United States Environmental Protection Agency
Office of Emergency and Remedial Response
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September 1985

EPA

Superfund Record of Decision:

Harvey-Knott, DE

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT

The Harvey-Knott Drum Site is located in New Castle County, Delaware, approximately one-half mile east of the Maryland-Delaware border. The Harvey and Knotts Trucking, Inc., operated an open dump and burning ground on the site between 1963 and 1969. The facility accepted sanitary, municipal, and industrial wastes believed to be sludges, paint pigments, and solvents. Wastes were emptied onto the ground, into excavated trenches, or left in drums (some of which were buried). Some of these wastes were either burned as a means of reducing waste volume, or allowed to seep into the soil. Contamination of soil, surface water, and ground water has occurred as a result of disposal of these industrial wastes.

The selected remedial action for this site includes: cleaning the onsite drainage pond by collecting and treating surface water; removal and offsite disposal of contaminated sediments, sludges, and bulk wastes to a qualifying RCRA facility; removal and offsite disposal of all crushed or intact surface drums, debris, wastepiles, and sludges to a qualifying RCRA facility; installation of ground water extraction and treatment facilities to collect and remove contaminants in the shallow ground water; applying treated ground water to flush contaminants from onsite surface and subsurface soils; and preparation of the site surface for installing the flushing pipe network which entails (a) grading the entire application area, (b) covering with a 24-inch (see separate sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Harvey-Knott, DE Contaminated Media: gw, soil, sw, wetlands Key contaminants: heavy metals, organics, PCBs, inorganics		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)* None	21. NO. OF PAGES 50
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SUPERFUND RECORD OF DECISION

Harvey-Knott, DE

Abstract - continued

layer of clean soil, and (c) establishing permanent vegetation as a precaution against direct contact. Total capital cost for the selected remedial alternative is estimated to be $3,572,000 with annual O&M costs approximately $776,000 for years 1-5, $90,000 for years 6-10 and $44,000 for years 11-30. Decisions on the extent of aquifer restoration, cleanup actions in offsite streams and wetlands, and final site closure will be deferred pending (a) additional soil investigation during design, (b) analyses on the effectiveness of the chosen alternative and (c) the impacts of the site on the adjacent wetlands.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Harvey and Knott Drum Site
New Castle County, Delaware

Data Reviewed:

The underlying technical information, unless otherwise specified, used for analysis of cost-effectiveness and feasibility of remedial alternatives is included in the following documents and project correspondence. I have been briefed by my staff of their contents, and they form the principal basis for my decision of the appropriate extent of remedial action.

- Remedial Investigation/Feasibility Study Report (Draft), Harvey and Knott Drum Site, New Castle County, Delaware, Volumes I, II, III and IV, (NUS Corp., August 1985)

- Work Plan, Initial Remedial Measure/Remedial Investigation/Feasibility Study of Alternatives, Harvey and Knott Drum Site, New Castle County, Delaware (NUS Corp., August 1983).

- Remedial Action Master Plan, Harvey Knott Site, Kirkwood, Delaware (Roy F. Weston, Inc., February 1, 1983)

- Summary of Remedial Alternative Selection

- Recommendations by the Delaware Department of National Resources and Environmental Control.

- Staff summaries and recommendations.

Description of the Selected Remedy

Specifically, this alternative includes the following elements:

° Cleaning the onsite drainage pond by collecting and treating surface water (est. 200,000 gallons). After the pond is dewatered, removal and disposal of contaminated sediments, sludges, and bulk wastes to a qualifying facility permitted under the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. Part 264, Subpart N.

° Removal and disposal of all crushed or intact surface drums, debris, wastepiles, and sludges to a qualifying RCRA facility.

° Installation of ground water extraction and treatment facilities to collect and remove contaminants in the shallow ground water. Treated ground water will then be applied to flush contaminants from onsite surface and subsurface soils. It is estimated that this extraction/treatment/flushing program will operate for five years to restore the aquifer to drinking water quality or final EPA approved alternate concentration limits.

° Preparation of the site surface for installing the flushing pipe network will entail (a) grading the entire application area, (b) covering with a 24 inch layer of clean soil, and (c) establishing permanent vegetation as a precaution against direct contact.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 C.F.R. Part 300), I have determined that the remedial action described above together with proper operation and maintenance constitute remedies which mitigate and minimizes threats to and adequately protects public health, welfare and the environment. The remedial action provides for the removal and offsite disposal of surface wastes as a source control remedy and the installation of ground water extraction/treatment/reapplication facilities as management of migration controls. Selection of target and final endpoint levels of residual ground water and soil contaminants will be established in such a way so as to minimize the extent of the shallow aquifer requiring long-term institutional controls while at the same time, providing a technically feasible and cost-effective remedy. The levels will take into account the site specific and regional characteristics and will be protective of the public health, welfare and the environment.

I have deferred a decision on final site closure requirements until the post ground water extraction/treatment/reapplication soil grid sampling program is evaluated.

I am also deferring selection of remedial response measures, if any, for the adjacent wetlands and surface waters. Further assessment of the impact of the site on these sensitive areas and evaluation of alternatives to provide adequate protection will be performed.

The selected remedy includes the operation and maintenance of the ground water extraction/treatment/reapplication facilities to reduce or eliminate the potential exposure to ground water contamination. These activities will be considered part of the approved action and eligible for Trust Fund monies until such time that I made the decision regarding the endpoint level of treatment for soils and ground water. At the time when the levels are achieved I will also decide on the future status and funding of O&M.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the offsite transport and disposal of contaminated material from the site is more cost-effective than other remedial actions and is necessary to protect public health, welfare, or the environment.

9/30/85

Date

James M. Seif
Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

HARVEY AND KNOTT DRUM SITE
NEW CASTLE COUNTY, DELAWARE

Site Location and Description

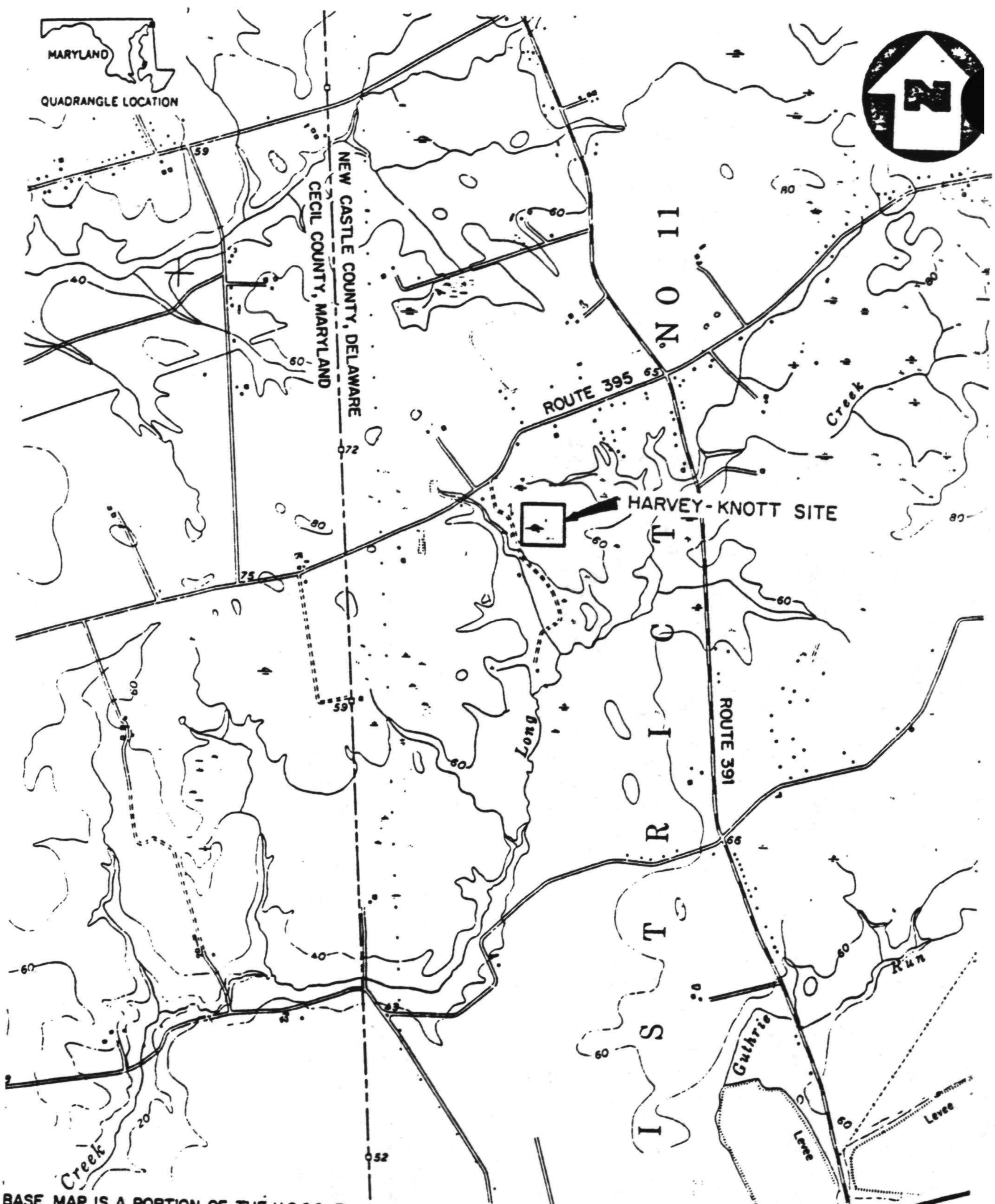
The Harvey and Knott Drum Site is located in New Castle County, Delaware, approximately one-half mile east of the Maryland-Delaware border (figure 1). The community of Kirkwood is located approximately 5 miles southeast of the site and the community of Glasgow lies approximately 3 miles northeast. The site is in a remote, rural area, previously used for farming. Light residential development to the north of the site consists of approximately 100 residences. The closest habitations are several rural and trailer homes along Old County Road (Route 395) and the Shelly Farms development (figure 2).

The Harvey and Knotts Trucking, Inc., operated an open dump and burning ground between 1963 and 1969 at the site. The facility accepted sanitary, municipal, and industrial wastes believed to be sludges, paint pigments, and solvents. Wastes were emptied onto the ground surface, into excavated trenches, or left in drums (some of which were buried). Some of the wastes were then either burned as a means of reducing waste volume or allowed to seep into the soil. A security fence installed as part of an EPA emergency action presently surrounds the areas (2.2 acres) of greatest visible surface contamination.

There are two major water supplying aquifers in the area of the site above bedrock (which is about 350 feet below the ground surface). The shallow ground water occurs under water-table conditions and is referred to as the Upper Hydrologic Zone (UHZ). It is flowing to the southwest, south, and southeast of the site, toward surface waters and wetland areas. Most of the domestic drinking water wells in the area are installed in the UHZ. Wells used for agriculture such as dairy farming or crop irrigation also use the UHZ.

The second major source of ground water in the site area is the Lower Hydrologic Zone (LHZ) which is under confined conditions. The UHZ and the LHZ are separated by an aquitard referred to as the Potomac clay. The LHZ is the major public and industrial water supply in New Castle County (figure 3). Both the UHZ and LHZ are Class II aquifers as classified under the Ground Water Protection Strategy.

Soils in the area consist of predominantly sandy materials underlain by silts, clays, sands, and some gravels. They are well drained with moderate to rapid permeabilities. The soils form a relatively flat land surface that slopes toward the south which is also the general direction of the shallow ground water. Ground water is generally encountered at about five to ten feet below the ground surface.



BASE MAP IS A PORTION OF THE U.S.G.S. ELKTON, MD-DEL QUADRANGLE (7.5 MINUTE SERIES, 1953, PHOTOREVISED 1970).
CONTOUR INTERVAL 20'.

FIGURE 1
LOCATION MAP
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE
SCALE: 1" = 2000'

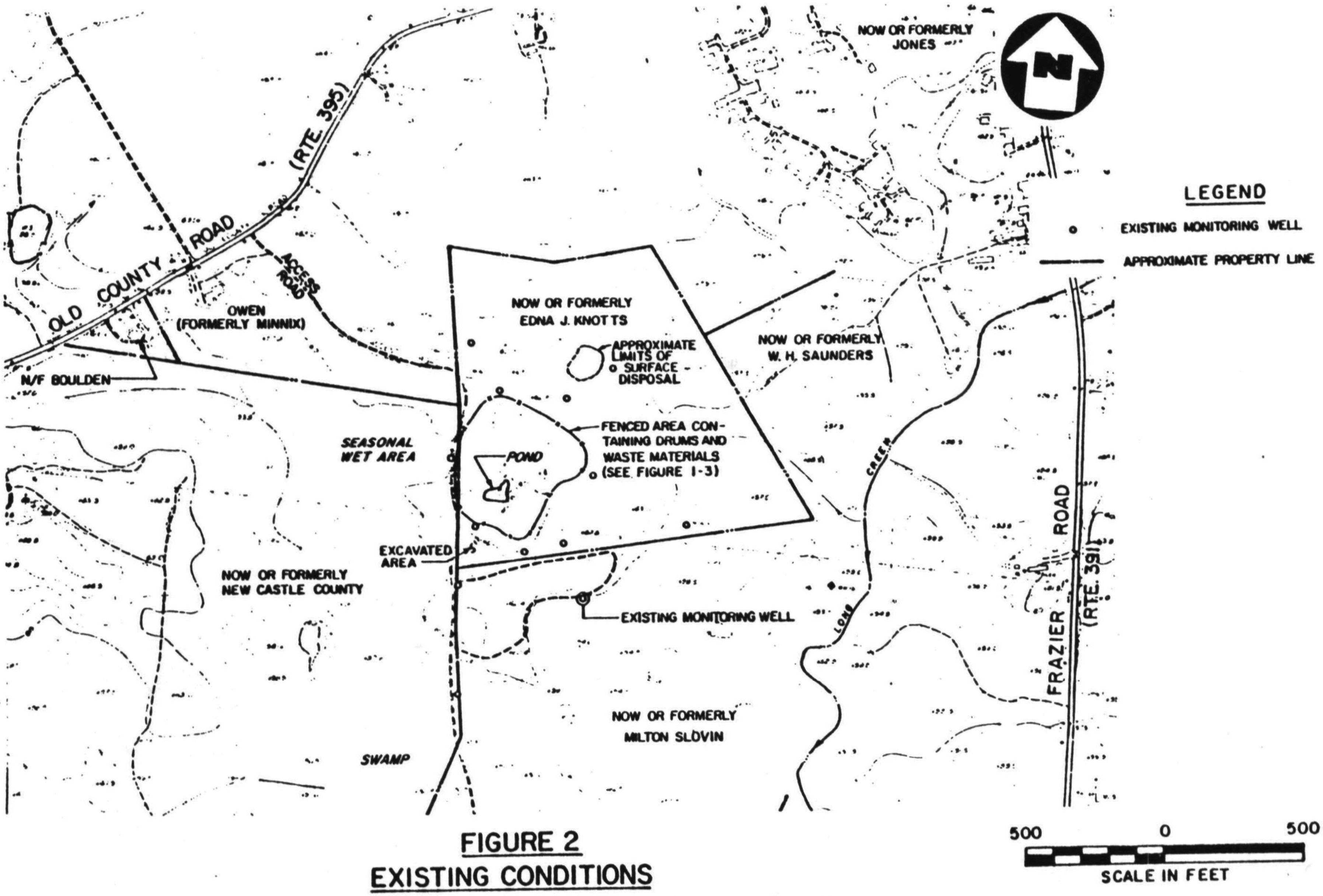
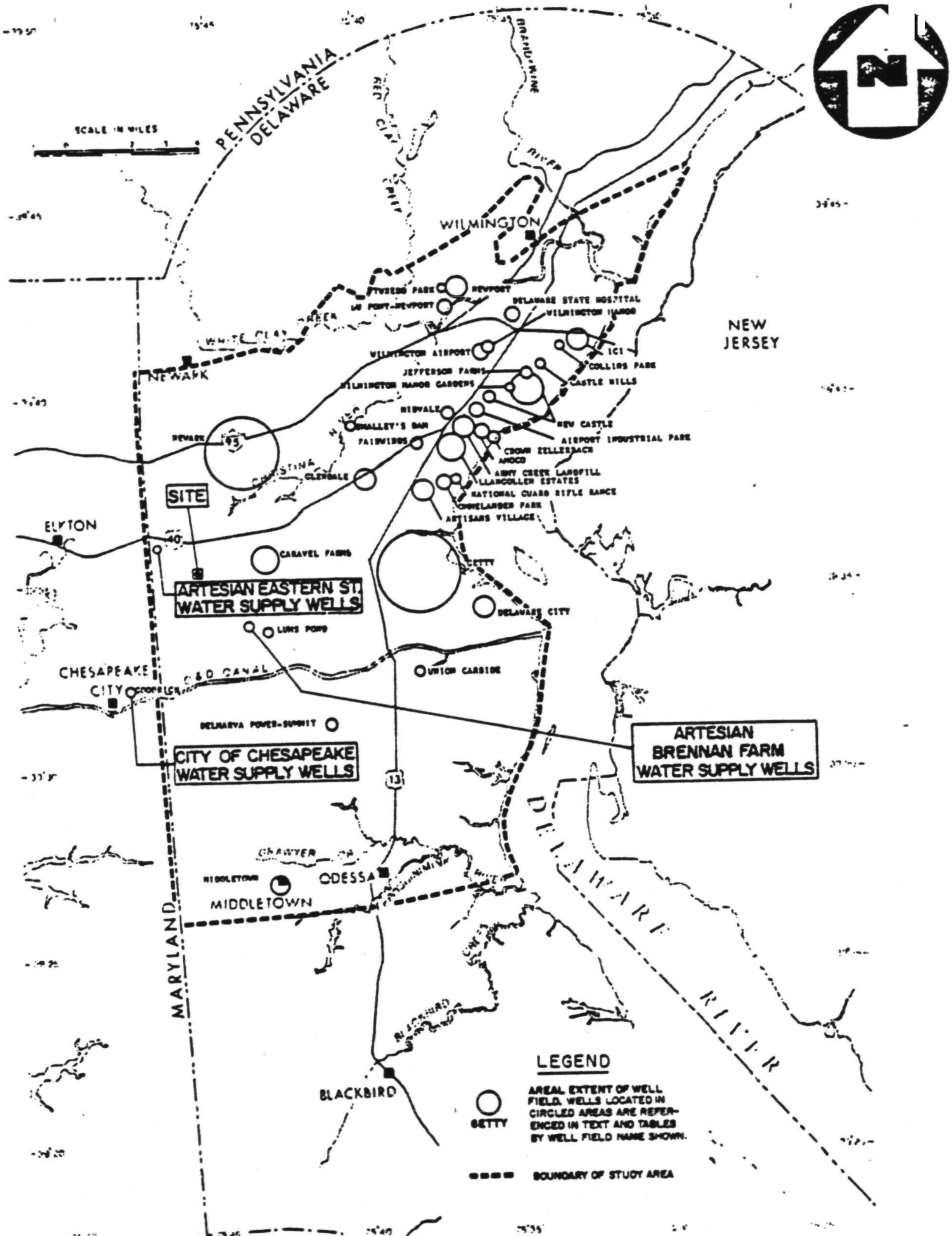


FIGURE 2

EXISTING CONDITIONS

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE



BASE MAP FROM DENVER AND MARTIN, U.S.G.S. OPEN FILE REPORT 81-916.

FIGURE 3

LOCATION OF POTOMAC FORMATION WELLS HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

The site area is drained by two unnamed tributaries which border the site on the east and west and flow south into Long Creek. Extensive wetland areas surround the southwest, south, and southeast sides of the site which have probably resulted from beavers building dams within the last fifteen year along the tributaries and Long Creek.

Site History

The site was discovered by the State of Maryland Waste Management Administration during an aerial overflight on January 14, 1981. Subsequent to the overflight, the State of Maryland conducted a ground search and determined that the site actually was located within the State of Delaware and notified the Delaware Department of Natural Resources and Environmental Control (DNREC). This onsite investigation by the State of Maryland had identified numerous drums and wastes which had been disposed in an uncontrolled manner at the site.

DNREC requested EPA assistance and both agencies conducted a preliminary assessment in December 1981 to determine the immediate effect of the site conditions on the public health and environment. Test results indicated contamination in the soils and ground water by heavy metals and organic chemicals including PCBs. To prevent direct contact with exposed hazardous wastes at the site and to minimize the spread of contamination via surface water runoff and ground water transport offsite, EPA instituted Immediate Removal measures during June through August of 1982. These emergency measures included the installation of a security fence around the areas of greatest visible surface contamination, overpacking and staging 43 leaking drums and performing an extent of contamination survey. In addition, seventeen monitoring wells were installed by the DNREC and EPA to identify the nature and extent of contaminated shallow ground water.

Based on the analytical results received from the preliminary assessment/site investigation, the Hazard Ranking System score at this site was 30.77. The site was then proposed for placement on the National Priorities List, and authorization to proceed with a Remedial Investigation/Feasibility Study was approved in April 1983.

Site conditions (Figure 4) as encountered prior to the Remedial Investigation can be characterized as follows:

- An area of approximately 2.5 acres had been fenced to prevent access to drums and an open pond.

- Stockpiles of empty to full drums in various states of deterioration, were located within the fenced area.

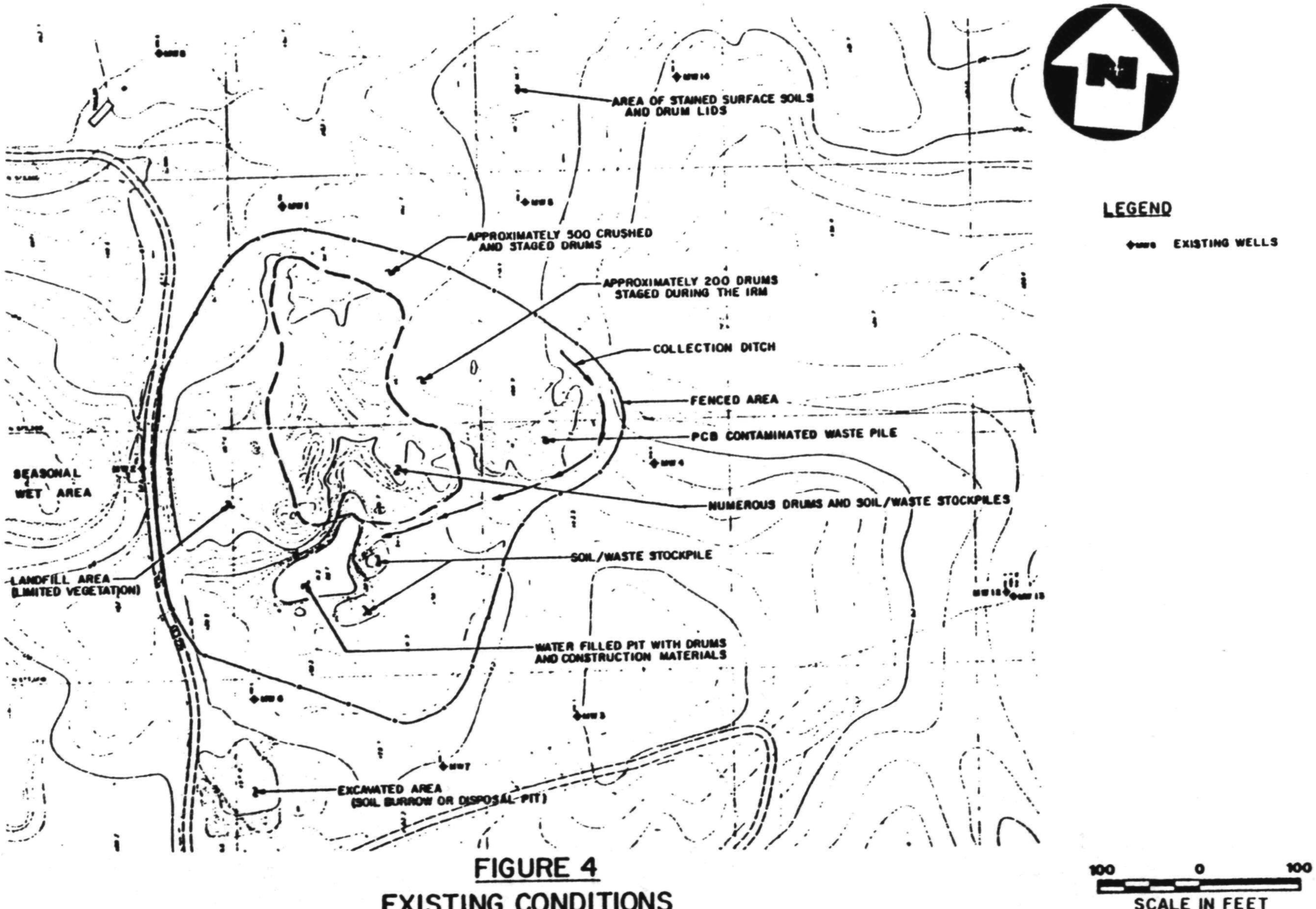


FIGURE 4

EXISTING CONDITIONS

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

- Stockpiles of landfill-type wastes (lumber, steel, garbage, and unknown waste) were generally located in the center of the fenced area.
- A small waste pile had been developed in the eastern side within the fenced area.
- A pond within the fenced limit contained various types of landfill waste in addition to drums.
- An area north to northeast of the fenced area showed evidence of localized stressed vegetation and land surface disposal of liquids and/or sludges.
- An area west of the fenced area, which receives surface runoff from the fenced area, showed evidence of stressed vegetation. However, this area is also poorly drained, a factor which could cause this condition.
- An area south-southwest of the fenced area had been excavated for soil borrow or for use as a supplementary disposal area.
- The natural topography of the land on and offsite indicates that drainage of surface runoff is poor and results in ponded water and swamps, both seasonal and perennial. Furthermore, beavers have created additional ponded water areas west and south of the site increasing wetlands conditions.

Contamination of soil, surface water, and ground water had occurred as a result of disposal of industrial wastes. The exposure to dermal contact had been temporarily mitigated by the installation of a fence. Since there were a number of residents using the shallow ground water upgradient of the site, the potential for contamination existed if the ground water flow was modified by increased pumping of upgradient wells. The wetland environmental habitat downgradient of the site also could be affected by (a) migration and discharge of shallow contaminated ground water and (b) surface runoff from the site.

In an effort to minimize immediate and obvious hazards to the public and the environment, an Initial Remedial Measure (IRM) was conducted by EPA within the fenced area during March through June of 1984. The IRM work plan consisted of characterizing the wastes within the fenced limits, consolidating wastes where appropriate, and transporting the wastes to an EPA-approved disposal facility. During the execution of the work it became obvious that the number of drums, waste stockpiles, and quantity of industrial type wastes (paint pigments, sludges, and solvents) was greater than anticipated. As a result, the amount of materials to be removed had to be reevaluated. The increased quantity affected the characterization of all onsite wastes and the scope of work had to be revised to remove only the most hazardous materials.

Based on analytical results (a composite sample of the overpacked drums showed 1.3 percent Aroclor 1254), the existing 43 overpacked drums were repackaged, removed, and disposed of at the CECOS International, Inc., facility in Ohio. Testing also indicated one waste stockpile in the eastern area of the fenceline contained at least 750 ppm of Aroclor 1254. A soil berm and surface drainage ditch were constructed around this PCB-contaminated wastepile to: (1) collect and direct surface runoff from the PCB-laden stockpile into the pond within the fenced limits, and (2) to prevent further runoff to the north and east areas outside the fence.

Approximately 500 drums that were identified as being empty were characterized, crushed, and staged within the fenced area. Another 200 drums that were partially to entirely full are staged in another area within the fenced area. The central zone of the fenced area still has numerous drums that have not been staged and characterized to determine whether they contain any hazardous wastes.

Current Site Status

Results of geophysical surveys did not identify the presence of buried ferromagnetic materials outside of the fenced area. Interpretations of the electromagnetic survey (plume identification or presence of clay) were used to locate monitoring wells and understand the subsurface conditions. A buried gravel deposit was identified outside of the southeast side of the fenced area.

Due to the presence of extensive amounts of surface metal within the fenceline, the use of geophysical techniques was precluded in this area. In an effort to determine the presence of buried drums and the extent of contamination within and immediately outside of the fenced area, test pit excavation programs were performed. Crushed and intact drums were found in the west-central part of the fenced area at depths of four to seven feet.

Surface and subsurface soil sampling locations are shown on figure 5. A number of Hazardous Substances List (HSL) organic compounds and inorganic elements were detected. Organic compounds include: volatile organics (halogenated aliphatics, monocyclic aromatics, and ketones); semi-volatile organics (phthalate esters, phenols, and amines); pesticides; and PCBs. Trace elements include all those on the HSL.

As indicated on Table 1, volatile contamination (numbers 1 through 5) was prevalent in high concentrations particularly in subsurface samples. The most highly contaminated soils were found in test pits 12(at a depth of 7 ft.), TP-17(8 ft.) and TP-18(4 ft.) on the southern periphery of the fenced area and also TP 20(3 and 6 ft.) just outside the western fence limit. Surface soils generally exhibited 100 to 1,000 times less than the volatile contamination found in subsurface soils. This could be attributed to

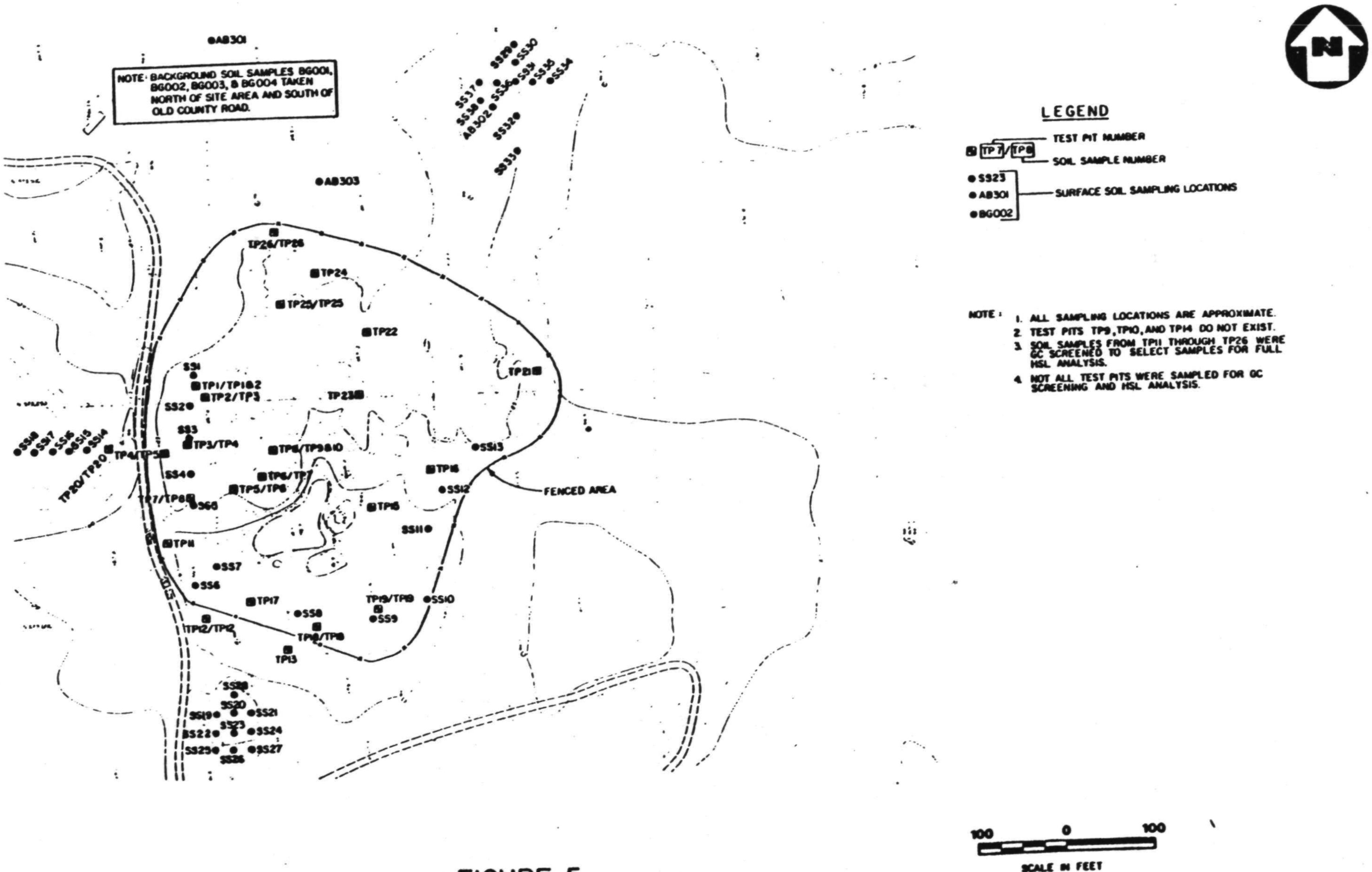


FIGURE 5
SOIL SAMPLING LOCATIONS
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

TABLE 1

CONTAMINANTS OF CONCERN
HARVEY AND KNOTT DRUM SITE

	Contaminant	Media	No. of Observations/ Total No. of Samples	Concentration Range	Pertinent Inclusion Rationale
1.	Benzene CAS No. 74-43-2	Surface Soils Groundwater	1/40 9/72	6 ug/kg 5 - 1,130 ug/l	Proven carcinogen, high groundwater concentration
2.	Ethylbenzene CAS No. 100-41-4	Subsurface Soils Groundwater Sediment	6/23 15/72 4/7	10 - 1,200,000 ug/kg 5 - 8,530 ug/l 8 - 990 ug/kg	Prevalent in media, high concentration in groundwater
3.	Methylene Chloride CAS No. 75-09-2	Surface Soils Subsurface Soils Groundwater Surface Water Sediment	4/40 14/23 24/72 5/7 7/7	36 - 134 ug/kg 13 - 5,200,000 ug/kg 4 - 81,300 ug/l 5 - 398 ug/l 9 - 47,000 ug/kg	Prevalent throughout media in high concentrations, highly mobile.
4.	Toluene CAS No. 108-88-3	Surface Soils Subsurface Soils Groundwater Sediment	10/40 8/23 16/72 3/7	1 - 727 ug/kg 6 - 2,400,000 ug/kg 8 - 211,746 ug/l 6 - 830 ug/kg	Prevalent in media, high concentration in groundwater, chronic toxicity
5.	Xylenes (Total) CAS No. 1330-20-7	Surface Soils Subsurface Soils Groundwater Sediment	3/40 9/23 20/72 4/7	26 - 180 ug/kg 27 - 1,600,000 ug/kg 7 - 36,593 ug/l 29 - 1,530 ug/kg	Prevalent in media, high concentration in groundwater
6.	Bis(2-ethylhexyl)phthalate CAS No. 117-81-7	Subsurface Soils Groundwater	5/23 8/72	396 - 7,300 ug/kg 10 - 286 ug/l	Carcinogenic potential, present in groundwater
7.	PCB-1260 CAS No. 11096-82-5	Surface Soils Subsurface Soils Sediment	3/40 6/23 2/9	93 - 237 ug/kg 49 - 330 ug/kg 1,600 - 41,000 ug/kg	Carcinogenic potential, bioaccumulation potential

TABLE 1
CONTAMINANTS OF CONCERN
HARVEY AND KNOTT DRUM SITE
PAGE TWO

	Contaminant	Media	No. of Observations/ Total No. of Samples	Concentration Range	Pertinent Inclusion Rationale
8.	Cadmium*	Surface Soils	34/40	0.08 - 291 mg/kg	Prevalent throughout media present in residential wells
	CAS No. 7440-43-9	Subsurface Soils	20/23	0.03 - 25 mg/kg	
		Groundwater	5/56	1 - 6 ug/l	
		Residential Wells	3/6	1 - 3 ug/l	
		Surface Water	1/9	4 ug/l	
		Sediment	8/9	0.22 - 3 mg/kg	
9.	Chromium*	Surface Soils	40/40	3 - 181 mg/kg	Found in groundwater in excess of primary drinking water standards, prevalent throughout media
	CAS No. 7440-47-3	Subsurface Soils	10/23	9 - 66 mg/kg	
		Groundwater	4/56	10 - 420 ug/l	
		Surface Water	2/9	10 ug/l	
		Sediment	8/9	3 - 29 mg/kg	
10.	Lead*	Surface Soils	40/40	3 - 20,200 mg/kg	Found in groundwater in excess of primary drinking water standards
	CAS No. 7439-92-1	Subsurface Soils	23/23	3 - 6,000 mg/kg	
		Groundwater	8/56	5 - 111 ug/l	
		Residential Wells	3/6	5 - 7 ug/l	
		Surface Water	4/9	6 - 162 ug/l	
		Sediment	8/9	10 - 128 mg/kg	

* Concentrations reported for groundwater are from post-1983 sampling only.

(a) the volatilization of surface (0-24 inches) contamination, (b) downward migration from infiltration of precipitation since volatiles are relatively water soluble, and (c) decomposition by biological activity.

Semi-volatile organics detected in subsurface soils reflect the contamination exhibited by volatiles. Samples obtained from test pits 12, 17, and 20 contained high concentrations (10-100 ppm) of base/neutral extractables. Although these compounds are not as mobile in the environment as the volatiles their appearance at high concentrations in subsurface soils may be attributable to increased solubility caused by volatile contamination or to direct deposition.

PCBs identified in surface and subsurface soil samples include the following:

Chemical	Concentration Range (ppb) Surface Soil	Subsurface Soil
PCB 1254	ND - 3169	ND - 540
PCB 1260	ND - 237	ND - 330

ND - Not detected

Areas contaminated with PCBs are:

- Surface soil to the northeast of the fenced area.
- Subsurface soil in the central portion of the fenced area.
- Surface soil directly west of the fenced area.
- Surface soil in the lowlying area directly south of the site.

PCBs are relatively immobile in the environment because of their limited water solubility and their tendency to adsorb to at sample locations soils. Thus, it is likely that these contaminants were deposited where they were detected, except in the area to the west of the fenced area. PCBs were probably adsorbed to soil particles and transported by surface water runoff from other areas of the site. The ability of PCBs to adsorb to soil particles makes them susceptible to transport because of erosion or airborne migration. The area to the west of the site is a drainage area that collected surface water runoff from the fenced area during site operation. It appears that the presence of PCBs in this location resulted from erosion of contaminated soils.

Most areas of the site contain trace elements above literature background levels. While trace element contamination is apparently scattered about the site, the concentrations encountered in some areas are very high. These areas include:

- Surface soil to the northeast of the site
- Subsurface soil in TP-1 through TP-8
- Surface soil near TP-7
- Subsurface soil in TP-25

The most contaminated area is the vicinity of test pits 1 through 8. Contaminants in this area probably resulted from the deposition of wastes containing trace elements. The presence of trace elements in the northeastern and southern areas is also indicative of concentrated disposal. The presence of trace elements outside of the fence area on the west side is probably due to erosion and surface runoff of contaminated soils, similar to the transport of PCBs in this area.

Chromatographic screening results identified HSL organic and inorganic substances in both surface water and sediment samples obtained from locations (figure 6) within site boundaries and in surface water bodies near the site. Sediment samples contained all of the volatile compounds frequently identified at high concentrations in other site media (see Table 1) which indicates that chemical contaminants are migrating from the site. It is believed that occurrence of volatile compounds in the sediment samples (101 through 106) could be attributed to the discharge of shallow contaminated ground water to the surface water bodies. Transport of eroded contaminated site soils is unlikely due to the distance from the site to the sample locations. Also, overland contaminated surface runoff is a possibility, but due to the volatilization process enroute to the surface water bodies, it is unlikely that this was the major mode of transport.

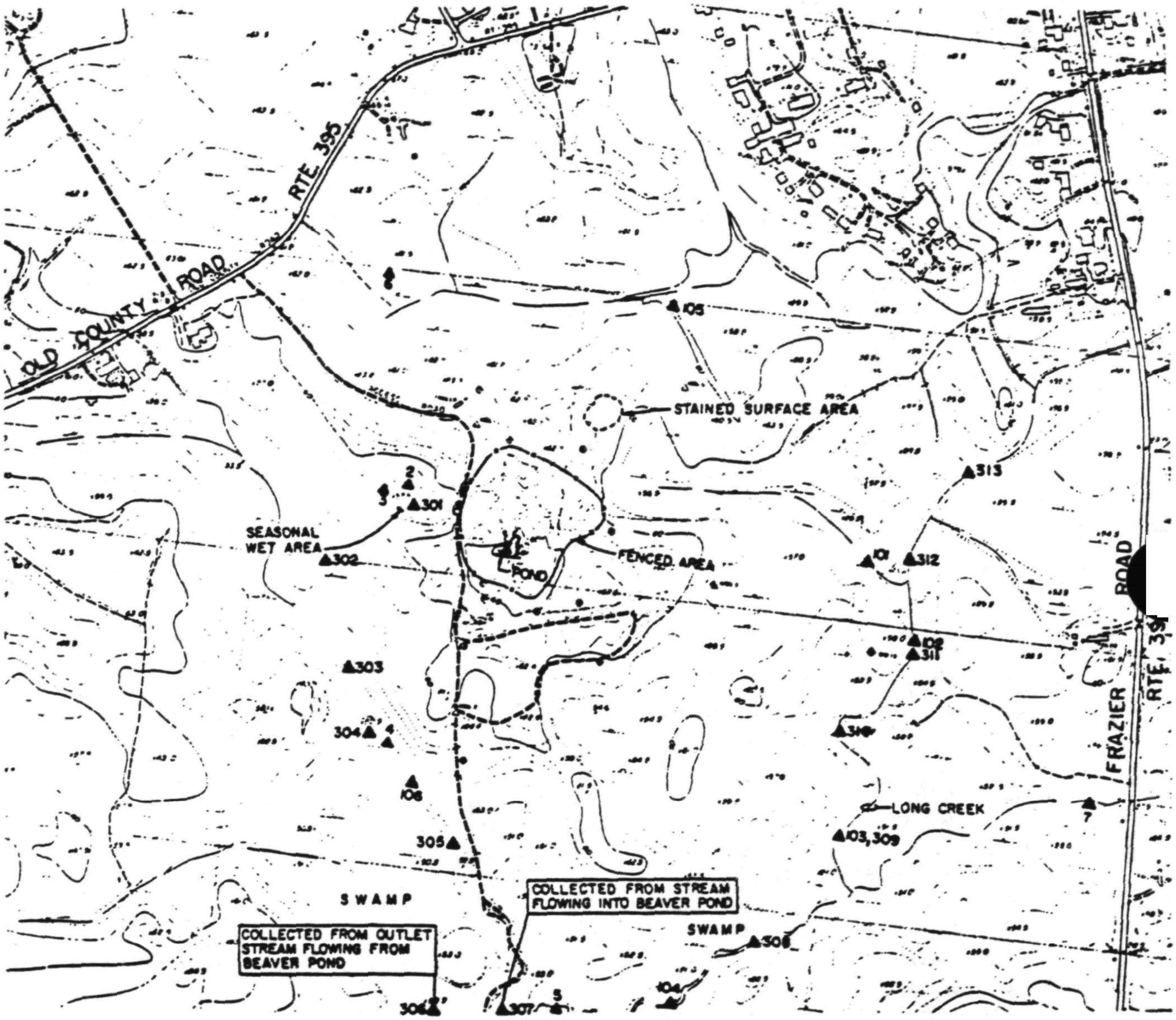
Surface water contamination from volatile compounds was minimal (only detected at location 101 and 102 at less than 0.4 ppm). Evaporation of volatiles from surface waters is expected to occur quite rapidly.

Semi-volatile contamination was detected in sediment samples 1, 2, 3, 4, 106, and 5. The presence of these compounds in sediment samples is probably attributable to (a) erosion of contaminated site soil since the travel distances are not great (with the exception of location 5) and (b) contaminated ground water discharge through sediments to surface water bodies.

The absence of semi-volatile compounds in surface water samples obtained at the same locations is indicative of the partitioning of the chemicals between the water and sediment compartments and is reflective of their generally low water solubility and high soil adsorption potential.

PCBs were detected in sediment samples at location #2 (41ppm), location #3(1.6 ppm), and location #5(0.08 ppm). It should be noted that a duplicate sample at location #5 did not detect PCBs. The presence of PCBs at locations 2 and 3 is probably due to erosion of contaminated soil from the site. There were no detectable PCBs in surface water samples.

Trace elements, which were detected in surface waters, are of concern because of their known toxic effects upon aquatic organisms. Lead (162 ppb) was the only element to significantly surpass the Proposed Water Quality Criteria level 2/7/84 (acute toxicity - 40 ppb based on calculated water hardness). This sample was taken from the pond within the fenceline. It should be noted that an upstream sample taken from Long Creek during preliminary investigations contained 130 ppb of lead. The onsite pond also contained the highest sediment sample concentrations for lead (98 ppm), cadmium (3.2 ppm), arsenic (9.5 ppm), and chromium (29 ppm).



LEGEND

▲ SURFACE WATER / SEDIMENT SAMPLING LOCATION

FIGURE 6

SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

0 550 1100

SCALE IN FEET

Geologic and Hydrogeologic Summaries

The purpose of the subsurface investigation/well installation program was to determine the nature and extent of contamination that had migrated through ground water movement. Previous investigations of the site hydrogeology (Shaly 1982) concluded that the shallow ground water under the site is flowing away from the residential area of Shelly Farms which is located northeast and north of the site. The shallow ground water flow is to the southwest, south, and southeast of the site, toward surface waters and wetland areas. Previous investigations also determined that the shallow ground water in the vicinity of the site is contaminated by organic compounds.

The location of site monitoring wells is shown on figure 7 while the $A\text{-}A^1$ geologic cross section is diagramed on Figure 8.

The uppermost formation occurring at the site is the Columbia Formation consisting of very dense, fine to coarse, grained sands, fine to coarse grained gravels, silty sand and gravels, and occasional cobbles. Deposits that occur at the site range in thickness from 19 to 46 feet. Ground water seepage velocities range from 550 feet/year southwest of the site to 2,300 feet/year southeast of the site.

Beneath the Columbia Formation lies the Upper Potomac Formation. These deposits are very dense, fine to coarse grained sands, uniform medium sands, silty sands, and very stiff, variegated sandy clays, and silty clays. Thickness of the Upper Potomac Formation increases to about 60 feet south of the site from almost non-existent north of the site. The ground water seepage velocity in the Upper Potomac deposits is estimated at 240 feet/year.

Based on the correlation of subsurface geology and hydraulic connection of the Columbia and Upper Potomac Formations, these deposits are considered to be one hydrologic zone (the Upper Hydrologic Zone). The UHZ is under water table conditions over most of the site area. Discharge from the UHZ supports base flow to the unnamed tributaries east and west of the site and Long Creek.

Precipitation is the source of recharge to the UHZ and affects its capacity to support base flow to streams in the study area. The average annual precipitation of over 44 inches is more than adequate to replenish the UHZ which requires about 14 inches per year for recharge.

Beneath the UHZ lies the Potomac clay and Lower Hydrologic Zone. The Potomac clay is a major confining layer (aquitard) between the UHZ and LHZ. It is comprised of very stiff, variegated, silty clay or clay with discontinuous lenses of very fine to medium sand, silty sand and sandy clay. The average thickness of the Potomac clay is approximately 150 feet. Ground water flowing through the Potomac clay has a downward vertical gradient. The average vertical velocity is only 1.3×10^{-2} ft/year.

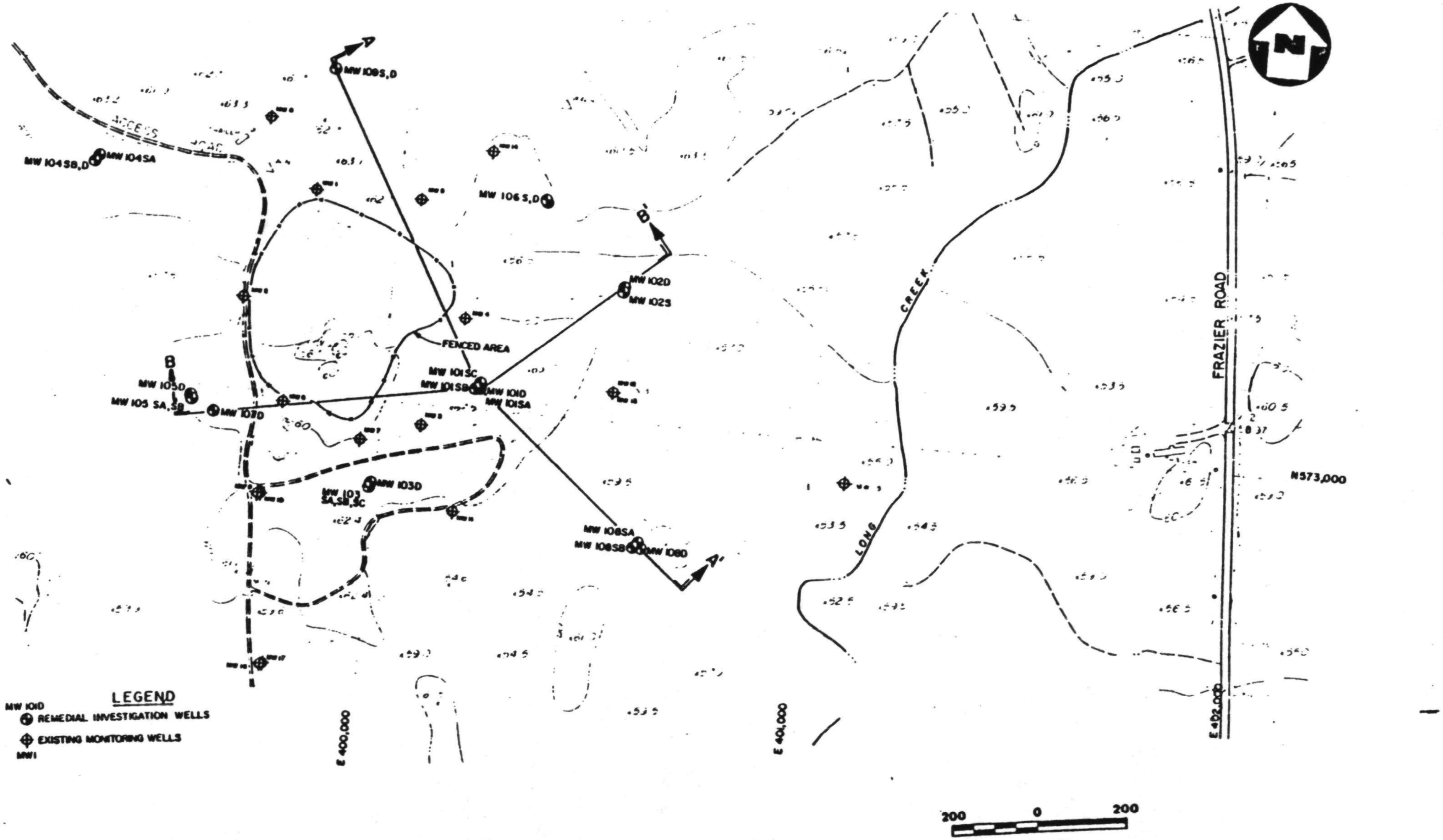
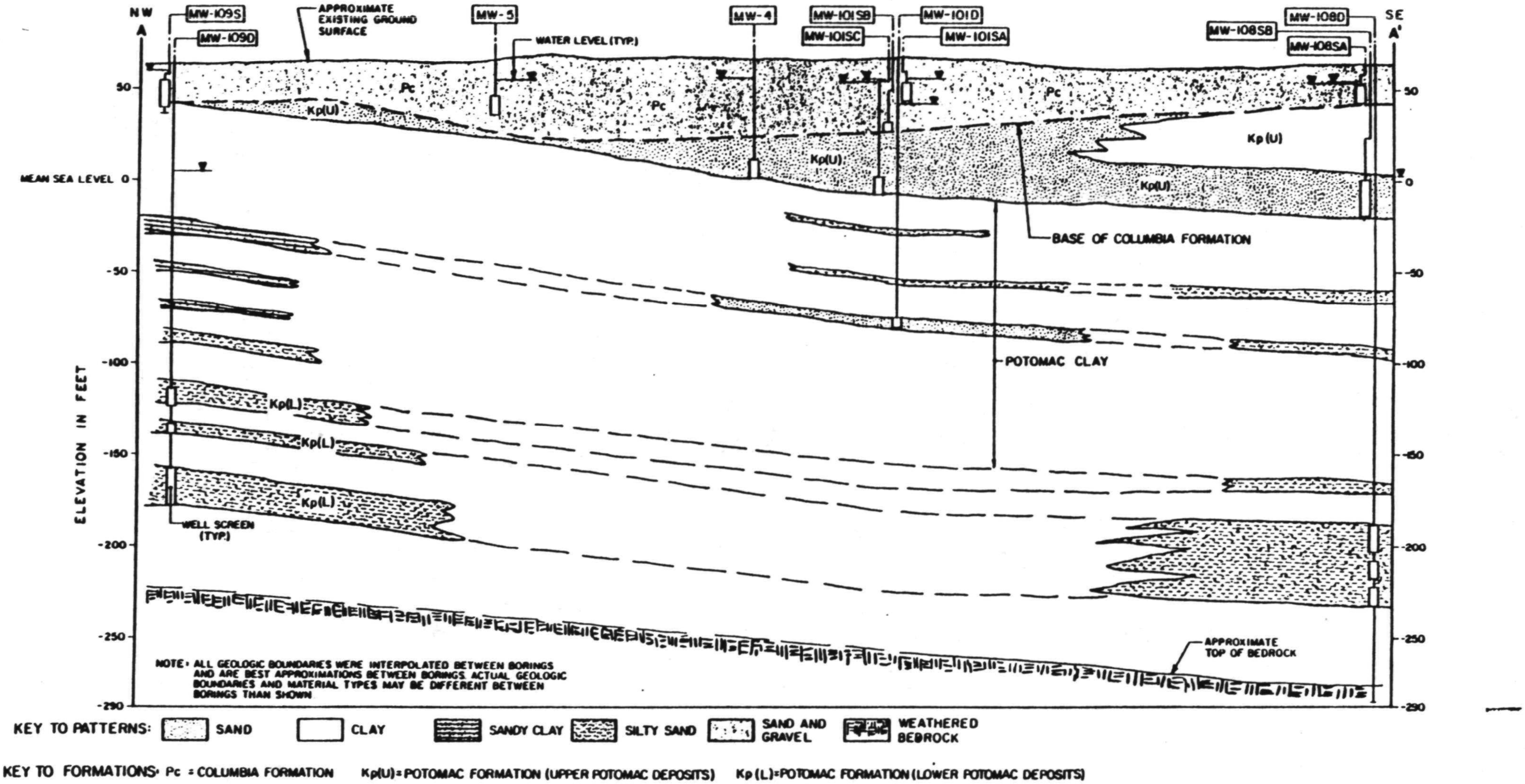


FIGURE 7

MONITORING WELL LOCATIONS

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE



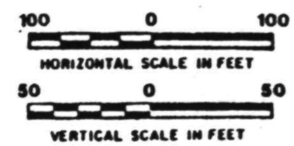


FIGURE 8

GEOLOGIC CROSS-SECTION A-A'

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

The Lower Potomac deposits and the weathered bedrock comprise the LHZ. Deposits in the LHZ consists of interbedded fine to medium sands, lignitic silty sand, and stiff silty clay. The lower deposits average about 70 feet in thickness. A velocity of 130 feet/year was calculated for the LHZ. Based on geologic data in the LHZ, the direction of ground water flow in the LHZ was expected to be toward the southeast in the downdip direction of the Potomac Formation. Monitoring well readings indicate that the LHZ is actually flowing in a northeast direction. This suggests that the LHZ is under some influence, perhaps from public water supply production wells in the vicinity of the site.

At this time there are three known well fields in the LHZ in the area of the site. As indicated on figure 3, these fields and their distances from the site are: Artesian Eastern State - 1.5 miles; Artesian Brennan Farm Wells - 2 miles; and City of Chesapeake Municipal Wells - 4 miles. The Eastern State well field (500 gpm) probably has more influence than the Chesapeake wells (118 gpm) due to distance from site and higher pumping rates. The Brennan Farm wells are not in production at this time due to the presence of excess iron in the ground water.

Ground Water Contamination

The majority of the monitoring wells installed at the site are screened in the UHZ. The available data indicates that contamination of ground water in the UHZ has occurred and the available data indicates that the LHZ may also be threatened. Monitoring well 101D is screened in a sand lens in the Potomac clay between the UHZ and LHZ (figure 8). Monocyclic aromatic contamination was present in this well during the August 1984 sampling round but not during the August 1985 sampling round. Geologic Investigations reveal that the Potomac clay layer below the site is not continuous and that there is a potential for contaminant migration to the LHZ. This potential is considered to be low based on (a) none of the three deep wells (107D, 108D, and 109D) in the LHZ were contaminated, and (b) the slow ground water velocity (1.3 x 10-2 ft/yr) and thickness of the confining layer (150 ft). It should be noted that there is no existing downgradient well in the LHZ since the general flow direction was found to be toward the northeast. Each Remedial Alternative will include installation and monitoring of the downgradient flow to evaluate whether contaminated ground water has traveled through the Potomac clay. If contamination is detected remedial actions will be investigated and implemented for deep aquifer contamination.

Chemical contaminants identified in shallow ground water correlate with contamination observed in surface and subsurface soils. Toluene, ethylbenzene, total xylenes, and methylene chloride were detected in shallow ground water samples at high concentrations. Coupled with chemical results from test pit samples, contaminants identified in UHZ monitoring wells indicate the existence of at least one major contaminant plume (figure 9). This plume has migrated from the site in the southerly direction of the shallow ground water flow.

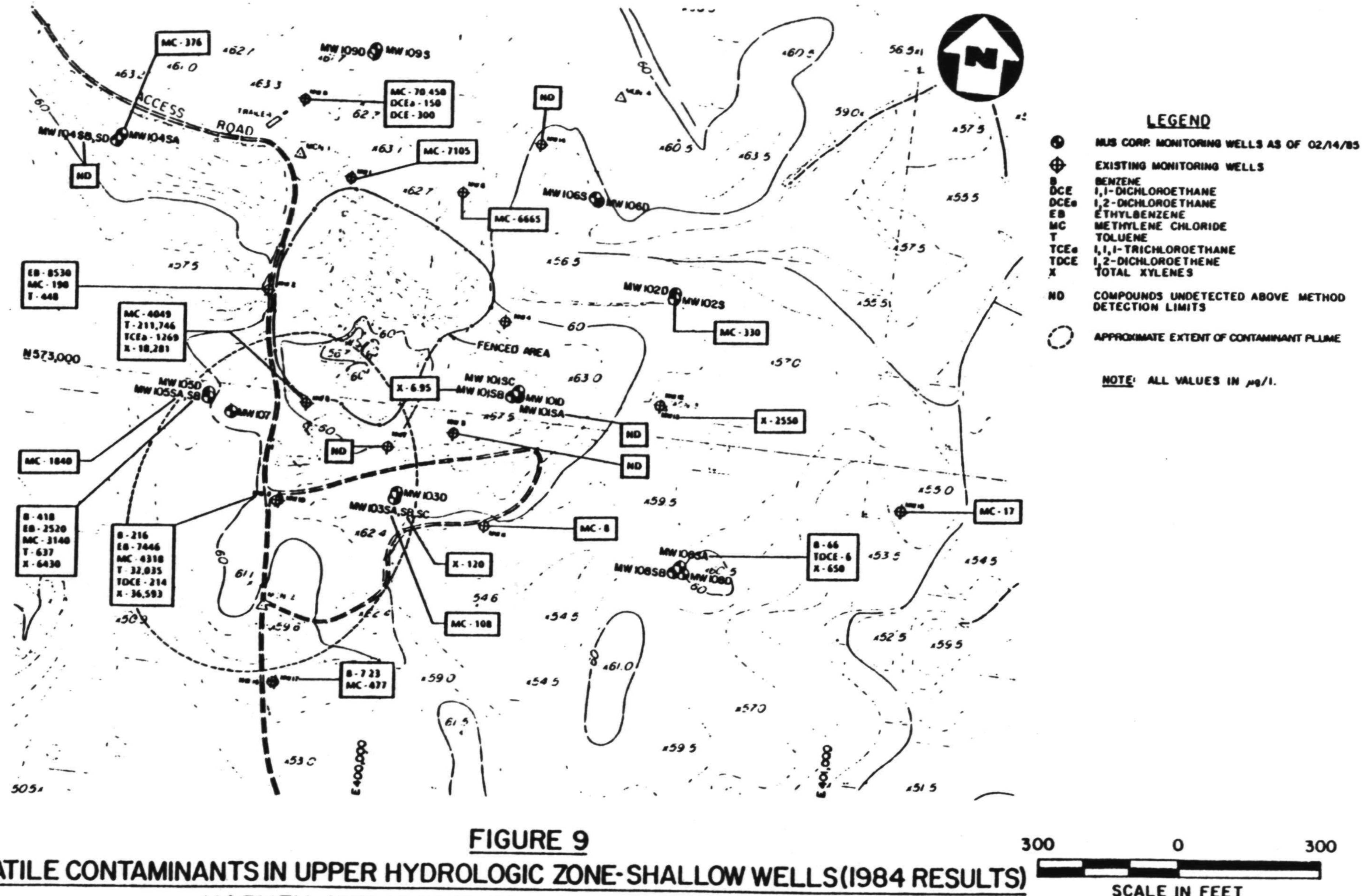


FIGURE 9

VOLATILE CONTAMINANTS IN UPPER HYDROLOGIC ZONE-SHALLOW WELLS (1984 RESULTS)

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

Figure 10 indicates that contamination has also migrated in an east/southeasterly direction toward the gravel channel and higher relative ground water seepage velocity of 2300 ft/year.

Contrary to expectations, methylene chloride was found in monitoring wells 104SA, 8, 1, and 5 which are north and west of the fenced area. Due to the flatness of the topography surface runoff and shallow ground water may be initially migrating in a radial pattern particularly after periods of heavy precipitation. It should be noted that monitoring wells 8 and 5 were found to be clean during the August 1985 sampling round.

Semi-volatiles followed the trend set by the volatiles in ground water, that is, they reflect the existence of a southerly contaminated ground water plume. The highest concentration of semi-volatiles were present in samples obtained from monitoring wells 6 and 9.

PCBs were not identified in ground water at the site. This is best explained by the low water solubility and high soil adsorption potential of these compounds.

The occurrence of pesticides found in monitoring wells 1 and 101SC is not considered to be site related for two reasons: these compounds were not identified in other media at the site, and these compounds are generally very insoluble in water unless they have been formulated for agricultural application. The adjacent areas around the site have been or are currently being used for agricultural purposes.

Inorganic contamination in ground water was not demonstrated to be widespread with the exception of chromium in monitoring well 11 (420 ppb) and lead in monitoring well 101D (111 ppb). The substantial amounts of inorganics in site soils constitute a source for trace metal contamination in the shallow ground water. Ground water contamination with lead and chromium is indicative of leaching of inorganics from the soil compartment since these locations are near the fenced area.

Available results from the LHZ reveal no inorganic contamination in this aquifer.

None of the organic HSL compounds identified at the site were detected in upgradient residential wells. Lead and cadmium were identified in one well during a 1983 sampling episode at concentrations of 7.1 ppb and 3.3 ppb respectively. These are below the National Interim Primary Drinking Water Standard (NIPDWS) limits of 50-ppb lead and 10-ppb cadmium. A subsequent resampling of this well in 1984 did not identify these contaminants above the detection levels.

Endangerment Assessment

Preliminary and Remedial Investigations at the site have revealed extensive contamination resulting from past waste disposal practices. Surface and subsurface soils and sediments are contaminated with organic compounds, PCBs, and inorganic trace elements. Shallow ground water and surface waters are contaminated with organic and inorganics substances.

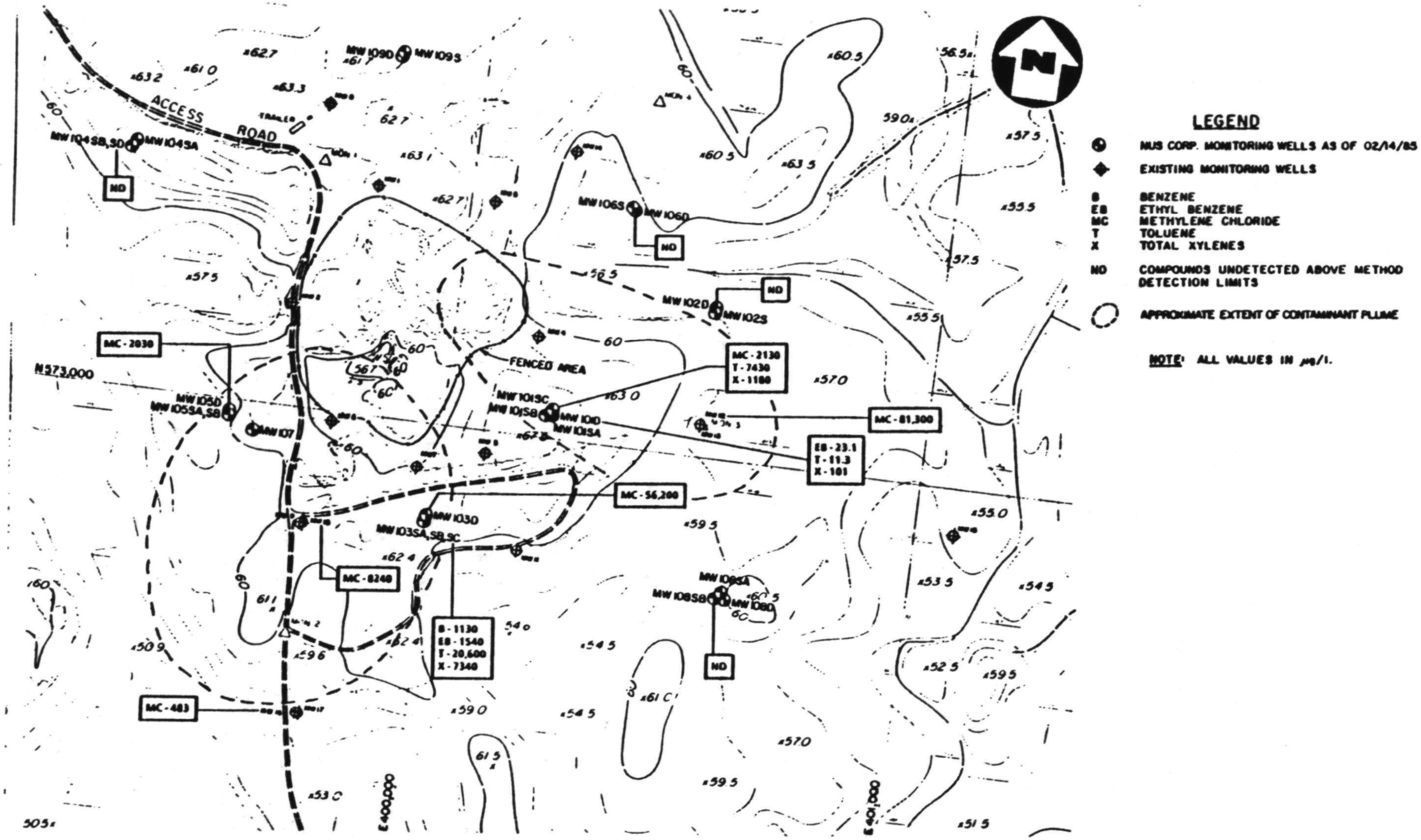


FIGURE 10

VOLATILE CONTAMINANTS IN UPPER HYDROLOGIC ZONE (DEEPER WELLS)

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

Routes of contaminant transport paths for potential exposure of human and environmental receptors in the vicinity of the site are:

- Transport via the movement of shallow contaminated ground water under the site. Contaminants may move with shallow ground water and discharge to the nearby surface water and to the wetland areas located in the vicinity of the site.

- Contaminated sediment transport due to erosion and surface water runoff of contaminated surface soils.

- Evaporation of volatile organics to ambient air, if favorable meteorological conditions and soil disturbances (during remedial action) enhance emissions to a significant degree.

- Physical transport of site contaminants by surface water during high flow conditions.

Potential human and environmental receptors at this site include:

- Users of ground water as a potable water supply. Potential receptors in the Upper Hydrologic Zone surround the site at varying distances from it. For receptors presently located upgradient of the site, there is a potential for exposure to site contaminants only if ground water movement is altered (i.e., by pumping). For those receptors in the UHZ located downgradient from the site, the wells are separated from the contaminated plume by the many wetland areas to the southwest, south, and southeast of the site. The effectiveness of the wetland areas in attenuating contaminants is not known; in addition, the percentage of the shallow ground water passing beneath the wetlands is also unknown.

  If the Lower Hydrologic Zone (lower Potomac Aquifer), which is classified as a production zone, were to become contaminated, the potential number of receptors would increase dramatically. At this time, there is no actual exposure to receptors via ingestion of contaminated ground water.

- Persons using Long Creek, the beaver pond, and all other surrounding wetland areas for recreational purposes, i.e., swimming (dermal exposure) and fishing (dermal exposure and ingestion of contaminated fish).

- Environmental receptors, including aquatic biota in affected surface waters, onsite terrestrial fauna using aquatic animals as food sources, and terrestrial vegetation.

- Property owners, third party intruders, and remediation personnel who traverse the site and come in direct contact with contaminated wastes, surface soils, or surface waters.

It should be noted that the available data do not indicate any documented past or present human exposure. The following health and environmental risks associated with this site are based on comparisons with relevant environmental exposure criteria, and the conclusions are derived from the contaminant patterns, opportunities for exposure, and the toxicity of the contaminants.

- The majority of the potential receptors using ground water for drinking purposes in the locally contaminated Upper Hydrologic Zone (UHZ) are upgradient of the site. Therefore they are not considered to be exposed to the site contaminants unless the ground water gradient changes dramatically. The UHZ water users to the southwest, south, and southeast are hydraulically downgradient from the contaminated ground water plume in the vicinity of the site. The potential for future contamination of these residential wells is related to the degree of contaminant migration beyond the site wetland areas. The downgradient ground water discharge rates have not been quantified because of site data base limitations. Monitoring wells have not been placed beyond and downgradient of the wetlands. Contaminant migration is potentially moving beyond the wetlands toward downgradient receptors.

- The many production wells located in the Lower Hydrologic Zone have not been affected by the contaminated ground water in the UHZ, however, the potential for downward migration between the UHZ and LHZ exists. The contamination detected in the sand lens in the clay-silt matrix separating the UHZ and LHZ (MW-101D) is an indication that the plume is migrating vertically through this aquitard.

- Much of the shallow ground water discharges to the numerous surface water bodies and wetlands to the southeast, south, and southwest of the site. Therefore, the potential for toxic effects to aquatic organisms is expected.

- Inhalation of volatilized contaminants and of contaminated inhalable particulates from the site is not considered to pose a potential health hazard at this time. However, should a major soil disturbance and/or contaminant migration occur, the potential for this exposure will increase.

- Dermal exposure to site contaminants is a concern. Even though the areas of highest surface soil contamination are contained within a fence, contamination to the northeast and west of the fenced area and in the surrounding wetland areas is easily accessible.

- The potential for toxic effects to terrestrial organisms (vegetation, soil/organisms, mammals, etc.) is expected to be high onsite due to levels of contamination found in the soils.

- There exists a potential risk of contaminant migration toward the wetland areas which would result in possible degradation of these environmentally sensitive areas.

Alternatives Evaluation

The major objectives for remedial action to be taken at the Harvey and Knott Drum site are to mitigate or eliminate environmental contamination and migration at the source area. This would involve preventing and/or reducing: (a) direct contact with contaminated surface soil, water, sediments and bulk waste products (b) further migration of existing contaminated shallow ground water, (c) existing concentrations of contaminants in the UHZ, (d) future contamination of the UHZ, and (e) existing contamination and further degradation of surface waters. The requirements of CERCLA Section 104, EPA's mandate to protect the public health and welfare and the environment, determine the goals and level of response for the site.

In an effort to determine remedial alternatives for the subject site, feasible technologies were identified for consideration in general response actions. Available technologies were then screened to eliminate all but the most definitive and implementable alternatives. This screening included: technical (site conditions or waste characteristics), environmental and public health, institutional, performance and cost criteria.

Certain response actions and technologies were not associated with any specific remedial objective or feasible technology for the site. These technologies and response actions and the rationale for not including them are listed on Table 2. Further detail of this initial screening is included in Section 9 of the Feasibility Study.

Those technologies that have passed the technology screening process were used to form remedial alternatives. These components were then combined to form various remedial alternatives (Table 3). These alternative are listed in the Alternatives Matrix with associated costs. Remedial alternatives were developed using best engineering judgement to select a technology or group of technologies that best addresses the problems existing at the site to protect public health, welfare and the environment. In an effort to provide a degree of flexibility in the final selection of a remedial action, alternatives covering a range of remedial action categories have been developed. These categories are described below:

A. No action: No-action alternatives could include monitoring activities.

B. Alternatives that meet the CERCLA goals of preventing or minimizing present or future migration of hazardous substances and protecting human health and the environment, but which do not attain all of the applicable or relevant standards. (This category may include an alternative that closely approaches but does not meet, the level of protection provided by the applicable or relevant standards.)

C. Alternatives that meet CERCLA goals and attain all applicable or relevant Federal public health and environmental standards, guidance, and advisories.

D. Alternatives that exceed all applicable or relevant Federal public health and environmental standards, guidance, and advisories.

E. Alternatives specifying offsite storage, destruction, treatment, or secure disposal of hazardous substances at a facilitiy approved under the Resource Conservation and Recovery Act (RCRA). Such a facility must also be in compliance with all other applicable Environmental Protection Agency (EPA) standards.

The evaluation criteria selected were: technical feasibility, public health, environmental, institutional evaluation, and cost effectiveness. Particular emphasis was placed on:

- Technical Feasibility
  - Performance
  - Implementability
  - Reliability

- Public Health Evaluation
  - Reduction of Health Impacts

- Environmental Evaluation
  - Reduction of environmental impacts
  - Protection of Natural Resources

- Institutional Evaluation
  - Legal requirements, institutional requirements
  - Community Impacts

- Cost Effectiveness
  - Capital Costs
  - Operation and Maintenance Costs
  - Present Worth Values
  - Sensitivity Analyses

Description of Remedial Alternatives

A. No Action Alternatives

Alternative No. 1 - No Action with Monitoring

This remediation activity will not improve site conditions, nor will it reduce the migration of site contaminants. Contaminants were identified in the shallow ground water (most notably toluene, xylene, and ethyl benzene). It is expected that ground water discharge to surrounding wetland areas could introduce contaminants into these locations. Regulatory control of the use of ground water in the vicinity of the site is recommended.

Soils in the vicinity of the site are highly contaminated. Soils inside the fenced area are not readily available for direct human contact; however, wildlife species are not currently prohibited from contact with this area. Extensive soil contamination has been detected outside the fenced area as well. These areas are available to human and wildlife receptors because the location of the site is close to a residential area and there is no additional fence to prohibit property access on foot.

Alternative 1 includes a long-term monitoring program to provide information on the extent of contaminant migration as a function of time. The results of the monitoring program could confirm (1) decreases in the extent or concentration of contaminants as a result of natural processes; (2) increases in the extent of concentrations of contaminants, in which case other remedial alternatives could be reconsidered; or (3) no change in the extent of concentration of contaminants, indicating that conditions have stabilized at the site.

The long-term monitoring program will consist of the following activities:

- installing nine new monitoring wells (one in the LHZ, and eight in the UHZ)
- sampling nine new and ten existing monitoring wells (see FS report p 10-8)
- sampling nine surface water locations (see FS report p 10-8).

- COMMON TO ALL ALTERNATIVES -

The remedial components for onsite pond cleanup, surface cleanup and offsite drum disposal, and post closure monitoring are essential site cleanup activities and have been included in all of the alternatives except for the No Action with monitoring.

TABLE 2

ELIMINATED GENERAL RESPONSE ACTIONS AND
ASSOCIATED REMEDIAL TECHNOLOGIES
HARVEY AND KNOTT DRUM SITE

General Response Action	Eliminated Remedial Technologies	Comments
Containment	Groundwater containment barrier walls and well point systems	Site characteristics do not support this technology (lack of a continuous impermeable formation). Installation and operation costs of this technology do not provide sufficient technical benefit.
	Gas barriers	Data does not support the need for this technology.
Diversion	Terraces and benches	Surface water runon not affecting site significantly.
	Chutes and downpipes	Surface water runon can be controlled by other means.
	Levees	Flood plains not applicable to site.
	Seepage basins	Site characteristics do not support this technology.
Complete Removal	Sewers and water pipes	Not applicable to this site.
Onsite Treatment	Solidification	Random co-disposal of various industrial waste mixtures cannot be treated with any effectiveness by this technology.
	Incineration	Waste characteristics do not support this technology.
In-Situ Treatment	Permeable treatment beds Bioreclamation Neutralization Landfarming	Random co-disposal of various industrial waste mixtures cannot be treated with any effectiveness by these technologies. Site characteristics, i.e. shallow groundwater table, also preclude the use of these technologies.

TABLE 3

REMEDIAL ACTION ALTERNATIVES
HARVEY AND KNOTT DRUM SITE

Component Technologies	Developed Remedial Action Alternatives								
	1	2A	2B	2C	3A	3B	3C	4	5
No Action with Monitoring	X	-	-	-	-	-	-	-	-
Post-Closure Monitoring	-	X	X	X	X	X	X	X	X
Soil Sampling Grid	-	X	X	X	X	X	X	X	X
Soil Cap	-	X	-	-	-	X	-	-	-
Surface Preparation	-	-	-	-	X	X	X	X	X
Magnetometer Survey	-	X	X	X	X	X	X	X	X
Multimedia Cap	-	-	X	-	-	-	X	-	-
Surface Water Drainage/Sedimentation	-	X	X	X	X	X	X	X	X
Groundwater Pumping/Treatment (Includes Pond Water)	-	-	-	-	X	X	X	X	X
Pond Water Pumping	-	X	X	X	X	X	X	X	X
Pond Water Pretreatment	-	X	X	X	-	-	-	-	-
Soil Flushing/Effluent Discharge	-	-	-	-	X	X	X	X	X
Pond/Surface Cleanup and Drum Removal	-	X	X	X	X	X	X	X	X
Partial Removal/Backfill	-	X	X	-	-	X	X	-	-
Complete Removal/Backfill	-	-	-	X	-	-	-	X	X
Onsite Landfill	-	-	-	-	-	-	-	-	X
Offsite Landfill (Container/Refuse)	-	X	X	X	X	X	X	X	X
Offsite Landfill (Complete Removal)	-	-	-	X	-	-	-	X	-
Grading/Revegetation	-	X	X	X	X	X	X	X	X

X Technology included in alternative
- Technology not included in alternative
Note: The Soil Sampling Grid will be performed twice for Alternatives 3A, 3B, 3C, 4 and 5.

REMEDIAL ACTION ALTERNATIVES EVALUATION SUMMARY

Remedial Action Alternative	Costs ($1,000s) Capital	Present Worth	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
1. No Action with Monitoring	53	729	Potential for chronic and/or carcinogenic health effects if shallow GW in site area were to be ingested at present levels. Does not address surface contamination outside of fenced area (direct contact).	Potential bio-accumulation of contaminants from surface soils (Pb, Cd, PCBs) Impacts to wetlands needs further investigation and assessment.	Installation of new MWs. Monitoring of both new and existing MWs will provide historic data on the status of the GW plume.	This alternative does not comply with RCRA GW corrective action requirements. Monitoring Program will be implemented for all alternatives.
2A. Onsite Pond Cleanup, Offsite Drum/Debris Wastepile Disposal, Contaminated Soil Excavation and Onsite Soil Cap or 2B. Onsite Multi-media Cap	1,738 2,396	2,482 3,140	Consolidation of soil contamination and residual capping reduces onsite surface exposure. Does not address existing and future contamination of the shallow aquifer.	Does not address existing contamination in saturated soils and shallow aquifer. Eventual discharge to wetland areas and potential impacts to downgradient wells.	Remaining contaminants in saturated soil will not be removed/treated or contained. GW diversion barrier not technically feasible.	SAME AS 1
2C. Onsite Pond Cleanup, Offsite Drum/Debris Wastepile Disposal, Complete Contaminated Soil Removal and Offsite Landfilling	19,004	19,721	Removal of unsaturated contaminated soil will eliminate direct contact exposure and future contamination from this source.	SAME AS 2A, 2B	Estimated excavated soil volume is 48,200 cu. yds. Source removal is effective and reliable.	SAME AS 1

Remedial Action Alternative	Costs ($1,000s) Capital	Present Worth	Public Health Considerations	Environmental Considerations	Technical Considerations	Other
3A. Onsite Pond Cleanup, Offsite Drum/Debris Wastepile Disposal Contaminated Groundwater Extraction, Treatment and reapplication and	3,572	6,825	Will prevent direct contact with highly contaminated materials. GW extraction should reduce extent of shallow aquifer plume removing pathway of potential ingestion of contaminated GW.	Should address all identified remedial objectives.	Close observation of rate of extraction and reapplication of treated GW is paramount to prevent dewatering of wetland areas.	The RA shall make a decision whether to cap residual soil contamination based on the results of a second soil grid sampling program. (3A ONLY)
3B Soil Cap or	4,363	7,486				
3C Multimedia Cap or	5,020	7,680				
4 Offsite Disposal or	21,635	17,042				
5 Onsite Landfill	6,328	8,468				

NOTE: All alternatives with the exception of No. 1 include a contingency to excavate, transport and dispose in an offsite HWMF of an additional 500 drums. This estimate is for buried drums within the fenced area.

Site action will be initiated with onsite pond cleanup. The ponded water (estimated at 200,000 gallons) will be drained and treated to a level acceptable for discharge to a Publicly Owned Treatment Works (POTW). After dewatering, drums, sludges, automobile scraps, and bulk wastes from the pond bottom (approximately 5 tons) will be removed. These wastes will be disposed offsite in a RCRA Hazardous Wastes Management Facility (HWMF).

The second remedial component common to all alternatives is a surface cleanup of all crushed and intact drums, debris, metal, waste piles and sludges. It is estimated that approximately 117 cubic yards of waste material require removal. This material will be removed from the site and disposed offsite in a RCRA HWMF.

Once the site is cleared of all surface debris and metal, a magnetometer study will be performed to determine whether additional drums are buried onsite. This study may indicate that additional excavation and drum removal is required. The cost of removing and disposing these drums is not included within the scope of the cost estimate for each of the alternatives.

The third common remedial component is that upon construction of the recommended remedial alternative, ground water and surface water post-closure monitoring program will be implemented. The scope of this program has been described previously in the No Action with Monitoring alternative.

B. Alternatives that meet the objectives of CERCLA 2A, 2B, 2C

Remedial Action Alternatives 2A, 2B, and 2C were developed to meet the CERCLA objective of protecting public health, welfare, and the environment by reducing present or future threats from hazardous substances. The intent of these alternatives is to reduce the migration of contaminants by providing surface cleanup actions consisting of onsite pond cleanup, pond water treatment, drum and bulk waste removal followed by offsite disposal, and contaminated soil excavation. Excavated materials will either be disposed onsite and capped or hauled offsite to a permitted Hazardous Waste Management Facility.

These remedial action alternatives are a combination of several remedial components and have common elements except for (a) the volume of excavated material and (b) its final disposed. Alternatives 2A and 2B include partial removal and onsite capping actions, whereas Alternative 2C is a complete removal/offsite disposal response.

Based upon results of previous site investigations, the areas of greatest surface and subsurface soil contamination are delineated on figure 11. Alternatives 2A and 2B include excavating soils in areas Nos. 1, 2, and 4, placing these soils into area Nos. 3, and capping onsite. Alternative 2C proposes to excavate areas 1, 2, 3, and 4 and dispose offsite in a RCRA Hazardous Wastes Management Facility.

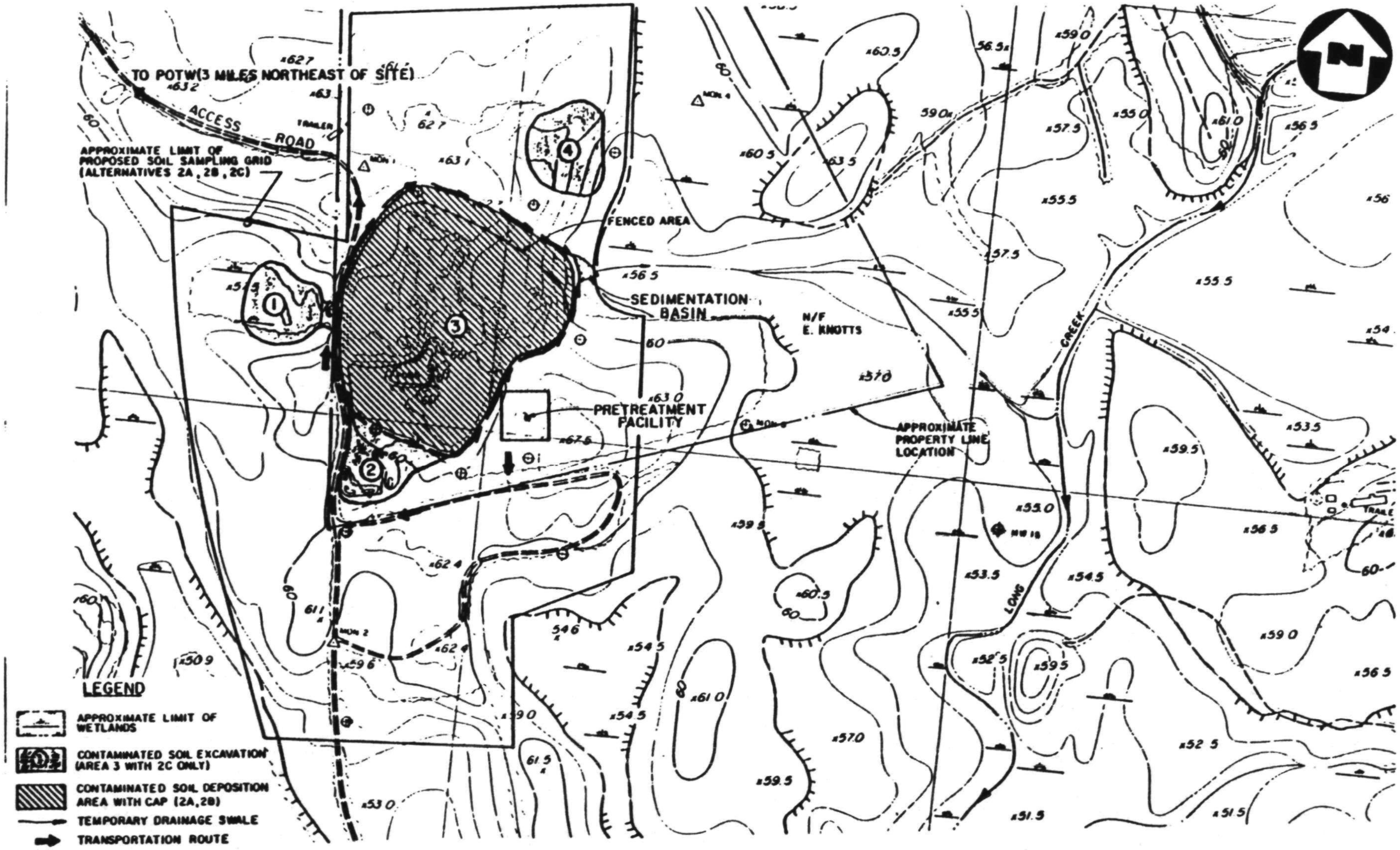


FIGURE II

REMEDIAL ACTION ALTERNATIVES 2A, 2B, & 2C

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

The depth of excavation will be limited to the elevation of the water table which is approximately five feet from the surface. A supplemental soil grid sampling program is proposed to be conducted during design. This program will determine the lateral extent of soil contamination and representative background soil characteristics. For alternatives 2A and 2B the grid sampling will determine the selected excavation volume and limits of the cap. For alternative 2C, it will determine the volume of excavation for complete removal (areas 1 through 4) and offsite disposal in an HWMF.

The only difference between alternative 2A and 2B is the inclusion of a 30 mil synthetic membrane and geotextile filter below the proposed 2A compacted soil cap. This would classify 2B as a multimedia cap.

After excavation and capping (2A, 2B) or offsite disposal (2C) is accomplished, excavated areas will be backfilled and graded to the approximate original contour. These disturbed areas will then be covered with topsoil and revegetated.

Upon completion of construction of one of these alternatives, the post-closure ground water and surface water monitoring program described under the No-action with monitoring alternative will be implemented.

C. (D) Alternatives that attain (Exceed) All Applicable Standards 3A, 3B, (3C)

Remedial Action Alternatives 3A, 3B, and 3C (figure 12) were developed to address the onsite bulk wastes, contaminated surface water, and contaminated soils (as described with alts. 2A, 2B, and 2C) as well as extraction/treatment/and reapplication of shallow contaminated ground water. Alternatives 3A and 3B are considered to attain all applicable standards while 3C is intended to exceed applicable standards.

The ground water extraction/treatment/reapplication systems are the same for Alterantives 3A to 3C. The alternatives differ with respect to remediation of residual contaminated soils. Final site closure for each alternative is contingent on the effectiveness of the reapplication (flushing) of treated ground water in reducing ground water and soil contaminants below respective target contamination levels.

Target soil and Alternate Concentration Levels (ACLs) for ground water contamination will be established during the design phase. Final levels will be determined as additional information is gained through operation of the systems.

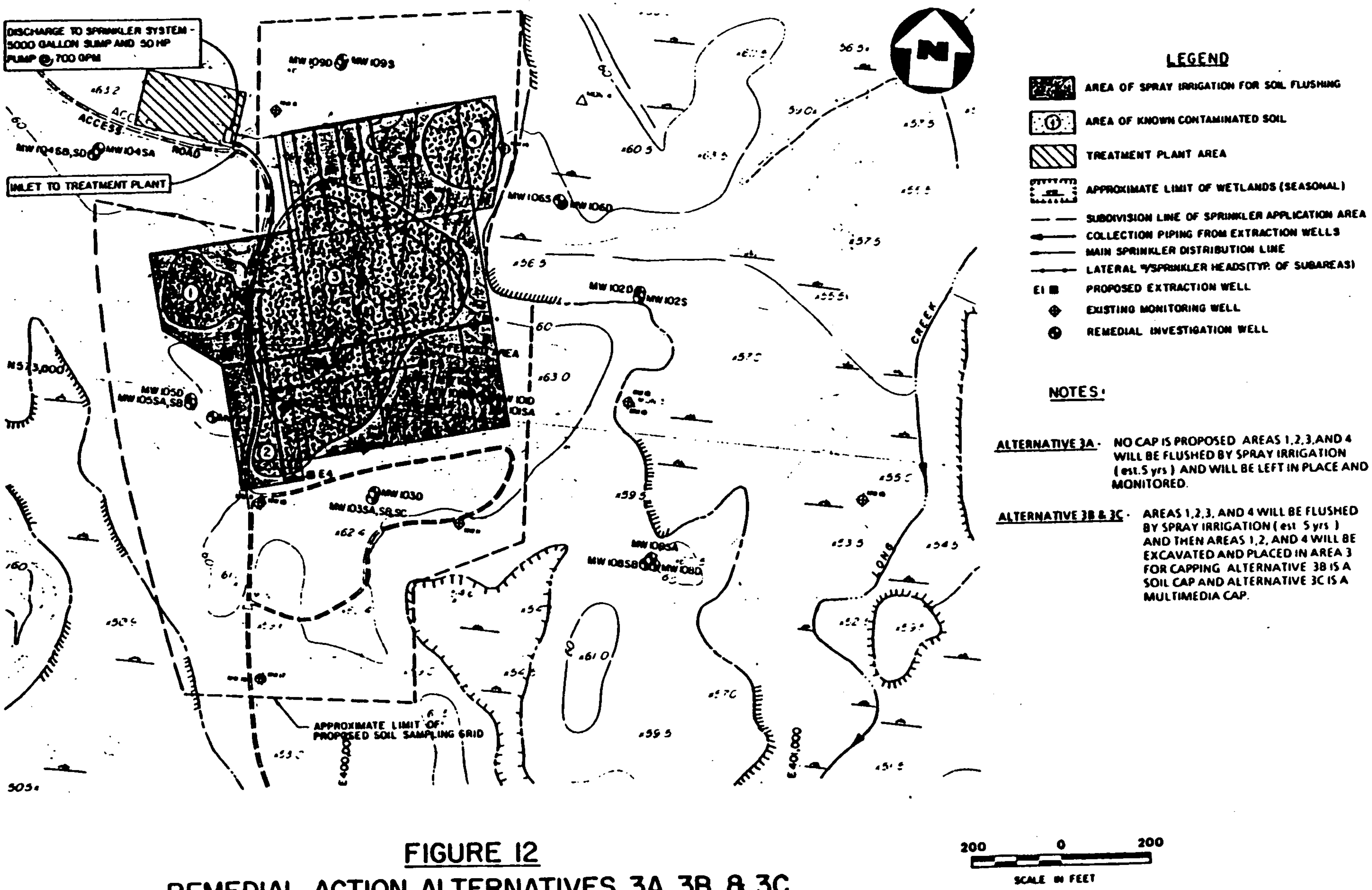


FIGURE 12

REMEDIAL ACTION ALTERNATIVES 3A, 3B, & 3C

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

The contaminant removal efficiency of the water flushing operation is expected to reduce the levels of existing contaminants in surface and subsurface soils thereby lowering the residual risk of contaminants leaching into the shallow ground water. It is estimated that the contaminated ground water extraction/treatment/reapplication systems will operate for at least five years. Once these sytems are no longer in operation, Alternative 3A requires no further action (except for post-closure monitoring). Alternative 3B would install a compacted soil cap at the end of the extraction/treatment reapplication operation due to possible residual soil contaminant levels above levels. Alternative 3C differs from 3B only by the design of the cap - 3C involves the installation of a multimedia cap and is intended to exceed RCRA requirements.

Prior to the installation of the extraction/treatment/reapplication systems the soil grid sampling program, similar to which is described in Category B, will be conducted to determine the actual limits of the reapplication (flushing) areas.

After the soil flushing has been completed, a second soil sampling program will be performed to assess residual contaminant levels in the soil. As stated previously, alternative 3A does not anticipate any further remedial action. Alternatives 3B and 3C propose to install a cap due to their expectation of higher than final levels of contamination remaining in the soil.

Upon completion of construction of the selected cap for alternatives 3B and 3C, the post-closure monitoring program initiated at the outset of these alternatives will continue as part of the operation and maintenance program. The caps will be effective as long as they are not disturbed. Post-closure inspection and maintenance will be required to ensure the integrity of the selected final cover.

Another alternative that meets all applicable standards is alternative 5. This alternative is similar to alternatives 3B and 3C with the difference being the method of remediating remaining soil contamination after the flushing program has been completed. Both 3B and 3C proposed to cap residual contaminated soil areas. Alternative 5 proposes to excavate remaining contaminated soil areas (based on the second soil grid sampling program) and place these in an onsite hazardous waste landfill designed in accordance with RCRA standards. The total estimated volume to be placed in the onsite landfill is 48,200 cubic yards.

Upon completion of construction of the onsite landfill the full post-closure monitoring program will be continued until final ground water levels have been attained, whereby only post closure monitoring for the landfill will be required.

E. Alternatives that Specify Offsite Disposal

Alternative 4 is also similar to 3B, 3C, and 5 with the difference in final remediation of the remaining post soil flushing contaminated areas being excavated and disposed in an offsite RCRA HWMF. This alternative would also be classified under Category C.

Upon completion of the excavation and offsite disposal of contaminated soil areas, the post-closure, monitoring program will continue until final contaminated ground water levels are attained.

Recommended Alternative

Section 300.68(j) of the National Contingency Plan (NCP) [47 FR 31180; July 16, 1983] states that the appropriate extent of remedy shall be determined by the lead agency's selection of a remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment. In selecting a remedial alternative, EPA considers all environmental laws that are applicable and relevant. Based on the evaluation of the cost-effectiveness of each of the proposed alternatives, the comments received from the public and information from the Delaware Department of Natural Resources and Environmental Control (DNREC), we recommend Alternative No. 3A be implemented at the Harvey and Knott Superfund Site. This selected alternative will address all onsite surface and subsurface contamination problems identified in the Remedial Investigation. Decisions on the extent of aquifer restoration, cleanup actions in offsite streams and wetlands, and final site closure will be deferred pending (a) additional soil investigation during design (b) analyses on the effectiveness of the chosen alternative and (c) the impacts of the site on the wetlands adjacent to the site.

The removal and offsite disposal to a RCRA HWMF of all crushed and intact surface drums, debris, contaminated sediments, and sludges, and the cleanup of the onsite drainage pond will:

1) eliminate and prevent further migration from these sources of contamination;

2) allow additional investigation for the presence of buried drums; these sources of contamination will also be eliminated if encountered.

3) prepare the site for the installation of the contaminated ground water extraction/treatment/reapplication facilities.

The extraction/treatment/reapplication facilities will serve a dual purpose. They will reduce the contaminated plume found in the UHZ and at the same time flush contaminants from the surface and subsurface soil compartments. These soils do not have the capacity to adsorb and significantly attenuate site contaminants as evidenced by the concentrations found in the shallow ground water. Flushing contaminated soil areas with treated water should expedite the release of contaminants from the soils.

As a precaution to direct contact with contaminated surface soils, alternative 3A proposes to grade the entire reapplication area, backfill and cover with a 24 inch layer of clean soil, and establish permanent vegetation. At the time the extraction/treatment/reapplication facilities are terminated, soils at the site will be sampled to determine whether an impermeable cap will be required. It is intended that soil flushing will reduce soil contaminants until residual levels pose no further threats to the shallow ground water which would and alleviate the necesssity to cap the site.

Results from both the ground water monitoring and soil grid sampling programs will then be evaluated to determine the level of residual contaminants and assess whether further remedial action is required. This could entail further operation of the extraction/treatment/reapplication systems and/or the installation of a more impermeable cap to attain a final site closure.

Operation and Maintenance

Periodic inspection and maintenance will be required during operation of the extraction/treatment/reapplication program to assure that it is properly functioning. Operation of the individual equipment units is expected to be relatively simple, however, the operator should have experience with a municipal well field or contaminated ground water pumping system or have demonstrated experience in a ground water related field. This is necessary to ensure that the adjacent wetlands are not dewatered by excessive pumping and insufficient reapplication rates. It is recommended that piezometers be placed at the nearest wetland boundaries to monitor the impact of the selected remedial actions on the wetlands and adjust pumping rates for seasonal fluctuations.

Maintenance of the soil cover will be required to ensure that an adequate vegetative cover is maintained to prevent erosion. The soil cover will be an effective direct contact barrier as long as it is not disturbed.

The ground water and surface water monitoring programs will commence after installation of the extraction/treatment/reapplication systems. Periodic analyses will evaluate the remedy's effectiveness in reducing the extent of contaminated ground water. Once target (ACL) cleanup levels are attained or after the ground water extraction/treatment/reapplication systems are terminated a second soil grid sampling program will be performed.

All operation and maintenance requirements will be the responsibility of the State of Delaware after completion of the extraction/treatment/reapplication program which is estimated to operate for five years.

Consistency With Other Environmental Laws

EPA is currently proposing regulation requiring the agency to select a remedial Superfund remedy which "..... attains or exceeds applicable or relevant Federal public health or environmental standards." See proposed 40 C.F.R. §300.68(f).

Environmental laws which may be applicable or relevant to remedial activity are:

- National Environmental Policy Act (NEPA)
- Clean Air Act (CAA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Delaware Hazardous Waste Regulations and Water Quality Standards

Compliance with all applicable substantive requirements of the CWA and CAA as well as Delaware Hazardous Waste Regulations and Water Quality Standards will be incorporated into the design of the recommended remedial alternative. Any potential emission of volatile gasses into the atmosphere which may occur during the construction of the remedial action or operation of the treatment systems is expected to pose a very low hazard to site personnel and a lower hazard to receptors in the vicinity of the site. All State permits for the extraction and discharge of treated ground and surface waters will be complied with as necessary.

This alternative meets the NEPA functional equivalency exception because the necessary and appropriate investigation and analysis of environmental factors as they specifically relate to the Harvey and Knott Drum site and the recommended alternative were considered and evaluated in the Remedial Investigation and Feasibility Study. A meaningful opportunity for public comment on environmental issues was provided before the final selection of the remedial alternative was made.

A Wetlands Functional Assessment was conducted by the U.S. Army Corps of Engineers and supports the implementation of the recommended alternative. Specifically, site area No. 1 as depicted on Figure 12, was designated as a wetland which had been impacted by the site. The cleanup of soil and ground water contamination with successful restoration of native vegetation in this area precludes the need for additional wetlands compensation. On a broader evaluation, the wetlands surrounding the site proper are much more extensive than site area No. 1. It was therefore recommended that measures be taken to ensure that it is not degraded. The recommended alternative will prevent the further migration of contamination from the site. A subsequent environmental assessment of the extensive wetlands and surface waters adjacent to the site will be performed to determine the impact the site has already had on these areas. Remediation decisions for the wetlands will be addressed as separate operable unit.

There is not at this time, any indication of the consumption of contaminated ground water which exceeds the National Interim Primary Drinking Water Standards (NIPDWS) in the site vicinity. All Maximum Contaminant Levels (MCLs) and Health-based exposure levels (10^{-6} cancer risk) will be used when establishing initial target levels for ground water remediation.

Decisions regarding RCRA final closure of the site and the level of ground water quality to be achieved are deferred. In order to be consistent with 40 C.F.R. 264 Subpart F of the regulations, ground water corrective action is required until the concentration of hazardous constituents at the point of compliance for a site achieves one of the following:

- MCLs for particular substances,
- an ACL which would provide adequate protection of public health and the environment,
- background levels

EPA is not prepared at this time to determine the appropriate level of ground water corrective action at this site. Operation of the extraction/treatment/reapplication facilities will operate for an estimated five years and should substantially reduce the amount of contaminants in the ground water in the vicinity of the fenced area and reduce the plume which has migrated in the southerly direction. Using 1) existing site characteristic data, 2) monitoring well analyses, 3) further wetland assessment and 4) additional information collected during the operation of the extraction/treatment/reapplication program, EPA will make a determination as to the final level of contaminants which would adequately protect human health and the environment. Under CERCLA, the ground water correction systems would continue to operate until the final established level is achieved unless that level proved technically infeasible or would not be cost-effective.

Where RCRA final closure regulations are applicable, they would require that all hazardous wastes at a site be removed, treated onsite, or capped in such a way as to minimize the migration of contaminants from the site. It is the intent of the recommended alternative to flush contaminants from the soil compartment. While these reapplication areas would not be capped immediately in accordance with RCRA, the backfill, clean soil, and revegetation should adequately address direct human exposure during the flushing program.

In conjunction with the establishment of a ground water treatment level, EPA would evaluate the level of contaminants which could be left in the soil without the necessity of a cap at the site.

Evaluation of Alternatives Not Selected

The No-Action with Monitoring alternative was not selected since it would not control the sources and migration of contamination at the site. Contaminated surface water, soils, and sediments will continue to pose a direct contact threat to human health and the environment. Contaminated peripheral monitoring wells south of the fenced area have documented the migratory behavior of contaminants found within the fenced area. Further leaching of contaminants from these sources as well as contaminated subsurface soils will continue to expand the existing contaminated plume in the shallow ground water. If the direction of the shallow ground water changes or if contamination of the lower Hydrologic Zone occurs, ingestion of contaminated ground water could occur.

Alternatives 2A and 2B involve consolidating contaminated soils and covering with compacted soil and multimedia caps respectively. Both of these alternatives reduce direct contact exposure in the vicinity of the site and decrease the amount of precipitation which would percolate through contaminated soils. Due to the high water table and geologic constraints of installing upgradient ground water barriers, leaching of contamination from saturated soils will continue to affect the shallow aquifer. The contamination persisting in the unsaturated soils will remain vulnerable to interaction with the changing water table. Thus, these two alternatives would not address the existing contamination in the shallow aquifer. The potential risk for ingestion of contaminated ground water would still remain for receptors in the site area. The discharge of contaminants to the wetlands would also cause degradation to these sensitive areas.

Alternative 2C would be more effective than 2A and 2B in reducing further leaching of contaminants in the soil by removing a greater quantity of the source (excavating 5 to 6 feet of unsaturated soils) and disposing in an offsite HWMF. However, all three of these alternatives do not address the residual contamination in saturated soils (below the water table level) and the contamination which has already migrated in the shallow aquifer. This contamination will continue to migrate with the natural ground water flow and could eventually discharge to wetlands and streams in the vicinity of the site or to other areas in the UHZ and potentially, the LHZ.

Alternatives 3B, 3C, 4 and 5 were developed to address the situation of residual soil contamination after the operation of the ground water extraction/treatment/reapplication program is terminated. For the purposes of selecting a cost-effective alternative, these alternatives were more expensive to construct and implement while achieving the same or greater level of protection of human health and the environment when compared to alternative 3A. Unless the post ground water flushing soil grid sampling program demonstrates levels of soil contamination above final accepted limits, these alternatives are considered to be less cost effective based on the expectation of the extraction/treatment/reapplication facilities cleaning the soils below final accepted limits.

HARVEY AND KNOTT

Responsiveness Summary

A public meeting was held on September 12, 1985 to discuss the Remedial Investigation and Feasibility Study for the Harvey and Knott Drum Site. The meeting was attended by 10 local residents. The EPA and Delaware preferred alternative was outlined in a one page fact sheet and the audience was invited to comment on it. A summary of the public's comments is attached. Two written statements were received. One letter written by an individual expressed concern over her health and the quality of her water source. The second letter requests EPA to pursue legal actions against the owner and operator of the site.

A fact sheet covering all the alternatives under consideration was mailed to all 120 nearby residents prior to the meeting.

There has been low community interest in the RI/FS study of the site. The first RI meeting drew 10-15 local residents.

A SUMMARY OF
CITIZEN AND INTERESTED-PARTY COMMENTS AND CONCERNS
AND OF U.S. ENVIRONMENTAL PROTECTION AGENCY RESPONSES

HARVEY AND KNOTT DRUM SITE
KIRKWOOD, NEW CASTLE COUNTY, DELAWARE
SEPTEMBER 1985

Monitoring and Artesian Wells

Issue: **Are there monitoring wells on the site?**

Response: Yes, both deep and shallow monitoring wells are located in clusters around the site. There are at least 17 monitoring wells on site. (A slide was presented to show monitoring well locations.)

Issue: **Wells in the Shelly Farms area and in the area north and northwest of the site on State Route 40 have been going dry. Could the artesian wells be responsible?**

Response: Because of the existence of the Potomac clay, it is unlikely that the deep wells are affecting the shallow wells. There is a great deal of water in the shallow aquifer, and the annual precipitation in the area is sufficient to replenish the supply. Shallow wells at the site are not going dry. However, the wells that are going dry are located in an area that is not involved in our study. It would be a good idea to find out more about conditions in that area from the appropriate local authorities.

A Delaware Department of Natural Resources and Environmental Control (DNREC) spokesman stated that this has been a dry year and that wells across the entire state have been going dry.

Issue: **How deep are the artesian wells?**

Response: They are about 230 feet deep.

Soil Contamination

Issue: **Is the soil contaminated?**

Response: There are volatile contaminants in the surface and subsurface soils now. The recommended remedial action alternative will flush these contaminants from the soil.

Issue: **Will you be removing the contaminants or just dispersing them?**

Response: Water treatment will probably consist of an initial air stripping facility to remove volatile organics from the water, and there will most likely be a carbon adsorption unit for polishing.

Issue: **How long will it take to flush the contaminants from the soil?**

Response: That will depend on how many aquifer volumes can be flushed through the system. Water flows very quickly in this area. We will keep water flushing through the system toward extraction wells, and we will treat the water and monitor water quality. After a point, the percentage of volatiles in the water will cease to reduce significantly, and at that time, we will have to decide if it is worthwhile to continue flushing water through the system.

<u>Procedural Issues</u>

Issue: **Is there any chance the State government will reject the EPA's remedial recommendations?**

Response: The EPA has put a lot of time into deciding on the remedial action alternative that is being recommended for this site and the State has already written a memo approving the EPA recommendations. No problems are anticipated.

Issue: **Will the EPA take action against Harvey and Knott Trucking, Inc.?**

Response: Part of the Superfund law requires that the Federal Government attempt to identify all potentially responsible parties (PRPs) and then find some kind of remedy with the help of the PRPs. PRPs include site owners, waste transporters, chemical manufacturers, and disposers--everyone identified with a site. From that standpoint, since they were owners and were operating as transporters, they would be identified as responsible parties. Enforcement efforts, however, are the responsibility of the attorneys.

<u>Water Quality</u>

Issue: **Four years ago, the State sampled residential water supplies. What was found?**

Response: The State did not find the water to be contaminated. The latest residential water samples indicate no organics above detection limits and no inorganic contamination exceeding the primary drinking water standards. As the earlier slide presentation illustrated, the groundwater contamination seems to be heading in a southerly or southeasterly direction.

Comments by the Potentially Responsible Parties (PRPs)

PRPs submitted written comments on three separate occasions:

1. June 19, 1985 - General Motors had retained Fred C. Hart Associates, Inc. to review remedial investigation data. Hart prepared a "Preliminary Endangerment Assessment and Remedial Alternatives" document. GM requested that the final draft RI/FS report take into account Hart's suggestions regarding (a) the endangerment assessment to the extent possible and (b) the remedial action alternatives developed by Hart.

EPA and its contractors, NUS Corporation, reviewed the Hart document, which was timely and pertinent, and to the extent possible incorporated the endangerment assessment into the Public Health and Environmental Concerns section of the RI/FS. Hart's alternatives were also similar to the remedial response alternatives developed by NUS with the exception of upgradient ground water diversion. Due to the lack of a continuous imperable formation and constructability difficulties (high water table levels and depth to the Potomac clay - 75 feet) this response action was eliminated during the initial screening of alternatives.

2. September 4, 1985 - General Motors submitted comments and observations based on the draft, August 1985 Remedial Investigation and Feasibility Study Report (NUS Corporation).

Comment #1 The report is generally adequate and comprehensive, however, the report (section 8.2) also identifies additional investigations that should be conducted prior to, or concurrent with, the selected remedial action alternative.

Answer: With the exception of the Environmental Assessment of adjacent wetlands and surface waters and Lower Hydrologic Zone investigation, EPA considers the remaining investigative work (p 8-12 of RI/FS) to be preliminary design or performance determination activities related to the recommended alternative. The Environmental Assessment of the wetlands/ surface waters has been separated as an operable unit while the LHZ investigation is necessary to further evaluate the impacts the site may have had on this confined aquifer. Thus, EPA believed it has taken GM's comment into account.

Comment #2 The report e.g., page 8-11) appears to recommend the application of drinking water quality criteria as the criteria for ground water remedial action. Since the remedial action design is not a design for the construction of a drinking water supply plant, it would be more appropriate to apply a criterion based on the level of contamination abatement necessary to meet the remedial action objectives and criteria.

Answer: Target and alternate concentration levels will be established for soil and ground water respectively to reduce or eliminate potential exposures to contamination. These levels will be investigated as a preliminary design task. GM's input will be taken into account during the development of these levels.

Comment #3 The background data for elements and compounds of concern were obtained in the Remedial Investigation. Therefore, the report should include comparisons and discussions of data representing background with those representing contaminated soils and ground water.

Answer: None of the organic Hazardous Substances List compounds identified in shallow ground water wells at the site were detected in upgradient residential wells. Also, the last sampling (1984) for inorganics did not identify these contaminants above detection levels in residential wells.

The surface soil sampling performed during the RI/FS identified areas of contamination and provided estimates for the purpose of developing and evaluating remedial response alternatives. An initial soil grid sampling program will better define the horizontal extent of soil contamination and background soil characteristics. This will be performed as a preliminary design task.

Comment #4 The general conclusions derived from the Remedial Investigation in pages ES-3 and 4, as well as page 6-63, of the report are supported by the data in the report. Relative to ground water, the most crucial migration pathway of concern, it is important to highlight the conclusions that "transport of dissolved organic and inorganic site contaminants to residential wells screened in the UHZ (upper hydrologic zone) is not considered likely at present" and "The absence of chemicals in samples obtained from wells 107D, 108D, and 109D indicates that the LHZ (lower hydrologic zone) is uncontaminated." Further, as stated in the conclusion to Chapter 6, the LHZ "does not appear to be threatened by site contamination."

Answer: Although there does not exist any present documented evidence of consumption of contaminated ground water, EPA must minimize and mitigate the threat of ingestion of contaminated ground water. This has been addressed in the endangerment assessment of the Summary of Remedial Alternative Selection.

Comment #5 We have evaluated the remedial action alternatives in the report. Based on the information in the report, we recommend EPA to select a modified alternative 3B consisting of an Operable Unit (see the February 12, 1985, EPA proposed 40 CFR 300.68(d)) and certain applicable investigation and monitoring. Implementation of the Operable Unit will be consistent with the final remedy if additional action such as Ground Water Extraction, Treatment, and Land Application via Spray Irrigation are determined to be necessary for broadening the Operable Unit into the final remedial measure.

Answer: EPA feels that this phased approach is consistent with the recommended alternative, 3A, as described in the Summary of Remedial Alternative Selection. It should be emphasized that target and alternate concentration levels established for soils and ground water must be consistent with other environmental laws. Ground water and surface water monitoring will be performed as described in the Summary of Remedial Alternative Selection.

3. September 25, 1985 - At the request of Chrysler Corporation, O'Brien and Gere Engineers, Inc., submitted technical comments after reviewing the draft, August 1985, RI/FS.

It should be noted that the original comment period for the Harvey and Knott Feasibility Study lasted from August 26, 1985, to September 20, 1985. At the request of Chrysler Corporation, the comment period was extended by EPA to September 27, 1985.

II Comment A - Until it is established that potential receptors have been or are likely to be significantly affected by ground water contamination, and until a link is then shown between the source and potential human exposure, the RI/FS is significantly flawed; it provides no basis for evaluating whether remedial action related to ground water is required, or if so, what type of remedial action is appropriate.

Answer: Potential receptors (users of both the Upper and Lower Hydrologic Zones) have been identified as described in Section 7 of the RI/FS. The link between the source of contamination and the receptor is the pathway or route of transport. This pathway is the shallow aquifer (UHZ) which is already contaminated. The plume(s) of contamination must be monitored and managed to prevent or mitigate its migration into a current source of drinking water.

Comment B - Although the RI/FS indicates that some upper level aquifers have been contaminated, it has failed to analyze the nature and extend (SIC) of any ground water contaminant plume(s).

Answer: EPA disagrees with this comment and refers to Figure 6-8, 6-9, 6-11, 6-12 and 6-16 of the RI/FS. These figures identify the nature of ground water contamination. Although many of the peripheral wells are contaminated which would indicate the plume is more widespread than presently documented, the information in the RI/FS report was sufficient to establish remedial objectives and develop and evaluate remedial alternatives.

Comment C - Type of Wastes - ANSWER: It is not the RI/FS report's sole purpose to define the generator or original source of contaminants identified in the field. It is the RI/FS reports responsibility to characterize the type of waste to assess the existing and potential threats to public health, welfare and the environment.

Comment D - Soil Contamination - The extent of soil contamination has not been determined or evaluated in the RI/FS. As a result, remedial costs associated with potential soil removal actions cannot be estimted nor can the need be evaluated.

Answer: See previous answer to Comment 3.

Comment E - Additional Data Required

Answer: See previous answer to Comment 1.

III Risk Assessment

A. EPA believes it performed an adequate risk assessment which is referenced in Section 7 of the RI/FS report. EPA disagrees with the comment that the exposure likelihood from ground water contamination is virtually nil. The potential exists and the EPA is concerned that (1) the shallow aquifer contamination will spread and (2) the deeper aquifer may become contaminated.

In reaching a decision on the appropriate CERCLA response action, EPA considers other environmental laws and regulations for guidance and will attempt to comply with these statutes. In this instance, it is clear that there is sufficient information to assess RCRA Part 264 regulations. These regulations call for a corrective action program when hazardous substances have migrated beyond the waste management boundaries and final site closure actions in waste disposal areas.

The RI/FS has established that the direction of ground water flows and how the wetlands are hydraulically influenced by the shallow aquifer. It is imperative that any current or future degradation or environmental impact to these sensitive areas be prevented. Also, further wetlands assessment will be performed to address contaminants which may have already impacted these areas and evaluate remedies to prevent additional threats.

B. As far as only doing a primary surface cleanup at the site, the PRPs comment does not take into account existing ground water contamination and the potential impacts if my have on drinking water supplies and adjacent wetlands/surface waters.

IV. Remedial Alternatives

A. Lack of Data or Analysis. See previous comment #1 and answer.

B. Technology Issues. This can be performed during preliminary design.

C. Treatment Level. The reader is referred to the Declaration section of the ROD.

V. Miscellaneous Deficiencies in Draft RI/FS

A. Cost Estimates. EPA believes it has selected the least cost alternative which meets all remedial objectives. Increases in volumes of soil, numbers of buried drums, etc., will be similarly reflected in all acceptable alternatives 3A, 3B, 3C, 4 and 5. Based on available data, EPA believes its cost estimates are accurate.

B. Laboratory Procedures

1. Standard QA/QC procedures were followed and EPA will make this information available for review.

2. There were other contaminants which did not show up in their respect laboratory blanks. These contaminants were used for assessing environmer impacts at the site. All data was subjected to stringent validating procedures.