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ELECTRICAL RESISTANCE HEATING (ERH) SUMMARY REPORT

PEMACO SUPERFUND SITE

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EXECUTIVE SUMMARY

On behalf of the United States Environmental Protection Agency (USEPA), Region IX T N & Associates, Inc. (TN&A) has prepared this *Electrical Resistance Heating (ERH) Remediation Summary Report for Pemaco Superfund Site, Maywood, California* under contract with the United States Army Corps of Engineers (USACE) Rapid Response Omaha District contract No. DACA45-00-D-0006 and Sullivan International Group, Inc. Remedial Action Contract (RAC) contract No. DACA45-97-D-0015. The purpose of this report is to document the design, construction, operation, and monitoring of the ERH technology applied as a part of Remedial Action (RA) strategy adopted for the Pemaco Superfund Site (site) in the Record of Decision (ROD) (USEPA, 2005). In addition, this report provides detailed discussion of field and analytical results and lessons learned (refer to Section 7.0). Full-scale implementation of ERH technology at the Pemaco site was the first USEPA Region IX project involving thermal heating. The decision to implement ERH technology was made based on results of a rigorous Feasibility Study (FS) process (TN&A, 2004). The design was reviewed and approved by USEPA and USACE's thermal remediation experts.

The Pemaco Superfund Site (approximately 1.4 acres) is located in a mixed industrial and residential neighborhood in Maywood, Los Angeles County, California. The former Pemaco custom chemical blending facility operated from the 1950s to 1991. A wide variety of chemicals were used and stored on site including chlorinated and aromatic solvents, flammable liquids, oils, and specialty chemicals. These chemicals were stored in drums, aboveground storage tanks (ASTs) and underground storage tanks (USTs). In 1991, the facility was abandoned by the owner/operator. Remaining stored chemicals in drums and storage tanks (USTs) were removed by the USEPA between 1992 and 1998. Environmental assessments performed between 1990 and 1999 identified soil and groundwater contamination that originated from the blending, handling, and storage of chemicals at the Site. The USEPA listed the Pemaco site into the Superfund program in 1999.

TN&A performed a site-wide remedial investigation (RI) from January 2001 and November 2001 (TN&A, 2003b). The treatability tests including aquifer testing were concluded in December 2001. In addition, a high vacuum dual-phase extraction (HVDPE) pilot test was performed in December 2002. Additional source area evaluations were performed in September 2003 and October 2005 using membrane interface probe (MIP) technology combined with completion of additional soil sampling program.

The remedial action objectives (RAOs) developed by USEPA for the Pemaco site are to protect human health and the environment from threats caused by exposure to contaminated soil, soil vapor, indoor air, and groundwater; and to restore groundwater to potential beneficial use as a drinking water source. All chemicals of concern (COCs) have been with their respective Site-Specific Remediation Levels (SSRLs) were documented in the Pemaco ROD (USEPA, 2005). In order to meet the RAOs for trichloroethylene (TCE), the primary site-specific COC, it was necessary to remediate groundwater to 5.0 micrograms per liter (µg/L) and soil from grade to 60 feet below ground surface (ft bgs) to 60 micrograms per kilograms (µg/kg) within the anticipated 5-year RA period.

Because of the 5-year remediation goal, aggressive thermal technology for the source reduction in the area with the highest groundwater and soil contamination was selected through a detailed FS process (TN&A, 2004). Besides source reduction using ERH technology, the overall site Pemaco RA strategy included dual-phase extraction (DPE) system, vacuum enhanced (VE)

groundwater extraction system, and vapor and groundwater treatment system followed by enhanced *in situ* bioremediation (EISB), and monitored natural attenuation (MNA).

Throughout the Pemaco treatment area of 1.4 acres, including the ERH area [approximately 14,400 square feet (sq ft)], there are multiple thin aquifers (saturated zones) across the site separated by 5 to 10 ft of low permeability soil horizons. All of these saturated zones have some degree of dissolved contaminants due to releases from the former Pemaco chemical blending facility.

Generally, the first groundwater aquifer is in the Perched Zone, approximately between 25 to 30 ft bgs. Below the Perched Zone there are Exposition A Zone (beginning at 60 ft bgs), the Exposition B Zone (beginning at 80 ft bgs), the Exposition C Zone (beginning at 100 ft bgs), and the Exposition D Zone (beginning at 120 ft bgs). The site-wide remediation activities encompass the targeted depth interval between 25 and 95 ft bgs including Perched Zone, Exposition A and B Zones. Based on the results of RI soil and groundwater sampling, 2005 MIP investigation and 2005 additional soil sampling, the treatment area for the ERH remediation was determined at 14,400 sq ft with a targeted depth interval between 35 and 95 ft bgs or approximately 30,000 cubic yards (cu yd) for ERH treatment. In addition, the following mass estimate was calculated for TCE and Volatile Organic Compounds (VOCs) using analytical results for over 300 soil samples collected in 2005 and the weight of the target soil volume to determine the following contaminant mass estimates:

Compounds	Estimated Mass [pounds (lbs)]	Soil Density
All VOCs	228	Low density soil
All chlorinated VOCs	131	Low density soil
Non-chlorinated VOCs	96	Low density soil
TCE	96	Low density soil
All VOCs	253	High density soil
All chlorinated VOCs	146	High density soil
Non-chlorinated VOCs	107	High density soil
TCE	106	High density soil

The calculated estimate of TCE mass, the major site-specific COC, in the focused treatment volume ranged from 96 to 106 lbs.

The application of ERH technology at the Pemaco site, which includes both heating the target volume and effective vapor and groundwater extraction, presented several challenges due to vertical and lateral heterogeneity of soil, significantly low permeability zones, and the thickness of the heating interval of approximately 60 ft (from 35 ft bgs to 95 ft bgs).

The key elements of the ERH design by Thermal Remediation Systems (TRS), the provider of the ERH technology for Pemaco are listed in the table below:

Design Element	Specifications
ERH Treatment Area	14,400 sq ft
Vertical Extent of ERH Treatment Area	Between 35 and 95 ft bgs
Average Depth to Groundwater	60 ft bgs
Approximate Treatment Volume	30,000 cu yd
Number of ERH Electrodes	58 (two 32-ft long electrodes per boring)
Distance Between Electrodes	11 to 30 ft
Total Depth of Electrodes	100 ft bgs
Top of Electrodes	35 ft bgs
Number of Temperature Monitoring Points (TMPs)	30
Total of Thermocouples	450 (at 5-foot intervals between 35 and 100 ft bgs)
Number of Vapor Extraction Wells	58 ERH electrodes and 27 vapor recovery (VR) wells
Vapor Flow Rate	560 scfm
Vapor Extraction Blower	Two 50hp liquid-ring
Vapor Treatment*	Flameless Thermal Oxidizer (FTO), vapor conditioning, Granular Activated Carbon (GAC)
Primary Contaminant	TCE
Secondary Contaminants	Vinyl chloride (VC), toluene, hexane
Maximum Subsurface Temperature	110°C
Estimated Electrical Power Input	1,400 kilowatts
Estimated Days to Heat-up Treatment Volume (TRS Estimate)	77
Estimated Energy to Heat-up Treatment Volume (TRS Estimate)	2,442,000 kilowatt-hours (kWhrs)
Estimated 30-Day Boiling Energy needed for Treatment Volume after Heat-up (TRS Estimate)	1,000,000 kWhrs

**Note that the construction and operation of the vapor and groundwater treatment plant was done by TN&A.*

The Pemaco ERH remediation set two contractual thermal milestones that the ERH vendor was responsible for. In addition, the ERH contractor guaranteed that the second milestone would be met without exceeding 3.44 million (MM) kWhrs of electricity. The temperature milestones were defined as follows:

Milestone #1

- A temperature of 87°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depths of 35 and 95 ft bgs.

Milestone #2

- A temperature of 87°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depth of 35 and 60 ft bgs (Vadose Zone),
- A temperature of 100°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depths of 60 and 80 ft bgs (A Zone), and
- A temperature of 110°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depths of 80 and 95 ft bgs (B Zone).

The Milestone #1 was set 87°C, which is the boiling point of TCE when present in the saturated zone. The goal of the Milestone #2 was to achieve water boiling point within the saturated zone (A and B Zones). Note that the original Milestone #2 for the B Zone was set up at 110°C to consider the water boiling point temperature with 30 ft of overlying water pressure; this milestone temperature was later changed to 100°C because of the partial de-watering of the saturated zone.

Extensive monitoring program including physical parameters (readings from instrumentation and meters) and chemical data (vapor and water sampling and analysis) was conducted during ERH operation to understand and evaluate the system performance and remediation progress as well as ensure compliance with discharge permit requirements. The physical and chemical data were further divided into the three operational elements, treatment plant process data, well field data, and ERH data. The types and collection frequency of the data are detailed in a comprehensive project-specific Sampling and Analysis Plan (SAP) prepared by TN&A (TN&A, 2007h) and approved by USEPA and USACE. The purpose of the SAP was to identify not only the critical data for identifying the progress of the ERH, but also to provide sufficient data to assist with future thermal projects conducted by USEPA.

Because thermal remediation projects cause responses in the subsurface far quicker than *in situ* remediation technologies and the operation is fairly expensive in terms of short-term energy use, it is important to have the capability of progress data review on weekly, if not daily basis. The four key elements that were measured for determining progress consisted of 1) temperature, 2) energy input, 3) mass removal rates in the vapor phase, and 4) groundwater concentrations within the target remediation area. These parameters were measured on a daily basis at Pemaco, except for the groundwater, which was analyzed bi-weekly and weekly.

The full-scale Pemaco ERH was implemented between September 25, 2007 and April 10, 2008. The following are key results of the Pemaco ERH remediation:

- Temperature specifications for the Milestone #1 were reached after 100 days of operation,
- Neither original nor revised temperature specifications for the Milestone #2 were reached after 206 days of operation,
- Total of approximately 5 MM kWhrs of energy were used for Pemaco ERH application,
- Groundwater concentrations of VOCs in the ERH area decreased over 99%,

- Post-ERH soil sampling results were 99% less then the pre-ERH sampling,
- Mass removal of TCE in vapor phase from the ERH treatment area was approximately 32 lbs,
- Mass removal of TCE from groundwater within the ERH treatment area was approximately 9 lbs,
- Post-ERH groundwater concentrations of TCE, benzene, and cis-1,2-dichloroethene in the ERH area were above the RAOs; however the concentration trends have been decreasing during continued operation of groundwater pump and treat system, and
- Post-ERH soil sampling results indicated concentrations below the RAOs.

Problems identified with the ERH application at Pemaco included:

- The technology failed to meet the temperature specifications of Milestone #2,
- The amount of energy used (5 MM kWhrs) was significantly greater then proposed (3.4 MM kWhrs),
- The electrode extraction wells were not capable of achieving pneumatic control by producing a vacuum in the Exposition B Zone for efficient extraction of the VOCs,
- The slant electrodes for heating under the bike walk were not effective and there was insufficient temperature monitoring network for proper evaluation of heating progress, and
- One of the electrodes in the northeast part of the ERH area was faulty and thus this part of the treatment area was not successfully heated.

The lessons learned, which may be valuable for future ERH projects, include:

- The ERH contractor has to have the ability to maintain electrical resistivity in the soil in order to effectively sustain heating of the targeted area,
- Implementation of slant electrodes may not be effective and requires close monitoring of temperature to determine success,
- Electrode malfunction is a possibility, but difficult to diagnose without closely monitoring temperatures,
- Symmetrical electrode spacing will aid in uniform temperature distribution, efficient heating, and efficient energy use,
- Temperature monitoring points located too close to an electrode will have a high temperature bias, and
- The clay layer separating Exposition A and B Zones may be not as thick or as impermeable as initially determined based on the case of Pemaco contamination of the lower aquifer (C Zone). The cross-contamination of C Zone was caused by installation of the 100-ft deep electrodes and TMPs below lower depth of the targeted heating zone bottom of the B Zone (estimated at 90-95 ft bgs).

The ERH remediation was only a portion of the overall Pemaco RA strategy. Over the last 2.5 years there were also significant reductions in groundwater VOC concentrations outside the ERH area due to on-going operation of the site-wide groundwater pumping and DPE systems. The site-wide remediation results are also summarized in this report.

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ATTACHMENTS

Attachment A Draft Technical Memorandum on Evaluation of 2005 Membrane Interface Probe (MIP) Investigation (*in preparation*)

Attachment B Draft Technical Memorandum on Evaluation of *Temperature Monitoring Points* (TMPs) Soil Sampling Results for Pre- and Post-ERH Remediation (TN&A, 2008d)

Attachment C Design Report "*In Situ* Thermal Remediation (Electrical Resistance Heating), Pemaco Superfund Site (TRS, 2006b)

Attachment D Pemaco ERH Data and Sample Collection Field Forms

Attachment E Examples of Temperature Data Evaluation Tools: Temperature Isotherms, Histograms, and Graphs

Attachment F Average Temperature Versus ERH Electrode Distance Evaluation

Attachment G Pemaco ERH Photos

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µg/kg	micrograms per kilograms
µg/L	micrograms per liter
1,1-DCE	1,1-dichloroethene
AHAs	Accident Hazards Analysis
AOR	Annual Operation Report
APP/SSHP	Accident Prevention Plan/Site Safety and Health Plan
ASTs	aboveground storage tanks
Calscience	Calscience Environmental Laboratories, Inc.
cDCE	cis-1,2-Dichloroethene
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CET	CET Environmental Services, Inc.
CLP	Contract Laboratory Program
COCs	chemicals of concern
CPVC	chlorinated polyvinyl chloride
cu yd	cubic yards
DNAPL	dense nonaqueous phase liquid
DPE	dual-phase extraction
E&E	Ecology and Environment, Inc.
EDDs	electronic data deliverables
EDMS	Environmental Data Management System
EISB	enhanced *in situ* bioremediation
ERH	Electrical Resistance Heating
ESI	Expanded Site Investigation
ET-DSP	Electro-Thermal Dynamic Stripping Process
EXES	Electronic Data Exchange and Evaluation System
FE	Flow Element for vapor
FI	Flow Indicator for vapor
FM	Flow Meter for water
FQI	Cumulative meter for water
FS	Feasibility Study
ft bgs	feet below ground surface
FTO	Flameless Thermal Oxidizer
FTP	File Transfer Protocol
GAC	granular activated carbon
gpm	gallons per minute
HRS	Hazardous Ranking System
HVDPE	high vacuum dual-phase extraction
in. Hg	inches of Mercury
kVA	kilovolt-ampere
kWhrs	kilowatt hours
lbs	pounds
LVR	lower vapor recovery
MICR	Maximum Individual Cancer Risk
MIP	Membrane Interface Probe
MM	million
MNA	monitored natural attenuation

ACRONYMS AND ABBREVIATIONS (Continued)

MOMP	Monitoring Operations and Maintenance Plan
NPL	National Priorities List
PCDDs	polychlorinated dibenzodioxins
PCDFs	polychlorinated dibenzofurans
PCE	tetrachloroethene
PCU	Power Control Unit
Perched	upper vapor wells
PI	Pressure Indicator
PID	photoionization detector
PIE	Pacific Industrial Electric, Inc.
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAC	Remedial Action Contract
RAOs	remedial action objectives
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCADA	System Control and Data Acquisition
SCE	Southern California Edison
scfm	standard cubic feet per minute
SPH	six-phase heating
sq ft	square feet
SQL	Structured Query Language
SSRLs	Site-Specific Remediation Levels
START	Superfund Technical Assistance Response Team
SVE	soil vapor extraction
SVOCs	semi-volatile organic compounds
TAT	turn-around time
TCE	trichloroethylene
TI	Temperature Indicator
TICs	tentatively identified compounds
TMP	Temperature Monitoring Points
TN&A	T N & Associates, Inc.
TRS	Thermal Remediation Systems
USACE	U. S. Army Corps of Engineers
USEPA	U. S. Environmental Protection Agency
USTs	underground storage
VC	vinyl chloride
VE	vacuum enhanced
VI	Vacuum Indicator
VMP	Vapor Monitoring Point
VOCs	Volatile Organic Compounds
VR	Vapor Recovery Well

1.0 INTRODUCTION

On behalf of the United States Environmental Protection Agency (USEPA), Region IX T N & Associates, Inc. (TN&A) has prepared this *Electrical Resistance Heating (ERH) Remediation Summary Report for Pemaco Superfund Site, Maywood, California* under contract with the United States Army Corps of Engineers (USACE) Rapid Response Omaha District contract No. DACA45-00-D-0006 and Sullivan International Group, Inc. Remedial Action Contract (RAC) contract No. DACA45-97-D-0015. The purpose of this report is to document the design, construction, operation, and monitoring of the ERH technology applied as a part of Remedial Action (RA) strategy adopted for the Pemaco Superfund Site (site) in the Record of Decision (ROD) signed on January 13, 2005 (USEPA, 2005).

Trichloroethylene (TCE) is the major Pemaco Chemical of Concern (COC) present at concentrations that warranted site-wide remediation for soil and groundwater. In accordance with ROD prepared for Pemaco (USEPA, 2005) the overall site RA consists of ERH technology, dual-phase extraction (DPE) system, vacuum enhanced (VE) groundwater extraction system, and vapor and groundwater treatment system followed by enhanced *in situ* bioremediation (EISB), and monitored natural attenuation (MNA).

A comprehensive description of the vapor and groundwater extraction and treatment system is provided in the *Final Remedial Design Report,* (TN&A, 2006a). TN&A prepared 2007 Annual Operation Report (AOR) to focus on the extraction treatment system performance and treatment plant operation in 2007 (TN&A, 2008). The ERH technology, focus of this report, was applied in the source area (approximately 14,400 - square foot area with the highest TCE concentrations) to expedite the remediation process and reach site-specific Remedial Action Objectives (RAOs) within five years.

Remedial progress based on groundwater monitoring results is documented in the Groundwater Monitoring Report for February, May, September, & December 2007 Events (TN&A, 2008c). All monitoring data for physical parameters, soil vapor, and groundwater are documented on the project website. Critical operational decision data are discussed in this report and presented in maps, tables and graphs.

1.1 PROJECT PURPOSE AND SCOPE

This report presents a detailed summary of the design, construction, operation and monitoring results of the ERH portion of the overall site remediation strategy for Pemaco site. The report is not comprehensive in terms of presenting all of the Pemaco RA data and activities, but will focus on the following elements:

- Site History and Background,
- Selection of ERH technology for source zone remediation,
- Design and operational parameters for the ERH technology,
- Identification of key operational parameters for tracking remediation progress,
- ERH performance evaluation, and
- Lessons learned from the Pemaco ERH project that may be relevant to other ERH projects.

It is important to understand that the ERH remediation is only one of several technologies selected for Pemaco RA (USEPA, 2005). In order to reach site-specific RAOs, the integrated

remedial approach included use of ERH combined with DPE, groundwater and vapor pump and treat, and EISB.

Site Background and Geology/Hydrogeology sections focus on the entire Pemaco site. In this report these sections provide a critical backdrop for understanding the strategy for overall site remediation and how ERH was selected for the area of highest COC concentrations, with TCE being the major site COC.

Comprehensive design, construction, and operation of the groundwater and vapor extraction and treatment system are not discussed in this report. TN&A has produced several reports for USEPA and USACE detailing the treatment system; portions of these reports are summarized in Section 3.0.

The *Draft Technical Memorandum on Evaluation of 2005 Membrane Interface Probe (MIP) Investigation, Pemaco Superfund Site, Maywood, CA* (provided in Attachment A) addressed the subsurface investigation for identification of potential Dense Non-aqueous Phase Liquid (DNAPL) of TCE, and the identification of the areal extent of dissolved TCE at concentrations greater then 10,000 µg/L. This area became the focus of the ERH treatment.

The *Draft Technical Memorandum on Evaluation of Temperature Monitoring Points (TMP) Soil Sampling Results Pre- and Post-ERH Remediation, Pemaco Superfund Site, Maywood, CA* (provided in Attachment B) provides details on the focused subsurface soil assessment activities performed in and around the 14,400 - square foot (sq ft) ERH area. The Technical Memorandum provides information regarding the specific geology, sampling methodology, results of pre-and post-ERH soil sampling, maps showing contaminant distribution, and the calculation of the contaminant mass in the ERH area.

The critical comparison of pre-and post-ERH soil data is described in Section 2.5.2; soil vapor and groundwater sampling results are presented and discussed in the Section 6.0 of this document. Maps showing vertical and horizontal Volatile Organic Compounds (VOCs) distribution in soil, and maps showing groundwater concentrations versus time are in Figures section of this report. The provided maps, tables, and graphs showing key operational parameters are powerful tools for understanding the effectiveness of the ERH.

Section 7.0, "Discussion and Lessons Learned", presents an overview of the major problems with the design, construction, and operation of the thermal remediation system. It is important to note that for the Pemaco site, the ERH was successful in reducing TCE concentrations in soil and groundwater by 99 percent despite some of the operational shortfalls.

1.2 Roles and Responsibilities

Detailed explanations of the roles and responsibilities for each of the project team members directly connected to the operation of the treatment system are provided below.

Affiliation & Position	Name	Major Roles and Responsibilities
USEPA Remedial Project Manager (RPM)	Rose Marie Caraway	Responsible for overall project execution and for coordination within USEPA Region IX and with Federal, State and local authorities; Providing management and technical oversight during data collection; and Reviewing and approving project documentation during the course of the project.
USEPA Technical Reviewer	Eva Davis	Reviewing project documentation and providing technical expertise during the course of the project.
USACE Project Manager	John Hartley	Administering the contract and ensuring appropriate execution of the contract; Coordinating technical review activities within the USACE; and, Reviewing and approving project documentation during the course of the project.
TN&A Project Director	Tim Garvey	Ensure sufficient corporate resources for successful operation and completion of the project Act as a technical resource and manage the bioremediation pilot test
TN&A Project Manager	Dacre Bush	Manage all project activities and administrate funds Assign and coordinate project resources Maintain compliance with environmental, health and safety, and quality assurance Report to the USEPA RPM on project progress, expenditures, and spending projections Review and report cost and schedule variances
TN&A Senior Engineer	John Wingate	Oversee the extraction and treatment system Perform site inspections, review all physical and chemical data of the treatment plant Ensure proper staffing for system operation Directly supervise two (2) full-time operators and the Site Operations Manager
TN&A Project Chemist	Ewelina Mutkowska	Ensure quality assurance/quality control (QA/QC) of analytical data Manage hard copy and electronic data Provide oversight and guidance for the subcontract laboratories through various QA/QC activities, including data review/validation and systems and performance auditing

Affiliation & Position	Name	Major Roles and Responsibilities
TN&A Site Operations Manager and On-site Health and Safety Officer	Mark Prostko	Ensure that the extraction and treatment system is staffed with qualified personnel, and that the staff has proper support for health and safety, equipment, and resolution of problems Ensure proper operational parameters for the system as determined by the Senior Engineer and the technical oversight team Record daily activities of the team members, track project progress, coordinate the sampling of all effluent streams with TN&A, and communicate with the Senior Engineer and the technical oversight team Grant access for site visitors, conduct daily health and safety "tailgate" meetings with the site workers, and perform the health and safety overview with site visitors
TN&A Site Sampling Manager	Mark Wanek	Record daily activities, coordinate all required sampling, and communicate activities to the Project Manager Perform inspections of the process equipment and piping/equipment in the well field
TN&A Alternate Site Sampling Manager	David Allen	Record daily activities, coordinate all required sampling, and communicate activities to the Project Manager Perform inspections of the process equipment and piping/equipment in the well field
Thermal Remediation Systems (TRS) ERH Project Manager	Joe Sturza	Safe and effective operation of all ERH remediation components Coordination of ERH system with the extraction and treatment system to ensure meeting temperature and remediation goals Overseeing data collection and transmittal of data per the SAP Weekly progress reports documenting energy use, thermocouple data, extraction rates of vapor and water, mass removal rates, and recommendations for future operations Documentation of all unforeseen site conditions that may impact the SOW, budget and/or timeline Participation in weekly progress conference calls
TRS ERH Project Director	Tom Powell	Senior technical leadership for ERH construction and operation
Sullivan Group RAC Contract leads	Chris Ohland and Rik Lantz	Sullivan became the lead contractor for USEPA in February 2008. Sullivan managed the budget, assisted with staffing for the system operation and maintenance, treatment, and well field sampling.

1.3 HEALTH AND SAFETY MANAGEMENT

The work performed at the site during the ERH remediation site has been in a manner that protects the health and safety of the workers, the community, and environment; and complies with all applicable federal, state, local, and employer requirements. Details related to specific health and safety requirements and procedures are not included in this report, but are detailed in the TN&A's Accident Prevention Plan (APP) (TN&A, 2007c) including the Site Safety Plan (SSHP), and Accident Hazards Analysis (AHAs) provided by TRS the builder and operator of the ERH system.

1.3.1 Hazard Analysis – Accident Prevention Plan

TN&A, working with TRS, evaluated all work activities and performed a hazard analysis for the operation of the ERH and treatment system. The format for the documented analyses followed the EM 385-1-1 (USACE, 2003) AHA format and includes at a minimum the specific hazards associated with each task, the controls or procedures associated with performance of the task, personal protective equipment required, exposure monitoring requirements, and any work limitations or restriction for each task. Site workers are an integral part of the hazard analysis process.

1.3.2 Emergency Response Actions

Emergency response actions within the scope of the remedial action included accidents or releases of chemicals, fires, or natural events such as a flood, earthquake, or other natural disaster. The site-specific APP (TN&A, 7007c) and Emergency Response Plan (TN&A, 2007e) contained personnel responsibilities and actions required by TN&A and subcontractors in the event of such emergency.

1.3.3 Health and Safety Documents

The TN&A Corporate Environmental Health and Safety Manual was the primary document that described TN&A's commitment to worker protection and defines specific policies related to worker health and safety (TN&A, 2007a). This manual is structured to provide standards for routine hazards and associated controls related to general industry and construction hazards.

To implement the health and safety for the Pemaco site, an APP including the SSHP was written to provide the framework for day-to-day implementation of the health and safety program (TN&A, 2007c).

TRS authored an AHA's that addressed the hazards and controls associated with their work performed at Pemaco during construction, operation, and maintenance of Pemaco ERH system. These AHAs at a minimum meet the requirements of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response".

Overall health and safety is detailed and documented in the 2007 AOR (TN&A, 2008a).

1.4 PROJECT COSTS

The cost of the ERH portion of the Pemaco RA project may be determined using the following costs:

- Design, construction, and operation of ERH system ($2,000,000);
- Electrical energy needed to operate the ERH system ($550,000);
- Additional personnel needed for plant operation and oversight during 6 months of ERH (estimated $150,00); and

- Additional sampling and analytical services required for the ERH operation (estimated $150,000).

This simple addition (total of $2,850,000 est.) does not account for what costs would be incurred if ERH was not performed, and the fact that a treatment plant was required for remediation of the much larger area outside of the "source reduction" area addressed by ERH. It is important to understand that the implementation of ERH at the Pemaco site accelerated the overall attainment of RAOs by a factor of several years, and that an overall cost benefit is accomplished from the reduced operation and maintenance of the site's large and complex pump and treat/dual-phase extraction system.

2.0 PROJECT SITE BACKGROUND

2.1 SITE HISTORY

The Pemaco Superfund site (1.4 acres) is located in a mixed industrial and residential neighborhood in Maywood, Los Angeles County, California. Figures 1 and 2 are maps showing the site location and vicinity. The facility formally operated as a custom chemical blender from the 1950s until 1991. A wide variety of chemicals were used and stored on site including chlorinated and aromatic solvents, flammable liquids, oils, and specialty chemicals. These chemicals were stored in drums, aboveground storage tanks (ASTs) and underground storage tanks (USTs). In 1991, the facility was abandoned by the owner/operator. Remaining stored chemicals in drums and storage tanks (USTs) were removed by the USEPA between 1992 and 1998.

2.2 PREVIOUS INVESTIGATIONS

Environmental assessments performed between 1990 and 1999 identified soil and groundwater contamination that originated from the blending and storage of chemicals at the Site. A soil vapor extraction (SVE) system was installed as an interim treatment measure in 1998 and operated until 1999, when it was shut down due to community concerns about emissions from the thermal oxidation unit used to treat the extracted vapors.

The USEPA listed the Pemaco site into the Superfund program in 1999, and TN&A performed a site-wide remedial investigation between January 2001 and November 2001. TN&A conducted treatability tests including aquifer testing in December 2001 and a high vacuum dual-phase extraction (HVDPE) pilot test in December 2002. Additional source area evaluations were performed in September 2003 and October 2005 by groundwater well installations, soil sampling and MIP technology.

The ROD for the soil vapor and groundwater systems was finalized in January 2005. Groundwater monitoring has been conducted at the site since May 2001. In addition, "data gap" investigations and pilot-scale activities for the evaluation of remedial technologies were implemented since 2001.

2.2.1 Removal and Remedial Actions

After cessation of operations by Pemaco Company in 1991, removal and remedial actions began. Between 1991 and 1994, approximately 400 55-gallon drums and three aboveground storage tanks were removed from the site by order of the Los Angeles District Attorney's office. A fire in 1993 destroyed much of the main warehouse building. In 1994, USEPA Region IX Emergency Response conducted a removal assessment at Pemaco at the request of Los Angeles County. As a part of this assessment, USEPA removed six 55-gallon drums, installed fencing, and secured UST fill pipes with locking well caps.

CET Environmental Services, Inc. (CET) completed additional removal activities at Pemaco between August 1997 and March 1998 under the direction of USEPA's Region IX's Emergency Removal Office [Ecology and Environment, Inc. (E&E), 1998a, 1998b]. Work included excavation and removal of over 30 USTs, building demolition, environmental sampling, and design, installation, and operation of a SVE system. The SVE system was operated between March 1998 and March 1999 (E&E, 1999) in the area of the current city park located northeast of ERH area. By the end of August 1998, the SVE system had operated for 3,230 hours (134.6 days), and removed and treated approximately 90,000 pounds (lbs) of hydrocarbons and solvents from vadose zone soils at the site. The system was turned off on March 3, 1999 due to

community concern regarding the possibility of dioxin releases from the thermal oxidation unit used to treat extracted soil vapor.

2.2.2 Preliminary Assessment/Site Investigation

In June 1995, Bechtel Corporation (Bechtel) completed a preliminary assessment/site investigation at Pemaco, which led to the listing of Pemaco into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) under the I.D. number CAD980737092. E&E Superfund Technical Assistance Response Team (START) completed an Expanded Site Investigation (ESI) in 1997, which included an evaluation of Hazardous Ranking System (HRS) factors. Based on these factors, Pemaco was added to the Superfund National Priorities List (NPL) in January 1999.

2.3 REMEDIAL ACTION OBJECTIVES

The RAOs developed by USEPA for the Pemaco site are to protect human health and the environment from threats caused by exposure to contaminated soil, soil vapor, indoor air, and groundwater; and to restore groundwater to potential beneficial use as a drinking water source. All COCs have been identified at the site and are listed with their respective Site-Specific Remediation Levels (SSRLs) in the Pemaco ROD dated January 13, 2005 (USEPA, 2005). In order to meet the RAOs for TCE, the primary site-specific COC, it is necessary to remediate groundwater to 5.0 micrograms per liter (µg/L) and soil from grade to 60 ft bgs to 60 micrograms per kilograms (µg/kg) by the end of the RA period, which is anticipated to last for 5 years.

Because of the 5-year remediation goal, aggressive thermal technology for the area with the highest groundwater and soil contamination was selected through a detailed Feasibility Study (FS) written by TN&A in 2004, (TNA, 2004) and reviewed by remediation experts from both USACE and USEPA. The technologies chosen to meet the source reduction goals within the target area [approximately 30,000 cubic yards (cu yd)] were ERH in combination with DPE. It was also believed that if this approach was operated for a long enough period, RAOs may be attained for soil and groundwater.

2.4 GEOLOGIC SETTING

Throughout the Pemaco site, including the ERH area, there are multiple thin aquifers (saturated zones) across the site separated by 5 to 10 ft of low permeability soil horizons. All of these saturated zones have some degree of dissolved contaminants due to releases from the Pemaco facility and operation. Generally, first groundwater aquifer is in the Perched zone, which is approximately 25 to 30 ft bgs. Below the Perched zone are the Exposition A Zone (beginning at 60 ft bgs), the Exposition B Zone (beginning at 80 ft bgs), the Exposition C Zone (beginning at 100 ft bgs), and the Exposition D Zone (beginning at 120 ft bgs). The site-wide remediation activities encompass the Perched, Exposition A and Exposition B Zones, which are from 25 ft bgs to approximately 95 ft bgs. These units are described in more detail below.

The complex nature of the stratigraphy is also illustrated in the Site Conceptual Model geologic cross-section (Figure 3). This cross-section shows the site-wide geology and hydrogeology as encountered in 93 continuously cored borings and MIP locations that were advanced during TN&A's Remedial Investigation (RI) and FS activities.

2.4.1 Lithology from Grade to Approximately 100 Ft Bgs

Surface and Near-surface Soil

Surficial fill in the area varies in thickness from 2 to 6 ft and is typically comprised of dark yellowish brown silty sands and local gravelly sands or clayey gravels.

Upper Vadose Zone Sands

Typical depth of the upper vadose zone is between 2 to 25 ft bgs. These native soils are predominately light olive gray to dark yellowish brown laminated to moderately bedded fine silty sands ranging from 1 to 20 ft in thickness inter-bedded with pale yellowish brown to light olive gray lenses of laminated to poorly bedded poorly graded sands to fine poorly graded sands with silt which are 2-in to 6-ft thick. Discontinuous lenses of olive gray sandy silt and lean clay lenses ranging from 3 inches to 4 ft in thickness are also present within the upper vadose zone sand.

Perching Clay

The typical depth of the perching clay is between 28 to 40 ft bgs. The top of this unit is comprised of silty lean and fat clays ranging from 1 to 15 ft in thickness, which are underlain and inter-bedded with olive gray to moderate yellowish brown clayey and sandy silts ranging from 1 to 8 ft in thickness. The perching clay and associated clayey silts comprise the fine-grained lithozone that ranges from 10 to 20 ft in total thickness. Local unsaturated silty sand and sands with silt lenses are found within this unit.

Lower Vadose Zone Sand

The lower vadose zone sand is typically present between 40 to 50 ft bgs. It is predominately fine- to medium-grained, unsaturated, poorly graded sands and gravelly well-graded sands derived from granitic source rocks. The zone typically coarsens downward with poorly bedded gravelly basal units. The lower vadose zone sands are usually 1- to 14-ft thick with local intervals of silty sands and poorly graded sands with silt which are 6-inches to 3-ft thick. Local beds of silt lenses are 6-inches to 4-ft thick within this unit. The lower vadose zone sand is generally continuous throughout the area.

Lower Vadose Zone Fine-Grained Unit

The lower vadose zone fine-grained unit is between 50 to 65 ft bgs. It is comprised of sandy and clayey silts ranging from 7 to 20 ft in thickness inter-bedded with lean and fat clays ranging from 6 inches to 5 ft in thickness. Local discontinuous lenses of unsaturated poorly graded sands and silty sands are 0.5- to 2-ft thick within this interval. The thickest areas of the unit are predominately silt.

A – B Zone Fine-Grained Unit

This zone separates the A and B Exposition groundwater zones and is generally present between 70 to 80 ft bgs. It is comprised of light olive gray fat and lean moderate to very stiff clays with local beds of dark greenish gray clayey silt with sand. Local mottling of the gray clays with dark yellowish orange and medium yellow brown clays distinguish this unit. This aquitard interval ranges from 5 to 10 ft in thickness and is continuous where both A and B Exposition groundwater zones are present.

B – C Zone Fine-Grained Unit

This unit is approximately 90 to 100 ft bgs. It is comprised predominately of olive gray to dark greenish gray fat and lean clays 8- to 10-ft thick with localized beds of sandy silts and silt with clay 1- to 5-ft thick. Total thickness of the unit is 7 to 12 ft.

2.4.2 Saturated Zones to 100 Ft Bgs

Perched Zone

The perched saturated interval comprises a few inches to 4 ft of the "perched zone" lithozone. Typical depth of the perched zone is between 25 and 30 ft bgs. This partially-wet to saturated zone is comprised of laminated fine silty sands ranging from 6 inches to 4 ft in thickness. The perched zone is generally comprised of two perched intervals of sandy silts or silt with sand separated by a 1- to 3-foot-thick layer of "perching" clay. The perched zone is absent in some areas where it is replaced by "high points" of the underlying "perching" clay. Groundwater flow direction and hydraulic communication between different localities of the perched zone is dependent upon the geometry of the underlying perching clay. The perched zone can be characterized by low transmissivities and very limited yield. This is not a viable aquifer.

Exposition A Zone

This is the first saturated zone encountered below the perched zone. The A Zone is present between 65 and 75 ft bgs. It is comprised of light olive gray to dark greenish gray fine silty and poorly graded sands locally inter-bedded with well-graded sands with silt. The thickness of this zone is highly variable ranging from 3 inches to 10 ft in thickness. The thickest A Zone intervals are comprised of inter-bedded poorly graded silty sands and well-graded sands. The thinnest intervals of the A Zone are a series of 1- to 3-in-thick saturated silty sands inter-bedded with 0.5- to 1-ft-thick silts and clays. Overall, the A Zone can be characterized as a series of semi-discontinuous saturated sand lenses.

Exposition B Zone

The B Zone is the second saturated zone below the perching layer and is typically found between 80 and 90 ft bgs. It is comprised of fine silty sands, poorly graded sands and poorly graded sands with silt ranging from 1.5 to 10 ft in thickness. The fine-grained silty sands are typically light olive gray mottled with moderate yellowish brown or moderate olive brown. Some of the thicker portions of the unit have 4-foot-thick beds of silt/clay. The B Zone is continuous throughout the site vicinity, except in the area along District Blvd., south of 60th Street, where it pinches out.

Exposition C Zone

The top of the C Zone starts generally between 100 and 105 ft bgs. The C Zone is comprised of saturated dark greenish gray fine silty sands, poorly graded sands and poorly graded sands with silt ranging from 2 to 6 ft in thickness.

2.4.3 Lithological/Groundwater Flow Considerations

The units of the Exposition Zone are both semi-confined and confined units. Aquifer testing results have been consistent with a leaky-confined system. Primary groundwater flow in the A Zone is to the south, while flow in the deeper units (B, C, and D Zones) is more to the southwest. The shallow water- bearing units of the Exposition Zones investigated at Pemaco are discontinuous in most cases, especially in the A Zone. Furthermore, subsurface interpretation of site-wide data show that the Exposition Zones may inter-finger in some areas and that small sand stringers located within the aquitard units may be a pathway between the lower units.

2.5 ERH Area Remedial Assessment

Initial remedial investigation activities in the vicinity of the ERH area are detailed in the RI Report (TN&A 2003b). Based on the site history and the findings of the soil, groundwater and

MIP data in 2003 and 2005, a more focused investigation prior to ERH was performed in 2005. The intent of this investigation was to confirm the final footprint for the source area (where the Pemaco building and loading dock was located) for the large TCE groundwater plume in preparation of the ERH remediation. This focused remedial investigation targeted an area of approximately 14,400 square (sq) ft from 35 to 95 ft bgs (Figure 4), and is detailed in the Technical Memorandum present in Attachment B.

2.5.1 Summary of Attachment A: Technical Memorandum on Evaluation of 2005 Membrane Interface Probe (MIP) Investigation

This Technical Memorandum will be prepared and submitted in Attachment A of this report prior to submittal of the Final ERH Summary Report.

2.5.2 Summary of Attachment B: Technical Memorandum on Temperature Monitoring Points (TMPs) Soil Sampling Results for Pre- and Post-ERH Remediation

Attachment B of this report provides *Draft Technical Memorandum (Tech Memo) on the Evaluation of Temperature Monitoring Points (TMPs) Soil Sampling Results for Pre- and Post-ERH Remediation at the Pemaco Superfund Site, Maywood CA* (TN&A, 2008d). This Tech Memo provides evaluation of the soil sampling results generated prior to and after implementation of ERH technology at the Pemaco site. Pre-ERH soil data were used to complete final delineation of TCE soil contamination and to compare with post-ERH soil results to determine mass reduction and ERH remediation progress.

In summary during pre-ERH soil sampling event 19 borings to be used for TMP installation were continuously cored and sampled at generally 5-foot intervals from 25 to 100 ft bgs. This coring and sampling provides the most detailed analysis of the lithology and contaminant distribution of the ERH area. TN&A followed the sampling and analysis program as described in the SAP Addendum (TN&A, 2006b). During post-ERH soil sampling event, seven borings were selected for post-ERH soil sampling at generally 5-foot intervals from 25 to 95 ft bgs

Drill logs for the TMP installation are provided in Appendix A of the Tech Memo (Attachment B). Comparison of pre- and post-ERH results for Pemaco COCs is presented in Table 6 of the Tech Memo, and analytical reports are contained in Appendix B.

The geology in the ERH area is generally the same as the rest of the site. There are three water-bearing zones:

- Upper and Lower Vadose Zone (35-55 ft bgs),
- A Zone (60 to 75 ft bgs), and
- B Zone (80 to 95 ft bgs).

All of these zones contained VOCs, with the B Zone having the highest concentrations. The pre-ERH soil concentrations for TCE, n-hexane, *cis*-1,2-Dichloroethene (c-DCE), and vinyl chloride (VC) are presented for Upper and Lower Vadose Zone, A Zone, and B Zone in Figures 2a, 2b and 2c (Attachment B), respectively. Figures 3a and 3b (Attachment B) are a 3-D representation of pre-ERH concentrations of TCE in soil. Comparison of pre- and post-ERH results of TCE are illustrated in Figure 4 (Attachment B).

Five groundwater monitoring wells were installed as part of the post-ERH soil sampling field activities. Groundwater results for the new ERH wells are summarized in Section 6.0 of this report.

2.5.3 Mass of Contaminants in ERH Area

The results of the TMP soil sampling defined the area of the ERH area to be approximately 14,400 sq ft, with a remediation target interval from 35 to 95 ft bgs. This calculates to approximately 30,000 cu yd for ERH treatment.

Because of the sampling density and locations of the TMP boring (over 300 analysis for a volume of approximately 30,000 cubic yards) calculations for the mass of all COCs and TCE are thought to be representative. The calculations of contaminant mass used the average concentrations of TCE, chlorinated VOCs, non-chlorinated VOCs, and all VOCs from the 300 analysis. These averages were multiplied by the weight of the target volume to determine the mass of each of the above. Note that two different values for soil density were used for the estimate. The calculations are shown in Table 5 in the Tech Memo (Attachment B) and are summarized below.

Compounds	Estimated Mass [pounds (lbs)]	Soil Density
All VOCs	228	Low density soil
All chlorinated VOCs	131	Low density soil
Non-chlorinated VOCs	96	Low density soil
TCE	96	Low density soil
All VOCs	253	High density soil
All chlorinated VOCs	146	High density soil
Non-chlorinated VOCs	107	High density soil
TCE	106	High density soil

The calculated/estimated the mass of TCE in the focused treatment volume ranges from 96 to 106 lbs. This calculation is not expected to be exact, but a reasonable estimate of the amount of TCE present based on the available data.

2.6 ERH Remediation Objectives

Within the ERH area there were no contractual obligations with the ERH vendor, TRS, to meet the soil and groundwater standards; TRS contractual obligation was to meet temperature milestones within a fixed energy budget of 3.44 million (MM) kilowatt hours (kWhrs). In order to meet the groundwater and soil RAOs in the ERH treatment area, TRS estimated that it would need 206 days of heating: and according to TRS, to heat the target zone to heat and hold at temperature at the second temperature milestone for 30-days would require approximately 3.44 MM kWhrs of electricity. TRS also estimated that meeting the RAOs in soil and groundwater would require an additional 90 days of heating, which would use another 3.0 MM kWhrs of electricity for a total of 6.44 MM kW/hrs.

3.0 REMEDIAL TECHNOLOGY DESCRIPTION

This section describes Pemaco extraction and treatment system, description of ERH technology, Pemaco ERH design modifications during construction, temperature milestones, data evaluation process, well field layout and construction, and site–wide remediation. The key elements of Pemaco remediation system are summarized in Table 1.

3.1 EXTRACTION AND TREATMENT SYSTEM

Pemaco extraction and treatment system design included the following:

- DPE system for perched zone
- Vapor enhanced (VE) groundwater extraction system for Exposition A and B Zones, and
- Vapor and groundwater treatment system.

The following sections of this document provide system description and operational optimization performed during the ERH remediation. Specific details of the plant operation are provided in the 2007 AOR (TN&A, 2008a). In general the semi-automated system for vapor and groundwater extraction at Pemaco was designed to reduce the subsurface VOC mass and provide pneumatic and hydraulic control during ERH operation.

3.1.1 Vapor Extraction from the ERH Area and Other Site Wells

The vapor extraction system for the ERH area was separated from the rest of the Pemaco DPE system. This enabled better control of flow and vacuum, and allowed for independent quantification of the vapor stream prior to entering the treatment plant. The ERH well field was subsequently divided into five sectors (Figure 5) connected to the treatment plant via header pipe VE-3 and VE-4 (Figures 6a and 6b). Each ERH sector could also be independently sampled (sampling ports SP-801 through SP-805) to determine VOC concentrations and calculate contaminant removal mass. The following wells were included in the vapor extraction system:

- 58 combination electrode/vapor extraction wells,
- Ten Lower Vadose Vapor Recovery (VR) wells,
- Nine Perched and Lower Vadose VR wells,
- Ten groundwater monitoring wells connected to the system for improved vapor extraction during ERH operation (details are provided in Section 3.9.1 "Well Field Modification during Operations"), and
- Six A and B Zone groundwater pumping wells (DA/DB-4, DA/DB-10 and DA/DB–11).

Figure 5 also shows locations of the electrode/vapor extraction wells, VR wells, the five sectors, and piping runs. Schematics/drawings for each well type are provided in the TRS Design Report (Attachment C) and shown on a generalized cross-section in Figure 7.

3.1.2 Groundwater Extraction from ERH area and Other Site Wells

The entire Pemaco groundwater extraction system including ERH area consisted of twelve (12) A Zone extraction wells (DA-01 through DA-12), twelve (12) B Zone extraction wells (DB-01 through DB-12), eight (8) A- and B Zone wells, and twenty-three (23) DPE perched wells (PA-01 through PA-05, PB-01 through PB-07, PC-01, PC-02, PC-05, PC-06, PD-01, PD-04 through PD-09), for locations refer to Figure 8. Groundwater was extracted from the A and B Zones

using down-well pneumatic submersible pumps, and from the shallow perched zone wells using "stingers".

3.1.3 Treatment System for Vapor and Groundwater

Pemaco vapor and groundwater system was set up with a system of headers which allowed control and/or monitoring of vapor and water influent to the treatment plant. The ERH well field had two vapor conduits dedicated to vapor influent, VE-3 and VE-4. These lines were combined into a single line immediately downstream of the vapor condenser as illustrated on Figure 6a. The sampling ports for vapor monitoring on the VE-3 and VE-4 lines were SP-115 and SP-116, respectively. Because the vapor flow from the ERH well field never exceeded 600 standard cubic ft per minute (scfm), line VE-4 was closed, and therefore the vapor influent from the ERH well field was monitored primarily using SP-115 sampling port.

Within the ERH well field, all the electrodes and VR wells were connected to one of five vapor extraction headers, i.e., 801 through 805 shown on Figure 6a. Each sector header had associated vapor sampling port, for example, header 801 had associated sampling port SP-801. Vapor sampling results from the sector headers were used to monitor vapor concentration changes in specific areas of the ERH well field during remediation.

Vapor extracted from the ERH well field was cooled by a vapor condenser (provided by TRS) prior to flowing into the treatment plant via line VE-3. Flow measurements for the influent vapor were taken using the flow indicator FI-701 located after the condenser (Figure 6b). This data was recorded weekly and used along with the vapor sampling results from SP-115 to calculate the mass removal rate and total mass removed from the ERH well field.

Groundwater was extracted within the ERH area via extraction wells DA/DB-04, DA/DB-10, and DA/DB-11. Analytical data and pumping rates for these wells were obtained directly from the wellhead sampling ports, and from the dedicated water meter for each well. The pumping rates and analytical data from each well were used to calculate mass removal rates and total of extracted VOCs, and changes in dissolved groundwater concentrations.

Groundwater extracted from DA/DB-04 was mixed with water extracted from other West Trench wells, Figure 8. Groundwater extracted from DA/DB-10 and DA/DB-11 was mixed with water pumped from other East Trench wells (Figures 6a and 6b). Eventually all extracted groundwater transported from the South, West, and East Trenches was mixed with condensate from the extracted vapors and treated using liquid-phase granular activated carbon (GAC). Two carbon adsorption vessels were operated in series prior to discharge of the treated groundwater to the sanitary sewer under provisions of Self-Monitoring Permit from Sanitation Districts of Los Angeles.

A Flameless Thermal Oxidizer (FTO) followed by two vapor-phase GAC adsorption units treated the contaminated soil vapors. The vapors exiting the FTO were "conditioned' by removing excess heat and moisture content before entering the two (2) vapor phase GAC vessels operated in series. Vapor extraction was conducted concurrently with groundwater extraction, but the vapor treatment system was operated independently of the groundwater treatment system.

3.2 Electrical Resistance Heating

3.2.1 Description of Technology

ERH is an *in situ* technology that can volatize VOCs and some semivolatile organic compounds (SVOCs) by an electric current that flows from an array of subsurface electrodes, through soil, which provides resistance and is therefore heated. The vapors generated from the volatilization

of the VOCs from the heating are recovered by a SVE system. ERH is applied using either three or six phases of electricity. ERH process options include six-phase heating (SPH), three-phase soil heating, and Electro-Thermal Dynamic Stripping Process (ET-DSP™). SPH splits conventional three-phase heating into six separate electrical phases. Three-phase heating is used in most full-scale ERH applications and is used by the SPH vendors if the site is large or has an uneven shape. ET-DSP™ uses three-phase line power, but incorporates water circulation inside the electrodes for more even power transfer and to generate steam in order to heat the target zone.

ERH requires surrounding the entire target area with electrodes, and either stacking electrodes in bore holes or building long electrodes the thickness of the treatment interval to get thorough heating of the target volume. Moisture present in the vadose zone conducts the electricity in the target treatment interval. Resistance to the flow of electrical current changes until the portion of the soil moisture turns into steam. Thermal energy volatizes the target contaminant and if there is sufficient water, it generates steam that facilitates extraction of VOCs via SVE system for treatment above the ground. The more electrically conductive zones heat up first and as water boiling point is reached then the less electrically conductive zones heat up. To avoid complete drying of the soil, each electrode usually is equipped with "drip lines" to supply water on as-needed basis.

There are three types of heating which are produced by ERH; resistant, convective and conductive. The temperature limit for resistive heating is the boiling temperature of water [100° Celsius (°C) or 212° Fahrenheit], because after water is converted to steam and is evaporated from the soil matrix, the resistivity in the soil increases to the point where current will not flow. Convective heat transfer can occur by the formation and movement of the steam. Finally, there is a minor component of conductive heating, which occurs near the electrodes due to their elevated temperatures.

Complete volatilization of most VOCs is achieved as temperature in the subsurface approaches the water boiling point of 100°C. It is important to emphasize that ERH must be simultaneously operated with an effective vapor and water extraction system to remove the contaminants from the subsurface.

Electrical resistance heating is an effective *in situ* thermal treatment process for reducing DNAPL mass in the source zone. ERH can also reduce the time to clean up the DNAPL from years to months, depending upon the mass present and the permeability of the soil. The technology is more tolerant of subsurface heterogeneities and actually performs as efficiently in low-permeability silts and clay as in higher-permeability sands and gravels.

The application of ERH at the Pemaco site, which includes both heating the target volume and effective vapor and groundwater extraction, presents several challenges due to vertical and horizontal heterogeneity of soil, significantly low permeability zones, and the thickness of the heating interval of approximately 60 ft (from 35 ft bgs to 95 ft bgs).

Attachment C contains the Design Report for Pemaco ERH prepared by TRS, which includes a more detailed description of the ERH application for the Pemaco site. Note that the system described in the Design Report is different from the system as constructed. The differences are explained in Section 3.3 of this report.

3.2.2 Site Factors Effecting ERH

In a typical application of ERH, electrodes are strategically placed around and within the contaminated zone at distances ranging from 15 ft to 22 ft. A triangular pattern of electrodes is

desirable so that conventional three-phase power can be used to heat the soil. The following are the primary factors affecting the spacing of electrodes:

1. Evaluation of heat transfer mechanisms (resistance, convective and conductive heating);
2. Effectiveness of vapor and liquid extraction (radius of influence); effectiveness of electrical heating (soil resistance);
3. Fluid movement in the contaminated zone (volume/rate of water extracted and groundwater flow into the heated zone); and
4. Electrical resistance of the soil, which affects its ability to conduct electrical current. If resistance is too high (greater then 200 ohms), electrodes would have to be spaced very close (<15 ft) or possibly the soil is too resistant for ERH. If resistance is to low (less then 10 ohms), the soil may be conductive, and will not heat up because of the lack of electrical resistance.

The shape and area of the target area will determine the ERH footprint, energy needs, and the number of electrodes needed to heat up the target volume. Because of the phasing requirement for ERH and the need for equilateral triangles, full access to the target area will minimize the number of electrodes, and therefore the amount of energy needed for remediation.

It is ideal to keep the spacing of the electrodes as uniform as possible (equilateral triangles), as the ability to conduct current between electrodes is a function of distance between electrodes [the power density from the electrode decreases by the square of the radius ($1/r^2$)]. Having electrodes at varying distances requires continuous "fine tuning" by the ERH contractor, and may require more energy to reach temperature goals than if the electrodes are evenly spaced. This was certainly the case with the slant electrodes on the east side of the ERH area, because the top of the electrodes were several ft closer to the vertical electrodes them the bottom of the slant electrodes, so the treatment volume under the bike walk on the east site of Pemaco site would require more "fine-tuning and potentially energy than if the electrodes were ideally spaced and vertical.

3.2.3 Bench Test

Although most soil types are in the range of the target resistance for ERH (10 to 200 ohms), testing site soil and groundwater for dynamic and static resistance is recommended to complete final design and evaluate the cost. Site-specific soil resistance information allows determination of project power requirements, electrode spacing, and project duration.

In order to determine the soil resistivity at the Pemaco site, TN&A had 30 soil samples (one sample for each 5-foot interval between 25 and 95 ft bgs) from two borings measured for static and dynamic resistivity testing. At a constant temperature of 20°C, the static resistivity of Pemaco soil was determined to be between 15 to 30 ohms.

Dynamic resistivity testing measures the change in resistivity as the soil is heated (i.e. electrical resistivity decreases with temperature increase). The dynamic resistivity testing showed a decrease in resistivity by a minimum factor of 2.92 (McMillan-McGee, 2004). This is an important factor because this test showed that electrical current would preferentially flow in the hotter and less resistive parts of the ERH area. Thus, in order to balance the power as the well field heats up, continuous adjustment of the energy into the electrodes would be required.

3.3 PEMACO ERH DESIGN MODIFICATIONS DURING CONSTRUCTION

The Design Report for the Pemaco ERH system (TRS, 2006) is included in Attachment C of this report. The report contains a description of the ERH technology designed by TRS including well

drawings of electrodes, TMPs, Vapor Monitoring Points (VMPs) installed in TMPs, VRs, process-flow drawings, and a drawing of system controls. The following are differences between the designed and "as-built" version of the Pemaco ERH system:

- Locations of installed TMPs were adjusted based on the presence of the subsurface utilities and to better accommodate selection of pre-ERH soil sampling locations. Utility survey was conducted after completion of Design Report and before commencement of construction activities. Figure 9 shows the design and "as-built" locations of TMP wells.
- Locations of installed electrodes were adjusted based on the presence of the subsurface utilities. Locations of subsurface utilities were not considered until utility survey was conducted prior to commencement of construction activities. Figure 9 shows the design and "as-built" locations for electrodes.
- The VMP screening depth intervals for vapor monitoring during ERH were determined by the site-specific geological features to target the following zones:
  - Lower Vadose (approximately 45 ft bgs),
  - Exposition A (approximately 72 ft bgs), and
  - Exposition B (approximately 87 ft bgs);
- Three VMP screens were installed in each TMP well at the actual depths listed in Table 2 summarizing field data collected using Pemaco ERH Data and Sample Collection Field Form 15.
- TRS connected six transformer substations, each rated at 275 kW, to control power to the 116 electrodes (two electrodes per electrode boring) to their Power Control Unit (PCU) instead of each electrode being directly controlled by the PCU per original design (TRS, 2006). Figure 10 shows this configuration.

The effects of these changes are discussed in Section 6.0 "ERH Progress Monitoring Results" and Section 7.0 "Discussion and Lessons Learned".

3.3.1 Northeast Area

Extraction well DB-10 was installed in September 2005 as a part of Pemaco groundwater extraction system construction. Groundwater sample collected at DB-10 in January 2006 indicated TCE concentration at 22,000 µg/L. After review and evaluation of January 2006 groundwater data, an additional electrode triangle was incorporated at the northeast area of the initially defined ERH area. In order to monitor temperature in this additional northeast triangle, TMP-29 was moved north about 16 ft as shown in Figure 9.

3.3.2 Power Supply for ERH Area

Pemaco ERH system required 3-phase power at 1,000 amps with either 13.6 kilovolt-ampere (kVA) or 12.47 kVA. The high voltage transmission lines in the area were rated at 16.2 kVA so it was necessary to step this power down to the required voltage. A "step-down" transformer, high voltage switchgear, and electrical meter were provided by Southern California Edison (SCE) to convert their transmission line voltage to required specification above.

Because the high voltage line was located south of the Pemaco site, and over 100 ft from the location of the step-down transformer, it was necessary to run high voltage lines down the power pole and then subsurface to the high voltage switchgear and meter, and then subsurface to base of the step-down transformer. From the step-down transformer the 3-phase 12.4 kVA line then ran subsurface to the TRS main PCU. Figure 10 is a drawing of the "as-built" Pemaco

ERH power supply components and construction. Note that the power supply work was done by electricians that were certified for high voltage applications. Photographs 1 through 9 (Attachment G) illustrate placement of the transformer and switchgear.

The power supply for the treatment plant was operated separately from the ERH system. Because of this, the electrical meter for the high voltage could be used to determine the power used for ERH.

3.3.3 Hydraulic and Pneumatic Control During ERH

Thermal projects require sufficient extraction of subsurface vapor and groundwater to prevent potential pressurizing of the subsurface as a result of steam generation. Moreover, as subsurface heats up, temporarily increases of COC concentrations in vapor and groundwater are expected and therefore hydraulic and pneumatic control are necessary to minimize potential for off-site/out-of-area migration of contaminants. As the temperature reaches 80°C, water viscosity decreases by a factor of 3. Reduced viscosity proportionately increases groundwater flow velocity, so ensuring hydraulic control is required to eliminate off-site migration of dissolved contaminants.

The ERH well field had an extensive network of vapor extraction wells including electrodes, VRs, and select groundwater monitoring wells (Figure 5). Each TMP was equipped with three VMPs screened through Lower Vadose, Exposition A, and Exposition B Zones for measuring vacuum and taking vapor samples to evaluate remediation progress. Six wells (DA/B-04, DA/B-10 and DA/B-11) from the extensive network of groundwater recovery wells were located within ERH area for groundwater extraction from A and B Zones. Note that due to the limited water in the A Zone, wells DA-04, DA-10, and DA-11 were operated only when water was present in the pumping wells.

3.4 Heating to Temperature Milestones

Any heating of the subsurface aids volatilization process of VOCs from groundwater and soil to improve vapor recovery of VOCs. The purpose of setting-up temperature benchmarks is to ensure the following goals are achieved:

1. TCE DNAPL in the saturated zone will boil/volatize at temperatures between 87°C and 100°C.
2. Dissolved VOC contaminants will be stripped and carried from the water by steam, to be removed by vapor extraction.
3. Heat may open vapor pathways by desiccation of clays.
4. Formation of steam in low permeability soil can cause micro-fracturing, which aids in contaminant transport for vapor recovery.
5. Elevated temperature of groundwater accelerates dissolution of absorbed contaminant mass and DNAPL into groundwater for more efficient mass removal via groundwater pumping.
6. Heating long enough and at temperatures high enough can reduce most VOCs in soil and groundwater by over 95%, providing there is a robust extraction system that can remove the volatized contaminants.

Two thermal milestones were defined for Pemaco ERH contractor to achieve, Milestone (Benchmark) #1 and #2. In addition, the ERH contractor guaranteed that the milestone #2 would

be met without exceeding 3.4 MM kWhrs of electricity. The temperature milestones were established as follows:

Milestone #1

- A temperature of 87°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depths of 35 and 95 ft bgs.

Milestone #2

- A temperature of 87°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depth of 35 and 60 ft bgs (vadose zone)
- A temperature of 100°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depths of 60 and 80 ft bgs (A Zone)
- A temperature of 110°C must be met in 85% of the TMP thermocouples strings in the ERH area between the depths of 80 and 95 ft bgs (B Zone)

The Milestone #1 was set 87°C, as that is the boiling point of TCE when present in the saturated zone. The goal of the Milestone #2 was to achieve water boiling point within the saturated zone (A and B Zones). A second set of specifications for Milestone #2 was negotiated as described in Section 6.3.1 of this document. Note that the original Milestone #2 for the B Zone was set up at 110°C to consider the water boiling point temperature with 30 ft of overlying water pressure; this milestone temperature was later changed to 100°C because of the partial de-watering of the saturated zone. Attainment of milestones is discussed further in Section 6.0.

3.5 Decision Process for Continued ERH Operation

The only contractual obligation defined for the ERH vendor, TRS, was to meet two Pemaco-specific temperature milestones within the energy budget. TRS estimated that 3.44 MM kWhrs of electricity would be required to reach Milestones #1 and #2 and hold Milestone #2 for 30 days, and it would require approximately 107 days of full operation to achieve this goal.

In addition, TRS estimated that an additional 3.0 MM kWhrs of electricity/energy would be needed to reach Pemaco RAOs for soil and groundwater within ERH area. The additional energy would extend the ERH remediation by 90 days. TRS was not contractually obliged to meet the RAOs, but provided the estimate in case USEPA wanted to extend the ERH beyond the 30-day holding period of Milestone #2.

The USEPA decision to continue ERH heating after the thermal milestones have been met would be based on evaluation of physical and analytical data from the subsurface and process equipment, especially the following key data elements:

- Temperature performance and distribution;
- COC concentration trends/mass removal rates in the ERH area vapor stream;
- COC concentrations from groundwater monitoring wells located within the ERH area;
- Soil vapor concentrations from the ERH header sampling points (SP-800s) and VMPs; and
- Possible soil sampling.

There was some consideration given to perform soil sampling to determine if ERH should be continued, but there was far too much infrastructure to access the ERH area to attempt soil sampling program. Note that there were logistical and safety problems associated with drilling in

soil/groundwater at or close to steam temperatures; the data available from the groundwater monitoring wells, TMPs, and VMPs were sufficient to evaluate the status of the ERH remediation without drilling.

Post-ERH soil sampling was performed in October 2008. The results were compared to the pre-ERH soil sampling results to determine ERH effectiveness of site clean up and reported in Tech Memo (Attachment B).

3.5.1 Temperature Performance and Distribution

If a thermal remediation is successful, there should be no "cold" spots within the target treatment volume. The initial design for the TMP thermocouple probes was to install them in locations considered as difficult to heat, i.e., near the center of three-electrode triangles. It is important to identify "cool" areas because these are places where contaminants can condense, and if present in the saturated zone, then the contaminants are not subject to the vapor extraction system.

At Pemaco the temperature measurements at each thermocouple string were taken every day during ERH operation. Data from a single string were used to show the vertical temperature profile and historic temperature data to show how quickly the soil responded to the energy input. Individual thermocouple data were used to identify heating efficiency at specific depths.

Subsurface temperature data were modeled and visualized in three dimensions, with graphic output taking the form of horizontal and vertical cross-sectional views of temperature distribution through the modeled space. During ERH operation project team was able to access the graphic outputs on the project team website. In this report temperature data evaluation is discussed in Section 6.0.

3.5.2 Contaminant Trends in Vapor and Liquid Streams

The analysis of contaminant concentrations in the vapor and groundwater over time was used to determine mass removal versus temperature. A sub-factor, energy input versus mass removal, was also considered. The length of time needed to reach asymptotic or near-asymptotic conditions of mass removal depends upon the quantity of mass, permeability of the medium, and the effectiveness/coverage of the extraction system.

3.5.3 Soil Vapor Concentrations from Well Heads and VMP

Trends of soil vapor concentrations versus time from the VR wells and VMPs were also used in conjunction with the data from the process equipment to determine if operation of ERH needs to continue. It is possible for the overall mass removal rate measured in the process line to be low or "flattening" while some wells could still have high concentrations. Identification of "clean" areas may allow turning off some electrodes, while increasing power and/or extraction to those zones requiring more treatment. The Pemaco well field was divided into five sectors (Figure 5) to facilitate targeted system management.

3.5.4 Groundwater Sampling

Groundwater sampling results from the extraction and monitoring wells were used to determine contaminant distribution in groundwater. The analytical data used in conjunction with the vapor and temperature data may give indications if an area of the site has met the RAOs or requires additional heating and/or extraction.

3.5.5 Possible Soil Sampling

Obtaining soil samples in conjunction with analysis of the groundwater, soil vapor, and system process data may help determine if the RAOs have been met or if additional remediation is

required. Confirmation soil sampling can be performed after significant mass has been recovered, or if vapor and/or groundwater concentrations from individual wells have fallen below RAOs, indicating significant remedial progress. Note that obtaining samples from the target area would require shutdown of the ERH system, and movement of vapor extraction piping for drilling assess.

3.6 EVALUATION PROCESS

It was proposed in the Draft Final Monitoring, Operations and Maintenance Plan (MOMP) for Pemaco Remedial Action (TN&A, 2007g) that as the second milestone approached, all key field and analytical data would be tabulated and graphed in a compiled form and distributed or posted on the project website for the project team review. Note that most, if not all of this data were collected in the course of normal operations in accordance with the SAP (TN&A 2007h). For the projected operation there were approximately 200 days of thermal operation, during which the type and quantity of data needed to make the decision to move forward with additional ERH operation or cessation of thermal treatment were generated. The project team expected that the evaluation process would evolve with the project, as strengths and weaknesses of the technology application become evident.

3.7 WELL FIELD LAYOUT AND CONSTRUCTION

The ERH well field layout was designed and constructed by TRS to cover approximately 14,400 sq ft of treatment area. During ERH installation, the well field layout had to be adjusted to avoid the subsurface utilities. Due to the depth of ERH remediation beginning at 34 ft bgs, it was not anticipated that these underground utilities were impacted by the ERH heating. The following sections described the details of ERH well field layout and components.

3.7.1 Electrode Well Field Layout

An ERH site plan depicting the location of underground utilities is shown as Figure 11. Several subsurface utilities were identified within the Pemaco ERH treatment area including a 4-inch natural gas line, a 10-inch water line, and a storm sewer system. Although these underground utilities did not interfere with the operations of the ERH remediation system, locations of the electrodes, TMPs/VMPs, VR wells, and ERH equipment needed to be adjusted to minimize the possibility of damage to subsurface utilities.

During ERH electrode installation, borings adjacent to the subsurface utilities were air knifed or hand dug to positively identify the location of any utilities. The location of the storm drain and gas line was directly between the F and G rows for electrode design locations and required electrode locations on the F row to be moved about 5 ft east (Figure 11). Many electrode locations were shifted several feet to miss the utilities, which run through the site. The impact analysis of ERH performance due to electrode shifting is presented in Section 7.0 in this report. A site map illustrating the design versus as-built ERH well field layouts is provided in Figure 9 to show the difference between the design and as-built electrode arrays.

3.7.2 Well Construction Details for Electrodes

A total of 58 electrodes, placed on 11 to 30-foot spacing, were used to heat the treatment area. A treatment area plot plan with electrode locations is shown on Figure 5. Each electrode had two separate heating intervals to provide flexibility during operations. The upper electrode element was constructed of 3-inch diameter steel pipe extending to approximately 62.5 ft bgs. The lower electrode element was constructed of coupled copper plates from 66 to 100 ft bgs. Active electrical resistance heating spanned the subsurface interval from 34 to 100 ft bgs.

To assist with vapor extraction, the pipe interval from 50 to 62.5 ft bgs was slotted (0.040 inches) to extract vapors from 50 ft bgs to the groundwater surface level. The 12-inch borehole was filled with graphite and steel shot (34 to 100 ft bgs) to expand the effective diameter of the electrode. Each borehole was then filled from 34 ft bgs to surface grade with grout (neat silica cement). Design details for electrode wells are shown on Figure 7 in this report and on Figure 2 of the Attachment C (TRS Design Report).

The electrodes were installed beginning in the southern portion of the ERH area and continued north until the installation was completed. The electrode elements were isolated electrically at the surface by an 8-inch diameter chlorinated polyvinyl chloride (CPVC) over-sleeve and non-conductive VR pipe connections, to prevent personnel exposure to hazardous voltages. Grout was used to seal the CPVC over-sleeve and electrode elements at the ground surface.

3.7.3 Well Field Construction for Vapor Recovery Wells

In addition to 58 combination electrode/vapor extraction wells, 19 VR wells were installed throughout the ERH treatment area. Ten out of 19 VR wells were screened through Lower Vadose Zone (from approximately 40 to 55 ft bgs; single screened VR wells) and remaining nine VR wells had dual screen intervals from 20 to 35 ft bgs (Perched Zone) and from 40 to 55 ft bgs (Lower Vadose Zone). The locations of the VR wells are shown on Figure 5.

The VR wells were constructed of 2-inch diameter CPVC pipe using 0.020-inch slotted CPVC pipe. A 2-inch diameter CPVC riser pipe was installed and extended to approximately 6 inches above grade. The borehole annulus in the screened interval was filled with high permeability sand. Each borehole was then sealed from approximately 38 ft bgs to surface grade with grout. Design details for the VR wells are shown on Figure 4 in the TRS Design Report (Attachment C), and Figure 7 in this report.

Each of the 19 VR wells was equipped with an isolation valve and was piped to the ERH VR piping headers. The ERH piping layout is shown on Figure 5.

3.7.4 Well Field Construction for TMPs/VMPs

The TMP/VMP construction details are summarized in the drill logs provided in the Tech Memo (Attachment B). Generally a TMP well for the Pemaco site is a 1-inch CPVC pipe (drilled using a hollow-stem auger), which extends to 100 ft bgs used for inserting the thermocouple wires for temperature recording. The VMPs were small-screen intervals placed in the A-B clay and B Zone for measuring pressure/vacuum, and obtaining soil gas samples. The Pemaco site may be the first ERH application including VMPs for subsurface vapor monitoring.

3.8 Construction and Details of ERH System

The ERH electrical energy delivery system consisted of an ERH step-down transformer provided by SCE, a PCU, six TRS auxiliary transformers, and 58 subsurface electrodes. There was an extensive network of electrical cables that linked the high voltage of each component to the electrodes.

The PCU adjusted the voltage applied to the six transformers. In order to get the necessary power to the ERH well field, a 100 amp electrical service at 12.4kV was routed to the site. The temporary ERH step-down transformer and meter were located adjacent to the bike path wall, between the TN&A treatment system area site entrance off 60th Street and the ERH area.

The PCU was located adjacent to the treatment area as shown on Figure 5. A power supply diagram for the ERH system is provided on Figure 10.

The ERH power supply system and control system are described in the following sections.

3.8.1 Power Control Unit and Auxiliary Transformers

For remediation of the Pemaco Superfund Site, a single PCU rated for 2,000 kW was mobilized to the site and connected to the temporary power supply. Electrical requirements for the operation of the 2,000 kW PCU were 100-ampere service at between 12 and 14kV. This service was sufficient to not only power the PCU, but also the ERH condenser.

In addition to the PCU, TRS installed six additional electrical transformer components (275 kW each) at the site. These auxiliary transformers were distributed within the electrode array and increased the variable range of voltage that was applied to the subsurface. The inputs of the transformers were connected directly to the PCU maintaining each of the safety and control features of the PCU. The auxiliary transformers also enabled to modify the applied voltage within regions of the treatment volume in response to differences in site lithology and electrode spacing.

Cables used to connect the PCU to the electrodes were Type W extra hard usage cords. These cables are often referred to as "mining cable" and are rated for outdoor use under routine foot traffic and occasional vehicle traffic.

3.8.2 Transformer and Power Supply Components

Electrical power was obtained from the nearest available high voltage utility pole approximately 40 ft west of intersection of 60th Street and South District Boulevard.

In order to power the PCU, it was necessary to have a "step-down" transformer to convert the high voltage from 16.3 kVA at the utility pole to a usable 12.4 kVA, 100-amp, three-phase power. An underground 16.3 kVA high voltage line connects from the utility pole to the "Pemaco transformer/switchgear" near the W.W. Henry Compound. Then the 16.3 kVA line split at the Pemaco transformer and connected to the ERH step-down transformer.

The ERH step-down transformer, switchgear, and metering cabinet were installed at approximately 300 ft northwest of the intersection of 60th Street and South District Boulevard (Figure 2). Because the Pemaco treatment plant power supply was operated separately from the ERH system, the ERH electrical meter was used to determine the energy consumed by the ERH independently.

In the ERH step-down transformer, the 16.3 kVA high voltage power was converted to 12.4 kVA and then supplied to the PCU. All electrical cables among the power supply components were installed subsurface. Figure 12 shows the as-built of the power supply components. Note that electricians certified for high voltage applications completed the power supply work. The ERH step-down transformer, switchgear, and metering were bought by USEPA and installed by Pacific Industrial Electric, Inc. (PIE). The ERH step-down transformer and meter were removed by SCE after the ERH system was turned off.

3.8.3 ERH Control System

ERH power control and data acquisition was performed on a dedicated computer. Remote data acquisition software was also used to collect and store temperature reading from the TMPs. The application of ERH was monitored continuously, and access for power control, data acquisition system, download data, temperature monitoring, and control the heating process either locally or remotely by telephone modem.

System diagnostics, controls, and alarms were also accessible through the computer in the PCU and the control panels of the condenser. Emergency shut downs and automatic notification alarms were routed through the same system components.

Because steam collection and vapor treatment were vital operations functions, system alarms that did not originate in the PCU were routed through the control panel of the ERH condenser. If the VR system faulted for any reason, the PCU was automatically shut down to discontinue power to the electrode field and auto-dialer would contact operations personnel. On-site action was then required by TN&A to correct the alarm condition and restart the VR treatment system before the PCU was reenergized.

If the Flameless Thermal Oxidizer (FTO) at the Pemaco Treatment Plant was unable to process vapors for any reason, it would fault and shutdown the PCU and trigger the automatic notification auto-dialer. If there were no operating faults within the condenser, it would continue to operate under this scenario until shut down manually.

The faults and alarms associated with ERH remediation system components, along with the actions caused by each condition were identified in the Operations and Maintenance Manual provided by ERH contractor (TRS, 2006f).

In the case of a site-wide power failure, all system equipment would shut down and the auto-dialer would contact operations staff using an emergency battery pack for power. When power was restored, the ERH components had to be restarted locally.

3.9 ADJUSTMENTS AND MODIFICATIONS

3.9.1 Well Field Modification during Operations

On November 27, 2007 TN&A conducted an airflow test in the ERH area to determine the amount of vapor flow from the electrode steam vents using Perched Zone and Lower Vadose Zone VR wells. The test was initially done to ascertain if any modifications to the extraction wells could aid in recovery of steam present in the A-B Clay Zone and B Zone. The presence of steam was evidenced by positive pressure readings in the VMPs and actual steam flowing out of the VMP sampling lines for many of the B Zone VMPs. The results of the tests showed that there was no increase in the airflow of any of the wells when they operated independently, and the ERH steam vent extraction wells had very low at less than 2 scfm flow per well on average. Table 3a shows the results of the airflow test.

In an attempt to increase vapor extraction from the A and B Zones, ten A and B Zone monitoring wells in and around the ERH treatment area were converted to SVE wells. This conversion increased the air flow from the ERH area, and was only marginally effective at reducing the positive pressure in the A and B Zones.

The converted SVE wells were plumbed to the ground surface piping and connected to the ERH headers. Refer to Figure 5 for the new SVE well locations and piping. These monitoring wells were selected as additional SVE wells because they were dry and greatly facilitated vapor extraction from the Exposition A and B Zones. The additional SVE wells and associated ERH sectors are listed in the table below:

SVE Well ID	Associated Hydrogeologic Unit	Associated ERH Sector
MW-03-70	A Zone	805
MW-03-90	B Zone	805
MW-19-70	A Zone	803
MW-19-90	B Zone	803

SVE Well ID	Associated Hydrogeologic Unit	Associated ERH Sector
MW-26-75	A Zone	801
MW-26-90	B Zone	801
MW-27-70	A Zone	803
MW-27-90	B Zone	803
RW-01-75	A Zone	801
RW-01-95	B Zone	802

A second airflow test was conducted on July 2, 2008 to determine if airflow in the ERH area had increased because of the formation of secondary permeability caused by formation of steam in the low permeability soil. The results of the second test were very similar to the first test, as the air flow increased by and average of 0.54 scfm per well (Table 3b). Note that the greatest number of negative pressure readings on Form 15 occurred near the end of the ERH operation when the B Zone had partially dewatered from the groundwater pumping.

The designers of the ERH system did not anticipate the low airflow from the electrodes, but the thickness of the Pemaco heating depth interval (60 ft) was much greater then the other ERH sites. TN&A and the USACE believed that the low electrode extraction vapor flow might result from:

1) Screen interval position – According to TRS electrode design, the electrode wells were slotted from 50 to 62.5 ft bgs to extract vapors. This screened section was located in Lower Vadose Zone (50 to 65 ft bgs) comprised of fine-grained unit (sandy and clayey silts inter-bedded with clay), and above the targeted Exposition A Zone (65 to 75 ft bgs) and B Zone (80 to 90 ft bgs). The higher screen location caused longer travel paths through low permeability soil horizons for vapors from A and B Zones.

2) Rusty conductive backfill – The electrode boreholes were filled with graphite and steel shot from 34 to 100 ft bgs; the steel shot, however, might have been corroded by steam and chemicals. It was also possible that the rust could fill in the voids of graphite and making the backfill impermeable during ERH operation.

3.9.2 ERH Operational Changes

Operational changes to the ERH well field and daily temperature recording were performed by TRS throughout the ERH remediation. There were numerous problems with the analog-digital conversion boxes used for the temperature readings. By the end of the project all the conversion boxes had to be replaced because of corrosion. Hand readings for the suspect or disconnected TMPs were taken by either TRS or TN&A. In addition, weekly 10% temperature data validation was done by taking manual temperature readings for comparison to electronic temperature data.

TRS recorded current levels for each electrode using an amp meter weekly. The evaluation of the current and temperature data was used by TRS to change tap-setting/current for individual electrodes in order to balance the energy in the well field and/or increase energy to areas of the well field that were below projected temperatures.

After 60 or more days of operation, there were clearly areas in the ERH well field that were heating much more slowly then other areas. Initially TRS disconnected some of the upper/vadose zone electrodes so that more power could be directed to the lower zones. It is important to note that there were power limitations for each of the 275 kW substations. So in order to increase power to one electrode, it was necessary to decrease or cease the power in another electrode.

The major operational change occurred when TRS had used almost 3.4 MM kWhrs of energy and had not reached the second temperature milestone. To obtain the boiling temperatures in the A-B Clay Zone and B Zone, TRS turned off energy supply to the Vadose Zone/upper 32-ft electrode sections, and directed the extra power to the lower 32-ft electrode sections. As a result of the energy re-direction, the soil adjacent to the lower electrode sections became extremely hot and adjacent soil dried off. Consequently, conductivity of the dry soil decreased to the extent that sufficient current could not flow between the electrodes to effectively heat up the soil. TRS attempted to manage the soil moisture/water content of the soil adjacent to the electrodes by increasing the amount of water injected into the electrodes via the drip lines. This was not effective, as the current continued to drop (Graph 1), and the subsurface temperatures declined (Graph 2). Temperature data is discussed in more detail in Section 6.0 of this document.

Note that TN&A, USEPA or USACE did not request or recommend changes to the operation of the ERH portion of the project. This change was executed by TRS to meet the temperature goals within the energy budget TRS developed on a performance-based contract.

3.10 SITE-WIDE REMEDIATION

As discussed in Section 2.0, the ERH remediation was directed at source removal of the 4.5-acre extent of TCE dissolved plume (site-wide). Concurrent with the ERH program remediation, the rest of the site was also being remediated. This entailed groundwater pumping from the A and B Zones via DA-, DB-, and DAB- extraction wells, and DPE from the Perched Zone via PA-, PB-, PC-, and PD- extraction wells. Figure 8 shows the entire treatment area. Previous Sections 3.1.1 and 3.1.2 provide an overview of the overall remediation design.

The treatment plant was designed for vapor treatment up to 1,000 scfm, and groundwater treatment up to 100 gallons per minute (gpm). The maximum vapor flow from the ERH area was 550 scfm, and the three B Zone pumping wells associated with the ERH area (DB-04, DB-10, and DB-11) pumped a combined maximum of 8 gpm.

Construction of the treatment plant ended in March 2007. Initial pumping of groundwater began in April/May 2007, and vapor extraction/dual phase extraction began in May 2007. Vapor extraction from the ERH well field started in August 2007 as part of the shakedown and testing for that area.

The capacity of the vapor extraction system was sufficient to allow for operation of both the ERH and non-ERH areas. The flow measurements for all the vapor entering the treatment plant was done by the instrumentation (FI-101) that was part of the FTO, and the data was continuously recorded by the System Control and Data Acquisition (SCADA) system for the treatment plant.

Vapor sampling of the combined vapor stream was done using sampling point SP-102 (Figure 6a). When the FTO was taken off-line in June 2008 (TN&A, 2008a), untreated vapor influent was tested using sampling port SP-104 (Figure 6a). Vapor samples were taken using Summa canisters at a frequency of 5 days a week, so there is a very detailed record of the concentration versus time for this vapor stream. The daily influent samples were analyzed for

VOCs by TO-15 method and one weekly sample was tested for light hydrocarbons by TO-3 method.

Sampling of the combined groundwater influent to the treatment plant was done using sampling port SP-201 (Figure 6a). Another sampling port, SP-204, was sampled to monitor VOC concentrations of combined groundwater influent and post-condensate water. The process water sampling was performed weekly at both sampling ports. Water meter FQI- 401 was used for measuring flow rate. Daily readings at FQI-401 were taken manually; the automated continuous readings were taken by the SCADA system. The 2007 AOR (TN&A, 2008a) and 2008 AOR (in preparation) provide detailed data analysis, tabulated meter readings, and laboratory reports for all the process vapor and water samples obtained within the treatment plant.

4.0 DATA COLLECTION DURING REMEDIATION

During the ERH remediation the following two types of collected data were critical to understand and evaluate the system performance and remediation progress as well as ensure compliance with discharge permit requirements:

1. Physical – readings from instrumentation and meters, and
2. Chemical – vapor and water sampling and analysis;

The physical and chemical data were further divided into the three operational elements, treatment plant process data, well field data, and ERH data. The types and collection frequency of the data are detailed in a comprehensive project-specific SAP prepared by TN&A and approved by USEPA and USACE (TN&A, 2007h). The purpose of the SAP was to identify not only the critical data for identifying the progress of the ERH, but also to provide sufficient data to assist with future thermal projects conducted by USEPA. Attachment D contains examples of the data collection field forms for the treatment plant operation and well field monitoring.

4.1 DATA TYPES FOR OPERATIONAL ELEMENTS

4.1.1 Treatment Plant Process Data

The treatment plant process data was used to understand how all the equipment is functioning and the types and concentrations of contaminants in the waste streams. The data measurement points and their acronyms are summarized as follows:

FE	Flow Element for vapor
FI	Flow Indicator for vapor
FM	Flow Meter for water
FQI	Cumulative meter for water
VI	Vacuum Indicator
TI	Temperature Indicator
PI	Pressure Indicator
VR	Vapor Recovery Well
VMP	Vapor Monitoring Point

The locations of the sampling ports for chemical data collection are shown on Figure 6a. The physical data collection point locations of the process and treatment system are shown on Figure 6b. Most process data were collected daily and generally consisted of:

1. Vapor flow rates (FE = for ERH well field, FI = flow into the FTO),
2. Pressure/vacuum (VI),
3. Temperature (TI),
4. Liquid flow rates (FI),
5. Liquid flow, cumulative (FM),
6. Liquid levels (PLC readings),
7. Analytical data for liquid (SP-200 series),
8. Analytical data for vapor (SP-100 series), and
9. Photoionization Detector (PID) measurements for vapor;

Operation and maintenance data of the treatment plant process are discussed in the 2007 (TN&A, 2008e) and 2008 AOR (in preparation).

4.1.2 Well Field Data

Optimization of vapor flow from the ERH well field, understanding temperature distribution, determining amount and effect of water withdrawal, and determining the radius of influence for the vapor extraction system were accomplished using the following well field data:

1. Well head vacuum (well ID),
2. Vapor flow/extraction rates (FE),
3. Liquid flow/extraction rates (FQM),
4. Temperature (TI),
5. Analytical data for liquid (SP-200 series),
6. Analytical data for vapor (SP-100 series),
7. Draeger or similar type screening for VMPs,
8. PID screening in vapor header system, and
9. Groundwater elevations (10 wells in and around the ERH area)

Results of ERH progress monitoring data collected from the well field are discussed in Section 6.0.

4.1.3 ERH Data

The following ERH data was used by TRS to make adjustments to power, water injection, and/or extraction systems for optimization of the heating process:

1. Total energy use,
2. Subsurface temperature/thermocouple data,
3. Energy per electrode,
4. Condensate/water in and out of the condenser, and
5. Total and individual water volume injected into the electrodes;

ERH data are discussed in Section 6.0 of this report.

4.2 MONITORING AND SAMPLING METHODOLOGY

4.2.1 Subsurface Temperature Monitoring

Subsurface temperature monitoring was done at Pemaco by standard thermocouple wire installed in a 1-inch CPVC TMPs. Construction of the TMPs and connection of the thermocouple wire to the analog/digital conversion boxes are described in Section 3.7.4 of this document. Automated daily temperature monitoring was set up by TRS. The automated data recording was accomplished by sending a signal to the site computer via the Internet, which in turn triggered a signal to the thermocouples installed in the TMPs. An analogy/digital signal converter box read resistance of the thermocouples, and that data was converted from analog to digital and sent back to the site computer. The computer stored and then sent the data to TRS personnel, who did the first level of QC, and then the temperature data was sent to TN&A via project-specific Electronic Data Deliverables (EDDs). The process of "pinging" the 420 thermocouples took less then a minute allowing collection of temperature data at the frequency of hundreds of times a day. The agreed frequency of temperature data recording was once a day, which was believed to be frequent enough to understand the progress of heating without overwhelming the reviewers with data.

The electronic temperature data were subject to errors due to programming and circuit broad design. Manual temperature readings were taken weekly on two or more TMP strings to corroborate the data. The temperature validation/hand readings were rarely identical to the electronic readings, but were usually within +/- 2°C. Occasionally data outliers of +/- 10°C were recorded, but because of the frequency of the data these could be flagged and QC'd and corrected using data from the following day. Examples of hand-taken versus computer-read temperature data comparison are presented in Table 4.

The output of the temperature data produced by TN&A included various types of graphs, maps, and tables. The data was usually posted on the project website within 24 hours of the reading, and all the graphs, maps, and tables were automatically updated. The ability to get the temperature data so quickly and in so many formats, allowed the stake-holders/reviewers to closely monitor the progress of the ERH heating. There were five types of temperature presentations:

1. Histograms,
2. Electrode specific graphs,
3. Depth specific graphs,
4. Isotherm maps, and
5. Comprehensive tables of temperature;

Figures and graphs provided in Attachment E present examples of the temperature data evaluation tools.

4.2.2 Vapor Sample Collection

Vapor sampling from the Pemaco well field consisted of weekly sampling of SP-801 through SP-805 (ERH sectors), weekly sampling at SP-115 (influent vapor from the ERH area), and monthly sampling of the VMPs. Sections below provide brief descriptions of sample collection methodologies.

4.2.2.1 Vapor Extraction System Sampling

The purpose of ERH Sector sampling at SP-801 through SP-805 was to monitor remediation progress and ensure heating optimization among five sectors within the ERH area illustrated in Figure 5. Weekly influent sampling at SP-115 provided VOC concentrations for mass removal calculations.

In accordance with the project SAP, soil vapor samples for the ERH Sector and ERH influent (SP-115) monitoring were collected using 400-milliliter Summa® canisters for VOC analysis by USEPA TO-15 method. Vapor samples were analyzed by USEPA Region 9 Laboratory located in Richmond, CA. Summa® canisters were prepared for sampling by evacuating the contents to a vacuum of approximately 29.9 inches of Mercury (in. Hg). Opening the stainless steel bellows-sealed valves allowed the air sample to enter the canister. The filter restricted airflow to ensure constant airflow at the predetermined rates for approximately 1 minute of sample collection. After the desired sampling time, the valve was then closed to capture the vapor sample. Pressure readings of each Summa® canister were taken before leaving the laboratory, before sampling, after sampling, and also upon receipt by the laboratory. Pressure data allowed for air volume calculations and leak detection. Evacuation of canisters was completed by the analytical laboratory under a controlled clean environment. All sampling canisters were batch-certified (1 out of 10 canisters). During each sampling event, a trip blank (canister under vacuum) was

shipped back to laboratory for analysis to ensure that no cross-contamination occurred during sample handling and shipping.

4.2.2.2 VMP Sampling

The purpose of monthly VOC sampling at 30 VMP locations (Figure 13) was to provide corroborative data for vapor extraction, heating optimization, and ERH shutdown. Each VMP was installed inside the corresponding TMP probe and screened across 1 foot of the Lower Vadose sand, approximately between 44 ft bgs and 45 ft bgs, with exception of VMP-01 (51-52 ft bgs), VMP-22 (48-49 ft bgs), and VMP-27 (43-44 ft bgs). The sampling frequency for the VMPs was monthly after start-up, except for the lower VMPs, which were not sampled until mid-January when the site had de-watered sufficiently for vapor sampling from A-B Clay Zone and B Zone.

Monthly VOC sampling of the VMPs was conducted using 0.5-liter Tedlar bags. A Tedlar bag is made of two plies of Tedlar film sealed together at the edges and features a valve that allows the interior to be filled. Samples were collected using a low flow rate pump. In accordance with USEPA requirements, samples collected in Tedlar bags were analyzed within 72 hours by California State-certified Calscience Environmental Laboratories, Inc. (Calscience) located in Garden Grove, CA.

The data from the VMP sampling were displayed on the website using contour maps and chem-box maps to facilitate evaluation of the data. Results of the VMP soil gas sampling are described in Section 6.0.

4.2.3 Groundwater Sampling

The purpose of groundwater monitoring during ERH effort was to evaluate remedial progress and mass removal. The following sections discuss groundwater sampling program and methodology for biweekly ERH groundwater sampling, weekly ERH groundwater sampling, hot water sampling, and new ERH well sampling.

4.2.3.1 Biweekly ERH Groundwater Sampling

Initially, eleven (11) groundwater monitoring wells were selected for biweekly (or every two weeks) sampling program. The groundwater sampling locations included:

- Seven (7) wells within ERH area DB-10, DB-11, MW-19-90, MW-24-110, MW-24-140, MW-26-90, and RW-01-95; and
- Four (4) wells outside ERH area DB-04, MW-03-90, MW-04-90, and MW-05-105.

The selected locations also included wells within the A Zone (DA-04, DA-10, DA-11, MW-03-70, MW-04-75, MW-19-70, MW-26-75, and RW-01-75; however due to scarcity of water in this zone, samples could only be collected when water was available. Locations of groundwater monitoring wells are presented in Figure 2.

The biweekly groundwater samples were submitted to USEPA Contract Laboratory Program (CLP) selected laboratories (Liberty Analytical Corporation, Inc. located in Cary, NC or Shealy Environmental Services, Inc. located in West Columbia, SC) for 7-day turn-around time (TAT). Groundwater samples were handled and shipped under chain-of-custody protocol in accordance with USEPA CLP requirements. Groundwater samples were collected in accordance with procedures described in the project SAP including water level measurements, low-flow well purging, and sample collection for VOCs by CLP SOM01.2 protocol by the analytical laboratory assigned by the USEPA CLP program.

4.2.3.2 Weekly ERH Groundwater Sampling

Between January 14, 2008 and April 11, 2008 the sampling frequency for eight groundwater monitoring was increased to weekly for DB-04, DB-10, DB-11, MW-03-90, MW-19-90, MW-26-90, MW-27-90, and RW-01-95. The purpose of increasing sampling frequency was to provide timely data for evaluation of groundwater VOC concentrations as a result of heating. Weekly groundwater samples were analyzed for VOCs by SW 8260B method on rush 48-hour TAT by Calscience laboratory located in Garden Grove, CA. Groundwater samples were collected in accordance with procedures described in the project SAP including water level measurements, low-flow well purging, and sample collection for VOCs. The biweekly groundwater-sampling program for selected wells under USEPA CLP-assigned case number was continued.

4.2.3.3 Hot Groundwater Sampling

During ERH operation sampling of hot water was conducted in accordance with hot groundwater sampling procedures involving ice batch prior to field measurements and sample collection described in the project SAP. ERH monitoring wells were equipped with the dedicated high temperature rated bladder pumps, Teflon tubing, and wellhead hardware to seal and electrically isolate each wellhead. The sealed wellhead hardware eliminated the need for opening the well. Sampling was done by opening valves for air and water sampling ports installed in the well cap. Sample collection without opening the well minimized any health and safety risks associated with potential of exposure to high pressure and steam accumulated in the well borehole.

Groundwater samples were collected using low-flow technique in accordance with procedures described in the project SAP. From the discharge valve the purged groundwater run through a coil of Teflon tubing immersed in ice to cool the groundwater below 50°C. This upper temperature limit was determined to be acceptable for using multi-parameter water meter to measure field parameters in accordance with low-flow purging technique.

The qualitative water level data was estimated by using a "bubbler" system. Due to logistical constraints, these systems were only placed in wells RW-01-75, RW-01-95, MW-26-75 and MW-26-90. The installation was done by installing dedicated tubing to the bottom of each well, and another tube in the dry well bore above the piezometric surface. Each tubing set was installed into the sealed well cap and had a valve similar to the bladder pump tubing. Prior to purging, the deep tubing was evacuated with an air source and then pressure measurements from each tubing set was taken with a digital manometer programmed to display pressure data in inches of water. The differential pressure from these two readings at each well was used to estimate water column thickness above the bottom of the bubbler tube. These data were evaluated against baseline water column data representing the "pre-heating" piezometric surface, to provide data sufficient to assess the rate of dewatering, and a comparison of hydraulic gradient inside the ERH area versus outside the ERH area.

4.2.3.4 New ERH Groundwater Monitoring Well Sampling

As described in the Tech Memo (Attachment B), six new monitoring wells screened within Exposition B Zone were installed in the ERH area during the post-ERH soil sampling program in October 2008. These wells include MW-28-90, MW-29-85, MW-30-90, MW-31-90, MW-32-90, and MW-33-90, refer to Figure 1 of the Tech Memo (Attachment B). All these wells were constructed to a depth of approximately 90 ft bgs (the bottom of the B Zone) using 10-ft of wells screen across the B Zone. Groundwater samples were collected in November 2008 following sampling methodology prescribed by the approved project SAP. Samples were shipped under

appropriate chain-of custody procedures to the analytical laboratory assigned by the USEPA CLP program for VOCs by CLP SOM01.2 protocol.

4.2.4 Pressure and Vacuum Monitoring

The VMPs were utilized for soil gas sampling and for measuring pressure/vacuum from the ERH remediation. The VMP construction is described in Section 3.0 of this document. In summary, the VMPs are 1-inch diameter, 1-foot long well screens placed in each of the TMPs at 45 ft bgs (Vadose Zone), 65-72 ft bgs (A-B Clay Zone), and 86-92 ft bgs (B Zone). Pressure/vacuum monitoring was done by placing a vacuum/pressure gauge on the sampling port and opening a valve, and then recording the reading by hand. The rational for monitoring pressure and vacuum was to evaluate the capture zones of the VR and electrode extraction wells.

Monitoring of the pressure and vacuum was done monthly on only the 45-foot VMPs, until mid-January, when de-watering of the A Zone and B Zone was evident and when steam temperatures were prevalent in these zones. Starting in mid-January 2008 VMPs screened through all three zones were monitored on monthly basis. In addition to monitoring the pressure/vacuum, the field technician made visual observations if steam flow was present at VMPs.

This data was very useful in understanding the effectiveness of vapor recovery in the deeper zones of the site. Note that once the site reached steam temperatures in many of the VMPs the monitoring was performed weekly. The pressure/vacuum monitoring was recorded on the Pemaco ERH Data Collection Field Form 15 (Attachment D). VMP vapor sampling was previously discussed in the Section 4.2.2.2 in the document.

4.3 Quality Assurance and Quality Control

Physical data recording and sample collection and analysis for chemical analysis were conducted in accordance with the project-specific SAP (TN&A, 2007) and TN&A's Standard Operating Practices provided in the SAP. Data collection points, frequency, and analytical details are summarized in the Pemaco ERH Data and Sample Collection Field Forms 1 through 15. Attachment D provides examples of the Pemaco ERH Field Forms.

The physical and field data collection was done on daily and weekly basis using the approved methods. The ERH-performance contractual parameters such as daily temperature and energy data were validated by weekly manual temperature readings taken at select 10% thermocouples and monthly energy bills from SCE.

The ERH and site-wide groundwater monitoring was performed in accordance with project-specific SAP requirements. Field QC samples included field duplicates collected at 10%, trip blanks submitted with every VOC sample shipment, and split samples. Laboratory QA/QC included all appropriate QC samples and QA/QC procedures in accordance with USEPA CLP SOM01.2 protocol requirements. The data review and validation was performed on 100% of the definitive level data and reported in the Groundwater Monitoring Report (TN&A, 2008c). The analytical data for groundwater monitoring samples collected at Pemaco were validated according to the QA/QC requirements specified in the project SAP. The validation was performed utilizing guidelines and procedures outlined in the USEPA CLP National Functional Guidelines for Organic Data Review (EPA-540/R-99-008, October 1999). The reviewer's professional judgment was used to evaluate data quality when called for in the Functional Guidelines and in instances with no clear policy or conflicting guidance on how the data should be qualified. The data validation was performed by the USEPA CLP Electronic Data Exchange and Evaluation System (EXES), IFC Consulting/Laboratory Data Consultants located in Richmond, California, and TN&A located in Ventura, California.

Vapor monitoring data were used for evaluation of ERH progress and risk assessment. Field QC samples included field duplicates collected at 10% and trip blanks submitted with weekly Summa canister sample shipment. Laboratory QA/QC included all appropriate QC samples and QA/QC procedures in accordance with the analytical method TO-15 and TO-15 Selective Ion Mode. The data review was performed on 100% of the definitive level data and validation was performed on 100% risk assessment data. The analytical data for groundwater monitoring samples collected at Pemaco were validated according to the QA/QC requirements specified in the project SAP. The validation was performed utilizing guidelines and procedures outlined in the USEPA CLP National Functional Guidelines for Organic Data Review (EPA-540/R-99-008, October 1999). The reviewer's professional judgment was used to evaluate data quality when called for in the Functional Guidelines and in instances with no clear policy or conflicting guidance on how the data should be qualified. The data validation of vapor risk assessment data was performed by TN&A.

4.4 DATA MANAGEMENT

All field and analytical data collected at the Pemaco site were stored permanently in TN&A's Environmental Data Management System (EDMS), a comprehensive MS Structured Query Language (SQL) or SEQUEL Server database hosted on the company intranet behind a secured firewall.

For the purposes related to the database, the collected data were classified as either manually recorded or electronically recorded. Standard procedures for entering the data into the EDMS database were developed for each field data type. Data that were manually recorded by field personnel on appropriate Field Forms (Attachment D) were hand-entered into pre-formatted user-friendly MS Excel spreadsheets. Completed and validated data were imported into the EDMS database via project specific design queries.

Electronically recorded data included data automatically recorded by sensors and analytical laboratory instrumentation. All electronic data were provided by subcontractors (TRS or analytical laboratories) using project-specific EDDs. From the database field and analytical data were transmitted to the project website on the daily basis via automatic synchronization. The remedial system data were managed using a password-controlled website accessible to the entire project team. In addition, stored data were exported out of the EDMS in a variety of formats on as-needed basis, including MS Access queries, MS Excel spreadsheets, delimited text files, dBase files, and others. The format and structure of these files were customized to meet the project specific export requirements for nomenclature, data structure, and file size. Exported files were distributed to the project team members via e-mail, File Transfer Protocol (FTP) site, written to CD or DVD, or other by using means depending upon the final size of the file(s). Integrity of the data stored in EDMS was maintained through software access permissions.

The full data management cycle, in which data generated as either EDDs or as manually entered readings, were imported into the EDMS database, and then were selectively mirrored to a web database from where the data were dynamically accessed via specialized interfaces, as shown in Figure 14.

5.0 KEY OPERATIONAL PARAMETERS

Because thermal remediation projects cause subsurface responses far quicker than other *in situ* remediation technologies and the operation is fairly expensive in terms of short-term energy use, it is important to have capability of reviewing monitoring data on weekly if not daily frequency. The four key operational parameters that were monitored to determine Pemaco ERH remediation progress consisted of:

- Temperature,
- Energy input,
- Mass removal rates in the vapor phase, and
- Groundwater concentrations within target area;

Temperature and energy input were measured on a daily basis at Pemaco. Mass removal rates in the vapor and groundwater were evaluated weekly. The following sections describe the evaluation methodology used for each parameter.

5.1 SUBSURFACE TEMPERATURE

Temperature is the easiest and possible the most important element in overseeing the progress of a thermal project. For Pemaco 30 TMPs were installed in and around the ERH area. Each TMP had 15 thermocouples; the shallowest at 25 ft bgs, and at 5-foot intervals from 35 to 100 ft bgs, refer to Figures 5 and 13 for TMP locations and Appendix B from the Tech Memo (Attachment B) for TMP drill logs. The thermocouples were simple wire-type, which meant that "paired-wires" were used for each depth. The analog signal from the thermocouple wires was sent to a translator box that changed the analog signal into a digital signal. The digital signal was then transmitted to an on-site computer, where the initial data was stored.

The temperature data for the 450 thermocouples deployed at the project site was provided on a daily basis using project specific EDDs by TRS. The EDDs were then imported into the TN&A's project database for permanent storage. The data was also transmitted to the project website on a same-day basis via automatic synchronization. From the project website, temperature data was directly accessed via interactive maps, database query, and dynamically generated graphs. Note that once a week random TMPs were selected for manual readings, and those readings were used for 10% QC of the electronic readings.

The ability to access temperature data daily by TN&A and TRS assisted in the optimization of the ERH operation.

5.2 ENERGY INPUT

The amount of energy (electricity) was measured daily from a meter connected to the TRS PCU. This data was reported in weekly Progress Reports prepared by TRS. Because it takes energy to heat up the soil (approximately 80 to 160 kWhrs per cubic yard of soil depending on site factors), understanding how much energy is being used by the ERH system will assist the operator in making the necessary changes to optimize the remediation. If the energy drops, this could be an indication that the soil around the electrodes is drying out, and therefore it may be necessary to increase the "drip" to restore conductivity.

For the Pemaco project, the second temperature milestone had to be met by using no more then 3.44 MM kWhrs of power. Tracking both temperature and energy use was needed to verify that the goal had been reached.

5.3 MASS REMOVAL RATES

The rate of contaminant removal of the contaminants (VOCs) in the vapor stream was determined by the weekly analysis vapor stream from the ERH well field (SP-115 sampling point), and the flow rate after the vapor condenser (FI-101). In addition, vapor samples were taken 5 days a week on the total flow entering the treatment plant. The vapor flow into the plant was recorded automatically by the system SCADA. Calculation and graphs of the mass removal was done on a weekly basis. The mass removal rate was compared to the energy input and average temperature for the target zone. Analysis of this data shows if addition of more energy creates more mass, and also when the removal rate becomes asymptotic.

5.4 GROUNDWATER CONCENTRATIONS

Prior to and during heating the ERH area, select groundwater monitoring and pumping wells were sampled to monitor dissolved COC concentrations. Groundwater sampling details are provided in Section 4.2.3, well locations are presented in Figure 5 and results of the sampling are discussed in Section 6.0 of this report.

Groundwater concentrations were used to evaluate dissolved concentrations of TCE and other Pemaco COCs. In addition to collecting groundwater samples for laboratory analysis, the temperature data on pumping wells were recorded. The fast TAT of 7 days by USEPA CLP laboratories and 48-hrs by Calscience laboratory allowed the results to be available for making timely operational decisions. The analytical data was posted on the project web site, and then automatically graphed, and plotted on a site map for review by the project team.

The sampling of the selected groundwater monitoring wells on a high frequency schedule was considered prudent, because these results were critical to aid decision on an early ERH shut off or other operational changes for the Pemaco ERH system.

6.0 ERH PROGRESS MONITORING RESULTS

6.1 OVERVIEW OF RESULTS, DATA COLLECTION, AND GENERAL TIMELINES

The results of the ERH remediation are subjective given the claims by the ERH vendor for the technology. There were significant reductions in the dissolved groundwater concentrations after 110 days of operation, but after additional 100 days of operation the following issues were became evident:

1. The technology failed to meet the second temperature milestone,
2. The amount of energy used was significantly greater then proposed,
3. The electrode extraction wells were not capable of achieving pneumatic control (producing a vacuum in the B Zone) for extraction of the VOCs,
4. The slant electrodes for heating under the bike walk were not effective, and
5. There was a failure of an electrode in the northeast part of the ERH area, so that area was not successfully heated based on temperature data for TMP-29.

A tremendous amount of physical parameters and analytical data for vapor and groundwater was obtained throughout the ERH remediation. This operational data was compared to baseline data for determining the remediation progress and the overall reduction in dissolved concentrations in the ERH area. Note that in addition to the key operational parameters listed in Section 5.0, additional data were collected from the well field such as VMP vapor concentrations, vapor concentration in the ERH well field headers, temperature data from VR wells, and vapor concentration from additional wells that were connected to the ERH area extraction system. These additional data did help understand the ERH remediation with more detail, but the key operational parameters were the most important elements used to evaluate remediation progress and to decide when to turn off the ERH system.

The following sections will discuss the operational data in detail. There are also numerous chemical concentration maps, tables and graphs that will greatly aid the reader in understanding the performance of ERH for the various elements discussed.

6.1.1 ERH Milestone Dates

The following is a general timeline for the ERH remediation starting with extraction and treatment system shakedown and ending with shutdown of the ERH system.

- Treatment system shakedown 03/19/07
- Begin ERH Shakedown 09/18/07
- Begin Full ERH Operation 09/25/07
- First Temperature Milestone 01/12/08
- Change in electrode configuration 01/21/08
- 3.4 MM kWhrs of energy 01/24/08
- ERH Shutdown 04/10/08

Comprehensive and detailed construction documentation and timelines are in the Design Report (TRS, 2007) contained in Attachment C and 2007 AOR (TN&A, 2008a). Site-wide groundwater monitoring reports also contain results of quarterly groundwater sampling events including the wells in the ERH area (TN&A, 2008c). VMP sampling data is discussed and presented in Figures and Graphs in this report, and other operational vapor data, such as air emissions and

GAC efficiency, will be reported in 2008 AOR (in progress). Soil data generated during the pre- and post-ERH soil sampling is described in the Tech Memo (Attachment B).

6.1.2 Quantity of Data

The ERH remediation lasted from September 25, 2007 (full-scale heat-up began) to April 10, 2008, approximately 200 days. During this time key operational data was collected on a daily, weekly, and monthly basis in accordance with the approved SAP. The following is a summary of data exclusive to the ERH remediation, which were collected to assist evaluation of key operational parameters described in Section 5.0:

- 35 vapor influent samples for measuring VOCs in the vapor stream from the ERH extraction wells collected from SP-115 during ERH operation;
- 200 daily readings of energy input from the PCU;
- 600 daily readings of vapor flow, temperature, and vacuum for the ERH well field;
- VOC data for quarterly site-wide groundwater sampling from over 100 monitoring wells; Baseline and 4 quarterly events were completed during ERH operation;
- VOC data for biweekly ERH groundwater sampling from 11 monitoring wells; 15 sampling events were completed during ERH operation;
- VOC data for weekly ERH groundwater sampling from 8 monitoring wells; 13 sampling events were completed between January 14, 2008 and April 11, 2008;
- 30 weekly reading events of temperature and vacuum from 19 Lower Vadose and nine Perched Zone VR sampling points;
- 8 monthly vapor sampling events for Lower Vadose Zone VMPs between August 2007 and April 2008;
- 4 monthly vapor sampling events for A-B Clay and B Zone VMPs between January 2008 and April 2008; and
- 30 weekly events of recording groundwater pumping rates for pumping wells DB-4, DB-10 and DB–11.

Note that TRS also collected data that was critical to operation and optimization of the energy in the well field. This data was not subject to review by the other members of the team.

The critical data was reviewed daily by the TN&A's Project Manager and Project Engineer, and it was discussed weekly during a 1 to 2 hr progress calls with team members (USEPA, USACE, TRS, Sullivan, and TN&A).

The type, amount, and timeliness of the generated data provided an excellent overview of the remediation progress and success of the ERH application.

6.2 SUBSURFACE TEMPERATURE

Temperature monitoring inside the ERH area was done using thermocouples installed in 21 TMPs (TMP-04, TMP-05, TMP-06, TMP-07, TMP-08, TMP-09, TMP-10, TMP-12, TMP-13, TMP-15, TMP-16, TMP-17, TMP-18, TMP-19, TMP-21, TMP-22, TMP-23, TMP-24, TMP-25, TMP-26, and TMP-29). Remaining nine TMPs (TMP-01, TMP-02, TPM-03, TMP-11, TMP-14, TMP-20, TMP-27, TMP-28, and TMP-30) were situated 5 to 10 ft outside the ERH area for monitoring heat loss. As discussed in Section 4.2.1, each TMP was equipped with 15

thermocouples, the shallowest at 25 ft bgs, and remaining 14 thermocouples installed every 5 ft between 35 and 100 ft bgs. Automated temperature readings were recorded daily.

The outputs of the temperature monitoring data included:

- Temperature profiles (temperature versus depth histograms) of each TMPs; examples are provided in Figures E-13 through E-16 of the Attachment E;
- Temperature history graphs (temperature versus time) of all thermocouples at every 5-ft interval;
- Temperature history graphs (temperature versus time) of each thermocouple for a specific TMP;
- A table of the complete temperature of every thermocouple for each TMP;
- Graphs of average temperature of all the thermocouples for the Vadose Zone (35 ft to 60 ft bgs) A-B Clay Zone (60 ft to 80 ft bgs), and B Zone (80 ft to 95 ft bgs); examples are provided in Graphs E-1 through E-6 of the Attachment E;
- Graph of the average temperature for all thermocouples in the ERH area;
- Tables showing the temperature of all the "temperature milestone" thermocouples, and the percent of thermocouples that met the milestone; and
- Temperature isotherms, which display all the horizontal intervals from 25 ft bgs to 100 ft bgs; examples are provided in Figures E-01 through E-12 of the Attachment E.

All of these data outputs were posted on the project website for unlimited access by the project team members. All forms of the temperature data outputs were evaluated to understand the vertical and horizontal temperature distribution of the ERH area. These various types of graphs, maps, and tables were critical for making operational changes and tracking the project progress. This amount of detail is common for large-scale thermal projects.

The following sections will discuss the performance of the ERH in relationship to the temperature milestones, and utilize all the above tools to illustrate the data analysis.

6.2.1 Attainment of First Temperature Milestone

6.2.1.1 Temperature Data

The first temperature milestone of 87°C in 85 percent of the thermocouples between 35 and 95 ft bgs in the ERH area was attained on January 12, 2008, i.e., 110 days after ERH began full operation on September 25, 2007. Tables 5a through 5f show the temperature of each thermocouple for each TMP including temperature data recorded on 9/25/07 (Table 5a), 10/25/07 (Table 5b), 11/25/07 (Table 5c), 12/11/07 (Table 5d), 12/25/07 (Table 5e) and 1/12/08 (Table 5f). Each table includes summary of how many thermocouples have met the benchmark, percentage of thermocouples meeting benchmark, and number of suspect readings. Note that TRS predicted that the second temperature milestone would be achieved after 77 days of full operation (Table 1); based on the temperature data, after 77 days of full operation only 49 percent of the thermocouples reached 87°C, as shown on Table 5d.

A clear pattern was observed in the TMPs that had reached the first milestone, i.e. the hottest TMPs were positioned closest to the electrodes, benefiting from conductive heating; TMPs located farther away from electrodes (the larger electrode and TMPs triangles) were heating much more slowly than the smaller electrode/TMPs triangles; TMP-29 in the northeast area was responding very slowly; and the TMPs closest to the slant electrodes (TMP-07 and TMP-15

were also not heating effectively in the lower (A and B Zones) thermocouples. Detailed discussions of these issues are provided in the Lessons Learned section of this document.

6.2.1.2 Energy Use

From September 18, 2007 (ERH shakedown) to January 12, 2008 (attainment of the first temperature milestone) the ERH remediation used approximately 2.9 MM kWhrs of electricity. This was about 85 percent of the total energy budget of 3.4 MM kWhrs for reaching the temperature milestones and 30-day holding of second milestone. The following graphs are provided to understand the performance of the ERH from the start of the system through ERH shut down:

- Graph 1 – Pemaco ERH Energy Consumption; this graph shows the total energy input for the entire project;
- Graph 2 – Average Temperature Versus Time Within ERH Area; this graph shows the average temperature for each of the three temperature milestone zones (Vadose Zone, A-B Clay Zone, and B Zone) over time;
- Graph 3 – Average Temperature Versus Energy Within ERH Area; this graph shows the temperature response as a function of energy input; and
- Graph 4 – Energy Consumption and Cumulative TCE Mass Extracted from ERH Well Field; this graph shows that increased energy had little effect on the rate of mass removal past 1/20/08.

Note that the energy usage estimate was based on the volume of soil/groundwater in the ERH treatment zone and the amount of energy it would take to meet the contractual temperature milestone. The type and amount of contaminates was not a factored into the estimate. It was thought prior to the implementation of ERH, that DNAPL was present and that the mass of contaminants was much greater than the amount quantified through January 2008. This is the one of the primary reasons the ERH system operated much longer than expected until April 2008.

6.2.1.3 Dissolved Concentrations

By January 12, 2008, concentrations of TCE, the primary site-specific COC, significantly decreased in monitoring and pumping wells in the B Zone within the ERH area as illustrated in Graphs 5a and 5b. Note that TCE concentrations in most of the monitoring wells decreased to asymptotic concentrations. Figure 15 displays graphs showing TCE concentrations versus time for the individual wells in the ERH vicinity.

6.2.1.4 Mass Removal

Mass removal of TCE within ERH area was accomplished by vapor extraction and groundwater pumping from wells DB-04, DB-10 and DB-11. Cumulative TCE removal data in the ERH area are illustrated in the following graphs:

- Graph 6a - Cumulative TCE Mass Removed from Vapor,
- Graph 6b - Cumulative TCE Mass Removed from Groundwater, and
- Graph 6c - Cumulative TCE Mass Removed from Vapor and Groundwater.

Graph 6c shows that the total of 40.3 lbs of TCE was removed from vapor and groundwater and that groundwater pumping accounted for approximately 25 percent of the TCE mass removed from the Pemaco ERH area during the ERH remediation, i.e., 8.9 lbs removed in groundwater (Graph 6b) versus 31.5 lbs removed in the vapor phase (Graph 6a). Graph 6d shows that

almost 70 percent of the dissolved mass of TCE was removed by pumping from wells DB-4, DB-10, and DB–11 prior to ERH and almost 30 percent of the TCE mass was removed during ERH heating.

Groundwater pumping was not originally planned during the ERH phase, but the pumps were turned on so that the screen interval in the B Zone would be available for additional vapor extraction from those dual-phase wells. The additional vapor recovery assisted in contaminant removal and pneumatic control.

6.2.1.5 Soil Gas Concentrations

Although the soil gas concentrations from the VMPs were not included in the key operational parameters for ERH progress evaluation, there were significant decreases of TCE concentrations in Lower Vadose Zone (45 ft bgs) in the post-ERH results (Figure 16b) when compared to the pre-ERH results (Figure 16a). The VMPs screened within the Lower Vadose Zone were sampled monthly after start up of the ERH system. Monthly vapor sampling of VMPs screened through A-B Clay Zone and B Zone was commenced in mid-January 2008.

Figures 17a through 17c show TCE concentration trends in Lowe Vadose Zone VMPs (45 ft bgs), A-B Clay Zone VMPs (65-72 ft bgs), and B Zone VMPs (86-92 ft bgs), respectively. Note that the maximum soil gas concentrations occurred when the site was at the highest temperatures. VMP concentrations were also significantly higher then the concentrations in the influent concentrations measured at SP-115 to the treatment plant. This is most likely because contaminated vapor from ERH area was diluted by uncontaminated air during extraction process. TCE concentrations in Lower Vadose Zone (45 ft bgs), A-B Clay Zone VMPs (65-72 ft bgs), and B Zone VMPs (86-92 ft bgs) are presented in Graphs 7a through 7c.

6.2.2 Second Temperature Milestone

Attainment of the second temperature milestone (boiling temperatures in the A and B Zones) was considered critical for meeting the RAOs for groundwater. The boiling of water was important because the COCs in the dissolved phase are removed via steam; and in addition permeability in the clay may be created by steam pathways. Note that attainment of the second temperature milestone was defined as 85 percent attainment of steam temperature (adjusted for water pressure) in the thermocouples that were located in the middle of the A-B clay (approximately 70 ft bgs) and in the middle of the B Zone (generally at 85 ft bgs). This meant that thermocouple above A-B clay and below the B Zone did not need to meet the steam temperature, even though the saturated zone was from approximately 60 to 95 ft bgs.

Tables 6a through 6f, presenting temperature data for evaluation of the ERH Benchmark #2, show which thermocouples were required to meet the second temperature milestone, and the percentage of thermocouples meeting the milestone temperature for each of the three temperature zones. In the Section 7.0 "Discussion and Lessons Learned", there is a discussion of why the second temperature milestone was not attained, and why steam temperatures were not reached in most of the area at depths greater then 85 ft bgs, even though the electrodes were installed to 100 ft bgs.

It is also important to note that because of the partial (not complete) dewatering of the A and B Zones, USEPA and USACE revised the temperature specification to 100°C in the B Zone. Despite the reduced temperature requirements, attainment of the second temperature milestone was not achieved.

Graphs showing temperature versus time include:

- Graph 2 - Average Temperature Versus Time Within ERH Area; and
- Graphs 8a through 8j - Temperature history for all TMPs.

As shown in Graph 2 (the average temperature versus time), Graphs 8a through 8j, and Tables 6a through 6f the overall temperature was highest near the end of January, prior to the ERH system modifications executed by TRS on 1/21/08 to direct more energy to the A-B Clay and B Zones. The consequences of redirecting energy are discussed in the Section 7.0.

6.2.2.1 Energy use

The estimate of energy use for attainment of the second temperature milestone and holding it for 30 days was 3.44 MM kW/hrs. As shown on Graph 1, the energy "budget" was used up on January 24, 2008 and as discussed in Section 6.2.2 and shown in Tables 6a through 6f, the milestone #2 was not attained. TRS did re-direct more energy into the A-B Clay Zone and B Zone by disconnecting the majority of electrodes in the Lower Vadose Zone. Disconnecting the upper 32-ft electrode section was required to add more energy to the lower 32-ft electrode section, because of a power limitation of 275 kWhrs per PCU substation. The addition of more energy to the lower electrode section was not effective for increasing the temperature of the A-B Clay Zone and B Zone to both original and renegotiated milestone criteria (100°C reduced from 110°C in the A-B Clay Zone). It is important to note that the re-direction of energy resulted in less efficient heating and temperatures in the ERH area declined overall after January 24, 2008 (Graph 3).

6.2.2.2 Dissolved Concentrations

As discussed in Section 6.2.1.3, the dissolved COC concentrations in most of ERH vicinity wells had become near asymptotic by the time of the first temperature milestone (January 12, 2008). Two weeks later (January 24, 2008), the concentrations had only decreased an additional small percentage in most wells and some wells actually increased in TCE concentrations. Note at this time TCE levels in all of the B Zone wells were still above the SSRL of 5 µg/L. The ERH vendor expected to further decrease dissolved TCE concentrations by re-directing energy to the lower electrodes inn order to heat the areas with temperatures below 100°C. Graphs 5a and 5b shows the dissolved TCE concentrations in the wells identified for evaluation of the ERH performance.

6.2.2.3 Mass removal

By January 24, 2008 the rate of mass removal was asymptotic, as shown on Graph 9 and Graph 10. The calculated mass removal by the end of January 2008 was less then 0.05 lbs/day of TCE, compared with the highest TCE mass removal rate of 0.8 lbs/day in mid-November. By the end of the ERH operation (April 10, 2008) the TCE mass removal rate from the ERH area was calculated to be 0.06 lbs/day.

6.2.2.4 Northeast Area

Temperature in the northeast portion of the ERH area was monitored using TMP-29 (Graph 8j). This area did not heat up to the first temperature milestone, and after many field adjustments done by TRS, the goal of 85°C was not achieved. The reason for this was a defective electrode, which was not diagnosed until March 2008. A more detailed discussion of this area is in Section 7.0 "Discussion and Lessons Learned".

6.3 ENERGY INPUT

6.3.1 Temperature Specifications and Energy Use

Energy and temperature are the major parameters for ascertaining the progress of thermal projects. Energy input should directly and immediately result in temperature increases to the subsurface. Because the cost of energy for ERH projects can amount to 20 percent or more of the cost of the remediation, it is critical to have a system that is efficient in heating up the target zone, yet have enough power to heat the target volume in the shortest time period feasible. Thermal technologies not only require high capital cost and high energy costs, but the staffing for these projects is typically higher because of the demand for remedial progress monitoring data; there are extra process equipment and controls; and there is more technical oversight. Considering these reasons and the high energy demand for the Pemaco project, an implementation schedule and a fixed amount of energy use to reach and hold the "boiling" temperature for 30 days were critical selection criteria. After winning the bid for the Pemaco ERH application, the contractor, TRS, renegotiated modification to the thermal requirements/specifications for the project. This modification was to divide the target volume into three zones, each with a different temperature requirement in accordance with the "Updated Proposal for Electrical Resistance Heating (ERH), Pemaco Superfund Site" (TRS, 2006a). The revised temperature zones and temperature specifications were:

- *Updated Specification # 1:* The temperature of the A-B clay middle thermocouple (for each TMP in the ERH area) will be 100°C
- *Updated Specification #2:* The temperature of the Exposition B middle thermocouple (for each TMP in the ERH area) will be 110°C
- *Updated Temperature Specification #3:* All other thermocouples (in the ERH area) located at the depth intervals that are likely to de-water and the temperature goal is 87°C.
- Eighty-five percent (85%) of the thermocouples must meet or exceed their goals to fulfill the requirements of each temperature specification.

The final contract specifications also had an initial performance payment for attainment of 87°C in 85 percent of all the thermocouples in the ERH. This was done to allow a payment to the ERH contractor in the period after construction and prior to the "steam" temperature goal.

The Updated Proposal from TRS (TRS, 2006a) also increased the energy estimate from 2.65 MM kWhrs to 3.44 MM kWhrs for meeting the temperature specifications and hold them for 30 days. This was due to USEPA increasing the target area from 10,000 to 14,400 sq ft, (this included a slight expansion of the entire area, and the addition of the northeast area surrounding TMP-29). The ERH area volume subsequently increased to approximately 30,000 cu yd.

The energy use by ERH was monitored by an ERH-dedicated meter provided by SCE. Energy usage by the treatment plant and ERH was monitored separately.

6.3.2 Energy Estimates

TRS estimated the amount of energy need to meet the above specifications without the 30-day holding period at 2.44 MM kWhrs (TRS Work Plan Summary Table 1). This equates to an average of 81 kWhrs per cubic yard (without losses). Several reviewers of the TRS Work Plan considered this estimate too low, noting that most ERH projects use 100 kWhrs or more per cubic yard to reach steam temperature. TRS defended their estimate, and because the energy

was "at risk" by the contractor, USEPA and COE accepted the estimate. TRS estimated the energy use for the 30-day holding period at 1.0 MM kWhrs, bringing the total of energy to meet and hold the above specifications to 3.44 MM kWhrs. As discussed, the second milestone was never reached, and a total of approximately 4.95 MM kWhrs was used for ERH from start-up to the end.

6.3.3 Energy Total for Pemaco

There are several graphs that depict energy use in the document:

- Graph 1 – "Pemaco ERH Energy Consumption" shows total energy usage from September 18, 2007 to April 10, 2008;
- Graph 3 – "Average Temperature Versus Energy Within ERH Area"; and
- Graph 4 – "Energy Consumption and Cumulative TCE Mass Extracted from ERH Well Field".

Graph 1 shows the total energy use and the project milestones:

- At 77 days when boiling temperatures would be attained as estimated by TRS;
- January 12, 2008 approximately 100 days of ERH operation, when the initial temperature milestone of 87°C in 85 percent of the thermocouples was attained;
- January 21, 2008 when TRS made major adjustments to the electrode field in order to increase power to the lower 32-ft electrode sections;
- January 24, 2008 when "budgeted" 3.44 MM kWhrs of energy was used; and
- April 10, 2008 the last day of operation with a total of 4.95 MM kWhrs used.

What is evident from Graph 1 is that the amount of daily power decreased after the field modifications to the electrodes were made. After operational changes were executed it is important to note that temperature in the A-B Clay Zone and B Zone actually decreased, despite more power being added. There is a critical question of "where did that energy go?" The extraction of vapor and groundwater cannot account for the falling temperatures, as the temperature decreased with the same extraction rates prior to the operational modification.

The reason for the drop in power consumption was most likely due to a boiling-off of water near the electrodes, which negatively affected the soil conductivity, and therefore there was little effective heating in the saturated zone during this period as discussed in Section 7.0. Temperature data taken from the VR wellheads (Graphs 11a through 11e) also show a decrease in the temperature of the vapors being extracted. A possible explanation may be that a large percent of the energy supplied after the operation change heated up the electrodes and soil outside and below the ERH area, rather then the soil between electrodes.

6.3.4 Turning off the ERH

Following decision process described in Section 3.5 the key reasons used to decide on turning off the ERH system included:

- Declining temperatures, despite using 25,000 kWhrs of energy per day (Graph 3),
- Mass removal rates from the ERH well field were asymptotic for 8 to 10 weeks (Graph 4),
- The mass removal was less then 0.1 lbs TCE per day (Graph 10), and

- Groundwater concentrations in the ERH area had remained asymptotic since late January 2008 (Graph 5b).

Above listed data evaluation conclusions contributed to decision to turn off Pemaco ERH system on April 10, 2008.

6.3.5 Actual Energy Use

The total energy for the ERH system was based on the meter provided by SCE dedicated to ERH system (as discussed earlier in Section 6.3.1). The total energy directed into the soil was less than what was "metered", when the following is considered:

- In addition to the ERH well field, there was a condenser, air conditioning unit, and other miscellaneous pieces of equipment that drew power from the ERH-dedicated SCE meter.
- The PCU stepped-down the 12,400 volts to 3-phase 480 volt 2000 amp power. There were some energy losses due to this process.
- The PCU powered six 275 kW substations; with each substation powering up to 20 electrodes. There would be losses through each of the substations and the hundreds of ft of wire.
- Each electrode was constructed with steel shot and graphite. There will be substantial resistance within each electrode as current travels through the length of the electrode, which will heat up the electrode. This is energy that will not flow through the soil for electrical resistance heating.

These losses could decrease the total amount of available power by 10 percent (+/-). These losses should have been considered in the TRS estimate, but TRS would not show their calculations to the reviewers, so it is not known what the estimate of energy loss estimate was.

6.4 ERH Groundwater Monitoring Results

The groundwater monitoring program was designed to monitor dissolved-phase TCE and other COCs at 12 wells located within ERH area DA-10, DB-10, DA-11, DB-11, MW-19-70, MW-19-90, MW-24-110, MW-24-140, MW-26-75, MW-26-90, RW-01-75, and RW-01-95; and seven (7) wells located outside ERH area DA-04, DB-04, MW-03-70, MW-03-90, MW-04-75, MW-04-90, and MW-05-105, refer to Section 4.2.3. Groundwater monitoring and extraction well locations are presented in Figure 13. The following sections describe groundwater results within the groundwater exposition A Zone and B Zone.

6.4.1 Groundwater Exposition A Zone

Due to the thin water table in the Exposition A Zone, the evaluation of groundwater data was conducted for four wells consisting of DA-04 (located downgradient of ERH), DA-10, DA-11, and MW-04-75 (located outside ERH area). The following wells were not available for sampling during ERH application:

- MW-26-75 no sample since 2/23/07,
- MW-19-70 no sample since 4/18/07,
- RW-01-75 no sample since 9/19/06, and
- MW-03-70 no sample since 4/10/07.

Table 7 summarizes minimum and maximum concentrations of COCs prior to and after ERH application. Out of 14 chemicals defined as Pemaco COCs in groundwater exposition A and B

Zones (USEPA, 2005) the consistent detections in A Zone prior to ERH included acetone, 1,1-dichloroethene (1,1-DCE), cis-1,2-Dichloroethene (cDCE), tetrachloroethene (PCE), and TCE. The pre-ERH maximum concentrations of 1,1-DCE at 19 µg/L, cDCE at 210 µg/L, PCE at 6.2 µg/L, and TCE at 8,500 µg/L exceeded Pemaco SSRLs.

Data available for the selected A Zone wells after ERH was shut down in April 2008 indicated consistent detections of only three out of 14 COCs namely acetone, cDCE, and TCE. The A Zone groundwater concentrations of COCs decreased below SSRLs except for cDCE at 14 µg/L (detected in DA-04 located downgradient of ERH area) and TCE at 190 µg/L (DA-10). Decreasing concentration trends for these two COCs are illustrated in Graphs 12a and 12b. It is expected that TCE and cDCE will attenuate due to a combination of on-going groundwater extraction, natural attenuation, and enhanced biodegradation processes proposed as a follow-up technology to polish site clean up.

6.4.2 Groundwater Exposition B Zone

The groundwater data evaluation for Exposition B Zone was completed for select five groundwater monitoring/extraction wells located within ERH area (DB-10, DB-11, MW-19-90, MW-26-90, and RW-01-95) and three wells immediately outside ERH area (DB-04, MW-03-90, and MW-04-90). Table 8 summarizes minimum and maximum concentrations of COCs prior to and after ERH application. Graphs 13a through 13e illustrate decrease of select COC concentrations as a result of ERH remediation effort.

Six out of 14 Pemaco COCs exceeded SSRLs in B Zone prior to ERH including 1,1-DCE, benzene, cDCE, PCE, TCE, and vinyl chloride (VC). The post-ERH groundwater results indicated that only four COCs were detected above SSRLs, i.e., TCE (Graph 13a), cDCE (Graph 13b), benzene (Graphs 13c and 13d), and VC (Graph 13e). Particularly within ERH area, post-ERH results summarized in Table 8 indicated that benzene exceeded SSRL of 1.0 ug/L in MW-19-90, cDCE exceeded SSRL of 6.0 ug/L in MW-19-90 and DB-10, TCE exceed SSRL of 5.0 ug/L in MW-19-90, MW-26-90, DB-10, and DB-11; and VC exceeded SSRL of 0.5 ug/L in MW-19-90 and DB-10. Overall, the calculated percent reduction for TCE ranged from 49% to 99.98%; cDCE from 67% to 99.91%; and for VC from 75% to 99.38%, refer to Table 9.

The primary COC, TCE, was reduced approximately 99.98% from 13,000 ug/L to 2.3 ug/L in RW-01-95 located within ERH area, refer to Table 9. In addition, TCE percent reduction was calculated at 49% for MW-19-90, 93% for MW-26-90, 97% for DB-10, and 98% for DB-11 (Table 9). The remaining TCE and other COCs are expected to attenuate due to a combination of on-going groundwater extraction, natural attenuation, and enhanced biodegradation processes proposed as a follow-up technology to polish site clean up.

6.4.3 Groundwater Sampling from New ERH Area Wells

As described in the Tech Memo (Attachment B) and Section 4.2.3.4, six new monitoring wells screened within Exposition B Zone were installed in the ERH area during the post-ERH soil sampling program in October 2008. New wells MW-28-90, MW-29-85, MW-30-90, MW-31-90, MW-32-90, and MW-33-90 were sampled for VOC analysis in November 2008.

TCE was detected at all new B Zone wells with concentrations ranging from 37 µg/L (MW-30-90) to 610 µg/L (MW-29-85) exceeding Pemaco-specific SSRL of 5 µg/L for TCE. Other exceedences of SSRLs included c-DCE (6.0 µg/L) and VC (0.5 µg/L).

The following are TCE, c-DCE, and VC concentrations in the new groundwater monitoring wells located within ERH area sampled in November 2008 (Figure 18):

Well ID	TCE (µg/L)	c-DCE (µg/L)	VC (µg/L)
SSRLs (µg/L)	**5.0**	**6.0**	**0.5**
MW-28-90	110	3.8	< 0.5
MW-29-85	610	40	< 0.5
MW-30-90	37	1.2	< 0.5
MW-31-90	370	40	0.97
MW-32-90	47	2.1	< 0.5
MW-33-90	99	28	2.0

When compared to the pre-ERH results illustrated in Figure 4, the most recent concentrations show a significant TCE reduction due to the ERH remediation and the 2.5 years of groundwater pumping.

6.5 Site-Wide Treatment Data

By reducing the major source of TCE impact in the ERH area and by operation of the site-wide vapor extraction and groundwater pumping system, TCE concentrations and plume extent in the B Zone decreased significantly. Figure 4 shows the B Zone groundwater TCE plume extent prior to the site-wide remediation, which began in May 2007; Figure 19 shows April/May 2007 groundwater TCE concentrations; and Figure 20 shows the B Zone groundwater TCE plume as of October 2008. A comparison of the TCE plume in B Zone based on data collected in 2006 before ERH remediation (Figure 4) to April/May 2007 data generated after ERH was shut off (Figure 19), and then to October 2008 data collected after continued groundwater pumping and treatment indicates a steady decrease of TCE concentrations and reduction in the TCE plume extent.

The 2008 AOR will provide details on remediation system. The Groundwater Monitoring Report (TN&A, 2008c) provides analytical results for April/May 2007 site-wide groundwater sampling event presented in Figures 19 and the 2008 Monitoring and Sampling Report (*in preparation*) will provide the analytical results and monitoring details for October 2008 data presented in Figure 20.

6.5.1 Mass Removal from Site-Wide Remediation

Although the primary COC at Pemaco was TCE, which had been detected at highest concentrations in groundwater and soil, there were numerous other VOCs in groundwater and the Vadose Zone, which could be treated by vapor extraction and DPE systems. Besides TCE, other VOCs included hexane and lightweight hydrocarbons (C1 through C6), toluene, benzene, vinyl chloride, and methylene chloride. Hexane and other lightweight hydrocarbons made up over 96 percent of the non-COC compounds in vapor.

Graphs showing mass removal from the site-wide vapor and groundwater system include:

- Graph 14a - compares extracted mass of VOCs and TCE from the vapor stream and the total of VOCs extracted from both vapor and groundwater streams between April 2007 and May 2008.
- Graph 14b - compares extracted mass of VOCs and TCE from the groundwater stream and the total of VOCs extracted from both vapor and groundwater streams between April 2007 and May 2008.

Below is a summary of site-wide VOC mass removed from vapor and groundwater. TCE mass extracted from the vapor stream was calculated at 222 lbs, which is almost seven times greater than TCE mass extracted from groundwater. Comparison of extraction efficiency of total VOC mass indicates that 0.5% of removed VOC mass was extracted from groundwater stream. The analytical results used for the VOC mass calculations had some effect on these calculations. It is important to note that the target list of VOC for water sample analysis was significantly shorter than for vapor sample analysis. Moreover, USEPA Region 9 Laboratory did an excellent job on reporting an extended list of tentatively identified compounds (TICs), which were also included in calculation of the total VOC mass extracted from the vapor stream.

Site-Wide Mass Removal Summary:

	Vapor	Groundwater	Vapor + Groundwater
VOCs including TCE	14,514 lbs	70 lbs	14,584 lbs
TCE only	222 lbs	34 lbs	256 lbs

As shown in Graphs 14a and 14b and data summarized above, 99% of all the VOC mass was removed by the vapor extraction system; TCE represented only 1% of the total VOC removed mass at the site.

The ERH area had the highest concentrations of TCE, but the ERH area only accounted for 20 percent removal at the Pemaco site. Graph 15 shows the comparison of TCE removed from the Pemaco site-wide treatment area versus from the ERH area. TCE mass removed from ERH area accounted for 16% of the total TCE mass removed from the site-wide treatment area.

6.5.2 Mass Removal Rates

Graph 16a shows the mass removal rate of VOCs in comparison to mass removal rate of TCE by the site-wide vapor extraction system. Detailed mass extraction data for TCE are presented in Graph 16b. The extracted mass was calculated using vapor influent results from vapor system sampling ports SP-102 (prior and during FTO operation) and SP-104 (post-FTO operation). Daily extracted mass of total VOCs (orange line) was significantly greater than daily extracted mass of TCE (green line), Graph 16a. The spikes of VOC extracted mass prior to the ERH start-up (September 25, 2007) were measured when a new header system was brought on line. At the start-up of ERH the total TCE removal rate was approximately 0.5 lbs/day (Graph 16b), but the removal rate of total VOCs was over 120 lbs/day (Graph 16a). At the end of the ERH, site-wide TCE removal was less then 0.2 lbs/day (Graph 16b) and the total VOC removal rate ranged from 5 to 20 lbs/day (Graph 16a).

6.5.3 Vapor Treatment

It is important to understand that because the granular-activated carbon system could not treat the light-end VOCs, and vinyl chloride, a thermal destruction system, a FTO was installed. Because of the concern by the community about generation of polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) by FTO for thermal destruction, a vapor conditioning package and two 3000-pound carbon vessels were installed for post-thermal treatment. The FTO operated for approximately 6 weeks after the ERH was turned off, because by then the light-end VOCs and vinyl chloride were low enough that the carbon treatment was effective to meet South Coast Air Quality Management District permit conditions and community concerns. The 2007 AOR contains the operational data for the FTO.

7.0 DISCUSSION AND LESSONS LEARNED

7.1 MAINTAINING ELECTRICAL RESISTANCE

Successful ERH is partially dependent on maintaining electrical resistance in the soil in range of 5 to 200 ohms. If the soil is too conductive, there is not enough resistance to generate a temperature high enough to boil water. If the soil has too much resistance, current may not flow from one electrode to another, and heating will also be affected.

Prior to ERH application, the soil at Pemaco was subjected to testing of dynamic and static resistance (McMillan-McGee, 2004). Static resistivity measured at a constant temperature of 20°C was determined between 11.5 and 31.0 ohms. The lower resistance was from soil sample taken from the saturated zone (water is the primary conductor of current in soil). In the static resistivity tests, the resistance dropped to 4 ohms as the soil was heated to a temperature of 86°C. When the soil reached boiling temperatures during the testing, the resistance increased significantly as the soil moisture evaporated.

Maintaining the resistance of the soil in the optimum range is a challenge for the ERH technology. This is primarily done by keeping the power level in the electrodes high enough to transmit current, but low enough that the heat buildup in the electrodes will not boil off the water adjacent to the electrode causing it to lose electrical contact with the surrounding soil. ERH vendors install "drip" lines or water injection systems for keeping the soil wet in order to prevent the loss of conductivity. The amount of water injected by the ERH vendors is more art then science; in other words, if the temperature is the soil is not responding to increasing energy supply, then water is dripped into the electrodes until a response is recorded. In addition, if the flow of current through the soil is inhibited by increased resistance due to the evaporation of water around the electrodes, the amount of power used by the ERH system will decrease. Because the temperature response in a TMP is delayed or not readily observed until a day or more after changes in the rate of drip have occurred, it is critical to have frequent and accurate temperature data to monitor changes.

At the Pemaco site, temperature buildup was very uneven due to the factors described earlier in this document: asymmetrical triangles, heterogeneous soil types, slant electrodes. The uneven temperature distribution is shown on the isotherm maps (Figures E-01 through E-12 of the Attachment E). Because of the uneven heating, attainment of the primary temperature goal, i.e., 87°C in 85 percent of all the thermocouples, took over 100 days.

The second temperature milestone, defined as maintenance of 85 percent of the vadose zone thermocouples at 87°C, and attainment of steam temperatures in 85% of the A B Clay Zone and 85 percent of the B Zone thermocouples, was a payment milestone. After 120 days of operation (January 21, 2008), this milestone was nine thermocouples short of the 85 percent goal (Table 6b).

In order to direct more energy into the A B Clay Zone and B Zone, the ERH vendor disconnected the upper 32-foot section of the electrode (note that each 65- foot long electrode was in fact two 32-foot electrodes separated by a 1-foot think section of concrete). By disconnecting the upper electrode section, it was theoretically possible to double the amount of energy to the lower 32-ft sections. As a result of this operational change, evaporation of much of the water around the lower part of the electrodes occurred. This in turn caused an increase of resistance in the soil around the electrodes, which decreased the amount of current transmitted between electrodes, and subsequently the temperatures in the A-B Clay Zone and B Zone thermocouples dropped (Tables 6c through 6f). TRS, the ERH vendor, increased the water drip

and adjusted the tap/voltage settings on each of the electrodes in order to restore the optimum site conditions until the end of the project. At the time of the operational change (January 21, 2008) approximately 3.4 MM kWhrs of energy had been used by ERH, which was the performance objective for total energy use. Despite applying another 1.6 MM kWhrs, the temperatures continued to decline, so USEPA ceased the ERH operation on April 10, 2008, approximately 204 days after start-up.

7.2 SLANT ELECTRODES

One of the challenges for the remediation of the ERH area was the TCE-impacted soil and groundwater under the bike walk. The bike walk is an elevated feature that is part of the Los Angeles County Flood District's concrete channel of the Los Angels River. Because there was no practical way to install and connect vertical electrodes through the bike walk, six slant electrodes were installed to heat up the subsurface under the bike walk, for locations of the slant electrodes refer to Figures 5 and 6. The cross-sections for the slant electrodes are provided in Figure 21. The dimensions of area under the bike walk were approximately 100 ft long and 20 ft at the widest point. The target temperatures for this treatment area were the same as for the rest of the ERH area. The TMPs closest to the slant electrodes were TMP-07, TMP-15, and TMP-21. All three TMPs were vertical and installed several ft west from the bike walk, so there was no accurate temperature recording of the soil column under or near the bottom of the slant electrodes.

7.2.1 Operational Factors

There are several factors of slant electrodes that are disadvantageous over electrodes that are installed parallel and in the equilateral triangles. The first obvious factor is that the top of the slant electrode is considerably closer to the nearest vertical electrode than the bottom of the electrode (Figure 21). Because electrical current will follow through the path of least resistance, i.e., the shortest distance between the electrodes, the amount of current available for heating up the deepest part of the soil column using slant electrode is significantly less than as amount of current in the shallow soil.

A second factor is the asymmetrical pattern of the series of triangles composed of vertical and slant electrodes. As discussed in Section 3.2.2, it is ideal to keep the spacing of electrodes as uniform as possible, because power density is a function of distance between electrodes. In the case of using slant and vertical electrodes this factor is more pronounced than when using vertical electrodes only.

The final factor is the considerable difference in the soil volume to be heated up for each of the triangles formed by the mix of slant and vertical electrodes. Slant and vertical electrode triangles create conditions for generating very uneven power density, uneven heating, and difficulty in optimizing ERH. Although the amount of energy for each individual electrode can be adjusted independently, such an adjustment can be done properly in response to the temperature data evaluation. Because no TMPs were installed directly under the bike walk or at an angle, sufficient data was not available to assess the actual temperatures under the bike walk. Insufficient temperature data prevented from proper evaluation of the slant electrode performance and any energy supply adjustments to the electrodes.

7.2.2 Subsurface Temperatures

Based on the evaluation of temperature data from the three TMPs located near the slant electrodes (TMP-07, TMP-15 and TMP-21), it is unlikely that heating of the A-B Clay Zone and B Zone under the bike walk resulted in the steam temperatures. Graphs 8c, 8e, and 8g present temperature data trends for these three TMPs during heating period. The steam temperatures

(100°C) were never recorded at TMP-07 and TMP-15. At TMP-07 the maximum temperatures were reached at 97°C in the shallow soil (35 to 60 ft bgs) and 87°C in the B Zone. Similarly in TMP-15 the temperature data indicated that Vadose Zone and A-B Clay Zone were heated up more efficiently than B Zone. On the other hand, at TMP-21 steam temperatures were achieved in the B Zone only. However, note that TMP-21 was only 6 ft away from vertical electrode EH-03 (Figure 5) and thus the recorded temperatures were biased high for evaluation of slant electrode performance.

7.3 INEFFICIENCY OF LONG ELECTRODES

The Pemaco ERH electrodes span the depth interval of 65 ft from approximately 35 to 100 ft bgs. The depth targeted for remediation was from 35 to 95 ft bgs. The description of the electrode construction and detailed electrode drawings are provided in the Design Report (Attachment C). In Section 4.0 of the Design Report it is stated that "[...] Active electrical resistance heating will span the subsurface interval from 34 to 100 ft bgs". This implies that the temperature milestone would be attained below the 85-ft depth, which is generally in the middle of the B Zone; however Pemaco ERH temperature data showed clearly that heating efficiency below 85 ft was significantly reduced. Tables 10a through 10i show that temperatures recorded at 90, 95 and 100 ft bgs are on average 5 degrees lower than at 85 ft bgs. Note that at 90 ft and below, the electrodes are in a contact with fully saturated high-conductivity clay, which should create an ideal environment for resistive heating. The inefficiency of heating below 85 ft is most likely due to the faulty design of the Pemaco ERH electrodes, which may be too long to sustain effective heating throughout the entire length of the electrode.

In order to heat up Pemaco 60-ft interval targeted for remediation, TRS designed two 32-ft long electrodes stacked up vertically in each electrode borehole to overcome problems with a single 64-ft electrode. However, when the upper electrode sections were discontinued in January 21, 2008, the bottom electrode sections were still not capable of heating the 85 to 100 ft depth interval to steam temperature in the majority of the TMPs (Tables 10a through 10i). Note that the four TMPs for which steam temperatures were achieved at 100 ft bgs (TMP-04, TMP-06, TMP-19 and TMP-22) were located in the middle of the small and symmetrical electrode triangles with the average distance between electrodes not exceeding 16 ft (Figure 22) to ensure the high energy density. It is also important to understand that for the deep borings or long vertical electrodes, a few degrees from electrode vertical plane at the surface can influence the construction distance at the bottom of the boring by 2 to 4 ft. This would also lead to unbalanced power transfer between electrodes due to uneven distances between the electrodes. The heating inefficiency of the long electrode is even greater in case of the slant electrodes as discussed above in Section 7.2. Table 6c shows the vertical profile of the 19 TMPs on January 25, 2008, when the average temperatures in the B Zone were the highest during the Pemaco ERH operation.

Graph 17 shows the average temperature profile for the TMPs in the ERH area at numerous times during the heating. Note that the temperatures for the top and bottom 10+/- ft of the profile have a much lower average temperature than the "middle" 40 ft throughout the heating. This profile shows two important elements:

1. There was very little electrical isolation between the "upper" and "lower" electrodes. Even when the upper electrode sections were disconnected on January 21, 2008, current from the bottom electrodes continued to flow into the top, as evidenced by the continued heating above 68 ft bgs.
2. There is a finite length for an efficient electrode performance, meaning that for a given amount of current available, the distance between the electrodes, and the diameter of the

electrodes, there is a length that should not be exceeded for optimum performance. The optimum length for these electrodes may be defined by the depth interval, which heated up more quickly and to higher temperatures than the rest of the profile; for Pemaco the optimum electrode length would be the interval from 70 to 90 ft, a length of approximately 20 ft.

7.4 NORTHEAST AREA ELECTRODE MALFUNCTION

Prior to ERH electrode installation, the ERH area was expanded to include a additional treatment section ("finger") on the northeast portion of the originally defined ERH treatment area. The additional area increased the Pemaco ERH treatment area by 600 square ft and Pemaco ERH treatment volume by approximately 1,700 cu yd. This area was heated by the additional three electrodes, EG-01, EG-02 and EH-01 (Figure 5). Vapor extraction in northeast area was accomplished via the three electrodes (as discussed previously in this document) and vapor extraction well VR-1. Temperature monitoring point, TMP-29, located near the center of this electrodes array, was used to monitor heating progress of this small area. The northeast area was not separated from the rest of the ERH area, so comparison with the rest of site in regards to heating progress and meeting temperature milestones could be made.

It was clear from the start of the Pemaco ERH operation that temperature measured at TMP-29 indicated that heating of northeast area was significantly behind the rest of the site, as presented in Tables 5a through 5f and Tables 6a through 6f. TRS recognized this problem early on, and attempted to rectify it by changing the power distribution/tap settings for the electrodes. This process was a "trial and error" approach, and was done several times over the next few months. Note that it may take several days to weeks to recognize if there is a positive response to these types of operational changes, and the entire "trial and error" period could last for a few months. Another possible reason for slow heating up of this area was its upgradient location and possibility of cooling by the unheated groundwater flowing through this area from northeast to southwest. It is important to note that "upgradient" cooling did not happen in other northern portions of the ERH area near TMP-25.

It was not until late March 2008, almost 6 months after ERH start-up, that TRS finally identified the cause of heating problems at northeast area. One of the three electrodes installed in this area, EH-01 (Figure 5), turned out to be faulty. TRS offered to replace EH-01 with a new electrode, however they could not guarantee that the new electrode would work and the heating of that area would require additional 60 days of operation. At that time the Pemaco ERH system was under evaluation for shutting down and thus USEPA declined the replacement of the new electrode and received back-payment from TRS for the faulty electrode instead.

The lessons to be learned from this electrode failure are:

- The case of EH-01 electrode failure confirmed that temperature monitoring using TMP network throughout the entire heating area is very important.
- The failure of EH-01 electrode confirmed that timely evaluation of temperature monitoring data and heating progress is critical; the recommended frequency for data evaluation is not less than once a week.
- The realization of the electrode failure at Pemaco took far too long. Temperature responses in areas that are significantly slower when compared to other areas of an ERH/thermal treatment site, need immediate action by the ERH/thermal contractor.

- The ERH contractor needs to warrantee system installation and working conditions of the equipment. Project delays and costs due to replacement of an electrode or other ERH equipment should be ERH contractor's responsibility.

7.5 CONTAMINATION OF THE C ZONE

The targeted maximum depth of thermal treatment at Pemaco was 95 ft bgs. The design of the Pemaco ERH system provided by TRS required drilling and boring installation to a depth of 100 ft bgs. The reason for advancing the ERH electrodes to 100 ft bgs was partially due to the long steel shot and graphite electrodes selected for Pemaco ERH application. Subsurface heating using long electrodes is not effective throughout their entire length and it requires installation depth to be extended by at least 5 ft or more past the bottom of the targeted depth interval for thermal remediation.

The general stratigraphy of the Pemaco ERH area based on evaluation of the TMP drill logs (Attachment B) showed that there is at least 10-ft thick clay between the Exposition B Zone and the C Zone. Advancing of 58 electrodes and 30 TMPs to 100 ft bgs was approved under assumption that because of the clay layer thickness, no cross-contamination of the C Zone was possible. It was not until well MW-24-110 located within ERH area and screened through C Zone was sampled in February 2007 (2-3 months after the electrode installation), that cross-contamination between B Zone and C Zone aquifer units was suspected. Concentration trends of select COCs (TCE, benzene, 1,1-DCE, and VC) are presented in Graph 18. This well was sampled again 3 and 4 months later, and the TCE concentrations had dropped from over 2,400 µg/L (February 2007) to 560 µg/L (May 2007), and increased again to 7,900 µg/L (June 2007).

In June 2007 a small pump was installed in well MW-24-110. Groundwater extraction from MW-24-110 was conducted until June 2008, when the pump failed. During this period, MW-24-110 was sampled every other week during biweekly ERH groundwater monitoring events until pump failed in June 2008. Every attempt to replace the pump in MW-24-110 failed, because the CPVC well warped during the thermal treatment and the pump could not be pulled from this well. MW-24-110 was abandoned and replaced with a stainless steel 6-inch pumping well in October 2008 (also MW-24-110). In November 2008, December 2008, and January 2009 TCE concentrations in the re-drilled MW-24-110 had a high of 280 µg/L. The most recent result for MW-24-110 is 45 µg/L (January 14, 2009). In addition, TCE concentrations in a new well MW-34-110 installed within the C Zone were 47 µg/L (November 11, 2008), 120 µg/L (December 19, 2008), and 58 µg/L (January 14, 2009). These analytical results indicate decreasing TCE concentrations trends in C Zone within the ERH area. Detailed information and copies of laboratory reports are provided in the First Quarter 2008 Groundwater Monitoring Report (*in preparation*).

Based on the pre-ERH soil and groundwater sampling results no DNAPL was identified in the Exposition B Zone and therefore no DNAPL migration into C Zone was suspected. In addition, an estimated TCE mass of around 70 lbs within the ERH treatment area was removed via combination of ERH, vapor extraction, and groundwater pumping during system shake-down, pre-ERH vapor and groundwater extraction, and during ERH operation. This result is very close to the TCE mass present within the targeted treatment area estimated at 90-106 lbs based on 2005 soil sampling results (Attachment B).

The lesson learned from the cross-contamination of the Pemaco Exposition C Zone is that clay layers may not be as thick or as impermeable as determined before construction phase.

7.6 IMPORTANCE OF ELECTRODE SPACING

The design spacing between ERH electrodes will affect:

- The number of total electrodes used for a given area,
- The length of time required to heat up the volume within the given electrode triangle,
- The ability to heat up a given volume (the electrodes can be spaced too far apart to achieve the project specific temperature requirements), and
- Uneven spacing will make it more difficult to balance power in the well field because current will preferentially travel through the path of least resistance, i.e. between closely spaced electrodes.

The conceptual design for the Pemaco ERH electrode installation was a pattern of equilateral triangles with the distance between the neighboring electrodes at approximately 17 ft (Figures 9 and 11). Because of the subsurface utilities and vapor lines, the design prescribed electrode spacing was compromised and as a result the installed electrode triangles were not equilateral with the distance between the electrodes ranging from 10.5 ft to 32.7 feet. Figure 22 illustrates the significant shape differences between the constructed electrode triangles. Variability of shape and size of electrode triangles caused very uneven power distribution and subsequently uneven heating across the site. This seems fairly intuitive, because a smaller electrode triangle has less volume to heat than the larger triangle. Assuming that equal energy is supplied to each electrode, a smaller volume/triangle will have a higher power density (kilo watts per cubic yard) than a larger triangle, thus a smaller volume/triangle will heat faster.

In addition, because the power will preferentially and continually flow to the more closely spaced electrodes, the challenge of the ERH provider is to increase the power in electrodes surrounding the larger electrode triangles while maintaining enough energy for continued heating of the smaller triangles. This becomes a delicate balancing act, especially if small and large triangles share a common electrode (which was the case for many electrode triangles at Pemaco).

The table below shows the time and temperature differences between heating a small electrode triangle (for example EG-10, EG-11, and EH-10 with TMP-04 for temperature monitoring) and a large electrode triangle (for example EE-11, EE-12, and EF-11 with TMP-05 for temperature monitoring). These two triangles were selected because of their proximity to each other, approximate equilateral shape, and TMP located in the middle of triangle. Note that a TMP located too close to an electrode may produce bias high temperature data and thus cause overestimation of the heating progress. The electrode triangle around TMP-04 was constructed according to the original design specifications and the electrodes around TMP-05 were shifted from the original design because of the subsurface utilities (Figure 22).

Comparison of Triangle Size and Average Temperature after 30, 60, and 90 days of Heating

TMP ID	Area (sq ft)	Average Length (ft)	Average Temp. (°C) @ 30-days (10/25/07)	Average Temp. (°C) @ 60-days (11/25/07)	Average Temp. (°C) @ 90-days (12/25/08)
Vadose Zone (between 35 and 60 ft bgs)					
TMP-04	119	16.3	57.0	71.0	79.5
TMP-05	187	21.3	28.4	39.1	61.0
A-B Clay (between 60 and 80 ft bgs)					
TMP-04	119	16.3	73.0	99.5	101.5
TMP-05	187	21.3	31.0	48.5	80.5
B Zone (between 80 and 90 ft bgs)					
TMP-04	119	16.3	68.7	98.4	104.5
TMP-05	187	21.3	31.8	48.7	67.1

In addition, the comparison of temperature data for TMP-04 and TMP-05 are further illustrated in the following graphs:

- Graph 19a – Heating Rate Comparison Between TMP-04 and TMP-05, Vadose Zone
- Graph 19b – Heating Rate Comparison Between TMP-04 and TMP-05, A-B Clay
- Graph 19c – Heating Rate Comparison Between TMP-04 and TMP-05, B Zone

In addition, Graphs 20a and 20b present the average temperatures measured at TMP-04 and TMP-05 versus the triangle sizes. It is evident from the above table and referenced graphs that the smaller triangles not only heated faster, but the larger triangle around TMP-05 failed to meet the steam temperatures needed for complete thermal remediation and consequently did not meet the project-specific temperature milestones.

Temperature maps (Figures E-01 through E-12 in the Attachment E) show the temperature distribution across the ERH area for every 5 ft depth interval. It is important to consider that the maps are only indicators of temperature, as there are only 19 TMPs in the ERH area, and there are 70 electrode triangles; and for the purpose of drawing the temperature isotherms, each electrode was assigned a value of 110°C. Even with the limited data, these horizontal temperature slices are helpful in identifying areas that have not responded to the energy input, and most of these areas are identified by TMPs in the larger electrode triangles and near the slant electrodes.

The important lessons learned at Pemaco are that smaller triangles heat up more quickly than large triangles, and a well field with equilateral triangles is preferred. Unequal spacing can be overcome, but requires constant changes to the power to individual electrodes and close observation of the temperatures. Note that at Pemaco there were over 20 of the "larger" triangles without any TMPs, and if the temperature of the TMP-5 is indicative of the temperature of these areas, boiling temperature in the A-B clay and B Zone was not attained in a large percentage of the site.

7.7 Temperature Measurement Bias

The proximity of a TMP to an electrode could have a significant affect on temperature recorded by the TMP thermocouples, i.e. the closer the TMP is located to the electrode the higher

temperatures are recorded. The electrodes become extremely hot due to all the contact points (steel shot) that heat as current travels through the electrode resulting in conductive heating in the soil close to the electrode, and potentially convective heating (steam propagation) through higher permeability soil proximate to an electrode. As a result, TMPs near electrodes are not measuring resistive heating in the soil, but heat generated from the nearby electrode.

The final installation locations of Pemaco ERH electrodes and TMPs were selected during the pre-ERH soil sampling activities using design specifications and considering field conditions such as presence of subsurface utilities. Adjustments of design locations for installation purposes caused asymmetry and non-uniform distribution of electrodes and TMPs; several electrodes were installed only a few ft from some of the TMPs. The variability of TMP and electrode distance had to be considered when evaluating temperature data to determine ERH effectiveness. The implication of this is that if the most difficult areas to heat reach the milestone temperature, the easiest areas to heat would have reached the required temperature.

To understand the temperature data bias, Tables F-1 through F-3 and Graphs F-1A through F1-C, F-2A through F-2C, and F-3A through F-3C provided in Attachment F show average temperatures versus distance after 30, 60 and 90 days of heating. The graphs have a "best fit" trend line indicating that the shorter the distance between TMP and electrode, the higher the temperature recorded for thermocouples in the given zone. In some cases the temperature difference between and "close" and "far" TMP/electrode distance was as much as 30°C or more after 30 days, and 20°C or more after 90 days.

The lessons learned from the temperature bias discussion include:

- The more TMPs, the better understanding of the overall progress of the ERH remediation,
- TMPs should be located at the distance 6 ft or greater from an electrode,
- If temperature milestones are used for payment schedule under the performance contract, the TMP locations need to be selected near the middle of the ERH electrode triangle to avoid bias of the temperature data.

7.8 Discussion of Remedial Action Objectives

The primary remedial objective for the ERH remediation, the Pemaco COC source reduction, was accomplished for both soil and groundwater within the ERH area. The analytical results supporting reduction of COCs in soil and groundwater are discussed in detail in Section 6.0 of this document. The site-specific RAOs for groundwater were not attained after 206 days of Pemaco ERH operation; however after cessation of the ERH in April 2008, groundwater concentrations continued to decline due to the on-going operation of groundwater pump and treat system. Post-ERH soil sampling results indicated that Pemaco SSRLs were not exceeded and therefore site-specific RAOs for soil were achieved within the ERH area (Attachment B).

Significant decreases of VOC concentrations in the Vadose Zone were determined due to the continued vapor extraction and DPE. This decrease has not been quantified by additional soil sampling outside the ERH area, but the VOCs in the vapor stream entering the plant were very low, with TCE less then 100 ppbv, and a mass removal rate of less then 0.01 lbs/day by November 2008 for ERH area refer to Graphs 10 and for site-wide area refer to Graph 16b.

There is speculation whether the RAOs for groundwater would have been met in the ERH area if the ERH system had been built with more uniform spacing, and the ability to operate without the energy losses to the subsurface soils outside ERH area. It is also a speculation to assume

that the ERH remediation had been more efficient if the mass of TCE would have been 9,000 lbs instead of 90 lbs, or significant DNAPL was present. The overall success rate of thermal projects is generally high, and application of ERH technology at other sites may have obtained soil and groundwater RAOs similar to Pemaco's. Undeniably, the application of ERH technology at Pemaco site reduced COCs in the source area and was effective in speeding up the site-wide remediation effort even though the RAOs for groundwater were not attained. Application of ERH at the Pemaco site most likely produced an overall savings in remediation and operational costs.

7.9 REMEDIAL APPROACH

Because of the complex hydrogeology of the Pemaco site (Perched, A Zone and B Zone), the vapor extraction, DPE, and VE pump and treat systems were designed to be the cornerstone technologies for Pemaco RA. The addition of ERH technology was deemed as the most prudent technology for the purpose of source removal. By reducing COC source, application of ERH technology at Pemaco site saved significant cost of extended operation and maintenance of vapor and groundwater treatment plant. The Pemaco FS concluded that other aggressive technologies would cost nearly the same as the ERH without some of the certainty of contaminant removal capabilities of a thermal approach.

Extending ERH beyond the source area would not be cost-effective because of the size of this area and small amount of TCE mass present; and DNAPL was expected to be present within the ERH area footprint. The ERH area was only 14,400 sq ft and the area covered by the site-wide treatment was over 4 acres (160,000 sq ft), and the amount of TCE removed from the ERH area was approximately 25% of all the TCE removed from May 2007 through November 2008 (Graph 15).

An EISB pilot study was conducted using lactate and soybean oil within the B Zone in 2007. The results of the study showed complete de-chlorination of TCE to harmless ethylene, and thus EISB is being considered for further treatment of in areas of the highest COC concentrations in the B Zone (TN&A, 2007i). As of January 2008, EISB is being considered for implementation outside the ERH area, in the vicinity of 59th Place and Walker Avenue (refer to the 500 µg/L TCE area presented on Figure 20). The decision for full-scale implementation of EISB will be made based on evaluation of the remediation progress by the on-going groundwater pump and treat system by mid-2009.

7.9.1 Heating Strategy

The strategy for heating of the site was defined by the Pemaco ERH contractor (TRS), and was described in details in the Design Report (Attachment C). Generally the area to be heated is covered by the electrode network and the electrodes extend from the top to the bottom of the depth interval targeted for remediation. The energy input is determined by the amount of energy needed to reach steam temperatures for the entire treatment volume, plus energy needed to compensate for heat losses due to system inefficiencies and extraction of vapor and water. As discussed in Sections 6.0 and 7.1, TRS had difficulties in heating the entire treatment volume and the TRS-executed operational changes did not accomplish the goal of the second temperature milestone.

ERH is a highly specialized technology and typically the heating strategy/approach is proposed and/or designed by the ERH vendor. Currently there are only a few vendors that specialize in ERH design and application. The site-specific data, provided by the site operator/owner, are carefully reviewed by the ERH vendor to determine if ERH remediation can be an effective remediation technology, select appropriate heating strategy, and complete site-specific design.

The site-specific data should include analytical sampling results, hydrogeological data, conceptual site model information, general site logistics, access to power, surface and subsurface obstacles such as buildings or subsurface utilities. In addition, bench testing for soil resistivity should be conducted prior to ERH design.

7.9.2 Effectiveness of Types of Vapor Extraction Wells

The most effective vapor extraction wells were purposely built for vapor extraction. Negative pressures indicating pneumatic control were measured in the all the Lower Vadose VMPs during extraction vapor from the Lower Vadose extraction wells. As discussed in Section 3.1.1 extraction of subsurface vapor via the electrode "steam vents" was not effective to establish an expected radius of influence or to reach an anticipated mass removal. Data provided in Table 3a show that 19 VR wells were significantly more effective in vapor extraction than 58 electrode extraction wells. The average air flow from VR wells was calculated at 8.5 scfm and from ERH electrode well only at 1.8 scfm (Table 3a). Also as the deep zones (A and B) became completely or partially the most effective extraction was accomplished at the end of the ERH operation. This is shown by the change from positive to negative pressure in the VMPs from January to April 2008 (Table 2).

The attempt to increase vapor recovery by converting SVE wells (Section 3.9.1) was marginally effective for increasing vapor flow and contaminant recovery. Wells specifically designed for SVE would have been more effective then these groundwater monitoring wells.

For ERH projects that have a thinner zone targeted for heating and contaminant recovery, "steam vent" extraction maybe sufficient. But there is no way of determining the radius of influence or establishment of pneumatic control without the presence of VMPs or other wells that can be used for measuring pressure or vacuum.

Graphs 11a through 11e show the temperature of each of the VR wells over the course of the ERH remediation. All of the VR wells were located within the ERH area for optimizing capture of VOC generated by the ERH heating. The Upper VR (Perched) wells had a screen interval from 30 to 35 ft bgs, and the Lower VR (LVR) wells had a screen interval from 40 to 45 ft bgs. Generally the LVR wells had higher vapor temperatures then the Perched VR wells. This is because of the higher temperatures attained by the ERH below a depth of 35 ft. None of the temperatures approached 100°C (steam temperature) because the temperature was lowered/diluted by ambient air from outside the ERH area; soil temperatures never reached steam temperatures; and/or there was only a small amount of water in the Perched and Lower Vadose soil that could be converted to steam.

7.9.3 Effectiveness and Types of Groundwater Pumping Wells

At Pemaco groundwater pumping in the ERH area was primarily from B Zone wells (DB-4, DB-10 and DB-11). Groundwater pumping from the A Zone wells was ceased because:

1. The length of the pump (almost 5 foot long) was at or above the water table in the A Zone; and
2. There was so little recharge into the A Zone that once the water was pumped out, the zone could not sustain pumping.

Note that because of the elevated temperatures, electrical pumps could not be used and instead the pneumatic pumps were manufactured to tolerate high temperatures.

The pumping wells were screened across the entire A and B Zones, and were also connected to the vapor extraction system. As shown in Graph 21, the wellhead temperatures taken from the

temperature indicators (TIs) on the vapor line are very hot, which is evidence that steam was being produced in the B Zone. From this data it may be concluded that these "dual purpose" wells contributed in removing both dissolved and vapor phase contaminants.

The groundwater pumping removed approximately 25 percent of the mass in the ERH area (Graphs 6a through 6d). One or two additional B Zone pumping wells would have accelerated the mass removal and ensured containment of the elevated dissolved concentrations. Any additional wells could have been connected to the vapor extraction system for more efficient vapor removal.

The pumping of the three DB wells did influence the B Zone groundwater gradient around the ERH area, which southwest direction was determined historically prior to Pemaco RA commencement. The capture zone/groundwater gradient generated by groundwater pumping from the B-Zone wells is illustrated on Figure 23.

7.9.4 Importance of Temperature Milestones

As discussed in Section 7.1, reaching and maintaining steam temperatures provides the greatest certainty that contaminants are volatized for removal and prevented from re-condensing within or around the target treatment volume. Pemaco ERH vendor was awarded a "performance-based" contract with the payment schedule for the ERH operation based on meeting the temperature milestones. An alternative performance goal could have been defined as an attainment of specific soil or groundwater concentrations; however, temperature monitoring is far the simplest method for tracking the progress of heating considering potential groundwater concentrations re-bounds or difficulty with access within the ERH well field for subsurface soil drilling.

Under Pemaco contract, USEPA had an option of continuing the ERH after the second (steam temperature) milestone at additional cost. The decision process for decision to continue Pemaco ERH remediation is described in Section 3.5. The Pemaco contractual approach for reaching temperature milestones with an energy use cap placed the risk for ERH design and operation on the technology vendor and allowed USEPA flexibility to continue operation until the decision to cease the operations was made.

7.10 Extraction and Treatment Plant Operation

The Pemaco extraction and treatment plant operated at nearly 95 percent uptime during the ERH remediation. There were three full-time operators working 5 days a week and 10 hours a day to operate and maintain the equipment and collect the operational and well field data. The major anticipated maintenance elements included changing the vapor and liquid GAC vessels. The major unanticipated operational problems were associated with the FTO operation. During the FTO downtime, vapor extraction was turned off from the site-wide wells except for ERH well field. In addition, when FTO was not available the vapor influent from ERH area was treated only by the vapor GAC units. The operational details of the treatment plant, which are not the subject of this document, were reported in the 2007 AOR (TN&A, 2008a) and 2008 AOR (in preparation).

It is important to note that the most critical parameter for the plant operation was the ability to treat a variable range of VOC concentrations in the vapor stream (generally between 0.1 lbs per day to 120 lbs per day) at a flow rate between 500 and 1,000 scfm. The Pemaco system treated influent vapor to below a risk level of less then 10^{-6} Maximum Individual Cancer Risk (MICR) required by the South Coast Air Quality Management District permit.

Because of the VC concentrations in the vapor influent exceeding the MICR levels, which is not effectively treated by GAC, a thermal oxidation using an FTO was chosen as a primary vapor treatment. The community concern of the production of dioxins (PCDDs) and furans (PCDFs) by the FTO was addressed by using two GAC vessels as secondary treatment step. A vapor-conditioning unit was needed for cooling the vapor stream from the FTO unit prior to entering the GAC vessels. Vapor influent samples were taken five days a week and the effluent samples were taken weekly. Dioxin and furan sampling of the vapor effluent was performed six times during the FTO operation. The results of the sampling showed that vapor treatment package work extremely well. The FTO was taken off-line 45 days after cessation of the ERH remediation.

Two liquid-phase GAC vessels were used for water treatment. The treated water was discharged into the city sewer under the Self-Monitoring permit from the Sanitation Districts of Los Angeles. Water treatment effluent was tested quarterly to ensure compliance with the permit, which included discharge limit of 1,000 µg/L for sum of VOCs at a discharge rate of 120 gpm. In addition, weekly effluent testing results were used for estimation of mass removal rates. Liquid GAC change-outs were performed about every three months due to fine sediment/silt buildup in the vessels from the groundwater pumping.

Pictures of the treatment plant and equipment are provided in Attachment G.

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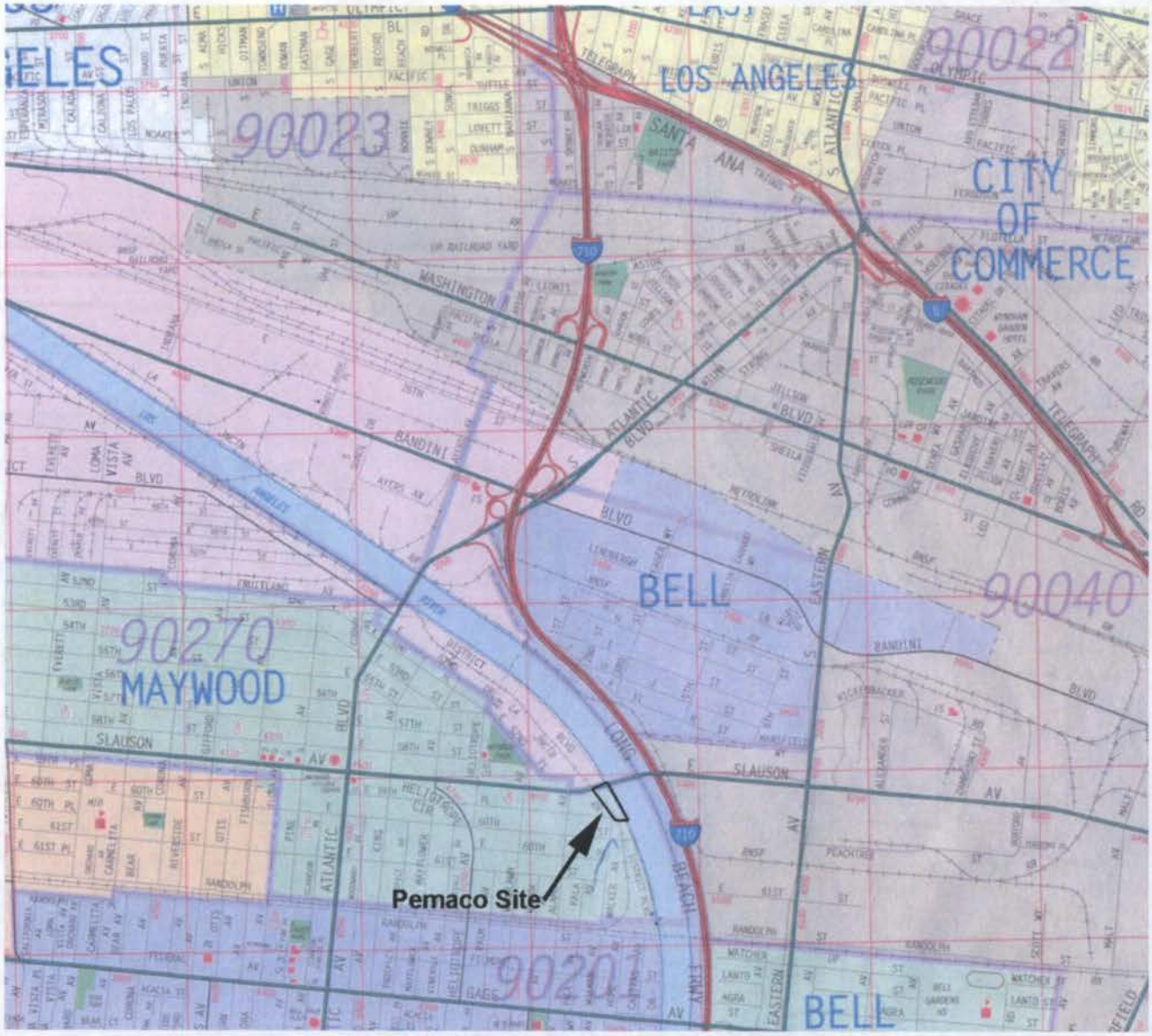
Figures



1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

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LEGEND

DATE:	FILE NAME:	APPROVED BY:
11/5/2000	PEMACO-SL	

PROJECT LOCATION MAP

PEMACO, INC.
MAYWOOD, CALIFORNIA

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FIGURE 1

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OVERSIZE ITEM(S)

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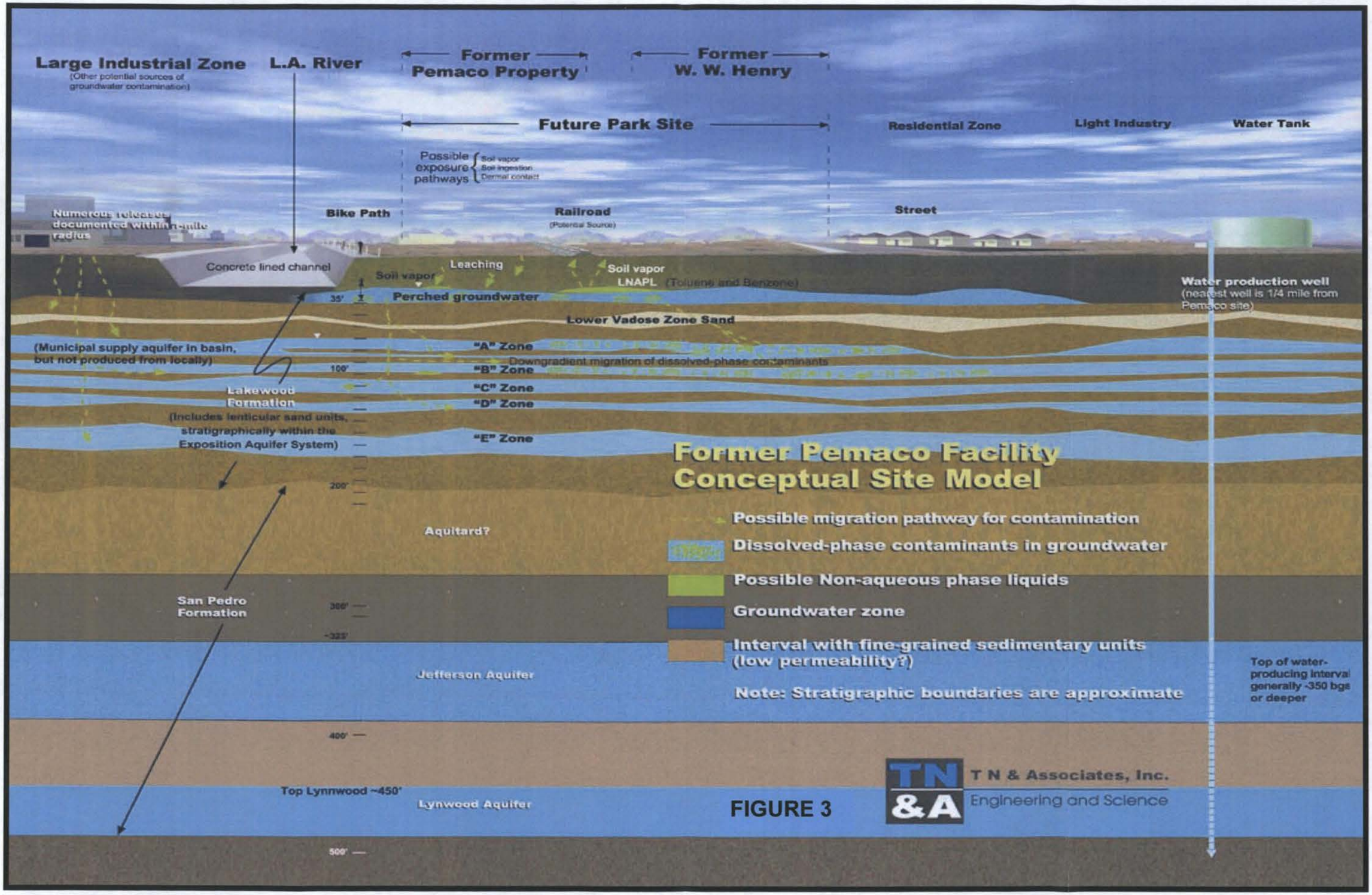
Large Industrial Zone
(Other potential sources of groundwater contamination)
L.A. River
Former Pemaco Property
Former W. W. Henry
Future Park Site
Residential Zone
Light Industry
Water Tank
Possible exposure pathways
Soil vapor
Soil ingestion
Dermal contact
Numerous releases documented within 1-mile radius
Bike Path
Railroad
(Potential Source)
Street
Concrete lined channel
Leaching
Soil vapor
Soil vapor
LNAPL (Toluene and Benzene)
Water production well
(nearest well is 1/4 mile from Pemaco site)
35'
Perched groundwater
Lower Vadose Zone Sand
(Municipal supply aquifer in basin, but not produced from locally)
"A" Zone
Downgradient migration of dissolved-phase contaminants
100'
"B" Zone
"C" Zone
"D" Zone
Lakewood Formation
(Includes lenticular sand units, stratigraphically within the Exposition Aquifer System)
"E" Zone
200'
Aquitard?
San Pedro Formation
300'
~325'
Jefferson Aquifer
400'
Top Lynnwood ~450'
Lynwood Aquifer
500'
Former Pemaco Facility
Conceptual Site Model
Possible migration pathway for contamination
Dissolved-phase contaminants in groundwater
Possible Non-aqueous phase liquids
Groundwater zone
Interval with fine-grained sedimentary units (low permeability?)
Note: Stratigraphic boundaries are approximate
Top of water-producing interval generally -350 bgs or deeper
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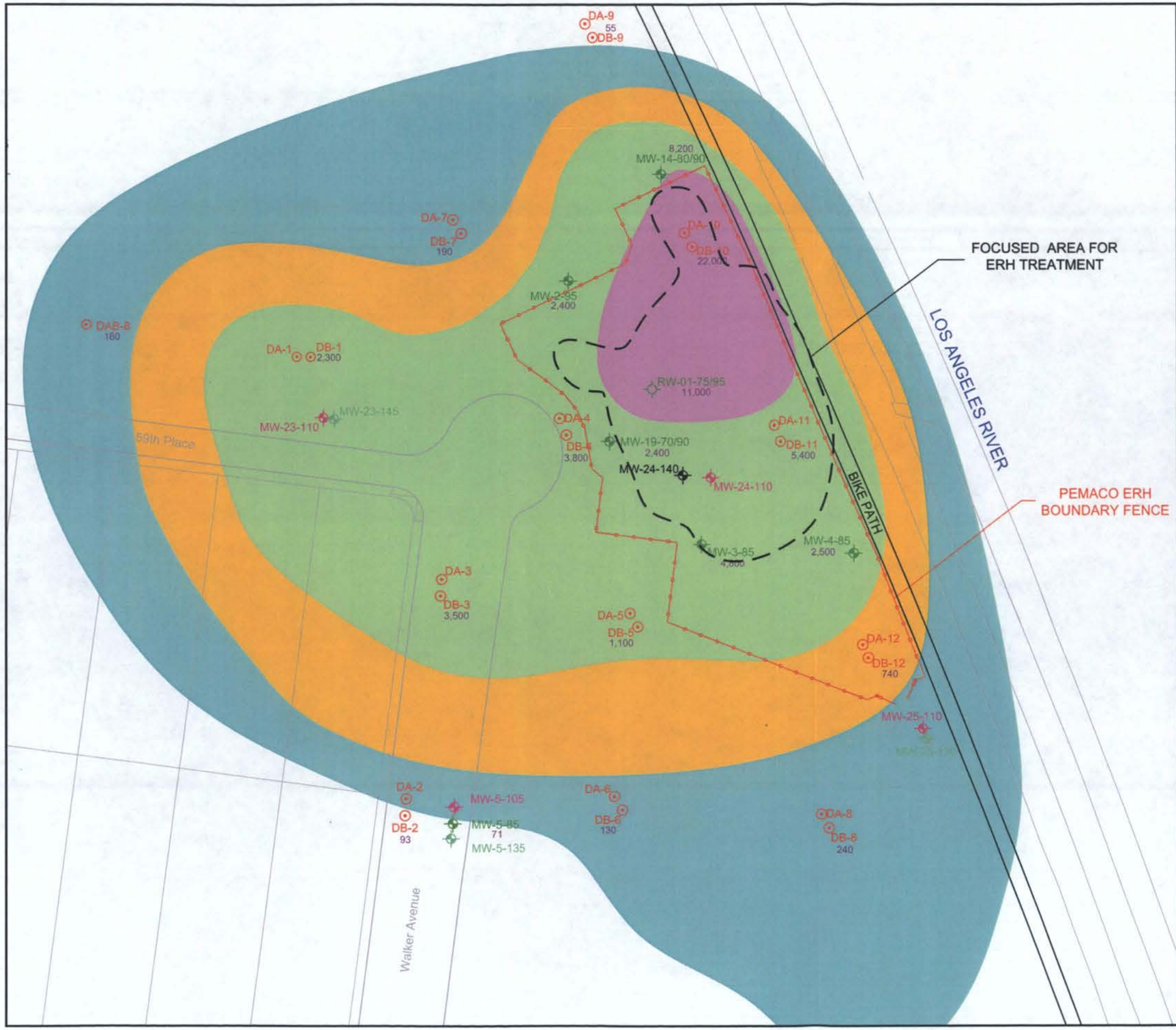
Engineering and Science

FIGURE 3



LEGEND:

MW-14-80/90	MONITORING WELL, EXPOSITION "A" AND "B" ZONES
RW-1-75/95	RECOVERY WELL, EXPOSITION ZONE (CURRENTLY USED AS A MONITORING WELL)
MW-5-105	USEPA, MONITORING WELL, EXPOSITION "C" ZONE
MW-5-135	USEPA, MONITORING WELL, EXPOSITION "D" ZONE
DA-10 DB-10	PEMACO WELL, EXTRACTION WELL, INDIVIDUAL SCREENS FOR THE "A" AND "B" ZONES
DAB-8	PEMACO WELL, EXTRACTION WELL, SCREENED THROUGH BOTH "A" AND "B" ZONES
400	TRICHLOROETHENE (TCE) RESULTS (ug/L)

TCE PLUMES:

- 100 - 500 ug/L
- 500 - 1,000 ug/L
- 1,000 - 10,000 ug/L
- >10,000 ug/L

NOTES:

1. Groundwater sampling event occurred during 2006.

0 50 100

APPROXIMATE SCALE IN FEET

2006 TCE CONCENTRATIONS IN GROUNDWATER EXPOSITION 'B' ZONE

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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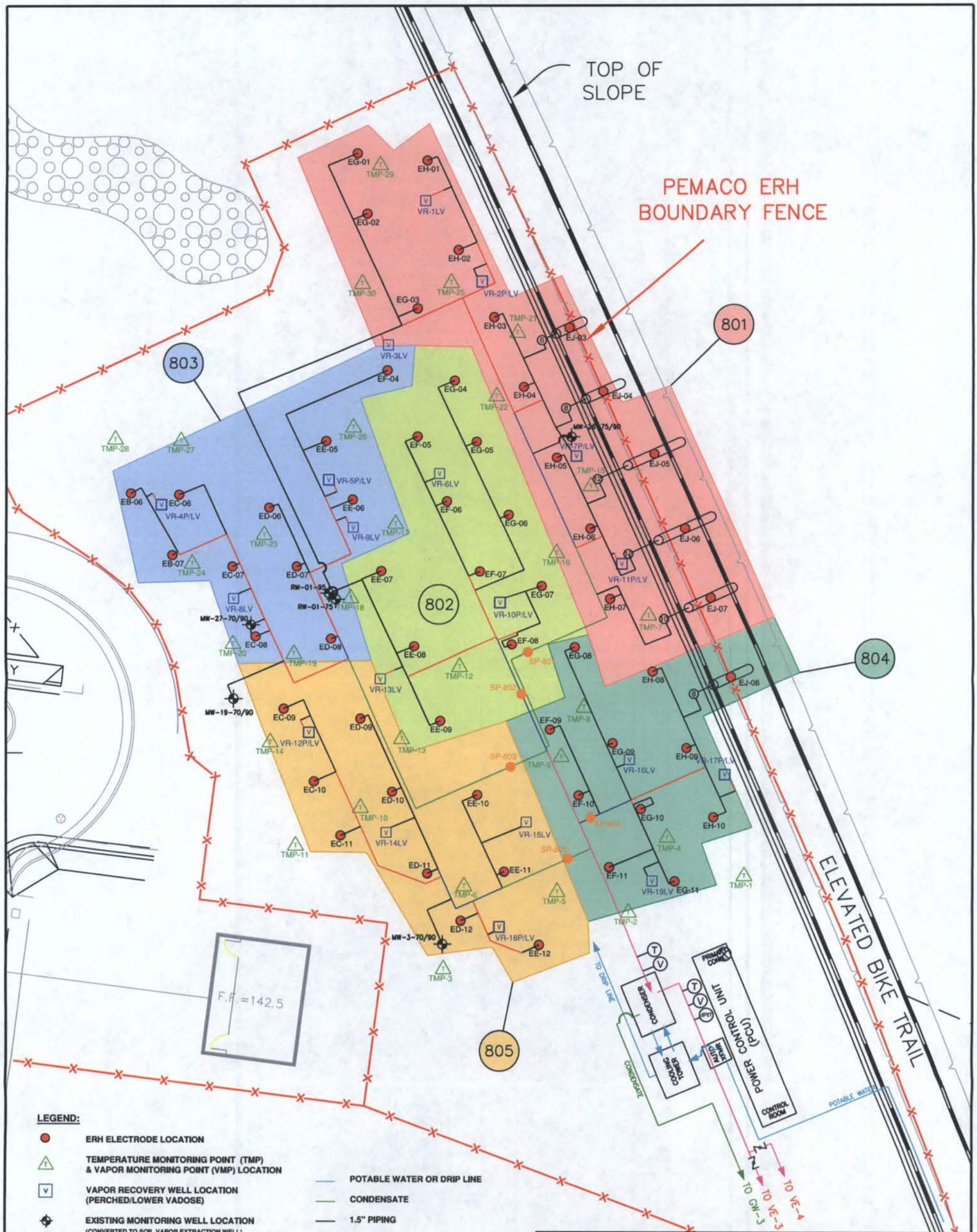
U.S. Environmental Protection Agency Region IX San Francisco, California	TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN	APPROVED	DATE: 12/10/08	
DESIGNED: EM DRAWN: GB CHECKED: JM	DRAFT	FIGURE 4	REV 1



FIVE SECTORS AND PIPING LAYOUT

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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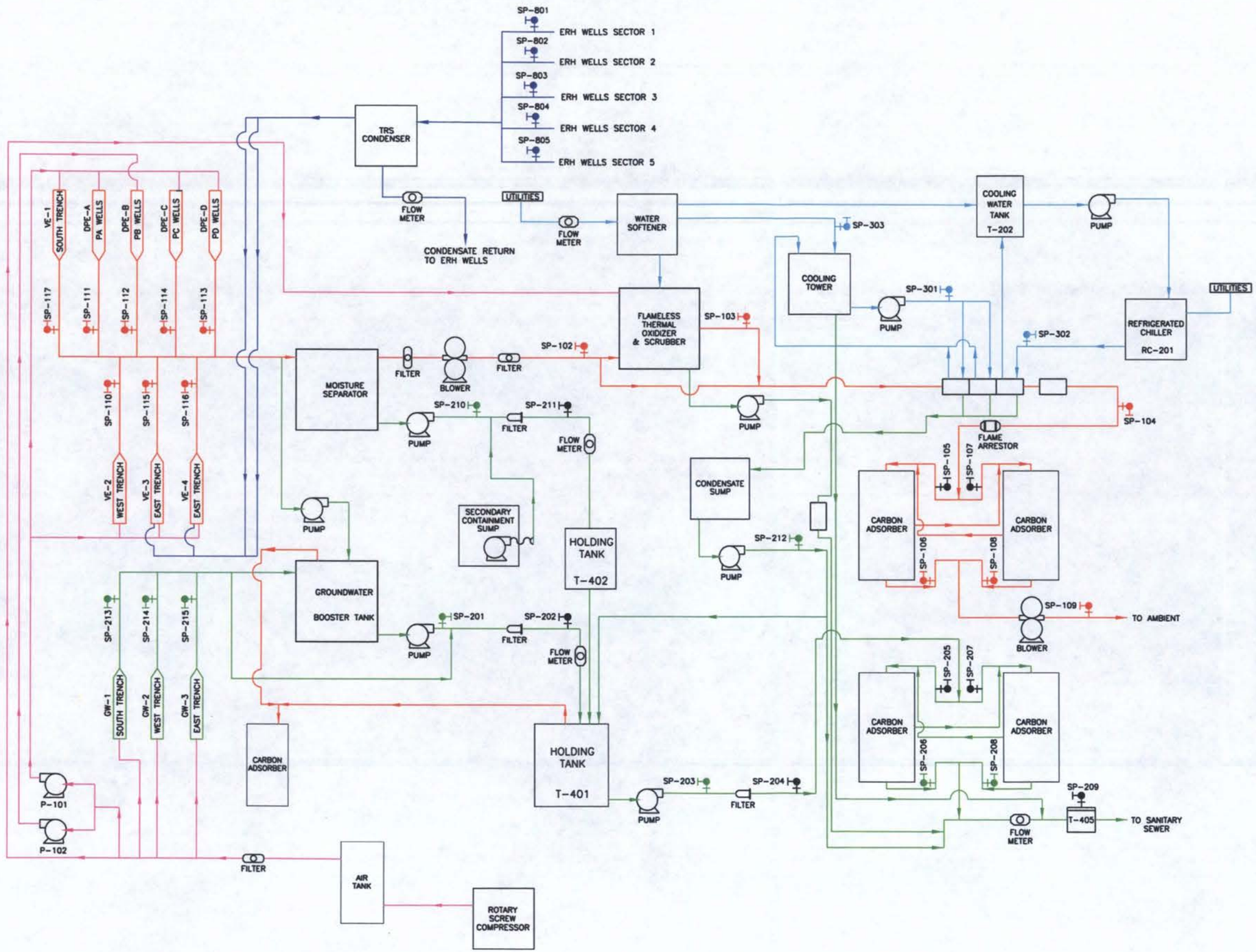
DESIGNED: JW DRAWN: DC CHECKED: JW		FIGURE 5



LEGEND:

- NON-CONTACT CLEAN WATER LINES
- SOIL VAPOR LINES
- GROUNDWATER LINES
- COMPRESSED AIR LINES
- TRS CONDENSER VAPOR AND WATER LINES

SAMPLE PORTS:

- SP-101 SP-1## Indicate Vapor Location
- SP-201 SP-2## Indicate Water Location
- SP-301 SP-3## Indicate Cooling Water Location
- SP-801 SP-8## Indicate Sector Sampling Location
- SP-### Additional Port Available for Sampling

NOTES:

Vapor and water samples will be collected at select sampling ports in accordance with sampling program presented in Table 10 of the SAP (TN&A, 2007).

PEMACO COMPOUND SAMPLE PORT LOCATIONS FOR CHEMICAL MONITORING

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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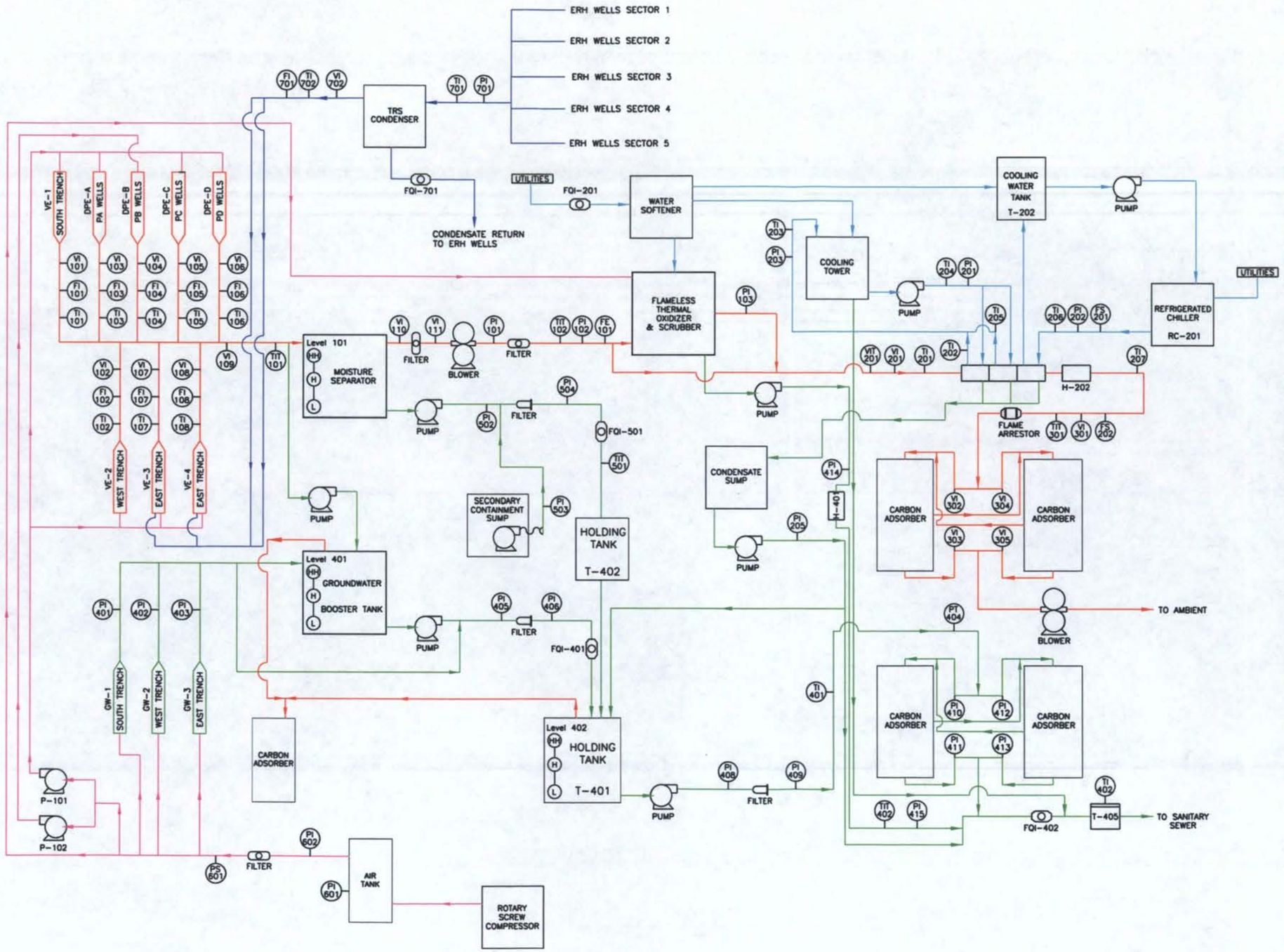
SCALE: AS SHOWN	APPROVED DRAFT- FINAL	DATE: 12/10/08
DESIGNED: JW & GN DRAWN: DC CHECKED: JW		FIGURE 6a



LEGEND:

- SOIL VAPOR LINES
  100 Series = Before FTO
  300 Series = After FTO
- NON-CONTACT CLEAN WATER LINES
  200 Series
- GROUNDWATER LINES
  400 Series = Exposition Water Treated by GAC
  500 Series = Condensate from Extraction Wells
- COMPRESSED AIR LINES
  600 Series = Pressurized Air Supply Line
- TRS CONDENSER VAPOR AND WATER LINES
  700 Series = TRS Vapor and Water Streams
  800 Series = TRS Vapor and Water Streams

FE 101 FLOW ELEMENT
PI 101 PRESSURE INDICATORS
PIT 101 PRESSURE TRANSMITTERS
TI 101 TEMPERATURE INDICATORS
TIT 101 TEMPERATURE INDICATOR TRANSMITTERS
VI 101 VACUUM INDICATORS
FQI-401 FLOW TOTALIZERS

PEMACO COMPOUND
PHYSICAL MONITORING LOCATIONS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

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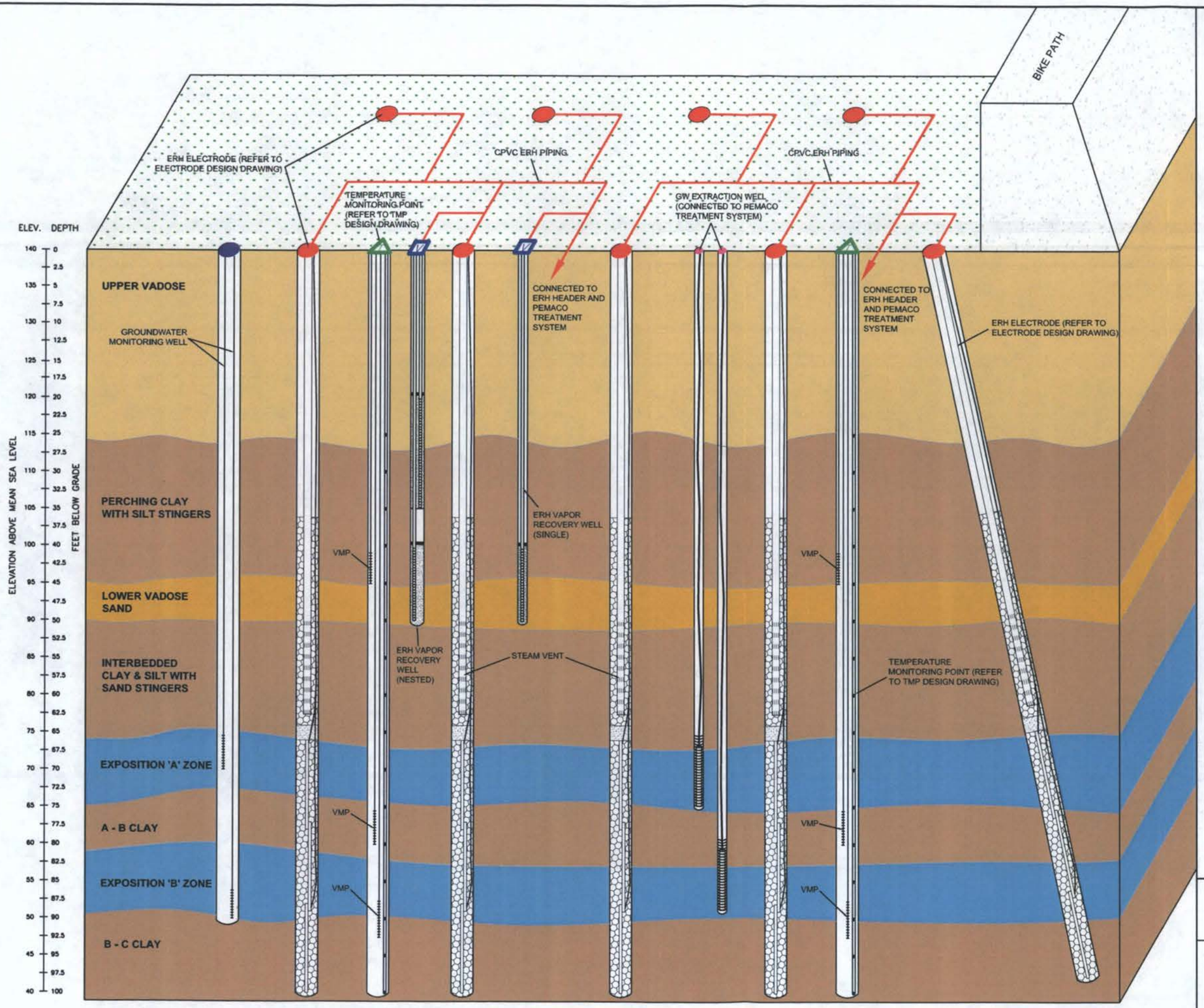
DESIGNED: JW & GH		FIGURE 6b
DRAWN: DC		
CHECKED: JW		



LEGEND:

- ERH ELECTRODE
- TEMPERATURE MONITORING POINT (TMP)
- ERH VAPOR RECOVERY WELL
- GROUNDWATER EXTRACTRON WELL
- EXISTING GROUNDWATER MONITORING WELL

ERH TREATMENT AREA CONCEPTUAL CROSS SECTION

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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DESIGN VERSUS "AS BUILT" LOCATIONS OF ERH ELECTRODES, TMPs, AND VR WELLS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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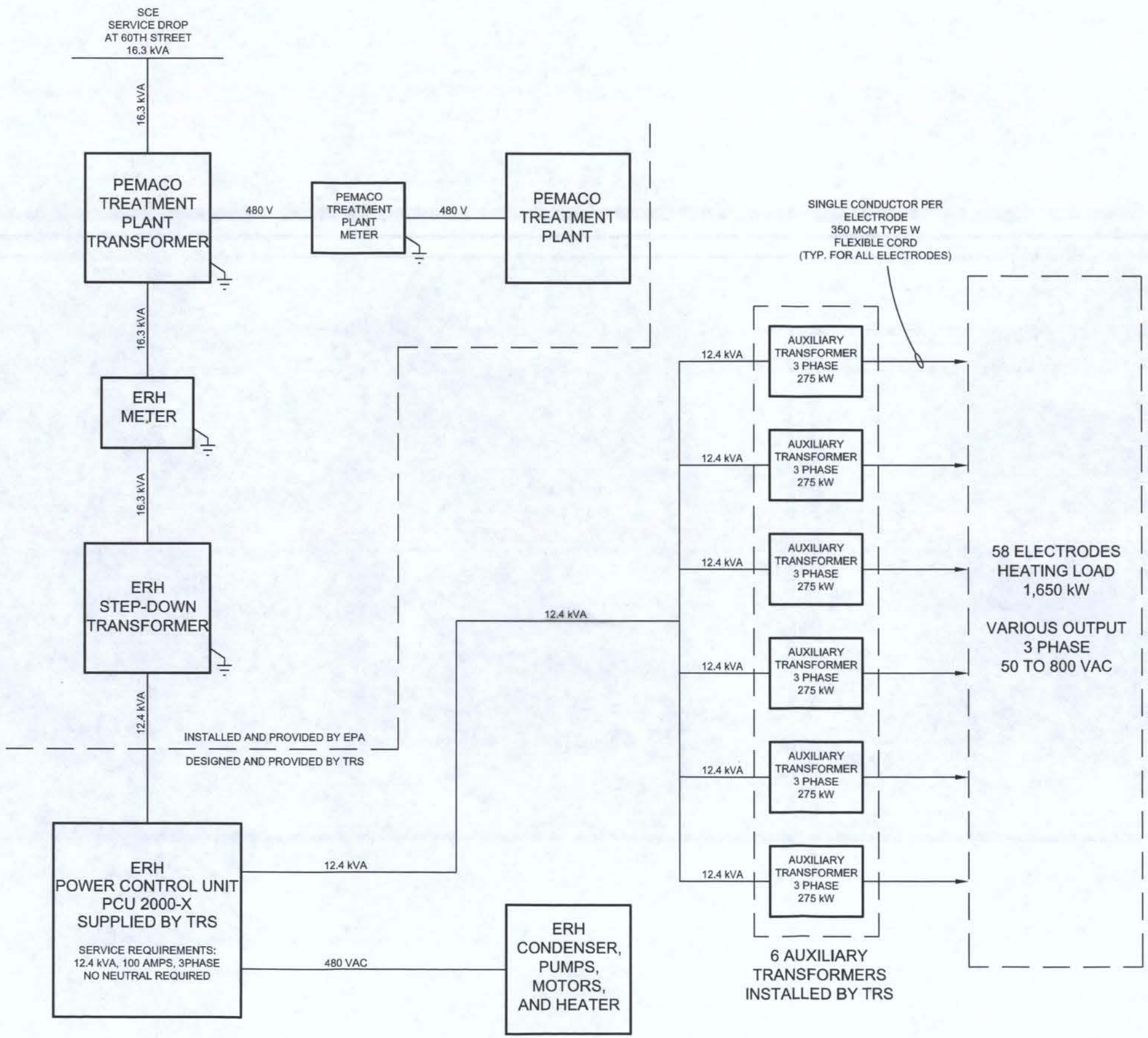
FIGURE 9	



NOTES:

1. THE SCE UTILITY POLE IS LOCATED AT 60TH STREET.
2. PEMACO TREATMENT PLANT TRANSFORMER, ERH METER, AND ERH TRANSFORMER ARE PROVIDED AND INSTALLED BY EPA.
3. THE ERH POWER CONTROL UNIT, EQUIPMENT, AND ELECTRODES ARE DESIGNED AND PROVIDED BY TRS.

ERH POWER SUPPLY DIAGRAM

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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SCALE: AS SHOWN	APPROVED: DRAFT
DATE: 12/10/08	FIGURE 10
DESIGNED: TRS	
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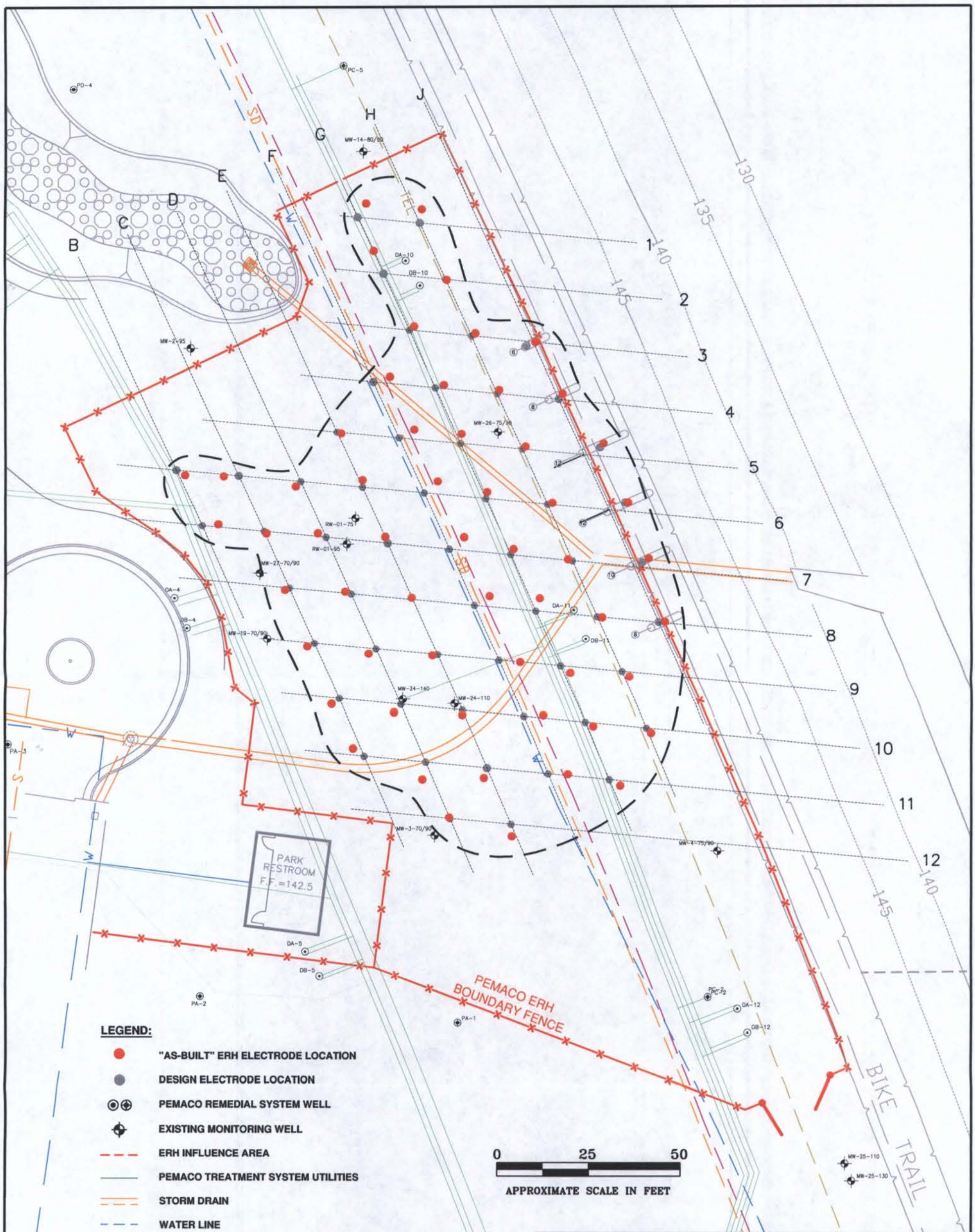

DESIGN ERH ELECTRODE GRID AND SUBSURFACE UTILITY LINES

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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DATE: 1/12/09	
REVISED: EM	
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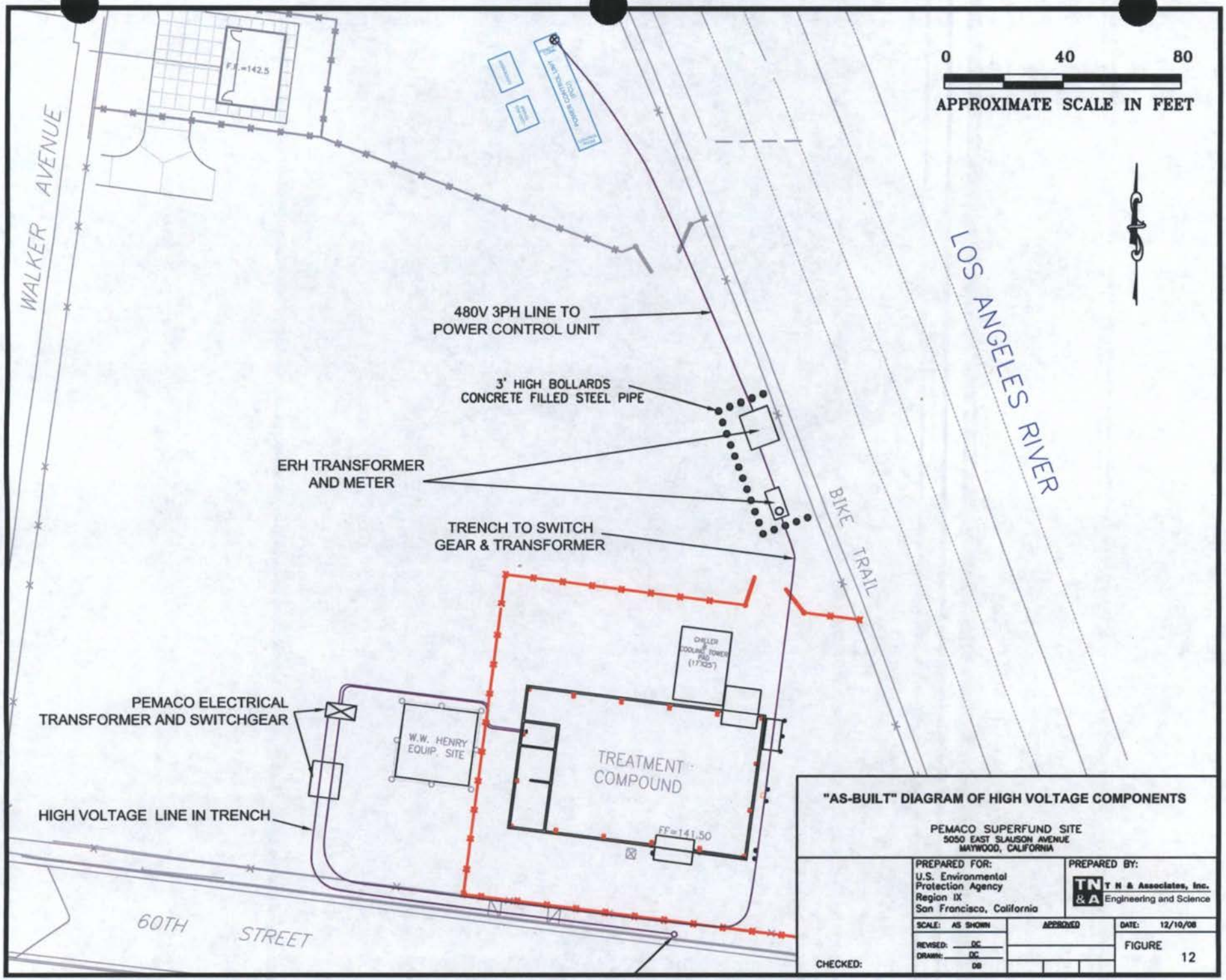
FIGURE 11	


0
40
80
APPROXIMATE SCALE IN FEET
WALKER AVENUE
LOS ANGELES RIVER
BIKE TRAIL
60TH STREET
480V 3PH LINE TO
POWER CONTROL UNIT
3' HIGH BOLLARDS
CONCRETE FILLED STEEL PIPE
ERH TRANSFORMER
AND METER
TRENCH TO SWITCH
GEAR & TRANSFORMER
PEMACO ELECTRICAL
TRANSFORMER AND SWITCHGEAR
HIGH VOLTAGE LINE IN TRENCH
W.W. HENRY
EQUIP. SITE
TREATMENT
COMPOUND
FF=141.50
"AS-BUILT" DIAGRAM OF HIGH VOLTAGE COMPONENTS
PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA
PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California
PREPARED BY:
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Engineering and Science
SCALE: AS SHOWN
APPROVED
DATE: 12/10/08
REVISED: DC
DRAWN: DC
DB
CHECKED:
FIGURE
12

LEGEND:

- ERH ELECTRODE LOCATION
- TMP/VMP LOCATION
- VR WELL LOCATION
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL
- ERH INLUENCE AREA

0 20 40

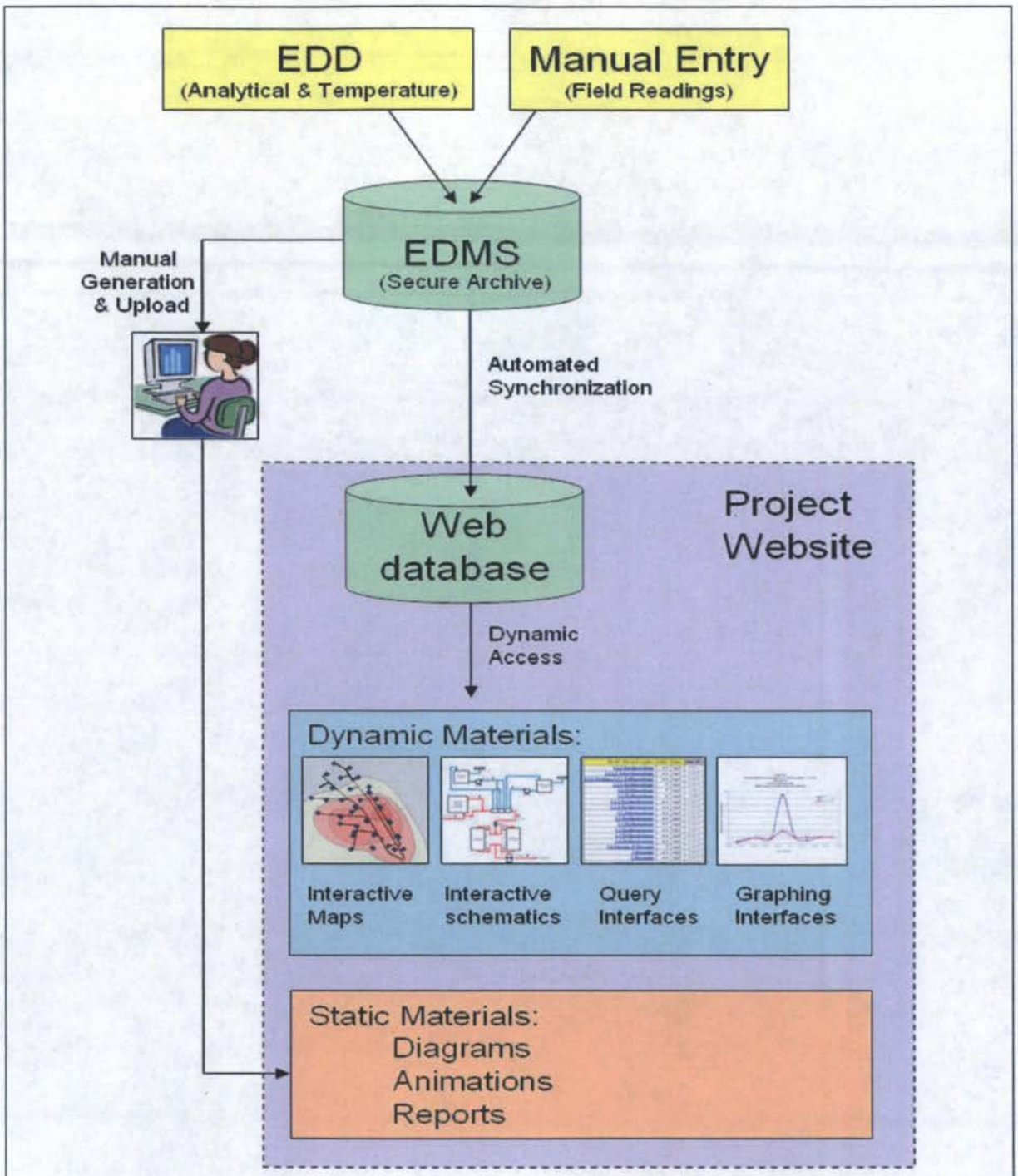
APPROXIMATE SCALE IN FEET

LOCATIONS OF VAPOR AND GROUNDWATER MONITORING POINTS IN ERH VICINITY AREA

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:	PREPARED BY:
U.S. Environmental Protection Agency Region IX San Francisco, California	TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN	APPROVED	DATE: 1/12/09
REVISED: EM DRAWN: DC CHECKED: DB		FIGURE 13



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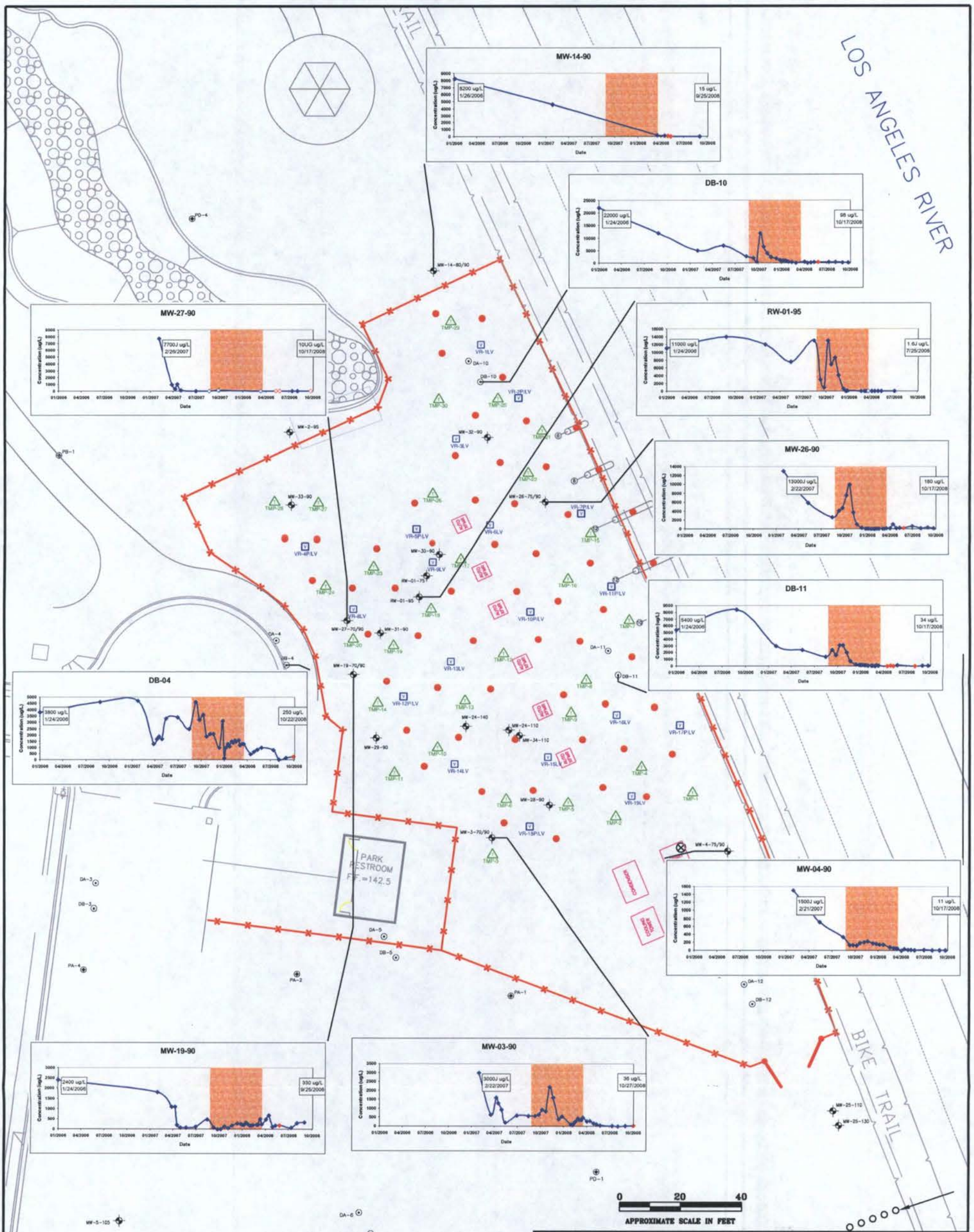
Engineering and Science

Figure 14

Data Management Flow Diagram
Pemaco Superfund Site, Maywood, CA



LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING POINT (TMP)
- VAPOR RECOVERY WELL
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL

TCE CONCENTRATION VERSUS TIME IN ERH VICINITY EXPOSITION B ZONE

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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SCALE: AS SHOWN	APPROVED	DATE: 12/10/08
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LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING POINT (TMP)
- VAPOR RECOVERY WELL (PERCHED/LOWER VADOSE ZONES)
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL

PLUMES:

8,200 TRICHLOROETHENE CONCENTRATION (PPBV)

- 100 - 1,000 PPBV
- 1,000 - 10,000 PPBV
- 10,000 - 100,000 PPBV
- +100,000 PPBV

0 20 40

APPROXIMATE SCALE IN FEET

NOTES:

1. SAMPLES WERE COLLECTED ON AUGUST 1-2, 2007.

TCE VAPOR CONCENTRATIONS IN AUGUST 2007
LOWER VADOSE ZONE VMPs (45 ft bgs)

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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DATE: 11/03/08
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CHECKED: DB

FIGURE 16a

LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING POINT (TMP)
- VAPOR RECOVERY WELL (PERCHED/LOWER VADOSE ZONES)
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL

PLUMES:

- 2,000 TRICHLOROETHENE CONCENTRATION (PPBV)
- 100 - 1,000 PPBV
- 1,000 - 10,000 PPBV
- 10,000 - 100,000 PPBV

0 20 40

APPROXIMATE SCALE IN FEET

NOTES:

1. SAMPLES WERE COLLECTED ON APRIL 21, 2008.

TCE VAPOR CONCENTRATIONS IN APRIL 2008
LOWER VADOSE ZONE VMPs (45 ft bgs)

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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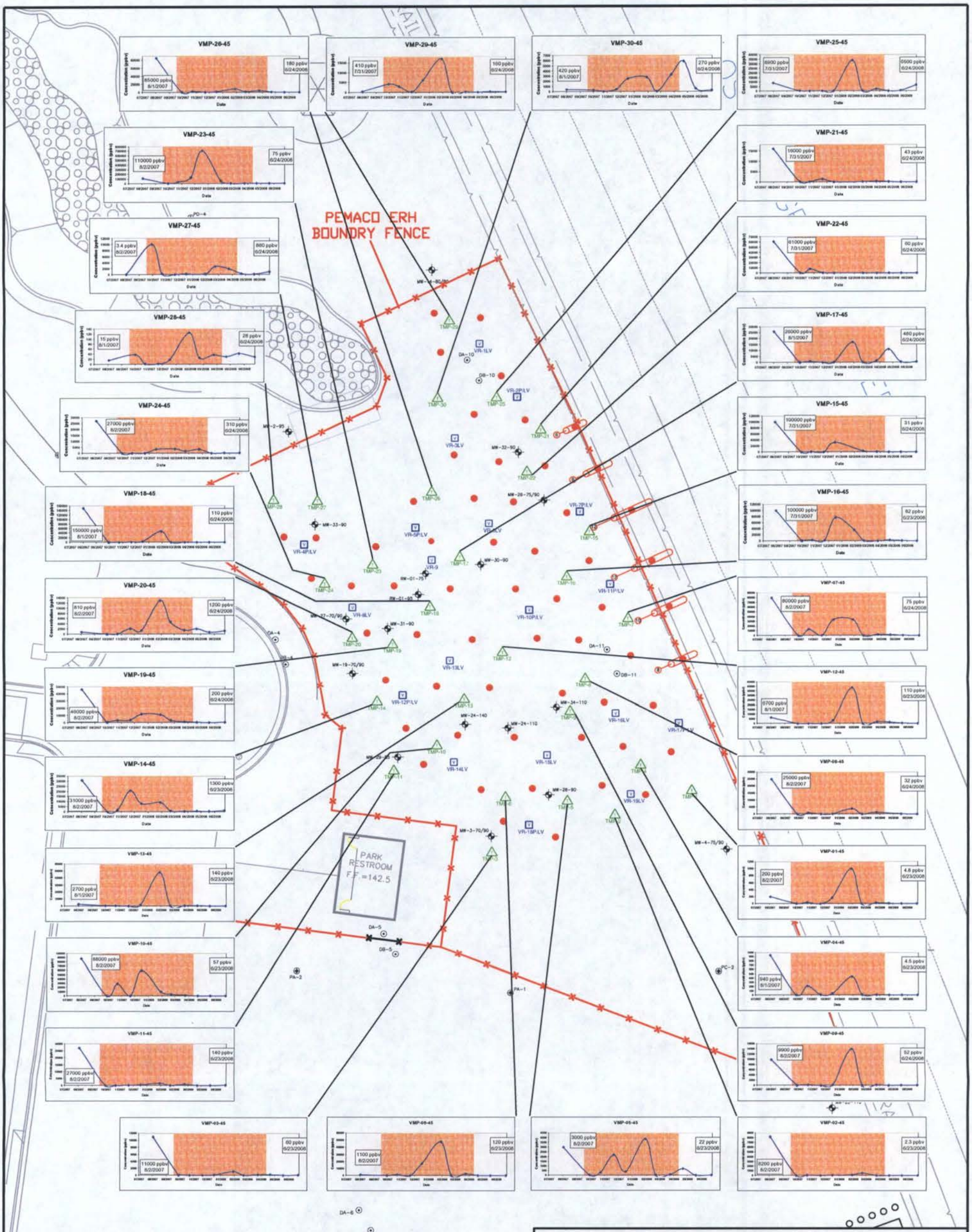
SCALE: AS SHOWN
APPROVED
DATE: 11/03/08
REVISED: DC
DRAWN: DC
CHECKED: DB

FIGURE 16b



LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING POINT (TMP)
- VAPOR RECOVERY WELL (PERCHED AND LOWER VADOSE ZONES)
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL

0 30 60

APPROXIMATE SCALE IN FEET

TCE VAPOR CONCENTRATIONS VERSUS TIME IN LOWER VADOSE ZONE (45 FT BGS)

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

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SCALE: AS SHOWN
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DATE: 12/10/08
REVISED: DC
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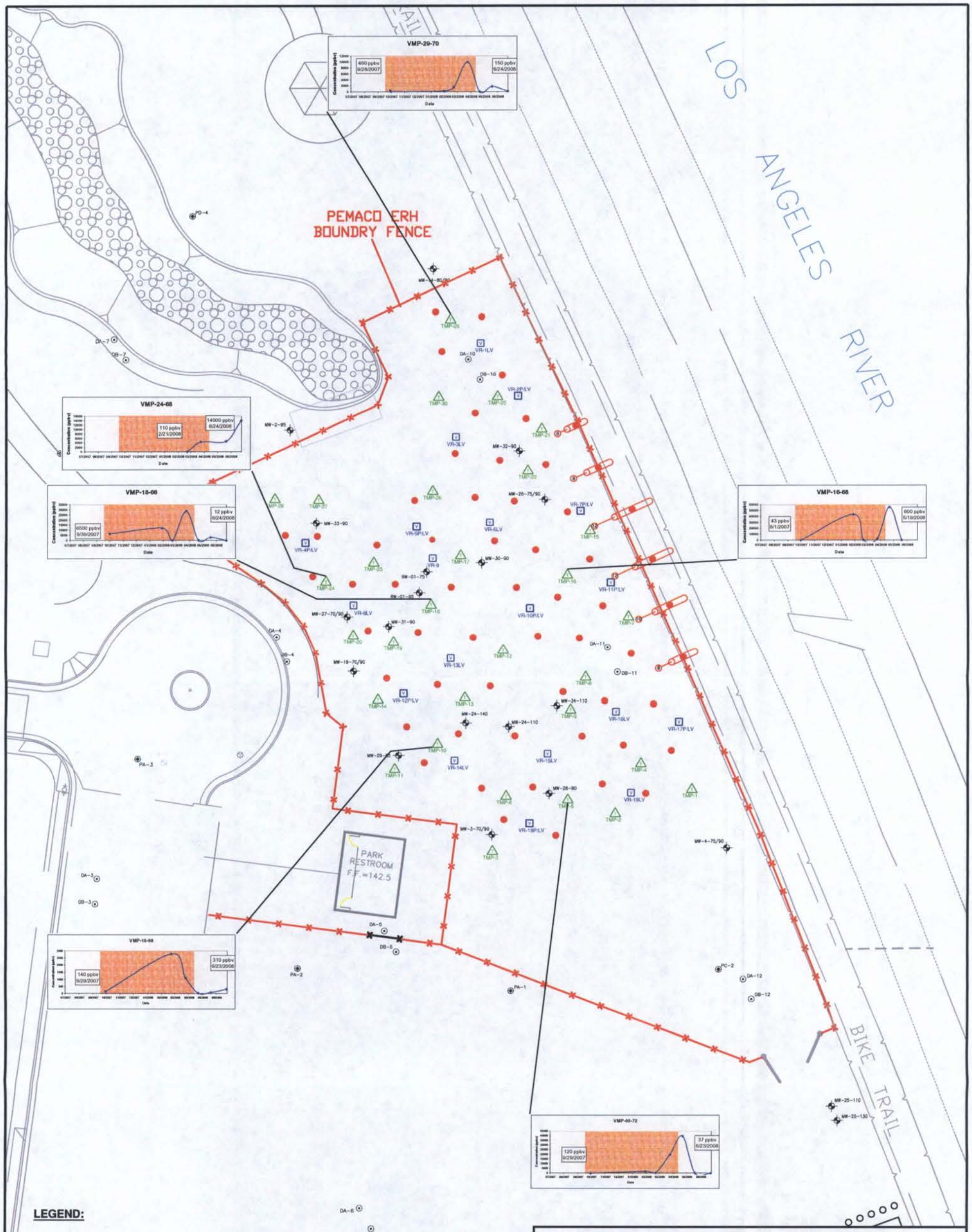
CHECKED: DB

FIGURE 17a



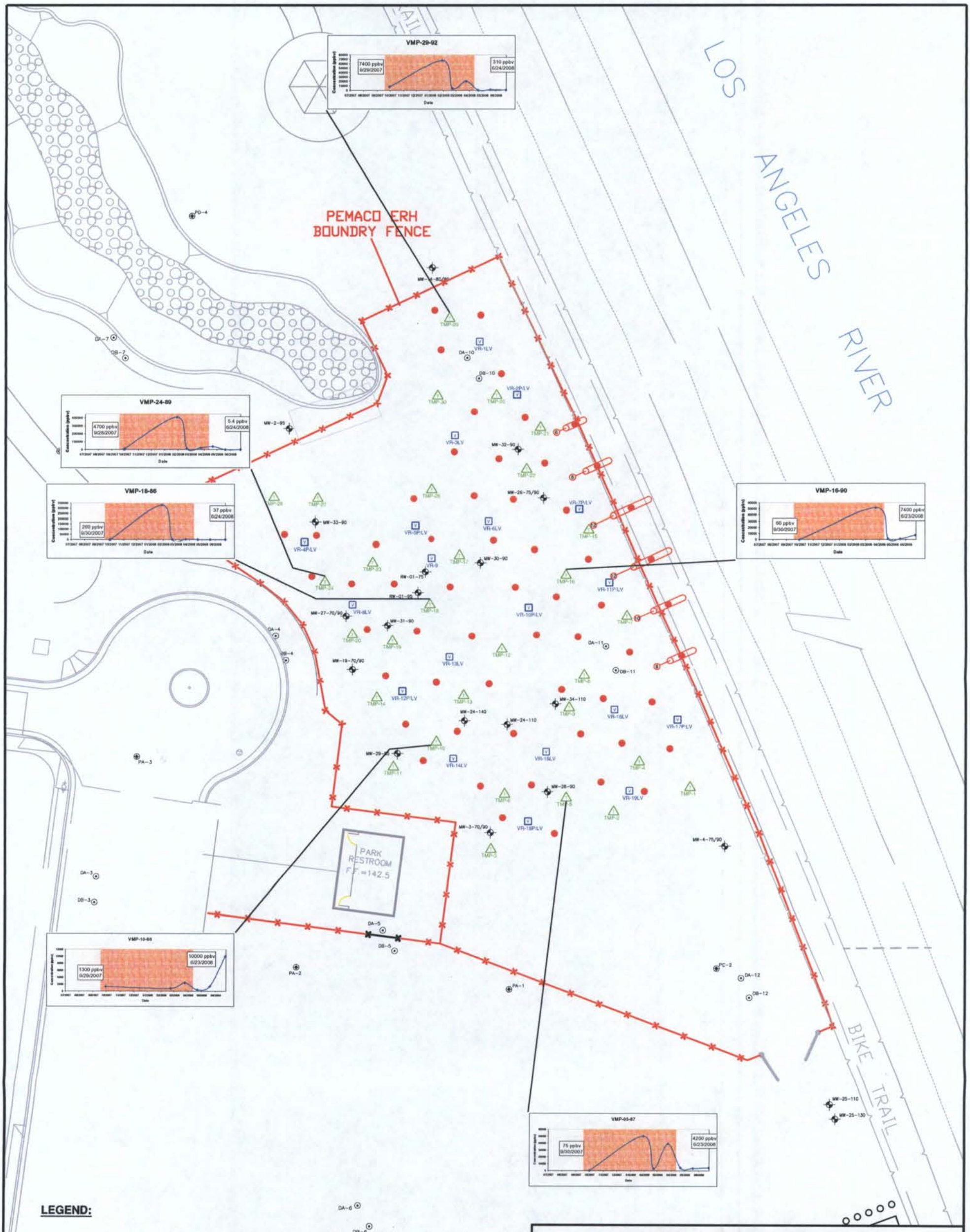
TCE VAPOR CONCENTRATIONS VERSUS TIME IN EXPOSITION A ZONE (65-72 FT BGS)

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
TN & A Associates, Inc.
Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 12/10/08
REVISED: DC
DRAWN: DC
CHECKED: DB
FIGURE 17b



LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING POINT (TMP)
- VAPOR RECOVERY WELL (PERCHED AND LOWER VADOSE ZONES)
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL

0 30 60

APPROXIMATE SCALE IN FEET

TCE VAPOR CONCENTRATIONS VERSUS TIME IN EXPOSITION B ZONE (86-92 FT BGS)

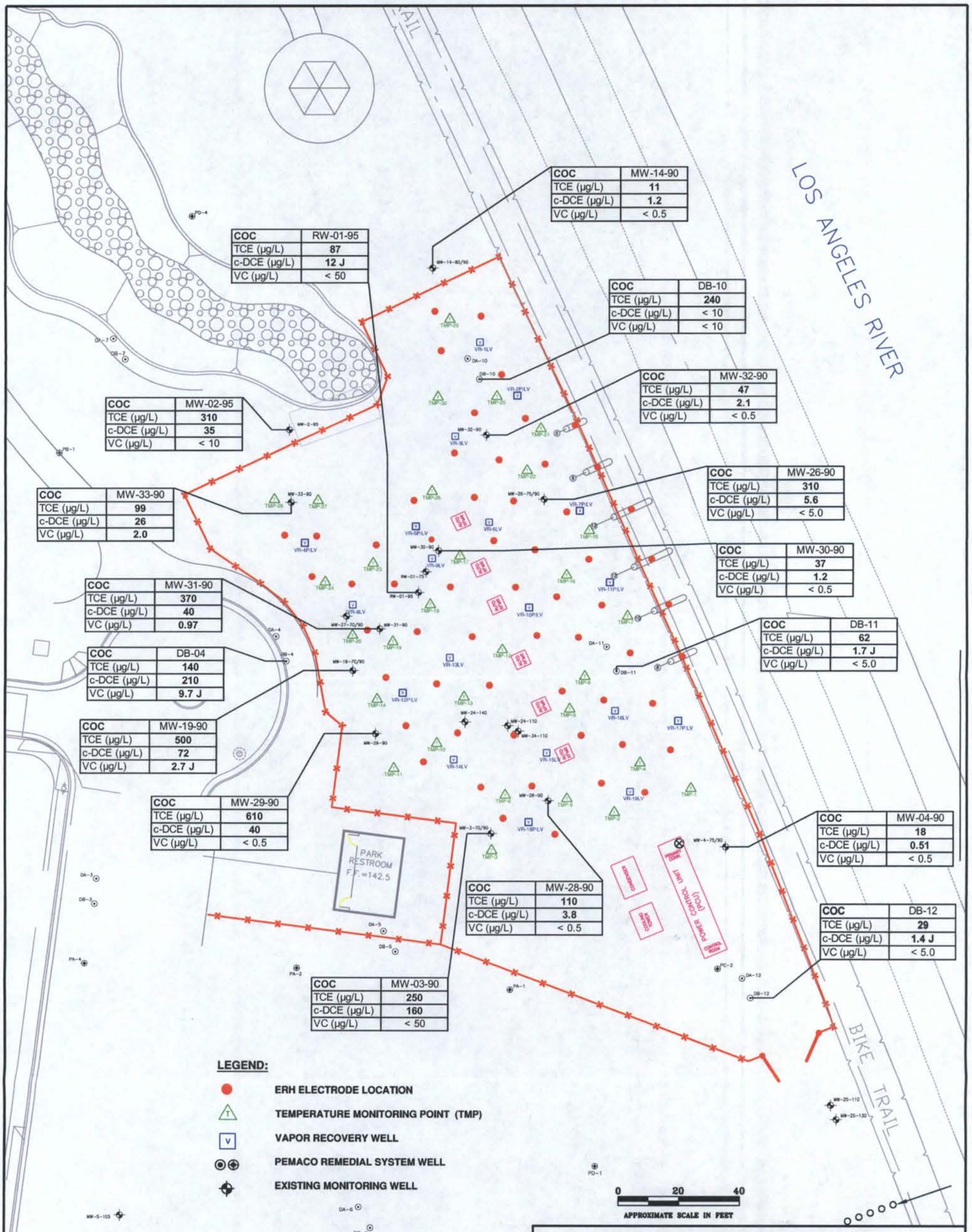
PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 12/10/08
REVISED: DC
DRAWN: DC
CHECKED: DB

FIGURE 17c



NOTES:

1) Pemaco Site Specific Remediation Levels are for TCE 5.0 µg/L, for c-DCE 6.0 µg/L, and for VC 0.5 µg/L

2) Groundwater samples were collected in November 2008

3) Abbreviations
- c-DCE - cis-1,2-dichloroethene
- COC - chemical of concern
- TCE - trichloroethene
- VC - vinyl chloride
- µg/L - micrograms per liter

SELECT COC CONCENTRATIONS WITHIN ERH AREA IN NOVEMBER 2008

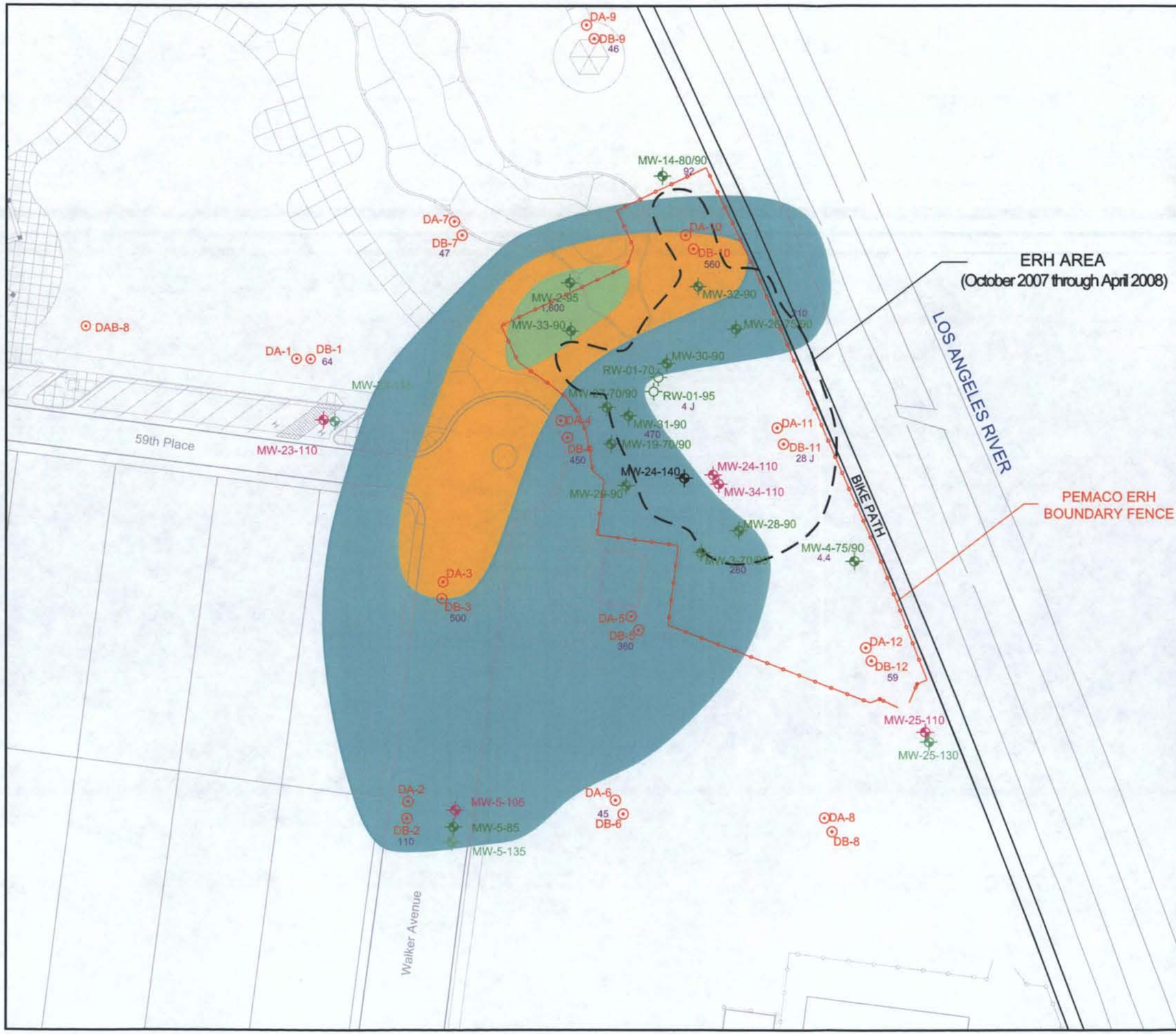
PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
T N & Associates, Inc.
Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 01/15/09
REVISED: EM & TB
DRAWN: DC
CHECKED: DB

FIGURE 18



LEGEND:

MW-14-80/90	MONITORING WELL, EXPOSITION "A" AND "B" ZONES
RW-1-70	RECOVERY WELL, EXPOSITION ZONE (CURRENTLY USED AS A MONITORING WELL)
MW-5-105	MONITORING WELL, EXPOSITION "C" ZONE
MW-5-135	MONITORING WELL, EXPOSITION "D" ZONE
DA-10 DB-10	PEMACO WELL, EXTRACTION WELL, INDIVIDUAL SCREENS FOR THE "A" AND "B" ZONES
DAB-8	PEMACO WELL, EXTRACTION WELL, SCREENED THROUGH BOTH "A" AND "B" ZONES
— — —	ELECTRICAL RESISTANCE HEATING (ERH) AREA
—o—o—	ELECTRICAL RESISTANCE HEATING (ERH) FENCE
400	TRICHLOROETHENE (TCE) RESULTS (ug/L)

TCE PLUMES:

- 100 - 500 ug/L
- 500 - 1,000 ug/L
- 1,000 - 10,000 ug/L

NOTES:

1. Groundwater Sampling Events occurred in April and May 2008.

0 50 100

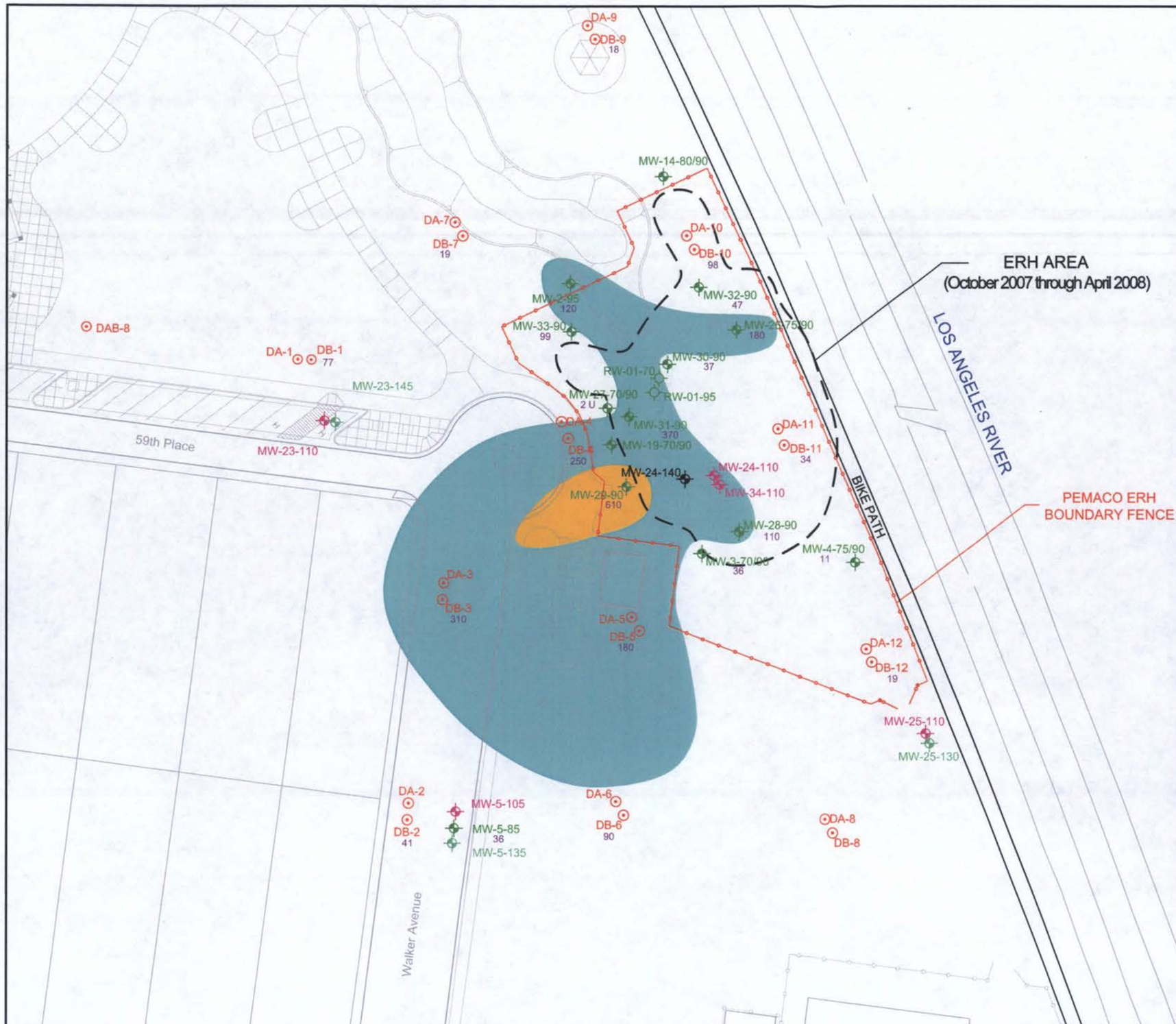
APPROXIMATE SCALE IN FEET

APRIL AND MAY 2008 TCE CONCENTRATIONS IN GROUNDWATER EXPOSITION 'B' ZONE

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:	PREPARED BY:
U.S. Environmental Protection Agency Region IX San Francisco, California	TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN	APPROVED	DATE: 05/15/08	
DESIGNED: EM DRAWN: GB CHECKED: JM	DRAFT	FIGURE 19	REV 1



LEGEND:

MW-14-80/90	MONITORING WELL, EXPOSITION "A" AND "B" ZONES
RW-1-70	RECOVERY WELL, EXPOSITION ZONE (CURRENTLY USED AS A MONITORING WELL)
MW-5-105	MONITORING WELL, EXPOSITION "C" ZONE
MW-5-135	MONITORING WELL, EXPOSITION "D" ZONE
DA-10 DB-10	PEMACO WELL, EXTRACTION WELL, INDIVIDUAL SCREENS FOR THE "A" AND "B" ZONES
DAB-8	PEMACO WELL, EXTRACTION WELL, SCREENED THROUGH BOTH "A" AND "B" ZONES
— — —	ELECTRICAL RESISTANCE HEATING (ERH) AREA
—o—o—	ELECTRICAL RESISTANCE HEATING (ERH) FENCE
400	TRICHLOROETHENE (TCE) RESULTS (ug/L)

TCE PLUMES:

100 - 500 ug/L

500 - 1,000 ug/L

NOTES:

1. Groundwater Sampling Events occurred in October and November 2008.

0 50 100

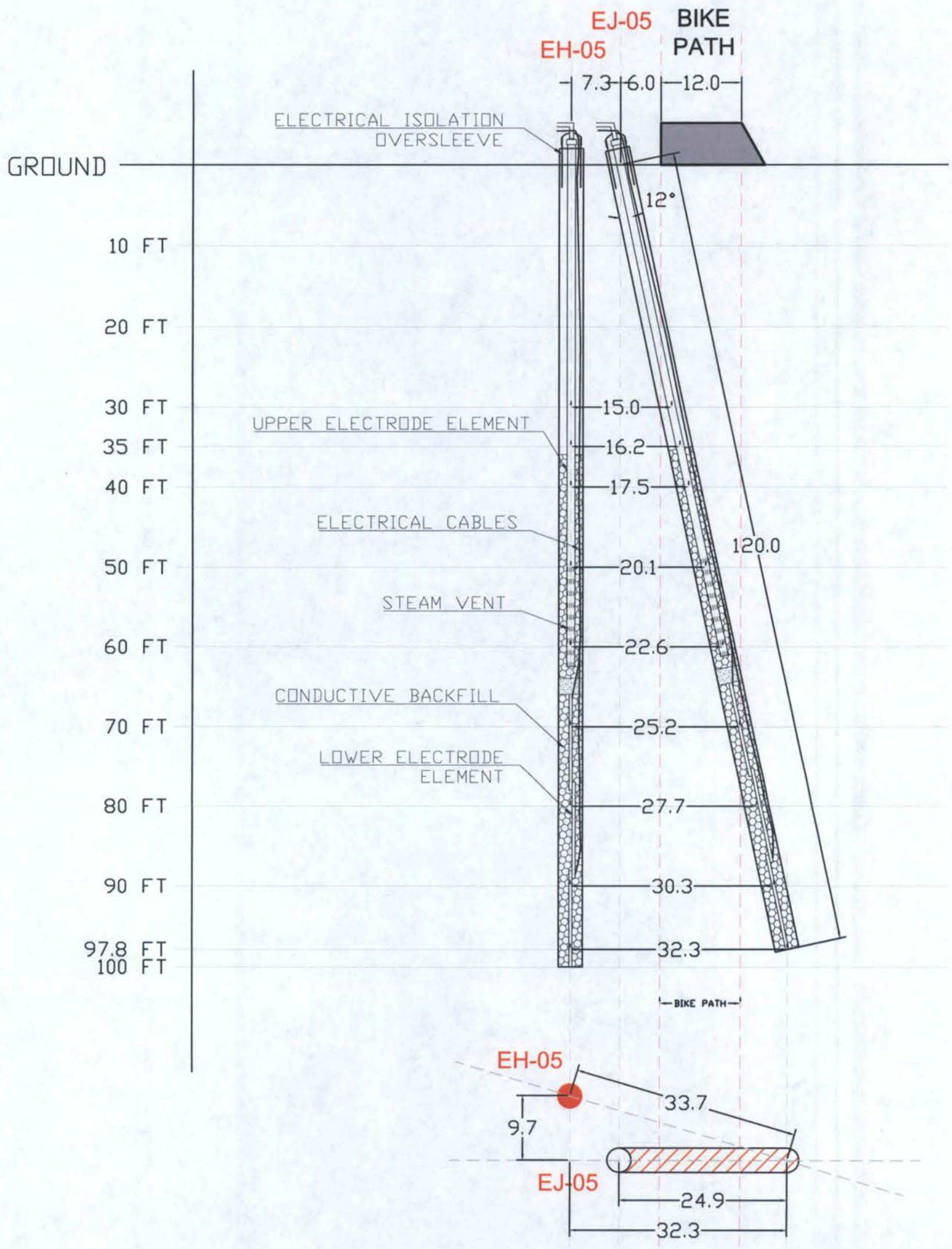
APPROXIMATE SCALE IN FEET

OCTOBER AND NOVEMBER 2008 TCE CONCENTRATIONS IN GROUNDWATER EXPOSITION 'B' ZONE

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California	PREPARED BY: TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN	APPROVED DRAFT	DATE: 12/05/08	
DESIGNED: EM		FIGURE 20	REV 1
DRAWN: GB			
CHECKED: JM			

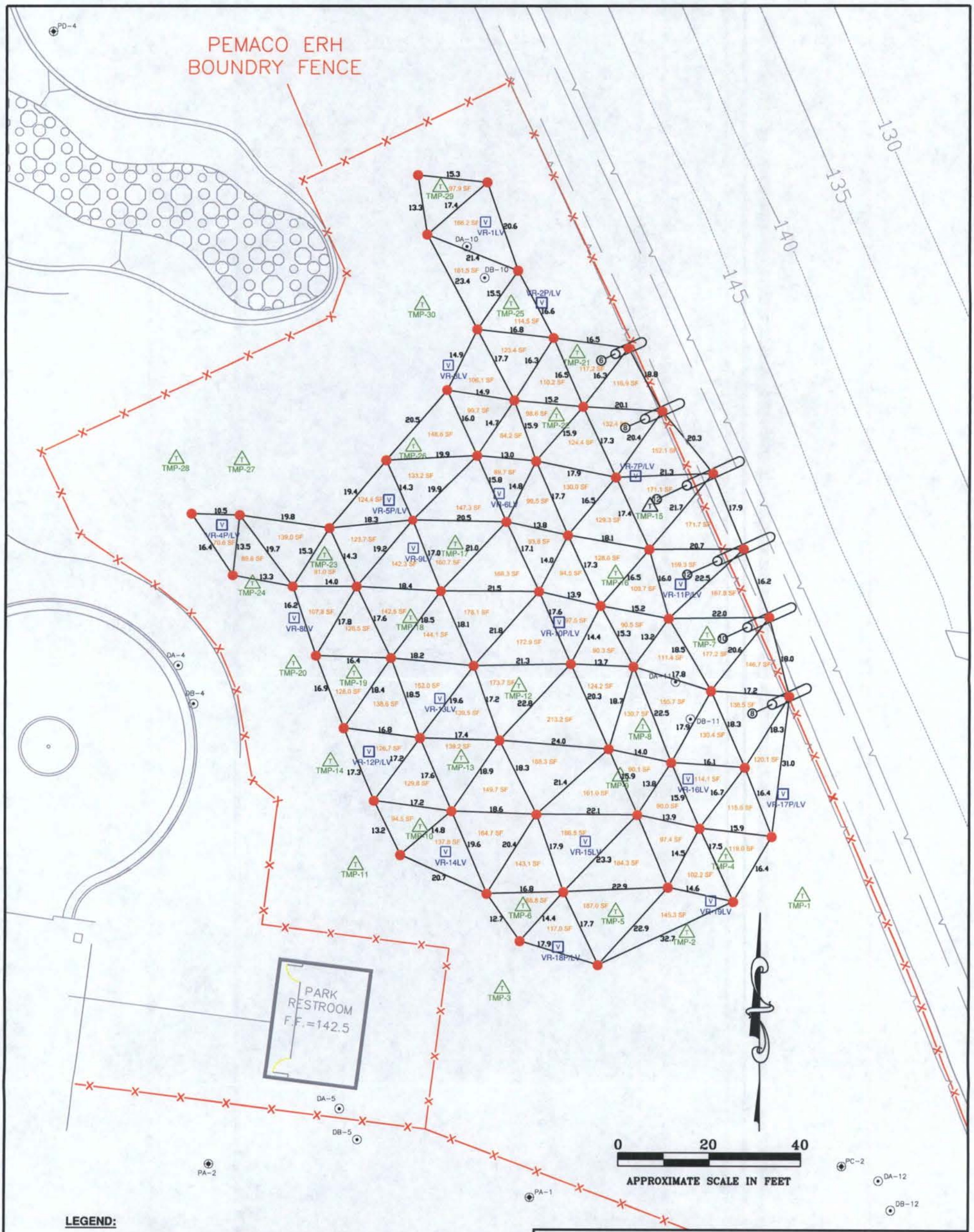


NOT TO SCALE

ERH ELECTRODE CROSS-SECTION AND PLAN VIEW

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California	PREPARED BY: TN & A — T N & Associates, Inc. Engineering and Science
SCALE: AS SHOWN	APPROVED
DATE: 09/11/08	
DESIGNED: DC	
DRAWN: DC	
CHECKED: DB	
FIGURE 21	



LEGEND:

- DISTANCE BETWEEN TWO ELECTRODES IN FEET (FT)
- AREA WITH ELECTRODE TRIANGLE IN SQUARE FEET (SF)
- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING POINT (TMP)
- VAPOR RECOVERY (VR) WELLS
- PEMACO REMEDIAL SYSTEM WELLS
- EXISTING MONITORING WELLS - EXPOSITION ZONE

"AS-BUILT" ERH ELECTRODE DISTANCES

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
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Region IX
San Francisco, California

PREPARED BY:
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Engineering and Science

SCALE: AS SHOWN	APPROVED	DATE: 08/20/08
REVISED: EM DRAWN: DC CHECKED: JW		FIGURE 22

LEGEND:

- ERH ELECTRODE LOCATION
- TMP/VMP LOCATION
- VR WELL LOCATION
- PEMACO REMEDIAL SYSTEM WELL
- EXISTING MONITORING WELL
- ERH INLUENCE AREA
- GROUNDWATER ELEVATION CONTOUR (ONE FOOT INTERVALS)
- GROUNDWATER FLOW DIRECTION
- 57.28 GROUNDWATER ELEVATION

0 20 40

APPROXIMATE SCALE IN FEET

ERH VICINITY GROUNDWATER GRADIENT MAP, FEBRUARY 6, 2008

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
TN & A Engineering and Science
T N & Associates, Inc.

SCALE: AS SHOWN
APPROVED
DATE: 1/12/09
REVISED: EM
DRAWN: DC
CHECKED: DB

FIGURE 23

Tables

Table 1
Pemaco ERH Summary
Pemaco Superfund Site, Maywood, CA

Item	Description	Comments
	Site Characteristics	
Treatment Area	14,400 ft^2	Approximately
Volume Treated	30,000 yd^3	Approximately
Deep Extent of Treatment	95 ft bgs	Bottom of B-zone saturated zone
Shallow Extent of Treatment	35 ft bgs	Top of shallowest saturated zone
Depth to Groundwater	Three Perched or saturated zones from 35-80' bgs	Perched/saturated zones separated by 5+ feet think clay zones.
Contaminants of Concern (COCs)	TCE is primary COC. Other VOCs are present	DNAPL is thought to be in lower saturated zone; 20,000 ppb TCE
Soil Resistivity (Static)	15-30 Ω·m	Based on Mc^2 thermal laboratory measured data
	Remedial Approach	
Vertical Electrodes	52	Stacked two per borehole; each connected to vapor extraction system; constructed w/ steel shot and graphite.
Slant Electrodes	6	Under bike path; constructed same as vertical electrodes.
Electrical Substations	6 x 275 kW	Connected to 1000 amp PCU
Temp. Sensors; installed as Temperature Monitoring Points (TMP)	480 sensor points	30 strings w/ 16 sensors @ 5' spacing beginning at 25 feet bgs.
Groundwater Recovery Wells	2	Two wells are present in the ERH area; each well can pump up to 3 gpm.
Electrode Spacing (Horizontal)	~12 - 24 feet	Spacing variable due to subsurface utilities.
Depth to Bottom of Electrodes	~100 feet bgs	Installed 5 feet deeper then target zone
Depth to Top of Electrodes	~35 feet bgs	Top of electrode same as top of target zone
Electrode Layers	2	Two electrodes per borehole
Target Temperature	87°C from 35 to 60 feet bgs 100°C from 60 to 80 feet bgs 110°C from 80 to 95feet bgs	Attainments of temperature in 85% of thermocouples are needed for milestone payments.
Vapor Extraction/muitl-phase extraction wells	10 with screen from 40-50ft bgs; 9 dual completion w/ screen from 20-35ft and 40-50ft bgs.	These wells were installed to supplement vapor recovery and remove water from the shallow perched zone.
Vapor Recovery Air Flow Rate and Vacuum	~1000 cfm & 15" hg	Actual operation may differ
Vapor Treatment Method	Flameless Thermal Oxidizer (FTO) w/ Granular Activated Carbon (GAC) polish	TN&A designed and operated system
Liquid Treatment Method	Granular Activated Carbon polish	TN&A designed and operated system

Table 1 - Continued
Pemaco ERH Summary
Pemaco Superfund Site, Maywood, CA

Item	Description	Comments
	Additional Information	
Electrical Power Input	~1,650 KW	Maximum power available from the substations
Cumulative Power Input	~3.4 MM KW·Hr	Amount of power needed to meet temperature milestone
Water Demand	~5 gpm	Estimated volume needed for electrode drip lines.
Time to Reach Target Temp	77 days	Estimate provided by TRS
Project Duration	6+ months	Time estimate needed to meet MCLs in groundwater; actual time will depend upon effectiveness of the ERH

Table 2
Vapor Monitoring Points (VMPs) Pressure Measurement
Pemaco Superfund Site, Maywood, CA

Well I.D.		Associated Hydrogeologic Unit	Casing Diameter (Inches)	Screen Interval (Feet bgs)	Screen Length (Ft)	Total Depth of Well (Ft bgs)*	Depth to Water (Ft bgs)	Vac/Pressure Measurement 01/15/08 (in H2O)	Vac/Pressure Measurement 01/21/08 (in H2O)	Pressure Measurement 01/29/08 (in H2O)	Pressure Measurement 02/07/08 (in H2O)	Pressure Measurement (2/12/08) (in H2O)	Pressure Measurement (2/20/08) (in H2O)	Pressure Measurement (2/27/08) (in H2O)	Pressure Measurement (03/05/08) (in H2O)	Pressure Measurement (03/10/08) (in H2O)	Pressure Measurement (03/26/08) (in H2O)	Pressure Measurement (04/01/08) (in H2O)	Other Comments
TMP-1	-LS*	Lower Vadose Sand*	1/2	51 - 52	1	52	NC	0.00	-0.34	-25.86	-26.00	-27.0	-26.0	-26.0	-30.0	-29.0	-29.5	-28.5	
	-A*	A Zone*	3/4	65 - 68	3	68	Dry	-17.42	-13.68	-27.22	-12.93	-24.0	-25.0	-5.2	-28.0	-27.0	-28.5	-31.5	
	-B*	B Zone*	3/4	85 - 88	3	88	80.5	2.05	-0.07	-1.55	3.65	6.29	1.89	4.59	7.8	3.8	2.2	2.7	
TMP-2	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-20.41	-0.68	-34.03	-30.00	-35.0	-32.0	-33.0	-35.5	-35.5	-39.0	-32.0	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-28.37	-32.24	-35.39	-29.00	14.60	-32.0	-34.0	-35.5	-35.0	-35.5	-31.5	
	-B*	B Zone*	3/4	85 - 88	3	88	82.3	38.21	34.02	17.83	23.86	0.27	15.21	24.10	8.5	6.9	18.4	7.2	
TMP-3	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-27.22	-40.13	-39.47	-36.00	-41.0	-40.0	-41.0	-40.0	-40.5	-46.5	-38.5	
	-A	A Zone	3/4	64 - 67	3	67	Dry	-23.46	-24.39	-34.03	-0.10	-38.0	-37.0	-30.0	-37.0	-39.0	-44.0	-40.5	
	-B	B Zone	3/4	85 - 88	3	88	80.1	5.39	1.03	5.17	0.02	0.00	0.00	0.00	0.0	0.0	0.0	0.0	
TMP-4	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-6.80	-23.81	-32.66	-33.00	-35.0	-34.0	-40.0	-41.0	-39.0	-42.0	-28.5	
	-A*	A Zone*	3/4	65 - 68	3	68	Steam	4.49	24.13	13.00	22.56	22.43	19.41	39.04	23.2	11.2	28.4	17.8	
	-B*	B Zone*	3/4	85 - 88	3	88	79.8	0.03	0.02	-4.20	3.44	0.44	-0.41	0.14	-0.4	-0.5	-0.2	-0.2	
TMP-5	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-27.22	-30.61	-39.47	-35.00	-40.0	-39.0	-43.0	-44.0	-43.5	-50.2	-33.0	
	-A	A Zone	3/4	69 - 72	3	72	Dry	-17.84	-22.72	-26.62	-16.96	-24.0	-25.0	-23.0	-34.0	-36.5	-43.0	-36.0	
	-B	B Zone	3/4	84 - 87	3	87	Dry	3.24	2.71	36.26	28.09	31.50	46.37	57.89	41.2	34.8	21.4	18.5	
TMP-6	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	0.00	-27.21	-39.47	-34.00	-42.0	-43.0	-44.0	-47.0	-48.5	-57.0	-40.0	
	-B*	B Zone*	3/4	85 - 88	3	88	72.2	1.63	0.26	-0.67	-0.19	33.04	22.24	31.73	23.8	14.2	24.4	26.0	
TMP-7	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	0.00	-20.40	-39.47	-31.00	-35.0	-38.0	-26.0	-45.0	-43.0	-42.5	-15.8	
	-A*	A Zone*	3/4	64 - 67	3	67	Dry	-18.00	-30.18	-38.11	-27.00	-34.0	-37.0	-40.0	-45.0	-42.5	-42.0	-15.8	
	-B*	B Zone*	3/4	85 - 88	3	88	Dry	15.31	10.42	34.93	4.92	-0.24	23.81	34.51	6.9	-2.0	-3.7	-10.9	
TMP-8	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-27.22	-30.61	-34.03	-39.00	-46.0	-49.0	-53.0	-56.0	-54.0	-58.0	-16.5	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-23.24	-22.83	-29.59	-39.00	-45.0	-47.0	-51.0	-56.0	-51.0	-56.0	-14.6	
	-B*	B Zone*	3/4	85 - 88	3	88	Dry	22.78	31.98	10.80	25.00	22.56	4.74	5.00	-2.7	6.3	6.5	-2.3	
TMP-9	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	0.00	0.00	-35.39	-36.00	-44.0	-46.0	-54.0	-55.0	-52.5	-59.5	-15.2	
	-LC	Lower Vadose Clay	1/2	59 - 60	1	60	NC	-23.53	-36.87	-40.33	-19.50	-30.0	-34.0	-41.0	-48.0	-46.0	-50.5	-14.7	
	-AB	A & B Zone Clay	3/4	73 - 76	3	76	Dry	23.73	33.73	17.15	3.95	12.31	2.17	1.11	1.6	0.6	-1.6	-5.8	
TMP-10	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-40.82	-53.41	-51.72	-48.00	-45.0	-56.0	-55.0	-47.0	-54.5	-66.0	-15.4	
	-A	A Zone	3/4	63 - 66	3	66	Steam	4.20	29.31	9.38	18.36	11.85	5.62	6.83	-4.6	-10.4	-21.5	-18.0	
	-B	B Zone	3/4	83 - 86	3	86	73.9	7.70	8.15	-54.01	-1.50	0.39	-0.81	-1.57	-0.9	-2.1	-28.0	-24.5	
TMP-11	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-40.82	-50.32	-49.00	-45.00	-51.0	-52.0	-51.0	-47.0	-52.5	-62.0	-29.5	
	-A	A Zone	3/4	69 - 72	3	72	Dry	-9.04	-12.30	-20.92	-17.51	-24.0	-30.0	-23.6	-15.0	-29.5	-42.5	-17.4	
	-B	B Zone	3/4	82 - 85	3	85	79.3	52.92	48.15	42.46	37.94	6.99	6.31	10.48	5.7	8.4	-1.7	-2.7	
TMP-12	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-20.41	-47.60	-54.44	-58.00	-64.0	-64.0	-68.0	-65.0	-66.5	>-80	-22.3	
	-LC	Lower Vadose Clay	1/2	59 - 60	1	60	Dry	4.18	0.97	0.24	-0.53	-35.0	-39.0	-8.0	-37.0	-49.5	-67.5	-52.0	
	-AB	A & B Zone Clay	3/4	75 - 78	3	78	Steam	83.87	75.91	63.13	31.60	25.41	28.54	35.80	20.2	-7.7	-21.8	-23.0	
TMP-13	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-47.63	-57.80	-62.61	-61.00	-70.0	-69.0	-71.0	-67.0	-71.5	>-80	-29.0	
	-LC	Lower Vadose Clay	1/2	58 - 59	1	59	Dry	-24.35	1.14	-13.01	1.36	-28.0	-32.0	-2.71	-30.0	-39.0	-52.5	-49.5	
	-AB	A & B Zone Clay	3/4	73 - 76	3	76	Steam	64.23	68.66	52.32	42.72	37.76	28.99	22.90	16.6	-4.1	-17.1	-21.3	
TMP-14	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-47.63	-61.79	-59.88	-60.00	-66.0	-66.0	-66.0	-62.0	-68.0	-76.5	-17.4	
	-A	A Zone	3/4	63.5 - 66.5	3	66.5	Dry	9.34	3.83	-1.78	-2.89	-14.45	-29.0	-24.95	-29.0	-42.5	-52.5	-24.0	
	-B	B Zone	3/4	82 - 85	3	82.5	Dry	64.71	67.08	59.72	54.14	52.12	42.45	47.53	26.9	4.9	2.2	-3.2	
TMP-15	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-27.22	-40.80	-55.80	-52.00	-58.0	-63.0	-61.0	-68.0	-72.5	-75.5	-22.2	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	10.63	-3.64	-16.56	-7.84	-20.15	-25.0	-12.8	-28.0	-37.5	-38.0	-34.0	
TMP-16	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-20.41	-34.00	-47.64	-42.00	-47.0	-50.0	-51.0	-47.0	-61.0	-66.0	-24.1	
	-A	A Zone	3/4	65 - 68	3	68	Dry	-0.54	-12.16	-29.94	-10.39	-14.59	-22.0	-18.11	-39.0	-44.0	-48.0	-40.2	
	-B	B Zone	3/4	87 - 90	3	90	buried	NA	NA	NA	---	---	---	---	8.4	-3.6	4.1	-3.1	
TMP-17	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-40.82	-42.16	-68.05	-62.00	-67.0	-69.0	-71.0	-64.0	-74.5	>-80	-27.5	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	16.55	11.93	-5.41	-5.71	-17.99	-28.0	-20.5	-31.0	-46.0	-52.5	-46.5	
	-B*	B Zone*	3/4	85 - 88	3	88	77.5	6.35	14.91	39.07	-0.14	30.36	40.66	53.99	30.5	3.4	3.7	-2.1	
TMP-18	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-47.63	-53.04	-61.25	-57.00	-66.0	-67.0	-68.0	-64.0	-69.5	>-80	-19.5	
	-A	A Zone	3/4	63 - 66	3	66	Dry	-39.23	-26.73	-43.55	4.48	-50.0	-54.0	-2.30	-54.0	-65.0	>-80	-26.2	
	-B	B Zone	3/4	83 - 86	3	86	78.5	32.17	9.92	-28.62	0.49	4.92	-0.47	-0.06	-0.5	-24.0	-15.4	-19.6	
TMP-19	-LS	Lower Vadose Sand	1/2	44 - 45	1	43	NC	-54.43	-53.04	-62.61	-61.00	-68.0	-68.0	-68.0	-63.0	-70.0	>-80	-19.8	
	-A	A Zone	3/4	64 - 67	3	67	Dry	9.96	14.74	4.63	-0.36	-9.48	-19.44	-0.97	-32.0	-46.5	-61.5	-42.2	
	-B	B Zone	3/4	86 - 89	3	89	73.8	11.02	2.55	20.14	0.34	6.32	0.94	-3.20	5.8	-9.3	-16.1	-12.7	

Table 2
Vapor Monitoring Points (VMPs) Pressure Measurement
Pemaco Superfund Site, Maywood, CA

Well I.D.		Associated Hydrogeologic Unit	Casing Diameter (Inches)	Screen Interval (Feet bgs)	Screen Length (Ft)	Total Depth of Well (Ft bgs)*	Depth to Water (Ft bgs)	Vac/Pressure Measurement 01/15/08 (in H2O)	Vac/Pressure Measurement 01/21/08 (in H2O)	Pressure Measurement 01/29/08 (in H2O)	Pressure Measurement 02/07/08 (in H2O)	Pressure Measurement (2/12/08) (in H2O)	Pressure Measurement (2/20/08) (in H2O)	Pressure Measurement (2/27/08) (in H2O)	Pressure Measurement (03/05/08) (in H2O)	Pressure Measurement (03/10/08) (in H2O)	Pressure Measurement (03/26/08) (in H2O)	Pressure Measurement (04/01/08) (in H2O)	Other Comments
TMP-20	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-47.63	-35.36	-61.25	-60.00	-66.0	-65.0	-54.0	-60.5	-69.5	-78.0	-19.8	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-57.11	-36.60	-42.19	-24.00	-48.0	-54.0	-55.0	-58.0	-67.0	-77.0	-20.1	
	-B*	B Zone*	3/4	85 - 88	3	88	70.3	5.50	3.87	59.86	-2.41	8.35	-0.60	2.42	-2.2	-2.1	-19.9	-24.5	
TMP-21	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	0.00	-20.40	-27.22	-25.00	-26.0	-30.0	-35.0	-42.0	-49.5	-50.0	-25.8	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-4.19	-5.86	-19.21	-10.25	-19.57	-24.0	-23.0	-31.0	-38.5	-35.5	-32.2	
	-B*	B Zone*	3/4	85 - 88	3	88	Steam	63.09	49.65	42.27	31.82	35.07	30.16	28.61	16.5	12.4	27.6	22.8	Steam
TMP-22	-LS*	Lower Vadose Sand*	1/2	48 - 49	1	45	NC	-20.41	-21.76	-32.66	-30.00	-35.0	-40.0	-40.0	-47.5	-55.0	-58.0	-25.5	
	-A	A Zone	3/4	60 - 63	3	63	Dry	16.38	9.84	-0.61	0.00	-8.99	-17.21	-5.69	-17.6	-27.0	-20.0	-26.0	
	-B	B Zone	3/4	85 - 88	3	88	Steam	73.12	65.93	60.08	43.68	53.04	43.62	54.67	30.4	25.4	47.4	33.7	Steam
TMP-23	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-54.84	-60.71	-62.61	-59.00	-64.0	-65.0	-60.0	-59.0	-68.5	-77.0	-20.1	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-27.37	-33.38	-19.25	-50.00	-60.0	-61.0	-56.0	-52.5	-62.0	-73.5	-20.5	
	-B*	B Zone*	3/4	85 - 88	3	88	Steam	Pressure	0.00	43.05	41.34	33.61	26.83	26.70	11.3	-9.0	-10.9	-16.4	
TMP-24	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-47.63	-54.40	-62.61	-60.00	-65.0	-65.0	-59.0	-60.5	-70.5	-80.0	-19.0	
	-A	A Zone	3/4	65 - 68	3	68	Dry	-33.01	-8.68	-26.85	0.37	-42.0	-40.0	-62.0	-56.5	-67.0	-72.5	-20.0	
	-B	B Zone	3/4	86 - 89	3	89	Steam	0.09	67.59	66.75	50.31	38.93	39.34	39.21	20.0	10.7	24.1	18.4	
TMP-25	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	0.00	0.00	-36.75	-6.34	-19.03	-22.03	-30.0	-24.0	-42.0	-42.0	-46.5	
	-A*	A Zone*	3/4	67 - 70	3	88	86.6	56.83	16.13	8.73	0.28	16.66	-4.61	12.09	-2.1	0.7	5.3	19.7	
TMP-26+	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-34.02	-28.56	-58.52	-53.00	-58.0	-63.0	-58.0	-53.5	-62.0	-68.5	-30.0	
	-LC	Lower Vadose Clay	1/2	57 - 58	1	58	Steam	34.89	27.29	-14.03	8.00	8.27	-60.0	0.82	4.0	-56.0	-59.0	-35.5	
	-AB	A & B Zone Clay	3/4	77 - 80	3	80	Dry	-31.95	-41.28	-49.28	-0.92	-18.06	26.61	-47.5	-43.8	-11.1	-6.2	-25.0	
TMP-27	-LS*	Lower Vadose Sand*	1/2	43 - 44	1	44	NC	-34.02	-30.75	-54.44	-51.00	-55.0	-57.0	-53.0	-51.0	-59.5	-66.0	-28.0	
	-A	A Zone	3/4	64 - 67	3	67	Dry	NC	-11.45	-33.50	-8.06	-36.0	-41.0	-16.16	-37.0	-44.0	-54.0	-26.5	
	-B	B Zone	3/4	84 - 87	3	87	81.3	NC	0.15	-0.31	0.03	0.03	-0.15	24.64	1.1	-0.4	-1.2	-6.5	
TMP-28	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-34.02	-34.00	-47.64	-44.00	-50.0	-53.0	-49.0	-48.0	-56.0	-62.0	-21.9	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-29.58	-43.87	-56.00	-6.33	-48.0	-49.0	-9.33	-42.0	-49.0	-54.5	-27.0	
	-B*	B Zone*	3/4	85 - 88	3	88	89.5	3.50	-0.10	3.60	0.02	0.84	0.15	1.90	-0.2	2.3	3.9	2.1	
TMP-29	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-20.41	0.00	-28.58	-6.46	-18.0	-17.51	-34.0	-13.3	-22.5	-33.5	-29.8	
	-A	A Zone	3/4	67 - 70	3	70	Dry	-29.96	-28.69	-25.86	-31.00	-28.0	-32.0	-20.90	-30.0	-36.5	-38.0	-32.2	
	-B	B Zone	3/4	89 - 92	3	92	Dry	1.16	0.72	4.01	33.42	6.87	1.79	8.50	-5.4	-11.1	4.2	-12.9	
TMP-30	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	0.00	-28.56	-46.27	-40.00	-46.0	-47.0	-42.0	-42.0	-49.5	-52.5	-35.5	
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-22.63	-23.55	-23.82	-10.45	-45.0	-48.0	-17.45	-41.0	-48.5	-52.0	-44.0	
	-B*	B Zone*	3/4	85 - 88	3	88	Dry	34.09	-5.86	19.82	-20.27	-14.31	-46.0	-6.11	-30.0	-8.6	20.0	9.3	

Notes:

1. Negative measurement indicates vacuum. Positive measurements are highlighted in Red and indicate pressure.
2. For Field Crews: 1/2" casing (no color) = shallow screen interval, White band = mid level, Red band = deep screen interval.
3. Beginning 02/07/08, probe measurements with vacuum > 20 inches water collected with Magnahelic range 0 - 80 inches water. Prior to that, measurements in LVZ and some A-Zone wells with vacuum > 20 inches water were collected using a standard gauge with a lower reading limit of 1 inch mercury (13.61 inches water column). The standard gauge reads vacuum only.
4. -22.63 Off the scale of the digital manometer (accurate to 20 inches water column). Value indicates highest reading of digital manometer before going off-scale.

* Not As-Built data.

NC - Not Collected

\+ = TMP-26 was previously mislabeled, transposing the deep and shallow readings. Readings from 3/10/08 forward are corrected for the proper corresponding depths.

Table 3a
ERH Air and Water Flow Test #1 (November 2007)
Pemaco Superfund Site, Maywood, CA

11/27/07 Time	Downstream				Upstream		Water Effluent From Condenser (Gal.)	Avg. Water Flow (GPM)	Note
	Diff. P (in H2O)	Temp (°F)	Vacuum (in Hg)	Air Flow (SCFM)	Temp (°F)	Vacuum (in Hg)			
11:15 AM	1.10	70	16.75	**351.82**	126	13.00	254,130	**8.0 GPM Total Wells**	All Shallow, Deep, & Electrode Wells Open
11:16 AM	Started Turning Shallow Wells Off						--		
11:22 AM	All Shallow Wells are Closed						254,186	**5.7 GPM Deep VRs & Electrodes**	
11:23 AM							254,186		
11:25 AM							254,202		
11:26 AM							254,202		
11:34 AM							254,255		
11:38 AM	Vapor sample collection using Summa canister at SP-115						--		
11:41 AM	0.75	74	18.25	**272.75**	130	15.00	254,295		Shallow VRs Closed, Deep VRs and Electrodes Open
11:48 AM	Started Shutting Deep Wells						254,332	--	
11:52 AM							254,332	--	
11:56 AM	All Deep Well Closed						254,332	**3.0 GPM Electrodes Only**	
12:01 PM							254,375		
12:05 PM	0.18	78	21.50	**112.98**	134	19.50	254,375		All Shallow & Deep VRs Closed
12:08 PM	0.16	76	21.50	**106.71**	133	19.50	254,375		All Shallow & Deep VRs Closed
12:10 PM	Vapor sample collection using Summa canister at SP-115						254,375		All Shallow & Deep VRs Closed
12:11 PM	0.16	76	21.50	**106.71**	133	19.50	254,375		All Shallow & Deep VRs Closed
12:22 PM	0.12	74	21.00	**95.29**	132	19.50	254,410		Condenser Pump On
12:23 PM	Started Opening All Wells						--	--	
12:27 PM	1.70	76	14.50	**470.56**	128	12.00	254,433	--	All Shallow, Deep, & Electrode Wells Open

Air Flow Calculation:

1) Air Flow from Shallow VRs = Total Flow - (Flow from Deep VRs & Electrodes) / # of Shallow VRs = (351.82 - 272.75) / 9 = 8.79 SCFM per well

2) Air Flow from Deep VRs = (Flow from Deep VRs & Electrodes) - Average Electrodes Flow / # of Deep VRs = (272.75 - 105.42) / 19 = 8.81 SCFM per well

3) Air Flow from Electrode Wells = Average Electrodes Flow / # of Electrode Wells = 105.42 / 58 = 1.82 SCFM per well

Water Flow Calculation:

1) Avg. Water Flow from Shallow VRs = Total Avg. Flow - (Avg. Flow from Deep VRs & Electrodes) / # of Shallow VRs = (8.0 - 5.7) / 9 = 0.26 GPM per well

2) Avg. Water Flow from Deep VRs = (Avg. Flow from Deep VRs & Electrodes) - (Avg. Flow from Electrodes) / # of Deep VRs = (5.7 - 3.0) / 19 = 0.14 GPM per well

3) Avg. Water Flow from Electrodes = (Avg. Flow from Electrodes) / # of Electrode Wells = 3.0 / 58 = 0.052 GPM per well

Table 3b
ERH Air Flow Test #2 (July 2008)
Pemaco Superfund Site, Maywood, CA

07/02/08 Time	Average Flow From Electrode Wells				Note
	Avg. Diff. P (in H2O)	Avg Temp (°F)	Avg. Vacuum (in Hg)	Avg. Air Flow (SCFM)	
3:33 PM	0.20	113.50	17.75	136.89	1. Only electrode (SVE) wells online, all VR's, CVRs, MW's...etc closed so that all flow on VE-3 is from electrode wells. 2. Measurements for flow were taken at ERH area piping and at VE-3 header, then averaged.

Air Flow Calculation:

1) Air Flow from Electrode Wells = Average Electrodes Flow / # of Electrode Wells = 136.89 / 58 = **2.36 SCFM per Electrode Well**

2) PREVIOUS Air Flow from Electrode Wells was 1.82 SCFM per Electrode Well on 11-27-07.

3) DIFFERENCE (or gain in air flow) is .54 SCFM per well for a total of 31 SCFM.

Table 4
Comparison of Manual Versus Automatic Temperature Measurements for TMP-05, TMP-09, and TMP-22
Pemaco Superfund Site, Maywood, CA

Station	Depth	Units	1/3/08 HMTR	1/3/08 LOG	Difference	10/18/07 HMTR	10/18/07 LOG	Difference	11/15/07 HMTR	11/15/07 LOG	Difference	2/21/08 HMTR	2/21/08 LOG	Difference	4/1/08 HMTR	4/1/08 LOG	Difference	5/6/08 HMTR	5/6/08 LOG	Difference
TMP-05	25	Deg C	48.3	49.8	-1.5	24.5	24.6	-0.1	33.2	32.3	0.9	61.8	57.9	3.9	40.8	60.7	-19.9	61	59.3	1.7
TMP-05	35	Deg C	53.7	52.8	0.9	24.7	25.6	-0.9	35.5	36.4	-0.9	70	68	2	38.7	65.2	-26.5	62.2	60.7	1.5
TMP-05	40	Deg C	53.3	52.5	0.8	26	25.1	0.9	35.2	36.3	-1.1	71.8	70.4	1.4	36	65	-29	60.4	59	1.4
TMP-05	45	Deg C	53.4	52.4	1	25.2	25.4	-0.2	34.4	33.2	1.2	69.8	68.7	1.1	33.2	61.1	-27.9	55	53.6	1.4
TMP-05	50	Deg C	57.2	55.6	1.6	24.8	24.7	0.1	32.8	31	1.8	72.7	71.3	1.4	33.2	65.4	-32.2	56.8	55.2	1.6
TMP-05	55	Deg C	68.6	68.2	0.4	26	24.8	1.2	34.8	33.9	0.9	85.1	83.4	1.7	53.6	77.2	-23.6	62.7	62.6	0.1
TMP-05	60	Deg C	84.3	82.9	1.4	28	26.5	1.5	37.4	36.2	1.2	95.2	94.6	0.6	67.8	91	-23.2	74	73.1	0.9
TMP-05	65	Deg C	94.6	92.6	2	28.9	27.9	1	41.6	40.3	1.3	96.5	95.9	0.6	71.3	94.2	-22.9	82	81.4	0.6
TMP-05	70	Deg C	93.7	94.6	-0.9	27.6	29	-1.4	44	43.3	0.7	97.4	95.2	2.2	73.9	93.5	-19.6	87.5	85.5	2
TMP-05	75	Deg C	86.1	80.2	5.9	28.9	28.7	0.2	44.4	44.5	-0.1	98.3	97.3	1	65.4	95.6	-30.2	91.4	89.9	1.5
TMP-05	80	Deg C	18	78	-60	27.2	28.5	-1.3	45.1	44.6	0.5	100.4	99.7	0.7	53	97.9	-44.9	89.4	88.4	1
TMP-05	85	Deg C	86.4	83.5	2.9	27.6	27.3	0.3	44.8	43.8	1	100.7	100.2	0.5	37.5	98.6	-61.1	75.1	74.7	0.4
TMP-05	90	Deg C	78	69.1	8.9	28.1	26.9	1.2	43.5	42.9	0.6	96.2	95.5	0.7	42.4	92.1	-49.7	74.3	73.9	0.4
TMP-05	95	Deg C	68.9	63.7	5.2	25.1	27.4	-2.3	42.4	41.5	0.9	83.7	82.1	1.6	46.4	90.6	-44.2	81.3	80.1	1.2
TMP-05	100	Deg C	55.5	52.3	3.2				36.1	34.7	1.4	67	65.2	1.8	44	76.9	-32.9	78	77.8	0.2

Station	Depth	Units	3/20/08 HMTR	3/20/08 LOG	Difference	3/6/08 HMTR	3/6/08 LOG	Difference	4/3/08 HMTR	4/3/08 LOG	Difference
TMP-09	25	Deg C	85.3	84.7	0.6	87.4	86.7	0.7	82.9	82.9	0
TMP-09	35	Deg C	90.4	89.7	0.7	92.1	91.5	0.6	88	87.9	0.1
TMP-09	40	Deg C	88.4	87.5	0.9	92.3	91.5	0.8	88.2	87.7	0.5
TMP-09	45	Deg C	93.5	93	0.5	94	93.3	0.7	87.6	87.6	0
TMP-09	50	Deg C	94.9	94.6	0.3	94.9	94.1	0.8	91.7	92	-0.3
TMP-09	55	Deg C	94.9	94.8	0.1	94.7	94.6	0.1	93.8	94.6	-0.8
TMP-09	60	Deg C	94.8	94.3	0.5	94.7	94	0.7	94.5	94.1	0.4
TMP-09	65	Deg C	98	97.4	0.6	97.7	97.2	0.5	98.9	97.9	1
TMP-09	70	Deg C	98.2	97.5	0.7	98.6	97.5	1.1	98.2	97.9	0.3
TMP-09	75	Deg C	98.8	98.1	0.7	99.1	98.3	0.8	98.4	98.5	-0.1
TMP-09	80	Deg C	101	100.9	0.1	100.9	100.9	0	101.3	101.5	-0.2
TMP-09	85	Deg C	101	100.8	0.2	99.6	101.5	-1.9	102.5	102.8	-0.3
TMP-09	90	Deg C	99.3	98.3	1	98	98.5	-0.5	101.5	100.6	0.9
TMP-09	95	Deg C	97.3	95.8	1.5	84	96.3	-12.3	97.7	96.1	1.6
TMP-09	100	Deg C	83.8	82.6	1.2	27.3	82.6	-55.3	83.7	82.8	0.9

Table 4 - Continued
Comparison of Manual Versus Automatic Temperature Measurements for TMP-05, TMP-09, and TMP-22
Pemaco Superfund Site, Maywood, CA

Station	Depth	Units	11/1/07	11/1/07	Difference	11/15/07	11/15/07	Difference	12/14/07	12/14/07	Difference	12/4/07	12/4/07	Difference	2/1/08	2/1/08	Difference
			HMTR	LOG		HMTR	LOG		HMTR	LOG		HMTR	LOG		HMTR	LOG	
TMP-22	25	Deg C	54	33.1	20.9	63.3	61	2.3	89.2	85.4	3.8	81.6	79.1	2.5	91.2	88.8	2.4
TMP-22	35	Deg C	67.4	50.6	16.8	78.1	76.2	1.9	100.2	97.3	2.9	91	90.6	0.4	98.2	97	1.2
TMP-22	40	Deg C	75.6	66.5	9.1	84.6	83	1.6	98.8	96.8	2	94.2	93.8	0.4	97.1	96.1	1
TMP-22	45	Deg C	82.4	96.7	-14.3	88.3	87.1	1.2								96.3	
TMP-22	50	Deg C	75.6	68	7.6	81.2	80.2	1	99.3	97	2.3	90.8	89.6	1.2	97.2	96.1	1.1
TMP-22	55	Deg C	66.4	61.5	4.9	80.7	80	0.7	100	98.6	1.4	93.2	92.6	0.6	98.1	97.3	0.8
TMP-22	60	Deg C	69	60.2	8.8	84.6	83.6	1	103.2	101.9	1.3	96.9	96.2	0.7	100.1	99.5	0.6
TMP-22	65	Deg C	74.3	63.7	10.6	91.3	90.5	0.8	102.4	101.7	0.7	99.3	98.1	1.2	99.4	98.8	0.6
TMP-22	70	Deg C	81.3	72	9.3	96.6	94.5	2.1	104.6	101.9	2.7	98.8	98.3	0.5	101.6	98.6	3
TMP-22	75	Deg C	85.1	91	-5.9	105	102.9	2.1	109.7	107.8	1.9	106.5	104.7	1.8	106.2	104.6	1.6
TMP-22	80	Deg C	86.1	80	6.1	96.8	95.1	1.7	106	103.8	2.2	101.5	100	1.5	104.6	103.2	1.4
TMP-22	85	Deg C	82.8	81	1.8	101.8	100.8	1	105.6	105.3	0.3	102.9	101.8	1.1	104.3	104.2	0.1
TMP-22	90	Deg C	99.5	102	-2.5	107.8	106.1	1.7	109.6	108	1.6	105.2	104.1	1.1	106.7	105.9	0.8
TMP-22	95	Deg C	100.1	119	-18.9	97.3	95.6	1.7	103.5	101.7	1.8	100.8	99.1	1.7	100.9	99	1.9
TMP-22	100	Deg C	95.3	133	-37.7	98.6	96.4	2.2							106.6	104.1	2.5

Notes:
Difference exceeds 3 Degrees Centigrade
LOG - Temperature recorded by automated logger
HMTR - Temperature recorded by handheld meter

Table 5a
ERH Benchmark #1 Evaluation - Temperature Data for 25-Sept-07
Pemaco Superfund Site, Maywood, CA

25-Sep-07			Number Meeting Benchmark			Percent Meeting Benchmark[a]						Suspect Probes[b]	
ERH Thermocouple > 87 °C			0			0%						0	
Depth	35	40	45	50	55	60	65	70	75	80	85	90	95
TMP-04	24.1	23.9	23.7	23	23	23.2	23	23.3	23.1	22.8	22.7	22.2	22
TMP-05	21.9	21.5	21.7	21	21.8	21.7	21.6	22.4	22.3	22	21.5	21.2	21
TMP-06	23.2	22.9	22.8	22.2	22.5	22.6	22.9	23.3	24	23.9	23.3	22.9	22.4
TMP-07	24.7	24.4	23.8	23.4	22.6	22.3	21.7	21.6	23.1	22.8	22.4	22.1	21.2
TMP-08	24.3	23.9	23.5	22.8	22.6	22.3	22.1	23.8	23.6	23.3	23	22	21.4
TMP-09	23.1	23	22.9	22.7	22.2	22	21.6	21.5	22.1	21.9	21.7	21.7	20.8
TMP-10	24	23.9	23.3	22.7	23.1	22.2	22.2	23.8	22.8	23	22.8	22.1	21.7
TMP-12	23.7	23.6	23.5	23.1	23	22.9	23	22.6	22.5	22.2	22.2	21.9	21.9
TMP-13	23.4	23.3	23	22.6	21.9	22.1	21.4	21.1	23.1	22.4	23.1	22.8	21.9
TMP-15	23.7	23.3	22.8	22.4	21.8	21.6	21.1	20.7	22.1	21.8	21.5	21.2	20.6
TMP-16	23.4	22.8	22.2	21.6	21.4	20.9	21	24	23.9	23.3	23	22.3	22
TMP-17	24.7	24.6	24.2	23.5	22.5	21.5	21.5	21.3	22.6	22.2	21.9	21.5	20.8
TMP-18	24.1	23.9	23.3	22.3	21.9	21.6	21.6	23.8	23.5	23.2	23.4	22.2	21.5
TMP-19	24	24.2	23.8	23.9	23.2	23.3	23	22.9	23.8	23.8	24.5	23.4	22.1
TMP-21	24	24.1	23.7	23.1	22.6	22.4	22.1	22	22.4	22.2	22	21.8	21.3
TMP-22	24.4	24.3	23.9	23.2	22.7	22.5	22.6	22.7	22.7	22.5	22.3	22.1	22.4
TMP-23	24.2	24.1	23.3	22.8	22.4	22.2	21.5	21.1	23.4	23.1	22.8	22.4	22
TMP-24	25.1	24.8	23.6	23.2	23.4	23.7	23.7	24.1	23.5	23.1	22.5	21.6	21.3
TMP-25	23.8	23.8	23.3	23	22.1	22	21.6	21.5	22.8	22.5	22.6	22.6	21.4
TMP-26	24.3	24.6	24.1	23.4	23	23	22.4	22.3	24.3	23.9	23.9	23.8	22.8
TMP-29	23.6	23.7	23.3	22.3	21.8	21.6	21.7	23.1	23.1	22.5	22.1	21.2	21.3

Table 5b
ERH Benchmark #1 Evaluation - Temperature Data for 25-Oct-07
Pemaco Superfund Site, Maywood, CA

25-Oct-07			Number Meeting Benchmark			Percent Meeting Benchmark[a]						Suspect Probes[b]	
ERH Thermocouple > 87 °C			8			3%						42	
Depth	35	40	45	50	55	60	65	70	75	80	85	90	95
TMP-04	49.2	51.6	52.6	51.2	55.1	68.4	70.8	80.9	70.6	69.8	62.1	72.1	70.9
TMP-05	26.7	25.3	28.8 #	28.3 #	28.9 #	29.6 #	31	29.6	31.8	31.7	30.9	31.6	33.2
TMP-06	54.8	47.4 *	49.1	45.1 #	50.9	77.6 #	96	95.1	91.8	97.8	86 #	103	95.9
TMP-07	43.7 *	35.6	32.6	32	31.5	35.1	34.3	34	34.5	30.1	31.9	30.5	30.4
TMP-08	45.2	42.6	41.4	38.8	41.9	45.4	45.1	46.3	44.8	44.5	42.2	42.5	42.3
TMP-09	50	45.9	43.6	43.1	43.1	48.6	42.8	47.4 #	44.8 #	46.4	47.7	49.6	40.5
TMP-10	49.3	47.6	50.1	49.7	55.4	57.1	58.3	61.5	44.2	54	55.8	62.4	59
TMP-12	38.7	37.8	37	36.5	39.3	44 #	46.5	48.9	48.3	55.8	52	58.1	58.8
TMP-13	39.4	36.9	34.5	34.6	35.6	40.5 #	40.3	41.5	41.1	37.3	42.3	43.6	42.5
TMP-15	44.8	44.9	38.7	34.6	33	35.6	34.9	34.1	33.2	30.2	29.2	29	29.8
TMP-16	49.3	50.3	46.6	42.3	44.9	48.4	47.2	51.3	49.8	48	45.5	46.8	45.8
TMP-17	36.3	38.2	32.8	31.4	30.5	32.9	30.6 *	33.2	33.8	32.2	32.4	29.7	30.7
TMP-18	45.2	44.6	42.5	36.4	37	38.7	37.8	41.9	40.5	42.1	47.7	48.2	41.6
TMP-19	44.3	39.6	38.6	43	42.4	45.4	47.1	52.2	59.4	73.8	106.8	78.1	58.7 #
TMP-21	51.6 #	57.2 #	62 #	49.5 #	46.3 #	48.8 #	50.8 #	58.8 #	52.2 #	52 #	64.4 #	51.8 #	49.4 #
TMP-22	59.4 *	66.4 #	72.3 #	64 #	56.4 #	58.8 #	61.8 #	68.4 #	71.4 #	75 #	75.3 #	85.3 #	96.6 #
TMP-23	67.6	69.1	48.2	46.6	49.6	58.8	54.8	54.4	51	50	46	46.5	44.8
TMP-24	68.8	72.8	42.2	41.4	51.9	69.1	71.2	80.7	66.8	69.7	83.8	69.5	58.5
TMP-25	50.7	54.9	51.2 #	48.4	43.5	47.9	52.3	56.9	53.2	53.7	55.3	64.6	57.5
TMP-26	47.1	55.2	30.6	82	23.9	38.9	65.3	62.4	48.5	42.5	47.1	55	53.7
TMP-29	51.9	71.2	70.9	53.2	42.9	48	51.3	50.9	59.3	50.6	45.8	40.3	40.7

Table 5c
ERH Benchmark #1 Evaluation - Temperature Data for 25-Nov-07
Pemaco Superfund Site, Maywood, CA

25-Nov-07			Number Meeting Benchmark			Percent Meeting Benchmark[a]						Suspect Probes[b]	
ERH Thermocouple > 87 °C			65			24%						1	
Depth	35	40	45	50	55	60	65	70	75	80	85	90	95
TMP-04	64.1	67.4	64.7	59.6	64.3	79.5	97.1	100	98.7	102.2	94.1	100.2	97.1
TMP-05	40	39.1	37	34.2	36.4	41	46.1	48.4	49.5	50	50.1	48.3	46.6
TMP-06	56.6	55.5	55.1	54.7	71.1	96.2	95.8	96.8	99.4	103.3	102.5	102.8	100.5
TMP-07	54.9	52.8	48.9	47	49.4	54.9	75.9	84.7	53.8	50.5	42.8	42.1	44.7
TMP-08	67.2	67.5	68.9	65.3	65.6	70.6	73.1	79.7	72	70.5	69	68.3	67.4
TMP-09	82.2	79	67.3	67.8	70.5	75.8	78.8	82.9	76.6	74.2	80.1	80.5	70.6
TMP-10	67.3	69.8	73.3	77	86.2	96.7	97.2	102.1	88.8 *	96	95.6	103	98.7
TMP-12	53.8	54.6	54.5	54.4	58.3	64.5	68.8	70.4	73.8	82	76.3	85.4	79
TMP-13	58.4	58.3	56.3	55.5	54.9	60.4	63.4	64.9	65.1	64.2	68.2	70.8	66.1
TMP-15	67.4	69.1	63.8	56	54.9	56.7	57.6	58.7	52.6	46.2	44.7	42.3	42.5
TMP-16	78	88.3	94.9	92.3	89.9	85.3	96.5	96.4	89.3	69.1	65.3	80.6	68.5
TMP-17	51.7	57.1	62.5	57.3	50.7	49.6	46.6	48	49.1	51.2	54.6	53.6	46.9
TMP-18	62.5	63.9	61.2	57.1	52.5	56.6	56.3	60.9	62.6	63.3	68.5	64.4	60.9
TMP-19	56.2	53	52.5	55.5	61.7	67	70	76.8	83.7	91.9	101.6	118.6	81
TMP-21	69.2	79	81.1	65.6	65	70.8	82.2	97	91.9	93.1	103.5	83.6	80.8
TMP-22	83.2	90.3	92.5	86	88.7	93.2	97.2	98	106	99.5	102.9	105.7	98.7
TMP-23	91.5	94.6	69.4	68.8	77.1	90.9	80.7	96	73.1	77.1	71	69.4	63.5
TMP-24	82.9	86.6	59.4	62.3	75	88	93.7	97.2	98.5	100.1	102.4	94.1	81.8
TMP-25	68.4	76.7	74.3	65	61.2	66.2	72.5	85.8	87.3	88.8	88.3	88.8	78.1
TMP-26	59.4	64.3	56.7	50	51.9	60.5	69.8	77.7	77.1	75.3	74.7	74.2	83
TMP-29	74.3	87.8	89.2	77.2	67.1	71.7	72.5	79.7	83.2	76.1	66.9	57.4	54.7

Table 5d
ERH Benchmark #1 Evaluation - Temperature Data for 11-Dec-07
Pemaco Superfund Site, Maywood, CA

11-Dec-07 (77 Days After Start)			Number Meeting Benchmark			Percent Meeting Benchmark[a]						Suspect Probes[b]	
ERH Thermocouple > 87 °C			134			49%						171	
Depth	35	40	45	50	55	60	65	70	75	80	85	90	95
TMP-04	71.3	73.5	68.4	63.6	68.8	89.9	102	104.7	109.3	107	107.6	111.4	108.7
TMP-05	46.3 *	45 *	42.5 #	41.4 #	46.4 #	56.9 #	67.3 *	66.7	60.4 *	61.1	39.2	60.2 *	56
TMP-06	67.9 #	67.8 #	72.2 #	84.9 #	95.2 #	98 #	97.3 #	98 #	103.3 #	105.3 #	104.2 #	104.6 #	104.4 #
TMP-07	64.7 #	63.8 #	91.7 *	95.1 *	71.3 *	82.4 #	96 #	97.4 *	70.4 *	63.6 *	62.6 *	51 *	49.7 *
TMP-08	81.3	87.7	95.8	95.8	95.2 #	90.7 *	90.7	95.1	87.4	87.9 *	91.3 *	83.4	71.8
TMP-09	94.2	94.9	95.5	95	95.2 *	89.9	91.8	96.7 #	90.4 #	88.9	82.4	76.8	77
TMP-10	84.3 #	80.2 #	78.2 #	86.7 #	97 #	99.8 #	99.9 #	99.3 #	102.4 #	104 #	105.2 #	105.9 #	100.7 #
TMP-12	61.7	63 *	62.6	64.1	69.7	76.2 #	81	84.7 *	88.3	101.5	96	99.4	87.7
TMP-13	67.2 *	67.7	66.5 *	66.5 *	67.7 *	73 #	76.1	77.4	78.2 *	78.8 *	82.1 *	83.4	71.7 *
TMP-15	79.6 *	84.2	92.5	76	67.9	68.3	80	104.6 *	56.9	48.9	50.7 *	49.8	51.6
TMP-16	83.7	92.6	96.6	94.4	100.3	93.9	102.4	101.2 *	103.4	95.2	95.2	89.1	82.4
TMP-17	62.8 *	81.7 *	96.6 *	98.3 *	83.4 *	65.5 *	56.4 *	50.9 *	54.3 *	65.4 *	74.4 *	67.9 *	56 *
TMP-18	73.1	74.8	76.3	76.8	61	64.8	61.9	69.9	72.5	80.9	105.6	82.1 *	68.3
TMP-19	62.3	57.7 *	57.4	62.3	70.3 *	76.3	81.2	87.3	94.5	101.8 *	107.6 #	110.9	94.9 #
TMP-21	84.1 #	89.1 #	91.5 #	79.3 #	78.4 #	92.2 #	96.1 #	98.9 #	98.9 #	97.8 #	103 #	88.1 #	87.1 #
TMP-22	93 #	95 #	96.3 #	95.5 #	96.5 #	98.1 #	95.7 #	100.1 #	107 #	101.6 #	103.6 #	107.3 #	100.6 #
TMP-23	86.3 #	89.3 #	72.1 #	77.8 #	88.4 #	94 #	97 #	98.6 #	91.1 #	92.5 #	100.6 #	84.5 #	73.2 #
TMP-24	87.8 #	90.6 #	66.5 #	77.9 #	89.8 #	96.6 #	96.6 #	98.3 #	102.6 #	103 #	104.2 #	100.3 #	84 #
TMP-25	78 #	84.7 #	86.1 #	76.1 #	75.7 #	80.7 #	88.5 #	97.8 #	99.7 #	110.1 #	103.1 #	100.8 #	91.1 #
TMP-26	64.7 #	71.3 #	62.3 #	57.4 #	60.7 #	73 #	88.4 #	95.7 #	86.9 #	88.1 #	101.5 #	96.7 #	93.8 #
TMP-29	79.2	91.8	91.7	81.7	76.1	81.3	80.8	84.5 *	87.1	79 *	65.1	42.6	49.1 *

Table 5e
ERH Benchmark #1 Evaluation - Temperature Data for 25-Dec-07
Pemaco Superfund Site, Maywood, CA

25-Dec-07			Number Meeting Benchmark			Percent Meeting Benchmark[a]						Suspect Probes[b]	
ERH Thermocouple > 87 °C			177			65%						151	
Depth	35	40	45	50	55	60	65	70	75	80	85	90	95
TMP-04	74.6*	79.3*	71.1*	65.8*	74.2*	91.6*	99.7*	102.5*	110.4*	93.3*	110.4*	102*	112.4*
TMP-05	50.4*	48.3*	47*	48.9*	60.6*	79.2*	92.6*	92.7*	68.2*	68.4*	70.4*	67.1*	62.6*
TMP-06	85.3	94.7	95.1	95.5	96.4	98.4	98.4	99.1	103.9	105.6	105	106	106.3
TMP-07	70*	79.4*	95.9*	96*	80.5*	84.6*	96.1*	96.9*	78.7*	74.2*	82*	60.6*	55.2*
TMP-08	86.5*	92.2*	95.8*	95.7*	94.6*	93.6*	95.7*	99*	93.3*	95.7*	98.7*	88.4*	75.5*
TMP-09	96.2	95.6	95.2	95.8	95.9	94.3	95.9	99.6	97.5	97	90.9	84.2	79.1
TMP-10	82.9	78.7	73.9	81.1	96.5	99.9	99.4	98.2	100.2*	101.6*	103.2	104.2*	96.2
TMP-12	67.6	73.1	79.7	83.4	86.8	90.3	95.6	99	99.7	103.1	103.4	103.3	94.7
TMP-13	74.9	75.1	74.3	77.4	81.7	86	92.1	97.5	93.2	97.1	99.1	92.5	81.9
TMP-15	84.6*	91.1*	95.9*	94.4*	98*	93.8*	87.9*	94.7*	96.3*	73.1*	71.9*	66.2*	46.9*
TMP-16	89.7*	94*	98.9*	91.8*	102.7*	95.5*	93.8*	99.4*	102.1*	91.5*	100.2*	101.1*	92.3*
TMP-17	75	92.9	97.6	100.8	98.7	69.3	61.2	70.2	71.4	79.2	107.3	86	56.9*
TMP-18	82.9	94.8	92.5	91.9	76.8	56.3*	52.1	81.4	78.4	90.3	111.5	104.3	85.8
TMP-19	63.6	58.9	58*	63.5	70.7	77.6*	84.6	90.4*	95.5	96.2	104.3	102.9	91.7
TMP-21	78.8*	88.9*	96*	96.5*	96.4*	96.6*	96.6*	99.6*	99.7*	98.8*	104.5*	99.9*	103.4*
TMP-22	98.4*	96.8*	96.3*	96.9*	98.6*	101.2*	101*	101.1*	106.5*	103.5*	105.2*	107.1*	100.7*
TMP-23	89.5	93.4	74.8	84.3	93.5	95.5	97.3	100.3	100.7	103	101.4	95.8	82.2
TMP-24	76.4	73	53	61.8	72.1	83.5	91.9	96	97.7	99.4	100.4	97	90.1
TMP-25	82.2*	89.5*	94.4*	95.9*	96.2*	96*	95.8*	98.2*	98.9*	100.8*	102.6*	98.4*	88.2*
TMP-26	73.7*	83.4*	93.7*	94.2*	93.7*	94.3*	98.6*	99.3*	101*	101.7*	103.5*	102.5*	93.9*
TMP-29	73.3*	84.7*	85.8*	79.6*	78.1*	86.9*	91.6*	95.7*	93.5*	83.8*	66.6*	42.1*	49.3*

Table 5f
ERH Benchmark #1 Evaluation - Temperature Data for 12-Jan-08
Pemaco Superfund Site, Maywood, CA

12-Jan-08 (Day Meet First Goal)			Number Meeting Benchmark			Percent Meeting Benchmark[a]			Meeting Benchmark +/- 2 °C			Suspect Probes[b]	
ERH Thermocouple > 87 °C			218			80%			91%			40	
ERH Thermocouple 85 - 87 °C													
Depth	35	40	45	50	55	60	65	70	75	80	85	90	95
TMP-04	81.7*	83.5*	77.4*	74.8*	81.1*	95*	100.6*	100.7*	100.9*	102.5*	99.2*	105.4*	105*
TMP-05	57	57.4	58	63.4	78.8	94.5	95.4	102	93.9	92.6	102.8	71.3	59.8
TMP-06	94.4	95.1	95.9	96.4	96.7	98.1	98	98.5	103.6	104.6	104.7	105.7	105.8
TMP-07	92.8	95.9	95.8	96.3	95.6	95.6	98.1	96.1	93.7	100	102.6	73.6	63
TMP-08	92.9	93.5	94.8	94.8	94.6	94.9	95.6	94.8	98.8	99.6	99.8	95.4	85
TMP-09	95.7	95.3	95	95.7	95.4	96.3	97.8	99.1	100.2	102.7	103.8	95.7	88
TMP-10	85.2	79.3	78.1	88.8	99.3	100	99.3	98.9	100.7	103.2	104.9	102.4	93.4
TMP-12	81.9	89.1	93.4	93.9	95.5	97.8	100.1	99.8	101.1	105.3	105.1	106.4	103.5
TMP-13	85.8	89	92.6	94.8	95.4	95.6	99.6	102.6	103.6	104.7	103.1	99.8	94.2
TMP-15	91*	96*	96.1*	96.1*	96.8*	97.5*	97.5*	100*	96.7*	88*	101.1*	85.7*	71.6*
TMP-16	93.8*	96.8*	96.9*	98.3*	99.7*	99.9*	99.6*	101*	103.3*	104.2*	105.7*	106.6*	100.3*
TMP-17	75.7	93	94	94.1	95.5	79	85.7	85.6	87.5	96.9	105.2	95.7	71.2
TMP-18	89	95	96.9	98.6	94.5	86.9	86.4	98.1	110.1	101.9	99.7	107.1	93.2
TMP-19	70	76.3	71.1	73.7	80.3	82.4	92.2	92.9	86.6	97.7	111.3	117.4	87.3
TMP-21	87.2	92.9	95.7	96.4	96.5	96.5	96.3	98.4	98.4	100.4	103.7	99	105.8
TMP-22	98.1	96.3	96.3*	96.4	97.9	100.3	99.8	99.9	105.2	102.7	103.9	106.4	99.5
TMP-23	90.4	93.8	90.1	94.4	94.8	95.5	97.4	100.7	102	104.5	104.4	103	93.5
TMP-24	65.3	61.9	50.3	56.1	66.3	77.8	86.6	90.6	94.5	96.2	99.2	93.1	85.4
TMP-25	90.9	94	94.9	95.5	96	95.7	95.5	97.2	98	101.2	101.1	88.1	88.9
TMP-26	84.7	93.7	94.2	94.5	96	95.3	98	97.7	100.2	101.2	102.4	102.7	103.1
TMP-29	69.2	76.2	78.9	78.5	78.6	81.5	91.3	94.7	94	84.4	63.3	40.6	51.4

Notes:

a - Goal of the Benchmark #1 was for 85% thermocouples to exceed 87 °C. This goal was achieved on January 12, 2008 when 91% of thermocouples reached revised Benchmark # 1 (temperature above 87 °C +/- 2 °C)

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

Table 6a
ERH Benchmark #2 Evaluation - Temperature Data for 12-Jan-08
Pemaco Superfund Site, Maywood, CA

1/12/2008 (Day Meet First Goal)	Benchmark	Number Meeting Benchmark	Percent Meeting Benchmark[a]	Zone	Suspect Probes[b]
Vadose Zone Probes > 87 °C	>87 C	89	70.6%		
A-B Clay Probes > 100 °C	>100 C	11	52.4%	Vadose	19
B Zone Probes 100 - 109 °C	>100 C	13	61.9%	A-B Clay	3
B Zone Probe >110 °C	>110 C	1	4.8%	B	3

Benchmark Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	A-B;Clay	Milestone	B Zone	Milestone
Depth (ft bgs)	35	40	45	50	55	60	60-80	Thermocouple[c]	80-95	Thermocouple[d]
TMP-04	81.7 *	83.5 *	77.4 *	74.8 *	81.1 *	95 *	100.9 *	TMP-04-75	105.4 *	TMP-04-90
TMP-05	57	57.4	58	63.4	78.8	94.5	93.9	TMP-05-75	102.8	TMP-05-85
TMP-06	94.4	95.1	95.9	96.4	96.7	98.1	103.6	TMP-06-75	104.7	TMP-06-85
TMP-07	92.8	95.9	95.8	96.3	95.6	95.6	93.7	TMP-07-75	73.6	TMP-07-90
TMP-08	92.9	93.5	94.8	94.8	94.6	94.9	98.8	TMP-08-75	99.8	TMP-08-85
TMP-09	95.7	95.3	95	95.7	96.4	96.3	100.2	TMP-09-75	103.8	TMP-09-85
TMP-10	85.2	79.3	78.1	88.8	99.3	100	100.7	TMP-10-75	104.9	TMP-10-85
TMP-12	81.9	89.1	93.4	93.9	95.5	97.8	105.3	TMP-12-80	105.1	TMP-12-85
TMP-13	85.8	89	92.6	94.8	95.4	95.6	103.6	TMP-13-75	99.8	TMP-13-90
TMP-15	91 *	96 *	96.1 *	96.1 *	96.8 *	97.5 *	96.7 *	TMP-15-75	85.7 *	TMP-15-90
TMP-16	93.8 *	96.8 *	96.9 *	98.3 *	99.7 *	99.9 *	103.3 *	TMP-16-75	106.6 *	TMP-16-90
TMP-17	75.7	93	94	94.1	95.5	79	87.5	TMP-17-75	105.2	TMP-17-85
TMP-18	89	96	96.9	98.6	94.5	86.9	110.1	TMP-18-75	99.7	TMP-18-85
TMP-19	70	76.3	71.1	73.7	80.3	82.4	86.6	TMP-19-75	111.3	TMP-19-85
TMP-21	87.2	92.9	95.7	96.4	96.5	96.5	98.4	TMP-21-75	103.7	TMP-21-85
TMP-22	98.1	96.3	96.3 *	96.4	97.9	100.3	105.2	TMP-22-75	103.9	TMP-22-85
TMP-23	90.4	93.8	90.1	94.4	94.8	95.5	102	TMP-23-75	104.4	TMP-23-85
TMP-24	65.3	61.9	50.3	56.1	66.3	77.8	94.5	TMP-24-75	99.2	TMP-24-85
TMP-25	90.9	94	94.9	95.5	96	95.7	98	TMP-25-75	88.1	TMP-25-90
TMP-26	84.7	93.7	94.2	94.5	96	95.3	100.2	TMP-26-75	102.4	TMP-26-85
TMP-29	69.2	76.2	78.9	78.5	78.6	81.5	84.4	TMP-29-80	40.6	TMP-29-90

Notes:

a - Goal of the Benchmark #2 was for 85% thermocouples in the Vadose Zone to exceed 87 °C, 85% thermocouples in the A-B Clay zone to exceed 100 °C, and for 85% thermocouples in the B zone to exceed 100 °C (revised).

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

c - Thermocouples in the middle of the A-B Clay Zone were used to determine achievement of milestone temperature.

d - Thermocouples in the middle of the B Zone were used to determine achievement of milestone temperature.

Table 6b
ERH Benchmark #2 Evaluation - Temperature Data for 21-Jan-08
Pemaco Superfund Site, Maywood, CA

1/21/2008 (Change in ERH Operation)	Benchmark	Number Meeting Benchmark	Percent Meeting Benchmark[a]	Zone	Suspect Probes[b]
Vadose Zone Probes > 87 °C	>87 C	95	75.4%		
A-B Clay Probes > 100 °C	>100 C	10	47.6%	Vadose	15
B Zone Probes 100 - 109 °C	>100 C	14	66.7%	A-B Clay	2
B Zone Probe >110 °C	>105 C	0	0.0%	B	2

Benchmark Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	A-B;Clay	Milestone	B Zone	Milestone
Depth (ft bgs)	35	40	45	50	55	60	60-80	Thermocouple[c]	80-95	Thermocouple[d]
TMP-04	82.4 *	85.5 *	78.2 *	74.9 *	78.8 *	92.2 *	100.8 *	TMP-04-75	101.9 *	TMP-04-90
TMP-05	58.8	59.9	60.4	64.6	80.4	93.9	96.2	TMP-05-75	101.4	TMP-05-85
TMP-06	93.9	88.3	94.4 *	95.8	96.7	98	103.5	TMP-06-75	104.8	TMP-06-85
TMP-07	95.4	95.5	95.6	96.1	95.4	95.4	95.4	TMP-07-75	84	TMP-07-90
TMP-08	93.1	93.5	94.7	94.6	94.6	94.7	98.6	TMP-08-75	99.5	TMP-08-85
TMP-09	95.9	95.3	93.3	95.5	95.1	94.3	99.7	TMP-09-75	104	TMP-09-85
TMP-10	94	96.1	98.8	98.8	99.4	100	101.1	TMP-10-75	106.8	TMP-10-85
TMP-12	82.8	89.6	93.7	94.3	95.3	97.2	104.5	TMP-12-80	105.8	TMP-12-85
TMP-13	91.2	92.6	93.5	94.6	95.6	96.3	103.7	TMP-13-75	99.6	TMP-13-90
TMP-15	90.5	93.3	93.7	94	95.2	95	95.5	TMP-15-75	89.6	TMP-15-90
TMP-16	91.9	94.7	94.4	95.2	96.5	97.5	100.4	TMP-16-75	103.4	TMP-16-90
TMP-17	79.9	92.9	91.8	93.2	95	80.2	96	TMP-17-75	105.5	TMP-17-85
TMP-18	90.6	95	93.1	97.1	95	89.4	106.9	TMP-18-75	99	TMP-18-85
TMP-19	74.5 *	79.1 *	83.2 *	87.1 *	89.6 *	90.9 *	99.9 *	TMP-19-75	104.7 *	TMP-19-85
TMP-21	92	94	81.8	82.4	96.9	96.9	98.8	TMP-21-75	103	TMP-21-85
TMP-22	97.1	96.2	96.3 *	96	97.2	99.9	105.3	TMP-22-75	104.8	TMP-22-85
TMP-23	92.8	94.8	90.2	94.6	95.1	95.6	100.8	TMP-23-75	104.7	TMP-23-85
TMP-24	68.2	64	52.5	57.6	68.9	81.5	99.4	TMP-24-75	104.8	TMP-24-85
TMP-25	92.6	95.1	95.5	95.9	96.2	96	97.8	TMP-25-75	86.8	TMP-25-90
TMP-26	84.6	91.6	94.2	94.8	96	95.4	100.1	TMP-26-75	101.9	TMP-26-85
TMP-29	70.1	80.1	81.6	79.9	76.8	79.5	83.6	TMP-29-80	37.3	TMP-29-90

Notes:

a - Goal of the Benchmark #2 was for 85% thermocouples in the Vadose Zone to exceed 87 °C, 85% thermocouples in the A-B Clay zone to exceed 100 °C, and for 85% thermocouples in the B zone to exceed 100 °C (revised).

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

c - Thermocouples in the middle of the A-B Clay Zone were used to determine achievement of milestone temperature.

d - Thermocouples in the middle of the B Zone were used to determine achievement of milestone temperature.

Table 6c
ERH Benchmark #2 Evaluation - Temperature Data for 25-Jan-08
Pemaco Superfund Site, Maywood, CA

1/25/2008	Benchmark	Number Meeting Benchmark	Percent Meeting Benchmark[a]	Zone	Suspect Probes[b]
Vadose Zone Probes > 87 °C	>87 C	100	79.4%		
A-B Clay Probes > 100 °C	>100 C	13	61.9%	Vadose	15
B Zone Probes 100 - 109 °C	>100 C	14	66.7%	A-B Clay	2
B Zone Probe >110 °C	>105 C	0	0.0%	B	2

Benchmark Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	A-B;Clay	Milestone	B Zone	Milestone
Depth (ft bgs)	35	40	45	50	55	60	60-80	Thermocouple[c]	80-95	Thermocouple[d]
TMP-04	84.2 *	86.3 *	79.5 *	74.3 *	79 *	94.8 *	101 *	TMP-04-75	104 *	TMP-04-90
TMP-05	60.3	61.7	62.1	66.6	81.9	94.3	96.7	TMP-05-75	101.6	TMP-05-85
TMP-06	94	95.3	94.4 *	95.7	96.7	98.1	102.9	TMP-06-75	104.5	TMP-06-85
TMP-07	95.6	95.6	95.6	96.1	95.5	95.5	95.9	TMP-07-75	83.1	TMP-07-90
TMP-08	93.6	93.8	95	94.9	94.8	94.9	98.6	TMP-08-75	98.4	TMP-08-85
TMP-09	96.2	95.4	95.3	95.7	95.4	94.5	100	TMP-09-75	103.9	TMP-09-85
TMP-10	90.3	90.8	87.1	89.8	94.5	99.7	100.8	TMP-10-75	105.8	TMP-10-85
TMP-12	83.8	90.2	94.3	94.6	95.6	97.4	103.9	TMP-12-80	105.2	TMP-12-85
TMP-13	92.7	93.3	93.6	94.8	95.8	96.3	103.2	TMP-13-75	99.6	TMP-13-90
TMP-15	91.2	93.5	93.8	94.2	95.3	95.2	95.8	TMP-15-75	91.6	TMP-15-90
TMP-16	92.1	94.7	95	95.8	97.3	97.7	100.1	TMP-16-75	103.1	TMP-16-90
TMP-17	80.9	93.6	95.3	93.6	95.6	93.9 *	99.5	TMP-17-75	107.5	TMP-17-85
TMP-18	91.6	97.6	95.6	97.9	95.5	90.2	105.8	TMP-18-75	98.4	TMP-18-85
TMP-19	79.2 *	85 *	90.9 *	93.8 *	94.7 *	94.8 *	101.5 *	TMP-19-75	106.2 *	TMP-19-85
TMP-21	96.4	96.1	96.7	96.8	97.8	98.4	98.9	TMP-21-75	102.6	TMP-21-85
TMP-22	97.1	96.3	96.3 *	96.3	97.6	100.1	104.8	TMP-22-75	104.7	TMP-22-85
TMP-23	91.8	94.7	92.7	94.4	94.9	95.2	103	TMP-23-75	104.3	TMP-23-85
TMP-24	72.8	69.2	58.6	62.2	77.1	95.8	102.7	TMP-24-75	104.5	TMP-24-85
TMP-25	93.4	95.7	95.8	96.4	96.4	96.1	98	TMP-25-75	84.1	TMP-25-90
TMP-26	83.2	91.6	94.2	94.6	95	94.7	100.1	TMP-26-75	101.6	TMP-26-85
TMP-29	72.1	84.1	85.8	82	81.9	86.8	83.5	TMP-29-80	37.1	TMP-29-90

Notes:

a - Goal of the Benchmark #2 was for 85% thermocouples in the Vadose Zone to exceed 87 °C, 85% thermocouples in the A-B Clay zone to exceed 100 °C, and for 85% thermocouples in the B zone to exceed 100 °C (revised).

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

c - Thermocouples in the middle of the A-B Clay Zone were used to determine achievement of milestone temperature.

d - Thermocouples in the middle of the B Zone were used to determine achievement of milestone temperature.

Table 6d
ERH Benchmark #2 Evaluation - Temperature Data for 25-Feb-08
Pemaco Superfund Site, Maywood, CA

2/25/2008	Benchmark	Number Meeting Benchmark	Percent Meeting Benchmark[a]	Zone	Suspect Probes[b]
Vadose Zone Probes > 87 °C	>87 C	108	85.7%		
A-B Clay Probes > 100 °C	>100 C	8	38.1%	Vadose	1
B Zone Probes 100 - 109 °C	>100 C	15	71.4%	A-B Clay	0
B Zone Probe >110 °C	>105 C	0	0.0%	B	0

Benchmark Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	A-B Clay	Milestone	B Zone	Milestone
Depth (ft bgs)	35	40	45	50	55	60	60-80	Thermocouple[c]	80-95	Thermocouple[d]
TMP-04	83.9	86.5	78.5	73.1	80.7	91.3	100.6	TMP-04-75	105.4	TMP-04-90
TMP-05	68	70.1	67.9	70.2	82.7	94.3	97.1	TMP-05-75	100.9	TMP-05-85
TMP-06	91	92.1	92.9	94.3	95.3	97.9	101.6	TMP-06-75	102.7	TMP-06-85
TMP-07	94.6	94.4	94.5	95	93.3	95.2	96.7	TMP-07-75	86.4	TMP-07-90
TMP-08	92	91.9	92.6	92	93.1	93.4	97.3	TMP-08-75	100	TMP-08-85
TMP-09	93.3	92.9	93	93.3	93.7	93.1	98.9	TMP-09-75	101.5	TMP-09-85
TMP-10	90.1	92.5	89.2	87.6	95.5	99.4	99.3	TMP-10-75	102.6	TMP-10-85
TMP-12	89	91.2	92.5	92.6	93.3	94.6	102	TMP-12-80	102.7	TMP-12-85
TMP-13	93.7	92.9	92.4	93.7	94.2	94.1	100.1	TMP-13-75	99	TMP-13-90
TMP-15	94.2	92.5	91.9	92.7	94.2	93.9	96.4	TMP-15-75	95.1	TMP-15-90
TMP-16	92.9	93.6	93.5	94.5	96.4	96.8	98.9	TMP-16-75	102.3	TMP-16-90
TMP-17	88.4	91.7	92.4	93.1	93.1	92.7	96.7	TMP-17-75	100.4	TMP-17-85
TMP-18	87.7	86.8	90.7	93	93.8	94.6	99.5	TMP-18-75	100.2	TMP-18-85
TMP-19	90.4	91.1	87.6	92.6	93.6	93.8	100.7	TMP-19-75	103.8	TMP-19-85
TMP-21	98.3	96.5	96.4	94.6	95.8	97.2	97.5	TMP-21-75	101.5	TMP-21-85
TMP-22	95.7	94.8	96.3 *	93.5	96.1	98.5	103.3	TMP-22-75	103	TMP-22-85
TMP-23	92.1	93.8	82.1	94	94.5	94.8	100.1	TMP-23-75	102.4	TMP-23-85
TMP-24	87.2	93	74.5	73.6	72	72.5	101.1	TMP-24-75	101.5	TMP-24-85
TMP-25	97.1	97	96.1	92.9	91.2	94.2	98.6	TMP-25-75	83.2	TMP-25-90
TMP-26	89.2	92.7	84.5	83.8	93.8	93.5	98.4	TMP-26-75	99.8	TMP-26-85
TMP-29	94.3	98	98.1	97.4	96.5	96.6	85.1	TMP-29-80	35.7	TMP-29-90

Notes:

a - Goal of the Benchmark #2 was for 85% thermocouples in the Vadose Zone to exceed 87 °C, 85% thermocouples in the A-B Clay zone to exceed 100 °C, and for 85% thermocouples in the B zone to exceed 100 °C (revised).

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

c - Thermocouples in the middle of the A-B Clay Zone were used to determine achievement of milestone temperature.

d - Thermocouples in the middle of the B Zone were used to determine achievement of milestone temperature.

Table 6e
ERH Benchmark #2 Evaluation - Temperature Data for 25-Mar-08
Pemaco Superfund Site, Maywood, CA

3/25/2008	Benchmark	Number Meeting Benchmark	Percent Meeting Benchmark[a]	Zone	Suspect Probes[b]
Vadose Zone Probes > 87 °C	>87 C	101	80.2%		
A-B Clay Probes > 100 °C	>100 C	3	14.3%	Vadose	1
B Zone Probes 100 - 109 °C	>100 C	7	33.3%	A-B Clay	0
B Zone Probe >110 °C	>105 C	0	0.0%	B	0

Benchmark Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	A-B Clay	Milestone	B Zone	Milestone
Depth (ft bgs)	35	40	45	50	55	60	60-80	Thermocouple[c]	80-95	Thermocouple[d]
TMP-04	74.6	74.9	66.9	62.3	68.3	88	100.7	TMP-04-75	104.2	TMP-04-90
TMP-05	66.2	66.4	62.6	67	78.1	91.7	96	TMP-05-75	99.6	TMP-05-85
TMP-06	87.5	90.9	92	93.8	94.7	95.5	97.4	TMP-06-75	99.5	TMP-06-85
TMP-07	95.5	94.2	94.6	95.1	93.8	94.7	96.2	TMP-07-75	85	TMP-07-90
TMP-08	91.6	92.8	93.6	93.8	94	94.2	97.3	TMP-08-75	98.8	TMP-08-85
TMP-09	89	88.4	91.7	94.3	95	94.5	98.3	TMP-09-75	101.5	TMP-09-85
TMP-10	86.3	87.7	89.8	93.6	96.9	98.2	97.6	TMP-10-75	99.8	TMP-10-85
TMP-12	87.9	89.7	92	92.2	92.6	93.7	99.6	TMP-12-80	99.4	TMP-12-85
TMP-13	91.6	90.9	91	92.6	93.9	94	97.8	TMP-13-75	99.1	TMP-13-90
TMP-15	93.5	92.3	89.9	91.7	93.6	93.3	95.4	TMP-15-75	90.8	TMP-15-90
TMP-16	91.7	93.2	93.5	94.3	95.6	95.8	96.7	TMP-16-75	101.2	TMP-16-90
TMP-17	89.5	91.3	92.1	92.7	92.9	91.9	95.5	TMP-17-75	99.7	TMP-17-85
TMP-18	73.5	73.4	77.6	82	79.8	92.4	95.9	TMP-18-75	98.6	TMP-18-85
TMP-19	88.1	80.9	72.2	79	84.5	89.5	95.1	TMP-19-75	99.3	TMP-19-85
TMP-21	96.6	95.7	95.6	92.5	85.2	95.9	96.8	TMP-21-75	100.9	TMP-21-85
TMP-22	93	93.8	96.3 *	93.6	95.8	98.4	103.3	TMP-22-75	102.8	TMP-22-85
TMP-23	83.7	79.7	88.1	93.6	94	94.5	98.4	TMP-23-75	103	TMP-23-85
TMP-24	93.9	92.7	90.2	92	94.1	94.4	100.4	TMP-24-75	103	TMP-24-85
TMP-25	94.4	95.3	95.1	91	92.1	94.3	97.1	TMP-25-75	84.2	TMP-25-90
TMP-26	85.7	86.4	93.1	93.6	94	93.6	97.9	TMP-26-75	99.8	TMP-26-85
TMP-29	96.3	96.4	96.6	96	96	96.1	85.8	TMP-29-80	43.8	TMP-29-90

Notes:

a - Goal of the Benchmark #2 was for 85% thermocouples in the Vadose Zone to exceed 87 °C, 85% thermocouples in the A-B Clay zone to exceed 100 °C, and for 85% thermocouples in the B zone to exceed 100 °C (revised).

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

c - Thermocouples in the middle of the A-B Clay Zone were used to determine achievement of milestone temperature.

d - Thermocouples in the middle of the B Zone were used to determine achievement of milestone temperature.

Table 6f
ERH Benchmark #2 Evaluation - Temperature Data for 10-Apr-08
Pemaco Superfund Site, Maywood, CA

4/10/2008 (Final Day of ERH)	Benchmark	Number Meeting Benchmark	Percent Meeting Benchmark[a]	Zone	Suspect Probes[b]
Vadose Zone Probes > 87 °C	>87 C	94	74.6%		
A-B Clay Probes > 100 °C	>100 C	2	9.5%	Vadose	1
B Zone Probes 100 - 109 °C	>100 C	7	33.3%	A-B Clay	0
B Zone Probe >110 °C	>105 C	0	0.0%	B	0

Benchmark Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	Vadose Zone	A-B Clay	Milestone	B Zone	Milestone
Depth (ft bgs)	35	40	45	50	55	60	60-80	Thermocouple[c]	80-95	Thermocouple[d]
TMP-04	70.9	70.5	64.2	62	69.6	89	100	TMP-04-75	103.8	TMP-04-90
TMP-05	64.3	63.5	60	64.9	77	91.2	95.9	TMP-05-75	98.4	TMP-05-85
TMP-06	84.6	89.1	90.1	91.8	93.9	94.6	97.9	TMP-06-75	99.1	TMP-06-85
TMP-07	94.8	94.1	94.3	94.9	94.7	94.5	96.3	TMP-07-75	84.2	TMP-07-90
TMP-08	91.2	92.5	92.9	93.3	93.6	93.8	97.4	TMP-08-75	99.4	TMP-08-85
TMP-09	87.2	87	88.9	94.1	94.7	94.2	98.6	TMP-09-75	101.5	TMP-09-85
TMP-10	84.9	86.5	87.6	92	95.5	97	96.5	TMP-10-75	99.1	TMP-10-85
TMP-12	86.6	89	91.6	91.7	92.3	93.7	99.4	TMP-12-80	99.7	TMP-12-85
TMP-13	89.9	89.4	87.9	91.3	93.1	93.2	97.5	TMP-13-75	99.1	TMP-13-90
TMP-15	93.4	91.4	91	91.5	93.1	93	95.5	TMP-15-75	87.8	TMP-15-90
TMP-16	90.4	92.9	93.2	94.2	95.3	95.4	96.7	TMP-16-75	101.4	TMP-16-90
TMP-17	88.9	91	91.6	92.2	92.5	91.4	95.8	TMP-17-75	100	TMP-17-85
TMP-18	70.6	71.6	79.1	80.8	80.8	92.7	96.1	TMP-18-75	98.9	TMP-18-85
TMP-19	85.2	76	67.4	73.4	79.9	87.1	95	TMP-19-75	99	TMP-19-85
TMP-21	95.9	95.1	95.1	91.2	84.4	95.4	96.3	TMP-21-75	100.9	TMP-21-85
TMP-22	92.1	93.3	*	93.7	95.3	97.9	101.4	TMP-22-75	101.2	TMP-22-85
TMP-23	82	79.4	87.1	92.3	93.1	93.6	97.7	TMP-23-75	101.7	TMP-23-85
TMP-24	92.4	91.9	81.1	91.9	94.7	95.2	98.1	TMP-24-75	99.3	TMP-24-85
TMP-25	92.4	94.3	94.4	88.7	89.5	92.9	95.9	TMP-25-75	84.9	TMP-25-90
TMP-26	84.3	89	92.4	92.7	93.3	92.6	96.7	TMP-26-75	98.4	TMP-26-85
TMP-29	87.6	90.5	92.5	91.7	87.2	85.5	81.7	TMP-29-80	44.1	TMP-29-90

Notes:

a - Goal of the Benchmark #2 was for 85% thermocouples in the Vadose Zone to exceed 87 °C, 85% thermocouples in the A-B Clay zone to exceed 100 °C, and for 85% thermocouples in the B zone to exceed 100 °C (revised).

b - Suspect Probes - number of thermocouples for which temperature readings were qualified with the following qualifiers:

* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

c - Thermocouples in the middle of the A-B Clay Zone were used to determine achievement of milestone temperature.

d - Thermocouples in the middle of the B Zone were used to determine achievement of milestone temperature.

Table 7
ERH Groundwater Data Summary for Exposition A Zone
Pemaco Superfund Site, Maywood, CA

Chemical of Concern	SSRLs (ug/L)	Pre-ERH Groundwater Results				Post-ERH Groundwater Results			
		Min. Conc. (ug/L)	Well Associated with min. conc.	Max. Conc. (ug/L)	Well Associated with max. conc.	Min. Conc. (ug/L)	Well Associated with min. conc.	Max. Conc. (ug/L)	Well Associated with max. conc.
Acetone	5,500	10 U	DA-11	44	MW-04-75	3.6	DA-11	30	DA-04 (downgradient)
1,1-Dichloroethene	6.0	5.4	MW-04-75 (outside ERH)	**19**	DA-04 (downgradient)	Not detected above the method reporting limits			
1,2-Dibromo-3-Chloropropane	0.2	Not detected above the method reporting limits				Not detected above the method reporting limits			
1,2-Dichloroethane	0.5	Not detected above the method reporting limits				Not detected above the method reporting limits			
Benzene	1.0	Not detected above the method reporting limits				Not detected above the method reporting limits except for 0.59 ug/L at DA-10			
Chloroform	80	Not detected above the method reporting limits except for 3.0 ug/L at DA-04				Not detected above the method reporting limits except for 5.0 ug/L at DA-10			
cis-1,2-Dichloroethene	6.0	16.0	MW-04-75 (outside ERH)	**210**	DA-10	1.8	MW-04-75 (outside ERH)	**14**	DA-04 (downgradient)
Dibromochloromethane	80	Not detected above the method reporting limits				Not detected above the method reporting limits			
Methylene chloride	5.0	Not detected above the method reporting limits				Not detected above the method reporting limits			
Methyl Tert-Butyl Ether	13	Not detected above the method reporting limits				Not detected above the method reporting limits			
Tetrachloroethene	5.0	1.8	MW-04-75 (outside ERH)	**6.2**	DA-04 (downgradient)	Not detected above the method reporting limits except for 0.38 ug/L at DA-10			
Trichloroethene	5.0	**550**	MW-04-75 (outside ERH)	**8,500**	DA-10	1.1	DA-11	**190**	DA-10
trans-1,2-Dichloroethene	10	Not detected above the method reporting limits except for 2.0 at MW-04-75				Not detected above the method reporting limits except for 0.19 ug/L at DA-10			
Vinyl chloride	0.5	Not detected above the method reporting limits except for **21 ug/L at DA-04**				Not detected above the method reporting limits			

Notes:

1) The pre-ERH samples were collected at DA-04 (2/15/07), DA-10 (2/23/07), DA-11 (9/18/07), and MW-04-75 (2/21/07)
2) The post-ERH samples were collected at DA-04 (4/24/08), DA-10 (5/8/08), DA-11 (9/25/08), and MW-04-75 (4/25/08)
3) **Bolded** values indicate results exceeding SSRLs
4) SSRLs - Site-Specific Remediation Levels; ug/L - micrograms per liter

Table 8
ERH Groundwater Data Summary for Exposition B Zone
Pemaco Superfund Site, Maywood, CA

Chemical of Concern	SSRLs (ug/L)	Pre-ERH Groundwater Results (9/6-7/08)				Post-ERH Groundwater Results (4/10/08)*			
		Min. Conc. (ug/L)	Well Associated with min. conc.	Max. Conc. (ug/L)	Well Associated with max. conc.	Min. Conc. (ug/L)	Well Associated with min. conc.	Max. Conc. (ug/L)	Well Associated with max. conc.
Acetone	5,500	10 U	MW-04-90, DB-10	220	RW-01-95	10 U	MW-04-90 (outside ERH)	310	RW-01-95
1,1-Dichloroethene	6.0	3.6	DB-04 (downgradient)	**14**	RW-01-95	0.79	RW-01-95	1.2	MW-26-90
1,2-Dibromo-3-Chloropropane	0.2	Not detected above the method reporting limits				Not detected above the method reporting limits			
1,2-Dichloroethane**	0.5	Not detected above the method reporting limits				Not detected above the method reporting limits			
Benzene	1.0	**3.3**	DB-10	**9.5**	DB-04 (downgradient)	0.072	DB-11	**13**	MW-19-90
Chloroform	80	3.4	DB-04 (downgradient)	3.7	DB-10	0.84	DB-10	1.2	DB-11
cis-1,2-Dichloroethene	6.0	3.9	MW-04-90	**2,200**	RW-01-95	0.37	RW-01-95	**430**	MW-19-90
Dibromochloromethane	80	Not detected above the method reporting limits				Not detected above the method reporting limits			
Methylene chloride	5.0	Not detected above the method reporting limits				Not detected above the method reporting limits			
Methyl Tert-Butyl Ether	13	Not detected above the method reporting limits				0.06	MW-26-90	0.2	DB-11
Tetrachloroethene	5.0	2.2	MW-26-90	**6.6**	RW-01-95	0.13 U	MW-26-90	2.4	DB-04 (downgradient)
Trichloroethene	5.0	**340**	MW-04-90 (outside ERH)	**13,000**	RW-01-95	2.9 U	RW-01-95	**1,300**	DB-04 (downgradient)
trans-1,2-Dichloroethene	10	2.2	DB-11	2.2	DB-11	0.14	DB-11	8.7	DB-04 (downgradient)
Vinyl chloride	0.5	**3.7**	DB-04 (downgradient)	**820**	MW-19-90	**1.5**	DB-10	**33**	DB-04 (downgradient)

Notes:

1) * The post-ERH samples were collected at DB-10 on 5/7/08 and at DB-11 on 5/8/08

2) ** 1,2-Dichloroethane was not detected above reporting limits except for 0.2 ug/L in DB-10 (5/7/08; post-ERH event)

3) **Bolded** values indicate results exceeding SSRLs

4) SSRLs - Site-Specific Remediation Levels; ug/L - micrograms per liter

5) The groundwater data evaluation was completed for 5 groundwater monitoring/extraction wells located within ERH area (DB-10, DB-11, MW-19-90, MW-26-90, and RW-01-95) and 3 wells immediately outside ERH area (DB-04, MW-03-90, and MW-04-90);

Table 9
Percent Reduction of Select Chemicals of Concern
Pemaco Superfund Site, Maywood, CA

	Well ID	MW-19-90			MW-26-90		
		pre-ERH	post-ERH	Reduction	pre-ERH	post-ERH	Reduction
	Sample Date	9/7/07	4/10/08		9/6/07	4/10/08	
Select COCs	**SSRLs**						
Benzene (ug/L)	1.0	50 U	**13**	n/a	5 U	5 U	n/a
cis-1,2-Dichloroethene (ug/L)	6.0	**1,300 J**	**430**	67%	**35**	3.4 J	90%
Trichloroethene (ug/L)	5.0	**470**	**240**	49%	**2,700**	**190**	93%
Vinyl Chloride (ug/L)	0.5	**820**	**18**	98%	5 U	5 U	n/a

	Well ID	RW-01-95			DB-10		
		pre-ERH	post-ERH	Reduction	pre-ERH	post-ERH	Reduction
	Sample Date	9/6/07	4/10/08		9/6/07	5/7/08	
Select COCs	**SSRLs**						
Benzene (ug/L)	1.0	5 U	1 U	n/a	**3.3 J**	0.33 J	90%
cis-1,2-Dichloroethene (ug/L)	6.0	**2,200 J**	2 U	99.91%	**100 J**	**18**	82%
Trichloroethene (ug/L)	5.0	**13,000**	2.3	99.98%	**2,700**	**71 J**	97%
Vinyl Chloride (ug/L)	0.5	**160**	1 U	99.38%	**6.1**	**1.5 J**	75%

	Well ID	DB-11		
		pre-ERH	post-ERH	Reduction
	Sample Date	9/6/07	5/8/08	
Select COCs	**SSRLs**			
Benzene (ug/L)	1.0	5 U	0.072 J	n/a
cis-1,2-Dichloroethene (ug/L)	6.0	**50 J**	1.6	97%
Trichloroethene (ug/L)	5.0	**1,400**	**28 J**	98%
Vinyl Chloride (ug/L)	0.5	5 U	0.5 U	n/a

Notes:

1) "U" analyte was not detected above the reporting limit
2) "J" reported value is a quantitative estimate
3) **Bolded** values indicate detections above SSRLs
4) SSRL - Site-Specific Remediation Goals;
5) "ug/L" - micrograms per liter

Table 10a
ERH Temperature Data Between 85 and 100 feet bgs (25-Sep-07)
Pemaco Superfund Site, Maywood, CA

25-Sep-07	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C
≥ 100 C°	0%	0%	0%	0%
Depth*	85	90	95	100
TMP-04	22.7	22.2	22	21.2
TMP-05	21.5	21.2	21	20.5
TMP-06	23.3	22.9	22.4	21.6
TMP-07	22.4	22.1	21.2	20.4
TMP-08	23	22	21.4	20.6
TMP-09	21.7	21.7	20.8	20
TMP-10	22.8	22.1	21.7	21.1
TMP-12	22.2	21.9	21.9	21.4
TMP-13	23.1	22.8	21.9	21.1
TMP-15	21.5	21.2	20.6	19.8
TMP-16	23	22.3	22	21.4
TMP-17	21.9	21.5	20.8	20.1
TMP-18	23.4	22.2	21.5	20.9
TMP-19	24.5	23.4	22.1	21.4
TMP-21	22	21.8	21.3	20.6
TMP-22	22.3	22.1	22.4	21.9
TMP-23	22.8	22.4	22	21
TMP-24	22.5	21.6	21.3	20.2
TMP-25	22.6	22.6	21.4	20.9
TMP-26	23.9	23.8	22.8	21.8
TMP-29	22.1	21.2	21.3	21.1

Table 10b
ERH Temperature Data Between 85 and 100 feet bgs (25-Oct-07)
Pemaco Superfund Site, Maywood, CA

25-Oct-07	% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C	
≥ 100 C°	5%		5%		0%		0%	
Depth*	85		90		95		100	
TMP-04	62.1		72.1		70.9		59.4	
TMP-05	30.9		31.6		33.2		27.3	
TMP-06	86	#	103		95.9		85	#
TMP-07	31.9		30.5		30.4		25.6	
TMP-08	42.2		42.5		42.3		34.3	
TMP-09	47.7		49.6		40.5		32.5	
TMP-10	55.8		62.4		59		45.4	
TMP-12	52		58.1		58.8		44.5	
TMP-13	42.3		43.6		42.5		36.3	
TMP-15	29.2		29		29.8		41.8	
TMP-16	45.5		46.8		45.8		37.1	
TMP-17	32.4		29.7		30.7		28.7	
TMP-18	47.7		48.2		41.6		32.7	
TMP-19	106.8		78.1		58.7	#	49.5	
TMP-21	64.4	#	51.8	#	49.4	#	38.4	#
TMP-22	75.3	#	85.3	#	98.6	#	91.4	#
TMP-23	46		46.5		44.8		39.7	
TMP-24	83.8		69.5		58.5		33.5	
TMP-25	55.3		64.6		57.5		38.7	
TMP-26	47.1		55		53.7		63.7	
TMP-29	45.8		40.3		40.7		42.3	

Table 10c
ERH Temperature Data Between 85 and 100 feet bgs (25-Nov-07)
Pemaco Superfund Site, Maywood, CA

25-Nov-07	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C
≥ 100 C°	24%	24%	5%	0%
Depth*	85	90	95	100
TMP-04	94.1	100.2	97.1	76.9
TMP-05	50.1	48.3	46.6	38.3
TMP-06	102.5	102.8	100.5	84.8
TMP-07	42.8	42.1	44.7	34.7
TMP-08	69	68.3	67.4	51.8
TMP-09	80.1	80.5	70.6	46.2
TMP-10	95.6	103	98.7	70.5
TMP-12	76.3	85.4	79	58.4
TMP-13	68.2	70.8	66.1	52.6
TMP-15	44.7	42.3	42.5	40.1
TMP-16	65.3	80.6	68.5	56.8
TMP-17	54.6	53.6	46.9	39.8
TMP-18	68.5	64.4	60.9	47.6
TMP-19	101.6	118.6	81	57.2
TMP-21	103.5	83.6	80.8	60.5
TMP-22	102.9	106.7	98.7	95.6
TMP-23	71	69.4	63.5	42.9
TMP-24	102.4	94.1	81.8	53.7
TMP-25	88.3	88.8	78.1	57.5
TMP-26	74.7	74.2	83	65.8
TMP-29	66.9	57.4	54.7	52.9

Table 10d
ERH Temperature Data Between 85 and 100 feet bgs (25-Dec-07)
Pemaco Superfund Site, Maywood, CA

25-Dec-07	% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C	
≥ 100 C°	67%		43%		19%		10%	
Depth*	85		90		95		100	
TMP-04	110.4	*	102	*	112.4	*	91.4	*
TMP-05	70.4	*	67.1	*	62.6	*	52.5	*
TMP-06	105		106		106.3		104.6	
TMP-07	82	*	60.6	*	55.2	*	43.6	*
TMP-08	98.7	*	88.4	*	75.5	*	61.3	*
TMP-09	90.9		84.2		79.1		63.5	
TMP-10	103.2		104.2	*	96.2		81.7	
TMP-12	103.4		103.3		94.7		76.5	
TMP-13	99.1		92.5		81.9		66	
TMP-15	71.9	*	66.2	*	46.9	*	52.2	*
TMP-16	100.2	*	101.1	*	92.3	*	65.4	*
TMP-17	107.3		86		56.9	*	40.8	
TMP-18	111.5		104.3		85.8		43.5	
TMP-19	104.3		102.9		91.7		60	
TMP-21	104.5	*	99.9	*	103.4	*	71.9	*
TMP-22	105.2	*	107.1	*	100.7	*	105.1	*
TMP-23	101.4		95.8		82.2		65	
TMP-24	100.4		97		90.1		58.1	*
TMP-25	102.6	*	98.4	*	88.2	*	68.3	*
TMP-26	103.5	*	102.5	*	93.9	*	75.5	*
TMP-29	66.6	*	42.1	*	49.3	*	53.8	*

Table 10e
ERH Temperature Data Between 85 and 100 feet bgs (12-Jan-08)
Pemaco Superfund Site, Maywood, CA

12-Jan-08	% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C	
≥ 100 C°	76%		48%		29%		10%	
Depth*	85		90		95		100	
TMP-04	99.2	*	105.4	*	105	*	96.3	*
TMP-05	102.8		71.3		59.8		45.6	
TMP-06	104.7		105.7		105.8		105.4	
TMP-07	102.6		73.6		63		49.4	
TMP-08	99.8		95.4		85		67.8	
TMP-09	103.8		95.7		88		69.9	
TMP-10	104.9		102.4		93.4		81.2	
TMP-12	105.1		106.4		103.5		86.3	
TMP-13	103.1		99.8		94.2		76.6	
TMP-15	101.1	*	85.7	*	71.6	*	59.7	*
TMP-16	105.7	*	106.6	*	100.3	*	81.4	*
TMP-17	105.2		95.7		71.2		58.1	
TMP-18	99.7		107.1		93.2		44.5	
TMP-19	111.3		117.4		87.3		66.7	
TMP-21	103.7		99		105.8		79.3	
TMP-22	103.9		106.4		99.5		102.1	
TMP-23	104.4		103		93.5		74.2	
TMP-24	99.2		93.1		85.4		57.8	
TMP-25	101.1		88.1		88.9		74	
TMP-26	102.4		102.7		103.1		82.7	
TMP-29	63.3		40.6		51.4		57.1	

Table 10f
ERH Temperature Data Between 85 and 100 feet bgs (25-Jan-08)
Pemaco Superfund Site, Maywood, CA

25-Jan-08	% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C		% ≥ 100 °C	
≥ 100 C°	76%		52%		33%		10%	
Depth*	85		90		95		100	
TMP-04	92.8	*	104	*	103.2	*	93.5	*
TMP-05	101.6		92.6		81.2		61.5	
TMP-06	104.5		105.2		105.3		104.9	
TMP-07	100.5		83.1		77.1		53	
TMP-08	98.4		95.9		88.9		72.2	
TMP-09	103.9		99.8		89.4		72.6	
TMP-10	105.8		106.6		98.3		81.7	
TMP-12	105.2		105.1		102.1		89	
TMP-13	102.9		99.6		94.9		78.7	
TMP-15	100.4		91.6		76.5		61.8	
TMP-16	101.8		103.1		101.6		83	
TMP-17	107.5		101.6		74.1		66.8	
TMP-18	98.4		102.7		97.2		61.7	
TMP-19	106.2	*	106.6	*	104.4	*	78.4	*
TMP-21	102.6		98.9		102.7		80.8	
TMP-22	104.7		106.2		99.9		104.4	
TMP-23	104.3		104.3		97.1		78.7	
TMP-24	104.5		98.2		82.4		59.1	
TMP-25	96.5		84.1		87.6		75.1	
TMP-26	101.6		102.5		104.3		85.5	
TMP-29	61.2		37.1		51.4		57.5	

Table 10g
ERH Temperature Data Between 85 and 100 feet bgs (25-Feb-08)
Pemaco Superfund Site, Maywood, CA

25-Feb-08	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C
≥ 100 C°	86%	48%	43%	19%
Depth*	85	90	95	100
TMP-04	102.1	105.4	104.7	102
TMP-05	100.9	96.2	83.1	66
TMP-06	102.7	104.1	104.7	104.5
TMP-07	100.6	86.4	77.1	60.4
TMP-08	100	99.6	96.7	81.3
TMP-09	101.5	99.5	96	81.2
TMP-10	102.6	102.8	100.9	94.9
TMP-12	102.7	103.2	102.2	95.5
TMP-13	100.6	99	96.8	85.3
TMP-15	102.2	95.1	90.5	71.6
TMP-16	100.6	102.3	102.1	86.5
TMP-17	100.4	97.4	91.5	75.1
TMP-18	100.2	99.7	94.8	76.6
TMP-19	103.8	104.1	105	100.7
TMP-21	101.5	99.7	103.6	83.7
TMP-22	103	104.3	98.3	102.7
TMP-23	102.4	104.7	106.3	87.3
TMP-24	101.5	103.5	99.9	71.1
TMP-25	97.4	83.2	86.1	77.3
TMP-26	99.8	101	103.8	90.5
TMP-29	61.3	35.7	63.7	58.9

Table 10h
ERH Temperature Data Between 85 and 100 feet bgs (25-Mar-08)
Pemaco Superfund Site, Maywood, CA

25-Mar-07	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C
≥ 100 C°	33%	43%	33%	10%
Depth*	85	90	95	100
TMP-04	102.1	104.2	103.5	102.1
TMP-05	99.6	93.3	90.8	76
TMP-06	99.5	100.8	101.3	93.7
TMP-07	95.3	85	85.4	66.2
TMP-08	98.8	98.7	95.8	83.3
TMP-09	101.5	98.8	95.9	82.6
TMP-10	99.8	100.5	101.4	94.6
TMP-12	99.4	100.2	98.2	85.8
TMP-13	99.4	99.1	99.8	89
TMP-15	99.9	90.8	92.5	86.3
TMP-16	98.8	101.2	100.4	87
TMP-17	99.7	98.6	96.8	88.6
TMP-18	98.6	99.9	94.9	80.5
TMP-19	99.3	99.6	98.4	85.7
TMP-21	100.9	93.1	99.2	84.8
TMP-22	102.8	104.6	98.1	102.9
TMP-23	103	103.4	104.7	98.1
TMP-24	103	103.4	103.5	78.1
TMP-25	101.7	84.2	83.2	76.7
TMP-26	99.8	101	103.5	87.9
TMP-29	65.3	43.8	60.1	60.5

Table 10i
ERH Temperature Data Between 85 and 100 feet bgs (11-Apr-08)
Pemaco Superfund Site, Maywood, CA

11-Apr-08	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C	% ≥ 100 °C
≥ 100 C°	10%	33%	33%	10%
Depth*	85	90	95	100
TMP-04	99.7	102.7	101.9	101.3
TMP-05	97.4	91.3	90.1	77.7
TMP-06	98.4	99	100.2	90.8
TMP-07	91.4	83	84.9	68.5
TMP-08	98.6	98.6	97.4	83.7
TMP-09	100.4	98.2	96	83.2
TMP-10	99	101.3	102.1	98.2
TMP-12	99.1	99.7	97.1	85.4
TMP-13	98.2	98.4	99.7	88.3
TMP-15	98.7	87.8	90.2	86.3
TMP-16	98.9	100.1	100.2	88.8
TMP-17	99.1	98.1	96.3	90.3
TMP-18	98.4	99.5	95.3	83.3
TMP-19	98.1	96.5	95.3	84.4
TMP-21	99.6	88.9	94	83.8
TMP-22	99.6	101.6	96.8	100.4
TMP-23	100.1	102	103.6	94.9
TMP-24	98.8	101.3	100.4	79.4
TMP-25	98.1	84.2	83.1	75.7
TMP-26	98	100.5	103.2	89.3
TMP-29	64	43.2	57.8	61.1

Notes:

1) Temperature reading qualifiers:

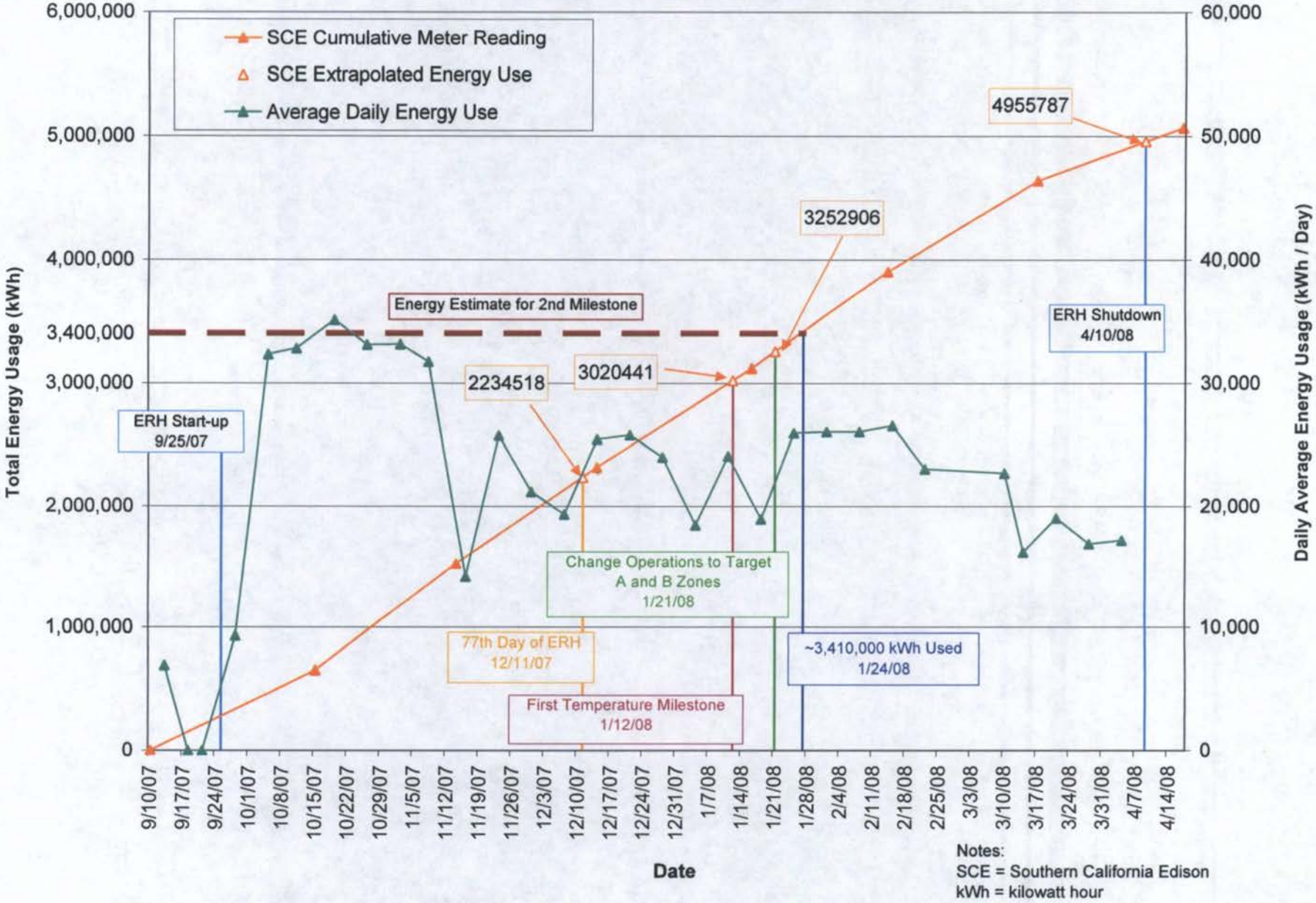
* - Equipment Malfunction, Data copied from previous day

\# - Data gathered by hand meter

2) * feet below ground surface

Graphs

Graph 1
Pemaco ERH Energy Consumption



Notes:
SCE = Southern California Edison
kWh = kilowatt hour

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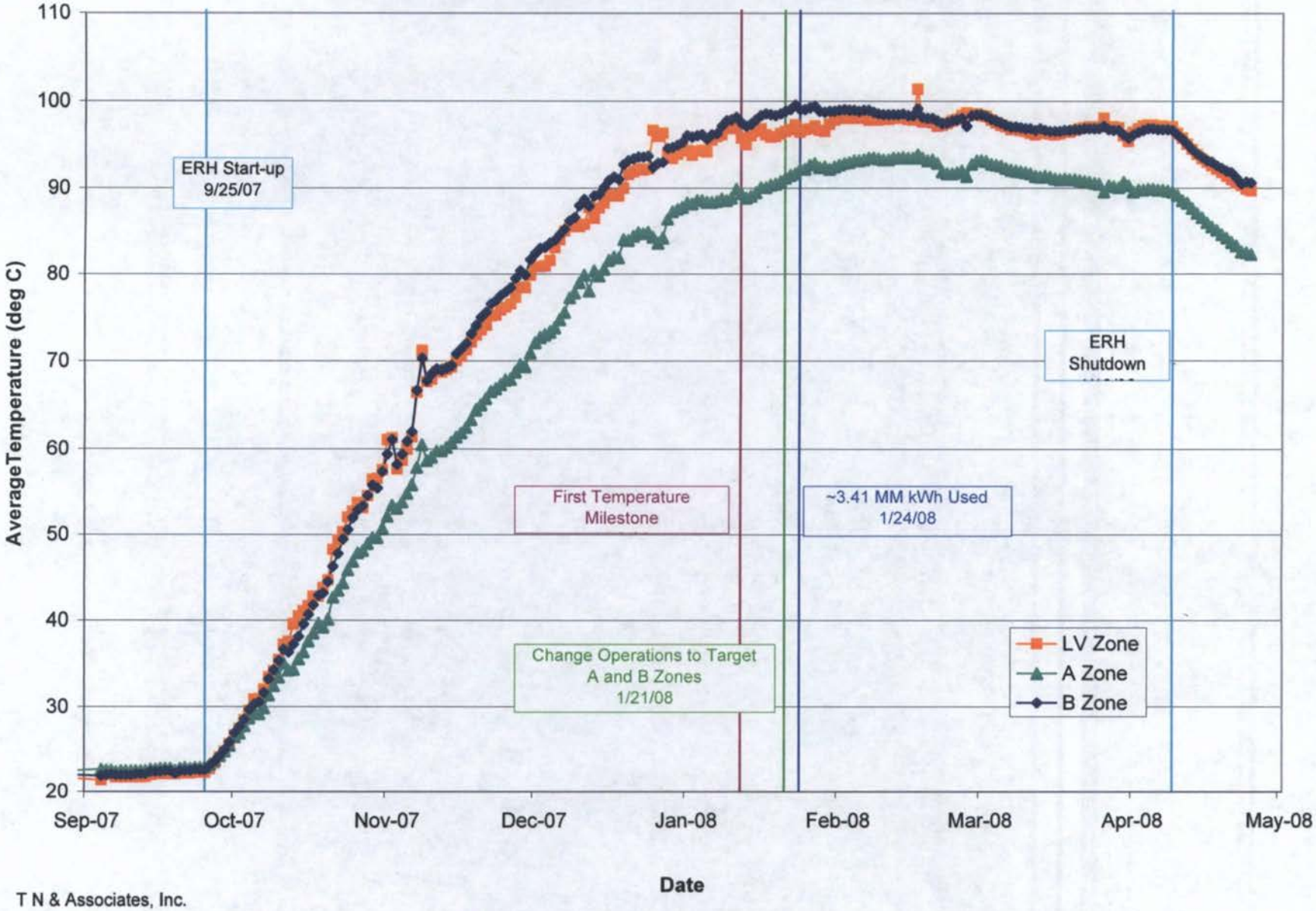
Graph 2
Average Temperature Versus Time Within ERH Area



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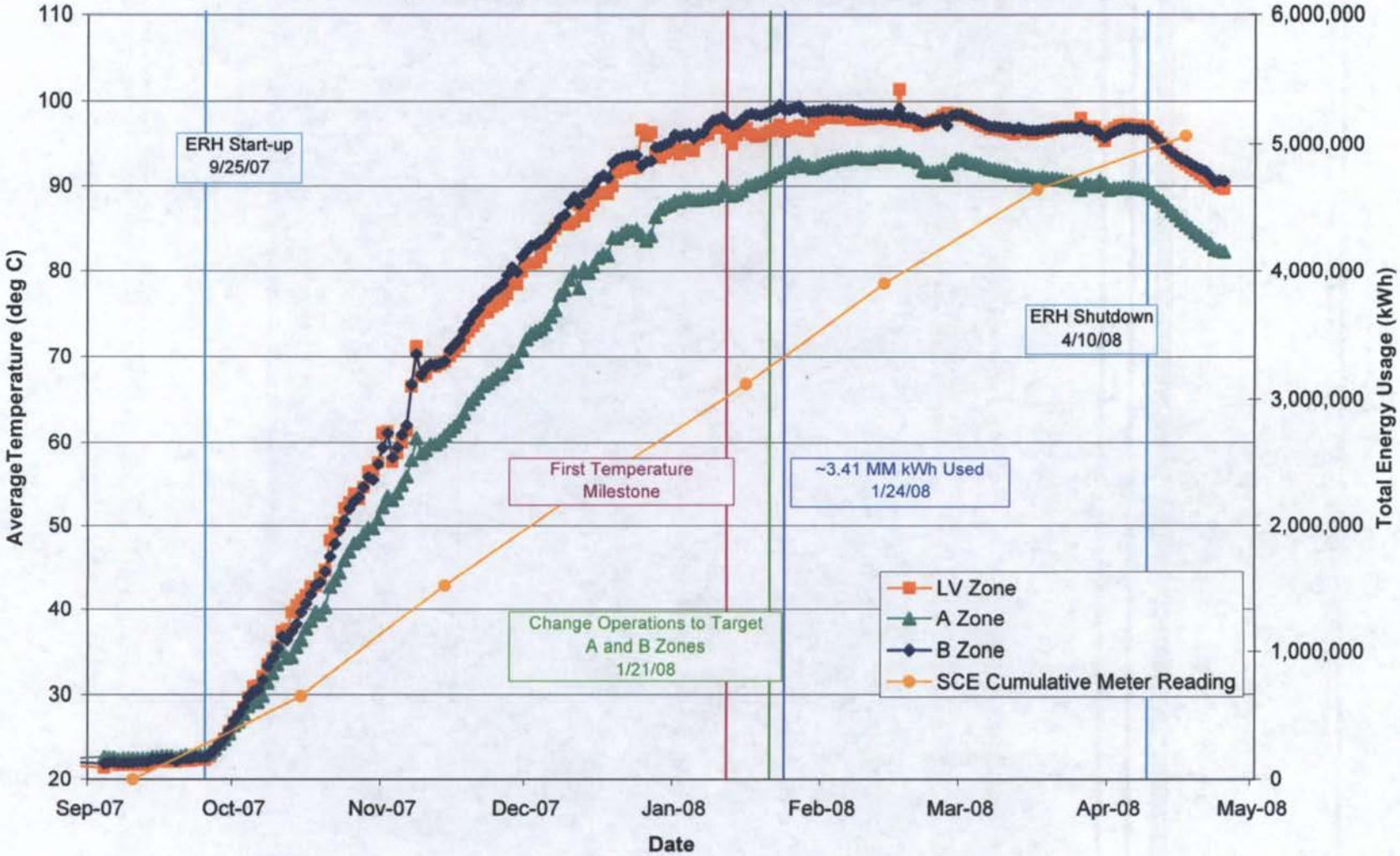
Graph 3
Average Temperature Versus Energy Within ERH Area



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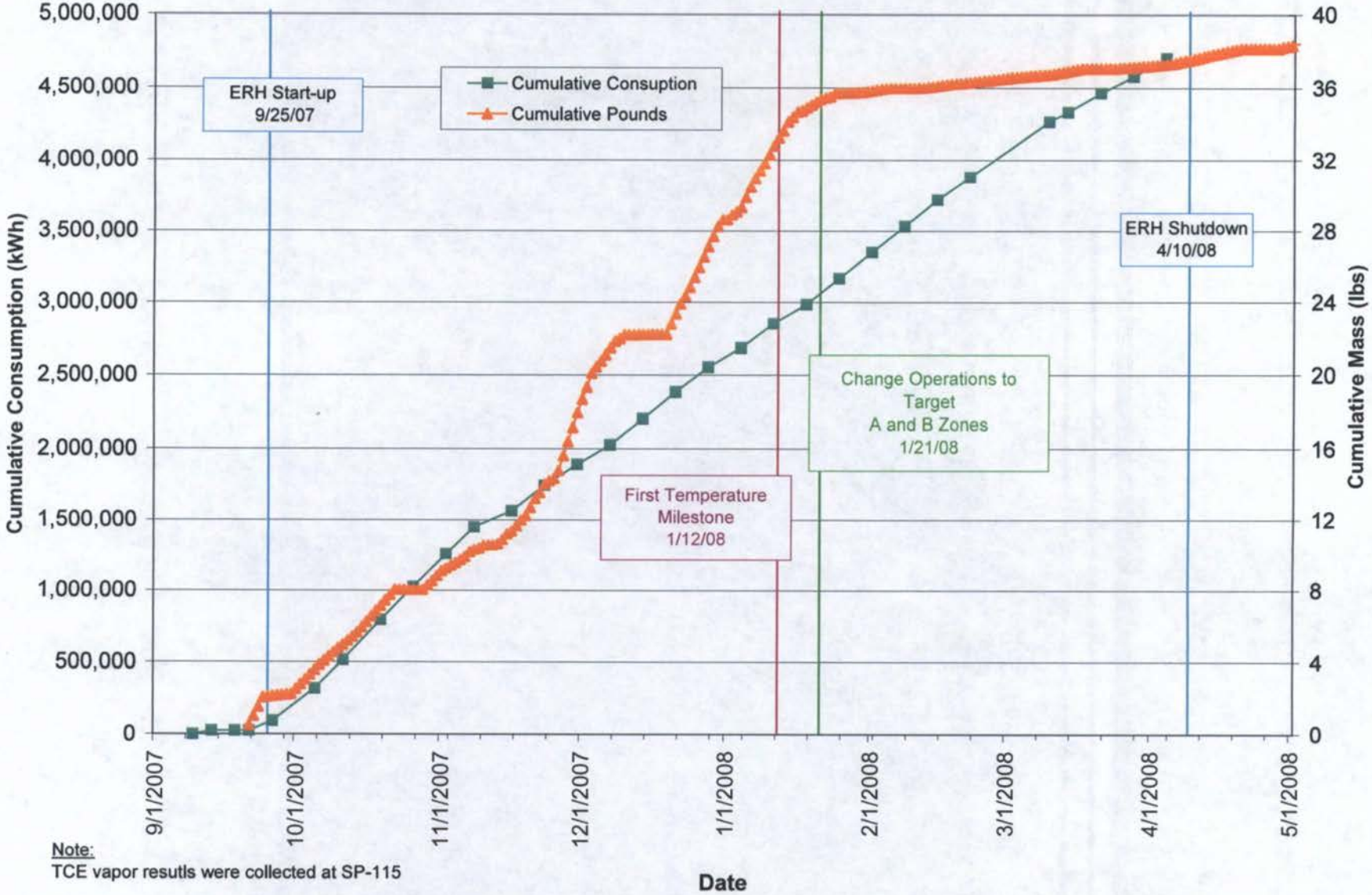
Graph 4
Energy Consumption and Cumulative TCE Mass Extracted from ERH Well Field



Note:
TCE vapor resutls were collected at SP-115

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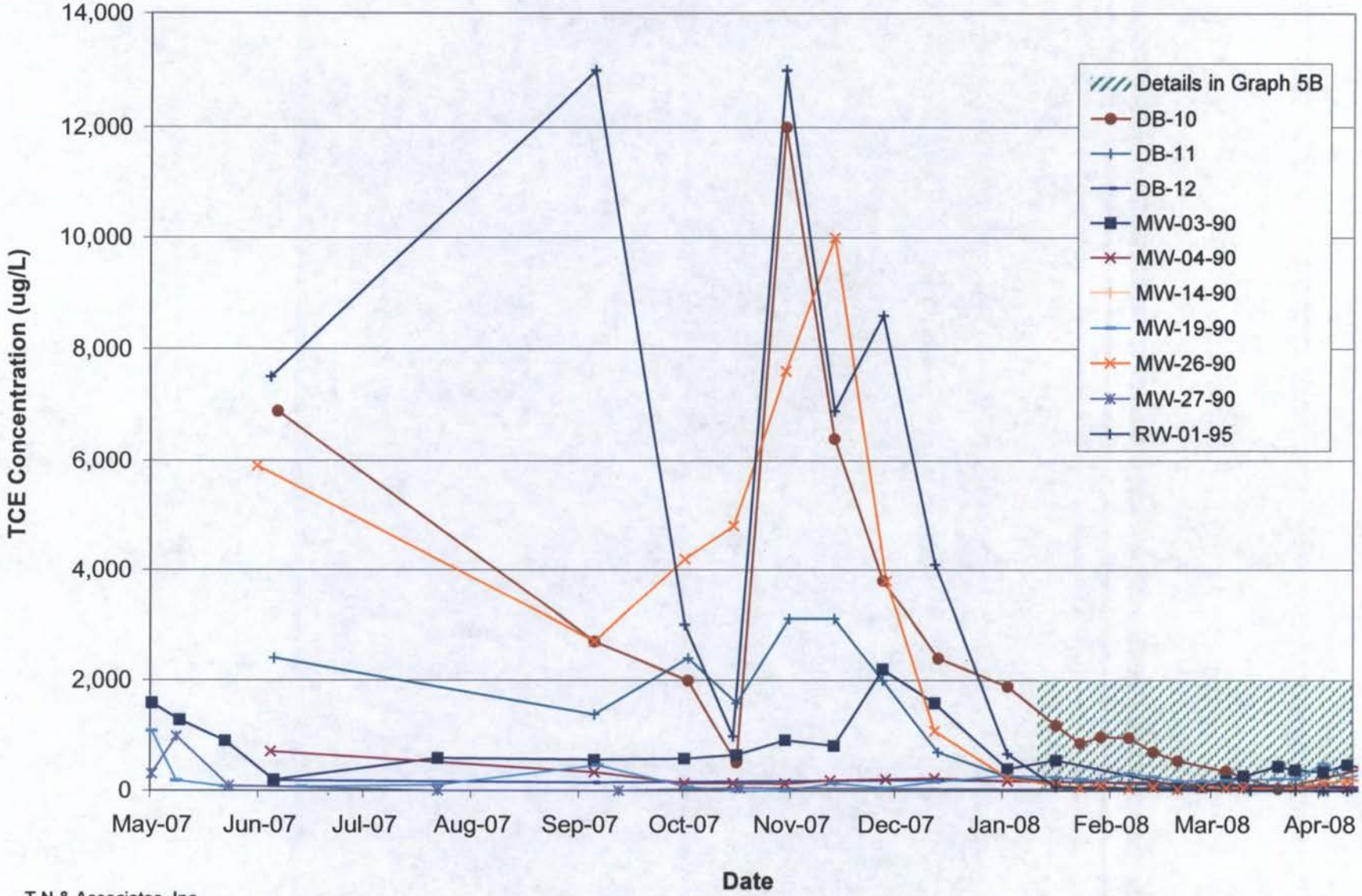
Graph 5a
Trichloroethene (TCE) in B Zone Groundwater Wells Within ERH Area
May 2007 Through April 2008



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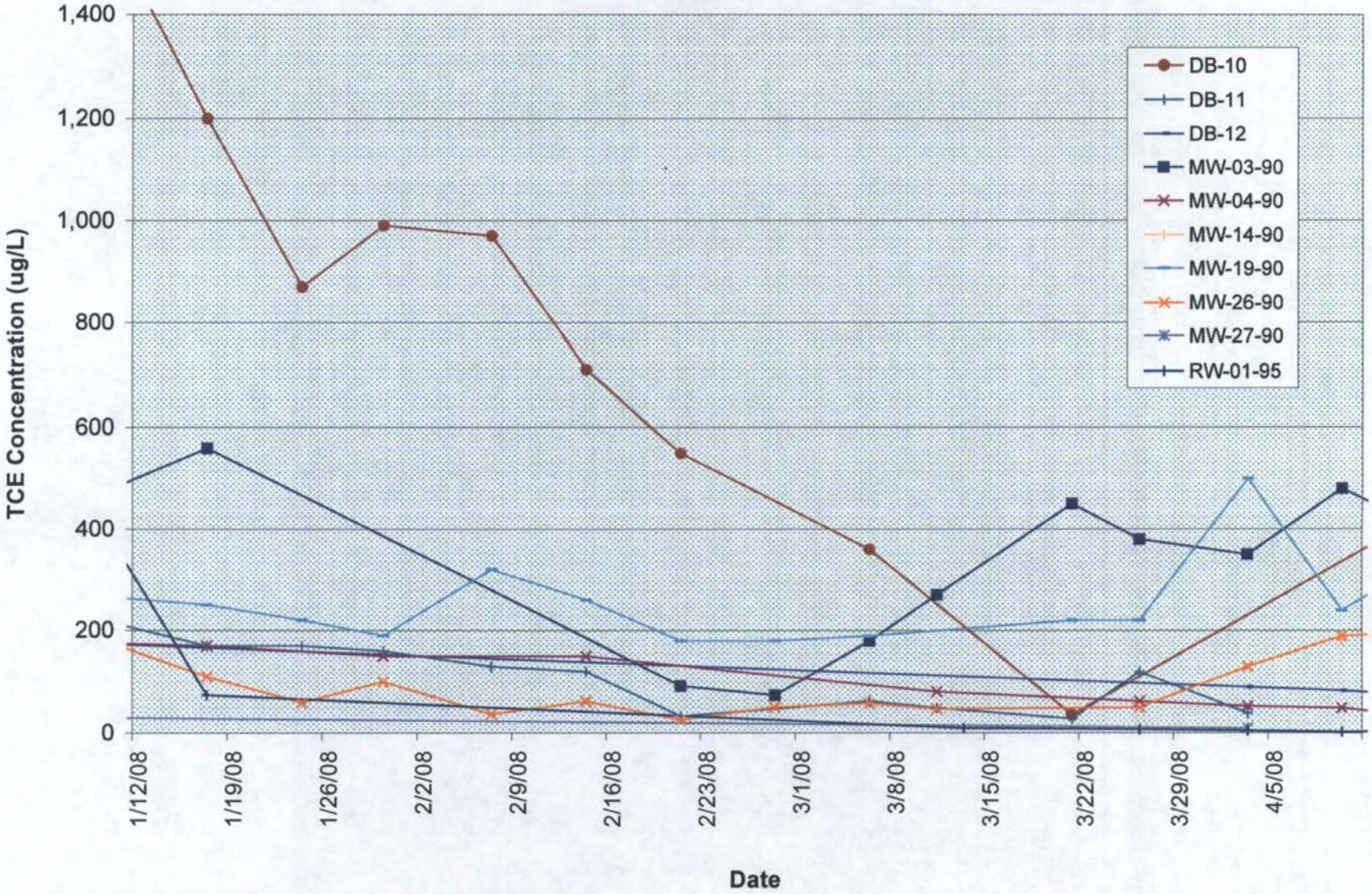
Graph 5b
Trichloroethene (TCE) in B Zone Groundwater Wells Within ERH Area
January 12, 2008 Through April 11, 2008



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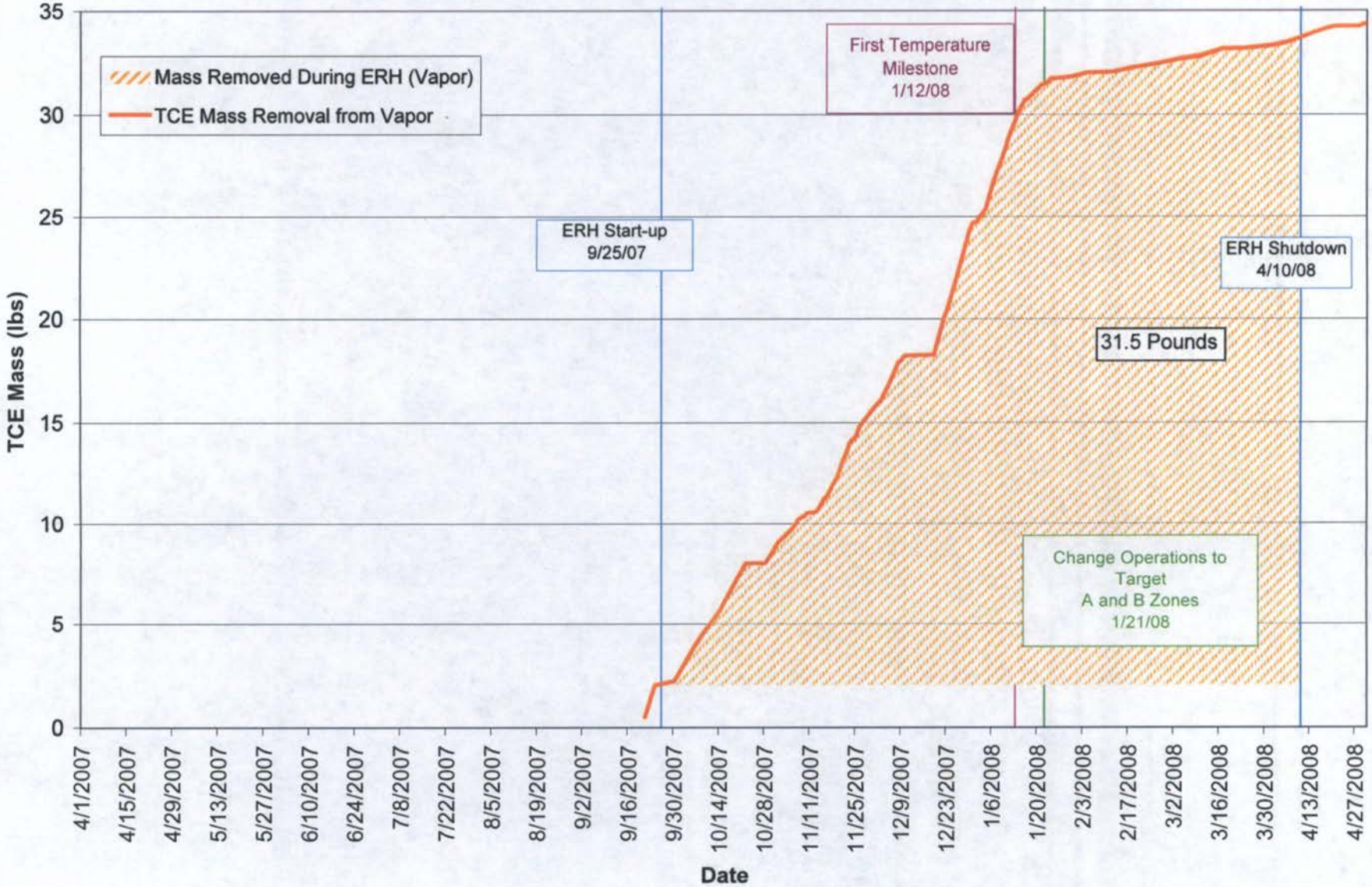
Graph 6a
Cumulative TCE Mass Removed from Vapor (ERH Treatment Area)



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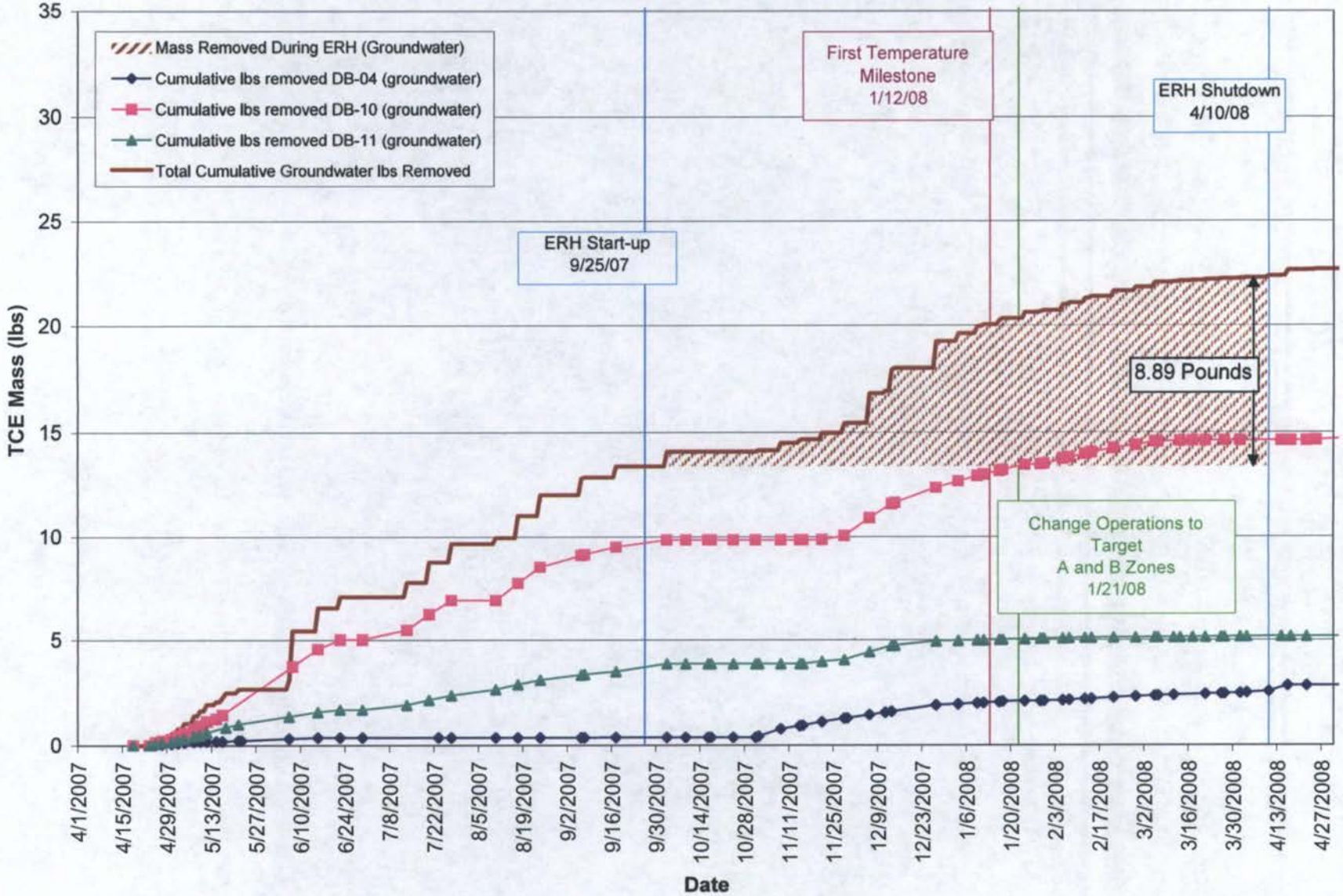
Graph 6b
Cumulative TCE Mass Removed from Groundwater (ERH Treatment Area)



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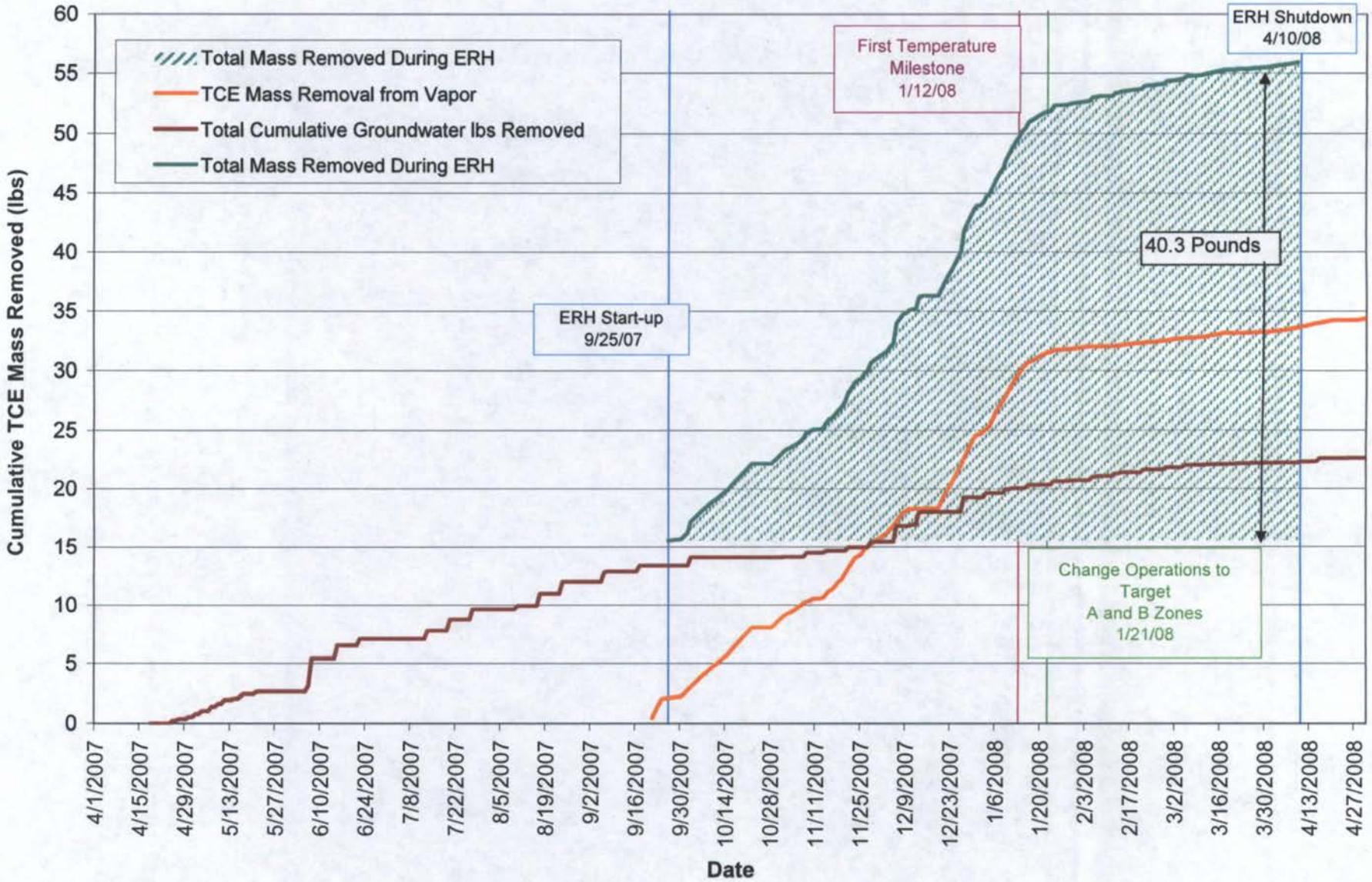
Graph 6c
Cumulative TCE Mass Removed from Vapor and Groundwater (ERH Treatment Area)



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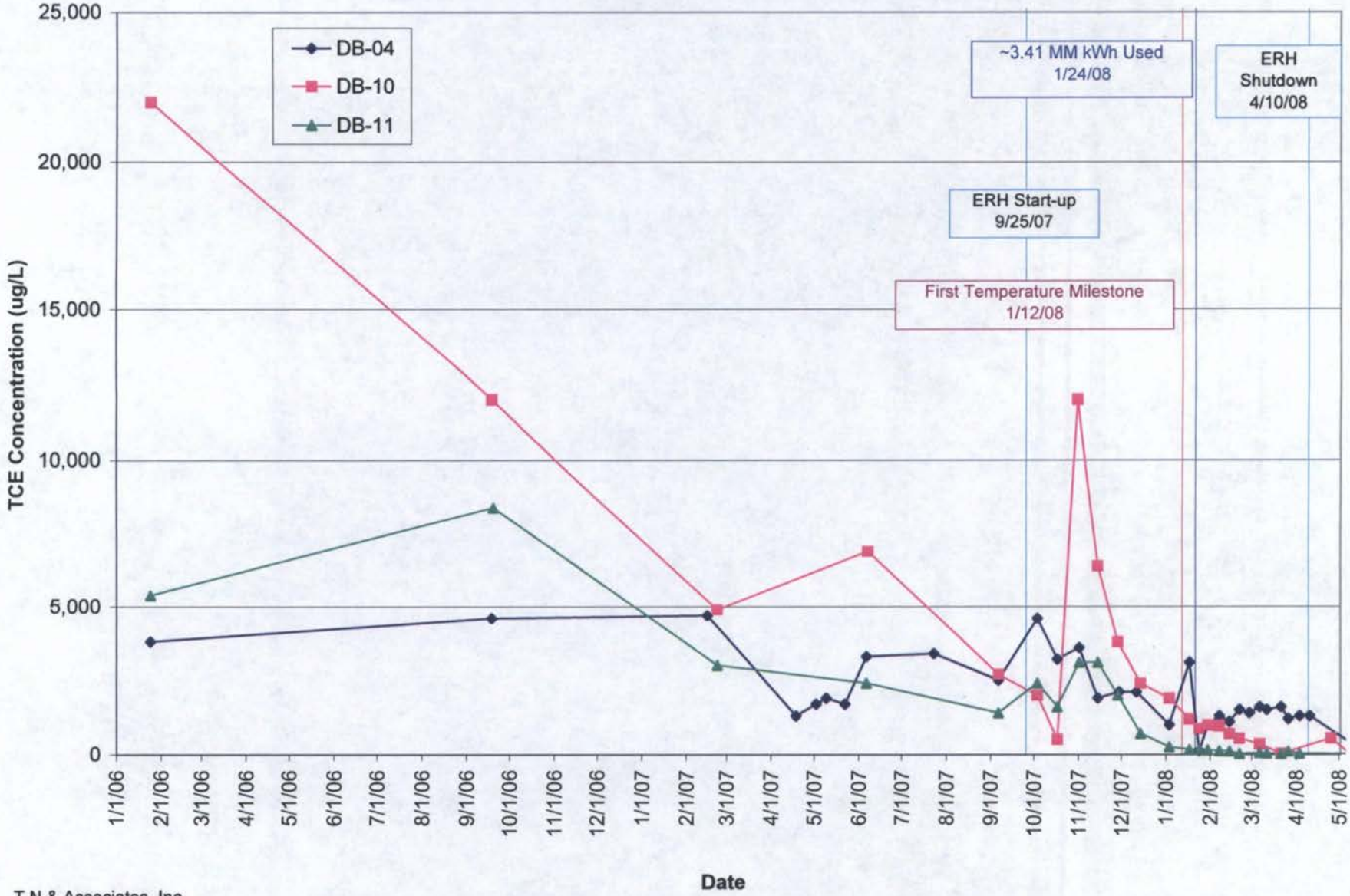
Graph 6d
Trichloroethene (TCE) in Groundwater at DB-04, DB-10, and DB-11



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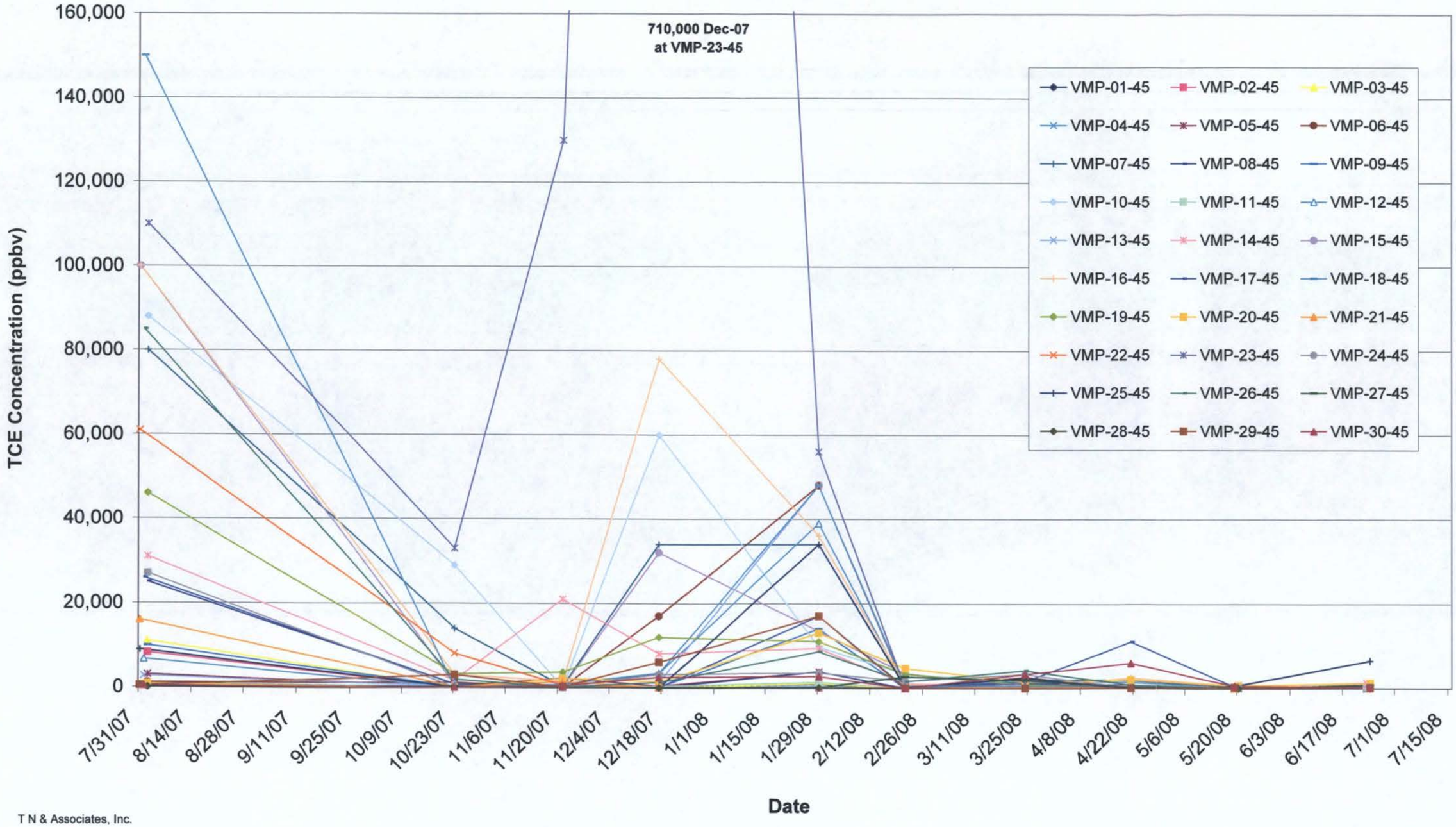
Graph 7a
TCE Vapor Concentrations in Lower Vadose VMPs (45 ft bgs)



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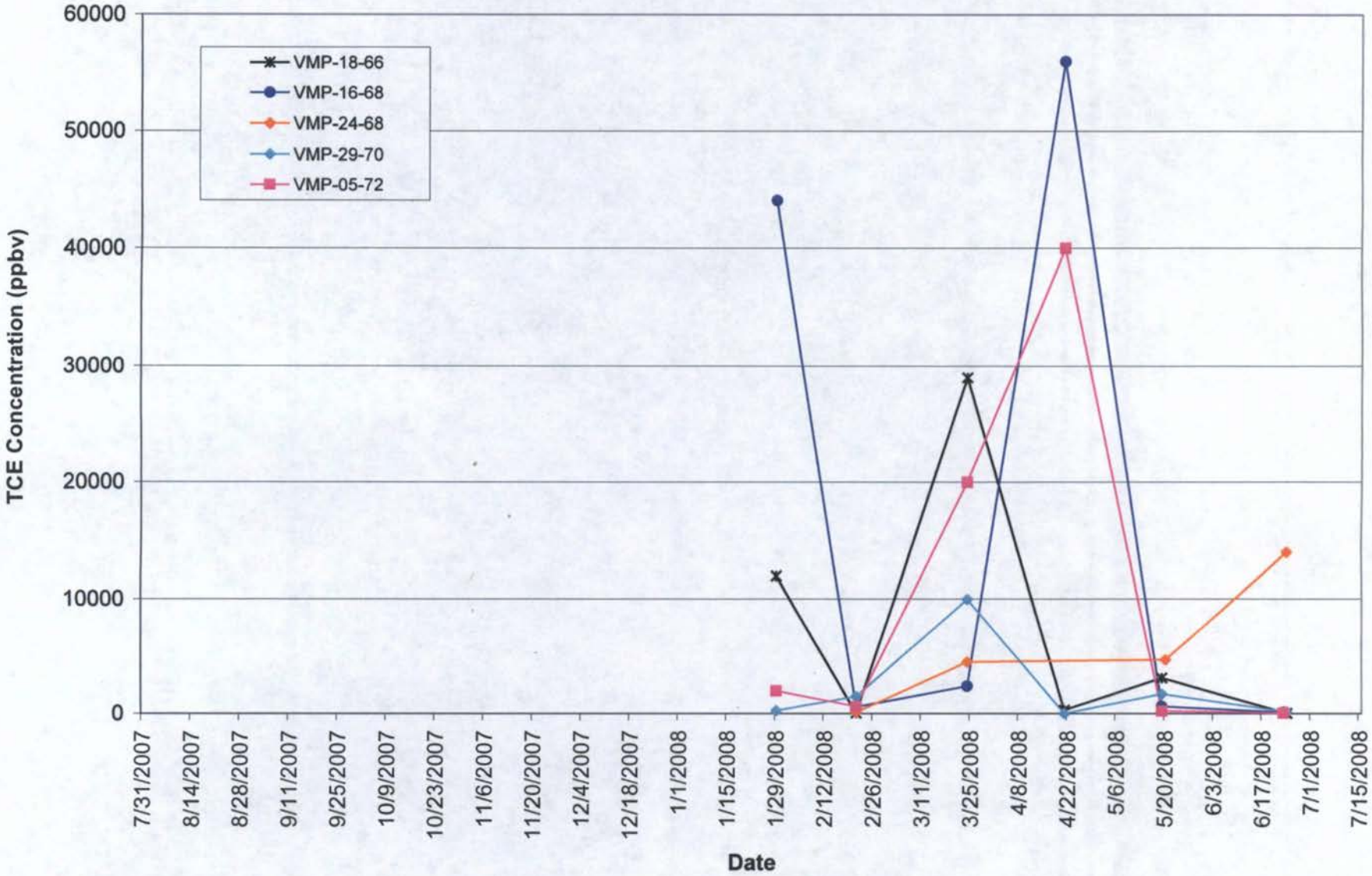
Graph 7b
TCE Vapor Concentrations in A Zone VMPs (65-72 ft bgs)



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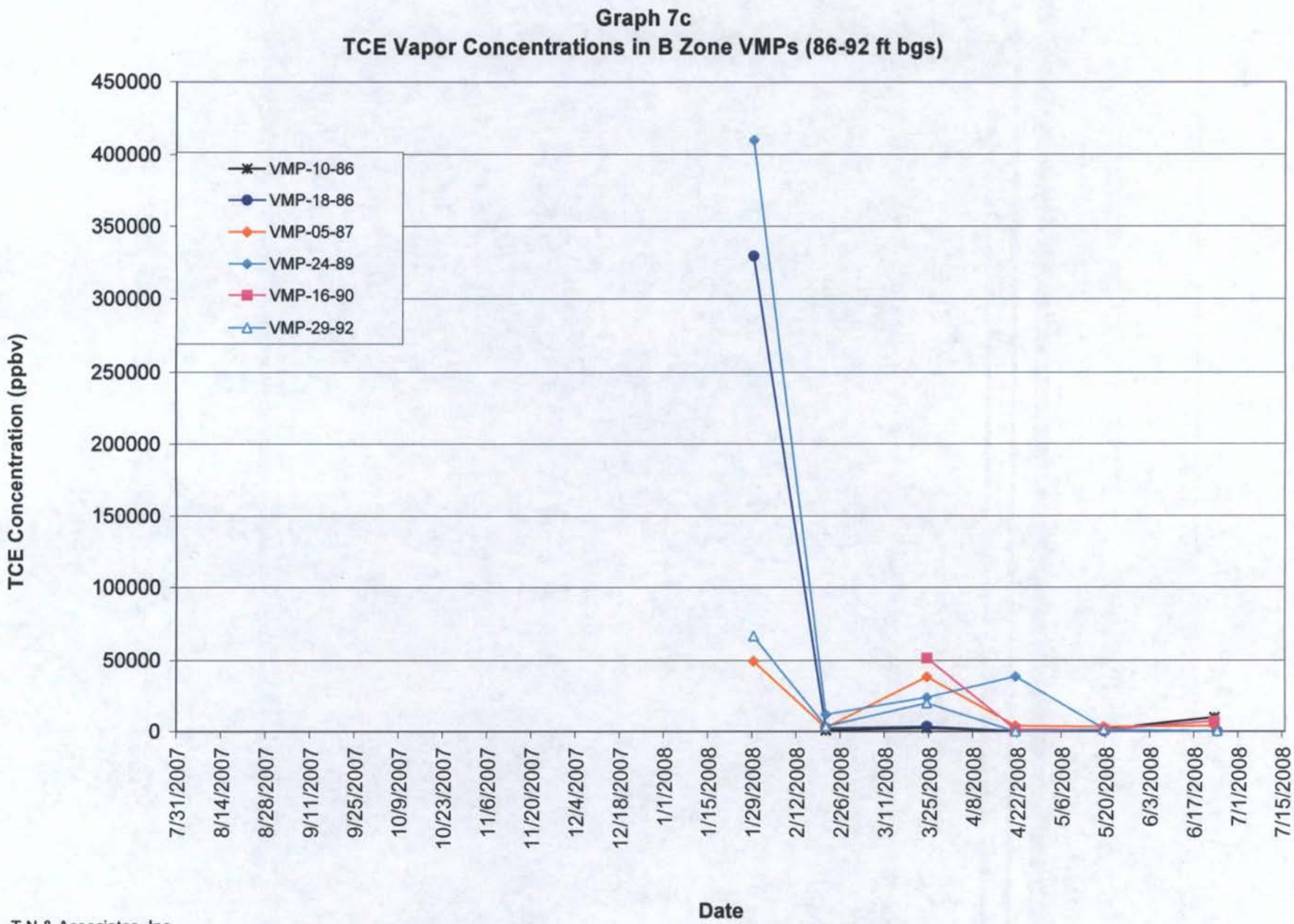

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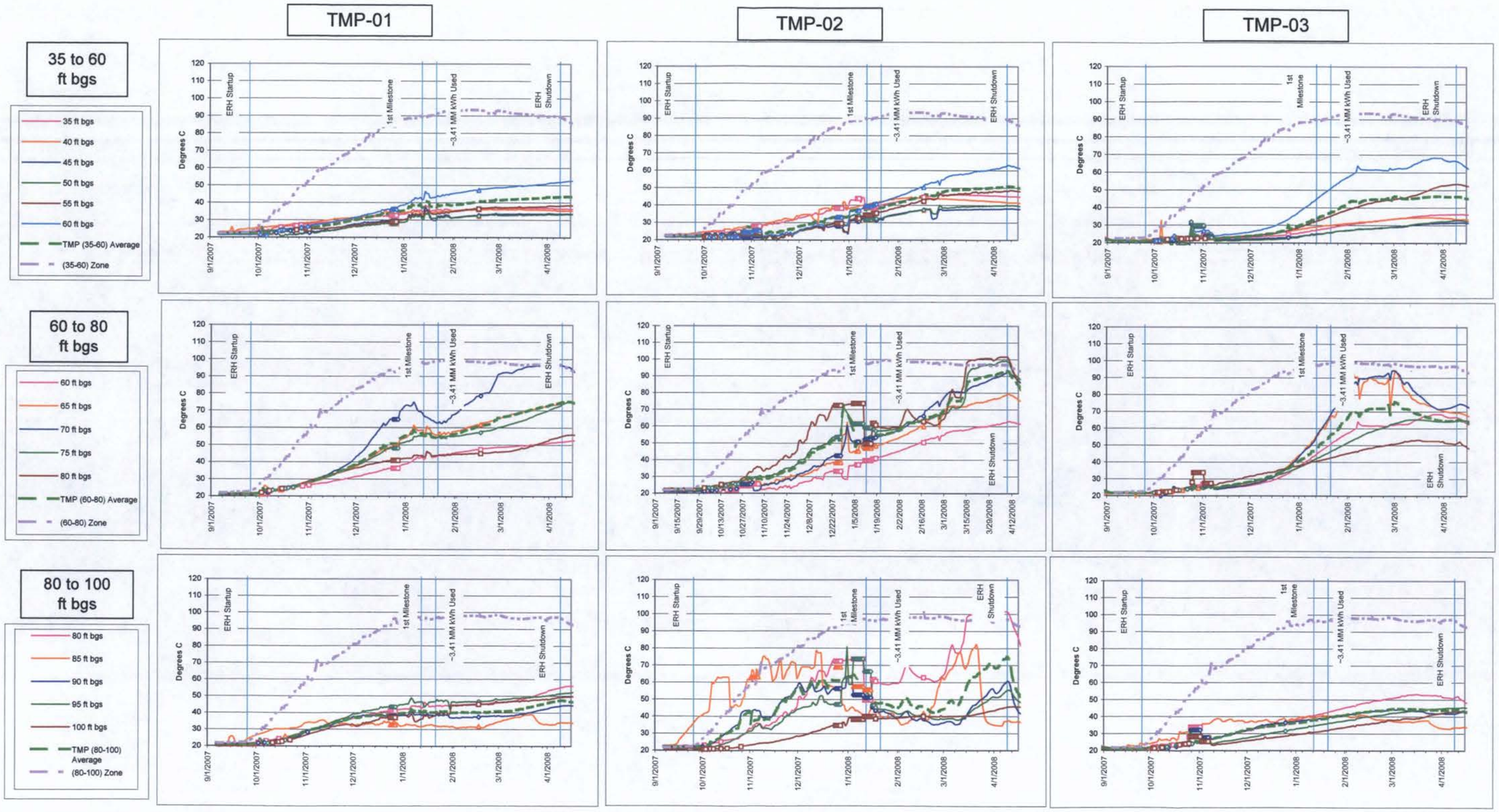
Graph 8a
Temperature History for TMP-01, TMP-02, and TMP-03



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

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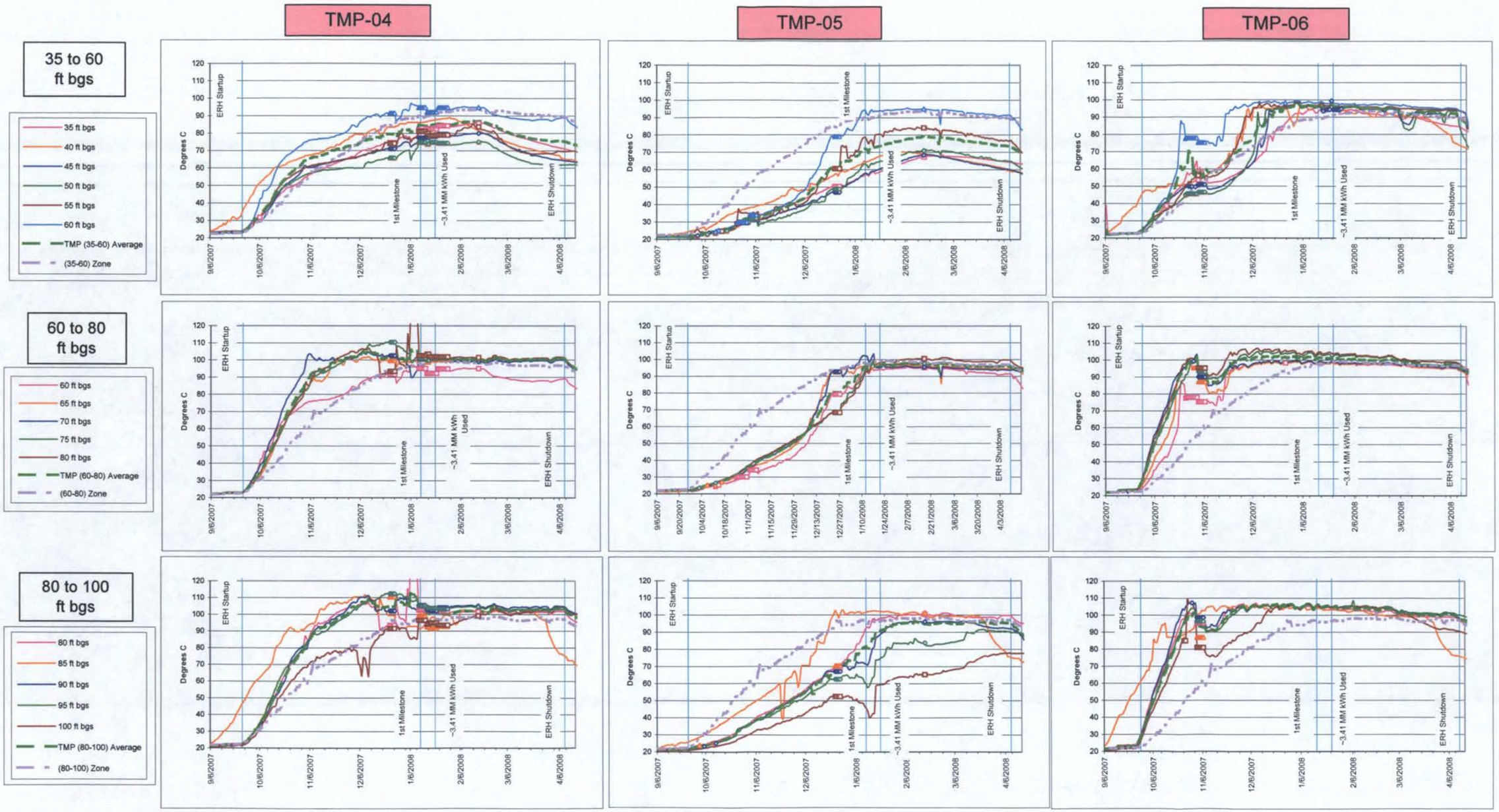
Graph 8b
Temperature History for TMP-04, TMP-05, and TMP-06



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

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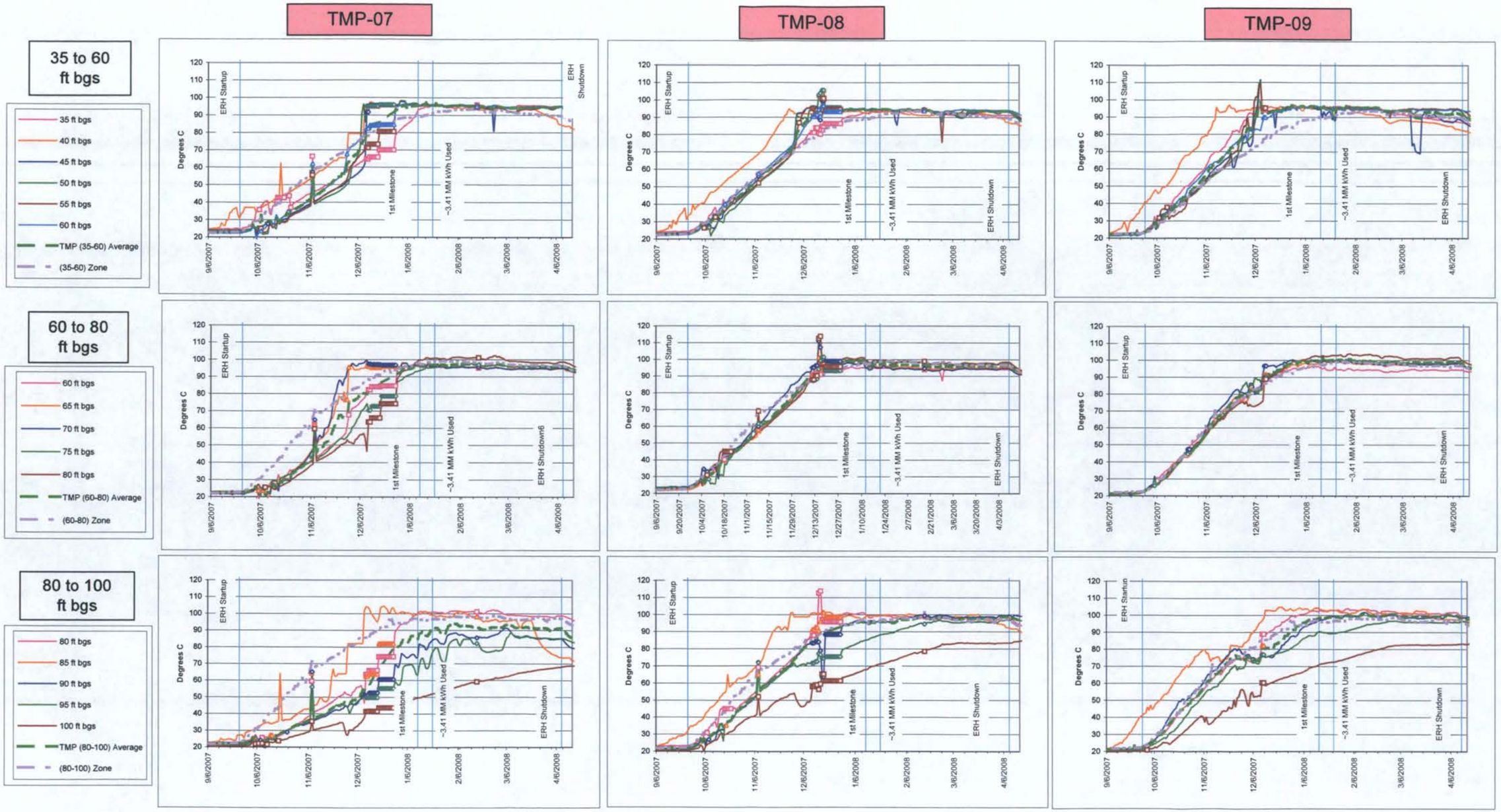
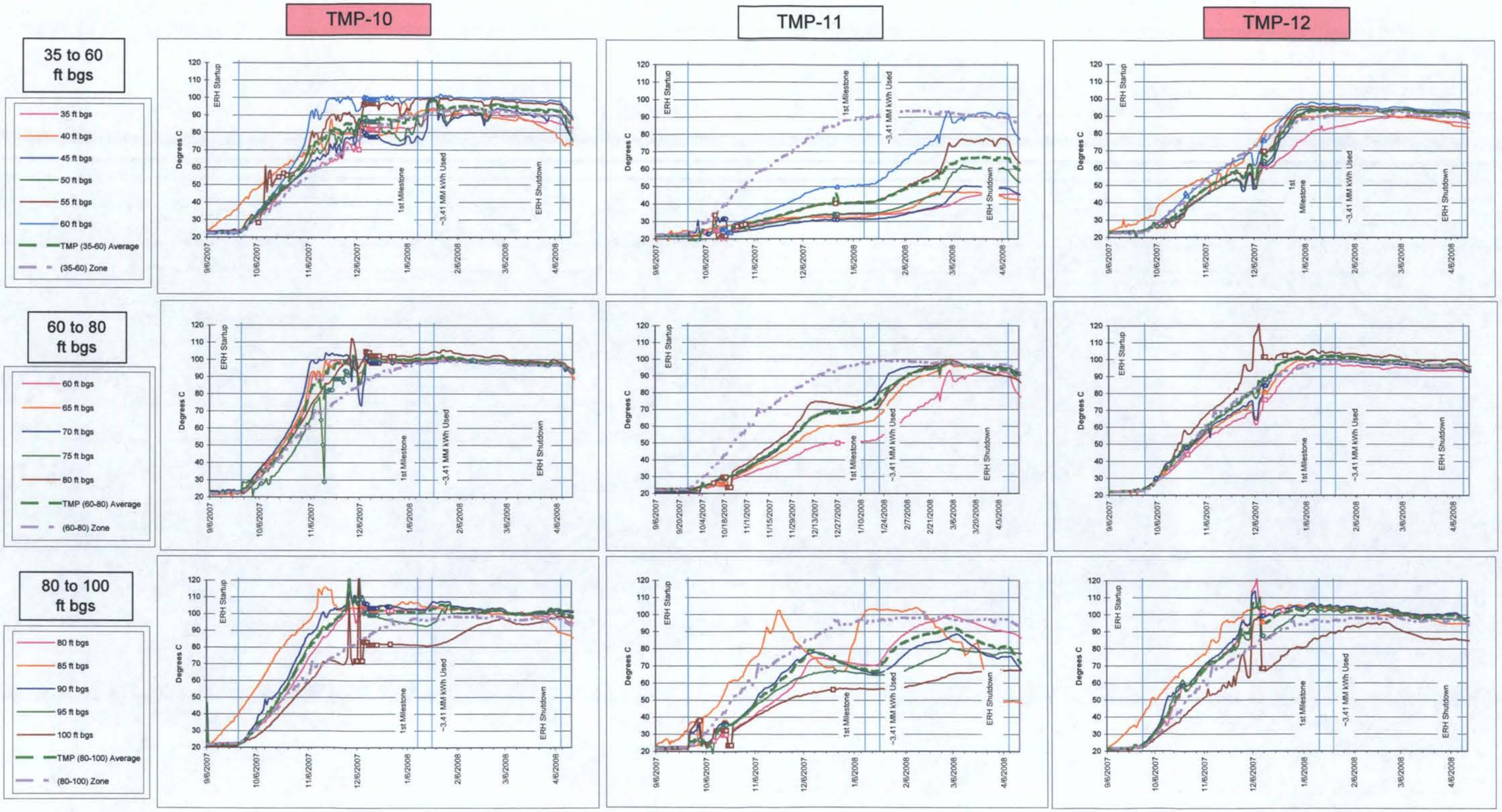
Graph 8c
Temperature History for TMP-07, TMP-08, and TMP-09



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

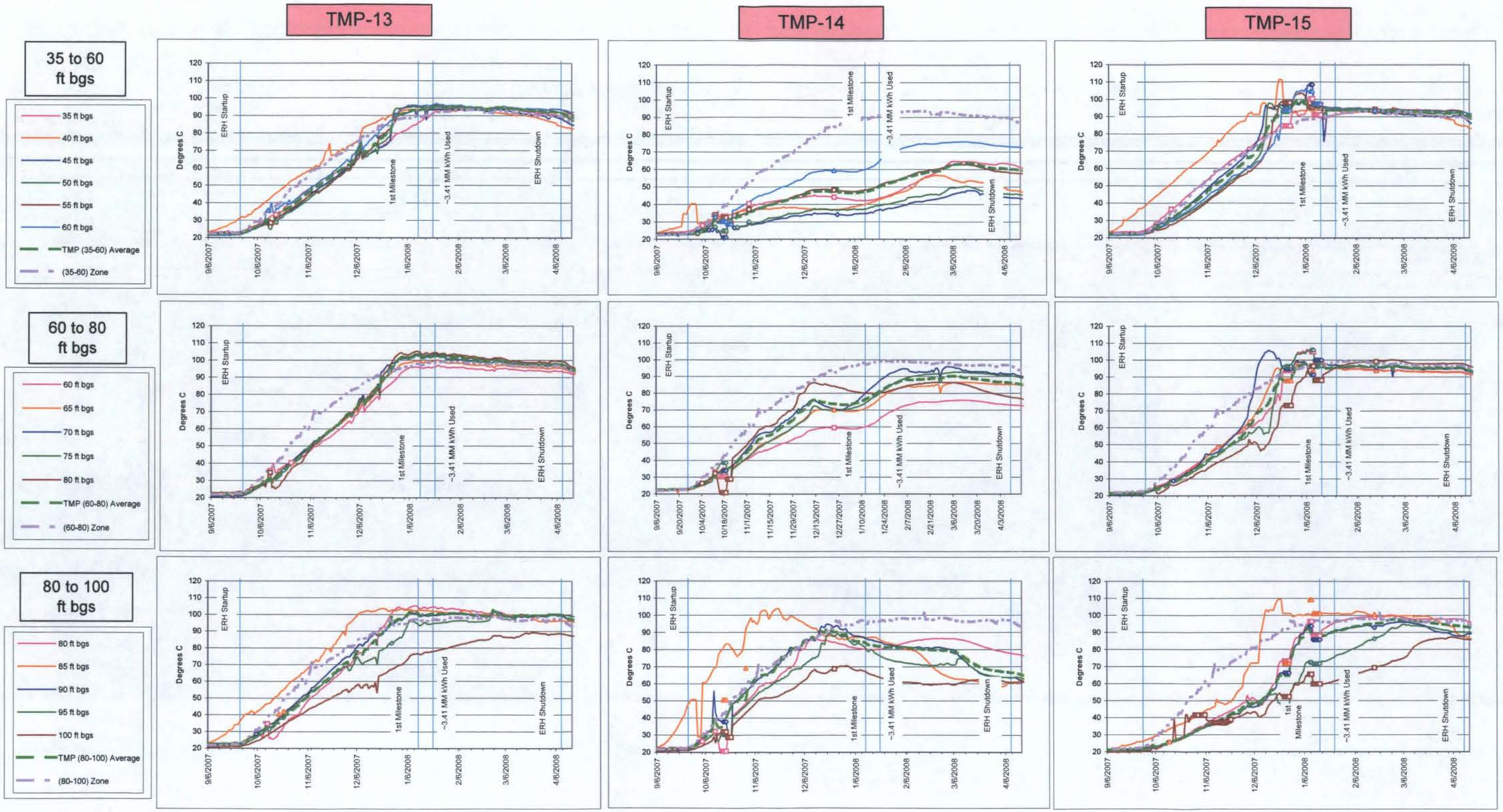
Graph 8d
Temperature History for TMP-10, TMP-11, and TMP-12



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

Graph 8e
Temperature History for TMP-13, TMP-14, and TMP-15



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

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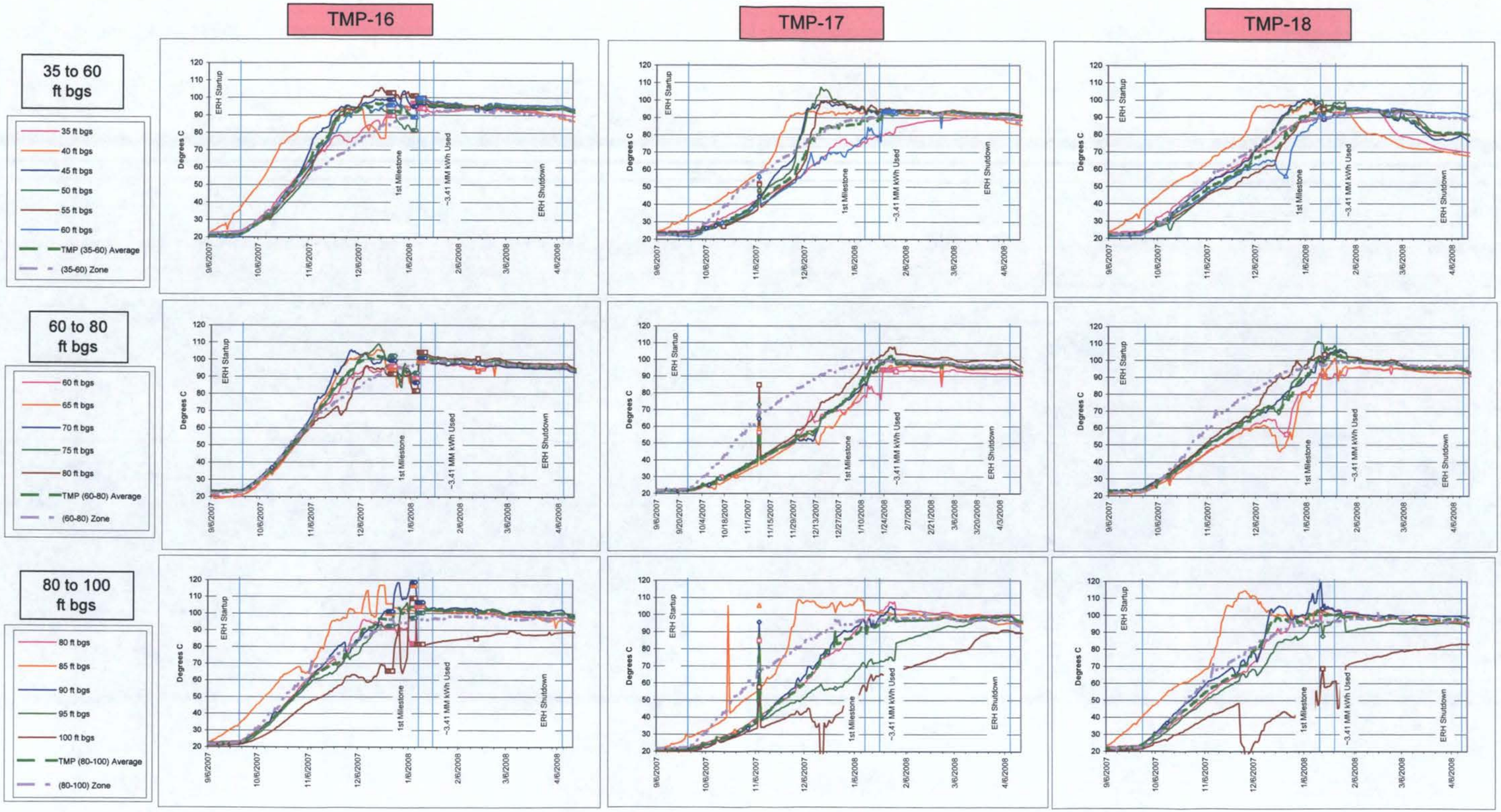
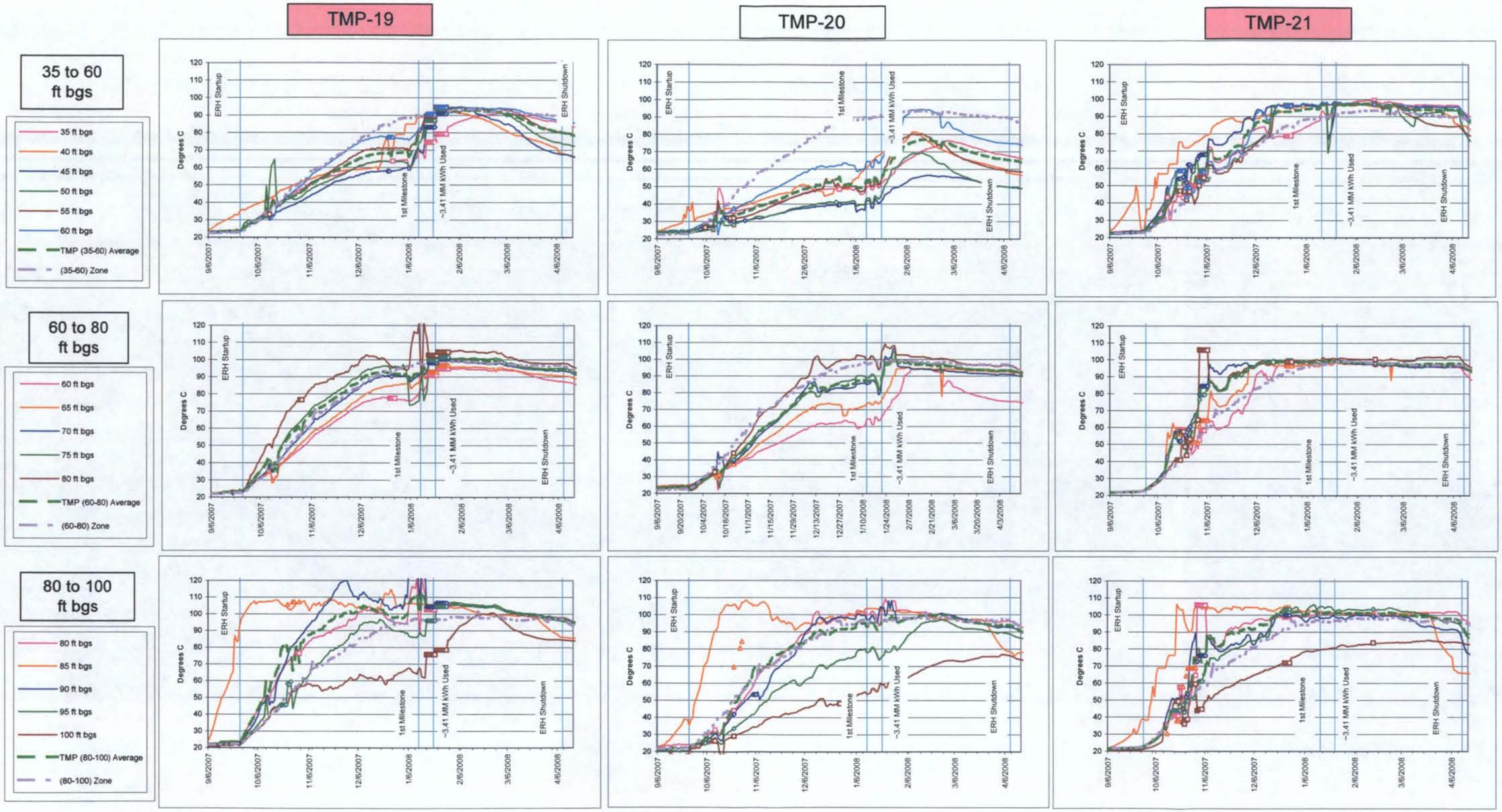
Graph 8f
Temperature History for TMP-16, TMP-17, and TMP-18



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

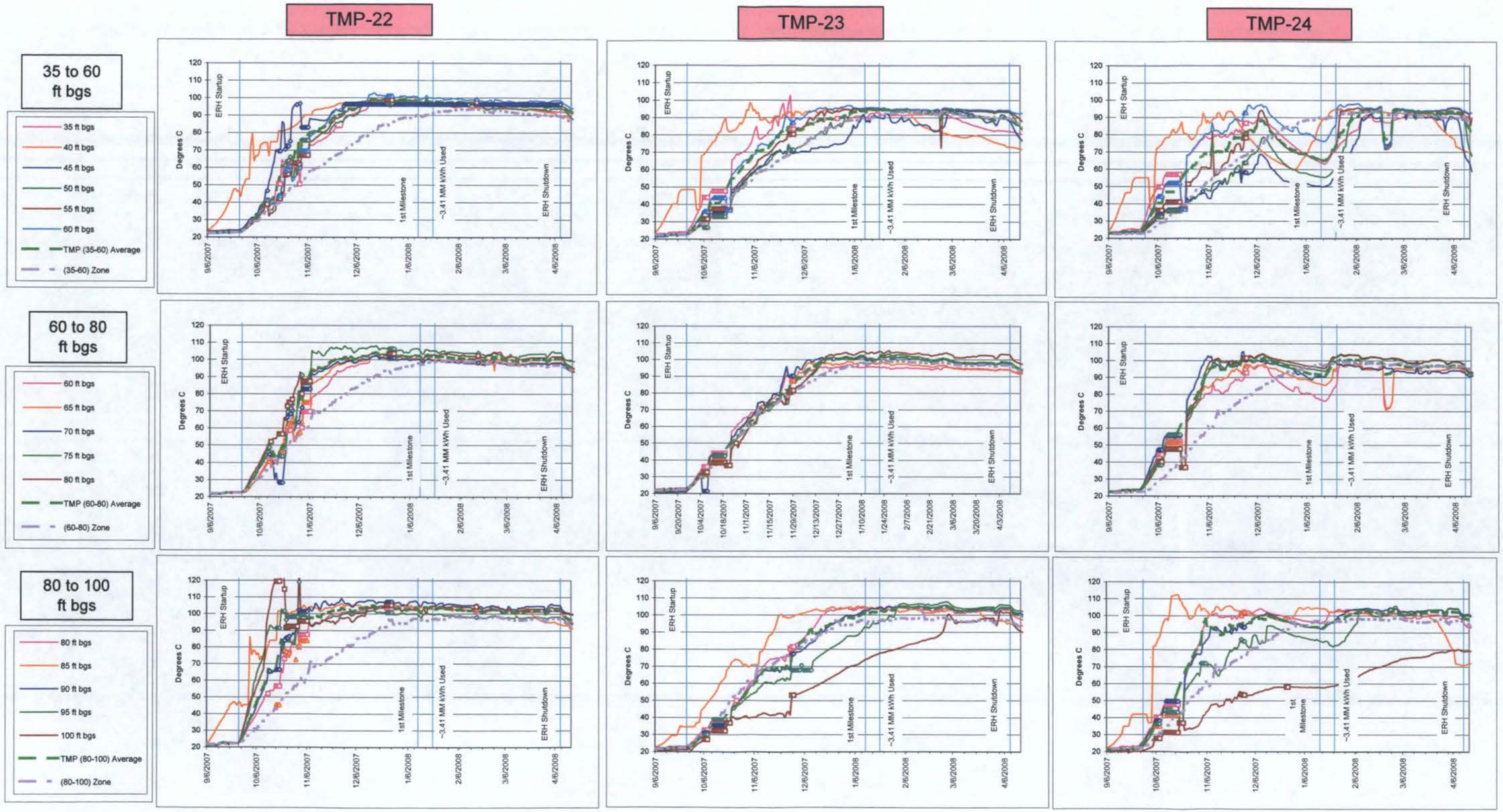
Graph 8g
Temperature History for TMP-19, TMP-20, and TMP-21



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

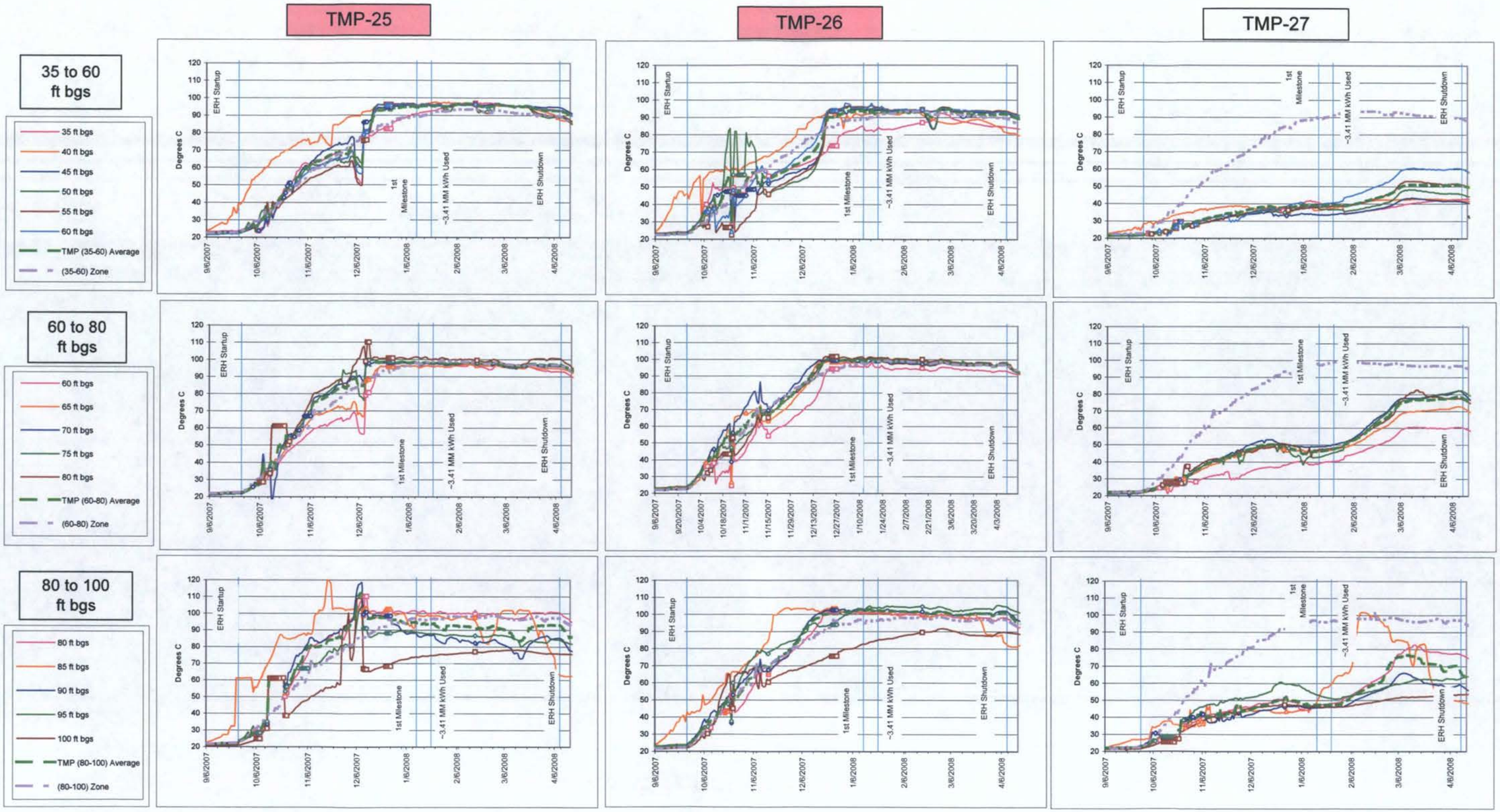
Graph 8h
Temperature History for TMP-22, TMP-23, and TMP-24



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

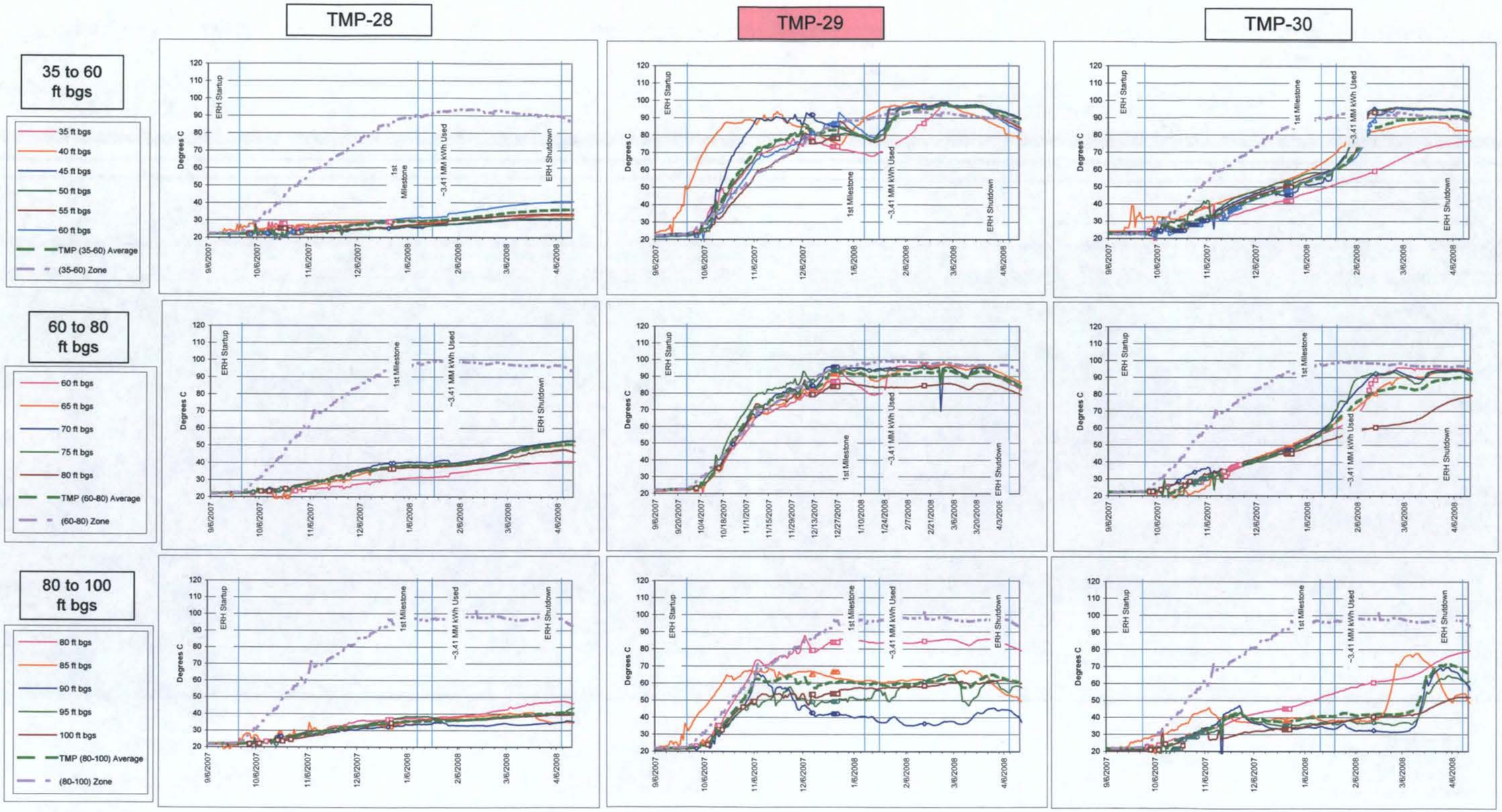
Graph 8i
Temperature History for TMP-25, TMP-26, and TMP-27



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

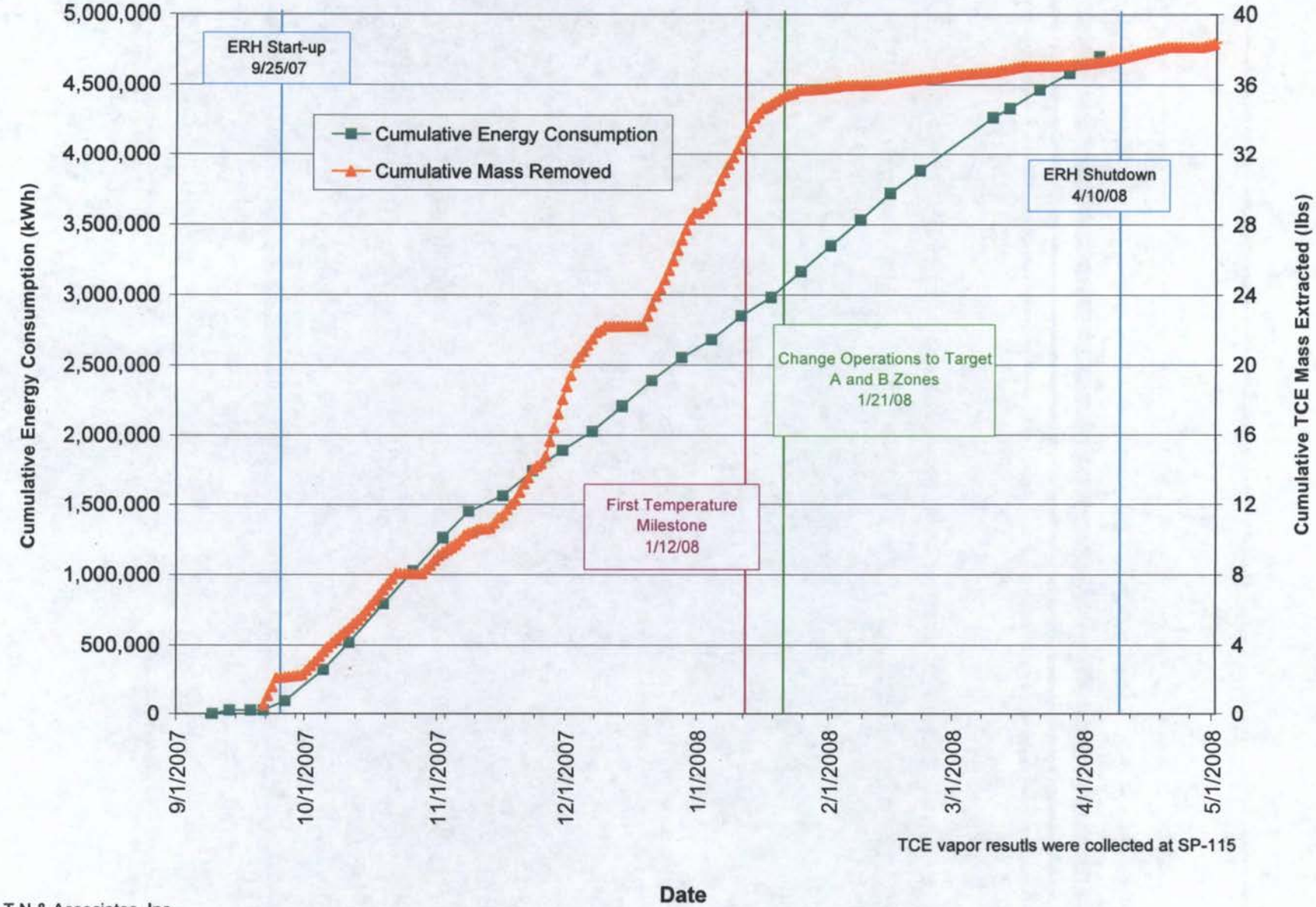
Graph 8j
Temperature History for TMP-28, TMP-29, and TMP-30



Notes:

- △ □ ◇ Symbols denote equipment logging issues
- Averages were calculated from readings within the ERH area
- Inconsistent or impossible readings not shown
- TMP-06 TMPs with pink background are located within the ERH Area

Graph 9
Energy Consupmtion and TCE Mass Extracted from ERH Well Field



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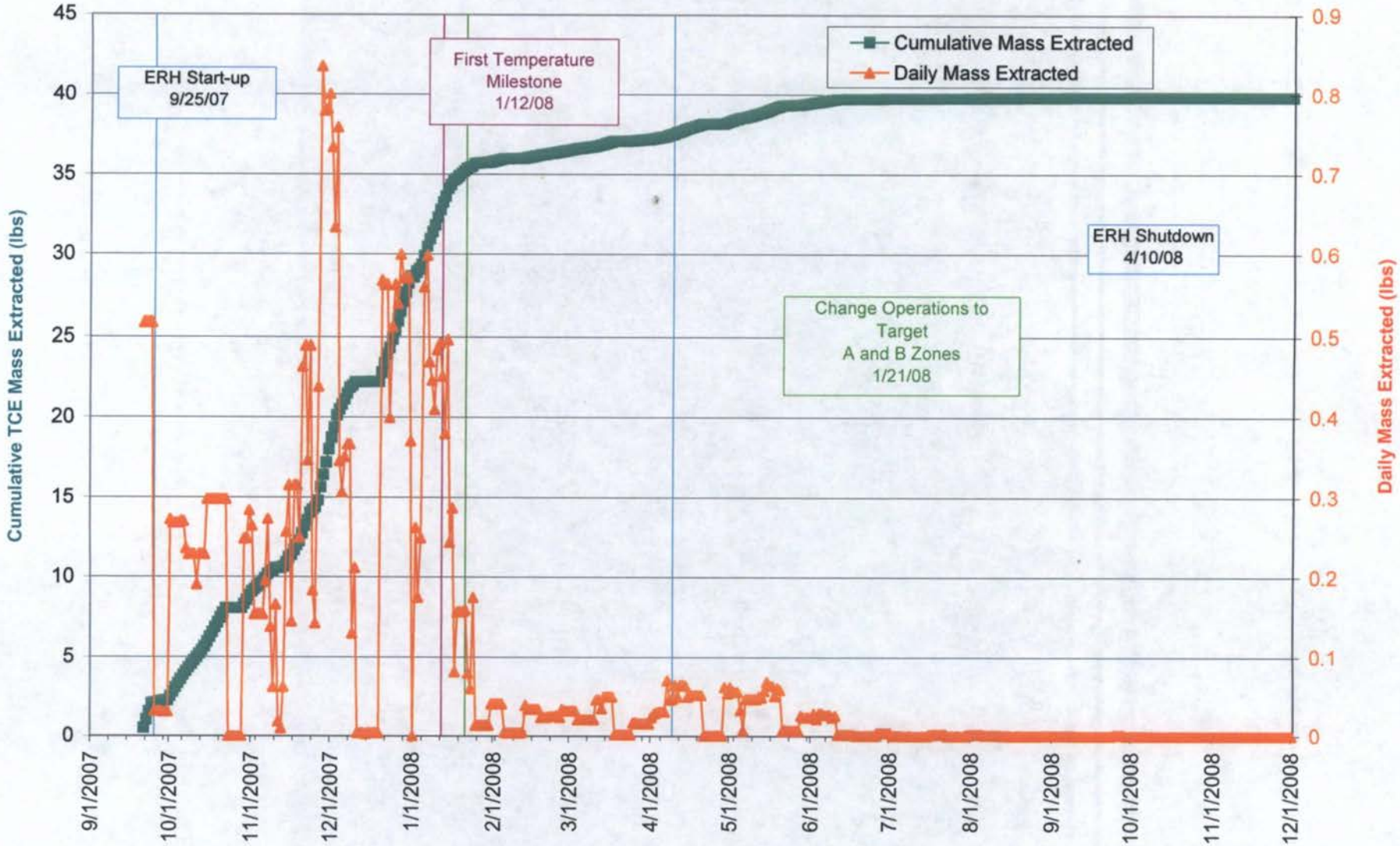
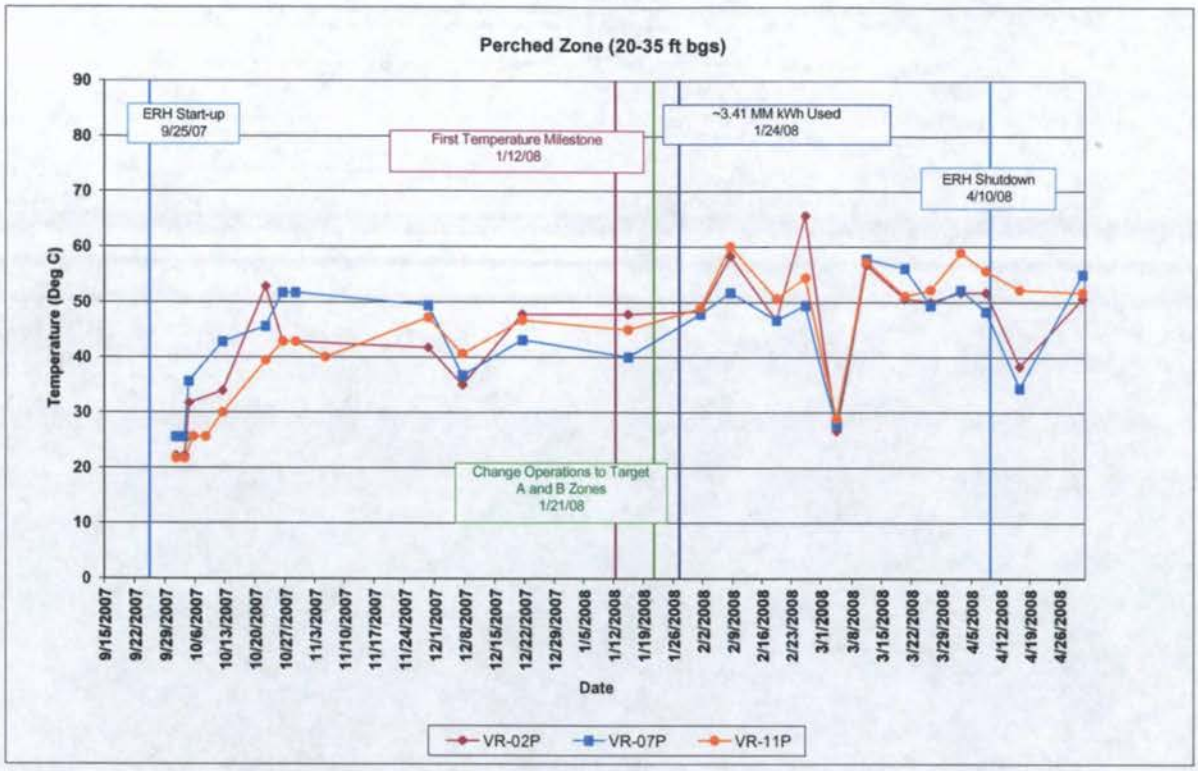
Graph 10
TCE Mass Extracted from ERH Well Field

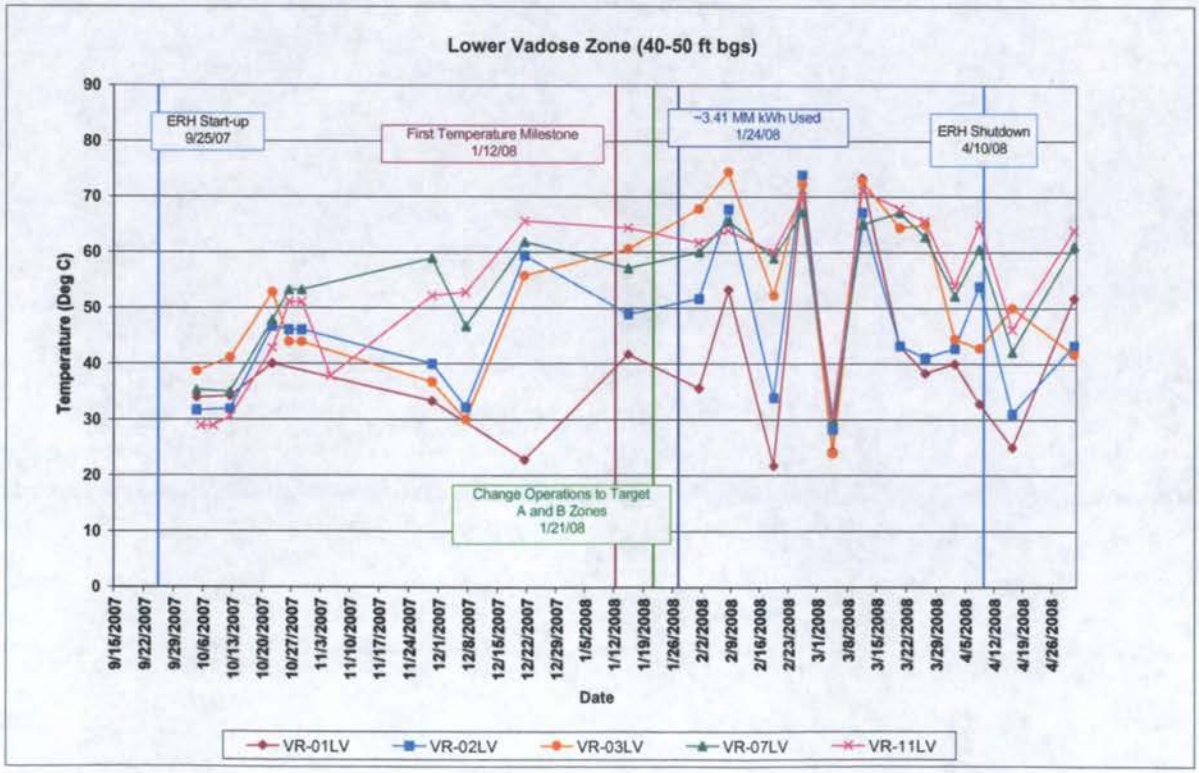


TCE vapor results were collected at SP-115 Analytical and SCFM at FI-702

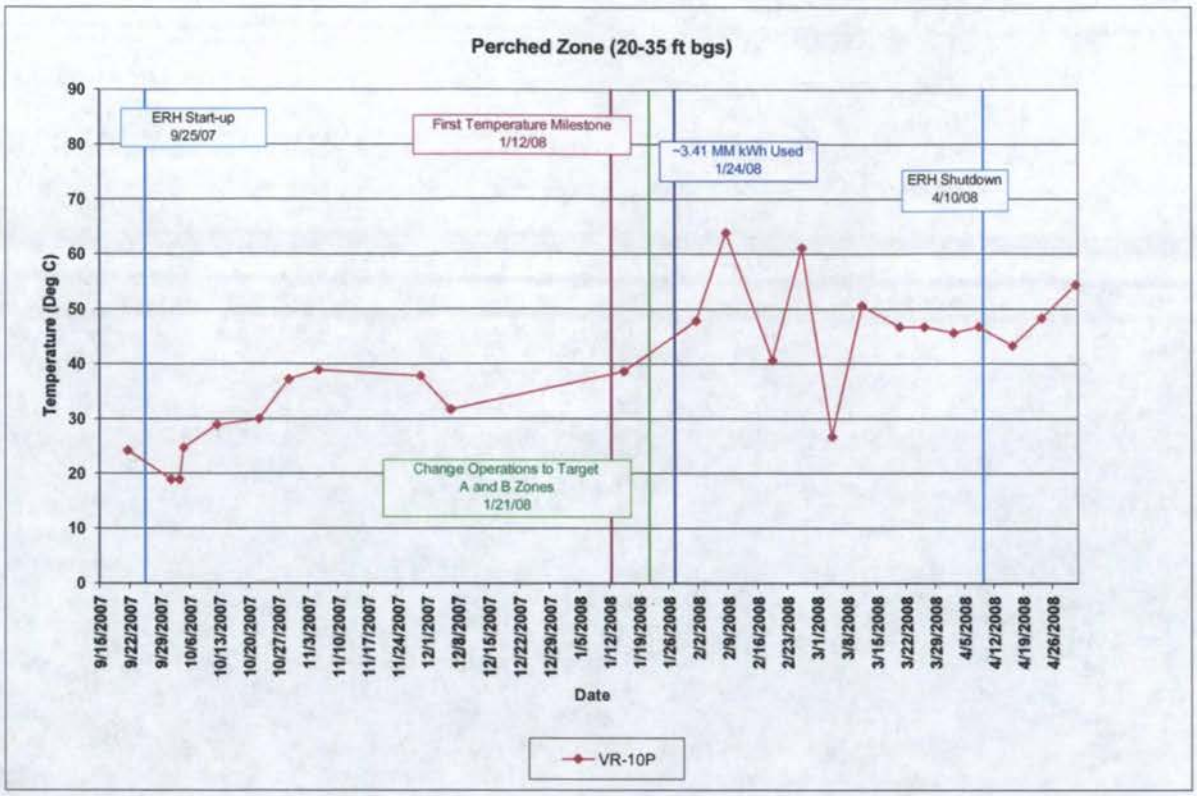
T N & Associates, Inc.

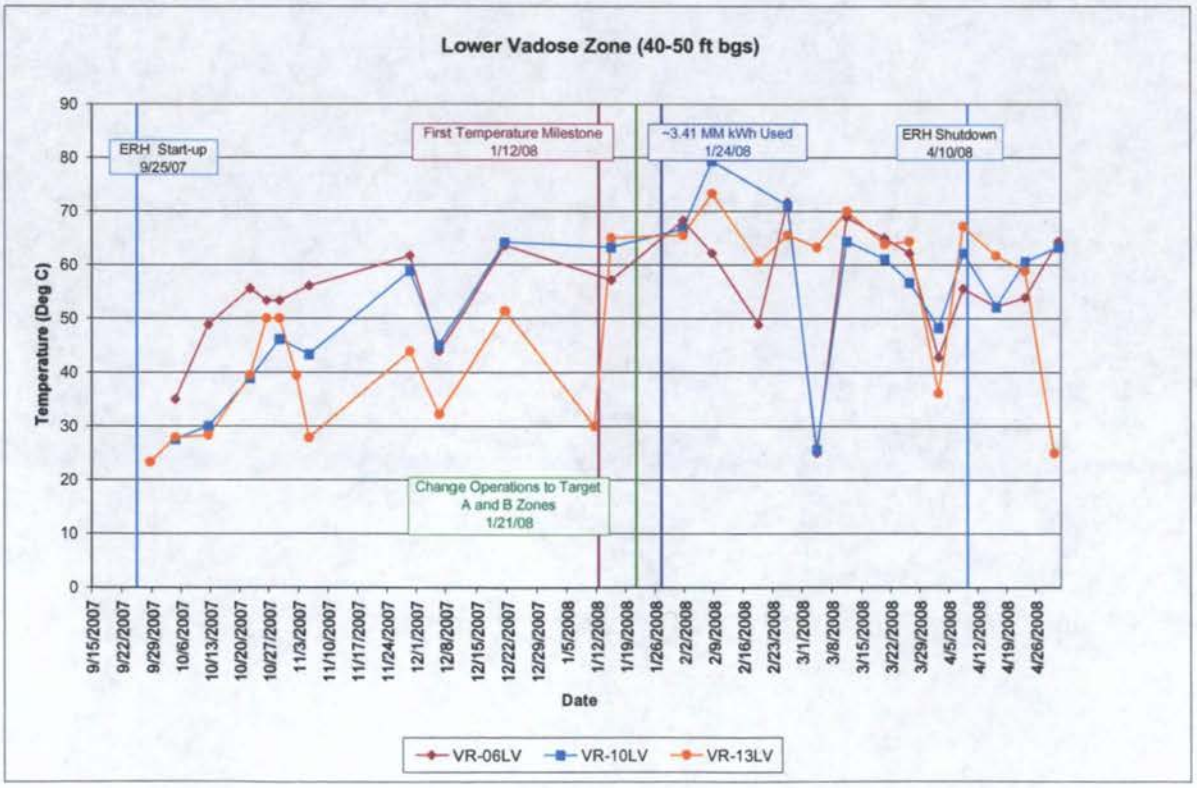
Graph 11a
Vapor Recovery Wellhead Temperature Data for ERH Sector 801



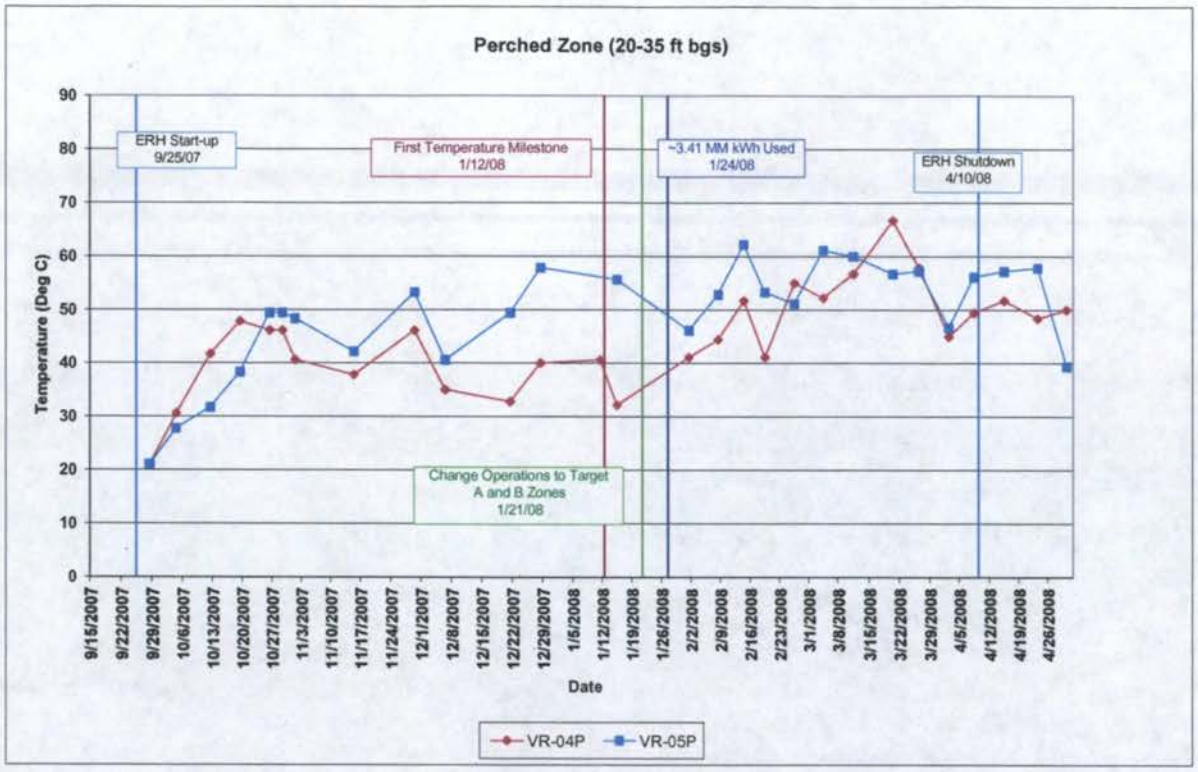


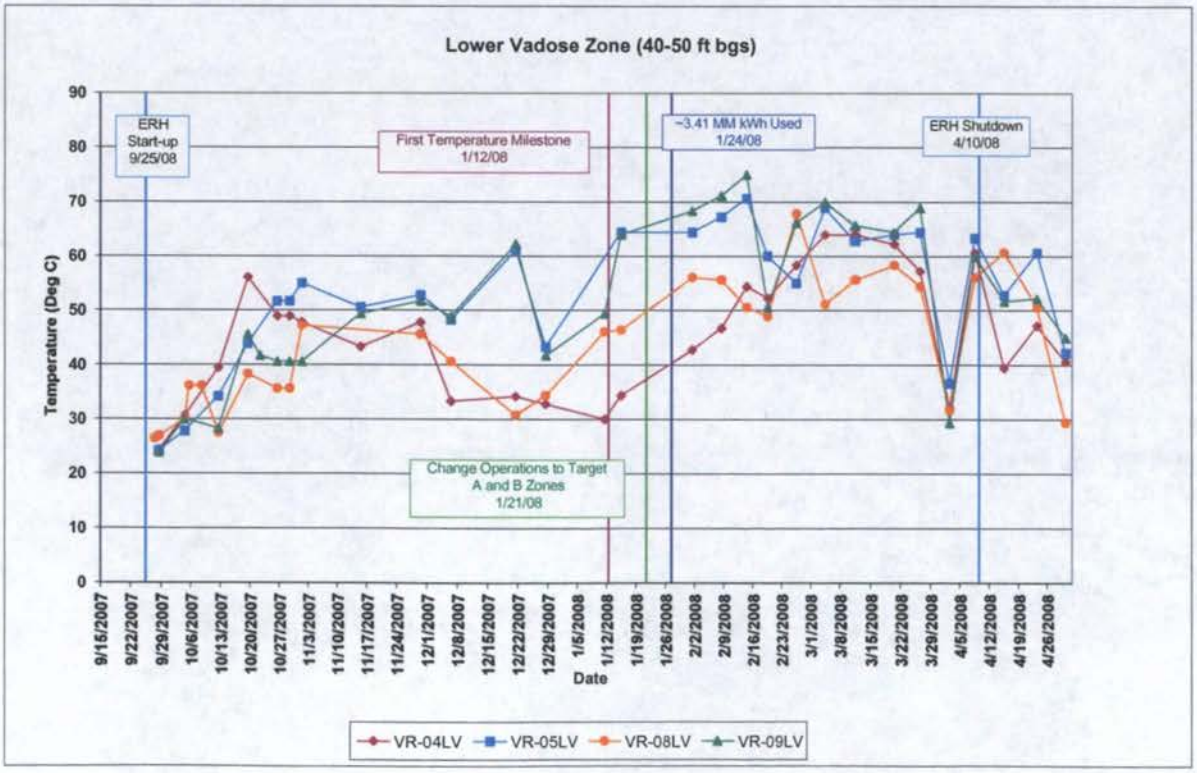
Graph 11b
Vapor Recovery Wellhead Temperature Data for ERH Sector 802



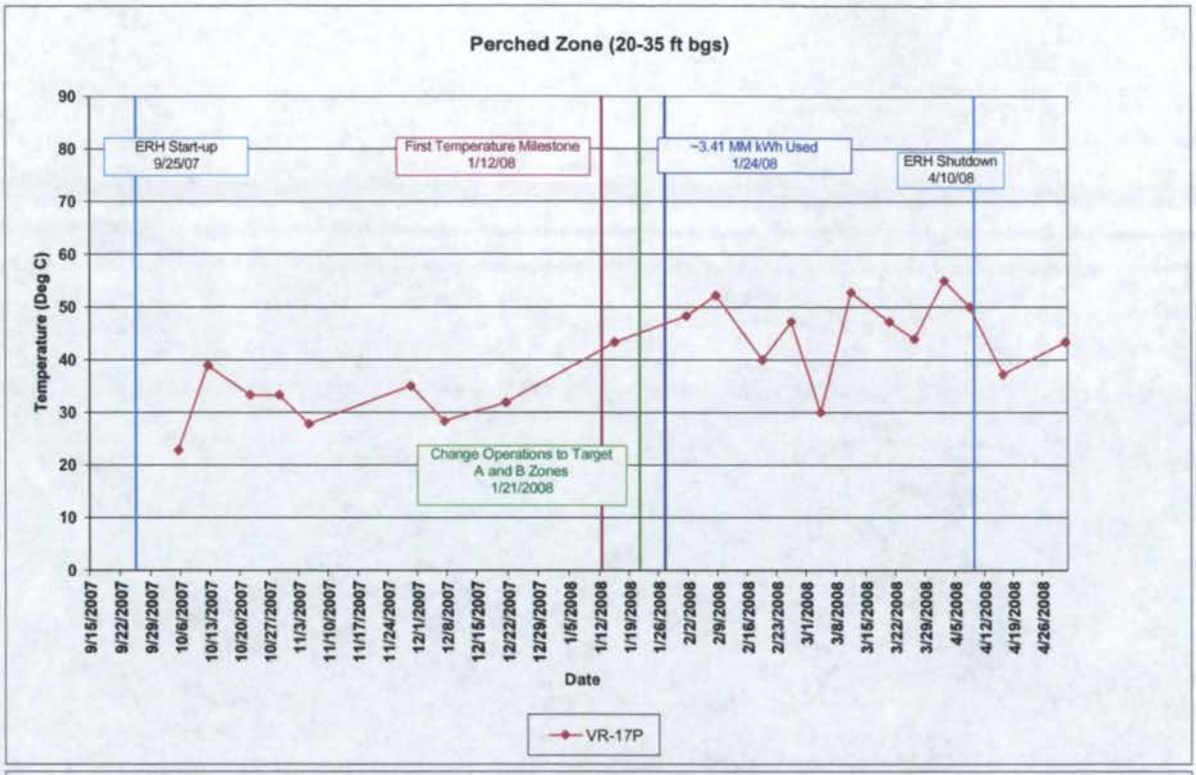


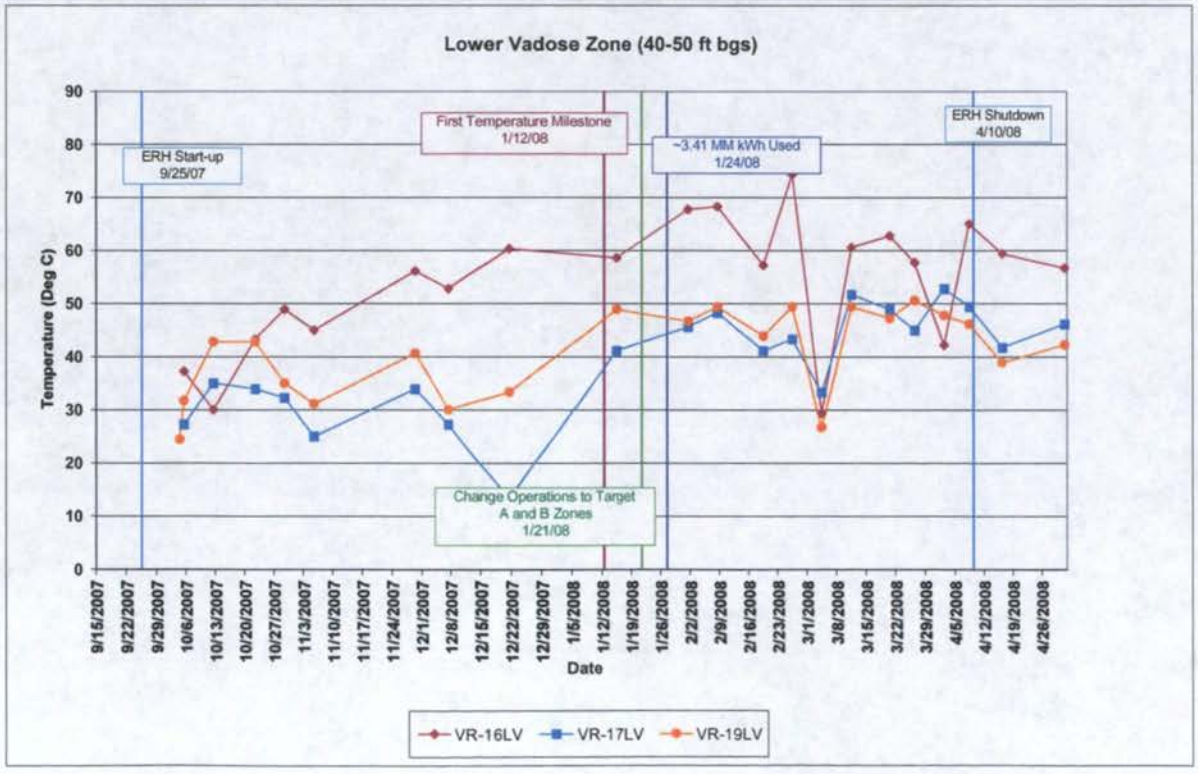
Graph 11c
Vapor Recovery Wellhead Temperature Data for ERH Sector 803



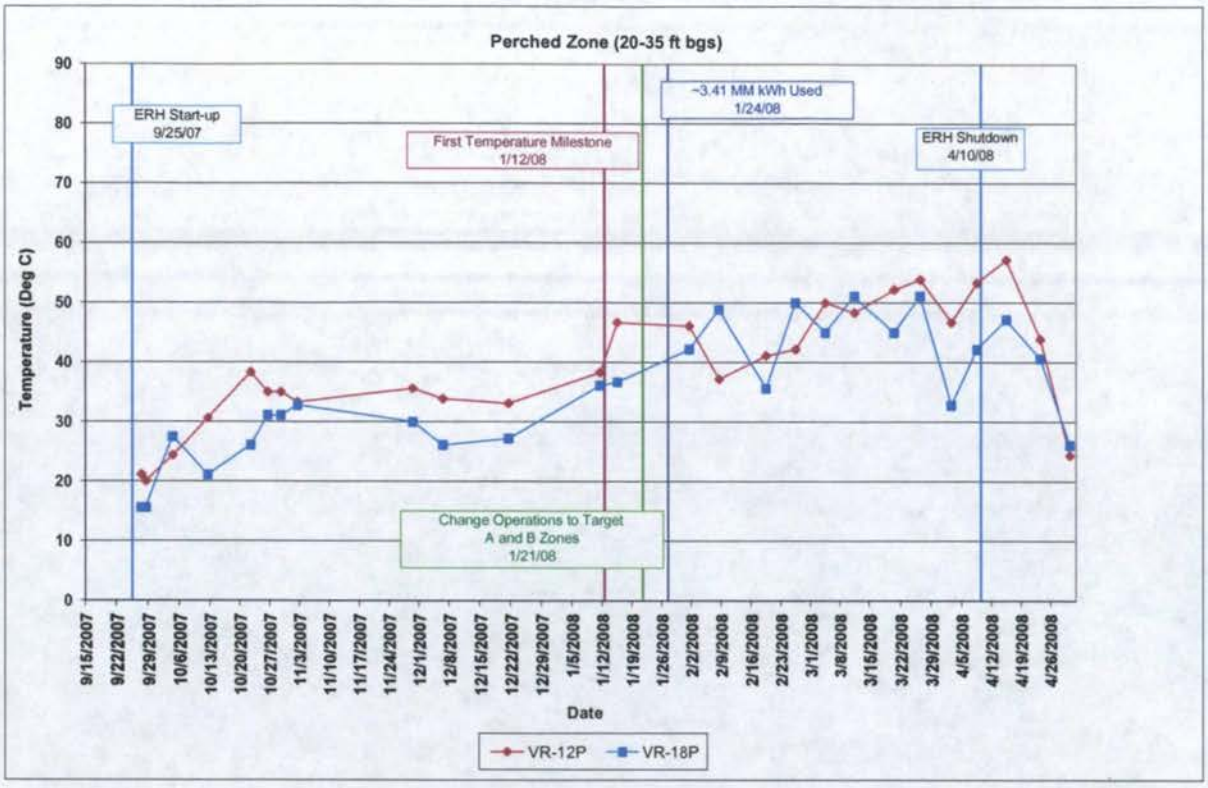


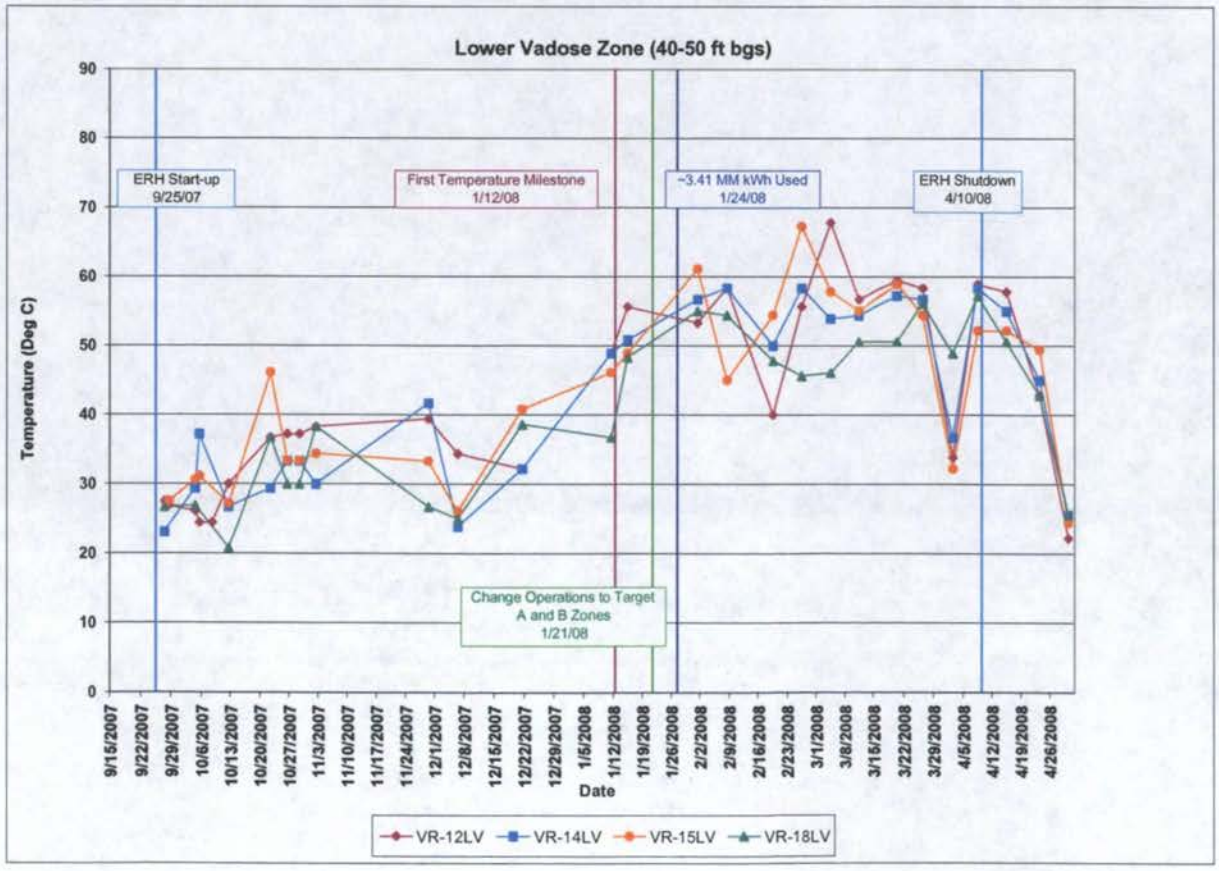
Graph 11d
Vapor Recovery Wellhead Temperature Data for ERH Sector 804



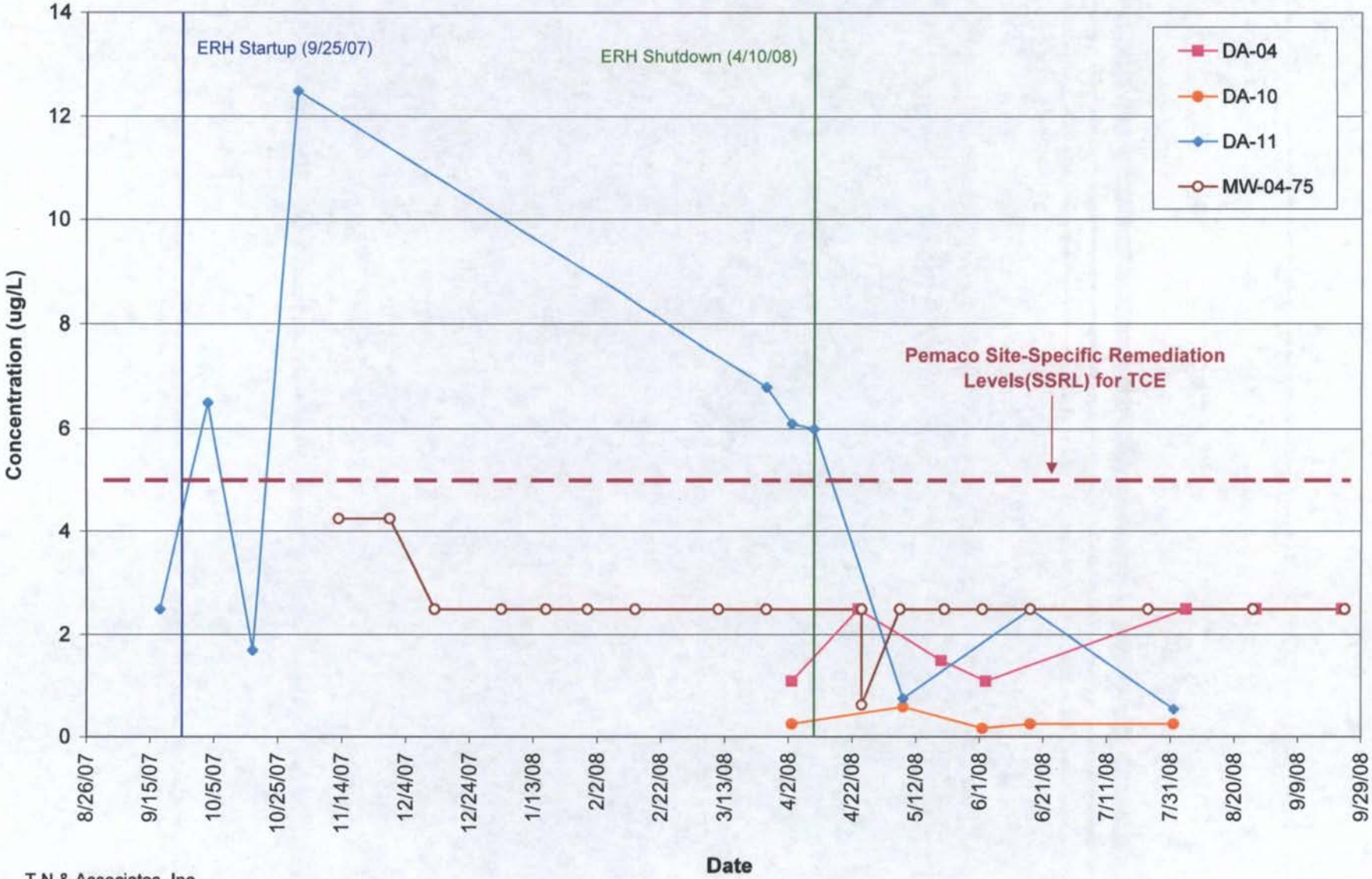


Graph 11e
Vapor Recovery Wellhead Temperature Data for ERH Sector 805





Graph 12a
TCE Concentrations in Groundwater A Zone Within ERH Area



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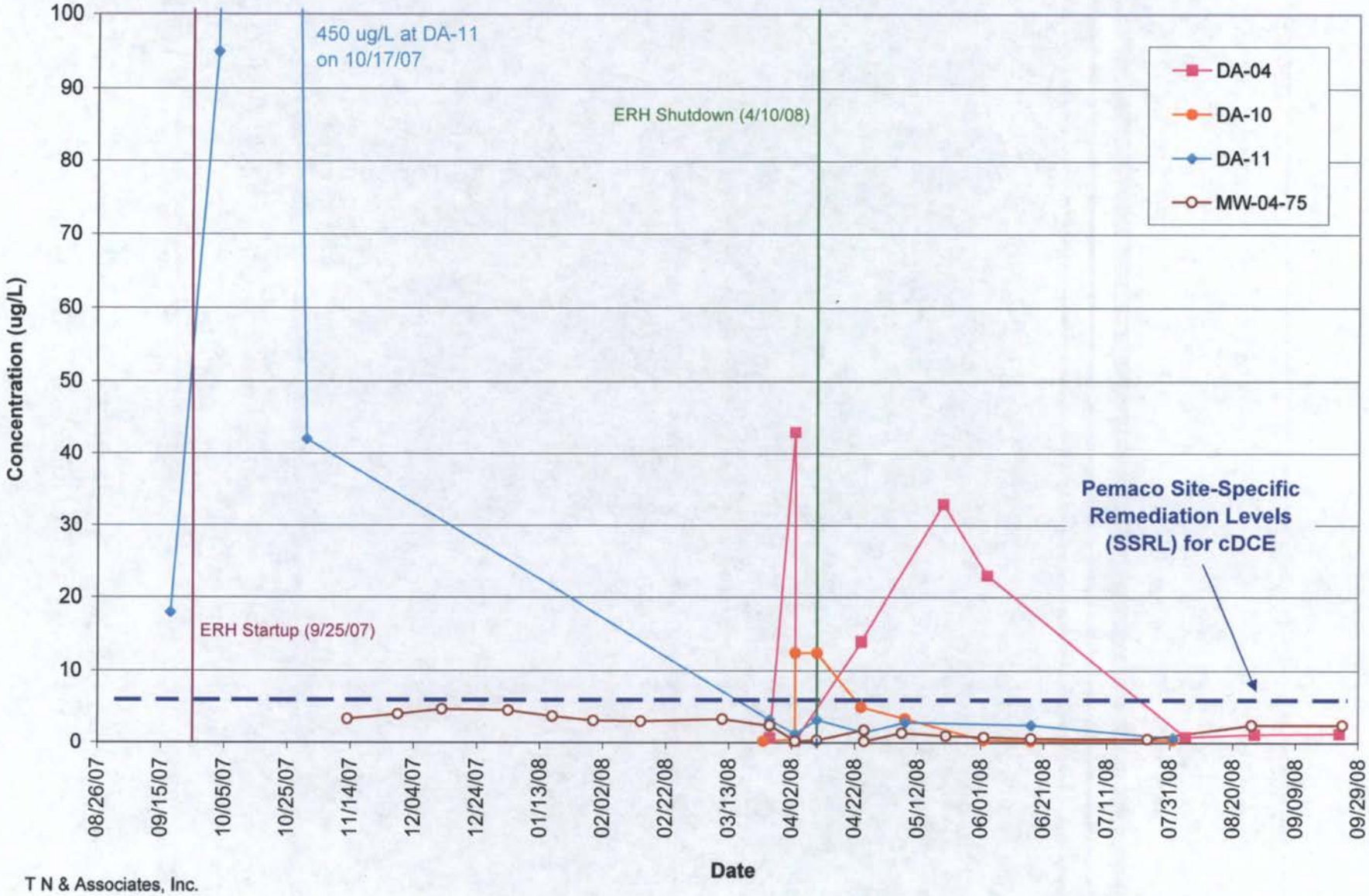
Graph 12b
cDCE Concentrations in Groundwater A Zone Within ERH Area



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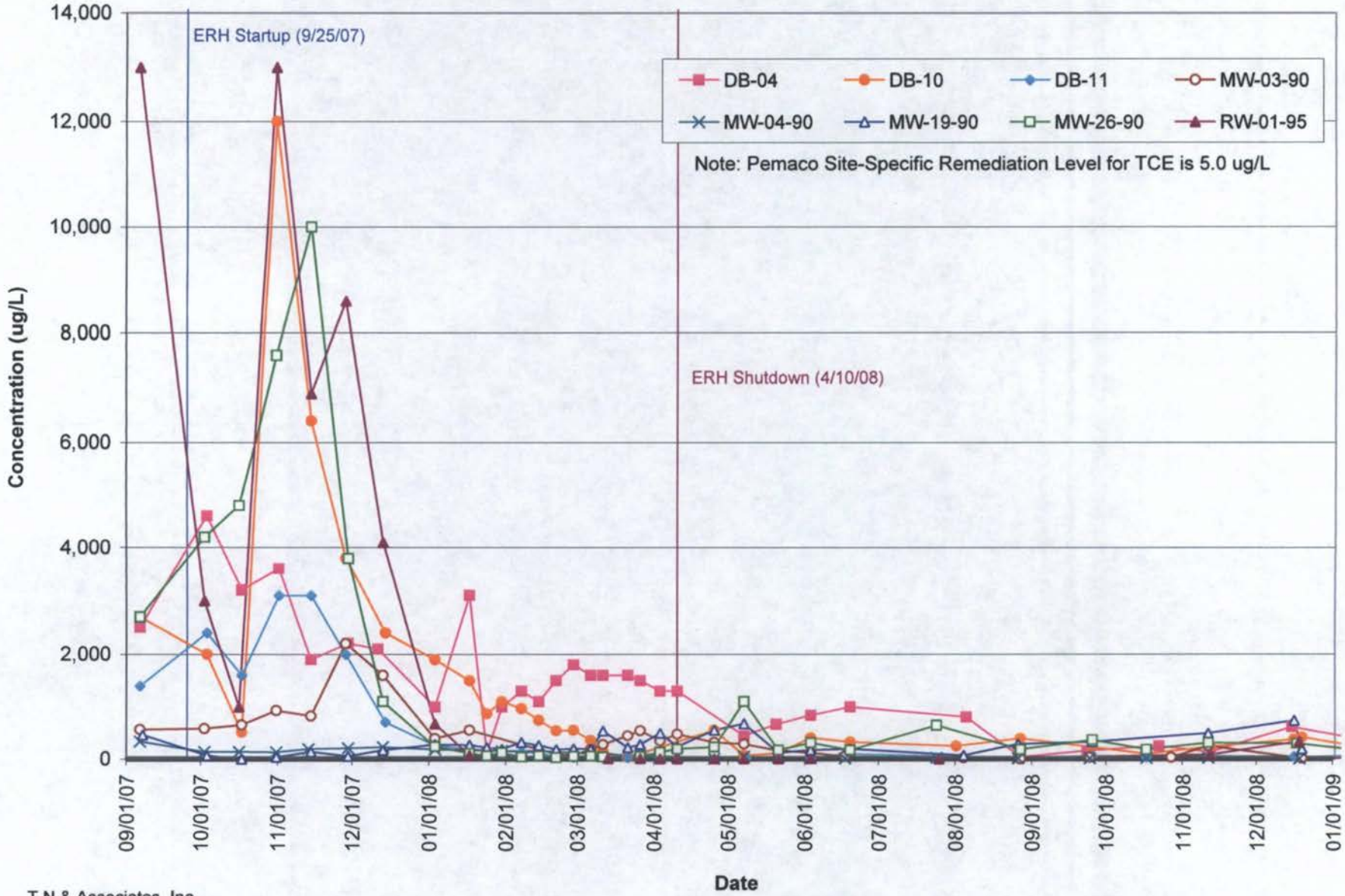
Graph 13a
TCE Concentrations in Groundwater B Zone Within ERH Vicinity Wells



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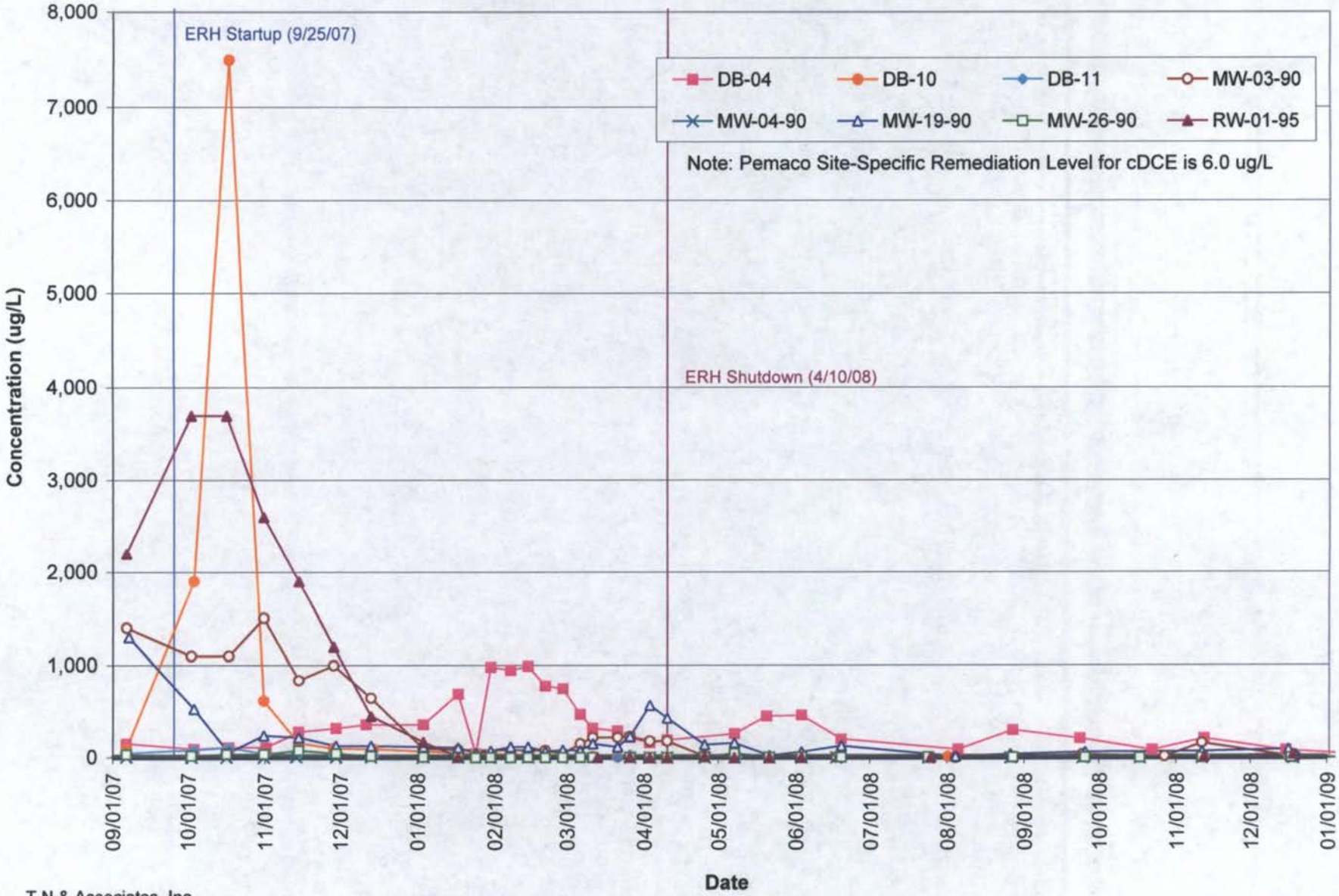
Graph 13b
cDCE Concentrations in Groundwater B Zone Within ERH Vicinity Wells



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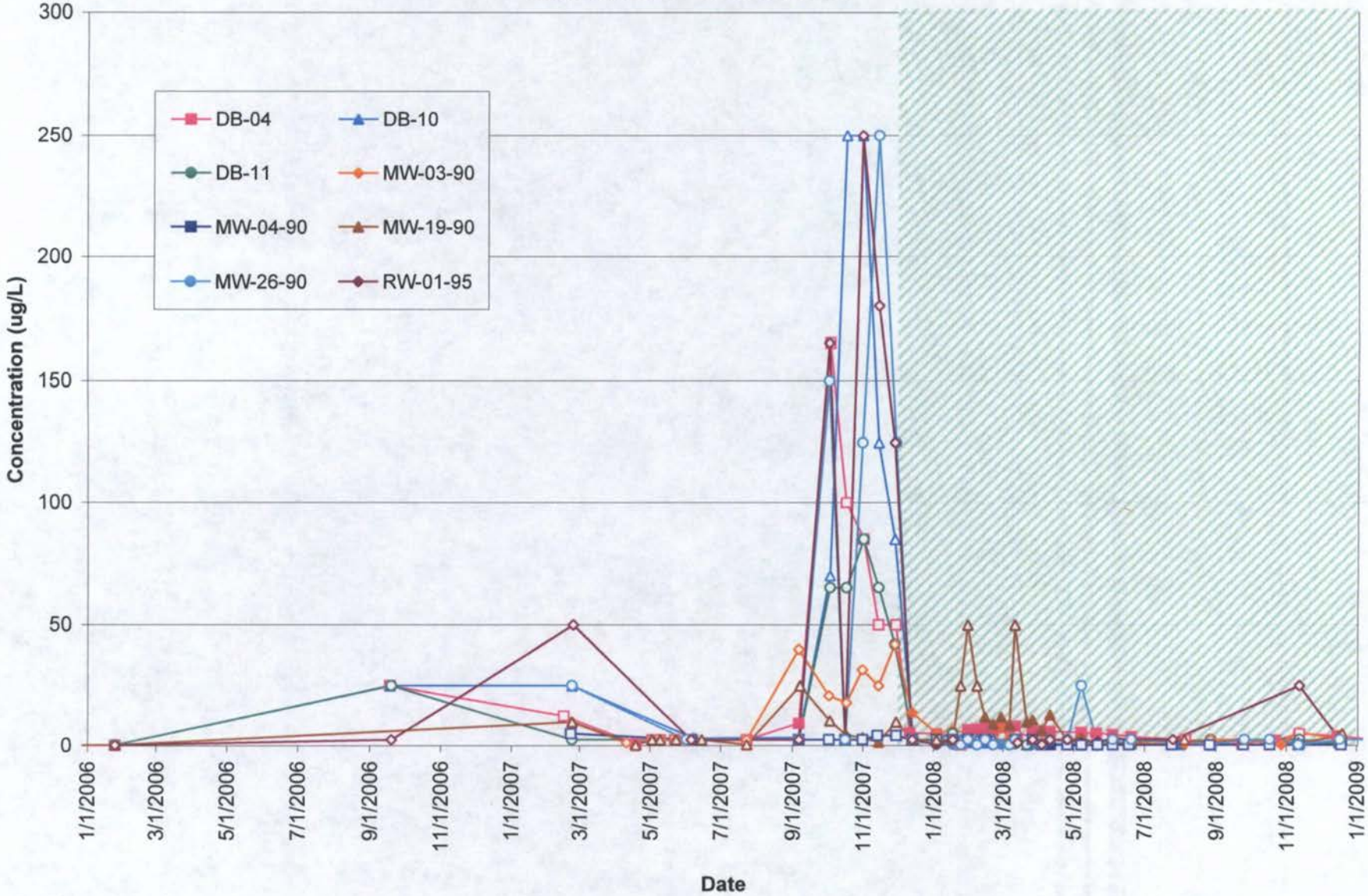
Graph 13c
Benzene Concentrations in Groundwater B Zone Within ERH Vicinity Wells
January 2006 - January 2009



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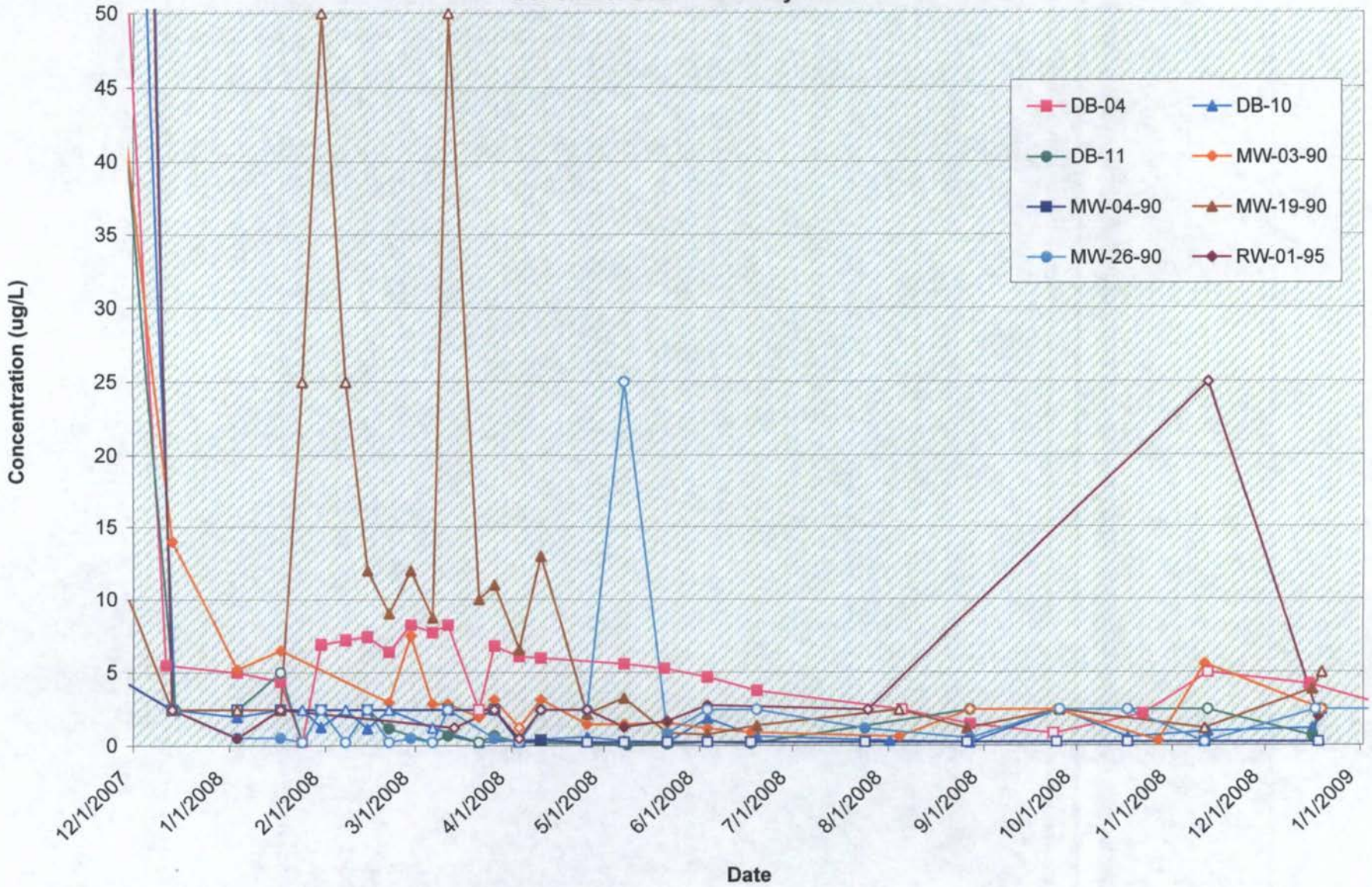
Graph 13d
Benzene Concentrations in Groundwater B Zone Within ERH Vicinity Wells
December 2007 - January 2009



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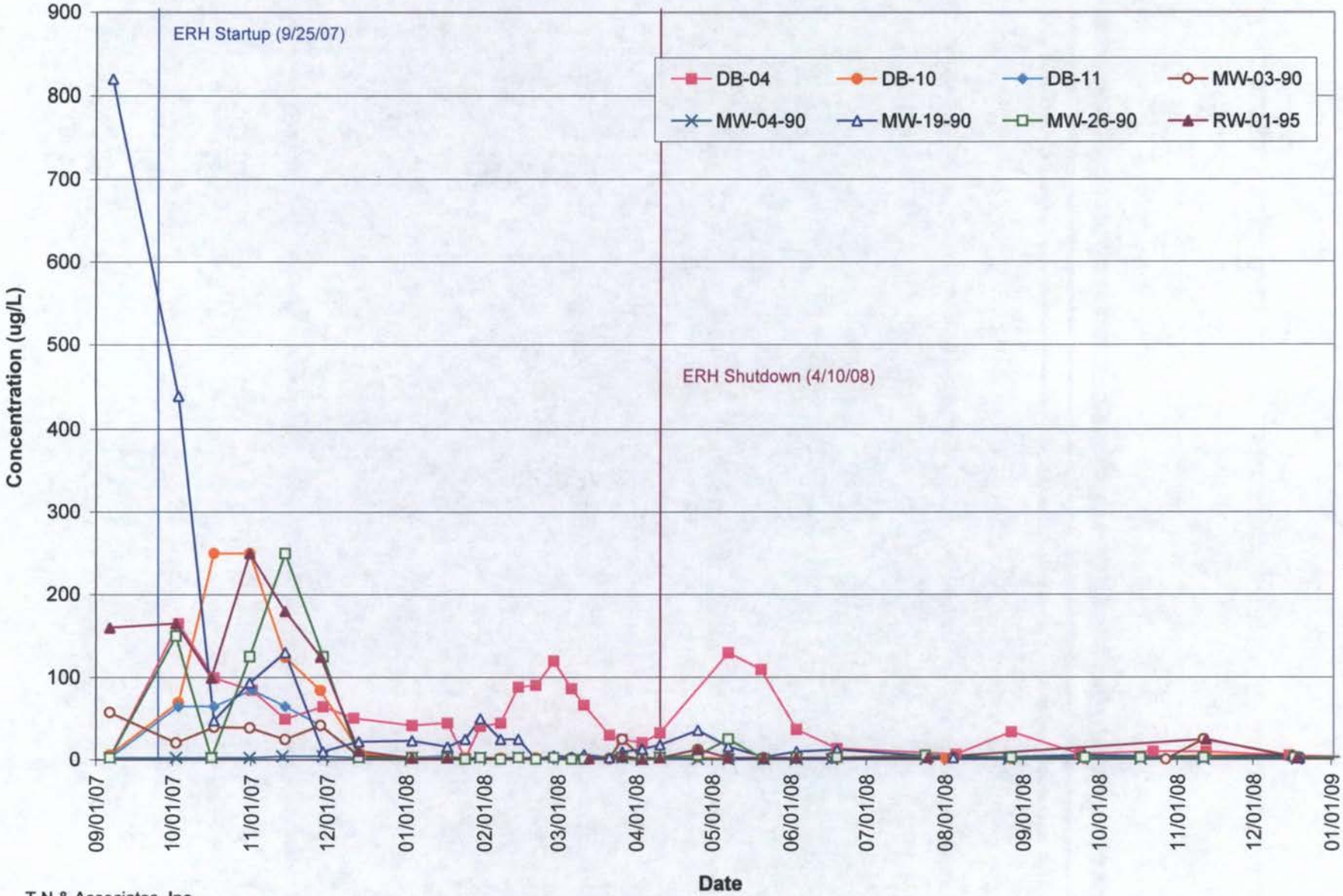
Graph 13e
Vinyl Chloride Concentrations in Groundwater B Zone Within ERH Vicinity Wells



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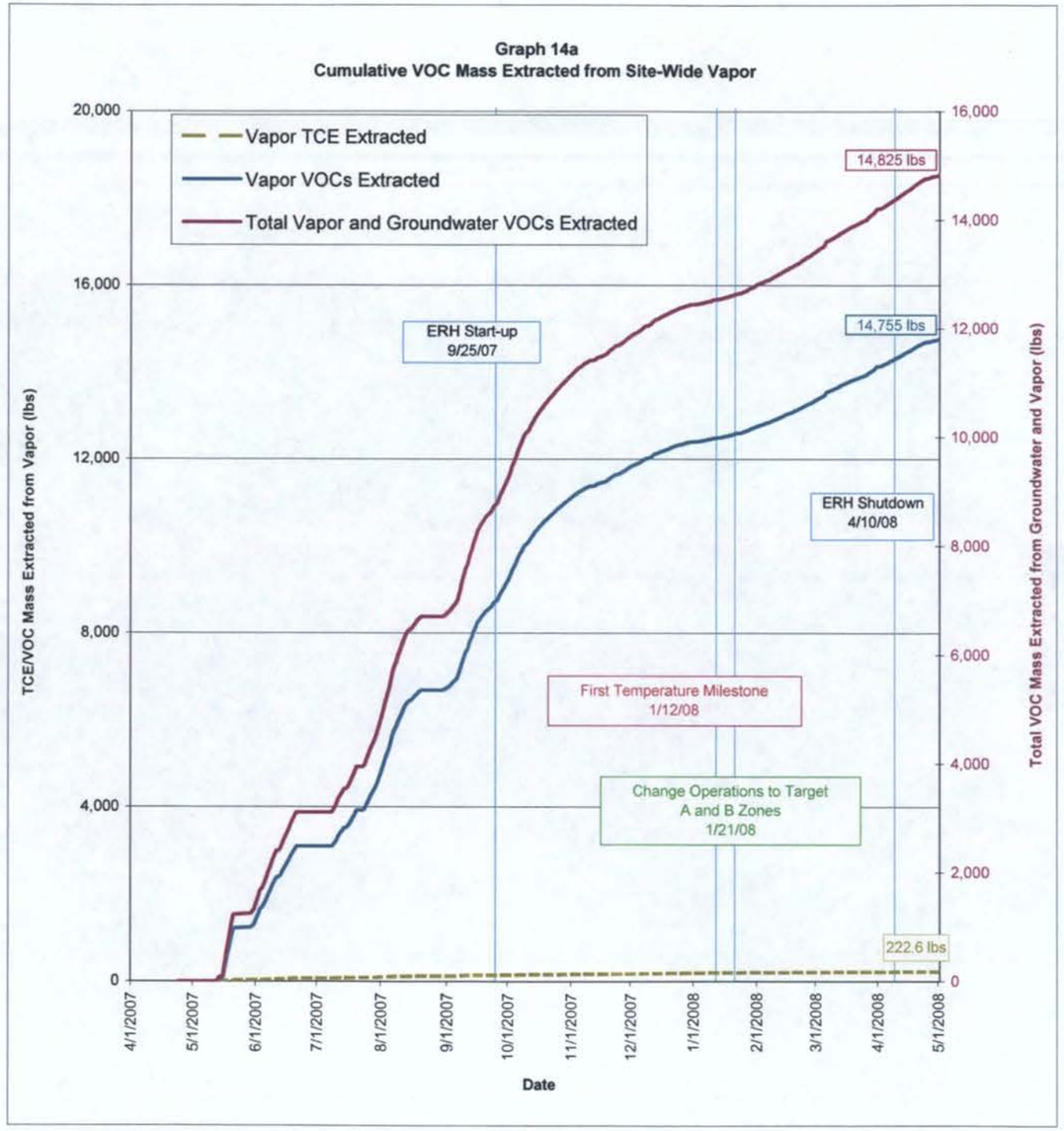
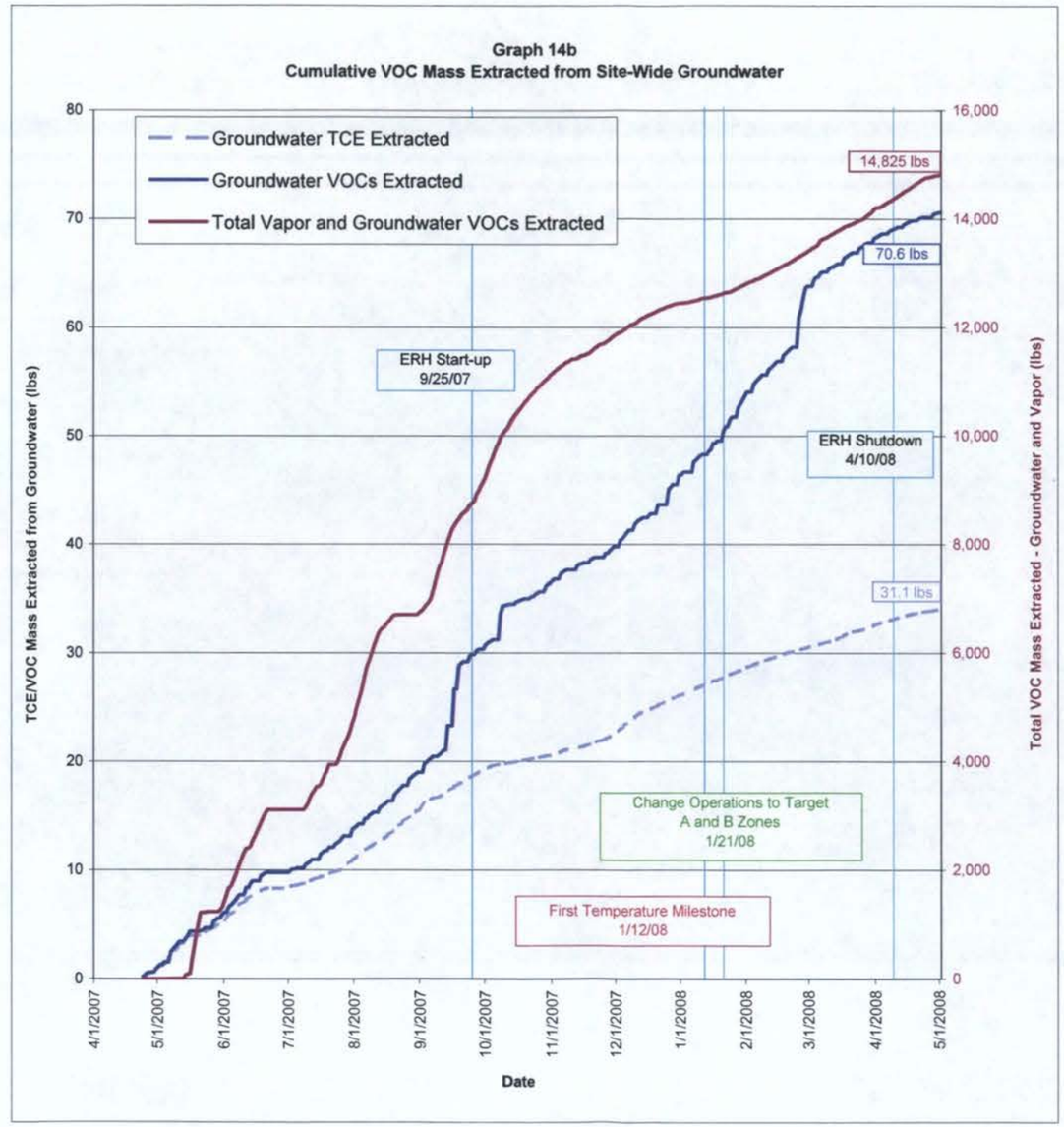
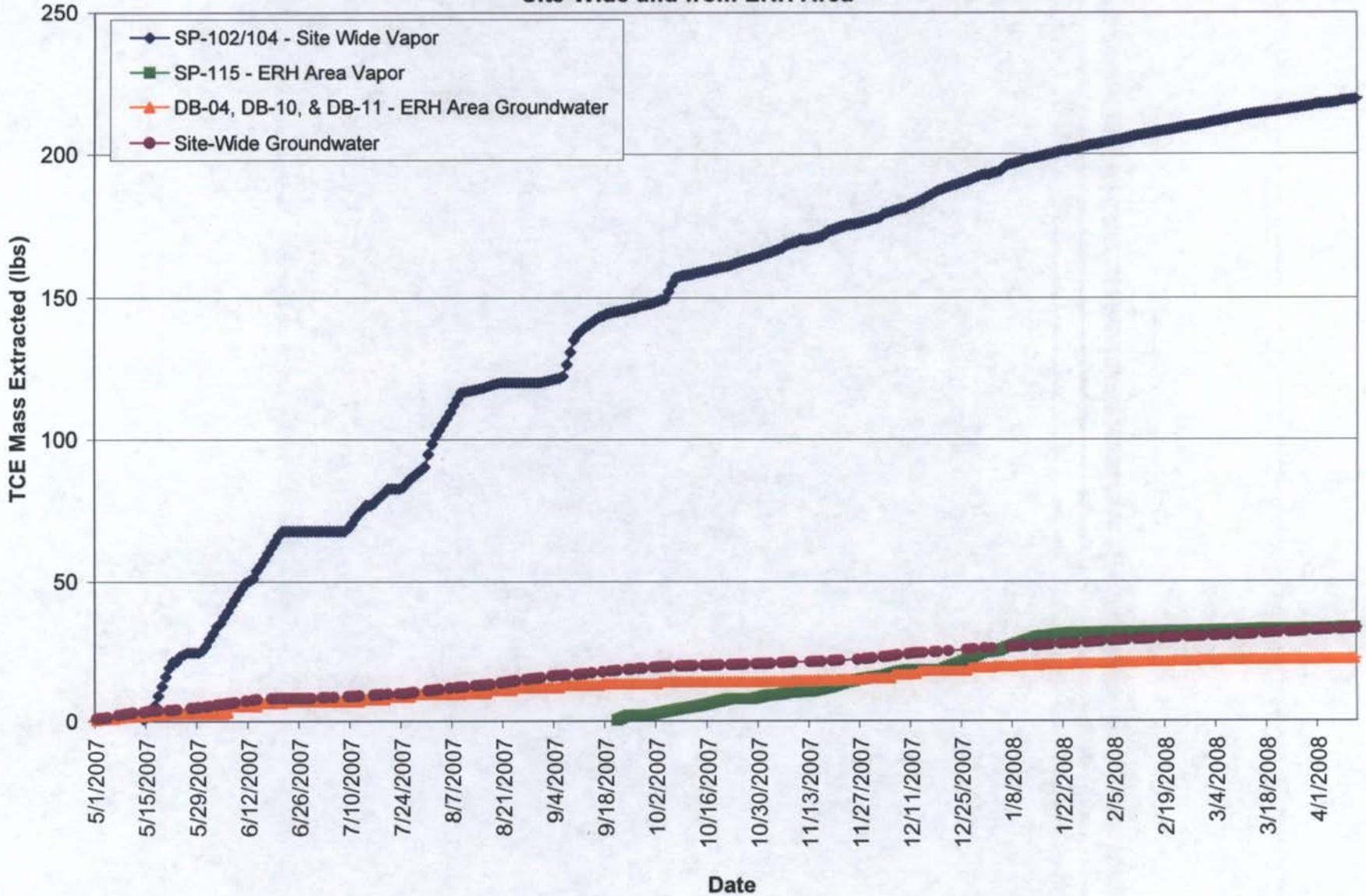

Graph 14a
Cumulative VOC Mass Extracted from Site-Wide Vapor
Vapor TCE Extracted
Vapor VOCs Extracted
Total Vapor and Groundwater VOCs Extracted
14,825 lbs
14,755 lbs
222.6 lbs
ERH Start-up
9/25/07
ERH Shutdown
4/10/08
First Temperature Milestone
1/12/08
Change Operations to Target
A and B Zones
1/21/08
TCE/VOC Mass Extracted from Vapor (lbs)
Total VOC Mass Extracted from Groundwater and Vapor (lbs)
Date

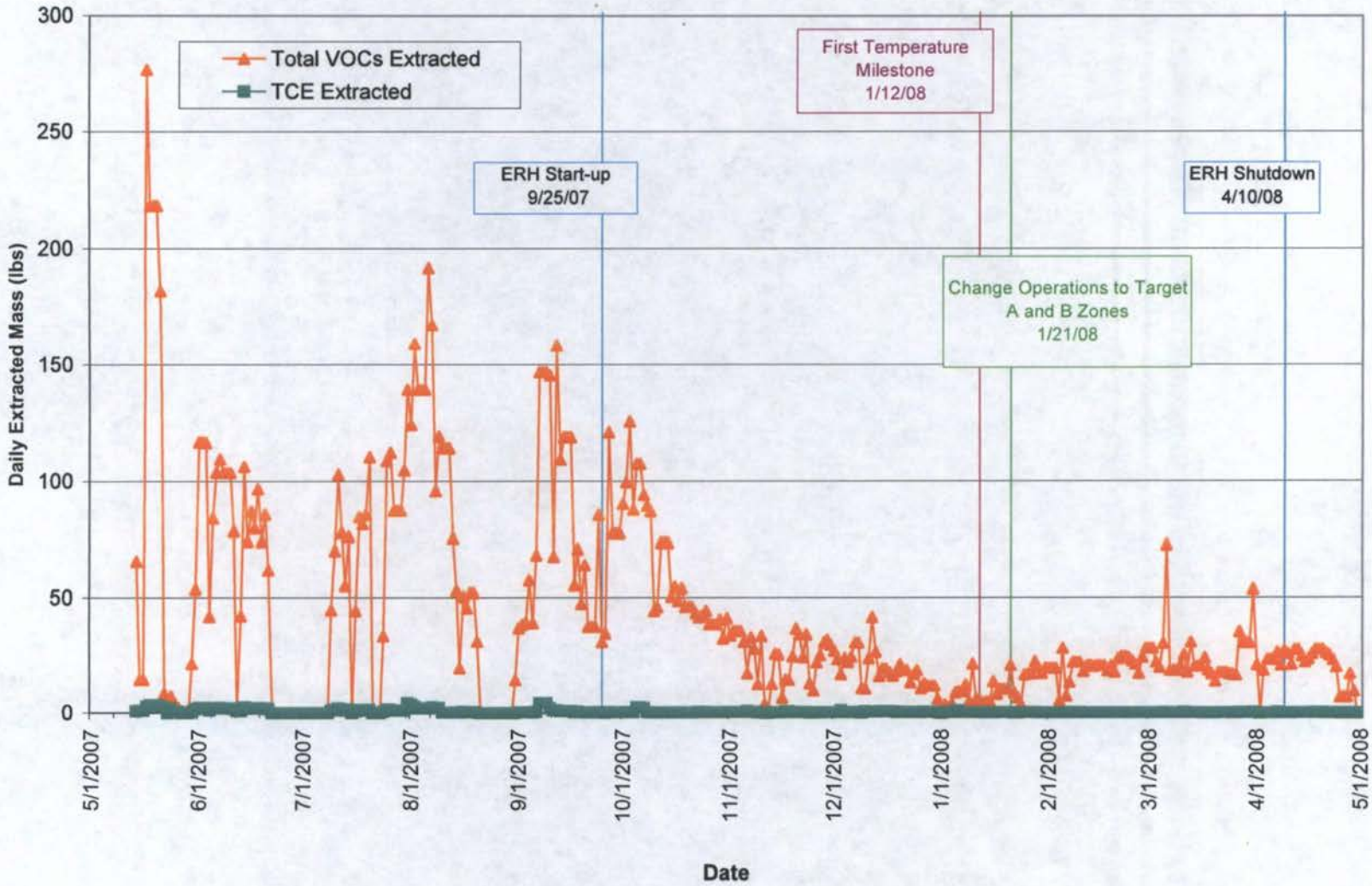

Graph 14b
Cumulative VOC Mass Extracted from Site-Wide Groundwater
Groundwater TCE Extracted
Groundwater VOCs Extracted
Total Vapor and Groundwater VOCs Extracted
14,825 lbs
70.6 lbs
31.1 lbs
ERH Start-up
9/25/07
ERH Shutdown
4/10/08
Change Operations to Target
A and B Zones
1/21/08
First Temperature Milestone
1/12/08
TCE/VOC Mass Extracted from Groundwater (lbs)
Total VOC Mass Extracted - Groundwater and Vapor (lbs)
Date

Graph 15
Comparison of Cumulative TCE Mass (Vapor and Groundwater) Extracted Site-Wide and from ERH Area



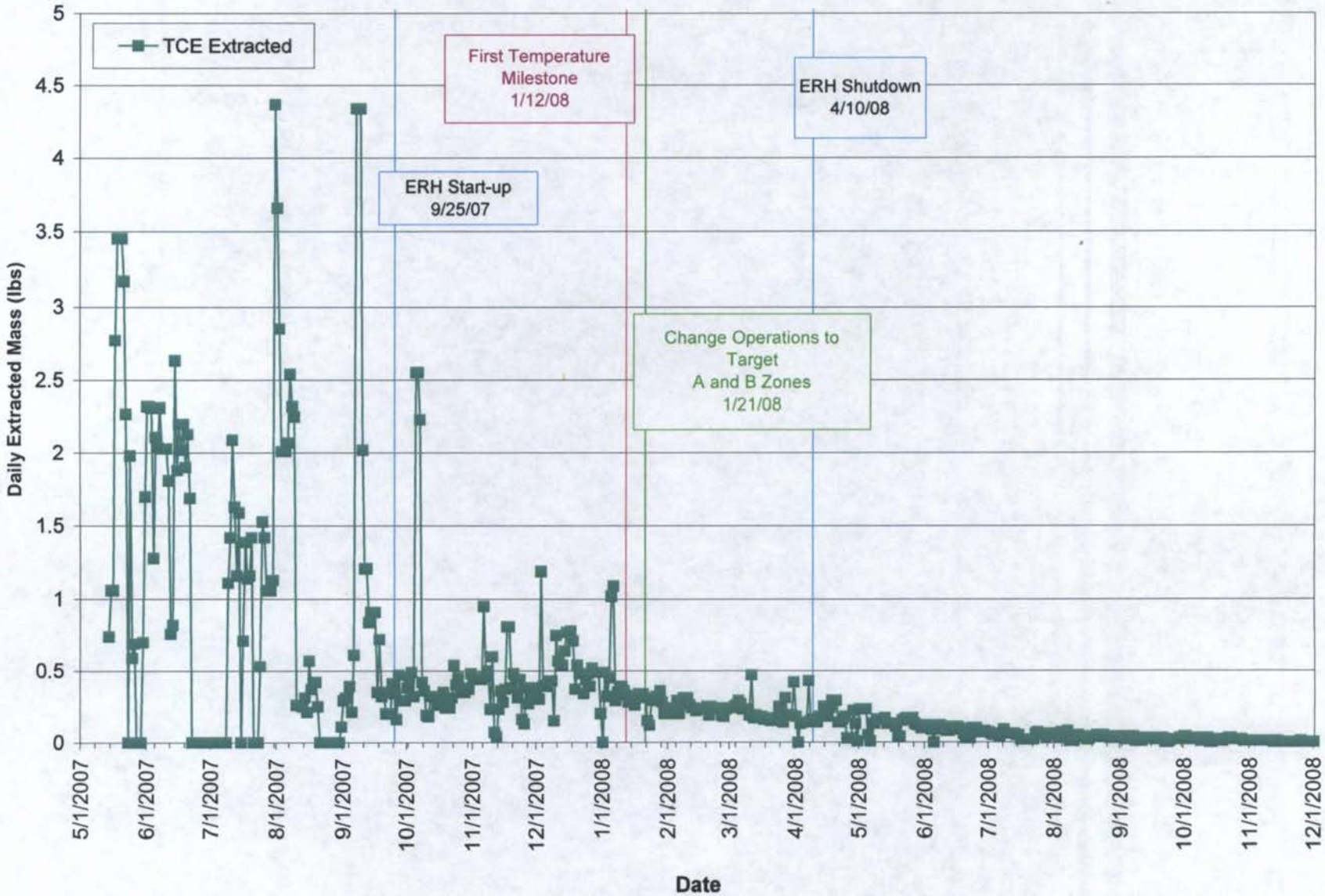
T N & Associates, Inc.

Graph 16a
Daily Mass of VOCs and TCE Extracted as Vapor (Site-Wide; SP-102/SP-104)



T N & Associates, Inc.

Graph 16b
Daily Mass of TCE Extracted as Vapor (Site-Wide; SP-102/SP-104)



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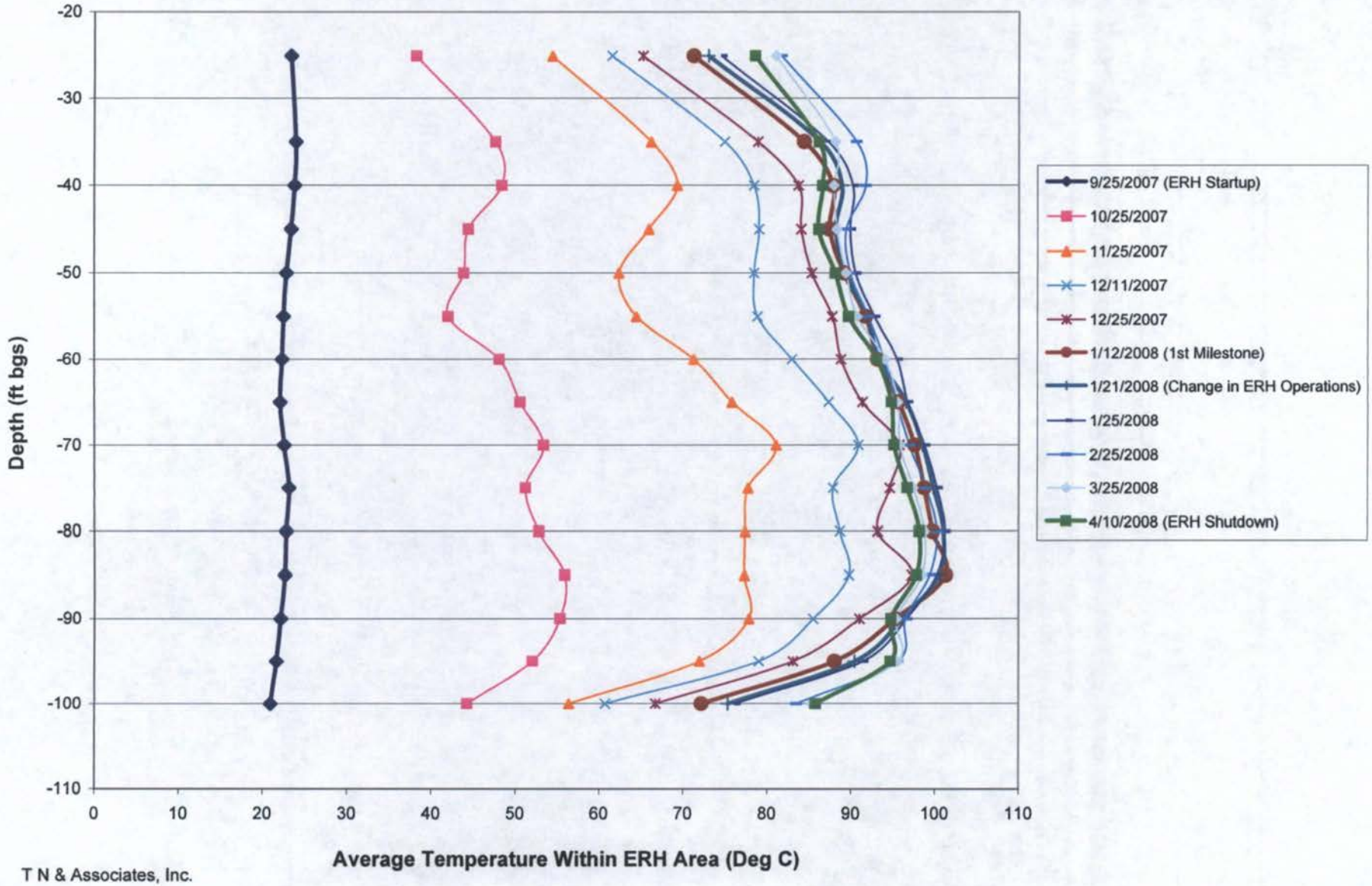
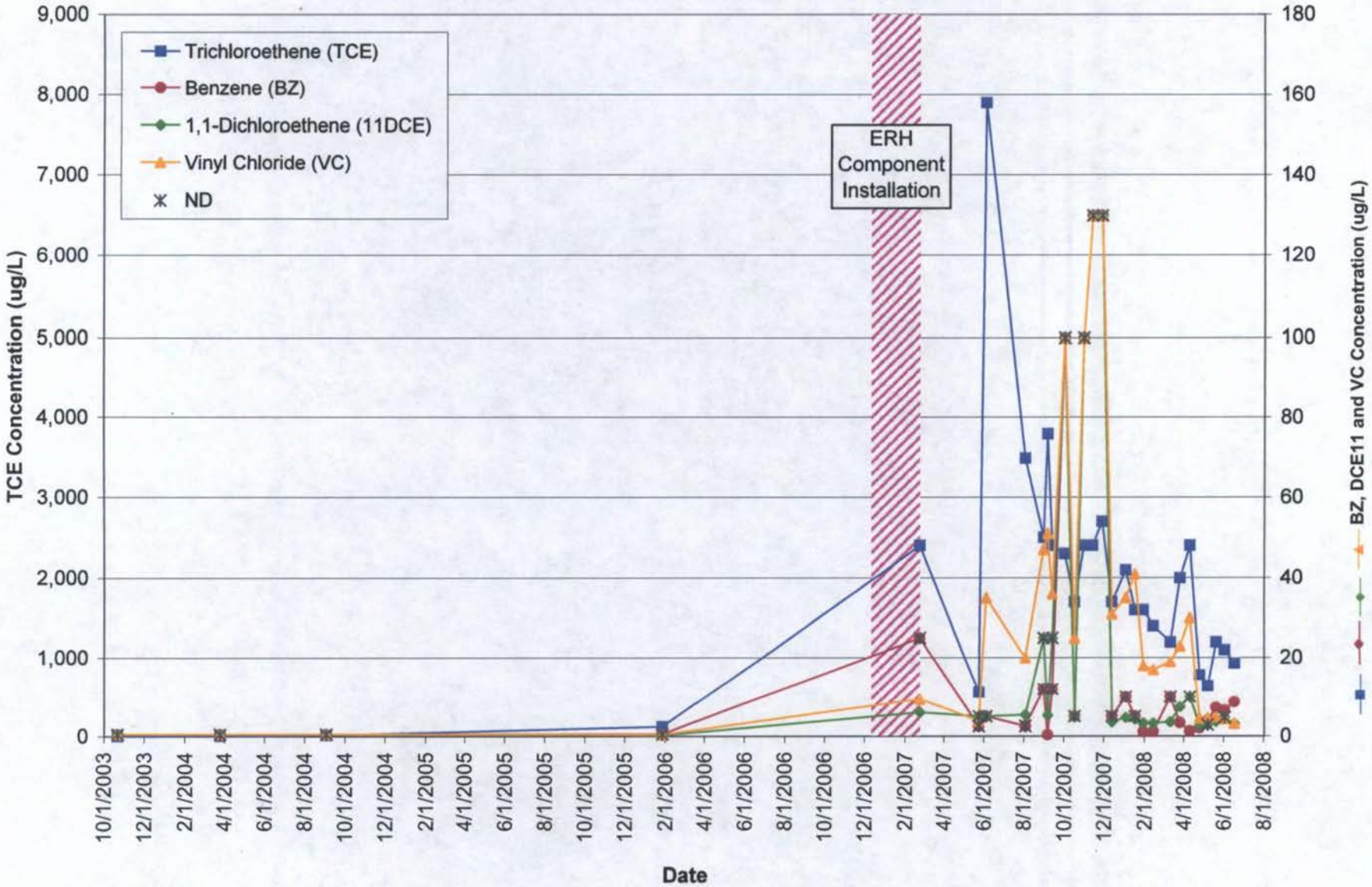
Graph 17
Average Subsurface Temperature Versus Depth During Pemaco ERH Operation



T N & Associates, Inc.

Graph 18
Concentration Trends of Select COCs in MW-24-110 Over Time



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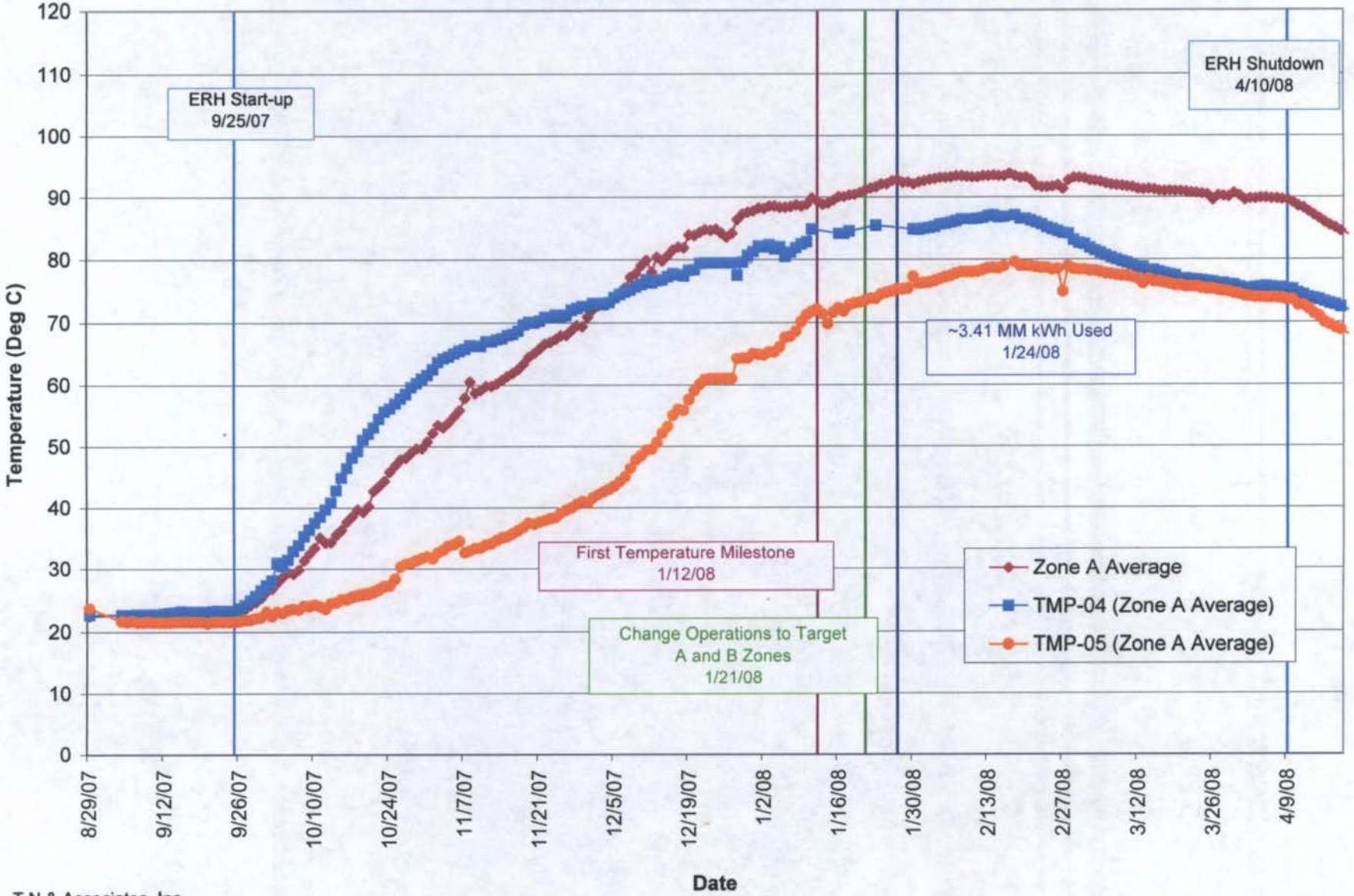
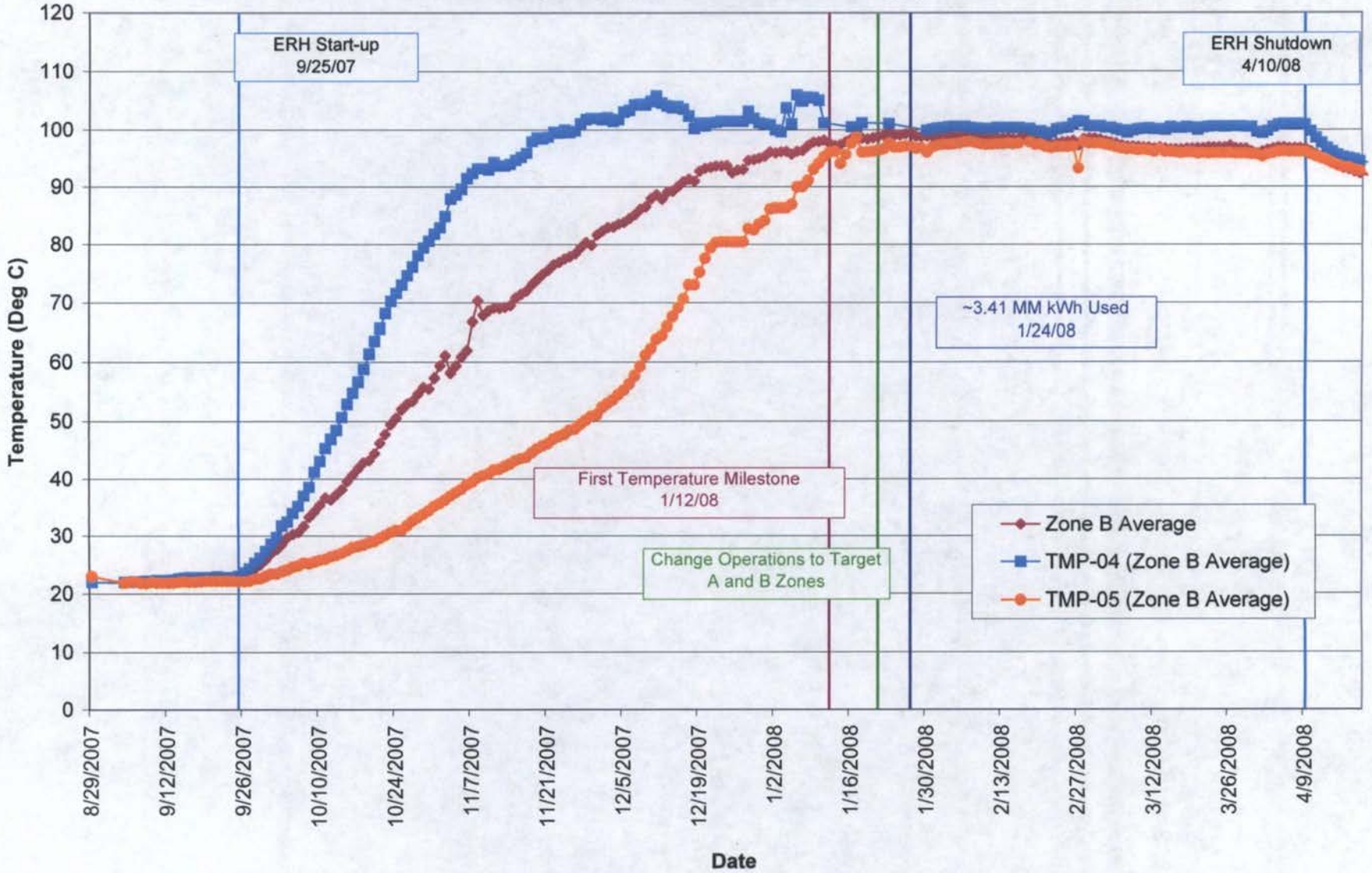
Graph 19a
Heating Rate Comparison Between TMP-04 and TMP-05
Vadose Zone (Between 35 and 60 ft bgs)



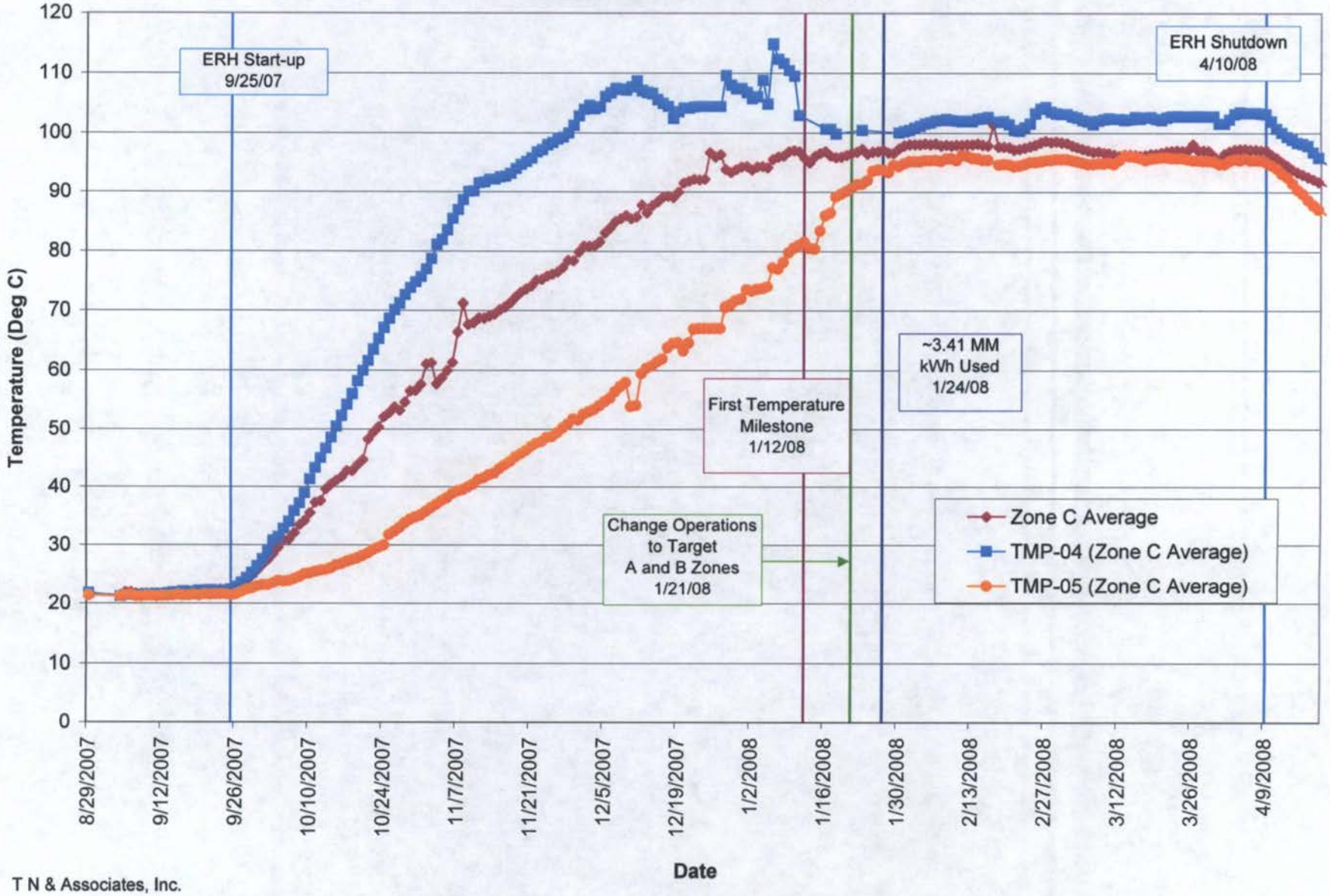
T N & Associates, Inc.

Graph 19b
Heating Rate Comparison Between TMP-04 and TMP-05
A-B Clay Zone (Between 60 and 80 ft bgs)



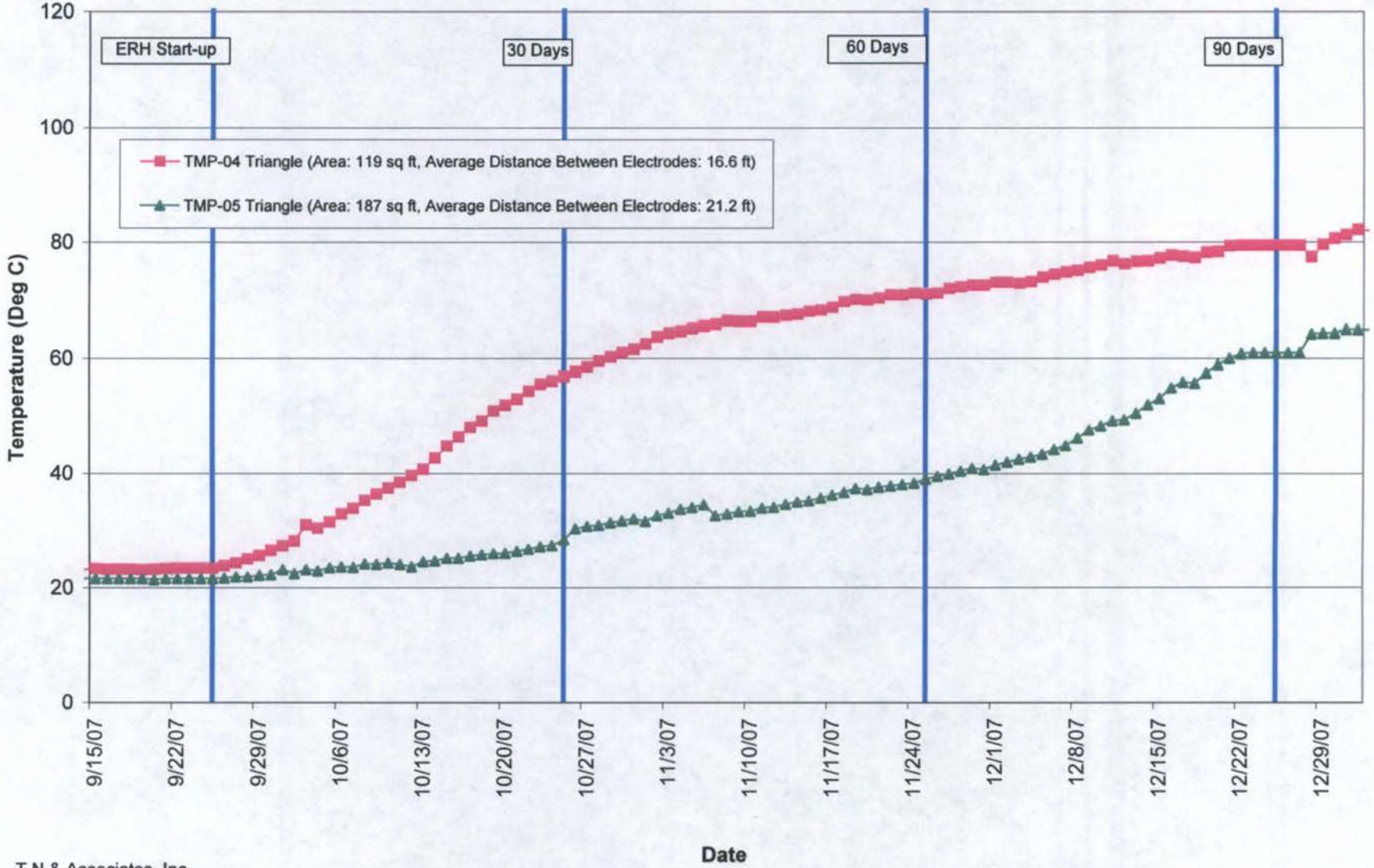
T N & Associates, Inc.

Graph 19c
Heating Rate Comparison Between TMP-04 and TMP-05
B Zone (Between 80 and 95 ft bgs)



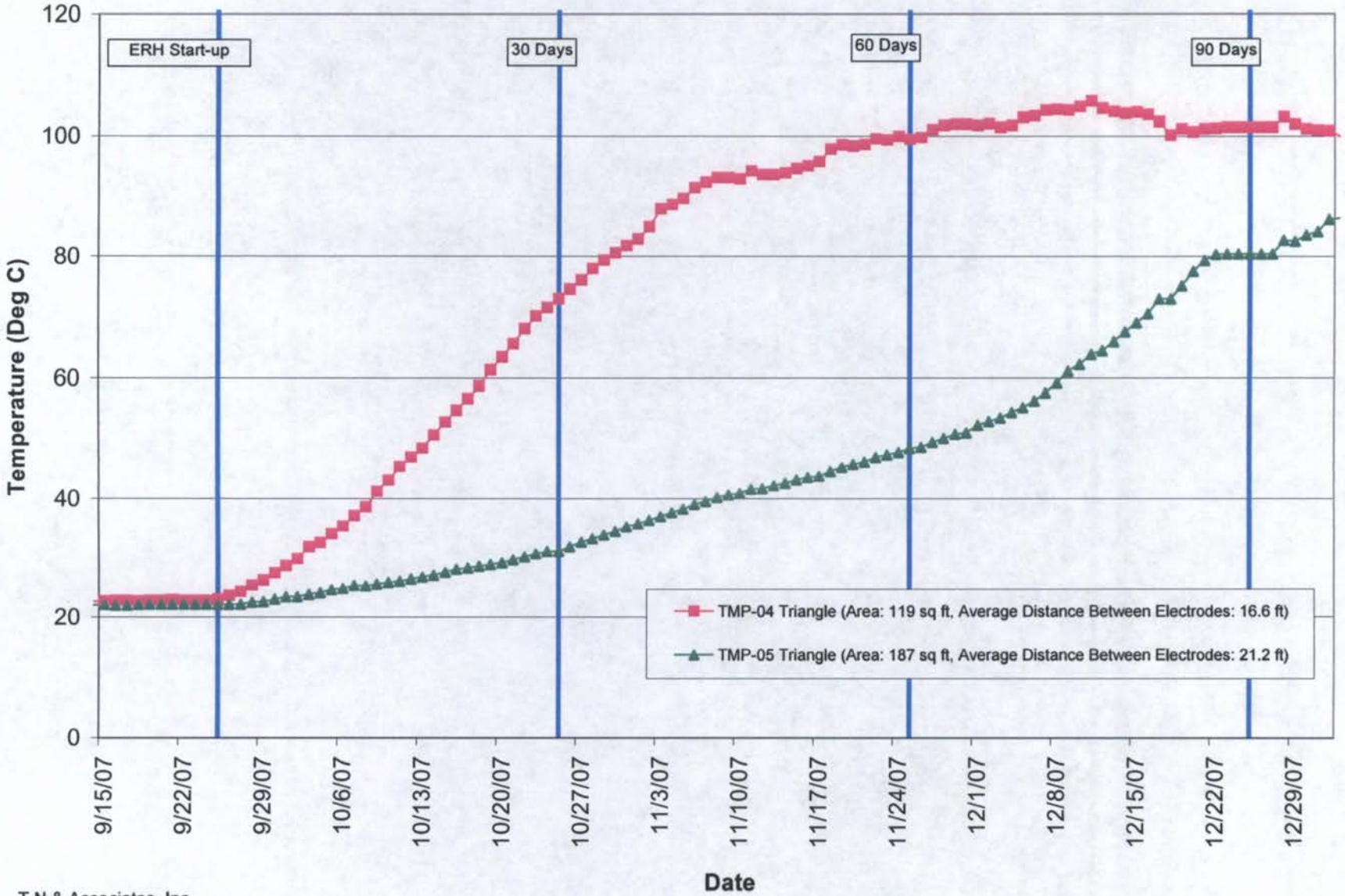
T N & Associates, Inc.

Graph 20a
Comparison of TMP Triangle Size and Average Temperature
Vadose Zone (Between 35 and 60 ft bgs)



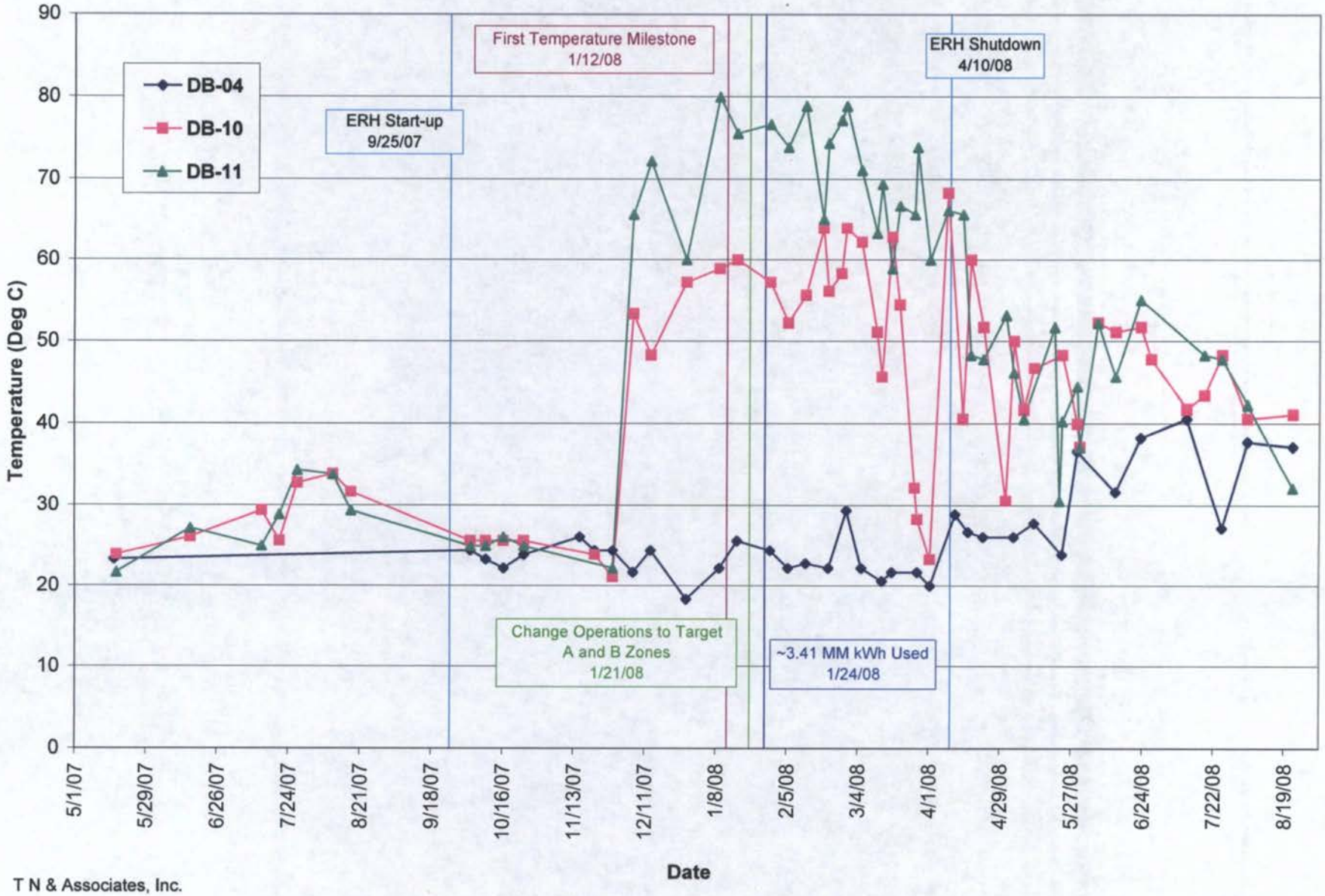
T N & Associates, Inc.

Graph 20b
Comparison of TMP Triangle Size and Average Temperature
A-B Clay Zone (Between 60 and 80 ft bgs)



T N & Associates, Inc.

Graph 21
Wellhead Temperature Data at DB-04, DB-10, and DB-11



T N & Associates, Inc.

ATTACHMENT A

DRAFT TECHNICAL MEMORANDUM
EVALUATION OF MEMBRANE INTERFACE PROBE INVESTIGATION

PREPARED BY
T N & ASSOCIATES, INC.
(in preparation; will be provided in the Final ERH Summary Report)

ATTACHMENT B

DRAFT TECHNICAL MEMORANDUM
EVALUATION OF TMP SOIL SAMPLING RESULTS
PRE- AND POST-ERH REMEDIATION

PREPARED BY
T N & ASSOCIATES, INC.
DECEMBER 2008

DRAFT TECHNICAL MEMORANDUM

Evaluation of TMP Soil Sampling Results
Pre- and Post-ERH Remediation

PEMACO SUPERFUND SITE

5050 E. Slauson Avenue
Maywood, California

Prepared for:

U.S. Environmental Protection Agency
Region IX
San Francisco, California

Sullivan International Group, Inc.
San Francisco, California

Prepared by:

T N & Associates, Inc.
Engineering and Science
317 E. Main Street
Ventura, California 93001

December 2008

T N & Associates, Inc.
Engineering and Science

DRAFT TECHNICAL MEMORANDUM

Prepared for:	Rose Marie Caraway, RPM USEPA Region IX
Prepared by:	T N & Associates, Inc. Dacre Bush; Project Manager Ewelina Mutkowska; Project Chemist
Date:	2 December 2008
Re:	Evaluation of TMP Soil Sampling Results Pre- and Post-ERH Remediation Pemaco Superfund Site, Maywood, CA

1.0 INTRODUCTION

This Technical Memorandum summarizes soil sampling data collected prior to and after the Electrical Resistance Heating (ERH) remediation at the Pemaco Superfund Site located in Maywood, California. Pre-ERH soil sampling activities were conducted in November and December 2006 during installation of the Temperature Monitoring Points (TMPs). The purpose of the pre-ERH sampling was to provide adequate data for finalizing the area and volume of the focused treatment/source reduction by the ERH technology. The post-ERH sampling was done in October 2008 at locations within 5 feet away from the pre-ERH TMP locations selected for groundwater monitoring well installation. The purpose of post-ERH soil sampling was to evaluate the effectiveness of ERH technology to reduce soil contaminant concentrations within the ERH area. Figure 1 shows the outline of the ERH area, TMP locations, and other features in the ERH area.

1.1 PRE-ERH SOIL SAMPLING DETAILS

For the pre-ERH soil sampling, 19 (out of 30) TMP locations were selected, namely TMP-02, -03, -04, -07, -09, -10, -11, -12, -13, -14, -16, -17, -18, -19, -22, -24, -26, -27, and -29 (Figure 1). The sampling protocol was presented in the Sampling and Analysis Plan (SAP) Addendum (TN&A, 2006). The soil sampling and TMP installation occurred over a 6-week period starting on November 8, 2006, and ending on December 7, 2006. Drilling logs for the pre-ERH program are provided in Appendix A.

Generally the sampling was performed on continuous core samples at 5-foot intervals from 25 to 100 feet below ground surface (bgs). Within each 5-foot interval the field geologist selected soil for sample collection based on the highest photoionization detector (PID) readings and/or clay intervals that would preferentially retain the

Contaminants of Concern (COCs), principally trichloroethene (TCE). Samples were collected using the TerraCore soil sampling kits to meet requirements of SW 5035 extraction method for Volatile Organic Compound (VOC) analysis in accordance with SAP Addendum (TN&A, 2006). All soils samples were submitted for VOC analysis by SW 5035/8260B to Calscience Environmental Laboratories, Inc. (Calscience) located in Garden Grove, California. The ten (10) split samples were submitted to Mitkem Corporation laboratory located in Warwick, RI under the USEPA Contract Laboratory Program (CLP) for Target Compound List (TCL) VOCs by SOM01.1. Split samples were collected for data comparison purpose. Laboratory reports and chain of custody forms are provided in Appendix B.

1.2 POST-ERH SOIL SAMPLING DETAILS

The post-ERH sampling was performed at 6 TMP locations selected for installation of new groundwater monitoring wells, namely TMP-05, -09, -11, -17, -22, and -27 (Figure 1). TMP IDs and associated IDs of the new groundwater monitoring wells are listed below. The sampling and analysis protocol for this program was detailed in the Addendum 1 to Sampling and Analysis Plan (TN&A, 2008). Post-ERH soil sampling was conducted between October 15 and30, 2008. Re-drilling locations were selected at approximately 5-foot distance from associated original TMP, because of the depth of the TMPs (approximately 100 feet bgs) and the potential for the boring to be less then vertical.

TMP IDs	New Groundwater Monitoring Well ID	Geologic Zone
TMP-05	MW-28-90	Exposition B
TMP-09	MW-34-110	Exposition C
TMP-11	MW-29-85	Exposition B
TMP-17	MW-30-90	Exposition B
TMP-22	MW-32-90	Exposition B
TMP-27	MW-33-90	Exposition B

During post-ERH sampling the subsurface soil in the ERH area was still hot, approximately between 100 and 150 degrees Fahrenheit, the samples were taken using a brass ring lined split-spoon sampler. The 6-inch long brass ring from each "5-foot" interval was capped; placed on ice; and cooled before the soil sample was collected for off-site laboratory analysis using TerraCore soil sampling kit. Also, after the brass rings were cool enough to handle, the soil was pushed out so the geologist could describe the soil type. Soil samples were shipped under chain-of-custody protocol to USEPA CLP selected analytical laboratory, Mitkem Corporation, Inc. in Warwick, RI, for TCL VOCs by SOM01.2 method.

A new groundwater monitoring well was installed in each of the post-ERH TMP borings and sampled for VOC analysis. Groundwater sampling results for those new wells are not included in this Technical Memorandum and will be reported under a separate cover.

1.3 GEOLOGICAL DESCRIPTION OF ERH AREA

The continuous cores provide additional detailed description of the geology/stratigraphy in the ERH area. The geology in this area is similar to much of the Pemaco site, basically consisting of the three water-bearing units:

- Upper and Lower Vadose, 35-60 ft bgs,
- A-Zone, 60 to 80 ft bgs, and
- B-Zone, 80 to 95 ft bgs.

There are clay units up to 5 feet thick separating each of the water-bearing units, which are 5 to 10 feet think, and are composed with a larger percentage of fine sand. Drill logs for the pre- and post-ERH borings are provided in Appendix A. These logs attest to the very heterogeneous and generally low permeability stratigraphy (interbedded silts, fine sands, and clay layers) that are present throughout the entire Pemaco site.

2.0 RESULTS AND DISCUSSION

The following sections described soil sampling results for pre- and post-ERH events, calculations of area and volume to be treated by ERH, and mass balance calculations.

2.1 PRE-ERH SOIL SAMPLING RESULTS

The pre-ERH soil sampling results are presented in the following three forms in this Technical Memorandum:

i. Comprehensive table of VOCs and 1,4-dioxane results provided in Table 1 and Table 2, respectively. An evaluation of Pemaco COC results summarized in Table 3.

ii. Chemical box maps showing data for *cis*-1,2-dichloroethene (*cis*-1,2-DCE), n-hexane, TCE, and vinyl chloride (VC) for shallow sampling depth interval (between 35 and 55 ft bgs) in Figure 2A, for A-zone depth interval (between 60 and 75 ft bgs) in Figure 2B, and for B-zone depth interval (between 80 and 95 ft bgs) in Figure 2C.

iii. Three-dimensional representation of pre-ERH TCE concentrations above 500 µg/kg in Figure 3A and above 3,000 µg/kg in Figure 3B.

Table 1 shows that TCE is the primary site contaminant with the highest concentrations detected prior to ERH remediation. These soil data are consistent with previous investigation results for groundwater, soil, and Membrane Interface Probes (MIP) sampling.

Results summarized in Table 3 show that results for four COCs exceeded the project-specific Site-Specific Remediation levels (SSRL), namely cis-1,2-DCE, methylene chloride, TCE, and VC. TCE, the primary site COC, was detected between 0.17 µg/kg and 3,800 µg/kg in 99% of soil samples collected between 25 and 65 ft bgs. The SSRL for TCE in soil was defined at 60 µg/kg in soil between 25 and 65 ft bgs as documented in the Record of Decision (ROD) for Pemaco Remedial Action (USEPA, 2005).

Although TCE is present throughout the ERH area in concentrations above the SSRL of 60 µg/kg (USEPA, 2005), the highest concentrations of TCE (greater then 6,000 µg/kg) are determined in the B-Zone, i.e., 80 to 90 ft bgs. The following TCE concentration ranges were detected below 65 ft bgs:

Depth (ft bgs)	TCE Concentration Range (µg/kg)
70	380 - 4,600
75	270 - 5,500
80	400 - 6,700
85	130 - 6,700
90	71 - 6,900
95	34 - 2,700
100	0.95 - 2,000

In addition, select samples at TMP-07, -09, -11, and -24 were analyzed for 1,4-dioxane, refer to Table 2. The 1,4-dioxane was not detected in collected samples above the reporting limits (primarily 0.2 mg/kg).

Split samples collected at TMP-07 between 45 and 85 ft bgs and TMP-24 between 35 and 60 ft bgs were analyzed by USEPA CLP selected laboratory – Mitkem Corporation located in Warwick, RI. Comparison of Calscience and Mitkem results are presented in Table 4. Relative percent difference (RPD) calculated between detected results for TCE ranged from 6% to 75%, which is not a significant difference considering typical heterogenic characteristics of soil samples.

Distribution of TCE concentrations in soil samples is illustrated in Figures 3A and 3B. Drill logs for the pre-ERH borings are provided in Appendix A. Laboratory reports, chain of custodies, and soil sample results are provided in Appendix B.

2.2 ERH Area and Volume

The results of the TMP soil sampling defined the area of the ERH remediation area to be approximately 14,400 square feet, with a target depth interval from 35 to 95 ft bgs. This calculates to approximately 30,000 cubic yards for the ERH treatment.

2.3 Mass Balance Calculations

High sampling density (over 300 soil samples for off-site analysis for a volume of approximately 30,000 cubic yards of soil) and closely-spaced locations of the TMP borings provided sufficient data for representative mass calculations of all VOCs and TCE. The calculations of contaminant mass were based on the average concentrations of TCE, chlorinated VOCs, non-chlorinated VOCs, and all VOCs generated for over 300 soil samples. These averages were multiplied by the weight of the target volume to determine the mass of each of the above. Note that two different values for soil density were used for the estimate. The detailed calculations are provided in Table 5, and are summarized below.

VOCs used for Estimate	Total Mass (lbs) Est.	Soil Density
All VOCs	228 lbs	Low density soil
All chlorinated VOCs	131 lbs	Low density soil
Non-chlorinated VOCs	96 lbs	Low density soil
TCE	96 lbs	Low density soil
All VOCs	253 lbs	High density soil
All chlorinated VOCs	146 lbs	High density soil
Non-chlorinated VOCs	107 lbs	High density soil
TCE	106 lbs	High density soil

The calculated mass of TCE in the focused treatment volume ranges from 96 to 106 pounds (lbs). This calculation is not expected to be exact, but a reasonable estimate of the amount of TCE present based on the available data.

2.4 POST-ERH SOIL SAMPLING RESULTS

The results of the post-ERH sampling are presented as:

1. Comparison of pre- and post-ERH COC concentrations evaluated against Pemaco SSRLs in Table 6,
2. Comparison of pre- and post-ERH other VOC (not COC) concentrations in Table 7,
3. Percent reduction calculations for select COCs (cis-1,2-DCE, methylene chloride, TCE, and VC) in Table 7, and
4. Chemical box map showing pre-and post-ERH concentration of TCE for each of the paired boring in Figure 4.

The results of the post-ERH sampling (approximately 105 soil samples) show that there were significant reductions of VOCs at every paired-sampling point. The most notable reduction of VOCs was TCE, which was detected at the highest concentrations prior to ERH remediation. Post-ERH concentrations of COCs did not exceed Pemaco SSRLs as presented in Table 6. Generally, there was approximately 99 percent reduction in TCE concentration when comparing the pre-ERH to the post-ERH concentrations, refer to Table 8. For many of the pre-ERH samples with the highest concentration, the reduction in the post-ERH samples was greater then 99.9 percent.

A mass calculation was not performed for the post-ERH analysis because only six of the 19 TMPs locations were sampled. If comparable results for the post-ERH results were applied to the entire site, the mass left in place would be approximately 1.0 lb of TCE, and 2.0 lbs of the other VOCs.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

Field and laboratory QA/QC procedures were carried out according to USEPA CLP analysis protocols and project SAP. The data was accepted based on the QA/QC criteria established by the USEPA. Field QA/QC samples included equipment blanks and field duplicates; and laboratory QA/QC samples consisted of method blanks, storage blank, and matrix spike/matrix spike duplicates [MS/MSD], and laboratory control samples (LCS).

All soil results were validated in accordance with the project SAP. Data validation reports are provided in Appendix B.

3.1 FIELD DUPLICATE RESULTS

In general, one FD sample was collected per every 10 samples collected; one equipment blank was collected per day, and one set of MS/MSD was collected for every 20 field samples collected. During pre-ERH soil sampling event 39 field duplicates and 25 equipment blanks were collected. During post-ERH sampling event 11 field duplicates and 10 equipment blanks were collected.

Field duplicate samples are collected at the same time and from the same source and then submitted as separate samples to the laboratory for analysis. The main purpose of field duplicate analysis is to measure the consistency of filed sampling procedures; however, the results are also affected by precision of the laboratory operations. Field duplicates were collected at a frequency of 10 percent for groundwater samples and submitted blind to the laboratory. During pre-ERH and post-ERH soil sampling events 39 and 11 field duplicates were collected, respectively.

Results for all field duplicate samples collected during the pre-ERH soil sampling in November/December 2006 are presented in Table 9 and during the post-ERH soil sampling in October 2008 in Table 10. Field duplicate results are compared to the results of the parent sample. In addition, Tables 9 and 10 presents values of the relative percent difference (RPD) calculated according to the following formula:

$$\text{RPD} = \frac{|A - B|}{(A + B)/2} \times 100\%$$

where: A = first duplicate concentration
B = second duplicate concentration

The following RPD ranges were calculated:

- between 0% an 151% during the pre-ERH soil sampling (November/December 2006; Table 9), and
- between 2% an 47% during the post-ERH soil sampling (October 2008; Table 10).

Results of the parent and duplicate samples were qualified as estimated for RPD greater than 70%. In addition, if an analyte was detected in only one sample of the field duplicate pair, it was also qualified as estimated.

3.2 EQUIPMENT BLANKS

During pre-ERH soil sampling event 25 equipment blanks were collected. The following VOCs were detected in equipment blank samples:

- 1,2,4-Trimethylbenzene (0.39 J µg/L)
- Acetone (from 7 J to 12 J µg/L),
- m,p-Xylene (0.38 J µg/L),
- Methylene chloride (from 0.29 J to 0.65 J µg/L),
- Naphthalene (0.46 J µg/L),

- N-Hexane (from 0.36 J to 0.78 J µg/L),
- Tetrachloroethene (0.38 J µg/L),
- Toluene (0.26 J µg/L),
- Trichloroethene (from 0.32 J to 0.78 J µg/L), and
- Vinyl chloride (from 0.27 J to 0.45 J µg/L).

Above listed detections are below the contract required quantitation limits (CRQLs). Sample results were validated and qualified based on the detections in the equipment blank in accordance with the project SAP.

During post-ERH sampling event 10 equipment blanks were collected. No VOCs were detected above the CRQLs of 5 or 10 µg/L.

References:

T N & Associates, Inc. (TN&A). 2001. Final Sampling and Analysis Plan, Remedial Investigation/Feasibility Study, DCN: 9KCA005S00VSF1, Pemaco Superfund Site, Maywood, California, February.

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US Environmental Protection Agency (USEPA). 2005. Record of Decision, Pemaco Maywood Superfund Site, Maywood, California. EPA ID: CAD980737092. 13 January.

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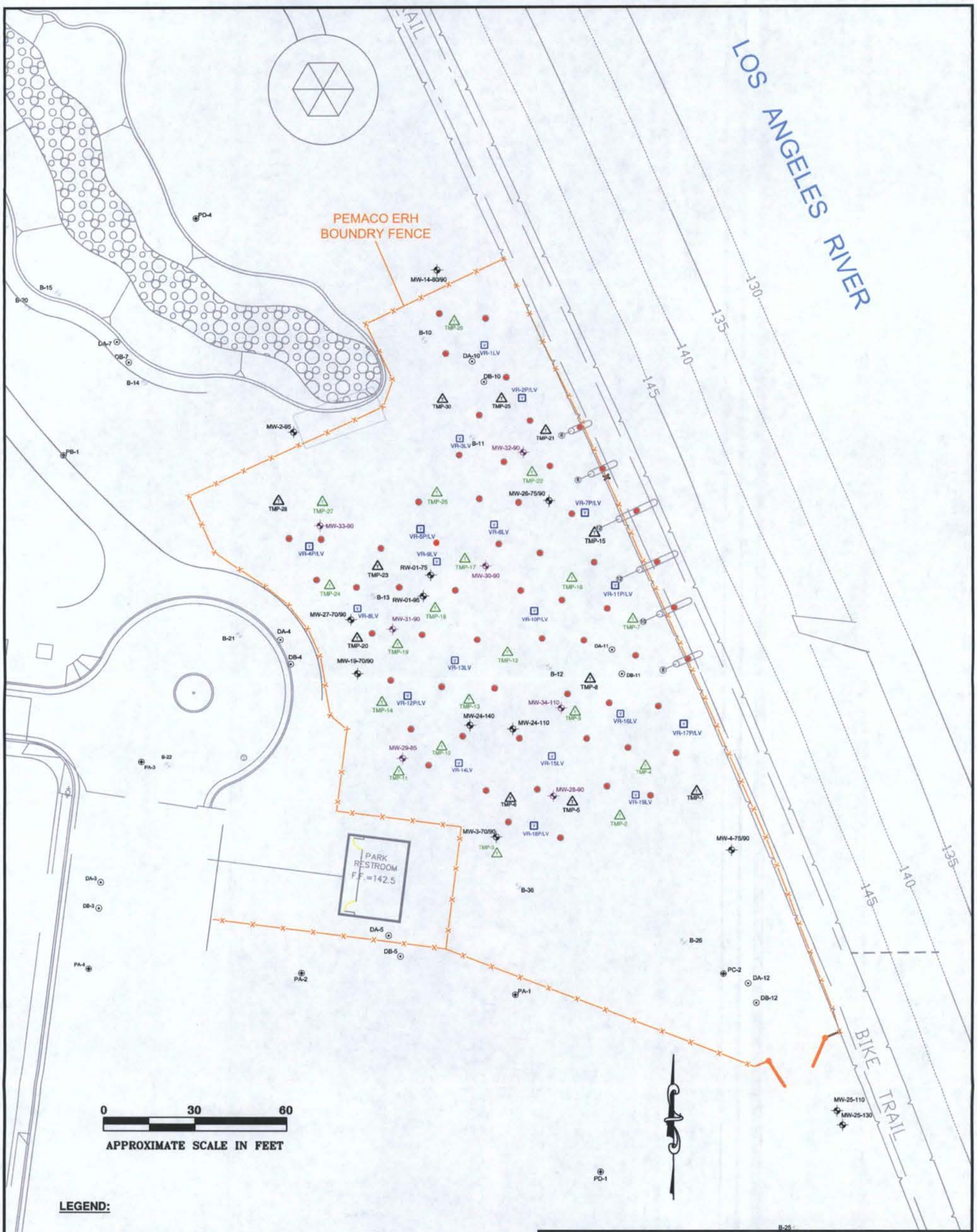
FIGURES

FIGURES



LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING PROBE (TMP) LOCATION
- TMP LOCATION SELECTED FOR PRE-ERH SOIL SAMPLING
- PERCHED/LOWER VADOSE VAPOR RECOVERY (VR) WELL LOCATION
- PEMACO REMEDIAL SYSTEM WELL LOCATION
- GROUNDWATER MONITORING WELL LOCATION
- GROUNDWATER MONITORING WELL INSTALLED IN OCTOBER 2008

PEMACO ELECTRICAL RESISTANCE HEATING (ERH) AREA

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:	PREPARED BY:
U.S. Environmental Protection Agency Region IX San Francisco, California	TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN	APPROVED	DATE: 11/21/08
REVISED: GB, EM DRAWN: DC CHECKED: DB		FIGURE 1

TMP-26	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	170	0.83 U	100	2.8
	40	22 J	3 UJ	110	0.65 J
	45	14	2 U	80	0.32 J
	50	54	29 U	460	5
	55	8.5	3 U	49	0.36 J

TMP-18	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	230	16 U	1100	49 U
	40	5.4	0.66 U	17	0.84 U
	45	35	1.4 U	77	0.27 J
	50	740	22 U	3000	44 U
	55	230	11 U	670	47 U

TMP-27	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	48	0.36 U	300	5.2
	40	2.7	0.89 U	9.1	0.91 U
	45	24	8 U	93	0.41 J
	50	59	13 U	330	6.9
	55	24	14 U	180	4.2

TMP-24	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	790	250 U	3000	78 J
	40	240	54 U	1100	48 U
	45	360	62 U	1900	52 U
	50	130	8.1 UJ	410	3.8
	55	230	35 U	1000	55 U

TMP-19	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	730	33 J	3800	17 J
	40	3	0.57 U	8.3	0.98 U
	45	550	17 J	3400	16 J
	50	430	19 J	2100	52 U
	55	160	15 J	690	43 U

TMP-12	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	91	28 J	940	38 U
	40	370	17 J	1800	34 U
	45	130	47	720	43 U
	50	310	23 J	2000	43 U
	55	370	21 J	2500	39 U

TMP-14	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	390	110	1500	51 U
	40	580	31 J	2800	37 U
	45	400	30 J	2100	9.4 J
	50	570	33 J	3500	66 U
	55	290	20 J	2100	45 U

TMP-13	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	84	4.9 U	150	0.94 U
	40	2.3	0.35 U	9.5	1.2 U
	45	320	34 U	1500	42 U
	50	310	21 U	1700	52 U
	55	220	16 U	920	54 U

TMP-10	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	2.3 J	1.1 U	5.5 J	0.93 U
	40	0.81 J	0.42 U	4.5	1.1 U
	45	1.1	2.9 U	6.5	0.87 U
	50	130	33 U	1000	45 U
	55	120	20 U	800	53 U

TMP-11	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	4.3	1.2 J	18	1.2 U
	40	0.56 J	0.29 J	3.4	1 U
	45	110	29 J	1300	46 U
	50	94	1.3	170	1.6
	55	61	17 J	690	46 U

TMP-03	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	1 U	0.48 U	0.7 J	1 U
	40	1.1 U	0.18 U	0.33 J	1.1 U
	45	3.2	10	47	1.3 U
	50	19	32	310	1.8
	55	14	53	300	1.2

TMP-09	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	0.96 U	2 U	2.7	0.96 UJ
	40	47	21 U	320	2.7
	45	23 J	41 U	420	40 U
	50	44 J	22 UJ	960	47 U
	55	47	32 U	1000	42 U

TMP-29	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	67	0.92 U	42	0.75 J
	40	38	32	3.1	1.9
	45	1.7	7.1	2	0.55 J
	50	0.91 U	0.49 J	1.8 U	0.91 U
	55	0.88 U	3.5	2.8	0.88 U

TMP-22	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	11	0.64 UJ	130	0.82 U
	40	7.6	0.75 UJ	130	0.75 U
	45	17	4.4 UJ	430	2.1
	50	0.86 UJ	0.57 UJ	1.8 J	0.86 U
	55	14	6.3 U	240	1.3

TMP-17	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	130	39 U	570	39 U
	40	0.8 J	0.6 U	7.3	0.88 U
	45	120	3.2 U	800	3.4
	50	130	1.8 U	1100	6.2
	55	160	28 U	1500	42 U

TMP-16	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	14 J	29 U	480	48 U
	40	14	27 U	33 J	0.86
	45	21 J	11 UJ	700	43 U
	50	44 U	44 U	430	44 U
	55	44 J	12 U	1900	46 U

TMP-07	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	1.2	5.5 U	85	1.1 U
	40	1.9	3.5 U	130	1.4 U
	45	6.1	8 U	570	1.3
	50	7.5	7.2 U	1100	1.9
	55	6.6	3.5 U	630	0.62 J

TMP-04	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	1.2 U	5.3 U	5.3	1.2 U
	40	0.61 J	7.2 U	30	0.86 U
	45	0.99 U	2.4 U	9.7	0.99 U
	50	0.91 U	0.75 U	2.1	0.91 U
	55	3.1	1.5 U	330	0.75 J

TMP-05	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	35	4	15	100	0.38 J
	40	3.9	10	100	0.36 J
	45	8.6	22	150	0.83
	50	1.1 U	0.39 U	3.4	1.1 U
	55	8	4.3	200	0.66 J

LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING PROBE (TMP) LOCATION
- TMP LOCATION SELECTED FOR PRE-ERH SOIL SAMPLING
- PERCHED/LOWER VADOSE VAPOR RECOVERY (VR) WELL LOCATION
- PEMACO REMEDIAL SYSTEM WELL LOCATION
- GROUNDWATER MONITORING WELL LOCATION
- GROUNDWATER MONITORING WELL INSTALLED IN OCTOBER 2008

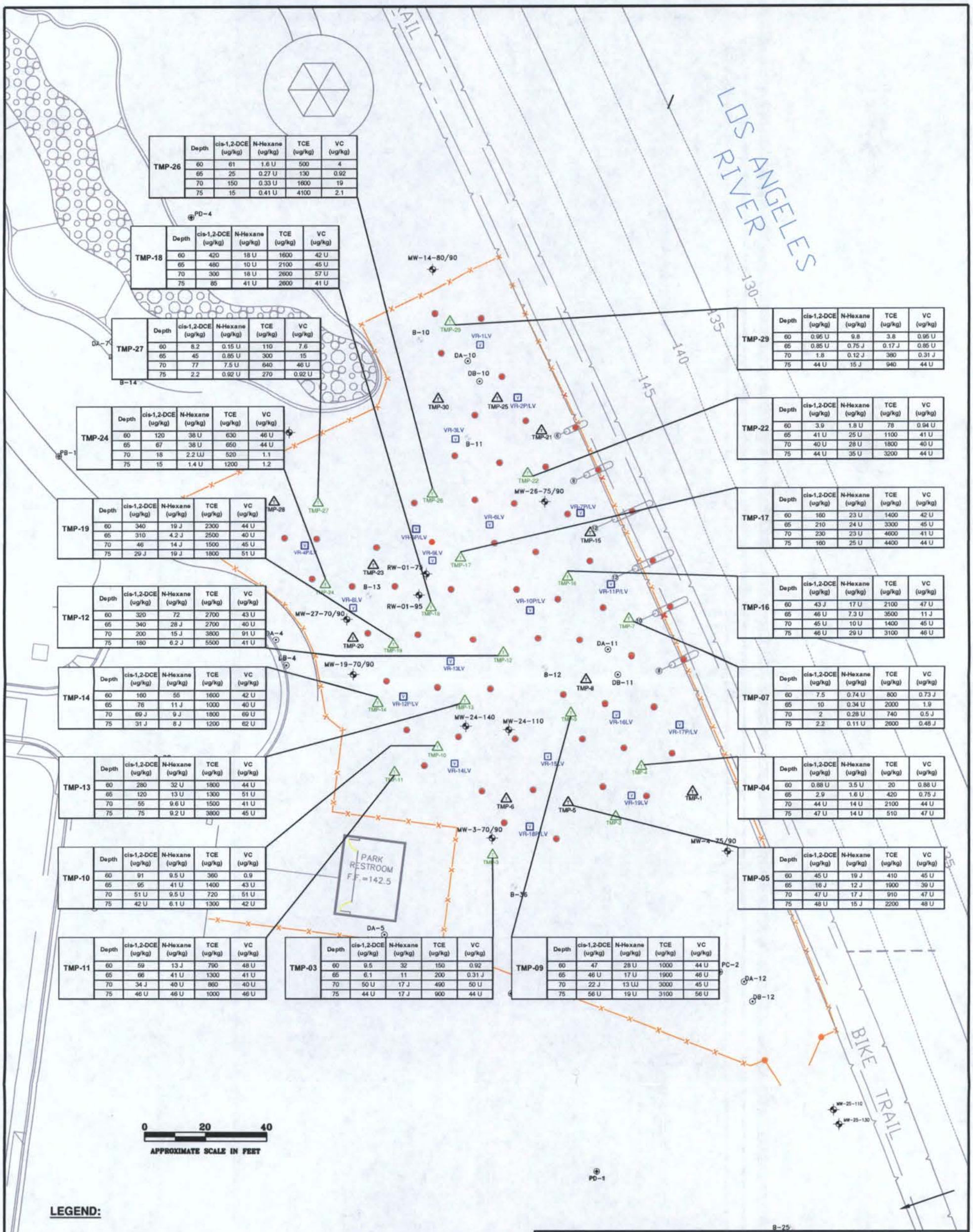
PRE-ERH TMP SOIL CONCENTRATION MAP
35 ~ 55 FT BGS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 11/24/08
REVISED: DC, EM
DRAWN: DC
CHECKED: DB
FIGURE 2A



TMP-26	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	61	1.6 U	500	4
	65	25	0.27 U	130	0.92
	70	150	0.33 U	1600	19
	75	15	0.41 U	4100	2.1

TMP-18	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	420	18 U	1600	42 U
	65	480	10 U	2100	45 U
	70	300	18 U	2600	57 U
	75	85	41 U	2600	41 U

TMP-27	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	8.2	0.15 U	110	7.6
	65	45	0.85 U	300	15
	70	77	7.5 U	640	46 U
	75	2.2	0.92 U	270	0.92 U

TMP-24	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	120	38 U	630	46 U
	65	67	38 U	650	44 U
	70	18	2.2 UJ	520	1.1
	75	15	1.4 U	1200	1.2

TMP-19	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	340	19 J	2300	44 U
	65	310	4.2 J	2500	40 U
	70	46	14 J	1500	45 U
	75	29 J	19 J	1800	51 U

TMP-12	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	320	72	2700	43 U
	65	340	28 J	2700	40 U
	70	200	15 J	3800	91 U
	75	180	6.2 J	5500	41 U

TMP-14	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	160	55	1600	42 U
	65	76	11 J	1000	40 U
	70	69 J	9 J	1800	69 U
	75	31 J	8 J	1200	62 U

TMP-13	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	280	32 U	1800	44 U
	65	120	13 U	1300	51 U
	70	55	9.6 U	1500	41 U
	75	75	9.2 U	3800	45 U

TMP-10	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	91	9.5 U	360	0.9
	65	95	41 U	1400	43 U
	70	51 U	9.5 U	720	51 U
	75	42 U	6.1 U	1300	42 U

TMP-11	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	59	13 J	790	48 U
	65	66	41 U	1300	41 U
	70	34 J	40 U	860	40 U
	75	46 U	46 U	1000	46 U

TMP-03	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	9.5	32	150	0.92
	65	6.1	11	200	0.31 J
	70	50 U	17 J	490	50 U
	75	44 U	17 J	900	44 U

TMP-09	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	47	28 U	1000	44 U
	65	46 U	17 U	1900	46 U
	70	22 J	13 UJ	3000	45 U
	75	56 U	19 U	3100	56 U

TMP-29	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	0.95 U	9.8	3.8	0.95 U
	65	0.85 U	0.75 J	0.17 J	0.85 U
	70	1.8	0.12 J	380	0.31 J
	75	44 U	15 J	940	44 U

TMP-22	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	3.9	1.8 U	78	0.94 U
	65	41 U	25 U	1100	41 U
	70	40 U	28 U	1800	40 U
	75	44 U	35 U	3200	44 U

TMP-17	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	160	23 U	1400	42 U
	65	210	24 U	3300	45 U
	70	230	23 U	4600	41 U
	75	160	25 U	4400	44 U

TMP-16	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	43 J	17 U	2100	47 U
	65	46 U	7.3 U	3500	11 J
	70	45 U	10 U	1400	45 U
	75	46 U	29 U	3100	46 U

TMP-07	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	7.5	0.74 U	800	0.73 J
	65	10	0.34 U	2000	1.9
	70	2	0.28 U	740	0.5 J
	75	2.2	0.11 U	2600	0.48 J

TMP-04	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	0.88 U	3.5 U	20	0.88 U
	65	2.9	1.6 U	420	0.75 J
	70	44 U	14 U	2100	44 U
	75	47 U	14 U	510	47 U

TMP-05	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	60	45 U	19 J	410	45 U
	65	16 J	12 J	1900	39 U
	70	47 U	17 J	910	47 U
	75	48 U	15 J	2200	48 U

LEGEND:

- ERH ELECTRODE LOCATION
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- GROUNDWATER MONITORING WELL LOCATION
- GROUNDWATER MONITORING WELL INSTALLED IN OCTOBER 2008

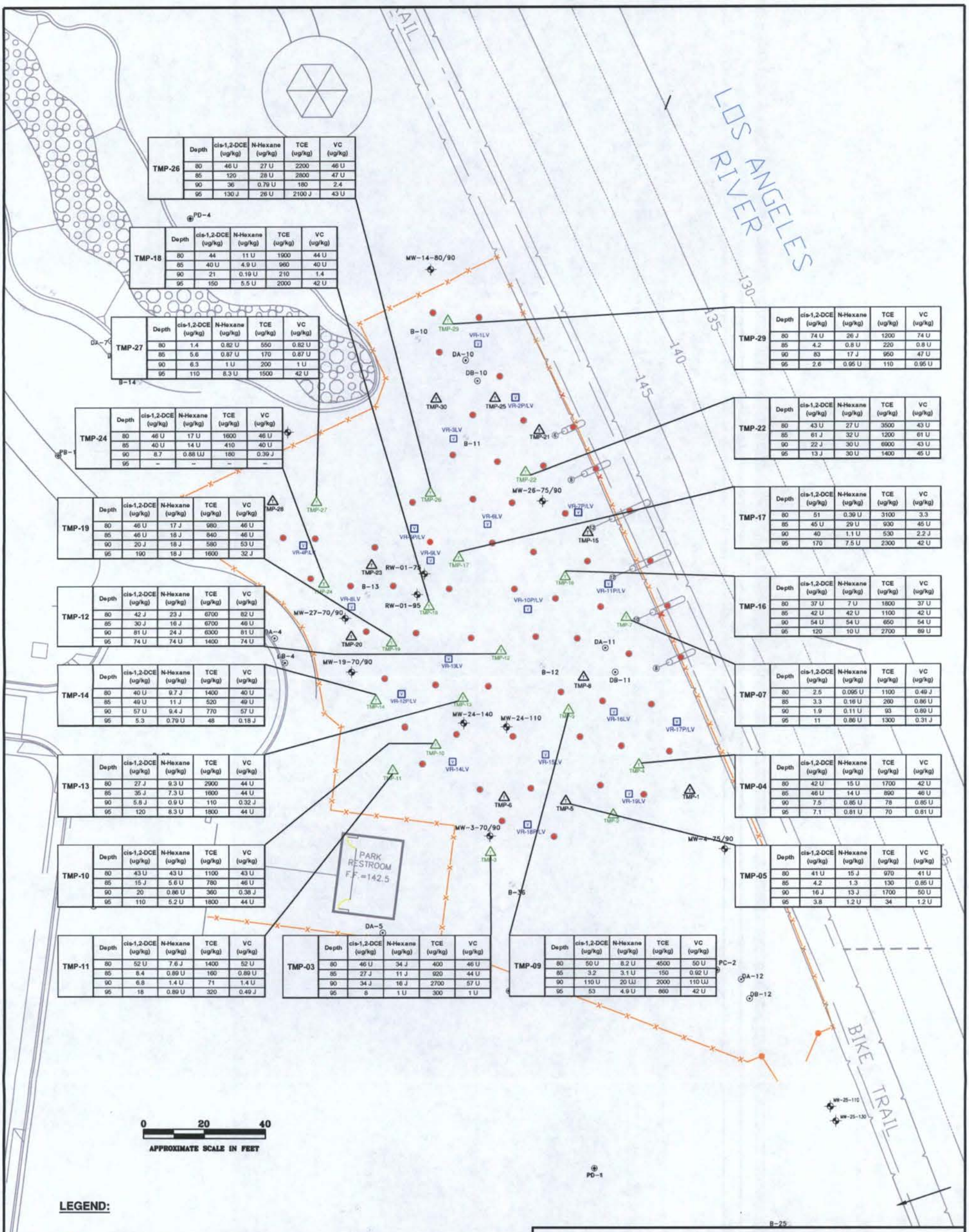
PRE-ERH TMP SOIL CONCENTRATION MAP
60 ~ 75 FT BGS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 11/24/08
REVISED: DC, EM
DRAWN: DC
CHECKED: DB
FIGURE 2B



TMP-26	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	46 U	27 U	2200	46 U
	85	120	28 U	2800	47 U
	90	36	0.79 U	180	2.4
	95	130 J	26 U	2100 J	43 U

TMP-18	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	44	11 U	1900	44 U
	85	40 U	4.9 U	960	40 U
	90	21	0.19 U	210	1.4
	95	150	5.5 U	2000	42 U

TMP-27	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	1.4	0.82 U	550	0.82 U
	85	5.6	0.87 U	170	0.87 U
	90	6.3	1 U	200	1 U
	95	110	8.3 U	1500	42 U

TMP-24	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	46 U	17 U	1600	46 U
	85	40 U	14 U	410	40 U
	90	8.7	0.88 UJ	180	0.39 J
	95	–	–	–	–

TMP-19	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	46 U	17 J	980	46 U
	85	46 U	18 J	840	46 U
	90	20 J	18 J	580	53 U
	95	190	18 J	1600	32 J

TMP-12	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	42 J	23 J	6700	82 U
	85	30 J	16 J	6700	46 U
	90	81 U	24 J	6300	81 U
	95	74 U	74 U	1400	74 U

TMP-14	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	40 U	9.7 J	1400	40 U
	85	49 U	11 J	520	49 U
	90	57 U	9.4 J	770	57 U
	95	5.3	0.79 U	48	0.18 J

TMP-13	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	27 J	9.3 U	2900	44 U
	85	35 J	7.3 U	1600	44 U
	90	5.8 J	0.9 U	110	0.32 J
	95	120	8.3 U	1800	44 U

TMP-10	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	43 U	43 U	1100	43 U
	85	15 J	5.6 U	780	46 U
	90	20	0.86 U	360	0.38 J
	95	110	5.2 U	1800	44 U

TMP-11	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	52 U	7.6 J	1400	52 U
	85	8.4	0.89 U	160	0.89 U
	90	6.8	1.4 U	71	1.4 U
	95	18	0.89 U	320	0.49 J

TMP-03	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	46 U	34 J	400	46 U
	85	27 J	11 J	920	44 U
	90	34 J	16 J	2700	57 U
	95	8	1 U	300	1 U

TMP-09	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	50 U	8.2 U	4500	50 U
	85	3.2	3.1 U	150	0.92 U
	90	110 U	20 UJ	2000	110 UJ
	95	53	4.9 U	860	42 U

TMP-29	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	74 U	26 J	1200	74 U
	85	4.2	0.8 U	220	0.8 U
	90	83	17 J	950	47 U
	95	2.6	0.95 U	110	0.95 U

TMP-22	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	43 U	27 U	3500	43 U
	85	61 J	32 U	1200	61 U
	90	22 J	30 U	6900	43 U
	95	13 J	30 U	1400	45 U

TMP-17	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	51	0.39 U	3100	3.3
	85	45 U	29 U	930	45 U
	90	40	1.1 U	530	2.2 J
	95	170	7.5 U	2300	42 U

TMP-16	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	37 U	7 U	1800	37 U
	85	42 U	42 U	1100	42 U
	90	54 U	54 U	650	54 U
	95	120	10 U	2700	89 U

TMP-07	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	2.5	0.095 U	1100	0.49 J
	85	3.3	0.16 U	260	0.86 U
	90	1.9	0.11 U	93	0.89 U
	95	11	0.86 U	1300	0.31 J

TMP-04	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	42 U	15 U	1700	42 U
	85	46 U	14 U	890	46 U
	90	7.5	0.85 U	78	0.85 U
	95	7.1	0.81 U	70	0.81 U

TMP-05	Depth	cis-1,2-DCE (ug/kg)	N-Hexane (ug/kg)	TCE (ug/kg)	VC (ug/kg)
	80	41 U	15 J	970	41 U
	85	4.2	1.3	130	0.85 U
	90	16 J	13 J	1700	50 U
	95	3.8	1.2 U	34	1.2 U

LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING PROBE (TMP) LOCATION
- TMP LOCATION SELECTED FOR PRE-ERH SOIL SAMPLING
- PERCHED/LOWER VADOSE VAPOR RECOVERY (VR) WELL LOCATION
- PEMACO REMEDIAL SYSTEM WELL LOCATION
- GROUNDWATER MONITORING WELL LOCATION
- GROUNDWATER MONITORING WELL INSTALLED IN OCTOBER 2008

PRE-ERH TMP SOIL CONCENTRATION MAP

80 ~ 95 FT BGS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
TN & A — T N & Associates, Inc. Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 11/24/08
REVISED: DC, EM
DRAWN: DC
CHECKED: DB

FIGURE 2C

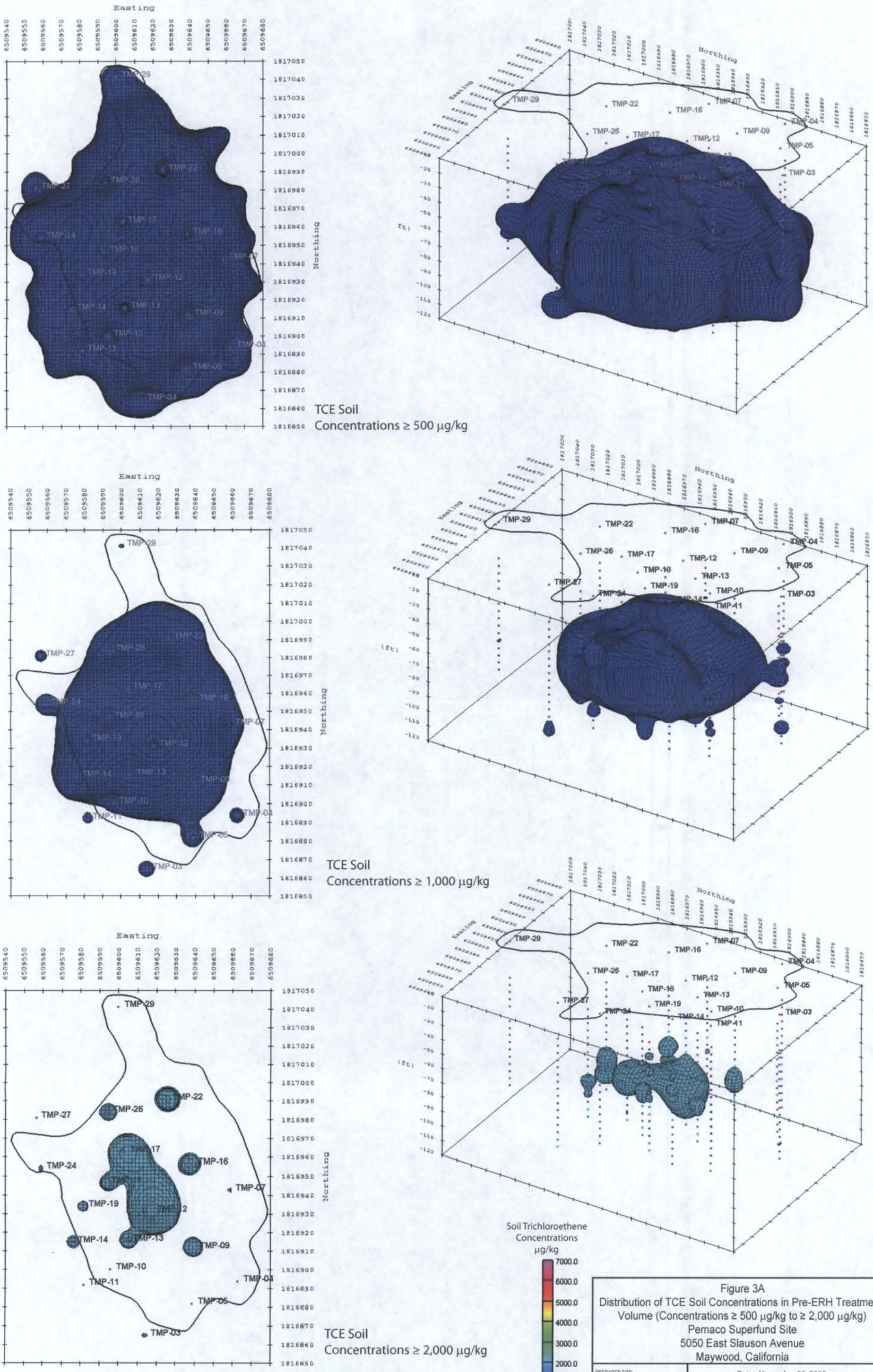
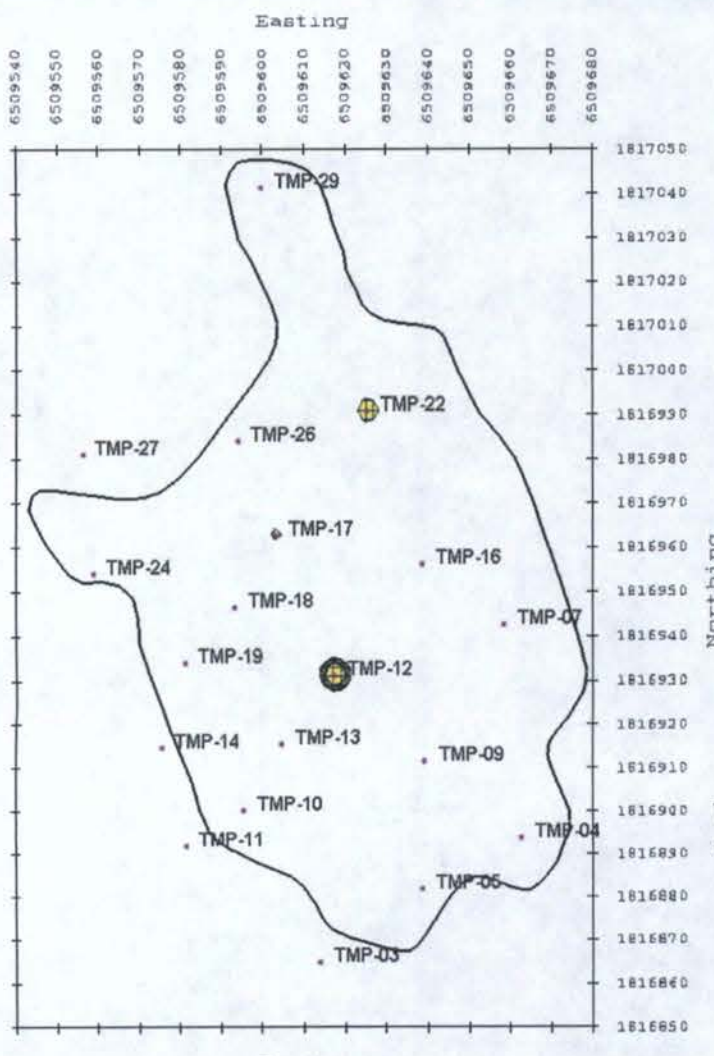


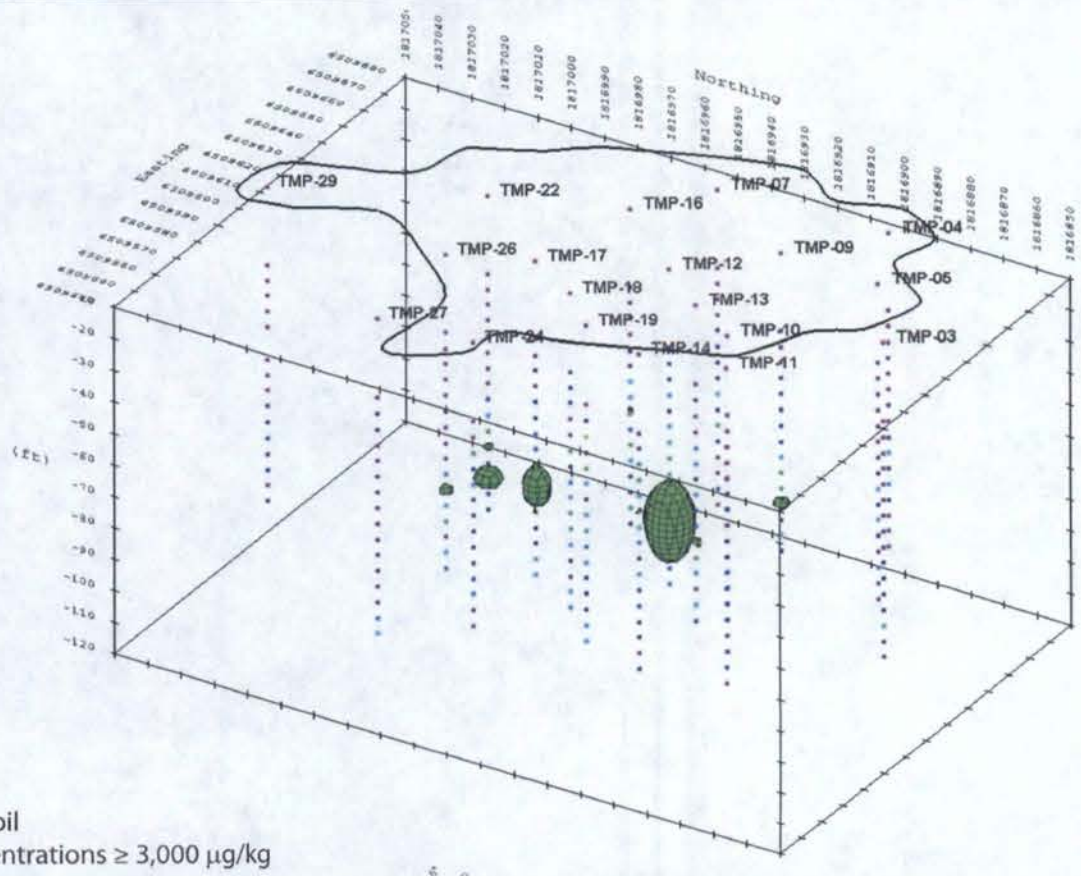
Figure 3A
Distribution of TCE Soil Concentrations in Pre-ERH Treatment Volume (Concentrations ≥ 500 µg/kg to ≥ 2,000 µg/kg)
Pemaco Superfund Site
5050 East Slauson Avenue
Maywood, California

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

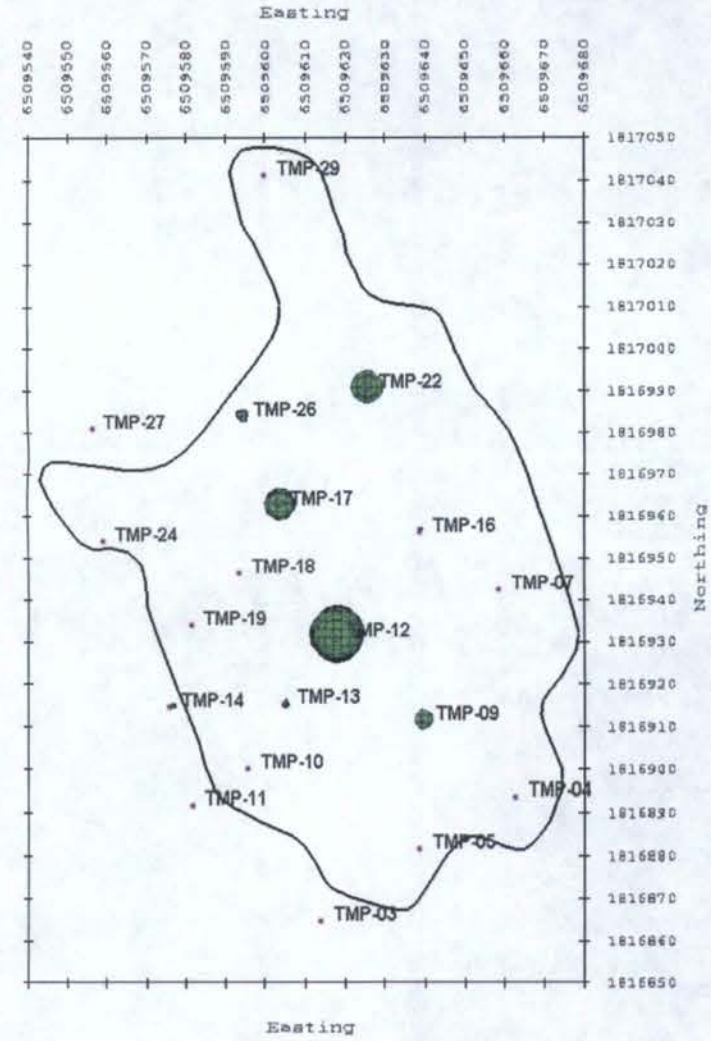
Date: November 30, 2008

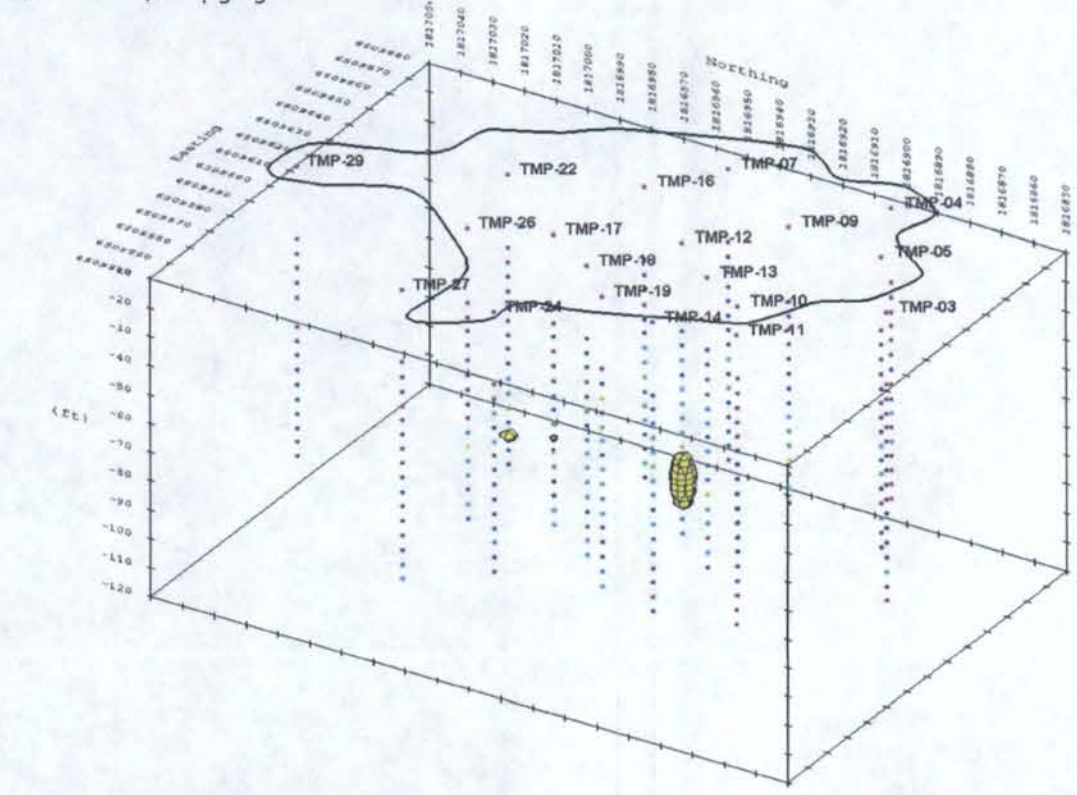
T N & Associates, Inc.
Engineering and Science



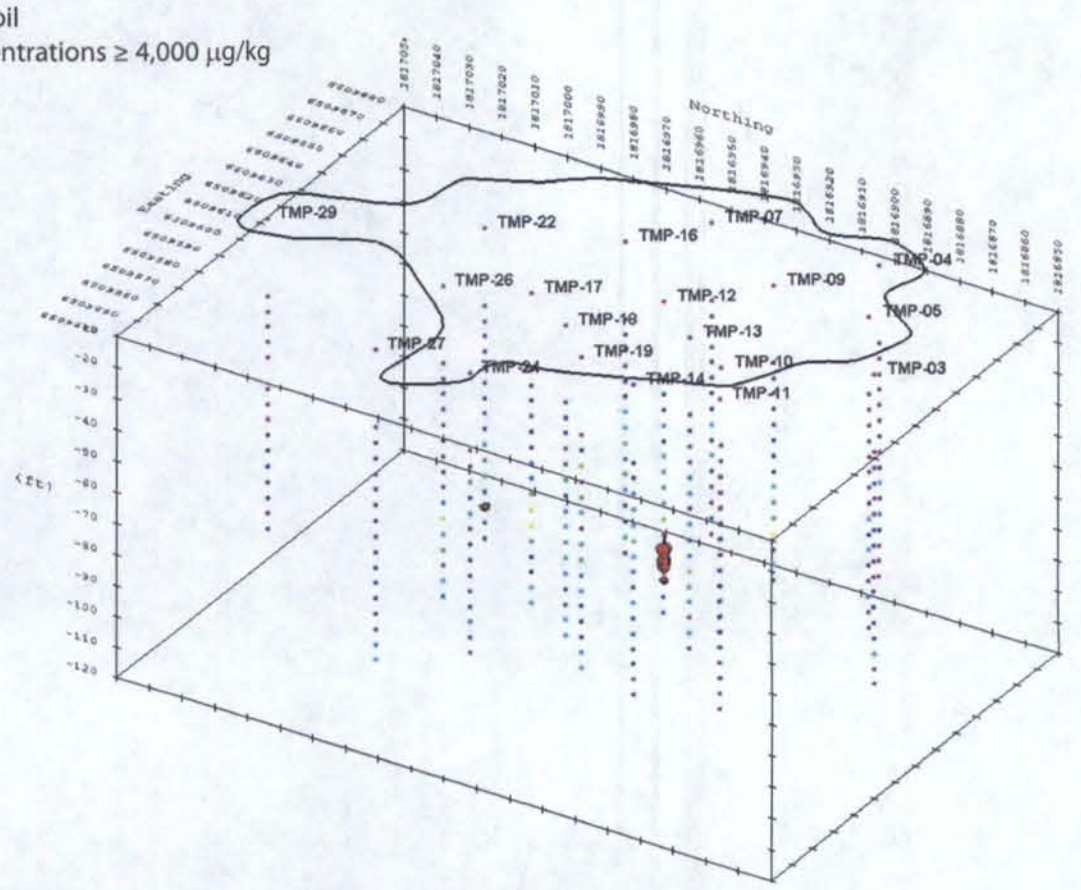


TCE Soil
Concentrations ≥ 3,000 µg/kg





TCE Soil
Concentrations ≥ 4,000 µg/kg



TCE Soil
Concentrations ≥ 5,000 µg/kg

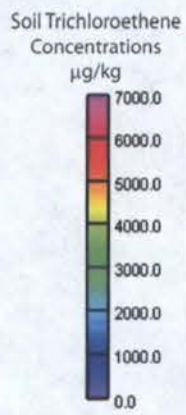
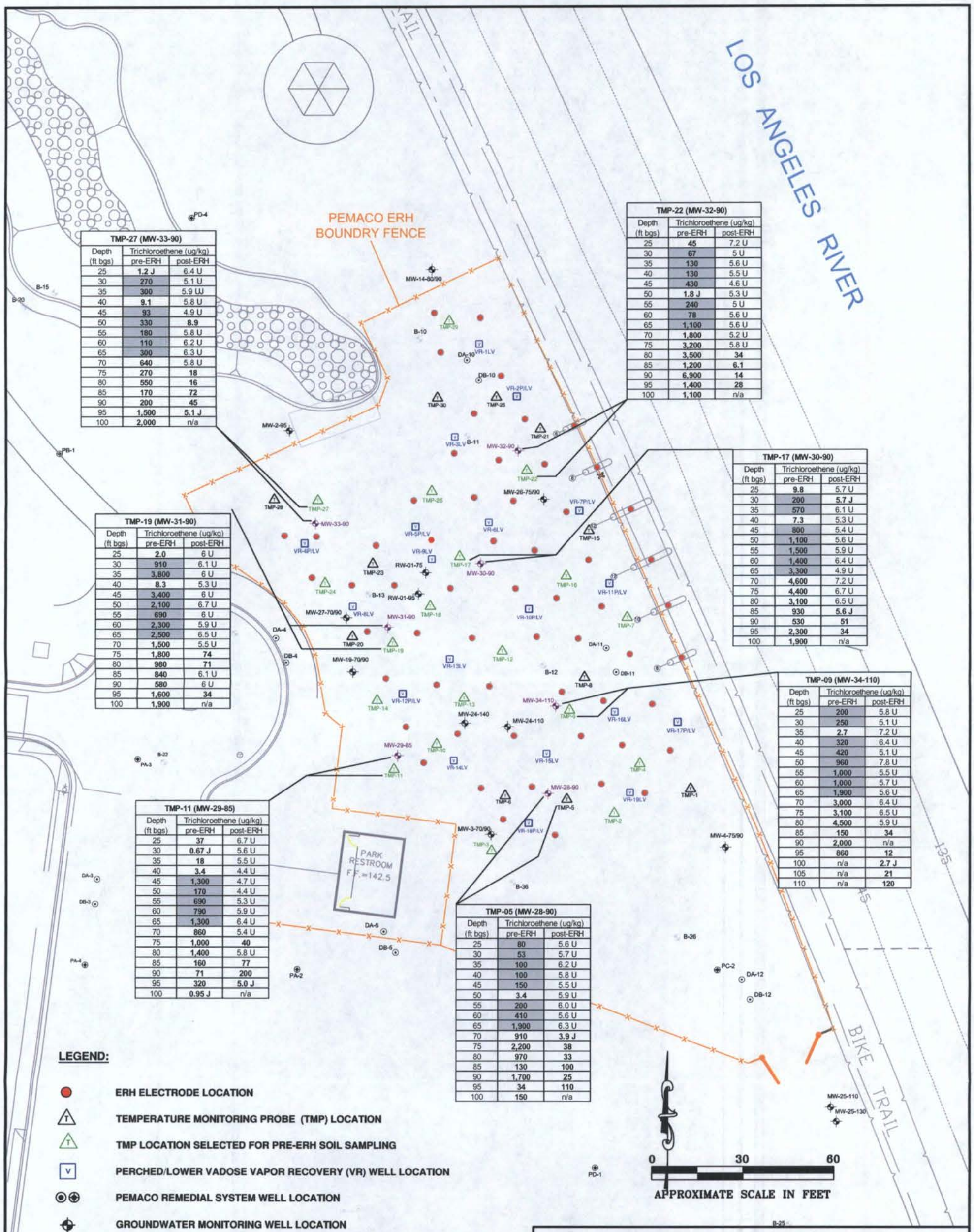


Figure 3B
Distribution of TCE Soil Concentrations in Pre-ERH Treatement Volume (Concentrations ≥ 3,000 µg/kg to ≥ 5,000 µg/kg)
Pemaco Superfund Site
5050 East Slauson Avenue
Maywood, California

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

Date: November 30, 2008

TN & Associates, Inc.
Engineering and Science



TMP-27 (MW-33-90)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	1.2 J	6.4 U
30	270	5.1 U
35	300	5.9 UJ
40	9.1	5.8 U
45	93	4.9 U
50	330	8.9
55	180	5.8 U
60	110	6.2 U
65	300	6.3 U
70	640	5.8 U
75	270	18
80	550	16
85	170	72
90	200	45
95	1,500	5.1 J
100	2,000	n/a

TMP-22 (MW-32-90)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	45	7.2 U
30	67	5 U
35	130	5.6 U
40	130	5.5 U
45	430	4.6 U
50	1.8 J	5.3 U
55	240	5 U
60	78	5.6 U
65	1,100	5.6 U
70	1,800	5.2 U
75	3,200	5.8 U
80	3,500	34
85	1,200	6.1
90	6,900	14
95	1,400	28
100	1,100	n/a

TMP-17 (MW-30-90)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	9.8	5.7 U
30	200	5.7 J
35	570	6.1 U
40	7.3	5.3 U
45	800	5.4 U
50	1,100	5.6 U
55	1,500	5.9 U
60	1,400	6.4 U
65	3,300	4.9 U
70	4,600	7.2 U
75	4,400	6.7 U
80	3,100	6.5 U
85	930	5.6 J
90	530	51
95	2,300	34
100	1,900	n/a

TMP-19 (MW-31-90)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	2.0	6 U
30	910	6.1 U
35	3,800	6 U
40	8.3	5.3 U
45	3,400	6 U
50	2,100	6.7 U
55	690	6 U
60	2,300	5.9 U
65	2,500	6.5 U
70	1,500	5.5 U
75	1,800	74
80	980	71
85	840	6.1 U
90	580	6 U
95	1,600	34
100	1,900	n/a

TMP-09 (MW-34-110)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	200	5.8 U
30	250	5.1 U
35	2.7	7.2 U
40	320	6.4 U
45	420	5.1 U
50	960	7.8 U
55	1,000	5.5 U
60	1,000	5.7 U
65	1,900	5.6 U
70	3,000	6.4 U
75	3,100	6.5 U
80	4,500	5.9 U
85	150	34
90	2,000	n/a
95	860	12
100	n/a	2.7 J
105	n/a	21
110	n/a	120

TMP-11 (MW-29-85)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	37	6.7 U
30	0.67 J	5.6 U
35	18	5.5 U
40	3.4	4.4 U
45	1,300	4.7 U
50	170	4.4 U
55	690	5.3 U
60	790	5.9 U
65	1,300	6.4 U
70	860	5.4 U
75	1,000	40
80	1,400	5.8 U
85	160	77
90	71	200
95	320	5.0 J
100	0.95 J	n/a

TMP-05 (MW-28-90)

Depth (ft bgs)	Trichloroethene (ug/kg) pre-ERH	post-ERH
25	80	5.6 U
30	53	5.7 U
35	100	6.2 U
40	100	5.8 U
45	150	5.5 U
50	3.4	5.9 U
55	200	6.0 U
60	410	5.6 U
65	1,900	6.3 U
70	910	3.9 J
75	2,200	38
80	970	33
85	130	100
90	1,700	25
95	34	110
100	150	n/a

LEGEND:

- ERH ELECTRODE LOCATION
- TEMPERATURE MONITORING PROBE (TMP) LOCATION
- TMP LOCATION SELECTED FOR PRE-ERH SOIL SAMPLING
- PERCHED/LOWER VADOSE VAPOR RECOVERY (VR) WELL LOCATION
- PEMACO REMEDIAL SYSTEM WELL LOCATION
- GROUNDWATER MONITORING WELL LOCATION
- GROUNDWATER MONITORING WELL INSTALLED IN OCTOBER 2008

NOTES:

1. "pre-ERH" soil samples were collected at TMP locations between 11/8/06 and 12/7/06
2. "post-ERH" soil samples were collected at re-drilled TMP/new well locations between 10/15/08 and 10/30/08
3. "U" - not detected above the reporting limit
4. "UJ" - not detected above the estimated reporting limit
5. "J" - estimated result
6. **Bolded** values indicate positive detections
7. [ ] indicates trichloroethene results above Pemaco SSRL of 60 ug/kg defined for soils between 2 and 65 ft bgs (USEPA, 2005)
8. "n/a" - not available

PRE- AND POST-ERH TRICHLOROETHENE CONCENTRATIONS IN SOIL

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental Protection Agency
Region IX
San Francisco, California

PREPARED BY:
T N & Associates, Inc.
Engineering and Science

SCALE: AS SHOWN
APPROVED
DATE: 11/21/08
REVISED: GB, EM
DRAWN: DC
CHECKED: DB
FIGURE 4

TABLES

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-03	25	12/5/06	0.77 U	0.77 U	1.5 U	1.5 U	3.9 UJ	15 U	15 U	5.9 U	0.27 U	**0.17 J**	0.77 U	15 UJ	**0.46 J**	--	1.5 U	0.77 U	39 UJ
TMP-03	30	12/5/06	0.79 U	**0.3 J**	1.6 U	1.6 U	3.9 UJ	16 U	16 U	19 U	0.27 U	7.9 U	0.79 U	16 UJ	**1.1**	--	1.6 U	0.79 U	39 UJ
TMP-03	35	12/5/06	1 U	1 U	2 U	2 U	5.1 UJ	20 U	20 U	12 U	0.83 U	**0.33 J**	1 U	20 UJ	1 U	--	2 U	1 U	51 UJ
TMP-03	40	12/5/06	1.1 U	1.1 U	2.2 U	2.2 U	5.4 UJ	22 U	22 U	13 U	1.1 U	**0.9 J**	1.1 U	22 UJ	1.1 U	--	2.2 U	1.1 U	54 UJ
TMP-03	45	12/5/06	1.3 U	1.3 U	2.5 U	2.5 U	6.4 UJ	25 U	25 U	14 U	1.8 U	13 U	1.3 U	25 UJ	**3.2**	--	2.5 U	1.3 U	64 UJ
TMP-03	50	12/5/06	0.87 U	**0.9**	1.7 U	1.7 U	4.4 UJ	17 U	17 U	15 U	1.3 U	8.7 U	0.87 U	17 UJ	**19**	--	1.7 U	0.87 U	44 UJ
TMP-03	55	12/5/06	0.89 U	**1**	1.8 U	1.8 U	4.5 UJ	18 U	18 U	15 U	1.1 U	8.9 U	0.89 U	18 UJ	**14**	--	1.8 U	0.89 U	45 UJ
TMP-03	60	12/5/06	0.8 U	**0.5 J**	1.6 U	1.6 U	**0.62 J**	16 U	16 U	11 U	0.35 U	**0.72 J**	0.8 U	16 UJ	**9.5**	--	1.6 U	0.8 U	40 UJ
TMP-03	65	12/5/06	1.3 U	**0.28 J**	2.6 U	2.6 U	6.4 UJ	**16 J**	26 U	24 U	5.5 U	**0.24 J**	1.3 U	26 UJ	**6.1**	--	2.6 U	**0.46 J**	64 UJ
TMP-03	70	12/5/06	50 U	50 U	99 U	99 U	250 UJ	990 U	990 U	2500 U	50 U	500 U	50 U	990 U	50 U	--	99 U	50 U	2500 UJ
TMP-03	75	12/5/06	44 U	44 U	89 U	89 U	220 UJ	890 U	890 U	2200 U	6.4 U	440 U	44 U	890 U	44 U	--	89 U	44 U	2200 UJ
TMP-03	80	12/5/06	46 U	46 U	92 U	92 U	230 UJ	920 U	920 U	2300 U	46 U	460 U	46 U	920 U	46 U	--	92 U	46 U	2300 UJ
TMP-03	85	12/5/06	44 U	44 U	89 U	89 U	220 UJ	890 U	890 U	2200 U	6.4 U	440 U	44 U	890 U	**27 J**	--	89 U	44 U	2200 UJ
TMP-03	90	12/5/06	57 U	57 U	110 U	110 U	280 U	1100 U	1100 U	2800 UJ	57 U	570 U	57 U	1100 U	**34 J**	--	110 U	57 U	2800 U
TMP-03	95	12/5/06	1 U	**0.63 J**	2.1 U	2.1 U	5.2 UJ	21 U	21 U	8.1 UJ	1 U	10 U	1 U	21 UJ	**8**	--	2.1 U	1 U	52 U
TMP-03	100	12/5/06	0.89 U	0.89 U	1.8 U	1.8 U	4.5 UJ	18 U	18 U	9.8 UJ	1.7 U	8.9 U	0.89 U	18 UJ	**1.1**	--	1.8 U	**0.17 J**	45 U
TMP-04	25	12/6/06	0.89 U	**0.14 J**	1.8 U	1.8 U	4.4 UJ	18 UJ	18 U	12 UJ	**2.8**	**0.25 J**	0.89 U	18 U	**0.89**	--	1.8 U	**0.14 J**	44 U
TMP-04	30	12/6/06	0.75 U	**0.16 J**	1.5 U	1.5 U	3.7 UJ	15 UJ	15 U	11 UJ	**0.11 J**	7.5 UJ	0.75 U	15 U	**0.23 J**	--	1.5 U	0.75 U	37 U
TMP-04	35	12/6/06	1.2 U	1.2 U	2.3 U	2.3 U	5.8 UJ	23 UJ	23 U	55 UJ	**0.65 J**	**1.3 J**	1.2 U	23 U	1.2 U	--	2.3 U	1.2 U	58 U
TMP-04	40	12/6/06	0.86 U	**0.2 J**	1.7 U	1.7 U	4.3 UJ	17 UJ	17 U	19 UJ	**3.1**	**0.37 J**	0.86 U	17 U	**0.61 J**	--	**0.18 J**	**0.19 J**	43 U
TMP-04	45	12/6/06	0.99 U	0.99 U	2 U	2 U	5 UJ	20 UJ	20 U	9.4 UJ	**0.47 J**	**0.25 J**	0.99 U	20 U	0.99 U	--	2 U	0.99 U	50 U
TMP-04	50	12/6/06	0.91 U	0.91 U	1.8 U	1.8 U	4.6 UJ	18 UJ	18 U	46 UJ	**0.37 J**	**0.27 J**	0.91 U	18 U	0.91 U	--	1.8 U	0.91 U	46 U
TMP-04	55	12/6/06	0.84 U	**0.48 J**	1.7 U	1.7 U	4.2 UJ	17 UJ	17 U	6.5 UJ	**0.81 J**	8.4 UJ	0.84 U	17 U	**3.1**	--	1.7 U	0.84 U	42 U
TMP-04	60	12/6/06	0.88 U	0.88 U	1.8 U	1.8 U	4.4 UJ	18 UJ	18 U	13 UJ	**0.53 J**	**0.8 J**	0.88 U	**3.1 J**	0.88 U	--	1.8 U	0.88 U	44 U
TMP-04	65	12/7/06	0.96 U	**0.66 J**	1.9 U	1.9 U	4.8 UJ	19 UJ	19 U	48 UJ	**0.82 J**	9.6 UJ	0.96 U	19 U	**2.9**	--	1.9 U	0.96 U	48 U
TMP-04	70	12/7/06	44 U	44 U	88 U	88 U	220 UJ	880 UJ	880 U	2200 UJ	44 U	440 UJ	44 U	880 U	44 U	--	88 U	44 U	2200 U
TMP-04	75	12/7/06	47 U	47 U	94 U	94 U	230 UJ	940 UJ	940 U	2300 UJ	47 U	470 UJ	47 U	940 U	47 U	--	94 U	47 U	2300 U
TMP-04	80	12/7/06	42 U	42 U	83 U	83 U	210 UJ	830 UJ	830 U	2100 UJ	42 U	420 UJ	42 U	830 U	42 U	--	83 U	42 U	2100 U
TMP-04	85	12/7/06	46 U	46 U	91 U	91 U	230 UJ	910 UJ	910 U	2300 UJ	46 U	460 UJ	46 U	910 U	46 U	--	91 U	46 U	2300 U
TMP-04	90	12/7/06	**0.3 J**	**0.51 J**	1.7 U	1.7 U	4.3 UJ	17 UJ	17 U	43 UJ	**1.1 J**	8.5 UJ	**0.26 J**	17 U	**7.5**	--	1.7 U	0.85 U	43 U
TMP-04	95	12/7/06	**0.29 J**	**0.59 J**	1.6 U	1.6 U	4.1 UJ	16 UJ	16 U	7.6 UJ	**0.56 J**	8.1 UJ	0.81 U	16 U	**7.1**	--	1.6 U	0.81 U	41 U
TMP-04	100	12/7/06	0.94 U	**0.17 J**	1.9 U	1.9 U	4.7 UJ	19 UJ	19 U	8.4 UJ	**0.56 J**	9.4 UJ	0.94 U	19 U	**3.6**	--	1.9 U	0.94 U	47 U
TMP-05	25	12/7/06	0.87 U	0.87 U	1.7 U	1.7 U	4.4 UJ	17 U	17 U	18 UJ	1.7 U	**0.19 J**	0.87 U	17 U	**0.92**	--	1.7 U	**0.14 J**	44 U
TMP-05	30	12/7/06	0.87 U	**0.22 J**	1.7 U	1.7 U	4.3 UJ	17 U	17 U	13 UJ	0.39 U	**0.25 J**	0.87 U	17 U	**1.7**	--	1.7 U	0.87 U	43 U
TMP-05	35	12/7/06	0.89 U	**0.42 J**	**0.11 J**	**0.13 J**	4.5 U	**9.5 J**	18 U	36 UJ	17 U	**0.28 J**	0.89 U	18 U	**4**	--	1.8 U	**0.79 J**	45 UJ
TMP-05	40	12/7/06	1.1 U	**0.37 J**	2.2 U	2.2 U	5.4 U	22 UJ	22 U	17 UJ	1.8 U	**0.37 J**	1.1 U	22 U	**3.9**	--	2.2 U	1.1 U	54 UJ
TMP-05	45	12/7/06	0.81 U	**0.46 J**	1.6 U	1.6 U	4 U	16 UJ	16 U	40 UJ	0.46 U	**0.17 J**	0.81 U	16 U	**8.6**	--	1.6 U	0.81 U	40 U
TMP-05	50	12/7/06	1.1 U	1.1 U	2.1 U	2.1 U	5.4 U	21 UJ	21 U	8.9 UJ	0.15 U	11 U	1.1 U	21 U	1.1 U	--	2.1 U	1.1 U	54 U
TMP-05	55	12/7/06	1 U	**0.33 J**	2 U	2 U	5.1 U	20 UJ	20 U	17 UJ	1.4 U	10 U	1 U	20 U	**8**	--	2 U	**0.17 J**	51 U
TMP-05	60	12/7/06	45 U	45 U	91 U	91 U	230 U	910 UJ	910 U	2300 UJ	45 U	450 U	45 U	910 U	45 U	--	91 U	45 U	2300 U
TMP-05	65	12/7/06	39 U	39 U	79 U	79 U	200 U	790 UJ	790 U	2000 UJ	39 U	390 U	39 U	790 U	**16 J**	--	79 U	39 U	2000 U
TMP-05	70	12/7/06	47 U	47 U	94 U	94 U	240 U	940 UJ	940 U	2400 UJ	47 U	470 U	47 U	940 U	47 U	--	94 U	47 U	2400 U
TMP-05	75	12/7/06	48 U	48 U	97 U	97 U	240 U	970 UJ	970 U	2400 UJ	48 U	480 U	48 U	970 U	48 U	--	97 U	48 U	2400 U
TMP-05	80	12/7/06	41 U	41 U	81 U	81 U	200 U	810 UJ	810 U	2000 UJ	41 U	410 U	41 U	810 U	41 U	--	81 U	41 U	2000 U
TMP-05	85	12/7/06	**0.15 J**	**0.65 J**	1.7 U	1.7 U	4.2 U	17 UJ	17 U	5.8 UJ	0.55 U	8.5 U	0.85 U	17 U	**4.2**	--	1.7 U	0.85 U	42 UJ
TMP-05	90	12/7/06	50 U	50 U	100 U	100 U	250 U	1000 UJ	1000 U	2500 UJ	50 U	500 U	50 U	1000 U	**16 J**	--	100 U	50 U	2500 U
TMP-05	95	12/7/06	1.2 U	**0.3 J**	**0.14 J**	2.3 U	5.8 U	23 UJ	23 U	23 UJ	15 U	12 U	1.2 U	23 U	**3.8**	--	2.3 U	**0.7 J**	58 U
TMP-05	100	12/7/06	0.81 U	**0.31 J**	1.6 U	1.6 U	4.1 U	16 U	16 U	24 UJ	0.97 U	**0.34 J**	0.81 U	16 U	**4.6**	--	**0.23 J**	0.81 U	41 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-03	25	0.77 U	1.5 U	1.5 U	7.7 UJ	7.7 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.16 U	0.77 U	**18**	**0.12 J**	0.77 U
TMP-03	30	0.79 U	1.6 U	1.6 U	7.9 UJ	7.9 U	**43**	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.13 U	0.79 U	**25**	7.9 UJ	0.79 U
TMP-03	35	1 U	2 U	2 U	10 UJ	10 U	0.48 U	1 U	1 U	1 U	1 U	1 U	0.6 U	1 U	**0.7 J**	**0.22 J**	1 U
TMP-03	40	1.1 U	2.2 U	2.2 U	11 UJ	11 U	0.18 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	**0.33 J**	11 UJ	1.1 U
TMP-03	45	1.3 U	0.36 U	2.5 U	13 UJ	13 U	**10**	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.2 U	1.3 U	**47**	13 UJ	1.3 U
TMP-03	50	0.87 U	1.7 U	1.7 U	8.7 UJ	8.7 U	**32**	0.87 U	0.87 U	0.87 U	0.87 U	**0.63 J**	0.57 U	**1.5**	**310**	8.7 UJ	**1.8**
TMP-03	55	0.89 U	1.8 U	1.8 U	8.9 UJ	8.9 U	**53**	0.89 U	0.89 U	0.89 U	0.89 U	**0.93**	0.76 U	**1.1**	**300**	8.9 UJ	**1.2**
TMP-03	60	0.8 U	1.6 U	1.6 U	8 UJ	8 U	**32**	0.8 U	0.8 U	0.8 U	0.8 U	**0.35 J**	0.23 U	**0.78 J**	**150**	8 UJ	**0.92**
TMP-03	65	1.3 U	0.93 U	2.6 U	13 UJ	13 U	**11**	1.3 U	1.3 U	1.3 U	1.3 U	**0.37 J**	3.9 U	**0.5 J**	**200**	13 UJ	**0.31 J**
TMP-03	70	50 U	99 U	99 U	**290 J**	500 U	**17 J**	50 U	50 U	50 U	50 U	50 U	7.5 U	50 U	**490**	500 UJ	50 U
TMP-03	75	44 U	89 U	89 U	**250 J**	440 U	**17 J**	44 U	44 U	44 U	44 U	44 U	7.5 U	44 U	**900**	440 UJ	44 U
TMP-03	80	46 U	92 U	92 U	**330 J**	460 U	**34 J**	46 U	46 U	46 U	46 U	46 U	8.2 U	46 U	**400**	460 UJ	46 U
TMP-03	85	44 U	89 U	89 U	**240 J**	440 U	**11 J**	44 U	44 U	44 U	44 U	44 U	44 U	44 U	**920**	440 UJ	44 U
TMP-03	90	57 U	110 U	110 U	**380 J**	570 U	**16 J**	57 U	57 U	57 U	57 U	57 U	9.4 U	57 U	**2,700**	570 U	57 U
TMP-03	95	1 U	2.1 U	2.1 U	10 UJ	10 U	1 U	1 U	1 U	1 U	1 U	1 U	0.68 U	1 U	**300**	10 UJ	1 U
TMP-03	100	0.89 U	0.31 U	1.8 U	8.9 UJ	8.9 U	1.6 U	0.89 U	**0.11 J**	0.89 U	0.89 U	**0.19 J**	1.5 U	0.89 U	**20**	8.9 UJ	0.89 U
TMP-04	25	0.89 U	**0.32 J**	1.8 U	8.9 UJ	8.9 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	**1.8 J**	1.3 U	0.89 U	**110**	8.9 U	0.89 U
TMP-04	30	0.75 U	1.5 U	1.5 U	7.5 UJ	7.5 U	11 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 UJ	0.22 U	0.75 U	**13**	7.5 U	0.75 U
TMP-04	35	1.2 U	2.3 U	2.3 U	12 UJ	12 U	5.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 UJ	0.44 U	1.2 U	**5.3**	12 U	1.2 U
TMP-04	40	0.86 U	**0.36 J**	1.7 U	8.6 UJ	**0.32 J**	7.2 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 UJ	1.7 U	0.86 U	**30**	8.6 U	0.86 U
TMP-04	45	0.99 U	**0.21 J**	2 U	9.9 UJ	9.9 U	2.4 U	0.99 U	0.99 U	0.99 U	0.99 U	0.99 UJ	0.5 U	0.99 U	**9.7**	9.9 U	0.99 U
TMP-04	50	0.91 U	**0.19 J**	1.8 U	9.1 UJ	9.1 U	0.75 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 UJ	0.32 U	0.91 U	**2.1**	9.1 U	0.91 U
TMP-04	55	0.84 U	**0.29 J**	1.7 U	8.4 UJ	8.4 U	1.5 U	0.84 U	0.84 U	0.84 U	0.84 U	**0.37 J**	0.58 U	**0.63 J**	**330**	8.4 U	**0.75 J**
TMP-04	60	0.88 U	**0.24 J**	1.8 U	8.8 UJ	8.8 U	3.5 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 UJ	0.44 U	0.88 U	**20**	8.8 U	0.88 U
TMP-04	65	0.96 U	**0.24 J**	1.9 U	9.6 UJ	9.6 U	1.6 U	0.96 U	0.96 U	0.96 U	0.96 U	**0.43 J**	0.55 U	**0.93 J**	**420**	9.6 U	**0.75 J**
TMP-04	70	44 U	88 U	88 U	330 UJ	440 U	14 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**2,100**	440 U	44 U
TMP-04	75	47 U	94 U	94 U	310 UJ	470 U	14 U	47 U	47 U	47 U	47 U	47 UJ	47 U	47 U	**510**	470 U	47 U
TMP-04	80	42 U	83 U	83 U	270 UJ	420 U	15 U	42 U	42 U	42 U	42 U	42 UJ	42 U	42 U	**1,700**	420 U	42 U
TMP-04	85	46 U	91 U	91 U	350 UJ	460 U	14 U	46 U	46 U	46 U	46 U	46 UJ	46 U	46 U	**890**	460 U	46 U
TMP-04	90	0.85 U	1.7 U	1.7 U	8.5 UJ	8.5 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	**0.35 J**	0.62 U	0.85 U	**78**	8.5 U	0.85 U
TMP-04	95	0.81 U	1.6 U	1.6 U	8.1 UJ	8.1 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	**0.28 J**	0.38 U	0.81 U	**70**	8.1 U	0.81 U
TMP-04	100	0.94 U	1.9 U	1.9 U	9.4 UJ	9.4 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 UJ	0.44 U	0.94 U	**40**	9.4 U	0.94 U
TMP-05	25	0.87 U	0.19 U	1.7 U	8.7 U	8.7 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	**0.94 J**	0.72 U	0.87 U	**80**	8.7 U	0.87 U
TMP-05	30	0.87 U	1.7 U	1.7 U	8.7 U	0.83 U	**16**	0.87 U	0.87 U	0.87 U	0.87 U	**0.16 J**	0.18 U	0.87 U	**53**	8.7 U	0.87 U
TMP-05	35	**0.13 J**	1.5 U	1.8 U	8.9 U	2.1 U	**15**	0.89 U	**0.53 J**	0.89 U	0.89 U	**0.28 J**	7.8 U	**0.24 J**	**100**	8.9 U	**0.38 J**
TMP-05	40	1.1 U	0.33 U	2.2 U	11 U	0.39 U	**10**	1.1 U	1.1 U	1.1 U	1.1 U	**0.22 J**	0.92 U	1.1 U	**100**	11 U	**0.36 J**
TMP-05	45	0.81 U	1.6 U	1.6 U	8.1 U	8.1 U	**22**	0.81 U	0.81 U	0.81 U	0.81 U	**0.29 J**	0.28 U	**0.86**	**150**	8.1 U	**0.83**
TMP-05	50	1.1 U	2.1 U	2.1 U	11 UJ	11 U	0.39 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.1 U	1.1 U	**3.4**	11 U	1.1 U
TMP-05	55	1 U	0.31 U	2 U	10 UJ	10 U	**4.3**	1 U	1 U	1 U	1 U	**0.26 J**	0.49 U	**0.49 J**	**200**	10 U	**0.66 J**
TMP-05	60	45 U	91 U	91 U	**340 J**	450 U	**19 J**	45 U	45 U	45 U	45 U	45 UJ	8.4 U	45 U	**410**	450 U	45 U
TMP-05	65	39 U	79 U	79 U	**280 J**	390 U	**12 J**	39 U	39 U	39 U	39 U	39 UJ	39 U	39 U	**1,900**	390 U	39 U
TMP-05	70	47 U	94 U	94 U	**380 J**	470 U	**17 J**	47 U	47 U	47 U	47 U	47 UJ	7.7 U	47 U	**910**	470 U	47 U
TMP-05	75	48 U	97 U	97 U	**350 J**	480 U	**15 J**	48 U	48 U	48 U	48 U	48 UJ	7.8 U	48 U	**2,200**	480 U	48 U
TMP-05	80	41 U	81 U	81 U	**300 J**	410 U	**15 J**	41 U	41 U	41 U	41 U	41 UJ	7.8 U	41 U	**970**	410 U	41 U
TMP-05	85	0.85 U	1.7 U	1.7 U	8.5 U	8.5 U	**1.3**	0.85 U	0.85 U	0.85 U	0.85 U	**0.32 J**	0.37 U	**0.29 J**	**130**	8.5 U	0.85 U
TMP-05	90	50 U	100 U	100 U	**390 J**	500 U	**13 J**	50 U	50 U	50 U	50 U	50 UJ	7.6 U	50 U	**1,700**	500 U	50 U
TMP-05	95	1.2 U	1 U	2.3 U	12 UJ	12 U	1.2 U	1.2 U	**0.34 J**	1.2 U	1.2 U	1.2 UJ	7.4 U	**0.3 J**	**34**	12 U	1.2 U
TMP-05	100	0.81 U	1.6 U	1.6 U	8.1 UJ	8.1 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 U	0.81 UJ	0.59 U	**0.29 J**	**150**	8.1 U	**0.32 J**

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-07	25	11/6/06	0.97 U	0.24 J	1.9 U	1.9 U	4.9 U	19 U	19 U	15 J	1.5 U	9.7 U	0.97 U	19 U	0.74 J		1.9 U	0.97 U	27 U
TMP-07	30	11/6/06	0.86 U	0.42 J	1.7 U	1.7 U	4.3 U	17 U	17 U	14 J	0.9 U	0.17 J	0.86 U	17 U	1		1.7 U	0.86 U	16 U
TMP-07	35	11/6/06	1.1 U	1.1 U	2.1 U	2.1 U	5.3 U	21 U	21 U	9.9 J	0.19 U	0.33 J	1.1 U	21 U	1.2		2.1 U	1.1 U	15 U
TMP-07	40	11/6/06	1.4 U	1.4 U	2.8 U	2.8 U	7 U	28 U	28 U	37 J	0.81 U	0.49 J	1.4 U	28 U	1.9		2.8 U	1.4 U	49 U
TMP-07	45	11/6/06	0.99 U	0.53 J	2 U	2 U	5 U	20 U	20 U	9.2 J	1.2 U	9.9 U	0.99 U	20 U	6.1		2 U	0.99 U	24 U
TMP-07	50	11/6/06	0.91 U	0.93	1.8 U	1.8 U	4.6 U	18 U	18 U	10 J	0.82 U	9.1 U	0.91 U	18 U	7.5		1.8 U	0.91 U	52 U
TMP-07	55	11/6/06	1 U	0.46 J	0.17J	2 U	5 U	20 U	20 U	8.9 J	0.85 U	10 U	1 U	20 U	6.6		2 U	1 U	24 U
TMP-07	60	11/6/06	1.3 U	0.5 J	2.6 U	2.6 U	6.6 U	26 U	26 U	66 U	0.3 U	13 U	1.3 U	26 U	7.5		2.6 U	1.3 U	39 U
TMP-07	65	11/6/06	0.75 U	1.1	1.5 U	1.5 U	3.8 U	15 U	15 U	38 U	0.88 U	7.5 U	0.75 U	15 U	10		1.5 U	0.75 U	14 U
TMP-07	70	11/6/06	0.83 U	0.7 J	1.7 U	1.7 U	4.2 U	17 U	17 U	7.4 J	0.46 U	8.3 U	0.83 U	17 U	2		1.7 U	0.83 U	25 U
TMP-07	75	11/6/06	0.93 U	0.86 J	1.9 U	1.9 U	4.7 U	19 U	19 U	14 J	0.13 U	9.3 U	0.93 U	19 U	2.2		1.9 U	0.93 U	26 U
TMP-07	80	11/6/06	0.8 U	1.9	1.6 U	1.6 U	4 U	16 U	16 U	5.3 J	0.21 U	8 U	0.8 U	16 U	2.5		1.6 U	0.8 U	27 U
TMP-07	85	11/6/06	0.86 U	0.79 J	1.7 U	1.7 U	4.3 U	17 U	17 U	7.6 J	0.86 U	8.6 U	0.59 J	17 U	3.3		1.7 U	0.86 U	38 U
TMP-07	90	11/6/06	0.89 U	0.26 J	1.8 U	1.8 U	4.4 U	18 U	18 U	6.3 J	0.19 U	8.9 U	0.5 J	18 U	1.9		1.8 U	0.89 U	29 U
TMP-07	95	11/6/06	0.86 U	0.77 J	1.7 U	1.7 U	4.3 U	17 U	17 U	6.4 J	0.36 U	8.6 U	0.31 J	17 U	11		1.7 U	0.86 U	30 U
TMP-07	100	11/6/06	0.89 U	0.89 U	1.8 U	1.8 U	4.5 U	18 U	18 U	14 J	2.1 U	8.9 U	0.89 U	18 U	2.1		1.8 U	0.89 U	25 U
TMP-09	25	11/16/06	0.95 U	0.95 U	1.9 U	1.9 U	4.7 U	19 U	19 U	25 J	3.3 U	0.39 U	0.95 U	19 U	3	--	1.9 U	0.2 J	47 U
TMP-09	30	11/16/06	1.5 U	0.44 J	3 U	3 U	7.6 U	30 U	30 U	15 J	0.49 U	15 U	1.5 U	30 U	12	--	3 U	1.5 U	76 U
TMP-09	35	11/16/06	0.96 U	0.96 U	1.9 U	1.9 U	4.8 U	19 U	19 U	42 J	0.26 U	9.6 U	0.96 U	19 U	0.96 U	--	1.9 U	0.96 U	48 UJ
TMP-09	40	11/16/06	0.82 U	1.0	1.6 U	1.6 U	4.1 U	16 U	16 U	9.5 J	0.36 U	8.2 U	0.82 U	16 U	47	--	1.6 U	0.82 U	41 U
TMP-09	45	11/16/06	40 U	40 U	80 U	80 U	200 U	800 U	800 U	2000 U	40 U	400 U	40 U	800 U	23 J	--	80 U	40 U	2000 U
TMP-09	50	11/16/06	47 U	47 U	93 U	93 U	230 U	930 U	930 U	2300 U	47 U	470 U	47 U	930 U	44 J	--	93 U	47 U	2300 U
TMP-09	55	11/16/06	42 U	42 U	85 U	85 U	210 U	850 U	850 U	2100 U	42 U	420 U	42 U	850 U	47	--	85 U	42 U	2100 U
TMP-09	60	11/16/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	2200 U	44 U	440 U	44 U	880 U	47	--	88 U	44 U	2200 U
TMP-09	65	11/16/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	46 U	460 U	46 U	920 U	46 U	--	92 U	46 U	2300 U
TMP-09	70	11/16/06	45 U	45 U	6.7 J	89 U	220 U	890 U	890 U	2200 UJ	45 U	450 U	45 U	890 U	22 J	--	89 U	45 U	2200 U
TMP-09	75	11/16/06	56 U	56 U	110 U	110 U	280 U	1100 U	1100 U	2800 UJ	56 U	560 U	56 U	1100 U	56 U	--	110 UJ	56 U	1800 J
TMP-09	80	11/16/06	50 U	50 U	100 U	100 U	250 U	1000 U	1000 U	2500 U	50 U	500 U	50 U	1000 U	50 U	--	100 U	50 U	2500 U
TMP-09	85	11/16/06	0.92 U	0.53 J	1.8 U	1.8 U	4.6 U	18 U	18 U	46 U	0.15 U	0.22 U	0.91 J	18 U	3.2	--	1.8 U	0.92 U	46 U
TMP-09	90	11/16/06	110 U	110 U	220 U	220 U	560 U	2200 U	2200 U	5600 UJ	110 U	1100 U	110 U	2200 U	110 U	--	220 UJ	110 U	5600 UJ
TMP-09	95	11/16/06	42 U	42 U	84 U	84 U	210 U	840 U	840 U	2100 U	42 U	420 U	42 U	840 U	53	--	84 U	42 U	2100 U
TMP-10	25	11/27/06	0.91 U	0.47 J	0.16 U	1.8 U	4.6 U	18 U	18 U	14 J	3.3	0.18 J	0.91 U	18 U	13	--	1.8 U	0.27 J	46 U
TMP-10	30	11/27/06	0.87 U	0.38 J	0.12 U	1.7 U	4.4 U	17 U	17 U	20 J	0.19 J	0.54 J	0.87 U	17 U	12	--	1.7 U	0.87 U	44 U
TMP-10	35	11/27/06	0.93 U	0.93 U	0.19 U	1.9 U	4.6 U	19 U	19 U	12 J	0.69 J	0.24 J	0.93 U	19 U	2.3 J	--	1.9 U	0.93 U	46 U
TMP-10	40	11/27/06	1.1 U	1.1 U	0.39 U	2.2 U	5.4 U	22 U	22 U	54 U	1.1 U	11 U	1.1 U	22 U	0.81 J	--	2.2 U	1.1 U	54 U
TMP-10	45	11/27/06	0.87 U	0.87 U	0.13 U	1.7 U	4.3 U	17 U	17 U	7.7 J	0.23 J	8.7 U	0.87 U	17 U	1.1	--	1.7 U	0.87 U	43 U
TMP-10	50	11/27/06	45 U	45 U	5.9 U	91 U	230 U	910 U	910 U	2300 U	45 U	450 U	45 U	910 U	130	--	91 U	45 U	2300 U
TMP-10	55	11/27/06	53 U	53 U	110 U	110 U	260 U	1100 U	1100 U	2600 U	53 U	530 U	53 U	1100 U	120	--	110 U	53 U	1400 U
TMP-10	60	11/27/06	0.87 U	0.33 J	1.7 U	1.7 U	4.4 U	17 U	17 U	44 U	0.45 J	8.7 U	0.87 U	17 U	91	--	1.7 U	0.87 U	23 U
TMP-10	65	11/27/06	43 U	43 U	86 U	86 U	220 U	860 U	860 U	2200 U	43 U	430 U	43 U	860 U	95	--	86 U	43 U	1100 U
TMP-10	70	11/27/06	51 U	51 U	100 U	100 U	260 U	1000 U	1000 U	2600 U	51 U	510 U	51 U	1000 U	51 U	--	100 U	51 U	1500 U
TMP-10	75	11/27/06	42 U	42 U	85 U	85 U	210 U	850 U	850 U	2100 U	42 U	420 U	42 U	850 U	42 U	--	85 U	42 U	1100 U
TMP-10	80	11/27/06	43 U	43 U	86 U	86 U	220 UJ	860 U	860 U	2200 U	43 U	430 U	43 U	860 U	43 U	--	86 U	43 U	2200 UJ
TMP-10	85	11/27/06	46 U	46 U	91 U	91 U	230 U	910 U	910 U	2300 U	46 U	460 U	46 U	910 U	15 J	--	91 U	46 U	1300 U
TMP-10	90	11/27/06	0.42 J	2.0	1.7 U	1.7 U	4.3 U	17 J	17 U	31 J	14	8.6 U	0.86 U	17 U	20	--	1.7 U	0.45 J	43 U
TMP-10	95	11/27/06	44 U	44 U	87 U	87 U	220 U	870 U	870 U	2200 U	44 U	440 U	44 U	870 U	110	--	87 U	44 U	2200 U
TMP-10	100	11/27/06	0.88 U	0.48 J	1.8 U	1.8 U	4.4 U	18 U	18 U	7.4 J	0.5 J	8.8 U	0.88 U	18 U	23	--	1.8 U	0.88 U	44 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-07	25	0.97 U	1.9 U	1.9 UJ	9.7 U	9.7 U	0.97 U	0.97 U	0.97 U	0.97 U	0.97 U	**0.77 J**	0.78 U	0.97 U	**66**	9.7 U	0.97 U
TMP-07	30	0.86 U	**0.18 J**	1.7 U	8.6 UJ	0.48 U	0.38 U	0.86 U	0.86 U	0.86 U	0.86 U	**0.57 J**	0.47 U	**0.27 J**	**140**	8.6 U	0.86 U
TMP-07	35	1.1 U	2.1 U	2.1 U	11 UJ	11 U	5.5 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	0.17 U	1.1 UJ	**85**	11 U	1.1 U
TMP-07	40	1.4 U	2.8 U	2.8 UJ	14 U	14 U	3.5 U	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	0.51 U	1.4 U	**130**	14 U	1.4 U
TMP-07	45	0.99 U	**0.25 J**	2 U	9.9 UJ	9.9 U	8 U	0.99 U	0.99 U	0.99 U	0.99 U	**0.3 J**	0.96 U	**0.94 J**	**570**	9.9 U	**1.3**
TMP-07	50	0.91 U	1.8 U	1.8 UJ	9.1 U	9.1 U	7.2 U	0.91 U	0.91 U	0.91 U	0.91 U	**0.47 J**	0.51 U	**1.2**	**1,100**	9.1 U	**1.9**
TMP-07	55	1 U	**0.2 J**	2 UJ	10 U	0.4 U	3.5 U	1 U	1 U	1 U	1 U	**0.19 J**	0.59 U	**0.69 J**	**630**	10 U	**0.62 J**
TMP-07	60	1.3 U	2.6 U	2.6 UJ	13 U	13 U	0.74 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 UJ	0.25 U	**0.81 J**	**800**	13 U	**0.73 J**
TMP-07	65	0.75 U	**0.24 J**	1.5 U	7.5 U	7.5 U	0.34 U	0.75 U	0.75 U	0.75 U	0.75 U	**0.48 J**	0.59 U	**1.1**	**2,000**	7.5 U	**1.9**
TMP-07	70	0.83 U	1.7 U	1.7 U	8.3 UJ	8.3 U	0.28 U	0.83 U	0.83 U	0.83 U	0.83 U	**0.36 J**	0.33 U	**0.27 J**	**740**	8.3 U	**0.5 J**
TMP-07	75	0.93 U	1.9 U	1.9 U	9.3 U	9.3 U	0.11 U	0.93 U	0.93 U	0.93 U	0.93 U	**0.47 J**	0.93 U	**0.45 J**	**2,600**	9.3 U	**0.48 J**
TMP-07	80	0.8 U	1.6 U	1.6 U	8 UJ	8 U	0.095 U	0.8 U	0.8 U	0.8 U	0.8 U	**0.6 J**	0.17 U	**0.61 J**	**1,100**	8 U	**0.49 J**
TMP-07	85	0.86 U	1.7 U	1.7 U	8.6 UJ	8.6 U	0.16 U	0.86 U	0.86 U	0.86 U	0.86 U	**0.26 J**	0.18 U	**0.46 J**	**260**	8.6 U	0.86 U
TMP-07	90	0.89 U	1.8 U	1.8 U	8.9 U	8.9 U	0.11 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 UJ	0.24 U	0.89 U	**93**	8.9 U	0.89 U
TMP-07	95	0.86 U	1.7 U	1.7 U	8.6 U	8.6 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	**0.31J**	0.27 U	**0.52 J**	**1,300**	8.6 U	**0.31 J**
TMP-07	100	0.89 U	**0.2 J**	1.8 U	8.9 U	8.9 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 UJ	1.1 U	0.89 U	**22**	8.9 U	0.89 U
TMP-09	25	0.95 U	0.4 U	1.9 U	9.5 U	9.5 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	**4.9 J**	1.5 U	0.95 U	**200**	9.5 UJ	0.95 U
TMP-09	30	1.5 U	3 U	3 U	15 U	15 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	**1.2 J**	0.32 U	**0.71 J**	**250**	15 UJ	1.5 U
TMP-09	35	0.96 U	0.27 U	1.9 U	9.6 UJ	9.6 U	2 U	0.96 U	0.96 U	0.96 U	0.96 U	0.96 UJ	0.24 U	0.96 U	**2.7**	9.6 U	0.96 UJ
TMP-09	40	0.82 U	1.6 U	1.6 U	8.2 U	8.2 U	21 U	0.82 U	0.82 U	0.82 U	0.82 U	**0.73 J**	0.3 U	**3.2**	**320**	8.2 U	**2.7**
TMP-09	45	40 U	80 U	80 U	460 U	400 U	41 U	40 U	40 U	40 U	40 U	40 UJ	40 U	40 U	**420**	400 U	40 U
TMP-09	50	47 U	93 U	93 U	560 UJ	470 U	22 UJ	47 U	47 U	47 U	47 U	47 UJ	47 U	47 U	**960**	470 UJ	47 U
TMP-09	55	42 U	85 U	85 U	510 U	420 U	32 U	42 U	42 U	42 U	42 U	42 UJ	42 U	42 U	**1,000**	420 U	42 U
TMP-09	60	44 U	88 U	88 U	520 U	440 U	28 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**1,000**	440 U	44 U
TMP-09	65	46 U	92 U	92 U	510 U	460 U	17 U	46 U	46 U	46 U	46 U	46 UJ	46 U	46 U	**1,900**	460 U	46 U
TMP-09	70	45 U	12 U	89 U	580 UJ	450 U	13 UJ	45 U	45 U	45 U	45 U	45 UJ	7.5 U	45 U	**3,000**	450 UJ	45 U
TMP-09	75	56 U	110 U	110 U	680 UJ	560 U	19 U	56 U	56 U	56 U	56 U	56 UJ	56 U	56 U	**3,100**	560 UJ	56 U
TMP-09	80	50 U	100 U	100 U	580 U	500 U	8.2 U	50 U	50 U	50 U	50 U	50 UJ	50 U	50 U	**4,500**	500 U	50 U
TMP-09	85	0.92 U	1.8 U	1.8 U	9.2 U	9.2 U	3.1 U	0.92 U	0.92 U	0.92 U	0.92 U	**0.25 J**	0.16 U	**0.25 J**	**150**	9.2 U	0.92 U
TMP-09	90	110 U	220 U	220 U	1400 UJ	1100 U	20 UJ	110 U	110 U	110 U	110 U	110 U	110 U	110 U	**2,000**	1100 U	110 UJ
TMP-09	95	42 U	84 U	84 U	540 U	420 U	4.9 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	**860**	420 U	42 U
TMP-10	25	0.91 U	**0.57 J**	1.8 U	9.1 U	0.32 U	0.91 U	0.91 U	**0.16 J**	0.91 U	0.91 U	**3.2**	**1.8**	**0.78 J**	**230**	9.1 U	0.91 U
TMP-10	30	0.87 U	**0.27 J**	1.7 U	8.7 U	8.7 U	35 U	0.87 U	0.87 U	0.87 U	0.87 U	**0.32 J**	**0.35 J**	**0.91**	**100**	8.7 U	**0.67 J**
TMP-10	35	0.93 U	**0.37 J**	1.9 U	9.3 U	9.3 U	1.1 U	0.93 U	**0.14 J**	0.93 U	0.93 U	0.93 U	**0.63 J**	0.93 U	**5.5 J**	9.3 U	0.93 U
TMP-10	40	1.1 U	**0.45 J**	2.2 U	11 U	11 U	0.42 U	1.1 U	**0.12 J**	1.1 U	1.1 U	1.1 U	**0.37 J**	1.1 U	**4.5**	11 U	1.1 U
TMP-10	45	0.87 U	**0.24 J**	1.7 U	8.7 U	8.7 U	2.9 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	**0.31 J**	0.87 U	**6.5**	8.7 U	0.87 U
TMP-10	50	45 U	91 U	91 U	**240 J**	450 U	33 U	45 U	45 U	45 U	45 U	45 U	45 U	45 U	**1,000**	450 U	45 U
TMP-10	55	53 U	110 U	110 U	530 U	530 U	20 U	53 U	53 U	53 U	53 U	53 U	53 U	53 U	**800**	530 U	53 U
TMP-10	60	0.87 U	1.7 U	1.7 U	8.7 U	8.7 U	9.5 U	0.87 U	0.87 U	0.87 U	0.87 U	**0.32 J**	**0.35 J**	**2.2**	**360**	8.7 U	**0.9**
TMP-10	65	43 U	86 U	86 U	430 U	430 U	41 U	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**1,400**	430 U	43 U
TMP-10	70	51 U	100 U	100 U	**270 J**	510 U	9.5 U	51 U	51 U	51 U	51 U	51 U	51 U	51 U	**720**	510 U	51 U
TMP-10	75	42 U	85 U	85 U	**220 J**	420 U	6.1 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	**1,300**	420 U	42 U
TMP-10	80	43 U	86 U	86 U	**240 J**	430 UJ	43 U	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**1,100**	430 UJ	43 U
TMP-10	85	46 U	91 U	91 U	**260 J**	460 U	5.6 U	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**780**	460 U	46 U
TMP-10	90	0.86 U	**0.63 J**	1.7 U	8.6 U	8.6 U	0.86 U	0.86 U	**0.17 J**	0.86 U	0.86 U	0.86 U	**5.4**	**1.2 J**	**360**	8.6 U	**0.38 J**
TMP-10	95	44 U	87 U	87 U	**340 J**	83 U	5.2 U	44 U	44 U	44 U	44 U	44 U	44 U	44 U	**1,800**	440 U	44 U
TMP-10	100	0.88 U	1.8 U	1.8 U	8.8 U	8.8 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	**0.32 J**	**0.77 J**	**340**	8.8 U	**0.86 J**

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-11	25	11/28/06	0.8 U	0.8 U	**0.11 J**	1.6 UJ	4 UJ	16 U	16 U	40 U	0.25 U	8 U	0.8 U	16 UJ	**2.7**	--	1.6 UJ	0.8 U	40 UJ
TMP-11	30	11/28/06	0.95 U	0.95 U	1.9 U	1.9 UJ	4.7 UJ	19 U	19 U	**19 J**	0.95 U	9.5 U	0.95 U	19 UJ	0.95 U	--	1.9 U	0.95 U	47 UJ
TMP-11	35	11/28/06	1.2 U	1.2 U	2.3 U	2.3 UJ	5.8 UJ	23 U	23 U	**30 J**	1.2 U	12 U	1.2 U	23 UJ	**4.3**	--	2.3 U	1.2 U	58 UJ
TMP-11	40	11/28/06	1 U	1 U	2 U	2 UJ	5 UJ	20 U	20 U	**7.3 J**	1 U	**0.18 J**	1 U	20 UJ	**0.56 J**	--	2 U	1 U	29 UJ
TMP-11	45	11/28/06	46 U	46 U	93 U	93 UJ	230 UJ	930 U	930 U	2300 U	46 U	460 U	46 U	930 UJ	**110**	--	93 U	46 U	2300 UJ
TMP-11	50	11/29/06	0.87 U	**0.43 J**	1.7 U	1.7 UJ	4.3 UJ	17 U	17 U	**10 J**	0.76 U	8.7 U	0.87 U	17 UJ	**94**	--	1.7 U	0.87 U	43 UJ
TMP-11	55	11/29/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	46 U	460 U	46 U	920 U	**61**	--	92 U	46 U	2300 U
TMP-11	60	11/29/06	48 U	48 U	96 U	96 U	240 U	960 U	960 U	2400 U	48 U	480 U	48 U	960 U	**59**	--	96 U	48 U	2400 U
TMP-11	65	11/29/06	41 U	41 U	82 U	82 U	200 U	820 U	820 U	2000 U	41 U	410 U	41 U	820 UJ	**66**	--	82 UJ	41 U	2000 UJ
TMP-11	70	11/29/06	40 U	40 U	80 U	80 U	200 U	800 U	800 U	2000 U	40 U	400 U	40 U	800 U	**34 J**	--	80 U	40 U	2000 U
TMP-11	75	11/29/06	46 U	46 U	91 U	91 U	230 U	910 U	910 U	2300 U	46 U	460 U	46 U	910 U	46 U	--	91 U	46 U	2300 U
TMP-11	80	11/29/06	52 U	52 U	100 U	100 UJ	260 UJ	1000 U	1000 U	2600 U	52 U	520 U	52 U	1000 UJ	52 U	--	100 U	52 U	2600 UJ
TMP-11	85	11/29/06	**0.4 J**	**0.87 J**	1.8 U	1.8 U	4.5 U	18 U	18 U	**20 J**	0.42 U	**0.17 J**	**3.7**	18 UJ	**8.4**	--	1.8 UJ	0.89 U	45 UJ
TMP-11	90	11/29/06	1.4 U	**0.54 J**	2.8 U	2.8 U	7 U	**24 J**	28 U	**69 J**	24 U	**0.26 J**	1.4 U	28 UJ	**6.8**	--	2.8 UJ	**0.93 J**	70 UJ
TMP-11	95	11/29/06	0.89 U	**0.45 J**	**0.12 J**	1.8 U	4.4 U	**13 J**	18 U	**23 J**	7.1 U	8.9 U	0.89 U	18 UJ	**18**	--	1.8 UJ	**0.46 J**	44 UJ
TMP-11	100	11/29/06	1 U	1 U	2.1 U	2.1 U	5.2 U	21 U	21 U	**12 J**	0.29 U	10 U	1 U	21 UJ	1 U	--	2.1 UJ	1 U	24 UJ
TMP-12	85	11/20/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	46 U	460 U	46 U	920 U	**30 J**	--	92 U	46 U	2300 U
TMP-12	90	11/20/06	81 U	81 U	160 U	160 U	410 U	1600 U	1600 U	4100 U	81 U	810 U	81 U	1600 U	81 U	--	160 U	81 U	**3100 J**
TMP-12	95	11/20/06	74 U	74 U	150 U	150 U	370 U	1500 U	1500 U	3700 U	74 U	740 U	74 U	1500 U	74 U	--	150 U	74 U	**2700 J**
TMP-12	100	11/20/06	78 U	78 U	160 U	160 U	390 U	1600 U	1600 U	3900 U	78 U	780 U	78 U	1600 U	**84**	--	160 U	78 U	**2400 J**
TMP-12	25	11/20/06	39 U	39 U	78 U	78 U	200 U	780 U	780 U	2000 U	39 U	390 U	39 U	780 U	**62**	--	78 U	39 U	2000 UJ
TMP-12	30	11/20/06	43 U	43 U	87 U	87 U	220 U	870 U	870 U	2200 U	43 U	430 U	43 U	870 U	**270**	--	87 U	43 U	2200 UJ
TMP-12	35	11/20/06	36 U	36 U	73 U	73 U	180 U	730 U	730 U	1800 U	36 U	360 U	36 U	730 U	**91**	--	73 U	36 U	1800 UJ
TMP-12	40	11/20/06	34 U	34 U	69 U	69 U	170 U	690 U	690 U	1700 U	34 U	340 U	34 U	690 U	**370**	--	69 U	34 U	1700 UJ
TMP-12	45	11/20/06	43 U	43 U	86 U	86 U	220 U	860 U	860 U	2200 U	43 U	430 U	43 U	860 U	**130**	--	86 U	43 U	2200 UJ
TMP-12	50	11/20/06	43 U	43 U	86 U	86 U	220 U	860 U	860 U	2200 U	43 U	430 U	43 U	860 U	**310**	--	86 U	43 U	2200 UJ
TMP-12	55	11/20/06	39 U	39 U	79 U	79 U	200 U	790 U	790 U	2000 U	39 U	390 U	39 U	790 U	**370**	--	79 U	39 U	**1000 J**
TMP-12	60	11/20/06	43 U	43 U	86 U	86 U	220 U	860 U	860 U	2200 U	43 U	430 U	43 U	860 U	**320**	--	86 U	43 U	2200 UJ
TMP-12	65	11/20/06	40 U	40 U	79 U	79 U	200 U	790 U	790 U	2000 U	40 U	400 U	40 U	790 U	**340**	--	79 U	40 U	**1000 J**
TMP-12	70	11/20/06	91 U	91 U	180 U	180 U	460 U	1800 U	1800 U	4600 U	91 U	910 U	91 U	1800 U	**200**	--	180 U	91 U	**2200 J**
TMP-12	75	11/20/06	41 U	41 U	83 U	83 U	210 U	830 U	830 U	2100 U	41 U	410 U	41 U	830 U	**180**	--	83 U	41 U	2100 UJ
TMP-12	80	11/20/06	82 U	82 U	160 U	160 U	410 U	1600 U	1600 U	4100 U	82 U	820 U	82 U	1600 U	**42 J**	--	160 U	82 U	**2300 J**
TMP-13	25	11/30/06	40 U	40 U	81 U	81 U	200 U	810 U	810 U	2000 U	40 U	400 U	40 U	810 U	**24 J**	--	81 U	40 U	2000 U
TMP-13	30	11/30/06	0.74 U	**1.1**	1.5 U	1.5 U	3.7 U	15 U	15 U	9.6 U	**0.29 J**	**0.26 J**	0.74 U	15 UJ	**100**	--	1.5 U	0.74 U	37 UJ
TMP-13	35	11/30/06	0.94 U	0.94 U	1.9 U	1.9 U	4.7 U	19 U	19 U	20 U	**0.94 J**	9.4 U	0.94 U	19 UJ	**84**	--	1.9 U	0.94 U	47 UJ
TMP-13	40	11/30/06	1.2 U	1.2 U	2.3 U	2.3 U	5.8 U	23 U	23 U	8 U	**0.21 J**	**0.29 J**	1.2 U	23 UJ	**2.3**	--	2.3 U	1.2 U	58 UJ
TMP-13	45	11/30/06	42 U	42 U	84 U	84 U	210 U	840 U	840 U	2100 U	42 U	420 U	42 U	840 U	**320**	--	84 U	42 U	2100 U
TMP-13	50	11/30/06	52 U	52 U	100 U	100 U	260 U	1000 U	1000 U	2600 U	52 U	520 U	52 U	1000 U	**310**	--	100 U	52 U	2600 U
TMP-13	55	11/30/06	54 U	54 U	110 U	110 U	270 U	1100 U	1100 U	2700 U	54 U	540 U	54 U	1100 U	**220**	--	110 U	54 U	2700 U
TMP-13	60	11/30/06	44 U	44 U	87 U	87 U	220 U	870 U	870 U	2200 U	44 U	440 U	44 U	870 U	**280**	--	87 U	44 U	2200 U
TMP-13	65	11/30/06	51 U	51 U	100 U	100 U	260 U	1000 U	1000 U	2600 U	51 U	510 U	51 U	1000 U	**120**	--	100 U	51 U	2600 U
TMP-13	70	11/30/06	41 U	41 U	82 U	82 U	200 U	820 U	820 U	2000 U	41 U	410 U	41 U	820 U	**55**	--	82 U	41 U	2000 U
TMP-13	75	11/30/06	45 U	45 U	89 U	89 U	220 U	890 U	890 U	2200 U	45 U	450 U	45 U	890 U	**75**	--	89 U	45 U	2200 U
TMP-13	80	11/30/06	44 U	44 U	87 U	87 U	220 U	870 U	870 U	2200 U	44 U	440 U	44 U	870 U	**27 J**	--	87 U	44 U	2200 U
TMP-13	85	11/30/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	2200 U	44 U	440 U	44 U	880 U	**35 J**	--	88 U	44 U	2200 U
TMP-13	90	11/30/06	0.9 U	**0.81 J**	1.8 U	1.8 U	4.5 U	**12 J**	18 U	33 UJ	**21**	**0.2 J**	0.9 U	18 U	**5.8 J**	--	1.8 U	**0.38 J**	45 U
TMP-13	95	11/30/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	2200 U	44 U	440 U	44 U	880 U	**120**	--	88 U	44 U	2200 U
TMP-13	100	11/30/06	29 U	29 U	58 U	58 U	140 U	580 U	580 U	1400 U	29 U	290 U	29 U	580 U	**63**	--	58 U	29 U	1400 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-11	25	0.8 UJ	1.6 U	1.6 U	8 UJ	1.7 U	**0.35 J**	0.8 U	0.8 U	0.8 U	0.8 U	**0.6 J**	0.16 U	0.8 U	**37**	8 U	0.8 U
TMP-11	30	0.95 UJ	1.9 U	1.9 U	9.5 UJ	9.5 U	**2**	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	**0.67 J**	9.5 U	0.95 U
TMP-11	35	1.2 UJ	2.3 U	2.3 U	12 UJ	12 U	**1.2 J**	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	0.2 U	1.2 U	**18**	12 U	1.2 U
TMP-11	40	1 UJ	2 U	2 U	10 UJ	10 U	**0.29 J**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**3.4**	10 U	1 U
TMP-11	45	46 UJ	93 U	93 U	**270 J**	460 U	**29 J**	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**1,300**	460 U	46 U
TMP-11	50	0.87 U	1.7 U	1.7 U	8.7 UJ	8.7 U	**1.3**	0.87 U	0.87 U	0.87 U	0.87 U	**0.43 J**	0.58 U	**4**	**170**	8.7 U	**1.6**
TMP-11	55	46 U	92 U	92 U	460 U	460 U	**17 J**	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**690**	460 U	46 U
TMP-11	60	48 U	96 U	96 U	480 U	480 U	**13 J**	48 U	48 U	48 U	48 U	48 U	48 U	48 U	**790**	480 U	48 U
TMP-11	65	41 U	82 U	82 U	**230 J**	410 U	41 U	41 U	41 U	41 U	41 U	41 U	41 U	41 U	**1,300**	410 U	41 U
TMP-11	70	40 U	80 U	80 U	400 U	400 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	**860**	400 U	40 U
TMP-11	75	46 U	91 U	91 U	460 U	460 U	46 U	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**1,000**	460 U	46 U
TMP-11	80	52 UJ	100 U	100 U	520 UJ	520 U	**7.6 J**	52 U	52 U	52 U	52 U	52 U	52 U	52 U	**1,400**	520 U	52 U
TMP-11	85	0.89 U	1.8 U	1.8 U	8.9 UJ	8.9 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	**0.75 J**	0.2 U	**0.54 J**	**160**	8.9 U	0.89 U
TMP-11	90	1.4 U	1.6 U	2.8 U	14 UJ	0.76 U	1.4 U	1.4 U	0.46 U	1.4 U	1.4 U	1.4 U	**10**	1.4 U	**71**	14 U	1.4 U
TMP-11	95	0.89 U	0.67 U	1.8 U	8.9 UJ	0.37 U	0.89 U	0.89 U	0.16 U	0.89 U	0.89 U	0.89 U	**4.1**	**0.45 J**	**320**	8.9 U	**0.49 J**
TMP-11	100	1 U	2.1 U	2.1 U	10 UJ	10 U	1 U	1 U	1 U	1 U	1 U	1 U	0.29 U	1 U	**0.95 J**	10 U	1 U
TMP-12	85	46 U	92 U	92 U	460 U	460 U	**16 J**	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**6,700**	460 U	46 U
TMP-12	90	81 U	160 U	160 U	**600 J**	810 U	**24 J**	81 U	81 U	81 U	81 U	81 U	81 U	81 UJ	**6,300**	810 U	81 U
TMP-12	95	74 U	150 U	150 U	**510 J**	740 U	74 U	74 U	74 U	74 U	74 U	74 U	74 U	74 U	**1,400**	740 U	74 U
TMP-12	100	78 U	160 U	160 U	**520 J**	780 U	**12 J**	78 U	78 U	78 U	78 U	78 U	78 U	78 U	**1,500**	780 U	78 U
TMP-12	25	39 U	78 U	78 U	390 UJ	390 U	**6.4 J**	39 U	39 U	39 U	39 U	39 U	39 U	39 U	**630**	390 U	39 U
TMP-12	30	43 U	87 U	87 U	430 UJ	430 U	**10 J**	43 U	43 U	43 U	43 U	43 U	43 U	**24 J**	**1,300**	430 U	43 U
TMP-12	35	36 U	73 U	73 U	360 UJ	360 U	**28 J**	36 U	36 U	36 U	36 U	36 U	36 U	36 U	**940**	360 U	36 U
TMP-12	40	34 U	69 U	69 U	340 UJ	340 U	**17 J**	34 U	34 U	34 U	34 U	34 U	34 U	**13 J**	**1,800**	340 U	34 U
TMP-12	45	43 U	86 U	86 U	430 UJ	430 U	**47**	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**720**	430 U	43 U
TMP-12	50	43 U	86 U	86 U	430 UJ	430 U	**23 J**	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**2,000**	430 U	43 U
TMP-12	55	39 U	79 U	79 U	390 UJ	390 U	**21 J**	39 U	39 U	39 U	39 U	39 U	39 U	39 U	**2,500**	390 U	39 U
TMP-12	60	43 U	86 U	86 U	430 UJ	430 U	**72**	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**2,700**	430 U	43 U
TMP-12	65	40 U	79 U	79 U	400 UJ	400 U	**28 J**	40 U	40 U	40 U	40 U	40 U	40 U	40 U	**2,700**	400 U	40 U
TMP-12	70	91 U	180 U	180 U	**500 J**	910 U	**15 J**	91 U	91 U	91 U	91 U	91 U	91 U	91 U	**3,800**	910 U	91 U
TMP-12	75	41 U	83 U	83 U	**220 J**	410 U	**6.2 J**	41 U	41 U	41 U	41 U	41 U	41 U	41 U	**5,500**	410 U	41 U
TMP-12	80	82 U	160 U	160 U	820 UJ	820 U	**23 J**	82 U	82 U	82 U	82 U	82 U	82 U	82 U	**6,700**	820 U	82 U
TMP-13	25	40 U	81 U	81 U	400 UJ	400 U	7.6 U	40 U	40 U	40 U	40 U	40 UJ	40 U	40 U	**380**	400 U	40 U
TMP-13	30	0.74 U	1.5 U	1.5 U	7.4 UJ	7.4 U	0.87 U	0.74 U	0.74 U	0.74 U	0.74 U	**1.2 J**	0.17 U	**5.1**	**340**	7.4 U	0.74 U
TMP-13	35	0.94 U	1.9 U	1.9 U	9.4 UJ	9.4 U	4.9 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 UJ	0.42 U	**2.1**	**150**	9.4 U	0.94 U
TMP-13	40	1.2 U	2.3 U	2.3 U	12 UJ	12 U	0.35 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 UJ	1.2 U	1.2 U	**9.5**	12 U	1.2 U
TMP-13	45	42 U	84 U	84 U	420 UJ	420 U	34 U	42 U	42 U	42 U	42 U	42 UJ	42 U	42 U	**1,500**	420 U	42 U
TMP-13	50	52 U	100 U	100 U	520 UJ	520 U	21 U	52 U	52 U	52 U	52 U	52 UJ	52 U	52 U	**1,700**	520 U	52 U
TMP-13	55	54 U	110 U	110 U	540 UJ	540 U	16 U	54 U	54 U	54 U	54 U	54 UJ	54 U	54 U	**920**	540 U	54 U
TMP-13	60	44 U	87 U	87 U	440 UJ	440 U	32 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**1,800**	440 U	44 U
TMP-13	65	51 U	100 U	100 U	510 UJ	510 U	13 U	51 U	51 U	51 U	51 U	51 UJ	51 U	51 U	**1,300**	510 U	51 U
TMP-13	70	41 U	82 U	82 U	410 UJ	410 U	9.6 U	41 U	41 U	41 U	41 U	41 UJ	41 U	41 U	**1,500**	410 U	41 U
TMP-13	75	45 U	89 U	89 U	450 UJ	450 U	9.2 U	45 U	45 U	45 U	45 U	45 UJ	45 U	45 U	**3,800**	450 U	45 U
TMP-13	80	44 U	87 U	87 U	440 UJ	440 U	9.3 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**2,900**	440 U	44 U
TMP-13	85	44 U	88 U	88 U	440 UJ	440 U	7.3 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**1,600**	440 U	44 U
TMP-13	90	0.9 U	**0.6 J**	1.8 U	9 UJ	0.46 U	0.9 U	0.9 U	**0.17 J**	0.9 U	0.9 U	0.9 UJ	**5.9**	**0.4 J**	**110**	9 U	**0.32 J**
TMP-13	95	44 U	88 U	88 U	440 UJ	440 U	8.3 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**1,800**	440 U	44 U
TMP-13	100	29 U	58 U	58 U	290 UJ	290 U	6 U	29 U	29 U	29 U	29 U	29 UJ	29 U	29 U	**940**	290 U	29 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-14	25	11/21/06	0.76 U	**0.38 J**	1.5 U	1.5 U	3.8 UJ	15 U	15 U	**18 J**	1.5 U	**0.16 J**	0.76 U	15 U	**82**	--	1.5 U	**0.17 J**	38 UJ
TMP-14	30	11/21/06	41 U	41 U	82 U	82 U	210 UJ	820 U	820 U	2100 UJ	6.8 U	410 U	41 U	820 U	**320**	--	82 U	41 U	2100 UJ
TMP-14	35	11/21/06	51 U	51 U	100 U	100 U	250 UJ	1000 U	1000 U	2500 UJ	7.9 U	510 U	51 U	1000 U	**390**	--	100 U	51 U	2500 UJ
TMP-14	40	11/21/06	37 U	37 U	74 U	74 U	190 UJ	740 U	740 U	1900 UJ	37 U	370 U	37 U	740 U	**580**	--	74 U	37 U	1900 UJ
TMP-14	45	11/21/06	42 U	42 U	85 U	85 U	210 UJ	850 U	850 U	2100 UJ	6 U	420 U	42 U	850 U	**400**	--	85 U	42 U	2100 UJ
TMP-14	50	11/21/06	66 U	66 U	130 U	130 U	330 UJ	1300 U	1300 U	3300 UJ	66 U	660 U	66 U	1300 U	**570**	--	130 U	66 U	3300 UJ
TMP-14	55	11/21/06	45 U	45 U	90 U	90 U	220 UJ	900 U	900 U	2200 UJ	45 U	450 U	45 U	900 U	**290**	--	90 U	45 U	2200 UJ
TMP-14	60	11/21/06	42 U	42 U	84 U	84 U	210 UJ	840 U	840 U	2100 UJ	42 U	420 U	42 U	840 U	**160**	--	84 U	42 U	2100 UJ
TMP-14	65	11/21/06	40 U	40 U	79 U	79 U	200 UJ	790 U	790 U	2000 UJ	40 U	400 U	40 U	790 U	**76**	--	79 U	40 U	2000 UJ
TMP-14	75	11/21/06	62 U	62 U	120 U	120 U	310 UJ	1200 U	1200 U	3100 UJ	62 U	620 U	62 U	1200 U	**31 J**	--	120 U	62 U	3100 UJ
TMP-14	70	11/21/06	69 U	69 U	140 U	140 U	350 UJ	1400 U	1400 U	3500 UJ	69 U	690 U	69 U	1400 U	**69 J**	--	140 U	69 U	3500 UJ
TMP-14	80	11/21/06	40 U	40 U	81 U	81 U	200 U	810 U	810 U	2000 U	40 U	400 U	40 U	810 U	40 U	--	81 U	40 U	2000 U
TMP-14	85	11/21/06	49 U	49 U	98 U	98 U	240 U	980 U	980 U	2400 U	49 U	490 U	49 U	980 U	49 U	--	98 U	49 U	2400 U
TMP-14	90	11/21/06	57 U	57 U	110 U	110 U	290 U	1100 U	1100 U	2900 U	57 U	570 U	57 U	1100 U	57 U	--	110 U	57 U	2900 U
TMP-14	95	11/21/06	0.79 U	**0.51 J**	1.6 U	1.6 U	4 UJ	**28**	16 U	**61 J**	26 U	**0.3 J**	0.79 U	16 U	**5.3**	--	1.6 U	**0.66 J**	40 UJ
TMP-14	100	11/21/06	41 U	41 U	82 U	82 U	200 U	820 U	820 U	2000 U	41 U	410 U	41 U	820 U	**63**	--	82 U	41 U	2000 U
TMP-16	25	11/17/06	42 U	42 U	84 U	84 U	210 U	840 U	840 U	2100 U	**5.9 J**	420 U	42 U	840 U	**27 J**	--	84 U	42 U	2100 U
TMP-16	30	11/17/06	0.75 U	**0.81**	**0.14 J**	1.5 U	3.7 U	15 U	15 U	**9 J**	**0.36 J**	7.5 U	0.75 U	15 U	**15**	--	**0.21 J**	0.75 U	37 U
TMP-16	35	11/17/06	48 U	48 U	97 U	97 U	240 U	970 U	970 U	2400 U	48 U	480 U	48 U	970 U	**14 J**	--	97 U	48 U	2400 U
TMP-16	40	11/17/06	0.78 U	**0.4 J**	**0.13 J**	1.6 U	3.9 U	16 U	**7.4 J**	**6.5 J**	**0.74 J**	7.8 U	0.78 U	16 U	**14**	--	1.6 U	0.78 U	39 U
TMP-16	45	11/17/06	43 U	43 U	87 U	87 U	220 U	870 U	870 U	2200 U	**7.1 J**	430 U	43 U	870 U	**21 J**	--	87 U	43 U	2200 U
TMP-16	50	11/17/06	44 U	44 U	89 U	89 U	220 U	890 U	890 U	2200 U	44 U	440 U	44 U	890 U	44 U	--	89 U	44 U	2200 U
TMP-16	55	11/17/06	46 U	46 U	91 U	91 U	230 U	910 U	910 U	2300 U	46 U	460 U	46 U	910 U	**44 J**	--	91 U	46 U	2300 U
TMP-16	60	11/17/06	47 U	47 U	94 U	94 U	240 U	940 U	940 U	2400 U	**8 J**	470 U	47 U	940 U	**43 J**	--	94 U	47 U	2400 U
TMP-16	65	11/17/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	**7.9 J**	460 U	46 U	920 U	46 U	--	92 U	46 U	2300 U
TMP-16	70	11/17/06	45 U	45 U	91 U	91 U	230 U	910 U	910 U	2300 U	45 U	450 U	45 U	910 U	45 U	--	91 U	45 U	2300 U
TMP-16	75	11/17/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	**6.4 J**	460 U	46 U	920 U	46 U	--	92 U	46 U	2300 U
TMP-16	80	11/17/06	37 U	37 U	75 U	75 U	190 U	750 U	750 U	1900 U	37 U	370 U	37 U	750 U	37 U	--	75 U	37 U	1900 U
TMP-16	85	11/17/06	42 U	42 U	85 U	85 U	210 U	850 U	850 U	2100 U	42 U	420 U	42 U	850 U	42 U	--	85 U	42 U	2100 U
TMP-16	90	11/17/06	54 U	54 U	110 U	110 U	270 U	1100 U	1100 U	2700 U	54 U	540 U	54 U	1100 U	54 U	--	110 U	54 U	2700 U
TMP-16	95	11/17/06	89 U	89 U	180 U	180 U	440 U	1800 U	1800 U	4400 U	89 U	890 U	89 U	1800 U	**120**	--	180 U	89 U	4400 U
TMP-16	100	11/17/06	53 U	53 U	110 U	110 U	260 U	1100 U	1100 U	2600 U	53 U	530 U	53 U	1100 U	**33 J**	--	110 U	53 U	**1300 J**
TMP-17	25	11/13/06	0.85 U	**0.5 J**	**0.64 J**	**0.21 J**	4.3 U	17 U	17 U	19 U	**3.2**	**0.28 J**	0.85 U	17 U	**140**	--	1.7 U	**6.7**	43 U
TMP-17	30	11/13/06	0.74 U	**0.39 J**	1.5 U	1.5 U	3.7 U	15 U	15 U	9.5 U	0.14 U	7.4 U	0.74 U	15 U	**27**	--	1.5 U	0.74 U	37 U
TMP-17	35	11/13/06	39 U	39 U	78 U	78 U	190 U	780 U	780 U	1900 U	39 U	390 U	39 U	780 U	**130**	--	78 U	39 U	1900 U
TMP-17	40	11/13/06	0.88 U	0.88 U	1.8 U	1.8 U	4.4 U	18 U	18 U	44 U	0.32 U	8.8 U	0.88 U	18 U	**0.8 J**	--	1.8 U	0.88 U	44 U
TMP-17	45	11/13/06	0.82 U	**0.47 J**	1.6 U	1.6 U	4.1 U	16 U	16 U	8.5 U	0.57 U	8.2 U	0.82 U	16 U	**120**	--	1.6 U	0.82 U	41 U
TMP-17	50	11/13/06	0.93 U	**0.94**	1.9 U	1.9 U	4.7 U	19 U	19 U	47 U	**0.93 J**	9.3 U	0.93 U	19 U	**130**	--	1.9 U	0.93 U	47 U
TMP-17	55	11/13/06	42 U	42 U	83 U	83 U	210 U	830 U	830 U	2100 U	42 U	420 U	42 U	830 U	**160**	--	83 U	42 U	2100 U
TMP-17	60	11/13/06	42 U	42 U	84 U	84 U	210 U	840 U	840 U	2100 U	42 U	420 U	42 U	840 U	**160**	--	84 U	42 U	2100 U
TMP-17	65	11/13/06	45 U	45 U	90 U	90 U	220 U	900 U	900 U	2200 U	45 U	450 U	45 U	900 U	**210**	--	90 U	45 U	2200 U
TMP-17	70	11/13/06	41 U	41 U	82 U	82 U	210 U	820 U	820 U	2100 U	41 U	410 U	41 U	820 U	**230**	--	82 U	41 U	2100 U
TMP-17	75	11/13/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	2200 U	44 U	440 U	44 U	880 U	**160**	--	88 U	44 U	2200 U
TMP-17	80	11/13/06	0.84 U	**1.1**	1.7 U	1.7 U	4.2 U	17 U	17 U	9.5 U	0.18 U	8.4 U	0.84 U	17 U	**51**	--	1.7 U	0.84 U	42 U
TMP-17	85	11/13/06	45 U	45 U	90 U	90 U	220 U	900 U	900 U	2200 U	45 U	450 U	45 U	900 U	45 U	--	90 U	45 U	2200 U
TMP-17	90	11/13/06	**0.24 J**	**1.3 J**	2.3 U	2.3 U	5.7 UJ	23 U	23 U	17 UJ	**1.5**	**0.21 J**	1.1 UJ	23 UJ	**40**	--	2.3 U	1.1 U	57 U
TMP-17	95	11/13/06	42 U	42 U	83 U	83 U	210 U	830 U	830 U	2100 U	42 U	420 U	42 U	830 U	**170**	--	83 U	42 U	2400 U
TMP-17	100	11/13/06	42 U	42 U	84 U	84 U	210 U	840 U	840 U	2100 U	42 U	420 U	42 U	840 U	**110**	--	84 U	42 U	2600 U

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Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-14	25	0.76 U	0.42 J	1.5 U	7.6 UJ	7.6 U	0.09 J	0.76 U	0.14 J	0.76 U	0.76 U	3.5	1.3	1.7	380	7.6 UJ	2.6
TMP-14	30	41 U	8.9 J	82 U	410 UJ	410 U	41 U	41 U	41 U	41 U	41 U	41 U	9.2 J	41 U	490	410 UJ	41 U
TMP-14	35	51 U	100 U	100 U	510 UJ	510 U	110	51 U	51 U	51 U	51 U	51 U	51 U	51 U	1,500	510 UJ	51 U
TMP-14	40	37 U	74 U	74 U	370 UJ	370 U	31 J	37 U	37 U	37 U	37 U	37 U	37 U	18 J	2,800	370 UJ	37 U
TMP-14	45	42 U	85 U	85 U	420 UJ	420 U	30 J	42 U	42 U	42 U	42 U	42 U	42 U	42 U	2,100	420 UJ	9.4 J
TMP-14	50	66 U	130 U	130 U	660 UJ	660 U	33 J	66 U	66 U	66 U	66 U	66 U	66 U	66 U	3,500	660 UJ	66 U
TMP-14	55	45 U	90 U	90 U	450 UJ	450 U	20 J	45 U	45 U	45 U	45 U	45 U	45 U	45 U	2,100	450 UJ	45 U
TMP-14	60	42 U	84 U	84 U	420 UJ	420 U	55	42 U	42 U	42 U	42 U	42 U	42 U	42 U	1,600	420 UJ	42 U
TMP-14	65	40 U	79 U	79 U	210 J	400 U	11 J	40 U	40 U	40 U	40 U	40 U	40 U	40 U	1,000	400 UJ	40 U
TMP-14	75	62 U	120 U	120 U	380 J	620 UJ	8 J	62 U	62 U	62 U	62 U	62 UJ	62 U	62 U	1,200	620 UJ	62 U
TMP-14	70	69 U	140 U	140 U	690 UJ	690 U	9 J	69 U	69 U	69 U	69 U	69 U	69 U	69 U	1,800	690 UJ	69 U
TMP-14	80	40 U	81 U	81 U	400 UJ	400 U	9.7 J	40 U	40 U	40 U	40 U	40 UJ	40 U	40 U	1,400	400 UJ	40 U
TMP-14	85	49 U	98 U	98 U	490 UJ	490 U	11 J	49 U	49 U	49 U	49 U	49 UJ	49 U	49 U	520	490 UJ	49 U
TMP-14	90	57 U	110 U	110 U	570 UJ	570 U	9.4 J	57 U	57 U	57 U	57 U	57 UJ	57 U	57 U	770	570 UJ	57 U
TMP-14	95	0.79 U	0.68 J	1.6 U	7.9 UJ	0.3 U	0.79 U	0.79 U	0.15 J	0.79 U	0.79 U	0.79 UJ	7.8	0.28 J	48	7.9 UJ	0.18 J
TMP-14	100	41 U	82 U	82 U	410 UJ	410 U	8.8 J	41 U	41 U	41 U	41 U	41 UJ	41 U	41 U	960	410 UJ	41 U
TMP-16	25	42 U	9.3 J	84 U	420 U	420 U	8.4 U	42 U	42 U	42 U	42 U	42 U	9.5 U	42 U	480	420 U	42 U
TMP-16	30	0.75 U	1.5 U	1.5 U	7.5 U	7.5 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.2	0.25 U	2.3	250	0.67 J	0.75 U
TMP-16	35	48 U	97 U	97 U	480 U	480 U	29 U	48 U	48 U	48 U	48 U	48 U	48 U	48 U	480	480 U	48 U
TMP-16	40	0.78 U	0.22 J	1.6 U	7.8 U	7.8 U	27 U	0.78 U	0.78 U	0.78 U	0.78 U	0.25 J	0.59 U	1.2	33 J	7.8 U	0.86
TMP-16	45	43 U	18 J	87 U	260 J	430 U	11 UJ	43 U	7.5 J	43 U	43 U	43 U	20 UJ	43 U	700	430 U	43 U
TMP-16	50	44 U	89 U	89 U	440 U	440 U	44 U	44 U	44 U	44 U	44 U	44 U	7.2 U	44 U	430	440 U	44 U
TMP-16	55	46 U	91 U	91 U	460 U	460 U	12 U	46 U	46 U	46 U	46 U	46 U	7.4 U	46 U	1,900	460 U	46 U
TMP-16	60	47 U	94 U	94 U	250 J	470 U	17 U	47 U	47 U	47 U	47 U	47 U	11 U	47 U	2,100	470 U	47 U
TMP-16	65	46 U	92 U	92 U	260 J	460 U	7.3 U	46 U	46 U	46 U	46 U	46 U	46 U	46 U	3,500	460 U	11 J
TMP-16	70	45 U	91 U	91 U	450 U	450 U	10 U	45 U	45 U	45 U	45 U	45 U	6.9 U	45 U	1,400	450 U	45 U
TMP-16	75	46 U	92 U	92 U	250 J	460 U	29 U	46 U	46 U	46 U	46 U	46 U	16 U	46 U	3,100	460 U	46 U
TMP-16	80	37 U	75 U	75 U	200 J	370 U	7 U	37 U	37 U	37 U	37 U	37 U	5.9 U	37 U	1,800	370 U	37 U
TMP-16	85	42 U	85 U	85 U	240 J	420 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	1,100	420 U	42 U
TMP-16	90	54 U	110 U	110 U	300 J	540 U	54 U	54 U	54 U	54 U	54 U	54 U	54 U	54 U	650	540 U	54 U
TMP-16	95	89 U	180 U	180 U	510 J	890 U	10 U	89 U	89 U	89 U	89 U	89 U	89 U	89 U	2,700	890 U	89 U
TMP-16	100	53 U	110 U	110 U	300 J	530 U	6.6 U	53 U	53 U	53 U	53 U	53 U	8.8 U	53 U	540	530 U	53 U
TMP-17	25	0.85 U	48	1.7 U	8.5 U	8.5 U	3.7 U	0.85 U	16	0.85 U	0.85 U	0.4 J	130	7.5	9.8	8.5 U	120
TMP-17	30	0.74 U	1.5 U	1.5 U	7.4 U	7.4 U	0.32 U	0.74 U	0.74 U	0.74 U	0.74 U	0.53 J	0.22 U	3	200	7.4 U	0.74 U
TMP-17	35	39 U	78 U	78 U	480 U	390 U	39 U	39 U	39 U	39 U	39 U	39 U	39 U	39 U	570	390 U	39 U
TMP-17	40	0.88 U	1.8 U	1.8 U	8.8 U	8.8 U	0.6 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.27 U	0.88 U	7.3	8.8 U	0.88 U
TMP-17	45	0.82 U	1.6 U	1.6 U	8.2 U	8.2 U	3.2 U	0.82 U	0.82 U	0.82 U	0.82 U	0.3 J	0.42 U	3.7	800	8.2 U	3.4
TMP-17	50	0.93 U	1.9 U	1.9 U	9.3 U	9.3 U	1.8 U	0.93 U	0.93 U	0.93 U	0.93 U	0.59 J	1.2 U	4.1	1,100	9.3 U	6.2
TMP-17	55	42 U	83 U	83 U	260 U	420 U	28 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	1,500	420 U	42 U
TMP-17	60	42 U	84 U	84 U	490 U	420 U	23 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	1,400	420 U	42 U
TMP-17	65	45 U	90 U	90 U	540 U	450 U	24 U	45 U	45 U	45 U	45 U	45 U	45 U	45 U	3,300	450 U	45 U
TMP-17	70	41 U	82 U	82 U	500 U	410 U	23 U	41 U	41 U	41 U	41 U	41 U	41 U	41 U	4,600	410 U	41 U
TMP-17	75	44 U	88 U	88 U	570 U	440 U	25 U	44 U	44 U	44 U	44 U	44 U	44 U	44 U	4,400	440 U	44 U
TMP-17	80	0.84 U	1.7 U	1.7 U	8.4 U	8.4 U	0.39 U	0.84 U	0.84 U	0.84 U	0.84 U	0.53 J	0.3 U	2.1	3,100	8.4 U	3.3
TMP-17	85	45 U	90 U	90 U	560 U	450 U	29 U	45 U	45 U	45 U	45 U	45 U	45 U	45 U	930	450 U	45 U
TMP-17	90	1.1 U	0.27 J	2.3 U	11 UJ	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	0.48 J	0.98 U	1 J	530	11 UJ	2.2 J
TMP-17	95	42 U	83 U	83 U	310 U	420 U	7.5 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	2,300	420 U	42 U
TMP-17	100	42 U	84 U	84 U	310 U	420 U	7.3 U	42 U	42 U	42 U	42 U	42 U	9.1 U	42 U	1,900	420 U	42 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-18	25	11/15/06	1.2 U	**1.9**	**0.77 J**	**0.21 J**	5.8 U	23 U	23 U	**21 J**	3.3 U	0.46 U	1.2 U	23 U	**180**	--	2.3 UJ	**2.5**	58 UJ
TMP-18	30	11/15/06	40 U	40 U	80 U	80 U	200 U	800 U	800 U	2000 U	40 U	400 U	40 U	800 U	**220**	--	80 U	40 U	2000 U
TMP-18	35	11/15/06	49 U	49 U	99 U	99 U	250 U	990 U	990 U	2500 U	7.4 U	490 U	49 U	990 U	**230**	--	99 U	49 U	2500 UJ
TMP-18	40	11/15/06	0.84 U	0.84 U	1.7 U	1.7 U	4.2 U	17 U	17 U	**6.5 J**	0.37 U	8.4 U	0.84 U	17 U	**5.4**	--	1.7 UJ	0.84 U	42 UJ
TMP-18	45	11/15/06	0.89 U	0.89 U	1.8 U	1.8 U	4.5 U	18 U	**21**	**9.9 J**	0.79 U	8.9 U	0.89 U	18 U	**35**	--	1.8 UJ	0.89 U	45 UJ
TMP-18	50	11/15/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	2200 UJ	44 U	440 U	44 U	880 U	**740**	--	88 U	44 U	2200 U
TMP-18	55	11/15/06	47 U	47 U	93 U	93 U	230 U	930 U	930 U	2300 UJ	47 U	470 U	47 U	930 U	**230**	--	93 U	47 U	**2600**
TMP-18	60	11/15/06	42 U	42 U	85 U	85 U	210 U	850 U	850 U	2100 UJ	42 U	420 U	42 U	850 U	**420**	--	85 U	42 U	**1900 J**
TMP-18	65	11/15/06	45 U	45 U	90 U	90 U	230 U	900 U	900 U	2300 UJ	45 U	450 U	45 U	900 U	**480**	--	90 U	45 U	2300 U
TMP-18	70	11/15/06	57 U	57 U	110 U	110 U	280 U	1100 U	1100 U	2800 UJ	57 U	570 U	57 U	1100 U	**300**	--	110 U	57 U	**2800 J**
TMP-18	75	11/15/06	41 U	41 U	83 U	83 U	210 U	830 U	830 U	2100 UJ	41 U	410 U	41 U	830 U	**85**	--	83 U	41 U	**2000 J**
TMP-18	80	11/15/06	44 U	44 U	87 U	87 U	220 U	870 U	870 U	2200 UJ	44 U	440 U	44 U	870 U	**44**	--	87 U	44 U	2200 U
TMP-18	85	11/15/06	40 U	40 U	81 U	81 U	200 U	810 U	810 U	2000 UJ	40 U	400 U	40 U	810 U	40 U	--	81 U	40 U	2000 U
TMP-18	90	11/15/06	**0.19 J**	**0.94**	1.8 U	1.8 U	4.5 U	18 U	18 U	**18 J**	8 U	9 U	0.9 U	18 U	**21**	--	1.8 UJ	**0.2 J**	45 U
TMP-18	95	11/15/06	42 U	42 U	85 U	85 U	210 U	850 U	850 U	2100 UJ	42 U	420 U	42 U	850 U	**150**	--	85 U	42 U	2100 U
TMP-18	100	11/15/06	48 U	48 U	97 U	97 U	240 U	970 U	970 U	2400 UJ	48 U	480 U	48 U	970 U	**130**	--	97 U	48 U	**2000 J**
TMP-19	25	12/4/06	0.92 U	**0.17 J**	**0.12 J**	1.8 U	4.6 UJ	18 U	18 U	13 UJ	1.3 U	9.2 U	0.92 U	18 UJ	**70**	--	1.8 U	**1.1**	46 U
TMP-19	30	12/4/06	53 U	53 U	110 U	110 U	260 UJ	1100 U	1100 U	2600 U	7.8 U	530 U	53 U	1100 UJ	**300**	--	110 U	53 U	**1400 J**
TMP-19	35	12/4/06	49 U	49 U	98 U	98 U	250 UJ	980 U	980 U	2500 U	49 U	490 U	49 U	980 UJ	**730**	--	98 U	49 U	**1500 J**
TMP-19	40	12/4/06	0.98 U	0.98 U	2 U	2 U	4.9 UJ	20 U	**11 J**	13 UJ	0.98 U	9.8 U	0.98 U	20 UJ	**3**	--	2 U	0.98 U	49 U
TMP-19	45	12/4/06	42 U	42 U	85 U	85 U	210 UJ	850 U	850 U	2100 U	42 U	420 U	42 U	850 UJ	**550**	--	85 U	42 U	2100 U
TMP-19	50	12/4/06	52 U	52 U	100 U	100 U	260 UJ	1000 U	1000 U	2600 U	52 U	520 U	52 U	1000 UJ	**430**	--	100 U	52 U	**1200 J**
TMP-19	55	12/4/06	43 U	43 U	85 U	85 U	210 UJ	850 U	850 U	2100 U	43 U	430 U	43 U	850 UJ	**160**	--	85 U	43 U	2100 U
TMP-19	60	12/4/06	44 U	44 U	89 U	89 U	220 UJ	890 U	890 U	2200 U	6.7 U	440 U	44 U	890 UJ	**340**	--	89 U	44 U	**1200 J**
TMP-19	65	12/4/06	40 U	40 U	80 U	80 U	200 UJ	800 U	800 U	2000 U	6.5 U	400 U	40 U	800 UJ	**310**	--	80 U	40 U	**1200 J**
TMP-19	70	12/4/06	45 U	45 U	89 U	89 U	220 UJ	890 U	890 U	2200 U	45 U	450 U	45 U	890 UJ	**46**	--	89 U	45 U	**1600 J**
TMP-19	75	12/4/06	51 U	51 U	100 U	100 U	250 UJ	1000 U	1000 U	2500 UJ	51 U	510 U	51 U	1000 UJ	**29 J**	--	100 U	51 U	**1400 J**
TMP-19	80	12/4/06	46 U	46 U	93 U	93 U	230 UJ	930 U	930 U	2300 U	46 U	460 U	46 U	930 UJ	46 U	--	93 U	46 U	**1200 J**
TMP-19	85	12/4/06	46 U	46 U	92 U	92 U	230 UJ	920 U	920 U	2300 U	46 U	460 U	46 U	920 UJ	46 U	--	92 U	46 U	**1200 J**
TMP-19	90	12/4/06	53 U	53 U	110 U	110 U	270 U	1100 U	1100 U	2700 UJ	53 U	530 U	53 U	1100 U	**20 J**	--	110 U	53 U	2700 U
TMP-19	95	12/4/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	340 UJ	44 U	440 U	44 U	880 U	**190**	--	88 U	44 U	**1400 J**
TMP-19	100	12/4/06	48 U	48 U	96 U	96 U	240 U	960 U	960 U	2400 UJ	48 U	480 U	48 U	960 U	**110**	--	96 U	48 U	**1300 J**
TMP-22	25	11/8/06	0.86 U	**0.8 J**	1.7 U	1.7 U	4.3 U	17 U	17 U	**17 J**	**3.3**	**0.46 J**	0.86 U	17 U	**64**	--	1.7 U	**0.67 J**	43 U
TMP-22	30	11/8/06	0.84 U	**0.8 J**	1.7 U	1.7 U	4.2 U	17 U	17 U	**11 J**	**0.62 J**	**0.17 J**	0.84 U	17 U	**7.1**	--	1.7 U	0.84 U	42 U
TMP-22	35	11/8/06	0.82 U	**0.79 J**	1.6 U	1.6 U	4.1 U	16 U	16 U	**7.7 J**	0.82 U	**0.19 J**	0.82 U	16 U	**11**	--	1.6 U	0.82 U	41 U
TMP-22	40	11/8/06	0.75 U	**0.93**	1.5 U	1.5 U	3.8 U	15 U	15 U	**7.1 J**	**0.41 J**	7.5 U	0.75 U	15 U	**7.6**	--	1.5 U	0.75 U	38 U
TMP-22	45	11/8/06	0.97 U	**0.82 J**	1.9 U	1.9 U	4.9 U	19 U	19 U	**6.8 J**	**0.51 J**	9.7 U	0.97 U	19 U	**17**	--	1.9 U	0.97 U	49 U
TMP-22	50	11/8/06	0.86 U	0.86 U	1.7 U	1.7 U	4.3 U	17 U	17 U	**11 J**	**0.48 J**	8.6 U	0.86 U	17 U	0.86 UJ	--	1.7 U	0.86 U	43 UJ
TMP-22	55	11/8/06	1 U	**0.49 J**	2 U	2 U	5 U	20 U	20 U	**12 J**	**1.7**	10 U	1 U	20 U	**14**	--	2 U	1 U	50 U
TMP-22	60	11/8/06	0.94 U	0.94 U	1.9 U	1.9 U	4.7 U	19 U	19 U	**11 J**	**0.44 J**	9.4 U	0.94 U	19 U	**3.9**	--	1.9 U	0.94 U	**120**
TMP-22	65	11/8/06	41 U	41 U	82 U	82 U	200 U	820 U	820 U	**270 J**	41 U	410 U	41 U	820 U	41 U	--	82 U	41 U	2000 U
TMP-22	70	11/8/06	40 U	40 U	80 U	80 U	200 U	800 U	800 U	2000 UJ	40 U	400 U	40 U	800 U	40 U	--	80 U	40 U	**2900**
TMP-22	75	11/8/06	44 U	44 U	89 U	89 U	220 U	890 U	890 U	**350 J**	44 U	440 U	44 U	890 U	44 U	--	89 U	44 U	**3700**
TMP-22	80	11/8/06	43 U	43 U	87 U	87 U	220 U	870 U	870 U	**310 J**	43 U	430 U	43 U	870 U	43 U	--	87 U	43 U	**3400**
TMP-22	85	11/8/06	61 U	61 U	120 U	120 U	310 U	1200 U	1200 U	**510 J**	61 U	610 U	61 U	1200 U	**61 J**	--	120 U	61 U	**4400**
TMP-22	90	11/8/06	43 U	43 U	86 U	86 U	210 U	860 U	860 U	**390 J**	43 U	430 U	43 U	860 U	**22 J**	--	86 U	43 U	**3200**
TMP-22	95	11/8/06	45 U	45 U	90 U	90 U	220 U	900 U	900 U	**360 J**	45 U	450 U	45 U	900 U	**13 J**	--	90 U	45 U	**3800**
TMP-22	100	11/8/06	35 U	35 U	71 U	71 U	180 U	710 U	710 U	**280 J**	35 U	350 U	35 U	710 U	**51**	--	71 U	35 U	**2500**

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TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-18	25	1.2 U	15 U	2.3 U	12 U	12 U	5.9 U	1.2 U	**4.9**	1.2 U	1.2 U	**4.8**	83 U	**9.2**	**270**	12 U	**180**
TMP-18	30	40 U	80 U	80 U	430 U	400 U	8.8 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	**950**	400 U	40 U
TMP-18	35	49 U	99 U	99 U	490 U	490 U	16 U	49 U	49 U	49 U	49 U	49 U	49 U	**15 J**	**1,100**	490 U	49 U
TMP-18	40	0.84 U	1.7 U	1.7 U	8.4 U	8.4 U	0.66 U	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U	0.26 U	0.84 U	**17**	8.4 U	0.84 U
TMP-18	45	0.89 U	1.8 U	1.8 U	8.9 U	8.9 U	1.4 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	0.6 U	**0.6 J**	**77**	8.9 U	**0.27 J**
TMP-18	50	44 U	88 U	88 U	460 U	440 U	22 U	44 U	44 U	44 U	44 U	44 U	44 U	**12 J**	**3,000**	440 U	44 U
TMP-18	55	47 U	93 U	93 U	480 U	470 U	11 U	47 U	47 U	47 U	47 U	47 U	47 U	47 U	**670**	470 U	47 U
TMP-18	60	42 U	85 U	85 U	450 U	420 U	18 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	**1,600**	420 U	42 U
TMP-18	65	45 U	90 U	90 U	480 U	450 U	10 U	45 U	45 U	45 U	45 U	45 U	45 U	45 U	**2,100**	450 U	45 U
TMP-18	70	57 U	110 U	110 U	620 U	570 U	18 U	57 U	57 U	57 U	57 U	57 U	12 U	57 U	**2,600**	570 U	57 U
TMP-18	75	41 U	83 U	83 U	450 U	410 U	41 U	41 U	41 U	41 U	41 U	41 U	41 U	41 U	**2,600**	410 U	41 U
TMP-18	80	44 U	9.1 U	87 U	510 U	**26 J**	11 U	44 U	44 U	44 U	44 U	44 U	30 U	44 U	**1,900**	440 U	44 U
TMP-18	85	40 U	81 U	81 U	460 U	400 U	4.9 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	**960**	400 U	40 U
TMP-18	90	0.9 U	0.34 U	1.8 U	9 U	9 U	0.19 U	0.9 U	0.9 U	0.9 U	0.9 U	0.9 U	2.9 U	**0.92**	**210**	9 U	**1.4**
TMP-18	95	42 U	85 U	85 U	500 U	420 U	5.5 U	42 U	42 U	42 U	42 U	42 U	42 U	42 U	**2,000**	420 U	42 U
TMP-18	100	48 U	97 U	97 U	570 U	480 U	7.6 U	48 U	48 U	48 U	48 U	48 U	48 U	48 U	**1,700**	480 U	48 U
TMP-19	25	0.92 U	**3.9**	1.8 U	9.2 UJ	9.2 U	0.48 U	0.92 U	**0.97**	0.92 U	0.92 U	0.92 U	24 U	**1.4**	**2**	9.2 U	**67**
TMP-19	30	53 U	110 U	110 U	**390 J**	530 U	**28 J**	53 U	53 U	53 U	53 U	53 U	14 U	**21 J**	**910**	530 U	53 U
TMP-19	35	49 U	98 U	98 U	**350 J**	490 U	**33 J**	49 U	49 U	49 U	49 U	49 U	9.6 U	**32 J**	**3,800**	490 U	**17 J**
TMP-19	40	0.98 U	**0.2 J**	2 U	9.8 UJ	9.8 U	0.57 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.78 U	0.98 U	**8**	9.8 U	0.98 U
TMP-19	45	42 U	85 U	85 U	**330 J**	420 U	**17 J**	42 U	42 U	42 U	42 U	42 U	42 U	**14 J**	**3,400**	420 U	**16 J**
TMP-19	50	52 U	100 U	100 U	**410 J**	520 U	**19 J**	52 U	52 U	52 U	52 U	52 U	8.3 U	**19 J**	**2,100**	520 U	52 U
TMP-19	55	43 U	85 U	85 U	**320 J**	430 U	**15 J**	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**690**	430 U	43 U
TMP-19	60	44 U	89 U	89 U	**340 J**	440 U	**19 J**	44 U	44 U	44 U	44 U	44 U	7.6 U	44 U	**2,300**	440 U	44 U
TMP-19	65	40 U	80 U	80 U	**300 J**	400 U	**4.2 J**	40 U	40 U	40 U	40 U	40 U	6.5 U	40 U	**2,500**	400 U	40 U
TMP-19	70	45 U	89 U	89 U	**380 J**	450 U	**14 J**	45 U	45 U	45 U	45 U	45 U	45 U	45 U	**1,500**	450 U	45 U
TMP-19	75	51 U	100 U	100 U	**410 J**	510 U	**19 J**	51 U	51 U	51 U	51 U	51 U	8.3 U	51 U	**1,800**	510 U	51 U
TMP-19	80	46 U	93 U	93 U	**310 J**	460 U	**17 J**	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**980**	460 U	46 U
TMP-19	85	46 U	92 U	92 U	**360 J**	460 U	**18 J**	46 U	46 U	46 U	46 U	46 U	7.9 U	46 U	**840**	460 U	46 U
TMP-19	90	53 U	110 U	110 U	**360 J**	530 U	**18 J**	53 U	53 U	53 U	53 U	53 U	53 U	53 U	**580**	530 U	53 U
TMP-19	95	44 U	88 U	88 U	**360 J**	440 U	**18 J**	44 U	44 U	44 U	44 U	44 U	8.1 U	44 U	**1,600**	440 U	**32 J**
TMP-19	100	48 U	96 U	96 U	**400 J**	480 U	**19 J**	48 U	48 U	48 U	48 U	48 U	9 U	48 U	**1,900**	480 U	48 U
TMP-22	25	0.86 U	4 U	1.7 U	8.6 UJ	8.6 U	0.86 UJ	0.86 U	**1.1**	0.86 U	0.86 U	**1.6 J**	3 U	**4.6**	**45**	8.6 UJ	0.86 U
TMP-22	30	0.84 U	1.7 U	**0.18 J**	8.4 UJ	8.4 U	0.84 UJ	0.84 U	0.84 U	0.84 U	0.84 U	**0.3 J**	0.39 U	**0.81 J**	**67**	8.4 UJ	0.84 U
TMP-22	35	0.82 U	1.6 U	1.6 U	8.2 UJ	8.2 U	0.64 UJ	0.82 U	0.82 U	0.82 U	0.82 U	0.82 UJ	0.82 U	**1.5**	**130**	8.2 UJ	0.82 U
TMP-22	40	0.75 U	1.5 U	1.5 U	7.5 UJ	7.5 U	0.75 UJ	0.75 U	0.75 U	0.75 U	0.75 U	0.75 UJ	0.19 U	**1.1**	**130**	7.5 UJ	0.75 U
TMP-22	45	0.97 U	1.9 U	1.9 U	9.7 UJ	9.7 U	4.4 UJ	0.97 U	0.97 U	0.97 U	0.97 U	0.97 UJ	0.31 U	**1.1**	**430**	9.7 UJ	**2.1**
TMP-22	50	0.86 U	1.7 U	1.7 U	8.6 UJ	8.6 U	0.57 UJ	0.86 U	0.86 U	0.86 U	0.86 U	0.86 UJ	0.24 UJ	0.86 U	**1.8 J**	8.6 UJ	0.86 U
TMP-22	55	1 U	2 U	2 U	10 UJ	10 U	6.3 U	1 U	1 U	1 U	1 U	1 UJ	0.92 U	**0.54 J**	**240**	10 UJ	**1.3**
TMP-22	60	0.94 U	1.9 U	1.9 U	9.4 U	9.4 U	1.8 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 UJ	0.31 U	0.94 U	**78**	9.4 UJ	0.94 U
TMP-22	65	41 U	82 U	82 U	250 U	410 U	25 U	41 U	41 U	41 U	41 U	41 UJ	8.1 U	41 U	**1,100**	410 UJ	41 U
TMP-22	70	40 U	80 U	80 U	400 U	400 U	28 U	40 U	40 U	40 U	40 U	40 UJ	40 U	40 U	**1,800**	400 UJ	40 U
TMP-22	75	44 U	89 U	89 U	270 U	440 U	35 U	44 U	44 U	44 U	44 U	44 UJ	8.4 U	44 U	**3,200**	440 UJ	44 U
TMP-22	80	43 U	87 U	87 U	260 U	430 U	27 U	43 U	43 U	43 U	43 U	43 UJ	7.9 U	43 U	**3,500**	430 UJ	43 U
TMP-22	85	61 U	120 U	120 U	400 U	610 U	32 U	61 U	61 U	61 U	61 U	61 UJ	61 U	61 U	**1,200**	610 UJ	61 U
TMP-22	90	43 U	86 U	86 U	290 U	430 U	30 U	43 U	43 U	43 U	43 U	43 UJ	8.6 U	43 U	**6,900**	430 UJ	43 U
TMP-22	95	45 U	90 U	90 U	320 U	450 U	30 U	45 U	45 U	45 U	45 U	45 UJ	45 U	45 U	**1,400**	450 UJ	45 U
TMP-22	100	35 U	71 U	71 U	180 U	350 U	28 U	35 U	35 U	35 U	35 U	35 UJ	35 U	35 U	**1,100**	350 UJ	35 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-24	25	11/7/06	0.81 U	0.81 U	1.6 U	0.2 J	4 U	16 U	16 U	60 J	1 U	0.53 U	0.81 U	16 U	1.2		1.6 U	2.1	40 UJ
TMP-24	30	11/7/06	1.1 U	1.1 U	2.2 U	2.2 U	5.4 U	22 U	22 U	25 J	1.1 U	0.73 U	1.1 U	22 U	1.3		2.2 U	0.55 J	54 UJ
TMP-24	35	11/7/06	45 U	7.6 J	90 U	90 U	220 U	900 U	900 U	2200 U	45 U	450 U	45 U	900 U	790		90 U	45 U	1000 J
TMP-24	40	11/7/06	48 U	48 U	95 U	95 U	240 U	950 U	950 U	2400 U	48 U	480 U	48 U	950 U	240		95 U	48 U	2400 UJ
TMP-24	45	11/7/06	52 U	52 U	100 U	100 U	260 U	1000 U	1000 U	2600 U	52 U	520 U	52 U	1000 U	360		100 U	52 U	2600 UJ
TMP-24	50	11/7/06	1 U	0.59 J	2 U	2 U	5 U	20 U	20 U	22 J	1.1 U	10 U	1 U	20 U	130		2 U	1 U	50 UJ
TMP-24	55	11/7/06	55 U	55 U	110 U	110 U	280 U	1100 U	1100 U	2800 U	55 U	550 U	55 U	1100 U	230		110 U	55 U	2800 UJ
TMP-24	60	11/7/06	46 U	46 U	91 U	91 U	230 U	910 U	910 U	2300 U	46 U	460 U	46 U	910 U	120		91 U	46 U	2300 UJ
TMP-24	65	11/7/06	44 U	44 U	89 U	89 U	220 U	890 U	890 U	2200 U	44 U	440 U	44 U	890 U	67		89 U	44 U	2200 UJ
TMP-24	70	11/7/06	0.95 U	0.45 J	1.9 U	1.9 U	4.8 U	19 U	19 U	17 J	0.76 U	9.5 U	0.95 U	19 U	18		1.9 U	0.95 U	48 UJ
TMP-24	75	11/7/06	1 U	0.74 J	2 U	2 U	5.1 U	20 U	20 U	16 J	1.2 U	10 U	1 U	20 U	15		2 UJ	1 U	25 J
TMP-24	80	11/7/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	46 U	460 U	46 U	920 U	46 U		92 U	46 U	2300 UJ
TMP-24	85	11/7/06	40 U	40 U	81 U	81 U	200 U	810 U	810 U	2000 U	40 U	400 U	40 U	810 U	40 U		81 U	40 U	2000 UJ
TMP-24	90	11/7/06	0.25J	0.37 J	1.9 U	1.9 U	4.7 U	19 U	19 U	14 J	1.1 U	9.5 U	1.4	19 U	8.7		1.9 UJ	0.95 U	47 UJ
TMP-26	25	11/9/06	0.82 U	0.82 U	5.8	1.5 J	4.1 U	16 U	16 U	38 J	3	0.97 J	0.82 U	16 U	8.4	--	1.6 U	9	41 U
TMP-26	30	11/9/06	0.73 U	0.62 J	1.5 U	1.5 U	3.7 U	15 U	15 U	11 J	0.2 J	7.3 U	0.73 U	15 U	99	--	1.5 U	0.73 U	37 UJ
TMP-26	35	11/9/06	0.83 U	0.7 J	1.7 U	1.7 U	4.2 U	17 U	17 U	8.2 J	0.2 J	8.3 U	0.83 U	17 U	170	--	1.7 U	0.83 U	42 UJ
TMP-26	40	11/9/06	0.9 U	0.15 J	1.8 U	1.8 U	4.5 U	18 U	18 U	16 J	0.51 J	9 U	0.9 U	18 U	22 J	--	1.8 U	0.9 U	45 UJ
TMP-26	45	11/9/06	0.82 U	0.82 U	1.6 U	1.6 U	4.1 U	16 U	16 U	9.1 J	0.28 J	8.2 U	0.82 U	16 U	14	--	1.6 U	0.82 U	41 UJ
TMP-26	50	11/10/06	0.13 J	0.85	0.11 J	1.4 U	3.5 U	14 U	14 U	14 J	1.7	7 U	0.7 U	14 U	54	--	1.4 U	0.26 J	35 UJ
TMP-26	55	11/10/06	0.92 U	0.92 U	1.8 U	1.8 U	4.6 U	18 U	18 U	25 J	0.83 J	9.2 U	0.92 U	18 U	8.5	--	1.8 U	0.92 U	46 UJ
TMP-26	60	11/10/06	1 U	0.82 J	2.1 U	2.1 U	5.2 U	21 U	21 U	12 J	1.2	0.23 J	1 U	21 U	61	--	2.1 U	1 U	52 UJ
TMP-26	65	11/10/06	0.84 U	0.24 J	1.7 U	1.7 U	4.2 U	17 U	17 U	11 J	0.52 J	8.4 U	0.84 U	17 U	25	--	1.7 U	0.84 U	23 UJ
TMP-26	70	11/10/06	0.17 J	2.2	0.28 J	1.8 U	4.4 U	14 J	18 U	20 J	7.3	8.9 U	0.89 U	18 U	150	--	1.8 U	0.5 J	44 UJ
TMP-26	75	11/10/06	0.96 U	1.7	1.9 U	1.9 U	4.8 U	19 U	19 U	18 J	2.7	9.6 U	0.96 U	19 U	15	--	1.9 U	0.23 J	48 UJ
TMP-26	80	11/10/06	46 U	46 U	92 U	92 U	230 U	920 U	920 U	2300 U	46 U	460 U	46 U	920 U	46 U	--	92 U	46 U	2300 U
TMP-26	85	11/10/06	47 U	47 U	95 U	95 U	240 U	950 U	950 U	2400 U	47 U	470 U	47 U	950 U	120	--	95 U	47 U	2400 U
TMP-26	90	11/10/06	0.18 J	1.7	1.6 U	1.6 U	3.9 U	16 U	16 U	15 J	0.67 J	7.9 U	0.79 U	16 U	36	--	1.6 U	0.79 U	39 U
TMP-26	95	11/10/06	43 U	43 U	85 U	85 U	210 U	850 U	850 U	2100 U	43 U	430 U	43 U	850 U	130 J	--	85 U	43 U	2100 U
TMP-26	100	11/10/06	53 U	53 U	110 U	110 U	270 U	1100 U	1100 U	2700 UJ	53 U	530 U	53 U	1100 U	80	--	110 U	53 U	2700 U
TMP-27	25	11/14/06	0.91 U	0.91 U	110	15	4.6 U	18 U	18 U	15 U	2.9 U	9.1 U	0.91 U	18 U	0.32 J	--	1.8 UJ	2.2	46 UJ
TMP-27	30	11/14/06	0.15 J	1.2	0.14 J	1.8 U	4.4 U	18 U	18 U	11 U	0.76 U	8.9 U	0.89 U	18 U	110	--	1.8 UJ	0.89 U	44 UJ
TMP-27	35	11/14/06	0.2 J	1.9	1.5 U	1.5 U	3.9 U	15 U	15 U	6.2 U	0.12 U	0.26 U	0.77 U	15 U	48	--	1.5 UJ	0.77 U	39 U
TMP-27	40	11/14/06	0.91 U	0.91 U	1.8 U	1.8 U	4.5 U	18 U	18 U	12 U	0.91 U	9.1 U	0.91 U	18 U	2.7	--	1.8 UJ	0.91 U	45 UJ
TMP-27	45	11/14/06	0.85 U	0.85 U	1.7 U	1.7 U	4.3 U	17 U	17 U	11 U	0.41 U	8.5 U	0.85 U	17 U	24	--	1.7 UJ	0.85 U	43 UJ
TMP-27	50	11/14/06	0.15 J	0.97	1.7 U	1.7 U	4.2 U	17 U	17 U	42 U	0.87 U	8.5 U	0.85 U	17 U	59	--	1.7 UJ	0.15 J	42 U
TMP-27	55	11/14/06	0.99 U	0.68 J	2 U	2 U	5 U	20 U	20 U	8.9 UJ	0.81 U	9.9 U	0.99 U	20 U	24	--	2 UJ	0.99 U	50 UJ
TMP-27	60	11/14/06	0.77 U	1.6	1.5 U	1.5 U	3.9 U	15 U	15 U	8.7 UJ	0.86 UJ	7.7 U	0.77 U	15 U	8.2	--	1.5 UJ	0.77 U	39 U
TMP-27	65	11/14/06	0.85 U	2	1.7 U	1.7 U	4.2 U	17 U	17 U	42 UJ	1.3 U	8.5 U	0.85 U	17 U	45	--	1.7 UJ	0.85 U	42 UJ
TMP-27	70	11/14/06	46 U	46 U	91 U	91 U	230 U	910 U	910 U	2300 UJ	46 U	460 U	46 U	910 U	77	--	91 UJ	46 U	2300 UJ
TMP-27	75	11/14/06	0.92 U	0.29 J	1.8 U	1.8 U	4.6 U	18 U	18 U	15 UJ	0.59 U	9.2 U	0.92 U	18 U	2.2	--	1.8 UJ	0.92 U	46 UJ
TMP-27	80	11/14/06	0.82 U	0.3 J	1.6 U	1.6 U	4.1 U	16 U	16 U	41 UJ	0.21 U	8.2 U	0.82 U	16 U	1.4	--	1.6 UJ	0.82 U	59 UJ
TMP-27	85	11/14/06	0.26 J	0.47 J	1.7 U	1.7 U	4.4 U	17 U	17 U	6 UJ	0.99 U	8.7 U	3.4	17 U	5.6	--	1.7 UJ	0.87 U	44 UJ
TMP-27	90	11/14/06	0.25 J	0.61 J	2 U	2 U	5.1 U	20 U	20 U	15 UJ	1.3 U	10 U	1 U	20 U	6.3	--	2 UJ	1 U	51 UJ
TMP-27	95	11/14/06	42 U	42 U	84 U	84 U	210 U	840 U	840 U	2100 UJ	42 U	420 U	42 U	840 U	110	--	84 UJ	42 U	2100 UJ
TMP-27	100	11/14/06	44 U	44 U	87 U	87 U	220 U	870 U	870 U	2200 UJ	6 U	440 U	44 U	870 U	100	--	87 UJ	44 U	1400 UJ

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-24	25	0.81 U	1.4 U	1.6 U	8.1 UJ	8.1 U	0.22 U	0.81 U	3.9 U	0.81 U	0.81 U	0.81 UJ	2.2 U	0.81 U	**0.85 J**	8.1 UJ	0.81 U
TMP-24	30	1.1 U	2.2 U	2.2 U	11 UJ	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 UJ	1.3 U	1.1 U	**1.2 J**	11 UJ	**0.44 J**
TMP-24	35	45 U	90 U	90 U	300 UJ	450 U	250 U	45 U	45 U	45 U	45 U	45 UJ	45 U	**52**	**3,000**	450 U	**78J**
TMP-24	40	48 U	95 U	95 U	360 UJ	480 U	54 U	48 U	48 U	48 U	48 U	48 UJ	48 U	48 U	**1,100**	480 U	48 U
TMP-24	45	52 U	100 U	100 U	430 UJ	520 U	62 U	52 U	52 U	52 U	52 U	52 UJ	52 U	52 U	**1,900**	520 U	52 U
TMP-24	50	1 U	0.24 U	2 U	10 UJ	10 U	8.1 UJ	1 U	1 U	1 U	1 U	**0.35 J**	0.88 U	**2.9**	**410**	10 UJ	**3.8**
TMP-24	55	55 U	110 U	110 U	370 UJ	550 U	35 U	55 U	55 U	55 U	55 U	55 UJ	55 U	55 U	**1,000**	550 U	55 U
TMP-24	60	46 U	91 U	91 U	370 UJ	460 U	38 U	46 U	46 U	46 U	46 U	46 UJ	46 U	46 U	**630**	460 U	46 U
TMP-24	65	44 U	89 U	89 U	290 UJ	440 U	38 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**650**	440 U	44 U
TMP-24	70	0.95 U	1.9 U	1.9 U	9.5 UJ	9.5 U	2.2 UJ	0.95 U	0.95 U	0.95 U	0.95 U	0.95 UJ	0.46 U	**0.54 J**	**520**	9.5 UJ	**1.1**
TMP-24	75	1 U	2 U	2 U	10 UJ	10 U	1.4 U	1 U	1 U	1 U	1 U	**0.22 J**	0.77 U	**0.86 J**	**1,200**	10 UJ	**1.2**
TMP-24	80	46 U	92 U	92 U	370 UJ	460 U	17 U	46 U	46 U	46 U	46 U	46 UJ	46 U	46 U	**1,600**	460 U	46 U
TMP-24	85	40 U	81 U	81 U	330 UJ	400 U	14 U	40 U	40 U	40 U	40 U	40 UJ	40 U	40 U	**410**	400 U	40 U
TMP-24	90	0.95 U	1.9 U	1.9 U	9.5 UJ	9.5 U	0.88 UJ	0.95 U	0.95 U	0.95 U	0.95 U	**0.3 J**	0.62 U	**0.3 J**	**180**	9.5 U	**0.39 J**
TMP-26	25	**0.24 J**	**60**	1.6 U	8.2 UJ	8.2 U	0.63 UJ	0.82 U	**14**	0.82 U	**0.14 J**	0.82 U	140 U	**2.3**	**0.96 J**	8.2 UJ	**15**
TMP-26	30	0.73 U	1.5 U	1.5 U	7.3 U	7.3 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	**8.4**	**130**	7.3 U	**5.2**
TMP-26	35	0.83 U	1.7 U	1.7 U	8.3 U	8.3 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.13 U	**15**	**100**	8.3 U	**2.8**
TMP-26	40	0.9 U	**0.23 J**	1.8 U	9 U	9 U	3 UJ	0.9 U	0.9 U	0.9 U	0.9 U	**0.18 J**	0.39 UJ	**2.4**	**110**	9 U	**0.65 J**
TMP-26	45	0.82 U	1.6 U	1.6 U	8.2 U	8.2 U	2 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.25 U	**0.61 J**	**80**	8.2 U	**0.32 J**
TMP-26	50	0.7 U	**0.44 J**	1.4 U	7 U	0.62 U	29 U	0.7 U	**0.2 J**	0.7 U	0.7 U	**0.21 J**	1 U	**2.1**	**460**	7 U	**5**
TMP-26	55	0.92 U	**0.22 J**	1.8 U	9.2 U	9.2 U	3 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.55 U	0.92 U	**49**	9.2 U	**0.36 J**
TMP-26	60	1 U	**0.28 J**	2.1 U	10 U	10 U	1.6 U	1 U	1 U	1 U	1 U	1 U	0.97 U	**1.1**	**500**	10 U	**4**
TMP-26	65	0.84 U	1.7 U	1.7 U	8.4 U	8.4 U	0.27 U	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U	0.34 U	**0.33 J**	**130**	8.4 U	**0.92**
TMP-26	70	0.89 U	**1.4 J**	1.8 U	8.9 U	0.41 U	0.33 U	0.89 U	**0.3 J**	0.89 U	0.89 U	**0.69 J**	4.4 U	**3.4**	**1,600**	8.9 U	**19**
TMP-26	75	0.96 U	**0.32 J**	1.9 U	9.6 U	9.6 U	0.41 U	0.96 U	0.96 U	0.96 U	0.96 U	**0.76 J**	1.8 U	**2.6**	**4,100**	9.6 U	**2.1**
TMP-26	80	46 U	92 U	92 U	440 U	460 U	27 U	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**2,200**	460 U	46 U
TMP-26	85	47 U	95 U	95 U	470 U	470 U	28 U	47 U	47 U	47 U	47 U	47 U	47 U	47 U	**2,800**	470 U	47 U
TMP-26	90	0.79 U	1.6 U	1.6 U	7.9 U	7.9 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.52 U	**1.3**	**180**	7.9 U	**2.4**
TMP-26	95	43 U	85 U	85 U	450 U	430 U	26 U	43 U	43 U	43 U	43 U	43 U	43 U	43 U	**2,100 J**	430 U	43 U
TMP-26	100	53 U	110 U	110 U	590 U	530 U	37 U	53 U	53 U	53 U	53 U	53 U	53 U	53 U	**1,300**	530 U	53 U
TMP-27	25	**2.2**	2.3 U	1.8 U	9.1 U	9.1 U	0.87 U	**2.6**	**1.2**	**0.61 J**	**2.4**	0.91 U	1.6 U	0.91 U	**1.2 J**	9.1 U	0.91 U
TMP-27	30	0.89 U	1.8 U	1.8 U	8.9 U	8.9 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	**6.6**	0.89 U	**26**	**270**	8.9 U	**54**
TMP-27	35	0.77 U	1.5 U	**0.13 J**	7.7 U	7.7 U	0.36 U	0.77 U	0.77 U	0.77 U	0.77 U	**0.73 J**	0.77 U	**5.8**	**300**	7.7 U	**5.2**
TMP-27	40	0.91 U	1.8 U	1.8 U	9.1 U	9.1 U	0.89 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.17 U	0.91 U	**9**	9.1 U	0.91 U
TMP-27	45	0.85 U	1.7 U	1.7 U	8.5 U	8.5 U	8 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.26 U	**0.53 J**	**93**	8.5 U	**0.41 J**
TMP-27	50	0.85 U	0.19 U	1.7 U	8.5 U	8.5 U	13 U	0.85 U	0.85 U	0.85 U	0.85 U	**0.19 J**	0.62 U	**1.8**	**330**	8.5 U	**6.9**
TMP-27	55	0.99 U	2 U	2 U	9.9 U	9.9 U	14 U	0.99 U	0.99 U	0.99 U	0.99 U	0.99 UJ	0.46 U	**0.96 J**	**180**	9.9 U	**4.2**
TMP-27	60	0.77 U	0.17 U	1.5 U	7.7 U	7.7 U	0.15 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.51 U	**0.46 J**	**110**	7.7 U	**7.6**
TMP-27	65	0.85 U	0.18 U	1.7 U	8.5 U	8.5 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	**0.21 J**	0.66 U	**1.2**	**300**	8.5 U	**15**
TMP-27	70	46 U	91 U	91 U	510 U	460 U	7.5 U	46 U	46 U	46 U	46 U	46 UJ	46 U	46 U	**640**	460 U	46 U
TMP-27	75	0.92 U	1.8 U	1.8 U	9.2 U	9.2 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 UJ	0.52 U	0.92 U	**270**	9.2 U	0.92 U
TMP-27	80	0.82 U	1.6 U	1.6 U	8.2 U	8.2 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 UJ	0.18 U	0.82 U	**550**	8.2 U	0.82 U
TMP-27	85	0.87 U	1.7 U	1.7 U	8.7 U	8.7 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	**0.3 J**	0.56 U	0.87 U	**170**	8.7 U	0.87 U
TMP-27	90	1 U	2 U	2 U	10 U	10 U	1 U	1 U	1 U	1 U	1 U	1 UJ	0.73 U	1 U	**200**	10 U	1 U
TMP-27	95	42 U	84 U	84 U	470 U	420 U	8.3 U	42 U	42 U	42 U	42 U	42 UJ	42 U	42 U	**1,500**	420 U	42 U
TMP-27	100	44 U	87 U	87 U	520 U	440 U	11 U	44 U	44 U	44 U	44 U	44 UJ	44 U	44 U	**2,000**	440 U	44 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Date	1,1-DCA	1,1-DCE	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2,2-Dichloropropane	2-Butanone	2-Hexanone	Acetone	Benzene	Carbon disulfide	Chloroform	Chloromethane	cis-1,2-DCE	Cyclohexane	Dichlorodifluoromethane	Ethylbenzene	Isopropanol
TMP-29	25	12/1/06	0.88 U	**0.35 J**	**0.15 J**	**0.11 J**	4.4 U	**9.2 J**	18 U	25 U	**9.8**	**0.34 J**	0.88 U	18 UJ	**6.6**	--	1.8 U	**0.77 J**	44 UJ
TMP-29	30	12/1/06	0.87 U	0.87 U	1.7 U	1.7 U	4.3 U	17 U	17 U	14 UJ	**0.29 J**	**0.29 J**	0.87 U	17 UJ	**8.9**	--	1.7 U	0.87 U	43 UJ
TMP-29	35	12/1/06	0.92 U	**0.47 J**	1.8 U	1.8 U	4.6 U	18 U	18 U	17 U	**0.72 J**	**0.97 J**	0.92 U	18 UJ	**67**	--	1.8 U	0.92 U	46 UJ
TMP-29	40	12/1/06	**0.43 J**	0.79 U	1.6 U	1.6 U	3.9 U	16 U	16 U	39 U	**0.36 J**	**0.24 J**	0.79 U	16 UJ	**38**	--	1.6 U	0.79 U	39 UJ
TMP-29	45	12/1/06	0.92 U	0.92 U	1.8 U	1.8 U	4.6 U	18 U	18 U	46 U	**0.29 J**	**0.4 J**	0.92 U	18 UJ	**1.7**	--	1.8 U	0.92 U	46 UJ
TMP-29	50	12/1/06	0.91 U	0.91 U	1.8 U	1.8 U	4.5 U	18 U	18 U	45 U	**0.45 J**	**0.21 J**	0.91 U	18 UJ	0.91 U	--	1.8 U	0.91 U	45 UJ
TMP-29	55	12/1/06	0.88 U	0.88 U	1.8 U	1.8 U	4.4 U	18 U	18 U	10 U	**1.1**	8.8 U	0.88 U	18 UJ	0.88 U	--	1.8 U	0.88 U	44 UJ
TMP-29	60	12/1/06	0.95 U	0.95 U	1.9 U	1.9 U	4.7 U	19 U	19 U	47 U	**0.7 J**	9.5 U	0.95 U	19 UJ	0.95 U	--	1.9 U	0.95 U	47 UJ
TMP-29	65	12/1/06	0.85 U	0.85 U	1.7 U	1.7 U	4.2 U	17 U	17 U	17 U	**0.46 J**	8.5 U	0.85 U	17 UJ	0.85 U	--	1.7 U	0.85 U	42 UJ
TMP-29	70	12/1/06	1 U	**0.76 J**	2.1 U	2.1 U	5.2 U	21 U	21 U	18 UJ	**6.4**	10 U	1 U	21 UJ	**1.8**	--	2.1 U	**0.55 J**	52 UJ
TMP-29	75	12/1/06	44 U	44 U	88 U	88 U	220 U	880 U	880 U	2200 UJ	44 U	440 U	44 U	880 U	44 U	--	88 U	44 U	2200 U
TMP-29	80	12/1/06	74 U	74 U	150 U	150 U	370 U	1500 U	1500 U	3700 UJ	74 U	740 U	74 U	1500 U	74 U	--	150 U	74 U	3700 U
TMP-29	85	12/1/06	**0.19 J**	**0.84**	1.6 U	1.6 U	4 U	16 U	16 U	6.7 UJ	**0.2 J**	**0.23 J**	**1.9**	16 UJ	**4.2**	--	1.6 U	0.8 U	40 UJ
TMP-29	90	12/1/06	47 U	47 U	93 U	93 U	230 U	930 U	930 U	2300 UJ	47 U	470 U	47 U	930 U	**83**	--	93 U	47 U	2300 U
TMP-29	95	12/1/06	0.95 U	**0.48 J**	1.9 U	1.9 U	4.8 U	19 U	19 U	21 U	**1**	9.5 U	0.95 U	19 UJ	**2.6**	--	1.9 U	0.95 U	48 UJ
TMP-29	100	12/1/06	46 U	46 U	91 U	91 U	230 U	910 U	910 U	2300 UJ	46 U	460 U	46 U	910 U	**27 J**	--	91 U	46 U	2300 U

Table 1
Pre-ERH Volatile Organic Compound Soil Results (ug/kg)
Pemaco Superfund Site, Maywood, California

TMP ID	Depth (ft bgs)	Isopropylbenzene	m,p-Xylene	MTBE	Methylene chloride	Naphthalene	N-Hexane	N-Propylbenzene	o-Xylene	p-Isopropyltoluene	Sec-Butylbenzene	PCE	Toluene	trans-1,2-DCE	TCE	Trichlorofluoromethane	Vinyl chloride
TMP-29	25	**0.11 J**	**1.1 J**	1.8 U	8.8 UJ	**0.57 J**	0.88 U	0.88 U	**0.44 J**	0.88 U	**0.59 J**	**1.9**	5.2 U	**1.9**	**39**	8.8 U	**0.47 J**
TMP-29	30	0.87 U	**0.23 J**	1.7 U	8.7 UJ	8.7 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	0.87 U	0.29 U	**0.81 J**	**6.4**	8.7 U	0.87 U
TMP-29	35	0.92 U	1.8 U	1.8 U	9.2 UJ	9.2 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.25 U	**6.6**	**42**	9.2 U	**0.75 J**
TMP-29	40	0.79 U	1.6 U	1.6 U	7.9 UJ	7.9 U	**32**	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	**1.3**	**3.1**	7.9 U	**1.9**
TMP-29	45	0.92 U	1.8 U	1.8 U	9.2 UJ	9.2 U	**7.1**	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.26 U	0.92 U	**2**	9.2 U	**0.55 J**
TMP-29	50	0.91 U	1.8 U	1.8 U	9.1 UJ	9.1 U	**0.49 J**	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.19 U	0.91 U	1.8 U	9.1 U	0.91 U
TMP-29	55	0.88 U	1.8 U	1.8 U	8.8 UJ	8.8 U	**3.5**	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.6 U	0.88 U	**2.8**	8.8 U	0.88 U
TMP-29	60	0.95 U	1.9 U	1.9 U	9.5 UJ	9.5 U	**9.8**	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.35 U	0.95 U	**3.8**	9.5 U	0.95 U
TMP-29	65	0.85 U	1.7 U	1.7 U	8.5 UJ	8.5 U	**0.75 J**	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.25 U	0.85 U	**0.17 J**	8.5 U	0.85 U
TMP-29	70	1 U	**1.2 J**	2.1 U	10 UJ	**0.37 J**	**0.12 J**	1 U	**0.31 J**	1 U	1 U	1 U	4.1 U	1 U	**380**	10 U	**0.31 J**
TMP-29	75	44 U	88 U	88 U	**250 J**	440 U	**15 J**	44 U	44 U	44 U	44 U	44 U	7 U	44 U	**940**	440 U	44 U
TMP-29	80	74 U	150 U	150 U	**440 J**	740 U	**26 J**	74 U	74 U	74 U	74 U	74 U	74 U	74 U	**1,200**	740 U	74 U
TMP-29	85	0.8 U	1.6 U	1.6 U	8 UJ	8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	**0.51 J**	0.8 U	**0.29 J**	**220**	8 U	0.8 U
TMP-29	90	47 U	93 U	93 U	**240 J**	470 U	**17 J**	47 U	47 U	47 U	47 U	47 U	7.7 U	47 U	**950**	470 U	47 U
TMP-29	95	0.95 U	1.9 U	1.9 U	9.5 UJ	9.5 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.6 U	0.95 U	**110**	9.5 U	0.95 U
TMP-29	100	46 U	91 U	91 U	**280 J**	460 U	**17 J**	46 U	46 U	46 U	46 U	46 U	46 U	46 U	**510**	460 U	46 U

VOCs that were not detected above the reporting limits:

1,1,1-Trichloroethane	Bromodichloromethane	Isopropylbenzene
1,1,2,2-Tetrachloroethane	Bromoform	Methyl Acetate
1,1,2-Trichloroethane	Bromomethane	N-Propylbenzene
1,2,3-Trichloropropane	Carbon tetrachloride	trans-1,3-Dichloropropene
1,2,4-Trichlorobenzene	Chloroethane	Trichlorofluoromethane
1,2,4-Trimethylbenzene	Chloromethane	p-Isopropyltoluene
1,2-Dibromo-3-Chloropropane	cis-1,3-Dichloropropene	Sec-Butylbenzene
1,3,5-Trimethylbenzene	Dichlorodifluoromethane	Vinyl acetate
2,2-Dichloropropane	Isopropanol	Trichlorofluoromethane

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit

Abbreviations:

DCA - Dichloroethane
DCE - Dichloroethene
ERH - Electrical Resistance Heating
ft bgs - feet below ground surface
MTBE - Methyl tert-Butyl Ether
n/a - not available
TCE - Trichloroethene
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms
VOCs - Volatile Organic Compounds

Table 2
Pre-ERH 1,4-Dioxane Soil Results
Pemaco Superfund Site, Maywood, California

TMP ID	Sample Depth (ft bgs)	Sample Date	1,4-Dioxane (mg/kg)	Analysis Method
TMP-07	45	11/6/06	0.12 U	SOM01.1
TMP-07	50	11/6/06	0.14 U	SOM01.1
TMP-07	55	11/6/06	0.11 U	SOM01.1
TMP-07	60	11/6/06	0.09 U	SOM01.1
TMP-07	65	11/6/06	0.096 U	SOM01.1
TMP-07	85	11/6/06	0.11 U	SOM01.1
TMP-09	25	11/16/06	0.2 UJ	SW 8270C
TMP-09	30	11/16/06	0.2 UJ	SW 8270C
TMP-09	35	11/16/06	0.2 UJ	SW 8270C
TMP-09	40	11/16/06	0.2 UJ	SW 8270C
TMP-09	45	11/16/06	0.2 UJ	SW 8270C
TMP-09	50	11/16/06	0.2 UJ	SW 8270C
TMP-09	55	11/16/06	0.2 UJ	SW 8270C
TMP-09	60	11/16/06	0.2 UJ	SW 8270C
TMP-09	65	11/16/06	0.2 UJ	SW 8270C
TMP-09	70	11/16/06	0.2 UJ	SW 8270C
TMP-09	75	11/16/06	0.2 UJ	SW 8270C
TMP-09	80	11/16/06	0.2 UJ	SW 8270C
TMP-09	85	11/16/06	0.2 UJ	SW 8270C
TMP-09	90	11/16/06	0.2 UJ	SW 8270C
TMP-09	95	11/16/06	0.2 UJ	SW 8270C
TMP-11	25	11/28/06	0.2 U	SW 8270C
TMP-11	30	11/28/06	0.2 UJ	SW 8270C
TMP-11	35	11/28/06	0.2 UJ	SW 8270C
TMP-11	40	11/28/06	0.2 UJ	SW 8270C
TMP-11	45	11/28/06	0.2 U	SW 8270C
TMP-11	50	11/29/06	0.2 UJ	SW 8270C
TMP-11	55	11/29/06	0.2 U	SW 8270C
TMP-11	60	11/29/06	0.2 U	SW 8270C
TMP-11	65	11/29/06	0.2 U	SW 8270C
TMP-11	70	11/29/06	0.2 U	SW 8270C
TMP-11	75	11/29/06	0.2 U	SW 8270C
TMP-11	80	11/29/06	0.2 U	SW 8270C
TMP-11	85	11/29/06	0.2 U	SW 8270C
TMP-11	90	11/29/06	0.2 U	SW 8270C
TMP-11	95	11/29/06	0.2 U	SW 8270C
TMP-11	100	11/29/06	0.2 U	SW 8270C
TMP-24	35	11/7/06	0.11 U	SOM01.1
TMP-24	50	11/7/06	0.13 U	SOM01.1
TMP-24	55	11/7/06	6.7 U	SOM01.1
TMP-24	60	11/7/06	0.095 U	SOM01.1

Notes:
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit

Abbreviations:
ERH - Electrical Resistance Heating
ft bgs - feet below ground surface
TMP - Temperature Monitoring Point
mg/kg - milligrams per kilograms

Table 3
Evaluation of Pre-ERH Chemical of Concern Results

Chemicals of Concern in Upper Vadose Zone (between 2 and 30 ft bgs)

Chemical of Concern	SSRLs[1] (ug/kg)	Minimum Detections		Maximum Detections		Percent Detected
		Concentration (ug/kg)	Associated TMP ID & Sample Depth	Concentration (ug/kg)	Associated TMP ID and Sample Depth	
1,1-Dichloroethene	60	**0.14 J**	TMP-04, 25 ft bgs	**1.1**	TMP-13, 30 ft bgs	55%
Acetone	16,000	**9.0 J**	TMP-16, 30 ft bgs	**38 J**	TMP-26, 25 ft bgs	42%
Ethylbenzene	13,000	**0.14 J**	TMP-04 & TMP-05, 25 ft bgs	**9.0**	TMP-26, 25 ft bgs	37%
Tetrachloroethene	60	**0.16 J**	TMP-05, 30 ft bgs	**6.6**	TMP-27, 30 ft bgs	53%
Toluene	12,000	**0.35 J**	TMP-10, 30 ft bgs	**130**	TMP-17, 25 ft bgs	13%
Xylenes[3]	210,000	**0.11 J**	TMP-03, 100 ft bgs	**74**	TMP-26, 25 ft bgs	28%

Chemicals of Concern in both Upper and Lower Vadose Zones (between 2 and 65 ft bgs)

Chemical of Concern	SSRLs[2] (ug/kg)	Minimum Detections		Maximum Detections		Percent Detected
		Concentration (ug/kg)	Associated TMP ID & Sample Depth	Concentration (ug/kg)	Associated TMP ID and Sample Depth	
1,2-Dichloroethane	20	*Not detected above reporting limits*		*Not detected above reporting limits*		0%
Benzene	30	**0.11 J**	TMP-04, 30 ft bgs	**9.8**	TMP-29, 25 ft bgs	30%
cis-1,2-Dichloroethene	400	**0.23**	TMP-04, 30 ft bgs	**790**	TMP-24, 35 ft bgs	89%
Methylene chloride	20	**210 J**	TMP-14, 65 ft bgs	**410 J**	TMP-19, 50 ft bgs	9%
Trichloroethene	60	**0.17 J**	TMP-29, 65 ft bgs	**3,800**	TMP-19, 35 ft bgs	99%
Vinyl chloride	10	**0.27 J**	TMP-18, 45 ft bgs	**180**	TMP-18, 25 ft bgs	34%

Notes:

Bolded value indicates positive detection

"J" - reported value is a quantitative estimate

730 highlighted values indicate exceeding Pemaco SSRLs

Abbreviations:

ERH - Electrical Resistance Heating

ft bgs - feet below ground surface

SSRLs - Site-Specific Remediation Levels

TMP - Temperature Monitoring Point

ug/kg - micrograms per kilograms

Site-Specific Remediation Levels (SSRLs)

[1] SSRLs were established for COCs detected in upper vadose zone only (between 2 and 30 ft bgs)

[2] SSRLs were established for COCs detected in both upper and lower vadose zone (between 2 and 65 ft bgs)

[3] SSRL at 210,000 ug/kg was defined for total xylenes

Reference: Record of Decision (EPA, 2005)

Table 4
Comparison Between Calscience and Mitkem Laboratory Sample Results
Pemaco Superfund Site, Maywood, California

Field Sample ID:		TMP-07-45			TMP-07-50			TMP-07-55			TMP-07-60			TMP-07-65		
CLP EPA Sample ID:		n/a	Y3062	RPD***	TMP-07-50	Y3064	RPD***	TMP-07-55	Y3065	RPD***	TMP-07-60	Y3066	RPD***	TMP-07-65	Y3067	RPD***
Analytical Laboratory:		CEL*	Mitkem**		CEL*	Mitkem**		CEL*	Mitkem**		CEL*	Mitkem**		CEL*	Mitkem**	
Analyte Name	**Units**															
1,1,1-Trichloroethane	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,1,2,2-Tetrachloroethane	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	9.9 U	6.2 U	n/a	9.1 U	7 U	n/a	10 U	5.3 U	n/a	13 U	4.5 U	n/a	7.5 U	4.8 U	n/a
1,1,2-Trichloroethane	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,1-Dichloroethane	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,1-Dichloroethene	ug/kg	**0.53 J**	6.2 U	n/a	**0.93**	7 U	n/a	**0.46 J**	5.3 U	n/a	**0.5 J**	4.5 U	n/a	**1.1**	**2.2 J**	**67%**
1,2,3-Trichlorobenzene	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
1,2,4-Trichlorobenzene	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
1,2-Dibromo-3-Chloropropane	ug/kg	5 U	6.2 U	n/a	4.6 U	7 U	n/a	5 U	5.3 U	n/a	6.6 U	4.5 U	n/a	3.8 U	4.8 U	n/a
1,2-Dibromoethane	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,2-Dichlorobenzene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,2-Dichloroethane	ug/kg	0.99 U	6.2 U	n/a	0.91 UJ	7 U	n/a	1 UJ	5.3 U	n/a	1.3 UJ	4.5 U	n/a	0.75 UJ	4.8 U	n/a
1,2-Dichloropropane	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,3-Dichlorobenzene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
1,4-Dichlorobenzene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
2-Butanone	ug/kg	20 U	12 U	n/a	18 U	14 U	n/a	20 U	11 U	n/a	26 U	9 U	n/a	15 U	9.6 U	n/a
2-Hexanone	ug/kg	20 U	12 U	n/a	18 U	14 U	n/a	20 U	11 U	n/a	26 U	9 U	n/a	15 U	9.6 U	n/a
4-Methyl-2-pentanone	ug/kg	20 U	12 U	n/a	18 U	14 U	n/a	20 U	11 U	n/a	26 U	9 U	n/a	15 U	9.6 U	n/a
Acetone	ug/kg	**9.2 J**	**13**	**34%**	**10 J**	**18**	**57%**	**8.9 J**	11 U	n/a	66 U	**11**	n/a	38 U	**13**	n/a
Benzene	ug/kg	1.2 U	6.2 U	n/a	0.82 U	7 U	n/a	0.85 U	2.2 J	n/a	0.3 U	4.5 U	n/a	0.88 U	4.8 U	n/a
Bromochloromethane	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
Bromodichloromethane	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Bromoform	ug/kg	5 U	6.2 U	n/a	4.6 U	7 U	n/a	5 U	5.3 U	n/a	6.6 U	4.5 U	n/a	3.8 U	4.8 U	n/a
Bromomethane	ug/kg	20 U	6.2 U	n/a	18 U	7 U	n/a	20 U	5.3 U	n/a	26 U	4.5 U	n/a	15 U	4.8 U	n/a
Carbon disulfide	ug/kg	9.9 U	6.2 U	n/a	9.1 U	7 U	n/a	10 U	5.3 U	n/a	13 U	4.5 U	n/a	7.5 U	4.8 U	n/a
Carbon tetrachloride	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Chlorobenzene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Chloroethane	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
Chloroform	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Chloromethane	ug/kg	20 U	6.2 U	n/a	18 U	7 U	n/a	20 U	5.3 U	n/a	26 U	4.5 U	n/a	15 U	4.8 U	n/a
cis-1,2-Dichloroethene	ug/kg	**6.1**	**6.9**	**12%**	**7.5**	**7.9**	**5%**	**6.6**	**9.1**	**32%**	**7.5**	**11**	**38%**	**10**	**15**	**40%**
cis-1,3-Dichloropropene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Dibromochloromethane	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
Dichlorodifluoromethane	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
Ethylbenzene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Isopropanol	ug/kg	24 U	31 U	n/a	52 U	35 U	n/a	24 U	27 U	n/a	39 U	23 U	n/a	14 U	24 U	n/a
Isopropylbenzene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
m,p-Xylene	ug/kg	**0.25 J**	6.2 U	n/a	1.8 U	7 U	n/a	**0.2 J**	5.3 U	n/a	2.6 U	4.5 U	n/a	**0.24 J**	4.8 U	n/a
Methyl Tert-Butyl Ether	ug/kg	2 U	6.2 U	n/a	1.8 UJ	7 U	n/a	2 UJ	5.3 U	n/a	2.6 UJ	4.5 U	n/a	1.5 U	4.8 U	n/a
Methylene chloride	ug/kg	9.9 UJ	6.2 U	n/a	9.1 U	7 U	n/a	10 U	5.3 U	n/a	13 U	4.5 U	n/a	7.5 U	4.8 U	n/a
N-Hexane	ug/kg	8 U	**5.8**	n/a	7.2 U	**4.2**	n/a	3.5 U	**3.8**	n/a	0.74 U	**0.66**	n/a	0.34 U	0.48 U	n/a
o-Xylene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Styrene	ug/kg	0.99 U	6.2 U	n/a	0.91 U	7 U	n/a	1 U	5.3 U	n/a	1.3 U	4.5 U	n/a	0.75 U	4.8 U	n/a
Tetrachloroethene	ug/kg	**0.3 J**	6.2 U	n/a	**0.47 J**	7 U	n/a	**0.19 J**	5.3 U	n/a	1.3 UJ	4.5 U	n/a	**0.48 J**	4.8 U	n/a
Toluene	ug/kg	0.96 U	6.2 U	n/a	0.51 U	7 U	n/a	0.59 U	5.3 U	n/a	0.25 U	4.5 U	n/a	0.59 U	4.8 U	n/a
trans-1,2-Dichloroethene	ug/kg	**0.94 J**	6.2 U	n/a	**1.2**	7 U	n/a	**0.69 J**	5.3 U	n/a	**0.81 J**	4.5 U	n/a	**1.1**	4.8 U	n/a
trans-1,3-Dichloropropene	ug/kg	2 U	6.2 U	n/a	1.8 U	7 U	n/a	2 U	5.3 U	n/a	2.6 U	4.5 U	n/a	1.5 U	4.8 U	n/a
Trichloroethene	ug/kg	**570**	**820**	**36%**	**1100**	**500**	**75%**	**630**	**1300**	**69%**	**800**	**750**	**6%**	**2000**	**3300**	**49%**
Trichlorofluoromethane	ug/kg	9.9 U	6.2 U	n/a	9.1 U	7 U	n/a	10 U	5.3 U	n/a	13 U	4.5 U	n/a	7.5 U	4.8 U	n/a
Vinyl chloride	ug/kg	**1.3**	6.2 U	n/a	**1.9**	7 U	n/a	**0.62 J**	5.3 U	n/a	**0.73 J**	4.5 UJ	n/a	**1.9**	4.8 UJ	n/a

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit

Notes (Continued):

* CEL - Calscience Environmental Laboratories, Inc. in Garden Grove, CA
** Mitkem - Mitkem Corporation, Inc. in Warwick, RI
*** Relative percent difference (RPD) was calculated only for positive detections in both samples

Abbreviations:

n/a - not applicable or not available
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms
RPD - relative percent difference

Table 4 (Continued)
Comparison Between Calscience and Mitkem Laboratory Sample Results
Pemaco Superfund Site, Maywood, California

Field Sample ID:		TMP-07-85			TMP-24-35			TMP-24-50			TMP-24-55			TMP-24-60		
CLP EPA Sample ID:		TMP-07-85	Y3068	RPD***	TMP-24-35	Y30E3	RPD***	TMP-24-50	Y30E4	RPD***	TMP-24-55	Y30E5	RPD***	TMP-24-60	Y30E6	RPD***
Analytical Laboratory:		CEL*	Mitkem**		CEL*	Mitkem**		CEL*	Mitkem**		CEL*	Mitkem**		CEL*	Mitkem**	
Analyte Name	**Units**															
1,1,1-Trichloroethane	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,1,2,2-Tetrachloroethane	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	8.6 U	5.5 U	n/a	450 U	5.3 U	n/a	10 U	6.3 U	n/a	550 U	5.8 U	n/a	460 U	4.7 U	n/a
1,1,2-Trichloroethane	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,1-Dichloroethane	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,1-Dichloroethene	ug/kg	**0.79 J**	5.5 U	n/a	**7.6 J**	**2.8 J**	**92%**	**0.59 J**	6.3 U	n/a	55 U	5.8 U	n/a	46 U	**2.3 J**	n/a
1,2,3-Trichlorobenzene	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
1,2,4-Trichlorobenzene	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
1,2-Dibromo-3-Chloropropane	ug/kg	4.3 U	5.5 U	n/a	220 U	5.3 U	n/a	5 U	6.3 U	n/a	280 U	5.8 U	n/a	230 U	4.7 U	n/a
1,2-Dibromoethane	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,2-Dichlorobenzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,2-Dichloroethane	ug/kg	0.86 U	5.5 U	n/a	45 UJ	5.3 U	n/a	1 UJ	6.3 U	n/a	55 UJ	5.8 U	n/a	46 UJ	4.7 U	n/a
1,2-Dichloropropane	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,3-Dichlorobenzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
1,4-Dichlorobenzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
2-Butanone	ug/kg	17 U	11 U	n/a	900 U	11 U	n/a	20 U	13 U	n/a	1100 U	12 U	n/a	910 U	9.5 U	n/a
2-Hexanone	ug/kg	17 U	11 U	n/a	900 U	11 U	n/a	20 U	13 U	n/a	1100 U	12 U	n/a	910 U	9.5 U	n/a
4-Methyl-2-pentanone	ug/kg	17 U	11 U	n/a	900 U	11 U	n/a	20 U	13 U	n/a	1100 U	12 U	n/a	910 U	9.5 U	n/a
Acetone	ug/kg	**7.6 J**	11 U	n/a	2200 U	11 U	n/a	**22 J**	**24**	**9%**	2800 U	12 U	n/a	2300 U	9.5 U	n/a
Benzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1.1 U	**2.8 J**	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Bromochloromethane	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Bromodichloromethane	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Bromoform	ug/kg	4.3 U	5.5 U	n/a	220 U	5.3 U	n/a	5 U	6.3 U	n/a	280 U	5.8 U	n/a	230 U	4.7 U	n/a
Bromomethane	ug/kg	17 U	5.5 U	n/a	900 U	5.3 U	n/a	20 UJ	6.3 U	n/a	1100 U	5.8 U	n/a	910 U	4.7 U	n/a
Carbon disulfide	ug/kg	8.6 U	5.5 U	n/a	450 U	5.3 U	n/a	10 U	6.3 U	n/a	550 U	5.8 U	n/a	460 U	4.7 U	n/a
Carbon tetrachloride	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Chlorobenzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Chloroethane	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Chloroform	ug/kg	**0.59 J**	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Chloromethane	ug/kg	17 U	5.5 U	n/a	900 U	5.3 U	n/a	20 U	6.3 U	n/a	1100 U	5.8 U	n/a	910 U	4.7 U	n/a
cis-1,2-Dichloroethene	ug/kg	**3.3**	**3.4 J**	**3%**	**790**	**980**	**21%**	**130**	**180**	**32%**	**230**	**120**	**63%**	**120**	**160**	**29%**
cis-1,3-Dichloropropene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Dibromochloromethane	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Dichlorodifluoromethane	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Ethylbenzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Isopropanol	ug/kg	38 U	28 U	n/a	**1000 J**	26 U	n/a	50 UJ	31 U	n/a	2800 UJ	29 U	n/a	2300 UJ	24 U	n/a
Isopropylbenzene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
m,p-Xylene	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	0.24 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Methyl Tert-Butyl Ether	ug/kg	1.7 U	5.5 U	n/a	90 U	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Methylene chloride	ug/kg	8.6 UJ	5.5 U	n/a	300 UJ	5.3 U	n/a	10 UJ	6.3 U	n/a	370 UJ	5.8 U	n/a	370 UJ	4.7 U	n/a
N-Hexane	ug/kg	0.16 U	0.55 U	n/a	250 U	**110 J**	n/a	8.1 UJ	**3.2**	n/a	35 U	**4.1**	n/a	38 U	**15**	n/a
o-Xylene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Styrene	ug/kg	0.86 U	5.5 U	n/a	45 U	5.3 U	n/a	1 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
Tetrachloroethene	ug/kg	**0.26 J**	5.5 U	n/a	45 UJ	5.3 U	n/a	**0.35 J**	6.3 U	n/a	55 UJ	5.8 U	n/a	46 UJ	4.7 U	n/a
Toluene	ug/kg	0.18 U	5.5 U	n/a	45 U	5.3 U	n/a	0.88 U	6.3 U	n/a	55 U	5.8 U	n/a	46 U	4.7 U	n/a
trans-1,2-Dichloroethene	ug/kg	**0.46 J**	5.5 U	n/a	**52**	**19**	**93%**	**2.9**	**2.7 J**	**7%**	55 U	5.8 U	n/a	46 U	**3.4 J**	n/a
trans-1,3-Dichloropropene	ug/kg	1.7 U	5.5 U	n/a	90 UJ	5.3 U	n/a	2 U	6.3 U	n/a	110 U	5.8 U	n/a	91 U	4.7 U	n/a
Trichloroethene	ug/kg	**260**	**130**	**67%**	**3000**	**3700**	**21%**	**410**	**480**	**16%**	**1000**	**650**	**42%**	**630**	**1200**	**62%**
Trichlorofluoromethane	ug/kg	8.6 U	5.5 U	n/a	450 U	5.3 U	n/a	10 UJ	6.3 U	n/a	550 U	5.8 U	n/a	460 U	4.7 U	n/a
Vinyl chloride	ug/kg	0.86 U	5.5 U	n/a	**78 J**	**40**	**64%**	**3.8**	6.3 U	n/a	55 U	5.8 UJ	n/a	46 U	**20**	n/a

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit

Notes (Continued):

* CEL - Calscience Environmental Laboratories, Inc. in Garden Grove, CA
** Mitkem - Mitkem Corporation, Inc. in Warwick, RI
*** Relative percent difference (RPD) was calculated only for positive detections in both samples

Abbreviations:

n/a - not applicable or not available
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms
RPD - relative percent difference

Table 5
Summary of Contaminant Mass Calculations
Temperature Monitoring Probe Soil Sampling - November 6, 2006 through December 7, 2006
Pemaco Superfund Site, Maywood, CA

	1000000000 ug/kg			2.204622622 lb/kg		
Sum of Avg Conc.	Avg Conc	Mass of Soil	Mass of VOCs	Mass of Soil		
2813.987448 ug/kg	2.81399E-06 kg/kg	3.67E+07	1.03E+02 kg	**227.9 lbs**	**All**	**Low Soil Density**
1622.816318 ug/kg	1.62282E-06 kg/kg	3.67E+07	5.96E+01 kg	**131.4 lbs**	**Chlorinated**	**Low Soil Density**
1191.17113 ug/kg	1.19117E-06 kg/kg	3.67E+07	4.38E+01 kg	**96.5 lbs**	**non-chlorinated**	**Low Soil Density**
1183.584435 ug/kg	1.18358E-06 kg/kg	3.67E+07	4.35E+01 kg	**95.9 lbs**	**TCE**	**Low Soil Density**
	2.81399E-06	40823313.3	1.15E+02 kg	**253.3 lbs**	**All**	**High Soil Density**
	1.62282E-06	40823313.3	6.62E+01 kg	**146.1 lbs**	**Chlorinated**	**High Soil Density**
	1.19117E-06	40823313.3	4.86E+01 kg	**107.2 lbs**	**non-chlorinated**	**High Soil Density**
	1.18358E-06	40823313.3	4.83E+01 kg	**106.5 lbs**	**TCE**	**High Soil Density**

				2.204622622 lb/kg
	Volume of Soil	Density of Soil	Mass of soil	Mass of Soil
low	30000 yd3	2700 lb/yd3	81000000 lbs	36740981.97 kg
high	30000 yd3	3000 lb/yd3	90000000 lbs	40823313.3 kg

Calculation Procedures:

1 - The average concentration in ug/kg of each individual constituent was calculated using analytical data from soil samples collected while installing the TMPs. Non detected concentrations were included in the average as a 0 concentration

2 - The average concentrations were summed to estimate the total concentration of VOCs in the categories listed above.

3 - The average concentration was converted from ug/kg to kg/kg.

3 - The mass in kg of impacted soil was calculated using an estimated volume of soil and a high and low estimation for soil density

4 - Two estimates of the mass of VOCs in each category within the impacted area was calculated by multiplying the each of the mass of impacted soil values calculated using the high and low soil densities by the average concentration of VOC in each category

5 - The resulting mass was converted from kg to pounds

6 - Data used for the above calculations is provided in Appendix C of this Technical Memorandum

Table 6
Pre- and Post-Electrical Resistance Heating (ERH) Results for Chemicals of Concern
Pemaco Superfund Site, Maywood, California

Chemicals of Concern		1,1-Dichloroethene (ug/kg)			1,2-Dichloroethane (ug/kg)			Acetone (ug/kg)			Benzene (ug/kg)			cis-1,2-Dichloroethene (ug/kg)			Ethylbenzene (ug/kg)			m,p-Xylene (ug/kg)		
TMP ID	Depth (ft bgs)	SSRLs[1]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[1, 3]	pre-ERH	post-ERH
TMP-05	25	60	0.87 U	5.6 U	20	0.87 UJ	5.6 U	16,000	18 UJ	11 U	30	1.7 U	5.6 U	400	**0.92**	5.6 U	13,000	**0.14 J**	5.6 U	210,000	0.19 U	5.6 U
TMP-05	30	60	**0.22 J**	5.7 U	20	0.87 UJ	5.7 U	16,000	13 UJ	11 U	30	0.39 U	5.7 U	400	**1.7**	5.7 U	13,000	0.87 U	5.7 U	210,000	1.7 U	5.7 U
TMP-05	35	n/a	**0.42 J**	6.2 U	20	0.89 UJ	6.2 U	n/a	36 UJ	**29**	30	17 U	6.2 U	400	**4**	6.2 U	n/a	**0.79 J**	6.2 U	n/a	1.5 U	6.2 U
TMP-05	40	n/a	**0.37 J**	5.8 U	20	1.1 UJ	5.8 U	n/a	17 UJ	**17**	30	1.8 U	5.8 U	400	**3.9**	5.8 U	n/a	1.1 U	5.8 U	n/a	0.33 U	5.8 U
TMP-05	45	n/a	**0.46 J**	5.5 U	20	0.81 UJ	5.5 U	n/a	40 UJ	**20**	30	0.46 U	5.5 U	400	**8.6**	5.5 U	n/a	0.81 U	5.5 U	n/a	1.6 U	5.5 U
TMP-05	50	n/a	1.1 U	5.9 U	20	1.1 UJ	5.9 U	n/a	8.9 UJ	**34**	30	0.15 U	**4.6 J**	400	1.1 U	5.9 U	n/a	1.1 U	5.9 U	n/a	2.1 U	5.9 U
TMP-05	55	n/a	**0.33 J**	6 U	20	1 UJ	6 U	n/a	17 UJ	**26**	30	1.4 U	6 U	400	**8**	6 U	n/a	**0.17 J**	6 U	n/a	0.31 U	6 U
TMP-05	60	n/a	45 U	5.6 U	20	45 UJ	5.6 U	n/a	2300 UJ	**16**	30	45 U	5.6 U	400	45 U	5.6 U	n/a	45 U	5.6 U	n/a	91 U	5.6 U
TMP-05	65	n/a	39 U	6.3 U	20	39 UJ	6.3 U	n/a	2000 UJ	**25**	30	39 U	6.3 U	400	**16 J**	6.3 U	n/a	39 U	6.3 U	n/a	79 U	6.3 U
TMP-05	70	n/a	47 U	6.2 U	n/a	47 UJ	6.2 U	n/a	2400 UJ	**24**	n/a	47 U	6.2 U	n/a	47 U	6.2 U	n/a	47 U	6.2 U	n/a	94 U	6.2 U
TMP-05	75	n/a	48 U	7.2 U	n/a	48 UJ	7.2 U	n/a	2400 UJ	**53**	n/a	48 U	7.2 U	n/a	48 U	7.2 U	n/a	48 U	7.2 U	n/a	97 U	7.2 U
TMP-05	80	n/a	41 U	6 U	n/a	41 UJ	6 U	n/a	2000 UJ	**43**	n/a	41 U	6 U	n/a	41 U	6 U	n/a	41 U	6 U	n/a	81 U	6 U
TMP-05	85	n/a	**0.65 J**	7.1 U	n/a	0.85 UJ	7.1 U	n/a	5.8 UJ	**54**	n/a	0.55 U	7.1 U	n/a	**4.2**	**4.4 J**	n/a	0.85 U	7.1 U	n/a	1.7 U	7.1 U
TMP-05	90	n/a	50 U	5.1 U	n/a	50 UJ	5.1 UJ	n/a	2500 UJ	**16**	n/a	50 U	5.1 U	n/a	**16 J**	5.1 U	n/a	50 U	5.1 U	n/a	100 U	5.1 U
TMP-05	95	n/a	**0.3 J**	6.6 U	n/a	1.2 UJ	6.6 U	n/a	23 UJ	13 U	n/a	15 U	6.6 U	n/a	**3.8**	6.6 U	n/a	**0.7 J**	6.6 U	n/a	1 U	6.6 U
TMP-05	100	n/a	**0.31 J**	n/a	n/a	0.81 UJ	n/a	n/a	24 UJ	n/a	n/a	0.97 U	n/a	n/a	**4.6**	n/a	n/a	0.81 U	n/a	n/a	1.6 U	n/a
TMP-09	25	60	0.95 U	5.8 U	20	0.95 UJ	5.8 U	16,000	**25 J**	**31**	30	3.3 U	5.8 U	400	**3**	5.8 U	13,000	**0.2 J**	5.8 U	210,000	0.4 U	5.8 U
TMP-09	30	60	**0.44 J**	5.1 U	20	1.5 UJ	5.1 U	16,000	**15 J**	**63**	30	0.49 U	5.1 U	400	**12**	5.1 U	13,000	1.5 U	5.1 U	210,000	3 U	5.1 U
TMP-09	35	n/a	0.96 U	7.2 U	20	0.96 UJ	7.2 U	n/a	**42 J**	**81**	30	0.26 U	7.2 U	400	0.96 U	7.2 U	n/a	0.96 U	7.2 U	n/a	0.27 U	7.2 U
TMP-09	40	n/a	**1.0**	6.4 U	20	0.82 UJ	6.4 U	n/a	**9.5 J**	**20**	30	0.36 U	6.4 U	400	**47**	6.4 U	n/a	0.82 U	6.4 U	n/a	1.6 U	6.4 U
TMP-09	45	n/a	40 U	5.1 U	20	40 UJ	5.1 U	n/a	2000 U	**11**	30	40 U	5.1 U	400	**23 J**	5.1 U	n/a	40 U	5.1 U	n/a	80 U	5.1 U
TMP-09	50	n/a	47 U	7.8 U	20	47 UJ	7.8 U	n/a	2300 U	**28**	30	47 U	7.8 U	400	**44 J**	7.8 U	n/a	47 U	7.8 U	n/a	93 U	7.8 U
TMP-09	55	n/a	42 U	5.5 U	20	42 UJ	5.5 U	n/a	2100 U	**14**	30	42 U	5.5 U	400	**47**	5.5 U	n/a	42 U	5.5 U	n/a	85 U	5.5 U
TMP-09	60	n/a	44 U	5.7 U	20	44 UJ	5.7 U	n/a	2200 U	**19**	30	44 U	5.7 U	400	**47**	5.7 U	n/a	44 U	5.7 U	n/a	88 U	5.7 U
TMP-09	65	n/a	46 U	5.6 U	20	46 UJ	5.6 U	n/a	2300 U	**78**	30	46 U	5.6 U	400	46 U	5.6 U	n/a	46 U	5.6 U	n/a	92 U	5.6 U
TMP-09	70	n/a	45 U	n/a	n/a	45 UJ	6.4 U	n/a	2200 UJ	13 U	n/a	45 U	6.4 U	n/a	**22 J**	n/a	n/a	45 U	6.4 U	n/a	12 U	6.4 U
TMP-09	75	n/a	56 U	6.5 U	n/a	56 UJ	6.5 U	n/a	2800 UJ	**110**	n/a	56 U	6.5 U	n/a	56 U	6.5 U	n/a	56 U	6.5 U	n/a	110 U	6.5 U
TMP-09	80	n/a	50 U	5.9 U	n/a	50 UJ	5.9 U	n/a	2500 U	**230**	n/a	50 U	5.9 U	n/a	50 U	5.9 U	n/a	50 U	5.9 U	n/a	100 U	5.9 U
TMP-09	85	n/a	**0.53 J**	5.9 U	n/a	0.92 UJ	5.9 U	n/a	46 U	**23**	n/a	0.15 U	5.9 U	n/a	**3.2**	5.9 U	n/a	0.92 U	5.9 U	n/a	1.8 U	5.9 U
TMP-09	90	n/a	110 U	n/a	n/a	110 U	n/a	n/a	5600 UJ	n/a	n/a	110 U	n/a	n/a	110 U	n/a	n/a	110 U	n/a	n/a	220 U	n/a
TMP-09	95	n/a	42 U	6.7 U	n/a	42 U	6.7 U	n/a	2100 U	**73**	n/a	42 U	6.7 U	n/a	**53**	6.7 U	n/a	42 U	6.7 U	n/a	84 U	6.7 U
TMP-09	100	n/a	n/a	4.8 U	n/a	n/a	4.8 U	n/a	n/a	**11**	n/a	n/a	4.8 U	n/a	n/a	4.8 U	n/a	n/a	4.8 U	n/a	n/a	4.8 U
TMP-09	105	n/a	n/a	5.8 U	n/a	n/a	5.8 U	n/a	n/a	**14**	n/a	n/a	5.8 U	n/a	n/a	**2.4 J**	n/a	n/a	5.8 U	n/a	n/a	5.8 U
TMP-09	110	n/a	n/a	5.7 U	n/a	n/a	5.7 U	n/a	n/a	**16**	n/a	n/a	5.7 U	n/a	n/a	**34**	n/a	n/a	5.7 U	n/a	n/a	5.7 U
TMP-11	25	60	0.8 U	6.7 U	20	0.8 UJ	6.7 U	16,000	40 U	13 U	30	0.25 U	6.7 U	400	**2.7**	6.7 U	13,000	0.8 U	6.7 U	210,000	1.6 U	6.7 U
TMP-11	30	n/a	0.95 U	5.6 U	20	0.95 UJ	5.6 U	16,000	**19 J**	**18**	30	0.95 U	5.6 U	400	0.95 U	5.6 U	13,000	0.95 U	5.6 U	210,000	1.9 U	5.6 U
TMP-11	35	n/a	1.2 U	5.5 U	20	1.2 UJ	5.5 U	n/a	**30 J**	**21**	30	1.2 U	5.5 U	400	**4.3**	5.5 U	n/a	1.2 U	5.5 U	n/a	2.3 U	5.5 U
TMP-11	40	n/a	1 U	4.4 U	20	1 UJ	4.4 U	n/a	**7.3 J**	**13**	30	1 U	4.4 U	400	**0.56 J**	4.4 U	n/a	1 U	4.4 U	n/a	2 U	4.4 U
TMP-11	45	n/a	46 U	4.7 U	20	46 UJ	4.7 U	n/a	2300 U	**15**	30	46 U	4.7 U	400	**110**	4.7 U	n/a	46 U	4.7 U	n/a	93 U	4.7 U
TMP-11	50	n/a	**0.43 J**	4.4 U	20	0.87 UJ	4.4 U	n/a	**10 J**	**15**	30	0.76 U	4.4 U	400	**94**	4.4 U	n/a	0.87 U	4.4 U	n/a	1.7 U	4.4 U
TMP-11	55	n/a	46 U	5.3 U	20	46 U	5.3 U	n/a	2300 U	**18**	30	46 U	**2.2 J**	400	**61**	5.3 U	n/a	46 U	5.3 U	n/a	92 U	5.3 U
TMP-11	60	n/a	48 U	5.9 U	20	48 U	5.9 U	n/a	2400 U	12 U	30	48 U	5.9 U	400	**59**	5.9 U	n/a	48 U	5.9 U	n/a	96 U	5.9 U
TMP-11	65	n/a	41 U	6.4 U	20	41 U	6.4 U	n/a	2000 U	**23**	30	41 U	6.4 U	400	**66**	6.4 U	n/a	41 U	6.4 U	n/a	82 U	6.4 U
TMP-11	70	n/a	40 U	5.4 U	n/a	40 U	5.4 U	n/a	2000 U	**21**	n/a	40 U	5.4 U	n/a	**34 J**	5.4 U	n/a	40 U	5.4 U	n/a	80 U	5.4 U
TMP-11	75	n/a	46 U	6.6 U	n/a	46 U	6.6 U	n/a	2300 U	**63**	n/a	46 U	**3.7 J**	n/a	46 U	6.6 U	n/a	46 U	6.6 U	n/a	91 U	6.6 U
TMP-11	80	n/a	52 U	5.8 U	n/a	52 UJ	5.8 UJ	n/a	2600 U	12 U	n/a	52 U	5.8 U	n/a	52 U	5.8 U	n/a	52 U	5.8 U	n/a	100 U	5.8 U
TMP-11	85	n/a	**0.87 J**	5.4 U	n/a	0.89 U	5.4 U	n/a	**20 J**	**18**	n/a	0.42 U	5.4 U	n/a	**8.4**	**6.6**	n/a	0.89 U	5.4 U	n/a	1.8 U	5.4 U
TMP-11	90	n/a	**0.54 J**	6.6 U	n/a	1.4 U	6.6 U	n/a	**69 J**	**89**	n/a	24 U	**12 J**	n/a	**6.8**	**13**	n/a	**0.93 J**	6.6 U	n/a	1.6 U	6.6 U
TMP-11	95	n/a	**0.45 J**	6.3 U	n/a	0.89 U	6.3 U	n/a	**23 J**	13 U	n/a	7.1 U	6.3 U	n/a	**18**	6.3 U	n/a	**0.46 J**	6.3 U	n/a	0.67 U	6.3 U
TMP-11	100	n/a	1 U	n/a	n/a	1 U	n/a	n/a	**12 J**	n/a	n/a	0.29 U	n/a	n/a	1 U	n/a	n/a	1 U	n/a	n/a	2.1 U	n/a
TMP-17	25	60	**0.5 J**	5.7 U	20	0.85 U	5.7 U	16,000	19 U	**48**	30	**3.2**	**2.6 J**	400	**140**	5.7 U	13,000	**6.7**	5.7 U	210,000	**48**	5.7 U
TMP-17	30	n/a	**0.39 J**	5.9 U	20	0.74 U	5.9 U	16,000	9.5 U	**460**	30	0.14 U	5.9 U	400	**27**	5.9 U	13,000	0.74 U	5.9 U	210,000	1.5 U	5.9 U
TMP-17	35	n/a	39 U	6.1 U	20	39 U	6.1 U	n/a	1900 U	**33**	30	39 U	6.1 U	400	**130**	6.1 U	n/a	39 U	6.1 U	n/a	78 U	6.1 U
TMP-17	40	n/a	0.88 U	5.3 U	20	0.88 U	5.3 U	n/a	44 U	11 U	30	0.32 U	5.3 U	400	**0.8 J**	5.3 U	n/a	0.88 U	5.3 U	n/a	1.8 U	5.3 U
TMP-17	45	n/a	**0.47 J**	5.4 U	20	0.82 U	5.4 U	n/a	8.5 U	**22**	30	0.57 U	5.4 U	400	**120**	5.4 U	n/a	0.82 U	5.4 U	n/a	1.6 U	5.4 U
TMP-17	50	n/a	**0.94**	5.6 U	20	0.93 U	5.6 U	n/a	47 U	**19**	30	**0.93 J**	5.6 U	400	**130**	5.6 U	n/a	0.93 U	5.6 U	n/a	1.9 U	5.6 U
TMP-17	55	n/a	42 U	5.9 U	20	42 U	5.9 U	n/a	2100 U	**170**	30	42 U	5.9 U	400	**160**	5.9 U	n/a	42 U	5.9 U	n/a	83 U	5.9 U
TMP-17	60	n/a	42 U	6.4 U	20	42 U	6.4 U	n/a	2100 U	**170**	30	42 U	6.4 U	400	**160**	6.4 U	n/a	42 U	6.4 U	n/a	84 U	6.4 U
TMP-17	65	n/a	45 U	4.9 U	20	45 U	4.9 U	n/a	2200 U	**150**	30	45 U	4.9 U	400	**210**	4.9 U	n/a	45 U	4.9 U	n/a	90 U	4.9 U
TMP-17	70	n/a	41 U	7.2 U	n/a	41 U	7.2 U	n/a	2100 U	**210**	n/a	41 U	7.2 U	n/a	**230**	7.2 U	n/a	41 U	7.2 U	n/a	82 U	7.2 U
TMP-17	75	n/a	44 U	6.7 U	n/a	44 U	6.7 U	n/a	2200 U	**230**	n/a	44 U	**3.2 J**	n/a	**160**	6.7 U	n/a	44 U	6.7 U	n/a	88 U	6.7 U
TMP-17	80	n/a	**1.1**	6.5 U	n/a	0.84 U	6.5 U	n/a	9.5 U	**140**	n/a	0.18 U	6.5 U	n/a	**51**	6.5 U	n/a	0.84 U	6.5 U	n/a	1.7 U	6.5 U
TMP-17	85	n/a	45 U	6.3 U	n/a	45 U	6.3 U	n/a	2200 U	**49**	n/a	45 U	6.3 U	n/a	45 U	6.3 U	n/a	45 U	6.3 U	n/a	90 U	6.3 U
TMP-17	90	n/a	**1.3 J**	5.6 U	n/a	1.1 UJ	5.6 U	n/a	17 UJ	**190**	n/a	**1.5**	5.6 U	n/a	**40**	**4.3 J**	n/a	1.1 U	5.6 U	n/a	**0.27 J**	5.6 U
TMP-17	95	n/a	42 U	6.9 U	n/a	42 U	6.9 U	n/a	2100 U	**110**	n/a	42 U	6.9 U	n/a	**170**	**5.2 J**	n/a	42 U	6.9 U	n/a	83 U	6.9 U
TMP-17	100	n/a	42 U	n/a	n/a	42 U	**n/a**	n/a	2100 U	n/a	n/a	42 U	n/a	n/a	**110**	n/a	n/a	42 U	n/a	n/a	84 U	n/a

Table 6 (Continued)
Pre- and Post-Electrical Resistance Heating (ERH) Results for Chemicals of Concern
Pemaco Superfund Site, Maywood, California

Chemicals of Concern		1,1-Dichloroethene (ug/kg)			1,2-Dichloroethane (ug/kg)			Acetone (ug/kg)			Benzene (ug/kg)			cis-1,2-Dichloroethene (ug/kg)			Ethylbenzene (ug/kg)			m,p-Xylene (ug/kg)		
TMP ID	Depth (ft bgs)	SSRLs[1]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[1, 3]	pre-ERH	post-ERH
TMP-19	25	60	**0.17 J**	6 U	20	0.92 UJ	6 U	16,000	13 UJ	**64**	30	1.3 U	6 U	400	**70**	6 U	13,000	**1.1**	6 U	210,000	**3.9**	6 U
TMP-19	30	n/a	53 U	6.1 U	20	53 UJ	6.1 U	16,000	2600 U	**240**	30	7.8 U	6.1 U	400	**300**	**5.1 J**	13,000	53 U	6.1 U	210,000	110 U	6.1 U
TMP-19	35	n/a	49 U	6 U	20	49 UJ	6 U	n/a	2500 U	**14**	30	49 U	6 U	400	**730**	6 U	n/a	49 U	6 U	n/a	98 U	6 U
TMP-19	40	n/a	0.98 U	5.3 U	20	0.98 UJ	5.3 U	n/a	13 UJ	**11 J**	30	0.98 U	5.3 U	400	**3.0**	5.3 U	n/a	0.98 U	5.3 U	n/a	**0.2 J**	5.3 U
TMP-19	45	n/a	42 U	6 U	20	42 UJ	6 U	n/a	2100 U	**16**	30	42 U	6 U	400	**550**	6 U	n/a	42 U	6 U	n/a	85 U	6 U
TMP-19	50	n/a	52 U	6.7 U	20	52 UJ	6.7 U	n/a	2600 U	**29**	30	52 U	6.7 U	400	**430**	6.7 U	n/a	52 U	6.7 U	n/a	100 U	6.7 U
TMP-19	55	n/a	43 U	6 U	20	43 UJ	6 U	n/a	2100 U	**19**	30	43 U	6 U	400	**160**	6 U	n/a	43 U	6 U	n/a	85 U	6 U
TMP-19	60	n/a	44 U	5.9 U	20	44 UJ	5.9 U	n/a	2200 U	**18**	30	6.7 U	5.9 U	400	**340**	5.9 U	n/a	44 U	5.9 U	n/a	89 U	5.9 U
TMP-19	65	n/a	40 U	6.5 U	20	40 UJ	6.5 U	n/a	2000 U	**36**	30	6.5 U	6.5 U	400	**310**	6.5 U	n/a	40 U	6.5 U	n/a	80 U	6.5 U
TMP-19	70	n/a	45 U	5.5 U	n/a	45 UJ	5.5 U	n/a	2200 U	**79**	n/a	45 U	5.5 U	n/a	**46**	5.5 U	n/a	45 U	5.5 U	n/a	89 U	5.5 U
TMP-19	75	n/a	51 U	7.2 U	n/a	51 UJ	7.2 U	n/a	2500 UJ	**140**	n/a	51 U	7.2 U	n/a	**29 J**	**5.1 J**	n/a	51 U	7.2 U	n/a	100 U	7.2 U
TMP-19	80	n/a	46 U	6.8 U	n/a	46 UJ	6.8 U	n/a	2300 U	**60**	n/a	46 U	6.8 U	n/a	46 U	**6.3 J**	n/a	46 U	6.8 U	n/a	93 U	6.8 U
TMP-19	85	n/a	46 U	6.1 U	n/a	46 UJ	6.1 U	n/a	2300 U	**270**	n/a	46 U	6.1 U	n/a	46 U	**7.8**	n/a	46 U	6.1 U	n/a	92 U	6.1 U
TMP-19	90	n/a	53 U	6 U	n/a	53 U	6 U	n/a	2700 UJ	**230**	n/a	53 U	6 U	n/a	**20 J**	**6.2**	n/a	53 U	6 U	n/a	110 U	6 U
TMP-19	95	n/a	44 U	7 U	n/a	44 U	7 U	n/a	340 UJ	**110**	n/a	44 U	7 U	n/a	**190**	**5 J**	n/a	44 U	7 U	n/a	88 U	7 U
TMP-19	100	n/a	48 U	n/a	n/a	48 U	n/a	n/a	2400 UJ	n/a	n/a	48 U	n/a	n/a	**110**	n/a	n/a	48 U		n/a	96 U	
TMP-22	25	60	**0.8 J**	7.2 U	20	0.86 UJ	7.2 U	16,000	**17 J**	14 U	30	**3.3**	7.2 U	400	**64**	7.2 U	13,000	**0.67 J**	7.2 U	210,000	4 U	7.2 U
TMP-22	30	n/a	**0.8 J**	5 U	20	0.84 UJ	5 U	16,000	**11 J**	**27**	30	**0.62 J**	5 U	400	**7.1**	5 U	13,000	0.84 U	5 U	210,000	1.7 U	5 U
TMP-22	35	n/a	**0.79 J**	5.6 U	20	0.82 UJ	5.6 U	n/a	**7.7 J**	**680 J**	30	0.82 U	5.6 U	400	**11**	5.6 U	n/a	0.82 U	5.6 U	n/a	1.6 U	5.6 U
TMP-22	40	n/a	**0.93**	5.5 U	20	0.75 UJ	5.5 U	n/a	**7.1 J**	11 U	30	**0.41 J**	5.5 U	400	**7.6**	5.5 U	n/a	0.75 U	5.5 U	n/a	1.5 U	5.5 U
TMP-22	45	n/a	**0.82 J**	4.6 U	20	0.97 UJ	4.6 U	n/a	**6.8 J**	**12**	30	**0.51 J**	4.6 U	400	**17**	4.6 U	n/a	0.97 U	4.6 U	n/a	1.9 U	4.6 U
TMP-22	50	n/a	0.86 U	5.3 U	20	0.86 UJ	5.3 U	n/a	**11 J**	**20**	30	**0.48 J**	5.3 U	400	0.86 UJ	5.3 U	n/a	0.86 U	5.3 U	n/a	1.7 U	5.3 U
TMP-22	55	n/a	**0.49 J**	5 U	20	1 UJ	5 U	n/a	**12 J**	**21**	30	**1.7**	**2.1 J**	400	**14**	5 U	n/a	1 U	5 U	n/a	2 U	5 U
TMP-22	60	n/a	0.94 U	5.6 U	20	0.94 UJ	5.6 U	n/a	**11 J**	**19**	30	**0.44 J**	5.6 U	400	**3.9**	5.6 U	n/a	0.94 U	5.6 U	n/a	1.9 U	5.6 U
TMP-22	65	n/a	41 U	5.6 U	20	41 UJ	5.6 U	n/a	**270 J**	**21**	30	41 U	5.6 U	400	41 U	5.6 U	n/a	41 U	5.6 U	n/a	82 U	5.6 U
TMP-22	70	n/a	40 U	5.2 U	n/a	40 UJ	5.2 U	n/a	2000 UJ	**32**	n/a	40 U	5.2 U	n/a	40 U	5.2 U	n/a	40 U	5.2 U	n/a	80 U	5.2 U
TMP-22	75	n/a	44 U	5.8 U	n/a	44 UJ	5.8 U	n/a	**350 J**	**20**	n/a	44 U	5.8 U	n/a	44 U	5.8 U	n/a	44 U	5.8 U	n/a	89 U	5.8 U
TMP-22	80	n/a	43 U	5.8 U	n/a	43 UJ	5.8 U	n/a	**310 J**	**67**	n/a	43 U	5.8 U	n/a	43 U	5.8 U	n/a	43 U	5.8 U	n/a	87 U	5.8 U
TMP-22	85	n/a	61 U	5.5 U	n/a	61 UJ	5.5 U	n/a	**510 J**	**16**	n/a	61 U	5.5 U	n/a	**61 J**	5.5 U	n/a	61 U	5.5 U	n/a	120 U	5.5 U
TMP-22	90	n/a	43 U	6.4 U	n/a	43 UJ	6.4 U	n/a	**390 J**	**370**	n/a	43 U	6.4 U	n/a	**22 J**	6.4 U	n/a	43 U	6.4 U	n/a	86 U	6.4 U
TMP-22	95	n/a	45 U	6.8 U	n/a	45 UJ	6.8 U	n/a	**360 J**	**37**	n/a	45 U	6.8 U	n/a	**13 J**	6.8 U	n/a	45 U	6.8 U	n/a	90 U	6.8 U
TMP-22	100	n/a	35 U	n/a	n/a	35 UJ	n/a	n/a	**280 J**	n/a	n/a	35 U	n/a	n/a	**51**	n/a	n/a	35 U	n/a	n/a	71 U	n/a
TMP-27	25	60	0.91 U	6.4 U	20	0.91 U	6.4 U	16,000	15 U	**28**	30	2.9 U	**3 J**	400	**0.32 J**	6.4 U	13,000	**2.2**	6.4 U	210,000	2.3 U	6.4 U
TMP-27	30	n/a	**1.2**	5.1 U	20	0.89 U	5.1 U	16,000	11 U	**24**	30	0.76 U	5.1 U	400	**110**	5.1 U	13,000	0.89 U	5.1 U	210,000	1.8 U	5.1 U
TMP-27	35	n/a	**1.9**	5.9 U	20	0.77 U	5.9 U	n/a	6.2 U	**19**	30	0.12 U	5.9 U	400	**48**	5.9 UJ	n/a	0.77 U	5.9 U	n/a	1.5 U	5.9 U
TMP-27	40	n/a	0.91 U	5.8 U	20	0.91 U	5.8 U	n/a	12 U	**15**	30	0.91 U	5.8 U	400	**2.7**	5.8 U	n/a	0.91 U	5.8 U	n/a	1.8 U	5.8 U
TMP-27	45	n/a	0.85 U	4.9 U	20	0.85 U	4.9 U	n/a	11 U	9.9 U	30	0.41 U	4.9 U	400	**24**	4.9 U	n/a	0.85 U	4.9 U	n/a	1.7 U	4.9 U
TMP-27	50	n/a	**0.97**	5.3 U	20	0.85 U	5.3 U	n/a	42 U	11 U	30	0.87 U	5.3 U	400	**59**	**5.9**	n/a	**0.15 J**	5.3 U	n/a	0.19 U	5.3 U
TMP-27	55	n/a	**0.68 J**	5.8 U	20	0.99 U	5.8 U	n/a	8.9 UJ	12 U	30	0.81 U	5.8 U	400	**24**	5.8 U	n/a	0.99 U	5.8 U	n/a	2 U	5.8 U
TMP-27	60	n/a	**1.6**	6.2 U	20	0.77 U	6.2 U	n/a	8.7 UJ	**28**	30	0.86 UJ	6.2 U	400	**8.2**	6.2 U	n/a	0.77 U	6.2 U	n/a	0.17 U	6.2 U
TMP-27	65	n/a	**2.0**	6.3 U	20	0.85 U	6.3 U	n/a	42 UJ	**25**	30	1.3 U	6.3 U	400	**45**	6.3 U	n/a	0.85 U	6.3 U	n/a	0.18 U	6.3 U
TMP-27	70	n/a	46 U	5.8 U	n/a	46 U	5.8 U	n/a	2300 UJ	**22**	n/a	46 U	5.8 U	n/a	**77**	5.8 U	n/a	46 U	5.8 U	n/a	91 U	5.8 U
TMP-27	75	n/a	**0.29 J**	5.9 U	n/a	0.92 U	5.9 U	n/a	15 UJ	**43**	n/a	0.59 U	5.9 U	n/a	**2.2**	**3 J**	n/a	0.92 U	5.9 U	n/a	1.8 U	5.9 U
TMP-27	80	n/a	**0.3 J**	5.7 U	n/a	0.82 U	5.7 U	n/a	41 UJ	**17**	n/a	0.21 U	5.7 U	n/a	**1.4**	5.7 U	n/a	0.82 U	5.7 U	n/a	1.6 U	5.7 U
TMP-27	85	n/a	**0.47 J**	5.8 U	n/a	0.87 U	5.8 U	n/a	6 UJ	**28**	n/a	0.99 U	5.8 U	n/a	**5.6**	**4.4 J**	n/a	0.87 U	5.8 U	n/a	1.7 U	5.8 U
TMP-27	90	n/a	**0.61 J**	6.2 U	n/a	1 U	6.2 U	n/a	15 UJ	**110**	n/a	1.3 U	6.2 U	n/a	**6.3**	**5.5 J**	n/a	1 U	6.2 U	n/a	2 U	6.2 U
TMP-27	95	n/a	42 U	5.3 U	n/a	42 U	5.3 U	n/a	2100 UJ	11 U	n/a	42 U	5.3 U	n/a	**110**	**2.7 J**	n/a	42 U	5.3 U	n/a	84 U	5.3 U
TMP-27	100	n/a	44 U	n/a	n/a	44 U	n/a	n/a	2200 UJ	n/a	n/a	6 U	n/a	n/a	**100**	n/a	n/a	44 U	n/a	n/a	87 U	n/a

Notes:
Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit
730 highlighted values indicate exceeding Pemaco SSRLs

Site-Specific Remediation Levels (SSRLs)
[1] SSRLs were established for COCs detected in upper vadose zone only (between 2 and 30 ft bgs)
[2] SSRLs were established for COCs detected in both upper and lower vadose zone (between 2 and 65 ft bgs)
[3] SSRL at 210,000 ug/kg was defined for total xylenes
Reference: Record of Decision (EPA, 2005)

Abbreviations:
ERH - Electrical Resistance Heating
ft bgs - feet below ground surface
n/a - not applicable or not available
SSRLs - Site-Specific Remediation Levels
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms

Table 6 (Continued)
Pre- and Post-Electrical Resistance Heating (ERH) Results for Chemicals of Concern
Pemaco Superfund Site, Maywood, California

Chemicals of Concern		Methylene chloride (ug/kg)			o-Xylene (ug/kg)			Tetrachloroethene (ug/kg)			Toluene (ug/kg)			Trichloroethene (ug/kg)			Vinyl chloride (ug/kg)		
TMP ID	Depth (ft bgs)	SSRLs[2]	pre-ERH	post-ERH	SSRLs[1, 3]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH
TMP-05	25	20	8.7 U	5.6 U	210,000	0.87 U	5.6 U	60	**0.94 J**	5.6 U	12,000	0.72 U	5.6 U	60	**80**	5.6 U	10	0.87 U	5.6 U
TMP-05	30	20	8.7 U	5.7 U	210,000	0.87 U	5.7 U	60	**0.16 J**	5.7 U	12,000	0.18 U	5.7 U	60	**53**	5.7 U	10	0.87 U	5.7 U
TMP-05	35	20	8.9 U	6.2 U	n/a	**0.53 J**	6.2 U	n/a	**0.28 J**	6.2 U	n/a	7.8 U	6.2 U	60	**100**	6.2 U	10	**0.38 J**	6.2 U
TMP-05	40	20	11 U	5.8 U	n/a	1.1 U	5.8 U	n/a	**0.22 J**	5.8 U	n/a	0.92 U	5.8 U	60	**100**	5.8 U	10	**0.36 J**	5.8 U
TMP-05	45	20	8.1 U	5.5 U	n/a	0.81 U	5.5 U	n/a	**0.29 J**	5.5 U	n/a	0.28 U	5.5 U	60	**150**	5.5 U	10	**0.83**	5.5 U
TMP-05	50	20	11 UJ	5.9 U	n/a	1.1 U	5.9 U	n/a	1.1 UJ	**2.5 J**	n/a	1.1 U	5.9 U	60	**3.4**	5.9 U	10	1.1 U	5.9 U
TMP-05	55	20	10 UJ	6 U	n/a	1 U	6 U	n/a	**0.26 J**	6 U	n/a	0.49 U	6 U	60	**200**	6.0 U	10	**0.66 J**	6 U
TMP-05	60	20	**340 J**	5.6 U	n/a	45 U	5.6 U	n/a	45 UJ	5.6 U	n/a	8.4 U	5.6 U	60	**410**	5.6 U	10	45 U	5.6 U
TMP-05	65	20	**280 J**	6.3 U	n/a	39 U	6.3 U	n/a	39 UJ	6.3 U	n/a	39 U	6.3 U	60	**1,900**	6.3 U	10	39 U	6.3 U
TMP-05	70	n/a	**380 J**	6.2 U	n/a	47 U	6.2 U	n/a	47 UJ	6.2 U	n/a	7.7 U	6.2 U	n/a	**910**	**3.9 J**	n/a	47 U	6.2 U
TMP-05	75	n/a	**350 J**	7.2 U	n/a	48 U	7.2 U	n/a	48 UJ	7.2 U	n/a	7.8 U	7.2 U	n/a	**2,200**	**38**	n/a	48 U	7.2 U
TMP-05	80	n/a	**300 J**	6 U	n/a	41 U	6 U	n/a	41 UJ	6 U	n/a	7.8 U	6 U	n/a	**970**	**33**	n/a	41 U	6 U
TMP-05	85	n/a	8.5 U	7.1 U	n/a	0.85 U	7.1 U	n/a	**0.32 J**	7.1 U	n/a	0.37 U	7.1 U	n/a	**130**	**100**	n/a	0.85 U	7.1 U
TMP-05	90	n/a	**390 J**	5.1 U	n/a	50 U	5.1 U	n/a	50 UJ	5.1 U	n/a	7.6 U	5.1 U	n/a	**1,700**	**25**	n/a	50 U	5.1 U
TMP-05	95	n/a	12 UJ	6.6 U	n/a	**0.34 J**	6.6 U	n/a	1.2 UJ	6.6 U	n/a	7.4 U	6.6 U	n/a	**34**	**110**	n/a	1.2 U	6.6 U
TMP-05	100	n/a	8.1 UJ	n/a	n/a	0.81 U	n/a	n/a	0.81 UJ	n/a	n/a	0.59 U	n/a	n/a	**150**	n/a	n/a	**0.32 J**	n/a
TMP-09	25	20	9.5 U	5.8 U	210,000	0.95 U	5.8 U	60	**4.9 J**	5.8 U	12,000	1.5 U	5.8 U	60	**200**	5.8 U	10	0.95 U	5.8 U
TMP-09	30	20	15 U	5.1 U	210,000	1.5 U	5.1 U	60	**1.2 J**	5.1 U	12,000	0.32 U	5.1 U	60	**250**	5.1 U	10	1.5 U	5.1 U
TMP-09	35	20	9.6 UJ	7.2 U	n/a	0.96 U	7.2 U	n/a	0.96 UJ	7.2 U	n/a	0.24 U	7.2 U	60	**2.7**	7.2 U	10	0.96 UJ	7.2 U
TMP-09	40	20	8.2 U	6.4 U	n/a	0.82 U	6.4 U	n/a	**0.73 J**	6.4 U	n/a	0.3 U	6.4 U	60	**320**	6.4 U	10	**2.7**	6.4 U
TMP-09	45	20	460 U	5.1 U	n/a	40 U	5.1 U	n/a	40 UJ	5.1 U	n/a	40 U	5.1 U	60	**420**	5.1 U	10	40 U	5.1 U
TMP-09	50	20	560 UJ	7.8 U	n/a	47 U	7.8 U	n/a	47 UJ	7.8 U	n/a	47 U	7.8 U	60	**960**	7.8 U	10	47 U	7.8 U
TMP-09	55	20	510 U	5.5 U	n/a	42 U	5.5 U	n/a	42 UJ	5.5 U	n/a	42 U	5.5 U	60	**1,000**	5.5 U	10	42 U	5.5 U
TMP-09	60	20	520 U	5.7 U	n/a	44 U	5.7 U	n/a	44 UJ	5.7 U	n/a	44 U	5.7 U	60	**1,000**	5.7 U	10	44 U	5.7 U
TMP-09	65	20	510 U	5.6 U	n/a	46 U	5.6 U	n/a	46 UJ	5.6 U	n/a	46 U	5.6 U	60	**1,900**	5.6 U	10	46 U	5.6 U
TMP-09	70	n/a	580 UJ	6.4 U	n/a	45 U	6.4 U	n/a	45 UJ	6.4 U	n/a	7.5 U	**2.7 J**	n/a	**3,000**	6.4 U	n/a	45 U	6.4 U
TMP-09	75	n/a	680 UJ	6.5 U	n/a	56 U	6.5 U	n/a	56 UJ	6.5 U	n/a	56 U	6.5 U	n/a	**3,100**	6.5 U	n/a	56 U	6.5 U
TMP-09	80	n/a	580 U	5.9 U	n/a	50 U	5.9 U	n/a	50 UJ	5.9 U	n/a	50 U	5.9 U	n/a	**4,500**	5.9 U	n/a	50 U	5.9 U
TMP-09	85	n/a	9.2 U	5.9 U	n/a	0.92 U	5.9 U	n/a	**0.25 J**	5.9 U	n/a	0.16 U	5.9 U	n/a	**150**	**34**	n/a	0.92 U	5.9 U
TMP-09	90	n/a	1400 UJ	n/a	n/a	110 U	n/a	n/a	110 U	n/a	n/a	110 U	n/a	n/a	**2,000**	n/a	n/a	110 UJ	n/a
TMP-09	95	n/a	540 U	6.7 U	n/a	42 U	6.7 U	n/a	42 U	6.7 U	n/a	42 U	6.7 U	n/a	**860**	**12**	n/a	42 U	6.7 U
TMP-09	100	n/a	n/a	4.8 U	n/a	n/a	4.8 U	n/a	n/a	4.8 U	n/a	n/a	4.8 U	n/a	n/a	**2.7 J**	n/a	n/a	4.8 U
TMP-09	105	n/a	n/a	5.8 U	n/a	n/a	5.8 U	n/a	n/a	5.8 U	n/a	n/a	5.8 U	n/a	n/a	**21**	n/a	n/a	5.8 U
TMP-09	110	n/a	n/a	5.7 U	n/a	n/a	5.7 U	n/a	n/a	5.7 U	n/a	n/a	5.7 U	n/a	n/a	**120**	n/a	n/a	5.7 U
TMP-11	25	20	8 UJ	6.7 U	210,000	0.8 U	6.7 U	60	**0.6 J**	**2.8 J**	12,000	0.16 U	6.7 U	60	**37**	6.7 U	10	0.8 U	6.7 U
TMP-11	30	20	9.5 UJ	5.6 U	210,000	0.95 U	5.6 U	60	0.95 U	5.6 U	12,000	0.95 U	5.6 U	60	**0.67 J**	5.6 U	10	0.95 U	5.6 U
TMP-11	35	20	12 UJ	5.5 U	n/a	1.2 U	5.5 U	n/a	1.2 U	5.5 U	n/a	0.2 U	5.5 U	60	**18**	5.5 U	10	1.2 U	5.5 U
TMP-11	40	20	10 UJ	4.4 U	n/a	1 U	4.4 U	n/a	1 U	4.4 U	n/a	1 U	4.4 U	60	**3.4**	4.4 U	10	1 U	4.4 U
TMP-11	45	20	**270 J**	4.7 U	n/a	46 U	4.7 U	n/a	46 U	4.7 U	n/a	46 U	4.7 U	60	**1,300**	4.7 U	10	46 U	4.7 U
TMP-11	50	20	8.7 UJ	4.4 U	n/a	0.87 U	4.4 U	n/a	**0.43 J**	4.4 U	n/a	0.58 U	4.4 U	60	**170**	4.4 U	10	**1.6**	4.4 U
TMP-11	55	20	460 U	5.3 U	n/a	46 U	5.3 U	n/a	46 U	5.3 U	n/a	46 U	5.3 U	60	**690**	5.3 U	10	46 U	5.3 U
TMP-11	60	20	480 U	5.9 U	n/a	48 U	5.9 U	n/a	48 U	5.9 U	n/a	48 U	5.9 U	60	**790**	5.9 U	10	48 U	5.9 U
TMP-11	65	20	**230 J**	6.4 U	n/a	41 U	6.4 U	n/a	41 U	6.4 U	n/a	41 U	6.4 U	60	**1,300**	6.4 U	10	41 U	6.4 U
TMP-11	70	n/a	400 U	5.4 U	n/a	40 U	5.4 U	n/a	40 U	5.4 U	n/a	40 U	5.4 U	n/a	**860**	5.4 U	n/a	40 U	5.4 U
TMP-11	75	n/a	460 U	6.6 U	n/a	46 U	6.6 U	n/a	46 U	6.6 U	n/a	46 U	6.6 U	n/a	**1,000**	**40**	n/a	46 U	6.6 U
TMP-11	80	n/a	520 UJ	**3.1 J**	n/a	52 U	5.8 U	n/a	52 U	5.8 U	n/a	52 U	5.8 U	n/a	**1,400**	5.8 U	n/a	52 U	5.8 U
TMP-11	85	n/a	8.9 UJ	5.4 U	n/a	0.89 U	5.4 U	n/a	**0.75 J**	5.4 U	n/a	0.2 U	5.4 U	n/a	**160**	**77**	n/a	0.89 U	5.4 U
TMP-11	90	n/a	14 UJ	6.6 U	n/a	0.46 U	6.6 U	n/a	1.4 U	6.6 U	n/a	**10**	**5.7 J**	n/a	**71**	**200**	n/a	1.4 U	6.6 U
TMP-11	95	n/a	8.9 UJ	6.3 U	n/a	0.16 U	6.3 U	n/a	0.89 U	6.3 U	n/a	**4.1**	6.3 U	n/a	**320**	**5 J**	n/a	**0.49 J**	6.3 U
TMP-11	100	n/a	10 UJ		n/a	1 U	n/a	n/a	1 U	n/a	n/a	0.29 U	n/a	n/a	**0.95 J**	n/a	n/a	1 U	n/a
TMP-17	25	20	8.5 U	5.7 U	210,000	**16**	5.7 U	60	**0.4 J**	5.7 U	12,000	**130**	5.7 U	60	**9.8**	5.7 U	10	**120**	5.7 U
TMP-17	30	20	7.4 U	5.9 U	210,000	0.74 U	5.9 U	60	**0.53 J**	5.9 U	12,000	0.22 U	5.9 U	60	**200**	**5.7 J**	10	0.74 U	5.9 U
TMP-17	35	20	480 U	6.1 U	n/a	39 U	6.1 U	n/a	39 U	6.1 U	n/a	39 U	6.1 U	60	**570**	6.1 U	10	39 U	6.1 U
TMP-17	40	20	8.8 U	5.3 U	n/a	0.88 U	5.3 U	n/a	0.88 U	5.3 U	n/a	0.27 U	5.3 U	60	**7.3**	5.3 U	10	0.88 U	5.3 U
TMP-17	45	20	8.2 U	5.4 U	n/a	0.82 U	5.4 U	n/a	**0.3 J**	5.4 U	n/a	0.42 U	5.4 U	60	**800**	5.4 U	10	**3.4**	5.4 U
TMP-17	50	20	9.3 U	5.6 U	n/a	0.93 U	5.6 U	n/a	**0.59 J**	5.6 U	n/a	1.2 U	5.6 U	60	**1,100**	5.6 U	10	**6.2**	5.6 U
TMP-17	55	20	260 U	5.9 U	n/a	42 U	5.9 U	n/a	42 U	5.9 U	n/a	42 U	5.9 U	60	**1,500**	5.9 U	10	42 U	5.9 U
TMP-17	60	20	490 U	6.4 U	n/a	42 U	6.4 U	n/a	42 U	6.4 U	n/a	42 U	6.4 U	60	**1,400**	6.4 U	10	42 U	6.4 U
TMP-17	65	20	540 U	4.9 U	n/a	45 U	4.9 U	n/a	45 U	4.9 U	n/a	45 U	4.9 U	60	**3,300**	4.9 U	10	45 U	4.9 U
TMP-17	70	n/a	500 U	7.2 U	n/a	41 U	7.2 U	n/a	41 U	7.2 U	n/a	41 U	7.2 U	n/a	**4,600**	7.2 U	n/a	41 U	7.2 U
TMP-17	75	n/a	570 U	6.7 U	n/a	44 U	6.7 U	n/a	44 U	6.7 U	n/a	44 U	6.7 U	n/a	**4,400**	6.7 U	n/a	44 U	6.7 U
TMP-17	80	n/a	8.4 U	6.5 U	n/a	0.84 U	6.5 U	n/a	**0.53 J**	6.5 U	n/a	0.3 U	6.5 U	n/a	**3,100**	6.5 U	n/a	**3.3**	6.5 U
TMP-17	85	n/a	560 U	6.3 U	n/a	45 U	6.3 U	n/a	45 U	6.3 U	n/a	45 U	6.3 U	n/a	**930**	**5.6 J**	n/a	45 U	6.3 U
TMP-17	90	n/a	11 UJ	5.6 U	n/a	1.1 U	5.6 U	n/a	**0.48 J**	5.6 U	n/a	0.98 U	5.6 U	n/a	**530**	**51**	n/a	**2.2 J**	5.6 U
TMP-17	95	n/a	310 U	6.9 U	n/a	42 U	6.9 U	n/a	42 U	6.9 U	n/a	42 U	6.9 U	n/a	**2,300**	**34**	n/a	42 U	6.9 U
TMP-17	100	n/a	310 U		n/a	42 U	n/a	n/a	42 U	n/a	n/a	9.1 U	n/a	n/a	**1,900**	n/a	n/a	42 U	n/a

Table 6 (Continued)
Pre- and Post-Electrical Resistance Heating (ERH) Results for Chemicals of Concern
Pemaco Superfund Site, Maywood, California

Chemicals of Concern		Methylene chloride (ug/kg)			o-Xylene (ug/kg)			Tetrachloroethene (ug/kg)			Toluene (ug/kg)			Trichloroethene (ug/kg)			Vinyl chloride (ug/kg)		
TMP ID	Depth (ft bgs)	SSRLs[2]	pre-ERH	post-ERH	SSRLs[1, 3]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[1]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH	SSRLs[2]	pre-ERH	post-ERH
TMP-19	25	20	9.2 UJ	6 U	210,000	**0.97**	6 U	60	0.92 U	6 U	12,000	24 U	6 U	60	**2.0**	6.0 U	10	**67**	6 U
TMP-19	30	20	**390 J**	6.1 U	210,000	53 U	6.1 U	60	53 U	6.1 U	12,000	14 U	6.1 U	60	**910**	6.1 U	10	53 U	6.1 U
TMP-19	35	20	**350 J**	6 U	n/a	49 U	6 U	n/a	49 U	6 U	n/a	9.6 U	6 U	60	**3,800**	6.0 U	10	**17 J**	6 U
TMP-19	40	20	9.8 UJ	5.3 U	n/a	0.98 U	5.3 U	n/a	0.98 U	5.3 U	n/a	0.78 U	5.3 U	60	**8.3**	5.3 U	10	0.98 U	5.3 U
TMP-19	45	20	**330 J**	6 U	n/a	42 U	6 U	n/a	42 U	6 U	n/a	42 U	6 U	60	**3,400**	6.0 U	10	**16 J**	6 U
TMP-19	50	20	**410 J**	6.7 U	n/a	52 U	6.7 U	n/a	52 U	6.7 U	n/a	8.3 U	6.7 U	60	**2,100**	6.7 U	10	52 U	6.7 U
TMP-19	55	20	**320 J**	6 U	n/a	43 U	6 U	n/a	43 U	6 U	n/a	43 U	6 U	60	**690**	6.0 U	10	43 U	6 U
TMP-19	60	20	**340 J**	5.9 U	n/a	44 U	5.9 U	n/a	44 U	5.9 U	n/a	7.6 U	5.9 U	60	**2,300**	5.9 U	10	44 U	5.9 U
TMP-19	65	20	**300 J**	6.5 U	n/a	40 U	6.5 U	n/a	40 U	6.5 U	n/a	6.5 U	6.5 U	60	**2,500**	6.5 U	10	40 U	6.5 U
TMP-19	70	n/a	**380 J**	5.5 U	n/a	45 U	5.5 U	n/a	45 U	5.5 U	n/a	45 U	5.5 U	n/a	**1,500**	5.5 U	n/a	45 U	5.5 U
TMP-19	75	n/a	**410 J**	7.2 U	n/a	51 U	7.2 U	n/a	51 U	7.2 U	n/a	8.3 U	7.2 U	n/a	**1,800**	**74**	n/a	51 U	7.2 U
TMP-19	80	n/a	**310 J**	6.8 U	n/a	46 U	6.8 U	n/a	46 U	6.8 U	n/a	46 U	6.8 U	n/a	**980**	**71**	n/a	46 U	6.8 U
TMP-19	85	n/a	**360 J**	6.1 U	n/a	46 U	6.1 U	n/a	46 U	6.1 U	n/a	7.9 U	6.1 U	n/a	**840**	6.1 U	n/a	46 U	6.1 U
TMP-19	90	n/a	**360 J**	6 U	n/a	53 U	6 U	n/a	53 U	6 U	n/a	53 U	6 U	n/a	**580**	6.0 U	n/a	53 U	6 U
TMP-19	95	n/a	**360 J**	7 U	n/a	44 U	7 U	n/a	44 U	7 U	n/a	8.1 U	7 U	n/a	**1,600**	**34**	n/a	**32 J**	7 U
TMP-19	100	n/a	**400 J**		n/a	48 U	n/a	n/a	48 U	n/a	n/a	9 U	n/a	n/a	**1,900**	n/a	n/a	48 U	n/a
TMP-22	25	20	8.6 UJ	7.2 U	210,000	**1.1**	7.2 U	60	**1.6 J**	7.2 U	12,000	3 U	7.2 U	60	**45**	7.2 U	10	0.86 U	7.2 U
TMP-22	30	20	8.4 UJ	5 U	210,000	0.84 U	5 U	60	**0.3 J**	5 U	12,000	0.39 U	5 U	60	**67**	5.0 U	10	0.84 U	5 U
TMP-22	35	20	8.2 UJ	5.6 U	n/a	0.82 U	5.6 U	n/a	0.82 UJ	5.6 U	n/a	0.82 U	5.6 U	60	**130**	5.6 U	10	0.82 U	5.6 U
TMP-22	40	20	7.5 UJ	5.5 U	n/a	0.75 U	5.5 U	n/a	0.75 UJ	5.5 U	n/a	0.19 U	5.5 U	60	**130**	5.5 U	10	0.75 U	5.5 U
TMP-22	45	20	9.7 UJ	4.6 U	n/a	0.97 U	4.6 U	n/a	0.97 UJ	4.6 U	n/a	0.31 U	4.6 U	60	**430**	4.6 U	10	**2.1**	4.6 U
TMP-22	50	20	8.6 UJ	5.3 U	n/a	0.86 U	5.3 U	n/a	0.86 UJ	5.3 U	n/a	0.24 UJ	5.3 U	60	**1.8 J**	5.3 U	10	0.86 U	5.3 U
TMP-22	55	20	10 UJ	5 U	n/a	1 U	5 U	n/a	1 UJ	5 U	n/a	0.92 U	5 U	60	**240**	5.0 U	10	**1.3**	5 U
TMP-22	60	20	9.4 U	5.6 U	n/a	0.94 U	5.6 U	n/a	0.94 UJ	5.6 U	n/a	0.31 U	5.6 U	60	**78**	5.6 U	10	0.94 U	5.6 U
TMP-22	65	20	250 U	5.6 U	n/a	41 U	5.6 U	n/a	41 UJ	5.6 U	n/a	8.1 U	5.6 U	60	**1,100**	5.6 U	10	41 U	5.6 U
TMP-22	70	n/a	400 U	5.2 U	n/a	40 U	5.2 U	n/a	40 UJ	5.2 U	n/a	40 U	5.2 U	n/a	**1,800**	5.2 U	n/a	40 U	5.2 U
TMP-22	75	n/a	270 U	5.8 U	n/a	44 U	5.8 U	n/a	44 UJ	5.8 U	n/a	8.4 U	5.8 U	n/a	**3,200**	5.8 U	n/a	44 U	5.8 U
TMP-22	80	n/a	260 U	5.8 U	n/a	43 U	5.8 U	n/a	43 UJ	5.8 U	n/a	7.9 U	5.8 U	n/a	**3,500**	**34**	n/a	43 U	5.8 U
TMP-22	85	n/a	400 U	5.5 U	n/a	61 U	5.5 U	n/a	61 UJ	5.5 U	n/a	61 U	5.5 U	n/a	**1,200**	**6.1**	n/a	61 U	5.5 U
TMP-22	90	n/a	290 U	6.4 U	n/a	43 U	6.4 U	n/a	43 UJ	6.4 U	n/a	8.6 U	6.4 U	n/a	**6,900**	**14**	n/a	43 U	6.4 U
TMP-22	95	n/a	320 U	6.8 U	n/a	45 U	6.8 U	n/a	45 UJ	6.8 U	n/a	45 U	6.8 U	n/a	**1,400**	**28**	n/a	45 U	6.8 U
TMP-22	100	n/a	180 U	n/a	n/a	35 U	n/a	n/a	35 UJ	n/a	n/a	35 U	n/a	n/a	**1,100**	n/a	n/a	35 U	n/a
TMP-27	25	20	9.1 U	6.4 U	210,000	**1.2**	6.4 U	60	0.91 U	6.4 U	12,000	1.6 U	6.4 U	60	**1.2 J**	6.4 U	10	0.91 U	6.4 U
TMP-27	30	20	8.9 U	5.1 U	210,000	0.89 U	5.1 U	60	**6.6**	5.1 U	12,000	0.89 U	5.1 U	60	**270**	5.1 U	10	**54**	5.1 U
TMP-27	35	20	7.7 U	5.9 U	n/a	0.77 U	5.9 U	n/a	**0.73 J**	5.9 U	n/a	0.77 U	5.9 U	60	**300**	5.9 UJ	10	**5.2**	5.9 U
TMP-27	40	20	9.1 U	5.8 U	n/a	0.91 U	5.8 U	n/a	0.91 U	5.8 U	n/a	0.17 U	5.8 U	60	**9.1**	5.8 U	10	0.91 U	5.8 U
TMP-27	45	20	8.5 U	4.9 U	n/a	0.85 U	4.9 U	n/a	0.85 U	4.9 U	n/a	0.26 U	4.9 U	60	**93**	4.9 U	10	**0.41 J**	4.9 U
TMP-27	50	20	8.5 U	5.3 U	n/a	0.85 U	5.3 U	n/a	**0.19 J**	5.3 U	n/a	0.62 U	5.3 U	60	**330**	**8.9**	10	**6.9**	5.3 U
TMP-27	55	20	9.9 U	5.8 U	n/a	0.99 U	5.8 U	n/a	0.99 UJ	5.8 U	n/a	0.46 U	5.8 U	60	**180**	5.8 U	10	**4.2**	5.8 U
TMP-27	60	20	7.7 U	6.2 U	n/a	0.77 U	6.2 U	n/a	0.77 U	6.2 U	n/a	0.51 U	6.2 U	60	**110**	6.2 U	10	**7.6**	6.2 U
TMP-27	65	20	8.5 U	6.3 U	n/a	0.85 U	6.3 U	n/a	**0.21 J**	6.3 U	n/a	0.66 U	6.3 U	60	**300**	6.3 U	10	**15**	6.3 U
TMP-27	70	n/a	510 U	5.8 U	n/a	46 U	5.8 U	n/a	46 UJ	5.8 U	n/a	46 U	5.8 U	n/a	**640**	5.8 U	n/a	46 U	5.8 U
TMP-27	75	n/a	9.2 U	5.9 U	n/a	0.92 U	5.9 U	n/a	0.92 UJ	5.9 U	n/a	0.52 U	5.9 U	n/a	**270**	**18**	n/a	0.92 U	5.9 U
TMP-27	80	n/a	8.2 U	5.7 U	n/a	0.82 U	5.7 U	n/a	0.82 UJ	5.7 U	n/a	0.18 U	5.7 U	n/a	**550**	**16**	n/a	0.82 U	5.7 U
TMP-27	85	n/a	8.7 U	5.8 U	n/a	0.87 U	5.8 U	n/a	**0.3 J**	5.8 U	n/a	0.56 U	5.8 U	n/a	**170**	**72**	n/a	0.87 U	5.8 U
TMP-27	90	n/a	10 U	6.2 U	n/a	1 U	6.2 U	n/a	1 UJ	6.2 U	n/a	0.73 U	6.2 U	n/a	**200**	**45**	n/a	1 U	6.2 U
TMP-27	95	n/a	470 U	5.3 U	n/a	42 U	5.3 U	n/a	42 UJ	5.3 U	n/a	42 U	5.3 U	n/a	**1,500**	**5.1 J**	n/a	42 U	5.3 U
TMP-27	100	n/a	520 U	n/a	n/a	44 U	n/a	n/a	44 UJ	n/a	n/a	44 U	n/a	n/a	**2,000**	n/a	n/a	44 U	n/a

Notes:
Bolded value indicates positive detections
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit
730 highlighted values indicate exceeding Pemaco SSRLs

Site-Specific Remediation Levels (SSRLs)
[1] SSRLs were established for COCs detected in upper vadose zone only (between 2 and 30 ft bgs)
[2] SSRLs were established for COCs detected in both upper and lower vadose zone (between 2 and 65 ft bgs)
[3] SSRL at 210,000 ug/kg was defined for total xylenes
Reference: Record of Decision (EPA, 2005)

Abbreviations:
ERH - Electrical Resistance Heating
ft bgs - feet below ground surface
n/a - not applicable or not available
SSRLs - Site-Specific Remediation Levels
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms

Table 7
Pre- and Post-Electrical Resistance Heating (ERH) Results for Volatile Organic Compounds Excluding Chemicals of Concern
Pemaco Superfund Site, Maywood, California

	Other VOCs	1,1-Dichloroethane		2-Butanone		2-Hexanone (ug/kg)		Carbon disulfide		Chloroform		Dichlorodifluoromethane		Isopropylbenzene		Methyl Tert-Butyl Ether		N-Hexane		trans-1,2-Dichloroethene	
TMP ID	Depth (ft bgs)	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH
TMP-05	25	0.87 U	5.6 U	17 U	11 U	17 U	11 U	**0.19 J**	5.6 U	0.87 U	5.6 U	1.7 U	5.6 U	0.87 U	5.6 U	1.7 U	5.6 U	0.87 U	0.56 U	0.87 U	5.6 U
TMP-05	30	0.87 U	5.7 U	17 U	11 U	17 U	11 U	**0.25 J**	5.7 U	0.87 U	5.7 U	1.7 U	5.7 U	0.87 U	5.7 U	1.7 U	5.7 U	**16**	0.57 U	0.87 U	5.7 U
TMP-05	35	0.89 U	6.2 U	**9.5 J**	12 U	18 U	12 U	**0.28 J**	6.2 U	0.89 U	6.2 U	1.8 U	6.2 U	**0.13 J**	6.2 U	1.8 U	6.2 U	**15**	0.62 U	**0.24 J**	6.2 U
TMP-05	40	1.1 U	5.8 U	22 UJ	12 U	22 U	12 U	**0.37 J**	5.8 U	1.1 U	5.8 U	2.2 U	5.8 U	1.1 U	5.8 U	2.2 U	5.8 U	**10**	0.58 U	1.1 U	5.8 U
TMP-05	45	0.81 U	5.5 U	16 UJ	11 U	16 U	11 U	**0.17 J**	5.5 U	0.81 U	5.5 U	1.6 U	5.5 U	0.81 U	5.5 U	1.6 U	5.5 U	**22**	0.55 U	**0.86**	5.5 U
TMP-05	50	1.1 U	5.9 U	21 UJ	12 U	21 U	12 U	11 U	5.9 U	1.1 U	5.9 U	2.1 U	5.9 U	1.1 U	5.9 U	2.1 U	5.9 U	0.39 U	0.59 U	1.1 U	5.9 U
TMP-05	55	1 U	6 U	20 UJ	12 U	20 U	12 U	10 U	6 U	1 U	6 U	2 U	6 U	1 U	6 U	2 U	6 U	**4.3**	0.6 U	**0.49 J**	6 U
TMP-05	60	45 U	5.6 U	910 UJ	11 U	910 U	11 U	450 U	5.6 U	45 U	5.6 U	91 U	5.6 U	45 U	5.6 U	91 U	5.6 U	**19 J**	0.56 U	45 U	5.6 U
TMP-05	65	39 U	6.3 U	790 UJ	13 U	790 U	13 U	390 U	6.3 U	39 U	6.3 U	79 U	6.3 U	39 U	6.3 U	79 U	6.3 U	**12 J**	0.63 U	39 U	6.3 U
TMP-05	70	47 U	6.2 U	940 UJ	12 U	940 U	12 U	470 U	6.2 U	47 U	6.2 U	94 U	6.2 U	47 U	6.2 U	94 U	6.2 U	**17 J**	0.62 U	47 U	6.2 U
TMP-05	75	48 U	7.2 U	970 UJ	14 U	970 U	14 U	480 U	7.2 U	48 U	7.2 U	97 U	7.2 U	48 U	7.2 U	97 U	7.2 U	**15 J**	0.72 U	48 U	7.2 U
TMP-05	80	41 U	6 U	810 UJ	12 U	810 U	12 U	410 U	6 U	41 U	6 U	81 U	6 U	41 U	6 U	81 U	6 U	**15 J**	0.6 U	41 U	6 U
TMP-05	85	**0.15 J**	7.1 U	17 UJ	14 U	17 U	14 U	8.5 U	7.1 U	0.85 U	7.1 U	1.7 U	7.1 U	0.85 U	7.1 U	1.7 U	7.1 U	**1.3**	0.71 U	**0.29 J**	7.1 U
TMP-05	90	50 U	5.1 U	1000 UJ	10 U	1000 U	10 U	500 U	5.1 U	50 U	5.1 U	100 U	5.1 U	50 U	5.1 U	100 U	5.1 U	**13 J**	0.51 U	50 U	5.1 U
TMP-05	95	1.2 U	6.6 U	23 UJ	13 U	23 U	13 U	12 U	6.6 U	1.2 U	6.6 U	2.3 U	6.6 U	1.2 U	6.6 U	2.3 U	6.6 U	1.2 U	0.66 U	**0.3 J**	6.6 U
TMP-05	100	0.81 U	n/a	16 U	n/a	16 U	n/a	**0.34 J**	n/a	0.81 U	n/a	**0.23 J**	n/a	0.81 U	n/a	1.6 U	n/a	0.81 U	n/a	**0.29 J**	n/a
TMP-09	25	0.95 U	5.8 U	19 U	12 U	19 U	12 U	0.39 U	5.8 U	0.95 U	5.8 U	1.9 U	5.8 U	0.95 U	5.8 U	1.9 U	5.8 U	0.95 U	0.58 U	0.95 U	5.8 U
TMP-09	30	1.5 U	5.1 U	30 U	10 U	30 U	10 U	15 U	5.1 U	1.5 U	5.1 U	3 U	5.1 U	1.5 U	5.1 U	3 U	5.1 U	1.5 U	0.51 U	**0.71 J**	5.1 U
TMP-09	35	0.96 U	7.2 U	19 U	14 U	19 U	14 U	9.6 U	7.2 U	0.96 U	7.2 U	1.9 U	7.2 U	0.96 U	7.2 U	1.9 U	7.2 U	2 U	0.72 U	0.96 U	7.2 U
TMP-09	40	0.82 U	6.4 U	16 U	13 U	16 U	13 U	8.2 U	6.4 U	0.82 U	6.4 U	1.6 U	6.4 U	0.82 U	6.4 U	1.6 U	6.4 U	21 U	0.64 U	**3.2**	6.4 U
TMP-09	45	40 U	5.1 U	800 U	10 U	800 U	10 U	400 U	5.1 U	40 U	5.1 U	80 U	5.1 U	40 U	5.1 U	80 U	5.1 U	41 U	0.51 U	40 U	5.1 U
TMP-09	50	47 U	7.8 U	930 U	16 U	930 U	16 U	470 U	7.8 U	47 U	7.8 U	93 U	7.8 U	47 U	7.8 U	93 U	7.8 U	22 UJ	0.78 U	47 U	7.8 U
TMP-09	55	42 U	5.5 U	850 U	11 U	850 U	11 U	420 U	5.5 U	42 U	5.5 U	85 U	5.5 U	42 U	5.5 U	85 U	5.5 U	32 U	0.55 U	42 U	5.5 U
TMP-09	60	44 U	5.7 U	880 U	11 U	880 U	11 U	440 U	5.7 U	44 U	5.7 U	88 U	5.7 U	44 U	5.7 U	88 U	5.7 U	28 U	0.57 U	44 U	5.7 U
TMP-09	65	46 U	5.6 U	920 U	11 U	920 U	11 U	460 U	5.6 U	46 U	5.6 U	92 U	5.6 U	46 U	5.6 U	92 U	5.6 U	17 U	0.56 U	46 U	5.6 U
TMP-09	70	45 U	6.4 U	890 U	13 U	890 U	13 U	450 U	n/a	45 U	6.4 U	89 U	n/a	45 U	6.4 U	89 U	6.4 U	13 UJ	n/a	45 U	n/a
TMP-09	75	56 U	6.5 U	1100 U	13 U	1100 U	13 U	560 U	6.5 U	56 U	6.5 U	110 UJ	6.5 U	56 U	6.5 U	110 U	6.5 U	19 U	0.65 U	56 U	6.5 U
TMP-09	80	50 U	5.9 U	1000 U	**26**	1000 U	12 U	500 U	5.9 U	50 U	5.9 U	100 U	5.9 U	50 U	5.9 U	100 U	5.9 U	8.2 U	0.59 U	50 U	5.9 U
TMP-09	85	0.92 U	5.9 U	18 U	12 U	18 U	12 U	0.22 U	5.9 U	**0.91 J**	5.9 U	1.8 U	5.9 U	0.92 U	5.9 U	1.8 U	5.9 U	3.1 U	0.59 U	**0.25 J**	5.9 U
TMP-09	90	110 U	n/a	2200 U	n/a	2200 U	n/a	1100 U	n/a	110 U	n/a	220 UJ	n/a	110 U	n/a	220 U	n/a	20 UJ	n/a	110 U	n/a
TMP-09	95	42 U	6.7 U	840 U	13 U	840 U	13 U	420 U	6.7 U	42 U	6.7 U	84 U	6.7 U	42 U	6.7 U	84 U	6.7 U	4.9 U	0.67 U	42 U	6.7 U
TMP-09	100	n/a	4.8 U	n/a	9.7 U	n/a	9.7 U	n/a	4.8 U	n/a	4.8 U	n/a	4.8 U	n/a	4.8 U	n/a	4.8 U	n/a	0.48 U	n/a	4.8 U
TMP-09	105	n/a	5.8 U	n/a	12 U	n/a	12 U	n/a	5.8 U	n/a	5.8 U	n/a	5.8 U	n/a	5.8 U	n/a	5.8 U	n/a	0.58 U	n/a	5.8 U
TMP-09	110	n/a	5.7 U	n/a	11 U	n/a	11 U	n/a	5.7 U	n/a	5.7 U	n/a	5.7 U	n/a	5.7 U	n/a	5.7 U	n/a	0.57 U	n/a	5.7 U
TMP-11	25	0.8 U	6.7 U	16 U	13 U	16 U	13 U	8 U	6.7 U	0.8 U	6.7 U	1.6 UJ	6.7 U	0.8 UJ	6.7 U	1.6 U	6.7 U	**0.35 J**	0.67 U	0.8 U	6.7 U
TMP-11	30	0.95 U	5.6 U	19 U	11 U	19 U	11 U	9.5 U	5.6 U	0.95 U	5.6 U	1.9 U	5.6 U	0.95 UJ	5.6 U	1.9 U	5.6 U	**2**	0.56 U	0.95 U	5.6 U
TMP-11	35	1.2 U	5.5 U	23 U	11 U	23 U	11 U	12 U	5.5 U	1.2 U	5.5 U	2.3 U	5.5 U	1.2 UJ	5.5 U	2.3 U	5.5 U	**1.2 J**	0.55 U	1.2 U	5.5 U
TMP-11	40	1 U	4.4 U	20 U	8.8 U	20 U	8.8 U	**0.18 J**	4.4 U	1 U	4.4 U	2 U	4.4 U	1 UJ	4.4 U	2 U	4.4 U	**0.29 J**	0.44 U	1 U	4.4 U
TMP-11	45	46 U	4.7 U	930 U	9.5 U	930 U	9.5 U	460 U	4.7 U	46 U	4.7 U	93 U	4.7 U	46 UJ	4.7 U	93 U	4.7 U	**29 J**	0.47 U	46 U	4.7 U
TMP-11	50	0.87 U	4.4 U	17 U	8.9 U	17 U	8.9 U	8.7 U	4.4 U	0.87 U	4.4 U	1.7 U	4.4 U	0.87 U	4.4 U	1.7 U	4.4 U	**1.3**	0.44 U	**4.0**	4.4 U
TMP-11	55	46 U	5.3 U	920 U	11 U	920 U	11 U	460 U	5.3 U	46 U	5.3 U	92 U	5.3 U	46 U	5.3 U	92 U	5.3 U	**17 J**	0.53 U	46 U	5.3 U
TMP-11	60	48 U	5.9 U	960 U	12 U	960 U	12 U	480 U	5.9 U	48 U	5.9 U	96 U	5.9 U	48 U	5.9 U	96 U	5.9 U	**13 J**	0.59 U	48 U	5.9 U
TMP-11	65	41 U	6.4 U	820 U	13 U	820 U	13 U	410 U	6.4 U	41 U	6.4 U	82 UJ	6.4 U	41 U	6.4 U	82 U	6.4 U	41 U	0.64 U	41 U	6.4 U
TMP-11	70	40 U	5.4 U	800 U	11 U	800 U	11 U	400 U	5.4 U	40 U	5.4 U	80 U	5.4 U	40 U	5.4 U	80 U	5.4 U	40 U	0.54 U	40 U	5.4 U
TMP-11	75	46 U	6.6 U	910 U	13 U	910 U	13 U	460 U	6.6 U	46 U	6.6 U	91 U	6.6 U	46 U	6.6 U	91 U	6.6 U	46 U	0.66 U	46 U	6.6 U
TMP-11	80	52 U	5.8 U	1000 U	12 U	1000 U	12 U	520 U	5.8 U	52 U	5.8 U	100 U	5.8 U	52 UJ	5.8 U	100 U	5.8 U	**7.6 J**	0.58 U	52 U	5.8 U
TMP-11	85	**0.4 J**	5.4 U	18 U	11 U	18 U	11 U	**0.17 J**	5.4 U	**3.7**	**2.6 J**	1.8 UJ	5.4 U	0.89 U	5.4 U	1.8 U	5.4 U	0.89 U	0.54 U	**0.54 J**	5.4 U
TMP-11	90	1.4 U	6.6 U	**24 J**	13 U	28 U	13 U	**0.26 J**	6.6 U	1.4 U	6.6 U	2.8 UJ	6.6 U	1.4 U	6.6 U	2.8 U	6.6 U	1.4 U	0.66 U	1.4 U	6.6 U
TMP-11	95	0.89 U	6.3 U	**13 J**	13 U	18 U	13 U	8.9 U	6.3 U	0.89 U	6.3 U	1.8 UJ	6.3 U	0.89 U	6.3 U	1.8 U	6.3 U	0.89 U	0.63 U	**0.45 J**	6.3 U
TMP-11	100	1 U	n/a	21 U	n/a	21 U	n/a	10 U	n/a	1 U	n/a	2.1 UJ	n/a	1 U	n/a	2.1 U	n/a	1 U	n/a	1 U	n/a
TMP-17	25	0.85 U	5.7 U	17 U	11 U	17 U	11 U	**0.28 J**	5.7 U	0.85 U	5.7 U	1.7 U	5.7 U	0.85 U	5.7 U	1.7 U	5.7 U	3.7 U	0.57 U	**7.5**	5.7 U
TMP-17	30	0.74 U	5.9 U	15 U	**48**	15 U	12 U	7.4 U	5.9 U	0.74 U	5.9 U	1.5 U	5.9 U	0.74 U	5.9 U	1.5 U	5.9 U	0.32 U	0.59 U	**3**	5.9 U
TMP-17	35	39 U	6.1 U	780 U	12 U	780 U	12 U	390 U	6.1 U	39 U	6.1 U	78 U	6.1 U	39 U	6.1 U	78 U	6.1 U	39 U	0.61 U	39 U	6.1 U
TMP-17	40	0.88 U	5.3 U	18 U	11 U	18 U	11 U	8.8 U	5.3 U	0.88 U	5.3 U	1.8 U	5.3 U	0.88 U	5.3 U	1.8 U	5.3 U	0.6 U	0.53 U	0.88 U	5.3 U
TMP-17	45	0.82 U	5.4 U	16 U	11 U	16 U	11 U	8.2 U	5.4 U	0.82 U	5.4 U	1.6 U	5.4 U	0.82 U	5.4 U	1.6 U	5.4 U	3.2 U	0.54 U	**3.7**	5.4 U
TMP-17	50	0.93 U	5.6 U	19 U	11 U	19 U	11 U	9.3 U	5.6 U	0.93 U	5.6 U	1.9 U	5.6 U	0.93 U	5.6 U	1.9 U	5.6 U	1.8 U	0.56 U	**4.1**	5.6 U
TMP-17	55	42 U	5.9 U	830 U	12 U	830 U	12 U	420 U	5.9 U	42 U	5.9 U	83 U	5.9 U	42 U	5.9 U	83 U	5.9 U	28 U	0.59 U	42 U	5.9 U
TMP-17	60	42 U	6.4 U	840 U	13 U	840 U	13 U	420 U	6.4 U	42 U	6.4 U	84 U	6.4 U	42 U	6.4 U	84 U	6.4 U	23 U	0.64 U	42 U	6.4 U
TMP-17	65	45 U	4.9 U	900 U	9.8 U	900 U	9.8 U	450 U	4.9 U	45 U	4.9 U	90 U	4.9 U	45 U	4.9 U	90 U	4.9 U	24 U	0.49 U	45 U	4.9 U
TMP-17	70	41 U	7.2 U	820 U	14 U	820 U	14 U	410 U	7.2 U	41 U	7.2 U	82 U	7.2 U	41 U	7.2 U	82 U	7.2 U	23 U	0.72 U	41 U	7.2 U
TMP-17	75	44 U	6.7 U	880 U	13 U	880 U	13 U	440 U	6.7 U	44 U	6.7 U	88 U	6.7 U	44 U	6.7 U	88 U	6.7 U	25 U	0.67 U	44 U	6.7 U

Table 7 (Continued)
Pre- and Post-Electrical Resistance Heating (ERH) Results for Volatile Organic Compounds Excluding Chemicals of Concern
Pemaco Superfund Site, Maywood, California

	Other VOCs	1,1-Dichloroethane		2-Butanone		2-Hexanone (ug/kg)		Carbon disulfide		Chloroform		Dichlorodifluoromethane		Isopropylbenzene		Methyl Tert-Butyl Ether		N-Hexane		trans-1,2-Dichloroethene	
TMP ID	Depth (ft bgs)	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH	pre-ERH	post-ERH
TMP-17	80	0.84 U	6.5 U	17 U	13 U	17 U	13 U	8.4 U	6.5 U	0.84 U	6.5 U	1.7 U	6.5 U	0.84 U	6.5 U	1.7 U	6.5 U	0.39 U	0.65 U	**2.1**	6.5 U
TMP-17	85	45 U	6.3 U	900 U	13 U	900 U	13 U	450 U	6.3 U	45 U	6.3 U	90 U	6.3 U	45 U	6.3 U	90 U	6.3 U	29 U	0.63 U	45 U	6.3 U
TMP-17	90	**0.24 J**	5.6 U	23 U	**29**	23 U	11 U	**0.21 J**	5.6 U	1.1 UJ	5.6 U	2.3 U	5.6 U	1.1 U	5.6 U	2.3 U	5.6 U	1.1 U	0.56 U	**1 J**	5.6 U
TMP-17	95	42 U	6.9 U	830 U	14 U	830 U	14 U	420 U	6.9 U	42 U	6.9 U	83 U	6.9 U	42 U	6.9 U	83 U	6.9 U	7.5 U	0.69 U	42 U	6.9 U
TMP-17	100	42 U	n/a	840 U	n/a	840 U	n/a	420 U	n/a	42 U	n/a	84 U	n/a	42 U	n/a	84 U	n/a	7.3 U	n/a	42 U	n/a
TMP-19	25	0.92 U	6 U	18 U	12 U	18 U	12 U	9.2 U	6 U	0.92 U	6 U	1.8 U	6 U	0.92 U	6 U	1.8 U	6 U	0.48 U	0.6 U	**1.4**	6 U
TMP-19	30	53 U	6.1 U	1100 U	**31**	1100 U	12 U	530 U	6.1 U	53 U	6.1 U	110 U	6.1 U	53 U	6.1 U	110 U	6.1 U	**28 J**	0.61 U	**21 J**	6.1 U
TMP-19	35	49 U	6 U	980 U	12 U	980 U	12 U	490 U	6 U	49 U	6 U	98 U	6 U	49 U	6 U	98 U	6 U	**33 J**	0.6 U	**32 J**	6 U
TMP-19	40	0.98 U	5.3 U	20 U	11 U	**11 J**	11 U	9.8 U	5.3 U	0.98 U	5.3 U	2 U	5.3 U	0.98 U	5.3 U	2 U	5.3 U	0.57 U	0.53 U	0.98 U	5.3 U
TMP-19	45	42 U	6 U	850 U	12 U	850 U	12 U	420 U	6 U	42 U	6 U	85 U	6 U	42 U	6 U	85 U	6 U	**17 J**	0.6 U	**14 J**	6 U
TMP-19	50	52 U	6.7 U	1000 U	13 U	1000 U	13 U	520 U	6.7 U	52 U	6.7 U	100 U	6.7 U	52 U	6.7 U	100 U	6.7 U	**19 J**	0.67 U	**19 J**	6.7 U
TMP-19	55	43 U	6 U	850 U	12 U	850 U	12 U	430 U	6 U	43 U	6 U	85 U	6 U	43 U	6 U	85 U	6 U	**15 J**	0.6 U	43 U	6 U
TMP-19	60	44 U	5.9 U	890 U	12 U	890 U	12 U	440 U	5.9 U	44 U	5.9 U	89 U	5.9 U	44 U	5.9 U	89 U	5.9 U	**19 J**	0.59 U	44 U	5.9 U
TMP-19	65	40 U	6.5 U	800 U	13 U	800 U	13 U	400 U	6.5 U	40 U	6.5 U	80 U	6.5 U	40 U	6.5 U	80 U	6.5 U	**4.2 J**	0.65 U	40 U	6.5 U
TMP-19	70	45 U	5.5 U	890 U	11 U	890 U	11 U	450 U	5.5 U	45 U	5.5 U	89 U	5.5 U	45 U	5.5 U	89 U	5.5 U	**14 J**	0.55 U	45 U	5.5 U
TMP-19	75	51 U	7.2 U	1000 U	14 U	1000 U	14 U	510 U	7.2 U	51 U	7.2 U	100 U	7.2 U	51 U	7.2 U	100 U	7.2 U	**19 J**	0.72 U	51 U	7.2 U
TMP-19	80	46 U	6.8 U	930 U	14 U	930 U	14 U	460 U	6.8 U	46 U	6.8 U	93 U	6.8 U	46 U	6.8 U	93 U	6.8 U	**17 J**	0.68 U	46 U	6.8 U
TMP-19	85	46 U	6.1 U	920 U	**39**	920 U	12 U	460 U	6.1 U	46 U	6.1 U	92 U	6.1 U	46 U	6.1 U	92 U	6.1 U	**18 J**	0.61 U	46 U	6.1 U
TMP-19	90	53 U	6 U	1100 U	**33**	1100 U	12 U	530 U	6 U	53 U	6 U	110 U	6 U	53 U	6 U	110 U	6 U	**18 J**	0.6 U	53 U	6 U
TMP-19	95	44 U	7 U	880 U	14 U	880 U	14 U	440 U	7 U	44 U	7 U	88 U	7 U	44 U	7 U	88 U	7 U	**18 J**	0.7 U	44 U	7 U
TMP-19	100	48 U	n/a	960 U	n/a	960 U	n/a	480 U	n/a	48 U	n/a	96 U	n/a	48 U	n/a	96 U	n/a	**19 J**	n/a	48 U	n/a
TMP-22	25	0.86 U	7.2 U	17 U	14 U	17 U	14 U	**0.46 J**	7.2 UJ	0.86 U	7.2 U	1.7 U	7.2 UJ	0.86 U	7.2 U	1.7 U	7.2 U	0.86 UJ	0.72 UJ	**4.6**	7.2 U
TMP-22	30	0.84 U	5 U	17 U	10 U	17 U	10 U	**0.17 J**	5 U	0.84 U	5 U	1.7 U	5 U	0.84 U	5 U	**0.18 J**	5 U	0.84 UJ	0.5 U	**0.81 J**	5 U
TMP-22	35	0.82 U	5.6 U	16 U	**130**	16 U	11 U	**0.19 J**	5.6 U	0.82 U	5.6 U	1.6 U	5.6 U	0.82 U	5.6 U	1.6 U	5.6 U	0.64 UJ	0.56 U	**1.5**	5.6 U
TMP-22	40	0.75 U	5.5 U	15 U	11 U	15 U	11 U	7.5 U	5.5 U	0.75 U	5.5 U	1.5 U	5.5 U	0.75 U	5.5 U	1.5 U	5.5 U	0.75 UJ	0.55 U	**1.1**	5.5 U
TMP-22	45	0.97 U	4.6 U	19 U	9.2 U	19 U	9.2 U	9.7 U	4.6 U	0.97 U	4.6 U	1.9 U	4.6 U	0.97 U	4.6 U	1.9 U	4.6 U	4.4 UJ	0.46 U	**1.1**	4.6 U
TMP-22	50	0.86 U	5.3 U	17 U	11 U	17 U	11 U	8.6 U	5.3 U	0.86 U	5.3 U	1.7 U	5.3 U	0.86 U	5.3 U	1.7 U	5.3 U	0.57 UJ	0.53 U	0.86 U	5.3 U
TMP-22	55	1 U	5 U	20 U	10 U	20 U	10 U	10 U	5 U	1 U	5 U	2 U	5 U	1 U	5 U	2 U	5 U	6.3 U	0.5 U	**0.54 J**	5 U
TMP-22	60	0.94 U	5.6 U	19 U	11 U	19 U	11 U	9.4 U	5.6 U	0.94 U	5.6 U	1.9 U	5.6 U	0.94 U	5.6 U	1.9 U	5.6 U	1.8 U	0.56 U	0.94 U	5.6 U
TMP-22	65	41 U	5.6 U	820 U	11 U	820 U	11 U	410 U	5.6 U	41 U	5.6 U	82 U	5.6 U	41 U	5.6 U	82 U	5.6 U	25 U	0.56 U	41 U	5.6 U
TMP-22	70	40 U	5.2 U	800 U	10 U	800 U	10 U	400 U	5.2 U	40 U	5.2 U	80 U	5.2 U	40 U	5.2 U	80 U	5.2 U	28 U	0.52 U	40 U	5.2 U
TMP-22	75	44 U	5.8 U	890 U	12 U	890 U	12 U	440 U	5.8 U	44 U	5.8 U	89 U	5.8 U	44 U	5.8 U	89 U	5.8 U	35 U	0.58 U	44 U	5.8 U
TMP-22	80	43 U	5.8 U	870 U	12 U	870 U	12 U	430 U	5.8 U	43 U	5.8 U	87 U	5.8 U	43 U	5.8 U	87 U	5.8 U	27 U	0.58 U	43 U	5.8 U
TMP-22	85	61 U	5.5 U	1200 U	11 U	1200 U	11 U	610 U	5.5 U	61 U	5.5 U	120 U	5.5 U	61 U	5.5 U	120 U	5.5 U	32 U	0.55 U	61 U	5.5 U
TMP-22	90	43 U	6.4 U	860 U	**44**	860 U	13 U	430 U	6.4 U	43 U	6.4 U	86 U	6.4 U	43 U	6.4 U	86 U	6.4 U	30 U	0.64 U	43 U	6.4 U
TMP-22	95	45 U	6.8 U	900 U	14 U	900 U	14 U	450 U	6.8 U	45 U	6.8 U	90 U	6.8 U	45 U	6.8 U	90 U	6.8 U	30 U	0.68 U	45 U	6.8 U
TMP-22	100	35 U	n/a	710 U	n/a	710 U	n/a	350 U	n/a	35 U	n/a	71 U	n/a	35 U	n/a	71 U	n/a	28 U	n/a	35 U	n/a
TMP-27	25	0.91 U	6.4 U	18 U	13 U	18 U	13 U	9.1 U	6.4 U	0.91 U	6.4 U	1.8 UJ	6.4 U	**2.2**	6.4 U	1.8 U	6.4 U	0.87 U	0.64 U	0.91 U	6.4 U
TMP-27	30	**0.15 J**	5.1 U	18 U	10 U	18 U	10 U	8.9 U	**2.2 J**	0.89 U	5.1 U	1.8 UJ	5.1 U	0.89 U	5.1 U	1.8 U	5.1 U	0.89 U	0.51 U	**26**	5.1 U
TMP-27	35	**0.2 J**	5.9 U	15 U	12 U	15 U	12 U	0.26 U	5.9 U	0.77 U	5.9 U	1.5 UJ	5.9 U	0.77 U	5.9 U	**0.13 J**	5.9 U	0.36 U	0.59 U	**5.8**	5.9 U
TMP-27	40	0.91 U	5.8 U	18 U	12 U	18 U	12 U	9.1 U	5.8 U	0.91 U	5.8 U	1.8 UJ	5.8 U	0.91 U	5.8 U	1.8 U	5.8 U	0.89 U	0.58 U	0.91 U	5.8 U
TMP-27	45	0.85 U	4.9 U	17 U	9.9 U	17 U	9.9 U	8.5 U	4.9 U	0.85 U	4.9 U	1.7 UJ	4.9 U	0.85 U	4.9 U	1.7 U	4.9 U	8 U	0.49 U	**0.53 J**	4.9 U
TMP-27	50	**0.15 J**	5.3 U	17 U	11 U	17 U	11 U	8.5 U	5.3 U	0.85 U	5.3 U	1.7 UJ	5.3 U	0.85 U	5.3 U	1.7 U	5.3 U	13 U	0.53 U	**1.8**	5.3 U
TMP-27	55	0.99 U	5.8 U	20 U	12 U	20 U	12 U	9.9 U	5.8 U	0.99 U	5.8 U	2 UJ	5.8 U	0.99 U	5.8 U	2 U	5.8 U	14 U	0.58 U	**0.96 J**	5.8 U
TMP-27	60	0.77 U	6.2 U	15 U	12 U	15 U	12 U	7.7 U	6.2 U	0.77 U	6.2 U	1.5 UJ	6.2 U	0.77 U	6.2 U	1.5 U	6.2 U	0.15 U	0.62 U	**0.46 J**	6.2 U
TMP-27	65	0.85 U	6.3 U	17 U	13 U	17 U	13 U	8.5 U	6.3 U	0.85 U	6.3 U	1.7 UJ	6.3 U	0.85 U	6.3 U	1.7 U	6.3 U	0.85 U	0.63 U	**1.2**	6.3 U
TMP-27	70	46 U	5.8 U	910 U	12 U	910 U	12 U	460 U	5.8 U	46 U	5.8 U	91 UJ	5.8 U	46 U	5.8 U	91 U	5.8 U	7.5 U	0.58 U	46 U	5.8 U
TMP-27	75	0.92 U	5.9 U	18 U	12 U	18 U	12 U	9.2 U	5.9 U	0.92 U	5.9 U	1.8 UJ	5.9 U	0.92 U	5.9 U	1.8 U	5.9 U	0.92 U	0.59 U	0.92 U	5.9 U
TMP-27	80	0.82 U	5.7 U	16 U	11 U	16 U	11 U	8.2 U	5.7 U	0.82 U	5.7 U	1.6 UJ	5.7 U	0.82 U	5.7 U	1.6 U	5.7 U	0.82 U	0.57 U	0.82 U	5.7 U
TMP-27	85	**0.26 J**	5.8 U	17 U	12 U	17 U	12 U	8.7 U	5.8 U	**3.4**	5.8 U	1.7 UJ	5.8 U	0.87 U	5.8 U	1.7 U	5.8 U	0.87 U	0.58 U	0.87 U	5.8 U
TMP-27	90	**0.25 J**	6.2 U	20 U	12 U	20 U	12 U	10 U	6.2 U	1 U	6.2 U	2 UJ	6.2 U	1 U	6.2 U	2 U	6.2 U	1 U	0.62 U	1 U	6.2 U
TMP-27	95	42 U	5.3 U	840 U	11 U	840 U	11 U	420 U	5.3 U	42 U	5.3 U	84 UJ	5.3 U	42 U	5.3 U	84 U	5.3 U	8.3 U	0.53 U	42 U	5.3 U
TMP-27	100	44 U	n/a	870 U	n/a	870 U	n/a	440 U	n/a	44 U	n/a	87 UJ	n/a	44 U	n/a	87 U	n/a	11 U	n/a	44 U	n/a

VOCs that were not detected above the reporting limits during pre- and post-ERH soil sampling events:

1,1,1-Trichloroethane	1,2-Dibromo-3-Chloropropane	Bromomethane	Isopropanol	p-Isopropyltoluene
1,1,2,2-Tetrachloroethane	1,3,5-Trimethylbenzene	Carbon tetrachloride	Isopropylbenzene	Sec-Butylbenzene
1,1,2-Trichloroethane	1,4-Dioxane (P-Dioxane)	Chloroethane	Methyl Acetate	Vinyl acetate
1,2,3-Trichloropropane	2,2-Dichloropropane	Chloromethane	N-Propylbenzene	Trichlorofluoromethane
1,2,4-Trichlorobenzene	Bromodichloromethane	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	
1,2,4-Trimethylbenzene	Bromoform	Dichlorodifluoromethane	Trichlorofluoromethane	

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit

Abbreviations:

ERH - Electrical Resistance Heating
ft bgs - feet below ground surface
n/a - not available
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms
VOCs - Volatile Organic Compounds

Table 8
Evaluation of Contaminant Reduction for Select Chemicals of Concern
Pemaco Superfund Site, Maywood, California

	Analyte	cis-1,2-Dichloroethene				Methylene chloride				Trichloroethene				Vinyl chloride			
TMP ID	**Depth (ft bgs)**	SSRL*	pre-ERH	post-ERH	Reduction**	SSRL*	pre-ERH	post-ERH	Reduction**	SSRL*	pre-ERH	post-ERH	Reduction**	SSRL*	pre-ERH	post-ERH	Reduction**
TMP-05	25	400	**0.92**	5.6 U	204%	20	8.7 U	5.6 U	n/a	60	**80**	5.6 U	-97%	10	0.87 U	5.6 U	n/a
TMP-05	30	400	**1.7**	5.7 U	68%	20	8.7 U	5.7 U	n/a	60	**53**	5.7 U	-95%	10	0.87 U	5.7 U	n/a
TMP-05	35	400	**4**	6.2 U	-23%	20	8.9 U	6.2 U	n/a	60	**100**	6.2 U	-97%	10	**0.38 J**	6.2 U	716%
TMP-05	40	400	**3.9**	5.8 U	-26%	20	11 U	5.8 U	n/a	60	**100**	5.8 U	-97%	10	**0.36 J**	5.8 U	706%
TMP-05	45	400	**8.6**	5.5 U	-68%	20	8.1 U	5.5 U	n/a	60	**150**	5.5 U	-98%	10	**0.83**	5.5 U	231%
TMP-05	50	400	1.1 U	5.9 U	n/a	20	11 UJ	5.9 U	n/a	60	**3.4**	5.9 U	-13%	10	1.1 U	5.9 U	n/a
TMP-05	55	400	**8**	6 U	-63%	20	10 UJ	6 U	n/a	60	**200**	6.0 U	-99%	10	**0.66 J**	6 U	355%
TMP-05	60	400	45 U	5.6 U	n/a	20	**340 J**	5.6 U	-99%	60	**410**	5.6 U	-99%	10	45 U	5.6 U	n/a
TMP-05	65	400	**16 J**	6.3 U	-80%	20	**280 J**	6.3 U	-99%	60	**1,900**	6.3 U	-100%	10	39 U	6.3 U	n/a
TMP-05	70	n/a	47 U	6.2 U	n/a	n/a	**380 J**	6.2 U	-99%	n/a	**910**	**3.9 J**	-100%	n/a	47 U	6.2 U	n/a
TMP-05	75	n/a	48 U	7.2 U	n/a	n/a	**350 J**	7.2 U	-99%	n/a	**2,200**	**38**	-98%	n/a	48 U	7.2 U	n/a
TMP-05	80	n/a	41 U	6 U	n/a	n/a	**300 J**	6 U	-99%	n/a	**970**	**33**	-97%	n/a	41 U	6 U	n/a
TMP-05	85	n/a	**4.2**	**4.4 J**	5%	n/a	8.5 U	7.1 U	n/a	n/a	**130**	**100**	-23%	n/a	0.85 U	7.1 U	n/a
TMP-05	90	n/a	**16 J**	5.1 U	-84%	n/a	**390 J**	5.1 U	-99%	n/a	**1,700**	**25**	-99%	n/a	50 U	5.1 U	n/a
TMP-05	95	n/a	**3.8**	6.6 U	-13%	n/a	12 UJ	6.6 U	n/a	n/a	**34**	**110**	224%	n/a	1.2 U	6.6 U	n/a
TMP-05	100	n/a	**4.6**	n/a	-100%	n/a	8.1 UJ	n/a	n/a	n/a	**150**	n/a	n/a	n/a	**0.32 J**	n/a	n/a
TMP-09	25	400	**3**	5.8 U	-3%	20	9.5 U	5.8 U	n/a	60	**200**	5.8 U	-99%	10	0.95 U	5.8 U	n/a
TMP-09	30	400	**12**	5.1 U	-79%	20	15 U	5.1 U	n/a	60	**250**	5.1 U	-99%	10	1.5 U	5.1 U	n/a
TMP-09	35	400	0.96 U	7.2 U	n/a	20	9.6 UJ	7.2 U	n/a	60	**2.7**	7.2 U	33%	10	0.96 UJ	7.2 U	n/a
TMP-09	40	400	**47**	6.4 U	-93%	20	8.2 U	6.4 U	n/a	60	**320**	6.4 U	-99%	10	**2.7**	6.4 U	19%
TMP-09	45	400	**23 J**	5.1 U	-89%	20	460 U	5.1 U	n/a	60	**420**	5.1 U	-99%	10	40 U	5.1 U	n/a
TMP-09	50	400	**44 J**	7.8 U	-91%	20	560 UJ	7.8 U	n/a	60	**960**	7.8 U	-100%	10	47 U	7.8 U	n/a
TMP-09	55	400	**47**	5.5 U	-94%	20	510 U	5.5 U	n/a	60	**1,000**	5.5 U	-100%	10	42 U	5.5 U	n/a
TMP-09	60	400	**47**	5.7 U	-94%	20	520 U	5.7 U	n/a	60	**1,000**	5.7 U	-100%	10	44 U	5.7 U	n/a
TMP-09	65	400	46 U	5.6 U	n/a	20	510 U	5.6 U	n/a	60	**1,900**	5.6 U	-100%	10	46 U	5.6 U	n/a
TMP-09	70	n/a	**22 J**	n/a	n/a	n/a	580 UJ	6.4 U	n/a	n/a	**3,000**	6.4 U	-100%	n/a	45 U	6.4 U	n/a
TMP-09	75	n/a	56 U	6.5 U	n/a	n/a	680 UJ	6.5 U	n/a	n/a	**3,100**	6.5 U	-100%	n/a	56 U	6.5 U	n/a
TMP-09	80	n/a	50 U	5.9 U	n/a	n/a	580 U	5.9 U	n/a	n/a	**4,500**	5.9 U	-100%	n/a	50 U	5.9 U	n/a
TMP-09	85	n/a	**3.2**	5.9 U	-8%	n/a	9.2 U	5.9 U	n/a	n/a	**150**	**34**	-77%	n/a	0.92 U	5.9 U	n/a
TMP-09	90	n/a	110 U	n/a	n/a	n/a	1400 UJ	n/a	n/a	n/a	**2,000**	n/a	n/a	n/a	110 UJ	n/a	n/a
TMP-09	95	n/a	**53**	6.7 U	-94%	n/a	540 U	6.7 U	n/a	n/a	**860**	**12**	-99%	n/a	42 U	6.7 U	n/a
TMP-09	100	n/a	n/a	4.8 U	n/a	n/a	n/a	4.8 U	n/a	n/a	n/a	**2.7 J**	n/a	n/a	n/a	4.8 U	n/a
TMP-09	105	n/a	n/a	**2.4 J**	n/a	n/a	n/a	5.8 U	n/a	n/a	n/a	**21**	n/a	n/a	n/a	5.8 U	n/a
TMP-09	110	n/a	n/a	**34**	n/a	n/a	n/a	5.7 U	n/a	n/a	n/a	**120**	n/a	n/a	n/a	5.7 U	n/a
TMP-11	25	400	**2.7**	6.7 U	24%	20	8 UJ	6.7 U	n/a	60	**37**	6.7 U	-91%	10	0.8 U	6.7 U	n/a
TMP-11	30	400	0.95 U	5.6 U	n/a	20	9.5 UJ	5.6 U	n/a	60	**0.67 J**	5.6 U	318%	10	0.95 U	5.6 U	n/a
TMP-11	35	400	**4.3**	5.5 U	-36%	20	12 UJ	5.5 U	n/a	60	**18**	5.5 U	-85%	10	1.2 U	5.5 U	n/a
TMP-11	40	400	**0.56 J**	4.4 U	293%	20	10 UJ	4.4 U	n/a	60	**3.4**	4.4 U	-35%	10	1 U	4.4 U	n/a
TMP-11	45	400	**110**	4.7 U	-98%	20	**270 J**	4.7 U	-99%	60	**1,300**	4.7 U	-100%	10	46 U	4.7 U	n/a
TMP-11	50	400	**94**	4.4 U	-98%	20	8.7 UJ	4.4 U	n/a	60	**170**	4.4 U	-99%	10	**1.6**	4.4 U	38%
TMP-11	55	400	**61**	5.3 U	-96%	20	460 U	5.3 U	n/a	60	**690**	5.3 U	-100%	10	46 U	5.3 U	n/a
TMP-11	60	400	**59**	5.9 U	-95%	20	480 U	5.9 U	n/a	60	**790**	5.9 U	-100%	10	48 U	5.9 U	n/a
TMP-11	65	400	**66**	6.4 U	-95%	20	**230 J**	6.4 U	-99%	60	**1,300**	6.4 U	-100%	10	41 U	6.4 U	n/a
TMP-11	70	n/a	**34 J**	5.4 U	-92%	n/a	400 U	5.4 U	n/a	n/a	**860**	5.4 U	-100%	n/a	40 U	5.4 U	n/a
TMP-11	75	n/a	46 U	6.6 U	n/a	n/a	460 U	6.6 U	n/a	n/a	**1,000**	**40**	-96%	n/a	46 U	6.6 U	n/a
TMP-11	80	n/a	52 U	5.8 U	n/a	n/a	520 UJ	**3.1 J**	-99%	n/a	**1,400**	5.8 U	-100%	n/a	52 U	5.8 U	n/a
TMP-11	85	n/a	**8.4**	**6.6**	-21%	n/a	8.9 UJ	5.4 U	n/a	n/a	**160**	**77**	-52%	n/a	0.89 U	5.4 U	n/a
TMP-11	90	n/a	**6.8**	**13**	91%	n/a	14 UJ	6.6 U	n/a	n/a	**71**	**200**	182%	n/a	1.4 U	6.6 U	n/a
TMP-11	95	n/a	**18**	6.3 U	-83%	n/a	8.9 UJ	6.3 U	n/a	n/a	**320**	**5 J**	-98%	n/a	**0.49 J**	6.3 U	543%
TMP-11	100	n/a	1 U	n/a	n/a	n/a	10 UJ	n/a	n/a	n/a	**0.95 J**	n/a	-100%	n/a	1 U	n/a	n/a
TMP-17	25	400	**140**	5.7 U	-98%	20	8.5 U	5.7 U	n/a	60	**9.8**	5.7 U	-71%	10	**120**	5.7 U	-98%
TMP-17	30	400	**27**	5.9 U	-89%	20	7.4 U	5.9 U	n/a	60	**200**	**5.7 J**	-97%	10	0.74 U	5.9 U	n/a
TMP-17	35	400	**130**	6.1 U	-98%	20	480 U	6.1 U	n/a	60	**570**	6.1 U	-99%	10	39 U	6.1 U	n/a
TMP-17	40	400	**0.8 J**	5.3 U	231%	20	8.8 U	5.3 U	n/a	60	**7.3**	5.3 U	-64%	10	0.88 U	5.3 U	n/a
TMP-17	45	400	**120**	5.4 U	-98%	20	8.2 U	5.4 U	n/a	60	**800**	5.4 U	-100%	10	**3.4**	5.4 U	-21%
TMP-17	50	400	**130**	5.6 U	-98%	20	9.3 U	5.6 U	n/a	60	**1,100**	5.6 U	-100%	10	**6.2**	5.6 U	-55%
TMP-17	55	400	**160**	5.9 U	-98%	20	260 U	5.9 U	n/a	60	**1,500**	5.9 U	-100%	10	42 U	5.9 U	n/a
TMP-17	60	400	**160**	6.4 U	-98%	20	490 U	6.4 U	n/a	60	**1,400**	6.4 U	-100%	10	42 U	6.4 U	n/a
TMP-17	65	400	**210**	4.9 U	-99%	20	540 U	4.9 U	n/a	60	**3,300**	4.9 U	-100%	10	45 U	4.9 U	n/a
TMP-17	70	n/a	**230**	7.2 U	-98%	n/a	500 U	7.2 U	n/a	n/a	**4,600**	7.2 U	-100%	n/a	41 U	7.2 U	n/a
TMP-17	75	n/a	**160**	6.7 U	-98%	n/a	570 U	6.7 U	n/a	n/a	**4,400**	6.7 U	-100%	n/a	44 U	6.7 U	n/a
TMP-17	80	n/a	**51**	6.5 U	-94%	n/a	8.4 U	6.5 U	n/a	n/a	**3,100**	6.5 U	-100%	n/a	**3.3**	6.5 U	-2%
TMP-17	85	n/a	45 U	6.3 U	n/a	n/a	560 U	6.3 U	n/a	n/a	**930**	**5.6 J**	-99%	n/a	45 U	6.3 U	n/a

Table 8
Evaluation of Contaminant Reduction for Select Chemicals of Concern
Pemaco Superfund Site, Maywood, California

	Analyte	cis-1,2-Dichloroethene				Methylene chloride				Trichloroethene				Vinyl chloride			
TMP ID	**Depth (ft bgs)**	SSRL*	pre-ERH	post-ERH	Reduction**	SSRL*	pre-ERH	post-ERH	Reduction**	SSRL*	pre-ERH	post-ERH	Reduction**	SSRL*	pre-ERH	post-ERH	Reduction**
TMP-17	90	n/a	**40**	**4.3 J**	-89%	n/a	11 UJ	5.6 U	n/a	n/a	**530**	**51**	-90%	n/a	**2.2 J**	5.6 U	27%
TMP-17	95	n/a	**170**	**5.2 J**	-97%	n/a	310 U	6.9 U	n/a	n/a	**2,300**	**34**	-99%	n/a	42 U	6.9 U	n/a
TMP-17	100	n/a	**110**	n/a	n/a	n/a	310 U	n/a	n/a	n/a	**1,900**	n/a	n/a	n/a	42 U	n/a	n/a
TMP-19	25	400	**70**	6 U	-96%	20	9.2 UJ	6 U	n/a	60	**2.0**	6.0 U	50%	10	**67**	6 U	-96%
TMP-19	30	400	**300**	**5.1 J**	-98%	20	**390 J**	6.1 U	-99%	60	**910**	6.1 U	-100%	10	53 U	6.1 U	n/a
TMP-19	35	400	**730**	6 U	-100%	20	**350 J**	6 U	-99%	60	**3,800**	6.0 U	-100%	10	**17 J**	6 U	-82%
TMP-19	40	400	**3.0**	5.3 U	-12%	20	9.8 UJ	5.3 U	n/a	60	**8.3**	5.3 U	-68%	10	0.98 U	5.3 U	n/a
TMP-19	45	400	**550**	6 U	-99%	20	**330 J**	6 U	-99%	60	**3,400**	6.0 U	-100%	10	**16 J**	6 U	-81%
TMP-19	50	400	**430**	6.7 U	-99%	20	**410 J**	6.7 U	-99%	60	**2,100**	6.7 U	-100%	10	52 U	6.7 U	n/a
TMP-19	55	400	**160**	6 U	-98%	20	**320 J**	6 U	-99%	60	**690**	6.0 U	-100%	10	43 U	6 U	n/a
TMP-19	60	400	**340**	5.9 U	-99%	20	**340 J**	5.9 U	-99%	60	**2,300**	5.9 U	-100%	10	44 U	5.9 U	n/a
TMP-19	65	400	**310**	6.5 U	-99%	20	**300 J**	6.5 U	-99%	60	**2,500**	6.5 U	-100%	10	40 U	6.5 U	n/a
TMP-19	70	n/a	**46**	5.5 U	-94%	n/a	**380 J**	5.5 U	-99%	n/a	**1,500**	5.5 U	-100%	n/a	45 U	5.5 U	n/a
TMP-19	75	n/a	**29 J**	**5.1 J**	-82%	n/a	**410 J**	7.2 U	-99%	n/a	**1,800**	**74**	-96%	n/a	51 U	7.2 U	n/a
TMP-19	80	n/a	46 U	**6.3 J**	-73%	n/a	**310 J**	6.8 U	-99%	n/a	**980**	**71**	-93%	n/a	46 U	6.8 U	n/a
TMP-19	85	n/a	46 U	**7.8**	-66%	n/a	**360 J**	6.1 U	-99%	n/a	**840**	6.1 U	-100%	n/a	46 U	6.1 U	n/a
TMP-19	90	n/a	**20 J**	**6.2**	-69%	n/a	**360 J**	6 U	-99%	n/a	**580**	6.0 U	-99%	n/a	53 U	6 U	n/a
TMP-19	95	n/a	**190**	**5 J**	-97%	n/a	**360 J**	7 U	-99%	n/a	**1,600**	**34**	-98%	n/a	**32 J**	7 U	-89%
TMP-19	100	n/a	**110**	n/a	n/a	n/a	**400 J**	n/a	n/a	n/a	**1,900**	n/a	n/a	n/a	48 U	n/a	n/a
TMP-22	25	400	**64**	7.2 U	-94%	20	8.6 UJ	7.2 U	n/a	60	**45**	7.2 U	-92%	10	0.86 U	7.2 U	n/a
TMP-22	30	400	**7.1**	5 U	-65%	20	8.4 UJ	5 U	n/a	60	**67**	5.0 U	-96%	10	0.84 U	5 U	n/a
TMP-22	35	400	**11**	5.6 U	-75%	20	8.2 UJ	5.6 U	n/a	60	**130**	5.6 U	-98%	10	0.82 U	5.6 U	n/a
TMP-22	40	400	**7.6**	5.5 U	-64%	20	7.5 UJ	5.5 U	n/a	60	**130**	5.5 U	-98%	10	0.75 U	5.5 U	n/a
TMP-22	45	400	**17**	4.6 U	-86%	20	9.7 UJ	4.6 U	n/a	60	**430**	4.6 U	-99%	10	**2.1**	4.6 U	10%
TMP-22	50	400	0.86 UJ	5.3 U	n/a	20	8.6 UJ	5.3 U	n/a	60	**1.8 J**	5.3 U	47%	10	0.86 U	5.3 U	n/a
TMP-22	55	400	**14**	5 U	-82%	20	10 UJ	5 U	n/a	60	**240**	5.0 U	-99%	10	**1.3**	5 U	92%
TMP-22	60	400	**3.9**	5.6 U	-28%	20	9.4 U	5.6 U	n/a	60	**78**	5.6 U	-96%	10	0.94 U	5.6 U	n/a
TMP-22	65	400	41 U	5.6 U	n/a	20	250 U	5.6 U	n/a	60	**1,100**	5.6 U	-100%	10	41 U	5.6 U	n/a
TMP-22	70	n/a	40 U	5.2 U	n/a	n/a	400 U	5.2 U	n/a	n/a	**1,800**	5.2 U	-100%	n/a	40 U	5.2 U	n/a
TMP-22	75	n/a	44 U	5.8 U	n/a	n/a	270 U	5.8 U	n/a	n/a	**3,200**	5.8 U	-100%	n/a	44 U	5.8 U	n/a
TMP-22	80	n/a	43 U	5.8 U	n/a	n/a	260 U	5.8 U	n/a	n/a	**3,500**	**34**	-99%	n/a	43 U	5.8 U	n/a
TMP-22	85	n/a	**61 J**	5.5 U	-95%	n/a	400 U	5.5 U	n/a	n/a	**1,200**	**6.1**	-99%	n/a	61 U	5.5 U	n/a
TMP-22	90	n/a	**22 J**	6.4 U	-85%	n/a	290 U	6.4 U	n/a	n/a	**6,900**	**14**	-100%	n/a	43 U	6.4 U	n/a
TMP-22	95	n/a	**13 J**	6.8 U	-74%	n/a	320 U	6.8 U	n/a	n/a	**1,400**	**28**	-98%	n/a	45 U	6.8 U	n/a
TMP-22	100	n/a	**51**	n/a	n/a	n/a	180 U	n/a	n/a	n/a	**1,100**	n/a	n/a	n/a	35 U	n/a	n/a
TMP-27	25	400	**0.32 J**	6.4 U	900%	20	9.1 U	6.4 U	n/a	60	**1.2 J**	6.4 U	167%	10	0.91 U	6.4 U	n/a
TMP-27	30	400	**110**	5.1 U	-98%	20	8.9 U	5.1 U	n/a	60	**270**	5.1 U	-99%	10	**54**	5.1 U	-95%
TMP-27	35	400	**48**	5.9 UJ	-94%	20	7.7 U	5.9 U	n/a	60	**300**	5.9 UJ	-99%	10	**5.2**	5.9 U	-43%
TMP-27	40	400	**2.7**	5.8 U	7%	20	9.1 U	5.8 U	n/a	60	**9.1**	5.8 U	-68%	10	0.91 U	5.8 U	n/a
TMP-27	45	400	**24**	4.9 U	-90%	20	8.5 U	4.9 U	n/a	60	**93**	4.9 U	-97%	10	**0.41 J**	4.9 U	498%
TMP-27	50	400	**59**	**5.9**	-90%	20	8.5 U	5.3 U	n/a	60	**330**	**8.9**	-97%	10	**6.9**	5.3 U	-62%
TMP-27	55	400	**24**	5.8 U	-88%	20	9.9 U	5.8 U	n/a	60	**180**	5.8 U	-98%	10	**4.2**	5.8 U	-31%
TMP-27	60	400	**8.2**	6.2 U	-62%	20	7.7 U	6.2 U	n/a	60	**110**	6.2 U	-97%	10	**7.6**	6.2 U	-59%
TMP-27	65	400	**45**	6.3 U	-93%	20	8.5 U	6.3 U	n/a	60	**300**	6.3 U	-99%	10	**15**	6.3 U	-79%
TMP-27	70	n/a	**77**	5.8 U	-96%	n/a	510 U	5.8 U	n/a	n/a	**640**	5.8 U	-100%	n/a	46 U	5.8 U	n/a
TMP-27	75	n/a	**2.2**	**3 J**	36%	n/a	9.2 U	5.9 U	n/a	n/a	**270**	**18**	-93%	n/a	0.92 U	5.9 U	n/a
TMP-27	80	n/a	**1.4**	5.7 U	104%	n/a	8.2 U	5.7 U	n/a	n/a	**550**	**16**	-97%	n/a	0.82 U	5.7 U	n/a
TMP-27	85	n/a	**5.6**	**4.4 J**	-21%	n/a	8.7 U	5.8 U	n/a	n/a	**170**	**72**	-58%	n/a	0.87 U	5.8 U	n/a
TMP-27	90	n/a	**6.3**	**5.5 J**	-13%	n/a	10 U	6.2 U	n/a	n/a	**200**	**45**	-78%	n/a	1 U	6.2 U	n/a
TMP-27	95	n/a	**110**	**2.7 J**	-98%	n/a	470 U	5.3 U	n/a	n/a	**1,500**	**5.1 J**	-100%	n/a	42 U	5.3 U	n/a
TMP-27	100	n/a	**100**	n/a	n/a	n/a	520 U	n/a	n/a	n/a	**2,000**	n/a	n/a	n/a	44 U	n/a	n/a

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit
730 highlighted values indicate exceeding Pemaco SSRLs

Notes (Continued):

* SSRLs for cis-1,2-Dichloroethene, methylene chloride, trichloroethene, and vinyl chloride were established for soil concentrations in both upper and lower vadose zones (between 2 and 65 ft bgs)
** Percent reduction for non-detects was calculated using 1/2 of the reporting limit. Negative values indicate that concentration was reduced after ERH treatment;

Abbreviations:

ERH - Electrical Resistance Heating
ft bgs - feet below ground surface
n/a - not applicable or not available
SSRLs - Site-Specific Remediation Levels
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms

Table 9
Evaluation of Field Duplicate Results for Pre-ERH Soil Sampling Event
Pemaco Superfund Site, Maywood, California

Field Sample ID:		TMP-05-35			TMP-05-95			TMP-09-35			TMP-09-90			TMP-11-35			TMP-11-90			TMP-17-40		
Sample Date:		12/7/06			12/7/06			11/16/06			11/16/06			11/28/06			11/29/06			11/13/06		
Sample Type:		FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**
Analyte*	**Units**																					
1,1-Dichloroethane	ug/kg	0.88 U	0.89 U	n/a	0.92 U	1.2 U	n/a	0.82 U	0.96 U	n/a	100 U	110 U	n/a	0.83 U	1.2 U	n/a	**0.41 J**	1.4 U	n/a	0.86 U	0.88 U	n/a
1,1-Dichloroethene	ug/kg	**0.54 J**	**0.42 J**	**25%**	**0.27 J**	**0.3 J**	**11%**	0.82 UJ	0.96 U	n/a	100 U	110 U	n/a	0.83 U	1.2 U	n/a	**1.2 J**	**0.54 J**	**76%**	0.86 U	0.88 U	n/a
1,2,4-Trimethylbenzene	ug/kg	1.8 U	**0.11 J**	n/a	1.8 U	**0.14 J**	n/a	1.6 U	1.9 U	n/a	210 U	220 U	n/a	1.7 U	2.3 U	n/a	2 U	2.8 U	n/a	1.7 U	1.8 U	n/a
1,3,5-Trimethylbenzene	ug/kg	1.8 U	**0.13 J**	n/a	1.8 U	2.3 U	n/a	1.6 U	1.9 U	n/a	210 U	220 U	n/a	1.7 UJ	2.3 UJ	n/a	2 U	2.8 U	n/a	1.7 U	1.8 U	n/a
2-Butanone	ug/kg	18 UJ	**9.5 J**	n/a	**19 J**	23 UJ	n/a	16 U	19 U	n/a	2100 U	2200 U	n/a	17 U	23 U	n/a	**15 J**	**24 J**	**46%**	17 U	18 U	n/a
Acetone	ug/kg	23 UJ	36 UJ	n/a	38 UJ	23 UJ	n/a	**28 J**	**42 J**	**40%**	5200 UJ	5600 UJ	n/a	**20 J**	**30 J**	**40%**	**53**	**69 J**	**26%**	8.9 U	44 U	n/a
Benzene	ug/kg	3.9 U	17 U	n/a	19 U	15 U	n/a	0.82 U	0.26 U	n/a	100 U	110 U	n/a	0.69 U	1.2 U	n/a	12 U	24 U	n/a	0.28 U	0.32 U	n/a
Carbon disulfide	ug/kg	**0.19 J**	**0.28 J**	**38%**	9.2 U	12 U	n/a	8.2 U	9.6 U	n/a	1000 U	1100 U	n/a	**0.33 J**	12 U	n/a	**0.4 J**	**0.26 J**	**42%**	8.6 U	8.8 U	n/a
cis-1,2-Dichloroethene	ug/kg	**3.3**	**4.0**	**19%**	**3.3**	**3.8**	**14%**	**0.33 J**	0.96 U	n/a	100 U	110 U	n/a	**5.1**	**4.3**	**17%**	**13**	**6.8**	**63%**	**0.83 J**	**0.8 J**	**4%**
Ethylbenzene	ug/kg	**0.27 J**	**0.79 J**	**98%**	**0.98 J**	**0.7 J**	**33%**	0.82 U	0.96 U	n/a	100 U	110 U	n/a	0.83 U	1.2 U	n/a	**0.41 J**	**0.93 J**	**78%**	0.86 U	0.88 U	n/a
Isopropanol	ug/kg	44 U	45 UJ	n/a	46 U	58 U	n/a	41 UJ	48 UJ	n/a	5200 UJ	5600 UJ	n/a	42 UJ	58 UJ	n/a	50 UJ	70 UJ	n/a	43 U	44 U	n/a
Isopropylbenzene	ug/kg	0.88 U	**0.13 J**	n/a	0.92 U	1.2 U	n/a	0.82 U	0.96 U	n/a	100 U	110 U	n/a	0.83 UJ	1.2 UJ	n/a	1 U	1.4 U	n/a	0.86 U	0.88 U	n/a
m,p-Xylene	ug/kg	0.5 U	1.5 U	n/a	1.4 U	1 U	n/a	1.6 U	0.27 U	n/a	210 U	220 U	n/a	0.18 U	2.3 U	n/a	0.75 U	1.6 U	n/a	1.7 U	1.8 U	n/a
Methylene chloride	ug/kg	8.8 UJ	8.9 U	n/a	9.2 UJ	12 UJ	n/a	8.2 UJ	9.6 UJ	n/a	1400 UJ	1400 UJ	n/a	8.3 UJ	12 UJ	n/a	10 UJ	14 UJ	n/a	8.6 U	8.8 U	n/a
N-Hexane	ug/kg	**19**	**15**	**24%**	0.16 U	1.2 U	n/a	0.52 U	2 U	n/a	19 UJ	20 UJ	n/a	**5.2 J**	**1.2 J**	**125%**	1 U	1.4 U	n/a	0.65 U	0.6 U	n/a
o-Xylene	ug/kg	**0.13 J**	**0.53 J**	**121%**	**0.37 J**	**0.34 J**	**8%**	0.82 U	0.96 U	n/a	100 U	110 U	n/a	0.83 U	1.2 U	n/a	0.18 U	0.46 U	n/a	0.86 U	0.88 U	n/a
Tetrachloroethene	ug/kg	**0.25 J**	**0.28 J**	**11%**	0.92 UJ	1.2 UJ	n/a	0.82 UJ	0.96 UJ	n/a	100 U	110 U	n/a	0.83 U	1.2 U	n/a	1 U	1.4 U	n/a	0.86 U	0.88 U	n/a
Toluene	ug/kg	2 U	7.8 U	n/a	9.7 U	7.4 U	n/a	0.82 U	0.24 U	n/a	100 U	110 U	n/a	0.46 U	0.2 U	n/a	**5.1**	**10**	**65%**	0.36 U	0.27 U	n/a
trans-1,2-Dichloroethene	ug/kg	0.88 U	**0.24 J**	n/a	0.92 U	**0.3 J**	n/a	0.82 U	0.96 U	n/a	100 U	110 U	n/a	0.83 U	1.2 U	n/a	**0.42 J**	1.4 U	n/a	0.86 U	0.88 U	n/a
Trichloroethene	ug/kg	**110**	**100**	**10%**	**33**	**34**	**3%**	**5.1**	**2.7**	**62%**	**1900**	**2000**	**5%**	**19**	**18**	**5%**	**76 J**	**71**	**7%**	**7.2**	**7.3**	**1%**
Vinyl chloride	ug/kg	**0.51 J**	**0.38 J**	**29%**	0.92 U	1.2 U	n/a	0.82 UJ	0.96 UJ	n/a	100 UJ	110 UJ	n/a	0.83 U	1.2 U	n/a	1 U	1.4 U	n/a	0.86 U	0.88 U	n/a

Field Sample ID:		TMP-17-90			TMP-19-35			TMP-19-90			TMP-22-50			TMP-22-80			TMP-27-60			TMP-27-90		
Sample Date:		11/13/06			12/4/06			12/4/06			11/8/06			11/8/06			11/14/06			11/14/06		
Sample Type:		FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**	FD	N	RPD**
Analyte*	**Units**																					
1,1-Dichloroethane	ug/kg	**0.16 J**	**0.24 J**	**40%**	48 U	49 U	n/a	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	0.78 U	0.77 U	n/a	**0.21 J**	**0.25 J**	**17%**
1,1-Dichloroethene	ug/kg	**0.74 J**	**1.3 J**	**55%**	48 U	49 U	n/a	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	**1.5**	**1.6**	**6%**	**0.68 J**	**0.61 J**	**11%**
1,2,4-Trimethylbenzene	ug/kg	1.8 U	2.3 U	n/a	96 U	98 U	n/a	97 U	110 U	n/a	1.8 U	1.7 U	n/a	68 U	87 U	n/a	1.6 U	1.5 U	n/a	1.9 U	2 U	n/a
1,3,5-Trimethylbenzene	ug/kg	1.8 U	2.3 U	n/a	96 U	98 U	n/a	97 U	110 U	n/a	1.8 U	1.7 U	n/a	68 U	87 U	n/a	1.6 U	1.5 U	n/a	1.9 U	2 U	n/a
2-Butanone	ug/kg	18 U	23 U	n/a	960 U	980 U	n/a	970 U	1100 U	n/a	18 U	17 U	n/a	680 U	870 U	n/a	16 U	15 U	n/a	19 U	20 U	n/a
Acetone	ug/kg	6 UJ	17 UJ	n/a	2400 UJ	2500 U	n/a	2400 UJ	2700 UJ	n/a	**9.6 J**	**11 J**	**14%**	**290 J**	**310 J**	**7%**	39 UJ	8.7 UJ	n/a	10 UJ	15 UJ	n/a
Benzene	ug/kg	**1.2**	**1.5**	**22%**	48 U	49 U	n/a	49 U	53 U	n/a	**0.49 J**	**0.48 J**	**2%**	34 U	43 U	n/a	1 UJ	0.86 UJ	n/a	0.86 U	1.3 U	n/a
Carbon disulfide	ug/kg	9 U	**0.21 J**	n/a	480 U	490 U	n/a	490 U	530 U	n/a	8.9 U	8.6 U	n/a	340 U	430 U	n/a	0.14 U	7.7 U	n/a	9.4 U	10 U	n/a
cis-1,2-Dichloroethene	ug/kg	**26**	**40**	**42%**	**570**	**730**	**25%**	**17 J**	**20 J**	**16%**	**0.44 J**	0.86 UJ	n/a	34 U	43 U	n/a	**9.7**	**8.2**	**17%**	**8.4**	**6.3**	**29%**
Ethylbenzene	ug/kg	0.9 U	1.1 U	n/a	48 U	49 U	n/a	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	0.78 U	0.77 U	n/a	0.94 U	1 U	n/a
Isopropanol	ug/kg	45 U	57 U	n/a	**1200 J**	**1500 J**	**22%**	**1400 J**	2700 U	n/a	45 UJ	43 UJ	n/a	**2300**	**3400**	**39%**	39 UJ	39 U	n/a	47 UJ	51 UJ	n/a
Isopropylbenzene	ug/kg	0.9 U	1.1 U	n/a	48 U	49 U	n/a	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	0.78 U	0.77 U	n/a	0.94 U	1 U	n/a
m,p-Xylene	ug/kg	1.8 U	**0.27 J**	n/a	96 U	98 U	n/a	97 U	110 U	n/a	1.8 U	1.7 U	n/a	68 U	87 U	n/a	0.21 U	0.17 U	n/a	1.9 U	2 U	n/a
Methylene chloride	ug/kg	9 UJ	11 UJ	n/a	**390 J**	**350 J**	**11%**	**360 J**	**360 J**	**0%**	8.9 U	8.6 UJ	n/a	220 U	260 U	n/a	7.8 U	7.7 U	n/a	9.4 U	10 U	n/a
N-Hexane	ug/kg	0.9 U	1.1 U	n/a	**37 J**	**33 J**	**11%**	**17 J**	**18 J**	**6%**	1.3 UJ	0.57 UJ	n/a	24 U	27 U	n/a	0.18 U	0.15 U	n/a	0.94 U	1 U	n/a
o-Xylene	ug/kg	0.9 U	1.1 U	n/a	48 U	49 U	n/a	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	0.78 U	0.77 U	n/a	0.94 U	1 U	n/a
Tetrachloroethene	ug/kg	**0.34 J**	**0.48 J**	**34%**	48 U	49 U	n/a	49 U	53 U	n/a	0.89 UJ	0.86 UJ	n/a	34 UJ	43 UJ	n/a	0.78 U	0.77 U	n/a	0.94 UJ	1 UJ	n/a
Toluene	ug/kg	0.66 U	0.98 U	n/a	7.4 U	9.6 U	n/a	49 U	53 U	n/a	0.31 UJ	0.24 UJ	n/a	34 U	7.9 U	n/a	0.55 U	0.51 U	n/a	0.57 U	0.73 U	n/a
trans-1,2-Dichloroethene	ug/kg	**0.79 J**	**1 J**	**23%**	**21 J**	**32 J**	**42%**	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	**0.55 J**	**0.46 J**	**18%**	**0.28 J**	1 U	n/a
Trichloroethene	ug/kg	**480**	**530**	**10%**	**2800**	**3800**	**30%**	**590**	**580**	**2%**	**13 J**	**1.8 J**	**151%**	**3100**	**3500**	**12%**	**120**	**110**	**9%**	**210**	**200**	**5%**
Vinyl chloride	ug/kg	**2 J**	**2.2 J**	**10%**	**11 J**	**17 J**	**43%**	49 U	53 U	n/a	0.89 U	0.86 U	n/a	34 U	43 U	n/a	**7.3**	**7.6**	**4%**	0.94 U	1 U	n/a

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit

Notes (Continued):

* Only analytes with positive detections in field duplicate pair are listed in this table
** Relative percent difference (RPD) was calculated only for positive detections in both samples

Abbreviations:

ERH - Electrical Resistance Heating
FD - field duplicate
N - normal field sample
n/a - not applicable
RPD - relative percent difference
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms

Table 10
Evaluation of Field Duplicate Results for Post-ERH Soil Sampling Event
Pemaco Superfund Site, Maywood, California

Field Sample ID:		TMP-05R-25			TMP-05R-75			TMP-09R-45			TMP-09R-80		
Sample Date:		10/29/08			10/29/08			10/15/08			10/16/08		
Sample Type:		FD	N	RPD	FD	N	RPD	FD	N	RPD	FD	N	RPD
AnalyteName	**Units**												
2-Butanone	ug/kg	13 U	11 U	n/a	12 U	14 U	n/a	11 U	10 U	n/a	**35**	**26**	**30%**
Acetone	ug/kg	13 U	11 U	n/a	**39**	**53**	**30%**	**16**	**11**	**37%**	**340**	**230**	**39%**
Benzene	ug/kg	6.4 U	5.6 U	n/a	**4.5 J**	7.2 U	n/a	5.5 U	5.1 U	n/a	5.7 U	5.9 U	n/a
cis-1,2-Dichloroethene	ug/kg	6.4 U	5.6 U	n/a	6.1 U	7.2 U	n/a	5.5 U	5.1 U	n/a	5.7 U	5.9 U	n/a
Tetrachloroethene	ug/kg	6.4 U	5.6 U	n/a	6.1 U	7.2 U	n/a	5.5 U	5.1 U	n/a	5.7 U	5.9 U	n/a
Trichloroethene	ug/kg	6.4 U	5.6 U	n/a	**47**	**38**	**21%**	5.5 U	5.1 U	n/a	5.7 U	5.9 U	n/a

Field Sample ID:		TMP-11R-25			TMP-11R-70			TMP-17R-50			TMP-19R-30		
Sample Date:		10/27/08			10/28/08			10/23/08			10/23/08		
Sample Type:		FD	N	RPD	FD	N	RPD	FD	N	RPD	FD	N	RPD
AnalyteName	**Units**												
2-Butanone	ug/kg	13 U	13 U	n/a	11 U	11 U	n/a	12 U	11 U	n/a	**50**	**31**	**47%**
Acetone	ug/kg	13 U	13 U	n/a	**15**	**21**	**33%**	**24**	**19**	**23%**	**340**	**240**	**34%**
Benzene	ug/kg	6.3 U	6.7 U	n/a	5.3 U	5.4 U	n/a	6 U	5.6 U	n/a	5.9 U	6.1 U	n/a
cis-1,2-Dichloroethene	ug/kg	6.3 U	6.7 U	n/a	5.3 U	5.4 U	n/a	6 U	5.6 U	n/a	**5.2 J**	**5.1 J**	**2%**
Tetrachloroethene	ug/kg	6.3 U	**2.8 J**	n/a	5.3 U	5.4 U	n/a	6 U	5.6 U	n/a	5.9 U	6.1 U	n/a
Trichloroethene	ug/kg	6.3 U	6.7 U	n/a	5.3 U	5.4 U	n/a	6 U	5.6 U	n/a	5.9 U	6.1 U	n/a

Field Sample ID:		TMP-22R-45			TMP-22R-60			TMP-27R-35		
Sample Date:		10/17/08			10/17/08			10/21/08		
Sample Type:		FD	N	RPD	FD	N	RPD	FD	N	RPD
AnalyteName	**Units**									
2-Butanone	ug/kg	8.9 U	9.2 U	n/a	12 U	11 U	n/a	12 U	12 U	n/a
Acetone	ug/kg	**11**	**12**	**9%**	**19**	**19**	**0%**	**17**	**19**	**11%**
Benzene	ug/kg	4.5 U	4.6 U	n/a	5.8 U	5.6 U	n/a	5.8 U	5.9 U	n/a
cis-1,2-Dichloroethene	ug/kg	4.5 U	4.6 U	n/a	5.8 U	5.6 U	n/a	**15**	5.9 UJ	n/a
Tetrachloroethene	ug/kg	4.5 U	4.6 U	n/a	5.8 U	5.6 U	n/a	5.8 U	5.9 U	n/a
Trichloroethene	ug/kg	4.5 U	4.6 U	n/a	5.8 U	5.6 U	n/a	**22**	5.9 UJ	n/a

Notes:

Bolded value indicates positive detection
"J" - reported value is a quantitative estimate
"U" - analyte was not detected above the reporting limit
"UJ" - analyte was not detected above the estimated reporting limit
* Only analytes with positive detections in field duplicate pair are listed in this table
** Relative percent difference (RPD) was calculated only for positive detections in both samples

Abbreviations:

ERH - Electrical Resistance Heating
FD - field duplicate
N - normal field sample
n/a - not applicable
RPD - relative percent difference
TMP - Temperature Monitoring Point
ug/kg - micrograms per kilograms

APPENDICES ON CD

APPENDIX A - Drill Logs for Pre-ERH and Post-ERH Borings

APPENDIX B - Chain of Custody Forms, Laboratory Reports, and Data Validation Reports

APPENDIX C - Volatile Organic Compound Data for Contaminant Mass Calculations

ATTACHMENT C

DESIGN REPORT
IN SITU THERMAL REMEDIATION
(ELECTRICAL RESISTANCE HEATING)
PEMACO SUPERFUND SITE

PREPARED BY
THERMAL REMEDIATION SERVICES, INC.
MAY 2005

Design Report

In Situ Thermal Remediation
(Electrical Resistance Heating)
Pemaco Superfund Site

5050 East Slauson Avenue
Maywood, California 90270

THERMAL
REMEDIATION
services inc.

Prepared by

Thermal Remediation Services, Inc.
2325 Hudson Street
Longview, Washington 98632

Table of Contents

Design Report 1
1.0 General Site Preparation 1
2.0 Process Flow 1
3.0 ERH Power Control Unit 2
4.0 Electrode Design 2
5.0 Vapor Recovery System and VR Well Design 3
6.0 TMP and Vacuum Monitoring Point Design 4
7.0 Electrode Wetting System 5
8.0 ERH Condenser 5
9.0 System Controls 7
10.0 Power and Mechanical Failures 8

1.0 General Site Preparation

General site preparation will include grading and preparing the ground surface for the placement of equipment components and installation of electrodes, and erecting security fencing. The maximum slope of the ground surface shall not be greater than 2%. A temporary power supply will be installed to operate the remediation equipment. Several subsurface utilities have been identified in the immediate vicinity and within the ERH treatment area at the Pemaco Superfund Site. These utilities include a 4 inch natural gas line, a 10 inch water line, and a storm sewer system. It is not anticipated that these underground utilities will interfere with the operations of the ERH remediation system. However, installation of the electrodes and ERH equipment will be performed to minimize the possibility of damage to subsurface utilities. During ERH electrode installation any boring adjacent electrode utilities markings shall be hand dug to positively identify the location of any utilities. Accurate location markings by TN&A are essential to prevent damage to these utilities during installation of the ERH electrodes. The location of the water and gas line is directly between the F and G row of electrodes and should not require the need for adjusting the ERH electrode array. However, it is anticipated that some electrodes may need to be shifted slightly to miss the storm drain which runs through the site. This slight shifting will not impact the performance of the ERH equipment. An ERH site map depicting the location of underground utilities is shown as Figure 1.

2.0 Process Flow

Three-phase electrical power is taken from the utility grid by the PCU for controlled delivery to the subsurface. Heating of the subsurface occurs as it resists the movement of the electrical current between the electrodes. The remediation treatment depth interval extends from 35 to 95 feet bgs. The electrodes are designed to deliver electrical power from 34 to 100 feet bgs.

As the subsurface treatment interval is heated, COCs will be volatilized and mobilized from the soil matrix. Volatilized COCs and steam will be collected at the electrode wells and associated VR wells located within the ERH area. The electrode wells are designed to allow the recovery of soil vapors, volatilized COCs, and steam from the subsurface. The vacuum blowers installed and operated by TN&A provide the vacuum necessary to recover these media from the subsurface and to move them through the VR system. A process flow diagram for the ERH remediation system is presented as Figure 7.

Once collected at the VR wells, vapors and steam are transported through the VR piping system to an ERH condenser. The ERH condenser includes an integral inlet vapor liquid separator. At the ERH condenser, steam is condensed to water, while vapors pass through to the VR blowers. Condensate collected in the condenser is pumped to the TN&A water treatment system. Soil vapors and volatilized VOCs pass through the condenser and are transported to the TN&A installed and operated system for treatment utilizing an on-site FTO.

3.0 ERH Power Control Unit

For remediation of the Pemaco Superfund Site, a single PCU rated for 2,000 kW (7 Million BTUs/hour) will be mobilized to the site, placed on level ground, and connected to the temporary power supply. The PCU is designed to allow local utility power to be connected directly to the PCU input disconnect. Electrical requirements for the operation of the PCU are 100 ampere service at between 12 and 14kV. This service will be sufficient to not only power the PCU, but also the ERH condenser. A one-line diagram of the ERH equipment electrical requirements is shown in Figure 8.

The PCU is designed for 100% duty cycle. Over the course of the remediation, the average output from the PCU is assumed to average approximately 65% of the rated capacity, based upon an estimated 80% uptime factor at operations of 80% of rated capacity. During ERH, the subsurface acts as a purely resistive load. This load will vary during the course of the site remediation. For this reason, the 2,000 kW PCU is capable of adjustable voltage outputs from 0 to 800 V while maintaining a near constant power output.

Each of the electrodes discussed in the next section will be connected to the PCU with one 350 MCM Type W cable. These cables are rated for 550 amps and are designed for routine foot traffic and occasional vehicle traffic.

4.0 Electrode Design

A total of 58 electrodes, placed on 17-foot spacing, will be used to heat the treatment area. A treatment area plot plan with electrode locations is shown on Figure 1. The electrode design consists of ERH heating elements and VR system components co-located in 12-inch diameter boreholes. Electrode elements are constructed of nominally 3-inch diameter steel pipe extending to approximately 62.5 feet bgs and coupled copper plates from approximately 66 to 100 ft. bgs. Active electrical resistance heating will span the subsurface interval from 34 to 100 feet bgs. To assist with VR operations, the pipe interval from 50 to 62.5-feet bgs is slotted (0.040 inches). The borehole annulus

from 34 to 100 ft. bgs is filled with high permeability conductive backfill to expand the effective diameter of the electrode. Each borehole is then filled from 34 ft. bgs to surface grade with high temperature Class G grout (neat silica cement). Design details for electrode wells are shown on Figure 2.

The electrode elements are isolated electrically at the surface by a nominally 8-inch diameter CPVC over-sleeve and non-conductive vapor recovery pipe connections, to prevent exposure to hazardous voltages by on-site personnel. High temperature Class G grout is used to seal the CPVC over-sleeve and electrode elements at the ground surface. High temperature Class G grout has shown the capability to allow thermal expansion of the electrode elements without failure, and is an efficient barrier to steam flow upward along the outside of the casings. Materials of construction are steel, carbon backfill, temperature rated plastics, and neat cement grout. These materials have been proven to withstand a combination of elevated temperature, pressure, and chemical attack.

The electrodes have been located to provide active electrical resistance heating slightly beyond the established boundaries of the treatment area. The electrode elements extend the entire depth of the treatment volume to ensure that subsurface heating is applied evenly and uniformly.

5.0 Vapor Recovery System and VR Well Design

A total of 19 additional vapor recovery wells will be installed throughout the ERH treatment area. The locations of the additional VR wells are shown on Figure 1. The VR wells are constructed of nominally 2-inch diameter CPVC pipe extending to approximately 50 feet bgs. All of the VR wells will be screened from 30 to 50 feet bgs using 0.020-inch slotted CPVC pipe. The borehole annulus is filled with high permeability sand to maximize air flow from the soil. Each borehole is then sealed from 5 feet bgs to surface grade with high temperature Class G grout (neat silica cement). Design details for the VR wells are shown on Figure 4.

In addition, nine VR wells will have a second screened pipe installed to recover vapors from the upper vadose zone soils. These nine VR locations will also be plumbed into the ERH vapor recovery system, resulting in the same vacuum influence. If greater vacuum influence is required, the VR wells will need to plumb these locations separately to their vacuum blower system. The nine co-located locations are shown on Figure 1. Design details for the co-located VR wells are shown on Figure 4.

Each of the 28 additional VR wells will be equipped with an isolation valve and is piped to the ERH VR piping headers. The vapor recovery headers are designed to minimize the pressure drop between the condenser and each individual well. It is expected that with a vacuum of 8 in. of Hg, site conditions will yield between 7 and 8 scfm of combined steam and vapors from each vapor recovery location at the height of ERH. The vapor recovery headers are designed for a pressure drop of less than 2 in. of Hg. With a typical pressure drop across the condenser of approximately 2 in. of Hg, the vacuum delivered to the ERH equipment needs to be a minimum of 12 in. of Hg. The layout of the vapor recovery headers is shown on Figure 5.

All vapor recovery headers will be constructed of Schedule 40 CPVC piping.

6.0 TMP and Vacuum Monitoring Point Design

In order to measure subsurface temperatures, a total of 20 TMP locations will be installed inside the ERH treatment area and 10 TMP locations will be installed adjacent to the ERH treatment area. The locations of the TMPs were selected to be at the coolest locations in the ERH treatment area and represent a "worst case" temperature profile. The locations of the TMPs are shown on Figure 1. The TMPs are constructed of 1.25-inch diameter CPVC pipe extending to approximately 100 feet bgs. All of the TMPs will have 15 dedicated thermocouples installed at five-foot intervals from 25 to 100 feet bgs.

In order to measure subsurface vacuum influence from the VR system each TMP will also have co-located vacuum monitoring point (VMP). In Addition, in order to collect vapor samples, providing the sample location is above the groundwater surface, eight Vapor Sampling Points (VSPs) will be installed in the Exposition Zone A layer co-located in selected TMPs and eight VSPs will be installed in the Exposition Zone B layer co-located in selected TMPs.

The VMPs designed to measure subsurface vacuum from the VR system will be constructed using ½" CPVC pipe, extend to a depth of 46 feet bgs, and will be screened from approximately 44 to 46 feet bgs. This configuration will allow measurement of vacuum influence in the depth interval of 40 to 50 feet bgs.

The VSPs designed to measure subsurface vacuum and/or collect vapor samples from the Exposition Zone A layer will be constructed using ½" PTFE tubing, extend to a depth of approximately 70 feet bgs, and will collect a sample from approximately 66 to 72.5 feet bgs.

The VSPs designed to measure subsurface vacuum and/or collect vapor samples from the Exposition Zone B layer will be constructed using ½" PTFE tubing, extend to a depth of approximately 87.5 feet bgs, and will collect a sample from approximately 84.5 to 90 feet bgs.

The remaining TMPs will have two, 3/4 inch CPVC pipes installed to facilitate nutrient and substrate injection once the ERH system is demobilized. One screened pipe section will be installed in the Exposition Zone A and one screened section will be installed in Exposition Zone B. Each pipe will have three feet of screen and the well annulus will be filled with sand from one foot above the screened section to one foot below. The remaining TMP annulus will be filled with grout (neat silica cement). Design details for the TMPs are shown on Figure 3.

Each of the 30 vacuum monitoring points will be equipped with a quick connect fitting at the surface to facilitate the collection of vacuum measurements.

7.0 Electrode Wetting System

To prevent electrode "dry out" conditions, an electrode wetting system will be installed to each electrode. In order to minimize the risk of water migration from the ERH treatment area the delivery system will be designed and operated in a manner that less water is added than is extracted in the form of steam from the subsurface. A water totalizer will be installed to measure the quantity of water added to the subsurface as well as water extracted during vapor recovery.

8.0 ERH Condenser

Once any portion of the subsurface reaches the boiling point of water, steam generation will begin. As steam rises into the vadose zone, it is collected at the electrode and VR wells and routed to the ERH condenser. The skid-mounted ERH condenser is sized and manufactured to accommodate the PCU used in the remediation effort. The condenser package will be mobilized to the site by TRS and placed on level ground near the PCU.

The condenser performs as a vapor-liquid separator, separates soil vapors from steam condensate, provides automated condensate pumping functions and cools the soil vapors to ambient temperatures. The vapor outlet of the condenser contains a mist eliminator that is 99% efficient in removing droplets to a size of 10 microns. When connected to the TN&A installed and operated vacuum blower, the pressure drop across the condenser is expected to be approximately 2-inches of Hg.

The expected volumes of steam, soil vapors, and condensate passing through the condenser during the remediation process are summarized in Table 1. Initially, as the treatment area is heating, there will be no steam generated resulting in an expected flow rate of 560 scfm. Once the treatment volume is completely heated, the VR system will recover approximately 1,600 scfm of steam and vapors from the subsurface. This combined flow will be composed of approximately 900 scfm of steam and 560 scfm of soil vapors. The TN&A installed and operated vacuum blower system needs to be designed to accommodate these variations.

Steam extraction will remove water from the subsurface at a rate of up to 10 gpm. Some of the steam will condense within the recovery piping and join with the extracted liquids to be captured by the vapor-liquid separator and pumped directly to the TN&A installed and operated treatment system.

Table 1: Estimated Condenser Operating Parameters

Process Stream	Maximum Flow Rate[a] or Volume (gal)
Combined steam and vapor flow	1,600 scfm
Steam from the subsurface	900 scfm
Air and vapors from the subsurface	560 scfm
Inlet vacuum	10 inches of Hg
Outlet vacuum	12 inches of Hg
Inlet temperature	160 to 180 °C
Outlet temperature	Near ambient
Water recovered from the subsurface as steam	up to 10 gpm
Total volume over the entire remediation period	1,811,000 gallons

[a]Estimated flow rates when the heated region is at design temperatures

The conditions within the condenser are a good application of Henry's Law. Based on Henry's Law, and borne out by experience at previous ERH sites, 99.6% of the TCE vapor will remain in the vapor phase as it passes through the condenser. Only 0.4% of the TCE will become dissolved in the steam condensate for treatment. Condensate exiting the condenser will not be cooled prior to delivery to the TN&A installed and operated treatment system.

The condenser utilizes a non-contact water-cooled heat exchanger. The heat that is removed from the steam in condensation is reflected in a temperature rise of the recirculation cooling water. The heat is then removed from the recirculation water using a cooling tower in which a portion of the recirculation water evaporates with each pass.

9.0 System Controls

System diagnostics, controls, and alarms are accessed and set through the computer in the PCU and the control panels of the condenser. Emergency shut downs and automatic notification alarms are routed through these same system components.

On-site and remote operators can turn the PCU on or off, change the voltage applied to the electrodes, reset some PCU alarms and monitor temperatures throughout the ERH system. Voltage changes are accomplished by selecting the appropriate voltage tap.

Alarms are provided for transformer over-temperature, current trips and faults, and excessive current levels. Closing the main contactor on the PCU is the only way to energize the electrode field. Only authorized operations personnel using the PCU control computer are allowed to close the main contactor.

Remote and on-site operators can determine if system faults or unwanted operating conditions exist inside the PCU or the electrode field. Most faults and undesired operating conditions can be corrected locally or remotely by altering operating parameters or can be tolerated until field staff can make adjustment to the PCU or the electrode field. More severe system faults may require portions of the electrode field, or the entire PCU, to be shut down for repairs or adjustments. Transformer alarms instigate immediate shut down of the PCU and must be cleared on-site before the PCU can be reenergized.

Because steam collection and vapor treatment are vital operations functions, system alarms that do not originate in the PCU are routed through the control panel of the ERH condenser. If the VR system faults for any reason, the PCU is automatically shut down discontinuing power to the electrode field and an auto-dialer contacts operations personnel. On-site action is then required to correct the alarm condition and restart the VR treatment system before the PCU can be reenergized.

If the ERH condenser is unable to process steam or condensate, it will fault. This condenser fault immediately stops the VR blowers and halts steam and vapor recovery. Stopping steam recovery also halts condensate production. Stopping the VR blower triggers a shut down of the PCU and initiates the automatic notification auto-dialer.

If the FTO is unable to process vapors for any reason, it will fault and shutdown the PCU and trigger the automatic notification auto-dialer. If there are no operating faults within the condenser, it will continue to operate under this scenario until shut down manually.

The faults and alarms associated with ERH remediation system components, along with the actions caused by each condition are identified in the Operations and Maintenance Manual.

10.0 Power and Mechanical Failures

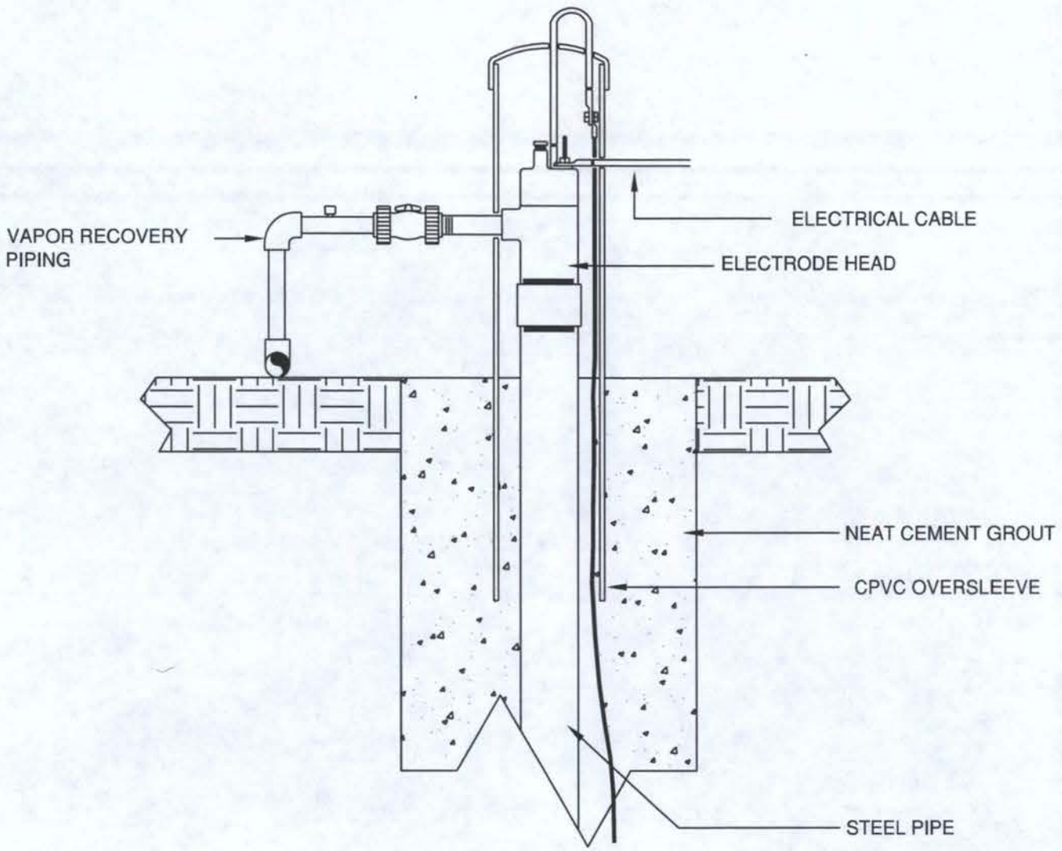
In case of a site-wide power failure, all system equipment will shut down and the auto-dialer will contact operations staff using an emergency battery pack for power. When power is restored, the ERH components must be restarted locally.

The creation of steam in the subsurface stops quickly when the PCU is shut down. Residual steam, however, remains in the subsurface and that steam continues to rise toward the surface. If the VR system is operating, residual steam is collected at the bottom of the vadose zone. If the VR system is not operating, a small flux of residual steam will enter the non-heated portion of the vadose zone and condense. The condensate will be remediated by the system once operations are restarted.

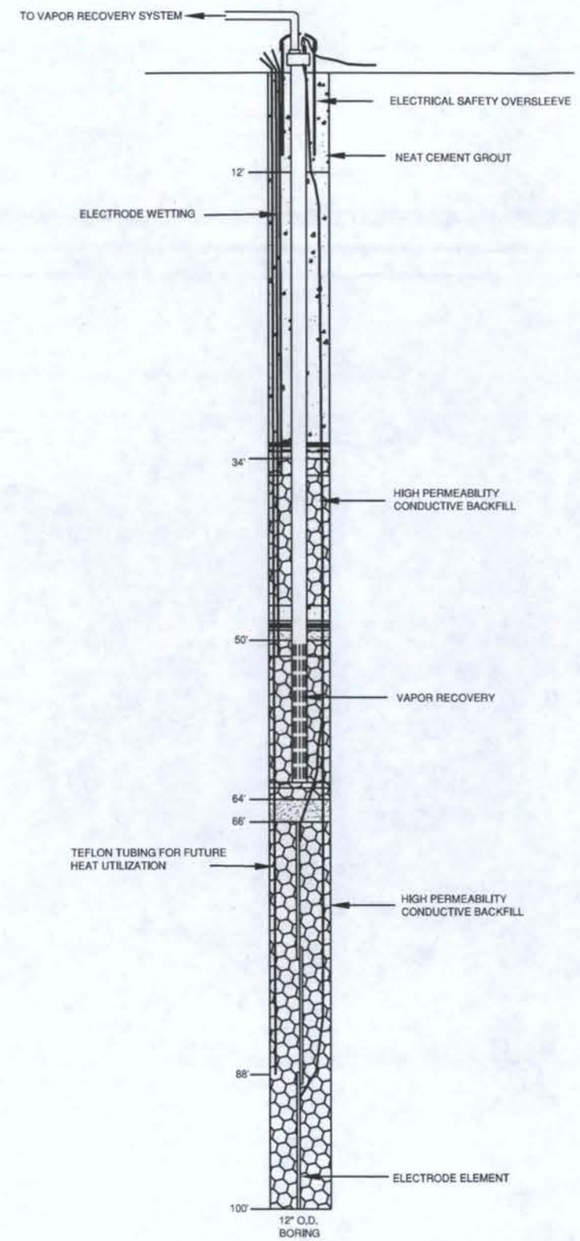
FIGURE 1 "ERH PLOT PLAN"

Figure 1 is confidential and not available for submittal in this attachment.

ELECTRODE WELLHEAD DETAIL



ELECTRODE WELL DETAIL



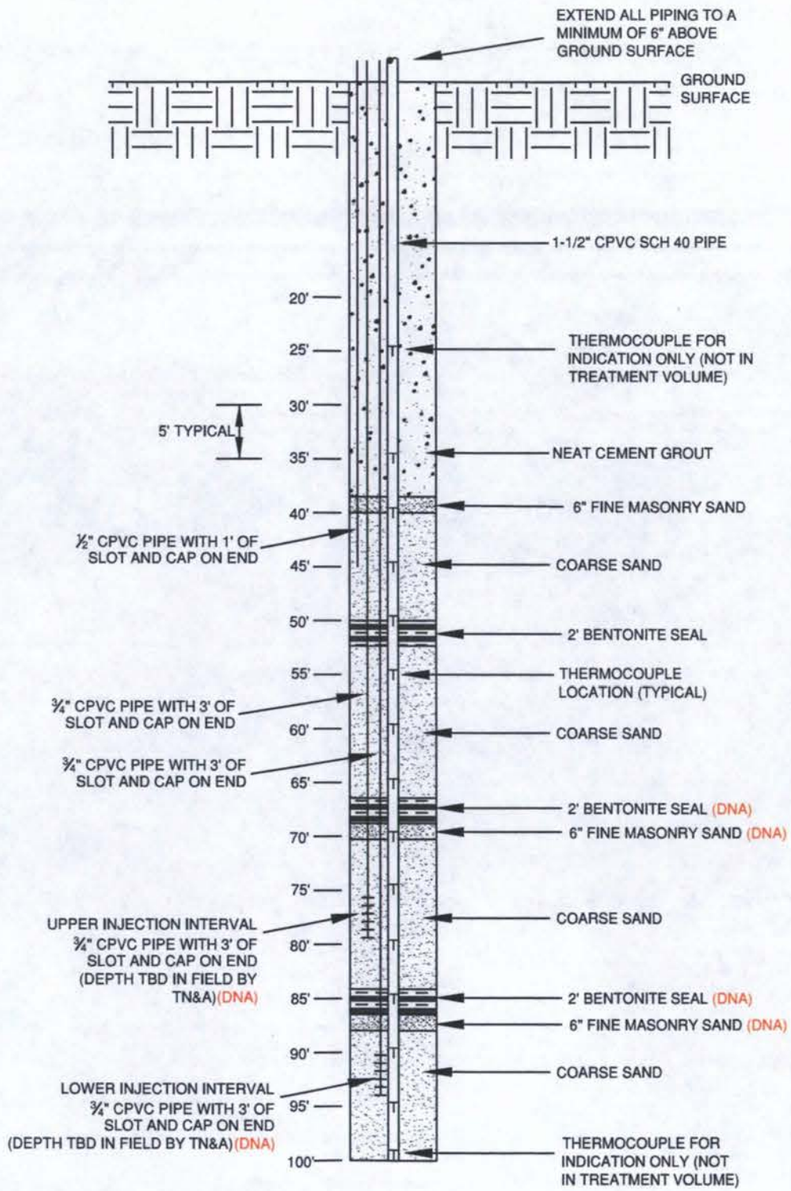
NO.	DATE	BY	REVISIONS

DESIGN BY:	DS
DRAWN BY:	DS
CHECKED BY:	XX
PROJECT MANAGER:	PB
DATE:	08-31-05
SCALE:	N/A
FIGURE NUMBER:	XXX
PROJECT NUMBER:	MAY-05
FILE NAME:	MAY05 Electrode Detail 053105.cld

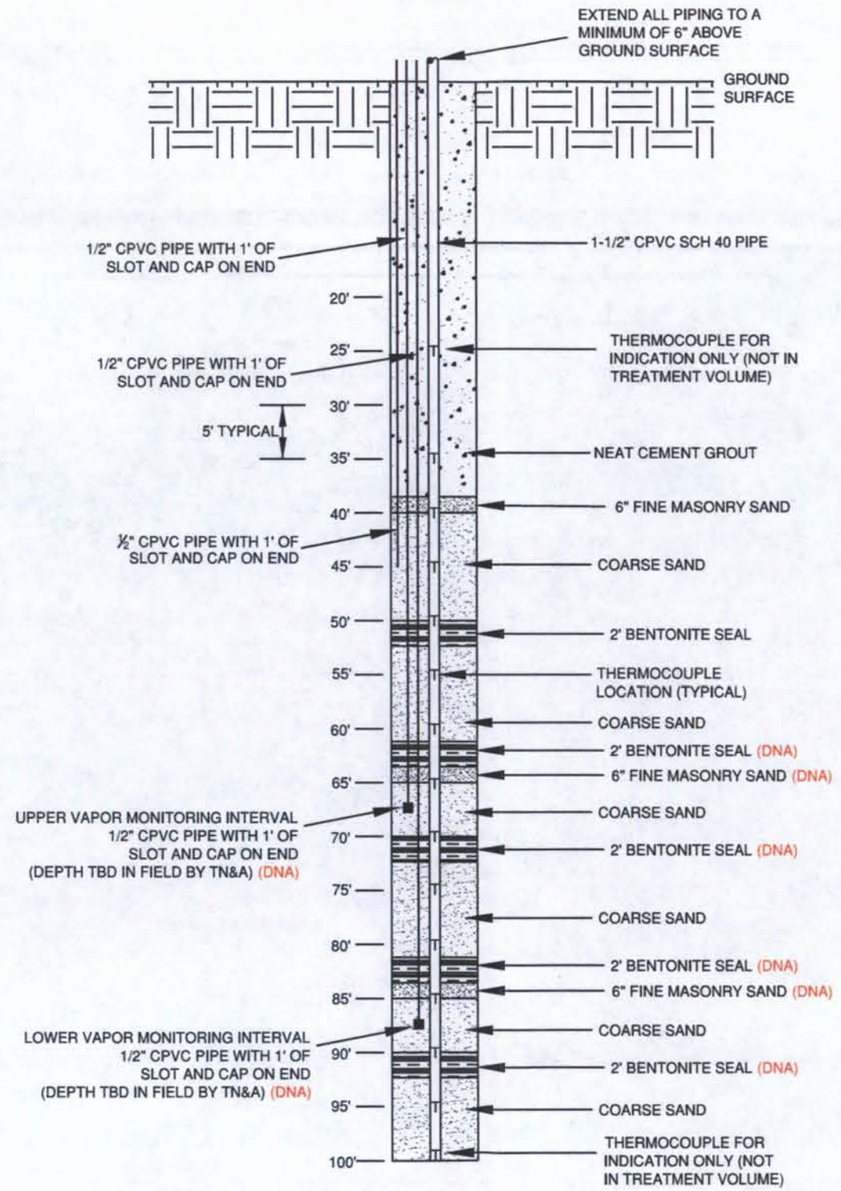
ELECTRODE & WELLHEAD DETAIL
INTERNAL USE ONLY
FIGURE 2
PEMACO
MAYWOOD, CA

THERMAL REMEDIATION SERVICES, INC.

TMP WITH INJECTION
(TYPICAL OF 23)



TMP WITH VAPOR MONITORING
(TYPICAL OF 7)



NOTES:

1. USE OF INFORMATION AND DATA FROM THIS DRAWING IS RESTRICTED TO PARTICIPANTS IN THE PEMACO SUPERFUND SITE. INFORMATION AND DATA FROM THIS DRAWING MAY NOT BE TRANSMITTED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF TRS.
2. DNA = DEPTH NOT ACCURATE AS SHOWN ON VERTICAL SCALE OF DRAWING, FINAL DEPTH TO BE DETERMINED IN THE FIELD BY TN&A BASED ON CORING DATA. DRAWING TEXT CORRECT.

NO.	DATE	BY	REVISIONS
1	10-19-05	PB	ADDED A ZONE AND B ZONE MONITORING WELLS
2	08-16-06	PB	ADDED A ZONE AND B ZONE OXIDANT INJECTION WELLS
3	11-01-06	PB	REVISED IN ACCORDANCE WITH TN&A REQUEST ON 10/26/06
4	10-01-07	JS	PM CHANGE

DESIGN BY:	PB
DRAWN BY:	DS
CHECKED BY:	DS
PROJECT MANAGER:	JS
DATE:	10-01-07
SCALE:	AS SHOWN
FIGURE NUMBER:	3
PROJECT NUMBER:	MAY-05

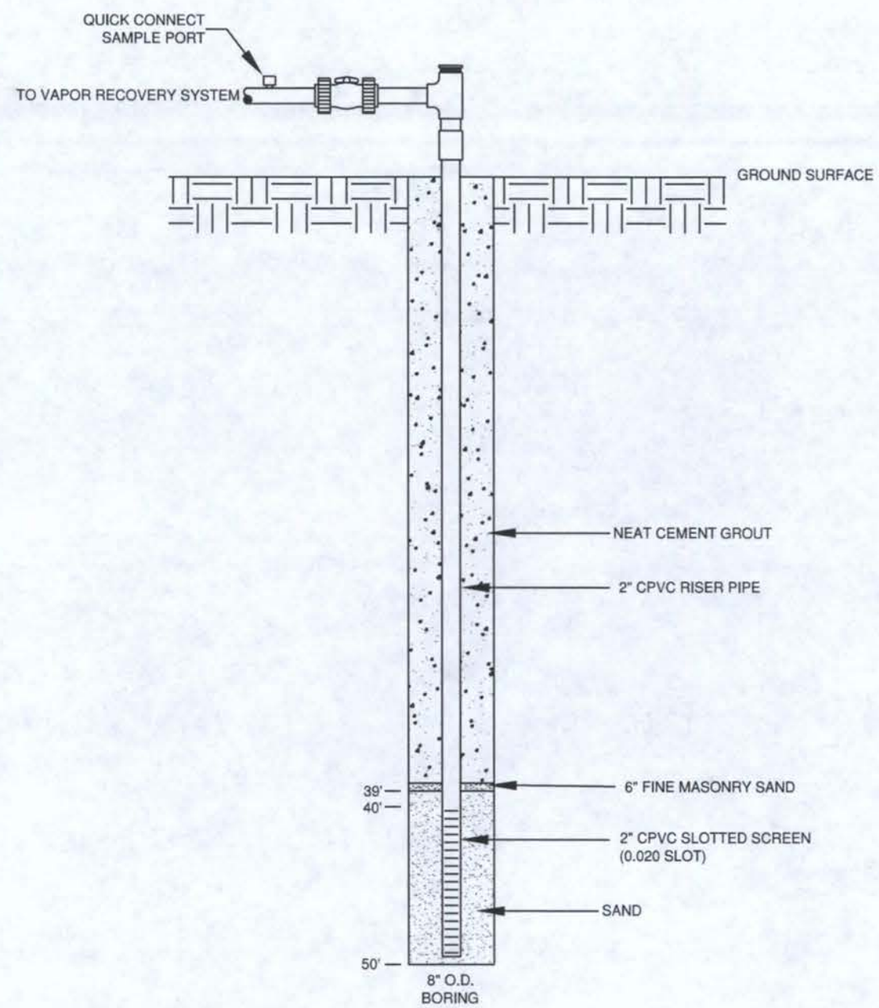
ERH TMP WELL DETAIL
AS-BUILT

FIGURE 3

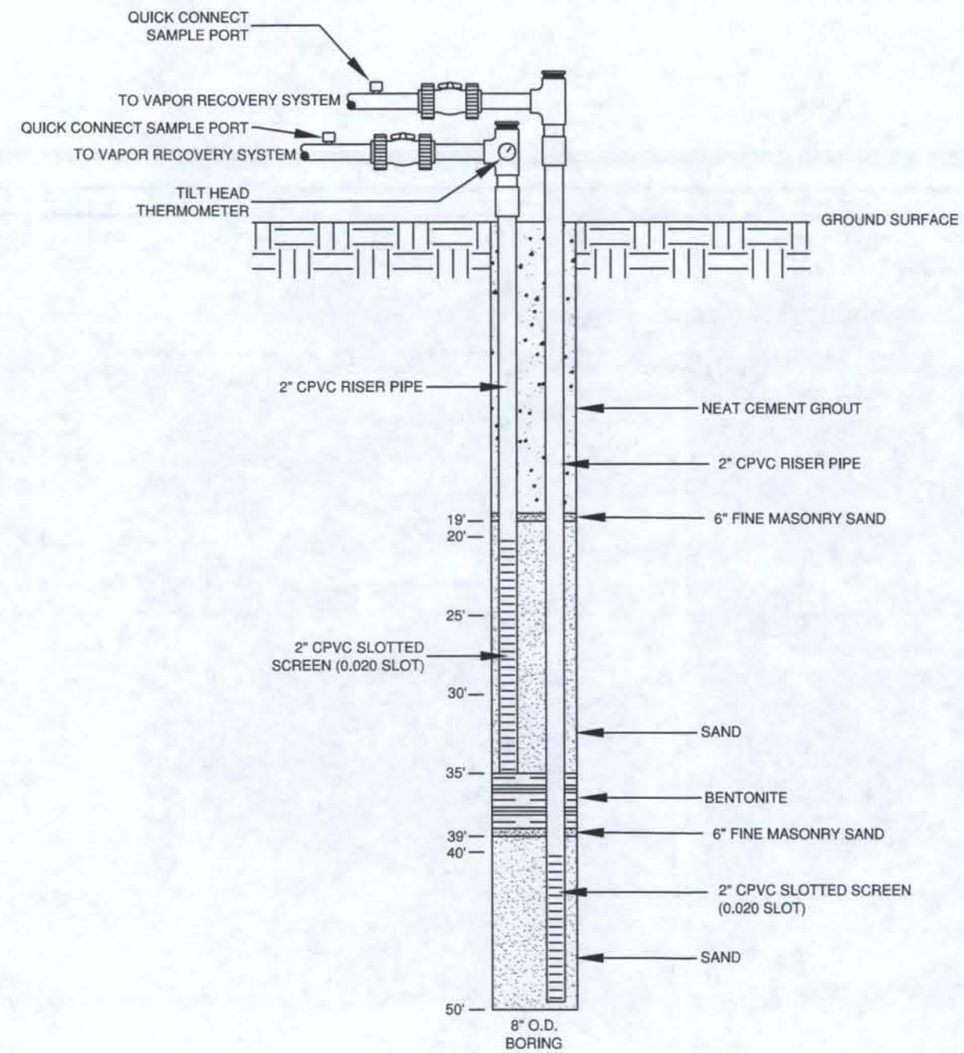
PEMACO SUPERFUND SITE
5973 SOUTH DISTRICT BLVD., MAYWOOD, CA 90270

THERMAL REMEDIATION SERVICES, INC.

TRS VR WELLS
(TYPICAL 10 LOCATIONS)



CO-LOCATED TRS AND TN&A VR WELLS
(TYPICAL 9 LOCATIONS)



ENGINEER'S SEAL

NO.	DATE	BY	REVISIONS

DESIGN BY:	DS
DRAWN BY:	DS
CHECKED BY:	GB
PROJECT MANAGER:	PB
DATE:	05-17-07
SCALE:	AS SHOWN
FIGURE NUMBER:	4
PROJECT NUMBER:	MAY-05

ERH VAPOR RECOVERY WELL DETAIL
AS BUILT

FIGURE 4

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE, MAYWOOD, CA 90270

THERMAL REMEDIATION SERVICES, INC.

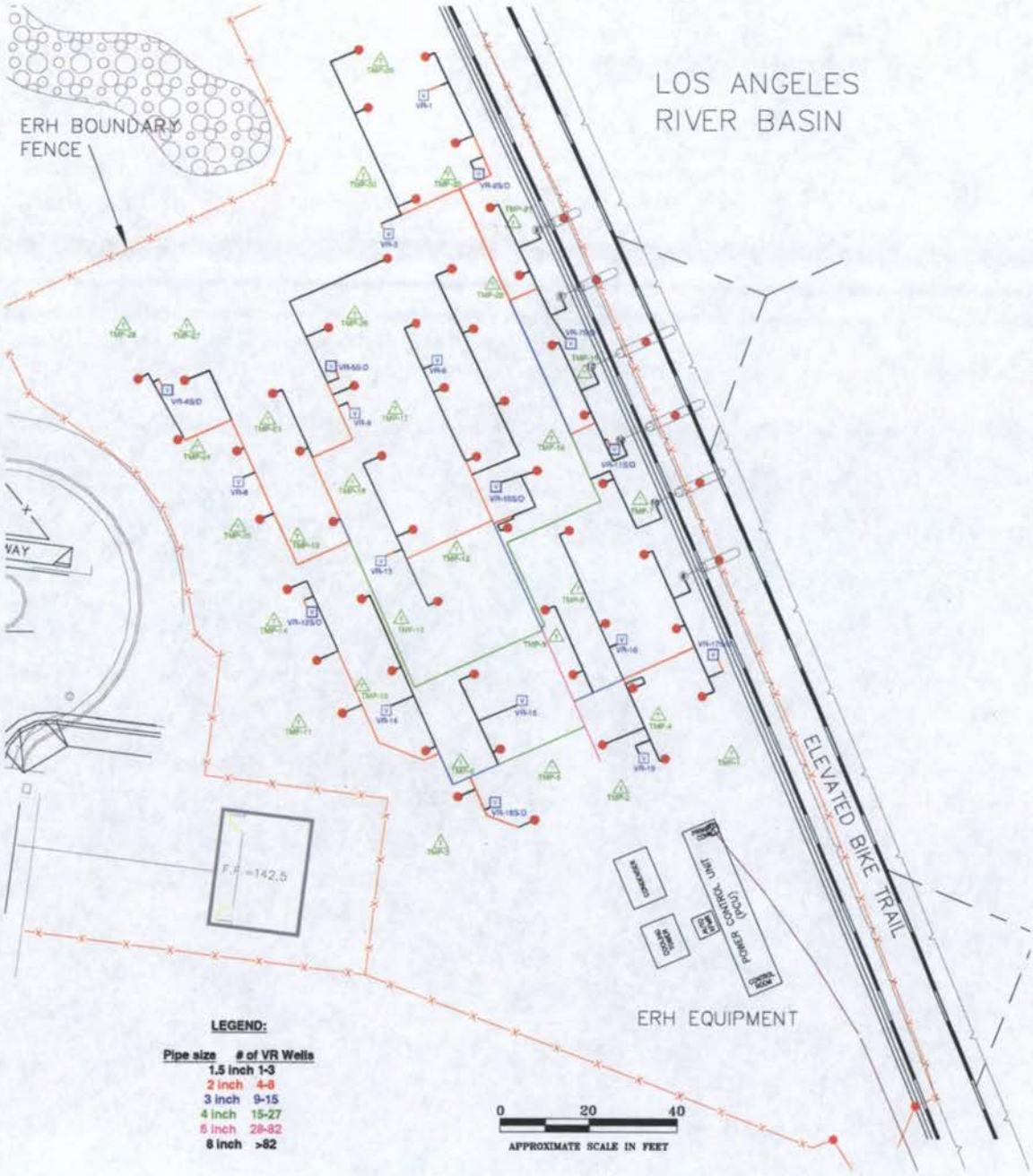


Figure 5 Vapor Recovery Conveyance Piping Layout

FIGURE 6 "TMP FIELD BOX PLAN"

Figure 6 is confidential and not available for submittal in this attachment.

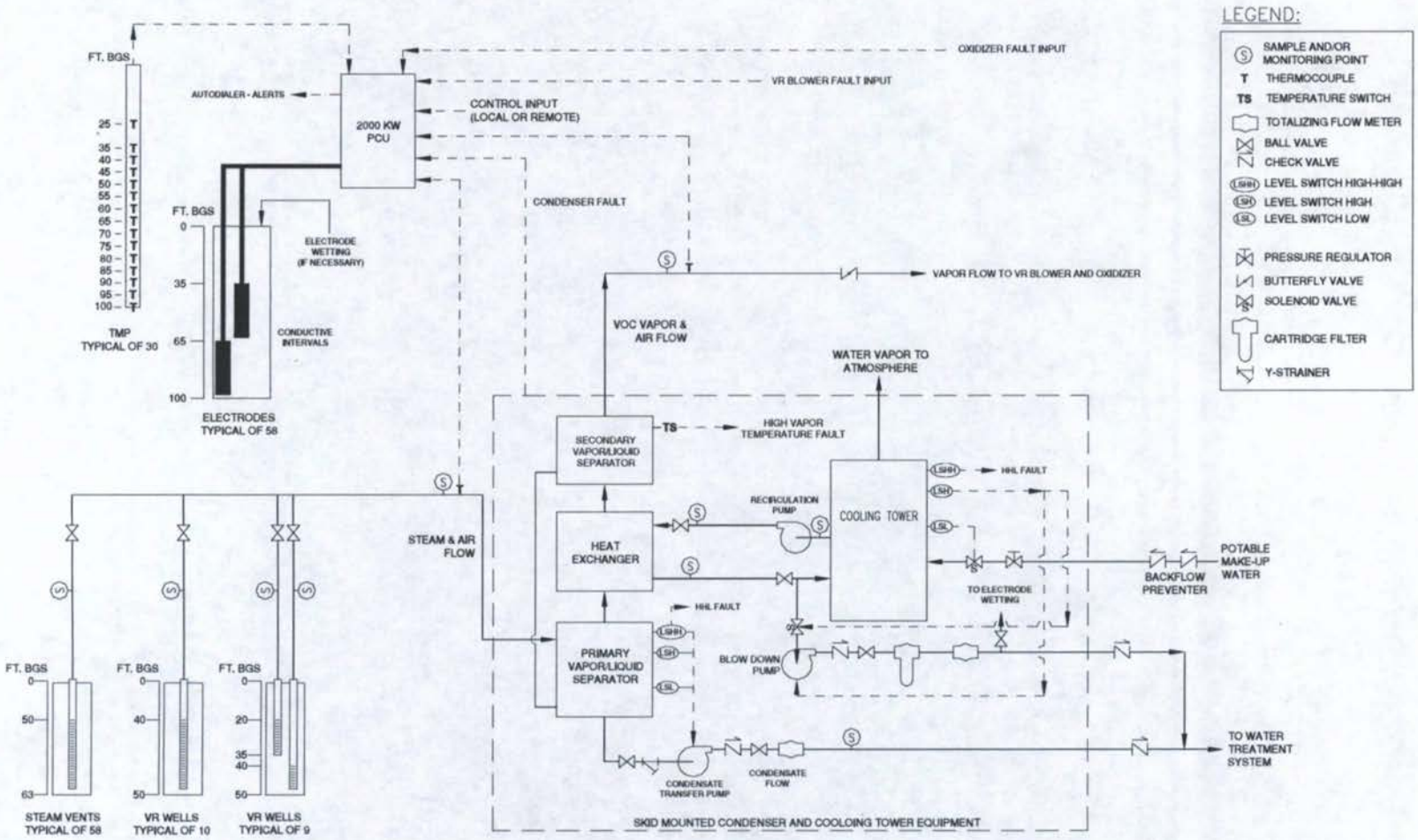
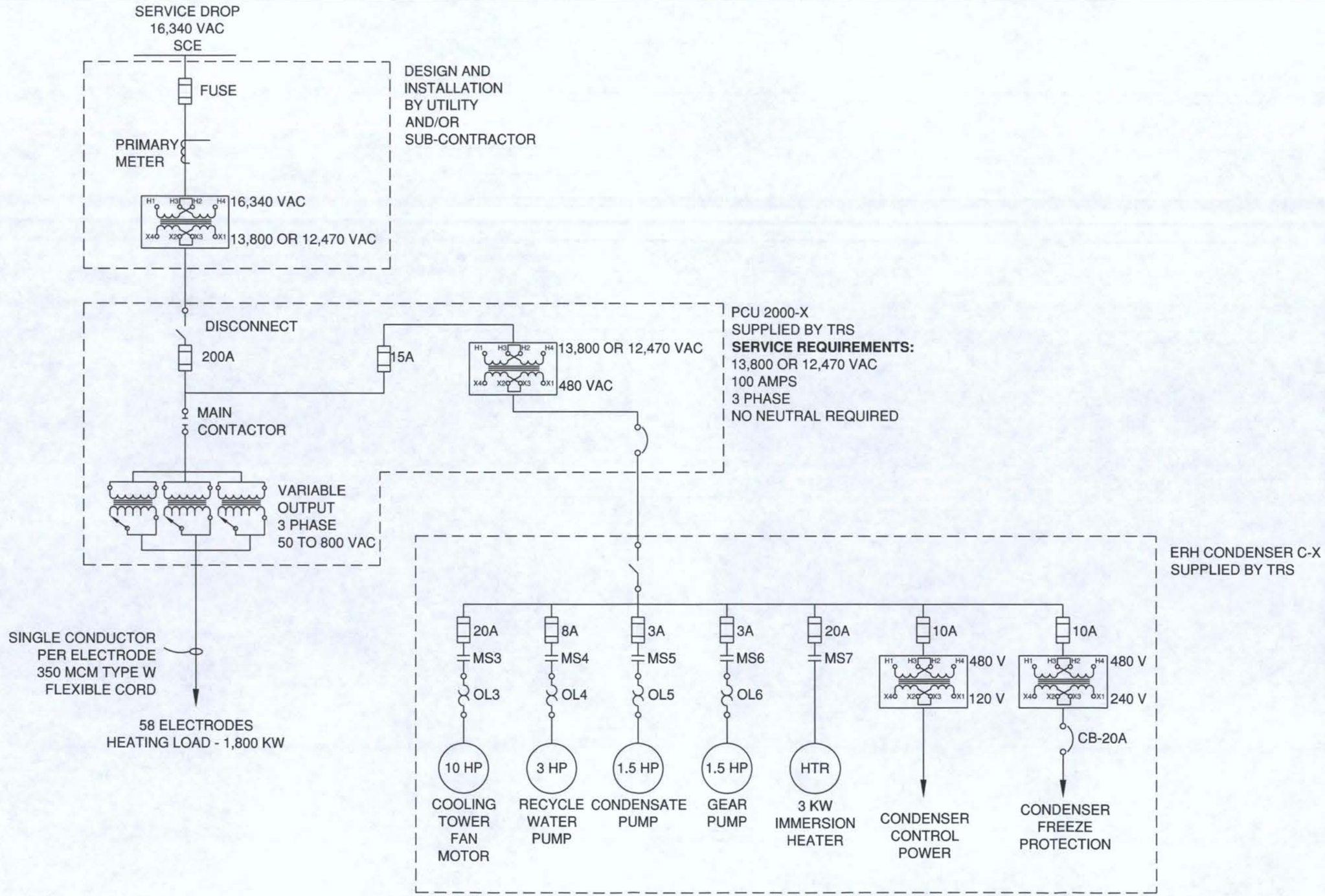


Figure 7 As-Built Process and Instrumentation Diagram



NO.	DATE	BY	REVISIONS
dcf	10-07-05	DKS	CHANGED SERVICE DROP TO SITE CONDITIONS AND ADDED DETAIL TO PCU

DESIGN BY:	DKS
DRAWN BY:	DKS
CHECKED BY:	TP
PROJECT MANAGER:	PB
DATE:	03-17-06
SCALE:	NTS
FIGURE NUMBER:	8
PROJECT NUMBER:	MAY-05
ENGINEERING APPROVAL:	DKS

ERH ONE-LINE DIAGRAM

FIGURE 8

PEMACO SUPERFUND SITE

5050 EAST SLAUSON AVENUE, MAYWOOD, CA 90270

THERMAL REMEDIATION SERVICES, INC.

ATTACHMENT D

PEMACO ERH DATA AND SAMPLE COLLECTION FIELD FORMS

FORMS:

FORM No. 1	MANIFOLD / LEL INSTRUMENT MEASUREMENT (REVISED ON 01/11/08)
FORM NO. 2	FIELD INPUT FORM FOR PROCESS PHYSICAL PARAMETERS GUAGES AND SAMPLING PORTS (REVISED ON 9/6/07)
FORM NO. 3	FIELD INPUT FORM FOR PROCESS PHYSICAL PARAMETERS FROM PLC & MANUAL
FORM NO. 4	DAILY VAPOR SAMPLING (REVISED ON 2/11/08)
FORM NO. 5	WEEKLY VAPOR SAMPLING (REVISED ON 1/31/08)
FORM NO. 6	WEEKLY PROCESS WATER SAMPLING (REVISED ON 1/11/08)
FORM NO. 7	FIELD INPUT FORM FOR VAPOR RECOVERY (VR) AND OTHER SVE WELLS (REVISED ON 2/11/08)
FORM NO. 8	FIELD INPUT FORM FOR ELECTRODE WELLS (NOT APPLICABLE)
FORM NO. 9	FIELD INPUT FORM FOR TEMPERATURE THERMOCOUPLE 10% VALIDATION
FORM NO. 10	FIELD INPUT FORM FOR VAPOR MONITORING PROBES (VMPS) (REVISED ON 2/11/08)
FORM NO. 11	GROUNDWATER MONITORING WITHIN ERH AREA (REVISED ON 10/24/07)
FORM NO. 11	GROUNDWATER MONITORING WITHIN ERH AREA (REVISED ON 1/11/08)
FORM NO. 12	PEMACO WELL VALVE OPERATIONS - PERCHED WELLS
FORM NO. 13	PEMACO WELL VALVE OPERATIONS - EXPOSITION WELLS - O&M
FORM NO. 14	FIELD INPUT FORM FOR SENTRY SOIL VAPOR (SSV) PROBES (REVISED ON 3/13/08)
FORM NO. 15	VAPOR MONITORING PROBES (VMPS) VMP VACUUM OR PRESSURE MEASUREMENT (REVISED ON 2/11/08)

FORM No. 1 **MANIFOLD / LEL INSTRUMENT MEASUREMENT**

Pemaco Superfund Site, Maywood, CA

Frequency: Daily **Revised on 01/11/08**

Name: _____ Instrument 1: MiniRAE 2000, Gov't ID: 50001 (Standard PID) Instrument 1 - Calibration Time/Date: _____

Date: _____ Instrument 2: MultiRAE Plus PGM-50, S/N: 095-512098, (4-Gas Meter) Instrument 2 - Calibration Time/Date: _____

Background Notes: _____

Manifold/Sample Port ID	Frequency	Time	Open/ Closed (O/C)	Instrument 1	Draeger* Tube (ppm)	Instrument 2 - MultiRAE Plus PGM-50 Readings					Diff. P (in wc) **	Temp (Deg F)	Vacuum (in Hg)	Notes
				PID Isobutylene Cal. (ppm)		VOC Hexane Cal. (ppm)	LEL (%)	H_2S (ppm)	CO (ppm)	Oxygen (%)				
DPE-A (SP-111 & VI/TI103)	Weekly													
DPE-B (SP-112 & VI/TI104)	Weekly													
DPE-C (SP-114 & VI/TI105)	Weekly													
DPE-D (SP-113 & VI/TI106)	Weekly													
VE-1 (SP-117 & VI/TI101)	Weekly													
VE-2 (SP-110 & VI/TI102)	Weekly													
VE-3 (SP-115 & VI/TI107)	Daily													
VE-4 (SP-116 & VI/TI108)	Daily													
SP-102	Daily		N/A		N/A									
SP-105 (1st GAC in)	Daily		N/A		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SP-106 (1st GAC out)	Daily		N/A		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SP-107 (2nd GAC in)	Daily		N/A		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SP-108 (2nd GAC out)	Daily		N/A		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SP-801	Weekly		N/A								N/A	N/A	N/A	
SP-802	Weekly		N/A								N/A	N/A	N/A	
SP-803	Weekly		N/A								N/A	N/A	N/A	
SP-804	Weekly		N/A								N/A	N/A	N/A	
SP-805	Weekly		N/A								N/A	N/A	N/A	
TRS Condenser - upstream (TI/ VI-701)	Weekly		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
TRS Condenser - downstream (FI/ TI/ VI-702)	Weekly		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				

Notes:

1. List all activities, observations, recommendations in Notes Column.
2. Instrument 1 - MiniRAE 2000 PID is calibrated for 100 ppm Isobutylene. Instrument 2 - MultiRAE Plus PGM-50 is calibrated for 50 ppm Hexane prior to each sampling event.

* PID or dreager measurements apply as follows: 1) Baseline (1st time sampling) - both PID and Dreager; 2) Continue taking only PID readings until moisture interfers; When PID is considered unreliable due to moisture, then take only Dreager tube readings

** indicate wet or reading

FORM No. 2 **Field Input Form for Process Physical Parameters Guages and Sampling Ports**
Pemaco Superfund Site, Maywood, CA

Revised 01/11/08

Name: _____

Date: _____

	No Guage/Port for Field
	Collect Daily (5 days a week)
	Collect Weekly

	VI (units)		TI (units)		PI (units)		SP (ppm)		
	Time	Value	Time	Value	Time	Value	Time	Value	
101	Manifold Readings		Manifold Readings						101
102					Form 3	PT-101			102
103									103
104									104
105									105
106							Manifold Readings		106
107									107
108									108
109	Form 3	VT-101							109
110									110
111									111
201	Form 3	VT-201							201
202			Form 3	TIT-202					202
203									203
204									204
205									205
206									206
207			Form 3	TIT-201					207
208									208
301								TDS: ____ pH:	301
302								TDS: ____ pH:	302
303								Hardness	303

FORM No. 2 **Field Input Form for Process Physical Parameters Guages and Sampling Ports**

Pemaco Superfund Site, Maywood, CA

Revised 9/6/07

Name: _____

Date: _____

	No Guage/Port for Field
	Collect Daily (5 days a week)
	Collect Weekly

	VI (units)		TI (units)		PI (units)		SP -PID (ppm)		
	Time	Value	Time	Value	Time	Value	Time	Value	
304									304
305									305
401									401
402									402
403									403
404									404
405					Form 3	PT-401			405
406									406
407									407
408					Form 3	PT-403			408
409					Form 3	PT-404			409
410									410
411									411
412									412
413									413
414									414
415									415
501									501
502					Form 3	PT-501			502
503									503
504									504
601									601
602									602

FORM No. 3 Field Input Form for Process Physical Parameters from PLC & Manual
Pemaco Superfund Site, Maywood, CA

Name: _____

Date: _____

[ ] **Collect Daily**
(5 days a week)

ID	Parameter	Time	Value
dPIT-101	Pressure		
FE-101	Flow		
PT-101	Pressure		
PT-401	Pressure		
PT-403	Pressure		
PT-404	Pressure		
PT-501	Pressure		
TIT-101	Temp		
TIT-102	Temp		
TIT-201	Temp		
TIT-202	Temp		
TIT-401	Temp		
TIT-402	Temp		
TIT-501	Temp		
VT-101	Vacuum		
VT-201 (VIT-201)	Vacuum		

Manual Readings:

FQI-401	gal		
FQI-402	gal		
FQI-501	gal		
SP-104	Temperature		
SP-104	Rel. Humidity		

Water Meter	ft3		
Gas Meter	ft3		
FQI-201	ft3		

FTO Fan Monitoring:

dPI-102	Pressure		
TI-109	Temp		

FORM No. 4 **Daily Vapor Sampling** **Revised: 11-Feb-08**

Pemaco Superfund Site, Maywood, CA

Name _____

Daily

Biweekly - Mondays and Thursdays

	Sampling Logic	Matrix	Date/Time Collected	Container	Analysis	Lab	TAT (days)
SP-104	Daily influent sampling	A		400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Region 9 Lab	3
SP-104	PID Readings	A		n/a	PID reading:		
		A		6L summa	VOCs by TO-15	Calscience	24-hrs
SP-106	PID Readings	A			PID reading:		
		A		6L summa	VOCs by TO-15	Calscience	24-hrs
SP-108	PID Readings	A			PID reading:		
		A		6L summa	VOCs by TO-15	Calscience	24-hrs

to be shipped priority overnight via FedEx to EPA Reg. 9 Lab in Richmond, CA; Friday samples hold and ship on Monday.

EPA Region 9 Laboratory
Sample Custodian
1337 S. 46th Street, Bldg. 201,
Richmond, CA 94804

Calscience - for pick-up call Virendra at 714-895-5494

FORM No. 5 **Weekly Vapor Sampling**
Pemaco Superfund Site, Maywood, CA

Tuesdays - Vapor

Name _____

Revised: Jan-31-08

	Matrix	Date/Time Collected	Draeger Tube	Container	Analysis	Lab	TAT (days)
SP-104	A			400mL Summa	VOCs by TO-15	Reg 9 Lab	3
SP-104	A			Tedlar Bag	C1-C6 TO-3(M)	Calscience	5
SP-109	A			400mL Summa	VOCs by TO-15	Reg 9 Lab	3
SP-109	**A**			**6L Summa**	**VOCs by TO-15SIM**	**Air Toxics**	**15**
SP-900	A			400mL Summa	VOCs by TO-15	Reg 9 Lab	3
SP-110	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-111	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-112	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-113	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-114	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-115	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-116	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-117	A			400ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	5
SP-801	A			400 ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	3
SP-802	A			400 ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	3
SP-803	A			400 ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	3
SP-804	A			400 ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	3
SP-805	A			400 ml Summa	TCE & 2-6 Highest VOCs by TO-15	EPA Reg. 9 Lab	3

Air samples (Summas) ship priority overnight to EPA Reg. 9 & Air Toxics Laboratories
Air Toxics Ltd., 180 Blue Ravine Road, Ste. B, Folsom, CA 95630; contact: Kyle Vagadori at (800) 985-5955 x. 1039
EPA Region 9 Laboratory, Sample Custodian, 1337 S. 46th Street, Bldg. 201, Richmond, CA 94804 - NO SHIPPING ON FRIDAY
Vapor sample for TO-3(M) to Calscience - schedule pick-up with Virendra at (714) 895-5494

FORM No. 6 **Weekly Process Water Sampling**
Pemaco Superfund Site, Maywood, CA

Wednesday - Water

Name _____

Revised: 01/11/08

ID	Matrix	Date/Time Collected	Container	Analysis	Lab	TAT (days)
SP-201	W		3 x 40 ml	VOCs by EPA 8260B +1,4-Dioxane, hexane	Calscience	5
SP-201	W		1-L Amber with Na2S2O3 or unpreserved	1,4-dioxane by EPA 8270C	Calscience	10
SP-204	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-204	W		1-L Amber with Na2S2O3 or unpreserved	1,4-dioxane by EPA 8270C	Calscience	10
SP-206	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-206	W		1-L Amber with Na2S2O3 or unpreserved	1,4-dioxane by EPA 8270C	Calscience	10
SP-208	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-208	W		1-L Amber with Na2S2O3 or unpreserved	1,4-dioxane by EPA 8270C	Calscience	10
SP-210	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-212	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-213	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-214	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5
SP-215	W		3 x 40 ml	VOCs by EPA 8260B + 1,4-Dioxane, hexane	Calscience	5

Water samples (8260B) for Calscience - schedule pick-up with Virendra at (714) 895-5494

FORM No. 7 **Field Input Form for Vapor Recovery (VR) and other SVE Wells**
Pemaco Superfund Site, Maywood, CA Revised on 11-Feb-08

Name: _____
Date: _____

Physical Measurements Weekly During ERH
Vapor sampling frequency: as required

ID	Time (24 hr)	Draeger (ppm)	Temp (deg C)	Vacuum (in H2O)	Valve Position (Open, Partial, Closed)
ZONE 801					
VR–01LV					
VR–02P					
VR–02LV					
VR–03LV					
VR–07P					
VR-07LV					
VR–11P					
VR-11LV					
MW-26-75 (Zone A; 75 ft bg)					
MW-26-90 (Zone B; 90 ft bg)					
RW-01-75 (Zone A; 75 ft bg)					
ZONE 802					
VR–06LV					
VR–10P					
VR-10LV					
VR–13LV					
RW-01-95 (B Zone; 95 ft bg)					
ZONE 803					
VR–04P					
VR–04LV					
VR–05P					
VR–05LV					
VR–08LV					
VR–09LV					
MW-19-70 (A zone; 67 ft bg)					
MW-19-90 (B zone; 87 ft bg)					

FORM No. 7 **Field Input Form for Vapor Recovery (VR) and other SVE Wells**
Pemaco Superfund Site, Maywood, CA Revised on 11-Feb-08

Name: _____
Date: _____

Physical Measurements Weekly During ERH
Vapor sampling frequency: as required

ID	Time (24 hr)	Draeger (ppm)	Temp (deg C)	Vacuum (in H2O)	Valve Position (Open, Partial, Closed)
ZONE 803 (Continued)					
MW-27-70 (A zone; 70 ft bg)					
MW-27-90 (B zone; 90 ft bg)					
ZONE 804					
VR–16LV					
VR–17P					
VR-17LV					
VR–19LV					
ZONE 805					
VR–12P					
VR-12LV					
VR–14LV					
VR–15LV					
VR–18P					
VR-18LV					
MW-03-70 (A zone; 70 ft bg)					
MW-03-90 (B zone; 90 ft bg)					
VE-4					
DA-10 (A zone; 77 f bg)					
DB-10 (B zone; 92 ft bg)					
DA-11 (A zone; 76 ft bg)					
DB-11 (B zone; 87 ft bg)					

* Collect only PID readings until moisture interfers; When PID is considered unreliable due to moisture, then take only Dreager tube readings instead
P = perched screen interval (shallow)
LV = lower vadose zone screen interval (deep)

FORM No. 8 **Field Input Form for Electrode Wells**
Pemaco Superfund Site, Maywood, CA

Name: _____

Date: _____ ☐ Physical Measurements: TBD

ID	Time (24 hr)	PID or Draeger		Temp (deg C)	Vacuum (in H2O)	Valve Position
		PID (ppm)	Draeger (ppm)			
ZONE 801						
EG-01						
EG-02						
EG-03						
EH-01						
EH-02						
EH-03						
EH-04						
EH-05						
EH-06						
EH-07						
EJ-03						
EJ-04						
EJ-05						
EJ-06						
EJ-07						
ZONE 802						
EE-07						
EE-08						
EE-09						
EF-05						
EF-06						
EF-07						
EF-08						
EG-04						
EG-05						
EG-06						
EG-07						
ZONE 803						
EB-06						
EB-07						
EC-06						
EC-07						
EC-08						

FORM No. 8 **Field Input Form for Electrode Wells**
Pemaco Superfund Site, Maywood, CA

Name: _____

Date: _____ ☐ Physical Measurements: TBD

ID	Time (24 hr)	PID or Draeger		Temp (deg C)	Vacuum (in H2O)	Valve Position
		PID (ppm)	Draeger (ppm)			
ZONE 803 (Continued)						
ED-06						
ED-07						
ED-08						
EE-05						
EE-06						
EF-04						
ZONE 804						
EF-09						
EF-10						
EF-11						
EG-08						
EG-09						
EG-10						
EG-11						
EH-08						
EH-09						
EH-10						
EJ-08						
ZONE 805						
EC-09						
EC-10						
EC-11						
ED-09						
ED-10						
ED-11						
ED-12						
EE-10						
EE-11						
EE-12						

* Collect only PID readings until moisture interfers; When PID is considered unreliable due to moisture, then take only Dreager tube readings instead

FORM No. 9 **Field Input Form for Temperature Thermocouple 10% Validation**
Pemaco Superfund Site, Maywood, CA

Collect at 2 TMPs Once A Week

Name _____

Collect additional readings when requested

Temperature (deg C) at depth

Depth ft bgs	Date (dd/mm/yy)	Time	TMP-____	TMP-____	TMP-____	TMP-____	Comments
25							
35							
40							
45							
50							
55							
60							
65							
70							
75							
80							
85							
90							
95							
100							

FORM No. 10 **Field Input Form for Vapor Monitoring Probes (VMPs)**
Pemaco Superfund Site, Maywood, CA

Revised on 11-Feb-08

Name _____
Date: _____

Frequency: Monthly during ERH
Frequency: Weekly during ERH

ID	Initials	Time	Vacuum (in H2O)	PID (ppm)	Draeger (ppm)	Container	Analysis	Lab
				PID or Draeger *				
VMP-01-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-02-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-03-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-04-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-05-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-05-72			Form 15			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-05-87			Form 15			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-06-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-07-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-08-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-09-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-10-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-10-66			Form 15			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-10-86			Form 15			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-11-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-12-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-13-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-14-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-15-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-16-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-16-68			Form 15			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-16-90			Form 15			Tedlar	VOCs by TO-15 (5-day TAT)	CEL

FORM No. 10 **Field Input Form for Vapor Monitoring Probes (VMPs)**
Pemaco Superfund Site, Maywood, CA

Revised on 11-Feb-08

Name _____
Date: _____

Frequency: Monthly during ERH
Frequency: Weekly during ERH

ID	Initials	Time	Vacuum (in H2O)	PID (ppm)	Draeger (ppm)	Container	Analysis	Lab
				PID or Draeger *				
VMP-17-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-18-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-18-66			**Form 15**			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-18-86			**Form 15**			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-19-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-20-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-21-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-22-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-23-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-24-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-24-68			**Form 15**			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-24-89			**Form 15**			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-25-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-26-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-27-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-28-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-29-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-29-70			**Form 15**			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-29-92			**Form 15**			Tedlar	VOCs by TO-15 (5-day TAT)	CEL
VMP-30-45						Tedlar	VOCs by TO-15 (5-day TAT)	CEL

* Collect only PID readings until moisture interfers; When PID is considered unreliable due to moisture, then take only Dreager tube readings instead

** Tedlar bag for VOCs by TO-15 to Calscience; For pick-up call Virendra at (714) 895-5494

FORM 15 Vacumm readings to be recorded on Form 15

FORM No. 11 Groundwater Monitoring within ERH Area
Pemaco Superfund Site, Maywood, CA

Revised: 10/24/07

Frequency:
Every 2 weeks
Monthly

Name

Well ID	Matrix	Date/Time Collected	Depth to Water (ft bgs)	Container	Analysis	Lab	TAT (days)
DA-04	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DA-10	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DA-11	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DB-04	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DB-10	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DB-11	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-02-95	W			n/a	n/a	n/a	n/a
MW-03-70	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-03-90	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-04-75	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-04-90	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-05-105	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-14-80	W			n/a	n/a	n/a	n/a
MW-14-90	W			n/a	n/a	n/a	n/a
MW-19-70	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-19-90	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-24-110	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-24-140	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-26-75	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-26-90	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-27-70	W			n/a	n/a	n/a	n/a
MW-27-90	W			n/a	n/a	n/a	n/a
RW-01-75	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
RW-01-95	W			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7

Water samples for EPA CLP Lab - ship priority overnight to *(tbd)*

FORM No. 11 Groundwater Monitoring within ERH Area
Pemaco Superfund Site, Maywood, CA

Revised: Jan-11-08

Name _____

Well ID	Matrix	Frequency	Date/Time Collected	Depth to Water (ft bgs)	Container	Analysis	Lab	TAT (days)
DA-04	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DA-10	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DA-11	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DB-04	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DB-10	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
DB-11	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-02-95	W	Monthly			n/a	n/a	n/a	n/a
MW-03-70	W				4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-03-90	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-04-75	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-04-90	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-05-105	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-14-80	W	Monthly			n/a	n/a	n/a	n/a
MW-14-90	W	Monthly			n/a	n/a	n/a	n/a
MW-19-70	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-19-90	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-24-110	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-24-140	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-26-75	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-26-90	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
MW-27-70	W	Monthly			n/a	n/a	n/a	n/a
MW-27-90	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Monthly			n/a	n/a	n/a	n/a
RW-01-75	W				4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7
RW-01-95	**W**	**Weekly**			**3 x 40 mL**	**VOCs by 8260B**	**Calscience**	**48 hrs**
	W	Bi-weekly			4 x 40 ml	VOCs by SOM01.1	EPA CLP Lab	7

FORM No. 12 **PEMACO WELL VALVE OPERATIONS - PERCHED WELLS**
Pemaco Superfund Site, Maywood, CA

Name: _____ Date: _____ Frequency: Weekly

Well ID	Time	Total Depth (Ft Bgs)	Screen Starting Depth (Ft Bgs)	Vapor Extraction Valve (Open/Close)	Est. Water Level (Ft Bgs)	Vacuum Gauge (in Hg)	PID (ppm)	Temp. (deg F)	Sample Port (Open/Close)	Air Flow[1]	Water Flow[1]	Stinger Length (Ft Bgs)	Note
PA-01		30	17										
PA-02	--	35	22		--		--					32.0	Remote Vault.
PA-03		35	22										
PA-04		30	20										
PA-05		30	20										
PB-01		40	26										
PB-02		35	22										
PB-03		35	22										
PB-04		30	16										
PB-05		35	24										
PB-06	--	35	22		--		--					32.0	Remote Vault.
PB-07		35	24										
PC-01		25	15										
PC-02		30	17										
PC-05		40	29										
PC-06		40	28										
PD-01		30	17										
PD-04		40	27										
PD-05		40	27										
PD-06		35	24										
PD-07		40	26										
PD-08		37	26										
PD-09		40	28										

Note:
1. Estimated air/water flow is subjective based on visual and auditory methods. Use high, med, and low to describe flow based on tactile and auditory methods.

FORM No. 13 **PEMACO WELL VALVE OPERATIONS - EXPOSITION WELLS - O&M**

Pemaco Superfund Site, Maywood, CA

Revised on 12-Feb-08

Name: _____ Date: _____ Frequency: Weekly

Well ID	Time	Vapor Extraction Valve (Open/Close)	GW Extraction Valve (Open/Close)	Air Supply Valve (Open/Close)	Vapor Sample Port in Well Flange (Open/Close)	Sample Port on GW Outlet (Open/Close)	Vacuum Gauge (in Hg)	Air Regulator (psi)	QED Pulse Counter	Pump Status	Temp. of Water (deg F)	Notes
DA-1												
DB-1												
DA-2												
DB-2												
DA-3												
DB-3												
DA-4 *												
DB-4 *												
DA-5												
DB-5												
DA-6												
DB-6												
DA-7												
DB-7												
DA-8												
DB-8												
DA-9												
DB-9												
DA-10 *												
DB-10 *												
DA-11 *												
DB-11 *												
DA-12												
DB-12												
DAB-1												
DAB-2												
DAB-3												
DAB-4												
DAB-5												
DAB-6												
DAB-7												
DAB-8												
MW-24-110												

* Located within ERH area

** if pump is not working, include explanation in the note column.

FORM No. 14 **Field Input Form for Sentry Soil Vapor (SSV) Probes**
Pemaco Superfund Site, Maywood, CA

Revised on 13-Mar-08

Name _____

Weekly during ERH
Monthly during ERH

Station ID	Date (dd/mm/yy)	Time	PID (ppm)	SSV Pressure (Hg)	Canister #	Init. Summa Vac. (Hg)	Final Summa Vac. (Hg)	Container	Analysis *	Comment
SSV-01-05								1-L Summa	AT VOCs by TO-15	
SSV-01-15								1-L Summa	AT VOCs by TO-15	
SSV-02-05								1-L Summa	AT VOCs by TO-15	
SSV-02-15								1-L Summa	AT VOCs by TO-15	
SSV-03-05								1-L Summa	AT VOCs by TO-15	
SSV-03-15								1-L Summa	AT VOCs by TO-15	
SSV-04-05								1-L Summa	AT VOCs by TO-15	
SSV-04-15								1-L Summa	AT VOCs by TO-15	
SSV-05-05								1-L Summa	AT VOCs by TO-15	
SSV-05-15								1-L Summa	AT VOCs by TO-15	
SSV-06-05								1-L Summa	AT VOCs by TO-15	
SSV-06-15								1-L Summa	AT VOCs by TO-15	
SSV-07-05								1-L Summa	AT VOCs by TO-15	
SSV-07-15								1-L Summa	AT VOCs by TO-15	
SSV-08-05								1-L Summa	AT VOCs by TO-15	
SSV-08-15								1-L Summa	AT VOCs by TO-15	
SSV-09-05								1-L Summa	AT VOCs by TO-15	
SSV-09-15								1-L Summa	AT VOCs by TO-15	
SSV-10-05								1-L Summa	AT VOCs by TO-15	
SSV-10-15								1-L Summa	AT VOCs by TO-15	

FORM No. 15 **Vapor Monitoring Probes (VMPs)VMP Vacuum Or Pressure Measurement**
Pemaco Superfund Site, Maywood, CA

Revised on 11-Feb-08
Frequency: Weekly during ERH

Name: Mark W
Date: _____

Well I.D.		Associated Hydrogeologic Unit	Casing Diameter (Inches)	Screen Interval (Feet bgs)	Screen Length (Ft)	Total Depth of Well (Ft bgs)*	Depth to Water (Ft bgs)	Vac/Pressure Measurement 01/29/08 (in H2O)	Vac/Pressure Measurement 02/07/08 (in H2O)	Vac/Pressure Measurement (2/12/08) (in H2O)	Comments
TMP-1	-LS*	Lower Vadose Sand*	1/2	51 - 52	1	52	NC	-25.86	-26.00		
	-A*	A Zone*	3/4	65 - 68	3	68	Dry	-27.22	-12.93		
	-B*	B Zone*	3/4	85 - 88	3	88	80.5	-1.55	3.65		
TMP-2	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-34.03	-30.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-35.39	-29.00		
	-B*	B Zone*	3/4	85 - 88	3	88	82.3	17.83	23.86		
TMP-3	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-39.47	-36.00		
	-A	A Zone	3/4	64 - 67	3	67	Dry	-34.03	-0.10		
	-B	B Zone	3/4	85 - 88	3	88	80.1	5.17	0.02		
TMP-4	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-32.66	-33.00		
	-A*	A Zone*	3/4	65 - 68	3	68	Steam	13.00	22.56		
	-B*	B Zone*	3/4	85 - 88	3	88	79.8	-4.20	3.44		
TMP-5	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-39.47	-35.00		
	-A	A Zone	3/4	69 - 72	3	72	Dry	-28.62	-16.96		
	-B	B Zone	3/4	84 - 87	3	87	Dry	36.26	28.09		
TMP-6	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-39.47	-34.00		
	-B*	B Zone*	3/4	85 - 88	3	88	72.2	-0.67	-0.19		
TMP-7	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-39.47	-31.00		
	-A*	A Zone*	3/4	64 - 67	3	67	Dry	-38.11	-27.00		
	-B*	B Zone*	3/4	85 - 88	3	88	Dry	34.93	4.92		
TMP-8	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-34.03	-39.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-29.59	-39.00		
	-B*	B Zone*	3/4	85 - 88	3	88	Dry	10.80	25.00		
TMP-9	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-35.39	-36.00		
	-LC	Lower Vadose Clay	1/2	59 - 60	1	60	NC	-40.33	-19.50		
	-AB	A & B Zone Clay	3/4	73 - 76	3	76	Dry	17.15	3.95		
TMP-10	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-51.72	-48.00		
	-A	A Zone	3/4	63 - 66	3	66	Steam	9.38	18.36		
	-B	B Zone	3/4	83 - 86	3	86	73.9	-54.01	-1.50		
TMP-11	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-49.00	-45.00		
	-A	A Zone	3/4	69 - 72	3	72	Dry	-20.92	-17.51		
	-B	B Zone	3/4	82 - 85	3	85	79.3	42.46	37.94		
TMP-12	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-54.44	-58.00		
	-LC	Lower Vadose Clay	1/2	59 - 60	1	60	Dry	0.24	-0.53		
	-AB	A & B Zone Clay	3/4	75 - 78	3	78	Steam	63.13	31.60		
TMP-13	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-62.61	-61.00		
	-LC	Lower Vadose Clay	1/2	58 - 59	1	59	Dry	-13.01	1.36		
	-AB	A & B Zone Clay	3/4	73 - 76	3	76	Steam	52.32	42.72		
TMP-14	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-59.88	-60.00		
	-A	A Zone	3/4	63.5 - 66.5	3	66.5	Dry	-1.78	-2.89		
	-B	B Zone	3/4	82 - 85	3	82.5	Dry	59.72	54.14		
TMP-15	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-55.80	-52.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-16.56	-7.84		
TMP-16	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-47.64	-42.00		
	-A	A Zone	3/4	65 - 68	3	68	Dry	-29.94	-10.39		
	-B	B Zone	3/4	87 - 90	3	90	buried	NA	---		
TMP-17	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-68.05	-62.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-5.41	-5.71		
	-B*	B Zone*	3/4	85 - 88	3	88	77.5	39.07	-0.14		
TMP-18	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-61.25	-57.00		
	-A	A Zone	3/4	63 - 66	3	66	Dry	-43.55	4.48		
	-B	B Zone	3/4	83 - 86	3	86	78.5	-28.62	0.49		
TMP-19	-LS	Lower Vadose Sand	1/2	44 - 45	1	43	NC	-62.61	-61.00		
	-A	A Zone	3/4	64 - 67	3	67	Dry	4.63	-0.36		
	-B	B Zone	3/4	86 - 89	3	89	73.8	20.14	0.34		
TMP-20	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-61.25	-60.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-42.19	-24.00		
	-B*	B Zone*	3/4	85 - 88	3	88	70.3	59.86	-2.41		
TMP-21	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-27.22	-25.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-19.21	-10.25		
	-B*	B Zone*	3/4	85 - 88	3	88	Steam	42.27	31.82		
TMP-22	-LS*	Lower Vadose Sand*	1/2	48 - 49	1	45	NC	-32.66	-30.00		
	-A	A Zone	3/4	60 - 63	3	63	Dry	-0.61	0.00		
	-B	B Zone	3/4	85 - 88	3	88	Steam	60.08	43.68		
TMP-23	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-62.61	-59.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-19.25	-50.00		
	-B*	B Zone*	3/4	85 - 88	3	88	Steam	43.05	41.34		
TMP-24	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-62.61	-60.00		
	-A	A Zone	3/4	65 - 68	3	68	Dry	-28.85	0.37		
	-B	B Zone	3/4	86 - 89	3	89	Steam	66.75	50.31		
TMP-25	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-36.75	-6.34		
	-A*	A Zone*	3/4	67 - 70	3	88	86.6	8.73	0.28		
TMP-26	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-58.52	-53.00		
	-LC	Lower Vadose Clay	1/2	57 - 58	1	58	Steam	-14.03	8.00		
	-AB	A & B Zone Clay	3/4	77 - 80	3	80	Dry	-49.28	-0.92		
TMP-27	-LS*	Lower Vadose Sand*	1/2	43 - 44	1	44	NC	-54.44	-51.00		
	-A	A Zone	3/4	64 - 67	3	67	Dry	-33.50	-8.06		
	-B	B Zone	3/4	84 - 87	3	87	81.3	-0.31	0.03		
TMP-28	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-47.64	-44.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-56.00	-6.33		
	-B*	B Zone*	3/4	85 - 88	3	88	89.5	3.60	0.02		
TMP-29	-LS	Lower Vadose Sand	1/2	44 - 45	1	45	NC	-28.58	-6.46		
	-A	A Zone	3/4	67 - 70	3	70	Dry	-25.86	-31.00		
	-B	B Zone	3/4	89 - 92	3	92	Dry	4.01	33.42		
TMP-30	-LS*	Lower Vadose Sand*	1/2	44 - 45	1	45	NC	-46.27	-40.00		
	-A*	A Zone*	3/4	67 - 70	3	70	Dry	-23.62	-10.45		
	-B*	B Zone*	3/4	85 - 88	3	88	Dry	19.82	-20.27		

Notes:

1. Negative measurement indicates vacuum. Positive measurements are highlighted in Red and indicate pressure.
2. For Field Crews: 1/2" casing = shallow screen interval, White band = mid level, Red band = deep screen interval.
3. Beginning 02/07/08, probe measurements with vacuum > 20 inches water collected with Magnahelic range 0 - 80 inches water. Prior to that, measurements in LVZ and some A-Zone wells with vacuum > 20 inches water were collected using a standard gauge with a lower reading limit of 1 inch mercury (13.61 inches water column). The standard gauge reads vacuum only.
4. -22.63 Off the scale of the digital manometer (accurate to 20 inches water column). Value indicates highest reading of digital manometer before going off-scale.

* Not As-Built data.

NC - Not Collected

ATTACHMENT E

EXAMPLES OF TEMPERATURE DATA EVALUATION TOOLS: TEMPERATURE ISOTHERMS, HISTOGRAMS, AND GRAPHS

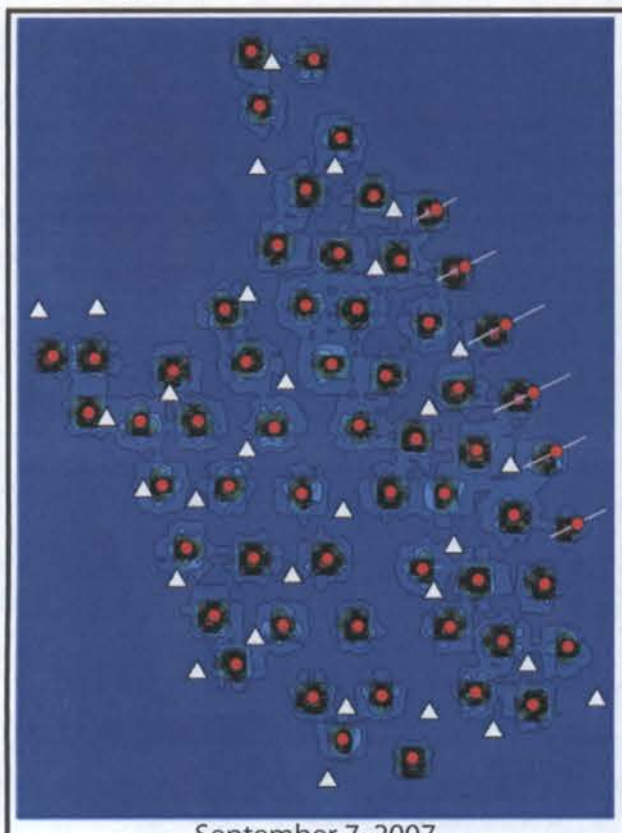
FIGURES:

Figure E-1 Temperature Isotherms (35 ft bgs)
Figure E-2 Temperature Isotherms (40 ft bgs)
Figure E-3 Temperature Isotherms (45 ft bgs)
Figure E-4 Temperature Isotherms (50 ft bgs)
Figure E-5 Temperature Isotherms (55 ft bgs)
Figure E-6 Temperature Isotherms (60 ft bgs)
Figure E-7 Temperature Isotherms (65 ft bgs)
Figure E-8 Temperature Isotherms (70 ft bgs)
Figure E-9 Temperature Isotherms (75 ft bgs)
Figure E-10 Temperature Isotherms (80 ft bgs)
Figure E-11 Temperature Isotherms (85 ft bgs)
Figure E-12 Temperature Isotherms (90 ft bgs)
Figure E-13 Temperature Data Distribution Versus ERH Depth Intervals for TMP-04, TMP-05, TMP-06, TMP-07, TMP-08, TMP-09
Figure E-14 Temperature Data Distribution Versus ERH Depth Intervals for TMP-10, TMP-12, TMP-13, TMP-15, TMP-16, TMP-17
Figure E-15 Temperature Data Distribution Versus ERH Depth Intervals for TMP-18, TMP-19, TMP-21, TMP-22, TMP-23, TMP-24
Figure E-16 Temperature Data Distribution Versus ERH Depth Intervals for TMP-25, TMP-26, TMP-29

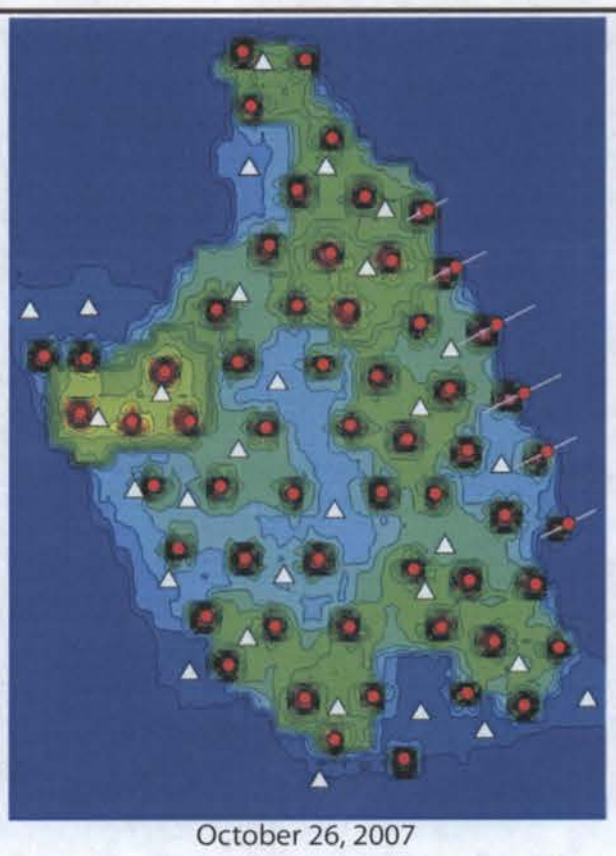
GRAPHS:

Graph E-1 Temperature Over Time for TMP-06 Vadose Zone (Heating between 35 and 60 ft bgs)
Graph E-2 Temperature Over Time for TMP-06 A-B Clay Zone (Heating between 60 and 80 ft bgs)
Graph E-3 Temperature Over Time for TMP-06 B Zone (Heating between 80 and 95 ft bgs)
Graph E-4 Temperature Over Time for TMP-21 Vadose Zone (Heating between 35 and 60 ft bgs)
Graph E-5 Temperature Over Time for TMP-21 A-B Clay Zone (Heating between 60 and 80 ft bgs)
Graph E-6 Temperature Over Time for TMP-21 B Zone (Heating between 80 and 95 ft bgs)
Graph E-7 Temperature Data at 55 ft bgs Versus Time Within ERH Area
Graph E-8 Temperature Data at 70 ft bgs Versus Time Within ERH Area
Graph E-9 Temperature Data at 85 ft bgs Versus Time Within ERH Area

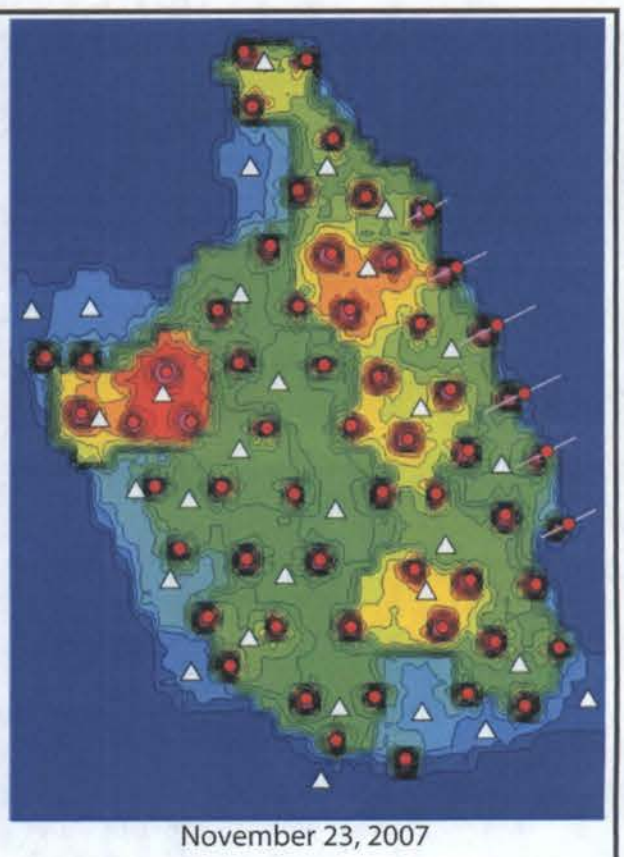
Figures



September 7, 2007



October 26, 2007



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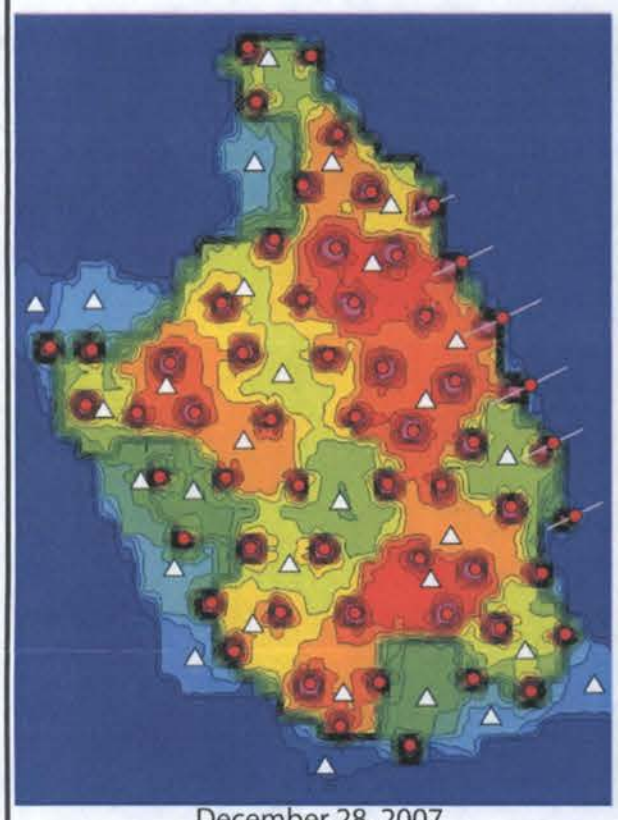

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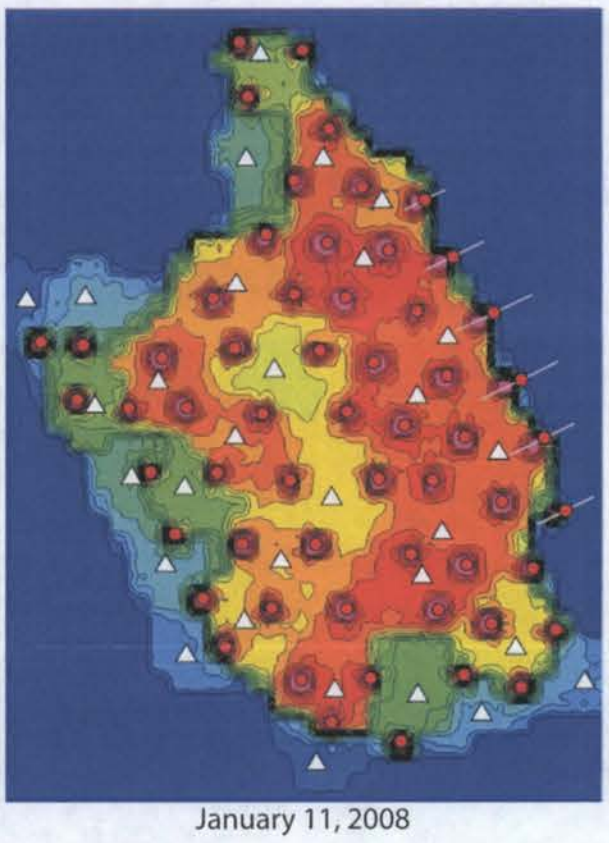
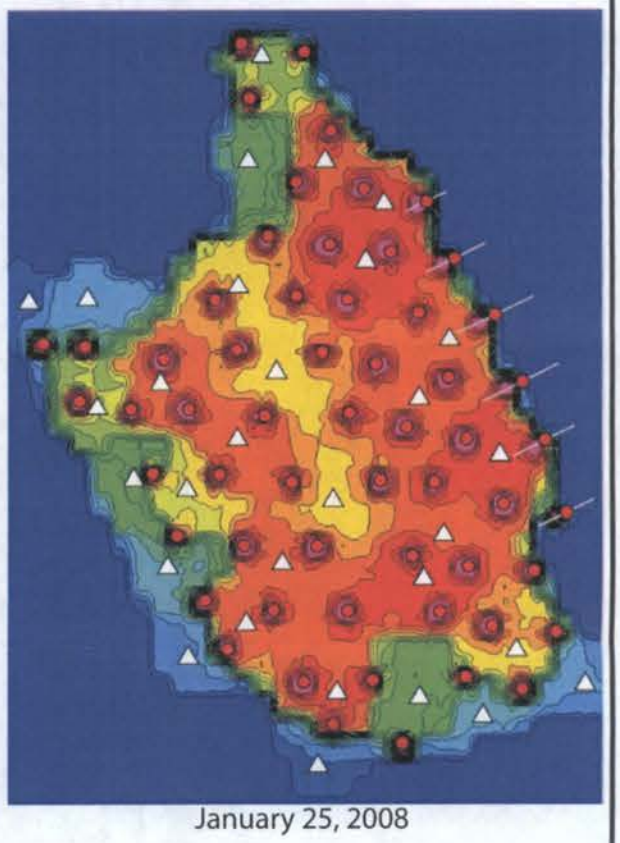
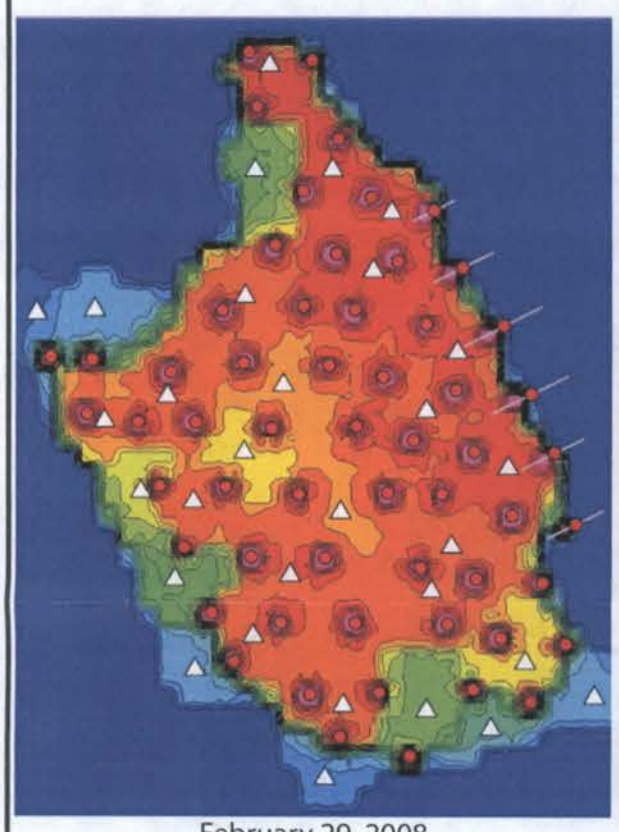


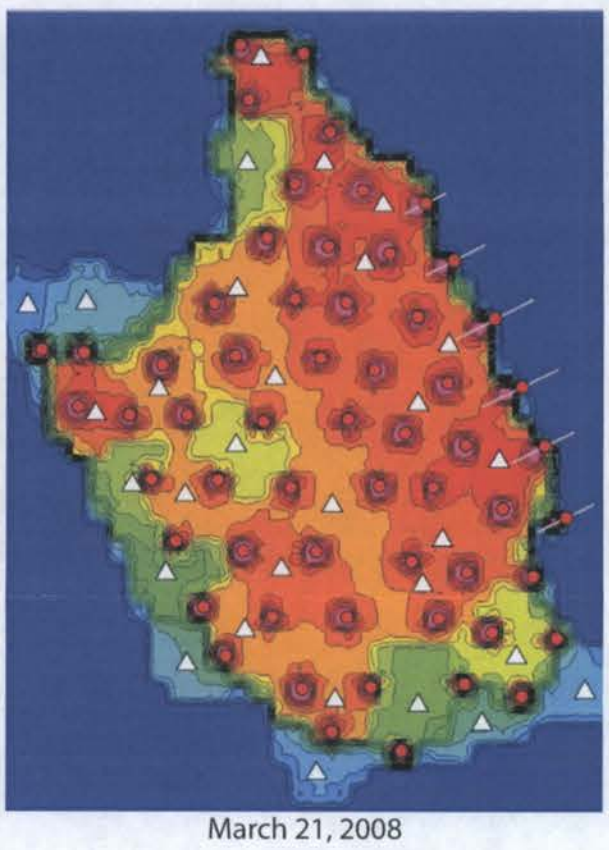
January 11, 2008



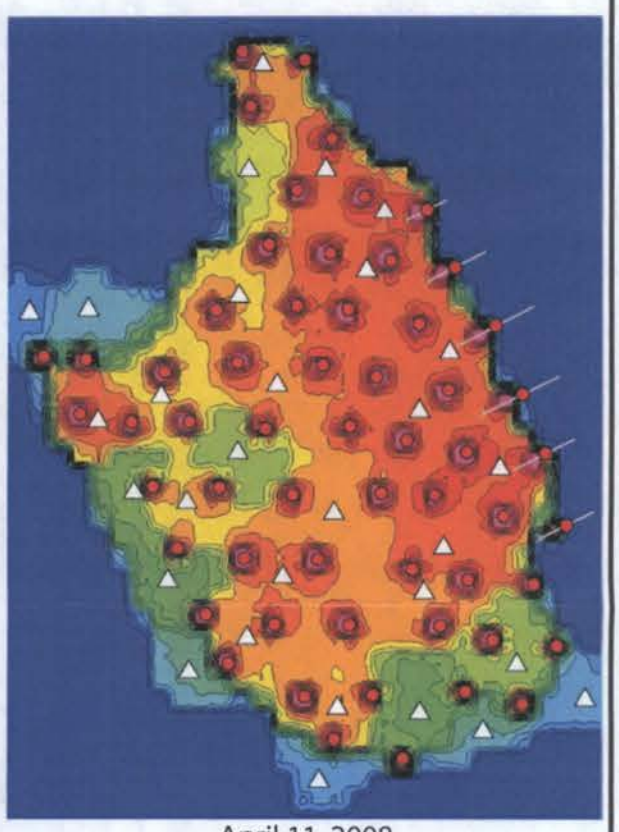
January 25, 2008



February 29, 2008



March 21, 2008



April 11, 2008

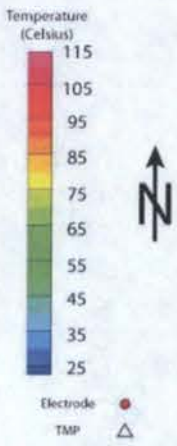


Figure E-1
Temperature Isotherms (35 ft bgs)
Pemaco Superfund Site
Maywood, California

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San Francisco, California

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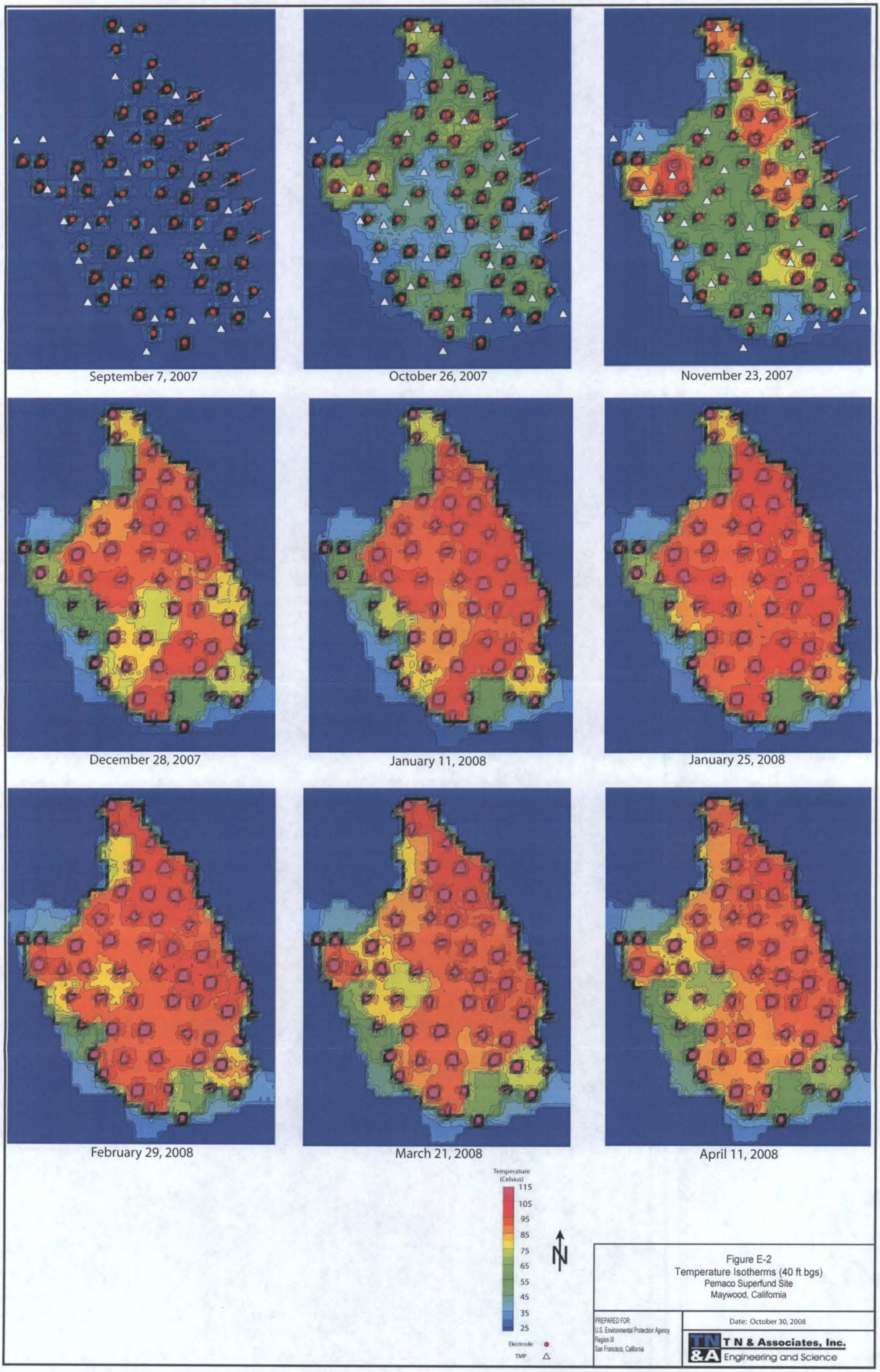

Figure E-2
Temperature Isotherms (40 ft bgs)
Pemaco Superfund Site
Maywood, California

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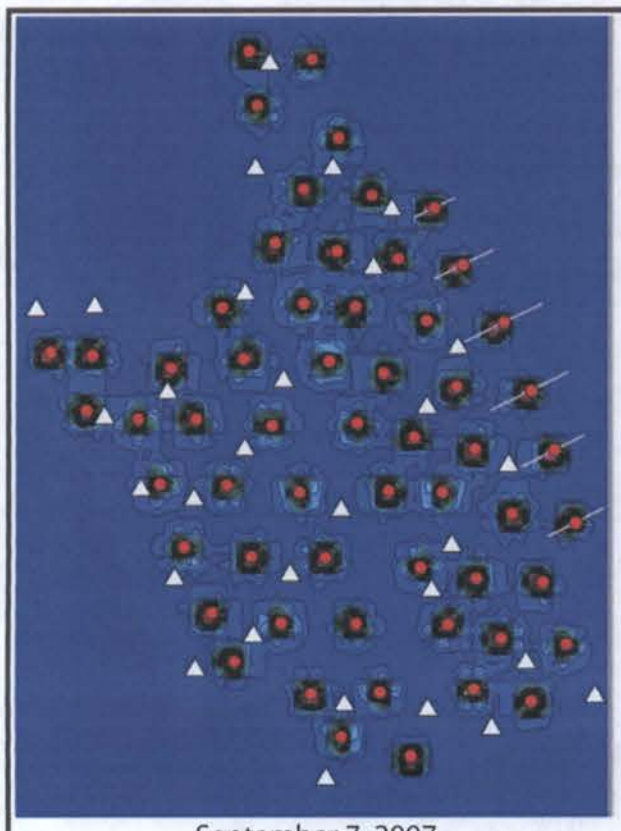
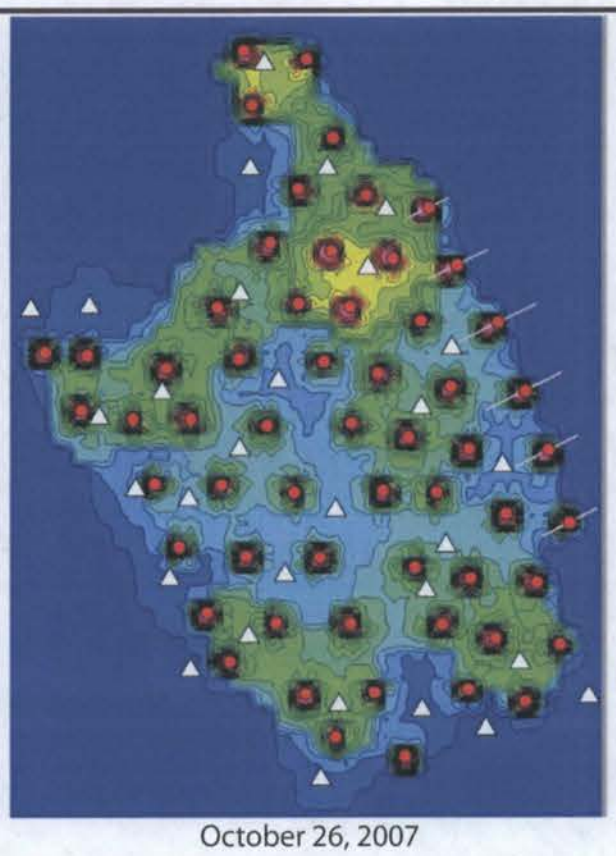
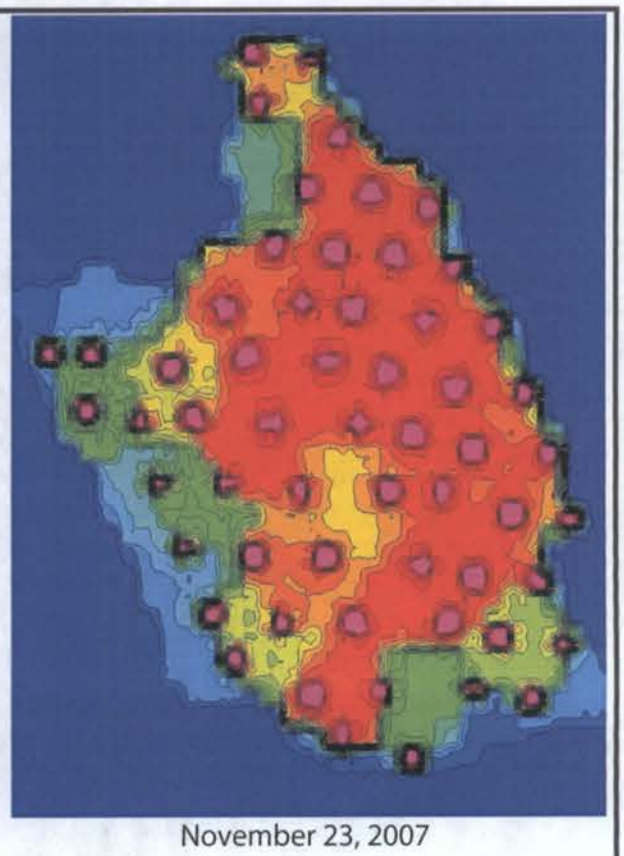


September 7, 2007



October 26, 2007



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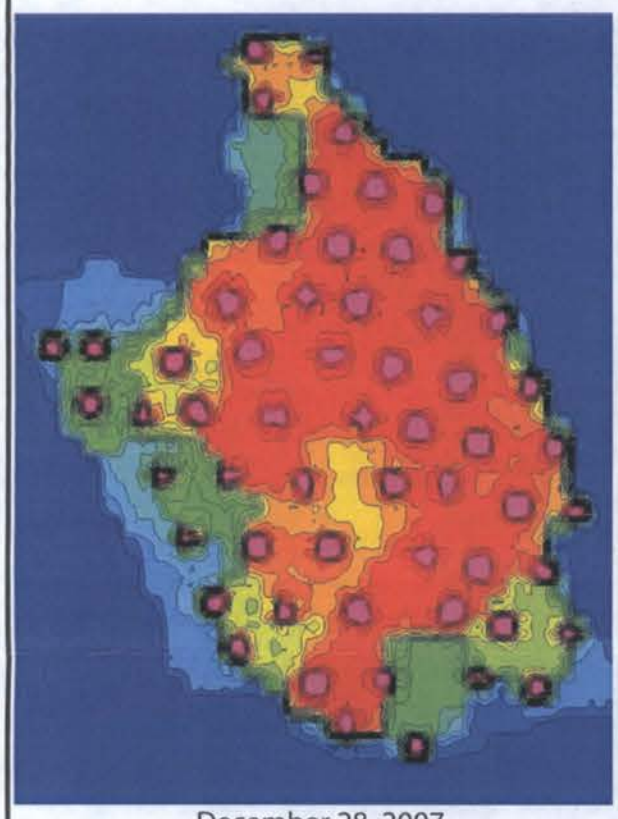

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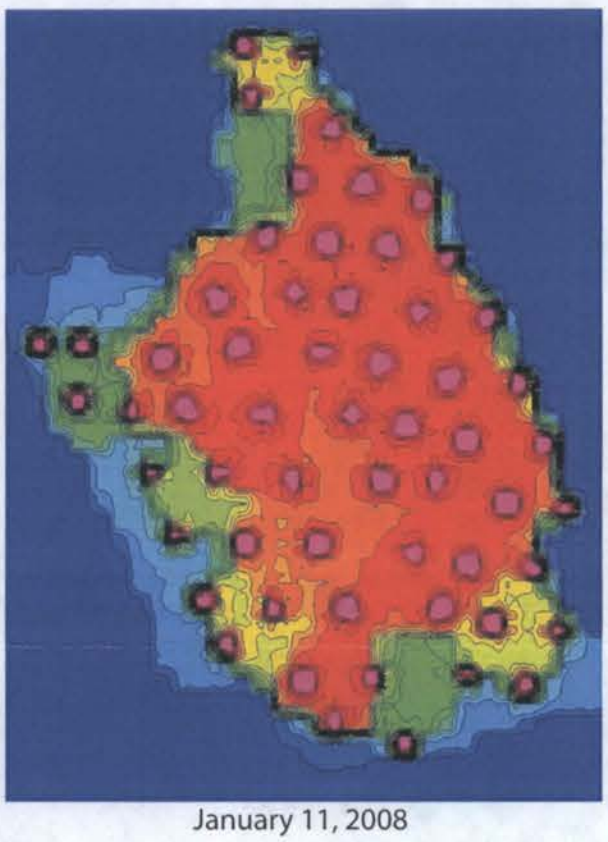
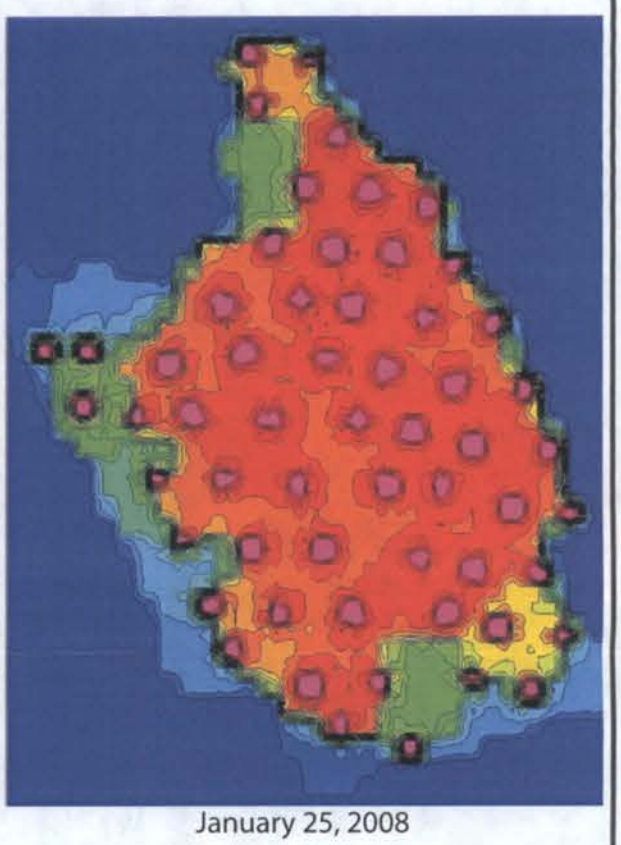


January 11, 2008



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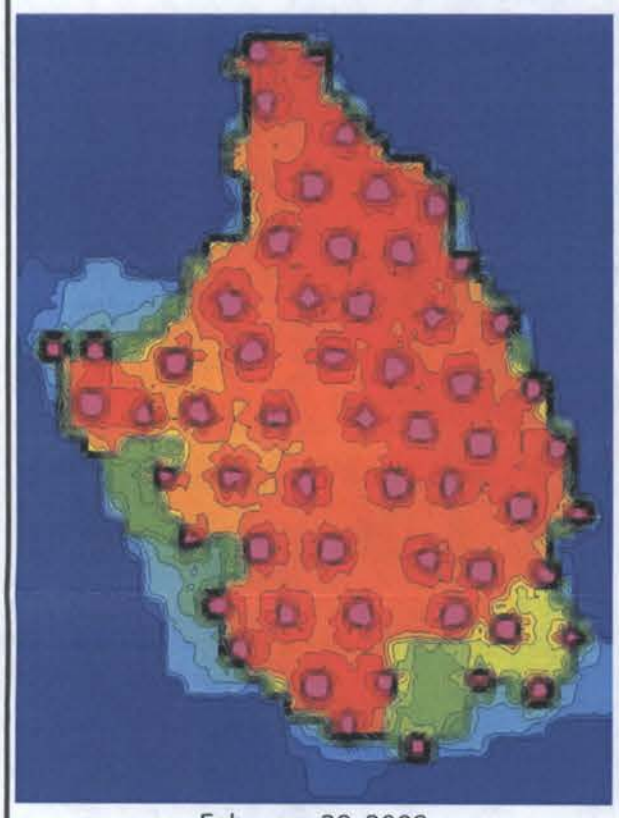

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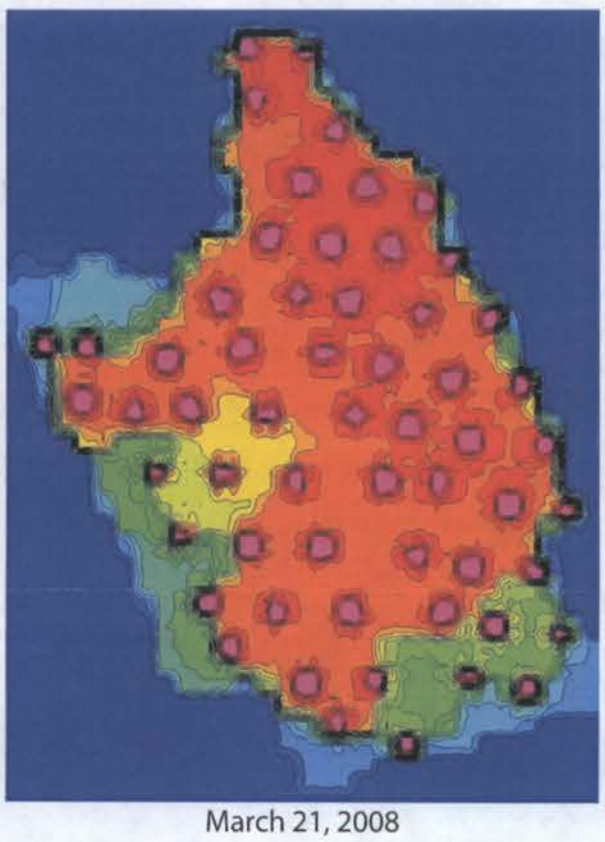
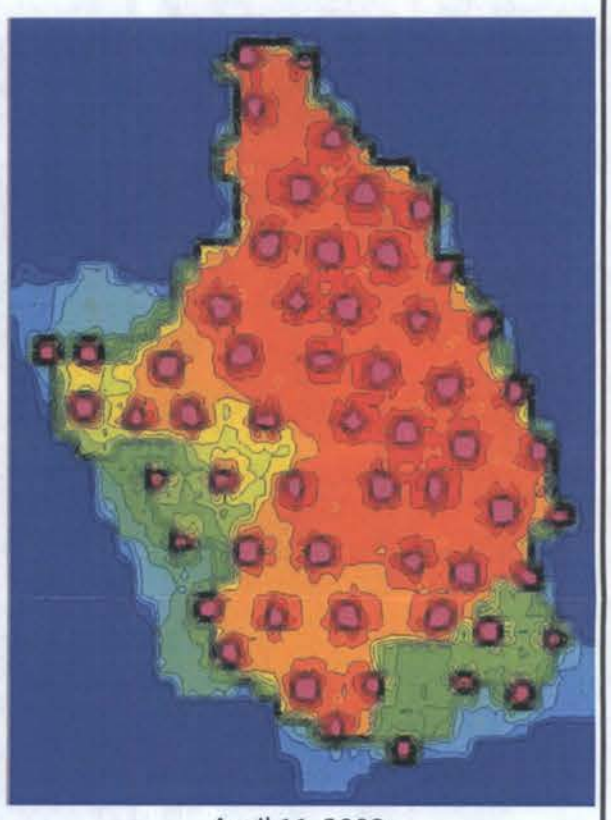


March 21, 2008



April 11, 2008

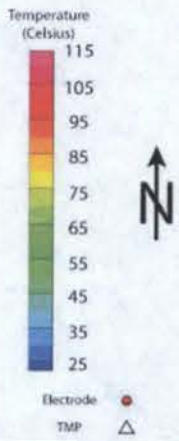


Figure E-3
Temperature Isotherms (45 ft bgs)
Pemaco Superfund Site
Maywood, California

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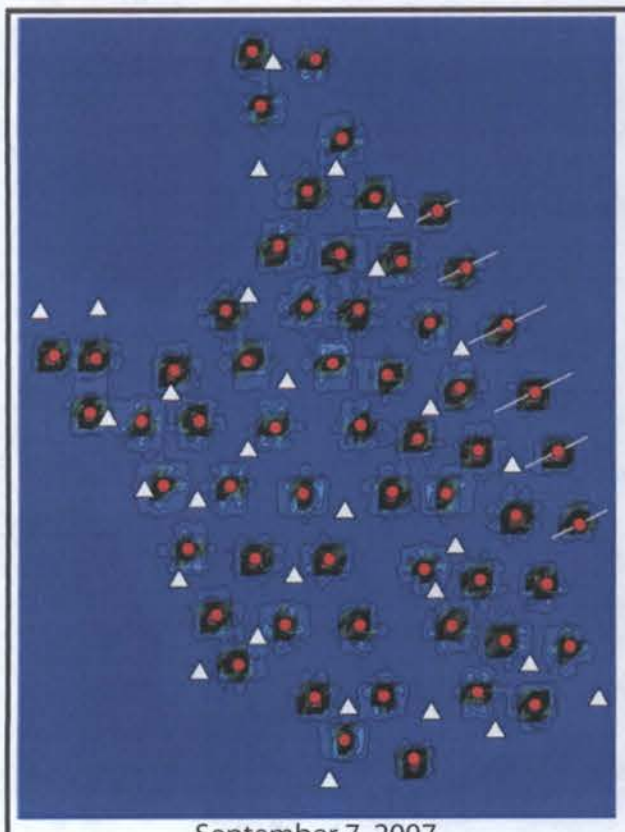
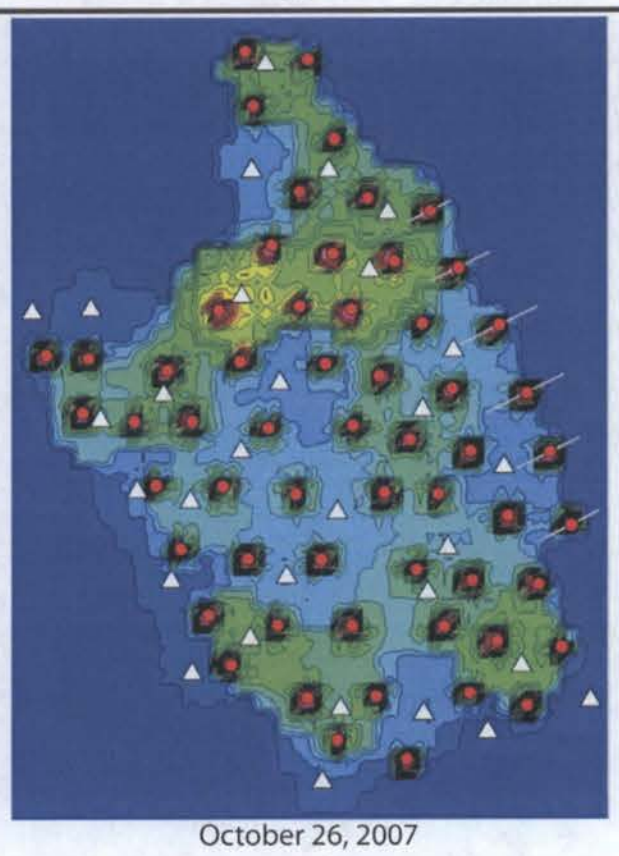
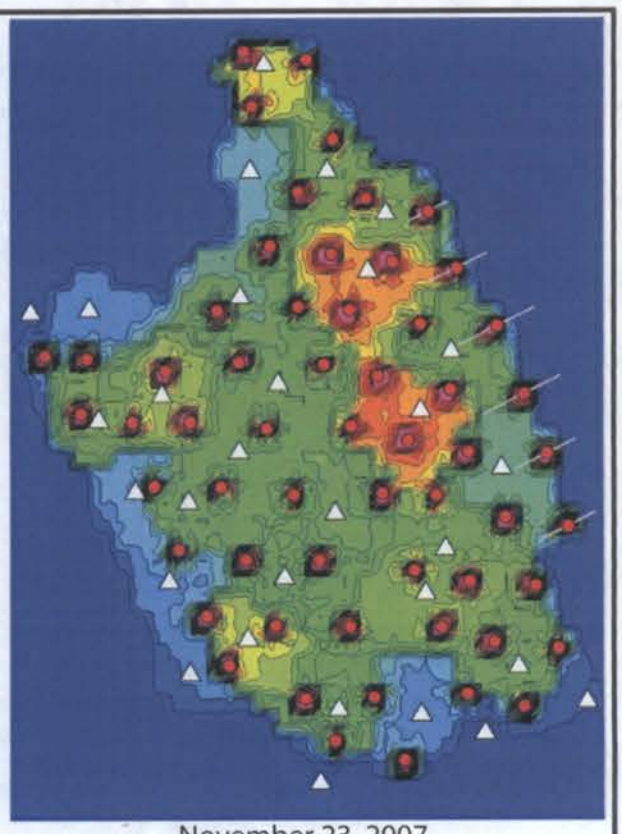


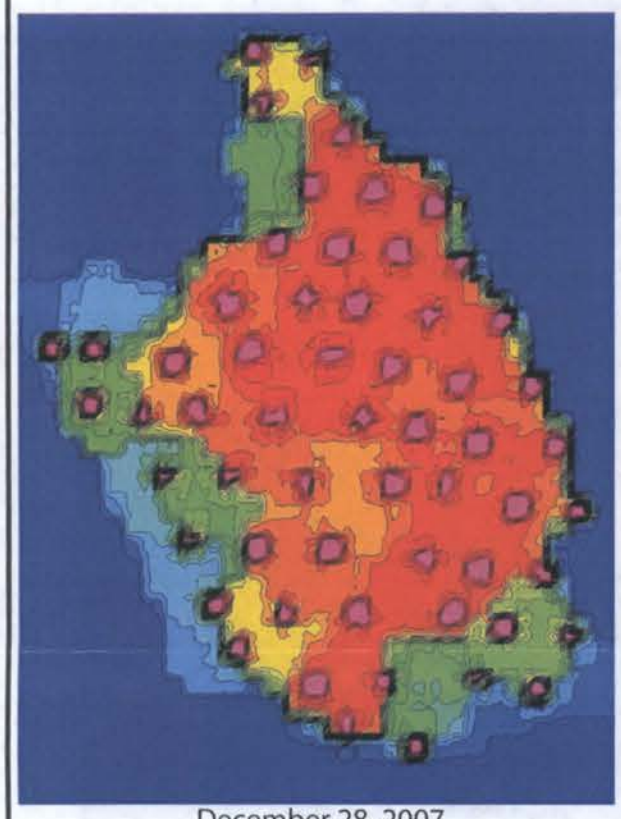
September 7, 2007



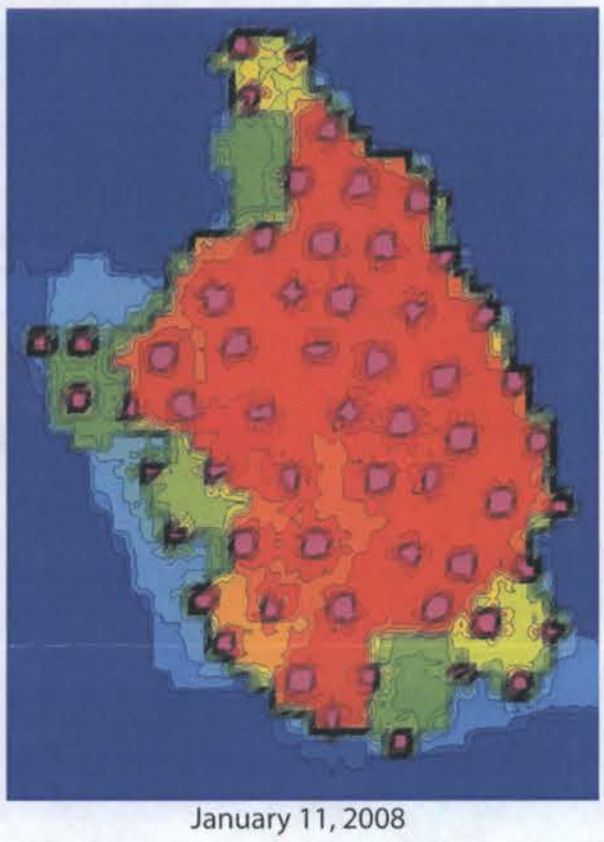
October 26, 2007



November 23, 2007



December 28, 2007



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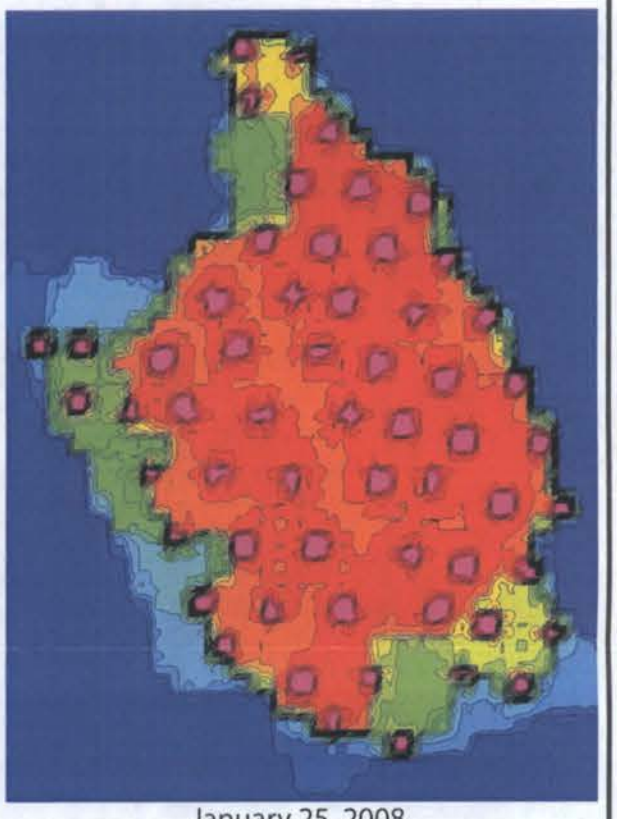

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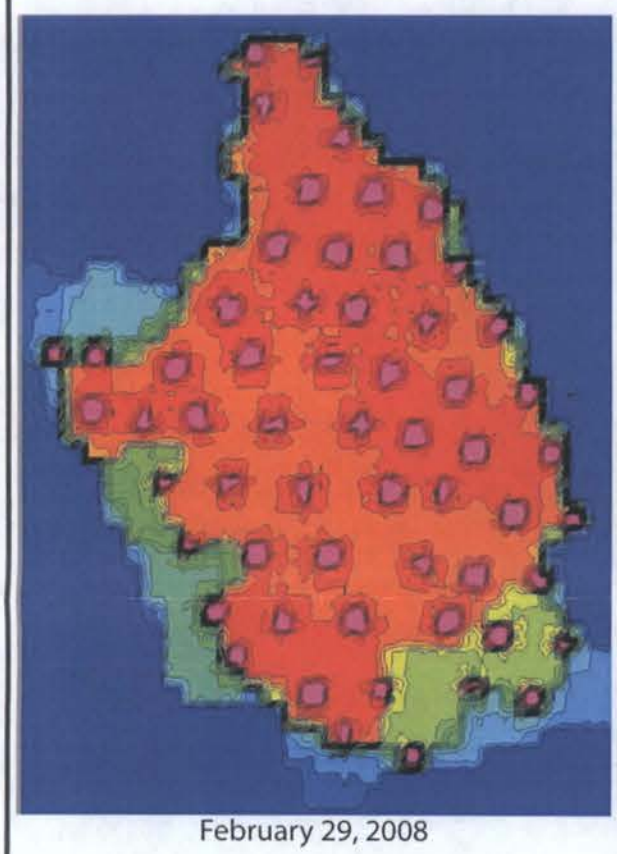

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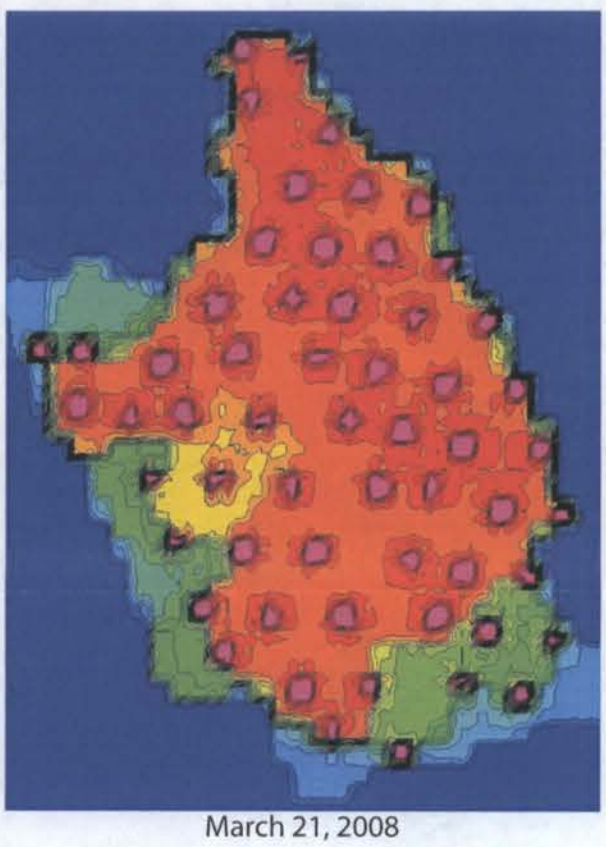
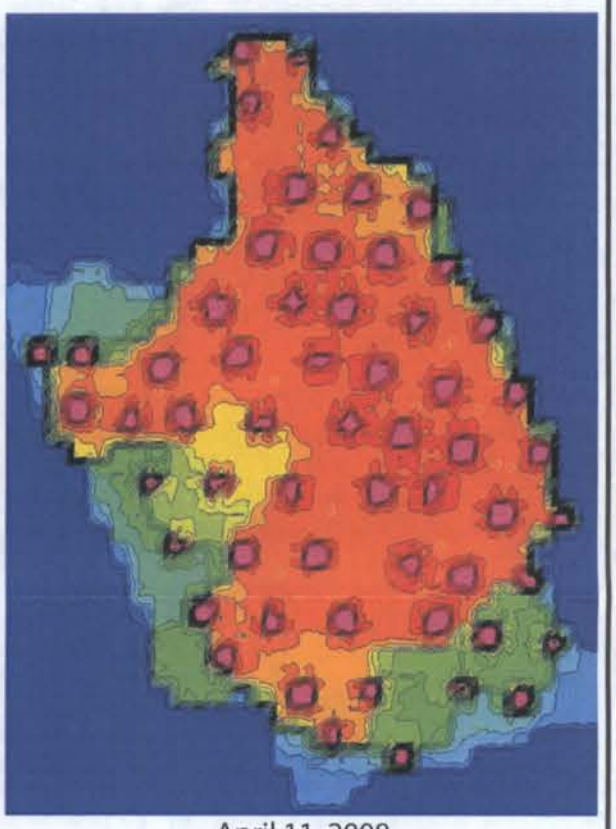


March 21, 2008



April 11, 2008

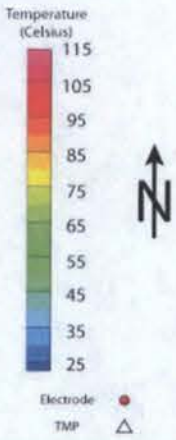


Figure E-4
Temperature Isotherms (50 ft bgs)
Pemaco Superfund Site
Maywood, California

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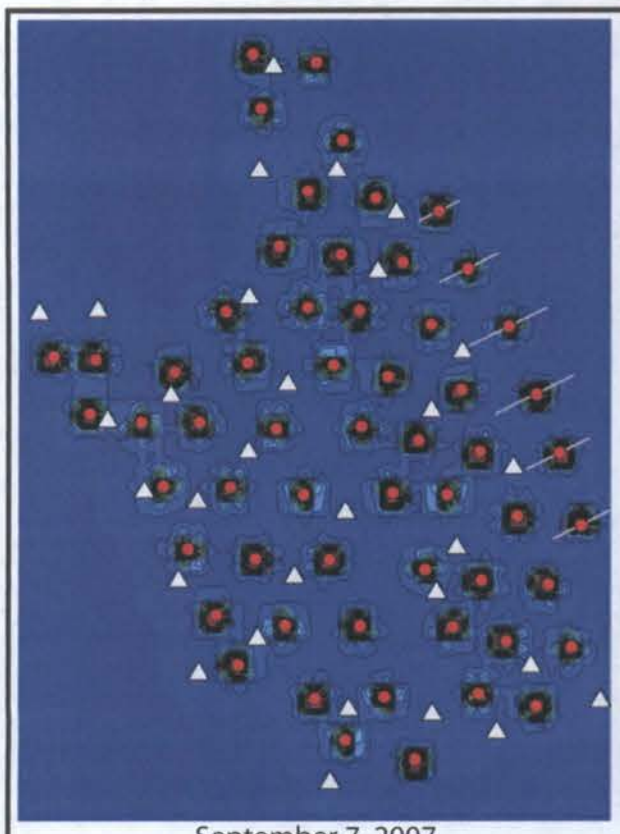

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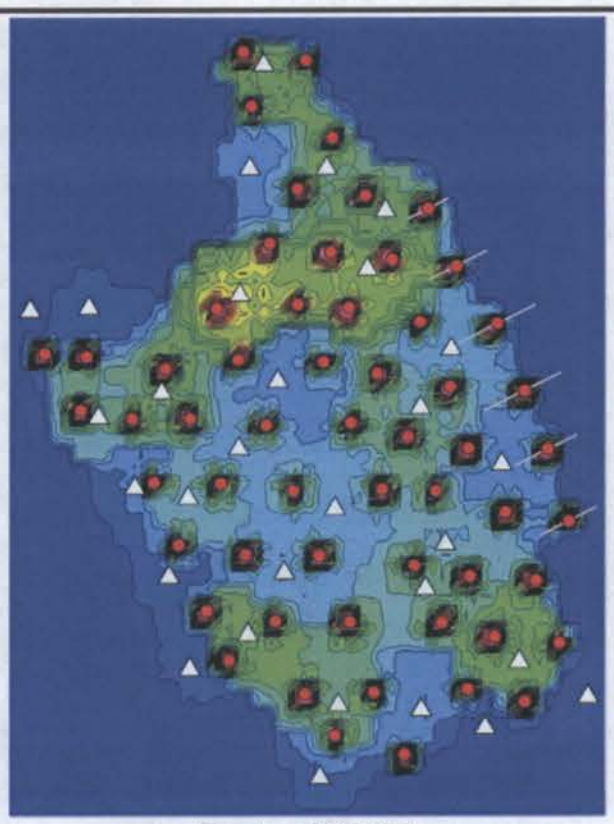
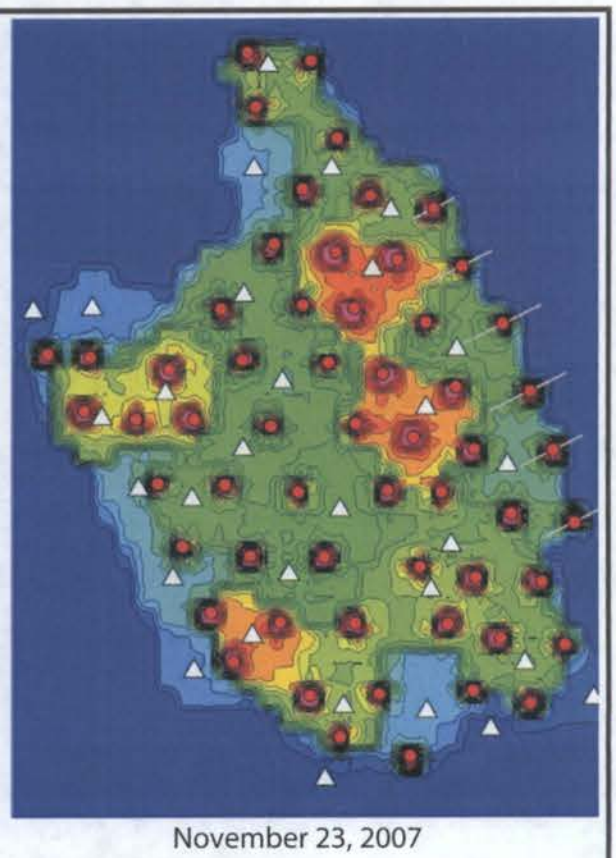
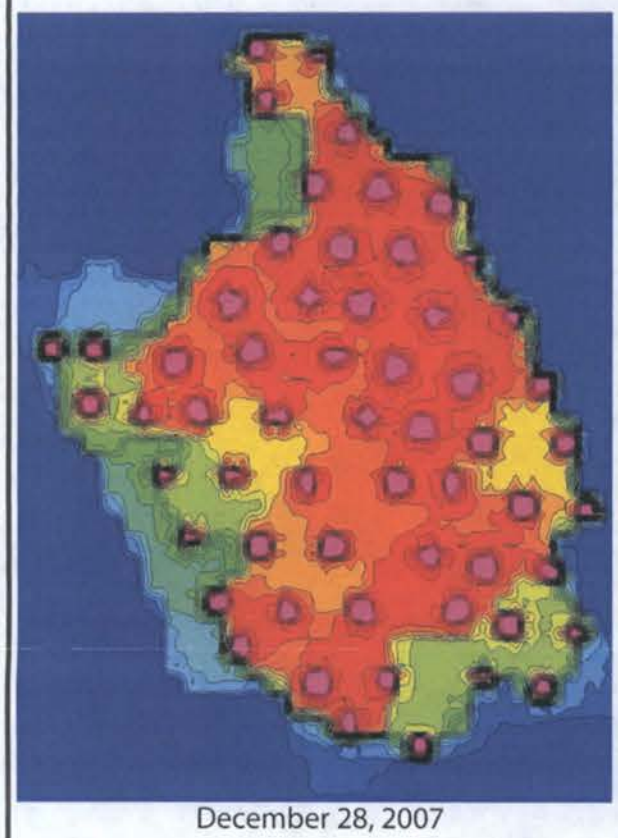


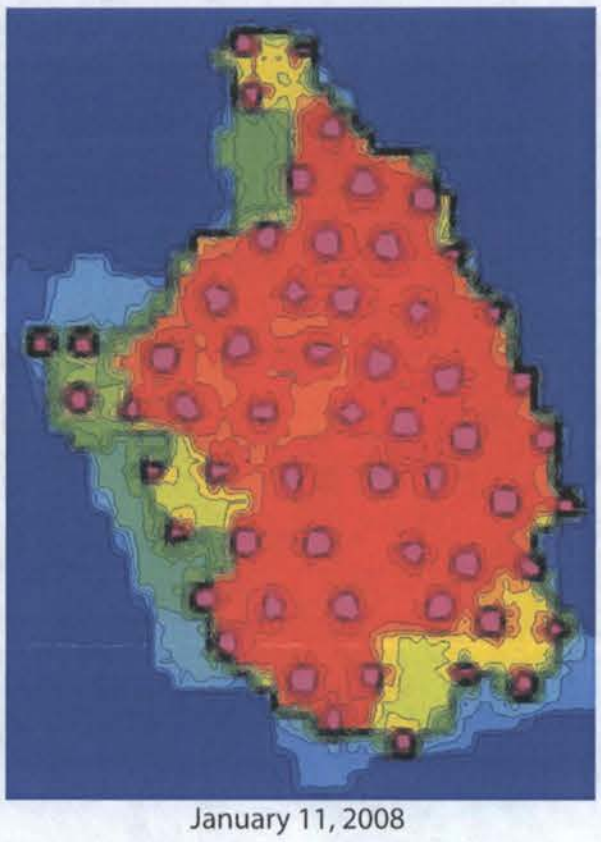
October 26, 2007



November 23, 2007



December 28, 2007



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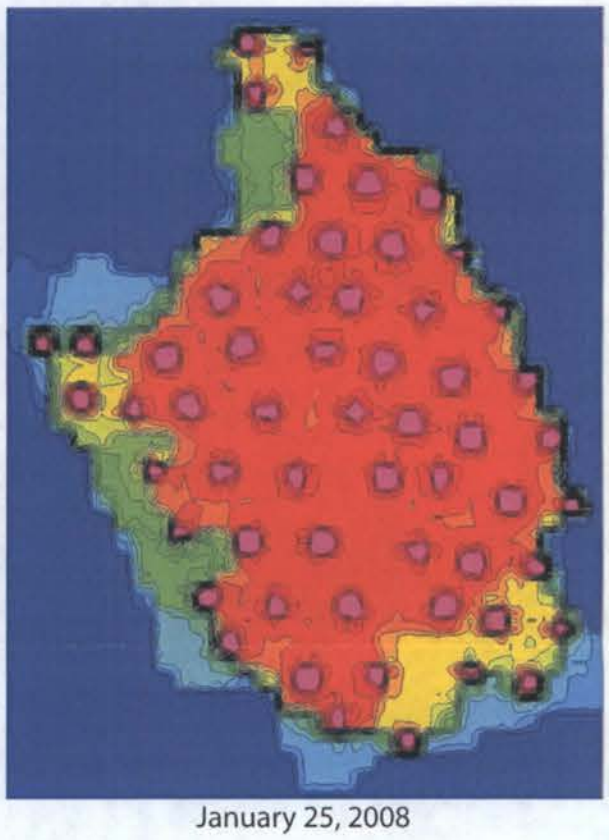

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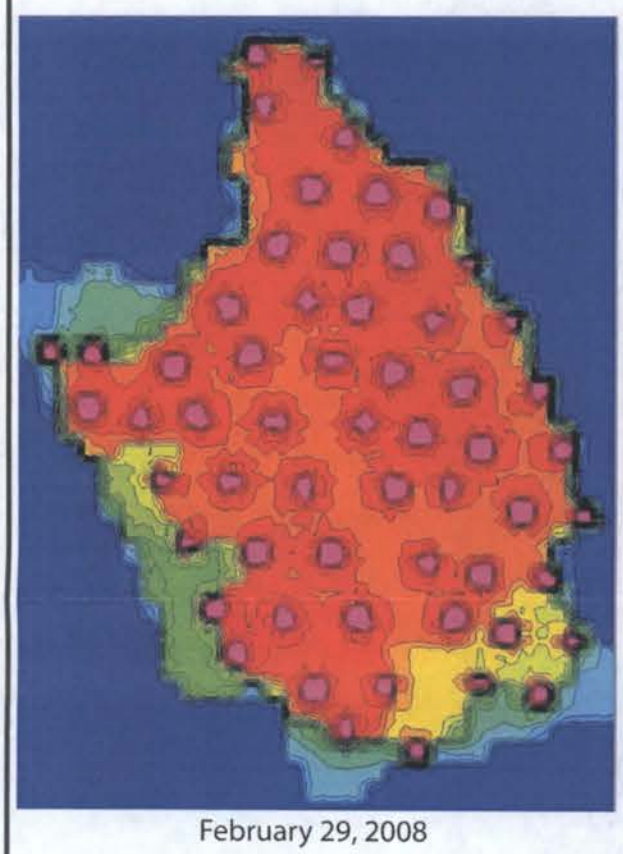
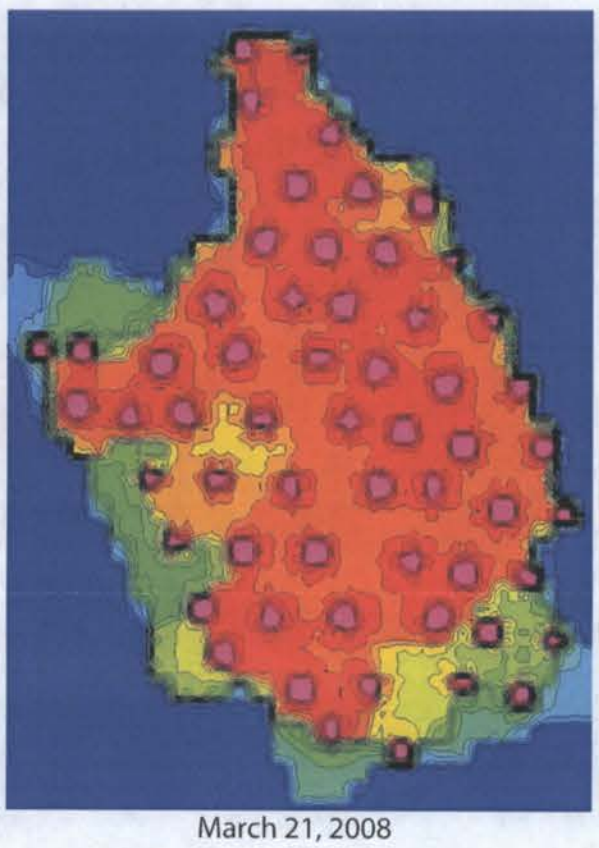
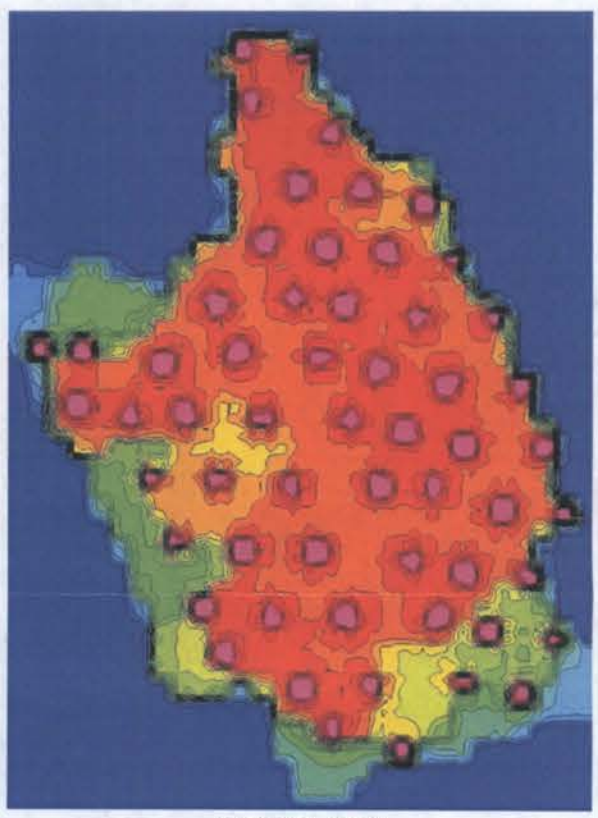


February 29, 2008



March 21, 2008



April 11, 2008

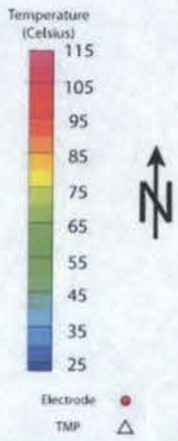


Figure E-5
Temperature Isotherms (55 ft bgs)
Pemaco Superfund Site
Maywood, California

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San Francisco, California

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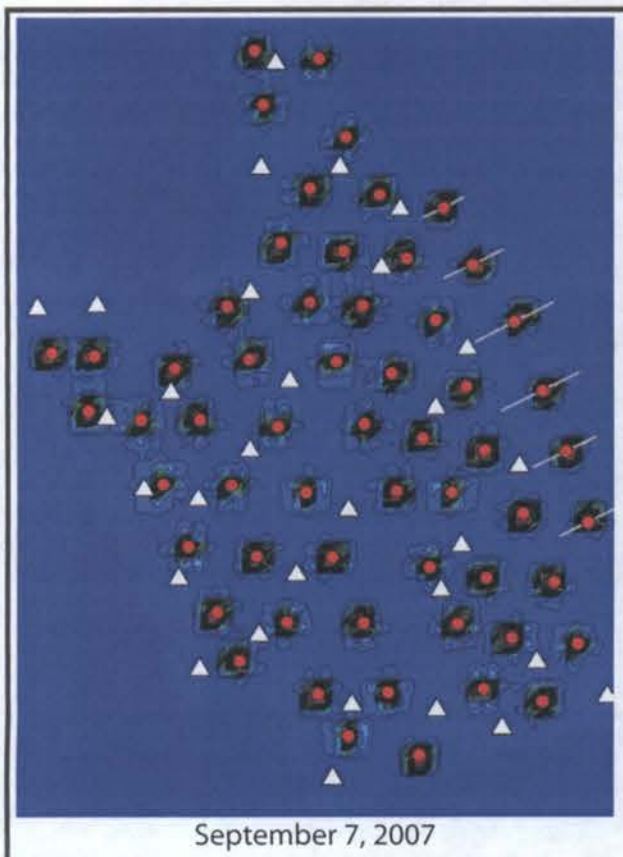
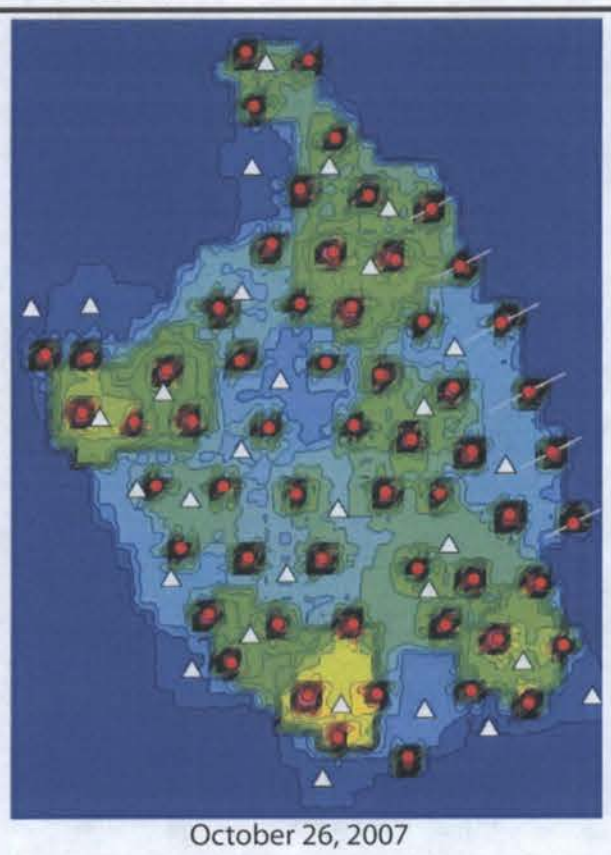
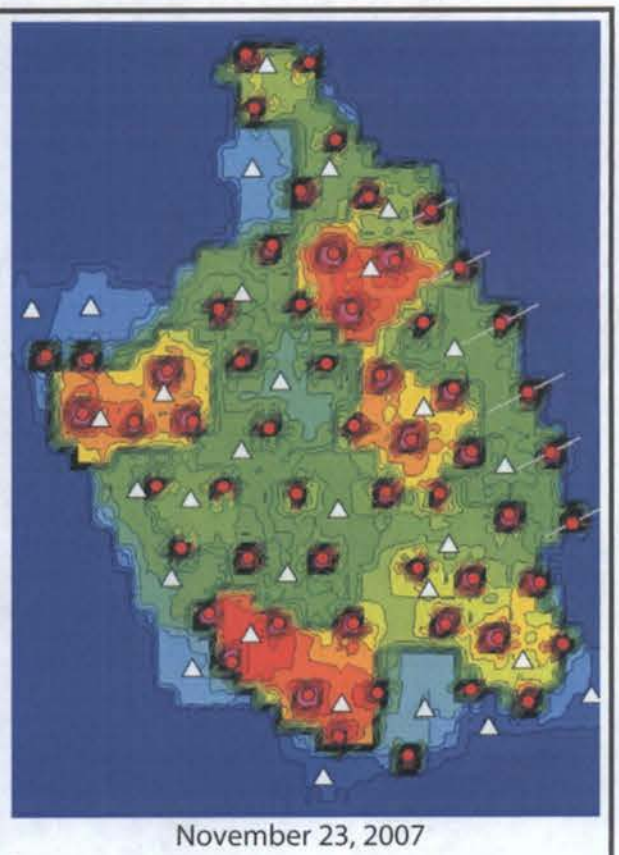


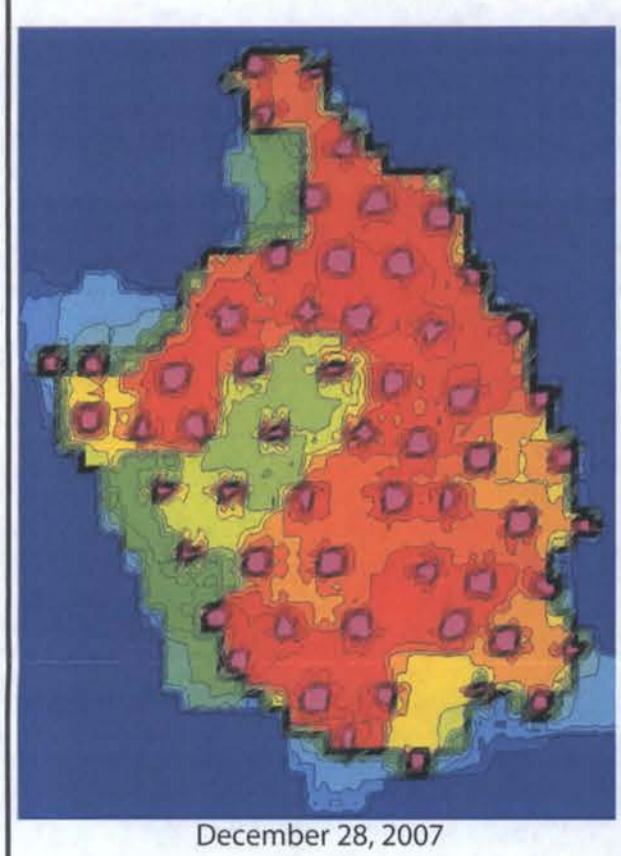
September 7, 2007



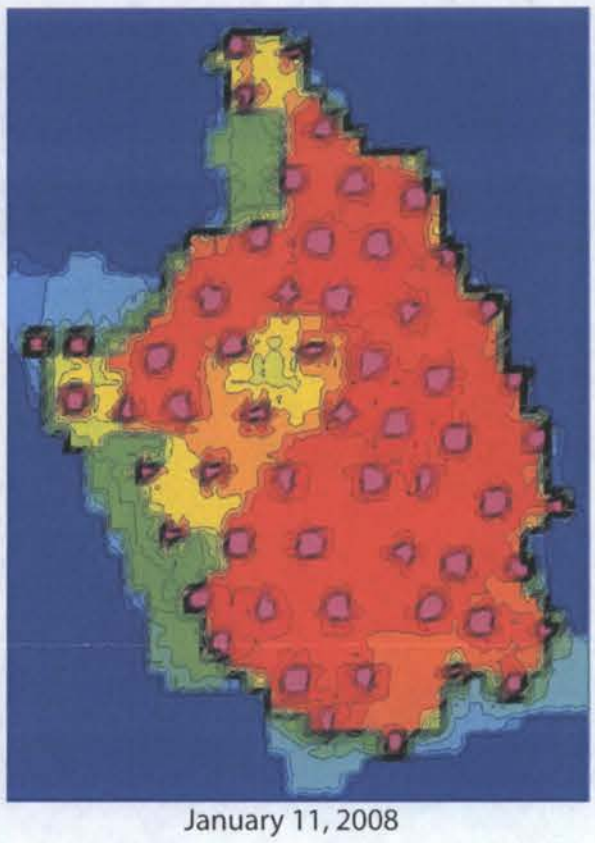
October 26, 2007



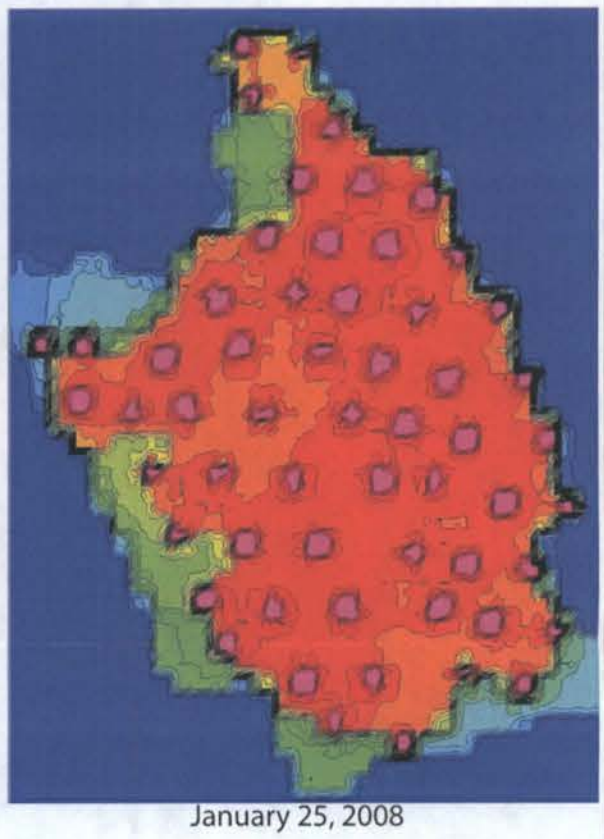
November 23, 2007



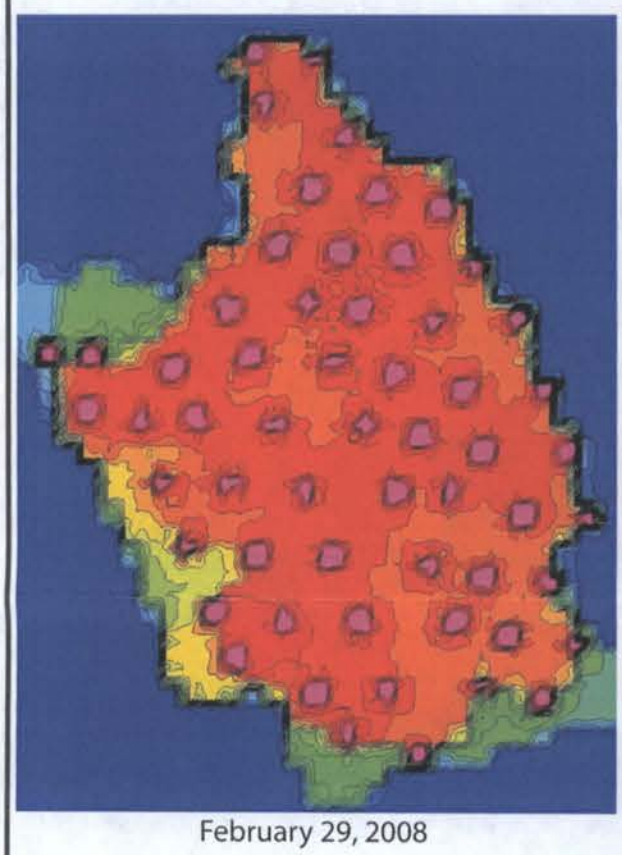
December 28, 2007



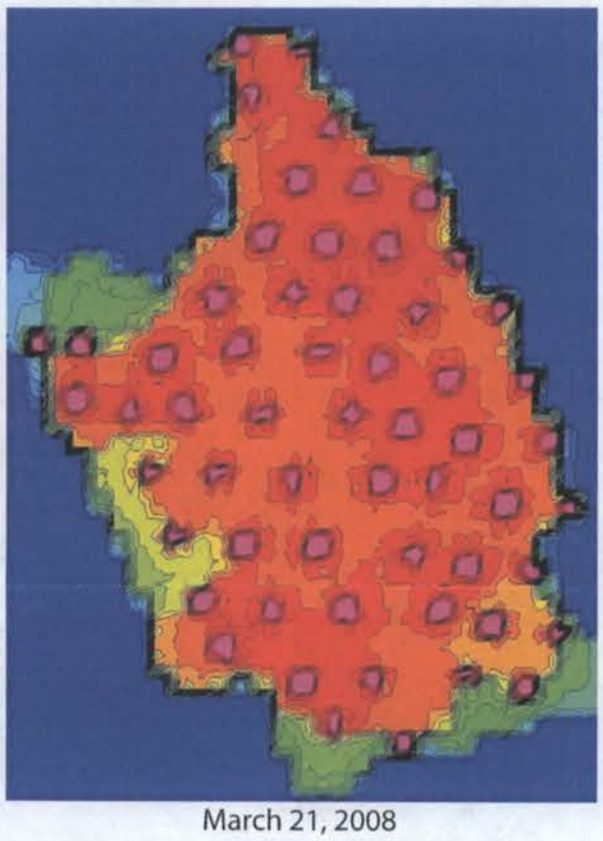
January 11, 2008



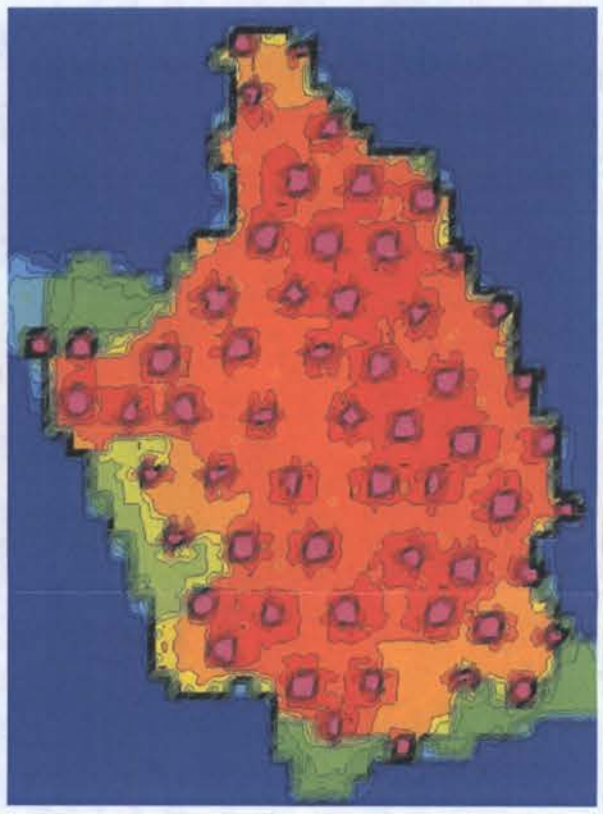
January 25, 2008



February 29, 2008



March 21, 2008



April 11, 2008

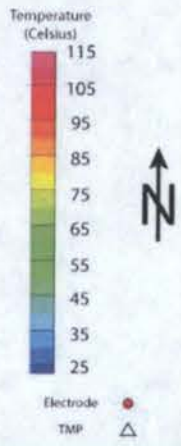


Figure E-6
Temperature Isotherms (60 ft bgs)
Pemaco Superfund Site
Maywood, California

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San Francisco, California

Date: October 30, 2008

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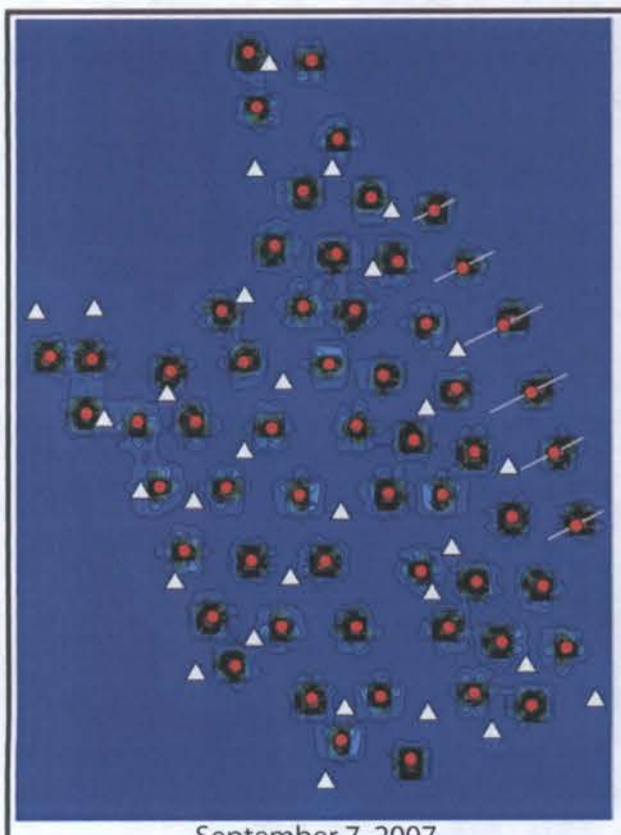
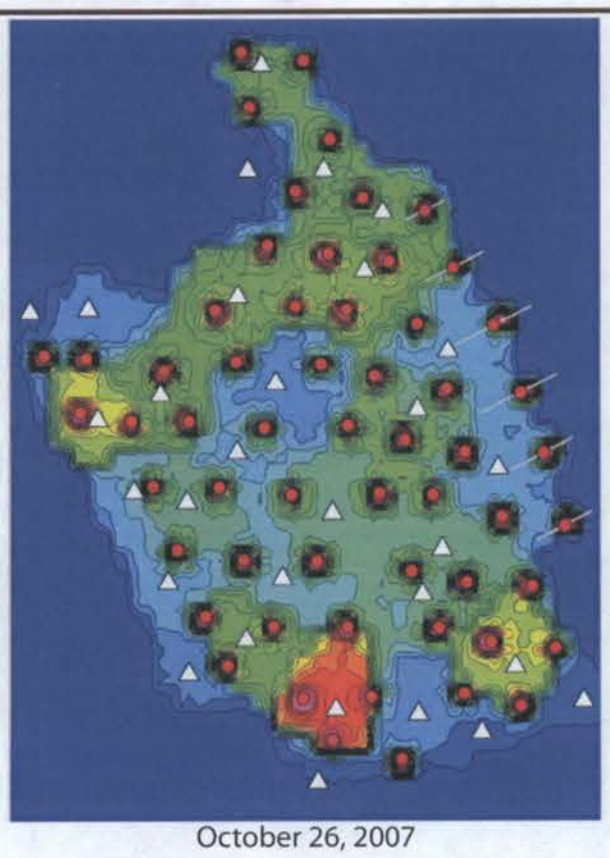
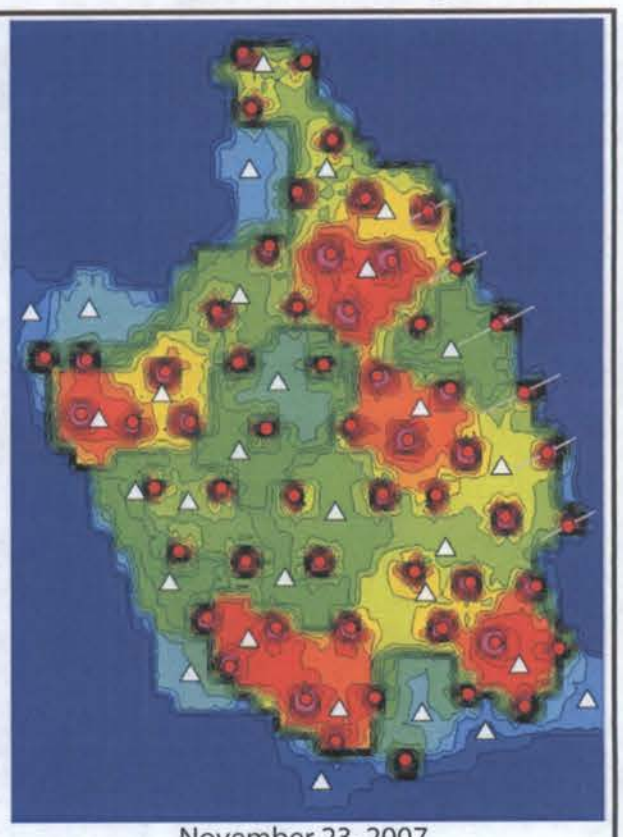


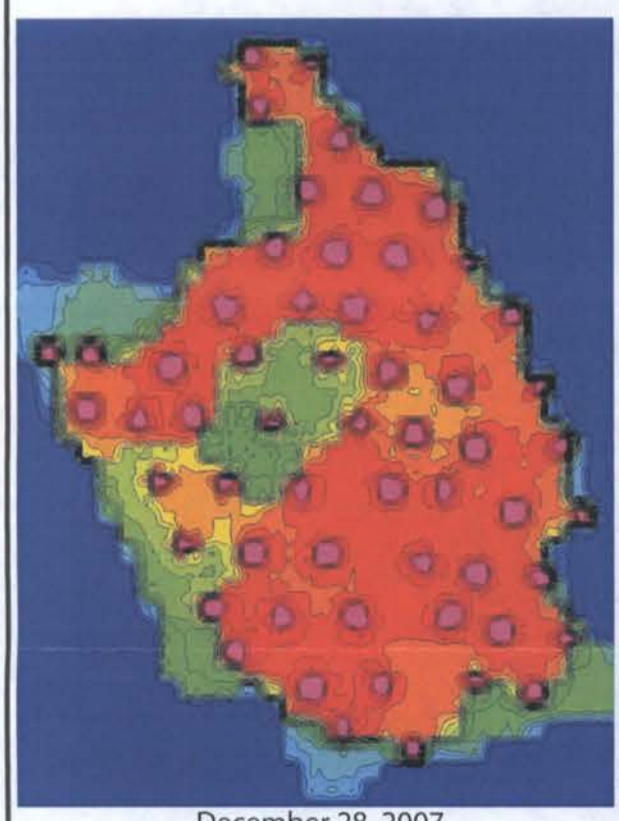
September 7, 2007



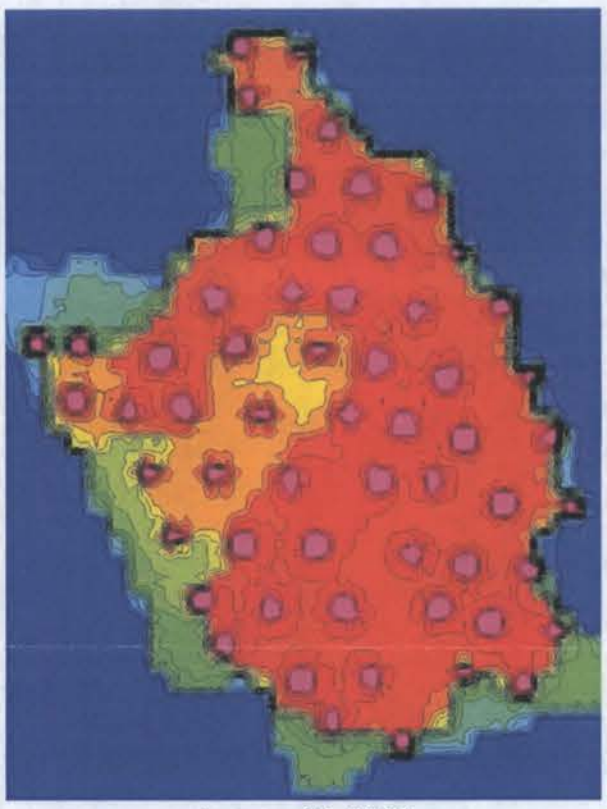
October 26, 2007



November 23, 2007



December 28, 2007



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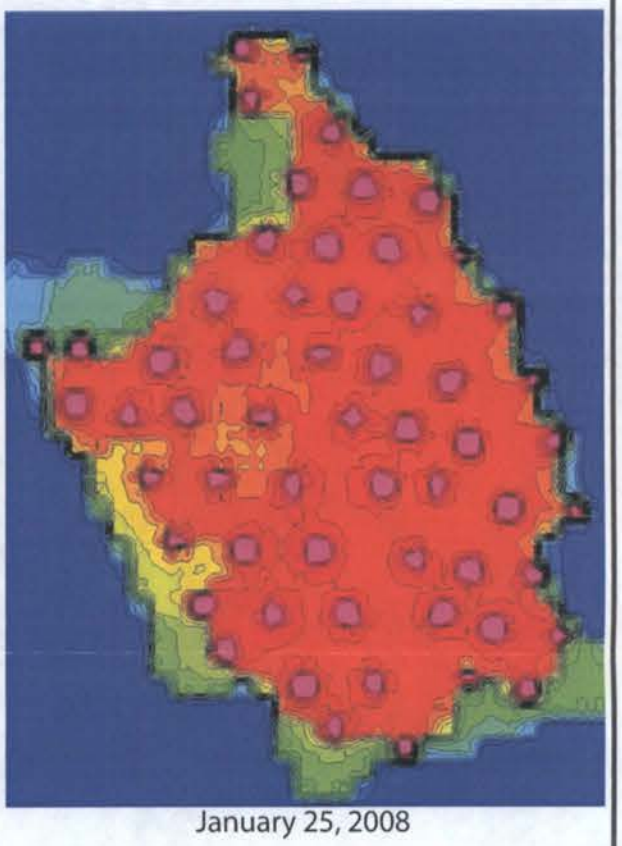
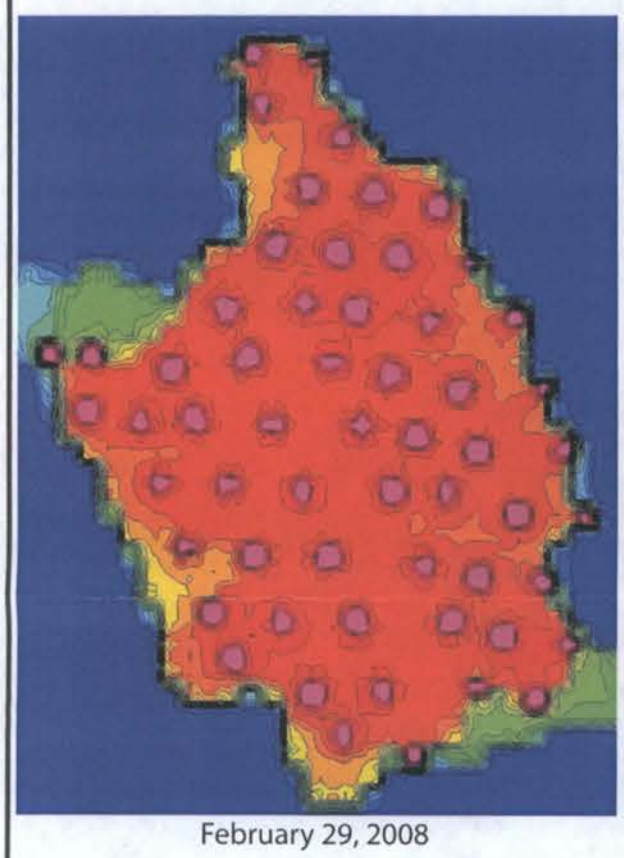
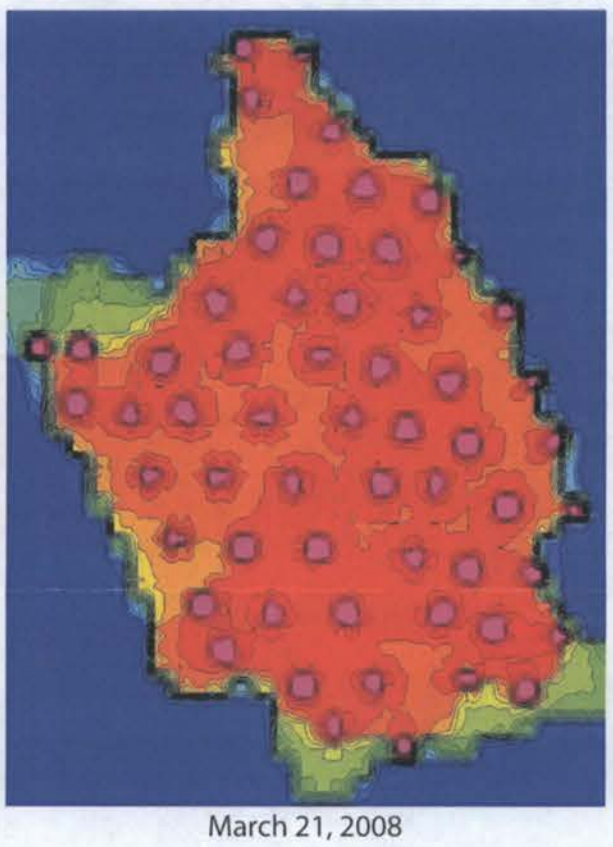


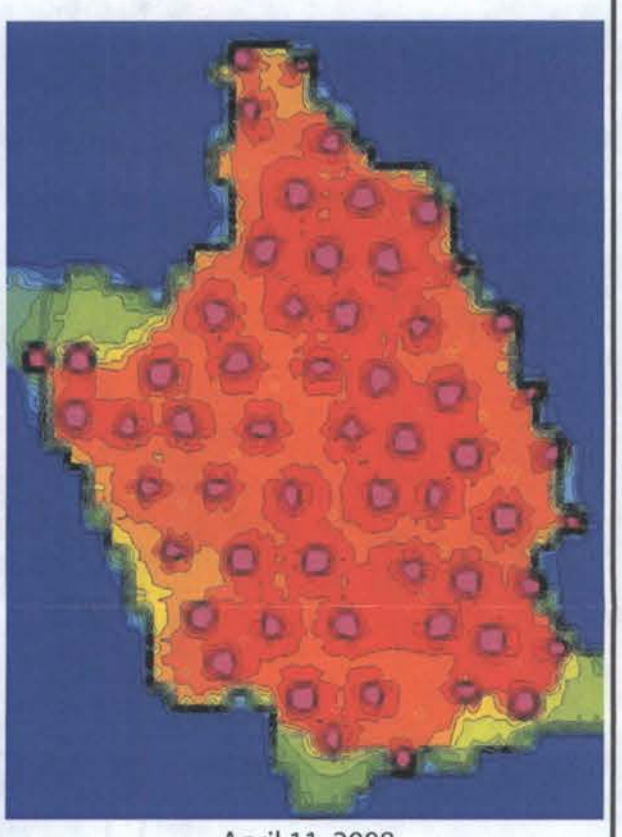
January 25, 2008



February 29, 2008



March 21, 2008



April 11, 2008

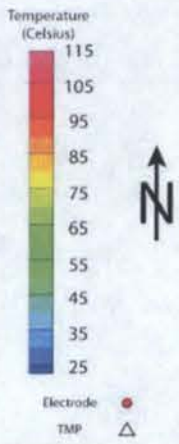


Figure E-7
Temperature Isotherms (65 ft bgs)
Pemaco Superfund Site
Maywood, California

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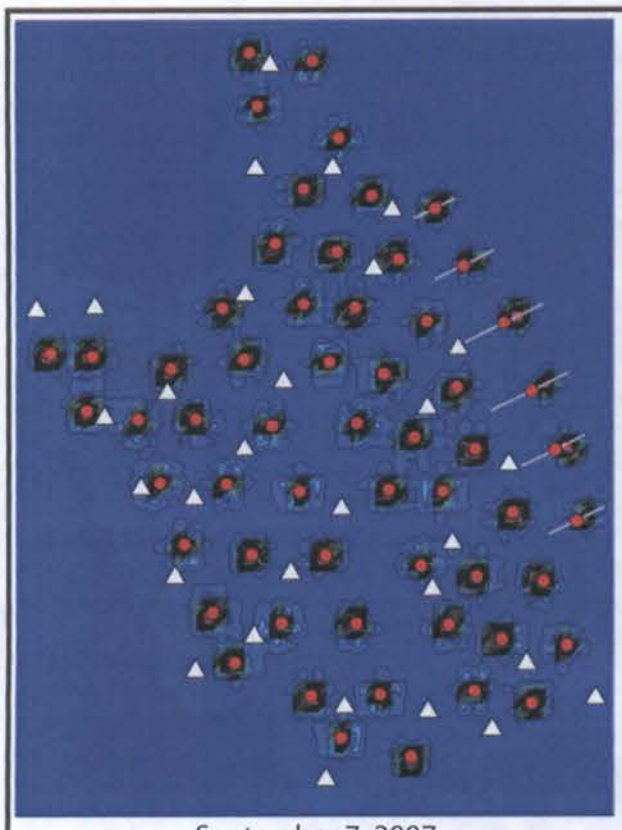
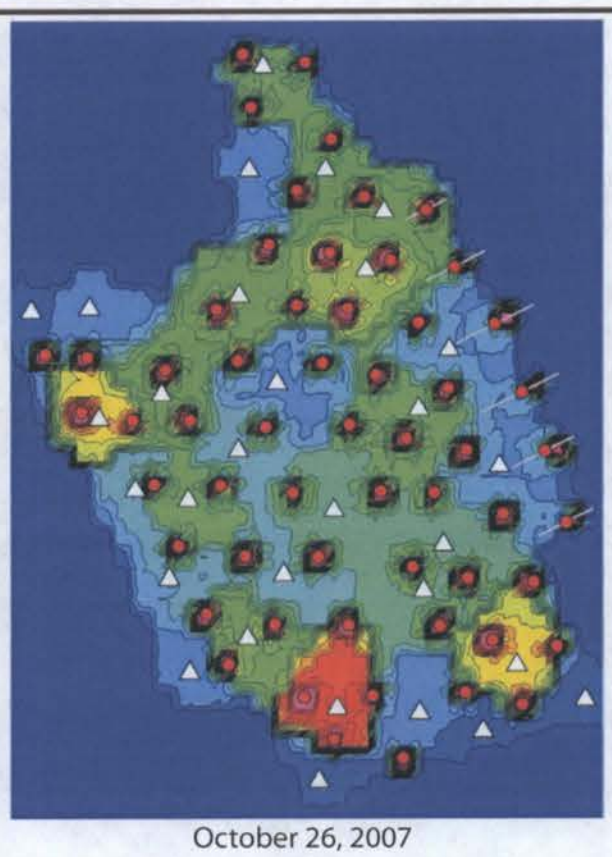


September 7, 2007



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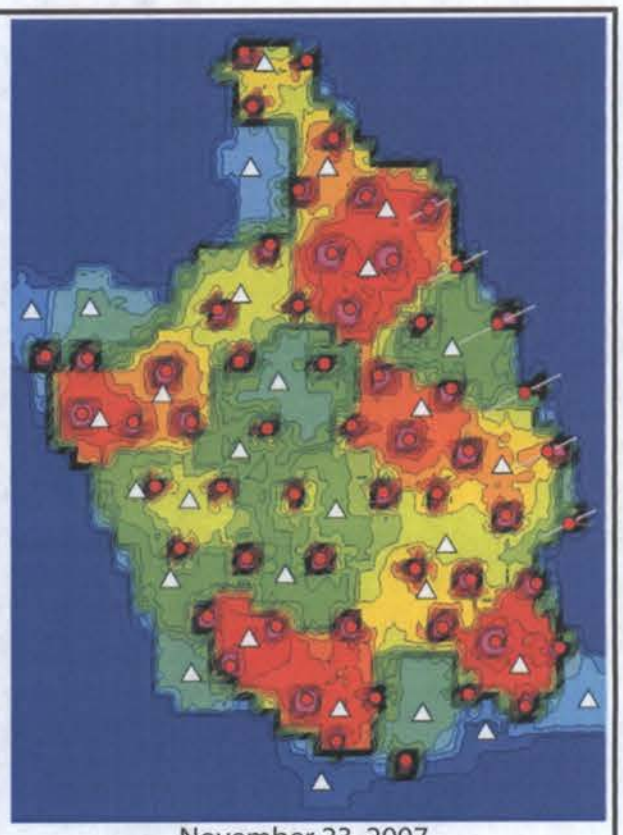

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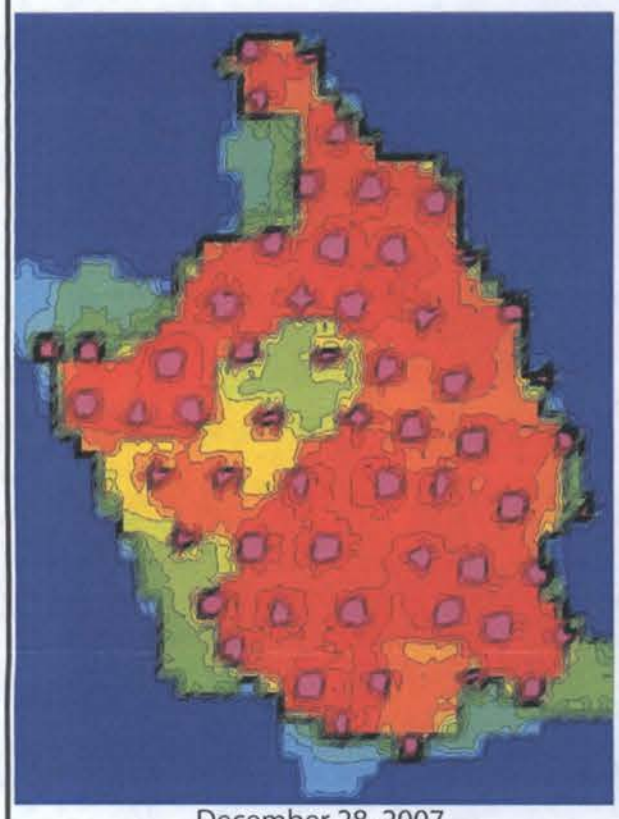

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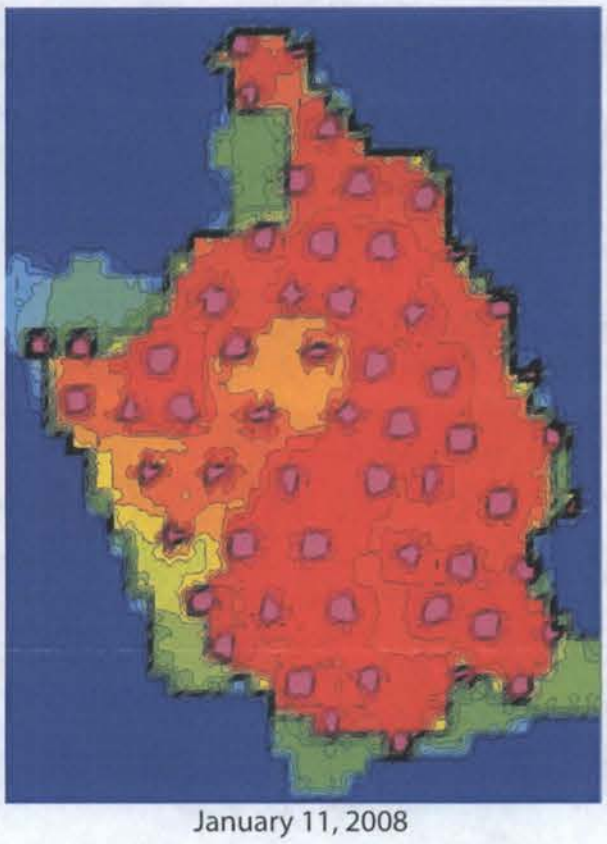
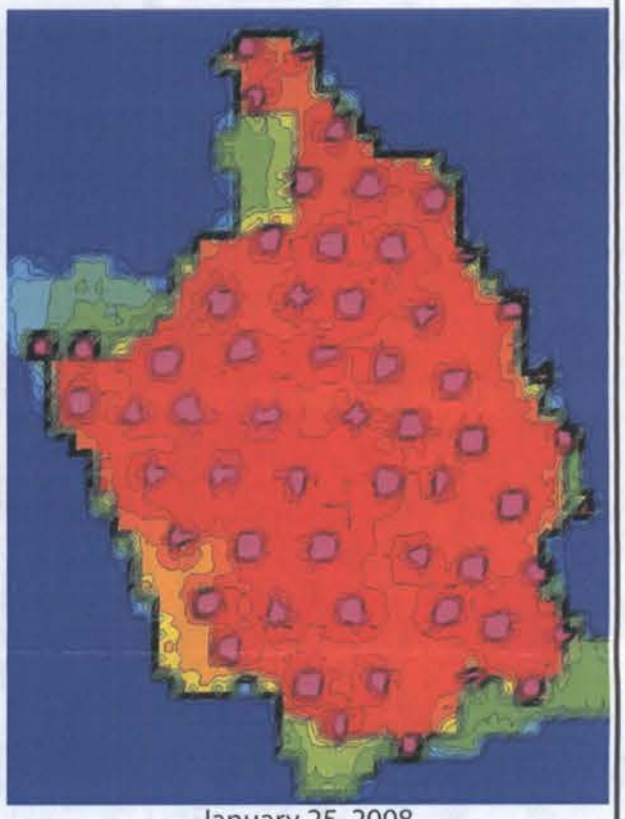


January 11, 2008



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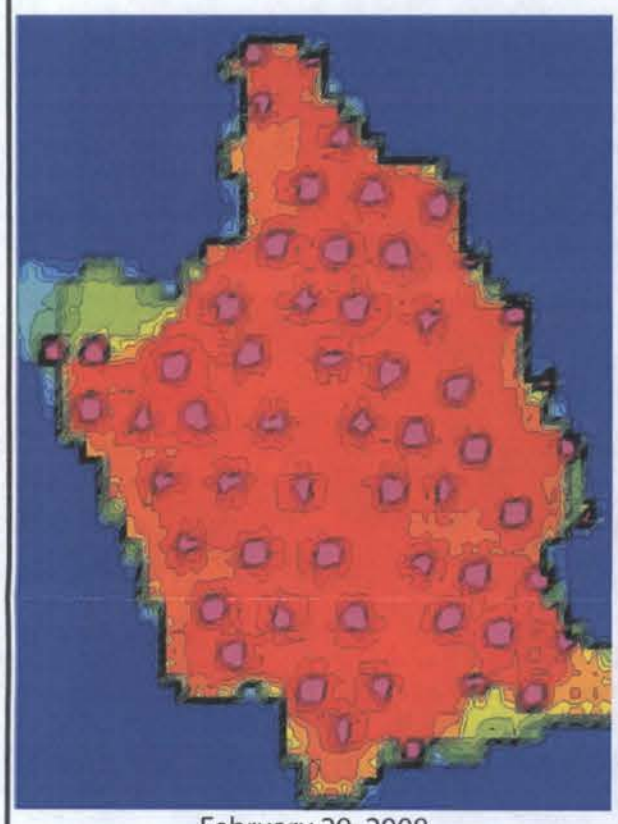
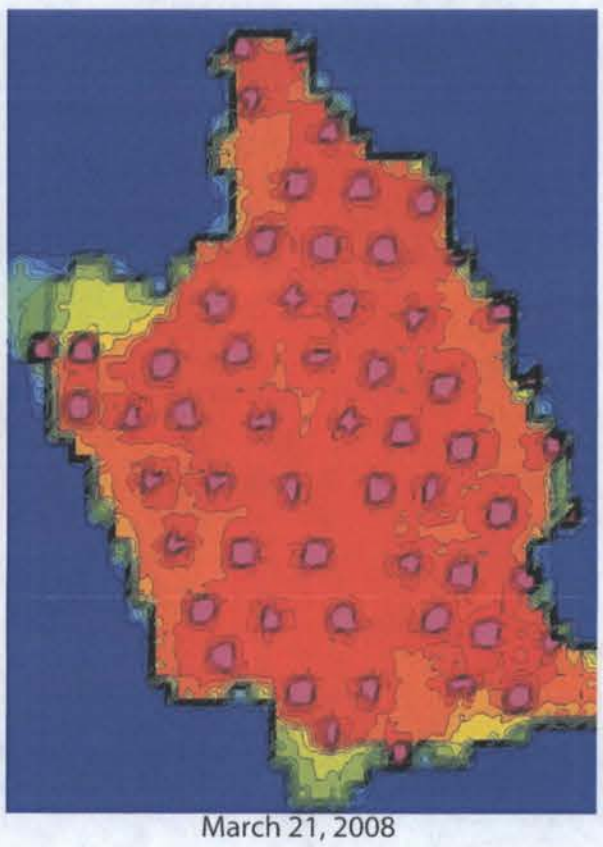
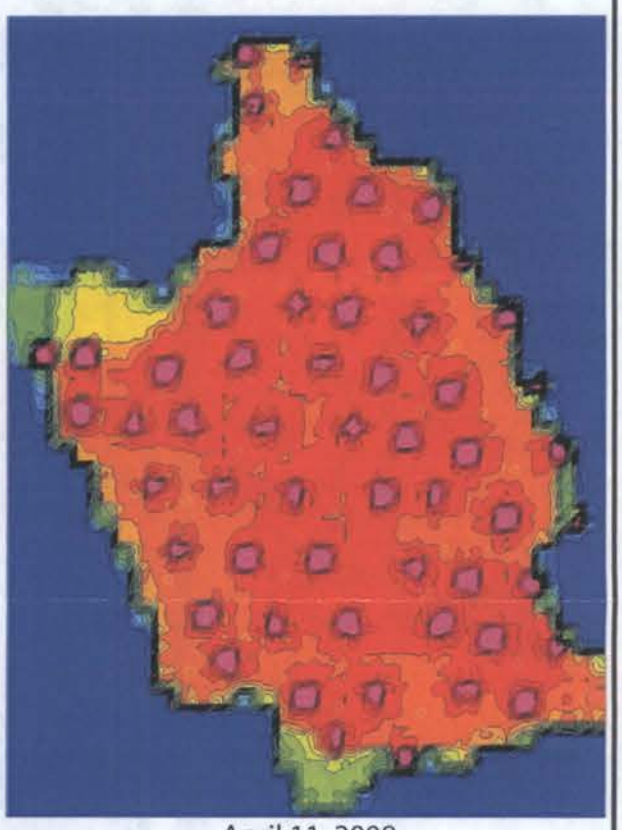


February 29, 2008



March 21, 2008



April 11, 2008

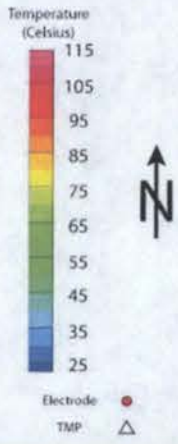


Figure E-8
Temperature Isotherms (70 ft bgs)
Pemaco Superfund Site
Maywood, California

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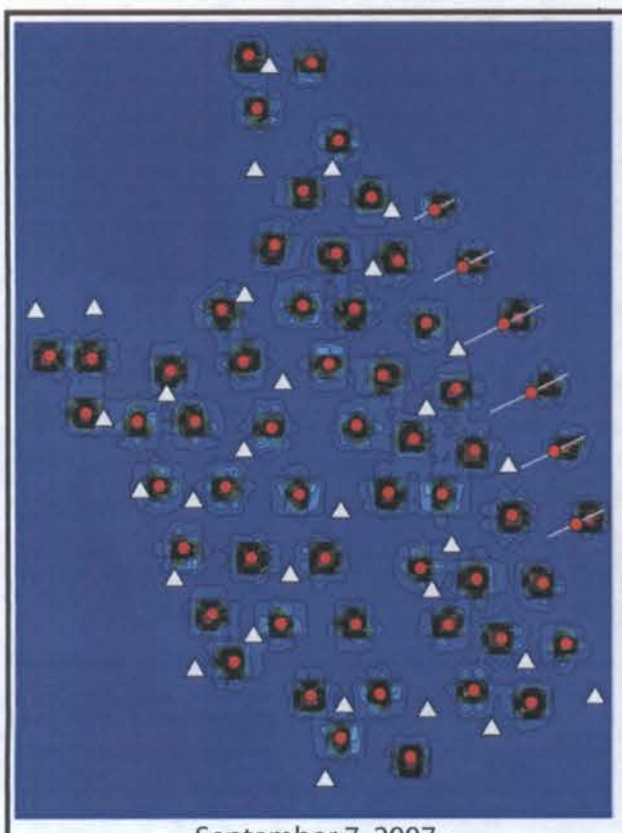
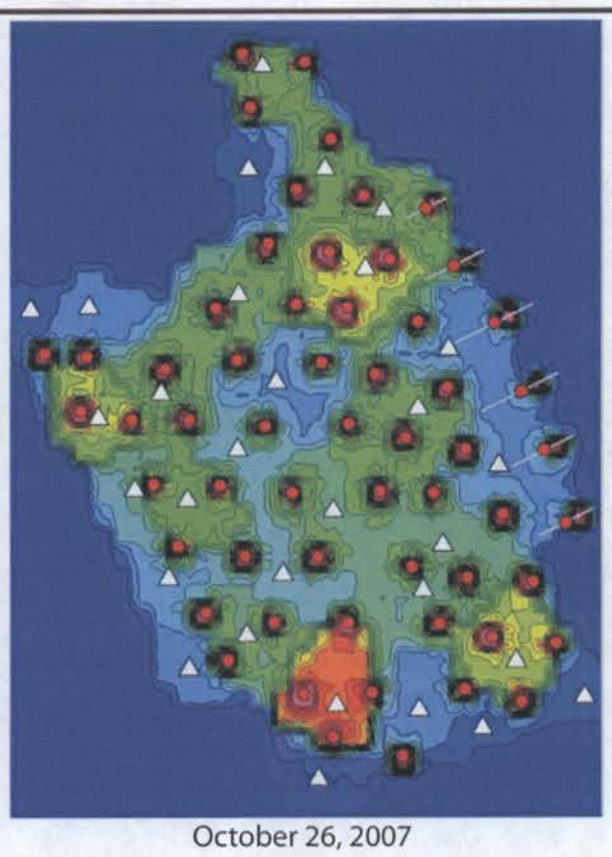
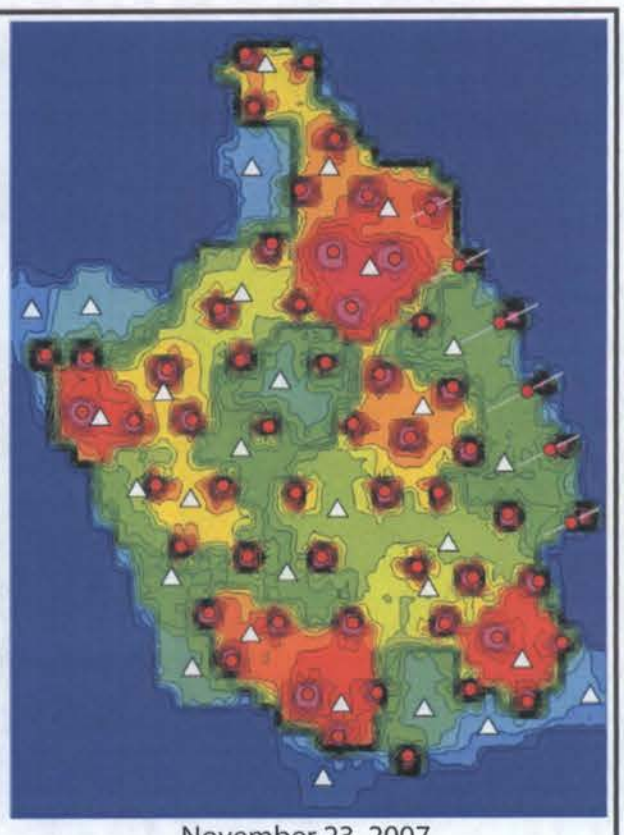


September 7, 2007



October 26, 2007



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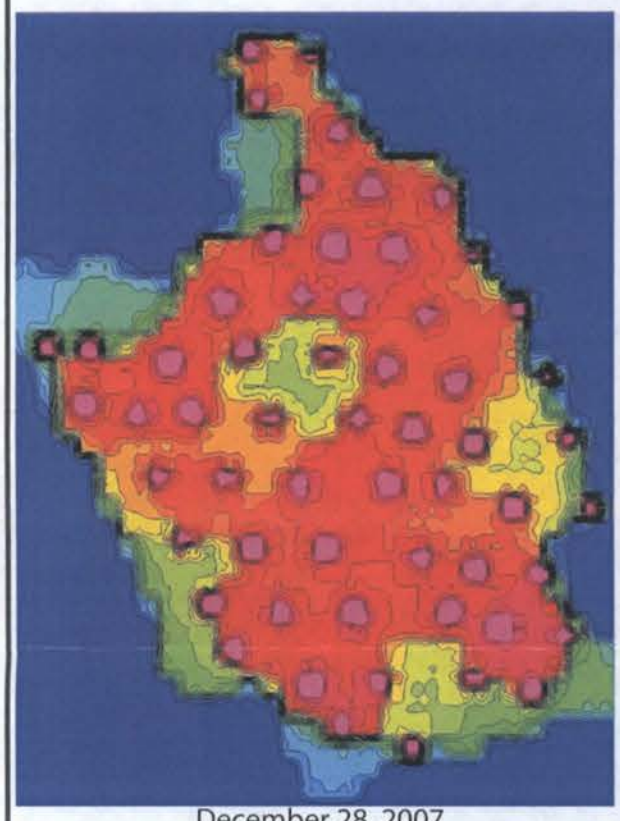

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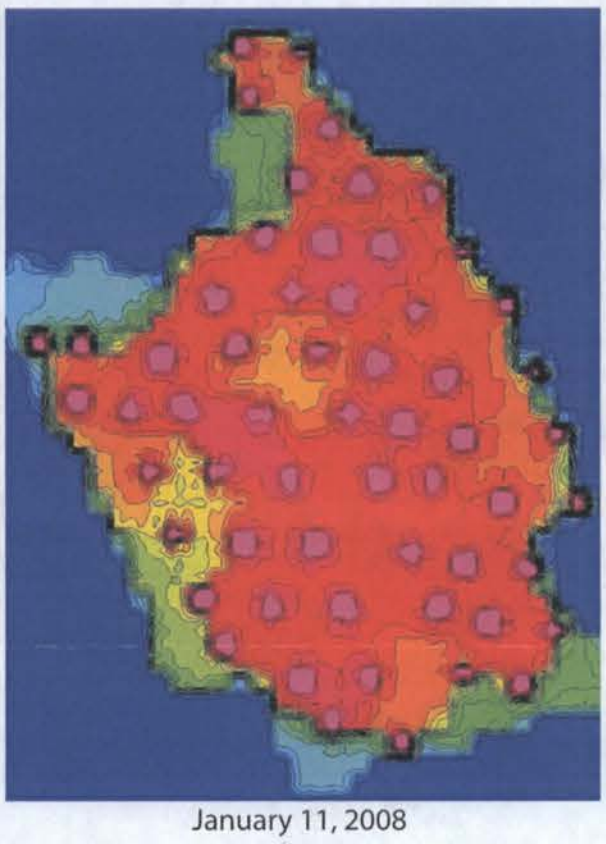

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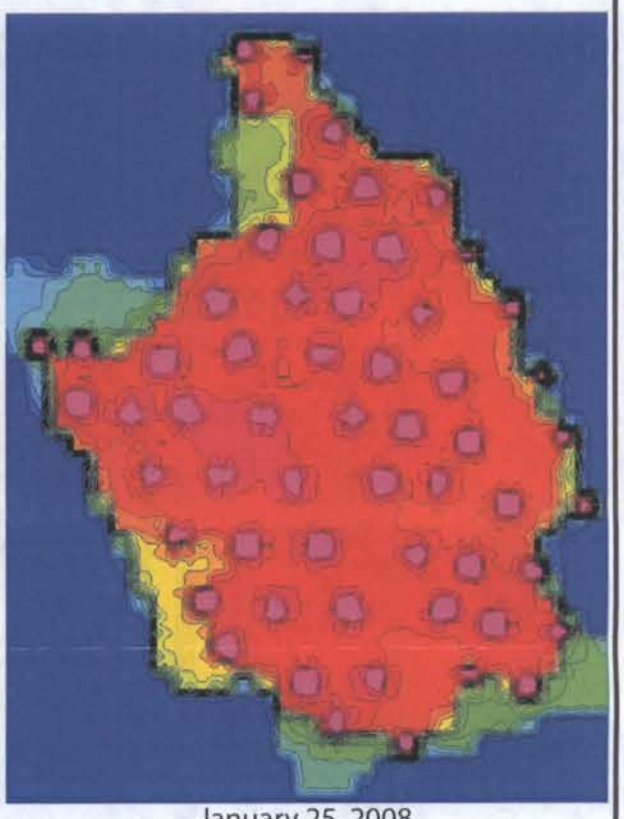
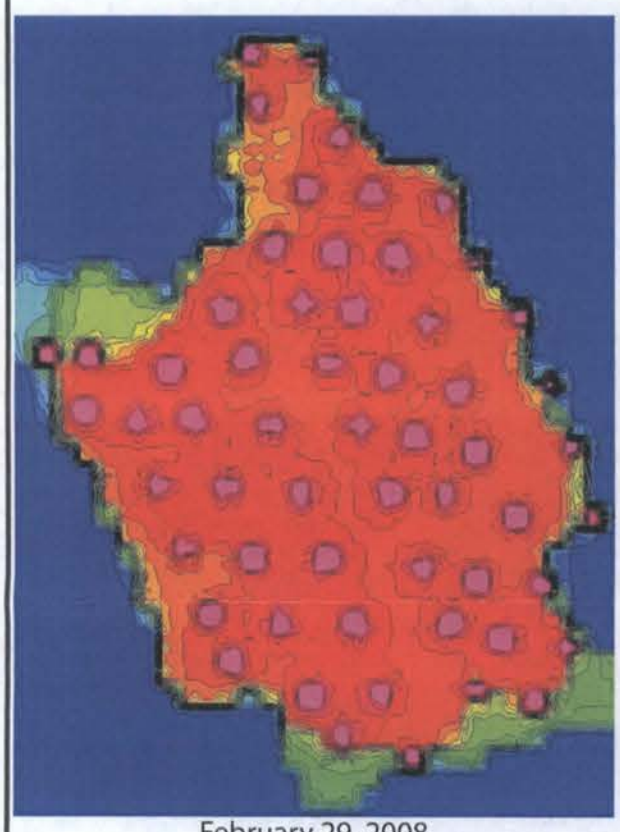
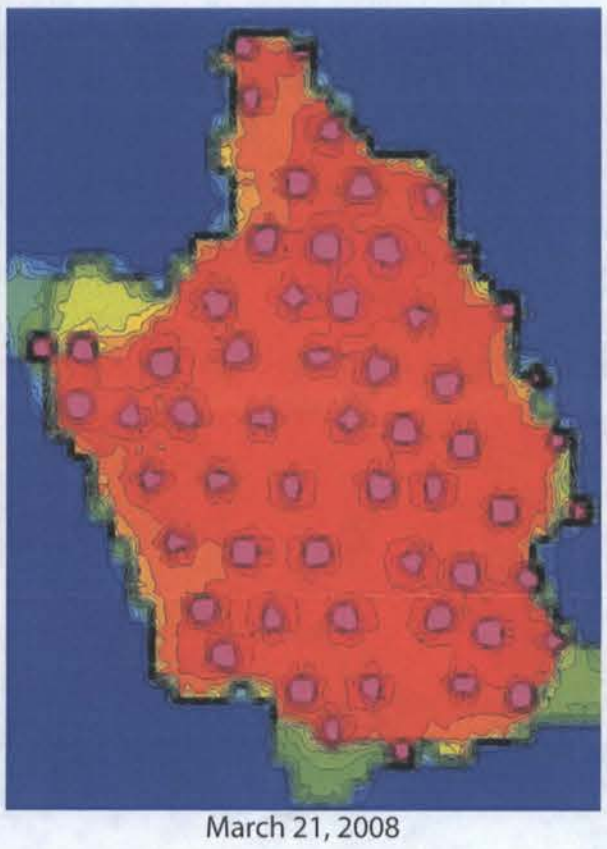


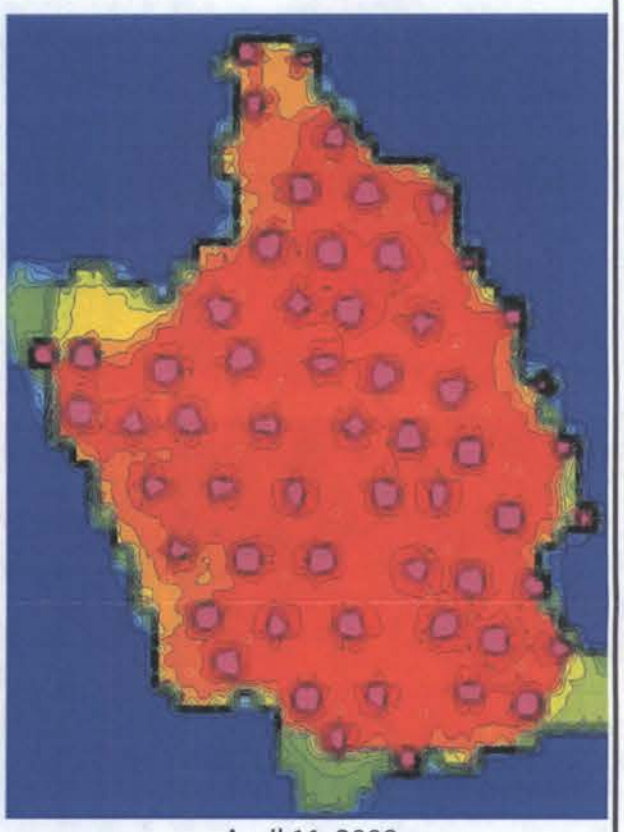
January 25, 2008



February 29, 2008



March 21, 2008



April 11, 2008

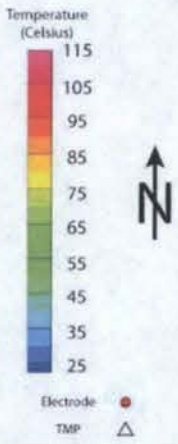


Figure E-9
Temperature Isotherms (75 ft bgs)
Pemaco Superfund Site
Maywood, California

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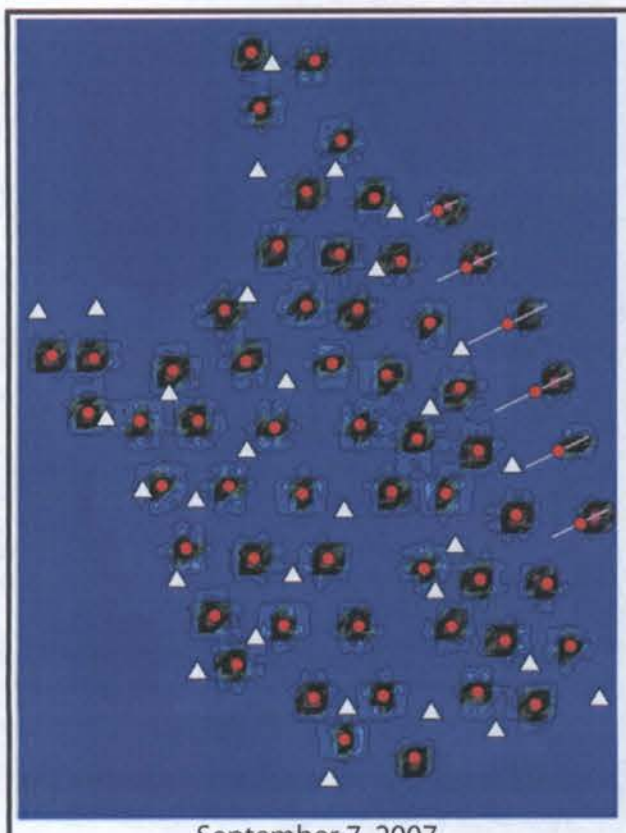

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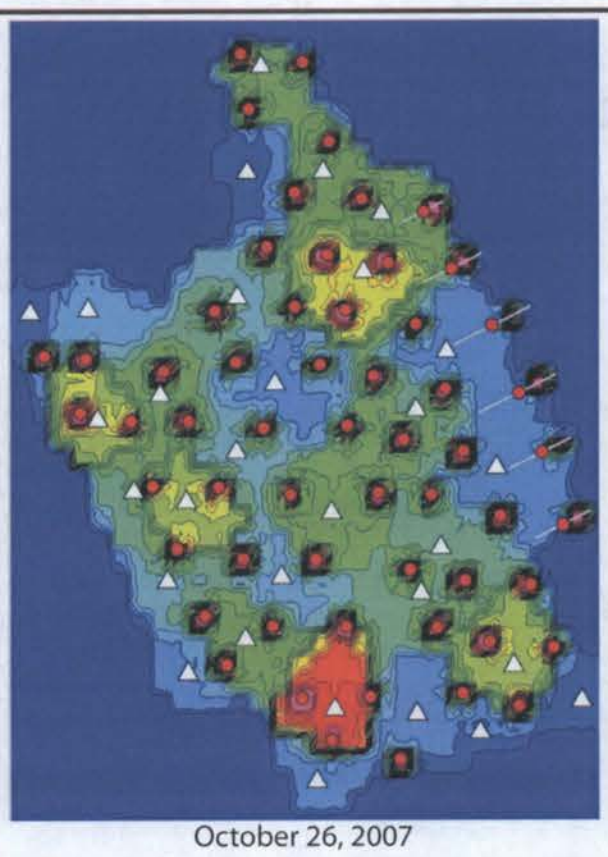
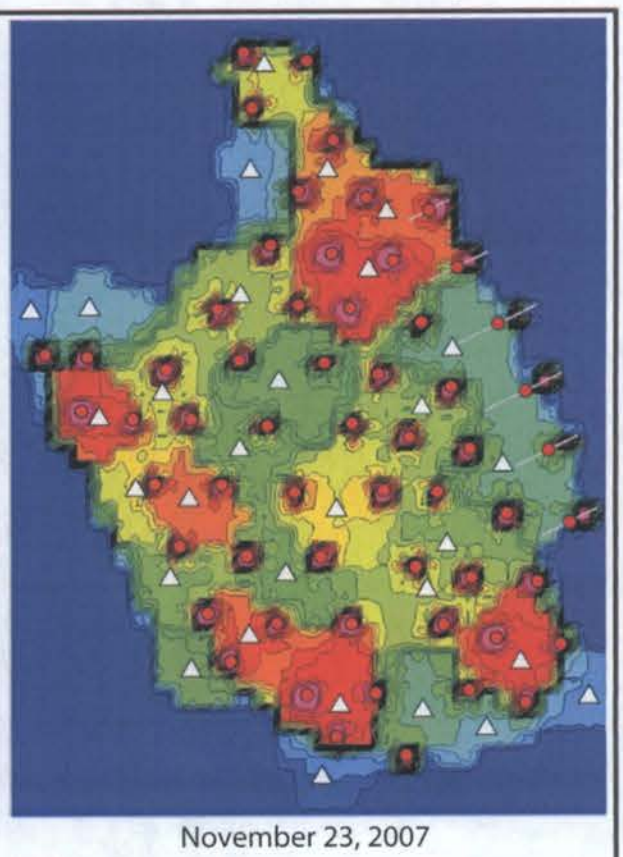


October 26, 2007



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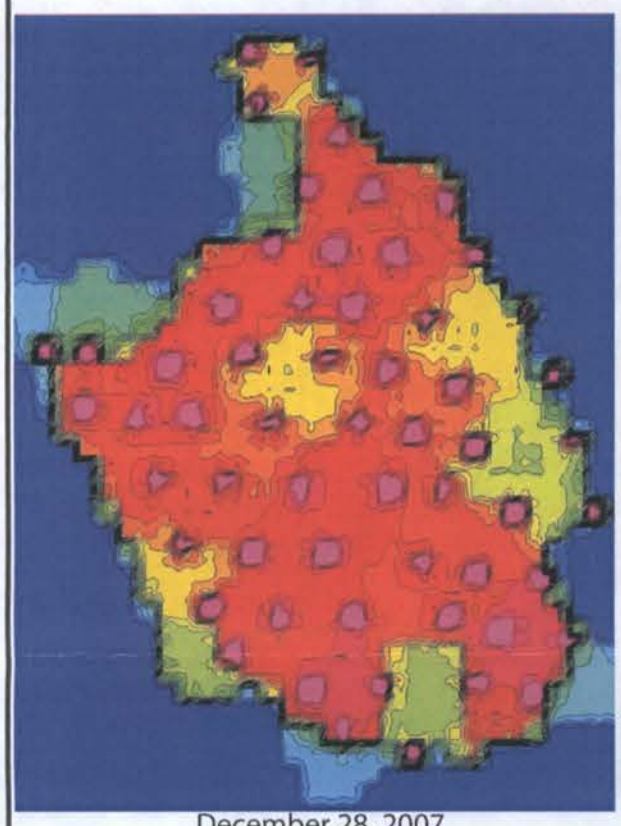
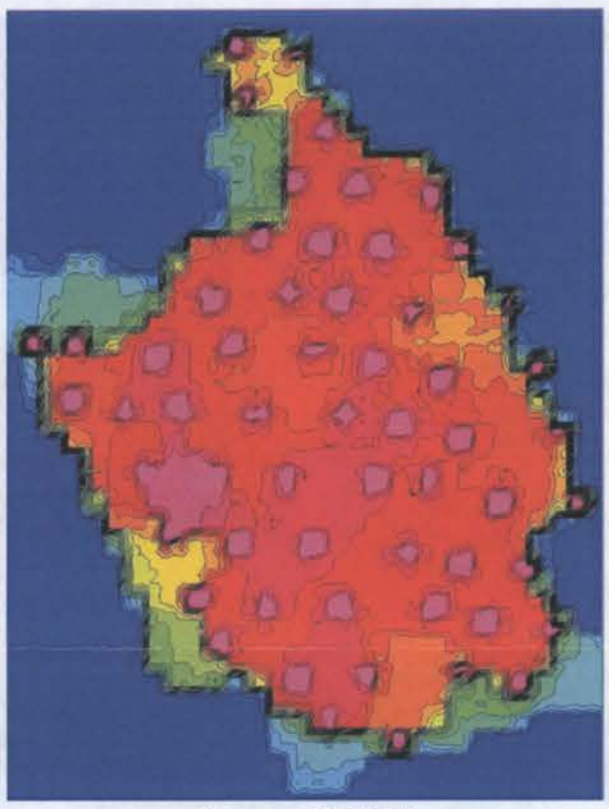


December 28, 2007



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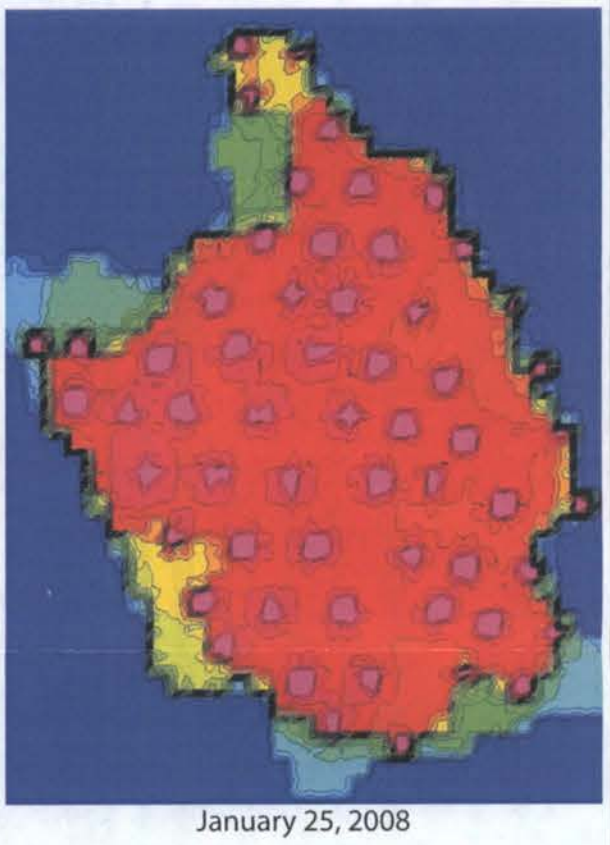

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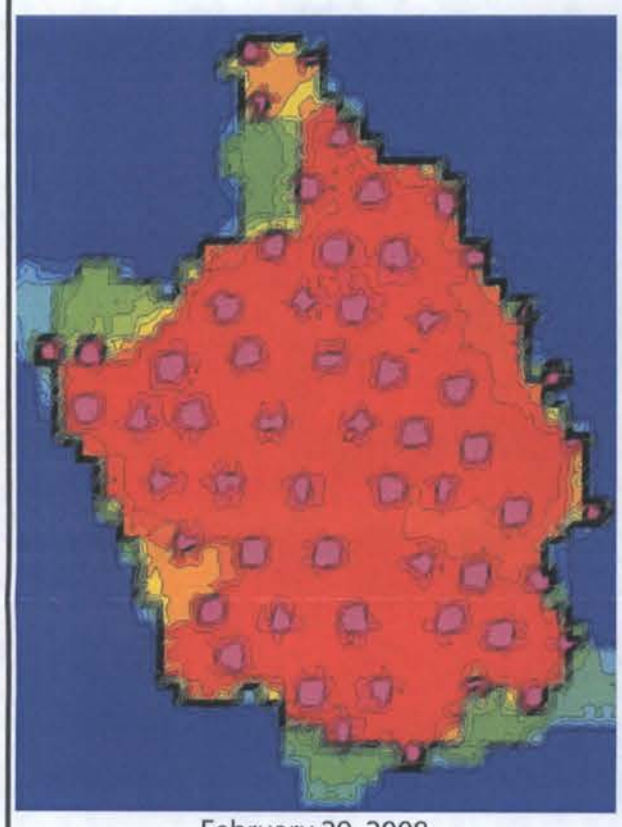
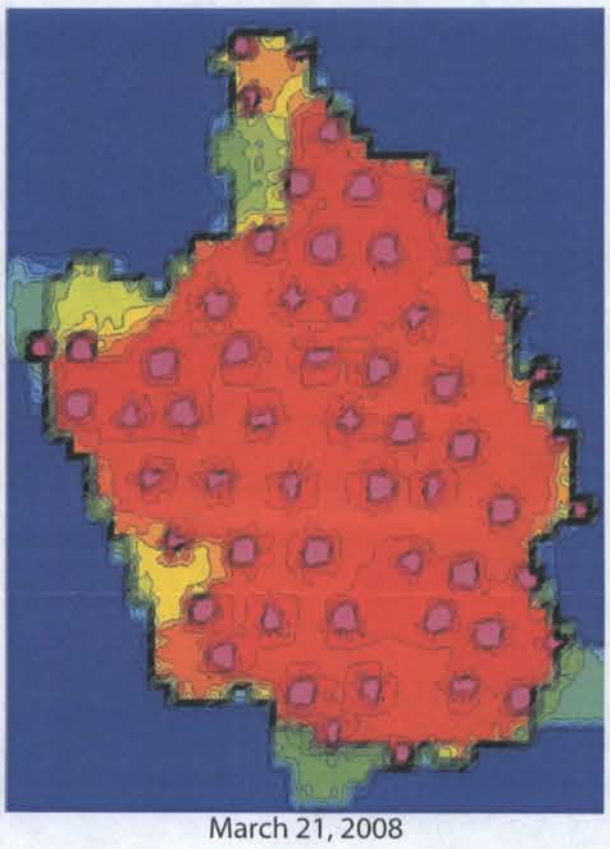
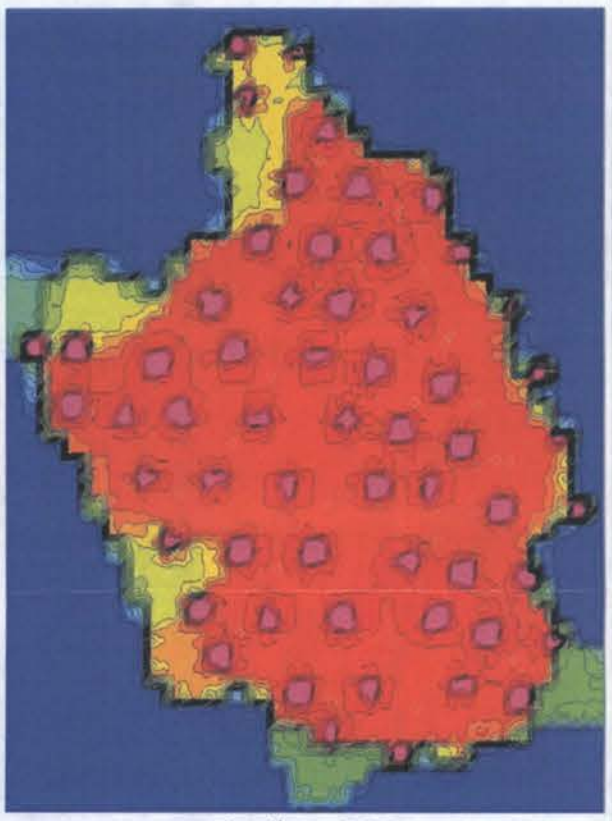


February 29, 2008



March 21, 2008



April 11, 2008

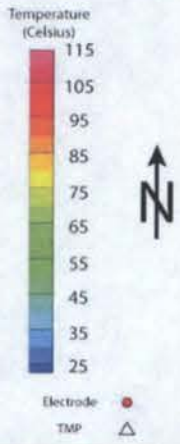


Figure E-10
Temperature Isotherms (80 ft bgs)
Pemaco Superfund Site
Maywood, California

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San Francisco, California

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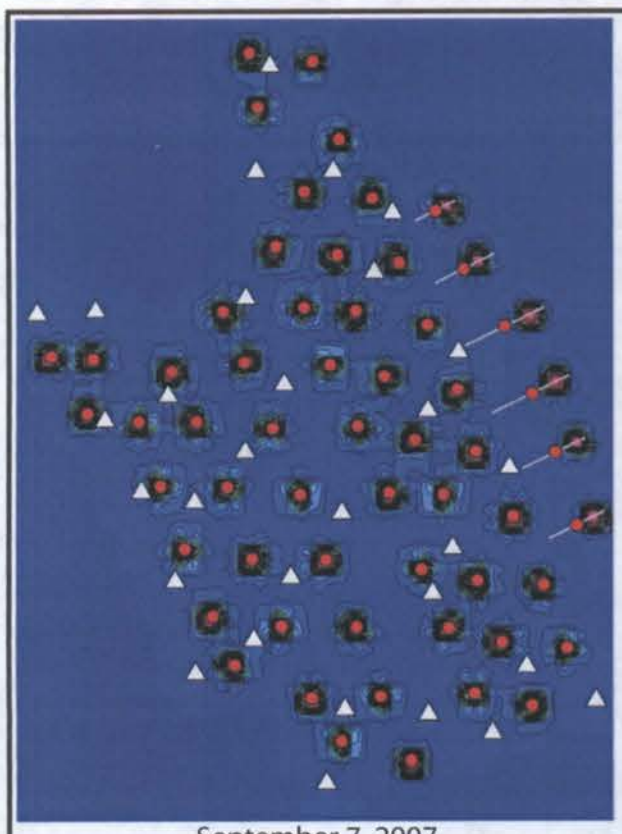
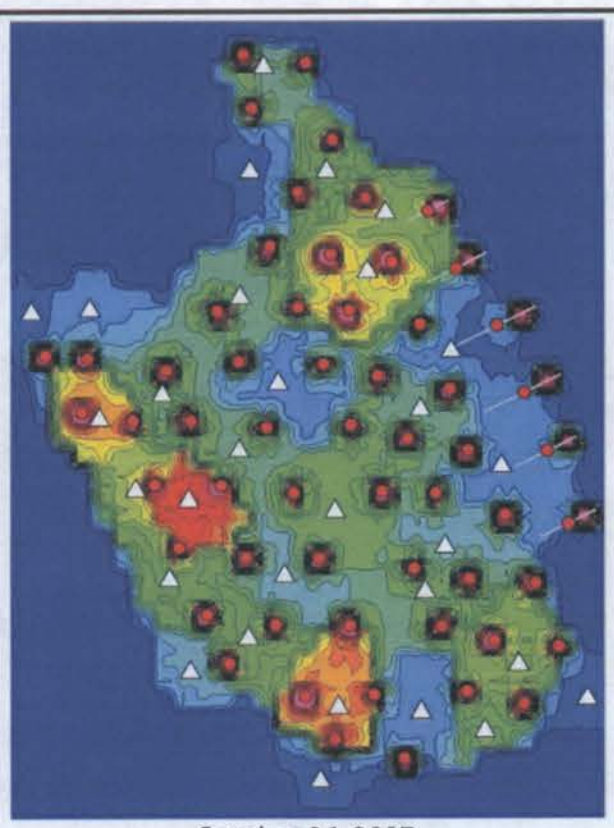
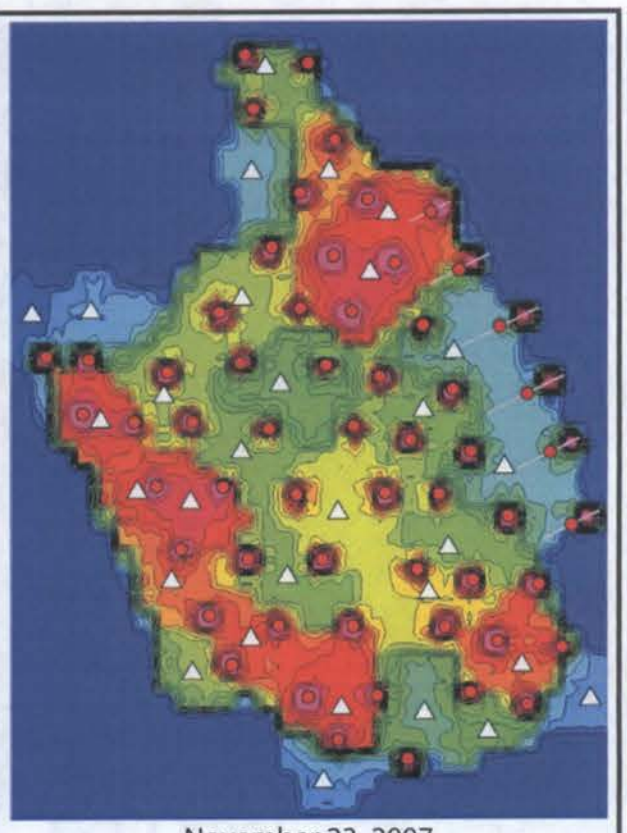


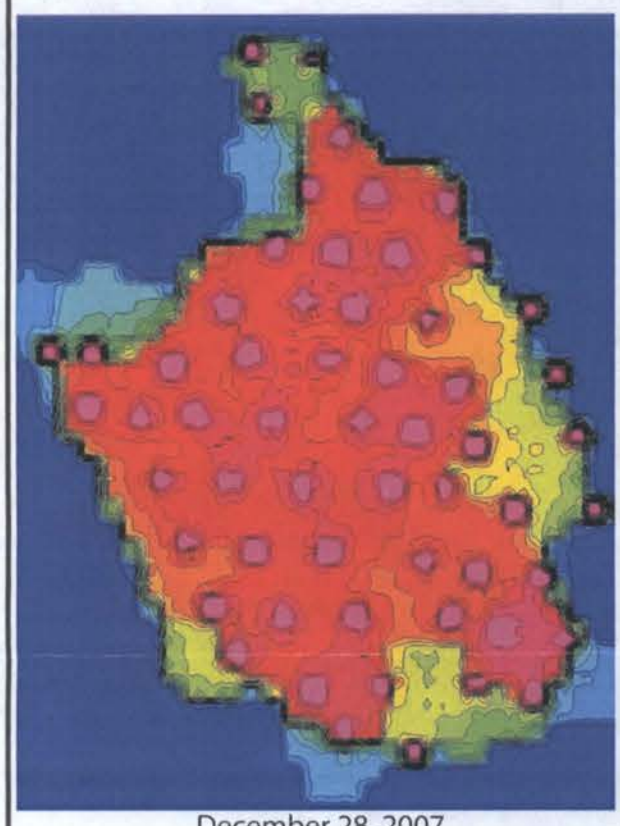
September 7, 2007



October 26, 2007



November 23, 2007



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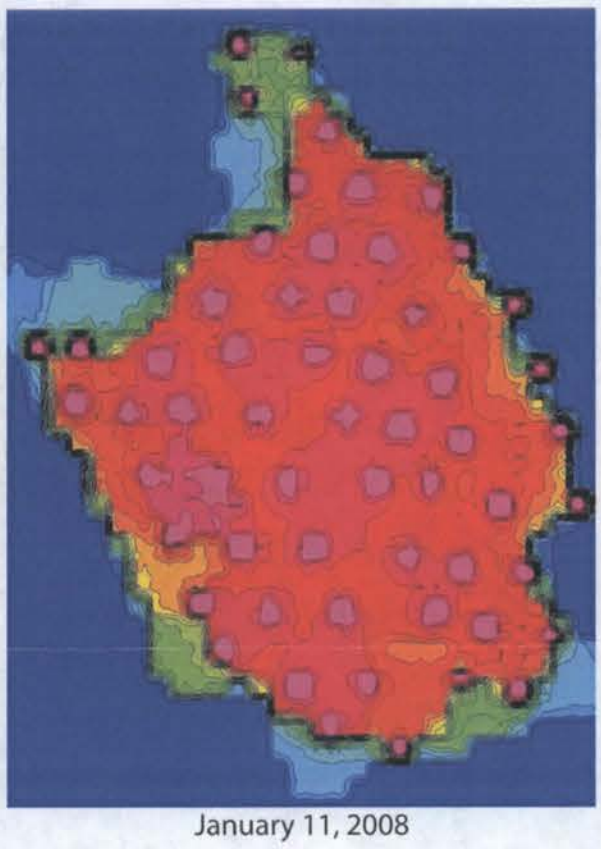

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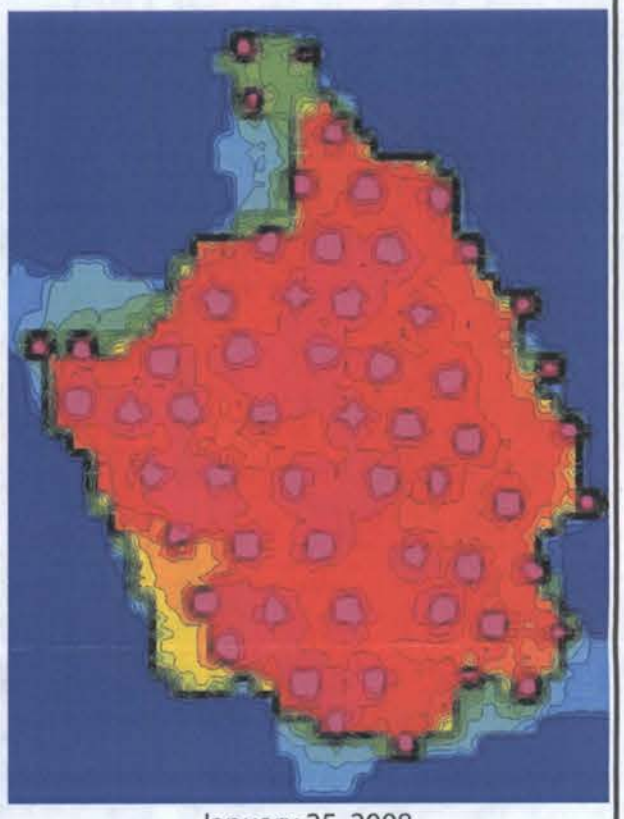

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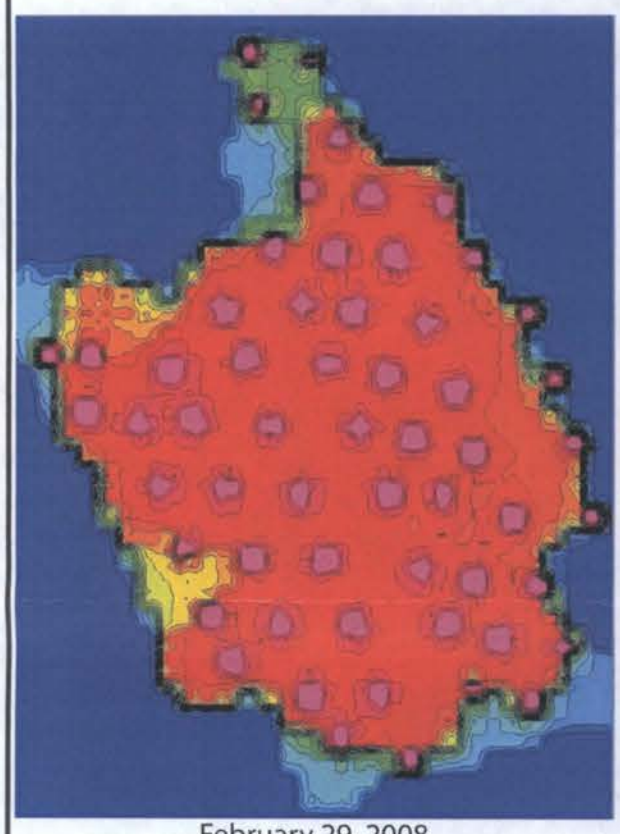

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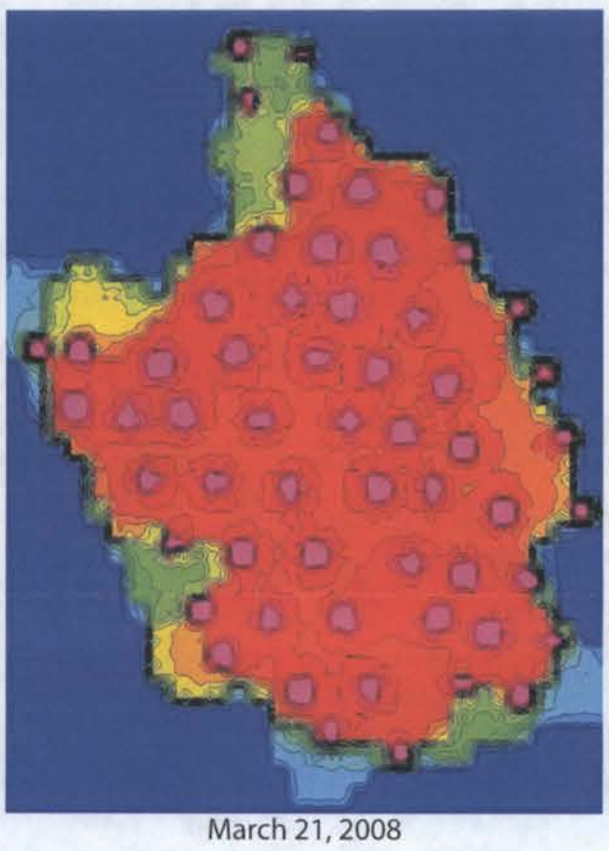
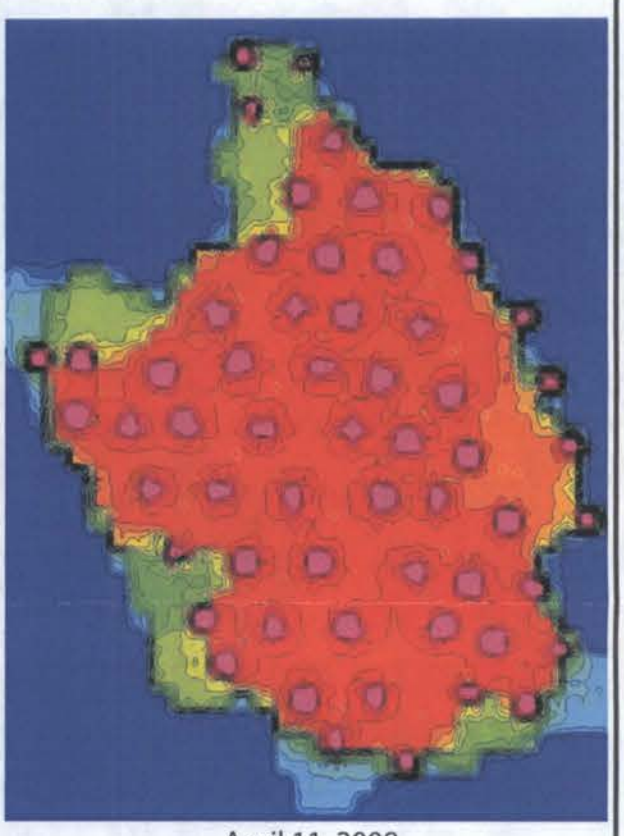


March 21, 2008



April 11, 2008

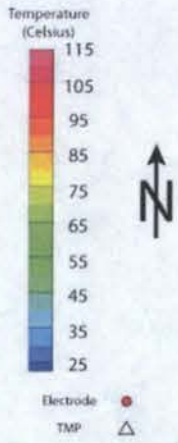


Figure E-11
Temperature Isotherms (85 ft bgs)
Pemaco Superfund Site
Maywood, California

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San Francisco, California

Date: October 30, 2008

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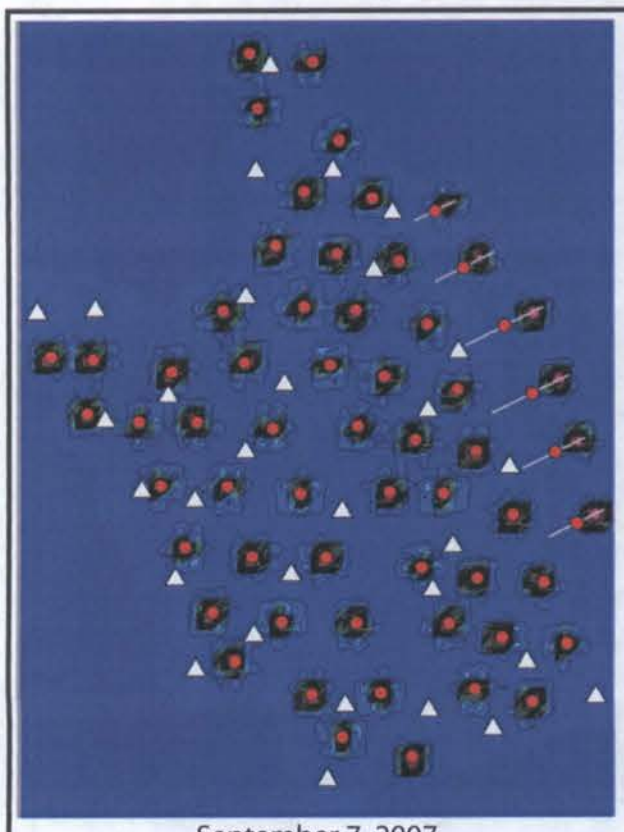

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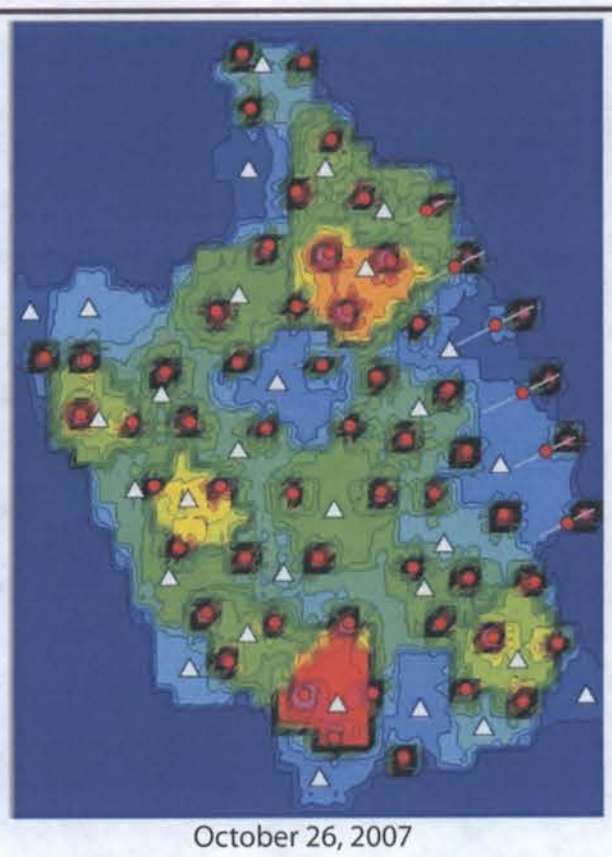

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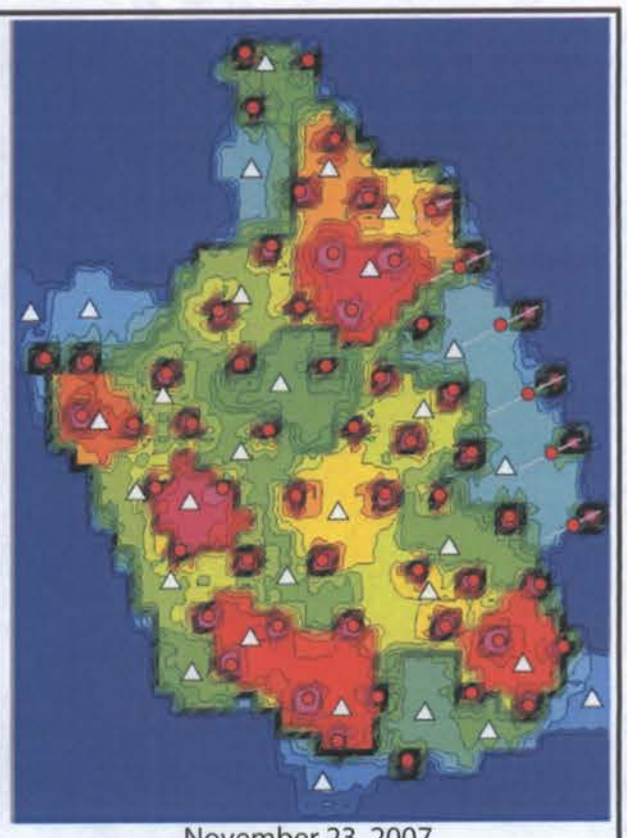

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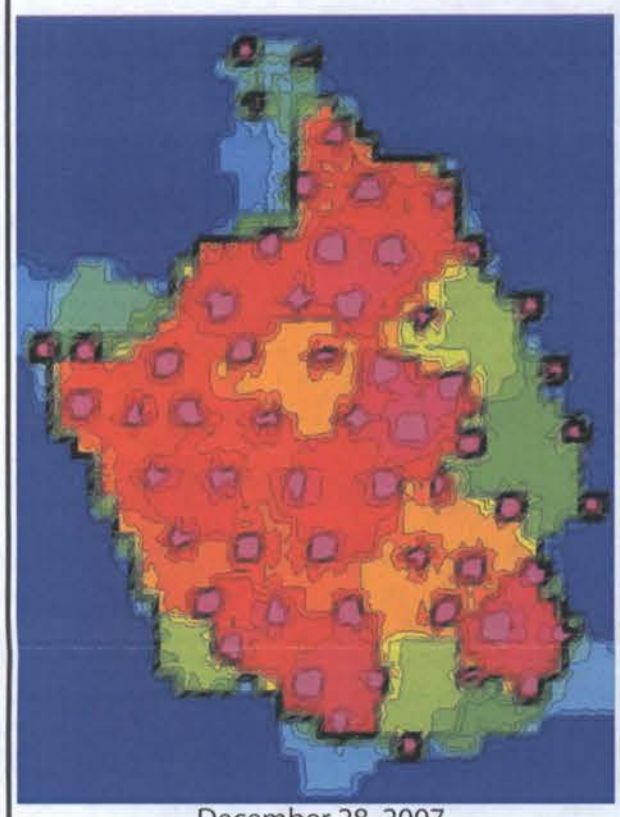

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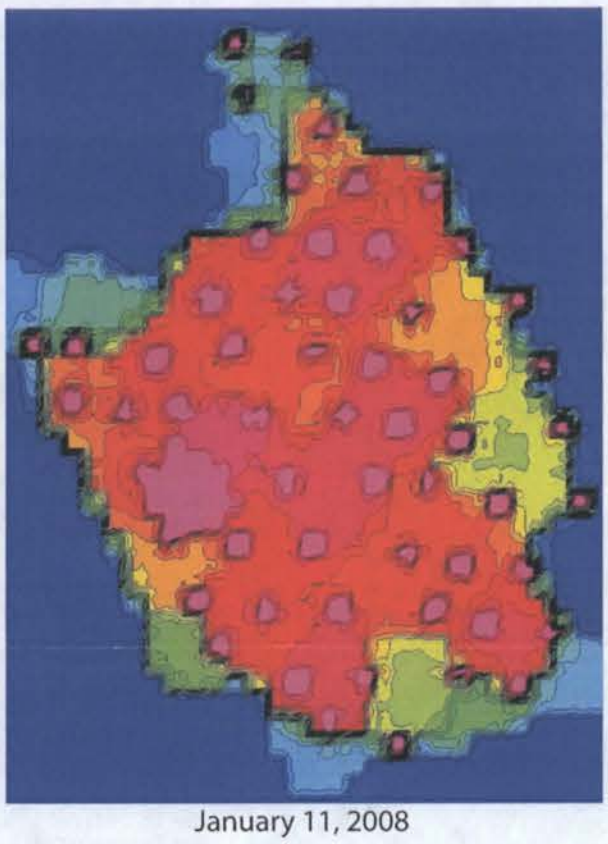

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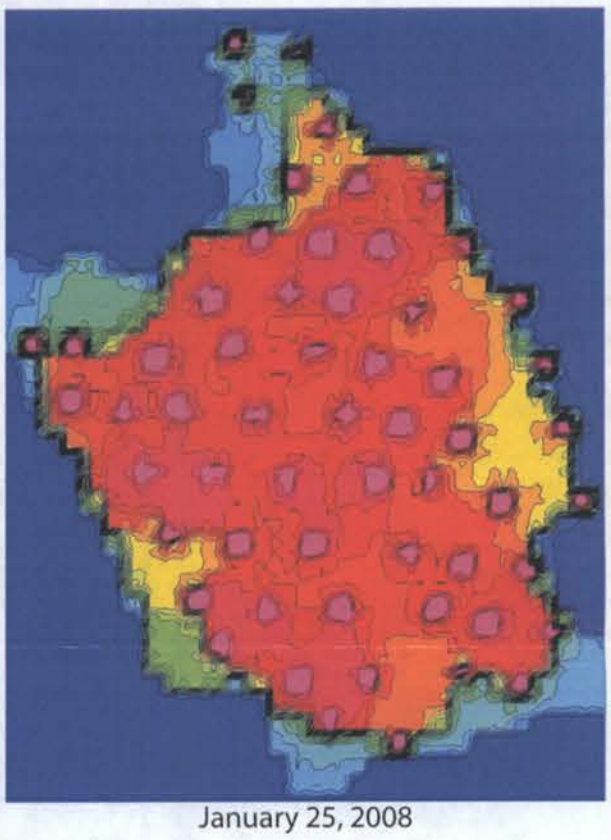

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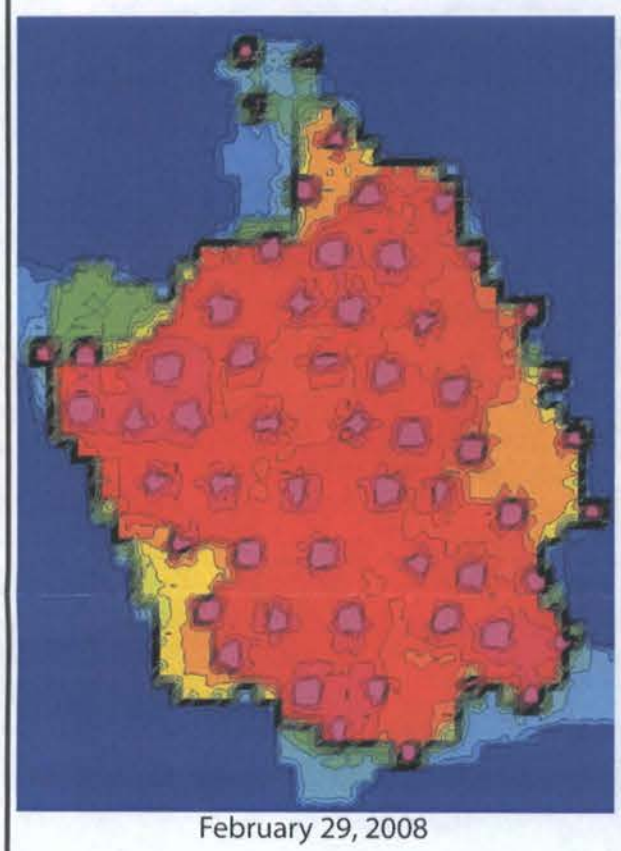

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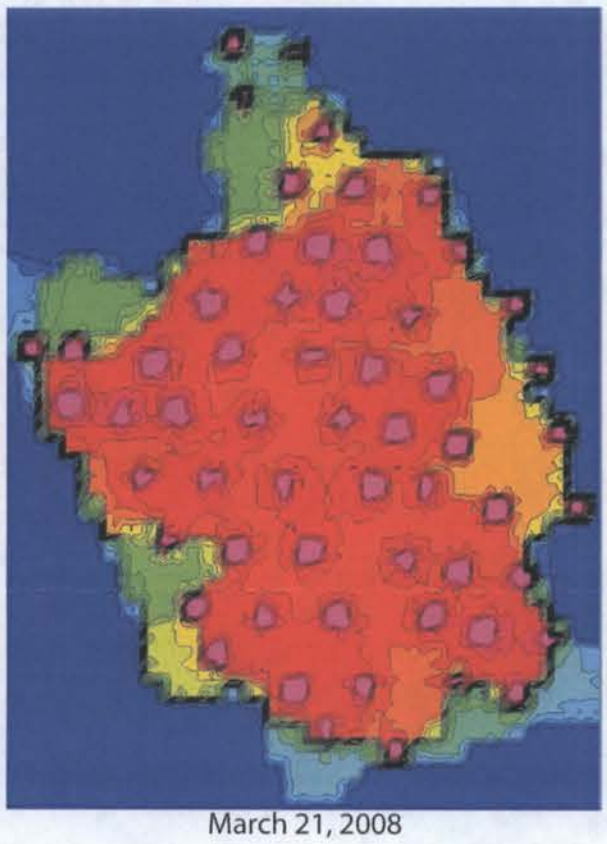

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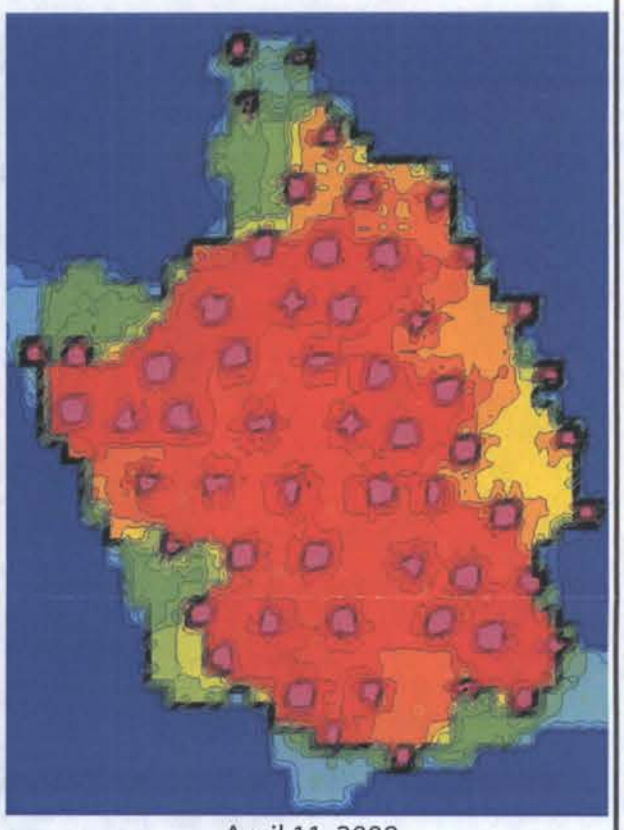

April 11, 2008

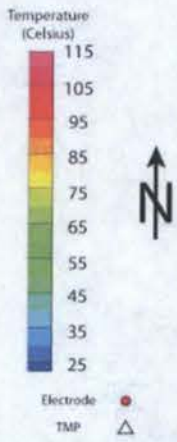

Figure E-12
Temperature Isotherms (90 ft bgs)
Pemaco Superfund Site
Maywood, California

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San Francisco, California

Date: October 30, 2008

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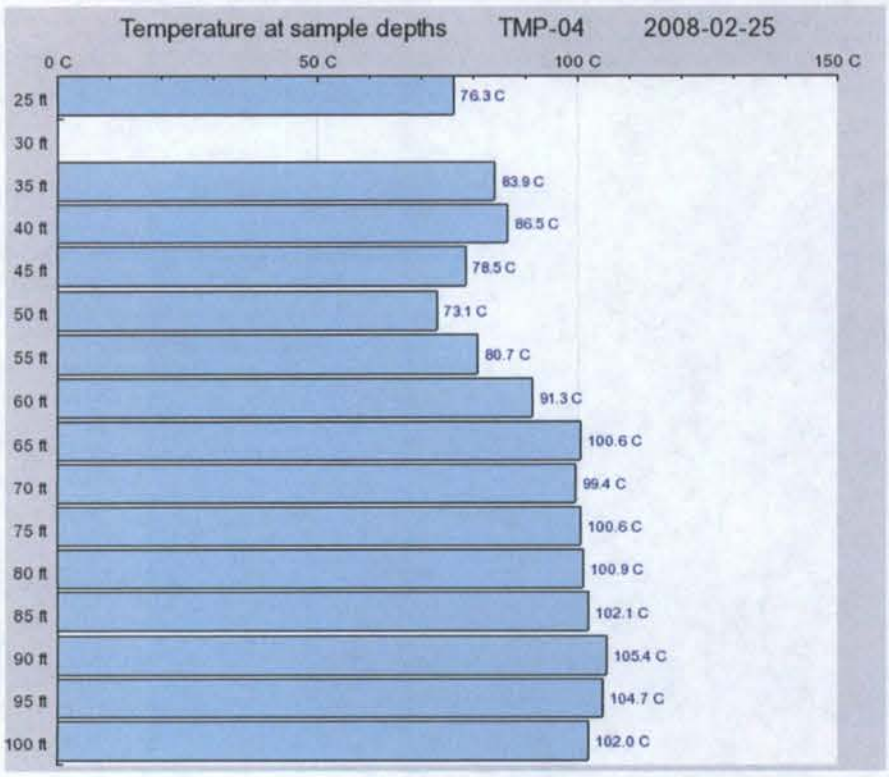

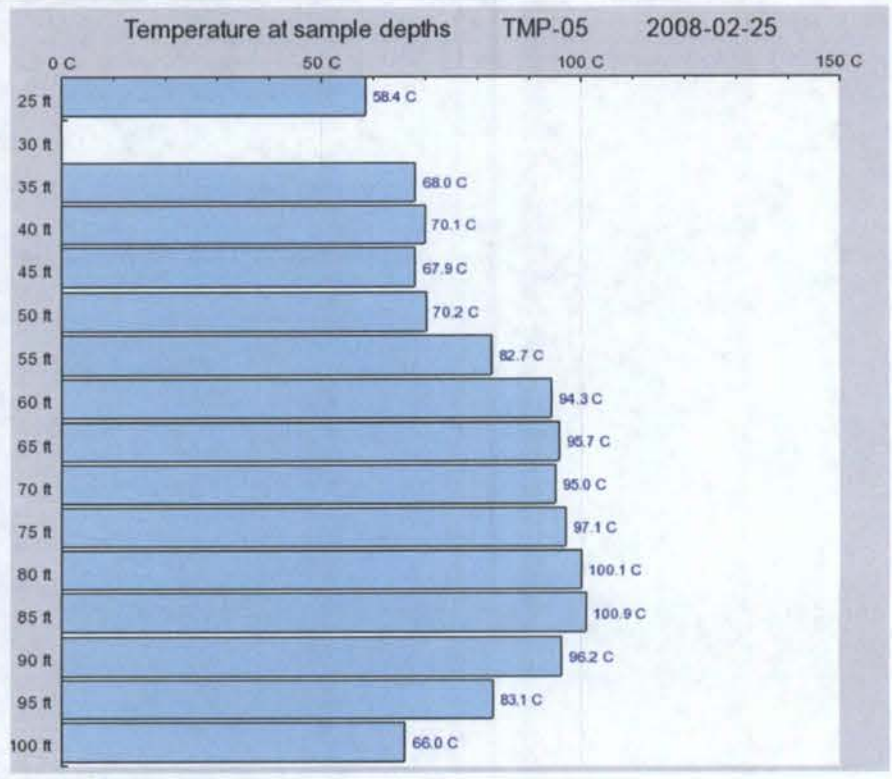

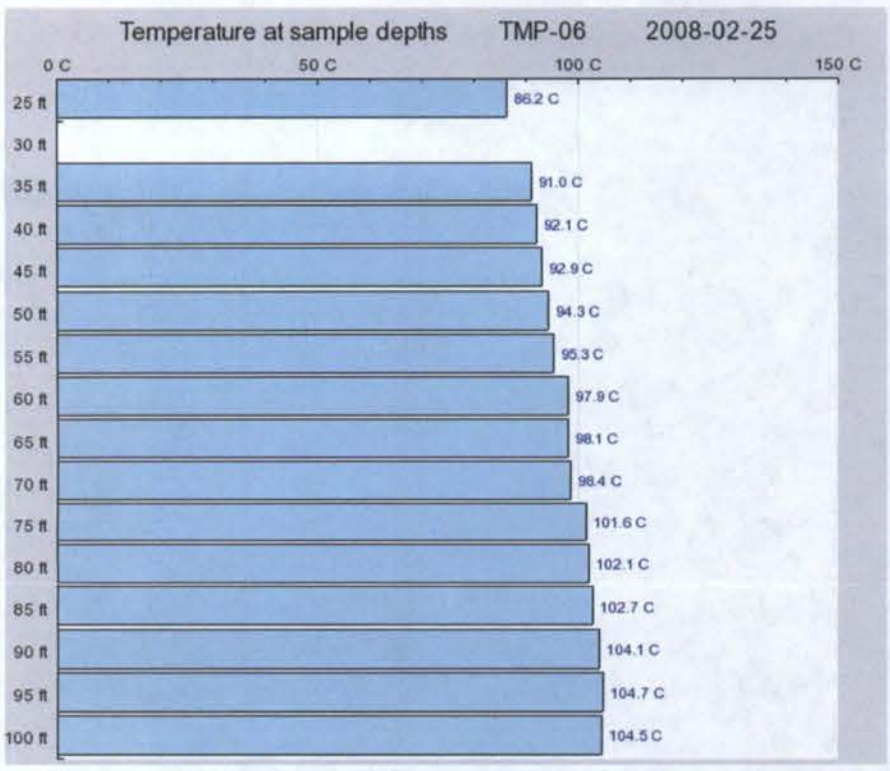

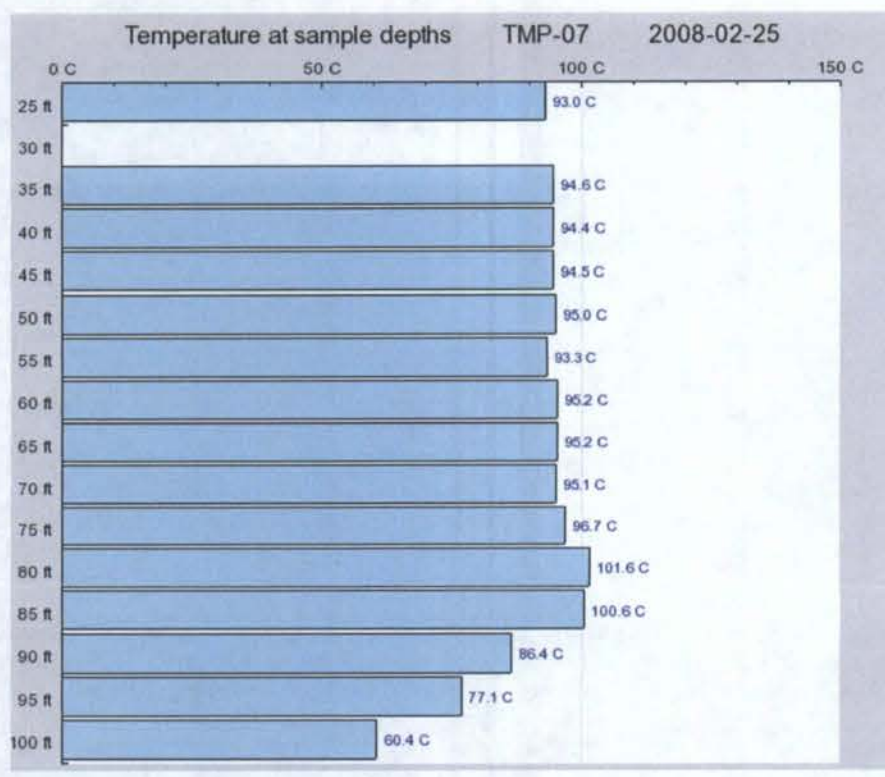

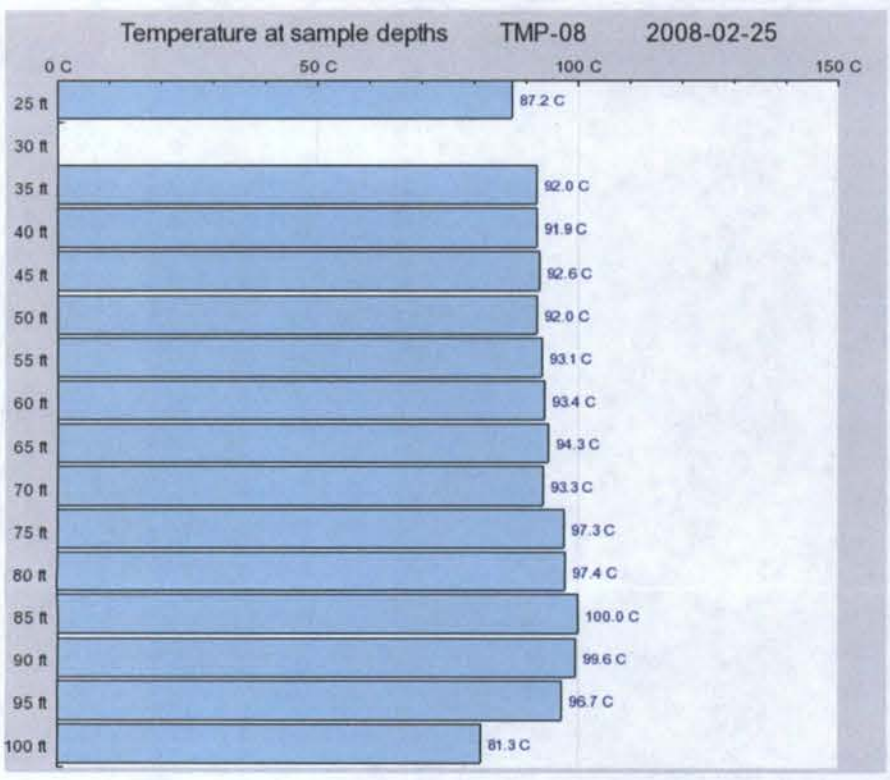

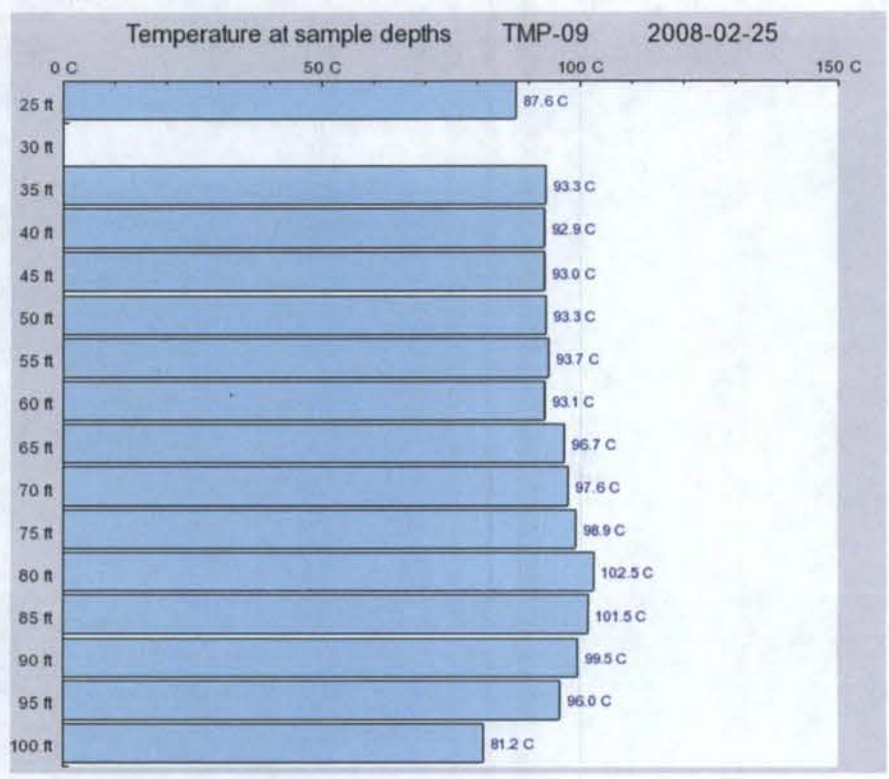

Figure E-13
Temperature Data Distribution
Versus ERH Depth Intervals for TMP-04, TMP-05, TMP-06, TMP-07, TMP-08, TMP-09
Pemaco Superfund Site
Maywood, California

PREPARED FOR:
U. S. Environmental Agency, Region IX
San Francisco, California

Date: January 23, 2009

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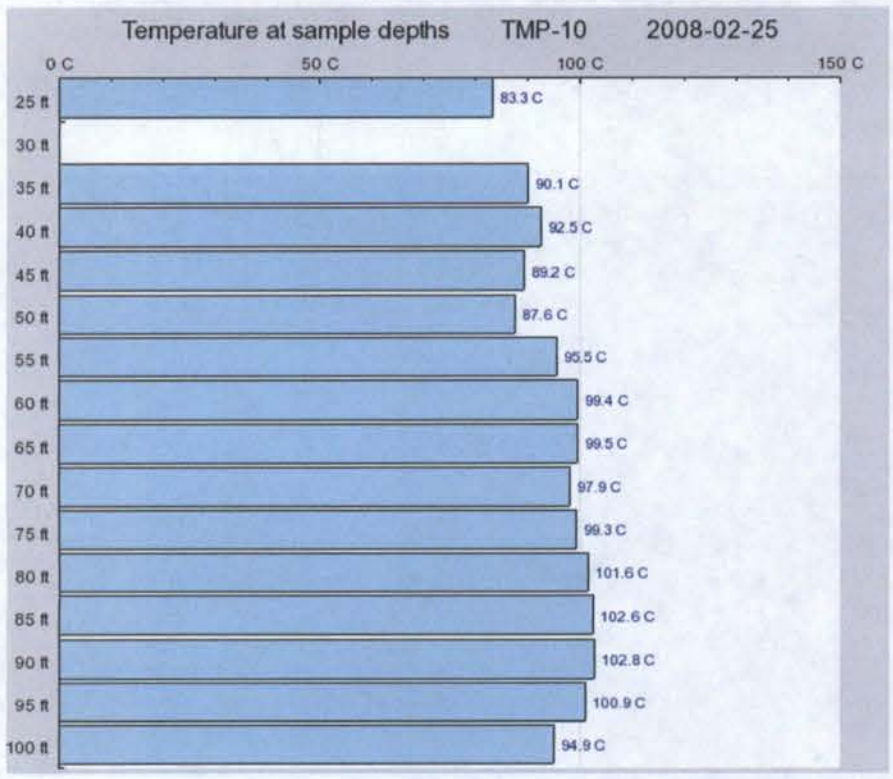

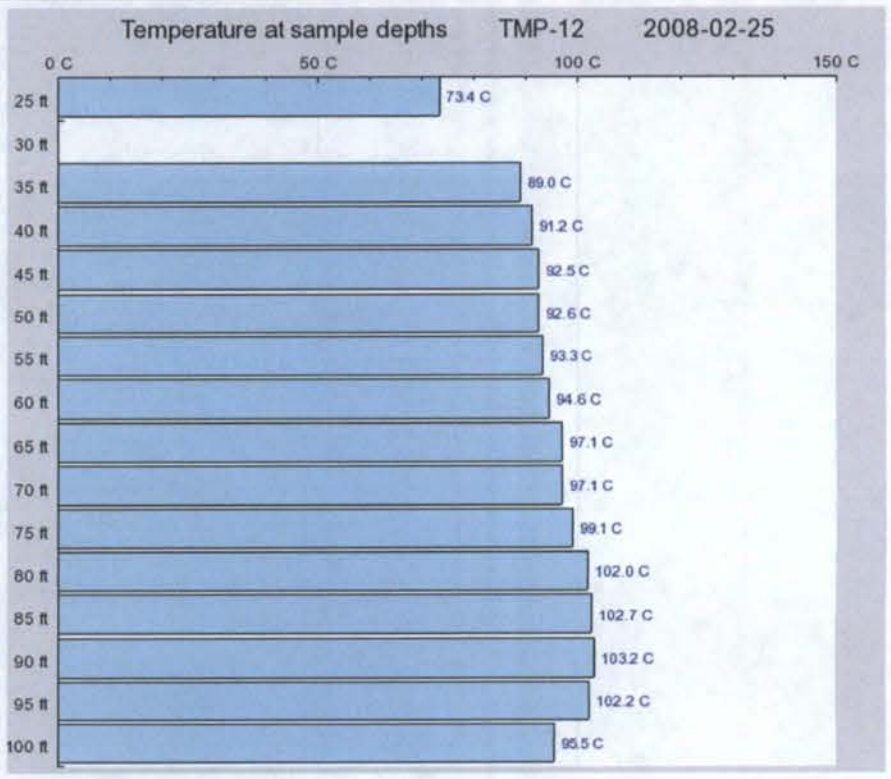

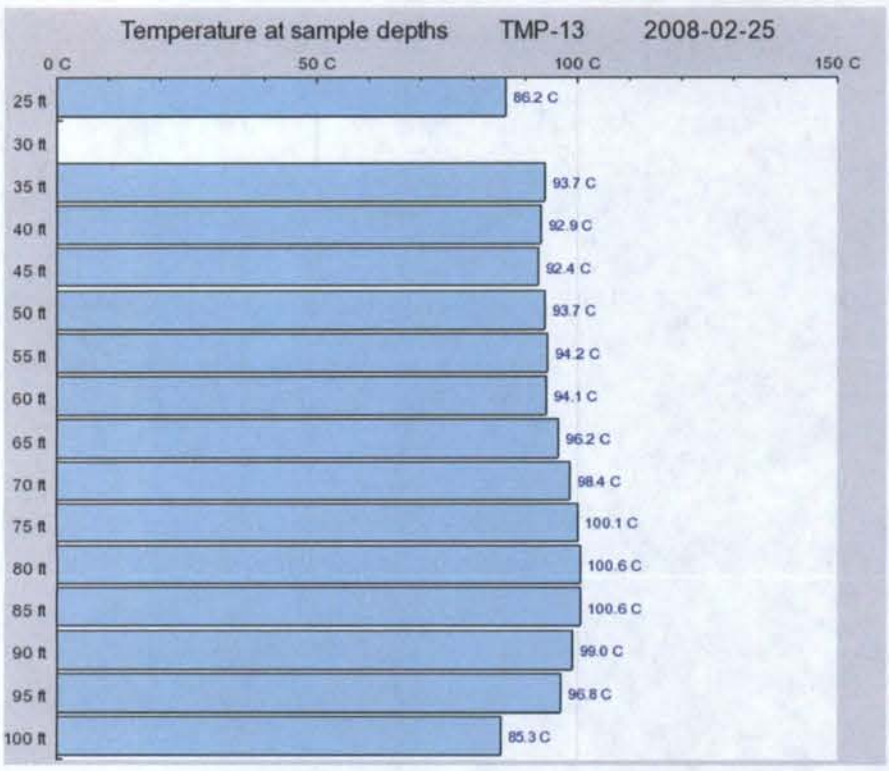

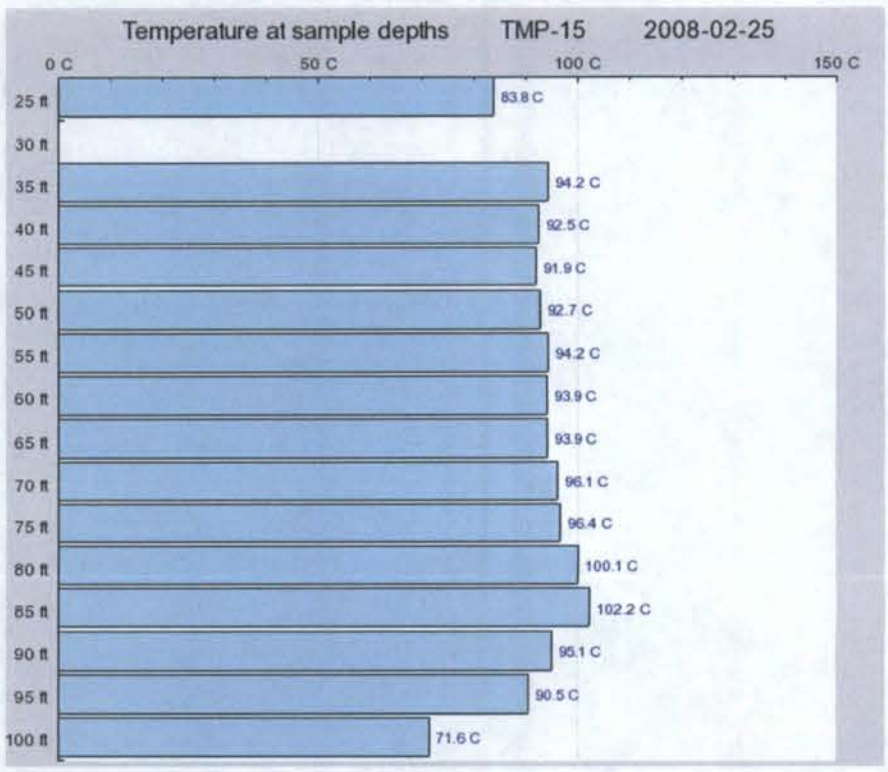

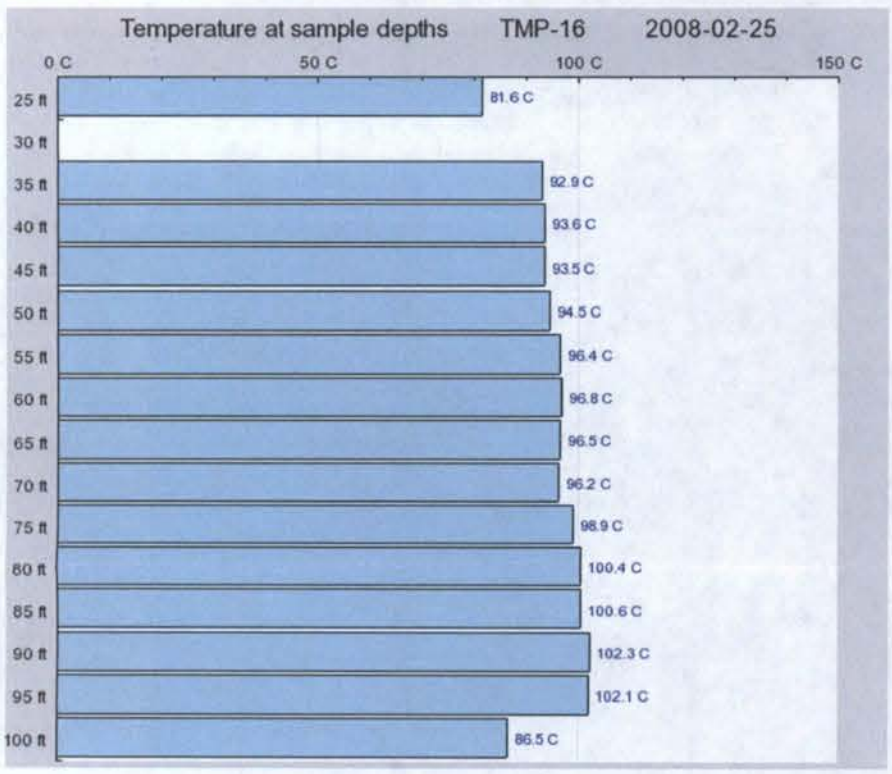

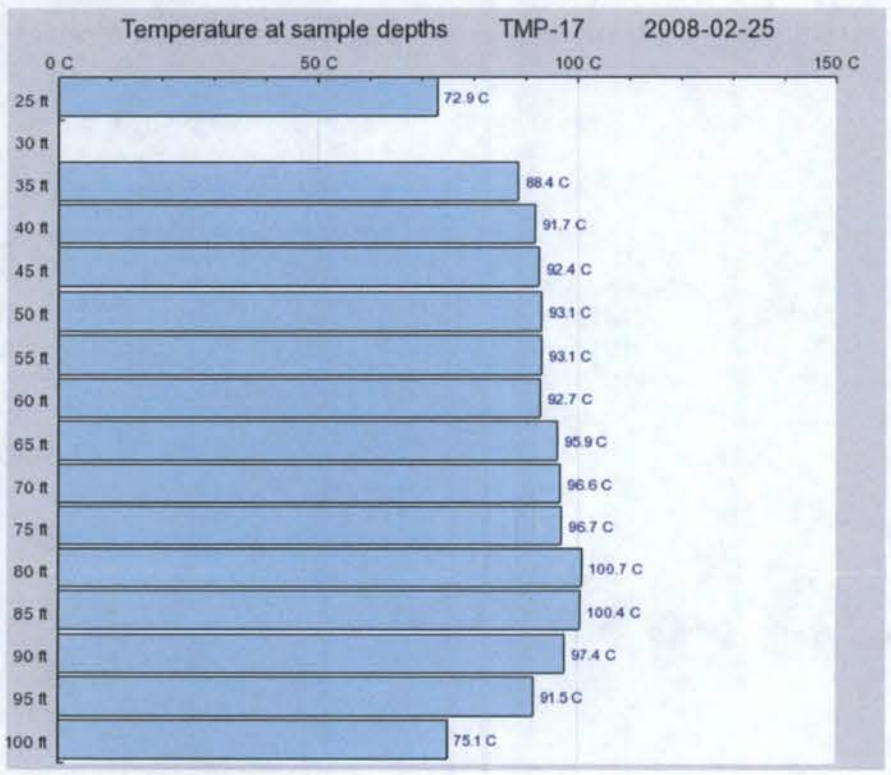

Figure E-14
Temperature Data Distribution
Versus ERH Depth Intervals for TMP-10, TMP-12, TMP-13, TMP-15, TMP-16, TMP-17
Pemaco Superfund Site
Maywood, California

PREPARED FOR:
U. S. Environmental Agency, Region IX
San Francisco, California

Date: January 23, 2009

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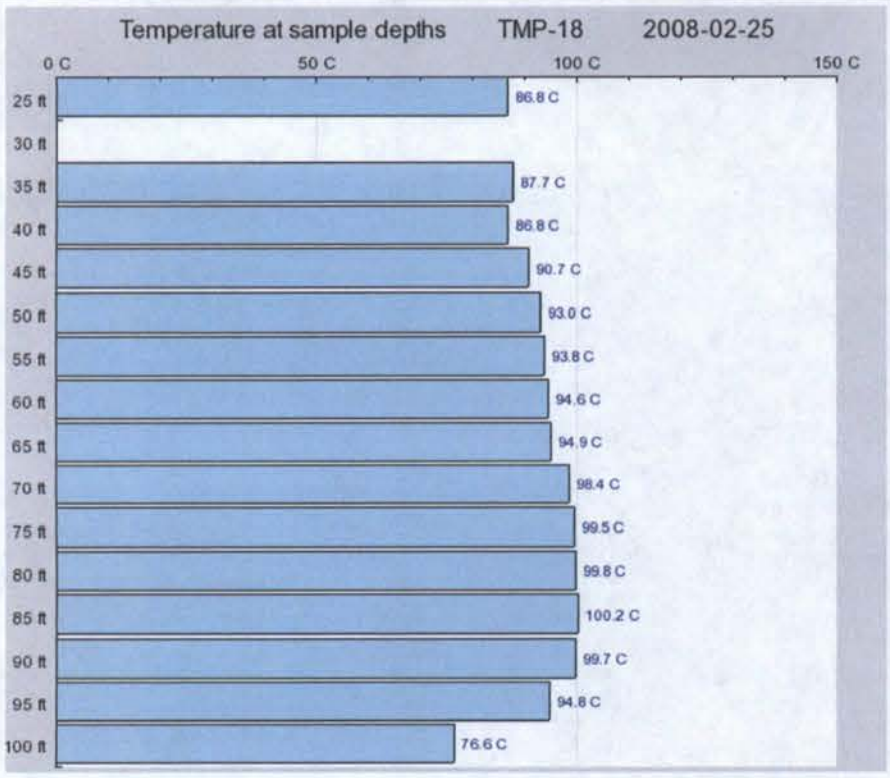

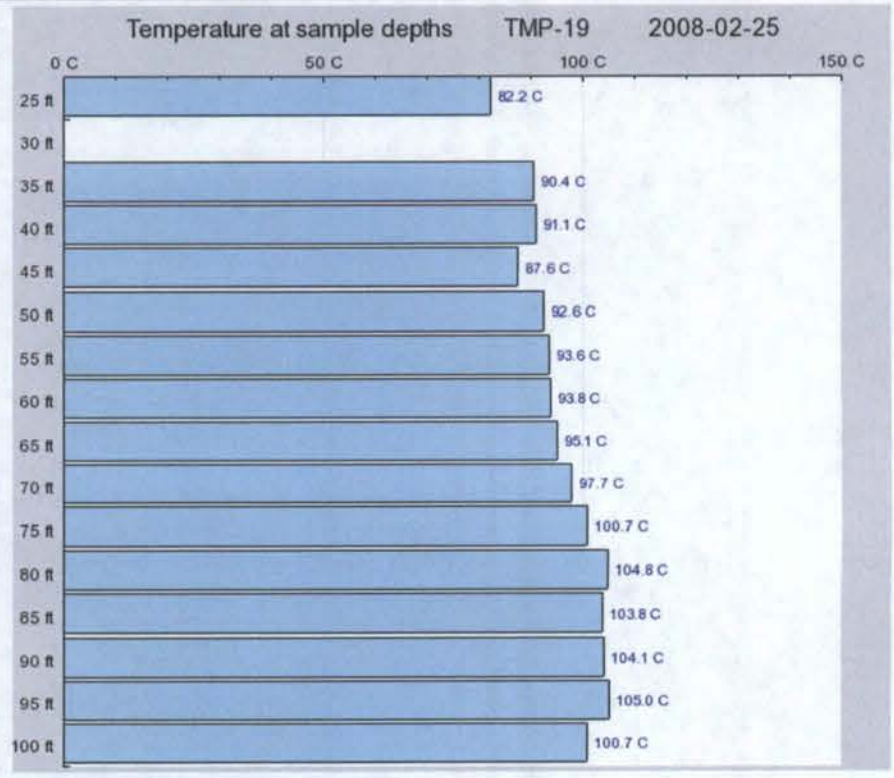

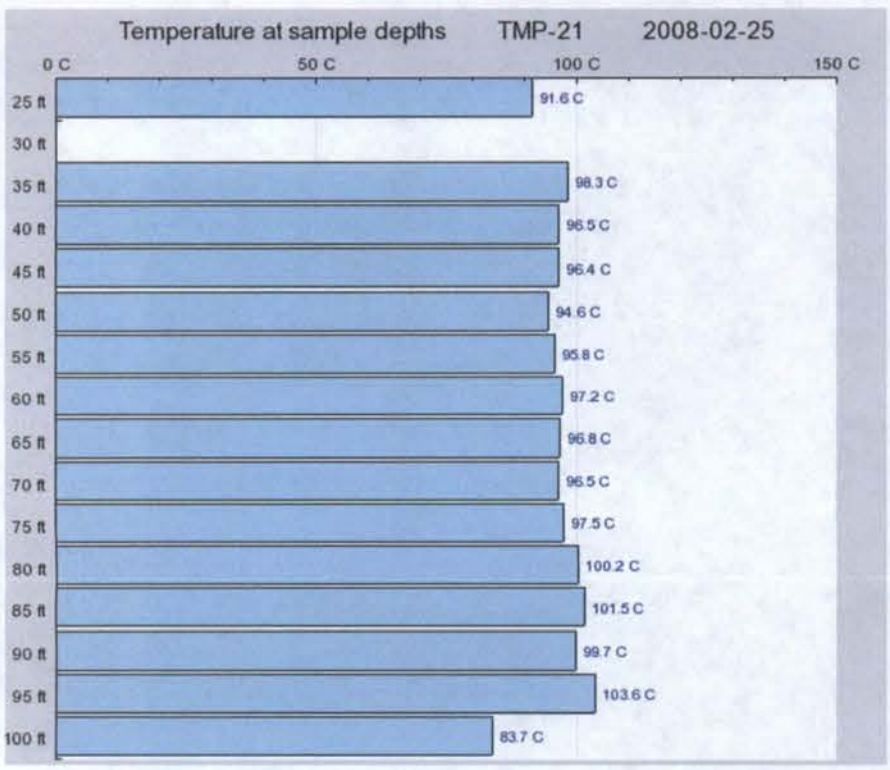

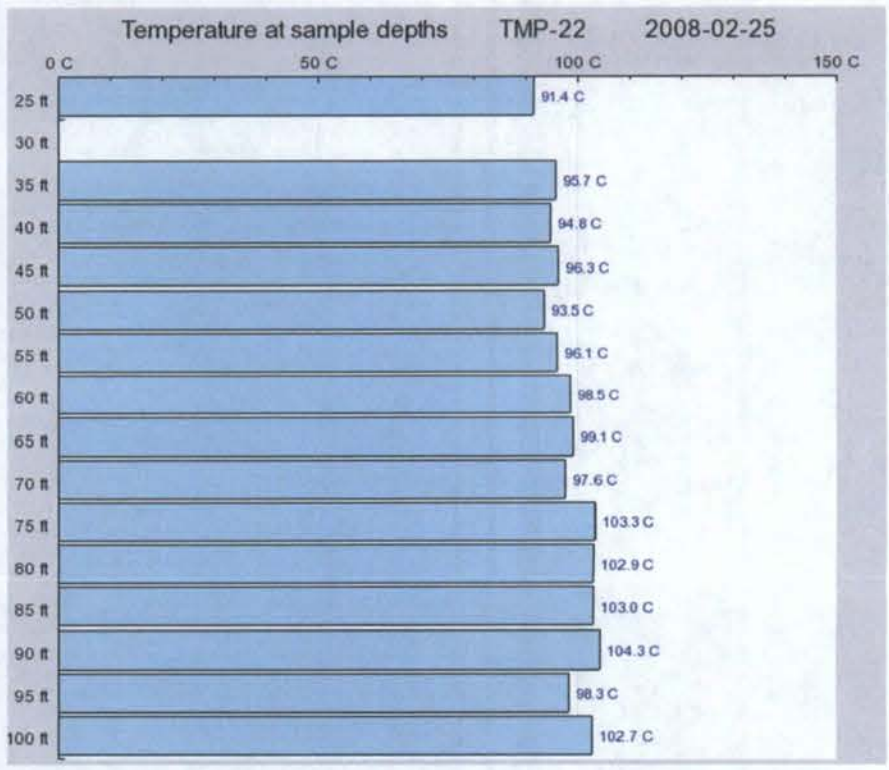

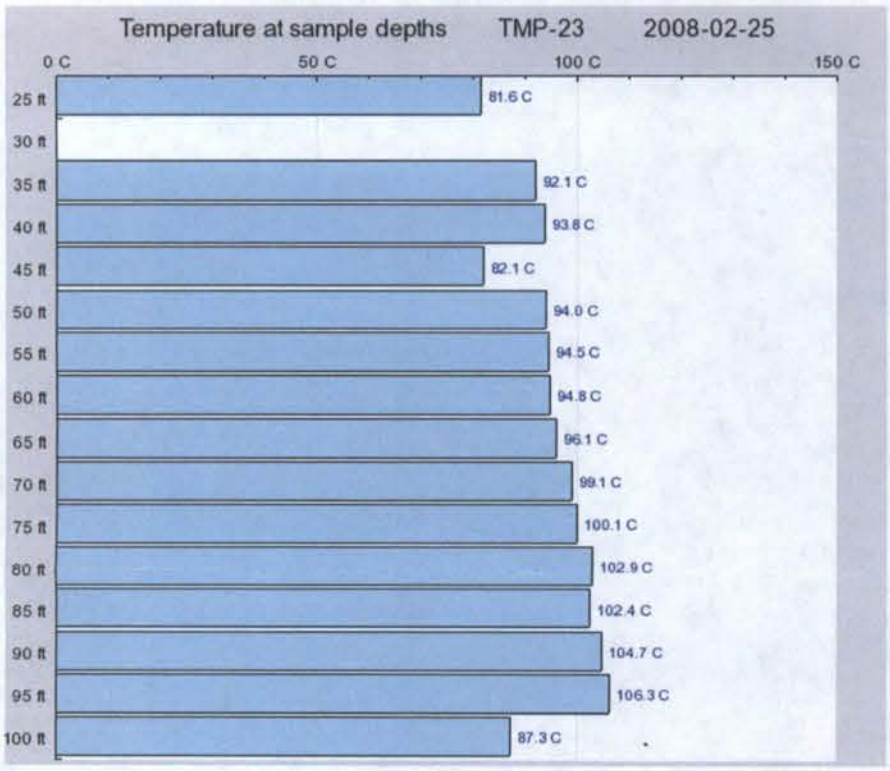

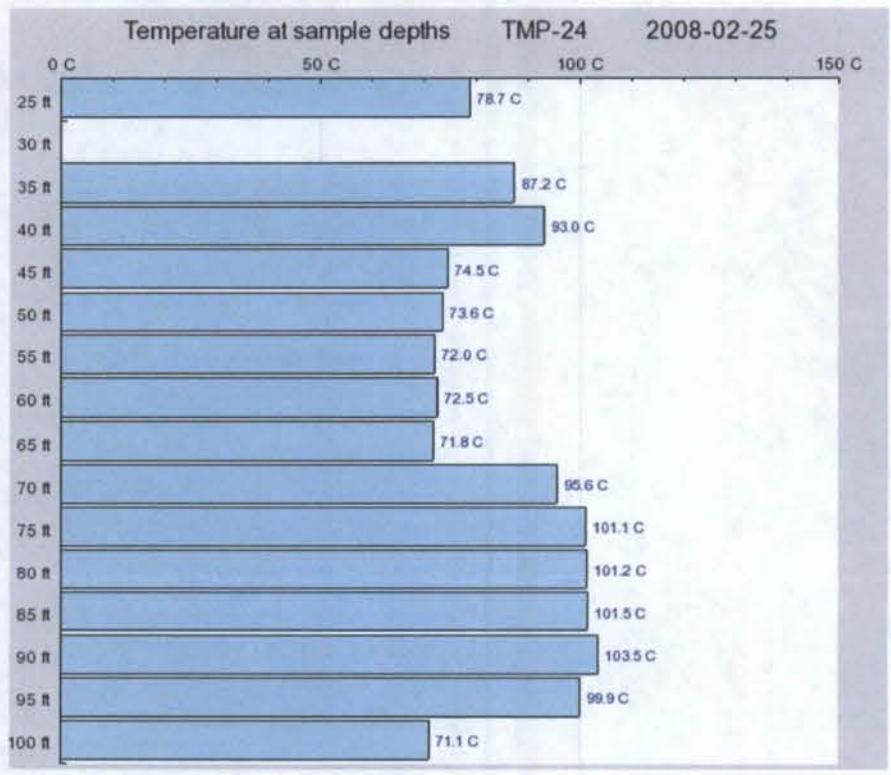

Figure E-15
Temperature Data Distribution
Versus ERH Depth Intervals for TMP-18, TMP-19
TMP-20, TMP-21, TMP-22, TMP-23
Pemaco Superfund Site
Maywood, California

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San Francisco, California

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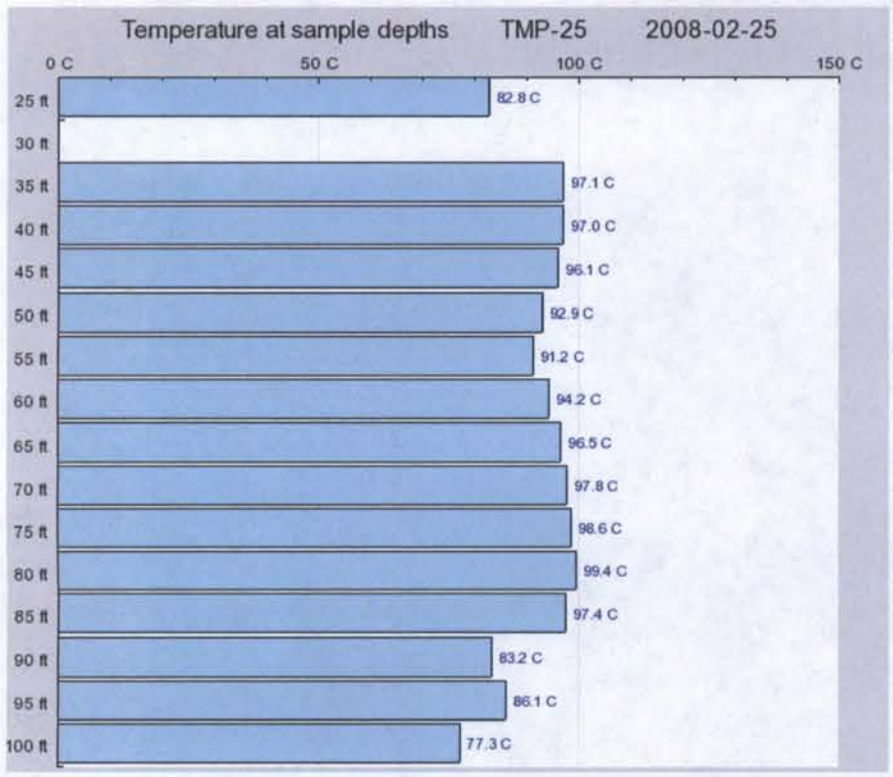

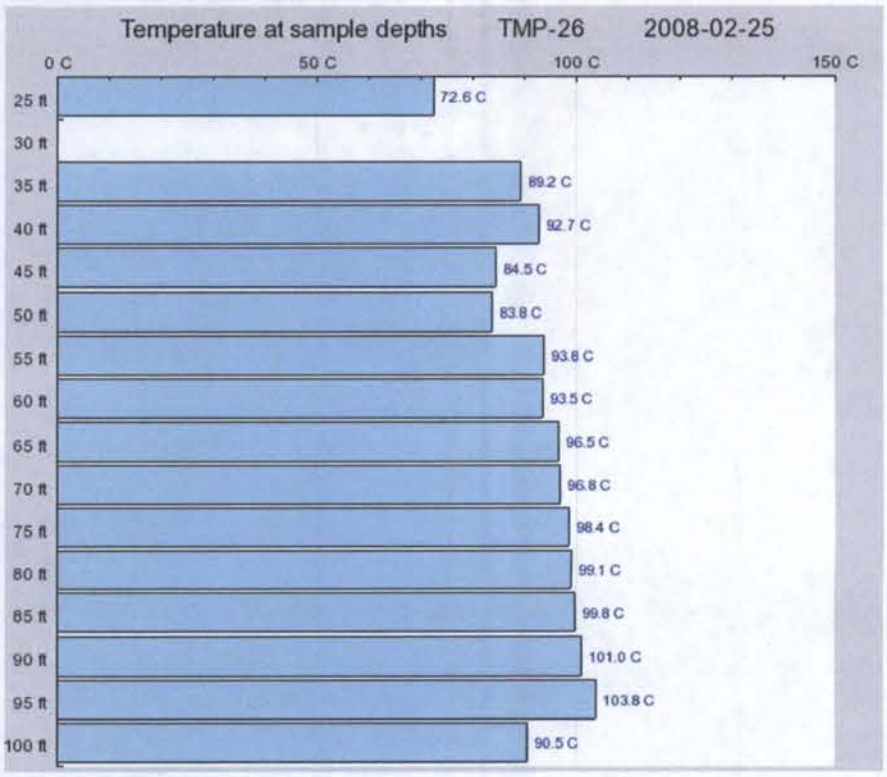

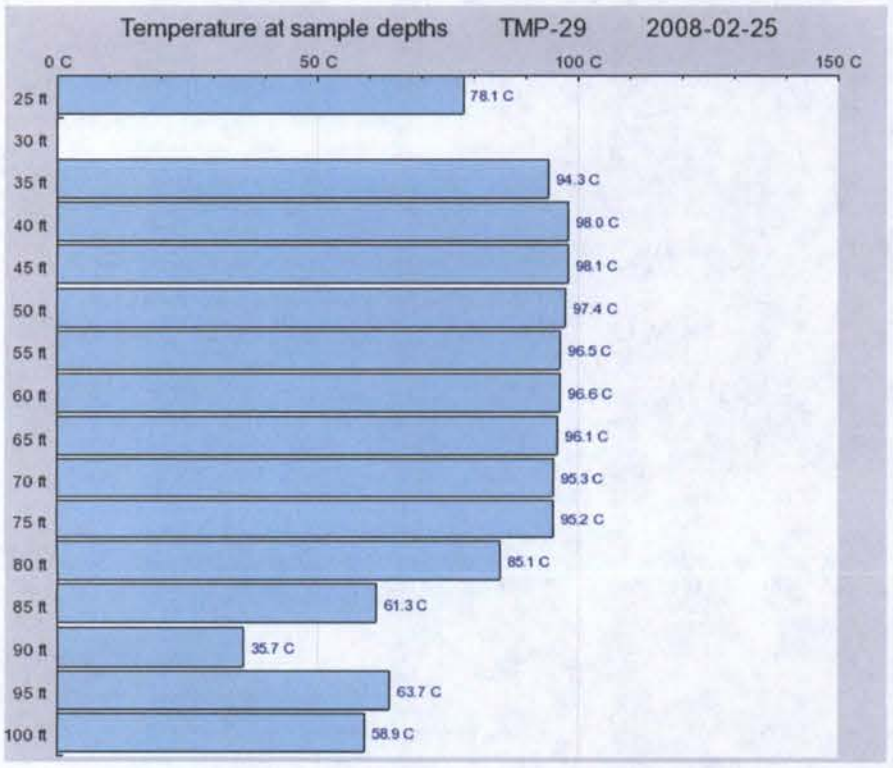

Figure E-16
Temperature Data Distribution
Versus ERH Depth Intervals for
TMP-25, TMP-26 TMP-29
Pemaco Superfund Site
Maywood, California

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San Francisco, California

Date: January 23, 2009

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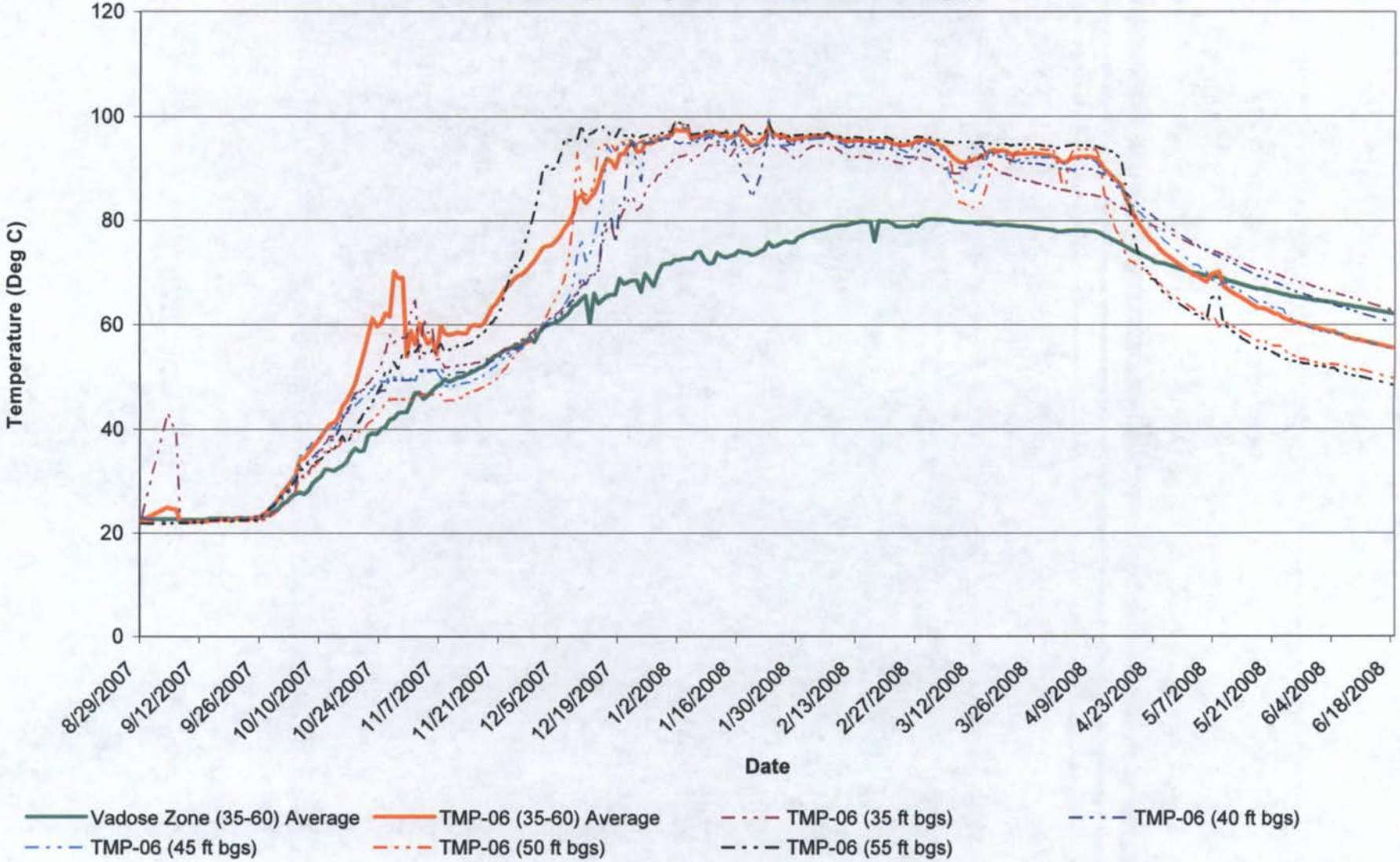
Graphs

Graph E-1
Temperature Over Time for TMP-06
Vadose Zone (Heating between 35 and 60 ft bgs)



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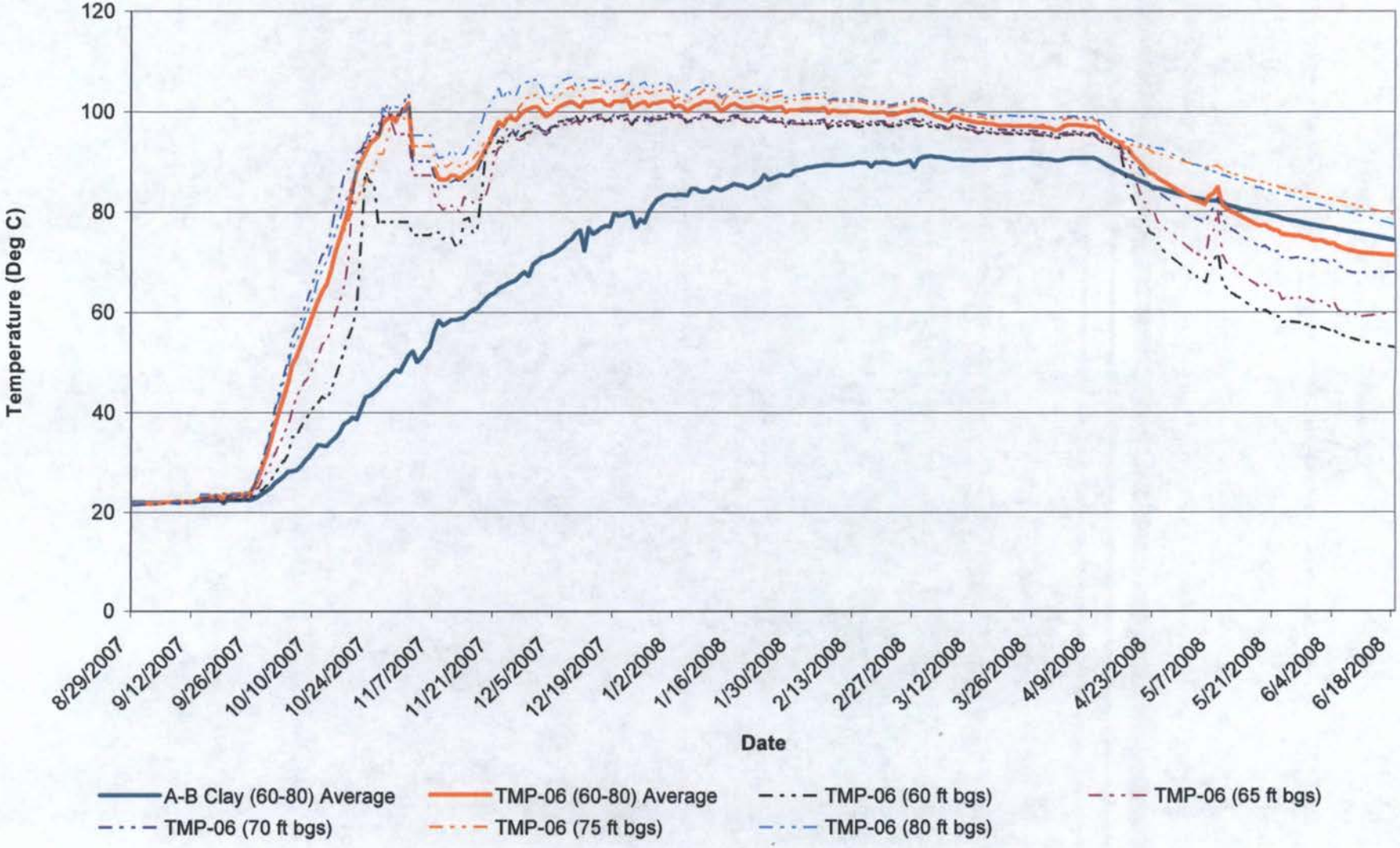
Graph E-2
Temperature Over Time for TMP-06
A-B Clay Zone (Heating between 60 and 80 ft bgs)



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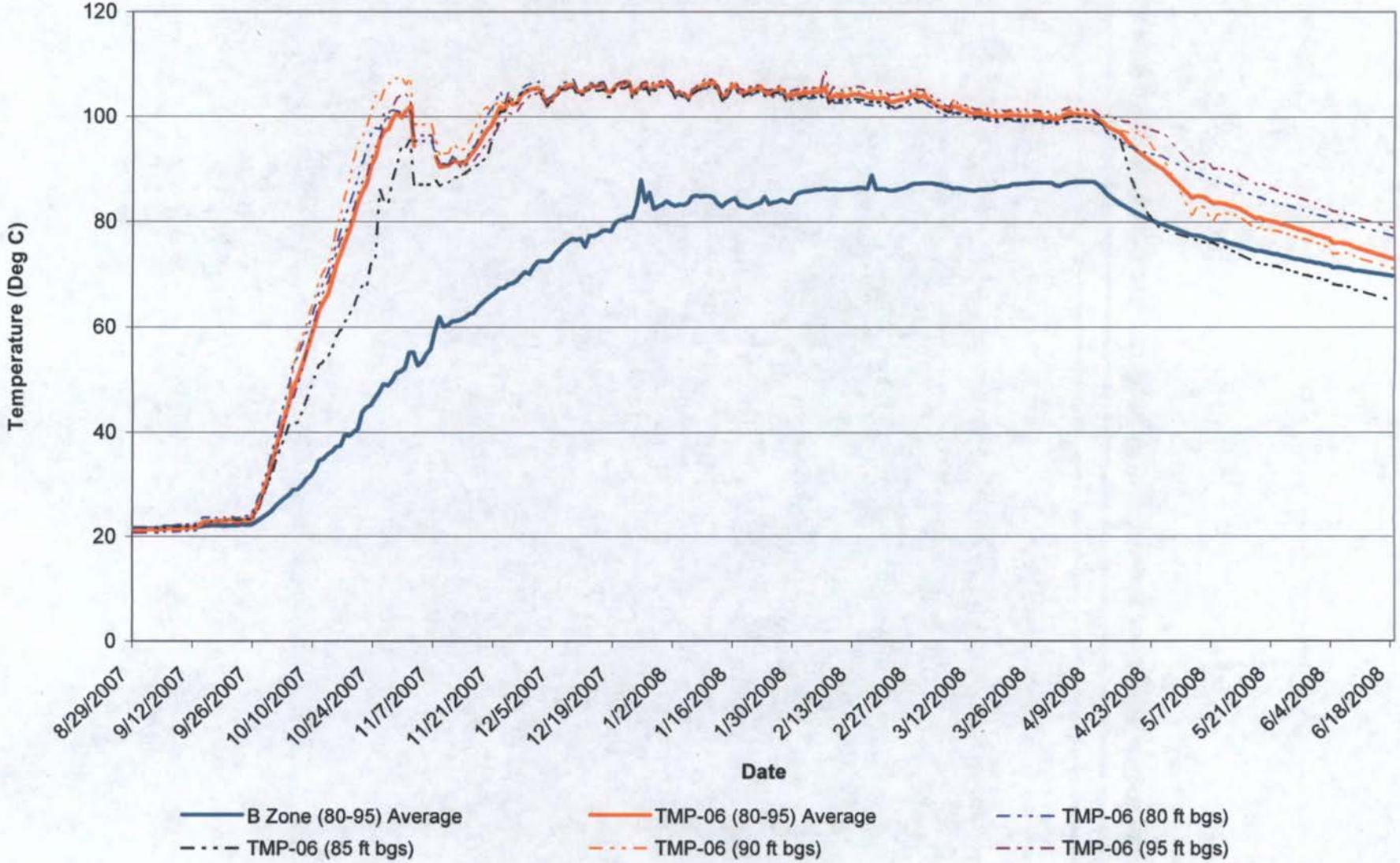
Graph E-3
Temperature Over Time for TMP-06
B Zone (Heating between 80 and 95 ft bgs)



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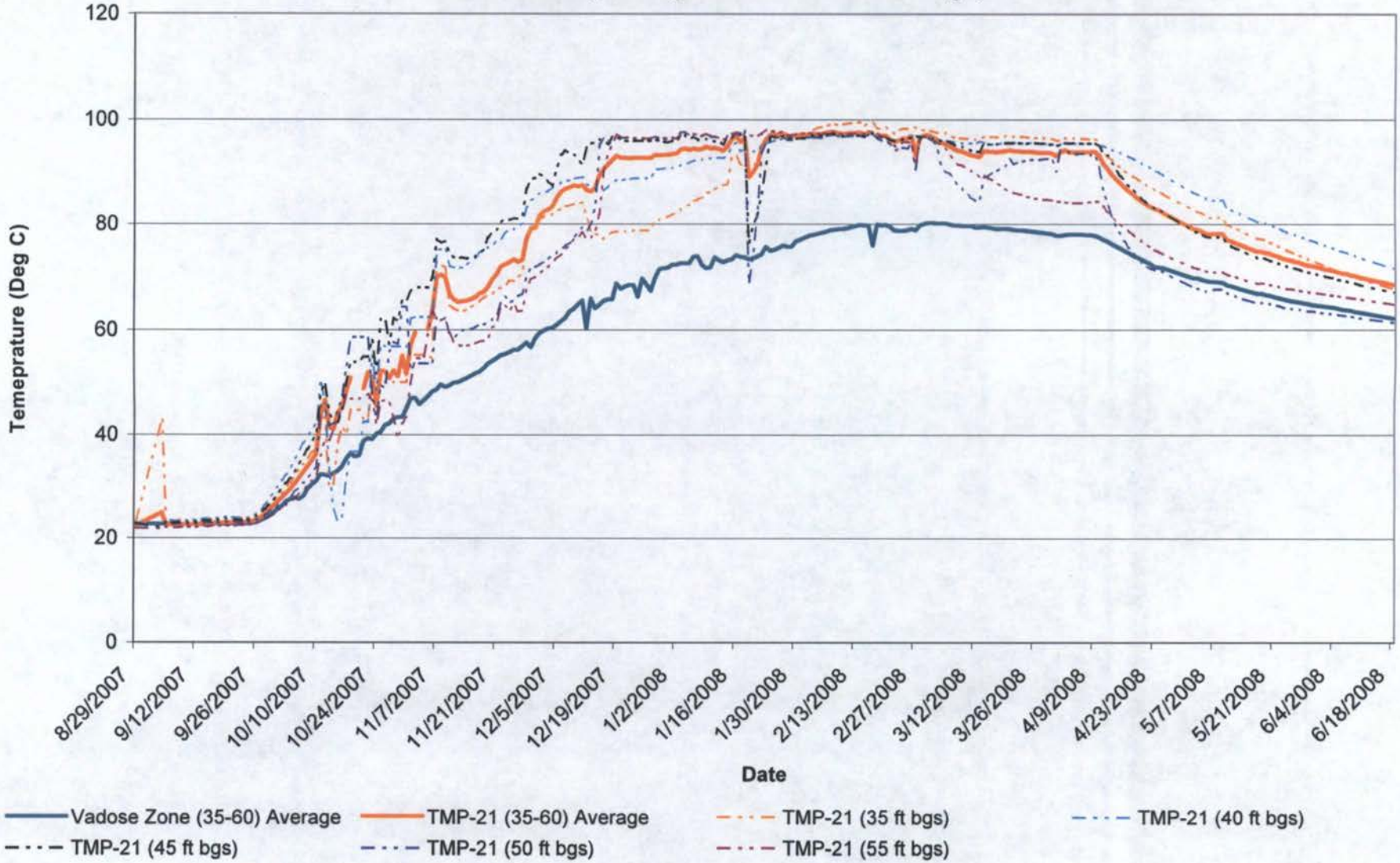
Graph E-4
Temperature Over Time for TMP-21
Vadose Zone (Heating between 35 and 60 ft bgs)



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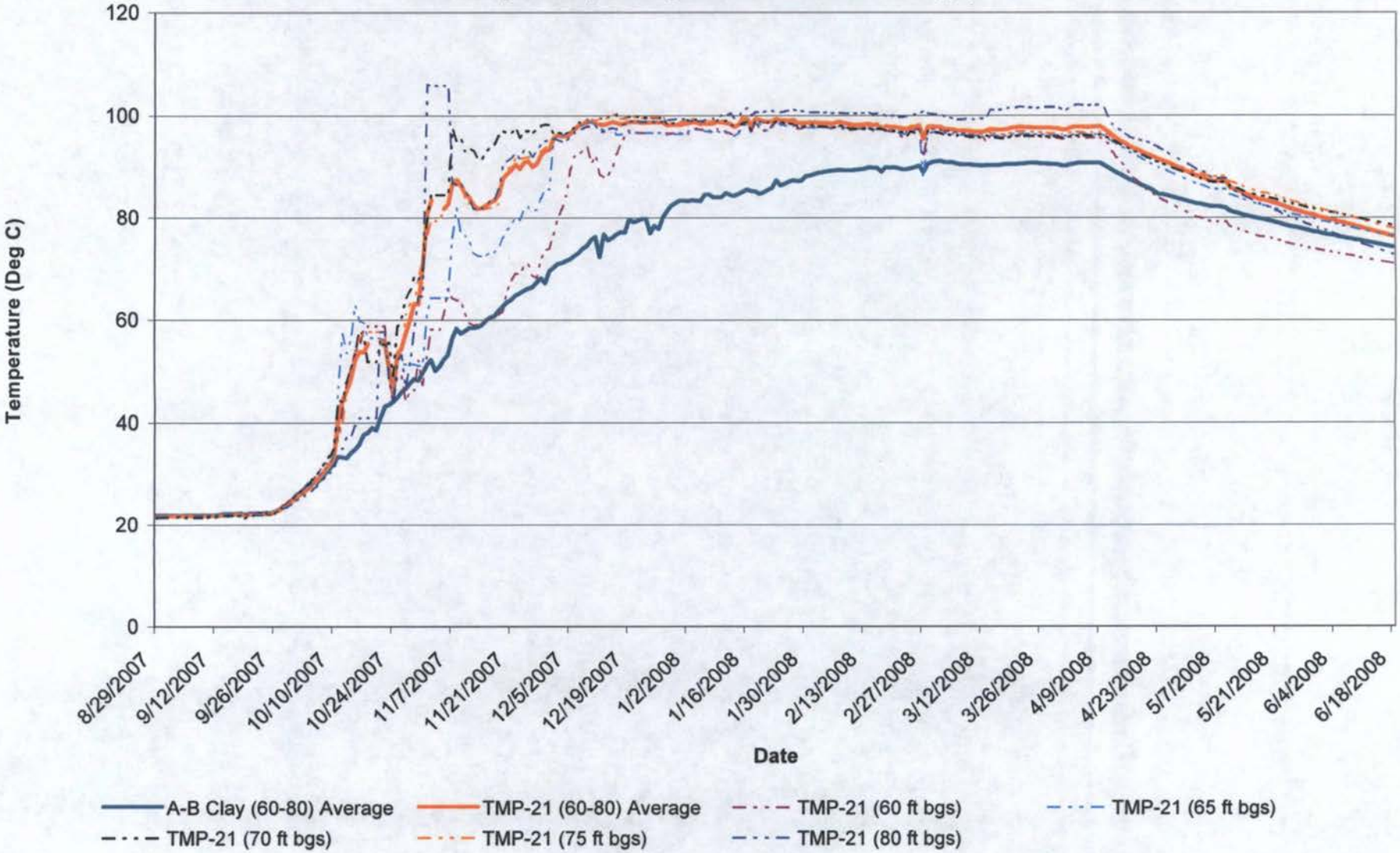
Graph E-5
Temperature Over Time for TMP-21
A-B Clay Zone (Heating between 60 and 80 ft bgs)



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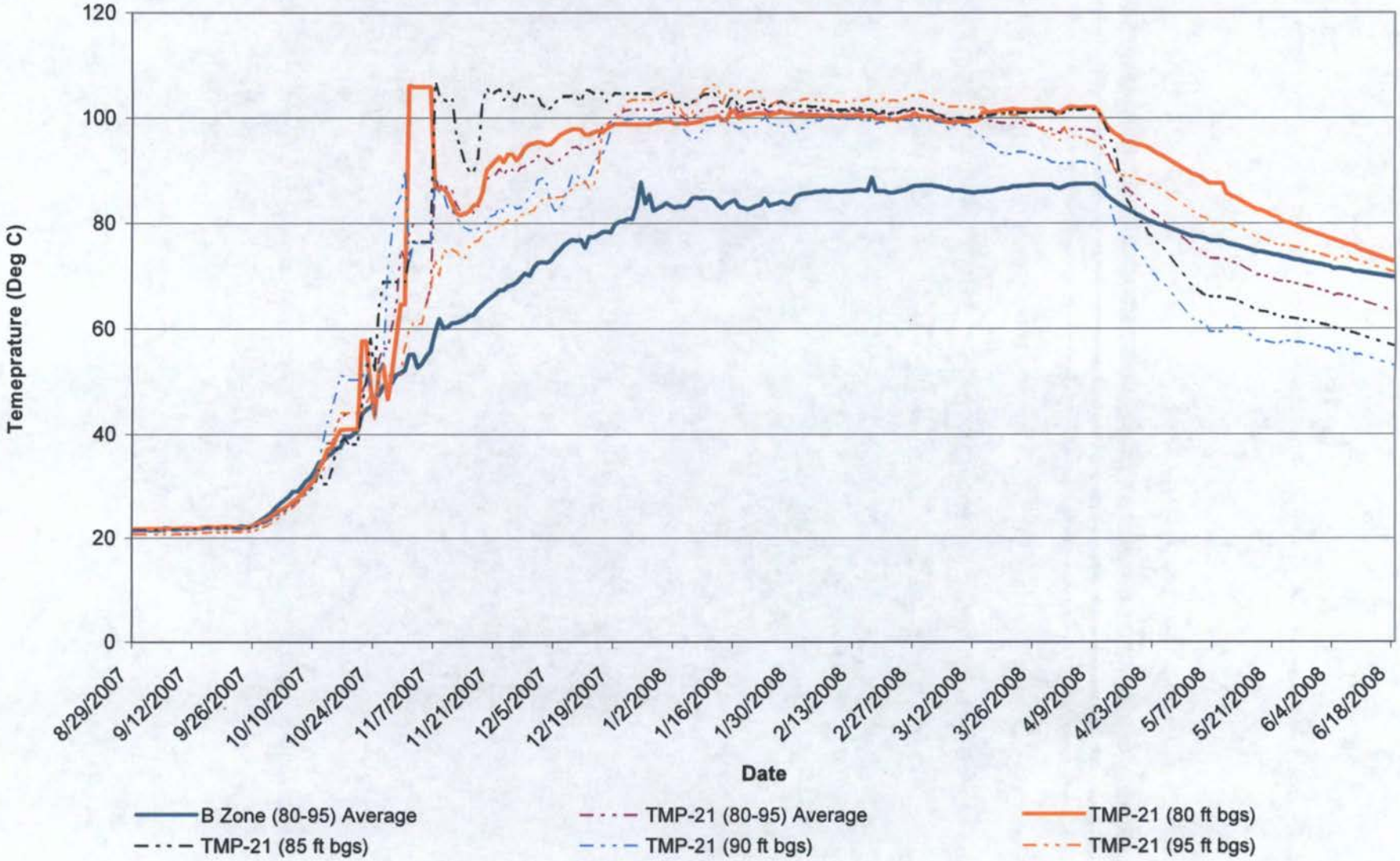
Graph E-6
Temperature Over Time for TMP-21
B Zone (Heating between 80 and 95 ft bgs)



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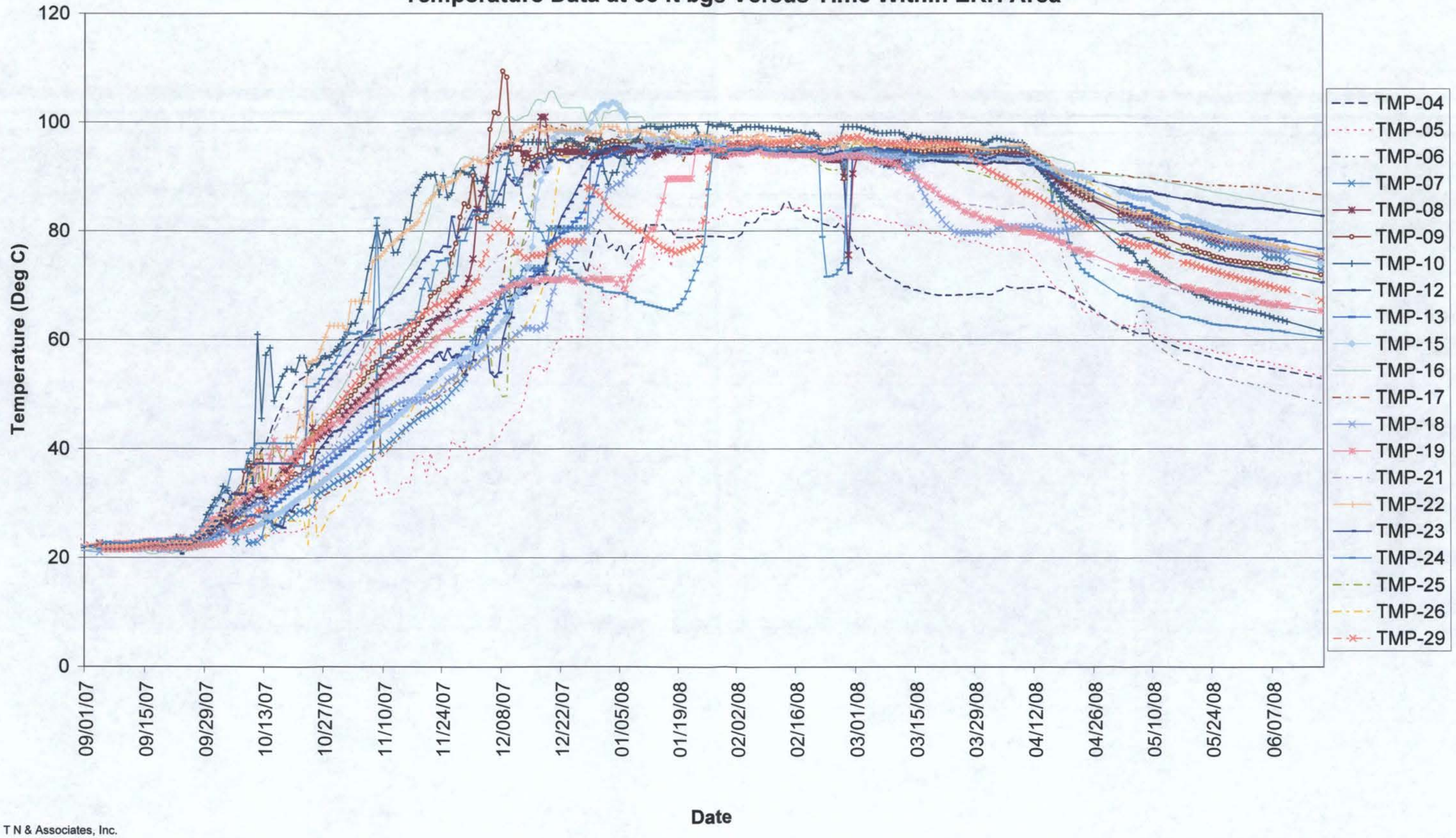
Graph E-7
Temperature Data at 55 ft bgs Versus Time Within ERH Area



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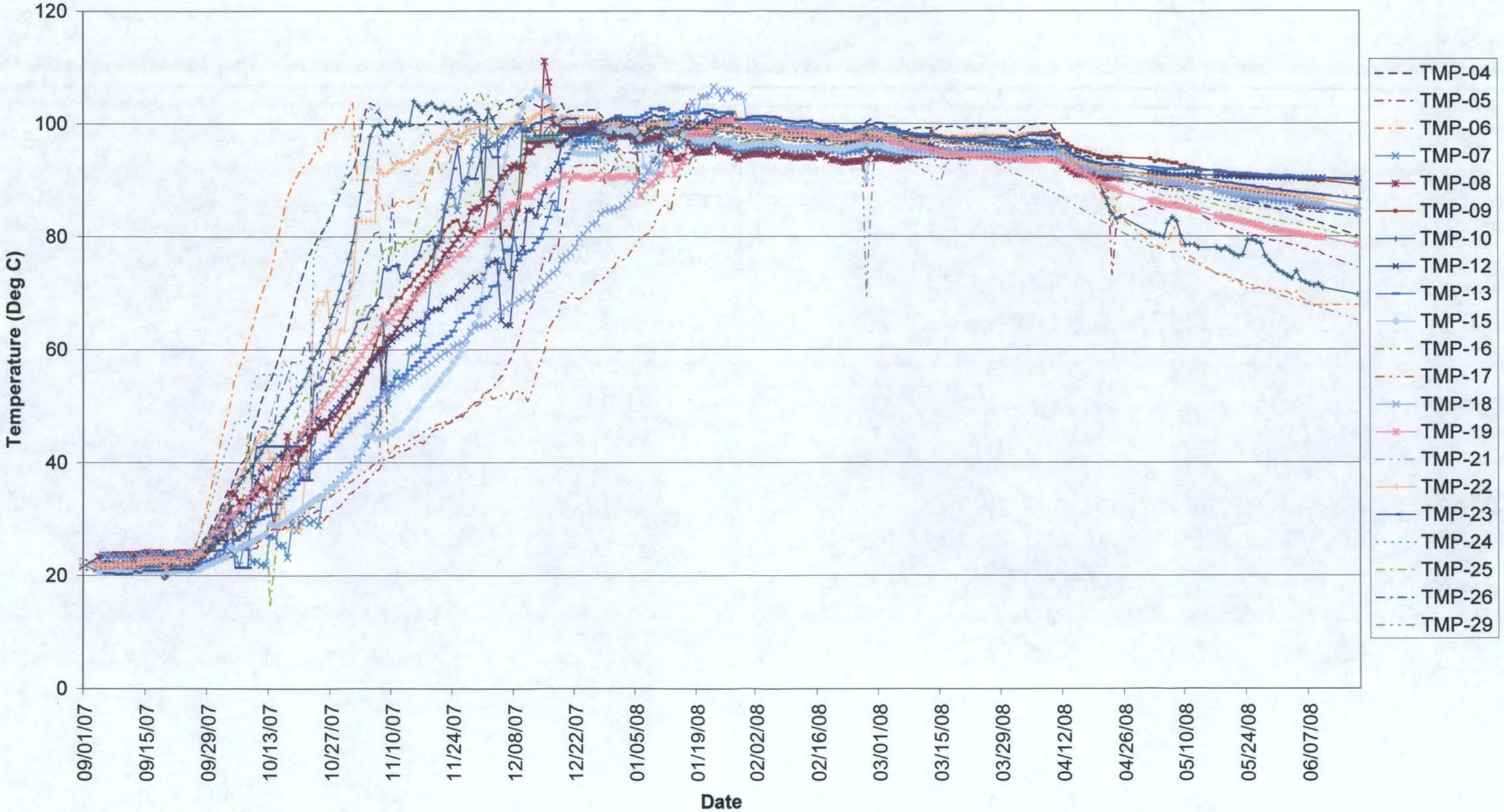
Graph E-8
Temperature Data at 70 ft bgs Versus Time Within ERH Area



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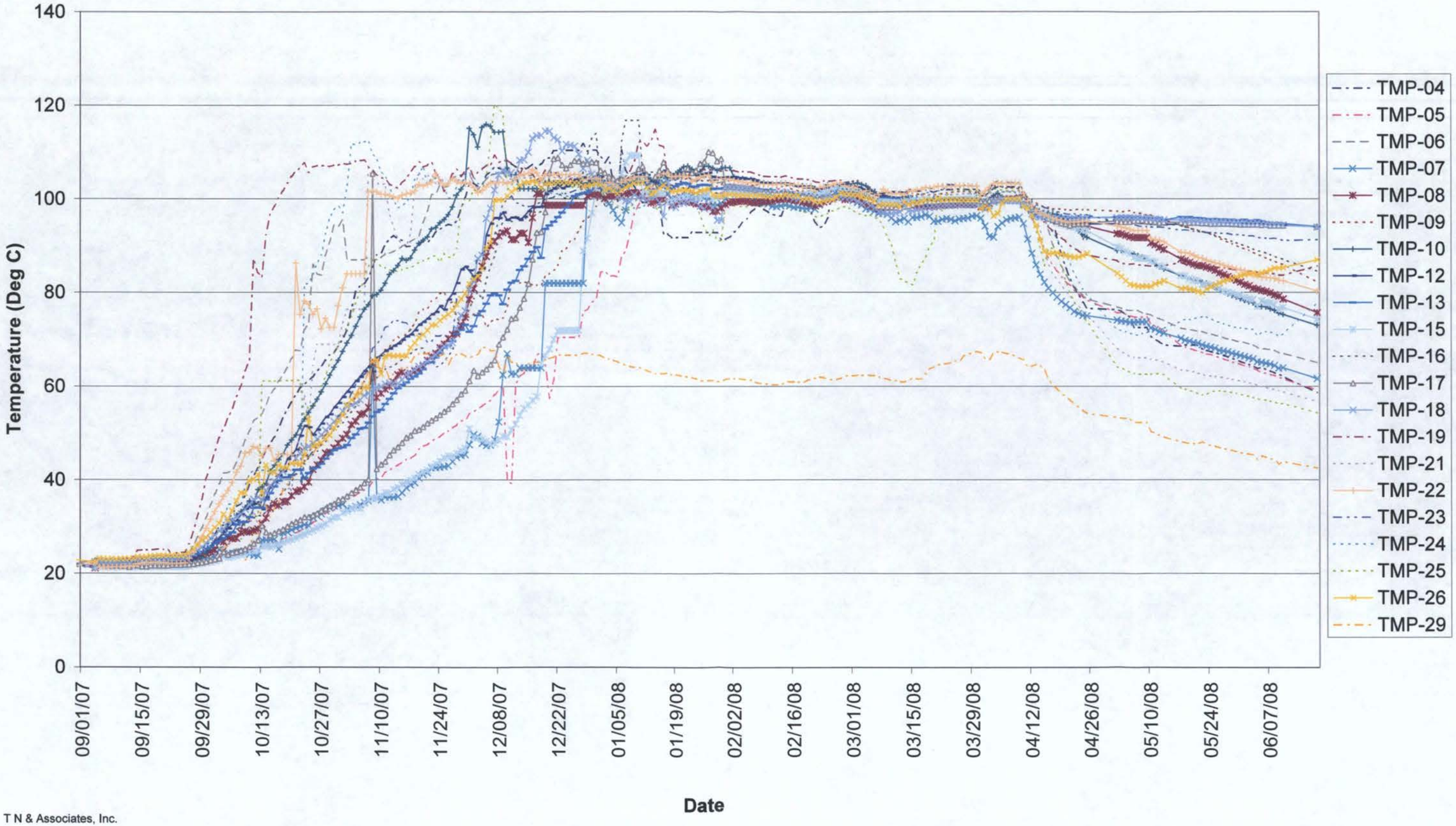
Graph E-9
Temperature Data at 85 ft bgs Versus Time Within ERH Area



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ATTACHMENT F

AVERAGE TEMPERATURE VERSUS ERH ELECTRODE DISTANCE EVALUATION

TABLE F-1	PEMACO ERH TMP EVALUATION SUMMARY-30 DAYS.
GRAPH F-1A	LOWER VADOSE (35'~60' bgs) - AVERAGE TEMPERATURE VS DISTANCE -30 DAYS
GRAPH F-1B	A-B CLAY (60'~80' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 30 DAYS
GRAPH F-1C	B-ZONE (85'~95' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 30 DAYS
TABLE F-2	PEMACO ERH TMP EVALUATION SUMMARY-60 DAYS.
GRAPH F-2A	LOWER VADOSE (35'~60' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 60 DAYS
GRAPH F-2B	A-B CLAY (60'~80' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 60 DAYS
GRAPH F-2C	B-ZONE (85'~95' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 60 DAYS
TABLE F-3	PEMACO ERH TMP EVALUATION SUMMARY-90 DAYS.
GRAPH F-3A	LOWER VADOSE (35'~60' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 90 DAYS
GRAPH F-3B	A-B CLAY (60'~80' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 90 DAYS
GRAPH F-3C	B-ZONE (85'~95' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 90 DAYS

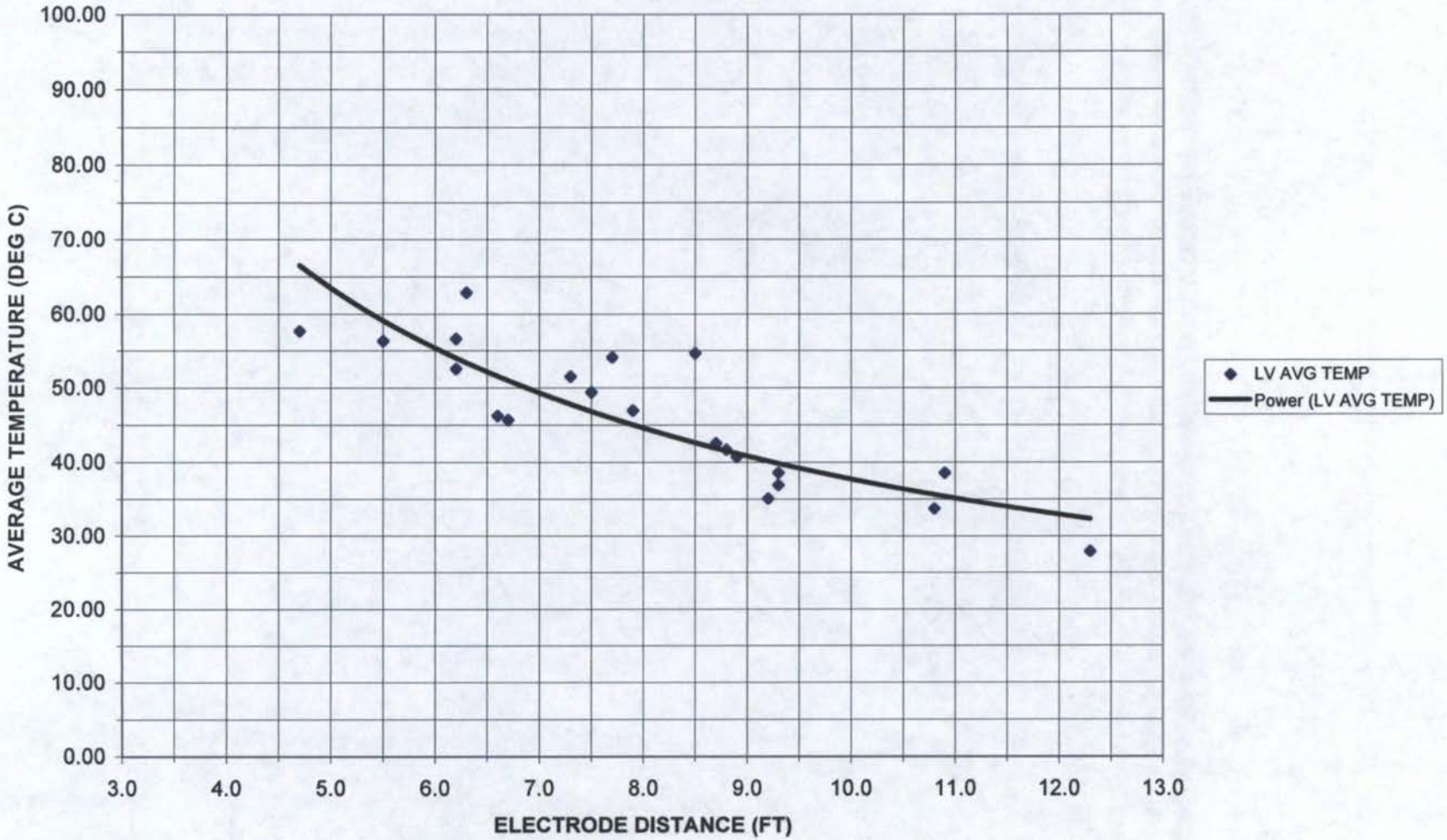
TABLE F-1
PEMACO ERH TMP EVALUATION SUMMARY - 30 DAYS

Zone	TMP ID	# of Electrodes within 10 FT	# of Electrodes within 20 FT	Nearest Electrode	Distance	Lower Vadose 35'~60' bgs Avg. Temp (°C)	A-B Clay 60'~80' bgs Avg. Temp (°C)	B-Zone 85'~95' bgs Avg. Temp (°C)
801	TMP-29	2	3	G1	5.5	56.35	53.03	42.27
	TMP-21	1	4	H3	6.2	52.57	53.45	55.20
	TMP-22	2	6	H4	6.3	62.88	69.15	86.40
	TMP-25	2	3	H2	7.5	49.43	54.03	59.13
	TMP-07	1	4	H7	9.2	35.08	33.23	30.93
	TMP-15	2	4	H6	9.3	38.60	33.10	29.33
802	TMP-26	1	4	E5	6.6	46.28	54.68	51.93
	TMP-16	2	5	G7	7.9	46.97	49.08	46.03
	TMP-13	2	3	E9	9.3	36.92	40.05	42.80
	TMP-17	0	3	E6	10.8	33.68	32.45	30.93
	TMP-12	0	4	E8	10.9	38.58	48.95	55.50
803	TMP-24	2	4	B7	4.7	57.70	72.10	70.60
	TMP-23	3	3	D6	6.2	56.65	52.55	45.77
	TMP-19	2	5	D8	8.8	41.72	56.85	80.87
	TMP-18	2	4	E7	8.9	40.73	40.58	45.83
804	TMP-09	2	4	G9	6.7	45.72	45.35	45.93
	TMP-04	2	4	G10	8.5	54.68	73.03	68.37
	TMP-08	2	5	G9	8.7	42.55	45.18	42.33
805	TMP-10	2	4	C11	7.3	51.53	54.50	59.07
	TMP-06	3	3	D12	7.7	54.15	95.08	94.97
	TMP-05	0	3	E12	12.3	27.93	31.03	31.90
					Average	**46.22**	**51.78**	**53.15**

NOTE:

1. Temperature data is based on 10/25/2007 temperature measuments .
2. TMP-1, 2, 3, 11, 14, 20, 27, 28, and 30 were eliminated due to outside the ERH area.

GRAPH F-1A
LOWER VADOSE (35'~60' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 30 DAYS



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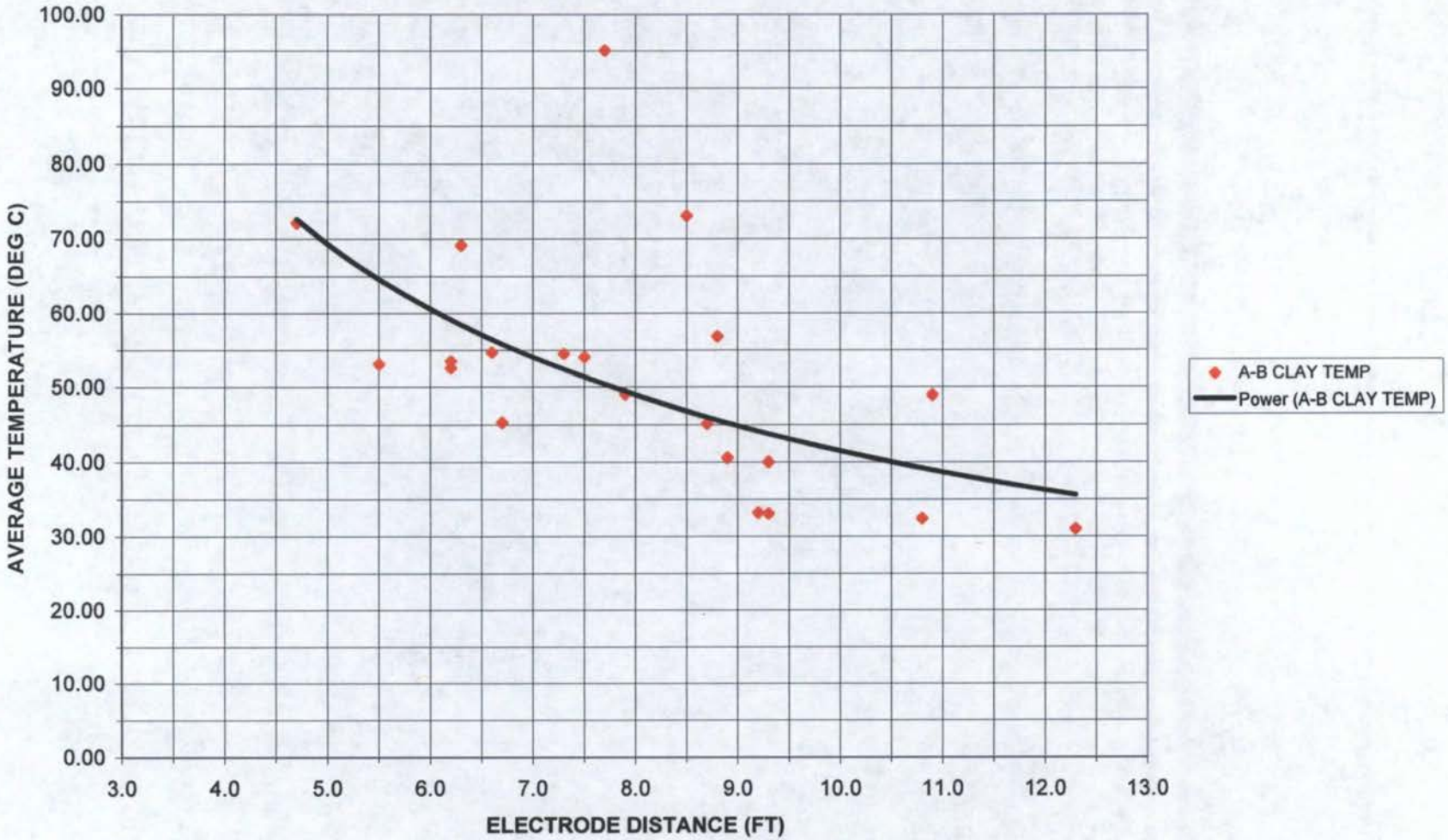
GRAPH F-1B
A-B CLAY (60'~80' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 30 DAYS



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GRAPH F-1C
B-ZONE (85'~95' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 30 DAYS

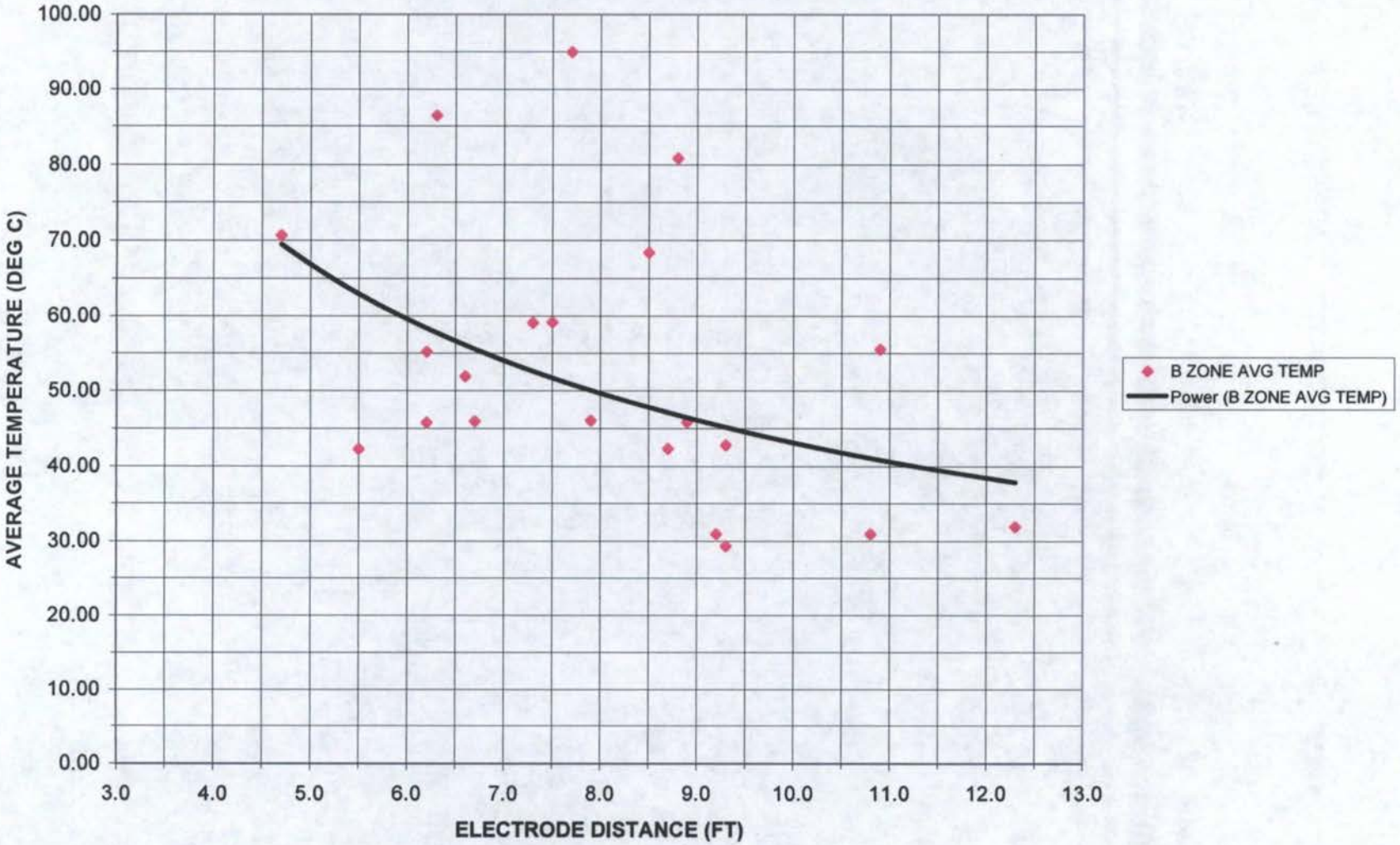

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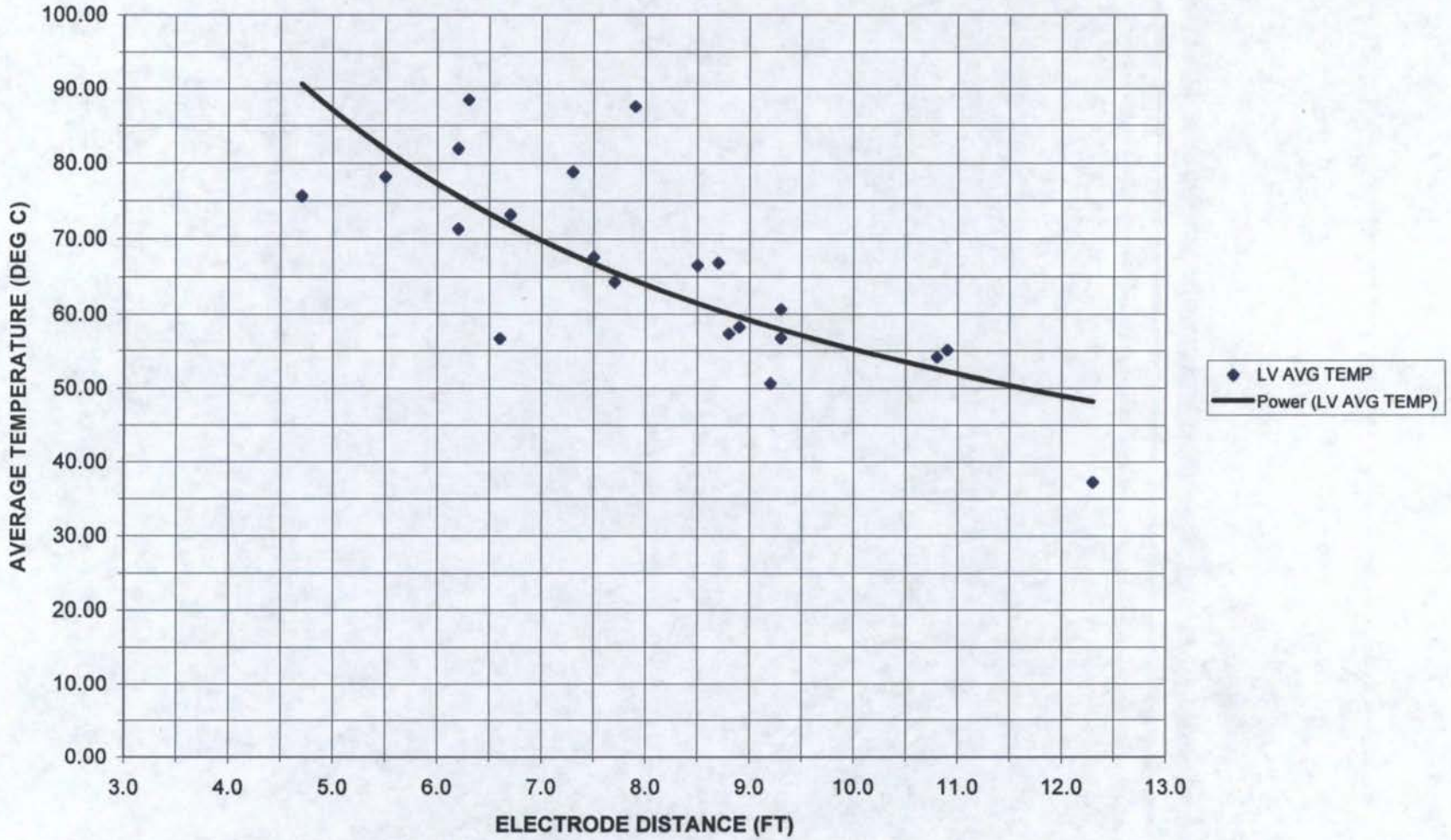
TABLE F-2
PEMACO ERH TMP EVALUATION SUMMARY - 60 DAYS

Zone	TMP ID	# of Electrodes within 10 FT	# of Electrodes within 20 FT	Nearest Electrode	Distance	Lower Vadose 35'~60' bgs Avg. Temp (°C)	A-B Clay 60'~80' bgs Avg. Temp (°C)	B-Zone 85'~95' bgs Avg. Temp (°C)
801	TMP-29	2	3	G1	5.5	78.18	78.70	59.40
	TMP-21	1	4	H3	6.2	71.33	90.85	89.60
	TMP-22	2	6	H4	6.3	88.53	100.40	102.97
	TMP-25	2	3	H2	7.5	67.60	83.55	84.00
	TMP-07	1	4	H7	9.2	50.62	67.40	43.17
	TMP-15	2	4	H6	9.3	60.63	53.08	42.73
802	TMP-26	1	4	E5	6.6	56.70	74.08	76.87
	TMP-16	2	5	G7	7.9	87.60	86.70	70.93
	TMP-13	2	3	E9	9.3	56.77	63.43	67.63
	TMP-17	0	3	E6	10.8	54.15	48.38	51.13
	TMP-12	0	4	E8	10.9	55.12	73.18	81.13
803	TMP-24	2	4	B7	4.7	75.62	97.38	91.43
	TMP-23	3	3	D6	6.2	81.92	80.00	67.10
	TMP-19	2	5	D8	8.8	57.37	80.20	100.83
	TMP-18	2	4	E7	8.9	58.22	60.35	65.20
804	TMP-09	2	4	G9	6.7	73.18	77.70	76.80
	TMP-04	2	4	G10	8.5	66.50	99.95	96.67
	TMP-08	2	5	G9	8.7	66.83	72.93	67.53
805	TMP-10	2	4	C11	7.3	78.85	96.18	98.63
	TMP-06	3	3	D12	7.7	64.32	98.68	102.47
	TMP-05	0	3	E12	12.3	37.25	47.80	48.27
					Average	**66.06**	**77.66**	**75.45**

NOTE:

1. Temperature data is based on 11/24/2007 temperature measuments .
2. TMP-1, 2, 3, 11, 14, 20, 27, 28, and 30 were eliminated due to outside the ERH area.

GRAPH F-2A
LOWER VADOSE (35'~60' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 60 DAYS



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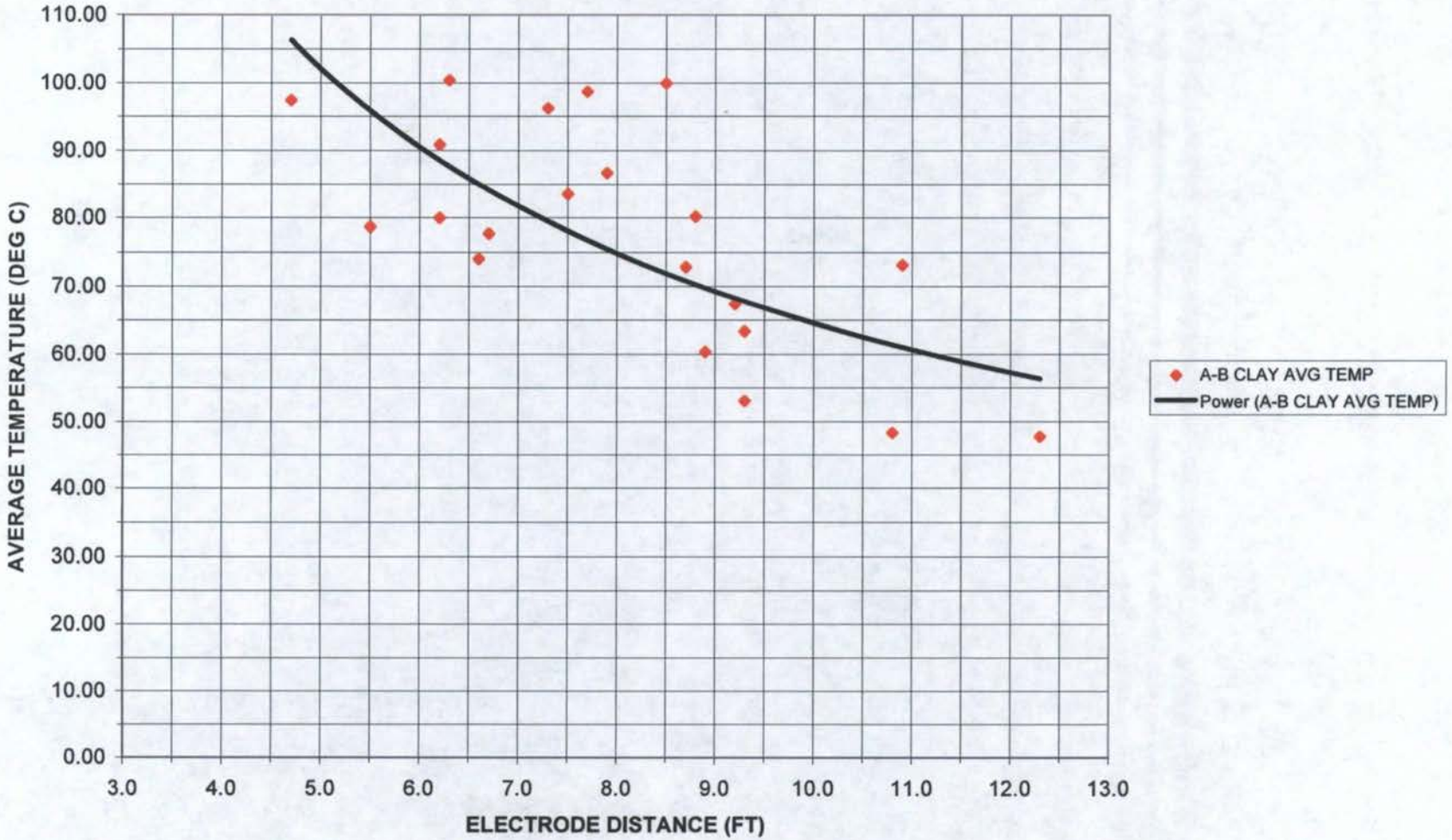
GRAPH F-2B
A-B CLAY (60'~80' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 60 DAYS



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GRAPH F-2C
B-ZONE (85'~95' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 60 DAYS

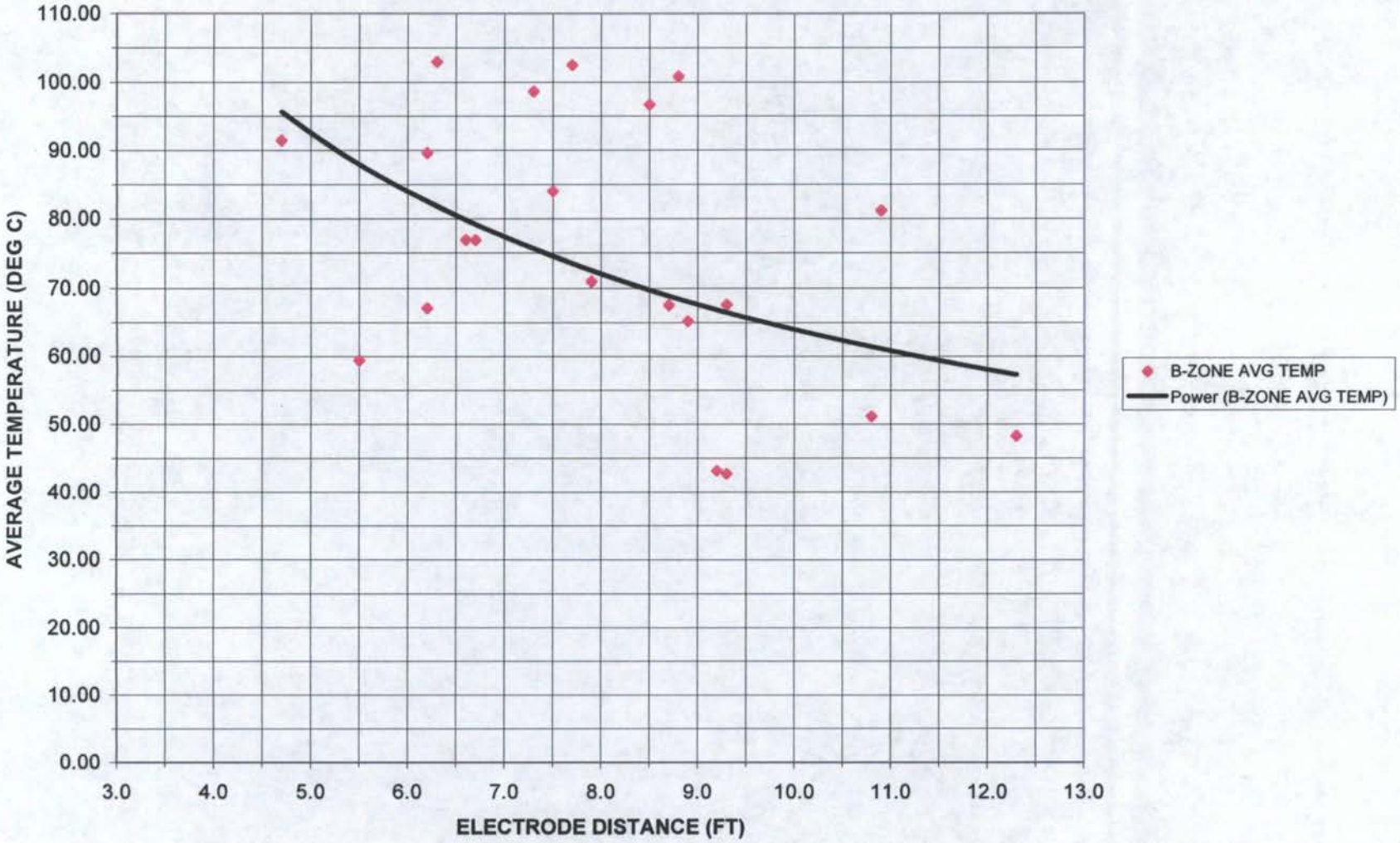

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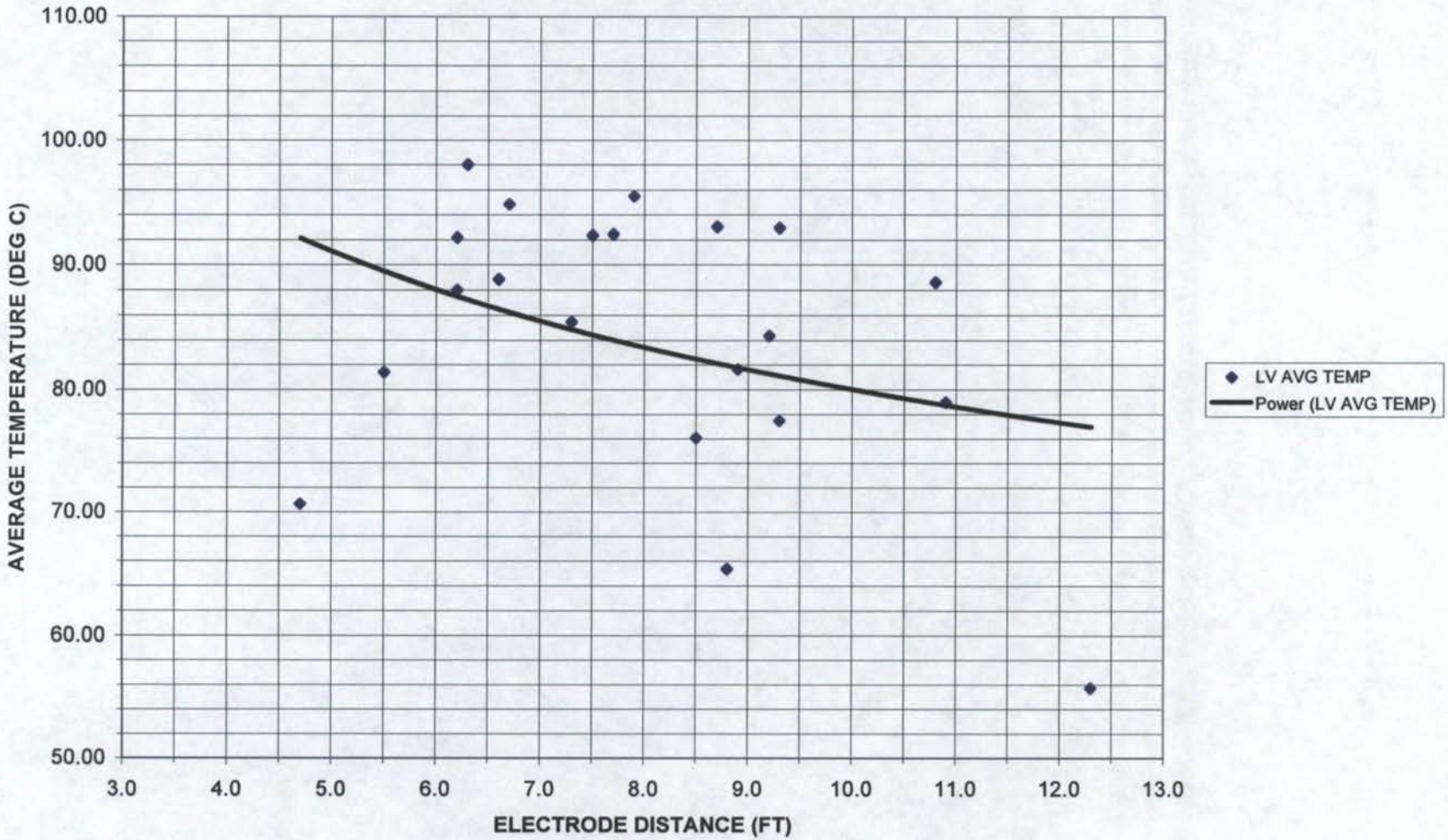
TABLE F-3
PEMACO ERH TMP EVALUATION SUMMARY - 90 DAYS

Zone	TMP ID	# of Electrodes within 10 FT	# of Electrodes within 20 FT	Nearest Electrode	Distance	Lower Vadose 35'~60' bgs Avg. Temp (°C)	A-B Clay 60'~80' bgs Avg. Temp (°C)	B-Zone 85'~95' bgs Avg. Temp (°C)
801	TMP-29	2	3	G1	5.5	81.40	91.15	52.67
	TMP-21	1	4	H3	6.2	92.20	98.68	102.60
	TMP-22	2	6	H4	6.3	98.03	103.03	104.33
	TMP-25	2	3	H2	7.5	92.37	98.45	96.40
	TMP-07	1	4	H7	9.2	84.40	86.48	65.93
	TMP-15	2	4	H6	9.3	92.97	88.00	61.67
802	TMP-26	1	4	E5	6.6	88.83	100.15	99.97
	TMP-16	2	5	G7	7.9	95.52	96.73	97.87
	TMP-13	2	3	E9	9.3	77.50	93.88	90.93
	TMP-17	0	3	E6	10.8	88.62	69.48	82.77
	TMP-12	0	4	E8	10.9	78.98	98.65	99.87
803	TMP-24	2	4	B7	4.7	70.65	96.60	96.17
	TMP-23	3	3	D6	6.2	87.98	100.08	92.67
	TMP-19	2	5	D8	8.8	65.37	91.58	100.27
	TMP-18	2	4	E7	8.9	81.65	74.33	100.40
804	TMP-09	2	4	G9	6.7	94.85	96.48	83.57
	TMP-04	2	4	G10	8.5	76.10	101.48	108.27
	TMP-08	2	5	G9	8.7	93.07	95.93	87.53
805	TMP-10	2	4	C11	7.3	85.47	99.90	101.30
	TMP-06	3	3	D12	7.7	92.47	101.45	105.13
	TMP-05	0	3	E12	12.3	55.73	80.48	66.70
					Average	**84.48**	**93.48**	**90.33**

NOTE:

1. Temperature data is based on 12/24/2007 temperature measuments .
2. TMP-1, 2, 3, 11, 14, 20, 27, 28, and 30 were eliminated due to outside the ERH area.

GRAPH F-3A
LOWER VADOSE (35'~60' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 90 DAYS



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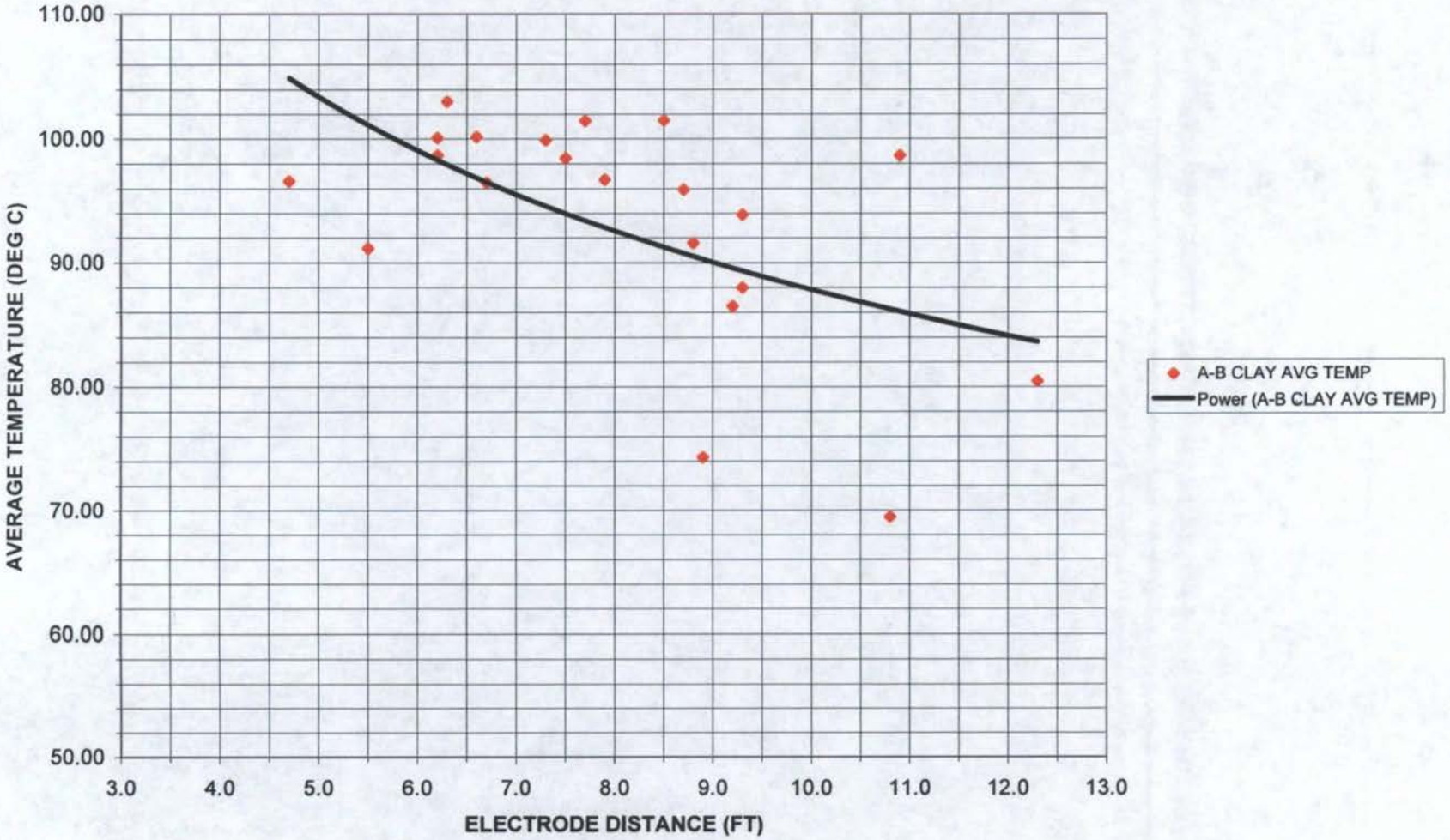
GRAPH F-3B
A-B CLAY (60'~80' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 90 DAYS



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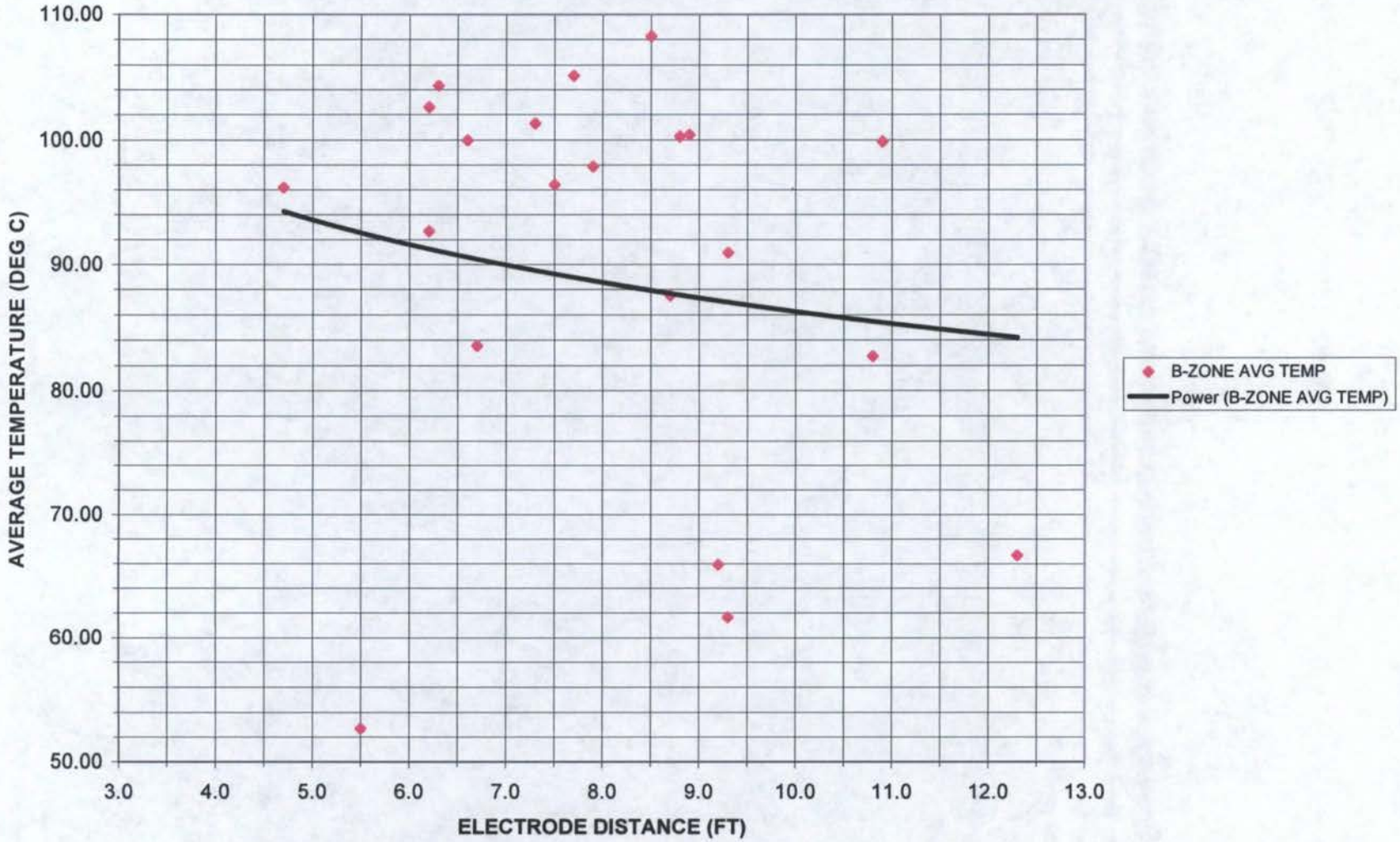
GRAPH F-3C
B-ZONE (85'~95' bgs) - AVERAGE TEMPERATURE VS DISTANCE - 90 DAYS

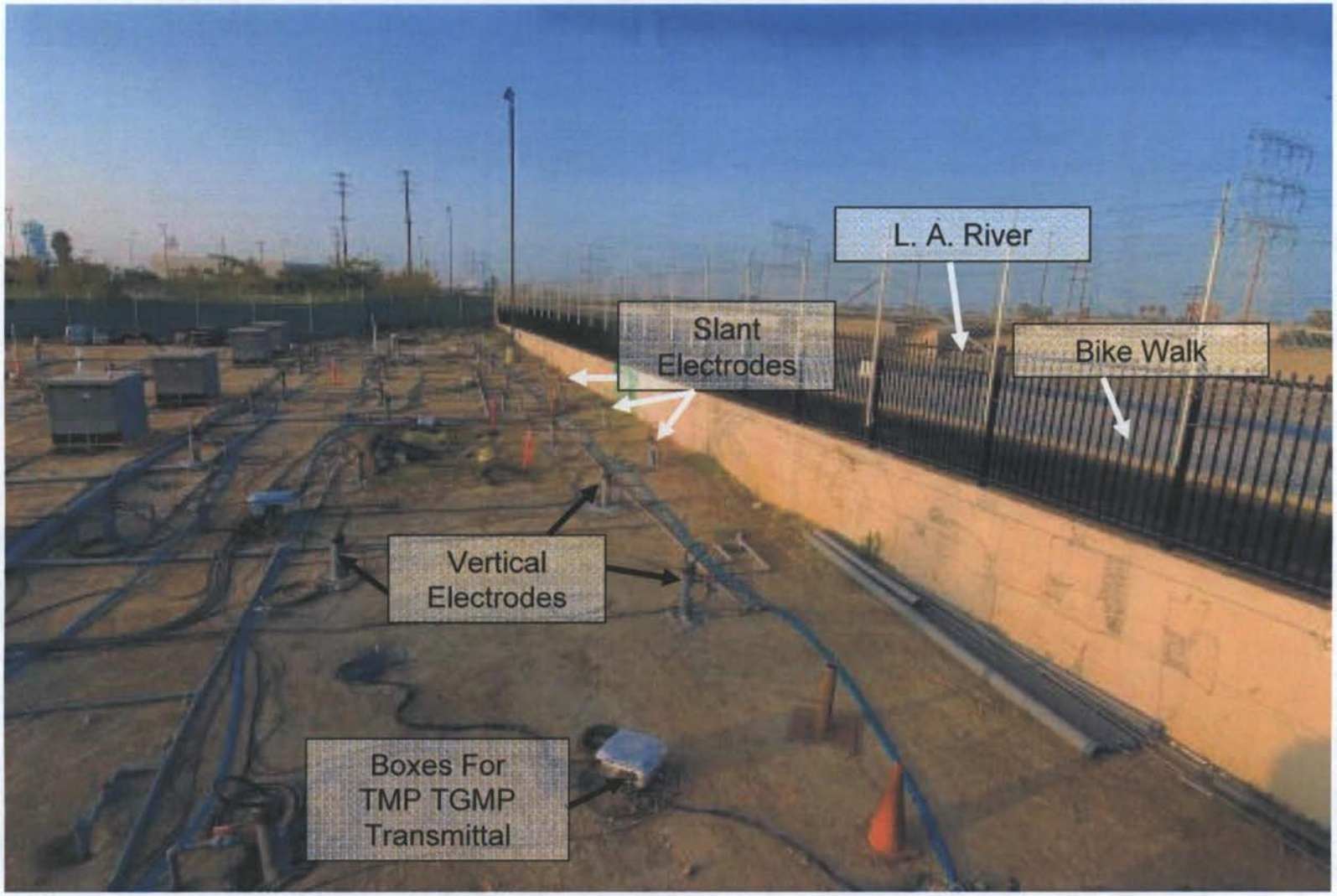


T N & Associates, Inc.

ATTACHMENT G

PEMACO ERH PHOTOS

Photo 1	Pemaco ERH Well Field
Photo 2	Pemaco ERH Transformer Substations
Photo 3	Pemaco ERH Power Control Unit and Vapor Condenser
Photo 4	Southern California Edison (SCE) Transformer and Switch Gear for Pemaco
Photo 5	Southern California Edison (SCE) Transformer and Switch Gear for Pemaco
Photo 6	Southern California Edison (SCE) Transformer and Switch Gear for Pemaco
Photo 7	Southern California Edison (SCE) Transformer and Switch Gear for Pemaco
Photo 8	Pemaco ERH Well Field (During ERH Construction)
Photo 9	Pemaco ERH Well Field
Photo 10	Pemaco Water and Vapor Treatment Plant
Photo 11	Inside of the Pemaco Treatment Plant
Photo 12	Pemaco Flameless Thermal Oxidizer
Photo 13	Vapor Headers (VE-1 through VE-4, and DPE-A through DPE-D)
Photo 14	Pemaco Liquid-Ring Blower
Photo 15	Granular Activated Carbon (GAC) Vessel for Pemaco Process Water Treatment
Photo 16	Granular Activated Carbon (GAC) Vessel for Pemaco Process Vapor Treatment



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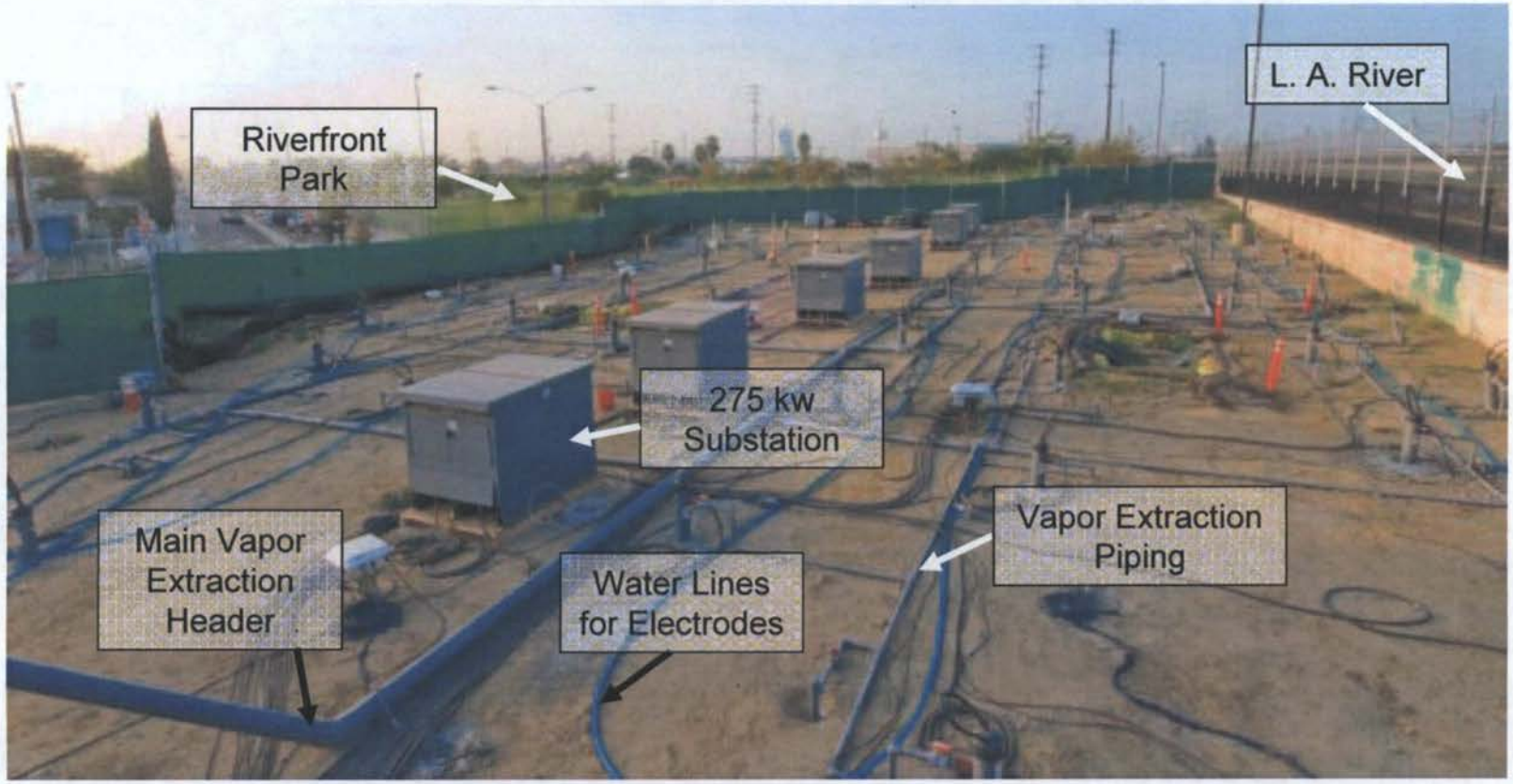

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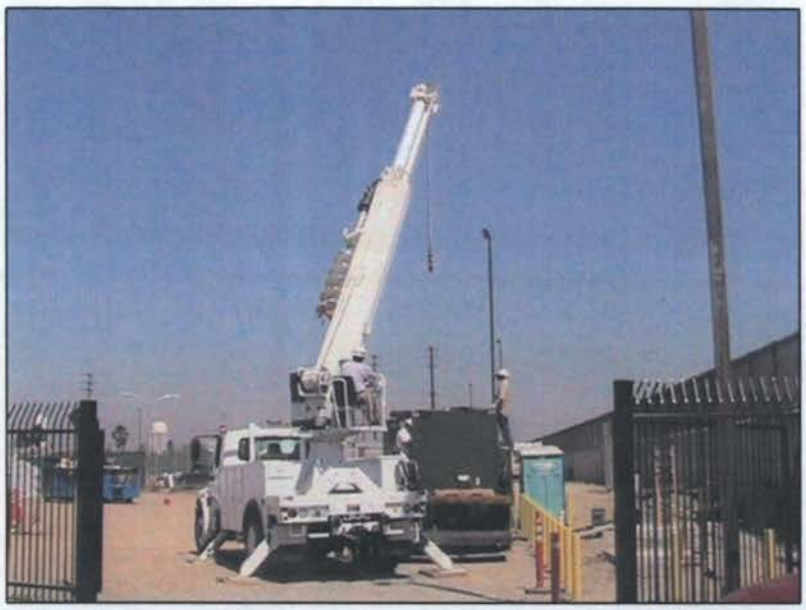

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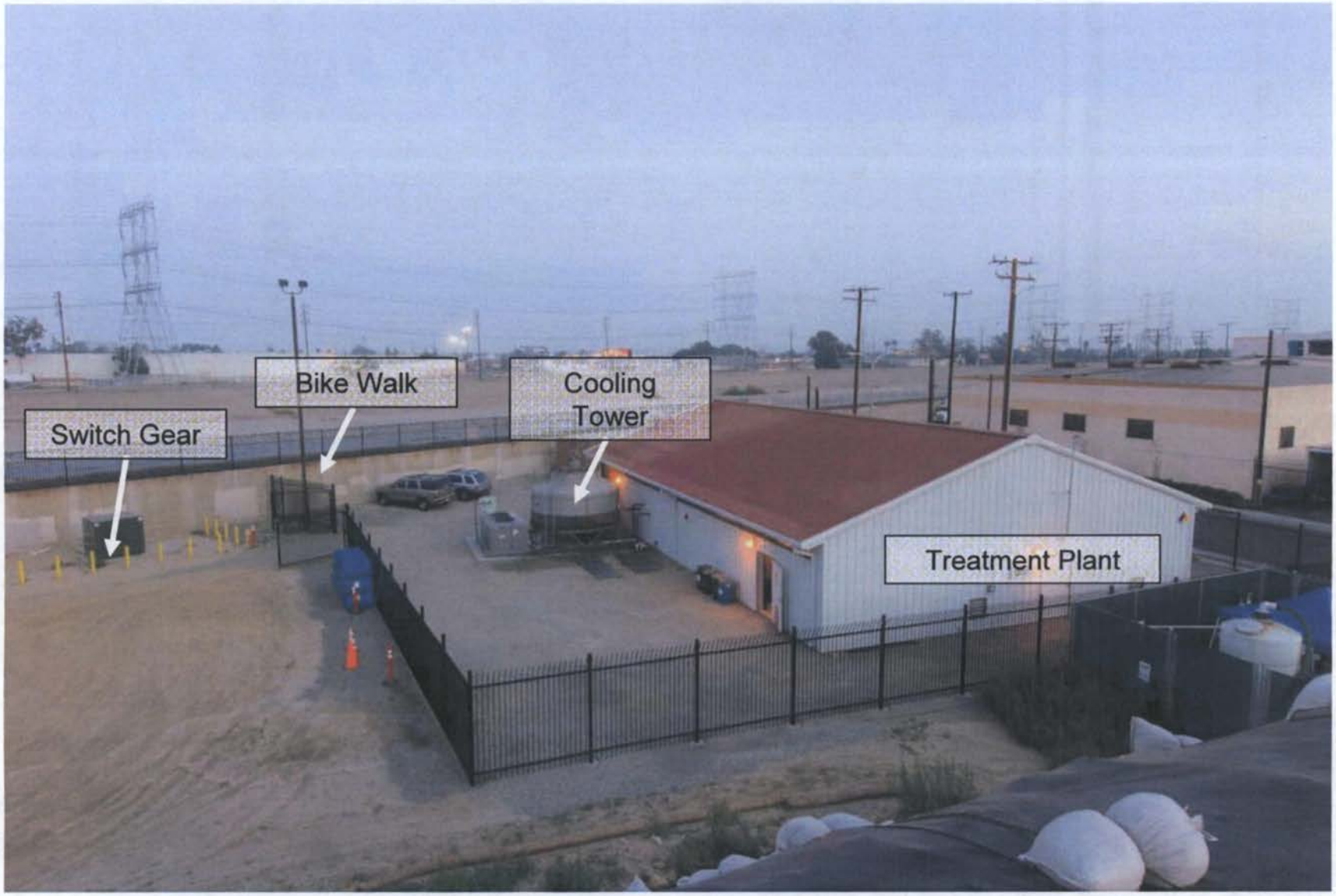

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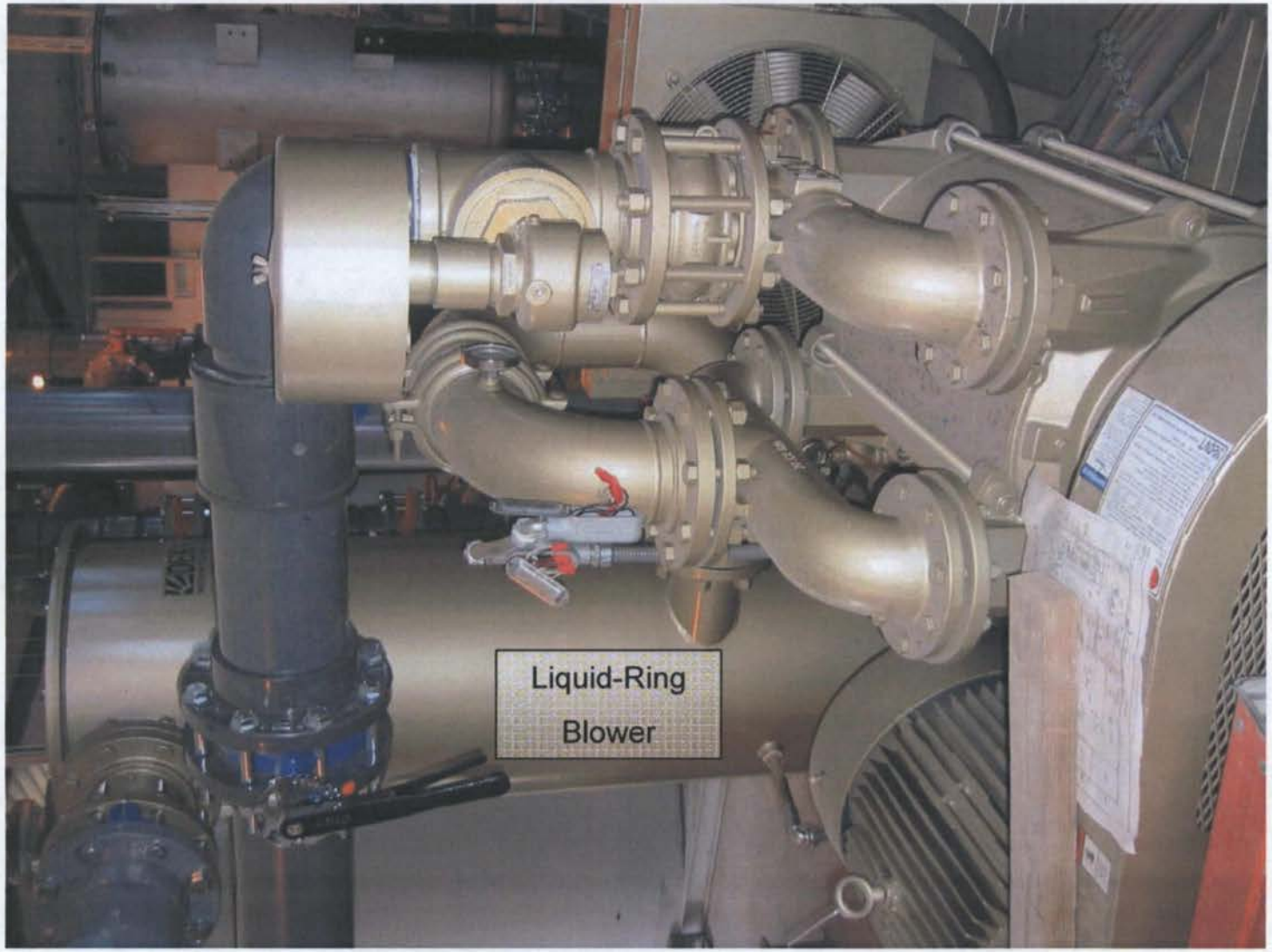

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Photo 15. Granular Activated Carbon (GAC) Vessel for Pemaco Process Water Treatment

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T N & Associates, Inc.
Engineering and Science

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Transmittal Letter

To: Ms. Rose Marie Caraway **Company:** U.S. EPA
Remedial Project Manager

Address: US-EPA Region IX
75 Hawthorne St.
San Francisco, CA 94105-3901

From: Dacre Bush
Date: **February 6, 2009**

Re: Draft Electrical Resistance Heating (ERH) Summary Report,
Pemaco Superfund Site, 5050 Slauson Avenue, Maywood, California.

CC: Rik Lantz, Sullivan International Group
John Hartley, U. S. Army Corps of Engineers, Omaha District
Eva Davis, RS Kerr Environmental Drive

☐ **Urgent**	☑ **For Review**	☐ **Please Comment**	☐ **Please Reply**	☐ **FYI**

Dear Ms. Caraway;

Enclosed please find for your review, one hard copy of the *Draft Electrical Resistance Heating (ERH) Summary Report, Pemaco Superfund Site, 5050 Slauson Avenue, Maywood, California.*

Please contact me if you have any questions or comments at 805-295-9071.

Regards,
T N & Associates, Inc.

Dacre Bush

Dacre Bush
Senior Remedial Specialist
dbush@tnainc.com

UNSCANNABLE MEDIA

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contact the Region 9 Regional Records Center – Superfund Division