

## EXPLANATION OF SIGNIFICANT DIFFERENCE

### From the Selected Remedy for Environmental Contamination Described in The Final Decision and Response to Comments, Dated February 2008

Solutia Inc., Sauget, Illinois

ILD 000 802 702

#### I. Purpose

This *Explanation of Significant Difference* (ESD) documents the decision of the U.S. Environmental Protection Agency Region 5 to significantly change part of the remedy selected in the *Final Decision and Response to Comments* (FDRC) signed February 26, 2008, for the Solutia Inc. (Solutia) facility (also known as the W.G. Krummrich Plant). The significant change involves a single component of the remedy and does not fundamentally alter the overall cleanup approach, and complies with the statutory requirements of the Resource Conservation and Recovery Act (RCRA), as amended.

Solutia proposed a change to a component of the selected remedy on December 20, 2010. A meeting between EPA and Solutia was held on January 20, 2011, to discuss the proposed change. In response to EPA comments, Solutia updated its proposal on February 4, 2011. Solutia's proposal to change a component of the selected remedy has been included in the administrative record for the facility.

The remedy selected at the Solutia facility includes controlling the source areas of groundwater contamination, controlling the migration of contaminated groundwater, soil cleanup, monitoring, institutional controls, and financial assurance. This modification involves changing the manner in which a source area of groundwater contamination at the facility will be treated and controlled. Specifically, this modification involves changing the treatment method for contaminated unsaturated and upper saturated soils at the Former Chlorobenzene Process Area from in-situ thermal desorption (ISTD) to a combined approach using thermally-enhanced (i.e., steam) soil vapor extraction (T-SVE), enhanced aerobic bioremediation (EABR), and bioventing.

This ESD and all technical information and data relating to it shall become part of the administrative record for the Solutia facility. The administrative record is available for viewing during normal business hours at the following information repositories:

- Cahokia Public Library  
140 Cahokia Park Drive  
Cahokia, Illinois
- U.S. EPA Region 5 Records Center  
77 West Jackson Boulevard  
Chicago, Illinois

## **II. Facility Description, History, Contaminants of Concern, and Selected Remedy**

### **Facility Description and History**

The Solutia facility is located at 500 Monsanto Avenue in Sauget, Illinois. It is bound on the west by Mississippi Avenue (Illinois Route 3) and on the east by Falling Springs Road and the City of East St. Louis. The Mississippi River is located less than one-mile to the west. The facility manufactured industrial chemicals, chemical intermediates, agricultural intermediates, and rubber chemicals. Most of the manufacturing operations, initiated as early as 1917, have ceased. Small portions of the facility are used to manufacture specialty chemicals.

A RCRA Facility Investigation and a Corrective Measures Study (CMS) were conducted by Solutia pursuant to a RCRA Administrative Order on Consent, EPA Docket No. R8H-5-00-003 (AOC), effective May 3, 2000. Corrective measures initiated by Solutia to date include: 1) installation and operation of a groundwater migration control system (GMCS) near the Mississippi River; 2) excavation of contaminated soil and off-site disposal; 3) installation of asphalt or concrete covers over contaminated areas; 4) implementation of a pilot study and full-scale design for a soil vapor extraction (SVE) system; 5) implementation of an ISTD pilot study; 6) implementation of long-term groundwater monitoring; 7) recordation of an environmental land use control restricting certain uses of the facility; and 8) provision of a financial assurance mechanism to ensure completion of all corrective measure activities the facility.

### **Contaminants of Concern**

The main contaminants of concern identified in the FDRC are benzene, chlorinated benzenes, PCBs, 4-chloroaniline, chlorinated phenols, nitrobenzenes, lead, and mercury. Both soil and groundwater at the facility are contaminated with these compounds. Benzene and chlorinated benzenes are present as dense non-aqueous phase liquids.

### **Corrective Measures Study**

Solutia submitted a CMS on August 27, 2004. EPA concluded that the CMS did not provide the necessary information to select a remedy. EPA requested further investigations, evaluation of more technologies, and additional risk assessments. EPA subsequently prepared a Technology Selection Report on January 15, 2007, that evaluated possible remedial technologies for the Solutia facility consistent with EPA corrective measures objectives. The proposed remedy alternatives to address contaminants at and from the Solutia facility were:

1. ISTD treatment at the Former PCB Manufacturing Area and Former Chlorobenzene Process Area.
2. Excavation and off-site disposal of contaminated soil at the Former Chlor-Alkali Production Area.
3. Capping and monitoring of buried waste at the Route 3 Drum Site.

4. SVE treatment, and excavation and off-site disposal of contaminated soil at the Central Plant Process Area and Former Chlorobenzene and Benzene Storage Area.
5. SVE treatment at the North Plant Process Area.
6. Excavation and off-site disposal of contaminated soil at the Former PCB Warehouse Area.
7. Continued operation of GMCS and monitoring of groundwater.

### **Statement of Basis**

EPA issued a *Statement of Basis* (SB) in July 2007. The SB evaluated and proposed a remedy for addressing contamination at and from the Solutia facility. The SB was issued as part of the EPA's public participation responsibilities under RCRA. The proposed remedy consisted of the following components:

1. Excavation and off-site disposal, and capping of PCB-contaminated soil at the Former PCB Manufacturing Area.
2. An ISTD pilot test and implementation, and excavation and off-site disposal of PCB and lead-contaminated soil at the Former Chlorobenzene Process Area.
3. Excavation and off-site disposal of mercury-contaminated soil at the Former Chlor-Alkali Production Area.
4. Capping and monitoring of the Route 3 Drum Site.
5. SVE, and excavation and off-site disposal of PCB and lead-contaminated soil at the Central Plant Process Area and the Former Chlorobenzene and Benzene Storage Area..
6. Institutional controls at the North Plant Process Area.
7. Excavation and off-site disposal of PCB-contaminated soil at the Former PCB Warehouse Area.
8. Continued operation of the GMCS and monitoring of groundwater, surface water, and sediment.
9. Facility-wide institutional controls.

Additionally, the SB provided a comparison of the EPA proposed remedy with evaluation criteria, including protection of human health and the environment; attainment of media cleanup standards; source control; compliance with waste management standards; long-term reliability; short and long-term effectiveness; reduction in toxicity, mobility, and volume; implementability; and cost. EPA requested comments from the public on the proposed remedy during a public comment period open from August 24 to October 9, 2007. A public meeting was held on September 6, 2007 to explain the proposed remedy and accept oral comments. A total of 40 comments were received from the public and addressed by EPA.

### **Final Decision and Response to Comments**

The FDRC concluded that a response action was necessary to protect human health and the environment. The FDRC selected the final remedy for the Solutia facility and responded to

public comments. The final remedy required Solutia to implement the following remedial components at its facility:

1. *Contaminated Groundwater Source Control*
  - a. Conduct a pilot test for ISTD at the Former Chlorobenzene Process Area and implement ISTD.
  - b. Design a corrective measure for the excavation and off-site treatment/disposal of PCB-contaminated soil at the Former PCB Manufacturing Area.
  - c. Implement SVE in unsaturated soil at the Former Chlorobenzene and Benzene Storage Area, and the Central Plant Process Area.
  - d. Submit an O&M Plan for the Route 3 Drum Site Landfill.
  
2. *Contaminated Groundwater Migration Control*
  - a. Operate and maintain the GMCS at the Mississippi River.
  - b. Assess the discharge of contaminated groundwater to the Mississippi River and, if necessary, submit design plans to address adverse impacts to the river.
  - c. Assess the migration of PCBs in groundwater and, if necessary, submit design plans to address the PCB contaminant plume.
  
3. *Soil Cleanup*
  - a. Assess risks posed by residual PCBs at the Former PCB Manufacturing Area.
  - b. Remediate PCB-contaminated soil at hotspot areas throughout the facility.
  - c. Remediate lead-contaminated soil at hotspot areas throughout the facility.
  - d. Excavate mercury-contaminated soil at the Former Chlor-Alkali Production Area.
  
4. *Reports and Monitoring*
  - a. Submit final remedy construction completion reports for the remediated areas.
  - b. Submit and implement a long-term monitoring program.
  - c. Conduct periodic technical reviews.
  - d. Submit semi-annual progress reports.
  
5. *Institutional Controls*
  - a. Conduct due diligence for municipal ordinances and off-site activities that may affect the remedy.
  - b. Restrict land use with the recordation of an environmental land use control (ELUC).
  
6. *Financial Assurance*
  - a. Obtain financial assurance to complete the remedy, including O&M.
  - b. Provide updated cost estimates every three years.

### **III. Corrective Measures Implementation**

The remedial components of the final remedy were initiated for specific areas and facility-wide. The status of each remedial component is provided below.

#### ***Contaminated Groundwater Source Control***

- A successful pilot test for ISTD was performed in the field at the Former Chlorobenzene Process Area. EPA approved the plan for full-scale implementation of ISTD on June 1, 2010. On November 19, 2010, Solutia informed EPA that the final design for the ISTD system resulted in cost increases of about \$10 million, with a final estimated cost for implementation of the selected remedy to be \$24.5 million. In the alternative, Solutia proposed T-SVE, EABR, and bioventing to treat the source area at an estimated cost of \$9.72 million. This alternative proposal is the subject of this ESD.
- A Remedial Action Plan Permit (RAPP) application was submitted to Illinois EPA on July 7, 2008, to allow disposal of excavated PCB-contaminated soil at the nearby Judith Lane containment cell. At the same time, Solutia also requested coordinated approval for this proposal from EPA. EPA has provided draft comments to Illinois EPA on the Solutia RAPP. Illinois EPA has not yet acted on the RAPP application.
- Solutia conducted a pilot test for the use of SVE near the former benzene storage tank (also known as Big Mo) and designed a system to treat four areas of unsaturated soils contaminated with benzene and chlorobenzene. The SVE design and schedule was approved by EPA and startup of the system is scheduled for January 2012.
- Solutia continues to conduct inspections and monitor the Route 3 Drum Site in accordance with the approved O&M Plan.

#### ***Contaminated Groundwater Migration Control***

- Solutia continues to operate the GMCS at the Mississippi River which consists of a barrier wall and three extraction wells. Extracted groundwater is treated at the nearby American Bottoms POTW.
- Solutia conducted an analysis of contaminated groundwater discharging to the Mississippi River. Illinois EPA is currently reviewing the analysis to see if the discharge complies with applicable Illinois regulations.
- Solutia has installed additional wells to monitor the PCB plume on a quarterly basis. No statistical increases of PCBs at the leading edge of the plume have been detected.

### ***Soil Cleanup***

- Risks posed by residual PCBs at the Former PCB Manufacturing Area will be determined upon completion of excavation. Solutia has applied for a RAPP to dispose of the PCB-contaminated soil at the Judith Lane containment cell.
- Hotspot cleanup of on-site PCB-contaminated soil has been completed. Areas of significant contamination were excavated and the soils were sent off-site for disposal at a permitted landfill. Residual areas of PCB contamination were capped with asphalt and warning signs posted. These areas are identified in the ELUC filed with the county recorder.
- Areas of lead contamination were capped with asphalt. These areas are identified in the ELUC filed with the county recorder.
- Mercury-contaminated soil was excavated and sent off-site for disposal at a permitted landfill. Groundwater monitoring confirms that mercury exceeding standards was not found in groundwater.

### ***Reports and Monitoring***

- Final remedy construction completion reports have been submitted for the mercury and lead-contaminated soil cleanups. An interim report was submitted for the PCB hotspot cleanup. In 2011, a final report will be submitted upon completion of off-site PCB cleanup this year along state road and railroad right-of-ways.
- A long-term monitoring program for groundwater, surface water, and sediment was implemented by Solutia to evaluate the effectiveness of monitored natural attenuation. Recent information on dewatering wells north of the facility requires a re-examination of the program as groundwater flow may be influenced to the north by these wells.
- A periodic technical review has not yet been required.
- Semi-annual progress reports are being submitted to EPA.

### ***Institutional Controls***

- Due diligence reports are submitted semi-annually by Solutia.
- An ELUC was filed with the Office of Recorder of Deeds for St. Clair County on April 30, 2009. Amendment No. 1 of the ELUC was recorded on April 28, 2010.

### ***Financial Assurance***

- Financial assurance was provided by Solutia and updated as required. As of June 1, 2010, Solutia provides a Surety Bond and Standby Trust Agreement to guarantee performance of corrective action activities in the amount of \$22,123,173.
- Costs have been updated as the remedy has been implemented. Costs are expected to remain essentially the same in 2011, as provided for on June 1, 2010.

### **IV. Description of Significant Difference**

This section of the ESD discusses in detail the modification to a component of the contaminated groundwater source control remedy. Specifically, this modification involves changing the treatment method for contaminated unsaturated and upper saturated soils in the Former Chlorobenzene Process Area from ISTD to T-SVE, EABR and bioventing. This modification will not fundamentally alter the scope or performance of the remedy selected in the FDRC.

The original source control remedy required Solutia to conduct a field pilot-scale test for ISTD at the Former Chlorobenzene Process to evaluate its effectiveness in treating chlorinated benzenes above the water table and in the shallow hydrogeologic unit. The pilot study report, submitted in February 2010, concluded that ISTD was effective in heating the upper 20-feet of soil to 100°C and contaminants were effectively removed. However, steam enhanced extraction (SEE) was necessary to effectively heat and remove contaminants from 20-30 feet below ground surface. A work plan for full-scale implementation of ISTD/SEE, over approximately three acres within the footprint of the Former Chlorobenzene Process Area, was submitted by Solutia in March 2010, and approved by EPA on June 1, 2010. Startup was to be initiated in April 2011. However, upon completion of the final design in October 2010, the initial projected costs of \$14.3 million rose to \$24.5 million for implementation of the ISTD remedy.

The revised source control remedy addresses the same physical area of contamination at the Former Chlorobenzene Process Area. This revised remedy utilizes T-SVE using steam injection, EABR using pure oxygen injection, and bioventing using the T-SVE extraction wells to inject ambient air to increase aerobic bioremediation. T-SVE and bioventing would be used to treat the unsaturated soils and EABR would treat the saturated soils below the water table which is typically found at a depth of 15 feet. Completion of the system design will add about nine months to the initial scheduled startup. The system is estimated to operate for at least two years and as long as four years, depending on the efficiency of the T-SVE system in reaching asymptotic levels and the attainment of treatment standards throughout the treatment zone.

Contaminants extracted by T-SVE will be destroyed on-site using a thermal oxidizer. Since some clay layers exist in the upper 15 feet of soil, bioventing will be used after shutdown of T-SVE to bioremediate residual contamination diffusing from the clay. Benzene and chlorobenzenes are known to readily volatilize, and steam will be added to increase the

volatilization of the higher chlorinated benzenes. Benzene and chlorobenzenes can also readily biodegrade under aerobic conditions. This has been shown through site treatability studies and is documented in EPA guidance (EPA 510-R-04-002, May 2004). Bioventing will accomplish this in the unsaturated portion of the soil. For the saturated portion of the soil, pure oxygen will be injected below the water table using biosparge wells.

T-SVE and EABR will be operated concurrently during the two to four year treatment period. The protocols for completing T-SVE and transitioning to bioventing, and completing EABR operations were proposed by Solutia on February 24, 2011, and approved by EPA on March 23, 2011. The treatment standards to be attained will be the same as those proposed for ISTD. Total costs for T-SVE and EABR implementation at the site are estimated to be \$9.7 million.

**V. Statutory Determinations**

With the change in a component of the originally selected remedy as described in this ESD, the overall remedy remains protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this remedial action, and is cost-effective.

**VI. Summary Table**

<b>Nature of Work</b>	<b>ISTD</b>	<b>T-SVE/EABR/Bioventing</b>
<i>Differences</i>	<ul style="list-style-type: none"> <li>- Higher soil temperatures attained using electricity with thermal conduction wells to heat the formation.</li> <li>- Uses steam to strip contaminants from Saturated zone.</li> </ul>	<ul style="list-style-type: none"> <li>- Lower soil temperatures attained using air and steam injected into the unsaturated soil.</li> <li>- Uses oxygen to bioremediate saturated zone.</li> </ul>
<i>Cost</i>	\$24.5 million	\$9.7 million
<i>Schedule</i>	Scheduled Startup - April 2011 Scheduled Completion - October 2014	Scheduled Startup - January 2012 Estimated Completion - 2 to 4 years
<i>Similarities</i>	<ul style="list-style-type: none"> <li>- Both effectively extract benzene and chlorinated benzenes through heating and volatilization from the source area.</li> <li>- Both destroy contaminants after removal by thermal oxidation.</li> <li>- Both treat and remove contaminants from 0-30 feet.</li> <li>- Both meet remediation objectives based on attainment of asymptotic levels, protect human health under an industrial scenario, and meet groundwater performance standards.</li> </ul>	

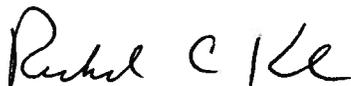
## VII. Public Participation Compliance

This ESD and copies of other documents related to the Solutia facility are available at:

- Cahokia Public Library  
140 Cahokia Park Drive  
Cahokia, Illinois
- U.S. EPA Region 5 Records Center  
77 West Jackson Boulevard  
Chicago, Illinois

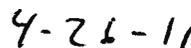
The significant change described above involves a single component of the remedy and does not fundamentally alter the overall remedial approach. Therefore, EPA has determined that a formal public comment period is not necessary. If you have any questions or concerns, you should contact the project manager directly:

Ken Bardo  
U.S. EPA Region 5  
77 W. Jackson Boulevard, LU-9J  
Chicago, Illinois 60604-3590



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Richard C. Karl  
Acting Director  
Land and Chemicals Division



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Date

*Explanation of Significant Difference*  
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