ROD - Kentucky Ave.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

OCT 2 1990

SENT BY MAIL

Mr. Gardiner Cross
Bureau of Western Remedial Action
Division of Hazardous Waste Remediation
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233

902018

Re: Kentucky Avenue Wellfield Site Record of Decision

Dear Mr. Cross:

Enclosed is a copy of the Record of Decision for the Kentucky Avenue Wellfield Site.

If you have any questions please call me at (212) 264-4183.

Sincerely yours,

J. Jeff Josephson
Western New York Compliance Section

attachments

SEP 27 1990

Record of Decision for the Kentucky Avenue Wellfield Site, Town of Horseheads, Chemung County, New York

Richard L. Caspe, P.E. Director
Emergency & Remedial Response Division

Constantine Sidamon-Eristoff
Regional Administrator

Attached is the Record of Decision (ROD) for the Kentucky Avenue Wellfield Site located in Chemung County, New York.

This is an EPA fund lead site. A Supplemental Remedial Investigation and Feasibility Study (RI/FS) was conducted by Ebasco for EPA. This ROD addresses the second operable unit remedial action. The first operable unit ROD was signed in 1986. This decision is identical to the one proposed in the Proposed Plan.

The New York State Department of Environmental Conservation (NYSDEC) has reviewed the ROD and supporting documents and concurs on this remedy. Both the ROD and Proposed Plan were reviewed in-house by the Hazardous Waste Facilities Branch (RCRA), Office of Ground Water Management, Environmental Impacts Branch, Air Compliance Branch, Office of Regional Counsel, NY Compliance Branch (Superfund), and Program Support Branch (Superfund).

The 60 day public comment period for the Proposed Plan ended on September 18, 1990. A 30 day extension to the public comment period had been granted pursuant to a request by the Westinghouse Electric Corporation, a potentially responsible party for the site. A public meeting was held on August 1, 1990. Comments received during the public comment period are addressed in the attached Responsiveness Summary.

This supplemental RI/FS was conducted in order to determine the potential sources of the groundwater contamination.

The remedy selected contains the following components:

- Restore the Kentucky Avenue Well as a public drinking water supply well. If evaluation of the well condition indicates that the well should be replaced, then the well will be reconstructed in order that the Kentucky Avenue Well can provide approximately 700 gallons per minute (gpm) potable water.

- Prevent further spread of contaminated groundwater within the Newtown Creek Aquifer with the installation of ground water recovery wells between the Westinghouse Electric Corporation facility and the Kentucky Avenue Well. The exact location and pumping rates will be determined during the design stage.

SYMBOL --->	WNYNCS	NYCCB	ADNY/CP	ERRD/DD	ERRD/D	OEP	DRA	RA
SURNAME -->	Josephson/Lynch	Petersen	Pavlou	Callahan	Caspe	Marshall	Muszynski	Sidamon-Eristoff
DATE ----->	9/27				9/27/90		9/27	9/27

SYMBOL --->	ORC							
SURNAME -->	Blazey							

- Construct two treatment plants, one located near the Kentucky Avenue Well, and one located between the Westinghouse facility and the Kentucky Avenue Well which will treat all the recovered ground water to Federal and New York State Standards for public drinking water systems. The selected treatment will include the following:

  Filtration to remove any suspended solids with adsorbed inorganic contamination.

  Air Stripping to remove volatile organic contaminants.

  Vapor Phase Carbon Adsorption to eliminate volatile organic vapor emissions at the air stripper.

- Discharge the treated ground water to the public water supply. In addition, engineered provisions to allow for testing reinjecting ground water to evaluate the feasibility of expanding the ground wate remediation effort will be provided for.

- Install a limited number of monitoring wells to monitor contaminant migration and to evaluate effectiveness of the interim remedial action. The location and specifications for these monitorin wells will be determined during the design phase.

- Conduct a limited investigation in order to determine if the contamination detected at the Horseheads Automotive Junkyard contributes to the contamination at the Kentucky Avenue Wellfield.

I am available to discuss this ROD at your convenience.

Attachments

bcc: R. Caspe, ERRD
K. Callahan, DD-ERRD
C. Petersen, NYCCB
K. Lynch, NYCCB
J. Dolyle, ORC
J. Josephson, WNYCS
T. Lieber, ORC

DECLARATION
KENTUCKY AVENUE WELLFIELD SITE
TOWN OF HORSEHEADS
CHEMUNG COUNTY, NEW YORK

United States Environmental Protection Agency
Region II

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Kentucky Avenue Wellfield Site
Town of Horseheads
Chemung County, New York

Statement of Basis and Purpose

This decision document presents the selected interim remedial action for the Kentucky Avenue Wellfield site (the "Site"), in Chemung County, New York, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for the Site.

The New York State Department of Environmental Conservation concurs with the selected remedy.

The information supporting this remedial action decision is contained in the administrative record for the Site.

Assessment of the Site

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial threat to public health, welfare, or the environment.

Description of the Selected Remedy

This operable unit is the second operable unit of three operable units for the Site.

The first operable unit ROD called for the following actions: 1) An investigation to identify all residences in the study area currently using private wells, and upon completion of the investigation, all private well users would be connected to the public water supplies. 2) Further investigation of potential source areas identified during the RI/FS, and 3) Installation of monitoring wells upgradient of the Sullivan Street Wells.

The third operable unit for the site will be for source controls at the Westinghouse Electric Corporation facility, and a final aquifer restoration operable unit.

The major components of the selected remedy for the second operable unit include the following:

The interim remedial action selected for the Site, and the remedial objectives for the contaminated groundwater in the vicinity of the Kentucky Avenue Wellfield are as follows:

- Restore the Kentucky Avenue Well as a public drinking water supply well. If evaluation of the well condition indicates that the well should be replaced, then the well will be reconstructed in order that the Kentucky Avenue Well can provide approximately 700 gallons per minute (gpm) potable water.

- Prevent further spread of contaminated groundwater within the Newtown Creek Aquifer with the installation of ground water recovery wells between the Westinghouse Electric Corporation facility and the Kentucky Avenue Well. The exact location and pumping rates will be determined during the design stage.

- Construct two treatment plants, one located near the Kentucky Avenue Well, and one located between the Westinghouse facility and the Kentucky Avenue Well which will treat all the recovered ground water to Federal and New York State Standards for public drinking water systems. The selected treatment will include the following:

  Filtration to remove any suspended solids with adsorbed inorganic contamination.

  Air Stripping to remove volatile organic contaminants.

  Vapor Phase Carbon Adsorption to eliminate volatile organic vapor emissions at the air stripper.

- Discharge the treated ground water to the public water supply. In addition, engineered provisions to allow for testing reinjecting ground water to evaluate the feasibility of expanding the ground water remediation effort will be provided for.

- Install a limited number of monitoring wells to monitor contaminant migration and to evaluate effectiveness of the interim remedial action. The location and specifications for these monitoring wells will be determined during the design phase.

- Conduct a limited investigation in order to determine if the contamination detected at the Horseheads Automotive Junkyard contributes to the contamination at the Kentucky Avenue Wellfield.

Active restoration of the ground water is appropriate for the Kentucky Avenue Wellfield Site. The ground water cleanup levels at the Site are based primarily upon the classification of the ground water as a potential drinking water source. Therefore, the Maximum Contaminant Levels promulgated under the Safe Drinking Water Act are relevant and appropriate requirements, and the non-zero Maximum Contaminant Level Goals are relevant and appropriate requirements for aquifer remediation. Reaching the cleanup levels in the aquifer upgradient of the Kentucky Avenue Well will not be possible until effective source control measures are in place at the Westinghouse Facility, and possibly at the Horseheads Automotive Garage.

Declaration of Statutory Determinations

The selected interim remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and it satisfies the statutory preference for remedies that employ treatment that reduce toxicity, mobility, or volume as their principal element. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Constantine Sidamon-Eristoff
Regional Administrator

9/27/96
Date

DECISION SUMMARY

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ATTACHMENTS

Decision Summary for the Kentucky Avenue Wellfield Site

1. Site Name, Location and Description

The Kentucky Avenue Wellfield is located within the Town of Horseheads, Chemung County, New York. The Kentucky Avenue Well is located east of NY Route 14 and approximately 1 mile south of the intersection of NY Route 14 and 17. The Kentucky Avenue Wellfield Site includes the wellfield, the contaminated portion of the underlying valley-fill aquifer locally known as the Newtown Creek Aquifer, and the sources of the contamination. The Newtown Creek Aquifer in the Elmira area is a drinking water supply that currently provides approximately 30 percent of the drinking water to the Elmira Water Board (EWB).

The area in the vicinity of the Kentucky Avenue Wellfield site is characterized by a terrain of low relief with residential and commercial areas occupying more than half of the overall valley floor. The area has extensive industrial developments, and is crossed by major transportation routes, including highways and freight railroad lines. In the 1980 census, Chemung County reported a population of 97,656. Between 1980 and 1984,the population of Chemung County reportedly dropped by 1.2 percent. Figure 1 is an area map.

Figure 2 illustrates areas within the Kentucky Avenue Site boundary delineated by the Federal Emergency Management Agency as being within the 100-year flood plain boundaries, and/or the 500-year flood plain boundaries. Figure 3 indicates wetland areas regulated by the New York State Department of Environmental Conservation (NYSDEC).

The Newtown Creek Aquifer is classified by EPA as a Class IIa aquifer, and the New York State Department of Environmental Conservation classifies this aquifer as Class GA. Both of these classifications indicate that the Newtown Creek Aquifer is a potential or currently used source of drinking water. Figure 4 indicates the limits of the aquifer and provides a contoured map of ground water elevation data collected in 1990 by EPA at monitoring wells screened in the Newtown Creek Aquifer. The water level elevation data indicate that the direction of ground water flow within the Newtown Creek Aquifer west of the Newtown Creek is generally in a south, southeasterly, or easterly direction within the aquifer depending on location within the aquifer. In addition, the data collected indicate that both upward and downward gradients within the aquifer exits, although away from the Newtown Creek the gradient was generally downward and near the Newtown Creek the gradient is generally upwards.

Prehistoric occupation of the Horseheads region is indicated by the reported discovery of a Paleo-Indian fluted point (circa 9000 BC). The Archaic period (8000-1000 BC) is represented by several Lamoka-style beveled adzes, dateable to approximately 2500 BC, found in the Horseheads area. Parker (1922) reported three archaeological sites

in the area. Two of these contained pottery, indicating Woodland occupations (1000 BC to 1600 AD). One of Parker's sites, located a mile southeast of Horseheads, contained graves that yielded glass beads, indicative of the Contact period (17th-18th century).

2. Site History

The Kentucky Avenue Wellfield is part of the EWB public water supply system. The 1.0 million gallon per day (mgd) municipal well was developed to provide water directly to a local food processing plant. Constructed in 1962, the Wellfield provided about 10 percent of the water produced by the EWB until the wellfield was closed in 1980 following the discovery of elevated levels of trichloroethene (TCE). The Wellfield, which overlies the Newtown Creek aquifer, includes three test wells and a production well. The food processing plant closed its operations, prior to the closing of the Kentucky Avenue well.

Contamination of the Kentucky Avenue Wellfield with TCE was first detected in May 1980, during a "hot spot" inventory of local wells initiated by the New York State Department of Health (NYSDOH). Further sampling of the area by the Chemung County Health Department (CCHD) in July 1980 showed elevated levels of TCE detected in the Kentucky Avenue Well, and several private residences and commercial facilities. In September 1980, the Kentucky Avenue Well was closed. In July 1982 the Kentucky Avenue Wellfield Site was proposed for inclusion on the National Priorities List (NPL), and was finalized on the NPL in September 1983.

Results of continued ground water sampling conducted by CCHD, NYSDOH, New York State Department of Environmental Conservation (NYSDEC), and EPA of private residential wells through June 1985 showed that TCE was present throughout the Newtown Creek Aquifer.

Volatile organic compounds such as trans-1,2-dichloroethene, tetrachloroethane, 1,1,1-trichloroethane, trans-1,2-dichloroethane, benzene, and chloroform were also found to be sporadically present in private well samples, but at lower concentrations.

EPA began providing alternative water supplies to impacted residences not connected to the public water distribution system in March 1985. Phase I of this response action connected 20 homes to the public water supply. In May 1986, a Phase II response action connected 26 affected homes identified in the area bounded on the north by Denver Street, on the west by Oakwood Avenue, on the South by Lenox Avenue, and on the east by South Main Street to the municipal water supply.

A Remedial Investigation/Feasibility Study was conducted by the NYSDEC under a cooperative agreement with EPA. The RI/FS involved the installation of 12 cluster wells, and 7 point sampling devices, collection and analysis of surface water and sediment samples, a preliminary evaluation of potential sources, evaluation of remedial alternatives, and performance of a risk assessment. A total of 36

ground water samples were collected from monitoring wells and analyzed. In addition, 14 surface water samples and 11 sediment samples were collected.

The cluster wells were installed to evaluate upgradient ground water quality, regional ground water quality, impact from potential sources identified and evaluated in the RI, and downgradient water quality. Analytical results from samples collected from these monitoring wells confirmed the presence of a ground water contamination plume in several potential source areas, and downgradient or southern perimeter wells. Analytical results of ground water collected from monitoring wells upgradient of the potential source areas did not indicate organic contaminant presence.

A Record of Decision (ROD) for the Kentucky Avenue Wellfield Site was issued by EPA on September 26, 1986. The ROD outlined the following actions to address the contamination at the Kentucky Avenue Wellfield:

a. Installation and sampling and analysis of ground water monitoring wells upgradient of the Sullivan Street Wellfield.

b. Identification of all private wells in the study area. After identification of all private wells, users were to be connected to the public water supply.

c. Further investigation of potential source areas identified during the RI/FS in order to develop an effective program of source control and contaminated ground water migration control.

To date EPA and the NYSDEC have conducted the following actions at the Kentucky Avenue Wellfield site in fulfillment of the 1986 ROD:

The NYSDEC under a cooperative agreement with the EPA completed installation of the monitoring wells upgradient of the Sullivan Street Wellfield in July, 1989. These monitoring wells were sampled in January 1990 by EPA, and the results are presented in the Supplemental RI/FS. The monitoring wells were installed in order to monitor regional ground water quality downgradient of contaminant source areas.

An additional forty-six residences were identified as using private drinking water wells in the area affected. Of this total, forty-five residences were connected to the public water supply provided by the EWB. One residence refused to be connected. Regrading of lawns and resurfacing of roads have been completed. Overall a total of ninety-one residences have been connected to the public water supply in the Elmira-Horseheads area.

During the Spring of 1990, EPA issued an Explanation of Significant Difference (ESD) to the 1986 ROD in order that design and construction of an air stripper for the Sullivan Street Wells could be implemented. As explained in the ESD, this action is taken by

EPA because of information supplied to EPA by the CCHD, the NYSDOH, and the EWB indicating that TCE contamination at the public water supply provided to residences exceeded the maximum contaminant level allowed by EPA of (5 ppb) for TCE.

EPA has conducted and completed a Supplemental RI/FS for the purpose of investigating potential source areas, to evaluate an effective method of source control, and to develop a program of ground water migration control. The results of the Supplemental RI/FS are presented in this ROD.

3. Enforcement History

In November 1982, Westinghouse Electric Company and Koppers Company, two industrial facilities in the Elmira-Horseheads area, were identified by EPA as potentially responsible parties for sources of volatile organic ground water contamination at the Kentucky Avenue Wellfield Site. LRC Electronics has been identified as a potential source of aquifer contamination by the NYSDEC. One additional facility, Facet Enterprises, Inc., located downgradient of the Kentucky Ave well is within the study area. This facility is listed on the NPL. Each of these facilities is discussed below.

In 1983, Facet Enterprises, Inc. entered into a consent agreement with EPA under Section 3013 of the Resource Conservation and Recovery Act (RCRA) as amended, 42 U.S.C. §6934. This consent agreement required Facet Enterprises, Inc. to conduct a limited investigation of the geology and hydrogeology at the facility. On May 16, 1986, Facet Enterprises, Inc. entered into an Administrative Order on Consent with EPA pursuant to Section 106 of CERCLA. This investigation requires Facet Enterprises to investigate the nature and extent of the ground water, surface water, and soil/sediment contamination at its facility, and to evaluate remedial alternatives for it. The RI/FS is scheduled for completion during the Spring of 1991.

On February 22, 1985, LRC Electronics entered into an Order on Consent with the NYSDEC in order to determine the nature of wastes and the areal extent and vertical distribution of the wastes at the facility, to determine the extent and the impact, or the potential impact, on natural resources, and if necessary after completion of the field activities, to provide for the development and implementation of an inactive hazardous waste disposal facility remedial program.

On February 25, 1985 pursuant to Section 104(E) of CERCLA, EPA sent out "Request for Information" letters to the following establishments:

The Great Atlantic and Pacific Tea Company
Westinghouse Electric Corporation
Town of Horseheads
Fairway Spring Company
LRC, Inc.
Leprino Foods
MacMillian-Bloedel Containers, Inc.
Wickes Lumber
Village of Horseheads
Horseheads Central School District
Chemung County Highway Department
Horseheads Automotive
Koppers Company, Inc.
American Bridge Division
Bendix Corporation
Facet Enterprise, Inc.
Allied-Signal Corporation

On September 30, 1985 pursuant to the Environmental Conservation Law (ECL) 27-1313, NYSDEC sent the "Chemung County Chemical Survey" to the following organizations to request specific information regarding the use of hazardous substances at each facility.

Newtown Die & Tool
Horseheads Automotive
Koppers Company
New York State Electric and Gas
Diamond-Bathurst, Inc.
Army Navy Reserve Center
The Great Atlantic and Pacific Tea Company
MacMillian Bloedel Containers Inc.
United States Steel
American Dry Cleaning

The responses to the "Requests for Information" and the Chemical Survey are included in the Administrative Record File.

On May 22, 1986, Westinghouse Electric Corporation entered into a consent agreement with EPA, under Section §3013 of RCRA to perform ground water and soil investigations to determine the nature and extent of any contamination at the Westinghouse facility.

On September 27, 1989, EPA sent Westinghouse Electric Company a notification demanding payment of $2,160,817.51 for response costs incurred by EPA at the Kentucky Avenue Wellfield Site and documented as of March 31, 1989.

4. Highlights of Community Participation

The RI/FS Report and the Proposed Plan for the Kentucky Avenue Wellfield Site were released to the public for comment on July 21, 1990 . These two documents were made available to the public in information repositories maintained at the EPA Docket Room in Region II and at the Town of Horseheads, Town Hall, respectively. The notice of availability for these two documents was published in the Elmira Star Gazette on July 21, 1990. A public comment period on the documents was held from July 21, 1990 to September 18, 1990. In addition, a public meeting was held on August 1, 1990. At this meeting, representatives from EPA and the NYSDEC answered questions about problems at the Site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD.

5. Scope and Role of Operable Unit or Response Action Within Site Strategy

As with many Superfund sites, the problems at the Kentucky Avenue Wellfield Site are complex. As a result, EPA has organized the remedial work into three operable units. In addition, EPA anticipates that the investigations conducted by Facet Enterprises, Inc. at its facility and an investigation completed by Westinghouse Company will result in RODs for these facilities. This ROD addresses the second planned remedial action at the Site.

The three operable units are described below:

First Operable Unit - Nature and Extent of Contamination

The RI/FS for the first operable unit determined the nature and extent of contamination at the Kentucky Avenue Wellfield. The ROD for this operable unit was issued by EPA on September 30, 1986. The response actions conducted pursuant to this ROD are described below.

a. Installation and sampling and analysis of ground water monitoring wells upgradient of the Sullivan Street Wellfield.

Monitoring wells were installed by the NYSDEC under a cooperative agreement with EPA. The monitoring well installation was completed during the summer of 1989. During January 1990 the monitoring wells were sampled by EPA, and the analytical results of this sampling are presented in the Supplemental RI/FS.

b. Identification of all private wells in the study area. After identification, all private well users were connected to the public water supply, except two who refused service.

c. Further investigation of potential source areas identified during the RI/FS in order to develop an effective program of source control and contaminated ground water migration control. EPA

completed the Supplemental Remedial Investigation and Feasibility Study in July 1990.

During the Spring of 1990, EPA issued an ESD to the 1986 Record of Decision. The ESD provides for the construction of an Air Stripper for the Sullivan Street Wellfield.

Second Operable Unit - Source Identification Operable Unit

This ROD results from the data collected during the Supplemental RI/FS conducted pursuant to the first operable unit ROD. The results of this investigation are provided in the Supplemental RI/FS Report for the Kentucky Avenue Wellfield Site, Chemung County, New York 1990. The Supplemental RI indicates that the primary source of TCE contamination in the Newtown Creek Aquifer in the area of the Kentucky Avenue Wellfield is the Westinghouse Facility whose property is bounded by State Route 17 on the north, State Route 14 on the East, a Conrail track on the south, and property of the New York State Electric and Gas company to the west. In addition, data collected at the Horseheads Automotive by the NYSDOH indicate that TCE is present in the aquifer below this facility and therefore this may also be a source of TCE contamination at the Kentucky Avenue Wellfield.

This operable unit will restore the drinking water supply at the Kentucky Avenue Well and will provide for the active plume containment in order to prevent the worsening of ground water quality of the Newtown Creek Aquifer. This operable unit will not address the threats (if any) posed by the areas identified in the Supplemental RI as contributors to the ground water contamination. In addition, this operable unit will provide the necessary data to establish the technical feasibility of restoring the Newtown Creek Aquifer to its beneficial use as a drinking water aquifer.

This operable unit remedy will not address the risk posed by direct exposure to sediment in the industrial outfall drainageway used by Westinghouse Electric Corporation. Cadmium levels in the drainageway sediments south of the Westinghouse facility 002 outfall are contaminated with metals at levels resulting in excess lifetime hazard index of >1. EPA anticipates that this will be addressed as a part of the Westinghouse investigation.

Third Operable Unit - Source Control and Aquifer Restoration Operable Unit

This operable unit will be for source control at the Westinghouse Electric Corporation and will be the final ROD for the ground water remediation.

The Facet Enterprises, Inc. facility is currently undergoing an RI/FS. EPA expects to select a remedy for remediating the Facet facility and affected areas next year. The Westinghouse facility and the LRC Electronics facility are undergoing investigations under different federal and state authorities. Remedies for these

facilities including sources of aquifer contamination are expected to be selected within two years.

6.Summary of Site Characteristics

Chapter Four of the Supplemental RI Report presents the data collected during this source identification investigation and also presents the data collected by private parties who have conducted investigations pursuant to orders on consent with EPA or the NYSDEC. Tables summarizing the data are attached to the ROD. The type of hazardous substance or compound and the maximum concentration detected at each area investigated is provided in the following text.

NATURE AND EXTENT OF GROUND WATER CONTAMINATION

A ground water investigation was completed in order to evaluate the nature and extent of the contamination. Eight monitoring wells were installed at locations upgradient, downgradient and in possible source areas. Monitoring wells were sampled, and the analytical data obtained from these samples was used in conjunction with soils data obtained from the seven areas investigated by EPA to determine the extent that each area investigated contributes to the ground water contamination. In addition, regional monitoring wells installed by either EPA or NYSDEC were sampled.

Figure 5 illustrates the location of each monitoring well where ground water samples were collected and analyzed.

Table 1 summarizes the chemicals detected in background monitoring wells that are hydraulically upgradient of identified potential source areas. This table indicates that low levels of the organic contaminants occur sporadically in the Newtown Creek Aquifer. Table 1 indicates that barium (174 ppb), calcium (111,000 ppb), magnesium (22,300 ppb), potassium (2,790 ppb), and sodium (66,200 ppb), and possibly zinc (22 ppb) occur naturally or possibly as a result of road salt entering the Newtown Creek Aquifer.

Table 1 also indicates that the other metals that were detected; namely beryllium (1.3 ppb), copper (18.0 ppb), lead (4.2 ppb), manganese (231 ppb), nickel (19.3 ppb), and vanadium (11.0 ppb) are present in the ground water sporadically, and they occur at levels that are below Federal and New York State drinking water standards.

Table 2 summarizes the ground water quality from all monitoring wells sampled and analyzed by EPA.

Table 2 and Figure 6 indicate that the ground water contamination with TCE is widespread throughout the Newtown Creek Aquifer. A ground water sample collected from monitoring well CW-7D screened at the bottom of the Newtown Creek Aquifer north of the Kentucky Avenue Well indicates the presence of TCE at 110 ppb. In addition, the one monitoring well (CW-3R) open to the bedrock is contaminated

with TCE. Table 2, in addition to the information provided by private party ground water investigations including the Westinghouse Electric Corporation, Facet Enterprises, Inc. and LRC Electronics, Inc. confirms that the TCE contamination in ground water has the highest concentration at source areas and is at lower concentrations away from the sources. In addition to TCE, other organic compounds and the highest concentrations detected include trans-1,2-dichloroethene (12 ppb), methylene chloride (4 ppb), acetone (2,200 ppb), and 1,1,1-trichloroethane (5.4 ppb) were detected.

Table 2 indicates that there is a widespread presence of inorganics in the ground water at levels above drinking water standards. During the Supplemental RI, eleven metals were detected in the ground water at levels above New York State Class GA Water Quality Standards. The metals detected, and the highest concentrations, are aluminum (281,000 ppb), arsenic (55 ppb), barium (2690 ppb), beryllium (13.1 ppb), chromium (49,100 ppb), iron (654,000 ppb), lead (321 ppb), magnesium (557,000 ppb), manganese (21,300 ppb), and thallium (8.5 ppb). Nickel (8,880 ppb), and antimony (668 ppb) were also present at elevated levels. Figures are located in the Supplemental RI which indicate the monitoring wells where the levels of the inorganics contamination exceed NYS Class GA water Quality Standards, and the concentrations of the inorganics at each monitoring well where the drinking water standard is exceeded.

The Supplemental RI Report presents the results of sampling and analyzing monitoring wells for dissolved inorganic constituents. The following inorganics, and the highest levels detected, are: aluminum (2,980 ppb), chromium (439 ppb), nickel (797 ppb). The results of the sampling for dissolved inorganics are presented in Table 3.

Hexavalent chromium was detected at the monitoring wells PS-4 (267 ppb), and at CW-2D (11 ppb).

The contamination in the aquifer is believed to occur by downward vertical migration of contaminants. Source areas identified during the Westinghouse Investigation, the Facet Enterprises Investigation, and the LRC Investigation are the primary contributors to the aquifer contamination, and the contaminants are believed to have originated by waste disposal in lagoons, waste spills at storage and handling areas, disposal in dry wells, and possibly downward migration at industrial discharges. The fact that the water table aquifer is the drinking water source indicates that this aquifer is vulnerable to spills and disposal. Lateral movement of contaminants occurs, by flow of contaminants either dissolved within the aquifer or as inorganic contaminants adsorbed to particulates. The ground water elevation data presented in Figure 4 indicate that the Facet Enterprises, Inc. facility is hydraulically downgradient of the Kentucky Avenue Wellfield.

Ground Water Quality Investigation West of Westinghouse Conducted by the NYSDOH and the CCHD

Ground water sampling and analysis at the Horseheads Automotive Junkyard located on Sears Road indicates the presence of TCE at 95 ppb, and 1,1,1-trichloroethane present at 50 ppb. Figure 7 illustrates the residential wells sampled and the data collected by the NYSDOH, and CCHD in the Fisherville area west of the Westinghouse Facility.

Ground Water Investigation at Westinghouse Electric Corporation

Table 4 summarizes analyses from ground water samples collected at monitoring wells on the Westinghouse Corporation property. Analytical results indicate the presence of volatile organic, semi-volatile organic, and inorganic compounds. TCE is present in concentrations up to 430 ppb. The highest concentrations occur downgradient of Disposal Area F. Figure 8 illustrates the TCE distribution in the area of Disposal Area F. Other volatiles detected in ground water at the Westinghouse Electric Corporation Facility include: 1,1,1-trichloroethane (7 ppb), methylene chloride (29 ppb), chloromethane (20 ppb). The following maximum concentrations of semi-volatile organic compounds were detected: bis(2-ethylhexyl)phthalate (180 ppb), and 2-chlorophenol (14 ppb).

EPA collected "split samples" during the investigation carried out at the Westinghouse facility in 1987-1988. The results of the TCE analysis of ground water are presented below:

TCE Concentration in Ground Water Sample in parts per billion

Monitoring Well Number	Data provided by Westinghouse	EPA Split Sample Data
2S	nd	nd<5
2D	nd	nd<5
4	nd	4.18J
6	8	9.24
10	210	187
11	14	13.3
5	13	14
6	13	13

nd = TCE not detected (<"5" denotes detection limit)
J = TCE detected at a level below contract requirement

Ground water Investigations at Facet Enterprises Inc.

Table 5 summarizes the analyses of ground water samples collected

at the Facet Enterprises, Inc. facility in 1986. The data was provided by Facet Enterprises to EPA pursuant to the requirements of their 1986 Administrative order.

Ground water analyses from monitoring wells collected in 1983 and 1986 located at the Facet Enterprises facility indicate the following contaminants are present at the following maximum levels: TCE (800 ppb), 1,1,1- trichloroethene (268 ppb), trans-1,2-dichloroethylene (189 ppb) vinyl chloride (14 ppb). Lower levels of fluorocarbons and methylene chloride were also detected in samples analyzed. Phenolics were detected at levels up to .37 ppb at this property.

The following semi-volatiles and the maximum concentrations were detected in 1986 follows: bis(2-ethylhexyl)phthalate (7 ppb), and pentachlorophenol (300 ppb).

The results of the 1986 sampling at Facet Enterprises Inc. indicate that the following maximum levels of chromium (280 ppb), lead (69 ppb), and thallium (38 ppb) all exceed New York State Water Quality Standards for drinking water.

Ground water Investigations at LRC Electronics

Table 6 summarizes the analytical data from ground water samples collected at the LRC facility. This data was provided by LRC Industries to the NYSDEC pursuant to the requirements of their Order.

The results of sampling in 1988 indicate the presence of, among other organics, TCE (27 ppb), xylene (234 ppb), 1,1,1-TCA (4 ppb), 1,1-dichloroethane (3 ppb), chloroform (16 ppb), methylene chloride (14 ppb).

The inorganic compounds detected in ground water included cadmium (35 ppb), chromium (190 ppb), and lead (300 ppb).

RESULTS OF SOIL BORING INVESTIGATION

A soil boring investigation was completed at areas identified in the Remedial Action Master Plan (RAMP) or the RI/FS as potential sources of ground water contamination. The location of the soil borings is presented in Figure 9. The location of each of the borings was determined by review of historical photographs and the results of a soil gas survey at each area. At one of the potential fill areas identified (area 18), the soil gas survey showed no anomalous results, therefore, no soil borings were completed. The results of the soil boring investigation at the remaining areas are summarized below. The data collected during this soil boring investigation was used to determine if, and if so, the extent to which a particular area is contributing to the widespread aquifer contamination

problem, and to collect data to support the baseline risk assessment.

Any organic compound detected during the soil boring investigation is considered to be a contaminant. Table 7 presents concentrations of inorganic compounds that may normally occur in soils. The widespread occurrence of calcium, iron, magnesium, potassium, and sodium at levels above these reported ranges indicates that, regionally, these inorganic compounds occur at levels above published data for average soil concentrations. A list of polyaromatic hydrocarbons that typically occur in rural, residential, or urban areas for comparison with data collected during this investigation is presented as Table 8.

Chemung County Department of Highways (Area 2)

Table 9 and 10 presents the summary results of the surface and subsurface soil boring investigation at this area. Full details are presented in Chapter Four of the Supplemental RI/FS.

Four soil borings were completed at this area in order to characterize the subsurface geology and in order to collect boring samples for analysis. A total of 13 samples were analyzed. TCE was detected at a maximum concentration of 8 ppb in one boring at 15-17 feet below grade. The water table was encountered at 13.1 feet below grade at this area.

Semi-volatile constituents were detected at each boring, and one or more semi-volatiles were detected at all sampling depths. The total semi-volatile estimated concentrations range from 137 to 4229 ppb. The highest estimated total semi-volatile concentrations were detected in soil borings collected from within two feet of the surface. Phthalates were detected in all four borings with estimated concentrations ranging from 43 to 1100 ppb.

Polychlorinated biphenyls (PCBs) were detected at 0.34 ppm in one soil sample collected from within two feet of the ground surface.

One soil boring contained inorganic constituents above normal background concentrations. Thallium (3.4 ppm) and arsenic (123 ppm) were detected in the sample collected from the upper two feet of soil; lead (79 ppm) was detected in the sample collected at 5 to 7 feet below grade.

The analytical data from soil samples collected at the Chemung County Department of Transportation Garage during the Supplemental RI do not indicate that a source of TCE exists at this facility. The presence of TCE in ground water upgradient of the area indicates the primary source is upgradient.

Old Horseheads Landfill (Area 3)

Eight soil borings were completed in order to establish the area geology at and in the vicinity of the Old Horsehead Landfill, and thirty three soil samples were collected from these borings and analyzed in order to determine if contaminants are present and are contributing to the TCE ground water contamination problem at the Kentucky Avenue Wellfield. The data is presented in Tables 11 and 12.

TCE was detected at concentrations ranging from 2 ppb to 3 ppb in two soil samples. The two soil samples were collected at a depth of 20-22 feet below grade, and were collected from below the water table (approximately 16 feet). 1,2-dichloroethylene was detected in two soil borings at 5 -45 ppb. The samples were collected at or below the water table. In addition the following organic compounds were detected at the following maximum concentrations: 2-butanone (2-25 ppb), ethylbenzene (2-180 ppb), toluene (2-12 ppb), methylene chloride (1-45 ppb), total xylenes (5-220 ppb), vinyl chloride (140 ppb).

Semi-volatiles were detected in soil samples. Bis(2-ethylhexyl) phthalate (BEHP) was detected in ten soil borings at various depths. The highest concentration of BEHP was at 520,000 ppb detected in a soil sample collected at a depth of 5-7 feet. Di-n-butyl phthalate was also detected in four borings with a range of 53-77,000 ppb.

The highest levels of semi-volatiles occurred in the southeastern portion of the landfill near the surface soils. Besides the BEHP and Di-n-butyl phthalate, the compounds detected are typical of compounds detected in soils where oil or other petroleum products have spilled.

PCBs were found in five soil borings at depths ranging from 0-2 feet to 15-17 feet below grade. The PCB concentration ranged from 20 ppb to 300 ppm. The highest concentration was detected in a soil sample collected at a depth of from 10 feet to 12 feet below grade.

Arsenic (25.6 ppm), cadmium (15 ppm), chromium (118 ppm), copper (1360 ppm), lead (1,520 ppm), magnesium (37,600 ppm), nickel (200 ppm), and zinc (7120 ppm) have been detected at this area in levels above normal background concentrations.

Former Sand and Gravel Pit (Area 4)

Three soil borings were completed at this area and one boring was collected in the immediate vicinity of the area in order to characterize the subsurface geology. A total of 20 soil/sediment samples were collected for chemical analysis. The data is presented

in Tables 13 and 14. TCE was detected at levels ranging from 1 to 7 ppb in two of the samples. Both of these sample were collected at or below the water table. Acetone was also detected in two soil borings, however it is also present in the field and laboratory blanks, therefore and the acetone is likely a result of field and/or laboratory contamination.

The following semi-volatile was detected with the following maximum concentration in soil samples collected from the sand and gravel pit: bis(2-ethylhexyl)phthalate (890 ppb).

Magnesium was the only inorganic detected in the soil borings at above background levels for soils at this area. The highest level detected was 37,700 ppm in a sample collected at a depth of 5-7 feet below grade.

Koppers Company Disposal Area (Area 15)

The data collected during the soil boring investigation at this source area are presented in Table 15 and 16.

Three soil borings were completed and 15 samples were analyzed from the Koppers Disposal Area. TCE was detected in two soil borings at 11 ppb and at 2 ppb. The TCE was detected in split spoon samples collected from at or below the water table. The relatively low concentrations (<11 ppb) found in soil do not indicate that this is a source of ground water contamination.

Most semi-volatile compounds which were detected were in the upper five feet of soil suggesting that semi-volatile contamination is restricted to the surface. Bis(2-ethylhexyl)phthalate (39-2900 ppb) and di-n-octyl phthalate (DNOP) (91 ppb) were detected. Polynuclear aromatic hydrocarbons (PAHs) totaled a maximum in one sample of 2,280 ppb.

Lindane was detected in one sample at a concentration of 8.0 ppb which was obtained from within 7 feet of grade, and chloroform was detected at 20 feet below grade at 4 ppb.

Above background concentrations of magnesium (22,900 ppm), calcium (93,400 ppm), and zinc (153 ppm) were detected.

Koppers Company Waste Oil Lagoon Area (Area 17)

The data collected for the soil boring investigation in this area are presented in Tables 17 and 18.

Six soil borings were completed in or adjacent to the investigation area 17. TCE (1-15 ppb) was detected in soil borings. All concentrations were detected in samples collected at or below the water table. The concentrations of TCE at less than or equal to 15 ppb indicate that the soil in this area is not a likely source of TCE contamination in the ground water.

Other volatile organic compounds detected in the soil samples were toluene (5 ppb), acetone (590 ppb), benzene (3 ppb), and methylene chloride (33 ppb).

Semi-volatile contamination was most commonly detected in soil samples collected from the surface to five feet below grade. The semi-volatile contaminants detected were Bis(2-ethylhexyl)phthalate (740 ppb), and Di-n-octyl phthalate (62 ppb). Polynuclear aromatic hydrocarbons (PAHs) totaled a maximum in one sample of 5,586 ppb.

The pesticide 4,4 DDT was detected in one sample at 18 ppb collected 15-17 feet below grade.

The inorganics magnesium (33,400 ppm), calcium (118,000 ppm), and zinc (120 ppm) were detected in soil samples at levels above normal background soils.

Koppers Company Open Storage Are (Area 16)

One soil boring was completed in this area, and 4 soil boring samples were analyzed from this boring. The data is presented in Tables 19 and 20. PAHs totalling 0.37ppm were detected. Di-n-butylphthalate (80 ppb) was the only other organic chemical detected. The D-n-butylphthalate was detected in samples collected at 5 and at 10 feet below grade.

Cadmium (1.4 ppm), calcium (26,400 ppm), and zinc (86.6 ppm) were detected in the soil boring collected in this area.

Soil Investigation at the Westinghouse Electric Company Facility

Soil samples were collected from 22 soil borings from 5 potential source areas located at the Westinghouse facility. The soil samples were composited and analyzed for priority pollutant volatile organics and inorganics. The data in Table 21 was provided by Westinghouse to EPA pursuant to the requirements of the consent order.

Composite soil samples were collected from various depths in the runoff basin area, and a single sample collected from a former solvent storage tank area exhibited concentrations of a number of volatile and semi-volatile organic compounds. TCE was detected in a composited soil sample at 40 ppb, and the polyaromatic hydrocarbons fluoranthene, phenanthrene, and pyrene were also detected. In the former storage tank area, chloroform (96,000), toluene (5,700 ppb), 1,2-dichloroethene (1,600 ppb), tetrachloroethene (PCE) (700 ppb), and trichloroethylene (120,000 ppb) were detected in the upper three feet of soil.

Results from composite soil analysis at the coal pile storage area indicated that three priority pollutant volatile organics

tetrachloroethylene (12 ppb), TCE (19 ppb) and Bis(2-ethylhexyl)phthalate (400 ppb) were detected.

A single soil sample and three composite soil samples collected at the fluoride disposal area indicate the presence of PCE (15 ppb), as well as the polycyclic aromatic hydrocarbons totalling 6200 ppb (anthracene (400 ppb), benzo(a)pyrene (420 ppb) benzo(a)anthracene (540 ppb), benzo(b)fluoranthene (380 ppb), benzo(k)fluoranthene (340 ppb), chrysene (530 ppb) fluoranthene (1300 ppb), phenanthrene (1100 ppb) and pyrene (1200 ppb)).

Composite soil samples collected from the "Area F Disposal Area" indicate the presence of benzene (38 ppb), and TCE (108 ppb). Nickel was detected at a concentration of 38.4 ppb.

Composite soil samples collected during monitoring well installation indicate the presence of PAHs totalling 33,370 ppb (acenapthhene (890 ppb), anthracene (1200 ppb) benzo(a)anthracene (3900 ppb), benzo (a)perylene (3200 ppb) benzo(b)fluorenthene (4000 ppb), benzo(g,h,i)perylene (1900 ppb), fluorene (4680 ppb), benzo (k)fluorenthene (1400 ppb) chrysene (4300 ppb), and pyrene (7900 ppb)). Pesticides were detected in these soil samples including the following: (aldrin 150 ppb), gamma-BHC (72 ppb), 4,4'-DDT (800 ppb), 4,4'-DDD (150 ppb), dieldrin (1500 ppb), heptachlor (130 ppb), and methoxychlor (490 ppb)).

Facet Enterprises, Inc. Studies

Fifty-two soil boring samples were collected by Facet Enterprises at various depths at the Facet Enterprises facility. Soil samples from twenty-nine locations were analyzed by Facet Enterprises for TCE and other volatile organics. Two samples were analyzed for priority pollutants. The data is presented in Table 22. Based on the results of the analysis, Facet Enterprises reported to EPA that TCE (at concentrations up to 253 ppb) was detected in 17 of the 29 soil borings collected west of the plant building. PCE (150 ppb) was detected at 9 of the 29 shallow soil borings. Other volatile organic compounds detected in the soils were 1,1,1-trichloroethane (48 ppb), 1,1-dichloroethane (13 ppb), trichlorofluoromethane (29 ppb), methylene chloride (15.8 ppb), trans-1,2-dichloroethene (22.6 ppb).

Two soil samples were analyzed for semi-volatile organics and inorganic metals. Di-n-butyl-phthalate (3600 ppb) and bis (2-ethylhexyl)phthalate (800 ppb) were detected south of the plant buildings. A soil boring sample collected during monitoring well installation from the southwest corner of the plant revealed the following: naphthalene (170 ppb), phenanthrene (605 ppb), anthracene (190 ppb), di-n-butyl phthalate (230 ppb), fluoranthene (550 ppb), pyrene (350 ppb), chrysene (370 ppb), chromium (288 ppm), lead (429 ppm), and zinc (1070 ppm).

Shallow soil samples collected at the waste oil lagoon had PCBs detected in concentrations up to 24 ppm.

LRC Electronics

In 1981, 1 soil borings was obtained and analyzed by LRC Electronics for chromium, lead, nickel, silver, cyanide, oil and grease, and fluoride. The highest concentration of metals were detected in one sample that had the following concentrations cadmium (58 ppm), chromium (374 ppm), lead (124 ppm), cyanide (6.2 ppm) and silver (41 ppm). Table 23 summarizes data collected from the LRC facility.

Sediment and Surface Water Investigation

Table 24 presents a summary of surface water and sediment samples collected in the drainageway which flows south of the Westinghouse facility, discharges into the pond south of the Old Horseheads Landfill, and then continues to flow south-east to the Newtown Creek. Figure 10 illustrates the drainage way which flows south from the Westinghouse facility to the pond south of the Old Horseheads Landfill.

Five surface water and sediment samples were collected from the drainageway during the Supplemental RI. TCE was detected in two of the five surface water samples at 2-3 ppb. One sediment sample had TCE detected at 8 ppb. PCB's were detected in one sample at 3.9 ppm. One sediment sample contained cadmium at 2,660 ppm.

The pond surface water samples contained no organic contamination, and all inorganics were below New York State Water Quality Standards.

Westinghouse Investigation

1,1,1-Trichloroethane was detected in surface water at 6 ppb from flume 001W. TCE was detected at 6ppb in a surface water sample at outfall 001W. Cadmium was detected at 9 ppb, and copper was detected at 32 ppb.

Organics detected in sediments include 5 ppb of TCE and 6 ppb of 1,1-trichloroethane.

Inorganics detected in sediments at levels considered to be above background include cadmium (729 ppm), chromium (72 ppm), copper (445 ppm), lead (373 ppm), mercury (1 ppm), nickel (90 ppm), silver (6.9 ppm), and zinc (20,450 ppm). This data is presented in Figure 11.

The data collected during the Supplemental RI do not indicate that areas investigated by EPA, including the Chemung County Garage, the Old Horseheads Landfill, the former Koppers Company disposal areas, a sand and gravel pit, and a fill area, contribute to the ground water contamination at the Kentucky Avenue Well. Although these

areas do contain some contaminants, neither the concentration nor distribution of the contaminants indicate they are sources of the aquifer contamination at the Kentucky Avenue Wellfield. In addition, based on the baseline risk assessment for current Site use conditions, these above referenced areas do not pose a threat to human health or the environment.

7.Summary of Site Risks

A Risk Assessment was prepared by EPA as a part of the Supplemental RI/FS, and the results are used to evaluate the ramifications of the no-action remedial alternative and in order to determine if an actual or threatened release of a hazardous substance from the Site may present an imminent or substantial endangerment to public health, welfare, or the environment. The Risk Assessment is presented as Chapter 6 of the Supplemental RI Report.

Contaminants of Concern

A list of chemicals of concern for each area investigated, and for the ground water, was developed based on the toxicity, mobility, concentration, frequency of detection, and persistence of the contaminants detected. The list for each area and medium investigated, and for the ground water, are provided in Table 25. The range of concentrations for each contaminant in each medium investigated are presented in the Tables in the Summary of Site Conditions section of this ROD.

Exposure Assessment

In this assessment, both current and potential future exposure pathways are considered. Current activity patterns at the Site are examined to identify current exposure potential to residents and workers from the Site as it presently exists. In developing future exposure pathways, it is assumed that no further remedial actions will be undertaken.

The exposure pathways evaluated for current Site use conditions are:

1) Ingestion of ground water in the area of the Kentucky Avenue Wellfield. Inhalation of volatile chemicals released from tap water into indoor air is qualitatively discussed.

2) Incidental ingestion and dermal absorption of chemicals from surface soil by children and teenagers using source areas recreationally. (This was evaluated for each of the areas investigated separately).

3) Incidental ingestion and dermal absorption of chemicals from sediments by children and teenagers using source areas recreationally.

The exposure pathway evaluated for future use given the Site condition is:

1) Incidental ingestion and dermal absorption of chemicals from surface and subsurface soils by future residents living at source areas. (This was evaluated for each of areas investigated separately).

To quantitatively assess the potential risks to human health associated with the exposure scenarios considered in this assessment, estimates of chronic daily intakes (CDIs) are developed. CDIs are expressed as the amount of a substance taken into the body per unit body weight per unit of time, or mg/kg/day. A CDI is averaged over a lifetime for carcinogens and an exposure period for noncarcinogens. An average case and a maximum case are considered. The average case is based on average (but conservative) conditions of exposure and the average exposure point concentrations. The maximum case is based on upper-bound conditions of exposure and the maximum exposure point concentration, and as such represents the extreme upper limit of potential exposure.

The following are exposure parameters and assumptions used to estimate residential ground water ingestion exposures; direct contact with surface soil and sediments by children and teenagers under current Site use conditions; and direct contact with surface soil by residents under future Site use as presented in Tables 26 through 28. The tables indicate each parameter and or assumptions for the average case and the maximum case.

Toxicity Assessment Summary

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

For known or suspected carcinogens, the EPA considers excess upper bound individual lifetime cancer risks of between 1E-04 to 1E-06 to be acceptable with 1E-06 being the point of departure. (i.e., the probability of one excess cancer is one in 10,000 or 1,000,000, respectively, under the conditions of exposure).

Noncarcinogenic risks were assessed using a hazard index (HI) computed from expected daily intake levels (subchronic and chronic) and reference doses (RfDs) representing acceptable intakes. Potential concern for noncarcinogenic effects of a single

contaminant in a single medium is expressed as the hazard quotient (HQ). This is the ratio of the estimated intake (derived from the contaminant concentration in a given medium) to the contaminant's RfD. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI is useful as a reference point for gauging the potential effects of environmental exposures to complex mixtures. In general, HIs which are less than one are not likely to be associated with any health risk, and are therefore less likely to be of concern than HIs greater than one.

In accordance with EPA's guidelines for evaluating the potential toxicity of complex mixtures, it was assumed that the toxic effects of the site related chemicals would be additive. Thus, lifetime excess cancer risk and the CDI:Rfd ratios were summed to indicate the potential risks associated with the mixtures of potential carcinogenic and noncarcinogens, respectively.

Under current EPA guidelines, the likelihood of carcinogenic and noncarcinogenic effects as a result of exposure to Site chemicals are considered separately.

The summary of health effects criteria for chemicals of potential concern at the Kentucky Avenue Wellfield site are presented in Table 29 and are discussed below.

Human Health Risk Characterization

The risk calculation characterization quantifies present and/or potential future threats to human health that result from exposure to the contaminants of concern at the seven areas investigated and the ground water. The specific risk values are estimated by incorporating information from the toxicity and exposure assessments. Tables 30 and 31 summarize carcinogenic and noncarcinogenic risks for the site.

The results of the Risk Assessment are presented in Tables 32 thru 45. The results indicate that long-term exposure to contaminated ground water poses the greatest human health concern. Ground water contaminants at the Site include relatively water soluble volatile organics and metals detected primarily (with the exception of chromium, calcium, magnesium) in the particulate phase. Chlorinated straight-chain hydrocarbons (e.g. TCE, PCE, TCA) constitute the predominant organic ground water contaminants. All potential carcinogenic substances detected in ground water were included as indicator compounds, regardless of their frequency of occurrence or concentration.

A detailed discussion of the results of the risk assessment conducted for each area investigated, including ground water, is set forth below:

1. Current Ground Water and Land Use Scenarios

Ground Water

Risks to public health were estimated by combining information on exposure at possible exposure points with toxic potency of the ground water contaminants. Drinking water from ground water wells in the vicinity of the Kentucky Avenue Well for a lifetime (estimated at 70 years) would be associated with an upperbound excess lifetime cancer risk for the average case of 5E-05, and a plausible maximum of 1E-03. These risks are primarily attributable to the presence of arsenic, trichloroethylene, and vinyl chloride in unfiltered ground water.

Risks in terms of the hazard index associated with ingestion of unfiltered ground water attributable to non-carcinogenic contaminants for the average case is 2E+01, and for the maximum case the hazard index is 9E+01. The hazard index value greater than one is due to the presence and concentrations of antimony, barium, cadmium, chromium, manganese, nickel, thallium, and vanadium in unfiltered ground water samples. Although barium, chromium, manganese, and nickel were detected in unfiltered ground water samples, only the concentration of nickel in one filtered ground water sample resulted in a hazard index greater than one.

The chemical concentration in ground water from unfiltered ground water samples which exceed federal and state drinking water standards are arsenic, barium, cadmium, lead (maximum concentration detected only), total chromium, (average and maximum concentrations exceed the federal MCL and proposed MCL, the maximum concentration exceeds the state standard for chromium VI), iron, manganese (average and maximum concentrations exceed the state standard and the federal secondary drinking water standards), and TCE (average and maximum concentrations exceed the federal MCL and the state standard). The average and maximum lead concentrations exceed the proposed MCL. The maximum concentration exceeds the federal secondary drinking water standard.

Exposure to Lead

Potential exposures to lead at the site were evaluated. The evaluation indicated that ingestion of the maximum detected level of lead in the unfiltered ground water would result in blood lead levels exceeding the EPA range of concern. If ground water is filtered prior to ingestion, the blood lead range of concern would be exceeded in one case.

Direct Contact With Surface Soils by Children and Teenagers

The potential risks associated with exposure to carcinogens in the surface soil at each of the areas investigated are as follows: At the Chemung County Garage, the excess lifetime cancer risks range from 2E-06 for the average case to 5E-05 for the maximum case. At

the Old Horseheads Landfill the excess lifetime cancer risks range from 1E-06 for the average case to 2E-05 for the maximum case. At the Sand and Gravel Pit, the excess lifetime cancer risks range from 4E-11 for the average case to 3E-09 for the maximum case. At the Koppers Storage Area, none of the selected carcinogenic chemicals of concern were detected. At the Koppers Former Waste Oil Lagoon area, the excess lifetime cancer risks are 3E-11 for the average case and 3E-09 for the maximum case. At each source area investigated for exposure to surface soils, the risks estimated are within or below the 10-6 to 10-4 target risks range used to evaluate cancer risks at Superfund sites.

For noncarcinogens, the estimated hazard index values are less than one for all the evaluated potential source areas. This indicates that adverse noncarcinogenic effects are unlikely to occur as a result of direct soil contact exposures under current Site use conditions.

Direct Contact With Sediment By Children and Teenagers

The excess lifetime cancer risks for direct contact with sediments in the drainageway which flows south from the Westinghouse 002 outfall adjacent to the Chemung County Department of Highways Garage range from 3E-06 for the average case to 4E-04 for the maximum case. For direct contact with the sediments in the same drainage way at the Old Horseheads Landfill, the excess lifetime cancer risks are estimated to range from 7E-07 for the average case to 6E-05 for the maximum case.

The Hazard Index value for the drainageway adjacent to the Chemung County Garage is less than one for the average case but greater than one for the maximum case. The exceedance of the threshold value of one is due to exposure scenarios which consider routine ingestion of maximum detected concentrations of cadmium in drainage ditch sediments. The average and maximum case hazard index values for direct contact with drainageway sediments adjacent to the Old Horseheads Landfill is was less than one.

2. Future Land Use Scenarios

Direct Contact with Surface Soils

The estimated risks associated with Residential Exposures by direct contact with carcinogens in surface soil for the future use scenario are as follows: for the Chemung County Garage, the excess lifetime cancer risks are estimated to be 8E-07 for the average case and 4E-05 for the maximum case. For the Old Horseheads Landfill,

the risks ranged from 6E-07 for the average case scenario to 2E-05 for the maximum case. For the average case at the Sand and Gravel Pit, the excess lifetime cancer risks are estimated to range from 2E-11 for the average case to 4E-09 for the maximum case. None of the selected carcinogenic chemicals were detected at the Koppers

Disposal Area. At the Koppers Company former waste lagoons, the calculated risks are estimated at 1E-11 for the average case and 2E-09 for the maximum case. The risks for all these areas are within or below the 1E-06 to 1E-04 cancer risk range.

For subsurface soil, potential risks were also calculated in the same manner except that subsurface soil concentrations were used rather than the surface soil concentrations. The excess lifetime cancer risks for the average and maximum cases, respectively were as follows for subsurface soil collected at each of the areas investigated: 3E-07 and 8E-06 for contaminants detected at the Chemung County Garage; 4E-07 and 1E-03 for the Old Horseheads Landfill (primarily a result of carcinogenic PAHs, PCBs, and arsenic); 5E-07 and 2E-05 for the Sand and Gravel Pit; 1E-11 and 8E-9 for the Koppers Disposal Area; and 8E-8 and 3E-6 for the former Koppers Waste Oil Lagoon. The maximum excess lifetime cancer risk calculated for the Old Horseheads Landfill results from using the data collected from one soil boring collected from a depth of approximately 10 to 12 feet below the ground surface which contained PCBs contamination at 300 ppm. Other soil boring samples collected at the landfill had PCBs detected in concentrations ranging from 0.020 ppm to 4.3 ppm. It is most likely that the PCB concentration of 300 ppm is restricted and confined to a small area surrounding the sampling location.

The Hazard Index values for all the areas investigated are below one for both surface and subsurface soils.

Environmental Risk Characterization

Impacts on aquatic life were evaluated for chemicals in surface water and sediment. Surface water concentrations were compared with ambient water quality standards (AWQS) developed by the State of New York or ambient water quality criteria (AWQC) developed by EPA. This comparison is presented in Table 46.

With the exception of PCB's and mercury, none of the chemicals detected in near surface soils, sediments, or surface waters accumulates to a significant degree in plants or animals, and therefore foodchain exposures are expected to be minimal. However, potential exposures and impacts associated with such exposures, if occurring, are not expected to be significant because of the limited extent of the contamination.

Mean and maximum surface water concentrations of aluminum, cadmium, iron, lead, and zinc in the drainage way exceed Class C or Class D AWQS. Maximum concentrations of chromium, cobalt, and mercury exceed their respective surface water criteria.

Sediment concentrations were compared with toxicity "criteria' derived from the available literature. Sediment "criteria" are exceeded in the drainage way or pond by mean and maximum concentrations of copper, lead, mercury, PAHs, PCBs, and zinc and cadmium.

For more specific information concerning public health risks, including quantitative evaluation of the degree of risk associated with various exposure pathways, please see the volume entitled Public Health Evaluation for the Kentucky Avenue Wellfield Site located at the Horseheads Town Hall, NYSDEC Region 8 Office located in Avon, N.Y., or EPA Region II office Superfund Site file room located in New York City.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

-environmental chemistry sampling and analysis,
-environmental parameter measurement,
-fate and transport modeling,
-exposure parameter estimation,
-toxicological data.

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Chemicals such as vinyl chloride contribute to excess lifetime cancer risks greater than 1E-06 under specific conditions of exposure addressed in the public health evaluation, although vinyl chloride was detected infrequently and at low concentrations. Environmental chemistry analysis error can stem from several sources including the errors inherent in the analytical methods, chain of custody procedures, and characteristics of the matrix being sampled. Environmental parameter measurements primarily contribute to uncertainty because little verified information is available.

In risk assessment there are uncertainties regarding the estimates of how often, if at all, an individual would come in contact with the chemical of concern and the period of time over which such exposure would occur. In particular, this applies to the future land use scenarios.

Toxicological data error (potentially occurring in extrapolating both from animals to humans and from high to low doses) is also a large source of potential error in this risk assessment. There is also a great deal of uncertainty in assessing the toxicity of a mixture of chemicals. In this assessment, the effects of exposure to each of the contaminants present in the environmental media have initially been considered separately. In summary, the calculated

risks to public health from this Superfund site based on average, but conservative, exposure assumptions primarily involve exposure to contaminants in the ground water.

Risk Summary

It is for the above stated reasons that EPA has determined that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

8.DESCRIPTION OF ALTERNATIVES

The alternatives chosen for detailed analysis include the following:

MOM-1 No Action (Ground Water)

MOM-2A Water Use Restrictions/Permit Requirements

MOM-2B Pumping Kentucky Avenue Well/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Distribution to Public Water Supply.

MOM-2C Pumping Kentucky Avenue Well/Filtration/Carbon Adsorption/Distribution to the Public Drinking Water Supply.

MOM-2D Pumping Kentucky Avenue Well/Filtration/UV-Ozone Oxidation/Discharge to Drinking Water Supply

MOM-2E Pumping Kentucky Avenue Well/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Downgradient Reinjection

MOM-2F Pumping Kentucky Avenue Well/Filtration/Carbon Adsorption/Downgradient Reinjection

MOM-2G Pumping Kentucky Avenue Well/Filtration/UV-Ozone Oxidation/Downgradient Reinjection

MOM-3A Pumping at the Southern Boundary of the Site/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Downgradient Reinjection

MOM-3B Pumping at the Southern Boundary of the Site/Filtration/Carbon Adsorption/Downgradient Reinjection

MOM-3C Pumping at the Southern Boundary of the Site/Filtration/UV-Ozone Oxidation/Downgradient Reinjection

MOM-4A Pumping at Two Locations/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Downgradient Reinjection

MOM-4B Pumping along two lines of extraction wells/Filtration/Carbon Adsorption/Downgradient Reinjection

MOM-4C Pumping at Two Locations/Filtration/UV-Ozone Oxidation/Downgradient Reinjection

MOM-5A Pumping Downgradient of Westinghouse Facility/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Discharge to Surface Water

MOM-5B Pumping Downgradient of Westinghouse Facility/Filtration/Carbon Adsorption/Discharge to Surface Water

MOM-5C Pumping Downgradient of Westinghouse Facility/Filtration/Uv-Ozone Oxidation/Discharge to Surface Water

Alternative MOM-1 No Action

The No Action alternative for the contaminated ground water aquifer underlying the Site includes a long term monitoring program. The long-term monitoring program would consist of annual sampling for TCL volatiles and metals at ten of the existing monitoring wells. In addition, new wells would be constructed in areas downgradient of the ground water contamination. A 30-year monitoring period is used for cost estimation purposes. The data gathered would be used to verify whether the concentrations of the contaminants of concern have been lowered to cleanup levels through migration of contaminants downgradient and to the Newtown Creek. Public information meetings, workshops, and presentations would be provided to increase public awareness. Institutional management would also be required to review the Site every five years as required by the NCP.

The costs associated with this alternative is indicated below:

Alternative 1: No Action and Alternative

Capital cost	$41,400
Operation and Maintenance (30 yrs)	$22,500
Present Worth (Discount Rate 5%)	$415,300

Alternative MOM-2A: Water Use Restrictions/Permit Requirements

The implementation of the limited action alternative for the contaminated ground water aquifer includes both a long-term monitoring program and an institutional control program to regulate/restrict the use of the ground water. Such restrictions would involve limited use and/or use with specially acquired permits. The long-term monitoring program would consist of annual sampling for TCL volatiles and metals at ten of the existing

monitoring wells plus new wells to be constructed on-site and downgradient of the ground water contamination. The data gathered would be used to verify whether the concentrations of the contaminants of concern have been lowered to cleanup levels through natural attenuation, and to monitor potential migration of

contaminants downgradient and to the Newtown Creek. Public information meetings, workshops, and presentations would be provided to increase public awareness.

The costs associated with this alternative are indicated below:

Alternative 2A: Water Use Restrictions/Permitting Requirements

Capital cost	$55,200
Operation and Maintenance (30 yrs)	$22,500
Present Worth (Discount Rate 5%)	$429,100

Alternative MOM-2B-2D: Pumping Kentucky Avenue Well/Filtration/Air Stripping/Discharge to Drinking Water Supply or Reinjection

These alternatives require pumping at the existing well, or replacement of this well, treatment, discharge of treated ground water, and a performance monitoring program. The existing Kentucky Avenue Well would be restored to pump the ground water at a rate of approximately 700 gallons per minute. The treated ground water would be discharged to the local drinking water supply or reinjected. The schematic diagram of the plant is shown in the Feasibility Study.

The well head treatment system would consist of a filtration step to remove metals in suspended solids, followed by one of the following treatment alternatives to treat volatile emissions: 1) an air stripping tower with a vapor phase carbon adsorption system to control air emissions from the air stripping unit, 2) carbon adsorption treatment of ground water, or 3) UV-Ozone oxidation.

These alternatives include the use of existing and newly installed monitoring wells at the Site to conduct a long-term monitoring program to track the migration and concentration of the contaminants of concern in the aquifer underlying the Site. The migration of ground water would be assessed every five years utilizing the data collected during the monitoring program.

The following outline briefly discusses ground water extraction and treatment methods for these alternatives. Other alternatives for treating contaminated ground water discussed in the ROD would schematically use the same types of systems, but would be scaled appropriately for the particular ground water remedial alternative. Any design of treatment plants for the selected remedial action will be based solely on performance and the ability of the treatment system to meet Federal and New York State water quality criteria for drinking water at the tap. Detailed discussion of the treatment systems for each alternative can be found in Chapter 4 of the Feasibility Study

- Pumping and collection: The ground water pumping system would consist of the existing Kentucky Avenue Well. Extracted ground water would be delivered to a collection tank used to

equalize the ground water flow and the concentration of the contaminated feed stream to the treatment system.

◦ Filtration: A pressure filtration system would consist of a feed pump used to pump ground water to a filter. Typically the filter would consist of one dual media filter, equipped with backwash pumps and controls. The treated water from the filters will be fed to the air stripper, and the backwash stream along with coagulant, will be sent to an approximately 4200- gallon carbon steel clarifier. The supernatant from the clarifier will be collected in an approximately 525-gallon supernatant tank and then fed back to the collection tank by means of a centrifugal pump, having a flow of approximately 35 gallons per minute. The sludge from the clarifier will be delivered to a pump. The filtrate out of the pressure filter will also be collected into the supernatant tank. The filter press would produce a dewatered sludge cake of approximately 30-40 percent solids by weight. The dewatered sludge cake is expected to accumulate at a rate of approximately 0.70 tons per day. The sludge cake would be collected/stored in drums or rolloffs, then removed for fixation and ultimate disposal in a RCRA Subtitle C landfill. Land Disposal Restriction may apply to disposal of sludge material. This will be evaluated with Toxicity Characteristic Leaching Procedure Test (TCLP). If the sludge material exhibits toxicity characteristics according to the specifications of the TCLP test, then the sludge will be handled as a RCRA waste and all manifesting, transportation, treatment, and disposal regulations will apply.

◦ Air Stripping: An air stripping tower, approximately 6 foot in diameter by approximately 21 feet high, would be operated with countercurrent flow and 1-inch polypropylene tri-packed packing. The ground water would pass over the packing surface as a thin film or droplets, which provide a high surface area for the volatile organics to transfer from the water phase to the vapor phase. The air laden with volatile organics would leave the air stripper and enter a vapor phase carbon adsorption unit, equipped with duct heater/dehumidifier to reduce the relative humidity to 50 percent. The exiting vapor stream from the vapor phase carbon unit would be free of volatile organic compounds and could be discharged to the atmosphere. The estimated annual carbon usage would be approximately 23 pounds per day for the vapor phase adsorption systems. The spent carbon would be collected by the carbon supplier and shipped for off- site disposal or regeneration and reuse. The treated ground water from the air stripping towers would be collected into a stripped water sump.

◦ Carbon Adsorption: An approximately 700-gpm carbon adsorber unit, having two approximately 20,000 lb. carbon beds would be operating for the removal of TCE. An approximately 23,860 gallon carbon steel tank would be used for collecting the treated water. Spent carbon would be collected and disposed of off-site in

accordance with Subtitle C requirements. Land disposal restrictions may apply.

•UV-Ozone Oxidation: An approximately 700-gpm UV-Ozone Oxidation Unit would be installed for the removal of volatile organics. The UV-Ozone oxidation process includes a stainless steel oxidation chamber with UV lamps, and a ozone generation and feed system. The contaminated ground water would come into contact with ozone while passing through baffled arrangements inside the oxidation chamber. In the presence of UV light, ozone would oxidize the volatile organic compounds to carbon dioxide, water, and chlorine. The treated ground water from the oxidation chamber would be collected in a sump.

Treated ground water would be discharged to the local drinking water supply by a carbon steel centrifugal pump, having a flow of 700 gpm.

The costs associated with each of the treatment alternatives are indicated below:

MOM-2B Pumping Kentucky Avenue Well/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Distribution to Public Water Supply.

Capital cost	$1,089,900
Operation and Maintenance (30 yrs)	$549,700
Present Worth (Discount Rate 5%)	$9,137,600

MOM-2C Pumping Kentucky Avenue Well/Filtration/Carbon Adsorption/Distribution to the Public Drinking Water Supply.

Capital cost	$1,435,400
Operation and Maintenance (30 yrs)	$790,800
Present Worth (Discount Rate 5%)	$10,084,700

MOM-2D Pumping Kentucky Avenue Well/Filtration/UV-Ozone Oxidation/Discharge to Drinking Water Supply

Capital cost	$1,703,300
Operation and Maintenance (30 yrs)	$610,300
Present Worth (Discount Rate 5%)	$10,666,700

MOM-2E Pumping Kentucky Avenue Well/Filtration/Air Stripping/Carbon Adsorption of Air Emissions/Reinjection

Capital cost	$1,650,200
Operation and Maintenance (30 yrs)	$603,500
Present Worth (Discount Rate 5%)	$10,485,600

MOM-2F Pumping Kentucky Avenue Well/Filtration/Carbon Adsorption/Reinjection

Capital cost	$1,996,300
Operation and Maintenance (30 yrs)	$645,700
Present Worth (Discount Rate 5%)	$11,450,300

MOM-2G Pumping Kentucky Avenue Well/Filtration/UV-Ozone Oxidation/Reinjection

Capital cost	$2,264,200
Operation and Maintenance (30 yrs)	$665,300
Present Worth (Discount Rate 5%)	$12,004,400

Alternative MOM3A-MOM3C Pumping at the Southern Boundary of the Site/Treatment and Reinjection to the Aquifer

These alternatives consist of pumping contaminated ground water from a line of extraction wells located at the southern boundary of the contaminant plume. A total pumping rate of approximately 4,900 gpm would be required to effectively capture all the ground water and minimize contaminant migration. Ten wells would be installed with pumps; each pump would operate at approximately 490 gpm. The on-site treatment would consist of filtration to remove metals in suspended solids, and either air stripping, carbon adsorption, or UV-Ozone Oxidation to remove volatile organics. A vapor phase carbon adsorption system would be provided to control air emissions from the air stripping unit. These treatment alternatives are discussed on page 31 of the ROD. The treated ground water would either be reinjected downgradient using approximately 20 reinjection wells or if possible, discharged to surface water.

The costs associated with each of these alternatives are indicated below:

MOM-3A Pumping at Southern Boundary of Site/Air Stripping/Carbon Adsorption of Air Emissions/Reinjection

Capital cost	$5,339,100
Operation and Maintenance (30 yrs)	$1,528,700
Present Worth (Discount Rate 5%)	$26,654,600

MOM-3B Pumping at Southern Boundary of Site/Carbon Absorption/Reinjection

Capital cost	$6,116,100
Operation and Maintenance (30 yrs)	$1,627,100
Present Worth (Discount Rate 5%)	$28,803,800

MOM-3C Pumping at Southern Boundary of Site/UV-Ozone Oxidation/Reinjection

Capital cost	$7,366,700
Operation and Maintenance (30 yrs)	$1,878,700
Present Worth (Discount Rate 5%)	$33,561,800

Alternative MOM4A-MOM4D Pumping Ground water from Two Lines of Extraction Wells/Treatment/Reinjection to Aquifer

These alternatives consist of pumping contaminated ground water from two lines of extraction wells. A total pumping rate of approximately 4,900 gpm would be required to effectively capture all the ground water and minimize further migration of contaminants. Ten wells would be installed with pumps; each pump would operate at approximately 490 gpm. The on-site treatment would consist of filtration to remove metals in suspended solids, and either air stripping, carbon adsorption, or UV-Ozone Oxidation to remove volatile organics. A vapor phase carbon adsorption system would be provided to control air emissions from the air stripping unit. These treatment alternatives are discussed on page 31 of the ROD. The treated ground water would either be reinjected downgradient using approximately 20 reinjection wells, or if possible, discharged to surface water.

The costs associated with each of these treatment alternatives are indicated below:

MOM-4A Pumping from Two Lines of Pumping Wells/Air Stripping/Carbon Adsorption of Air Emissions/Reinjection

Capital cost	$8,514,500
Operation and Maintenance (30 yrs)	$1,812,900
Present Worth (Discount Rate 5%)	$33,792,000

MOM-4B Pumping from Two Lines of Pumping Wells/Carbon Absorption/Reinjection

Capital cost	$9,291,400
Operation and Maintenance (30 yrs)	$1,910,100
Present Worth (Discount Rate 5%)	$35,924,400

MOM-4C Pumping from Two Lines of Pumping Wells/UV-Ozone Oxidation/Reinjection

Capital cost	$10,541,900
Operation and Maintenance (30 yrs)	$2,156,700
Present Worth (Discount Rate 5%)	$40,613,900

Alternative MOM5A-MOM5C Pumping the Aquifer Downgradient of the Westinghouse Facility/Treatment/Discharge to the Public Water Supply or to Surface Water

The contaminated ground water would be extracted by installation of extraction wells downgradient of the Westinghouse Facility. A total pumping rate of approximately 140 gpm would be required to effectively contain the contaminated ground water and minimize

downgradient migration. Four wells with pumps are required; each pump would operate at approximately 35 gpm. The on-site ground water treatment scheme would consist of filtration to remove metals in suspended solids and either air stripping, carbon adsorption, or UV-Ozone Oxidation to remove volatile organics. A vapor phase carbon adsorption system would be provided to control air emissions from the air stripping unit. These treatment alternatives are discussed on page 31 of the ROD. The treated ground water would be discharged either to the public water supply as needed or to surface waters. The migration of contaminated ground water downgradient of extraction would be assessed every five years utilizing the data collected during the monitoring program.

The costs associated with each of the treatment alternatives is indicated below:

MOM-5A Pumping Ground Water Downgradient of Westinghouse/Air Stripping/Carbon Adsorption of Air Emissions/Discharge to Drinking Water Supply or Surface Water

Capital cost	$839,600
Operation and Maintenance (30 yrs)	$355,600
Present Worth (Discount Rate 5%)	$5,826,300

MOM-5B Pumping Ground Water Downgradient of Westinghouse/Carbon Adsorption/Discharge to Public Water Supply or Surface Water

Capital cost	$1,092,000
Operation and Maintenance (30 yrs)	$378,600
Present Worth (Discount Rate 5%)	$6,370,600

MOM-5C Pumping Ground Water Downgradient of Westinghouse/UV-Ozone Oxidation/Discharge to Public Water Supply or Surface Water

Capital cost	$1,016,600
Operation and Maintenance (30 yrs)	$388,900
Present Worth (Discount Rate 5%)	$6,466,300

9.Summary of Comparative Analysis of Alternatives

Overall Protection of Human Health and the Environment

Section 121(d) of CERCLA provides that remedial actions shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and shall control further release at a minimum to assure protection of human health and the environment.

The remedial alternatives that restore the Kentucky Avenue Well (MOM 2A-2G) and the alternatives which require installation of recovery wells between Westinghouse Electric Corporation Facility and the Kentucky Avenue Well (MOM 5A-5C) provide for overall

protection of human health because they would provide for a long-term, treated, drinking water supply. The water quality at the tap would meet all Federal and State drinking water standards. These alternatives would also gradually remove the contaminants of concern from the aquifer in the vicinity of Kentucky Avenue Well. After source controls are in place, this alternative will have a role in restoration of the contaminated ground water aquifer by preventing further downgradient contaminant migration in areas influenced by the pumping well. Beyond the influence of the capture well this alternative would not minimize the migration of contaminated ground water.

Alternatives involving pumping ground water between the Westinghouse Facility and the Kentucky Avenue Well (MOM5A-5C) would prevent further deterioration of the aquifer downgradient of the pumping wells, and they would play an active role in remediating the aquifer between the Westinghouse facility and the Kentucky Avenue Wellfield. After source control is effectively in place these remedial alternatives would require approximately 30 years to restore the aquifer to drinking water standards in areas of the aquifer actively managed by the pumping wells. Because of the extent of the TCE and inorganics contamination in the aquifer, an uncertainty exists as to whether the alternatives can attain the ARARs required for final remediation of the drinking water supply. The MOM5A-5C alternatives would provide for collecting the data necessary for a technical evaluation to determine the feasibility of a full aquifer remediation program for the Newtown Creek Aquifer. Treated ground water from these pumping wells would meet EPA and NYSDEC Drinking Water Standards and therefore any risk from drinking contaminated water would be reduced to acceptable levels.

The alternatives involving either 1) pumping at the southern boundary of the Site with one line of pumping wells (MOM3A-C), or 2) with two lines of pumping wells (MOM 4A-C), followed by treatment, reinjection to the aquifer, or surface water discharge would eventually eliminate migration of ground water contamination, and would gradually reduce the contaminants from the aquifer if source controls were in place. Pumping at the southern boundary of the contaminant plume would not be as protective of the environment because it would probably require all the contamination to flow the length of the contamination in the entire aquifer. The remediation time for these alternatives, assuming source controls are in place, is estimated to be 53 years (pumping at the southern boundary of the site) or 30 years (pumping at two lines of recovery wells and reinjecting the treated ground water. These alternatives are expected to eventually result in the overall protection of human health and the environment after a long period of time.

Both the No Action and the limited action alternatives would entail no removal of on-site contaminants or treatment of the contaminated ground water. At least 50 years would be required after source control is in place for natural flow of ground water

to reduce the contaminant concentrations to cleanup levels. The volume of contaminated ground water is expected to increase due to migration of contaminants. The No-action alternative is not considered responsive to the remedial objectives, but, rather, provides a "base case" for comparison with other alternatives; the limited action alternative is also not considered responsive to the remedial objectives, but with effective institutional controls it would prevent exposure to ground water contamination. These 2 alternatives would not provide adequate protection of human health and the environment.

Compliance with ARARs

Section 121(d) of CERCLA requires that all final remedial actions comply with all applicable or relevant and appropriate Federal and State Standards, requirements, criteria or limitations that apply to the Site.

Without source control measures in place at the areas identified in the Supplemental RI, the attainment of Federal and New York State drinking water standards in the ground water for the entire aquifer cannot be attained.

The ultimate goal of EPA's Superfund Program approach to ground water remediation as stated on the National Oil and Hazardous Substances Pollution Contingency Plan (40CFR Part 300) is to return useable ground water to their beneficial uses within a time frame that is reasonable. Therefore, for the Newtown Creek Aquifer, the final remediation goals will be the Federal and New York State MCLs, or non-zero MCLGs.

The alternatives that restore the Kentucky Avenue Well and provide for management of the plume will comply with all action and location-specific ARARs identified in this ROD. In addition, the alternatives will comply at the tap with Federal and New York State Drinking Water Standards which are the contaminant-specific ARARs for drinking water. These ARARs are listed in Table 47.

Filtration and air stripping and/or carbon absorption systems are proven methods of ground water treatment for removing metals and organics, respectively, from ground water to contaminant-specific ARAR levels. UV-Ozone Oxidation alternatives would require treatability studies to ensure effectiveness. The discharge of treated ground water to the drinking water supply system will be conducted in accordance with New York State and Federal drinking water standards. The air stripper tower will be designed to release emissions in accordance with NESHAPS, NAAQS, New York State Air Guide 1 values for volatile organics, and proposed VHAP standards.

In addition, the alternative will comply with other action and location-specific ARARs, which are common to all ground water pump and treat alternatives. All pumping/treatment systems will be designed, constructed, operated, and closed in accordance with

Federal and New York State RCRA facility standards, OSHA standards for worker protection and safety, and federal and New York Flood Hazard and Flood Plain Regulations. All piping systems will be installed to prevent loss of soil or the creation of sedimentation in accordance with New York's Guidelines for Urban Erosion and Sediment Control. The placement and location of buried Pipelines will be reported to the NYSDEC in accordance with the New York Industrial Code on Buried Pipelines. All Site activity will be conducted to prevent fugitive emissions and adverse impacts to fish and wildlife, which are required by the New York General Prohibitions Against Air Emission, Fish and Wildlife Coordination Act and the Endangered or Threatened Species Act. Floodplain assessments and Cultural Resources assessments will be conducted to ensure that site construction activities will not adversely affect these resources. Further, all treatment residuals, such as sludge cake or spent carbon, would be treated to comply with the LDR requirements if appropriate. That waste which is classified as RCRA characteristic waste or listed waste will be labeled and marked to comply with federal and state hazardous waste transportation requirements.

The No Action alternative would leave contaminated ground water at the Site. The Federal and New York MCLs and ground water standards in Table 47 are currently exceeded for the contaminants of concern in the ground water underlying the Site. Since MCLs and ground water standards are ARARs for ground water that either is or may be used for drinking, the No-action alternative will not satisfy the contaminant-specific ARARs. Long-term ground water monitoring will comply with pertinent RCRA action-specific ARARs for ground water monitoring.

Like the No Action alternative, the Limited Action Alternative which would restrict ground water uses at the Site would leave contaminated ground water at the Site. The Federal and New York MCLs and ground water standards in Table 47 are currently exceeded for the contaminants of concern in the ground water underlying the Site. Because MCLs and ground water standards are ARARs for ground water that either is or may be used for drinking, Alternative MOM-2A would not meet the contaminant specific ARARs. This alternative will satisfy all action specific ARARs for ground water monitoring wells.

Long-Term Effectiveness and Permanence.

Long-term effectiveness and permanence addresses the long-term protection and reliability of an alternative and the magnitude of residual risk.

Restoring the Kentucky Avenue Well and installing a line of pumping wells to contain the TCE contamination, treating the water to drinking water standards, and discharging the ground water to the water supply will provide an effective long-term drinking water supply that meets all Federal and New York State

requirements. All the treatment technologies utilized in treating the ground water have been demonstrated to be effective in treating ground water to drinking water standards. By providing a treated ground water system to supplement the existing public water supply, the risks associated with long-term exposure to contaminated drinking water, primarily through ingestion, are greatly reduced.

The major benefits of pumping and treating ground water at and in the vicinity of the Kentucky Avenue Wellfield is that this alternative will prevent migration of the ground water contamination. These alternatives will restore the aquifer in the vicinity of the public water supply to drinking water standards sooner than the other pump and treat alternatives. In addition, these alternatives will provide data on aquifer response to pump and treatment in order to evaluate the feasibility of remediating the entire aquifer. The treatment would continue until TCE concentrations in the influent to the treatment plant are equal to or below the established cleanup levels.

Pumping ground water at the southern boundary of the plume may minimize contaminated ground water migration beyond areas currently contaminated, but such an approach would require all the contamination to flow through the entire aquifer before capture. The ground water would be treated to ground water remediation cleanup levels prior to reinjection. The remediation would continue until volatile organics concentrations in the influent to the treatment plant are equal to or below the cleanup levels. All the components of the treatment systems are commercially available and have been used for similar water treatment processes.

Regular performance monitoring would include checking for plugging in the filters and the air strippers. Carbon regeneration or replacement would be required for the carbon absorption unit,and occasional replacement of UV lamps would be required.

Long-term risks associated with the No Action alternative are related to (1) the continuous migration of contaminants, (2) the possibility of migration within the Site and to Newtown Creek (3) any potential future use of the ground water for domestic, municipal and industrial, or irrigation purposes. Adverse environmental impacts resulting from contaminant migration would include inorganic (mainly suspended metals) and organic (mainly TCE) contamination of ground water which would pose hazards to both the public and the environment. Therefore, the No Action alternative is not considered to be effective over the long-term.

With all of the alternatives, a long-term ground water monitoring program would be required to determine whether contaminant concentrations are being reduced through natural flushing and to verify that the model predictions are realistic.

Reduction of Toxicity, Mobility, or Volume through Treatment.

This evaluation criteria relates to the ability of a remedial alternative to reduce the toxicity, mobility, or volume of hazardous substance at a Site and to thereby control the risks associated with such hazardous substances.

Restoring the Kentucky Avenue Well would offer reduction of toxicity, mobility, and volume of the contaminants of concern by collecting and treating the contaminated ground water.

Treating ground water between the Westinghouse facility and the Kentucky Avenue Well would offer a significant overall reduction of toxicity, mobility, and volume of the contaminants of concern in the area of the aquifer affected by this pumping. However, the toxicity, mobility and volume of the downgradient ground water would be left to natural attenuation until the final remedy for the aquifer is selected.

Pumping and treating ground water in pumping wells at the southern boundary of the plume or from two lines of pumping wells would treat significant quantities of contaminated ground water, but the design of the recovery system would leave the contamination to flow the entire length of the contaminated area. However, a larger volume of contaminated ground water would result and would ultimately have to be treated.

The no-action alternative would not involve any removal, treatment, or disposal of the contaminants in the ground water and, as such, no active reduction in toxicity, mobility, or volume would result. A very gradual reduction in toxicity of contaminants would be achieved over time as natural flushing of the ground water would transport the contaminants downgradient. However, the volume and concentration of contaminated ground water would probably increase with time due to the migration of contaminants downgradient.

Short-Term Effectiveness.

The short term effectiveness criterion relates to the time required to meet remedial objectives and the short term impacts of the implementation of the remedy.

There are no major short-term threats to the neighboring community or to workers during remedial actions associated with any alternative. The workers performing the well drilling and sampling activities would be provided with personnel protection equipment

to minimize direct contact risks and would be health-and-safety trained. The No-Action Alternative relies on migration of contaminants primarily to surface water to achieve cleanup levels. Although it is not possible to develop a time frame to achieve cleanup levels without extensive contaminant transport modeling,

it is estimated that it will take over 50 years to approach these levels.

Potential short-term risks to workers during implementation of pump and treat remedial alternatives would be from direct contact and inhalation of organic vapors from contaminated ground water resulting from piping leaks or accidental discharges and from air emissions from the air stripper. However, a vapor phase carbon adsorption system would be provided to control the emissions so as to meet the New York State air quality requirements. Exposure risks such as these will be mitigated through proper health and safety training and appropriate process controls. Other potential short-term risks to on-site workers would include normal construction hazards. The treatment plant would be fenced, and access to this area would be restricted. Dust control measures such as wind screens and water sprays would if necessary be used to minimize fugitive dust resulting from excavation operations. Minimal risk to the community from increased traffic during construction and transportation of treatment residuals is expected. No adverse impacts are expected from the discharge of treated ground water to the drinking water supply.

Implementability.

Implementability addresses the ability to implement and operate each alternative from design through construction and operation and maintenance.

The only technical concern for the No Action alternative and the limited action alternative is the implementation of a long-term ground water monitoring program. Monitoring wells are already present and new wells would be installed. The existing and proposed new wells will be used to monitor any further spread of contamination within the Site. The required technologies will involve installation of new monitoring wells, collection of the samples, analyses for contaminants of concern, and the evaluation of the extent of contamination, which are all proven and reliable activities.

The primary process steps of pumping and treating ground water at the Kentucky Avenue Well and at treatment wells between Westinghouse and the Kentucky Avenue Well (Pumping, collection, filtration, air stripping, adsorption, and discharge) are used extensively to treat water contaminated with organic and inorganic contaminants. All components of these alternatives are well developed, commercially available, and are not expected to incur major technical problems which could lead to schedule delays. The treated ground water would be expected to meet discharge

requirements and therefore, discharge to the existing drinking water system should not pose any problems. Process residues would have to be regenerated or disposed of in an approved off-site facility. Land disposal requirements may apply.

Proper operation and routine maintenance of the treatment plant would be required to achieve treatment goals. During the operation of the treatment system, effectiveness would be monitored by periodic analysis of contaminant concentrations in the treated ground water before discharge. Sufficient space, approximately 0.5 acre, is available at the Site for construction and operation of this alternative.

Pump and treat alternatives would require compliance with EPA, U.S. Department of Transportation, and state regulations regarding the transport and disposal of process residuals. Long-term ground water monitoring would be required to measure the performance of the treatment system. The pump and treat alternatives would require a comprehensive management and maintenance program to ensure the effectiveness of the treatment and discharge system. In addition, discharge to the existing drinking water system would require coordination with the Elmira Water Board.

The alternatives that would require reinjection of treated ground water would have to meet state and federal reinjection requirements. Reinjection in general is more difficult to implement than surface water discharge or public water distribution and requires more operation and maintenance due to well screen clogging.

COST

The cost evaluation of each alternative is based on the capital cost (cost to construct), long-term monitoring, operation and maintenance (O&M), and present worth costs. Table 48 presents estimates of these cost for all alternatives evaluated.

For the alternatives evaluated, the costs ranged from $415,000 for the "No Action" alternative to $40,613,900 for a complete aquifer remediation program.

A comparison of capital costs and operation and maintenance costs for air stripping versus carbon adsorption and UV-Ozone oxidation indicates that for all of the ground water pumping alternatives, air stripping was the least expensive treatment alternative.

For the discharge of treated ground water, discharge to surface water was the least expensive discharge alternative evaluated.

State Acceptance.

The NYSDEC concurs with this interim remedial action at the Kentucky Avenue Wellfield Site.

Community Acceptance.

Community acceptance of the selected remedy was evaluated after the public comment period had ended. Comments raised at the public meeting and during the public comment period are summarized in the attached Responsiveness Summary.

10. Selected Remedy

The interim remedial action selected for the Site, MOM 2-B and MOM 5-A, and the remedial objectives for the contaminated ground water in the vicinity of the Kentucky Avenue Wellfield are as follows:

- Restore the Kentucky Avenue Well as a public drinking water supply well. If evaluation of the well condition indicates that the well should be replaced, then the well will be reconstructed in order that the Kentucky Avenue Well can provide approximately 700 gpm of potable water.

- Prevent further spread of contaminated ground water within the Newtown Creek Aquifer with the installation of ground water recovery wells between the Westinghouse Electric Corporation facility and the Kentucky Avenue Well. The exact location and pumping rates will be determined during the design stage. The determination will be made after pump tests have been conducted to verify the preliminary estimate that approximately 140 gpm will be adequate to ensure an inward hydraulic gradient. If the ground water pumping rate at the Westinghouse facility changes dramatically, the design pump rate will be modified to ensure an inward gradient at the capture wells. The interim remedial action may require continuous pumping, and/or pulse pumping, and flexibility in placing pumping wells in strategic locations during the course of the interim remedial action.

- Construct two treatment plants; one located near the Kentucky Avenue Well, and one located between the Westinghouse facility and the Kentucky Avenue Well, which will treat all the recovered ground water to Federal and New York State Standards for public drinking water systems. The selected treatment will include the following:

  Filtration to remove any suspended solids with adsorbed inorganic contamination.

  Air Stripping to remove volatile organic contaminants.

  Vapor Phase Carbon Adsorption to eliminate volatile organic vapor emissions at the air stripper.

- Discharge the treated ground water to the public water supply. In addition, engineered provisions to allow for testing reinjecting ground water to evaluate the

feasibility of expanding the ground water remediation effort will be provided for.

- Conduct a limited investigation in order to determine if the contamination detected at the Horseheads Automotive Junkyard contributes to the contamination at the Kentucky Avenue Wellfield.

- Install a limited number of monitoring wells to monitor contaminant migration and to evaluate effectiveness of the interim remedial action. The location and specifications for these monitoring wells will be determined during the design phase.

EPA's Superfund Program uses EPA's Ground Water Protection Strategy as guidance when determining the appropriate remediation for contaminated ground water at CERCLA sites. The Ground Water Protection Strategy establishes different degrees of protection for ground waters based on their vulnerability, use, and value. For the Newtown Creek Aquifer, the final remediation goals will be drinking water standards. However, EPA recognizes that the final selected remedial action for the Newtown Creek Aquifer may not achieve this goal because of the technical difficulties associated with removing contaminants in ground water to ground water cleanup levels. The monitoring results of this interim remedial action will be evaluated carefully to determine the feasibility of achieving this final goal. The interim remedial action may require continuous pumping and/or pulse pumping, as well as flexibility in placing pumping wells in strategic locations during the implementation of the interim remedial action.

The ground water cleanup levels at the site are based primarily upon the classification of the ground water as a potential drinking water source. Therefore, the Maximum Contaminant Levels promulgated under the Safe Drinking Water Act are relevant and appropriate, and the non-zero Maximum Contaminant Level Goals and New York State MCL's are relevant and appropriate for aquifer remediation. Reaching the cleanup levels in the aquifer upgradient of the Kentucky Avenue Well will not be possible until effective source control measures are in place at the Westinghouse Facility, and if appropriate, at the Horseheads Automotive Junkyard.

The total capital cost of pumping the Kentucky Avenue Well, and the recovery wells designed to prevent further migration of the plume, filtration, air stripping, carbon adsorption of emissions, and discharge to the public water supply is $2,106,500.

The total annual operations and maintenance cost associated with the selected remedial action is expected to be $905,300.

The total present worth (1989 dollars) assuming a 5% discount for over a thirty year period for the selected remedial action is $14,963,900.

It is estimated that over the period of thirty years, approximately 1.32 x 10^{10} gallons of ground water would be treated to drinking water standards. It is estimated that the treatment of contaminated ground water will annually produce approximately 311 tons of sludge from the filtration system and approximately 5.6 tons of spent carbon from the air emissions treatment system. Treatment wastes will be disposed of offsite, and Land Disposal Restrictions may apply.

In addition, during the design stage a Stage I cultural resources assessment, and a wetlands assessment will be conducted to ensure that Site activities will not adversly impact these resources.

11.Statutory Determinations

The remedial action selected for implementation at the Site is consistent with CERCLA, and the NCP. The selected remedy is protective of human health and the environment. As an interim remedy the selected remedy attains location specific, and action specific ARARs, and will attain chemical specific ARARs at the tap. Chemical specific ARARs will not be attained within 50 years for the portion of the aquifer beyond the radius of the pumping wells, and it is estimated that once source control is in place the selected remedial action will attain ARARs in approximately 30 years.

Protection of Human Health and the Environment.

Once an effective filtration and air stripping system for ground water treatment, and carbon absorption of air emissions, and connection of all private residences to the public water supply is completed, the estimated risk to human health from consumption of ground water will be less than 10^{-6}. The implementation of this remedy will not pose any unacceptable short-term risks.

The risk posed by direct contact to sediments in the industrial outfall drainageway used by the Westinghouse Electric Corporation will not be remedied until either the sediments are removed or the exposure pathway is halted. The elevated levels of inorganics in the drainageway may be the result of the permitted discharge at the Westinghouse facility. The results of further investigation of this drainageway may indicate that action pursuant to other federal and state authorities is necessary.

Compliance with Applicable or Relevant and Appropriate Requirements.

This remedy will provide a source of drinking water that meets or attains all applicable or relevant and appropriate Federal and State requirements at the tap that apply to the Site. The selected remedy will meet or attain all ARARs for the portion of the aquifer in the vicinity of the Kentucky Avenue Well; to the extent of the pumping wells after source control is in place in an estimated time frame of approximately 30 years. Beyond the hydraulic influence of the pumping wells, the remedy will not meet all contaminant specific ARARS within a 50 year period after source controls are in place. ARARs for the selected interim remedial action for the Site are included in Table 47.

Cost-Effectiveness.

Each of the alternatives underwent a detailed cost analysis to develop costs to the accuracy of -30 to + 50 percent. In that analysis, capital and operation and maintenance costs have been estimated and used to develop present worth costs. In the present worth analysis, annual costs were calculated for thirty years (estimated life of an alternative) using a five percent interest rate factor and they were based on 1990 costs.

Of those remedial alternatives that are protective and attain ARARs, and satisfy the preference for treatment to the maximum extent practicable, EPA selected an interim remedy that is cost-effective in mitigating the risks posed by the ground water within a reasonable period of time. Overall, the total cost (present worth) of the selected remedy is estimated at $14,963,000.

This cost is higher than that of some of the other alternatives; however, none of the less expensive alternatives can ensure that the treated ground water will reach the target cleanup levels. Additionally EPA has determined that this remedy will yield results that are in proportion to its cost in terms of effectiveness. Thus, while other alternatives evaluated are cheaper than the selected alternative, they do not provide the same degree of effectiveness.

The cost of the selected remedial action is lower than that of some of the other alternatives; however, implementation of the more expensive alternatives are not cost effective until after the reduction of contamination is observed and shown to be effective. When source control measures are effectively in place they will be reevaluated.

Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable (MEP).

The selected remedy utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The ground water extraction/treatment system provides permanent removal and reduction of the mass of volatile organic contaminants in ground water through ground water recovery and treatment via air stripping and carbon adsorption. Carbon columns will remove contaminants from the airstream before being released to the atmosphere. Treated ground water will be discharged in compliance with limitations required by ARARs. Figure 12 is a schematic of the treatment systems to be employed.

Preference for Treatment as a Principal Element.

The preference for treatment as a principal element is satisfied since treatment of the principal threat (the ground water) will be conducted. The treatment systems will include filtration to remove any suspended solids with adsorbed inorganic contamination, air stripping to remove volatile organic contaminants, and vapor phase carbon adsorption to eliminate volatile organic vapor emissions at the air stripper.

12. Documentation of Significant Changes

There have been no significant changes in the selected interim remedy from the interim remedy described in the Proposed Plan.

APPENDIX 1

Table 1

Summary of Chemicals Detected in Background
Groundwater Samples for the Kentucky Avenue Site
(All concentrations in ug/l)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
carbon tetrachloride	2/4	3.3	5.0 J
diethylphthalate	1/4	5.4	7.0 J
methylene chloride	1/4	2.7	3.0 J
Inorganics:			
barium	4/4	145.1	174.0
beryllium	1/4	NR	1.3
calcium	4/4	103,000	111,000.0
copper	2/4	13	18.0
iron	2/4	51	121.0
lead	1/4	2.8	4.2
magnesium	4/4	20,700	22,300.0
manganese	2/4	20	231.0
nickel	1/4	NR	19.3
potassium	4/4	2,600	2,790.0
sodium	4/4	30,300	66,200.0
vanadium	1/4	NR	11.0
zinc	3/4	15	22.0

Notes:

NR = The geometric mean was not reported (NR), as this estimated concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

Samples
Gw-1, Gw-3, Gw-4 (Residential wells)
Gw-11 (James & Moore well PS-25)

Table 2
Summary of Chemicals Detected in
Groundwater at the Kentucky Avenue Wellfield Site
(All concentrations in ug/l)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
1,1,1-trichloroethane	8/45	2.2	54
2-butanone	2/19	NR	4
acetone	10/45	8.0	2,200
bis(2-ethylhexyl)phthalate	9/35	5.6	20
chloroform	7/45	1.6	9
methylene chloride	11/45	2.3	4
toluene	1/45	2.6	4
total xylenes	3/45	3.1	48
trans-1,2-dichloroethene	17/45	3.3	12
trichloroethene	34/45	11.7	121
vinyl chloride	4/45	1.2	2
Inorganics:			
aluminum	46/47	8,335	281,000
antimony	8/47	354	666
arsenic	24/38	9.8	55
barium	45/47	360	2,690
beryllium	25/47	11.8	13.1
cadmium	4/47	3.0	270
calcium	47/47	162,951	1,620,000
chromium (total)	45/46	212	45,100
chromium (VI)	1/12	3.7	267
cobalt	31/47	35.5	243
copper	35/40	78.7	894
iron	31/31	20,000	654,000
lead	40/44	20.9	321
magnesium	46/47	37,078	557,000
manganese	47/47	957	21,300
mercury	7/47	0.1	1
nickel	40/47	109.4	8,880
potassium	41/47	4,951	2,470,000
sodium	42/42	56,650	433,000
thallium	1/47	5.1	6.5
vanadium	34/47	37.7	385
zinc	41/42	136.4	2,640

Notes:

NR = The geometric mean was not reported (NR), as this estimated concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

Samples:

Round 1

Mw-1 (Gw-1), Cw-4 (Gw-4), Cw-5 (Gw-5), Cw-6 (Gw-6), Cw-7 (Gw-7)
Cw-8 (Gw-8), Cw-9 (Gw-9), Cw-10 (Gw-10), Mw-11 (Gw-11)
Mw-12 (Gw-12), Mw-13 (Gw-13), Mw-14 (Gw-14), Mw-15 (Gw-15)
Cw-16 (Gw-16), Cw-17 (Gw-17), Cw-18 (Gw-18), Cw-19 (Gw-19)
Mw-21 (Gw-21), Mw-22 (Gw-22), Mw-23 (Gw-23)
Cw-24 (Gw-24), Cw-25 (Gw-25), Cw-26 (Gw-26)
Cw-27 (Gw-27), Cw-28 (Gw-28), Cw-29 (Gw-29)

Confirmatory Sampling Round

Cw-04, Cw-04, Cw-05, PS-40, PS-50, Mw-02, Mw-04, Mw-05, Mw-06, Mw-07, Mw-11

Table 3

SUMMARY OF DISSOLVED INORGANICS DETECTED IN GROUND WATER
AT THE KENTUCKY AVENUE WELLFIELD SITE
(All concentrations in ug/l)

Chemical	Frequency of Detection (a)	Concentration Range
aluminum	1/11	2,880
calcium	10/11	52,200 - 128,000
chromium	1/11	439
iron	1/11	119
magnesium	10/11	9,170 - 26,700
manganese	3/11	33 - 204
nickel	1/11	797
potassium	2/11	5,300 - 2,700,000
sodium	11/11	48,300 - 214,000
zinc	10/11	27.9 - 46.1

(a) Number of samples in which chemical was detected divided by the total number of samples analyzed.

Samples: Dw-15SFI, Dw-7SFI, Mw-21FI
PS-4FI, PS-5SFI, Mw-2FI, Mw-4FI
Mw-5FI, Mw-6FI, Mw-7FI, Mw-11FI

Table 4
Ground Water Analyses for Westinghouse Electric Corporation

SUMMARY OF PHASE II WATER ANALYSES
PRIORITY POLLUTANT VOLATILE, ACID EXTRACTABLE, AND BASE/NEUTRAL ORGANIC COMPOUNDS[1]

Sample Location	Chloroform	Chloromethane	Methylene Chloride	1,1,1-Trichloroethane	Trichloroethylene	2-Chlorophenol	Bis(2-ethylhexyl) phthalate	Di-N-Butyl phthalate
MW-1S	ND	ND	9(13)[2]	5	11	ND	86	ND(58)[2]
MW-1S(Dup)	ND	ND	8(13)[2]	6	11	ND	ND	13(58)[2]
MW-1D	ND	ND	9(13)[2]	ND	ND	ND	74	30(58)[2]
MW-2S	ND	ND	11(12)[2]	ND	ND	14	NA	NA
MW-2D	ND	ND	10(12)[2]	ND	ND	ND	NA	NA
MW-3S	ND	ND	9(12)[2]	ND	ND	ND	NA	NA
MW-3D	ND	ND	24(16)[2]	ND	ND	ND	NA	NA
MW-4	ND	ND	20(16)[2]	BMRL	ND	ND	NA	NA
MW-5S	ND	ND	10(12)[2]	ND	ND	ND	NA	NA
MW-5D	ND	ND	11(12)[2]	ND	ND	ND	NA	NA
MW-6(I)[3]	BMRL	ND	29	5	10	BMRL	ND	ND(BMRL)[2]
MW-6(II)[3]	ND	15	18(12)[2]	BMRL	8	ND	ND	ND(58)[2]
MW-7S	ND	ND	24(16)[2]	BMRL	20	ND	ND	ND
MW-7D	ND	ND	20(16)[2]	BMRL	ND	ND	ND	ND(58)[2]
MW-8S	ND	ND	19(16)[2]	BMRL	62	ND	ND	ND(58)[2]
MW-8D	ND	20	13(12)[2]	ND	140	ND	ND	11(58)[2]
MW-9S	ND	ND	18(12)[2]	BMRL	210	ND	ND	ND(58)[2]

*See footnotes at end of table.

(Continued)

Table 4 contd.

Sampling Location	Chloroform	Chloromethane	Methylene Chloride	1,1,1 Trichloroethane	Trichloroethylene	2-Chlorophenol	Bis(2-ethylhexyl) phthalate	Di-N Butyl phthala
MW 95(Dup)	ND	ND	20(12)[2]	7	300	ND	100	14(58)[2]
MW-9D	ND	ND	15(13)[2]	BMRL	51	ND	ND	ND(59)[2]
MW-10(I)[3]	ND	ND	10	BMRL	430	ND	177	ND(22)[2]
MW-10(II)[3]	ND	ND	13(12)[2]	BMRL	210	ND	ND	17(19)[2]
MW-11(I)[3]	ND	ND	10	ND	ND	ND	BMRL	ND
MW-11(II)[3]	ND	13	15(12)[2]	BMRL	14	ND	ND	BMRL(58)[2]
OW-1	ND	ND	7(7)[2]	ND	ND	ND	11(54)[2]	ND
SW-5	ND	ND	9(13)[2]	BMRL	13	ND	ND	64(9)[2]
SW-6	ND	ND	23(16)[2]	ND	14	ND	ND	ND(3)[2]
SW-7	ND	ND	7(ND)[2]	BMRL	45	ND	250(54)[2]	ND
Baller-Decon Rinsate Blank	ND	ND	16(7)[2]	ND	ND	ND	NA	NA
Trip Blank[4]	ND	ND	26(16)[2]	ND	ND	ND	NA	NA
Trip Blank[5]	ND	ND	10(16)[2]	ND	ND	ND	NA	NA
Trip Blank[6]	ND	ND	20(12)[2]	BMRL	ND	ND	NA	NA
Trip Blank[7]	ND	ND	17(13)[2]	ND	ND	ND	NA	NA
Trip Blank[8]	ND	ND	9(13)[2]	BMRL	ND	ND	NA	NA
Trip Blank[9]	ND	ND	18(13)[2]	ND	ND	ND	NA	NA
Trip Blank[10]	ND	ND	13(7)[2]	ND	ND	ND	NA	NA
MCL[11]				200	5			

(Continued)

Footnotes

[1]Results reported in)g/l.

[2]( ) = Concentration in laboratory QC blank; QC concentration not shown if ND.

[3](I) and (II) refer to Phase I and II sampling events.

[4]Shipped with samples from SW-6, MW-75, and MW-70.

[5]Shipped with samples from MW-2S, 2D, 3S, 3D, 5S, 5D, 8S, 9S, and 9S(Dup).

[6]Shipped with samples from MW-4, 6, and 10.

[7]Shipped with samples from MW-8D, 9D, and 11.

[8]Shipped with samples from SW-5.

[9]Shipped with samples from MW-1S, 1S(Dup), and 1D.

[10]Shipped with samples from SW-7, OW-1, and baller-decon rinsate blank.

[11]50 FR 46880 (Nov. 13, 1985), Safe Drinking Water Act.

NA = Not analyzed.

ND = Not detected at minimum reporting level.

BMRL = Present but below minimum reporting level.

Table 5 Ground Water Analyses
RESULTS OF TRICHLOROETHYLENE ANALYSES
Facet Enterprises, Inc.

Well Number	Concentration (µg/L) Sample Date 5/25-26/83[1]	7/11/83[2]	7/23/83[2]
C-2	2.0	0.1	—
D-1	230	240,218[3]	—
D-2	800	515	—
D-3	2.0	0.5	—
D-4	12	17	—
D-5	—	—	210
D-6	—	—	18.7
D-7	—	—	127
D-8	—	—	41.6
Process Well 1	—	25.	—
Process Well 2	—	7.8	—
Municipal Supply	8.2	—	—

[1]GC-MS, Method 624

[2]GC, Method 601

[3]Duplicate samples

Table 5 contd.

ANALYTICAL GROUNDWATER RESULTS-INORGANIC
FACT INDUSTRIES (NPL) SITE

PARAMETER	D-1	D-3	D-4	D-9	D-10	D-11	D-11(DUP)	D-12	U-2
METALS (mg/l) (total/dissolved)									
Silver	0.009/0.009	0.009/0.009	0.009/0.009	0.009/0.009	0.009/0.009	0.009/0.009	0.009/0.009	0.009/0.009	0.009/0.00
Arsenic	0.012/0.001	0.010/0.005	0.005/(0.003)	0.010/0.001	0.016/0.001	(0.009)/(0.003)	0.012/0.005	0.041/0.001	0.010/0.00
Beryllium	0.002/0.002	0.002/0.002	0.002/0.002	0.002/0.002	0.002/0.002	0.002/0.002	0.002/0.002	0.002/0.002	0.002/0.00
Cadmium	0.005/0.005	0.005/0.005	0.005/0.005	0.005/0.005	0.005/0.005	0.005/0.005	0.005/0.005	0.005/0.005	0.005/0.00
Chromium	0.200/0.042	0.041/0.009	0.119/0.067	0.058/0.011	0.062/0.064	0.062/0.009	0.070/0.009	0.135/0.009	0.106/0.00
Copper	0.115/0.015	0.115/0.015	0.060/0.015	0.117/0.029	0.015/0.006	0.125/(0.021)	0.152/0.015	0.191/0.015	0.355/0.01
Nickel	0.065/0.024	0.069/0.024	0.061/0.024	0.068/0.024	0.109/0.024	0.078/0.024	0.090/0.024	0.090/0.024	0.210/0.02
Lead	0.050/0.003	0.051/0.001	0.014/0.001	0.018/0.001	0.020/0.001	0.021/.003	0.069/.003	0.069/0.003	0.117/0.00
Tin	0.056/0.056	0.056/0.056	0.056/0.056	0.056/0.056	0.056/0.056	0.056/0.056	0.056/0.056	0.056/0.056	0.056/0.05
Selenium	0.017/0.002	0.017/0.002	0.017/0.002	0.017/0.017	0.017/0.002	0.017/0.017	0.017/0.017	0.017/0.002	0.017/0.00
Thallium	0.004/0.010	0.004/0.010	0.004/0.010	0.004/0.010	0.004/0.004	0.004/0.004	0.004/0.004	0.038/0.004	0.038/0.00
Zinc	0.165/0.012	0.208/0.012	0.075/0.012	0.004/0.012	0.251/0.012	0.162/0.012	0.218/0.012	0.566/0.012	0.640/0.01
CYANIDE (mg/l)	0.051	0.024	0.100	0.021	0.010	0.010	0.010	0.010	N
MERCURY (mg/l)	0.0001/0.0001	0.0002/(0.0001)	(0.0001)/0.0001	0.0002/0.0001	(0.0001)/0.0001	0.0002/(0.0001)	0.0001/0.0001	0.0001/0.0001	0.0001/0.00
ASBESTOS (mg/l)	0.41	1.1	0.50	0.31	0.97	2.8	0.67	1.2	

DUP - duplicate

NA - not analyzed

Source: Radian (1986)

1290K

Table 5 cont'd.

ANALYTICAL GROUNDWATER RESULTS-ORGANIC
FACET ENTERPRISES (NPL) SITE

Compounds:	Monitoring Well: D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-8(DUP)	D-9	D-10	D-11	D-11(DUP)	D-12	D-13	U-2
Volatiles																
acetone	ND	ND	7.9	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
1,1-dichloroethene	5.3	ND	ND	ND	NA	NA	NA	NA	NA	2.3J	NA	ND	ND	ND	ND	ND
trans-1,2-dichloro-ethene	31.3	176	ND	ND	11.5	2.96	189	25.4	21.4	ND	ND	14	12	ND	140	ND
2-butanone	1.7	ND	ND	ND	NA	NA	NA	NA	NA	9.6	ND	ND	ND	6.9	NA	ND
1,1,1-trichloroethane	2.5J	46.5	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	268	ND
trichloroethene	140	418	ND	7.3	10	11.9	66.5	51.3	55.1	NA	NA	NA	NA	NA	ND	ND
Vinyl chloride	NA	ND	NA	NA	ND	ND	14.0	N	ND	3.1J	ND	15	22	ND	NA	ND
Semivolatiles:																
pentachlorophenol	300	NA	ND	ND	NA	NA	NA	NA	NA	1	ND	ND	ND	ND	NA	NA
bis(2-ethylhexyl) phthalate	7	NA	ND	ND	NA	NA	NA	NA	NA	5	ND	3	4	3	NA	NA

NA: Compound not analyzed.

ND: Compound not detected.

J: Estimated value less than minimum detection limit.

Concentrations are in ppb (ug/l).

Source: Radian (1986)

Table 6. Ground Water Analyses

SUMMARY OF ANALYTICAL GROUNDWATER RESULTS - ORGANICS
L.R.C. ELECTRONICS, INC.

Compounds: (1984)	Well ID: MW-1S	MW-1D	MW-2S	MW-3S	MW-3D	MW-7S	MW-7D	MW-8S	MW-10S	MW-10D
1,1-Dichloroethane	30	22	1400	1300	21	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	-	-	-	15	-	NA	NA	NA	NA	NA
Trichloroethene	-	-	30	141	11	NA	NA	NA	NA	NA
Compounds: (1985)										
Chloromethane	NA	NA	NA	-	-	42	-	-	-	-
Methylene Chloride	NA	NA	NA	54	-	110	27	-	-	-
Trichlorofluoromethane	NA	NA	NA	-	-	15	-	-	-	-
1,1-Dichloroethane	NA	NA	NA	-	-	15	-	-	-	-
1,1,1-Trichloroethane	NA	NA	NA	-	-	10	-	-	-	-
Trichloroethene	NA	NA	NA	54/10	-	19/54	-	-	-	-
Ethylbenzene	NA	NA	NA	-	-	-	-	55	-	-
Tetrachloroethene	NA	NA	NA	-	-	-	-	19	-	-
Compounds: (1986)										
Trichloroethene	54	-	-	-	-	19	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	10	-	-	-	-
Methylene	-	-	-	-	-	-	-	6	-	-
Chloride	-	-	-	-	-	-	-	6	-	-
Compounds: (1987)										
Chloroform	NA	NA	NA	-	-	58	-	-	-	-
Methylene Chloride	NA	NA	NA	-	-	-	9	-	-	-
1,1,1-Trichloroethane	NA	NA	NA	2	-	8	-	-	-	-
Trichloroethene	NA	NA	NA	28/49	-	24/38	-	-	-	-
Xylene	NA	NA	NA	-	-	-	-	109	-	-
Compounds: (1988)										
Methylene Chloride	NA	NA	NA	14	-	-	-	-	-	-
Chloroform	NA	NA	NA	6	-	16	-	-	-	-
Trichlorofluoromethane	NA	NA	NA	1	-	-	-	-	-	-
1,1-Dichloroethane	NA	NA	NA	3	-	-	-	-	-	-
1,1,1-Trichloroethane	NA	NA	NA	4	-	4	-	-	-	-
Trichloroethene	NA	NA	NA	27	-	17	-	-	-	-
Tetrachloroethene	NA	NA	NA	1	-	-	-	-	-	-
Carbon Tetrachloride	NA	NA	NA	1	-	1	-	-	-	-
Xylene	-	-	-	-	-	-	-	234	-	-

-: Compound Not Detected.
NA: Compound Not Analyzed.
* More than one value indicates a second sample collected in that same year.
Concentrations are in ppb (= ug/l).
Source: Empire Soil Investigations (1984-1988)

Table 6 contd.

SUMMARY OF ANALYTICAL GROUNDWATER RESULTS - INORGANICS
L.R.C. ELECTRONICS, INC.

Compounds:	Monitoring Well ID: MW-35	MW-30	MW-25	MW-20	MW-05	MW-10S	MW-10D
(Jan. 1985)							
Cadmium	2.5	3.0	2.1	8.1	60	1	<1
Chromium	<20	20	80	10	10	<20	20
Lead	<2	48	76	95	61	10	4
(March, 1985)							
Cadmium	2.7	1.7	2.3	1.5	1.3	2.1	<1
Chromium	<20	<20	<20	<20	<20	<20	<20
Lead	<2	6	2	11	5.0	2	38
(August, 1986)							
Cadmium	10	10	10	10	<10	20	<10
Chromium	370	<20	140	<20	<20	60	<20
Lead	500	<100	200	100	<100	300	>100
(April, 1987)							
Cadmium	20	-	37	-	20	20	-
Chromium	250	-	370	-	100	90	-
Lead	350	-	570	-	200	250	-
(Sept, 1987)							
Cadmium	5	-	5	-	20	< 5	-
Chromium	<10	-	1	-	52	<10	-
Lead	<50	-	50	-	120	50	-
(Feb, 1988)							
Cadmium	35	< 5	20	20	15	< 5	< 5
Chromium	190	<10	170	<10	60	60	10
Lead	300	<50	250	50	200	100	<50

Concentrations in ppb (= ug/l).

-: Not analyzed.

Source: Empire soil Investigation (1985-1988)

Table 7

BACKGROUND SOIL CONCENTRATIONS FOR INORGANIC CHEMICALS FOR THE KENTUCKY AVENUE WELLFIELD SITE

Chemical	Regional Range of Background Concentrations (mg/kg) (a)
Aluminum	70,000
Antimony	<150 - 500 (b)
Arsenic	7.2 - 16
Barium	300
Beryllium	1 - 1.5
Cadmium	<1 - 1 (b)
Calcium	600 - 3,500
Chromium	30
Cobalt	7 - 15
Copper	15 - 20
Iron	15,000 - 30,000
Lead	15 - 30
Magnesium	3,000 - 7,000
Manganese	300 - 1,500
Mercury	0.03 - 0.37
Nickel	10 - 30
Potassium	12,100 - 21,000
Selenium	0.3 - 0.6
Silver	<0.5 - 3 (c)
Sodium	3,000 - 7,000
Thallium	0.02 - 2.8 (d)
Vanadium	50 - 70
Zinc	75 - 85

(a) Based on surface soil data collected in Steuben (14 miles W of site), Tioga (18 miles SE) and Tompkins (30 miles NE) Counties, New York and Tioga (40 miles SW) County, Pennsylvania (Boerngen and Shacklette 1981).

(b) Cultivated and uncultivated B horizon - Eastern U.S. (Connor and Shacklette 1975).

(c) Uncultivated B horizon-Missouri (Connor and Shacklette 1975).

(d) Surface Soils of the U.S. (Kabata-Pendias and Pendias 1984).

Table 8

BACKGROUND SOIL CONCENTRATIONS OF TARGET COMPOUND LIST
POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

	Concentration (ug/kg)		
	Rural Soil	Agricultural Soil	Urban Soil
Carcinogenic PAH			
Benzo(a)anthracene	5 - 20	56 - 110	169 - 59,000
Benzo(b)fluoranthene	20 - 30	58 - 220	15,000 - 62,000
Benzo(j)fluoranthene			6,000 - 97,000
Benzo(b+j)fluoranthene	25 - 110		
Benzo(k)fluoranthene	10 - 110	58 - 250	300 - 26,000
Benzo(a)pyrene	2 - 1,300	4.6 - 900	165 - 22,000
Chrysene	38.3	78 - 120	251 - 64,000
Dibenz(a,h)anthracene			
Indeno(1,2,3-cd pyrene)	10 - 15	63 - 100	8,000 - 61,000
Non-Carcinogenic PAH			
Acenaphthene	1.7	6	
Acenaphthylene		5	
Anthracene		11 - 13	
Benzo(g,h,i)perylene	10 - 70	66	900 - 47,000
Benzo(e)pyrene		53 - 130	60 - 14,000
Biphenyl	14.8		
Fluoranthene	0.3 - 75	120 - 210	200 - 166,000
Fluorene		9.7	
Naphthalene	46.2		
Perylene		14 - 18	100 - 4,800
Phenanthrene	30.0	48 - 140	
Pyrene	0.1 - 64	99 - 150	3,000 - 147,000

Sources
IARC (1973)
Blumer (1977)
White and Vandenslice (1980)
Windsor and Hites (1979)
Puckner (1981)
Edwards (1983)
Butler et al. (1984)
Vogt et al. (1988)
Jones et al. (1989)

Table 9

Summary of Chemicals Detected in Surface Soil at the
Kentucky Avenue Wellfield
Area Area-2
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
Bis(2-ethylhexyl)phthalate	3/3	0.13	0.275
Butyl benzyl phthalate	1/3	0.17	0.17
Di-n-butyl phthalate	1/3	NR	0.001
CPAH	3/3	0.87	1
Di-n-octyl phthalate	2/3	NR	0.074
NCPAH	3/3	2.1	2.4
PCB	1/3	0.24	0.34
Inorganics:			
Aluminum	3/3	7,520	9,930
Arsenic	3/3	16	123
Barium	3/3	82	119
Beryllium	3/3	1	1.4
Cadmium	1/1	1.6	1.6
Calcium	3/3	40,900	77,700
Cobalt	3/3	15	20
Copper	3/3	7.7	8.4
Iron	1/1	NC	176
Lead	3/3	17,600	18,400
Magnesium	3/3	17	22
Manganese	3/3	9,360	17,000
Mercury	3/3	38	620
Nickel	2/3	0.1	0.3
Potassium	3/3	19	24
Selenium	3/3	670	801
Sodium	3/3	2	29
Thallium	3/3	294	819
Vanadium	1/1	1.5	3.4
Zinc	3/3	16	26
		118	165

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

NCPAH = Noncarcinogenic PAHs.
CPAH = Carcinogenic PAHs.

Area 2 Samples: SB-1, 2, 3, and 4.

Table 10
Summary of Chemicals Detected in Subsurface Soil at the
Kentucky Avenue Wellfield
Area: Area-2
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
acetone	1/11	0.01	8.3
bis(2-ethylhexyl)phthalate	8/12	0.21	1.1
chloroform	1/12	0.002	0.007
CPAs	1/12	NR	0.709
di-n-octyl phthalate	4/12	NR	0.1032
BCPAs	4/12	2.5	4.2
toluene	1/12	0.0008	0.001
total xylenes	1/12	0.003	0.011
trichloroethene	1/12	0.003	0.008
Inorganics:			
aluminum	12/12	6,910	8,980
arsenic	12/12	5.6	23
barium	12/12	57	113
beryllium	12/12	0.8	1.7
cadmium	1/3	0.7	1.1
calcium	12/12	65,700	93,700
chromium	12/12	12	17
cobalt	12/12	5.9	9
copper	3/3	36	45
iron	11/12	15,900	23,300
lead	12/12	11	79
magnesium	12/12	14,200	24,400
manganese	12/12	481	680
nickel	12/12	16	21
potassium	12/12	748	1,180
selenium	1/11	0.6	2.7
sodium	12/12	231	1,470
vanadium	12/12	11	21
zinc	12/12	78	118

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. All samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

BCPAs = Benzo(a)pyrene PAHs.
CPAs = Carcinogenic PAHs.

Area 2 Samples: SB-1, 2, 3, and 4.

Table 11
Summary of Chemicals Detected in Surface Soil at the
Kentucky Avenue Wellfield
Area: Area-3
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
acetone	1/7	0.007	0.087
bis(2-ethylhexyl)phthalate	3/7	0.23	520
2-butanone	3/6	0.005	0.012
CPAH	3/7	1.4	6.1
di-n-butylphthalate	2/7	0.17	77
benzene	1/7	0.005	0.02
methylene chloride	3/7	0.005	0.007
BCPAH	2/7	2.5	3.9
Inorganics:			
aluminum	11/11	11,369	15,500
antimony	1/11	4.8	7.9
arsenic	10/10	9.4	17
barium	11/11	98	169
beryllium	11/11	0.5	1.3
cadmium	3/11	0.5	1.6
calcium	11/11	16,100	106,000
chromium	11/11	17	24
cobalt	11/11	10	15
copper	11/11	60	213
iron	11/11	27,900	51,700
lead	11/11	36	193
magnesium	11/11	6,348	11,300
manganese	11/11	721	3,200
mercury	1/11	0.02	0.2
nickel	11/11	25	33
potassium	11/11	796	1,020
selenium	2/9	0.5	5.3
silver	1/11	0.8	2.4
sodium	4/11	298	497
vanadium	9/9	19	22
zinc	11/11	102	178

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

BCPAH = Benzo(a)pyrene PAHs.
CPAH = Carcinogenic PAHs.

Area 3 Samples: SB-6, 7, 8, 9, 10, 11, and 12.

Table 12
Summary of Chemicals Detected in Subsurface Soil at the
Kentucky Avenue Wellfield
Area: Area-3
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
acetone	8/24	0.019	0.82
[illegible]	1/24	0.004	0.016
beta-BHC	1/24	0.004	0.036
bis(2-ethylhexyl)phthalate	10/24	0.47	8.9
2-butanone	4/20	0.006	0.025
butyl benzyl phthalate	4/24	NR	0.62
chlorobenzene	1/24	0.005	0.043
chloroform	1/24	0.003	0.02
DDA	9/24	1.4	284
DDT	1/25	0.005	0.12
1,2-dichloroethene	1/24	0.003	0.045
diethyl phthalate	9/24	0.17	0.67
di-n-octyl phthalate	4/24	NR	0.13
endosulfan I	2/24	0.006	3.8
endosulfan II	2/24	0.01	2.5
endosulfan sulfate	1/24	0.008	0.023
ethylbenzene	5/24	0.004	0.18
gamma-BHC	1/24	0.004	0.014
heptachlor	1/24	0.004	0.02
methylene chloride	9/24	0.005	0.045
4-methylphenol	1/24	0.17	0.19
PAH	14/24	2.6	78.9
PCB	3/24	0.32	300
toluene	5/24	0.002	0.012
total xylenes	8/24	0.005	0.22
trichloroethene	2/24	NR	0.002
vinyl chloride	1/24	0.006	0.14
Inorganics:			
aluminum	38/38	8,942	34,200
arsenic	36/37	6.1	25.6
barium	39/39	120	753
beryllium	30/39	0.5	1.3
cadmium	18/39	1.1	15
calcium	39/39	38,600	221,000
chromium	39/39	20	118
cobalt	39/39	7.5	22
copper	39/39	41	1,360
iron	39/39	24,500	167,000
lead	34/35	32	1,520
magnesium	37/39	7,820	37,600
manganese	39/39	519	7,200
mercury	11/39	0.1	9.2
nickel	39/39	26	200
potassium	39/39	767	1,470
selenium	2/32	0.26	0.68
silver	4/32	0.9	4.3
sodium	14/39	306	1,050
[illegible]	29/31	13.6	29
zinc	38/38	175	7,120

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least ten times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

BAP = Benzo(a)pyrene PAHs.
DAH = Dibenzo(a,h)anthracene PAHs.

Table 13
Summary of Chemicals Detected in Surface Soil at the
Kentucky Avenue Wellfield
Area: Area-4
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
bis(2-ethylhexyl)phthalate	1/3	0.27	0.75
BCPAs	1/3	NR	1.4
Inorganics:			
aluminum	4/4	10,520	15,800
arsenic	4/4	7.4	11
barium	4/4	76	96
beryllium	4/4	0.9	1.3
calcium	4/4	13,480	77,800
chromium	4/4	13.9	22
cobalt	4/4	9.8	14.3
copper	4/4	26	32
iron	4/4	23,900	34,000
lead	4/4	14	16
magnesium	4/4	6,600	12,600
manganese	4/4	746	975
nickel	4/4	22.6	33
potassium	4/4	840	1,210
sodium	2/4	NR	92
vanadium	3/4	17	26
zinc	3/4	89	121

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

BCPAs = Benzo(a)pyrene PAHs.
CPAs = Carcinogenic PAHs.

Area 4 Samples: SB-13, 14, and 15.

Table 14
Summary of Chemicals Detected in Subsurface Soil at the
Kentucky Avenue Wellfield
Area: Area-4
(All concentrations in MG/KG)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
acetone	5/11	0.14	56
bis(2-ethylhexyl)phthalate	2/11	0.2	0.89
chloroform	2/11	0.002	0.005
CPAH	2/11	7.4	8.7
di-n-octyl phthalate	1/11	NR	0.085
methylene chloride	2/11	0.009	0.46
BCPAH	3/11	2.9	9.3
toluene	1/11	NR	0.001
trichloroethene	6/11	0.004	0.009
Inorganics:			
aluminum	13/13	8,696	13,260
arsenic	13/13	5.6	14
barium	13/13	61	86
beryllium	13/13	0.8	1.2
cadmium	1/13	0.4	0.8
calcium	13/13	60,800	99,500
chromium	13/13	13	21
cobalt	13/13	8.3	12
copper	13/13	30	79
iron	13/13	20,200	22,800
lead	13/13	13	64
magnesium	13/13	14,600	37,700
manganese	13/13	532	722
mercury	1/13	0	0.3
nickel	13/13	19	26
potassium	9/13	845	1,120
selenium	1/12	0.4	2
sodium	11/13	188	1,000
vanadium	13/13	14	22
zinc	13/13	91	130

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

BCPAH = Benzo(a)pyrene PAHs.
CPAH = Carcinogenic PAHs.

Area 4 Samples: SB-13, 14, and 15.

Table 15
Summary of Chemicals Detected in Surface Soil at the
Kentucky Avenue Wellfield
Area: Area-15
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
CPAH	3/3	0.91	1.1
diethylhexyl phthalate	1/3	NR	0.02
gamma-BHC	1/3	0.005	0.0095
BCPAH	3/3	1.9	2.4
Inorganics:			
aluminum	4/4	9,830	11,600
arsenic	4/4	7.6	9.4
barium	4/4	80	111
beryllium	4/4	0.8	1.2
cadmium	1/4	0.5	1.1
chromium	4/4	44,900	54,500
cobalt	4/4	14	18
copper	4/4	8.7	9.2
iron	2/2	30.3	33
lead	4/4	23,315	25,600
magnesium	4/4	14	20
manganese	4/4	9,900	11,700
mercury	2/4	577	783
nickel	4/4	0.1	0.3
potassium	4/4	23	24
selenium	1/3	766	1,150
silver	1/4	0.4	0.5
sodium	2/4	0.8	1
vanadium	4/4	NR	51
zinc	4/4	13	19
		113	153

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations (see Section 6.2 for rationale).

BCPAH = Benzo(a)pyrene PAHs.
CPAH = Carcinogenic PAHs.

Area 15 Samples: SB-17, 18, and 21.

Table 16
Summary of Chemicals Detected in Subsurface Soil at the
Kentucky Avenue Wellfield
Area, Area-15
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
acetone	1/11	0.008	0.5
bis(2-ethylhexyl)phthalate	4/11	0.18	2.9
chloroform	1/11	0.003	0.004
CPAs	1/11	NR	0.8
di-n-octyl phthalate	5/11	NR	0.05
heptachlor epoxide	1/11	0.004	0.008
MCPAs	1/11	NR	2.28
trichloroethene	3/11	0.003	0.01
Inorganics:			
aluminum	15/15	8,470	20,400
arsenic	15/15	6.5	16
barium	15/15	83	253
beryllium	14/15	0.7	1.2
cadmium	3/15	0.5	1.1
calcium	15/15	47,200	93,400
chromium	15/15	15	30
cobalt	15/15	8.7	17
copper	8/8	21	30
iron	15/15	20,600	38,900
lead	15/15	9.7	17
magnesium	15/15	10,830	22,900
manganese	15/15	438	949
nickel	15/15	23	33
potassium	15/15	951	3,450
selenium	4/15	0.4	0.5
silver	3/15	0.8	0.9
sodium	9/15	195	455
thallium	1/15	NR	0.3
vanadium	15/15	14	36
zinc	15/15	77	131

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

MCPAs = Monocarcinogenic PAHs.
CPAs = Carcinogenic PAHs.

Area 15 Samples: SB-17, 18, and 23.

Table 17
Summary of Chemicals Detected in Surface Soil at the
Kentucky Avenue Wellfield
Area
Area-17
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
bis(2-ethylhexyl)phthalate	4/6	0.16	0.74
Di-n-butylphthalate	1/6	NR	0.13
Di-n-octylphthalate	1/6	NR	0.062
Inorganics:			
aluminum	4/6	5,930	7,240
arsenic	6/6	4.6	8.3
barium	6/6	56	227
beryllium	6/6	0.9	1.3
cadmium	2/6	0.6	1.2
calcium	6/6	49,700	118,000
chromium	6/6	11	16
cobalt	6/6	6.9	14
copper	1/1	NC	22
iron	6/6	18,000	27,900
lead	6/6	11	25
magnesium	6/6	12,900	26,600
manganese	6/6	547	1,020
nickel	6/6	19	26
potassium	6/6	587	1,350
sodium	5/6	NC	107
vanadium	6/6	12	28
zinc	6/6	81	120

Notes

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

NCPAH = Non-carcinogenic PAHs.
CPAH = Carcinogenic PAHs.

Area 17 Samples SB-19, 20, 21, 22, 24, and 25.

Table 18
Summary of Chemicals Detected in Subsurface Soil at the
Kentucky Avenue Wellfield
Area, Area-17
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
4-nitrophenol	1/1	0.15	0.15
acetone	1/21	0.006	0.59
benzene	2/23	0.002	0.003
bis(2-ethylhexyl)phthalate	10/22	0.19	0.72
CPAH	4/22	1.2	1.5
DDT	1/19	0.008	0.018
di-n-octyl phthalate	2/22	0.18	0.34
methylene chloride	2/23	0.006	0.033
NCPAH	2/22	NR	2.3
toluene	2/23	0.0006	0.005
trans-1,2-dichloroethene	1/1	0.001	0.001
trichloroethene	8/23	0.003	0.015
Inorganics:			
aluminum	23/23	8,186	17,300
antimony	1/23	NR	4.9
arsenic	22/22	5.1	8.6
barium	23/23	73	228
beryllium	23/23	1	1.3
cadmium	6/23	0.6	1.3
calcium	22/23	53,100	117,000
chromium	23/23	13	28
cobalt	23/23	7.1	12
copper	4/4	27	29
iron	23/23	18,800	29,200
lead	23/23	8.5	26
magnesium	23/23	12,800	33,400
manganese	22/23	466	1,060
mercury	1/23	0	0.2
nickel	23/23	18	25
potassium	23/23	737	1,790
selenium	2/23	0.5	0.6
silver	1/23	NR	0.8
sodium	22/23	102	143
vanadium	23/23	12	24
zinc	22/23	79	119

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

NCPAH = Noncarcinogenic PAHs.
CPAH = Carcinogenic PAHs.

Area 17 Samples: SB-19, 20, 21, 22, 24, and 25.

Tables 19
Summary of Chemicals Detected in Surface Soil at the
Kentucky Avenue Wellfield
Area: 16
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Inorganics:			
aluminum	1/1	NC	18,600
antimony	1/1	NC	6
arsenic	1/1	NC	7.7
barium	1/1	NC	235
beryllium	1/1	NC	1.4
cadmium	1/1	NC	1.4
calcium	1/1	NC	1,710
chromium	1/1	NC	21
cobalt	1/1	NC	14
iron	1/1	NC	29,900
lead	1/1	NC	14
magnesium	1/1	NC	40,000
manganese	1/1	NC	672
nickel	1/1	NC	27
potassium	1/1	NC	1,800
sodium	1/1	NC	110
vanadium	1/1	NC	23
zinc	1/1	NC	86.6

Notes:

NC = The geometric mean was not calculated because there was only one sample.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

NPAH = Noncarcinogenic PAHs.
CPAH = Carcinogenic PAHs.

Area 16 Sample: SS-25

Table 20

Summary of Chemicals Detected in Subsurface Soil at the
Kentucky Avenue Wellfield
Area: 16
(All concentrations in mg/kg)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
CPAH	2/3	0.11	0.12
Di-n-butylphthalate	1/3	NR	0.08
NCPAH	1/3	0.19	0.25
Inorganics:			
aluminum	3/3	10,700	13,900
arsenic	3/3	5.6	7.8
barium	3/3	85	176
beryllium	3/3	0.8	1.4
cadmium	1/3	0.6	0.9
calcium	3/3	5,220	26,400
chromium	3/3	14	17
cobalt	3/3	9.3	11
iron	3/3	20,600	26,100
lead	3/3	20	40
magnesium	3/3	5,080	10,600
manganese	3/3	480	538
nickel	3/3	20	23
potassium	3/3	1,080	1,230
sodium	1/3	297	105
vanadium	3/3	15	18
zinc	3/3	61	73

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the geometric mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

NCPAH = Non-carcinogenic PAHs.
CPAH = Carcinogenic PAHs.

Area 16 Sample: SB-28

Table 21

RUNOFF BASIN AREA
SUMMARY OF SOIL ANALYSES
PRIORITY POLLUTANT VOLATILE AND BASE/NEUTRAL ORGANIC COMPOUNDS

Boring or Well No.	Sample Depth (ft)	Analyzed Sample Type	Chloroform	1,2-Dichloroethane	Tetrachloroethene	Toluene	Trichloroethylene	Fluoranthene	Phenanthrene	Pyrene
RB-1,2, 4,5	1.5-3.0	Lateral Composite[1]	ND	ND	ND	ND	ND	NA	NA	NA
RB-1,2, ,4,5	6.0-7.5	Lateral Composite[1]	ND	ND	ND	ND	22	NA	NA	NA
RB-1,2,	12.0-13.5	Lateral Composite[1]	ND	ND	ND	ND	17	NA	NA	NA
RB-1,3 RB-2,4 RB-5	3.0-4.5 9.0-10.5 13.5-15.0	Composite[1]	ND	ND	ND	ND	40	590	420	600
T-1	1.5-3.0	Single Sample[1]	96,000	1,600	700	5,700	120,000	NA	NA	NA
T-1	7.5-9.0	Single Sample[1]	ND	ND	ND	ND	1,200	NA	NA	NA
RB-3 (Sample Spoon)	-	Aqueous Field Blank[2]	ND	ND	ND	ND	ND	NA	NA	NA
RB-4 (Sample Spoon)	-	Aqueous Field Blank[2]	ND	ND	ND	ND	ND	NA	NA	NA
--	-	Trip Blank[2]	ND	ND	ND	ND	ND	NA	NA	NA

[1]Results reported in ug/kg (dry-weight basis).

[2]Results reported in ug/l.

ND = Not detected at minimum reporting level; NA = Not analyzed.

FIGURES

Table 21 (cont'd)

FLUORIDE DISPOSAL SITES
SUMMARY OF SOIL ANALYSES
PRIORITY POLLUTANT VOLATILE, BASE/NEUTRAL, AND PESTICIDE ORGANIC COMPOUNDS

Boring or Well No.	Sample Depth (ft)	Analyzed Sample Type	Benzene	Methylene Chloride	Tetrachloro-ethene	Acenaphthene	Anthracene
F-1,2,3,4,5,6	1.5-3.0	Lateral Composite[1]	ND	48 (24)[2]	15	NA	NA
F-1,2,3,4,5,6	6.0-7.5	Lateral Composite[1]	ND	28 (23)[2]	14	NA	NA
F-1	12.0-13.5	Single Sample[1]	ND	ND (24)[2]	9	NA	NA
F-1	3.5-5.0	Composite[1]	BMRL	45 (24)[2]	7	BMRL	400
F-2	3.0-4.5						
F-3	3.0-4.5						
F-4	3.0-4.5						
F-5	3.0-4.5						
F-6	3.0-4.5						
Sample Spoon F-3	-	Aqueous Field Blank[3]	ND	ND (24)[2]	ND	NA	NA
Sample Spoon F-3	-	Aqueous Field Blank[3]	ND	ND (25)[2]	11	NA	NA
--	-	Trip Blank[3]	ND	ND (25)[2]	ND	NA	NA

[1]Results reported in µg/kg (dry-weight basis).

[2]( ) = concentration in laboratory QC blank; QC blank concentration not shown if ND.

[3]Results reported in µg/l.

ND = Not detected at minimum reporting level.
NA = Not analyzed.
BMRL = Present but below minimum reporting level.

Table 21 cont'd.

FLUORIDE DISPOSAL SITES
SUMMARY OF SOIL ANALYSES
PRIORITY POLLUTANT VOLATILE, BASE/NEUTRAL, AND PESTICIDE ORGANIC COMPOUNDS

(Continued)

Boring or Well No.	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Chrysene	Fluoranthene	Fluorene	Phenanthrene	Pyrene	Heptachlor
F-1,2,3,4,5,6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F-1,2,3,4,5,6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F-1 F-2 F-3 F-4 F-5 F-6	540	420	380	340	530	1,300	BMRL	1,100	1,200	BMRL
F-3 (blank)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
F-4 (blank)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 21 contd.

COAL PILE SITE
SUMMARY OF SOIL ANALYSES
PRIORITY POLLUTANT VOLATILE AND BASE/NEUTRAL ORGANIC COMPOUNDS

Boring or Well No.	Sample Depth (ft)	Analyzed Sample Type	Benzene	Methylene Chloride	Tetrachloro-ethene	Trichloro-ethylene	Bis(2-Ethylhexyl) phthalate	Naphthalene	Phenanthrene
CP-1,2,3,4,5	1.5-3.0	Lateral Composite[1]	BMRL	ND (15)[2]	7 (BMRL)[2]	9	NA	NA	NA
CP-1,2,3,4,5	6.0-7.5	Lateral Composite[1]	ND	ND (15)[2]	ND (BMRL)[2]	19	NA	NA	NA
CP-1,3,4,5 CP-2	3.0-4.5 10.5-12.0	Composite[1]	BMRL	76 (24)[2]	12	9	400	BMRL	BMRL
Sample Spoon CP-3	-	Aqueous Field Blank[3]	ND	ND (25)[2]	BMRL	ND	NA	NA	NA
--	-	Trip Blank[3]	ND	ND (25)[2]	ND	ND	NA	NA	NA

[1]Results reported in µg/kg (dry-weight basis).

[2]( ) = concentration in laboratory QC blank, QC blank concentration not shown if ND.

[3]Results reported in µg/l.

ND = Not detected at minimum reporting level.
NA = Not analyzed.
BMRL = Present but below minimum reporting level.

Table 21 contd.

AREA F DISPOSAL SITE
SUMMARY OF SOIL ANALYSES
PRIORITY POLLUTANT VOLATILE ORGANIC COMPOUNDS

Boring or Well No.	Sample Depth (ft)	Analyzed Sample Type	Benzene	1,1,1-Trichloroethane	Trichloroethylene
AF-1A,2,3,4,5	1.5-3.0	Lateral Composite[1]	ND	ND	103
AF-4,5 AF-3 AF-1,2	6.0-7.5 7.5-9.0 9.0-10.5	Composite[1]	38	ND	41
AF-1,2,3 AF-5	12.0-13.5 13.5-15.0	Composite[1]	BMRL	ND	108
AF-3 AF-4 AF-2,5	1.5-3.0 3.0-4.5 9.0-10.5	Composite[1]	ND	ND	66
Spigot A	-	Aqueous[2] Single Sample	ND	BMRL	ND
Sample Spoon AF-3	-	Aqueous[2] Field Blank	ND	ND	ND
Sample Spoon AF-5	-	Aqueous[2] Field Blank	ND	ND	ND
Sample Spoon AF-2	-	Aqueous[2] Field Blank	ND	ND	ND
-	-	Trip Blank[2]	ND	ND	ND

[1]Results reported in ug/kg (dry-weight basis).
[2]Results reported in ug/l.

ND = Not detected at minimum reporting level; NA = Not analyzed.
J = Estimated concentration
BMRL = Present but below minimum reporting level.

Table 21 contd.
SUMMARY OF COMPOSITE SOIL ANALYSES
PRIORITY POLLUTANT INORGANIC AND MISCELLANEOUS PARAMETERS

Parameter(1) (mg/kg)	Boring or Well Numbers				
	AF-2,3,4,5	RB-1,2,3,4,5	CP-1,2,3,4,5	F-1,2,3,4,5,6	MW-1,2,3,5(2)
Antimony	11.5 U	11.5 U,N	11.6 U,N	11.4 U,N	11.6 U,N
Arsenic	20.5 N*	9.2 +*	11.4 N	6.8 U,N	12.6 N
Beryllium	0.5	0.5 U	0.5 U	0.5 U	0.5 U,N
Cadmium	1.1 N	2.8	1.2 U,N	3.4 N	1.2 U,N
Chromium	12.6	21.4	43.0 N	28.2 N	27.9 N
Copper	23.0	58.2	35.1 N	21.6 N	29.1 N
Lead	65.7 N*	19.2 N*	24.0 *	24.8 N	24.0 N+
Mercury	0.1 U	0.2 *	0.1 U	0.1	0.1 U
Nickel	31.4	50.6	43.7 *	37.0	45.8 N
Selenium	1.1 U,N	1.1 U,N	5.8 U,N	5.7 U,N	1.2 U,N
Silver	9.4 N	2.3 U,N	2.3 U,N	2.3 U,N	2.3 U,N
Thallium	1.1 U,N	1.1 U,N	11.6 U,N	11.4 U,N	1.2 U,N
Zinc	109.7 N	161.1	160.7 E	164.5	178.6 N
Cyanide	0.1 U	0.1 U	0.1 U	0.1 U	0.3
Phenol	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Percent Solids	87	87	86	88	86

1 Dry-weight basis.
2 Composite soil sample representative of background conditions, 1.5 - 3.0 feet.

E - Estimated or not reported due to presence of interference.
U - Element was analyzed for but not detected. Reported with the instrument detection limit value.
N - Spike sample recovery is not within control limits.
* - Duplicate analysis is not within control limits.
+ - Correlation coefficient for method of standard addition is <0.995.

Table 22
ANALYTICAL SOIL RESULTS - VOLATILE AND SEMIVOLATILE
FACET ENTERPRISES (NPL) SITE

Compounds:	SOIL BORING ID: SB-10 Depth: 2.5-4.5	SB-11 Depth 7.5-9.5	SB-12 Depth 2.5-4.5	SB-12 Depth 5-7	SB-13 Depth 2.5-5.5	SB-14 Depth 2.5-4.5	SB-15 Depth 2.5-4.5	SB-15 Depth 7.5-9.5	SB-16 Depth 2.5-4.5	SB-17 Depth 7.5-9.5	SB-18 Depth 2.5-4.5	SB-18 Depth 5-7	SB Depth 5
Trichloroethene	253	39.7	118	65.1	7.57	-	83.9	118	-	7.13	156	16.9	14.
Tetrachloroethene	-	-	-	-	-	-	-	-	-	7.65	7.83	-	-
1,1,1-Trichloroethane	20.5	-	20.2	-	14.6	-	-	8.0	-	-	18.5	11.2	19.
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chloride	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	5.75	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylphenol-4	NA	NA	NA	96 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	170	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methynaphthylene -2	NA	NA	NA	140 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	83 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
phenanthrene	NA	NA	NA	605	NA	NA	NA	NA	NA	NA	NA	NA	NA
anthracene	NA	NA	NA	190	NA	NA	NA	NA	NA	NA	NA	NA	NA
di-n-butylphthalate	NA	NA	NA	230	NA	NA	NA	NA	NA	NA	NA	NA	NA
flouranthene	NA	NA	NA	550	NA	NA	NA	NA	NA	NA	NA	NA	NA
pyrene	NA	NA	NA	350	NA	NA	NA	NA	NA	NA	NA	NA	NA
benzo(a)anthracene	NA	NA	NA	250 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate	NA	NA	NA	-	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	370	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 22 contd.
ANALYTICAL SOIL RESULTS - VOLATILE AND SEMIVOLATILE
FALLI ENTERPRISES (NPL) SITE

Compounds:	SOIL BORING ID: SB-1 Depth: 2.5-4.5	SB-2 Depth 2.5-4.5	SB-3 Depth 2.5-4.5	SB-4 Depth 2.5-4.5	SB-5 Depth 5-7	SB-6 Depth 2.5-4.5	SB-7 Depth 7.5-9.5	SB-8 Depth 5-7	SB-8 Depth 7.5-9.5	SB-9 Depth 5-7	SB-10 Depth 2.5-4.5	SB-10 Depth 7.5-9.
Trichloroethene	-	-	-	-	12.4	-	-	50.8	23.5	-	28.9	25.4
Tetrachlorothene	-	-	-	-	-	-	-	150	-	-	6.34	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-	-	13.5	-	18.5	15.0
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	8.58	13.0
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chloride	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-	-	-	9.22
1,2-Dichloroenzene	-	-	-	-	-	-	-	-	-	-	-	-

Concentrations are in ppb (= ug/kg)

-: Not Detected

N.A: Not Analyzed

Source: (Radian, 1986)

Table 22 contd.
ANALYTICAL SOIL RESULTS - VOLATILE AND SEMIVOLATILE
FACET ENTERPRISES (NPL) SITE

Compounds:	SOIL BORING ID: SB-20 Depth: 5-7	SB-21 Depth 2.5-4.5	SB-22 Depth 5-7	SB-22 Depth 7.5-9.5	SB-23 Depth 7.5-9.5	SB-24 Depth 2.5-9.5	SB-24 Depth 2.5-4.5	SB-25 Depth 2.5-4.5	SB-26 Depth 2.5-9.5	SB-26 Depth 7.5-9.5	SB-27 Depth 2.5-4.5	SB-27 Depth 2.5-4.5
Trichloroethene	7.59	-	28.9	23.6	-	112	27.5	4.92	121	3.46	-	58.5
Tetrachloroethene	-	-	-	-	-	-	-	-	7.97	-	-	12.7
1,1,1-Trichloroethane	-	-	24.7	-	20.7	75.7	-	21.6	48.1	12.2	-	18.1
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoroethane	-		-	-	-	-	-	15.0	29.0	-	-	15.3
Methylene chloride	-	-	-	-	-	-	-	-	15.8	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	22.6	10.4	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-	-	-	-	-

Table 22 contd.
RESULTS OF PRIORITY POLLUTANT ANALYSES OF SOILS,
FACET ENTERPRISES, ELMIRA, NY

Sample Location Parameter	SB-31-7	D-12-5
Metals (mg/kg)		
Ag	1.8	2.46 N
As	12.4	29.7 N*
Be	0.45	0.47 U
Cd	1.22	31.8 N
Cr	15.8	288
Cu	49.3	996*
Ni	26.7	138 N
Pb	17.6	429
Sb	11	12 UN
Se	3.4	3.7 UQN
Tl	0.77	0.77 UQ
Zn	104	1070
Mercury (mg/kg)	0.02 U	0.22
Cyanide (mg/kg)	0.55 UN	2.57 N
Purgeable Organics (ug/kg) EPA Method 8240		
methylene chloride	1.8 BL	18 BL
acetone	5 BL	8 BL
Semivolatile Organics (ug/kg) EPA 8270		
methylphenol-4	ND	96 J
naphthalene	ND	170
methylnaphthalene-2	ND	140 J
fluorene	ND	83 J
phenanthrene	ND	605
anthracene	ND	190
di-n-butylphthalate	3600	230
fluoranthene	ND	550
pyrene	ND	350
benzo(a)anthracene	ND	250 J
bis(2-ethylhexyl)-phthalate	800	ND
chrysene	ND	370

(Continued)

Table 22 contd.

Sample Location / Parameter	SB-31-7	D-12-5
Pesticides EPA Method 8080	ND	ND
Phenol (ug/kg) EPA Method 8040	NA	3600
PCBs (ug/kg) EPA Method 8080	ND	ND
Asbestos	ND	ND

NOTE: All results reported to highest level of accuracy possible taking into account detection limits and dilution factors.

ND - not detected
NA - not analyzed
BL - estimated value obtained after subtraction of reagent blank
J - estimated value less than detection limit
DUP - duplicate analysis
U - Indicates element was analyzed for but not detected. Report with the instrument detection limit value.
N - Indicates spike sample recovery is not within control limits for spiking before digestion.
* - Indicates duplicate analysis is not within control limits.
Q - Indicates analytical spike (performed at bench) recovery was not within control limit for values less than the CRDL.

Table 2 contd.

RESULTS OF SOIL SAMPLE ANALYSES, FORMER OIL LAGOON AREA
(EPA Method 8080-PCBs in Soil, mg/kg)

Coring Location	PCB 1016	PCB 1221	PCB 1232	PCB 1242	PCB 1248	PCB 1254	PCB 1260
L1	0.12	ND	ND	ND	ND	ND	0.11
L2	ND	ND	ND	ND	24.	ND	ND
L3	ND	ND	ND	ND	ND	ND	ND
L4	ND	ND	ND	ND	ND	0.23	ND
L5	ND	ND	ND	ND	4.8	ND	ND
L6	ND	ND	ND	ND	ND	0.15	ND
L7	ND	ND	ND	ND	ND	0.053	ND

ND = not detected.

Table 23

USEPA
KENTUCKY AVENUE WELLFIELD
SUMMARY OF CHEMICAL DATA -

REPORT	FIELD INVESTIGATION	LABORATORY INVESTIGATION
LNC ELECTRONICS (EMPIRE SOILS) (1981 - 1988) (Cont'd)	1981: (6) wells,(1) Soil Boring	Cd=54.4-58.8 Cr=114.3-374.7 ppm Pb=15 - 124.3 ppm Ag=<1.0 - 41.1 ppm CN=1.0 - 6.26 ppm Water analyses for Al, Cd, Cr, CN, FL, Ni indicated all levels were below NYSDEC standards.
	1984: Water Analysis (5) wells onsite	1984: Water: Cd (2/5).04-.15 ppm Fluoride (3/5) 1.8-26 ppm DCE (5/5) 21-1400 ppm 1,1,1-TCA (2/5) 7-15 ppm TCE (3/5) 11-141 ppm
	June, 1985: (15) soil borings groundwater sampling	1985: Water: CD (2/9) .06-.72 ppm Cr (2/9) .08-.22 ppm Pb (6/9) .068-.168 ppm Fluoride (9/9) 0.18-15.0 ppm TOC (9/9) 1.0-125 ppm TOX (9/9) .05-27,500 ppm POC (9/9) 0.25-26.9 ppm POX (6/9) 0.14-1.65 ppm Oil & Grease (1/9) 101 ppm Soils: Cd (5/17) .10-1.31 ppm Cr (5/17) .02-1.32 ppm Pb (13/17) .01-1.20 ppm Oil & Grease (5/17) 1240-5200 ppm Fluoride (14/17) .56-94 ppm
	June, 1986: (18) soil borings	June, 1986: Sed/Soil: Analysis of purgeable aromatics volatile halogenated organics revealed no detection: Soil: Only cadmium exceeded TOX limits (2/11) 1.2 2.3 ppm

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Table 23 cont'd.

USEPA
KENTUCKY AVENUE WELLFIELD
SUMMARY OF CHEMICAL DATA - PREVIOUS INVESTIGATIONS

REPORT	FIELD INVESTIGATION		LABORATORY INVESTIGATION
*LRC ELECTRONICS (EMPIRE SOILS) (1981-88 (Cont'd)	November 1986:	7 wells samples	Nov. 1986: Water: Methylene Chloride (3/7)27-130 ppm Chloromethane (1/7) 42 ppb Trichlorofluoromethane (1/7) 15 ppb 1,1-DCE (1/7) 15 ppb TCE (2/7) 54-70 ppb 1,1,1-TCA (1/7) 290 ppb Ethylbenzene (1/7) 19 ppb 1,2-DCE (1/7) 55 ppb
	May, 1988:	7 wells samples	May, 1988: Water: TCE (2/7) 38-49 ppb 1,1,1-TCA (1/7) 4 ppb 1,1-DCE (1/7) 3 ppb

Table 23 contd.
ANALYTICAL SOIL RESULTS - INORGANIC

L.R.C. ELECTRONICS, INC.

Boring Number	Depth (ft.)	Compounds					
		Cadmium Mg/Kg	Chromium Mg/Kg	Lead Mg/Kg	Nickel Mg/Kg	Silver Mg/Kg	Fluoride Mg/Kg
B-1	2.0- 4.0	1.29	0.07	1.20	1.60	0.18	-
	4.0- 6.0	0.45	<0.02	0.07	0.17	0.04	14.00
	6.0- 8.0	-	-	-	-	-	34.00
	8.0-10.0	0.35	0.03	<0.01	0.32	0.05	15.20
	12.0-14.0	0.04	<0.02	<0.01	<0.03	0.02	11.80
B-2	0.5- 2.0	-	-	-	-	-	8.40
	4.0- 6.0	0.10	<0.02	<0.01	0.06	0.02	-
	6.0- 8.0	0.07	<0.02	<0.01	0.05	0.02	-
	10.0-12.0	-	-	-	-	-	16.00
	12.0-14.0	0.02	<0.02	<0.01	0.03	0.02	8.00
	14.0-16.0	0.33	<0.02	<0.01	0.26	0.02	18.50
B-3	0.5- 2.0	-	-	-	-	-	0.98
	6.0- 8.0	0.27	<0.02	0.06	0.06	0.03	-
	8.0-10.0	-	-	-	-	-	25.00
	12.0-14.0	0.02	<0.02	0.01	0.04	0.02	-
	16.0-17.0	0.04	<0.02	0.01	0.03	0.02	-
B-5	6.0- 8.0	0.10	<0.02	<0.01	0.04	0.02	20.00
B-6	8.0-10.0	0.50	<0.02	0.01	0.07	<0.02	32.00
	12.0-14.0	-	-	-	-	-	-
B-7	4.0- 6.0	1.33	1.32	0.44	0.29	0.09	94.00
B-8	4.0- 6.0	<0.02	<0.02	0.02	<0.02	<0.02	0.66
B-9	6.0- 8.0	<0.02	<0.02	0.02	0.65	<0.02	<0.50
	8.0-10.0	<0.02	<0.02	<0.01	<0.02	<0.02	0.56
	14.0-16.0	-	-	-	-	-	-

Note: - = Parameter Not Tested For.

mg/kg = PPM

Source: Empire Soil Investigations (1985)

Table 23 contd.

ANALYTICAL SOIL RESULTS - INORGANIC
L.R.C. ELECTRONICS, INC.

Boring Number	Depth (ft.)	Compounds					
		Cadmium Mg/Kg	Chromium Mg/Kg	Lead Mg/Kg	Nickel Mg/Kg	Silver Mg/Kg	Fluoride Mg/Kg
B-10	0.0- 2.0	<0.02	<0.02	0.01	<0.02	<0.02	0.80
	14.0-16.0	<0.02	<0.02	<0.01	0.02	<0.02	2.60
B-11	4.0- 6.0	<0.02	<0.02	0.02	<0.02	<0.02	<0.50
B-12	4.0- 6.0	<0.02	<0.02	<0.01	<0.02	<0.02	0.74
	14.0-16.0	<0.02	<0.02	<0.01	<0.02	<0.02	2.30
B-13	12.0-14.0	<0.02	<0.02	0.01	0.03	<0.02	<2.50
B-14	8.0-10.0	<0.02	<0.02	0.02	0.03	<0.02	<0.63
B-15	6.0- 8.0	<0.02	<0.02	0.04	0.06	<0.02	<1.30
MW-7S	6.0- 8.0	<0.02	<0.02	<0.01	0.11	<0.02	<0.50
MW-9S	6.0- 8.0	<0.02	<0.02	0.01	0.02	<0.02	2.00
	12.0-14.0	<0.02	0.03	0.01	0.11	<0.02	2.60
MW-10S	6.0- 8.0	<0.02	0.02	<0.01	0.02	<0.02	4.00
	14.0-16.0	<0.02	0.02	<0.01	0.03	<0.02	2.00

Note: - = Parameter Not Tested For.

Mg/kg = PPM

Source: [illegible] Soil Investigation (1985)

Table 24

Summary of Surface Water Sampling Data
Area 2 - Former Sand and Gravel Pit
(All concentrations in ug/l)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
Acetone	1/1	NC	97
Methylene chloride	1/1	NC	2
Trichloroethene	1/1	NC	3
Inorganics:			
Aluminum	1/1	NC	270
Calcium	1/1	NC	98,800
Chromium	1/1	NC	7
Iron	1/1	NC	97
Lead	1/1	NC	45
Magnesium	1/1	NC	17,300
Sodium	1/1	NC	80,900
Zinc	1/1	NC	58

Notes:

NC = A geometric mean concentration was not calculated since there was only one sample.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Any samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in calculating geometric mean concentrations.

Samples: Sw-6.

Table 24 contd.

Summary of Surface Water Sampling Data
Area 3 - Old Horsehead Landfill (a)
(All concentrations in ug/l)

Chemical	Frequency of Detection (a)	Geometric Mean Concentration (b)	Maximum Detected Concentration
Organics:			
acetone	2/3	20	77
chloromethane	1/4	NR	1
methylene chloride	2/3	1.5	2
trichloroethene	1/3	NR	2
Inorganics:			
aluminum	4/5	471	6,360
barium	2/5	122	239
beryllium	1/4	NR	0.2
cadmium	1/4	4.89	37
calcium	5/5	101,000	118,000
chromium	2/5	8.1	38
cobalt	1/4	NR	6
iron	4/4	811	8,050
lead	3/3	15	43
magnesium	5/5	18,000	20,600
manganese	3/4	25	177
potassium	2/5	1,630	2,290
sodium	5/5	87,400	111,000
vanadium	1/4	NR	8.6
zinc	5/5	67	596

Notes:

NR = The geometric mean was not reported (NR), as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the mean.

(a) The number of samples in which the contaminant was detected divided by the total number of samples analyzed.

(b) Non-detected samples were set to one-half the detection limit for calculating geometric means. Also, samples in which the contaminant was not detected at a detection limit at least two times greater than the maximum detected concentration were not included in estimating geometric mean concentrations.

Samples:
Round 1: Sw-01, Sw-02
Round 2: Sw-01, Sw-02, Sw-MC, Sw-PD

Table 24 contd.
SUMMARY OF DISSOLVED INORGANICS DETECTED IN SURFACE WATER
AT THE KENTUCKY AVENUE WELLFIELD SITE
(All concentrations in ug/l)

Chemical	Frequency of Detection (a)	Concentration Range
Area 3		
calcium	3/3	84,350 - 103,000
lead	2/3	3.6 - 26.3
magnesium	3/3	16,950 - 17,800
mercury	1/3	0.4
sodium	3/3	31,750 - 108,000
zinc	2/3	19 - 19.1
Area 2		
calcium	1/1	92,000
lead	1/1	27
magnesium	1/1	17,300
sodium	1/1	85,100
zinc	1/1	26.1

(a) Number of samples in which chemical was detected divided by the total number of samples analyzed.

Area 3 Samples: SW-WFP1
Area 2 Samples: SW-LDP1, SW-KDP1, SW-PDP1

Table 24 contd.
SUMMARY OF SEDIMENT SAMPLING DATA FROM
AREA 2 - FORMER SAND AND GRAVEL PIT

	Frequency of Detection	Geometric Mean Concentration	Maximum Concentration
ORGANICS (ug/kg)			
Acetone	1/5	6.7	22.3
Bis(2-ethylhexyl)phthalate	4/4	3,680	5,200
Carbon disulfide	2/5	5.4	19
Diethylphthalate	1/4	16	540
Di-n-butylphthalate	1/4	20	1,200
Methylene chloride	3/5	26	240
Toluene	2/5	3.2	16
Trichloroethene	3/5	4.9	8
Vinyl acetate	1/5	9.1	100
CPAH	4/4	11,700	58,800
HCPAH	4/4	12,400	78,100
PCBs (Aroclors 1254, 1260)	3/4	560	2,180
INORGANICS (mg/kg)			
Aluminum	5/5	3,170	7,650
Arsenic	1/5	0.5	7.1
Barium	5/5	310	467
Calcium	5/5	750	2,680
Iron	5/5	139,000	251,000
Magnesium	5/5	135	411
Nickel	1/5	2	13.7
Copper	5/5	61.5	1,950
Lead	5/5	530	1,680
Potassium	2/5	530	5,154
Manganese	5/5	95	169
Vanadium	5/5	1.1	2.57
Zinc	5/5	170	315
Silver	5/5	21	42
Sodium	2/5	2.7	31
Total	5/5	11,500	48,300

(a) Sample locations RI confirmatory sampling: KY-SD-W2. 1988 NUS sampling: NYJB-SED1, NYJB-SED2, NYJB-SED3, NYJB-SED4.
Note that the RI confirmatory sampling round analyzed for volatile organics and manganese only. The NUS samples were analyzed for all target compound list chemicals.

Table 24 contd.

SUMMARY OF SEDIMENT SAMPLING DATA FROM
AREA 3 - OLD MORSEHEADS LANDFILL

Chemical	Frequency of Detection	Geometric Mean Concentration	Maximum Concentration
ORGANICS (ug/kg)			
Acetone	3/6	11	130
Methylene chloride	4/6	18	340
Trichloroethene	1/6	3.2	11
PCB (Aroclor 1254)	2/3	840	3,900
INORGANICS (mg/kg)			
Aluminum	6/6	8,270	11,300
Arsenic	3/6	1.4	5.4
Barium	6/6	160	315
Calcium	5/6	14	220
Chromium	6/6	45,800	80,100
Cobalt	6/6	48	140
Copper	1/6	2.8	10.2
Lead	6/6	92	360
Magnesium	6/6	98	320
Manganese	6/6	7,400	18,700
Mercury	6/6	3.7	820
Nickel	3/6	0.05	0.5
Potassium	6/6	66	210
Silver	1/6	280	1,000
Vanadium	2/6	2.1	19
Zinc	5/6	17	31
	5/6	250	3,600

(a) Sample locations
Aliquot Theory Sampling - KV-SD-LD, KV-SD-MD, KV-SD-PD
Test Pit Sampling - KV1V-SED-1, KV1V-SED-2, KV1V-SED-3
Note that the Aliquot Theory sampling points analyzed for volatile organics and inorganics only. The Pit samples were analyzed for all target compound list chemicals.

Table 25

SUMMARY OF SELECTED CHEMICALS OF CONCERN FOR THE REMEDIAL AVENUE WELLFIELD SITE

CHEMICAL	SOIL						GROUND WATER	SEDIMENTS		SURFACE WATER	
	Area 2	Area 3	Area 4	Area 15	Area 16	Area 17		Area 2	Area 3	Area 2	Area 3
ORGANICS											
acetone	--	--	--	X	--	--	--	--	--	--	--
bis(2-ethylhexyl)phthalate	X	X	X	X	--	X	--	X	--	--	--
carbon disulfide	--	--	--	--	--	--	--	X	--	--	--
carcinogenic PAHs	--	X	X	--	--	--	--	X	--	--	--
chloroform	--	--	--	--	--	X	--	X	--	--	--
dimethylphthalate	--	--	--	--	--	--	X	--	--	--	--
di-n-butyl phthalate	--	X	--	--	--	--	--	X	--	--	--
di-n-octyl phthalate	--	--	--	--	--	--	--	X	--	--	--
endosulfan	--	X	--	--	--	X	--	--	--	--	--
ethylbenzene	--	X	--	--	--	--	--	--	--	--	--
methylene chloride	--	X	X	--	--	--	--	--	--	--	--
noncarcinogenic PAHs	--	X	X	X	--	X	--	X	--	--	--
PCBs	X	X	--	--	--	--	--	X	X	--	--
toluene	--	--	--	--	--	--	--	X	--	--	--
total xylenes	--	X	--	--	--	--	X	X	--	--	--
trans-1,2-dichloroethene	--	--	--	--	--	--	X	--	--	--	--
1,1,1-trichloroethene	--	--	--	--	--	--	X	--	--	--	--
trichloroethene	X	--	X	X	--	X	X	--	--	--	--
vinyl acetate	--	--	--	--	--	--	X	X	X	X	X
vinyl chloride	--	X	--	--	--	--	X	X	--	--	--
INORGANICS								--	--	--	--
aluminum (a)	--	--	--	--	--	--	--	--	--	X	X
antimony	--	--	--	--	--	--	X	--	--	--	--
arsenic	X	X	--	--	--	--	X	--	--	--	--
barium	--	X	--	--	--	--	X	--	--	--	--
beryllium	--	--	--	--	--	--	X	X	X	--	X
cadmium	X	X	--	--	--	--	X	--	--	--	X
chromium	--	X	--	--	--	--	X	X	X	--	X
cobalt	--	X	--	--	--	--	X	X	X	X	X
iron (a)	--	X	--	X	--	--	X	--	--	--	X
lead	X	X	X	--	X	--	X	--	--	X	X
manganese	--	X	--	--	--	--	X	X	X	X	X
mercury	--	X	--	--	--	--	X	X	X	--	X
nickel	--	X	X	X	--	--	X	X	X	--	X
selenium	X	X	X	--	--	--	X	--	--	--	--
silver	--	X	--	--	--	--	--	X	X	--	--
thallium	X	--	--	--	--	--	--	X	X	--	--
vanadium	--	--	--	--	--	--	X	--	--	--	--
zinc	X	X	X	X	--	X	X	X	X	X	X

(a) Selected as a chemical of concern in surface water only for potential ecological effects.

Table 26

ASSUMPTIONS USED TO ESTIMATE RESIDENTIAL GROUNDWATER INGESTION EXPOSURES

Parameter	Average Case	Plausible Maximum Case
Ingestion Rate (l/day) (a)	1.4	2
Exposure Frequency (days/year)	351 (b)	365
Exposure Duration (years) (c)	9	30
Body Weight (kg) (d)	70	70
Lifetime (years) (e)	75	75

(a) Based on EPA (1988a) values for average adult ingestion for average and maximum plausible daily activity levels.
(b) Assuming 2 weeks vacation spent away from home each year.
(c) Based on EPA (1988a) values for average and plausible maximum durations for residents in the same place.
(d) Based on EPA (1988a) standard assumption for average adult body weight.
(e) Based on EPA (1988a) standard assumption for a lifetime.

Table 27

EXPOSURE PARAMETERS FOR DIRECT CONTACT WITH SURFACE SOIL
BY CHILDREN AND TEENAGERS
CURRENT SITE USE

Parameter	Average Case	Plausible Maximum Case
Exposure Frequency (days/year) (a)	83	219
Exposure Duration (years) (b)	10	10
Soil Ingestion Rate (mg/day) (c)	110	110
Area of Skin Exposed (cm2/day)	2,220 (d)	5,870 (e)
Soil Accumulation Rate (mg/cm2) (f)	0.5	0.5
Soil Contact Rate (mg/day)	1,110	2,940
Body Weight (kg) (g)	40	40
Lifetime (years) (h)	75	75
Relative Oral Absorption Fraction:		
Arsenic (i)	0.8	0.8
PCBs, PAHs, Bis(2-ethylhexyl) phthalate (j)	0.15	0.5
Other inorganics, other semi-volatile organics, volatile organics	1	1
Dermal Absorption Fraction:		
Carcinogenic PAHs (k)	0.009	0.02
Noncarcinogenic PAHs (k)	0.03	0.05
PCBs (k)	0.07	0.07
Bis(2-ethylhexyl)phthalate (k)	0.003	0.03
Other phthalates (k)	0.05	0.05
Other organics (k)	0.1	0.1
Mercury, inorganics (k)	0.1	0.1
Other inorganics (k)	0	0

(a) Based on 219 days/year when ground is not frozen and/or snow covered (Allen 1985), and assuming 2 days/week for average case and 7 days/week for plausible maximum case.
(b) Assuming children and teenagers play on source areas from ages 6 to 16.
(c) Weighted average lifetime ingestion rates based on EPA (1989b).
(d) Based on surface area of the hands and arms. Calculated from data in EPA (1985a).
(e) Based on surface area of the hands, arms and legs. Calculated from data in EPA (1985a).
(f) Based on Sedman (1989).
(g) Calculated from EPA (1985a).
(h) Based on EPA (1989a) standard assumption for lifetime.
(i) Listed value represents fraction assumed to be absorbed from ingested soil. Based on EPA (1984).
(j) Based on data from Poiger and Schlatter (1980).
(k) Based on data from Fang et al. (1984a,b), Wester et al. (1987), and Poiger and Schlatter (1980).
(l) Assumed values.

Table 28

EXPOSURE PARAMETERS FOR DIRECT CONTACT WITH SURFACE SOIL BY RESIDENTS
FUTURE SITE USE

Parameter	Average Case	Plausible Maximum Case
Exposure Frequency (days year) (a)	65	219
Exposure Duration (years) (b)	9	30
Soil Ingestion Rate (mg day) (c)	100	100
Area of Skin Exposed (cm2/day)	793 (d)	2,980 (e)
Soil Accumulation Rate (mg cm2) (f)	0.5	0.5
Soil Contact Rate (mg day)	397	1,490
Body Weight (kg) (g)	70	70
Lifetime (years) (h)	75	75
Relative Oral Absorption Fraction:		
Arsenic (i)	0.8	0.8
PCBs, PAHs, Bis(2-ethylhexyl) phthalate (j)	0.15	0.5
Other inorganics, other semivolatile organics, volatile organics	1	1
Dermal Absorption Fraction:		
Carcinogenic PAHs (k)	0.005	0.02
Noncarcinogenic PAHs (k)	0.01	0.05
PCBs (k)	0.01	0.07
Bis(2-ethylhexyl) phthalate (k)	0.005	0.03
Other semivolatile organics	0.01	0.05
Other organics	0.1	0.1
Volatile organics (l)	0.1	0.1
Other inorganics (l)	0	0

(a) Based on 219 days year when ground is not frozen and or snow covered (NCDC 1985) and assuming 5 days week for average case and 7 days week for plausible maximum case

(b) Based on EPA (1985) values for average and plausible maximum durations for residents at the same place

(c) Weighted average of lifetime ingestion rates based on EPA (1985)

(d) Based on surface area of the hands. Calculated from data in EPA (1985)

(e) Based on surface area of the hands and arms. Calculated from data in EPA (1985)

(f) Based on Sedman (1989)

(g) Based on EPA (1985) standard assumption for adult body weights.

(h) Based on EPA (1985) standard assumption for lifetime

(i) Listed value represents fraction assumed to be absorbed from ingested soil. Based on EPA (1984)

(j) Based on data from Poiger and Schlatter (1980)

(k) Based on data from Wester et al. (1985a,b), Wester et al. (1987), and Poiger and Schlatter (1980)

(l) Assumed values

Table 29

ORAL HEALTH EFFECTS CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
FOR THE KENTUCKY AVENUE WELLFIELD SITE

Chemical	Noncarcinogenic Critical Toxicity Values			CAG Cancer Potency Factors		
	RfD (mg/kg/day)	Safety Factor (a)	Source (b)	Potency Factor (mg/kg/day)-1	Potency Factor Source	Weight of Evidence (c)
ORGANICS						
Acetone	1E-01	1000	IRIS	ND	IRIS	--
Bis(2-ethylhexyl)phthalate (BEHP)	2E-02	1000	IRIS	1.4E-02	IRIS	B2
Benzo(a)pyrene (Carcinogenic PAH)	ND	ND	IRIS	1.15E+01 (d)	HEA 1984 (e)	B2
Carbon disulfide	1E-01	100	IRIS	ND	IRIS	--
Chloroform	1E-02	1000	IRIS	6.1E-03	IRIS	B2
1,2-Dichloroethylene (trans)	2E-02	1000	IRIS	ND	HA 03/31/87	D
Dimethylphthalate (f)	ND	ND	IRIS	ND	IRIS	D
Dibutyl Phthalate	1E-01	1000	IRIS	ND	IRIS	D
Di-n-octylphthalate (f)	ND	ND	ND	ND	ND	--
Endosulfan	6E-05	3000	IRIS	ND	IRIS	--
Ethylbenzene	1E-01	1000	IRIS	ND	IRIS	D
Methylene Chloride	6E-02	100	IRIS	7.5E-03	IRIS	B2
Naphthalene (Noncarcinogenic PAH)	4E-02 (d)	100	HEA	ND	HEA	--
Polychlorinated Biphenyls (PCBs)	ND	ND	IRIS	7.7E+00	IRIS	B2
Toluene	3E-01	100	IRIS	ND	IRIS	D
1,1,1-Trichloroethane	9E-02	1000	IRIS	ND	IRIS	D
Trichloroethylene	7.35E-03 (d)	1000	HA 03/31/87	1.1E-02 (d)	HEA	B2
Vinyl Acetate	ND	ND	ND	ND	ND	--
Vinyl Chloride (g)	ND	ND	ND	2.3E+00	HEA	A
Xylene (mixed)	2E-02	100	IRIS	ND	IRIS	D
INORGANICS						
Antimony	4E-04	1000	IRIS	ND	IRIS	--
Arsenic	(c)		IRIS	2E+00	(h)	A
Barium	5E-02	100	IRIS	ND	IRIS	--
Beryllium	5E-03	100	IRIS	ND	IRIS	B2
Cadmium	(c)			ND	IRIS	--
	1E-03 (food)	10	HEA (i)			
	5E-04 (water)	10	HEA			
Chromium III & Compounds	1E-00	1000	IRIS	ND	IRIS	--
Chromium VI & Compounds	5E-03	500	IRIS	ND	IRIS	--
Cobalt	ND	ND	IRIS	ND	IRIS	D
Lead	ND	ND	IRIS	ND	IRIS	B2
Manganese	2E-01	1000	HEA	ND	IRIS	D
Mercury (inorganic)	ND	ND	IRIS	ND	IRIS	D
Mercury (inorganic & alkyl)	3E-04	10	HEA (j)	ND	ND	--
Mercury (methyl)	3E-04 (d)	1000	HEA	ND	ND	--
Nickel	2E-02	300	IRIS	ND	IRIS	--
Nickel refinery dust	ND	ND	IRIS	ND	IRIS	--
Nickel subsulfide	ND	ND	IRIS	ND	IRIS	--
Selenium	3E-03 (d)	15	HEA	ND	HEA	--
Silver	3E-03	2	IRIS	ND	IRIS	D
Thallium & Compounds (in soluble salts)	7E-05	3000	HEA	ND	HEA	--
Vanadium	7E-03	100	HEA	ND	HEA	--
Zinc (metal)	2E-01	10	HEA	ND	HEA	--

(a) Safety factors are the products of uncertainty factors and modifying factors. Uncertainty factors used to develop reference doses generally consist of multiples of 10, with each factor representing a specific area of uncertainty in the data available. The standard uncertainty factors include the following:
- a 10-fold factor to account for the variation in sensitivity among the members of the human population;
- a 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a 10-fold factor to account for the uncertainty in extrapolating from less-than-chronic NOAELs to chronic NOAELs; and
- a 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

Modifying factors are applied at the discretion of the reviewer to cover other uncertainties in the data.

Table 29 contd.
ORAL HEALTH EFFECTS CRITERIA FOR CHEMICALS OF POTENTIAL CONCERN
FOR THE KENTUCKY AVENUE WELLFIELD SITE

Source of reference doses: IRIS = the chemical files of EPA's Integrated Risk Information System (as of 07/01/89).
HEA = Health Effects Assessment Summary Tables (04/01/89). HA = Health Advisory (Office of Drinking Water).
EPA weight of evidence classification scheme for carcinogens: A--Human Carcinogen, sufficient evidence from human epidemiological studies. B1--Probable human Carcinogen, limited evidence from epidemiological studies and adequate evidence from animal studies. B2--Probable human Carcinogen, inadequate evidence from epidemiological studies and adequate evidence from animal studies. C--Possible human carcinogen, limited evidence in animals in the absence of human data. D--Not classified as to human carcinogenicity; and E--Evidence of Noncarcinogenicity.
Under review pending.
Health Effects Assessment for Benzo(a)pyrene, Environmental Criteria and Assessment Office, Cincinnati, Ohio. September, 1984. EPA 540/1-86-022
Data inadequate for quantitative risk assessment.
Scheduled for Carcinogen Risk Assessment Verification Endeavor workgroup (CRAVE).
Environmental Protection Agency (EPA). 1988. Special Report on Ingested Inorganic Arsenic Skin Cancer: Nutritional Essentiality. Risk Assessment Forum. Washington, D.C.
Verified two separate one day RfD's, 0.001 for food and 0.0005 for water.
Based on RfD for methyl mercury.

- No data are available.

Table 30

Summary of Human Health Risk Estimates for the Kentucky Ave. Wellfield Site

Exposure Pathway	Excess Lifetime Cancer Risk (a)		
	Average Case	Maximum Plausible Case	Predominant Chemicals (d)
Current Site Use Conditions			
Ingestion of Groundwater (e)	8E-05	1E-03	arsenic, TCE, vinyl chloride
Direct Surface Soil Contact (c):			
Source Area 2	2E-06	5E-05	arsenic, PCBs
Source Area 3	1E-06	2E-05	arsenic, CPAHs
Source Area 4	<1E-06	<1E-06	NA
Source Area 15	NC	NC	NC
Source Area 17	<1E-06	<1E-06	NA
Direct Sediment Contact			
Source Area 2	3E-06	4E-04	CPAHs, PCBs
Source Area 3	<1E-06	6E-05	PCBs
Future Site Use Conditions			
Direct Surface Soil Contact (c):			
Source Area 2	<1E-06	4E-06	arsenic, PCBs
Source Area 3	<1E-06	2E-06	arsenic, CPAHs
Source Area 4	<1E-06	<1E-06	NA
Source Area 15	NC	NC	NC
Source Area 17	<1E-06	<1E-06	NA
Direct Subsurface Soil Contact (c)			
Source Area 2	<1E-06	8E-06	arsenic
Source Area 3	<1E-06	1E-06	arsenic, CPAHs, PCBs
Source Area 4	<1E-06	<1E-06	CPAHs
Source Area 15	<1E-06	<1E-06	NA
Source Area 17	<1E-06	3E-06	CPAHs

NA = Not applicable since hazard index is less than one or the total cancer risk is less than 1E-06.
NC = Not calculated since none of the selected carcinogenic chemicals of concern for Source Area 15 were detected in surface soil.

Chemical Abbreviations

CPAHs = Carcinogenic polycyclic aromatic hydrocarbons. PCBs = Polychlorinated biphenyls: TCE = Trichloroethene. A = Arsenic. Cd = Cadmium. Cr = Chromium. Pb = Lead. Ni = Nickel. Se = Selenium. Sb = Antimony. Ba = Barium. Cr = Chromium. Mn = Manganese

(a) The upper bound risk of excess lifetime cancer risk represents the additional probability that an individual may have of cancer over a 70-year lifetime as a result of exposure conditions evaluated.

(b) The hazard index indicates whether or not exposures to mixtures of noncarcinogenic chemicals may result in adverse health effects. A hazard index less than one indicates that adverse human health effects are unlikely to occur.

(c) Risks for Source Area 15 are not shown since lead was the only selected chemical of concern for this area. Lead will be dealt with using a different approach than that shown in this table (see Section 6.6.2.3).

(d) Listed chemicals are those with excess lifetime cancer risks of 1E-06 or greater for carcinogens and those with a hazard index of one or greater.

(e) For volatile chemicals present in the water, potential risks from inhaling volatiles released into indoor air may be as large as those associated with direct ingestion. Additional exposures could also potentially result from groundwater through building foundations into indoor air.

Table 31

Summary of Human Health Risk Estimates for the Kentucky Ave. Wellfield Site

Exposure Pathway	Hazard Index for Noncarcinogenic Effects (b)		
	Average Case	Maximum Plausible Case	Predominant Chemicals (d)
Current Site Use Conditions			
Ingestion of Groundwater (e)	>1	>1	Sb, Be, Cd, Cr, Mn, Ni, Tl, V
Direct Surface Soil Contact (c):			
Source Area 2			
Source Area 3	<1	<1	NA
Source Area 4	<1	<1	NA
Source Area 15	<1	<1	NA
Source Area 17	<1	<1	NA
	<1	<1	NA
Direct Sediment Contact			
Source Area 2	<1	>1	Cd
Source Area 3	<1	<1	NA
Future Site Use Conditions			
Direct Surface Soil Contact (c):			
Source Area 2			
Source Area 3	<1	<1	NA
Source Area 4	<1	<1	NA
Source Area 15	<1	<1	NA
Source Area 17	<1	<1	NA
	<1	<1	NA
Direct Subsurface Soil Contact (c)			
Source Area 2			
Source Area 3	<1	<1	NA
Source Area 4	<1	<1	NA
Source Area 15	<1	<1	NA
Source Area 17	<1	<1	NA
	<1	<1	NA

NA = Not applicable if the hazard index is less than one, or the total cancer risk is less than 1E-06.
NA = Not applicable if the none of the selected carcinogenic chemicals of concern for Source Area 2 were detected in surface soil.

Chemical Abbreviations

BAP = Benzo(a)pyrene; PAHs = Polycyclic aromatic hydrocarbons; PCBs = Polychlorinated biphenyls; TCE = Trichloroethene; As = Arsenic; Be = Beryllium; Cd = Cadmium; Sb = Antimony; Be = Beryllium; Cr = Chromium; Mn = Manganese

(a) The upper bound individual excess lifetime cancer risk represents the additional probability that an individual may have of cancer over a 70-year lifetime as a result of exposure conditions evaluated.

(b) The hazard index indicates whether or not exposures to mixtures of noncarcinogenic chemicals may result in adverse health effects. A hazard index less than one indicates that adverse human health effects are unlikely to occur.

(c) Risks for Source Area 2 are not shown since lead was the only selected chemical of concern for this area; lead was evaluated using a different approach than that shown in this table (see Section 6.5.2.3).

(d) Listed chemicals are those with excess lifetime cancer risks of 1E-06 or greater for carcinogens and those with a hazard ratio of one or greater.

(e) For volatile organics present in the water, potential risks from inhaling volatiles released into indoor air may be as large as those associated with direct ingestion. Additional exposures could at least potentially result from [illegible] through building foundations into indoor air.

Table 32

RISKS ASSOCIATED WITH INGESTION OF GROUND WATER
FROM THE KENTUCKY AVENUE WELLFIELD SITE
CURRENT SITE USE CONDITIONS

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) (mg/kg/day)		CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	UPPERBOUND EXCESS LIFETIME CANCER RISK	
	Average	Plausible Maximum		Average	Plausible Maximum
arsenic	2.26E-05	8.25E-04	2 [A]	4.5E-05	1.3E-03
chloroform	3.66E-06	1.03E-04	0.0061 [B2]	2.3E-08	6.3E-07
trichloroethene	2.70E-05	1.38E-03	0.011 [B2]	3.0E-07	1.5E-05
vinyl chloride	2.77E-06	2.29E-05	2.3 [A]	6.4E-06	5.3E-05
TOTAL				5E-05	1E-03

(a) USEPA Weight of Evidence for Carcinogenic Effects:
[A] = Human carcinogen based on adequate evidence from human studies.
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies.

RISKS ASSOCIATED WITH INGESTION OF GROUND WATER
FROM THE KENTUCKY AVENUE WELLFIELD SITE
CURRENT SITE USE CONDITIONS

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	CDI/RfD RATIO	
	Average	Plausible Maximum		Average	Plausible Maximum
1,1,1-trichloroethane	4.28E-05	1.56E-03	9.00E-02	4.7E-04	1.7E-02
antimony	6.81E-03	1.91E-02	4.00E-04	1.7E+01	4.8E+01
barium	6.92E-03	7.69E-02	5.00E-02	1.4E-01	1.5E+00
beryllium	2.27E-04	3.74E-04	5.00E-03	4.5E-02	7.5E-02
cadmium	5.99E-05	7.72E-03	5.00E-04	1.2E-01	1.5E+01
cellosolve	6.08E-03	2.55E-02	1.00E-02	3.1E-03	2.6E-02
chromium III	7.12E-03	7.83E-01	5.00E-03	1.4E-02	1.5E+02
chromium III (a)	4.01E-03	1.40E-01	1.00E+00	4.0E-03	1.4E+00
cobalt	8.44E-04	8.54E-03	NA	---	---
manganese	1.84E-02	8.08E-01	2.00E-01	9.2E-02	3.0E+00
mercury	1.92E-06	2.86E-05	3.00E-04	6.4E-03	9.5E-02
nickel	2.10E-03	2.54E-01	2.00E-02	1.1E-01	1.3E+01
thallium	5.81E-05	2.43E-04	7.00E-05	1.4E+00	3.5E+00
total xylenes	5.66E-05	1.37E-03	2.00E+00	3.0E-05	6.9E-04
trans-1,2-dichloroethene	6.35E-05	3.43E-04	2.00E-02	3.2E-03	1.7E-02
trichloroethene	2.20E-04	3.46E-03	7.00E-03	3.1E-02	4.7E-01
vanadium	2.22E-04	1.11E-03	7.00E-03	1.0E-01	1.6E+00
zinc	2.80E-02	1.96E-02	2.00E-01	1.3E-02	9.8E-01
HAZARD INDEX				2E+01	9E+01

NA = Reference dose not available
(a) Chromium III concentrations are assumed to be equal to total chromium concentrations minus chromium VI concentrations

Table 33

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO POTENTIAL CARCINOGENS IN SURFACE SOIL, AREA 2
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (q) (mg/kg/day)-1 [weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
arsenic	NC	NC	8.10E-07	2.16E-05	2 [A]	1.6E-06	4.3E-05
Bis(2-ethylhexyl)phthalate	2.49E-10	4.85E-08	1.23E-08	3.03E-06	0.014 [B2]	2.1E-11	1.1E-08
PCBs	1.65E-06	2.00E-07	2.28E-08	3.74E-08	7.7 [B2]	1.4E-07	1.8E-06
TOTAL						2E-06	5E-05

NC = Not calculated. For inorganics, dermal absorption assumed to be negligible.
(a) USEPA weight of Evidence for Carcinogenic Effects:
[A] = human carcinogen based on adequate evidence from human studies.
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO NONCARCINOGENS IN SURFACE SOIL, AREA 2
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI/RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Bis(2-ethylhexyl) phthalate	1.87E-09	3.64E-07	9.26E-08	2.27E-07	2.0E-02	5.6E-07	3.0E-05
cadmium	NC	NC	7.59E-07	2.64E-06	5.0E-04	1.5E-03	5.3E-03
selenium	NC	NC	6.49E-07	4.78E-06	3.0E-03	3.2E-04	1.6E-03
thallium	7.15E-07	1.50E-05	7.12E-07	5.61E-06	7.0E-05	2.0E-02	2.9E-01
zinc	NC	NC	5.60E-05	2.74E-04	2.0E-01	2.8E-04	1.4E-03
HAZARD INDEX						2E-02	3E-01

NC = Not calculated. For inorganics except thallium, dermal absorption assumed to be negligible.

Table 34

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL AREA 3
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (q) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Arsenic	NC	NC	4.76E-07	2.89E-06	2 [A]	9.5E-07	6.0E-06
Bis(2-ethylhexyl)phthalate	4.41E-10	9.17E-08	2.18E-06	5.72E-08	0.014 [B2]	3.7E-11	2.1E-09
Carcinogenic PAHs	8.05E-06	7.17E-07	1.33E-08	6.71E-07	11.5 [B2]	2.5E-07	1.6E-05
Methylene chloride	3.19E-10	4.12E-06	3.16E-10	1.54E-06	0.0075 [B2]	4.8E-12	4.2E-11
						1E-06	2E-05
TOTAL							

NC = Not calculated. For inorganics, dermal absorption assumed to be negligible.
USEPA Weight of Evidence for Carcinogenic Effects:
[A] = Human carcinogen based on adequate evidence from human studies.
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies.

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL AREA 3
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI:RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Barium	NC	NC	4.65E-05	2.79E-04	5.0E-02	9.3E-04	5.6E-03
Bis(2-ethylhexyl)phthalate	3.80E-09	8.85E-07	1.64E-08	4.29E-07	2.0E-02	9.8E-07	2.6E-05
Chromium	NC	NC	2.37E-07	2.64E-05	5.0E-04	4.7E-04	5.3E-03
Copper	NC	NC	8.07E-06	3.96E-05	5.0E-03	1.6E-03	7.9E-03
Lead	NC	NC	4.75E-05	2.47E-05	NA	---	---
Di-n-butyl phthalate	4.07E-06	5.04E-07	8.07E-08	8.76E-07	1.0E-01	1.2E-05	1.6E-05
Manganese	NC	NC	2.42E-04	5.28E-03	2.0E-01	1.7E-03	2.6E-02
Mercury	8.58E-09	8.82E-07	5.49E-06	3.30E-07	3.0E-04	6.4E-05	4.0E-03
Methylene chloride	2.38E-06	3.06E-06	2.37E-06	1.15E-06	6.0E-02	7.9E-06	7.1E-05
Nickel	NC	NC	1.19E-05	5.44E-05	2.0E-02	5.9E-04	2.7E-03
Noncarcinogenic PAHs	3.55E-07	8.80E-06	1.78E-07	3.22E-05	4.0E-01	1.3E-05	3.0E-05
Selenium	NC	NC	2.37E-07	8.75E-06	5.0E-03	7.9E-05	2.9E-03
Silver	NC	NC	3.80E-07	3.96E-06	3.0E-03	1.3E-04	1.3E-03
Zinc	NC	NC	4.84E-05	2.94E-04	2.0E-01	2.4E-04	1.5E-03
						6E-03	6E-02
HAZARD INDEX							

NA = Reference dose not available.
NC = Not calculated. For inorganics except mercury, dermal absorption assumed to be negligible.

Table 35

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO POTENTIAL CARCINOGENS IN SURFACE SOIL AREA 4
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Bis(2-ethylhexyl)phthalate	5.17E-10	1.32E-07	2.56E-09	8.25E-06	0.014 [B2]	4.3E-11	9.0E-09
TOTAL						4E-11	9E-09

(a) USEPA Weight of Evidence for Carcinogenic Effects:
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies.

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO NONCARCINOGENS IN SURFACE SOIL AREA 4
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI AND RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Bis(2-ethylhexyl) phthalate	3.88E-09	9.92E-07	1.92E-08	6.19E-07	2.0E-02	1.2E-06	8.1E-05
Nickel	NC	NC	1.07E-05	5.44E-05	2.0E-02	5.4E-04	2.7E-03
Noncarcinogenic PAHs	NC	3.09E-06	NC	1.15E-05	4.0E-01	---	1.1E-05
Zinc	NC	NC	4.22E-05	2.00E-04	2.0E-01	2.1E-04	1.0E-03
HAZARD INDEX						7E-04	4E-03

NC = Not calculated. For inorganics, dermal absorption assumed to be negligible.
NA = CDI and risk not calculated because geometric mean soil concentration was not reported (see Table 6-7).

Table 36

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO POTENTIAL CARCINOGENS IN SURFACE SOIL AREA 15 KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (mg/kg/day)-1 (Weight of Evidence)	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
None of the selected carcinogenic chemicals of concern for Source Area 15 were detected in surface soils.							

TABLE 6-35

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO NONCARCINOGENS IN SURFACE SOIL AREA 15 KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED DELIRIO RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
cobalt	NC	NC	4.13E-06	1.52E-05	NA	---	---
nickel	NC	NC	1.05E-05	3.86E-05	2.0E-02	5.5E-04	2.0E-03
Noncarcinogenic PAHs	2.73E-07	5.26E-06	1.00E-07	1.98E-06	4.0E-01	1.0E-06	1.8E-05
zinc	NC	NC	5.36E-05	2.52E-04	2.0E-01	2.7E-04	1.3E-03
HAZARD INDEX						8E-04	3E-03

NA = Reference dose not available
NC = Not calculated for inorganics as dermal absorption assumed to be negligible.

Table37

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL AREA 17
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPER-BOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
bis(2-ethylhexyl)phthalate	3.07E-10	1.30E-07	1.52E-09	6.14E-08	0.014 [B2]	2.6E-11	3.0E-09
TOTAL						3E-11	3E-09

(a) USEPA Weight of Evidence for Carcinogenic Effects:
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL AREA 17
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CONCERN RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
bis(2-ethylhexyl)phthalate	2.30E-09	9.75E-07	1.14E-08	6.10E-07	2.0E-02	6.8E-07	7.9E-05
Chromium	NC	1.36E-05	NR	1.02E-04	NA	---	---
Zinc	NC	NC	3.84E-05	1.58E-04	2.0E-01	1.9E-04	9.9E-04
HAZARD INDEX						2E-04	1E-03

NA = Reference dose not available
NC = Not calculated for carcinogenics; dermal absorption assumed to be negligible.
NR = Conc and risk not calculated because geometric mean soil concentration was not reported

Table 38

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO POTENTIAL CARCINOGENS IN SEDIMENTS — AREA 2
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day) Plausible Maximum	CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day) Plausible Maximum	CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK Average	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK Plausible Maximum
bis(2-ethylhexyl)phthalate	1.1[illegible]E-06	3.17E-05	3.48E-05	5.72E-07	0.014 [B2]	6.5E-10	5.2E-06
carcinogenic PAHs	1.11[illegible]E-07	2.39E-05	1.11E-07	6.47E-06	11.5 [B2]	2.5E-06	3.5E-04
PCBs	5.68E-06	4.43E-05	5.32E-09	2.40E-07	7.7 [B2]	4.9E-07	3.8E-06
trichloroethene	5.15E-10	1.63E-08	3.10E-10	1.76E-09	0.011 [B2]	9.1E-12	2.0E-10
TOTAL						3E-06	4E-04

a) USEPA weight of Evidence for Carcinogenic Effects
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO NONCARCINOGENS IN SEDIMENTS — AREA 2
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day) Plausible Maximum	CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day) Average	CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day) Plausible Maximum	REFERENCE DOSE (mg/kg/day)	COMBINED CDI/RFD RATIO Average	COMBINED CDI/RFD RATIO Plausible Maximum
arsenic	NC	NC	1.47E-04	7.71E-04	5.0E-02	2.8E-03	1.5E-02
bis(2-ethylhexyl)phthalate	5.69E-08	2.38E-05	2.82E-07	4.29E-06	2.0E-02	1.7E-05	1.4E-03
cadmium	NC	NC	9.59E-04	4.39E-03	5.0E-04	7.1E-01	8.8E+00
carbon disulfide	4.29E-06	2.80E-04	2.56E-06	3.13E-05	1.0E-01	6.8E-05	3.3E-03
chromium	NC	NC	6.17E-05	6.78E-04	5.0E-03	1.2E-02	1.4E-01
dimethylphthalate	6.82E-08	4.12E-06	7.59E-06	8.91E-07	NA	---	---
di-n-butyl phthalate	7.86E-08	5.18E-06	8.49E-06	1.98E-05	1.0E-01	1.7E-04	1.1E-03
mercury	8.66E-07	3.92E-05	5.22E-07	4.24E-06	3.0E-04	4.6E-03	1.4E-01
nickel	NC	NC	8.07E-05	5.20E-04	2.0E-02	4.0E-03	2.6E-02
noncarcinogenic PAHs	2.93E-06	5.96E-04	8.83E-07	6.44E-05	4.0E-01	6.5E-06	1.7E-03
silver	NC	NC	5.97E-06	6.63E-05	3.0E-03	3.3E-03	2.2E-02
toluene	2.62E-06	2.44E-04	1.52E-06	2.64E-05	3.0E-01	1.3E-05	9.0E-04
trichloroethene	3.66E-06	1.22E-04	2.38E-06	1.32E-05	7.3E-03	8.4E-04	1.8E-02
vinyl acetate	7.17E-08	1.63E-06	4.32E-06	1.85E-07	NA	---	---
zinc	NC	NC	5.46E-03	7.64E-02	2.0E-01	2.7E-02	3.8E-01
HAZARD INDEX						8E-01	1E+01

NA = Reference dose not available
NC = Not calculated - For inorganics except mercury, dermal absorption assumed to be negligible.

Table 39

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO POTENTIAL CARCINOGENS IN SEDIMENTS AREA 3 KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
PCBs	6.84E-08	7.93E-06	7.87E-09	4.29E-07	7.7 [B2]	7.4E-07	6.4E-05
trichloroethene	3.87E-10	2.24E-08	2.03E-10	2.42E-09	0.011 [B2]	5.9E-12	2.7E-10
						7E-07	6E-05
TOTAL							

(a) USEPA Weight of Evidence for Carcinogenic Effects:
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies.

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH CHILDREN AND TEENAGERS EXPOSED BY DIRECT CONTACT TO NONCARCINOGENS IN SEDIMENTS AREA 3 KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI:RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
barium	NC	NC	7.55E-05	5.20E-04	5.0E-02	1.5E-03	1.0E-02
cadmium	NC	NC	6.68E-05	3.69E-04	5.0E-04	1.3E-01	7.4E-01
chromium	NC	NC	2.26E-05	2.01E-04	5.0E-03	4.5E-03	4.0E-02
copper	NC	NC	2.97E-05	8.25E-04	4.0E-02	2.1E-04	2.0E-02
mercury	3.85E-08	7.65E-06	2.83E-08	3.46E-04	2.0E-02	1.6E-03	1.7E-01
nickel	NC	NC	9.23E-06	3.13E-05	2.0E-02	3.3E-04	1.6E-03
silver	NC	NC	9.57E-07	2.13E-05	5.0E-03	1.9E-04	4.3E-03
trichloroethene	2.60E-09	1.68E-07	1.52E-09	1.80E-08	7.0E-01	2.2E-09	2.6E-08
zinc	NC	NC	1.13E-04	5.94E-03	2.0E-01	5.6E-04	3.0E-02
						2E-02	9E-01
HAZARD INDEX							

NC = Not calculated. For noncarcinogens except mercury, dermal absorption assumed to be negligible.

Table 40

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL — AREA 2
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (q) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
enic	NC	NC	4.0E-07	2.0E-05	2 [A]	8.2E-07	4.2E-05
(2-ethylhexyl)phthalate	4.5E-11	2.4E-08	8.2E-10	2.9E-08	0.014 [B2]	9.4E-12	7.4E-10
s	2.6E-08	9.9E-08	1.1E-08	3.9E-08	7.7 [B2]	3.1E-08	1.0E-06
						8E-07	4E-05

AL

* Not calculated. For inorganics, dermal absorption assumed to be negligible.
USEPA Weight of Evidence for Carcinogenic Effects:
[A] = Human carcinogen based on adequate evidence from human studies
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL — AREA 2
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED HAZARD QUOTIENT	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
is(2-ethylhexyl)phthalate	3.8E-10	8.0E-08	5.1E-08	7.2E-06	2.0E-02	2.6E-07	5.5E-05
senic	NC	NC	4.2E-07	8.4E-06	3.0E-04	1.4E-03	2.8E-02
ium	NC	NC	5.3E-10	1.8E-08	4.3E-04	1.2E-06	4.2E-05
ium	1.4E-07	2.4E-06	3.9E-07	1.8E-05	7.0E-03	7.7E-05	3.6E-03
ium	NC	NC	3.1E-05	8.7E-05	2.0E-01	3.1E-04	4.4E-04
						0E-03	7E-02

HAZARD INDEX

NC = Not calculated. For inorganics except thallium, dermal absorption assumed to be negligible.

Table 41

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL — AREA 3
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Arsenic	NC	NC	2.40E-07	2.87E-06	2 [A]	4.8E-07	5.7E-06
Bis(2-ethylhexyl)phthalate	8.10E-11	4.55E-08	1.10E-06	5.50E-06	0.014 [B2]	1.7E-11	1.4E-09
Carcinogenic PAHs	1.48E-09	3.55E-07	6.71E-09	6.45E-07	11.5 [B2]	9.4E-08	1.2E-05
Methylene chloride	5.87E-11	2.04E-09	1.60E-10	1.48E-09	0.0075 [B2]	1.6E-12	2.6E-11
TOTAL						6E-07	2E-05

NC = Not calculated. For inorganics, dermal absorption assumed to be negligible.
(a) USEPA Weight of Evidence for Carcinogenic Effects:
[A] = Human carcinogen based on adequate evidence from human studies.
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL — AREA 3
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI/RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Barium	NC	NC	2.61E-05	8.93E-05	5.0E-02	5.2E-04	1.8E-03
Bis(2-ethylhexyl)phthalate	8.75E-10	1.14E-07	5.15E-06	1.37E-07	2.0E-02	4.9E-05	1.9E-05
Cadmium	NC	NC	1.93E-07	8.45E-07	5.0E-04	2.7E-04	1.7E-03
Chromium	NC	NC	4.26E-06	1.27E-05	5.0E-03	8.5E-04	2.5E-03
Cobalt	NC	NC	2.85E-06	7.93E-06	NA	---	---
Di-n-butyl phthalate	8.31E-09	1.48E-07	4.83E-06	2.17E-07	1.0E-01	5.4E-07	3.7E-06
Manganese	NC	NC	1.92E-04	1.69E-03	2.0E-01	9.6E-04	8.5E-03
Mercury	1.90E-09	1.48E-07	5.33E-06	1.06E-07	3.0E-04	2.4E-05	8.4E-04
Methylene chloride	4.85E-10	5.10E-06	1.33E-06	3.70E-06	6.0E-02	3.0E-05	1.6E-07
Nickel	NC	NC	6.66E-06	1.74E-05	2.0E-02	3.3E-04	8.7E-04
Noncarcinogenic PAHs	7.33E-08	1.42E-06	5.59E-06	1.03E-06	4.0E-01	4.3E-07	6.1E-06
Selenium	NC	NC	1.93E-07	2.80E-06	3.0E-03	4.4E-05	9.3E-04
Silver	NC	NC	2.13E-07	1.27E-06	3.0E-03	7.1E-05	4.2E-04
Zinc	NC	NC	2.72E-05	8.41E-05	2.0E-01	1.4E-04	4.7E-04
HAZARD INDEX						3E-03	2E-02

NA = Reference dose not available
NC = Not calculated. For inorganics except mercury, dermal absorption assumed to be negligible.

Table 42

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL — AREA 4
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (q) (mg/kg/day)-1 [weight of evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
(2-ethylhexyl)phthalate	9.51E-11	1.15E-07	1.29E-09	1.39E-07	0.014 [B2]	1.9E-11	3.6E-09
						2E-11	4E-09
AL							

USEPA Weight of Evidence for Carcinogenic Effects:
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL — AREA 4
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
s(2-ethylhexyl)phthalate	[illegible]	2.87E-07	1.08E-08	3.47E-07	2.0E-02	5.4E-07	1.7E-05
ene	NC	NC	8.02E-08	3.08E-06	2.0E-02	3.0E-04	1.5E-04
rocarbons PAHs	NC	8.94E-07	NC	6.48E-07	4.0E-01	---	2.9E-06
ne	NC	NC	2.37E-05	1.12E-04	2.0E-01	1.2E-04	5.6E-04
						4E-04	2E-03
ZARD INDEX							

a = Not calculated. For routes of dermal absorption assumed to be negligible
b = CDI and risk not calculated because geometric mean soil concentration was not reported

Table 43

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL — AREA 4
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (q) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
,(2-ethylhexyl)phthalate	9.5E-11	1.1SE-07	1.29E-05	1.39E-07	0.014 [B2]	1.9E-11	3.6E-09
						2E-11	4E-09
TAL							

, USEPA Weight of Evidence for Carcinogenic Effects:
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies.

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL — AREA 4
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI/RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
is(2-ethylhexyl)phthalate	9.5E-10	2.8E-07	1.0E-05	3.4E-07	2.0E-02	5.8E-07	3.2E-05
ickel	NC	NC	8.02E-06	3.0E-05	2.0E-02	3.0E-04	1.6E-03
ncarcinogenic PAHs	NC	8.9E-07	NC	8.4E-07	4.0E-03	---	3.9E-05
inc	NC	NC	2.87E-05	1.12E-04	2.0E-01	1.2E-04	5.6E-04
						4E-04	2E-03
AZARD INDEX							

NC = Not calculated. For inorganics, dermal absorption assumed to be negligible.
NR = CDI and risk not calculated because geometric mean soil concentration was not reported (see Table 6-7).

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO POTENTIAL CARCINOGENS IN SURFACE SOIL — AREA 15
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
One of the selected carcinogenic chemicals of concern for Source Area 15 were detected in surface soils.							

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT
TO NONCARCINOGENS IN SURFACE SOIL — AREA 15
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI/RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
cobalt	NC	NC	2.92E-05	4.86E-05	NA	---	---
nickel	NC	NC	8.12E-05	1.27E-04	2.0E-02	3.8E-04	6.3E-04
phenol	5.67E-05	8.75E-07	7.69E-05	6.34E-04	6.0E-01	9.4E-05	1.0E-03
nonCarcinogenic PAHs	NC	NC	3.02E-05	8.08E-05	4.0E-02	1.4E-03	3.8E-03
zinc					2.0E-01	1.5E-04	4.0E-04
HAZARD INDEX						5E-04	1E-03

NA = Reference dose not available (see)
NC = Not calculated for inorganics, dermal absorption assumed to be negligible.

Table 45

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT TO POTENTIAL CARCINOGENS IN SURFACE SOIL AREA 17
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING POTENTIAL CARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		CANCER POTENCY FACTOR (a) (mg/kg/day)-1 [Weight of Evidence]	COMBINED UPPERBOUND LIFETIME EXCESS CANCER RISK	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Bis(2-ethylhexyl)phthalate	5.63E-11	6.47E-08	7.87E-10	7.82E-08	0.014 [B2]	1.2E-11	2.0E-09
TOTAL						1E-11	2E-09

(a) USEPA Weight of Evidence for Carcinogenic Effects:
[B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies

ESTIMATED EXPOSURES AND RISKS ASSOCIATED WITH RESIDENTIAL EXPOSURE BY DIRECT CONTACT TO NONCARCINOGENS IN SURFACE SOIL AREA 17
KENTUCKY AVENUE WELLFIELD SITE

CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS	CHRONIC DAILY INTAKE (CDI) VIA DERMAL ABSORPTION (mg/kg/day)		CHRONIC DAILY INTAKE (CDI) VIA INCIDENTAL INGESTION (mg/kg/day)		REFERENCE DOSE (mg/kg/day)	COMBINED CDI:RFD RATIO	
	Average	Plausible Maximum	Average	Plausible Maximum		Average	Plausible Maximum
Bis(2-ethylhexyl)phthalate	4.69E-10	1.82E-07	6.56E-09	1.96E-07	2.0E-02	3.4E-07	1.0E-05
Di-n-octyl phthalate	NC	2.26E-08	NC	3.26E-08	NA	---	---
Zinc	NC	NC	2.16E-05	6.34E-05	2.0E-01	1.1E-04	3.2E-04
HAZARD INDEX						1E-04	3E-04

NA = Reference dose not available
NC = Not calculated. For inorganics, dermal absorption assumed to be negligible.
NR = CDI and risk not calculated because geometric mean soil concentration was not reported

COMPARISON OF SURFACE WATER CONCENTRATIONS WITH SURFACE WATER CRITERIA — AREAS 2 AND 3

(Concentrations in ug/l)

Chemical (a)	New York AWQS (b)		Concentration		
			Area 2 (c)	Area 3 (c)	
	Class D	Class C		Geometric Mean	Maximum
Aluminum	NA	100	270	471	6,360
Beryllium	NA	1,100 (f) 11 (g)	ND	NR	0.2
Cadmium	3.9 (d)	1.1 (d)	ND	4.89	37
Chromium (VI)	16	11	7	8.1	38
Cobalt	NA	5	ND	NR	6
Iron	300	300	97	811	8,090
Lead	83 (d)	3.2 (d)	45	15	43
Mercury	0.012 (j)	0.012 (j)	ND	--	0.4 (h)
Trichloroethene	21,900 (i)	21,900 (i)	3	NR	2
Vanadium	190	14	ND	NR	9.6
Zinc	320 (d)	30	58	67	596

(a) Only those chemicals detected in surface waters for which AWQS exist are listed.

(b) State water Quality Standard (New York State Codes, Rules and Regulations, Title 6, Chapter X, Parts 700-705). See text for description of classes.

(c) Single sample collected. Value reported is detected value.

(d) Hardness-dependent criterion. A hardness of 100 mg CaCO3/liter was assumed.

(e) Concentrations are from samples collected in drainage ditch and pond.

(f) Criterion for hardness greater than 75 ppm.

(g) Criterion for hardness less than or equal to 75 ppm.

(h) Only detected in one sample, based on dissolved concentration.

(i) No New York AWQS available, the value given is the chronic lowest observed effect level (EPA 1986e).

(j) No New York AWQS available, the value given is the Federal chronic AWQC (EPA 1986e).

NA = Criterion not available.
ND = Chemical not detected in this area at a concentration above the detection limit.
NR = The geometric mean was not reported as this concentration was greater than the detected maximum because one-half of the detection limits were used in calculating the mean.

Table 47

ACTION-SPECIFIC ARARS, CRITERIA AND GUIDANCE FOR GROUNDWATER TREATMENT

KENTUCKY AVENUE, WELLFIELD SITE

REMEDIAL ACTION	ARARs	STATUS	REQUIREMENT SYNOPSIS
A. Common to All Alternatives	OSHA - General Industry Standards (29 CFR 1910)	Applicable	These regulations specify 8 hour time-weight average concentrations for worker exposure t various organic compounds. Training require for workers at hazardous waste operations ar specified in 29 CFR 1910.120.
	OSHA - Safety and Health Standards (29 CFR 1926)	Applicable	These regulations specify the type of safety ment and procedures to be implemented during remediation.
	OSHA - Record Keeping, Reporting, and Related Regulations (29 CFR 1904)	Applicable	This regulation outlines the record keeping porting requirements for an employer under O
	USEPA Groundwater Protection Strategy - USEPA Policy Statement, August 1984	To Be Considered	Identifies groundwater quality to be achieve remedial actions based on aquifer characteri tics and use.
	RCRA - Standards for Generators of Hazardous Waste (40 CFR 262.1)	Relevant and Appropriate	General generator requirements which outline manifest, recordkeeping, and transporting requirements.
	RCRA - Standards for Owners/Operators of Permitted Hazardous Waste Facilities (40 CFR 264.10-264.18)	Relevant and Appropriate	General facility requirements which outline analysis, security measures, inspection, and training requirements.
	RCRA - Preparedness and Prevention (40 CFR 264.30-264.31)	Relevant and Appropriate	This regulation outlines the requirements fo equipment and spill control.
	RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50-264.56)	Relevant and Appropriate	This regulation outlines the requirements fo emergency procedures to be used following e sions, fires, etc.
	RCRA - Groundwater protection (40 CFR 264.90-264.109)	Relevant and Appropriate	This regulation outlines requirements for a water monitoring program to be installed at site.
	RCRA - Miscellaneous Units (40 CFR 264.600-264.999)	Relevant and Appropriate	These standards are applicable to miscellan units not previously defined under existing regulations for treatment, storage, and dis
	RCRA - Closure and Post-Closure (40 CFR 264.110-164.120)	Relevant and Appropriate	The regulation outlines specific requiremen closure and post-closure of hazardous waste management facilities.
	RCRA - Land Disposal Restrictions (40 CFR 268)	Relevant and Appropriate	The regulation outlines the requirements fo land disposal of certain hazardous contamin. These regulations will be applicable to CER and debris, including treatment residuals, November 9, 1990.

Table 47 contd.
ACTION-SPECIFIC ARARs, CRITERIA AND GUIDANCE FOR GROUNDWATER TREATMENT
KENTUCKY AVENUE WELLFIELD SITE

REMEDIAL ACTION	ARARs	STATUS	REQUIREMENT SYNOPSIS
	DOT Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171 to 177, 397)	Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transpo of hazardous materials.
	New York Hazardous Waste Manifest System Rules (6NYCRR 372)	Relevant and Appropriate	This regulation outlines New York State manif requirements.
	New York Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements (6 NYCRR 370 and 371)	Relevant and Appropriate	This regulation outlines general waste facili and waste analysis requirements, security mea and inspections and training requirements.
	New York Industrial Code Rule #53 (12 NYCRR 753)	Applicable	This regulation establishes the notification requirements for buried pipeline.
B. Groundwater Treatment			
Discharge of Treated Groundwater	National Pollution Discharge Elimination System Requirements (NPDES) (40 CFR 122.44 and 40 CFR 122.41)	Relevant and Appropriate	Requirements for the Best Available Technolog to control toxic and nonconventional pollutant of Best Conventional Technology (BCT) for con tional pollutants. Technology-based limitati be determined on a case-by-case basis. Also outlines monitoring requirements.
	NPDES (40 CFR 125.100 and 40 CFR 125.104)	Relevant and Appropriate	Requirements to develop and implement a Best Management Practices program to prevent the r of toxic constituents to surface waters.
	NPDES (40 CFR 136.1-136.4)	Relevant and Appropriate	Addresses approved test methods for waste con stituents to be monitored. Outlines requirem for analytical procedures and quality control
			Sample preservation procedures, container mate and maximum allowable holding times are presc
	NY State Pollution Discharge Elimination System (SPDES) (6 NYCRR 750)	Applicable	Provides effluent limitations applicable to discharges to surface waters.

Table 47 contd.
ACTION-SPECIFIC ARARs, CRITERIA AND GUIDANCE FOR GROUNDWATER TREATMENT
KENTUCKY AVENUE WELLFIELD SITE

REMEDIAL ACTION	ARARs	STATUS	REQUIREMENT SYNOPSIS
Reinjection of Treated Groundwater	SDWA Underground Injection Control (UIC) (40 CFR 144.12, 144.13, 144.16, 144.28, 144.51, 14.55, 40 CFR 144.55)	Relevant and Appropriate	Provides criteria for reinjection of treated groundwaters.
	SDWA UIC (40 CFR 146.4, 146.12, 146.13)	Relevant and Appropriate	Provides criteria for determining whether an aq may be determined to be an exempted aquifer, wh addresses current and future uses, yield, and w quality characteristics. Regulates injection c ditions and monitoring requirements.
	RCRA LDR (40 CFR 268.2)	Relevant and Appropriate	Hazardous waste to be injected is subject to la ban regulations. Treated groundwater that meet the definition of hazardous waste and is to be injected also is subject to land ban regulation
	NY Groundwater Reinjection Guidance NY TOGS 2.1.2 April 1987	To be Considered	Provides standards for reinjection of treated groundwater. References the application of NY effluent limitations for discharge of tr groundwaters, 6 NYCRR 703.6. Groundwaters ar be treated to drinking water standards prio reinjection.
Release of Air Contaminants			
	National Emissions Standards for Hazardous Air Pollutants (NESHAPs)	Applicable	These standards provide acceptable limits for emissions of specific chemicals, such as merc beryllium, vinyl chloride, and asbes Requirements address operational, recordkeep and general emission standards that apply releases of all matter (500 ppb above backgroun 95% organic vapor recovery) from pumps, val compressors, and vessels.
	Proposed Air Emission Standards for Volatile Hazardous Air Pollutants (VHAP) (52 Federal Register 3748, 2/5/87)	Relevant and Appropriate	This proposal would require equipment that could release hazardous pollutants in concentrations greater than 10% of total organics by weight t designed with a closed vent system that can capt leaks and achieve at least a 95% emiss reduction.
	New York State General Prohibition on Fugitive Air Emissions (6 NYCRR 211)	Applicable	The NYS general prohibition on air emissions restricts the emission of air contaminants associated with particulate matter, fumes, mi and smoke, among other visible emissions.
	New York State (NYS) Guidelines for Soil Erosion and Sediment Control (Soil Conservation Service)	Relevant and Appropriate	The guidelines require the minimization of soil erosion and sedimentation and describe various techniques for achieving compliance.

Table 47 contd.
CHEMICAL-SPECIFIC ARARs, CRITERIA, AND GUIDANCE VALUES
KENTUCKY AVENUE WELLFIELD SITE

REGULATORY LEVEL	ARAR IDENTIFICATION	STATUS	REQUIREMENT SYNOPSIS	FS CONSIDERATION
Federal	CWA Water Quality Criteria (WQC) for Protection of Human Health and Aquatic Life	Relevant and Appropriate	Contaminant levels regulated by WQC are provided to protect human health from exposure to drinking water and ingested aquatic organisms (primarily fish) and from fish consumption alone.	These values were compared to the maximum detected levels at the Kentucky Avenue Wellfield Site to determine necessary treatment. Note that WQC are also relevant and appropriate for the evaluation of surface water discharge acceptability.
Federal	RCRA Maximum Concentration Limits (MCLs) (40 CFR 264)	Relevant and Appropriate	Provides standards for 14 toxic compounds and pesticides for protection of groundwater. These standards are equal to the MCLs established by the SDWA.	The promulgated values are included in the SDWA MCLs (Refer to SDWA below). The combined standards were compared with the maximum detected levels at Kentucky Avenue Wellfield Site to determine the lev of cleanup. See SDWA below.
Federal	SDWA Maximum Contaminant Levels (MCLs) (40 CFR 141.11-.16)	Relevant and Appropriate	Provides at-the-tap standards for 30 toxic compounds, including the 14 compounds adopted as RCRA MCLs, for protection of public drinking systems.	Metallic species and organic compounds wer identified in Remedial Investigation. The SDWA MCLs, in conjunction with NY State Water Quality Standards, MCLs, and guidanc values, were used to select indicator chemicals and as treatment requirements.
Federal	SDWA MCL Goals	Relevant and Appropriate	EPA has promulgated MCLGs for 9 contaminants and has proposed MCLGs for 40 others (50 FR 46936) for protection of public water systems. The MCLGs are non-enforceable and are set at levels that would result in no known or anticipated adverse health effects with adequate margins of safety.	Since the MCLGs are non-enforceable, they used as reference values as design points for the treatment system performance.
New York	Groundwater Quality Regulations 6 NYCRR Part 703.5	Applicable	Provide standards for groundwater quality. Certain contaminant levels are specified.	The concentrations of metallic and organic contaminants in groundwater at the Kentuck Avenue Wellfield Site were compared to the standards to determine treatment requireme
New York	Ambient Surface Water Quality Standards 6 NYCRR Part 701	Applicable	Provide standards for discharge to surface waters.	The concentrations of metallic and organic contaminants in groundwater at the Kentuck Avenue Wellfield Site were compared to these standards to determine treatment requirements. Discharge water will be tre to comply with these levels prior discharge to a surface body.

Table 47 contd.
CHEMICAL-SPECIFIC ARARS, CRITERIA, AND GUIDANCE VALUES
KENTUCKY AVENUE WELLFIELD SITE

REGULATORY LEVEL	ARAR IDENTIFICATION	STATUS	REQUIREMENT SYNOPSIS	FS CONSIDERATION
New York	Ambient Water Quality Standards and Guidance Values, Technical and Operations Guidance Series (1065) 1.1.1, April 1, 1987	To be considered	Provide standards and guidance values for groundwater quality and discharges to surface water.	The concentration of metallic and organic contaminants in the groundwater at the Kentucky Avenue Wellfield Site were compa to these standards to determine requirem Discharge water will be treated to levels prior to discharge to a surface bo
New York	Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) (10 NYCRR 5)	Relevant and Appropriate	Provide acceptable levels of organic chemicals and metals in drinking water at-the-tap.	The MCLs were used to determine necessary cleanup levels for groundwater at the Kentucky Avenue Wellfield Site.
Federal	National Ambient Air Quality Standards (NAAQS) (40 CFR 50)		These standards provide acceptable limits for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, and lead that must not be exceeded in ambient air.	Remediation technologies that could release contaminants to the air will be designed to meet these standards.
New York	New York State Air Guide 1, 7/86	Applicable	This guidance provides acceptable ambient levels of volatile contaminants in emissions from all sources. The acceptable ambient levels for PCE and TCE are 1116 and 900 ug/m^3, respectively.	See above.
New York	Air Cleanup Criteria	To be considered	Provides guidance values for emission release.	
Federal	Air/Superfund National Technical Guidance Study Series	To be considered		

Table 42 cont'd

KENTUCKY AVENUE WELLFIELD SITE

GROUNDWATER AND SURFACE WATER ARARs FOR CONTAMINANTS OF CONCERN

	SDWA MCLs (ug/l)	WQC WATER AND FISH CONSUMPTION (ug/l)	NY MCLs (ug/l)	NYS GROUNDWATER STANDARDS CLASS GA (ug/l)	NYS SURFACE WATER STANDARDS CLASS C (ug/l)	NYS TECHNICAL-OPERATIONAL GUIDANCE SERIES (TOGS) GUIDANCE VALUES (ug/
Organics						
1,1,1 Trichloroethane	200[a]	10,400	5	-	-	50 (GA)
T-1,2 Dichloroethene	100[P,b]	0.033	5	-	-	50 GA)
Trichloroethene	5[a]	2.7	5	10	-	11 (C)
Vinyl Chloride	2[a]	2	2	2	-	-
Inorganics						
Antimony	-	146	-	-	-	3 (GA)
Arsenic	50[a]	0.0022	50	25	190	-
Barium	1,000[a]	-	1,000	1,000	-	-
Beryllium	-	0.0037	-	-	11 (hardness ≤15ppm) 1,100 (hardness ≥75 ppm)	3 (GA)
Cadmium	10	10	10	10	-	-
Chromium	50[a]	50	50	-	-	-
Cobalt	-	-	-	-	5	-
Lead	50[a]	50	50	25	-	-
Manganese	5 (P)	50	30	300	-	-
Mercury	2[a]	0.144	2	2	-	0.2 (C)
Nickel	-	13.4	-	-	-	-
Gallium	-	13	-	-	8	4 (GA)
Vanadium	-	-	-	-	14	-
Zinc	-	5000	-	5,000	30	-

- Standard not developed for this chemical.
(P) Proposed
(a) 40 CFR, Part 141 - National Primary Drinking Water Regulations, 526-533, 585-587.
(b) EPA 1988, Drinking Water Regulations; Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper: Proposed Rule. Federal Register No. 50, Vo. 160 31515-31578, Thursday, August 18, 1988.
(GA) Groundwater Standard.
(C) Surface Water Standard.

Table 4B

KENTUCKY AVENUE WELLFIELD SITE
SUMMARY OF
COST ANALYSES

	MOM-1A	MOM-2A	MOM-2B,2C		MOM-3A,3C		MOM-4A-4C		MOM-5A,5C	
	No Action Alternative	Limited Action Water-Use Restrictions	Pump and Treat Kent, Avenue Wellfield		Pump and Treat Groundwater at Southern Border of Site		Pump and Treat Groundwater at Two Lines of Extraction Wells		Pump and Treat Groundwater Downgradient of Westinghouse	
Total Capital Cost	$61,400	$55,200	2b)	$1,009,900	3a)	$5,339,100	4a)	$8,514,500	5a)	$819,600
			2c)	$1,435,400	3b)	$6,116,100	4b)	$9,291,400	5b)	- $1,092,000
			2d)	$1,703,300	3c)	$7,366,700	4c)	$10,541,900	5c)	$1,016,600
			2e)	$1,650,200						
			2f)	$1,996,300						
			2g)	$2,266,200						
Annual Operation and Maintenance and Cost	$22,500	$22,500	2b)	$549,700	3a)	$1,528,700	4a)	$1,812,900	5a)	$355,600
			2c)	$590,800	3b)	$1,627,100	4b)	$1,910,000	5b)	$378,600
			2d)	$610,300	3c)	$1,878,700	4c)	$2,156,700	5c)	$388,900
			2e)	$603,500						
			2f)	$645,700						
			2g)	$665,300						
Present Worth (5%, 30 year basis)	$415,300	$429,100	2b)	$9,137,600	3a)	$26,654,600	4a)	$33,792,000	5a)	$5,826,300
			2c)	$10,004,700	3b)	$28,803,800	4b)	$35,924,400	5b)	$6,370,600
			2d)	$10,666,700	3c)	$31,561,800	4c)	$40,613,900	5c)	$6,466,300
			2e)	$10,485,600						
			2f)	$11,450,300						
			2g)	$12,004,400						

APPENDIX 2

STUDY AREA MAP

Figure 1

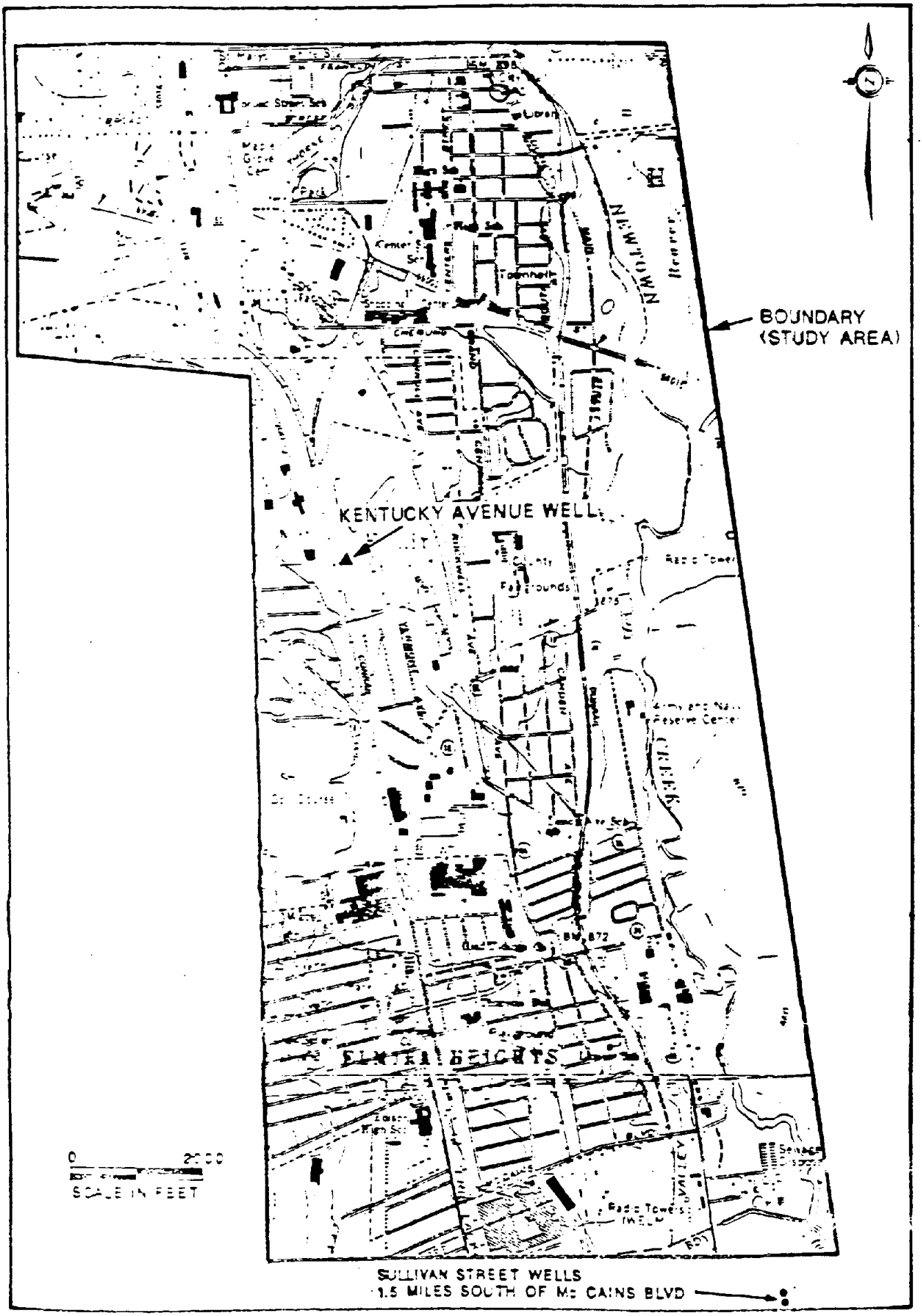
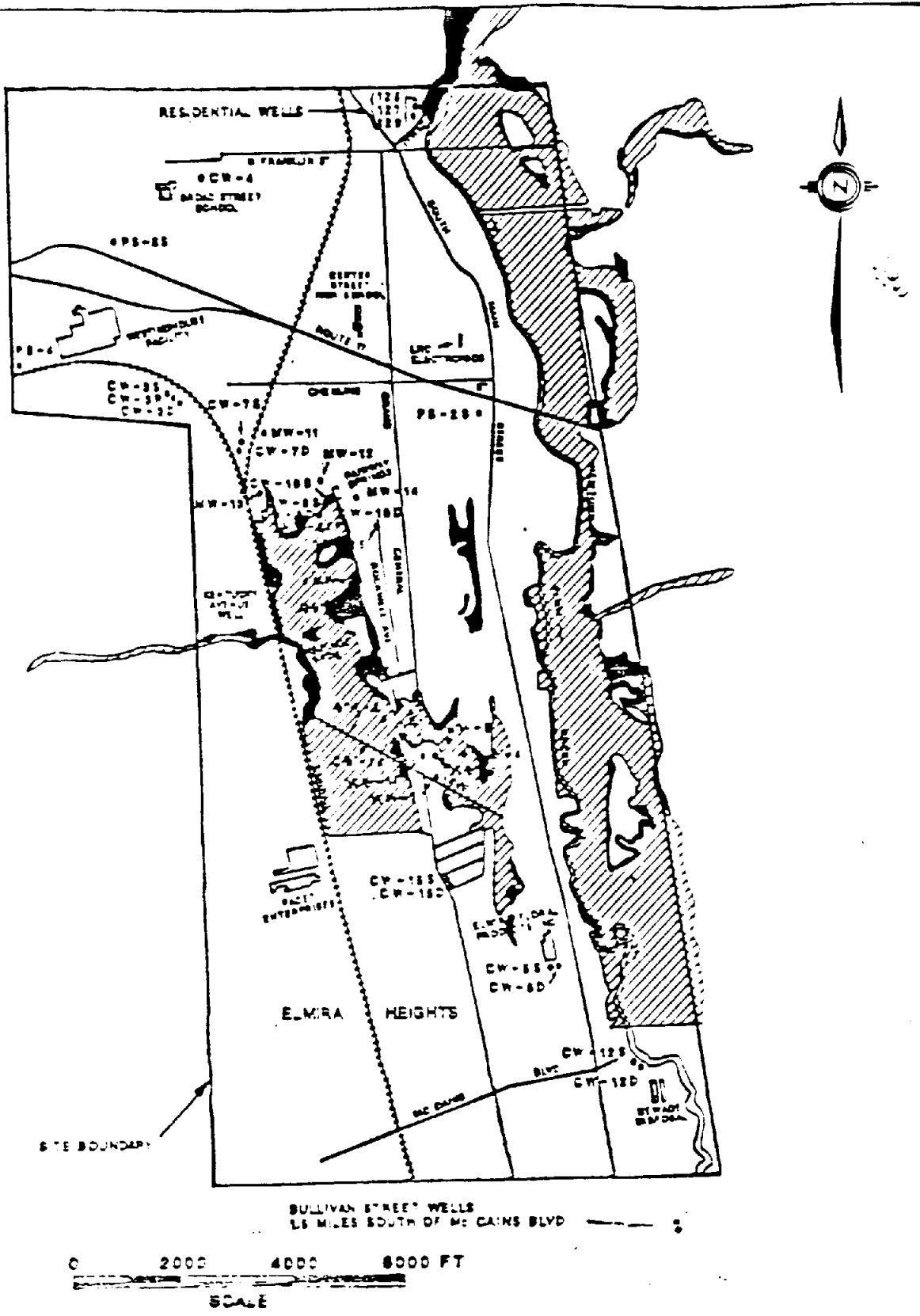


Figure 2



LEGEND:

- AREAS OF 100 YEAR FLOOD; BASE FLOOD ELEVATIONS AND FLOOD HAZARD FACTORS DETERMINED.
- AREAS OF 500 YEAR FLOOD; BASE FLOOD ELEVATIONS AND FLOOD HAZARD FACTORS DETERMINED.

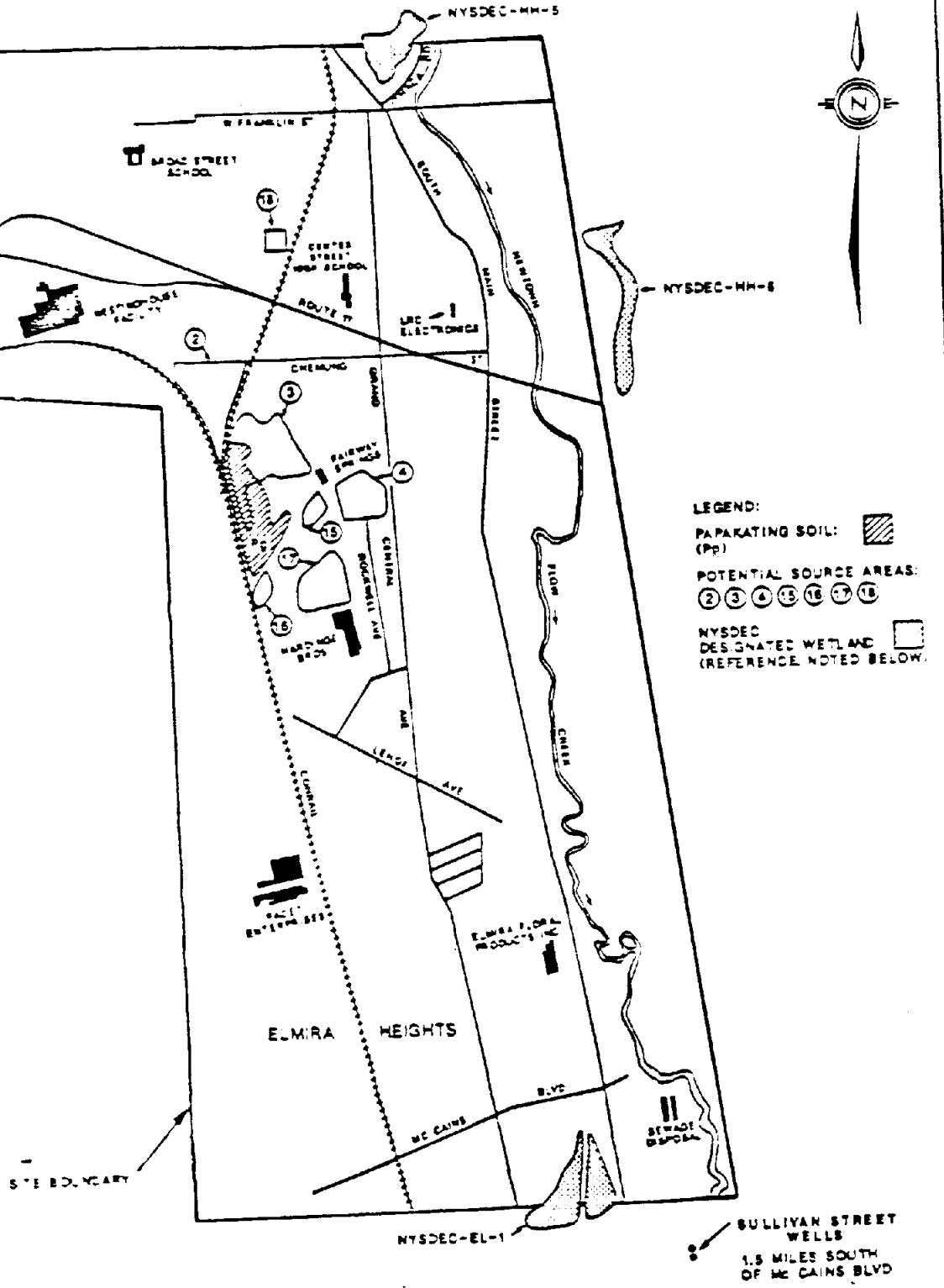
SOURCE FEDERAL EMERGENCY MANAGEMENT AGENCY (SEPTEMBER 1986)

U.S. ENVIRONMENTAL PROTECTION AGENCY

KENTUCKY AVENUE WELLFIELD SITE

100 YEAR AND 500 YEAR FLOOD PLAIN BOUNDARY

Figure 3



REFERENCE
NEW YORK STATE FRESHWATER WETLANDS
CHEMUNG COUNTY MAP 8 AND 10, MARCH 26, 1985

ENVIRONMENTAL PROTECTION AGENCY
KENTUCKY AVENUE WELLFIELD SITE
LOCATIONS OF WETLANDS AND POORLY DRAINED SOILS

SECTION 4.0

Figure 4

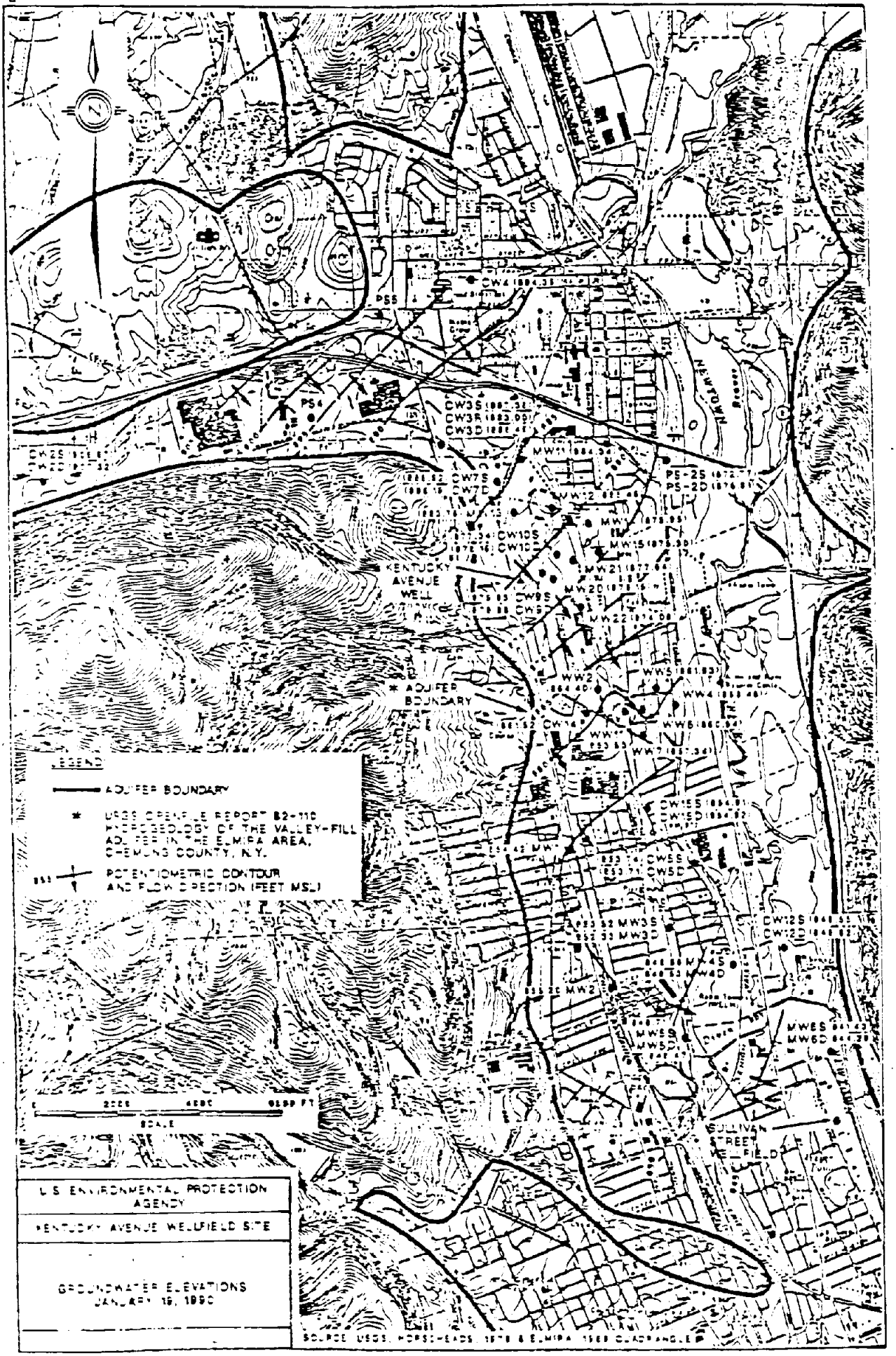

LEGEND
ADJUFER BOUNDARY
USGS OPEN-FILE REPORT 82-110
HYDROGEOLOGY OF THE VALLEY-FILL
AQUIFER IN THE ELMIRA AREA,
CHEMUNG COUNTY, N.Y.
POTENTIOMETRIC CONTOUR
AND FLOW DIRECTION (FEET MSL)
SCALE
KENTUCKY
AVENUE
WELL
* AQUIFER
BOUNDARY
NEWTOWN
SULLIVAN
STREET
FIELD
U.S. ENVIRONMENTAL PROTECTION
AGENCY
KENTUCKY AVENUE WELLFIELD SITE
GROUNDWATER ELEVATIONS
JANUARY 16, 1990
SOURCE USGS, HORSEHEADS 1978 & ELMIRA 1969 QUADRANGLE

Figure 5

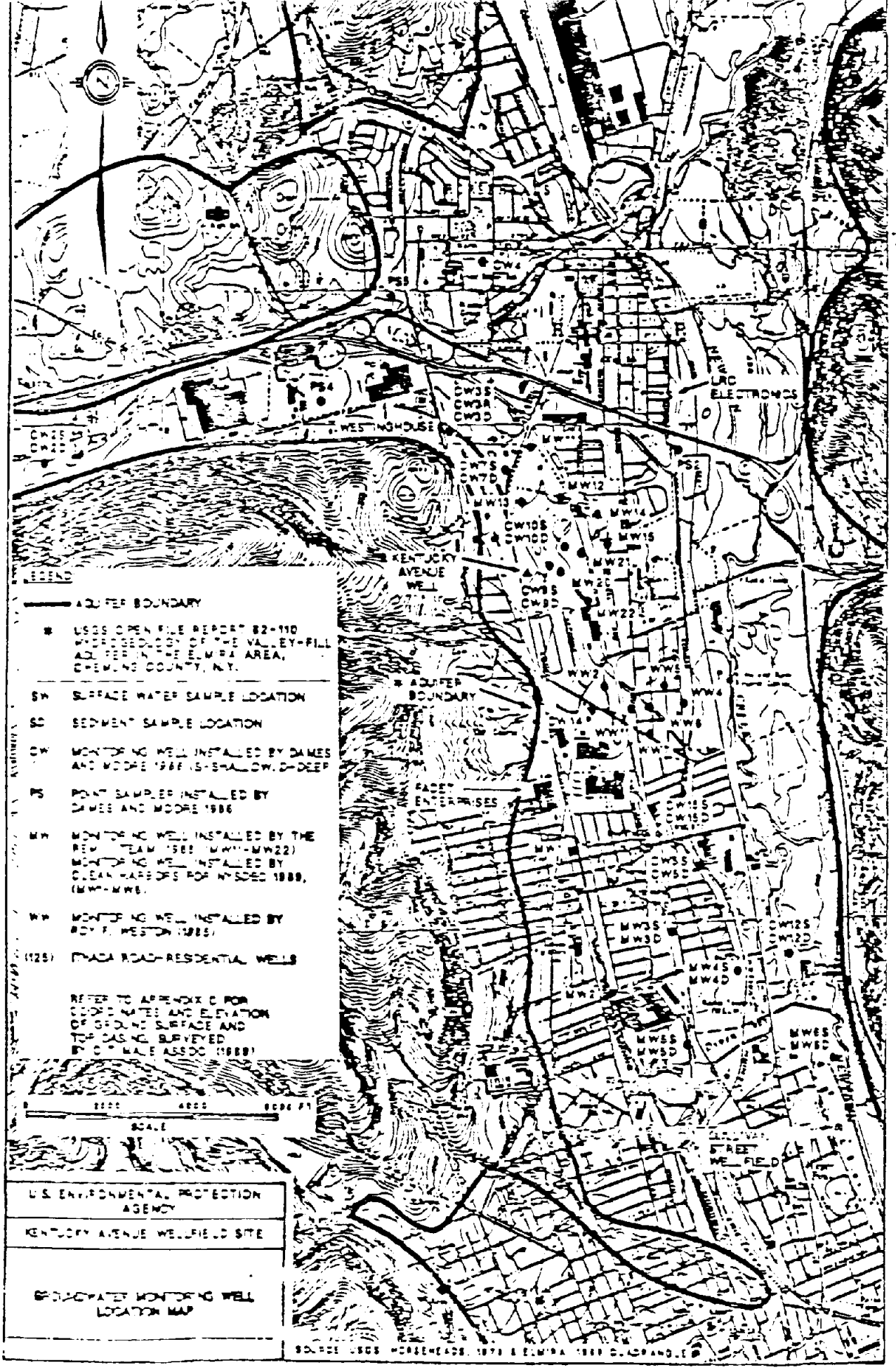
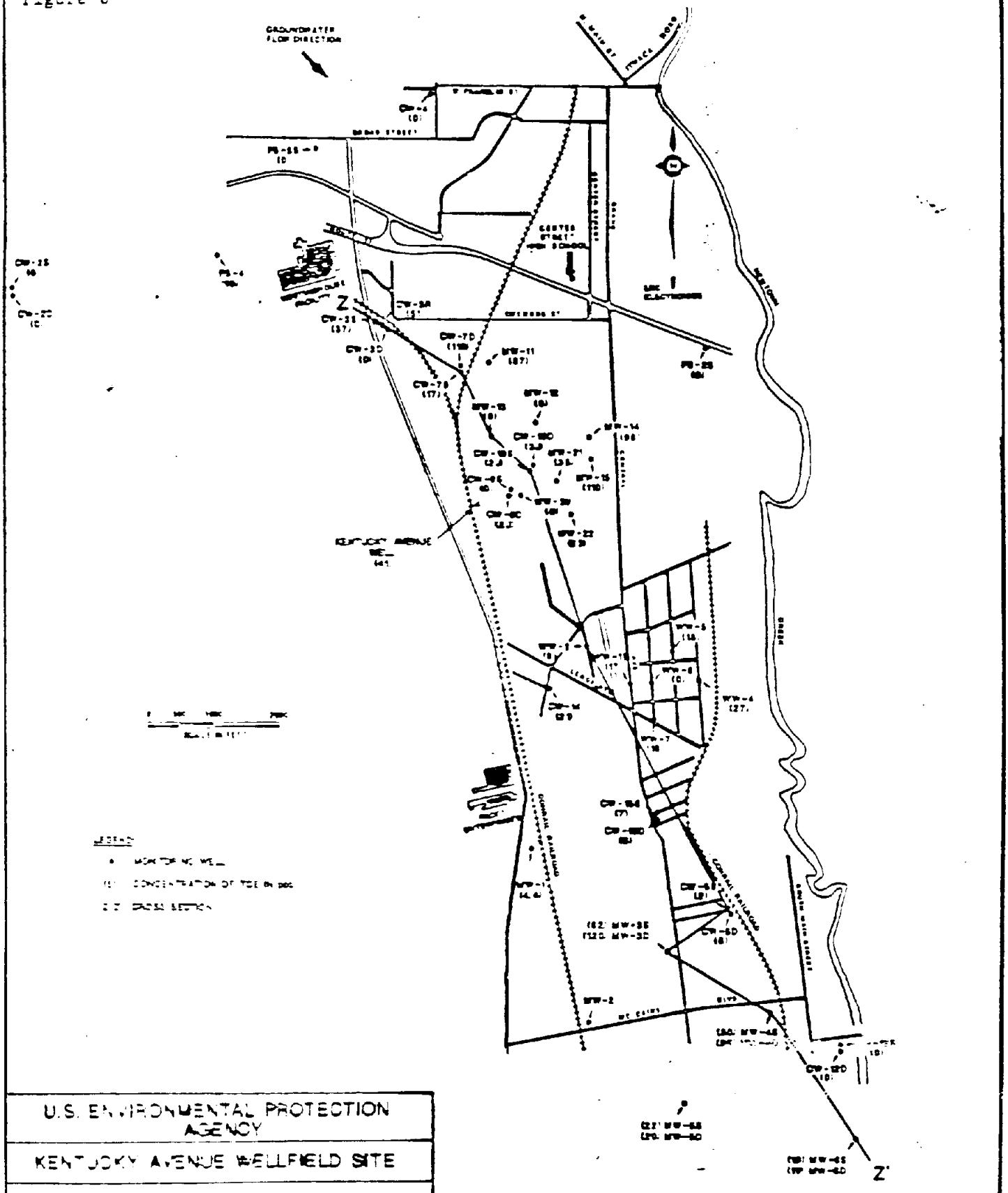

LEGEND
AQUIFER BOUNDARY
USGS OPEN FILE REPORT 82-110
SURFACE WATER SAMPLE LOCATION
SEDIMENT SAMPLE LOCATION
MONITORING WELL INSTALLED BY DAMES AND MOORE 1986 (S-SHALLOW, D-DEEP)
POINT SAMPLER INSTALLED BY DAMES AND MOORE 1986
MONITORING WELL INSTALLED BY THE REM TEAM 1988 (MW1-MW22)
MONITORING WELL INSTALLED BY CLEAN HARBORS FOR NYSDEC 1989, (MW1-MW6)
MONITORING WELL INSTALLED BY ROY F. WESTON (1985)
(125) ITHACA ROAD-RESIDENTIAL WELLS
REFER TO APPENDIX C FOR COORDINATES AND ELEVATION OF GROUND SURFACE AND TOP CASING SURVEYED BY C.T. MALE ASSOC. (1989)
SCALE
U.S. ENVIRONMENTAL PROTECTION AGENCY
KENTUCKY AVENUE WELLFIELD SITE
GROUNDWATER MONITORING WELL LOCATION MAP
SOURCE: USGS HORSEHEADS, 1978 & ELMIRA 1981 QUADRANGLES
KENTUCKY AVENUE WELL
AQUIFER BOUNDARY
WESTINGHOUSE
LRC ELECTRONICS
FASCO ENTERPRISES
FASCO WELL FIELD

Figure 5



U.S. ENVIRONMENTAL PROTECTION AGENCY

KENTUCKY AVENUE WELLFIELD SITE

TCE DISTRIBUTION

Figure 2

DOH ANALYTICAL RESULTS FROM SAMPLING OF PRIVATE* WELLS IN THE FISHERVILLE AREA

SAMPLING OF 9/28/89

		1,1-DCA	TCE	PCE
A.	1281 Horseheads-Big Flats Road	20	ND	ND
B.	Windham Tool Horseheads-Big Flats Road	9	ND	ND
C.	Auto Electric Inc. Horseheads-Big Flats Road	ND	ND	ND
D.	Lorenzo's Restaurant RD #1 Fisherville	ND	ND	ND
E.	1403 Hickory Grove Rd.	ND	ND	ND
F.	1611 Sears Road	21	ND	ND
G.	Dalrymple Asphalt County Rd. 664	2(i)	ND	ND
	Field Blank	ND	ND	ND

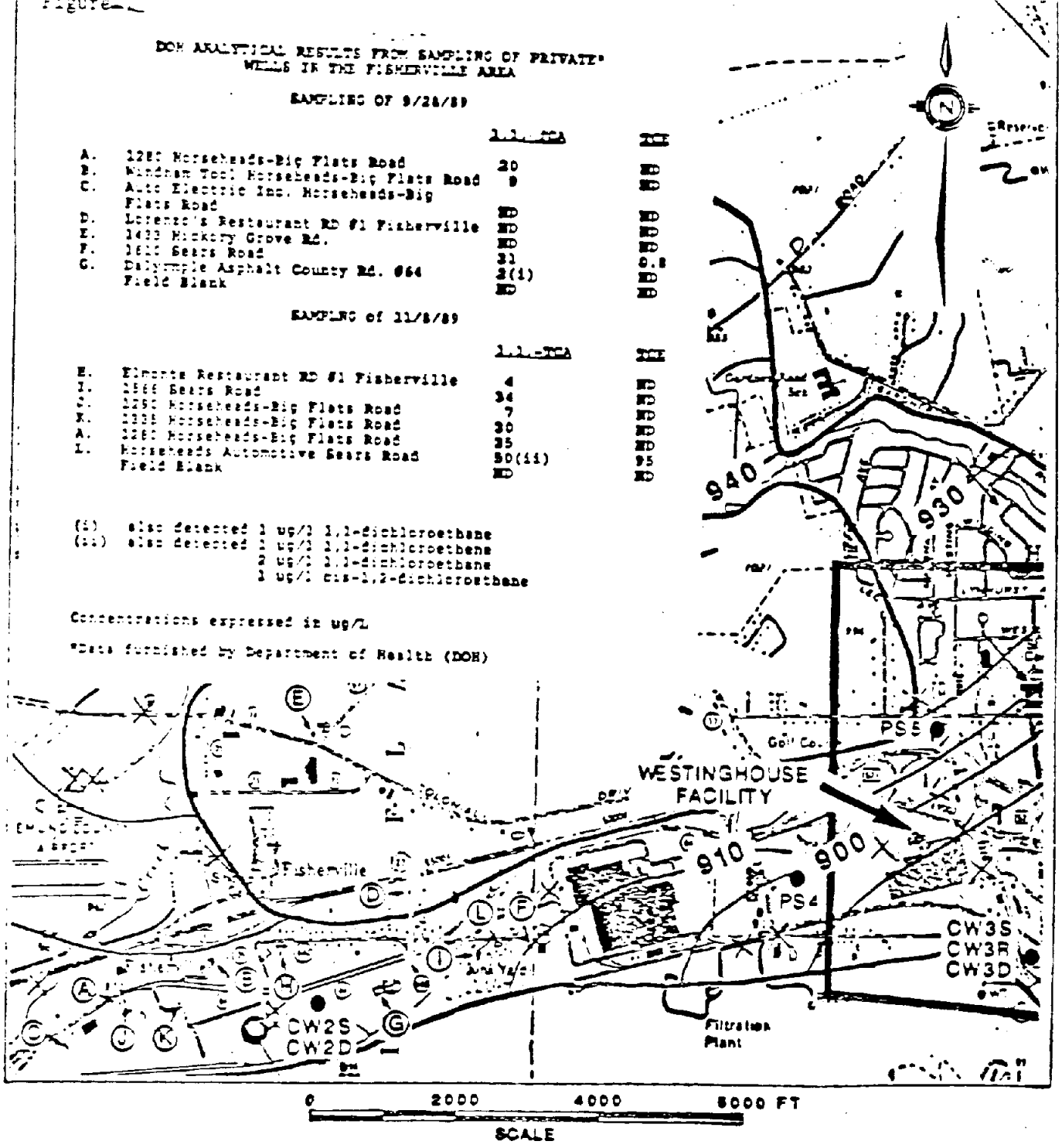
SAMPLING of 11/8/89

		1,1-DCA	TCE	PCE
E.	Elmenta Restaurant RD #1 Fisherville	4	ND	ND
I.	1566 Sears Road	34	ND	ND
J.	1250 Horseheads-Big Flats Road	7	ND	ND
K.	1331 Horseheads-Big Flats Road	30	ND	ND
A.	1281 Horseheads-Big Flats Road	35	ND	ND
L.	Horseheads Automotive Sears Road	50(ii)	95	ND
	Field Blank	ND	ND	ND

(i) also detected 1 ug/l 1,1-dichloroethane
(ii) also detected 1 ug/l 1,1-dichloroethene
2 ug/l 1,1-dichloroethane
1 ug/l cis-1,2-dichloroethene

Concentrations expressed in ug/L

*Data furnished by Department of Health (DOH)



LEGEND:

—950— POTENTIOMETRIC CONTOURS (FT MSL)* FOR 1932-1968

Ⓐ GROUNDWATER SAMPLING LOCATION (DOH 1989)

*SOURCE MILLER 1982 USGS OPEN FILE REPORT 82-710 GROUNDWATER HYDROLOGY OF THE VALLEY-FILL AQUIFER IN THE ELMIRA AREA CHEMUNG COUNTY, N.Y.

U.S. ENVIRONMENTAL PROTECTION AGENCY

KENTUCKY AVENUE WELLFIELD SITE

DEPARTMENT OF HEALTH (FISHERVILLE) GROUNDWATER SAMPLING LOCATIONS WITH TCE CONCENTRATIONS

Figure 8

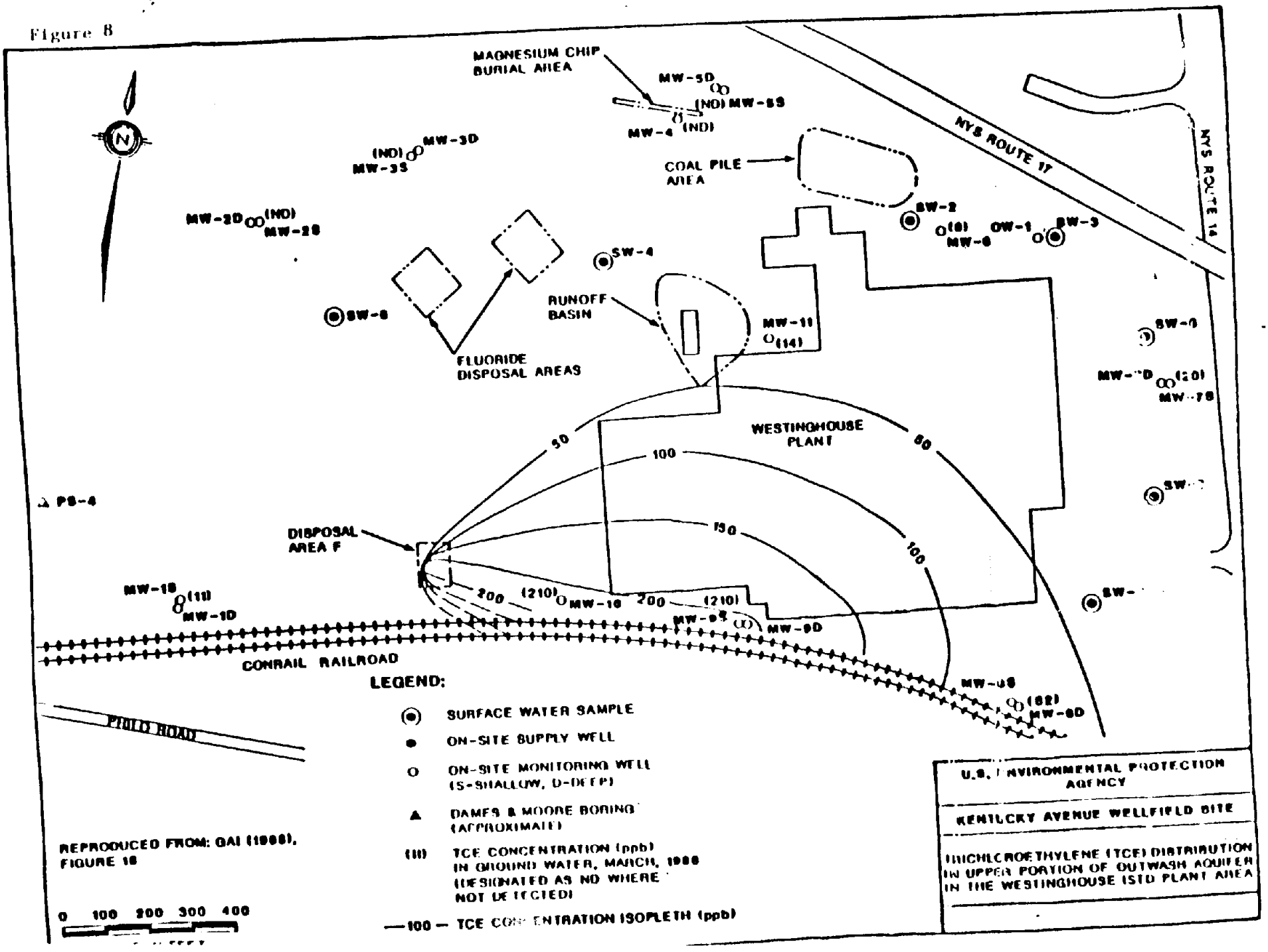
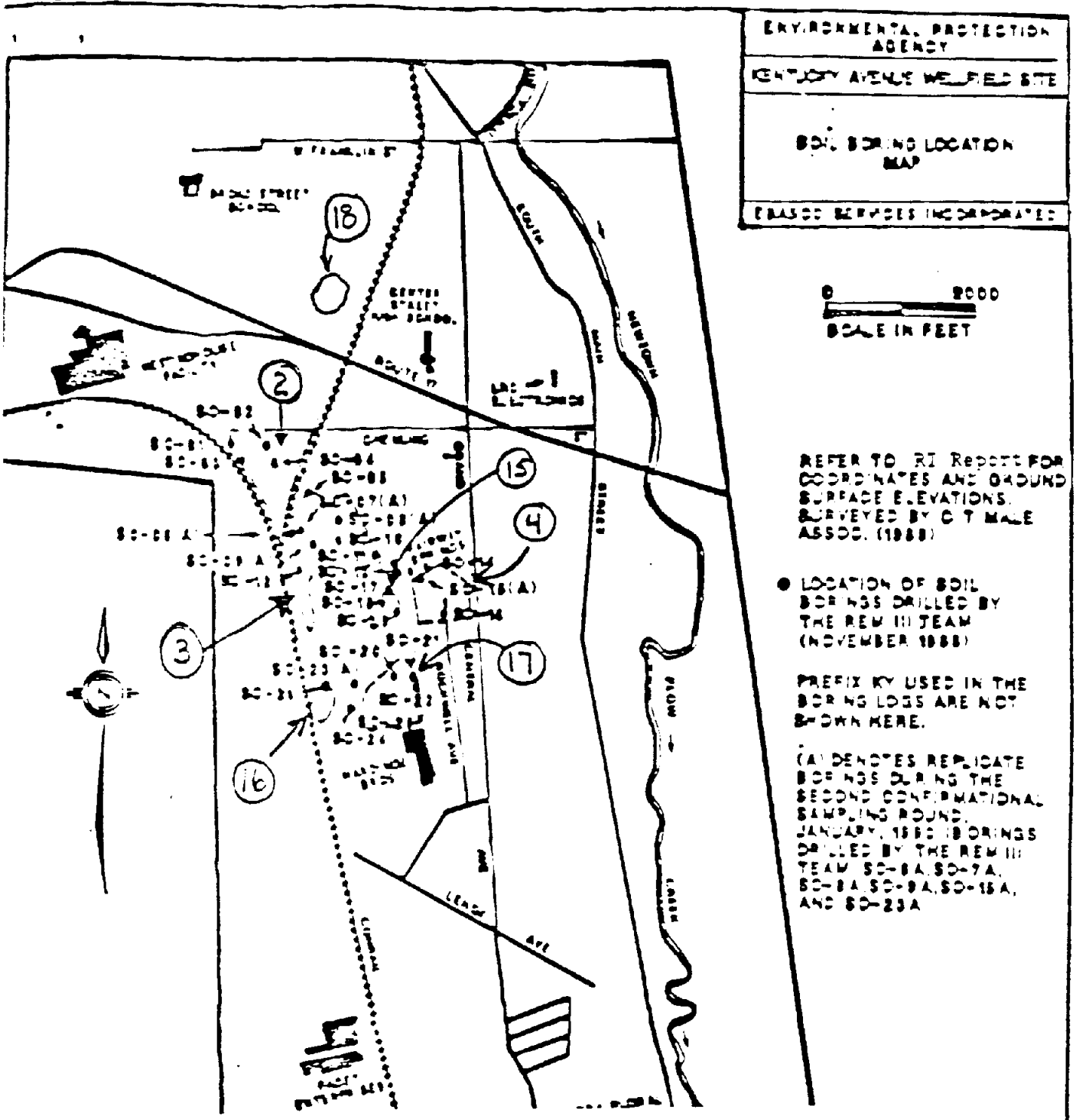

MAGNESIUM CHIP BURIAL AREA
MW-5D
(ND) MW-5S
MW-4 (ND)
(ND) MW-3D
MW-3S
COAL PILE AREA
NYS ROUTE 17
NYS ROUTE 14
MW-2D (ND)
MW-2S
SW-2
(8) MW-6
OW-1
SW-3
SW-4
SW-5
RUNOFF BASIN
MW-11
(14)
FLUORIDE DISPOSAL AREAS
SW-1
MW-7D (20)
MW-7S
50
100
150
200
WESTINGHOUSE PLANT
PS-4
DISPOSAL AREA F
MW-1S (11)
MW-1D
(210) MW-10
MW-9S
MW-9D
CONRAIL RAILROAD
MW-8S
(82) MW-8D
PIGG ROAD
LEGEND:
SURFACE WATER SAMPLE
ON-SITE SUPPLY WELL
ON-SITE MONITORING WELL (S-SHALLOW, D-DEEP)
DAMES & MOORE BORING (APPROXIMATE)
(11) TCE CONCENTRATION (ppb) IN GROUND WATER, MARCH, 1988 (DESIGNATED AS ND WHERE NOT DETECTED)
100 TCE CONCENTRATION ISOPLETH (ppb)
REPRODUCED FROM: GAI (1988), FIGURE 18
0 100 200 300 400
FEET
U.S. ENVIRONMENTAL PROTECTION AGENCY
KENTUCKY AVENUE WELLFIELD SITE
TRICHLOROETHYLENE (TCE) DISTRIBUTION IN UPPER PORTION OF OUTWASH AQUIFER IN THE WESTINGHOUSE (STD PLANT AREA

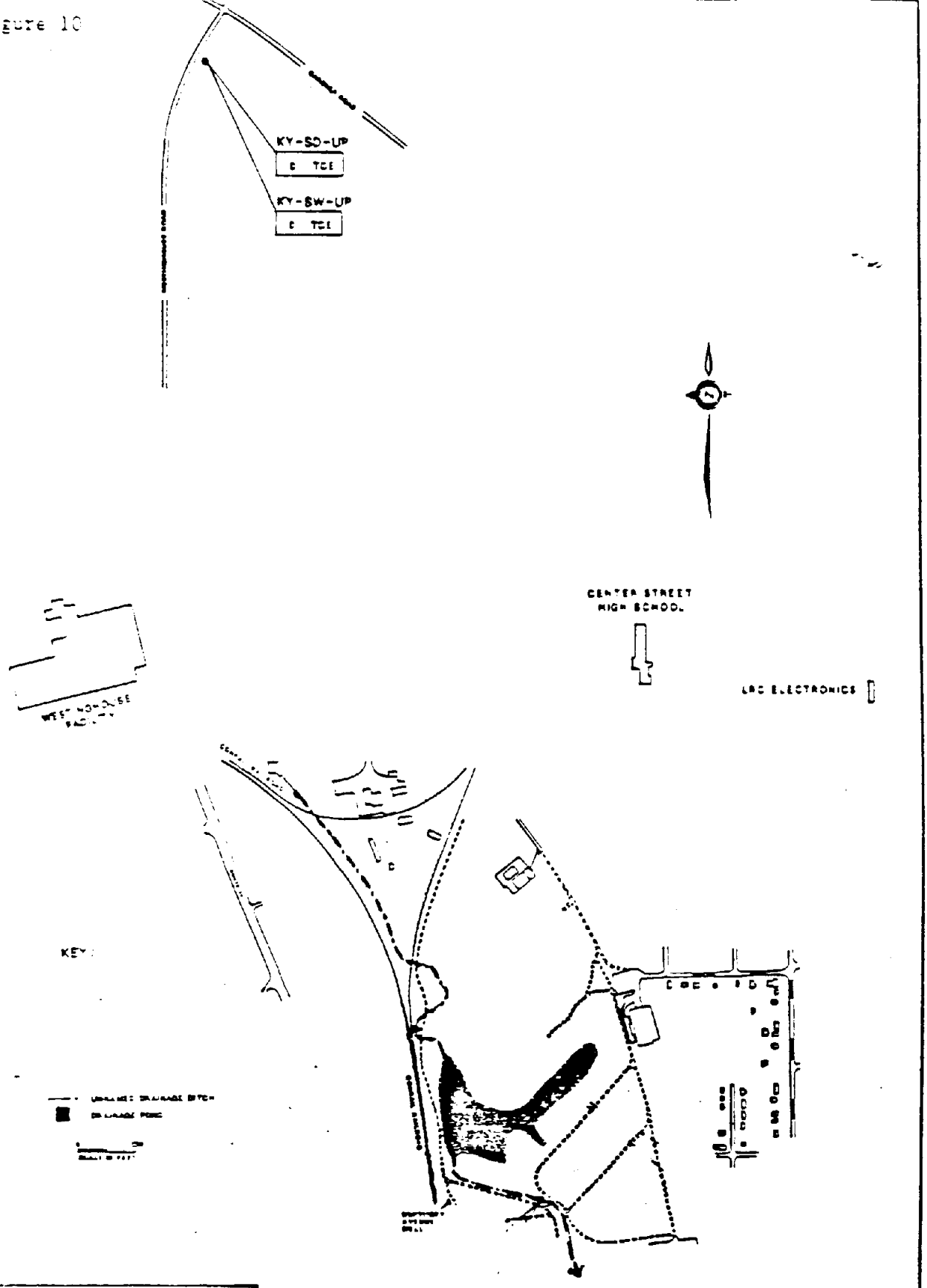
Figure 6



Areas investigated by EPA during the Supplemental RI

2. - Shelburg County Department of Highways Garage
3. - Old Horseheads Landfill
4. - Sand and Gravel Pit
15.- Koppers Company Disposal Area
16.- Koppers Company Lagoon Area
17. - Koppers Company Storage Area
18. - Fill Area

Figure 10

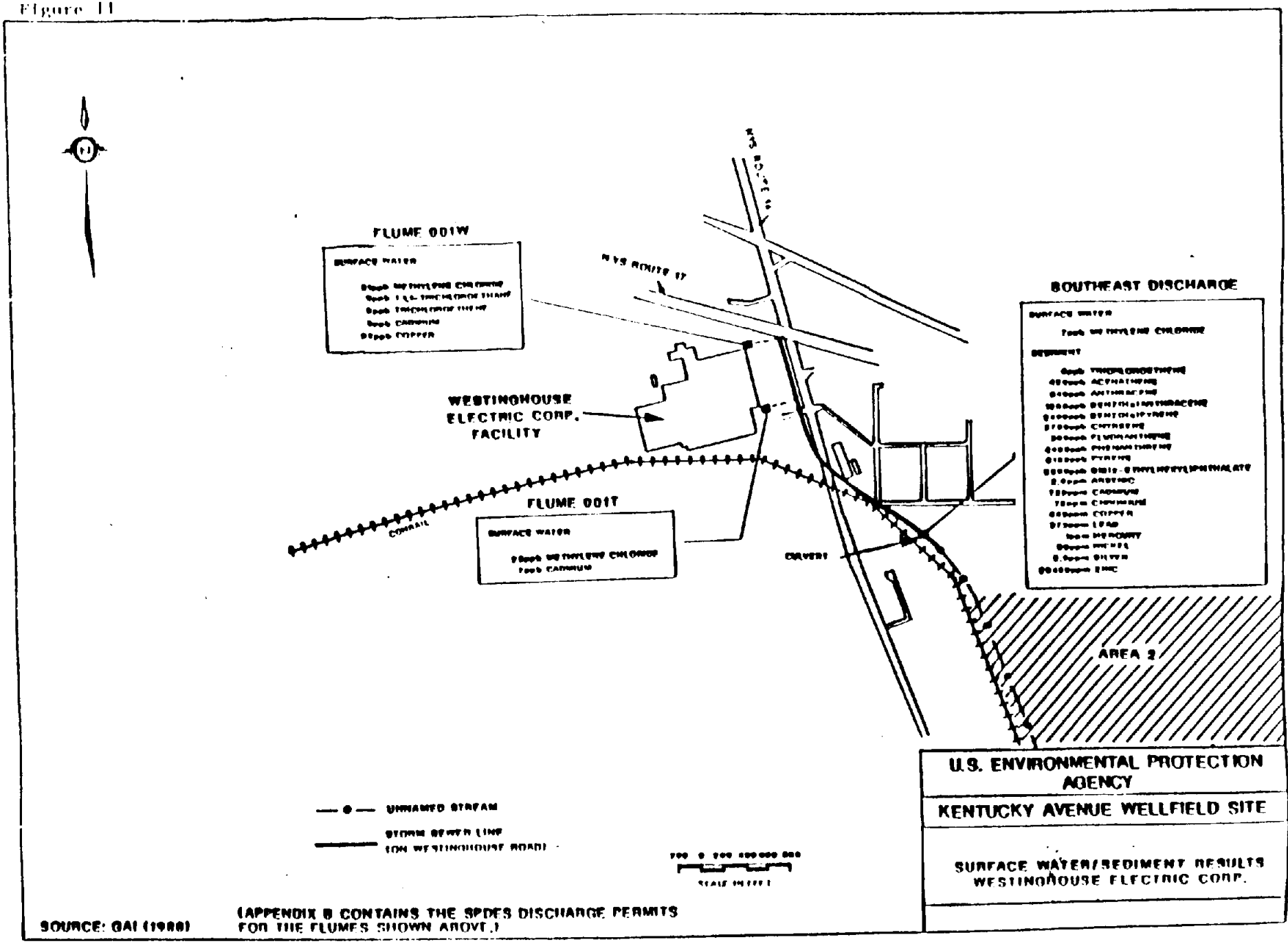


U.S. ENVIRONMENTAL PROTECTION AGENCY

KENTUCKY AVENUE WELLFIELD SITE

SURFACE WATER SEDIMENT RESULTS-
ORGANIC
FIRST CONFIRMATIONAL SAMPLING ROUND
(MAY 1986)

Figure 11

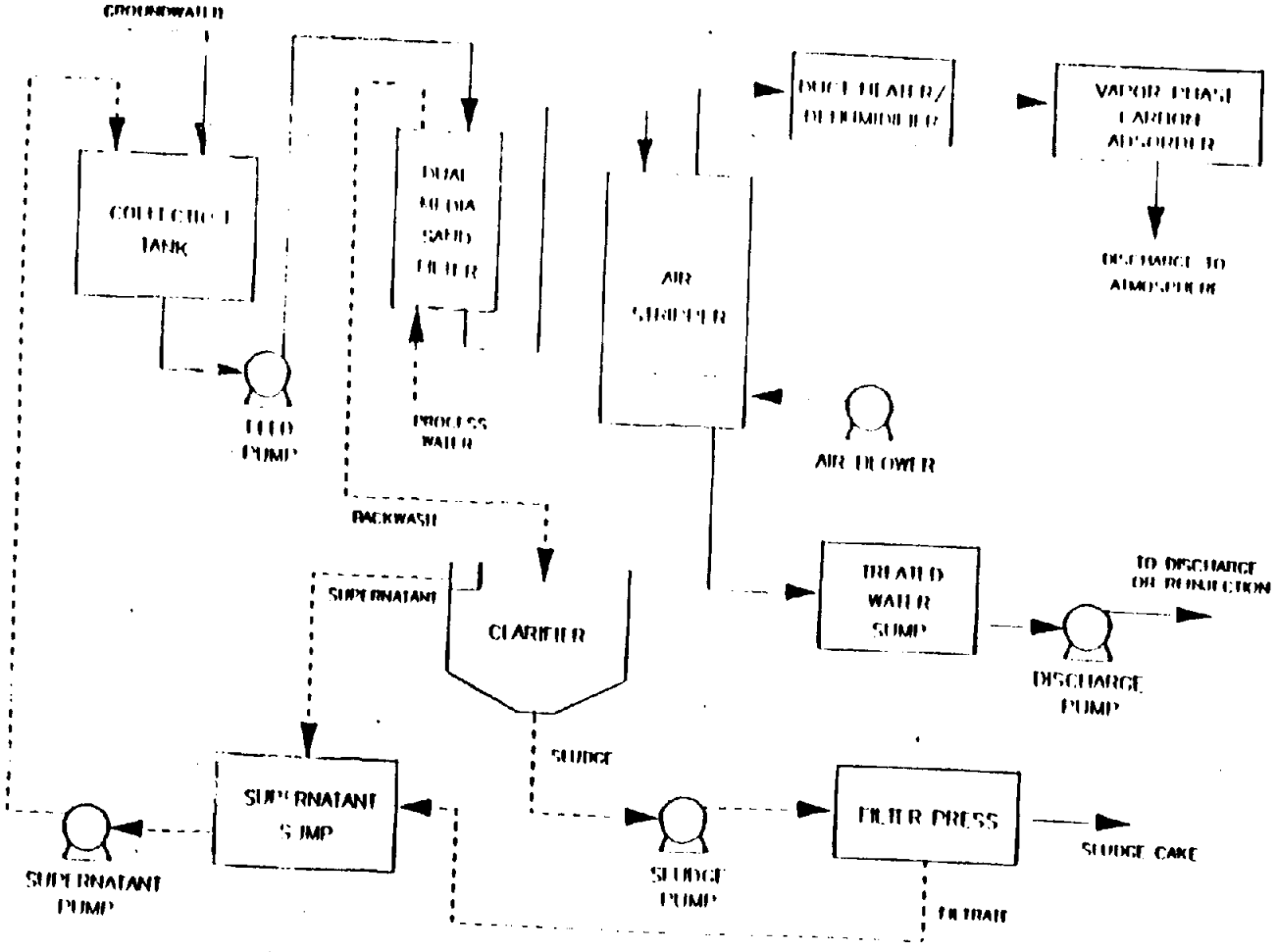


SOURCE: GAI (1988)

(APPENDIX B CONTAINS THE SPDES DISCHARGE PERMITS FOR THE FLUMES SHOWN ABOVE.)

Figure 12

GROUNDWATER TREATMENT PROCESS USING AN AIR STRIPPER



APPENDIX 3

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

SEP 2 7 1990

Mr. Richard L. Caspe, P.E.
Director, Emergency and Remedial
Response Division
U.S. Environmental Protection Agency
26 Federal Plaza
Room 737
New York, New York 10278

Re: Kentucky Avenue Wellfield Site, Chemung County,
Site No. 808012, Record of Decision

Dear Mr. Caspe:

The purpose of this letter is to confirm the New York State Department of Environmental Conservation's concurrence with USEPA's Record of Decision (ROD) for the Kentucky Avenue Wellfield NPL site in Horseheads, New York. The selected interim remedial measure will restore an important public water supply and will make some progress in restoring the Newtown Creek Aquifer.

As mentioned in the ROD, the problem of sediment contamination in the unnamed drainageway and pond near the Old Horseheads Landfill remains unaddressed by this interim remedial measure. The NYSDEC fully supports USEPA's efforts to include evaluation of this problem in the upcoming investigation of the Westinghouse facility.

The NYSDEC also has concerns about New York State potentially assuming the operations and maintenance expenses of the groundwater treatment system. It is requested that strong efforts be made by EPA to have the responsible party assume this expense.

Sincerely,

Edward O. Sullivan
Deputy Commissioner

GC/kk

TOTAL P.02

APPENDIX 4

FINAL RESPONSIVENESS SUMMARY
KENTUCKY AVENUE WELLFIELD SITE
CHEMUNG COUNTY, NEW YORK

SEPTEMBER 1990

FINAL RESPONSIVENESS SUMMARY
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FINAL RESPONSIVENESS SUMMARY
KENTUCKY AVENUE WELLFIELD SITE
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This Final Responsiveness Summary provides a summary of citizen's comments and concerns, and the U.S. Environmental Protection Agency's (EPA) responses to those comments and concerns, related to the Supplemental Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan for cleaning up and minimizing migration of contaminated ground water associated with the Kentucky Avenue Wellfield Superfund site ("the Site") in Chemung County, New York. All comments received during the designated public comment period and summarized in this document will be considered in EPA's final selection of the remedial alternative(s) for cleanup of the Site.

EPA held a public comment period from July 21, 1990 through September 18, 1990 for interested parties to comment on the Supplemental RI/FS and Proposed Plan. Although the public comment period was originally scheduled to end on August 19, 1990, EPA extended it to September 18, 1990 at the request of an interested party.

During the public comment period, EPA held a public meeting to present the results of the Supplemental RI, describe the remedial alternatives evaluated in the Supplemental FS, and to present EPA's and the New York State Department of Environmental Conservation's (NYSDEC) Proposed Plan for cleaning up the Site. The meeting was held on August 1, 1990 in the Town of Horseheads Town Hall, Town of Horseheads, New York.

In general, public comment during the public meeting was positive as evidenced by the lack of criticism for EPA's Proposed Plan and public encouragement to expedite cleanup of the Site. There was some concern, however, about the health and safety of residents growing vegetable gardens in the site area. Several residents were also concerned about trace contamination detected in the Sullivan Street Well and how long it would take to design and construct an extraction and treatment system at the Sullivan Street Well. In addition, residents expressed concern about the length of time that the cleanup process has taken in the past, and the length of time the proposed cleanup would take. Residents said that they want all cleanup activities to be implemented on an expedited basis. Additionally, a resident expressed concern about contamination found in the Old Horseheads Landfill, and has witnessed drums being dumped at the landfill in the past. Several residents expressed interest in the investigations being conducted at the Westinghouse Corporation, LRC Electronics, Inc. and Facet Industries facilities.

This Responsiveness Summary is organized into three sections and appendices; each of these sections is described briefly below:

I. RESPONSIVENESS SUMMARY OVERVIEW
This section briefly describes the background of the Site and outlines the proposed remedial alternatives for the Site.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS
This section provides a brief history of community interest and concerns regarding the Site.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES
This section summarizes comments submitted to EPA by citizens at the public meeting during the public comment period, and EPA's responses to these comments.

APPENDICES

There are seven appendices attached to this document. They are as follows:

APPENDIX A: Proposed Plan;

APPENDIX B: Public Notice which appeared in the Elmira Star-Gazette on July 21, 1990 to inform the local community about the public meeting held at the Town of Horseheads Town Hall, Town of Horseheads, New York, on August 1, 1990;

APPENDIX C: Public Meeting Agenda;

APPENDIX D: Public Meeting Sign-In Sheets;

APPENDIX E: A list of information repositories which contain technical and informational documents pertaining to the Site;

APPENDIX F: Written comments from the general public and Elmira Water Board, and EPA's responses; and

APPENDIX G: Written comments from Westinghouse Corporation and EPA's responses.

I. RESPONSIVENESS SUMMARY OVERVIEW

A. SITE DESCRIPTION

The Kentucky Avenue Wellfield is located in the Town of Horseheads in Chemung County, New York. The Kentucky Avenue Well is located east of New York (NY) Route 14 and approximately one mile south of the intersection of NY Routes 14 and 17. The Site includes the wellfield, the contaminated ground water plume, and the source areas. A site map can be found in the Proposed Plan, which is attached as Appendix A.

The Kentucky Avenue Wellfield consists of three test wells and one production well (the Kentucky Avenue Well) and overlies its source, the Newtown Creek Aquifer. The Kentucky Avenue Well, part of the Elmira Water Board (EWB) public water supply system, was constructed in 1962 to provide a 1.0 million gallon per day water supply to a food processing plant which has since closed. In 1980, the Kentucky Avenue Well was closed due to trichloroethylene (TCE) contamination.

B. SITE ACTIVITIES

The Site was placed on the National Priorities List (NPL) in September 1983 as a result of investigations by the New York State Department of Health (NYSDOH) and the Chemung County Health Department (CCHD) which found TCE contamination in the Kentucky Avenue Well and the wells of several residences and commercial facilities. The results of subsequent residential well sampling by EPA, NYSDEC and CCHD detected the presence of TCE, other volatile organic compounds (VOCs) and inorganic compounds. Subsequently, EPA connected 49 residential homes with private drinking water wells to the public water supply.

In 1985, EPA funded and NYSDEC conducted an RI/FS at the Site in order to identify the extent of the ground water contamination in the Newtown Creek Aquifer. Based on the results of the RI/FS and consideration of public comments and community concerns, EPA signed a Record of Decision (ROD) on September 30, 1986.

As a result of the 1986 ROD, 44 additional residences have been connected to a public water supply and two residences have refused connection. In addition, EPA entered into a cooperative agreement with NYSDEC to install strategically-placed monitoring wells upgradient of the Sullivan Street Well, another public water supply providing approximately 30% of the water supply to EWB. In 1988, samples from the Sullivan Street Well revealed TCE concentrations above 5 parts per billion (ppb), the maximum contaminant level permitted in a public water supply. Subsequently, EPA published an Explanation of Significant Difference announcing an additional remedial action to be undertaken at the Site, namely the design and construction of an

air stripper at the Sullivan Street Well.

Additionally, the 1986 ROD called for a supplemental source control RI/FS (Draft Supplemental RI/FS) to identify sources of contamination and to determine which, if any, source control measures would be feasible. This Draft Supplemental RI/FS was completed in July 1990.

The results of EPA's Draft Supplemental RI/FS activities indicated the following contamination problems:

- Ground water contamination within the Newtown Creek Aquifer is widespread and extends well beyond the Kentucky Avenue Wellfield. The ground water is contaminated with TCE and inorganic compounds. The most widespread contaminant detected in the ground water is TCE.

- The Westinghouse Corporation facility, Facet Enterprises facility and LRC Electronics, Inc. facility are all contributory sources to the ground water contamination.

- Chemical analysis of soil and ground water samples collected from six other potential source areas indicate that these areas do not contribute to the ground water contamination.

- Accumulation of heavy metals has occurred in the drainageway south of the Westinghouse Corporation property.

- Elevated levels of TCE and 1,1,1-trichloroethane (1,1,1-TCA) were detected in a monitoring well at the Horseheads Automotive Junkyard, and elevated chromium levels were detected in the ground water located between the Horseheads Automotive Junkyard and the Westinghouse facility.

- Elevated levels of polychlorinated biphenyls (PCBs) were found in the soil beneath the Old Horseheads Landfill.

C. SUMMARY OF PREFERRED REMEDIAL ALTERNATIVES

EPA's selection for cleanup of the Site will be based on the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA). These regulations require that a selected site remedy be protective of human health and the environment, cost effective and in accordance with other statutory requirements. Current EPA policy also emphasizes permanent solutions incorporating on-site remediation of hazardous waste contamination whenever possible. Final selection of a remedial alternative(s) will be documented in the ROD only after consideration of all comments received by the EPA during the public comment period are addressed in this Responsiveness Summary. The remedial alternatives evaluated in the FS are summarized in the Proposed Plan attached as Appendix A of this document.

The goal of this interim remedial action is to restore the Kentucky Avenue Well and to halt the spread of ground water contamination within the Newtown Creek Aquifer. Also, this action will permit the collection of data on aquifer and contaminant response to remediation measures. After careful consideration of all reasonable alternatives and the evaluation criteria, EPA recommends both alternatives described below.

Management of Migration (MOM) - 2B
Pumping Kentucky Avenue Well/Filtration/Air Stripping/Discharge to the Drinking Water Supply

Construction Period:	2 yrs.
Implementation Period:	30 yrs.
Capital Costs:	$1,089,000
Annual Operation and Maintenance (O&M) Costs:	$550,000 (30 yrs)
Present Worth Cost:	$9,100,000[1]

[1] Present Worth is the amount of money EPA would have to invest now at a discount rate of 5% interest in order to have the appropriate funds available at the time the remedial action is implemented.

MOM - 5A
Pumping Downgradient of Westinghouse Facility/Filtration/Air Stripping/Discharge to Either Public Water Supply or Surface Water

Construction Period:	2 yrs.
Implementation Period:	30 yrs. for affected area 53 yrs. for complete remediation downgradient of extraction by natural attenuation
Capital Costs:	$840,000
O&M Costs:	$356,000 (30 yrs.)
Present Worth Cost:	$5,800,000

These alternatives involve extracting, or pumping, the ground water; filtering it to remove metals in suspended solids; treating the water to remove VOCs; and discharging the water to the public water supply or to surface water. Well extraction, or collection systems, may consist of a line or circle of wells placed around the contaminated area or in the direction of contaminated ground water flow. The well system limits migration by pumping. Pumping delivers the ground water to the surface where it is treated to remove contaminants. The proposed treatment system is air stripping, which removes, or "strips" VOCs from contaminated ground water or surface water by forcing an air stream through the water and causing the compounds to evaporate.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Community awareness of the contamination in the Horseheads area began as a result of newspaper articles describing the well sampling program conducted by NYSDOH in 1980. Residents were further informed about the contamination when the CCHD sent letters to residents in the affected area that described the result of its sampling program. The CCHD letters made recommendations for each residence based on the level of contamination found in the residential wells. These recommendations included connections to the public water supply if contamination levels exceeded NYSDOH ground water quality guidelines, or, remaining on residential wells if contamination levels were below these guidelines. The CCHD letter also provided information on public health risks from consumption and use of the residential wells.

Community concern about health effects from contaminated residential wells increased as a result of the CCHD letters and several residents in the affected area made connections to the public water supplies based on CCHD recommendations. Subsequently, concerns dissipated to a low level because

residents felt that the connections had resolved the contamination problems.

On September 17, 1986, EPA held a public meeting in the Town of Horseheads to discuss the findings and recommendations based on the 1986 RI/FS. Approximately 20 residents attended that meeting. Concerns raised at the meeting included reimbursements for the connections made by residents, the future use of the Kentucky Avenue Well, whether or not future sampling and monitoring would be conducted in the area, and identification of contamination sources. Public comments and questions received during the meeting and three week public comment period were included and considered in EPA's 1986 ROD.

Community concerns have also been expressed by several residents over the last few years who have written letters and made phone calls to EPA, NYSDEC and local officials.

III. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES

Comments raised at the public meeting during the public comment period for the Site and EPA's responses to them are summarized below. EPA announced the commencement of the public comment period in a public notice which was printed in the Elmira Star-Gazette newspaper on July 21, 1990. The public comment period was held from July 21, 1990 through September 18, 1990 to receive comments from the public on EPA's Draft Supplemental RI/FS and Proposed Plan for the Site. The comments received by EPA during the public meeting are organized into the following categories:

A. Health and Safety;
B. Draft Supplemental Remedial Investigation;
C. Contamination Problem at Sullivan Street Well;
D. EPA's Proposed Plan;
E. Investigation at Old Horseheads Landfill;
F. Investigation at LRC Electronics, Inc. Facility; and
G. Proposed Cleanup Schedule.

Additional written questions, comments and concerns received during the public comment period, and EPA's responses, are attached as Appendices F and G.

A. HEALTH AND SAFETY

Comment: A representative from the CCHD commented that EPA said if anyone present at the meeting knew of a resident in the Site area who was not hooked up to the public water supply should encourage the resident to do so. The representative asked whether or not the map in the Proposed Plan outlines the area in question. He commented that the map in the Proposed Plan extends

farther than was originally surveyed.

EPA Response: Yes, the map in the Proposed Plan is the one that EPA is referring to when it encourages residents in the Site area to switch to the public water supply.

Comment: A resident asked if there was any possibility of ingesting contaminants by eating vegetables grown in the soil.

EPA Response: The contaminated ground water away from source areas is believed to be too deep below the ground surface to be the water supply for vegetation. Therefore, the ground water is not contaminating vegetable gardens. Based on the results of EPA's Risk Assessment, an analysis conducted to estimate the health or environmental problems that could result if the ground water contamination at the Site was not cleaned up, the risks at the Site are from drinking untreated ground water. For that reason, EPA encourages anyone in the area who has a private well to switch to the public water supply.

Comment: A resident commented that EPA had also found organic compounds in the soil and ground water. The resident asked if EPA had considered the toxic effects of metal uptake through the ground water or through gardens growing in contaminated soil.

EPA Response: EPA responded that yes, it did consider the effects of contamination by heavy metals in ground water and has proposed the construction of a filtration plant to eliminate the metals from the ground water as part of the Proposed Plan.

Similarly, there is no risk of metal uptake from the soil by vegetable gardens because the contaminated soils are located in the industrial sites, not in residential areas.

B. DRAFT SUPPLEMENTAL REMEDIAL INVESTIGATION

Comment: A resident asked how far below the surface the ground water was, and what was the deepest monitoring well that EPA sampled from.

EPA Response: EPA responded that the data it collected during the RI indicates that the ground water is approximately 15-25 feet below the ground surface. The monitoring wells installed to sample ground water varied in depth, ranging from shallow wells of 15-20 feet, to deeper wells of 30-40 feet, to very deep wells of 60-70 feet below the ground surface.

Comment: A resident asked whether EPA had analyzed the age of the material found at the Westinghouse permitted discharge outfalls.

EPA Response: EPA responded that no, it did not analyze the age of the material found at the Westinghouse permitted discharge outfalls.

Comment: A representative of the EWB asked if there were any investigations being conducted at the Westinghouse Corporation facility.

EPA Response: EPA responded that the Westinghouse Corporation facility is undergoing an investigation under a different federal authority. This investigation will be completed and the findings will be made public within two years.

Comment: A resident asked if EPA had conducted soil sampling in residential neighborhoods.

EPA Response: EPA answered that no, it did not conduct soil sampling in residential neighborhoods. After carefully considering area photographs and past practices in the Town of Horseheads area, EPA found no indication that industrial or disposal activity had occurred in the residential neighborhoods. EPA focused the sampling on areas where industrial or disposal activity may have occurred in the past.

C. CONTAMINATION PROBLEM AT SULLIVAN STREET WELL

Comment: A resident asked how this Draft Supplemental RI/FS and Proposed Plan related to the contamination found at the Sullivan Street Well. Also, the commentor asked if Facet Industries could potentially be contributing to the contamination at the Sullivan Street Well, especially in light of the fact that it is located downstream of the Kentucky Avenue Wellfield but upstream of the Sullivan Street Well. The commentor also asked how long it would take to implement the Proposed Plan for the Site.

EPA Response: EPA explained that it has committed to building an air stripper at the Sullivan Street Well to reduce the contamination level to below federal and state mandated drinking water levels. This difference from the original remedy selected in the 1986 ROD was announced to the public via an Explanation of Significant Difference which was published in the Elmira Star-Gazette on April 20, 23 and 24, 1990. Presently, EPA is in the process of procuring funds and resources to design and build the treatment system.

With regard to the Facet Industries, Inc. facility, Facet is conducting an ongoing RI/FS on their site under EPA's oversight. The results of that study should indicate to what extent Facet Industries, Inc. is contributing to the contamination of the Newtown Creek Aquifer.

As for the Proposed Plan for the Site, the remedial design and remedial action will take approximately three years to design and construct the treatment system, and thirty years for the actual remediation effort.

Comment: A representative from the EWB asked for the status of installing an air stripper at the Sullivan Street Well, and whether there was any possibility of 1991 being a target date for implementation of the air stripper.

EPA Response: EPA explained that it is working on obtaining funding for the air stripping system at the Sullivan Street Well. Once funding has been approved, EPA believes that it can design and construct the air stripper, with the help of the EWB, in approximately six weeks, and construct it in approximately three months. If funding and contractual requirements proceed without difficulty, it may be possible to construct the air stripper during 1991.

D. EPA'S PROPOSED PLAN

Comment: A representative of the EWB asked for the pumping rate of the proposed extraction and treatment system for the Site.

EPA Response: The proposed extraction and treatment system for the Site has a total pumping rate of approximately 140 gallons per minute. This is in addition to 700 gpm proposed for the Kentucky Avenue Well.

Comment: A representative of the EWB commented that the Proposed Plan mentioned a few alternatives for discharge of the treated water, one being discharge to the public water supply. The commentor asked for the status of that discharge method and which water system would the treated ground water potentially be discharged to--the Village of Horseheads water system or EWB's?

EPA Response: EPA responded that as part of the current public comment period to solicit public comment on the Proposed Plan, public comment on the discharge alternatives was being sought. EPA is proposing to discharge the treated ground water into the public water supply because it believes that the extraction and treatment system described in the Proposed Plan can effectively treat ground water to drinking water standards. Ground water

extraction, filtration and air stripping technologies are commercially available and have been successfully implemented at numerous other Superfund sites.

If the treated ground water is discharged to the public water supply, it would be discharged to the EWB system.

E. INVESTIGATION AT OLD HORSEHEADS LANDFILL

Comment: A resident commented that he lives close to the landfill and has often witnessed sealed barrels of liquid being dumped at the Old Horseheads Landfill. He asked if those barrels will be excavated and removed.

EPA Response: EPA reiterated that the focus of this Draft Supplemental RI was to determine the nature and extent of contamination at the Site and to identify the primary sources of ground water contamination in the Newtown Creek Aquifer, where possible. Therefore, a full characterization of the entire site to determine all potential contamination problems other than those contributing to the ground water contamination, was not conducted. EPA has given all information that it gathered related to the Old Horseheads Landfill to NYSDEC.

NYSDEC Response to the same comment: NYSDEC elaborated that there will be a Phase II RI at the Old Horseheads Landfill. Currently, NYSDEC is gathering information about past site practices at the landfill and would be interested in any information that residents may have. [The representatives from NYSDEC took the resident's name and phone number after the public meeting for future reference]

Comment: A resident commented that he was concerned about the ability of the investigation and cleanup project at the Old Horseheads Landfill to be implemented in a timely manner.

NYSDEC Response: NYSDEC responded that a Phase II RI on the Old Horseheads Landfill would probably begin in a year. If the town wishes to initiate the investigation themselves, they should contact NYSDEC, Division of Hazardous Waste Remediation, to make those arrangements.

F. INVESTIGATION AT LRC ELECTRONICS, INC. FACILITY

Comment: A resident asked if EPA had ever sampled in the vicinity of the Agway facility when sampling the LRC Electronics, Inc. site.

NYSDEC Response: NYSDEC explained that it is overseeing the investigation at the LRC Electronics, Inc. facility. To date, there has been limited sampling of existing wells, and some monitoring wells have been installed in the vicinity of Agway. Additional monitoring wells will be installed in the next few months. The contamination found to date at the LRC Electronics, Inc. site is relatively low-level. However, the investigation is ongoing to fully characterize that area.

Comment: A resident asked if NYSDEC had conducted any water sampling at the high school to see if that area is contaminated.

NYSDEC Response: NYSDEC responded that no, it has not sampled the water at the high school because the upgradient wells at the LRC Electronics, Inc. site are clean, and the school is located much further upgradient than the wells. The contamination problem appears to be in the immediate area south and east of the LRC Electronics, Inc. facility.

G. PROPOSED CLEANUP SCHEDULE

Comment: A resident commented that EPA should expedite the cleanup of the Kentucky Avenue Wellfield with the highest speed. The resident explained that the dearest thing that people have is water, and people cannot afford to lose it or waste it.

EPA Response: EPA recognizes this concern and within the constraints of its regulations, intends to proceed with implementing the selected remediation plan.

APPENDICES

APPENDIX A: Proposed Plan

Superfund Proposed Plan

Kentucky Avenue Wellfield Site

Chemung County, New York

EPA

Region 2 — July 1990

ANNOUNCEMENT OF THE PROPOSED PLAN

This Proposed Plan identifies the U.S. Environmental Protection Agency's (EPA's) preferred alternative for cleaning up and minimizing migration of contaminated groundwater associated with the Kentucky Avenue Wellfield Superfund site (the Site) located in Chemung County, New York.

COMMUNITY ROLE IN THE SELECTION PROCESS

This Proposed Plan is being distributed to solicit public comments regarding EPA's preferred alternative as well as the other alternatives which are being considered to clean up the Site. The public comment period will begin on July 21, 1990 and continue until August 19, 1990.

EPA, in consultation with the New York State Department of Environmental Conservation (NYSDEC), will select a remedy for the Site only after the close of the public comment period, during which time the available information may be reviewed and considered by the public.

EPA is issuing this Proposed Plan as part of its public participation responsibilities under section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, better known as Superfund. Detailed information on all of the material discussed here may be found in the April 1990 Supplemental Remedial Investigation (RI) report, the April 1990 Draft Feasibility Study (FS) report, and other documents contained in the record file for this Site. The record file can be found at the following information repositories:

New York State Department of
Environmental Conservation
Region 8 Headquarters
6274 East Avon-Lima Road
Avon, New York 14414
Phone: (716) 226-2246
Hours: M-F, 8:30-4:45 p.m.

Town of Horseheads Town Hall
150 Wygant Road
Horseheads, New York 14841
Phone: (607) 739-8783
Hours: M-F, 8:30-4:30 p.m.

EPA, in consultation with NYSDEC, may modify the preferred alternative or select another alternative presented in this Proposed Plan and the FS report based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives identified here.

A public meeting will be held at the Town of Horseheads Town Hall located at 150 Wygant Road in Horseheads, New York on August 1, 1990 at 7:30 p.m. to present both the findings of the RI and FS reports and the proposed remedy. EPA will also update the public on the implementation of the 1986 Record of Decision. All interested persons are encouraged to attend to ask questions and provide comments.

SUMMARY OF RATIONALE FOR THE RECOMMENDED ALTERNATIVE

The proposed remedy for the Site is protective of human health and the environment and affords a high degree of long-term effectiveness and permanence while utilizing treatment as the principal element. The proposed remedy would provide the affected community with potable water, remove contaminants from the upgradient groundwater, and prevent further contamination of downgradient groundwater. Cleanup levels in groundwater for the contaminants of concern would comply with the most stringent federal and state ARARs.

The proposed alternative provides the best balance among the alternatives with respect to the criteria used to evaluate the alternatives (Table 1). Moreover, this combination of alternatives would satisfy the statutory preference for remedies which use treatment as a principal element, and for permanent remedies. This combination of alternatives is also the lowest cost combination of alternatives which is protective of human health and the environment and utilizes highly effective treatment technologies as the principal element.

APPENDIX B: Public Notice which appeared in the Elmira Star-Gazette on July 21, 1990 to inform the local community about the public meeting held at the Town of Horseheads Town Hall, Town of Horseheads, New York, on August 1, 1990

The United States Environmental Protection Agency Invites Public Comment on the Proposed Cleanup of the Kentucky Avenue Wellfield Site in Town of Horseheads, Chemung County, New York

The U.S. Environmental Protection Agency (EPA) will hold a Public Meeting to discuss the Supplemental Remedial Investigation/Feasibility Study Report (RI/FS) and the Proposed Plan for the Kentucky Avenue Wellfield Site. The meeting will be held on August 1, 1990 at 7:30 p.m. in the Town of Horseheads Town Hall located at 150 Wygant Road, Horseheads, New York.

EPA and the New York State Department of Environmental Conservation (NYSDEC) evaluated the following options for addressing the contaminated groundwater at the site:

MOM-1 (Management of Migration) No Action

MOM-2A Water Use Restrictions/Permit Requirements

Pumping Kentucky Avenue Well/Filtration/

MOM-2B Air Stripping/Discharge to Drinking Water Supply
MOM-2C Carbon Adsorption/Discharge to Drinking Water Supply
MOM-2D UV-Ozone Oxidation/Discharge to Drinking Water Supply
MOM-2E Air Stripping/Downgradient Reinjection
MOM-2F Carbon Adsorption/Downgradient Reinjection
MOM-2G UV-Ozone Oxidation/Downgradient Reinjection

Pumping at the Southern Boundary of the Site/Filtration/

MOM-3A Air Stripping/Downgradient Reinjection
MOM-3B Carbon Adsorption/Downgradient Reinjection
MOM-3C UV-Ozone Oxidation/Downgradient Reinjection

Pumping at Two Locations/Filtration/

MOM-4A Air Stripping/Downgradient Reinjection
MOM-4B Carbon Adsorption/Downgradient Reinjection
MOM-4C UV-Ozone Oxidation/Downgradient Reinjection

Pumping at Downgradient of Westinghouse Facility/Filtration/

MOM-5A Air Stripping/Discharge to Surface Water/Public Supply
MOM-5B Carbon Adsorption/Discharge to Surface Water/Public Supply
MOM-5C UV-Ozone Oxidation/Discharge to Surface Water/Public Supply

Based on available information, the preferred alternative at this time is MOM-2B, Pumping Kentucky Avenue Well/Filtration/Air Stripping/Discharge to the Drinking Water Supply; and MOM-5A, Pumping Downgradient of Westinghouse Facility/Filtration/Air Stripping/Discharge to either the public water supply or to surface water. This proposed remedy would provide the community with portable water, remove contaminants from the upgradient groundwater and prevent further contamination of downgradient groundwater.

Although this is the preferred alternative at the present time, EPA and NYSDEC will choose the final remedy after the public comment period ends and may select any one of the alternatives after taking those comments into account.

The Proposed Plan, along with more detailed documentation of the analysis, may be found in the Supplemental RI/FS Report and other documents contained in the record file available in the information repositories at: NYSDEC Region 8 Headquarters, 6274 East Avon-Lima Road, Avon, New York 14414; and at the Town of Horseheads, Town Hall, 150 Wygant Road.

The public may comment in person at the public meeting and/or may submit written comments on the proposed alternatives through August 19, 1990 to:

J. Jeff Josephson
Remedial Project Manager
U.S Environmental Protection Agency
26 Federal Plaza, Room 747
New York, NY 10278

APPENDIX C: Public Meeting Agenda

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

AGENDA

Public Meeting
Kentucky Avenue Wellfield Superfund Site
Town of Horseheads Town Hall
Town of Horseheads, New York

August 1, 1990
7:30 p.m.

I.	Welcome and Introductions	Ann Rychlenski Public Affairs Specialist U.S. Environmental Protection Agency, Region II
II.	Site History and Overview of the Superfund Process	Kevin Lynch Chief, Western New York Compliance Section U.S. Environmental Protection Agency, Region II
III.	Results of the Remedial Investigation	Jeff Josephson Remedial Project Manager U.S. Environmental Protection Agency, Region II
IV.	Results of the Feasibility Study	K. Subburamu Site Manager Ebasco Services, Inc. (EPA's Contractor)
V.	EPA's Proposed Plan	Jeff Josephson
VI.	Questions and Answers	

Other EPA Participants

James Doyle, Esq.
Office of Regional Counsel
U.S. Environmental Protection Agency
Region II

APPENDIX D: Public Meeting Sign-in Sheets

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

KENTUCKY AVENUE WELLFIELD SUPERFUND SITE

Sign-In Sheet
August 1, 1990
Town of Horseheads, New York

Please be sure to print your name and address clearly so that we can add you to our mailing list:

Name	Address
[illegible]	279 Parnall St Edison, NJ 08837
[illegible]	355 E. Franklin ST Horseheads NY 14845
Robert J. Cox	193 Clair Blvd Hhds 14845
Joseph J Caparulo	153 Robinwood Ave Elmira 14903
[illegible]	312 W. Water St. Elmira 14905
Charles [illegible]	210 W. Center St Elmira NY 14901
[illegible]	[illegible] Horseheads
[illegible]	201 WALNUT ST. ELMIRA NY 14901
R B HOYLAND	1415 W. WATER St ELMIRA NY 14905
[illegible]	4162 Center St HHDS
Richard L. Munger	121 Oakwood Ave Elm Ht. 14903
Gardiner Cross	NYDEC 50 Wolf Rd Albany 12122
[illegible]	T. of Hhds [illegible] St Elmira 14901
Carmen Christie	[illegible] Elmira
Cynthia Hutchinson	Sayles, Evans 1 W. Church St. Elmira
Edward J. Lorenz, Jr.	Toshiba Display Devices, Inc. Horseheads, NY 14845
John F. Keefe IV	366 S. Hampton Rd Elmira NY 14904

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

KENTUCKY AVENUE WELLFIELD SUPERFUND SITE

Sign-In Sheet
August 1, 1990
Town of Horseheads, New York

Please be sure to print your name and address clearly so that we can add you to our mailing list:

Name		Address
KEVIN LYNCH	USEPA	26 FEDERAL PLZ NY/NY 10278
[illegible]	USEPA	26 Federal Plaza NY NY 10278
LYNN RYCHLENSKI	USEPA	26 FEDERAL PLAZA, N.Y. 10278
JEF JEFFISON	USEPA	26 Federal Plaza N.Y. 10278
Lee H. Younge	EMC	425-447 Pa. Ave. Elmira 14904
Vernal Swartout		101 Binns Elmira NY 14905
KEN CUMMER		3263 EASTERBROOK DR 14845
Ed Mendess		103 Florida Dr. New Stanton PA 15672
Kenneth Bohrer		530 Perkins Ave. Horseheads
Andi Levin	NYSDEC	6274 East Avon-Lima Road Avon, N.Y. 14414
Jim Matteson		206 Pine Forest Horseheads NY 14845
Teresa McKinley	Fagan Engr.	113 E Chemung Pl. Elmira NY 14904
Dennis Fagan	" "	" "
Ed Thorne		[illegible]
Dominic M. Caringe		261 W. Water St Elmira.
Howard Phillips		3210 Goff Rd. 14845.
James Barr	Chemung Co Health Dept	Elmira

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

KENTUCKY AVENUE WELLFIELD SUPERFUND SITE

Sign-In Sheet
August 1, 1990
Town of Horseheads, New York

Please be sure to print your name and address clearly so that we can add you to our mailing list:

Name	Address
[illegible]	[illegible]
[illegible]	[illegible]

APPENDIX E: Information Repositories which contain technical and informational documents pertaining to the site.

ELMIRA WATER BOARD

RUTH G. MURRAY
President
ROBERT I. PERSONIUS
Vice-President
ROBERT W. APPLEBY
Secretary-Treasurer
L. EDWARD CONSIDINE, P.E.
General Manager

261 WEST WATER STREET
P. O. Box 267
ELMIRA, NEW YORK 14902
(607) 733-9179
FAX (607) 733-2225

August 14, 1990

Mr. Jeff Josephson
Remedial Project Manager
U.S.E.P.A.
26 Federal Plaza, Room 747
New York, NY 10278

Re: U.S.E.P.A. Superfund Proposed Plan
Kentucky Avenue Wellfield Site
Chemung County, New York

Dear Mr. Josephson:

The above referenced indicates that the ultimate goal of the E.P.A.'s Superfund Program is to return useable groundwaters to their beneficial uses within a time frame that is reasonable. The above referenced further states that the final remediation goals for the Newtown Creek aquifer will be drinking water standards. The Elmira Water Board is pleased to know that the Newtown Creek aquifer will be restored as a drinking water source of supply.

The Elmira Water Board has, over the past many years, drilled more than forty (40) test wells in various parts of its service area. The test wells were used to provide hydrogeological data to support groundwater development in Chemung County. The hydrogeological data mentioned above are on file at the Elmira Water Board. The data indicate that the Newtown Creek aquifer is the best water supply aquifer in the Elmira Water Board service area. The Elmira Water Board's long range plans included and, indeed depended upon, high water production yields from the Newtown Creek aquifer. These long range plans were decimated by the groundwater contamination problems which became evident in the early 1980's.

The above referenced plan gives the Elmira Water Board reason to believe that they can once again plan on using the Newtown Creek aquifer and its thick clean gravel deposits as a groundwater source of supply.

U.S.E.P.A.
Mr. Jeff Josephson

The Elmira Water Board believes the proposed plan for the Kentucky Avenue wellfield site and the Newtown Creek aquifer is practical and beneficial to Chemung County.

The Elmira Water Board offers its support in whatever way possible to assist in the restoration of the Newtown Creek aquifer as a potable groundwater source of supply.

Thank you for allowing the Elmira Water Board the opportunity to comment.

Respectfully submitted,

ELMIRA WATER BOARD

L. Edward Considine, P.E.
General Manager

LEC cs

Response to Comments
Kentucky Avenue Wellfield Site
Chemung County, New York

The following summarizes the comments received by EPA from the general public, the Elmira Water Board, and the New York State Department of Health and provides EPA's response to these comments.

Response to comments Submitted by Ms. Barbara Gilman-Ottey

Ms. Gilman-Ottey commented that she agrees with the proposed remedial action at the Kentucky Avenue Wellfield site but that she did not feel that tax payers should have to pay for the aquifer cleanup and the restoration of the Kentucky Avenue Well.

EPA Response: EPA does not consider who will pay for the selected remedial action during our evaluation of all of the remedial alternatives. After final selection of the remedial alternative EPA reviews the possible options for funding the remedial action including funding provided by Superfund and funding by responsible parties. In accordance with EPA Administrator Riely's 90-day Management Study, it is currently EPA's policy to proceed with an "enforcement first" approach for funding remedial action.

Response to Comments Submitted by Purolator (formally Facet Enterprises, Inc.)

Purolator commented that the Supplemental RI/FS was generally accurate, and that they support the proposed plan.

Section 1.3.1, Page 1-14 - RI
Purolator indicates that they have changed their process at the Elmira Plant and that they are negotiating to modify their SPDES permit referenced in the Supplemental RI.

EPA Response: EPA acknowledges this comment.

Section 6.8, Page 6-114 - RI
Purolator recommends that data to support the assessment that volatiles from ground water may present a health risk in basements due to volatilization through cracks be collected.

EPA Response: EPA will consider if an air pathway analysis is necessary during design phase of the remedial action. In addition, air pathway analysis will be considered at each facility undergoing a Remedial Investigation.

Section 4.0, Inclusive - RI Organization
Purolator commented that there are several inconsistencies between text, figures, and tables in Chapter 4.0 of the RI report.

EPA Response: We apologize for any confusion this may cause.

Response to Comments Submitted by Mr. Reeve B. Howland

Mr. Howland commented that the following errors in the text were made:

3.5.2 river (should be Newtown Creek)

Figure 3-8 13-8 13-Horseshoe Landfill (this should be Horseheads Landfill)

4.3.1.4 Lake Erie and Western RR (+ other Ref's) should be Delaware, Lackawanna, & Western Railroad)

4.3.2.4 Facet connects to Halderman Hollow Creek. This should be May's Creek)

EPA Response: We acknowledge these editorial changes.

Response to Mr. John J . Cain

Mr. Cain indicated that he is a member of an environmental group in Chemung County and he missed the Public Meeting for the Proposed Plan for the Kentucky Avenue Wellfield. He requested information concerning this site.

EPA Response: On September 17, 1990, EPA sent a copy of the Proposed Plan for the Kentucky Avenue Wellfield to Mr. Cain.

Response to Comments Submitted by the Elmira Water Board

The Elmira Water Board indicated that they are pleased to know that the Newtown Creek Aquifer will be restored as a drinking water source of supply.

The Elmira Water Board indicated that they were pleased that EPA was proposing aquifer remediation for the Newtown Creek Aquifer and that they believe that the Proposed Plan for the Kentucky Avenue Wellfield is practical and beneficial to Chemung County.

The Elmira Water Board offered assistance during implementation of the remedial action.

EPA Response: EPA would like to thank the Elmira Water Board for providing Newtown Creek Aquifer data which they have collected since the early 1960s. EPA also appreciates your offer to provide assistance during implementation of the proposed remedy.

As explained in the Proposed Plan, although it is EPA's goal to return useable ground water to their beneficial uses within a reasonable time frame, there is some uncertainty as to whether the entire Newtown Creek Aquifer can be cleaned up to the low levels required by Federal and State drinking water regulations. In addition, we believe that source control measures must be in place before the entire aquifer can be remediated.

APPENDIX G: Written comments from Westinghouse Corporation and EPA's responses

PHILLIPS, LYTLE, HITCHCOCK, BLAINE & HUBER

ATTORNEYS AT LAW

3400 MARINE MIDLAND CENTER BUFFALO, NEW YORK 14203

TELECOPIER (716) 852-6100

(716) 847-5400

September 10, 1990

TELECOPY

James F. Doyle
Office of Regional Counsel
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Rm. 437
New York, New York 10278

Re: Kentucky Avenue Wellfield Site ("Site")

Dear Mr. Doyle:

This is to confirm the meeting of representatives of Westinghouse Electric Corporation ("Westinghouse") and EPA on September 12, 1990, 10:00 a.m., at 26 Federal Plaza, New York, New York. We will come to the Regional Counsel's offices on the 4th Floor. We understand that you, Jeff Josephson and representative(s) of EBASCO will be present.

As we discussed on September 5, 1990, the meeting will focus on certain technical questions Westinghouse has concerning the Draft Final Feasibility Study Report, July 1990 (DFFSR), for the Site. In general, these questions pertain to the calculation of remediation time relative to EPA's preferred selected alternative as described in the "Superfund Proposed Plan," July, 1990.

More specifically,

(1) How is the design pump rate of 140 gpm arrived at?
Reference: DFFSR, Section 4, p. 4-59 and Appendix C, p. C-10.

(2) What equations were used in the Flush-Pro model? Westinghouse would like to review and discuss the equations.
Reference: DFFSR, Appendix C, page C-12.

(3) How does EPA's flushing models (as presented in Appendix D of the "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites," December 1988) differ from the EBASCO Flush-Pro Model?

INFORMATION REPOSITORIES FOR THE KENTUCKY AVENUE WELLFIELD SUPERFUND SITE CHEMUNG COUNTY, NEW YORK

Technical and informational documents pertaining to the Kentucky Avenue Wellfield Site can be found at the following information repositories:

New York State Department of Environmental Conservation
Region 8 Headquarters
6274 East Avon-Lima Road
Avon, New York, 14414

Phone: (716) 226-2246
Hours: M-F, 8:30-4:45 p.m.

Town of Horseheads Town Hall
150 Wygant Road
Horseheads, New York 14841

Phone: (607) 739-8783
Hours: M-F, 8:30-4:30 p.m.

APPENDIX F: Written comments from the general public and Elmira Water Board, and EPA's Responses

228 Sunset Circle
Horseheads, New York 14845
August 15, 1990

J. Jeff Josephson
Remedial Project Manager
U.S. Environmental Protection Agency
26 Federal Plaza Room 747
New York, New York 10278

Re: Kentucky Ave. well cleanup Horseheads

Dear Mr. Josephson:

I would like to request that this letter be entered into the official records regarding the proposed Kentucky Avenue wellfield cleanup in Horseheads, N.Y.

I am firmly in favor of this planned method of cleanup of the contaminated wellfields, but only if Westinghouse is made to pay for the lions share of the expenses. I realize that whatever method of cleanup is used, it will certainly be a costly process which should not fall on the overburdened taxpayer.

While I was president of the Chemung County TAxpayers Association, I attended a meeting of the Susquehanna River Basin Commission on July 13, 1978 in Camp Hill, PA.

Since I was very interested and concerned about chemicals produced by Westinghouse Electric Corp. and released into a nearby swampy area which drained into Newtown Creek, I created a "Westinghouse" file which I retained.

I have a copy of the SRBC July 13, 1978 AGENDA with my notes of discussions at this meeting. Following are my notes of discussion:

1) Westinghouse releases radio active 100 micro curie
2) Elmira well within 600 feet of discharge into swamp
3) Elmira WaterBoard people upset
4) Dept. ignored Commission's rejection and took action and approved by EPA

At this meeting, I also remember the statement being made that Westinghouse was not going to be permitted to dump much longer and they were tired of this going on with no compliance from Westinghouse and being approved by state review.

I also have a September 15, 1978 SRBC DISPOSITION OF PROJECT APPLICATIONS FROM JUNE 29, 1978 TO AUGUST 22, 1978:

	TYPE	ACTION
WESTINGHOUSE ELECTRIC Corp. (N.Y. -0004103)	Discharge of effluent containing U-235, Fluoride, Cadmium, Copper cyanide, Lead, Nickel into a swampy area.	Accept state review

I have a February 14, 1980 SRBC DISPOSITION OF PROJECT APPLICATIONS FROM DECEMBER 10,1979 to JANUARY 28, 1980:

	TYPE	ACTION
WASTINGHOUSE ELECTRIC CORP. (N.Y.-004103)	Application for renewal of permit for existing discharge of 1.9 mgd of cooling water and treated process wastes to unnamed tributary of Newtown Creek from electroplating facility	Accept state review

In view of the fact that SRBC was very upset with Westinghouse for the pollution and toxic wastes it released into the wellfield, I am requesting that Westinghouse Electric Corporation be held responsible for the cleanup of their own damage they created. They dumped their wastes for many years, knowing what they were creating. They also defied warnings to treat their wastes. This was ignored for many years.

Westinghouse went on with their determination to pollute while making millions of dollars for themselves. Why should taxpayers be held responsible for the cleanup of a private corporation?

As a concerned taxpayer, I insist that Westinghouse be forced to pay for the problem they willfully and knowingly created, even if it means taking them to court!!

I have furnished you with proof of the extent of damage Westinghouse created and the types of chemicals they admitted to, so certainly you should have a right to demand payment from Westinghouse and NOT the taxpayer.

I respectfully request a response from you pertaining to my comments.

I thank you in advance.

Sincerely.

Barbara Gilman-Ottey

Barbara Gilman-Ottey

P.S. If you wish to discuss anything with me I can be reached at 607-739-7111. Also, if you are not the right person to report my evidence to, kindly let me know to whom it should be sent. Thank you.

Purolator
Products Company

CERTIFIED- RETURN RECEIPT

September 18, 1990

Mr. Jeff Josephson
Remedial Project Manager
U.S. Environmental Protection Agency
Region II
Room 747
26 Federal Plaza
New York, NY 10278

RE: KENTUCKY AVENUE WELLFIELD SUPERFUND SITE
CHEMUNG COUNTY, NEW YORK

Dear Mr. Josephson:

Purolator Products Company (formerly Facet Enterprises, Inc.) is engaged in the production of automotive, industrial, and household products. Purolator operates an automotive motor components facility in Chemung County and has been cited in the report as a potential contributor to the Kentucky Avenue Wellfield Superfund Site. We would like to take this opportunity to comment on EPA's Draft Final Remedial Investigation/ Feasibility Study (RI/FS).

Overall, Purolator feels the report has generally presented the available data on the site accurately, while also discussing other potential source areas that need additional data collection (including Purolator's Elmira facility). As part of this data collection activity, as you know, Purolator is in the process of completing a Remedial Investigation (RI) regarding its Elmira facility pursuant to an administrative order with the Agency. The report of this investigation will address the specific conditions on the Elmira facility and the impact of those conditions upon the study area outlined by the Kentucky Avenue Wellfield Superfund Site. We must therefore defer our comments on the statements in the Kentucky Avenue Wellfield RI/FS regarding Purolator's contribution to environmental conditions in the study area until the completion of the Purolator RI.

Motor Components Division
P.O. Box 1502
Elmira, NY 14902-1502
(607) 737-8011
Sales Fax (607) 737-8335
Purchasing Fax (607) 737-8296
Telex 6854130 FACETMCD

We support EPA's concern for investigating additional suspected and, to date, unknown sources of contamination in and outside the current study area. In addition, Purolator agrees that the assumptions used to complete the Risk Assessment have been conservatively stated. Finally, Purolator supports the chosen remedial alternative outlined in the Feasibility Study as the best available technology for this Superfund site. However, we do have some specific comments on the documents, as follows.

1. Section 1.3.1, Page 1-14 - RI

The references at paragraph five regarding the Purolator SPDES permit at the Elmira facility should be updated. During 1989, Purolator's Elmira facility discontinued operating a tin-on-carbon plating shop. Therefore, future discharge waters should not contain significant levels of tin. In addition, we are currently negotiating with the New York Department of Environmental Conservation for a new SPDES permit that reflects this change in operations.

2. Section 6.8, Page 6-114 - RI

Although EPA indicates that inhalation of volatiles from cracks in basements or from running tap water may pose a greater health threat than ingestion of unfiltered ground water, no air quality data is presented to document this condition. Purolator recommends that EPA resolve this lack of data.

3. Section 4.0, Inclusive - RI Organization

Several inconsistencies were found in the numerical designation between text, figures, and tables in this section.

Purolator appreciates this opportunity to comment on the Kentucky Avenue Wellfield Superfund Site RI/FS and hopes that our input will enhance the quality of the final report.

Sincerely,

Reeve B. Howland
Plant Engineer

RBH/pdc

1415 W. Water Street
Elmira, NY 14905
17 August 1990

J. Jeff Josephson
Remedial Project Manager
U S E P A
26 Federal Plaza , Room 747
New York, NY 10278

RE: KENTUCKY AVE. RI/FS

Dear Mr. Josephson,

The RI documents which I had an opportunity to review for a very brief period contain data and wording that appears to be in error. Those items requiring review that I noted in my brief perusal are as follows:

3.5.2 river (should be Newtown Creek)

Fig. 3-8 13-Horseshoe Landfill

4.3.1.4 Lake Erie and Western RR (+other Ref's)
(Delaware, Lackawanna & Western)

4.3.2.4 Facet connects to Halderman Hollow Creek
(May's Creek)

Other items may need review, but time did not permit an in-depth study of the volumes prior to the required reply date.

Very truly yours,

Reeve B. Howland

RBH/pdc

STATE OF NEW YORK
DEPARTMENT OF HEALTH
Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 12237

David [illegible] M.D.
Commissioner

OFFICE OF PUBLIC HEALTH
[illegible]
Director

William [illegible]
Executive Deputy Director

September 18, 1990

Mr. Edward R. Belmore, Director
Bureau of Western Remedial Action
Division of Hazardous Waste Remediation
NYS Dept. of Environmental Conservation
50 Wolf Road
Albany, New York 12233

RE: Draft Kentucky Avenue Wellfield
Record of Decision (ROD)
Elmira, Chemung County
Site ID #808012

Dear Mr. Belmore:

The Department of Health has completed its review of the draft Record of Decision (ROD) for the Kentucky Avenue wellfield. As a result of this review we have no comments on the ROD.

If there are any questions regarding this, please feel free to contact Richard Tuers at (518) 458-6308.

Sincerely,

Ronald Tramontano

Ronald Tramontano, P.E.
Director
Bureau of Environmental Exposure
Investigation

jlf/02600772

cc: G. Cross - DEC
J. Josephson - EPA
C. Smith-Blackwell - WRD
D. Napier - RFO
G.A. Carlson
R. Tuers

Sept. 14

Dear Jeff Jackson,

I'm writing you concerning the Kentucky Ave wellfield Superfund site in Chemung County NY. I am a member of an environmental group in Chemung County and am aware of a number of people that missed the public meeting concerning the Kentucky Ave. wells. I would greatly appreciate you sending me any information you have concerning this problem. Thank you for your time.

Sincerely Yours,

John J. Cain

Alliance For Environmental Awa

John J. Cain
1407 W. Water St.
Elmira, N.Y. 14905

(4) Why was the Flush-Pro model used rather than EPA flushing models?

(5) How was the reported kd of 1.76 used in the flushing model derived?
Reference: DFFSR, Appendix C, page C-12.

(6) What retardation factor was used for TCE?

(7) Was the remediation time of 30 years for the MOM-5 design calculated using the 140 gpm extraction rate; was the aquifer discharge not captured by the recovery wells considered in the remediation time calculations; how is the remediation time effected if the natural aquifer discharge rate of 1100 gpm were substituted into the flushing model?
Reference: DFFSR, Appendix C, page C-14, scenario 4 (MOM-5).

(8) What amount of aquifer volume is intended to be remediated by the MOM-5 alternative?
Reference: DFFSR, Appendix C, Table C-1, page C-3. Executive Summary, page E-5.

We look forward to our meeting.

Very truly yours,

PHILLIPS, LYTLE, HITCHCOCK, BLAINE & HUBER

By Morgan G. Graham

DDDar
15980
cc: by telecopy J. Jeffrey Josephson

Written Response to questions submitted to EPA by Phillips, Lytle, Hitchcock, Blaine, & Huber, on behalf of Westinghouse Electric Corporation, September 10, 1990. Each question was discussed during a meeting between EPA and Westinghouse Electric Corporation on September 12, 1990.

1. How is the design pump rate of 140 gallons per minute (gpm) arrived at?

EPA Response: The design pump rate referenced in the FS report was arrived at as follows:

a) A design pump rate for three representative but consecutively smaller cross sectional areas (See Figure 1) of the aquifer was determined. Each scenario modeled used the same generalized aquifer properties based on data obtained during the Supplemental RI. The depth of the aquifer was constant at 30 feet in all three evaluations, but the length through which flow occurs was smaller, and therefore, available ground-water flow was approximated to be proportional to the recharge area available, and cross sectional area through which flow could occur. Withdrawals from the aquifer (due primarily to industrial pumping) were evaluated for each of the three scenarios, as was recharge due to infiltration from industrial drainageways.

A value of 140 gpm was arrived at by considering an aquifer width of 1600 ft, and an aquifer depth of 30 feet. The cross sectional area is, as explained in the Supplemental Feasibility Study, modeled to be 40% of the recharge area represented in the entire aquifer modeled, and the width of the aquifer through which flow occurs in the area modeled is 25% of the width of the maximum width modeled. An approximation of net withdrawal due to aquifer pumping at the Westinghouse facility is accounted for by considering total pumping minus a percentage returned to the aquifer through recharge in an unlined drainage way.

Average net recharge	0.5 million gallons per day (mgd)
minus net withdrawal	0.3 mgd
Design flow rate	0.2 mgd (140 gpm)

2. What equations were used in the Ebasco "flush-pro" model?

EPA Response: In a given total volume V there is a mixture of solids and voids that are completely filled with water, and both are contaminated.

Therefore $M_t = M_s + M_w$

where: M_t = total mass of contaminants
M_s = contaminants associated with solids
M_w = contaminants associated with water

The mass of the solids is equal to the volume of the solids times the density of solids and the mass of contaminants on the solids is equal to the mass of solids times the concentration per unit mass. Therefore, the total mass is equal to the following:

$$M_t = C_s V_s p_s + C_w V_w p_w$$

where:
C_s = Concentration of contaminants associated with solids
V_s = Volume of solids
p_s = density of solids
C_w = Concentration of contaminants associated with water
V_w = Volume of water
p_w = density of water

now,

The total volume V_t is equal to volume of solids plus volume of liquids. $V_t = V_s + V_w$.

where:

V_w = volume of water
V_s = volume of solids

However,

$V_w = nV_t$ and $V_s = (1-n)V_t$

where n=porosity

Therefore:

$$M_t = C_s(1-n)V_t p_s + C_w n V_t p_w$$

From the definition of the distribution coefficient K_d,

$K_d = C_s/C_w$

For organics the following relationship holds:

$K_d = f_{oc} * k_{oc} / 100$

where f_{oc} = percent organic carbon, and
k_{oc} = is the partition coefficient normalized for organic carbon

3. How does EPA's flushing models (as presented in Appendix D of

the "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites," December 1988) differ from the EBASCO Flush-Pro model?

EPA Response: Appendix D of the EPA guidance document entitled "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites," (December 1988) presents a batch flushing model, and a continuous flushing model. The "flush pro" model utilized by Ebasco is similar to the batch flushing model in the December 1988 guidance but is a more simplified approach.

4. Why was the Flush-Pro model used rather than an EPA flushing model?

EPA Response: The scope of work, and budget planning for the Remedial Investigation/Feasibility Study was conducted during the Summer of 1988, and a final workplan was completed during the Fall of 1988. EPA decided the modeling approach and appropriate budget for modeling for this project during this period. We chose a simplified model which did not require extensive detailed hydrogeologic investigation because the model was to be used primarily as a tool for evaluating the relative cost effectiveness of the various alternatives that would be investigated. The guidance document Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites which contains the referenced equations in question 3 above, was finalized in December 1988; therefore, we did not have this guidance document during the planning stages of the project. However, as discussed in question 3, the model that was used for the Kentucky Avenue Supplemental FS is very similar to the batch flush model discussed in the EPA guidance.

5. How was the reported k_d of 1.76 used in the flushing model derived?

From the definition of the distribution coefficient K_d,

$K_d = C_s/C_w$

For organics the following relationship holds:

$K_d = f_{oc} * k_{oc} / 100$

where f_{oc} = percent organic carbon, and
k_{oc} = is the partition coefficient normalized for organic carbon

f_{oc} was taken from a value measured in the field during the Kentucky Avenue Wellfield site Supplemental Remedial Investigation. The values obtained during the Supplemental RI are reported in Appendix I of the Supplemental RI report. k_{oc} was obtained from a published EPA document entitled " EPA

600/8-90/003 Basics of Pump and Treat Groundwater Remediation Technologies.

EPA anticipates that additional f_{oc} data will be collected in order to refine the estimate of K^d.

6. What retardation factor was used for TCE?

EPA Response: A "retardation factor" is implicit in the k_{oc} value chosen during our analysis.

7. Was the remediation time of 30 years for the MOM-5 design calculated using the 140 gpm extraction rate; was the aquifer discharge not captured by the recovery wells considered in the remediation time calculation; how is the remediation time effected in the natural aquifer discharge rate of 1100 gpm were substituted into the flushing model?

EPA Response: Assuming that all source controls are in place at the Westinghouse facility, and that the pumping wells at the Westinghouse facility pump at a constant rate, a remediation time of 30 years was calculated using the "Flush-Pro" model. With Westinghouse and the Kentucky Avenue Well pumping, EPA does not at this time believe the aquifer could sustain a pumping rate of 1100 gpm for an extended period of time.

8. What amount of aquifer volume is intended to be remediated by the MOM-5 alternative?

EPA Response: As stated in the Proposed Plan, page 6, the goal of the preferred remedial action is to halt the spread of a contaminant plume, and to remove contaminant mass. Also, this action will permit collection of data on aquifer and contaminant response to remediation measures. On page 7 the Proposed Plan states that ... a final ROD for the Newtown Creek Aquifer which specifies the ultimate goal, remedy and anticipated remediation time-frame, will be prepared. On page 9 of the Proposed Plan, under the discussion "Compliance with ARARs" EPA has indicated that this is an interim remedial action, and compliance with ARARs is not required.

The decision to conduct an interim remedial action is based on, among other considerations, EPA's recent guidance on aquifer remediation which indicates a preference to initiate action as early as feasible. Actions can be taken by EPA if they will prevent the situation from getting worse, initiate risk reduction, and/or the operation of such a system would provide information useful to the design of the final remedy.

The action proposed by EPA is intended to meet all three basic objectives. By implementing this interim remedial action, contaminant spread would be reduced or stopped until source controls are in place. This will prevent worsening of the water quality in the aquifer. This interim action will reduce the risk to human health and the environment by reducing the concentrations of contaminants that will spread within the aquifer or that may eventually discharge to the Newtown Creek.

Without source controls in place, the ground water alternative MOM-5A will not result in ground water quality reaching renmediation levels for any portion of the aquifer. As stated on page 11 of the proposed plan, after sources of aquifer contamination have been stopped, the preferred alternative will remediate a portion of the aquifer hydraulically influenced by the pumping wells.

WEIL, GOTSHAL & MANGES
A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

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NEW YORK, N.Y. 10153
(212) 310-8000
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701 BRICKELL AVENUE
MIAMI, FLORIDA 33131
(305) 577-3100
TELECOPIER: (305) 374-7159

September 18, 1990

Mr. J. Jeff Josephson
Remedial Project Manager
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Room 747
New York, New York 10278

Re: Kentucky Avenue Wellfield Site
Chemung County, New York

Dear Mr. Josephson:

Enclosed please find the written Comments of Westinghouse Electric Corporation pertaining to EPA Region II's "Superfund Proposed Plan Kentucky Avenue Wellfield Site, Chemung County, New York, July 1990." These Comments are hereby submitted by Westinghouse Electric Corporation to EPA during the period for public comment in response to the Plan, and for inclusion and filing in the administrative record file for this Site.

In a telephone conversation between Morgan G. Graham, counsel for Westinghouse, and James F. Doyle, Assistant Regional Counsel for EPA, Mr. Doyle stated that these Comments would be considered timely filed if they were post-marked by September 18, 1990, and copies were sent to EPA by Federal Express. You further agreed to this procedure in your telephone conference with Morgan G. Graham today. Accordingly, these Comments are being submitted by U.S. mail, with today's post-mark, and we are sending copies by Federal Express. At your request, we are also faxing you the first 10 pages of the Comments today; however,

certain blanks appear in the faxed pages where there are cross-references to other pages in the document. Those blanks will be filled in on the copies you will receive by mail and Federal Express.

Sincerely,

David Hird

David B. Hird

cc. Richard L. Caspe (w/encs.)
James F. Doyle, Esq. (w/encs.)

Response to Comments submitted by Weil, Gotshal & Manges on behalf of Westinghouse Electric Corporation.

Pages 1-10. The comments are summarized as follows: a) Westinghouse Electric Corporation believes that EPA did not comply with its public participation responsibilities under Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). b) Westinghouse Electric Corporation believes it has not been provided adequate time to comment on the Proposed Plan. c) Westinghouse Electric Corporation requests a meeting with EPA before the Record of Decision is executed to discuss the conditions and solutions for the contamination problems at their facility. d) Westinghouse commented that the model used by Ebasco Service is proprietary.

EPA Response: EPA has met the requirements of Section 117 of CERCLA. Section 117 (a) of CERCLA states that the following requirements be met before EPA adopts any plan for remedial action.

1) "Publish a notice and brief analysis of the proposed plan and make such a plan available to the public".

2) "Provide a reasonable opportunity for submission of written and oral comments and an opportunity for a public meeting at or near the facility of issue regarding the proposed plan and regarding any proposed findings under Section 121 (d)(4). The President or the State shall keep a transcript available to the Public".

EPA satisfied the requirements of Section 117 (a)(1) of CERCLA when it published a Public Notice in the ELmira Star-Gazette on July 21, 1990. This Public Notice is attached to this Responsiveness Summary as Appendix B. This notice provides a reasonable explanation of the proposed plan and the alternative proposals. In addition, EPA distributed the Proposed Plan, entitled "Superfund Proposed Plan, Kentucky Avenue Wellfield Site, Chemung County, New York" July 1990 (Proposed Plan) to the public repositories identified in the Public Notice, and mailed a copy of the Proposed Plan on July 21, 1990 to interested parties including Westinghouse Electric Corporation. A copy of the mailing list is included in the Administrative Record File.

EPA satisfied the requirements of Section 117(a)(2) and 40 C.F.R. Part §300.430 (f)(3)(C) (The National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule or simply NCP) by establishing a thirty day public comment period. Upon request by Westinghouse Electric Corporation, the public comment period was extended by EPA for an additional 30 days as required in the NCP. This is consistent with requests for extensions in Region II. The public comment period ended on September 18, 1990.

On August 1, 1990 EPA held a Public Meeting at the Town of Horseheads Town Hall located in the Town of Horseheads, New York. At the public meeting, EPA explained the public participation process in the Superfund Program, presented a general overview of the Superfund Program and how it relates to the Kentucky Avenue Wellfield site, discussed the results of the Supplemental Remedial Investigation/Feasibility Study, and presented the Proposed Plan. EPA answered all questions presented to us at the public meeting and recorded all comments. A copy of the transcript from the public meeting is a part of the Administrative Record File for the Site.

Westinghouse Electric Corporation submitted a written request to EPA on September 10, 1990 for a meeting with EPA to discuss technical questions. (The technical questions and the EPA response to these questions are provided in the Responsiveness Summary section entitled "Response to comments submitted by Phillips, Lytle, Hitchcock, Blaine & Huber on behalf of Westinghouse Electric Corporation). EPA promptly scheduled a meeting with Westinghouse on September 12, 1990, and EPA and its contractor Ebasco Services, Inc. answered all the questions which were raised by Westinghouse Electric Corporation, their consultants and attorneys.

Problems encountered at many Superfund Sites are complex. It is for this reason that EPA provides for at a minimum thirty day public comment period, and EPA will extend the comment period when it receives a timely request. For the Kentucky Avenue Wellfield Site EPA extended the public comment period by 30 days. We believe that this is a sufficient amount of time to review the Proposed Plan and the supporting documentation.

The "flush-pro" model used in the Feasibility Study conducted by Ebasco Services Incorporated is not proprietary information. Ebasco Services adapted the equations presented in the text of the Feasibility Study, Appendix C, for use on a personnel computer.

EPA cannot at this time commit to meet with Westinghouse Electric Corporation to discuss the sources of contamination at the Horseheads facility before the Second Operable Unit Record of Decision is issued, but will meet with Westinghouse Electric Corporation to discuss the Horseheads facility.

Page 11-18 Provide discussion on Facility history, operations and operations, with comment.

Page 18 - 48 Westinghouse Electric Corporation indicates that they believe that EPA has failed to Implement the 1986 Record of Decision.

<u>EPA Response:</u> EPA has implemented the 1986 Record of Decision as

The 1986 Record of Decision Remedial Alternative Selection "Description of Selected Remedy" reads as follows:

- An investigation to identify all residences in the study area currently using private wells. Upon completion of the investigation, all private well users will be connected to the public water supply.

- Installation of monitoring wells upgradient of the Sullivan Street wells, with sampling at and upgradient of the wells to be performed on a quarterly basis.

- Conduct a supplemental source control Remedial Investigation/Feasibility Study (RI/FS) to identify the source of contamination and to determine which, if any source control measures would be feasible and cost effective. The source control RI/FS will be a composite of both ongoing and proposed studies at various potential source sites within the study area.

1) The Supplemental Remedial Investigation/Feasibility Study was conducted in order to determine the extent to which potential source areas in the vicinity of the Kentucky Avenue Well contribute to the aquifer contamination. (see Supplemental RI Report). The work conducted for the Supplemental RI included collection of 148 soil gas readings, completion of 32 soil borings, and analysis of 147 soil samples for a large number of potential contaminants at the sites which were determined during the design stage of the Remedial Action to require investigation. In addition, EPA collected ground water samples for analysis for either hazardous substance list or target compound list parameters on at least three occasions from 30 monitoring wells, and 3 residential wells. EPA conducted aquifer testing at 27 monitoring wells to characterize the aquifer properties.

EPA collected 8 surface water samples and 6 sediment samples in order to have them analyzed for contaminants.

Incorporated in the Supplemental RI are data tabulated from investigations within the study area including Westinghouse Electric Corporation, Facet Enterprises, Inc., and LRC Electronic, Inc.

The data collected by Westinghouse Electric Corporation is included in the Supplemental RI/FS and supports EPA's contention that the Westinghouse Electric Corporation Horsehead facility is a source area. The investigation conducted by Westinghouse at their facility did not evaluate source control measures.

The Supplemental RI/FS enabled EPA to determine that the potential source areas investigated by EPA were not contributing to the aquifer contamination and therefore source controls are not necessary at the Chemung County Department of Highways Garage, the Old Horseheads Landfill, the former Koppers Company Properties, a sand and gravel pit, and a fill area. In addition, EPA determined that therefore no source control measures would be required.

2) As of August 1990, EPA had connected an additional forty five residences to the public water supply due to TCE contamination in their private wells.

3) Under a cooperative agreement with EPA, the New York State Department of Environmental Conservation (NYSDEC) installed monitoring wells strategically located in order to monitor ground water quality upgradient of the Sullivan Street Wellfield. Installation of these monitoring wells was completed in the Summer of 1989, and were sampled by EPA in January 1990. The results of the sampling are presented in the Supplemental RI Report.

Page 23. The comment indicates that Westinghouse Electric believes that the RI/FS has not adequately evaluated all potential sources of TCE.

EPA Response: EPA conducted soil boring investigations and ground water sampling investigations in order to evaluate if seven potential source areas contribute to the aquifer contamination, and to conduct a baseline risk assessment in order to evaluate no-action alternatives at these seven areas. EPA detected contaminants in soils at some of the areas investigated, but none of these areas appear to be contributing to the TCE contamination at the Kentucky Avenue Well.

In addition, EPA compiled data gathered during investigations at industrial facilities in the Elmira-Horseheads area in order to determine if and if so, the extent to which the facilities contribute to contamination at the Kentucky Avenue Wellfield.

In January 1990, the New York State Department of Health provided data to EPA which was collected during an investigation of 1,1,1-trichloroethane contamination in the aquifer in the Fisherville/Big Flats area. The data indicates that TCE is present in the ground water at the Horseheads Automotive Garage at a concentration of 95 ppb. The data provided to EPA is presented in the Supplemental RI and EPA has considered this data. Based upon an evaluation of this data and considerations of the geologic and hydrologic conditions in this area EPA has decided to conduct an evaluation of the ground-water flow direction from the Horseheads Automotive Garage in order to determine if this facility contributes to the contamination at

the Kentucky Avenue Wellfield.

Westinghouse Electric Corporation has indicated that EPA did not consider TCE contamination detected at monitoring well CW-2D and two private wells in the Fisherville area.

EPA Response: EPA did consider the TCE at the Horseheads Automotive Garage as discussed above. TCE was also detected at a residence at 0.8 ppb. This data is presented in the Supplemental RI Report. The level of 0.8 ppb TCE at this residence indicates that the residence is not a likely source of TCE contamination at the Kentucky Avenue Well, located approximately 1.7 miles away.

Page 24-25. Westinghouse does not believe that other facilities identified including Facet Enterprises, Inc. and LRC Electronics Inc. have been adequately characterized.

EPA Response: As discussed on page 6 of the Proposed Plan, Facet Enterprises, Inc., a separate National Priorities List site, is conducting a Remedial Investigation and Feasibility Study under Administrative Order with EPA. EPA anticipates that a remedy for this facility will be selected during 1991. LRC Electronics, Inc. is conducting an investigation under a consent agreement with the New York State Department of Environmental Conservation (NYSDEC), and the NYSDEC has indicated that they expect to select a remedy within two years for this facility. The results from both of the investigations at these facilities to date, have been considered and incorporated into the RI/FS.

Page 28. The comments indicate that Westinghouse Electric Corporation does not believe that EPA has justified selecting a Mitigation (sic) of Migration Remedy before source control is in place.

EPA Response: Page 6 of the Proposed Plan "Scope and Role of the Response Action" indicates that the goal of this preferred remedial action is to halt the spread of a contaminant plume, and to capture contaminant mass. In addition, page 6 of the Proposed Plan indicates that the ultimate goal of EPA's Superfund Program approach to ground water remediation as stated in the NCP, is to return useable ground water to its beneficial uses within a time frame that is reasonable. Therefore, for the Newtown Creek Aquifer which is classified as a Class IIa aquifer, the final remediation goals are State and Federal drinking water standards.

EPA is justified in its decision to halt the spread and capture of contaminants, and furthermore it is acting in a manner consistent with our national policy and the NCP in the selection of this remedy.

Page 29 -31. The comment indicates that Westinghouse Electric Corporation does not believe that there is an immediate need to put the Kentucky Avenue Wellfield back in operation. The comments indicate that the Sullivan Street Wellfield could be used as a "reserve capacity". Westinghouse comments that EPA has already connected all the families in the community to water supplied by the Elmira Water Board, except two families which have refused connection and drink from private wells.

EPA Response: The Kentucky Avenue Well is a public water supply well closed in 1980 as a result of TCE contamination. In September 1983, EPA placed the Kentucky Avenue Wellfield site on the National Priorities List making it eligible to receive funds from Superfund.

The proposal to distribute the ground water collected and treated from the Kentucky Avenue Wellfield as a public water supply will result in reinstating a natural resource which was developed for public use by the Elmira Water Board during the 1960's and then subsequently rendered useless in the early 1980's by the TCE contamination. The data included in the "Annual Report 1988 Elmira Water Board City of Elmira, New York" indicates that ground water used for public distribution increased from 9.3% in 1962 to 42.1% in 1981. This growth in ground water use resulted from the large amount of exploratory work conducted by the Elmira Water Board which indicated that the Newtown Creek Aquifer is a long-term reliable source of drinking water. Since 1981, use of the Newtown Creek Aquifer as a drinking water source has leveled off as a consequence of contamination of the Newtown Creek Aquifer. The use of this aquifer has leveled off, and not discontinued altogether, because the Elmira Water Board relies on the ground water to supply approximately 44% of its supply.

By reinstating the Kentucky Avenue Well and installing the pumping wells between the Westinghouse facility and the Kentucky Avenue Well now, EPA will begin a phased approach to restore the aquifer quality while source control measures at Westinghouse are evaluated.

Since the Proposed Plan was released in July 1990, the public has provided information to EPA indicating that there are still private well users in the Elmira-Horseheads area in areas potentially impacted by contamination from the Westinghouse facility. EPA has requested that the New York State Department of Health sample residential homes that are using private wells in this area. In addition, EPA has identified three additional commercial facilities which use private wells as a potable water source and therefore they should be connected to the public water supply.

The Elmira Water Board uses the Sullivan Street Wellfield to supply approximately 30% of its total water supply.

Pages 34-38. Westinghouse Electric Corporation indicate that they believe EPA and Ebasco have overestimated the time for natural attenuation to clean up the aquifer. Westinghouse Electric Corporation also commented that they believe EPA lacks confidence in the Proposed Remedy.

A detailed description of the modeling approach used by EPA is provided as Response to comments submitted by Phillips, Lytle, Hitchcock, Blaine & Huber on behalf of Westinghouse Electric Corporation. The data EPA used to estimate cleanup was from published reports, or data obtained in the field. As stated in the Proposed Plan on page 6, this interim remedial action will allow for the collection of data to assess aquifer and contaminant response to remediation efforts. If the data collected during this interim remedial action indicates that the pumping is effective at reducing contaminant mass and preventing the concentration of TCE in the aquifer from increasing, then EPA may expand the aquifer remediation program in a phased approach to achieve cleanup levels.

If the period required for aquifer remediation is less than 30 years this will be beneficial to both human health and the environment. Models used to estimate remediation time are useful tools. However, EPA has identified several trends and limiting factors associated with ground water remediation actions at Superfund Sites. (EPA Directive No. 9355.4-03 located in the Administrative Record File) They are:

1. The extraction systems are generally effective in containing contaminant plumes.

2. Significant mass removal of contaminants is being achieved.

3. Concentrations of contaminants have generally decreased significantly after initiation of extraction systems but tend to level off after a period of time. The leveling off may begin to occur at levels above the cleanup criteria.

4. Data collection may not be sufficient to fully assess contaminant movement and system response to extraction.

Factors which limit effectiveness may include:

1. Hydrological factors such as heterogeneity of the subsurface, or the presence of low permeability layers.

2. Contaminant related factors such as sorption to soil.

3. System design parameters.

4. Continued leaching from source areas.

Actual field data collected during the interim remedial action will best determine the effectiveness of the selected remedy. The data collected will permit an evaluation to assess the feasibility of final aquifer remediation Record of Decision.

EPA does not lack confidence in the proposed interim remedy. The purpose of the proposed interim remedy is to prevent the ground water contamination from continuing to spread throughout the Newtown Creek Aquifer, to collect data in order to optimize design parameters for a final remedy, and to restore a potable drinking water source. The data collected will be used to optimize system design or to reconsider the technical feasibility of reaching final remediation goals if remediation goals are not approached during the interim remedial action.

Pages 39-46. Westinghouse Electric Corporation comments that 1) The Proposed Remedy cannot be justified as an interim measure. and 2) They do not believe that the Proposed Plan meets the criteria set forth in EPA Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, as it relates to interim remedial actions.

EPA Response: 1) EPA intends to evaluate the data collected during this interim remedial action and issue a Record of Decision which will either call for a complete aquifer program, or, if necessary, will consider ARAR waivers because of a technical impracticability of a pump and treat remedy to meet ARARs for the Newtown Creek Aquifer. The NCP states that interim measures are acceptable for controlling or preventing the further spread of contamination while EPA is deciding upon a final remedy. That is the express goal of the pump & treat program at the Site.

2) EPA has determined that the Proposed Plan would meet the criteria for an interim remedial action. As specified in Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites.

The following criteria are from the Guidance, and an explanation of how each criteria is met by the proposed action follows.

a) " The interim action is necessary or appropriate to stabilize the site, control the source, prevent further degradation, prevent exposure, or otherwise significantly reduce threats to human health and the environment."

b) "The interim action will not exacerbate the site problem."

c) "The interim action is consistent with the final remedy."

d) "There is a commitment to evaluate additional information and select a final remedy within a specified time frame."

Pumping ground water at 700 gpm at the Kentucky Avenue Well, and 140 gpm from recovery wells down gradient of the Westinghouse facility is intended to capture the contaminant mass and prevent further deterioration of ground water quality within the Newtown Creek Aquifer. This action is intended to stabilize the site by capturing the flow of contaminants from Westinghouse Electric Corporation. This interim action will permit the collection of data to evaluate the aquifer and contaminant response to a ground water pump and treat remedial action. In addition, the proposed action will provide a reliable, long-term potable water supply.

EPA has characterized the quality of the ground water sufficiently to determine that the Westinghouse facility is a source of aquifer contamination. EPA has also conducted soil boring and analysis investigation at other areas including the Old Horseheads Landfill, the property formally owned and operated by the Koppers Company, a sand and gravel pit, and the Chemung County Department of Highways Garage. These areas which are located in the vicinity of the Kentucky Avenue Well do not have concentrations of contaminants indicating that they are a source of aquifer contamination. Detailed design work will be conducted in order to ensure that pumping wells are properly placed to ensure effectiveness, and careful monitoring of the remedial action will ensure that the ground water contamination problem is not exacerbated.

As stated in the Proposed plan the ultimate goal of EPA's Superfund Program approach to ground water remediation, as stated in the NCP, is to return useable ground water to it's beneficial uses within a time frame that is reasonable. EPA has reported that the most common method for restoring contaminated ground water is extraction and treatment of the contaminated ground water, rather than taking no action to remediate the Newtown Creek Aquifer, and restore it as a resource, as Westinghouse repeatedly suggests; the goal of the proposed/remedy would make this interim remedial action consistent with an anticipated/ potential final remedial action (" See Considerations in Ground Water Remediation at Superfund Site, EPA Directive No. 9355.4-03, included in the Administrative Record File").

There is a commitment to evaluate information from the known sources of aquifer contamination and evaluate source control measures. As discussed in the Proposed Plan (page 6), a RI/FS for the Facet Enterprises, Inc. facility is scheduled for completion in 1991. EPA anticipates selecting a remedy for this facility during 1991. Selection of source control measures at the Westinghouse and LRC facilities are scheduled within two

years.

Page 46. Westinghouse Electric Corporation commented that selecting the remedy at this time is neither cost effective nor consistent with the NCP and that they do not believe that EPA has sufficient data to select a remedy at this time.

EPA Response: The Supplemental RI/FS has identified the potential sources of aquifer contamination, and the delays associated with further studies, are not in the publics best interest. Furthermore, since EPA policy is to restore aquifers, 14 million is not being wasted since, eventually it is likely we will select aquifer remediation.

Westinghouse has assumed in their estimates of total time to remediate the entire aquifer that the proposed interim remedial action is the only action that EPA will take to remediate the aquifer. EPA will collect data during this interim remedial action and determine the feasibility of a complete aquifer cleanup project. EPA may, for example, propose installing more recovery wells to expedite the final cleanup if the results of the interim action indicate that the pumping effectively reduces contaminant migration, and/or reaching ARARs for the entire aquifer is feasible.

EPA believes that the selected interim remedial action is cost effective. The proposed interim action will begin the remediation process for the Newtown Creek Aquifer, and it will provide a potable source of drinking water to the public. EPA believes that the treatment technologies that are available and are proposed for this remedial action can remove the contaminants from the contaminated ground water to meet Federal and New York State Drinking Water Standards, and that the proposed treatment systems are cost effective in providing this treatment. Compared to the other ground water remediation alternative evaluated, the proposed interim action provides a cost proportionate to its effectiveness. By implementing the Proposed Plan, EPA will provide for initiation of an aquifer remediation program. A phased approach which relies on data collected during each phase of the remediation program is required for the Site because of the extent of the contamination, the fact that more than one source is contributing to the aquifer contamination, and because of the complexity of evaluating aquifer response to pump and treat remedial action over large areas of aquifer.

EPA believes that the data collected for the Remedial Investigation is more than adequate to support the proposed interim remedial action.

Page 49. Westinghouse Electric Corporation indicates that EPA identified a drainage ditch as a major source of contamination.

EPA Response: Page 5 of the Proposed Plan #7, indicates that "The results of sampling and analysis from a drainage way south of the Westinghouse Electric Corporation Property indicate that accumulation by heavy metals has occurred which may be a result of the permitted industrial discharge from this facility. This unnamed drainageway empties into a pond south of the Old Horseheads Landfill, and then continues to flow south to the Newtown Creek. The permitted discharges may also be contributing to the metals and TCE contamination, although the primary (emphasis added) source of TCE in the ground water is believed to be from the disposal areas or spills at the facilities identified in the Supplemental RI as contributors to the aquifer contamination."

Page 50. Westinghouse Electric Corporation believes that EPA should have performed soil borings at the Landfill before we concluded that this is not a source of aquifer contamination.

EPA Response: EPA collected soil gas data and performed soil borings at the Old Horseheads Landfill. Section 4.2.3 of the Supplemental Remedial Investigation Report discusses the results of the investigations at this landfill.

Page 50. Westinghouse Electric Corporation believes that the soil-gas results were faulty for boring SO-26 because no soil gases were detected, but a boring at this location detected volatiles.

EPA Response: Contrary to Westinghouse's assertion, the soil boring data indicate that bis(2-ethylhexyl)phthalate (BEHP) was detected in soil samples at a level of 120 ppb. The level of BEHP and the nature of the contamination detected in this sample does not indicate that this area is a source of contamination.

Page 53. Westinghouse Electric Corporation commented that the QA/QC was not adequate for the samples collected by EPA.

EPA Response: All the samples collected were collected according to EPA-approved field methods as described in the Field Operations Plan. Also, all data is validated according to EPA Region II Standard Operating Procedures as described in the Region II CERCLA Quality Assurance Manual Final Copy October 1989.

Page 54. Westinghouse Electric Corporation questioned the model used to calculate remediation time, and, presented an alternative analysis. Westinghouse Electric Corporation feels that the analysis of alternatives fails to properly assess the impact of the proposed remedy on the plume. Westinghouse Electric Corporation commented that with the pumping rate proposed, the Keely and Tsang analysis does not indicate an effective

withdrawal rate to prevent contaminant spread.

EPA Response: This response is provided in conjunction with our Written Response to questions submitted to EPA by Philips, Lytle, Hitchcock, Blaine, & Huber on behalf of Westinghouse Electric Corporation.

Westinghouse uses the same generalized aquifer properties as EPA for the Newtown Creek Aquifer, but then uses Darcy's Law to calculate flow for ground water in the vicinity of the proposed pumping wells. They arrive at a higher design pumping rate than Ebasco. One difference between the results Westinghouse reached and the results that Ebasco reached may be that the Westinghouse calculations do not take into account the millions of gallons withdrawn from the aquifer every day as a result of industrial pumping at their facility.

The information presented in the Feasibility Study is not intended to be a design. Careful aquifer testing and strategic placement of recovery wells will be required. A major purpose of the model used in the feasibility study includes evaluation of cost effectiveness of the all the pump and treat alternatives evaluated.

The proposed remedial alternatives are designed to prevent the plume from the Westinghouse facility from spreading further into the aquifer.

At this time EPA believes that the rate of ground water pumping at the Westinghouse facility should be accounted for in the preliminary design. The results of the modelling will be verified during design stage to ensure that the pumping rate during the remedial action is optimized.

Page 60. Westinghouse Electric Corporation comments that, according to its calculations, EPA's proposal would result in remediation of only 5% of the aquifer (or capture of 265 kilograms of TCE at a cost of 5.8 million dollars). Westinghouse Electric Corporation argues that the proposed aquifer remediation would only remove a small mass of contaminant at a cost of $105,455 per gallon of TCE removed.

EPA Response: The calculations provided in the Supplemental RI assume that the distribution of TCE is uniform throughout the aquifer. This assumption is necessary in order to use the model to evaluate the remedial alternatives cost effectiveness.

As indicated in the Supplemental RI, the contaminant concentration is higher in source areas. Downgradient of the source areas at the Westinghouse facility, EPA data indicate that the concentration of TCE tends to be between 50 and 100 ppb for a distance of 4000 feet southeast of the facility and then drops to

20 ppb level or lower until other source areas contaminate the aquifer. EPA studies indicate that by removing the higher levels of ground water contamination early in the remedial process it will prevent further degradation of aquifer water quality and accelerate the overall remedial process.

EPA does not believe that by calculating the mass of TCE dissolved in the water which will be removed is an appropriate method of considering cost effectiveness of the proposed remedy, because once a volume of water becomes contaminated with the TCE, that entire volume of water must be treated. The TCE within the water cannot be treated independently of the water itself. If this remedial action continues for 30 years at a pumping rate of 700 gpm at the Kentucky Avenue Well, and 140 gpm at the recovery wells, a total of 1.32×10^{10} gallons of water will be treated to Federal and New York State drinking water standards. EPA believes that the proposed treatment of this ground water is cost effective.

Page 62. Westinghouse Electric Corporation comments that by selecting the remedies in the proposed plan EPA would be acting arbitrarily and capriciously.

EPA Response: The Proposed plan reflects that the ultimate goal of EPA's Superfund Program approach to aquifer remediation is to return ground water to its most beneficial use. For the Kentucky Avenue Wellfield site, the contamination is widespread throughout the Newtown Creek Aquifer, and there are a number of sources as indicated in the Supplemental RI Report and the Proposed Plan. For these reasons EPA has proposed a phased approach to aquifer restoration. The proposed remedial action will provide a long-term source of drinking water which meets Federal and New York State Drinking water standards. The proposed treatment alternatives for treating the ground water are easily implementable, reliable, and demonstrated to be effective. The proposed remedial action will reduce the mobility and volume of contaminated ground water within the aquifer, and the proposed treatment system is a cost effective method for treating ground water. EPA received positive comments on our proposed plan during the Public meeting held at the Town Hall in Horseheads, New York. In addition, EPA received three positive written public comments during the public comment period. Only one set of written comments (from Westinghouse Electric Corporation) favored a different remedy than EPA's Proposed Plan. Westinghouse Electric favored a no-action alternative.

Page 68. Westinghouse comments that it is EPA's conclusion that the drainageway is the sole source of TCE in the ground water.

EPA Response: The Supplemental RI and the Proposed Plan state that the TCE sources in the vicinity of the Westinghouse facility include former disposal areas, waste handling and storage areas,

and spill areas and possibly the industrial drainageway.

Page 70. Westinghouse comments that incorrect Rfd values were used by Ebasco in the Risk Assessment. Westinghouse provides values for toluene, arsenic, manganese, acenaphthene, anthracene, fluoranthene, fluorene, and pyrene. A oral cancer slope factor for beryllium is provided.

EPA Response: The values provided by Westinghouse Electric Corporation are the most recent data from the IRIS computer system for risk assessment information. This data base is updated monthly. Since completion of the risk assessment, values have been updated in IRIS for toluene, manganese, and arsenic. Also, the method for calculating risk associated with exposure to the polyaromatic hydrocarbons has been recently changed from past guidance.

EPA has considered the data provided by Westinghouse Electric Corporation. All of the numbers provided by Westinghouse Electric indicate that a lower risk due to exposure to soils exists than that calculated in the risk assessment. The risks posed by the soils at the seven areas investigated by EPA were below a level at which Superfund would typically conduct an action and therefore our conclusions about these areas are the same as stated in the Proposed Plan.

Page 72. Compliance with ARARs.

EPA Response: The proposed interim remedial action for the aquifer remediation will not by itself, result in the entire Newtown Creek aquifer reaching ARARs. The proposed interim remedial action will provide drinking water which meets all Federal and New York State regulations for a public drinking water supply and provide data to assess the potential for final remediation of the aquifer. The goal of any aquifer remedy will be to satisfy ARAR's, but compliance for an interim action is not required; Westinghouse is inaccurate in concluding that an interim remedy which has the intended goal of complying with ARARs has no lawful purpose.

Page 74. Westinghouse commented that the Proposed remedy will not be a permanent remedy and will not achieve long-term effectiveness.

EPA Response: The proposed remedy will provide a reliable, long-term source of potable water for the community.

Page 75. Westinghouse Electric Company commented that "EPA has based the effectiveness of this remedy, in part, on the statement that Facet Enterprises and LRC Electronics, Inc. "could not contribute to the ground water contamination at the Kentucky Avenue Well."

EPA Response: EPA does not generally base the effectiveness of any remedy on a statement. Pump and treat remedial alternatives have been proven at many Superfund sites to be effective at containing contaminant migration. In addition, the ground water treatment alternatives evaluated are proven technologies for treating ground water to drinking water standards.

The Facet Enterprises facility is located between 4,000 and 5,000 feet south or slightly southwest of the Kentucky Avenue Well. Ground water elevation data collected during the Supplemental RI indicate that the water level elevation in the Newtown Creek Aquifer at the Facet Enterprises facility is approximately 20 feet lower than at the Kentucky Avenue Well (without the well pumping). TCE was detected during the Supplemental RI at the Kentucky Avenue well and based on the data collected during the Supplemental RI the Westinghouse facility has been identified as a source of TCE. In addition, EPA has proposed to investigate a possible source of aquifer contamination to the west of the Westinghouse facility.

Page 77. Westinghouse commented that they do not believe that the proposed remedy will achieve any significant reduction in the toxicity, mobility, or volume of the materials in the plume. Westinghouse Electric Corporation comments that although the proposed remedy involves the use of treatment technology, so does source control.

EPA Response: If the pumping wells and the Kentucky Avenue Well pump at the estimated rate of 840 gpm for thirty years, the ground water remediation program will treat a total of 1.32×10^{10} gallons of contaminated ground water which would have otherwise continued lowering ground water quality within the Newtown Creek Aquifer for the next 30 years. The proposed interim remedial action will prevent the spread of contaminants to areas downgradient of the pumping wells. The proposed interim remedial action will reduce the mobility of the contaminants by preventing contaminant flow downgradient of the pumping wells. EPA agrees that source control measures would likely involve treatment technologies, and establishing source control measures is discussed as a priority in the proposed plan.

Page 78. Westinghouse Electric Corporation does not believe that the proposed plan is implementable.

EPA Response: The interim remedial action is implementable. Installation of recovery wells is relatively simple, and restoration of the Kentucky Avenue Well, or the replacement of the Kentucky Avenue Well, can be easily accomplished.
All the proposed treatment systems are proven technologies for removing the contaminants to drinking water standards. All of the material needed to implement this remedy are easily obtained, and

the services needed to operate and maintain the pumping and treatment systems are commercially available.

Page 79 Westinghouse Electric Corporation commented that they do not believe that the proposed remedy is cost effective. (This comment is also made on the following pages: 22,45,46,73,74,79, and page 87)

EPA Response: The capital costs of restoring the Kentucky Avenue Well and providing a filtration system, air stripper, carbon adsorption unit for the air emissions, and discharge to the public water supply is estimated to be $1,089,000, and the annual operation and maintenance costs are estimated to be $549,000. The capital cost for the pumping wells installed down gradient of the Westinghouse facility for treatment of the ground water with filtration, air stripping, and carbon absorption for air emissions, and eventual discharge to the public water supply is estimated to be $839,600. Annual operation and maintenance costs are estimated to be $355,600. EPA believes that considering the benefits of controlling contaminant migration and providing additional potable water this is a cost effective proposed remedy.

Page 83. Westinghouse Electric Corporation commented that although the state initially concurred on the Proposed Plan, the state and EPA did not have sufficient data to make an informed decision because potential sources were not adequately characterized and source control had not been implemented.

EPA Response: The New York State Department of Environmental Conservation would have informed EPA if they felt that insufficient data exists for them to concur on the Proposed Plan.

The NYSDEC has concurred on this Record of Decision. The letter of concurrence is attached to the Record of Decision.

Page 83. Westinghouse Electric Corporation has evaluated "Community Awareness" and has commented that 1) The community is aware that an adequate water supply is being provided by another source (by using filtered river water and by reinstating the Sullivan Street Wellfield), 2) that there has been no popular demand for the proposed remedy, and 3) that as a long time member of the community, Westinghouse has proposed addressing the problem through source control and natural attenuation.

EPA Response: EPA evaluates Community Acceptance of all Proposed Remedial Actions at Superfund sites to ensure public input into our decision making process. The Community Acceptance is generally evaluated by the question and comment period during the Public Meeting, and by evaluating comments sent by the Public to EPA during the Public Comment Period.

EPA received favorable comments on the Proposed Plan during the Public Meeting with respect to our proposal to begin initiation of an aquifer remediation program. (See Responsiveness summary pp.12).

During the public comment period, EPA received six comments. Three letters favored the planned interim remedial action. One letter requested clarification of the Supplemental RI text, one letter requested general information about the site, and Westinghouse Electric Corporation's letter which favors a no - action alternative. Based on the comments received during the public comment period EPA concludes that there is community acceptance of the proposed interim remedial action.

Page 84. Westinghouse comments that "EPA has said that active restoration is most appropriate in Class I aquifers where there is need for a drinking water supply or where institutional controls are ineffective."

EPA Response: The preamble to the NCP indicates that "EPA's preference is for rapid restoration, when practicable, of Class I ground water and (underline added for emphasis) contaminated ground waters that are currently, or likely in the near-term to be the source of a drinking water supply". The preamble to the NCP further states that "For Class I and Class II ground waters, preliminary remediation goals are generally set at maximum contaminant levels, and non-zero maximum contaminant level goals where relevant an appropriate, promulgated under the Safe Drinking Water Act or more stringent state standards..."

The Elmira Water Board began to develop the Newtown Creek Aquifer resources in 1962 as a public water supply. In 1980, the Kentucky Avenue Well provided approximately 10% of the water for this public water supply. The Kentucky Avenue Well was closed due to TCE contamination in the Newtown Creek Aquifer. In 1988, the Elmira Water Board Sullivan Street Wells which obtain ground water from the Newtown Creek Aquifer provided approximately 30% of the total water required for this supply which serves approximately 60,000 people.

Page 87. Westinghouse Electric Corporation comments that the Proposed Remedy Exceeds EPA's Legal Authority Under CERCLA and the NCP.

EPA Response: The Proposed Remedy does not exceed EPA's legal authority under CERCLA and the NCP.

Section 104 (a)(1) of CERCLA 42 U.S.C. §9604 (a) (1) indicates "Whenever (a) any hazardous substance is released or there is a substantial threat of such a release into the environment, or (b) there is a release or substantial threat of release into the

environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare, the President is authorized to act, consistent with the national contingency plan, to remove or arrange for the removal of, and provide for remedial action relating to such hazardous substance, pollutant, or contaminant at any time (including its removal from any contaminated natural resource), or take any other response measure consistent with the national contingency plan which the President deems necessary to protect the public health or welfare or the environment..."

The ground water quality investigation conducted by EPA during the Supplemental Remedial Investigation has detected the presence of hazardous substances listed in Section 302.4 of the NCP. These hazardous substance detected in the Newtown Creek Aquifer, include trichloroethylene, arsenic, and chromium. The Newtown Creek Aquifer is a drinking water aquifer which currently provides approximately 30% of the water supply for the Elmira Water Board and serves approximately 60,000 people. The interim remedial action described in the Proposed Plan provides for the removal of hazardous substances from the drinking water aquifer. In addition, the treatment of ground water removed from the Newtown Creek Aquifer will result in a potable water supply which meets both Federal and New York State drinking water standards. Federal and New York State drinking water standards are applicable requirement for this interim remedial action because the water will be distributed to the public water supply system.

During the Supplemental Remedial Investigation the following metals were detected at the following maximum concentrations: chromium (49,100 ppb), lead (321 ppb), and zinc (2640 ppb). EPA believes that these substances at these concentrations do not represent naturally occurring substance in their unaltered forms as intended by Section 104(a)(3) of CERCLA. Furthermore the inorganic contamination exceeds Federal and State drinking water standards. Filtration will be required to reduce the level of these substances in the ground water, and the cost associated with this process is the same for filtering one or more substances. Arsenic was detected in 24 out of 38 ground water samples analyzed. Only 3 samples of the 24 detections exceed New York State and Federal drinking water standards. The proposal to treat the inorganic contamination was not based solely on the arsenic detected in ground water samples.

Page 90. Westinghouse Electric Corporation concludes that EPA should reopen the public comment period and that EPA make public all available information about the RI/FS, so that Westinghouse and others may have an opportunity to comment more completely.

EPA Response: As EPA stated in its response to Westinghouse's request for additional time EPA believes that sixty days was an adequate period for review of the proposed plan. The NYSDEC, and

other members of the public reviewed the Supplemental RI/FS during this two month period and were able to reach a conclusion as to the acceptability of the proposed plan. Furthermore, it is unclear to EPA what additional information Westinghouse desires in light of the fact that EPA has provided the information requested by Westinghouse pursuant to Freedom of Information Act (5 U.S.C.§ 552) requests as mentioned on page 5 of the comments submitted to EPA. Information related to the site including the Supplemental RI/FS is located in the information repositories.

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September 18, 1990

Mr. J. Jeff Josephson
Remedial Project Manager
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Room 747
New York, New York 10278

Re: Kentucky Avenue Wellfield Site
Chemung County, New York

Dear Mr. Josephson:

Enclosed please find the written Comments of Westinghouse Electric Corporation pertaining to EPA Region II's "Superfund Proposed Plan Kentucky Avenue Wellfield Site, Chemung County, New York, July 1990." These Comments are hereby submitted by Westinghouse Electric Corporation to EPA during the period for public comment in response to the Plan, and for inclusion and filing in the administrative record file for this Site.

In a telephone conversation between Morgan G. Graham, counsel for Westinghouse, and James F. Doyle, Assistant Regional Counsel for EPA, Mr. Doyle stated that these Comments would be considered timely filed if they were post-marked by September 18, 1990, and copies were sent to EPA by Federal Express. You further agreed to this procedure in your telephone conference with Morgan G. Graham today. Accordingly, these Comments are being submitted by U.S. mail, with today's post-mark, and we are sending copies by Federal Express. At your request, we are also faxing you the first 10 pages of the Comments today; however,

certain blanks appear in the faxed pages where there are cross-references to other pages in the document. Those blanks will be filled in on the copies you will receive by mail and Federal Express.

Sincerely,

David Hird

David B. Hird

cc: Richard L. Caspe (w/encs.)
James F. Doyle, Esq. (w/encs.)

The site was included on the National Priorities List (NPL) on October 5, 1984. A federally funded/federal lead RI/FS was completed by Camp, Dresser & McKee, Inc. on July 15, 1987. The study concluded that multiple sources contributed to the contamination of the Katonah Well including dry cleaning establishments located west and southwest of the well, and the Town-owned pumphouse located on the peninsula. Parts from meters and valves were cleaned by municipal employees within or immediately outside the pumphouse, and the solvents used in this process were disposed of in the sump of the pumphouse and/or directly on the ground.

A Record of Decision (ROD) was signed by the EPA Regional Administrator on September 25, 1987. NYSDEC concurred with the ROD, which called for the following:

* A new production well to be installed on the peninsula owned by the City of New York, designed for a rated capacity of 370 gallons per minute (gpm). The existing Katonah Well will be filled and sealed to mitigate the possibility of contaminants entering the aquifer by natural or other means and to prevent future use of untreated groundwater.

* A new water treatment facility will be installed on the peninsula, designed to treat the rated capacity of the production well. Treatment processes will include an air stripper and disinfection. Treated water will be discharged to the Bedford Consolidated Water District Distribution System, to be used for drinking water by the community.

* A monitoring program designed to detect the presence of identified contaminants in the treated water will be required. The results of this monitoring program will be evaluated on a routine basis to ensure protection of human health.

* A general clean up of the peninsula area to remove trash and debris, which may adversely affect water quality in the future, is recommended for Town implementation. Also, past practices of using the peninsula area as a convenient dumping area for debris and other potentially hazardous material should be discontinued.

An Administrative Order on Consent was signed between the EPA and the Town of Bedford on June 10, 1988. The document listed the remaining PRPs as Honebon Cleaners, Dutch Girl Cleaners, Village Cleaners and Tailors, and Katonah Shopping Center Associates. The Town of Bedford under this order agreed to complete a Remedial Design. NYSDEC has reviewed and commented on the Project Operations Plans (POP) and Design Work Plan prepared by the Town's consultant Hahn Engineering. EPA has not received the 30% Design complete documents. Delays in the agreed upon project schedule have occurred.