Preliminary Closeout Report

Silresim Chemical Corp.
Lowell, Massachusetts

August 2011

Prepared by:
The United States Environmental Protection Agency
Region 1, New England
Boston, Massachusetts

EPA
New England

I INTRODUCTION

This Preliminary Closeout Report (PCOR) documents the completion of all physical, remedial construction activities which were performed at the Silresim Chemical Corp. (Silresim) Superfund Site. This PCOR was prepared in accordance with *Closeout Procedures for National Priorities List Sites* (OSWER Directive 9320.2-22 dated May 2011). EPA conducted a pre-final inspection of the Final Cap on October 7th, 2010 and with regard to the Electrical Resistive heating (ERH) a Final Inspection was completed on August 2, 2011. All components of the remedy were constructed in accordance with EPA-approved plans and specifications. No outstanding items were identified (other than those associated with site restoration) and thus no additional remedial construction is anticipated at the Site.

Performance of Five-Year Reviews; Operation & Maintenance (O&M) including continued operation of the Groundwater Treatment Plant (GWTP) by the Massachusetts Department of Environmental Protection (MassDEP); implementation of Institutional Controls; and performance of Long-Term Monitoring will continue to ensure that the remedy continues to be protective in accordance with the 1991 Record of Decision (ROD) as amended by two (2) Explanation of Significant Differences (ESDs) in 2003 and 2008.

II SUMMARY OF SITE CONDITIONS

1. Background

The Site is located at 86 Tanner Street in an industrial area of Lowell, Massachusetts, just south of the City's central business district (see Figure 1 – Site Location Map). The 4.5-acre Silresim property was formerly owned and operated by the Silresim Chemical Corporation. As a result of past operations at the Site, groundwater and soil are contaminated; this contamination has migrated to abutting nearby properties.

Site Description

The Silresim property is bordered by the Lowell Iron and Steel to the north and northeast, the B&M railroad yard and tracks to the east, 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. The groundwater treatment plant (GWTP) 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.

Operational History

The Site and the 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 (MassDWPC) 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. It was 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 millions of gallons of hazardous materials in drums and bulk tanks, including almost 30,000 decaying drums covering virtually all open areas of the Silresim property. In 1982, EPA proposed the Site for inclusion on the National Priorities List (NPL) and the site was subsequently added in 1983.

2. Removal Activities

From 1978 to 1982, prior to its listing on the NPL, MassDWPC erected a fence, hired a 24-hour security guard, removed wastes in drums and aboveground storage tanks, and constructed berms and trenches to reduce the spread of waste through surface runoff. In 1984, EPA raised the height of the fence and covered contaminated areas with 9 inches of crushed gravel and an interim 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 additional contaminated areas and the fence was again reconstructed to prevent access by the public, and a gravel cover was placed over the contaminated soil to further prevent contact.

Between 1985 and 1990, the Remedial Investigation and Feasibility Study (RI/FS) was completed. The RI identified approximately 100 individual contaminants in groundwater and soils. Volatile organic compounds (VOCs) were the predominant contaminant identified. Other types of contaminants identified included: semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, herbicides, pesticides and dioxin. Numerous remedial alternatives were evaluated in the FS prior to EPA's selection of a remedy.

3. Selected Remedy

In 1991, EPA signed a Record of Decision (ROD) memorializing a comprehensive remedy for the Site; one which addressed both the source of contamination (i.e., a Source Control component) and the management of groundwater migration (i.e., a Management of Migration component). These are further detailed below.

Record of Decision Summary (1991)

The 1991 ROD contemplated both a Management of Migration and Source Control remedy to provide a comprehensive remedy for the site. Each is described more fully below.

Management of Migration
The ROD outlined the following objectives for the GWTP:

- Manage the migration of contaminated groundwater to minimize the potential for exposure to down-gradient receptors including nearby 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 (i.e., Soil Vapor Extraction or "SVE").

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. Following treatment, residual contamination in soil was to be stabilized prior to on site disposal under a Final Cap. The Cap would be constructed using a design consistent with State and Federal closure requirements for a RCRA Subtitle C landfill; these caps 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.

ESD Summary (2003)

The 2003 ESD memorialized two changes to the 1991 ROD. Specifically, the 2003 ESD adopted revised, risk-based clean-up goals and created a second operable unit (OU) to mitigate risk associated with soil contamination identified off the Silresim property. With regard to changes to the clean-up goals, these were warranted given a number of changes since the ROD was issued and are 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, specifically the indoor air migration pathway; and

- Updated toxicological information

ESD Summary (2008)

The 2008 ESD documented three (3) significant changes to the remedy; two of the changes are specific to the original 1991 remedy, the third is an update to clean-up goals (CUGs) that were previously modified in a 2003 ESD. These changes are summarized below:

Changes to the 1991 ROD:

The 1991 ROD contemplated SVE of unsaturated soil above the water table. Accordingly, SVE pilot tests were conducted from July 1995 to December 1996. However, extracted vapor flow rates for the extraction wells and radii of influence were less than expected. Notwithstanding this, a SVE system was constructed and operated beginning in October 1998 with the objective of reducing the total mass of VOCs. This resulted in the removal of an estimated 12 tons of VOCs; however, the effectiveness of the SVE system was still limited because the Site was not sufficiently de-watered, soil moisture content was high, and low permeability soils were encountered. Accordingly, operation of traditional SVE system was terminated in December 1999.

To address the lack of effectiveness of traditional SVE, an evaluation of alternative methods of treatment was completed. A variation of SVE, namely Electrical Resistive Heating or "ERH", was pilot tested in 2002 and 2003. The results of the pilot test concluded that while it may be a still be a substantially long time (> 100 years) to meet all groundwater clean-up goals in all layers beneath the site, a significant reduction for the majority of contaminants could be achieved for most substances in the most-contaminated layers (i.e., from 0 – 25 feet). MassDEP has stated their preference for ERH treatment with a goal of "significant mass reduction". Accordingly, ERH was identified in the ESD as the clean-up technology for soil. Subsequently, an ERH Treatment Zone Evaluation (i.e., remedial design) was completed by the U.S. Army Corps of Engineers (USACE) in 2008.

The second change to the 1991 remedy was regarding the ROD's provision for the stabilization/solidification of residual contaminated soil. During the remedial design for the final cap, EPA determined that a final cover constructed according to the Commonwealth's Guidance for Engineered Barriers was sufficient to reduce contaminant mobility and that the additional reduction to contaminant mobility afforded by stabilization was not required. The Remedial Design for the Final Cap was completed in 2008. The major objectives of the Final Capping Remedy were (1) to increase the soil cover over the contaminated soil so as to be consistent with the Guidance for Engineered Barriers, (2) to maximize the uniformity of the cap construction across the Site, (3) to install a defining layer over the clay barrier layer so ensure protection of the clay layer in the event of intrusive activities after construction, and (4) to reuse all soil stripped from the existing cap and minimize the importing of soil and materials to the Site.

Significant change to the 2003 ESD:

In addition to the changes noted above, a third change was memorialized in the 2008 ESD. Based on correspondence from the City of Lowell regarding the potential future uses of the site and updated toxicological data, CUGs were again recalculated.

4. Remedial Action

In 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 allocated to the Commonwealth for long-term operation and maintenance (O&M) of the GWTP and final cap. Thus, all remedial activities have been led by EPA.

GWTP Construction

Construction of the GWTP began in 1994 and groundwater extraction and treatment has been underway since November 1995. A Final Inspection occurred on September 24th, 1997 thus beginning the 10-year period of Long-Term Remedial Action (LTRA). The groundwater extraction system was unable to achieve the drawdown objective across the Site to facilitate the original source control remedy (e.g. SVE). However, despite this, the GWTP continues to operate and remove significant quantities of VOCs. Based on the most recent comprehensive groundwater sampling report, *Status Report 35(Draft)* dated June 2011, approximately 6,436 pounds of total volatile organics were removed during the preceding year and the total quantity of volatiles removed since the plant's construction is 112 tons. As required, O&M of the GWTP was transfer to the Commonwealth, acting through MassDEP, on September 24, 2007. An Operational and Functional Completion Report (i.e., an Interim Remedial Action Report) was completed in November 1998.

Off-site Soil Excavation (OU2)

Off-site excavation activities on the adjacent Tucci, Railroad, and Lowell Iron & Steel properties commenced in September 2004 and were completed by December 2004 at which time a pre-final inspection occurred. Surface restoration occurred in Summer 2005 and the Final Inspection was on September 1, 2005. It was estimated that approximately 1,943 cubic yards of soil were excavated. This material was contaminated primarily with metals (lead and arsenic), SVOC, and dioxin. The contaminated soil was brought back to Silresim for placement under an Interim cap constructed of 40-mil high-density polyethylene (HDPE). An Interim Remedial Action Report was completed in September 2005.

Final Cap Construction

Final cap construction began in April 2010 with the mobilization of earthwork subcontractor. Initial phases include the strategic removal and stockpiling of interim cap material (predominately clay) so as to reuse this material as part of the "*supplemental separation layer*" to increase the cap's thickness (one of the capping objectives). The typical final cap

section contains the following components, from bottom to top: a 7-inch thick layer of protective gravel, a 14-inch thick layer of clay; a defining layer (e.g., geotextile); 21-inch thick layer of supplemental soil separation layer; and a 6-inch-thick layer of topsoil, which was seeded and mulched. A pre-final inspection occurred on October 7, 2010. The majority of punch list items were resolved by the earthwork subcontractor prior to their demobilization on October 15th; however two punch list items remain. Specifically, these are associated with cap restoration activities that need to be completed in the area of the cap that is co-located with the ERH treatment area (and after ERH treatment). Refer to Figure 3 for the areal extent of the Final Cap.

ERH Construction

ERH construction began in the spring 2010 with the mobilization of drill rigs, thermal subcontractor and other support subcontractors (such as utility clearance subcontractors). Construction of the well field consisted of advancing 138 soil borings between 20 and 60 below round surface (BGS) for ERH "electrodes", as well as installing 77 multi-phase and 50 shallow vapor extraction wells. Construction was temporarily delayed due to lack of sufficient electrical power, thus EPA began discussion with the local electric utility, National Grid (NGrid), to devise and construct temporary infrastructure. NGrid completed their utility construction in May 2011. Concurrent with the NGrid construction of temporary electrical service, EPA and their contractor and subcontractors continued to mobilize ERH equipment to the site including: electrodes, thermal oxidizer, transformers, switch boxes and piping materials. Groundwater extraction wells were turned on July 8th, 2011 to achieve hydraulic control before heating. Vapor extraction wells were turned on July 19th, 2011 to ensure pneumatic control of vapors before heating. On July 29th, 2011 – power to the electrodes was supplied thus beginning Phase I – Initial heating. A final ERH site inspection occurred with MassDEP on August 2, 2011. The initial heating stage (i.e., *Phase I* heating) is estimate to last 90 day at which time soil and groundwater will have achieved boiling point temperatures and *Phase II* heating will begin. During *Phase II,* electricity is applied only as needed to maintain treatment temperatures; this is anticipated for another 75 days. Other than site restoration (the only remaining punch list item associated with the Final Cap construction) there are no new punch list items (other than site restoration across the entire ERH treatment area). Refer to Figure 4 for the areal extent of the ERH treatment area.

5. Institutional Controls (ICs)

In 1995, consistent with their obligations under the 1993 Consent Decree, PRPs obtained access rights and land use restrictions on behalf of the United States from all properties abutting the Silresim Superfund site. In total, seven easements were obtained - this being the number of individual abutting property owners. The restrictions are location-specific and contemplate that different activities described in the 1991 ROD (i.e., Permanent Cap Area, Soil Vapor Extraction Area, Groundwater Monitoring Area, etc.) would occur at different locations (refer to Figure 5). Notwithstanding these location-specific restrictions (which vary based on nature of remedial action) there are general provision which apply to the "Remediation Area"; these are : (1) groundwater underlying the remedial area shall not be withdrawn for drinking water and no drinking water wells shall be installed on any part of the Remediation Area, and (2) prior to any

construction activity or other activity that would withdraw groundwater from beneath the site, the owner (Grantor) shall give notice to EPA (as Grantee).

At the time the easements were obtained the Silresim property, itself, was in default for non-payment of taxes. It remains in default and no member of the property owner's family has or is available to sign a Grant of Environmental Restriction. Notwithstanding the lack of formal restriction on the Silresim property, EPA and MassDEP (inclusive of MassDEP's GWTP contractors) have a daily presence at the Site and thus the likelihood of intrusive activities occurring which might result in exposure to workers or the community is non-existent. Should the City decide to take a portion of the property for non-payment of taxes, EPA would discuss with the City the necessary land use restrictions and seek to record these against any new property deed. In the interim, the need for additional Institutional Controls (ICs) will be evaluated as part of periodic Five Year Reviews.

III Demonstration of Cleanup Activity Quality Assurance and Quality Control

The methods, procedures, inspections and tests were performed in accordance with various Construction Quality Assurance Plan prepared as part of the EPA- and MassDEP-approved remedial designs. The construction contractors' Quality Control Plans were implemented and verified by the EPA's remedial project manager and various EPA remedial action oversight contractors. Construction of the Remedy, as amended by ESDs, is complete. Groundwater Treatment continues by the Commonwealth of Massachusetts and the Electrical Resistive Heating (i.e. Source Control) remedy was constructed and is functioning as designed. The constructed remedy is complete and is consistent with the ROD, ESDs, and the remedial design plans and specifications.

GWTP Construction (1995 – 1997)
The GWTP construction contractor implemented a Quality Control (QC) program to monitor all construction activities and inspected work for conformance with contract documents. An integral part of the QC Program was the QC Plan which was relied on and describes the personnel, facilities, and administrative procedures for QC testing and inspections. Frequent inspections were performed and consisted of verifying compliance with contract documents and any change orders as they were received. In 1995 EPA, along with MassDEP and the U.S. Army Corps of Engineers conducted a Pre-Final Inspection. In 1997, all punch list items had be completed as well as repairs to the GWTP thermal oxidizer, thus the 10-year Long-Term Remedial Action (LTRA) period began. On September 24, 2007, EPA transferred operation and maintenance of the GWTP to the Commonwealth of Massachusetts, acting through the MassDEP, whom continue to operate the treatment facility.

Off-site Soil Excavation (2004 – 2005)
The location and depth of off-property material to be excavated and relocated on site (under an HDPE cap) was established during the remedial design. Quality Control activities included utilization of registered land surveyors to complete a property boundary survey and to record the limits of excavation. During implementation, activities adhered to QC plan prepared by a Corps'

subcontractor. Regular testing by the Corps of back fill material as well as the HDPE liner was conducted. A final inspection occurred in September 2005.

Final Cap Construction (2010)
Quality assurance and quality control (QA/QC) measures were implemented as outlined in the technical specifications and the Construction Quality Assurance Plan (CQAP). Throughout the construction of the cap, construction quality control measures were performed by EPA contractor and subcontractors to ensure compliance with the material and workmanship requirements set forth in the contract documents. Construction quality assurance measures included, but not limited to, the following: review of soil QC submittals for material source testing for imported soil, gravel, and clay; observation of imported Geotextile (defining layer) and GCL; observation and/or collection of soil samples from imported soil for laboratory testing; observation of the installation and compaction of the various cap layers; observation of in-place moisture-density testing; and verification of the depth of cap layers by field measurements.

ERH Construction (2011)
The ERH subcontractor has installed system components in accordance with their Final Design dated October 2010 for *In-situ Thermal Treatment*. Quality assurance is insured by regular oversight of EPA's Remedial Action Contractor (Nobis). In addition, there is significant and comprehensive testing during installation and prior to operation. Prior to start-up the following is reviewed:

- Review of treatment area,
- Review of effluent treatment system,
- Review of operations and maintenance plan,
- Review of health and safety plan,
- Review of data collection schedule, and
- Review of sampling and analysis schedule

Similarly, prior to start-up, the following test are conducted to verify proper ERH system operation:

- testing all pipelines,
- leak-checking vapor and liquid transfer lines,
- inspecting grounding systems and measuring for stray voltage,
- verifying instrument settings, and
- calibrating signals and alarms and interlock devices

The ERH system which was constructed was inspected prior to start up and all system found to be operating as designed and functioning as intended.

IV Schedule of Activities for Site Completion

It is estimated that all activities associated with site completion will be performed according to the schedule below:

Schedule for Site Completion

Task	Date	Responsible Organization
Conclude ERH Heating (Phase III - cooling) begins	February 2012	EPA
Site Restoration Activities (cap repairs complete)	August 2012	EPA
Final Cap Inspection	September 2012	EPA, MassDEP
IC for Silresim Property*	To Be Determined	EPA
Fourth Five-Year Review	September 2014	EPA
Fifth Five-Year Review (every 5 years thereafter)	September 2019	EPA
Complete Groundwater Treatment**	September 2041	MassDEP
Final Site Inspection	Apr 2042	EPA, MassDEP
Final Closeout/Final Remedial Action Report	June 2042	EPA
Propose Site Deletion from NPL	June 2042	EPA
NPL Site Deletion	Sept 2042	EPA

* Institutional Controls (ICs) exist for all abutting properties; however do not exist on the subject property due to lack of a viable entity (i.e., property owner) to record against the property deed. Should the City of Lowell acquire the property, or another third-party, EPA will insure that appropriate land-use restrictions are recorded on the property deed.

** Based on substantial uncertainty with regard to both (1) residual contaminant concentrations (post-ERH treatment) as well as with groundwater flow models which are estimate of attenuation rates as well as the uncertainty regarding the Commonwealth's groundwater pumping strategy (post-ERH), a default of 30 years is presumed for continued groundwater treatment.

Five-Year Review

Hazardous substances will remain at the Site above levels that allow unlimited use and unrestricted exposure after the completion of the action. Pursuant to CERCLA §121(c) and as provided in the current guidance on Five-Year Reviews (OSWER Directive 9355.7-03B-P, June 2001), EPA must conduct statutorily required Five-Year Reviews. The first Five-Year Review was conducted in 1999. The second Five-Year Review was completed in 2004, and the most recent review was competed in September 2009. The Five-Year Reviews concluded that the remedy is protective of human health and the environment.

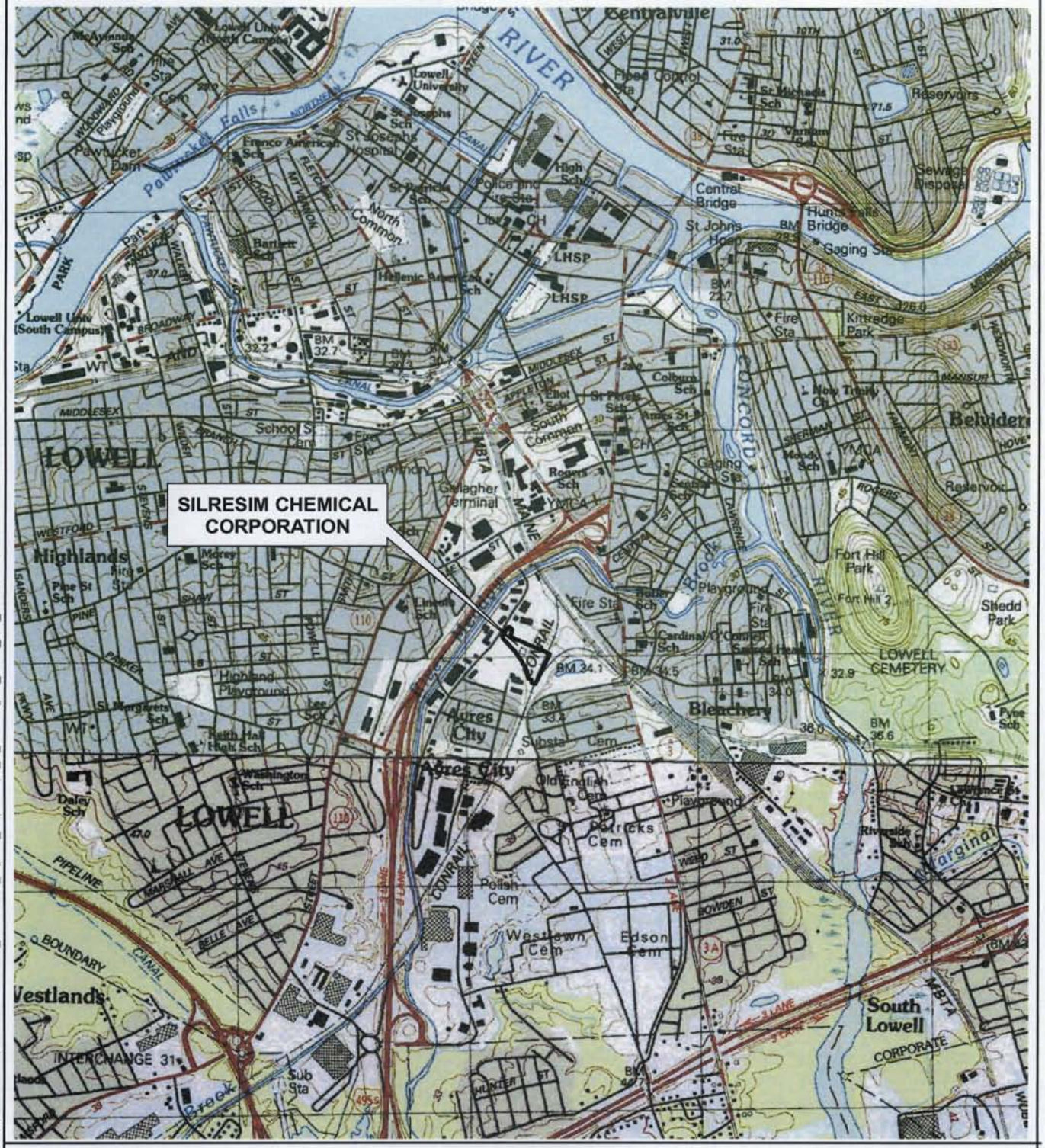
Approved by:

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

8/3/11

Date

Site Figures



Quadrangle Location

USGS TOPOGRAPHIC MAPS

LOWELL, MASSACHUSETTS, 1987
&
BILLERICA, MASSACHUSETTS, 1987

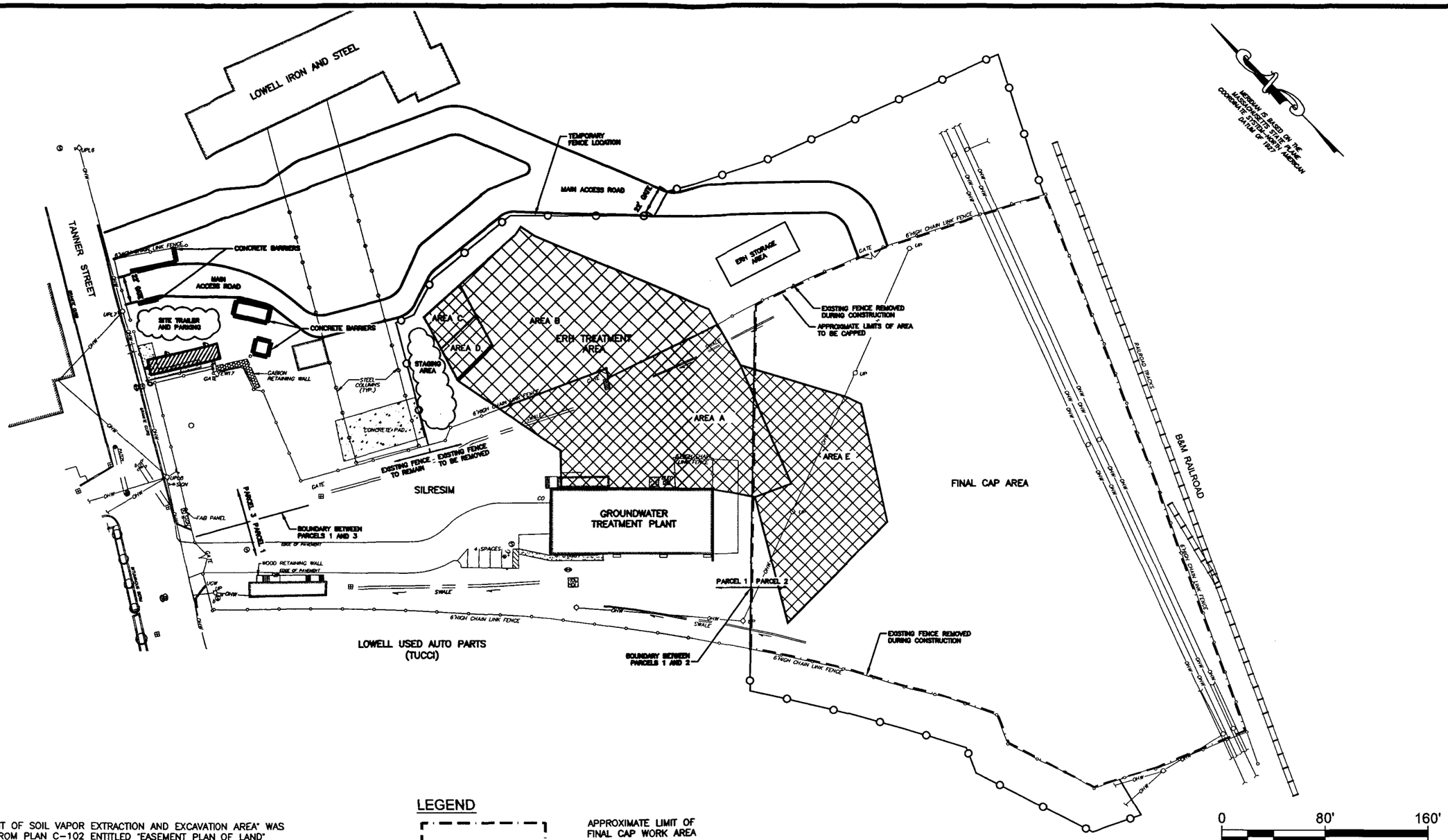
APPROXIMATE SCALE
1" = 2,000 FEET

Images obtained from MASSGIS

FIGURE 1-1	SILRESIM CHEMICAL CORPORATION (RECOVERY) LOWELL, MASSACHUSETTS SITE LOCUS PLAN	Nobis Nobis Engineering, Inc. 585 Middlesex Street Lowell, MA 01851 (978) 683-0891 www.nobisengineering.com	DATE: 11/23/09 REV. 0 PROJECT NO. 80045 PREPARED BY: D. McGRATH CHECKED BY: B. ALLEN	N

R:\80000 Task Orders\80045 Silresim Chemical Corp (RECOVERY)\Technical Data\GIS_Data\Nobis_Figures_Maps\Scope_of_Work\Figure_01-01_Site_Locus.mxd

Figure 1



NOTES:

1. THE "LIMIT OF SOIL VAPOR EXTRACTION AND EXCAVATION AREA" WAS TAKEN FROM PLAN C-102 ENTITLED "EASEMENT PLAN OF LAND" FROM THE SILRESIM PROPERTY FINAL CAP DESIGN, 100% DESIGN SUBMITTAL PREPARED BY TETRA TECH EC, INC. DATED SEPTEMBER 19, 2008.
2. THE "THERMAL TREATMENT ZONE AREA" WAS TAKEN FROM FIGURE 1 ENTITLED "PROPOSED THERMAL TREATMENT ZONES" FROM THE FINAL TECHNICAL MEMORANDUM, TREATMENT ZONE EVALUATION FOR SILRESIM SUPERFUND SITE, LOWELL MASSACHUSETTS" PREPARED BY THE US ARMY CORPS OF ENGINEERS DATED APRIL 19, 2009.

LEGEND

- APPROXIMATE LIMIT OF FINAL CAP WORK AREA
- THERMAL TREATMENT ZONE AREA
- TEMPORARY CHAIN LINK FENCE INSTALL DURING ERH TREATMENT AND CAPPING
- CONCRETE BARRIERS

Nobis Engineering, Inc. | New Hampshire | Massachusetts

Nobis

Engineering a Sustainable Future

18 Chenell Drive, Concord, NH 03301, T(603) 224-4182
585 Middlesex Street, Lowell, MA 01851, T(978) 683-0891

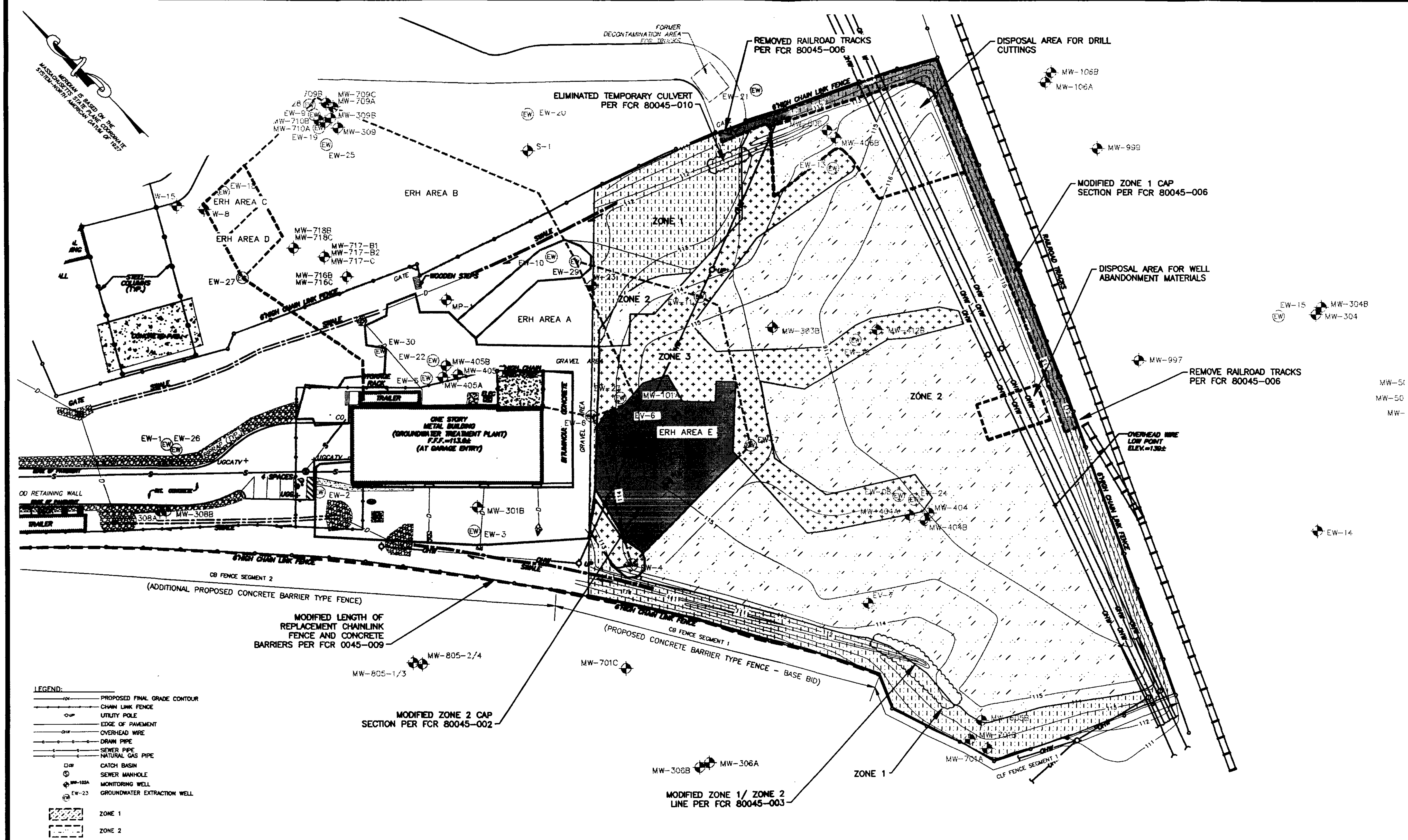
Client - Focused, Employee - Owned
www.nobiseng.com

FIGURE 2

SITE DIAGRAM
SILRESIM SUPERFUND SITE
TANNER STREET
LOWELL, MASSACHUSETTS

DRAWN BY:	ML	APPROVED BY:	BA
PROJECT NO.	80045.01	DATE:	AUGUST 2011

R:\80000 Task Orders\80045 Silresim Chemical Corp (RECOVERY)\Technical Data\CAD\dwg\80045-NOBIS Construction Layout Plan.dwg 8/2/2011 4:28 PM



NOTES:

1. THIS PLAN SHOWS THE APPROXIMATE EXTENTS OF THE PARCEL 2 CAP ZONES, ZONES 1, 2, AND 3.
2. THE BASE PLAN FOR THIS PLAN IS SHEET C-101 ENTITLED "EXISTING CONDITIONS PLAN" FROM THE SILRESIM PROPERTY FINAL CAP DESIGN, 100% DESIGN SUBMITTAL PREPARED BY TETRA TECH EC, INC. DATED SEPTEMBER 19, 2008.
3. PROPOSED FINAL GRADES ON PARCEL 2 ARE BASED ON GRADES ON PLAN C-105 FROM THE FINAL CAP DESIGN, 100% DESIGN SUBMITTAL PREPARED BY TETRA TECH EC, INC. DATED SEPTEMBER 19, 2008.
4. SOURCE OF ERH AREAS SHOWN IS FIGURE 1 ENTITLED "PROPOSED THERMAL TREATMENT AREAS" FROM THE DOCUMENT ENTITLED "FINAL TECHNICAL MEMORANDUM TREATMENT ZONE EVALUATION FOR SILRESIM SUPERFUND SITE, LOWELL, MASSACHUSETTS" PREPARED FOR THE U.S. EPA BY THE U.S. ARMY CORP OF ENGINEERS DATED APRIL 19, 2009.
5. REFER TO THE DETAILS ON PROPOSED CONCRETE BARRIER TYPE FENCE AND CHAIN LINK FENCE.
6. THE SUBCONTRACTOR SHALL PROTECT ALL EXTRACTION WELLS AND GROUNDWATER MONITORING WELLS TO REMAIN DURING CONSTRUCTION. DAMAGE TO WELLS SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO THE CONTRACTOR.

GRAPHIC SCALE
0 15' 30' 60'

Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851
Tel (978) 683-0891
Fax (978) 683-0966
www.nobisengineering.com

DESIGN	PJM
DRAFTING	BW
CHECKED	PJM
APPROVED	PJM

DATE		REVISIONS	BY
11/2010	△	MULTIPLE REVISIONS	CL/PJM

U.S. ENVIRONMENTAL PROTECTION AGENCY
1 CONGRESS STREET
BOSTON, MASSACHUSETTS

JANUARY 2010

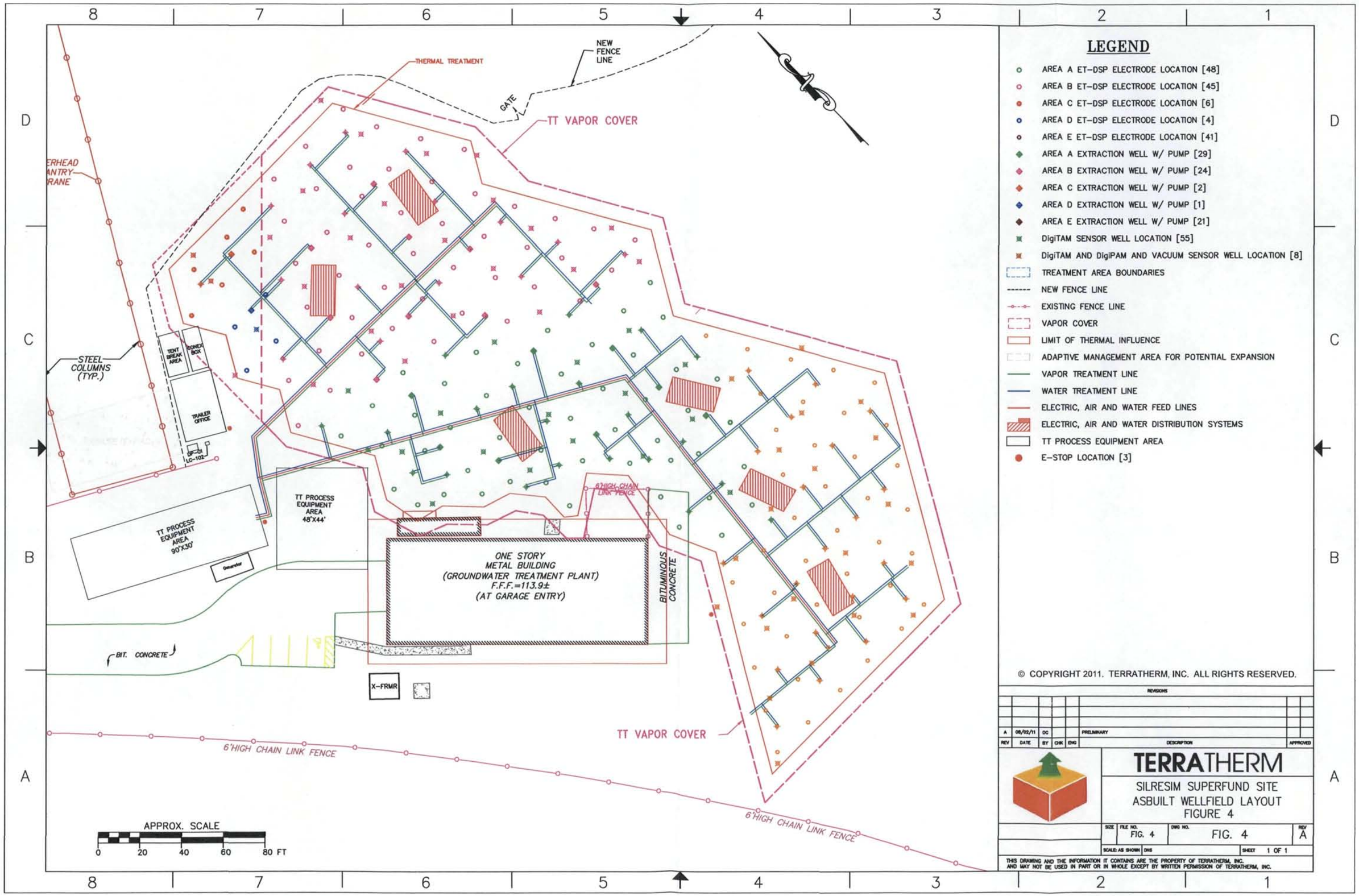
FINAL CAP PLAN
AS-BUILT

PROJECT NO. 80045.03

SHEET N-2 AS-BUILT

SHEET 2 OF 6

Figure 3



LEGEND

- AREA A ET-DSP ELECTRODE LOCATION [48]
- AREA B ET-DSP ELECTRODE LOCATION [45]
- AREA C ET-DSP ELECTRODE LOCATION [6]
- AREA D ET-DSP ELECTRODE LOCATION [4]
- AREA E ET-DSP ELECTRODE LOCATION [41]
- AREA A EXTRACTION WELL W/ PUMP [29]
- AREA B EXTRACTION WELL W/ PUMP [24]
- AREA C EXTRACTION WELL W/ PUMP [2]
- AREA D EXTRACTION WELL W/ PUMP [1]
- AREA E EXTRACTION WELL W/ PUMP [21]
- DigiTAM SENSOR WELL LOCATION [55]
- DigiTAM AND DigiPAM AND VACUUM SENSOR WELL LOCATION [8]
- TREATMENT AREA BOUNDARIES
- NEW FENCE LINE
- EXISTING FENCE LINE
- VAPOR COVER
- LIMIT OF THERMAL INFLUENCE
- ADAPTIVE MANAGEMENT AREA FOR POTENTIAL EXPANSION
- VAPOR TREATMENT LINE
- WATER TREATMENT LINE
- ELECTRIC, AIR AND WATER FEED LINES
- ELECTRIC, AIR AND WATER DISTRIBUTION SYSTEMS
- TT PROCESS EQUIPMENT AREA
- E-STOP LOCATION [3]

REVISIONS					
REV	DATE	BY	CHK	ENG	DESCRIPTION / APPROVED
A	08/02/11	DC			PRELIMINARY

TERRATHERM

SILRESIM SUPERFUND SITE
ASBUILT WELLFIELD LAYOUT
FIGURE 4

SIZE	FILE NO.	DWG NO.	REV
	FIG. 4	FIG. 4	A

SCALE: AS SHOWN | DRS | SHEET 1 OF 1

I HEREBY CERTIFY THAT THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIPS AND THE LINES OF THE STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS AND WAYS ALREADY ESTABLISHED AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

I FURTHER CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN ACCORDANCE WITH THE UNIFORM INSTRUCTIONS FOR THE PREPARATION OF PLANS AS SET FORTH BY THE REGISTERS OF DEEDS.

DATE: 01/25/94

REGISTERED PROFESSIONAL LAND SURVEYOR MASS. NO. 33187

FOR REGISTRY USE ONLY

EASEMENT PLAN OF LAND IN LOWELL, MASSACHUSETTS

PREPARED FOR

THE SILRESIM SUPERFUND SITE

SCALE: 1" = 60' JANUARY 25, 1994

MARTINAGE ENGINEERING ASSOCIATES, INC.
CIVIL - ENVIRONMENTAL ENGINEERS & LAND SURVEYORS
131 MAIN STREET, READING, MA 01867
TEL: (617) 944-4808 FAX: (617) 944-9676

60 0 60 120 240

IMPORTANT NOTE:
FOR NOTES & EASEMENT AREAS
SEE SHEET 2 OF 2

Figure 5