Stratford Army Engine Plant
Restoration Advisory Board (RAB)
Meeting June 1, 2000

The Stratford Army Engine Plant (SAEP) which is proceeding with closure action under provisions of the Base Realignment and Closure Act (BRAC) of 1995 will hold a Restoration Advisory Board (RAB) on June 1, 2000 at 7p.m. in Room 22, Stratford Army Engine Plant. The meeting is open to the public. Parking is in the West Lot and entry through the main guard station.

Stratford Army Engine Plant
Restoration Advisory Board (RAB)
Meeting June 1, 2000

AGENDA

1. Welcome, opening remarks, introductions, announcements, old business.

2. Presentation of Engineering Evaluation/Cost Analysis [EE/CA] for Operable Unit 2 (Groundwater).

   Discussion of remedy alternatives.

3. Open forum, next meeting, adjourn. Aug 17

For additional information call the SAEP BRAC office (John Burleson) at 385-4316 or Jim Otto, RAB Community Co-Chairperson at Redacted - Privacy Act

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RAB MEETING – JUNE 1, 2000
SIGN-IN SHEET

Ken Feathers	CT DEP	
RICK NOERIS	SAEP LRA	381-2045
X Nelson Walter	Harding Lawson	207-775-5401
X GINA RUSTAD	Harding Lawson	207-775-5401
X STU PEARSON	" "	" " "
JIM OTTO	RAB	—
Phil Durgin	USACE	978-318-8507
John Burleson		
JIM MIHALEY	RAB	Redacted - Privacy Act
MICHAEL SUSCA	TRC	(860) 298-6234
Michelle Beach	USACE	978-318-8228
Megan Cassidy	EPA	
Marcia Stewart	RAB	
Stan Silverstein	RAB	
Elaine O'Keefe	RAB	
Jim Murphy	USEPA	617-918-1028
Fred Berger	Team Std	

Redacted - Privacy Act

Brad Robbins	Team Std	
Janet Calucci	RAB	
DEBBIE GALLO	SECRETARY	

STRATFORD ARMY ENGINE PLANT (SAEP)
RESTORATION ADVISORY BOARD (RAB)

MEETING MINUTES

June 1, 2000

The SAEP Restoration Advisory Board conducted a Regular Meeting on Thursday, June 1, 2000 at 7:00 pm in Room 22 of SAEP, 550 Main St., Stratford, CT, pursuant to notice duly given.

Call to Order: The meeting was called to order at 7:05 p.m.
Presiding: J. Otto and J. Burleson, Community Co-Chairmen
In Attendance: J. Carlucci, E. O'Keefe, S. Silverstein, M. Stewart, J. Mihaley, K. Feathers, R. Norris, N. Walter, G. Rustad, S. Pearson, P. Durgin, M. Susca, M. Brock, M. Cassidy, J. Murphy, Redacted - Privacy Act F. Berger, B. Robbins

1. Welcome, Opening Remarks, Introductions, Announcements, Old Business: J. Burleson welcomed Gina Rustad of Harding Lawson.

2. Presentation of Engineering Evaluation/Cost Analysis (EE/CA) for Operable Unit 2 (Groundwater):

- °OU2 Pilot Tests & Objectives
- °TCE Areas & Treatments
- °Hexavalent Chrome Area
- °Groundwater VOCs

Discussion and review of remedy alternatives.

3. Open Forum, Next Meeting: The next RAB meeting will be on Thursday, August 17, 2000.

4. Adjournment: There being no further business, the meeting adjounred at 9:15 p.m. on a Motion by M. Stewart and seconded by J. Mihaley.

Respectfully submitted,

Debbie Gallo

Debbie Gallo, Recording Secretary

NOTE: Informal discussion regarding meetings with RAB members other than the monthly formal presentations by specialists.

Operable Unit (OU) 2 Pilot Tests and Engineering Evaluation/Cost Analysis (EE/CA)

STRATFORD ARMY ENGINE PLANT

Foster Wheeler and
Harding Lawson Associates

June 1, 2000

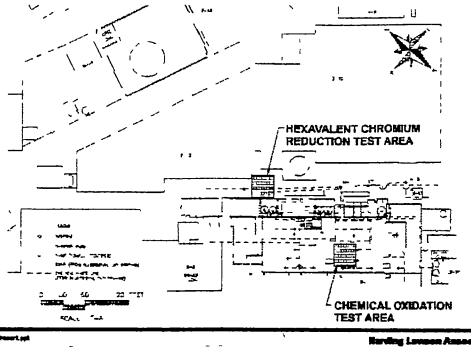
OU 2 - Pilot Tests

- Evaluation of remedial technology for hot-spot contamination near former Chromium Plating Facility
- Conducted in-situ Hexavalent Chromium and Trichloroethene tests from November 30 through December 11, 1999 and from January 19 to February 1, 2000
- Review Objectives

OU 2 - Pilot Tests

- Review System Setup/Installation
- Review Results

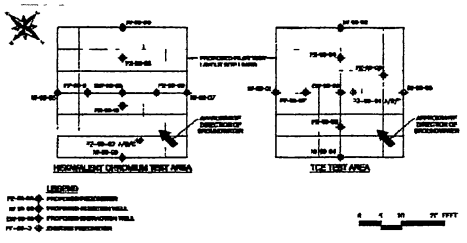
Locations of Pilot Tests



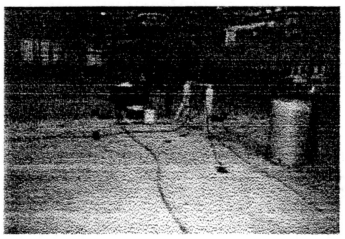
OU 2 - Pilot Test Objectives

- **Hexavalent Chromium (Cr^{6+}) Area**
  - In-situ reduction of Cr^{6+} to Cr^{3+} by addition of ferrous sulfate
  - Mass reduction of source area
  - Attempt to achieve CTDEP RSR (SWPC) of less than 0.11 mg/L Cr^{6+}
- **Trichloroethene (TCE) Area**
  - In-situ oxidation of TCE to end products (CO_2, Cl^-, H_2O) by potassium permanganate
  - Mass reduction of source area
  - Attempt to achieve CTDEP RSR (SWPC) of less than 2.34 mg/L TCE

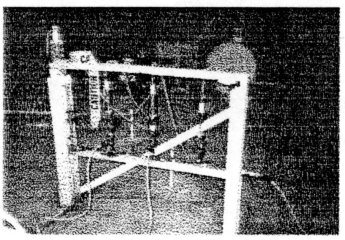
Pilot Test Layouts



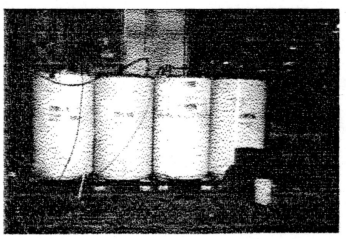
TCE Treatment Area



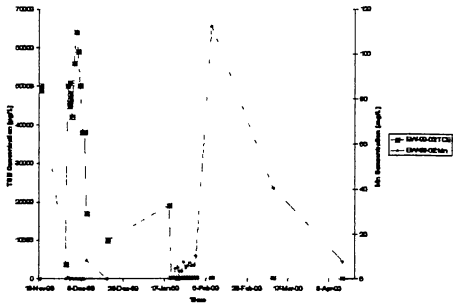
Ferrous Sulfate Injection Manifold



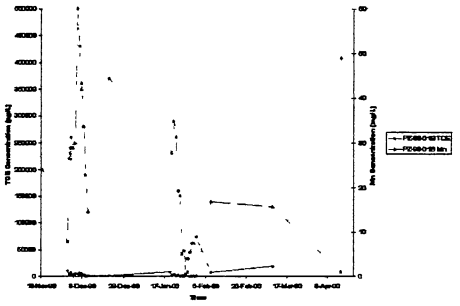
Carbon Treatment Units



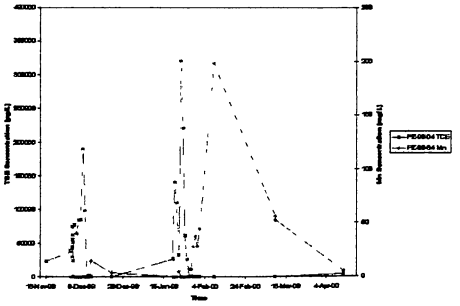
TCE Area - EW-99-02



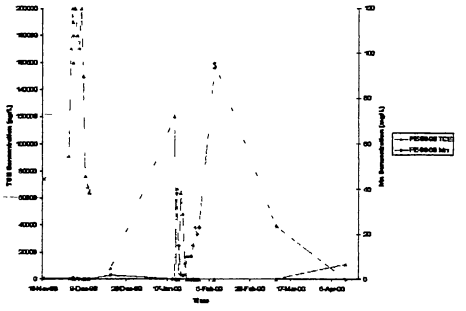
TCE Area - PZ-99-01B



TCE Area - PZ-99-04



TCE Area - PZ-99-05



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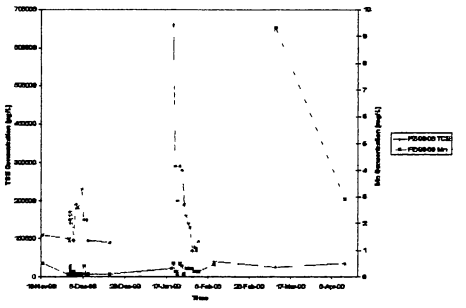
TCE Area - PZ-99-06



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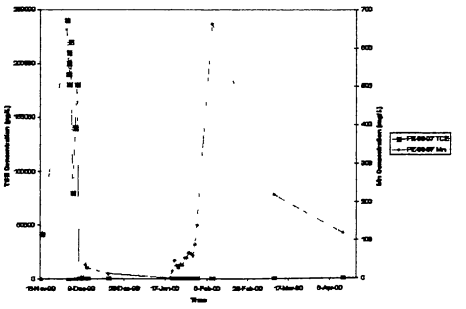
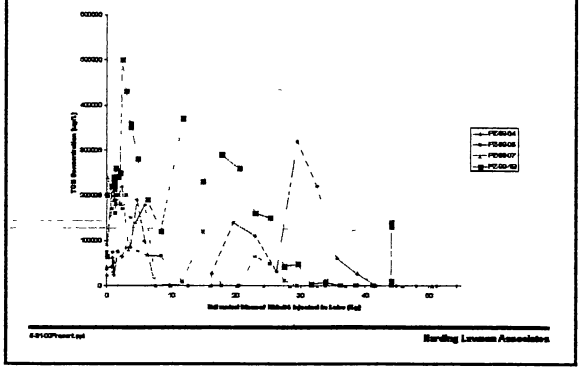
TCE Area - PZ-99-07

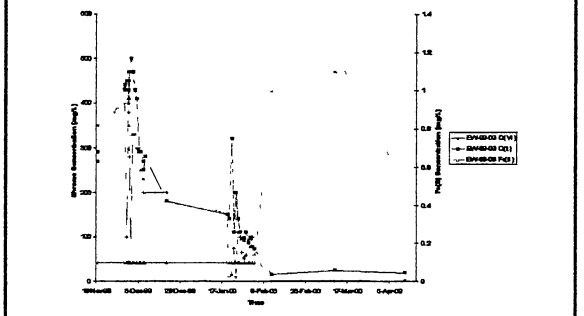


Harding Lawson Associates

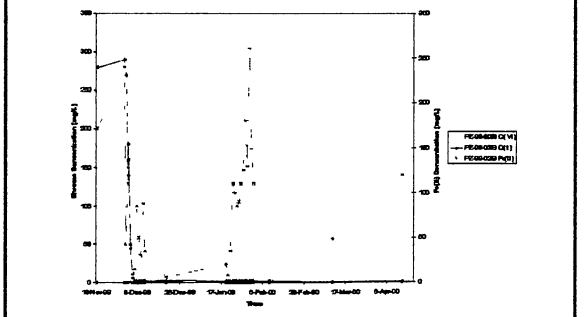
TCE Area - Effect of KMn04 Dose



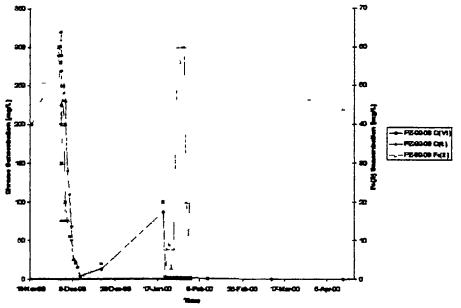
Hexavalent Chrome Area - EW-99-03



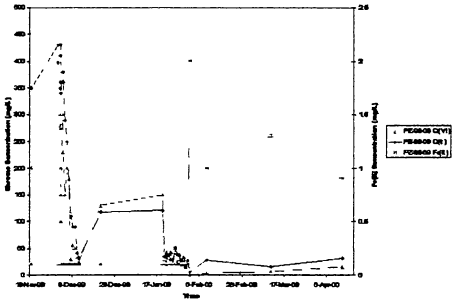
Hexavalent Chrome Area - PZ-99-02B



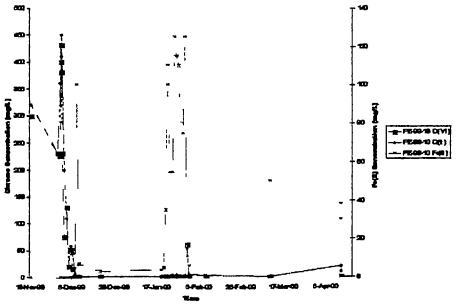
Hexavalent Chrome Area - PZ-99-08



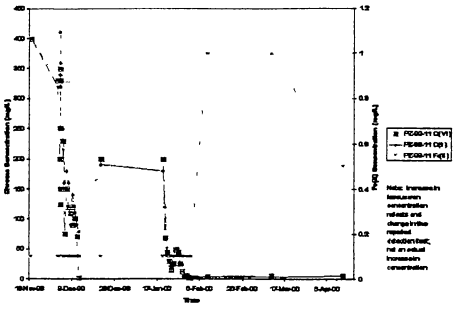
Hexavalent Chrome Area - PZ-99-09



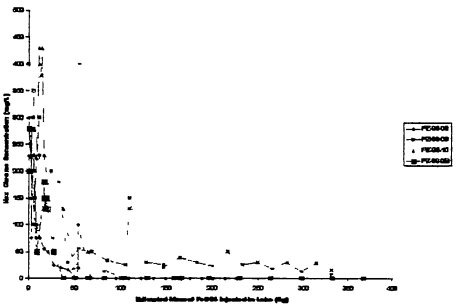
Hexavalent Chrome Area - PZ-99-10



Hexavalent Chrome Area - PZ-99-11



Chrome Area - Effect of FeSO4 Dose



Pilot Test - Summary of Results

- Reduction of Cr^{6+} and TCE in groundwater demonstrated
- Effective treatment achieved in piezometers at conclusion of test
- Heterogeneous aquifer properties affect distribution of reagents
- Time required to treat the pilot test area is longer than predicted

Pilot Test - Summary of Results *(continued)*

- Rebounding concentrations have been observed, but still orders of magnitude below initial concentrations
- Rebound sampling to be conducted through July 2000

OU 2 Engineering Evaluation/Cost Analysis (EE/CA)

- Documents the process for development and evaluation of potential removal actions
- Considers short-term removal actions to minimize or eliminate site risk
- Deals with the removal of risk, not necessarily contamination

Relationship to the Feasibility Study (FS)

- FS considers remedial actions rather than removal actions
- Remedial actions are long-term, permanent actions to minimize or eliminate site risk
- Removal actions in this EE/CA are consistent with potential long-term remedial actions

OU 2 EE/CA Process

- Summarize site background and previous investigations
- Identify the objectives and scope of the removal actions
- Identify possible ARARs
- Develop potential removal action alternatives
- Perform an evaluation of the alternatives using the general criteria of effectiveness, implementability, and cost
- Recommend a preferred removal action alternative

OU 2 EE/CA

- Purpose:
  - To identify removal action objectives and develop and evaluate removal action alternatives to meet the objectives
  - To promote early reuse of facilities by expediting environmental cleanup (BRAC)
- Scope:
  - Identify removal action objectives
  - Develop and evaluate removal action alternatives
  - Propose a removal action remedy

OU 2 EE/CA

- The EE/CA was prepared in accordance with the:
  - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
  - National Oil and Hazardous Substances Pollution Contingency Plan (NCP)
  - USEPA Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA (August 1993)
  - Base Realignment and Closure Cleanup Plan Guidebook (Fall 1993)

OU 2 EE/CA

- **The OU 2 EE/CA addresses:**
  - **Chromium-contaminated interior structures in the former Chromium Plating Facility**
  - **Hexavalent chromium-contaminated groundwater**
  - **Volatile organic compound (VOC)-contaminated groundwater hot-spots**

Chromium-contaminated Structures

- **Removal Action Objective:**
  - Protect potential receptors from exposure to high concentrations of hexavalent chromium on structures
- **Extent of Contamination:**
  - Northwestern wall
  - Concrete floor (throughout facility)
  - Overhead beams in northern portion of facility

Hexavalent Chromium in Groundwater

- **Removal Action Objective:**
  - Prevent high concentrations of hexavalent chromium from potentially migrating to surface water and impacting receptors
- **Extent of Contamination:**
  - Defined as the area of detectable hexavalent chromium (>0.1 mg/L)
  - A smaller area (10,400 square feet) below the southern end of the facility
  - A larger area (40,000 square feet) north of the facility
  - Vertical extent generally less than 35 feet below ground surface

VOCs in Groundwater

- **Removal Action Objectives:**
  - Prevent the migration of VOC-contaminated vapors from groundwater hot-spots to the interior of on-site buildings
  - Prevent high concentrations of VOCs in shallow groundwater from potentially migrating to surface water and impacting receptors
- **Extent of VOC Hot-spot Contamination:**
  - TCE greater than 100,000 micrograms per liter
  - 1,1-DCE greater than 5,000 micrograms per liter
  - 1,1,1-TCA greater than 100,000 micrograms per liter

VOCs in Groundwater (continued)

- **Extent of VOC Hot-spot Contamination (continued)**
  - **VOC Hot-spot No. 1** is located beneath the former Chromium Plating Facility and contains primarily TCE contamination
  - **VOC Hot-spot No. 2** is located between Buildings B-16 and B-48 and contains primarily TCE contamination
  - **VOC Hot-spot No. 3** is located in the center of Building B-2 and contains primarily 1,1-DCE and 1,1,1-TCA contamination
  - Considering contamination less than 60 feet below the groundwater table

Applicable or Relevant and Appropriate Requirements (ARARs)

- **Chemical-specific (partial listing)**
  - **CTDEP RSR criteria**
- **Location-specific (partial listing)**
  - **Floodplain management**
  - **Coastal zone management**
- **Action-specific (partial listing)**
  - **Air Emissions**
  - **Clean Water Act**
  - **Underground Injection Regulations**
  - **Hazardous Waste Management**

Groundwater Technology Screening

- Developed a list of potential technologies considering literature information, vendor information, and past technology perfomance
- Screened the technologies with respect to site- and waste-limiting characteristics
- Resulting list of technologies can be used alone or in combination to create removal action alternatives

Chromium Structures Alternatives

- CR-S-1: Removal and Off-site Disposal of Floor and Wall/Decontamination of Beams
- CR-S-2: Removal and Off-site Disposal of Wall/Impermeable Cover on Floor/Decontamination of Beams

Alternative CR-S-1

- Components include:
  - Complete a structural analysis
  - Remove contaminated wall
  - Remove contaminated floor
  - Place impermeable vapor barrier
  - Pour a new concrete floor
  - Re-wash, sandblast, and/or paint overhead beams, as necessary
  - Re-wash entire facility
  - Implementation of an Environmental Land Use Restriction (ELUR)

Alternative CR-S-2

- Components include:
  - Complete a structural analysis
  - Remove contaminated wall
  - Re-wash, sandblast, and paint overhead beams, as necessary
  - Re-wash entire facility
  - Place impermeable vapor barrier
  - Pour a new concrete floor
  - Implementation of an ELUR

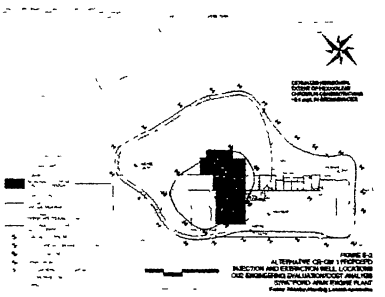
Hexavalent Chromium Groundwater Alternatives

- CR-GW-1: In-situ Reduction using Ferrous Sulfate
- CR-GW-2: Groundwater Monitoring

Alternative CR-GW-1

- Injection of a ferrous sulfate solution into the subsurface to convert hexavalent chromium to the less toxic trivalent form
- Components include:
  - Installation of a ferrous sulfate injection system
  - Installation of a groundwater extraction system
  - Pressure testing of the chemical waste pipeline
  - Construction of an organics treatment system
  - Operation and maintenance of the treatment system
  - Groundwater sampling and analysis
  - Implementation of an ELUR

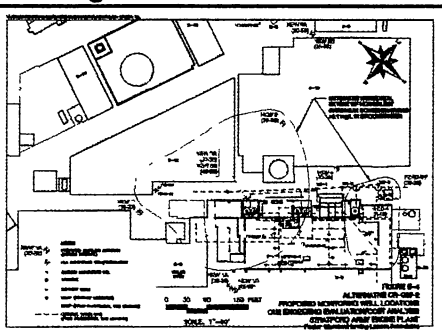
Alternative CR-GW-1 - In-situ Reduction Layout



Alternative CR-GW-2

- Monitoring of chromium concentrations to evaluate if contamination is migrating or converting to the trivalent form
- Components include:
  - Installation of groundwater monitoring wells
  - Groundwater sampling and analysis
  - Implementation of an ELUR

Alternative CR-GW-2 - Groundwater Monitoring



VOC Hot-spot Groundwater Alternatives

- Alternative VOC-1: In-situ SVE and Groundwater Monitoring
- Alternative VOC-2: In-situ Chemical Oxidation using Potassium Permanganate, In-situ Air Sparging, In-situ SVE, and Groundwater Monitoring
- Alternative VOC-3: In-situ Thermal Treatment, In-situ SVE, and Groundwater Monitoring

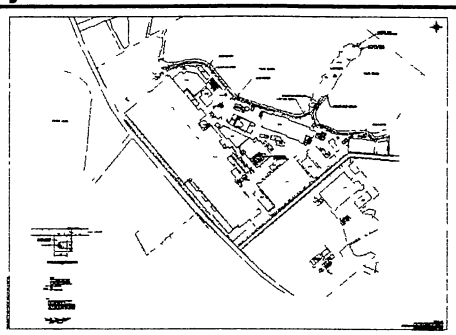
Alternative VOC-1

- SVE system: collects VOC-contaminated vapors from the subsurface and transports them to a surface treatment system
- Groundwater Monitoring: evaluates if VOC contamination is migrating or if natural attenuation is occurring

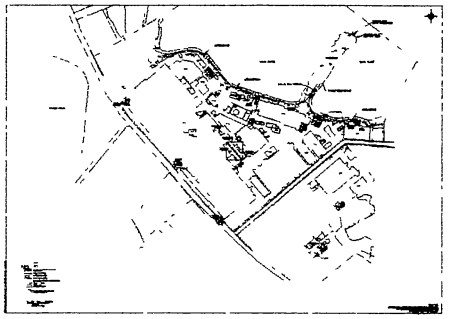
Alternative VOC-1 (continued)

- Components include:
  - Installation of a 20-acre SVE system
  - Operation and maintenance of the SVE system
  - Installation of groundwater monitoring wells
  - Groundwater sampling and analysis
  - Implementation of an ELUR

Alternative VOC-1 - Soil Vapor Extraction Layout



Alternative VOC-1 - Groundwater Monitoring



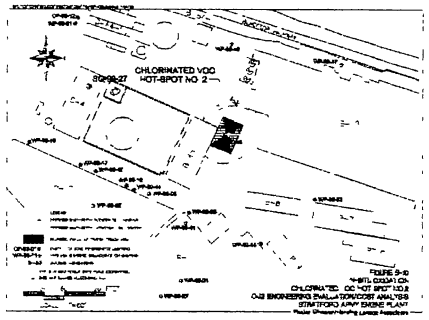
Alternative VOC-2

- **Chemical Oxidation:** Injection of a potassium permaganate solution into the subsurface to convert TCE to less toxic compounds
- **Air Sparging:** Injection of air into the subsurface to physically strip 1,1,1-TCA and 1,1-DCE from groundwater and transport them to a subsurface vapor collection system
- **Soil Vapor Extraction and Groundwater Monitoring:** same as for Alternative VOC-1

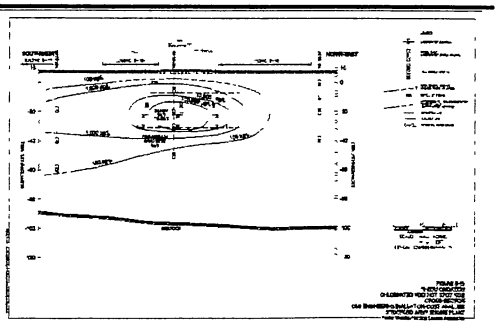
Alternative VOC-2 (continued)

- **Components include:**
  - Installation of a potassium permanagante injection system
  - Installation of a groundwater extraction system
  - Pressure testing of the chemical waste pipeline
  - Construction of an organics treatment system
  - Construction of an in-situ air sparging system
  - Construction of a 20-acre SVE system
  - Operation and maintenance of the treatment systems
  - Installation of groundwater monitoring wells
  - Groundwater sampling and analysis
  - Implementation of an ELUR

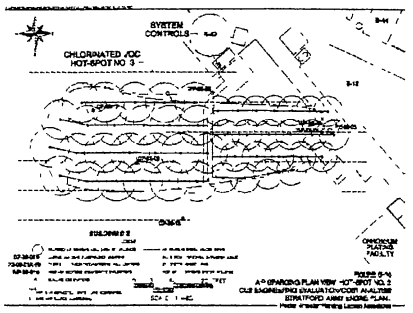
Alternative VOC-2 - In-situ Chemical Oxidation Layout



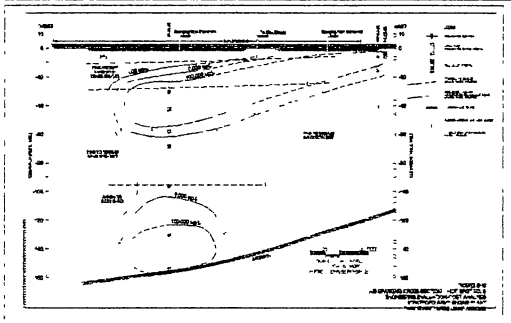
Alternative VOC-2 - In-situ Chemical Oxidation Cross Section



Alternative VOC-2 - Air Sparging Layout



Alternative VOC-2 - Air Sparging Cross Section



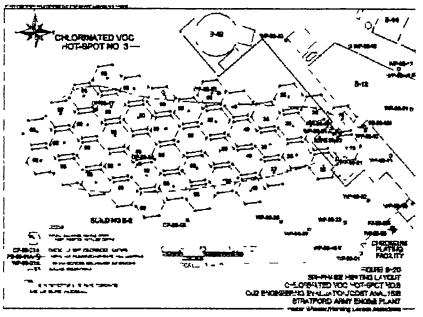
Alternative VOC-3

- **Six-phase Heating:** Electrical heating of the subsurface volatilizes contaminants and causes them to rise to a subsurface vapor collection system
- **Dynamic Underground Stripping:** Injection of steam into the subsurface volatilizes contaminants and causes them to rise to a subsurface vapor collection system
- **Soil Vapor Extraction and Groundwater Monitoring:** same as for Alternative VOC-1

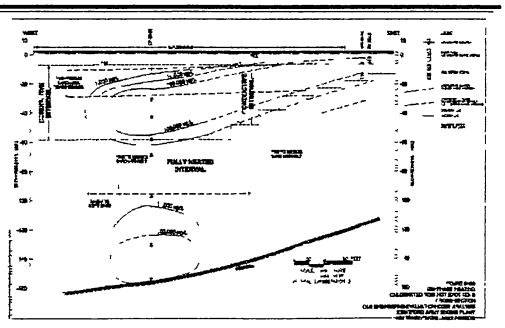
Alternative VOC-3 (continued)

- **Components include:**
  - Construction of the thermal treatment systems
  - Construction of a 20-acre SVE system
  - Operation and maintenance of the treatment systems
  - Installation of groundwater monitoring wells
  - Groundwater sampling and analysis
  - Implementation of an ELUR

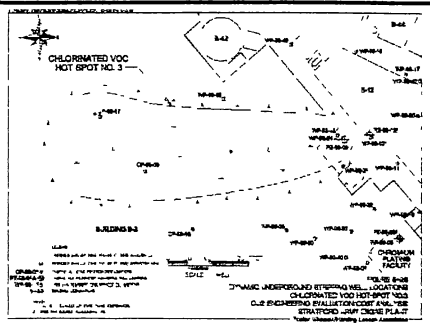
Alternative VOC-3 - Six-phase Heating Layout



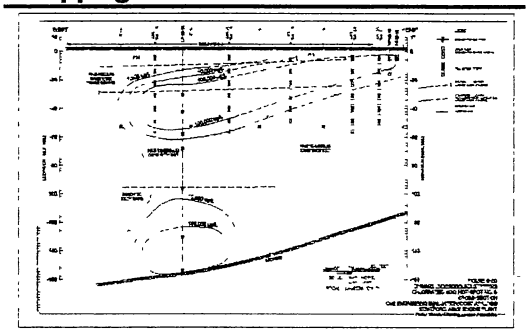
Alternative VOC-3 - Six-phase Heating Cross Section



Alternative VOC-3 - Dynamic Underground Stripping Layout



Alternative VOC-3 - Dynamic Underground Stripping Cross Section



Evaluation of Removal Action Alternatives

- **Evaluation is based on specific criteria set forth in the NCP and USEPA guidance on preparing EE/CAs**
- **Evaluation criteria are:**
  - Effectiveness
  - Implementability
  - Cost

Effectiveness Evaluation

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness

Implementability Evaluation

- Technical feasibility
- Administrative feasibility
- Availability of services and materials
- State acceptance
- Community acceptance

Cost Evaluation

- Capital cost (direct and indirect costs): for the construction of an alternative and the first two years of operation
- Operation and maintenance cost: for the lifetime operation of the alternative up to 30 years, if necessary

Comparative Analysis

- Compares the alternatives to one another relative to the evaluation criteria
- Identifies the advantages and disadvantages of the alternatives relative to one another
- Aids in the selection of a recommended removal action alternative
- Completed separately for each contaminant type

Comparative Analysis of Alternatives - Chromium Structures

Nine Criteria	Wall Removal/ Beam Decontamination/Floor Removal and Replacement	Wall Removal/ Beam Decontamination/ New Floor Over Old
Protects human health and environment	⊕	⊕
Meets Federal and State requirements	⊕	○
Provides long-term protection	⊕	⊕
Reduces mobility, toxicity or volume through treatment	⊖	⊖
Provides short-term protection	⊕	⊕
Can be implemented	⊕	⊕
Cost	Capital: $772,000 O&M: $47,000	Capital: $888,000 O&M: $47,000
State Agency Acceptance	To be determined after the public comment period	
Community Acceptance	To be determined after the public comment period.	

⊖ Does not meet criteria ⊕ Meets or exceeds criteria ○ Partially meets criteria

Comparative Analysis of Alternatives - Chromium Groundwater

Nine Criteria	In-situ Reduction	Groundwater Monitoring
Protects human health and environment	⊕	⊕
Meets Federal and State requirements	⊕	○
Provides long-term protection	⊕	○
Reduces mobility, toxicity or volume through treatment	⊕	⊖
Provides short-term protection	⊕	⊕
Can be implemented	⊕	⊕
Cost	Capital: $3.65 M O&M: $310,000	Capital: $409,000 O&M: $457,000
State Agency Acceptance	To be determined after the public comment period.	
Community Acceptance	To be determined after the public comment period.	

⊖ Does not meet criteria ⊕ Meets or exceeds criteria ○ Partially meets criteria

Comparative Analysis of Alternatives - VOC Groundwater

Nine Criteria	SVE and Groundwater Monitoring	Oxidation/Air Sparging/ SVE/Groundwater Monitoring	Thermal Treatment/ SVE/ Groundwater Monitoring
Protects human health and environment	⊛	⊛	⊛
Meets Federal and State requirements	○	○	⊛
Provides long-term protection	⊛	⊛	⊛
Reduces mobility, toxicity or volume through treatment	○	○	⊛
Provides short-term protection	⊛	⊛	⊛
Can be implemented	⊛	⊛	⊛
Cost	Capital: $620,000 O&M: $420,000	Capital: $771,000 O&M: $2,530,000	Capital: $2,620,000-$3,710,000 O&M: $20,000-$40,000
State Agency Acceptance	To be determined after the public comment period.		
Community Acceptance	To be determined after the public comment period.		

⊖ Does not meet criteria ⊛ Meets or exceeds criteria ○ Partially meets criteria

Chromium Structures Recommended Alternative

- **Alternative CR-S-1**
  - Is protective of human health and the environment
  - Complies with ARARs
  - Provides long-term effectiveness
  - Provides short-term effectiveness to site workers and the community
  - Is easily implemented
  - Is cost-effective

Chromium Groundwater Recommended Alternative

- **Alternative CR-GW-1**
  - Is protective of human health and the environment
  - Complies with ARARs
  - Provides long-term effectiveness
  - Reduces mobility, toxicity, and volume through treatment
  - Provides short-term effectiveness
  - Is easily implemented
  - Is cost-effective

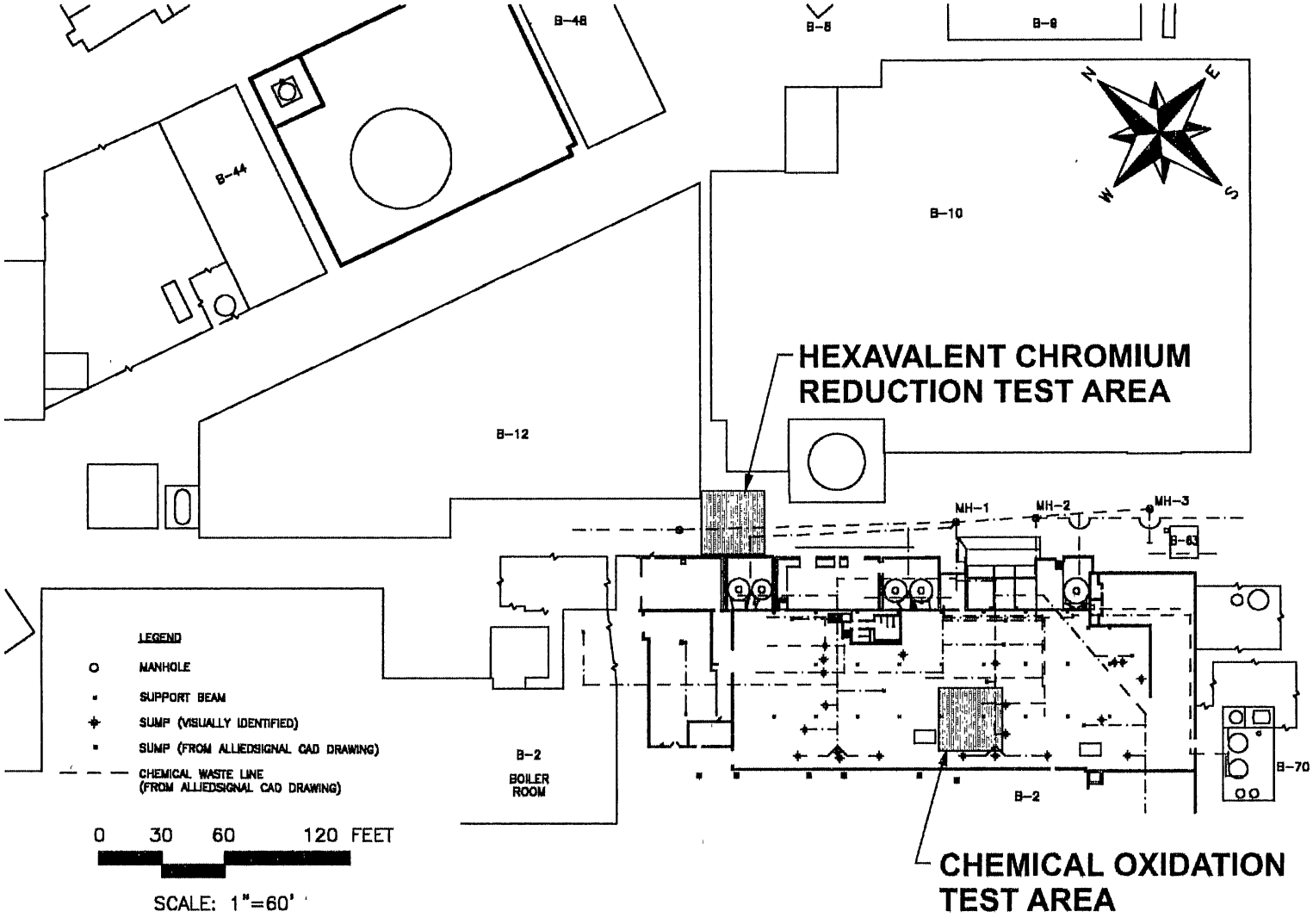
VOC Hot-spot Groundwater Recommended Alternative

- Discussions regarding the recommended alternative for VOC-contaminated groundwater are being conducted

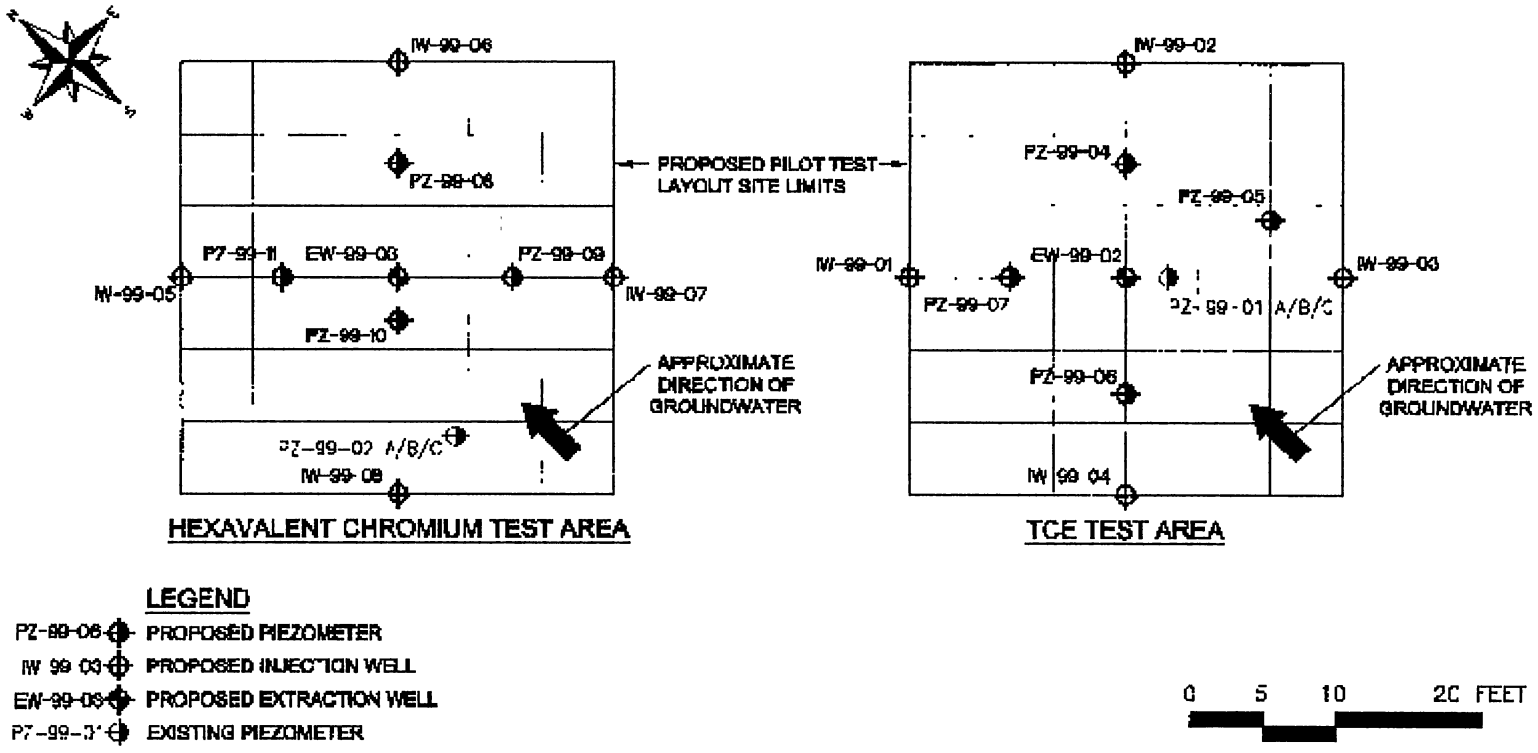
OU 2 EE/CA Schedule

- Submit Draft EE/CA for regulatory agency review (June 2000)
- Submit Final EE/CA for Public Comment Period (August 2000)
- Submit Removal Action Memorandum (October 2000)

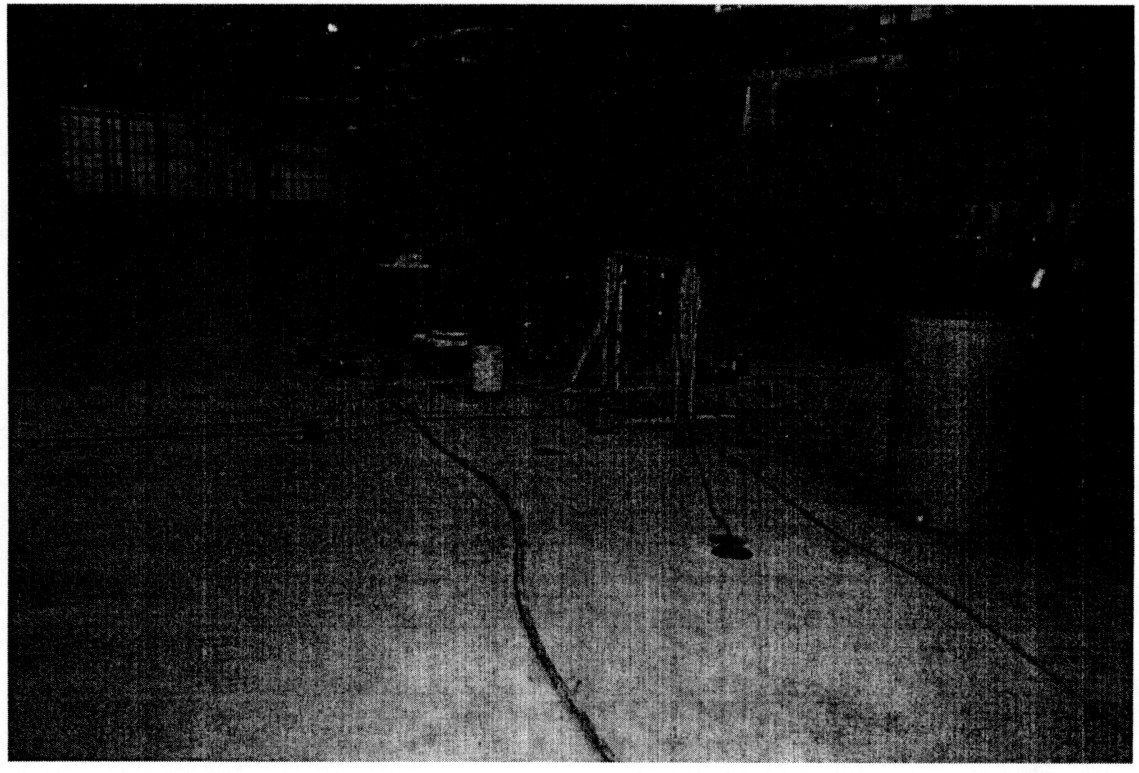
Locations of Pilot Tests



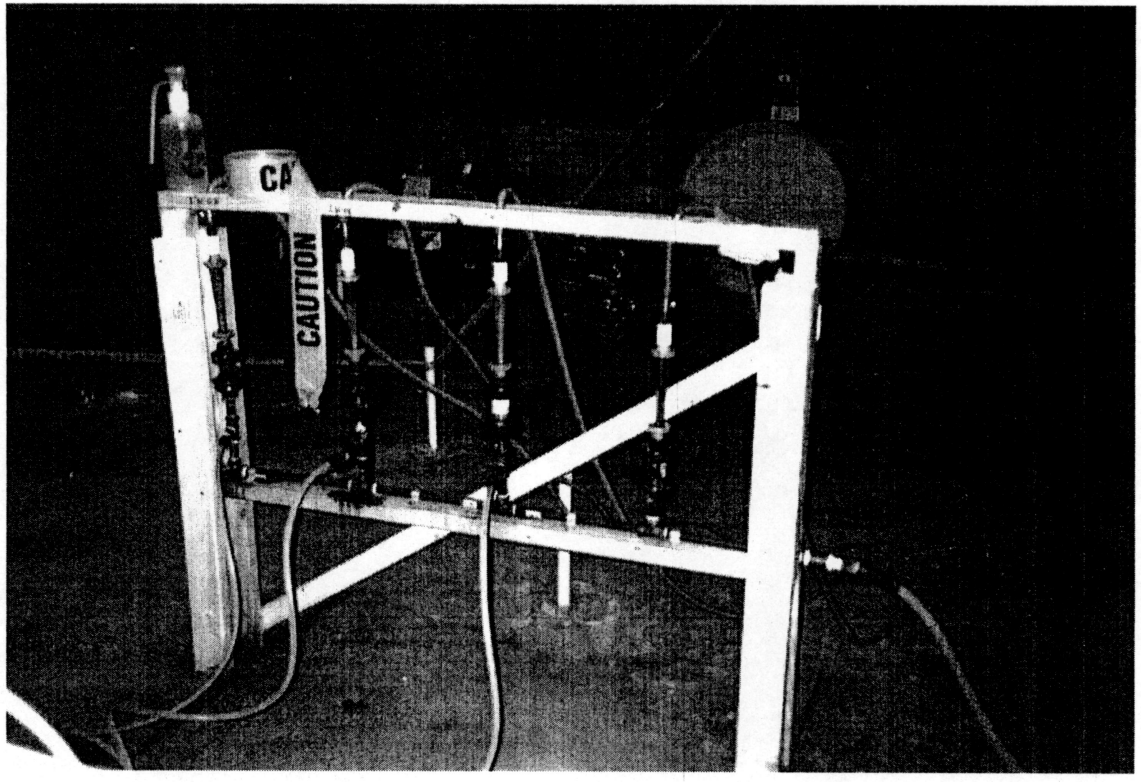
Pilot Test Layouts



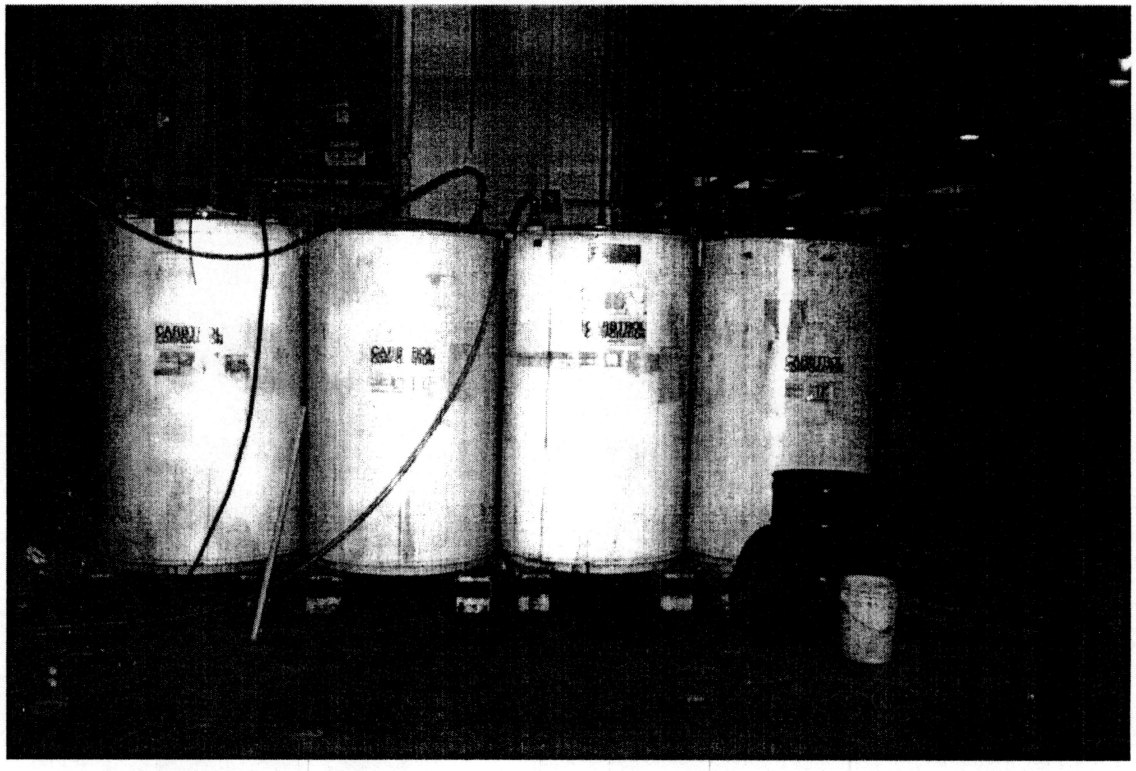
TCE Treatment Area



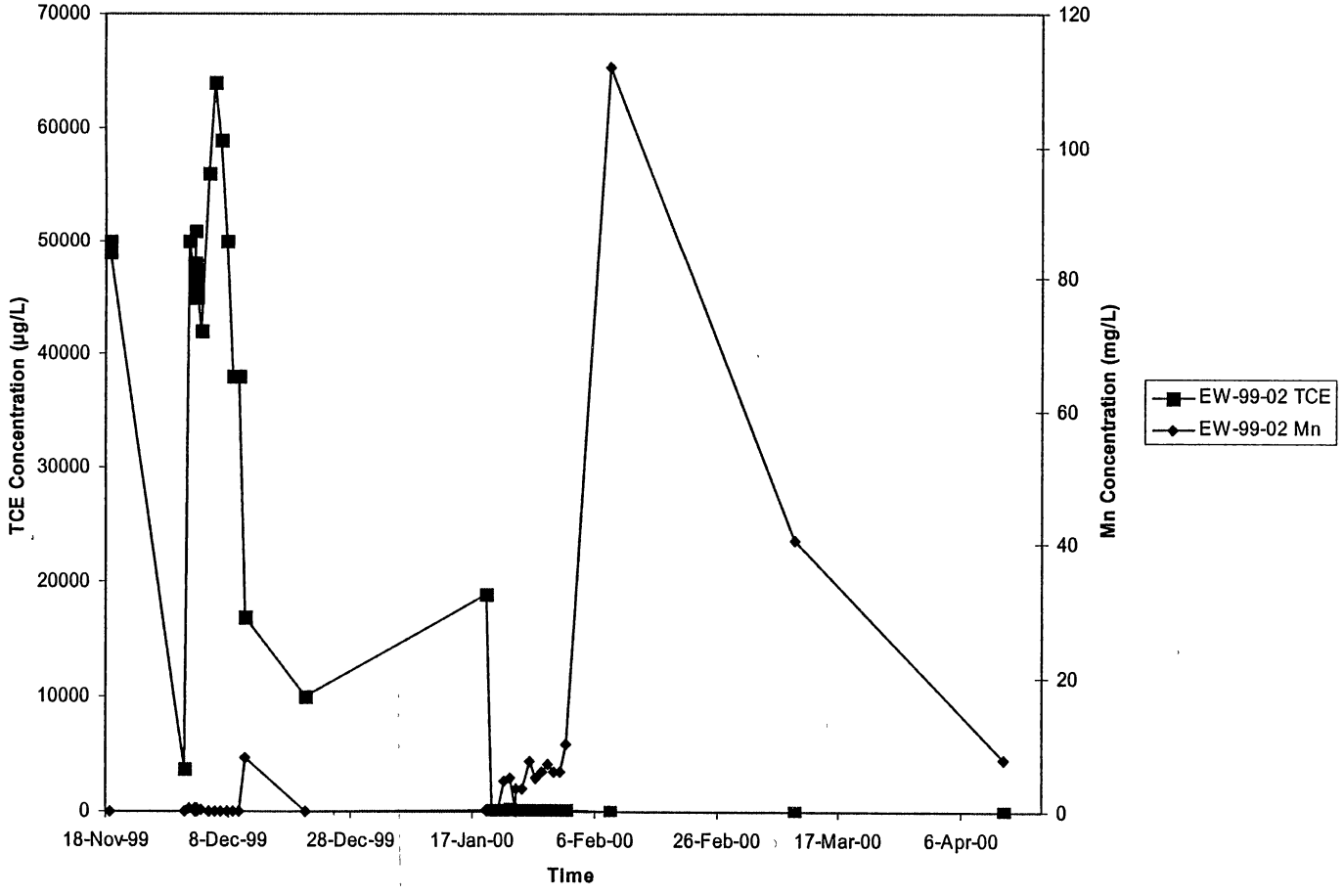
Ferrous Sulfate Injection Manifold



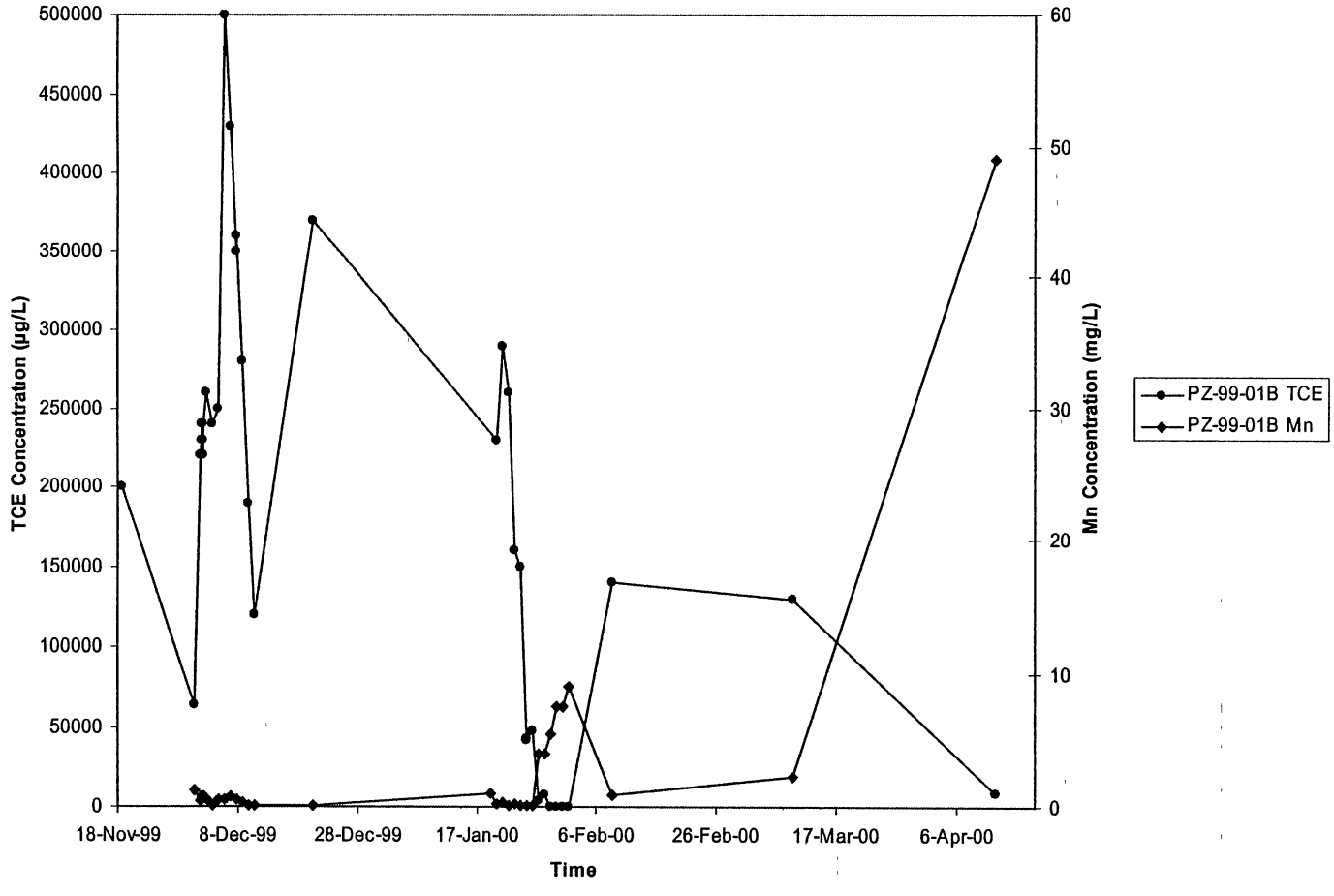
Carbon Treatment Units



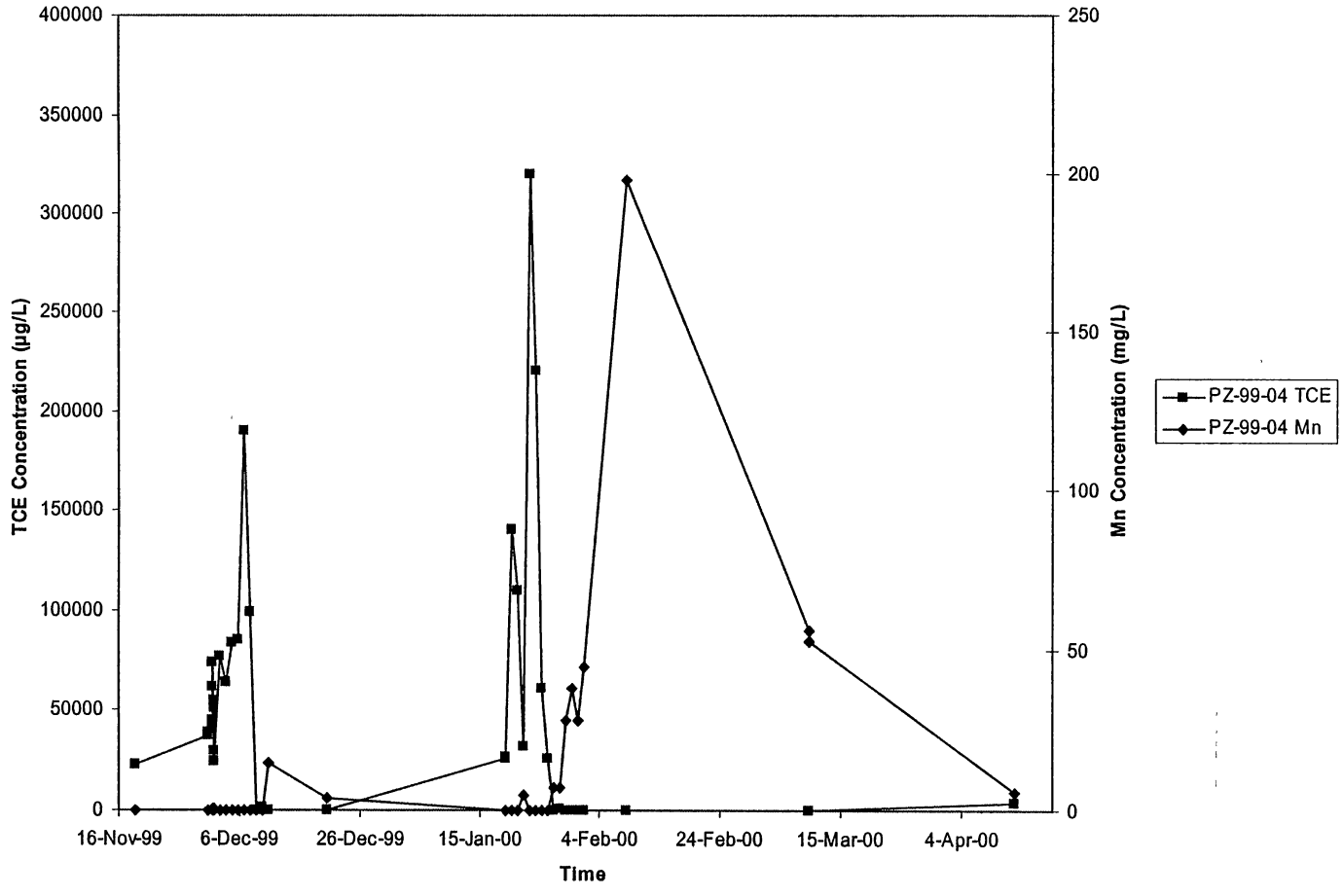
TCE Area - EW-99-02



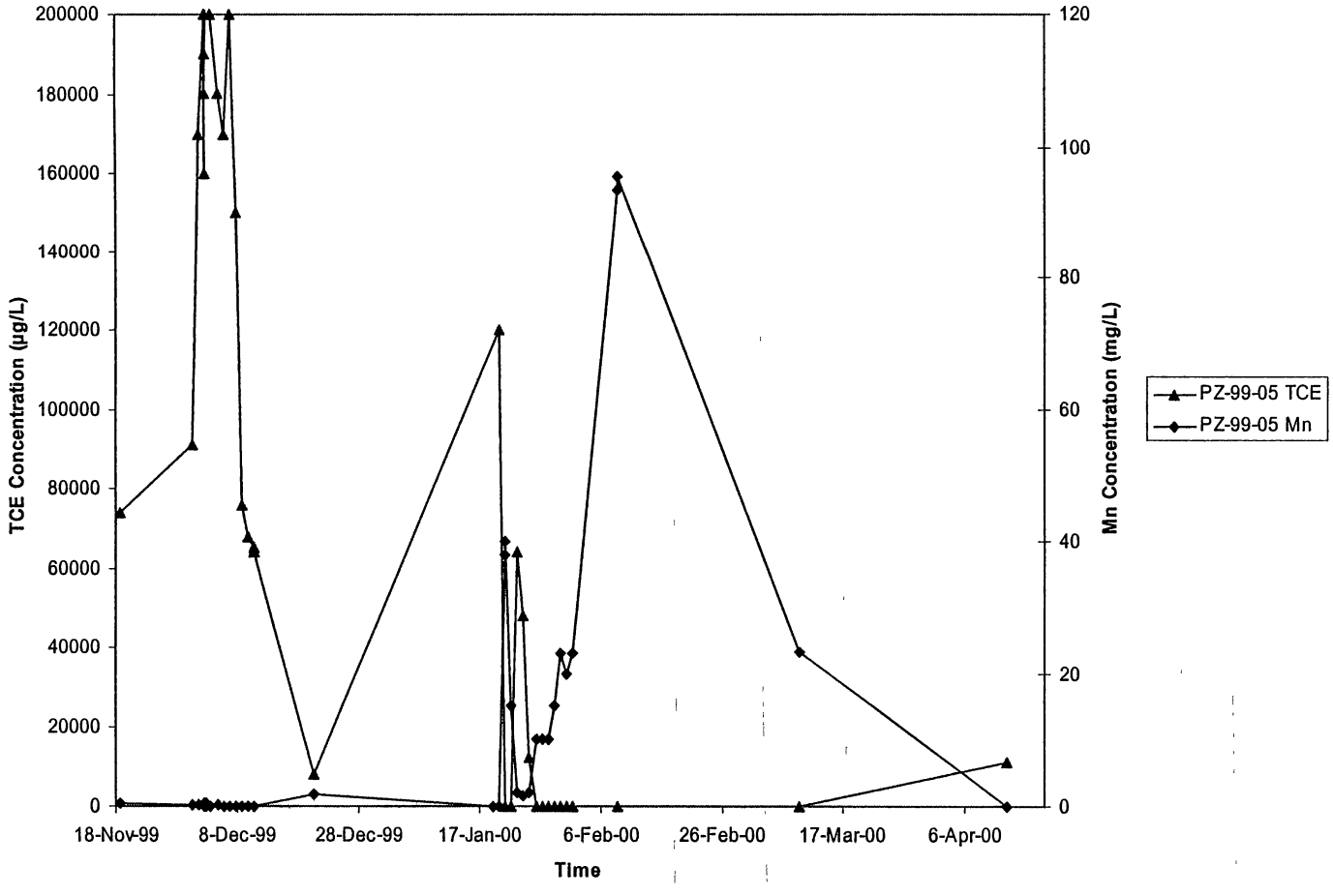
TCE Area - PZ-99-01B



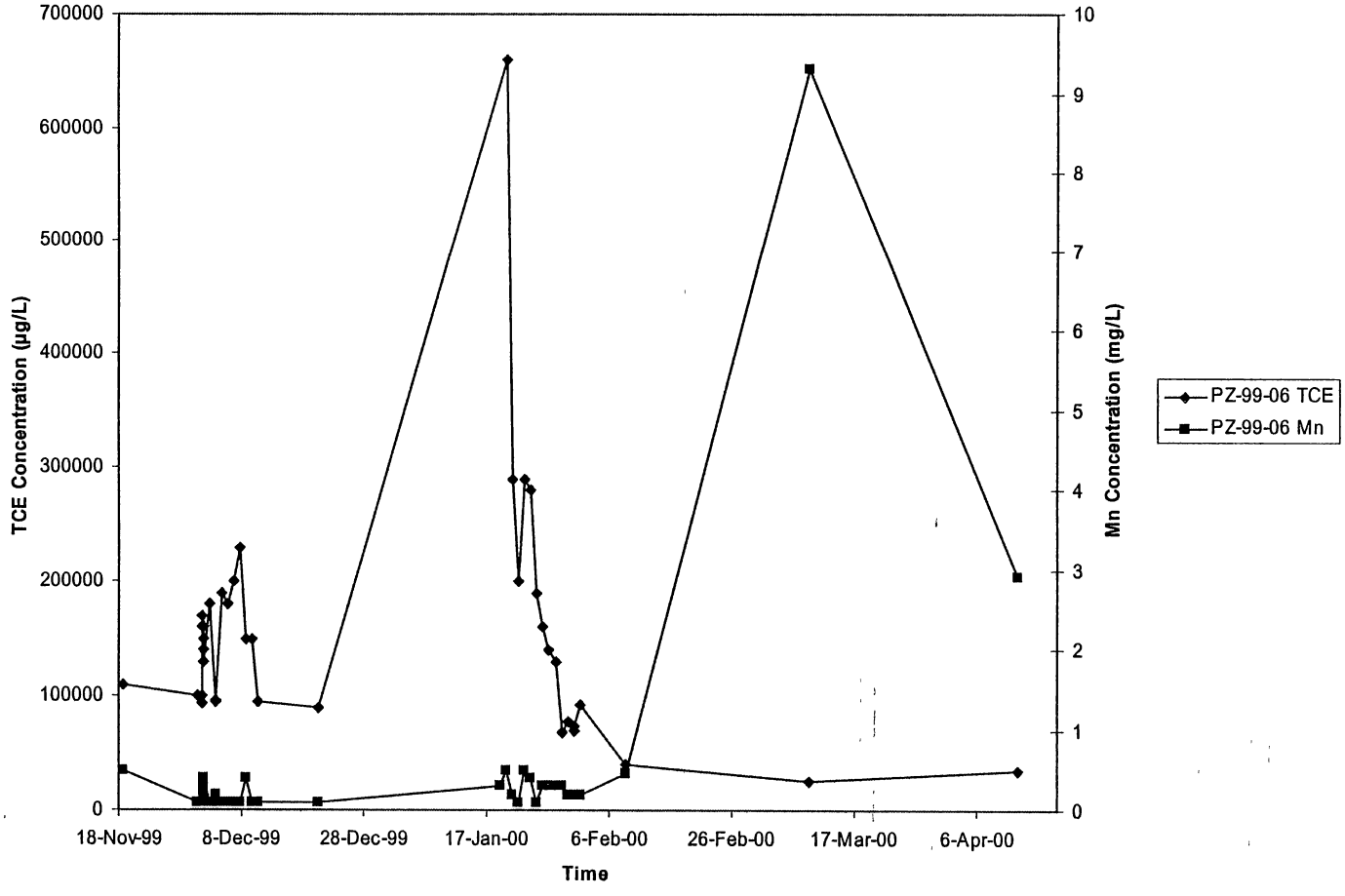
TCE Area - PZ-99-04



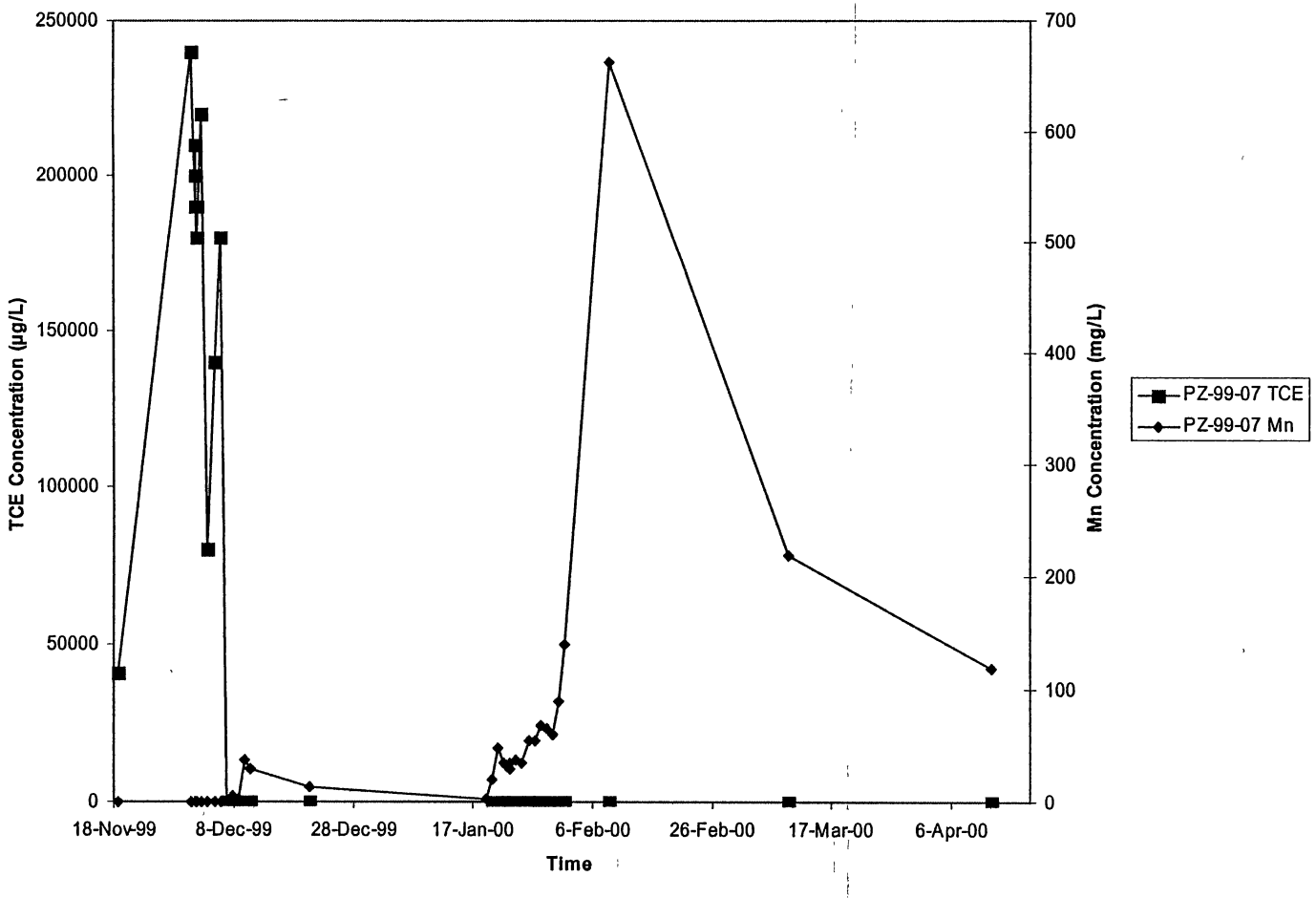
TCE Area - PZ-99-05



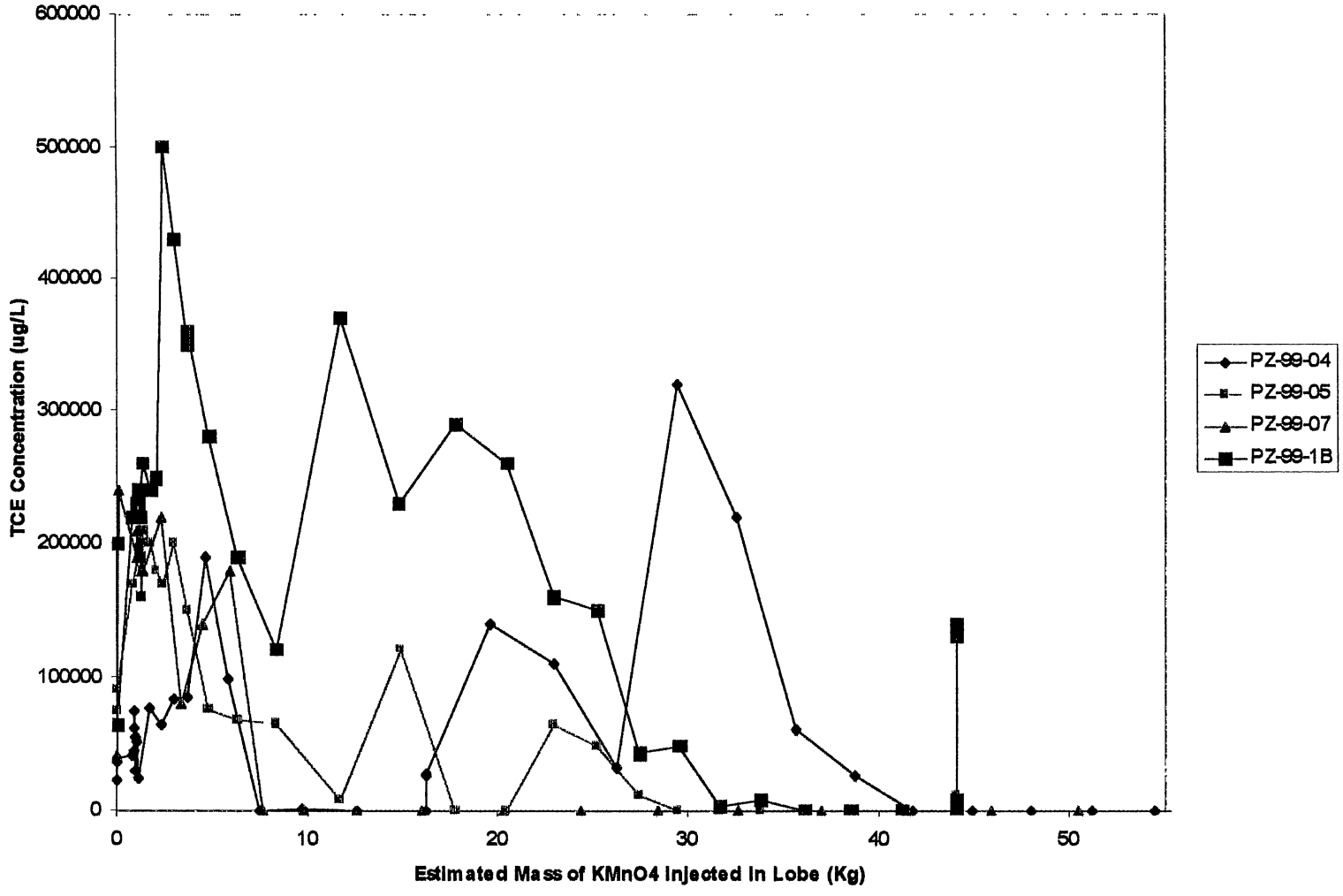
TCE Area - PZ-99-06



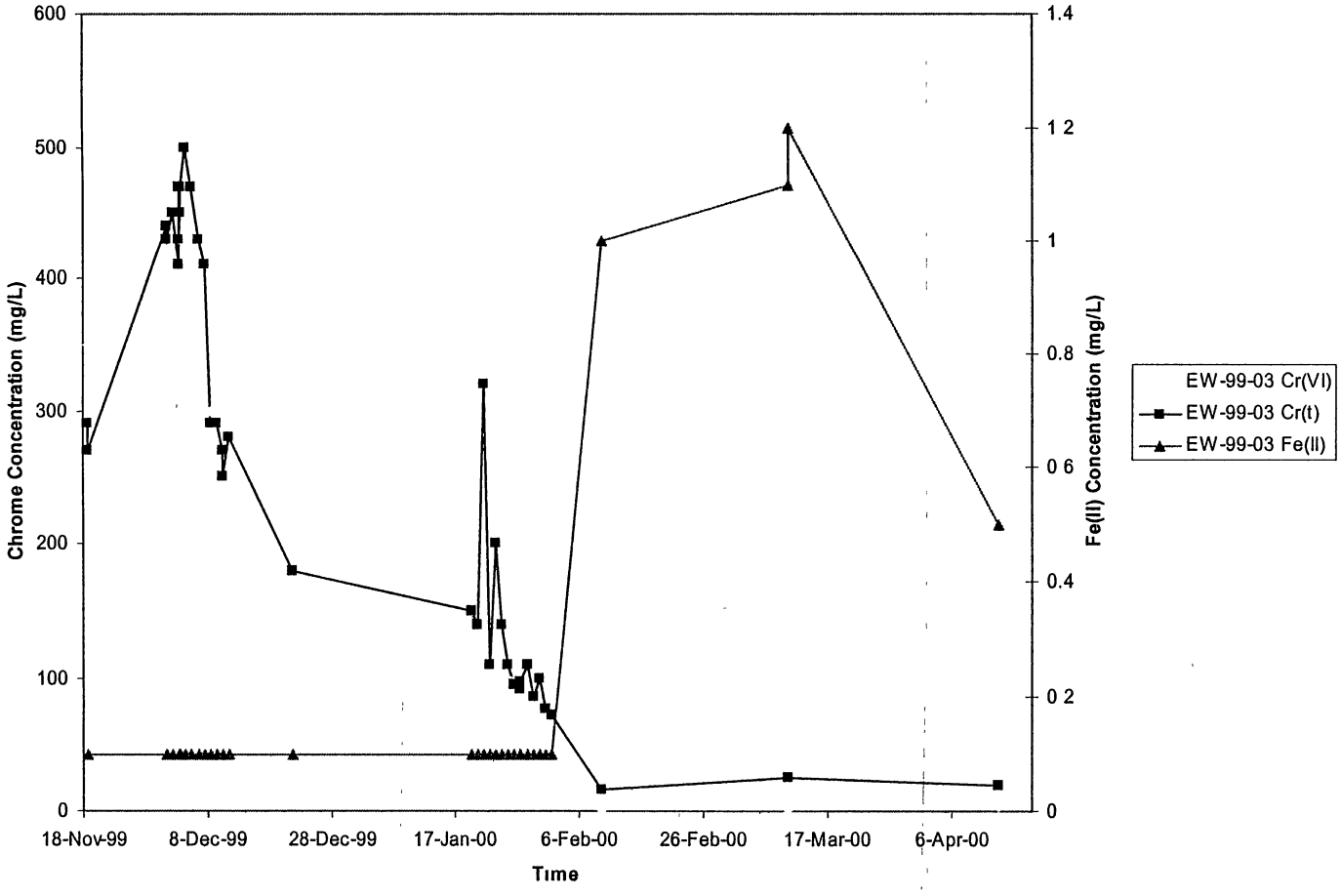
TCE Area - PZ-99-07



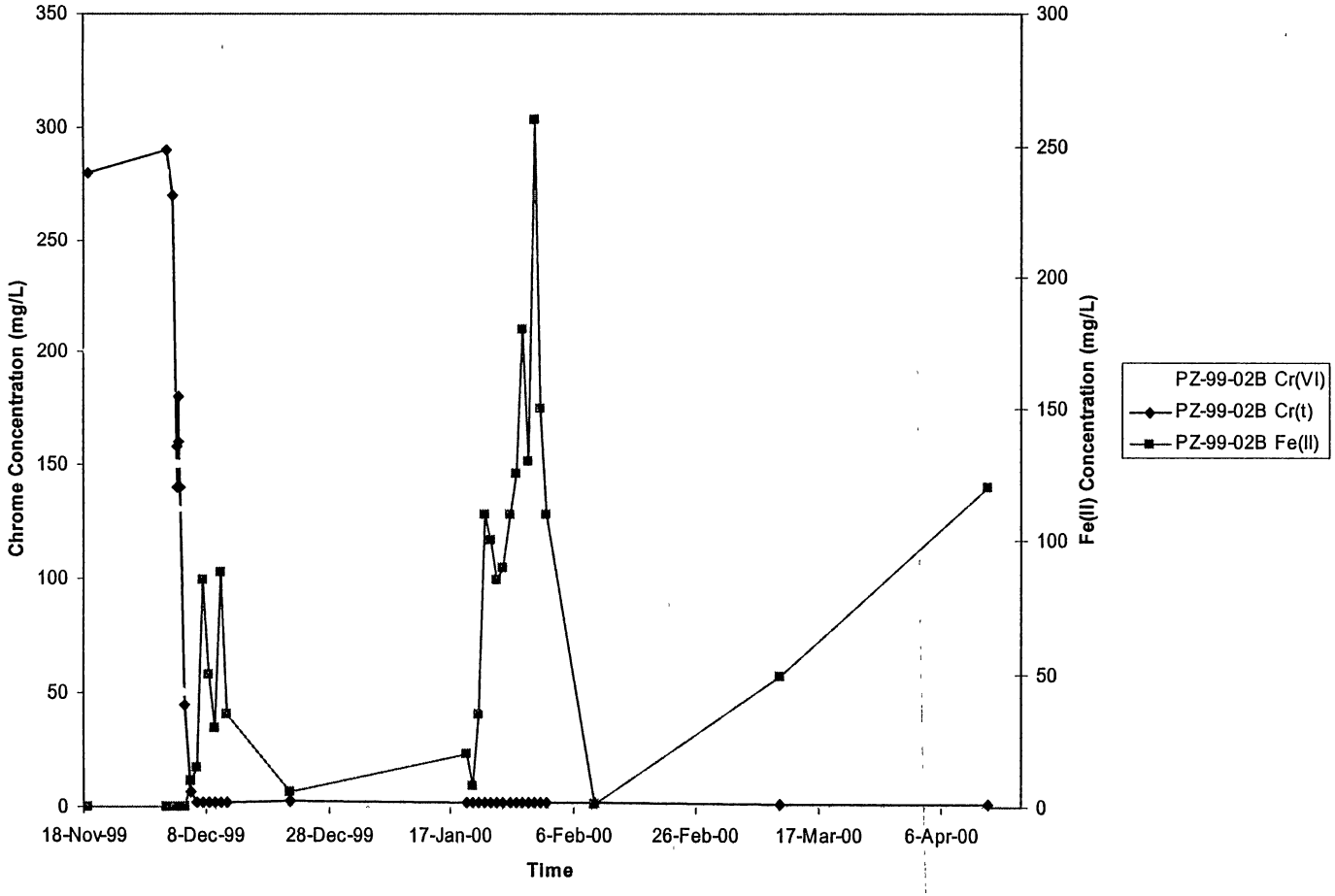
TCE Area - Effect of KMn04 Dose



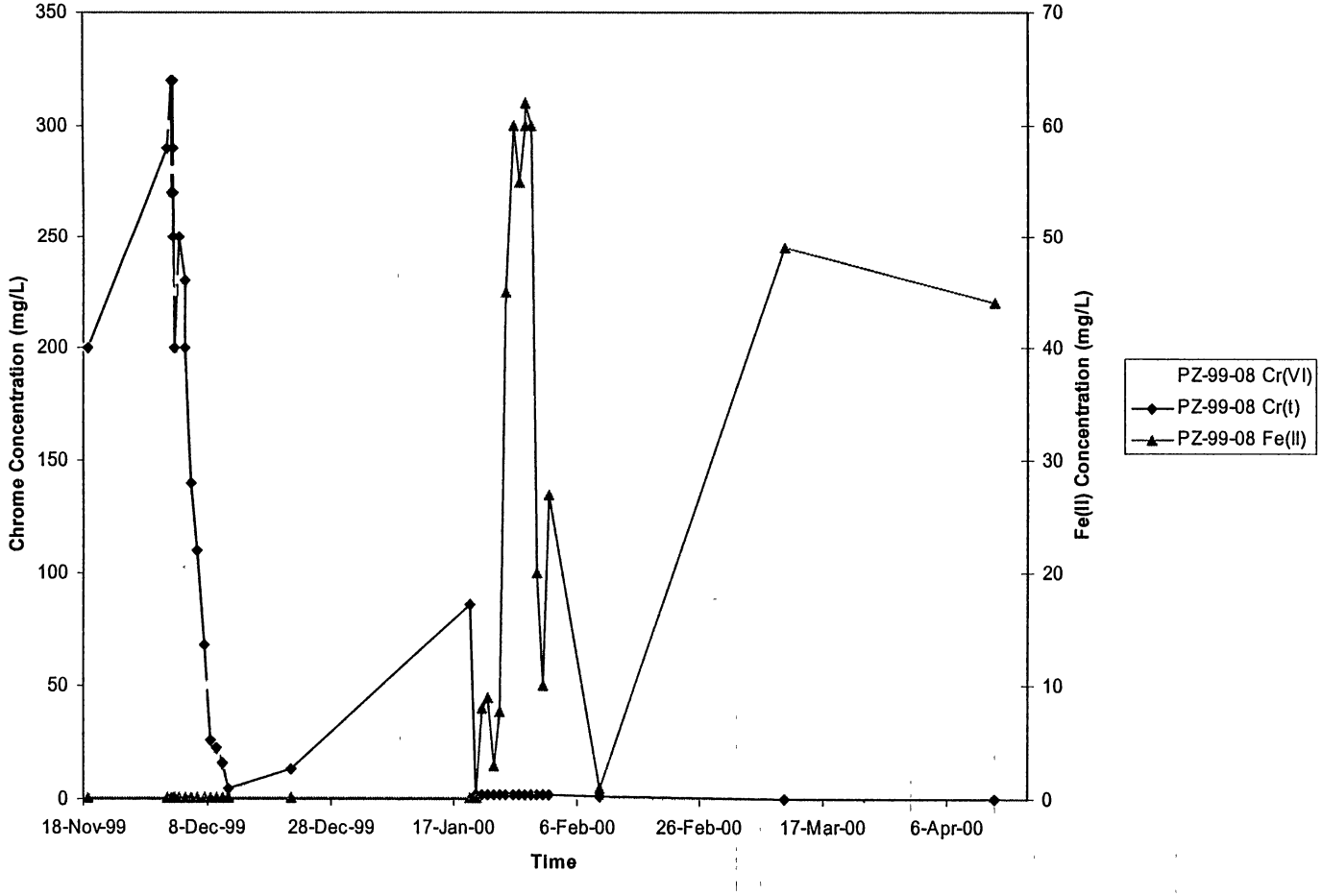
Hexavalent Chrome Area - EW-99-03



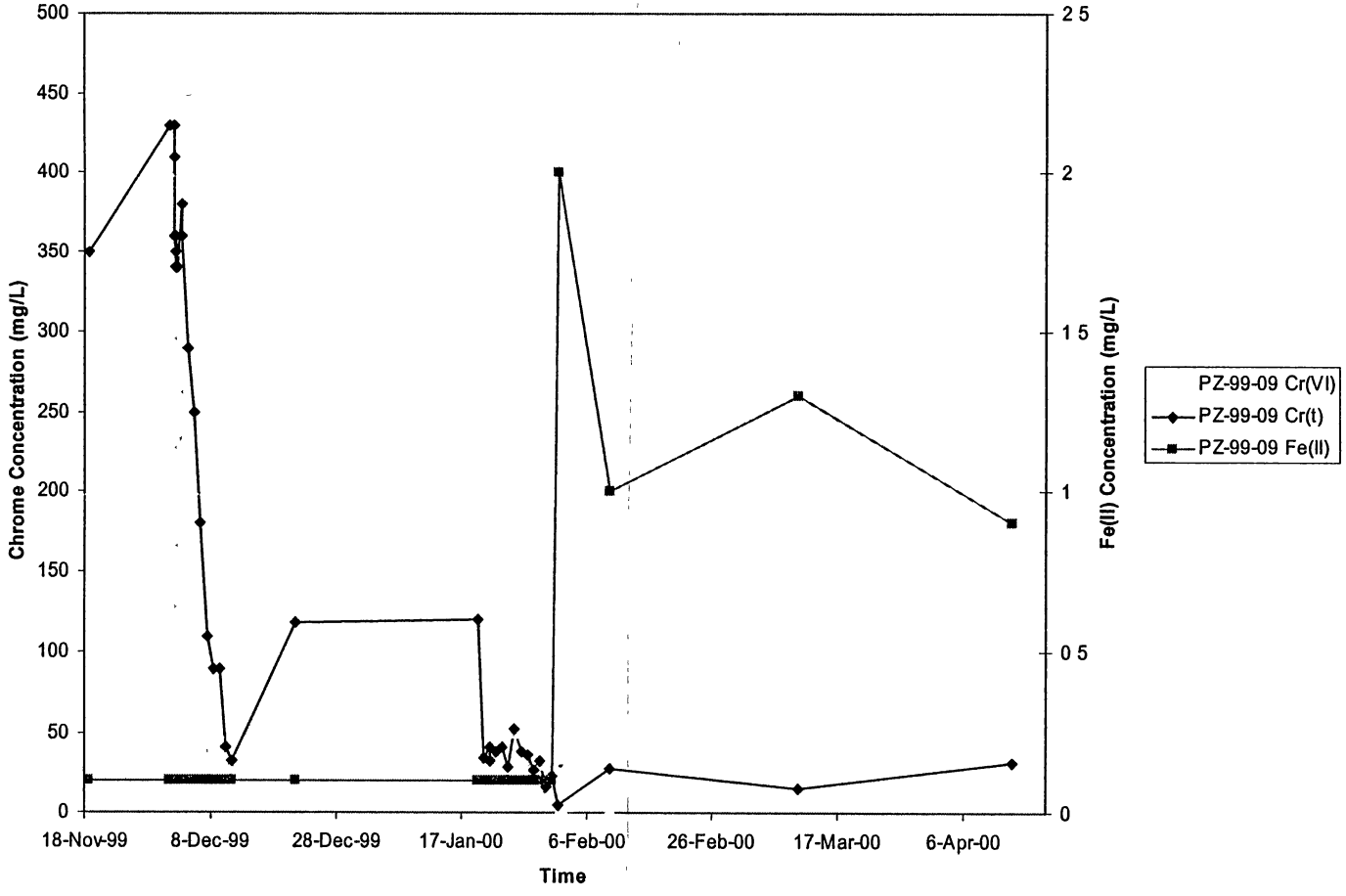
Hexavalent Chrome Area - PZ-99-02B



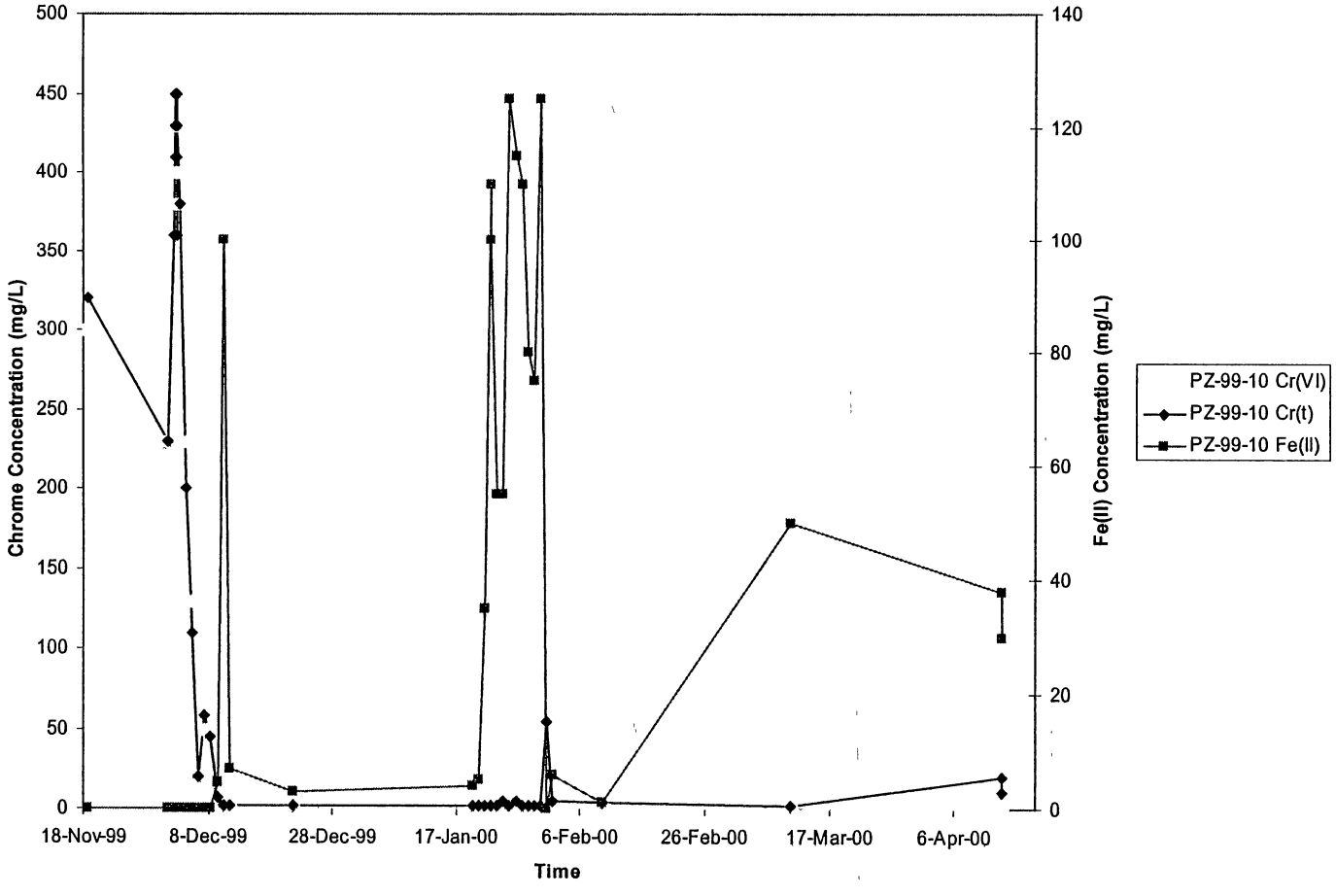
Hexavalent Chrome Area - PZ-99-08



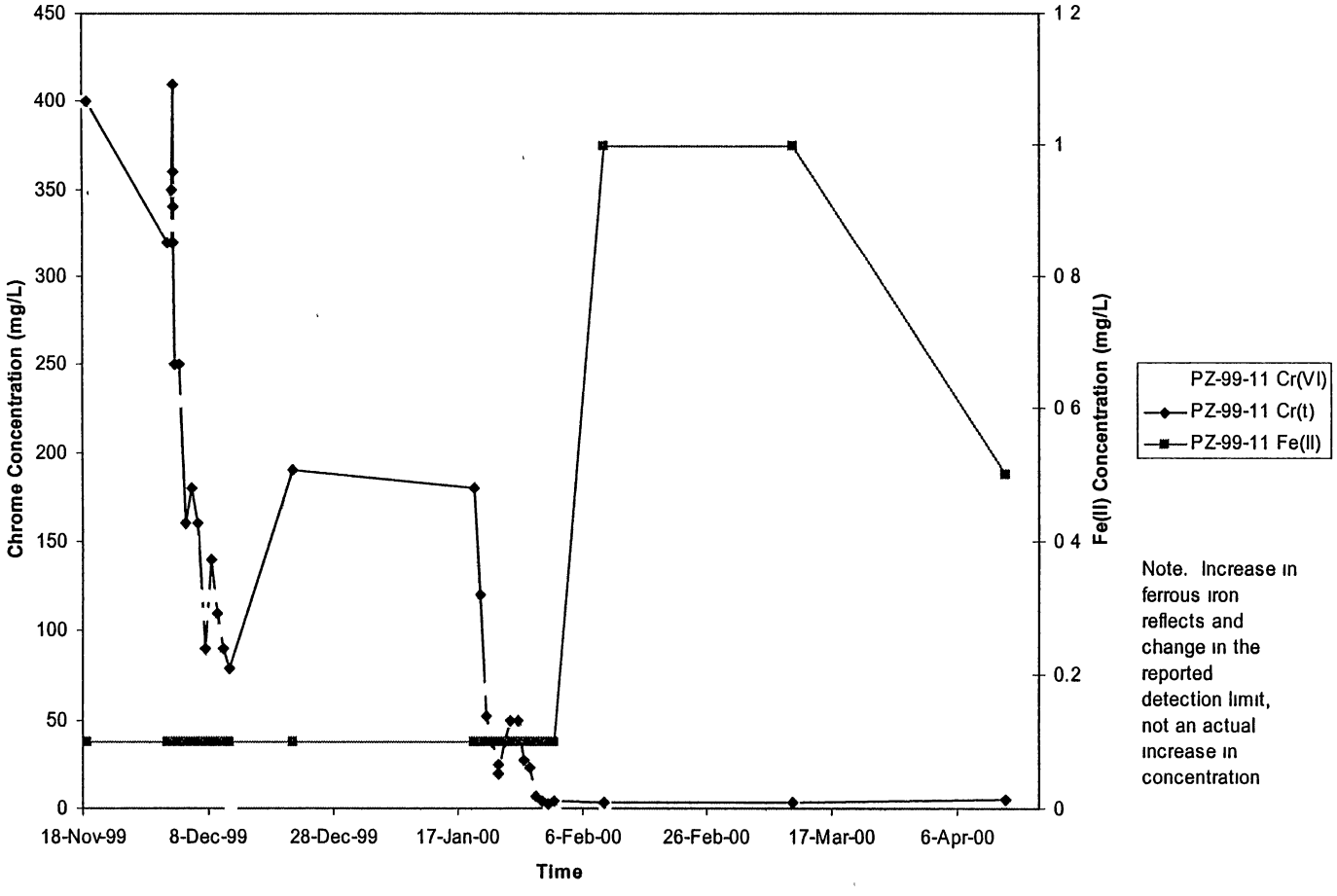
Hexavalent Chrome Area - PZ-99-09



Hexavalent Chrome Area - PZ-99-10

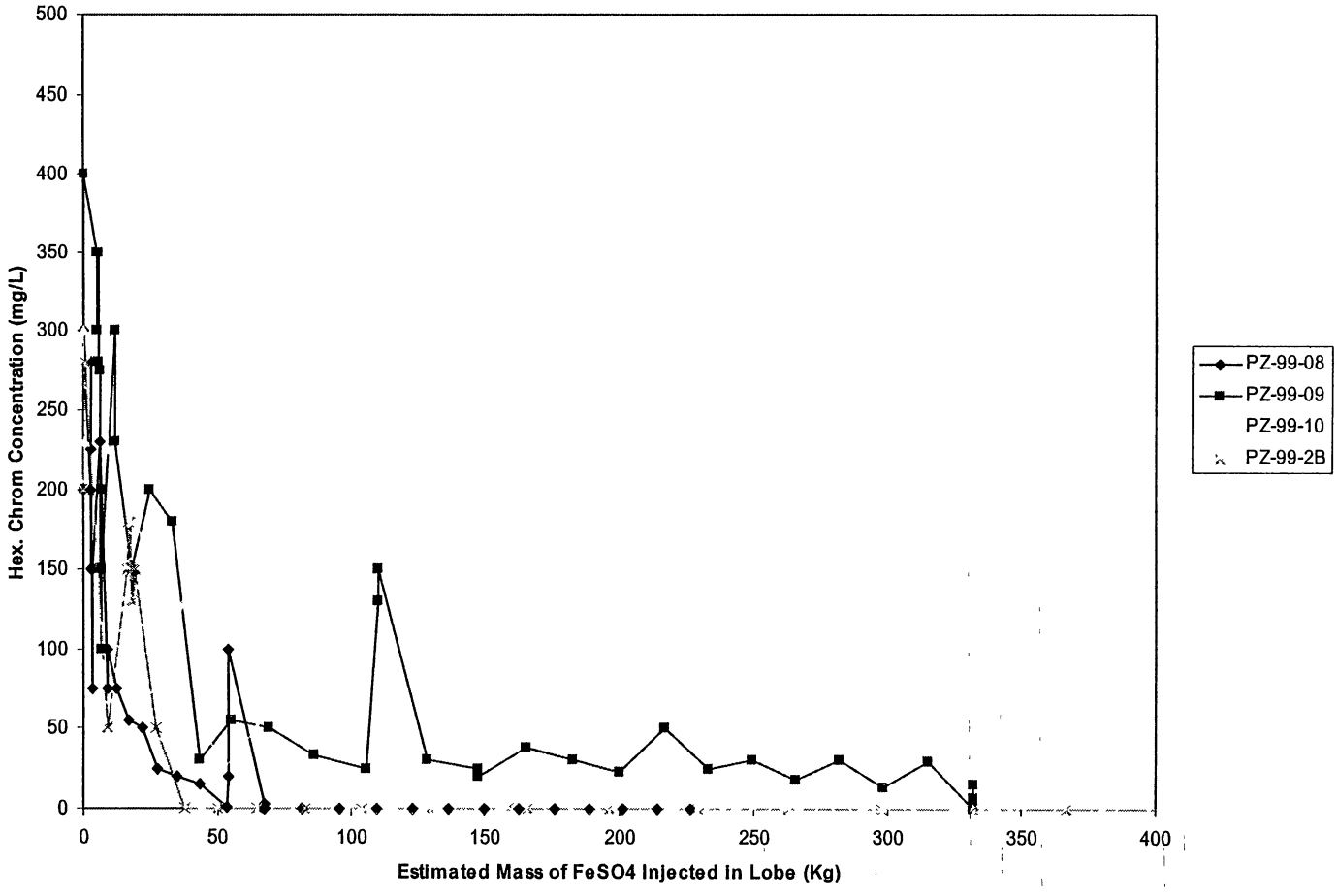


Hexavalent Chrome Area - PZ-99-11



Note. Increase in ferrous iron reflects and change in the reported detection limit, not an actual increase in concentration

Chrome Area - Effect of FeSO4 Dose



Alternative CR-GW-1 - In-situ Reduction Layout

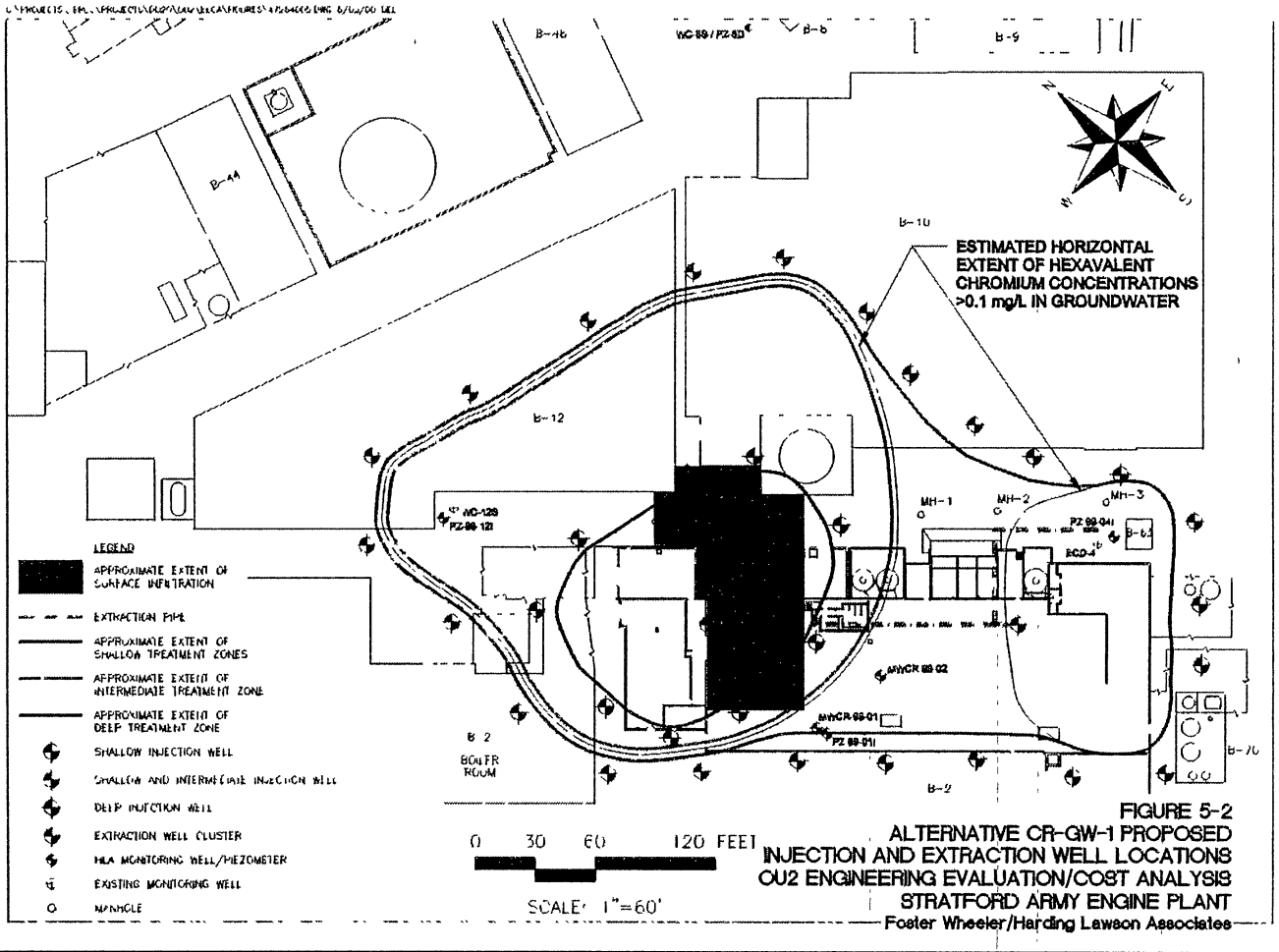
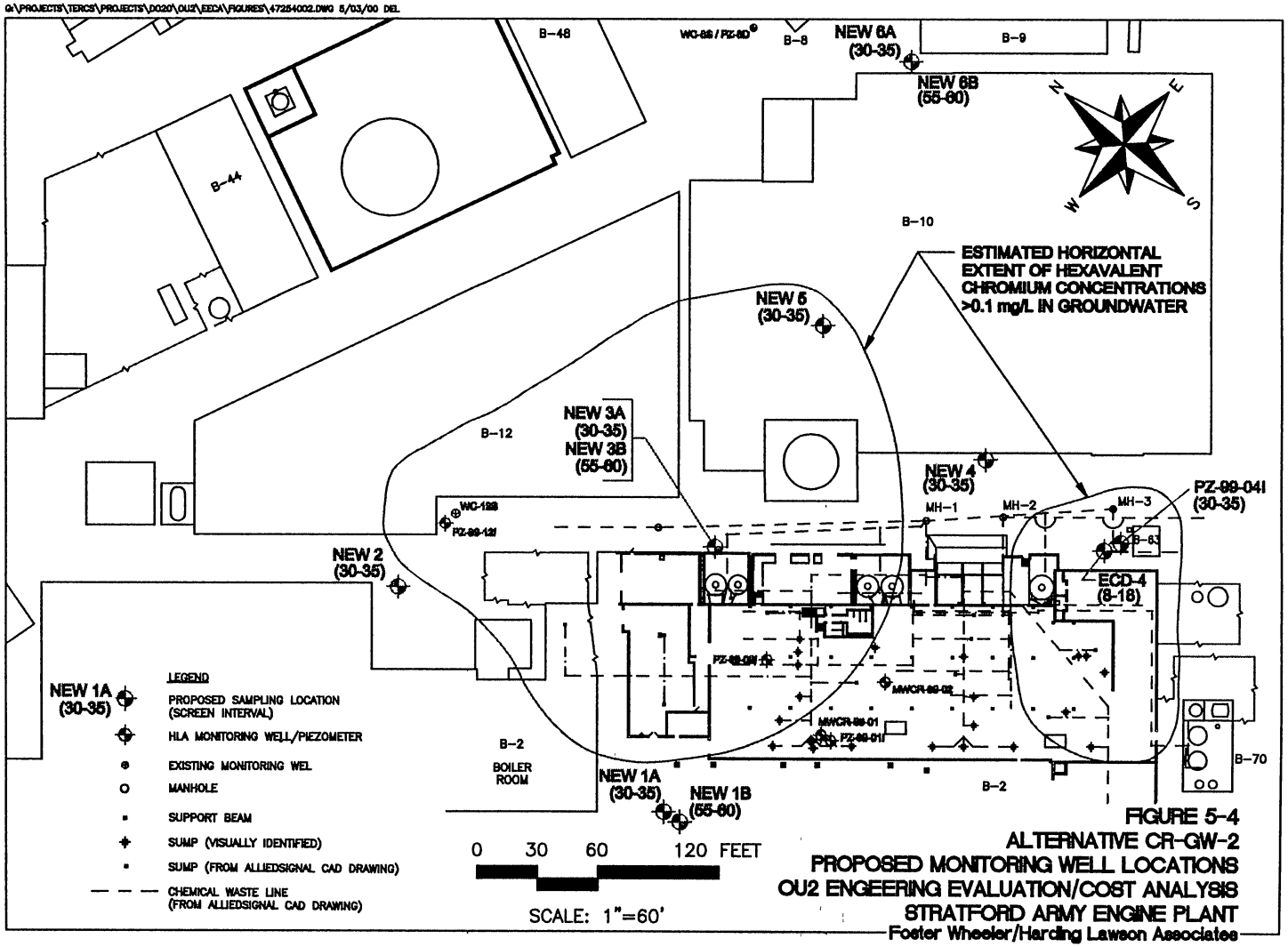
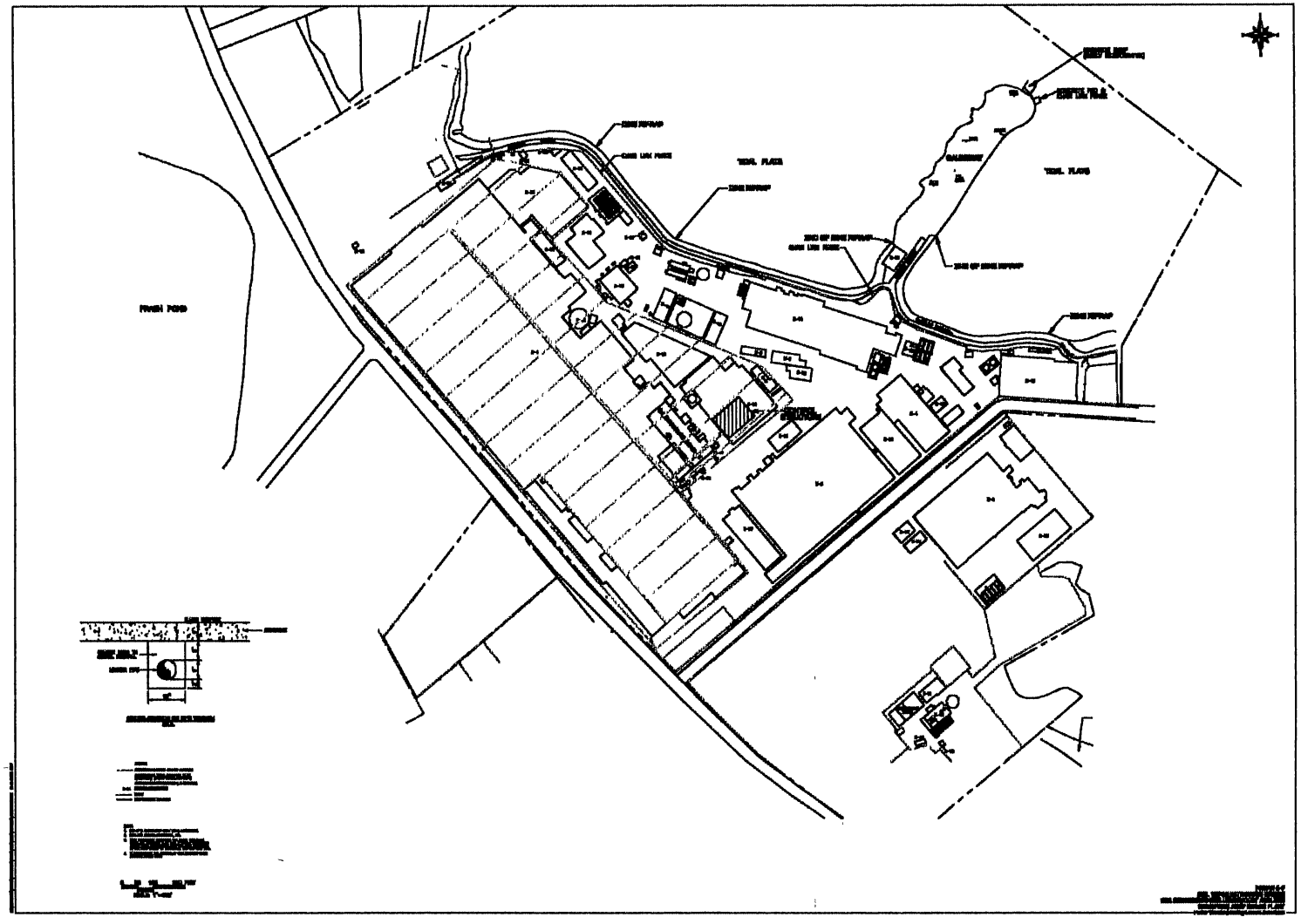


FIGURE 5-2
ALTERNATIVE CR-GW-1 PROPOSED INJECTION AND EXTRACTION WELL LOCATIONS
OU2 ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

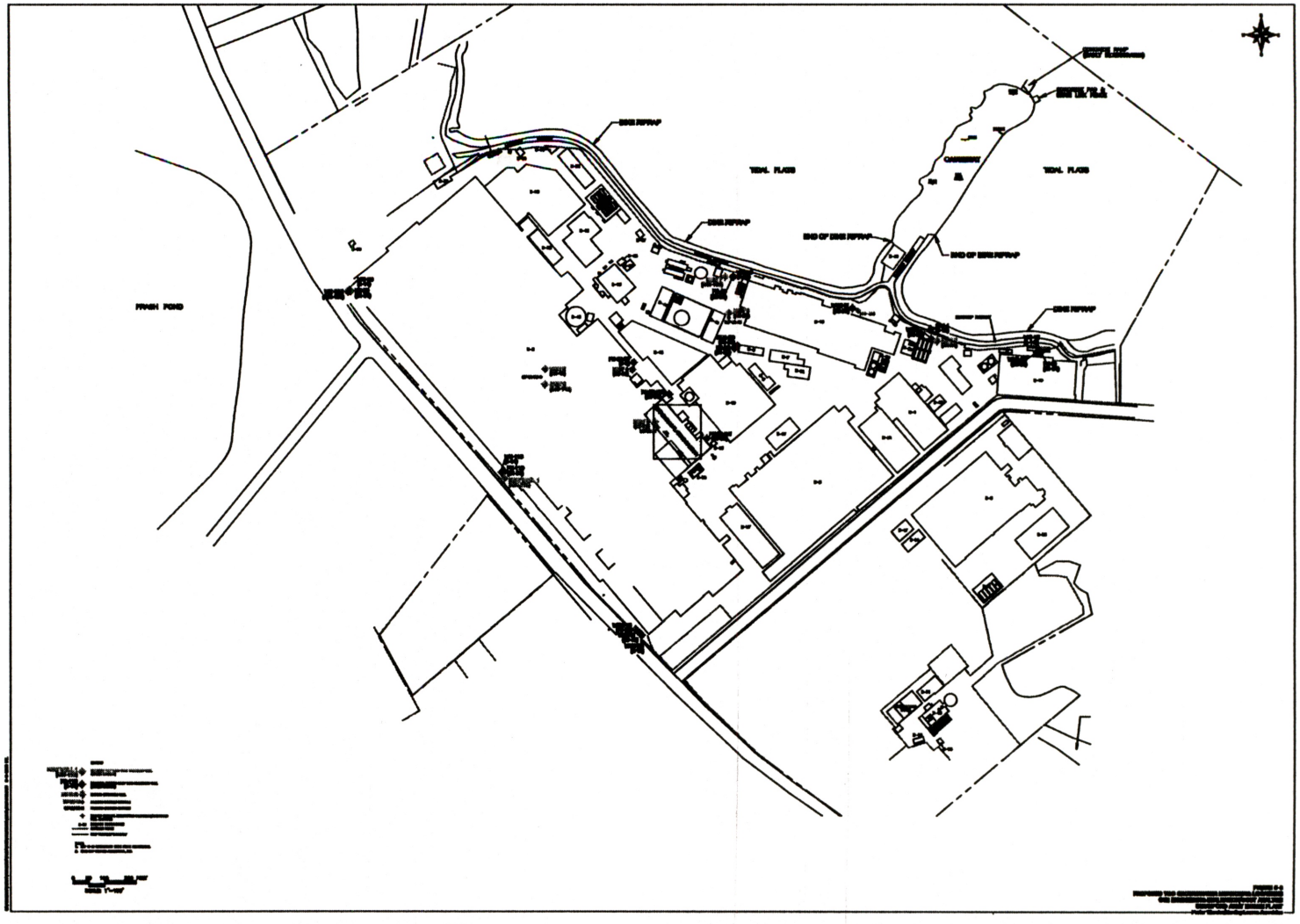
Alternative CR-GW-2 - Groundwater Monitoring



Alternative VOC-1 - Soil Vapor Extraction Layout



Alternative VOC-1 - Groundwater Monitoring



Alternative VOC-2 - In-situ Chemical Oxidation Layout

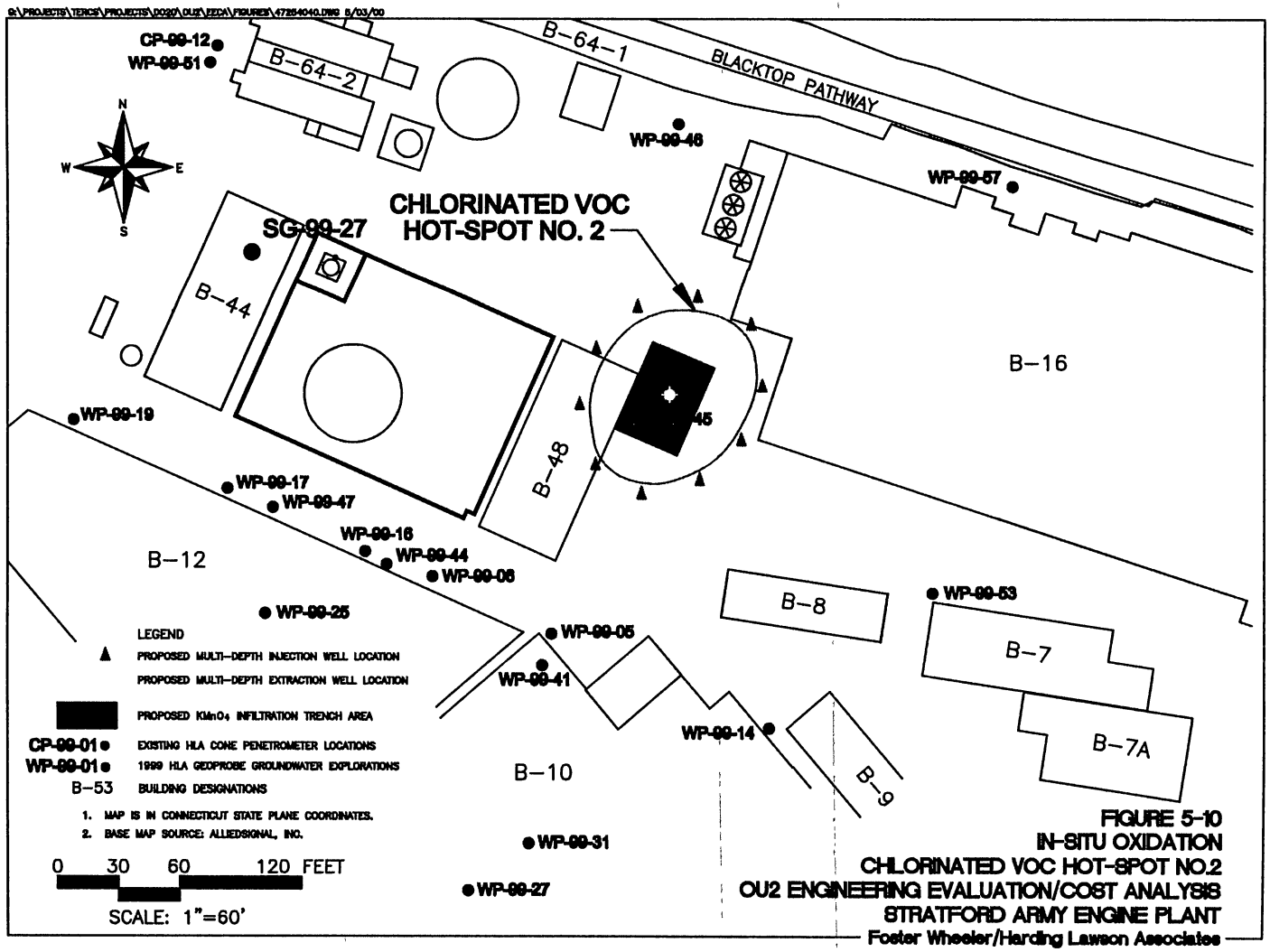


FIGURE 5-10
IN-SITU OXIDATION
CHLORINATED VOC HOT-SPOT NO.2
OU2 ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

Alternative VOC-2 - In-situ Chemical Oxidation Cross Section

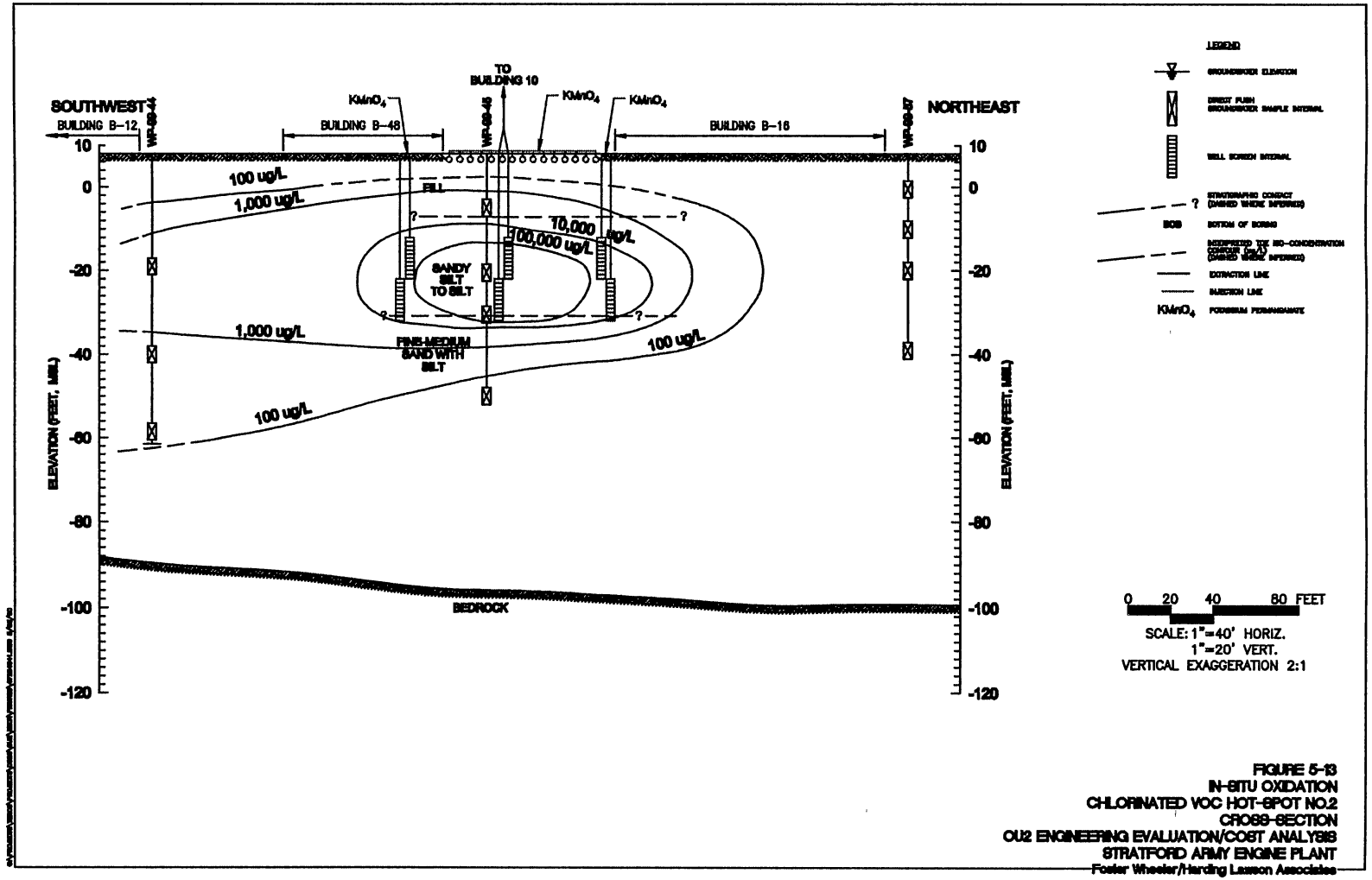


FIGURE 5-13
IN-SITU OXIDATION
CHLORINATED VOC HOT-SPOT NO.2
CROSS-SECTION
OU2 ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

Alternative VOC-2 - Air Sparging Layout

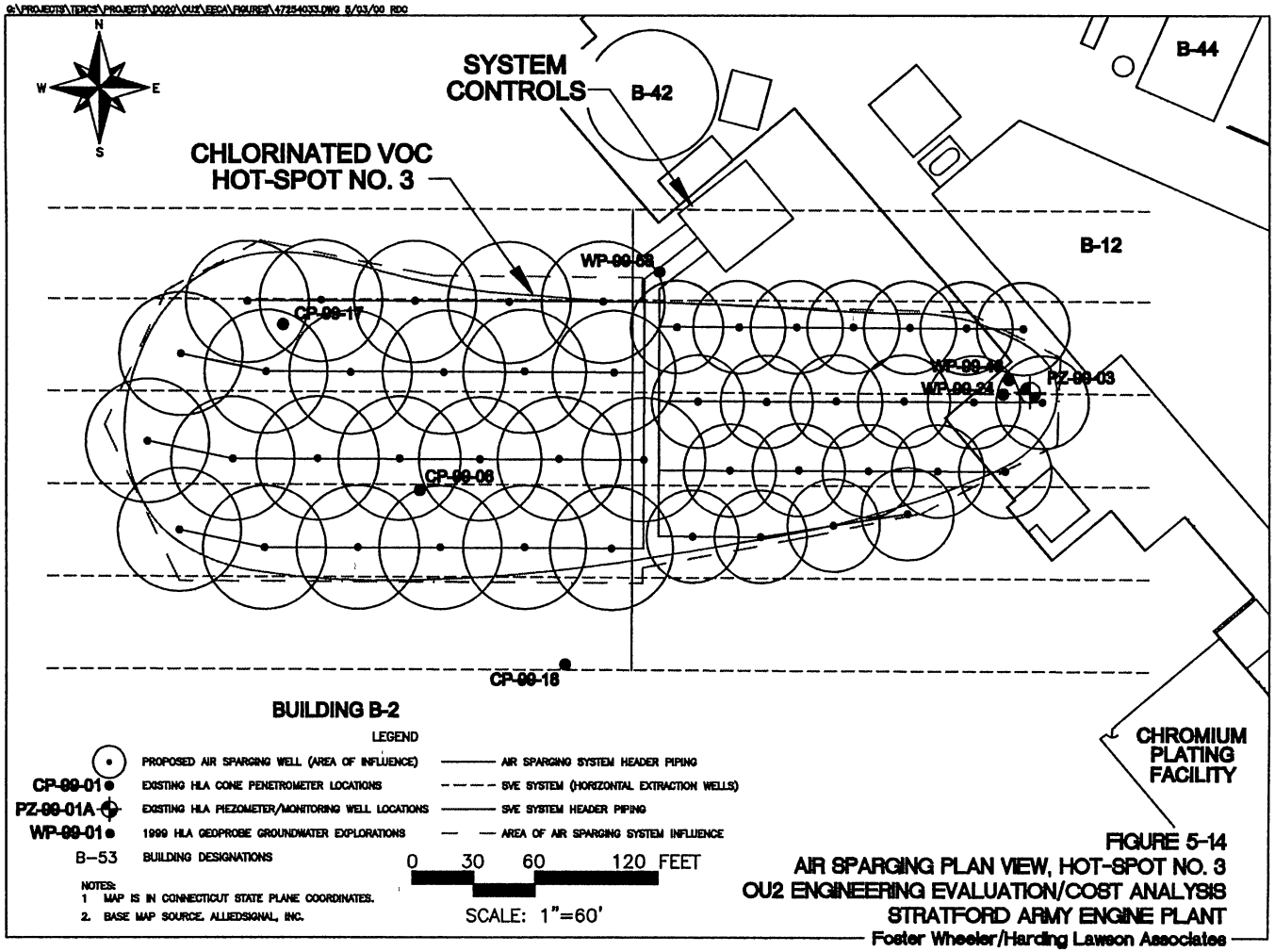


FIGURE 5-14
AIR SPARGING PLAN VIEW, HOT-SPOT NO. 3
OU2 ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

Alternative VOC-2 - Air Sparging Cross Section

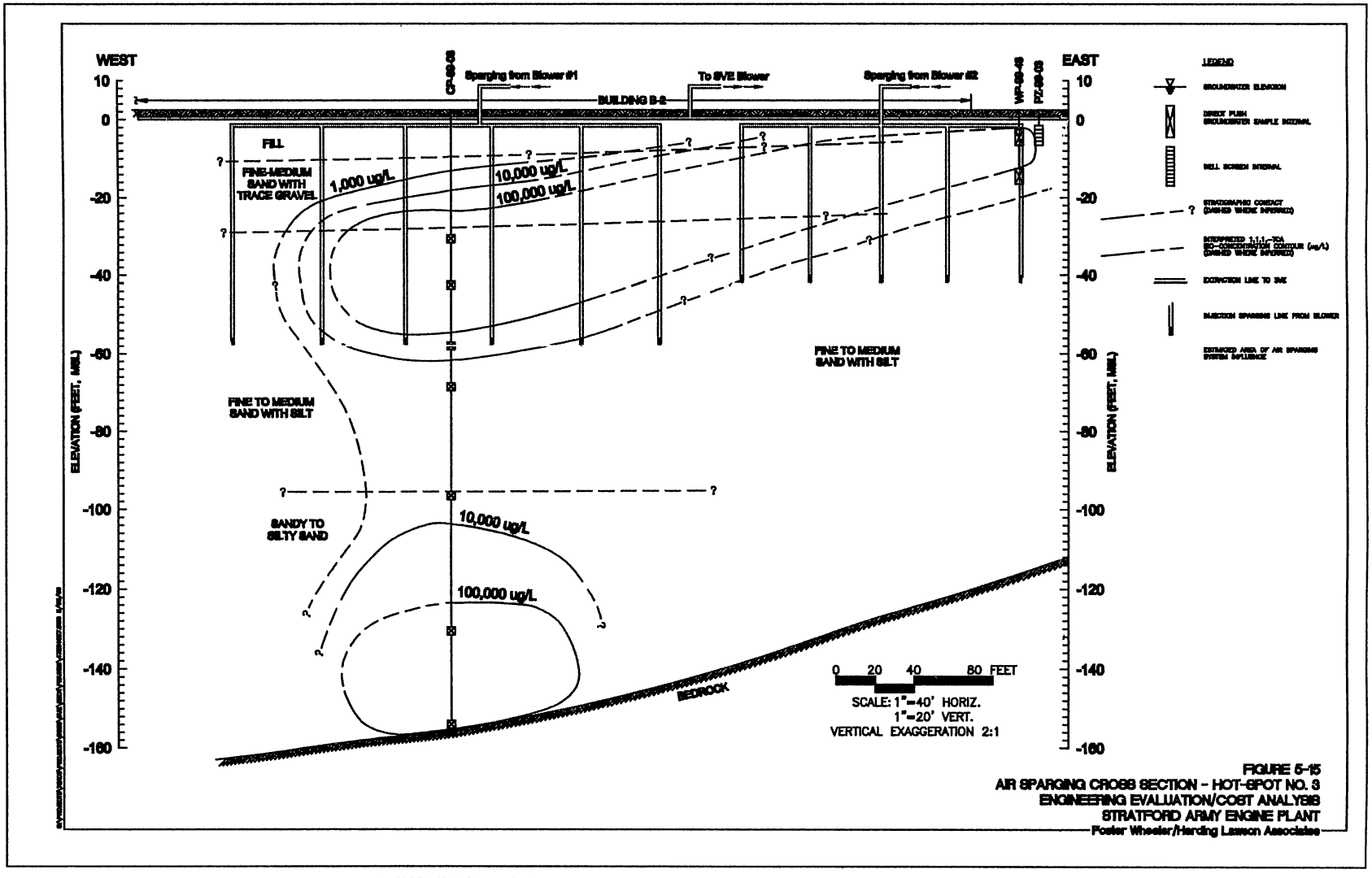
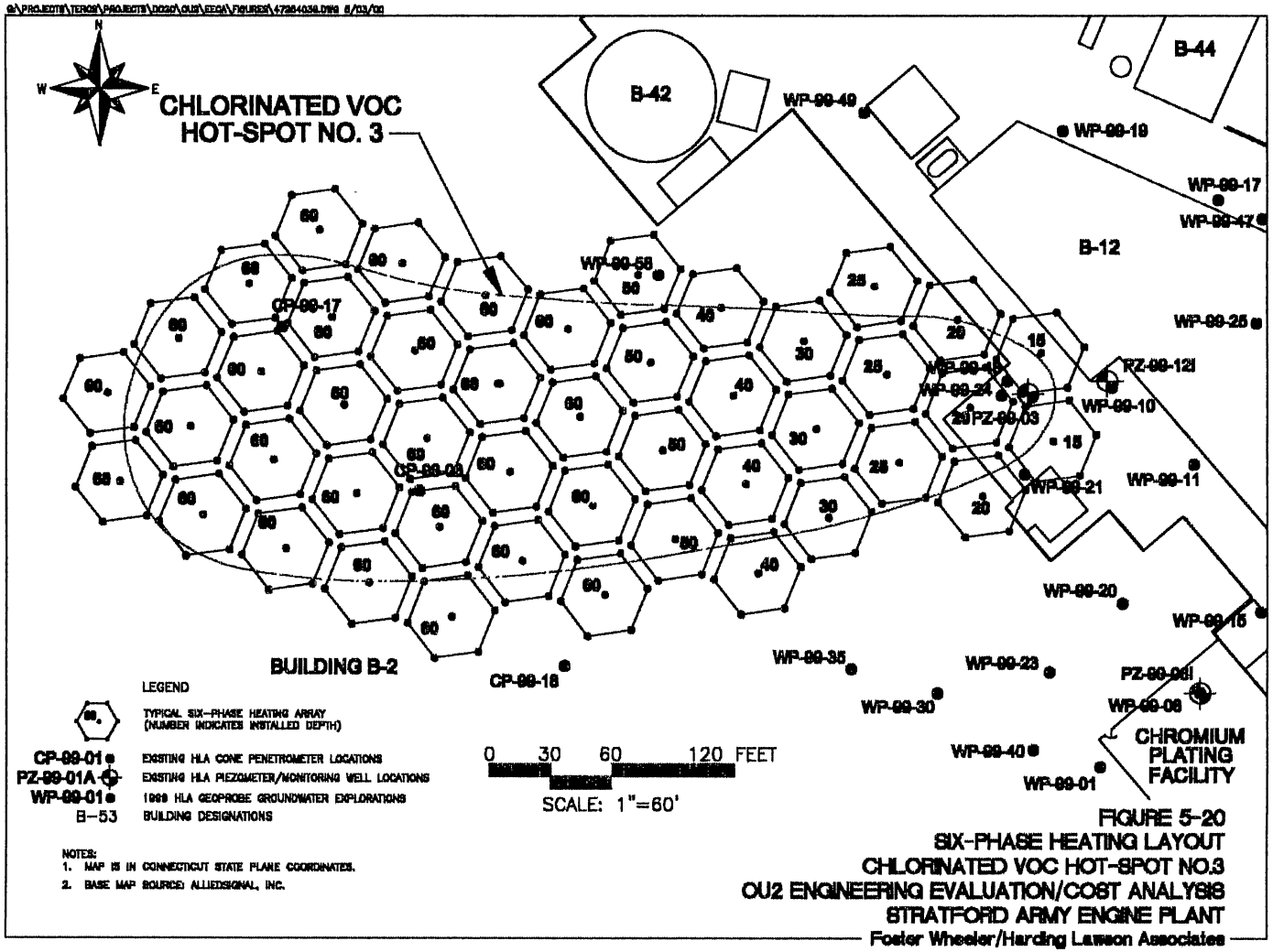


FIGURE 5-15
AIR SPARGING CROSS SECTION - HOT-SPOT NO. 3
ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

Alternative VOC-3 - Six-phase Heating Layout



Alternative VOC-3 - Six-phase Heating Cross Section

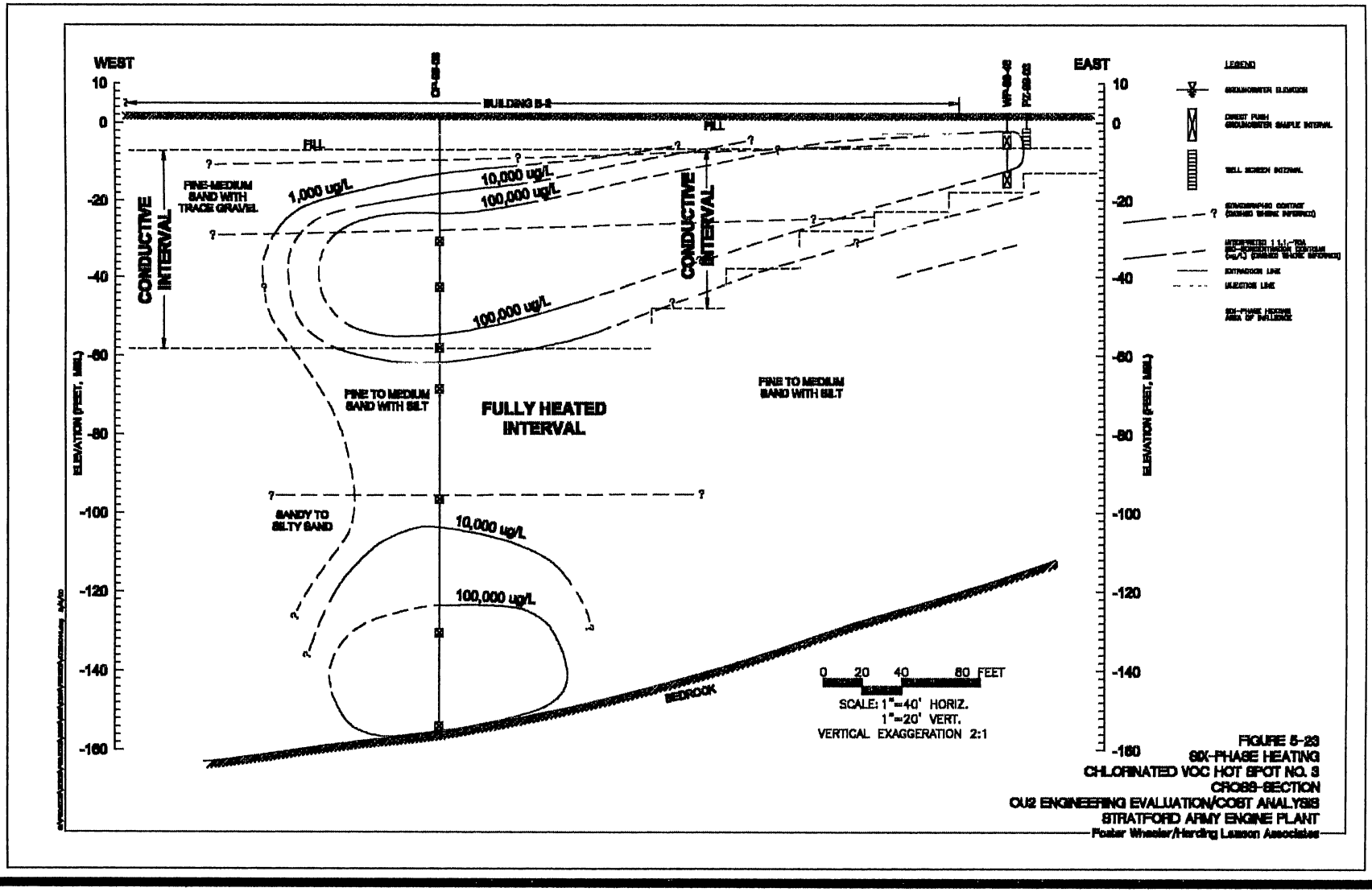
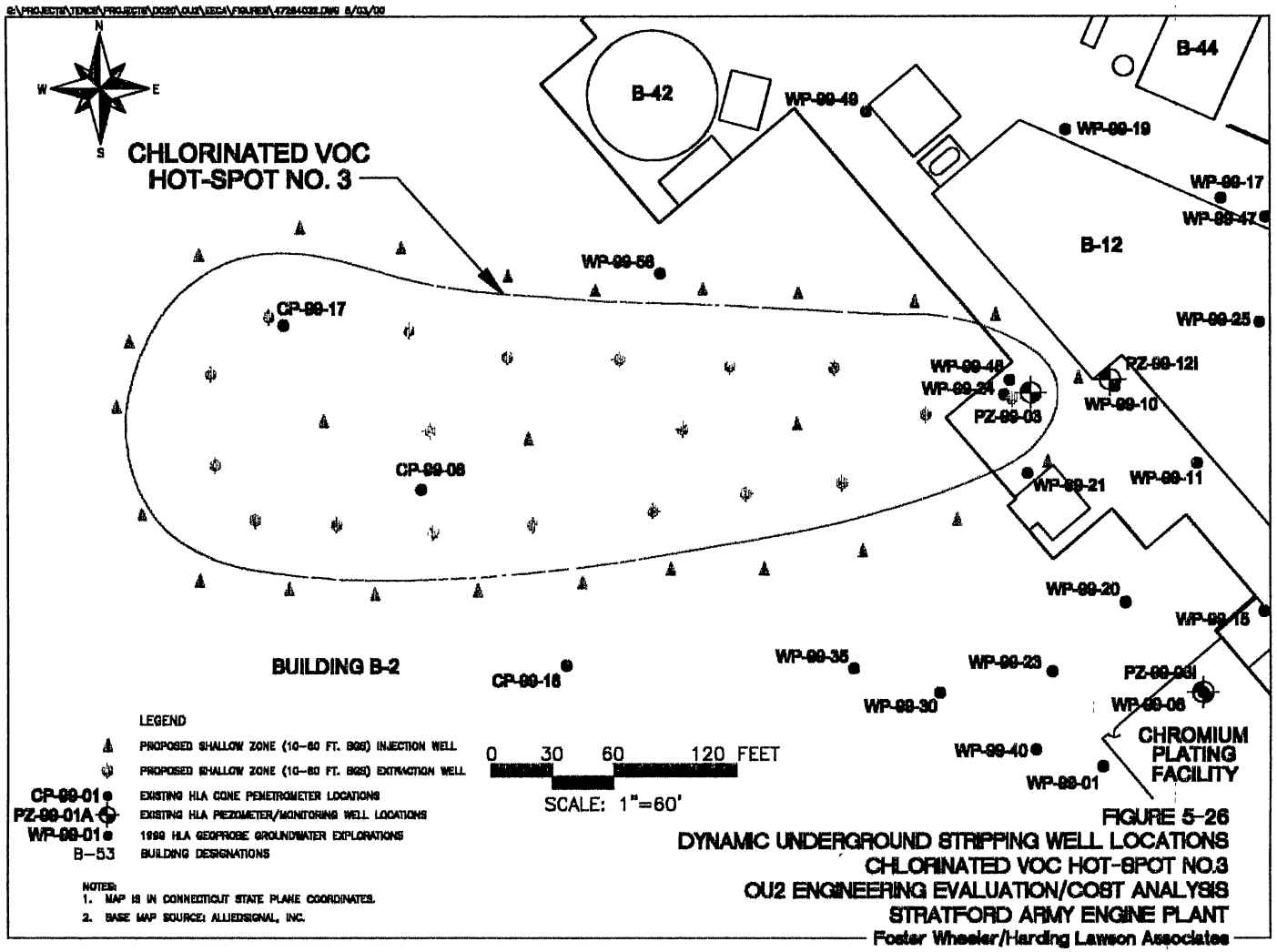


FIGURE 5-23
SIX-PHASE HEATING
CHLORINATED VOC HOT SPOT NO. 3
CROSS-SECTION
OU2 ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

Alternative VOC-3 - Dynamic Underground Stripping Layout



Alternative VOC-3 - Dynamic Underground Stripping Cross Section

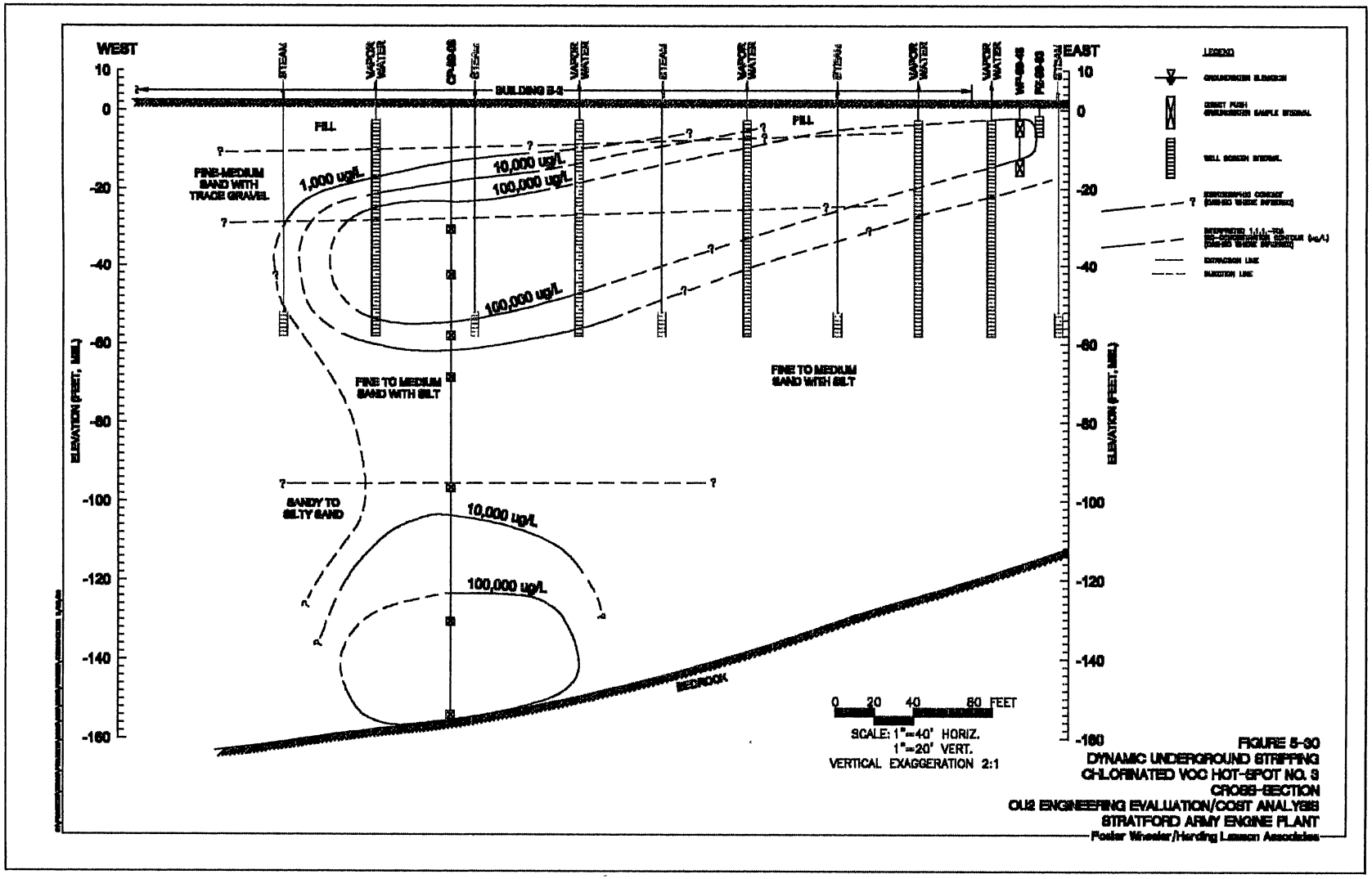


FIGURE 5-30
DYNAMIC UNDERGROUND STRIPPING
CHLORINATED VOC HOT-SPOT NO. 9
CROSS-SECTION
OU2 ENGINEERING EVALUATION/COST ANALYSIS
STRATFORD ARMY ENGINE PLANT
Foster Wheeler/Harding Lawson Associates

Comparative Analysis of Alternatives - Chromium Structures

Nine Criteria	Wall Removal/ Beam Decontamination/Floor Removal and Replacement	Wall Removal/ Beam Decontamination/ New Floor Over Old
Protects human health and environment	⊕	⊕
Meets Federal and State requirements	⊕	○
Provides long-term protection	⊕	⊕
Reduces mobility, toxicity or volume through treatment	⊖	⊖
Provides short-term protection	⊕	⊕
Can be implemented	⊕	⊕
Cost	Capital: $772,000 O&M: $47,000	Capital: $693,000 O&M: $47,000
State Agency Acceptance	To be determined after the public comment period.	
Community Acceptance	To be determined after the public comment period.	

⊖ Does not meet criteria

⊕ Meets or exceeds criteria

○ Partially meets criteria

Comparative Analysis of Alternatives - Chromium Groundwater

Nine Criteria	In-situ Reduction	Groundwater Monitoring
Protects human health and environment	⊕	⊕
Meets Federal and State requirements	⊕	○
Provides long-term protection	⊕	○
Reduces mobility, toxicity or volume through treatment	⊕	⊖
Provides short-term protection	⊕	⊕
Can be implemented	⊕	⊕
Cost	Capital: $3.65 M O&M: $310,000	Capital: $403,000 O&M: $457,000
State Agency Acceptance	To be determined after the public comment period.	
Community Acceptance	To be determined after the public comment period.	

⊖ Does not meet criteria ⊕ Meets or exceeds criteria ○ Partially meets criteria

Comparative Analysis of Alternatives - VOC Groundwater

Nine Criteria	SVE and Groundwater Monitoring	Oxidation/AirSparging/ SVE/Groundwater Monitoring	Thermal Treatment/ SVE/ Groundwater Monitoring
Protects human health and environment	⊕	⊕	⊕
Meets Federal and State requirements	○	○	⊕
Provides long-term protection	⊕	⊕	⊕
Reduces mobility, toxicity or volume through treatment	○	○	⊕
Provides short-term protection	⊕	⊕	⊕
Can be implemented	⊕	⊕	⊕
Cost	Capital: $5.03 M O&M: $4.01 M	Capital: $17.1 M O&M: $8.83 M	Capital: $20.0 M/$16.6 M O&M: 4.01 M/$4.54 M
State Agency Acceptance	To be determined after the public comment period.		
Community Acceptance	To be determined after the public comment period.		

⊖ Does not meet criteria

⊕ Meets or exceeds criteria

○ Partially meets criteria