# Five-Year Review Report

## Second Five-Year Review Report for LaSalle Electric Utilities Site LaSalle, LaSalle County, Illinois

**September 2004**

**Prepared by:**

**Richard Lange**
**Illinois Environmental Protection Agency**
**Springfield, Illinois**

**For U.S. EPA, Region 5**

Approved by:

for Richard C. Karl, Director
Superfund Division
U.S. Environmental Protection Agency, Region 5

Date 9/27/04

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# List of Acronyms

| | |
|---|---|
| ARARs | applicable or relevant and appropriate requirements |
| CAA | Clean Air Act |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CWA | Clean Water Act |
| E & E | Ecology and Environment, Inc. |
| ESD | Explanation of Significant Difference |
| FS | Feasibility Study |
| GAC | granular activated carbon |
| GTU | groundwater treatment unit |
| HDPE | high-density polyethylene |
| HRS | Hazard Ranking System |
| Illinois EPA | Illinois Environmental Protection Agency |
| LEU | LaSalle Electric Utilities |
| MCLs | maximum contaminant levels |
| NAPL | non-aqueous-phase liquid |
| NCP | National Contingency Plan |
| NESHAPs | National Emission Standards for Hazardous Air Pollutants |
| NPL | National Priorities List |
| O & M | operation and maintenance |
| OSHA | Occupational Safety and Health Administration |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| POTW | Publicly Owned Treatment Works |
| ppb | part per billion |
| ppm | parts per million |
| PRP | Potentially Responsible Party |
| RAOs | remedial action objectives |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| RPM | Remedial Project Manager |
| SDWA | Safe Drinking Water Act |
| SVE | soil vapor extraction |
| 1,1,1-TCA | 1,1,1-trichloroethane |
| TCE | trichloroethene |
| TSCA | Toxic Substances Control Act |
| TSD | Treatment Storage or Disposal Facility |
| ug/L | micrograms per liter |
| U.S. EPA | United States Environmental Protection Agency |
| VOC | volatile organic compound |

## Executive Summary

The remedy for the LaSalle Electric Utilities (LEU) site located in LaSalle, Illinois included the excavation and on-site incineration of contaminated soils.

The initial Five-Year Review found that the remedy was constructed and operated in accordance with the requirements of the Record of Decision (ROD). Since the initial Five-Year Review, one Explanation of Significant Difference (ESD) was issued to account for the addition of remedy enhancements (i.e., two soil vapor extraction systems and two phytoremediation plots), which were implemented to reduce the potential that volatile organic compound (VOC) groundwater concentrations will increase (i.e., rebound effect) once groundwater extraction is discontinued.

Currently, the remedy is functioning as designed, and groundwater monitoring results show a significant reduction in the concentrations of trichloroethene and 1,1,1-trichloroethane in the groundwater. There currently are no immediate threats. However, based on the groundwater modeling results, the continued operation of the on-site groundwater extraction, treatment, and remedy enhancements is still necessary in order to provide the level of protection to human health and the environment that was mandated in the March 1988 ROD for the site.

# Five-Year Review Summary Form

## *SITE IDENTIFICATION*

**Site name *(from WasteLAN)*: LaSalle Electrical Utilities**

**EPA ID *(from WasteLAN)*: ILD 980 794 333**

| **Region: 5** | **State: IL** | **City/County: LaSalle, LaSalle** |
|---|---|---|

## *SITE STATUS*

**NPL status:** ☒ **Final** ☐Deleted ☐Other (specify)

**Remediation status** (choose all that apply): ☐Under Construction ☒ **Operating** ☐Complete

| **Multiple OUs?*** ☒ **YES** ☐NO | **Construction completion date: Off-Site OU – Sept. 30, 1990**<br>**On-site OU - Feb. 28, 1994** |
|---|---|

**Has site been put into reuse?** Off-Site OU ☒ **YES** ☐ NO , On-Site OU ☐ YES ☒**NO**

## *REVIEW STATUS*

**Lead agency:** ☐ EPA ☒**State** ☐Tribe ☐Other Federal Agency

**Author name: Richard Lange**

| **Author title: Project Manager** | **Author affiliation: Illinois Environmental Protection Agency** |
|---|---|

**Review period:** ** **Jan. 1, 2004 to Sept. 2004**

**Date(s) of site inspection: June 23, 2004**

**Type of review:**
☒ **Post-SARA** ☐Pre-SARA ☐NPL-Removal only
☐Non-NPL Remedial Action Site ☐NPL State/Tribe-lead ☐Regional Discretion

**Review number:** ☐ 1 (first) ☒ **2 (second)** ☐ 3 (third) ☐Other (specify) _____

**Triggering action:**
☐Actual RA Onsite Construction at OU #____
☐Construction Completion ☒ **Previous Five-Year Review Report**
☐Other (specify)

**Triggering action date *(from WasteLAN)*:** Sept. 28, 1999

**Due date *(five years after triggering action date)*:** Sept. 30, 2004

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

## Five-Year Review Summary Form, cont'd.

**Issues:**

Infrequent exceedance of effluent standards due to equipment wear
Unutilized contaminated carbon stored on site
Reduced collection system efficiency

**Recommendations and Follow-up Actions:**

Monitor equipment for normal wear and fatigue closely
Remove the unutilized carbon from the site to an off-site compliant TSD
Hydraulic cleaning of collection system as soon as possible with periodic maintenance cleaning

**Protectiveness Statement:**

The remedy at the Site is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled as long as the O&M activities are maintained.

**Other Comments:**

None

# 1 INTRODUCTION

The purpose of the Five-Year Review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and make recommendations to address them.

The Illinois Environmental Protection Agency (Illinois EPA) prepared this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [1-6], the President shall take or require such action. The President shall report to the congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The United States Environmental Protection Agency (U.S. EPA) interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Illinois EPA conducted the Five-Year Review of the remedy implemented at the LaSalle Electric Utilities (LEU) site located in LaSalle, Illinois. The review was performed by the Illinois EPA's Remedial Project Manager (RPM) for the entire site from October 1999 through August 2004. This report documents the results of the review.

This is the second Five-Year Review for the LEU site. The triggering action for this policy review was the completion of the initial Five-Year Review in September 1999. The Five- Year Review is required because volatile organic compounds (VOCs), mainly trichloroethene (TCE), 1,1,1-trichloroethane (TCA), vinyl chloride, and tetrachloroethene (PCE), were detected in site groundwater above their respective maximum contaminant levels (MCLs) and the remedy will take more than 5 years to achieve the MCL goals of the ROD.

# 2 SITE CHRONOLOGY

## Chronology of Site Events

| Event | Date |
|---|---|
| LEU cited for inadequate polychlorinated biphenyl (PCB) storage facilities by U.S. EPA. | September 1975 |
| Violation of PCB management practices documented by U.S. EPA and the Occupational Safety and Health Administration (OSHA). | October 1979 |
| U.S. EPA issues Toxic Substances Control Act (TSCA) complaint. | July 1980 |
| Illinois EPA soil sampling revealed extensive PCB contamination on the LEU property. | December 1980 |
| Illinois EPA soil sampling revealed PCB contamination on property beyond the LEU site. | March and May 1981 |
| Illinois EPA, under authority of Section 34 of the Illinois Environmental Protection Act, sealed all but the leased areas of the LEU property. | May 1981 |
| Illinois EPA conducted additional soil sampling in the area. | June to September 1981 |
| Illinois EPA fills a State of Illinois complaint. | May 1982 |
| Illinois EPA amended the State of Illinois complaint and also filed a Federal complaint under TSCA. | August 1982 |
| The U.S. EPA Field Investigation Team installed four monitoring wells at the site. | August 1982 |
| Based on the information gathered, the site is included on the first publication of the National Priorities List (NPL). The Hazard Ranking System (HRS) score equaled 42.06. | December 1982 |
| A U.S. EPA contractor fenced part of the LEU property as an immediate removal measure at the site. | July 1983 |
| The U.S. EPA conducted additional sampling south of the LEU property. Results indicated heavy contamination on the property immediately to the south. | July and October 1983 |
| The U.S. EPA conducted an immediate removal action at the site and capped the section of the property south of the LEU site, which was found to be heavily contaminated. This cap diverted drainage to an on-site pond that was also constructed. | June 1984 |
| Illinois EPA conducted additional soil and groundwater sampling in the area. Groundwater contamination, including VOCs and PCBs, was identified. | June 1984 to July 1985 |
| The U.S. EPA conducted an immediate removal action at the | April 1985 |

| Event | Date |
|---|---|
| site. PCB waste material that had been stored on the site was staged, sampled, and packaged for eventual disposal. | |
| Draft Feasibility Study (FS) by Illinois EPA contractor addressed contamination in area soils. | August 1985 |
| The Illinois EPA conducted an immediate removal at the site. An Illinois EPA contractor removed the previously staged material and transported it to a nearby incineration facility. | December 1985 |
| Draft Remedial Investigation (RI) report prepared by Illinois EPA. | January 1986 |
| Illinois EPA contractor prepares Phased Feasibility Study regarding soil contamination beyond the LEU property. | June to August 1986 |
| U.S. EPA Record of Decision regarding residential soil contamination is signed. | August 1986 |
| Illinois EPA contractor prepared design plans and specifications for the cleanup of contaminated residential soils. | January to July 1986 |
| Illinois EPA contractor conducted investigation of groundwater contamination at the site. | January to December 1987 |
| Illinois EPA signs contract and begins preliminary work related to the cleanup of residential soils. | January 1988 |
| U.S. EPA signs on-site soils and groundwater ROD | March 1988 |
| Illinois EPA contractor begins off-site soil incineration. | November 1988 |
| Illinois EPA contractor completes off-site incineration. | June 1989 |
| Illinois EPA contractor begins on- site remedial efforts. | August 1990 |
| Illinois EPA contractor begins construction of the groundwater collection and treatment system. | October 1991 |
| Illinois EPA receives permit to discharge treated groundwater. | April 1992 |
| Groundwater collection and treatment systems started up. | April 1993 |
| Illinois EPA contractor completes on-site soil incineration. | October 1993 |
| Illinois EPA contractor conducts pilot testing of soil vapor extraction (SVE). | April 1999 |
| Five Year Review by Illinois EPA | September 1999 |
| Illinois EPA contractor implements phytoremediation test plot in the Northwest corner of the site. | April 2002 |
| Illinois EPA contractor begins construction of SVE systems. | September 2002 |
| Illinois EPA implements phytoremediation test plot along the eastern boundary of the site. | September 2002 |

| Event | Date |
| --- | --- |
| SVE systems begin operation. | March 2003 |
| U.S. EPA signs Explanation of Significant Difference (ESD) for remedy enhancements (SVE and phytoremediation). | July 2004 |

# 3 BACKGROUND

## 3.1 Physical Characteristics

The LEU site is located in west-central LaSalle County, in the city of LaSalle in north-central Illinois (SE 1/4, SW 1/4 of Section 3, T33N, Rffi). The LEU site address is 2427 St. Vincent Avenue. The site originally consisted of five buildings, interconnected to form one main complex. This complex included an office building, two metal buildings, a brick building, and a Quonset building. Additional small buildings (pump house, two hose houses, a thinner shed, a small incinerator building, and a sandblasting shed) and a stormwater holding pond that received stormwater runoff from the parking lot was also present on site.

Approximately 70 residences are located within 1/8 mile of the LEU property. Based on the 1980 Census data showing approximately 2.7 individuals per household in the area, it was estimated that these residences house approximately 190 people. The land use to the north of the property is rural with an agricultural field separating the site from a residential development. Immediately south of the site are several commercial developments. East of the site is the residential area that was addressed by the PCB soil removal effort. Finally, a mixture of small businesses and residences lies to the west.

## 3.2 Land and Resource Use

LEU is a former manufacturer of electrical equipment. Operations at the site began prior to World War n, and in the late 1940s the plant began utilizing PCBs in the production of capacitors. This manufacturing practice continued until October 1978. During the 1970s, the company expanded its operations and opened another plant in Farmville, North Carolina. In May 1981, manufacturing operations ceased at the LaSalle site. Subsequently, the Illinois EPA, enforcing Section 34 of the Illinois Environmental Protection Act, ordered the production areas of the plant to be sealed. The LEU office building remained in use by a lessee until some time in the early 1980s. Since that time, the entire facility has been abandoned.

## 3.3 History of Contamination

Information is limited on the waste management practices of the LEU Company. Undocumented reports allege that PCB-contaminated waste oils may have been applied as a dust suppressant both on the site and off the property as late as 1969. Following the regulation of PCBs, inventory reports for LEU document the disposal of PCBs at approved facilities.

## 3.4 Initial Response

Beginning in September 1975, numerous government agencies including the U.S. EPA, Illinois EPA, and OSHA conducted various inspections and issued myriad complaints and orders to the LEU Company as a result of its past manufacturing and handling practices.

Analysis of site records indicated there was only one Potentially Responsible Party (PRP), LEU, from which the U.S. EPA could seek reimbursement of costs associated with the investigation and removal of contamination from the site. However, LEU was not financially viable.

On September 19, 1983, LEU petitioned for relief under Chapter 11 of the Bankruptcy Act in the U.S. Bankruptcy Court, Wilson, North Carolina. On June 26,1986, the court entered an order approving the company's planned liquidation.

From December 1980 through August 1982, multiple soil and groundwater sampling events were conducted at the LEU site. Based on the analytical results at the facility, the LEU site was included in the first publication of the NPL in December 1982. An HRS score of 42 06 was calculated for the LEU site.

Starting in July 1983 and running through December 1987, additional site investigations and limited site removals were performed. Specifically, investigative reports prepared

for the LEU site included a draft Feasibility Study addressing contamination in area soils (August 1985), a draft Remedial Investigation report (January 1986), and a Phased Feasibility Study addressing soil contamination beyond the LEU property (August 1986).

### 3.5 Basis for Taking Action

Hazardous substances identified in the March 1988 ROD for the LEU site that have been released into each medium include:

| Soil | Groundwater |
|---|---|
| Polychlorinated biphenyls | Polychlorinated biphenyls |
| Volatile organic compounds | Trichlorpethene |
| | Trans-1, 2-dichloroethene |
| Sediment | 1,1,1-Trichloroethane |
| Polychlorinated biphenyls | 1,1-Dichloroethane |
| Volatile organic compounds | Vinyl chloride |
| | 1,1-Dichloroethene |
| | Toluene |
| | Tetrachloroethene |
| | Ethylbenzene |
| | Xylenes |

# 4 REMEDIAL ACTIONS

## 4.1 Remedy Selection

The U.S. EPA elected to split the site into two separate operable units. The first operable unit (Phase I) dealt with PCB soil contamination beyond the LEU property (ROD dated August 1986). The second operable unit (Phase H ROD dated March 30, 1988) addressed all remaining contamination and required the following:

- Excavation of PCB-contaminated soil on the LEU property;
- High-pressure flushing and mechanical cleaning of contaminated sewer lines;
- Excavation of PCB-contaminated sediment from the unnamed creek downstream of the storm sewer discharge;
- Incineration of PCB-contaminated soil and sediment by a mobile, on-site thermal destruction unit;
- Construction of a groundwater collection system on and/or near the LEU property; and
- Construction of an on-site treatment system that will process the VOC- and PCB-contaminated groundwater collected.

The March 1988 ROD also stipulated that all applicable or relevant and appropriate requirements (ARARs) of other Federal and State environmental laws will be attained. Specifically, the ROD identified the following:

- **Toxic Substances Control Act (TSCA).** PCB disposal regulations under 40 CFR 761.60 require that PCB-contaminated soil at concentrations greater than 50 parts per million (ppm) be taken to a TSCA-regulated facility. Incineration of PCB waste must be able to meet a destruction removal efficiency of at least 99.9999%. These requirements are applicable and will be met. In addition, residual material from the incinerator would be required to contain less than 2 ppm PCBs;

- **Resource Conservation and Recovery Act (RCRA).** Groundwater will be monitored for three years following attainment of cleanup levels consistent with corrective action minimum requirements under 40 CFR 264.100;

- **Safe Drinking Water Act (SDWA).** Contaminated groundwater will be collected to achieve Maximum Contaminant Levels for VOCs; PCBs will be removed to the 1-part per billion (ppb) level;

- **Clean Water Act (CWA).** Groundwater that is collected will be discharged to the local wastewater treatment plant following treatment and will meet pretreatment standards established pursuant to 40 CFR 403.5; and

- **Clean Air Act (CAA).** Emission control requirements may be applicable to emissions from the incinerator depending on their magnitude. Asbestos in the LEU buildings will be disposed of in accordance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) for asbestos, 40 CFR 61.147.

## 4.2 Remedy Implementation

### 4.2.1 PCB Soil Remediation

Phase I was initiated in January of 1988. Approximately 23,000 cubic yards of soil were removed from off-site properties and treated by the on-site incinerator. Phase n was initiated in July of 1990, and approximately 68,000 cubic yards of on-site contaminated soil were incinerated. Additionally, high-pressure flushing and mechanical cleaning of contaminated sewer lines, and excavation of contaminated sediment from the unnamed creek downstream of the storm sewer discharge were performed.

Soil thermally treated by the on-site incinerator in phase one of the project was used at a local land disposal facility as daily cover. The soil, sediments and building demolition debris thermally treated during phase two was used as on-site fill material. Upon completion of the thermal treatment, a soil cover was placed over the thermally treated soil, and a protective vegetative cover was established.

### 4.2.2 Groundwater Treatment Unit and Groundwater Quality

In April of 1992, construction of the on-site groundwater collection and treatment system was initiated. The groundwater collection and treatment system became fully operational in April 1993. The groundwater collection system consists of a series of interconnected trenches that drain by gravity into a single collection manhole. From the manhole, the collected groundwater is then pumped into the groundwater treatment unit (GTU).

The GTU consists of an acid feed system to adjust pH, an oil water separator capable of removing both light and dense non-aqueous phase oils, pressurized vessel filtration to remove particulate (including gypsum created by pH adjustment), twin air-stripping towers to remove VOCs from the influent with vapor phase carbon adsorption of VOCs, and aqueous-phase granular activated carbon to remove PCBs. Once treated, the groundwater is discharged to the local Publicly Owned Treatment Works ( POTW).

Throughout its operation, the performance of the GTU, as well as groundwater quality, has been monitored. Through 2002, groundwater samples were collected on a quarterly basis, and analyzed for VOCs and PCBs. In 2003, groundwater sampling and analysis were reduced to semiannual events. Additionally, weekly influent and effluent samples from the GTU have been collected and analyzed for VOCs and PCBs.

As part of the ongoing groundwater and GTU monitoring programs, Illinois EPA has contracted Ecology and Environment, Inc., (E & E) to gather and model data, and to develop reports of the findings. Reports generated by E & E include:

- *Assessment of Performance Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit, Inception Through 1995, dated April 1996;*
- *Review and Assessment Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit 1996 Through 1997, dated April 1998;*
- *Summary Report, Phase I Investigation of VOCs in Subsurface Soils, dated July 1998;*
- *Focused Feasibility Study Report, Phase II Investigation of VOCs in Subsurface Soils, dated January 1999;*
- *Review and Assessment Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit 1998, dated April 7999;*
- *Review and Assessment Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit 1999-2000, dated March 2001;*
- *Review and Assessment Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit 2001, dated July 2003; and*
- *Review and Assessment Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit 2002-2003, dated August 2004.*

Based on the data gathered to date and the associated modeling efforts, the groundwater extraction system at the LEU site has developed a sufficient hydraulic gradient such the contaminant plume has been captured. Analytical results also show that no non-aqueousphase liquid (NAPL) is present in the groundwater. Additionally, the GTU has consistently met the POTW effluent limitations.

In May 1999, after receipt of approval from the City of LaSalle, the granular activated carbon (GAC) cells were taken offline. Previous sampling in 1998 indicated that the carbon cells were no longer needed to maintain the required effluent standards, and in an

effort to maximize the throughput of the treatment system, the carbon cells were bypassed, allowing effluent from air stripper #2 to discharge directly to the City sewer connection. The carbon cells have remained offline to this date. As a result, back-flushing the carbon cells was no longer required as part of routine operation and maintenance of the GTU.

Since the system has been in operation, no oil has been collected from the oil/water separator. The separator is functioning as a settler for the suspended soil material that enters the collection system with the groundwater and for gypsum (CaSO-4). This material is removed from the separator periodically via an under drain and the unit is fully emptied when the system is shut down for routine maintenance. The sludge is pumped into used bag filters, which are on a drying rack, and allowed to dewater before being placed into 55-gallon drums with the bag filters. Water generated in this process is returned to the treatment system for re-treatment and discharge to the POTW and the drummed filters and dried sludge is sent for off-site disposal.

While the contaminant plume has been captured, subsequent investigations conducted in early 1998 to refine the understanding of site hydrology have determined that contaminant migration is slower than the original model predictions. Additionally, the influent data showed that the concentration of VOCs in certain monitoring locations was steadily increasing. This trend indicated that there were potential VOC-contaminated source areas within the unsaturated zone, which led to additional investigations conducted in mid-1998. The additional soil investigations located three isolated areas in the unsaturated zone that had elevated VOC concentrations. The three areas are located on site and in the former Laboratory area, the Thinner Shed area, and the northwest corner of the she.

In order to ensure that the groundwater MCLs are met in a timely fashion and to reduce the rebound effect associated with shutting down the GTU, a series of remedy enhancements, documented in the July 2004 BSD, were implemented.

#### 4.2.2.1 Soil Vapor Extraction Units

Installation of dual phase SVE units in the Laboratory area and in the Thinner Shed area was completed hi January 2003, and the startup and shakedown period took place during February 2003. By pneumatically fracturing the site soils, an increase in the hydraulic conductivity of the remediation areas was achieved, and groundwater extraction was significantly increased. By the end of 2003, the Laboratory area SVE system had removed a total of 20,930 gallons of groundwater, and 42,270 gallons had been removed by the Thinner Shed SVE system.

#### 4.2.2.2 Phytoremediation Systems

Two phytoremediation systems were installed in 2002. The first was located in the northwest corner of the site to address PCE-contaminated soil and groundwater. The second was installed along the eastern side of the GTU parallel to St. Vincents Avenue. The GTU phytoremediation system was installed to enhance collection of the TCE groundwater plume and secondarily as a hydraulic curtain to reduce the volume of the uncontaminated groundwater flowing into the site from the northeast and southeast.

In the northwest corner, an area approximately 95 feet by 235 feet was planted with fastgrowing poplar, willow, and bald cypress trees in April 2002. Due to an unseasonably hard freeze on May 20, 2002, some poplar and all of the willow clones suffered significant stunting and/ or mortality. The affected poplars and willows were removed, and subsequently these species were replanted in early 2003. A non-dedicated mobile spray gun irrigation system was used for watering this area.

In the GTU area, a plot approximately 90 feet by 300 feet was planted with fast-growing poplars and willows. Planting in the GTU area was completed in the fall of 2002. In order to prevent tree roots from coming into contact with the thermally treated ash, a hole was bored to native soil for each individual tree, and the borehole was lined with high-density polyethylene (HDPE) pipe. All the GTU trees were planted by lowering rooted whips to the bottom of the boring and then filling in the boring with a mixture of soil, sand, bark, and peat. A dedicated drip irrigation system was also installed within this plot.

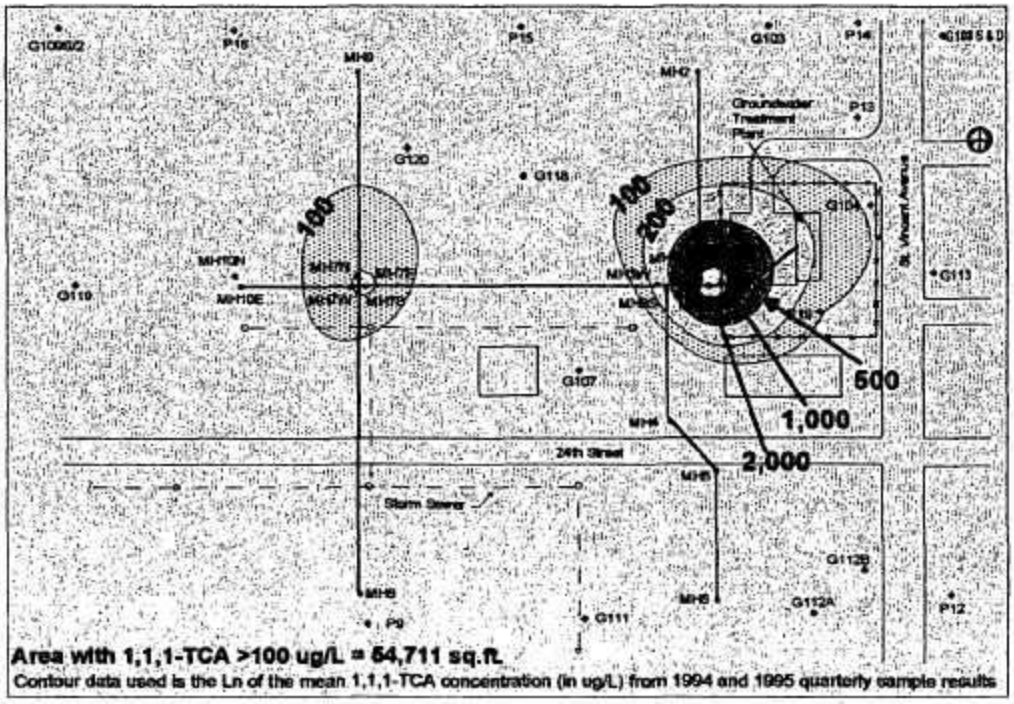
In total, approximately 1,000 trees were planted at the LEU site, and it has been estimated that for the 2003 growing season, the average tree took up approximately 210 gallons of groundwater. Multiplying this amount by the total number of trees, the approximate water uptake by both phytoremediation systems was 209,000 gallons of groundwater.

## 5 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

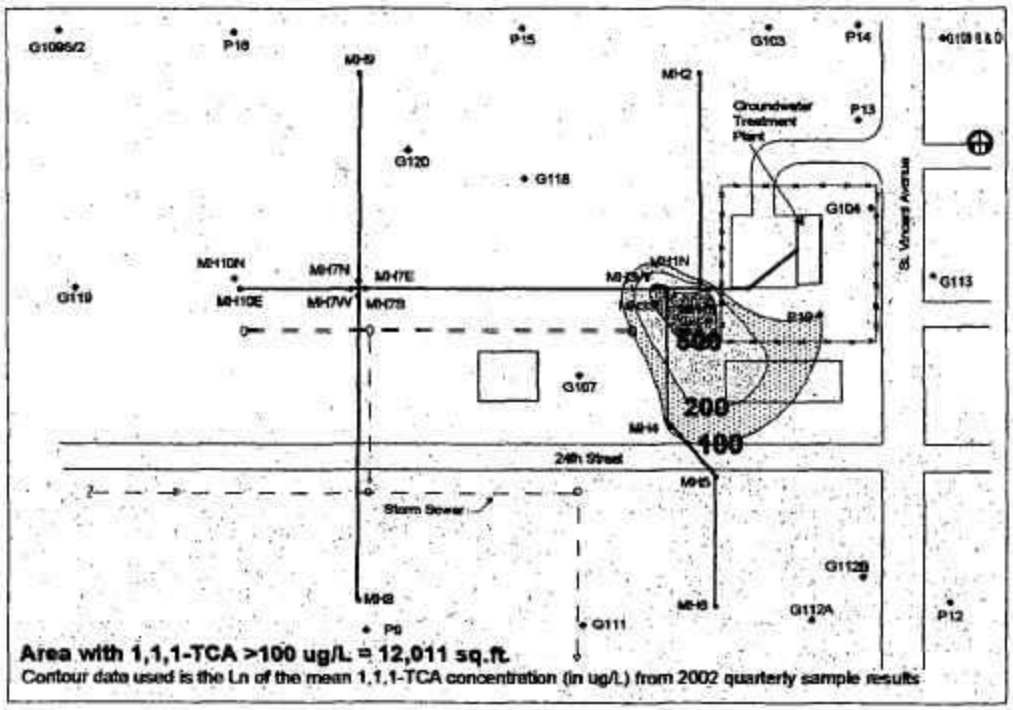
The groundwater extraction system and GTU have continued to provide a sufficient hydraulic gradient to facilitate capture and collection of groundwater, and a reduction of the groundwater contaminants. Groundwater contaminant concentrations continue to be reduced, and the overall size of the contaminant plume has decreased by approximately 43% or 2.4 acres (see Figures 5-1, 5-2 and Table 6-1).

Recommendations presented in the initial Five-Year Review report were implemented. Two SVE systems enhanced by pneumatic fracturing were installed. During the course of their design, it was determined that the SVE systems should operate as dual-phase collection systems (i.e., collecting both soil vapor and groundwater). Both systems are functioning appropriately.

While an additional collection lateral was proposed in the initial Five-Year Review, the Illinois EPA determined that a phytoremediation system was a more innovative and cost-effective approach to enhance groundwater collection along the eastern side of the GTU area. Additionally, given the relatively shallow groundwater table in the Northwest corner of the site, a dual-phase extraction system would be limited in its effectiveness in addressing both vadose-zone and groundwater contamination. Therefore, a phytoremediation system was installed in lieu of a mechanical system in the northwest PCE contaminated area. Analytical results show that the trees are extracting and degrading VOC contamination.

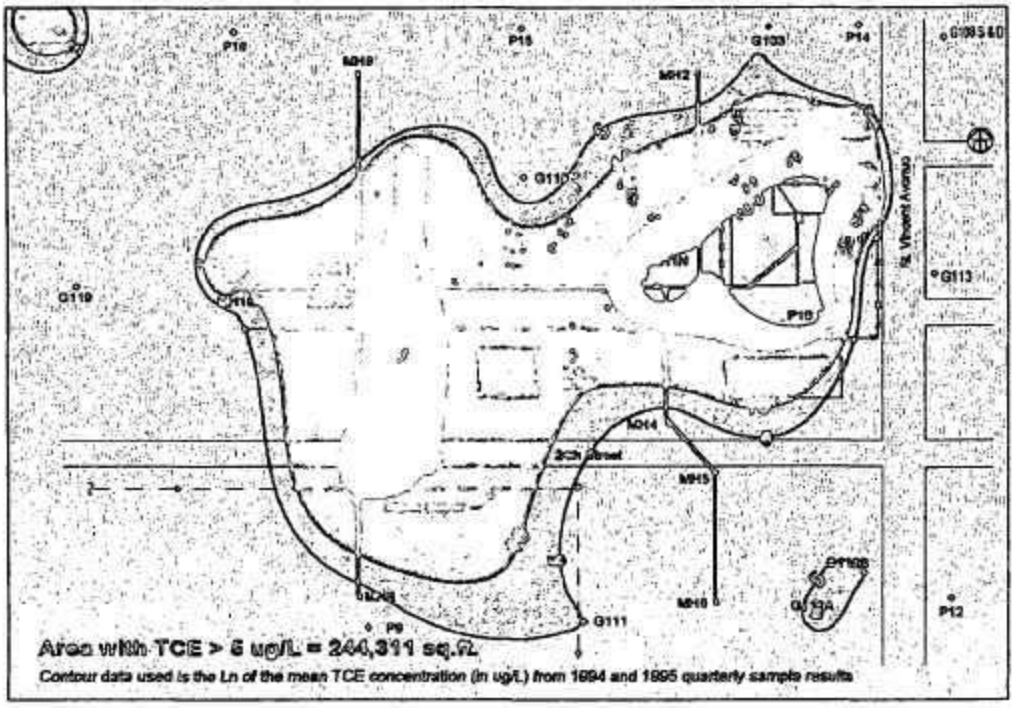



**Configuration of 1,1,1-TCA Plume 1994-1995**

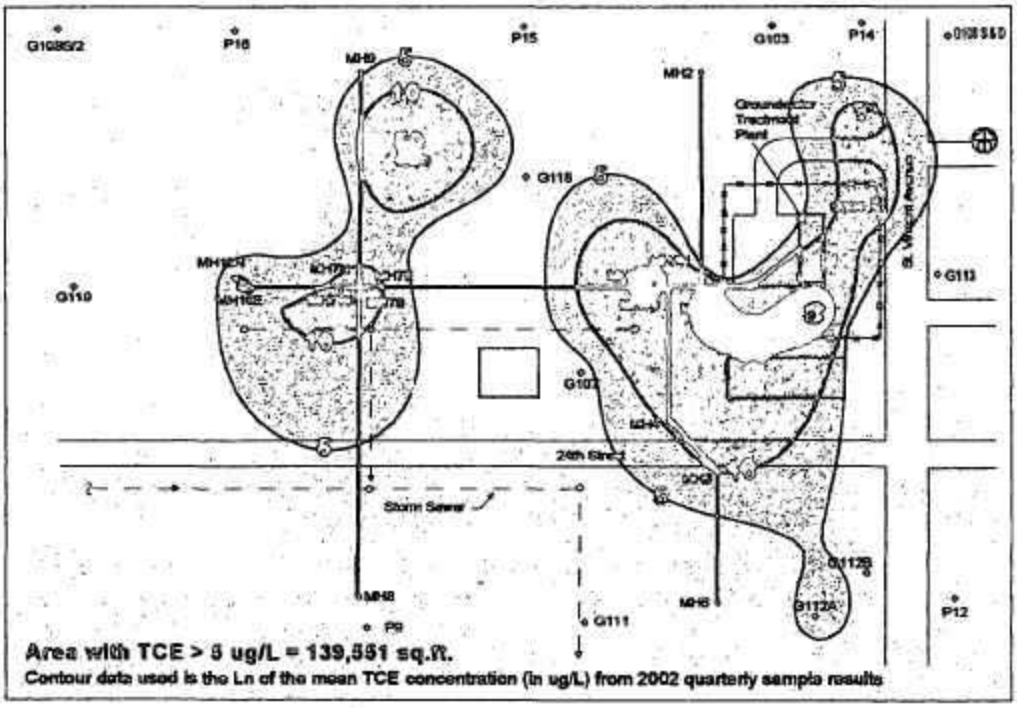



**Configuration of 1,1,1-TCA Plume 2002**

**Figure 5-1 Reduction of 1,1,1-TCA Plume Over Time**




Configuration of TCE Plume 1994-1995




Configuration of TCE Plume 2002

Figure 5-2 Reduction of TCE Plume Over Time

# 6 FIVE-YEAR REVIEW PROCESS

## 6.1 Administrative Components

The LEU site is a Federally funded, State-lead site. Illinois EPA subcontractors operate the GTU and remedy enhancement systems, and perform engineering evaluations, as well as groundwater monitoring. The Illinois EPA maintains a local office in LaSalle, Illinois for our RPM. The RPM has prepared this Five-Year Review report using accumulated data and data submitted by the subcontractors in support of operating, maintaining, and monitoring the implemented remedy at the LEU site.

## 6.2 Community Involvement

The Illinois EPA maintains an office in LaSalle within '/2 mile of the site and the Illinois EPA RPM is on-site from one (1) to two (2) hours per day, three (3) to five (5) days per week. The same Illinois EPA RPM has managed this site since 1988, and is well known in the community. As a result, local residents have relatively immediate access to the Illinois EPA and discuss the site frequently with the Illinois EPA RPM. Additionally, Illinois EPA maintains a repository at the local junior college serving LaSalle. While no specific meeting was held to notify the public that the Five-Year Review process had been initiated, the continuous presence of the RPM in the community as well as a local repository has kept the public informed and allowed their questions and concerns to be addressed. Several informal public meetings have been held to describe the remedy enhancements implemented following the previous Five-Year Review and community support of the remedy is strong.

Upon acceptance and approval of this report by the U.S. EPA, the Illinois EPA will publish a notice in the local newspaper that the Five-Year Review report is available in the local repository.

## 6.3 Document and Data Review

Since the initial Five-Year Review report, quarterly groundwater monitoring has been performed through 2002. Starting in 2003, groundwater monitoring is being performed on a semiannual basis. The following text provides an abbreviated summary of the most recent data and interpretations. A complete summary of the existing groundwater quality data and systems operations can be found in the following document:

- *Review and Assessment Report, LaSalle Electric Utilities Company Site, Groundwater Treatment Unit 2002-2003, dated August 2004.*

### 6.3.1 Groundwater

Of the 20 available wells and piezometers, eight contained VOCs at concentrations above MCLs during at least one sampling event conducted in 2002 and 2003. VOCs in the remaining 12 wells and piezometers were non-detect or below MCLs for all of the sampling events in 2002 and 2003.

In two of the eight wells, the MCL concentration for TCE was exceeded during a single sampling event only. Additionally, the annual mean concentration of TCE in both of these wells was below the MCL. The annual mean TCE concentration has consistently been below the MCL in both of these wells since at least 1998. Therefore, only six wells are consistently indicating VOC concentrations above the MCLs.

Surfer™-generated contour maps showing the annual mean 1,1,1-TCA and TCE concentrations in groundwater in 1994-1995 and 2002 are provided in Figures 5-1 and 5-2, respectively. The natural log of the average concentration at each monitoring point was used to develop each map, and although the maps may overestimate the a real extent of these contaminants (due to the lack of data in certain areas, and the interpolation method used), they provide a means to view the approximate position of the MCL boundary for each compound, over time.

As depicted in Figures 5-1 and 5-2, the groundwater extraction system has been effective in reducing the size of the contaminant plume. Based on the Surfer™ mapping, the size of the plume relative to time was calculated with the results presented in Table 6-1. Since 1994-1995, the overall size of the TCA plume has been decreased by 78%, and the TCE plume has been reduced by 43%. Based on these results, it can be concluded that the LEU remedy is effectively reducing the groundwater contaminant plume and providing protection of human health and the environment. Insufficient groundwater data exist to accurately assess the positive impacts of the dual phase SVE and phytoremediation systems at the time of this Five-Year Review. It should be noted however that demonstration of contaminant extraction and degradation along with water table depression in the PCE contamination area has been documented recently (summer of 2004). Additionally one asymptotic removal cycle has been achieved at the SVE systems.

**Table 6-1 Percent Change in Area of Contamination**
**LaSalle Electric Utilities Site**
**LaSalle, Illinois**

| Contaminant Concentration Range (ug/L) | 1994-1996 | 2002 | Percent Reduction |
|---|---|---|---|
| | Area (square feet) | Area (square feet) | |
| **1,1,1- TrichIoroethane** | | | |
| 100-200 | 32,488 | 486 | 98% |
| 200-500 | 13,435 | 8,660 | 35% |
| 500- 1,000 | 5,328 | 2,865 | 46% |
| 1,000- 2,000 | 2,735 | 0 | 100% |
| > 2,000 | 725 | 0 | 100% |
| **Total Area > 100 ug/L** | 54,711 | 12,011 | 78% |
| **Trichloroethene** | | | |
| 5-10 | 54,988 | 80,033 | -45% |
| 10-50 | 132,164 | 54,371 | 59% |
| 50-100 | 41,889 | 4,713 | 89% |
| > 100 | 15,270 | 434 | 97% |
| **Total Area > 5 ug/L** | 244,311 | 139,551 | 43% |

### 6.3.2 Groundwater Treatment Unit

The GTU is operated by a "K" class operator, licensed by the State of Illinois and discharge from the GTU is via a permit issued by the City of LaSalle for discharge to the city sanitary sewer. Compliance with the operating permit requirements is on a self-monitoring basis. The permit requires that the operator of the GTU collect weekly effluent samples and analyze them for PCBs and 16 VOCs. Continuous measurement of effluent pH is also required by the permit to ensure that certain pH limitations are met prior to discharge. Permissible discharge criteria for PCBs and VOCs are based on 1990 drinking water MCLs as required in the March 1988 ROD.

Throughout this Five-Year Review period, the GTU has continued to be operated in batch mode to maximize the achievable drawdown while maintaining pump protection. The total volume of water processed during this period is 16,274,000 gallons. The GTU has removed an estimated total of 320 pounds of VOCs since its startup in 1994, and approximately 138 pounds have been removed since 1999. Table 6-2 provides a summary of pertinent GTU data.

**Table 6-2 Groundwater Treatment Unit Performance Data**
**LaSalle Electric Utilities Site**
**LaSalle, Illinois**

| Parameter/Year | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Volume treated (million gallons) | 4.02 | 2.60 | 4.40 | 3.81 | 1.45 |
| VOCs removed (pounds) | 31 | 34 | 33 | 28 | 12 |
| **Number of effluent exceedances:** | | | | | |
| PCBs | 0 | 0 | 0 | 0 | 1 |
| VOCs | 1 | 2 | 0 | 2 | 1 |
| **Influent VOC Makeup:** | | | | | |
| 1,1, 1-Trichloroethane | 65% | 65% | 56% | 55% | 56% |
| 1, 1-Dichloroethane | 20% | 20% | 23% | 23% | 23% |
| Trichloroethene | 10% | 10% | 13% | 14% | 10% |
| 1, 2-Dichloroethene | 5% | 5% | 6% | 6% | 6% |

Although the monthly influent concentrations have varied throughout the years, the predominant VOC treated by the plant was 1,1,1-TCA. The VOC load was composed of 1,1,1-TCA, 1,1-DCA, TCE, and 1,2-DCE. These results indicate that the major contributor of VOC volume into the system is still the Laboratory plume located along the southeastern portion of the site. This plume and associated source area were identified and delineated during the Phase I and Phase II soil investigations conducted during 1996 and 1998. Other VOC plumes and source areas, including the Thinner Shed source area and the Northwest area plume, are still contributing to influent concentrations, although to a lesser degree than the Laboratory plume area.

## 6.4 Site Inspection

The Region V RPM accompanied the Illinois EPA Project Manager visited the she on June 23,2004 in support of this Five-Year Review. At that time the groundwater treatment unit, the SVE units and the phytoremediation units were assessed. The site was in generally good condition. As the Illinois EPA Project Manager is based within 1A mile of this site State presence at the site is frequent. Neither the State nor U.S. EPA RPMs noted any specific deficiencies on the day of inspection.

## 6.5 Interviews

Given the presence of an Illinois EPA office in LaSalle, questions and/or concerns from local residents are addressed in a timely fashion. Therefore, specific interviews associated with the preparation of the Five-Year Review report were not conducted.

## 7 TECHNICAL ASSESSMENT

*Question A: Is the remedy junction as intended by the decision documents?*

For the LEU site, the implementation status would be considered an operating remedial action, which is defined by U.S. EPA as:

> *... Actions that are ongoing, but where cleanup levels have not been achieved. Such actions typically have remedial components requiring several years to reach cleanup levels (e.g., groundwater and surface water restoration, monitored natural attenuation, soil vapor extraction, and bioremediation).*

The following subsections provide the necessary support to demonstrate that the LEU remedy is functioning as intended by the decision documents (i.e., March 1988 ROD).

**Remedial Action performance:** As shown in Figures 5-1 and 5-2, the remedy implemented at the LEU site has reduced the size of the groundwater contaminant plume. Based on groundwater analytical data, the remedy is functioning as intended by the ROD for the LEU site. However, continued operations are needed in order to meet the remedial action objectives (i.e., MCLs) established for the site.

**System operations/operation and maintenance (O&M):** The GTU, dual phase SVE systems, and phytoremediation plots are monitored on a daily basis. Illinois EPA has retained a group of highly qualified subcontractors whose familiarity with the remedy and its enhancements allows for timely O&M activities and troubleshooting (as needed).

With the GTU having been in operation for over 10 years, replacement and/or rebuilding of certain low life expectancy equipment is expected and has been performed. The rebuilding of a filter bag chamber is one such example.

Provided the O&M associated with GTU and other remedy enhancements is maintained at reasonable levels, the remedy at the LEU site will continue to be protective of human health and the environment and will ultimately obtain the remedial action objectives established for the site.

**Implementation of institutional controls and other measures:** The GTU and SVE systems are located within fenced areas. No break-ins have occurred, which is supportive of no additional security being required. The vegetated soil cover over the thermally treated soil is well maintained and no apparent burrowing by small animals into the ash is apparent. While the majority of phytoremediation plantings are not within a secured area, vandalism has not been noted. Therefore, no additional institutional controls or other measures are needed at the LEU site. The March 1988 ROD requires return of the LEU site to a usable property with the goal of placing it back on the real estate tax roles; to that end, institutional controls restricting reasonable development are contrary to the March 1988 ROD and would require a ROD amendment.

**Monitoring activities:** Quarterly groundwater monitoring was performed through 2002, and semiannual groundwater monitoring was started in 2003. Groundwater elevations are also monitored to ensure that contaminated groundwater is being captured by the groundwater extraction system and not migrating away from the she. GTU effluent samples are analyzed on a weekly basis for VOCs and PCBs to ensure ongoing compliance with discharge limitations. The frequency of monitoring is adequate to ensure the surrounding area is provided with adequate protection.

**Opportunities for optimization:** In the initial Five-Year Review report, implementation of the SVE systems and additional groundwater collection systems (i.e., phytoremediation plots) was identified. Since 1999, two dual phase SVE systems and two phytoremediation plots have been installed.

With the decrease in groundwater extraction, the rate at which VOCs are being removed has also decreased. A study should be conducted to determine how to increase the extracted volume of groundwater. The effects of hydraulically cleaning the groundwater collection laterals and the impact t of injecting/reintroducing the treated GTU effluent to areas of soil contamination thereby increasing groundwater flow and capture should be evaluated as part of this study.

**Early indicators of potential remedy problems:** Blockages in the groundwater collection laterals have recently been identified. As illustrated in the GTU performance data (Table 6-2), VOC removal decreases as the volume of extraction groundwater decreases. Should the laterals become sufficiently blocked, hydraulic control of the contaminant plume will be lost, and the remedy will loose its protectiveness.

*Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*

The ROD developed remedial action objectives for the site based on groundwater MCLs. For the contaminants of concern, their respective MCLs have not changed. Given that there have not been any changes in the physical site conditions nor have any new exposure pathways or contaminants been identified, the RAOs for the LEU site are still valid.

*Question C: Has any other information come to light that could call into question the protectiveness of the remedy?*

All remedy enhancements implemented at the LEU site were installed to reduce the overall time frame associated with meeting the remedial action objectives. As discussed previously, the groundwater collection system and GTU have performed as anticipated by creating a zone of capture for the contaminant plume and reducing the overall size of the plume. No additional information has been obtained to indicate that the remedy is insufficient.

Finally, trespassing and vandalism at the LEU site have not occurred. Therefore, the implemented remedy at the LEU site is providing the proposed level of protectiveness.

**Technical Assessment Summary**
The LEU site remedy and its enhancements are functioning in accordance with the expectations of the ROD and the ESD. Provided that the remedy continues to operate at current levels of effort, attainment of groundwater MCLs will be achieved. However, reduced groundwater extraction will increase the time frame associated with achieving MCLs. Therefore, a method(s) to increase the amount of groundwater extracted needs to be identified and implemented.

# 8 ISSUES

On July 29, 2003, results obtained from the July 22 effluent samples indicated that the limit for PCBs had been exceeded. The GTU was immediately shut down. Since samples of the effluent from the knockout drums in the SVE system indicated a presence of PCBs, it was felt that the exceedance could have been caused by the increased amount of water collected by the SVE system in the initial development of the extraction wells. It was also theorized that by disturbing the carbon during a nearly coincidental carbon cell sampling effort, particles that might have contained PCBs could have gotten into the system when the carbon cells were repressurized and the system put back on line. To rectify the situation, the original 100- and 25-micron bag filters were replaced with bag filters of 25- and 5-micron pore size. While changing the bag filters it was found that the supporting structure inside the canister was severely eroded. This structure was rebuilt and put back into service. In addition to rebuilding the existing GTU filters, particulate filtration was added at each knockout drum in the dual phase SVE systems to provide localized removal of entrained soil. Subsequent to these repair and enhancement actions the effluent limit for PCBs has not been exceeded.

The groundwater collection system has been in operation since April 3, 1993. For 2003, the volume of groundwater collected by the system was approximately 1.45 million gallons, 63% less than the volume collected in 2002. While the reduction in volume was initially believed to be the result of a relatively "dry" year, in mid-2004, it was determined that the collection laterals were partially clogged. Limited hydraulic cleaning and mild acid flushing of segments of the collection laterals has been successful in removing major blockages. The Illinois EPA has retained a subcontractor to hydraulically clean the entire collection system. The effectiveness of the cleaning will be measured by monitoring groundwater extraction and local piezometric impacts before and after the cleaning process. It is likely that cleaning of the collection laterals will become a recurring maintenance requirement.

# 9 RECOMMENDATIONS AND FOLLOWUP ACTION

Based on the groundwater monitoring data, the groundwater collection system has contained and reduced the size of the contaminant plume. Initial data from the SVE and phytoremediation systems shows that they are collecting vadose-zone and shallow VOC groundwater contamination. However, the cleanup objectives established in the ROD for the LEU site have not yet been met, and continued operation and maintenance of the GTU, dual phase SVE, and phytoremediation systems is required if the expectations of the 1988 ROD are to be met. Based on modeling calculations, and to meet the 1988 ROD, it is estimated that the systems should be operated through the next Five-Year Review period. During the next review, it is possible that a more definitive estimate can be made about when the groundwater remediation objectives will be met.

As discussed above in Section 8, the collection laterals are beginning to clog. Therefore, additional maintenance will have to be performed to ensure continued groundwater collection. The use of periodic mild acid flushing in conjunction with hydraulic cleaning should be performed as necessary to ensure a sufficient volume of groundwater is collected to maintain gradient control and reasonable contaminant extraction. Site personnel and contractors should investigate and implement reasonable methods of monitoring collection system effectiveness.

While maintenance of the collection laterals has increased the groundwater flow rates, it is uncertain what effects maintenance will have on increasing the extraction rates. As discussed previously, reduced groundwater extraction rates lead to a reduction in the VOC removal rate. Therefore, the reinjection or infiltration of the treated GTU effluent to assist in flushing VOCs out of the vadose zone should be further evaluated.

Monitoring of extraction gas volumes and contaminant concentrations should be closely monitored to manage the SVE systems. If and when extracted gas volumes decrease below reasonable limits maintenance pneumatic fracturing should be performed. The determination of "reasonable" extraction gas volumes should be the subject of study and be completed in the near term. The practice of resting the SVE systems following attainment of asymptotic contaminant removal rates should continue. Soil sampling in locations replicating those used to design the SVE systems should additionally be performed in the near future to assess short-term gains and project long-term expectations for the SVE systems.

The original risk assessment assumptions relative to exposure pathways, groundwater use in the area of the site, and current ARARs should be reevaluated to insure that the remediation of groundwater to MCLs at the LEU site is still an appropriate and necessary remedy. The revaluation of the risk assessment should be completed by calendar year-end (Dec. 31, 2004). Any change(s) to the remediation objectives, which might be indicated as appropriate by this reevaluation, would require formal amendment of the ROD prior to implementation.

## 10 PROTECTIVENESS STATEMENT

The remedy as currently implemented at the LEU site is expected to be protective of human health and the environment upon attainment of the ground water cleanup goals, through continued operations of the GTU, dual phase SVE, and phytoremediation systems, which are expected to require most probably, 10 more years of operation. In the interim, exposure pathways that could result in unacceptable risks are being minimized by the groundwater gradient control established by the groundwater collection system and GTU.

Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate potential migration of the contaminant plume downgradient from the treatment area. Current data indicates that the majority of the plume remains on site. Semiannual groundwater sampling will continue, and sampling of the GTU effluent will also be maintained to ensure compliance with the local POTW discharge requirements.

## 11 NEXT REVIEW

The next five-year review for the LEU site is required by September 2009, five years from the date of this review.