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Office of
Emergency and
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Superfund Record of Decision:

Krysowaty Farm Site, NJ

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

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Krysowaty farm is located on a 42-acre tract of land in Hillsborough Township, New Jersey. The disposal of chemical wastes at the site was reported to have occurred between 1965 and 1970. An estimated 500 drums of paint and dye wastes were dumped, crushed and buried at the site. In addition to drums, other wastes including demolition debris, tires, automobiles, bulk waste, solvents, waste sludge and other materials were disposed at the site.

The cost-effective remedial alternative selected for this site is excavation and off-site disposal of contaminated soils and wastes at a facility approved for PCBs and monitoring of existing on-site wells semi-annually for a period of 5 years. A permanent alternative water supply will also be provided to potentially affected residences as part of the remedial action. The capital cost for the selected alternative is $2,164,014 and the O&M costs for the project, which include water usage cost (20 year present worth) and post closure envirionmental monitoring, are $145,698.

Key Words: Alternate Water Supply, Ground Water Contamination, Ground Water Monitoring, Cost/Benefit, Excavation, Remnant Contamination, Capping, Ground Water Monitoring, PCBs, TSCA Requirements

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision: Krysowaty Farm Site, NJ Contaminated media: gw, sw, soil Key contaminants: paint, dye, solvents, pesticides, inorganics		

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ROD BRIEFING ISSUES

Site: Krysowaty Farm, Hillsborough, New Jersey

Region: II

AA, OSWER
Briefing Date: June 15, 1984

SITE DESCRIPTION

The Krysowaty farm is located on a 42-acre tract of land in Hillsborough Township, New Jersey. The disposal of chemical wastes at the site was reported to have occurred between 1965 and 1970. An estimated 500 drums of paint and dye wastes were dumped, crushed and buried at the site. In addition to drums, other wastes including demolition debris, tires, automobiles, bulk waste, solvents, waste sludge and other materials were disposed at the site.

SELECTED ALTERNATIVE

The cost-effective remedial alternative selected for this site is excavation and off-site disposal of contaminated soils and wastes at a facility approved for PCBs and monitoring of existing on-site wells semi-annually for a period of 5 years. A permanent alternative water supply will also be provided to potentially affected residences as part of the remedial action. The capital cost for the selected alternative is $2,164,014 and the O&M costs for the project, which include water usage cost (20-year present worth) and post closure environmental monitoring, are $145,698.

ISSUES AND RESOLUTIONS	KEY WORDS
1. Although monitoring did not indicate that existing water supply wells were contaminated at this time, the remedy included the provision of an alternative water supply for ground water uses potentially affected by migration of waste from the site. Fractured bedrock conditions make it difficult or impossible to track movement of contamination toward water supply wells. While water supply wells were to be sampled periodically, there was a potential for episodes of contamination to escape detection, resulting in risks to water users. Upgrading	. Alternate Water Supply . Ground Water Contamination . Ground Water Monitoring

ISSUES AND RESOLUTIONS	KEY WORDS
the monitoring system would mitigate, but not eliminate, the possibility that contamination would be detected. In addition, installation of a water supply system was estimated to be slightly less expensive than an upgraded monitoring effort; if contamination were actually detected, this cost difference would increase.	
3. Extension of the existing municipal water supply system and service connections to affected residents is the most reliable and cost-effective source of an alternate water supply. The cost differential between a 6-inch water line, which will meet State requirements, and an 8-inch water line, which may be required by the water purveyor, will not be Federally funded.	. Alternate Water Supply
4. There is no assurance that all contamination will be excavated. Remnant contamination could have migrated into the 30 feet of fractured bedrock underlying the site. Excavation will include the first 6 inches of bedrock which is practical with common excavation equipment. Deeper excavation would become technically impractical and marginal costs would rapidly increase with respect to benefits from additional contaminant removal. Also, deeper excavation could potentially open fissures and compound problems associated with any remnant contamination. Potential problems due to remnant contamination will be addressed by ground water monitoring at the site.	. Cost/Benefit . Excavation . Remnant Contamination

ISSUES AND RESOLUTIONS	KEY WORDS
4. Possible on-site remedies, which included capping in place and construction of an on-site landfill, were rejected due to locational factors. These factors include difficulty of monitoring migration of contaminated ground water in fractured bedrock, and the fact that the site was inconsistent with TSCA requirements for disposal of PCB-containing wastes.	. Capping . Ground Water Monitoring . PCBs . TSCA Requirements

Record of Decision

Remedial Alternative Selection

Site

Krysowaty Farm, Hillsborough, New Jersey

Documented Reviewed

I am basing my decision on the following documents describing the analysis of cost-effectiveness of remedial alternatives for the Krysowaty site:

- Krysowaty Farm Remedial Investigation Report and Feasibility Study (RI/FS, March 1984)

- Summary of Remedial Alternative Selection

Description of Selected Remedy

- Excavation and removal of waste disposal area
- Transport and disposal of waste to approved hazardous waste disposal facility
- Provision of permanent alternative water supply for potentially affected residences
- Monitor onsite wells, semi-annually, for five year period

Declarations

Consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 CFR Part 300), I have detrmined that the excavation and offsite disposal of contaminated soil and waste, provision of a permanent alternative water supply for affected residences, monitioring of onsite wells, and sampling of offsite soils at the Krysowaty Farm site is a cost-effective remedy and provides adequate protection of public health, welfare, and the environment. The State of New Jersey has been consulted and agrees with the approved remedy.

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 off site transport, storage, destruction, treatment, or secure disposition is more cost-effective than other remedial action, and is necessary to protect public health, welfare, or the environment.

6/20/84
Date

Lee M. Thomas, Assistant Administrator
Office of Solid Waste and Emergency Response

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

Krysowaty Farm Site
Hillsborough, New Jersey

SITE LOCATION AND DESCRIPTION

The Krysowaty Farm site is located on a 42-acre tract of land in Hillsborough Township, Somerset County, New Jersey, near the Village of Three Bridges (Figure 1-1). The property consists of a northeasterly ridge, with stream valleys to the northwest and southeast. The site is located just south of the South Branch of the Raritan River in Hillsborough Township, in the extreme western section of Somerset County. The property is identified as Block 5, Lot 7 on local tax maps. Elevations at the site range from approximately 130 to 200 feet above mean sea level. Slopes range from 7 to 20 percent.

The disposal area (approximately 0.5 acres) appears to be a partly filled, semi-perennial stream channel ravine situated at approximately 74°47'00" west longitude and 40°30'00" north latitude. This stream drains into the South Branch of the Raritan River. Primary land use of adjacent property is agricultural and residential. Scattered woodlots, an oval-shaped marsh/meadow area, corn fields and pastureland are located immediately downslope of the site.

The nearest residences are located along Three Bridges Road, which parallels the South Branch of the Raritan River. The closest of these residences is located approximately 900 feet to the northeast of the site (Figure 1-2). Occupants of more than 50 residences, which are within 2500 feet of the site, depend on private wells of varying depths and construction for their potable water supplies. Currently, twelve residences north of the site are supplied with bottled water because of the possibility of contamination from the site.

The Krysowaty Farm site is located in the Triassic Lowlands section of the Piedmont Physiographic Province. Bedrock at the site is the Triassic Brunswick Formation, which is covered by a thin mantle consisting of less than six feet of red silt and decomposed siltstone. Local topography is strongly influenced by rock structure. Stream valleys tend to be linear and parallel the strike of the rocks. Valleys and hills are especially well-developed along northeasterly trends. Fracture orientation causes a secondary valley development oriented northwest. Generally, the Brunswick Formation dips northwestward and derives its permeability from fractures.

Groundwater flow occurs along the fractures or joint faces Which have been correlated to well yeilds in the area. Packer testing has shown that permeabilities at the site are moderate to very low, generally less than 10^{-5} cm/sec. Packer tests, visual inspection of rock cores, and hydrogeologic observations during drilling at the site indicate that the bulk of the formation examined comprises a single multicomponent groundwater flow system. Groundwater is strongly influenced by horizontal flow at near-surface depths. A small component of this shallow system flows into a deep regime. This deeper regime is predominantly influenced by vertical flow in its upper portion. Near the base of the deeper aquifer, the horizontal component becomes more significant.

An estimated 500 drums of paint and dye wastes and unknown materials were allegedly dumped, crushed and buried at the site. The State of New Jersey confirmed the presence of hazardous waste during a test pit excavation and sampling of approximately 20 to 30 crushed metal drums. In addition to drums, other wastes including demolition debris, tires, automobiles, bulk waste, solvents, waste sludge and other material were disposed at the site.

SITE HISTORY

The farm was owned by the Krysowaty family of Hillsborough for about 60 years, until the death of Mr. William Krysowaty in 1976. The property is currently owned by Mr. Nicholas DiGeorgia of Franklin Township, who is planning to use the land for a tree nursery.

During the period of July 1977 through November 1979, several medical complaints (e.g. contact dermititis, dizziness, and nausea during bathing, miscarriages, neurological disorders) relating to well water quality were registered by residents in the area of the site (Three Bridges Road). All complaints were registered to the Town Health Department independently, without prior knowledge of the existence of the disposal site.

Eyewitness accounts and an affidavit alleged the specific location and nature of dumping activities on the Krysowaty Farm site. The disposal of chemical wastes at the site was reported to have occurred between 1965 and 1970. Estimates are that 500 drums and unknown volumes of waste solvents and sludges were involved. Other materials are also buried and partially exposed at the site. Disposal activities, involving the deposition and mechanical crushing of drummed material, took place without the knowledge of regulatory authorities.

A test pit excavation by the State of New Jersey uncovered 20 to 30 rusted and crushed drums with adjacent soil contamination. A composite sample of the drummed waste residue was obtained and analyzed. A list of the major organic and inorganic chemicals detected in the composite sample from the excavation, leachate and on-site shallow wells are presented in Table 3-1.

Following the verification of hazardous materials disposal, the Township of Hillsborough commissioned a consultant (Betz, Converse and Murdock) to undertake a hydrogeologic study of the Krysowaty Farm site. Work commenced on the drilling of groundwater monitoring wells onsite during February 1982. According to the Township Health Officer, on February 26, 1982, the consultant notified the Township that they had confirmed that toxic wastes from the site had entered the groundwater system which flowed directly toward the private well supplies of 12 homes which lie between the dump site and the nearby river (South Branch of the Raritan). On February 27, 1982, the Township, in consultation with the State of New Jersey, issued a drinking water advisory to discourage the use of private well water for drinking, cooking and bathing purposes. The Township established a temporary alternate supply of (bottled) water for 12 residents along Three Bridges Road as a precautionary measure until additional data could be collected. In April 1982, the consultant issued a report containing, in part, the following conclusions:

> "hazardous chemical waste, including benzidine, benzene, hexacholorbenzene and other known or suspected carcinogens are buried at the site; hazardous waste constituents... are being released from the disposal site; groundwater and surface water quality is being degraded by hazardous waste constituents; a plume of contaminated groundwater is travelling in rock fractures in a generally north to northeast direction toward residences along Three Bridges Road; heavy metals are present in the residential well water samples obtained by NJDEP and the presence of organic compounds is suspected..."

Several of the consultant's preliminary findings could not be replicated by subsequent EPA sampling. However, due to the complexity of the site and the toxic nature of the wastes found at the site, these preliminary assessments/investigations were utilized to place the Krysowaty Farm Site on the National Priorities List (NPL).

In December 1982, EPA and the State of New Jersey signed a State Superfund Contract to undertake a remedial investigation and feasibility study (RI/FS) at the Krysowaty Farm Site. Since March 1983, the State of New Jersey has monitored 13 selected residential wells on a quarterly basis. Residents in twelve homes downgradient of the site have been receiving bottled water since February 1982.

CURRENT SITE STATUS

Characterization and Extent of Buried Waste Materials:

Drums, bulk chemicals, refuse, automobiles, and other wastes were identified at the site. The State of New Jersey excavated a test pit in the ravine disposal area and uncovered 20 to 30 drums from which they collected a composite waste sample. Following is a summary of contaminants found in the composite drum sample (NJDEP, 1981):

Xylenes
Ethylbenzene
N-nitrosodimethylamine
Benzidine
Dichlorobenzene
Hexachlorobenzene
4-Bromophenol phenyl ether
Bis(2-chloroethoxy)phthalate
Diethyl phthalate
Fluoranthene
Bis(2-chloroethoxy)ether
Pentachlorophenol
4,4-DDE
Butyl benzyl phthalate
Bis(2-chloroethyl)ether
Naphthalene
Hexachlorocyclohexane

Table 3-1 depicts chemical constituents encountered during various investigations at the site as well as their respective concentrations. Based on topographic analysis, power auger borings and magnetometer survey, the extent of buried waste material is estimated to be approximately 0.5 acres and the average thickness of the material is estimated at 5 feet. The resulting in-place volume of waste material is approximately 4000 cubic yards.

The waste materials in the disposal area contain contaminants (e.g. PCBs, n-nitrosodiphenylamine, bis(2-ethylhexyl) phthalate, ethylbenzene, xylene, benzidine, pentachlorophenol, chlorobenzene) that are associated with significant health risks as determined by the consultant's evaluation of their respective toxicity, concentrations encountered, and probability for exposure (RI/FS, March 1984). Specifically, these contaminants pose a threat to the public by direct contact and by virtue of the contaminants' contact with the groundwater which serves as a local water supply source.

Characterization and Extent of Contaminated Soil and Sediments:

Figure 3-4 and 3-5 graphically portray the concentration range for some of the chemicals found in the soils sediments, surface water, and groundwater during the RI/FS (March 1984) at the Krysowaty Farm Site.

A variety of organic compounds were identified in soil and sediment on-site during the remedial investigation RI/FS (March 1984). There was not a consistent pattern of distribution of the contaminants; each compound appeared to have a unique distribution in the soil and sediment. Approximately 40 different compounds were identified. Compounds detected in three or more samples were:

°Base Neutral Compounds
- -n-Nitrosodiphenylamine
- -bis(2-ethylhexyl)phthalate
- -fluoranthene
- -benzo(a)anthracene
- -benzo(a)pyrene
- -benzo(b) fluoranthene
- -benzo(k) fluoranthene
- -chrysene
- -phenanthrene
- -pyrene

°Volatiles
- -tetrachloroethene
- -ethylbenzene
- -toluene
- -methylene chloride

°Pesticides

°Polychlorinated biphenyls (PCBs)
- -Aroclor - 1221 and 1260

Samples located in the stream valley near the waste contained base-neutral compounds in addition to those listed above in concentrations in excess of 40 parts per million, and PCB 1221 concentrations in excess of 300 ppm. Base-neutral compounds were found (3317 ppb) in a sediment sample taken at the furthest downgradient sample location.

Although concentrations of individual compounds do not show discernible patterns, the concentrations of Hazardous Substance List (HSL) compounds do give an indication of the extent of contamination.

The distribution of the organics in soil and sediments indicates an elevated concentration adjacent to the suspected waste area. Progressing topographically downslope, contamination by organics decreases away from this waste source. The subtle trend of decreasing concentration away from the buried materials is probably the result of transport by surface runoff and shallow groundwater flow.

Selected inorganic parameters in soil and sediments are also the highest from samples near the suspected waste source. Their distribution away from the source may be a result of normal background distribution and not of contaminant migration.

It can be estimated that 1.3 acres of soil and sediment may be affected by contamination immediately downslope of the burial site. The contaminants in these downgradient soils off site do not pose a risk to public health based upon the consultant's evaluation of their respective carcinogenicity, toxicity, concentrations encountered, and probability of exposure (RI/FS, March 1984).

Geology and Hydrogeology:

Bedrock at the site is the Triassic Brunswick Formation, which is predominantly a reddish-brown, fractured, vuggy siltstone. The upper 20-30 feet has a higher frequency of fracturing than the lower unit. The rocks strike approximately N55°E, and dip 7 to 15°NW. Major fracture orientations are N45°E and N50°W. The residual soil is a red silt, which is less than 6 feet thick (Fiqure 3-10).

The Brunswick Formation derives its permeability predominantly from fractures. Groundwater flow occurs along these fractures or joint faces. Packer testing has shown that permeabilities are moderate to very low, ranging from 10^{-4} to 10^{-8} cm/sec, and are generally less than 10^{-5} cm/sec. Packer tests, visual inspection of rock cores, and hydrogeologic observations during drilling indicate that the bulk of the formation examined comprises a single, multicomponent groundwater flow system. A small component of this shallow system flows into a deeper regime. This deeper regime is predominantly influenced by vertical flow in its upper portion. Near the base of the deeper aquifer, the horizontal component becomes more significant.

In the vicinity of the wastes, the top of the water table was within the waste or very near this elevation during the site investigation. Seasonal fluctuation will cause the water table to rise during wet periods; thereby permitting contact of the waste with the water table. Seeps at the base of the wastes may be discharge points for the shallow portion of the groundwater system. The water table slopes towards the seeps and has a configuration similar to the surface topography.

Very shallow groundwater flows predominantly parallel to the surface drainage, until it reaches the seeps or other discharge points. A small component of this shallow groundwater system flows vertically into the deeper groundwater flow system. Groundwater flow in this system is nearly vertical and downward with a slight northward component (Figure 3-14). This occurrence was indicated by comparison of the water levels in wells 901, 904 and 905, which are all finished at approximately 75 feet of elevation. The magnitude of the vertical gradient decreases at depth, so that groundwater flow becomes more nearly horizontal. Such a change in hydraulic gradient would be necessary for the deep groundwater to discharge at the Raritan River. Based on the low elevations at the river, this is the most likely point of groundwater discharge. The Raritan is also the destination for regional surface water drainage.

The shallow and deep groundwater flow systems described above are not isolated, but interact with one another. A small quantity of the water in the shallow system, directly under the site, enters the deep system. Some of the water which discharges from the shallow system at the seep reinfiltrates and enters the deep system. Shallow groundwater is determined to be contaminated, as evidenced by elevated concentrations of several organics in the analyses of leachates and shallow wells. Toluene and carbon tetrachloride are obvious contaminants, with concentrations up to 750,000 ppb. Ethylbenzene and xylene (total) are present in concentrations up to 13,250 and 3,500 ppb, respectively. Some results are shown in Table 3-1, others are included in Appendix C (RI/FS, March 1984).

Conductivity anomalies were detected by Electromagnetic Profile (EMP) studies at all depth intervals, 0-25, 0-50, and 0-100 feet. Near-surface anomalies and water levels indicate shallow groundwater movement eastward toward the marsh area. Anomalies at deeper zones may suggest a subtle shift toward the west and northwest as indicated by analysis of groundwater in boring W-1, which is located within this boundary. Deep groundwater flow is moving northwestward toward existing residences. There are 50 residences within 2500 feet of the site which are dependent upon private wells utilizing the deep groundwater system for their potable water. It was determined that 22 homes could potentially be affected by contaminated groundwater migration to the residential wells because of their location downgradient from the site.

Based on testing performed during the remedial investigation, residential wells were not found to be contaminated by organic compounds, although low levels of contamination have been found in some groundwater monitoring wells located immediately offsite. A health risk assessment performed by the consultant indicates that, under the present circumstances, there would be no adverse health effects on the local population from the use of the local aquifer if no changes in groundwater quality were to occur. Nevertheless, twelve (of the twenty-two potentially affected) residences are currently supplied bottled water under a Township drinking water advisory as a precautionary measure.

Characterization and Extent of Surface Water Contamination:

Some surface water contamination has been detected. This data indicates the contamination is limited to the site itself and the intermittent stream bed in the ravine downgradient. As discussed in the health risk assessment (RI/FS, March 1984), at the observed concentrations and expected exposure rates, the contamination does not pose any hazard to the public or wildlife. It is not known whether the contaminant levels encountered during the remedial investigation represent a worst case situation because little is known about the type and quantity of waste disposed or the present condition of containers which may hold waste. If the wastes remain, a potential exists that the surface waters will transport contaminants to the marsh area downgradient and the Raritan River.

ENFORCEMENT

Enforcement activity is not anticipated in the near future for the Krysowaty Farm Site. The results of the investigation into potentially responsible parties are as follows:

Owner at time of disposal:

The alleged dumping occurred in 1965-1970. The owner of the property at the time and the person responsible for the dumping, William Krysowaty, is deceased. His estate was liquidated; no assets are available from the estate to pay for clean-up.

Current Owner:

The current owner purchased the property at its assessed value through an estate sale. He had no knowledge of the dumping at the time of purchase. The property currently has little, if any, value; remedial action will simply return it to its assessed value.

Generators and Transporters:

At this time, no generators or transporters have been identified. Investigation into the source of the material is continuing for the purposes of possible cost recovery. It is questionable that these efforts will be successful, since the person responsible for the dumping is deceased and there are no written records whatsoever.

ALTERNATIVES EVALUATION

During the feasibility study, alternatives were developed in order to meet a set of site-specific remedial action objectives. These objectives were:

- °To ensure public health and safety
- °To protect the quality of local ground and surface water
- °To preserve local land use by preventing the migration of contaminants to nearby agricultural and residential lands
- °To ensure that the remedial actions are technically feasible and cost-effective.

A preliminary list of remedial technologies was developed based on the assesssment of site conditions (Table 4-1). These technologies were run through an initial screening using technical feasibility, costs, and environmental/public health impacts as criteria for evaluation (RI/FS, March 1984). Following the initial screening, chemical treatment of soil, solidification, insitu treatment and bioreclamation were removed from further consideration due primarily to high cost, unproven technology status and waste compatability problems. Whereas similiar problems were considered complicating factors for groundwater control and treatment technologies, geologic conditions at the site were considered the most limiting factors discouraging the application of these technologies at the Krysowaty Farm site. The fractured bedrock geology of the Brunswick Formation does not provide a reliable foundation to isolate the waste from the environment through the use of grout curtains or slurry walls. Furthermore, because much of the bedrock underlying the site is relatively impermeable, except for open fractures, technologies employing active groundwater pumping were considered impractical since there is no assurance that all contaminated groundwater could be affected by pumping.

After completion of the initial screening of technologies, a detailed evaluation of technologies was conducted in order to recommend a cost-effective alternative.

The following six remedial action alternatives were developed for a more detailed analysis of effectiveness and cost measures:

1. No Action

2. Cap waste - collect and treat groundwater - monitor groundwater

3. Excavate waste - dispose by incineration - monitor groundwater

4. Excavate waste - dispose onsite - monitor groundwater

5. Excavate waste - dispose offsite - monitor groundwater

6. Excavate waste - dispose offsite - alternate water supply-monitor groundwater

The cost-effective alternative is the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates or minimizes damage to and provides adequate protection of public health, welfare, and the environment. The candidate technologies were rated according to several measures of effectiveness and cost.

The critical components of effectiveness measures were determined to be:

- o Technology Status
- o Risk and Effect of Failure
- o Level of Cleanup/Isolation Achievable
- o Ability to Minimize Community Impacts
- o Ability to Meet Relevant Public Health & Environmental Criteria
- o Ability to Meet Legal and Institutional Requirements
- o Time required to Achieve Cleanup/Isolation
- o Acceptability of Land Use After Action

The following evaluation of the six remedial action alternatives will consider the effectiveness of each alternative to meet these critical components.

According to the National Contingency Plan, a total cost estimate for remedial action must include both construction and annual operation and maintenance costs. Construction costs and operation and maintenance cost were estimated for the alternatives under consideration (Table 5-1). For operating and maintenance cost, a "present value" analysis was used to convert the annual costs to an equivalent single value. Operation and maintenance costs were considered over a 20 year period; a 10 percent discount rate and 0 percent inflation rate were assumed.

Alternative #1: the "No Action" alternative was eliminated. Contamination has been demonstrated onsite and immediately offsite. Direct contact with exposed drums and contaminated onsite soil presents a public health hazard because the site is accessible.

It has been demonstrated that the waste in the disposal area is in contact with the groundwater at least seasonally, therefore, the transport of contaminants to the shallow groundwater system would continue if no action is taken. Simarily, contaminants discharging at the seep located at the bottom of the disposal fill area, as well as surface runoff, can result in transport of contamination offsite through farm and pasture lands into an adjacent watercourse, the Raritan River. A health assessment (RI/FS, March 1984) of the types and concentrations of waste found at the site reveals a significant health threat is posed by exposure to the waste through direct contact. Whereas a lesser health threat is posed by the types and levels of contamination identified downgradient of the disposal area, the potential would remain for discharge of more hazardous materials from the disposal area if no action is taken. It is not known whether the contaminant levels encountered during the remedial investigation represent a worst case situation because little is known about the type and quantity of waste disposed or the present condition of containers which may hold waste.

The remaining mitigation alternatives under consideration for the Krysowaty Farm site involve both onsite and offsite actions. Onsite remedial action is required to address the hazards (i.e. direct contact and contact with the local drinking water aquifer posed by wastes in the disposal area). Offsite action is required to: 1) fulfill the need for post-closure monitoring to address the migration of any fugitive contamination plume generated during, or remaining after, onsite work is completed, and 2) ensure that the 22 potentially affected residences immediately downgradient of the site, including the 12 which are currently provided with an alternative (bottled) water supply under a drinking water advisory issued by the Township and the State of New Jersey, be provided with a potable water source.

Alternative #2: the "Cap waste-collect and treat groundwater-monitor groundwater" alternative involves: 1) the construction of a French drain system immediately downgradient of the disposal area to: a) lower the water table and thereby prevent its contact with the wastes, b) collect runoff to prevent migration of contaminants c) treat collected ground and surface water; 2) Cap the entire disposal area (0.5 acres) with fill and synthetic liner; and 3) monitor onsite wells and offsite residential well to track remnant contaminant migration and/or ensure adequate drinking water quality.

The various technologies used in the development of this alternative are well established and are considered common engineering practices. However, a failure (e.g. inadequate interface with fractures bearing contaminants) of the system could result in the migration of contaminants into the area surface waters and groundwater. Although the chance of failure is small, the environmental and health risks are of concern because of site conditions which are unfavorable to siting a landfill at this location. In particular, the fractured bedrock will make a failure difficult to detect.

Failure of the cap could result from erosion due to high topographic relief at site. Such a failure could result in the release of contaminated groundwater or could permit the instrusion of surface water into the capped areas and thus allow the vertical flow of contaminants into the groundwater.

PCB's were found in several soil and sediment samples taken at, and downslope of, the site. Concentrations ranged up to 340 ppm. PCB wastes are regulated under the Toxic Substances Control Act (TSCA). Many of the other substances found at the site are regulated under the Resource Conservation and Recovery Act (RCRA). Although most of contaminated material at the site does not contain PCB's, the precise location of PCB disposal is not known. Separation of the PCB material from the other wastes at this site would require such extensive sampling that it would be impractical. Limited excavation and disposal of the PCB material was, therefore, not considered. Since the landfill siting requirements under TSCA are more stringent than those under RCRA, the in-place alternatives will be evaluated with respect to TSCA requirements.

Allowing the dump site to remain in-place would violate the spirit of several technical siting requirements for PCB landfills given in 40 CFR Section 761.75(b). The regulations require that a landfill shall be located in thick, relatively impermeable formations such as large area clay pans. Groundwater recharge areas should be avoided and there should be no hydraulic connection between the site and standing or flowing surface water. The bottom of the liner or in-place soil barrier should be at least 50 feet from the historical high water table. In addition, the site should be located in an area of low to moderate relief to minimize the potential for erosion. Moreover, PCB wastes should be segregated from organic solvents in the disposal area. All of these technical requirements would be violated by implementation of an in-place alternative at the Krysowaty Farm site.

The threat of the wastes remaining on the site and the potential of its migration to public drinking water supplies would cause a high degree of community concern. There is strong pressure at the state and local level to clean up the site. An in-place alternative would be strongly protested.

The design and implementation of a groundwater monitoring program is proposed to partially address this offsite concern by tracking any migration of groundwater contaminants from the site. This program would involve the utilization of existing (or establishment of a new system of) monitoring wells to detect any contaminant plume in the groundwater and assure the health of nearby residents. Several monitoring scenerios were examined in the RI/FS report and are highlighted in Table 5-2. The options presented involve the sampling of residential wells and existing onsite monitoring wells. The costs associated with these options, for various monitoring periods were also examined (Tables 5-2, 5-3 and 5-4).

Based on existing information, a program to sample 8 existing monitoring wells and 22 residential drinking water supplies lying within the area northeast to west-northwest of the site was proposed. The sampling frequency would initially be monthly for 6 months during remedial onsite activities and then quarterly for twenty years thereafter. The samples would be analyzed for the 129 priority pollutants.

The probability of failure of this monitoring program is directly dependent upon the number of wells in the monitoring network, since the possibility of not detecting a contaminant plume in fractured rock increases as the area between well borings increases. The frequency of sampling in the fractured Brunswick Formation will also affect the reliability of any monitoring program because of the way groundwater passes through the fractures intermittantly.

Should this system fail to detect a contaminant plume and should the plume reach residential wells downgradient, significant health risks may result.

The proposed monitoring will neither clean up any groundwater contamination nor isolate the residents from contacting it. The monitoring program can only serve as a warning system for contaminant migration. Inherent to monitoring programs are problems associated with delays in obtaining critical data and adequacy of frequency in sampling or location of monitoring wells.

Based on the types and levels of contamination found in the shallow groundwater system during the investigation, the health risk for a population ingesting this contamination was not considered significant (RI/FS, March 1984). However, additional risks are associated with the unknown character of wastes leaked below the site and the fact that the recent investigation may not be representative of a worst-case situation discharge from the site (e.g. rupture of additional drums or influence of wetter seasons on character of discharge).

The monitoring of wells, in itself, should not affect resident's, daily lives. If contamination is noted in the monitoring or drinking water wells, further remedial actions may be required.

The remaining Alternatives #3,4,5, and 6 under consideration all involve the excavation of the waste disposal area. Based on topographic analysis, power auger borings and magnetometer investigations, the extent of the disposal area is estimated to be approximately 4000 cubic yards. Sampling results show that the contamination is spread throughout this volume in a random pattern. The wastes in the disposal area contain contaminants (e.g. PCB's, n-nitrosodiphenylamine, bis (2-ethylhexyl) phthlate, ethylbenzene, xylene, benzidine, pentachlorophenol, chlorobenzene) that are associated with significant health risks, as determined by an evaluation of their respective carcinogenicity, toxicity, concentrations encountered and probability of exposure to man and the environment (RI/FS, March 1984).

Implementation of the excavation component of Alternatives #3,4,5, and 6 would involve excavation of the waste material. The area to be stripped will first be cleared of vegetation, and stumps and roots will be grubbed. The waste and contaminated soils, including the first 6 inches of bedrock, will be removed for final disposal. The excavated areas will be covered by a layer of backfill and then topsoil, which will be revegetated.

The various technologies utilized to excavate material are common and well established. Removal of the waste would eliminate a very large percentage of the source contamination. However, there is a risk that not all contamination can be practically excavated. The remedial investigation identified that as much as 30 feet of fractured bedrock underlies the disposal area (RI/FS, March 1984). These fractures could provide a haven for remnant groundwater contamination. Resistivity studies during the remedial investigation were suggestive of potential contaminant migration between 25 and 100 feet, but confirmation could not be obtained from the existing sampling points. Removal of the first 6 inches of bedrock is practical with common excavation equipment. Deeper excavation, however, would become increasingly difficult. The marginal costs for excavation would rapidly increase with respect to benefits derived from any additional contaminant removal. Futhermore, deeper bedrock excavation could potentially open fissures and compound problems associated with any remnant contamination which could exist.

Implementation of excavation will result in remediation of most aspects of the site except for any contaminated ground water and offsite surface contamination downgradient from the site. Although the potential for deep ground water contamination may persist, the excavation should eliminate the contamination of the shallow ground water and seeps. Offsite soils will be sampled by the State followed by an analysis of the need for additional remedial action. The ability of excavation to minimize community impacts would be high since the source of contamination would be removed. Following revegetation, the potential land uses should be the same as the predisposal and surrounding land uses.

Alternative #3: "Excavate waste - dispose by incineration - monitor groundwater" involves excavation of the disposal area (described above), high temperature destruction of contaminated soils in a rotary kiln incinerator and monitoring of onsite wells and offsite residential wells.

A typical soil incineration system would include the batch feeding of solids into the incineration unit, incineration of soils, disposal of residue, and air pollution control. The system proposed for Krysowaty Farm would include the use of three mobile rotary kilns operating at a continuous feed rate of 2 tons per hour each. At this rate, the entire amount of contaminated materials could be detoxified within 5 months. The resultant material would be considered non-hazardous and could remain onsite.

Technology status for rotary incineration is established. The installation and operation of the treatment area may require compliance with technical requirements under RCRA. In addition, it may be necessary to address other federal and state requirements for air and water discharges. Operation of the incinerators, soil handling equipment, traffic associated with fuel and other supplies will increase noise levels in the residential/ agricultural area and adversely affect the community.

A ground water monitoring program would be required to address any remnant contamination remaining after excavation. The monitoring program proposed to address this concern would be similar in scope to the program described in Alternative #2, except the duration of monitoring would be reduced to 5 years because the source of wastes would no longer be located onsite. The effectiveness of a monitoring program was previously described in Alternative #2; however, additional risk of failure could be associated due to the shorter term of the monitoring proposed herein.

Alternative #4: "Excavate waste - dispose onsite - monitor groundwater" involves excavation of the disposal area (described above), construction of a secure onsite hazardous waste landfill, and ground water monitoring of onsite wells and offsite residential wells (described under Alternative #2).

Whereas the technology for constructing and operating a secure hazardous waste facility is developed, the characteristics of Krysowaty Farm are inappropriate for locating such a facility, as previously discussed. In fact, construction of a PCB landfill at this site would violate TSCA siting requirements for such landfills. Thus, a landfill on this site would not be considered adequate to protect public health and the environment.

Beyond physical limitations of the site, the construction of a hazardous waste landfill would be delayed because New Jersey has no regulations for siting such a facility within its boundaries.

To address any remnant contamination after excavation, and to back up the onsite disposal faciltiy monitoring, a monitoring program (described in Alternative #2) has also been considered for this alternative.

Alternative #5: " Excavate waste - dispose offsite - monitor groundwater" involves excavation of the disposal area (described above), transportation of waste to an approved hazardous waste disposal facility, and groundwater monitoring of onsite wells and offsite residential wells (described above in Alternative #3).

Offsite disposal involves loading the excavated waste (approximately 4000 cubic yards) onto large-capacity hauling trucks and transporting it to an approved waste disposal facility. Since wastes would be disposed in a properly sited facility, less risk is associated with implementation of offsite disposal than onsite disposal. It is estimated that four months would be required to remove the waste from Krysowaty Farm and dispose offsite.

Excavation and offsite disposal would meet all public health and environmental criteria except for any remnant contamination left after onsite action is completed. The effectiveness of the groundwater monitoring program described in Alternative #3 was considered to address this concern. No legal or institutional requirements are expected to complicate implementation of this alternative. Aside from the annoyance of increased (short-term) vehicular traffic during removal, the public is expected to react favorably to removal of the waste from the residential/ agricultural community.

Alternative #6: "Excavate waste - offsite disposal - alternative water supply-limited groundwater monitoring" involves excavation of wastes and offsite disposal in a secure landfill (described above in Alternative 5) and provisions for an alternative water supply source to the 22 homes which lie immediately downgradient from the site. This alternative combines the attributes of source excavation and offsite disposal with provision of a reliable potable supply to potentially affected groundwater supply users immediately downgradient of the site. In addition, limited groundwater monitoring will be undertaken to ensure that any remnant groundwater contamination does not pose on environmental threat further downgradient (e.g. Raritan River).

Alternatives #2,3,4, and 5 have incorporated a groundwater monitoring program to address potential problems of remnant contamination after onsite remedial action. As identified in the discussion above in Alternative #2, there are several risks and short-comings associated with implementing a monitoring program in a fractured geologic system such as the Brunswick Formation at Krysowaty Farm. Efforts to minimize these risks by improving the design of the monitoring program would involve the collection of additional data costing as much as $400,000 or more. However, the complexity of the geology at Krysowaty Farm may continue to thwart this study effort. To date, a minimum of $500,000 has already been expended in an attempt to understand the complex hyrogeologic system of the Krysowaty Farm site.

Wastes in the disposal area contain contaminants which pose a significant health threat. At best, an adequate monitoring program will only track the progress or arrival of contamination. The fractured bedrock poses special problems which create a unique situation at this site. It is possible that contaminants could migrate through fractures and evade detection. Also, under these circumstances, it would be difficult to purge the contaminants by groundwater pumping.

As pointed out in the discussion under Alternative #2, additional risks are associated with the unknown character of wastes leaked into fractures below the disposal area during, or left after, onsite remedial action is complete. If contamination is noted under any monitoring program, further remedial action may be required. Alternative #6 incorporates the provision of an alternative water supply to protect groundwater supply users immediatly downgradient of the site against the health risks associated with remnant contamination and the uncertainty surrounding the adequacy of monitoring to address these health risks. A limited monitoring program involving the 8 existing onsite wells is proposed to address the environmental risks any remnant groundwater contamination may pose further downgradient (e.g. discharge of the regional groundwater system at the Raritan River).

Several alternative water supply technologies including: 1) extension from an existing municipal supply, 2) a newly developed supply (well), 3) individual treatment at each residential wellhead and 4) bottled water were evaluated to determine the most cost-effective means to provide residents with a reliable potable supply. The screening process identified that extension of the existing municipal supply and individual well treatment were the least cost alternatives. Analysis of these option shows that municipal water supply extension is the most reliable and least prone to risk or failure (RI/FS Appendix G). Therefore, this alternative would involve a 17,000 foot pipeline extension from the Elizabethtown Water Company's 16 inch water main [located on U.S. Route 202 near the South Branch of the Raritan River] to the 22 homes (Figure 1-3) immediately downgradient of the site.

COMMUNITY RELATIONS

On March 1, 1983 EPA held a scoping meeting at the Hillsborough Municipal Building to make a public presentation of the remedial investigation and feasibility study work plan for the Krysowaty Farm Site. Notification of the meeting was accomplished through newsreleases and Township mailings (Attachment 1). Attachment 2 is a list of attendees from the meeting. In general, the public welcomed the involvement of EPA after two years of local and state government investigation of the site. The overriding emphasis of the public comment was toward cleanup action in lieu of additional study work. Twelve residents were on bottled water because of the threat posed by the site. Many residents voiced their views that the obvious remedial solution for Krysowaty Farm was removal and establishment of a permanent water supply. Therefore, suggestions were made to not waste monies on additional studies, but rather begin the obvious remediation immediately.

On March 13, 1984, EPA made the draft Remedial Investigation Report and Feasibility Study (RI/FS) available for public comment at select locations (e.g. Township Library, and Health Office). In addition, the Agency established a 65 day public comment period which ended May 17, 1984. On March 20, 1984, a public meeting was held in the Township Municipal Building. Notification of the meeting was handled by a Township mailing. No attendance list is available from this meeting however, many residents who attended the scoping meeting were again in attendance. EPA and NUS Corporation made a presentation on the RI/FS findings and recommendations. The RI/FS had recommended excavation and removal of waste disposal area onsite with follow up monitoring of onsite and offsite (residential) wells for an indeterminant period. EPA specifically requested public input on the number of years monitoring should be maintained after the onsite remedial actions was completed. Following the EPA/NUS presentation, Township Council members expressed their concern that, beyond excavation and removal (which was fully endorsed) a reliable alternative water supply source to affected residents be provided. Comments were raised regarding the adequacy of the consultants understanding of the geologic system underlying the dump site, the sufficiency of one year's quarterly sampling of residential homes to establish the absence of contamination or threat of contamination, and the adequacy of the risk assessment data base and conclusions.

Concern was raised for the adequacy of monitoring to address the potential unknowns regarding migration pathways through the geology underlying the site and the contaminants which may remain after site remediation. The council members found it unjustifiable to accept monitoring instead of an alternate water supply at roughly the same costs. The Township Engineer submitted a revised cost estimate of $500,000 for providing 22 residents with an alternative water supply.

The residents present at the meeting endorsed the excavation and removal aspects of the proposed remedial action. In general, the affected residents (receiving bottled water) as well as others from the Township and neighboring communities were in support of a permanent alternative water supply to ensure a reliable potable source and eliminate the psychological stress caused by the uncertainties associated with monitoring. At least one resident was opposed to the provision of a water line to the area. This resident felt the quality of her water was good and there was no need to replace it.

A responsiveness summary for all comments received during the public comment period is attached (Attachment 3).

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

The final recommended remedial alternative for Krysowaty Farm will require that excavated materials be manifested for transport from the site to a secure landfill in accordance with RCRA and TSCA requirements. The material to be removed will be visible, contaminated soil (down to and including the first six inches of bedrock within the disposal area, as defined by magnetometer and topographic analysis) crushed and buried drums and other debris contaminated by contact with the wastes. PCB contamination at Krysowaty Farm did not exceed 500 ppm; therefore, disposal of contaminated soils will occur in a landfill approved to receive PCB's in accordance with TSCA. If soils are encountered with PCB levels over 500 ppm, these soils will be incinerated as per TSCA requirements. Compliance with the Safe Drinking Water Act will be the responsibility of the water purveyor. The recommended monitoring of the onsite wells for five years following removal of the wastes is not inconsistent with RCRA requirements for detection monitoring.

RECOMMENDED ALTERNATIVE

According to 40 CFR Part 300.68(j), cost-effective is described as the lowest cost alternative that is technically feasible and reliable and which effectively mitigates and minimizes damages to and provides adequate protection of public health, welfare, and the environment. Evaluation of the six suggested remedial alternatives leads to the conclusion that ALTERNATIVE #6 is the most cost-effective.

The components of Alternative #6 are technically feasible and reliable, and when combined, provide the greatest level of protection for public health, welfare and the environment. Excavation and offsite disposal of contaminated soils and wastes to a secure hazardous waste management facility is a well established and reliable technology. The removal of wastes from the residential/agricultural setting will minimize public health threats posed by direct contact with the waste as well as minimize the release and continued degradation of the surface and groundwater immediately offsite. The monitoring of existing onsite wells for a short term following excavation will evaluate the migration of any remnant contamination and thereby ensure the effectiveness of the onsite remedial action. The provision of permanent alternative water supply to the potentially affected residences located downgradient will ensure the protection of public health by preventing use of local aquifer which may currently be contaminated, or become contaminated as a consequence of onsite remedial action due to the fractured system.

Of the remaining alternatives, four (alternatives 1,2,4,and 5) were found to be significantly deficient in their ability to minimize actual or potential hazards at the site. In particular, onsite alternatives 2 and 4 were not considered appropriate because they were inconsistent with TSCA regulations for the siting of PCB landfills. The deficiency in alternative 5 was the inability to assure, with a high level of confidence, that the monitoring system would be sufficient to ensure that groundwater users would not be exposed to contaminated drinking water. By providing an alternative water supply, alternative 6 provided a higher degree of certainty of safe drinking water at a marginally lesser cost. However, the cost for alternative 5 assumes that no contamination is detected in the deep aquifer. If contamination were detected, the monitoring costs for alternative 5 would be significantly greater. Alternative 3 was rejected because the cost is significantly higher than the cost for alternative 6.

None of the alternatives address existing offsite contamination downgradient from the waste disposal area. This is not believed to pose a significant risk. However, the State will conduct further sampling in this area and a final determination of the need for further action will be made at a later date.

The following activities are recommended for approval:

Onsite

- °Excavation and removal of the waste disposal area (approximately 4000 cubic yards)
- °Transport and disposal of waste to nearest approved hazardous waste disposal facility
- °Monitoring onsite wells for 129 priority pollutants, semi-annually, for a period of 5 years.

Offsite

- °Provision of an alternative water supply to potentially affected residents (approximately 22 homes).

The following listed figures represent a cost estimate for the proposed actions. Cost sharing for project implemetation is 90% Federal and 10% State on capital costs. Water usage costs will be borne by the individual residential consumers. Post-closure monitoring costs will be borne by the State of New Jersey.

Cost Summary for Recommended Remedial Alternative #6

Individual Remedial Measure Components	Capital	Costs O&M	Total
Excavate waste - regrade	77,114	-	77,114
Offsite disposal	1,518,000	-	1,518,000
Water Line Extension	568,900*	52,800**	621,700
Monitor Groundwater Onsite		92,898***	92,898
	2,164,014	145,698	2,309,712

Total Project Cost	$2,309,712
Federal Share (90% Capital Cost)	2,078,741
Detailed Design (Estimated Cost)	160,000
Total Federal Obligation	$2,238,741

Footnotes:

* a 6" water line will meet State requirements and provide affected residents with an adequate replacement potable supply. An 8" water line may be required (by the purveyor) at a capital cost of $681,200. The cost differential between these water lines will not be federally funded.

** This O&M cost (52,800) reflects water usage cost (20 year present worth) to be borne by the residential consumer.

*** This O&M cost (92,898) reflects post-closure environmental monitoring which the State of New Jersey has agreed to undertake.

OPERATION AND MAINTENANCE (O&M)

During, and subsequent to, onsite remedial actions (excavation), a limited monitoring of the site will occur to evaluate the migration of contaminants offsite into the local groundwater system. There are eight monitoring wells located onsite (surrounding the disposal area) which penetrate the upper and lower reaches of the underlying aquifer. These wells will be sampled for the 129 priority pollutants on a semi-annual basis, for a period of five years. Estimated costs for this monitoring is presented in Table 5-4. The State of New Jersey Department of Environmental Protection has agreed to finance and undertake this effort (Attachment 4).

SCHEDULE

	Date
- There is no enforcement action for this site	
- Final Record of Decision (ROD)	June 15, 1984
- Amend State Superfund Contract	June 30, 1984
- Award IAG for Design and Construct	June 30, 1984
- Start Design	August 1, 1984
- Complete Design	December 1, 1984
- Start Construction	March 15, 1985
- Complete Construction	July 30, 1985

FUTURE ACTIONS

Since the waste will be removed and disposed offsite in a secure hazardous waste facility, and downgradient residents will be isolated from any remnant contamination by provisions of an alternate water supply, the significant health threat posed by the Krysowaty Farm Site will be mitigated. The fugitive contamination remaining after onsite remedial action can no longer threaten human health but it may pose an environmental hazard downgradient. Regional groundwater discharges to the Raritan River. To date, no contamination has been identified; however, the State of New Jersey has agreed to sample the existing onsite monitoring wells to evaluate this potential hazard. Furthermore, additional sampling of the contaminated soils downgradient from the disposal site will be undertaken to assess the need for future remedial action.

KEY TO ILLUSTRATIONS

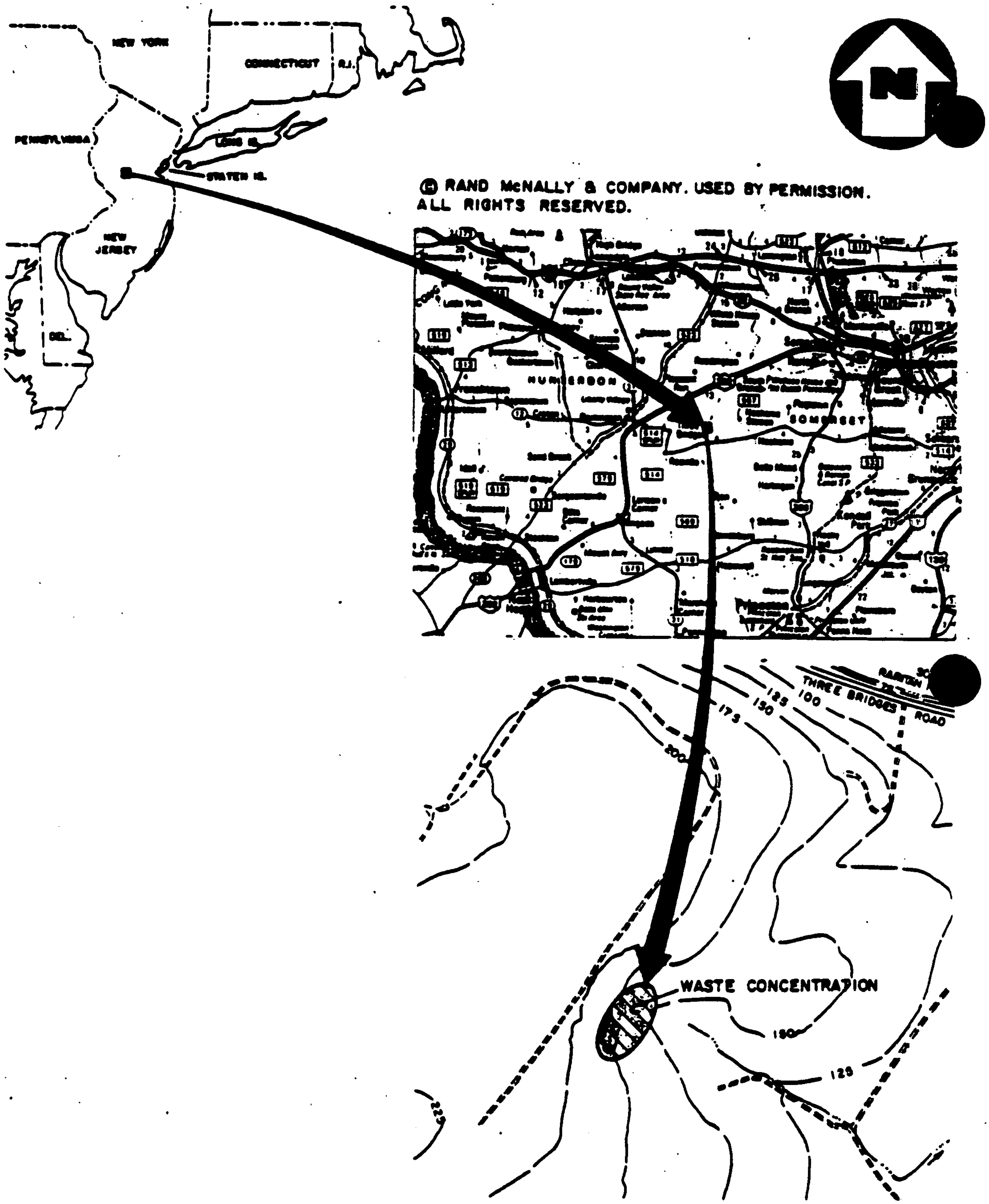
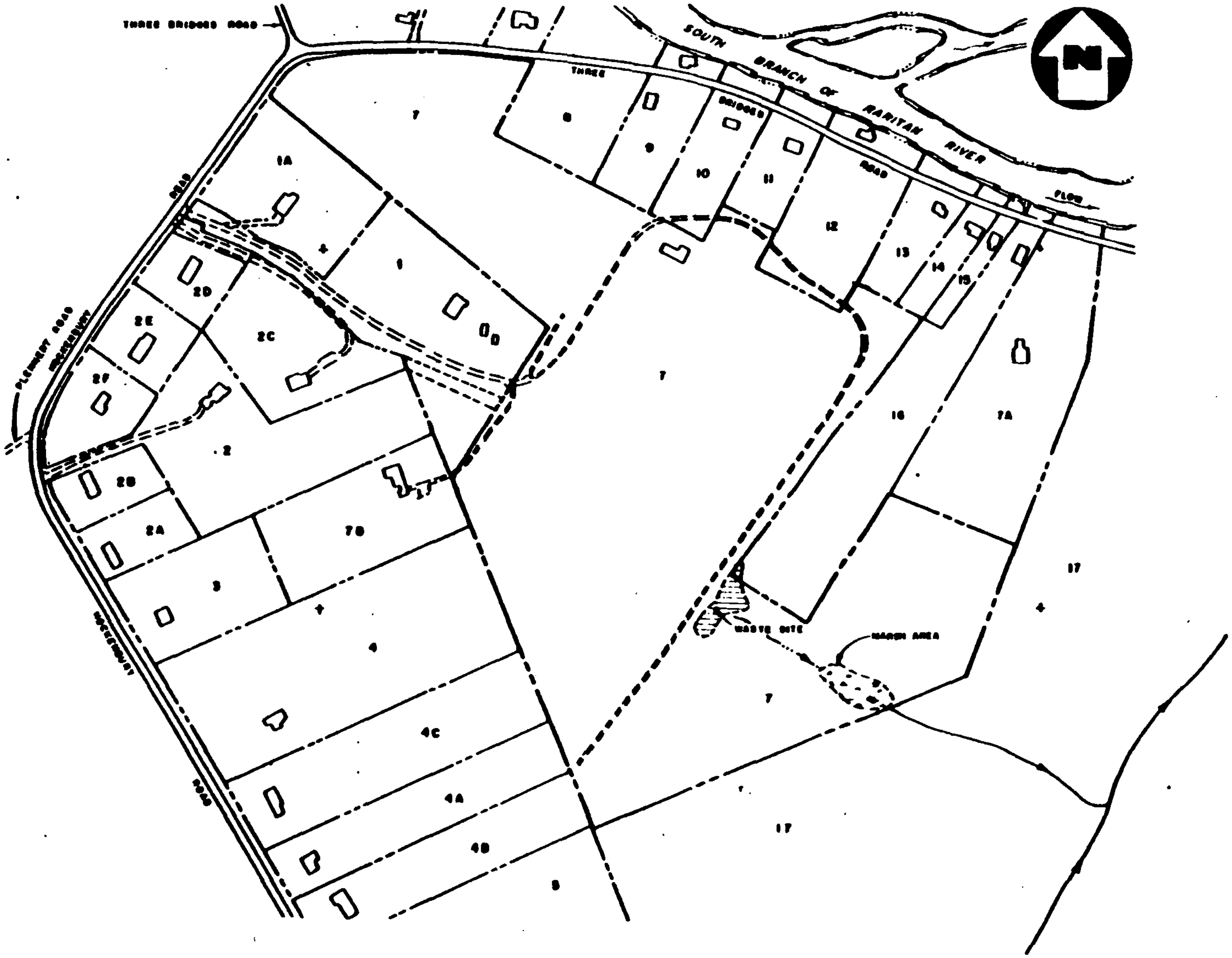


FIGURE 1-1

VICINITY MAP
KRYSOWATY FARM SITE, HILLSBOROUGH TWP., NJ

NO SCALE

NUS CORPORATION
A Halliburton Company



1	HAYNES, HOWARD H. & NANCY L.
1A	SEEBER, CHARLES & CONSTANCE E.
2	FISHER, WILHELM & R.
2A	QEKELMAN,
2B	MILES,
2C	FISCHER, WM. & L.
2D	SNELL, CARL T. & RITA M.
2E	KAHN,
2F	POUYAT,
3	SCOTT, GEORGE W. & JEAN F.
4	LUCKETT, ESTHER & HOWARD
4A	KHAN, FAROUK A. & LEKHA
4B	COPPOLA, FREDERIC P. & DANIELLE
4C	LAMBERT, DAVID F. & CAROLYN J.
5	CRUM, DONALD J. & R.W.
6	NOT SHOWN ON DRAWING
7	DiGIORGIA, NICHOLAS & PHILIPPA M.
7A	EVANS, CARL B. & GWEN
7B	SCOTT, GEORGE W. & JEAN F.
8	LINDL CORPORATION
9	PERLMANN, RONALD B. & MARYANN
10	KORTH, CHARLES V. & V.F.
11	BRICKEY, MARK K. & NANCY M.
12	PRESSER, LEROY FRANK & AUDREY E.
13	COLMAN, ROBERT W. & GAIL
14	HUNTER, FRANKLIN M. & FAYE E.
15	GARDNER, LILLIAN
16	FULTON, DAVID L. & NOREEN
17	KANACH, SAMUEL & OLGA

FIGURE 1-2

RESIDENCE LOCATION MAP

KRYSOWATY FARM SITE, HILLSBOROUGH TWP., NJ

SCALE: 1" = 300'

NUS CORPORATION
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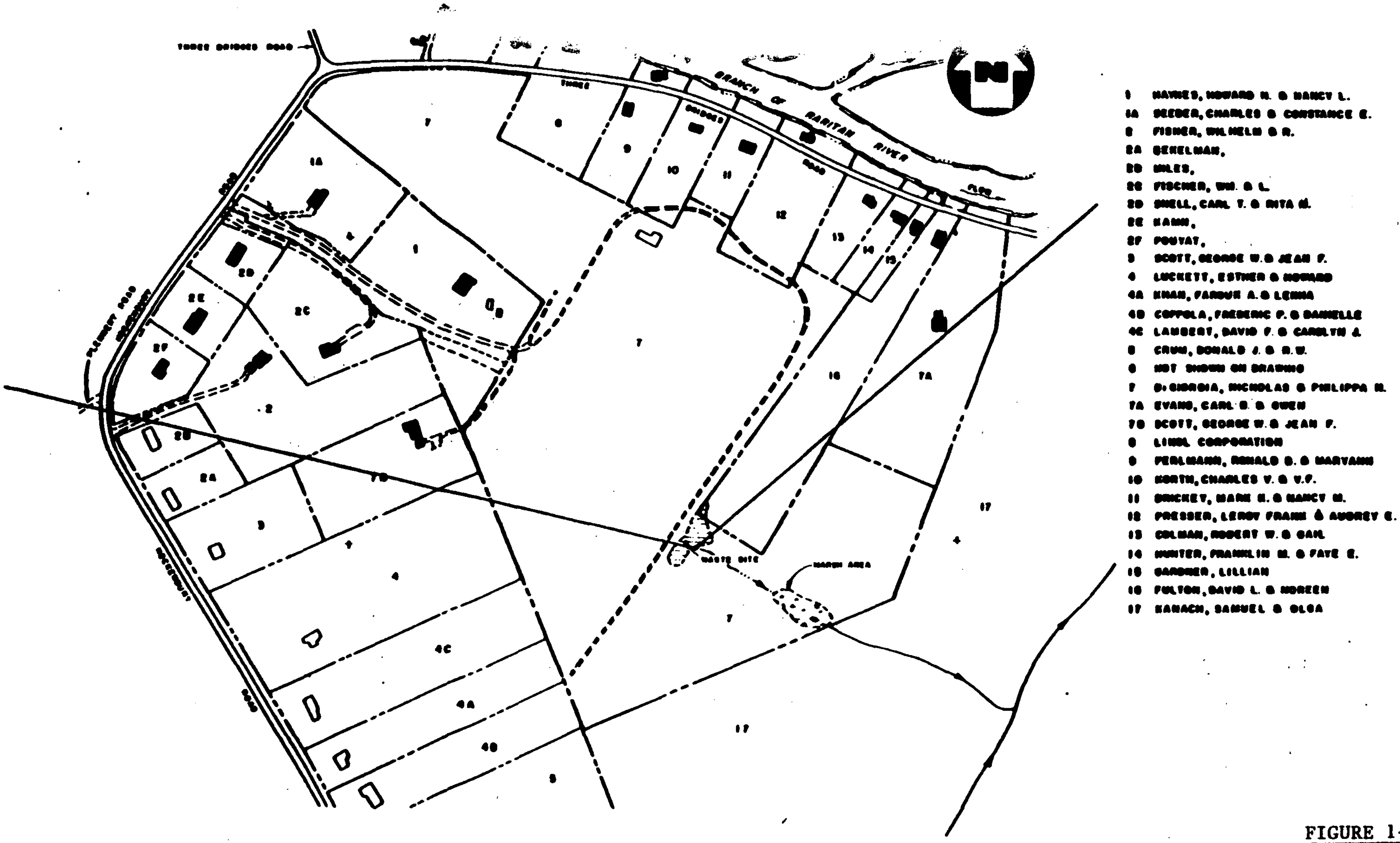

FIGURE 1-3

NUS CORPORATION
A Halliburton Company

RESIDENCE LOCATION MAP
KRYSOWATY FARM SITE, HILLSBOROUGH TWP., NJ
SCALE: 1" = 300'

■ - Potentially Affected Residences

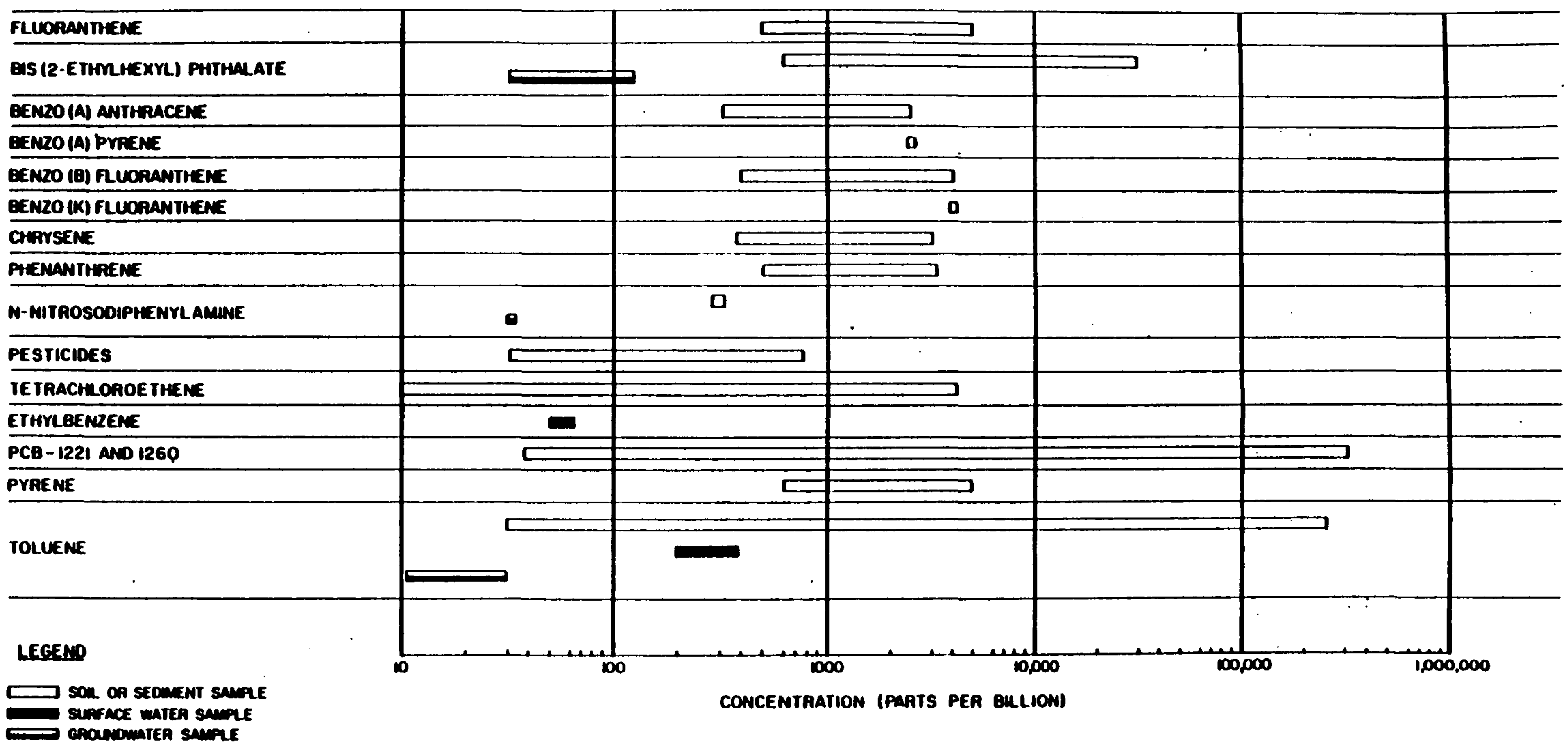

FIGURE 3-4

SELECTED ORGANIC CHEMICAL DISTRIBUTION
KRYSOWATY FARM SITE, HILLSBOROUGH TWP, NJ

NUS CORPORATION
A Halliburton Company

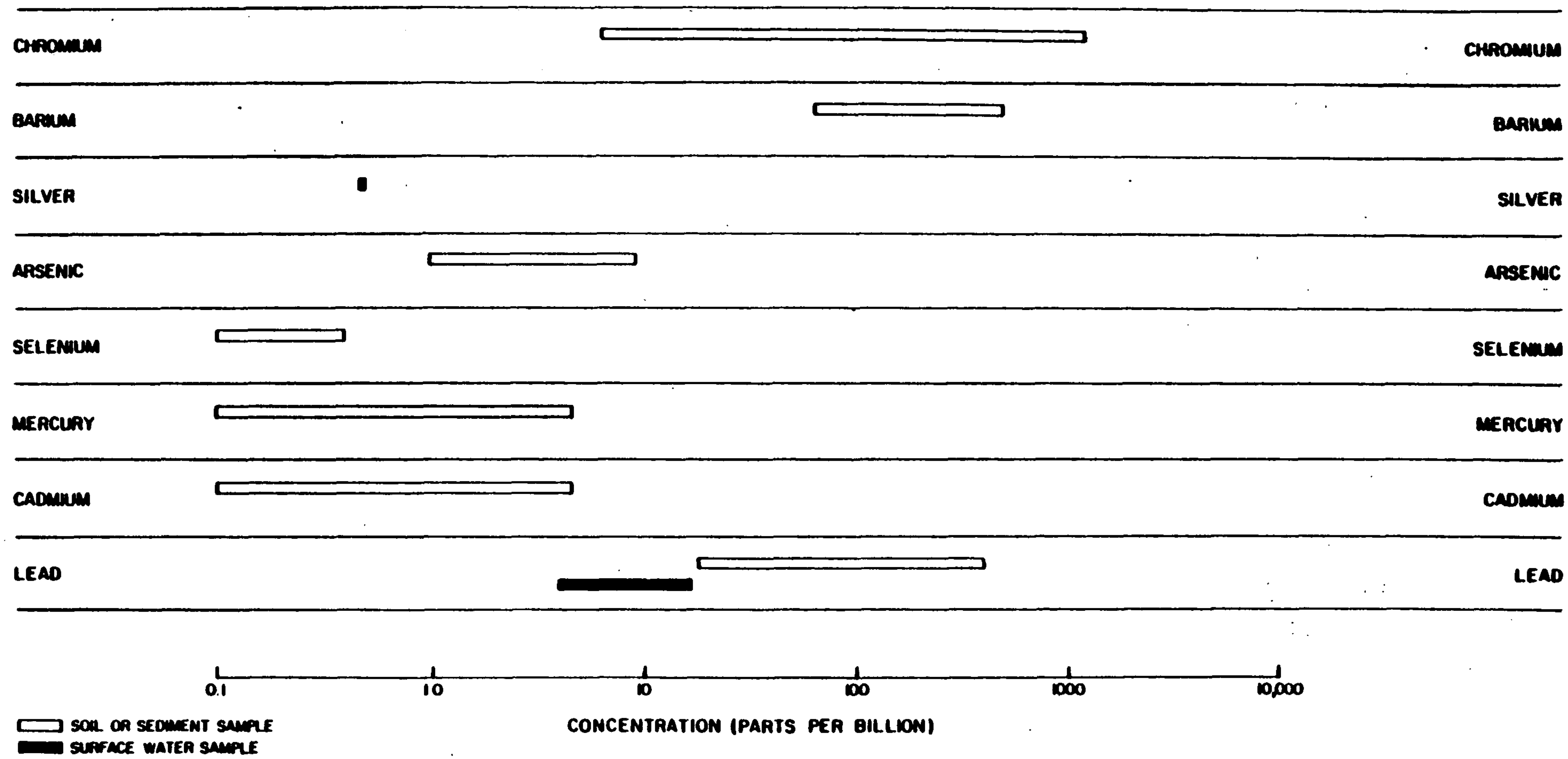

FIGURE 3-5

SELECTED PRIORITY METAL DISTRIBUTION
KRYSOWATY FARM SITE, HILLSBOROUGH TWP., NJ

NUS CORPORATION
A Halliburton Company

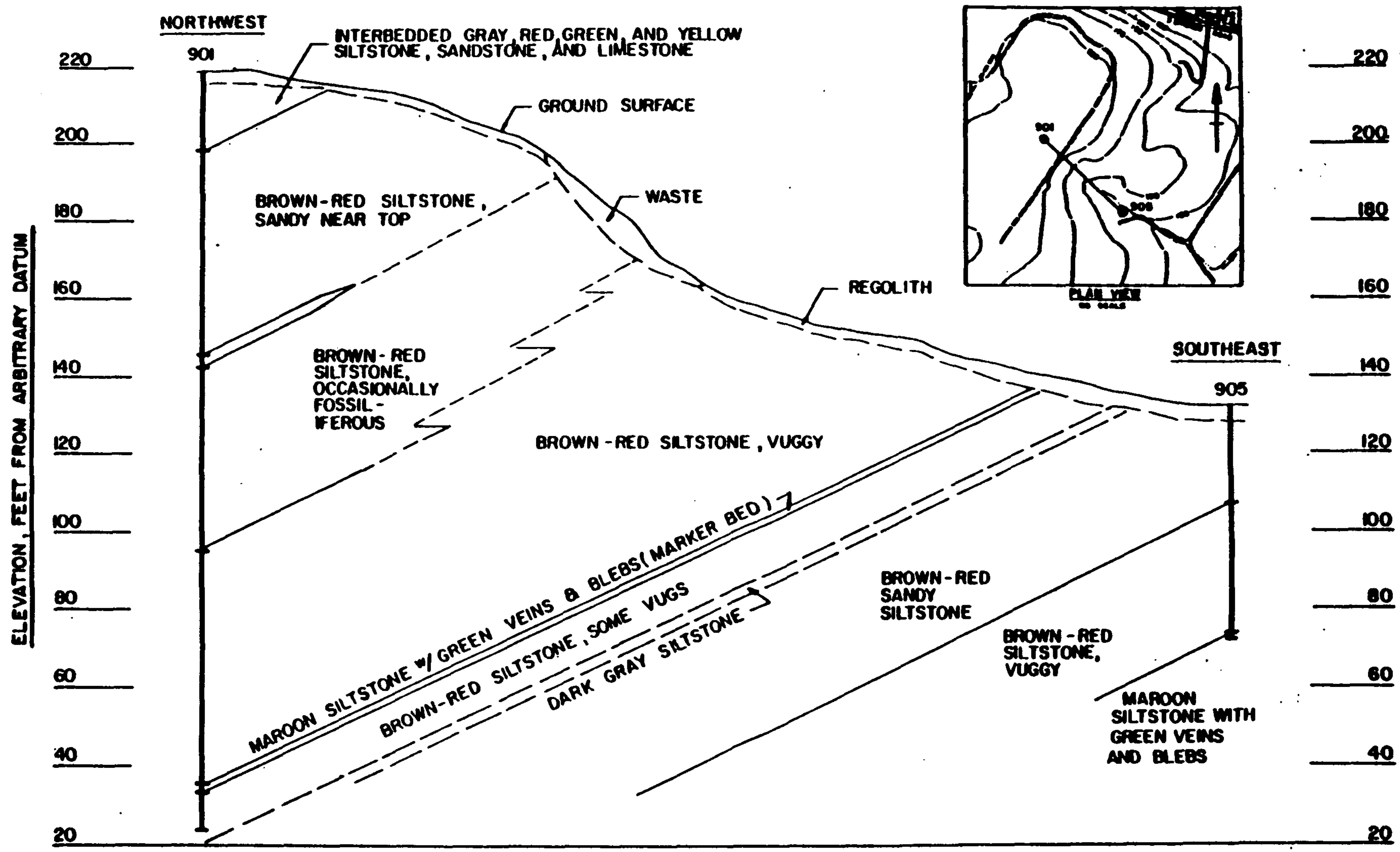

FIGURE 3-10

GEOLOGIC CROSS SECTION Nº 2
KRYSOWATY FARM SITE, HILLSBOROUGH TWP., NJ

SCALE 1" = 40' VERT., 1" = 100' HORIZ.

NUS CORPORATION
A Halliburton Company

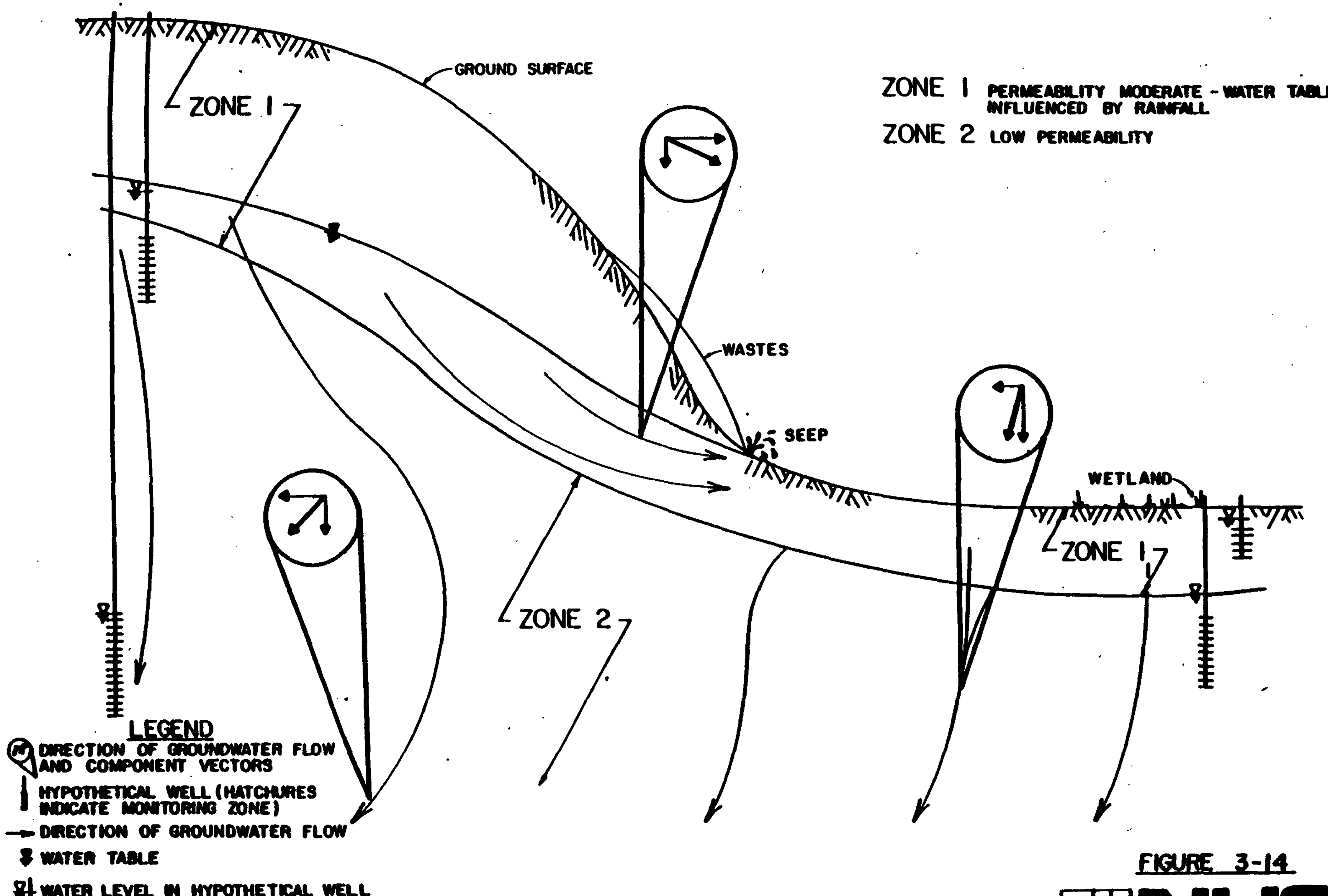

FIGURE 3-14

SCHEMATIC DIAGRAM OF GROUNDWATER FLOW IN CROSS SECTION
KRYSOWATY FARM SITE, HILLSBOROUGH TWP., NJ

NUS CORPORATION
A Halliburton Company

TABLE 3-1

SUMMARY OF PREVIOUS SURFACE AND GROUNDWATER ANALYSES KRYSOWATY FARM SITE

Parameters (ppb)	Composite[1] Waste Sample	Leachate	K-1	TPW-2	TPW-1	W-1-A	W-1-B	W-1-C	W-1-D	SW-1	SW-2	SW-3
Xylenes (total)	891,000	13,250	55	190	ND	ND	1,860	1,625	ND	ND	ND	ND
Ethylbenzene	305,000	3,500	80	140	<10	ND	360	200	ND	120	<10	<10
N-Nitrosodimethylamine	300,000	ND	ND	<50	ND	ND	ND	ND	ND	ND	ND	ND
Benzidine	100,000	ND	ND	ND	ND	ND	ND	ND	ND	140	<20	<20
Dichlorobenzene (total)	86,000	ND	ND	<50	<10	ND	283	317	ND	ND	ND	ND
Hexachlorobenzene	42,000	ND	ND	<50	ND	ND	ND	ND	ND	ND	ND	ND
4-Bromophenyl Phenyl Ether	42,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyoxy)Phthalate	32,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	21,000	ND	ND	ND	ND	7	ND	ND	ND	ND	ND	ND
Fluoranthene	20,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyoxy)Ether	15,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	14,500	ND	ND	ND	ND	ND	ND	ND	50	ND	ND	ND
4,4 DDE	4,570	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butyl Benzyl Phthlate	4,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-Chloroethyl)Ether	2,000[2]	ND	ND	<50	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	1,000[2]	ND	ND	<50	64	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclohexane	23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	750,000	266	350	8,500	ND	15,400	12,500	ND	380	<10	<10
Carbon Tetrachloride	ND	750,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Iron	ND	18,550	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenols (total)	ND	389	31	26	ND	ND	ND	ND	ND	ND	ND	ND
Copper	ND	206	10	<50	ND	ND	ND	ND	ND	ND	ND	ND
Octane	ND	175	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	ND	33	26	<50	ND	ND	ND	ND	ND	ND	ND	ND
Cyanide	ND	15	30	290	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	6	ND	ND	ND	ND	ND	12	<10	<10
Nickel	ND	ND	ND	60	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	ND	ND	ND	150	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	<2	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 3-1
SUMMARY OF PREVIOUS
SURFACE AND GROUNDWATER ANALYSES
PAGE TWO

Parameters (ppb)	Composite(1) Waste Sample	Leachate	K-1	TPW-2	TPW-1	W-1-A	W-1-B	W-1-C	W-1-D	SW-1	SW-2	SW-3
Transdichloroethylene	ND	ND	ND	ND	230	ND	ND	ND	ND	12	<10	<10
Diphenol Hydrozenes	ND	ND	ND	ND	ND	.2	ND	ND	ND	ND	ND	ND
Di-N-Butyl Phthalate	ND	ND	ND	ND	ND	.6	ND	ND	ND	ND	ND	ND
4 Dimethyl Phenol	ND	ND	ND	ND	ND	.9	ND	ND	ND	ND	ND	ND
Bis(2-Ethyl Hexyl) Phthalate	ND	ND	ND	ND	ND	.9	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND	10	4	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	690	875	ND	ND	ND	ND
Benzofuran	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium (total)	ND	150	80	20	ND	ND	ND	ND	ND	ND	ND	<20
Heptane	ND	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	2700	NA	NA	NA

ND Not Detected; This is because either the compound was not reported as a test result or it was in concentrations below detectable limits

NA Not Analyzed

(1) Sample Description (For locations see Figure 3-1)

Composite Waste Sample - Collected by NJDEP on July 6, 1981. Twenty to thirty drums were excavated and a composite sample was taken from ten drums

Leachate - Collected by NJDEP on November 29, 1979 Leachate from a pond downgradient of the site

K-1 - Collected by NJDEP on November 29, 1979 Groundwater discharge at a site probably located at NUS sample point K-1.

TABLE 3-1
SUMMARY OF PREVIOUS
SURFACE AND GROUNDWATER ANALYSES
PAGE THREE

TPW-1 - Collected by EPA on April 23, 1982. Leachate from shallow test pit well at site.

TPW-2 - Collected by NJDEP on December 8, 1980 Leachate from shallow test pit well at site.

W-1-A - Collected by NJDEP on August 18, 1982. Deep well in W-1.

W-1-B - Collected by NJDEP on September 2, 1982. Shallow well in W-1.

W-1-C - Collected by NJDEP on September 2, 1982 Shallow well in W-1

W-1-D - Collected by EPA on August 18, 1982. Deep well in W-1.

SW-1 - Collected by BCM on March 12, 1982 Surface water sample approximately 40 feet from the site

SW-2 - Collected by BCM on March 12, 1982 Surface water sample approximately 230 feet downgradient on the site.

SW-3 - Collected by BCM on March 12, 1982. Surface water sample approximately 1200 feet downgradient of the site.

Results for the BCM data were reported in µg/g, and detection limits ranged from 10 µg/kg to 100 µg/g.

(1) Detectable limit is 3,000 parts per billion (ppb)

TABLE 4-1

KRYSOWATY FARM SITE
POTENTIAL REMEDIAL ACTION TECHNOLOGIES

1 **Disposal Technologies**

Onsite Disposal
Offsite Disposal
Incineration
Chemical Treatment of Soils

2 **Offsite Technologies**

No Action Offsite
Municipal Water Line Extension
Satellite Water Supply System
Individual Well Treatment
Bottled Water

3 **Onsite Technologies**

No Action Onsite
Excavation
Solidification
In-situ Treatment
Groundwater Control: Groundwater Pumping
Groundwater Control: Impermeable Barriers
Groundwater Treatment: Permeable Treatment Beds
Groundwater Treatment: Bioreclamation
Surface Water Diversion
Groundwater Collection
Fencing
Capping
Contaminated Water Treatment/Disposal

Compiled by NUS Consultants
Pittsburgh, Pa. 1984

Table 5-1

Remedial Alternative	Capital Cost	O+M*	Total
1. No Action	-	-	
2. Cap-Collect and Treat GW - Monitor (20 years)	255K	2861K 1267	4.38M
3. Excavate-incinerate - Monitor (5 years)	4100	765	4.87
4. Excavate-Disposal onsite - Monitor (20 years)	663	473 1267	2.40
5. Excavate-Dispose offsite- Monitor (5 years)	1595	765	2.36
6. Excavate-Disposal Offsite- Alternative W.S.-Monitor (5 years)	1595 569	(53) 93	2.31†

*Operation and Maintenance cost (20% contingency) for proposed durations, present worth

() water user charge 20 year present worth. To be paid by local residents.

†Recommended Cost-Effective Alternative

Table 5-2

MONITORING SCENERIOS WITH CONSTRUCTION COSTS AND SCHEDULES*

Existing Monitoring Wells to be Sampled Each Quarter	New Monitoring Wells to be Sampled Each Quarter	Residential Wells to be Sampled Each Quarter	Construction Time	Construction Costs	Operation and maintenance costs (20% contingency) for Proposed Durations, Present Worth					
					Annual Cost	1 Year	3 Years	5 Years	10 Years	20 Years
8	-	11 alternating	-	-	82,600	82,600	246,500	375,700	609,000	843,800
8	-	22	-	-	124,000	124,000	370,000	564,100	914,300	1,266,800
8	8	11 alternating	2 months	$ 118,800	121,300	121,300	362,000	551,800	894,400	1,239,200
8	8	22	2 months	$ 118,800	163,300	163,300	487,300	742,800	1,204,100	1,668,300

* Compiled by NUS Consultants, Pittsburgh, Pa. 1984

Table 5-3

EPA Proposed Monitoring Program
(No Alternate Water Supply)

Sampling: 8 on site monitoring wells
22 off site residential wells

Frequency: monthly for 1/2 year during on-site remedial action
quarterly for 4 1/2 years following on-site remedial action

Parameters: 129 Priority Pollutants

Costs:

Capital	$0
O+M 5 year Period (20% contingency) Present Worth	$764,660

Basis:

Annual cost for 4-quarterly samples (from NUS Table 5-2)	$124,000
Cost per quarterly sample run	31,000
Monthly sampling for 1/2 year	186,000
Quarterly sampling for 1/2 year	62,000
Quarterly sampling for 4 years	389,217
Subtotal	637,217
20% Contingency	127,443
Total	$764,660

Table 5-4

EPA Proposed Monitoring Program
(with Alternate Water Supply)

Sampling: 8 on site monitoring wells

Frequency: semi-annual

Parameters: 129 Priority Pollutants

Costs:

Capital	$0
O+M 5 year Period (20% contingency) Present Worth	$92,898

Basis:*	Per Run	Semi Annual
labor (8 hrs/well)	2560	5120
living	450	900
travel	51	102
analytical report	500	1000
analysis	6200	12400
shipping	450	900
	present worth	77,415
	20% Contingency	15,483
5 yr	Total O+M Cost	92,898

*prepared from cost estimate developed by NUS Consultants (RI/FS, Appendix F March 1984)