Second Five-Year Review Report

for

Union Chemical Company Site

Hope

Knox County, Maine

September 2007

PREPARED BY:

US Environmental Protection Agency

Region 1

Boston

Approved by:

9.28.07

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U.S. Environmental Protection Agency – New England

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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
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
MOM	Management of Migration
MRSA	Maine Revised Statutes Annotated
NCP	National Contingency Plan
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 second five-year review of the Union Chemical Company Superfund Site (Site) in Hope, Maine. The review is required by CERCLA 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 initial five-year review in September 2002.

The December 27, 1990 Record of Decision (ROD) for the Site specified a multi-component remedy to address contaminated on-site soils, groundwater, and facilities, 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 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.

Decontamination of facilities and demolition were completed in May 1994. The soil cleanup technology was changed by EPA in a June 1994 ESD from ex-situ, low-temperature thermal aeration to in-situ soil vapor extraction. The soil treatment portion of the remedy was initiated in October 1994 and was completed in December 1999 after EPA and Maine Department of Environmental Protection (MEDEP) accepted the results of soil closure sampling.

Startup of the groundwater extraction and treatment system occurred in January 1996 and system operations continued until October 2000 when the system was deactivated. Several modifications to the groundwater component have been carried out with the intent of both accelerating the clean up process and attaining the performance standards. These modifications have included in-situ addition of potassium and sodium permanganate from 1997 to 2000, the reinjection of treated water into the subsurface, in-situ addition of carbon sources in 2001-2002, and in-situ hydrogen peroxide additions in the bedrock in 2005.

Specific institutional controls were not selected in the ROD, but the ROD did identify a number of actions that could be taken. Of these possible actions, two were implemented: a restriction on the use of groundwater from an existing bedrock well directly across Route 17 from the Site; and well advisories, where property owners were asked to voluntarily notify EPA or MEDEP when they installed a bedrock well on their property.

Meteorological data was collected onsite from 1993 to 1996. From this data, possible areas where deposition in soil from air emissions may have occurred were identified.

Soil samples were collected in July and September 1996. Review of these data resulted in agreement by all parties that the data did not show measurable deposition in off-site soil from the site incinerator. A 1997 ESD was prepared to document the completion of off-site soil activities.

The 2002 five-year review concluded the remedy was functioning as intended. The remedy was expected to be protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks were being controlled. As part of the review, EPA stated that it anticipated that the remaining component of the selected remedy, restoration of the groundwater, would be achieved by 2005. This has not happened, in large extent because of the limitations inherent in the site-specific geology and hydrology.

Since the 2002 five-year review, additional efforts have been undertaken to understand better the site hydrology, particularly within the bedrock. In-situ injection of hydrogen peroxide (the second in-situ chemical oxidant and third in-situ effort overall) was performed. Physical removal of components from the groundwater extraction and monitoring system has continued since the 2002 review. The available monitoring data indicates that the contaminant concentrations are gradually decreasing and the footprint of the plume appears relatively stable . Although there are no sentinel wells beyond the plume (that is, the wells farthest downgradient have concentrations that are slightly above cleanup goals), as these downgradient wells are located 200-300 feet from the property boundary, it is believed that the plume attenuates prior to the Union Chemical boundary.

Five-Year Review Protectiveness Statement:

The remedy currently protects human health and the environment because there is no evidence that there is current exposure. 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.

Five-Year Review Summary Form

SITE IDENTIFICATION
Site name *(from WasteLAN)*: Union Chemical Company Superfund Site
EPA ID *(from WasteLAN)*: **MED042143883**
Region: 1 State: ME City/County: Hope/Knox
SITE STATUS: Final
NPL status: Added on October 4, 1989
Remediation status: Ongoing
Multiple Operable Units? No Construction completion date: December 19, 1997
Has site been put into reuse? No
REVIEW STATUS
Lead agency: USEPA
Author name: Terrence Connelly
Author title: Remedial Project Manager
Author affiliation: EPA Region I
Period for this review: 04/16/07 to 09/28/07 (Time period covered by this review, 2002 – 2007)
Date of site inspection: 07/24/07 Type of review: Post-SARA Review number: 2nd Triggering action: Five years after first review Triggering action date *(from WasteLAN)*: 09/18/2002 Due date *(five years after triggering action date)*: 09/18/2007
ISSUES: - Restoration of groundwater has not been achieved even though multiple innovative in-situ technologies have been applied. - Residual deep bedrock contamination remains. - Although the soil performance standards were attained, and soil is no longer considered a source for groundwater contamination, the residual contamination may be a source for unacceptable levels of vapors should buildings be constructed. - As required in the ROD, when the cleanup levels are reached and maintained, the residual risk will

need to be calculated. The attainment of the cleanup levels is not expected to occur for many years, so this issue will not likely be addressed within the next review period.

- The ROD did not require specific institutional controls but instead made suggestions as to possible ways to prevent exposure to contamination. Because MEDEP holds the property in receivership, there is sufficient control in the short-term to prevent expose to groundwater beneath the property and to prevent construction of buildings where vapor intrusion could be an issue. However, voluntary measures to evaluate potential off-site exposure to contaminated groundwater have not been fully successful and should be reexamined.
- A fence originally was put in place to prevent access during active remediation. Active remediation has been completed so the requirements for locked gates and restricted access are no longer required for purposes of the ROD. However, monitoring wells are still in active use on the property and are not always secure.

RECOMMENDATIONS and FOLLOW-UP ACTIONS:

- Using the revised site conceptual model as a basis, assess the need to modify the remedy selected in the 1990 ROD.
- Provide whatever information is requested should MEDEP decide it no longer wants to hold the property in receivership.
- Reexamine institutional controls, both for the UCC property and offsite.
- Measures should be taken to ensure monitoring wells are secure.

PROTECTIVENESS STATEMENT:

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.

OTHER COMMENTS:

1.0 INTRODUCTION

This is the second 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 between April and September 2007. 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
November 5, 1993	EPA approves Facilities Remedial Action Work Plan
1994 – 1996	PRPs 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
October 1994 – May 1995	PRPs excavate and consolidate soil from four outlying areas into central location and construct soil cap over the entire area that will be treated using soil vapor extraction
April 5, 1995	EPA approves 100% Soil Vapor Extraction/Management of Migration (SVE/MOM) Remedial Design and its Remedial Action Work Plan
June – July 1995	PRPs drill borings and install hot air injection points, vapor and groundwater extraction wells
July – Nov 1995	PRPs construct treatment building, install treatment equipment and interior and exterior piping

Nov – Dec 1995	Equipment tested using clean water
January – June 1996	Start-up period for SVE/MOM
October 1996	EPA and PRPs 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	PRPs perform permanganate pilot study
December 19, 1997	EPA approves Construction Completion Report for SVE/MOM systems
August – Sept 1998	PRPs perform compliance sampling for soil performance standards
Summer 1998	First full-scale permanganate application
Summer – Fall 1999	Second full-scale permanganate application
December 17, 1999	EPA approves Final Closure Action Plan for Soils, Findings, and Summary, completing source control component of remedy
Summer – Fall 2000	Third full-scale permanganate application
2000 - 2001	Decommissioning of external piping network and decommissioning of vapor points
December 2000	Shutdown of MOM 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 CERCLA five-year review of Site
Fall 2003	PRPs install new bedrock well in southwestern portion of Site and replacement wells along Quiggle Brook
2004	Agencies and PRPs synthesize site data (going back more than twenty years) into Site Conceptual Model
July 2004	PRPs perform bromide tracer tests in ODW, the bedrock monitoring well located farthest south on the Site
Summer 2005	PRPs abandon vapor extraction wells and monitoring wells on upgradient portion of site
June – November 2005	PRPs conduct bedrock pump tests, then hydrogen peroxide injections
Dec 2005 – Oct 2006	PRPs conduct four post-injection sampling events
Summer 2006	PRPs abandon 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
April 25, 2007	*Public Notice for Second Five-Year review published*

3.0 BACKGROUND

3.1 PHYSICAL CHARACTERISTICS

The Site is located on Route 17 in a rural, residential area of South Hope, Maine (Figure 3-1). The Site occupies approximately 12.5 acres along the south side of Route 17 and is coincident with the boundary of the Union Chemical Company property though the footprint of the contamination is less than the entire property. The majority of UCC's past operations were conducted within a fenced two-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 3-2). 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 contents of the treatment building are being decontaminated and dismantled. Figure 3-3 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 and consolidation 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).

The Site is in close proximity to several residential dwellings with the nearest located on the north side of Route 17 across from the site's main entrance. A home on the property adjacent to the western boundary was moved off that property since the 2002 five-year review; there are several homes to the west of that property. Additional residential properties are located farther to the east and southeast. There is no public water supply in the area therefore all properties have private water supply wells. The private water supply wells closest to the Site 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. Such aquifers can be used as a drinking water source.

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 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 MRSA, § 465-A.1.A.)

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

The Union Chemical Company 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 by Wright-Pierce Architects/Engineers 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 3-2). 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. All of these drums and their contents and the contents of the storage tanks 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 (NPL) 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 twenty-three contaminants of concern (COCs). The results of the RI and risk assessment were used to evaluate potential cleanup alternatives in the FS. 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, tetratchloroethene, 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 Contaminants of Concern 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 facilities. Instead, it stated that best-available treatment would be required prior to off-site disposal to address the Contaminants of Concern identified with the facilities: VOCs, dioxin, inorganics, and polyaromatic hydrocarbons, and asbestos. Following the applicable decontamination process, the facilities 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 describes the remedial actions selected for and implemented at the Site.

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 Union Chemical 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, a bedrock well located on private property (lot #8 on Figure 4-2), directly across Route 17 from the Site. 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, no site-related contaminants were found in any of these residential wells. Monitoring wells were also installed on the 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. With the significant reduction in contaminant mass by the soil vapor extraction system and the augmented groundwater extraction activities, it is believed that the contaminant plume attenuates prior to the downgradient 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, directly across Route 17 from the Site;
- 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.

In June 1994, after comment from MEDEP and the public, including a public hearing and thirty-day comment period, EPA approved a request from the PRPs to change technologies for soil cleanup. EPA issued an ESD that documented the change in technology for soil cleanup from low-temperature thermal aeration to soil vapor extraction. In addition to the change in technologies, EPA also set a deadline of five years for achieving the soil cleanup standards. This change in technology also provided for a more immediate and aggressive treatment of the groundwater than was originally planned in the ROD.

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.

A third ESD was issued 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, such as the addition of potassium and sodium permanganate, molasses and sodium lactate to groundwater in specific portions of the Site, were incorporated into the groundwater remedy with the expectation of attaining groundwater cleanup levels by 2003 – 2005. In addition, a decrease in the areal extent of the overburden-shallow

bedrock plume resulted in a reduction in the volume of groundwater extracted necessary to maintain hydraulic control. This in turn allowed for a change from surface water discharge of treated groundwater to reinjection of the treated groundwater into the ground upgradient of the pumping wells. This was accomplished by piping the treated water to extraction wells that were no longer needed to maintain hydraulic control of the groundwater flowing beneath the source area.

TABLE 4-1 SOIL CLEANUP LEVELS

Soil Contaminant	Soil Cleanup Level (ppm)
Carcinogenic Contaminants	
1,1-Dichloroethene (DCE)	0.1
Trichloroethene (TCE)	0.1
Tetrachloroethene (PCE)	0.1
Non-Carcinogenic Contaminants	
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)**
Carcinogenic	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
Non-Carcinogenic	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

4.2 REMEDY IMPLEMENTATION

This section describes the implementation of the multi-component remedy specified in the ROD.

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 off-site 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

On September 21, 1994, EPA gave approval for three specific actions described in the 100% Remedial Design. Approval for these three actions: soil consolidation, excavation for and the construction of the SVE building foundation, clay cap installation, and their concurrent mobilization tasks, was given to allow for onsite activities to begin during the 1994 construction season and thereby improve the prospect of construction completion during the 1995 season.

Consolidation activities of the soil began in October 1994 and after suspension of activities for the winter, they were completed in May 1995, removing approximately 2,260 cubic yards (compared to the FS estimate of 860 cubic yards). The soil consolidation and cap installation activities resulted in an increase in elevation of up to five feet in the active soil remediation area of the Site.

4.2.2.2 SVE Phase II Activities

The 100% Remedial Design was revised and resubmitted on February 17, 1995. It was approved by EPA, after review and comment from MEDEP, on April 5, 1995.

Installation of 28 groundwater wells, 33 SVE wells, and 91 hot air injection points began on June 4, 1995, and was completed on July 30, 1995. The treatment building foundation and floor slab were installed during July and August. The treatment building was completed in September. Breaks in the foundation slab, attributed to uneven settling, occurred in December 1995 and were repaired within the same month.

Installation of the treatment equipment for the soil vapor and groundwater extraction systems was completed in the fall of 1995. The soil vapor extraction system consisted of a propane-fired thermal oxidizer, and a heat exchange unit that heated clean air for the hot air injection system. For the groundwater treatment, the system consisted of sand filters, equalization tank, tray-type air stripper, an advanced oxidation unit, two granulated activated carbon filters, an ion exchange unit, and a 500-gallon effluent tank.

Interior and exterior piping were completed in November 1995; testing of individual pieces of equipment was performed in December 1995. EPA and MEDEP conducted a pre-final inspection on December 6, 1995 followed by 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 PRPs' contractor was allowed to begin discharging treated effluent to Quiggle Brook.

Start-up continued through June 1996. Throughout this period, the treatment system experienced several shutdowns resulting from equipment failure inside and outside of the treatment building and from winter conditions. Following the repair/replacement of several components, such as expansion loops for the hot air injection lines, the soil vapor system approached its objective of continuous operation. Sampling of thermal oxidizer effluent indicated that the Maine Ambient Air Guidelines were being met.

Sampling of the treated groundwater, however, indicated the Ambient Water Quality Criteria were not being achieved for metals, particularly manganese and copper. Consequently, the PRPs' contractor removed the ion exchange unit from the treatment process and began making other adjustments. EPA and MEDEP agreed to extend the start-up period for the metals removal to February 1997 to allow time for the treatment system adjustments. A new metals removal system, using pH adjustment and flocculation, was installed in September-October 1996 and tested in the following months. 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.

While this change to the treatment process decreased metals concentrations, there continued to be fluctuations in the concentrations of metals in the effluent. With the prospect of not meeting the AWQC standards for manganese and copper, preparations were made for setting a site-specific standard by performing total toxicity testing as allowed under the state law. The testing was terminated prior to completion for three reasons. First, the control group in two of the first three testing efforts experienced fatalities above the acceptable range, making the results from these two tests questionable. Second, MEDEP changed their surface water assimilation policy; and third, once hydraulic control was achieved, it required a lower pumping rate that allowed for the successful reinjection of the treated groundwater back into the subsurface.

4.2.2.4 Source Control Activities

Following 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. Air was heated to approximately 775 degrees F and injected into the 91 hot air points to enhance the volatilization of VOCs. Vapors were collected from SVE wells placed within the hexagonal grid of hot air points. Soil samples were collected in late 1997 for an interim evaluation of the performance of the SVE system. Based on the results of the 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. The closure-sampling plan was approved by the agencies in September 1998 and sampling was completed in the fall of 1998. 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 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. While the groundwater extraction system continued to operate to maintain hydraulic control of the plume, a number of innovative treatment options were employed at the Site to enhance the reduction of contaminant concentrations in the groundwater. The first innovative treatment involved the in-situ application of potassium permanganate. As a strong oxidizer, the permanganate was expected to accelerate the destruction of dissolved chlorinated VOCs. A potassium permanganate pilot study was completed in October 1997. 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 in an attempt to achieve further reductions in VOC concentrations.

Sodium permanganate, rather than potassium permanganate, was added to groundwater near the pumping wells in the summer of 2000 since higher doses could be used than could be used for potassium permanganate. This was a further attempt to achieve reductions of VOC concentrations in the groundwater. Also in 2000, the discharge location for treated groundwater was changed from Quiggle Brook to upgradient reinjection. The groundwater extraction system operated during the permanganate additions in 2000, between July 6, 2000 and October 25, 2000.

Carbon sources in the form of molasses and sodium lactate were added in 2001 to create a reducing environment to enhance degradation of ethane compounds by reductive dechlorination. Molasses was added to groundwater at four wells in the eastern portion of the Site in August and November 2001. Sodium lactate was added to groundwater at three wells in the south central portion of the Site in 2001. Lactate addition was carried out again in August 2002. The extraction system has not been operated since October 2000 and was not in operation during the carbon source additions in 2001.

The extraction system has since 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; a subset of the groundwater monitoring wells is also sampled for natural attenuation parameters. 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 has not shown any concentration increases in the perimeter wells, indicating that the plume has not expanded since the extraction system was deactivated. Groundwater monitoring will continue until the cleanup standards have been, or are close to being, achieved, and no residual permanganate or carbon sources are observed. At that time, compliance monitoring will

begin to ensure cleanup levels continue to be achieved at the Site. The ROD also specifies that once cleanup standards are attained, the residual risk will be recalculated.

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 but specific institutional controls were not included in the ROD. However, a number of possible controls were identified for possible use. Since that time, an easement that runs with the land prohibiting the use of residential well #20-2 has been put in place.

In addition, a well advisory zone was established in 1992 and, in accordance with procedures approved by EPA, all 54 property owners within the zone were contacted and requested to notify EPA, MEDEP or the PRP's Project Coordinator prior to installing any new bedrock wells. This zone encircled the Site and included properties from Taylor Road to the northwest of the Site to properties south and east of Harts Mill Road (Figure 4-1). If notification is received from a property owner that he or she wants to install a bedrock well, the bedrock wells may be sampled and tested by the PRPs 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. EPA made this adjustment following discussions with MEDEP and Hope Committee for a Clean Environment (HCCE). 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. In May 2001, EPA sent letters to 14 of the original 54 property owners notifying those individuals that their properties continued to be within the zone and requesting notification prior to installation of any new bedrock wells. The properties that remain within the advisory zone are on Town of Hope, Maine Tax Maps 10 and 11, and are in close proximity to the Site (Figure 4-2). In May 2001, EPA also notified the remaining 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 PRPs be notified prior to the installation of any new bedrock well. Between 1992 when the property owners were initially notified and 2002, EPA and MEDEP became aware of the installation of approximately five new bedrock wells within the zone. In a number of cases, the new wells were installed without notification. At the agencies' request, the PRPs sampled those wells that the agencies believed could potentially be hydraulically connected with the Site. No site contaminants were detected in any of these wells.

Neither EPA nor MEDEP are aware of any new wells installed between 2002 and the present. No further actions or institutional controls have been put in place.

4.4 SYSTEM OPERATIONS/O& M

The groundwater treatment system is currently deactivated. The system began start-up in February 1996 and it was certified operational and functional on April 28, 1997. The system ran full-time from then until December 1999, when it was shut down to allow for a contaminant rebound evaluation. Operation of the system resumed in June 2000, and continued until October 2000 during a period of permanganate addition, when it was once again shut down. EPA agreed, after comment from MEDEP, to approve in-situ treatment in the area of the pumping wells during the summer of 2001. The system remained off-line during the molasses addition activities in 2001. The system has remained off-line except for use of the activated carbon during the pump test and hydrogen peroxide additions in summer – fall 2005. See Section 6.4.3 for more detail on the pump test and hydrogen peroxide additions.

During the period of operation, O&M activities included the continuous extraction and treatment of contaminated groundwater, facility maintenance, treatment system monitoring and sampling, and groundwater monitoring and sampling. Annual costs associated with these activities were approximately $150,000 according to the PRPs' Project Coordinator and the costs associated with molasses addition were approximately $50,000.

Costs since the completion of the carbon source additions were requested from the PRPs' Project Coordinator but were not available prior to the writing of this review report. With both the soil and groundwater treatment systems deactivated and dismantled, and the reduction in sampling, it is presumed that O&M costs have decreased since the 2002 five-year review.

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the second five-year review for the Site. The first five-year review, completed by EPA in September 2002, assessed the Site and drew the following conclusions:

- The remedy was expected to be or was protective of human health and the environment, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.
- The threat of groundwater contamination from soils was mitigated by the excavation and consolidation of outlying areas, capping of the soil treatment area, and then the successful treatment of the contaminated soils.
- Through the implementation of innovative technologies, EPA expected the groundwater to achieve the ROD performance standards by 2005.
- The data indicated that the groundwater contaminant plume had not migrated offsite. Monitoring data indicated that the remedy was functioning as required to achieve groundwater cleanup goals.
- Other threats posed by the Site have been addressed through institutional controls that were preventing exposure to, or the ingestion of, contaminated site groundwater and the effort to sample all newly installed bedrock wells in the properties surrounding the Site.

In addition, the 2002 FYR made the following recommendations:

- When sampling for compliance monitoring begins, use analytical methods with detection limits lower than the performance standards for surface water and groundwater.
- Reevaluate the MOM remedy if concentrations below Maximum Contaminant Level/ Maximum Exposure Guidelines (MCLs/MEGs) are not achieved.
- Evaluate the risks associated with contamination in the deep bedrock.
- Recalculate the remaining site risk as required in the ROD once it has been determined that the performance standards have been attained.

The following describes the progress made in addressing these recommendations following the 2002 Five-Year Review:

- *When sampling for compliance monitoring begins, use analytical methods with detection limits lower than the performance standards for surface water and groundwater.*

The first recommendation was made because for some groundwater samples, dilution was required in order to measure the relatively high concentrations of a particular VOC, and the dilution also raised the detection limit for all other VOCs. However, when the concentrations for

all contaminants are close to their respective performance standards, then dilution will not be required, and thus the appropriate detection limits will be lower than the performance standards.

- Reevaluate the MOM remedy if concentrations below MCLs/MEGs aren't achieved.

In 2001, EPA approved the change from permanganate additions to carbon source additions. This change from an oxidizer to a reducing agent was made because the permanganate did not appear to be decreasing the concentrations of 1,1-DCA whereas significant decreases had been measured in TCE, 1,1-DCE, PCE, and cis-1,2-DCE. EPA agreed that this change offered a better opportunity for a decrease in 1,1-DCA concentrations through reductive dechlorination under anaerobic conditions. Yet at the time of the 2002 five-year review, the results did not suggest similar significant decreases in 1,1-DCA concentrations. While a second implementation of carbon source was being performed, the 2002 five-year review acknowledged that even with these innovative technologies, the MOM performance standards might not be met in the short term as originally envisioned. Therefore, it identified the possible need to reevaluate the MOM remedy. EPA, MEDEP, and the PRPs have discussed this possibility since the follow-up sampling for the carbon source additions and are working to revise the conceptual site model that will serve as a basis for the future direction for the Site.

- Evaluate the risks associated with contamination in the deep bedrock

Concurrent with this reevaluation of the overburden and shallow bedrock groundwater, the 2002 review noted the ROD requirement and MEDEP's concern for a more detailed assessment of the deep bedrock. As a result, several on-site actions were performed. In fall 2003, a new bedrock well cluster was installed southwest of the source control area to provide information regarding suspected groundwater flow along the bedrock strike direction. At the same time, the B-5 monitoring well cluster, located southeast of the source control, was replaced. This three-well cluster included two overburden wells and one shallow bedrock well. In 2004, a bromide tracer test was performed in monitoring well ODW to obtain groundwater velocity information to compare with yields attributed to it during its use by the facility. In 2005, following pump tests of wells OPW and B-6A(D) that determined hydraulic control of the bedrock flow could be maintained, hydrogen peroxide was added to several wells in an attempt to decrease contaminant concentrations in the bedrock.

As these on-site activities were underway, a draft Site Conceptual Model Report was submitted to the agencies in September 2003, and then revised in September 2004. The purpose of this report was to synthesize all geologic, hydrologic, and chemistry data to provide a comprehensive explanation of the fate and transport of the site contaminants. This report is currently being updated and is scheduled to be submitted to the agencies in September 2007 and should help provide a better understanding of the contamination in the deep bedrock.

- Recalculate the remaining site risk as required in the ROD once it has been determined that the performance standards have been attained.

Because performance standards have not yet been attained, this recalculation has not occurred.

6.0 FIVE-YEAR REVIEW PROCESS

6.1 ADMINISTRATIVE COMPONENTS

EPA, the lead agency for this five-year review, notified MEDEP and the Union Chemical Company Trust's Project Coordinator at the beginning of 2007 that the five-year review would take place during the spring and summer of 2007. Rebecca Hewett of MEDEP was part of the review team.

The schedule established by EPA included completion of the review by September 2007.

6.2 COMMUNITY INVOLVEMENT

EPA prepared a public notice announcing the five-year review and requesting public participation. The notice was published May 24, 2007 in the Rockland, Maine Courier-Gazette. Since the publication of the notice, there has been no response from the public to either MEDEP or EPA regarding the five-year review. This level of response was similar to that of the previous five-year review.

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 Trust's Project Coordinator. These meetings have decreased over the past two years 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 July 25, 2007, 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, other than a neighbor of the Site who has looked periodically at the documents, there has been little interest in the site documents.

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 actions (such as hydrogen peroxide additions). *These documents are listed in Section 12.*

6.4 DATA REVIEW

A review was completed of various PRP-contractor plans and monitoring reports. A summary of relevant data regarding the components of the Site remedy is presented below.

6.4.1 Decontamination of Facilities, Demolition, and Off-Site Disposal

The on-site facilities, including the former church, warehouse building, still building, incinerator, underground piping and vaults and other containers, were decontaminated. Asbestos in the still building was containerized and concrete structures were crushed. Decontamination, demolition, and off-site disposal activities were completed in May 1994.

6.4.2 Soil Vapor Extraction

The SVE treatment system operated from October 1996 through March 1998. Closure soil sampling was completed in September 1998 with 50 samples (42 soils and 8 duplicates) analyzed for the four target compounds (DCE, TCE, PCE and total xylenes). A statistical analysis of the data indicated that the soils had been cleaned up to below the ROD-specified cleanup levels. The results of the soil sample analyses for source control closure are summarized below. EPA approved the report on the soil closure sampling findings on December 17, 1999. This completed the soil treatment portion of the remedy.

TABLE 6-1: SOIL CLOSURE SAMPLING RESULTS SUMMARY

Analyte	Analytical Results (ppb dry weight basis)	Cleanup Standard (ppb dry weight basis)
1,1-DCE	None detected (ND)	100
TCE	2J - 14J (majority reported at DL)	100
PCE	3J - 20J (one at 140*)	100
Xylenes	3J - 243J (many at DL)	100,000

* Sample collected from center of Site, surrounded by ND or low ppb results. This result was shown not to be statistically significant.

6.4.3 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. Groundwater and surface water samples have been analyzed for the 23 site-specific VOCs and DMF.

The vacuum-enhanced pump-and-treat groundwater system required by the 1990 ROD became operational and functional in April 1997 after one year of start-up and several adjustments. The mass of contaminants extracted from the groundwater on a monthly basis dropped from 142 pounds in December 1996 to 48 pounds in July 1997 then to 10 pounds in August 1998 and to 5

pounds in June 1999. This decreasing removal of mass is typical of pump-and-treat systems as the groundwater system approaches equilibrium between dissolved contaminants and adsorbed contaminants. While the mass of VOCs removed from the groundwater followed an asymptotic curve, VOC concentrations did not show a similar decrease and remained elevated.

As a result, a request was made to augment the pump-and-treat system with in-situ application of permanganate in an attempt to decrease contaminant concentrations with this oxidizer. This request was agreed to and in-situ additions of permanganate took place from 1998 through 2000. This was then followed by two years of in-situ application of two carbon sources, and then most recently, in-situ application of hydrogen peroxide.

The sections below summarize these activities and provide tables with contaminant concentrations before and after each of the applications. For context, the tables also include the maximum contaminant concentrations detected in the RI, before any remedial measures were taken.

Groundwater and Surface Water Data through the Permanganate Additions

After receiving approval from EPA, the PRPs' contractor performed a potassium permanganate pilot study in a limited area in the center of the source area in October 1997. Following this pilot study, in-situ chemical oxidation was expanded to the entire source area during the summers of 1998 and 1999. While these applications were made, the groundwater extraction system continued operation, assuring that hydraulic control was maintained so that neither the contaminant plume nor permanganate migrated to Quiggle Brook.

Upon review of the April 2000 water quality data, it appeared that the remaining contamination was no longer beneath the source area (the active area of the UCC operations) but was located between the source area and Quiggle Brook. To address this, sodium permanganate was used rather than potassium permanganate because the sodium permanganate solution could be applied at a higher concentration, and this reduced the volume of permanganate solution added into the subsurface, and lessened the possibility of permanganate reaching Quiggle Brook.

Table 6-2 presents a summary of contaminant concentrations before and after the permanganate additions. It can be seen that there were significant decreases in a majority of compounds, particularly the ethene compounds (double carbon bond compounds, such as trichloroethene), hydrocarbons, and DMF. Overall, this produced an environment where the principal remaining groundwater contaminant was 1,2-dichloroethane (1,2-DCA). There also appeared to be a slight increase in vinyl chloride concentrations. The cause of the increase in vinyl chloride was not determined. It may have been an artifact of the sampling program (the locations sampled before and after the additions varied somewhat so it was not a straight comparison) or that with the decrease in overall total VOC concentrations, vinyl chloride that had previously been masked by higher TCE and 1,2-DCE concentrations was now being detected. A third possibility existed as well: the oxidation of the TCE was not going to completion, and thus the increase in vinyl chloride was a byproduct.

Nonetheless, since 1,1-DCA, a single carbon bond compound, had the highest concentrations and had the greatest number of locations above its performance standard, in the summer 2001, EPA agreed to a proposal to change the subsurface environment from aerobic to anaerobic. This was

to be done by adding a carbon source to the subsurface so that the groundwater could be driven to anaerobic conditions and thereby promote reductive dechlorination of ethane compounds.

Groundwater Data Before and After the Carbon Source Additions

Carbon source additions were conducted in summer 2001 and summer-fall 2002. Solutions of food-grade molasses and sodium lactate were tried in separate locations in 2001. Although the data did not show significant decreases in the 1,1-DCA concentrations that could be attributed to either carbon source (unlike the immediate decreases of the ethene compounds following the permanganate additions), sodium lactate was selected for the 2002 additions. Concurrently, physical parameters, such as dissolved oxygen and the oxidation-reduction potential, were monitored frequently to assure that the anaerobic conditions continued to allow for the reductive dechlorination. The parameters continued to be indicative of reducing conditions throughout the fall 2002, winter 2003, and spring 2003.

Table 6-3 presents a summary of contaminant concentrations before and after the carbon source additions. As shown in the spring 2003 data, concentrations of 1,1-DCA and 1,1,1-TCA did decrease following the carbon source additions, which was the sought outcome from this effort. Unfortunately, this was accompanied by increases in the concentrations and percentage of locations that exceeded the performance standards of all the other compounds.

It is believed that the most likely explanation for the increases in the ethene concentrations was a rebound effect following the permanganate additions rather than a byproduct of the carbon source additions. One of the known limiting factors in cleaning up the site groundwater was the low transmissivity of the overburden material and shallow bedrock. While this aided in keeping contamination from moving beyond the property boundary, it also limited the ability for the permanganate to move out into the soils where it could react with the dissolved plume. Consequently, the concentrations measured in the spring 2003, nearly three years after the final permanganate addition, may have been more representative of overall groundwater quality when non-affected groundwater finally moved into hydraulic connection with the monitoring wells.

TABLE 6-2 GROUNDWATER DATA – PERMANGANATE ADDITIONS

Constituent Performance Standard	RI Maximum Concentration	Pre-Permanganate Application Q23 (Spring 1998)			Post-Permanganate Application Q29 (Spring 2001)		
		Max. Conc.	Avg. Conc.	Performance Standard Exceedances	Max. Conc.	Avg. Conc.	Performance Standard Exceedances
(all concentrations in parts per billion)							
1,1,1,-TCA 200	73,000	1400	69	2/30	200	11	0/38
1,1-DCA 5	12,000	1300	197	15/30	3300	476	28/38
1,1-DCE 7	2,700	420	43	10/30	270	28	8/38
MEK 170	NA	1400	81	2/30	270	18	1/38
Ethylbenzene 700	2,700	810	55	1/30	740	36	1/38
PCE 5	150	56	6	5/30	13	3	2/38
TCE 5	84,000	560	63	13/30	230	29	19/38
Vinyl chloride 2	7.6	16J	3	10/30	77	10	12/38
Cis-1,2,-DCE 70	19,000	1300	166	9/30	1400	123	12/38
Trans-1,2-DCE 100	NA	49J	5	0/30	31	6	0/38
DMF 390	NA	3700	288	4/30	500	112	2/17

TABLE 6-3 GROUNDWATER DATA – CARBON SOURCE ADDITIONS

Constituent Performance Standard	RI Maximum Concentration	Pre-Carbon Source Application Q29 (Spring 2001)			Post-Carbon Source Application Q33 (Spring 2003)		
		Max. Conc.	Avg. Conc.	Performance Standard Exceedances	Max. Conc.	Avg. Conc.	Performance Standard Exceedances
(all concentrations in parts per billion)							
1,1,1,-TCA 200	73,000	200	11	0/38	90	9	0/34
1,1-DCA 5	12,000	3300	476	28/38	2300	491	31/34
1,1-DCE 7	2,700	270	28	8/38	200	38	17/34
MEK 170	NA	270	18	1/38	3300	371	9/34
Ethylbenzene 700	2,700	740	36	1/38	1400	111	2/34
PCE 5	150	13	3	2/38	30	8	19/34
TCE 5	84,000	230	29	19/38	1300	102	26/34
Vinyl chloride 2	7.6	77	10	12/38	100	25	26/34
cis-1,2,-DCE 70	19,000	1400	123	12/38	2000	270	18/34
Trans-1,2-DCE 100	NA	31	6	0/38	480	29	3/34
DMF 390	NA	500	112	2/17	1200	387	3/6

Groundwater Data Before and After Hydrogen Peroxide Additions

Given the post-carbon source addition results, it was decided by EPA and MEDEP to allow time for the groundwater system to return to steady-state conditions; that is, with no pumping nor any in-situ treatment, in order to gauge where the cleanup efforts had progressed. In addition, it was agreed that attention needed to be given to the deeper bedrock groundwater system, a concern voiced by MEDEP in the 2002 five-year review process.

The 1990 ROD required a groundwater extraction system "to address the significant groundwater contamination existing throughout the shallow till and weathered, shallow bedrock aquifers underlying the Site" (page 63). It then went on to state that if contamination in deep bedrock was still exceeding the performance standards during the remedial action monitoring program, then additional extraction wells in the bedrock aquifer may be required.

With the termination of the groundwater pumping from the till and shallow bedrock, the focus turned to the deep bedrock flow regime. At the conclusion of the carbon source additions, groundwater results for existing deep bedrock wells MW13A-D, MW15D, ODW-U, ODW-L and ITW-1 indicated that while the upgradient wells (ITW-1, MW15D) met the performance standards, the most southerly wells, ODW-U and ODW-L, continued to exceed the performance standard for 1,1-DCA.

As noted above, in 2005, pump tests of wells OPW and B-6A-D confirmed hydraulic connections between these two wells and a majority of the bedrock wells at the Site. The measured drawdown and area of pumping influence from well OPW was most pronounced along the dominant strike of the bedrock fractures (west/northwest to south-southeast). The drawdown and area of influence of B-6A-D was most pronounced along the direction of the dominant strike of the shallow bedrock fractures (northeast to southwest). Whereas pumping OPW affected an area greater than 300 feet in radius, the area affected by pumping B-6A-D was less than 200 feet in radius.

With these hydraulic connections developed and maintained, hydrogen peroxide was added into eight bedrock wells, one overburden well, and one well, P-20, that is fully screened through the overburden and shallow bedrock. A total of 1,100 gallons of 35% solution were added to these wells in July-August, and in September 2005.

Table 6-4 presents overburden data from before and after the hydrogen peroxide additions. The results are mixed, with concentrations of some contaminants increased whereas others decreased. This was not unexpected as hydrogen peroxide was primarily added to bedrock wells and two of the four sampled overburden wells that did not receive hydrogen peroxide had increases in total VOCs.

Table 6-5 presents bedrock data from before and after the hydrogen peroxide additions. Again, not surprising, the total VOCs concentrations decreased in five of the bedrock wells sampled since they were the wells that received the hydrogen peroxide. Whether these decreases prove to be a long-term reaction to the additions or whether there will be a rebound will be assessed later this fall. Figures 6-1 and 6-2 depict the most recent overburden and bedrock sampling data, respectively.

TABLE 6-4 GROUNDWATER DATA, OVERBURDEN, – HYDROGEN PEROXIDE ADDITIONS

Constituent Performance Standard	RI Maximum Concentration	Pre-Hydrogen Peroxide Application Q36 (Fall 2004)			Post-Hydrogen Peroxide Application Q37 (Fall 2006)		
		Max. Conc.	Avg. Conc.	Performance Standard Exceedances	Max. Conc.	Avg. Conc.	Performance Standard Exceedances
(all concentrations in parts per billion)							
1,1,1,-TCA 200	73,000	20U	15U	0/4	10U	8U	0/4
1,1-DCA 5	12,000	3800	1631	¾	2800	921	4/4
1,1-DCE 7	2,700	240	65	¾	250	66	1/4
MEK 170	NA	4600	1353	2/4	1000	285	1/4
Ethylbenzene 700	2,700	230	71	0/4	460	127	0/4
PCE 5	150	20U	16U	3/4*	10U	8U	3/4*
TCE 5	84,000	2400	611	¾	570	156	3/4
Vinyl chloride 2	7.6	210	68	¾	110	42	2/4
cis-1,2,-DCE 70	19,000	3600	1068	2/4	1500	583	2/4
Trans-1,2-DCE 100	NA	1500	386	¼	250	66	1/4
DMF 390	NA	1000	320	¼	1500	425	1/4

* There were no detections of PCE, but because of the dilution to allow for the measurement of TCE and cis-1,2,-DCE, the detection limit for PCE was raised above its performance standard.

TABLE 6-5 GROUNDWATER DATA, BEDROCK, – HYDROGEN PEROXIDE ADDITIONS

Constituent Performance Standard	Q32 (Fall 2002)* Max/Avg Exceedances	Pre-Hydrogen Peroxide Application Q36 (Fall 2004)			Post-Hydrogen Peroxide Application Q37 (Fall 2006)		
		Max. Conc.	Avg. Conc.	Performance Standard Exceedances	Max. Conc.	Avg. Conc.	Performance Standard Exceedances
(all concentrations in parts per billion)							
1,1,1,-TCA 200	2U 0/6	20U	6U	0/6	20U	5U	0/6
1,1-DCA 5	690/207/ 4 of 6	4200	786	5/6	3000	596	4/6
1,1-DCE 7	230/40 1/6	420	92	2/6	310	82	2/6
MEK 170	1900/382 2/6	100U	32	0/6	100U	27	0/6
Ethylbenzene 700	20/5 0/6	1600	270	1/6	1900	320	1/6
PCE 5	2U 0/6	20U	6U	2/6**	20U	5U	1/6**
TCE 5	20/5 1/6	60	13	2/6	66	16	2/6
Vinyl chloride 2	5/3 6/6	160	30	2/6	220	39	2/6
cis-1,2,-DCE 70	78/27 1/6	2400	408	1/6	2100	363	1/6
Trans-1,2-DCE 100	2U 0/6	20U	6U	0/6	45	9	0/6
DMF 390	1400/613 1/3	800	247	2/6	1200	302	2/6

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

**There were no detections of PCE, but because of the dilution to allow for the measurement of TCE and cis-1,2,-DCE, the detection limit for PCE was raised above its performance standard.

Surface Water Data Since the Previous Five-Year Review

The 2002 five-year review assessed the first thirty quarters through fall 2001. 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.

Following the permanganate additions and the lackluster results after the first carbon source additions, discussions were begun on what would constitute a long-term monitoring program. It was agreed that a long-term monitoring program would need to include data from the perimeter of the plume (both overburden and bedrock) and the plume hot spots. While these discussions have continued, it was agreed that the surface water sampling could be reduced since applicable standards had not been exceeded. Consequently, QB-4 was kept in the monitoring program because it was the farther downstream location of the two.

Location QB-4 has been sampled eight times for VOCs and twice for DMF since fall 2001. Since that event, there have been no detections of either VOCs or DMF at QB-4.

6.4.4 Limited Action for Off-Site Soils

Because the Remedial Investigation relied on meteorological data from Augusta, approximately twenty-five miles to the west, the 1990 ROD specified that five years of meteorological data were to be collected onsite to assess possible airborne deposition from the facility's incinerator. Because the first three years of site-specific data were consistent with the Augusta data, in 1996, EPA and MEDEP agreed that the three years of data were representative of local conditions. In July 1996, soil samples were collected from off-site locations as specified in the ROD for this component of the remedy. Two locations showed elevated lead concentrations. With input from community members, a more intensive soil sampling program was completed in September 1996. Review of these data in October 1996 resulted in a concurrence by all parties that the data did not show measurable off-site deposition from the site incinerator. In 1997, as documented in the 1997 ESD, off-site soil activities were completed with a finding that no additional work was required.

6.5 SITE INSPECTION

A site inspection was conducted on July 24, 2007 with representatives from EPA, MEDEP, PRPs, and HCCE. The inspection included a site walkover, inspection of monitoring wells both within and outside the site fence, 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 Union Chemical 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, since the 2002 five-year review, the agencies and the PRPs' Project Coordinator have received numerous reports that the gates have been left open. The PRPs' contractor, who arrived first at the Site for this inspection, reported that the gates

were open upon his arrival. Because of the suspension of active remedial activities at the Site, the Site is only routinely checked during the sampling events. Although we have asked that the gates be closed at all times, under the ROD, access to the Site need only be limited during the performance of active remediation. Because this phase of the work was completed some time ago, for purposes of the ROD, failure to lock the gates does not present an issue.

At the time of the 2002 five-year review, it was noted that many of the site wells were not well secured with either locks or protective devices. The wells were subsequently secured by the PRPs' contractor. Since then, the PRPs' contractor decommissioned 16 wells in August 2005 and 46 wells in October 2006. These included groundwater monitoring wells, vapor and groundwater extraction wells, and piezometers. This leaves 90 wells onsite with the preponderance of them located between the eastern edge of the soil vapor extraction area and Quiggle Brook. During the 2007 inspection, some of these remaining wells were no longer secured, likely the result of the one-use protective devices not being replaced following monitoring activities. 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 2002 five-year review noted that the internal and external piping associated with the soil vapor and groundwater extraction systems had been removed, and there were some incidental containers and piping materials remaining. A roll-off box container and two stainless steel tanks are the only materials remaining now outside the treatment building. Inside the treatment building, there are the two containers of granular activated carbon, the metals removal component, and assorted tanks that were used in the groundwater treatment and are now empty. There is electric service to the building but it is usually turned off by the PRPs; 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 here. The buried discharge line from the treatment building to the former discharge point at Quiggle Brook remains in place.

The most visible changes to the Union Chemical property since the 2002 review are two access roads that have been cut through the back portion of the property by the holder of the ROW. The ROW holder notified the agencies and the PRPs of her intention to reestablish these former woods roads, consistent with her interpretation of the ROW.

A drive of the surrounding roads was made to look for any new developmental activity. Since the 2002 review, there have been a few individual homes constructed off 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

In the fall 2005, with the successful completion of the source control component, and the substantial reduction in the mass of groundwater contamination, EPA contacted MEDEP, the PRPs, the Town of Hope Administrator, and HCCE members to begin discussions on the future use of the Union Chemical property. After getting a positive response from all parties, on

January 14 and February 18, 2006, EPA hosted meetings with MEDEP at the Hope Elementary School to solicit community input on possible reuse options for the Site. These two meetings were followed by meetings with the Hope Selectmen on March 30 and May 9, 2006. Common to all these meetings were questions about the ownership of the property and the ROW.

These issues, as well possible long-term environmental restrictions and site access, were the focus of the interviews conducted on July 24 and 25, 2007 for this five-year review.

The following is a summary of comments from affected stakeholders:

Rebecca Hewett is MEDEP's Project Manager. Ms. Hewett presented her understanding of the property transfer process during the site visit. This would be one of the first steps necessary for redevelopment as the State currently holds the property in receivership. She agreed that it would be necessary to clarify this before the State would petition the Superior Court, but it would also be necessary to develop the environmental restrictions prior to a transfer.

Regarding the cleanup process of the Site, Ms. Hewett stated that MEDEP continues to have concerns about the boundary of the bedrock plume, i.e., although the concentrations are low in the wells closest to the southern boundary, the concentrations have not yet decreased to the cleanup levels.

Randy Smith is the PRPs' Project Coordinator. Because the PRPs do not have an interest in the property, their concern regarding any future reuse of the Site is access for long-term monitoring and any potential active remedial measures, such as further in-situ applications, and security of the monitoring network.

Overall, Mr. Smith echoed his comments from the 2002 five-year review that the parties had worked well together, with all parties seeking ways to accelerate the cleanup process beyond the traditional remedies selected in the 1990 ROD.

Jonathan Duke is the Town of Hope Administrator. Mr. Duke was hired after the community meetings and discussions with the Hope selectmen regarding reuse of the property. In an interview with EPA, Mr. Duke identified the issues of the transfer of the property from MEDEP, the ROW, and the long-term environmental restrictions. All of these would affect the ability of the property to be redeveloped. He also noted that there are differences of opinion regarding the ultimate reuse approach for the Site, with some in Town favoring the Town maintaining ownership after it is released from receivership, whereas others favored its return to private ownership.

Mr. Duke stated that the Town was satisfied with the cleanup efforts and felt that the Town had been kept informed. He did indicate the likely costs associated with resolving the property transfer were not something that the Town could easily take on.

Florance Merrifield is the Town Clerk and is assisted by Mary Cooke. Current land use designations, local land use ordinances, tax maps, and lists of property owners were obtained from the Hope Town Hall. They are familiar with the Site but they did not express any concerns about the activities that have been completed. The administrative record and site documents are stored, along with other town documents, in the attic of the town hall; few individuals have accessed the documents. Ms. Merrifield commented that the public is generally well informed about the cleanup activities, primarily via the HCCE.

Lois Jensen and Brian Powers are active HCCE members and attended the Site visit as well as the reuse meetings in the spring 2006. When active remediation was ongoing at the Site, the agencies and the PRPs met regularly with HCCE to provide an update of Site activities and receive feedback from the community. During the Site visit, concerns were expressed about effect the ROW might have on redevelopment. Additionally, it was strongly advocated that the property be steered in the direction of private ownership, saying this was the consensus of the neighboring property owners in the community of South Hope.

Leslie Robinson inherited two parcels of land that are adjacent to, and south of, the Union Chemical property. With these two parcels came the ROW through the Union Chemical property. The attorney for Ms. Robinson was informed of the Site visit and invited to participate but declined to attend. Nonetheless, Ms. Robinson and her husband, Bruce Melanson, have indicated to both EPA and MEDEP their desire to ultimately acquire the Union Chemical property.

7.0 TECHNICAL ASSESSMENT

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

ANSWER A: NO, 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 facilities decontamination and demolition activities were completed in May 1994, and the debris was sent offsite. These activities were carried out in accordance with the ROD, and this portion of the remedy remained protective of human health and the environment.

After the time period for meteorological monitoring that had been set forth in the ROD was decreased, an off-site soil investigation was conducted in October 1996. 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 information presented in 1999 Closure Action Plan for Soils, Findings and Summary Report showed that the site soils have been cleaned up in accordance with the requirements of the ROD as modified by the 1994 ESD. The source control consolidation and capping reduced the risk of further groundwater contamination at the Site. Soil closure samples were collected in 1998 and the results showed that the soil program had met the intended objectives.

The MOM remedy began in 1996 with a twenty-nine extraction well pump-and-treat system. The remedy was augmented with in-situ permanganate injections during the summers of 1998 through 2000, and in-situ carbon source additions in 2001 and 2002. These augmentations were documented in a 2001 ESD. Active operation of the pump-and-treat system ceased in October 2000; a portion of it was used to provide treatment during summer 2005 for the bedrock pumping component of the hydrogen peroxide additions. Monitoring of groundwater and surface water continues.

The most recent groundwater monitoring results indicate that concentrations of a number of COCs (1,1-DCA, 1,1-DCE, TCE, Vinyl chloride, cis 1,2-DCE) are greater than their performance standards. Long-term monitoring will continue until performance standards have been achieved. The Site Conceptual Model is currently being updated. This will serve as the basis for determining future approaches for the Site, whether it will be resumption of some form of active remediation or a shift to long-term monitoring. If it is determined that the latter is warranted, this may require the preparation of a decision document by EPA.

Operations and Maintenance Costs. The UCC groundwater treatment system has been deactivated. The external piping from the wellheads to the treatment plant has been removed. Inside the treatment building, the tray air stripper, advanced oxidation unit, system piping and

various tanks have been removed. The soil treatment system has been dismantled as has all the external piping connecting the injection points and vapor extraction wells to the treatment system. 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 PRPs' Project Coordinator, but they were not received in time for this review.

Opportunities for Optimization. EPA and MEDEP gave conditional approval of a long-term monitoring plan in October 2004, pending the update of the Site Conceptual Model that was to be done after the 2005 pump test and hydrogen peroxide additions. This is expected within the next month. Should, as a result of the discussions initiated with the submittal of the updated Site Conceptual Model, there be a formal termination of active remedial measures, then a long-term monitoring plan will be made final. This will likely involve a reduction in the groundwater monitoring well network that has been in place since the ROD, and continued decommissioning of monitoring and soil vapor and groundwater extraction wells.

Indicators of Remedy Problems. Based on the results of periodic groundwater and surface water monitoring, groundwater concentrations remain above the ROD performance standards (MCLs/MEGs). The remaining contamination is primarily located in the overburden soils between the former leach field and Quiggle Brook. Concentrations in the underlying shallow bedrock are generally an order of magnitude lower than in the overburden, but still above performance standards for most of the Contaminants of Concern. There are a limited number of monitoring wells in the deep bedrock, and the concentrations in these are generally an order of magnitude lower than the shallow bedrock, either below or slightly above the cleanup goals.

Implementation of Institutional Controls. 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, 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 PRPs prior to installation of any new bedrock wells. Since the well advisory was put in place, at least five wells have been put in place within the well advisory zone without the requested notification. Although the well advisory zone is now significantly smaller, there is nothing to prevent this from occurring on these properties and suggests that this institutional control may not be 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: YES. However, vapor intrusion is a new potential exposure pathway that was not evaluated in the decision documents, and there have been some changes in toxicity data, but these have not affected the cleanup levels or the RAOs.

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.

There are no current chemical-specific ARARs that apply to soil contaminants at the Site. TBC guidance that was written following the 1990 ROD include the 1997 Maine Remedial Action Guidelines (RAGs) 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 Maine RAGs for 1,1-DCE range from 0.2 to 3.0 ppm for residential, trespasser and adult worker guidelines. TCE RAGs range from 19 to 400 ppm, and PCE RAGs range from 3 to 65 ppm. Xylene was the fourth contaminant for which a soil remediation goal was set; its RAG is 10,000 ppm. These values are above the performance standards set (and attained) for soils in the 1990 ROD. 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.

The 1999 Closure Action Plan for Soils, Findings and Summary Report compared the current Site data, the ROD clean-up goals and the Maine RAGs to ensure that the initial risk assessment from the RI/FS remained valid. The evaluation concluded that the most recent Site soil concentrations available indicated that clean up goals had been met and 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 Maine RAGs.

The primary change to the ARARs list of VOCs in the groundwater is the addition of the 1992 Maine MEGs. Some of the 1992 MEGs are lower than the 1990 ROD target cleanup standards, while others are less conservative. Therefore, for the purpose of this five-year review, the MEGs for site groundwater 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 MEG	2006 MEG (TBC)
All standards in parts per billion (ppb)			
BEHP	4 (6)[1]	25	25
Carbon Tetrachloride	5	2.7	3
Chloroform	100 (80)[2]	NS	70
1,1- DCE	7	7	0.6
1,2- DCA	5	5	4
1,1- DCA	5[3]	5	70
Methylene Chloride	5	48	47
PCE	5	3	7
TCE	5	5	32
Vinyl Chloride	2	0.15	0.2
1,2- DCE (cis/trans)	70/100	70/70	70/140
Ethylbenzene	700	700	70
MEK	170[3]	170	3600
Toluene	2000 (1000)[4]	1400	1400
1,1,1- TCA	200	200	200
Xylene	10,000	600	1400

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.

Most of the 1990 ROD clean-up standards are the same as the 1992 MEGs (when comparing the 1992 and 2006 MEGs, eight values have been increased, and three have been decreased). 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 Contaminants of Concern but groundwater cleanup goals for either of these metals was not set 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.

A new action-specific ARAR was added when the 2001 ESD was issued. This ESD changed the discharge location for treated groundwater from surface water discharge to Quiggle Brook to underground injection upgradient of the pumping wells. Maine's Underground Injection Control Program regulations, 38 MSRA 413(1-B), Chapter 543 were added as applicable requirements. Injection wells used for previously contaminated groundwater that has been treated are defined as Class V wells. Class V wells may be used provided injection does not "result in a violation of any Maine Primary Drinking Water Standard, or which may otherwise adversely affect human health". There are no applicable drinking water standards for permanganate, molasses, or sodium lactate, thus this remedy change complies with this ARAR.

Analyses of treated groundwater indicated that the treatment system was meeting all Maine Primary Drinking Water Standards. Therefore, this change in discharge location complied with this ARAR.

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 Baseline Risk Assessment (ROD, 1990). 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. Since the 2002 five-year review, an additional

potential future exposure pathway has been identified based upon new information. In November 2002, EPA issued draft guidance on the vapor intrusion pathway. Following up on this guidance, shallow groundwater samples were collected and analyzed in May 2005. While the PRPs' contractor concluded, after modeling the data using the 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". Consequently, prior to the property being redeveloped, the potential vapor intrusion pathway would need to be addressed. Because the groundwater data does not indicate the plume is moving beyond the property boundary, it is unlikely that vapor intrusion would be an exposure pathway in off-site locations.

Changes in Toxicity and Other Contaminant Characteristics. Although toxicity factors have changed for some of the chemicals, the cancer slope factors (CSFs) have, in general, decreased. A decrease in a cancer slope factor for a chemical indicates that the risk posed by that chemical is lower than previously thought. The major contaminants of concern that contribute most to the cancer risk potential at the Site are vinyl chloride, TCE, and 1,1-DCA. Since the 2002 five-year review, the cancer slope factor for TCE was withdrawn from EPA's IRIS database and is currently under review. The major contaminants of concern that contribute most to the non-carcinogenic risk potential are 1,1-DCA, DMF, 1,1-DCE, and cis-1,2-DCE.

Review of ARARs and other research could not ascertain the previous CSFs that were used to calculate risk for the RI/FS and subsequently the ROD, and therefore a comparison between the original risk assessment and the current toxicity factors cannot be made. However, as CSFs have, in general decreased, the original risk assessment can be considered more conservative than a risk assessment using the current CSFs would be. The ROD states that "... the source control and management of migration components will attain the groundwater cleanup standards set at MCLs, which are generally within the range for protection of human health. Once all the groundwater cleanup standards specified above are attained, the residual risk will be re-calculated. If at that point the cumulative risk posed by remaining contaminants falls outside the 10^{-4} to 10^{-6} incremental risk range, then further remedial action will be taken to bring the cumulative risk within the acceptable range." (page 73, Section XI.A). Therefore, 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.

Changes in Risk Assessment Methods. The cleanup goals set for the groundwater were MCLs or MEGs rather than site-specific risk-based concentrations. Consequently, any change in risk assessment methods would not affect the cleanup goals. The potential human health risks discussed in the ROD have been addressed in the short-term by the implementation of the groundwater extraction and treatment system augmented by in-situ technologies. Groundwater monitoring data collected over the past fifteen years indicates the contaminant plume has stabilized on the Site and EPA believes that the plume attenuates prior to the site boundary. For long-term protectiveness, institutional controls will need to be placed on the property and reassessment of the voluntary well advisory program may be necessary.

Expected Progress Towards Meeting RAOs. The RAOs for three of the four remedy components, facilities, 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. At the time of the 2002 five-year review, which was prior to the rebound from the permanganate addition, EPA anticipated that the performance standards would be attained ahead of that schedule. An update of the Site Conceptual Model is underway by the PRPs' contractor. Using that document as the basis, EPA and MEDEP will assess the progress toward achieving this RAO, and whether any changes need to be made to it.

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

According to 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 facilities, on-site soils, and limited off-site soils components have been completed and the intended 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 augmented by three different in-situ approaches, and will be undergoing a reassessment over the next several months. Surface water and groundwater monitoring continue as part of the MOM remedy. Because MEDEP holds the Site in receivership, this has ensured the integrity of the remedial measures conducted at the Site, and prevented exposure to site groundwater.

The primary ARAR for soils on-site are the Maine RAGs. A 1999 evaluation of the soils concluded that cleanup goals had been met and that the site-specific cleanup goals were more conservative than the RAGs and therefore the remedy remains protective.

The primary ARARs for groundwater are the federal MCLs and 1992 Maine MEGs. Most of the clean-up standards set in the 1990 ROD remain below their respective MEGs and therefore will remain protective once they are attained. However, several contaminants have clean-up levels higher than the 1992 MEGs, including xylene, PCE, trans-1,2 DCE, carbon tetrachloride, toluene and vinyl chloride. In addition, MCLs for arsenic and toluene have been lowered since the 1990

ROD. The risk assessment conducted at the end of the cleanup will determine if any of the groundwater cleanup standards need to be revised.

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, reuse discussions have begun among all parties involved with the Site. Since reuse could result in unacceptable exposure, some restrictions need to be placed on the property. In the ROD, cancer potency factors were used to calculate risk. Those values were not located during this review and therefore could not be compared to recent values in order to evaluate any changes in risk. Therefore, 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 preventing use of the groundwater beneath the property. Beyond the property, a permanent water use restriction was placed on residential well #20-2, 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 PRPs prior to installation of any new bedrock wells. Since the well advisory was put in place, at least five wells have been put in place within the well advisory zone without notification. Although the well advisory zone is now significantly smaller, there is nothing in place to ensure notification relative to these properties and this suggests that institutional control may not be functioning as intended.

8.0 ISSUES

The 2002 five-year review identified the possibility of reevaluating the groundwater remedy if the cleanup levels were not achieved. Since that review, in-situ applications of a carbon source in the overburden and hydrogen peroxide in the bedrock have been completed. Notwithstanding these efforts, and previous active remediation measures, concentrations of several VOCs (vinyl chloride, 1,1-DCA, 1,1-DCE, TCE, cis-1,2-DCE) in groundwater remain orders of magnitude higher than the 1990 ROD cleanup goals. In addition to these concentrations in the overburden/shallow bedrock, there remains residual contamination in the deep bedrock. Sampling this fall will be used to assess the effectiveness of the hydrogen peroxide additions in decreasing the concentrations in the deep bedrock.

In November 2002, EPA issued draft guidance on the vapor intrusion pathway. In May 2005, shallow groundwater samples were collected and analyzed against the criteria provided in this guidance. Because the results of this effort did not rule out the possibility of vapor intrusion should structures be built in a redevelopment of the Site, restrictions would need to be placed on the property to prevent this potential pathway.

The 2002 five-year review also noted that residual risk would need to be calculated once cleanup levels were attained. This remains a responsibility of EPA. However, given the levels of contaminants that remain in groundwater, EPA does not expect to perform this evaluation for twenty years or more. Prior to that occurring, it is noted that since the ROD, CSFs have generally decreased, and thus the original risk assessment can be considered more conservative.

Because the RAOs for soils have been met and significant progress has occurred in the groundwater, reuse discussions have begun among all parties involved with the Site. Because reuse could result in unacceptable exposure, some restrictions need to be placed on the property. A major issue that would need to be addressed before the Site could be reused is moving the property out of receivership.

A fence originally was put in place to prevent access during active remediation. Active remediation has been completed so the requirements for locked gates and restricted access are no longer required for purposes of the ROD. However, monitoring wells are still in active use on the property and are not always secure.

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 all 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	Begin re-evaluation in 09/2007; complete by 09/2008	N	Y
Ownership	Provide assistance to the State if requested	MEDEP	EPA	09/2008	N	N
Institutional Controls	Place long-term restrictions on UCC property; reevaluate well advisory zone	EPA/DEP		09/2008	N	Y
Monitoring wells security	Secure all well both inside and outside fence	PRPs	EPA/ MEDEP	Nov 2007	N	N

10.0 PROTECTIVENESS STATEMENT

The remedy currently protects human health and the environment because there is no evidence that there is current exposure. 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.

It was thought at the time of the last five-year review that because of the apparent success of the permanganate additions, the groundwater would achieve the ROD performance standards by 2005. This, in fact, did not occur. Concentrations of ethenes and hydrocarbons rebounded after the permanganate additions (during the carbon source additions) and then generally decreased following the hydrogen peroxide additions. Upcoming sampling in fall 2007 will indicate whether the ethene concentrations have rebounded after the termination of the hydrogen peroxide additions. Vinyl chloride was the exception to this trend for ethenes, with its maximum and average concentrations continuing to increase. This suggests that the dechlorination is not going to completion.

Concentrations of 1,1,-DCA have continued to decrease through the carbon source and hydrogen peroxide additions, though its average concentration remains the highest of the contaminants of concern. The most recent sampling of bedrock wells south of the source area detected concentrations of 1,1-DCA at the performance standard at NBW-U and slightly above the performance standard at ODW-U.

The threat of groundwater contamination from soils was mitigated by the excavation and consolidation of outlying areas, capping of the soil treatment area, and then the successful treatment of the contaminated soils. The possible threat of vapor intrusion contamination to future structures needs to be evaluated and addressed. Other threats posed by the Site have been partially addressed through institutional controls. A review of these controls will determine if additional steps are necessary.

Discussions are underway to set up a long-term monitoring plan that will track both the perimeter of the contaminant plume in both the overburden and bedrock and hot spots within the plume. This long-term monitoring will ensure that the Site Conceptual Model can continue to be assessed and adjustments made as needed. Long-term protectiveness of the remedial action will be verified by the collection and analysis of groundwater and surface water samples during compliance monitoring to evaluate potential migration of the contaminant plume. Current data indicates that the groundwater contaminant plume has not migrated offsite.

11.0 NEXT REVIEW

A third five-year review for the Union Chemical Company Site will be conducted in 2012.

12.0 DOCUMENTS REVIEWED AND REFERENCES

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

IT Corporation, 1998, Twenty-third Quarterly Monitoring of Surface Water and Groundwater (Spring 1998), Union Chemical Company Site; June

IT Corporation, 1999. Final Closure Action Plan for Soils, Findings, and Summary, Union Chemical Company Site; October

IT Corporation, 2001, Twenty-ninth Periodic Monitoring of Surface Water and Groundwater (Spring 2001), Union Chemical Company Site; July

IT Corporation, 2001. Carbon Source Addition Summer/Fall 2001 Activities, Union Chemical Company Site; November

IT Corporation, 2002. Test Results for Permanganate Additions – 2000, Union Chemical Company Site; March

Maine DEP, 2007. Review of Rizzo Associates "Human Health Risk Evaluation Using the Johnson & Ettinger Vapor Intrusion into Indoor Air Model" letter report; July

Rizzo Associates, 2003. Thirty-third Periodic Monitoring of Surface Water and Groundwater (Spring 2003), Union Chemical Company Site; June

Rizzo Associates, 2004. Conceptual Site Model, Revised, Union Chemical Company Site, September

Rizzo Associates, 2004. Bedrock Well Installation and Geophysical Evaluation, Union Chemical Company Site, April

Rizzo Associates, 2004. Draft Long-Term Monitoring Plan, Union Chemical Company Site, September

Rizzo Associates, 2005. Thirty-sixth Periodic/First Long Term Monitoring of Surface Water and Groundwater (Fall 2004), Union Chemical Company Site; March

Rizzo Associates, 2006. Bedrock Well Pump Tests/Bedrock Aquifer Drawdown Report, Union Chemical Company Site, February

Rizzo Associates, 2007. 2006 Well Decommissioning Report, Union Chemical Company Site, February

Rizzo Associates, 2007. Thirty-seventh Periodic/Second Long Term Monitoring of Surface Water and Groundwater (Fall 2006), Union Chemical Company Site; March

Rizzo Associates, 2007. Letter Report, Human Health Risk Evaluation Using the Johnson & Ettinger Vapor Intrusion into Indoor Air Model; March

Rizzo Associates, 2007. Hydrogen Peroxide Additions Report – 2005, Union Chemical Company Site; April

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

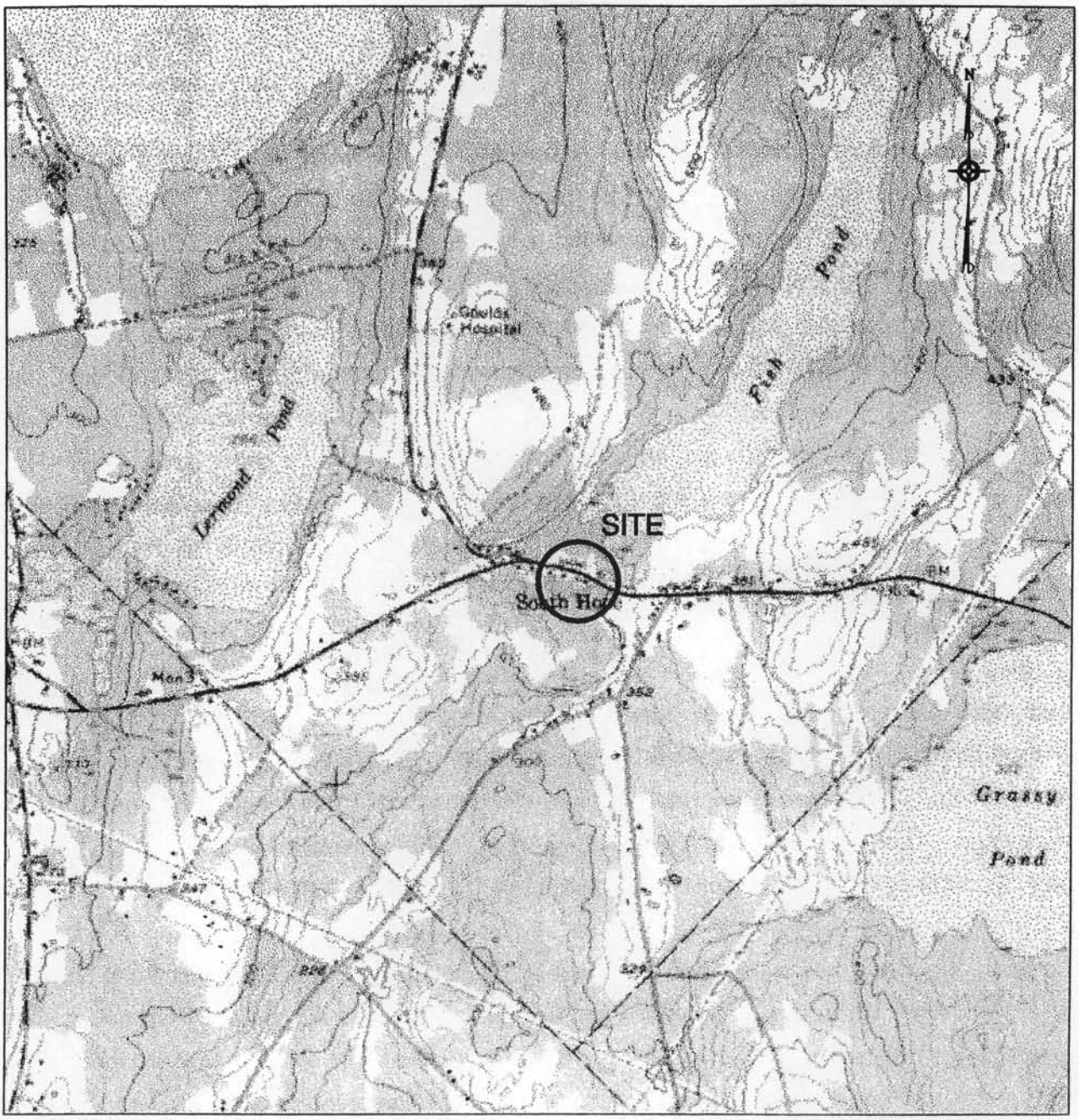
USEPA, 2001. Explanation of Significant Differences, Union Chemical Company Site; September

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

USEPA, 2002. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*; November

UNION CHEMCIAL COMPANY SITE
SECOND FIVE-YEAR REVIEW

FIGURES



THIS MAP IS A PORTION OF THE WEST ROCKPORT, MAINE QUADRANGLE, 1955, PHOTOINSPECTED 1988, PHOTOREVISED 1973.

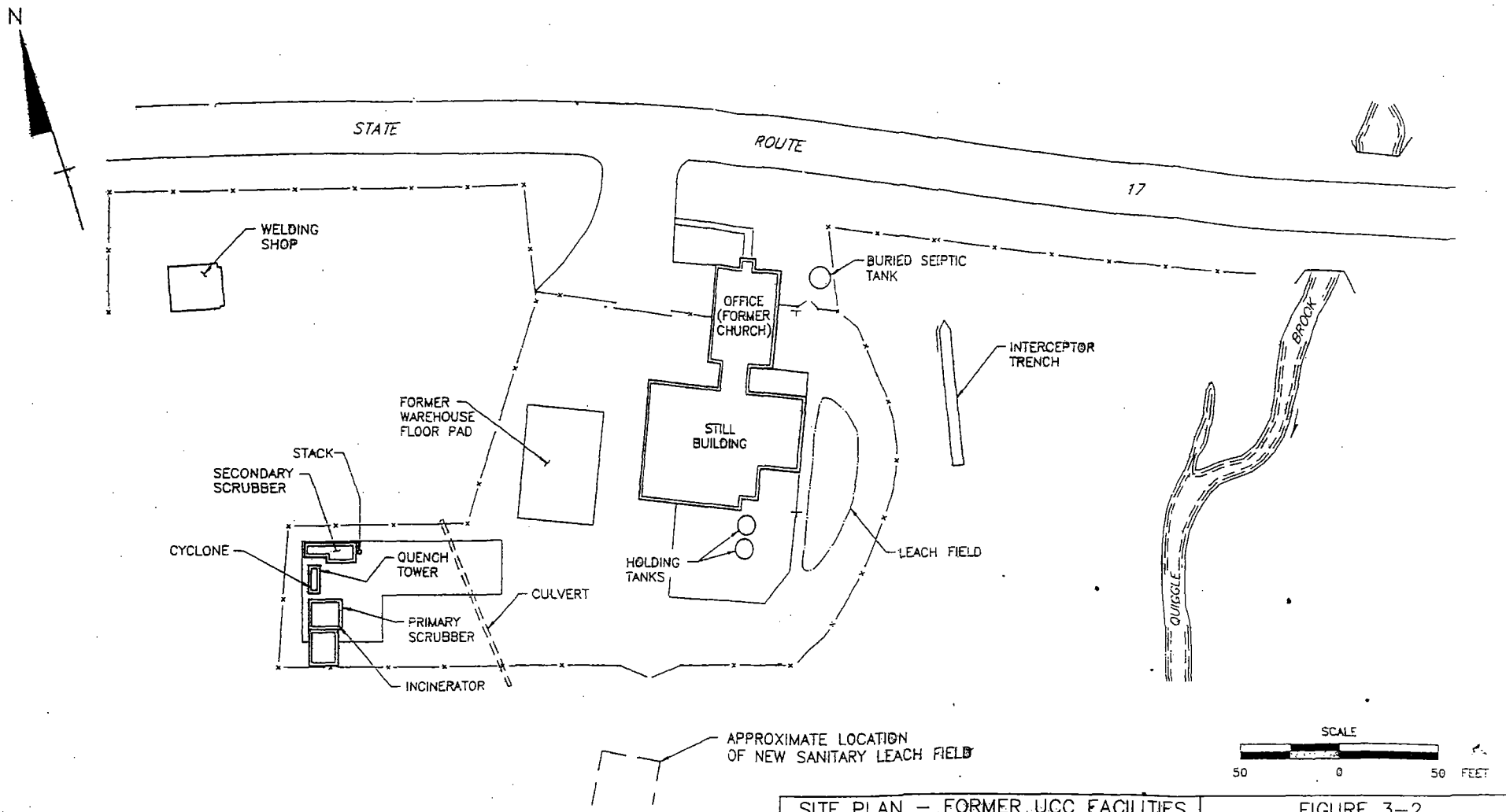
QUADRANGLE LOCATION

GRAPHIC SCALE

0′ 2000′

1 INCH = 2000± FEET

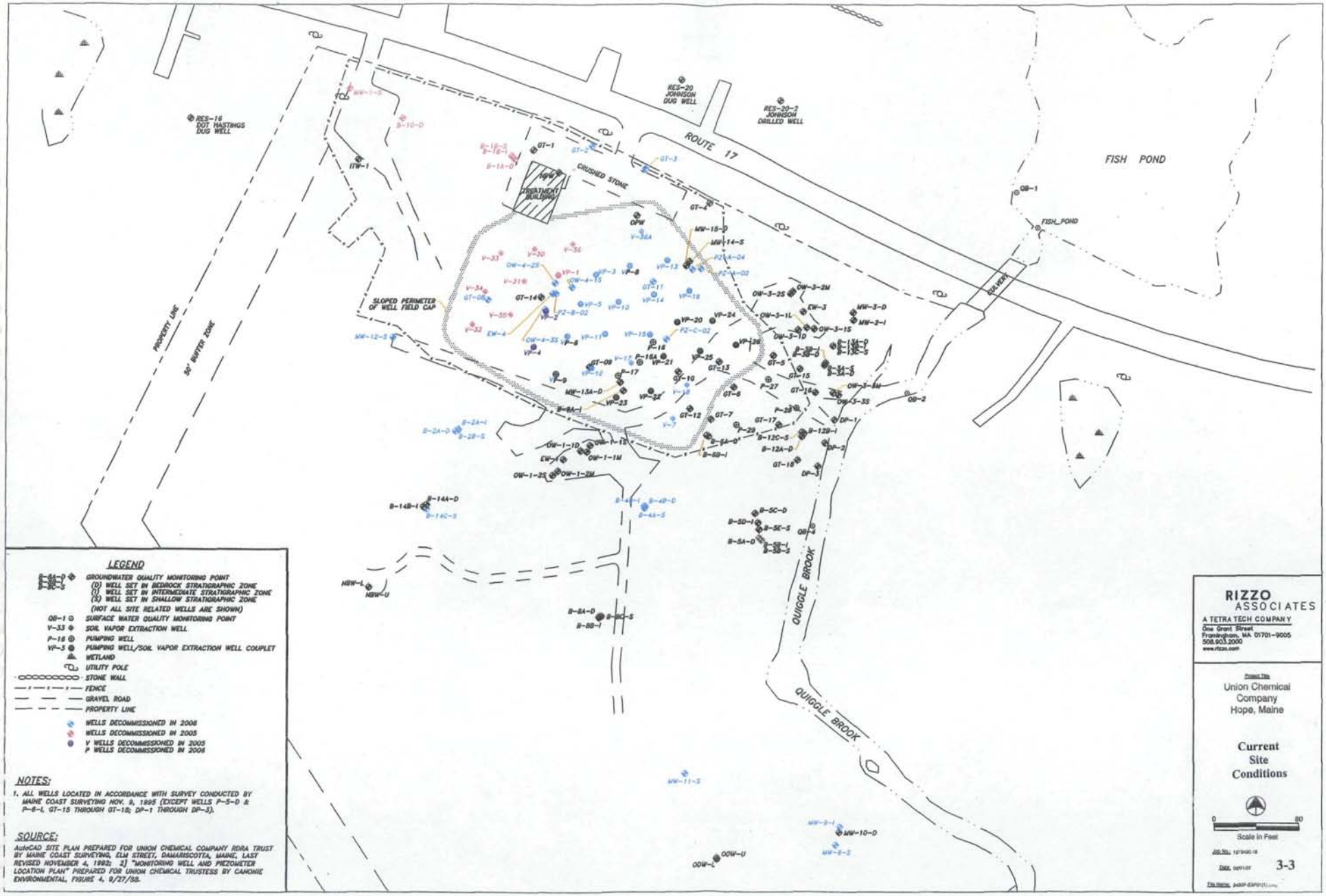
SITE LOCATION MAP		FIGURE 3–1
UNION CHEMICAL COMPANY SITE – FIVE YEAR REVIEW		
SOUTH HOPE, MAINE		
DRAWN BY: R.G. DEWSNAP	REV.: 0	
CHECKED BY: P. CALL	DATE: JULY 9, 2002	
SCALE: 1" = 2000 ±'	ACAD NAME: \DWG\4255\0600\SITE_LOC.DWG	

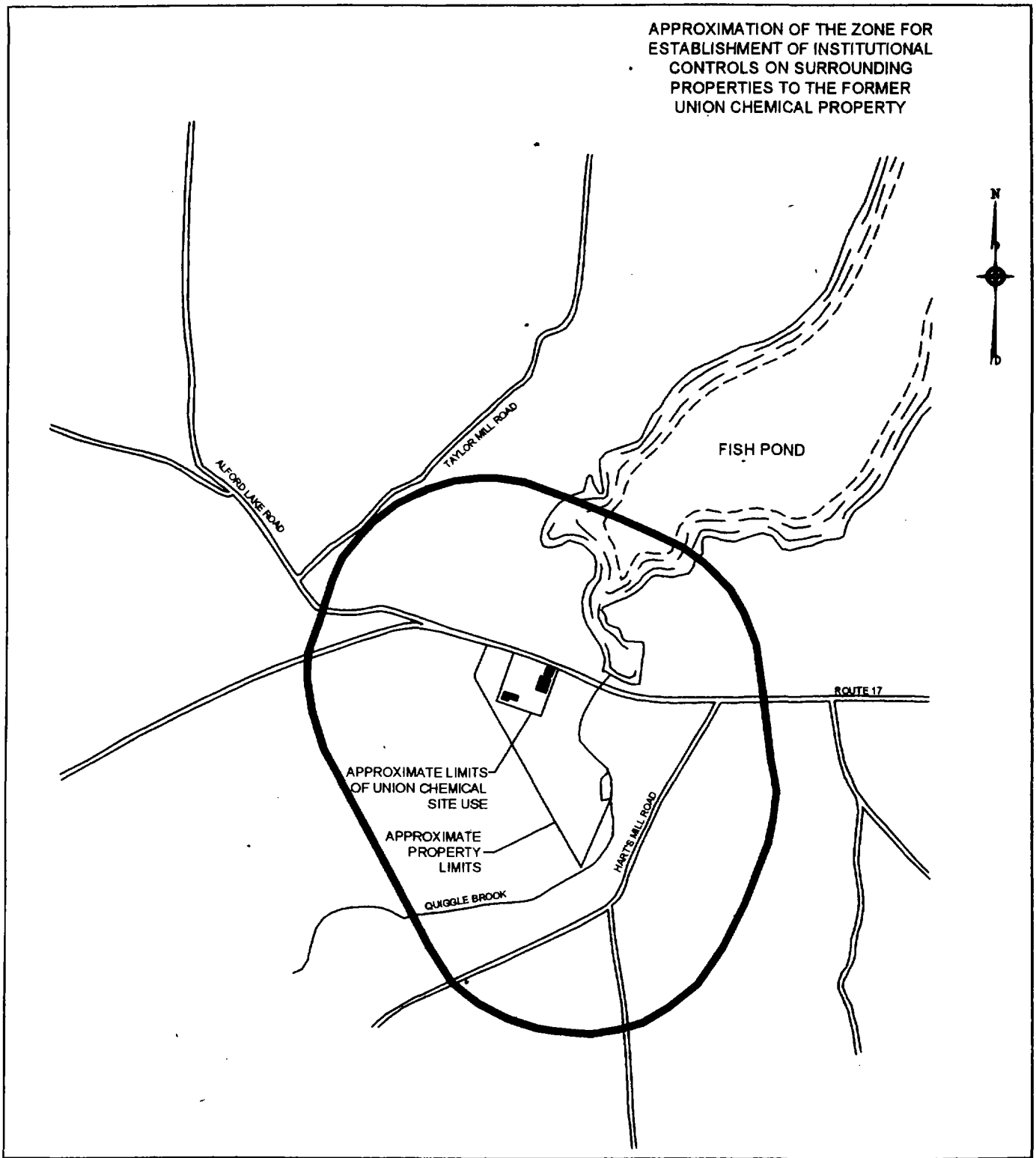


NOTES:

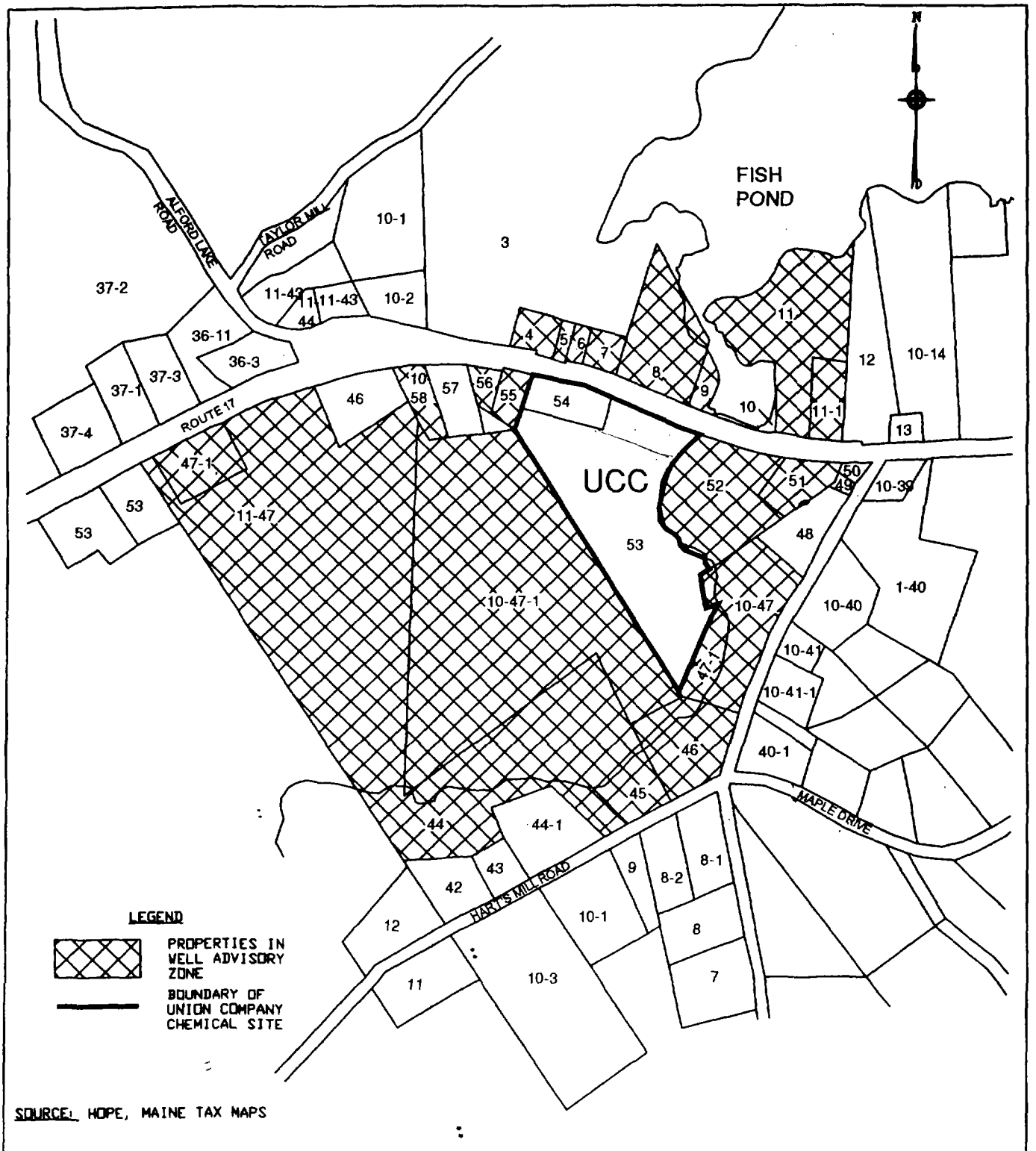
1. PLAN ADAPTED FROM A PLAN BY CANONIE ENVIRONMENTAL, ENTITLED: SITE PLAN REMEDIAL INVESTIGATION SOUTH HOPE, MAINE PREPARED UNION CHEMICAL TRUSTEES", DATED: 2-13-90, FIGURE 2, DRAWING NUMBER 87-072-B176.
2. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
3. PLAN NOT TO BE USED FOR DESIGN.

SITE PLAN – FORMER UCC FACILITIES		FIGURE 3-2
UNION CHEMICAL COMPANY SITE – FIVE YEAR REVIEW		
SOUTH HOPE, MAINE		
DRAWN BY: R.G. DEWSNAP	REV.: 0	
CHECKED BY: P. CALL		
SCALE: AS SHOWN		


ROUTE 17
FISH POND
FISH_POND
RES-20 JOHNSON DUG WELL
RES-20-2 JOHNSON DRILLED WELL
RES-16 DOT HASTINGS DUG WELL
CRUSHED STONE
TREATMENT BUILDING
SLOPED PERIMETER OF WELL FIELD CAP
PROPERTY LINE
50' BUFFER ZONE
QUIGGLE BROOK
QUIGGLE BROOK
RIDA HERE
LEGEND
GROUNDWATER QUALITY MONITORING POINT
(0) WELL SET IN BEDROCK STRATIGRAPHIC ZONE
(I) WELL SET IN INTERMEDIATE STRATIGRAPHIC ZONE
(S) WELL SET IN SHALLOW STRATIGRAPHIC ZONE
(NOT ALL SITE RELATED WELLS ARE SHOWN)
SURFACE WATER QUALITY MONITORING POINT
SOIL VAPOR EXTRACTION WELL
PUMPING WELL
PUMPING WELL/SOIL VAPOR EXTRACTION WELL COUPLET
WETLAND
UTILITY POLE
STONE WALL
FENCE
GRAVEL ROAD
PROPERTY LINE
WELLS DECOMMISSIONED IN 2006
WELLS DECOMMISSIONED IN 2005
V WELLS DECOMMISSIONED IN 2005
P WELLS DECOMMISSIONED IN 2006
NOTES:
1. ALL WELLS LOCATED IN ACCORDANCE WITH SURVEY CONDUCTED BY MAINE COAST SURVEYING NOV. 9, 1995 (EXCEPT WELLS P-5-D & P-8-I, GT-15 THROUGH GT-18; DP-1 THROUGH DP-3).
SOURCE:
AutoCAD SITE PLAN PREPARED FOR UNION CHEMICAL COMPANY RDRA TRUST BY MAINE COAST SURVEYING, ELM STREET, DAMARISCOTTA, MAINE, LAST REVISED NOVEMBER 4, 1992; 2) "MONITORING WELL AND PIEZOMETER LOCATION PLAN" PREPARED FOR UNION CHEMICAL TRUSTEES BY CAMONIE ENVIRONMENTAL, FIGURE 4, 9/27/88.
RIZZO ASSOCIATES
A TETRA TECH COMPANY
One Grant Street
Framingham, MA 01701-9005
508.903.2000
www.rizzo.com
Project Title
Union Chemical Company
Hope, Maine
Current Site Conditions
0
80
Scale in Feet
Job No. 12190.18
Date 09/11/07
3-3

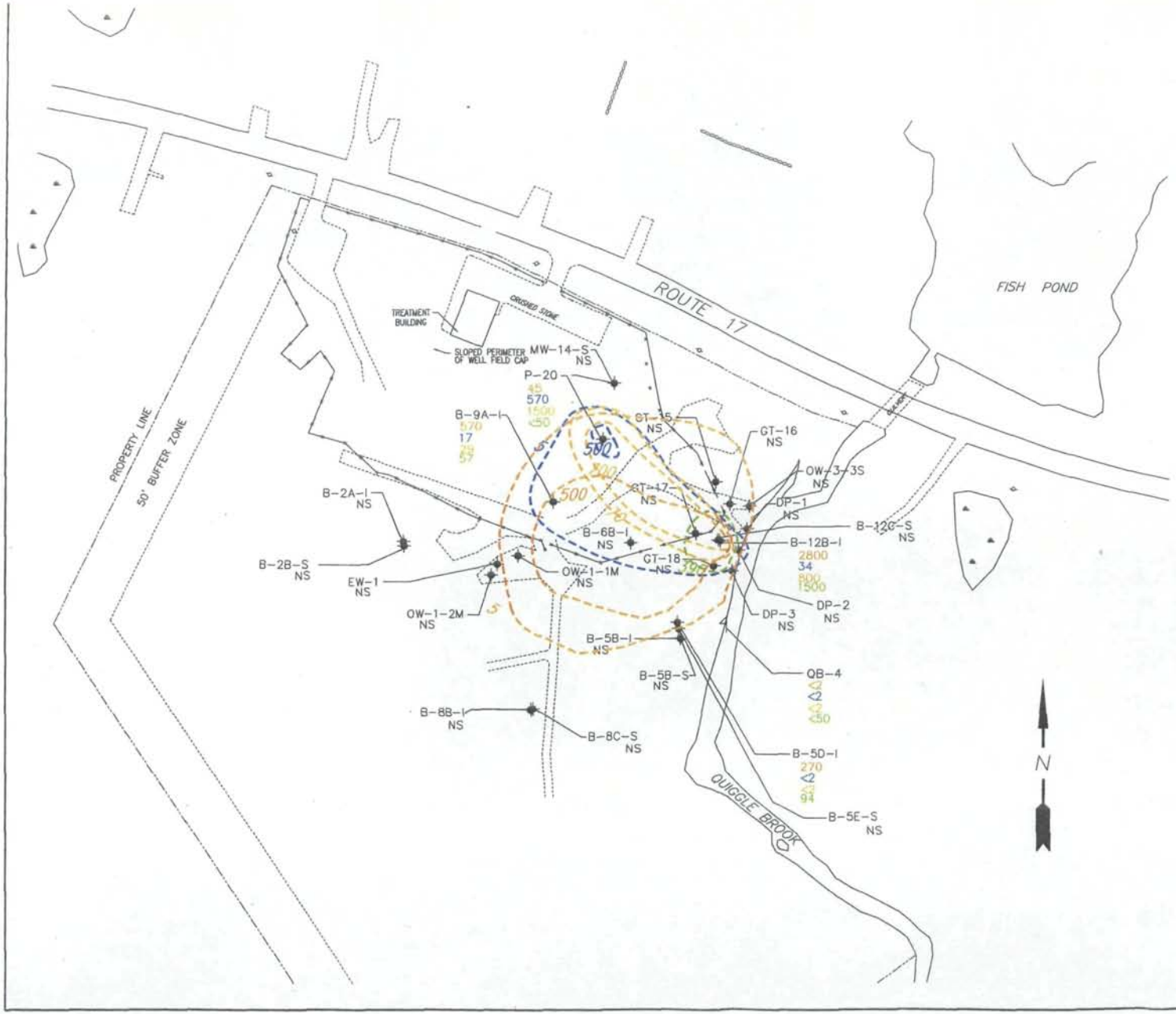


WELL ADVISORY ZONE – 1992			FIGURE 4–1
UNION CHEMICAL COMPANY SITE – FIVE YEAR REVIEW			
SOUTH HOPE, MAINE			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	P. CALL	DATE:	AUGUST 29, 2002
SCALE:	NOT TO SCALE	ACAD NAME:	DWG\4255\0600\FIG_4-1.DWG



SOURCE: HOPE, MAINE TAX MAPS

WELL ADVISORY ZONE – 2001	FIGURE 4-2
UNION COMPANY CHEMICAL 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	ACAD NAME: DWG\4255\0600\FIG_4-2.DWG



LEGEND

4 SURFACE WATER QUALITY MONITORING POINT

GROUNDWATER QUALITY MONITORING POINT

(D) WELL SET IN BEDROCK STRATIGRAPHIC ZONE
(I) WELL SET IN INTERMEDIATE STRATIGRAPHIC ZONE
(S) WELL SET IN SHALLOW STRATIGRAPHIC ZONE

NOT ALL SITE RELATED WELLS ARE SHOWN

SAMPLING DATES: November 2004

SITE SPECIFIC PERFORMANCE STANDARDS

4 – 1,1-DICHLOROETHANE (µg/L)
5 – TRICHLOROETHENE (µg/L)
70 – CIS 1,2-DICHLOROETHENE (µg/L)
390 – DIMETHYLFORMAMIDE (µg/L)

< or U – LESS THAN METHOD DETECTION LIMIT
– – – – – – – INFERRED ISOCONCENTRATION CONTOUR (µg/L)
J – ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED QUANTITY
D – CONSTITUENT IDENTIFIED IN DILUTED SAMPLE
B – CONSTITUENT IDENTIFIED IN TRIP BLANK
( ) – CONCENTRATION NOT USED IN CONTOURING
NA – NOT ANALYZED
NS – NOT SAMPLED
STONE WALL
WETLAND
UTILITY POLE
FENCE

MAP SOURCE: 1) AUTOCAD SITE PLAN PREPARED FOR UNION CHEMICAL COMPANY RORA TRUST BY MAINE COAST SURVEYING, ELM STREET, DAMARISCOTTA, MAINE, LAST REVISED NOVEMBER 4, 1992; 2) "MONITORING WELL AND PIEZOMETER LOCATION PLAN" PREPARED FOR UNION CHEMICAL TRUSTESS BY CANONIE ENVIRONMENTAL, FIGURE 4, 9/27/88.

ALL WELLS LOCATED IN ACCORDANCE WITH SURVEY CONDUCTED BY MAINE COAST SURVEYING NOV. 9, 1995 (EXCEPT WELLS GT-15 THROUGH GT-18; DP-1, DP-2, DP-3, B-5C-D, B-5D-I, B-5E-S, NBW-U, NBW-L).

RIZZO ASSOCIATES
A TETRA TECH COMPANY
One Grant Street
Framingham, MA 01701-9005
508.903.2000
www.rizzo.com

Project Title:
Union Chemical Company
Hope, Maine

Drawing Title:
OVERBURDEN
PLUME EXTENTS
Q37/LTM-2 - October 2006

0 100
Scale in Feet

Job No. 2420-1

Date: 04/02/07

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6-1

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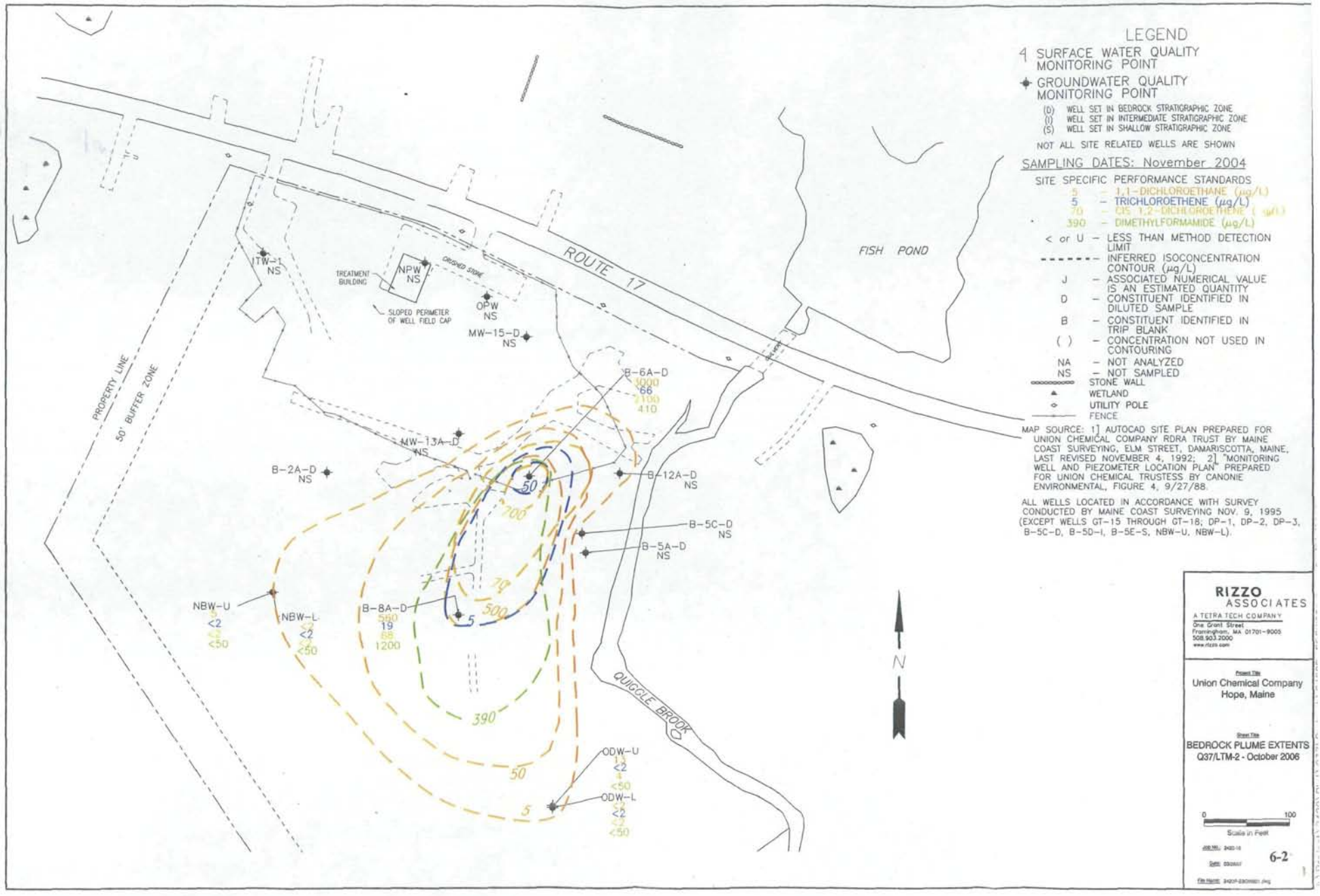
LEGEND
SURFACE WATER QUALITY MONITORING POINT
GROUNDWATER QUALITY MONITORING POINT
(D) WELL SET IN BEDROCK STRATIGRAPHIC ZONE
(I) WELL SET IN INTERMEDIATE STRATIGRAPHIC ZONE
(S) WELL SET IN SHALLOW STRATIGRAPHIC ZONE
NOT ALL SITE RELATED WELLS ARE SHOWN
SAMPLING DATES: November 2004
SITE SPECIFIC PERFORMANCE STANDARDS
5 – 1,1-DICHLOROETHANE (µg/L)
5 – TRICHLOROETHENE (µg/L)
70 – CIS 1,2-DICHLOROETHENE (µg/L)
390 – DIMETHYLFORMAMIDE (µg/L)
< or U – LESS THAN METHOD DETECTION LIMIT
– – – – – – – INFERRED ISOCONCENTRATION CONTOUR (µg/L)
J – ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED QUANTITY
D – CONSTITUENT IDENTIFIED IN DILUTED SAMPLE
B – CONSTITUENT IDENTIFIED IN TRIP BLANK
( ) – CONCENTRATION NOT USED IN CONTOURING
NA – NOT ANALYZED
NS – NOT SAMPLED
STONE WALL
WETLAND
UTILITY POLE
FENCE
MAP SOURCE: 1] AUTOCAD SITE PLAN PREPARED FOR UNION CHEMICAL COMPANY RDRA TRUST BY MAINE COAST SURVEYING, ELM STREET, DAMARISCOTTA, MAINE, LAST REVISED NOVEMBER 4, 1992; 2] "MONITORING WELL AND PIEZOMETER LOCATION PLAN" PREPARED FOR UNION CHEMICAL TRUSTESS BY CANONIE ENVIRONMENTAL, FIGURE 4, 9/27/88.
ALL WELLS LOCATED IN ACCORDANCE WITH SURVEY CONDUCTED BY MAINE COAST SURVEYING NOV. 9, 1995 (EXCEPT WELLS GT-15 THROUGH GT-18; DP-1, DP-2, DP-3, B-5C-D, B-5D-I, B-5E-S, NBW-U, NBW-L).
ROUTE 17
FISH POND
PROPERTY LINE
50' BUFFER ZONE
TREATMENT BUILDING
NPW NS
DRIVED STONE
SLOPED PERIMETER OF WELL FIELD CAP
OPW NS
ITW-1 NS
MW-15-D NS
MW-13A-D NS
B-2A-D NS
B-6A-D 3000 66 1100 410
B-12A-D NS
B-5C-D NS
B-5A-D NS
B-8A-D 590 19 69 1200
NBW-U 3 <2 <2 <50
NBW-L <2 <2 <2 <50
ODW-U 3 <2 4 <50
ODW-L <2 <2 <2 <50
50
700
70
500
5
390
50
5
QUIGGLE BROOK
N
RIZZO ASSOCIATES
A TETRA TECH COMPANY
One Grant Street
Framingham, MA 01701-9005
508.903.2000
www.rizzo.com
Project Title
Union Chemical Company
Hope, Maine
Sheet Title
BEDROCK PLUME EXTENTS
Q37/LTM-2 - October 2006
0 100
Scale in Feet
6-2

APPENDIX A

UNION CHEMICAL COMPANY SITE
SECOND FIVE-YEAR REVIEW

SITE INSPECTION CHECKLIST

APPENDIX A

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Union Chemical Company	**Date of inspection: July 24, 2007**
Location and Region: South Hope, Maine; Region 1	**EPA ID: MED042143883**
Agency, office, or company leading the five-year review: EPA	**Weather/temperature: Sunny, mid 70's**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- X Institutional controls
- X Groundwater pump and treatment
- ☐ Surface water collection and treatment
- X Other Soil Vapor Extraction
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager:** **Bob Ankstitus** (Name) Sr. Project Manager (Title) July 24, 2007 (Date)
   Interviewed **X** at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached: **No problems noted with site activities now down to groundwater and surface water monitoring.**

2. **O&M staff:** **N/A** (Name) _____ (Title) _____ (Date) _____
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ 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 (Name) Project Manager (Title) July 24, 2007 (Date) 207 287-8554 (Phone no.)
Problems; suggestions; ☐ Report attached: **MEDEP has voiced concerns about not knowing the precise extent of the bedrock plume, and long-term access and restrictions.**

Agency: Town of Hope
Contact: Jonathon Duke (Name) Town Administrator (Title) July 25, 2007 (Date) 207 763-4199 (Phone no.)
Problems; suggestions; ☐ Report attached: **Transfer of the property from State receivership is the first step for reuse of the property, and clarification of the ROW will also be needed.**

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; July 24, 2007; 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 less items that need to be secured.

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

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house X Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

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

Describe costs and reasons: _____

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

A. Fencing

1. **Fencing damaged** X Location shown on site map ☐ Gates secured ☐ N/A

Remarks: **Main vehicle gate is typically closed but not locked. Other two vehicle gates are not typically closed. Pedestrian gate near Quiggle Brook typically locked. However because the requirement for restricted access under the ROD was only while active remediation was occurring this is no longer a necessary requirement to ensure protectiveness of the remedy.**

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map X N/A

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes **X** No* ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes **X** 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 ten times a year**
Responsible party/agency: PRPs
Contact: Randy Smith
Name Title Date Phone no.

Reporting is up-to-date **X** Yes ☐ No ☐ N/A
Reports are verified by the lead agency **X** Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met **X** Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No **X** N/A
Other problems or suggestions: ☐ Report attached

***There have been periodic installations of bedrock wells in the well advisory zone without the requested notification of the agencies. The well advisory zone is now smaller and may be easier to monitor; however, this control should be revaluated and revised as appropriate. Controls should be placed on the property prior to being removed from receivership. Institutional controls to address vapor intrusion issues may also be necessary.**

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

Remarks: **As long as the property remains in receivership status, held by MEDEP, the site ICs are adequate. Controls should be placed on the Site property prior to being removed from receivership.**

There have been periodic installations of bedrock wells in the well advisory zone without the requested notification of the agencies. The well advisory zone is now smaller and may be easier to monitor; however, this control should be revaluated and revised as appropriate.

Institutional controls to address vapor intrusion issues may also be necessary.

D. General

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

Remarks_____

2. **Land use changes on site X** 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 **X** Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map **X** 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 revegetating. 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: Remaining active wells that are not secure should be secured and periodically revisited to confirm status.**

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

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

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

A. Groundwater Extraction Wells, Pumps, and Pipelines **X** Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
X Good condition ☐ All required wells properly operating ☐ Needs Maintenance **X** 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 **X** N/A
Remarks

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

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

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping X Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   X 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, but the GAC has been periodically used during in-situ additions and pump tests.**

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A X 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 PRPs' contractor is offsite.**

3. **Tanks, Vaults, Storage Vessels**
   X N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   X N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A X Good condition (esp. roof and doorways) ☐ Needs repair
   X Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked☐ Functioning ☐ Routinely sampled X Good condition
   X All required wells located X Needs Maintenance ☐ N/A
   Remarks: **Some of the wells are not secured.**

D. Monitoring Data

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

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

E. Monitored Natural Attenuation X N/A

1. **Monitoring Wells** (natural attenuation remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks _____

X. OTHER REMEDIES

If there are remedies applied at the site that 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.

Soil vapor extraction system was dismantled from 1999 to 2001.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
The Remedial Action Objective for the management of migration component of the remedy was restoration of the groundwater to drinking water quality. The pump-and-treat system operated from 1996 to 2000. The MOM component has been augmented with three separate in-situ additions. The RAO has not been attained with all these efforts, and it is uncertain that it can be attained through active remedial measures. There is currently no ongoing active remediation. Monitoring indicates that the contaminant plume is stable. Institutional controls at site should be revisited.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
With the termination of pump-and-treat, there has not been a need for system O&M. Equipment is stored in the treatment building so that it can be used when needed, such as during the in-situ additions or pump tests. Monitoring wells are not always secure. Measures should be taken to address this issue.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
There are no indications of remedy problems itself.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.
It is anticipated that the Site will soon proceed to a long-term monitoring phase. This transition will require a Long-Term Monitoring Plan that will set forth location and frequency of sampling as well as routine site inspections.

APPENDIX B

UNION CHEMICAL COMPANY SITE
SECOND FIVE-YEAR REVIEW

ARARS AND TBCS

CHEMICAL-SPECIFIC ARARS AND TBC CRITERIA

REQUIREMENT/GUIDANCE	STATUS	REQUIREMENT/GUIDANCE SYNOPSIS
GROUNDWATER		
Federal Regulatory Requirements and Guidance		
SDWA- Section 1412 (MCLs) 40 CFR 141.11 – 141.16	Relevant and Appropriate	MCLs have been promulgated for several organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered for groundwater aquifers uses for drinking water
SDWA- Section 1412 (MCLGs) 40 CFR 141.50 – 141.51	Relevant and Appropriate	MCLGs are health-based criteria established for a number of organic and inorganic contaminants as water quality goals for drinking water supplies
EPA Risk Reference Doses (RfDs) Integrated Risk Information System	TBC	RFDs are guidance values used to evaluate the potential non-carcinogenic hazard caused by exposure to site contaminants
EPA Cancer Slope Factors IRIS	TBC	CSFs are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to site contaminants
Proposed MCLs and MCLGs	TBC	Proposed MCL and proposed non-zero MCLGs were considered in establishing the groundwater cleanup goals
State of Maine Regulatory Requirements and Guidance		
Standards for Classification of Groundwater (38 MSRA, Chapter 3, Section 470	Applicable	Groundwater is classified under the Maine standards. The groundwater at the UCC Site is classified as GW-A (i.e., water shall be of such quality that it can be used for domestic purposes)
Drinking Water Rules (10-144A CMR Chapter 231-233	Relevant and Appropriate	Maine's Primary Drinking Water Standards are equivalent to federal MCLs
1992 Maximum Exposure Guidelines (MEGs) for Drinking Water (Bureau of Health)	Relevant and Appropriate	MEGs are the Bureau of Health's recommendations for concentrations of chemical contaminants in drinking water. The 1992 MEGs were promulgated by reference in Rule 10-144A CMR Chapter 233
2006 MEGs	To Be Considered	2006 MEGs are the BOH's most recent recommendations for concentrations of chemical compounds in drinking water. These are health-based guidelines and are not legally enforceable

CHEMICAL-SPECIFIC ARARS AND TBC CRITERIA (CONTINUED)

SURFACE WATER		
Federal Guidance		
Clean Water Act, Section 304(a) Ambient Water Quality Criteria	Relevant and Appropriate	Federal AWQC include health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and other water quality parameters protective of fish and aquatic life. AWQC for the protection of human health provide levels for exposure from drinking water and consuming aquatic organisms, and from consuming fish alone. Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release
National Recommended Water Quality Criteria (Federal Register, Part IV, FRL-OW-6186a, December 1998	To Be Considered	This guidance describes the recommended criteria for 157 pollutants used in implementing environmental programs
State of Maine Regulatory Requirements and Guidance		
Statewide Water Quality Criteria 38 MSRA Section361-A 06-096 CMR Chapter 530.5	Applicable	These standards pertain to surface water quality statutes for the State of Maine

ACTION-SPECIFIC ARARS AND TBC CRITERIA

REQUIREMENT/GUIDANCE	STATUS	REQUIREMENT/GUIDANCE SYNOPSIS
GROUNDWATER		
State of Maine Regulatory Requirements and Guidance		
Hazardous Waste Management Rules (06-096 CMR Chapters 800-802, 850, 851, 854, 856,857	Applicable	These rules incorporate RCRA hazardous waste regulations, including standards for hazardous waste facilities and manifesting requirements.
Underground Injection Control Program 38 MSRA Sec 413(1-B), Chapter 543	Applicable	These rules regulate the use of wells to inject substances into the subsurface, specifically "injection wells used to help clean up contaminated groundwater, either by injecting solutions to neutralize contamination or to return previously contaminated groundwater that has been treated"
Water Pollution Control Law 38 MSRA Sec 411, et seq, and regulations in Chapter 580, 581, and 584	Applicable	This law regulates the discharge of waste to surface water bodies. Treated groundwater discharged to Quiggle Brook must achieve federal AWQC for the beneficial uses of the brook, or site-specific numerical criteria

LOCATION-SPECIFIC ARARS AND TBC CRITERIA

REQUIREMENT/GUIDANCE	STATUS	REQUIREMENT/GUIDANCE SYNOPSIS
GROUNDWATER		
State of Maine Regulatory Requirements and Guidance		
Standards for Classification of Groundwater 38 MSRA, Sections 465-C and 470	Applicable	Groundwater is classified under the Maine standards. The groundwater at the UCC is classified as GW-A, i.e., water shall be of such quality that it can be used for domestic purposes
SURFACE WATER		
State of Maine Regulatory Requirements and Guidance		
Water Pollution Control Law 38 MSRA Sec 411, et seq, and regulations in Chapter 580, 581, and 584	Applicable	This law regulates the discharge of waste to surface water bodies. Treated groundwater discharged to Quiggle Brook must achieve federal AWQC for the beneficial uses of the brook, or site-specific numerical criteria
Standards for Classification of Fresh Surface Waters 38 MSRA Section 468	Applicable	Quiggle Brook is classified as a tributary to a Class GPA water (Crawford Pond) and a Class B water under State water quality standards
WETLANDS/FLOODPLAIN		
Federal Regulatory Requirements and Guidance		
Executive Order 11990, Protection of Wetlands 40 CFR, Part 6, Appendix A	Applicable	The Wetlands Executive Order requires federal agencies to minimize the destruction. Loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands
Executive Order 11988, Floodplain Management 40 CFR, Part 6, Appendix A	Applicable	This Executive Order requires that a remedial action must reduce the risk of floodplain loss, and restore and preserve the natural and beneficial values served by floodplains
State of Maine Regulatory Requirements and Guidance		
Natural Resources Protection Act 38 MSRA, Section 480-A and Permit By Rule Standards Chapter 305 and 310	Relevant and Appropriate	This law and its regulations prohibit the degradation of streams and brooks by prohibiting alterations in or adjacent to protected natural areas without a permit. At the UCC Site, removal of soil or alteration of structures next to Quiggle Brook must not cause unreasonable soil erosion, and must meet other standards

APPENDIX C

UNION CHEMICAL COMPANY SITE
SECOND FIVE-YEAR REVIEW

MEDEP CONCURRENCE LETTER

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAVID P. LITTELL
COMMISSIONER

September 27, 2007

Mr. Terrence Connelly
U.S. EPA, Reg. 1
1 Congress Street
Suite 1100 (HBT)
Boston, MA 02114-2023

Re: **Review of September 2007 "Second Five-Year Review Report" for the Union Chemical Company Superfund Site, Hope, Maine" received September 25, 2007**

Dear Mr. Connelly:

The Maine Department of Environmental Protection (MEDEP) has reviewed the revised draft "Second Five-Year Review Report" text for the Union Chemical Company Superfund Site, Hope, Maine which was prepared by the U.S. Environmental Protection Agency (EPA) and submitted to us on September 25, 2007. Additionally, MEDEP has revisited our January 9, 2003, comment letter on the Five-Year Review Report for the Union Chemical Co. Superfund Site dated September 2002.

The MEDEP agrees with the 7 (seven) issues identified in Issues section of the Five-Year Review Summary Form of the report and concurs with the recommendations and follow-up actions listed in the Five-Year Review Summary Form and in Section 9.0.

The MEDEP is pleased that issues concerning deep bedrock contamination and institutional controls have been identified in this Second Five-Year Review Report. In our January 9, 2003, comment letter on the September 2002 Five-Year Review Report, MEDEP expressed concern that "...contamination in deep bedrock has been detected but not fully characterized and evaluated to determine what, if anything needs to be done" and doubts regarding how effective the "...permanent restriction that runs with the property was placed on the use of residential well #20-2..." and the well advisory zone institutional controls are.

Lastly, the MEDEP appreciates the opportunity to be part of the Five-Year Review Report review team and we look forward to working collaboratively with EPA in the future. If you have any questions or concerns regarding this letter, please contact me directly at (207) 287-8554 or at (207) 287-2651.

Sincerely,

Rebecca L. Hewett, Project Coordinator
Division of Remediation
Bureau Remediation & Waste Management

pc: Mary Jane O'Donnell, EPA
Ted Wolfe, MEDEP

5-yrReview draft 9-2007.doc

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