 3, 4, and 5 provide similar long-term effectiveness and permanence; although, Alternatives 3, 4, and 5 offer a slight enhancement of long-term effectiveness over Alternative 2 through partial removal and treatment of contaminants. Alternatives 4 and 5 require slightly greater long-term controls than alternatives 2 and 3 due to continued interception and treatment of ground water.

Reduction of Toxicity Mobility and Volume. Alternative 2 would not provide destruction or treatment of any contaminants. Alternative 3 provides for destruction or treatment of a portion of the source contaminants. Alternative 4 provides for treatment of a portion of the ground water seepage. Alternative 5 provides for destruction or treatment of a portion of the source contaminants, and treatment of intercepted ground water. Alternative 6 would result in the destruction or treatment of a substantial portion of the site contaminants.

Alternatives 2, 3, 4, and 5 would reduce mobility through capping of the disposal areas. Alternatives 4 and 5 would additionally reduce mobility by intercepting and extracting a portion of the ground water. Alternative 6 would accomplish the greatest mobility reduction through total source removal.

Alternatives 3, 4, and 5 would accomplish slight volume reduction through the treatment and discharge of contaminated water. Alternative 6 would result in the most significant volume reduction through treatment and discharge of contaminated water and dewatering liquids, and/or treatment or incineration of wastes.

In summary, Alternative 2 would result in decreased mobility of contamination due to capping, but provide no reduction in toxicity or volume. Alternative 3 would offer a slightly greater reduction in mobility through treatment of a portion of the source contaminants. Alternative 3 would also offer some reduction in toxicity and volume through treatment of a portion of the source contaminants. Similarly, Alternative 4 offers slight reductions in mobility, toxicity, and volume not provided by Alternative 2 through interception and treatment of a portion of the ground water seepage. Alternative 5 combines the reductions of Alternatives 2, 3, and 4. Alternative 6 offers the greatest achievable reduction in mobility at the site through complete source removal, and substantial volume and/or toxicity reduction through incineration or other treatment of dewatering liquids and soils/wastes.

Short-term Effectiveness. Alternatives 2 and 4 would be similar with respect to short-term effectiveness, with the exception of a small difference in length of time for construction activities. The potential for direct public exposure to any contamination should be minimal for these alternatives. Potential exposure of workers to contaminants could occur during the removal activities of Alternatives 3, 5, and 6. This is particularly true for Alternative 6 where there is potential for fire and explosion, physical hazards, and sudden exposure to currently unidentified sources of volatile organic contaminants. No significant environmental impacts are anticipated from implementation of any alternative. Alternative 6 could generate significant amounts of sediment and runoff during implementation; however, the use of appropriate engineering controls would minimize the potential for adverse impacts.

Similar worker protection and access control are required for Alternatives 2 through 5. Alternative 6 would require significantly greater amounts of access control, worker protection, and traffic control.

In summary, all alternatives except Alternative 6 are very similar in short-term effectiveness with the exception of small differences in implementation time. Alternative 6 may pose significant implementation hazards due to the magnitude and diversity of the materials to be removed.

Implementability. The ground water control measures of Alternatives 4 and 5 would pose certain construction difficulties due to bedrock and topographic constraints. These constraints would also pose construction difficulties in the implementation of Alternative 6, since much of the wastes and soils to be removed are located along steep slopes. Site restoration in Alternative 6 would be significantly more difficult than for all other alternatives. Alternatives 2 and 3 would encounter only minimal construction difficulties, although Alternative 3 would include the additional difficulty of removing the ponded liquids.

The administrative feasibility of Alternatives 4 and 5 would be dependant on acceptance of the intercepted ground water by a permitted treatment facility on a long-term basis. Alternatives 3 and 5 would require the short-term availability of a permitted treatment facility to accept up to 100,000 gallons of liquid wastes. Alternative 6 would require permitted facilities which could accept over 300,000 cubic yards of wastes and soils. The volume and heterogeneity of the wastes makes a workable approach to treatment of these wastes difficult to design. Additionally, Alternative 6 would require the availability of permitted haulers to complete over 21,000 trips during the 24 to 26-month excavation period.

In summary, Alternative 6 would encounter the most administrative constraints, since it would require substantial and potentially unavailable facilities. Alternative 6 would also encounter some significant technical constraints due to the location, volume, and unknown characteristics of the materials to be removed. Alternative 2 would have relatively few implementation constraints, all of which are also relevant to the other alternatives. Alternatives 4 and 5 would require very skilled construction, since a high level of difficulty would be encountered. Alternative 3 would entail only moderate construction complexity and administrative constraints.

Cost. Each alternative was evaluated for estimated costs of implementation. Estimated costs include capital costs as well as annual operation and maintenance costs. The net present worth of these costs provides the basis for comparison.

Alternatve 1, the no-action alternative, has no costs. The estimated costs for the remaining alternatives are summarized in Table 6.

Modifying Criteria:

State Acceptance. The State of Kansas supports the selected alternative.

Community Acceptance. A public comment period was held from August 4, 1989, through August 25, 1989. In addition, a public meeting was held on August 16, 1989, to explain the preferred remedy and elicit comments from the public. Public comments received during the comment period indicate that a majority of the community supports the major components of the selected remedy. All comments received from the public are addressed in the attached Responsiveness Summary.

The Selected Remedy

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, the U.S. EPA and the State of Kansas have determined that Alternative 3: Capping and Partial Source Removal is the most appropriate remedy for the Doepke-Holliday site in Johnson County, Kansas.

Alternatives 3, 4, and 5 perform similarly well when evaluated against the primary balancing criteria, and they outperform Alternatives 2 and 6. The reasons that Alternative 3 is selected over Alternatives 4 and 5 are: A) there are potentially significant uncertainties associated with the constructability of the clay cutoff wall and extraction system;

TABLE 6
SUMMARY OF COST ANALYSIS OF ALTERNATIVES

ALTERNATIVE	Capital Cost	Annual O&M Cost	Present Worth Cost***
2 - Capping	4,130,000	72,000*	5,240,000
3 - Capping with partial source removal	4,330,000	107,000*	5,970,000
4 - Capping with partial ground water controls	5,110,000	109,000*	6,790,000
5 - Capping, partial source removal and ground water controls	5,230,000	109,000*	6,910,000
6 - Complete excavation	110,780,000	32,000**	110,920,000

PW Factor for capital costs = 1.000

PW Factor for 30 years O&M = 15.372

PW Factor for 5 years O&M = 4.329

* Constant for 30 years

** Constant for 5 years

*** Interest (discount rate) = 5%

B) if the multi-layer impermeable cap performs as expected, there will be no need for ground water controls; C) the selected alternative (Alternative 3) includes collection and analysis of significant ground water seepage which, for the near-term, will achieve many of the same benefits of the ground water controls of Alternative 4; and, D) if need be, the remedy can be later modified to include the ground water controls of Alternative 4.

The major components of the selected remedy include the following:

- Removal and offsite treatment of contaminated liquids currently ponded underground in the former surface impoundment area; and

- Construction of an impermeable multi-layer cap over the majority of the waste diposal area; and

- Collection and offsite treatment, as necessary, of significant ground water seepage; and

- Extended ground water monitoring to evaluate the effectiveness of the remedy; and

- Deed and access restrictions; and

- If necessary, the response action will be modified to include the ground water controls of Alternative 4: construction of a clay cutoff wall, and extraction and offsite treatment of collected ground water.

Successful removal of the liquid currently ponded underground in the former surface impoundment area is dependant on the assumption that this is a discrete source situated in a relatively impermeable sedimentary formation that can be removed through pumping or other conventional dewatering techniques. If it were discovered that these liquids are in free communication with the shallow ground water, the advisability of this action will be reevaluated.

Pre-design work will include A) additional investigations to firmly establish the northern, western, and southern extent of contaminated soils and buried wastes; and, B) additional investigations to evaluate the vertical extent of contaminated ground water, and the southern extent of contaminated ground water. The results of these investigations will be used to define the extent of the impermeable multi-layer cap, and the nature of the extended ground water monitoring network.

TABLE 7
CAPITAL COST SUMMARY
ALTERNATIVE 3 - CAPPING WITH
PARTIAL SOURCE REMOVAL

ITEM	QUANTITY	UNITS	UNIT COST ($)	TOTAL COST ($)
Contractor Mobilization and Demobilization	1	LS	1300.00	1,300
Well Installation	35	LF	75.00	2,625
Cap Boundary Trenches (approx. 20 @ 20' deep x 50' long)	2,200	CY	4.00	8,800
South Lagoon - Dewater, Transport & Treatment	96,000	GAL	0.75	72,000
Seep Well, Pump, Pipeline & Tank	1	LS	44,620.00	44,620
New Road to Seep Storage Tank	100	LF	55.00	5,500
Cap System				
Topsoil (6")	24,800	CY	6.00	148,000
Clean Fill (18")	74,400	CY	6.00	446,400
Sand (12")	49,600	CY	10.00	496,000
HDPE Liner	1, 339,000	SF	0.30	401,700
Geotextile Membrane	1,339,000	SF	0.15	200,850
Clay (24")	99,200	CY	4.70	466,240
Seed & Fertilizer	31	AC	1650.00	51,150
Asphalt Cap				
Asphalt Layer (2")	50,800	SF	0.75	38,100
Drainage Layer (6")	940	CY	10.00	9,400
Geotextile Membrane	50,800	SF	0.15	7,620
HDPE Liner	50,800	SF	0.30	15,240
Rough Grading	133,300	SY	0.09	11,997
Drainage Channels	5,000	LF	10.00	50,000

TABLE 7 (continued)

ITEM	QUANTITY	UNITS	UNIT COST ($)	TOTAL COST ($)
Site Security Fencing				
Rock Barrier	3,000	LF	9.50	28,500
Chain Link	5,500	LF	11.00	60,500
Decontamination Station	1	LS	20000.00	20,000
Decontamination Wastes Disposal	1	LS	20000.00	20,000
Construction Subtotal				2,607,342
Bid Contingencies (15%)				391,101
Scope Contingencies (20%)				521,460
Construction Total				3,519,911
Permitting and Legal (5%)				175,996
Service During Construction (10%)				351,991
Engineering Design Cost (8%)				281,593
Total Capital Cost				4,330,000

TABLE 8
OPERATION AND MAINTENANCE COSTS
ALTERNATIVE 3 - CAPPING

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST
Continued Monitoring				
Labor	80	HR	40	3,200
Equipment	60	HR	25	1,500
Sampling/Analysis	32	EA	1000	32,000
Seep Water Disposal	1500	KGAL	20	30,000
Mowing and General Maintenance & Upkeep	31	AC	700	21,700
Asphalt Cap Maintenance	5600	SY	0.8	4,480
Option Subtotal				92,880
Scope Contingencies (15%)				15,932
Total Annual O&M Costs				107,000

The extended monitoring program will include sampling and analysis of ground water seeps and the primary pathway for offsite ground water migration. Contaminant concentrations will be compared with Federal Water Quality Criteria for the protection of aquatic life (FWQC), Kansas Water Quality Standards (KWQS), and Alternate Kansas Action Levels (AKALs) to determine compliance of the remedy. As discussed in the previous section, Summary of the Comparitive Analysis of Alternatives, the appropriate standard or criteria for a particular contaminant is considered to be the most stringent of these three. Contaminants which have been detected in the seep water in excess of ARARs and TBCs are summarized in Table 9.

Collection and analysis of significant ground water seepage (referred to as seep no. 1 in the RI/FS reports) will be carried out during the remedial action period and for some reasonable time after completion of the remedial action. If continued analysis of the collected water demonstrates that offsite migration of contaminants is not significant (i.e., below chemical-specific ARARs and TBCs as discussed), and that the ground water monitoring program will be sufficiently protective, this action will be discontinued. The remedy will be modified to include ground water controls if the extended monitoring program identifies a significant increase in the offsite migration of contaminants.

The capital costs and O&M costs for this remedy are detailed in Tables 7 and 8, respectively. The use of specific dimensions and technologies is for costing purposes only and actual design may differ.

It is anticipated that the selected remedy will achieve all of the remediation goals described in a previous section of the ROD Decision Summary, Role and Scope of the Response Action. Specifically, placement of the impermeable multi-layer cap will control health risks posed by direct contact with contaminated soils and waste materials, and eliminate the potential for significant offsite migration of contaminants.

Since contaminants will remain onsite above health-based levels, Section 121 (c) of SARA requires that the remedial action be reviewed at least every five years to assure that human health and the environment are protected. It is anticipated that this requirement will be satisfied through extended ground water monitoring.

Statutory Determinations

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In

TABLE 9
DOEPKE-HOLLIDAY SITE
SUMMARY OF COMPOUNDS DETECTED IN SEEP WATER
THAT EQUAL OR EXCEED
CHEMICAL-SPECIFIC ARARs & TBCs

Compound	Conc.* (mg/l)	AKAL (mg/l)	KWQS (mg/l)	FWQC (mg/l)
Aluminum	4.2	0.75	---	---
Cadmium	0.005	---	---	0.0011
Copper	0.013	---	---	0.012
Silver	0.05	---	0.00012	0.00012
Endosulfan Sulfate	0.001	0.00022	---	---
Chlordane	0.001	0.0024	0.0000043	0.0000043
DDT	0.0001	0.0011	0.000001	0.000001
Dieldrin	0.0001	---	0.0000019	0.000001
Endosulfan	0.0001	0.00022	0.000056	---
Heptachlor	0.0005	0.00052	0.0000038	---

* Maximum Concentration Detected

AKAL - Alternate Kansas Action Level

KWQS - Kansas Water Quality Standard for Protection of Aquatif Life

FWQC - CWA Ambient Water Quality Criteria for Protection of Freshwater Aquatic Life (Chronic) addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws, unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

Protection of Human Health and the Environment

The selected remedy protects human health and the environment through installation of a multi-layer impermeable cap over the majority of the waste disposal areas. Placement of the cap will minimize or eliminate health risks posed by direct contact with contaminated soils and waste materials. Also, cap design will be consistent with appropriate portions of the RCRA landfill closure requirements, thereby minimizing the likelihood of contaminant migration to offsite areas. There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected.

Compliance With Applicable or Relevant and Appropriate Requirements

The selected remedy of capping and partial source removal will comply with all applicable or relevant and appropriate chemical-, action-, and location-specific requirements (ARARs). The ARARs are presented below.

Chemical-specific ARARs:

Clean Water Act (CWA) Ambient Water Quality Criteria for the protection of aquatic life. Contaminants in ground water seeps discharging to surface waters will comply with these criteria.

CWA Publicly-Owned Treatment Works (POTW) standards. Contaminated water will meet pretreatment standards prior to discharge to a POTW.

Kansas Water Quality Standards (KWQS). Contaminants in the ground water seeps will comply with these standards.

Clean Air Act (CAA) National Air Quality Standards for Total Suspended Particulates may be applicable during cap installation.

Action-specific ARARs:

RCRA requirements for landfill closure (40 CFR 264.111, 264.228, 264.258, and 264.310), which require that the site will be capped with a final cover designed and constructed to provide long-term minimization of the migration of liquids through the capped area, and to maintain its integrity over time while functioning with minimum maintenance. RCRA minimum technology requirements are not ARAR.

40 CFR 264.117(a)(1) Subpart G Post-Closure and Monitoring requirements for thirty years or another period determined by the Regional Administrator.

Location-specific ARARs:

No location-specific ARARs were found to be either applicable or relevant and appropriate to the Doepke-Holliday site.

Other Criteria, Advisories or Guidance To Be Considered for This Remedial Action (TBCs):

Alternate Kansas Action Levels (AKALs). Contaminants in the ground water seeps will comply with these guidelines.

Local deed restrictions will be necessary to prohibit excavation at the site after remedial action is complete.

Cost-Effectiveness

The selected remedy has been determined to provide overall effectiveness proportional to its costs. The selected remedy provides protection of human health and the environment which is similar to those alternatives involving ground water controls yet is about 20 % less expensive. The selected remedy effectively reduces the hazards posed by all of the contaminants at the site, yet is an order of magnitude less expensive than the alternative involving complete excavation.

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

It has been determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the Doepke-Holliday site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, also considering the statutory preference for treatment as a principal element and considering State and community acceptance.

The only alternative providing significantly better long-term effectiveness and permanence involves complete excavation and treatment of the contaminant sources. This alternative is not considered practicable due to technical constraints, the potential for significant short-term risks to public health, and the prohibitive costs.

Preference for Treatment as a Principal Element

Treatment of the bulk of the contaminant sources at the site was not found to be practicable; and therefore, the remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The remedy includes treatment of a discrete portion of the liquids contained in the source area; however, the large extent of the landfill, the heterogeneous disposition of the wastes, and the fact that there are no identified hot spots that can be considered to represent the major sources of contamination preclude implementation of a remedy in which contaminants could be excavated and treated effectively.

The preference for remedies which involve treatment is inherent to the process used to evaluate and compare alternatives. This is demonstrated by the fact that Alternatives 3, 4, and 5, which involve some treatment, out perform Alternative 2, containment only, when these alternatives are evaluated against the balancing criteria. However, the treatment components of Alternatives 3, 4, and 5 are not considered a principal element of these remedies, because the majority of the contaminants would remain untreated.

Alternative 6, complete excavation and offsite treatment/disposal, is the only alternative which involves treatment as a principal element; however, this alternative is not practicable to implement due to technical constraints, the potential for significant health risks during implementation, and the prohibitive costs. See the Summary of Comparative Analysis of Alternatives Section for more discussion on the disadvantages of this alternative.

RESPONSIVENESS SUMMARY

DOEPKE-HOLLIDAY SITE

I. RESPONSES TO WRITTEN COMMENTS

A. Responses to Written Comments in the August 24, 1989 Letter from Ralph G. Wyss, P.E., Chief Engineer/Director of Production Services, Water District No. 1 of Johnson County.

Comment 1: We feel that the proposed plan to cap the contaminated area should sufficiently reduce the amount of leachate formed, and thus lessen the risk of contaminants migrating from the site.

EPA Response 1: We agree. The multi-layer impermeable cap in the Selected Alternative will significantly reduce the amount of precipitation infiltrating into the contaminated materials on the site, thereby significantly reducing the amount of leachate formed and significantly reducing contaminant migration via ground water. The Selected Alternative will be protective of public health and the environment and will comply with Federal and Kansas requirements that are legally applicable or relevant and appropriate to this action.

Comment 2: We are concerned with the runoff from the cap that is redirected through the concrete and earthen drainage channels. Since this runoff would ultimately drain into the Kansas River, we propose that this runoff be sampled after sufficient amounts of rainfall.

EPA Response 2: Runoff from the cap will not come in contact with any contaminated materials, so there is no demonstrated needed to sample and analyze the runoff. Runoff from the cap will consist of precipitation flowing over the cap surface and of infiltration flowing through the drainage layer in the multi-layer cap system. The design of the cap will keep runoff separated from contact with the contaminated soils and materials currently on the site. The Remedial Design and Remedial Action will include provisions and activities to ensure that the materials brought on site to construct the cap are not contaminated.

Comment 3: We encourage a stringent monitoring program of all existing and proposed monitoring wells as well as ground seeps.

EPA Response 3: The Selected Alternative includes a long-term monitoring program of existing and future monitoring wells and of ground water seeps.

Comment 4: Should the monitoring program reveal that the cap is ineffective, the addition of a partial groundwater control system would be in the best interest of the Water District and the people it serves.

EPA Response 4: If ground water monitoring indicates an increase in contaminant migration, the Selected Alternative would be modified to include partial ground water control measures.

B. Response to Written Comment in the August 25, 1989 Letter from William G. Beck, Lathrop Koontz & Norquist, on the behalf of Browning-Ferris Industries of Kansas City, Inc.

Comment 1: We suggest that the Record of Decision, when issued, should explicitly defer the selection of the final design of the impermeable multi-layer cap to the remedial design phase. By testing the anticipated performance of several different possible design options, an alternative design which is better in performance or cost effectiveness may be discovered.

EPA Response 1: We agree, as this is consistent with our guidance for the preparation of Records of Decision. The selection of the final design for the impermeable multi-layer cap will performed during Remedial Design.

C. Responses to Written Comments in the August 25, 1989 Letter from Ronald D. Deffenbaugh, Deffenbaugh Industries, Inc.

Comment 1: We agree that doing additional site investigations in an attempt to locate buried drums would probably be detrimental to the site. Detrimental effects to the site may include risk of fire or explosion, worker exposure during intrusive site investigations and the uncertainty of drum integrity after 20 years.

EPA Response 1: We agree. The potential short-term negative impacts on public health and the environment are significantly greater than the long-term benefits posed by the additional site investigation to locate buried drums containing liquids and the removal of the located drums still containing liquids. After 20 years of burial, it is doubtful that the drums still have enough integrity to hold liquids. The additional site investigation will yield numerous indications of buried metallic objects, few of which are expected to be buried drums and none of which are expected to be buried drums containing liquids. The intrusive activities to unearth the buried metallic objects located by the additional site investigation would probably be unproductive, yet will pose the potential risks of fire or explosion and of worker exposure to unknown hazardous materials.

Comment 2: As the RI fieldwork was performed, it was noted that the south lagoon is situated in the Vilas Shale formation. The Vilas Shale is a relatively impermeable sedimentary formation. Data obtained from the adjacent monitoring well does not indicate significant groundwater contaminants associated with the contaminants detected in the south lagoon. We feel that since the lagoon is now intact in a tight shale formation that the potential for off-site migration is low. In addition, the proposed cap should further minimize any migration potential of this source area.

EPA Response 2: As stated in the RI Report, the south lagoon was observed to contain petroleum type sludges and used oil filters, some of which appeared to be charred or burnt. It is agreed the Vilas Shale is relatively impermeable, as otherwise the now subsurface south lagoon would not still contain liquids after 20 years of burial. However, it is not agreed that the potential for off-site migration is low. Furthermore, the additional pressures posed by the cap construction equipment and by the cap may cause contaminant migration from the south lagoon or may increase existing contaminant migration from the south lagoon.

Comment 3: It is stated that significant groundwater seepage will be collected and analyzed. If the collected water is found to be contaminated in excess of the Kansas Action Levels (KAL's), it will be taken off-site for treatment. We believe since the site has been idle for 20 years, it would be premature to install collection devices when the significant groundwater seepages can be effectively monitored in their current state. In the future, if significant contamination does appear in excess of KAL's, collection devices could easily be installed for subsequent treatment.

EPA Response 3: We agree that the significant ground water seepages can be effectively monitored in their current state. However, for the remedial action period and for some time after, EPA believes it would be prudent to implement this action as an additional assurance that the Selected Alternative will be protective of public health and the environment. For that reason, the Selected Alternative includes the collection and analysis of significant ground water seepage and, if the collected water is found to be contaminated in excess of Applicable or Relevant and Appropriate Requirements (ARARs), offsite treatment of the collected ground water seepage. If it is demonstrated over after a reasonable period that extended monitoring of the seepage will be sufficiently protective, then collection of the seepage will be discontinued.

D. Responses to Written Comments in the August 24, 1989 Letter from Craig A. Lubow and M. Troy Gordon, Sierra Club, Kanza Group of the Kansas Chapter

Comment 1: Alternative 1—No Action—fails to comply with federal and state (ARARs) regulations. Since failure to take action would threaten the public health, we find this alternative to be completely unacceptable.

EPA Response 1: We agree.

Comment 2: Alternative 2—Capping—along with the remaining alternatives does comply with the applicable regulations.

EPA Response 2: We agree.

Comment 3: In regard to Alternative 2, capping will prevent precipitation from entering the disposal site, but still permits the potential for contaminants to migrate into the ground water and the Kansas River. It also fails to protect against continued contamination from the buried drums, as well as contamination from liquids ponded below grade in the south lagoon area. Therefore, capping alone is unacceptable.

EPA Response 3: Alternative 2 would comply with ARARs and would be protective of public health and the environment. The major transport mechanism for contaminant migration into the ground water and the Kansas River is the infiltration and percolation of precipitation into and through contaminated materials on the site. Because capping will significantly reduce the amount of precipitation entering and flowing through contaminated materials on the site, capping will significantly reduce contaminant migration into the ground water and the Kansas River. As stated in a previous EPA response, the short-term negative impacts of buried drum removal significantly outweigh the long-term benefits of buried drum removal.

Comment 4: If capping is utilized as an option, or in conjunction with another alternative, it must encompass the entire disposal site to be effective and must be composed of a RCRA multilayer cap. If the disposal area is found to include any portion of the adjacent Deffenbaugh site or the old Overland Park landfill, it will be necessary to cap the additional land.

EPA Response 4: All of the capping alternatives include additional investigations during Remedial Design to evaluate the extent of the cap needed to cover contaminated materials. If the additional investigations indicate that contaminated materials extend onto adjacent properties, the cap will be designed to extend onto those adjacent properties to cover contaminated materials. As stated in a previous EPA response, it is premature now to select the final design for the cap. The final design for the multi-layer impermeable cap will be selected during Remedial Design. The final design will be consistent with the relevant and appropriate RCRA requirements for landfill closure.

Comment 5: In regard to Alternative 3—Capping and Partial Source Removal, in addition to the benefits of capping, the partial source removal as proposed by the EPA would potentially remove the liquid contaminants in the south lagoon area. Effective partial source removal would also mandate the Deffenbaugh proposal to excavate the buried drums be adopted. The long-term benefits from the excavation of the buried drums outweighs the risk of contamination, as well as the dangers associated with the removal process.

EPA Response 5: The Feasibility Study Report prepared by Deffenbaugh Industries, Inc., proposed that additional investigations be performed to locate buried drums in a specific area (the vicinity of the shale pile) and that only intact buried drums containing liquids be removed. As stated in a previous EPA response, the search for buried drums containing liquids would be detrimental to public health and the environment. The potential short-term negative impacts on public health and the environment are significantly greater than the long-term benefits posed by the additional site investigation to locate buried drums containing liquids and the removal of the located drums still containing liquids. After 20 years of burial, it is doubtful that the drums still have enough integrity to hold liquids. The additional site investigation will yield numerous indications of buried metallic objects, few of which are expected to be buried drums and none of which are expected to be buried drums containing liquids. The intrusive activities to unearth the buried metallic objects located by the additional site investigation would probably be unproductive, yet will pose the potential risks of fire or explosion and of worker exposure to unknown hazardous materials.

Comment 6: In regard to Alternative 3—Capping and Partial Source Removal, partial source removal fails to protect against migration of contaminants through ground water and into the Kansas River. This deficiency makes this alternative unacceptable from a public health viewpoint.

EPA Response 6: Alternative 3 would comply with ARARs and would be protective of public health and the environment. The major transport mechanism for contaminant migration into the ground water and the Kansas River is the infiltration and percolation of precipitation into and through contaminated materials on the site. Because capping will significantly reduce the amount of precipitation entering and flowing through contaminated materials on the site, capping will significantly reduce contaminant migration into the ground water and the Kansas River. In addition, no significant migration of contaminants into the ground water and the Kansas River has been observed during the last 8 years of monitoring this uncontrolled site.

Comment 7: In regard to Alternative 4—Capping and Partial Ground Water Control, partial ground water control helps to prevent contaminated ground water from entering the Kansas River, if done in conjunction with capping. Ground water control is essential to the protection of the drinking water of Johnson County. Ground water control without partial source removal, however, guarantees the continuing of leachate from the drums, as well as hazardous liquids at the impoundment area. The foregoing problems render this alternative unacceptable from an environmental viewpoint.

EPA Response 7: Alternative 4 would comply with ARARs and would be protective of public health and the environment. As previously stated, capping without any other actions would comply with ARARs and would be protective of public health and the environment. Capping will significantly reduce the amount of precipitation entering and flowing through contaminated materials on the site, thereby significantly reducing the formation of contaminated leachate from the buried drums, hazardous liquids in the south lagoon area, and contaminated soils and materials at the site. This, in turn, will significantly reduce contaminant migration into the ground water and the Kansas River. The partial ground water control proposed in Alternative 4 would manage only one flow path of ground water migration to the Kansas River and would not account for all ground water migration off of the site. The inappropriateness of a drum search and removal has been discussed under previous EPA responses.

Comment 8: In regard to Alternative 4—Capping and Partial Ground Water Control, it will be necessary that the collected ground water be taken to a facility specifically designed for the treatment of contaminated water. Care must be taken to prevent the discharge of inadequately treated water.

EPA Response 8: As discussed in the Feasibility Study Report, the collected ground water would be transported by tank truck to a wastewater treatment facility. The collected ground water would be sampled and analyzed to evaluate whether the collected ground water requires pretreatment prior to discharge to the wastewater treatment facility. If necessary, the collected ground water will be pretreated prior to discharge to the wastewater treatment facility. These steps will be taken so as not to cause non-compliance problems for the treatment facility in regard to its discharge permit requirements.

Comment 9: In regard to Alternative 5--Capping, Partial Ground Water Control, and Partial Source Control, this option combines the foregoing benefits of alternatives two, three, and four. While long-term contamination of the area will remain in the absence of complete excavation of the disposal site, this alternative is acceptable from a public health and environmental perspective. The costs associated with this option are only 23% higher than the alternative preferred by the EPA and the additional annual costs would be minimal. The increased benefits of this alternative justify the additional costs.

EPA Response 9: With the exception of "No Action", all of the alternatives would comply with ARARs and would be protective of public health and the environment. The Selected Alternative involves capping, partial source removal through the removal of ponded liquids in the south lagoon area and, as an additional assurance, collection and treatment (as necessary) of significant seepage. It is uncertain at this time whether partial ground water control would provide any increased benefits, because the measures included in the Selected Alternative are expected to significantly reduce contaminant migration to the ground water and the Kansas River. Extended monitoring of ground water and seepage is a fundamental part of the Selected Alternative. The Selected Alternative includes a contingent action: if continued ground water monitoring indicates an increase in contaminant migration, the Selected Alternative would be modified to include partial ground water control measures.

Comment 10: In regard to Alternative 6--Complete Excavation and Offsite Disposal, this option provides the only complete solution to resolving the site's contamination. It most effectively protects the public against the risk of contamination of its drinking water supplies. The cost of implementing this alternative, however, would be prohibitive. If this alternative were selected, there would need to be assurances that adequate treatment facilities are available for the large volume of excavated materials.

EPA Response 10: With the exception of "No Action", all of the alternatives would comply with ARARs and would be protective of public health and the environment. It is agreed that the cost of implementing Alternative 6 would be prohibitive, plus there would need to be assurances that adequate disposal facilities are available for the large volume of excavated materials. It should be noted that this alternative would protect the public drinking water supply in Johnson County, however it poses potential risks to the public along the transportation route and in the vicinity of the disposal facility.

Comment 11: We feel that alternative six is the optimal long-term solution. However, recognizing the cost constraints involved, we advocate adoption of alternative five. The benefits of alternative five include shielding the site from precipitation, removal of the sources of contamination, and protection against contaminated ground water entering the Kansas River. Alternative five should be adopted with the following modifications. The cap should be an RCRA multi-layer cap and should cover the entire disposal site, including any adjacent tracts which were also used for disposal. Deffenbaugh's proposal to remove the drums must be implemented. Care must also be taken to assure prevention of the discharge of inadequately treated water after collection.

EPA Response 11: All of the alternatives, with the exception of "No Action", would comply with ARARs and would be protective of public health and the environment. We do agree that Alternative 6 may be the optimal solution in regard to long-term effectiveness. However, long-term effectiveness is only one of the several criteria that must be balanced against in the selection process. For the short-term, Alternative 6 poses significant potential risks to the public health and the environment associated with potential exposures during waste excavation and transportation activities. Furthermore, Alternative 6 involves the relocation of wastes from one site to another site.

Alternative 5 does not include removal of the bulk of the sources of contamination. The site consists of a heterogeneous mix of wastes and contaminated soils. For Alternative 5, only a partial removal of contamination sources is proposed: removal of ponded liquids in the south lagoon area. A drum search and removal program is not feasible for this site, because of the potential risk and non-productiveness reasons stated in previous EPA responses.

As previously stated, capping without any other actions would comply with ARARs and would be protective of public health and the environment. Capping will significantly reduce the amount of precipitation entering and flowing through contaminated materials on the site, thereby significantly reducing the formation of contaminated leachate. This, in turn, will significantly reduce contaminant migration into the ground water and the Kansas River. The partial ground water control proposed in Alternative 5 would manage only one flow path of ground water migration to the Kansas River and would not account for all ground water migration off of the site.

It is uncertain at this time whether partial ground water control would provide any increased benefits, because the measures included in the Selected Alternative are expected to significantly reduce contaminant migration to the ground water and the Kansas River and may reduce ground flow to the point where ground collection may not be practicable. The Selected Alternative includes a contingent action: if continued ground water monitoring indicates an increase in contaminant migration, the

Selected Alternative would be modified to include partial ground water control measures.

As stated in previous EPA responses, it is premature to select the final design of the multi-layer impermeable cap. The final design of the cap will be consistent with the relevant and appropriate RCRA requirements for landfill closure. The cap will be designed to cover the extent of contaminated materials as established by additional investigations. Care will be taken to prevent the discharge of inadequately treated water.

Comment 12: We believe it is essential that the implementation of the selected remedial action must be closely monitored by the EPA. Maintaining public confidence and assurance of quality work necessitates that the EPA not contract with a private firm having any potential conflict of interest.

EPA Response 12: It is now unknown whether EPA or potentially responsible parties will implement the remedial action. In either case, EPA will closely monitor the implementation of the remedial action to assure that quality work is performed. It is also now unknown whether EPA will use contractor support to monitor the remedial action. If contractor support is used, standard EPA contract language will be used to preclude the use of contractors having actual, potential, or perceived conflicts of interest, at the risk of breach of contract and of contractor debarment from future Federal contracting.

E. Responses to Written Comments in the August 24, 1989 Letter from John P. Cleary, Assistant Project Manager, and Robert F. Wells, Vice President and Treasurer, T H Agriculture & Nutrition Company, Inc.

Comment 1: EPA's proposal to collect and analyze the seep water does not appear to be technically supported by the data and would not provide benefits to the public or environment. Since the late 1970's or early 1980's, USEPA has monitored the effluent from Seep #1 at the Doepke-Holliday landfill for all compounds on the Priority Pollutant List. The EPA analytical data base indicates that only trace levels of organics and metal compounds have been detected throughout the many years of sampling and analysis. The Public Health Assessment concludes that "The concentration of indicator chemicals in groundwater and seepwater at the site poses no significant risk to public health or the environment because the concentrations of indicator chemicals in the seepwater are below the maximum contaminant levels (MCLS)."

EPA Response 1: The Public Health Assessment was limited to evaluations of certain indicator chemicals, and the conclusions stated in the Public Health Assessment are limited to only those certain indicator chemicals. However, as presented in Table 3-6 of the Feasibility Study Report, the concentrations of several organic and metal compounds (non-indicator chemicals) in the seep water have exceeded contaminant-specific ARARs.

The cap in the Selected Alternative is expected to reduce contaminant migration and to decrease ground water seep discharges, if not eliminate them. However, for the remedial action period and for some time after, EPA believes it would be prudent to implement this action as an additional assurance that the Selected Alternative will be protective of public health and the environment. For that reason, the Selected Alternative includes the collection and analysis of significant ground water seepage and, if the collected water is found to be contaminated in excess of ARARs, offsite treatment of the collected ground water seepage. If it is demonstrated over after a reasonable period that extended monitoring of the seepage will be sufficiently protective, then collection of the seepage will be discontinued.

Comment 2: The RI/FS documents, which were reviewed by EPA, make no recommendations or provisions for collection of seep waters due to the fact that only trace levels of selected compounds have been detected. We believe that the Proposed Remedial Alternative No. 3 (capping and partial source removal) will not adversely influence the documented water quality in the seep effluent but will eventually reduce the average discharge rate and additionally reduce the amount of contaminants potentially entering the Kansas River.

EPA Response 2: The collection of significant site seepage for analysis and possible treatment was addressed in a Feasibility Study supplement that was prepared by EPA and included in the site's Administrative Record. We agree that capping and partial source removal will not adversely influence water quality in the seep effluent and will eventually reduce the average discharge rate and the amount of contaminants potentially entering the Kansas River. However, as stated in the previous response, EPA believes it to be prudent to include the collection, analysis, and treatment as necessary of seep water in the Selected Alternative, as an additional assurance that the Selected Alternative will be protective of public health and the environment.

Comment 3: It is unclear from the Proposed Plan whether the final remedy will include indefinite collection of the seep water. Continual monitoring of the seep appears to be a rational approach to implement during and subsequent to the remedial action to assess a potential change of water quality. Provisions for more frequent seep sampling during the remedial action would provide adequate information to determine if seep waters should be collected and treated. The Remedial Design/Remedial Action work plan could include a contingency if future analytical data support this proposed action.

EPA Response 3: The Selected Alternative includes the collection and analysis of significant ground water seepage and, if the collected water is found to be contaminated in excess of Applicable or Relevant and Appropriate Requirements, offsite treatment. This management of seepage is included in the Selected Alternative as an additional assurance that the Selected Alternative will be protective of public health and the environment. If it is demonstrated over a reasonable period that extended monitoring of the seepage will be sufficiently protective, then collection of the seepage will be discontinued.

Comment 4: The Proposed Plan indicates that EPA is considering the inclusion of a rock fill layer on top of the final site cap. We believe EPA should consider the long term economic and technical disadvantages of the rock fill layer. If future groundwater monitoring indicates that additional remedial action would be required, it may be necessary to remove the rock fill layer for investigation purposes. This procedure would be extremely costly and could delay investigation activities. In light of these potential concerns, we recommend that EPA reject the proposed rock fill layer concept.

EPA Response 4: The Feasibility Study Report incorporated into all capping alternatives the proposed inclusion of an interim soil cap and rock fill layer between the waste deposits and the multi-layer cap. The Record of Decision did not incorporate the interim soil cap and rock fill layer into the alternatives that it presented and evaluated. We agree that the rock fill layer poses several disadvantages. For that reason, the rock fill layer was not included in the Record of Decision alternatives. However, the feasibility of incorporating the rock fill layer into the Selected Alternative will be rigorously evaluated during Remedial Design.

Comment 5: The proposal to remove and dispose of approximately 96,000 gallons of liquids currently ponded underground in the area of the southern lagoon is premature and unsupported by data. Neither Deffenbaugh nor EPA has collected and analyzed any of these "liquids" proposed to be removed. There is no chemical data available for these liquids, yet they have been alleged to be a "source" of contamination. These liquids may simply be groundwater which has collected and become perched on the upper rock units. If the liquids do not constitute a "source", they should be left in place and not "pumped and treated" unless alternatives No. 4 or 5, as identified in the proposed plan, are implemented.

EPA Response 5: As stated in the RI Report, the south lagoon was observed to contain petroleum type sludges and used oil filters, some of which appeared to be charred or burnt. Analytical results for "soil" samples collected in the south lagoon area indicate significant contamination by metals, semi-volatile organic compounds, and volatile organic compounds, with concentrations of up to several hundred parts per million. Some or all of the liquid ponded in the south lagoon area may have been perched ground water. However, the observation of petroleum type sludges and the high solubility of contaminants in water indicate that the ponded liquids are contaminated. As stated in a previous EPA response, additional pressures posed by the cap construction equipment and by the cap may cause contaminant migration from the south lagoon or may increase existing contaminant migration from the south lagoon. Therefore, partial source removal is warranted.

Comment No. 6: We are concerned that EPA's Proposed Plan does not take into account effects of wastes placed into the Overland Park municipal landfill, which is immediately adjacent to the Doepke-Holliday landfill. High concentrations of lead and other organic compounds have been detected by Deffenbaugh at the Overland Park Landfill and not coincidentally, lead has been detected in the surface and subsurface soils at the Doepke-Holliday site. These wastes placed by Overland Park into their landfill may have adversely affected the groundwater quality and/or soils on the Doepke-Holliday site.

The Remedial Investigation clearly points out in Section 4.2.3 the presence of highly contaminated material exposed on the surface of the Overland Park property. Section 3.7.1 of the Feasibility Study states that "previous landfill activities for the Doepke-Holliday site and the Overland Park demolition landfill to the south were intertwined with little apparent regard to property lines." Section 4.2.3 of the Remedial Investigation also indicates that landfilling activities were contiguous operations, straddling property boundaries. This information indicates that Overland Park may have placed waste materials, similar to the contaminated superficial soils, into the Doepke-Holliday landfill. Deffenbaugh could not gain access to the Overland Park Landfill property for extensive investigation when it conducted the RI/FS. Hence, the data EPA relied upon in formulating the Proposed Plan does not account for the effects of possible wastes at the Overland Park Landfill on the remedial actions at the Doepke-Holliday site. It is essential, therefore, that EPA conduct supplemental investigations at Overland Park to determine the impact on remediation at the Doepke-Holliday landfill. The remedial alternatives contained in the FS such as the extent of the Doepke-Holliday cap boundaries should then be adjusted based on the results of the investigations.

EPA Response 6: The Selected Alternative includes (a) additional investigations to establish the northern, western, and southern extent of contaminated soils and buried wastes and (b) additional investigations to evaluate the vertical extent of contaminated ground water on the Doepke-Holliday property and the southern extent of contaminated ground water. These investigations will extend to the south onto the Overland Park Landfill property. The findings from these investigations will be used to adjust, as necessary, design features of the Selected Alternative, such as the extent of the cap.

Comment 7: The FS states that EPA should conduct the investigations at the Overland Park Landfill prior to Remedial Design for the Doepke-Holliday site. EPA's Proposed Plan for remediation and cleanup, however, does not address the Overland Park Landfill nor its potential impact on the remediation at the site. Because the potential wastes at Overland Park can significantly affect the overall remedial action at the Doepke-Holliday Landfill, we urge EPA to address this issue prior to issuing the Record of Decision and, at a minimum, include Overland Park as potentially responsible party for the Doepke-Holliday site.

EPA Response 7: The Selected Alternative includes additional investigations to the south, which will address conditions at the Overland Park Landfill property. Given the facts that (a) the Overland Park Landfill received similar or less contaminated wastes that the Doepke-Holliday landfill, (b) the two landfills were similarly operated, and (c) the two landfills are similarly geologically situated, the data from the additional investigations to the south on the Overland Park Landfill property are not expected to impact the type of remediation selected for the site. Rather, the data are expected to impact the size of remediation (such as, the extent of the cap) necessary for the site, which may be both the Doepke-Holliday property and the Overland Park Landfill property. For those reasons, the additional investigations will be conducted during the Remedial Design phase, prior to final design of the remedial action. EPA intends to seek any information that the City of Overland Park may have on waste disposal operations at the Overland Park Landfill.

F. Responses to Written Comments in the August 23, 1989 Letter from Randy D. Bradley, Director, Environmental Department, Johnson County, Kansas

Comment 1: In regard to Section 2.4.1 (page 2-18) of the Remedial Investigation Report, what "other subsurface groundwater systems" are located on the site?

EPA Response 1: Prior to the Remedial Investigation, five monitoring wells had been installed at the site: EPA Well, MW-1, MW-2, MW-3, and MW-4. The October 1987 RI/FS Work Plan called for additional monitoring wells to provide a better definition of the chemical characteristics of aquifers and "other subsurface groundwater systems." Five new monitoring wells were installed during the RI: three were installed with screened interval in the aquifer in the Plattsburg Formation and two were installed with screened interval in the "subsurface groundwater system" present in the I-435 construction rubble fill. In addition to ground water present in aquifers in geologic formations, ground water flows down the slope of the old ravine atop geologic formations through the I-435 construction rubble fill and waste deposits.

Comment 2: In regard to Section 2.4.1 (page 2-18) of the Remedial Investigation Report, only five groundwater monitoring wells were utilized. The only argument for not using more is that the heterogeneity of landfill materials encountered defies thorough site characterization. Due to the low mobility of many of the pollutants found, it would appear that more wells would be necessary to better define the extent of groundwater contamination.

EPA Response 2: When the RI/FS Work Plan was developed in October 1987, it was thought that five additional monitoring wells would provide enough data to sufficiently characterize the site's hydrogeology for RI/FS purposes. The Remedial Investigation did yield sufficient data upon which to base the Feasibility Study, Proposed Plan, and Record of Decision. The Selected Alternative includes additional investigations to refine further the hydrogeological characterization of the site. The information from these additional investigations will be used during Remedial Design to design the Selected Alternative's ground water monitoring program, that will be used to evaluate the effectiveness of the Selected Alternative in mitigating contaminant migration.

Comment 3: In regard to page 2-19 of the Remedial Investigation Report, the Plattsburg Formation has three members: Spring Hill Limestone, Hickory Creek Shale, and Merriam Limestone.

EPA Response 3: As indicated by the monitoring well records and Exhibits 3-1 and 3-2 in the Remedial Investigation Report, monitoring wells MW-5, MW-6, and MW-7 were installed with screened interval across all three members of the Plattsburg Formation.

Comment 4: In regard to page 2-26 of the Remedial Investigation Report, a third round of groundwater samples was collected in June 1988 for confirmation of previous data. The results were not included with the sample analysis. Did they confirm the previous data?

EPA Response 4: The analytical results from the third round of ground water sampling in June 1988 confirmed the analytical results from the previous two sampling rounds in February and March 1988, in that the June 1988 results did not produce any findings or conclusions other than that drawn from the previous results.

Comment 5: In regard to page 3-7 of the Remedial Investigation Report, we agree it is difficult, if not impossible, to discern who operated where on the Doepke and Overland Park landfills. The boundaries are poorly defined. There is no question that much more work is needed to define the extent of contamination on what is now Overland Park property. A field investigation by Division staff on the Overland Park property revealed a number of extensive asphalt-like sludge deposits on the site. The FS addresses this concern. However, what will it take to get access to the Overland Park property?

EPA Response 5: The Selected Alternative includes additional investigations to be conducted during the Remedial Design phase that will address the extent of contamination and other concerns in regard to the Overland Park Landfill property. Under various statutory authorities, EPA has several means at its disposal to gain access to the Overland Park Landfill property to enable performance of these additional investigations.

Comment 6: In regard to page 3-46 of the Remedial Investigation Report, as noted in the RI, three data points give only an approximate and rough estimate of the surface of the groundwater table, gradient and the direction of the groundwater flow. How will this be addressed in the remediation efforts? A small amount of groundwater re-enters which bedrock formation? In regard to Conclusion 2 on page 5-52 of the Remedial Investigation Report, how was it determined that groundwater flow in bedrock units other that the Plattsburg Limestone is less significant? In regard to Conclusion 3 on page 5-52 of the Remedial Investigation Report, will additional data be collected to characterize additional flow paths extending west and south from the area?

EPA Response 6: As stated in a previous EPA response, the current hydrogeological characterization of the site was sufficient to enable preparation of the Feasibility Study, Proposed Plan, and Record of Decision. However, the current hydrogeological characterization is not complete, as indicated by the questions in this comment. The Selected Alternative includes additional investigations, to be conducted during the Remedial Design phase, having the objective to refine and expand the current hydrogeological characterization both vertically to deeper formations and horizontally to the south.

Comment 7: In regard to page 7-2 of the Remedial Investigation Report, if there is concern that highway spraying for weed control may have impacted the seep samples, then will additional samples be collected in such a manner to eliminate this problem? Also, were all seep samples collected from water which was exposed to the atmosphere for an extended period of time?

EPA Response 7: The Selected Alternative includes additional investigations to be conducted during the Remedial Design phase and an expanded monitoring program to be conducted during and after Remedial Action implementation. Collection and analysis of seep water samples are part of both the additional investigations and the expanded monitoring program. The seep water sampling design will include provisions that will allow the impact of any highway spraying for weed control to be evaluated and will move the sample collection point closer to the seep discharge point.

Comment 8: In regard to page 7-5 of the Remedial Investigation Report, what is the second data gap relating to groundwater conditions at the DHS?

EPA Response 8: The word "second" was omitted from the fourth sentence in the second whole paragraph on page 7-5. The two data gaps are: (a) lack of information on potential contaminant migration vertically into deeper geological formations and (b) insufficient characterization of potential contaminant migration horizontally to or from the south.

Comment 9: In regard to Feasibility Study Alternative 1—No Action, this action is unacceptable since it does not provide for any protection of human health or the environment.

EPA Response 9: We agree.

Comment 10: In regard to Feasibility Study Alternative 2—Capping, the heterogeneous nature of waste distribution and the resultant inability to identify all potential areas of high concentrations of contaminants prevent this alternative from being acceptable to the County. The relative location of the site to the Water District Number 1 intake requires further identification and removal of the worst concentrations of contaminants.

EPA Response 10: All of the alternatives, with the exception of "No Action", would comply with all Federal and Kansas legally applicable or relevant and appropriate requirements and would be protective of public health and the environment. As has been found at other sites, capping is an effective method (and sometimes the only method) for management of heterogeneous waste deposits in landfills such as that present at the Doepke-Holliday site. As stated in previous EPA responses, the cap will result in a significant reduction in contaminant migration to ground water and the Kansas River.

Comment 11: In regard to Feasibility Study Alternative 3—Capping with Rock Fill, this is essentially the same as Alternative 2, but allows for the disposal of waste rock from Johnson County Landfill operations as part of the capping process. This alternative is unacceptable for the same reasons as for Alternative 2. Also, the addition of the rock would increase the difficulties in removal of waste areas at a later date, if this were found to be necessary.

EPA Response 11: EPA did not incorporate the rock fill layer into any of the alternatives presented and evaluated in the Record of Decision. The rock fill layer is not integral part of the Selected Alternative. As stated in previous EPA responses, whether the rock fill layer will be included in the Selected Alternative will be rigorously evaluated during Remedial Design.

Comment 12: In regard to Feasibility Study Alternative 4—Capping with Rock Fill with Partial Source Removal (USEPA's Preferred Alternative), this alternative provides for the removal of approximately 96,000 gallons of liquids currently ponded underground. Also, it provides for identification and possible removal of other high concentration areas, such as the Thompson-Hayward drums. Criteria to be used to determine liquids removal would be linked to industrial pretreatment criteria for Metal Finishing Standards. This should not be the only criteria, however, to determine disposal through a wastewater treatment facility. Treatability studies would also be necessary prior to any consideration for disposal at a County wastewater treatment facility. Also, since there is extensive removal of contaminants, use of waste rock as part of the capping procedure is acceptable. The County would also expect additional groundwater monitoring wells to be installed.

EPA Response 12: The Selected Alternative is Record of Decision Alternative 3, which has significant differences from Feasibility Study Alternative 4. The Selected Alternative does not include the rock fill layer and the search for and removal of buried drums containing liquids in the vicinity of the shale pile. As stated in previous EPA responses, whether the rock fill layer is included in the Selected Alternative will be rigorously evaluated during Remedial Design. Also as stated in previous EPA responses, the drum search and removal program was not included because it probably would be non-productive and its potential risks to public health and the environment outweigh its benefits. Furthermore, the partial source removal proposed in Feasibility Study Alternative 4 would not involve extensive removal of contaminants. Extensive removal of contaminants in the heterogeneous waste deposits in the landfill is part of only the alternatives in which complete excavation and offsite disposal are proposed.

Under the Selected Alternative, the liquids currently ponded underground in the south lagoon area would be removed and transported to an offsite permitted facility for treatment and disposal. Whether this treatment is at a NPDES permitted facility (publicly owned treatment works) or at a RCRA permitted facility will be established by treatability evaluations (and possibly treatability studies) to be conducted during Remedial Design.

All of the Record of Decision alternatives include an expanded and extended ground water monitoring program. In addition, the Selected Alternative includes collection, analysis, and possible treatment of significant ground water seepage at the site.

Comment 13: In regard to Feasibility Study Alternative 5—Capping with Rock Fill and Partial Groundwater Control, this alternative incorporates the components of Feasibility Study Alternative 3; however, it does not provide for any source removal. It is, therefore, unacceptable to the County.

EPA Response 13: As stated in previous EPA responses, all of the alternatives, with the exception of "No Action" would comply with Federal and State legally applicable or relevant and appropriate requirements and would be protective of public health and the environment.

Comment 14: In regard to Feasibility Study Alternative 6—Capping with Rock Fill, Partial Groundwater Control, and Partial Source Removal, this alternative incorporates the components of Feasibility Study Alternatives 4 and 5. It would be the most thorough remediation effort other than complete excavation. USEPA stated at the public meeting that off-site movement of groundwater will be all but stopped by the capping process. They do not believe, therefore, that groundwater remediation is necessary at this time. If future monitoring reveals contamination movement off-site, then groundwater controls would be considered. The County agrees with this logic; however, additional investigative work should be done to better characterize the nature and movement of the groundwater.

EPA Response 14: Feasibility Study Alternative 6 does not involve ground water remediation. It would provide for management of one ground water flow path and would not account for all ground water flow off of the site. The Selected Alternative includes (a) additional investigations to be conducted during Remedial Design to refine and expand the site's hydrogeological characterization, (b) collection, analysis, and possible treatment of significant ground water seepage at the site, (c) expanded and extended ground water monitoring, and (d) a contingent action to implement partial ground water control measures if ground water monitoring indicates an increase in contaminant migration.

Comment 15: In regard to Feasibility Study Alternative 7—Complete Excavation and Off-site Disposal, based on the RI findings, complete excavation and off-site disposal does not appear necessary to protect human health and the environment.

EPA Response 15: We agree. All of the alternatives, with the exception of "No Action", would protect public health and the environment. The prohibitive costs and significant potential risks associated with this alternative do not justify its minimal additional benefits.

Comment 16: The County can accept the preferred action plan found in Feasibility Study Alternative 4; however, in lieu of groundwater cleanup, additional monitoring systems must be added. Also, the County should be involved with sampling and data analysis. County representatives should also be allowed to observe the remediation efforts. If, during remediation efforts, a significant groundwater contamination problem becomes apparent, groundwater cleanup will have to reconsidered.

EPA Response 16: As stated in previous EPA responses, the Selected Alternative is Record of Decision Alternative 3, which is different from Feasibility Study Alternative 4. None of the alternatives involved ground water cleanup. The partial ground water control measures proposed in some alternatives would provide for management of one ground water flow path and would not account for all ground water flow off of the site. As previously stated, the Selected Alternative includes (a) additional investigations to be conducted during Remedial Design to refine and expand the site's hydrogeological characterization, (b) collection, analysis, and possible treatment of significant ground water seepage at the site, (c) expanded and extended ground water monitoring, and (d) a contingent action to implement partial ground water control measures if ground water monitoring indicates an increase in contaminant migration.

The County will be informed in advance of ground water sampling events. County representatives will be allowed to observe these events and, if the County so desires, the County may collect split samples for their independent analysis. County representatives will be allowed to observe the remedial action construction activities. EPA will keep the County apprised of progress and developments. EPA encourages the participation of the County.

Comment 17: The County fully supports the need for additional investigation in the following areas: (1) verification of the western limits of the disposed wastes, (2) verification of the northern edge of the disposed wastes, (3) location of the drums disposed as a result of a fire in 1966 at the Thompson-Hayward Chemical Company, (4) relationship of the Doepke-Holliday Site to the Overland Park Landfill, and (5) determination of groundwater contamination in formations below the Plattsburg.

EPA Response 17: The Selected Alternative includes additional investigations to be conducted during Remedial Design for the all listed areas, with the exception of the drum search. As stated in previous EPA responses, the drum search and removal program was not included in the Selected Alternative because it probably would be non-productive and its potential risks to public health and the environment outweigh its benefits.

F. <u>Responses to Written Comments in the August 25, 1989 Letter from Von Beougher, Engineering Technician, City of Shawnee, Kansas</u>

Comment 1: The City of Shawnee has a keen interest in the clean-up and management of the Doepke-Holliday Site, and would appreciate being kept informed of any progress and developments as they occur.

EPA Response 1: The City of Shawnee will be kept informed of progress and developments as they occur.

Comment 2: We support a thoroughly planned and evaluated alternative which best protects human health and the environment, as opposed to a "hurry up and get it behind us" approach. It is hoped that the alternative which is ultimately implemented will be based on sufficient data and analysis to adequately define the actual extent of the hazard to public health during both the short and long term.

EPA Response 2: We agree that the approach taken has been deliberate. The site has been investigated numerous times since the closure of the landfill in 1970. Over the past 2 years, a Remedial Investigation and Feasibility Study was performed to evaluate the site's characteristics and to evaluate alternatives to remedy its hazards. The Selected Alternative will comply with Federal and Kansas legally applicable or relevant and appropriate requirements and will be protective of public health and the environment. The Selected Alternative includes additional investigations during Remedial Design and extended monitoring after Remedial Action implementation to assure its effectiveness in protecting public health and the environment.

II. RESPONSES TO ORAL COMMENTS AT THE PUBLIC MEETING ON AUGUST 16, 1989

A. <u>Responses to Oral Comments of Johnna Lingle, County Commissioner, Johnson County, Kansas</u>

Comment 1: This site is within my district as County Commissioner. I am very interested in what EPA is proposing as well as what role the Johnson County Environmental Department might be in this process.

EPA Response 1: The Proposed Plan and the Preferred Alternative were presented earlier in the Public Meeting. EPA has kept the Johnson County Environmental Department, as well as the Kansas Department of Health and Environment, apprised throughout the process. EPA has shared documentation on progress and findings of the Remedial Investigation and Feasibility Study. EPA has met with the Johnson County Environmental Department and has provided them with the Remedial Investigation, Public Health Assessment, and Feasibility Study reports when the reports were completed. EPA will continue to share information with the Johnson County Environmental Department, as well as the Kansas Department of Health and Environment.

Comment 2: It is very important for us to know that there is protection for our citizens and also to know about the local tax dollars that would be involved. We need to have a cooperative effort, not only for what has been done so far, but also in the future.

EPA Response 2: We agree.

B. <u>Responses to Oral Comments of Craig Lubow and Diane Arnst, representing members of the Sierra Club</u>

Comment 1: Who will be responsible for monitoring to assure that contamination is not migrating to the Kansas River? Will it be EPA or Deffenbaugh or another agency?

EPA Response 1: EPA will be ultimately responsible to ensure that the monitoring is performed. EPA does not now have an agreement with any of the Potentially Responsible Parties concerning the implementation of the remedial action. EPA will be responsible to make sure that it gets done, but EPA does not now know who will actually carry out the remedial action.

After EPA has selected a remedy for the site, ordinarily EPA first seeks implementation of the remedial action by Potentially Responsible Parties identified by EPA. If the Potentially Responsible Parties agree that they will implement the remedial action, then they might perform the monitoring under the oversight of EPA. EPA would review the results from their monitoring, as well as from time to time collecting split samples for independent analysis. EPA would be basically managing the monitoring effort, whether it is done by EPA or a Potentially Responsible Party or, in the long-term, by the State of Kansas. Under the Superfund law, after EPA has completed the remedial action, the State is responsible for performing the required operation, maintenance and monitoring activities, if the Potentially Responsible Parties have not agreed to perform those activities.

Comment 2: If Deffenbaugh were to agree to do the monitoring, would EPA have any oversight to the extent that EPA is not only reviewing the results, but actually collecting samples for analysis on occasion?

EPA Response 2: Yes, EPA would require the prior approval by EPA of the sample collection and analysis procedures to be utilized. From time to time, EPA would collect splits of the samples collected by the Potentially Responsible Parties and have the splits independently analyzed. Also, EPA may perform independent sampling efforts.

Comment 3: Has EPA provided such oversight of past sampling activities?

EPA Response 3: EPA has provided oversight of past sampling activities.

Comment 4: Are any of the migrating substances on EPA's "too hazardous list"? Which ones have been detected?

EPA Response 4: Up to seventy different chemicals on the Priority Pollutant List have been detected in samples collected on the site. Some of these are hazardous at varying degrees of toxicity.

The concentrations that have been detected in seepage that is going off the site have not been significantly large. However, the Selected Alternative includes the collection of seepage from the major seep on the site and, in the event concentrations in the seepage exceed ARARs, the seepage would be treated prior to discharge.

Many of the chemicals have been detected in the fill material, but in either the ground water or the seepage. Part of the reason for requiring a cap is to minimize the amount water that is entering the fill area, and therefore minimize the opportunity for offsite migration.

Comment 5: Does the Preferred Alternative include any flood plain barrier, as required by EPA regulations for the management of PCBs?

EPA Response 5: EPA has regulations regarding the siting of hazardous waste management facilities within flood plains. The Doepke-Holliday Site is not located in the flood plain of the Kansas River. The lowest elevation waste deposits on the site are approximately 100 feet higher than the maximum record flood stage. Therefore, the Selected Alternative does not include any flood barriers. However, the Selected Alternative includes a cap and runoff controls to keep water from contacting any of the waste sources.

Comment 6: Aren't there special regulations that just deal with cleanup of PCBs?

EPA Response 6: There are regulations specifically for the cleanup of PCB spills. However, those regulations do not apply to the situation present at this site, because the PCBs are in a landfill and are not the result of a recent spill.

Comment 7: What are the underlying assumptions that were made to determine which remedial action alternative is most cost-effective?

EPA Response 7: Cost-effectiveness is one of the balancing criteria used in the alternative evaluation and selection process.

There are two primary criteria used in the evaluation and selection process. These criteria, which are referred to as the threshold criteria, are (1) the requirement to be protective of public health and the environment and (2) the requirement to comply with all Federal and State legally applicable or relevant and appropriate standards and regulations. If the alternative meets these minimum threshold criteria, then it is evaluated further against the balancing criteria.

The balancing criteria include cost-effectiveness, implementability, and other criteria that are subjective in nature. There is no set rule for cost-effectiveness that says a cost-benefit ratio or similar factors have to be a certain level.

Comment 8: If contaminant level increases are detected in the future by the long-term monitoring, would there be additional design activity then to take this into account?

EPA Response 8: In the event that monitoring shows that there is an increase in contaminant migration, additional action would be taken.

Comment 9: Would there be a public report in the Federal Register or in the local newspaper if something like that happened?

EPA Response 9: If EPA significantly modifies the remedy for the site, EPA would issue a public notice. However, this notice would not be in the Federal Register.

Comment 10: Would the monitoring results--such as, greater quantities, different constituents or chemicals, or a larger proportion being detected from the acutely toxic list--be available to the public?

EPA Response 10: All monitoring data that EPA collects on sites is available to the public. The public can gain access to this data by submitting a request to EPA.

C. Responses to Oral Comments of Don Durham

Comment 1: When does EPA start the process?

EPA Response 1: After the public comment period, the next step in the process will be to respond to the comments and to sign the Record of Decision. Following that, there will be period during which EPA will probably issue notice letters to and possibly negotiate with the Potentially Responsible Parties in regard to their implementation of the remedial action. Following that, Remedial Design will be initiated either by EPA using Superfund money or by Potentially Responsible Parties under EPA oversight. Remedial Design will take 6 to 12 months. Then bids for the remedial action contract will be let using the documents prepared during Remedial Design. It might take another 4 to 6 months until the remedial action contract is awarded. It would probably be 12 to 18 months from now before remedial action construction is started. The exact duration of the remedial action construction will become more evident during the design period, but it probably will take another 12 to 18 months. It would probably be 2 to 3 years from now before the remedial action is completed.

Comment 2: On the funding, does EPA already have the money in Superfund or has it been budgeted or will it have to be budgeted?

EPA Response 2: There is certain amount of Superfund monies that are budgeted. Currently, EPA is working on the budget for Fiscal Year '90, looking at sites projected for remedial action during the year that begins this October. EPA does not currently foresee any funding problems. EPA expects that when projects become ready for action, EPA will have the funds to do the work. But that is not to say that a situation may not develop when there are projects ready for action but the funds are not quite yet available. However, if the Potentially Responsible Parties implement the remedial action, then EPA would not have to use the Superfund trust fund.

Comment 3: Where will the collected seepage be treated?

EPA Response 3: The actual facility where the collected seepage will be treated has not been established yet. If the level of contaminants in the collected seepage do not exceed ARARs, the collected seepage will be discharged to the Kansas River. If the level of contaminants exceed ARARs but meet pretreatment standards, the collected seepage will be transported to a publicly owned wastewater treatment plant for treatment and disposal. If the level of contaminants exceed pretreatment standards, the collected seepage will be treated to reduce the level below pretreatment standards and then will be treated at a publicly owned wastewater treatment plant.

Comment 4: The purpose of the cap is to keep precipitation from infiltrating, therefore the cap will increase the amount of runoff. Will the cap cause any flooding problems, particularly in the lowland area by Holliday Drive and I-435?

EPA Response 4: The cap will increase the rate of runoff. However, it is expected that the cap will not result in a major difference in the rate of runoff, because not that large an area will be capped. Nevertheless, the design of the remedial action will include provisions to handle the runoff without causing erosion or flooding problems.

Comment 5: In regard to long-term monitoring, what is long-term: 10 years, 50 years, or what?

EPA Response 5: The long-term monitoring will be for a minimum of 30 years.

Comment 6: What are the planned deed restrictions? What is the eventual land use for the site?

EPA Response 6: The deed restrictions must be commensurate with the level of risk associated with the site. Under the Selected Alternative, the contaminants would not removed from the site. As long as the contaminants remain on the site, intrusive activities and residential land use on the site will not be acceptable. Deed restrictions will be used to assure that land use is not changed from the present.

D. Responses to Oral Comments of Ralph Wyss, Chief Engineer, Johnson County Water District No. 1

Comment 1: In regard to partial source removal, does this only include removal of liquids ponded underground in the south lagoon area or does this also include removal of buried drums?

EPA Response 1: The Selected Alternative does not include a search for and removal of buried drums. Based on the previous investigative work and the nature of the landfill, the buried drums would be very difficult to locate. To locate the buried drums will entail two steps. First, a surface geophysics survey would be used to locate buried metallic deposits. Then, there would be excavation activities to unearth the buried metallic deposits. Given that this was a landfill, it is expected that the excavation activities would unearth mostly buried scrap metal and white goods (refrigerators, washing machines, etc.) with little success in finding buried drums. These excavation activities would pose the potential risk of fire and explosion and the potential risk of worker exposure to unknown hazardous materials in the heterogeneous landfill. These excavation activities would have unjustifiable short-term potential risks to public health and the environment.

Comment 2: What is in the buried drums?

EPA Response 2: Considering how long the drums have been buried and that they were either steel or fiberboard drums, the buried drums probably are no longer intact. It would be very difficult to locate the buried drums and, if they were located, it is doubtful that the buried drums would contain anything significant.

D. Responses to Oral Comments of Betsy Betros, Johnson County Environmental Department

Comment 1: Would you expand on the reasoning behind not including the clay barrier and other partial ground water controls in the Preferred Alternative? The long-term monitoring proposed in the Preferred Alternative may not be sufficiently responsive to avert downstream problems. If the long-term monitoring indicates a problem, enough offsite migration of contaminants may have already occurred to cause a problem at the nearby Kansas River intake of Johnson County Water District No. 1. Also, what will be the frequency of monitoring?

EPA Response 1: Ground water is currently not flowing offsite in that significant of a quantity or in significant concentrations of contaminants to warrant installation of the partial ground water controls at this time. Furthermore, after the cap is in place, ground water flow will be significantly reduced. The monitoring program will provide sufficient time to take actions to avert downstream problems, because monitoring will be on a quarterly basis and contaminant migration levels are not expected to have a sudden increase.

Comment 2: It appears that Doepke-Holliday waste disposal operations extended onto the Overland Park Landfill property. Will the Overland Park Landfill property be investigated? Will the cap for the Doepke-Holliday Site extend onto the Overland Park Landfill property?

EPA Response 2: During the preliminary stages of Remedial Design, there will be additional investigations to establish the extent of the cap and to characterize further the hydrogeology of the site. These investigations will extend onto the Overland Park Landfill property. If the investigations indicate that the cap should extend onto the Overland Park Landfill property, then the cap will so designed and constructed under this action.

Comment 3: Have contaminants from the buried drums leached far enough to have been detected by the existing monitoring wells?

EPA Response 3: Some contaminants have been detected in ground water samples from the existing monitoring wells. It is uncertain whether these contaminants originated from what might have been originally in the buried drums. The hydrogeological study performed as part of the Remedial Investigation and Feasibility Study indicates that some of the contaminants which are expected to migrate may not have yet reached the extent of the current monitoring system. There is a possibility, if no action is taken, that the level of contaminants detected by the monitoring system will increase in the future. With the cap in place, the potential of this happening would be reduced.