EPA/ROD/R02-99/107
1999

EPA Superfund
Record of Decision:

LEHIGH VALLEY RAILROAD
EPA ID: NYD986950251
OU 01
LE ROY, NY
07/27/1999

ROD FACT SHEET

SITE:

Name	:	Lehigh Valley Railroad Derailment Site
Location/State	:	LeRoy, New York
EPA Region	:	2
HRS Score	:	50.0 (March 1998)
Site ID #	:	NYD986950251

ROD:

Date Signed	:	March 28,1997
Remedies	:	water line
Operating Unit	:	OU-1
Capital Cost	:	$9,822,000 (in 1997 dollars)
Construction Completion	:	12/2005
O&M per year	:	$241,000 (in 1997 dollars)
Present Worth	:	$11,193,000 (discount rate: 5%)(O&M:30 years assumed)

LEAD:

Remedial	:	State(NYSDEC)
Primary Contact	:	Joseph Moloughney (NYSDEC)(518-457-G315)
Secondary Contact	:	Paul J. Olivo (USEPA) (212-637-4280)
Main PRP	:	(None) (Fund-Lead)
PRP Contact	:	N/A

WASTE:

Type	:	Trichloroethylene (TCE)
Medium	:	Ground Water, Soil, and Bedrock
Origin	:	Spill from two ruptured tank cars after a derailment on December 6, 1970.
Estimated Quantity	:	35,000 gallons

JUL 27 1999

Michael J. O'Toole, Jr., P.E.
Director, Division of Hazardous Waste Remediation
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dear Mr. O'Toole:

This letter pertains to the New York State Department of Environmental Conservation's (DEC's) Record of Decision (ROD) for the Lehigh Valley Railroad Derailment Site and the U.S. Environmental Protection Agency's (EPA's) concurrence with one of the major remedial action components specified in that document.

The major remedial components of the March 1997 ROD for the site include:

- the design and construction of a waterline extension which will connect all impacted residents to a potable water supply;
- the excavation of approximately 10,000 cubic yards of trichloroethene-contaminated soil and on-site treatment by ex-situ soil vapor extraction; and,
- the installation of a bedrock vapor extraction system within a 10-acre dense nonaqueous phase liquid (DNAPL) zone.

EPA hereby concurs with the installation of the waterline extension as defined in the ROD. EPA believes however, that the ROD does not adequately address the restoration of ground waters to their beneficial use as required in the National Contingency Plan and that restoration of the aquifer must be evaluated. As mutually agreed upon by our respective staffs, EPA will assume the lead for future ground-water studies.

C:\WINDOWS\lvrroto4.ltr

SYMBOL -->	WNYRS	WNYRS	ORC	NYRB	ERRD	ERRD	DRA	RA
SURNAME ->	OLIVO PJO	LYNCH	SIMON	LA PACULA	MCCABE	CASPE	MUSZYNSKI	
DATE ------>	7-21-99		MTS 7/21	7/21		7/23		7/27/99

Also, through discussions with your staff, we understand that the DEC is evaluating new information regarding the applicability of innovative technologies to the remediation of overburden soils at the spill site. Therefore, at this time, EPA reserves its concurrence as to the remediation of source area soils, pending evaluation of the innovative technologies for the shallow soils. Our respective staffs also mutually agreed that EPA would assume the lead for the source area remedy after this evaluation has been completed.

Should you have any questions regarding the above, please call Richard Caspe at (212) 637-4390.

Sincerely,

Jeanne M. Fox
Regional Administrator

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision
Lehigh Valley Railroad Derailment Site
Town of LeRoy, Genesee County
Site Number 8-19-014

March 1997

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* John P. Cahill, *Acting Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Lehigh Valley Railroad Derailment Inactive Hazardous Waste Disposal Site
Operable Units #1 (Groundwater) & #2 (Soils)
Town of LeRoy, Genesee County, New York
Site No. 8-19-014

Statement of Purpose and Basis

This Record of Decision (ROD) presents the selected remedial action plan for the Lehigh Valley Railroad Derailment inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40 CFR 300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Lehigh Valley Railroad Derailment site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents include as part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents for this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to human health and environment.

Designation of CAMU at the Site

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Lehigh Valley Railroad Derailment site, approximately three acres of the site at and around the site of the derailment have been designated as a Corrective Action Management Unit (CAMU) for the purpose of remediating the site. The first one and one-half acres contains soils contaminated with trichloroethene which will be treated in ex-situ soil vapor extraction units to be located in the vicinity of the spill site. The treatment area will be the second one and one-half acres (exact size dependent upon design) of the CAMU. Once treated, the soils will be placed back into their original location.

Description of the Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Lehigh Valley Railroad Derailment site and the criteria identified for evaluation of alternatives, the NYSDEC has selected soil and bedrock vapor extraction as a source control measure and a water line extension to provide a safe potable water supply to all impacted residents. The remedy will be conducted in stages, each building on the other, as more detailed site information becomes available. The components of the remedy are as follows:

> Design and construction of a waterline extension which will connect all impacted residents to a potable water supply. The waterline extension will extend from the existing Monroe County Water Authority water main in the Town of Wheatland and run through the Towns of Wheatland and LeRoy and the Villages of Caledonia and Mumford. The waterline extension

will be designed to provide current fire flow demand.

Based upon additional information received during the public comment period, the Department has tentatively decided to expand the water line extension component of the remedy to include the section from Spring Street, west along George Street/Flint Hill Road to Lime Rock Road. A final determination will be made based upon additional engineering and hydrogeologic analyses to be conducted during the design phase of the waterline extension.

Design of the Source Control measures which will include a detailed pilot study.

Excavation of about 10,000 cubic yards of TCE contaminated soil at the former spill site. This will include removal and replacement of a portion of Gulf Road. Excavation will be performed in accordance with the cleanup goals in Section 5. On-site treatment of contaminated soil by ex-situ soil vapor extraction. Treated soil will be placed back on-site.

Installation of a bedrock vapor extraction system within the approximately 10 acre DNAPL zone. Extracted vapors will be properly managed prior to discharge.

Initiation of a long term monitoring program which is design to protect human health and the environment during and after construction of the above remedial plan.

<u>New York State Department of Health Acceptance</u>

The New York State Department of Health concur with the remedy selected for this site as being protective of human health.

<u>Declaration</u>

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

3/28/97
Date

Michael J. O'Toole, Jr. Director
Division of Environmental Remediation

TABLE OF CONTENTS

RECORD OF DECISION

LEHIGH VALLEY RAILROAD DERAILMENT
OPERABLE UNITS #1 (GROUNDWATER) & #2 (SOILS)
Town of LeRoy, Genesee County, New York
Site No. 8-19-014
March 1997

SECTION 1: SITE LOCATION AND DESCRIPTION

The Lehigh Valley Railroad Derailment site (the "site") is the location of a 1970 train derailment and chemical spill which occurred east of the Village of LeRoy, along Gulf Road (see Figure 1). The area is flat and encompasses the property of the former Knickerbocker Hotel, Gulf Road, the former LehighValley main line railroad bed and several adjoining parcels of land. The site is in a rural setting characterized by mixed industrial, residential and recreational land use types. Large stone quarries (both active and inactive) are located immediately adjacent to the site. Mud Creek, a frequently dry stream bed which carries substantial water flow during flood events, is located approximately 600 feet to the east of the site. Mud Creek has formed a narrow gorge extending roughly one mile northeast from the site to Oatka Creek. Oatka Creek is a New York State designated trout stream.

The spill site, at the surface, is approximately 1.5 acres in area and is characterized by soil contaminated with trichloroethene (TCE). Beneath the soil surface in the bedrock, the spill site covers. approximately 10 acres and is believed to be characterized by pure, undissolved TCE in the bedrock.

SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

On December 6, 1970, a portion of an eastbound 114-car freight train operated by the Lehigh Valley Railroad derailed at the crossing intersection of Gulf Road. Two tank cars containing trichloroethene (TCE), a common industrial solvent, ruptured and spilled their contents onto the ground. It is estimated that roughly 30,000 gallons of TCE were spilled. A third car containing a crystalline form of cyanide was also reported to have partially spilled its contents onto the ground. Newspaper articles from this time period and recent interviews with local emergency response personnel indicate that most of the cyanide was recovered shortly after the derailment. The TCE, on the other hand, rapidly infiltrated into the ground. None was recovered.

In early 1971, acting on residents' complaints of TCE odors in homes and reported contamination of nearby drinking water wells, the Lehigh Valley Railroad conducted limited clean up activities at the spill site. Carbon filters were installed to remove TCE from the drinking water from several local private wells. The railroad company also constructed ditches in the area of the TCE spill which were flooded with water in an attempt to flush the TCE out of the ground. These are the only known cleanup activities conducted at the site at the time of the spill, and it was not until further studies were conducted in early 1990 that the full extent of the contamination was discovered.

The Lehigh Valley Railroad ceased operations in 1976. Tracks at the spill site were removed shortly thereafter. A portion of the railroad right-of-way was acquired by the Town of LeRoy, and another portion by the Northwoods Sportsman's Club. The railroad's corporate successor retains title to a piece of the right-of-way north of Gulf Road. The right-of-way remains passable to vehicles, and is used by quarry workers to access an explosives storage area north of Gulf Road. Recreational use by all-terrain vehicles and motorcycles is common.

2-2: Remedial History

In 1990 and 1991, in response to another inactive hazardous waste disposal site, the NYSDOH sampled private water supplies east of the spill site and discovered TCE contamination in more than 35 private wells. Acting on this information, the USEPA installed carbon filtration units on all private wells which were found to be contaminated with TCE above the NYSDOH drinking water standard of 5.0 parts per billion (ppb). These carbon treatment units remove TCE from the water so that it can be used safely for drinking, bathing and other domestic purposes.

In 1991, the NYSDEC and NYSDOH listed the site on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a "class 2 site," indicating that it poses a significant threat to the environment and/or public health and that remedial actions are required. A Remedial Investigation/ Feasibility Study (RI/FS) was performed to characterize the nature and extent of contamination. In addition, an Operation and Maintenance (O&M) program was initiated to protect public health by maintaining the carbon filter units which the USEPA installed. NYSDEC, using money from the State Superfund, contracted the engineering services of Rust Environment and Infrastructure to conduct the RI/FS and the O&M program.

In 1992, the Remedial Investigation (RI) began and was designed to evaluate the nature and extent of the contamination caused by the TCE spill. The feasibility study (FS) began in 1993 while the RI was under way. Both the RI and the FS are now complete.

2.3: Operable Units

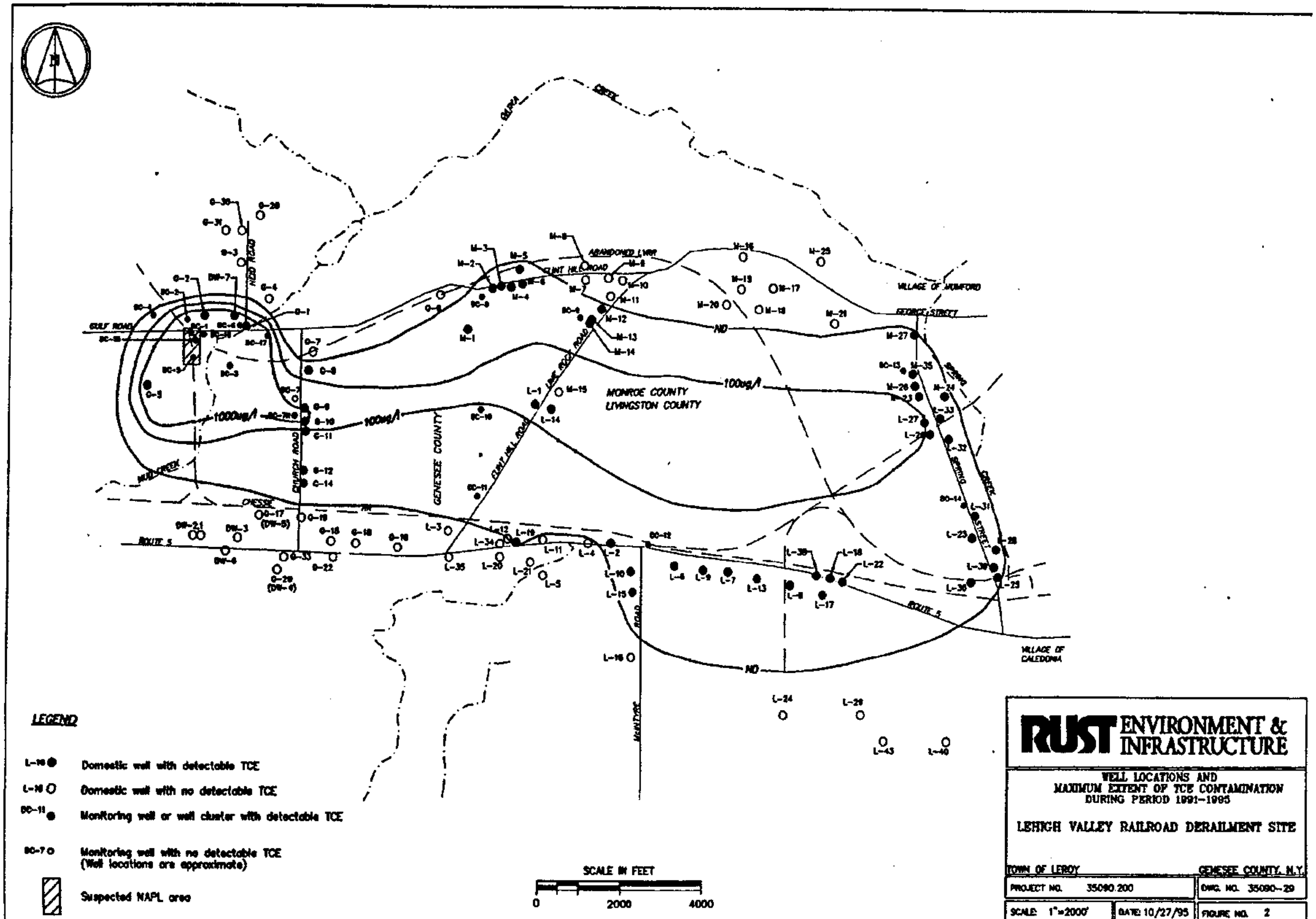
The site has been split into two Operable Units for administrative purposes. An Operable Unit represents a discrete portion of a site which can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the contanmination present at a site. In this case, the two operable units deal with contamination in the surface soil and the bedrock, respectively:

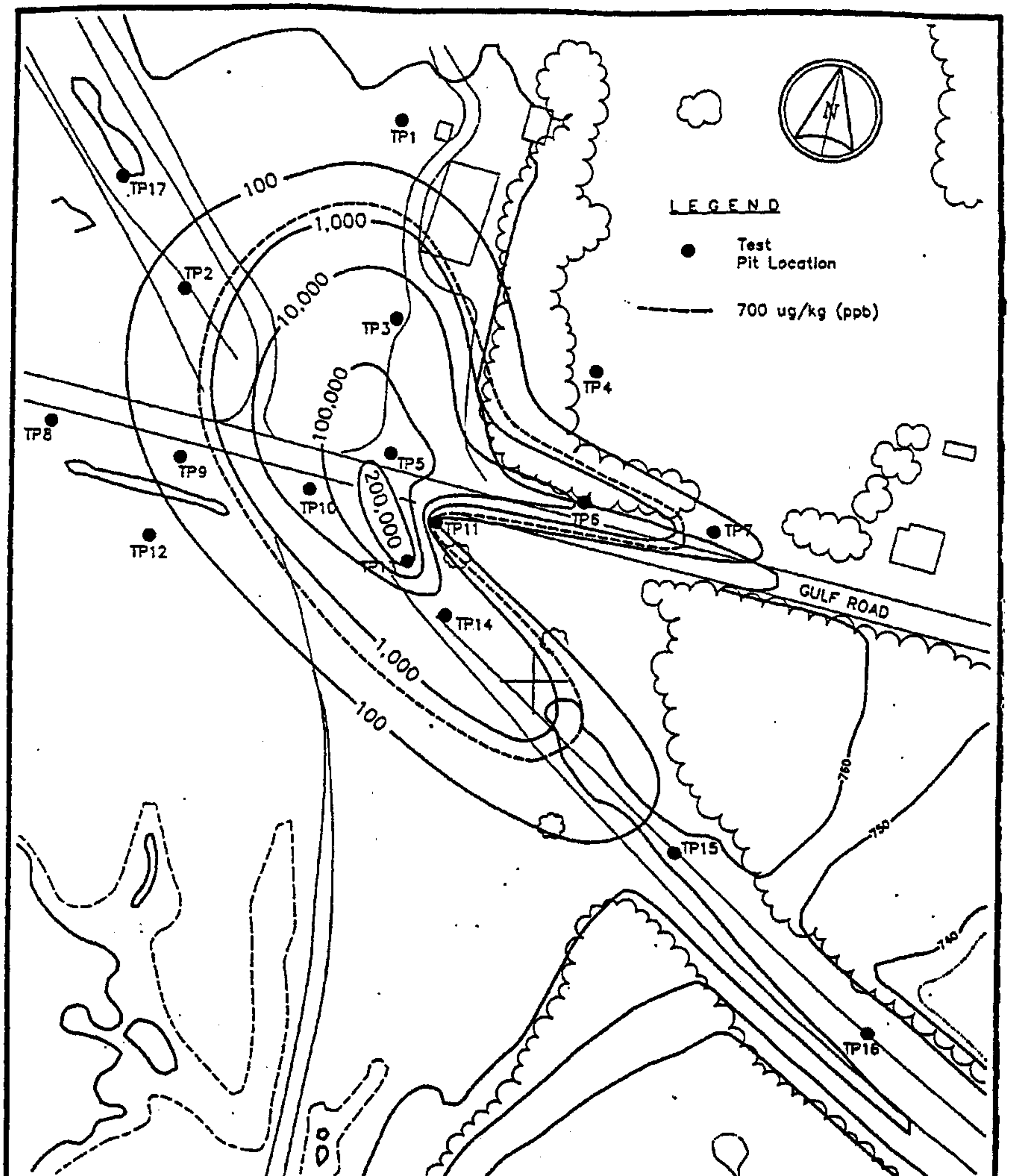
Operable Unit #1, Groundwater
Operable Unit #2, Surface Soils

Operable Unit No.1 (groundwater) consists of a roughly 10-acre "source area" immediately surrounding the derailment where spilled chemicals remain in the bedrock, and an area of roughly three and one half square miles in which groundwater contamination resulting from the spill has been detected (see Figure 2).

Operable Unit No. 2 (surface soils) consists of an approximately 1.5 acre area where the soils, both at the surface and at depth, are contaminated from the TCE spill. The spill site soil boundary is based on soil gas analytical results. The study defines the residual soil contamination as an irregularly shaped area centered around the former railroad crossing (see Figure 3).

Both operable units contribute to groundwater contamination. Groundwater which comes in contact with spilled chemicals in the soil and bedrock becomes heavily contaminated and migrates rapidly away


RUST ENVIRONMENT & INFRASTRUCTURE
WELL LOCATIONS AND MAXIMUM EXTENT OF TCE CONTAMINATION DURING PERIOD 1991-1995
LEHIGH VALLEY RAILROAD DERAILMENT SITE
TOWN OF LEROY
GENESEE COUNTY, N.Y.
PROJECT NO. 35090.200
DWG. NO. 35090-29
SCALE: 1"=2000'
DATE: 10/27/95
FIGURE NO. 2
LEGEND
Domestic well with detectable TCE
Domestic well with no detectable TCE
Monitoring well or well cluster with detectable TCE
Monitoring well with no detectable TCE (Well locations are approximate)
Suspected NAPL area
SCALE IN FEET
0
2000
4000
MONROE COUNTY
LIVINGSTON COUNTY
GENESEE COUNTY
VILLAGE OF MUMFORD
VILLAGE OF CALEDONIA
GEORGE STREET
ROUTE 5
CHURCH ROAD
GULF ROAD
ND
100ug/l
1000ug/l



DUNN GEOSCIENCE ENGINEERING CO., P.C. 12 Metro Park Road Albany, NY 12205	TCE CONCENTRATION CONTOURS (TEST PIT SOILS) LEHIGH VALLEY RR DERAILMENT SITE

PROJECT NO. 00296-02379	DATE 11/92	DWG. NO. A9181_3	SCALE 1"=100'	FIGURE NO. 3

from the site.

The site has been split into two operable units because the soil contamination and bedrock contamination appear to be physically separated from each other, and because techniques for dealing with soil contamination are different from those required for the groundwater operable unit. The two operable.units are presently together in this ROD to provide consistency to the remedy selection process.

SECTION 3: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the site presents a significant threat to human health and the environment, the NYSDEC has recently completed a Remedial Investigation/Feasibility Study (RI/FS).

The RI/FS was conducted in several phases, with a report issued to the public following each phase. Eight reports describe the field activities, engineering studies, and findings of the RI/FS which pertain to the groundwater and surface soils:

Remedial Investigation Report, Phase A, Lehigh Valley Derailment Site RI/FS, dated August, 1992

The Spill Site Soil Investigation Report, Lehigh Valley Railroad Derailment, dated April 1993.

Domestic Well and Initial Environmental Sampling Report, Lehigh Valley Railroad Derailment, dated May, 1993.

First Phase Feasibility Study, Preliminary Screening, Lehigh Valley Railroad Derailment, dated September 1994.

Lehigh Valley Railroad Derailment, Field Sampling Report, dated March 1995.

Laboratory Bench-Scale Treatability Study, Lehigh Valley Railroad Derailment, dated January 1996.

Remedial Investigation Report, Lehigh Valley Derailment Site, dated October, 1996.

Feasibility Study Operable Unit #1 (Groundwater), Lehigh Valley Railroad Derailment, dated February 1997.

Feasibility Study Operable Unit #2 (Surface Soils), Lehigh Valley Railroad Derailment,, dated February 1997.

3.1: Summary of the Remedial Investigation

The purpose of the Remedial Investigation (RI) was to define the nature and extent of any contamination resulting from the TCE spill.

The RI included the following activities for **Operable Unit # 1 (Groundwater):**

Geophysical surveys to determine the location and orientation of voids and joints in the bedrock.

Installation of monitoring wells to determine the location of groundwater contaminants and their routes of migration.

Detailed inspection of the monitoring well boreholes with video cameras and geophysical logging equipment.

Sampling and analysis of groundwater samples from monitoring wells and domestic wells.

Identification, mapping, and sampling of springs and seeps in order to determine locations where contaminated groundwater is discharging to the ground surface.

Sampling and analysis of surface water from ponds, and streams in areas where contaminated groundwater discharges to the surface. This was done to assess the extent to which discharge of contaminated groundwater was producing surface water contamination.

Sampling and analysis of sediment samples from these same springs, ponds, and streams to determine whether contaminants have become bound to the sediments.

The RI included the following activities for **Operable Unit #2 (Surface Soils):**

Soil gas survey to characterize the approximate extent of the residual TCE soil contamination.

Subsurface exploration utilizing test pits to evaluate the geologic characteristics of the subsurface soils and to determine the volume of contaminated soil requiring remediation.

Soil sampling and analytical testing to evaluate the concentrations of site specific contaminants in the soil and to ascertain the limits of the lateral and vertical dimensions of the spill site.

3.2 Contamination Assessment

Many groundwater, surface water, soil and sediment samples were collected at the Site to characterize the nature and extent of contamination. Of the two chemicals spilled at the time of the derailment (TCE and cyanide), only TCE has migrated extensively away from the site. Cyanide has been detected at low levels in soil samples near the spill and has also been detected in groundwater from monitoring wells immediately adjacent to the spill. However, only one monitoring well closest to the spill site (DC-lA) exceeds NYSDEC standards for cyanide. No other wells exceed this level. Consequently, cyanide contamination of groundwater is not considered a significant environmental concern at this site.

Fate and Transport

Trichloroethene (TCE) is the principal groundwater contaminant of concern at this site. In its pure form, TCE is a clear, colorless liquid with a low boiling point (186 degrees Fahrenheit) and a distinctive odor. It is 42 percent more dense than water, and thus tends to sink rapidly through the ground until it encounters a barrier which will not let it pass. Horizontal migration may then take place along joints and fractures, often in directions different from the direction of groundwater flow. The exact position and orientation of these fractures cannot be readily determined, making it very difficult to define the path which the TCE will follow.

TCE is only slightly soluble in water. The maximum amount which can be held in solution is roughly 0.11 percent by weight (equivalent to 1100 ppm or 1,100,000 ppb). At greater concentrations, TCE forms a separate liquid phase. At the Lehigh Valley Derailment Site, the TCE was in the form of a pure liquid product at the time of the spill. Due to the low solubility and the rapid release of the TCE at the time of the spill, it is assumed that the TCE spread initially as a separate phase, flowing both over the ground surface and through soils and jointed bedrock in the subsurface.

Although TCE is not highly soluble in water, it is sufficiently soluble to cause serious environmental contamination problems. This is because a very small amount of TCE dissolved in water makes the water unsuitable for human use. The physical properties of this contaminated water are nearly identical to ordinary water, so the contamination will be carried along with ordinary groundwater flow. The contamination will not be readily apparent to the human senses unless the water is very heavily contaminated.

Extent of Contamination

Table 1 summarizes the extent of contamination of TCE in groundwater, spring water, surface water, and sediments and compares the data with the proposed remedial action levels derived from an evaluation of appropriate standards, criteria and guidance (SCGs) for the Site. The following are the media which were investigated and a summary of the findings of the investigation.

Groundwater

Groundwater contamination at the Lehigh Valley site is far more widespread than what is commonly found at most other hazardous waste sites in New York State. This is due to a combination of the large volume of spilled material (roughly 30,000 gallons) and the geologic setting of the site. The bedrock is predominantly carbonate and solution-enlarged voids and conduits present in the bedrock. An extensive network of interconnected openings (voids) has developed along horizontal fractures (bedding planes) and vertical fractures (joints) in the bedrock. Groundwater travels through these voids far more rapidly than would otherwise be the case. The extent of the groundwater contamination is shown by the distribution of contaminated domestic wells as shown on Figure 2. Contaminated groundwater has migrated away from the site and formed a "plume" of contamination which reaches at least as far as Spring Street in the Village of Caledonia, three and a half miles to the east. It is likely that the plume discharges into Spring Creek but it is possible that it extends farther to the east. Because a different source is known to have contaminated groundwater with TCE to the east, it is not practicable to distinguish between the two sources and definitively mark the eastern edge of the plume from this site.

The groundwater contamination can be logically divided into three geographic areas as shown on Figure 2. The first area is defined as the zone in which pure, undissolved TCE has spread in the bedrock. TCE does not mix readily with water, and so is commonly referred to as a "non-aqueous phase liquid" (NAPL). The area where remnants of pure TCE are believed to reside is thus referred to as the NAPL zone. TCE concentrations as high as 58,000 ppb have been detected in groundwater samples from this zone.

The second area lies beyond the limits of NAPL migration, but west of (roughly) Church Road. Only dissolved-phase TCE is present in this area, but concentratioils are still quite high (maximum 8600 ppb). This area is discussed below as the "Mud Creek Zone."

The third area consists of the rest of the TCE plume, reaching from Church Road eastward to Spring Creek and possibly beyond, between Mumford and Caledonia. The TCE plume broadens significantly in this area, reaching a width of over one mile when it reaches Spring Creek. Contaminant concentrations in this area are generally much lower than in the other two zones due to dilution with clean groundwater, but are still considerably above drinking water standards. Most of the domestic wells which have been contaminated with TCE are located in this zone. The limits of this zone are defined largely on the basis of these contaminated domestic wells, which are shown as filled-in circles on Figure 2.

NAPL Zone

Non-aqueous TCE liquid was not observed during the Remedial Investigation, despite the fact that wells were installed directly beneath the location of the spill. This failure to directly observe NAPL is not uncommon, and should not be taken as evidence that NAPL does not exist in the area. TCE is a very common environmental contaminant, yet it is relatively rare to be able to observe this colorless liquid directly. Other indirect techniques are normally required in order to determine the presence of NAPL.

In this case, the NYSDEC has used the distribution of TCE dissolved in groundwater to estimate the likely boundaries of the NAPL zone. Areas where TCE concentrations exceed one percent of the saturation level (that is, a concentration of approximately 11,000 ppb) are considered likely to contain undissolved NAPL. It should be emphasized that this definition of the NAPL zone is a rough estimate and may be subject to change as further data is received.

It appears that most of the NAPL has now dispersed into the bedrock. It may be either spread out into very small droplets on the surfaces of bedrock fractures or adsorbed in the rock itself. In either of these forms, the NAPL would no longer be capable of moving as a separate phase liquid, and would be released very slowly by dissolving in groundwater which passes through the bedrock. However, the possibility that small "pools" of mobile, liquid NAPL still exist in the bedrock cannot be dismissed. Disturbance of these pools, if they exist, would allow NAPL to begin migrating once again, which could lead to a sharp increase in groundwater contamination throughout the plume.

Despite the high density of liquid TCE, it appears that the spilled chemical spread horizontally to a greater extent than it spread downward. This conclusion is based on the fact that shallow wells in the NAPL zone are far more heavily contaminated than deeper wells at the same locations. From this evidence, it appears that the spilled TCE infiltrated into the bedrock and encountered bedding planes which it could not penetrate readily, and so spread horizontally. Most of the horizontal spread took place to the south, because the bedding planes dip slightly in this direction.

A large proportion of the NAPL in the bedrock appears to be located in the vadose zone, which is the part of the bedrock above the normal position of the water table. This conclusion was reached by examining the contamination levels in the monitoring wells at different times of the year. During the spring months, the water table in the NAPL zone rises by over thirty feet into parts of the bedrock which are normally dry during the rest of the year. This is due to the input of large volumes of uncontaminated water from Mud Creek. Ordinarily, the introduction of large volumes of clean surface water would be expected to lower TCE concentrations due to dilution. However, TCE concentrations *rise* dramatically in the NAPL-zone instead. This is believed to result from having groundwater

Table 1
Lehigh Valley Railroad Derailment
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING	SCG (ppb)
Groundwater	Votatile Organic Compounds (VOCs)	Trichloroethylene	ND (.001) to 58,000	46 of 55	5
Spring Water	Volatile Organic Compounds (VOCs)	Trichloroethylene	ND (.001) to 1,900	7 of 12	5
Surface Water in Streams	Volatile Organic Compounds (VOCs)	Trichloroethylene	ND (.001) to 29	1 of 7	11
Sediments	Volatile Organic Compounds	Trichloroethylene	ND (.010) to 170	2 of 13	46

Notes: SCG - Standards, Guidance and Criteria
ppb - parts per billion
ND - Not detected

contact highly contaminated bedrock which does not ordinarily contain water.

Mud Creek Zone

Groundwater which has become contaminated by contact with TCE in the NAPL zone moves away from the site toward the east and southeast. In doing so, it passes through an area between the spill site and Church Road where hydrogeological conditions are highly complex. For discussion purposes, this area is referred to as the "Mud Creek Zone."

As the name implies, the groundwater flow in this area is greatly influenced by the presence of Mud Creek, which flows generally southwest to northeast across the area. Mud Creek begins a few miles south of Route 5. Shortly after crossing Route 5 near the LeRoy airport, the stream begins flowing over Onondaga Limestone bedrock. At this point, Mud Creek begins losing water downward into the bedrock aquifer. During most of the year, Mud Creek loses all of its flow into the aquifer. This can be readily demonstrated by observing significant flow in the stream at the Route 5 crossing, and a dry stream bed a few hundred yards farther to the north. Farther downstream near the spill site, Mud Creek only carries flow during extreme flooding. Shortly after crossing Gulf Road, the Mud Creek stream bed enters a narrow bedrock gorge and passes over a waterfall. North of the waterfall, the stream bed drops in elevation to the point that groundwater flows into the stream instead of out of it. Several springs exist in this area, which will be discussed in greater detail in the next section.

During most of the year, Mud Creek does not greatly affect the flow of contaminated groundwater leaving the spill site. This is because during these times, Mud Creek is dry. Groundwater passes beneath the stream bed in a generally eastward and southeastward direction. However, during spring flooding, Mud Creek carries a substantial flow of water, much of which infiltrates downward into the groundwater system. This causes rapid rises in groundwater levels near Mud Creek. Several zones in the bedrock have very high permeability (that is, they transmit groundwater very rapidly and efficiently). Consequently, the water which infiltrates from Mud Creek spreads rapidly away from the creek bed and water levels rise sharply throughout the "Mud Creek Zone." Water levels increase as much as 50 feet in some wells, and 30-foot rises are common.

As mentioned in the previous sections, one of the most important effects of these rises in water level is in the NAPL zone, where water rises up into the most heavily NAPL-contaminated portions of the bedrock. In the Mud Creek zone, where no NAPL is believed to exist, the principal effect is to spread dissolved TCE contamination. Contaminated groundwater spreads both vertically and horizontally into areas where it does not exist during the rest of the year.

The flow of contaminated groundwater through the Mud Creek Zone is largely controlled by the location of horizontal bedding planes and vertical joints in the bedrock. These joints are well connected to each other, as is shown by the fact that water levels in all wells rise and fall in unison during the spring months when Mud Creek is introducing large volumes of water into the system. If the joints and bedding planes were not well connected with each other, it would be expected that some wells would respond much more slowly than others. The same effect would take place in reverse if wells are installed to capture the TCE plume. The same interconnected fractures which efficiently move Mud Creek's water throughout a broad area should allow groundwater to be captured over a broad area with wells.

Despite the high degree of fracture inter-connection, the TCE plume has not spread broadly in the Mud Creek Zone. Except during periods of extreme high water,the plume is largely limited horizontally to one or two narrow zones. The most obvious of these zones crosses Church Road in the vicinity of monitoring well DC-7R. It is roughly 800 feet wide at this point, and it appears that most of the groundwater contamination spreading southeastward toward Caledonia leaves the site via this route.

A second route of migration may exist to the north of this point, passing just north of the intersection of Gulf Road and Church Road. The existence of this second zone has not been firmly established. Monitoring wells DC-6 and DC-17 clearly show that TCE is moving in this direction, but it is not certain whether the contaminated water continues on eastward from these points or turns northward and discharges into Mud Creek. Several contaminated springs have been identified in the lower reaches of Mud Creek below the waterfalls, and this may be the ultimate destination of the groundwater contamination in this area. Further work would be required to verify whether significant amounts of contamination are escaping through this area. Throughout the remainder of this document, a conservative assumption has been made that this zone of contamination does exist and would need to be remediated.

The vertical extent of the plume is also fairly narrow. As it passes through the Mud Creek Zone, most of the contaminated groundwater flows through a bedrock unit known as the Falkirk Formation. Bedrock units above and below the Falkirk contain far lower levels of contamination. Further discussion of the bedrock jointing and bedding can be found in Section 5 of the RI Report.

The Dolomite Products Company limestone quarry is located immediately to the west of the Mud Creek Zone. Groundwater pumping at this quarry complicates the flow pattern in two ways: First, the plant pumps from a well located near the plant office to provide wash water for the processing of crushed stone. TCE levels in this well have fluctuated from below-detection values to over 900 ppb since monitoring began in 1991. This well is located upgradient of the spill site, and thus should not be contaminated. Instead, a combination of pumping at this well and seasonal flow reversals due to Mud Creek's flooding draw contaminated water westward from the spill site. This has the effect of spreading the contaminated water into areas where it otherwise would not go.

The second effect of Dolomite's operation is more subtle. The pit floods with water during the winter months, and this water needs to be removed in the springtime so that mining operations can begin. The pit water is discharged to Mud Creek under the terms of a permit issued by the NYSDEC. Samples of this discharge water were taken in the spring of 1993 and showed that the water contained 80 ppb TCE. The fate of this contaminated water has not been established, but it appears that it is rapidly diluted as it mixes with Mud Creek's flow.

Main Body of Aquifer

From Church Road eastward to Spring Creek between Caledonia and Mumford, the plume broadens considerably, and its vertical position within the aquifer drops. Seven clusters of monitoring wells have been installed in this area. All seven clusters encountered contamination in excess of NYSDEC groundwater standards, but the contamination is generally found only at specific depths.

Most of the domestic wells contaminated by the spill are located in this area. Not all of these domestic wells are deep enough to encounter the contaminated zones; consequently, several produce clean water and have not required installation of carbon treatment systems. NYSDEC has received reports that previously uncontaminated wells in this area have become contaminated after they were deepened in response to drought conditions.

TCE contamination is geographically widespread in the main body of the aquifer, but relatively dilute in comparison with the Mud Creek Zone and the NAPL Zone. TCE concentrations are above the 5 ppb MCL in 34 domestic wells and several monitoring wells, but only 3 wells have produced water with over 100 ppb TCE.

Although this portion of the plume is far removed from Mud Creek, the effects of surface water infiltration into the aquifer can be seen throughout the area. Water levels in all wells rise sharply during periods of high runoff in the spring, although not as sharply as in the wells closer to Mud Creek. Not all of this rise is due solely to Mud Creek. Three other streams which run roughly parallel to Mud Creek disappear into the subsurface as they approach the south side of Route 5 between LeRoy and Caledonia. Although these streams are far smaller than Mud Creek, it is clear that all three contribute surface water runoff into the groundwater system during the spring in the same manner as Mud Creek.

As is the case with the "Mud Creek Zone," water levels in the main body of the aquifer rise and fall nearly in unison, indicating that fractures and enlarged bedding planes are well connected throughout this area. During extreme flood events (such as during the spring of 1992) groundwater levels reach the surface of the ground resulting in flooding in some areas. Although this flood water was not sampled (the RI was not yet underway during the latest extreme event), it is highly unlikely that it was contaminated.

Surface Water

Due to the highly fractured nature of the bedrock and the thin soil cover at the spill site, all or nearly all of the rainwater which falls on the site infiltrates into the ground. There is little or no surface water runoff, so *direct* contamination of surface water from the site has not been observed. However, the Lehigh Valley Derailment Site has *indirectly* impacted surface water resources, because contaminated groundwater from the site reaches the surface of the ground in the form of springs and seeps in two areas as discussed below.

During the course of the Remedial Investigation, a concerted effort was made to identify all springs and seeps in the area of concern between the spill site and Spring Creek. These locations were sampled to determine which were contaminated.

Contaminated springs were found in two areas: along the lower reaches of Mud Creek below the falls (about 800 feet northeast of the spill site) and along Spring Creek between LeRoy and Caledonia (roughly 3 to 3.5 miles east of the site). In both cases, the springs are located in very shallow pools along the banks of streams, and the contaminated water is rapidly diluted by clean water flowing by in the stream. Table 1 shows the ranges of contamination levels encountered in the springs. Detailed descriptions of the springs and the contaminant levels found in each can be found in the RI Report.

Sediments

At other sites where TCE has been released into surface water bodies, it is often found to bind preferentially to bottom sediments. Sediments with high organic content (such as decaying algae, leaf litter, etc.) are particularly likely to accumulate TCE. The contaminated sediments can, under certain conditions, constitute a threat to human health or to aquatic organisms that live in the sediments. To evaluate this possibility, stream sediment samples were collected in areas near the locations where contaminated springs were found.

Table 1 summarizes the results of the sediment sampling. NYSDEC screening levels for contaminated sediments are shown for comparison. Minor amounts of sediment contamination were detected in Spring Creek and in Mud Creek. A more detailed analysis of the public health risk and environmental risk posed by the sediments can be found in Sections 4.3 and 4.4 of this PRAP.

Air

Air quality monitoring was conducted during the field activities portion of the Remedial Investigation. Except during periods of invasive activity (such as well drilling or test pit excavation), no elevated levels of TCE vapors were detected. Even during these activities, TCE levels were elevated only in areas immediately surrounding the work. Consequently, NYSDEC does not consider air emissions to be a significant problem at the site.

Soil

The results of the RI indicate levels of TCE in the site soils are as high as 550 parts per million (ppm) and concentrations of 1,2-dichloroethene (DCE), a common natural breakdown product of TCE, are at much lower levels (maximum of 5.2 ppm). The site-wide average concentration of TCE found in the soil is estimated at 100 ppm. Table 2 presents a summary of the analytical soil results.

The October 1994 sampling also revealed an elevated level of organic carbon in the site soils, as high as 14%. The site wide average for soil organic carbon was approximately 9.6% and is well above what would be expected in native soils. New York State native soils tend to have organic carbon contents around 0. 1 to 1.5 %. The elevated organic carbon of the site's soils may be attributed to coal chips or other waste products from historic railroad activities. A soil sample collected about 150 feet from the former railroad bed had an organic carbon content of 3.5 % which is still above typical native soil. This is significant because soils with high organic content tend to retain TCE more strongly than other soils, making it somewhat more difficult to remove the TCE.

The TCE analytical soil results correlated well with the soil vapor results which indicate an irregularly-shaped source area of approximately 1.5 acres (see Figure 3). Test pits have shown that bedrock lies at a depth from 1.3 to 9.3 feet.

In addition, the investigation noted that the highest levels of soil contamination were associated with soils found within fractures at the top-of-bedrock zone. A sample collected from within a bedrock fracture near TP-13 had a TCE concentration of 550 ppm. It is possible that liquid TCE or soils saturated with TCE may be pooled in the fractures at the top-of-bedrock zone.

Two other contaminants, mercury and cyanide, were noted during the soil investigation. The analytical results are presented in Table 2. Analytical results indicated mercury concentration of 30 ppm in one test pit (TD-13, see figure 3), which is elevated above site background levels. Subsequent re-sampling of this location in 1994, did not confirm the mercury result. The source of the mercury contamination is unknown and is not reported to be associated with the derailment. It is believed that the elevated mercury contamination is an isolated occurrence and that the site average mercury concentration of 0.3 ppm found in subsequent sampling, represents site background concentrations. Therefore, mercury is not considered a contaminant of concern and will not be discussed further.

As discussed previously, it was reported that a solid form of cyanide was spilled during the train derailment. It is also reported that in 1971, the Lehigh Valley Railroad removed the spilled cyanide

TABLE 2

SUMMARY OF SOIL ANALYTICAL RESULTS

LEHIGH VALLEY DERAILMENT SITE

Operable Unit #2 (Surface Soils)

(all results in mg/kg or ppm)

Contaminant	Minimum	Maximum	Contaminant Average	Frequency[1]	Remedial Action Objectives
Trichloroethene	0.02	550	100	26/28	7.0
1,2-DCE (total)	ND	5.2	0.5	4/27	3.0
Mercury	0.1	30	7.9	1/4	0.30
Cyanide	ND	25.3	10.4	1/12	15.0

[1]Frequency: Number of samples which exceeded Remedial Action Ojectives (RAO) / Number of samples collected

DCE - dichloroethene

ND - not detected

Note: *The Remedial Action Objectives for TCE and DCE are determine using NYSDEC, Technical and Administrative Guidance Memorandum # 4046, "Determination of Soil Cleanup Objectives and Cleanup Levels". The RAO for mercury is based on site background concentrations and cyanide is based on the protection of groundwater resources.*

just after the spill. The average concentration of cyanide found in soils at the spill site was 12.2 ppm. The maximum soil concentration of 65 ppm was also found near TP-13 (the same location as the elevated mercury). The cyanide appears to be associated with soils found south of Gulf Road (see TP-11 and TP-13 of figure 3). This part of the spill site has shallow soil depths (0.5 - 1.5 ft to the top of the bedrock). The volume of soil contaminated with elevated levels of cyanide is expected to be minimal. The low frequency of detections and the relatively low concentration in the spill site soil indicate that cyanide is not a concern and will not be discussed further.

3.3 Summary of Human Exposure Pathways:

This section describes the types of human exposures which present potential health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Volume II of the RI Report.

An "exposure pathway" is the term used to describe how an individual may be exposed to a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Completed pathways which are known to exist or may exist at the site include:

Ingestion: Groundwater which comes into contact with spilled TCE in the soils and bedrock beneath the site becomes heavily contaminated and migrates away from the site to the east and southeast. Wells as far as three and one-half miles from the site have been contaminated at levels which exceed health-based standards for drinking water.

All wells known to produce contaminated water above the MCL of 5 ppb have been equipped with carbon filters, so this exposure pathway is currently incomplete. However, *future* exposure to contaminated groundwater in this area is likely if agricultural land is subdivided for residential development. New homes will require additional carbon filters which will require additional expense on the part of the builders and/or occupants. Based on likely future exposure pathways, the existence of the contaminated groundwater plume is considered an unacceptable health risk.

The exact boundaries of the TCE plume are difficult to define and are subject to change with time due to droughts, floods, or the installation of large pumping wells. Numerous domestic wells near the perimeter of the plume, which are currently uncontaminated, could become contaminated in the future as the result of these factors, either individually or in combination.

In addition, the downgradient edge of the contaminant plume has not been fully defined. It appears that some portion of the plume continues on eastward beyond Spring Creek, flowing beneath the Village of Caledonia. Caledonia has its own public water supply, and no bedrock wells are known to exist, so exposure to TCE in the bedrock aquifer in the Village is unlikely. However, if future development in the area east of the village results in bedrock wells being drilled, human exposure to contaminated groundwater could occur.

Without remediation, the groundwater ingestion exposure pathway is likely to persist indefinitely. Twenty-five years have passed since the spill took place, and contaminant levels in groundwater do not appear to be declining. This is because the source of contamination (the contaminated soils and bedrock in the NAPL Zone) are allowing very high concentrations of TCE to be released into the aquifer. There is no evidence that significant natural attenuation of the plume is taking place.

Based on the results of the Spill Site Soil Investigation, the spill site has soil concentrations of TCE in surface and subsurface soils that are acting as a continuing source of groundwater contamination above the environmental standards. Health hazards related to the ingestion of TCE contaminated groundwater are considered unacceptable and remediation of the site soils is required.

> **Inhalation:** Present and future uses of the site may pose a short-term threat to human health from the potential exposure to contaminated vapors and dust. Shallow and deeper soils in the source area are significantly contaminated. Present uses which may cause inhalation exposure include, utility and road maintenance, use of recreational vehicles (dirt bikes), and fossil collection. Future mining or residential development cannot be ruled out. Therefore, direct contact with contaminated vapors and dust both currently and in the future, cannot be ruled out and remediation of the site soil is required.
>
> **Direct contact:** Present and future uses of the site may pose a long-term threat to human health as a result of potential exposure to site soils. Present uses which cause direct exposure to site soils include, motorcycling, hunting, fossil collection and trespass. Further, future industrial or residential development cannot be ruled out. Therefore, direct contact with contaminated soils by the public both currently and in the future, poses an unacceptable threat to human health and remediation of the site soil is required.
>
> Direct contact with contaminated water (in a shower, bath, or pool) has been eliminated as described under "ingestion" above. Direct contact with TCE-contaminated bedrock in the subsurface would require mining the rock. Under current conditions, this is highly unlikely.
>
> Direct contact with surface water and sediments in Spring Creek and Mud Creek was evaluated during the RI/FS in the Human Health Risk Assessment. The risk from such exposures was determined to be very low, and this is not considered to be a significant risk factor.

3.4 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. A more detailed discussion of the potential impacts from the site to fish and wildlife resources can be found in the Wildlife Impact Assessment in the RI Report.

Significant Habitat: Presently there are no identified sensitive habitats or endangered species located at the spill site. There is the possibility of direct contact to contaminated soil by wildlife species. However, the spill site surface is characterized by fill, gravel, a county road and the remains of the Knickerbocker Motel. The habitat on and around the spill site is considered minimal.

The following pathways for environmental exposure have been identified:

Aquatic organisms in Mud Creek are exposed to TCE-contaminated water discharged into the creek from springs located north of the falls. However, the contaminated water issuing from the springs is quickly diluted, and TCE concentrations fall as a result. The maximum TCE concentration in creek water (encountered at the inlet to a pond located immediately downstream of the contaminated springs) was 29 ppb. Although this is higher than the NYSDEC guidance value for protection of human health from ingesting fish (11 ppb), it is far below the value calculated on the basis of protecting the aquatic organisms themselves (1217 ppb). Furthermore, the physical size of the contaminated zone represented by this sample is quite small. The next sampling location downstream contained 6 ppb, which meets the guidance value. The RI concluded that the contaminated springs do not discharge enough TCE-contaminated water to constitute a threat to aquatic life, either in Mud Creek or farther downstream in Oatka Creek.

Aquatic organisms in Spring Creek, three miles east of the site, are also exposed to TCE in surface water. The NYSDEC fish hatchery in Caledonia uses water from Spring Creek for its fish propagation operations. On the whole, TCE concentrations in the Spring Creek springs are lower than those in Mud Creek springs; however, one intermittent spring (location SPR-21) near Mackay Park in Caledonia contained 1900 ppb TCE during the April 1994 sampling event. This spring only flows during high water conditions, and subsequent efforts to resample and confirm the original results have been unsuccessful. As is the case in Mud Creek, TCE concentrations in the main body of the stream fall off sharply with distance from the springs.

With the exception of SPR-21, all samples of spring water collected in the Spring Creek area have had TCE concentrations well below the 1217 ppb calculated guidance value. This, combined with the absence of reported ill effects on the NYSDEC fish hatchery, supports the RI's conclusion that TCE levels in Spring Creek water do not constitute a threat to aquatic organisms.

Similar analyses of contaminated **sediments** in Mud Creek and Spring Creek lead to the conclusion that the sediments are not a threat to aquatic life. The RI derived a calculated value of 5458 ppb TCE in sediments for protection of aquatic organisms. No sediment sample from Mud Creek or Spring Creek exceeded this concentration.

A more stringent sediment criterion of 46 ppb was calculated for protection of human health from possible bioaccumulation of TCE in the food chain. One sediment sample in each drainage basin exceeded this value. In Mud Creek, sample SED-2 contained 71 ppb TCE. However, this sample location is in a portion of Mud Creek which dries out during the summer months and thus cannot be considered as a viable aquatic habitat. In Spring Creek, a sample collected from a ponded area near Mumford (SED-14) contained 170 ppb TCE. This location has been resampled four times subsequently and no TCE has been detected. The NYSDEC has concluded that the first sample does not represent an extensive area of TCE-contaminated sediment.

In summary, no significant wildlife impacts resulting from the Lehigh Valley Derailment site have been identified.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at the site. This may include past or present owners and operators, waste generators, and haulers.

One PRP for the site has been documented so far:

Lehigh Valley Railroad (and corporate successors).

Other parties may also be classified as PRPs as defined by federal and state Superfund law. The search for other PRPs is continuing.

The identified PRP choose not to implement the RI/FS at the site when requested by the NYSDEC. After the remedy is selected, the PRPs (and any others identified subsequently) will again be contacted and asked to implement the remedial program. If an agreement cannot be reached with the PRPs, and the site is not listed on the federal NPL, the NYSDEC will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the State for recovery of all costs the State has incurred in conducting this project.

SECTION 5: SUMMARY OF THE REMEDIATION GOALS & OBJECTIVES

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR 375-1.10. The overall remedial goal is to protect human health and the environment and meet all standards, criteria, and guidance (SCGs) to the extent practicable.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to the public health and the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remedial action goals selected for this site include:

Provide for attainment of SCGs for groundwater quality and surface water quality at the limits of the area of concern, to the extent practicable.

Prevent, to the extent possible, migration of contaminants in groundwater and reduce the impacts of contaminated groundwater to the environment.

Reduce, control, or eliminate, to the extent practicable, the soil and bedrock contamination present at the derailment site.

Eliminate the potential for human and wildlife exposure to soil containing site related contaminants.

Contain, treat and/or dispose of contaminated soil in a manner consistent with applicable state and federal regulations and guidance.

5.1 Remedial Action Objectives

For Operable Unit #1 (Groundwater) the remedial action objective (RAO) is based on the goal of attaining SCGs for groundwater quality, to the extent practicable. The NYSDEC Water Quality Regulations for Surface Water and Groundwater (6 NYCRR Parts 700-705) provide the objectives for groundwater and surface water remediation. Although surface water contamination above the SCG (11 ppb for surface water) is present at the site, this is a result of the groundwater contamination. Thus, any remedial measures which achieve SCG's for groundwater would indirectly do the same for surface water. The following table lists the RAOs for the groundwater operable unit.

REMEDIAL ACTION OBJECTIVES
FOR OPERABLE UNIT #1 (GROUNDWATER)

Media	Remedial Action Objective (ppb)

Trichloroethene concentration in:	
Groundwater	5
Surface Water	11

Note: *Objective is based on NYSDEC, Division of Water, Technical and Operational Guidance Series, # 1.1.1, "Ambient water Quality Standards and Guidance Values".*

For Operable Unit # 2 (Surface Soils) two environmental problems were considered in determining soil remedial action objectives. First, the soils must be cleaned up to the point that they will no longer contribute significantly to the contamination of groundwater. Second, the soils must not constitute a health threat to people who come into direct contact with them. At this site, the soil cleanup objectives for groundwater protection turned out to be more stringent than the objectives for direct contact. The following table lists the RAOs for the soil operable unit.

REMEDIAL ACTION OBJECTIVES
FOR OPERABLE UNIT #2
(SURFACE SOIL)

Contaminant	Remedial Action Objective (ppm)
Trichloroethene (TCE)	7.0
1,2-dichloroethene (DCE)	3.0

The soil objectives are based, in part, on NYSDEC, Division of Environmental Remediation, Technical and Administrative Guidance, #4046, "Determination of Soil Cleanup Objectives and Cleanup Levels". The guidance uses partitioning theory and the organic carbon content of the soil. The objectives are calculated using a site wide average organic carbon content of 9.6% The cleanup guidance uses theoretical models which predict the amount of TCE that will leave the contaminated soil as leachate and contribute to groundwater contamination. Therefore, the RAOs developed for the site provide for protection of the groundwater resource.

The partitioning theory calculations include several assumptions such as the actual extent of dilution and other attenuation mechanisms as well as determining a soil total organic carbon value that is truly representative of the site. Examining these assumptions results in a cleanup range for TCE from approximately 1.5 pprn to 7.0 ppm for TCE. After considering this range and the results of a cost-benefit sensitivity analysis, the Department has concluded that the additional costs associated with removing contamination to the low end of the range would not be commensurate with the environmental benefits that would be achieved. In particular, it is likely that residual contamination left in bedrock would mask the benefits achieved by remediating soils to low levels.

Therefore, based on a soil cleanup goal of 7.0 ppm and assuming the soil is contaminated all the way to the top-of-rock, the volume of contaminated soil is estimated to be 10,000 cubic yards.

A more detailed discussion of the development of the RAOs is found in the feasibility study.

Sediment samples in exceedance of SCGs are present in limited areas of both Mud Creek and Spring Creek. However, no significant human health risk was identified and the Fish and Wildlife Impact Analysis presented in the RI report concluded that this contamination does not adversely affect wildlife.

Thus, no remediation is necessary for sediments.

The RAOs represent groundwater, surface water and soil concentrations which are considered protective of public health both via direct contact with contaminated media and prevent further contaminated of groundwater and surface water resources.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other laws and utilize permanent solutions, alternative technologies, or resource recovery technologies to the extent practicable. Potential remedial alternatives for the Lehigh Valley Railroad Derailment site were identified, screened and evaluated in a Feasibility Study. For Operable Unit # 1 (Groundwater), this evaluation is presented in the report entitled **"Feasibility Study, Lehigh Valley Derailment Site," dated February 1997.** For Operable Unit #2 (Surface Soils), the remedial alternatives were identified, screened and evaluated in a two phase FS. This evaluation is presented in the report entitled **"Lehigh Valley Railroad Derailment, Feasibility Study, Operable Unit #2 (Surface Soils)," dated February 1997.**

6.1: Evaluation of Technologies

At many sites, it becomes apparent early in the feasibility study process that only a few alternatives for cleaning up the site warrant serious consideration. The complexity and size of this site made it difficult to narrow the range of alternatives to a reasonable number. The following pages discuss several technologies and approaches that were evaluated before creating the six alternatives evaluated in detail in Section 6.2. The following discussion also includes descriptions of components common to several of the alternatives in Section 6.2.

Operable Unit #1 (Groundwater)

For Operable Unit #1 (Groundwater), the evaluation of alternatives is presented in the report entitled **"Feasibility Study, Lehigh Valley Derailment Site," dated February 1997**The FS identified, screened and evaluated a number of potential remedial alternatives. In general, the FS for OU #1 looked at three major remedial components. First, is the appropriate way to provide safe drinking water to all impacted residents. Second, ways to address the source area contamination (DNAPL in bedrock) was considered. And third, ways to intercept the groundwater plume were considered. A more detailed discussion of the evaluation process is presented in the Feasibility Study Report for Operable Unit #1 (Groundwater) and is summarized below.

<u>Safe Drinking Water:</u>

To provide a safe supply of drinking water to impacted residents, a number of alternatives were evaluated in the FS. The alternatives evaluated included maintaining the present carbon filtration systems on private wells (also known as point-of entry or POE systems) and a number of possible scenarios to extend public water supplies to impacted residents. A public water supply extension provides the highest degree of assurance of an adequate safe drinking water supply. But due to the rural nature of the area (only 38 impacted wells in a 3.5 square mile area) and the high cost associated with installation of a water line in this area (the shallow depth to bedrock would require blasting of trenches to lay the pipe) the cost of constructing a water line extension to all impacted residence is expensive. As such, cost becomes an important consideration in evaluating the appropriate remedial response. Just maintaining the existing carbon systems has a present worth cost of over $2 million dollars.

Because of the high costs associated with waterline extensions in the impacted area, a cost analysis of a number of possible scenarios was evaluated. The alternatives evaluated included two scenarios in which only part of the impacted area was provided a waterline extension and three variations of an all encompassing waterline extension which would hookup all impacted residents. These three comprehensive waterline scenarios include, 1) no provisions for fire flow, 2) providing fire flow for current usage, and 3) providing system upgrades necessary for future potential development of the area.

Fire protection requires a number of system upgrades such as fire hydrants, pump stations, and storage tanks. This increases the cost of a waterline extension. Providing fire flow for future development includes additional system upgrades including replacing existing waterlines with larger diameter pipe, increasing the size of pump stations and adding storage tanks. Constructing a waterline extension for potential future development may be highly desirable but is not necessary to protect human health from the contaminated groundwater, nor is it cost effective.

Public water supply has several other advantages which do not directly relate to the remediation of the Lehigh Valley Derailment Site and thus were not considered in the analysis of alternatives for this project. For example, other sources of groundwater contamination (especially bacterial contamination from inadequate septic tanks or improperly controlled barnyard wastes) are known to exist in the area. Several homes along Church Road have been subject to a "boil water" advisory for several years due to bacterial contamination of their well water. If these residents are connected to a public water supply, it would be effective in eliminating health risks resulting from these conditions. However, State Superfund monies can not be used to hook up homes that are not impacted by TCE.

NYSDEC completed a Focused Feasibility Study in 1994, examining the possibility of connecting all or part of the area to public water supplies. Public water supplies already exist at the outer edges of the groundwater plume in the Villages of LeRoy and Caledonia. The Monroe County Water Authority (MCWA) serves the hamlet of Mumford and has the capacity to supply the entire area. The MCWA would be the most likely source of water for a public water supply system for the area of contaminated groundwater. Details regarding the routing of public water lines and estimated costs can be found in the Feasibility Study Report, dated April, 1994 and February 1997.

The various public water line extension scenarios ranged in present worth cost from $2.5 million to $6.6 million depending of the length, the aerial coverage of the water line extension, and the degree of system upgrades.

For the purpose of this document, four potential scenarios were carried on for further evaluation as common elements to provide safe drinking water. These include maintaining the present carbon systems and three public water line scenarios. Figure 4 presents the approximate locations of the water line extensions.

If the local municipalities or authorities consider funding public water supply hookups beyond those selected in this document, or would like to fund system upgrades beyond those selected in this plan, the NYSDEC would be willing to work jointly with these groups on the scope the project.

Source Area Contamination:

To address the source area bedrock contamination, the FS evaluated a number of possible remedial actions including, *vapor extraction, air sparging, air sparging with ozone, and quarrying the source area.* The remedial technologies proposed for the source area are modifications of technologies widely employed at other sites.

Vapor extraction is recognized as a highly efficient technique for remediating volatile organic compounds (VOC's) from soil but has not been applied to a bedrock system in New York State. Because of the high permeability of the bedrock fractures under the site, bedrock vapor extraction should work effectively to remove TCE if the extraction points are installed in the proper locations. Also, to increase the effectiveness of a bedrock vapor extraction system, groundwater pumping wells could be installed to lower the water table and expose more bedrock to the effects of the vapor extraction system.

Air sparging is now commonly applied to increase the effectiveness of groundwater remediation. Application of these technologies to contaminated bedrock has not been reported. Because of the difficulty in identifying and locating fractures in the bedrock, the possibility exists that air injected by the sparging system could escape capture by the vapor extraction system. A contingency would need to be built into the system, allowing for expansion of the vapor extraction system to include any area where such leakage was occurring.

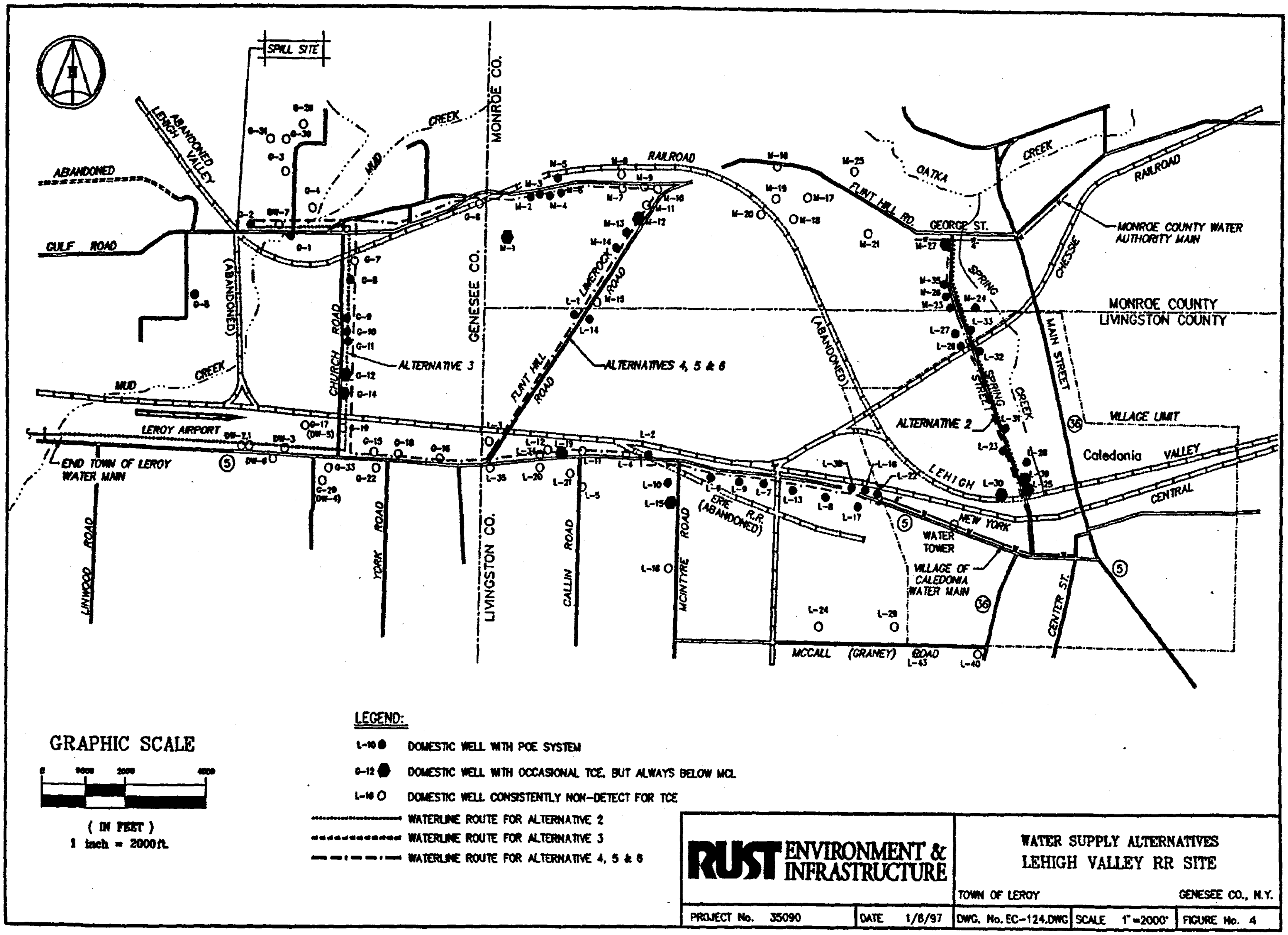
Sparging with ozone has been reported recently in the engineering literature for subsurface soils, but not in contaminated bedrock. It would be important to control the migration of ozone gas in a bedrock system, since ozone is a highly reactive gas and a strong irritant. Migration through fractures in the rock could allow ozone to escape capture by the vapor extraction system, leading to possible exposure of nearby residents. Engineering controls are available to address this issue.

The *quarrying of contaminated bedrock* has not, to NYSDEC's knowledge, been attempted elsewhere. All of the component technologies (mining methods, stockpiling and treatment, etc.) have been used elsewhere, but apparently not in the combination considered here. Significant administrative and legal issues would need to be resolved. Although the Onondaga limestone bedrock in the NAPL zone is a valuable mineral commodity, it is not entirely certain that a market could be found for stone from a known hazardous waste site, even if decontaminated. The NAPL zone encompasses several parcels of land, two of which are owned by competing mining companies. The question of who would have responsibility for operation of the plant and liability for the treatment system, would be a complex legal issue.

Based on the detailed analysis in the FS, the selected remedy to address DNAPL contamination in the bedrock is vapor extraction. Vapor extraction is a demonstrated technology for addressing VOCs and does not have some of the serious implementation difficulties as the other approaches,

Bedrock quarrying has the uncertainties of marketing of decontaminated stone products and some serious administrative/ legal difficulties. Air sparging and air sparging with ozone present implementability problems in controlling the migration of air and/or ozone injected into the ground.

Therefore, bedrock vapor extraction and groundwater collection and treatment were carried on for further evaluation as a common element to address the bedrock source contamination.


SPILL SITE
ABANDONED LEHIGH VALLEY
ABANDONED
GULF ROAD
(ABANDONED)
MUD CREEK
LEROY AIRPORT
END TOWN OF LEROY WATER MAIN
LINWOOD ROAD
CHURCH ROAD
ALTERNATIVE 3
YORK ROAD
MONROE CO.
GENESEE CO.
LIVINGSTON CO.
RAILROAD
FLINT HILL ROAD
LIMEROCK ROAD
ALTERNATIVES 4, 5 & 6
CALLIN ROAD
MCINTYRE ROAD
ERIE R.R. (ABANDONED)
(ABANDONED)
FLINT HILL RD.
GEORGE ST.
OATKA CREEK
SPRING CREEK
SPRING STREET
ALTERNATIVE 2
LEHIGH VALLEY
NEW YORK CENTRAL
WATER TOWER
VILLAGE OF CALEDONIA WATER MAIN
MCCALL (GRANEY) ROAD
MONROE COUNTY WATER AUTHORITY MAIN
CHESSIE RAILROAD
MONROE COUNTY
LIVINGSTON COUNTY
MAIN STREET
VILLAGE LIMIT
Caledonia
CENTER ST.
GRAPHIC SCALE
(IN FEET)
1 inch = 2000ft.
LEGEND:
DOMESTIC WELL WITH POE SYSTEM
DOMESTIC WELL WITH OCCASIONAL TCE, BUT ALWAYS BELOW MCL
DOMESTIC WELL CONSISTENTLY NON-DETECT FOR TCE
WATERLINE ROUTE FOR ALTERNATIVE 2
WATERLINE ROUTE FOR ALTERNATIVE 3
WATERLINE ROUTE FOR ALTERNATIVE 4, 5 & 6
RUST ENVIRONMENT & INFRASTRUCTURE
WATER SUPPLY ALTERNATIVES
LEHIGH VALLEY RR SITE
TOWN OF LEROY
GENESEE CO., N.Y.
PROJECT No. 35090
DATE 1/8/97
DWG. No. EC-124.DWG
SCALE 1"=2000'
FIGURE No. 4

The conceptual design for this alternative would consists of approximately 180 vertical wells in the NAPL zone. Suction would be applied to each well to draw air through the dry bedrock. Vapors recovered from the wells would be treated to remove TCE and then discharged to the atmosphere.

Deeper wells would also be installed in the NAPL Zone to pump groundwater to the surface for treatment. Although some TCE would be removed from the ground by *pumping and treating groundwater*, the primary purpose of these water wells would be to lower the water table, exposing more rock to the effects of the vapor extraction system.

Although vapor extraction is likely to succeed in removing a large proportion of the TCE from the NAPL Zone, complete removal of TCE from this area is unlikely. The USEPA has estimated that, in general, recoveries approaching 50% of the spill NAPL in a bedrock system is about the best one can obtain. This is because some of the TCE has probably been absorbed into small crevices and into the rock itself, where it would not be readily reached by flowing air. Provisions are included for future evaluation of fracture enhancement and lowering of the water table by pumping in the NAPL Zone to enhance air flow through unfractured portions of the bedrock. This would only be undertaken if ordinary operation of the vapor extraction system was not meeting its cleanup targets.

Interception of the Plume:

Three possible approaches for capturing the groundwater plume before it passes Church Road were evaluated in the FS. The three related alternatives differ in how they seek to ensure complete capture. These approaches are, 1) vertical wells installed in a blasted bedrock interceptor trench; 2) a row of vertical wells enhanced by hydrofracturing; and 3) a series of horizontal wells. The degree of sophistication required to completely capture the plume has not yet been determined. In all three cases, further investigative work would be required during the design phase to more precisely define the pumping well locations and pumping rates. Due to the high degree of interconnection between bedrock fractures and bedding planes, a simple row of wells along a line west of Church Road may be sufficient to completely capture the plume. However, the volume of water flowing through this zone, especially during spring flooding, is likely to be quite large. Thus, a conservative assumption has been made that additional measures would be required to ensure that all bedrock fractures would be intercepted.

As noted in Section 3, most of the contaminated groundwater leaving the site appears to pass through a zone roughly 800 feet wide near monitoring well cluster DC-7R. A second zone may exist farther to the north, near the Church Road/Gulf Road intersection. The narrowness of this zone (or zones) presents an opportunity to capture the plume before it broadens out into the main body of the aquifer.

All three alternatives are designed to capture the plume at this narrow point by pumping groundwater and treating it to remove the TCE. If the plume is successfully captured, input of TCE-contaminated water into the main body of the aquifer would cease. Since groundwater flow through this aquifer is quite rapid, clean water should flush the aquifer within a period of several years. The geographic extent of the TCE plume and the TCE concentrations at each contaminated well would be expected to decrease rapidly.

This system may need to remain in operation indefinitely to maintain its protective effects. By itself, the interception of the groundwater plume as it leaves the spill site would not clean up the NAPL zone in the bedrock which is one of the sources of the contamination. Consequently, bedrock source control and some type of mechanism to provide a safe drinking water supply to impacted residents would be required.

For comparison purposes, it has been assumed that the interceptor system must capture all of the shallow groundwater flow along a 2,500 foot-long line connecting the known flow zone near well cluster DC-7R and the suspected second zone near the Church Road/Gulf Road intersection. This is a highly conservative assumption--the actual size of the pumping system is likely to be smaller (and less costly).

Therefore, a row of vertical pumping wells installed in a blasted bedrock trench was carried on for further evaluation as a common element to address plume containment.

Operable Unit #2 (Surface Soil)

For Operable Unit #2 (Surface Soils), the remedial alternatives were identified, screened and evaluated in a two phase FS. This evaluation is presented in the report entitled **"Lehigh Valley Railroad Derailment, Feasibility Study, Operable Unit #2 (surface soils)," dated February 1997.** The goal is to mitigate two primary environmental health concerns. First, contaminated soil at the site is acting as a continuing source of surface water and groundwater contamination and second, the contaminated surface soil poses a threat to public health through direct exposure to contaminated soil, dust, and vapor.

Capping or *containment* of the contaminated soil was removed from consideration in the early stages of the FS. Capping, and the associated administrative controls necessary to protect the cap, would reduce the potential for direct human exposure to contaminated soil. But capping would not adequately protect groundwater resources because containment would not isolate site contamination from the groundwater. The hydrogeologic investigation indicates that the rise and fall of the groundwater table is significant and independent of infiltration of rain water at the spill site. If left in place untreated, TCE, being both toxic and mobile, would continue to present a significant threat to the human health and the environment. Finally, capping could possibly hinder future remedial efforts to address the bedrock contamination. Therefore, capping or containment was removed from consideration in the early stages of the FS. The FS then focused on treatment of the principle threat, TCE contaminated surface and sub-surface soil.

Following guidance prepared by the USEPA, the NYSDEC determined that the site was appropriate for development of "*Presumptive remedies.*" Presumptive remedies are preferred technologies for common categories of waste sites which and are based on historic patterns of remedy selection and scientific/engineering evaluation of technology performance data. One category of sites appropriate for presumptive remedies is soils contaminated with volatile organic compounds (VOCs). TCE is considered a VOC. The presumptive remedies evaluated included *soil vapor extraction (both in-situ and ex-situ), low temperature thermal desorption and incineration.* One important aspect evaluated in the FS was if the contaminated soil could be effectively treated in-place (known as in-situ treatment) or if it would be better to excavate the contaminated soil and treat it above ground (ex-situ treatment).

As mentioned above a presumptive remedy commonly used to treat VOC contaminated soil is *In-situ Soil Vapor Extraction.* Though effective at treating VOCs contaminated soil, site conditions would make implementation of this technology difficult. The shallow depth to bedrock could short-circuit air from the surface and impede remediation. Further, as discussed in Section 4, potentially highly contaminated soil (and possibly residual pure product) is found in the top-of-rock fractures. It is questionable whether the in-situ vapor extraction points could be placed in the appropriate fractures. If untreated, highly contaminated soil within bedrock fractures at the top-of-rock zone would continue to act as a source of groundwater and surface water contamination and could impede any future groundwater remediation. Since concerns regarding the effectiveness of in-situ technologies could not be ruled out, only alternatives which include excavation and cleaning of the bedrock surface are considered viable. All of the remaining remedies include excavation of site soils, removal of a portion of Gulf Road, and cleaning of the top of the bedrock surface.

With the elimination of in-situ treatment, the remaining presumptive remedies to address the excavated VOC contaminated soil were *soil vapor extraction, low temperature thermal desorption and incineration (both on-site and off-site).* Because all of these alternatives involved excavation and treatment of the TCE contaminated soil, they were all considered equally protective of the environment and human health. They all were considered implementable, feasible, and had similar degrees of short and long term potential impacts.

Because all of the alternatives provided equal performance, cost became the critical evaluation criteria. The present worth cost of the remaining alternatives was evaluated in the FS. In general, *ex-situ soil vapor extraction* had the lowest present worth cost but would require two years to complete the remedy. On-site *low temperature thermal desorption* was more expensive but could be completed in one construction season. The two incineration alternatives (either on-site or off-site) had significantly greater costs.

Therefore, both ex-situ soil vapor extraction and low temperature thermal desorption were carried on for further evaluation.

The conceptual design to address the contaminated surface and subsurface soils includes excavation of contaminated soil and cleaning of the bedrock surface. It is anticipated that Gulf Road would be closed for one construction season (about 6 months).

Soils and any debris excavated would be reduced to a uniform size by mechanical methods in an enclosed structure to control release of VOC vapors. The soils would be transferred to on-site vacuum extraction piles or to a low temperature thermal desorption unit. All extracted vapors and any water collected would be properly managed to meet appropriate requirements. The emissions would be monitored to determine if vapor treatment was necessary.

6.2: Description of Alternatives

A summary of the detailed analysis follows. As used in the following text, the time to implement reflects only the time required to construct the remedy, and does not include the time required to design the remedy, procure contracts for design and construction, or to negotiate with responsible parties for implementation of the remedy.

Two common elements appear in most of the alternatives. The first addresses the TCE contamination at the former spill site. For the purpose of this document, source area remediation consists of bedrock vapor extraction and groundwater pump and treat to address the DNAPL bedrock zone and excavation and ex-situ treatment of contaminated surface and subsurface soils. In the following description of the alternative, this will be noted as *source area control.*

The second common element addresses preventing the TCE, contaminated groundwater from migrating to the east. This would consist of a series of vertical pumping wells installed in a blasted bedrock trench which would be installed just west of Church Road. In the following description of the alternatives, this hydraulic containment of the plume will be noted as *plume interception.*

Alternative #1: No Action - Continued Monitoring

Present Worth:	$1,993,000
Capital Cost:	$ 42,000
Annual O&M:	$ 127,000
Time to Implement	1 years

The no action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring and maintenance only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment. However, due to the requirement for continued monitoring and maintenance of the point-of-entry (POE) home water treatment units, the cost of this option is not zero.

Alternative #2: Spring Street Waterline; POE for other Impacted Residents; Source Area Control; Plume Interception

Present Worth:	$ 12,740,000
Capital Cost:	$ 8,626,000
Annual O&M:	$ 439,000
Time to Implement	5 years

This alternative proposes extension of *Monroe County Water Authority (MCWA) water lines along Spring Street from Mumford to Caledonia* and would allow for the connection of about 11 contaminated wells, almost one-third of the total. The approximate alignment of this proposed extension is shown on Figure 4. Because of the closer spacing of homes in this area and easier excavation (little bedrock blasting should be necessary), the estimated unit costs are lower than the other water line extension scenarios.

As a *source control measure*, this alternative would include a *bedrock vapor extraction* system in the NAPL zone. Deeper wells would also be installed in the NAPL Zone to pump groundwater to the surface for treatment. The primary purpose of these *groundwater pumping wells* would be to lower the water table, exposing more rock to the effects of the vapor extraction system.

To address the contaminated surface and subsurface soils, an above ground (ex-situ) soil *vapor extraction system* would be constructed. Contaminated soil would be excavated and the bedrock surface would cleaned. It is anticipated that Gulf Road would be closed for one construction season (about 6 months)

This alternative calls for a blasted interceptor trench to *intercept the plume.* All blasting would be conducted well outside the NAPL zone to ensure that NAPL is not mobilized and allowed to migrate. This would offer a double layer of protection: in the short term, migration of contaminated groundwater into the aquifer would be eliminated by installation of a *plume interception system* west of Church Road. Once that system was operational and its effectiveness had been verified, then a long-term remediation of the NAPL source area would begin. If the plume capture system's effectiveness was not clearly demonstrated, then NAPL zone remediation would not be attempted.

As an additional precautionary measure, t he point of entry (POE) carbon treatment systems installed in homes would continue in operation until the Spring Street waterline extension is in place and the effectiveness of the interceptor system and the vapor extraction systems had been verified. For cost estimation, it has been assumed that continued monitoring and maintenance of the carbon filter systems would be required for ten years. POE systems on Church Road would be monitored more closely during the period when NAPL-zone remediation is underway, because these wells are located close to the plume capture system.

Alternative #3: Church/Gulf Road Waterline; POE for other Impacted Residents; Plume Interception; Source Area Control

Present Worth: .... $ 13,379,000
Capital Cost: .... $ 9,187,000
Annual O&M: .... $ 449,000
Time to Implement .... 5 years

This alternative is similar to alternative #2 except for the proposed aerial coverage of the public water supply extension. Interception of the plume and source area control are the same as described in alternative #2.

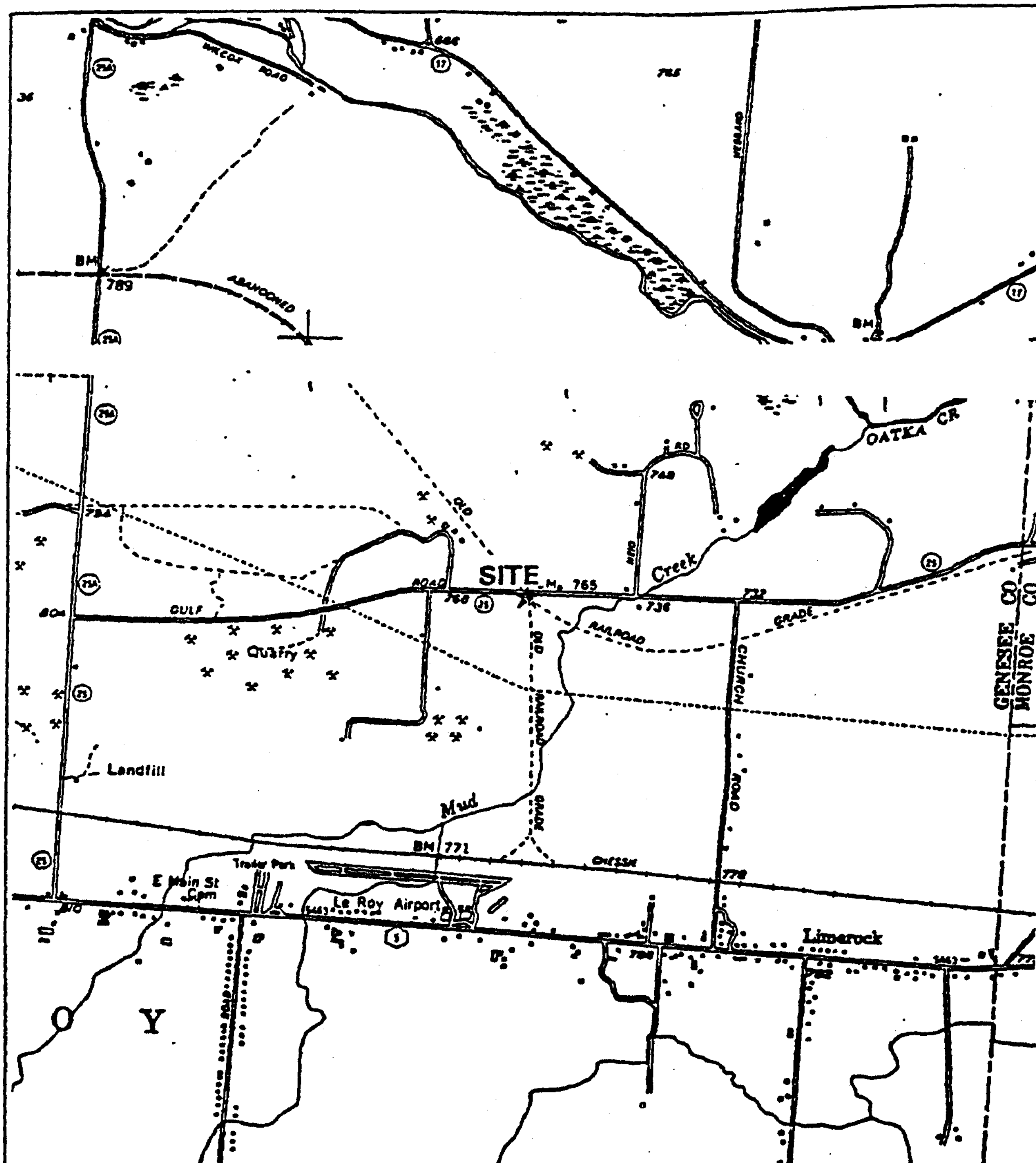
This alternative proposes extension of public *water supply lines from the Town of LeRoy Water District.* The approximate alignment of this proposed extension is shown on Figure 4. The water lines would be installed west along Route 5 to Church Road, north along Church Road to Gulf Road, and west along Gulf Road to the home closest to the spill site. This would allow for the connection of about 6 homes with contaminated wells. This scenario allows for the hook up of the most heavily contamination private homes and mitigates any potential concerns of de-watering of these private wells when the *plume interception system* is operated. Because of the spacing of homes in this area and high construction costs (bedrock blasting would be necessary to install the water supply lines), the estimated costs are high when compared on a per home basis.

Alternative #4: Large Scale Waterline with No Provisions for Fire Protection; Source Area Control

Present Worth: .... $ 12,531,000
Capital Cost: .... $ 10,703,000
Annual O&M: .... $ 346,000
Time to Implement .... 5 years

Under Alternative 4, water lines would be extended to all homes with contaminated wells The water supply extension would be installed **without provisions for fire protection**. Although the hookups would be provided free of charge to the contaminated homes, monthly water bills would be the responsibility of the homeowners. Existing POE carbon filter systems would be removed. Other homeowners along the route of the water lines would be offered the opportunity to connect for a fee.

Because of the shallow depth to bedrock (which requires blasting in order to excavate a trench for the water pipes) and the long distances between homes, the estimated construction costs are quite high.



Site Location Map

819014 Lehigh Valley Railroad Derailment

NYSDOT Planimetric Quadrangle(s):
CHURCHVILLE, LE ROY

N

0 500 1000 1500 2000
FEET

Scale 1:24,000
March 23, 1996

Figure 1

To address the source area, alternative #4 would include the source *area control* described in alternative #2. Although this alternative would remove potential human exposure to contaminated groundwater, it would not address the groundwater contamination itself. Even with source control the residual contamination would remain in the NAPL zone indefinitely, and contaminated groundwater would continue to flow from the source area through the aquifer.

Environmental exposure to contaminated groundwater could still occur if new wells were drilled in the area, or if the plume changed position due to drought, flooding, or heavy pumping. The springs along Mud Creek and Spring Creek would continue to discharge contaminated water to the creeks.

Alternative #5: Large Scale Waterline with Provisions for Current Fire Flow Demand Detailed Pilot Study; Source Area Control

Present Worth:	$ 11,193,000
Capital Cost:	$ 9,822,000
Annual O&M:	$ 241,000
Time to Implement	5 years

This alternative is similar to alternative # 4 but the water line extension component is upgraded to provide for current fire flow demand and includes a *pilot study* to evaluate the cost and technical feasibility of the plume interception and groundwater pump & treat in the NAPL zone.

Source control would be similar to that described in alternative #2. The soil remedy would still be excavation and ex-situ soil vapor extraction and the bedrock remedy would still include bedrock vapor extraction. However, there would be no provisions to lower the watertable by groundwater pumping. Present site characterization data indicates that the majority of the DNAPL contamination in the bedrock is above the watertable for most of the year. Therefore, it appears cost effective to install a bedrock system which would target this unsaturated zone. However, this assumption needs to be clarified in the design phase and additional work is proposed in the Detailed Pilot Study, see below.

Detailed Pilot Study: The degree of sophistication required to completely capture the plume has not yet been determined. Due to the high degree of interconnection between bedrock fractures and bedding planes, pumping wells may not be sufficient to completely capture the plume. Further, the volume of water flowing through this system, especially during spring flooding, is likely to be quite large. At present, it does not appear cost effective to collect and treat this large volume of water. Further investigative work would be required during the design phase to more precisely define the technical practicability and the cost of pumping groundwater. It is possible that the actual size of the pumping system is likely to be smaller (and less costly) than proposed in alternative #2.

The pilot study would also verify the design criteria for the other aspects of the source remediation (both the ex-situ soil vapor extraction system and the bedrock vapor extraction system). Any uncertainties identified during the RI/FS would be resolved.

Alternative #6: Large Scale Waterline with Future Potential Fire Flow Demand; Plume Interception; Source Area Control

Present Worth:	$ 17,228,000
Capital Cost:	$ 14,698,000
Annual O&M:	$ 387,000

Time to Implement . . . . 5 years

This alternative represents the most complete approach to eliminating future human exposure to contaminated groundwater but is also the most expensive. This alternative builds on alternative 2 and 5, with the addition of measures to deal directly with the groundwater plume and provides fire protection upgrades for the water supply extension which are designed for future potential development of the area. Source remediation would be the same as described in alternative #2.

This alternative would offer a double layer of protection. First, all impacted residents would be provided public water by a waterline extension which includes upgrades necessary to provide for future development. Secondly, the migration of contaminated groundwater into the aquifer would be eliminated by installation of a plume interception system west of Church Road as described in Alternatives 2. Once that system was operational and its effectiveness had been verified, then a long-term remediation of the NAPL source area would begin.

6.3 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. <u>Compliance with New York State Standards, Criteria, and Guidance (SCGs)</u>. Compliance with SCGs addresses whether or not a remedy would meet applicable environmental laws, regulations, standards, and guidance.

In this case, the principle SCGs of interest pertain to the presence of TCE in water. The principle SCGs are the groundwater and drinking water standards. The NYSDOH has set a Maximum Contaminant Limit (MCL) of 5 ppb TCE in drinking water. This same limit is applied by NYSDEC for ambient groundwater, in order to protect the use of groundwater as drinking water.

For Operable Unit #2, the principle SCG is levels of TCE in soil which would be protective for both direct human contact to contaminated soil and protection of groundwater resources. At this site, the soil cleanup objectives for groundwater protection are more stringent than the objectives for direct human contact. Based in part on guidance prepared by the NYSDEC, and cost sensitivity, the soil cleanup goal for TCE in soil is 7.0 ppm.

All of the alternatives meet the SCG for safe drinking water by providing either continued maintenance of point-of-entry (POE) carbon filter systems, public water supply extensions, or a combination of the two.

Alternative #1 (No Action-Continued Monitoring) provides for continued maintenance of the POE carbon filter systems, and thus satisfies SCG for drinking water. However, alternative #1 does not address the source area contamination. Contaminated soil and bedrock would continue to act as an ongoing source of groundwater and surface water contamination. Groundwater would continue to have TCE levels which exceed The SCGs.

Neither alternative #1 (No Action - Continued Monitoring) nor alternative #4 (Large Scale Waterline Extension; Source Control) offer protection for groundwater itself, which would continue to be contaminated above SCGs over a broad area of at least three square miles indefinitely. Likewise, the surface water contamination in the springs along Mud Creek and Spring Creek would not be addressed.

Meeting SCG's for groundwater in the main body of the aquifer might be achieved by controlling the amount of TCE which leaches from the NAPL zone and enters the aquifer. Alternatives #2 (Spring Street Waterline; Plume Interception; Source Control), #3 (Church/ Gulf Road waterline; Plume Interception; Source Control) and #6 (Large Scale Waterline; Plume Interception; Source Control) provide for plume interception which controls or eliminates the input of TCE contamination. Because of the very large size of the TCE plume (over three square miles), directly remediating the plume is not considered practicable.

Alternative #5 (Large Scale Waterline; Pilot Test; Source Control) includes an evaluation of plume interception but does not actually include that component as do alternatives #2, 3, and 6.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

All alternatives, including alternative #1 (No Action - Continued Monitoring), would protect human health directly by eliminating direct human exposure to contaminated groundwater. This would be achieved either through continued operation of POE carbon filter systems, public water supply extensions, or a combination of both. However, alternative #1 does not address the potential for direct human contact with contaminated surface soil.

Potential future exposures could still occur, however, under Alternatives #1 (No Action - Continued Monitoring), #2 (Spring Street waterline; source control; plume interception) and #3 (Church/Gulf Road waterline; source control; plume interception). Builders and occupants of new homes would need to be notified of the potential for contaminated groundwater and provide their own filtration systems if the plume is not remediated. Furthermore, the geographic position of the plume may change in the future if large amounts of groundwater are pumped in the area or if drought or flood conditions develop.

The alternatives which include a large scale waterline extension (alternatives # 4, 5 & 6) offer the highest degree of protection of human health by providing a continuous, reliable and safe source of drinking water.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

The principle risk of adverse short-term effects at this site is the risk of mobilizing NAPL in the source area. Remediation of the NAPL zone opens the possibility that drilling, blasting, or other subsurface activities might liberate NAPL currently trapped in the bedrock. If mobilized in this way, NAPL pools could cause sharp increases in TCE concentrations throughout the aquifer. Existing POE systems on wells located near the spill site could be overwhelmed if this were to occur.

To protect against this possibility, some of the alternatives which include source control include waterline extensions to provide local residents with a safe drinking water supply. In these scenarios the waterline extension would be installed before the source control measures are initiated.

Alternatives # 2, 3, & 6 include capture of the groundwater plume west of Church Road, with either increased monitoring of domestic wells during remediation, and/or connection of public water supply throughout the area. Alternative #5 (large scale water line; pilot test; source control) does not preclude plume interception but allows for a pilot test to further evaluate uncertainties identified in the RI/FS. Alternative #4 (Large scale waterline; source control) has no provision to address NAPL mobilization because plume interception is not included.

The options which call for plume capture west of Church Road (Alternatives # 2, 3, 6 and possibly 5) may require pumping large volumes of groundwater. The large groundwater collection component of alternative #2 (Spring Street waterline; plume interception; source control)raises the possible problem that domestic wells along Church Road could become less productive, more salty, or go dry. Alternatives #3, 5 and 6 address this issue by installing a waterline extension on Church Road.

All of the alternatives which include source control measures (all except for the no-action alternative) would have some short-term impacts which would require engineering controls. These impacts would include the potential for releases of contaminated dust and vapors during construction. Air quality at the site would be monitored continuously to detect any release of contaminants.

The vapor and thermal treatment could produce air emissions that could produce impacts if not managed properly. However, engineering controls are presently available and considered adequate to mitigate any significant impact on the community and the environment.

All of the remedial alternatives can be constructed over a period of 1-5 years. Direct comparisons between alternatives on the basis of implementation time, however, are potentially misleading because the alternatives differ greatly in the extent to which they attempt to actively remediate the spill site. For example, Alternative # 4 (Large Scale Public Water Supply; Source Remediation) can be constructed in approximately five years, but with out plume containment the contamination would persist in the aquifer indefinitely. Further, with the lack of groundwater collection in Alternative 5, the water table would occasionally rise up into the BVE treatment zone during the wet part of the year. This would increase the time needed to complete the bedrock remedy and would increase the amount of TCE released to the aquifer during remediation compared with the alternatives that include groundwater collection.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative #1 (No Action - Continued Monitoring) offers protection only through long-term maintenance of the existing POE carbon filter systems. No activities would be conducted to control the release of TCE into the aquifer, so contamination would continue indefinitely. Thus, this alternative offers very low long-term effectiveness.

Those alternatives which include active remediation of the NAPL source area (Alternatives #2, 3, 4, 5, and 6) offer a high degree of permanence by permanently removing a significant amount of TCE from the source area. However, it is quite likely that some residual TCE would not be recoverable. Although it appears that most of the NAPL is contained in bedrock above the water table, some may have penetrated below the water table. If NAPL exists below the permanent water table, it would be far more difficult to locate and remove. Any NAPL remaining would continue to be a threat to groundwater resources; however, the amount of TCE exposed to contact with groundwater would be greatly reduced. Thus, the input of TCE into the aquifer would be lower, and it is anticipated that both the size of the TCE plume and the maximum TCE concentrations encountered in the plume would decrease markedly. Despite these limitations, these alternatives are considered to offer the highest degree of long-term effectiveness and permanence.

Alternatives # 2, 3, and 6 (which include Interception of Plume) would provide the highest degree of long-term effectiveness. Not only do these alternatives provide for source control, they also capture the groundwater plume west of Church Road. This would be expected to shrink the size and severity of the plume. However, the system would need to be operated indefinitely to maintain its effects. Once the system was turned off (or if the system were taken out of service due to maintenance or equipment failure), TCE-contaminated water leaving the NAPL Zone would rapidly recontaminate the aquifer.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that significantly reduce the toxicity, mobility or volume of the wastes at the site through treatment.

Alternative #1 (No Action - Continued Monitoring), offers no reduction of mobility, toxicity, or volume because it does not call for removing any TCE from the site.

Alternative # 4 (large scale waterline extension; source control) would significantly reduce the toxicity, mobility and volume of the source area TCE but does not address the groundwater plume.

Alternatives # 2, 3, and 6 (which include interception of the plume) would remove dissolved TCE from the groundwater before it escapes into the main body of the aquifer, however, the amount of TCE removed would be a relatively small proportion of the total TCE believed to reside as a NAPL in the source area. Alternatives # 2, 3, and 6 also include source control measures with interception of plume and would remove the maximum amount of TCE from the environment. These alternatives are considered to provide the maximum compliance with this criterion.

Alternative #5 (large scale waterline; pilot study; source control) would significantly reduce toxicity, mobility and volume of waste in the source area and would not preclude addressing the groundwater contamination. The pilot test would clarify the uncertainties found in the RI/FS and evaluate innovative approaches and design calculations for plume containment.

6. Implementability. Under this criterion the technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility,

the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Since alternative #1 (No Action - Continued Monitoring) would require no additional action beyond continued monitoring and maintenance of the POE carbon treatment systems, it is considered implementable.

Alternatives #2, 3, 4, 5, and 6 call for installation of water mains, which is an implementable and well-established technology. However, significant administrative problems may arise. For the alternatives which include a large scale waterline extension (#4, 5, and 6), a water district encompassing parts of three different townships and one incorporated village in three different counties would need to be formed in order to extend water mains into the entire area of concern. Legal measures for obtaining easements for construction of the water lines are available, but can be time-consuming.

The plume capture system west of Church Road (Alternative #2, 3, 6, and possibly 5) may require techniques to increase fracture interconnection which have been implemented successfully at other hazardous waste sites. These alternatives would require construction of a line of pumping wells west of Church Road and, potentially, north of Gulf Road. Access agreements with landowners would be required before construction could begin.

The remedial technologies proposed for source area control in Alternatives #2, 3, 4, 5, and 6 are modifications of technologies widely employed at other sites. Vapor extraction is recognized as a highly efficient technique for remediating volatile organic compounds (VOC's) from soil and the use of this technology in an ex-situ (or above ground) mode has been used successfully at other hazardous waste sites. Application of this technology to contaminated bedrock has not been reported. Because of the difficulty in identifying and locating fractures in the bedrock, the possibility exists that bedrock vapor extraction may require contingencies for fracture enhancement. Alternative #5 includes a pilot study to evaluate the effectiveness of bedrock vapor extraction.

This would provide a way of obtaining critical design parameters including determination of the need for fracture enhancement.

Two promising technologies which would be evaluated in the pilot study under alternative #5 are plume interception by ozone/peroxide sparging or reactive iron. Recent engineering literature has suggested that an in-place "reactive wall" of elevated ozone/peroxide concentration or physically placing reactive iron in the bedrock fractures would destroy TCE in groundwater and prevent plume migration. However, these innovative technologies have not been demonstrated in fractured bedrock. It would be important to control the migration of ozone gas in the subsurface, since ozone is a highly reactive gas and a strong irritant. Migration through fractures in the rock could allow ozone to escape, leading to possible exposure of nearby residents. The placement of reactive iron in the appropriate fracture zones may be a difficult geoengineermg problem to overcome. However, when compared to plume interception by pumping wells, the "reactive wall" is very cost effective remedial approach. Alternative 5 provides a mechanism to further evaluate these innovative technologies.

Construction activities required for the source area controls and the plume containment system (alternative # 2, 3, 4, 5, and 6) would take place on land owned by a local Sportsman's Club, neighboring private individuals and local quarrying interests. Hunting and recreational activities would be disrupted during this period for the safety of construction workers, but the work could be scheduled so as to minimize the disturbance. Once the system is completed, routine operation would create far less disruption.

Alternative 5 does not include provision for a groundwater pump & treat system to depress the watertable. As such, alternative 5 would not have as an elaborate treatment system as compared to alternatives # 2, 3, 4, and 6 which pump and treat contaminated groundwater. There would be fewer structures, less plumbing and less maintenance. In general, alternative 5 is more implementable then either alternative # 2, 3, 4 or 6.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 3.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan have been evaluated. The "Responsiveness Summary" included as Appendix A presents the public comments received and the Department's response to the concerns raised.

In general the public comments received were supportive of the selected remedy. The comments received generally involved questions on the extent and timing of the remedy, particularly the waterline component, the health effects of the current site conditions, and questions pertaining to how the NYSDEC would proceed with implementation of the remedy.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 6, the NYSDEC selects **Alternative 5** as the remedy for this site.

Alternative # 5 - Includes a large scale water line extension (with provisions for current fire now demand); source area control using soll and bedrock vapor extraction; and a detailed pilot study.

The remedy is selected for the following reasons:

Alternative 1 (No Action - Continued Monitoring) is protective of human health for current residents, but does not protect the groundwater resource for future residents who build new homes. Alternative #1 does not does not meet the preference for permanent solutions or for remedies which reduce mobility, toxicity, and volume.

Alternative 2 (Spring Street water line; plume interception; source control) by itself is protective of human health, but a number of private residents would continue to use POE systems to provide a safe drinking water supply. The plume interception system may adversely impact private wells on Church Road. Due to groundwater pumping, there are concerns that domestic wells along Church Road could become less productive, more salty, or go dry.

Alternative #3 (Church/Gulf Road waterline; plume interception; source control) addresses the concern of Church Road from the pumping of the groundwater wells but a large number of private wells continue to use POC carbon filter systems.

Alternative 4 (Large Scale Public Water Supply with Source Area Control) is less protective of the environment because it does.not include plume interception. Any large-scale release of TCE resulting

Table 3
Lehigh Valley Railroad Derailment
Present Worth Cost

Alternatives	*Present Worth Cost ($ millions)*
#1 No Action - Continued Monitoring	$1.99
#2 Spring Street Waterline; POE for other impacted residents; Source Area Control; Plume Interception	$ 12.74
#3 Church/Gulf Road Waterline; POE for other impacted residents; Source Area Control; Plume Interception	$ 13.38
#4 Large Scale Waterline with no provisions for Fire Protection; Source Area Control	$ 12.53
#5 Large Scale Waterline with current fire flow demand; Source Area Control; Detailed Pilot Study	$ 11.19
#6 Large Scale Waterline with potential future fire flow demand; Source Area Control; Plume Interception	$ 17.23

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from invasive activities in the NAPL Zone could escape into the main body of the aquifer. Alternative 4 would be protect human health, but would not protect the groundwater itself.

This leaves alternative # 5 (large scale waterline-current demand fire flow; pilot study; source control) and #6 (large scale water line with potential future fire flow demand; plume interception; source control). These alternatives both offer the maximum protection of human health by including a water line extension to all impacted residents. They both have similar short and long term effectiveness and are both implementable. Alternative #6 would provide a greater degree of protection for the environment by including plume interception but alternative #5 does not preclude it.

As present on Table 3, the cost of alternative #6 is over $6 million dollars more than alternative #5. Alternative #5 has cost savings in two areas. One, in alternative #5 the waterline extension does not include provisions for potential future development. Though a system designed for future development is a desirable upgrade, it is not necessary to protect human health from the exposure to TCE contaminated groundwater. Second, the pilot study proposed for alternative #5 will provide important information to better define the cost of the bedrock vapor extraction system and the plume interception system. The plume interception system would protect against the release of NAPL but its estimated high cost (approximately $6 million) does not make it cost effective. The pilot study may provide information which could greatly reduce the cost of the plume interception system and it could be considered at a future time.

Therefore, based on both the protection of human health, groundwater resources, and cost effectiveness, the selected remedy is Alternative #5 (Large Scale Public Waterline to meet current fire flow demand; Source Area Control; Detailed Pilot Study). The selected remedy provides timely, cost effective remediation while minimizing undesirable Impacts. Other alternatives examined are either inadequately protective, present unacceptable side effects, or are not cost effective.

The estimated present worth cost to implement the remedy is $11,193,000. The cost to construct the remedy is estimated to be $9,822,000 and the estimated average annual operation and maintenance cost is $241,000. As discussed in Section 8.1 below, the Department has tentatively decided to modify the remedy from what is described in Section 6 above and from what was included in the Proposed Remedial Action Plan. The change is to increase the area covered by the waterline extension to include Flint Hill Road between George Street and Lime Rock Road. If ultimately implemented, this change would increase the present worth of the remedy by $400,000 to $700,000.

7.1 Conceptual Design

It is estimated that the remedy will take seven years to construct and, if the plume interception system is implemented, would be operational for fifteen years.

The selected remedial action plan for the Lehigh Valley Railroad Derailment site will be divided into stages. Each stage will build on the other and at any time the NYSDEC in consultation with the NYSDOH could consider the need to make changes to the remedy. Any major changes which impact the degree of protection of human health and the environment, or the change the intent of the source control measure will be presented in detail to the public prior to implementation. A detailed description of the conceptual design is presented in the feasibility study for each operable unit.

STAGE 1: Remedial Design Program:

A remedial design program will be implemented to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program.

This stage will focus on the design of the overall program and focus on the design of the water line extension. In addition, any uncertainties identified during the RI/FS will be resolved. It anticipated that assumptions made in the FS and this ROD will be verified. For example, the high construction cost of the waterline is predicated by the cost of constructing line in a bedrock trench. A soil boring or test program to verify the depth to bedrock along the proposed waterline route is anticipated.

Since the remedy may result in untreated hazardous waste remaining at the site (i.e. NAPL remaining below the water table or remaining trapped above the water table in the source area), a long-term monitoring program will be instituted. This program will be designed to protect human health during the implementation of the remedy and after completion of the remediation. This program will include monitoring of selected monitoring wells, surface water, and selected domestic wells both within the plume and along the edge of the plume to verify that the plume has not shifted position.

The estimated present worth cost of this stage is about $0.5 million and will take one year to implement.

STAGE 2: Waterline Construction

Construction of a large scale water line extension. Water lines will be extended to all homes with contaminated wells. Figure 4 presents the proposed extent of the extension. The water will be provided by the Monroe County Water Authority via the proposed hook up in Mumford. The water supply extension will be installed *with provisions for current fire flow demand.* Other homeowners along the route of the water lines will be offered the opportunity to connect for a fee. Although the hookups will be provided free of charge to the contaminated homes, monthly water bills will be the responsibility of the homeowners. Existing POE carbon filter systems will be removed.

Maintenance of the POE carbon filter systems in private homes will continue until water line extension is constructed and tested. This will not include installation of new POE systems in newly constructed homes. Such new systems will be the responsibility of the builder and/or owner of the property.

The estimated present worth cost of this stage is about $4.4 million and will take two years to construct.

STAGE 3: Source Area Remediation Design / Detailed Pilot Study.

This stage will include the design of the source area remediation and a detailed pilot study to determine the appropriate design parameters for the soil vapor extraction system and the bedrock vapor extraction system.

The source area remedial design program will be implemented to verify the components of the conceptual design presented in the feasibility study and this PRAP, and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program.

For the soil remediation, the design will include excavation of contaminated soil, removal and replacement of Gulf Road, and a determination of the appropriate method to clean the bedrock surface.

The soil vapor extraction component of the pilot test will include a field pilot test of the ex-situ vapor extraction system. In this above ground test, a small vapor extraction pile containing about 50 cubic yards of contaminated soil will be constructed. Information necessary for the design of the full scale system will be generated including pneumatic permeability, radius of influence, air emission estimates, etc.

For the bedrock vapor extraction system, the detailed pilot study will include the drilling of a 100 foot deep, six inch diameter, vapor test well. Vapor monitoring probes will be installed at various depths around the vapor test well. Data important to the design of the full scale system will be generated including pneumatic permeability, location of major fracture zones, radius of influence, air emission estimates, etc.

In addition, the detailed pilot study will be designed to further evaluate the technical practicability and cost of a plume interception strategy and a source area groundwater pump & treat system. Because of the high cost of groundwater collection and treatment, these two components are not presently part of the proposed remedial plan. However, the cost of the plume interception and the groundwater pump & treat systems could be substantially reduced, either by reducing the scope of these plans or by using innovative technologies. Therefore, it is possible that plume interception at Church Road and groundwater pump & treat in the NAPL source area could be reconsidered at a later date if these components are deemed necessary to an effective design and are cost effective.

Another aspect of the pilot study will be to evaluate innovative technologies for plume interception (such as reactive wall technologies) and innovative approaches to treat the large volume of extracted vapors and groundwater from the source control measure. Innovative technologies could be supplemented for the remedial technologies described in this plan if the innovative technologies are deem cost effective and technically viable.

The estimated present worth cost of this stage is about $ 1. 0 million and will take one year to implement.

STAGE 4: Source Control

Stage 4 will include implementation of the source area control system. To assure the protection of human health and the environment, stage 4 will not be implemented until the waterline extension is constructed, all impacted residents are hooked up, and a long term monitoring program to observe changes in the groundwater plume dynamics is in place. The remedy assumes that the soil remediation and the bedrock remedation will be designed and constructed concurrently. To the extent practical, the equipment, structures and construction activities for both the soil and bedrock remediation will be combined to provide consistency between the two operable units. However, it is anticipated that the soil excavation will occur first because information critical to the final design of the bedrock vapor extraction system (e.g., mapping the nature and extent of bedrock fractures at the spill site) will be generated.

Gulf Road will be closed and alternate routes will be posted. A portion of the present road surface and sub-grade will be removed and disposed of on site. Following the soil excavation and cleaning of the bedrock surface, Gulf Road will be replaced. It is anticipated that Gulf Road will be closed for one construction season (about 6 months).

Source area soils will be excavated to the top-of-rock zone. The horizontal extent of the excavation will be determined by comparison of soil analytical results with the soil clean up objectives. The soil will be excavated in cells to limit the amount of construction water which require treatment.

Soils and any debris excavated will be transferred to on-site vacuum extraction piles.

Vacuum will be applied to the piles to extract contaminated vapors. All extracted vapors and any water collected will be properly managed to meet appropriate requirements. The emissions will be monitored to determined if vapor treatment was necessary.

The top-of-rock surface and any fractures observed will be cleaned of residual soil or NAPL, if observed. The details of the process to remediate the top-of-rock surface will be evaluated more fully in the design phase of the project. This material will be placed on the soil piles or sent off-site for disposal if it is highly contaminated with TCE.

Construction of a bedrock vapor extraction system in the NAPL zone to directly remove as much of the source TCE as possible. The system will consist vertical wells installed in the approximately ten acre NAPL zone. Suction will be applied to each well to draw air through the dry bedrock.

A treatment facility will be constructed to remove TCE from vapor prior to discharge. The present conceptual design is for treatment by carbon absorption. However, innovative approaches to vapor treatment will be evaluated in the stage three (the detailed pilot study) in an attempt to reduce the cost of treatment.

The effectiveness of the bedrock vapor extraction system will be evaluated to determine whether fracture enhancement or groundwater pumping is necessary to increase TCE recovery.

The soil and bedrock vapor extraction systems will be monitored for compliance with RAOs. Once the soil RAOs are achieved, it is anticipated that the excavated soil will be placed back on-site. If the RAOs for groundwater are met at the source area the bedrock remediation will end. If the RAOs are not achieved, the bedrock and soil vapor extraction systems will continue to be operated until TCE removal rates become insignificant. After this, the systems will continue to operate while system modification and enhancements are evaluated. Should system modifications and enhancements be infeasible or prove unsuccessful, a focused feasibility study will be conducted to determine if further remedial action will be necessary.

Once stage four is started, source area control will take two years to construct and test, and an estimated five years to operate. The present worth cost of stage 4 is about $5.3 million.

SECTION 8: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation (CP) activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

A Citizen Participation Plan was released to the public in January 1996 and two repositories for documents pertaining to the site were established.

A site mailing list was established which included nearby property owners, local political officials, local media and other interested parties.

Fact sheets describing site activities were distributed in February 1997, September 1994, July 1993, and November 1992.

Details of the PRAP were presented at a public meeting on March 4, 1997.

In March 1997, a Responsiveness Summary was prepared to address the comments received during the public comment period. The Responsiveness Summary was made available to the public by placing a copy of the Record of Decision in the document repositories.

8.1 Documentation of Significant Changes

As a result of evaluating several comments received on this issue during the public comment period, the Department has tentatively decided to modify the remedy presented in the Proposed Remedial Action Plan. The proposed modification will expand the scope of the waterline extension to include the section from Spring Street, west along George Street/Flint Hill Road to Lime Rock Road. This proposed modification will be evaluated in the design phase of the project and the final decision to install this section of the waterline extension will be based on satisfying two issues. One, a determination that private wells in this area are threatened from the TCE groundwater plume and two, a determination of the hydraulic adequacy of the design originally proposed in the PRAP. Both of these issues will be resolved early in the design process and the public will be notified of the Department's decision.

Several factors have contributed to this proposed modification. First, information from the Genesee Country Museum located along Flint Hill Road points to the likelihood that there is a significant potential for a future threat to human health from ingestion of contaminated groundwater. The Museum indicates that it is likely that they will need to expand their water supply by deepening existing wells or adding new wells. In both cases, it is reasonable to expect that these wells may encounter contaminated groundwater. Second, additional information from the Museum indicates that, contrary to previous information, it may be possible to install a waterline along a significant portion of George Street and Flint Hill Road without the need to excavate into bedrock. This increases the "implementability" and lowers the anticipated construction cost of this proposed segment. Third, comments from other reviewer questioned the reliability and operation/maintenance assumptions of the waterline configuration presently in the PRAP. It is pointed out that the lack of a second loop along Flint Hill Road could create engineering design problems that could result in the overall system being less reliable. These concerns include the potential for pressure drops during period of fire flow demand and contingencies in the case of a water main break along Route 5. Although these issues were evaluated previously and found to be manageable, in combination with the potential exposure to a large population at the Country Museum, the engineering concerns add weight to the conclusion that this section should be included in the waterline extension.

The Department considers these issues substantive and tentatively has decided that the section from Spring Street, west along George Street/Flint Hill Road to Lime Rock Road is necessary to create a waterline system that is adequately protective of public health. These issues will be further evaluated in the design phase of the waterline extension to confirm that the information and assumptions adequately support the decision to extend the waterline in this area. Once a final determination has been made, the Department will issue a notice to everyone of the mailing list informing them of the Department's decision. Based upon preliminary cost estimates, the additional present worth cost of this modification is believed to range between $400,000 and $700,000 depending on the percent of the line which will require excavation in bedrock.

Appendix A
Responsiveness Summary
Lehigh Valley Railroad Derailment Site
Site # 8-19-014, Genesee County

This appendix summarizes the comments and questions received by the New York State Department of Environmental Conservation (NYSDEC) regarding the proposed remedial action plan (PRAP) for the Lehigh Valley Railroad Derailment site. A public comment period to receive comments on the PRAP opened on February 14, 1997 and closed on March 17, 1997. A public meeting was held on March 4, 1997 at the Caledonia-Mumford High School, Caledonia New York, to present the results of the remedial investigation/feasibility study (RI/FS) performed at the site and to describe the details of the proposed remedy. The public meeting was attend by over 100 people and included elected officials from the Towns and Villages impacted from the site. This responsiveness summary addresses the public comments and questions received by NYSDEC at the public meeting and provides the Department's response.

DESCRIPTION OF THE SELECTED REMEDY

The major elements of the selected remedy include:

- A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance of the remedial program. Uncertainties identified during the RI/FS will be resolved.

- Design and construction of a waterline extension which will connect all impacted residences to a potable water supply. The waterline extension will extend from the existing Monroe County Water Authority water main in the Town of Wheatland and run through the Towns of Wheatland and LeRoy and the Villages of Caledonia and Mumford. The waterline extension will be designed to provide current fire flow demand.

- Design of the Source Control Measures which will include a detailed pilot study.

- Excavation of about 10,000 cubic yards of TCE contaminated soil at the former spill site. This will include removal and partial replacement of Gulf Road. Excavation will be preformed in accordance with the cleanup goals in Section 5. The excavated soil will be treated on-site by ex-situ soil vapor extraction. Treated soil will be placed back on-site.

- Installati on of a bedrock vapor extraction system within the approximately 10 acre DNAPL zone. Extracted vapors will be properly managed prior to discharge.

- Initiation of a long term monitoring program designed to monitor the effectiveness of the remedy during and after construction.

The information given below is summarized from the March 4, 1997 public meeting and letters received during the comment period. The issues raised have been grouped into the following categories:

I. Questions/Comments Raised During the Public Meeting

I. Questions and Comments Raised During the Public Meeting

A. <u>Issues Regarding the Overall Remedy</u>

A. 1 What is the cost to maintain the carbon filters compared to the cost of the overall remedy? It seems more cost effective to continue to use the present carbon filters then to conduct the proposed remedy.

R: The cost to maintain the carbon filter was evaluated in the proposed remedial action plan (PRAP) as alternative #1 (No action - Continued monitoring). The estimated present worth of alternative #1 is $1.9 million. The cost of the proposed remedy is about $11.2 million. Maintaining the present carbon filter systems, at first blush, does appears to be cost effective, however it is not adequately protective of human health and provides no protection to the environment. The waterline extension provides a permanent and safe supply of potable water to all impacted residences and addresses the contamination which continues to leach into the bedrock aquifer. Without the proposed remedy, there is the potential that additional private wells could be contaminated in the future, increasing the estimate cost for the no action alternative.

A.2 I live in the surrounding area. What effect does the chemical (trichloroethene or TCE) have to the surrounding area? Does it go out to the Genesee River and other areas?

R: The purpose of the remedial investigation (RI) was to determine the nature and extent of TCE contamination caused by the 1970 spill. During the RI, the Department installed 55 groundwater monitoring wells, collected numerous surface and spring water samples, and analyzed both soil and sediment samples for the presences of TCE. The impacts on the local area are described in detail in the RI. The following is a generalized evaluation of the nature and extent of contamination at the Lehigh Valley Railroad Derailment site.

At present, it appears that the spill has created a 3 ½ square mile groundwater plume from the spill site on Gulf Road to Spring Creek in Caledonia. The groundwater, which travels easterly and northeasterly, discharges to Mud Creek and Spring Creek via springs and groundwater seeps.

Some of these spring have shown detectable levels of TCE. However, surface water and sediment samples from within the streams themselves have shown little or no TCE. This is probably due to dilution. Spring Creek and Mud Creek both flow to Oatka Creek which, in turn, is a tributary to the Genesee River. Because there is little or no detectable TCE in Mud and Spring Creek and due to the large dilution effect that both Oatka Creek and the Genesee River would have, it does not appear that the spill site has an impact on either Oatka Creek or the Genesee River.

The surface soil samples collected at the spill site indicate an approximately 1 acre area contaminated with TCE above Department guidance levels. This area is impacting groundwater and surface water quality as described above. The bedrock below the spill site in about a 10 acre area is also contaminated TCE, possibly in a pure phase. This dense non-aqueous phase liquid (DNAPL) zone, is over 50 feet below the ground surface and contributes significantly to the groundwater contamination.

A.3 You said that the NYSDEC has petitioned the United States Environmental Protection Agency (USEPA) for listing the site on the federal Superfund, or National Priority List (NPL). What if the site does not make the NPL? Would the New York State pay for the cleanup?

R: If the site is not listed on the federal NPL, the State of New York intends to go forward and fund the remediation. If the site is listed on the NPL the State of New York will still use some state funds to remediate the site, however the federal government would help pay for part of the remedy's projected cost.

A.4 What is the half life of TCE? Will it go away?

R: TCE does not have a half life like radioactive materials. However, natural mechanisms (called natural attenuation) can degrade TCE in the environment. These natural attenuation processes include dilution, sorption, biodegradation, etc.. However, at the Lehigh Valley site we believe these "natural attenuation" process are not greatly reducing the toxicity, mobility or volume of the spilled TCE. The spill occurred over twenty five years ago and we still have extensive soil, bedrock and groundwater contamination. Therefore, without active source remediation the contamination could persist in the environment for a very long period of time.

A.5 When were the carbon filter systems installed in the private wells?

R: A couple of carbon filter systems were installed by the Lehigh Valley Railroad immediately after the spill back in 1971. However, it was not until the site was rediscovered in 1991 that actions were taken to install carbon filter systems to all impacted residents within the plume boundary. Presently, 37 homes are provided with carbon filtration systems which are maintained by the State of New York.

A.6: It is reported that the spill happened 25 years ago. Why didn't DEC step in earlier? Could actions have been taken at the time of the spill (e.g., excavation of the contaminated soil) to have stopped the TCE contamination from traveling so far?

R: At the time of the spill, December 1970, the NYSDEC was in its infancy. The major concerns to the environment at that time (just after the first 'Earth Day' of April 22, 1970) were issues such as uncontrolled releases of nitrates and phosphates in wastewater that caused severe algal blooms and fish kills in lakes and streams. In part, as a result of the incident at Love Canal in 1978, the federal law to address historical waste disposal (the Comprehensive Environmental Response, Compensation, and Liability Act or CERCLA) was passed in 1980 and the state equivalent was passed in 1982. Frankly, in 1970 the state of the art to deal with environmental insults like the derailmen t spill of TCE at Gulf Road had not advanced to the point were a spill like this could be managed properly. TCE is not considered flammable and the potential human health threats were not fully known. Further, from the remedial stand point, the technological fixes described in the present feasibility study and PRAP were unknown at the time of the spill.

In addition, it was reported at the time of the spill that the liquid TCE infiltrated quickly into the ground. From the RI this becomes self-evident because of the porous nature of the site's soils, the shallow depth to rock and the highly fractured nature of the bedrock under the spill site. Therefore, even if the spill occurred today, recovery of the spilled material by excavation or containment may not have prevented the liquid TCE from entering the bedrock system. Present day spill notification laws would have prompted quicker actions and possibly an aggressive pumping of groundwater at the spill site might have captured much of the spilled liquid TCE. But with the highly fractured and karst like bedrock system and the reported fast infiltration of the liquid TCE into the ground, it is quite possible that the present groundwater plume described in the RI would have developed.

A.7: What is the proposed schedule do the remedial work? When will the waterline be installed?

R: After the public comment period is closed on March 17, 1997, the Department is required by law to pursue potentially responsible parties (PRPs) and provide them an opportunity to step in and fund the remedial program. The negotiations with the PRPs can take anywhere from 9 to 12 months and has taken longer at some sites due to complex legal issues. After the PRP phase, the design and construction of the waterline should take about two years. Once all impacted residents are hooked up, the design and construction of the source remediation would occur. This should take about two years. The soil treatment should be completed in two years and the clean soil would be placed back at the spill site. The bedrock source remediation would continue past the soil phase and could last several years.

B. Issues Regarding the Waterline Extension

B.1 When the waterline is installed and we are hooked up to the water main, will we have to pay for the water?

R: Yes, the remedial plan only calls for the design and construction of the waterline extension. Operation and maintenance of the system will be the responsibility of the municipality or water district that takes over control of the new system. At present, it is still unclear administratively how this will work but if you are hooked up to the water line, you should expect a water bill.

B.2: If we get hooked up, what happens to the carbon filter system presently installed in the house?

R: Once you are hooked up to the public water supply line the Department plans to remove the carbon filter systems.

B.3: Do I have to hook up to the water line? Can I continue to use my well and will the state pay for the maintenance of the carbon filter system?

R: You can decide not to hook up to the waterline and continue to use your private well. The NYSDEC will allow you to keep the carbon filtration system. However, the state will not pay to maintain or test the system. The resident will be responsible for maintenance and operation of the carbon filter system, which should include semi-annual sampling for volatile organic compounds and replacement of the carbon when "break through" occurs. Due to the sampling costs and carbon replacement, maintenance cost of the system could be expensive. We strongly recommend that all impacted residents be hooked up to the waterline. The NYSDOH also recommends that residents not impacted by the TCE contamination also connect (at their expense) to the public waterline due to problems with bacterial contamination in the area.

B.4 The Genesee Country Museum uses six wells to provide drinking water. Over 150,000 people visit the Museum each year. Under the proposed plan the waterline will not be extended west along George Street/Flint Hill Road and therefore the Museum is not included. We believe the plan should be modified to include a loop from Spring Street to Flint Hill Road.

R: As a result of evaluating several comments received on this issue during the public comment period, the Department has tentatively decided to modify the remedy presented in the Proposed Remedial Action Plan. The proposed modification will expand the scope of the waterline extension to include the section from Spring Street west along George Street/Flint Hill Road to LimeRock Road. This proposed modification will be evaluated in the design phase of the project and the final decision to install this section of the waterline extension will be based on satisfying two issues. One, a determination that private wells in this area are threatened from the TCE plume and two, a determination of the hydraulic adequacy of the proposed design. Both of these issues will be resolved early in the design process and the public will be notified of the Department's decision. For more details on this modification, please see Section 8.2 of the record of decision and the Department's response to question L.39.

B.5 I just paid for hook up of my private well with the Monroe County Water Authority. If found to be contaminated, would we be reimbursed?

R: If it was determined that your well was contaminated by the spilled TCE from the derailment site, the Department would consider reimbursing your hook up costs.

B.6 As a resident, if I hook up to the public water line extension, can I keep my well to use for watering my lawns and garden, or wash my car?

R: Under public water supply regulations, the private wells could not be connected to the household water supply as this would create a potential cross connection. While a final decision regarding this matter has not been taken, it may be possible for a homeowner to keep their well if it is physically disconnected form the household water supply system. In order to protect the public water supply and eliminate potential exposure, it is strongly recommended that private wells be abandoned and/or plugged after the homes are connected to the public waterline.

C. Issues Regarding the Source Remediation

C.1 I was alarmed when you said that this is the largest chemical spill in western New York, how does this compare to Love Canal?

R: The former TCE spill site impacts the groundwater in an approximate 3 ½ square miles area. This unusually large groundwater plume and is one of the largest in western New York. In contrast, the Love Canal site plume covers only 40 acres. However, Love Canal received over 420,000 tons of chemical wastes whereas the Lehigh Valley spill was about 160 tons TCE. The reason for the large groundwater plume at the Lehigh valley site is the complex geological makeup of the bedrock. The karst type system in the bedrock has allowed the TCE contamination to extend over a very large area.

C.2 Is there any evidence that the plume has stabilized?

R: Over the time that the NYSDEC and NYSDOH have monitored (about 6 years), the groundwater plume does appear to have reached a quasi-steady state condition. The area of the groundwater plume has remained constant and the TCE levels in the surface soil have not changed. However, there is a noted seasonal flux in the level of groundwater contamination which occurs each spring. Data collected during the remedial investigation indicates that during the spring the groundwater table in the bedrock rises into an area of heavily contaminated bedrock (this was called the DNAPL zone in the FS and PRAP). This rise in the groundwater table flushes out a pulse of TCE each spring and increases TCE concentration in monitoring wells and surface water springs downgradient from the site. In the summer as the water table drops the TCE concentration also decrease.

C.3 When excavating the contaminated soil, could it affect the extent of the groundwater plume? Could it create more of a problem?

R: There is the potential that source remediation, both excavation of the shallow TCE contaminated soil and the installation and operation of the bedrock vapor extraction system could cause a pulse or slug of contamination to migrate through the aquifer. That is one of the reasons why the Department has selected a large scale waterline extension which hooks up all impacted residents. In addition, a long term monitoring program will be in place, prior to the source remediation, to evaluate the potential impacts from a potential pulse or slug of contamination.

C.4 How will the TCE vapors collected from the soil and bedrock be treated?

R: The present plan is to route the extracted vapor through carbon canisters. Activated carbon is an effective means of removing TCE from the vapor. However, because of the large volume of contaminated vapor which will require treatment activated carbon may not be the most cost effective means to treat the TCE contaminated vapor. In the design of the source remediation the Department plans to evaluate other possible mechanisms including innovative technologies to treat the extracted TCE.

D. <u>Issues Regarding the Potential Human Health Risk</u>

D.1 The spill occurred in 1970 and carbon filter system were not installed until 1991. Are you saying that people have been drinking contaminated water for 20 years?

R: It is quite possible that the private wells presently impacted with TCE were contaminated soon after the chemical spill back in 1970. As stated above, the Lehigh Valley Railroad did install carbon filter systems on a couple of private wells with obvious TCE contamination, however most of these filters were not maintained and were not functioning properly when the USEPA installed the present carbon filters in 1991.

D.2: My daughter was born in October 1970, and used groundwater for most of her youth. Before 1990, no one warned us of the potential health risks associated with the groundwater. What are the potential health effects on my daughter? What health risks are associated with long-term risk?

R: The health effects of long term exposure to TCE are not well known. Studies of animals exposed to moderate levels showed some liver problems. At this time TCE is not classified as a carcinogen, however additional research is needed to make a clear determination.

D.3 What are the health risks if the carbon filters fail?

R: It is extremely unlikely that one of the current carbon filter systems would fail. Each carbon filter system consists of two (and sometimes 3) carbon tanks. Each carbon tank is designed to last about twelve months, therefore the overall system should last two years. Every six months tile NYSDEC samples the water before, in between and after the carbon tanks to check for "breakthrough" of TCE. If breakthrough is noted after in the first tank, the second tank is moved to the first position and the new tank is installed in the second position. At the Lehigh Valley site, we have never seen breakthrough after the second tank. The carbon filter systems installed to protect private wells have proven to be an effective means of treating water contaminated with TCE. With proper maintenance, the possibility of these tanks failing and allowing TCE to passing into the house is remote.

However, should the carbon filter systems fail and TCE enter the drinking water system, exposure would be for a short period of time (less than 6 months) and at a low level. Health risks form low levels of TCE exposure for this short a duration should be very minimal.

D.4 My well (east of the Genesee Country Museum) has not been tested since 1995, why?

R: As noted above, the NYSDEC and NYSDOH believe that the groundwater plume, has reached a quasi-steady state with regards to the area impacted by the plume. Sampling of private wells in this area has historically shown no TCE contamination. If conditions within the plume boundary don't change significantly, we can expect that private wells in this area which tested clean in 1995 are most likely still clean. All of the private wells in this area that were previously tested will be tested again during the design, construction, and post construction phase of the remedy to insure the protection of human health.

The NYSDOH is willing to sample selected private wells in the area of the groundwater plume both this year and in the future. Concerned resident should contact the DOH at (716)- 423-8071.

D.5 My husband has hepatitis. It's never been determined where he contracted the disease. Could it be caused by the TCE in the water?

R: From information presently available on the health impacts from the consumption of TCE, it appears that hepatitis could not be caused by drinking water contaminated with TCE.

D.6 Will the TCE in the groundwater impact plants and vegetables? The farmer in back of us has a cornfield. One year it had big ugly things growing in it. Was this caused by the groundwater problem?

R: The depth to the groundwater table is about 50 feet below the ground surface. Plants and vegetable typically draw water into their root systems from the top couple of feet of soil. Impacts to plants vegetables grown on the surface from contaminated groundwater from the Lehigh site would be minimal.

D.7 What is the safety for children playing in yards, digging and playing?

R: The spill site has concentrations of TCE in surface soil that would be considered an unacceptable risk to children playing in the soil. However, the spill site area is not in a back yard and more closely resembles an industrial type setting. Present human exposure to the TCE contaminated soil is limited to occasional recreational vehicles, people walking over the site and possibly fossil collectors. There appears to be little human risk associated with these activities because the duration of the exposure to the TCE contaminated soil is very short. TCE is **not** present in off-site soils, so there is not risk to children playing in residential yards.

D.8 Have any public warning signs been posted to warn people about the potential exposure to TCE contaminated soil at the spill site?

R: There are presently no restrictions to site access and no warning signs posted. As stated above, the potential human exposure to the contaminated surface soil is limited and the duration of the potential exposure is short. Therefore, the current risk to human health for casual contact with contaminated soil is low and actions to prevent contact with the contaminated soil (signs or fencing) do not appear warranted at this time.

D.9: Was there an independent health assessment for the site?

R: Both a detailed human and environmental health risk assessments were conducted for the site. It was part of the state-funded RI/FS. Both the New York State Department of Health and the local County Health Departments were involved in the development and review of the human health risk assessment. In 1992, the NYSDOH conducted a Health Exposure Survey for the site. A survey form was distributed to all residences where a water sample was collected (some were contaminated and some were not). The results of this survey did not find any statistically significant differences between symptoms and disease reported by those exposed to TCE contaminated drinking water verse the unexposed group.

E. Issues of a General Nature

E.1 What measures have been taken by the railroads to be sure this doesn't happen again?

R: This remediation plan does not address issues related to railroad safety and no recommendations are made regarding preventing future releases from similar railroad accidents. However in general, the design of railroad tank cars has improved to try to prevent chemical releases caused by derailment accidents. However, given the reported severity of the incident back in 1970, it is not clear whether the improved tank car design would have prevented the Lehigh spill. However, since the time of the spill, there are a number of federal, state and local laws and regulations which require notification and corrective actions for a chemical spill. If the spill occurred today, actions to protect public health (e.g., installing carbon filters) would have happened immediately.

E.2 At the spill site there is a fenced area with 55-gallon drums of chemicals. What is contained in these drums? Is this the location of the spill?

R: The fenced area is used for storage of drill cuttings (soil from drilling wells, etc.), development water and other wastes generated during the RI/FS. The material in these drums is consider contaminated with low levels of TCE. The material will be stored on-site until the final remediation of the source area is started. At that time the waste material in the drums will be treated and properly disposed.

The fenced area is just south-east of the spill site. The soil under the fenced area is not believed to be contaminated. However, the fenced area is over the anticipated bedrock DNAPL zone. The fenced area will be utilized during the upcoming remedy as a support zone for construction activities.

E.3 The area near the spill site has many current and former rock quarries. There is also a proposal for a rock quarry which appears to be within the area of the groundwater plume. Will the proposed remedy place any restrictions on new or existing quarries or gravel pits? What would be the implication of a quarry with regards to the plume in this area?

R: The proposed remedial plan itself would not place any restrictions on existing or proposed quarries or mines within the area of the plume boundary. Due to the mineral resource value of the bedrock under the spill site the Department, in the FS, considered quarrying the contaminated bedrock. However, the quarrying alternative was screened out because the site is owned by multiple landowners and the complex administrative requirements of the Department overseeing a mineral extraction operation. However, it is clear that the bedrock in the area of the plume boundary is a valuable mineral resource and future mining in the area is a real possibility.

If a quarry was expanded or newly constructed within the plume boundary the activity could change the flow dynamics of the existing groundwater plume. The Department would evaluate these types of potential impacts as part of the State Environmental Quality Review Act requirements for an expanded or new quarry.

E.4: Does Dolomite (the quarry adjacent to the spill site) have a special permit to dump contaminated water into Mud Creek?

The quarry does have a state pollution discharge elimination (SPDES) permit but they are not required to monitor for TCE. Results of the RI conducted for the Lehigh Valley Railroad Derailment site did find that the water pumped from the quarry has low levels of TCE. Because of the geologic makeup of the site, the impact to Mud Creek is minimal. The highly fractured bedrock at the site causes Mud Creek, and the water pumped from the quarry, to quickly infiltrate back into the same bedrock that it was removed from. Therefore, the impacts on Mud Creek and water bodies downgradient of Mud Creek (Oatka Creek) from the quarry discharge are minimal when compared to the impacts from the spill site itself. The remedy proposed for the site includes efforts to reduce the source of the TCE contamination and therefore, reducing the risk to Mud Creek and other water bodies in the immediate area.

E.5: Some of the area residents have been dealing with this problem for over 25 years. It would be nice to get reimbursed for our costs prior to the DEC involvement in 1990.

R: We understand that some residents have maintained the carbon filter systems installed by the railroad in 1970. It is likely that the best chance for recovering past costs would come from pursuing the responsible parties. However, the Department will continue to evaluate this issue to determine if there are other mechanisms for responding to this comment.

II. Letters Received During the Comment Period

The following letters were received during the public comment period. This section includes either a summary of the comments; received in the letter or the actual comment followed by the Department's responses.

L.1: Summary of a letter dated March 13,1997 from the Town of Wheatland Fire Marshall:

The letter requests that the Department select alternative #6 as the preferred remedy for the Lehigh Valley Derailment site. In general, the letter requested that the proposed waterline extension be sized to meet future potential growth of the regional area because of the need to provide for adequate fire protection. Several severe fires with major property loss were cited in the letter.

R: One of the remedial goals identified for the Lehigh Valley Railroad Derailment site is to provide the impacted public a safe drinking water supply. While providing a water main system that can handle the future growth of the area is desirable, it is not necessary to meet the remedial goal of protecting human health. Further, the Department proposed remedy would provide for fire protection for current residents and this proposed system will hopefully assist in preventing major property loss in the future.

On February 14, 1997, the Department held a meeting with local elected officials, town and county representatives and members of the local water authorities. It was explained to them at that time that the Department would be willing to allow the local municipalities/authorities to join with the NYSDEC on the waterline extension project. The local municipalities/ authorities could pay for upgrades to the NYSDEC's proposed waterline which could include designs for future potential growth of the area. Further, members of the NYSDOH explained that there were possibly funds available through the recently passed Clean Water/Clean Air Bond Act. The offer to the local municipalities/authorities to join with the Department on the waterline project will be available until the design of the waterline extension is started.

The following five questions (L.2 - L.7) are from a letter dated March 13, 1997 and a transmittal received on March 17, 1997 from the Monroe County Water Authority (MCWA). In general, the authority recommend the NYSDEC coordinate the project closely with the authority as they can provide valuable information regarding design criteria. In response, the Department plans to involve the authority in all aspects of the design of the water line extension. The following are a summary of the major comments:

L.2 The MCWA suggested an alternate route for the waterline extension. In general, this route would use Flint Hill Road to provide public water to impacted residents in Monroe County and in Genesee County along Church Road and Gulf Road up to the spill site. The suggested change would include using the Caledonia system to provide water for Spring Street and west along Route 5 to the county line. The reason given for the change in the proposed routing are, 1) it will saves money on installation costs, 2) the MCWA has concerns that because of the age of the Village of Caledonia system it would not be able to handle the pressure of the water received from the authority and the resulting stress could result in main breaks or necessitate pressure reducers, 3) the proposed change in routing would allow the Genesee Village Museum to hook up to the system.

R: The Department thanks the MCWA for the comment and the proposed change in waterline route will be considered in the design phase of the project. As a result of evaluating several comments received on this issue during the public comment period, the Department has tentatively decided to modify the remedy presented in the Proposed Remedial Action Plan. The proposed modification will expand the scope of the waterline extension to include the section from Spring Street west along George Street/Flint Hill Road to Lime Rock Road. For more details on this modification, please see Section 8.2 of the record of decision and the Department's response to question L.39.

However, with regards to the proposed routing, the MCWA proposal would not provide residents in Genesee County at the intersection of Church and Route 5 an opportunity to hook up to public water. Even though the private wells at this location are not presently contaminated with TCE, the Department has concerns that when source remediation efforts commence the position of the groundwater plume could change and any deflection to the south could threaten these homes. Without the waterline extension in this area the Department could not quickly mitigate this potential threat to public health.

Second, homes in this area have documented bacteria problems and are on "boil water" notices. Under the current proposal the residents in this area could hook up to the waterline extension at their cost. By not routing the line through this area these resident will be able to correct their longstanding human health problem.

Should the MCWA wish to fund upgrades to the NYSDEC proposal, the Department is willing to allow them to join in on the project. This would save money in both the design and construction phases.

L.3: The Monroe County Water Authority (MCWA) does not have the legal capacity to lease or own any facilities in the Town or Village of Caledonia. To allow MCWA to operate and maintain facilities in Caledonia, our enabling legislation would need to be amended. MCWA can own, operate and maintain the proposed facilities in the Towns of Wheatland and LeRoy.

R: The specific administrative method to purvey the water to the local residences has not been formalized and can more appropriately be finalized in the design phase of the project. However, the most appropriate source of the public water is the MCWA because it has an adequate supply of good quality water. However, from the discussion with the local municipal and county officials, it is our understanding that Livingston County has a fledgling water authority and that they may be able to purchase water from the MCWA and be the purveyor of water in the part of the impacted area in Livingston County (i.e., the Town of Caledonia). Again, the details of how to purvey the water will be an important issue evaluated in the design phase of the project.

L.4: The hydraulic evaluation of providing flow from the MCWA's Mumford Tank through the hamlet of Mumford and into Caledonia should be reviewed. It appears that the pressures would be extremely low. This could easily be remedied by moving the proposed pump station further back into the system. As indicated on Page 23, Item 4, if the pump station is placed at a ground elevation of 720' the pressure coming into the pump station would be below zero at the LWL of the Mumford Tank. This is not a reasonable hydraulic design.

R: The Department thanks the MCWA for the comment. The mentioned design concern will be closely looked into during the design phase of the project.

L.5: Regarding the services to homes, an open cut installation is for a small service line to a home (typically 1 inch diameter). Services of this size are usually missiled across road pavements (or roadways). It is MCWA's desire that all services be installed in this manner.

R: The Department thanks the MCWA for the comment. The mentioned design concern will be closely looked into during the design phase of the project.

L.6: The concept of utilizing a portion of the pipelines in the Village of Caledonia, and the impact on their existing water tank should be throughly reviewed with the Village. It is my (MCWA) belief that your (NYSDEC) proposal could sever the Caledonia system form its sole water storage tank.

R: The Department thanks the MCWA for the comment. The mentioned design concern will be closely looked into during the design phase of the project.

L.7: The cost estimate of the study lists a price of $75,000 for the pump station. I believe this is well below a reasonable cost for a pump station of this size.

R: The Department thanks the MCWA for the comment. The mentioned design concern will be closely looked into during the design phase of the project.

Questions L.8 and L.9 are summarized comments a of a letter dated March 14,1997 from the Genesee County Department of Health (GCDOH).

L.8: The Genesee County Health Department is in agreement that "...the primary component of the remedial program should be as designated: to bring public water to the area." However, the GCDOH has concerns with the proposed conceptual design of the waterline extension, in particular that a large portion of the area is fed by a single line. The GCDOH is concerned that a disruption of service could occur with a waterline break. Further, they are concerned that during fire flow demands, negative pressure flow could introduce contamination into the waterline system. To mitigate these concerns the GCDOH suggests that a second loop be added to the proposed system by extending the waterline west from Spring Street along George Street to the Flint Hill/ Lime Rock Road.

R: The Department thanks the GCDOH for the comments and will evaluate in detail the potential hydraulic concerns raised in the letter during the design phase of the project. As a result of evaluating several comments received on this issue during the public comment period, the Department has tentatively decided to modify the remedy presented in the Proposed Remedial Action Plan. The proposed modification will expand the scope of the waterline extension to include the section from Spring Street west along George Street/Flint Hill Road to LimeRock Road. This proposed modification will be evaluated in the design phase of the project and the final decision to install this section of the waterline extension will be based on satisfying two issues. One, a determination that private wells in this area are threatened from the TCE plume and two, a determination of the hydraulic adequacy of the proposed design. Both of these issues will be resolved early in the design process and the public will be notified of the Department's decision. For more details on this modification, please see Section 8.2 of the record of decision and the Department's response to question L.39.

L.9: The GCDOH also believes that the proposed waterline extension should be designed to meet the potential future demand of the area. They cite that under the present plan the potential threat "..will remain in some portions of the remediation area, as well in the peripheral area. The need for long-term monitoring and private system protection within the remediation area will extend long into the future, and the ultimate cost will continue to increase." Therefore, GCDOH believes a system design to handle future potential demand is a cost effective alternative.

R: One of the remedial goals identified for the Lehigh Valley Railroad Derailment site is to provide the impacted public a safe drinking water supply. While providing a water main system that can handle the future growth of the area is desirable, it is not necessary to meet the remedial goal of protecting human health. Further, the Department's proposed remedy would provide for fire protection for current residents. If in the future, the area expands and the present waterline is not adequate, it will be up to the local municipalities and the water authorities to develop funding mechanisms to upgrade the system. Again, if Genesee County, or any municipality or authority, wishes to fund upgrade the NYSDEC proposal, the Department would allow them to join in on the project. This would save money in both the design and construction phases.

Questions L.10 through L.13 summarize comments from a letter dated March 17, 1997 from the Monroe County Department of Health (MCDOH):

L. 10: In general the MCDOH agreed with the proposed plan. "We generally concur with the selected remedy including a large scale waterline with current fire flow demand...". However, the MCDOH had similar concerns as the GCDOH did with the hydraulic feasibility of the design. Specifically they mentioned the potential impacts on the Village of Caledonia system and the possibility of large dead end areas. They suggested that all the impacted municipalities and authorities be closely involved with the development of the design of the project.

R: The Department thanks the MCDOH for the comments. As stated in response to questions L. 8 and the response to the various MCWA comments (L.2 through L.7) the Department will closely look at the hydraulic adequacy of the proposed plan in the design phase of the project. The Department also plan to involve all interested parties in the design of the waterline extension.

L.11: The MCDOH points out that the MCWA does not have the legal authority to purvey water in Livingston County.

R: Please see response to question L.3 above.

L.12: The MCDOH also submitted a comment similar to question LA from the MCWA which questioned the hydraulic elevations of providing flow from the MCWA's Mumford tank.

R: Please see the response to LA above.

L.13: The MCDOH also expressed similar concerns as did other commentors that the proposed waterline extension does not include a line which allow the Genesee County Museum to hook up to the system.

R. As a result of evaluating several comments received on this issue during the public comment period, the Department has tentatively decided to modify the remedy presented in the Proposed Remedial Action Plan. The proposed modification will expand the scope of the waterline extension to include the section from Spring Street west along George Street/Flint Hill Road to Lime Rock Road. For more details on this modification, please see Section 8.2 of the record of decision and the Department's response to question L.39.

Questions L.14 through L.38 are summarized comments a of a letter dated March 12,1997 from the LeRoy Conservation Advisory Council (the 'Council'):

L. 14: It is not clear in the plan if the water being permitted to be pumped by the Dolomite Corporation Quarry on Gulf Road, into Mud Creek, is regularly monitored. Since TCE level exceeded acceptable standards, we are recommending that the water pumped from this area be monitored on a regular basis.

R. At the present time, the Department does not believe it is necessary to monitor the discharge from the quarry. Please see the response to question E.4 above for a more detailed response.

L.15 In summary, the question asked is why the site is called an inactive hazardous waste disposal site?

R: In a legal sense, the term inactive hazardous waste disposal site is from the enabling legislation that created the New York State superfund program. In a more general sense, the term describes a site were improper disposal of a hazardous waste (in this case the spilled TCE is considered disposal) has cause a threat to the environment or human health. Further, the term "Inactive" generally refers to a site or facility that is not "currently" generating, treating or disposing of hazardous waste and therefore is not subject to the remediation requirements under the New York State hazardous waste management regulations (or at the federal level, regulations developed under the Resource Conservation and Recovery Act or RCRA).

L. 16 The Council asks about the ramification of the pending nomination to the federal National Priority List (NPL) and why it has taken so long to act at the spill site.

R: The main reasons why the State of New York nominated the site for the federal NPL is, 1) the site is of a magnitude and threat that warrants a potential listing, and 2) if accepted by the USEPA they would assist in the technical evaluation and funding the remediation. The major ramification to the remedial plan outlined in the PRAP is time. It may take some time for the USEPA to determine if the site warrants inclusion of the federal NPL.

The Department understands the concerns of the local officials with regards to the apparent long time it has taken for the remedial process to unfold. However, main reason why it has taken this long to get to this stage in the process boils down to the size and complexity of the site. The unique hydrogeologic conditions of the site coupled with the large size of the impacted area has required the Department to extensively study of the problem. The proposed remedial plan presented to the public is the result of over four years of study and the expenditure of over $1.7 million dollars.

L.17 The Council has concern with the reported spill of cyanide that occurred during the railroad derailment and whether warning signs should be posted to warn of potential human exposure to contaminated soil.

R: The cyanide reported to be spilled during the railroad derailment was of a crystalline solid form. It was also reported that the solid cyanide was recovered and removed from the site. During the remedial investigation, the Department sampled both the spill site soil and the monitoring wells for the presence of cyanide. Two soil samples in the spill area had levels of cyanide above guidance values and, as was stated in the comment letter, one source area monitoring well has cyanide levels in groundwater above state standards. The cyanide contaminated soil is not considered a concern for the following reasons. First, the soil samples were collected in an area that has significant TCE soil contamination and this area will be excavated and remediated. Second, the two soil samples with elevated cyanide were collected in an area were the bedrock is just below the ground surface (less then 6 inches). Therefore the volume of soil contaminated with cyanide is expected to be minimal. With regards to the groundwater contamination, the levels do exceed state standards but only in the source area monitoring wells. Monitoring wells outside of this area show little or no cyanide contamination. Further, as stated above, the contaminated soil will be excavated and remediated and we anticipate that once this is completed the cyanide levels in the groundwater will decrease.

With regards to the posting of warning sign to prevent access to the site, the Department does not believe that it is necessary at this time. Please see response to question D.8 above.

L.18: The RI indicates that "...the eastern boundary of the contaminated plume has not been defined" However, Figure 2 indicates that 14 wells are contaminated along Spring Street but none east of Spring Street. "Does this mean that the eastern flow of the plume has stabilized or that DEC does not know due to the lack of monitoring wells to the east of Spring Creek"?

R: There are no monitoring wells associated with the Lehigh valley Railroad Derailment site to the east of Spring Street. This is because Department chose Spring Creek as the eastern boundary of the site. The decision to establish Spring Creek as the eastern boundary was based on several factors.

First, the geologic conditions found east of Spring Street suggest it is doubtful that the plume has traveled farther to the east. During the RI it was learned that geologic conditions change significantly just to the east of Spring Street as depth to bedrock increases dramatically due to a buried bedrock valley. This valley is filled with surficial deposits formed by a glacial delta. These deposits are characterized by sands and gravels. At the Jones Chemical site, just east of the Village of Caledonia, these deposits are over 100 feet thick.

Second, the Village is on a public water supply and as such, there are no reported private wells in the Village of Caledonia. The Village of Caledonia water supply is derived from a series of groundwater wells placed in a sand aquifer. Because of contamination from the Jones Chemical site, the groundwater pumped from these wells is treated by air stripping prior to distribution. Therefore, to the east of Spring Street there is very limited opportunity for human ingestion of contaminated water.

The sand and gravel deposits provide a excellent yielding aquifer and the Village of Caledonia uses this geologic formation for their water supply. While it is possible that contaminated groundwater from the Lehigh Valley Railroad Derailment site is discharging into this bedrock valley and its associated sand/gravel unit, to the extent that it does so, it is greatly diluted by the volume of ground water already in these beds.

Third, the Department believes that the groundwater from the spill site flowing eastward discharges to Spring Creek. Two observations from the RI justify this assumption. First, the monitor ing wells installed into bedrock just west of Spring Street exhibit higher water level elevations that are higher than the surface elevation of Spring Creek. This relationship suggests that groundwater in the bedrock is discharging to the Creek. Second, the occurrence of numerous springs both within and surrounding Spring Creek strongly suggest a major discharge of groundwater to surface water.

L.19: The Council is concerned with possible impacts to the fish hatchery on Spring Creek.

R: During the RI, TCE contamination was documented in springs and groundwater near Spring Creek. However, samples collected within the water column of Spring Creek showed TCE at either non-detectable levels or at levels below the surface water guidance value of 11 ppb (whichis considered protective of human health from the consumption of aquatic life). The low levels found are most likely due to the extensive dilution of Spring Creek.

The Caledonia fish hatchery uses water from Spring Creek in its fish rearing ponds. The water is aerated prior to use to increase the dissolved oxygen concentration and reduce the nitrogen concentration. This aeration would tend to reduce TCE concentrations in the raw Spring Creek water. Further, the fish hatchery has observed no unusual fish kills and a review of their records indicated no unusual fish kills just after the spill event in 1971.

L.20: The Council has concerns with the means to estimate the extent of the NAPL bedrock zone. They cited apparent confusion in the indirect method used to estimate the boundary. In particular, what techniques were used to determine the NAPL zone? Were bedrock bore holes used and if the NAPL zone boundary is estimated how accurate is it?

R: The Council has identified a crucial question with regard to establishment of the source area boundary. Prior to conducting the Remedial Investigation, it was expected that direct evidence of DNAPL (TCE) would be found in the bedrock. This expectation was based on the spill size and the fact that an extensive plume has persisted for a quarter of a century. Therefore the investigation was designed to detect DNAPL if it were present.

Two methods were used to look for direct evidence of DNAPL in the bedrock during well installation. One was to test for TCE vapors using an instrument called a photoionization detector. The second was to examine rock core and ground water samples using an ultraviolet light. (TCE is known to fluoresce, responding to invisible ultraviolet light by glowing a distinctive color.) The results of these tests were negative; that is, no TCE was detected in this way. (TCE is a dense non-aqueous phase liquid and, therefore, if TCE were present at this site it would be in the form of a DNAPL.)

Notwithstanding these findings, chemical analysis of ground water samples collected from these same wells reveal very high concentrations of TCE in certain bedrock zones near the exact location of the spill. Because TCE does not readily dissolve in water, these analytical results clearly suggest the presence of a TCE DNAPL in the bedrock at the locations where these high results were found. If it can't be detected directly but can be inferred from indirect evidence, then has it migrated into the fabric of the rock? This question is the basis for mentioning the possibility that TCE has diffused into the rock matrix.

High concentrations of dissolved TCE in ground water is considered indirect evidence of DNAPL presence. As an example of what we mean by "high levels," a summary by well cluster of results from round 4 sampling shows the following. Monitoring wells within the "source area" (MW-1 through -6 except for upgradient location MW-4; and MW-15 and -16): maximum TCE value 50,000 parts per billion, minimum 490 ppb, and average 20,580 ppb. Monitoring wells outside the "source area" (MW-4, MW-7 through -14, and MW-17): maximum 620 ppb, minimum 0 ppb, and average 101. Under laboratory conditions, TCE will dissolve in water up to a level of 1, 100,000 parts per billion, or about one ounce per seven gallons.

Faced with these findings the Department chose to define the DNAPL boundary to encompass all wells with levels greater than 1,000 ppb.

L.21: The Council points out the apparent critical influence of the "Mud Creek Zone" on the direction of the groundwater plume. They cite the PRAP which describes Mud Creek as a losing stream (losing water to the bedrock) and that its impact on the source area is more pronounced during the spring melt out. They ask, "...has any consideration been given to a civil engineering type solution to the problem. For example, diverting the flow of Mud Creek after it crosses route 5 near the LeRoy Airport or constructing an irrigation type canal to contain the flow during spring time flooding..."?

R: During the RI, the water levels were measured routinely in all monitoring wells. In addition,selected monitoring wells were fitted with "Telog" units which continuously measure the water table level. In addition, staff gages were used to measure the streams, including Mud Creek. In the spring, the watertable rises over 30 feet at the spill area and almost 50 feet at Mud Creek.
This is caused by the large amount of water which enters the system in a very short period of time during the spring melt out. In addition, it appears that monitoring wells throughout the systemrise and fall in 'lock step' which indicates that the bedrock system over the entire study area is reacting to this rapid influx of water. Therefore, the rise in the water table is a regional anomaly and yes, diverting Mud Creek may help the situation, but this action may also have no impact, whatsoever on this regional rise of the water table.

The Department has proposed an action which will remove the TCE from the bedrock system and not attempt to change the complex hydrogeologic system found at the site. By reducing the available TCE in the bedrock and soil system, we hope to reduce the extent and magnitude of the groundwater plume.

L.22: The Council asked about the decision not to include cyanide and mercury as contaminants of concern for the Lehigh Valley Railroad Derailment spill site.

R: With regards to the cyanide contamination, please see response to question L.17 above.

With regards to the mercury contamination, the soil sampling conducted in the source area during the RI found one sample with elevated mercury concentrations. This sampling point, as well as other points within the spill site, were resampled by the Department. The second round of sampling did not find mercury levels in excess of the guidance values. Therefore the one isolated sample sample result was not replicated. In addition, mercury was not reported to be associated with the railroad derailment and the Department has found no potential source for this isolated mercury occurrence. Finally, the mercury detection above guidance values occurred in an area of extremely shallow depth to bedrock and therefore the volume of soil associated with this mercury occurrence would be minimal. Therefore, based on the isolated occurrence of the elevated mercury result, the non-reproducibility of the result and the potentially minimal volume associated with the location of the result, mercury was not considered a concern at the derailment site.

L.23: The council cites the PRAP and the reference to future potential exposure to contaminated groundwater from residential development. They asked if the Department had any statistics about the potential residential development of the area and could this be used to influence the decision on the extent of the proposed waterline extension.

R: The Department did not use any statistics that indicated the likelihood or the potential for futureresidential development. Further, we agree with the Council that much of the area is presently owned by quarries and sportsmen clubs and, at present, it is doubtful that residential development will occur in the near future. However, in a health risk assessment, one of the generic potential exposure pathways we evaluate for all inactive hazardous waste sites is the possibility of future residential development of the site. This is a worst case scenario used to judge the potential impactof the site on the surrounding community. Many times, because of existing site conditions, this scenario is not practical but it is still evaluated as it provides the most conservative exposure scenario.

For the Lehigh Valley site, the potential for future residential development and the associated potential exposure to contaminated groundwater was one of the factors considered during the feasibility study. A large scale water line is a permanent and effective means of providing a safe drinking water supply to all impacted residents. Further, under the Department's proposal, the waterline is designed to handle about 100 total hookups. This could handle all impacted residents with room for a moderate increase in the number of new homes in the area.

L.24: The Council refers to text in the PRAP which states that direct exposure to contaminated bedrockby mining is highly unlikely. Does this take into account the present Dolomite Quarry operations and what about any proposed of future quarry operations?

R: As noted in response to comment E.3, it is unlikely that the spill site area will be used for quarry development. The site lies within multiple property boundaries and yes, the Department would require methods to monitor for and mitigate any potential exposures to workers from the release of TCE vapors during the quarry operations as well as require the quarry to prove that the crushed rock is free of TCE residual. However, outside of the approximately ten acre NAPL area, theTCE contamination would not be in the bedrock matrix and only be in the groundwater in the dissolve d phase. With the lower concentrations, the amount of TCE released in quarry operationswould be minimal, the potential exposure to workers would be less, and the final crushed stone product would most likely not be impacted. As stated in response to comment E.3, the quarry would most likely have to monitor the water pumped out of it's pit for the presence of TCE.

L.25: "Section 4.3, Significant Habitat, indicates there are no identified sensitive habitats or endangered species located at the spill site. Question is: How detailed was the DEC study on this subject? The LeRoy Conservation Advisory Council (CAC) has information and maps obtained from Genesee County that may indicate otherwise.

R: The Department would welcome any additional information the CAC way have to clarify the potential for impact of endangered and sensitive habitats. The statement in the PRAP was based on the site boundary as defined in the NYS Registry of Inactive Hazardous Waste Sites, which only cites the approximately one acre area of the actual spill as the "site". Further, the RI report, which is available at the local document repositories in the Towns of LeRoy and Caledonia Libraries, has a detailed discussion on the potential impact to fish and wildlife resources. The RI report also has a "Cover Type" map identifies all important fish and wildlife resources within 1/2 mile of the study area.

L.26: The Council asks about the potential for impacts to Oatka Creek and homes north of Oatka Creek.

R: The Department does not believe there is a concern with regards to water quality for Oatka Creek. Please see response to question A.2.

With regards to private wells north of Oatka Creek, the NYS Department of Health has sampled selected private wells north of the stream and has found no site related contamination. The Department believes that Oatka Creek is the northern boundary of the spill site and that contaminated groundwater may discharge to Mud Creek which flows to Oatka Creek but due to the dilution of Mud Creek and Oatka Creek, detectable TCE concentrations have not been found in surface water.

L.27: The Council asks which potentially responsible parties (PRP) is the department pursuing?

R: The Department plans to pursue a number of PRPs for cost recovery at the site. These may include, but are not limited to, the corporate successor of the Lehigh Valley Railroad, the manufacturer of the spill chemical (possible Olin Chemical), the tank car owner (unknown at this time). The actual list of PRPs will be available to the public when the next phase of the project is over (please see response to questions A.7 above).

L.28: The Council asks about the organic carbon results and how the Department selected the site wide average of 9.6 percent? Why is a high organic carbon amount used when it will result in a higher TCE cleanup goal?

R: The 'site wide average' is the average concentration of the organic carbon samples collected within the one acre spill site during the RI. The soil organic carbon results ranged from a high of 14.3 % to a low of 3.5 %. The simple mathematical average of the five samples collected in the spill site was 9.6 %. For more information on the organic carbon testing please see the feasibility study of Operable Unit #2 (Surface Soils) which is available in the document repositories.

Using the Department's guidance, the higher the organic carbon content of the soil, the more TCE the soil can contain without leaching to groundwater. For the Lehigh Valley Derailment site this clean up objective calculated out to 7.0 ppm of TCE in soil. As noted in the PRAP, this level of TCE in soil is considered protective of groundwater resources and is also protective to human health via direct human contact with the TCE contaminated soil.

L.29: The Council asks would there be any impact to private wells located on Circular Hill Road from the remediation plan?

R: First, the present plan calls for a large scale waterline to be installed prior to any work in the source area. So there would be no impact on drinking water supplies in the impacted area. Further, the remedial plan calls for bedrock vapor extraction and does not presently include large scale pumping of the groundwater at the spill site. This was considered in the FS and will be looked at further in the design, however given the high cost of treating the large volume of water that would be required to dewater the bedrock, groundwater pumping is not proposed. If, in the future, the Department considers the need to pump the bedrock aquifer to increase the efficiency of the bedrock vapor extraction system, a detailed pump test will be conducted and the potential impact on nearby private wells will be evaluated.

L.30: The Council asks about the statement made in the PRAP which indicates that the plume would flush itself out in a couple of years if plume interception is initiated.

R: First, the current plan does not include provisions for plume interception. At this time, it is not considered cost effective to capture and treat the large amount of groundwater necessary to intercept the plume. However, the Department plans to further evaluate this in the design phase of the source remediation. The statement in the PRAP refers to the possibility that given the highly fractured nature of the bedrock system, that an effective plume interception system could reduce and possibly eliminate the downgradient extent of the plume in a short period of time. The water for this flushing would come from the surrounding areas not presently impacted by the TCE plume and in the spring, with the large rise in the groundwater table, could significantly dilute the TCE groundwater plume.

L.31 The Council's comment regards the proposed closure of Gulf Road which is required for the soil excavation. They wish to know when this will happen and how much of the road will be closed.

R: The exact schedule of the closure of Gulf Road will be determined in the design phase of the source control measures. As noted in response to question A.7, this will only occur after the waterline extension is installed and all impacted resident are hookup to the waterline. At that time, the Department will provide the schedule of the road closure to the local officials and impacted residents. However, it is anticipated that the excavation of the soil would occur during the summer or fall seasons. This is because it is easier to excavate soil in a dryer time of year.

With regards to the scope of the road closure, about 2000 feet of the road will be closed for about 4 to 6 months. Appropriate detours and warning signs will be posted. After the road is closed, about 500 feet of the road surface will be removed so the contaminated soil under the road can be excavated. Once the contaminated soil is excavated and the bedrock surface is cleaned of all visible contamination, the road will be replaced.

L.32: The Council asked questions regarding the different waterline scenarios described in the various alternatives and for each would the Department would pay for the hook up of impacted residents.

R: The Department evaluated a number of potential waterline scenarios which all had different proposed routes. In each case, if an impacted resident was along the route of the waterline extension, they would be hooked at no expense. This is the same with the large scale waterline which the Department has selected. All impacted private residents will be hooked up to the waterline extension at no cost. Other residents not impacted by the spill site can hook up at their own expense. But since the remedial contractor will already be doing similar work in the area, we anticipate that the cost to the non-impacted homeowner would be less if they decided to hook during the remediation then if they wait for a later date.

L.33: The Council's next question addressed the ability of the Town of LeRoy to provide adequate flow to service the waterline proposed in alternative #3.

R: This was one of the concerns that the Department had with this alternative. In the feasibility study for the groundwater operable unit, the state's consultant pointed out the possible problems that the Town of LeRoy may bave in providing water to the spill site area. One of these concerns was available capacity. Because of this and other reasons, the Department has not selected alternative #3. Instead the proposed plan is to use water provided by the MCWA, whose supply is adequate to service the impacted area.

L.34: The Council asked about the potential health risks associated with the TCE contaminated soil found at the spill site.

R: The Department has rejected alternative #1 (No action - continued monitoring) as a viable remedy. The present plan is to excavate the contaminated soil and treat it on site until it reaches the remedial action objectives. With regards to the potential health risks associated TCE contaminated soil please see response to questions D.2, D.3, D.7, and D.8.

L.35: The Council asks about the risk associated with the proposed bedrock vapor extraction system. What happens if it does not work?

R: The risks associated with the bedrock vapor extraction system are; one, the possibility of a pulse of groundwater contamination migrating through the aquifer and two, the potential impact of the release to the air of the extracted vapors. Please see the Department's response to questions C.3 and C.4 above.

If the bedrock vapor extraction system is not effective at remediating the site, the Department will conducting additional engineering studies to evaluate possible enhancements and/or modifications to the existing system. If deemed feasible, the system be adjusted and re-tested. One possible modification already considered in the feasibility study is pumping of the groundwater in the spill area to depress the groundwater table. This modification could expose more bedrock to the actions of the vapor extraction.

L.36 Where will the pumped water from the NAPL zone be pumped to during the remediation process and will it be treated during the remediation?

R: The present plan does not call for pumping of contaminated groundwater from the source area. However, this was considered in the feasibility study and the PRAP. If pumping of source area groundwater had been selected it would have been treated on-site to the appropriate state discharge standards and either released to Mud Creek or injected back into the ground.

There will be a small volume of water that will be entrained by the actions of the bedrock vapor extraction system. Depending on the TCE concentration, the contaminated water will be decanted from the vapor stream, collected and either treated on-site by activated carbon or sent off-site for proper disposal.

L.37: Will there be additional TCE in the Mud and Oatka Creeks during the source area remediation and will the DEC test fish tissue and sediment samples for traces of TCE?

R: As stated above in response to questions L.35, C.3 and C.4, there is the possibility of a pulse of contamination migrating through the groundwater system and potentially impacting surface water quality. However, if it occurs, the Department believes that this pulse of contamination would be only for a short duration (days to weeks). The Department will monitor both surface water and sediment before, during, and after implementation of the source area remediation, and if the levels in these samples warrant, the Department would consider testing aquatic organisms in impacted streams.

L.38: Our committee has an endangered species map of the NAPL area that indicates the possibility of endangered species in the work zone vicinity. Will DEC protect this area from impact?

R: The Department appreciates any help the Council can provide on the identification and possible location of any endangered species in the NAPL remediation area. The NAPL source remediation will consist of a series of extraction wells drilled within the approximately ten area NAPL area. This type of construction activity can be conducted with minimal adverse impact to the surrounding environment. We hope to work closely with the Council on this issue and would appreciate any reports, maps or sightings that the Council may have to assist the Department in the design phase of the project.

Question L.39 is the summarized comments a of a letter dated March 17,1997 from the Genesee Country Museum:

L.39: The Genesee County Museum believes the PRAP fails to address the threat to human health posed by the spill site's potential impact to the Museum's water supply. The significance of the threat must be considered by reviewing the large number of people who would be threatened by the TCE contamination of the museum's wells. At present the museum receives over 150,000 visitors a year. The Museum believes that the number of people threatened by the spill site will increase as the museum expands and the number of visitors increase. Further, the museum has concerns with the safety of over 200 staff members who drink the well water. In general, the museum raised the following concerns:

- The museum is the largest user of drinking water is the affected area. One of the Museum's four wells has been proven to be marginal (it has gone dry three of the past four years) and we are prepared to replace it with a deeper well the next time it goes dry. The PRAP stated that previously uncontaminated wells in this area have become contaminated after they were deepened in response to drought conditions.

- The groundwater plume is inadequately defined. The sampling has been inadequate and consideration was not given to the likelihood that our site will be impacted by the remedial action project and the reduced levels of water taken from the aquifer when the public waterline extension is installed.

- If the Museum's wells are found to be contaminated at a later date, it will be much more difficult to use a carbon filter then a residential well because of the volume of water used.

- Even in the absence of documented contamination of the Museum's wells, we believe that the Museum faces significant economic risk because of the public perception that the museum is located directly over a plume of groundwater contamination and its water supply is not included in the planned project. This places an economic burden upon the museum for the period of time it would take to either install a filter system or to run water lines to the site.

In conclusion, the Genesee Country Museum believes that the water supply described in the PRAP should be provided to the museum in the same manner as proposed to the contaminated wells in the impacted area. We believe that there is compelling justification to make this necessary amendment.

R: As a result of evaluating several comments received on this issue during the public comment period, the Department has tentatively decided to modify the remedy presented in the Proposed Remedial Action Plan. The proposed modification will expand the scope of the waterline extension to include the section from Spring Street, west along George Street/Flint Hill Road to LimeRock Road. This proposed modification will be evaluated in the design phase of the project and the final decision to install this section of the waterline extension will be based on satisfying two issues. One, a determination that private wells in this area are threatened from the TCE groundwater plume and two, a determination of the hydraulic adequacy of the design originally proposed in the PRAP. Both of these issues will be resolved early in the design process and the public will be notified of the Department's decision. The Department will actively seek the involvement of the Genesee Country Museum on both the determination of threat to it's wells and the evaluation of the hydraulic adequacy of the modified waterline conceptual design.

Several factors have contributed to this proposed modification. First, information from the Genesee Country Museum located along Flint Hill Road points to the likelihood that there is a significant potential for a future threat to human health from ingestion of contaminated groundwater. The Museum indicates that it is likely that they will need to expand their water supply by deepening existing wells or adding new wells. In both cases, it is reasonable to expect that these wells may encounter contaminated groundwater. Second, additional information from the Museum indicates that, contrary to previous information, it may be possible to install a waterline along a significant portion of George Street and Flint Hill Road without the need to excavate into bedrock. This increases the "implementability" and lowers the anticipated construction cost of this proposed segment. Third, comments from other reviewers questioned the reliability and operation/maintenance assumptions of the waterline configuration presently in the PRAP. It is pointed out that the lack of a second loop along Flint Hill Road could create engineering design problems that could result in the overall system being less reliable. These concerns include the potential for pressure drops during period of fire flow demand and contingencies in the case of a water main break along Route 5. Although these issues were evaluated previously and found to be manageable, in combination with the potential exposure to large population at the Country Museum, the engineering concerns add weight to the conclusion that this section should be included in the waterline extension.

The Department considers these issues substantive and tentatively has decided that the addition of a section from Spring Street, west along George Street/Flint Hill Road to Lime Rock Road is may be necessary to create a waterline system that is adequately protective of public health. These issues will be further evaluated in the design phase of the waterline extension to confirm that the information and assumptions adequately support the decision to extend the waterline in this area Once a final determination has been made, the Department will issue a notice to everyone of the mailing list informing them of the Department's decision.

Question L.40 is the summarized comments a of a letter dated March 17,1997 from Regional Gravel Products, Inc.

L.40: Regional Gravels Products, Inc. (RGP) is the owner of 277 acres of land located south and east of the spill site. Monitoring wells sampled on RGP's property have shown only minor amounts of the spilled TCE, however the public perception is that this property has been significantly impacted by the spill and has negatively impacted the property's value and potential development. RGP believes that alternative #1 (No action - continued monitoring) is unacceptable. While the other alternatives in the PRAP include provision for public water supply extensions and/or treatment of the spilled material, only alternative #6 addresses the future development of the impacted area. By not spending for potential development the State of New York will save remediation dollars today and jeopardize individual property owners investments tomorrow. For the PRAP to recommend trading-off future development potential and the future economic well-being of the area homeowners and businesses on the basis that it is not cost effective is shortsighted. As compensation, area landowners should be given compensation for the years of frustration, worry, and inconvenience caused by the delayed clean up of this spill. RGP recommends that the Department select alternative #6 which includes provisions for a waterline design for the future potential growth of the impacted area.

R: The Department understands the concerns that are raised by the comments. At this and all other sites across the State, the Department's obligation is to select and implement remedies that are protective of human health and the environment. The Department believes that Alternative 5 best meets the criteria for selecting a remedy including overall protectiveness and cost effectiveness. Given this determination, implementing Alternative 6 would not be an appropriate use of limited resources and could prevent the Department from implementing timely remedies at other sites that present threats to human health and the environment. Also, the issue of future development is complicated, speculative, and raises issues that need to be resolved by the local community through thorough consideration and deliberation. Implementing Alternative 5 does, however, present an opportunity for the local community to consider these issues and decide if the possible benefits of future development warrant local investment to upgrade the remedy to address future development issues.

On February 14, 1997, the Department held a meeting with local elected officials, town and county representatives and members of the local water authorities. It was explained to them at that time that the Department would be willing to allow the local municipalities/authorities to join with the NYSDEC on the waterline extension project. The local municipalities/authorities could pay for upgrades to the NYSDEC's proposed waterline which could include designs for future potential growth of the area. Further, members of the NYSDOH explained that there were possibly funds available through the 1996 New York State Clean Water/Clean Air Bond Act. The offer to the local municipalities/authorities to join with the Department on the waterline project will be available until the design of the waterline extension is started.

Regarding compensation for damages created by the spill, it is suggested that persons who desire to recover damage costs need to bring these issues up with the potentially responsible parties for the Site.

Administrative Record File Index
Lehigh Valley Railroad Derailment
Site ID No. 8-19-014
Town of LeRoy/ Genesee County
ROD Signed: March 1997

Reports

1. Record of Decision; Operable Unit #1 (Groundwater) and Operable Unit #2 (Surface Soil), prepared by the NYSDEC, dated March 1997.

2. Public Meeting Transcript, Lehigh Valley Railroad Derailment, Inactive Hazardous Waste Disposal Site, Operable Unit #1 (Groundwater) and #2 (Surface Soil), held on March 4, 1997 at the Caledonia-Mumford High School, 99 North Street, Caledonia New York.

3. Public Notice, Lehigh Valley Railroad Derailment Proposed Remedial Action Plan, published in the Democrat and Chronicle, Rochester, New York on February 14, 1997.

4. Proposed Remedial Action Plan; Operable Unit #1 (Groundwater) and Operable Unit #2 (Surface Soil), prepared by the NYSDEC, dated February 1997.

5. Feasibility Study, Operable Unit #2 (Surface Soils), prepared by the NYSDEC, dated February 1997.

6. Feasibility Study, Operable Unit #1 (Groundwater), prepared by RUST Environment and Infrastructure, dated January 1997.

7. Remedial Investigation Report, prepared by RUST Environment and Infrastructure, dated October 1996.

8. Laboratory Bench-Scale Treatability Study, Operable Unit #2 (Surface Soils), prepared by the NYSDEC, dated January 1996.

9. Citizen Participation Plan; prepared by the NYSDEC, dated January 1996.

10. Field Sampling Report, Operable Unit #2 (Surface Soils), prepared by the NYSDEC, dated March 1995.

11. First Phase Feasibility Study, Operable Unit #1 (Groundwater), prepared by Dunn Geoscience, Inc., dated September 1994.

12. Domestic Well and Initial Sampling Report Operable Unit #1 (Groundwater), prepared by Dunn Geoscience, Inc., dated May 1993.

13. The Spill Site Soil Investigation Report, Operable Unit #2 (Surface Soil), prepared by Dunn Geoscience, Inc., dated April 1993.

14. Work Plan - Remedial Investigation/Feasibility Study, prepared by Dunn Geoscience, Inc., dated April 1992.

Fact Sheets

1. Fact Sheet, Proposed Remedial Action Plan, prepared by the NYSDEC, February 1997.

2. Fact Sheet, prepared by the NYSDEC, September 1994.

3. Fact sheet, prepared by the NYSDEC, July 1993.

4. Fact Sheet, prepared by the NYSDEC, November 1992.

5. Fact Sheet - Update, prepared by the NYSDOH, April 1992.

6. Public Meeting Notice, prepared by the NYSDOH, October 1991.

7. Fact Sheet, prepared by the NYSDOH, October 1991.

Correspondence

1. Letter, from G. Anders Carlson, Director, Bureau of Environmental Exposure Investigation, NYSDOH to Michael O'Toole, Director, Div. of Environmental Remediation, Re: Record of Decision for the Lehigh Valley Railroad Derailment Site, dated March 27, 1997.

2. Letter, from Richard Elliott, Principal Public Health Engineer, Monroe County Health Department, to David Crosby, Project Manager, NYSDEC, Re: Lehigh Valley Railroad Derailment, dated March 17, 1997.

3. Letter, from Douglass W. McDonald, President of CEO, Genesee Country Museum, to David Crosby, Project Manager, NYSDEC, Re: Comments on the Proposed Remedial Action Plan for the Lehigh Valley Railroad Derailment, dated March 17, 1997.

4. Letter, from Susan J. Keister, Environmental Recourse Manager, Regional Gravel Products, Inc., to David Crosby, Project Manager, NYSDEC, Re: Lehigh Valley Railroad Derailment, dated March 17, 1997.

5. Letter, from Thomas Guerin, Director, Environmental Health Services, Genesee County Health Department, to David Crosby, Project Manager, NYSDEC, Re: Lehigh Valley Railroad Derailment, dated March 14, 1997.

6. Letter, from Richard Metzger, Chief Engineer, Monroe County Water Authority, to David Crosby, Project Manager, NYSDEC, Re: Lehigh Valley Railroad Site, dated March 13, 1997.

7. Letter, from Andy Olenick, Chairman, Town of LeRoy Conservation Advisory Council, to David Crosby, Project Manager, NYSDEC, Re: NYSDEC, Proposed Remedial Action Plan, Lehigh Valley Railroad Derailment, dated March 12, 1997.

8. Letter, from Jamie Thompson, Fire Marshal, Town of Wheatland, to Linda Vera, NYSDEC, Region 8, Re: Lehigh Valley Railroad Derailment, Proposed Remedial Action Plan,, dated March 8, 1997.

9. Letter, from G. Anders Carlson, Director, Bureau of Environmental Exposure Investigation, NYSDOH to Michael O'Toole, Director, Div. of Environmental Remediation, Re: Proposed Remedial Action Plan for the Lehigh Valley Railroad Derailment Site, dated January 14, 1997.

10. Letter, from Michael O'Toole, Director, DHWR to George Pavlou, Acting Director, Emergency and Remedial Response Division, USEPA, Re: Lehigh Valley Railroad Derailment - Notice to Proceed for NYSDEC take over of O&M of GAC filter system, dated May 26, 1993.

11. Letter, from Michael O'Toole, Director, DHWR to James Behan, Dunn Geoscience Corp., Re: State Superfund Work Plan Approval, dated May 18, 1992.

12. Letter, from David Smith, Chief Contract Development Section, DHWR to James Behan, Dunn Geoscience Corp., Re: State Superfund Standby Contract, dated February 3, 1992.

13. Memorandum, From George Harris thru Ed Belmore to Michael O'Toole, Re: Conceptual Approval for RI/FS at the Lehigh Valley Railroad Derailment, dated January 30, 1992.

14. Memorandum, from David Markell to Michael O'Toole, Re: Referral - Lehigh Valley Railroad Site, dated November 28, 1991.

15. Memorandum, from Nick Magriples, On-Scene Coordinator, USEPA to Kathleen Callahan, Director, Emergency Response Division, USEPA, Re: Lehigh Valley Railroad, Bottled Water Expedited Action, dated April 8, 1991.

16. Document, Addition/Changes to Registry of Inactive Hazardous Wastes Disposal Sites, Lehigh valley Railroad Derailment, prepared by the NYSDEC, dated February 1991.

17. Letter, from Michael O'Toole, Director, DHWR to Kathleen Callahan, Director Emergency and Remedial Response Division, USEPA, Re: Lehigh Valley Railroad Derailment - Request for Emergency Response, dated March 20, 1991.