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Agency

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Remedial Response

EPA/ROD/R02-88/059
June 1988

EPA Superfund Record of Decision:

Tabernacle Drum Dump, NJ

50272-101

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Tabernacle Drum Dump, NJ
First Remedial Action - Final

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Washington, D.C. 20460

13. Type of Report & Period Covered
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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Tabernacle Drum Dump (TDD) site is a one-acre facility located in Tabernacle Township, Burlington County, New Jersey. Drum disposal activities, which resulted in contamination by hazardous substances, occurred on a 2,000 ft^2 area portion of the site. Land use in the area consists mainly of woodland, bogs, agriculture, and recreation. The soils typically found in the area are highly permeable, sandy, and acidic. Approximately 75 to 100 residents live within a one-mile radius of the site. Most of the residents located down-gradient of the site depend on individual residential wells for potable and agricultural purposes. TDD is currently owned by Mr. and Mrs. Phillip Myers. In 1976 and 1977, the property was occupied by Mr. and Mrs. Robert Ware. During that period, Mr. Ware's employer, the Atlantic Disposal Services (ADS), disposed of approximately 200 fifty-five gallon drums, twenty gallon containers, and five gallon paint cans. These containers were stored at the site from 1977 to 1984. Deterioration and leakage of some containers resulted in visible soil contamination and ultimately ground water contamination. Based on a referral from Tabernacle Township officials, the Burlington County Health Department conducted a site inspection in August 1982, and discovered over 100 abandoned drums. In November 1982, the New Jersey Department of Environmental Protection (NJDEP) conducted a more detailed site
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Tabernacle Drum Dump, NJ
First Remedial Action - Final
Contaminated Media: gw
Key Contaminants: VOCs (DCE, TCA)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 105
	20. Security Class (This Page) None	22. Price

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

16. ABSTRACT (continued)

inspection. Leaking and deteriorated drums containing solvents, paint sludges, heavy metals, and visibly contaminated surface solids were revealed. In 1984, EPA issued an administrative order to ADS requiring it to perform a surface cleanup of the site, install and sample four monitoring wells, and sample and analyze site surface and subsurface soils for priority pollutants. During April 1984, ADS initiated some remedial measures including the numbering, logging, and sampling of site containers. Surface cleanup was completed in July 1984 and consisted of removing containers, 40 yd^3 of drum material, 8 truck loads of excavated soil, and approximately 3,000 gallons of liquid material. The principle threat posed at the site is potential ingestion of ground water by down-gradient residents. The primary contaminants of concern are VOCs including 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE).

The selected remedial action for this site includes: installation of ground water monitoring wells with implementation of a monitoring program to delineate the extent of the plume; ground water pump and treatment using air stripping and possibly carbon adsorption followed by reinjection, ground water monitoring, and exhaust gas analysis; and soil sampling of the former drum dumping and storage area. The estimated capital cost for this remedial action is $772,600 with present worth O&M of $215,600.

DECLARATION STATEMENT

RECORD OF DECISION

Tabernacle Drum Dump

SITE NAME AND LOCATION

Tabernacle Drum Dump, Tabernacle Township, Burlington County, New Jersey

STATEMENT OF PURPOSE

This decision document presents the selected remedial action for the Tabernacle Drum Dump site, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300.

STATEMENT OF BASIS

I am basing my decision primarily on the following documents, which are contained in the administrative record, and that characterize the nature and extent of contamination and evaluate long-term remedial alternatives for the Tabernacle site:

- Draft Remedial Investigation Report, Tabernacle Drum Dump, prepared by Camp Dresser & McKee, February 1988

- Draft Feasibility Study Report, Tabernacle Drum Dump, prepared by Camp Dresser & McKee, February 1988

- Proposed Remedial Action Plan, Tabernacle Drum Dump, March 1988

- The attached Decision Summary for the Tabernacle site

- The attached Responsiveness Summary for the site, which incorporates public comments received

- Staff summaries and recommendations

DESCRIPTION OF SELECTED REMEDY

The remedial alternative presented in this document represents a final remedial solution for the Tabernacle site. It addresses ground water contamination in the underlying aquifer. A surface cleanup involving the removal of drums and other containers as well as contaminated soil has already been accomplished.

The specific components of the remedial action are as follows:

- Installation of additional ground water monitoring wells to further delineate the extent of the contaminant plume;
- Implementation of a ground water monitoring program for down-gradient residential wells until the contaminant plume has been delineated precisely;
- Additional soil sampling at the former drum dumping and storage area to support existing data indicating only trace levels of contaminants;
- Extraction of the contaminated ground water through pumping followed by on-site treatment and reinjection of the treated effluent into the ground. This process will continue until federal and state cleanup standards are attained to the maximum extent practicable; and
- Implementation of a ground water monitoring program for a period of five years after site cleanup goals have been achieved.

DECLARATIONS

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, I have determined that the selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. Furthermore, this remedy satisfies the preference for treatment that reduces toxicity, mobility, or volume as a principal element. Finally, I have determined that this remedy utilizes permanent solutions and alternate treatment technologies to the maximum extent practicable.

The State of New Jersey has been consulted and agrees with the selected remedy.

JUNE 30, 1988
Date

Christopher J. Daggett
Regional Administrator

Decision Summary

Tabernacle Drum Dump

Site Description

The Tabernacle Drum Dump site is a wooded one-acre parcel of undeveloped land located on Carranza Road in Tabernacle Township, New Jersey in the northern region of the New Jersey Pine Barrens (Figure 1). The site is bordered to the northwest by farmland and to the south and east by residential properties. The illegal drum dumping activities which resulted in contamination by hazardous substances occurred on a portion of the one-acre site, approximately 2,000 square feet in size (Figure 2).

Land use in the area consists mainly of woodland, bogs, agriculture (including cranberry and blueberry farming) and recreation (especially canoeing in the Mullica River system). The soils typically found in the area are highly permeable, sandy and acidic. The nearest down-gradient surface water body is a cranberry bog located 0.7 miles south-southeast of the site dumping area. Another cranberry bog exists at a distance of 0.5 miles, but is located east-southeast of the site.

Approximately 75 to 100 residents live within a one-mile radius [illegible] the Tabernacle site. The nearest drinking water well is [illegible]cated about 650 feet to the southwest. Most of the residents located down-gradient of the site depend on individual residential wells for potable and agricultural purposes. Figure 3 shows the locations of some of the residential wells in the immediate site vicinity and the direction of ground water flow which is calculated as south-easterly. The nearest down-gradient well southeast of the site is found at a distance of approximately 2,300 feet.

Two aquifers exist beneath the site which are separated by an intermittent, 20-foot thick clay layer. The upper water bearing source is the Cohansey aquifer which has a depth of approximately 100 feet at the site and which supplies the majority of those residents living in the immediate site vicinity. In some areas, the Cohansey aquifer is hydraulically connected to the underlying Kirkwood aquifer which is not typically used as a source of potable water in the Pine Barrens region.

SITE HISTORY

Origin of Problem

The one-acre site is currently owned by Mr. and Mrs. Phillip Myers of Marlton, New Jersey. The legal description of the property is Block 1202, Lot 22, in the Tabernacle Township tax map. [illegible] 1976 and 1977, the property was occupied by the Myers' daughter, [illegible]th Ware (now Edith Ruhl), and her husband, Robert Ware. During

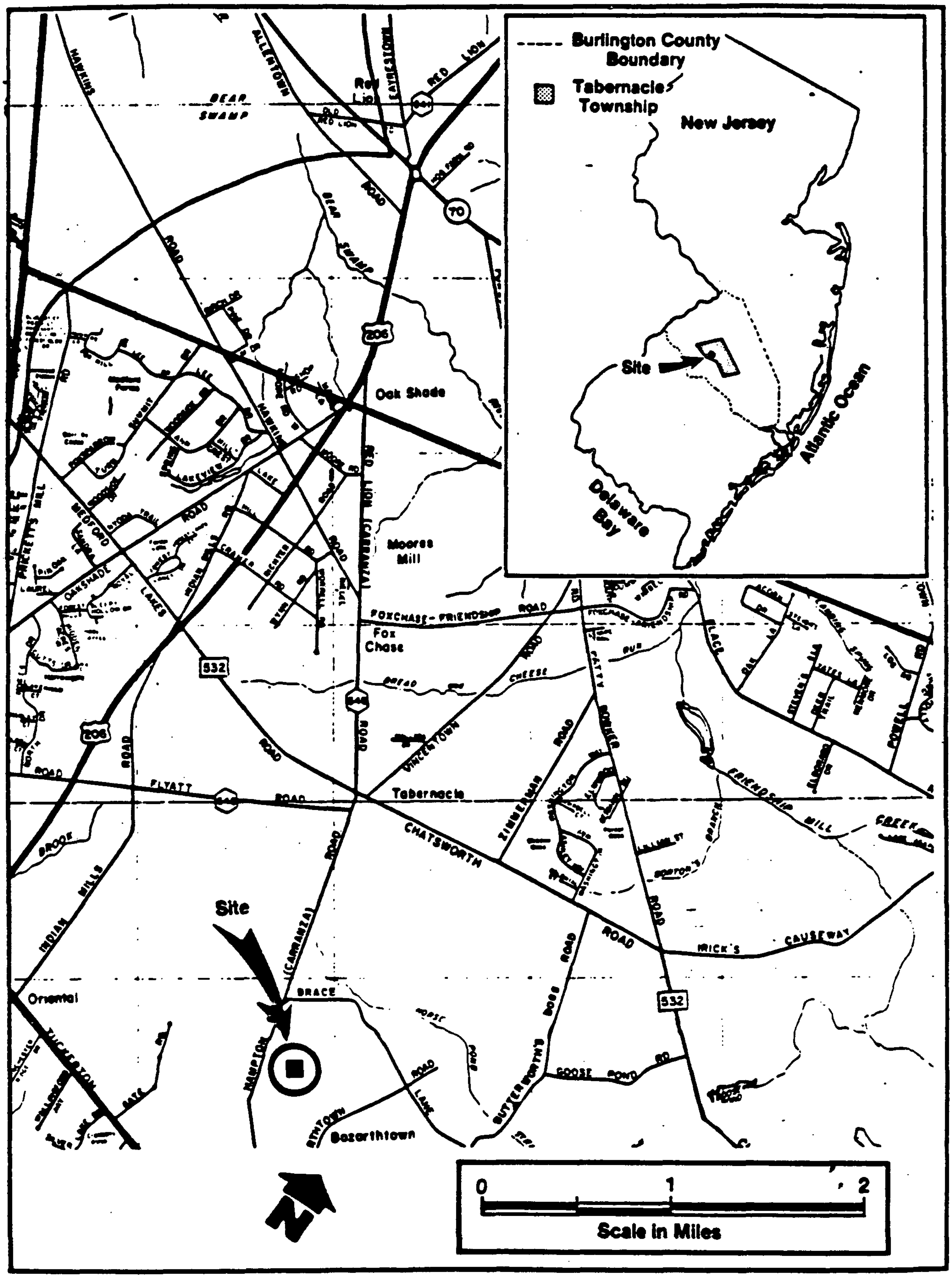

FIGURE 1 SITE LOCATION MAP- TABERNACLE DRUM DUMP SITE

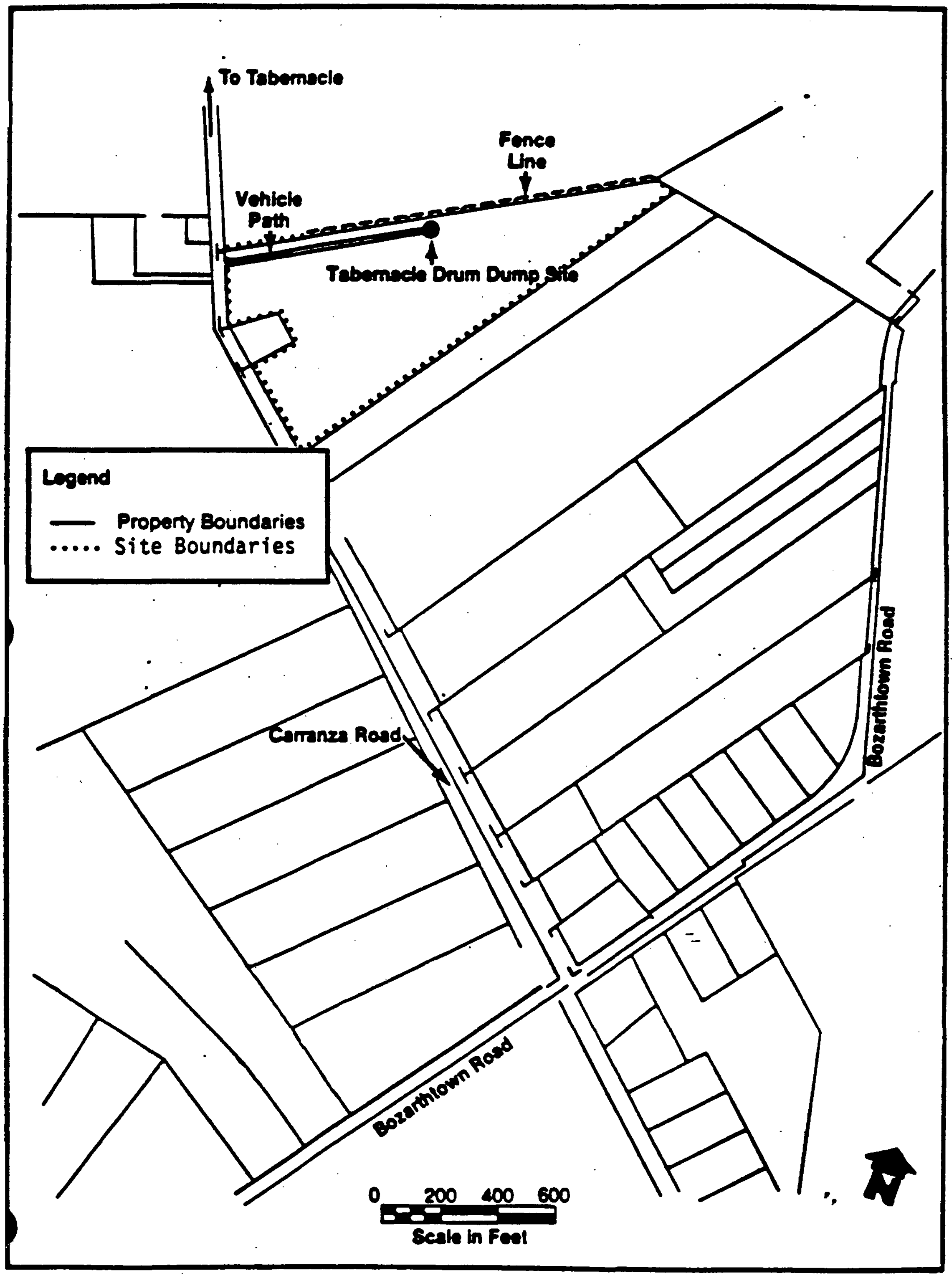

FIGURE 2 LOCATION OF TABERNACLE DRUM DUMP SITE

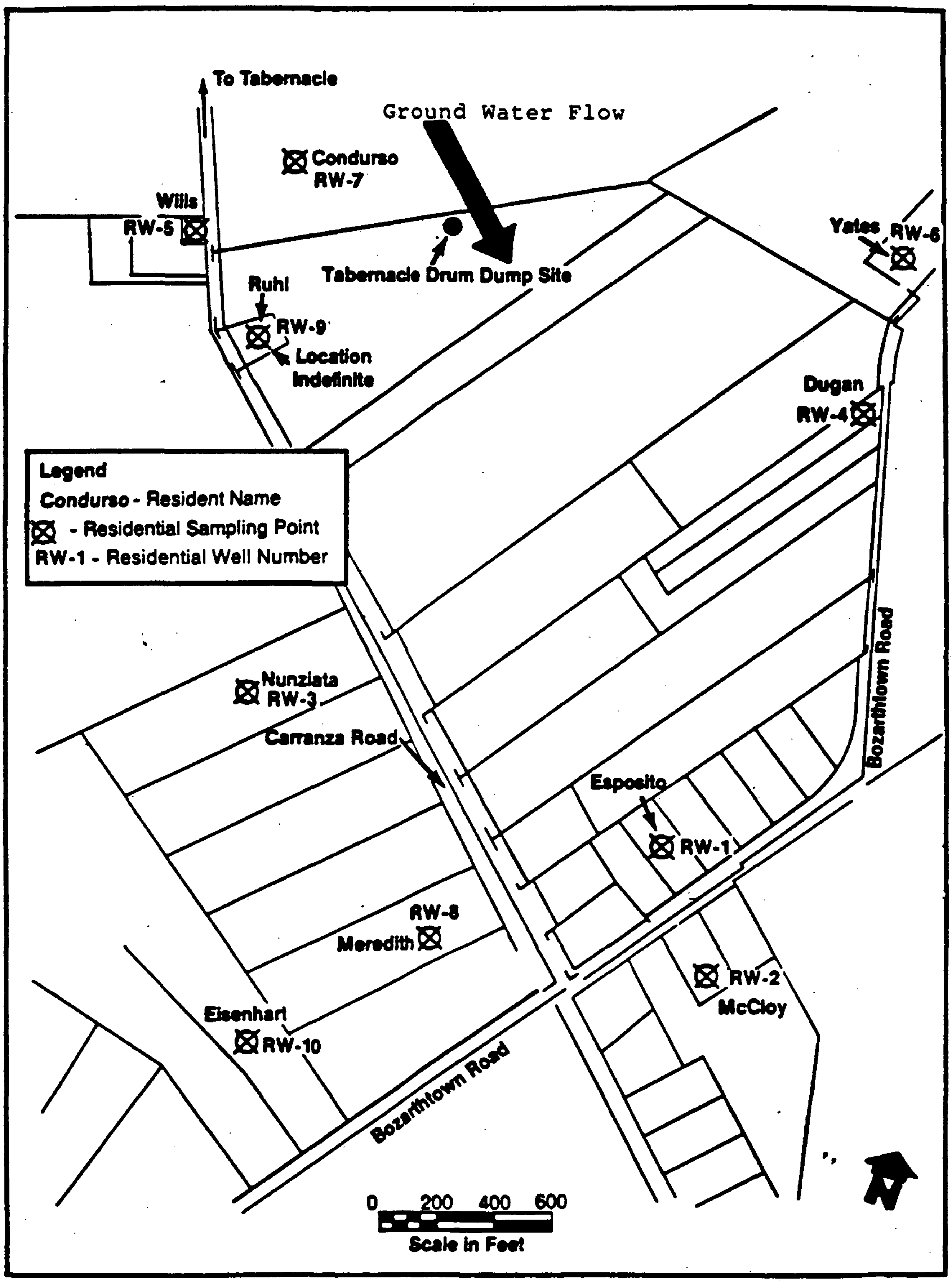

FIGURE 3 LOCATION OF RESIDENTIAL GROUNDWATER SAMPLING POINTS
TABERNACLE DRUM DUMP SITE - DECEMBER 1986

t period, Mr. Ware's employer, Atlantic Disposal Services, Inc. (ADS), disposed of approximately 200 containers on the Myers property. These containers included 55-gallon drums, 5-gallon paint cans and 20-gallon containers which were stored at the site between 1977 and 1984. Deterioration and leakage of some of the containers resulted in visible contamination of the soils and ultimately of the ground water underlying the site.

Initial Enforcement Actions and Subsequent Remedial Measures

Based on a referral from Tabernacle Township officials, the Burlington County Health Department (BCHD) conducted a site visit in August 1982, discovering over one hundred abandoned drums. In November 1982, the BCHD sampled approximately 25 private potable water wells in the area. No significant levels of contamination were measured in the residential drinking water at that time. At this point in time, the New Jersey Department of Environmental Protection (NJDEP) conducted a more detailed inspection of the site. This inspection revealed the presence of leaking and deteriorated drums containing solvents, paint sludges, heavy metals, and visibly contaminated surface soils as evidenced by dead vegetation. NJDEP obtained three organic waste samples from three separate drums and one aqueous sample composited from seven different spill locations. The laboratory analysis showed the presence of carbon tetrachloride, benzene, toluene, ethylbenzene, xylenes, chromium and lead.

In September 1983, the Tabernacle Drum Drump site was proposed for inclusion on the National Priorities List (NPL) to become eligible for Superfund monies. The final approval for inclusion on the NPL was given in September 1984. The site is ranked No. 445 on the most recent NPL update listing of March 1987. In February 1984, the U.S. Environmental Protection Agency (EPA) issued an administrative order to ADS to perform a surface cleanup of the site, install and sample four monitoring wells, and sample and analyze site surface and subsurface soils for priority pollutants. During April 1984, ADS initiated some remedial measures including the numbering, logging and sampling of the containers found on the site. Surface cleanup was completed in July 1984 and consisted of removing the containers found at the site, 40 cubic yards of material from the drums, eight truck loads of excavated contaminated soil, and approximately 3,000 gallons of liquid material. The only soil sampling performed by ADS was conducted in March and April 1985 and consisted of surface soil compositing from depths of 0-6 inches from within ten zones at the site.

ADS did not perform the additional soil sampling from various depths also mandated by the administrative order issued in February 1984, constituting a violation of that order. Monitoring wells were never installed by ADS to assess the impact of contamination on ground water resources, also constituting a violation of that order. It is important to note that the original findings of leaking and deteriorating drums, coupled with the highly permeable nature of the sandy soils, indicated a strong potential for ground water contamination beneath the site.

Subsequently, the United States filed a civil action against ADS, seeking penalties for its violations of the February 1984 administrative order, as well as the recovery of EPA's oversight costs. That judicial action was resolved by consent decree, pursuant to which ADS paid $115,000 in penalties and oversight costs.

Remedial Actions by EPA

The EPA performs remedial actions at toxic waste sites in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, which was amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. In most instances, these actions are conducted in three major phases. First, a remedial investigation and feasibility study (RI/FS) is done to determine the nature and extent of the contamination present at the site, and to develop and evaluate a range of remedial action alternatives to deal with that contamination. After the RI/FS is completed, a Record of Decision (ROD) is prepared to document the remedy selected. Subsequently, the remedial design (RD) phase begins, followed by the remedial action (RA), during which the design is actually implemented.

In addition to these scheduled activities, a removal action may be taken at any time to address acute hazards posed by the site.

Remedial Investigation

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), EPA conducted an RI/FS at the Tabernacle site. Preliminary sampling of ground water and surface and subsurface soils at the site was performed in July 1985 as part of an initial site evaluation. The formal field work for the RI began in December 1986 and was completed in December 1987. Major contaminants in the soils and ground water are listed in Table 1, which includes data from the two rounds of sampling undertaken in July 1985 and December 1986.

The RI report identified eight indicator chemicals in accordance with the Superfund Public Health Evaluation Manual and documented the existence of two contaminated media -- soil and ground water. These chemicals were detected at levels somewhat higher than background concentrations and were considered to be site-related. They are as follows: chromium, cyanide and lead in the surface soils; and cadmium, chromium, lead, 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE) in the ground water.

During the RI, the soils were investigated through the analysis of a total of eight soil borings and 17 surface soil samples. Although the metal concentrations of chromium, cyanide and lead in the surface soils exceeded site background levels, they did not exceed the existing cleanup criteria established for soils by the New Jersey Department of Environmental Protection (NJDEP). These levels are known as the New Jersey Recommended Soil Action Levels and are shown for comparison in Part A of Table 1.

During the RI, ground water was studied through on-site monitoring wells, three of which were installed and sampled in July 1985. Five additional wells were later installed and a total of eight monitoring wells were sampled in December 1986. In addition, three residential wells were sampled in July 1985, and a total of ten potable wells were sampled in December 1986. The analytical results for all of these ground water sampling events are shown in Table 1 (Parts B and C) along with the applicable or relevant and appropriate requirements (ARARs) established by EPA or NJDEP.

The state ARARs for the various inorganic compounds listed in Table 1 (Parts B and C) are known as the New Jersey Ground Water Quality Criteria. The cleanup criteria for cadmium and chromium in ground water are set at natural background levels by NJDEP and are more stringent than the federal ARARs, known as the primary maximum contaminant levels (MCLs) for these metals. The state and federal cleanup levels are both set at 50 parts per billion (ppb) for lead. Based on the RI results for the December 1986 ground water sampling event, five monitoring wells exhibited concentrations of total cadmium which exceed the state ARAR. Furthermore, cadmium was not detected in any of the ten residential wells which were sampled. During the RI, total chromium and total lead were analyzed for in the July 1985 and December 1986 ground water sampling events. Total chromium exceeds the state ARAR in all of the monitoring wells sampled and in five of the residential wells sampled. One of the monitoring wells and none of the residential wells displayed concentrations of total lead which exceed the state cleanup criteria.

In addition to the inorganic indicator chemicals identified as part of the public health evaluation in the RI report -- cadmium, chromium and lead -- some of the other metals detected in the ground water exceed state and federal cleanup levels. The state ARARs for iron, manganese and silver are equivalent to the federal ARARs for these inorganics as shown in Parts B and C of Table 1. Iron, manganese and silver were only analyzed for in the December 1986 ground water sampling event. The state cleanup criterion for total iron was exceeded in all of the monitoring wells sampled, but in only one of the residential wells. Two of the monitoring wells and none of the residential wells displayed concentrations of total manganese which exceed the state ARAR. Finally, while silver was not detected in any of the monitoring wells, three residential wells exhibited levels of silver which exceed the state ARAR.

The volatile organic compound, 1,1,1-trichloroethane (TCA), significantly exceeds the proposed MCL established by NJDEP in six of the monitoring wells sampled in December 1986 by up to a factor of 30 times. This observation confirms the exceptionally high concentrations of TCA found in all of the monitoring wells sampled in July 1985. In addition, the federal MCL for TCA is also exceeded. It is important to note that TCA was not detected in any of the residential wells sampled in December 1986. The residential wells sampled in July 1985 detected extremely low levels of TCA that are significantly below the most stringent drinking water standards for TCA.

TCA undergoes chemical hydrolysis and breaks down into another volatile organic compound, 1,1-dichloroethene (DCE), which is considered a potential carcinogen. DCE was detected in only two of the monitoring wells sampled in December 1986, at concentrations which were estimated and below method detection limits. Therefore, it cannot be determined accurately whether the levels of DCE found at the site exceed the proposed MCL set forth by NJDEP which is more stringent than the federal MCL for DCE. However, DCE was measured previously in two of the three monitoring wells sampled in July 1985. Again, it is important to note that DCE was never detected in any of the residential wells ever sampled during the RI.

Contaminant Pathways

A public health evaluation (PHE) was performed at the Tabernacle site to determine the impact on public health and the environment under various exposure scenarios and different contaminant pathways. This evaluation is presented in Section 6 of the RI report (Volume 1). Although the PHE only identified two contaminated media -- soil and ground water -- the potential exists for migration of the contaminants into other exposure media, such as air and surface water, which were both included in the PHE.

The potential for significant exposure through dermal contact with and incidental ingestion of site soils by trespassers is considered low. This direct pathway represents a very low potential health hazard since the RI findings indicate that the surface soils are not highly contaminated. As was previously noted, the levels of contaminants found in the surface soils did not exceed the existing soil ARARs established by NJDEP.

Two migration pathways may exist for the transport of contaminants from the soils and into the air: volatilization from the soils and resuspension of the soils through wind erosion or mechanical disturbances. Yet, site-related volatile organics are not present in the soils which makes volatilization a negligible pathway under current site conditions. Also, the coarseness of the sandy soils limits the suspension of particulates into the air.

TABLE 1
(page 1 of 5)

MAJOR CONTAMINANTS FOUND AT THE TABERNACLE SITE

A. SURFACE SOILS

ORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates Interval: 4/85 (0-6 in)	7/85 (0-12 in)	12/86 (0-12 in)	ARARs NJDEP
Volatiles				
Acetone	NA	NA	.029	1 ppm for total volatile organics (not exceeded)
2-Butanone	NA	.026J	.024	
Carbon Disulfide	NA	.012J	ND	
Chloroform	ND	.019J	ND	
1,1-Dichloroethene	ND	ND	ND	
Methylene Chloride	.172	.110	.003J	
Tetrachloroethylene	.022	ND	ND	
1,1,1-trichloroethane	ND	.014J	ND	
Base/Neutrals				
Benzo(a)anthracene	ND	ND	.007J	10 ppm for total base/ neutral compounds (not exceeded)
Benzo Perylene	.366	NA	ND	
Bis(2-ethylhexyl)phthalate	<.420	NA	.266	
Butyl Benzyl Phthalate	ND	NA	1.1	
Di-n-butyl Phthalate	.596	NA	6.3	
Dibenzoanthracene	.366	NA	ND	
Indenopyrene	.440	NA	ND	
Naphthalene	.073	NA	ND	
Phenanthrene	.217	NA	ND	

TABLE 1
(page 2 of 5)

A. SURFACE SOILS (Continued)

ORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates Interval: 4/85 (0-6 in)	7/85 (0-12 in)	12/86 (0-12 in)	ARARs NJDEP
Pesticides				
a-BHC	ND	.002J	ND	NG
B-BHC	ND	<.007	.077	NG
4,4'-DDD	<.118	<.017	.007	NG
4,4'-DDE	ND	.009	.210	NG
4,4'-DDT	.396	.020	.520	NG
Endosulfansulfate	ND	<.017	.008	NG
Endrin	ND	<.017	.023	NG
Heptachlor	ND	<.007	.140	NG

INORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates Interval: 4/85 (0-6 in)	7/85 (0-12 in)	12/86 (0-12 in)	ARARs NJDEP
Cadmium	ND	NA	2.8	3
Chromium	15	NA	23	100
Copper	8	NA	8.2	170
Cyanide	1.1	NA	2.88	NG
Iron	NA	NA	10,400	NG
Lead	10	NA	71	250-1,000
Manganese	NA	NA	44	NG
Nickel	4	NA	5.8	100
Silver	<.200	NA	ND	5
Zinc	70	NA	43	350

NOTE: In July 1985, the surface soil samples were analyzed for EPA Priority Pollutant volatile organic compounds, pesticides and PCBs. They were not analyzed for metals.

TABLE 1
(Page 3 of 5)

B. GROUND WATER (Sampled from on-site monitoring wells)

ORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates 7/85	12/86	ARARs State*	Federal\
1,1,1-trichloroethane(TCA)	1.000	.920	.026	.200
1,1-dichloroethene(DCE)	.018	.020J	.002	.007
Acetone	.006J	.035	NG	NG
Methylene Chloride	.006J	.030J	.002	NG
Trichloroethene	ND	ND	.001	.005

INORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates 7/85	12/86	ARARs State**	Federal\
Cadmium	NA	.013	(A)	.010
Chromium	.051	.072	(A)	.050
Copper	NA	.029	1.0	1.3 \\\
Iron	NA	142	.30	.30 \\
Lead	.132	.042	.050	.050
Manganese	NA	.234	.050	.050 \\
Nickel	NA	.043	NG	NG
Silver	NA	ND	.050	.050
Zinc	NA	.070	5.0	5.0 \\

NOTE: In July 1985, the ground water samples were analyzed for lead, chromium, EPA Priority Pollutant volatile organic compounds, pesticides and PCBs. No PCBs or pesticides were detected in the ground water samples.

TABLE 1
(Page 4 of 5)

C. GROUND WATER (Sampled from off-site residential wells)

ORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates 7/85	12/86	ARARs State*	Federal\
1,1,1-trichloroethane(TCA)	.002J	ND	.026	.200
1,1-dichloroethene(DCE)	ND	ND	.002	.007
Acetone	NA	ND	NG	NG
Methylene Chloride	.004J	---	.002	NG
Trichloroethene	ND	.001J	.001	.005

INORGANIC CONTAMINANTS (all units are in ppm)	Sampling Dates 7/85	12/86	ARARs State**	Federal\
Cadmium	NA	ND	(A)	.010
Chromium	.350	.012	(A)	.050
Copper	NA	.279	1.0	1.3 \\\
Iron	NA	.423	.30	.30 \\
Lead	.005	.031	.050	.050
Manganese	NA	.043	.050	.050 \\
Nickel	NA	ND	NG	NG
Silver	NA	.078	.050	.050
Zinc	NA	.192	5.0	5.0 \\

NOTE: In July 1985, the ground water samples were analyzed for lead, chromium, EPA Priority Pollutant volatile organic compounds, pesticides and PCBs. No PCBs or pesticides were detected in the ground water samples.

TABLE 1
(Page 5 of 5)

Data Reporting Qualifiers

*	State of New Jersey proposed Maximum Contaminant Levels (MCLs) for "A-280" contaminants (N.J.A.C. 7:10-16)
**	New Jersey Ground Water Quality Criteria for the Central Pine Barrens (N.J.A.C. 7:9-6)
\	All values reported as Federal MCLs unless stated otherwise
\\	Secondary MCLs
\\\	MCL Goals
A	Ground Water Quality Criteria set at natural background
J	Estimated value
NA	Sample was Not Analyzed for this compound.
NG	A value is Not Given for this compound.
[illegible]	Sample was analyzed for this compound but was Not Detected in that sample.
<	Value given is less than the method detection limit but is above zero.
---	Data invalidated by QA/QC

Soil contaminants may also migrate into surface water by overland flow or by percolation into the underlying aquifer with eventual surface discharge. There is no evidence of overland flow as a contaminant pathway based on numerous inspections of the site. Based on ground water flow data compiled during the RI, the Cohansey aquifer flows to the southeast and possibly discharges into a down-gradient surface water body. The nearest downgradient surface water body is a cranberry bog located 0.7 miles south-southeast of the site dumping area. Based on the estimated rate of travel of the contaminant plume and the distance to this cranberry bog, there is no indication that migration of the contaminants through the aquifer system will impact this relatively distant surface water body in the near future. It is more likely that the local residential wells would be impacted prior to ground water discharge to the cranberry bogs.

The most significant exposure scenario is the ingestion of contaminated ground water by residential well users. The analyses performed to date of various down-gradient residential wells give evidence that contaminants traveling by the ground water pathway have not yet impacted any of these residents, located within a one-mile radius of the site, who utilize ground water for potable purposes. Nonetheless, a ground water monitoring program will be implemented for those down-gradient residential wells with the highest potential for being impacted by a contaminant plume traveling through the ground water pathway.

The migration of contaminants into the air from the ground water is not considered significant based on the RI findings. A possible inhalation pathway could exist in a situation where contaminated water is being used in a household shower or outdoor sprinkler system. This usage could cause some organic contaminants to volatilize out of the water allowing them to be inhaled. Since there is no evidence that contamination has reached the various residential wells sampled, this pathway is not considered complete at this time.

ENFORCEMENT ACTIVITIES

Four potentially responsible parties (PRPs) were identified for the Tabernacle site. All of the PRPs were notified in writing and given the opportunity to perform the RI/FS under EPA supervision. However, none of them elected to undertake remediation of the site. After the RI/FS was completed, the 30-day public comment period was provided, ending on April 21, 1988. Special notice letters will be sent out to the previously identified PRPs updating the status of the site and providing them with the opportunity to perform the remedial design and remedial construction phases of the project.

COMMUNITY RELATIONS ACTIVITIES

A Community Relations Plan for the Tabernacle site was finalized on October 18, 1985. This document lists contacts and interested parties throughout government and the local community. It also establishes communication pathways to ensure timely dissemination of pertinent information.

EPA finalized the work plan for the RI/FS in June 1986 and placed this document in the three local information repositories established for the site. A public meeting was held on August 25, 1986 to discuss the work plan and to inform the public about the Superfund program and the history and status of the site.

The need to conduct some residential well surveys and potable water sampling gave EPA an opportunity to contact many local residents to inform them of the ongoing RI/FS activities and the current site status. Upon completion of these activities, the RI/FS reports were also sent to the three information repositories to initiate the public comment period, which extended from February 24, 1988 to April 21, 1988. A public meeting was held on March 10, 1988 to present the results of the RI/FS and the preferred remedial alternative for the site developed by EPA.

DESCRIPTION OF REMEDIAL ALTERNATIVES

This section describes the remedial alternatives that were developed, using suitable technologies, to meet the objectives of the NCP and the Superfund Amendments and Reauthorization Act (SARA). These alternatives were developed by screening a wide range of technologies for their applicability to site-specific conditions and evaluating them for effectiveness, implementability, and cost.

The remedial alternatives presented in this document are based on the findings of the RI and focus on contamination of the ground water by 1,1,1-trichloroethane (TCA) and one of its breakdown products, 1,1-dichloroethene (DCE). Yet, some additional activities will need to be performed during the initial phases of the remedial design process and prior to implementation of the selected remedial alternative. A detailed description and justification of these additional activities is included in the discussion of the selected site remedy which follows the evaluation of the various alternatives considered.

In general, applicable or relevant and appropriate requirements (ARARs) are promulgated and legally enforceable to address a specific contaminant (such as TCA), location (such as a wetland), or action (such as air stripping). Contaminant-specific ARARs can be applied to the RI results before any remedial alternatives are developed. The federal and state ARARs which have been established for ground water are presented in Table 1, Parts B and C. If available technologies exist that can meet or exceed the most stringent ARARs, these standards are used to develop the cleanup objectives (criteria) for the site remedy. The proposed Maximum Contaminant Levels (MCLs) established by NJDEP, which are more stringent than the federal standards for TCA and DCE, are as follows: 26 parts per billion (ppb) for TCA and 2 ppb for DCE. It is expected that the more stringent levels proposed by NJDEP will be promulgated prior to the implementation of the remedial action. Therefore, the remedial action will comply with the NJDEP levels in anticipation that these standards become state ARARs.

As previously indicated, the Tabernacle site is located in the Central Pine Barrens. The goal for ground water quality in this area is set as natural background conditions. In pursuit of this goal, best available technology will be employed for the treatment of the extracted contaminant plume. The treated ground water will be reinjected at 26 ppb or less of 1,1,1-trichlorethane.

A comprehensive list of candidate remedial technologies was compiled to characterize each technology and determine its applicability to the site. The original list is included as Table 2 which also provides a brief rationale as to why some of the technologies were excluded from further consideration.

The technologies that were retained after the preliminary screening process were assembled in various combinations to form nine general alternatives for remedial action. These technologies fall within five general response actions:

- no remedial action, ground water extraction/reinjection through pumping, on-site treatment, off-site treatment, and provisions for an alternate water supply.

The components of each of the nine remedial alternatives developed for the Tabernacle site are described below and the present-worth cost estimates for these alternatives are listed in Table 3.

TABLE 2
(Page 1 of 2)

SCREENING OF REMEDIAL TECHNOLOGIES
Tabernacle Drum Dump Site

Technology	Limitations/ Disadvantages	Technology Retained
I. GROUND WATER CONTROL MEASURES		
Capping	Contamination no longer contained to the site surface. Horizontal migration in ground water unaffected.	no
Containment Barriers	Difficult to install due to aquifer depth which exceeds 60 feet.	no
Ground Water Pumping	Discharge and recharge must be properly managed to avoid surface water impacts. Technology should be incorporated along with a treatment technology.	yes
[illegible]ped Diversion	Not suitable for deep aquifers. Adverse impact on surface waters and possible lowering of the water table. Requires disposal of large quantities of water.	no
Subsurface Collection Drains	Not suitable for depth of aquifer encountered on the site.	no
II. ON-SITE TREATMENT		
Physical Treatment		
Air Stripping	Most effective for treating volatile organic contaminants. May require air emission controls. Pilot studies required.	yes
Carbon Adsorption	Contaminated carbon generated would require regeneration or disposal. Pilot studies required.	yes
Reverse Osmosis	Energy-intensive. Requires extensive pre-treatment and disposal or post-treatment of the concentrated waste stream. Inappropriate for large volume of dilute solution.	no

TABLE 2
(Page 2 of 2)

Technology	Limitations/ Disadvantages	Technology Retained
Spray Lagoon	Questionable performance due to susceptibility to changing environmental conditions. Potentially uncontrollable air emissions.	yes
Chemical Treatment		
Chemical Oxidation	Process is not selective and oxidizing agents may be consumed by organic compounds other than the contaminants of concern.	no
Biological Treatment		
Aerobic Biodegradation	Not proven as an effective method for the contaminants of concern at low concentrations.	no
III. ALTERNATE WATER SUPPLIES		
Provide Bottled Drinking Water	Only a temporary solution. Existing residential wells would not be capped or abandoned and may be potentially contaminated in the future.	no
Install Deeper Private Wells	Confining layer is intermittent and cross contamination may occur during new well installation.	yes
Develop Central Water Supply	Extensive and lengthy construction requirements. Some residents may refuse to connect to a municipal supply or may object to billing charges.	yes
IV. OTHER		
Relocation of Impacted Families	Duration of relocation may be indefinite. Potential detrimental sociological and cultural impacts on the local families.	no
In-Situ Biological Treatment (Anearobic Bioreclamation)	Effectiveness limited by such variables as site pH range, microbial competition, and non-uniform nutrient addition which makes this technology unreliable. Products may be more toxic than the original contaminants.	no

TABLE 3

COMPARISON OF PRESENT WORTH FOR REMEDIAL ALTERNATIVES

Alternative	Alternative Description	Capital Cost ($)	O & M Present Worth	Total Project Cost
1	No Action	31,700	166,600	198,300
2	Pump/Treat Using GAC	916,000	159,500	1,075,500
3	Pump/Treat Using Air Stripping	772,600	215,000	987,600
4	Pump/Treat At Off-Site Facility	212,300	9,218,600	9,430,900
5	Existing Public Water Supply	1,941,000	776,600	2,717,700
6	Community Water Supply	439,300	291,600	730,900
7	Install New Residential Wells	378,900	287,500	666,400
8	GAC Treatment At Residential Wells	58,300	473,900	532,200
9	Pump/Treat Using Spray Lagoon	273,600	118,900	392,500

ALTERNATIVE 1: NO REMEDIAL ACTION

This alternative would not directly address nor reduce site contamination and its associated risks. Under current site conditions, contaminant movement and dispersion should continue to follow the path of natural ground water-flow, which may significantly impact water quality southeast of the site. Therefore, a comprehensive ground water sampling program would be implemented to track the movement of the contaminant plume in the Cohansey aquifer. This program would consist of the installation of two additional shallow monitoring wells located down-gradient of the site and up-gradient of those residential wells which are in the path of contaminant migration. The monitoring wells would be sampled and analyzed for priority pollutants on a quarterly basis for a period of fifteen (15) years.

All of the remaining alternatives also include this ground water monitoring program, with varying lengths of duration, to provide down-gradient residential well users with an adequate warning system of an approaching contaminant plume. Accordingly, the following descriptions will focus on those elements of the remedial alternatives that directly address or remediate ground water contamination.

ALTERNATIVE 2: PUMP/TREAT USING GRANULAR ACTIVATED CARBON

This alternative would involve extracting the contaminated ground water plume from the underlying aquifer through recovery wells and pumping it to a treatment/recharge location up-gradient of the extraction points. The contaminated water would be treated with a granular activated carbon (GAC) filtration bed to remove organic compounds from the liquid phase. When the contaminant concentration of the treated water meets or exceeds the required cleanup criteria, the water would be reinjected into the ground through recharge wells. Two new monitoring wells would be installed at points of interception between the site and down-gradient residential homes to verify that the removal of contaminants has been accomplished. This ground water monitoring program would continue for a period of five years.

A remedial action consisting of GAC treatment may also include mobilization, operation and maintenance, carbon regeneration, proper disposal of spent materials, and demobilization. In addition, the GAC treatment unit may be preceeded by granular media filtration to remove suspended solids, if necessary. A pilot test would be conducted to determine the need for pre-treatment and the frequency of change of the activated carbon.

ALTERNATIVE 3: PUMP/TREAT USING AIR STRIPPING

This alternative also involves extraction of the contaminated ground water plume through recovery wells. At the treatment/ recharge locations, the water would be treated through an air stripping tower to remove volatile organic compounds (VOCs). This technology involves injecting heated air into contaminated water and extracting the exhaust gases (off-gases) by pumping. The vapor phase concentrations of the volatile constituents would be monitored and, if necessary, the off-gases would be treated by GAC adsorption units before they are released to the atmosphere to ensure that the maximum allowable air emission standards are not exceeded. After the treated water reaches the cleanup criteria, it would be reinjected into the ground through several up-gradient recharge wells. This alternative includes the implementation of a ground water monitoring program for a period of five years.

A pilot test would be conducted to optimize the removal efficiency of air stripping which is a function of the ratio of air to water in the treatment tower unit.

ALTERNATIVE 4: PUMP/TREAT AT OFF-SITE FACILITY

Under this alternative, the contaminated ground water plume would be extracted from the underlying aquifer through several recovery wells equipped with submersible pumps and fed into a central holding tank. The contaminated ground water would be transported by tanker trucks to a RCRA-approved wastewater treatment plant. For cost estimating purposes, it is assumed that such a facility is located within twenty (20) miles of the site. Further classification of the contamination in the ground water would be required by the treatment facility to determine the volume of water which would be accepted, which is expected to be within the plant's capacity. In addition, a ground water monitoring program would be implemented for a period of five years.

ALTERNATIVE 5: EXISTING PUBLIC WATER SUPPLY

This alternative would involve supplying a minimum of twenty (20) potentially affected residents (within a one-mile radius of the site) with an alternate source of water from the nearest existing (municipal) potable water supply company. This alternative would provide a permanent and serviceable system requiring approximately seven (7) miles of piping running west along Route 70 and then south along Route 206 to Carranza Road. A booster pumping/disinfection station with a chlorine injection system, an adequate routing distribution design, and some house connections and appliances would also be required.

This alternative could take a period of approximately one year to implement due to construction and installation efforts. A ground water monitoring program would be implemented for a period of fifteen (15) years.

ALTERNATIVE 6: NEW COMMUNITY WATER SUPPLY

This alternative also provides a minimum of twenty (20) potentially affected residents with an alternate source of potable water. A new community well would be installed at a distant location up-gradient from the area of contamination, approximately 1,000 feet northwest of the site. The new community well system would provide a permanent supply of potable water from the Cohansey aquifer which can easily yield sufficient quantities of water.

This alternative would require 1.5 miles of water main piping along Bozarthtown and Carranza Roads, a pump station, disinfection and distribution systems, house connections, backup controls, and overall security and maintenance of the community well. The installation of the new well and some house connections could require up to two years to complete. A ground water monitoring program would be implemented for a period of fifteen (15) years.

ALTERNATIVE 7: INSTALLATION OF NEW RESIDENTIAL WELLS

This alternative would involve abandoning the existing downgradient residential wells which tap into the Cohansey aquifer and drilling new deep wells into the underlying Kirkwood aquifer. Installation of a minimum of twenty (20) new residential wells would involve test hole drilling, appropriate drilling and grouting methods, and connecting new wells to existing residential well piping. In the Pine Barrens area, the Kirkwood aquifer is not typically used as a source of potable water, but available information concludes that it would yield a sufficient quantity of slightly acidic water. Prior to usage, the water pumped from the Kirkwood would be tested and disinfected while residents could be required to utilize conditioning units to adjust and neutralize the water pH levels.

A twenty-foot thick layer of clay typically separates the Cohansey aquifer from the underlying Kirkwood aquifer in the Pine Barrens area. The ground water monitoring program for this alternative would entail the installation and periodic samping of two well clusters. Each cluster consists of one shallow and one deep monitoring well. Monitoring of both aquifers through the shallow and deep wells would be implemented for a period of fifteen (15) years.

ALTERNATIVE 8: GAC TREATMENT AT RESIDENTIAL WELLS

This alternative would involve treating the contaminated ground water from approximately twenty (20) residential well outlets prior to consumption through a granular activated carbon (GAC) adsorption tank system to remove organic compounds. Continuous treatment would be achieved by using two interchangeable GAC tanks connected in series. Training the residents in the proper use of the treatment system and properly maintaining the GAC units (including disposal or regeneration of the contaminated carbon in accordance with the appropriate environmental regulations) would ensure the effective treatment of the individual wells.

A pilot study would be required to determine the frequency of carbon replacement so that the cleanup criteria for contaminant removal is achieved. Periodic monitoring of the GAC system and analysis of the domestic well water would be carried out in addition to implementing the fifteen (15) year ground water monitoring program.

ALTERNATIVE 9: PUMP/TREAT USING A SPRAY LAGOON

This alternative would involve extracting the contaminated ground water plume through several recovery wells, pumping it to a collection station, and routing all of the water through a single pipeline back to the site for treatment.

The contaminated water would be distributed through a spray system consisting of several nozzles dispersing the water as a mist over a recharge basin. The volatile contaminants would leave the mist to enter the gaseous phase at an expected concentration which falls within environmentally acceptable limits (allowable air emission standards). The recharge basin would be appropriately sized so that the treated ground water which collects in the basin readily infiltrates back into the ground. The recharge water would be tested periodically to ensure that it meets the cleanup criteria for this site. Ground water monitoring would be conducted throughout the implementation of this alternative and for a period of five years following the initiation of site remediation activities.

<u>Evaluation of Alternatives</u>

Pursuant to CERCLA, as amended, EPA must evaluate each alternative developed with respect to nine criteria. These criteria were developed to address the requirements of Section 121 of SARA. They include short-term effectiveness, long-term effectiveness and permanence, reduction of toxicity, mobility and volume, implementability, cost, attainment of ARARs, protectiveness, community acceptance, and state acceptance. Table 4 indicates the various levels of evaluation criteria and the interrelationships between them.

TABLE 4

The Nine Remedial Evaluation Criteria

Overall Protection	Compliance with ARARs	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume (TMV)	Short-term Effectiveness
• How alternative eliminates, reduces, or controls existing and potential risks to human health and the environment through treatment, engineering controls, and/or institutional controls	• Attainment of chemical-, location-, and action-specific requirements • Compliance with other criteria, advisories, and guidances • Grounds for invoking a waiver	• Magnitude of total residual risk in terms of untreated waste & treatment residuals • Adequacy and suitability of controls (engineering & institutional) used to manage untreated waste and treatment residuals • Reliability of controls over time, including potential for failure and potential resulting risk	• Treatment process and amount of material to be treated • Amount of hazardous materials that will be destroyed or reduced, including how principal threat is addressed through treatment • Degree of expected TMV reduction (e.g., percent of total, order of magnitude) • Degree to which treatment is irreversible • Type and quantity of residuals resulting from treatment process	• Potential impacts on community during RA implementation • Potential impacts on workers during RA and the effectiveness and reliability of protective measures • Potential environmental impacts of RA and the effectiveness and reliability of mitigative measures • Time until protection is achieved

TABLE 4 (CONT.)

The Nine Remedial Evaluation Criteria

Implementability	Cost	State Acceptance	Community Acceptance*
• Technical feasibility - Difficulties & unknowns associated with technology - Reliability of technology - Ease of undertaking additional action, if required - Reliability & effectiveness of monitoring • Administrative feasibility - Ability & time necessary to obtain required approvals/permits - Steps required to coordinate with other Agencies and associated time requirements • Availability of services and materials - Treatment, storage or disposal capacity - Existence of multiple vendors - Availability of needed equipment & specialists - Timing of technology availability	• Capital • Operation & maintenance • Present worth	• Features of the alternative the State supports • Features of the alternative about which the State has reservations • Elements of the alternative the State strongly opposes	• Features of the alternative the community supports • Features of the alternative about which the community has reservations • Elements of the alternative the community strongly opposes

This type of comprehensive analysis helps to identify those criteria that are most important in evaluating the alternatives developed. Accordingly, the discussions given below focus on the significant evaluation criteria as they pertain to the site. Any criterion judged to be sufficiently important for at least one alternative is discussed for all the other alternatives, as well, to ensure consistency and minimize subjectivity.

For the purpose of avoiding redundancy in the discussions that follow, alternatives 2, 3, 4 and 9 will be evaluated as a group since they all involve pumping and treating contaminated ground water. Similarly, alternatives 5, 6 and 7 will also be grouped for evaluation since they all involve providing an alternate source of potable water.

ALTERNATIVE 1: NO REMEDIAL ACTION

Because hazardous contaminants are known to exist in the ground water at the Tabernacle site, in concentrations associated with significant health risks, the concept of a no-action alternative is untenable. Moreover, this alternative does not comply with any applicable or relevant and appropriate requirements (ARARs) or cleanup standards which were significantly exceeded in many of the monitoring wells tested during the RI.

The existing risks associated with current site conditions will not be reduced, and stem from the potential that down-gradient residential well users within a one-mile radius of the site may ingest or inhale volatile compounds found in the contaminated ground water. Full protection from the immediate risks will not be attained by this alternative which also exhibits the highest potential for future exposure to off-site human and environmental receptors such as the down-gradient wetlands and surface water bodies located beyond the immediate site vicinity.

The toxicity, mobility, or volume of the hazardous constituents will not be reduced and a committment to long-term monitoring of the ground water quality will be required. As a consequence, if the 15 year monitoring program identifies contaminated residential well water, the no-action alternative may need to be replaced with another remedy.

Of the nine alternatives evaluated, Alternative 1 is the lowest in cost and the least effective in addressing the contamination found at the Tabernacle site. In addition, the no-action alternative would be unacceptable to both the local community and the State of New Jersey.

ALTERNATIVE 2: PUMP/TREAT USING GAC
ALTERNATIVE 3: PUMP/TREAT USING AIR STRIPPING
ALTERNATIVE 4: PUMP/TREAT AT OFF-SITE FACILITY
ALTERNATIVE 9: PUMP/TREAT USING A SPRAY LAGOON

Alternatives 2, 3, 4 and 9 comply with the site ARARs by removing and treating contaminated ground water. The existing risks associated with ingestion or inhalation of volatile contaminants by residential well users will be significantly reduced. Full protection from the immediate risks will be attained by capturing the contaminant plume before it reaches down-gradient receptors. The potential for future exposure of these human and environmental receptors is minimized since these alternatives will permanently and significantly reduce the toxicity, mobility and volume of the hazardous constituents. The magnitude of any remaining residual risks will be evaluated through a five year ground water monitoring program.

While alternatives 2 and 3 will not cause any adverse impacts on nearby down-gradient wetland areas, alternative 4 does not include local recharge which may result in some surface water drawdown. Similarly, if unfavorable climatic conditions are encountered during implementation of alternative 9, the treated water may not easily recharge back into the ground resulting in an overflow from the lagoon and possible surface water runoff.

All four of these processes utilize technologies which are capable of accomplishing the same cleanup goals for remediation of the site. Alternatives 3 and 9 take advantage of the volatile nature of the contaminants and are particularly more effective in removing the volatile organic compounds from the ground water.

Alternatives 2 and 4 are also effective but they involve necessary off-site activities as well. Implementation of alternative 4 is dependent on obtaining the necessary approvals from other agencies for transporting and disposing contaminated ground water to an off-site wastewater treatment facility. Although the ground water is treated on-site with a GAC filter, alternative 2 would still involve considerable off-site disposal or regeneration of contaminated carbon in accordance with appropriate waste management regulations.

In alternative 3, GAC filters may also be required to treat the air stripper exhaust gases but only if monitoring of the vapor phase contaminant concentration during remediation reveals levels that exceed acceptable air emission standards. It is expected that the pilot studies will accurately determine the air stripping design parameters so that GAC treatment and carbon off-site disposal will not be necessary. Therefore, alternative 3 would not require this additional operation and maintenance (O&M) step while still maintaining very high short-term and long-term effectiveness.

Implementation of alternative 9 presents a very low degree of reliability or effectiveness since it is greatly influenced by fluctuations in ambient temperatures and wind speed and direction. The short-term and long-term effectiveness of alternative 4 is not very high, since hauling such a large volume of contaminated ground water off-site could result in transportational complications. Adequate engineering and institutional control measures would be critical to the proper management of the untreated waste water.

Alternatives 2 and 3 both employ on-site treatment technologies which mandate only standard design and construction requirements and are of comparable costs. The total project cost of alternative 4 is the highest of all the alternatives considered and reflects the extensive O&M functions required to haul and dispose of the large quantity of water. Alternative 9 is low in cost but is also extremely unreliable.

The community has given a highly favorable response to alternatives 2 and 3, while alternative 4 would not be well accepted since road congestion by tanker trucks would directly impact the local residents. Community opposition to alternative 9 seems likely since residents have expressed concerns over the health risks associated with releasing contaminants from the ground water and into the air. Alternative 9 is unreliable in that the contaminant volatilization process may not be controllable under certain conditions. These same concerns raised by the local residents are not relevant to alternative 3 since the air stripping unit would volatilize the organic contaminants through a controlled process which would release off-gases at concentrations well below the state air emission standards. It is unlikely that the State of New Jersey would accept alternative 4 and 9 in light of its preference for alternative 2 or 3.

ALTERNATIVE 5: EXISTING PUBLIC WATER SUPPLY
ALTERNATIVE 6: NEW COMMUNITY WATER SUPPLY
ALTERNATIVE 7: INSTALLATION OF NEW RESIDENTIAL WELLS

Alternatives 5, 6 and 7 are not effective in remediating the ground water contamination and, therefore, do not comply with the ARARs established for the site. These alternatives simply provide an alternate supply of potable water for residential use thereby reducing the immediate risks associated with the exposure of down-gradient residents to contaminated ground water in their existing individual wells. Full protection from the immediate risks is limited to those residents receiving a clean supply of potable water but the potential for future exposure to off-site human and environmental receptors farther down-gradient is still very high. Therefore, these alternatives cannot be considered permanent solutions to the contamination at the Tabernacle site.

The amount of potable water that is required by these alternatives to supply at least twenty or so residents is relatively small. Acquiring this amount from the underlying aquifers in alternatives 6 and 7 will not cause any adverse impacts on the wetland areas near the site. The construction of extensive water main pipes in alternative 5 may have some impact on the nearby floodplains. Also, the contamination left in the untreated ground water under alternatives 5, 6 and 7 may severely impact the wetlands and floodplains located in the vicinity of the site.

The toxicity, mobility or volume of hazardous constituents in the ground water will not be reduced under any of these alternatives unless natural processes such as biodegradation, dispersion or dilution occur. The occurrence of these natural processes cannot be accurately predicted or guaranteed since they are wholly dependent on a variety of conditions necessarily existing in the ground water environment.

Alternatives 5 and 6 are easily implemented entailing only standard design and construction requirements to install very extensive water main systems. It may take up to one year and two years to implement alternatives 5 and 6, respectively, because of the extensive construction required for a pumping station and several miles of piping. Alternative 7 may be implemented in much less time and the construction needed to install a new residential well is limited to the residential property. Improper well installation into the lower Kirkwood aquifer and the potential for hydraulic connection between the contaminated upper Cohansey aquifer and the lower one, renders alternative 7 as the most unreliable since the new residential wells may provide contaminated water. Alternatives 5 and 6 are equally reliable but implementation of alternative 5 is dependent on obtaining the necessary approvals from the existing water supply company and other regulatory agencies as well.

Extensive O&M functions are required in alternatives 5 and 6 since a pump station and a chlorination system must be continuously operated to provide the affected residents with an adequate potable water supply. In alternative 7, there is an increase in operational requirements for the new residential wells because of their extended depths. There are additional costs associated with the ground water monitoring program for both the upper and lower aquifers. The overall project costs for alternatives 6 and 7 are comparable while alternative 5 ranks second highest in cost of all nine alternatives considered.

Community opposition to alternatives 5 and 6 seems likely since construction activities may last up to two years. During this time, visible equipment and off-site road construction will impact the local traffic within a two to seven mile distance.

In addition, the community may react unfavorably to billing charges incurred for the use of municipal water in alternative 5. The possibility exists that some residents may refuse to connect to a community water supply in alternative 6, or may object to construction activities on their property to install new residential wells in alternative 7. Some of the residents have demonstrated a favorable response to the implementation of alternative 7, but only in combination with alternatives 2 or 3. It is unlikely that the State would favor alternatives 5, 6 or 7 since the contamination at the site would not be completely addressed.

ALTERNATIVE 8: GAC TREATMENT AT RESIDENTIAL WELLS

Alternative 8 does not comply with the site ARARs since it does not remediate ground water contamination in the underlying aquifer. This action simply provides for the treatment of local individual supplies of potable water to meet the cleanup standards, thereby reducing the immediate risks associated with the exposure of downgradient residents to contaminated water in their existing wells. Full protection from the immediate risks is limited to those residents receiving GAC treatment on an individual basis, but the potential for future exposure to off-site human and environmental receptors is still considerably high. Similar to alternatives 5, 6 and 7, this alternative cannot be considered a permanent site remedy.

No pumping is required by this alternative so that the water table of the nearby wetlands will not be affected in the least. Yet, the untreated and contaminated ground water may still have a detrimental impact on the wetlands and floodplains located near the site.

Similar to alternatives 5, 6 and 7, this alternative will not reduce the toxicity, mobility, or volume of hazardous constituents in the ground water unless certain natural processes such as biodegradation, dispersion or dilution occur. These processes are not predictable and the rate at which they occur cannot be fully ascertained in this environment.

Alternative 8 utilizes a very effective treatment technology that is easily implemented and capable of successfully removing the contaminants from the ground water to meet the cleanup standards for specific residential water supplies. Although the individual water supplies are treated on-site, considerable off-site disposal or regeneration of the contaminated carbon is required in accordance with appropriate waste management regulations. The degree of long-term reliability presented by this alternative will be determined by the necessary and proper maintenance of the GAC system.

This alternative necessitates only standard design and construction requirements to connect the GAC adsorption tank system to the residential well outlets and may be completed in a short period of time. The total project cost for alternative 8 is comparable to that of alternatives 7 and 9, and consists mainly of the O&M cost for servicing the GAC treatment system.

The construction activities to be carried out on the residential properties are not extensive or lengthy and, therefore, should not meet with community opposition based on this factor. Yet, there has been some indication that local residents would react unfavorably to any alternative that does not treat the contaminated ground water plume in the underlying aquifer, which is true of alternatives 1, 5, 6, 7 and 8. The potential exists for a household member to tamper with the system which would render alternative 8 unreliable. Therefore, residents may refuse to connect to the GAC treatment units since such a situation could arise in their homes. Again, it is unlikely that alternative 8 would be acceptable to the State as a final solution to the contamination present at the Tabernacle site.

SELECTED REMEDY

After careful review and evaluation of the alternatives presented in the feasibility study to achieve the best balance of all evaluation criteria, EPA presented alternative 3 to the public as the preferred remedy for the Tabernacle site. The input received during the public comment period, consisting primarily of questions and statements transmitted at the public meeting held on March 10, 1988, is presented in the attached Responsiveness Summary. Public comments received encompassed a wide range of issues but did not necessitate any major changes in the remedial approach taken at the site. Accordingly, the preferred alternative was selected by EPA as the remedial solution for the site. Some additional activities will be performed during the initial phases of the remedial design process and prior to implementation of the selected remedial alternative. These activities are described and justified as follows:

- Exact characterization and delineation of the vertical and horizontal extent of the contaminant plume has not been fully determined based on the data collected from the RI. Therefore, additional monitoring wells (including deep and shallow depth wells) will be installed and sampled to more accurately define and characterize the contaminant plume. These monitoring wells will be located down-gradient of the site and up-gradient of the residential wells, to intercept the plume well before it reaches potential down-gradient receptors.

- A treatability study will be conducted to evaluate the effectiveness of ground water treatment through air stripping. Carbon adsorption will also be evaluated, if necessary to remove contaminants which may not be effectively treated by air stripping, or to meet best available technology requirements associated with ground water reinjection. As discussed earlier, carbon adsorption is very effective in treating the major contaminants already identified in the ground water.

- A ground water monitoring program for down-gradient and nearby residential wells will be developed and implemented until the contaminant plume has been delineated precisely. Should contamination be detected, appropriate measures will be taken to mitigate the situation and provide potable water supplies to the affected residents.

- Additional discrete soil sampling will be conducted at the former drum dumping and storage area. The analytical results will be used to support existing data from the RI which shows only trace levels of inorganic (metal) contaminants in the surface soils. The extent of contamination and the health hazards associated with exposure of the local community to contamination by dermal contact with and incidental ingestion of the soils will be reevaluated if high levels of soil contaminants are observed. Should this confirmatory sampling event reveal significantly higher concentrations of hazardous substances, remediation measures will be carried out for site soils as a separate operable unit and may involve further soil excavation.

The costs associated with the selected alternative are itemized in Table 5. The major components of this action are as follows:

- Extracting contaminated ground water through pumping followed by on-site treatment through air stripping and reinjection of the treated effluent into the ground. Additional pre-treatment and post-treatment units may be necessary to meet ground water reinjection requirements, or to remove any other contaminants detected in the ground water during final delineation of the plume. Any wastes generated by the additional treatment units will be treated to meet applicable disposal requirements. The required overall treatment process will continue until federal and state cleanup standards are attained to the maximum extent which is technically practicable.

- Conducting an analysis of the contaminant concentration levels found in the exhaust gases emitted by the air stripping unit. This analysis will determine whether additional post-treatment units are required to meet national and state ambient air quality standards. If additional treatment units are necessary, the exhaust gases will be treated to meet federal air emission standards and the requirements of the New Jersey Air Pollution Control Act.

- Implementing a ground water monitoring program for a period of five years after site cleanup goals have been reached.

PROTECTIVENESS

The selected site remedy protects human health and the environment by dealing effectively with the principal threats posed by the Tabernacle site. These principal threats involve the ingestion or inhalation of volatile contaminants found in the ground water. The selected alternative addresses these contaminant pathways by capturing and treating the contaminant plume before it reaches any potential receptors. The primary contaminants of concern identified in the RI report are 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE). The statutory preference for treatment is satisfied by the selected remedy which employs on-site treatment of the ground water through air stripping to effectively reduce the toxicity, mobility, or volume of these contaminants.

Of the alternatives which most effectively address the principal threats posed by the contamination at the site, the selected remedy affords the highest level of overall effectiveness proportional to its cost. The selected remedy is cost-effective and represents a reasonable value for the money.

The selected remedy utilizes alternative treatment technologies to the maximum extent practicable by providing the best balance among the nine evaluation criteria of all the alternatives examined.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Action-specific

Under the Clean Air Act (CAA), the National Ambient Air Quality Standards (as contained in 40 CFR }} 50.6, 50.7 and 50.12) are considered applicable federal requirements for limiting the concentration of particulate matter which may be emitted from the air stripping unit in the selected remedy. Applicable state requirements include the Ambient Air Quality Standards (NJAC 7:27-13). The emission standards provided by NJAC 7:27-6 (Control and Prohibition of Particles from Manufacturing) and the substantive requirements for the operation of air pollution control equipment under NJAC 7:27-8 (Permits and Certificates) are considered to be relevant and appropriate requirements.

TABLE 5

COST SUMMARY FOR REMEDIAL ALTERNATIVE 3

PUMP AND TREAT USING AIR STRIPPING

1. Site Clearing and Site Restoration	$ 3,600
2. Installation of Recovery/Recharge Wells	$ 88,300
3. On-Site Air Stripping	$ 396,300
4. Mobilization/Demobilization	$ 107,800
5. Installation of Monitoring Wells	$ 31,700
6. Engineering and Contingencies	$ 144,900
TOTAL CAPITAL COST:	$ 772,600
O&M PRESENT WORTH:	$ 215,000
TOTAL PROJECT COST:	$ 987,600

Chemical-specific

As outlined in Table 1, Parts B and C, the federal MCLs under the Safe Drinking Water Act (SDWA) are promulgated applicable requirements which limit the concentration of contaminants in the treated ground water which is to be recharged on-site through reinjection wells. The more stringent New Jersey proposed MCLs are expected to be promulgated prior to the implementation of the remedial action. As promulgated applicable state requirements, these standards would limit the concentrations in the treated effluent at the point of reinjection to levels of 26 ppb for TCA and 2 ppb for DCE, the major contaminants in the ground water.

Location-specific

The Batsto River is located approximately 4.2 kilometers from the site and is on a list of rivers eligible to be designated as wild and scenic, under the National Wild and Scenic Rivers Act. It is expected that the selected remedy will not have an impact on the Batsto River based on its distance from the site.

In compliance with the Endangered Species Act, an informal consultation with the U.S. Fish and Wildlife Service will be carried out to evaluate the potential for encountering federal endangered or threatened species in the vicinity of the Tabernacle site. It is expected that the selected remedy will not have any detrimental impact on these species because of their transient nature in this area.

Regarding other location-specific ARARs, it appears that the selected remedy may have an impact on the wetlands and floodplains located in the vicinity of the site. Additional information on the wetlands and floodplains will be collected during and/or prior to remedial design to evaluate this potential. If this additional information indicates that the selected remedy may, in fact, have an impact on wetlands and floodplains, a combined wetlands and floodplains assessment will then be conducted to ensure compliance with Executive Orders 11988 and 11990 before the remedial action is implemented.

RESPONSIVENESS SUMMARY

TABERNACLE DRUM DUMP SITE

TABERNACLE, NEW JERSEY

Work Assignment No. 97-2LA4.8
Document Control Number: 197-CR1-RT-GCMD-1

CDM
environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.
40 Rector Street
New York, New York 10006
212 693-0370

June 9, 1988

Mr. Shaheer Alvi
Regional Project Officer
U.S. Environmental Protection Agency
26 Federal Plaza
New York, New York 10278

Ms. Lillian Johnson
Regional Superfund Community Relations Coordinator
U.S. Environmental Protection Agency
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U.S. Environmental Protection Agency
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New York, New York 10278

Project: REM II Contract: 68-01-6939
Tabernacle Drum Dump Site
Work Assignment No.: 97-2LA4
Document No.: 197-CR1-RT-GCMD-1

Subject: Final Responsiveness Summary
for the Tabernacle Drum Dump Site

Dear Mr. Alvi, Ms. Johnson, and Ms. Frigerio:

Camp Dresser & McKee Inc. is pleased to submit this Final Responsiveness Summary for the Tabernacle Drum Dump site in Tabernacle, New Jersey.

If you have any questions or comments, please contact me or Carl Zoephel, the REM II Community Relations Specialist for this site.

Very truly yours,

CAMP DRESSER & McKEE INC.

Peter W. Tunnicliffe, P.E.
REM II Region II Manager

xc: Document Control
Tom Stevenson
Carl Zoephel

(CD1/7)

399 Thornall Street, Sixth Floor
Edison, New Jersey
08837-0001

201/906-2400

ICF TECHNOLOGY INCORPORATED

MEMORANDUM

To: Tom Stevenson, REM II Site Manager

From: Elizabeth S. Marcotte, REM II Community Relations Manager

Date: May 20, 1988

Doc No.: 197-CR1-RT-GCMD-1

Project: REM II Contract No. 68-01-6939

W.A. No.: 97-2IA4.8

Subject: Responsiveness Summary for the Tabernacle Drum Dump Site

Action: Transmit to EPA

The attached Responsiveness Summary for the Tabernacle Drum Dump site in Tabernacle, Burlington County, New Jersey was prepared at the request of Lillian Johnson, EPA Regional Superfund Community Relations Coordinator.

If you have any questions about this Responsiveness Summary, please do not hesitate to contact me or Carl Zoephel at (201) 906-2400.

Elizabeth S Marcotte — Date: 5/20/88

Elizabeth S. Marcotte
REM II Community Relations Manager

cc: Peter Tunnicliffe, REM II Region II Manager
Lisa Lowe, REM II Technical Specialist
Carl Zoephel, REM II Community Relations Specialist
Bob Pierce, REM II Community Relations Specialist
Patrick Schaffner, CDM FPC (3)
File

PERFORMANCE OF REMEDIAL RESPONSE ACTIVITIES AT UNCONTROLLED HAZARDOUS WASTE SITES (REM II)

U.S. EPA CONTRACT NO.: 68-01-6939

RESPONSIVENESS SUMMARY FOR THE TABERNACLE DRUM DUMP SITE TABERNACLE, NEW JERSEY

REM II DOCUMENT NO.: 197-CR1-RT-GCMD-1

Prepared by: Carl Zoephel
Carl Zoephel
REM II Community Relations Specialist
Date: 5/20/88

Approved by: Elizabeth S. Marcotte
Elizabeth S. Marcotte
REM II Community Relations Manager
Date: 5/20/88

Approved by: Tom Stevenson (S.E.L.)
Tom Stevenson
REM II Site Manager
Date: 6-9-88

Approved by: Peter W. Tunnicliffe
Peter W. Tunnicliffe
REM II Region II Manager
Date: 6/9/88

TABERNACLE DRUM DUMP SITE
BURLINGTON COUNTY, NEW JERSEY

RESPONSIVENESS SUMMARY

The U.S. Environmental Protection Agency (EPA) held a public comment period from February 25, 1988 through April 21, 1988 for interested parties to comment on EPA's draft Feasibility Study (FS) and Proposed Remedial Action Plan (PRAP) for the Tabernacle Drum Dump (Tabernacle) site.

EPA also held a public meeting on March 10, 1988 at the Tabernacle Township Municipal Building to describe the remedial alternatives and present EPA's preferred remedial alternative for the Tabernacle site.

A responsiveness summary is required under the regulations of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Superfund Amendments and Reauthorization Act (SARA) for the purpose of providing EPA and the public with a summary of citizens' comments and concerns about the site, as raised during the public comment period, and EPA's responses to those concerns. All of the comments summarized in this document will be factored into EPA's final decision of the remedial alternative for cleanup of the Tabernacle site.

This community relations responsiveness summary is divided into the following sections:

I. Responsiveness Summary Overview. This section briefly outlines the proposed remedial alternatives for the Tabernacle site.

II. Background on Community Involvement Concerns. This section provides a brief history of community interest and concerns regarding the Tabernacle site.

III. Summary of Major Questions and Comments Received During the Public Comment Period and EPA Responses to These Comments. This section summarizes both oral and written comments submitted to EPA at the public meeting and the public comment period, and provides EPA's responses to these comments.

IV. Remaining Concerns. This section discusses community concerns that EPA should be aware of as they prepare to undertake the remedial design and remedial action at the Tabernacle site.

I. RESPONSIVENESS SUMMARY OVERVIEW

The Tabernacle Drum Dump site is a wooded, one-acre parcel of undeveloped land located off Carranza Road in Tabernacle Township. The site is located in the northern region of the New Jersey Pine Barrens. The Tabernacle site is bounded on the north by farmland and is otherwise surrounded by woodlands. Approximately 75 to 100 residents live within a one mile radius of the site. These residents rely on domestic wells for their water supply.

Between 1977 and 1984, approximately 200 containers, including 55-gallon drums, 5-gallon paint cans, and 20-gallon containers were stored at the site.

It is alleged that the containers were disposed of at the site by Atlantic Disposal Services, Inc. (ADS) in 1977. At the time the containers were disposed of at the site, the property was lived on by an ADS employee who is the son-in-law of the property's owners.

By 1982, drum deterioration had occurred and several drums were found empty. The drums containing chemicals were sampled and analyzed under the direction of the New Jersey Department of Environmental Protection (NJDEP). Laboratory results showed the presence of barium, chromium, lead, silver, nickel, toluene, benzene, ethylbenzene, and carbon tetrachloride.

In September 1983, the Tabernacle Drum Dump site was proposed for inclusion on the National Priorities List (NPL) — a listing of the nation's priority hazardous waste sites, thus making it eligible for federal Superfund monies. The final approval for inclusion on the NPL was given in September 1984. Two factors leading to placement of the site on the NPL included; its location within a sensitive environment (the Pine Barrens), and its setting over sandy soils which could allow contamination to seep down into the ground water.

In 1984, the drums and visibly-contaminated soils were removed from the site under EPA orders. Sampling conducted by ADS's contractor in April 1984 revealed that TCA, benzene, and ethylbenzene were the three compounds present in the highest concentrations. In 1985, EPA authorized an initial investigation to evaluate the nature and extent of the contamination at the site, and installed three ground water monitoring wells. The results of this initial investigation indicated that contamination was present in soil samples as well as in the ground water, and that a more in-depth investigation of site conditions was warranted. EPA, therefore, determined that a Remedial Investigation/Feasibility Study (RI/FS) was necessary to fully characterize contamination at the site and to develop alternatives for remediating the site.

The draft RI/FS reports have now been completed for the Tabernacle site. The RI determined that inorganic and volatile organic compounds are present in the soils and ground water at the Tabernacle site. However, since only trace amounts of contaminants were detected in the soils, the alternatives developed in the draft FS focus on the ground water contamination. This responsiveness summary addresses public comments on the draft FS. The alternatives evaluated for remediation of the Tabernacle site include:

Alternative 1: No Remedial Action

The no-remedial-action alternative would not directly address nor reduce site contamination and its associated risks. The site would remain in its present condition and contaminants in the ground water could eventually migrate off-site. In addition, periodic sampling of the existing on-site monitoring wells would be conducted to evaluate the ground water quality. All of the following remedial alternatives include monitoring of the ground water to provide an early warning of contamination.

Alternative 2: Pump/Treat Using Activated Carbon

Alternative 2 would involve extracting the contaminated ground water plume from the underlying aquifer through recovery wells and pumping it to a treatment/recharge location up-gradient of the extraction points. The contaminated water would be treated with a granular activated carbon (GAC) filtration bed to remove organic compounds. When the contaminant concentration of the treated water meets or exceeds the required cleanup criteria, the water would be reinjected into the ground through recharge wells. New monitoring wells would be installed at points of interception between the site and down-gradient residential homes to verify that the removal of contaminants has been accomplished. A pilot study would be required for this alternative.

Alternative 3: Pump/Treat Using Air Stripping

Alternative 3 also involves extraction of the contaminated ground water plume through recovery wells. The water would be treated through an air stripping tower to remove volatile organic compounds (VOCs). This technology involves forcing heated air into contaminated water and extracting the exhaust gases (off-gases) by pumping. The vapor phase concentration of the contaminants would be monitored and, if necessary, the off-gases would be treated by a GAC filter before they are released to the atmosphere to ensure that the maximum allowable air emissions are not exceeded. After the treated water reaches the cleanup criteria, it would be reinjected into the ground through recharge wells followed by implementation of a ground water monitoring program. A pilot study would also be required for this alternative.

Alternative 4: Pump/Treat at Off-Site Facility

Alternative 4 would involve extracting the contaminated ground water plume through recovery wells. The extracted water would then be transported to an approved off-site wastewater treatment plant located within 20 miles of the site for processing. In addition, a monitoring program would be implemented to evaluate ground water quality at the site.

Alternative 5: Existing Public Water Supply

Alternative 5 would involve supplying the potentially affected residents with an alternate source of water from the nearest existing potable water supply company. This alternative would provide a permanent and serviceable system requiring approximately seven (7) miles of piping, a booster pumping station, and an adequate routing distribution design. This alternative would not address the contaminated ground water; however, a monitoring program would be implemented.

Alternative 6: New Community Water Supply

Alternative 6 would involve installing a new community well at a distant location up-gradient from the area of contamination, approximately 1,000 feet northwest of the site. The new community well system would provide a permanent supply of potable water from the Cohansey aquifer and would require a pump station and distribution system. A monitoring program would be implemented as well.

Alternative 7: Installation of New Residential Wells

Alternative 7 would involve abandoning the existing residential wells which tap into the Cohansey aquifer and drilling new deep wells into the underlying Kirkwood aquifer. In the Pine Barrens area, the Kirkwood aquifer is not typically used as a source of potable water, but available information concludes that it would yield a sufficient quantity of slightly acidic water. Prior to usage, the water pumped from the Kirkwood would be tested and disinfected while residents could be required to utilize conditioning units to adjust the water pH levels. A ground water monitoring program would be implemented for both aquifers.

Alternative 8: GAC Treatment at Residential Wells

Alternative 8 would involve treating the contaminated ground water from the residential well outlets through a granular activated carbon (GAC) adsorption tank system to remove organic compounds. Training the residents in the proper use of the treatment system and properly maintaining the GAC units would ensure effective treatment of the well water. A pilot study would be required to determine the frequency of carbon replacement so that the cleanup criteria for contaminant removal is achieved. Periodic monitoring of the GAC system and of the ground water would be carried out.

Alternative 9: Pump/Treat Using a Spray Lagoon

Alternative 9 would involve extracting the contaminated ground water plume through recovery wells, pumping to a collection station, and returning the water back to the site for treatment. The contaminated water would be distributed through a spray system consisting of several nozzles dispersing the water as a mist over a recharge basin. The volatile contaminants would leave the mist to enter the gaseous phase at an expected concentration which falls within environmentally acceptable limits. The recharge basin would be appropriately sized so that the treated ground water which collects into the basin readily infiltrates back into the ground. The recharge water would be tested periodically to ensure that it meets or exceeds the cleanup criteria for this site. Ground water monitoring would be conducted throughout the implementation of this alternative.

Selection of an Alternative

EPA's selection for remediation at the Tabernacle site will be based on the requirements of the CERCLA and SARA regulations. These regulations require that a selected site remedy be protective of human health and the environment, cost-effective, and in accordance with other statutory requirements. Current EPA policy also emphasizes permanent solutions incorporating on-site remediation of hazardous waste contamination whenever possible. Final selection of a remedial alternative will be documented in the Record of Decision (ROD) only after consideration of all comments received by EPA during the public comment period and addressed in this responsiveness summary.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

In November 1982, the Burlington County Health Department (BCHD) first notified area residents living near the Tabernacle Drum Dump site of potential ground water contamination during preliminary testing of potable well water supplies. At that time, the New Jersey Department of Environmental Protection (NJDEP) and the BCHD collected information from nearby residents who had observed waste disposal activities at the site and were concerned about contamination of their private wells.

In May 1985, EPA conducted interviews with local officials and residents to assess their concerns regarding the contamination at the Tabernacle site, and EPA's plans for cleaning up the site. The key issues and concerns identified are summarized below.

Ground water contamination. In 1985, the residents and local officials did not perceive the Tabernacle site contamination as a serious problem. They did, however, believe that there was potential for area ground water to become contaminated and subsequently jeopardize the primary water supplies in the area. Residents and local officials also thought that ground water contamination could pose a potential threat to the stability of the local economy and quality of life in Tabernacle Township.

Wasteful use of taxpayer's money by EPA. Residents expressed the belief that the amount of money obligated for the Tabernacle RI/FS seemed excessive. They thought the removal action in 1984 had taken care of site contamination, and they were not aware of the Superfund program.

Negative press. The Tabernacle Township officials were concerned that the Tabernacle RI/FS would create adverse local publicity, discouraging economic and residential development in the area.

Coordination with local officials. Tabernacle Township officials expressed concern over the lack of timely information from EPA and NJDEP. The felt that there was a need for much more coordination with EPA, NJDEP and themselves.

In August 1986, EPA held a public meeting with area residents and officials to discuss the cleanup workplan and future remedial activities for the Tabernacle site. The major issues of concern expressed by residents at this meeting are summarized below.

Test results from the initial sampling efforts. Residents requested further information about TCA contamination detected during EPA sampling. They requested additional information about potential sources of TCA, and the extent to which contamination had spread.

Time and resources devoted to the Tabernacle site. The residents wanted clarification on the amount of testing that was needed at the Tabernacle site, and how long it would take. There was also concern about the cost of additional testing, and who was financially responsible for costs incurred.

The implication of NPL status for Tabernacle residents. Residents were concerned that the word "dump" in the NPL registered name of the Tabernacle Drum Dump site reflected badly on the whole Tabernacle area.

The need for improved communication among interested parties. Residents stated that information about EPA activities at the Tabernacle site was sporadic and insufficient.

III. SUMMARY OF MAJOR QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND EPA RESPONSES TO THESE COMMENTS

Comments raised during the Tabernacle site public comment period are summarized below. The public comment period was held from February 25, 1988 to April 21, 1988 to receive comments on the draft RI/FS reports and the Proposed Remedial Action Plan. Comments received during the public comment period are summarized and organized into the following categories:

A. Results of initial and RI sampling programs;

B. Characterization of primary contaminant, TCA;

C. Ground water flow and contaminant plume characterization;

D. Potential health hazards;

E. Technical questions regarding air stripping treatment;

F. Other possible treatment alternatives; and

G. Costs and financial responsibilities.

Written comments submitted to EPA during the public comment period along with EPA's responses to these comments, are attached as Appendix A.

A. RESULTS OF INITIAL AND RI SAMPLING PROGRAMS

1. Comment: A resident asked why additional monitoring wells had to be installed for the remedial investigation since wells had already been installed for the initial site investigation.

   EPA Response: The data from the initial wells were used primarily to interpret the direction of ground water flow. Additional wells were installed during the remedial investigation in order to further characterize the direction of ground water flow in the immediate area. These wells proved to be important because they identified the areas of highest contamination.

2. Comment: Several residents inquired about the results of the RI, and whether any site related contaminants were detected in residential wells.

EPA Response: Results of the RI identified the areas of contamination and characterized the plume of ground water contamination that is moving in a southeasterly direction away from the Tabernacle site. Contaminants from the site have not reached any residential wells which have been sampled. The contaminant plume is at least 2300 feet away from the closest residential well. The remedial actions proposed by EPA will ensure that contaminants will be removed from the ground water to avoid any possibility of residential well contamination.

3. Comment: Several residents inquired about the test results from the monitoring well located upgradient from the Tabernacle site and whether the results indicated if there were other sources of contamination.

   EPA Response: There is a monitoring well located about 60 feet upgradient of the original drum storage area. A contaminant, TCA, was detected in that well at 68 parts per billion (ppb), as compared to levels of TCA detected in downgradient monitoring wells at levels of up to 920 ppb. TCA was one of the major contaminants found in the drums that were stored on site. Most of the contaminants that went into the ground water are moving downgradient, but due to a high concentration of TCA at the site, some of the TCA contamination spread out in all directions for a short distance and was detected in the upgradient well.

4. Comment: During the public meeting EPA stated that the two chemicals of concern at Tabernacle are TCA and DCE. A resident inquired why other chemicals detected in the ground water are not a concern.

   EPA Response: EPA is concerned with any chemical detected in ground water, and has thoroughly investigated all the chemicals detected near the Tabernacle site. Many chemicals occur naturally in the soils of a particular area, and consequently are found dissolved in the ground water. With the exceptions of TCA and DCE, the other chemicals detected appear to be within normal background levels, and are within acceptable limits established by the Federal Safe Drinking Water Act, and the New Jersey State standards.

5. Comment: Several residents asked if soil samples had been taken at the site, and what the samples revealed.

   EPA Response: The soil samples indicate that the initial soil removal action at the site took care of virtually all of the contaminated soil. There is one small area of soil that may still contain contaminants and will be reexamined during the initial phases of the remedial design process. If that area shows contamination at levels above the cleanup criteria established for the soils, EPA will remediate the soil contamination.

B. CHARACTERIZATION OF PRIMARY CONTAMINANT, TCA

1. Comment: Two residents asked if TCA could possibly be a naturally occurring substance in the Tabernacle area. One of the residents asked whether TCA contamination had been introduced to the ground water via man-made products.

   EPA Response: TCA is a chlorinated hydrocarbon compound that is man-made and does not occur naturally. It is widely used as a degreasing agent; for example, electronics manufacturers use it to ensure that metal parts are very clean so they can be properly soldered and bonded.

2. Comment: One citizen asked whether TCA was a volatile chemical, and if it would escape into the air after being spilled on the ground.

   EPA Response: TCA is a volatile organic compound (VOC), which means that it does volatilize into the air. However, when spilled on the ground, some of it would percolate down into the ground water before it could volatilize.

3. Comment: The citizen also asked if EPA has ascertained whether the TCA at the Tabernacle site would biodegrade over a period of time.

   EPA Response: The contaminant plume at Tabernacle is too close to private wells for biodegradation to be a viable alternative at the site. Biodegradation has limited applications as a remedial technology and would take a long time as compared to more physical or chemical types of treatment. It would also require pumping additional material into the ground water, which is not a preferred EPA policy.

4. Comment: The citizen followed up his question by asking if the TCA could be diluted in the ground water by pumping in additional water.

   EPA Response: Dilution would expand the area of contamination over time. The contamination might be less concentrated but would still exceed acceptable levels.

5. Comment: One person questioned if EPA had estimated the volume of TCA that would have been necessary to create the contaminant plume at Tabernacle.

   EPA Response: A couple hundred gallons of TCA could have created the plume of contamination at Tabernacle, however, that data is not needed in order to estimate the extent and size of the plume.

6. Comment: A resident asked if there was any known agent or chemical that could be used on TCA to neutralize it so that it would not be harmful to drinking water.

EPA Response: Although chemical bonding could theoretically be used to neutralize TCA, that type of technology could take a long time to develop and perfect and is an unproven treatment for this type of contamination. There would be a possibility of creating a worse problem by pumping new chemicals into the ground.

C. Ground water FLOW AND CONTAMINANT PLUME CHARACTERIZATION

1. Comment: One citizen asked a number of questions about studies to characterize ground water flow and velocity in the Tabernacle area. The first question concerned the amount of background information that was used for these studies.

   EPA Response: EPA used information from the State of New Jersey and from the U.S. Geological Survey (USGS) that indicated a regional ground water flow to the east. However, when dealing with a particular site in a local area, it is important to define the direction of local ground water flow. The monitoring wells installed by EPA indicate that the ground water flow in the local area is to the south or southeast.

2. Comment: The citizen also asked if EPA had tested the direction of ground water flow by injecting dye into an upgradient well and then checking the downgradient wells for the dye.

   EPA Response: EPA prefers not to inject dye into the ground unnecessarily. Ground water moves very slowly and it could take many months for an injected dye to show up in a downgradient well. Instead, EPA conducted other proven, reliable tests to determine ground water flow direction.

3. Comment: The citizen stated that EPA's initial investigation at the Tabernacle site estimated the ground water flow velocity at 33 feet per year. The later remedial investigation indicates the velocity at 113 feet per year. The citizen wanted to know which figure was accurate and whether some of the data were inaccurate.

   EPA Response: The initial report was an estimate based on the data available at the time. The remedial investigation had more monitoring wells and more data, which enabled EPA to more accurately characterize both the direction and velocity of the ground water flow.

4. Comment: Several residents asked EPA for more information about the contaminant plume in the ground water and whether the eight monitoring wells installed by EPA were adequate to characterize the plume.

   EPA Response: The projection of the plume is based on data from the eight monitoring wells, along with the known information on the ground water velocity and the knowledge that the year 1977 was the earliest possible time for contaminants to have entered the ground.

5. Comment: One resident requested information on the depth of the plume. He asked if the plume stayed near the surface, or if it floated up and down in the ground water.

EPA Response: There is not a great deal of information about the vertical distribution of the contamination. The average depth of the monitoring wells is about 30 to 35 feet, with the deepest well going down to 60 feet. The deepest well did not detect any traces of contamination, but additional information about the depth of the plume will be compiled during the initial phases of the remedial design process.

6. Comment: A citizen asked if EPA's estimate of 14 years for the contaminant plume to reach residential wells is valid, or if the time frame could vary based on the initial ground water velocity data.

EPA Response: Regardless of the time estimate, EPA will not take a chance with peoples' health. The current data supports the estimate that it would take at least 14 years for the plume to reach residential wells. This is a conservative estimate, and it would probably take many more years for the situation to occur; however, it is EPA's policy to practice prudent environmental management by remediating contamination that poses a threat to public health.

D. POTENTIAL HEALTH HAZARDS

1. Comment: A local property owner asked if there was some type of filtering system he could install on his domestic well that would eliminate the types of contaminants that are found at the Tabernacle site.

EPA Response: There is absolutely no threat to residential wells at this time. If a resident felt more comfortable by utilizing a filtration system, then he could use one of the commercially available units that are several feet long and filled with activated charcoal.

2. Comment: One resident expressed concerned that contaminants extracted from ground water by air stripping would enter the air. He stated that if the contaminants are not good in the ground water, then they probably should not be in the air.

EPA Response: During the air stripping treatment contaminants volatilize into the air from the water. However, there is also a carbon filtration technology that EPA can use that can capture the contaminants prior to release into the air. In addition, the exhaust gases from the air stripping unit would be treated to meet federal air emission standards and the requirements of the New Jersey Air Pollution Control Act.

3. Comment: A resident inquired about the potential hazards to human health that could result from consumption of contaminated ground water.

EPA Response: At this time, there is no contamination of residential or municipal wells. If, however, someone was to drink contaminated ground water from a well directly on the Tabernacle site, it could result in illness. It should be reemphasized that the most recent sampling of wells indicated no sign of contamination.

E. TECHNICAL QUESTIONS REGARDING AIR STRIPPING TREATMENT

1. Comment: A resident inquired about the physical characteristics and operation of the proposed air strippers.

EPA Response: The air stripping towers are about 20 to 30 feet high, and will not be visible at the Tabernacle site because of the tree cover. The towers are relatively quiet, and could be compared to the noise of a washing machine. Several technical personnel will staff the towers at all times.

2. Comment: One resident commented that if the air stripping technique is used, then he would want a carbon filter on the unit to capture the off-gases.

EPA Response: EPA, as part of its commitment to protect the environment will comply with all federal and state environmental laws, including the New Jersey Emission Standards. A filter will certainly be used if the off gases are above allowable limits, to prevent the release of these gases into the atmosphere.

3. Comment: One individual inquired about EPA's experience in cleaning up sites similar to the Tabernacle site.

EPA Response: There is more work like this in New Jersey than in any other state in the country. Remediation decisions have been made at over 30 sites in New Jersey. In many of these cases the ground water is the primary problem, just as it is at Tabernacle. This is the tenth or twelfth time in this region that EPA will conduct this type of action, and EPA is confident that this remediation will be successful.

F. OTHER POSSIBLE TREATMENT ALTERNATIVES

1. Comment: One resident wanted to know if it would be feasible to dig up all of the contaminants and make a lake.

EPA Response: Virtually all of the contaminated soil has been removed. Contaminants remaining at the Tabernacle site are located in the subsurface ground water, and it would not be feasible to excavate them.

2. Comment: Another resident asked what would happen to the ground water during treatment if the "Pump/Treat Using Activated Carbon" alternative was used at the site.

   EPA Response: The ground water would be pumped out of wells, and passed through a portable treatment facility containing carbon filters. The water would then be immediately recharged into the ground.

3. Comment: A resident expressed concern about the alternative that involved pumping and then treating the water at an off-site facility. He wanted to know what would happen to the water after it was trucked to the off-site facility for treatment.

   EPA Response: The treated water would be released at the treatment facility. For example, if the chosen facility was near the Delaware River, then the treated water would be piped right into the river. EPA doesn't prefer this alternative because of the logistical difficulty required to move the estimated 143 million gallons of contaminated ground water.

4. Comment: One resident requested clarification of the "GAC Treatment at Residential Wells Alternative".

   EPA Response: This alternative would involve the installation of activated charcoal filter canisters on residential wells or taps. EPA does not prefer this alternative because filters need to be cleaned or replaced on a regular schedule or they become ineffective. It is also possible for residents to disconnect the filters and potentially drink contaminated water.

5. Comment: Several residents inquired if remedial alternatives could be combined, and how much public input counted in the final selection of an alternative.

   EPA Response: It is possible to combine alternatives or parts of alternatives and in fact EPA has done so, when a combination of alternatives was the best remedial action. Public input plays a major role in the selection process and is critical in the selection of a final remedy. At another Superfund site in New Jersey, EPA recently modified the recommended alternative as a result of concerns expressed by local residents.

G. COSTS AND FINANCIAL RESPONSIBILITIES

1. Comment: Residents asked EPA about the total cost of the RI/FS.

   EPA Response: The cost of the total RI/FS is approximately about $750,000.

2. Comment: A citizen asked EPA for the price breakdown of each alternative.

EPA Response: Alternative 1 is approximately $200,000; Alternative 2 is approximately $1,100,000; Alternative 3 is $1,000,000; Alternative 4 is $9,400,000; Alternative 5 is $2,700,000; Alternative 6 is $750,000; Alternative 7 is $700,000; Alternative 8 is $500,000; and Alternative 9 is $400,000.

3. Comment: A citizen also requested information on whether the cost of the alternatives included equipment and hardware costs that would be necessary to implement the treatments, and if there were residual values attached to the hardware after the cleanup was completed.

EPA Response: The cost estimates do include all the necessary equipment and hardware. However, any residual values are not included in the cost estimates.

4. Comment: A resident asked EPA if Atlantic Disposal Services would assume financial responsibility for the investigation and remediation of the Tabernacle site.

EPA Response: One of the reasons why Congress passed the Superfund law was to give EPA a block of money that could be used to clean up hazardous waste sites without delays. EPA pursues legal channels whenever possible to seek reimbursement for the costs incurred at Superfund sites.

IV. REMAINING CONCERNS

1. Comment: Several residents asked how much longer it will take to clean up the Tabernacle site.

EPA Response: A final decision regarding a selected remedial alternative will be made following completion of the public comment period. EPA will then hire a contractor to design the remedial alternative. This will take about 8 to 10 months. Construction of the remedial alternative will take an additional 6 months. Once the system is in operation, it will take one to two years to completely remove the contaminants from the aquifer.

2. Comment: Two residents wanted to know how EPA would determine when the ground water was really clean. They asked how long EPA would continue to monitor wells after the cleanup, and whether EPA could install a sentry well closer to residential wells that would give adequate warning if contamination continued to spread.

EPA Response: If necessary, EPA could install a sentry well closer to residential wells. EPA will continue to monitor wells after remediation until federal and state cleanup standards are attained to the maximum extent which is technically possible. At other sites of this type the monitoring has generally been continued on an annual basis over a five year period.

3. Comment: A resident inquired if there would be any residual damage at the Tabernacle site when EPA completed the remediation.

   EPA Response: When remediation is complete, there will not be any residual damage to the site. All equipment will be removed, and, upon completion of monitoring, there will be no indication that Tabernacle was a hazardous waste site.

4. Comment: A resident asked how the public will be notified once EPA reaches a decision regarding selection of a final remedial alternative.

   EPA Response: EPA will issue a press release to be published in local newspapers that will announce the selected remedial alternative.

5. Comment: A citizen inquired about the steps EPA took to finalize the Draft Final RI/FS Report. Two other residents requested information on the location of site related documents.

   EPA Response: EPA will incorporate public comments on the Draft Final RI/FS Report into the Record of Decision (ROD) for the Tabernacle site. This is done to ensure that the Report is accurate, and that everyone has a chance to comment on potential inconsistencies. Site related documents are available for review at the listed information repositories.

APPENDIX A

LIST OF ATTACHMENTS

Attachment I - Correspondences received from local residents during the public comment period and EPA's response.

Attachment II - Correspondences received from local/county officials or agencies during the public comment period and EPA's response.

Attachment III - Comments received from PRPs during the public comment period and EPA's technical response, as prepared by the government contractor.

Attachment I

21 March 1988

53 Bozarthtown Rd.

R.D. #3

Tabernacle Twp

Vincentown NJ 08088

Re: Tabernacle Drum Dump Site

Dear Ms Fregerio:

As residents affected by the above named dump site we are expressing our preference for alternatives #3 & #7 of the remedial plan (Region 2 Mar. 88).

We anticipate you will give this input careful & deliberate consideration

Sincerely,

[illegible]

ENVIRONMENTAL PROTECTION AGENCY, REGION II
1988 MAR 25 AM 11:33
ERRD-NJ REMEDIAL ACTION BRANCH

[redacted]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK. NEW YORK 10278

Dr. and Mrs. Anthony J. Andrews
53 Bozarthtown Road, R.D. No.3
Vincentown, New Jersey 08088

Dear Dr. and Mrs. Andrews:

This is in response to your letter, dated March 21, 1988, which provided comments on the proposed remedial action plan (PRAP) for the Tabernacle Drum Dump Superfund site in Tabernacle, New Jersey.

The Environmental Protection Agency (EPA) received a number of comments during the public meeting for the Tabernacle site. The comment period extended from February 24 to April 21, 1988. After review of all submitted comments, EPA intends to proceed with a final remedial solution for the site that is protective of human health and the environment, cost-effective, and attains federal and state requirements that are applicable or relevant and appropriate.

The remedial solution corresponds to Alternative 3 in the RI/FS report. It will be discussed in detail in the Record of Decision (ROD) for the Tabernacle site. The remedial action includes the following components: installation of additional ground water monitoring wells to further delineate the extent of the contaminant plume; implementation of a ground water monitoring program for down-gradient residential wells until the contaminant plume has been more precisely delineated; additional soil sampling at the former drum dumping and storage area to support existing data indicating only trace levels of contaminants; extraction of the contaminated ground water through pumping followed by on-site treatment and reinjection of the treated effluent into the ground (to continue until federal and state cleanup standards are attained to the maximum extent practicable); and implementation of a ground water monitoring program for a period of five years after site cleanup goals have been achieved.

Your March 23 letter expressed a preference for the implementation of both Alternatives 3 and 7 as the remedial solution for the Tabernacle site.

Implementation of Alternative 7 would involve abandoning the existing down-gradient residential wells, which tap into the Cohansey aquifer, and drilling new deep wells into the underlying Kirkwood aquifer. The evaluation of Alternative 7, which was carried out in the ROD, determined that this alternative is highly unreliable since the new residential wells may provide contaminated water. This situation could result from improper well installation and the potential for hydraulic connection between the contaminated upper Cohansey aquifer and the underlying Kirkwood aquifer. In addition, the Kirkwood aquifer is not typically used as a source of potable water in the Pine Barrens area.

The remedial action described in the ROD includes a provision for ground water monitoring of the residential wells during the initial phases of the remedial design process. In addition, should contamination be detected, appropriate measures will be taken to mitigate the situation and provide potable water supplies to the affected residents. This provision will ensure a more prompt and effective response than that proposed by Alternative 7. Therefore, Alternative 7 has not been incorporated into the final remedial solution developed by EPA for the Tabernacle site.

I hope that your concerns have been adequately addressed. Your interest in the environment at the Tabernacle site is greatly appreciated.

Sincerely yours,

Original Signed By
Lorraine Frigerio
Lorraine Frigerio, Project Manager
Southern New Jersey Remedial Action Section

73 B[illegible]own Road
P.O. Box 2252
Vincentown, N.J. 08088
March 25, 1988

Ms. Lorraine Frigerio
Remedial Project Manager
U.S. Environmental Protection Agency
Room 711
26 Federal Plaza
New York, New York 10278

Dear Ms. Frigerio:

We would like to take this time to comment on the Proposed Remedial Action Plan. While we agree, that alternative 3 is an acceptable choice to extract the contaminated ground water plume, we also feel alternative 7, the installation of new residential wells, is imperative and should be part of the PRAP.

We have reached this conclusion based on the facts released at the Tabernacle Township meeting. It had been stated at the meeting that the contamination is not primarily at the original source but has moved on to attack the wells of homeowners southeast of the drum site. Being a homeowner located southeast of the drum site and obtaining our drinking supply through the Cohansey Aquifer, we feel, to insure the safety of our family, we should be allowed to have a new residential well installed.

In our research we have determined that the clay layer between the Cohansey and Kirkwood Aquifers range from four (4) feet in thickness to ten (10) feet. We feel this is not sufficient thickness to protect us and our right to quality drinking water. We would like to see, since we are in the direct path of the plume, the construction of a new residential well in the Mt, Laurel Aquifer due to this clay layer being approximately two hundred (200) feet thick.

In conclusion, we feel that as a homeowner, we can protect our family if alternatives three (3) and seven (7) are implemented. We would like to see alternative seven (7) be extended to including the ability to tap into the Mt. Laurel Aquifer esprecially for residents in the direct plan of the contaminated plum.

Thank you for allowing us to express our concerns and views.

Sincerely,

John & Andrea Esposito

John and Andrea Esposito

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

Mr. and Mrs. Esposito
73 Bozarthtown Road
P.O. Box 2252
Vincentown, New Jersey 08088

Dear Mr. and Mrs. Esposito:

This is in response to your letter, dated March 23, 1988, which provided comments on the proposed remedial action plan (PRAP) for the Tabernacle Drum Dump Superfund site in Tabernacle, New Jersey.

The Environmental Protection Agency (EPA) received a number of comments during the public meeting for the Tabernacle site. The comment period extended from February 24 to April 21, 1988. After review of all submitted comments, EPA intends to proceed with a final remedial solution for the site that is protective of human health and the environment, cost-effective, and attains federal and state requirements that are applicable or relevant and appropriate.

The remedial solution corresponds to Alternative 3 in the RI/FS report. It will be discussed in detail in the Record of Decision (ROD) for the Tabernacle site. The remedial action includes the following components: installation of additional ground water monitoring wells to further delineate the extent of the contaminant plume; implementation of a ground water monitoring program for down-gradient residential wells until the contaminant plume has been more precisely delineated; additional soil sampling at the former drum dumping and storage area to support existing data indicating only trace levels of contaminants; extraction of the contaminated ground water through pumping followed by on-site treatment and reinjection of the treated effluent into the ground (to continue until federal and state cleanup standards are attained to the maximum extent practicable); and implementation of a ground water monitoring program for a period of five years after site cleanup goals have been achieved.

Your March 23 letter expressed a concern over the fact that the contamination at the site has extended beyond the original source as a ground water plume which is moving in a south-easterly direction. As a homeowner located in this direction, you also expressed a preference for the implementation of both Alternatives 3 and 7 as the remedial solution for the Tabernacle site.

Implementation of Alternative 7, as described in the PRAP, would involve abandoning the existing down-gradient residential wells which tap into the Cohansey aquifer and drilling new deep wells into the underlying Kirkwood aquifer. The evaluation of Alternative 7, which was carried out in the ROD, determined that this alternative is highly unreliable since the new residential wells may provide contaminated water. This situation could result from improper well installation and the potential for hydraulic connection between the contaminated upper Cohansey aquifer and the underlying Kirkwood aquifer. Your March 23 letter proposes that new residential wells be installed into the Mount Laurel aquifer which underlies the Kirkwood. These new residential wells would need to extend to a depth of several hundred feet. Improper well installation, which is more likely to occur at increasing depths, could also result in cross contamination of the water supply obtained from the Mount Laurel aquifer.

The remedial action described in the ROD includes a provision for ground water monitoring of the residential wells during the initial phases of the remedial design process. In addition, should contamination be detected, appropriate measures will be taken to mitigate the situation and provide potable water supplies to the affected residents. This provision will ensure a more prompt and effective response than that proposed by Alternative 7. Therefore, Alternative 7 has not been incorporated into the final remedial solution developed by EPA for the Tabernacle site.

I hope that your concerns have been adequately addressed. Your interest in the environment at the Tabernacle site is greatly appreciated.

Sincerely yours,
Original Signed By
Lorraine Frigerio

Lorraine Frigerio, Project Manager
Southern New Jersey Remedial Action Section

ENVIRONMENTAL PROTECTION AGENCY, REGION II
1988 MAR 29 AM 10: 49
ERRD-NJ REMEDIAL ACTION BRANCH

78 Bozarthtown Road
Vincentown, NJ 08088

March 23, 1988

Lorraine Frigerio
Remedial Project Manager
U.S. EPA
Room 711
26 Federal Plaza
New York, New York 10278

Dear Ms. Frigerio:

We have reviewed the proposed remedial action plan for the Tabernacle Drum Dump and have several concerns and recommendations.

Although we believe the primary objective of this remedial action is to provide the residents with pure water we also believe in a clean environment and any plan that only treats the symptoms and does not correct the problem is totally unsatisfactory. In our opinion Alternatives 1, 5, 6 and 8 fall into this category and we recommend that they be eliminated from serious consideration.

We believe that a combination of Alternative 3 (pump and treat via air stripping) and Alternative 7 (installation of new residential wells) is the best solution. Alternative 3 would eventually eliminate the source of contamination while Alternative 7 would immediately ensure residents with a pure water supply.

One concern with Alternative 3 is the potential health implications of the gases from the volatile organic compounds. What type of health risks are associated from these gases and how will the monitoring be conducted to ensure there is no health risk to residents? The report indicates that this procedure is an effective technology for removal of pollutants. However, we are concerned that should Alternative 3 become delayed or develops complications the residents will be living in fear of potential well contamination. Thus, the recommendation for implementation of Alternative 7 in addition to Alternative 3.

In summary, regardless which alternative is selected to purify the contaminated ground water, the installation of new residential wells should be incorporated into the remedial action. Residents of this area have had to live with the threat of well contamination since this dump site was discovered and should not be expected to endure this stress any longer.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK. NEW YORK 10278

Mr. and Mrs. McCloy
78 Bozarthtown Road
Vincentown, New Jersey 08088

Dear Mr. and Mrs. McCloy:

This is in response to your letter, dated March 23, 1988, which provided comments on the proposed remedial action plan (PRAP) for the Tabernacle Drum Dump Superfund site in Tabernacle, New Jersey.

The Environmental Protection Agency (EPA) received a number of comments during the public meeting for the Tabernacle site. The comment period extended from February 24 to April 21, 1988. After review of all submitted comments, EPA intends to proceed with a final remedial solution for the site that is protective of human health and the environment, cost-effective, and attains federal and state requirements that are applicable or relevant and appropriate.

The remedial solution corresponds to Alternative 3 in the RI/FS report. It will be discussed in detail in the Record of Decision (ROD) for the Tabernacle site. The remedial action includes the following components: installation of additional ground water monitoring wells to further delineate the extent of the contaminant plume; implementation of a ground water monitoring program for down-gradient residential wells until the contaminant plume has been more precisely delineated; additional soil sampling at the former drum dumping and storage area to support existing data indicating only trace levels of contaminants; extraction of the contaminated ground water through pumping followed by on-site treatment and reinjection of the treated effluent into the ground (to continue until federal and state cleanup standards are attained to the maximum extent practicable); and implementation of a ground water monitoring program for a period of five years after site cleanup goals have been achieved.

Your March 23 letter expressed certain concerns over the potential for residential well water contamination to occur should the implementation of Alternative 3 become delayed or develop complications. Therefore, you expressed a preference for the implementation of both Alternatives 3 and 7 as the remedial solution for the Tabernacle site.

Implementation of Alternative 7 would involve abandoning the existing down-gradient residential wells which tap into the Cohansey aquifer and drilling new deep wells into the underlying Kirkwood aquifer. The evaluation of Alternative 7, which was carried out in the ROD, determined that this alternative is highly unreliable since the new residential wells may provide contaminated water. This situation could result from improper well installation and the potential for hydraulic connection between the contaminated upper Cohansey aquifer and the underlying Kirkwood aquifer. In addition, the Kirkwood aquifer is not typically used as a source of potable water in the Pine Barrens area.

The remedial action described in the ROD includes a provision for ground water monitoring of the residential wells during the initial phases of the remedial design process. In addition, should contamination be detected, appropriate measures will be taken to mitigate the situation and provide potable water supplies to the affected residents. This provision will ensure a more prompt and effective response than that proposed by Alternative 7. Therefore, Alternative 7 has not been incorporated into the final remedial solution developed by EPA for the Tabernacle site.

Another concern raised in your letter was directed at the potential health impacts associated with the exhaust gases emitted from the air stripping unit in Alternative 3. One of the activities to be performed during the remedial design process is an analysis of the contaminant concentration levels in the air stripping emissions. This analysis will determine whether additional post-treatment units are required to meet national and state ambient air quality standards. If additional treatment units are necessary, the exhaust gases will be treated to meet federal air emission standards and the requirements of the New Jersey Air Pollution Control Act.

I hope that your concerns have been adequately addressed. Your interest in the environment at the Tabernacle site is greatly appreciated.

Sincerely yours,

Original Signed By
Lorraine Frigerio
Lorraine Frigerio, Project Manager
Southern New Jersey Remedial Action Section

Attachment II

The Pinelands Commission
P.O. Box 7, New Lisbon, N. J. 08064 (609) 894-9342

March 23, 1988

Lorraine Frigerio
Remedial Project Manager
U.S. Environmental Protection Agency
Room 711
26 Federal Plaza
New York, New York 10278

Re: Tabernacle Drum Superfund Site

Dear Ms. Frigerio:

The Pinelands Commission staff has reviewed the "Draft Final Remedial Investigation/ Feasibility Study" (RI/FS) prepared for the referenced hazardous waste site. The Commission is also in receipt of the News Release dated March 2, 1988 which identifies the preferred remedial alternative.

The following comments are offered concerning the RI/FS and the identified preferred remedial alternative:

1. The standards contained in the Pinelands Comprehensive Management Plan should be included as "Applicable Relevant and Appropriate Requirements" (ARARS). The conditions at the Tabernacle Drum Site raise particular concerns with regard to the Pinelands water quality standards.

   The Pinelands Comprehensive Management Plan (CMP) was adopted by the Pinelands Commission pursuant to the National Parks and Recreation Act of 1978 and the New Jersey Pinelands Protection Act of 1979. One of the stated purposes of both the state and federal acts is the preservation and protection of the exceptional surface and ground water quality within the Pinelands area. The water quality standards of the CMP (promulgated as N.J.A.C. 7:50-6.8) require that no development be permitted which degrades surface or ground water quality or which does not meet state water quality standards, in this case GW-1.

   Therefore, while the water quality standards of the CMP do not identify specific limits for the contaminants found in the groundwater at the site, the non-degradation standard should be applied to any proposed remediation. Proposed clean-up goals should be set at natural background levels for all substances.

2. The RI/FS does not address any environmental impacts such as potential degradation of the habitat and impacts upon the biota at the down-gradient cranberry bog and surface water intc which the contaminant plume will discharge.

3. Lead and chromium levels in groundwater exceeded background levels and at least one of the identified ARARS, yet the proposed remediation is for trichloroethane (TCA) and 1,1-dichloroethene only. Clarification is needed concerning the reason for the elimination of the metals as contaminants of concern.

The news release identifies the preferred remedial alternative as the pumping, treatment and reinjection of the contaminated plume of groundwater. The news release does not identify the levels to which the contaminant concentration will be treated. Any remediation which will not reduce contaminant concentrations to background levels cannot be considered to be consistent with the standards of the CMP. If it was not technically feasible to achieve background levels, the standards of the CMP would require that appropriate contaminant limits be based upon environmental risk assessment as well as human health risk assessments.

The Pinelands Commission will object to any Record of Decision which does not address the standards of the Pinelands Comprehensive Management Plan and the concerns raised herein. If there are any questions concerning this matter, please contact Kathleen Swigon, of my staff.

Sincerely,

William F. Harrison
Assistant Director

c.c. Arnold Schiffman, N.J. D.E.P.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

May 11, 1988

Mr. William F. Harrison
Assistant Director
The Pinelands Commission
P.O. Box 7
New Lisbon, New Jersey 08064

Dear Mr. Harrison:

This is in response to your letter, dated March 23, 1988, which provided comments on the remedial investigation and feasibility study (RI/FS) and the preferred remedial alternative for the Tabernacle Drum Dump Superfund site in Tabernacle, New Jersey.

The Environmental Protection Agency (EPA) has received a number of comments during the public meeting for the Tabernacle site. The comment period extended from February 24 to April 21, 1988. After review of all submitted comments, EPA intends to proceed with a final remedial solution for the site that is protective of human health and the environment, cost-effective, and attains federal and state requirements that are applicable or relevant and appropriate.

The remedial solution corresponds to Alternative 3 in the RI/FS report. It will be discussed in detail in the Record of Decision (ROD) for the Tabernacle site. The remedial action includes the following components: installation of additional ground water monitoring wells to further delineate the extent of the contaminant plume; implementation of a ground water monitoring program for down-gradient residential wells until the contaminant plume has been more precisely delineated; additional soil sampling at the former drum dumping and storage area to support existing data indicating only trace levels of contaminants; extraction of the contaminated ground water through pumping followed by on-site treatment and reinjection of the treated effluent into the ground (to continue until federal and state cleanup standards are attained); and implementation of a ground water monitoring program for a period of five years after site cleanup goals have been reached.

I would now like to address the specific comments presented in your March 23 letter.

Your first comment suggests that the proposed cleanup goals be set at natural background levels for all substances based on the non-degradation standard of the Pinelands Comprehensive Management Plan (CMP).

EPA would like to make a number of points relative to this comment. First, our proposed cleanup action should not be considered new development which may degrade water quality in the Pinelands. Rather, the ground water in the aquifer underlying the Tabernacle site is contaminated as a result of improper hazardous waste disposal. By extracting and treating this ground water, the water quality will be significantly improved. For this reason, we do not believe that the non-degradation standard is an applicable requirement.

In addition, it is EPA's policy to only consider numerical or quantitative standards in establishing cleanup goals for Superfund sites. Since the Pinelands CMP does not identify specific concentration limits for the contaminants found in the ground water underlying the Tabernacle site, EPA has looked at other regulatory and legislative requirements in determining appropriate cleanup levels.

The remediation planned by EPA will not reduce contaminant concentrations in the ground water to background levels. For your information, cleanup to such levels is not technically feasible.

The State of New Jersey has developed numerical water quality standards for a number of chemical substances under its A-280 legislation. The State standards have been developed based on risk assessment factors. Therefore, EPA has determined that they are appropriate cleanup requirements for the Tabernacle site.

EPA agrees with your second comment that further information is needed to assess any environmental impacts in the vicinity of the site. In particular, additional sampling will be undertaken in the nearby wetlands to determine whether it has been affected by site contaminants.

With regard to your third comment, although the RI/FS focused on ground water contamination involving 1,1,1-trichloroethane (TCA) and 1,1-dichloroethene (DCE) in the development of various remedial alternatives, the selected remedial action outlined above contains provisions to address other ground water contaminants which may be detected during final delineation of, the plume. The cleanup goals for these additional contaminants will be developed consistent with the most conservative appropriate numerical standards.

The ARARs (applicable or relevant and appropriate requirements) for the Tabernacle site which are currently identified in the ROD include cleanup levels of 26 parts per billion (ppb) for TCA and 2 ppb for DCE which are the proposed Maximum Contaminant Levels established by the State of New Jersey under its A-280 legislation. These health-based levels are more stringent than federal standards for these same compounds. Although they are only proposed at this time, promulgation of the State levels is expected prior to the implementation of the remedial action. Therefore, EPA has determined that they are the appropriate ARARs for the Tabernacle site. Cleanup levels for any additional contaminants which may be detected will be established in a similar manner.

Your cooperation in providing comments on our proposed remedial action is greatly appreciated. I hope that the concerns raised by the Pinelands Commission have been fully addressed. Should you have any further questions in this matter, do not hesitate to contact me or Lorraine Frigerio, the project manager for the Tabernacle site, at (212) 264-1870.

Sincerely yours,

ORIGINAL SIGNED BY
J. S. FRISCO

John S. Frisco, Chief
New Jersey Remedial Action Branch

cc: Anthony J. Farro, NJDEP

Attachment III

COMMENTS TO DRAFT FINAL REMEDIAL INVESTIGATION AND FEASIBILITY STUDY AT THE TABERNACLE DRUM SITE

SUBMITTED BY: ATLANTIC DISPOSAL SERVICE, INC.
Church and Springdale Roads
Mt. Laurel, New Jersey 08054

Of Counsel:
RIVKIN, RADLER, DUNNE & BAYH
EAB Plaza
Uniondale, N.Y. 11556-0111
(516) 357-3000

DATED: April 21, 1988

I. INTRODUCTION

These comments, along with the annexed comments by O.H. Materials, Inc. ("OHM") (Exhibit A), are submitted on behalf of Atlantic Disposal Service, Inc. ("Atlantic") in response to the Draft Final Remedial Investigation and Feasibility Study ("RI/FS") at the Tabernacle Drum Site prepared by Camp, Dresser & McKee, Inc. ("CDM"), dated February 24, 1988. The purpose for these comments is to highlight the deficiencies in the RI/FS, deficiencies which are so significant that they evidence inconsistencies with the National Contingency Plan ("NCP"). These deficiencies also invalidate the proposed remedial alternative offered by the United States Environmental Protection Agency ("EPA") for the Tabernacle Drum Site.

II. BACKGROUND

CDM notes that the Tabernacle Drum Site is located in Tabernacle, New Jersey in a rural section in the southern part of the State. The site measures approximately 125 by 75 feet in size. The RI reports that the site was the residence of Mr. Robert Ware, a former employee of Atlantic, and his wife in the mid-1970's when permission was granted to Atlantic to store containers at the site. In 1982 the Government was alerted to the presence of these containers and efforts were begun to remove them from the site. To that effect, CDM notes that in 1984, EPA ordered Atlantic to perform a surface cleanup at the site. Atlantic subsequently hired Freehold Cartage, Inc. to perform the surface cleanup work which was completed in July 1984. The site was cleared of all containers and visible surface contaminants.

The cost of this cleanup, which was borne entirely by Atlantic, was approximately $160,000. Subsequently, CDM prepared a work plan to undertake an RI/FS at which time comments were submitted by Atlantic challenging the scope and necessity of the outlined program. This program was subsequently implemented by CDM and has resulted in the subject Draft Final RI/FS Report. Under no circumstances does Atlantic concede the accuracy or relevancy of any of the facts alleged by CDM in its RI/FS.

III. GENERAL COMMENTS

The RI/FS is fundamentally flawed in that it does not determine the extent of any contamination at the site or the threat presented by the alleged releases. After expending $750,000 to conduct this RI/FS, CDM has failed to define the site. It must be noted here that EPA stated at the work plan stage that the cost of an RI/FS that would determine the extent of the release would not exceed $375,000-$500,000 for this site. The NCP requires that an RI/FS shall be undertaken to determine the nature and extent of the threat presented by a release, including the gathering of sufficient information to determine the necessity for and proposed extent of remedial action. Hence, the RI/FS for the Tabernacle Drum Site is inconsistent with the NCP and has exceeded the cost estimates for its preparation by almost 100%.

The Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA"), 42 U.S.C. § 9607, as amended by the Superfund Amendments and Reauthorization Act ("SARA"), requires that remedial alternatives be chosen on the basis of their ability to provide a permanent solution to the hazardous condition at a site. By CDM's own admission, the extent of any contaminant plume underlying the site remains undefined. This admission alone demonstrates an inability to fashion an appropriate remedial alternative. Therefore, any alternative selected by EPA based upon the scant data developed thus far is wholly speculative and cannot be considered consistent with Section 9621(b)(1) of SARA mandating the use of permanent solutions.

Atlantic recommends that an alternative be developed that will overcome the data deficiencies that pervade the RI and still provide for protection of the public health and environment. Consequently, Atlantic suggests an alternative remediation strategy consisting of removal of contaminated groundwater for treatment through a combination of air stripping and granular activated carbon. In this manner the benefits of EPA's alternatives No. 2 and No. 3 can be incorporated into a plan that is flexible enough to account for actual conditions at the site that have not been defined to date. Moreover, the needless expenditure of additional sums to further investigate this site will be avoided by this alternative.

IV. COMMENTS ON REMEDIAL INVESTIGATION

The NCP provides that:

> An RI/FS shall, as appropriate, be undertaken by the lead agency conducting the remedial action to determine the nature and extent of the threat presented by the release and to evaluate proposed remedies. This includes sampling, monitoring, and exposure assessment, as necessary, and includes the gathering of sufficient information to determine the

> necessity for and proposed extent of remedial action.

40 C.F.R. § 300.68(d). However, the RI/FS for the Tabernacle Drum site does not meet these requirements. The definition of contamination at this site, CDM admits, remains unknown. (Remedial Investigation ("RI"), 5-40, 7-1). In fact, CDM anticipates continuing its investigations during the design phase so that it can finally determine how it will remediate the site. (RI, 7-1). This methodology is inconsistent with the NCP and blatantly inappropriate as it undertakes the design of remedial alternatives before fully evaluating conditions at the site which could affect the choice of an alternative.

A. Data Evaluation Deficiencies

There is overwhelming evidence that CDM's remedial investigation was improperly conducted. Data inaccuracy and imprecision is found throughout CDM's draft final report. Strong support for the assertion that this data is unreliable is the fact that the results of field sampling is often based on contaminated rinse and field blanks, evidence of quality assurance and quality control ("QA/QC") deficiencies. Tables 5-6 and 5-9 demonstrate QA/QC results which highlight deficiencies in sampling and decontamination procedures. This point has been conceded by CDM in its discussion of chromium levels found in well samples, where they point out that chromium was also detected in field blanks accompanying these samples. (RI, 5-22).

The analysis of metals is another example of data evaluation deficiencies. Table 1-8 indicates metals contamination in upgradient wells (Wills and Condurso), as well as downgradient wells. This indicates that a measurement of total metals does not represent contamination solely as a result of the site. As indicated in the attached comments by OHM, the analysis for dissolved metals is a better indication of groundwater conditions.

B. Failure to Accurately Define Aquifer Characteristics

Further evidence of an inadequate investigation is represented by CDM's failure to adequately define aquifer characteristics. CDM has relied upon figure 2-2 to illustrate that the aquifer thickness is 100 feet. It is obvious that this assumption is pure speculation as that figure depicts most of New Jersey, while the site, indicated in the figure by a small dot is only about one acre in area and only a portion of that (approximately 2,000 square feet) was allegedly affected by contamination.

As OHM points out, CDM had only to install a deep boring at the site in order to accurately determine this parameter. CDM's assumption, however, is not based on site specific data, rather it is based upon literature references of a regional perspective. While this may be proper procedure for scoping the site, it is not appropriate for actual site characterization. Further, the depth of 100 feet is used later to calculate hydraulic conductivity which is key to a determination of groundwater velocity. Therefore, this assumption raises serious questions about the validity of estimated groundwater velocities and associated remedial alternatives which rely upon them.

Calculations for hydraulic gradient are not adequately described in the RI. OHM points out that the actual hydraulic gradient in the vicinity of the site can vary as much as 30% (7.7 ft/mile to 10.5 ft/mile). The use of 8.9 ft/mile as a gradient for calculating velocity includes enormous errors which have not been accounted for or even mentioned in the RI. The hydraulic conductivity utilized by CDM in calculating groundwater velocity (343.5 gpd/sq. ft.) is in great variance with conductivities referred to in the literature. (RI, Table 3-1). As CDM's estimate is also based upon its previously discussed estimate of aquifer thickness, there are obvious errors associated with this parameter which have not been accounted for in the RI.

The calculation of groundwater velocity, which is used in the report to estimate contaminant travel times, relies upon each of the above aquifer characteristics, as pointed out in the RI. (RI, 3-6). Given the enormous uncertainties associated with these parameters, as described above, there is no meaningful value in relying upon a velocity based upon them as has been done in the RI.

Another flaw in the remedial investigation concerns site specific data for subsurface soils. The general discussion of soils in the area does not rely upon site specific data concerning soil type, but instead relies upon interstate and regional data which could affect assumptions of vertical and horizontal permeabilities. Since background soil borings were not drilled, there is no basis for this data comparison. A more appropriate procedure would have been to compare specific on-site data and background data. The failure to make this comparison invalidates CDM's conclusions and ignores contaminant transport through on-site soils.

C. Failure To Define Contamination At The Site

A major consequence of the inadequate definition of the aquifer is a failure of the RI to characterize the extent of groundwater contamination, both vertically and areally. Indeed, the RI not only fails in this characterization, but it portrays a lack of understanding of contaminant migration. This is exemplified by figures 5-4 and 5-5 which obviously do not correspond. As noted by OHM, figure 5-4 depicts migration in an easterly direction from MW-2 towards MW-3. Figure 5-5, however, indicates that migration is now moving in a southerly direction towards MW-6. It is likely that CDM's decision also to ignore chemical transport parameters such as dispersion, sorption, dilution and biodegradation has contributed to its failure to characterize the contaminant plume. (RI, 6-19). It must be emphasized that this factor is critical to the evaluation of the "no action" alternative.

D. Inappropriate Reliance On Chemical Migration Rates

As noted above, inaccurate data and site characterization pervade the RI. Accordingly, estimated contaminant travel times should not be based upon these data and characterizations, as CDM has done. As the attached comments of OHM point out, estimates of contaminant velocity can vary tremendously rendering conclusions based upon these estimates unreliable. While the RI relies upon a contaminant migration rate of 94 feet per year, OHM finds a velocity of 42 feet per year to be reasonable. Moreover, in its work plan for the RI/FS, CDM had calculated groundwater velocity at approximately 31 feet per year. (RI/FS Work Plan, 2-19). The wide variation in estimates of velocity noted above, demonstrates that little weight should be placed upon them. However, CDM relies upon its estimate of contaminant migration rates in its assessment of exposures without qualification.

E. Inconsistencies in Public Health Evaluation

The public health evaluation contained in Section 6 of the RI points out the weakness in relying upon estimated values containing enormous errors in measurement and determination. It states that "all of these individual errors from different sources may be propagated into larger errors by mathematical combination in the risk assessment." (RI, 6-29). Nonetheless, it concludes that even with these enormous errors, useful information may be provided. However, the above statements ignore practical considerations of the validity of information forming the basis for determining remedial alternatives. While at one point the health evaluation points out the significance of factors tending to reduce the mobility of contaminants in soil and groundwater, these considerations are then explicitly ignored (RI, 6-19). In the place of estimates of chemical transport based upon reasonable scientific certainty are statements that migration time will approximate 14 years for TCA, for instance. This is in stark contrast to the estimated migration time of 33 years previously reported by the same authors in the RI/FS work plan (RI/FS Work Plan, 2-22). There seems to be no rhyme or reason to methodologies evaluating risk in this RI. Hence, the conclusions which are based upon flawed evaluation and which form the basis for the determination of a proposed remedial alternative in the feasibility study, are likewise invalid.

The RI also focuses on several chemicals as presenting potential health risks over time, without properly evaluating the reliability of the data utilized. For instance, lead is seen as a potential health risk although the RI fails to point out that lead was detected in significant concentrations in background residential and monitoring wells during sampling in 1985 (RI, Table 1-8). The same is true for chromium, where significant concentrations were detected in upgradient wells. This fact alone raises serious questions as to the validity of inorganic groundwater results, especially for total metals, as reported in RI, Tables 5-9 and 5-10 where inorganics were detected in upgradient wells in addition to trip, field and rinse blanks used to verify accuracy of the results obtained. Moreover, organics such as lead and copper have been viewed in the past by EPA as artifacts of residential water distribution systems containing copper and lead elements. Nonetheless, the RI's health evaluation relies upon total lead concentrations in estimating maximum exposure conditions. It can be seen from Table 6-10 that without lead, maximum exposure conditions would be below the total hazard index required for site remediation. Hence, the RI raises serious questions as to the validity of its conclusions that remediation at the site is necessary based upon concentrations of inorganics which have not been demonstrated to result from activities at the site alone.

V. COMMENTS ON FEASIBILITY STUDY

A. Inappropriateness of Proposed Remedial Alternative

As set forth above, many assumptions were made in the preparation of the RI report. These assumptions, therefore, have a significant effect on the determinations of the proposed remedial alternative by the EPA. As these assumptions have been shown to contain enormous and unqualified errors, the selected remedial alternative based upon these flawed assumptions must similarly be questioned.

As pointed out in the accompanying comments by OHM, many considerations have not been discussed in the feasibility study portion of this report. In particular, without adequate understanding of site characteristics, it seems impossible to fashion an alternative aimed at remediating the site. Not only is a decision favoring one alternative over another purely speculative, but an estimation of the dollar cost for implementing each specific alternative tends to approach absurdity.

B. Failure to Consider Additional Alternatives

It has been recommended by OHM that a further alternative be considered for remediating the site which would combine the benefits of alternatives No. 2 and No. 3. It is suggested that such an alternative would combine the benefits of both alternatives discussed in the Feasibility Study ("FS") while maintaining sufficient flexibility to be cost effective. In light of the major deficiencies in evaluating the site as noted above, a more flexible alternative capable of adjusting to actual site conditions as they become known would be preferred over one committing enormous financial resources without any guarantee of its effectiveness. For this reason, the FS is flawed for having failed to consider the alternative posed by OHM (combining alternatives 2 and 3) in the preparation of the FS.

VI. CONCLUSION

The deficiencies that pervade the Draft Final RI/FS are clear evidence of an investigation and study that is inconsistent with the NCP. Laboratory contamination and other inadequacies in the data reported in the RI undermine their value in describing potential environmental contamination at the site. More significantly, EPA has failed to define the aquifer characteristics and, as a consequence, has failed to characterize the extent of contamination at the site during the RI phase. Its reliance on an estimate of contaminant migration rates without qualification despite its awareness of the wide variation in estimates of velocity shows a disregard for the value of the information the Agency has sought to gather, and is irresponsible at best.

Without adequate data, a clear definition of the site contamination and an understanding of the contaminant migration times, EPA does not have the ability to formulate appropriate remedial alternatives. Accordingly, the proposed alternative decided upon by EPA could not reasonably have been based upon actual conditions at the site and is, therefore, arbitrary.

A more prudent remedial plan to pursue has been recommended by OHM. This plan involves a combination of alternatives considered by EPA. It is viewed as being capable of protecting public health and the environment in a cost effective manner and should, therefore, be considered by EPA.

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GENERAL COMMENTS

OHM

In general, the RI/FS has several flaws that are apparent throughout the report and may adversely affect the study conclusions and selection of the ultimate remedial action for the site. These are as follows:

- QA/QC problems are evident for many of the analyses performed. Irregularities were detected in both field procedures and laboratory procedures (field and trip blanks, respectively). Some key data, such as dissolved lead results were considered invalid by EPA and not used during the risk assessment.

- The velocity of groundwater is calculated using several assumed values. These assumptions may or may not be valid and should have been verified prior to using the data for decision making purposes. Specifically, the aquifer depth and hydraulic gradient are in question.

- The report uses total metals rather than dissolved metals concentrations throughout the study, particularly as a basis for risk assessment calculations. The total metals tests do not provide actual groundwater concentrations due to the potential for sediments to be present in the sample. Standard practice is to filter samples and test for dissolved metals (NJ DEP Field Sampling Guidance Manual, March, 1988).

- At least one goal and objective listed in Section 1.4 has not been met. In particular, the extent of groundwater contamination, both vertically and areally, has not been characterized.

- The risk assessment concludes that the potential hazard at the site is through groundwater ingestion due to lead concentration. Yet the feasibility study is directed towards TCA as the major contaminant of concern. The results of the risk assessment are not being used to justify any remedial actions.

VOLUME 1 - REMEDIAL INVESTIGATION

SECTION 2.0 GEOLOGY

Section 2.2
Page 2-5

Based on Figure 2-2, the thickness of the aquifer is assumed to be 100 feet. This assumption is not based on site specific data and therefore may be invalid. This depth (100 feet) is used later to calculate hydraulic conductivity which is key to groundwater velocity determinations.

In order to properly define aquifer thickness, a deep boring should have been drilled at the site to determine the exact depth of aquifer. If this boring had been drilled properly, the information to calculate hydraulic conductivity plus data necessary to evaluate the option of installing new private wells (suitability of lower aquifer) would be available.

SECTION 3.0 HYDROLOGY

Section 3.1
Page 3-6

Hydrogeological calculations are based on assumptions which may not be valid, yet affect the design of remedial alternatives. Calculations for hydraulic gradient are not provided in detail. It should be noted that MW-4 is located in a topographic low. Based on maps provided in the report, the hydraulic gradient between MW-1 and MW-4 could be approximately 10.5 ft/mile. The hydraulic gradient from MW-4 to the Esposito well is approximately 7.7 ft/mile. Also, the hydraulic conductivity of 343.5 gpd/sq ft is almost half the lower limit of the permeability presented in Table 3-1 for the Cohansey Sand. This discrepancy is not addressed in the report.

SECTION 4.0 SOILS

The general discussion of soils in the area does not address site specific data concerning soil type which could affect permeability assumptions. There was no assumption of TCA migration time from surface soil to the water table based on attenuation factors. Section 4.2 describes local soils using general references. No detail account of soils based on borings and field observation is provided other than a general statement that local soils are consistent with regional literature.

SECTION 5.0 SITE CONTAMINANTS

Page 5-2

Comparison of site data in Section 5.2.1 to background data should be limited to onsite specific background data. Interstate and regional data is too broad to be used in the RI context.

Page 5-8

Field and trip blanks in Table 5-2 and 5-3 contained traces of contamination. Therefore, QA/QC practices are questionable. This places doubt on the validity of surface soil analysis data for organic and inorganic constituents.

Page 5-17

Background soil borings were not drilled. (Figure 5-2). Therefore, there is no basis for data comparison. in Table 5-5. Using Table 5-5, lead concentrations are considered below background.

Page 5-19

Tables 5-6 and 5-7 show contamination of rinse and field blanks which are indicative of apparent QA/QC deficiencies. A trip blank was not analyzed for organic constituents of soil borings.

Page 5-22

Chromium was present in a field blank. Therefore QA/QC procedures for groundwater analysis are questionable.

Although total chromium was present in residential wells, dissolved chromium was not detected. Dissolved metals analysis is a better indication of groundwater conditions.

Page 5-24

Table 5-8 presents results that show lead analysis to be questionable. The only lead results available were for total lead which is non-representative of actual groundwater conditions. Additionally, since high copper concentrations were explained as due to copper piping, it follows that lead contamination may be due to solder of the copper pipes.

Page 5-27

Table 5-9 presents QA/QC results that show deficiencies in sampling and decon procedures. Chromium, iron, manganese and zinc were present in the rinse blank which shows that sampling equipment was contaminated. Some of these compounds were also present in the trip and field blanks.

Page 5-35

The methods for predicting contaminant migration velocity is unclear. The initial method is based on contour comparisons. Yet, there is no initial concentration at MW-6 to use. Therefore, no comparison can be made to previous concentration in the vicinity of MW-6. If the 300 ppb contour is used, a migration rate of 42 feet per year can be calculated. This wide range of values makes this methodology questionable.

Mention is made of a retardation factor used. This factor and calculation are not explained.

Also, the decrease in velocity down gradient of MW-4 is not taken into account. In general, the estimated TCA migration velocity is probably much higher than the actual velocity.

Page 5-35 (cont.)

These problems are acknowledged in a discussion on page 5-35 and 5-38. Yet, no attempt is made to validate the data. Instead, the 94 ft/yr velocity is used as a best guess. This rate is used later in the report to estimate the extent of the plume, as a factor in risk assessment and as a basis for alternative design. An overly conservative velocity would adversely alter these determinations.

In general, Figures 5-4 and 5-5 do not correspond. Figure 5-4 shows migration from MW-2 towards MW-3. In Figure 5-5, migration seems to change direction towards MW-6.

Section 6.0 PUBLIC HEALTH EVALUATION

Page 6-19

The report states that dispersion, sorption, dilution and biodegradation were ignored. This contributes to the inaccuracy of the predicted migration rate of TCA.

Although the report states that 1,1-DCE is present and a potential hazard, it should be noted that the concentration found was below the detection limit. The hazard rating is based on estimated concentration of 20 ppb which may or may not be accurate.

Page 6-35

The exposures and risks from periodic ingestion of local groundwater (current conditions) were determined to be less than 1 under average conditions. Using maximum concentrations, the report states that lead may be a problem. As previously noted, the feasibility study concentrates on TCA rather than lead as a problem.

VOLUME 2 - FEASIBILITY STUDY

SECTION 3.0 EVALUATION OF REMEDIAL ACTION ALTERNATIVES

Page 3-3

The decision to proceed with the feasibility study was apparently based on the concentration of TCA exceeding the proposed MCL of 26 ppb. Yet the risk assessment showed no hazard unless a well is installed at the site for drinking water purposes. The results of the risk assessment do not seem to justify remedial actions at the site.

SECTION 3.1.2.1

Page 3-4

There has been extensive sampling of surficial soil and deeper soils which indicated no significant contamination at the site. Additional soil sampling seems unnecessary.

Assumptions used during the feasibility study may have a significant effect on determining the appropriate remedial action. These assumptions should be validated prior to selecting the ultimate technology for the site.

SECTION 3.2 Alternative 1 - No Action with Monitoring

Page 3-7

The RI/FS has made no attempts to discuss or predict dilution, dispersion and biodegradation of TCA. This factor is critical to the evaluation of the no action alternative.

SECTION 3.3 Alternative 2 - Pump/treat using GAC

Page 3-16

Further information is needed to evaluate GAC such as definition of vertical and areal extent of contamination to determine total volume of water to be treated and amount of carbon necessary. Without these factors, this option may be substantially over estimated.

SECTION 3.4 Alternative 3 - Pump/treat using air stripper

Page 3-33

The possibility exists that EPA will require GAC to treat the air stripper air effluent stream. This cost should be included in the evaluation process. Also, the air stripper is oversized for 750 gpm. One five foot diameter stripper may be adequate. Capital costs should be reduced by approximately $150,000.

SECTION 3.8 Alternative 7 - Install new residential wells

Page 3-62

Deed restrictions would be limited to requiring deep wells for drinking water. This could be controlled by NJ DEP well permitting restrictions. Restricting all new construction at the site is excessive.

Cost of entire electrical usage is excessive. Only the cost above current costs now paid by the resident should be included.

Also, as discussed below, only 8 homes would require new wells, reducing this cost estimated significantly.

SECTION 3.9 Alternative 8 - GAC treatment at residential wells

Page 3-69

Assuming the plume direction is correct, only 8 homes would potentially be affected. Assuming 20 homes inflates the cost for this alternative tremendously.

Additional Alternatives for Consideration

One alternative not evaluated is the combination of air stripping and carbon adsorption. This alternative should be included in the evaluation since it combines the benefits of alternatives 2 and 3 and may be cost effective.

Tabernacle Drum Dump Site
Burlington County, New Jersey

Response To Comments
From
Atlantic Disposal Services, Inc.
For
Draft Remedial Investigation and Feasibility Study

On April 21, 1988, Atlantic Disposal Services, Inc., submitted written comments, via legal council of Riukin, Radler, Dunne and Bayh and technical council of O.H. Materials, concerning deficiencies in the draft Remedial Investigation and Feasibility Study for the Tabernacle Drum Dump Site. The comments have been reviewed and evaluated. Based on this evaluation, the following responses are made:

1. A general comment was made which alleged that there was a failure to define the site.

   Within Volume 1, Figures 1-3 and 1-4 define the area of waste storage and excavation area, Figure 1-2 defines the property boundary of the site and Figure 5-6 defines the estimated plume boundary.

2. A general comment was made that the extent of any contamination at the site or the threat presented by the alleged releases was not determined.

   Within Volume 1, Section 5 describes the extent of contamination at the site and Section 6 describes the threat presented by the alleged releases.

3. A general comment was made that the cost to perform the RI/FS should not have exceeded $375,000 - $500,000, however $750,000 was actually spent.

   The estimate prepared during the preliminary work plan stage was modified as site specific information was obtained during the initial work effort. The evaluation of this information resulted in a revised work plan being prepared, submitted for consideration by USEPA and approved for implementation.

4. A general comment was made that remedial alternatives could not be selected as a permanent solution because the extent of any contamination plume underlying the site remains undefined.

The estimated extent of the contaminant plume is based on field sampling, field measurements, literature review and mathematical calculations performed by trained staff hydrogeologists. The results of field sampling as described in Volume I, Section 5.2.4 indicates the presences of contaminants. The recording of field measurements in August 1985, October 1986, December 1986 and December 1987 for groundwater elevations and an aquifer pump test in October 1987 provided site specific information. To supplement the field measurements, a literature review, directed through the N.J. Pinelands Commission, was performed. As stated in Section 3.3 of the Addendum to Volume 1, three analytical methods,

a. Boulton's method for unsteady-state flow in unconfined aquifer with delayed yield.

b. Jacob's modification on Theis' non-equilibrium well formula, for draw down data.

c. Jacob's modification to Theis' non-equilibrium well formula, for recovery data,

were used to calculate aquifer transmissivity and specific yield. Based on these calculations, the extent of the contamination plume was estimated as stated in Section 5.4 of Volume 1 (see Figure 5-6).

5. A general comment was made that an alternative remediation strategy should be considered consisting of removal of contaminated groundwater for treatment through a combination of air stripping and granular activated carbon.

Based on the Technology Screening described in Section 2.0 of Volume II, treatment efficiency for air stripping or granular activated carbon "separately" should be sufficient to reduce contamination concentrations to acceptable levels. The use of either these two processes would result in the reduction of contamination levels considerably below acceptable levels.

During the public meeting held in March 1988, USEPA stated its willingness to combine air stripping of contaminated groundwater with GAC treatment of air exhausted from the stripping tower if necessary to reduce TCA emissions. It is not beneficial or necessary to combine air stripping of groundwater and GAC treatment of groundwater since each technology is in itself capable of removing TCA to levels which satisfy all ARARs as well as public health concerns.

6. A specific comment on the Remedial Investigation was made concerning data evaluation deficiencies. Sampling was performed in accordance with standard procedures required by EPA.

   As stated on Tables 5-6 and 5-9, data not in compliance with QA/QC standards was invalidated as directed by USEPA Region II (see notes on the bottom of each table). The presence of detectable contaminants in rinse blanks, field blanks and trip blanks indicate that QA/QC procedures were followed and gives assurance to the public that the other reported values are precise, accurate and that they can be correctly interpreted. Finally, the information presented in Table 1-8 is accurately and specifically noted concerning the analysis for total metals. Dissolved metals analysis was not performed.

7. A specific comment on the Remedial Investigation was made concerning the failure to accurately define aquifer characteristics.

   The hydrogeology of the site is described in Chapter 3 of Volume 1. Regional and site information is provided in this chapter. The installation of a deeper boring would be advantageous and is planned to be performed during the design phase of the site remediation program.

8. A specific comment on the Remedial Investigation was made concerning the failure to define contamination at the site.

   Contaminant migration is accurately shown on Figures 5-4 and 5-5, with migration to the southeast. Section 5.2 provides a detailed description of detected contaminants in the surface soils, subsurface soils and groundwater.

9. A specific comment concerning the Remedial Investigation was directed towards the inappropriate reliance on chemical migration rates.

As stated in Section 5.3 of Volume 1, contaminant migration rates were estimated using the horizontal movement of the 900 ppb concentration contour line for TCA between July 1985 to December, 1986, the hydraulic characteristics of the aquifer based on the pump test (Addendum, Vol 1) and the use of Wilson's Retardation Value for TCA of 1.2.

10. A specific comment concerning the Remedial Investigation was directed toward inconsistencies in the Public Health Evaluation (Section 6 of Volume 1).

The evaluation was a balanced, practical and conservative discussion concerning the estimated magnitude and probability of actual or potential harm to public health, welfare and the environment. As stated in response #9, the migration rate has been estimated to be higher than originally estimated in the work plan, therefore the migration times have been proportionally reduced. The presence of lead, chromium and copper were noted, and a discussion has been presented which interprets these inorganic contaminants.

11. A specific comment was made about the Feasibility Study concerning the inappropriateness of the proposed remedial alternatives.

Sufficient information has been collected at the site and evaluated so that there is an adequate understanding of site conditions to propose remedial alternatives. Assumptions were used, where appropriate, however, they are explicitly noted in the report and the implications are described as they impact the remediation alternative.

12. A specific comment was made about the Feasibility Study concerning the failure to consider one other additional alternative.

The combination of alternatives No. 2 and No. 3 is discussed in Response No. 5, above.

13. A final conclusion comment was made that the Draft Final RI/FS was deficient in general due to the previously stated comment.

The Draft Final RI/FS was prepared in compliance with USEPA guidelines. Adequate data was obtained at the site and this data was evaluated to formulate reasonable, feasible, corrective alternative to protect the public health, welfare and environment.

14. Additional comments were made by O.H. Materials Corporation which were not incorporated into the primary document prepared by Counsel. Response to these annexed comments are as follows:

a. General Comments

o Item No. 2
Groundwater velocity is calculated by using the hydraulic conductivity, the ground water gradient, and porosity. Groundwater elevations were measured at the site in August 1985, October 1986, December 1986 and December 1987, providing site specific data. The value for soil porosity was obtained from grain size fraction analysis performed on site soils samples. Hydraulic conductivity was calculated from the results of a pump test performed in October 1987. Thus, valid and verified data was employed in the RI/FS.

o Item No. 3
The study presented analyses for both total and dissolved metals, as given in tables 5-9 and 5-10. The risk assessment utilized total metals because such assessments employ the worst reasonable case assumptions for the sake of conservatism.

o Item No. 4
The vertical extent of groundwater contamination will be defined during the design phase of the program.

o Item No. 5
The study found that total lead concentrations exceeded the most stringent ARAR in a single sample out of the many samples taken. Thus the agency does not believe that high lead levels characterize site groundwater. The Record of Decision will state that if additional contaminants are found, they will be treated for.

b. Volume 1 - Remedial Investigation Comments

Response to Section 3-1, page 3-6.

The values of permeability, or hydraulic conductivity, presented in Volume 1, Table 3-1 represent available regional data for the Cohansy Aquifer. Site specific data was collected by means of a pump test from which transmissivity was calculated (see Appendix, Figure 3-3). Hydraulic conductivity was then calculated by dividing transmissivity by aquifer thickness.

Response to Section 4.0 Soils

In Appendix B, Volume 3, soil and well boring logs indicate that site-specific data concerning soil type has been collect and analyzed by size fraction.

Response to Section 5, page 5-2.

The study employed on site data which was developed during the study, and use regional data as a supplement.

Response to Section 5, page 5-17.

The RI/FS concludes that soil concentrations of lead are indeed below background levels.

Response to Section 5, page 5-19.

As shown in Table 5-7, trip blanks were taken. These are designated "trips" in the table heading.

Response to Section 5, page 5-24.

In addition to total lead, the RI/FS also addresses dissolved lead and other dissolved metals. This is shown in Table 5-9. The possibility of lead derivation from pipe solder is an additional reason for excluding lead as a site contaminant requiring remediation.

Response to Section 5, page 5-35.

The method for predicting contaminant migration velocity is based on using a concentration as a marker and following the movement of that marker over time and distance. There is greater confidence in using the highest measured TCA concentration as a marker, because the highest concentration is expected to have a more discreet distribution. Use of the 900 part ppb concentration as a marker also gives a more conservative result from the health effects perspective.

The retardation factor is explained on page 5-35 of Volume 1, and in response 9 above. Retardation is defined as the velocity of groundwater divided by the velocity of the contaminant, and is a factor which modifies the rate of contaminant movement. See also: Wilson, Section 8, Selected References in the RI/FS.

With regard to migration directions, please note that Figures 5-4 and 5-5 do not actually display migration directions. However, migration directions which can be estimated from the two figures are in close agreement. Figure 5-5, which includes additional data points which can be used in estimation of migration direction, confirms the direction as southeasterly.

Response to Section 6 page 6-19.

The suggested dispersion/dilution of TCA as a remedial action is not considered a reasonable option. Biodegradation of TCA within a soil strata above the groundwater table may be reasonable for consideration, however, within the groundwater system there is no known information to support rates or levels of removal. In the risk assessment process the most conservative, reasonable assumptions are taken. Thus physical, biological, and chemical factors which might act to change TCA migration rates, but which cannot be quantified for the Tabernacle Site, are not incorporated in the risk assessment portion of the RI/FS.

With respect to 1, 1-DCE, this compound was found at levels above detection level during 1985 sampling, and thus its further study is not based solely on estimated concentrations. DCE was evaluated as a contaminant of concern because it is a potential carcinogen. In addition, it is a breakdown product of TCA, and for this reason its concentration may increase over time, in the absence of ground- water remediation.

Response to page 6-35.

In characterizing the site only a single occurrence of lead in groundwater exceeded the most stringent ARAR.

Thus the RI/FS concludes that high lead levels do not characterize site groundwater.

C. Volume 2 - Feasibility Study Comments

Response to Section 3, page 3-3.

Although no well is currently installed on the site for drinking water purposes, as assumed in the risk analysis, a number of residential wells are in the path of plume movement. In addition, the possibility of development of the site and down-gradient areas above the plume also exists. SARA and CERCLA legislation require remediation in such cases.

Response to page 3-4.

With respect to possible additional soil samples, any such sampling will be conducted to confirm trace levels previously detected, rather than to investigate for new areas of potential contamination.

Response to page 3-16.

In the Design Phase, further definition of the vertical and aerial extent of contamination will be developed. This will allow refinement of the estimated volume to be treated. The amount of GAC required will be determined through pilot testing if this alternative is selected.

Response to page 3-33.

The assertion that the air stripper is oversized is not substantiated by our calculations. The air stripper was sized using the following values for model parameters:

Henry's Law Constant	=	300 atm
Air Temperature	=	10^{o} C
Water/Air Ratio	=	30 Vol/Vol
Blower Efficiency	=	70%
Pump Efficiency	=	60%

The air stripper proposed in the Feasibility Study has been conceptually designed with a margin of safety to account for the critical effects of pH, ionic strength and surfactants on the Henry's Constant, and the effects of low air temperatures in winter upon removal efficiency.

Response to page 3-62.

Deed restrictions were proposed to prevent the construction of new homes with private wells. The restriction was not proposed for all new construction.

The cost for electrical usage by a deep submersible pump is not excessive for normal residential consumption of water. It is estimated to cost each home owner about $0.30 per day.

Up to twenty homes may be effected if localized conditions vary as the plume travels in the estimated flow direction. In addition, lateral dispersion can cause contaminant movement in directions perpendicular to the plume axis.