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FIVE-YEAR REVIEW REPORT FOR CHEM-SOLV, INC. SUPERFUND SITE KENT COUNTY, DELAWARE

July 2013

United States Environmental Protection Agency
Region 3
Philadelphia, Pennsylvania

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Hazardous Site Cleanup Division
U.S. EPA, Region III

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TABLE OF CONTENTS

Tables

Figures

LIST OF ABBREVIATONS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
DNREC	Delaware Department of Natural Resources and Environmental Control
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
GWMZ	Ground Water Management Zone
IC	Institutional Control
JEM	Johnson and Ettinger Vapor Intrusion Model
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/L	Micrograms Per Liter
mg/kg-day	Milligrams Per Kilogram-Day
mg/L	Milligrams Per Liter
N/A	Not Applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethene
POTW	Publicly Owned Treatment Works
ppm	Parts Per Million
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
ROD	Record of Decision
RSL	Regional Screening Level
TBC	To-Be-Considered
TCE	Trichloroethene
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Introduction

The Chem-Solv, Inc. Superfund site (the Site) consists of a 1.5-acre former solvent recovery facility, as well as areas to the north and east where ground water has become contaminated due to releases of hazardous substances from the facility. The Site is several miles north of Dover, Delaware. An explosion and fire at the facility in 1984 resulted in a solvent spill and contamination of soil and ground water. Site investigations revealed volatile organic compound (VOC) contamination in soils. Investigations also found VOC contamination in the shallow Columbia aquifer (primarily trichloroethene (TCE)), in addition to localized elevated levels of manganese.

The Site's remedy includes ongoing collection of contaminated ground water; treating of ground water using an air stripper; discharge of treated ground water to local surface water; ground water monitoring; replacing contaminated wells with wells in the deeper, uncontaminated aquifer; and implementing a state Ground Water Management Zone to prevent the installation of water supply wells within the contaminated portion of the aquifer until cleanup levels are achieved. The State cleaned up the Site's soil in 1985; the remedial investigation found that no additional soil cleanup was needed.

The triggering action for this five-year review (FYR) was the signing of the previous FYR on September 26, 2008.

Remedial Action Objectives

The 1992 Record of Decision (ROD) selected the following remedial action objectives for the Site:

- Restore ground water to its beneficial use as a potential drinking water source by reducing contaminant levels to maximum contaminant levels (MCLs) and non-zero maximum contaminant level goals (MCLGs) established under the federal Safe Drinking Water Act and, where MCLs and MCLGs are not available, to levels determined by the EPA to be protective of human health.
- Prevent exposure to the contaminated ground water until the restoration is complete.

Technical Assessment

The remedy is functioning as intended by the Site's decision documents. TCE is the only contaminant of concern that remains above its cleanup level. The EPA and the potentially responsible parties (PRPs) will assess whether the system is capturing the contamination effectively to achieve cleanup goals in a timely manner and consider improving the remedy to remove the TCE contamination more quickly if needed. The State has implemented a Ground Water Management Zone (GMZ) to prevent the installation of water supply wells in the contaminated portion of the Columbia aquifer until cleanup levels are achieved. There are no known exposures to the contaminated ground water. However, during the 2013 FYR site inspection, one previously unknown residential well was identified within the area of the Site's ground water plume. According to the well permit application, this well draws from the deeper, uncontaminated aquifer. This well will be added to the semi-annual potable well sampling. An updated screening assessment indicates that vapor intrusion is not a concern for either residential or commercial exposures. State MCLs for TCE and tetrachloroethene (PCE) have been lowered

from 5 µg/L to 1 µg/L. The EPA will review the new state MCLs and will consider revising the ground water cleanup goals for PCE and TCE to meet the new state MCLs. The toxicity value for manganese has changed, so the current cleanup level (3,000 µg/L), as selected in the 1992 ROD, is no longer protective. Additional monitoring is needed for manganese in ground water and metals in effluent from the treatment system. Several contaminants that were not identified in the ROD as contaminants of concern (COCs) were detected in ground water and treated effluent during the previous five years. The PRPs will continue to analyze ground water and effluent for non-COC organics; the EPA will evaluate the data to determine whether the previously-detected non-COCs are a concern as it relates to the treatment system and associated effluent.

Conclusion

The Site's remedy currently protects human health and the environment because there are no known exposures to the contaminated ground water. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness:

- The recently identified residential well will need to be sampled as part of the semi-annual sampling program.
- The EPA and the PRPs will assess whether the system is capturing the contamination effectively to achieve cleanup goals in a timely manner and consider improving the remedy to remove the TCE contamination more quickly if needed.
- The EPA will review the new state MCLs for PCE and TCE and will consider revising the ground water cleanup goals for PCE and TCE to meet the state MCLs.
- The EPA will assess manganese concentrations in ground water and will prepare an ESD to select a new cleanup level if warranted.
- All wells and treated groundwater will need to be analyzed for manganese.
- The PRPs will analyze treated groundwater for metals. The EPA will determine whether additional treatment is needed to remove metals from recovered ground water in order to meet standards for discharge to surface water,.
- The PRPs will continue to analyze ground water and effluent for non-COC organics; the EPA will evaluate the data to determine whether the previously detected non-COCs are a concern as it relates to the treatment system and effluent.
- The PRPs will evaluate existing Site data for dioxin to confirm that implemented soil remedy is protective. Conduct sampling if needed.

GPRA Measures Review

As part of this Five-Year Review the GPRA Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators

Human Health: Current Human Exposure Controlled and Protective Remedy in Place (HEPR)
Groundwater Migration: Groundwater Migration Under Control (GMUC)

Sitewide RAU

The Site achieved Site-Wide Ready for Anticipated Use (SWRAU) on June 26, 2006.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Chem-Solv, Inc.		
EPA ID: DED980714141		
Region: 3	**State:** DE	**City/County:** Cheswold/Kent
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA **If "Other Federal Agency" selected above, enter Agency name:** Click here to enter text.		
Author name: Christian Matta, Remedial Project Manager		
Author affiliation: EPA Region 3 (support provided by Skeo Solutions)		
Review period: December 2012 – July 2013		
Date of site inspection: January 10, 2013		
Type of review: Policy		
Review number: 3		
Triggering action date: September 26, 2008		
Due date *(five years after triggering action date)*: September 26, 2013		

FIVE-YEAR REVIEW SUMMARY FORM (CONTINUED)

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	Issue Category: Remedy Performance			
	Issue: State MCLs for PCE and TCE have been lowered from 5 µg/L to 1 µg/L.			
	Recommendation: The EPA will review the new state MCLs for PCE and TCE and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	07/31/2015

OU(s): 1	Issue Category: Institutional Controls			
	Issue: During the 2013 FYR site inspection, an additional residential well was identified within the area of the Site's ground water plume. This well is not being sampled.			
	Recommendation: Add the unsampled residential well to the semi-annual potable well sampling.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	09/30/2013

OU(s): 1	Issue Category: Remedy Performance			
	Issue: TCE remains in the ground water at concentrations above the cleanup level.			
	Recommendation: Consider whether the ground water remedy can be improved to achieve the TCE cleanup level more quickly.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	09/30/2015

OU(s): 1	Issue Category: Monitoring			
	Issue: The toxicity value for manganese has changed, so the current cleanup level (3,000 µg/L), as selected in the 1992 ROD, is no longer protective.			
	Recommendation: Assess manganese concentrations and prepare an ESD to select a new cleanup level if warranted.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	09/30/2015

OU(s): 1	Issue Category: Monitoring			
	Issue: Samples from only two monitoring wells were analyzed for manganese over the past five years.			
	Recommendation: Monitor all wells for manganese.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	09/30/2013

OU(s): 1	Issue Category: Monitoring			
	Issue: Treated ground water is not being analyzed for metals prior to being discharged to surface water.			
	Recommendation: PRPs will analyze treated ground water for metals. The EPA will determine whether additional treatment is needed to remove metals from recovered ground water in order to meet standards for discharge to surface water.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP, EPA	EPA	09/30/2013

OU(s): 1	Issue Category: Monitoring			
	Issue: Several non-COCs were detected in ground water and treated effluent during the previous five years.			
	Recommendation: Continue to analyze ground water and effluent for non-COC organics over the next five years. The EPA will evaluate the data to determine whether these detections are a concern as it relates to the treatment system and associated effluent.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP, EPA	EPA	09/30/2014

OU(s): 1	Issue Category: Monitoring			
	Issue: On February 17, 2012, EPA released the final non-cancer dioxin reassessment, publishing a non-cancer toxicity value, or reference dose (RfD), for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in EPA's Integrated Risk Information System (IRIS). Based on this new RfD, today's levels would be lower than levels that were considered protective at the time the soil remediation was conducted at the Site. Therefore the protectiveness of the remedy needs to be reevaluated.			
	Recommendation: Evaluate existing Site data for dioxin to confirm that implemented soil remedy is protective. Conduct sampling if needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	09/30/2014

ORIGINAL

Protectiveness Statement

Sitewide Protectiveness Statement

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Short-term Protective	N/A

Protectiveness Statement:

The Site's remedy currently protects human health and the environment because there are no known exposures to the contaminated ground water. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness. The newly identified residential well will be sampled as part of the semi-annual sampling. The EPA and the PRPs will assess whether the system is capturing the contamination effectively to achieve cleanup goals in a timely manner and consider improving the remedy to remove the TCE contamination more quickly if needed. The EPA will review the new state MCLs for PCE and TCE and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs. The EPA will assess manganese concentrations in ground water and will prepare an ESD to select a new cleanup level if warranted. The PRPs will monitor all wells for manganese and analyze treated ground water for metals. The PRPs will analyze treated groundwater for metals and. The PRPs will Evaluate existing Site data for dioxin to confirm that implemented soil remedy is protective. Conduct sampling if needed. The EPA will determine whether additional treatment is needed to remove metals from recovered ground water in order to meet standards for discharge to surface water. The PRPs will continue to analyze ground water and effluent for non-COC organics; the EPA will evaluate the data to determine whether the concentrations are a concern as it relates to the treatment system and associated effluent.

Third Five-Year Review Report
for
Chem-Solv, Inc. Superfund Site

1.0 Introduction

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. FYR reports document FYR methods, findings and conclusions. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency prepares FYRs pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 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 5 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 [106], 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 EPA interpreted this requirement further in the NCP, 40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii), which 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 initiation of the selected remedial action.

EPA Region III conducted the FYR of the remedy implemented at the Chem-Solv, Inc. Superfund Site (Site) in near Cheswold, in Kent County. This FYR was conducted from December 2012 to June 2013

This is the third FYR for the Site. The trigger for this five-year review was the completion of the second five-year review on September 26, 2008. This five-year review is required by statute because the continued presence of hazardous substances, pollutants or contaminants at the Site above levels that would allow for unlimited use and unrestricted exposure.

2.0 Site Chronology

Table 1 lists the dates of important events for the Site.

Table 1: Chronology of Site Events

Event	Date
Chem-Solv, Inc. conducted solvent recovery activities at Site	1981–1984
Explosion and fire at the facility caused release of hazardous substances; Delaware Department of Natural Resources and Environmental Control (DNREC) issued Cessation of Operation Order	September 1984
DNREC conducted on-site treatment of soil contaminated with volatile organic compounds (VOCs)	September – November 1985
DNREC conducted ground water recovery and treatment operations	December 1985 – November 1998
DNREC issued Administrative Order on Consent	September 27, 1988
EPA listed Site on National Priorities List	August 30, 1990
PRPs submitted revised Remedial Investigation Report and Groundwater Feasibility Study	November 1991
EPA signed Record of Decision (ROD) documenting selected cleanup plan	March 31, 1992
EPA issued Administrative Order governing PRPs' implementation of response activities	December 29, 1992
PRPs began remedial design	February 22, 1993
DNREC established Ground Water Management Zone (GWMZ) in vicinity of Site	March 1, 1994
PRPs suspended remedial design pending evaluation of extent of trichloroethene (TCE) in basal portion of Columbia aquifer	February 8, 1995
PRPs resumed remedial design (EPA notified PRPs of need for additional response actions)	October 18, 1995
PRPs replaced two contaminated private water supply wells with wells in the deeper, uncontaminated aquifer	October 1996
EPA approved remedial design (EPA approved PRPs' plans to carry out interim remedial measures) PRPs began remedial action	May 28, 1997
PRPs started construction	July 31, 1997
PRPs completed construction	September 17, 1997
U.S. Army Corps of Engineers conducted final inspection on behalf of EPA	September 18, 1997
PRPs began continuous operation of ground water recovery and treatment system	October 10, 1997
PRPs replaced one contaminated private water supply well with a well in the deeper, uncontaminated aquifer; PRPs replaced remaining (uncontaminated) down-gradient private water supply wells within GWMZ with wells in the deeper, uncontaminated aquifer	January 1998
EPA approved operation and maintenance (O&M) plan	June 8, 1998
PRPs completed remedial action (EPA determined that PRPs' interim remedial measures were sufficient to meet remedial action objectives specified in ROD)	June 10, 1998
EPA issued Site's Preliminary Close Out Report	June 30, 1998
EPA issued Explanation of Significant Differences (ESD) eliminating requirement for certain institutional controls	June 18, 1999
EPA approved PRPs' proposal to terminate ground water collection and treatment at Site on condition that PRPs resume these activities in the	October 12, 1999

Event	Date
event of increasing trends in ground water contaminant concentrations	
EPA directed PRPs to resume ground water recovery and treatment operations	March 4, 2003
PRPs resumed ground water recovery and treatment operations	November 5, 2003
EPA signed first FYR Report	September 26, 2003
EPA signed second FYR Report	September 26, 2008
Owners of former Chem-Solv property submitted revised Supplemental Brownfields Investigation Report to DNREC	December 2008
DNREC issued Final Plan of Remedial Action for redevelopment of former Chem-Solv property	January 29, 2009

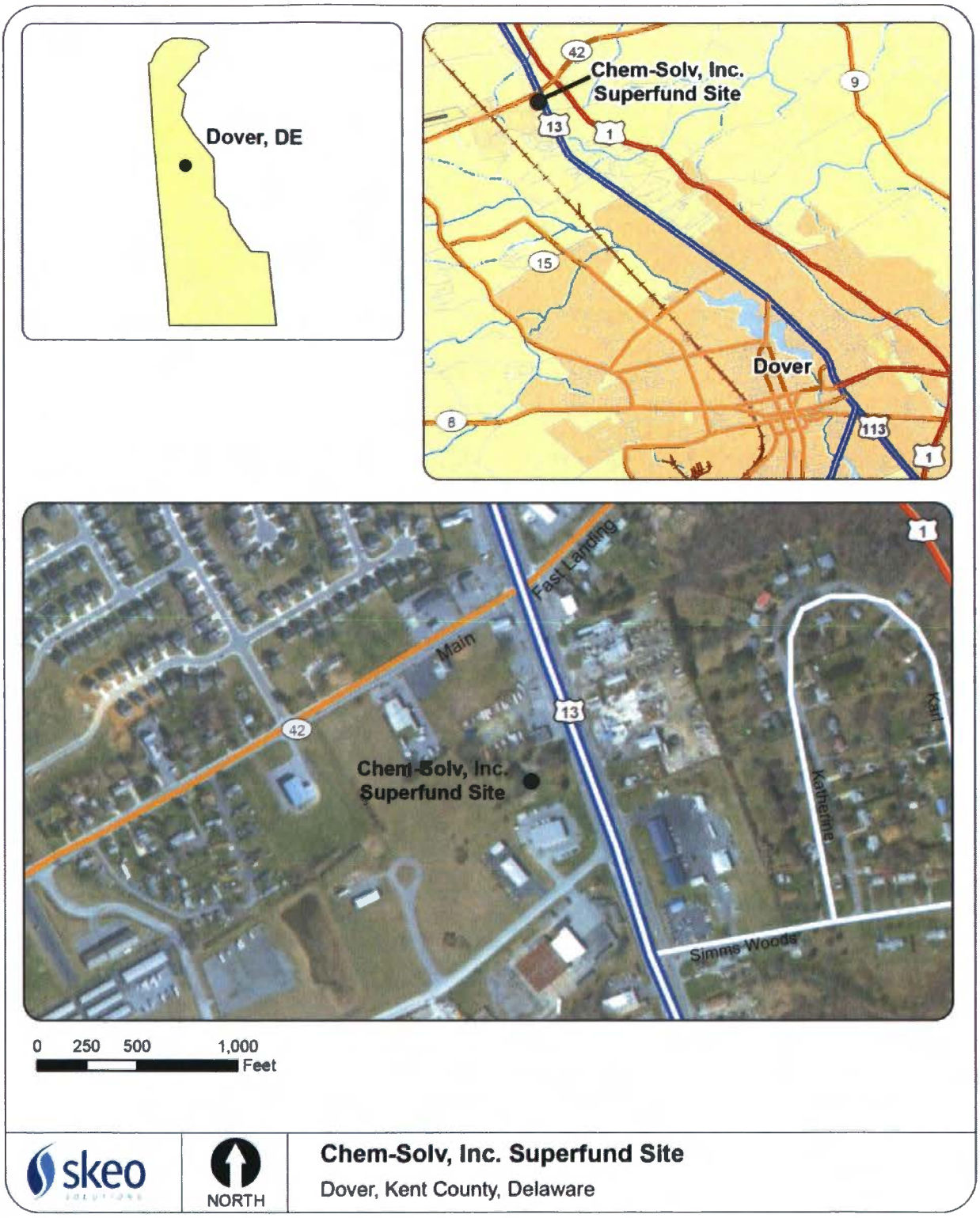
3.0 Background

3.1 Physical Characteristics

The Site consists of a 1.5-acre former solvent recovery facility, as well as areas to the north and east where ground water has become contaminated due to releases of hazardous substances from the facility. The Site property is located at 5301 North Dupont Highway in a suburban area near Cheswold, Delaware. The property is on the west side of U.S. Route 13 (Dupont Highway) just south of Delaware Route 42 (see Figures 1 and 2). The property's tax parcel number is LC00-46.02-01-07.09.

The Site and the surrounding area are flat. The uppermost geologic unit beneath the Site, the Columbia Formation, ranges in thickness from 20 to greater than 40 feet in the vicinity of the Site. The uppermost aquifer at the Site is the Columbia aquifer. The depth to ground water is about 8 feet. The Chesapeake Group lies beneath the Columbia Formation. The Cheswold aquifer is found within the Chesapeake Group in the vicinity of the Site; the top of the Cheswold aquifer is about 100 feet below ground surface. Ground water flow directions for both the shallow and the intermediate zones of the Columbia aquifer are generally to the northeast. The Alston Branch of the Leipsic River, which is located 0.4 miles north of the Site, is the probable discharge point for ground water from the Site.

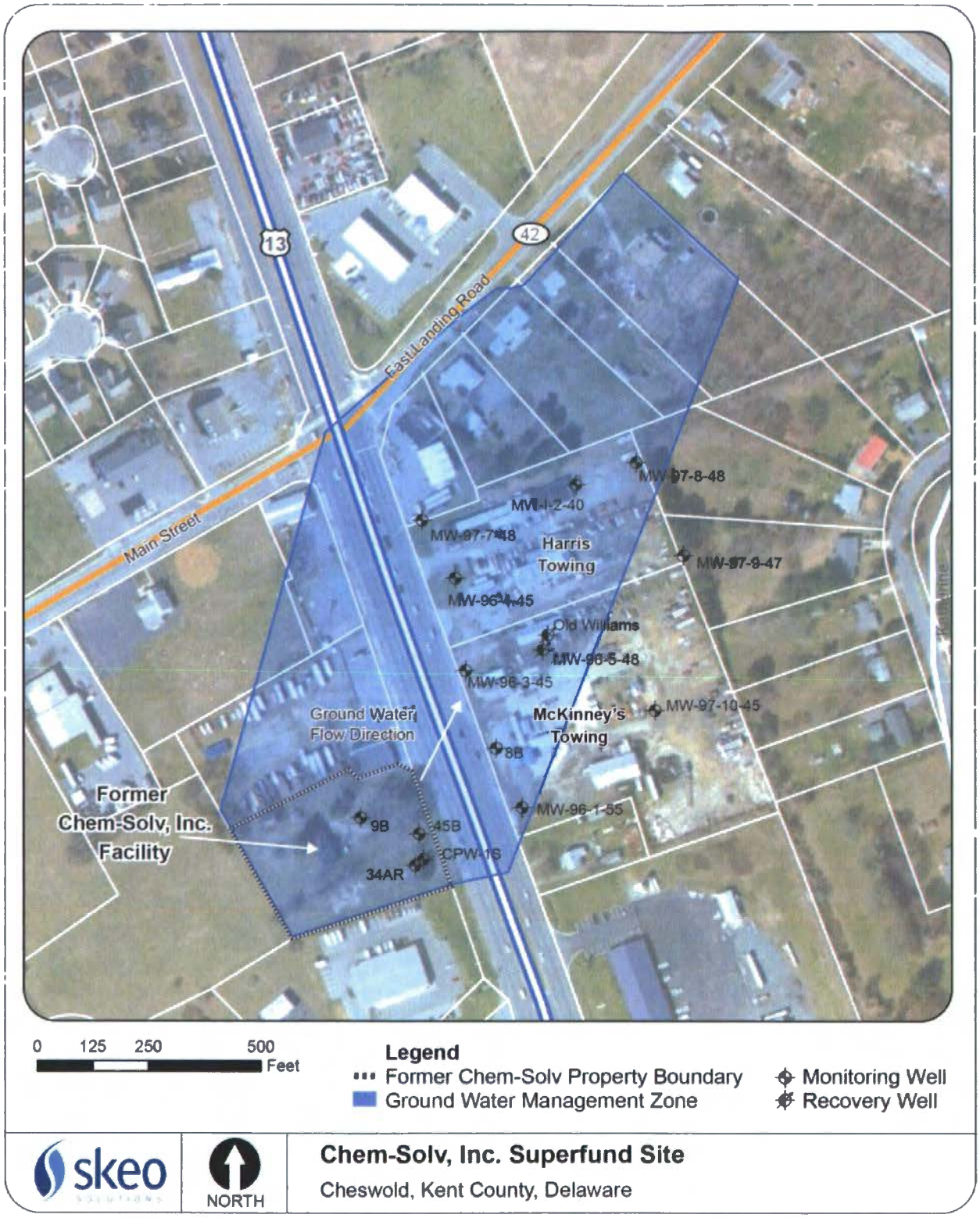
Figure 1: Site Location Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

ORIGINAL

Figure 2: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

3.2 Land and Resource Use

From 1981 until 1984, Chem-Solv, Inc. conducted solvent recovery activities at the 1.5-acre property. Several structures are located there, including a residential building on the northwest portion of the property consisting of two occupied rental units (four residents in total), a small barn, a shed and the former Chem-Solv, Inc. office building, which is abandoned and in poor condition. Surrounding land uses are primarily commercial, with some residential areas. Residences are located along Route 42 proceeding east from Route 13. The Central Delaware Business Park, an office/light-industrial park developed in the last 10 years, is located southwest of the former Chem-Solv facility. The Hostess baked goods outlet immediately south of the Chem-Solv property is now closed. A furniture store called American Heirlooms is located on a former truck stop immediately north of the site property. Several truck and automobile repair garages are located across Route 13, opposite the Chem-Solv property.

The former Chem-Solv property and the commercial properties across Route 13 are zoned for industrial use. The downgradient residential properties are zoned for residential use.

DNREC certified the property as a brownfield site. According to DNREC's January 29, 2009 Final Plan of Remedial Action, the parties who owned the property at that time planned to demolish the existing buildings and construct a retail building with a larger footprint than the current residential building. As part of that redevelopment effort, the then-owners hired contractors to prepare a Supplemental Brownfields Investigation Report, which was written in September 2008 and revised in December 2008. The report analyzed the property's potential for vapor intrusion. See Section 6.4 of this FYR Report for a discussion of vapor intrusion.

The aquifers in the area supply water for local residences and businesses. In 1994, DNREC established a Groundwater Management Zone (GWMZ) in the vicinity of the Site to prevent the installation of new water supply wells within the contaminated portions of the water table aquifer. The ground water flow direction in the Columbia aquifer is to the northeast.

The former facility property is serviced by a domestic well and private septic system.

3.3 History of Contamination

The Chem-Solv, Inc. property is a former solvent recovery facility. An explosion and fire at the facility in 1984 resulted in a solvent spill and contamination of soil and ground water. Site investigations revealed volatile organic compound (VOC) contamination in soils. Investigations also found VOC contamination in the shallow Columbia aquifer (primarily TCE), in addition to localized elevated levels of manganese.

Underground storage tanks were removed from several properties near the Site, including the former truck stop located immediately north of the Chem-Solv property. Benzene,

toluene, ethylbenzene and xylenes were found in soil and ground water at the former truck stop. Ground water at the former truck stop also contained manganese.

3.4 Initial Response

In 1985, DNREC excavated and aerated 1,300 cubic yards of contaminated soil to remove the VOCs. This process addressed the soil contamination by reducing contaminant concentrations to levels that permitted the soil to be returned to the excavated area. To address ground water contamination, DNREC also installed a ground water collection and treatment system in 1985 and operated the system until 1988. The extraction of contaminated ground water reduced TCE concentrations in the Columbia aquifer beneath the Site from the 250 milligrams per liter (mg/L) range to the 1 mg/L range.

The EPA proposed the Site for listing on the National Priorities List (NPL) on January 22, 1987, and finalized the Site on the NPL on August 30, 1990. In January 1992, the EPA issued the Site's remedial investigation/feasibility study and the Proposed Plan identifying the EPA's preferred remedy.

3.5 Basis for Taking Action

Table 2 lists the hazardous substances that have been released or detected at the Site in each medium.

Table 2: Hazardous Substances Detected at the Site

Soil	Ground Water
Benzoic acid	Acetone
Bis(2-ethylhexyl)phthalate	Benzene
Butylbenzylphthalate	1,1-Dichloroethane
1-Chloroethane	1,2-Dichloroethane
Chloroform	cis-1,2-Dichloroethene
1,2-Dichloroethane	Manganese
DDD	Methylene chloride
DDE	Tetrachloroethene (PCE)
DDT	Toluene
Ethylbenzene	1,1,1-Trichlorethane
Isophorone	Trichloroethene
Methylene chloride	Xylenes
Toluene	
1,1,1-Trichlorethane	
Trichloroethene	
Xylenes	

The baseline human health risk assessment conducted during the remedial investigation indicated that long-term exposure to contaminated ground water at the Site would result in unacceptable human health risks. Cancer risk was attributed mainly to the presence of benzene and TCE. Non-cancer risk was due to the presence of manganese. The presence

of dissolved manganese in ground water is believed to be caused by the Site's organic contaminants mobilizing naturally-occurring manganese.

Based on the remedial investigation, the EPA concluded that exposure to on-site soils would not present an unacceptable risk to human health or the environment.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the Site, and final selection was made based on an evaluation of each alternative against nine evaluation criteria that are specified in Section 300.430(e)(9)(iii) of the NCP. The nine criteria are:

1. Overall Protection of Human Health and the Environment
2. Compliance with ARARs
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

4.1 Remedy Selection

The EPA signed the Site's Record of Decision (ROD) selecting the Site's remedy on March 31, 1992. The remedial action objectives (RAOs) for the Site are:

- Restore ground water to its beneficial use as a potential drinking water source by reducing contaminant levels to maximum contaminant levels (MCLs) and non-zero maximum contaminant level goals (MCLGs) established under the federal Safe Drinking Water Act and, where MCLs and MCLGs are not available, to levels determined by the EPA to be protective of human health.
- Prevent exposure to the contaminated ground water until the restoration is complete.

The major components of the remedy selected in the ROD include:

1. Collection of contaminated ground water using recovery wells located in the contaminated portion of the Columbia aquifer until cleanup levels are achieved.
2. Discharge of extracted ground water to the local publicly owned treatment works via the Kent County sewer system. If an agreement with the publicly owned treatment works cannot be reached, on-site treatment of extracted ground water and discharge of treated ground water to local surface water.
3. Continued ground water monitoring at domestic, recovery and monitoring wells until cleanup levels are achieved (see Table 3).
4. Provision of an alternate water supply for users of private water supply wells should any become contaminated before the ground water restoration is complete.

5. Establishment and enforcement of a state Ground Water Management Zone (GWMZ) to prevent the installation of water supply wells within the contaminated portion of the Columbia aquifer until cleanup levels are achieved.
6. Placement of a notice of the GWMZ in the property record of all properties located within the GWMZ until the cleanup levels are achieved.
7. Removal of existing recovery wells and establishment of new recovery wells.

Table 3: Ground Water Contaminant of Concern (COC) Cleanup Goals

Ground Water COC	ROD Cleanup Goal (micrograms per liter (µg/L))[a]
Acetone	3,500[b]
Benzene	5
1,2-Dichloroethane	5
Manganese	3,000[c]
Tetrachloroethene	5
Toluene	1,000
1,1,1-Trichlororethane	200
Trichloroethene	5
Xylene	10,000

Notes:
a) The cleanup goal is based on the MCL and non-zero MCLG unless otherwise stated.
b) Drinking Water Equivalent Level calculated using the reference dose following the procedure in EPA/540/G088-003.
c) No Observed Adverse Effect Level calculated based on a 70-kilogram adult consuming two liters of water per day.

The ROD called for a risk assessment for the air stripper to ensure that the risk from air emissions does not exceed 10^{-4}. The ROD stated that if the risk assessment found the risk to be greater than that level, then emission controls would be installed.

The EPA issued an Explanation of Significant Differences (ESD) on June 18, 1999, to eliminate the requirement that a notice be placed in the property records of the properties located within the GWMZ. The EPA determined that such notices were no longer necessary to alert prospective purchasers of property within the GWMZ to the potential for contamination of the property drinking water supply well. All drinking water wells in the contaminated portion of the Columbia aquifer were replaced with water supply wells in a deeper, confined aquifer that has not been affected by releases from the Site. The residential building on the former Chem-Solv, Inc. property is still served by a shallow drinking water well. This well is within the GWMZ, but it has not been affected by the Site's contamination because it is hydraulically upgradient from the ground water plume. As part of the redevelopment initiative being overseen by DNREC, the 2009 Final Plan of Remedial Action requires the proper abandonment of this well. In the meantime, any prospective purchaser of the former facility property will be made aware of the Site's condition because the ROD and the 1992 Administrative Order calling for the

performance of the remedial design and remedial action have been recorded by the Recorder of Deeds for Kent County, Delaware.

4.2 Remedy Implementation

On December 29, 1992, the EPA issued an Administrative Order to 33 PRPs, requiring them to design, construct, operate and maintain the selected remedy. The PRPs abandoned existing monitoring and recovery wells not needed for monitoring purposes in November 1993 and April 1999. The PRPs began designing the new ground water extraction and on-site treatment system on October 18, 1995; the EPA approved the design on May 28, 1997. The extracted ground water is treated on site and then discharged to local surface water, rather than being discharged to the local publicly owned treatment works via the Kent County sewer system.

In 1994, DNREC established a Ground Water Management Zone (GWMZ) in the vicinity of the Site to prevent the installation of new water supply wells within the contaminated portion of the Columbia aquifer.

The PRPs awarded the remedial action contract to contractor Rare Earth Envirosciences, Inc. (Rare Earth) on May 28, 1997. Construction of the ground water recovery and treatment system began on July 31, 1997, when an air stripper was delivered to the Site. The contractor completed its construction on September 17, 1997. Rare Earth, the U.S. Army Corps of Engineers (on behalf of the EPA) and DNREC conducted the final inspection on September 18, 1997 and noted no construction deficiencies.

Continuous operation of the ground water recovery and treatment system began on October 10, 1997, after the EPA and DNREC confirmed the efficiency of the air stripper in removing VOCs from influent ground water. Rare Earth submitted an Interim Remedial Action Report to the EPA and DNREC on December 2, 1997, to document completion of physical construction of the ground water recovery and treatment system. On May 19, 1998, following review of Rare Earth's April 24, 1998 Interim Report documenting system performance, the EPA and DNREC jointly determined that the remedial action was operational and functional. The Site achieved construction completion with the signing of the Site's Preliminary Close Out Report on June 30, 1998.

By 1999, ground water quality at the Site had substantially improved. In July 1999, only one monitoring well (well 9B) had TCE concentrations exceeding the cleanup standards. The well was located on the Chem-Solv, Inc. property and had a TCE concentration of 41 µg/L. Manganese concentrations in ground water exceeded the cleanup standard only in isolated areas beneath the former Chem-Solv, Inc. property and immediately downgradient from the former truck stop.[1] On August 20, 1999, the PRPs proposed the

[1] In some cases, naturally occurring insoluble manganese (III) and manganese (IV) within the aquifer matrix are used as electron acceptors during the anaerobic biodegradation of organic carbon. During this process, the manganese is reduced to water soluble manganese (II). It is believed that releases of organic compounds at the Chem-Solv, Inc. site and the adjacent former truck stop are responsible for the reduction and solubilization of

termination of ground water collection and treatment operations, with continued ground water monitoring to document anticipated continuing declines in TCE concentrations. The EPA approved the proposal on October 12, 1999, with the stipulation that the PRPs resume operation of the ground water collection and treatment system should sampling identify an increasing trend in TCE concentrations.

On March 4, 2003, the EPA determined that TCE concentrations had not declined. Based on results of monitoring well samples collected since the treatment system was shut off, the EPA determined that TCE concentrations were exhibiting a statistically significant increasing trend in two site monitoring wells. As a result, the EPA requested that site PRPs resume treatment of ground water. The EPA also requested that the PRPs analyze ground water samples for 1,4-dioxane, because 1,4-dioxane was once commonly used as a stabilizer for chlorinated solvents such as TCE, which is present at the Site.

In June 2003, the PRPs proposed certain modifications to the ground water collection system to remediate the Site more efficiently. These modifications consisted primarily of collecting ground water from the location exhibiting the highest TCE concentrations, and increasing the withdrawal rate by using two recovery wells. The current recovery wells (MW-96-5-48 and an adjacent unused private well (Old Williams well)) are located about 200 feet upgradient of the original recovery well, MW-96-6-48 (see Figure 2). The collection system modifications also included a contingency to allow collection of ground water from the original recovery well, should such collection be deemed appropriate. No modifications to the ground water treatment system were needed because flow rates were all within the original design parameters. The EPA approved the collection system modification in August 2003. Ground water recovery operations resumed in November 2003.

The EPA and DNREC have determined that all construction activities performed to date, as well as the implementation of institutional controls, were performed according to specifications. The EPA expects dissolved manganese concentrations to decline as organic carbon is depleted from the aquifer and aerobic conditions are restored. Once the ground water cleanup levels have been met and no further ground water treatment is necessary, the EPA will issue the Site's Final Close Out Report.

4.3 Operation and Maintenance (O&M)

The PRPs are conducting long-term monitoring and maintenance activities according to the operation and maintenance (O&M) plan, which was approved by EPA on June 8, 1998. The primary activities associated with O&M have included:

- Collection of contaminated ground water from extraction well(s).
- Treatment of recovered ground water in a shallow tray air stripper.
- Discharge of treated ground water to the local storm sewer.
- Monthly inspection of treatment system and appurtenances.

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manganese. Once the organic ground water contaminants are remediated, and oxygen is reintroduced into the aquifer, it is expected that dissolved manganese levels will decline to acceptable background levels.

- Quarterly monitoring of the effluent from the air stripper.
- Quarterly monitoring of ground water.

Yields from the ground water recovery wells are diminishing, possibly due to accumulation of calcium precipitate on the wells. It may be necessary to rehabilitate the extraction wells.

Table 4 shows annual O&M costs for the last five years. They include the costs of ground water recovery, treatment, monitoring and reporting. The reported O&M costs are less than the cost estimate for the remedy provided in the ROD of $57,000 to $148,000 per year.

Table 4: Annual O&M Costs

Year	Total Cost
2008	$32,000
2009	$29,000
2010	$27,000
2011	$30,000
2012	$30,000

5.0 Progress Since the Last Five-Year Review

The protectiveness statement from the 2008 FYR for the Site stated the following:

> *The remedy currently protects human health and the environment because exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to contaminated groundwater.*
>
> *In order for the remedy to be protective in the long term, EPA will determine if an ESD should be issued to establish a cleanup standard for manganese which is protective of human health. In addition, a determination will be made regarding the need to provide additional treatment to remove metals from recovered groundwater in order to meet standards for discharge to surface water. Finally, the material in the on-site drum will be analyzed to determine the appropriate waste management option.*
>
> *A vapor intrusion assessment was conducted in 2003, as a component of the first Five-Year Review for this Site; potential risks were determined to be unremarkable. Since 2003, the manner in which this pathway is evaluated has changed significantly but the conclusion reached for this Site remains unchanged. There is currently no risk due to vapor intrusion. DNREC is performing a Brownfield Site Investigation as part of the State redevelopment initiative. The findings will be presented in a final report due to be finalized by October 2008 and will be reviewed for potential changes to the screening assessment. As of the date of this report there is no risk expected due to vapor intrusion at this Site.*

The 2008 FYR included eight issues and recommendations. This report summarizes each recommendation and its current status below.

Table 5: Progress on Recommendations from the 2008 FYR

Section	Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
5.1	Install bolts or locks on wells to prevent tampering.	PRP	12/30/2008	Completed.	10/2008
5.2	Reassess monitoring well network and develop a plan for abandoning unnecessary wells and replacing those wells that are integral to the ground water monitoring program but were destroyed. Install posts around selected monitoring wells to prevent damage.	PRP	12/30/2008	No action taken to abandon unnecessary wells. PRPs installed posts around wells to prevent damage.	10/2008

Section	Recommendation	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
5.3	Assess the need for and, if appropriate, issue an ESD to establish a protective cleanup standard for manganese in ground water. EPA will continue to monitor the ground water over the next five years to determine if an ESD is needed to establish a site-specific cleanup level for manganese. The ESD will also identify any changes that need to be made to the sampling plan as well as treatment system to ensure manganese[2] is treated and will establish the inorganic surface water discharge standards for treated ground water.	EPA	9/30/2010	The EPA has not yet issued an ESD. This 2013 FYR finds that the current cleanup level for manganese (3,000 µg/L), as selected in the 1992 ROD, is no longer protective (see Section 7.2). Therefore, manganese concentrations will be assessed and an ESD will be prepared if warranted. Also, this 2013 FYR finds that an ESD is not needed to establish inorganic surface water discharge standards for treated ground water because these standards were already established by the ROD (state surface water quality standards.)	N/A
5.4	Determine if treatment to remove metals from recovered ground water is necessary in order to meet discharge standards.	PRP	9/30/2009	Not completed. PRPs are not analyzing effluent for metals.	N/A
5.5	Determine if drum contains hazardous materials and select waste management option.	PRP	6/30/2009	Completed.	10/2008
5.6	Review the findings of the Supplemental Brownfield Investigation vapor intrusion report being developed as part of a state redevelopment initiative.	EPA	6/30/2009	The EPA reviewed the vapor intrusion findings in the 2008 Supplemental Brownfield Investigation.	12/15/2008
5.7	All wells monitored as part of this remedy should have samples analyzed to identify the manganese levels.	PRP	9/30/2009	Not completed. PRPs analyzed samples from only two wells for manganese over the past five years.	N/A
5.8	Review information and assess potential for a source area not related to Chem-Solv facility.	EPA	9/1/2013	Completed.	07/01/2013

5.1 Install bolts or locks on wells to prevent tampering

During the January 2013 FYR site inspection, all monitoring wells were either locked or secured within a fenced area.

[2] The 2008 FYR Report incorrectly stated "magnesium" in Table 5. This was a typographical error.

5.2 Reassess monitoring well network

The PRPs have not abandoned unnecessary wells. The PRPs installed posts around wells to prevent damage.

5.3 Establish a manganese ground water cleanup level and surface water discharge standards for metals, if needed

This recommendation has not been implemented. This 2013 FYR finds that the current cleanup level for manganese (3,000 µg/L), as selected in the 1992 ROD, is no longer protective (see Section 7.2). Therefore, manganese concentrations will be assessed and an ESD prepared if warranted to identify a new cleanup level. An ESD is not needed to establish surface water discharge standards for metals in treated ground water because these standards were already established by the ROD, which selected Delaware's surface water quality standards as ARARs.

5.4 Determine if treatment is needed to remove metals from recovered ground water

This recommendation has not been implemented. The PRPs are not currently analyzing effluent for metals. This is because the effluent was sampled for manganese weekly for the first month of operation at system startup in 2003, and at that time the manganese concentrations were in compliance with applicable surface water quality standards. Based on data since the last FYR, the effluent will need to be sampled to assess the concentrations.

5.5 Properly dispose of drum

During the January 2013 FYR site inspection, there was no abandoned drum on the former facility property.

5.6 Review the findings of the Supplemental Brownfield Investigation vapor intrusion report

The EPA reviewed the vapor intrusion findings in the 2008 Supplemental Brownfield Investigation. See Section 6.4 and Appendix E of this FYR Report.

5.7 Sample all wells for manganese

This recommendation has not been implemented. The PRPs analyzed samples from only two wells for manganese over the past five years.

5.8 Assess potential for a source area not related to Chem-Solv facility

Benzene has never been detected in ground water directly below the former Chem-Solv facility (wells 9B or 45B) or immediately downgradient of the Site (well 8B). These findings suggest a source of benzene unrelated to the Site.

6.0 Five-Year Review Process

6.1 Administrative Components

EPA Region 3 initiated the FYR in December 2012 and scheduled its completion for September 2013. EPA remedial project manager Christian Matta led the EPA site review team, which also included EPA community involvement coordinator Vance Evans and contractor support provided to the EPA by Skeo Solutions. In December 2012, the EPA held a scoping call with the review team to discuss the Site and items of interest as they related to the protectiveness of the remedy currently in place. The review schedule established consisted of the following activities:

- Community notification.
- Document review.
- Data collection and review.
- Site inspection.
- Local interviews.
- FYR Report development and review.

6.2 Community Involvement

The EPA mailed notices to nearby residents informing them of the Site's FYR process and inviting community participation. The EPA will make the final FYR report available to the public. The EPA will place copies of the document in the designated site repository: William C. Jason Library, Delaware State University, 1200 North DuPont Highway, Dover, Delaware 19901.

6.3 Document Review

This FYR included a review of relevant, site-related documents including the ROD, remedial action reports and recent monitoring data. A complete list of the documents reviewed can be found in Appendix A.

ARARs Review

Remedial actions are required to comply with the chemical-specific applicable relevant and appropriate requirements(ARARs) identified in the ROD. In performing the Five-Year Review for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Ground Water ARARs
According to the Site's 1992 ROD, the primary ground water ARARs are:

- Federal Maximum Contaminant Levels
- Non-zero federal Maximum Contaminant Level Goals
- Delaware's regulations governing public drinking water

The ROD stated that the remedial action must meet Delaware's public drinking water standards if those levels are more stringent than the federal MCLs and non-zero MCLGs. This FYR compared the MCLs and MCLGs from the 1992 ROD with the current ARARs (Table 6). None of the federal MCLs and MCLGs have changed since the 1992 ROD. However, Delaware has lowered the state MCLs for tetrachloroethene (PCE) and TCE from 5 µg/L to 1 µg/L.

The EPA developed health-based cleanup levels for contaminants with no associated MCLs or MCLGs (acetone and manganese). The health-based cleanup levels are discussed in Section 7.2 of this FYR Report.

Table 6: Ground Water ARAR Review

COC	1992 ROD ARAR (µg/L)		Current ARAR (µg/L)			ARAR Change
	Federal MCL	Federal MCLG	Federal MCL[a]	Federal MCLG[a]	State MCL[b]	
Acetone	no MCL	no MCLG	no MCL	no MCLG	no MCL	None
Benzene	5	0	5	0	5	None
1,2-Dichloroethane	5	0	5	0	5	None
Manganese	no MCL	no MCLG	no MCL	no MCLG	no PMCL[c]	None
Tetrachloroethene	5	0	5	0	1[d]	More stringent
Toluene	1,000	1,000	1,000	1,000	1,000	None
1,1,1-Trichlororethane	200	200	200	200	200	None
Trichloroethene	5	0	5	0	1[d]	More stringent
Xylene	10,000	10,000	10,000	10,000	10,000	None

Notes:

a) Current MCLs and MCLGs are available at: http://water.epa.gov/drink/contaminants/index.cfm (accessed 2/11/2013).

b) Current Delaware Regulations Governing Drinking Water are available at: http://regulations.delaware.gov/AdminCode/title16/Department%20of%20Health%20and%20Social%20Services/Division%20of%20Public%20Health/Health%20Systems%20Protection%20%28HSP%29/4462.pdf (accessed 2/11/2013). The 1992 ROD does not list the state drinking water standard values.

c) Delaware has no primary MCL for manganese. The federal and state secondary MCL is 50 µg/L.

d) State MCLs for PCE and TCE were lowered to 1 µg/L effective January 1, 2013. Systems that met the federal MCL of 5 µg/L on January 1, 2013 effective date yet did not comply with the 1 µg/L have until January 1, 2015, to reach compliance. For enforcement purposes during the transition period between January 1, 2013, until January 1, 2015, any water system not meeting the MCL of 1 µg/L on January 1, 2013, shall continue to be monitored for enforcement purposes at the federal MCL of 5 µg/L until January 1, 2015. On January 1, 2015, the state MCL of 1 µg/L goes into full effect (http://regulations.delaware.gov/AdminCode/title16/Department%20of%20Health%20and%20Social%20Services/Division%20of%20Public%20Health/Health%20Systems%20Protection%20%28HSP%29/4462.pdf) (accessed 2/11/2013).

Surface Water ARARs

The 1992 ROD selected ARARs for both of the discharge options (discharge to the publicly owned treatment works or discharge to surface water). Because the remedy is discharging to surface water, rather than to the publicly owned treatment works, the following surface water ARARs are in effect:

- Federal Clean Water Act National Pollutant Discharge Elimination System (NPDES) requirements
- Delaware surface water quality standards
- Memorandum of Agreement between the Delaware River Basin Commission and EPA Region 3 (§III.5 and V.8)

The Site's surface water discharge is required to meet the substantive requirements of NPDES, although CERCLA sites are not required to have NPDES permits.

This FYR compared the surface water quality standards from the 1992 Feasibility Study with the current Delaware surface water quality standards for the Site's ground water COCs (Table 7). Values from the Feasibility Study were used because the ROD does not include numerical values for the surface water ARARs. Five of the COCs now have more stringent surface water standards. Two of the COCs have less stringent standards and two of the COCs have no change.

Table 7: Surface Water ARAR Review

COC	1992 Feasibility Study ARAR (µg/L)[a]	Current Delaware Surface Water Quality Criteria for Leipsic River Basin (µg/L)[b]		ARAR Change
		Systemic Toxicants	Human Carcinogens	
Acetone	N/A	N/A	N/A	None
Benzene	40	3,100	14	More stringent
1,2-Dichloroethane	243	N/A	37	More stringent
Manganese	100	N/A	N/A	Less stringent
Tetrachloroethene	8.85	1,300	3.3	More stringent
Toluene	424,000	30,000	N/A	More stringent
1,1,1-Trichlororethane	1,003,000	1,400,000	N/A	Less stringent
Trichloroethene	80.7	N/A	30	More stringent
Xylene	N/A	N/A	N/A	None

Notes:
N/A indicates that there is no standard for this COC.
a) Human health standard for fish consumption, from Table 2-4 of the 1992 Feasibility Study. The fish consumption values are presented here because the Leipsic River basin is currently not designated as a Public Water Supply Source.
b) Current Delaware Surface Water Quality Standards are available at: http://regulations.delaware.gov/AdminCode/title7/7000/7400/7401.shtml (accessed 2/11/2013). These values are for "Fish Ingestion Only" because the Leipsic River basin is not designated as a Public Water Supply Source.

According to the ROD, the Memorandum of Agreement between the Delaware River Basin Commission and EPA Region 3 is applicable if the remedial action involves the discharge of greater than 50,000 gallons per day average over any month or a withdrawal of ground water of 100,000 gallons per day or more average over any month. Data from the past five years indicates that the average discharge rate in some months is greater than 50,000 gallons per day, so the Memorandum of Agreement is applicable.

Air ARARs
The ROD selected the following ARARs for the Site's air stripper:

- National Ambient Air Quality Standards
- National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61) (according to the ROD, this regulation is relevant to benzene emissions from the air stripper)
- Delaware's regulations governing the control of air pollution
- Delaware Ambient Air Quality Standards

Table 8 presents the current air emission standards that must be met by the Site's air stripper.

Table 8: Air ARAR Review

COC	National Ambient Air Quality Standards[a]	National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61) (parts per million (ppm))[b]	Delaware Ambient Air Quality Standards (ppm)[d]
Acetone	N/A	N/A	(e)
Benzene	N/A	10[c]	(e)
1,2-Dichloroethane	N/A	N/A	(e)
Manganese	N/A	N/A	N/A
Tetrachloroethene	N/A	N/A	(e)
Toluene	N/A	N/A	(e)
1,1,1-Trichlororethane	N/A	N/A	(e)
Trichloroethene	N/A	N/A	(e)
Xylene	N/A	N/A	(e)

Notes:
N/A indicates that there is no standard for this COC.
a) Current National Ambient Air Quality Standards are available at: **http://epa.gov/air/criteria.html** (accessed 2/12/2013).
b) Current National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61) are available at **http://www.gpo.gov/fdsys/pkg/CFR-2011-title40-vol8/xml/CFR-2011-title40-vol8-part61.xml** (accessed 2/12/2013).
c) 10 ppm by weight. See 40 CFR §61.348(a)(1)(i).
d) Current Delaware Ambient Air Quality Standards are available at: **http://regulations.delaware.gov/AdminCode/title7/1000/1100/1103.shtml#TopOfPage** (accessed 2/13/2013).
e) Section 7.2 of the Delaware Ambient Air Quality Standards states that "The average concentration of hydrocarbons, exclusive of methane, taken over a three hour period from 6 to 9 a.m., local time, shall not exceed 160 micrograms per cubic meter (0.24 ppm) more than once per year."

The ROD states that Delaware's regulations governing the control of air pollution are applicable, and that if emissions from the air stripper exceed 2.5 pounds per day then the substantive requirements of these regulations must be met. This threshold has become more stringent since the ROD was issued in 1992. Delaware's air quality regulations now require a permit for equipment that emits more than 0.2 pounds per day.[3] Based upon DNREC's review of the EPA's air emission screening model and its own review of the projected emissions, DNREC determined that the potential maximum emissions from the treatment system would be below the threshold that would trigger the substantive requirements of an air permit. Given that the mass of contaminants removed by the air stripper is about 100 to 200 grams per year (see Table 10), the Site is not expected to exceed the 0.2 pounds per day threshold.

[3] http://www.dnrec.delaware.gov/whs/awm/AQM/Pages/AQMPermittingFAQs2.aspx.

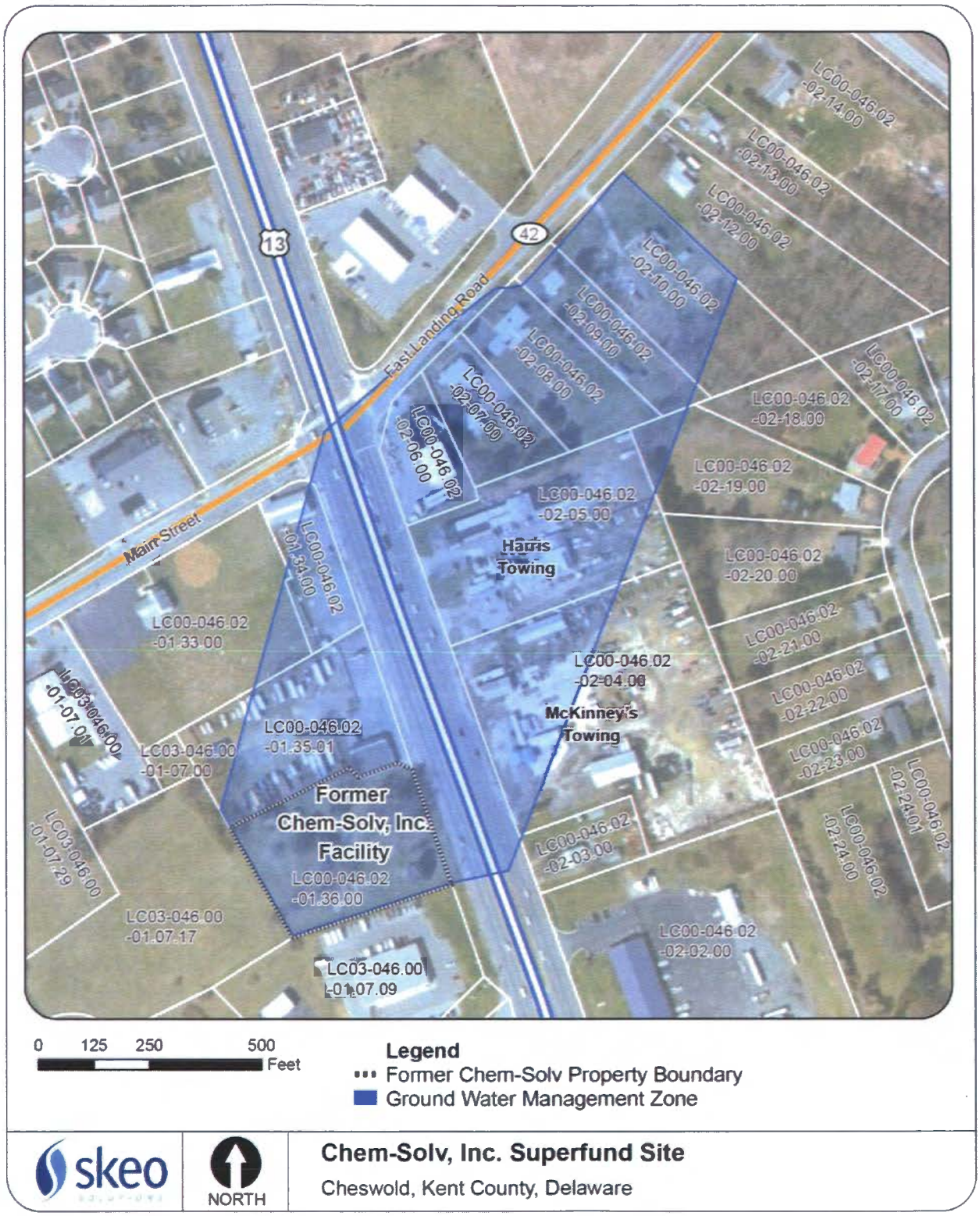
Institutional Controls

Table 9 lists the Site's institutional controls. Figures 2 and 3 show the Site's Ground Water Management Zone. DNREC uses Ground Water Management Zones as part of its well permitting process. Permit applications for wells within such zones are subject to additional review and any appropriate restrictions.

Table 9: Institutional Control (IC) Summary Table

Media	ICs Needed?	ICs Called for in the Decision Documents?	Impacted Parcels	IC Objective	Instrument in Place
Ground Water	Yes	Yes	All parcels with site-related ground water contamination.	Restrict installation of drinking water wells in contaminated portion of the Columbia aquifer.	DNREC has established a Ground Water Management Zone (see Figure 3).
Note: A map of the GWMZ can be viewed online using the Delaware Environmental Navigator: http://maps.dnrec.delaware.gov/navmap.					

Figure 3: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

ORIGINAL

6.4 Data Review

Ground Water Extraction and Treatment Monitoring

As of September 2012, the cumulative volume of ground water extracted, treated and released was 300,498,238 gallons. The mass of contaminants removed as of September 2012 is presented in Table 10.

Table 10: Mass of Contaminants Removed by Treatment

Contaminant	Mass Removed (grams)					
	Prior to October 2008	October 2008 - September 2009	October 2009 - September 2010	October 2010 - September 2011	October 2011 - September 2012	Total
Benzene	3,357	0	0	0	0	3,357
Toluene	12	0	6	8	56	82
1,2-Dichloroethane	194	0	0	0	0	194
1,1,1-Trichloroethane	42	0	0	0	0	42
Trichloroethene	3,080	81	102	66	139	3,468

Samples of the raw influent and treated effluent are collected on a monthly basis. The influent and effluent samples are not analyzed for metals, including manganese. Results from samples collected between March 2008 and August 2012 were available for this FYR. During this time period, TCE was not detected above the ROD cleanup level (5 µg/L) in either influent or effluent. TCE was detected above the current state MCL (1 µg/L) in influent samples on 22 occasions. TCE was not detected in any of the effluent samples. TCE concentrations in the raw influent consistently exceeded 1 µg/L between September 2011 and July 2012, but were below 1 µg/L during the August 2012 sampling.

Other COC and non-COC contaminants were detected in influent samples during the previous five years. No COCs other than TCE were detected above MCLs. None of the effluent samples collected in the last five years contained any organic COC concentrations above the laboratory analytical method detection limits; this is consistent with historical results.

Several non-COCs were detected in the effluent during the previous five years. Table 11 presents these findings. These contaminants do not have state surface water standards. This FYR recommends that site PRPs continue to analyze effluent samples for these contaminants. The EPA will continue to evaluate the monitoring data to determine whether these detections are a concern.

Table 11: Detections of Non-COCs in Treated Effluent, March 2008 to August 2012

Contaminant	Number of Detections	Highest Concentration	MCL	Any Concentrations Above MCL?
Methylene chloride	7[a]	11 µg/L	5 µg/L	Yes (2)
Chloromethane	2	790 D µg/L	None	N/A
Bromomethane	1	8 µg/L	None	N/A

Notes:
a) Methylene chloride was detected in 11 total samples, but the concentrations in four of these samples were likely the result of laboratory contamination.
D = This flag identifies all compounds identified in an analysis at a secondary dilution factor.

Private Well Test Results

Samples from residential and commercial potable supply wells near the Site are analyzed for VOCs on a semi-annual basis. During the 2013 FYR site inspection, one previously unknown residential well was identified within the area of the Site's ground water plume. The PRPs will add this well to the semi-annual potable well sampling.

During May and October 2008, acetone was detected at low concentrations in several potable well samples, but all of these detections likely resulted from laboratory contamination during sample analysis. Other than these anomalous detections, no COCs were detected in any potable well samples during the previous five years; this finding is consistent with historical results for potable well samples. Potable well samples are not analyzed for metals, including manganese.

Ground Water Monitoring

This data review included May 2008 through July 2012 results from quarterly sampling of 11 ground water monitoring wells (96-1, 96-3, 96-4, 97-7, 97-8, 97-9, 97-10, 8B, 9B, 45B and I-2). Previous site documentation appears to have used a slightly different identification system for the monitoring wells. The current data review assumed that the sample identification numbers present in the 2008-2012 raw data analytical reports were equivalent to those in the 2008 FYR according to the following system (Table 12):

Table 12: Monitoring Well Sample Identification Numbers in 2008 and 2013 FYRs

2008 FYR Well ID	2013 FYR Well ID
96-1-55	96-1
96-3-45	96-3
96-4-45	96-4
97-7-48	97-7
97-8-48	97-8
97-9-47	97-9
97-10-45	97-10
8B	8B
9B	9B
45B	45B
I-2-40	I-2

Ground water monitoring has been conducted at the Site since the mid-1980s. Since the initial period of ground water treatment (1997-1999) was discontinued in October 1999, concentrations of six of the nine contaminants with established ground water cleanup levels have remained below their respective cleanup levels, as established in the 1992 ROD. These COCs are acetone,Benzene, 1,2-dichloroethane, manganese, tetrachloroethene, toluene, 1,1,1-trichloroethane, Trichloroethene and xylene.[4] Since 1999, concentrations of TCE and benzene have been above cleanup levels in some wells, as discussed in detail below. Other than the specific COCs and wells discussed below, most COC concentrations were below the laboratory detection limits or detected sporadically at concentrations significantly below the cleanup levels.

During the previous five years, concentrations of TCE in well 9B have been consistently above the cleanup level established in the ROD (5 µg/L). Concentrations in 9B are consistently the highest of all wells and are significantly above the cleanup level, which is consistent with concentrations between 2003 and 2008. The highest TCE concentration detected during the last five years was 14 µg/L during April 2010 sampling of 9B. TCE concentrations in well 96-3 were not above the 1992 ROD cleanup level (5 µg/L) over the past five years but were consistently above the current state MCL (1 µg/L), which reflects an increase in concentrations above values between 2003 and 2008.

During 2006-2009, TCE concentrations in well 45B were consistently below the laboratory detection limit; however, since 2010, they have been about 1 µg/L. Conversely, TCE concentrations in well 96-4 have decreased over the past five years. In general, other wells have had sporadic detections of TCE, but all concentrations were below the 1992 ROD cleanup level, with one exception (well 97-10 in October 2010).

Between 2003 and 2008, benzene concentrations in wells 96-3, 96-4 and 97-8 were sometimes above the ROD cleanup level of 5 µg/L. The highest benzene concentration during this time period (38 µg/L) was detected in well 97-8 during September 2005

[4] TCE was detected above the current state MCL of 1 µg/L one time over the past five years (during October 2011 sampling of well 96-1).

sampling. Between 2008 and 2012, all benzene concentrations in well 97-8 were below the laboratory detection limit. Also between 2008 and 2012, all benzene concentrations in wells 96-3 and 96-4 were below the cleanup level. However, benzene concentrations in well 96-4 appear to have been increasing since 2010. Well 96-3 is located hydraulically upgradient of the recovery well network and 97-8 is located hydraulically downgradient of the recovery well network. Benzene has never been detected in wells 9B or 45B, which monitor the ground water directly below the former Chem-Solv facility, or in well 8B, which is immediately downgradient of the Site. These findings suggest a source of benzene unrelated to the former Chem-Solv facility.

Samples from only two wells (CPW-1S and 34AR) were analyzed for manganese over the past five years. Between 2003 and 2008, manganese concentrations were as high as 2,330 µg/L (in 2005 sample from CPW-1S). Manganese concentrations in 34AR and CPW-1S between 2009 and 2012 were all well below the 1992 ROD cleanup level (3,000 µg/L) (Table 13). The presence of dissolved manganese in ground water is believed to be caused by the Site's organic contaminants mobilizing naturally occurring manganese. Once the organic ground water contaminants are remediated and oxygen is reintroduced into the aquifer, it is expected that dissolved manganese levels will decline to acceptable background levels. In the interim, this FYR recommends that the PRPs monitor manganese levels in all of the wells that are sampled (see Table 15).

Table 13: Manganese in Shallow Ground Water

Well ID	Manganese Concentration (µg/L)				
	February 2009	January 2010	January 2011	January 2012	February 2013
34AR	160	133	63.7	373	164
CPW-1S[a]	20.2	46.4	49.9	376	75.4

Note:
a) This well is sometimes referred to as CPW-I5.

Several contaminants not identified as COCs were detected in ground water monitoring samples between 2008 and 2012, including methylene chloride, chloroform, vinyl chloride, 1,1-dichloroethene and 1,1-dichloroethane. Most of these concentrations were sporadic and very low, with the exception of methylene chloride and chloroform. During October 2010, methylene chloride was detected in 97-8 at a concentration of 7 µg/L, which is above the MCL of 5 µg/L. In January 2012, methylene chloride concentrations in 8B, 9B, 45B and 96-1 were above the MCL. The presence of methylene chloride in the wells that monitor ground water immediately below (9B and 45B) and downgradient (8B) of the Site suggest that there might be an on-site source of methylene chloride ground water contamination. Chloroform concentrations have generally been below the laboratory detection limit or detected sporadically at very low concentrations. However, in July 2008 samples, chloroform concentrations in all samples (including treatment system influent and effluent samples) were extremely high (up to 2,400 µg/L). Chloroform concentrations during the subsequent sampling event were again below the

laboratory detection limit; it is not clear why chloroform concentrations were so consistently high during July 2008 sampling.

Vapor Intrusion

The EPA conducted a vapor intrusion assessment in 2003 as part of the Site's first FYR and found that the potential risks were not significant. In 2008, Ten Bears Environmental, a contractor for the property owner, performed a Supplemental Brownfields Investigation as part of the state redevelopment initiative. The December 2008 Supplemental Brownfields Investigation Report presented the findings of the investigation. A conservative risk assessment using the Johnson and Ettinger vapor intrusion model indicated that cumulative soil gas concentrations are within acceptable risk levels for the commercial development scenario, but are not within acceptable levels for a hypothetical future residential land use scenario. A limited vapor intrusion assessment was also performed to assess the risk posed to the current occupant of the property, using VOC detections that exceeded applicable standards in three vapor points closest to the residence. The results of that assessment indicated that vapor intrusion into the current residence is not a concern.

Based on the 2008 investigation, DNREC issued a Final Plan of Remedial Action for the Site on January 29, 2009. The Final Plan states that the cumulative soil gas vapor risk to human health due to the contaminants is above DNREC's restricted use standard. Therefore, the Final Plan requires an environmental covenant on the property limiting its use only to non-residential purposes and prohibiting land-disturbing activities without prior written approval from DNREC. This covenant has not been implemented.

Because toxicity values have changed for many of the VOCs since the 2008 investigation, this FYR reevaluated the 2008 soil gas results using a conservative, screening-level evaluation (see Appendix E). The results suggest that the remedy remains protective for both residential and commercial exposures. This conclusion differs from that of the 2008 investigation because this FYR's analysis excluded several soil gas sample locations with high VOC concentrations that DNREC deemed to be unusable, whereas the 2008 investigation included those data points. The findings of the reevaluated 2008 soil gas results coupled with the low concentrations of VOCs in ground water (see Section 6.4 discussion above) suggest that vapor intrusion is not a significant exposure pathway at the Site under commercial and residential redevelopment scenarios. However, any redevelopment of the former Chem-Solv property must either comply with DNREC's 2009 Final Plan of Remedial Action, which prohibits residential redevelopment, or be otherwise approved by DNREC if an alternate redevelopment is planned.

6.5 Site Inspection

On January 10, 2013, the EPA and DNREC conducted the FYR site inspection, with contractor support provided by Skeo Solutions. The following people were present at the site inspection:

- Christian Matta, EPA Remedial Project Manager
- Vance Evans, EPA Community Involvement Coordinator
- Bob Asreen, DNREC
- Doug Beaver, Rare Earth Environsciences
- Kristin Sprinkle, Skeo Solutions
- Hagai Nassau, Skeo Solutions

Appendix C of this FYR report contains the site inspection checklist. Appendix D presents photographs from the site inspection.

The attendees toured the Site, including the former Chem-Solv property, commercial parcels east of Route 13 (McKinney's Towing, Harris Towing) and residential parcels along the south side of Route 42 (Fast Landing Road, east of Route 13). Attendees observed the ground water recovery pump in a garage on the McKinney's Towing property, and the air stripper in the Harris Towing garage. The ground water recovery system was not operating at the time of the site inspection. It had been shut down temporarily two days before the site inspection due to a malfunctioning blower motor. The recovery system was restarted on February 9, 2013.

The attendees visually inspected monitoring wells on the former facility property and at the commercial properties east of Route 13. Attendees observed that the monitoring wells appeared to be in good condition. Some monitoring wells are no longer sampled, but have not been properly abandoned. The attendees visually inspected potable wells at the residential properties along the south side of Route 42. On one of the residential properties, the attendees saw a well that is not included in the PRPs' potable well sampling. According to the well permit application, this well draws from the deeper, uncontaminated aquifer. Section 9 of this FYR Report recommends that the PRPs add this well to the semi-annual potable well sampling.

On January 10, 2013, as part of the FYR site inspection, Skeo Solutions staff visited the designated site repository, the William C. Jason Library at Delaware State University, 1200 North DuPont Highway, Dover, Delaware 19901. No site documents were found. Contractor staff also conducted research at the Kent County Recorder of Deeds Office. The Site's 1992 Administrative Order (Docket number III-93-11-DC) was filed on February 10, 1993, in Volume R52, Pages 43 through 129.

6.6 Interviews

The FYR process included interviews with parties affected by the Site, including nearby residents and a nearby business owner. The interviews were conducted by phone on January 2-3, 2013. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. The interviews are summarized below. Appendix B provides the complete interviews. As noted in the interview summaries, the interviewee identified EPA as the party that installed new wells and conducts the sampling. However, this is incorrect as the PRPs installed the wells and conducts the ongoing sampling as part of implementing the remedy.

Resident #1 is aware of the cleanup project. The resident has no negative impressions of the Site. The PRP installed a new well for the resident and the PRP tests the water about every six months; the resident has no concerns with the water or the testing.

Resident #2 is aware of the cleanup project because the PRP had to install a new well for the resident. The PRP contracts with a company to test the water every three or six months. The resident has no concerns with the Site; the problem has been taken care of.

Business owner #1 owns a commercial property near the Site. The PRP installed a well on their property. There is also an older well, which they use for sanitary water (for example, in the restroom). The PRP tests the water from that older well once or twice per year. Business owner #1 has no concerns with the Site.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

The remedy is functioning as intended by the ROD and ESD. Contaminated ground water is being collected using recovery wells and treated with an air stripper. Contaminated private wells have been replaced with deeper, uncontaminated wells. The PRPs continue to monitor ground water at domestic, recovery and monitoring wells. DNREC has implemented a Ground Water Management Zone to prevent the installation of water supply wells within the contaminated portion of the Columbia aquifer until cleanup levels are achieved.

TCE is the only COC that remains above its cleanup level. It remains above the ROD cleanup level (5 µg/L) in only one well (9B). However, four locations have TCE concentrations above the current state MCL (1 µg/L). This FYR report recommends that the EPA and the PRPs consider improving the remedy to remove the TCE contamination more quickly.

Samples from only two monitoring wells were analyzed for manganese over the past five years.

Treated effluent is being discharged to surface water and meets the state's surface water standards for organic COCs. The treated ground water is not being analyzed for metals prior to being discharged to surface water.

Yields from the ground water recovery wells are diminishing, possibly due to accumulation of calcium precipitate on the wells. It may be necessary to rehabilitate the extraction wells.

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

The exposure assumptions and RAOs used at the time of remedy selection are still valid.

On February 17, 2012, EPA released the final non-cancer dioxin reassessment, publishing a non-cancer toxicity value, or reference dose, for 2,3,7,8- tetrachlorodibenzo-p-dioxin in EPA's Integrated Risk Information System. The new reference dose is now the recommended value "to be considered" for use in developing site-specific dioxin preliminary remediation goals and cleanup levels under CERCLA and the NCP. EPA's Office of Solid Waste and Emergency Response has proposed to revise the interim preliminary remediation goals for dioxin and dioxin-like compounds, based on technical assessment of scientific and environmental data. The new preliminary remediation goals calculated using the new reference dose of 0.7 picograms per kilogram-day and EPA non-adjusted exposure factors are 0.051 µg/kg (ppb) *toxicity equivalence (TEQ)* for residential soil and 0.6654 µg/kg *TEQ* for commercial/industrial soil (both are based on toxicity equivalence quotients, which add up the toxicity of all dioxin-like contaminants.

Available information for dioxin should be evaluated to confirm that the implemented remedy is protective based on the revised toxicity of dioxin.

This FYR reevaluated the potential for vapor intrusion at the Site because toxicity values have changed for many of the VOCs since the 2008 Supplemental Brownfields Investigation. This FYR reevaluated the 2008 soil gas results using a conservative, screening-level evaluation (see Appendix E). The results of this evaluation, coupled with the low concentrations of VOCs in ground water, suggest that the remedy remains protective for both residential and commercial exposures. However, residential redevelopment of the former Chem-Solv property would require approval from DNREC, because DNREC's 2009 Final Plan of Remedial Action prohibits residential redevelopment.

Delaware has lowered its state MCLs for PCE and TCE from 5 µg/L to 1 µg/L. PCE concentrations have been below 1 µg/L in all wells over the past five years, with one exception.[5] TCE concentrations are consistently above 5 µg/L in one well, and consistently above 1 µg/L at several other locations. The EPA will review the new state MCLs for PCE and TCE and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs. All of the other MCL-based cleanup goals are still valid.

The Site's health-based cleanup level for acetone is still valid. However, toxicity values for manganese have been revised. The EPA used a No Observed Adverse Effect Level of 0.14 milligrams per kilogram-day (mg/kg-day) to calculate the 1992 ROD's ground water cleanup level for manganese (3,000 µg/L).[6] The EPA now uses a more stringent reference dose (0.024 mg/kg-day) when evaluating non-food (e.g., drinking water or soil) exposures to manganese (see Appendix F).[7] The current regional screening level for manganese in tapwater is 320 µg/L based on protection from adverse non-cancer endpoints in child residents. As a consequence, the cleanup goal identified in the ROD for manganese is no longer protective.

The Site's other health-based cleanup level (3,500 µg/L for acetone) was calculated using the reference dose. Acetone's reference dose has become less stringent since the 1992 ROD (see Appendix F), so the cleanup level for acetone is still valid.

The EPA now has inhalation reference concentrations for acetone and manganese; these toxicity values did not exist at the time of the 1992 ROD (see Appendix F). These new toxicity values do not affect the protectiveness of the ground water cleanup levels, because the risk associated with these COCs is driven by ingestion, not inhalation.

In 2003, the PRPs analyzed ground water samples for 1,4-dioxane as requested by the EPA. None of the samples contained detectable levels of 1,4-dioxane. As a result, no changes to the treatment system were needed to address 1,4-dioxane. The laboratory

[5] October 2011 sampling of well 96-1.
[6] November 1991 Groundwater Feasibility Study (page 2-14).
[7] http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm.

detection limit for this analysis was 11 µg/L. The current regional screening level for 1,4-dioxane in residential tapwater is 0.67 µg/L. Regional screening levels are derived based on a risk level of 10^{-6}. The 11 µg/L detection limit is less than two orders of magnitude larger than the current regional screening level, so a concentration of 11 µg/L corresponds to a risk of less than 10^{-4}, which is within the EPA's acceptable risk range. Therefore, no additional sampling is needed for 1,4-dioxane.

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

During the 2013 FYR site inspection, one previously unknown residential well was identified within the area of the Site's ground water plume. The PRPs will add this well to the semi-annual potable well sampling.

Several non-COCs were detected in ground water and treated effluent during the previous five years. The PRPs will continue to analyze ground water and effluent for non-COC organics over the next five years. The EPA will evaluate the data to determine whether these detections are a concern.

7.4 Technical Assessment Summary

The remedy is functioning as intended by the ROD and ESD. TCE is the only COC that remains above its cleanup level. The EPA and the PRPs will consider improving the remedy to remove the TCE contamination more quickly. DNREC has implemented a Ground Water Management Zone to prevent the installation of water supply wells in the contaminated portion of the Columbia aquifer until cleanup levels are achieved. There are no known exposures to the contaminated ground water. However, during the 2013 FYR site inspection, one previously unknown residential well was identified within the area of the Site's ground water plume. According to the well permit application, this well draws from the deeper, uncontaminated aquifer. The PRPs will add this well to the semi-annual potable well sampling. An updated screening assessment indicates that vapor intrusion is not a concern for either residential or commercial exposures. State MCLs for PCE and TCE have been lowered from 5 µg/L to 1 µg/L. The EPA will review the new state MCLs and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs. The toxicity value for manganese has changed, so the current cleanup level (3,000 µg/L), as selected in the 1992 ROD, is no longer protective in the long term. Additional monitoring is needed for manganese in ground water and for metals in effluent from the treatment system. Several non-COCs were detected in ground water and treated effluent during the previous five years. The PRPs will continue to analyze ground water and effluent for non-COC organics; the EPA will evaluate the data to determine whether the previously-detected non-COCs are a concern as it relates to the treatment system and associated effluent.

8.0 Issues

Table 14 summarizes the current site issues.

Table 14: Current Site Issues

Issue	Affects Current Protectiveness?	Affects Future Protectiveness?
State MCLs for PCE and TCE have been lowered from 5 µg/L to 1 µg/L.	No	Yes
During the 2013 FYR site inspection, an additional residential well was identified in the area of the Site's ground water plume. This well is not being sampled.	No	Yes
TCE remains in the ground water at concentrations above the cleanup level.	No	Yes
The toxicity value for manganese has changed, so the current cleanup level (3,000 µg/L), as selected in the 1992 ROD, is no longer protective.	No	Yes
Samples from only two monitoring wells were analyzed for manganese over the past five years.	No	Yes
Treated ground water is not being analyzed for metals prior to being discharged to surface water.	No	Yes
Several non-COCs were detected in ground water and treated effluent during the previous five years.	No	Yes
On February 17, 2012, EPA released the final non-cancer dioxin reassessment, publishing a non-cancer toxicity value, or reference dose (RfD), for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in EPA's Integrated Risk Information System (IRIS). Based on this new RfD, today's levels would be lower than levels that were considered protective at the time the soil remediation was conducted at the Site. Therefore the protectiveness of the remedy needs to be reevaluated.	No	Yes

9.0 Recommendations and Follow-up Actions

Table 15 provides recommendations to address the current site issues.

Table 15: Recommendations to Address Current Site Issues

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
State MCLs for PCE and TCE have been lowered from 5 µg/L to 1 µg/L.	The EPA will review the new state MCLs for PCE and TCE and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs.	EPA	EPA	07/31/2015	No	Yes
During the 2013 FYR site inspection, an additional residential well was identified within the area of the Site's ground water plume. This well is not being sampled.	Add the unsampled residential well to the semi-annual potable well sampling.	PRP	EPA	09/30/2013	No	Yes
TCE remains in the ground water at concentrations above the cleanup level.	Consider whether the ground water remedy can be improved to achieve the TCE cleanup level more quickly.	EPA/PRP	EPA	09/30/2015	No	Yes
The toxicity value for manganese has changed, so the current cleanup level (3,000 µg/L), as selected in the 1992 ROD, is no longer protective in the long term.	Assess manganese concentrations and prepare an ESD to select a new cleanup level if warranted.	EPA	EPA	09/30/2015	No	Yes
Samples from only two monitoring wells were analyzed for manganese over the past five years.	Monitor all wells for manganese.	PRP	EPA	09/30/2013	No	Yes

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
Treated ground water is not being analyzed for metals prior to being discharged to surface water.	PRPs will analyze treated ground water for metals. The EPA will determine whether additional treatment is needed to remove metals from recovered ground water in order to meet standards for discharge to surface water.	PRP, EPA	EPA	09/30/2013	No	Yes
Several non-COCs were detected in ground water and treated effluent during the previous five years.	Continue to analyze ground water and effluent for non-COC organics over the next five years. The EPA will evaluate the data to determine whether these detections are a concern.	PRP, EPA	EPA	09/30/2014	No	Yes

Issue	Recommendation / Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
On February 17, 2012, EPA released the final non-cancer dioxin reassessment, publishing a non-cancer toxicity value, or reference dose (RfD), for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in EPA's Integrated Risk Information System (IRIS). Based on this new RfD, today's levels would be lower than levels that were considered protective at the time the soil remediation was conducted at the Site. Therefore the protectiveness of the remedy needs to be reevaluated.	Evaluate existing Site data for dioxin to confirm that implemented soil remedy is protective. Conduct sampling if needed.	PRP	EPA	9/30/2014	No	Yes

The following additional items, though not expected to affect protectiveness, warrant additional follow-up:

- The EPA requests that site PRPs begin submitting annual ground water monitoring reports that include tabulated monitoring data, charts of historical ground water concentrations for key COCs. Potentiometric maps and ground water plume maps for COCs that exceed cleanup levels should be prepared.
- Some monitoring wells are no longer sampled, but have not been properly abandoned. The EPA requests that the PRPs determine if there is a possible need for those wells in the future. If it is determined that there is no future need for certain monitoring wells, then the wells should be properly abandoned in accordance with applicable Delaware regulations.

10.0 Protectiveness Statement

ORIGINAL

The Site's remedy currently protects human health and the environment because there are no known exposures to the contaminated ground water. However, in order for the remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness. The PRPs will sample the previously unsampled residential well. The EPA and the PRPs will assess whether the system is capturing the contamination effectively to achieve cleanup goals in a timely manner and consider improving the remedy to remove the TCE contamination more quickly if needed. The EPA will review the new state MCLs for PCE and TCE and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs. The EPA will assess manganese concentrations in ground water and will prepare an ESD to select a new cleanup level if warranted. The PRPs will monitor all wells for manganese and analyze treated ground water for metals. The PRPs will evaluate existing Site data for dioxin to confirm that implemented soil remedy is protective. Conduct sampling if needed. The PRPs will continue to analyze ground water and effluent for non-COC organics; the EPA will evaluate the data to determine whether the previously-detected non-COCs are a concern as it relates to the treatment system and associated effluent.

Appendix A: List of Documents Reviewed

BCM. Remedial Investigation Report. May 1991.

BCM. Groundwater Feasibility Study. November 1991.

EPA. Record of Decision. March 31, 1992.

Rare Earth Environsciences, Inc. Operations and Maintenance Manual for Interim Remedial Action Ground Water Treatment System. December 1997.

EPA. Explanation of Significant Differences. June 18, 1999.

EPA. Second Five-Year Review Report for Chem-Solv Inc. Site. September 26, 2008.

Ten Bears Environmental. Supplemental Brownfields Investigation Report. Revised December 2008.

DNREC. Final Plan of Remedial Action. January 29, 2009.

Appendix B: Interview Forms

Chem-Solv Superfund Site		**Five-Year Review Interview Form**	
Site Name:	Chem-Solv	**EPA ID No.:**	DED980714141
Interviewer Name:	Kristin Sprinkle	**Affiliation:**	Skeo Solutions
Subject Name:	Resident #1	**Affiliation:**	Resident
Subject Contact Information:			
Time:	4:30 p.m.	**Date:**	01/02/2013
Interview Location:	N/A		

Interview Format (circle one): **In Person** **(Phone)** **Mail** **Other:**

Interview Category: **Residents**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Knew what they were doing and remember seeing them clean the Site. Took a lot of truck loads out. Refilled with different dirt.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   No impression.

3. What have been the effects of the Site on the surrounding community, if any?

   The Site itself was across the highway of the house. The chemical plant is catty-corned to the corner across the highway from my house. Right now there is just open ground. An Amish company has a place over there. No negative impressions. During the summer, right on the corner, is a store that has been 50 million things and right now is a food place, and next to that is an open lot. In the summer time, there are vegetable stands. Area is not messy.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No – directly on the highway.

5. Has the EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can the EPA best provide site-related information in the future?

   Yeah – they check water supply every six months or so. Do not have a problem with it and do not think about it very much. It is in the past.

6. Do you own a private well in addition to the one the EPA put in? If so, for what purpose(s) is your private well used? What actions has the EPA taken to make sure your well water is safe?

   Only have the new one the EPA built. The EPA tests water every six months or so to make sure the water seems safe, and they have been doing that for what seems like forever. The man knocks on my door every six months or so and ask for some water, and I let him get it.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   No, not really. Nothing is bothering me and I am happy where I am. I have no problems with my property or the water.

Chem-Solv Superfund Site **Five-Year Review Interview Form**

Site Name: Chem-Solv **EPA ID No.:** DED980714141
Interviewer Name: Kristin Sprinkle **Affiliation:** Skeo Solutions
Subject Name: Resident #2 **Affiliation:** Resident
Subject Contact Information:
Time: 4:40 p.m. **Date:** 01/02/2013
Interview Location: N/A

Interview Format (circle one): **In Person** **(Phone)** **Mail** **Other:**

Interview Category: **Residents**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Yes, because they had to put a new well in for me because of the contamination of the Site.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   It is alright – there are other problems up in that area with the water. Probably less than half a mile away, a trailer park put a new well in and had problems with *E. coli*, also had problems at the fire house and had to have wells sanitized. But Chem-Solv seems to be alright.

3. What have been the effects of this Site on the surrounding community, if any?

   Has not had much effect on it now. Taken care of the problem.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No, I haven't seen any issues.

5. Has the EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can the EPA best provide site-related information in the future?

   The EPA had a company they contracted with out of Philadelphia that comes and tests the water every so often.

6. Do you own a private well in addition to the one the EPA put in? If so, for what purpose(s) is your private well used? What actions has the EPA taken to make sure your well water is safe?

   Had a private well, but only use the new one the EPA put in. The company comes in to test every three or six months.

ORIGINAL

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   No, no comments.

Chem-Solv Superfund Site **Five-Year Review Interview Form**

Site Name: Chem-Solv **EPA ID No.:** DED980714141
Interviewer Name: Kristin Sprinkle **Affiliation:** Skeo Solutions
Subject Name: Business owner #1 **Affiliation:** Local business owner
Subject Contact Information:
Time: 12:41 p.m. **Date:** 01/03/2013
Interview Location: N/A

Interview Format (circle one): **In Person** **Phone** **Mail** **Other:**

Interview Category: **Residents**

1. Are you aware of the former environmental issues at the Site and the cleanup activities that have taken place to date?

   Well, do not know much at all. Knew there was a cleanup and there were a lot of companies involved, but do not know much of the past.

2. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

   Does not know of anything that is affected today, knows there are wells on the property, but not aware of the impact.

3. What have been the effects of this Site on the surrounding community, if any?

   No.

4. Have there been any problems with unusual or unexpected activities at the Site, such as emergency response, vandalism or trespassing?

   No.

5. Has the EPA kept involved parties and surrounding neighbors informed of activities at the Site? How can the EPA best provide site-related information in the future?

   When bought property six years ago, the EPA cleared us of any problems with the property that we are using. The only thing known to happen is they come to test our water once or twice a year.

6. Do you own a private well in addition to the one the EPA put in? If so, for what purpose(s) is your private well used? What actions has the EPA taken to make sure your well water is safe?

   We do; was installed prior to acquiring the property. Use the well for sanitary water for things like the restroom. It is the water the EPA tests once or twice a year.

7. Do you have any comments, suggestions or recommendations regarding any aspects of the project?

   No, no comments.

Appendix C: Site Inspection Checklist

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Chem-Solv, Inc.	**Date of Inspection: January 10, 2013**
Location and Region: Cheswold, Delaware, Region 3	**EPA ID: DED980714141**
Agency, Office or Company Leading the Five-Year Review: EPA Region 3	**Weather/Temperature: clear, 50°F**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☒ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: _____
- ☐ Monitored natural attenuation
- ☐ Ground water containment
- ☐ Vertical barrier walls

Attachments: ☒ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** _____ Name _____ Title mm/dd/yyyy Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** _____ Name _____ Title mm/dd/yyyy Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone: _____
   Problems/suggestions ☐ Report attached: _____

ORIGINAL

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____Name _____ _____ _____
Title Date Phone No.
Problems/suggestions ☐ Report attached:_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached:_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached: _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attached:_____

4. **Other Interviews** (optional) ☐ Report attached: _____

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: Site does not require an air permit or NPDES permit.

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

7. **Ground Water Monitoring Records** ☒ Readily available ☒ Up to date ☒ N/A

Remarks: _____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☒ Water (effluent)	☒ Readily available	☐ Up to date	☐ N/A

Remarks: Effluent data is available from the O&M contractor. Air emissions do not need to be monitored.

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house	☐ Contractor for state
☐ PRP in-house	☒ Contractor for PRP
☐ Federal facility in-house	☐ Contractor for Federal facility
☐ _____	

ORIGINAL

2. **O&M Cost Records**

☒ Readily available ☒ Up to date

☒ Funding mechanism/agreement in place ☐ Unavailable

Original O&M cost estimate: $57,000 - $148,000 per year ☐ Breakdown attached

Total annual cost by year for review period if available

From: 01/01/2008 Date	To: 12/31/2008 Date	$31,750 Total cost	☐ Breakdown attached
From: 01/01/2009 Date	To: 12/31/2009 Date	$29,300 Total cost	☐ Breakdown attached
From: 01/01/2010 Date	To: 12/31/2010 Date	$27,150 Total cost	☐ Breakdown attached
From: 01/01/2011 Date	To: 12/31/2011 Date	$29,500 Total cost	☐ Breakdown attached
From: 01/01/2012 Date	To: 12/31/2012 Date	$30,450 Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: Former Chem-Solv property is not fenced. Ground water pump and air stripper are in secured garages at businesses.

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: Delaware Department of Natural Resources and Environmental Control

Contact	Bob Asreen	hydrologist	mm/dd/yyyy	302-395-2600
	Name	Title	Date	Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: During the 2013 FYR site inspection, an additional residential well was identified within the area of the Site's ground water plume. This well is not being sampled.

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: no changes

3. **Land Use Changes Off Site** ☐ N/A

Remarks: no changes

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

ORIGINAL

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident
   Arial extent: _____ Depth: _____
   Remarks: _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths: _____ Widths: _____ Depths: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Arial extent: _____ Depth: _____
   Remarks: _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Arial extent: _____ Depth: _____
   Remarks: _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)
   Remarks: _____

6. **Alternative Cover** (e.g., armored rock, concrete) ☐ N/A
   Remarks: _____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Arial extent: _____ Height: _____
   Remarks: _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
   ☐ Wet areas ☐ Location shown on site map Arial extent: _____
   ☐ Ponding ☐ Location shown on site map Arial extent: _____
   ☐ Seeps ☐ Location shown on site map Arial extent: _____
   ☐ Soft subgrade ☐ Location shown on site map Arial extent: _____
   Remarks: _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map
   ☐ No evidence of slope instability
   Arial extent: _____
   Remarks: _____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
C. Letdown Channels		☐ Applicable	☐ N/A
	(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement** (Low spots)	☐ Location shown on site map	☐ No evidence of settlement
	Arial extent: _____		Depth: _____
	Remarks: _____		
2.	**Material Degradation**	☐ Location shown on site map	☐ No evidence of degradation
	Material type:_____		Arial extent: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Undercutting**	☐ Location shown on site map	☐ No evidence of undercutting
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Obstructions**	Type: _____	☐ No obstructions
	☐ Location shown on site map	Arial extent: _____	
	Size: _____		
	Remarks: _____		
6.	**Excessive Vegetative Growth**	Type: _____	
	☐ No evidence of excessive growth		
	☐ Vegetation in channels does not obstruct flow		
	☐ Location shown on site map	Arial extent: _____	
	Remarks: _____		

ORIGINAL

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

4. **Extraction Wells Leachate**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
   Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs maintenance
   Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs maintenance
   Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs maintenance ☐ N/A
   Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A
   ☐ Siltation not evident
   Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____
   ☐ Erosion not evident
   Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks: _____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement: _____ Vertical displacement: _____
   Rotational displacement: _____
   Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Area extent: _____ Type: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Area extent: _____ Depth: _____
   Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks: _____

ORIGINAL

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Area extent: _____ Depth: _____
   Remarks: _____

2. **Performance Monitoring** Type of monitoring: _____
   ☐ Performance not monitored
   Frequency: _____ ☐ Evidence of breaching
   Head differential: _____
   Remarks: _____

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing and Electrical**
   ☐ Good condition ☒ All required wells properly operating ☐ Needs maintenance ☐ N/A
   Remarks: Well yields are diminishing; wells may need to be rehabilitated.

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**
   ☒ Good condition ☐ Needs maintenance
   Remarks: _____

3. **Spare Parts and Equipment**
   ☐ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**
   ☐ Good condition ☐ Needs maintenance
   Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**
   ☐ Good condition ☐ Needs maintenance
   Remarks: _____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks: _____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☒ Air stripping ☐ Carbon adsorbers

☐ Filters: _____

☐ Additive (e.g., chelation agent, flocculent): _____

☐ Others: _____

☐ Good condition ☒ Needs maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☒ Equipment properly identified

☐ Quantity of ground water treated annually: _____

☐ Quantity of surface water treated annually: _____

Remarks: Ground water extraction and treatment system was not operating at the time of the FYR site inspection (January 10, 2013) due to a malfunctioning blower motor. The system was restarted on February 9, 2013.

2. **Electrical Enclosures and Panels** (properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Tanks, Vaults, Storage Vessels**

☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs maintenance

Remarks: _____

4. **Discharge Structure and Appurtenances**

☐ N/A ☐ Good condition ☐ Needs maintenance

Remarks: _____

5. **Treatment Building(s)**

☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair

☒ Chemicals and equipment properly stored

Remarks: _____

6. **Monitoring Wells** (pump and treatment remedy)

☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☐ N/A

Remarks: _____

D. Monitoring Data

1. **Monitoring Data**

☒ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☒ Ground water plume is effectively contained ☐ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The remedy was designed to restore ground water to its beneficial use as a potential drinking water source and to prevent exposure to contaminated ground water until the restoration is complete.

The remedy is functioning as intended by the ROD and ESD. TCE is the only COC that remains above its cleanup level. The EPA and the PRPs will consider improving the remedy to remove the TCE contamination more quickly. DNREC has implemented a Ground Water Management Zone to prevent the installation of water supply wells in the contaminated portion of the Columbia aquifer until cleanup levels are achieved. There are no known exposures to the contaminated ground water. However, during the 2013 FYR site inspection, one previously unknown residential well was identified within the area of the Site's ground water plume. According to the well permit application, this well draws from the deeper, uncontaminated aquifer. The PRPs will add this well to the semi-annual potable well sampling. An updated screening assessment indicates that vapor intrusion is not a concern for either residential or commercial exposures. State MCLs for PCE and TCE have been lowered from 5 µg/L to 1 µg/L. The EPA will review the new state MCLs and will consider revising the ground water cleanup goals for PCE and TCE to meet the state ARARs. Additional monitoring is needed for manganese in ground water and for metals in effluent from the treatment system. Several non-COCs were detected in ground water and treated effluent during the previous five years. The PRPs will continue to analyze ground water and effluent for non-COC organics; the EPA will evaluate the data to determine whether the previously-detected non-COCs are a concern.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Additional monitoring is needed for manganese in ground water and for inorganics in effluent from the treatment system.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None identified.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The EPA and the PRPs will consider improving the remedy to remove the TCE contamination more quickly.

ORIGINAL

Appendix D: Photographs from Site Inspection Visit

Former Chem-Solv facility property.

Recovery pump, located in a garage at McKinney's Towing.

Air stripper, located in a garage at Harris Towing.

Appendix E: Vapor Intrusion Screening

Because toxicity values have changed for many of the VOCs since the 2008 Supplemental Brownfields Investigation, this FYR reevaluated the soil gas results using the following screening-level evaluations:

- Application of the EPA's suggested attenuation factor of 0.3 (soil gas to indoor air migration) to the 2008 data; comparing results to regional screening levels (RSLs) to identify contaminants of potential concern (COPCs) for further vapor intrusion evaluation.[8]
- Evaluation of maximum concentration of COPCs in the EPA's screening-level Johnson and Ettinger vapor intrusion model (JEM) for soil gas using standard model defaults.
- Evaluation of cumulative risk and hazard index for COPCs by using the same default exposure assumptions used in development of the EPA's November 2012 RSLs for residential and commercial air.

The maximum soil gas concentrations presented in Table 3 of the 2008 Supplemental Brownfields Investigation Report were multiplied by the EPA's suggested attenuation factor of 0.3 to provide a conservative prediction of the concentration in indoor air. Samples VP-7, VP-9, VP9A and VP-10, were deemed unusable for various reasons by DNREC so they were excluded from this analysis. The 2008 investigation did not exclude these samples, which contained maximum concentrations for several chemicals (e.g., acrolein, benzene and ethylbenzene). This caused the Site's calculated vapor intrusion risks to decrease in this analysis, as compared to the 2008 investigation.

The predicted indoor air concentrations were then compared to the EPA's November 2012 RSLs for air for both residential and commercial exposures (see Table E-1). The comparison identified the most stringent of the carcinogenic-based RSL (denoted by a "c") and the noncancer-based RSL (denoted by an "n"). The contaminants that exceeded the RSL are COPCs. As shown in Table E-1, 16 chemicals were identified as COPCs based on residential exposure; 12 of the 16 chemicals were also identified based on industrial exposure.

[8] The attenuation factor of 0.3 is the 95th percentile value estimated from an extensive database of soil-gas-to-indoor-air attenuation factors compiled by the EPA (EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings. Office of Solid Waste and Emergency Response. EPA 530-R-10-002 March 16, 2012).

Table E-1: Vapor Intrusion COPCs

Chemical	MW	Measured Soil Vapor Concentration[a]		Modeled Indoor Air	Indoor Air RSL ($\mu g/m^3$)				Exceedance of RSL	
		ppbv	($\mu g/m^3$)[b]	($\mu g/m^3$)	Residential		Commercial		Residential	Commerical
Acetone	58.08	70	166.2	49.86	32000	n	140000	n	N	N
Acrolein	56.05	2.7	6.2	1.86	0.021	n	0.088	n	Y	Y
Benzene	78.1	14	44.7	13.41	0.31	c	1.6	c	Y	Y
Bromodichloromethane	163.83	0.21	1.4	0.42	0.066	c	0.33	c	Y	Y
Butanone, 2-	72.11	340	1002.3	300.70	5200	n	22000	n	N	N
Butyl alcohol, tert-[c]	74.12	4.8	14.5	4.36	31000	n	130000	n	N	N
Carbon Disulfide	76.13	12	37.3	11.20	730	n	3100	n	N	N
Chloroethane	64.52	0.54	1.4	0.43	10000	n	44000	n	N	N
Chloroform	119.38	0.47	2.3	0.69	0.11	c	0.53	c	Y	Y
Chloromethane	50.49	14	28.9	8.67	94	n	390	n	N	N
Chloropropene, 3-	76.53	0.27	0.8	0.25	ND		ND		N	N
cis-Dichloroethene, 1,2-	96.94	35	138.7	41.61	ND		ND		N	N
Cumene	120.2	0.42	2.1	0.62	420	n	1800	n	N	N
Dichlorobenzene, 1,2-	147	0.44	2.6	0.79	210	n	880	n	N	N
Dichlorobenzene, 1,3-	147	0.73	4.4	1.32	ND		ND		N	N
Dichlorobenzene, 1,4-	147	0.73	4.4	1.32	0.22	c	1.1	c	Y	Y
Dichlorodifluoromethane	120.91	0.57	2.8	0.85	100	n	440	n	N	N
Dichloroethane, 1,1-	98.96	0.57	2.3	0.69	1.5	c	7.7	c	N	N
Dichloroethane, 1,2-	98.26	0.24	1.0	0.29	0.094	c	0.47	c	Y	N
Ethyl acetate	88.11	2.1	7.6	2.27	ND		ND		N	N
Ethylbenzene	106.17	13	56.4	16.93	0.97	c	4.9	c	Y	Y
Ethyltoluene, 4-	120.19	3.6	17.7	5.31	ND		ND		N	N
Heptane	100.2	5.4	22.1	6.64	ND		ND		N	N
Hexachloroethane	236.74	0.77	7.5	2.24	0.22	c	1.1	c	Y	Y
Hexane	86.18	19	66.9	20.08	730	n	3100	n	N	N
Hexanone, 2-	100.16	7.2	29.5	8.84	31	n	130	n	N	N
Hexchlorobutadiene	260.76	4.7	50.1	15.03	0.11	c	0.56	c	Y	Y
Isooctane	114.22	0.98	4.6	1.37	ND		ND		N	N
Methyl acrylate	86.09	0.55	1.9	0.58	21	n	88	n	N	N
Methyl methacrylate	100.12	0.39	1.6	0.48	730	n	3100	n	N	N
Methylene chloride	84.93	4.2	14.6	4.37	96	c	1200	c	N	N
Methyl-tert-butylether	88.15	5.9	21.3	6.38	9.4	c	47	c	N	N
Octane	114.23	12	56.0	16.81	ND		ND		N	N
Pentane	72.15	25	73.7	22.12	1000	n	4400	n	N	N
Styrene	104.15	0.71	3.0	0.91	1000	n	4400	n	N	N
Tetrachloroethane, 1,1,2,2-	167.85	0.28	1.9	0.58	0.042	c	0.21	c	Y	Y
Tetrachloroethene	165.83	5.3	35.9	10.78	9.4	c	47	c	Y	N
Toluene	92.14	49	184.6	55.37	5200	n	22000	n	N	N
trans-Dichloroethene, 1,2-	96.94	2.6	10.3	3.09	63	n	260	n	N	N
Trichlorobenzene, 1,2,4-	181.45	6.7	49.7	14.91	2.1	n	8.8	n	Y	Y
Trichloroethane, 1,1,1-	133.41	10	54.5	16.36	5200	n	22000	n	N	N
Trichloroethane, 1,1,2-	133.41	0.53	2.9	0.87	0.15	c	0.77	c	Y	Y
Trichloroethene	131.39	71	381.4	114.42	0.43	c	3	c	Y	Y
Trichlorofluoromethane	137.37	0.31	1.7	0.52	730	n	3100	n	N	N
Trimethylbenzene, 1,2,4-	120.2	5.3	26.0	7.81	7.3	n	31	n	Y	N
Trimethylbenzene, 1,3,5-	120.2	1.5	7.4	2.21	ND		ND		N	N
Vinyl chloride	62.5	0.65	1.7	0.50	0.16	c	2.8	c	Y	N
Xylene, m/p-	106.17	28	121.5	36.46	100	n	440	n	N	N
Xylene, o-	106.17	16	69.4	20.83	100	n	440	n	N	N

Notes:

ppbv - part per billion by volume n = noncancer-based c = cancer-based

a. Concentration ($\mu g/m^3$) = Concentration (PPBv) * Molecular weight/molar volume at 25°C and standard pressure.
Molecular weight (MW) is chemical-specific, molar volume = 24.46 at 25°C.

b. Maximum of soil gas concentrations detected in Table 3 excluding samples which did not meet data quality objectives (VP-7, VP-9, VP-10, VP9A).

c. Based on sec-isomer.

All 16 COPCs were further evaluated using the soil gas JEM screening model. The JEM model provides a conservative, but more realistic, indoor air concentration. The following assumptions were used:

- Slab-on-grade construction.
- Building dimensions and air exchange rate are default residential assumptions.
- Depth of soil gas samples of 152.4 centimeters because soil gas samples were collected at five feet below land surface.
- Soil type is sand (most conservative), using model defaults for soil properties.
- Average vapor flow rate in building using model recommendation of five liters per minute.

The JEM-derived indoor air concentrations are summarized in Table E-2. To provide screening-level cumulative risk and hazard index estimates, the RSLs for both cancer and noncancer were used if available. As shown in Table E-2, the cumulative residential risk is less than 1×10^{-5} and the hazard index is 1.0, while the cumulative industrial risk is below 1×10^{-6} and the hazard index is below 1.0.

Table E-2: Vapor Intrusion Screening

COPC	MW	Measured Soil Vapor Concentration		Modeled Indoor Air (JEM)	Indoor Air RSL ($\mu g/m^3$)				Residental		Industrial	
					Residential		Industrial					
		ppbv	($\mu g/m^3$)	($\mu g/m^3$)	Risk-Based	HI-Based	Risk-Based	HI-Based	Risk	HI	Risk	HI
Acrolein	56.05	2.7	6.2	1.8E-02	--	0.021	--	0.088	--	8.7E-01	--	2.1E-01
Benzene	78.1	14	44.7	1.2E-01	0.31	31	1.6	130	3.9E-07	3.9E-03	7.6E-08	9.4E-04
Bromodichloromethane	163.83	0.21	1.4	2.0E-03	0.066	--	0.33	--	3.1E-08	--	6.2E-09	--
Chloroform	119.38	0.47	2.3	6.7E-03	0.11	100	0.53	430	6.1E-08	6.7E-05	1.3E-08	1.6E-05
Dichlorobenzene, 1,4-	147	0.73	4.4	1.1E-03	0.22	830	1.1	3500	4.9E-09	1.3E-06	9.7E-10	3.1E-07
Dichloroethane, 1,2-	98.26	0.24	1.0	2.9E-03	0.094	7.3	0.47	31	3.1E-08	4.0E-04	6.2E-09	9.5E-05
Ethylbenzene	106.17	13	56.4	1.4E-01	0.97	1000	4.9	4400	1.5E-07	1.4E-04	2.9E-08	3.3E-05
Hexachloroethane	236.74	0.77	7.5	1.3E-03	0.22	31	1.1	130	5.7E-09	4.1E-05	1.1E-09	9.7E-06
Hexchlorobutadiene	260.76	4.7	50.1	1.1E-01	0.11	--	0.56	--	9.9E-07	--	1.9E-07	--
Tetrachloroethane, 1,1,2,2-	167.85	0.28	1.9	4.7E-03	0.042	--	0.21	--	1.1E-07	--	2.2E-08	--
Tetrachloroethene	165.83	5.3	35.9	8.9E-02	9.4	42	47	180	9.5E-09	2.1E-03	1.9E-09	4.9E-04
Trichlorobenzene, 1,2,4-	181.45	6.7	49.7	7.3E-02	--	2.1	--	8.8	--	3.5E-02	--	8.3E-03
Trichloroethane, 1,1,2-	133.41	0.53	2.9	7.5E-03	0.15	0.21	0.77	0.88	5.0E-08	3.6E-02	9.7E-09	8.5E-03
Trichloroethene	131.39	71	381.4	9.9E-01	0.43	2.1	3	8.8	2.3E-06	4.7E-01	3.3E-07	1.1E-01
Trimethylbenzene, 1,2,4-	120.2	5.3	26.0	5.9E-02	--	7.3	--	31	--	8.1E-03	--	1.9E-03
Vinyl chloride	62.5	0.65	1.7	5.0E-03	0.16	100	2.8	440	3.1E-08	5.0E-05	1.8E-09	1.1E-05
									4.E-06	1.E+00	7.E-07	3.E-01

Notes:

ppbv - part per billion by volume $\mu g/m^3$ = micrograms per cubic meter

Concentration in $\mu g/m^3$ = Concentration (ppbv) * Molecular weight/molar volume at 25°C and standard pressure.

MW is chemical-specific, molar volume = 24.46 at 25°C.

Cancer risks were calculated using the following equation, based on the fact that RSLs are derived based on 10^{-6} risk:

Cancer risk = (Predicted Indoor Air Concentration ÷ Cancer-based Air RSL) × 10^{-6}

Non-cancer hazard indexes (HIs) were calculated using the following equation based on the fact that RSLs are derived based on a HI of 1.0:

HI = (Predicted Indoor Air concentrations ÷ Non-cancer Air RSL)

Predicted Indoor Air Concentration using the EPA's SG-SCREEN-Feb04.xls and default assumptions.

Appendix F: Toxicity Review

	Carcinogenic toxicity changes						Non-carcinogenic toxicity changes					
	Oral Cancer Slope Factor			Inhalation Unit Risk (IUR)			Oral Reference Dose (RfD)			Inhalation Reference Concentration (RfC)		
Contaminant	1991 RI Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	2013 Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Change in Oral CSF	1991 RI Inhalation Unit Risk Value $(\mu g/m^3)^{-1}$	2013 Inhalation Unit Risk Value $(\mu g/m^3)^{-1}$	Change in IUR	1991 RI/FS Oral RfD Value (mg/kg-d)	2013 Oral RfD Value (mg/kg-d)	Change in Oral RfD	1991 RI Inhalation RfC Value (mg/m^3)	2013 Inhalation RfC Value (mg/m^3)	Change in Inhalation RfC
Acetone	N/A	N/A	no change	N/A	N/A	no change	0.1[a]	0.9	less stringent	N/A	31	more stringent
Manganese	N/A	N/A	no change	N/A	N/A	no change	0.14[b]	0.024[c]	more stringent	N/A	5.0E-05	more stringent

Notes:

N/A = toxicity value not available for this substance.

(a) November 1991 *Remedial Investigation Report*, Table 5-7.

(b) November 1991 *Groundwater Feasibility Study*, page 2-14.

(c) The IRIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet. The author of the IRIS assessment for manganese recommended that the dietary contribution from the normal U.S. diet (an upper limit of 5 mg/day) be subtracted when evaluating non-food (e.g., drinking water or soil) exposures to manganese, leading to a RfD of 0.071 mg/kg-day for non-food items. The explanatory text in IRIS further recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties that are discussed in the IRIS file for manganese, leading to a RfD of 0.024 mg/kg-day (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm).