United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R03-88/047
June 1988

EPA

Superfund Record of Decision:

Voortman Farm Landfill, PA

50272-101

REPORT DOCUMENTATION PAGE

1. REPORT NO. EPA/ROD/R03-88/047

2.

3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Voortman, PA
First Remedial Action - Final

5. Report Date 06/30/88

6.

Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

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

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

13. Type of Report & Period Covered
800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 43-acre Voortman Farm site is located in Upper Salucon Township, Lehigh County, Pennsylvania. The site consists of a sinkhole that contained empty battery casings disposed of in late 1979 and early 1980. Citizen complaints in 1980 prompted the prohibition of dumping and subsequent site investigation. In September 1986, the battery casings in the sinkhole caught on fire. Since the battery casings were burning underground, attempts to extinguish the fire remained unsuccessful. In October 1986, access was gained to the burning wastes, which were then excavated and extinguished. Additional wastes and residues were excavated from the sink hole and disposed of offsite. The collapse of the sinkhole walls has formed a natural cap. There does not appear to be any leaching from any residual metals, contaminated soils or battery casings present.

The selected remedial action for this site is a no further action with continued ground water monitoring for five years. The estimated present worth cost for this remedial action is $26,000 with annual O&M of $6,860.

(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Voortman, PA
First Remedial Action - Final
Contaminated Media: gw, soil
Key Contaminants: metals (chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

Availability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 31

22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. ABSTRACT (continued)

The selected remedial action for this site includes: in-situ biodegradation of sludges and contaminated soils with aeration of the lagoon waste for degradation enhancement; stabilization of residues followed by onsite disposal; ground water pump and treatment; surface water discharge to the San Jacinto River with treatment, as necessary; backfilling of the lagoon to grade and contour; and ground water monitoring. The estimated present worth for this remedial action is $47,000,000.

DECLARATION FOR THE RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Voortman Farm Site, Lehigh County, Pennsylvania

Statement of Basis and Purpose:

The purpose of this decision document is to describe the selected remedial action for ground water at the Voortman Farm Site and the technical evaluation to support this decision. This Record of Decision (ROD) fulfills the statutory requirements of Section 113 (k)(2)(B)(v) and Section 117 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 42 U.S.C. §9601 et. seq. and is consistent with the National Contingency Plan (NCP), 40 C.F.R Part 300.

Documents Reviewed:

The following documents provide the key supporting information in the Administrative Record which describe the environmental and public health concerns at the Voortman Farm Site.

- Voortman Farm Site, Final Remedial Investigation Report, January 1988, prepared by Baker/TSA Incorporated.
- Voortman Farm Site, Draft Feasibility Study Report, February 1988, prepared by Baker/TSA Incorporated
- Remedial Action Master Plan (RAMP), Voortman Farm Site, December 1984, prepared by Ecology and Environment
- Notes from DER Removal Actions, September 1986.

The Agency has presented a complete administrative record to the public for 30 days and has placed a newspaper advertisement describing the remedial action selected in this decision. The Agency has also discussed these reports with the Pennsylvania Department of Environmental Resources (DER) which has agreed on the alternative selected.

I have been briefed by my staff on the contents of these documents, the public comments and DER's letter of concurrence and they form the principal basis for my decision.

Description of Selected Remedy:

1. The selected remedy is a "NO ACTION ALTERNATIVE WITH CONTINUED GROUND WATER MONITORING".

2. EPA and DER will monitor onsite ground water wells and analyze for the metals related to the waste source.

3. All monitoring will be done on a yearly basis for the next five years. After this period, EPA and DER will review the site to determine any need for continued monitoring.

4. This remedial action will not require further treatment of ground water, surface water, sediments or soils. The removal of the burning battery casings, ashes and soils have effectively eliminated the source of future threats - ground water quality.

Declarations:

The selected remedy is protective of human health and the environment and attains Federal and State requirements that are applicable or relevant and appropriate. I have determined that the no action alternative combined with continued monitoring of the on site wells is an effective remedy for the ground water at the Voortman Site.

Since some hazardous substances remain in the sinkhole a review will be conducted within five years after this decision to ensure that the remedy continues to provide adequate protection of human health and the environment.

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. The no action alternative in conjunction with ground water monitoring will adequately protect public health, welfare and the environment.

6/30/88
Date

James M. Seif
Regional Administrator
Region III

CONTENTS

SITE DESCRIPTION AND SUMMARY OF REMEDIAL ALTERNATIVES

Site Location and Description

The Voortman Farm Site is located in Upper Saucon Township. This township is situated in the south-eastern corner of Lehigh County, seven miles from the metropolitan areas of Allentown and Bethlehem. More specifically, the site is located on a 43-acre farm between Vera Cruz Road and Limeport Pike approximately 3/4 miles southwest of Lanark, Pennsylvania as shown on Figure 1. (Figures are attached at the end of the text.) The sinkhole is situated adjacent to a north to south tree line on the farm, west of the Wedgewood Golf Course.

The site is a sinkhole that contained empty battery casings which were dumped there in late 1979 and early 1980. The battery casings remained until September 1986, when the casings were removed during an effort by Pennsylvania DER to extinguish a fire in the sinkhole.

The sinkhole now appears to contain no battery casings. Nearby surface soils have slumped into the bottom of the sinkhole giving the visible impression of depth to be only 40 to 45 feet. There have been reports that the sinkhole was much deeper at one time, but this has not been substantiated by the background information or the work performed in the Remedial Investigation/Feasibility Study (RI/FS). The sinkhole at the surface is slightly eliptical with dimensions of 45 feet north to south and 65 feet east to west. For site safety, the sinkhole is encircled at the surface by a snow drift fence. The land around the sinkhole is used primarily for agriculture.

The battery casings dumped into the sinkhole have been suspected of containing residual lead, cadmium and zinc. These were identified as the primary pollutants associated with the casings in the preliminary assessment of the site. DER sampled water from battery cases within the sinkhole in April, 1980, and found levels in excess of the National Primary or Secondary Drinking Water Standards. Concentrations ranged up .. 24 ug/l for cadimum; 49,500 ug/l for lead; and 10,350 ug/l for zinc. The overriding concern at the site was that these metals may be entering the ground water and may pose a threat to the public.

Site History

Empty automotive battery casings were dumped into the Voortman Sinkhole from late 1979 to early 1980 (estimated). In the spring of 1980, citizens complained to Upper Saucon Township Officials which resulted in the initial site investigation of the Voortman sinkhole by the Township. A preliminary injunction prohibiting further dumping was obtained by Upper Saucon Township. Upon review of the site by DER, an Illegal Resource Recovery Operation Order was issued through the Regional Solid Waste Manager to the property owners on June 27, 1980. This order prohibited any further dumping of wastes in the sinkhole and mandated a proposal for removal of such wastes. An appeal from the landowners was filed on July 27, 1980 and withdrawn on February 4, 1981.

A subsequent investigation by state and federal agencies resulted in the Voortman Farm Site receiving a ranking via the Hazard Ranking Score. Further review resulted in the Voortman Farm Site being placed on the first National Priorities List published in December 1982.

The Remedial Action Master Plan (RAMP) was prepared for the Voortman Farm Site by Ecology and Environment, Inc. in December 1984. The overall objective of the RAMP was to provide organized data to assist in the development of the RI/FS Work Plan. In August 1985, DER requested proposals to provide remedial investigation and feasibility study (RI/FS) services at the Voortman Farm. Baker/TSA, Inc. received Notice of Award to perform the work and initial contract documents in March 1986.

One major event that occurred at the site in the interim before initiation of the RI was a fire in the sinkhole. On September 10, 1986, DER's Site Representative was informed that the battery casings in the Voortman Sinkhole were on fire. Repeated attempts by the Upper Soucon Township Fire Department of extinguish the fire were unsuccessful because the battery casings were burning underground. Air monitoring by DER's Bureau of Air Quality Control showed that significant quantities of lead were being released from the fire. A meeting with underground-fire experts from several DER bureaus was held on September 17, 1986 to select the best solution to extinguish the fire and dispose of the wastes properly. Bids from three Emergency Response contractors were solicited to carry out the response plan. On September 25, 1986, DER funds were appropriated to implement DER's first Superfund clean-up action. On September 29, 1986, DER executed an emergency service contract with BES Environmental Specialists, Inc. DER Site Representative directed the mobilization and the excavation of a ramp down into the sinkhole. This work began on October 1, 1986. On October 3, 1986, access was gained to the burning wastes, which were excavated and extinguished. Additional wastes/residues were excavated from the sinkhole, and for several days afterwards, they were stored in a temporary lined storage area to await final disposal. On October 27, 1986, the final phase of the response occurred with the loading and transportation of the wastes from the temporary storage area to a RCRA authorized landfill in New York State. The removal was completed on October 30, 1986, and the contractor was demobilized. An estimated 230 cubic yards of wastes were transported offsite.

The RI began in April 1987 approximately seven months after the fire. The results show that removal of the battery casings has helped remediate the site. The RI/FS was completed in February and will be summarized as part of this decision making document.

Remedial Investigation Summary

The first step in the RI consisted of collecting and reviewing pertinent data from EPA, DER and various Lehigh County Agencies. Following these preliminary activities, an extensive field sampling program was conducted. The sampling was performed to: 1) determine the areal extent of contamination, 2) determine ground water quality in the vicinity of the sinkhole, 3) provide additional subsurface information, and 4) evaluate surface water and local water well quality offsite. On-site activities included air monitoring, surface and borehole geophysical surveys, a 12 hour pump test and sampling of surface waters, local residential water supplies, subsurface soils, sinkhole soils, and groundwater from the newly installed monitoring wells. The locations of these sampling points are shown in Figures 2 and 3.

Once the field investigation was completed, the next step was to compile and evaluate field investigation analytical results in order to identify the magnitude and extent of contamination associated with site. Inherent in this evaluation was an assessment of the reliability of the data through validation procedures. The review process included comparing the data with applicable standards. Then an evaluation was made as to the extent of potential threats to human health and the environment. The RI outlines the background information leading up to the remedial investigation, the field methods employed during the investigation, and the discussion of analytical results. Based on the findings of the field studies, a risk assessment was conducted to identify potential or actual health risks posed by site conditions.

Geology

The Voortman Farm site lies within the Saucon Creek Basin which is part of the Lehigh River and Delaware River drainage system. Geologic formations in the Saucon Creek Basin include Cambrian and Ordovician carbonates, Cambrian quartzite, Precambrian metamorphic and igneous rocks, and Triassic sandstone, shale conglomerates, and diabase. The carbonate rocks, consisting of dolomite and limestone, have been intensively folded, faulted and cut by two principal joint systems. These systems intersect each other and the bedding at nearly right angles. The joint systems are commonly filled with quartz and calcite. The Saucon Valley, which includes the Saucon Creek Basin, lies along Saucon Creek from Hellertown to Limeport and almost is completely encircled by hills of granite rocks that are part of the Reading Prong. The Voortman Farm Site bedrock is located in the Beekmantown Group. From the drilling program conducted at the site, the bedrock is est described as a medium gray to light gray dolomite. While drilling, the ground water that was discharged from the borehole was orange in color when in voids (due to the silt and clay void fill) and gray in color when in competent dolomite bedrock. The bedrock in this area is subdivided by faults, fractures, joints, and to a lesser extent bedding surfaces. These features tend to create large blocks of rock and it is along these structural surfaces that bedrock weathering is most intense. The weathering decreases inward and away from these features to a solid unweathered dolomite interior.

Hydrogeology

The presence of sinkholes both onsite and offsite characterize dissolved carbonate rock terrain, commonly called karst. Development of sinkholes and the associated significant solution of bedrock are dependent on climate, solubility, porosity and permeability of the rock; soil and vegetation covers; ground water level fluctuations; surface drainage and the chemical corrosiveness of ground water. Vertical ground water movement is by channeled flow through vertical shafts or joints; horizontal flow is primarily through solution conduits along fractures (faults, joints and bedding plane partings) which form a complex system of tubes or pipes. As corrosion along the fractures enlarge solution conduits, funnel-shaped sinkholes often appear, conduit roofs collapse and principal flow channels are formed.

Major water bearing fractures at the Voortman site trend northeast to southwest and dip northwest, north and northeast. Bedding planes trend to the northeast and dip to the southeast. The resulting general ground water and surface water flow directions are east to northeast towards Saucon Creek. Static water levels range from approximately 27 feet to 40 feet below ground surface.

The fracture trace analysis, drilling program and geophysical investigations all confirm the presence of fracture and void zones within the dolomite. Results from the aquifer test verify the fractured and cavernous nature of the dolomite and indicate large transmissivities and substantial flow rates of ground water.

Sinkhole Development

A solution-type sinkhole is a depression in the surface of the ground which usually is caused by the collapse of the solution cavity roof in carbonate rock. The formation of these sinkholes is dependent upon the presence of limestone or dolomite and their inherent solubility in water. It should be noted that not all areas underlain by carbonate bedrocks are subject to significant solution and sinkhole development. However, the dolomite bedrock present at this site is susceptible to sinkhole development. The ground water at the site flows through fractures caused by faulting. The carbonate bedrock at the site has been broken into a network of joints and fractures which allow the movement of ground water. As the ground water passes through these fractures, it widens the fractures by slowly dissolving the rock. Eventually, a system of caves or extremely large fractures form from the dissolving of the bedrock by the water. The widening continues until the cave roof is dissolved to a point where the soil overburden may be placed in suspension and eventually flushed out of the bottom of the newly formed sinkhole by ground water flow. The sinkhole will range in size from less than a foot to a large cave as witnessed near the Voortman Farm Site.

Sinkhole Waste Characterization

The purpose of sampling the sinkhole soils was to characterize and determine the concentrations of suspected contaminants remaining in the sinkhole. A sketch of the sinkhole is shown in Figure 4. Both soil and water samples were taken in the sinkhole, and these results are shown below in Tables 1 and 2. These specific metals are highlighted because of their potential toxicity and their association with the source of the battery casings.

Table 1
Sinkhole Soil Sampling Results *
(concentration in mg/kg)

	U. S. Soil Ranges	Sinkhole Soils 870251	870252	870253
Cadmium	0.01-7	10	6.5	8.7
Chromium	5-3,000	46	16	26
Copper	2-100	59	43	60
Lead	2-200	45	380	690
Nickel	10-1,000	35	41	37
Zinc	10-300	130	140	110

* Please note that these concentrations are further qualified in the RI report.

These levels do not appear to reflect contamination from leaching of any residual contaminated soils or buried battery casings that may remain in the bottom of the sinkhole.

Table 2
Sinkhole Water Sampling Results *
(concentrations in ug/l)

	Standards	Sinkhole Water Table 870232
Cadmium	10	<5
Chromium	50	<10
Copper	1,000	<25
Lead	50	10.6
Nickel	—	180
Zinc	5,000	17

* Please note that these concentrations are further qualified in the RI report.

Soils Waste Characterization

Soil samples were collected during the drilling of the overburden soils at the initial well which was approximately 100 feet south east of the sinkhole. Samples were collected at intervals of five feet. Organics analysis was conducted for the soil samples from the 45 to 47 foot depth but the only compounds detected were from laboratory introduced contamination rather than environmental contamination. The metals analysis performed on all the samples showed low levels of cadmium, copper, lead, nickel, and zinc. No compound or metal encountered is at levels that warrant concern.

As shown in Table 3, the values from different depths of soil boring VF-4 were within typical ranges for U.S. soils except for one high reading of copper at a depth interval of 10 to 12 feet.

Table 3
Soils from Boring VF-1
(concentrations in mg/kg)

	U.S. Soil Ranges	Depth 0-2	(ft.) 5-7	10-12	15-17	20-22
Cadmium	0.01-7	2.4	1.7	3.3	3.1	2.5
Chromium	5-3,000	12	14	14	11	12
Copper	2-100	65	68	120	75	71
Lead	2-200	18	9.1	7.4	12	3.7
Nickel	10-1,000	18	21	25	37	—
Zinc	10-300	100	67	100	99	110

	U.S. Soil Ranges	Depth 25-27	(ft.) 30-32	35-37	42-44	45-47 *
Cadmium	0.01-7	1.8	2.3	3.5	2.1	2.7
Chromium	5-3,000	8.4	76	12	5	12
Copper	2-100	59	73	85	53	85
Lead	2-200	4.9	13	6.3	13	13
Nickel	10-1,000	24	36	49	24	41
Zinc	10-300	91	130	170	65	130

* These concentrations are further qualified in the RI report.

Ground Water Waste Characterization

The field activities installed four monitoring wells surrounding the sinkhole on the north, east, southeast and south sides. These monitoring wells were sampled on two occasions. The results revealed no presence of volatile, pesticides or PCB constituents. Some semivolatile constituents were encountered but were attributed to laboratory contamination. The inorganics reveal that some of the compounds were detected below the National Primary and Secondary Drinking Water Standards. Table 4 summarizes these results for the inorganics of concern.

Table 4
Ground Water Monitoring Well Sampling Results
(concentrations in ug/l) *

May 21, 1987

	Standard	VF-1	VF-1	VF-2	VF-3	VF-4
Cadmium	10	5	5	5	5	5
Chromium	50	10	6	10	10	7
Copper	1000	25	25	25	25	25
Lead	50	0.75	0.6	9.15	10.95	0.3
Nickel	—	210	150	150	150	130
Zinc	5000	14	35	22	19	16

June 19, 1987

	Standard	VF-1	VF-2	VF-3	VF-3	VF-4
Cadmium	10	8	8	8	8	8
Chromium	50	14	14	14	14	14
Copper	1000	25	25	25	25	25
Lead	50	12	25	12	1.1	0.7
Nickel	—	45	41	62	73	47
Zinc	5000	20	20	19	7	20

Ten homeowners were also contacted for sampling of their residential wells to detect any possible offsite migration. All residential wells were within the National Primary and Secondary Drinking Water Standards. It should be noted that these are generally located south and east of the site which is considered an upgradient and background area for the Voortman site.

Surface Water Characterization

Surface water and sediment sampling was performed along Saucon Creek and the Wedgewood Water course (see Figure 2). The purpose of the sampling was to identify the potential of the Voortman Farm Site to affect offsite receptors and interceptors of ground water migration path ways.

Six surface water locations were sampled. The analytical results show that no volatile, semivolatile or pesticides/PCB organic compounds were detected. Inorganic data on Table 5 also shows no levels above limits of concern.

Table 5
Surface Water Sampling Results *
(concentrations in ug/l)

	870213	870214	870215	870216	870218	870219
Cadmium	8	8	8	8	8	8
Chromium	14	14	14	14	14	14
Copper	25	25	25	25	25	25
Lead	1.6	1.3	1.7	1.4	1.1	1.2
Nickel	40	40	40	40	40	40
Zinc	13	20	10	6	20	5

* please note that these concentrations are further qualified in the RI report.

Sediment Waste Characterization

Sediment samples were collected at the same locations as the surface water samples. The organic analysis results show the measure of methylene chloride and 4-methylphenol above detection limits. The results are shown in Appendix B of the RI Report. These estimated levels are not considered a threat to the environment. Some semivolatile compounds and pesticides were also revealed, but were below the detection limits for analysis.

Table 6 presents a summary of the sediment sample results for the metals of interest for the study.

Table 6 *
Sediment Sampling Results
(concentrations in mg/kg)

	870213	870214	870215	870216	870218	870219
Cadmium	.64	1.3	2.9	1.3	1.1	2.3
Chromium	14	6.2	16	4.4	5.1	9.4
Lead	5.45	6.7	40	6.5	6.0	21
Nickel	1.7	4.0	11	50	4.7	16
Zinc	15	33	160	47	25	140

* Please not all concentrations are further qualified in the RI report.

Though all metals were detected, none are considered present at levels indicating contamination from the Voortman Farm Site.

Air Investigation

Due to the nature of potential contamination from the Voortman Farm site, it was not expected that air quality would be affected. However the RI has documented air quality in order to insure that both onsite workers and local residents were not exposed to contaminants from this potential source. Air sampling was conducted around the perimeter of the sinkhole before the RI, during the field activities and after site activities had been completed. It was determined that air quality conditions at the site were not a concern. No organic vapor or inorganic gases were found at the site, and only trace levels of total metals were detected. There is no indication that the site is adversely affecting local air quality conditions.

Public Health and Environmental Concerns

The purpose of this section is to fulfill the public health evaluation requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The standards used as criteria for judgment of the project analytical results comply with the Applicable or Relevant and Appropriate Requirements (ARARs).

A comprehensive exposure pathway analysis was performed from data generated for the Voortman Farm Site to identify and characterize potential adverse health effects related to the site. Because all visual evidence of the initial primary source of contamination (battery casings) had been removed from the site, the principal release sources identified were soils in the sinkhole and ground water potentially contaminated from the primary source. The pathways examined included air, soil, ground water and surface water.

There were no volatile organic compounds detected during the air quality investigation; therefore, the potential for air releases associated with volatilization is considered very low. Fugitive dust emissions from the sinkhole that could pose a threat to human health or the environment are also judged not to be a concern due to the physical setting and remote location of the site to potential receptors.

When considering ARAR's, the soil pathway does present possible health effects related to ingestion of sinkhole soils. One sample collected from the bottom of the sinkhole did contain a sufficient concentration of lead to potentially cause chronic toxic effects to a child if ingested routinely over a lifetime. However, given the likelihood that this will occur, the risk posed is not a major concern.

The potential release of metals to the ground water by leaching of site soils and past possible releases from the waste source was identified as the most significant and probable exposure pathway at the Voortman Farm Site. This pathway was not evident, however, based on the results obtained from the RI field investigations. Neither the nearby monitoring wells nor the household wells that were sampled were found to have ground water that exhibited parameter concentrations above National Primary Drinking Water Standards. Also, the ground water samples did not contain metals at levels that would indicate that contaminants are being released from the Voortman Farm site. However, due to the heterogeneous nature of ground water flow at this site, this pathway may not be completely characterized and categorically cannot be assigned as a "no risk" route.

The results of the surface water/sediment investigation indicate that there is a low potential for adverse effects to human health or metals at levels that would indicate that contaminants are being released aquatic life. Data from the RI show that the recreational or agricultural use of these surface waters is not adversely affected.

Remedial Alternatives Review

Remedial Action Alternative No. 1 - No Action (RAA No. 1)

Description

A no action alternative means that no further measures are proposed for implementation at the Voortman Farm Site under this alternative. The only activity that will occur under the no action alternative is a review of the site every five years as required under SARA Section 121(c) as long as hazardous substances, pollutants, or contaminants that may pose a threat to human health or the environment remain at the site.

Technical Evaluation

Implementation of the no action alternative will not reduce the existing very low risk at the site. However, the physical hazards associated with implementing a remedial action at the sinkhole will be eliminated. The remote location of the site currently restricts access. Therefore, additional measures to restrict access will not be implemented. The no action alternative is feasible to implement.

Public Health and Environmental Evaluation

There is very low risks currently posed by the site. The lead in the sinkhole soils does not appear to be mobile, the small volume of soils and/or residual wastes that could potentially be removed, and the ability of the ground water system to attenuate the lead leached from the sinkhole soils should leaching occur, support the no action alternative as protective of human health and the environment.

Institutional Evaluation

The community perception of the current status of this site is positive. The initial concern of the community was associated with the practice of uncontrolled dumping at the site. Since dumping has ceased, all visible evidence of the disposed waste has been removed from the sinkhole; therefore, the public perception is considered positive. Moreover, there will be no local disruptions to the community from noise or truck traffic that could be associated with other RAAs.

Cost Evaluation

The only costs associated with implementation of this alternative include administration costs for conducting the five-year review. There are no capital or operation and maintenance costs. All of the remedial action alternatives will include the five-year review since all of the alternatives involve leaving some measure of wastes in place because of the extreme hazards and uncertainties associated with complete removal. Therefore, this cost was assumed to be zero.

Remedial Action Alternative No. 2 No Action with Continued Groundwater Monitoring (RAA No.2)

Description

This alternative is similar to RAA No. 1 but this alternative includes continued sampling of three onsite groundwater monitoring wells VF-1, VF-2, and VF-4. The three wells will be sampled annually for five years and analyzed for the metals related to the waste source.

As under the no action alternative, a review of the site will occur every five years. The monitoring well analysis reports are subject to the same five-year review outlined under the no action alternative.

Technical Evaluation

Implementation of this alternative at the Voortman Farm Site will prevent an increase in the current risk posed by the site. Groundwater monitoring and analysis are easy to implement technologies utilizing established field sampling and laboratory analysis procedures with vigorous quality assurance and quality control requirements. There is no risk posed to field personnel since the wells are located a minimum of 120 feet from the sinkhole. Sampling and analysis are reliable on a long-term basis and will provide a historical data base on water quality at the Voortman Farm Site.

Public Health and Environmental Evaluation

Continued monitoring will provide a mechanism to determine the trends, if any, or future contaminant concentrations and migration from the site. The prevention of increase in risk goal will be achieved through continued groundwater monitoring of the site. The only Applicable or Relevant and Appropriate Requirements (ARARs) which this alternative does not comply with is the Chronic Daily Intake for sinkhole soils. The groundwater, based on results of the RI, currently complies with the National Primary and Secondary Drinking Water Standards for the contaminants of concern at the Voortman Farm Site. No location-specific or action-specific ARARs are applicable to this alternative. Since contaminants remain in place, there will be no reduction in existing toxicity, mobility, or volume. However, the conservatively estimated groundwater velocities calculated during the RI indicated that a contaminant plume from the sinkhole would have migrated at least 2,450 feet. This plume would have been intercepted by the monitoring wells located less than 500 feet away from the sinkhole. Therefore, the results of the RI most likely are representative of the level of any impact on aquifer quality resulting from contaminant sources located in the sinkhole. The analytical data showed that any impact to the groundwater from the contaminants thought to exist in the sinkhole had been minimal. Continued monitoring will provide the mechanism to detect any contaminant plume migration from the site the site. In additon, in the unlikely event that a contaminant plume should be detected by the monitoring wells, additional remedial actions, including removal of sinkhole soils, could be implemented.

Overall, the no action alternative with continued monitoring is considered protective of human health and the environment.

Institutional Evaluation

Continued monitoring at the site should be positively perceived by the local community. The benefits of continued monitoring include active periodic review of the site, and provision of a historical water quality data base. As with RAA No. 1, there will be no disruptions to the local community by noise or truck traffic.

Cost Evaluation

There are no capital costs associated with this alternative. However, there will be annual costs incurred for sampling and analysis. Implementation of RAA No. 2 will result in a present worth cost of $26,010.

Remedial Action Alternative No. 3 - Excavation and Off-Site Treatment and Disposal at a RCRA-Approved Facility, and Continued Monitoring (RAA No.3)

Description

Several site preparation activities will be performed before initiation of excavation in the sinkhole. The site preparation activities include:

* Geophysical investigation;

* Construction of an access/haul road;

* Construction of a ramp and equipment staging area for access to the sinkhole;

* Construction of a dewatering discharge pipeline and sediment trap; and

* Construction of segregated soils and waste stockpile areas.

Because of the hazard posed by the sinkhole and the surrounding area, construction of a ramp and equipment ledge, similar to that used for the Emergency Removal Operation, is necessary. Construction of a ramp and equipment ledge, however, will not completely guard against a sinkhole collapse. The hazards associated with implementation of a remedial action alternative will be greater than the hazards posed during the Emergency Removal Operation because of the increased depth of excavation.

It is highly probable that the water table will be encountered during sinkhole excavation. Therefore, a continuous dewatering operation will be required during sinkhole excavation.

Assuming that the sinkhole dimensions are approximately the same as during the RI (65 feet east to west, 45 feet north to south, and 40 to 45 feet deep), approximately 300 cubic yards of soil can be removed from the sinkhole before bedrock is encountered. This estimate includes approximately 100 cubic yards of uncontaminated soil from overburden slumping. Therefore, it is estimated that approximately 200 cubic yards of contaminated soil/ashes will require disposal and/or treatment.

All wastes that are transported off-site must comply with RCRA manifest and other requirements under 40 CFR Parts 262 and 263. The facility selected to receive the waste must be in compliance with all applicable federal and state environmental and public health statutes.

The transportation of hazardous wastes is regulated by the Department of Transportation (DOT), the EPA, the State, and, in some instances, by local ordinances and codes. The EPA regulations in 40 CFR Parts 262 and 263 adopt DOT regulations pertaining to labeling, placarding, packaging, spill reporting, manifest system, and record keeping.

Monitoring of the three on-site groundwater wells will continue on an annual basis for five years as outlined in RAA No.2. At that time, a review of the site will be conducted to determine if additional monitoring is necessary.

Technical Evaluation

Excavation and off-site disposal will provide immediate benefits by reducing and virtually eliminating the potential risks associated with the site. However, during implementation of the alternative, which is estimated to take approximately six months, short-term risks will be posed to field personnel and the community. The risks include:

* Physical hazards to field personnel associated with the instability of the sinkhole during excavation;

* Fugitive dust and field personnel exposure to contaminants; and

* Possible exposure to the community from accidents or spillage during transportation.

This alternative provides a high degree of long-term effectiveness by virtue of the fact that the contaminants are removed. No operation and maintenance or equipment replacement are required in implementing this alternative.

The physical hazard associated with excavation in an area prone to sinkhole development and subsidence makes implementation of this alternative extremely difficult. An excavation operation within the sinkhole will increase the potential for further collapse, which could result in catastrophic loss of construction equipment and probable injury or death for the operators. However, removal and off-site disposal are reliable as long as an acceptable disposal site is identified.

Public Health and Environmental Evaluation

This RAA is capable of achieving all contaminant-specific ARARs. Compliance with action-specific ARARs includes: OSHA Regulations for protection of worker health and safety and Regulations governing transportation.

Institutional Evaluation

It is likely that implementation of this RAA would receive a positive response from the community, although residents in the immediate vicinity could be inconvenienced by disruption of normal traffic patterns due to truck movements. In addition, the community probably will be concerned with the safety of an excavation operation and possible exposure to fugitive emissions. Also, some resistance to hauling the waste removed through the local neighborhood may be evident because of the potential for spills or accidents that would potentially threaten the local citizens.

Cost Evaluation

A present worth analysis for this alternative is estimated to be $407,040. The annual operation and maintenance costs for continued groundwater monitoring were presented previously in RAA No. 2.

Remedial Action Alternative No. 4 - Excavation, On-Site Treatment by Solidification, Off-Site Disposal, and Continued Monitoring (RAA No.4)

Description

The excavation portion of this RAA is similar in scope to the description in RAA No. 3. In addition, an on-site treatment area will be designated to accommodate process equipment. A pozzolanic cement, such as Portland Type I, or lime based treatment method is chosen for the Voortman Farm Site because these methods are well suited for treatment of heavy metals. The contaminated soil/ashes will be sealed in a matrix of cement to minimize the potential for leaching.

Standard earth moving equipment can be used to move the waste to the staging area and spread into thin layers; followed by mixing of the cement or lime (by spraying or plowing). Following treatment, the solidified material will be subjected to the RCRA EP Toxicity Test to determine the leachability of lead. If the material passes, it can be "delisted" as hazardous waste and placed in a non-RCRA landfill. However, public perception of the hazards posed by the treated material may necessitate disposal at the RCRA-approved landfill.

Groundwater monitoring will continue for five years as outlined in RAA No. 2 if this alternative is implemented. The time required for implementation is estimated to be nine to twelve months, depending on the testing required to determine the proper additive and mixing requirements.

Technical Evaluation

On a short-term basis, this RAA will provide immediate benefits since the potential contaminant source is removed. The existing risks at the site are theoretically reduced to no risk. Although the process is commercially available and readily implementable, its waste treatment capability and long-term reliability with respect to leachability and structural integrity have not been demonstrated. Extensive site specific testing is required before technology implementation.

This alternative is potentially capable of achieving the contaminant specific ARARs.

The entire 200 cubic yards of contaminated soil/ashes can be treated by this method.

Institutional Evaluation

Although this RAA may be positively perceived because of the treatment and removal, there may be some resistance to hauling the waste through the community for disposal. Truck movements will disrupt normal traffic patterns inconveniencing local citizens. As mentioned under previous alternatives, the dangers posed by the sinkhole may be a concern to the local residents.

Cost Evaluation

The capital costs associated with implementation of this alternative are estimated to be $645,600. The costs for continued groundwater monitoring were presented previously in RAA No. 2.

Remedial Action Alternative No. 5 - Excavation, On-Site Treatment by Vitrification, Off-Site Disposal, and Continued Monitoring (RAA No. 5)

Description

For implementation of this alternative, excavation will proceed as outlined in RAA No. 3. In addition, a treatment area will be designated for on-site vitrification.

Vitrification is capable of providing a high degree of containment. Electrodes which provide heating energy are placed into the waste to be treated. Graphite is then placed between the electrodes in a pattern.

As energy is applied, convection currents distribute contaminants uniformly through the vitreous mass by fusion or vaporization. The material solidifies after the power is turned off.

Gaseous emissions are collected in a cover or ventilation hood placed over the area being vitrified. Site preparation for vitrification involves placement of the waste in an area, drilling the electrodes into place and setting up a ventilation hood for air pollution control. New electrodes are installed and the hood moved until the entire contaminated area has been vitrified. Some settling may occur as a result of densification. After removal of the vitrified mass for disposal, the treatment area may required backfilling and regrading with clean soil.

Mobile units are available for vitrification. An electric utility power source must be available.

Implementation of this alternative also includes five years of annual groundwater monitoring. Time for implementation likely will be in the range of 12 to 15 months, depending on equipment availability and

Technical Evaluation

Of all solidification technologies, vitrification is capable of providing the greatest degree of containment. However, this technology is extremely energy intensive and requires sophisticated machinery and specially trained personnel to operate.

Vitrification has been demonstrated as a successful treatment technology. However, its long-term reliability is still unknown at this time.

Public Health and Environmental Evaluation

Vitrification is capable of achieving all the identified contaminant specific ARARs associated with this site. Assuming that contaminants can not be leached from the glass matrix, the mobility of contaminants is greatly reduced, if not eliminated.

Implementation of such a technology also will required compliance with action-specific ARARs, principally relating to air pollution control and wastewater treatment.

Institutional Evaluation

Although implementation of this alternative may achieve all specified ARARs, public perception is uncertain. It is quite possible that the community will have a negative perception of the vitrification technology. The use of required air pollution control devices and the appearance of the process equipment also may create a negative perception.

Cost Evaluation

A present worth analysis for this alternative is estimated to be $656,760. The annual operation and maintainance costs for continued groundwater monitoring were previously presented.

Remedial Action Alternative No. 6 - Sinkhole Excavation, Onsite Treatment by Soil Washing, Offsite Disposal, and Continued Monitoring (RAA No. 6)

Description

Excavation will proceed as outlined in RAA No. 3. Washing lead contaminated soil involves five operational phases:

* Soil size sorting and classification;
* Stockpiling of unsuitable waste (battery casings and fragments);
* Using a chealating agent (EDTA) to extract lead from the soil:
* Separation of liquids from solids; and
* Removing lead from the extraction liquid.

The soil sorting step involves classifying the soil into size fractions that may or may not require treatment based on their lead content. Previous experience with lead contaminated soil from Superfund sites has indicated that lead contamination is concentrated in the smaller size fractions. The soil is then washed with a chelating agent to hold the metal ions in solution.

Technical Evaluation

Treatment processes using soil washing are still in the developmental stage. The ability to treat lead-contaminated soil at the Voortman Farm Site will be dependent on the soil and waste chemistry, permeability, and other factors. The long-term reliability of this treatment method is uncertain at this time.

Public Health and Environmental Evaluation

Lead removal efficiencies using soil washing technologies range from 70 percent to 90 percent. If a 90 percent removal efficiency is achieved, lead concentrations in soil could be reduced to background levels. Such a reduction will ensure compliance with contaminant-specific ARARs. Compliance with action-specific ARARs will require treatment of the process residuals to drinking water standards.

Institutional Evaluation

Residents in the immediate vicinity may be inconvenienced by noise and disruption of local traffic patterns during the implementation of this alternative. Some resistance to hauling the removed waste through the local neighborhood and concern with creation of another hazardous waste stream (process wastewater) may be evident. The community's perception of this innovative technology is uncertain at this time.

Cost Evaluation

The capital costs for implementation of this alternative are $562,462. The annual operation and maintenance costs for continued groundwater monitoring were presented previously.

A cost comparison summary of the Remedial Action Alternatives is presented in Table 7.

Table 7
Remedial Action Alternative Costs

	RAA #1	RAA #2	RAA #3	RAA #4	RAA #5	RAA #6
Capital Costs	0	0	381,030	619,590	630,750	562,460
Present Worth	0	260,10	407,040	645,600	656,760	588,470
Annual Cost per year	0	6,860	6,860	6,860	6,860	6,860

Evaluation Criteria for Superfund Selection of Remedy

The six alternatives described in the text can be grouped into two basic alternatives for this evaluation. The first two are no action alternatives, but RAA No. 2 has monitoring. The other four are for excavation with some kind of treatment for the lead in the sinkhole soils. This section will evaluate the two types of alternatives by the nine point criteria recommended in EPA guidance.

1. Compliance with ARAR's

   RAA #1 & 2: Actual lead levels in sinkhole soils could pose a health threat if ingested over a lifetime.

   RAA #3 - 6: Excavation would hope to remove contaminated sinkhole soils to comply but there are physical limitations to excavation.

2. Reduction of Toxicity, Mobility and Volume

   RAA #1 & 2: These will not reduce toxicity, mobility or volume.

   RAA #3 - 6: These alternatives will remove soils thereby reducing volume. Treatments will also reduce mobility.

3. Short Term Effectiveness

RAA #1 & 2: The site remains unchanged.
RAA #3 - 6: Excavation and treatments could take up to one construction season.

4. Long Term Effectiveness

RAA #1 & 2: There is a possibility for lead and the other metals to enter the water table.
RAA #3 - 6: There is a possibility that the excavation will actually remove all contaminated soils and possible battery casings.

5. Implementability

RAA #1 & 2: The monitoring wells are already in place.
RAA #3 - 6: Construction of access roads to the base of the sinkhole will be difficult and any further excavation may cause further slumping of surface soils into the hole.

6. Cost

RAA #1 & 2: Monitoring is an effective use of funds.
RAA #3 - 6: Excavation may not provide a cost effective reduction of possible releases to groundwater.

7. Community Reaction

RAA #1 & 2: Community reaction is acceptable.
RAA #3 - 6: The community may have Some resistance to increased traffic and hauling of "hazardous wastes".

8. State Acceptance

RAA #1 & 2: The State has agreed with the proposed plan.
RAA #3 - 6: DER has expressed that the risks of excavation are high for the safety of the workers involved in the sinkhole.

9. Overall protection of Human Health and the Environment.

RAA #1 & 2: Monitoring will protect both the residents on groundwater wells and the surface waters.
RAA #3 - 6: Excavation will cause some risks for the workers and air releases will have to be monitored. If excavation can assure complete removal of any possible remaining battery casings, the excavation remedies would be more protective of the environment but monitoring would still be necessary.

Recommended Alternative

The previous descriptions of the six alternatives have been reviewed to assess the protectiveness of human health and the environment and if they can attain the ARARs for the site specific contaminants.

This ROD has selected the second alternative described in RAA No.2:

1. The selected remedy is a "NO ACTION ALTERNATIVE WITH CONTINUED GROUND WATER MONITORING".

2. EPA and DER will monitor on site ground water wells and analyze for the metals related to the waste source.

3. All monitoring will be done on a yearly basis for the next five years. After this period, EPA and DER will review the site to determine if continued monitoring is necessary.

4. This remedial action will not require further treatment of ground water, surface water, sediments or soils. The removal of the burning battery casings, ashes and soils have effectively eliminated the source of future threats to ground water quality.

Compliance With ARARs (Applicable Relevant or Appropriate Requirements)

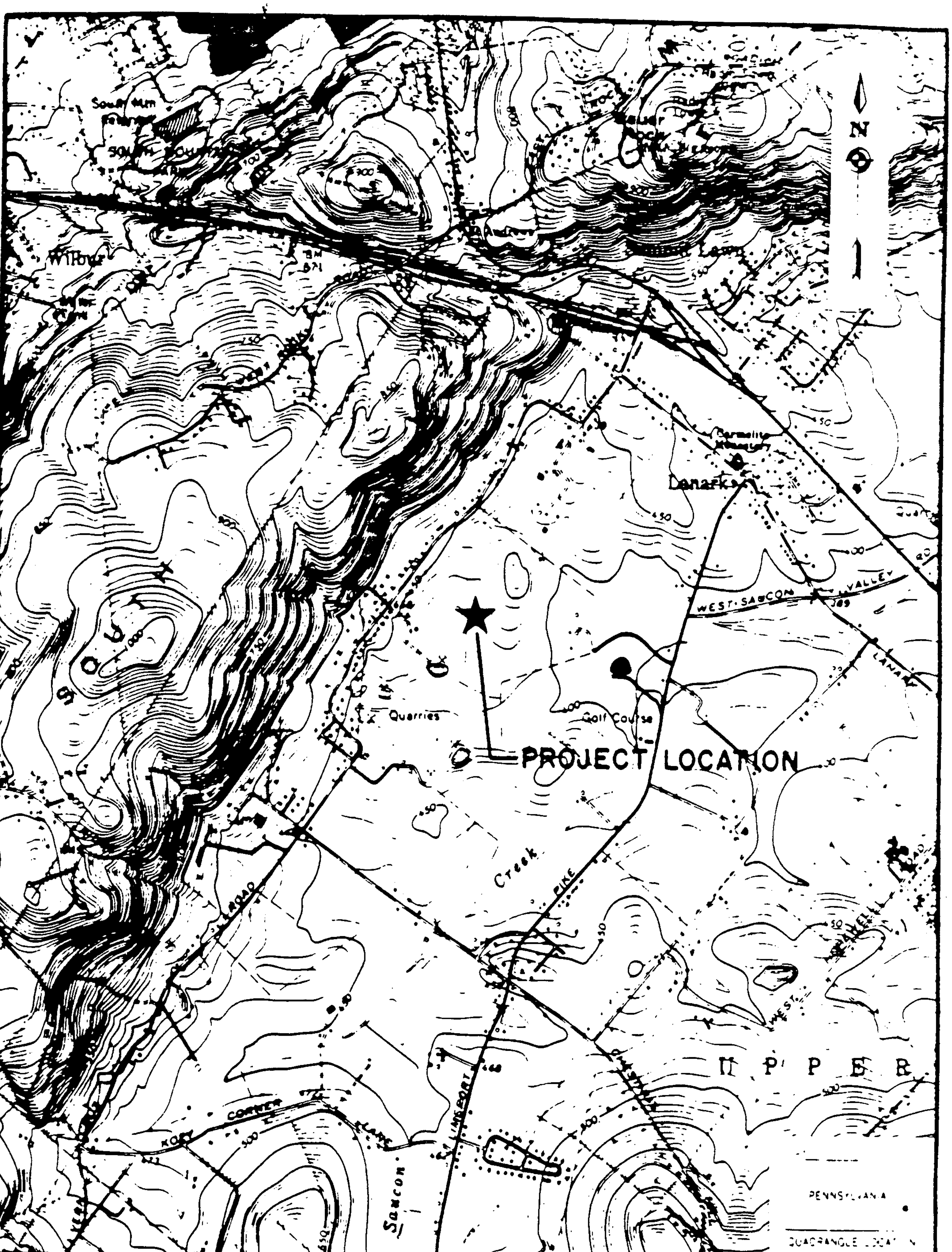
The only specific risk identified in the RI/FS is cronic daily intake levels for ingestion of the sink hole soils which contain elevated levels of lead. This recommended action will not remove the sinkhole soils so the risk may still be present when EPA and DER review the site in five years. However, we must take into consideration the site characteristics and the real risks associated with the contaminated sink hole soils.

Basically, the possibility for a child to come into contact with the sinkhole soils is remote and the biggest risk is from the fall into the sink hole; not from eating the sinkhole soils. At any rate a child would not be expected to ingest the contaminated soils on a routine basis over a lifetime. In addition to the unlikelihood of the exposure, the surface soils have continued to slump into the hole and have already covered the contaminated soils which could pose a threat. Therefore concern is with the potential risks posed to ground water quality. Currently the ground water quality does not violate the drinking water standards. RAA NO. 2 includes the yearly resampling and analysis of the ground water to assure the Agency that no further contamination will go undetected and possibly threaten the environment or local residents.

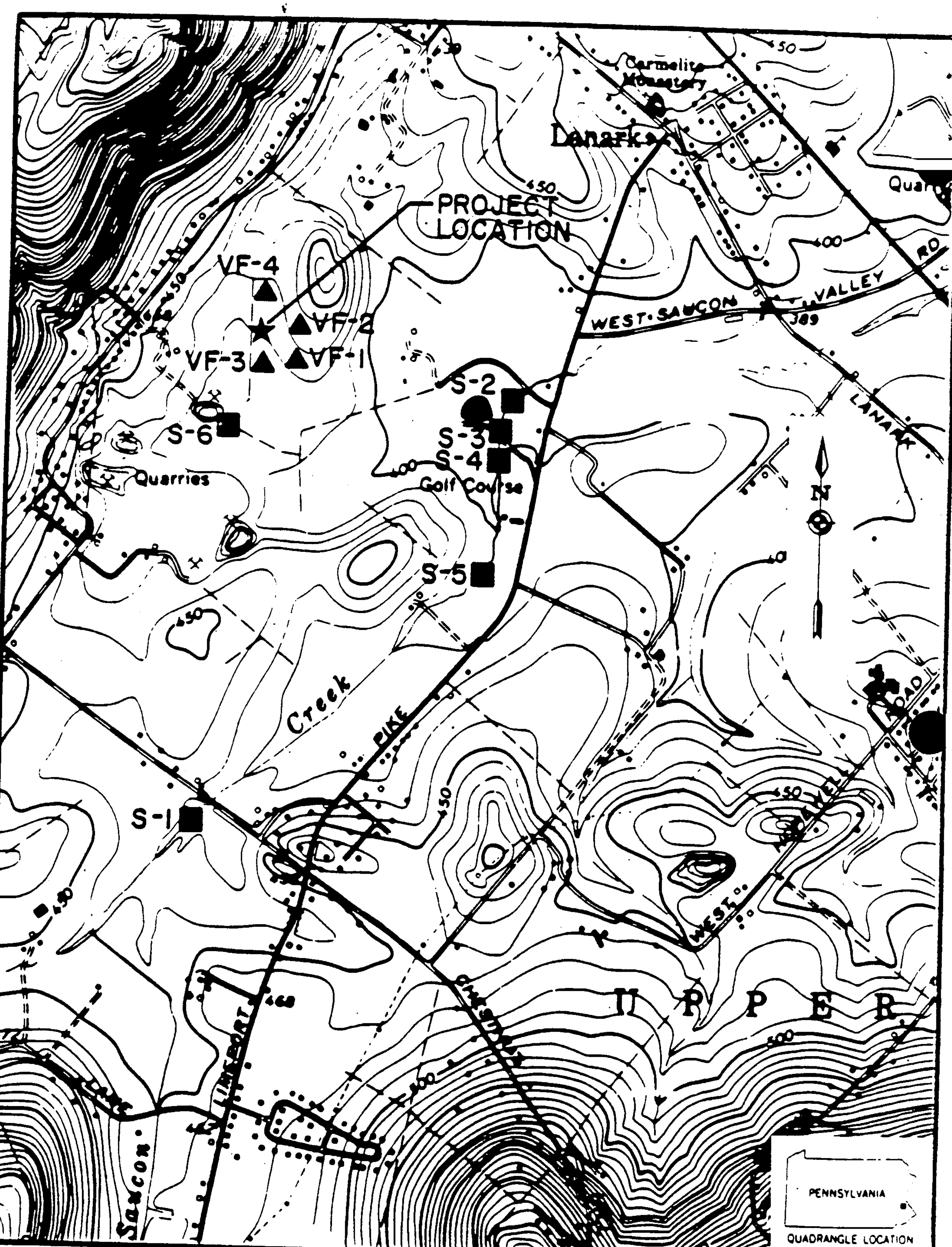
RCRA regulations have been reviewed and are not ARARs for the site.

Community Relations/Responsiveness Summary

This site has had most of the community involvement and participation in the earlier years of the Superfund investigations. As mentioned in the site history section, involvement began with the illegal dumping and continued with the National Priority listing of the site. As expected, the fire in 1986 also raised community interest and a public meeting was held to describe DER's proposed actions. The public clearly supported DER's emergency removal actions to put out the fire and remove and dispose of the battery casings. During the RI/FS the public was in contact with DER's representative and those who inquired were kept informed. In May 1988, DER placed the Administrative Record in the Township office and a newspaper advertisement was placed in the Allentown Newspaper a few days after our ad, a local represenitive wrote an editorial which supported our decisions. A copy of the ad is attached. No requests for a formal public meeting were received.



LEGEND	VOORTMAN FARM SITE RI/FS	BAKER/TSA, INC.
★ - Voortman Sinkhole	FIGURE 1 PROJECT LOCATION MAP	Scale: 1" = 2000' Allentown East Qua[illegible]



LEGEND

★ - Voortman Sinkhole

■ - Surface Water/Sediment Sampling Location

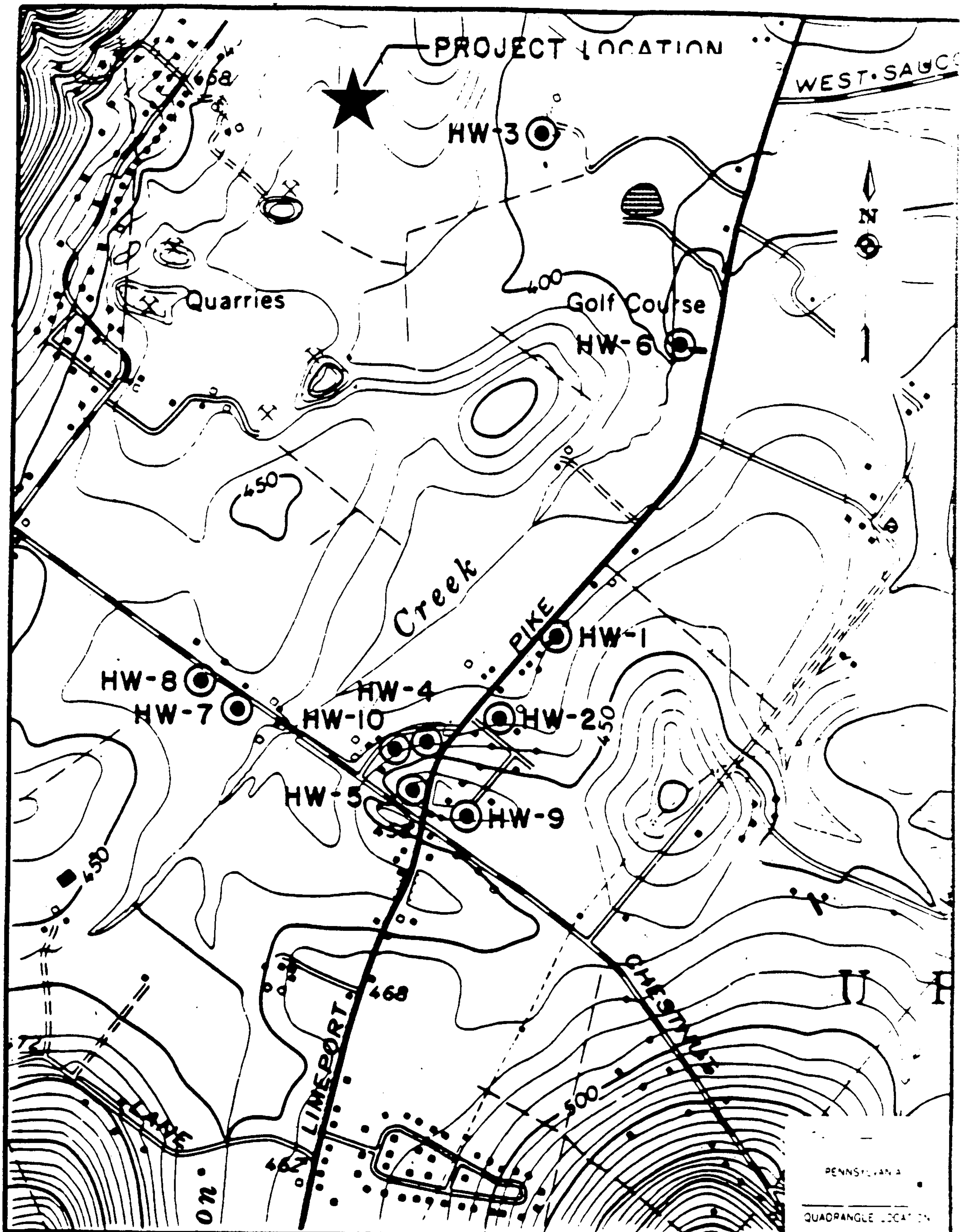
▲ - Monitoring Well Location

VOORTMAN FARM SITE RI/FS

FIGURE 2
SAMPLING AND MONITORING WELL LOCATIONS

BAKER/TSA, INC

Scale: 1" = 1500'
Allentown East Quad



LEGEND	VOORTMAN FARM SITE RI/FS	BAKER/TSA, INC.
★ – Voortman Sinkhole ⊙ – Residential Well Location	FIGURE 3 RESIDENTIAL WELL LOCATIONS	Scale: 1" = 1000' Allentown East Quad

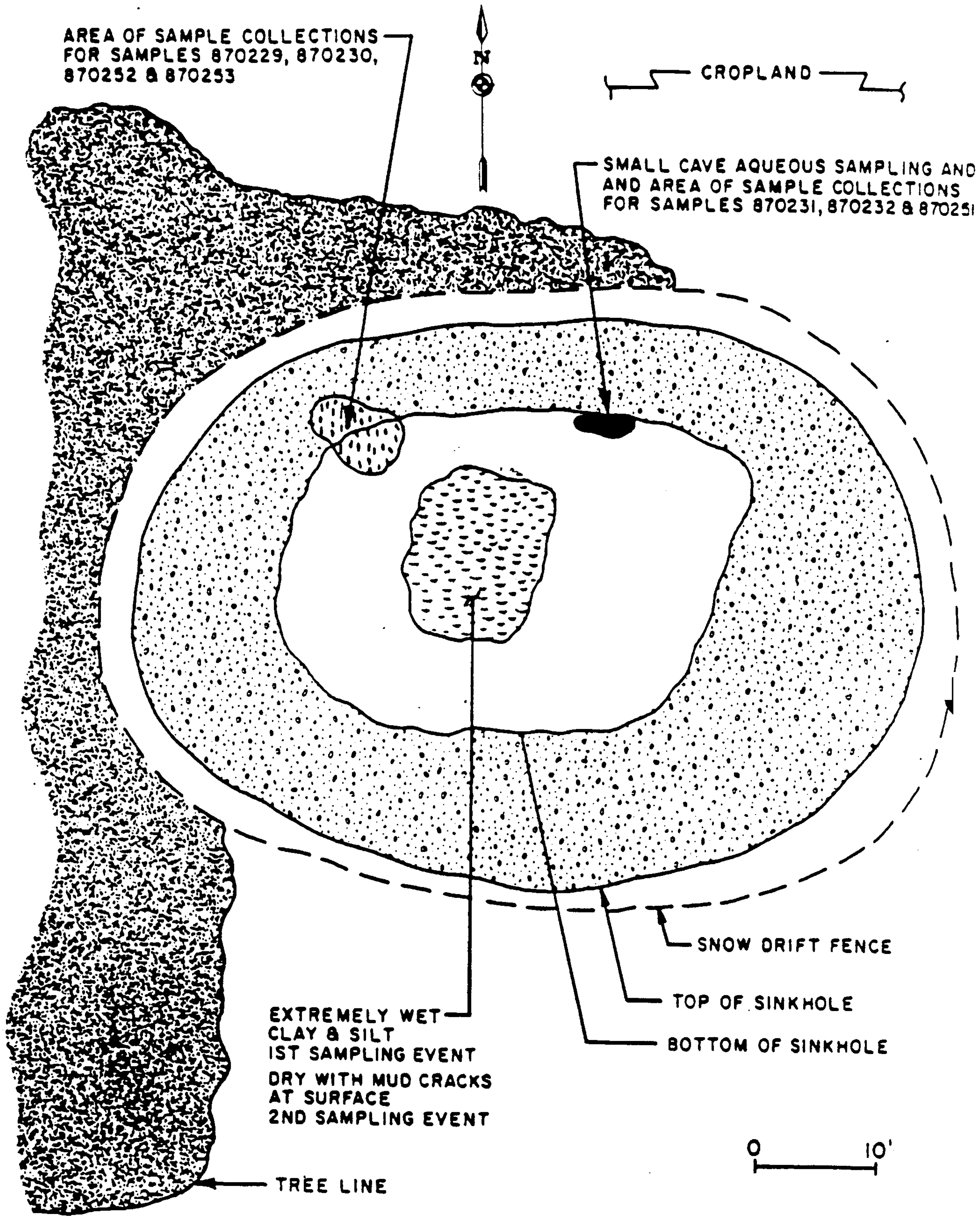


FIGURE 4
SINKHOLE SAMPLE LOCATIONS

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES

Seeks Comments on

The Voortman Farm Superfund Site

The Pennsylvania Department of Environmental Resources (DER) and the U.S. Environmental Protection Agency (EPA) are seeking comments on a report which outlines cleanup alternatives for the Voortman Farm Superfund Site in Upper Saucon Township, Lehigh County, Pennsylvania.

The Voortman Farm Site is a sinkhole located on farm property between Vera Cruz Road and Limeport Pike in Upper Saucon Township. In late 1979 and early 1980, battery casings, empty drums, miscellaneous debris and trash were dumped into the sinkhole. In 1980, citizens complained about the disposal practice to Township officials. Subsequent investigations resulted in the site receiving a ranking via the Hazardous Ranking System (HRS). The site was placed on the National Priorities List (NPL) in 1982.

A fire at the Voortman Farm Site in September 1986 triggered an Emergency Response Action by DER which resulted in the removal of all visible signs of the empty battery casings, which were the primary source of contamination.

Extensive sampling and analysis of air, surface water and sediments, household wells, and on-site groundwater monitoring wells conducted during DER's Remedial Investigation (RI) in 1987 revealed the following:

- Some sinkhole soils contained levels of lead in excess of background concentrations;
- The lead contained in the sinkhole soils appears to be immobile as evidenced by the quality of the on- and off-site groundwater; and
- No off-site contamination (air, groundwater, surface water, sediments) was evident.

A Feasibility Study (FS) was prepared under DER's direction to develop and analyze the following Remedial Action Alternatives (RAA) to evaluate the site problem of contaminated soil and residual ashes in the sinkhole:

#1 — No action. The existing contaminants will be left in place and no further remedial actions will be taken;

#2 — No action with continued on-site groundwater well monitoring.

#3 — Excavation of soil/ashes and off-site treatment and disposal.

#4 — Excavation of soil/ashes, on-site treatment by cement-based solidification, and off-site disposal.

#5 — Excavation of soil/ashes, on-site treatment by vitrication and off-site disposal. Vitrification is a process which would attempt to convert the wastes into a glass-like material by heating.

#6 — Excavation of soil/ashes, on-site treatment by soil washing and off-site disposal. A chemical would be added to the soil to extract lead, which would reduce contaminant concentrations.

While the Superfund amendments and Reauthorization Act (SARA) of 1986 promotes the preference for alternatives providing site remediation using innovative technologies, the Voortman Farm Site has the following limitations:

- Complete removal of contaminated soil, ashes, battery casings and fragments is not feasible due to their location deep within fractures or caverns in the bedrock underlying the site.
- Implementing any treatment technologies (solidification, vitrification, and soil washing) would be difficult because of the irregular distribution of contaminants in the sinkhole soils; and
- Extreme hazards would be associated with any further excavation due to the potential for collapse around the sinkhole. Such hazards will increase as any excavation proceeds deeper.

DER and EPA have determined from the Remedial Investigation/Feasibility Study an appoprpriate Remedial Action Alternative for the Voortman Farm Site.

DER and EPA are proposing to adopt a minimum action approach to this site which is detailed in the Feasibility Study (FS) Report. After extensive technical review and cost evaluations, DER and EPA are proposing that Remedial Action Alternative #2 — continued groundwater monitoring with no further action, is the most appropriate remedial action for the Voortman Farm Site. The basis for recommending this alternative is:

- There is no evidence of off-site migration of contaminants from the site, and the site currently does not pose a threat to human health or the environment.
- The hazards and costs associated with any deeper removal of any soils/ashes or battery casings far exceeds any benefits derived from this type of action.
- Periodic monitoring of groundwater quality at the site should provide sufficient information in the unlikely event that any contaminants are released prior to adversely affecting public health and the environment.

DER is seeking comments on the RI/FS Reports which are available for review, along with the Voortman Farm Superfund file, at the Upper Saucon Township Building, P.O. Box 278, Camp Meeting Road, Center Valley, PA 18034

If requests for a public meeting on the reports are received, a meeting will be held at the Upper Saucon Township Building. Requests for a meeting should be made by June 10 and should be directed to Frank J. Koller, DER Community Relations Coordinator, phone (717) 783-7816. General information about the Voortman Farm file can be obtained from Frank Koller.

Comments on the RI/FS reports should be made in writing on or before June 29, 1988 to: Joseph A. Kozlosky, Project Officer, PA Department of Environmental Resources, Bureau of Waste Mangement, Division of Emergency & Remedial Response, P.O. Box 2063, 7th Floor Fulton Building, Harrisburg, PA 17120.