EXPLANATION OF SIGNIFICANT DIFFERENCES

FOR THE

SILRESIM CHEMICAL CORPORATION SUPERFUND SITE

LOWELL, MASSACHUSETTS

September 2008

U.S. Environmental Protection Agency
Region I – New England
Boston, MA

Silresim Chemical Corporation Superfund Site
Explanation of Significant Differences
September 2008

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I. INTRODUCTION

A. Site Name and Location

Site Name: Silresim Chemical Corporation Superfund Site

Site Location: City of Lowell, Middlesex County, Massachusetts

B. Lead and Support Agencies

Lead Agency: United States Environmental Protection Agency (EPA)

Support Agency: Massachusetts Department of Environmental Protection (MassDEP)

C. Legal Authority

Under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617(c), Section 300.435(c) of the National Contingency Plan (NCP), 40 C.F.R. § 300.435(c)(2)(I) and EPA guidance, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-02, if EPA determines that differences in the remedial action significantly change but do not fundamentally alter the remedy selected in the Record of Decision (ROD) with respect to scope, performance, or cost, EPA shall publish an Explanation of Significant Differences (ESD) between the remedial action being undertaken and the remedial action set forth in the ROD or any preceding ESDs and the reasons such changes are being made.

D. Summary of Circumstances Necessitating this Explanation of Significant Differences

This ESD documents three (3) significant changes to the remedy for the Silresim Chemical Corporation Superfund Site (Site). Two of the changes are specific to the original remedy described in the 1991 ROD and the third is an update to clean-up goals (CUGs) that were previously memorialized in a 2003 ESD.

Significant changes to the ROD-specified remedy

The 1991 ROD described both Source Control (SC) and Management of Migration (MOM) response actions as integral parts of a comprehensive remedy for the Site. Specifically, the ROD-specified Source Control remedy ("SC-4") consisted of in-situ soil-vapor extraction (SVE) of approximately 137,000 cubic-yards (cy) of contaminated soil. Following treatment, soil with residual (non-volatile organic compound (non-VOC)) contamination would be excavated, stabilized, and placed under a Resource Conservation and Recovery Act (RCRA) Subtitle C Hazardous Waste Landfill Cap. It was estimated that approximately 18,000 cy of material would require stabilization and subsequent placement under the final cap.

Traditional SVE was evaluated, designed, and implemented for a period of approximately 14 months; however, due to unfavorable hydrogeological conditions, such as a high water table and low permeability soils, this treatment technology ceased in 1999. Because traditional SVE was not sufficiently effective, other similar alternatives were evaluated to determine if another technology would be more successful in addressing VOCs at the Site. Based upon that evaluation, the first significant change memorialized by this ESD is the substitution of "thermally-enhanced" SVE such as Electrical Resistance Heating (ERH) to replace traditional SVE as the cleanup technology for soil.

The second change is regarding the ROD's provision for the stabilization/solidification of up to 18,000 cubic yards of soil. As part of the recent evaluation of the design for the cap at the site, EPA determined that the anticipated cap design is sufficient to reduce contaminant mobility and comply with applicable and/or relevant and appropriate requirements and that the additional reduction to contaminant mobility afforded by stabilization is not required.

Significant change to the 2003 ESD

In addition to the changes noted above, a third significant change is being memorialized by this ESD. In 2003, an ESD was prepared which documented revised Groundwater and Soil clean-up goals (CUGs). Based on recent (2007) correspondence from the City of Lowell regarding the potential future uses of the site and updated toxicological data, CUGs were again recalculated. These revised CUGs are now formally incorporated into the clean-up goals for the Site.

E. Availability of Documents

This ESD and supporting documentation shall become part of the Administrative Record for the Site as per the National Contingency Plan (NCP 300.825(a)(2)). The Administrative Record, including its index, is available to the public at the following locations and may be reviewed at the times listed below:

U.S. Environmental Protection Agency
Records Center
One Congress Street
Boston, MA 02114
Monday through Friday from 10:00 a.m. to 1:00 p.m. and
from 2:00 p.m. to 5:00 p.m.

Pollard Memorial Library
401 Merrimack Street
Lowell, Massachusetts 01852
Ph: 978.970.4120
Monday through Thursday from 9:00 a.m. to 9:00 p.m., and
Friday from 9:00 a.m. to 5:00 p.m.

II. SUMMARY OF SITE HISTORY, CONTAMINATION PROBLEMS, AND SELECTED REMEDY

A. Site History and Contamination Problems

The Site is comprised of approximately 16 acres in an industrial area of Lowell, Massachusetts, just south of the City's central business district (see Figures 1 – Site Location Map). The 4.5-acre Silresim property was formerly owned and operated by the Silresim Chemical Corporation (Silresim) at 86 Tanner Street, and groundwater and soil contamination extended to other nearby properties.

The Silresim property is bordered by the Lowell Iron and Steel property to the north, the B&M railroad yard and tracks to the east/northeast, the Lowell Used Auto Parts and Tucci properties to the south, and Tanner Street to the west (see Figure 2 – Site Diagram). Residential areas are located south, east, and northeast of the Silresim property, with the closest residences located on Canada, Main, and Maple Streets, roughly 300 to 500 feet from the Silresim property boundary. River Meadow Brook is located approximately 400 feet west of the Silresim property and flows northeast and discharges into the Concord River. The Concord River joins the Merrimack River approximately 1 mile northeast of the Site. East Pond, a small, surface water body, is located about 300 feet to the east of the Silresim property.

An 8-foot high chain link fence surrounds the Silresim property. Most of the land surface within the fence is covered with a clay cap. Crushed stone has been placed on runoff areas along the northern and southern perimeter of the Silresim property to prevent direct contact with runoff from contaminated surface soils. The groundwater treatment plant (GWTP) required by the 1991 ROD occupies the central portion of the Silresim property and commenced operation in November 1995. The 10-year long-term remedial action (LTRA) period expired on September 24th, 2007 and operation of the treatment plant has since been transferred to the Commonwealth of Massachusetts (Commonwealth) acting through MassDEP.

The Site and its surrounding areas have been used for industrial activities since the early 1900s. From 1916 to 1971, several petroleum companies used the Silresim property as an oil and fuel storage depot. From 1971 through 1977, Silresim operated its chemical waste reclamation facility. The facility's primary operations included recycling and reclaiming various chemicals and consolidating wastes for off-site disposal.

The Massachusetts Division of Water Pollution Control (DWPC) granted the facility a hazardous waste collection and disposal permit in 1973. Wastes were accepted at the facility in drums, tank trucks, railroad tanker cars, and other containers. These substances included halogenated solvents, oily wastes, alcohols, plating wastes, metal sludge, and pesticide wastes. Although exact figures do not exist, it is estimated that the facility handled approximately 3 million gallons of waste per year.

Silresim filed for bankruptcy in late 1977 and abandoned the facility in January 1978, leaving behind approximately one million gallons of hazardous materials in drums and bulk tanks, including almost 30,000 decaying drums covering virtually all open areas of the 4.5-acre Silresim property. From 1978 to 1982, DWPC constructed a site fence, hired a 24-hour guard, removed liquid wastes in drums and aboveground tanks, constructed berms and absorbent-filled trenches to reduce the spread of waste through surface runoff, and conducted a series of studies of Site soils and groundwater.

In 1982, EPA proposed the Site for inclusion on the National Priorities List (NPL) and the site was subsequently listed on the NPL in 1983. In 1983, EPA monitored the air and sampled soils, and found contamination both on and off the Silresim property in soil and groundwater. In 1984, EPA raised the height of the fence and covered highly contaminated areas with 9 inches of crushed gravel and a clay cap. Subsequent sampling revealed an additional area of soil contamination that EPA similarly secured by extending the fence to prevent exposure. In 1986, EPA identified dioxin and the fence was reconstructed to prevent access by the public, and a gravel cover was placed over the dioxin-contaminated soil to prevent exposure by direct contact.

Between 1985 and 1990, Remedial Investigation (RI) and Feasibility Study (FS) activities were conducted to further characterize the Site. The RI assessed the type and extent of contaminants present and included human health and ecological risk assessments. Field activities conducted as part of the RI included monitoring well installation and the collection and analysis of groundwater, soil, sediment, surface water, and air samples. Soil sampling from areas beneath the clay cap as well as outside the fence determined the extent of soil contamination. The RI identified approximately 100 individual contaminants in on-site groundwater and soils. Volatile organic compounds were the primary contaminant type identified. Other contaminants which were identified included: semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, herbicides, pesticides and dioxin. Subsequent risk assessments were completed which evaluated the potential impacts from Site contaminants to human health and the environment. The RI provided baseline data required to evaluate potential clean-up actions.

In September 1991, EPA issued the ROD for the Site. The remedy selected in the ROD called for in-situ soil-vapor extraction (SVE). Soils with residual contamination (post-SVE treatment) would be consolidated, stabilized, and capped on-site. Contaminated groundwater would be extracted and treated by metals removal, air stripping, and vapor treatment prior to discharge to the City sewer system.

In early 1993, a Consent Decree between EPA and a group of potentially responsible parties (PRPs) was executed. Under this Consent Decree, the PRPs provided approximately $41 million in clean-up funding for the Site of which approximately $28 million was identified for Remedial Action and $13 million was given to the Commonwealth for long-term operation and maintenance (O&M) of the GWTP and cap.

Construction of the GWTP began in mid-1994 and groundwater extraction and treatment has been underway since November 1995. Initial response actions, including the installation of fencing and covering areas of contamination, have reduced the potential for accidental exposure and further migration of contaminated soils. Approximately 2,000 cy of surface soil contamination at off-property locations was consolidated onto the Silresim property and placed under an interim cap; this work was completed in 2005.

B. Summary of the Record of Decision

As was previously described, the 1991 ROD contemplated both a Management of Migration and Source Control remedy to provide a comprehensive remedy for the site. Each is discussed in more detail below.

Management of Migration

The ROD outlined the following objectives for the GWTP:

- Manage the migration of contaminated groundwater toward downgradient receptors of local building basements, River Meadow Brook, and East Pond;
- Capture as much of the contaminated plume as possible; and
- Drawdown the groundwater across the Site to support the Source Control remedy.

The groundwater extraction system has been unable to achieve the drawdown objective across the Site. However, the GWTP continues to operate and remove significant quantities of VOCs. Based on the most recent comprehensive groundwater sampling report, *Status Report 30* dated August 2007, approximately 5,150 pounds of total volatile organics were removed during the preceding year; the total quantity of volatiles removed since the plant's construction is 89 tons (178,000 pounds). Despite this mass removal via pump and treat technology, the plume remains relatively widespread, encompassing approximately 10 acres and includes both on- and off-property locations. *Status Report 30* also notes that 43 of the 57 wells that were sampled, the concentration of contaminants were either "stable or decreasing" or there was "insufficient data to ascertain a data trend". Thirteen of the wells were identified as potentially increasing. Continued treatment via groundwater pump and treat is required, and O&M of the GWTP was transfer to the MassDEP on September 24, 2007. Based on a report entitled *Evaluation of Future Groundwater Flushing* (March 2004), it was anticipated that attainment of groundwater clean-up goals utilizing Pump and Treat (P&T) technology alone may take several hundred years.

Source Control

Source control activities specified in the ROD included the construction, start-up, and operation of an SVE system to remove VOCs from unsaturated zone soils. Air permeability and SVE pilot tests were conducted at the Site from July 1995 to December 1996. SVE pilot tests were conducted using three techniques: conventional SVE, heated air injection, and high vacuum or multiphase SVE. In general, extracted vapor flow rates

for the extraction wells (< 9 standard cubic feet per minute) and radii of influence (< 2-3 feet at some locations) were less than expected.

A Phase I SVE program focusing on maximizing the removal of VOC mass was implemented from October 1998 through December 1999. This resulted in the removal of an estimated 12 tons of VOCs from the subsurface; however, the effectiveness of the SVE system was limited because the Site was not sufficiently de-watered, soil moisture content was high, and low permeability soils were encountered. It was subsequently concluded that conventional SVE would be unable to significantly reduce groundwater clean-up time frames. Accordingly, operation of the SVE system was terminated.

To address the lack of effectiveness of the selected Source Control remedy, an evaluation of alternative methods of treatment was performed. Several technologies were considered; however, only ERH was considered as a viable option for a pilot test. ERH is a "thermally-enhanced" application of SVE that employs electrical current to heat both the underlying soil and groundwater; this heating of the contaminated media liberates substantially more contamination which can then be captured, treated and/or destroyed.

ERH was pilot tested from October 2002 to January 2003. The results of the pilot test concluded that while it may be a substantially long time (> 100 years) to meet groundwater clean-up goals for all contaminants in all layers beneath the site, a significant reduction for the majority of contaminants can be achieved for most substances in the most-contaminated layers (i.e., from 0 – 25 feet). For example, the estimated clean-up timeframe for trichloroethylene (assuming 95% ERH effectiveness) was reduced from 497 to 37 years; and methylene chloride was reduced from 165 years to 59 years. MassDEP has stated a preference for ERH treatment with a goal of "significant mass reduction" of the predominant VOC source.

A supplemental ERH evaluation and remedial design for this technology is currently being completed by the U.S. Army Corps of Engineers (USACE). This evaluation will include an assessment of the cost-benefit of various ERH implementation scenarios. The benefit will be quantified both in terms of cost per pound [of VOC] removed, as well the potential anticipated savings associated with a reduced timeframe in which the GWTP will need to operate.

The 1991 ROD also specified that the final cap would be constructed using a design consistent with State and Federal closure requirements for a RCRA facility. A RCRA Subtitle C Landfill cap typically consists of a multi-layer system composed of a vegetative topsoil layer and a subsurface drainage layer overlying a low permeability barrier of clay and synthetic liner material.

C. Summary of the 2003 ESD

The 2003 ESD required two significant changes to the 1991 ROD. Specifically, the 2003 ESD (1) adopted revised, risk-based clean-up goals and (2) created a second operable

unit (OU) to address soil clean-up off the Silresim property.

With regard to the first change, the 2003 CUG revisions were warranted given a number of changes since the ROD's issuance in 1991. These changes are further described in the 2003 ESD and are briefly summarized below:

- Elimination of drinking water exposure population as a result of the Commonwealth's "low use and value" determination for groundwater;

- Evaluation of newly identified exposure pathways and populations (e.g., the 2003 Revised CUGs considered subsurface soil to indoor air migration pathway); and

- Updated toxicological information

Specifically, the carcinogenic risk goal was changed from 10^{-6} to 10^{-5} and the non-carcinogenic hazard index was changed from 0.1 to 1.0; both risk goals are consistent with the criteria specified by the NCP. The risk-based CUGs were also compared to other applicable MassDEP standards and the most stringent (lowest) was selected as the recommended CUG for each contaminant of concern. The other standards evaluated included the MassDEP Method 1 GW-3 standards (to account for ecological impacts from groundwater) and the MassDEP Method 3 Upper Concentration Limits for soil and groundwater.

The second change included in the 2003 ESD was the creation of a second operable unit (OU2). Whereas OU1 would include groundwater treatment activities as well as implementation of SVE, OU2 would include additional source control activities including the excavation of off-property soil contamination.

III. BASIS FOR ESD

This ESD documents EPA's decision to change the soil treatment portion of the Source Control remedy specified in the ROD, as well as change the CUGs identified in the 2003 ESD. The basis for modifying the remedy is described below.

Thermal Enhancements to the Soil Vapor Extraction Remedy

The ROD called for treatment of VOCs in soil above the groundwater table to be treated via SVE. This technology was fully evaluated, pilot-tested, and allowed to operate for a period of 14 months. Despite the removal of approximately 24,000 pounds of VOCs, traditional SVE technology was ineffective in treating the primary source of VOCs located predominantly at/near the groundwater/soil interface (approximately 10 – 12 feet below ground surface (bgs)). It was noted in the *SVE Evaluation Technical Memorandum* dated November 2004, that traditional SVE was ineffective due to:

1) Low permeability soils;
2) High groundwater table (compounded by the inability of the GWTP to substantially lower the groundwater table);

3) High soil moisture concentrations in the unsaturated zone; and
4) Presence of a gravel layer underlying the clay cap thereby causing short-circuiting.

An alternative source control technology has been pilot-tested and appears to be more effective in reducing contamination in the area that is the primary source of VOCs. Based on the findings in the *Electrical Resistance Heating Pilot Test Final Report* (September 2003), ERH technology could provide a significant benefit toward the cleanup of shallow groundwater while simultaneously remediating unsaturated soils. This report concluded that treatment, up to 25 feet bgs, would allow for the cost-effective removal of the bulk of the contaminant source. Moreover, the removal efficiency in shallow groundwater (up to 24 feet bgs) was estimated to be 99%.

Elimination of Soil Stabilization

The ROD anticipated that up to 18,000 cy of soil (from on and off the Silresim property) with residual (non-VOC) contamination would be stabilized. EPA has determined that in light of the material being contained under a hazardous waste cap as well as the off-site soil excavations conducted as part of OU2, that any further reduction in contaminant mobility afforded by the stabilization is not required and that the lack of stabilization will not present an unreasonable risk to the environment or human health. In addition, certain elements of TSCA which were previously waived per the 1991 ROD, are in full force and effect notwithstanding the elimination of the stabilization requirement. To the extent that contaminated subsurface soil will remain outside of the Silresim property and not covered by a cap, additional Institutional Controls (ICs) may be warranted. The adequacy of existing ICs will be evaluated and depending on the final scope and outcome of the Remedial Action for soil and groundwater, the existing institutional controls may need to be made permanent and/or amended.

Revision of Clean-Up Goals (CUGs)

The existing CUGs (memorialized in 2003) were based in part on exposure pathways that have either been eliminated or are not complete. Specifically, the City of Lowell envisions this property will be reused for commercial/industrial purposes and is no longer considering recreational reuse for this property. Other changes in the development of CUGs include the elimination of a railroad worker's exposure as this potential exposure is similar to exposure of a construction or utility worker. Lastly, based on indoor air sampling at an abutting property as well as observations as part of a recent property use assessment (2008), the indoor air migration pathway is considered incomplete. More specifically, EPA observed that various chemicals and/or solvents are used routinely, as part of business operations and are presumed to be managed appropriately; therefore EPA determined that it is not appropriate to consider this exposure population in the derivation of risk-based clean-up goals. Furthermore, the presence of these industrial solvents prevents the accurate assessment of risk posed by similar chemicals in a groundwater plume.

The revised CUGs are included in a report entitled, "*Supplemental Clean-up Goal Evaluation*" dated May 2008. The revised CUGs are protective of utility, construction, industrial/commercial workers, and trespassers and are listed in Appendix A as Tables 1 (Surface soil), Table 2 (Subsurface soil) and Table 3 (Groundwater). The revised CUGs do not show an overall increasing or decreasing trend as compared to the 2003 ESD clean-up levels because, despite eliminating some exposure pathways (i.e., indoor air migration), there were decreases in a number of toxicological values for certain contaminants of potential concern. The *Supplemental Clean-up Goal Evaluation* also identifies 1,4-dioxane as a chemical of potential concern (COPC) and which has been added to the list of contaminants that have CUGs (See Table 1).

EPA will continue to conduct periodic evaluations of groundwater sampling results and evaluate how the Silresim property and abutting properties are being utilized. Any potential new construction on adjacent properties requires notification to EPA, per the requirements of the property easements obtained in 1995 by the potentially responsible parties (PRPs). In the event of any such notice or observation that property use may have changed (e.g., residential) then CUGs may need to be recalculated and measures taken to protect those who may be exposed. Those pathways most likely to be re-evaluated include the indoor air migration pathway as well as any other pathway in which residential exposure scenarios have not been considered (i.e. direct contact).

IV. DESCRIPTION OF THE SIGNIFICANT DIFFERENCE

Detailed description of changes:

1. ERH

ERH, a thermally-enhanced SVE technology, was pilot-tested in 2002 and 2003 to evaluate its applicability to site conditions, identify potential difficulties, and determine its overall effectiveness. During the pilot test, 1,500 pounds of VOCs were removed from the treatment area which corresponded to an estimated 99% reduction in total VOC concentration. In addition, it was concluded that ERH can be very effective for increasing mass removal rates compared to more traditional methods of soil vapor extraction.

The 2003 pilot study report included a variety of treatment scenarios, all of which assumed relatively comprehensive treatment of the entire site (i.e., between 126,000 and 262,000 cy) with associated cost estimates ranging from $20 to $40 million. EPA determined that implementation of ERH at this size and scale would not be cost effective. Subsequent to this determination, MassDEP advocated for some amount of additional (focused) source control/reduction. Accordingly, the USACE completed a draft report (October 2007), and a supplemental evaluation report in August 2008, outlining a more focused treatment approach using ERH. Based on this analysis, the revised treatment volume is estimated to be approximately 65,000 cy (inclusive of a 10% volume contingency). Preliminary costs for ERH treatment for this volume of soil was estimated to be $13 million.

2. Soil Stabilization

Both the EPA and MassDEP have reviewed the Commonwealth of Massachusetts Guidance on the Use, Design, Construction and Monitoring of Engineered Barriers and concluded it is protective for this site and allows some flexibility in meeting the performance standards required of a RCRA Subtitle C Hazardous Waste Landfill cap. Based on the guidance, an engineered barrier:

- Shall prevent direct contact with contaminated media;
- Shall control any vapors or dust emanating from contaminated media;
- Shall prevent erosion and infiltration of precipitation or run-off that could jeopardize the integrity of the barrier or result in contamination mobilization;
- Shall be constructed of materials that are resistant to degradation;
- Shall be consistent with technical standards of RCRA Subpart N, 40 CFR 264.300, 3120 CMR 30.6000 or equivalent standards
- Shall include a defining layer that visually identifies the beginning of the barrier;
- Shall be appropriately monitored and maintained to ensure the long-tem integrity and performance of the barrier; and
- Shall not include an existing building, structure or cover material unless it was designed to serve as an engineered barrier.

Among these criteria, is the requirement that any final cover must provide long-term minimization of migration of liquids through a landfill. Based on the assessment of the existing cap, it was concluded that the existing low permeable clay layer on the property provides the necessary contaminant migration control required by this performance criterion. The additional reduction afforded by the stabilization is not necessary to prohibit contaminant migration. Thus, EPA is eliminating the need for additional treatment by stabilization as part of the remedy. Also, EPA is re-affirming the previous TSCA waivers (in the 1991 ROD) notwithstanding the elimination of the stabilization requirement. In addition, other cap improvements are expected to be incorporated into the remedy including increasing the thickness of the containment layer and adding a more visible marker layer in the area of the property most likely to be redeveloped. This parcel is referred to as Conceptual Parcel 2 on Figure 4.

3. Revised Clean-up Goals

The 2003 ESD identified clean-up levels for groundwater and soil contaminants that posed an unacceptable risk to either human health or the environment. Since the 2003 ESD was issued, property re-use assumptions have changed. In addition, ambient air sample results coupled with observations of abutting property industrial usage have resulted in the determination that the indoor air migration pathway is incomplete As a result, changes to clean up levels are appropriate.

In summary, the basis for recalculating CUGs include:

- the anticipated continued zoning of the site as "commercial/industrial";
- the elimination of the Railroad worker exposure scenarios due to this pathway being adequately considered under the Construction and Utility worker scenarios;
- the determination that the subsurface soil and groundwater to indoor air migration pathway for the for the commercial/industrial worker was incomplete;
- the identification of 1,4-dioxane as a contaminant of potential concern (COPC).

To support the development of revised CUGs, land use and risk assessment exposure assumptions have been updated to reflect current Site conditions. These assumptions are summarized below.

Current Land Use and Site Conditions

The approximate 16-acre Site is located in a heavily industrialized section of Lowell. Neighboring businesses include numerous used auto parts facilities; junkyards; auto repair facilities; factories for sheet-metal, steel, and plastic; a power plant; office and storage facilities; tractor-trailer storage, light industrial/commercial condominiums; and open industrial land. Groundwater beneath the site is not currently used as a drinking water source and, based on the Groundwater Use and Value determination by MassDEP, groundwater in the area would not be used as a drinking water source in the future.

Future Land Use

As affirmed recently by the City of Lowell, the reasonably foreseeable future land use for the Site will continue to be commercial/industrial. Accordingly, recreational future use of the site is no longer being considered. The commercial/industrial properties surrounding the Silresim property also are expected to continue to be used for similar purposes in the future. However, future renovation or redevelopment of these properties is possible, including construction of new buildings. Groundwater is assumed to remain unused for consumptive and non-consumptive uses in the future. In regard to these abutting properties, institutional controls (ICs) were obtained in the form of property restrictions contained in easements obtained by the PRPs in 1995. In general, for all the adjacent properties, the restrictions prohibit any groundwater withdrawal for drinking water purposes and 2) require that prior to any construction activities or activity that would withdraw groundwater, the property owner shall notify EPA.

Exposure Pathways

An exposure pathway describes the physical linkage between the source of contamination and a current or projected future exposed receptor. The potential human receptors that have been identified at this Site (under current and reasonably anticipated future exposure scenarios) include commercial/industrial workers, construction workers

(e.g., new facility construction or utility installation/maintenance workers), and trespassers. These potential human receptors may come in contact with surface soil (0-1 ft bgs), exposed subsurface soil as a result of excavation (unsaturated soil >1 ft bgs and < 10 ft bgs), groundwater, and ambient air containing contaminants originating from the Site. The potential routes of exposure are incidental ingestion, inhalation of particulates or volatiles, and dermal absorption.

CUGs were revised based on available technical information, EPA policy, and risk management considerations. The modified CUGs are identified as the "Revised Clean-up Goals" in Appendix A and are summarized in the individual tables for surface soil (Table 1), subsurface soil (Table 2) and groundwater (Table 3).

V. SUPPORTING AGENCY COMMENTS

On September 10th, 2008, MassDEP submitted a letter supporting the changes proposed to the ROD by this ESD

VI. STATUTORY DETERMINATIONS

EPA has determined that the selected remedy specified in the 1991 ROD, the 2003 ESD, and the changes pursuant to this ESD, remain protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate, and are cost-effective. The revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

VII. PUBLIC PARTICIPATION

This ESD and supporting information were made available for public review at the local public repository and via the internet. In addition, a Notice of availability of the ESD was published in a local newspaper on July 28th, 2008 marking the beginning of the 30-day public comment period. During the comment period, no public comments were received.

VIII. DECLARATION

For the foregoing reasons, by my signature below, I approve the issuance of an Explanation of Significant Differences for the Silresim Chemical Corporation Superfund Site in Lowell, Massachusetts and the changes and conclusions stated therein.

James T. Owens III, Director
Office of Site Remediation and Restoration
USEPA, Region I

9-17-08
Date

Figures

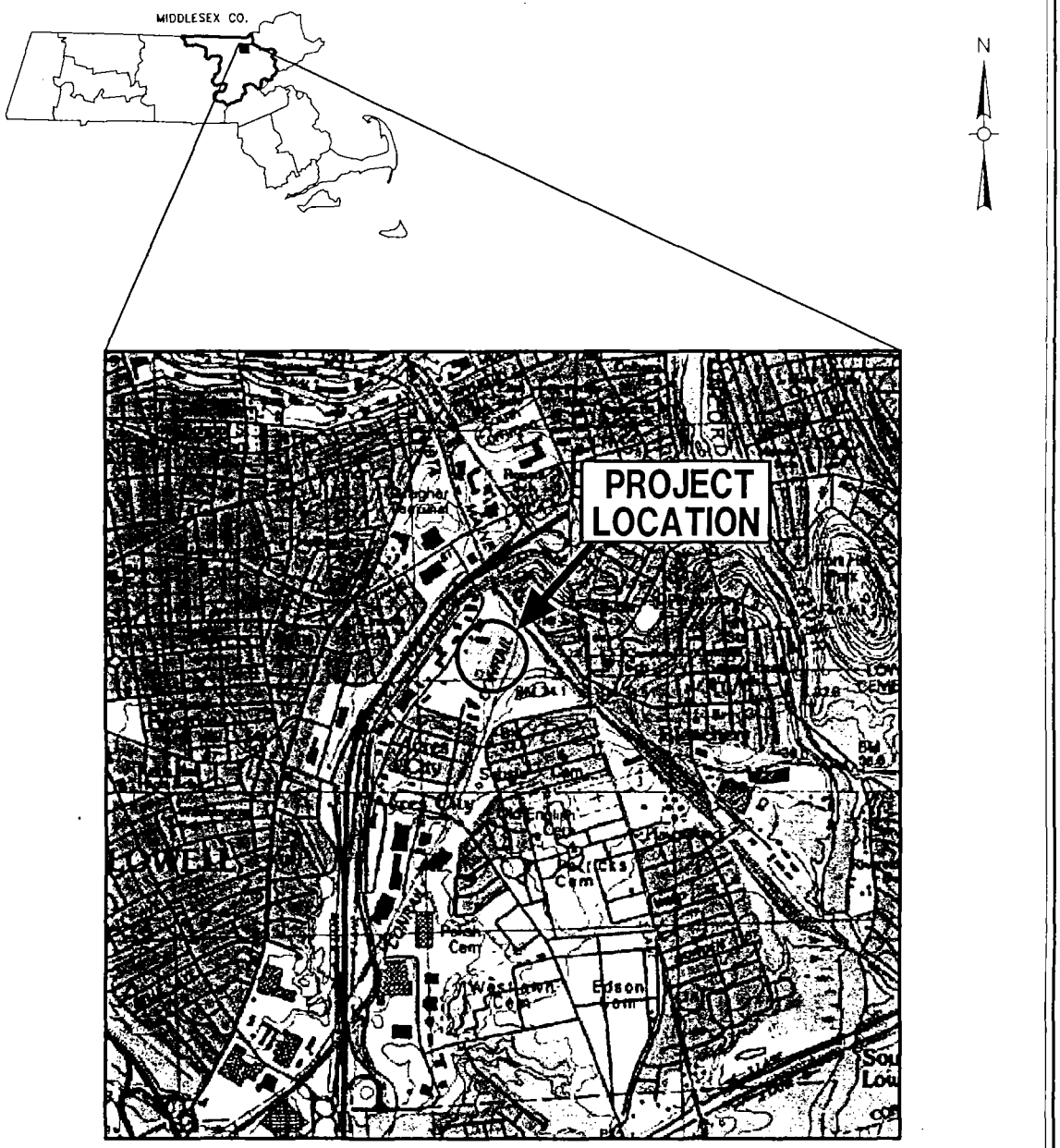


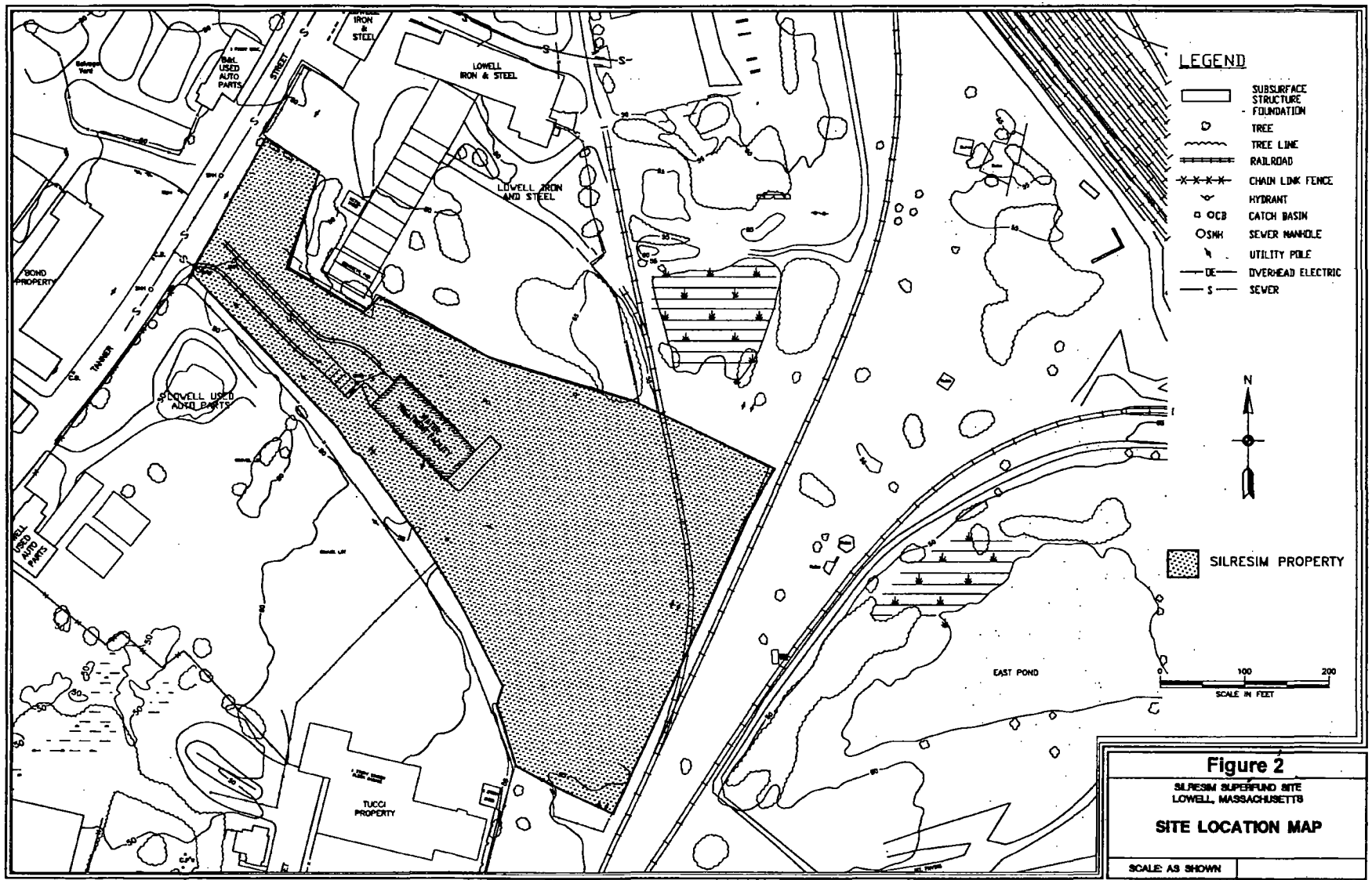
FIGURE 1

SILRESIM SUPERFUND SITE
LOWELL, MASSACHUSETTS

SITE LOCATION MAP

SCALE: AS SHOWN

CADDFILE: SIL_LOCUS.DWG



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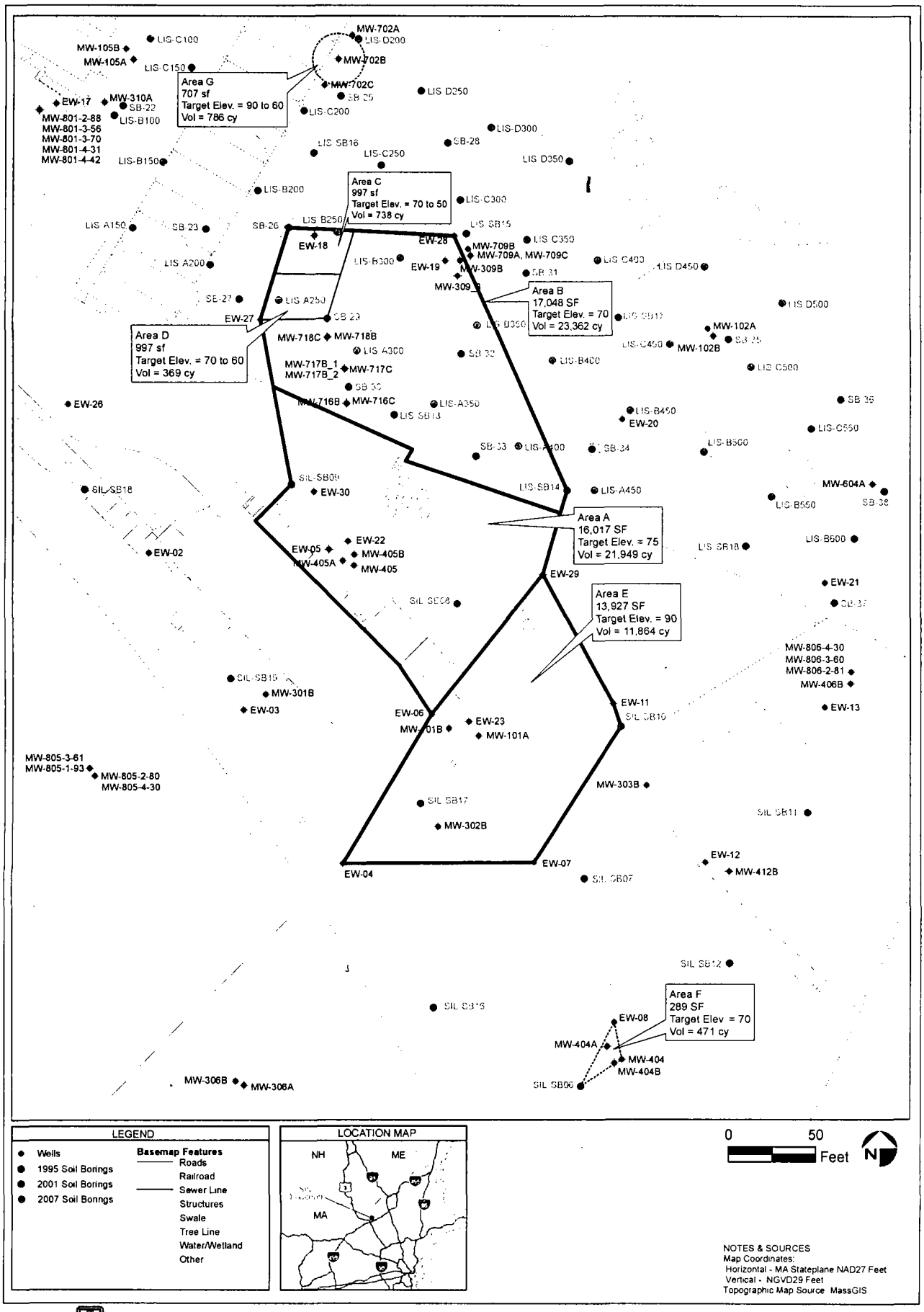

US Army Corps of Engineers - New England District

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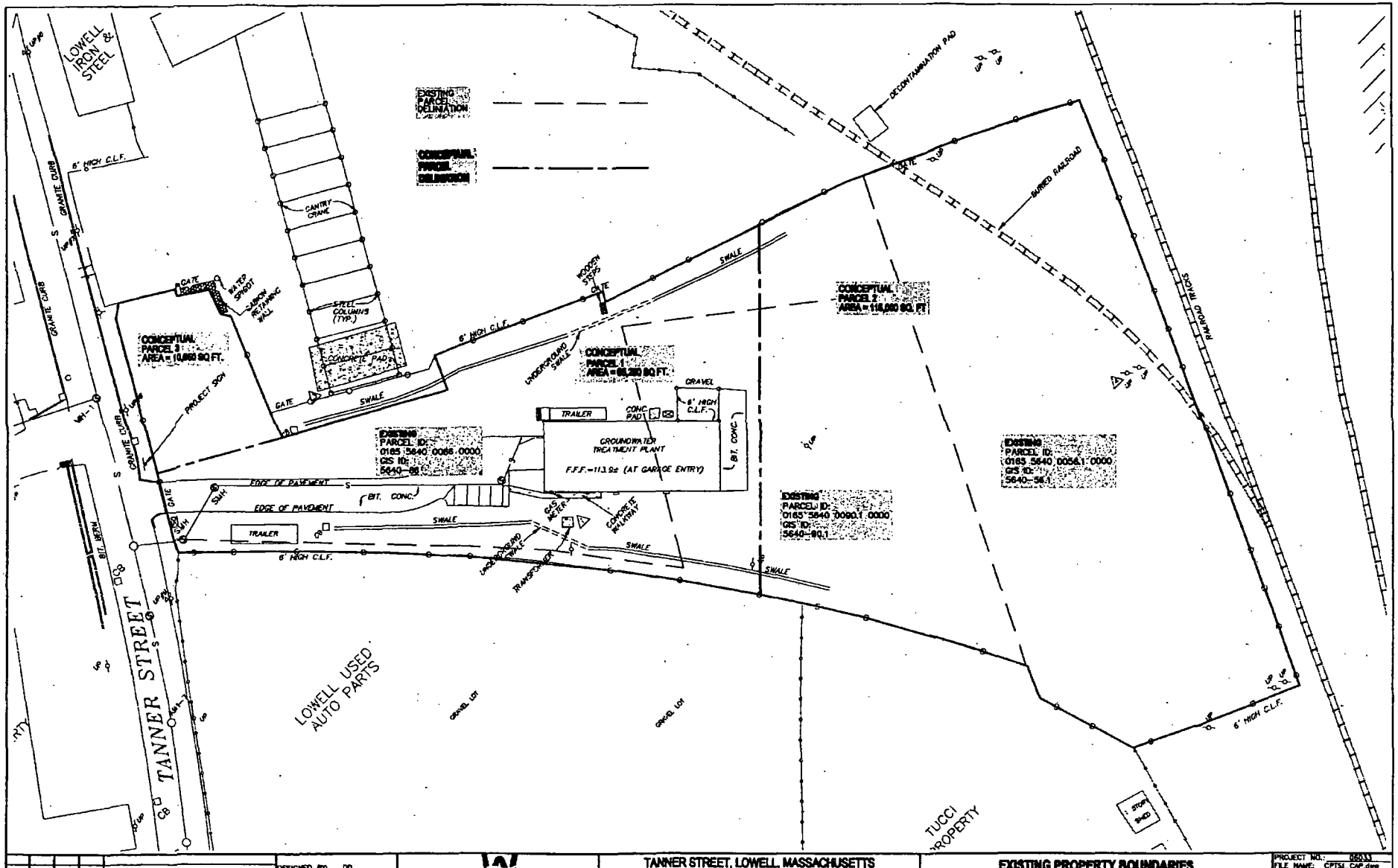
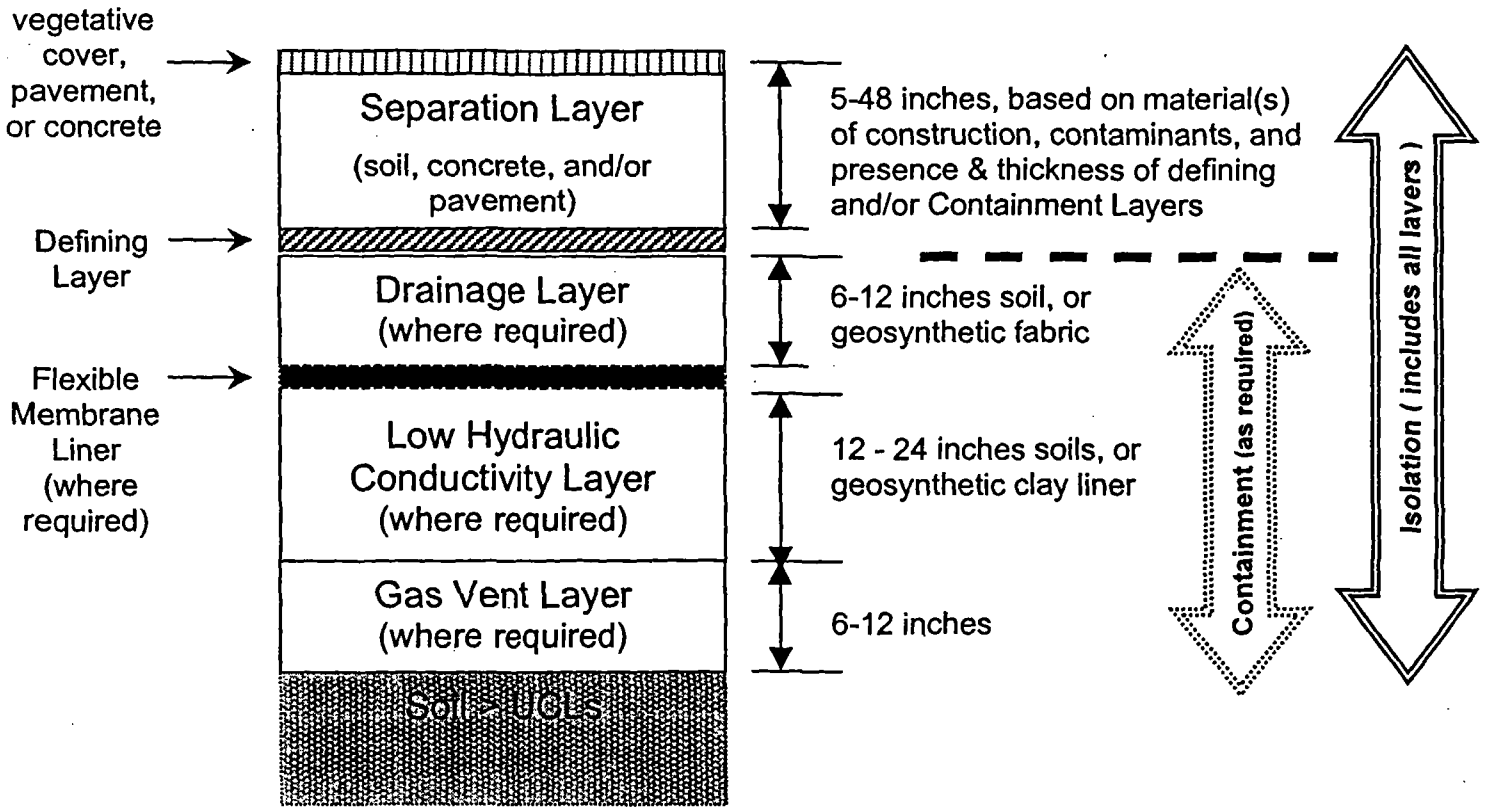
August 25, 2008 DWN: MTW CHKD: RAS

Figure 3
Conceptual ERH Applications



REV. NO.	DATE	DRAWN	CHKD	REMARKS	DESIGNED BY: DD DRAWN BY: DD CHECKED BY: JJH APPROVED BY: JJH DATE: MAY 2008	Watermark Engineering • Construction • Operations	TANNER STREET, LOWELL, MASSACHUSETTS TANNER STREET INITIATIVE SILRESIM CONCEPTUAL CAP DESIGN	EXISTING PROPERTY BOUNDARIES AND CONCEPTUAL PROPERTIES SUBDIVISION	PROJECT NO.: 05033 FILE NAME: CPTSI_CAP.dwg	Figure 4

Figure 5 – Engineered Barrier Design Components



Appendix A

Recommended Clean-Up Goals

TABLE 1
REVISED CLEAN-UP GOALS FOR SURFACE SOIL
SILRESIM SUPERFUND SITE, LOWELL, MASSACHUSETTS

Chemicals of Potential Concern	Current Silresim CUG from 2003 ESD (1) (mg/kg)	Risk-Based CUG for Surface Soil (2) (mg/kg)	MassDEP Method 3 Upper Concentration Limits (3) (mg/kg)	**Revised Site-Specific Surface Soil CUG (4) (mg/kg)**	Basis for Value
1,1,2,2-Tetrachloroethane	20	23	400	**23**	Risk-Based
Trichloroethene (5)	190	81	10,000	**81**	Risk-Based
1,2,4-Trimethylbenzene	73	73	-	**73**	Risk-Based
1,3,5-Trimethylbenzene	17	18	-	**18**	Risk-Based
Benzo(a)anthracene	50	50	3,000	**50**	Risk-Based
Benzo(a)pyrene	5	5.0	300	**5.0**	Risk-Based
Benzo(b)fluoranthene	50	50	3,000	**50**	Risk-Based
Dibenz(a,h)anthracene	5	5.0	300	**5.0**	Risk-Based
1,4-Dioxane	-	260	-	**260**	Risk-Based
Hexachlorobenzene	15	15	300	**15**	Risk-Based
1,2,4-Trichlorobenzene	18	150	9,000	**150**	Risk-Based
Arsenic	30	30	200	**30**	Risk-Based
Lead (6)	448	232	3,000	**380**	BKGD
Mercury	0.8	0.80	300	**0.80**	Risk-Based
2,3,7,8-TCDD (7)	0.0002	0.00034	0.003	**0.003**	MCP-UCL
Aroclor 1248	13	13	100	**13**	Risk-Based
Aroclor 1254	13	13	100	**13**	Risk-Based

NOTES AND ABBREVIATIONS:

- = No Value Identified
CUG = Clean-up Goals
BKGD = Background Concentration
MCP-UCL = Massachusetts Contingency Plan - Upper Concentration Limits
(1) Current Silresim CUGs from the Explanation of Significant Differences, 2003.
(2) Risk-based CUGs assume a target risk goal of 1E-5 and target hazard index of 1 for each chemical.
(3) UCLs taken from MassDEP's MCP Numerical Standards Spreadsheets - January 2008 http://www.mass.gov/dep/service/compliance/riskasmt.htm
(4) The most stringent of the risk-based CUG or the UCL was taken as the recommended CUG for each chemical.
(5) Trichloroethylene CUG based on CalEPA toxicity value (2007)
(6) Value resulting from the application of the Adult Lead Model (ALM) used per correspondance with Region 1 Risk Assessor (6/11/07)
(7) Current toxicological carcinogenic slope factor for dioxin published in CalEPA

TABLE 2
REVISED CLEAN-UP GOALS FOR SUBSURFACE SOIL
SILRESIM SUPERFUND SITE, LOWELL, MASSACHUSETTS

Chemicals of Potential Concern	Current Silresim CUG from 2003 ESD (1) (mg/kg)	Risk-Based CUGs for Subsurface Soil (2) (mg/kg)	MassDEP Method 3 Upper Concentration Limits (3) (mg/kg)	**Revised Site-Specific Subsurface Soil CUG (4) (mg/kg)**	Basis for Value
Benzene	0.04	68	9,000	**68**	Risk-based
Chlorobenzene	1.2	270	10,000	**270**	Risk-based
Chloroform	0.015	69	5,000	**69**	Risk-based
1,2-Dichloroethane	0.031	440	6,000	**440**	Risk-based
1,1-Dichloroethene	0.005	220	10,000	**220**	Risk-based
Ethylbenzene	1.2	4,500	10,000	**4,500**	Risk-based
Methylene Chloride	0.56	2,100	10,000	**2,100**	Risk-based
Styrene	290	11,000	10,000	**10,000**	MCP-UCL
1,1,2,2-Tetrachloroethane	0.16	140	400	**140**	Risk-based
Tetrachloroethene	0.85	210	10,000	**210**	Risk-based
Toluene	11	14,000	10,000	**10,000**	MCP-UCL
1,1,1-Trichloroethane	13	4,000	10,000	**4,000**	Risk-based
1,1,2-Trichloroethane	0.12	240	2,000	**240**	Risk-based
Trichloroethene (5)	0.25	81	10,000	**81**	Risk-based
Vinyl Chloride	0.0062	110	300	**110**	Risk-based
1,2-Dichlorobenzene	75	2,500	10,000	**2,500**	Risk-based
1,4-Dioxane	-	1,600	-	**1,600**	Risk-based
Hexachlorobenzene	6	140	300	**140**	Risk-based
Naphthalene	16	140	10,000	**140**	Risk-based
1,2,4-Trichlorobenzene	1	150	9,000	**150**	Risk-based
Lead (6)	448	232	3,000	**380**	Risk-based
Mercury	0.77	0.80	300	**0.80**	Risk-based
2,3,7,8-TCDD (7)	0.0002	0.0048	0.003	**0.003**	MCP-UCL
Aroclor 1242	13	13	100	**13**	Risk-based

NOTES AND ABBREVIATIONS:

- = No Value Identified
CUG = Clean-up Goals
MCP-UCL = Massachusetts Contingency Plan - Upper Concentration Limits
(1) Current Silresim CUGs from the Explanation of Significant Differences, 2003.
(2) Risk-based CUGs assume a target risk goal of 1E-5 and target hazard index of 1 for each chemical.
(3) MADEP UCLs taken from MCP Numerical Standards Spreadsheets - January 2008 http://www.mass.gov/dep/service/compliance/riskasmt.htm
(4) The most stringent of the risk-based CUG or the UCL was taken as the recommended CUG for each chemical.
(5) Trichloroethylene CUG based on CalEPA toxicity value (2007)
(6) Value resulting from the application of the Adult Lead Model (ALM) used per correspondance with Region 1 Risk Assessor (6/11/07)
(7) Current toxicological carcinogenic slope factor for dioxin published in CalEPA.

TABLE 3
REVISED CLEAN-UP GOALS FOR GROUNDWATER
SILRESIM SUPERFUND SITE, LOWELL, MASSACHUSETTS

Chemicals of Potential Concern	Current Silresim CUG from 2003 ESD (1) (mg/L)	Risk-Based Clean-up Goal for Groundwater (2) (mg/L)	MassDEP Method 1 GW-3 Standard (3) (mg/L)	MassDEP Method 3 Upper Concentration Limits (3) (mg/L)	**Revised Site-Specific Groundwater CUG (4) (mg/L)**	Basis for Value
Acetone	50	4,100	50	100	**50**	MCP GW-3
Benzene	0.48	5.6	10	100	**5.6**	Risk-based
Chlorobenzene	0.5	14	1	10	**1**	MCP GW-3
Chloroform	0.2	9.3	10	100	**9.3**	Risk-based
1,2-Dichloroethane	0.5	7.7	20	100	**7.7**	Risk-based
1,1-Dichloroethene	0.015	47	30	100	**30**	MCP GW-3
1,2-Dichloroethene (total)	120	58	-	100	**58**	Risk-based
cis-1,2-Dichloroethene	50	3,500	50	100	**50**	MCP GW-3
Ethylbenzene	3.4	67	4	100	**4**	MCP GW-3
Hexachlorobutadiene	0.041	0.041	3	30	**0.041**	Risk-based
Methylene Chloride	14	240	-	100	**100**	MCP-UCL
1,1,2,2-Tetrachloroethane	0.61	3.0	50	100	**3.0**	Risk-based
Tetrachloroethene	5	1.1	30	100	**1.1**	Risk-based
1,2,3-Trichlorobenzene	3.8	1.0	-	-	**1.0**	Risk-based
1,1,1-Trichloroethane	50	620	20	100	**20**	MCP GW-3
1,1,2-Trichloroethane	1.1	11	50	100	**11**	Risk-based
Trichloroethene (5)	1.4	0.87	5	50	**0.87**	Risk-based
Vinyl Chloride	0.13	7.9	50	100	**7.9**	Risk-based
1,4-Dioxane	-	37	-	-	**37**	Risk-based
Naphthalene	0.89	0.89	20	100	**0.89**	Risk-based
1,2,4-Trichlorobenzene	0.15	1.0	50	100	**1.0**	Risk-based
Arsenic	0.4	31	0.9	9	**0.90**	MCP GW-3
Cadmium (water)	0.01	2.6	0.004	0.05	**0.004**	MCP GW-3
Lead	0.03	-	0.01	0.15	**0.01**	MCP GW-3
Nickel	0.08	410	0.2	2	**0.2**	MCP GW-3

NOTES AND ABBREVIATIONS:

- = No Value Identified

CUG = Clean-Up Goal

MCP GW-3 = Established to be the Massachusetts Contingency Plan Groundwater 3 Standard for the protection of ecological resources.

MCP UCL= Established to be the Massachusetts Contingency Plan Upper Concentration Limit.

(1) Current Silresim CUGs from the Explanation of Significant Differences, 2003.

(2) Risk-based CUGs assume a target risk goal of 1E-5 and target hazard index of 1 for each chemical.

(3) MassDEP GW-3 Standards (310 CMR40.0974(2) Table 1) and UCLs (310 CMR 40.0996(7) Table 6) were included as possible ARAR for the site.

(4) The most stringent of the risk-based CUG, the GW-3 value, or the UCL was taken as the recommended CUG for each chemical.

(5) Trichloroethylene CUG based on CalEPA toxicity value (2007).