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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Cross Brothers Pail Recycling
Pembroke Township, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected remedial action for the Cross Brothers Pail Recycling site developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based upon the contents of the administrative record for the Cross Brothers Pail Recycling site.

The United States Environmental Protection Agency and the State of Illinois agree 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 Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

DESCRIPTION OF REMEDY

This final remedy addresses remediation of groundwater and soil contamination by eliminating or reducing the risks posed by the site, through treatment and engineering and institutional controls.

The major components of the selected remedy include:

- Re-sampling of the localized PCB soil area to identify the existence of a PCB source.
- If identified, remove the localized PCB-contaminated soil area and incinerate the soils at a TSCA approved incinerator.
- Install and maintain a groundwater collection system capable of capturing the groundwater contaminant plume.

- Install and maintain an on-site groundwater treatment facility to remove contaminants from the collected groundwater.
- Install and maintain a soil flushing system for the 3.5 acres of contaminated soil within the disposal area.
- Install and maintain a 6 inch vegetative cover over that portion of the disposal area not subject to the soil flushing operation.
- Monitor the groundwater collection/treatment system and the groundwater contaminant plume during groundwater remediation activities.
- Install and maintain a 6 inch vegetative cover over the 3.5 acre area subject to soil flushing upon terminating the soil flushing operation.
- Install and maintain a fence around the site during remedial activities.
- Initiate a deed notification identifying U.S. EPA and IEPA concerns regarding the conductance of intrusive activities at the site.

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 (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. As this remedy will initially 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.

for Frank M. Covington

Valdas V. Adamkus
Regional Administrator
U.S. EPA - Region V

9/28/89
Date

The State of Illinois, through the Illinois Environmental Protection Agency, concurs with the decision the Regional Administrator has made, in the exercise of his authority, in selecting this remedy.

Bernard P. Killian
Director
Illinois Environmental Protection Agency

9/21/89
Date

RECORD OF DECISION SUMMARY
CROSS BROTHERS PAIL RECYCLING

I. SITE DESCRIPTION

The Cross Brothers Pail Recycling site is a 20-acre parcel of land located 12 miles east of Kankakee, Illinois in Pembroke Township (Figure 1). Approximately half of the 20-acre site was used for waste disposal.

The site is situated within a semi-residential area which is interspersed with small farms and undeveloped pastureland. The nearest surface body of water is the Kankakee River, which is located approximately 4.5 miles north of the site.

The site is owned by James D. Cross. Mr. Cross currently resides on the site. In addition, Mr. Cross presently operates a wood pallet reclamation business on-site employing approximately 10 part-time workers.

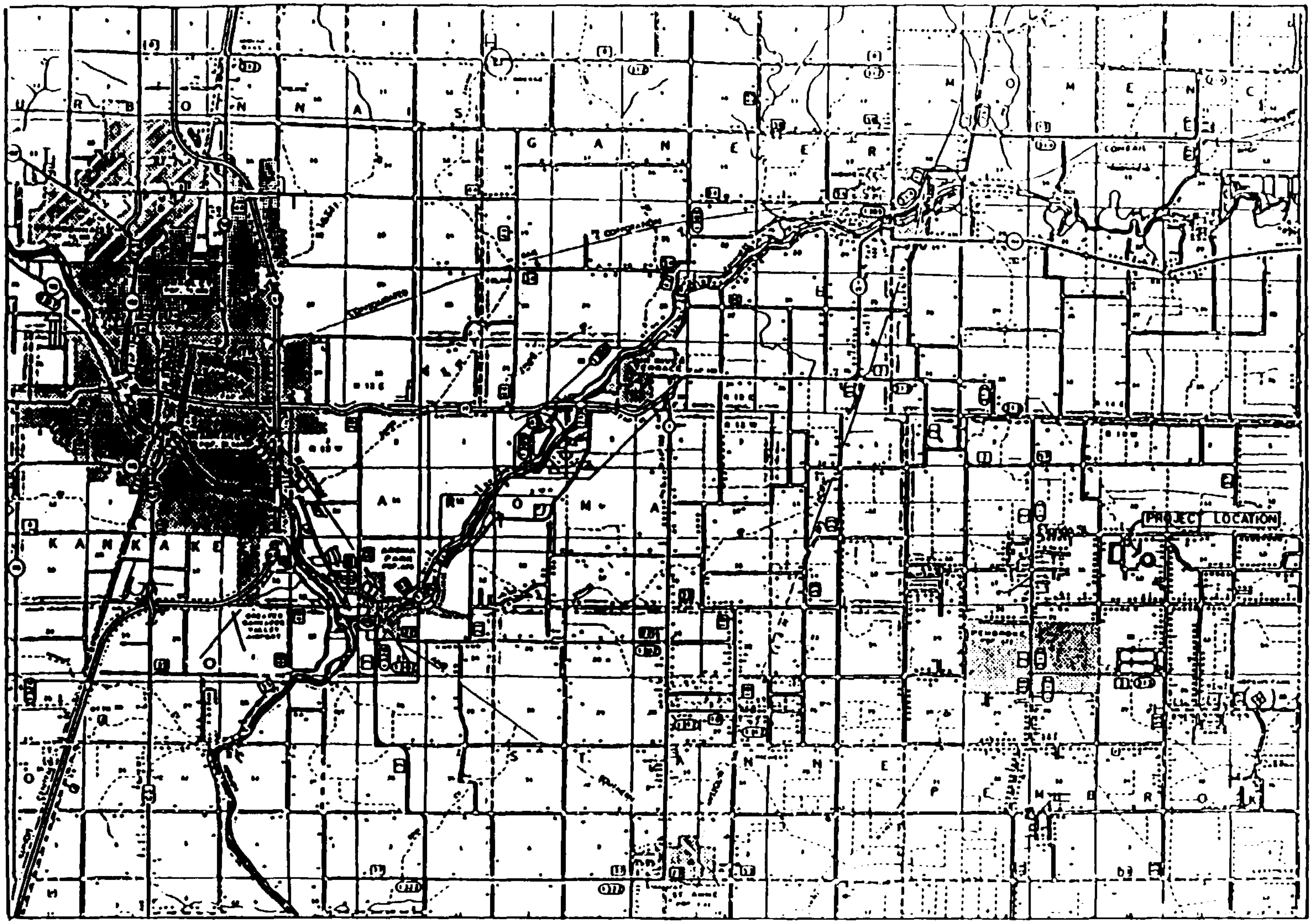
II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site History

James and Abner Cross operated a pail and drum reclamation business at the site from 1961 until 1980. The reclamation operation consisted of placing drums and pails containing dye, ink, and paint residue onto the ground, allowing their contents to drain. Waste solvents were then poured over and into the pails and drums to dissolve the remaining residue. This mixture was then ignited to burn out the remaining contents. The pails and drums were then moved to a reconditioning shed, sand blasted, and repainted. This process resulted in a layer of waste residue up to 6 inches thick covering approximately 10 acres of the property. The operation also included burial of crushed pails and drums in approximately 10 trenches at various locations around the site. The trenches varied in size, but were generally less than 20 feet in width and depth.

In June 1980, the site was discovered by Illinois Environmental Protection Agency (IEPA) personnel during an aerial survey. Subsequent to a site inspection, the Illinois Attorney General's Office obtained a court order from the Kankakee Circuit Court on August 19, 1980, requiring the site to be closed and cleaned up.

Following the court order, IEPA sampled and analyzed water from local private water supply wells. Based on the results from that sampling, the two home owners immediately north of the site were advised by IEPA to obtain an alternative



SYMBOLS

INCORPORATED AREA

PAVED ROAD

UNIMPROVED ROAD

STATE ROAD

DRAINAGE DITCH

CROSS BROTHERS SITE

MAP SOURCE: ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

TOWNSHIP 32 NORTH, RANGE II WEST,
SW 1/4, NE 1/4, OF SECTION 15,
SECOND PRIME MERIDIAN,
KANKAKEE COUNTY, ILLINOIS

0 1 2 3
SCALE IN MILES

FIGURE 1
SITE LOCATION MAP

source of water to replace their contaminated wells. Subsequently, Mr. Cross paid for the installation of new, deeper water wells at these two residences.

The IEPA then conducted a limited amount of additional field work to further characterize the contamination at the site. The results of this investigation are summarized in a August 1981 report by R.B. St. John entitled A Hydrogeological Study of the Pembroke Cross Brothers Site. This report indicated the presence of surficial and buried waste materials (i.e. pails and drums) and a groundwater contaminant plume.

In December 1982, the Cross Brothers Pail Recycling site was proposed for inclusion on the National Priorities List (NPL). The site listing was finalized in September 1983.

From May 1983 to June 1984, IEPA conducted a Remedial Investigation/Feasibility Study (RI/FS) at the Cross Brothers Pail Recycling site through a Cooperative Agreement (CA) with the United States Environmental Protection Agency (U.S. EPA). The primary focus of this investigation was to: locate additional drums/bulk waste, perform a waste inventory and characterization survey and accurately define the groundwater contaminant plume. The RI results indicated however, that additional studies would be necessary to accurately define the groundwater contaminant plume. Therefore, the FS focused on source control alternatives (i.e. removal of pails and drums), in addition to recommending that additional groundwater studies be performed.

Concurrent with the RI/FS, the Kankakee County Circuit Court ruled that James and Abner Cross could continue their pail and drum reclamation business at the site, as well as begin a wood pallet reclamation operation, as long as the pails and drums contained no hazardous wastes or substances.

On March 25, 1985, U.S. EPA, with IEPA's concurrence, signed a Record of Decision (ROD) requiring certain Initial Remedial Measures (IRM) at the Cross Brothers Pail Recycling site. The primary focus of the IRM was to remove surficial and buried waste materials, as well as visibly contaminated soils. In addition, the ROD recommended an investigation of soil and groundwater be continued after completion of the IRM, to determine if any additional remedial actions would be necessary at the site.

From October 16, 1985 until November 15, 1985, IEPA conducted the IRM utilizing State funds. During the IRM, the disposal area was cleared of all vegetation and 6438 tons of surficial soil containing paint, ink, dye and tar-like residue, 56 tons of crushed pails, 542 drums still containing wastes and 572 empty drums were removed from the site (Figure 2).

From January 1986, until the present, IEPA has been the lead agency in conducting a Hydrogeological Study/Feasibility Study (HS/FS) at the site. The HS/FS was conducted through a CA with the U.S. EPA. The HS was conducted to define the nature and extent of groundwater and residual soil contamination at the site and to characterize the potential threats to public health and the environment from the site. Field activities for the HS were conducted in two phases and were completed in October 1988. The results are described in the Final HS report, dated April 1989.

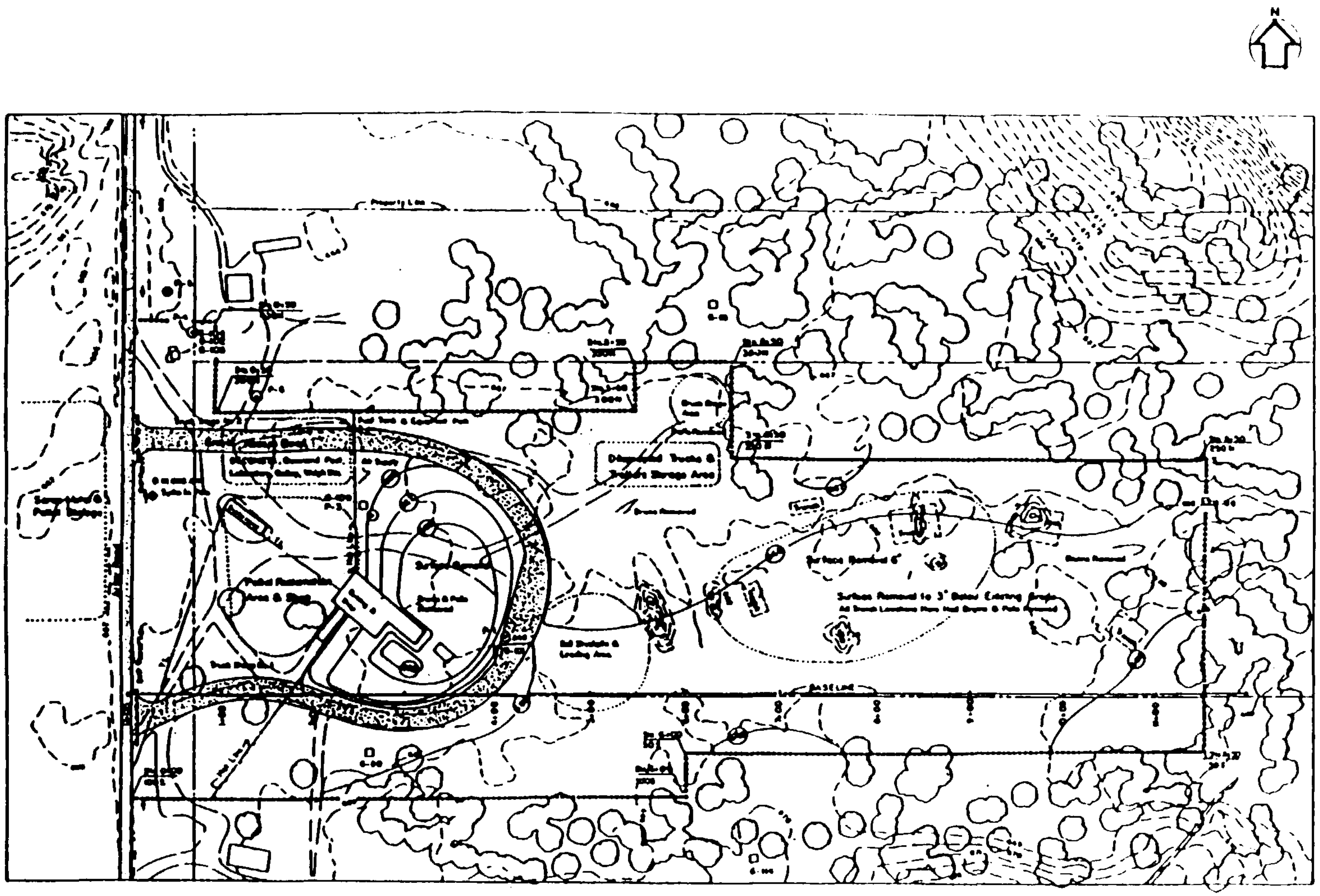
The Public Comment FS was completed in July 1989. The FS documents and describes in detail the development and evaluation of an array of remedial action alternatives for the Cross Brothers Pail Recycling site. Public comment on the FS ended August 25, 1989.

B. Enforcement Activities

U.S. EPA and IEPA have identified approximately twelve Potentially Responsible Parties (PRPs) for the Cross Brothers Pail Recycling site. This identification was based on records from the State of Illinois, responses to government information requests, on-site investigation reports, and company records.

All of the PRPs were identified by a general notice letter dated June 13, 1989. On July 11, 1989, U.S. EPA and IEPA held a meeting with the PRPs to discuss the HS and future enforcement activities.

On July 26, 1989, Special Notice Letters were sent to the twelve PRPs pursuant to Section 122(e) of the Superfund Amendments and Reauthorization Act (SARA) of 1986. The deadline for receipt of a "good faith offer" to conduct the remedial design and remedial action discussed in this Record of Decision Summary is October 3, 1989. If a "good faith offer" is not received by October 3, 1989, U.S. EPA and IEPA may conduct the Remedial Design/Remedial Action (RD/RA) with Federal and State funds or, U.S. EPA may issue an Unilateral Administrative Order (UAO) to the PRPs, to conduct the RD/RA.



SYMBOLS

- EXISTING IEPA MONITORING WELL (PVC)
- EXISTING STAINLESS STEEL MONITORING WELL
- PROPERTY LINE
- EXISTING CONTOUR
- 665 PROPOSED CONTOUR
- AREAS OF INTEREST OUTLINE
- HOT LINE
- IRM CONSTRUCTION LIMITS

NOTE: FIGURE REDRAWN FROM NOV., 14, 1985 AS BUILT PLANS OBTAINED FROM J. J. LARSON, IEPA.

0 100 200 300

SCALE IN FEET

CONTOUR INTERVAL = 1 FOOT

FIGURE 2

SITE CONDITIONS FOLLOWING THE IRM

METCALF & EDDY

III. COMMUNITY PARTICIPATION

The HS/FS and Proposed Plan for the Cross Brothers Pail Recycling site were released to the public in July 1989. These documents were made available to the public in both the administrative record and information repositories. The administrative record is at the following locations:

U.S. EPA - Region V
230 S. Dearborn
Chicago, IL 60409

Illinois EPA
2200 Churchill Road
Springfield, IL 62706

Kankakee Public Library
304 South Indiana Avenue
Kankakee, IL 60901

The information repositories are at the following locations:

Kankakee Public Library
304 South Indiana Avenue
Kankakee, IL 60901

Hopkins Park Village Hall
Central & Main Streets
Hopkins Park, IL 60944

A public comment period was held from July 26, 1989 through August 25, 1989. In addition, a public meeting was held on August 21, 1989. At this meeting representatives from U.S. EPA and IEPA answered questions about the problems at the site and the remedial alternatives under consideration. Responses to the comments received are included in the Responsiveness Summary, which is a part of this ROD.

IV. SCOPE AND ROLE OF RESPONSE ACTION

U.S. EPA and IEPA previously determined it necessary to perform an IRM at the Cross Brothers Pail Recycling site. The selection of the IRM was documented in the March 25, 1985, ROD for the site. The primary focus of the IRM was removal of surficial and buried waste materials (i.e. pails and drums), as well as visibly contaminated soils. This action was completed in November 1985.

This ROD supplements the earlier ROD, and addresses contaminated groundwater and residual surface and subsurface soil contamination not addressed by the IRM. Contaminated groundwater is the principal threat at the site, as it contains contaminants above health-based levels. In addition, the contaminants present in the surface and subsurface soils will continue to leach into groundwater. Therefore, the purpose of this response action is to prevent current or future exposures to the contaminated groundwater and to reduce contaminant migration into groundwater. This action will be the final response action for the site.

V. SITE CHARACTERISTICS

The nature and extent of site related contamination was determined by a series of field investigations during the HS. The results of these field investigations are summarized, by medium, in the following discussion. Any specific characteristics associated with a medium, are also summarized in the following discussion.

A. Surficial Soils

Results of the surface soil investigation indicate volatile organic, semi-volatile organic and polychlorinated biphenyl (PCB) contamination to be present at the site. Volatile organic compounds (VOCs) were identified at 13 of the 21 surface soil sampling locations. Tetrachloroethene was the most frequently detected VOC, while total xylenes were detected in the highest concentration.

Semi-volatile organic compounds were detected at 8 locations. The most frequently identified semi-volatile organic compound was bis (2-ethylhexyl) phthalate (DEHP).

At 5 locations PCBs were detected in surface soils. Each of these locations contained less than 10 ppm PCBs, which is the suggested cleanup level given in 40 CFR 761.

Concentrations of the inorganics detected were all within the median range of inorganics found naturally in soils in the United States. Therefore the surface soil is not considered to be contaminated with inorganics.

B. Subsurface Soils

Results of the subsurface soil investigation found volatile organic, semi-volatile organic and PCB contamination to be present at the site.

Sixteen VOCs were identified at 18 locations on the site. The compounds most frequently identified were acetone and methylene chloride. However, these compounds were also detected in the laboratory blanks indicating possible laboratory contamination of the samples. Total xylenes were detected in the highest concentrations.

Semi-volatile organic compounds were found to be present at the same locations as the VOCs. A total of 26 compounds were identified. The most frequently detected semi-volatile compound was DEHP.

PCBs were detected at four subsurface locations. One sample was found to contain 110 ppm of PCBs at a depth of 6 feet below ground surface. All other samples were below 10 ppm.

Soil contamination at depth by inorganics was not detected.

C. Distribution of Soil Contamination

The surface and subsurface soil investigation results reveal a strong similarity in contaminant distribution between surface and subsurface soils. Soil contamination by organic compounds exists throughout the thickness of the unsaturated zone. PCBs were also detected in surface and subsurface soils.

The areal extent of contamination is also very similar between surface and subsurface soils (Figure 3). The areal extent of soil contamination is approximately 3.5 acres. Assuming soil is contaminated throughout the unsaturated zone (0 to 6 feet), the estimated volume of contaminated soil is 33,880 yd^3. This area represents an area of fairly consistent contamination, but does not represent the only probable area of soil contamination. The waste disposal practices performed on-site may have left small localized areas of contaminated soil at other locations throughout the site area.

Table 1 presents a summary of the range and frequency of the organic contaminants detected in the surface and subsurface soils.

D. Groundwater Hydrogeology and Quality

The site area is underlain by the following sequence of sedimentary units: windblown deposits, glacial outwash, glacial till and a carbonate bedrock (Figure 4). The windblown deposits/glacial outwash and carbonate bedrock serve as the principal sources of groundwater in the site area. Each of these sources functions as a distinct hydraulic unit, as they are separated by a glacial till aquitard.

The carbonate bedrock aquifer consists of limestone and dolomite, with minor amounts of shale, that is overlain by a confining till layer. Boring logs indicate a gravel zone between the till and the bedrock. It is suspected this zone represents a highly fractured phase of the bedrock. The carbonate bedrock aquifer is used to supply large quantities of irrigation water regionally, and is used locally for residential water supplies.

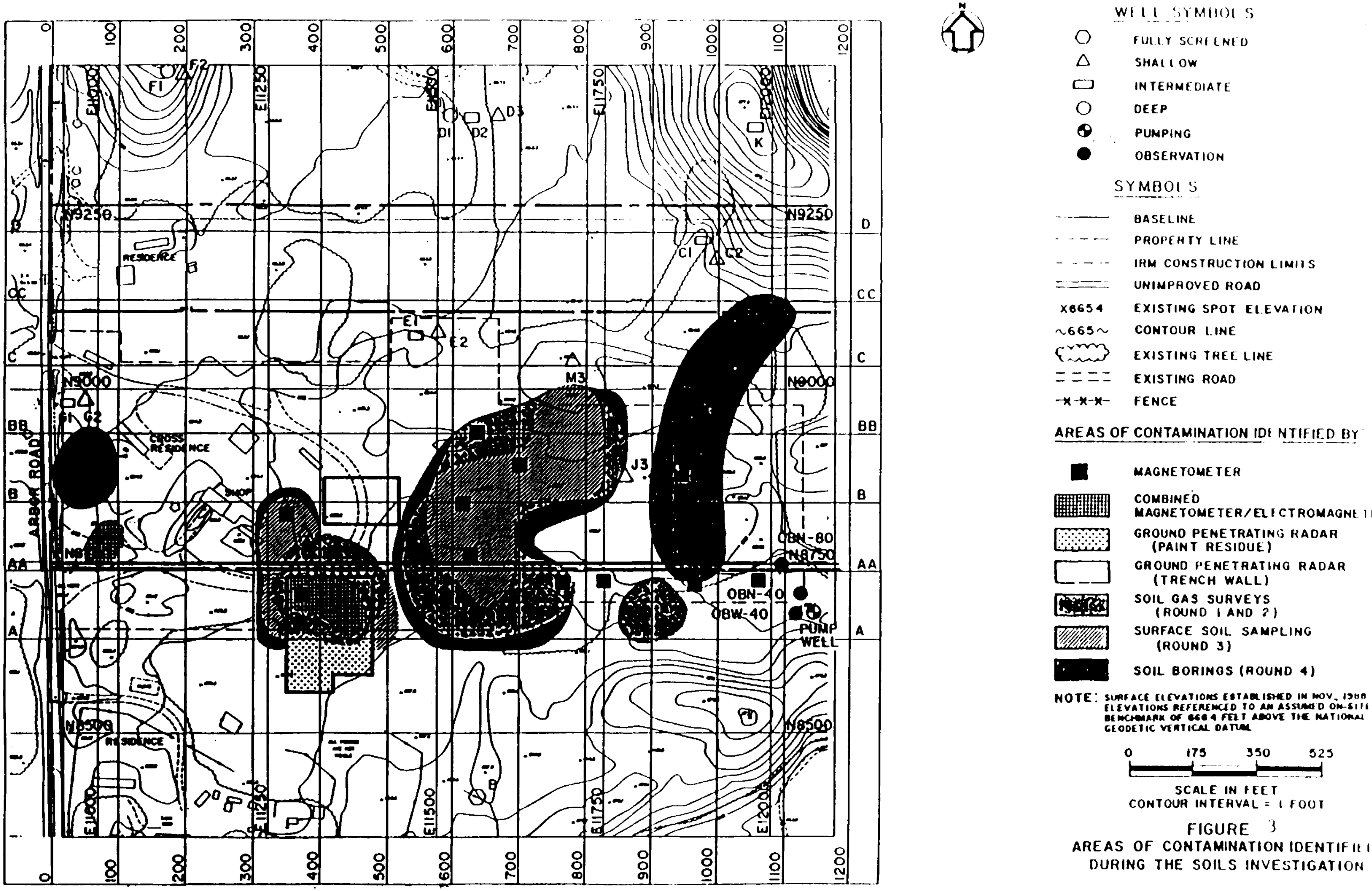


FIGURE 3
AREAS OF CONTAMINATION IDENTIFIED DURING THE SOILS INVESTIGATION

METCALF & EDDY

TABLE 1

RANGE AND FREQUENCY OF ORGANIC CONTAMINANTS DETECTED IN SOIL

Contaminants Detected	Surface Soils Concentration Range (ug/kg)	Frequency of Detection	Deep Soils Concentration Range (ug/kg)	Frequency of Detection
VOLATILE ORGANICS				
Methylene Chloride	ND - 226000 B	1/26	ND - 46 B	13/30
Acetone	ND - 132000 B	2/26	ND - 110 B	13/30
2-butanone	ND - 9.3	1/26	ND - 64	2/30
c-1,3-dichloropropene	ND - 15.8	1/26	ND	0/30
Trichloroethene	ND - 500	2/26	ND - 2800 E	2/30
4-Methyl-2-Pentanone	ND	0/26	ND - 120	5/30
Tetrachloroethene	ND - 2400	6/26	ND - 1300	9/30
Toluene	ND - 95400	3/26	ND - 250000	9/30
Ethylbenzene	ND - 71900	1/26	ND - 580000 D	7/30
Total Xylenes	ND - 1270000	6/26	ND - 3700000 D	9/30
SEMI-VOLATILE ORGANICS				
2-methylnaphthalene	ND - 20600	2/26	ND - 17000 D	10/30
Isophorone	ND - 215000	2/26	ND - 2300	6/30
Naphthalene	ND - 126000	1/26	ND - 27000 D	9/30
Acenaphthene	ND	0/26	ND - 330 E	4/30
Fluorene	ND	0/26	ND - 94 E	3/30
Anthracene	ND	0/26	ND - 81 E	2/30
Di-N-Butylphthalate	ND - 1370	2/26	ND - 4900	13/30
Fluoranthene	ND	0/26	ND - 280 E	2/30
Pyrene	ND	0/26	ND - 260 E	5/30
Butylbenzylphthalate	ND - 1970	1/26	ND - 6300	9/30
bis(2-ethylhexyl)phthalate	ND - 1770	10/26	ND - 25000 D	20/30
3,3'-Dichlorobenzidene	ND - 13200	1/26	ND	0/30
Chrysene	ND	0/26	ND - 210 E	2/30
Benzo(a)Anthracene	ND	0/26	ND - 130 E	2/30
Di-N-Octylphthalate	ND	0/26	ND - 980	4/30
Benzo(b)Fluoranthene	ND	0/26	ND - 240 E	2/30
Benzo(k)Fluoranthene	ND	0/26	ND - 240 E	2/30
Benzo(a)Pyrene	ND	0/26	ND - 210 E	2/30
Indeno(1,2,3-CD)Pyrene	ND	0/26	ND - 39 E	1/30
Benzo(g,h,i)Perylene	ND	0/26	ND - 43 E	1/30
Benzoic acid	ND	0/26	ND - 180 E	2/30
Phenol	ND	0/26	ND - 540	3/30
2-Methylphenol	ND	0/26	ND - 1200	1/30
2,4-Dimethylphenol	ND	0/26	ND - 4300	2/30
Pentachlorophenol	ND	0/26	ND - 1300	3/30
Diethylphthalate	ND	0/26	ND - 51 E	2/30
Phenanthrene	ND	0/26	ND - 240 E	4/30
PESTICIDES/PCBs				
Arochlor-1242	ND - 887	1/26	ND - 110000	2/30
Arochlor-1248	ND - 1120	1/26	ND	0/30
Arochlor-1254	ND - 568	1/26	ND - 3900	1/30
Arochlor-1260	ND - 429	2/26	ND - 250	1/30
Heptachlor	ND - 9.8	1/26	ND	0/30

B - Indicates that the contaminant was also found in the blanks of all samples in which it is detected.

E - Reported concentrations are all estimated.

D - Diluted sample.

ND - Not Detected.

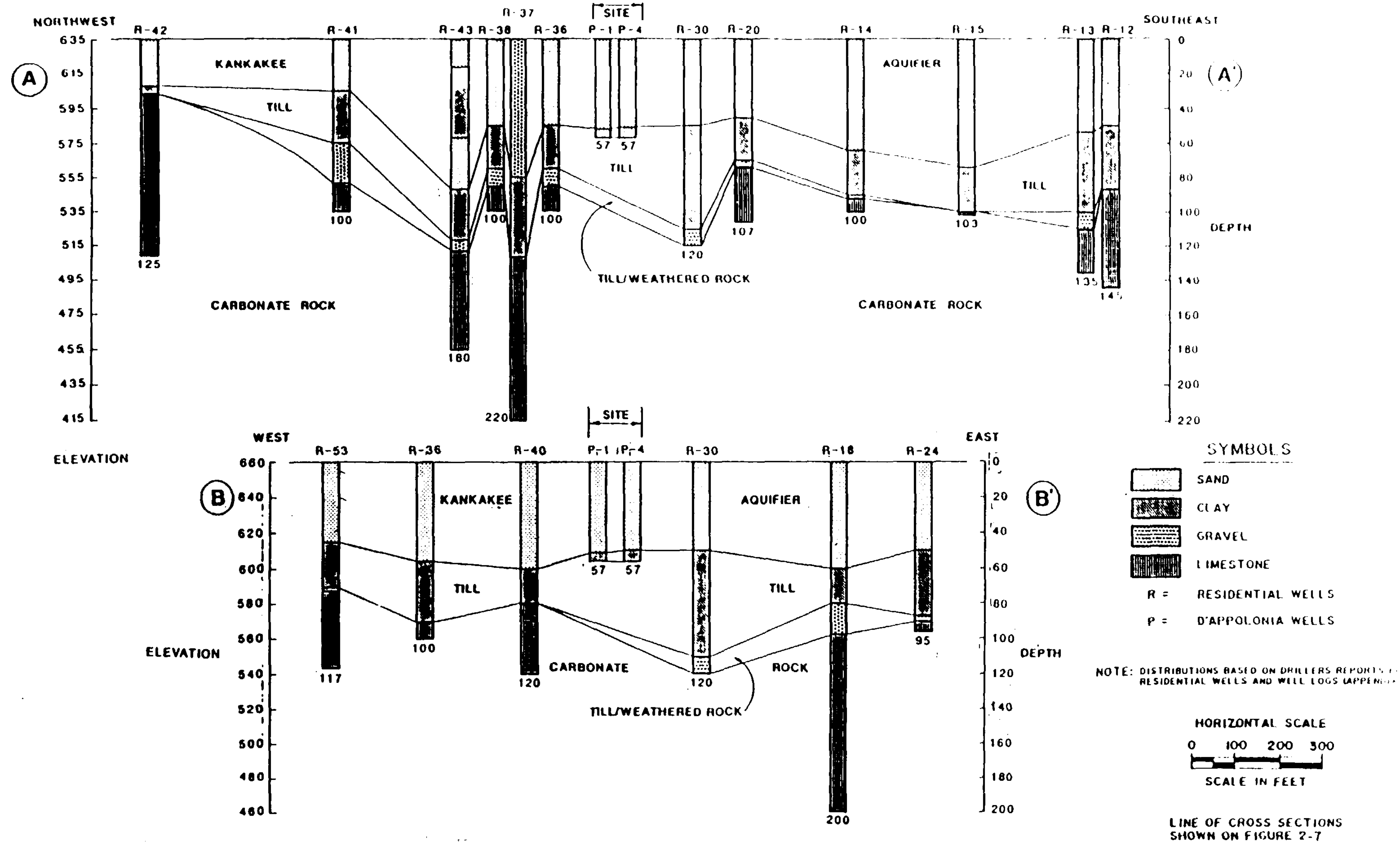


FIGURE 4
GEOLOGIC SECTIONS OF STUDY AREA

METCALF & EDDY

The windblown deposits/glacial outwash collectively form an extensive aquifer referred to as the Kankakee aquifer. This aquifer consists of well sorted, fine to medium grain sand with minor amounts of fine to medium gravel. The top of the aquifer is found within 10 feet below ground surface and ranges from < 10 to about 70 feet in thickness. The bottom of the aquifer is formed by the glacial till unit which hydraulically separates the Kankakee aquifer from the carbonate bedrock aquifer. The Kankakee aquifer is moderately productive and is a source of small domestic water supplies in the site area.

The general flow direction of the Kankakee aquifer is towards the north (Figure 5). The linear groundwater velocity of the Kankakee aquifer is approximately 192 feet/year.

Contaminant distribution in the aquifer system is limited to the Kankakee aquifer. Samples collected from residential bedrock wells in the site area do not indicate contaminants to be present in the carbonate bedrock aquifer.

Groundwater samples collected from 22 monitoring wells in the site area indicate the Kankakee aquifer is contaminated with volatile and semi-volatile organic compounds. Contamination was found primarily at the water table. This occurrence can be attributed to the low solubility of the contaminants identified, as well as the minimal density differences between the contaminants and the groundwater.

The most frequently detected compounds include: acetone, total xylenes, toluene, ethylbenzene, 1,2-dichloroethene, 2,4-dimethylphenol and isophorone. Concentrations of the following contaminants exceeded their established Maximum Contaminant Levels (MCLs):

- benzene
- trichloroethene
- vinyl chloride
- 1,1-dichloroethene
- 1,2-dichloroethane

Several inorganic compounds were detected in groundwater downgradient of the Cross Brothers Pail Recycling site. However, the concentrations of these inorganic compounds do not exceed background conditions.

WELL SYMBOLS

- FULLY SCREENED
- SHALLOW
- INTERMEDIATE
- DEEP
- PUMPING
- OBSERVATION

SYMBOLS

- BASELINE
- PROPERTY LINE
- IRM CONSTRUCTION LIMITS
- UNIMPROVED ROAD
- X665.4 EXISTING SPOT ELEVATION
- ~665~ CONTOUR LINE
- EXISTING TREE LINE
- EXISTING ROAD
- FENCE
- GROUNDWATER FLOW LINE
- 0.5 FEET GROUNDWATER CONTOUR INTERVAL

NOTE: SURFACE ELEVATIONS ESTABLISHED IN NOV. 1986. ELEVATIONS REFERENCED TO AN ASSUMED ON SITE BENCHMARK OF 666.4 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM.

0 175 350 525

SCALE IN FEET
CONTOUR INTERVAL = 1 FOOT

FIGURE 5
PIEZOMETRIC SURFACE
MARCH, 1988

METCALF & EDDY

Table 2 presents a summary of the range and frequency of contaminants detected in groundwater.

Figures 6 and 7 illustrate the distribution of groundwater contamination within the aquifer.

E. <u>Residential Wells</u>

Twenty-two residential wells were sampled during the HS. These wells were screened in both the Kankakee and carbonate bedrock aquifers.

Analysis of the residential well samples identified the presence of 2 organic compounds and 13 inorganic parameters. Phenol and DEHP were the 2 organic compounds detected at low levels. Although the cause and origin of these compounds can not be confirmed, it is probable that the phenol is a result of the septic fields present in the area, and the DEHP originated from the PVC plumbing fixtures used within the houses.

Maximum Contaminant Levels (MCLs) have been established for 3 out of the 13 inorganic compounds identified, while Secondary Maximum Contaminant Levels (SMCLs) have been established for 3 out of the 13 inorganic compounds identified. MCLs have been established for: arsenic, lead and nitrate as nitrogen. SMCLs have been established for iron, manganese and zinc. None of the residential well samples exceeded the MCLs. Only the concentrations of iron and manganese exceeded the established SMCLs. As the SMCLs are established for the aesthetic quality (i.e. taste, odor) of drinking water, they do not represent a potential health risk.

Table 2 presents a summary of the range and frequency of contaminants detected in residential wells.

VI. SUMMARY OF SITE RISKS

A baseline risk assessment was performed for the Cross Brothers Pail Recycling site as part of the HS. The risk assessment identified and evaluated potential human health and environmental threats from the site under the no action alternative. The no action alternative assumes that no remedial action (including institutional controls) will occur at the site.

TABLE 2

RANGE AND FREQUENCY OF CONTAMINANTS DETECTED IN GROUNDWATER

Contaminants Detected	Monitoring Well Concentration Range (ug/kg)	Frequency of Detection	Private Well Concentration Range (ug/kg)	Frequency of Detection
VOLATILE ORGANICS				
Chloromethane	ND - 150 E	1/33	ND	0/22
Vinyl Chloride	ND - 1200	6/33	ND	0/22
Chloroethane	ND - 7 E	3/33	ND	0/22
Methylene Chloride	ND - 3900	4/33	ND	0/22
Acetone	ND - 2400 D	13/33	ND	0/22
1,1-dichloroethene	ND - 74 E	1/33	ND	0/22
1,1-dichloroethane	ND - 15 D	2/33	ND	0/22
1,2-dichloroethene (total)	ND - 1200	12/33	ND	0/22
Chloroform	ND - 3 E	2/33	ND	0/22
1,2-dichloroethane	ND - 6	1/33	ND	0/22
2-butanone	ND - 43	1/33	ND	0/22
1,1,1-trichloroethane	ND - 12	2/33	ND	0/22
Trichloroethene	ND - 24	3/33	ND	0/22
Benzene	ND - 24	11/33	ND	0/22
2-Hexanone	ND - 15	3/33	ND	0/22
4-Methyl-2-Pentanone	ND - 26.1	6/33	ND	0/22
Tetrachloroethene	ND - 14	4/33	ND	0/22
Toluene	ND - 14000	13/33	ND	0/22
Ethylbenzene	ND - 2300	8/33	ND	0/22
Total Xylenes	ND - 14000 D	8/33	ND	0/22
SEMI-VOLATILE ORGANICS				
Benzyl Alcohol	ND - 12	1/33	ND	0/22
2-methylnaphthalene	ND - 3 E	3/33	ND	0/22
Isophorone	ND - 70	13/33	ND	0/22
Naphthalene	ND - 110	6/33	ND	0/22
Di-N-Butylphthalate	ND - 4 E	10/33	ND	0/22
bis(2-ethylhexyl)phthalate	ND - 10 E	2/33	ND - 210	7/22
Benzoic acid	ND - 180	1/33	ND	0/22
2-Methylphenol	ND - 180	4/33	ND	0/22
2,4-Dimethylphenol	ND - 200	9/33	ND	0/22
4-methylphenol	ND - 120	8/33	ND	0/22
Pentachlorophenol	ND - 3 E	1/33	ND	0/22
INORGANICS				
Aluminum	ND - 1520	3/28	ND - 410	1/22
Antimony	ND - 60 E	1/28	ND	0/22
Arsenic	ND - 19	11/28	ND - 6	2/22
Barium	ND - 100	14/28	ND	0/22
Calcium	16400 - 85700	13/13	ND	0/22
Chromium	ND - 29	6/28	ND	0/22
Copper	ND - 12 E	1/28	ND - 137	4/22
Iron	ND - 21000	6/28	ND - 2300	12/22
Lead	ND - 48	18/28	ND - 14	11/22
Manganese	46.7 - 4680	15/15	ND - 1170	18/22
Magnesium	5610 - 16500	13/13	NA	NA
Potassium	5220 - 24600	13/13	NA	NA
Sodium	5170 - 8220	13/13	NA	NA
Zinc	ND - 48	3/13	ND	0/22
Nitrogen-Ammonia	ND - 4000	13/15	30 - 8500	22/22
Nitrogen-Total Kjeldahl	80 - 4380	15/15	40 - 9920	22/22

TABLE 2 (CONT'D)

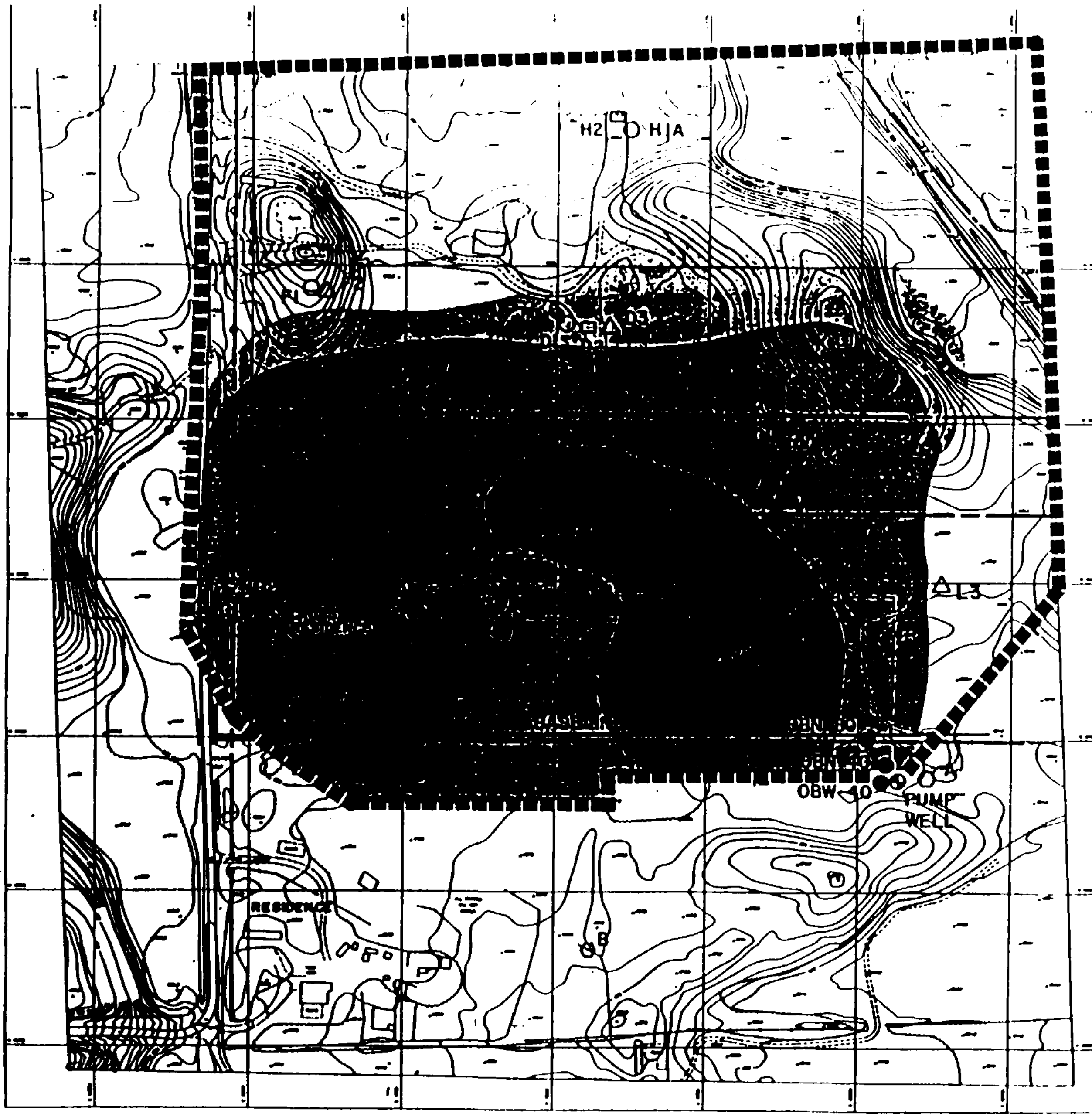
B - Indicates that the contaminant was also found in the blanks of all samples in which it is detected.

E - Contaminant levels detected are all estimated concentrations.

D - Diluted sample.

ND - Not detected.

NA - Not analyzed.



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- EXISTING ROAD
- FENCE
- 10,000-25,000 ppb TOTAL CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS
- 1,000-10,000 ppb TOTAL CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS
- 500-1,000 ppb TOTAL CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS

NOTES

SURFACE ELEVATIONS ESTABLISHED IN NOV., 1988. ELEVATIONS REFERENCED TO AN ASSUMED ON-SITE BENCHMARK OF 666.4 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM

CONCENTRATIONS OF TOTAL ORGANIC COMPOUNDS ARE BASED ON ROUND 2 GROUNDWATER SAMPLING DATA

0 175 350 525

SCALE IN FEET

CONTOUR INTERVAL = 1 FOOT

FIGURE 6

GENERALIZED AREAL EXTENT OF GROUND WATER CONTAMINATION BY TOTAL VOLATILE ORGANIC COMPOUNDS IN THE MONITORING WELLS SCREENED AT THE WATER TABLE

METCALF & EDDY

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WELL SYMBOLS

- FULLY SCREENED
- SHALLOW
- INTERMEDIATE
- DEEP
- PUMPING
- OBSERVATION

SYMBOLS

- BASELINE
- PROPERTY LINE
- IRM CONSTRUCTION LIMITS
- UNIMPROVED ROAD
- X665.4 EXISTING SPOT ELEVATION
- 665 CONTOUR LINE
- EXISTING TREE LINE
- EXISTING ROAD
- FENCE
- 1000-3000 ppb TOTAL CONCENTRATI OF VOLATILE ORGANIC COMPOUNDS
- 100-1000 ppb TOTAL CONCENTRATI OF VOLATILE ORGANIC COMPOUNDS
- 10-100 ppb TOTAL CONCENTRATI OF VOLATILE ORGANIC COMPOUNDS

NOTES:

1) SURFACE ELEVATIONS ESTABLISHED IN NOV. 1988. ELEVATIONS REFERENCED TO AN ASSUMED ON-SITE BENCHMARK OF 666.4 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM.

2) CONCETRATIONS OF TOTAL ORGANIC COMPOUNDS ARE BASED ON ROUND 2 GROUNDWATER SAMPLING DATA.

0 175 350 525

SCALE IN FEET

CONTOUR INTERVAL = 1 FOOT

FIGURE 7

GENERALIZED AREAL EXTENT OF GROUNDWAT CONTAMINATION BY TOTAL VOLATILE ORGANI COMPOUNDS IN MONITORING WELLS SCREENED IN THE MIDDLE OF THE AQUIF

The baseline risk assessment included the following:

- Identification of indicator chemicals
- Toxicity profiles
- Exposure Assessment
- Risk characterization

A. Identification of Indicator Chemicals

Developing a list of indicator chemicals is the first stage in the characterization of risk. The selection of indicator chemicals was designed to identify the "highest risk" chemicals at the site. Choosing the "highest risk" chemicals focuses the baseline risk assessment on the chemicals of greatest concern.

The indicator chemicals for the Cross Brothers site were selected in two steps. First, the chemicals were ranked utilizing the scoring system defined in the Superfund Public Health Evaluation Manual. Final selection was then based on a more comprehensive review of the physical and chemical characteristics of the contaminants, frequency of contaminant detection, distribution of contaminants across medium and the contaminants tentative rankings. Table 3 presents the groundwater and soil indicator selection process.

Twelve chemicals were ultimately selected as indicator chemicals for the Cross Brothers Pail Recycling site. Table 4 presents the indicator chemicals selected.

B. Toxicity Profiles

Toxicity profiles were developed for the selected indicator chemicals. Within each profile chemical and physical parameters of the compound as well as toxicological data on the compound are presented. Table 5 presents the physical and chemical parameters of each indicator chemical, while Table 6 presents the toxicological data for each indicator chemical.

Chemical and physical parameters assist in understanding the potential fate and transport of a chemical in the environment, while the toxicological data assists in defining the potential health effects of a given chemical. The chemical and physical properties taken under consideration included:

TABLE 3
GROUNDWATER INDICATOR COMPOUND SELECTION

COMPOUND	MAX CONC (ug/l)	# of Times Detected / # Times Analyzed	Blank	Weight of Evidence Oral	Weight of Evidence Inhalation	Other Notes	Include as Indicator Compound
Trichloroethene	66	1/20	OK	B2	B2	Detected in one well in 1987 & 88.	YES
Vinyl Chloride	1200	4/20	OK	A	A	All wells above MCL.	YES
1,2-Dichloroethene	1200	8/20	OK	B2	B2	Prevails in wells onsite.	YES
Toluene	14000	6/20	OK	D	D	Found at concentrations usually exceeding 300 ug/l.	YES
Benzene	24	2/20	OK	A	A	Found in C2 and F1. Found at either end of the site.	YES
Ethylbenzene	2300	4/20	OK	D	D	Found in both 1987 and 1988.	YES
Tetrachloroethylene	110	1/20	OK	B2	B2	Not prevalent throughout samples.	YES
2-Butanone	43	1/20	OK	D	D	Detected in 1988 only.	NO
1,1,1-Trichloroethane	98	1/20	OK			Found in only one well in 1987 and 1988.	NO
4-Methyl-2-pentanone	440	1/20	OK	D	D	Found in C2 on round 1 (87) only.	NO
2,4-Dimethylphenol	200	7/20	OK	D	D	Found in 1987 and 88 where sampled.	NO
Cresol	300	7/20	OK	D	D	Found in 1987 and 88 where sampled.	YES
Xylenes	14000	8/20	OK	D	D	Prevails in GW samples.	YES
Isophorone	70	6/20	OK	C	C	Found in 1987 and 88.	YES
Naphthalene	110	4/20	OK	D	D	Found in 1987 and 88.	YES
Benzyl alcohol	74	1/20	OK	D	D	Found in 1987 and 88.	NO
Lead	48	19/20	OK	B2	B2	Found at concentrations below MCL in both 1987 and 88.	NO
Acetone	2900	11/20	In Blank	D	D	Found in blank and, therefore, will not be evaluated	NO
Benzoic acid	180	1/20	OK	D	D	Found at low concentrations.	NO
1,1-dichloroethane	15	1/20	OK		B2	Found only in one well at low concentrations	NO

TABLE 3 (continued)
GROUNDWATER INDICATOR COMPOUND SELECTION

COMPOUND	MAX CONC (ug/l)	# of Times Detected / # Times Analyzed	Blank	Weight of Evidence Oral	Weight of Evidence Inhalation	Other Notes	Include as Indicator Compound
1,1-dichloroethene	74	1/20	OK	C	C	Found only in one well at low concentrations	NO
2-hexanone	12	1/20	OK	D	D	Found only in one well at low concentrations	NO
2-methylnaphthalene	15	4/20	OK	D	D	Found at low concentrations	NO
Bis(2-ethylhexyl)phthalate	10	2/20	OK	B2	B2	Found at low concentrations, but throughout the site area.	YES
Di-n-butylphthalate	4	10/20	OK	D	D	Found at low concentrations	NO
Chloromethane	150	1/20	OK	C	C	Found only once	NO

Weight of Evidence Groups:
- A Human Carcinogen (sufficient evidence from epidemiological studies)
- B Probable human carcinogen
- B1 At least limited evidence of carcinogenicity to humans
- B2 Usually a combination of sufficient evidence in animal and inadequate evidence in humans
- C Possible human carcinogen (limited evidence of carcinogenicity in animals in the absence of human data
- D Noncarcinogen

TABLE 3

SOIL INDICATOR COMPOUND SELECTION

COMPOUND	MAX CONC (ug/Kg)	# of Times Detected / # Times Analyzed	Blank	Weight of Evidence Oral	Weight of Evidence Inhalation	Other Notes	Include as Indicator Compound
Trichloroethene	2800	2/54	OK	B2	B2	Found in 1987 only.	YES
Toluene	95400	8/54	OK	D	D	Found at high concentrations	YES
Ethylbenzene	260000	6/54	OK	D	D	Found in both 1987 and 1988.	YES
Tetrachloroethylene	2400	12/54	OK	B2	B2	Found in both 1987 and 1988. samples.	YES
2-Butanone	9300	3/54	OK	D	D	Not found at high concentrations.	NO
2,4-Dimethylphenol	4300	1/54	OK	D	D	Low frequency of occurance.	NO
Cresol	1200	2/54	OK	D	D	Low frequency of occurance.	YES
Xylenes	1520000	14/54	OK	D	D	Found in 1987 and 88 at high concentrations.	YES
Isophorone	215000	6/54	OK	C	C	Found in 1987 and 88 at high concentrations.	YES
Naphthalene	126000	11/54	OK	D	D	Found at many locations.	YES
Butyl benzyl phthalate	6300	11/54	OK	D	D	Found in 1987 and 88.	NO
Bis(2-ethylhexyl)phthalate	25000	25/54	OK	B2	B2	Found in many samples.	YES
Phenol	560	1/54	OK			Found in only one sample.	NO
Pentachlorophenol	13000	1/54	OK	D	D	Found in only one sample.	NO
Di-n-butylphthalate	13000	7/54	OK	D	D	Not found in groundwater samples	NO
Polychlorinated biphenyls	110000	9/54	OK	B2	B2	Found at high concentrations	YES
1,1,1-trichloroethane	1	1/54	OK	D	D	Found at low concentrations	NO
2-methylnaphthalene	20600	3/54	OK	D	D	Found at low concentrations	NO
4 methyl-2-pentanone	1300	14/54	OK	D	D	Found in only 3 locations	NO
Gamma BHC	9.8	1/54	OK	B2	B2	One at 1300, all others < 120	NO
Benzoic acid	180	1/54	OK	D	D	Found at low concentrations	NO

Weight of Evidence Groups:
- A Human Carcinogen (sufficient evidence from epidemiological studies)
- B Probable human carcinogen
- B1 At least limited evidence of carcinogenicity to humans
- B2 Usually a combination of sufficient evidence in animal and inadequate evidence in humans
- C Possible human carcinogen (limited evidence of carcinogenicity in animals in the absence of human data
- D Noncarcinogen

TABLE 4

LIST OF INDICATOR CHEMICALS

Benzene
Bis (2-ethylhexyl) phthalate
Cresols
1,2-dichloroethene
Ethyl benzene
Isophorone
Naphthalene
Polychlorinated biphenyls
Tetrachloroethene
Toluene
Vinyl chloride
Xylenes (total)

TABLE 5

Physical Characteristics of Indicator Compounds (a)

COMPOUND	Koc (ml/g)	Molecular Weight (g/mol)	Log Octanol Water Partition Coefficient	Water Solubility (mg/L) 20-25 Deg. C
1,2-Dichloroethene	49-59	96.95	0.48-0.70	3500-6300
Benzene	83	78.12	2.12	1750
Bis(2-Ethylhexyl)Phthalate	na	391	na	0.4
Cresol	500	108	1.97	31000
Ethylbenzene	1100	106.18	3.15	152
Isophorone	na	138.21	1.7 (b)	12000
Naphthalene	na	128	na	34.4
Polychlorinated Biphenyls	530000	328	6.04	0.031
Tetrachloroethene	364	165.85	2.6	150
Toluene	300	92.15	2.73	535
Total Xylenes	240	106	3.26	198
Vinyl Chloride	57	62.5	1.38	2760

na - not available

Koc - Organic carbon partition coefficient

(a) Values obtained from the US EPA Superfund Public Health Evaluation Manual

(b) US PHS, 1988. Toxicological profile of Isophorone.

TABLE 6

TOXOLOGICAL DATA FOR INDICATOR COMPOUNDS

INDICATOR COMPOUND	WEIGHT OF EVIDENCE (a)	CPF (mg/Kg/day)-1	RfD (mg/Kg/day)	CRITICAL EFFECT
Vinyl chloride	A	2.3 (i)	0.0013 (i)	Liver (i)
1,2-Dichloroethene	D		0.01 (c)	Fatty deposit in liver (c)
Toluene	D		0.3 (d)	Hematological parameters (d)
Benzene	A	0.029 (f)	0.0007 (c)	Leukopenia (f)
Ethylbenzene	D		0.1 (e)	Liver, Kidney toxicity (e)
Tetrachloroethylene	B2	0.051 (b)	0.01 (b)	Hepatotoxicity in mice (b)
Xylene (total)	D		2 (g)	Hyperactivity, increased body weight (g)
Polychlorinated biphenyls	B2	7.7 (b)	0.0001 (j)	Reduced Offsping size (j)
Isophorone	C	0.0041 (b)	0.15 (b)	Kidney lesions (h)
Napthalene	D		0.4 (b)	Ocular and internal lesions (k)
Bis(2-ethylhexyl)phthalate	B2	0.014 (b)	0.02 (b)	Increased liver weight (k)
Cresol	D		0.05 (k)	Reduced body weight (k)

(a) USEPA, 1988a. Integrated Risk Information System, tetrachloroethene, January, 1989.
(b) USEPA, 1986. Superfund Public Health Evaluation Manual Update, July 1988.
(c) USEPA, 1987a. Health Advisories for 25 Organics, March, 1987.
(d) USEPA, 1989a. Integrated Risk Information System, Toluene, January, 1989.
(e) USEPA, 1989b. Integrated Risk Information System, Ethylbenzene, January, 1989.
(f) USEPA, 1988b. Integrated Risk Information System, Benzene, January, 1989.
(g) USEPA, 1988c. Integrated Risk Information System, Xylenes, October, 1988.
(h) USEPA, 1988d. Integrated Risk Information System, Isophorone, June, 1988.
(i) USPHS, 1988. Toxilogical Profile of Vinyl Chloride. Not an RfD referred to as "minimal risk of effects other than cancer for lifetime". See toxicological profile in Appendix N.
(j) USPHS, 1987. Toxicological Profile for Selected PCBs.
(k) USEPA, 1989. Health Effects Assessment Summary Tables. March, 1989.

Weight of Evidence Groups:
A Human carcinogen (sufficient evidence from epidemiological studies)
B Probable human carcinogen
B1 At least limited evidence of carcinogenicity to humans
B2 Usually a combination of sufficient evidence in animals and inadequate data in humans.
C Possible human carcinogen (limited evidence of carcinogenicity in animals in the absence of human data.
D Noncarcinogen

CPF - Carcinogenic Potency Factor

RfD - Reference Dose

- Organic Carbon Partition Coefficient (Koc)
- Molecular Weight
- Log Octanol-Water Partition Coefficient (Log Kow)
- Water Solubility

Cancer Potency Factors (CPFs) and Reference Doses (Rfd) are the main pieces of toxicological data considered for each chemical. CPFs are developed by U.S. 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 $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. CPFs 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.

Rfds have been developed by U.S. EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. Rfds, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (i.e. the amount of a chemical ingested from contaminated drinking water) can be compared to the Rfd. Rfds are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the Rfds will not underestimate the potential for adverse noncarcinogenic effects to occur.

C. Exposure Assessment

In the exposure assessment, the potential exposure pathways by which humans and wildlife could come into contact with contaminants from the site were evaluated. Exposure pathways were considered for both current and future land use conditions.

A complete exposure pathway has five elements: a contaminant source, a mechanism for contaminant release, an environmental transport medium, an exposure point and a route of exposure.

An initial screening of each potential pathway was performed to identify the routes likely to present the largest exposures and greatest health impacts. This screening identified two primary exposure pathways:

- o Ingestion of contaminated groundwater; and
- o Ingestion of contaminated soil.

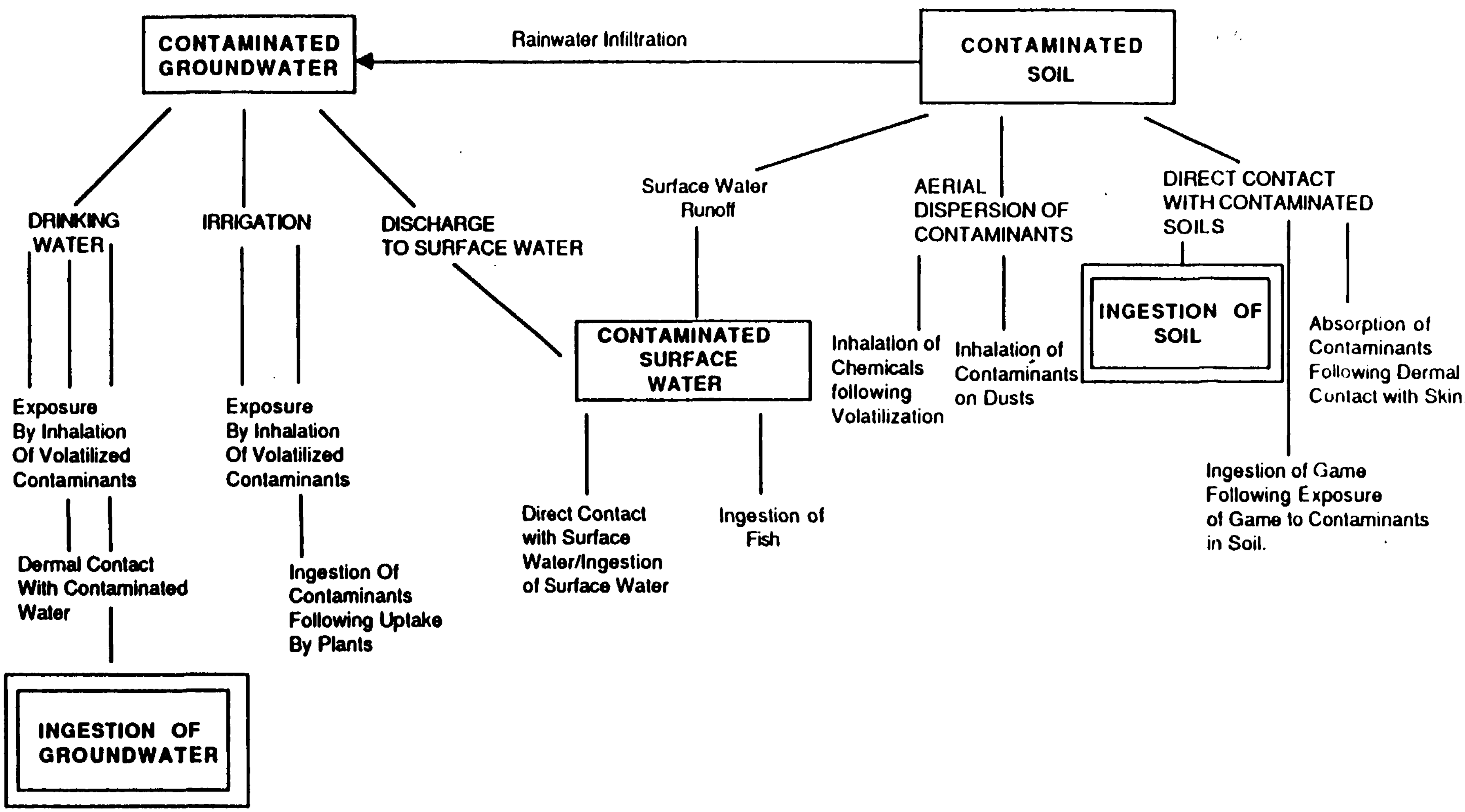
Figure 8 presents the potential exposure pathways considered for the the Cross Brothers Pail Recycling site. Table 7 presents the results of the initial screening of potential exposure pathways.

D. Risk Characterization

This portion of the risk assessment evaluated the various exposure pathways and identified, by medium, the potential risks to human health and the environment. The risk characterization for the Cross Brothers Pail Recycling site was presented in three parts: a comparison of contaminant levels with standards or criteria (i.e. MCLs), a comparison of estimated human dose with the Rfds and a calculation of increased lifetime cancer risk.

Increased lifetime cancer risks are determined by multiplying the intake level with the CPF. These risks are probabilities that are generally expressed in scientific notation (e.g. 1×10^{-6} or 1E-6). An increased lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a 1 in 1 million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

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



Potential
Figure 8 -- EXPOSURE PATHWAYS

TABLE 7

Initial Screening of Exposure Pathways

Potential Exposure Route	Potential Contaminant Source	Factors Influencing Exposure	Detailed Evaluation
Contaminated groundwater: Drinking water and water used for domestic purposes	Contaminated groundwater	There are residential wells located near the site, and contamination of the groundwater has been documented. This exposure pathway will be evaluted quantitatively using an ingestion rate of two liters of water a day. Inhalation and direct contact dose calculations will not be performed, however the two pathways will be discussed qualitatively.	Yes
Irrigation	Contaminated groundwater		
Ingestion of contaminated foods		Where contaminated groundwater is used to irrigate crops, there is a potential for uptake of contaminants by plants. Much of the surrounding area is cropland. Irrigation wells are installed in deep bedrocks, and since the data collected shows greatest contamination in wells screened at the water table interface, it is not expected that high concentrations of contaminants would be detected in a deep bedrock aquifer. In addition, groundwater cleanup based on protection of the aquifer as a drinking water supply is expected to be protective of use for irrigation.	No
Inhalation of volatile organics		Contaminants may volatilize during irrigation. Not included for quantitative evaluating, see previous discussion.	No
Contaminated Soil: Ingestion	Contaminated Surface soil	Factors influencing the extent of ingestion of contaminated soil include the accessability of the site, nearby population, and the extent of ground cover. Since there is no fence or other barrier, the site is active, and people are on site regularly, this pathway will be considered for a detailed evaluation.	Yes
Direct contact		Exposure to contaminants in soil by dermal contact is dependant on the above mentioned factors and the potential for absorption through the skin. For volatile organic compounds it is often assumed that 10-25% of the contaminants in soil on skin is absorbed (Ryan, 1987). This exposure pathway is likely to present a smaller impact than the ingestion pathways and will not be evaluated quantitatively.	No
Inhalation of dust		Dust dispersion beyond local tree cover is expected to be limited. In addition, exposure to soil as dust is expected to be small compared to exposure to soil by ingestion, and the inhalation of dust exposure is not expected to greatly impact this baseline assessment.	No
Inhalation of volatilized chemicals		Inhalation of contaminants following volatilization from soil is expected to represent a minimal exposure when compared to exposure by ingestion of soil. It will not be evaluated in detail.	No
Surface water	Surface water	Migration of contaminants to the nearest natural surface water, the Kankakee River, is expected to be minimal. This is due to the distance from the site to the river and expected decreases in contaminant concentration from interactions in the environment such as dilution, adsorption, and biodegradation.	No
		Drainage ditches in the area, used to collect runoff, are often dry. Exposure duration/frequency is not expected to be large enough to include a detailed evaluation.	No
Contaminated game	Contaminated game	While hunting does occur onsite, it seems unlikely that meat from hunting makes up a large portion of an individuals diet. The exposure pathway is not expected to result as large in an exposure as other pathways and, therefore, will not be evaluated in detail.	No

1. Groundwater Risk Characterization

As groundwater is currently being used by area residents as a drinking water source, the ingestion of contaminated groundwater is a probable exposure pathway. Although sampling of residential wells in the vicinity of the site do not indicate the presence of site related contaminants, contamination of these wells, in the future, is likely given current groundwater flow conditions. In addition, groundwater is an environmental resource which has been contaminated as a result of the disposal practices occurring during the site's operation.

Concentrations of the following groundwater contaminants currently exceed their established MCLs: benzene, trichloroethene, vinyl chloride, 1,1-dichloroethene and 1,2-dichloroethane. The MCLs are legally enforceable standards of the maximum permissible levels of contaminants allowed in a drinking water used by the general public. These standards reflect the best achievable levels considering monitoring capabilities, cost of treatment, available technology and health effects.

In addition, a Hazard Index (HI) and the cumulative increased lifetime cancer risk was calculated for the ingestion of groundwater. A maximum and representative value was calculated for each of the above parameters. The maximum and representative HI for groundwater are 33.49 and 2.59, respectively. The maximum and representative cumulative increased lifetime cancer risk values for groundwater are 7.9×10^{-2} and 4.2×10^{-3}, respectively.

The concentration of vinyl chloride is a significant contributor to the calculation of both the maximum and representative HI and cumulative increased lifetime cancer risk. In addition, the following chemicals are at concentrations of concern due to either their exceedance of the MCL or their calculated hazard ratio or increased lifetime cancer risk: 1,1-dichloroethene, toluene, benzene, 1,2-dichloroethene, 1,2-dichloroethane, and tetrachloroethene.

Table 8 presents a summary of the groundwater risk characterization.

TABLE 8

Groundwater Risk Characterization

INDICATOR CHEMICAL	CONCENTRATION MAXIMUM (mg/l)	CONCENTRATION REPRESENTATIVE (mg/l)	DOSE MAXIMUM (mg/Kg/day)	DOSE REPRESENTATIVE (mg/Kg/day)	RfD (mg/Kg/day)	CPF (mg/Kg/day)-1	HAZARD RATIO MAXIMUM	HAZARD RATIO REPRESENTATIVE	INCREASED LIFETIME CANCER RISK MAXIMUM	INCREASED LIFETIME CANCER RISK REPRESENTATIVE
Vinyl chloride	1.2	0.063	0.0343	0.0018	0.0013	2.3	26.37	1.38	7.89E-02	4.14E-03
1,2-Dichloroethene	1.2	0.075	0.0343	0.0021	0.01		3.43	0.21	---	---
Toluene	14	0.5714	0.4000	0.0163	0.3		1.33	0.05	---	---
Benzene	0.024	0.019	0.0007	0.0005	0.0007	0.029	0.98	0.78	1.99E-05	1.57E-05
Ethylbenzene	2.3	0.2245	0.0657	0.0064	0.1		0.66	0.06	---	---
Tetrachloroethene	0.11	0.019	0.0031	0.0005	0.01	0.051	0.31	0.05	1.60E-04	2.77E-05
Xylene (total)	14	1.434	0.4000	0.0410	2		0.20	0.02	---	---
Polychlorinated biphenyls	ND	ND	---	---	0.0001	7.7	---	---	---	---
Isophorone	0.07	0.012	0.0020	0.0003	0.15	0.0041	0.01	0.00	8.20E-06	1.41E-06
Naphthalene	0.11	0.018	0.0031	0.0005	0.4		0.01	0.00	---	---
Bis(2-Ethylhexyl)Phthalate	0.01	0.005	0.0003	0.0001	0.02	0.014	0.01	0.01	4.00E-06	2.00E-06
Cresol	0.3	0.021	0.0086	0.0006	0.05		0.17	0.01	---	---
					TOTAL (HAZARD INDEX) =		33.49	2.59	7.90E-02	4.19E-03

ND: Not detected

RfD - Reference Dose

CPF - Carcinogenic Potency Factor

EQUATIONS:

Dosages were calculated as follows:

$$\text{Dose (mg/Kg/day)} = \frac{\text{(Concentration (mg/l))} \times \text{(2 Liters of water per day)}}{\text{(70 Kg body weight)}}$$

$$\text{Hazard Ratio (unitless)} = \frac{\text{(Calculated dose (mg/Kg/day))}}{\text{(Reference dose (mg/Kg/day))}}$$

Hazard Index = Sum of Hazard Ratios

Increased Lifetime Cancer Risk (unitless) = (Dose (mg/Kg/day)) x (Cancer Potency Factor (mg/Kg/day)-1)

2. Surface and Subsurface Soil Risk Characterization

At this time, no standards have been established by U.S. EPA or IEPA for soils. U.S. EPA does however, have guidance relating to the cleanup of PCB spills onto soils. This guidance sets a 10 ppm requirement for decontaminating PCB spills in nonrestricted access areas (40 CFR 761.125(c)(4)). It is considered appropriate to compare the concentrations of PCBs found in the soils at the Cross Brothers Pail Recycling site to this requirement.

The concentrations of PCBs in surface soils do not exceed the 10 ppm cleanup requirement of U.S. EPA's PCB spill guidance. In addition, the concentrations of PCBs in subsurface soils, with the exception of one location, do not exceed the 10 ppm cleanup requirement of U.S. EPA's PCB spill guidance. One sampling location in the south-central portion of the site had PCBs at 110 ppm (Figure 9).

In calculating the HI and the cumulative increased lifetime cancer risk for the soils at the Cross Brothers Pail Recycling site, the representative values were calculated using an average of the surface soils concentrations. The maximum value was calculated however, using the maximum soil concentrations found in surface and subsurface soils. As such the representative HI and cumulative increased lifetime cancer risk is felt to represent the potential exposure resulting from trespassing or working on the site, while the maximum HI and increased lifetime cancer risk reflects a conservative, worst-case exposure scenario. The maximum and representative HI for the soils are 1.6 and .006 respectively. The maximum and representative cumulative increased lifetime cancer risk for the soils are 1.21×10^{-3} and 2.45×10^{-6}.

A review of the hazard ratios and increased lifetime cancer risk for each indicator chemical indicates that PCBs are the primary contributor to the HI and cumulative increased lifetime cancer risks for soils. As such, the one sampling location with 110 ppm of PCBs present in the south-central portion of the site is responsible for the calculated maximum HI and cumulative increased lifetime cancer risk.

Although volatile and semi-volatile organic compounds were detected in surface and subsurface soils, the hazard ratios and increased lifetime cancer risk values for the various indicator chemicals representing these groups of compounds indicate, volatile and semi-volatile organic compounds present a negligible amount of risk to human health from direct contact. The presence of these compounds in the soils due to their physical and chemical properties do, however, present a continual risk to groundwater.

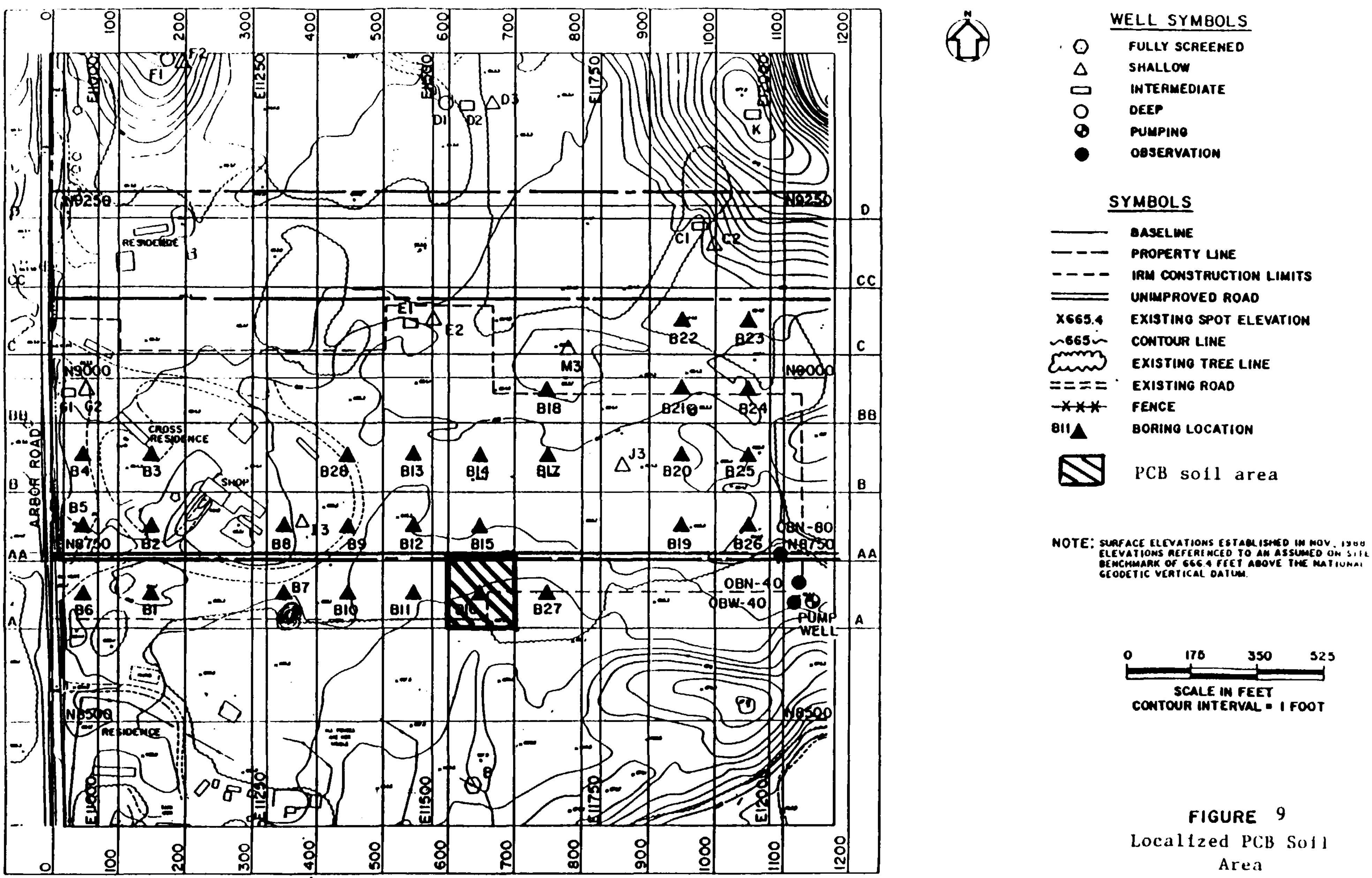


FIGURE 9
Localized PCB Soil Area

TABLE 9

Soil Risk Characterization

INDICATOR CHEMICAL	CONCENTRATION MAXIMUM (mg/Kg)	CONCENTRATION REPRESENTATIVE (mg/Kg)	DOSE MAXIMUM (mg/Kg/day)	DOSE REPRESENTATIVE (mg/Kg/day)	RfD (mg/Kg/day)	CPF (mg/Kg/day)-1	HAZARD RATIO MAXIMUM	HAZARD RATIO REPRESENTATIVE	INCREASED LIFETIME CANCER RISK MAXIMUM	INCREASED LIFETIME CANCER RISK REPRESENTATIVE
Vinyl chloride	ND	ND	---	---	0.0013	2.3	---	---	---	---
1,2-Dichloroethene	ND	ND	---	---	0.01		---	---	---	---
Toluene	95.4	5.28	1.36E-04	7.54E-06	0.3		0.00045	0.00003	---	---
Benzene	ND	ND	---	---	0.0007	0.029	---	---	---	---
Ethylbenzene	260	2.6	3.71E-04	3.71E-06	0.1		0.00371	0.00004	---	---
Tetrachloroethene	2.4	0.287	3.43E-06	4.10E-07	0.01	0.051	0.00034	0.00004	1.75E-07	2.09E-08
Xylene (total)	1520	63.4	2.17E-03	9.06E-05	2		0.00109	0.00005	---	---
Polychlorinated biphenyls	110	0.208	1.57E-04	2.97E-07	0.0001	7.7	1.57143	0.00297	1.21E-03	2.29E-06
Isophorone	215	10.797	3.07E-04	1.54E-05	0.15	0.0041	0.00205	0.00010	1.26E-06	6.32E-08
Naphthalene	126	7.325	1.80E-04	1.05E-05	0.4		0.00045	0.00003	---	---
Bis(2-ethylhexyl)phthalate	25	4.094	3.57E-05	5.85E-06	0.002	0.014	0.01786	0.00292	5.00E-07	8.19E-08
Cresol	1.2	0.0001	1.71E-06	1.43E-10	0.05		0.00003	0.00000	---	---
					TOTAL (HAZARD INDEX) =		1.597414	0.006173	1.21E-03	2.45E-06

ND: NOT DETECTED
RfD - Reference Dose
CPF - Carcinogenic Potency Factor

EQUATIONS:
Dosages were calculated as follows:

$$\text{Dose (mg/Kg/day)} = \frac{\text{(Concentration (mg/Kg))} \times \text{(0.0001 Kilograms of contaminated soil per day)}}{\text{(70 Kg body weight)}}$$

$$\text{Hazard Ratio (unitless)} = \frac{\text{(Calculated dose (mg/Kg/day))}}{\text{(Reference dose (mg/Kg/day))}}$$

Hazard Index = Sum of Hazard Ratios.

Increased Lifetime
Cancer Risk (unitless) = (Dose (mg/Kg/day)) x (Cancer Potency Factor (mg/Kg/day)-1)

Four remedial alternatives were developed for the Cross Brothers site. These alternatives progress from addressing the principal threat of groundwater contamination; to more complex alternatives addressing both the threat of groundwater contamination and surface/subsurface soils as a source for groundwater contamination. In addition, two options addressing the small volume of PCB contaminated soils were developed. These alternatives and options are described below.

ALTERNATIVE 1 - NO ACTION

Estimated Total Remedial Cost: $ 0

Estimated Remedial Action Time: 0

The Superfund program requires that the "no action" alternative be considered at every site. Under this alternative, U.S. EPA and IEPA would take no further action at the site to control the sources of contamination. All wastes, routes of off-site contaminant migration (i.e. groundwater), and human and environmental exposure pathways will remain unchanged. This alternative would not reduce the threats to human health or the environment identified at the site.

ALTERNATIVE 2 - PUMP AND TREAT/SOIL FLUSHING

Estimated Total Remedial Cost: $ 1,729,400 present worth
Estimated Total Capital Costs: $ 888,708
Estimated Annual O & M Costs : $ 58,130

Estimated Remedial Action Time: 15 years

Alternative 2 includes the following major components: access restrictions, a groundwater collection system, an on-site groundwater treatment system and a soil flushing system. Figure 10 shows the major components of Alternative 2.

Groundwater would first be removed from the aquifer with a series of pumping wells. The collected groundwater is then transported through piping to the on-site treatment system for treatment. Subsequent to treatment the groundwater will meet the following 2 standards:

- **Currently promulgated MCLs; and**
- **A cumulative lifetime excess cancer risk not exceeding 10^{-6} and a Hazard Index $\leq$ 1.**

The treated groundwater will then be applied with a spray irrigation system to the 3.5 acre area of heavy soil contamination in the center of the site (Figure 10). Six inches of gravel will be laid in this area to assist in distributing the treated groundwater evenly across the area. The water will then flush through the soils, leaching contaminants from the soil and into the groundwater where they will be captured and treated. This type of soil flushing operation should reduce the contaminant levels present in the soils to negligible levels.

A groundwater monitoring program will be implemented to assess changes in aquifer conditions during and after the remedial activities, and to evaluate the effectiveness of the groundwater collection system. Access restrictions will include fencing the site and a deed notification.

ALTERNATIVE 3 - PUMP AND TREAT/SOIL COVER

Estimated Total Remedial Cost 3A:	$ 1,956,700	present worth
Estimated Total Capital Costs 3A:	$ 1,214,541	
Esitmated Annual O & M Costs 3A :	$ 59,235	

Estimated Total Remedial Cost 3B:	$ 1,872,800	present worth
Estimated Total Capital Costs 3B:	$ 1,006,680	
Estimated Annual O & M Costs 3B :	$ 72,170	

Estimated Remedial Action Time 3A: 15 years
3B: 11 years

Alternative 3A includes the same major components as Alternative 2. Alternative 3A will however, include a 6 inch vegetative cover. Initially, the cover will be placed over that portion of the site not subject to soil flushing. The cover will however be extended to include that portion of the site subject to soil flushing upon completion of the soil flushing activities. Figure 11 illustrates the extent of the vegetative cover.

Alternative 3B includes most of the same major components as Alternative 3A. Alternative 3B will use the same access restrictions, 6 inch vegetative cover, groundwater collection system and groundwater treatment system described for Alternative 3A. In Alternative 3B however, the treated groundwater will be reinjected back into the aquifer and the 6 inch vegetative cover will be placed over the entire site area (10 acres) initially.

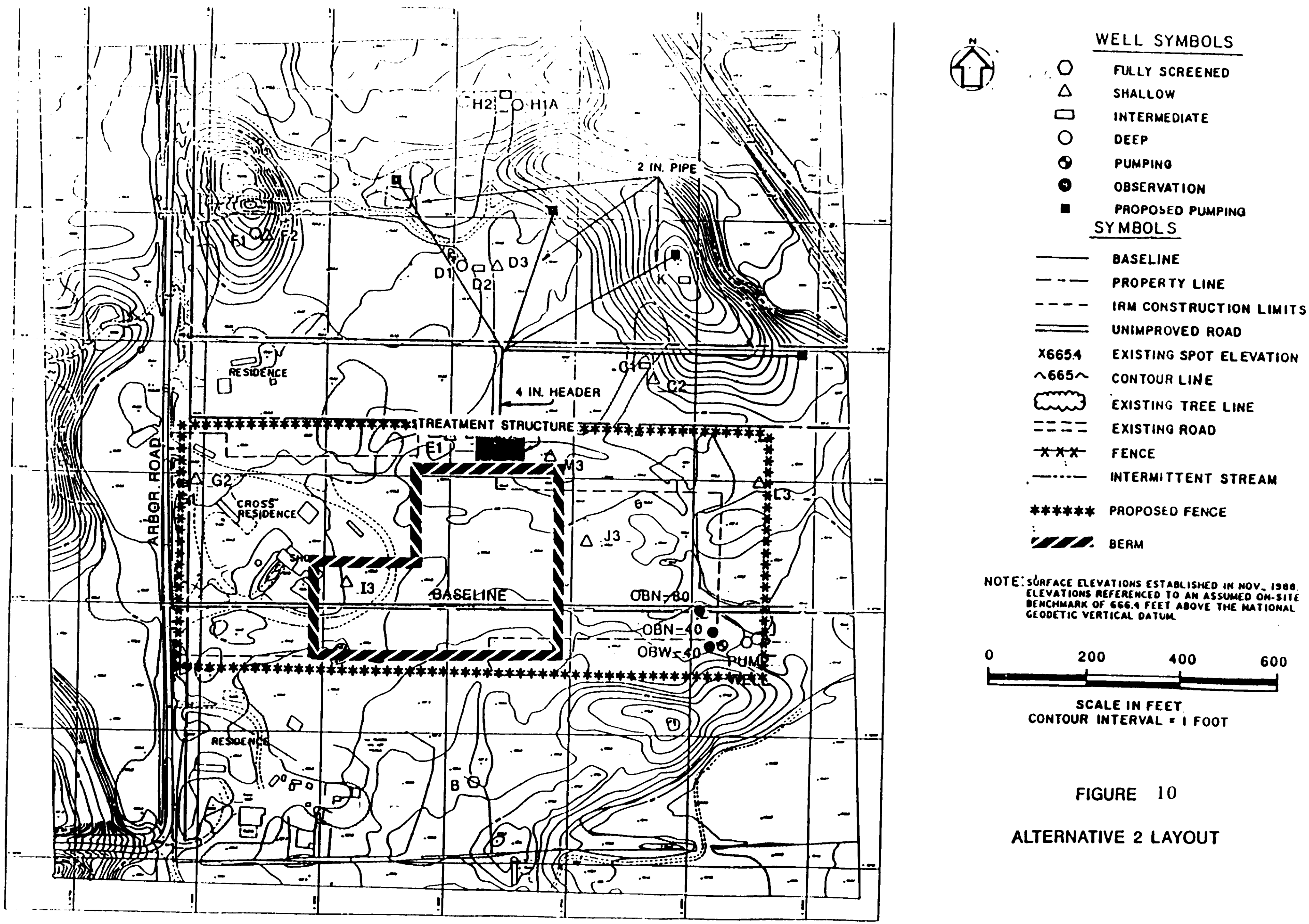


FIGURE 10

ALTERNATIVE 2 LAYOUT

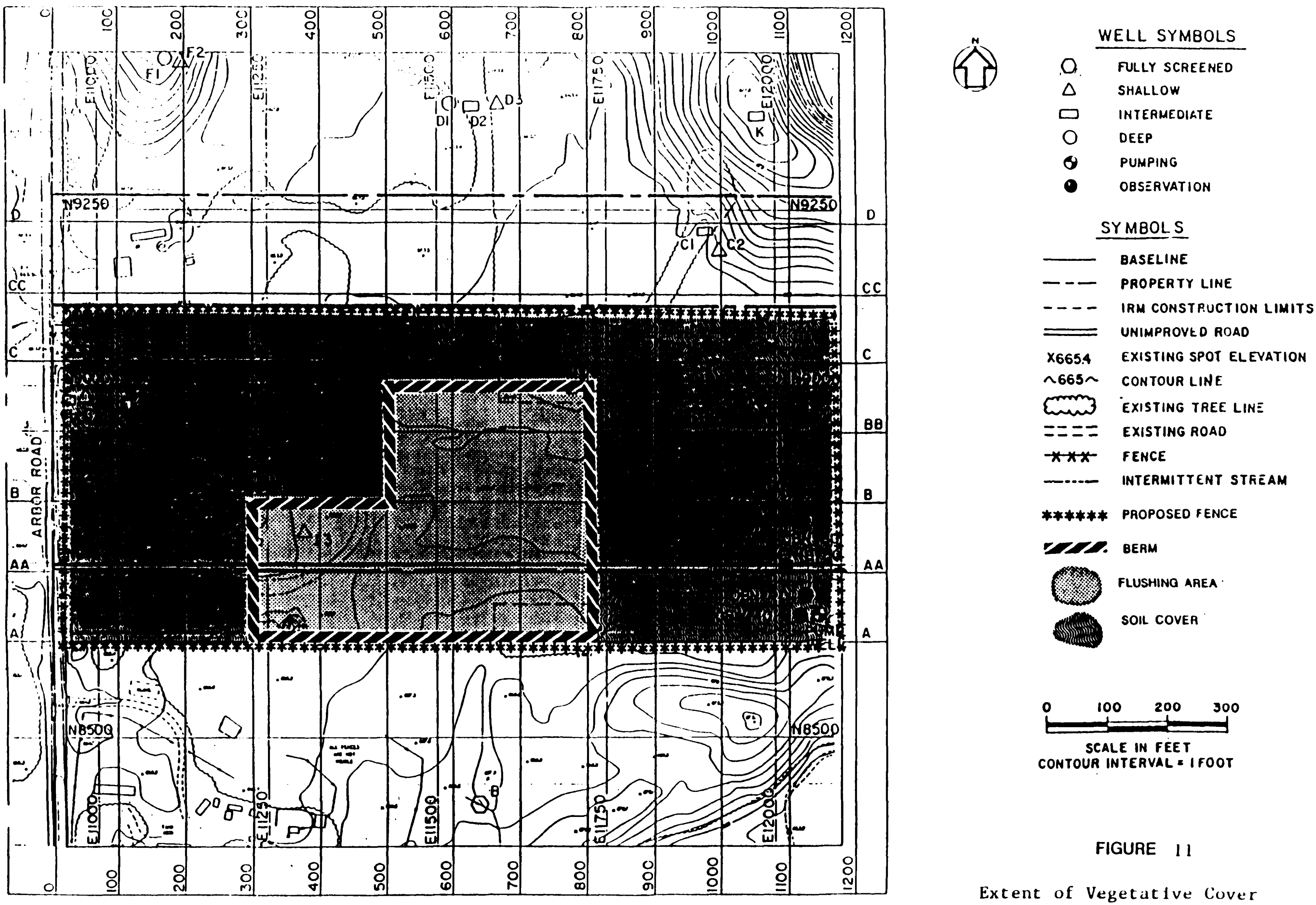


FIGURE 11

Extent of Vegetative Cover

ALTERNATIVE 4 - PUMP AND TREAT/MULTI-LAYER CAP

Estimated Total Remedial Cost 4A: $ 2,285,000 present worth
Estimated Total Capital Costs 4A: $ 1,371,268
Estimated Annual O & M Costs 4A : $ 74,378

Estimated Total Remedial Cost 4B: $ 2,997,300 present worth
Estimated Total Capital Costs 4B: $ 1,946,575
Estimated Annual O & M Costs 4B : $ 77,254

Estimated Remedial Action Time 4A: 10 years
4B: 10 years

Alternative 4A utilizes the same major process options as Alternative 3B, with the exception that a multi-layer cap is installed rather than a vegetative cover. The multi-layer cap would be installed over the 3.5 acre area of heavy soil contamination. The multi-layer cap will prevent rainwater from infiltrating through the area, thereby precluding contaminant leaching into the groundwater.

Alternative 4B is identical to Alternative 4A except the multi-layer cap would be installed over the entire site area (10 acres).

OPTIONS FOR PCB CONTAMINATED SUBSURFACE SOILS

Both options require resampling of the PCB soil area initially, to confirm the presence of a PCB source in the area. If these samples indicate soils to be contaminated above 10 ppm then the other activities (i.e. excavation, incineration, etc.) described in either option would be conducted.

OPTION 1 - PCB SOILS REMOVAL AND INCINERATION

Estimated Total Remedial Cost: $ 17,700

Option 1 includes excavation of an estimated 5 yd^3 of soils contaminated above a concentration of 10 ppm PCBs. This area will initially be resampled to determine the exact volume of PCB contaminated soils to be excavated. Under this option the excavated soils will be drummed and transported to an off-site TSCA approved incinerator for thermal treatment.

OPTION 2 - PCB SOILS REMOVAL AND LANDFILLING

Estimated Total Remedial Cost: $ 8,600

Option 2 is similar to Option 1 except the excavated soils would be transported in bulk to a TSCA approved landfill for land disposal.

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives developed during the Cross Brothers Pail Recycling site FS were evaluated by U.S. EPA and IEPA using the following 9 criteria. The advantages and disadvantages of each alternative were then compared to identify the alternative providing the best balance among these 9 criteria.

1. **Overall Protection of Human Health and the Environment** addresses whether or not an alternative provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment and engineering or institutional controls.

2. **Compliance with Applicable or Relevent and Appropriate Requirements (ARARs)** addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements or provide grounds for invoking a waiver.

3. **Long-term Effectiveness and Permanence** refers to the ability of an alternative to maintain reliable protection of human health and the environment, over time, once cleanup objectives have been met.

4. **Reduction of Toxicity, Mobility or Volume** is the anticipated performance of the treatment technologies an alternative may employ.

5. **Short-term Effectiveness** involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup objectives are achieved.

6. **Implementability** is the technical and administrative feasibility of an alternative, including the availability of goods and services needed to implement the solution.

7. **Cost** includes capital costs, as well as operation and maintenance costs.

8. **Agency Acceptance** indicates whether, based on its review of the HS/FS and Proposed Plan, U.S. EPA and IEPA agree on the preferred alternative.

9. **Community Acceptance** indicates the public support of a given alternative. This criteria is discussed in the Responsiveness Summary.

A matrix summarizing the comparative analysis of alternatives on a criteria by criteria basis is presented in Table 10.

The following discussion expounds on the information provided in Table 10.

A. Overall Protection of Human Health and the Environment

All of the remedial alternatives considered for the Cross Brothers Pail Recycling site, except for the no action alternative, are protective of human health and the environment by eliminating, reducing or controlling risks through various combinations of treatment and engineering controls and/or institutional controls. As the no action alternative does not provide protection of human health and the environment, it is not eligible for selection and shall not be discussed further in this document.

All of the alternatives reduce the risks associated with groundwater contamination by pumping and treating contaminated groundwater. A groundwater monitoring program will also be implemented to evaluate the effectiveness of the groundwater remediation activities. In addition, all of the alternatives utilize access restrictions (i.e. fence and deed notification).

Alternative 3A does, however, include the removal of soil contaminants through soil flushing. The treated groundwater will be utilized as the flushing agent. In addition, a 6 inch vegetative cover will be placed over the non-flushed areas to stablize the soils on-site. Alternative 2 includes the same basic remedial components as Alternative 3A, less the vegetative soil cover.

Alternative 3B does not include the soil flushing system. Treated groundwater would be returned to the aquifer through a series of re-injection wells. Alternative 3B also includes a 6 inch vegetative cover over the entire site area. The use of this cover type will result in passive flushing of the soils through natural infiltration.

Alternative 4A is very similar to Alternative 3B. The treated groundwater will be re-injected into the aquifer. Rather than a 6 inch vegetative cover, Alternative 4A utilizes a small multi-layer cap over the most heavily contaminated soil area to prevent the infiltration of precipitation. Alternative 4B is identical to Alternative 4A except the multi-layer cap will cover the entire site area.

PCB Soil Removal - Option 1 requires removal of the localized PCB-contaminated soil area and incineration at a TSCA approved incinerator. PCB Soil Removal - Option 2 requires removal of the localized PCB-contaminated soil area and landfilling of the soils at a TSCA approved landfill.

B. <u>ARARs Compliance</u>

SARA requires that remedial actions meet legally applicable or relevant and appropriate requirements (ARARs) of other environmental laws. These laws may include: the Toxic Substances Control Act, the Safe Drinking Water Act, the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, and any state law which has stricter requirements than the corresponding federal law.

A "legally applicable" requirement is one which would legally apply to the response action if that action were not taken pursuant to Sections 104, 106 or 122 of CERCLA. A "relevant and appropriate" requirement is one that, while not "applicable", is designed to apply to problems sufficiently similar that their application is appropriate.

All of the alternatives proposed for the Cross Brothers Pail Recycling site meet or exceed ARARs.

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

The alternatives considered for the Cross Brothers Pail Recycling site vary in their ability to provide long-term effectiveness and permanence.

Each of the alternatives considered includes a groundwater pump and treat component. By eliminating the contaminants present in groundwater each of the alternatives achieves a certain degree of long-term effectiveness and permanence. The difference between the alternatives with regard to long-term effectiveness and permanence is directly related to how each alternative addresses soil contamination at the site.

Alternative 3A provides the greatest degree of permanence. The heavily contaminated soil area is flushed, removing any leachable materials from the soil. A 6 inch vegetative cover is placed over the site's non-flushed area stabilizing the soils on-site. Alternative 2 follows Alternative 3A in degree of permanence. Alternative 2 does not include the 6 inch vegetative cover. As such, soils in the non-flushed areas will be subject to wind and water erosion. Alternative 3B, which includes pump and treat with re-injection of the treated groundwater, provides the least amount of long-term effectiveness and permanence.

Alternative 3B does not actively address the contamination in the soil. The presence of only a 6 inch vegetative cover will allow passive flushing of the soil contaminants. Thus recontamination of the groundwater due to leaching of the contaminated soils is likely. Alternatives 4A and 4B, while not removing the contaminants present in the soil, do offer greater long-term effectiveness than Alternative 3B by containing the contaminants. Both of these alternatives include a multi-layer cap that will limit the infiltration of precipitation through the soils and preclude the leaching of contaminants into the groundwater.

The long-term effectiveness and permanence differ greatly with respect to the PCB Soil Removal Options. Option 1, removal and incineration, provides far greater permanence than Option 2 - removal and landfilling. Under Option 1, the PCBs present in the soils will be permanently destroyed. Option 2, however, only displaces the contamination to a new location.

D. Reduction of Toxicity, Mobility or Volume through Treatment

All of the alternatives include a component which reduces the toxicity, mobility and volume of the contaminants present in the groundwater at the site through treatment. The difference between alternatives is most noted with regard to the contaminants present in the soils at the site.

Alternatives 2 and 3A provide for the greatest reduction in the toxicity, mobility and volume of the contaminated soils. Both of these alternatives require the soils to be continually flushed during the groundwater remediation activities. Upon completion of the groundwater remediation activities (estimated 15 years), any leachable contaminants will be removed from the soils. Alternatives 4A and 4B reduce only the mobility of the soil contaminants through the use of a multi-layer cap. The multi-layer cap will limit the infiltration of precipitation, and preclude the leaching of soil contaminants into the groundwater. Alternative 3B does not actively address the contaminated soils at the site. Therefore, Alternative 3B does not provide a significant reduction in the toxicity, mobility or volume of the soil contaminants.

PCB Soil Removal - Option 1 significantly reduces the toxicity, mobility and volume of the PCB contaminated soils by thermally destroying the PCBs. Option 2, however, only reduces the mobility of the PCBs by landfilling the soil in a TSCA landfill.

E. Short-term Effectiveness

All of the alternatives considered have similar impacts on short-term effectiveness resulting from a groundwater treatment system being utilized. The alternatives differ, however, with respect to the other remedial components used, as well as the length of time required to remediate the site. These factors present varying potential short-term risks across all the alternatives. It is not obvious however, that any one alternative presents lower overall short-term risks than the others.

The use of the soil flushing under Alternatives 2 and 3A presents a potential short-term risk to the environment by temporarily increasing the mobility of the contaminants within the soils. This increased risk, however, will be controlled through the proper placement of the groundwater pumping system. In addition, the groundwater monitoring program will assess any changes in aquifer conditions. The use of soil flushing in these alternatives lengthens the estimated period required to meet the site's cleanup objectives. The remedial action time estimated for Alternatives 2 and 3A is 15 years, compared with the 11 years estimated for Alternative 3B and the 10 years estimated for Alternatives 4A and 4B.

Alternatives 3A, 3B, 4A and 4B which utilize a vegetative cover or a multi-layer cap will involve the grading of surface soils which may create a temporary dust problem. Conventional dust control measures will be employed however, to limit any fugitive dust emissions that may occur during grading activities.

The PCB Soil Removal Options are similar in the area of short-term effectiveness. Both options require the excavation and off-site transport of the contaminated sub-soils. Short-term exposure risks to workers and the community may result. One potential difference between the options is the length of time necessary to complete the remedial action if a larger quantity of soil needs to be removed. Option 1 will take longer than Option 2 due to capacity restraints of the licensed TSCA incinerators. The projected volume of soil to be excavated under either option, however, is expected to be small enough that no problems would arise with either incineration or landfilling.

F. Implementability

While all of the alternatives considered are implementable, some alternatives are technically easier to implement than others, based on their design and complexity.

Alternative 3B is the easiest alternative to implement as the remaining alternatives involve modifying this design. Next in implementability would be Alternative 2, which involves installing flushing equipment at the site. Alternative 3A is next and is similar to Alternative 2 with the addition of the 6 inch vegetative cover. Alternatives 4A and 4B would be next, respectively, due to the complexities in designing and installing a multi-layered cap. Alternative 4A would be easier to implement than Alternaitve 4B as it involves a smaller multi-layer cap than Alternative 4B.

Excavation of the localized PCB-contaminated soil area is easily implemented under either PCB Soil Removal Option. Option 1 has some implementability problems due to the finite availability of incinerators that are licensed to handle PCB contaminated soil. This could potentially lead to delays in transporting the materials to be incinerated if a large volume of soils is removed.

G. Cost

The estimated present worth value of each alternative and option is as follows:

Groundwater and Soil Remediation Alternatives

Alternative 2	$ 1,729,400
Alternative 3A	$ 1,956,700
Alternative 3B	$ 1,872,800
Alternative 4A	$ 2,285,000
Alternative 4B	$ 2,997,000

Localized PCB Soil Removal Options

Option 1	$ 17,700
Option 2	$ 8,600

H. Agency Acceptance

U.S. EPA and IEPA agree on the preferred alternative. Both Agencies have been involved in the technical review of this state-lead fund financed HS/FS, and the development of the Proposed Plan and ROD.

TABLE 10
COMPARISON OF ALTERNATIVES SUMMARY

ALTERNATIVE	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	REDUCTION OF TOXICITY, MOBILITY AND VOLUME	IMPLEMENTABILTY	COST (TOTAL PRESENT WORTH)	ARARS COMPLIANCE	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
Alternative 2 Soil Flushing Pump & Treat	15 year remedial action time; soil flushing causes a temporary increase of contaminant mobility.	Soil flushing yields excellent long-term effectiveness and permanance.	Excellent reduction of toxicity, mobility and volume of the contaminants.	Highly implementable.	$1,729,400	Meets or exceeds ARARs.	Yes
Alternative 3a Soil Flushing with Pump and Treat and Soil Cover	15 year remedial action time; soil flushing causes a temporary increase of contaminant mobility.	Soil flushing yields excellent long-term effectiveness and permanance. The use of a soil cover provides an added level of protection.	Excellent reduction of toxicity, mobility and volume of the contaminants.	Highly implementable.	$1,956,700	Meets or exceeds ARARs.	Yes
Alternative 3b Pump and Treat Soil Cover	11 year remedial action time required to meet remedial action goals.	Comparitively low level of long-term effectiveness due to no action on contaminated soils.	Reduction of toxicity and volume of groundwater contaminants only.	Highly implementable.	$1,872,800	Meets or exceeds ARARs.	Yes
Alternative 4a Pump & Treat Partial Multi-Layer Cap	10 year remedial action time; dust control measures necessary to prevent excessive dust emissions from cap construction.	Good long-term effectiveness from small multi-layer cap.	Reduction of toxicity and volume of groundwater contaminants and reduction of mobility of soil contaminants.	Highly implementable.	$2,285,000	Meets or exceeds ARARs.	Yes
Alternative 4b Pump & Treat Full Multi-Layer Cap	10 year remedial action time; dust control measures necessary to prevent excessive dust emissions from cap construction.	Good long-term effectiveness from large multi-layer cap.	Reduction of toxicity and volume of groundwater contaminants and reduction of mobility of soil contaminants.	Highly implementable, but the large size of the cap causes lengthy construction period.	$2,997,300	Meets or exceeds ARARs.	Yes
Option 1 PCB Soil Removal and Incineration	Short-term risk of exposure by uncovering deep PCB contamination within the soil.	Excellent long-term effectiveness from removal and off-site incineration.	Excellent reduction of toxicity, mobility, and volume of PCB contaminants in the soil matrix.	Good implementability, but treatment of large quantities of soil will be subject to incinerator capacity constraints.	$17,700	Meets or exceeds ARARs.	Yes
Option 2 PCB Soil Removal and Land Disposal	Short-term risk of exposure by uncovering deep PCB contamination within the soil.	Adequate long-term effectiveness from removal and off-site landfilling of PCB-contaminated soils, but landfilling cannot be considered a permanent solution.	Reduction of contaminant mobility only through off-site TSCA landfilling.	Good implementability under current regulations.	$8,600	Compliant with current ARARs, but future land ban regulations may prohibit the landfilling of PCBs.	Yes

I. Community Acceptance

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides a thorough review of the public comments received on the HS/FS and Proposed Plan, and U.S. EPA's and IEPA's responses to the comments received.

IX. SELECTED REMEDY

Based upon the information developed in the HS/FS, as well as the comparative analysis of the remedial alternatives with the 9 criteria, the U.S. EPA and IEPA have selected Alternative 3A in combination with PCB Soil Removal - Option 1 as the appropriate remedial action for the Cross Brothers Pail Recycling site. The major components of this remedy are as follows:

- Re-sampling of the localized PCB soil area to identify the existence of a PCB source.
- If identified, remove the localized PCB-contaminated soil area and incinerate the soils at a TSCA approved incinerator.
- Install and maintain a groundwater collection system capable of capturing the groundwater contaminant plume.
- Install and maintain an on-site groundwater treatment facility to remove contaminants from the collected groundwater.
- Install and maintain a soil flushing system for the 3.5 acres of contaminated soil within the disposal area.
- Install and maintain a 6 inch vegetative cover over that portion of the disposal area not subject to the soil flushing operation.
- Monitor the groundwater collection/treatment system and the groundwater contaminant plume during groundwater remediation activities.
- Install and maintain a 6 inch vegetative cover over the 3.5 acre area subject to soil flushing upon termination of the soil flushing operation.
- Install and maintain a fence around the site during remedial activities.

- o Initiate a deed notification identifying U.S. EPA and IEPA concerns regarding the conductance of intrusive activities at the site.

Initiation of the remedial action will involve securing the site, which begins with placing a deed notification on the property. Any buildings left on-site will be demolished or removed, and a fence constructed around the site area. The remedial activities will involve two operable units: the localized PCB soil removal and the groundwater and soil remediation.

Prior to initiating the localized PCB soil removal, the area will be re-sampled to establish whether a PCB source truly exists in that area. If a PCB source is identified to exist in that area above a 10 ppm action level, the soils will be removed. The PCB soil removal would involve excavating the soils and transporting the soils to a TSCA licensed facility for incineration.

The groundwater and soil remediation will be treated as one operable unit. The site can be divided into 2 areas: a 6.5 acre area that is characterized by small local areas of soil contamination and a 3.5 acre area that contains contamination throughout the unsaturated zone. Initially, the 6.5 acre area will be covered with a 6 inch vegetative cover, while the 3.5 acre area will be covered by 6 inches of gravel.

Groundwater will be extracted by a series of downgradient extraction wells and pumped back to a treatment facility on the site. The groundwater will be treated and pumped into an irrigation system that will place the treated groundwater onto the 3.5 acre gravel area.

This system will establish a "cleansing loop". The groundwater will pass through the soil and pick up contaminants on its way back to the water table. The groundwater will then be captured by the extraction wells, treated and sprayed back on the site. This process will continue until the groundwater analyses consistently indicate that the groundwater cleanup objectives have been achieved. The groundwater cleanup objectives for the Cross Brothers Pail Recycling site require that treated groundwater meet the following 2 standards:

- o Currently promulgated MCLs; and
- o A cumulative excess lifetime cancer risk not exceeding 10^{-6} and a hazard index ratio ≤ 1.

It is estimated that this process will take 15 years to achieve the groundwater cleanup objectives.

Once the groundwater cleanup objectives are met, the fence, treatment system and irrigation equipment will be removed from the site, and a 6 inch vegetative cover placed on the area initially flushed.

Table 11 presents a cost breakdown of the selected remedy.

X. STATUTORY DETERMINATIONS

U.S. EPA and IEPA believe the selected remedy satisfies the statutory requirements to: protect human health and the environment, attain ARARs, be cost-effective, utilize permanent solutions and alternate treatment technologies (or resource recovery technologies) to the maximum extent practicable and provide the preference for treatment as a principal element.

The following sections discuss how the selected remedy meets these statutory requirements.

A. Protection of Human Health and the Environment

The selected remedy protects human health and the environment through the removal and incineration of the localized PCB-contaminated soils, pumping and treating the contaminated groundwater and flushing the leachable contaminants from the 3.5 acre contaminated soil area.

Excavation of the localized PCB-contaminated soils will reduce the potential direct contact risk posed by these soils. Incineration of the soils will reduce any possible future threat the soils could provide if landfilled elsewhere. Pumping and treating groundwater will result in the removal of any risks to humans or the environment from contact with or utilization of the groundwater. The soil flushing will remove any leachable contaminants from the soil. These contaminants will then be treated through the groundwater collection and treatment system. By flushing the contaminants from the soils, future leaching of contaminants will be prevented.

B. Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with ARARs. The ARARs for the selected remedy are presented in Table 12.

Table 11

COST BREAKDOWN FOR SELECTED REMEDY IN TOTAL PRESENT WORTH

Site Security/Restriction		
Fencing		$ 96,000
Monitoring		$ 119,400
Deed Restriction		$ 10,000
Building Demolition		$ 10,000
	Total	$ 235,400
Localized PCB Soil Removal		
Mob/Demobilize/Decon		$ 3,400
Excavation/Backfilling		$ 500
Sampling and Analysis		$ 900
Loading, Transport, Incineration		$ 12,900
	Total	$ 17,700
Groundwater Treatment/Soil Flushing/6 Inch Vegetative Cover		
Extraction Wells		$ 13,800
Water Treatment		$ 1,298,700
Phase I Soil Cover		$ 289,100
Phase II Soil Cover		$ 43,300
Irrigation/Flushing System		$ 178,500
	Total	$ 1,823,400
	Total Cost	$ 2,076,500

TABLE 12

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
FOR THE SELECTED REMEDY

Federal Action-Specific ARARs

Resource Conservation and Reccvery Act (RCRA)

- 40 CFR 261 - Definitions and Identification of Hazardous Waste
- 40 CFR 262 - Standards for Generators of Hazardous Wastes
- 40 CFR 263 - Standards for Transport of Hazardous Wastes

Toxic Substances Control Act

- 40 CFR 761 - Regulations of PCBs and TSCA Section 6

Occupational Safety and Health Act

- 29 CFR 1910 - General standards for Worker Protection
- 29 CFR 1910 - Regulations for Workers Involved in Hazardous Waste Operations

Intergovernmental Review of Executive Programs
(Executive Order 12372)

- 40 CFR 29

State Action-Specific ARARs

- 35 AIC 215.101-102, 215.121-122, 215.141-144, 215.304, 215.500, 215.541, 215.562 - Organic Air Emission Standards
- 35 AIC 807.101-104, 807.316-317 - Permits for Waste Disposal Sites
- 35 AIC 809.101-802 Special Waste Hauling
- 35 AIC 700 -Hazardous Waste Management
- Title 8, Chapter 1, Part 650 - State Guidelines for Erosion and Sediment Control (Department of Agriculture)

TABLE 12 (CONT.)

Federal Chemical-Specific ARARs

Safe Drinking Water Act

- 40 CFR 141.11 - Maximum Contaminant Levels (MCLs)

Clean Air Act

- 40 CFR 50 - National Ambient Air Quality Standards and CAA Section 109
- CAA Section 112 - National Emission Standards for Hazardous Air Pollutants

State Chemical-Specific ARARs

- 35 AIC 302.208 - General Use Water Quality Standards: Chemical Constituents
- 35 AIC 302.301-305 - Public Food Processing and Water Supply Standards
- 35 AIC 303.202-203 - Nonspecific Water Use Designations

Federal Location-Specific ARARs

None

State Location-Specific ARARs

- **Designated State Highway Truck Route System for Large Vehicles and Combinations (Illinois Department of Transportation, January 1989)**
- **Informational, Notification and Consultation Responsibilities of Government at Public Hearings (35 AIC 164-165)**
- **Hazardous Waste Crane and Hoisting Equipment Operators Licensing Act (S.H.A., Chapter 111, Paragraph 7701)**
- **Hazardous Waste Laborers Licensing (S.H.A., Chapter 111, Paragraph 7801)**

TABLE 12 (CONT.)

- Monitoring Well Worker Licensing (Illinois Water Well Construction Code Law, Illinois Revised Statutes, Chapter 111.5, Paragraphs 1116.111-118, as amended)

Federal "To Be Considered" - Chemical-Specific

- 40 CFR 141.50 Maximum Contaminant Level Goals (MCLGs)
- Any Proposed MCLs and MCLGs
- Any 10^{-6} Lifetime Health Advisories
- TSCA PCB Spill Policy

State "To Be Considered" - Chemical-Specific

TBC	Chemical	Conc.
Proposed MCL	Toluene	2000 ug/l
Lifetime Health Advisory	Toluene	2420 ug/l
MCLG	Xylene	440 ug/l
Lifetime Health Advisory	Xylene	400 ug/l
MCLG	Cadmium	5 ug/l
MCLG	Lead	20 ug/l
Lifetime Health Advisory	Mercury	1.1 ug/l

C. Cost-Effectiveness

The selected remedy, Alternative 3A in combination with PCB Soil Removal - Option 1, is considered to be cost-effective. This remedy is permanent, provides long-term effectiveness and reduces the toxicity, mobility or volume of the contaminants at the site at a cost proportional to the overall benefits achieved by the remedy. This alternative has a present worth value of $2,076,500.

Of the alternatives that cost less, Alternative 3B treats the groundwater but does not actively pursue treatment of the contaminated soils. As such, future leaching of the soil contaminants into the groundwater is probable rendering the overall timeframe for groundwater cleanup to be questionable. Alternative 3A actively addresses the contaminated soils, thereby eliminating future concerns with regards to the contaminated soils. Although Alternative 2 provides for treatment of soil contamination, the alternative does not include the 6 inch vegetative cover that Alternative 3A includes. This cover increases the stability of the non-flushed areas, where small localized areas of soil contamination exist. This cover should prevent wind or water erosion of these soils and provide a foundation for vegetative growth which was destroyed during the site's operation.

While Alternatives 2 and 3B cost the least, Alternative 3A provides a better solution for the on-site soils than Alternative 3B for a 4.4% increase in cost. The cost difference between Alternatives 2 and 3A (approximately 13%), is offset by the stability the presence of the vegetative cover adds to the non-flushed areas.

Alternatives 4A and 4B cost the most of all the alternatives considered. These costs are due primarily to the complexities of the multi-layer cap which will contain the soil contaminants.

As for the PCB Soil Removal Options, it is believed that Option 1 is the most cost-effective of the 2 Options. Although Option 2 costs less than Option 1, Option 2 does not provide the permanence that will be attained by Option 1. The cost difference between landfilling and incineration is minimal due to the limited amount of PCB contaminated soils expected to be removed from the site (estimated 5 yd^3).

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

The U.S. EPA and IEPA have determined that the selected remedy utilizes permanent solutions and alternative treatment technologies (or resource recovery technologies) to the maximum extent practicable. The selected remedy - Alternative 3A in combination with PCB Soil Removal - Option 1 - focuses on providing permanent and significant treatment for those threats (i.e. groundwater, soil contamination and the localized PCB soil area) identified at the site.

E. Preference for Treatment as a Principal Element

The selected remedy addresses the principal threats posed by the site (i.e. groundwater, soil contamination and the localized PCB soil area) through treatment. The selected remedy requires groundwater treatment and soil flushing. In addition, subsequent to identifying the existence of a PCB soil source, the selected remedy requires that area to be excavated and the soils incinerated. As such, the selected remedy employs treatment as a principal element.