

FIVE-YEAR REVIEW REPORT FOR  
UNION CHEMICAL COMPANY SUPERFUND SITE  
KNOX COUNTY, MAINE

Superfund Records Center

SITE: Union Chem

BREAK: 8.3

OTHER: 522178



Prepared by

U.S. Environmental Protection Agency  
Region 1  
Boston, Massachusetts



SDMS DocID 522178

Nancy Benmakian for  
James T. Owens, III Office Director

09/27/12  
Date

THIS PAGE INTENTIONALLY LEFT BLANK

## TABLE OF CONTENTS

SECTION	PAGE NUMBER
Executive Summary	
1. Introduction	1
2. Site Chronology	2
3. Background	4
3.1 Physical Characteristics	4
3.2 Land and Resource Use	5
3.3 History of Contamination	6
3.4 Initial Response	6
3.5 Basis for Taking Action	6
4. Remedial Actions	8
4.1 Remedy Selection	8
4.2 Remedy Implementation	11
4.3 Institutional Controls	13
4.4 System Operations/O&M	14
5. Progress Since Last Five-Year Review	15
6. Five-Year Review Process	17
6.1 Administrative Components	17
6.2 Community Involvement	17
6.3 Document Review	17
6.4 Data Review	17
6.5 Site Inspection	21
6.6 Interviews	22
7. Technical Assessment	23
7.1 Question A: Is the remedy functioning as intended by the decision documents?	23
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?	24
7.3 Question C: Has any other information come to light that could call into Question the protectiveness of the remedy?	29
7.4 Technical Assessment Summary	29
8. Issues	31
9. Recommendations and Follow-Up Actions	32
10. Protectiveness Statement	33
11. Next Review	34
12. Document Review List and References	35

## LIST OF TABLES

Table 2-1: Chronology of Site Events	2
Table 4-1: Soil Cleanup Levels	9

Table 4-2: Groundwater Cleanup Levels	10
Table 6-1: Groundwater Data, Overburden	19
Table 6-2: Groundwater Data, Bedrock	20
Table 7-1: ROD Groundwater Cleanup Goals and Maine MEGs	26

## LIST OF FIGURES

Figure 1:	Site Locus Map
Figure 3:	Former UCC Plan
Figure 2:	Site Plan
Town of Hope:	Tax Map 4
Town of Hope:	Tax Map 8
Figure 4-1:	Well Advisory Zone – 1992
Figure 4-2:	Well Advisory Zone - 2001

## APPENDIX

### APPENDIX A: Site Inspection Checklist and Photographs

## LIST OF ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cis-1,2-DCE	cis-1,2-dichloroethene
COCs	Contaminants of Concern
CSF	Cancer Slope Factor
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCE	1,2-dichloroethene
DMF	N,N-dimethylformamide
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
HCCE	Hope Committee for a Clean Environment
MCL	Maximum Contaminant Level
MEDEP	Maine Department of Environmental Protection
MEGs	Maximum Exposure Guidelines
MRSA	Maine Revised Statutes Annotated
NPL	National Priorities List
O&M	Operations and Maintenance
PCE	tetrachloroethene
ppb	parts per billion
ppm	parts per million
PRPs	Potentially Responsible Parties
RAGs	Remedial Action Guidelines
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RfDs	USEPA Risk Reference Doses
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROW	Right-of-Way
Site	Union Chemical Company Superfund Site
SVE/MOM	Soil Vapor Extraction/Management of Migration
SWQC	(Maine) Surface Water Quality Criteria
TBC	To Be Considered
1,1,1-TCA	trichloroethane
TCE	trichloroethene
UCC	Union Chemical Company
VOC	volatile organic compound

## EXECUTIVE SUMMARY

This is the third five-year review of the Union Chemical Company Superfund Site (Site) in Hope, Maine. The review is required when hazardous substances are left onsite resulting in restricted use of a site. The purpose of the five-year review is to assess whether the remedy selected for the Site remains protective of human health and the environment. The trigger for this five-year review was the completion of the second five-year review in September 2007.

The December 27, 1990 Record of Decision (ROD) for the Site specified a multi-component remedy to address contaminated on-site soils, groundwater, the facility's buildings and aboveground structures, and to further evaluate potential off-site soil contamination. The risk assessment concluded that the current and future risks were through exposure to on-site groundwater as a drinking water supply. The remedy selected in the ROD included demolition and off-site disposal of the buildings and structures, excavation and low thermal aeration of the contaminated on-site soil, further investigation of off-site soil, and extraction and treatment of groundwater. This remedy was subsequently modified three times to accelerate the cleanup of the Site. In 1994 EPA signed an Explanation of Significant Differences to change the on-site soil remedy to soil vapor extraction (SVE) with hot air injection. In 1996 EPA signed a second ESD that determined that there was sufficient meteorological data to assess the potential off-site aerial transport of contaminants from the facility's operations. In 2001 EPA signed the third ESD that documented the supplemental use of *in-situ* technologies for groundwater restoration.

The 2007 Five-Year Review concluded the remedy was protective of human health and the environment because there was no evidence of exposure at that time. In the short-term, the threat associated with the contaminated groundwater moving beyond the Union Chemical Company (UCC) property had been mitigated through a combination of standard and innovative technologies. In addition, Maine Department of Environmental Protection (MEDEP) is the court-appointed receiver of the property and, as such, use of the property is controlled by MEDEP. However, in order for the remedy to be protective in the long-term, the 2007 Five-Year Review stated the following actions need to be taken: reevaluation of the Remedial Action Objective for restoration of groundwater; and implementation of institutional controls.

During this review period a reevaluation of the restoration of the groundwater objective has occurred and MEDEP has prepared environmental covenants for the property. There have been no changes on the Site or in the land use in the area surrounding the Site that has altered the nature and extent of the contamination.

The assessment of this five-year review found that the Site remedy is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled by the Site being held in receivership by MEDEP.

### Five-Year Review Summary Form

#### SITE IDENTIFICATION

**Site Name:** Union Chemical Company Superfund Site

**EPA ID:** MED042143883

**Region:** 1

**State:** ME

**City/County:** Hope/Knox County

#### SITE STATUS

**NPL Status:** Final

**Multiple OUs?**

No

**Has the site achieved construction completion?**

Yes

#### REVIEW STATUS

**Lead agency:** EPA

If "Other Federal Agency" was selected above, enter **Agency name:** [Click here to enter text.](#)

**Author name (Federal or State Project Manager):** Terrence Connelly

**Author affiliation:** Region 1

**Review period:** January 24, 2012 – September 28, 2012

**Date of site inspection:** August 23, 2012

**Type of review:** Statutory

**Review number:** 3

**Triggering action date:** September 28, 2007

**Due date (five years after triggering action date):** September 28, 2012

**Five-Year Review Summary Form (continued)**

**Issues/Recommendations**

**Issues and Recommendations Identified in the Five-Year Review:**

<b>OU(s): 1</b>	<b>Issue Category: Remedy Performance</b>			
	<b>Issue:</b> Groundwater RAO has not been attained			
	<b>Recommendation:</b> Reevaluate the Management of Migration remedy			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	EPA	EPA	09/30/2013

**Issues and Recommendations Identified in the Five-Year Review:**

<b>OU(s): 1</b>	<b>Issue Category: Institutional Controls</b>			
	<b>Issue:</b> Ownership of the property is temporarily held by MEDEP			
	<b>Recommendation:</b> Assist MEDEP and Town of Hope in the process of releasing UCC property from court-appointed receivership			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	State	EPA	09/30/2014

**Issues and Recommendations Identified in the Five-Year Review:**

<b>OU(s): 1</b>	<b>Issue Category: Institutional Controls</b>			
	<b>Issue:</b> Institutional controls on the Site have not been established			
	<b>Recommendation:</b> Work with MEDEP and Town of Hope to place long-term restrictions on UCC property			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Implementing Party</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	State	EPA	09/30/2014

## Protectiveness Statement(s)

*Operable Unit:*  
Site-wide

*Protectiveness Determination:*  
Protective

*Addendum Due Date  
(if applicable):*  
[Click here to enter date.](#)

*Protectiveness Statement:*

The remedy at the Site currently protects human health and the environment because MEDEP is the court-appointed receiver of the property and, as such, use of the property is controlled by MEDEP and there is no evidence that there is current exposure. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: modification of the groundwater RAO, resolution of property ownership, and implementation of institutional controls.

## 1.0 INTRODUCTION

This is the third five-year review for the Union Chemical Company Superfund Site (Site) in Hope, Maine. The purpose of this five-year review is to determine if the remedy selected for the Site is protective of human health and the environment. This report summarizes the five-year review process, investigations and remedial actions undertaken at the Site; evaluates the monitoring data collected; reviews the Applicable or Relevant and Appropriate Requirements (ARARs) specified in the Record of Decision (ROD) for changes; discusses any issues identified during the review; and presents recommendations to address these issues.

The United States Environmental Protection Agency, Region 1 (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan. CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [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 regulations promulgated to implement these requirements state:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action. 40 CFR § 300.430(f)(4)(ii)

This statutory five-year review is required as hazardous substances remain at the Site above levels that allow for unlimited use and unrestricted exposure. The trigger for the initial statutory review was initiation of the remedial action following remedial design.

EPA conducted this five-year review of the remedial action implemented at the Site. Work on this review was undertaken in August and September 2012. The review was completed in accordance with USEPA Guidance OSWER NO. 9355.7-03B-P.

## 2.0 SITE CHRONOLOGY

TABLE 2-1 CHRONOLOGY OF SITE EVENTS

DATE	EVENT
1967	The Union Chemical Company (UCC) began paint stripping and solvent manufacturing operations
November 1979	MEDEP discovered groundwater contamination beneath the UCC property and in Quiggle Brook
1981	UCC conducted soil and groundwater contamination studies
June 1984	MEDEP closed the hazardous waste treatment operations
November 1984	MEDEP and EPA completed the removal of over 2,000 55-gallon drums and the contents of 28 liquid storage tanks
1986	UCC evicted from the property by state court order; MEDEP appointed as receiver of the property
Fall 1987	Under two Administrative Orders by Consent, Potentially Responsible Parties (PRPs) agrees to reimburse EPA and MEDEP for response costs and perform an RI/FS. Removal of all storage tanks was completed
August 7, 1989	Additional PRPs sign Consent Decree, reimbursing EPA for past response costs
October 4, 1989	Final listing of the Site on the NPL
1990	PRPs complete the RI/FS
December 27, 1990	EPA signs ROD
April 1993	PRPs complete a focused feasibility study demonstrating soil vapor extraction as a viable soil treatment technology
October 23, 1993	EPA approves Facilities Remedial Design
Spring 1994	Settling Parties (a subset of the PRPs) complete the Facilities Remedial Action
1994 – 1996	Settling Parties collect on-site meteorological data to support off-site soils component of ROD
June 24, 1994	EPA issues Explanation of Significant Differences (ESD), changing source control remedy from excavation and low-thermal aeration to in-situ, thermal enhanced soil vapor extraction (SVE)
October 1994 – May 1995	Settling Parties excavate and consolidate soil from four outlying areas into central location and construct soil cap over SVE area
April 5, 1995	EPA approves SVE and groundwater Remedial Design
January – June 1996	Start-up period for SVE and groundwater
October 1996	EPA and Settling Parties perform joint off-site soil investigation
April 27, 1997	EPA and MEDEP perform Operational & Functional final inspection for SVE/MOM systems
September 25, 1997	EPA signs ESD documenting change to off-site soil remedy
November 1997	Settling Parties perform permanganate pilot study

December 19, 1997	EPA approves Construction Completion Report for SVE and groundwater systems
Summer 1998	First full-scale permanganate application
Summer – Fall 1999	Second full-scale permanganate application
December 17, 1999	EPA approves <u>Final Closure Action Plan for Soils, Findings, and Summary</u> , completing source control component of remedy
Summer – Fall 2000	Third full-scale permanganate application
2000 - 2001	Decommissioning of SVE system begins
December 2000	Shutdown of groundwater extraction and treatment system
Summer – Fall 2001	First carbon source application, using solutions of sodium lactate and food-grade molasses
September 21, 2001	EPA signs ESD documenting permanganate and carbon source in-situ enhancements of MOM remedy
Summer – Fall 2002	Second carbon source application
September 2002	EPA completes first five-year review
Fall 2003	Settling Parties install new bedrock well in southwestern portion of Site and replacement wells along Quiggle Brook
2004	Agencies and Settling Parties synthesize site data (going back more than twenty years) into Site Conceptual Model
July 2004	Settling Parties perform bromide tracer tests in ODW, the bedrock monitoring well located farthest south on the Site
Summer 2005	Settling Parties complete decommissioning of vapor extraction wells and monitoring wells on upgradient portion of site
June – November 2005	Settling Parties conduct bedrock pump tests, then hydrogen peroxide injections
Dec 2005 – Oct 2006	Settling Parties conduct four post-injection sampling events
Summer 2006	Settling Parties decommission second set of monitoring wells in soil cap area
Winter – Spring 2006	EPA holds two public meetings with MEDEP and meets twice with Town of Hope selectmen to develop possible reuse scenarios
September 2007	EPA completes second five-year review
Fall 2008, 2010, and 2012	Long-term groundwater and surface water sampling events
January 2011	Final Technical Impracticability Evaluation Report submitted
August 2012	EPA conducts Site inspection for third five-year review

### **3.0 BACKGROUND**

#### **3.1 PHYSICAL CHARACTERISTICS**

The Site is located on Route 17 in a rural, residential area of South Hope, Maine (Figure 1). The Site occupies approximately 12.5 acres along the south side of Route 17 and is coincident with the boundary of the UCC property though the extent of contamination is less than the entire property. The majority of UCC's past operations were conducted within a fenced 2.5 acre area. This fenced-in area enclosed most of the plant's former waste handling facilities including the still building, warehouse and concrete pad, the leach field, and the incinerator and associated equipment (Figure 3). These facilities were demolished and removed from the Site in 1993 and 1994.

In 1995 and 1996, soil vapor and groundwater extraction systems and corresponding treatment equipment were installed within the fenced-in area. Since the completion of the soil cleanup in 1999, the Site has been readily accessible with one of two gates along Route 17 unlocked and the back vehicular gate typically left open. The extraction and treatment systems are no longer in operation. All of the exterior piping for the treatment system has been removed from the SVE treatment area and the majority of the contents in the treatment building have been decontaminated and disposed of offsite. Figure 2 shows current conditions, including the treatment building and remaining monitoring well network.

The current topography of the Site reflects changes made during the soil excavation, consolidation, and capping phase to the original surface grades. A high point (elevation 373 ft) was created in the center of the facility's operational area where the SVE treatment area and cap were constructed. The property slopes in a southerly direction to a wetland area (elevation 361 ft) and in a southeasterly direction toward Quiggle Brook (elevation 344 ft).

The Site is bounded on the east and southeast by Quiggle Brook, which is the southerly flowing outlet stream of Fish Pond. A floodplain and wetland area exists along Quiggle Brook at the eastern portion of the Site. Intermittent wetland areas have also been delineated in the northwest corner of the property, immediately south of Route 17.

Previous investigations have indicated that the Site is underlain primarily by unconsolidated drift or glacial till, interspersed with discontinuous lenses of sand. Fractured bedrock was identified at the bedrock/till interface. Groundwater flows through both the overburden and the fractured bedrock. Groundwater in the overburden flows east/southeast through the easterly thickening glacial till soils. Shallow groundwater discharges to Quiggle Brook. Based on the available data, groundwater in bedrock flows primarily in the upper five feet of fractured/weathered bedrock, flowing east/southeast from the northern portion of the Site and southeasterly in the southern portion of the Site. There also appears to be a secondary flow direction to the southwest along bedrock strike. Bedrock yield is highly variable throughout the Site.

### 3.2 LAND AND RESOURCE USE

The 12.5-acre property is mostly wooded, with 2.5-acres of open field where the former operations were located. Surrounding land uses include low-density residential, small business, and forest. A review of the current Town of Hope zoning map indicates that the area around the Site is zoned BT-3, or Business Transition District 3. This land use description allows business and service uses, as well as retail use of buildings smaller than 15,000 square feet, which are "consistent with the residential and rural character of the Town." (Hope Land Use Ordinance, revised June 18, 2007). This zoning is unchanged from the last five-year review.

The Site is in close proximity to several residential dwellings with the nearest located on the north side of Route 17 within 150' of the Site entrance (this residence is located upgradient of the Site and no site-related contaminants were detected in the dug well during the residential well sampling program). A home on the property adjacent to the western boundary was moved off that property between the 2002 and 2007 five-year reviews and the property remains vacant. There are several homes to the west of that property. Quiggle Brook forms the eastern boundary of the Site. The property on the other side of Quiggle Brook is a slightly less than four acre wooded lot that is owned by the Town of Hope. An active business is east of the town property and additional residential properties are located farther to the east and southeast of that business. See Town of Hope tax maps 4 and 8 (UCC property is comprised of lots 18 and 19 on map 8, the nearest residence is lot 44).

There is no public water supply in the area; all properties rely on private water supply wells. The closest water supply wells that are in use are upgradient of the contaminant plumes and therefore, are not at risk of contamination by Site contaminants. The groundwater aquifers below and surrounding the Site are classified by MEDEP as GW-A per Maine Revised Statute Title 38, Chapter 3 (current through December 31, 2011). Such aquifers can be used as a drinking water source. This classification is unchanged from the last five-year review.

Quiggle Brook is classified as a Class B water. Such waters are acceptable for fishing, recreation, habitat for fish and other aquatic life, and after treatment, use as a drinking water supply. Quiggle Brook is also classified as a tributary to a Class GPA water body, Crawford Pond. Class GPA is the sole State of Maine classification of great ponds and natural ponds and lakes less than ten acres in size. Class GPA waters are suitable for: drinking water use after disinfection, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation and navigation and as habitat for fish and other aquatic life (38 MRS.A, § 465-A.1.A.). These classifications are unchanged from the last five-year review.

There are several surface water bodies near the Site. As noted, Quiggle Brook is the outlet stream from Fish Pond. Quiggle Brook flows southwest from Fish Pond for approximately five miles before discharging into Crawford Pond, a drinking water source and recreational area. Alford Lake, northwest of the Site, is an active recreational area with many seasonal dwellings and camps. Alford Lake discharges into Lermond Pond, which discharges into Crawford Pond. Grassy Pond is located east of the Site. Alford Lake, Lermond Pond, and Grassy Pond are all topographically upgradient of the Site. All of these surface water bodies are in the St. George

River watershed. A portion of the Site near Quiggle Brook lies within the 100-year floodplain. There are no known critical habitats on the Site.

### **3.3 HISTORY OF CONTAMINATION**

UCC began operations in 1967, incorporating as a paint stripping and solvent manufacturing business. Initially, patented solvents were manufactured and utilized on the premises, and distributed nationally. The company expanded operations to include the recycling of used stripping compounds and solvents from other businesses. Operations were further expanded in 1982 to include a full-scale, fluidized-bed incinerator to treat waste solvents and other compounds.

Soil and groundwater contamination beneath the Site and surface water contamination in Quiggle Brook were first discovered by MEDEP in late 1979. A study conducted for UCC in 1981 concluded that two contaminated groundwater plumes were present in the area between the UCC facilities and Quiggle Brook. Volatile organic compounds (VOCs), similar to those processed by UCC, were the principal contaminants observed in the groundwater plumes and in the surface water of Quiggle Brook.

### **3.4 INITIAL RESPONSE**

The study completed in 1981 concluded that the source of contamination in the northern plume was a leach field that serviced the facility's offices and still buildings. The contamination in the southern plume was believed to have come from a leaking storage tank in the former drum disposal area south of the plant buildings (see Figure 3). MEDEP closed the hazardous waste treatment operations at the Site in June 1984. At that time approximately 2,000 - 2,500 55-gallon drums and 30 liquid storage tanks were present on the Site and they were removed by EPA and MEDEP by the end of November 1984. In 1986, a state court evicted UCC from the site and appointed MEDEP as the receiver of the property. The Site was formally included on the National Priorities List in October 1989.

### **3.5 BASIS FOR TAKING ACTION**

The PRPs under an EPA Administrative Order by Consent completed a Remedial Investigation/Feasibility Study (RI/FS) and Human Health Risk Assessment in 1990. The risk assessment indicated that the risks associated with exposure to site soils and residue on the surface of the building walls were within EPA's acceptable risk range. However, as there was risk from ingestion of the groundwater, a remedial action objective (RAO) was set for site soils to prevent further unacceptable leaching and migration into the groundwater of contaminants from the soil. RAOs were also set for the facilities and groundwater. The risk assessment indicated that there would be unacceptable carcinogenic and non-carcinogenic risks from future ingestion of the groundwater at the Site due to concentrations of contaminants of concern (COCs). The EPA-preferred cleanup approach was proposed to the public in the summer of 1990 and a ROD was signed in December 1990.

Based on the results of the Human Health Risk Assessment, Applicable or Relevant and Appropriate Requirements (ARARs), and other guidance, target cleanup goals for soil and groundwater were established to protect human health and the environment from the identified risks. The ROD proposed a multi-component remedy for the Site that would meet these target cleanup goals. The ROD set soil clean up levels for 1,1-dichloroethene, trichloroethene, tetrachloroethene, and total xylenes. For groundwater, the ROD set cleanup levels primarily for VOCs and hydrocarbons, including the above, and bis(2-ethylhexyl)phthalate, a semi-volatile. The ROD also stated that sampling would include arsenic and lead, identified as COCs but whose concentrations were within their respective standards, and N,N-dimethylformamide (DMF), a component of a patented product made by the facility, but that was not specifically sampled for during the RI.

The ROD did not set specific clean-up levels for the facility's buildings and above-ground structures. Instead, it stated that best-available treatment would be required prior to off-site disposal to address the COCs identified with the facility: VOCs, dioxin, inorganics, and polyaromatic hydrocarbons, and asbestos. Following the applicable decontamination process, the buildings and structures were to be demolished and disposed of offsite at a permitted demolition landfill or a RCRA hazardous waste facility.

## 4.0 REMEDIAL ACTIONS

This section briefly summarizes the remedial actions selected for and implemented at the Site up to the time of the 2007 Five-Year Review. For more detail on these remedial actions, please see the 2002 and 2007 reviews. Remedial actions taken since the 2007 Five-Year review are discussed in Section 6.

### 4.1 REMEDY SELECTION

The December 27, 1990 ROD for the Site specified a multi-component remedy to address contaminated on-site soils, groundwater, and facilities, and to evaluate further the potential off-site soil contamination. The risk assessment concluded that the current and future risks were through exposure to on-site groundwater as a drinking water supply. Based on the RI, the following RAOs were identified for the Site:

- Prevent further migration of the contaminated on-site groundwater;
- Prevent further leaching of contaminants from Site soil to groundwater; and
- Provide for rapid restoration of the contaminated groundwater throughout the Site.

The remedy selected in the ROD specified:

- decontamination of facilities and demolition, and off-site disposal of debris;
- soil excavation with on-site low-temperature thermal aeration;
- vacuum-enhanced groundwater extraction, on-site treatment, and discharge of treated groundwater to Quiggle Brook/institutional controls; and
- limited action for off-site soils.

EPA established target cleanup levels for soils in the ROD to prevent migration of VOCs from unsaturated soils to site groundwater and thus meet the Remedial Action Objectives. The cleanup standards for soil and groundwater are shown below in Tables 4-1 and 4-2, respectively. The standards were established for carcinogenic as well as non-carcinogenic contaminants. Included in the non-carcinogenic list are contaminants that exhibit both carcinogenic and non-carcinogenic effects.

Because there was some concern that contaminants may have also migrated from the Site via air emissions to off-site soils from when the facility was in operation, the ROD required meteorological data be collected for five years. This data would then be used to determine where to collect off-site soil samples to determine whether the operations of the former site incinerator resulted in deposition of contaminants offsite.

The ROD also required institutional controls for the UCC property, including restricted access and use of the Site during the remedial action and restricted use of groundwater for drinking water purposes. Residential wells in the area of the Site were sampled during the RI. A pump test was conducted during the RI on residential well #20-2 of a bedrock well located on private property directly across Route 17 from the Site (this lot is now #45 on tax map 8 following the

town's change to grid pattern tax maps). The pump test demonstrated that the well was hydraulically connected to the Site and the pump test was able to induce flow of contaminants from the Site to the well. While low levels of site-related VOCs were found in this well during several follow-up sampling events, federal or state drinking water standards were not exceeded in any of the sampling events. Regular sampling of other residential wells surrounding the UCC property were performed from 1992 to 1997 (i.e., sampling began before soil remediation began and continued after hydraulic control was established). With the exception of well #20-2/45, no site-related contaminants were found in any of these residential wells. Monitoring wells were also installed on the town property east of Quiggle Brook and no site-related contaminants were ever detected in these wells. No other evidence was found that site contaminants had migrated beyond the property boundary.

Institutional controls were also discussed in the ROD. Specific controls were not selected, but the ROD identified a number of actions that could be taken including:

- a restriction on the use of groundwater from existing bedrock wells that are hydraulically connected to the Site, specifically well #20-2/[45];
- restrictions on both the installation and use of new bedrock drinking water wells, on properties hydraulically connected to the Site;
- deed restrictions;
- advisory controls (e.g. well advisories); and
- other controls deemed necessary to protect public health.

As part of the voluntary well advisory program, EPA has requested that the owners of the properties within the well advisory zone notify EPA if they drill a bedrock well so sampling could be conducted to ensure that contamination has not migrated beyond the property boundary.

**TABLE 4-1 SOIL CLEANUP LEVELS**

<u>Soil Contaminant</u>	<u>Soil Cleanup Level (ppm)</u>
<u>Carcinogenic Contaminants</u>	
1,1-Dichloroethene (DCE)	0.1
Trichloroethene (TCE)	0.1
Tetrachloroethene (PCE)	0.1
<u>Non-Carcinogenic Contaminants</u>	
1,1-DCE	0.1
PCE	0.1
Total xylenes	100

Source: ROD, 1990, Table B.1

**TABLE 4-2 GROUNDWATER CLEANUP LEVELS**

Type	Contaminant	Cleanup Level (ppb)	
<b>Carcinogenic</b>	Bis-2(ethylhexyl)phthalate (BEHP)	4	
	Carbon tetrachloride	5	
	Chloroform (as THM)	100	
	1,1-Dichloroethane (DCA)	5	
	1,2-DCA	5	
	1,1-DCE	7	
	Methylene chloride	5	
	PCE	5	
	TCE	5	
	Vinyl chloride	2	
	<b>Non-Carcinogenic</b>	BEHP	4
		Carbon tetrachloride	5
Chloroform (as THM)		100	
cis-1,2-DCE		70	
Trans-1,2-DCE		100	
1,1-DCA		5	
1,1-DCE		7	
Ethylbenzene		700	
Methylene chloride		5	
Methyl Ethyl Ketone (MEK)		170	
PCE		5	
Toluene		2,000	
1,1,1-trichloroethane (TCA)		200	
Total xylenes	10,000		

Source: ROD, 1990, Tables A. 1, A.2

In June 1994, following a public comment period, EPA issued an ESD that documented the change in technology for soil cleanup from low-temperature thermal aeration to soil vapor extraction.

EPA issued a second ESD for the Site in September 1997 that modified the remedy for off-site soils. The ESD changed the length of time specified in the ROD for meteorological data collection from five years to three years, thus moving forward the timeframe for collection of off-site soil samples to determine whether the operations of the former Site incinerator resulted in deposition of contaminants off-site.

EPA issued a third ESD in September 2001 that documented a change in the technical approach for treatment of contaminated groundwater and changed the location for discharge of treated groundwater. Innovative treatment technologies were incorporated into the groundwater remedy and these were described in the ESD.

## **4.2 REMEDY IMPLEMENTATION**

### **4.2.1 Decontamination of Facilities, Demolition, and Off-Site Disposal**

As specified in the ROD, the on-site facilities were decontaminated, concrete structures crushed, asbestos in the still building containerized, and all material was shipped offsite for disposal in appropriate facilities. The demolition debris was tested and characterized prior to off-site disposal. The decontamination and demolition activities were completed in May 1994, and the debris was sent offsite.

#### **4.2.2.1 SVE Phase I Activities**

In Fall 1994 – Spring 1995 soil hot spots were consolidated into the area of soil cap and the clay soil cap was constructed.

#### **4.2.2.2 SVE Phase II Activities**

The second phase began in June 1995 and was completed in December 1995. It included installation of groundwater and SVE wells and hot air injection points, construction of the treatment building, installation of the treatment equipment, and associated interior and exterior piping. EPA and MEDEP conducted a final inspection on January 15, 1996. The final inspection confirmed that the punch list items identified during the previous inspection were completed and a six-month start-up period began.

#### **4.2.2.3 Treatment System Startup**

Following the testing of individual components with clean water in December 1995, hot start-up (using water pumped from the extraction wells) was initiated on January 16, 1996. Upon the receipt of laboratory data indicating the discharge standards had been met, the Settling Parties' contractor was allowed to begin discharging treated effluent to Quiggle Brook. Following a number of system modifications, on April 28, 1997, EPA and MEDEP conducted a final

inspection for the modified groundwater treatment system and determined the system was operational and functional.

#### **4.2.2.4 Source Control Activities**

Upon completion of startup activities in October 1996, the SVE system operated continuously until March 1998. Groundwater was pumped from the extraction wells to lower the water table and extend the depth to which the soils could be treated by the SVE system. Based on the results of an interim evaluation, a soil closure sampling program was prepared.

After agency approval in March 1998, operation of the SVE system was discontinued to allow the soils to cool prior to the closure-sampling program. The groundwater extraction system continued to operate during this period. Closure sampling was completed in the fall of 1998. Statistical analysis of the data by three groups working independently indicated that the soils had been cleaned up to below the ROD-specified cleanup levels. Following acceptance of the closure sampling result, unused wells and piping were decommissioned in accordance with the Operations and Maintenance (O&M) Plan.

#### **4.2.3 Management of Migration Activities**

After completion of the source control cleanup in March 1998, the 28-well groundwater extraction network was reduced to three pumping wells at the downgradient edge of the SVE treatment area. Computer modeling indicated these three pumping wells would be sufficient to control groundwater migration while Management of Migration (MOM) cleanup activities continued.

The rate of mass removal of VOCs decreased dramatically between 1996 and 1999 however the concentrations of VOCs in the groundwater did not show a similar decline. To enhance the reduction of contaminant concentrations in the groundwater potassium permanganate was initially injected into the soils and shallow bedrock in October 1997 as a pilot study. Based on the results of this study, potassium and sodium permanganate were used on an expanded basis in the summers of 1998, 1999, and 2000.

Carbon sources in the form of molasses and sodium lactate were added in August and November 2001 to create a reducing environment to enhance degradation of ethane compounds by reductive dechlorination. Lactate addition was carried out again in August 2002.

The extraction system has been deactivated. The effluent discharge line from the treatment building was flushed out, then disconnected below the ground surface and grouted. The external piping from the groundwater extraction wells was removed, and groups of extraction wells were decommissioned in 2005 and 2006.

Post-ROD quarterly groundwater and surface water monitoring began in the summer of 1992. The monitoring frequency was changed to semi-annual (spring/fall) in 1998. Surface water and groundwater samples are analyzed for VOCs and DMF. The monitoring well network includes wells in the source area, in areas with the highest groundwater concentrations, and perimeter

wells, near the downgradient boundaries of previously detectable concentrations. The monitoring leading up to the 2007 Five-Year Review did not show any concentration increases in the perimeter wells, indicating that the plume had not expanded since the extraction system was deactivated.

An additional potential future exposure pathway was identified during the previous five-year review. In November 2002, EPA issued draft guidance on the vapor intrusion pathway. Following up on this guidance, in May 2006 the Settling Parties' consultant collected and EPA's mobile laboratory analyzed shallow groundwater samples. While the Settling Parties' contractor concluded, after modeling the data using the Johnson and Ettinger computer model presented in the 2002 guidance, that soil gas sampling was not warranted, MEDEP disagreed because of the uncertainties in the model. It was the opinion of MEDEP that a "more reliable approach is to require placement of subslab ventilation in any future site development and to avoid disturbing the clay cap placed at the site." At the time of this study, the only building on the UCC property was the treatment building and as noted above, the SVE and groundwater extraction systems have been deactivated. In light of the concerns raised by MEDEP, EPA concurred that restrictions should be placed on the property to require any building constructed to have a vapor barrier system incorporated into the construction. However, because the groundwater data indicated that the concentrations at the leading edge of the plume were stable, EPA did not believe that the plume was moving beyond the property boundary and thus considered it unlikely that vapor intrusion would be an exposure pathway in off-site locations.

#### **4.2.4 Limited Action for Off-Site Soils**

In 1996, after collection of three of the five years of meteorological data specified in the ROD, EPA agreed that three years of data would be representative of local conditions. From this data, the possible areas where deposition in soil from air emissions may have occurred could be identified. Working with EPA, MEDEP, and with input from the local community, off-site sampling locations were selected. Soil samples were collected in July and September 1996. Review of these data in October 1996 resulted in agreement by all parties that the data did not show measurable off-site deposition in off-site soil from the Site incinerator. In 1997, as discussed in the 1997 ESD, off-site soil activities were completed.

#### **4.3 Institutional Controls**

As discussed previously, institutional controls were required by the ROD. A number of possible controls were identified for possible use but no specific controls were selected. Since that time, an easement that runs with the land prohibiting the use of residential well #20-2/45 has been put in place.

In addition, since there is no public water system serving the area around the Site (or the Town itself) a well advisory zone was established in 1992 (Figure 4-1). In accordance with procedures approved by EPA, all 54 property owners within the zone were contacted and requested to notify EPA, MEDEP, or the Settling Parties' Project Coordinator prior to installing any new bedrock wells. If notification is received from a property owner that he or she wants to install a bedrock

well, the bedrock well may be sampled and tested by the Settling Parties to enable the agencies to evaluate if use of the well could affect movement of groundwater at the Site.

The well advisory zone was most recently adjusted in May 2001 (Figure 4-2). EPA made this adjustment following discussions with MEDEP and Hope Committee for a Clean Environment. This adjustment was based on the successful remediation of the onsite soils, the continued progress in remediating the groundwater, and the absence of Site compounds in any of the residential wells from 1992 to 1997. The properties that remain within the advisory zone are on Town of Hope, Maine Tax Maps 4 and 8, and are in close proximity to the Site. In May 2001, EPA notified the owners of the 14 properties remaining in the well advisory zone of the request for notification. EPA also sent letters to the other 40 (of the original 54) property owners that their properties were no longer within the well advisory zone.

In April 2003, follow-up letters were sent to the 14 property owners reminding them of the request that the agencies or Settling Parties be notified prior to the installation of any new bedrock well.

#### **4.4 SYSTEM OPERATIONS/O&M**

The groundwater treatment system was decommissioned during the last review period and the SVE system in the review period before that. The only ongoing system monitoring is the annual cutting of volunteer saplings that have rooted on the soil cap.

## 5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year review for the Site. The second five-year review, completed by EPA in September 2007, assessed the Site and drew the following conclusions:

- The remedy currently protects human health and the environment because there is no evidence that there is current exposure. The facilities component was completed in 1994, the off-site soil component in 1997, and the on-site soils (source control) in 1999.
- In the short-term, the threat associated with the contaminated groundwater moving beyond the Union Chemical Company property has been mitigated through a combination of standard and innovative technologies.
- In addition, MEDEP is the court-appointed receiver of the property and, as such, use of the property is controlled by MEDEP.
- However, in order for the remedy to be protective in the long-term, the following actions need to be taken: reevaluation of the Remedial Action Objective for restoration of groundwater; and implementation of institutional controls.

In addition, the 2007 FYR made the following recommendations:

- Reevaluate the MOM remedy relative to the ROD-specified RAO of attainment of groundwater performance standards
- Provide assistance to the State Attorney General's office if requested regarding ownership of the property
- Assess institutional controls such as placing long-term restrictions on the property and reevaluating the well advisory zone
- Secure all wells both inside and outside fence for site security.

The following describes the progress made in addressing these recommendations following the 2007 Five-Year Review:

*- Reevaluate the MOM remedy relative to the ROD-specified RAO of attainment of groundwater performance standards*

The data after the multiple applications of *in-situ* injections, both oxidizing and reductive, indicated that restoration of the groundwater was not going to occur within the timeframe originally projected in the 1990 ROD. Consequently, EPA, MEDEP, and the Settling Parties reassessed the Conceptual Site Model to incorporate the post-2007 Five-Year Review data. Following this, the Settling Parties performed a Technical Impracticability evaluation. This was approved with conditions by EPA in December 2010 and resubmitted in January 2011. This evaluation included a feasibility study of other remedial approaches that could maintain the protectiveness while changing the RAO for attainment of groundwater performance standards.

If EPA determines that a Technical Impracticability waiver is appropriate, an amendment to the ROD will be prepared for public comment.

*- Provide assistance to the State Attorney General's office if requested regarding ownership of the property*

To date, the attention of MEDEP and ME AG office has been on establishing institutional controls on the Site. Upon resolution of the institutional control issues and an expression of commitment from the Town of Hope on acquiring the property, then MEDEP and AG office will work with Maine Superior Court to release the property out of receivership. As part of the release of the property from receivership environmental covenants will be recorded with the property deed that will include prohibitions on groundwater use and require actions taken to prevent vapor intrusion onto any building constructed on the UCC property.

*- Assess institutional controls such as placing long-term restrictions on the property and reevaluating the well advisory zone*

In early 2012, MEDEP provided EPA with a draft Declaration of Environmental Covenants. Following discussions with EPA, in March 2012 MEDEP forwarded the draft document to the Town of Hope. It is the understanding of both MEDEP and EPA that there is not a consensus within the Town regarding the future of the Site. The Town of Hope Administrator indicated that the process to bring it up for a town vote at next spring's town meeting (June 2013) could begin November 2012.

The well advisory was last revised in 2001. As noted in Section 3.4 above, there have been few changes in land use in the area surrounding the Site, and none on properties adjacent to the Site. During the site inspection/interview visit in August 2012, the Town of Hope provided EPA with an updated list of property owners in the applicable area.

*- Secure all wells both inside and outside fence for site security*

Following issuance of the 2007 Five-Year review, the Settling Parties' Coordinator and Consultant secured all wells with shrink-wrap fabric. This eliminated the need for locks (which can be cut/shot) and their periodic maintenance. The shrink-wrap provides weatherproofing for the well, and should it be tampered with, then that would be visible (whereas tampering with an unlocked well may not be). There were no indications of tampering observed in any of the subsequent sampling events (2007, 2008, 2010, and 2012). The shrink-wrap has been replaced following each sampling event.

## **6.0 FIVE-YEAR REVIEW PROCESS**

### **6.1 ADMINISTRATIVE COMPONENTS**

EPA, the lead agency for this five-year review, notified MEDEP and Settling Parties' Project Coordinator at the beginning of 2012 that the five-year review would take place during the spring and summer of 2012. Rebecca Hewett of MEDEP was part of the review team.

The schedule established by EPA included completion of the review by September 2012.

### **6.2 COMMUNITY INVOLVEMENT**

There is an established community group, Hope Committee for a Clean Environment, HCCE, which did receive support through an EPA technical assistance grant issued in 1990. While active remediation of the soils and groundwater were underway, this group met regularly with EPA, MEDEP, and the Settling Parties' Project Coordinator. These meetings ceased during this review period and now communication between the group and the agencies is primarily through email. Beyond the involvement of two active members of HCCE, and periodic meetings with the owners of the property across Route 17 from the Site, there has been little participation or involvement from the local community.

During a visit to the Hope Town Offices on August 24, 2012, EPA's project manager briefly described the five-year review process to the Town Administrator. All site-related documents are available at the town offices. The town clerk stated there has been little interest in the site documents, other than a neighbor of the Site who has looked periodically at the documents. EPA's project manager inquired as to whether there was interest in receiving the Administrative Record in electronic format and this was well received by town staff.

### **6.3 DOCUMENT REVIEW**

This five-year review included a review of relevant documents: decision documents, work plans, various monitoring reports, and reports for specific review (such as Conceptual Site Model and Technical Impracticability Evaluation). These documents are listed in Section 12.

### **6.4 DATA REVIEW**

A review was completed of various Settling Parties' consultant plans and monitoring reports. A summary of relevant data regarding the components of the Site remedy is presented below.

#### **6.4.1 Management of Migration**

A surface water and groundwater monitoring program has been performed since summer 1992 to monitor the COCs at the Site, assess the progress of the MOM remedial action and evaluate the surface water and groundwater for potential impacts during the remedial activities. The program was performed initially on a quarterly basis from summer 1992 through fall 1997 (22 sampling events), then semi-annually through fall 2004 (13 sampling events). The monitoring plan was modified in 2005 while pumping tests of the bedrock groundwater were being conducted and

then resumed in the fall 2006. Beginning in 2008, monitoring was reduced to every two years. Thus for this review period, monitoring occurred in the fall in 2007, 2008, 2010, and 2012. Data from the August 2012 monitoring event were not available for this review. Groundwater and surface water samples have been analyzed for the 23 site-specific VOCs and DMF.

Table 6.1 presents the overburden water quality data from the beginning and ending of the prior review period (Fall 2002 and Fall 2006 after the hydrogen peroxide injection) and then the data for this review period. Following the pump and treat remedy and the permanganate injections there was significant reduction in contaminant levels from pre-ROD concentrations to the 2002 data. Concentrations of TCE, 1,1,1-TCA, 1,2-cis DCE, and 1,1-DCA reflect this decrease: 84,000 to about 1300 ppb; 73,000 to non-detect, 19,000 to 2,000, and 12,000 to about 2,800 respectively. Subsequent use of carbon sources and then hydrogen peroxide did not produce similar decreases.

Since the termination of active remedial efforts, with the exception of cis-1,2-DCE and trans-1,2-DCE that appears to be fluctuating and MEK that is going up, the data indicates a gradual decrease in the overburden<sup>1</sup>. The gradual decrease is consistent with the advective transport rates, sorptive properties of the overburden soils, and the decay rates calculated in the development of the Conceptual Site Model and Technical Impracticability Evaluation. From that evaluation the projected timeframes to reach the performance standards in the overburden soils range from 13 to 107 years.

Table 6.2 presents the bedrock data covering the same time frames and similar to the overburden data, 1,1-DCA is the most elevated and widespread contaminant in the bedrock. The one hot spot for ethylbenzene increased during this review period and vinyl chloride appears to be fluctuating. Overall, the gradual decrease in concentrations in the bedrock is consistent with the low permeability of the bedrock, the low advective transport rate, and the decay rates calculated. From that evaluation the projected timeframes to reach the performance standards in the bedrock was estimated to be 345 years.

Concentrations of 1,1-DCA remain above the performance standard at the farthest southeasterly and southwesterly downgradient locations, fluctuating between 5 and 15 ppb during this review period (MEG is 5 ppb, no MCL has been set). These wells are located approximately 350 and 200 feet respectively from the property boundary. Maximum concentrations of 50-60 ppb were measured in the southeasterly well in the mid-1990s; the southwesterly wells were installed in 2004 as a follow-up to the original Conceptual Site Model and the concentrations have remained below 15 ppb. Given the low transmissivity of the bedrock, EPA believes the 1,1-DCA attenuates prior to the property boundary. The closest water wells are approximately 1200' farther downgradient and on the opposite side of Quiggle Brook. No other contaminants were detected above their respective performance standard in these downgradient wells during this review period.

---

<sup>1</sup> It is important to note that the wells sampled in the long-term monitoring program represent a subset of all the Site wells, some representing the elevated areas and others along the downgradient edge of the plume. Thus one highly elevated result can skew the average upward

**TABLE 6-1 GROUNDWATER DATA, OVERBURDEN**

Constituent Performance Standard	Q32 (Fall 2002)*	Q37 (Fall 2006)	Q39 (Fall 2008)	Q40 (Fall 2010)
	Max/Avg	Max/Avg	Max/Avg	Max/Avg
	Exceedances	Exceedances	Exceedances	Exceedances
(all concentrations in parts per billion)				
1,1,1,-TCA 200	20U/13U 0/4	10U/8U 0/4	1U/1U 0/4	2U/1U 0/4
1,1-DCA 5	2800/1120 4/4	2800/921 4/4	2210/601 3/4	1670/546 4/4
1,1-DCE 7	190/56 3/4	250/66 ¼	114/31 1/4	57/32 1/4
MEK 170	410/267 2/4	1000/285 ¼	1180/373 1/4	1190/550 3/4
Ethylbenzene 700	180/50 0/4	460/127 0/4	178/52 0/4	120/49 0/4
PCE 5	20U/10U 3/4 **	10U/8U 3/4 **	25U/9 1/4	50U/30 1/4 **
TCE 5	1300/355 3/4	570/176 ¾	439/119 3/4	108/45 3/4
Vinyl chloride 2	60/38 3/4	110/42 2/4	103/35 2/4	50U/30 3/4 **
cis-1,2,-DCE 70	2000/820 3/4	1500/583 2/4	2600/646 2/4	1830/467 2/4
Trans-1,2- DCE 100	480/128 1/4	250/66 ¼	920/238 1/4	670/185 1/4
DMF 390	470/245 1/4	1500/425 1/4	556/202 1/4	121/60 0/4

\* Q32 (Fall 2002) was the first monitoring report that separated the bedrock from the overburden data

\*\*Because of the dilution needed to measure 1,1-DCA and cis-1,2,-DCE concentrations, the detection limits for the other compounds were raised and in some cases, the detection limit was raised above their respective performance standard.

**TABLE 6-2 GROUNDWATER DATA, BEDROCK**

Constituent Performance Standard	Q32 (Fall 2002)*	Q37 (Fall 2006)	Q39 (Fall 2008)	Q40 (Fall 2010)
	Max/Avg	Max/Avg	Max/Avg	Max/Avg
	Exceedances	Exceedances	Exceedances	Exceedances
(all concentrations in parts per billion)				
1,1,1,-TCA 200	2U 0/6	20U/5U 0/6	1U/1U 0/6	1U/1U 0/6
1,1-DCA 5	690/207 4 of 6	3000/596 4/6	3630/750 5/6	2970/610 4/6
1,1-DCE 7	230/40 1/6	310/82 2/6	228/70 2/6	138/28 1/6
MEK 170	1900/382 2/6	100U/27 0/6	250U/72 1/6	1000U/220 2/6**
Ethylbenzene 700	20/5 0/6	1900/320 1/6	3120/523 1/6	3060/515 1/6
PCE 5	2U 0/6	20U/5U 1/6**	25U/7 1/6**	100U/22 2/6**
TCE 5	20/5 1/6	66/16 2/6	11/7 2/6	100U/22 2/6**
Vinyl chloride 2	5/3 6/6	220/39 2/6	729/125 2/6	354/64 4/6**
cis-1,2,-DCE 70	78/27 1/6	2100/363 1/6	1380/246 2/6	867/150 1/6
Trans-1,2- DCE 100	2U 0/6	45/9 0/6	26/21 0/6	100U/22 0/6
DMF 390	1400/613 1/3	1200/302 2/6	556/176 1/6	138/39 0/6

\* Q32 (Fall 2002) was the first monitoring report that separated the bedrock from the overburden data

\*\*Because of the dilution needed to measure 1,1-DCA and cis-1,2,-DCE concentrations, the detection limits for the other compounds were raised and in some cases, the detection limit was raised above their respective performance standard.

## Surface Water Data Since the Previous Five-Year Review

The 2007 five-year review assessed the first 37 quarters through Fall 2006. The review noted that there had been sporadic detections of organic and inorganic compounds at the two surface water locations in Quiggle Brook (QB-2 and QB-4), but not in excess of the applicable standards.

Location QB-4 has been sampled three times for VOCs and twice for DMF since Fall 2006. Since that event, there have been no detections of either VOCs or DMF at QB-4.

### **6.5 SITE INSPECTION**

A site inspection was conducted on August 23, 2012, with representatives from EPA, MEDEP, PRPs, and HCCE. The inspection included a site walkover, inspection of monitoring wells both within and outside the fenced area, and a walkthrough of the former treatment building. A Site inspection report is included in Appendix A.

There is a chain-link fence around the 2.5-acre treatment area with two vehicle gates on Route 17 and another on the south side of the fence. Because of an existing Right-of-Way (ROW) that extends across the treatment area to properties south of the UCC property, the ROW holder was given keys to the gate locks. The ROW holder was asked to keep the gates locked when the ROW was not being used. However, with the termination of active remediation, there has been a marked decrease in Settling Parties and regulatory agencies presence at the Site and the gates are left open by the holder of the ROW despite repeated requests that they be closed and locked. Because the soils have attained the performance standards set in the ROD and the monitoring wells have been secured, failure to lock the gates does not present an issue.

During the 2012 inspection, and other visits to the Site, the remaining wells were observed to be secured. There has been no physical indication of vandalism of any of the wells or chemical indication (laboratory analyses did not report any non-site related chemicals).

The treatment building remains secure with both pedestrian doors and the cargo door locked. Treatment components have been removed in a series of decommissioning activities since the termination of the SVE and groundwater pump and treat system. Currently all that remains within the building are the equalization tank, two carbon vessels (empty), air compressor, assorted well pumps and associated equipment. There is electric service to the building that is switched on by the Settling Parties during site visits; access is limited by a locked control panel.

The SVE treatment area was capped with a 12–18” layer of silty clay and that was topped with 6–12” of gravel. With the termination of the active treatment and the removal of the external piping, the cap now has naturally seeded vegetation. No significant areas of erosion were observed. The slope from the SVE treatment area down to Quiggle Brook (this was outside the capped area) is heavily vegetated and no erosion was observed there. Volunteer saplings and other woody stemmed brush are cut down by the PRPs during the groundwater monitoring events.

There are no noticeable changes to the UCC property since the 2007 review. A front-end loader belonging to the ROW holder was parked on the property. Similar events have occurred in the

past and the ROW holder has been reminded that the ROW is for access only but these reminders are heeded only occasionally.

A drive of the surrounding roads was made to look for any new developmental activity. Since the 2007 review, there have been a few individual homes constructed east of Harts Mill Road, the road that runs between the Site and Crawford Pond, but no sub-division type developments. As was the case at the time of the prior review, only private water supply is available.

## **6.6 INTERVIEWS**

EPA and MEDEP project managers met onsite with an HCCE member on August 23, 2012. The concerns voiced were the ultimate disposition of the Site and the apparent lack of progress in getting resolution on this issue. After the progress made in cleaning up the soils and greatly reducing the contaminant levels in the groundwater such that the property could be placed back in re-use with some restrictions, the HCCE member voiced frustration that there does not appear to be similar progress made on the legal/administrative issues. The agency representatives acknowledged the frustration.

The following day, EPA project manager met with the Town of Hope Administrator. His comments also centered on the long-term resolution of ownership and the identification of restrictions that will need to be placed on the property. He indicated that different views are held within the town as to the re-use of the property, but after a turnover on the board of selectmen, he believes the town government is ready to move forward in presenting options that would be placed on the agenda for the next town meeting tentatively scheduled for June 2013.

## 7.0 TECHNICAL ASSESSMENT

### 7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

**ANSWER A: NO**, and the answer remains unchanged from the 2007 review: “Three of the four remedy components functioned as intended and have been completed. The fourth component, management of migration and institutional controls, has achieved significant reductions in site contaminants but has not met the objective of groundwater restoration within the timeframe as intended by the decision documents. Institutional controls need to be placed on the Union Chemical property. In addition, participation in the voluntary notification process has been limited regarding installation of new wells within the well advisory area.”

Remedial action performance and monitoring results The decontamination and demolition of the facility’s buildings and structures has been done, on-site soils performance standards have been met, and off-site soils did not present an exposure pathway from site contamination. These components of the remedy remain protective of human health and the environment.

The groundwater remedy that began in 1996 with a pump-and-treat system, supplemented with *in-situ* permanganate injections during the summers of 1998 through 2000, *in-situ* carbon source additions in 2001 and 2002, and *in-situ* hydrogen peroxide in 2005, has not met the RAO of restoration of groundwater. Monitoring of groundwater and surface water continues.

During this review period the Conceptual Site Model was updated and a Technical Impracticability Evaluation was completed. These projected that it would take 100 plus years and 300 plus years for the groundwater in the overburden and bedrock, respectively, to meet the performance standards. The groundwater monitoring results from this review period are consistent with these projections, with the majority of the contaminants showing slight decreases in concentrations while MEK and ethylbenzene appear to have increased and other contaminant concentrations fluctuated.

Operations and Maintenance Costs The SVE and groundwater treatment system has been deactivated. All external piping and nearly all of the treatment components have been removed. Since both soil and groundwater treatment systems have been dismantled, there are no longer any systems O&M costs. However, O&M activities such as maintaining well security should continue.

O&M costs include site inspections and monitoring. Cost data was requested from the Settling Parties’ Project Coordinator, but they were not received in time for inclusion in this report.

Opportunities for Optimization The long-term monitoring has been reduced to bi-annual sampling of ten monitoring wells and one surface water location. This provides coverage of the hot spots and perimeter of the groundwater plume. No further optimization opportunities were identified.

Indicators of Remedy Problems Contaminant concentrations in the groundwater have been reduced by several orders of magnitude by the selected remedy and the innovative technologies that were implemented. However, removing the remaining residual contamination is projected to take an extended period of time. Beyond this recognition, there are no indications of remedy problems. The plume configuration is stable and there have been no changes in land use that might affect the distribution of the contamination.

Implementation of Institutional Controls Institutional controls have not been implemented. The ROD set forth examples of institutional controls that could be implemented for the UCC property and nearby properties to protect human health and the environment. Because the State has control over the Site, this has been a sufficient temporary measure to prevent exposure to site groundwater. However, permanent institutional controls still need to be put in place preventing use of the groundwater beneath the property. Beyond the property, a permanent water use restriction was placed on residential well #20-2/45, located across Route 17 from the UCC property, and a well advisory zone was established. In 2001, EPA reduced the well advisory zone and notified all affected residents of the change. Property owners within the zone have been requested to notify EPA, MEDEP and/or the Settling Parties prior to installation of any new bedrock wells. Between 1992 when the well advisory was put in place and 2002 at least five wells were installed within the well advisory zone without the requested notification. EPA directed the Settling Parties to sample those wells that may have been hydraulically connected to the Site. No site-related contaminants were detected. Although the well advisory zone is now significantly smaller (and those five wells are now outside the current zone) there is nothing to prevent this from occurring on the remaining properties and that suggests that this institutional control is not functioning as intended.

**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?**

**ANSWER B: NO.** The ROD did not identify vapor intrusion as a potential pathway, there have been some changes in toxicity data, and it is doubtful that the final RAO will be attained in a reasonable timeframe. The cleanup levels remain valid.

Changes in Standards and TBCs As part of this five-year review, Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) guidance for the Site presented in the ROD were reviewed, and a review of current ARARs was conducted. ARARs identified in the 1990 ROD and current ARARs and TBCs that are applicable to this five-year review are provided in Appendix B of the 2007 Five-Year Review.

There are no current chemical-specific ARARs that apply to soil contaminants at the Site. TBC guidances that were written following the 1990 ROD include the 2010 Maine Remedial Action Guidelines (MRAGs) and the 1994 USEPA Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. It was determined that the lead concentrations in off-site soils were below federal and state guidelines for residential property, did not pose a threat to human health and the environment, were not related to Site activities, and therefore the off-site soils portion of the remedy was deemed complete in late 1996.

The 1999 Closure Action Plan for Soils, Findings and Summary Report compared the current Site data, the ROD clean-up goals and the contemporaneous MRAGs to ensure that the initial risk assessment from the RI/FS remained valid. The 1999 evaluation concluded that the most recent Site soil concentrations available indicated that clean up goals had been met and stated that the "ROD defined site-specific clean-up goals are largely consistent with the State of Maine Remedial Action Guidelines" - that is to say, the ROD-set cleanup goals are all lower than the MRAGs.

For this review, the performance standards for soils set in the 1990 ROD (and attained by the SVE system) were compared to the 2011 MRAGs. As indicated previously in Table 4-1, the ROD only set soil cleanup goals for four contaminants because they were the most prevalent, their relatively high concentration, and that they were co-located with other soil contaminants within the source area. For 1,1-DCE, TCE, and PCE, the ROD standard is lower than the most conservative of the 2011 MRAGs values (multiple contaminants, leaching to groundwater) whereas the ROD standard of 100 ppm for total xylenes is considerably below the MRAG for residential property of 1,000 ppm, but above the leaching to groundwater value of 26 ppm.

The Maine Maximum Exposure Guidelines (MEGs) are TBCs and have been periodically updated since the 1990 ROD with 2011 being the most recent update. The 1992 MEGs were promulgated by reference and some of the 1992 MEGs are lower than the 1990 ROD interim cleanup standards, while others are less conservative. Therefore, to place the changes in context for the purpose of this five-year review, the 1992 MEGs, the 2006 MEGs in place at time of the last review, and the most recent MEGs are shown in Table 7-1.

**TABLE 7-1 ROD CLEAN-UP GOALS AND MAINE MEGS**

ROD Contaminants of Concern	1990 ROD Clean-up Goal	1992 MEGs	2006 MEGs	2011 MEGs (TBC)
	All standards in parts per billion (ppb)			
BEHP	4 (6) <sup>1</sup>	25	25	30
Carbon Tetrachloride	5	2.7	3	5
Chloroform	100 (80) <sup>2</sup>	NS	70	70
1,1- DCE	7	7	0.6	40
1,2- DCA	5	5	4	4
1,1- DCA	5 <sup>3</sup>	5	70	60
Methylene Chloride	5	48	47	50
PCE	5	3	7	0.6
TCE	5	5	32	4
Vinyl Chloride	2	0.15	0.2	0.2
1,2- DCE (cis/trans)	70/100	70/70	70/140	20/100
Ethylbenzene	700	700	70	30
MEK	170 <sup>3</sup>	170	3600	4000
Toluene	2000 (1000) <sup>4</sup>	1400	1400	600
1,1,1- TCA	200	200	200	10,000
Xylene	10,000	600	1400	1000

NS- No Standard

1 The ROD performance standard was a Proposed MCL; it has since become a final at 6 ppb.

2 The ROD performance standard was the MCL, this has been revised to 80 ppb.

3 The ROD performance standard was the MEG; no MCL has been set yet.

4 The ROD performance standard was a Proposed MCL; it has since become final at 1000 ppb.

Half of the 1992 MEGs are the same as the 1990 ROD interim cleanup standards (when comparing the 1992 and 2006 MEGs, eight values are less conservative, four unchanged, and four more conservative; comparing 1992 to 2011, ten values are less conservative and six more conservative). However, the ROD set clean-up standards higher than the 1992 MEGs for several compounds. The clean-up standards for carbon tetrachloride, PCE, trans-1,2 DCE, vinyl chloride, and xylene are all higher than the respective 1992 MEG, which are appropriate and relevant standards. Because the ROD requires a risk assessment be completed once cleanup standards established in the ROD are met, a decision regarding adjustments to the clean-up standards will be conducted at that time.

The 1990 ROD included the requirement that arsenic and lead be included in the groundwater sampling program. These metals were identified as COCs but groundwater cleanup goals were not set for either metal as their Remedial Investigation sampling results were below their respective standard. However, in 2001, EPA changed the arsenic MCL from 50 ppb to 10 ppb. In addition, EPA set an Action Level of 15 ppb for lead whereas at the time of the 1990 ROD, the MCL was 50 ppb. This action level requires implementation of a treatment technique in public water systems to control corrosiveness.

Per approval from EPA, analysis for arsenic and lead was suspended in April 1998 because there was not any indication of elevated concentrations in either the groundwater or surface water. In approving this change, EPA noted that sampling for these metals would be a part of compliance monitoring necessary to demonstrate attainment of the performance standards.

Guidance applicable to surface water at the Site issued since the ROD include the National Recommended Water Quality Criteria and the Maine Statewide Water Quality Criteria (SWQC) that are generally the same as the Federal guidelines. There are no freshwater SWQC for the organic compounds present in the site plume. As noted above, in 1998, EPA suspended analysis for arsenic and lead in Quiggle Brook because there no indication of elevated concentrations after six years of monitoring. Monitoring of the surface water for the site-related VOCs will continue.

Changes in Exposure Pathways. Eighteen potential current and future exposure scenarios were identified in the Baseline Risk Assessment. These exposures include ingestion and absorption of on-site and off-site soils, sediments and groundwater. Of these scenarios, only ingestion of groundwater had unacceptable risks. No new exposure pathways were identified in this review.

Changes in Toxicity and Other Contaminant Characteristics During the last five years, several changes have occurred to some of the EPA toxicity values maintained on the Integrated Risk Information System (IRIS) for the COCs identified in the ROD. Upon reviewing the groundwater COCs identified in the ROD and previous five-year review reports, there are five groundwater COCs with changes in toxicity since the 2007 FYR.

#### *Groundwater*

1) **cis-1,2-DCE** In 2010, EPA released the toxicity assessment for cis-1,2-DCE with a non-cancer reference dose toxicity value less stringent than the value used in the ROD which may result in lower risks from exposure to cis-1,2-DCE at the Site. However, this would not affect the remedy selected for the Site because there is no change to cis-1,2-DCE MCL, which was selected for the groundwater cleanup level.

**2) PCE** On February 10, 2012, EPA released the PCE assessment with new cancer and non-cancer toxicity values. EPA now characterizes PCE as likely to be carcinogenic in humans by all routes of exposure and a non-carcinogenic health hazard. Compared to the toxicity values used in the human health risk assessment conducted for the Site, the current PCE non-cancer toxicity values are more stringent and would result in higher PCE hazards while the current PCE cancer toxicity values are less stringent and would result in lower PCE cancer risks from exposure to PCE at the Site. However, this would not affect the remedy selected for the Site because there is no change to PCE MCL, which was selected for the groundwater cleanup level.

**3) 1,1,1-TCA** On September 28, 2007, EPA released the 1,1,1-TCA toxicity assessment with new non-cancer reference dose and reference concentration toxicity values. The assessment concluded that there was inadequate information to assess carcinogenic potential for 1,1,1-TCA and characterized the chemical as a non-carcinogenic health hazard. The previous EPA toxicity assessment for 1,1,1-TCA in 1987 classified the chemical as Group D, which is not classifiable as to human carcinogenicity. This toxicity change would not affect the remedy selected for the Site since there is no change to 1,1,1-TCA MCL, which was selected for the groundwater cleanup level.

**4) TCE** On September 28, 2011, EPA released the TCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes TCE as carcinogenic to humans by all routes of exposure and a non-carcinogenic health hazard. Although these toxicity values are more stringent than those used in the human health risk assessment conducted for the Site and would result in higher TCE risks from exposure to TCE at the Site, this would not affect the remedy selected for the Site because there is no change to TCE MCL, which was selected for the groundwater cleanup level.

**5) vinyl chloride** Although there is no recent change in toxicity values for vinyl chloride, based on EPA's 2005 Guidelines for Carcinogen Risk Assessment and 2005 Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens, vinyl chloride is considered a known human carcinogen that acts with a mutagenic mode of action. Chemical-specific data on susceptibility from early-life exposure to vinyl chloride were available to derive more stringent risk-based indoor air screening levels. This change does not affect the remedy selected for the Site because there is no change to vinyl chloride MCL, which was selected for the groundwater cleanup level.

Changes in Risk Assessment Methods Since the 2007 FYR EPA has published the Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (January 2009) (RAGS F). This document endorses the use of the Reference Concentration (RfC) and Inhalation Unit Risk (IUR) approach to inhalation risk assessment instead of the use of inhalation Reference Doses (RfD,s) and inhalation Cancer Slope Factors (CSFs).

Expected Progress Towards Meeting RAOs The RAOs for three of the four remedy components, the facility's buildings and structures, on-site soils, and off-site soils, have been achieved. The MOM component has not yet met the RAO of restoration of groundwater. The ROD estimated it would take 15 to 30 years of full-scale implementation of the groundwater

remedy (i.e., 2011 to 2026) to attain the performance standards, while acknowledging the possibility that the standards may not be achieved. As part of a Technical Impracticability Evaluation, timeframes to attain the groundwater performance standards were developed. The estimates were more than a 100 years for overburden and more than 300 years for the bedrock.

**7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?**

**ANSWER C: NO.**

The shallow groundwater data that was collected to assess the potential for vapor intrusion should structures be built on the Site did not rule out this potential future pathway. However, as this pathway is typically controlled through engineering methods or institutional controls, any structures built on the Site would be required to meet the institutional controls or put in place appropriate engineering methods. No other information has been discovered that would call into question the protectiveness of the remedy, either current or future.

It has been noted previously that participation in the voluntary well advisory program has been limited. Based on the available monitoring well data, EPA believes that the contaminant plume attenuates prior to the southern site boundary. No site-related contaminants were detected in monitoring wells located on the adjacent property to the east (east of Quiggle Brook). Nonetheless, should there be any development of these properties where bedrock water wells are installed, these wells should be sampled and analyzed for Site contaminants.

**7.4 TECHNICAL ASSESSMENT SUMMARY**

Based on the data reviewed, observations from the site inspection, and interviews, most components of the remedy functioned as intended by the ROD, as modified by the ESDs. The facility's buildings and structures, on-site soils, and limited off-site soils components have been completed and the applicable RAOs have been met. Therefore, the soil remedy at the Site has remained protective of human health and the environment through its completion. The MOM remedy was supplemented by three different *in-situ* approaches, and several orders of magnitude decreases in contaminant concentrations in the groundwater have been achieved but the residual contamination will provide a long-term source that will prevent restoration of the groundwater for an extended period of time.

Groundwater and surface water monitoring continue as part of the MOM remedy

Land use at the Site has not changed since the last five-year review. Because the RAOs for soils have been met and significant progress has occurred in the groundwater, re-use discussions have begun among all parties involved with the Site. Since re-use could result in unacceptable exposure, some restrictions will need to be placed on the property. As part of the completion of the remedial action, the residual risk will be calculated using the contemporaneous toxicity factors to ensure that the remedy is protective upon completion.

The ROD set forth examples of institutional controls that could be implemented for the UCC property and nearby properties to protect human health and the environment. Because the Site is in receivership that is held by MEDEP, this has been a sufficient temporary measure to prevent

exposure to site and groundwater. However, institutional controls still need to be put in place to prevent use of the groundwater beneath the property and to prevent the vapor intrusion pathway from occurring.

## 8.0 ISSUES

The 2007 Five-Year Review identified four issues associated with the groundwater remedy. Three of those issues remain: attainment of the groundwater RAO, resolution of long-term ownership of the UCC property, and the need to place institutional controls on the property. The contaminant concentrations have slightly decreased during this review period and the estimated timeframes for restoration of the groundwater exceed 100 and 300 years for the overburden and bedrock, respectively. Consequently in order for the remedy to remain protective, modification of the groundwater RAO and resolution of ownership and institutional controls will need to be implemented.

A Technical Impracticability evaluation was approved with conditions by EPA in December 2010 and resubmitted in January 2011. This evaluation included a feasibility study of other remedial approaches that could maintain the protectiveness while changing the RAO for attainment of groundwater performance standards. If EPA determines that a Technical Impracticability waiver is appropriate, an amendment to the ROD will be prepared for public comment.

The Site is currently in receivership, held by MEDEP. However this is viewed by MEDEP to be a temporary arrangement rather than a permanent one. MEDEP has provided a draft environmental covenant to the Town of Hope that indicates what restrictions (institutional controls) would need to be placed on the Site prior to releasing the Site from receivership. Upon receipt of a commitment from the Town, MEDEP and the Maine Attorney General's Office will determine what is necessary to release the Site from receivership and petition the Maine Superior Court to accomplish this.

The anticipated restrictions/institutional controls will include a prohibition on groundwater use and a requirement that any building constructed shall be equipped with a sub-slab vapor system or its equivalent designed to prevent migration of soil vapors into the interior of the building.

## 9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Of the four components of the remedy selected for the Site, only the MOM portion remains to be completed. Thus, the issues and recommendations below deal with the MOM remedy.

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Attainment of groundwater RAO	Reevaluate the MOM remedy	PRPs	EPA/ MEDEP	09/30/2013	N	Y
Ownership	Provide assistance to the State if requested	MEDEP	EPA	09/2014	N	Y
Institutional Controls	Place long-term restrictions on UCC property	EPA/DEP	EPA	09/2014	N	Y

## **10.0 PROTECTIVENESS STATEMENT**

The remedy at the Site currently protects human health and the environment because MEDEP is the court-appointed receiver of the property and, as such, use of the property is controlled by MEDEP and there is no evidence that there is current exposure. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: modification of the groundwater RAO, resolution of property ownership, and implementation of institutional controls.

## **11.0 NEXT REVIEW**

A fourth five-year review for the Union Chemical Company Site will be conducted in 2017.

## 12.0 DOCUMENTS REVIEWED AND REFERENCES

Hope, Town of, 2007. Hope Land Use Ordinance, revised June 18

Maine Legislation, 2011. Revised Statute Title 38, Chapter 3; December 31

Tetra Tech Rizzo, 2008. Thirty-eighth/Third Long Term Monitoring of Surface Water and Groundwater (Fall 2007), Union Chemical Company Site; February 27

Tetra Tech Rizzo, 2009. Thirty-ninth/Fourth Long Term Monitoring of Surface Water and Groundwater (Fall 2008), Union Chemical Company Site; March 27

Tetra Tech Rizzo, 2011. Fortieth/Fifth Long Term Monitoring of Surface Water and Groundwater (Fall 2010), Union Chemical Company Site; May 25

Tetra Tech Rizzo, 2009. Conceptual Site Model, Fourth Revision, Union Chemical Company Site; December 18

Tetra Tech Rizzo, 2011. Technical Impracticability Evaluation for the Union Chemical Company Site; January 20

Tetra Tech Rizzo, 2012. 2012 Work Plan Union Chemical Trust Former Union Chemical Company Superfund Site; May 10

USEPA, 1990. Record of Decision Summary, Union Chemical Company; U.S. Environmental Protection Agency, Region 1, Boston, Massachusetts; December.

USEPA, 1991. Consent Decree – United States of America, Plaintiff v. PRP List, Defendant; August

USEPA, 1994. Explanation of Significant Differences, Union Chemical Company Site; June

USEPA, 1997. Explanation of Significant Differences, Union Chemical Company Site; June

USEPA, 2001. *Comprehensive Five-Year Review Guidance, USEPA 540-R-01-0*, June

USEPA, 2001. Explanation of Significant Differences, Union Chemical Company Site; September

USEPA, 2002, Five-Year Review, Union Chemical Company Site, Hope, Maine, September

USEPA, 2007, Five-Year Review, Union Chemical Company Site, Hope, Maine, September

**2012 FIVE-YEAR REVIEW**  
**UNION CHEMICAL COMPANY SUPERFUND SITE**  
**HOPE, MAINE**

**FIGURES**



NOTE: DISTANCE EACH MEASURED FROM THE APPROXIMATE CENTER OF SITE PROPERTY.

2423-017

Union Chemical Company  
Hope, Maine



**TETRA TECH RIZZO**

Information obtained from:  
USGS Map of West Rockport, Maine  
Quadrangle dated 1988

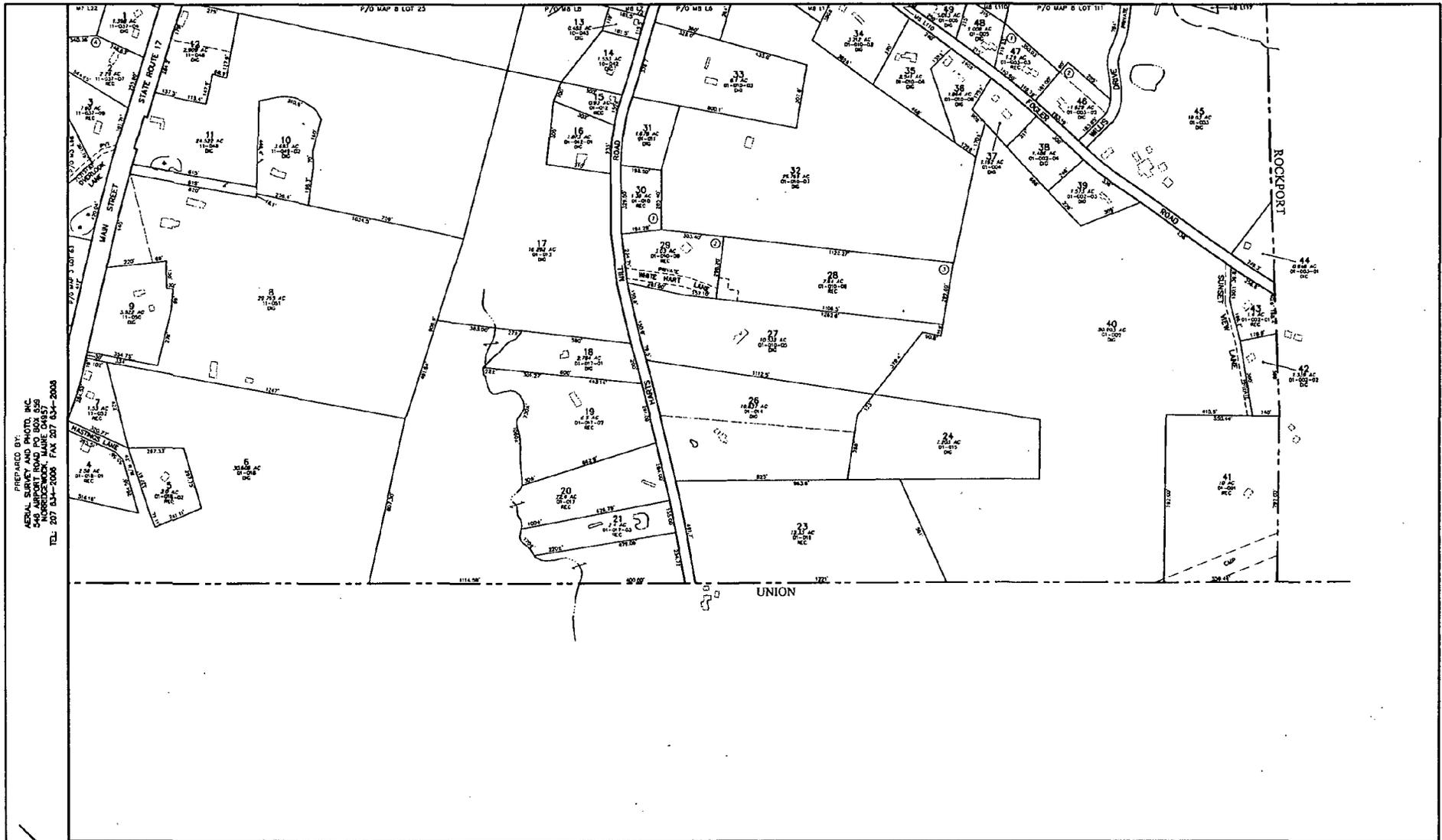
Site Locus Plan

Figure  
**1**

J:\PROJETS\2420\PILOT\2007\MAP\2420G-ESL04\_FIG1.dwg 10/25/2007 11:51:02 AM EDT







PREPARED BY:  
AERIAL SURVEY AND PHOTO, INC.  
1000 BROADWAY, SUITE 200  
ROCKPORT, MAINE 04857  
TEL: 207 634-2005 FAX: 207 634-2005

**NOTES:**

- 1) THIS MAP IS FOR ASSIGNMENT PURPOSES ONLY AND IS NOT INTENDED FOR LEGAL DESCRIPTION. PLEASE REFER TO FULL DESCRIPTION ON INDEX MAP.
- 2) REC = PARCEL AREA FROM RECORDED PLAN OR DETO  
DSC = PARCEL AREA CALCULATED DROTALLY



PARCEL NUMBER	74
PARCEL DIMENSION	412'0"
PARCEL AREA	2.438 AC
OLD MAP AND LOT NUMBER	10-041-01
MATCH LABEL	P70 MAP 50 LOT 24
SUBDIVISION LOT NUMBER	②

**MAP LEGEND**

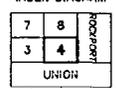
PARCEL BOUNDARY	—————
ROAD RIGHT OF WAY	—————
PAPER STREET	—————
EASEMENT LINE	—————
PRIVATE RIGHT OF WAY	—————
BUILDING FOOTPRINT	—————
WATER LINE	—————

APRIL 1, 2011

SCALE 1 INCH = 200 FEET

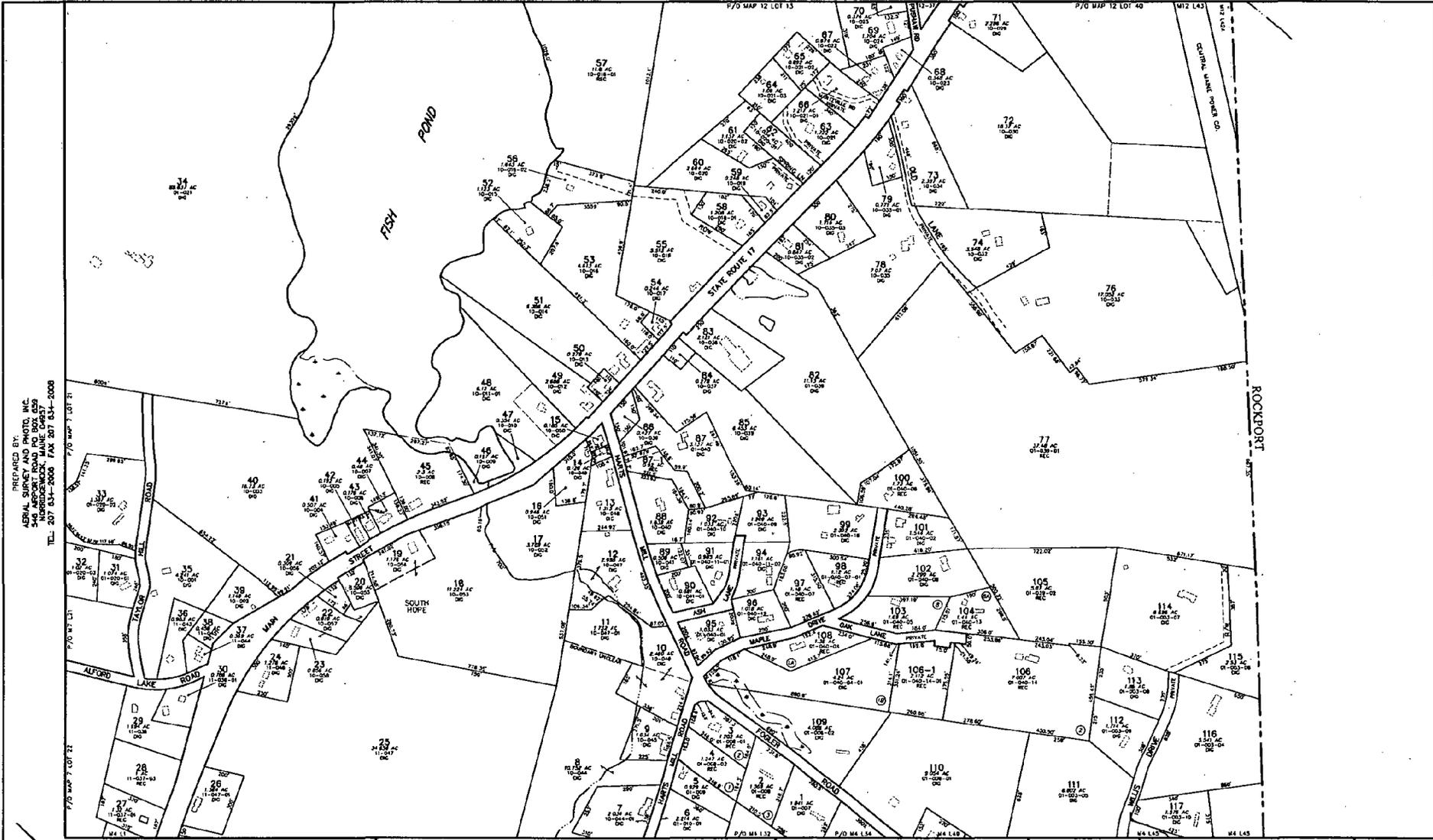
MAINE STATE PLANE COORDINATE GRID, EAST TIME, NAD 1983, US FEET  
PHOTOGRAPHY DATE, MAY 7, 2007  
PHOTOGRAMMETRIC CORRELATOR BY AERIAL SURVEY AND PHOTO, INC.  
PARCEL MAP COMPILED BY AERIAL SURVEY AND PHOTO, INC.

**INDEX DIAGRAM**



PROPERTY MAP  
**TOWN OF HOPE**  
KNOX COUNTY, MAINE

PREPARED BY:  
AERIAL SURVEY AND PHOTO, INC.  
546 AIRPORT ROAD, BOX 659  
ROCKPORT, MAINE 04866  
TEL: 207-634-2000 FAX: 207-634-2000



**NOTES:**  
1) THIS MAP IS FOR ASSESSMENT PURPOSES ONLY,  
AND IS NOT INTENDED FOR LEGAL DESCRIPTION.  
PLEASE REFER TO TAX RECORDS OR DEED MAP.  
2) AC = PARCEL AREA FROM RECORDED PLAN OR DEED  
DC = PARCEL AREA CALCULATED DIGITALLY



**MAP LEGEND**

PARCEL NUMBER	74	PARCEL BOUNDARY	—————
PARCEL DIMENSION	141.21'	ROAD RIGHT OF WAY	—————
PARCEL AREA	2.438 AC	PAPER STREET	—————
OLD MAP AND LOT NUMBER	10-041-02	EASEMENT LINE	—————
MATCH LABEL	P/O MAP 20 LOT 24	PRIVATE RIGHT OF WAY	—————
BUILDING FOOTPRINT		WETLAND EDGE	—————
SUBDIVISION LOT NUMBER	②	WATER LINE	—————

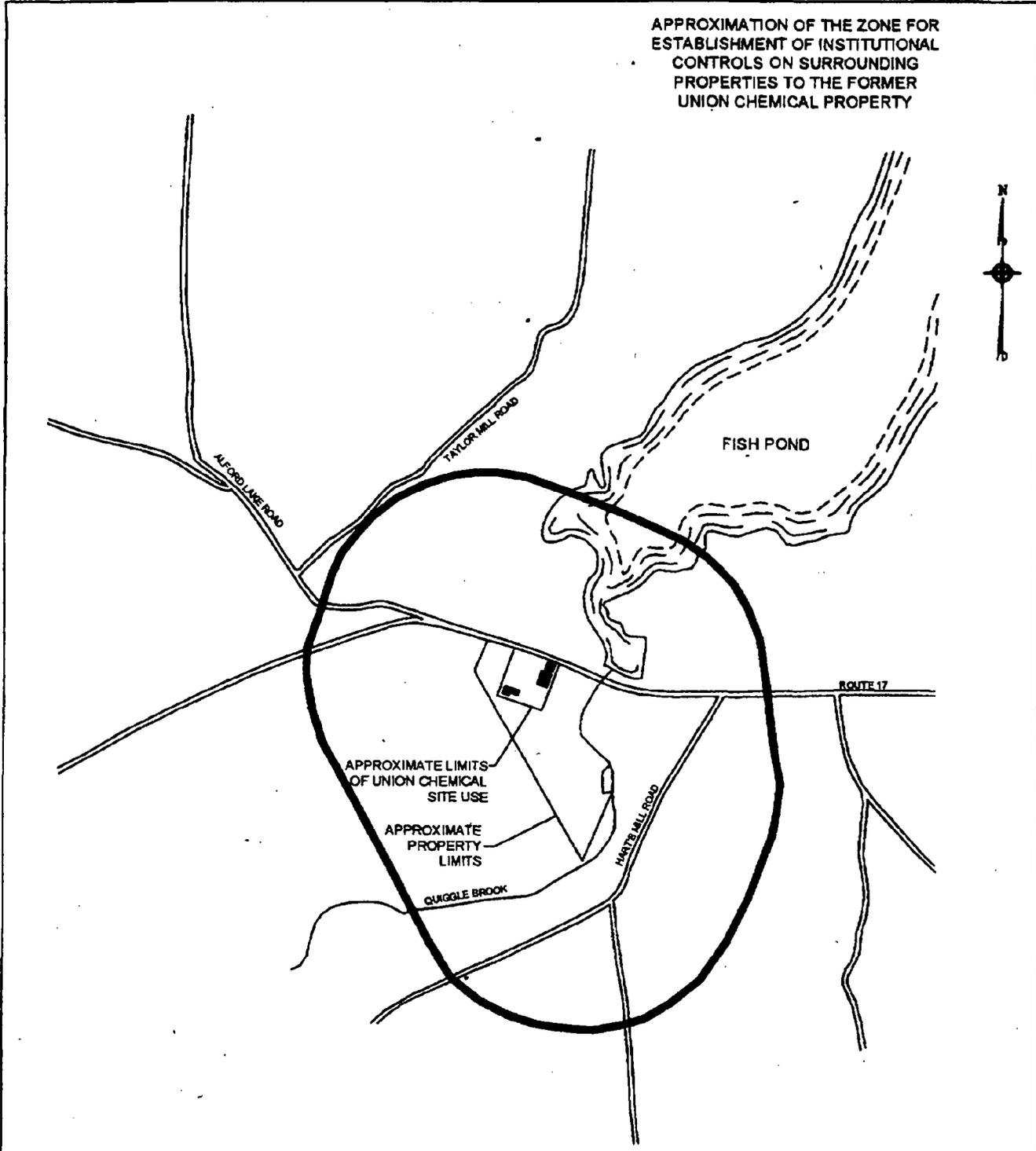
APRIL 1, 2011  
SCALE 1 INCH = 200 FEET  
MAINE STATE PLANE COORDINATE GRID, EAST ZONE, NAD 1983, US FEET  
PHOTOGRAPHY DATE: MAY 4, 2007  
PHOTOGRAPHIC CORRELATION BY AERIAL SURVEY AND PHOTO, INC.  
PARCEL MAP COMPILED BY AERIAL SURVEY AND PHOTO, INC.

**INDEX DIAGRAM**

11	12	ROCKPORT
7	8	
3	4	

**PROPERTY MAP**  
**TOWN OF HOPE**  
KNOX COUNTY, MAINE

APPROXIMATION OF THE ZONE FOR  
ESTABLISHMENT OF INSTITUTIONAL  
CONTROLS ON SURROUNDING  
PROPERTIES TO THE FORMER  
UNION CHEMICAL PROPERTY



WELL ADVISORY ZONE - 1992		FIGURE 4-1	
UNION CHEMICAL COMPANY SITE - FIVE YEAR REVIEW			
SOUTH HOPE, MAINE			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	P. CALL	DATE:	AUGUST 29, 2002
SCALE:	NOT TO SCALE	FILE:	DWG\4255\0600\FIG_4-1.DWG



## APPENDIX A

### Five-Year Review Site Inspection Checklist and Photographs

I. SITE INFORMATION													
Site name: <b>Union Chemical Company</b>	Date of inspection: <b>August 23, 2012</b>												
Location and Region: <b>South Hope, Maine; Region 1</b>	EPA ID: <b>MED042143883</b>												
Agency, office, or company leading the five-year review: <b>EPA</b>	Weather/temperature: <b>Sunny, mid 70's</b>												
<b>Remedy Includes:</b> (Check all that apply) <table style="width: 100%; border: none;"> <tr> <td><input type="checkbox"/> Landfill cover/containment</td> <td><input type="checkbox"/> Monitored natural attenuation</td> </tr> <tr> <td><input type="checkbox"/> Access controls</td> <td><input type="checkbox"/> Groundwater containment</td> </tr> <tr> <td><input checked="" type="checkbox"/> Institutional controls</td> <td><input type="checkbox"/> Vertical barrier walls</td> </tr> <tr> <td><input checked="" type="checkbox"/> Groundwater pump and treatment</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Surface water collection and treatment</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> Other <u>Soil Vapor Extraction</u></td> <td></td> </tr> </table>		<input type="checkbox"/> Landfill cover/containment	<input type="checkbox"/> Monitored natural attenuation	<input type="checkbox"/> Access controls	<input type="checkbox"/> Groundwater containment	<input checked="" type="checkbox"/> Institutional controls	<input type="checkbox"/> Vertical barrier walls	<input checked="" type="checkbox"/> Groundwater pump and treatment		<input type="checkbox"/> Surface water collection and treatment		<input checked="" type="checkbox"/> Other <u>Soil Vapor Extraction</u>	
<input type="checkbox"/> Landfill cover/containment	<input type="checkbox"/> Monitored natural attenuation												
<input type="checkbox"/> Access controls	<input type="checkbox"/> Groundwater containment												
<input checked="" type="checkbox"/> Institutional controls	<input type="checkbox"/> Vertical barrier walls												
<input checked="" type="checkbox"/> Groundwater pump and treatment													
<input type="checkbox"/> Surface water collection and treatment													
<input checked="" type="checkbox"/> Other <u>Soil Vapor Extraction</u>													
<b>Attachments:</b> <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached													
II. INTERVIEWS (Check all that apply)													
<b>1. O&amp;M site manager: <u>Bob Ankstitus</u></b> <u>Sr. Project Manager</u> <u>Aug 23, 2012</u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> <span>Name</span> <span>Title</span> <span>Date</span> </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached: <u>No problems noted with site activities. Now down to bi-annual groundwater and surface water monitoring.</u>													
<b>2. O&amp;M staff: <u>N/A</u></b> _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> <span>Name</span> <span>Title</span> <span>Date</span> </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone   Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____													

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, etc.) Fill in all that apply.

Agency: Maine DEP

Contact: Rebecca Hewett Project Manager Aug 23, 2012 207 287-8554  
Name Title Date Phone no.

Problems; suggestions;  Report attached: MEDEP recognizes the need for long-term access and restrictions but needs involvement from Town.

Agency: Town of Hope

Contact: Jonathon Duke Town Administrator Aug 24, 2012 207 763-4199  
Name Title Date Phone no.

Problems; suggestions;  Report attached: There are differing views within the Town over the long-term use of the property but he believes this coming year the issue will be placed on the town meeting agenda for a vote

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. Randy Smith, Coordinator for the Union Chemical Company Trustees; Aug 23, 2012; 603 673-0004

No problems with the Site itself. Although the ROW situation does mean that the fence is not secured, there has been no indication of vandalism. In addition, with the removal of the external piping for the soil vapor and groundwater extraction systems, hot air injection points, and two rounds of well decommissioning, there are fewer items that need to be secured.

**III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)**

1.	<b>O&amp;M Documents</b> <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks: <b>N/A – there is no ongoing remediation. Equipment for soil vapor and groundwater extraction system has been dismantled</b>	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	X N/A X N/A X N/A
2.	<b>Site-Specific Health and Safety Plan</b> <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A
3.	<b>O&amp;M and OSHA Training Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
4.	<b>Permits and Service Agreements</b> <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	X N/A X N/A X N/A X N/A
5.	<b>Gas Generation Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
6.	<b>Settlement Monument Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
7.	<b>Groundwater Monitoring Records</b> Remarks: <u>Monitoring reports are sent directly to EPA and MEDEP</u>	<input type="checkbox"/> Readily available	X Up to date	<input type="checkbox"/> N/A
8.	<b>Leachate Extraction Records</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A
9.	<b>Discharge Compliance Records</b> <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	X N/A X N/A
10.	<b>Daily Access/Security Logs</b> Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	X N/A



**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): During scheduled groundwater monitoring events and periodic site visits

Frequency: Varies, but typically fewer than five times a year

Responsible party/agency: UCC Trustees, with assistance from agencies

Contact: Randy Smith

Name	Title	Date	Phone no.
------	-------	------	-----------

Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A

Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Violations have been reported	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A

Other problems or suggestions:  Report attached

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

Remarks: As long as the property remains in receivership status, held by MEDEP, the ICs are adequate. Should the status change, then restrictions will need to be added to the property deed.

**D. General**

1. **Vandalism/trespassing**  Location shown on site map  No vandalism evident

Remarks: Owners of ROW continue to leave equipment (i.e., front-end loader or trailer, on the Site despite reminders that ROW is only for crossing to and from their property

2. **Land use changes on site**  N/A

Remarks \_\_\_\_\_

3. **Land use changes off site**  N/A

Remarks: There have been a few more homes built in the area since the last five-year review, but this is consistent with historical land use.

**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: Since the previous five-year review, the soil cap over the soil vapor extraction area is naturally re-vegetating. There are only a few items remaining onsite outside of the treatment building, and the treatment building is secured, so conditions are appropriate for a site with limited activities.

**VII. LANDFILL COVERS**    Applicable    N/A

**VIII. VERTICAL BARRIER WALLS**    Applicable    N/A

**IX. GROUNDWATER/SURFACE WATER REMEDIES**    Applicable    N/A

**A. Groundwater 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: There are pumps kept in the treatment building to be used when needed for pumping from the wells.

2.   **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**  
 Good condition    Needs Maintenance    N/A  
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 groundwater treated annually \_\_\_\_\_  
 Quantity of surface water treated annually \_\_\_\_\_  
Remarks: Treatment system deactivated in October 2000, and most components have been removed from the Site. Equalization tank and carbon vessels remain but are empty.

2. **Electrical Enclosures and Panels** (properly rated and functional)  
 N/A                       Good condition                       Needs Maintenance  
Remarks: Electrical service is maintained to the treatment building, but is turned off at the panel and the panel box is locked when UCC Trustees' contractor is offsite.

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: all wells have been secured.

**D. Monitoring Data**

1. Monitoring Data  
 Is routinely submitted on time                       Is of acceptable quality

2. Monitoring data suggests:  
 Groundwater plume is effectively contained     Contaminant concentrations are declining

<b>E. Monitored Natural Attenuation X N/A</b>	
1.	<b>Monitoring Wells</b> (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____
<b>X. OTHER REMEDIES</b>	
If there are remedies applied at the site which are 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. <u>Soil vapor extraction system was dismantled from 1999 to 2001.</u>	
<b>XI. OVERALL OBSERVATIONS</b>	
<b>A.</b>	<b>Implementation of the Remedy</b>
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 to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <u>See Sections 4 and 7 in the text</u>	
<b>B.</b>	<b>Adequacy of O&amp;M</b>
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. <u>With the termination of pump-and-treat, there has not been a need for O&amp;M. Equipment is stored in the treatment building so that it can be used when needed, such as during in-situ additions or pump tests.</u>	
<b>C.</b>	<b>Early Indicators of Potential Remedy Problems</b>
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. <u>There are no indications of remedy problems itself; the reestablishment of woods roads to properties south of the Union Chemical property point out the need to clarify the Right-of-Way</u>	
<b>D.</b>	<b>Opportunities for Optimization</b>
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>Site is in a long-term monitoring phase that has reduced the sampling frequency to bi-annual and the number of groundwater monitoring locations to ten and surface water locations to one.</u>	



**Union Chemical Company treatment building**



**Looking south from top of soil cap to access road. Monitoring wells with shrink-wrap fabric in foreground**



**Sampling port for discharge into Quiggle Brook**



**Front-end loader belonging to ROW holder and parked on UCC property**



**Main entrance to UCC Site**



**Looking west along Route 17 from site entrance. Red house on right is closest residence to the Site**



**Second entrance to Site from Route 17. Shop/apartment building on right has a dug well and vacant business on left has a bedrock well. Both are hydraulically upgradient from the Site**