Second Five-Year Review Report

For
Prewitt Superfund Site
Prewitt, New Mexico

September 2005

PREPARED BY:

U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

FIVE-YEAR REVIEW

Prewitt Abandoned Refinery Superfund Site
Prewitt, McKinley County, New Mexico

Summary of Five-Year Review Findings

The results of the second Five-Year Review for the Prewitt Abandoned Refinery site, located in Prewitt, McKinley County, New Mexico, indicate that the surface remedial actions continue to meet all remedial action objectives in accordance with the requirements of the Record of Decision for the site. The surface remedial actions continue to be protective of human health and the environment. The ground water remedy at the Site is not functioning as expected but is protective of human health and the environment in the short term. For the remedy to be protective in the long-term, continued monitoring and some type of institutional controls will be necessary. Deed restrictions currently in place to prevent exposure to ground water contamination may not be enforceable.

Actions Needed

No significant issues or deficiencies of remedy or the implementation were identified during this second five-year review that would affect the protectiveness.

Determinations

The response actions implemented for the Prewitt Abandoned Refinery site continue to be protective of human health and the environment in the short-term. Enforceable institutional controls will be necessary to ensure the long-term effectiveness of the response actions.

Approved By: Date

for Samuel Coleman, P.E. 9/20/05

Director, Superfund Division
U.S. Environmental Protection Agency
Region 6

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Second Five-Year Review

For the

Prewitt Superfund Site

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ACRONYMS AND ABBREVIATIONS

This document utilizes the following organization abbreviations. Abbreviations used in the documents shall be interpreted according to their recognized and well-known technical or trade meanings; such abbreviations include but are not limited to the following:

ARCO	Atlantic Richfield Company
AT&SF	Atcheson, Topeka and Santa Fe Railroad
COE (or U.S. COE)	U.S. Corps of Engineers
USACE	U.S. Army Corps of Engineers
EPA (or U.S. EPA)	U.S. Environmental Protection Agency
EPNG	El Paso Natural Gas Company
NMED	New Mexico Environment Department
NSP	Navajo Superfund Program

Common technical abbreviations, which may be found in this report, are listed below:

ACM	Asbestos-containing Material
AI	Air Injection
AQCR	Air Quality Control Regulation
ARARs	Applicable or Relevant and Appropriate Requirements
AS/NI	Air Sparging/Nutrient Injection
BTEX	Benzene, toluene, ethylbenzene and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminants of Concern
ESI	Expanded Site Inspection
FIT	Field Inspection Team
FS	Feasibility Study
GAC	Granular Activated Carbon
gpm	Gallon per Minute
GW	Ground Water
HASP	Health and Safety Plan
Hg	Mercury
HRS	Hazard Ranking System
I&CS	Instrumentation and Control System
lbs	Pounds
MCLs	Maximum Contaminant Limits

mg.	Milligram
mg/L	Milligram per Liter
MNA	Monitored Natural Attenuation
NAPL	Non-aqueous Phase Liquid
NCP	National Contingency Plan
NI	Nutrient Injection
NIS	Nutrient Injection System
NMAQR	New Mexico Air Quality Regulation
NMWQCCR	New Mexico Water Quality Control Commission Regulations
NPL	National Priorities List
NPDWR	National Primary Drinking Water Regulations
O&M	Operation and Maintenance
O&M Plan	Remedial Action Operation & Maintenance Plan
OSWER	Office of Solid Waste and Emergency Response
PAHs	Polynuclear Aromatic Hydrocarbons
PLC	Program Logic Controller
ppb	Parts Per Billion
ppm	Parts Per Million
ppmv	Parts Per Million Volume
PRPs	Potentially Responsible Parties
psi	Pounds Per Square Inch
QA/QC	Quality Assurance/Quality Control
QAP	Quality Assurance Plan
RA	Remedial Action
RA HASP	Remedial Action Health and Safety Plan
RA SAP	Remedial Action Sampling and Analysis Plan
RA WMP	Remedial Action Waste Management Plan
RA QAP	Remedial Action Quality Assurance Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RI	Prewitt Refinery Site Remedial Investigation (February 21, 1992)
ROD	Record of Decision
RI/FS	Remedial Investigation/Feasibility Study
RPM	EPA Remedial Project Manager

SAP	Sampling and Analysis Plan
SC/QAO	Supervising Contractor and Quality Assurance Official
SDWA	Safe Drinking Water Act
Site	Prewitt Superfund Site
SOP	Standard Operating Procedure
SVE	Soil Vapor Extraction
SVE/GW	Soil Vapor Extraction/Ground Water
TI	Technical Impracticability
TOC	Total Organic Carbon
TOU	Thermal/Catalytic Oxidizer Unit
TWS	Treated Water Storage Tank
UAO	Unilateral Administrative Order
VOCs	Volatile Organic Compounds
WMP	Waste Management Plan

EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) has conducted a second five-year review of the remedial actions implemented at the Prewitt Superfund Site (Site) in Prewitt, New Mexico. This second five-year review of the Site covers the period from May 2000 to April 2005. The trigger for this five-year review is the statutory requirement under CERCLA. The purpose of this review is to determine whether the remedy at the Site continues to be protective of human health and the environment, and functioning as intended.

As discussed in the first Five-Year Review Report, the surface remedial actions met all remedial action objectives in accordance with the ROD requirement. The EPA deleted the surface portion of the Site from the NPL in January 1998. However, the subsurface remedy at the Site is not functioning as expected but is protective of human health and the environment in the short term. For the remedy to function in the long term continued monitoring and some form of institutional controls are necessary. The PRPs were going to implement institutional controls consisting of deed restrictions against well drilling on their property. However, the NMED legal staff has indicated that deed restrictions are probably not enforceable. Therefore, the EPA will investigate if enforceable institutional controls can be implemented in addition to continued monitoring to ensure long-term protectiveness.

The subsurface remedy included Non-aqueous Phase Liquid (NAPL) extraction; nutrient injection; ground water extraction; and treatment and reinjection. The Phase I Subsurface Remedy was successful in attaining remedial action objectives for NAPL extraction as specified in the ROD. The remedial action objective for the NAPL was to remove or contain NAPL to prevent further contamination of ground water. Approximately 43,500 gallons of NAPL were identified in the ROD for the E, F and G Sandstone Units at the Site. The operation and performance assessment monitoring results showed that the Phase I Subsurface Remedy for the Site met the objectives specified in the ROD. The Phase I Subsurface Remediation completion has accomplished the following:

- Recovered over 5,600 gallons of NAPL by liquid recovery.
- Removed over 520,000 lbs. (approximately 80,000 gallons) of volatile hydrocarbon (NAPL), including about 21,000 lbs. of BTEX by SVE.
- Removed the volatile fraction of NAPL by SVE such that the site-specific contaminant target-levels for BTEX have been attained.
- Reduced toxicity, volume, and mobility of NAPL.

- Reduced ground water BTEX concentrations in source areas.

- Effectively contained contaminated ground water.

The operational and performance assessment monitoring data indicate that the subsurface remediation has reduced the ground water contaminant concentrations. However, ground water concentrations appear to have reached asymptotic limits, and the ground water extraction & treatment and in situ biodegradation is no longer efficient in further reducing BTEX concentrations. The inefficiency of the ground water extraction, treatment and nutrient injection remedy to further reduce ground water BTEX concentrations in the F and G Sandstone Units is due to the extreme heterogeneity and low hydraulic conductivity of the fractured bedrock formation.

The following are the five remedial action objectives (RAOs) specified in the ROD:

1. Removal of, or containment of, Non-aqueous Phase Liquid (NAPL) to prevent further contamination of ground water in the A-G units of the Sonsela aquifer.
2. Prevent future exposure to the contaminated ground water through the G, F, and E units, and restore the G, F, and E units of the Sonsela aquifer to their beneficial use, which is at this site a drinking water aquifer.
3. Excavation and treatment of wastes in the West Pits Area to prevent or reduce carcinogenic and non-carcinogenic risk to human health and the environment and to eliminate the physical hazard posed by the waste pits as they exist.
4. Control or eliminate the exposure to contaminated soils including the North Pit contents, contaminated with lead, asbestos or hydrocarbons.
5. Eliminate risk and hazards associated with exposure to the separator unit and its contents. The separator and its contents shall be removed such that there is no future risk to human health and the environment.

The surface and subsurface remedial actions have completely met RAOs #3, #4 and #5. RAO #1 and #2 have been partially met by reducing ground water contaminant concentrations and preventing exposure to the contaminated water.

There are currently no residential wells completed in the impacted aquifer units (E, F, and G Sandstone Units of the Sonsela Aquifer). The entire plume is within the Site. Engineering controls at nearby residential properties such as installation of water treatment units and ground water monitoring were implemented. A deed restriction prohibiting installation of water supply wells in the impacted aquifer units was placed on part of the Site property by the PRPs; however, EPA has subsequently learnt that this restriction may not be enforceable. However, New Mexico laws do not allow for enforcement of deed restrictions. Therefore other forms of enforceable institutional controls are necessary for remedy to function in the long term.

No significant issues or deficiencies of remedy or the implementation were identified during this second five-year review that would affect the protectiveness. Any difficulties observed during routine operation of the remediation system were addressed and corrected, as needed.

Hazardous substances remain in the subsurface at the Site at concentrations levels that are above levels that allow for unlimited use of ground water and unlimited exposure to groundwater. The EPA recommends continued monitoring to assess future clean up strategy at the Site.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name:(from WasteLan): Prewitt Superfund Site		
EPA ID (from WasteLan): NMD980622773		
Region: 6	State: NM	City/County: McKinley

SITE STATUS	
NPL status: X Final ___Deleted ___Other (specify) Partial deletion of Surface Media on 01/29/1998	
Remediation status (choose all that apply) ___Under Construction _X_ Operating ___Complete	
Multiple OUs? _ YES X_NO	Construction completion date: __March 1996__
Has site been put into reuse? ___ YES _X_NO	

REVIEW STATUS	
Reviewing agency: _X_ EPA ___State ___Tribe ___Other Federal Agency___________________	
Author Name: Sai Appaji	
Author Title: Remedial Project Manager	Author affiliation: U.S. EPA, Region 6
Review Period: May 2000 to April 2005	
Date (s) of site inspection: August 16, 2005	
Type of review: _X_ Post-SARA __ Pre-SARA __ NPL-Removal Only __ Non-NPL Remedial Action Site __ NPL State/Tribe-lead __ Regional Discretion)	
Review number: ___ 1(first) _X_ 2(second) ___3(third) ___ Other (specify)_____________________	
Trigging action:	
___ Actual RA Onsite Construction at OU#___	___ Actual RA Start at OU#___
___ Construction Completion	__X_ Previous Five-Year Review Report
___ Other (specify)____	
Trigging action date: (from WasteLan): 09/30/2005	
Due date: (five years after triggering action date): 09/20/2005	

I. Introduction

The U.S. Environmental Protection Agency (EPA) has conducted a second five-year review of the remedial action implemented at the Prewitt Superfund Site (Site) in Prewitt, New Mexico. This second Five-Year Review of the Site covers the period from May 2000 to April 2005. The purpose of this review is to determine whether the remedy at the Site is protective of human health and the environment. The methods, findings, and conclusions of this review are documented in this Five-Year Review report.

The EPA is preparing this Five-Year Review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This second five-year review report summarizes:

- Site background information;
- Remedial action activities;
- Performance and operational monitoring results;
- Site inspection
- Data review; and
- Remediation progress and status at the Site.

The information summarized in this Five-Year Review Report was obtained from the Site Remedial Investigation (RI)/Feasibility Study (FS) Report, Record of Decision (ROD), the first Five-Year Review report, monthly progress reports, annual remedial action reports, and the Phase I Subsurface

Remediation Completion Reports for the Site. The monthly progress reports have been submitted to the EPA since the implementation of remedial action in May 1995. These reports describe, in detail, the remedial action activities conducted, the results of sampling and tests, the activities planned for the next three months, and any problems encountered and their resolution. Ten Annual Remedial Action Reports have been submitted, starting with the first annual report for the period of May 1, 1995 through April 30, 1996. The Annual Remedial Action Reports provide a summary of remedial action activities conducted, the Non Aqueous Phase Liquid (NAPL) extraction evaluation results, and the ground water extraction, treatment, and reinjection results for the report period. Attachment I lists all documents that were reviewed for this second five-year review.

II. Site Chronology

Table 1 contains the Site chronology, listing milestones from initial discovery to the present.

Table 1: Site Chronology

Date	Event
May 26, 1981	NMED sampled and confirmed ground water hydrocarbon detection in a nearby resident well
December 15, 1982	EPA (FIT) Site Inspection
August 31, 1983	EPA (FIT) conducted ground water, soil and waste sampling
June – Dec 1985	NMED conducted further ground water and soil sampling
May 5 – 7, 1986	NMED performed test borings and sampling
May – December, 1987	EPA (FIT) Expanded Site Inspection
September 14 – 18, 1987	PRPs conducted localized hydrogeologic study
December 13, 1988	EPA (FIT) Residential Well Sampling
January 18, 1989	NMED performed residential well sampling
March 23, 1989	EPA issued UAO to PRPs to install Site fence and activated carbon filtration treatment system on five residential wells adjacent to the Site.
July 26, 1989	EPA issued an AOC to PRPs for RI/FS
August 30, 1990	Site placed on NPL
August 8, 1991	RI completed
February 21, 1992	FS completed
April 29, 1992	NAPL Extraction Pilot Test & Supplemental FS completed
July 16, 1992	EPA published proposed Plan of Action
September 30, 1992	EPA issued ROD for the Site RD/RA
May 14, 1993	EPA issued UAO for RD/RA
January 6, 1994	Final RD Work Plan completed
December 19, 1994	Remedial Design Reports (Surface and Subsurface) completed
February 21, 1995	Remedial Action Work Plan completed
May 4, 1995	Remedial action construction activities start (Pre-construction conference)
March 7, 1996	EPA final certification completion for asbestos-containing material, lead-contaminated soil and Separator remediation
March 7, 1996	EPA pre-final certification inspection for Phase I Subsurface Remedy construction and start-up completed
March 8, 1996	Phase I Subsurface Remedy O&M start
March 19, 1996	EPA certification of asbestos-containing material, lead-contaminated soil and Separator remediation completion
October 10, 1995	Remedial Design Report completion for surface hydrocarbon soil and Waste pits contents
May 7, 1996	Construction activities start for Landfarm Remedy for surface hydrocarbon soil
October 22, 1996	Attained Landfarm Performance Standard
November 22, 1996	EPA pre-certification inspection for completion of hydrocarbon soil remediation and Landfarm closure.
February 7, 1997	Landfarm remedial action completion report
January 29, 1998	EPA de-listed surface portion of the Site from NPL
July 22, 1998	EPA approved Completion of Phase I Subsurface Remediation for North NAPL Area and Plan for Phase II Subsurface Remediation for E-Sandstone Unit (North NAPL Area)
September 15, 1998	E-Sandstone Unit Phase II Subsurface Remedy construction completion, and implementation start-up phase
January 5, 1999	EPA final inspection of Phase II Subsurface Remedy start-up phase completion and O&M implementation
November 30, 2000	Temporary suspension of active remedial action activities for performance assessment monitoring.
January 17, 2003	EPA approved Completion of Phase I Subsurface Remediation for South and Miscellaneous NAPL Areas (F and G Sandstone Units)
March 31, 2002	Suspension of active remedial activities and continued ground water monitoring for containment and MNA implementation evaluation.

III. Background

A. Physical Characteristics

The Site is a former crude oil refinery located on approximately 70 acres near the town of Prewitt in McKinley County, New Mexico. The Site is located approximately 20 miles northwest of Grants, New Mexico as shown in Figure 1 of Attachment 2. The Site is bounded on the south by Interstate 40, and on the north by the Atchison, Topeka and Santa Fe (AT&SF) Railroad. New Mexico Highway 122 (former U. S. Highway 66) divides the Site into two tracts, as shown in Figure 2 and 3 of Attachment 2. The two Site tracts are jointly owned by the Potential Responsible Parties (PRPs), Atlantic Richfield Company (ARCO) and El Paso Natural Gas Company (EPNG). The Site is located near the southwest edge of the Rio San Jose Basin. A linear valley floor to the north and rocky uplands to the south typify the topography of the area at the Site. There are three major stratigraphic units at the Site. These are in ascending order, the San Andres/Glorieta Formations, the Lower Chinle Member, and the Sonsela Sandstone Unit Bed.

B. Land and Resource Use

The refinery was in operation between 1938 and 1957. In July 1957, the refinery was shut down and the refinery and accompanying structures were subsequently dismantled. Remnants and debris remained after the refinery was dismantled, including piping, waste pits, a separator structure, and other structural material. The Site was covered with scattered demolished structures and foundations, sparse desert vegetation, and exposed fill.

The surface portion of the Site has been remediated and is available for reuse but is currently only used solely for remedial activities. A fence restricts access to the Site. There are a few residences to the east and west of the Site. The area in which the Site is located is rural and approximately 50 people live within a one-mile radius of the Site.

C. History of Operation and Contamination

The refinery was in operation between 1938 and 1957. In July 1957, the refinery was shut down, and the refinery and accompanying structures were subsequently dismantled. The surface soil and shallow ground water underlying the site have been contaminated with RCRA listed wastes including slop tank contents (K049), primary separator sludge (F037), and secondary separator floats (F038) mixed with petroleum hydrocarbon products from past refinery-related activities. The Site was brought to the attention of the EPA by a citizen complaint in 1980. In May 1981, the New Mexico Environment Improvement Division (NMEID) initiated sampling of nearby residential wells. The EPA Field Inspection Team (FIT) performed ground water, soil and waste sampling at the Site during 1982 – 1983. In April 1984, the Site was scored by the EPA using the Hazard Ranking System (HRS)

MITRE model. The NMEID performed ground water and soil sampling, and test boring during 1985 through 1986.

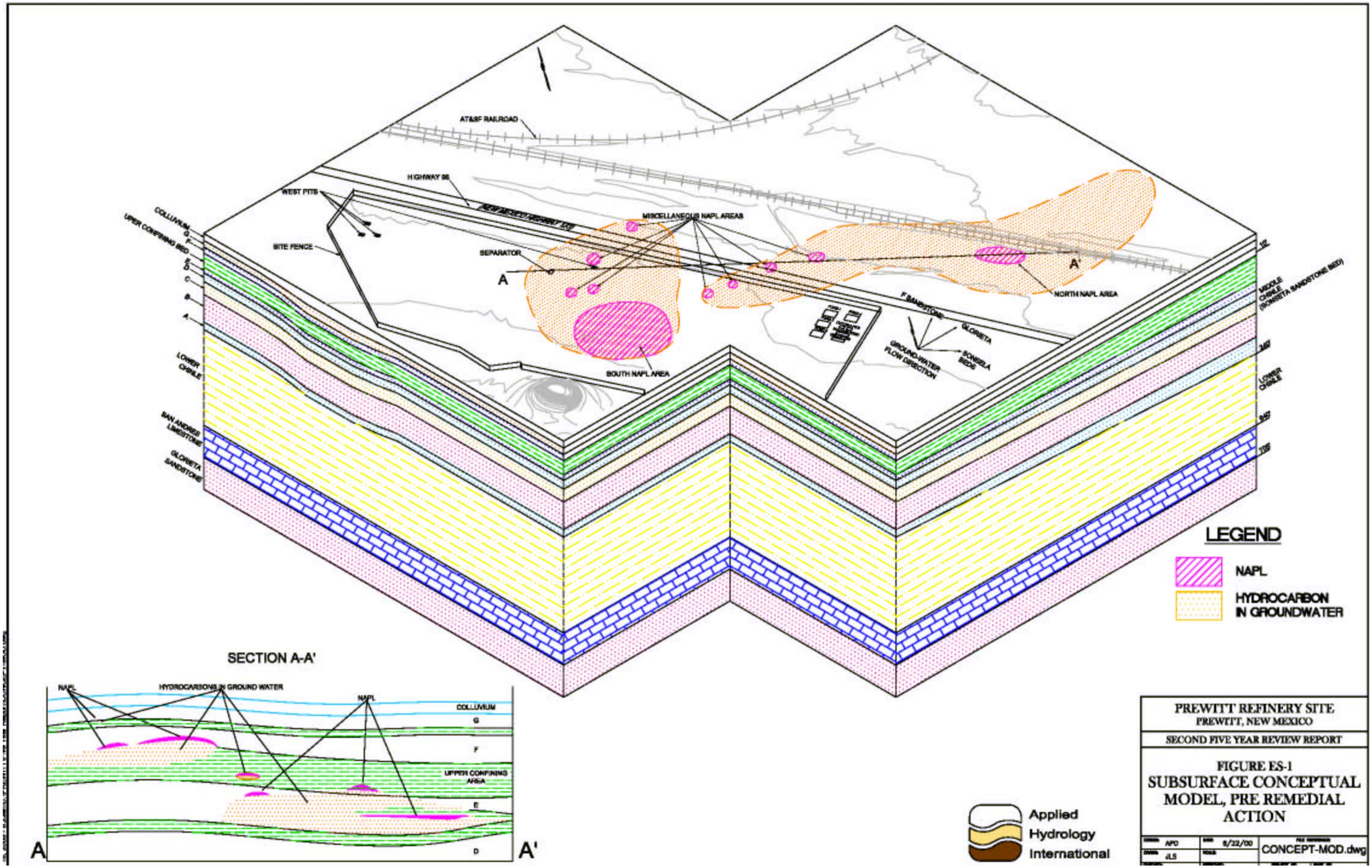
D. Initial Response

EPA's FIT performed an Expanded Site Inspection (ESI) during May 20 – December 17, 1987. ARCO/EPNG performed a localized hydrogeologic study during September 14 – 18, 1987. The EPA's FIT and the NMEID performed residential well sampling during December 1988 – January 1989. In June 1989, EPA issued an Administrative Order to both EPNG and ARCO. The order required EPNG and ARCO to fence the Site, and to install and maintain an activated carbon filtration treatment system on five residential wells adjacent to the Site. On August 30, 1990 (55 Fed. Reg. 33502, 33508), the EPA added the Prewitt Abandoned Refinery Site to the National Priorities List (NPL), pursuant to Section 105 of CERCLA, 42 U.S.C. §9605, qualifying the Site for remediation under CERCLA, more commonly known as "Superfund". On January 25, 1989, the EPA issued a Special Notice letter to both ARCO and EPNG regarding RI/FS activities at the Site. On June 22, 1989, ARCO and EPNG's parent company, the El Paso Company (TEPCO), signed an Administrative Order on Consent with EPA, which authorized the initiation of RI/FS activities at the Site.

The RI to determine the nature and extent of the problem presented by the release of hazardous substances at the Site was conducted in two Phases during 1990 and 1991. Phase I was the initial sampling and analysis phase. Phase II activities were conducted to resolve outstanding issues, and to fill data gaps remaining at the conclusion of Phase I. During the RI, contamination (lead, asbestos and various hazardous substances mixed with hydrocarbon products from refinery operations) was detected in the surface soil and in ground water at the Site. Figure 1, which was extracted from the RI Report, shows the Site conceptual model and presents a general summary of the RI findings. The RI findings concerning surface and subsurface contamination are summarized as follows:

D.1 Surface Contamination

Approximately 3,000 cubic yards of hydrocarbon-contaminated soil were identified, with PAHs at concentration levels that exceed Site remediation goals based on risk to human health.


AT&SF RAILROAD
HIGHWAY 66
WEST PITS
SITE FENCE
SEPARATOR
MISCELLANEOUS NAPL AREAS
NORTH NAPL AREA
SOUTH NAPL AREA
A
A'
LEGEND
NAPL
HYDROCARBON IN GROUNDWATER
SECTION A-A'
NAPL
HYDROCARBONS IN GROUND WATER
COLLUVIUM
UPPER CONFINING AREA
Applied Hydrology International
PREWITT REFINERY SITE
PREWITT, NEW MEXICO
SECOND FIVE YEAR REVIEW REPORT
FIGURE ES-1
SUBSURFACE CONCEPTUAL MODEL, PRE REMEDIAL ACTION
CONCEPT-MOD.dwg

The Separator unit contained approximately 83 cubic yards of a viscous liquid/sediment mixture or sludge, which is listed as FO37 hazardous waste (refinery oil/water separator sludge) under the Resource Conservation and Recovery Act (RCRA). Approximately 280 cubic yards of soil were impacted by hazardous wastes underneath the Separator.

Approximately 1,900 cubic yards of soil with lead concentrations greater than 500 ppm were identified in several locations at the Site.

Approximately 1,000 tons (800 cubic yards) of asbestos-containing material were removed from the Site during an asbestos abatement program performed prior to the RI. Approximately 15 cubic yards of additional asbestos-containing material (ACM) were identified during the RI.

D.2 Subsurface Contamination

Past refinery-related activities contributed to the ground water contamination underlying the Site. Four distinct hydrostratigraphic units underlie the Site. The uppermost water-bearing zone is a shallow zone of limited areal extent. This water bearing zone is divided into the F and G Sandstone Units, with the G Unit being the uppermost unit. The F and G Units are separated hydraulically from the A through E Units of the Sonsela Aquifer by the upper confining bed. The deeper San Andres/Glorieta aquifer is separated from the Sonsela Aquifer by approximately 400 feet of indurated, fine-grained sediments. The stratigraphy of the subsurface below the Site is illustrated in Figure 1.

NAPL had accumulated in the E, F, and G Sandstone Units and in the upper confining bed, between the E and F Sandstone Units. Staining noted during core logging indicated that bedrock fractures have been a significant transport mechanism for NAPL in the unsaturated zone. NAPL moved downward from the surface under the influence of gravity through the bedrock fracture systems and through several Site wells with unsealed annulus. Seven NAPL areas were identified at the Site during the RI. The NAPL at the Site is weathered refinery oil/primary separator sludge (F037) and other hazardous substances that were wastes from refinery operations. A total of 43,500 gallons of NAPL was estimated to be in the E, F and G Sandstone Units.

Ground water contamination at the Site is generally confined to uppermost portions (E, F and G Sandstone Units) of the Sonsela Aquifer. Ground water in the F & G Sandstone Units, which are separated hydrogeologically from the lower sandstones (A through E) by the upper confining bed, is above the upper confining bed. The contaminants of concern (COCs) for the shallow ground water are benzene, toluene, ethylbenzene, xylenes, lead and 1,2-DCA. The source of these contaminants is generally NAPL from spilled hazardous substances mixed with petroleum refinery products.

One of the activities that took place as part of the RI was the abandonment of some of the existing wells. The wells were abandoned or modified to prevent them from being conduits of contamination to lower ground water units.

Utilizing the findings of the RI, the FS was initiated to develop and assess various remediation measures for the areas of contamination at the Site. The FS process and the detailed evaluations of the alternatives are presented in the FS Report for the Site, which is part of the Administrative Record. The remedial alternatives were evaluated based on health risks assuming residential use of the Site. The FS was completed in April 1992.

E. Basis for Taking Action

Hazardous substances at the Site and the basis for taking action were:

- Approximately 43,000 gallons of light NAPL migrated downward from the surface and accumulated in the E, F and G Sandstone Units.

- Dissolved BTEX, 1,2-DCA and Lead in the E, F and G Sandstone Units in excess of Maximum Contaminant Limits (MCLs).

- Surface Soil impacted with lead, asbestos and refinery wastes that are hazardous substances.

- A Separator Unit containing approximately 83 cubic yards of sludge.

IV. Remedial Actions

A. Remedy Selection

The only ROD for the Site was signed on September 30, 1992. The remedial action objectives for the Site are:

1. Removal, or containment of NAPL to prevent further contamination of ground water in the A-G Sandstone Units of the Sonsela aquifer. Since NAPL impacts ground water, remediation goals for subsurface areas contaminated with NAPL are described below in the discussion of ground water remediation goals.

2. Prevent future exposure to the contaminated ground water through the G, F, and E units; and restore the G, F, and E units of the Sonsela Aquifer to their beneficial use, which at this site is a drinking water aquifer.

3. Excavation and treatment of wastes in the West Pits Area to prevent or reduce carcinogenic and noncarcinogenic risk to human health and the environment and to eliminate the physical hazard posed by the waste pits as they exist.

4. Control or eliminate the exposure to contaminated soil including the North Pit contents, contaminated with lead, asbestos or hydrocarbons.

5. Eliminate risk and hazards associated with exposure to the separator unit and its contents. The separator and its contents shall be removed such that there is no future risk to human health and the environment.

The Site is addressed in the ROD as one operable unit, in which all surface and subsurface contamination is addressed, including: the West Pits; lead, asbestos and hydrocarbon-contaminated soil; the Separator and its contents; and NAPL extraction and ground water remediation (subsurface contamination). For remedial design and remedial action, the contaminated media were divided into two categories, surface and subsurface media.

The remedial actions for surface media were:

- Excavation and off-site disposal of asbestos-containing materials.
- Excavation and off-site disposal of lead-contaminated soil.
- Excavation and off-site disposal of Separator contents, and removal and disposal of Separator structure.
- Excavation and on-site treatment of West Pits contents; hydrocarbon-contaminated surface soil; and hydrocarbon-contaminated soil beneath the Separator with hydrocarbon concentration levels above the cleanup levels specified in the ROD.

The remedial actions for the subsurface media are:

- Soil Vapor Extraction (SVE) of NAPL.
- Contaminated ground water migration control.
- Ground water remediation by extraction, treatment and re-injection.

B. Remedy Implementation

In May 1993, a Unilateral Administrative Order (UAO) was issued jointly to the PRPs. The UAO required the PRPs to design and implement remedies specified in the ROD. The RD Work Plan was prepared by the PRPs, and was approved by the EPA on January 6, 1994. The RD report for surface remediation (lead-contaminated and asbestos-contaminated soil, and the Separator (F037 waste) and its contents) was submitted to the EPA on November 18, 1994. The subsurface remediation was planned in two phases. Objectives for Phase I Subsurface Remediation are to: (1) remove or contain NAPL by SVE to prevent further contamination of ground water; (2) remediate ground water in NAPL source areas; (3) control migration of contaminated ground water; and (4) collect data during Phase I Subsurface Remedy implementation to be utilized to design Phase II Subsurface Remediation. Objective for Phase II Subsurface Remediation is to further remediate ground water in E, F and G Sandstone Units. The Phase I Subsurface Remediation RD report was submitted on December 19, 1994. The EPA approved the surface and Phase I Subsurface RD reports on January 17, 1995. A RA Work Plan was prepared and submitted to the EPA on February 21, 1995. The EPA approved the RA Work Plan on February 28, 1995.

The PRPs implemented the remedial action construction activities for surface (lead-contaminated and asbestos-contaminated soil, and the Separator (F037 waste) and its contents) and the Phase I Subsurface Remediation. The PRPs undertook overall project management, financial control, contract management, and continued interface communication with EPA and NMED. A qualified construction contractor was selected by the PRPs through a competitive bid process. The PRPs retained an outside party to serve as Supervising Contractor and Quality Assurance Official (SC/QAO). Remedial action construction activities started on May 4, 1995 with a pre-construction conference between the Construction Contractor, PRPs, SC/QAO, EPA, NMED and the Navajo Superfund Program (NSP). The following two subsections describe the remedial action activities for surface and subsurface remediation.

B1. Surface Remediation

The surface remedial actions as specified in the ROD were completed by February 1997 and the land is currently available for reuse. The remedial action objectives, as discussed in Section IV.A.3 to IV.A.5 were met in accordance with the ROD and the UAO, which were discussed in the September 2000 Five-Year Review Report. On January 29, 1998, the EPA published a notice in the Federal Register deleting the surface portion of the Site from the NPL.

B2. Subsurface Remediation

Remedial action construction and start-up activities for the Phase I Subsurface Remedy were completed in March 1996. The subsurface remediation was implemented in phases consistent with the EPA-approved RA Work Plan. The specified objectives of the Phase I Subsurface Remedy were to contain or remove NAPL, control migration of contaminated ground water, remediate ground water in the NAPL source areas, and to collect data and information for the Phase II remediation plan. The Phase I Subsurface Remedy consisted of NAPL extraction by SVE, ground water extraction in the NAPL source area, treatment, and re-injection.

The Phase I Subsurface Remediation System (Phase I System) was designed and constructed to provide substantial ground water remediation, in addition to the NAPL extraction. The Phase I System included a total of 53 SVE/GW wells installed in NAPL source areas to extract ground water for treatment and reinjection at a rate of up to 5,000 gallons per day. The Phase I System was also consistent with the ground water pumping, treatment, and reinjection remedy selected in the ROD for the ground water remedy.

The Phase I System, as designed, constructed, and operated, has incorporated remedies selected in the ROD for both the NAPL and ground water remediation. The Phase I System also included air injection at South NAPL Area wells and air sparging at North NAPL Area wells. While these components were designed to enhance SVE NAPL extraction, they also provide oxygen to the subsurface, which serves to enhance in situ biodegradation of residual NAPL and dissolved BTEX in the subsurface. The Phase I System components, design criteria and construction are described in the September 2000 first Five-Year Review Report.

The Phase I System was started on December 11, 1995, and operated until March 7, 1996, as a start-up phase to determine if the System was operational and functional. Following the pre-final inspection by EPA on March 7, 1996, EPA determined that the Phase I System was operational and functional. A final remedial action construction report was submitted to the EPA on August 30, 1996.

The North NAPL Area (E Sandstone Unit) Phase I Subsurface Remediation performance standards were attained in December 1997, and the ground water extraction and treatment was not efficient in reducing contaminant concentrations in ground water. Therefore, a Phase II Subsurface Remediation Plan (Phase II) for the E Sandstone Unit, consisting of batch injection of nutrient with continued vacuum enhanced pumping of ground water was submitted to the EPA. The EPA approved the Phase II Plan on July 22, 1998. The Phase II construction was completed, and the Operation and Maintenance (O&M) activities started in September 1998. Details of the Phase II System construction, remedy description and start-up data are included in the Remedial Action Construction Report for the E-Sandstone Unit for the Phase II Subsurface Remedy, which was submitted to the EPA on February 19, 1999.

The Phase II Subsurface Remedy for the E-Sandstone Unit consisted of batch injection of nutrients, initially at six wells, to enhance in situ biodegradation of BTEX constituents in ground water using a nutrient injection system (NIS) constructed within an enclosed trailer. The Phase II Subsurface

Remedy also includes continued ground water extraction at remediation wells as necessary to support in situ bioremediation and to maintain containment of the leading edge plume in the E-Sandstone Unit.

C. System Operations and Maintenance

The PRPs selected an O&M contractor using a competitive bidding system. The O&M activities started in March 1996 and continued during this second Five-Year Review period. The O&M activities are performed in accordance with the RA O&M Plan, RA Health and Safety Plan (RA HASP), RA Sampling and Analysis Plan (RA SAP), RA Waste Management Plan (RA WMP), and RA Quality Assurance Plan (RA QAP), all of which have been approved by EPA.

The O&M Plan describes procedures and schedules for inspection and maintenance of the operating remediation system. Activities include operating data collection and inspections to facilitate preventive maintenance and to insure that the system continues to operate with minimal problems. Manufacturer's specifications regarding performance of the system wells and equipment during the operation were also utilized to develop a preventive maintenance program to maintain efficient operation of the system. The O&M work for system operation included the following activities:

- System Inspections During Routine Operations
- Shallow Injection System Inspections and Maintenance
- Maintenance of SVE/Ground Water Pumping, and Air Injection/Air Sparging Wells
- Control System Operation Check
- Inspection and Maintenance of Compressed Air System
- Inspection and Maintenance of Oil/Water Separator
- Maintenance of the Equalization Tank and Air Stripper Feed Pump
- Maintenance of NAPL Tank
- Maintenance of Granular Activated Carbon Absorption System and Pre-Filter
- Maintenance of the Vacuum Pumps and SVE System
- Maintenance of the Thermal/Catalytic Oxidizer and Propane Supply
- Maintenance of Vapor Phase Granular Activated Carbon Drum
- Waste Management
- Well Abandonment
- Routine Air Monitoring for Health and Safety

In addition to the continued Phase I Subsurface Remediation O&M activities in the South and Miscellaneous NAPL Areas, the O&M activities for the E-Sandstone Unit Phase II Subsurface Remediation include:

- Scheduled batch injection of nutrients using the NIS.

- Maintenance of the NIS, including inspection and repair of equipment and controls on the NIS and maintenance in accordance with the equipment specifications; treatment of the injection wells for biofouling and nutrient precipitation, as needed, to remedy any significant declines in injection flow rates.

- Servicing and cleaning of pumps in SVE/GW wells as performed during the Phase I Subsurface Remediation.

- Operational and performance monitoring, including monthly monitoring of field parameters and nutrient levels; quarterly monitoring of total organic carbon (TOC), BTEX, inorganics; and continued quarterly monitoring of BTEX and total hydrocarbon in soil vapor at the North NAPL Area SVE remediation wells.

- Reporting Nutrient Injection (NI) activities, NI operating parameters, and results of sampling and monitoring in monthly and annual reports.

Occasional planned and unplanned shutdowns of the system occurred as part of the routine O&M activities. All circumstances related to unplanned system shutdowns were resolved. No operational or maintenance problems were encountered during the O&M. Details of the routine O&M activities performed to date, including system operation, downtime, and actions taken for operation and maintenance, are described in monthly progress reports and annual remedial action reports submitted to the EPA.

The subsurface remedial activities (ground water pumping, SVE, air sparging, air injection, and nutrient injection) were temporarily suspended on November 30, 2000 to implement the October 23, 2000, Sampling and Performance Assessment Plan for subsurface remediation progress evaluation. The October 23, 2000, Plan specified that SVE and ground water pumping will be resumed after steady state water and NAPL levels have been attained and the quarterly and semi-annual ground water sampling has been performed.

Following the performance assessment period, the SVE and vacuum enhanced pumping was resumed in April 2001 for the F and G Sandstone Units in the South NAPL Area in selected wells for focused SVE. Vacuum enhanced ground water pumping was also resumed in the North NAPL Area (E Sandstone Unit) in July 2001 after a rebound in the benzene concentration was observed in the leading edge plume well MW-10S.

The focused SVE in the South NAPL Area was suspended in October 2001 for further subsurface remediation progress evaluation, as agreed by the EPA. Ground water pumping without vacuum was continued at all the South NAPL Area remediation wells and at Miscellaneous NAPL Area wells RW-East and RW-20S until November 9, 2001, to determine the pumping rates without applied vacuum for the South NAPL Area remediation wells.

Vacuum enhanced ground water pumping in the North NAPL Area was suspended in October 2001 for the performance evaluation. Ground water pumping continued without vacuum through March 31, 2002, to observe benzene concentrations at well MW-10S and to determine the efficiency of pumping towards maintaining contaminated ground water containment in leading edge plume for Monitored Natural Attenuation (MNA) evaluation.

Vacuum enhanced ground water pumping in F and G Sandstone Units (South and Miscellaneous NAPL Areas) remediation wells was resumed on July 10, 2002, to implement injection testing. The field injection testing was completed on August 3, 2002.

Active subsurface remedial activities have been suspended for the remainder of the reporting period as Phase I Subsurface Remediation was completed in all areas of the Site. Ground water monitoring was continued for data collection, and evaluation of containment and MNA in the E Sandstone Unit. Maintenance of the remediation system, as needed, continued during this reporting period.

Table 2 lists the actual annual O&M costs for this review period, not including costs incurred by PRPs for project management and administration, and EPA oversight. The cost includes ground water monitoring and reporting.

Table 2
Annual O&M Costs

Period		Total Annual O&M Cost
From	To	
May 2000	April 2001	$453,800
May 2001	April 2002	$491,600
May 2002	April 2003	$318,400
May 2003	April 2004	$215,400
May 2004	April 2005	$233,700

The annual O&M costs of $430,400 for NAPL extraction remedy, and $367,200 for the ground water remedy were estimated in the ROD. The Phase I Subsurface Remedy is a combined remedy as it includes ground water containment, ground water pumping, treatment and re-injection in the source areas, and NAPL extraction. The actual O&M Costs reported in the first Five-Year Review report were representative of the combined remedy.

V. Progress Since the Last Five-Year Review

In the first Five-Year Review (September 2000), the remedy for the Site was found to be protective of human health and the environment. No deficiencies were noted, except that appropriate steps have not been implemented to ensure that supply wells are not installed in the impacted aquifer. The first Five-Year Review (September 2000) contained four recommendations for subsurface remedial actions at the Site. The recommendations and action taken are described below:

1. Appropriate steps need to be implemented to ensure that supply wells will not be drilled in an impacted aquifer in off-site areas.

   Except the E Sandstone Unit leading edge plume, the entire impacted shallow ground water was on site, owned by PRPs. The PRPs acquired the land that contains the E Sandstone Unit leading edge plume and some additional buffer area to ensure that supply wells will not be drilled in the impacted aquifer. Now the entire impacted shallow ground water plume on site is owned by the PRPs. In addition, the PRPs are in the process of placing deed restrictions on the property, which will prohibit installation of any supply wells in the impacted aquifer.

2. With the current progress of NAPL extraction and results of preliminary equilibrium soil vapor sampling, a confirmatory equilibrium soil vapor sampling and operational analysis should be performed to determine if remedial action objectives of Phase I Subsurface Remediation in South and Miscellaneous NAPL Areas are attained.

   A final confirmatory equilibrium soil vapor sampling and operational analysis was performed in November 2000. The equilibrium soil vapor sampling results supported a conclusion that the remedial action objectives of Phase I Subsurface Remediation in South and Miscellaneous NAPL Areas have been attained. The results were included in the December 2000 Monthly Progress Report and in the Phase I Subsurface Remediation in the South and Miscellaneous NAPL Areas Completion Report (December 12, 2002).

3. The data indicate an overall decline in BTEX concentration in the E Sandstone Unit since the Phase II Subsurface Remediation implementation, and the BTEX concentrations appear to have reached asymptotic levels. Therefore, testing for the magnitude of rebound in ground water BTEX concentrations in the North NAPL Area and in the leading edge plume should be performed. This testing would also determine if the decline in BTEX concentrations has resulted from biodegradation or from dilution by injection of water during nutrient injection operations.

The Sampling and Performance Assessment, as described in the October 23, 2000 Sampling and Performance Assessment Plan for subsurface remediation progress evaluation was implemented in November 2000, which included testing for the magnitude of rebound in ground water BTEX concentrations in the North NAPL Area and in the leading edge plume. The BTEX concentrations during more than seven months of suspension of the remedy were similar to the concentrations prior to the suspension. Thus, it appears that the nutrient injection activities were effective in initially reducing the BTEX concentrations, however, the concentrations have reached asymptotic levels with benzene concentrations well above the MCL. The testing showed a rebound in ground water BTEX concentrations in the E Sandstone Unit leading edge plume.

4. Even though the ground water BTEX concentrations in the E Sandstone Unit declined initially following implementation of both phases of the remedy (Phase I - ground water extraction, treatment and reinjection; Phase II - components of Phase I and enhanced in situ biodegradation of BTEX by nutrient injection), the concentrations have reached asymptotic levels and remain elevated above the ROD cleanup levels. Based on the data obtained during the O&M implementation, the time frame to remediate the E Sandstone Unit will be significantly longer than the 30 years estimated in the ROD. The lack of further progress in ground water remediation is due largely to the technical limitations in remediating NAPL-impacted ground water; especially in very low permeability heterogeneous fractured rock such as occurs at the Site. The ground water extraction and treatment, even with enhanced in situ biodegradation, may not be significantly more efficient than natural attenuation for this type of fractured bedrock formation. Therefore, it may be appropriate to consider a MNA remedy for the Site. The Site meets all relevant MNA selection criteria specified in the Office of Solid Waste and Emergency Response (OSWER) Directive Number 9200.4-17P (Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Actions, and Underground Storage tank Sites).

   In a meeting on April 29, 2005 at Santa Fe, NM, ARCO/El Paso, EPA and NMED agreed that the E Sandstone Unit at the Site might meet relevant MNA selection criteria specified in the OSWER Directive Number 9200.4-17P (Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Actions, and Underground Storage tank Sites). The EPA has directed the PRPs to collect additional data to make a determination of a future cleanup strategy.

VI. Five-Year Review Process

Mr. Sairam Appaji, EPA Remedial Project Manager (EPA RPM) and Mr. Jake Ingram, Project Manager (NMED) led the Prewitt Superfund Site second Five-Year Review. The following team members assisted in the review:

- Don Williams, EPA, Region 6
- Dana Bahar and Jake Ingram, NMED
- Brian Jordan, U.S. Army Corps of Engineers representative
- Natver Patel, O&M Contractor Project Manager

This five-year review included the following:

- Document Review,
- Data Review,
- Site Inspection,
- Interviews, and
- Five-Year Review Report Development and Review.

A. Document Review

This five-year review consisted of a review of relevant documents, including O&M records and monitoring data (see Attachment 2). The ARARs for the subsurface remediation, contained in the September 1992 ROD, were reviewed for applicability, relevance, and appropriateness.

B. Data Review

As discussed previously, extensive operational and performance monitoring data has been reported and analyzed to determine the effectiveness of the subsurface remediation. The results of all operational and performance monitoring are submitted to the EPA in monthly progress reports and are also summarized in annual remedial action reports. A review of records and monitoring reports through April 30, 2005 (end of the second five-year review period) was performed. The subsurface remediation data review is consistent with the phased remediation implementation.

The objectives of the Phase I Subsurface Remediation were:

- To remove or contain NAPL to prevent further ground water contamination,
- Control migration of contaminated ground water,
- Remediate ground water in NAPL source areas, and
- Collect data for Phase II Subsurface Remediation planning for further ground water remediation.

B.1 NAPL Extraction (Phase I Subsurface Remediation)

The RI for the Site identified two large NAPL plumes and five smaller NAPL plumes where refinery wastes (e.g., F037) have accumulated to measurable thickness in monitoring wells. The extents of these NAPL areas were identified from numerous borings, core samples, and field gas chromatographs taken during the RI. The large NAPL plume located in the E Sandstone Unit north of Highway 122 in the area around Well N-16P is referred to as the "North NAPL Area". The large NAPL plume in the F Sandstone in the area around Well N-22P in the former main refinery location is referred to as the "South NAPL Area". The eight smaller NAPL plumes identified in the RI and during RD/RA, which were each referred to by the well located within the NAPL plume (i.e., the Gas Well, the East Well, N-8P, 20S, N5P, 21S, 31E and 4S NAPL plumes) were collectively referred to as the "Miscellaneous NAPL Areas". The RI results showed that the NAPL at these Miscellaneous NAPL Areas were not laterally extensive.

Phase I Subsurface Remediation objectives for the North NAPL Area, primarily NAPL extraction from the E Sandstone Unit, were attained in 1998 and approved by the EPA during the first Five-Year Review period. The Phase I Subsurface Remediation completion in the North NAPL Area, and NAPL extraction progress in the South and Miscellaneous NAPL Areas through April 2000 were discussed in the September 2000 First Five-Year Review report.

The Phase I Subsurface Remediation in the South and Miscellaneous NAPL Areas continued during the second Five-Year Review period. Monitoring data collected to evaluate NAPL extraction include the following:

- Soil vapor contaminant concentrations and extraction rates at each extraction well.

- Concentrations and flow rates at the SVE headers and Thermal/Catalytic Oxidizer Unit (TOU) Feed.

- NAPL thickness in monitoring wells located within the NAPL plumes.

- Volume of NAPL extracted from fluids pumped from remediation wells.

Approximately 32,000 gallons of NAPL were estimated in the RI/FS and in the ROD in the South and Miscellaneous NAPL Areas at the Site. NAPL extraction is achieved through both the SVE and liquid NAPL recovery by pumping. As summarized in Table 3, more than twice the amount of NAPL has been removed than estimated in the ROD.

Table 3
South and Miscellaneous NAPL Area NAPL Extraction Summary Data – Feb 2002

<table>
<tr><th>NAPL Area</th><th>Total NAPL Volume Estimated In ROD (gallons)</th><th>NAPL Extracted by SVE (gallons)</th><th>NAPL Extracted by Pumping Liquids (gallons)</th><th>TOTAL (gallons)</th></tr>
<tr><td>South NAPL Area (F and G Sandstone Units)</td><td>29,700</td><td>68,518</td><td rowspan="2">4,208</td><td rowspan="2">87,542</td></tr>
<tr><td>Miscellaneous NAPL Areas (E, F and G Sandstone Units)</td><td>2,300</td><td>14,816</td></tr>
<tr><td>Total</td><td>32,000</td><td>83,334</td><td>4,208</td><td>87,542</td></tr>
</table>

Figures 2 and 3 summarize the SVE System performance based on the SVE mass recovery rates over time. The NAPL extraction monitoring data summary is included in Attachment 3. Recovered liquid NAPL was accumulated in the NAPL Recovery Tank located next to the Treatment Plant and the NAPL Storage Tank. Both NAPL tanks were vented to the SVE Header for headspace fume recycling as a supplemental fuel for the TOU. In addition, venting of these NAPL tanks to the vacuum headers minimized potential for hydrocarbon emission into the atmosphere from the tanks. The extracted soil vapors were treated with the TOU. The monthly monitoring data show that the TOU treatment met the performance ARARs for emission.

The NAPL thickness level measurements in monitoring wells show that the available liquid NAPL extraction has been completed in the South and Miscellaneous NAPL Areas. Table 4 summarizes the NAPL thickness levels in the South and Miscellaneous NAPL Area monitoring wells.

Table 4
NAPL Thickness Levels in Monitoring Wells

NAPL Area	Monitoring Well	NAPL Thickness Level, Feet		
		May 1995 (Initial)	Nov 2000	April 2005 (current)
South NAPL Area	N-22P	3.04	0.05	0.01
	N-25P	3.59	0	0
	N-26P	7.2	0.07	0.42
	MW-22S	0.21	0.00	0
Miscellaneous NAPL Area	MW-4S	0.14	0	0
	MW-20S	20.78	0	0
	N-1P	4.42	0	Traces
	N5P	4.62	0.02	0.02
	MW-21S	0.56	0	0
	MW-31E	0.13	0	0
	N6P	6.99	0.01	0.01
	N8P	4.05	0	0

Figure 2
SVE Mass Recovery, South NAPL Area

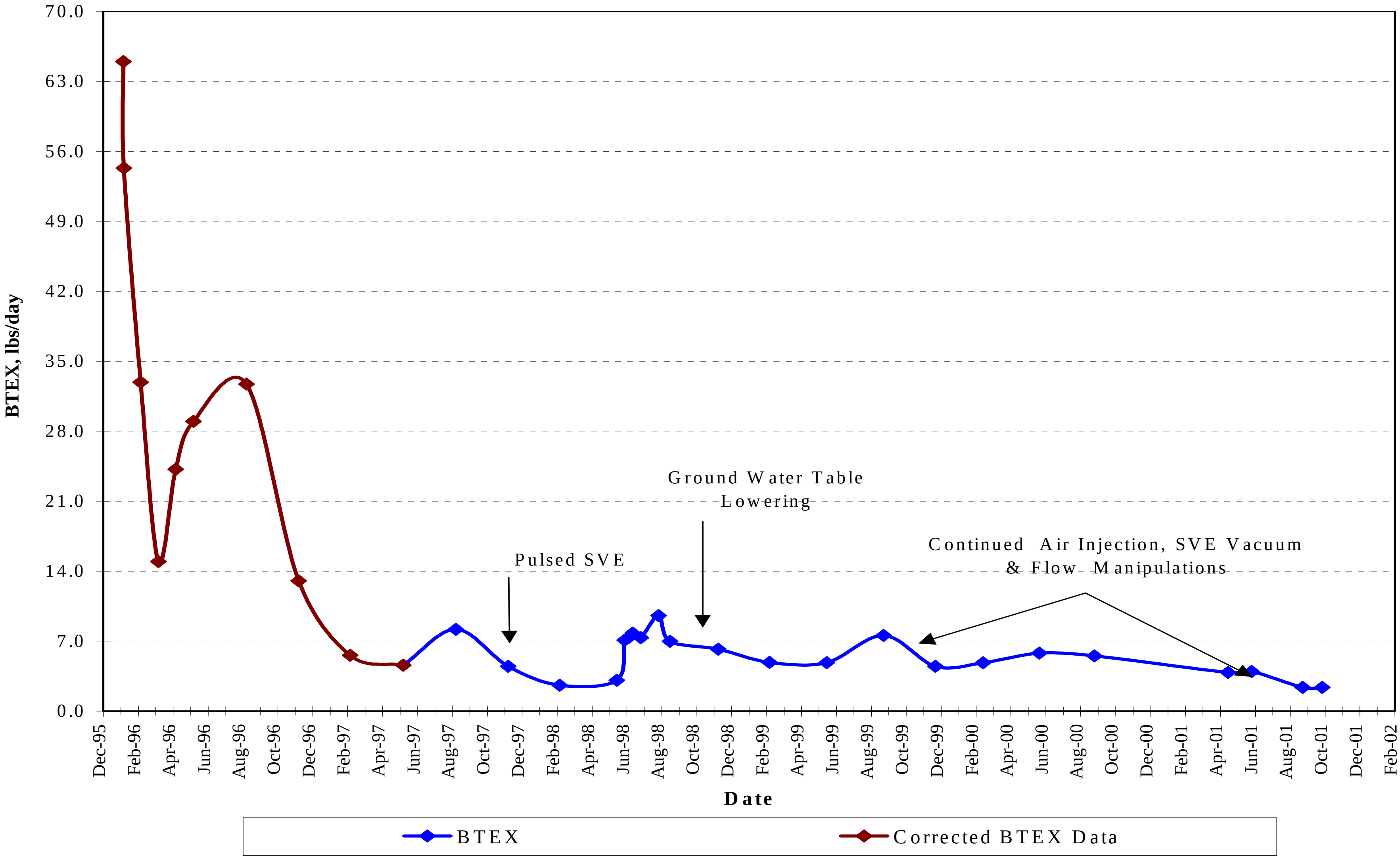
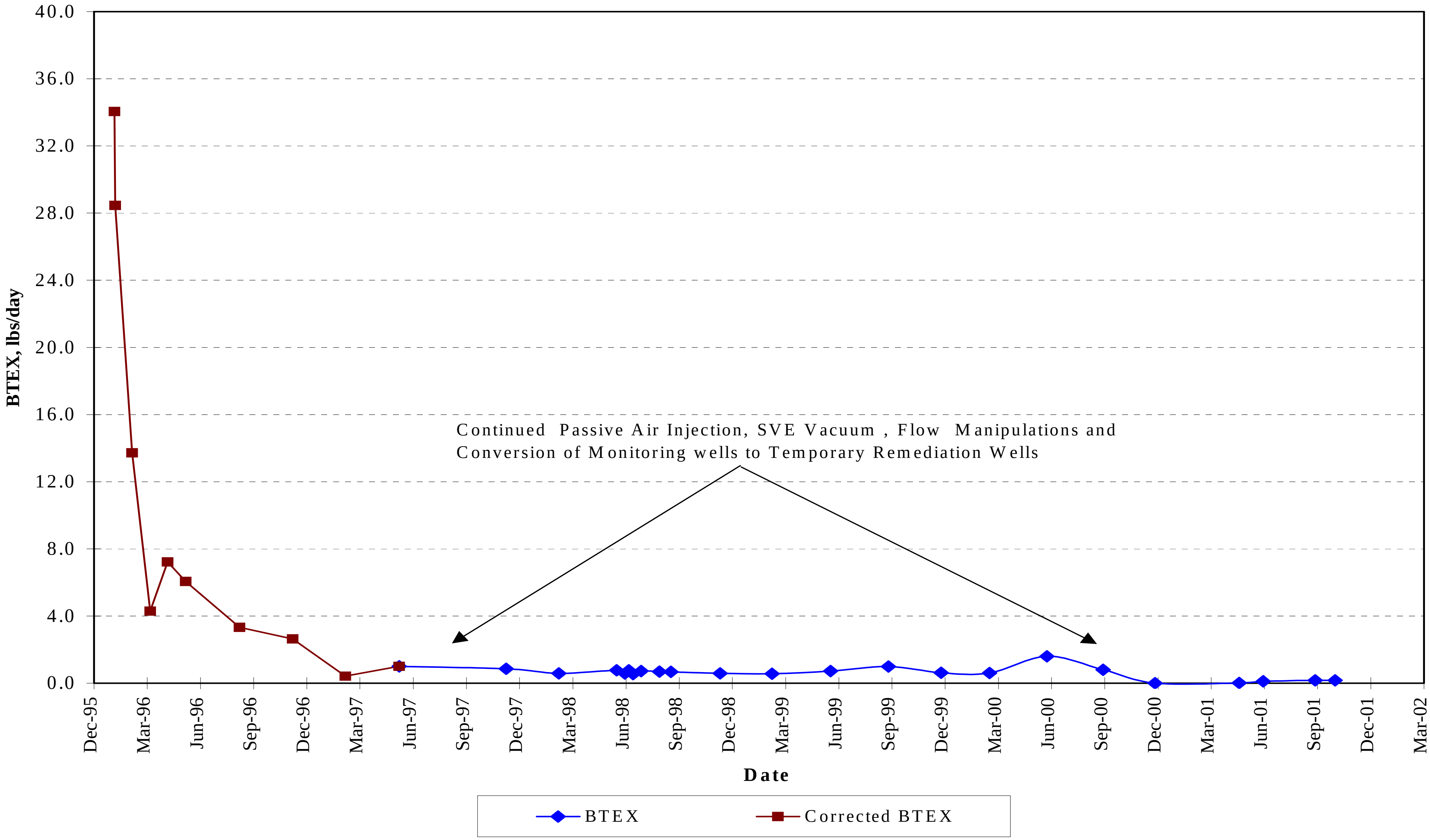


Figure 3
SVE Mass Recovery, Miscellaneous NAPL Areas



The NAPL thickness in nine of the thirteen South and Miscellaneous NAPL Area monitoring wells has been reduced to non-measurable levels. With an average measured residual NAPL thickness of 0.03' (0.4") during the performance assessment period (February 2002), the NAPL thickness has been reduced to less than 1% of the average NAPL thickness of 4.43' (57.6") for the 13 wells with NAPL prior to the RA. NAPL thickness in all of the Miscellaneous NAPL Area monitoring wells has been reduced to non-measurable levels, except at well N-6P. The NAPL thickness in well N-6P has been reduced from the pre-remediation level of approximately 7 feet to less than 0.01 feet (0.12") during the second performance assessment period.

A second equilibrium soil vapor test was performed in November 2000, as specified in the October 23, 2000 Sampling and Performance Assessment Plan for Subsurface Remediation. The results were included in the December 2000 Monthly Progress Report and are summarized in Table 5.

Table 5
November 2000 Equilibrium Soil Vapor Concentration Sampling Results

NAPL AREA	Pre-Remediation Estimated NAPL Volume (Gallons)	# of SVE Wells	Benzene SV Concentration, (ppmv)		Xylene SV Concentration, (ppmv)	
			Target Level	Sampling Results	Target Level	Sampling Results
South NAPL Area (F and G Sandstone Units)	29,700	36	25.0	6.6	390.0	17.4
Miscellaneous NAPL Area (F and G Sandstone Units)	800	10[(1)]	25.0	8.8	390.0	24.8

Note: (1) including the nearby monitoring well converted to temporary remediation well

Results for F and G Sandstone Unit wells in South and Miscellaneous NAPL Areas show that benzene and xylene concentrations are below the appropriate target levels. The remedial action goal for NAPL, as stated in the ROD, is removal or containment of the NAPL by SVE to prevent further contamination of ground water. Because the NAPL removal goal was based on its potential impact to ground water, site-specific target levels for BTEX constituents in soil vapors in equilibrium with residual NAPL were developed using a thermodynamic equilibrium analysis. These target levels for BTEX constituents in static or equilibrium soil vapors would indicate when the residual NAPL was no longer a source for BTEX in the aquifer at levels exceeding the remediation goals. The determination of that target level as measured by benzene concentration in the vapor stream is described in Sections 3.1.1 and 3.1.2 in the "Feasibility Report Supplement, NAPL/Ground Water Remedial Action Alternative" that was submitted to the EPA on April 29, 1992. The performance standard for the NAPL extraction specified in the EPA approved RD Report is to remove the volatile BTEX fraction of NAPL as is technically feasible.

The flow-weighted average benzene equilibrium soil vapor concentration for the three E Sandstone Unit Miscellaneous NAPL Area wells remained slightly above the target level, due to the elevated concentration in well RW-East. The soil vapor concentrations at the other two E Sandstone wells, RW-31E and RW-GAS, remained below the target level. The NAPL thickness measurements in the monitoring well N-6P located near the remediation well RW-East indicate residual NAPL in that area. Given the complexity and heterogeneity of the fractured bedrock formation, target level attainment in this isolated RW-East well area may not be technically practicable. NAPL levels and SVE extraction rates are at asymptotic levels and the remedy is no longer efficient in this area.

The performance assessment monitoring data indicate that the remediation system, with all reasonable modifications is no longer efficient in removing the residual NAPL due to heterogeneity and very low permeability of the fractured bedrock system.

A NAPL sampling was performed in October 2002 from the monitoring wells containing residual NAPL to determine if the residual NAPL would be a source for further contamination of ground water. Results of the BTEX analysis from this NAPL sampling event were reported in December 2002 Monthly Progress Report and the December 2002 completion Report for the Phase I Subsurface Remediation in the South and Miscellaneous NAPL Areas. The NAPL analysis provided estimates of the mole fractions of BTEX constituents in the residual NAPL so that current NAPL water solubility concentrations can be determined and compared with the current BTEX concentrations in ground water.

At this time, these results indicate that the presence of residual NAPL (following Phase I Subsurface Remediation) in the F and G Sandstone Units is not a source for further ground water contamination above the MCLs. By the time the BTEX concentrations in ground water in the F and G Sandstone Units decline below the current NAPL solubility limits, the NAPL solubility limits will be considerably lower than the current values due to volatilization, dissolution and biodegradation.

The operational and performance assessment monitoring results showed that the Phase I Subsurface Remedy for the F and G Sandstone Units met the objectives and performance standards specified in the EPA-approved RD Report. The Phase I Subsurface Remediation completion accomplished the following:

- Recovered over 4,200 gallons of free NAPL.
- Removed over 500,000 lbs. (approximately 75,000 gallons) of volatile hydrocarbon, including 20,000 lbs. of BTEX by SVE.
- Removed volatile fraction of NAPL by SVE such that the site-specific contaminant target levels for BTEX have been attained.

- Reduced ground water BTEX concentrations in source areas.
- Effectively contained contaminated ground water.
- Reduced toxicity, volume, and mobility of NAPL.

The NAPL extraction (Phase I Subsurface Remediation) for the South and Miscellaneous NAPL Areas was determined to be complete based on NAPL thickness levels, SVE mass recovery measurements, and the residual soil vapor concentration. The completion report for Phase I was approved by the EPA in January 2003.

B.2 Ground Water Remediation

In addition to the NAPL extraction, the Phase I Subsurface Remediation system was designed and constructed to provide substantial ground water remediation consistent with the ground water pumping, treatment, and re-injection remedy selected in the ROD.

Flow meters and sampling ports were installed on the pumping well discharge headers where they enter the Treatment Building. The North Header meter measures the ground water extracted from the North NAPL Area remediation wells in the E Sandstone Unit. The South Header meter measures the ground water extracted from the remediation wells in the South NAPL Area in the F Sandstone Unit and Miscellaneous NAPL Areas in the E, F and G Sandstone Units.

A flow meter is also installed on the treated water discharge line where it exits the Treatment Building. The cumulative flow meter readings for the North and South Header and the treated water discharge line have been recorded on the days that treatment plant operators were working at the Site. A summary of the daily ground water pumping and treated water discharge rates and volumes were provided to the agencies in monthly progress reports.

Plots of monthly flows from the North Header, the South Header, and the treated water discharge are provided in Figure 4. The volume of ground water extracted/treated, weighted average BTEX concentrations, and dissolved BTEX mass removed from the NAPL source areas are included in Attachment 3 and summarized in Table 6. As shown in Figure 4, both the North and South Header flows declined during the subsurface remediation toward lower steady state rates. The data show very low ground water pumping rates, even though the ground water is pumped with applied vacuum of over 15” Hg to the remediation wells, as the ground water extraction is performed in conjunction with SVE. The low rates are due to very poor hydraulic conductivity of the formation. Very wide range of pumping rates (0.001 to 0.05 gpm in F and G Sandstone Unit and 0.01 to 0.18 gpm in the E Sandstone Unit) indicate very low yield and significant heterogeneity of the fractured bedrock

Figure 4
Monthly Extracted Ground Water & Treated Water Discharge Flows

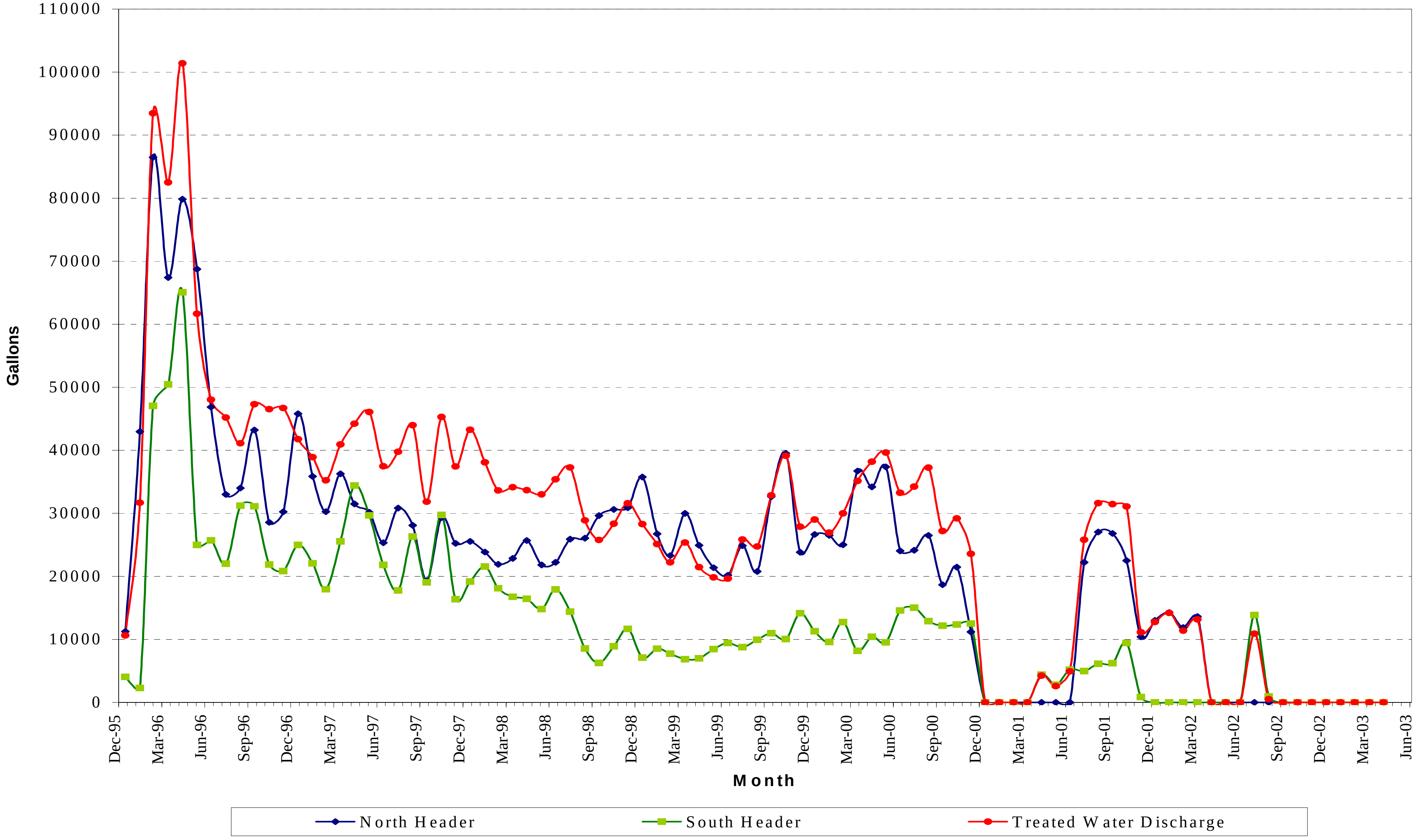


Table 6
Ground Water Extraction and Concentration Data for NAPL Source Areas

		North NAPL Area (E Sandstone Unit)	South & Misc NAPL Areas (1) (E, F & G Sandstone Units)	Total
Volume of Water Pumped and Treated (gallons)	First Five-Year Review Period (Dec 1995 – April 2000)	1,720,448	967,837	2,688,285
	Second Five Year Review Period (May 2000 – April 2005)	325,077	143,827	469,904
	Total	2,045,525	1,111,664	3,157,189
Benzene Concentration, mg/l	First Five-Year Review Period (Dec 1995 – April 2000)	2.610	3.240	--
	Second Five Year Review Period (May 2000 – April 2005)	0.82	0.55	
	Weighted Average	2.33	2.89	
Toluene Concentration, mg/l	First Five-Year Review Period (Dec 1995 – April 2000)	3.110	5.620	--
	Second Five Year Review Period (May 2000 – April 2005)	0.50	0.93	
	Weighted Average	2.70	5.01	
Ethylbenzene Concentration, mg/l	First Five-Year Review Period (Dec 1995 – April 2000)	0.520	0.680	--
	Second Five Year Review Period (May 2000 – April 2005)	0.08	0.11	
	Weighted Average	0.45	0.61	
Xylenes Concentration, mg/l	First Five-Year Review Period (Dec 1995 – April 2000)	3.232	4.790	--
	Second Five Year Review Period (May 2000 – April 2005)	1.20	1.28	
	Weighted Average	2.91	4.34	
BTEX Mass Removed (lbs)	First Five-Year Review Period (Dec 1995 – April 2000)	135.9	115.64	251.5
	Second Five Year Review Period (May 2000 – April 2005)	7.0	3.45	
	Total	142.9	119.09	

Note: (1) Five F&G Sandstone Unit NAPL Areas and three E Sandstone Unit NAPL Areas

formation at the Site, as the average distance between remediation wells is only about 15 feet within well fields.

Ground water recovery by vacuum enhanced pumping from the eleven E Sandstone Unit remediation wells in North NAPL Area averaged about 0.68 gpm, or about 0.06 gpm per well. The average annual pumping rate declined from about 0.1 gpm per well in 1996 to 0.05 gpm in 2001. The ground water pumping data shows that the E Sandstone Units yield an average of less than 0.03 gpm per well with normal ground water pumping without vacuum.

The data show that the average vacuum enhanced pumping rate from the F and G Sandstone Unit wells on the South Header was approximately 0.005 gpm per well during the period from 1996 through 2001. The average annual pumping rate declined from 0.0106 gpm (about 15 gallons per day) per well in year 1996 to 0.0028 gpm (about 4 gallons per day) in year 2001. The ground water pumping data shows that the F and G Sandstone Unit yield an average of less than 0.002 gpm per well or about 2 gallons per day per well with normal ground water pumping without vacuum.

The extracted ground water was treated using an air stripping system and filtered through 5-micron bag filters prior to discharge to the Shallow Injection System. The monthly sampling results of the stripper effluent indicate that the air stripper is efficient in removing the BTEX and naphthalenes to well below the discharge limit. Therefore, further treatment of the discharge water with Granular Activated Carbon (GAC) was not necessary. However, one GAC unit was maintained for standby use, if needed. A total of 2,564,892 gallons of treated water was either discharged to the shallow injection system or re-injected with NIS operations. The total treated water discharged and injected is less than the total ground water extracted because of evaporative loss of water during the air stripping treatment. A monthly monitoring data summary of contaminant concentrations in extracted ground water and treated water discharged is included in Attachment 3. The concentrations of BTEX, total lead, and naphthalenes in monthly samples (original and the sample duplicate) of the treated water discharge continued to meet the effluent limits for shallow injection.

Phase II Subsurface Remedial Activities, consisting of batch nutrient injection in conjunction with vacuum enhanced ground water pumping in the E Sandstone Unit continued during this review period. The nutrient injection activities were suspended in October 2000, as discussed in Section IV.C, for performance assessment monitoring implementation. Table 7 summarizes the nutrient injection activities during this review period. The nutrient injection activities are summarized in Table 8.

A review of nutrient injection operation data indicates that the formation injection acceptance rates are low. These poor acceptance rates are attributed to very low and heterogeneous permeability of the fractured bedrock formations. Moreover, the nutrient injection rates declined over time.

Table 7
E Sandstone Unit Nutrient Injection Summary (May 2000 to October 2000)

NI Well	# of Cycles	Injection Rate gpm	Total Volume gallons	NO_3 - N lbs	NH_4 - N lbs	PO_4 - P lbs
AS/NI-1	4	0.45	2,103	0.09	0.59	0.42
AS/NI-2	4	0.36	1,014	0.04	0.30	0.21
AS/NI-3	4	0.73	2,075	0.09	0.59	0.42
MW-2S	2	0.05	488	0.02	0.14	0.11
MW-24S	2	0.11	258	0.01	0.12	0.08
N-10P	2	0.04	237	0.01	0.08	0.05
MW-6S	0	0.00	0	0.00	0.00	0.00
MW-7S	0	0.00	0	0.00	0.00	0.00
Total	**18**	**0.22**	**6,174**	**0.26**	**1.81**	**1.28**

Table 8
E Sandstone Unit Nutrient Injection Summary (September 1998 to October 2000)

NI Well	# of Cycles	Injection Rate gpm	Total Volume gallons	NO_3 - N lbs.	NH_4 - N lbs.	PO_4 - P lbs.
AS/NI-1	47	0.55	24,812	1.09	6.91	5.07
AS/NI-2	34	0.24	13,408	0.62	3.74	2.73
AS/NI-3	47	0.73	24,952	1.09	6.91	5.07
MW-2S	25	0.06	7,313	0.35	2.04	1.49
MW-24S	7	0.07	1,094	0.04	0.31	0.22
N-10P	7	0.05	949	0.03	0.23	0.16
MW-6S	33	0.37	15,697	0.72	4.32	3.23
MW-7S	30	0.32	15,232	0.70	4.18	3.13
Total	**230**	**0.27**	**103,456**	**4.64**	**28.63**	**21.11**

B.3 Ground Water Remediation Progress Evaluation

The evaluation of ground water remediation progress is based on monitoring of BTEX in the ground water headers, and on semi-annual monitoring of BTEX concentrations in ground water within and near the NAPL source areas.

E Sandstone Unit

Monthly monitoring of BTEX concentrations in the ground water extracted from the NAPL source areas was also performed to provide an indication of the progress of ground water remediation in the NAPL source areas. A review of the North NAPL Area Ground Water Header (11 extraction wells combined) monitoring data is included in Attachment 3, and summarized in Table 9.

Table 9
North NAPL Area Ground Water Concentrations Summary

Constituent	Pre Phase II (September 1998) North Ground Water Header Concentration	Recent (Jan – March 2002 Average) North Ground Water Header Concentration	ROD Cleanup Level
Benzene, mg/l	3.300	0.96	0.005
Toluene, mg/l	3.100	0.64	0.750
Ethylbenzene, mg/l	0.830	0.09	0.700
Xylenes, mg/l	3.700	1.20	0.620
Total BTEX, mg/l	10.930	2.89	---

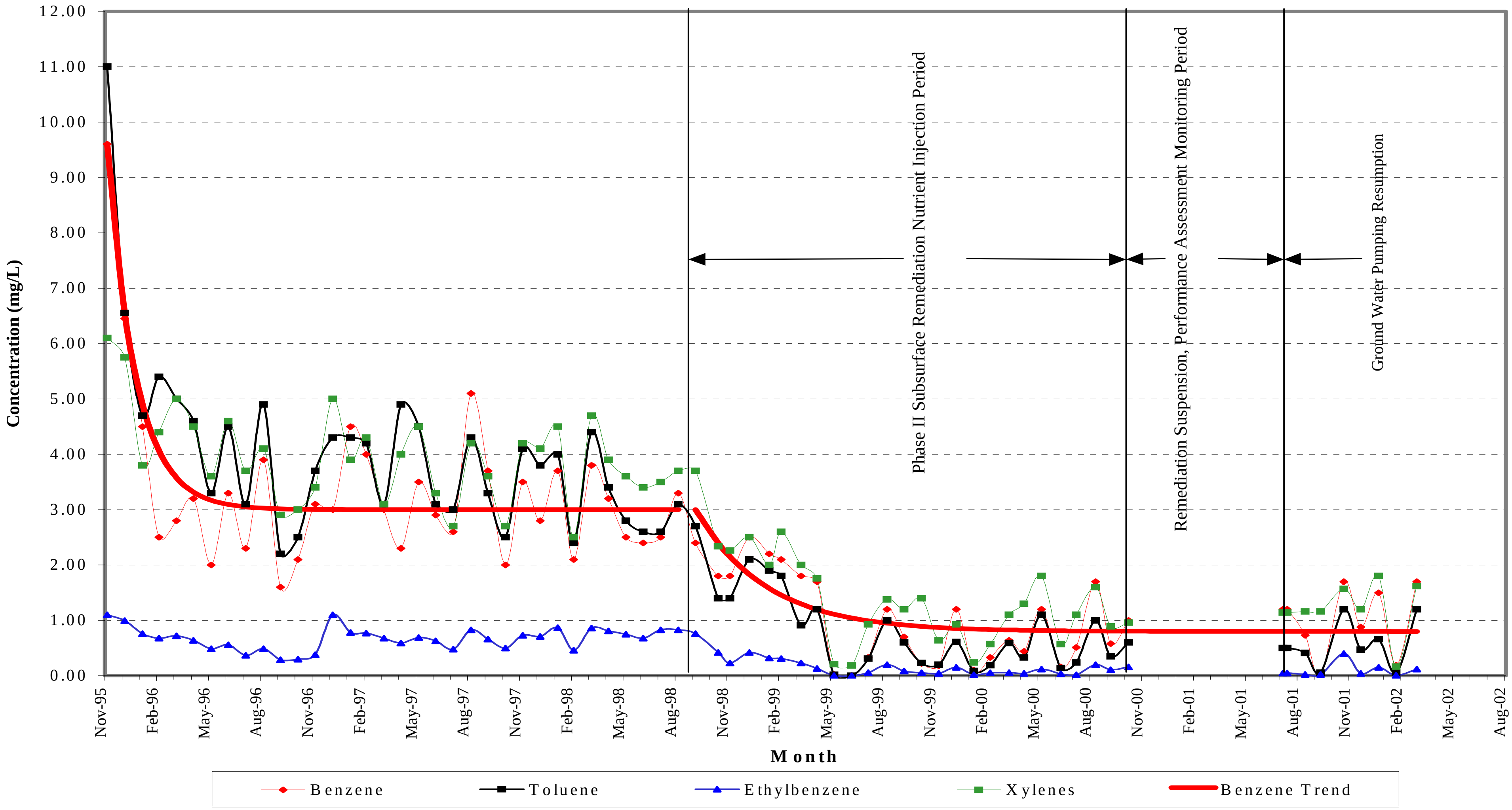
The data show a reduction in BTEX concentrations following implementation of Phase II nutrient injection activities in September 1998. The data indicates an overall decline in BTEX concentration in the North NAPL Area E Sandstone Unit since the Phase II Subsurface Remediation implementation, although there is a considerable fluctuation in the BTEX concentrations.

BTEX concentrations from monthly monitoring of the North Ground Water Header are plotted in Figure 5. Figure 5 shows initial concentration reductions in extracted ground water following start-up of Phase I Subsurface Remediation in the North NAPL Area. However, the concentrations remained elevated following the initial decline. BTEX concentrations declined following implementation of the Phase II Subsurface Remediation nutrient injection in September 1998. However, the BTEX concentrations reached a steady state level approximately a year following the implementation of nutrient injection in September 1998. The BTEX concentrations remained at steady state levels, above the cleanup levels for over a year, as shown in Figure 5. Based on agreement with EPA, the active remediation was suspended in November 2000 to implement performance assessment monitoring to determine if the decline in BTEX concentration was due to dilution from nutrient injection activities, and to determine any rebound in BTEX concentrations. As shown in Figure 5, the BTEX concentrations following over seven months of suspension of the remedy were essentially similar to the concentrations prior to the suspension. The nutrient injection activities were effective in reducing the BTEX concentrations initially, however, the concentrations reached asymptotic levels, and remain above the MCLs.

Semi-annual ground water monitoring is performed to provide an indication of ground water remediation progress. Time series plots for BTEX concentrations in the semi-annual monitoring wells in the E Sandstone Unit are provided in Attachment 3. The figures show unchanged to declining BTEX concentrations with no significant rebound in nine E Sandstone Unit monitoring wells (AS/OBS-1, AS/OBS-2, MW-E8E, MW-08S, N-14P, MW-31E, MW-06, MW-07, and N-10P). One monitoring well, MW-02S, shows wide fluctuations in BTEX concentrations with an apparent rebound following suspension of vacuum enhanced ground water pumping in October 2001.

Figure 5

North Ground Water Headers BTEX Concentration Trend



The Miscellaneous NAPL Area well, N-6P completed in the E Sandstone and the Upper Confining Zone (UCZ) had previously showed detectable levels of NAPL and was temporarily converted to SVE remediation. Comparison of recent sampling results with the pre-remediation level indicates a decline in benzene and toluene concentrations followed by a rebound in 2002. The BTEX concentrations appear to be declining with some fluctuations. Overall, the data shows a decline in BTEX concentrations in 10 of the 12 E Sandstone Unit wells, when compared to pre-remediation concentrations. Well MW-24S shows a decline in toluene concentrations; however, the benzene concentrations in this well fluctuate widely and show no apparent trend. BTEX concentrations fluctuate in well MW-02S with an apparent rebound following suspension of vacuum enhanced ground water pumping in October 2001.

The operational and performance assessment monitoring data have shown that pumping and treating and in situ biodegradation are inefficient for restoration of ground water at the Site due to technical limitations associated with the heterogeneous and low permeability fractured bedrock formation. The E Sandstone at the Site may meet the EPA's MNA Remedy Guidance criteria, including NAPL (source) removal, reduced source area ground water concentrations, inefficiency of continued active ground water remediation, and effective ground water containment with contingency, and presence of naturally biodegradable contaminants with no toxic by-products. Monitoring was implemented and maintained during the reporting period to obtain more information for MNA for the E Sandstone Unit.

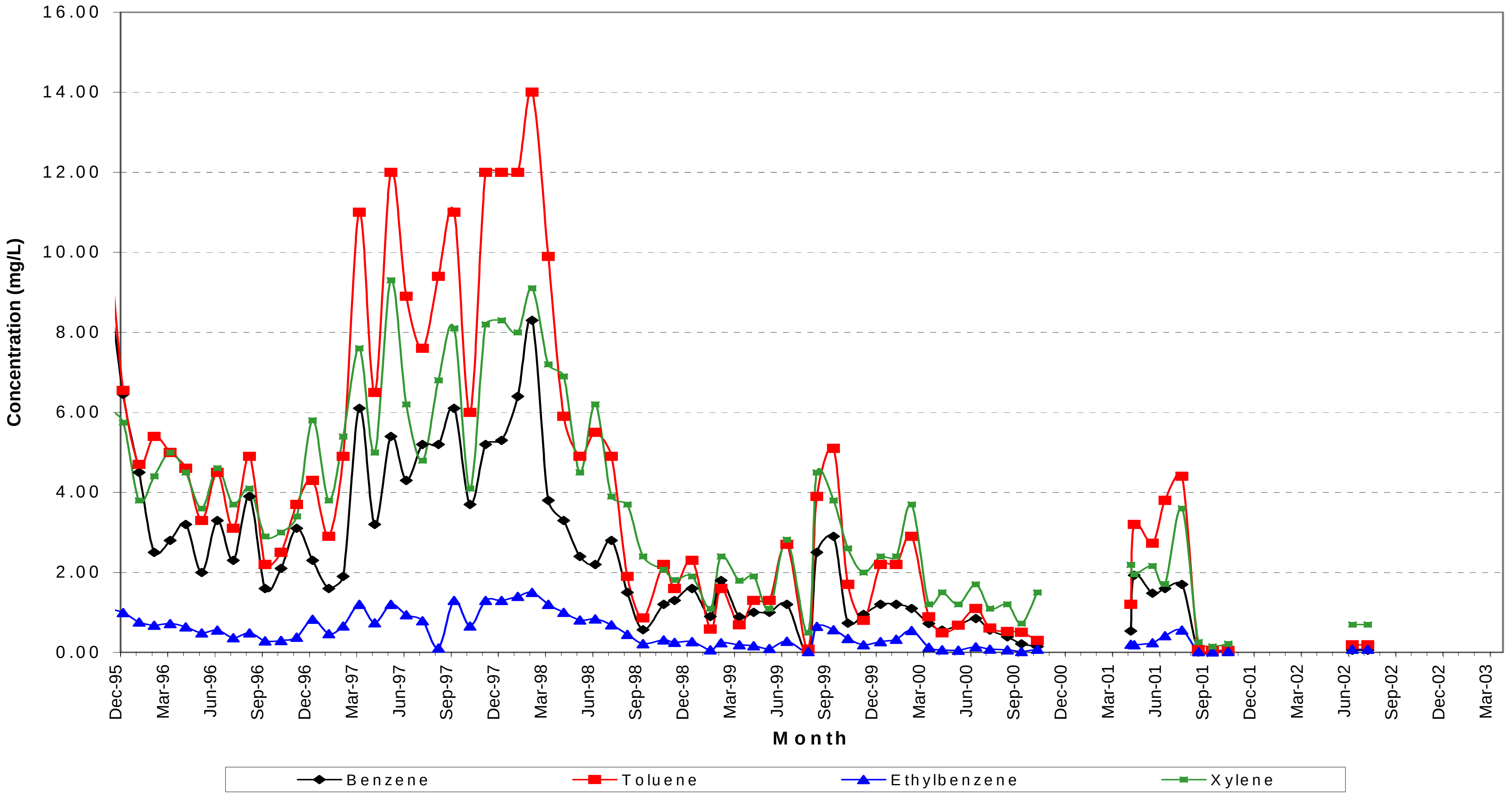
F and G Sandstone Units

BTEX concentrations from monthly monitoring of the South Ground Water Header, primarily the F and G Sandstone Units remediation wells, plotted in Figure 6, show an increase from March 1997 to March 1998 due to increased NAPL recovery following lowering of pumps in the South NAPL Area. The BTEX concentrations in the South Header declined significantly since April 1998 as shown in Figure 6. The decline in BTEX concentrations is due, in part, to the absence of liquid NAPL in much of the flow in the South Header. The BTEX concentrations in the South Header have declined significantly since April 1998 as shown in Figure 6.

Time series plots for BTEX concentrations in the semi-annual monitoring wells in the F and G Sandstone Units are provided in Attachment 3. Comparison of results with the baseline values in figures in Attachment 3 indicates a BTEX decline in all the wells. Well N-8P, which is completed in the UCZ, was the only well to show a significant rebound in benzene concentrations. Although NAPL is no longer present in this well, dissolved BTEX concentrations are not efficiently reduced by the very low rate of ground water flushing through this tight zone. The toluene, ethyl benzene, xylene

Figure 6

South Ground Water Headers BTEX Concentrations



concentrations in this well did not rebound like benzene. It appears that anaerobic biodegradation, which preferentially reduces TEX relative to benzene, is effective in preventing the rebound in these constituents. In the F and G Sandstone unit monitoring wells, it appears that aerobic biodegradation and effective SVE removal of more volatile constituents like benzene, toluene, and ethylbenzene has prevented a rebound in these constituents in the ground water.

Residual NAPL in the F and G Sandstone Units that has not been removed by the Phase I subsurface remediation is in equilibrium under current conditions. The current solubility limits calculated for BTEX constituents contained in residual NAPL are below the observed dissolved ground water concentrations. The BTEX compounds contained in the F and G Sandstone Unit ground water and the residual NAPL may decline over time due to volatilization and biodegradation.

The sampling results indicated that the ground water concentrations in the F & G Sandstone Units have reached asymptotic limits, and the ground water extraction and treatment is no longer efficient at further reducing BTEX concentration in ground water. The inefficiency of the ground water extraction and treatment remedy to further reduce ground water BTEX concentrations in the F and G Sandstone Units is due to the very low saturated thickness and the extreme heterogeneity and low hydraulic conductivity of the fractured bedrock formation.

B.4 Ground Water Containment

Quarterly sampling of five monitoring wells located within and beyond the leading edge plume in the E Sandstone Unit is performed in order to verify that the benzene plume in the E Sandstone Unit is not migrating. The ground water pumping during the subsurface remediation in the North NAPL Area also served to control the migration of the E Sandstone Unit leading edge plume. Annual monitoring of perimeter wells in the E, F and G Sandstone Units and deep wells in the B, C and D Sandstone Units of the Sonsela Aquifer is conducted to monitor overall containment of contaminated ground water.

Table 10 shows the pre-remediation and current benzene concentration monitoring results at leading edge plume monitoring wells. The quarterly benzene monitoring result summary for each well is included in Attachment 3. As indicated in Figure 7, benzene concentrations in wells MW-34E and MW-37E have remained at or below the detection limits. Benzene concentrations have declined significantly without any rebound in wells MW-27S and MW-38ER since the start of remedial actions.

Figure 7
E Sandstone Unit leading Edge Plume Well BTEX Concentrations

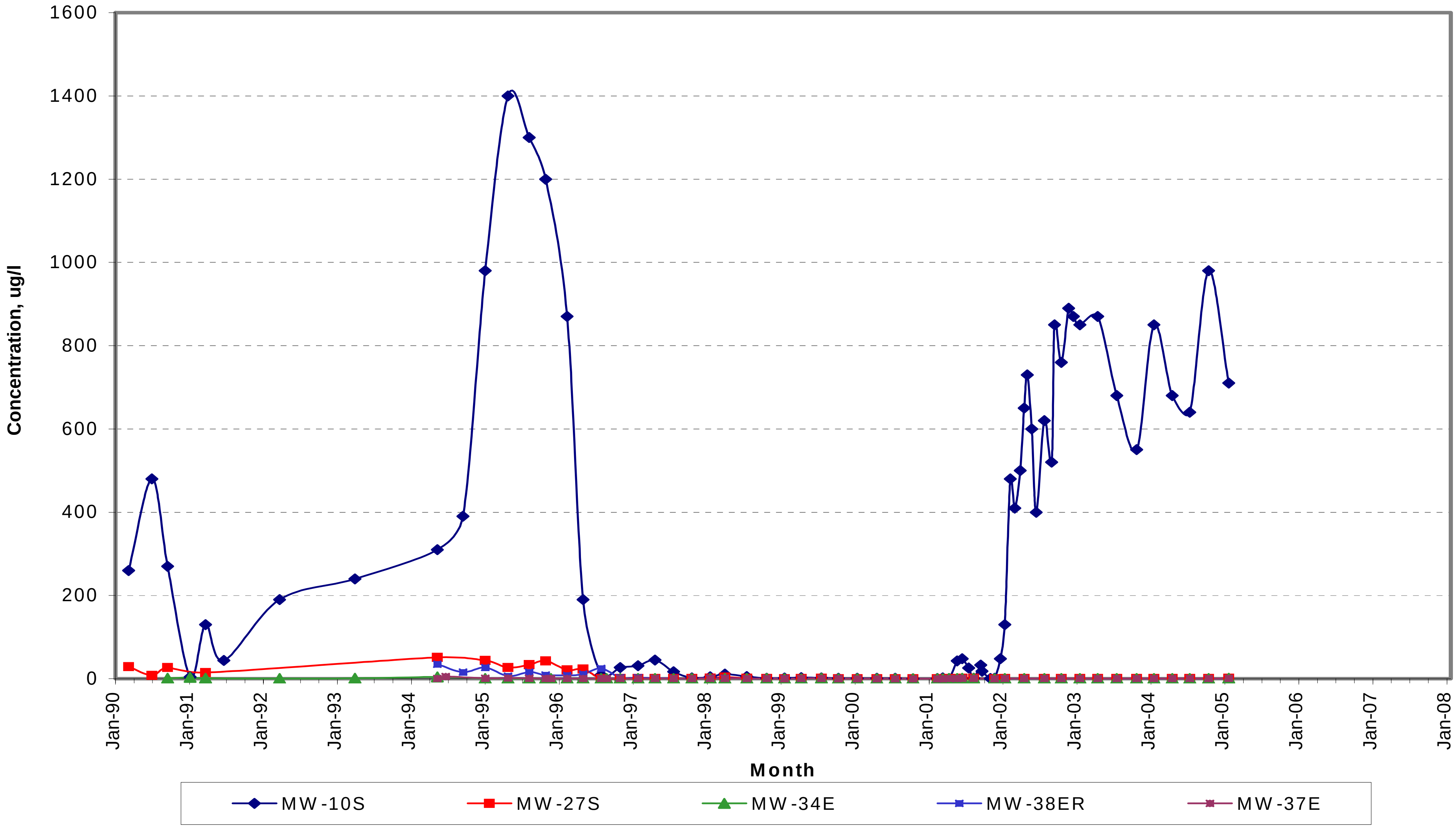


Table 10
E Sandstone Unit Leading Edge Plume Well Benzene Monitoring Results

Sampling Period	Benzene Concentrations in Leading Edge Plume Wells				
	MW-10S (ug/l)	MW-27S (ug/l)	MW-34E (ug/l)	MW-38ER (ug/l)	MW-37E (ug/l)
Pre-Remedial Action 1995 Quarterly Average	1220	37	<1.0	15	<1.0
Current February 2005	710	<1.0	<1.0	<1.0	<1.0

The benzene concentrations in well MW-10S have declined significantly from concentrations above 1200 ug/L to near the method detection limits of 1.0 ug/L in less than two years after the start-up of the Phase I Subsurface Remediation. The draw down resulting from vacuum enhanced ground water pumping in North NAPL Area was able to extend the capture zone to well MW-10S. The rapid decline in benzene concentrations with pumping also indicates the predominant influence of fracture flow.

The benzene concentrations in well MW-10S rebounded to about 44 ug/L in June 2001 following the temporary suspension of vacuum enhanced ground water pumping in November 2000. Benzene concentrations in MW-10S declined again to levels near the detection limit of 1.0 ug/L after vacuum enhanced ground water pumping was resumed in the North NAPL Area in July 2001. However, benzene concentrations in well MW-10S rebounded again in January 2002, following suspension of applied vacuum in North NAPL Area ground water remediation wells in October 2001. This rebound in benzene concentrations appears to be due to the reduction in pumping rates following suspension of applied vacuum in the North NAPL Area remediation wells. The collective ground water pumping rate from eleven North NAPL Area remediation declined from the 0.68 gpm to 0.31 gpm following termination of applied vacuum. The water level monitoring results in the North NAPL Area monitoring wells also indicated that the draw down from ground water pumping without vacuum was about half the draw down resulting from vacuum enhanced pumping. Apparently, the ground water draw down in the North NAPL Area resulting from pumping alone, without applied vacuum, may not be sufficient to extend the capture zone to well MW-10S.

The benzene concentration at well MW-10S was within the range of 400 to 500 ug/l at the end of March 2002 when all ground water pumping was suspended in the North NAPL Area. Benzene concentrations in well MW-10S rebounded further following the suspension of all pumping. Sample results over the last two years indicate that benzene concentrations have stabilized around 800 ug/L. Despite the rebound in benzene concentrations in the leading edge plume well MW-10S, the current benzene level is lower than the pre-remediation level of over 1200 ug/L. Thus, the subsurface remediation in the E Sandstone has met the objective of maintaining the benzene levels in leading edge plume wells at concentrations at or below the levels prior to start of remedial action. Also, benzene concentrations in leading edge plume wells MW-27S and MW-38ER have declined below the MDL and show no rebound. Monitoring well MW-38ER is down gradient of the well MW-10S, indicating effective containment.

Sampling and analysis for BTEX constituents in perimeter wells in the E, F, and G Sandstone Units; in deeper wells in the B, C, and D Sandstone Units was specified in the RD in order to monitor lateral and vertical extent of the BTEX containment. Benzene concentrations in all E, F, and G Sandstone Unit perimeter monitoring wells have remained near or below detection limits, indicating an effective lateral containment of contaminated ground water. Benzene concentrations in the deeper wells (B, C and D Sandstone Units) continue to remain at concentrations near or below detection, demonstrating effective vertical containment of contaminated ground water. The annual sampling results for BTEX for these monitoring wells are provided in Table 11. The New Mexico Water Quality Control Commission Regulations (NMWQCCR) standards and the EPA's MCLs for drinking water are included on the table for comparison.

Engineering Control & Residential Well Monitoring

The subsurface remedy includes the following engineering controls, which are being implemented, and maintained:

1. The ROD required installation of water treatment units (activated carbon treatment) on existing domestic wells that exceed MCLs. Nevertheless, the treatment units were installed on all five nearby residential wells, even though none of them exceeded the MCLs at that time.

2. Quarterly sampling of residential wells at the point of consumption. A quarterly sampling of residential well water before the treatment units, and after the treatment unit is performed at all wells.

3. The carbon treatment units are serviced quarterly by a local Culligan vendor.

Table 11
2005 Annual Ground Water Monitoring Results for BTEX

Well Description	Unit	Sample Date	Constituent Concentration (ug/L)				Comments
			Benzene	Toluene	Ethylbenzene	Xylenes	
MW-18S	F	04/08/05	1.0U	1.0U	1.0U	3.0U	Perimeter, clean
MW-32F	F	04/08/05	1.0U	1.0U	1.0U	3.0U	Perimeter, clean
MW-03S	F,E2	04/09/05	1.5	05J	1.0U	3.0U	Down gradient of the South NAPL Area, clean
MW-28E	E2	04/08/05	0.9J	1.3	1.0U	2.4J	Perimeter, clean
MW-32E	E	04/08/05	1.0U	1.0U	1.0U	3.0U	Perimeter, clean
MW-06S	E,D	04/08/05	1.0U	1.0U	1.0U	1.8J	Perimeter near North NAPL Area, clean
MW-06S Field Duplicate	E,D	04/08/05	1.0U	1.0U	1.0U	2.0U	MW-06S QA/QC Field Duplicate
MW-06S, USACE Field Duplicate	E,D	04/08/05	0.5U	0.5U	0.5U	1.0U	MW-06S QA/QC Field Duplicate Collected & Analyzed by USACE
MW-33E	E,D	04/09/05	1.0U	1.0U	1.0U	3.0U	Perimeter South Area
MW-08D	D	04/08/05	1.0U	1.0U	1.0U	3.0U	Below North NAPL Area
MW-31D	D	04/08/05	1.0U	1.2	0.6J	2.8J	Down gradient of Former MW-19S, clean
MW-06M	C	04/08/05	1.0U	1.0U	1.0U	1.7J	Down gradient intermittent detections
MW-07M	C	04/08/05	1.0U	1.0U	0.6J	1.9J	Down gradient the North NAPL Area, clean
MW-33C	C	04/09/05	1.0U	1.0U	1.0U	3.0U	Perimeter monitor (upgradient), clean
MW-36B	C	04/08/05	1.0U	1.0U	1.0U	3.0U	Below the North NAPL Area, clean
MW-17S	C	04/09/05	1.0U	1.0U	1.0U	3.0U	Deep well near N-6P NAPL, clean
MW-17S Field Duplicate	C	04/09/05	1.0U	1.0U	1.0U	3.0U	MW-17S QA/QC Field Duplicate
MW-17S, USACE Field Duplicate	C	04/09/05	0.5U	0.5U	0.5U	1.0U	MW-17S QA/QC Field Duplicate Collected & Analyzed by USACE
MW-10D	B	04/08/05	1.0U	1.0U	1.0U	1.6J	Perimeter monitor below MW-10S, clean
MW-10D Field Duplicate	B	04/08/05	1.0U	1.0U	1.0U	3.0U	MW-10D QA/QC Field Duplicate
MW-10D, USACE Field Duplicate	B	04/08/05	0.5U	0.5U	0.5U	1.0U	MW-10D QA/QC Field Duplicate Collected & Analyzed by USACE
NMWQCCR Human Health Standards			10.0	750	750	620	
USEPA Drinking Water MCLs			5.0	1,000	750	10,000	

Q Format: "U" indicates compound was not detected above the method detection limit
"J" indicates compound was detected below the method practical quantification limit
"B" indicates compound was detected in daily calibration blank

At the start of the remedial actions, five nearby houses were occupied. The three closest houses have been vacated since then. All three of these houses were demolished. Currently, only two houses are occupied. Analytical results of the quarterly sampling from wells at these two houses, and the Baca Chapter well were reported in appropriate monthly reports. The data shows that BTEX concentrations in pre and post carbon treatment filter unit water were below the method detection limits. The quarterly BTEX concentrations in the Site Well (formerly a residential well and also known as Wilcox Well) have remained below MCLs since March 2003.

Air Monitoring

Monitoring of the vapor phase GAC canister (Vapor Scrub) outlet for organic vapor emissions was performed semi-monthly when the Treatment Plant was operating. The air monitoring was modified on a quarterly basis when the active remedial activities were suspended for performance assessment. After a year of quarterly monitoring, the air monitoring was suspended while the active remedial activities are suspended. The monitoring data summary is included in Attachment 3. The air at the Site perimeter was monitored at the same time. The reading at the South boundary fence was used to represent background. The air monitoring results were provided in monthly progress reports.

The vapor vent scrub and perimeter measurements were fairly similar to the background measurements. Furthermore, the semi-monthly measurements indicated minimal fluctuations in the organic vapor levels. Also, there was no upward trend in measured concentrations, which indicate no breakthrough of organic vapors through the vent scrub system. The EPA no longer requires air monitoring at the Site.

C. Site Inspection

Mr. Sai Appaji, EPA RPM and Mr. Jake Ingram, Project Manager, NMED performed a Site inspection on August 16, 2005. Ms. Diana Malone, Navajo Nation was also present during the inspection. Native vegetation was present over much of the site. The soil cap over the former landfarm area is in good condition with abundant vegetation.

The water treatment building and the nutrient injection trailer that are no longer in use are still present at the Site and have been maintained well. Several monitoring wells were inspected around the casing area in the manhole. The piping and the appurtenances were in good condition.

D. Interviews

Ms. Diana Malone, Navajo Nation, was interviewed on August 11, 2005 by telephone to discuss any issues relating to the cleanup progress and communication with the community. She indicated that she was satisfied with the response at the Site and she is continuing to receive good communications regarding the cleanup activities at the Site. She has not heard of any violations at the Site. She also indicated that some time back a developer had shown interest about the Site and was seeking information, which she provided.

VII. Technical Assessment

A. Is remedy functioning as intended by the ROD?

The ground water remedy at the Site is not functioning as expected in meeting the remedial goal stated in the ROD. However, it is protective of human health and the environment as intended in the short term. The remedy is expected to be protective in the long term with monitoring and some form of institutional controls in place and enforced. The PRPs were going to implement institutional controls consisting of deed restrictions against well drilling on their property. However, the NMED legal staff has indicated that deed restrictions are probably not enforceable. Therefore, the EPA will investigate if other forms of enforceable institutional controls can be implemented at the Site to ensure long term protectiveness. The initial remedial actions have been effective at the Site. As discussed in the first Five-Year Review Report, the surface remedial actions met all remedial action objectives in accordance with the ROD requirement. EPA deleted the surface portion of the Site from NPL in January 1998.

As discussed in Section VI.B1, the Phase I Subsurface Remedy was successful in attaining remedial action objectives for NAPL extraction as specified in the ROD. The remedial action objective for the NAPL was to remove or contain NAPL to prevent further contamination of ground water. Approximately 43,500 gallons of NAPL were identified in the ROD for the E, F and G Sandstone Units at the Site. The operation and performance assessment monitoring results showed that the Phase I Subsurface Remedy for the Site met the objectives specified in the ROD. The Phase I Subsurface Remediation completion has accomplished the following:

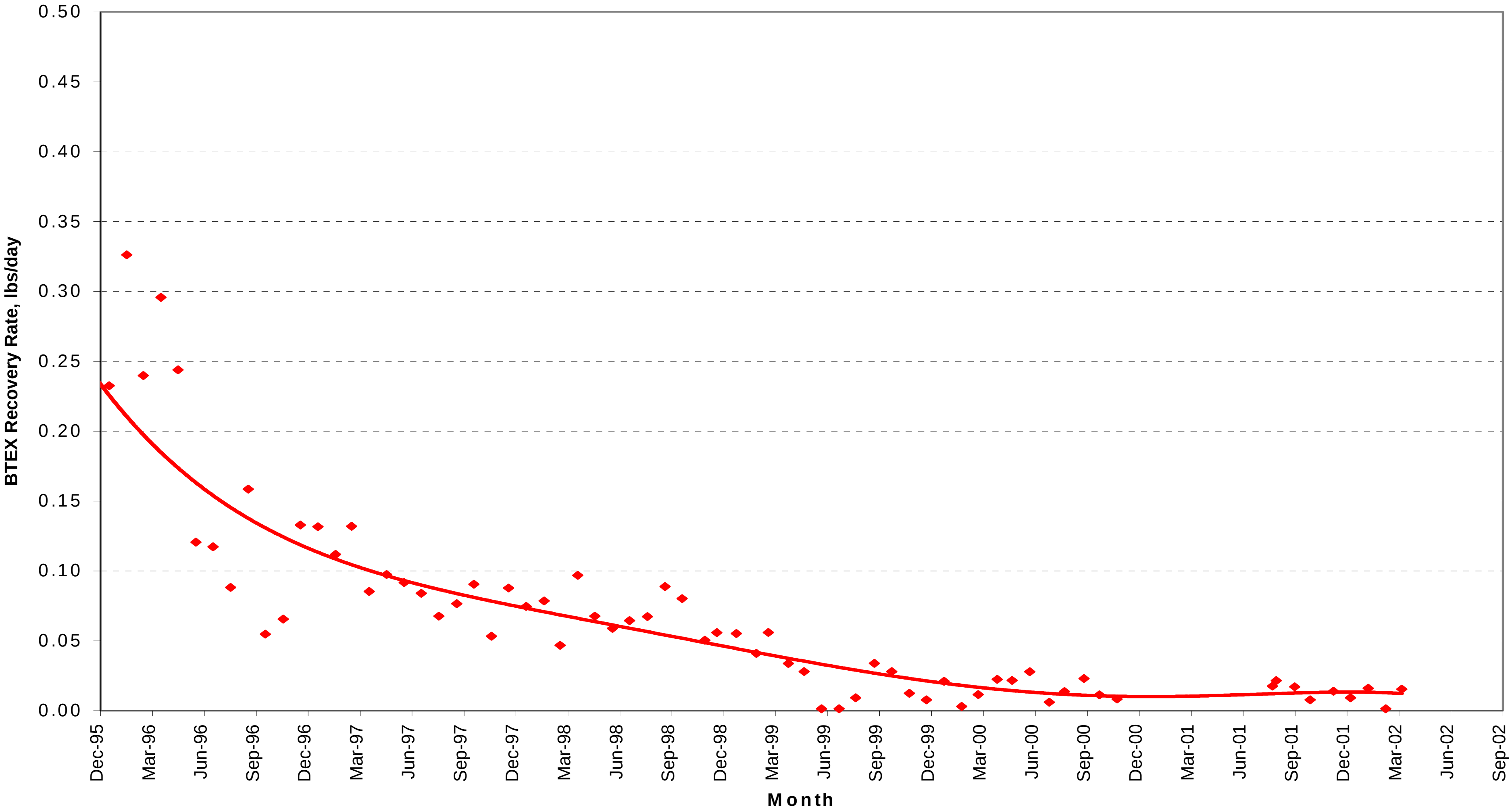
- Recovered over 5,600 gallons of Free NAPL by liquid recovery.
- Removed over 520,000 lbs. (approximately 80,000 gallons) of volatile hydrocarbon (NAPL), including about 21,000 lbs. of BTEX by SVE.
- Removed volatile fraction of NAPL such that site-specific contaminant target-levels for BTEX have been attained.
- Reduced toxicity, volume, and mobility of NAPL.
- Reduced ground water BTEX concentrations in source areas.

- Effectively contained contaminated ground water.

The operational and performance assessment monitoring data indicate that the subsurface remediation has reduced the ground water concentrations. However, the ground water concentrations have reached asymptotic limits, and the ground water extraction & treatment and in situ biodegradation is no longer efficient at further reducing BTEX concentrations at the Site due to technical limitations associated with the Site.

The slow progress in ground water remediation by pumping & treating, and air sparging in the E Sandstone Unit is due largely to the technical limitations of remediating NAPL-impacted ground water, especially in heterogeneous fractured rock as occurs at the Site. The slow ground water remediation progress at the Site is further exacerbated by the low permeability of the Sandstone units and the long time interval that NAPL has been present in the subsurface and the extremely slow rate of desorption of contaminants from the formation matrix.

Figure 8
North NAPL Area E Sandstone Unit Dissolved BTEX Mass Recovery Rates



Enhanced biodegradation, due to Phase II Subsurface Remediation nutrient injection, resulted in further declines in ground water BTEX concentrations. However, BTEX concentrations soon reached asymptotic levels and remained at concentrations above the cleanup levels. Lack of continued progress from enhanced biodegradation is the difficulty in getting the nutrients and oxygen to the sources of contamination in the heterogeneous fractured rock formation. This is the same site characteristic that limits the effectiveness of ground water flushing. In summary, the inefficiency of the ground water extraction, treatment and nutrient injection remedy to further reduce ground water BTEX concentrations in the F and G Sandstone Units is due to extreme heterogeneity and low hydraulic conductivity of the fractured bedrock formation.

The dissolved BTEX mass recovery rate resulting from ground water extraction is declining, as summarized in Attachment 3, and shown in Figure 9, with the recent (May 2001 – October 2002) rate estimated at <0.01 lbs/day. This dissolved BTEX mass recovery rate is ineffective for ground water remediation considering an estimated 37,000 pounds of BTEX dissolved in North NAPL Area E Sandstone Unit ground water, which does not include the BTEX adsorbed in the formation matrix.

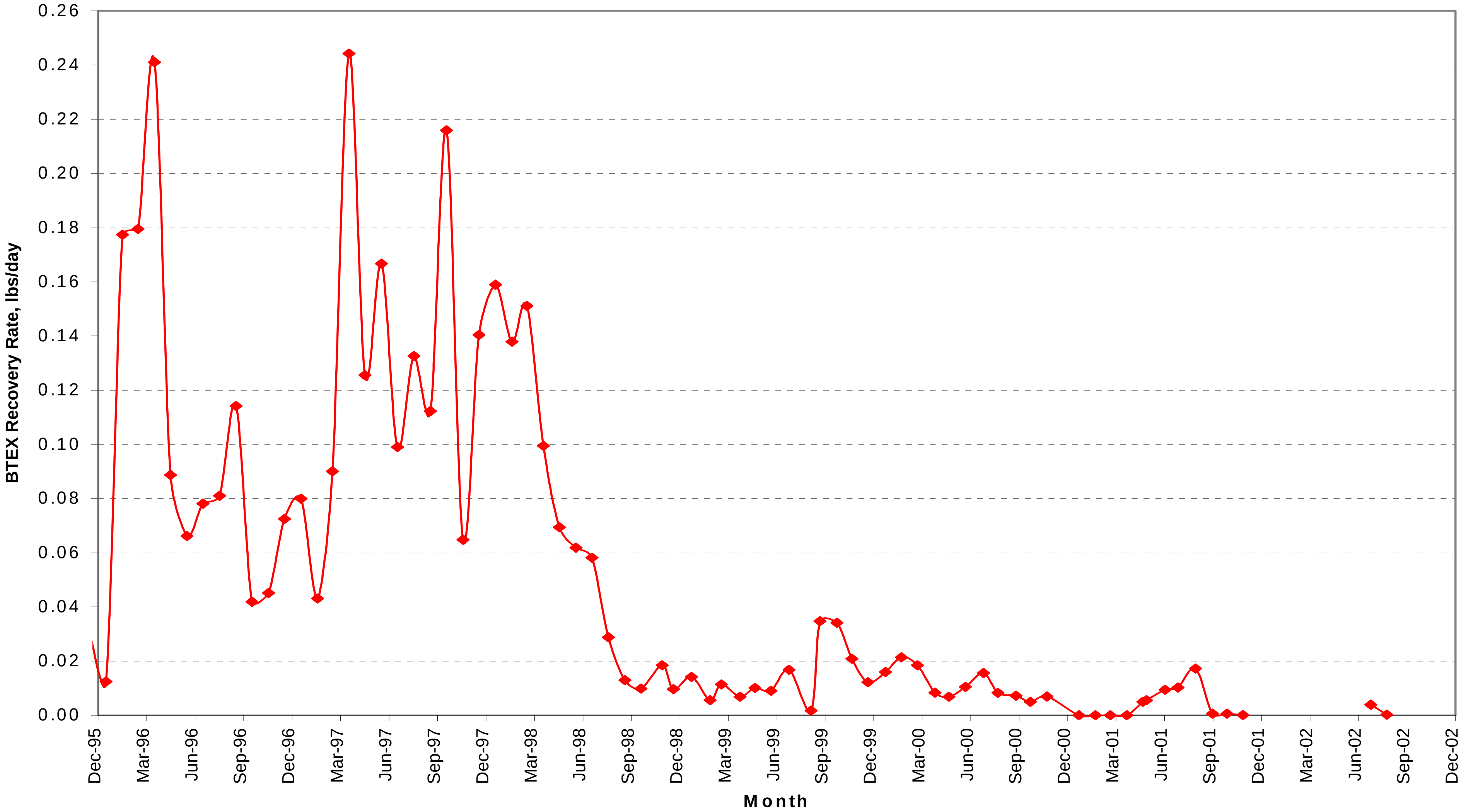
The subsurface remedy has significantly reduced the ground water BTEX concentrations, however, the BTEX concentrations have reached asymptotic limits, and the ground water extraction & treatment and in-situ biodegradation is no longer efficient at reducing BTEX concentrations in the dissolved phase at the Site due to technical limitations associated with heterogeneous and low permeability fractured bedrock formations at the Site.

The PRPs made the following comments in a draft report on the Restoration Potential for the F and G Sandstone Units (October 2004), at the request of the EPA for technical impracticability evaluation:

"Other potential active remediation alternatives, such as Chemical Oxidation, were also found to be inadequate due to the technical limitations posed by the heterogeneity of the fractured rock formation. Furthermore, none of the active remedial alternatives evaluated offer any measurable level of protectiveness beyond the institutional controls and ground water monitoring, and have significantly greater cost. Finally, the effectiveness of treatment alternatives at further reducing concentrations will be low and the timeframe required to attain MCLs will be very prolonged. The restoration rates will be similar to natural attenuation. Passive remedies involving Vertical Barriers and Chemical Grouting were rejected during the screening process in the FS because they do not restore the ground water to MCLs and it is difficult to assess the effectiveness.

Figure 9

South and Miscellaneous NAPL Areas Dissolved BTEX Mass Recovery Rates



Finally, the MNA alternative will not restore ground water to its beneficial use within a reasonable time frame. Fractured bedrock, extreme heterogeneity and low permeability are the hydrogeologic limitations to aquifer remediation. Heterogeneity of the F and G Sandstone Units, resulting from natural fractures and variations in stratigraphy, results in preferential flow paths for water and air movement to recovery wells. Preferential flow combined with the extremely low permeability results in poor recovery of hydrocarbon adsorbed into the rock matrix and trapped in fractures that are isolated from the preferential flow paths. In addition, the limited saturated thickness in the F and G Sandstone Units further limits the effectiveness of ground water restoration."

System Operations/O&M: System operation procedures are implemented in accordance with the RA O&M Plan. The O&M Plan describes procedures and schedules for inspection and maintenance of the remediation system. Activities included data collection and inspections to facilitate preventive maintenance and to insure that the system continues to operate with minimum problems. Manufacturer's specifications and performance of the system wells and equipment during the operation were also utilized for maintaining a preventative maintenance program to maintain efficient operation of the System. Difficulties that occurred during the O&M were addressed and resolved immediately. The Site subsurface remediation system operation is automated to allow for unattended operation. Instrumentation & Control (I&C) systems coordinate and interlock operation of each equipment component such that the system functions as an integrated unit. An auto dialer contacts the remote dispatcher in the event of system shutdown. All System shutdown calls were responded to immediately. Most of the unplanned shutdowns occurred due to power interruptions. Overall, the System operation was maintained at over 90 % of the time during the entire O&M.

Cost of System Operations and Maintenance: As noted in Table 2, Section IV, costs for the most part have been within the estimated range.

System Optimization: The System optimization was maintained continuously during O&M activities. Based on results of ongoing performance monitoring of the remediation System, various operational modifications were implemented to maintain efficient operation and improve contaminant mass recovery rates. The monitoring and assessment of the modifications indicated that they were effective following implementation. All feasible modifications have been implemented to maintain optimum system operation. The EPA has approved the Phase I Completion Report.

- **Indication of Potential Remedy Failure**: No indication of potential remedy failure is noted during the review. Cost and maintenance activities have been consistent with expectations. The leading edge plume containment component of subsurface remediation has met its specified containment objective.

The NAPL extraction component of the Phase I Subsurface Remedy was successful in removing the NAPL from all of the areas at the Site.

As expected, the subsurface remediation has reduced the contaminant concentrations in the ground water. However, concentrations have reached asymptotic levels and remain above the ROD cleanup levels. Further progress in ground water remediation is due to the technical limitations of remediating NAPL-impacted ground water, especially in heterogeneous and low permeability fractured rock as occurs at the Site.

B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

There have been no significant changes in physical conditions at the Site that would affect the protectiveness of the remedy.

Changes in Exposure Pathways

The cleanup levels in the ROD were established based on a residential scenario at the Site. The Site is not currently used for residential purposes. There are no current or planned changes in the land use by the PRPs, who own the Site; however, a potential future land use is still residential. Because remediation of contaminated surface soils has been completed to the ROD cleanup levels, the exposure and risk at the surface have been eliminated. No new contaminants, sources, or routes of exposure were identified as part of this second five-year review.

The remedial action goal for ground water, as stated in the ROD, is to prevent future exposures to contaminated ground water through the G, F and E Sandstone Units; and restore the G, F and E Sandstone Units to their beneficial use, which at this Site (according to the ROD) is a drinking water aquifer. As discussed earlier, 35 ground water extraction wells in the F & G Sandstone Units yield a combined total of only 0.054 gpm, or approximately 77 gallons per day.

The ground water pumping data for over six years indicates that a total of eleven remediation wells in the E Sandstone Unit within the North NAPL Area at the Site yield a combined total of about 0.35 gpm. This results in approximately 45 gallons per day per well (0.03 gpm).

During the ground water remedy, the EPA estimated a pumping rate of 0.2 gpm per well, or a total of approximately 5,000 gallons per day from 20 ground water extraction wells as specified in the remedy, without vacuum enhanced pumping. As indicated above, the ground water pumping yield from the F & G Sandstone Units is over 100 times lower than expected and about one sixth of expected yield from the E

Sandstone Unit. The current average ground water extraction rate without applied vacuum for the entire Site is far below the rate assumed in the ROD. The ground water pumping rates are due largely to the technical limitations in remediating ground water in very low permeability heterogeneous rock present at the Site. Currently, the ground water in the G, F, and E Sandstone Units is not being used as a drinking water supply.

Changes in Land Use

The surface soil cleanup levels in the ROD were established based on a residential scenario at the Site. The surface media have been remediated to the cleanup levels specified in the ROD. No new contaminants, sources, or routes of exposure were identified as part of this Five-Year Review. The Site is currently not used for residential purposes, however it has been remediated for residential use. There are no current or planned changes in land use by the PRPs.

A comprehensive hydrologic/hydrogeologic characterization was performed during RI/FS. The rates of constituent concentrations are consistent with expectation, and the ground water plume has been successfully contained. In addition, the present nearest residence proximity to the ground water plume is further than during the remedy selection period.

Changes in Standards To Be Considered

Table 12 lists the ground water COCs, maximum concentrations detected at the Site, and chemical specific ARARs (remediation goals) specified in the ROD. The NMWQCCRs are action-specific ARARs for discharge of treated ground water onto or below the surface of the ground (including re-injection of treated water), which are included in Table 12.

Table 12
Ground Water COC, Maximum Concentrations and Chemical-specific Standards

Contaminant	Maximum Contaminant Concentration (mg/l)	Chemical-specific Standards (Remediation Goal) ROD (mg/l)	Action Specific Standards for Discharge
Benzene	5.4	0.005 (MCL per SDWA)	0.010 (NMWQCCR Standard)
Ethylbenzene	0.8	0.700 (MCL per SDWA)	0.750 (NMWQCCR Standard)
Toluene	3.2	0.750 (NMWQCCR Standard)	0.750 (NMWQCCR Standard)
Xylene	6.4	0.620 (NMWQCCR Standard)	0.620 (NMWQCCR Standard)
1,2 DCA	0.5	0.005 (MCL per SDWA)	0.010 (NMWQCCR Standard)
Lead	0.2	0.015 (Note 1)	0.050 (NMWQCCR Standard)

Note (1): The lead cleanup Action level in the ROD was selected from the June 21, 1990 Memorandum from Henry L Longest, office of Emergency and Remedial Response of EPA, Washington DC.

Standards for COCs have not become more stringent since signing of the ROD in 1992 or the first Five-Year Review in 2000.

The remedial action goal for NAPL, as stated in the ROD, is removal or containment of the NAPL by SVE to prevent further contamination of ground water. Because the NAPL removal goal was based on its potential impact to ground water, site-specific target levels for BTEX constituents in soil vapors in equilibrium with residual NAPL were developed using a thermodynamic equilibrium analysis. These target levels for BTEX constituents in static or equilibrium soil vapors would indicate when the residual NAPL was no longer a source for BTEX in the aquifer at levels exceeding the remediation goals. The determination of that target level as measured by benzene concentration in the vapor stream is described in Sections 3.1.1 and 3.1.2 in the “Feasibility Report Supplement, NAPL/Ground Water Remedial Action Alternative” that was submitted to the EPA on April 29, 1992. The alternative presented in the Feasibility Report Supplement was the alternative selected in the ROD for NAPL extraction. The primary target was based on benzene due to its high solubility and low MCL. The NAPL-extraction equilibrium-based target levels are summarized in Table 13.

Table 13
NAPL Extraction Target Levels

Formation Unit	Benzene Soil Vapor Concentration, ppmv	Xylene Soil Vapor Concentration, ppmv
E-Sandstone Unit	2.5	39.0
F&G Sandstone Unit	25.0	390.0

The performance standard for the NAPL extraction specified in the EPA approved RD Report is to remove the volatile BTEX fraction of NAPL as is technically feasible.

New Mexico air quality regulations are action-specific ARARs for emission of VOCs into the atmosphere. The remediation system consists of SVE of VOCs and air stripping treatment of ground water to remove VOCs. In November 1995, New Mexico promulgated new air quality regulations applicable to construction permits, which is similar to AQCR 702 for hydrocarbon and benzene emission into the atmosphere as summarized in the Table 14.

Table 14
Hydrocarbon Emission ARARs

Contaminant	Action-specific Standard		Source
Non Methane Hydrocarbon Emission	Previous	10 lbs/hr or 25 tons/yr	NM Air Quality Regulation Part 702 & NESHAPs
	New	10 lbs/hr or 25 tons/yr	NM Air Quality Regulations, Chapter 2, Part 70 & 72
Benzene	Previous	10 tons/yr	NM Air Quality Regulation Part 702 & NESHAPs
	New	10 tons/yr	NM Air Quality Regulations, Chapter 2, Part 70 & 72

The Remediation System included a TOU to treat the emissions from the vapor extraction and air stripper units to meet the action-specific emission requirements.

<u>Changes in Toxicity and Other Contaminant Characteristics</u>

Surface soil remediation was completed during the first Five-Year Review period. Toxicity and other factors for COCs associated with NAPL, and the NAPL-impacted ground water have not changed.

<u>Changes in Risk Assessment Methodologies</u>

Any changes in risk assessment methodologies since the time of the ROD in September 1992, do not call into question the protectiveness of the remedy. The assumption of risk associated with potential exposure from drinking the impacted ground water in the G, F and E Sandstone Units is unchanged and protective.

C. Has any other information came to light that could call into question the protectiveness of the remedy?

No ecological targets were identified in the risk assessment performed during the RI or the first Five-Year Review, and none were identified during this Five-Year Review at the Site. The impacted shallow ground water does not discharge to surface on or near the Site. No additional information came to light that could call into question the protectiveness of the remedy at the Site.

<u>Technical Assessment Summary</u>

The remedial action objectives for the Site are:

1. Removal of, or containment of, NAPL to prevent further contamination of ground water in the A-G units of the Sonsela aquifer. Since NAPL impacts ground water, remediation goals for subsurface areas contaminated with NAPL are as described below in the discussion of ground water remediation goals.

2. Prevent future exposure to the contaminated ground water through the G, F, and E units, and restore the G, F, and E units of the Sonsela Aquifer to their beneficial use, which is at this site a drinking water aquifer.

3. Excavation and treatment of wastes in the West Pits Area to prevent or reduce carcinogenic and noncarcinogenic risk to human health and the environment, and to eliminate the physical hazard posed by the waste pits as they exist.

4. Control or eliminate the exposure to contaminated soil including the North Pit contents, contaminated with lead, asbestos or hydrocarbons.

5. Eliminate risk and hazards associated with exposure to the separator unit and its contents. The separator and its contents shall be removed such that there is no future risk to human health and the environment.

As discussed previously herein, and in the surface and subsurface remediation completion reports, the remedy at the Site has met completely three (3, 4 and 5) of the five remedial action objectives in the ROD listed above. The remedy has also met the parts of the RAO #1 and #2, by preventing exposure to the contaminated water through the G, F and E units. However, the comprehensive data collected over last 10 years show that the selected remedy may not be able to restore the G, F, and E units to drinking water MCLs due to technical limitations associated with the Site, as discussed previously herein. Nevertheless, the remedy has maintained containment of contaminated water during Phase I Subsurface Remediation implementation to prevent any movement of the plume. Phase I Subsurface Remediation has removed the source and significantly reduced ground water concentrations to minimize future exposure to contaminated ground water, as indicated in the revised ground water concentration model submitted to the EPA in March 2004. Thus the remedy has made progress in attaining the objectives specified in the ROD. The selected remedy may not be able to efficiently restore ground water to the MCLs because of the extremely heterogeneous and low permeability fractured bedrock formations.

VIII. Issues

No significant issues or deficiencies of remedy or the implementation were identified during this five-year review that would affect the protectiveness. Any difficulties observed during routine operation of the System were addressed and corrected, as needed. As discussed earlier, the pump and treat system, in conjunction with in situ nutrient injection did not fully restore the ground water in the impacted Sandstone Units to MCLs. However, the ROD specifies restoration of ground water to drinking water MCLs. Therefore a long-term strategy for ground water clean up should be developed.

A petition was prepared and submitted by the PRPs in March 2003 to the EPA to consider the following: "1*) Remove remedial action goal of restoration of the F and G Sandstone Units to their beneficial use as drinking water aquifers, and 2) remove the drinking water MCLs and the NMWQCCR human health GWS as ARARs for ground water remediation in the F and G Sandstone Units at the Site based on the following argument: The F and G Sandstone Units are not current or potential sources of water for drinking or beneficial use, in accordance with the EPA's Final Draft Guideline for Ground Water Protection Classification Under the EPA Ground Water Protection Strategy (Guideline) which specifies 150 gallons per day. The F and G Sandstone Units are hydraulically separated from the Sonsela Aquifer, which is the local source of domestic water supply. The ground water in the F and G Sandstone Units at the Site does not meet the NMWQCCR definition of ground water requiring remediation or protection for domestic or agricultural water supply, because the water in these units is not "capable of entering a well in sufficient amounts to be utilized as a water supply". Therefore, the PRPs believe that requirement of restoration of water in the F and G Sandstone Units to drinking water MCLs is unreasonable and unjustified requirement."*

In response, the EPA recommended that it is more appropriate to evaluate the appropriateness of a Technical Impracticability (TI) waiver rather than modifying the ARARs for the F and G Sandstone Units. The EPA started the TI evaluation process in July 2004, which could waive the MCLs as ARARs. The EPA requested that the PRPs provide a technical infeasibility evaluation for the F and G Sandstone Units TI Waiver process. A draft Evaluation of Restoration Potential for the F and G Sandstone Units was prepared and provided by the PRPs. In April 2005, the NMED indicated some concern regarding the proposed TI waiver for the F and G Sandstone Units only while remediation continued the E Sandstone Unit. The NMED was concerned because the F and G Sandstone Units may be hydraulically connected to the E Sandstone Unit. In response, the EPA proposed to continue monitoring and collecting additional data for all three Sandstone Units while evaluating the effectiveness of the remedial strategies and appropriateness of the TI Waiver for the entire Site during the next five-year review. Any technology in the future would be evaluated towards restoring the ground water in the F and G Sandstone Units only if the data shows that the alternate remedial strategy, primarily consisting of some form of institutional controls and monitoring, is no longer protective of human health and the environment.

IX. Recommendations and Follow-up Actions.

Based on the progress at the Site and review of the data collected over the past ten years, the following actions are recommended:

1. Operational and performance assessment monitoring data collected during implementation of the subsurface remedial actions demonstrate that the selected remedy is no longer effective in remediation of the ground water. The limited saturated thickness in the F and G Sandstone Units further limits the effectiveness of ground water restoration technologies. Heterogeneity of the E, F and G Sandstone Units, resulting from natural fractures and variations in stratigraphy, results in preferential flow paths for water and air movement to recovery wells. Preferential flow, in combination with the overall extremely low permeability of these Sandstone units, results in poor recovery of hydrocarbon adsorbed into the rock matrix and also results in hydrocarbon being trapped in fractures that are isolated from the preferential flow paths.

   It is recommended that an alternate remedial strategy that calls for monitoring be implemented. The EPA and NMED will investigate if additional enforceable institutional controls can be implemented at the Site. The monitoring will continue to provide protection of human health and the environment.

2. The PRPs have acquired the land that contains the leading edge of the contamination plume in the E Sandstone Unit along with some additional buffer area. By acquiring this land, the PRPs can prevent new supply wells from being drilled in the impacted aquifer as long at they own the property.

3. Continue monitoring off-site wells to ensure plume is contained and not migrating from the Site.

X. Protectiveness Statements

The surface remedy at the Site is protective of human health and the environment. Remedial actions were successful in attaining all of the remedial action objectives for surface media in accordance with the health-based remediation goals specified in ROD. No hazardous substances, pollutants, or contaminants remain in surface media at the Site at concentration levels that are above levels that allow for unlimited use of and unrestricted exposure to the surface media.

The subsurface remedy for the Site is protective of human health and the environment in the short term. However, for the remedy to be protective in the long term additional monitoring is required. The EPA and NMED will investigate if additional enforceable institutional controls can be implemented at this Site to ensure protectiveness. The Phase I and Phase II Subsurface Remedies operated and functioned as designed. The Phase I Subsurface Remedy was successful in attaining all remedial action objectives for the NAPL extraction in all areas of the Site. The ground water containment component of the Phase I Subsurface Remedy exceeded its expectation as it reduced and maintained BTEX concentrations in the leading edge plume wells below the pre-remediation levels, compared to its specified objective of maintaining benzene concentration at a steady state in the leading edge plume area. Phase I and II Subsurface Remedies significantly reduced the ground water BTEX concentrations in NAPL source areas.

The ground water air stripping system exceeded the specified treatment and discharge performance standards. The TOU operated to treat and destroy extracted soil vapors, even though the untreated VOCs and benzene emissions would be below the specified ARARs.

Even though the COCs remain in subsurface media at the Site at concentrations that are above levels that allow for unlimited use of and exposure to impacted ground water, the remedy remains protective since the impacted water is not used for any purpose. At this time the ground water in the E Sandstone Unit is not used directly, and continued monitoring will prevent any potential exposure.

Hazardous substances remain in subsurface media at the Site at concentration levels that are above levels that allow for unlimited use of the ground water and unlimited exposure to the ground water.

XI. Next Review

If a remedial action that is selected results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, then CERCLA requires EPA to conduct a review of that Site every five years. While the surface area of the Site has been fully remediated, allowing unlimited use and unrestricted exposure, the ground water at the Site remains contaminated, and consequently, the EPA will continue to perform five-year reviews of the ground water remedy. The next five-year review is due within five years of the completion of this second five-year review. The completion date is the date of the signature shown on the cover attached to the front of this report.

ATTACHMENT 1
Site Maps

Prewitt Superfund Site Documents Reviewed

"Prewitt Refinery Site Remedial Investigation Report", August 1991.

"Prewitt Refinery Site Feasibility Report", February 1992.

"Prewitt Refinery Site NAPL Extraction Pilot Test Report" and Appendices, April 1992.

"Prewitt Refinery Site Feasibility Report Supplement-NAPL/Ground Water Remedial Action Alternative", April 1992.

"Proposed Plan for Remedial Action", July 18, 1992.

"Record of Decision" for Prewitt Abandoned Refinery Site, Prewitt, New Mexico, September 30, 1992.

"Remedial Design Work Plan" for Prewitt Refinery Site, Revised January 6, 1994.

"Prewitt Refinery Site, Remedial Design Report, Volume 1, Surface Media, November 18, 1994.

"Prewitt Refinery Site, Remedial Design Report, Volume 2, Subsurface Media, December 19, 1994.

"Prewitt Refinery Site, Remedial Design Report, Volume 3, Remedial Action Plans, December 19, 1994.

"Remedial Action Work Plan for Prewitt Refinery Site"- Prewitt, New Mexico, February 1995.

"Prewitt Refinery Site Remedial Design Report, Volume 4, Landfarm Design", Revised Final, October 10, 1995.

Remedial Action Completion Report "Asbestos-containing Material, Lead-Contaminated Soil and Separator", Prewitt Refinery Site, Prewitt, New Mexico, April 1996.

"Remedial Action Construction Report, Phase I Subsurface Remedy"- Prewitt Refinery Site, Prewitt, New Mexico, August 1996.

"Remedial Action Construction and Completion Report, Landfarm Remedy", for Prewitt Refinery Site, Prewitt, New Mexico, February 1997.

"North NAPL Area Phase I Subsurface Remediation Completion Report and Phase II Subsurface Remediation Plan for E Sandstone", Prewitt Superfund Site, Prewitt, New Mexico. April 30, 1998.

"Remedial Action Construction Report for E Sandstone Phase II Subsurface Remedy", Prewitt Superfund Site, Prewitt, New Mexico, February 1999.

Prewitt Superfund Site Monthly Progress Reports, 6-120 (May 2000 to April 2005).

Annual Remedial Action Reports, Prewitt Refinery Site, Prewitt, New Mexico, (June 1996 to June 2005)

"First Five-Year Review Report", Prewitt Superfund Site, Prewitt, New Mexico, September 2000.

"Remedial Action Construction Report for E Sandstone Unit Phase II Subsurface Remedy", for Prewitt Superfund Site, Prewitt, New Mexico, February 19, 1999.

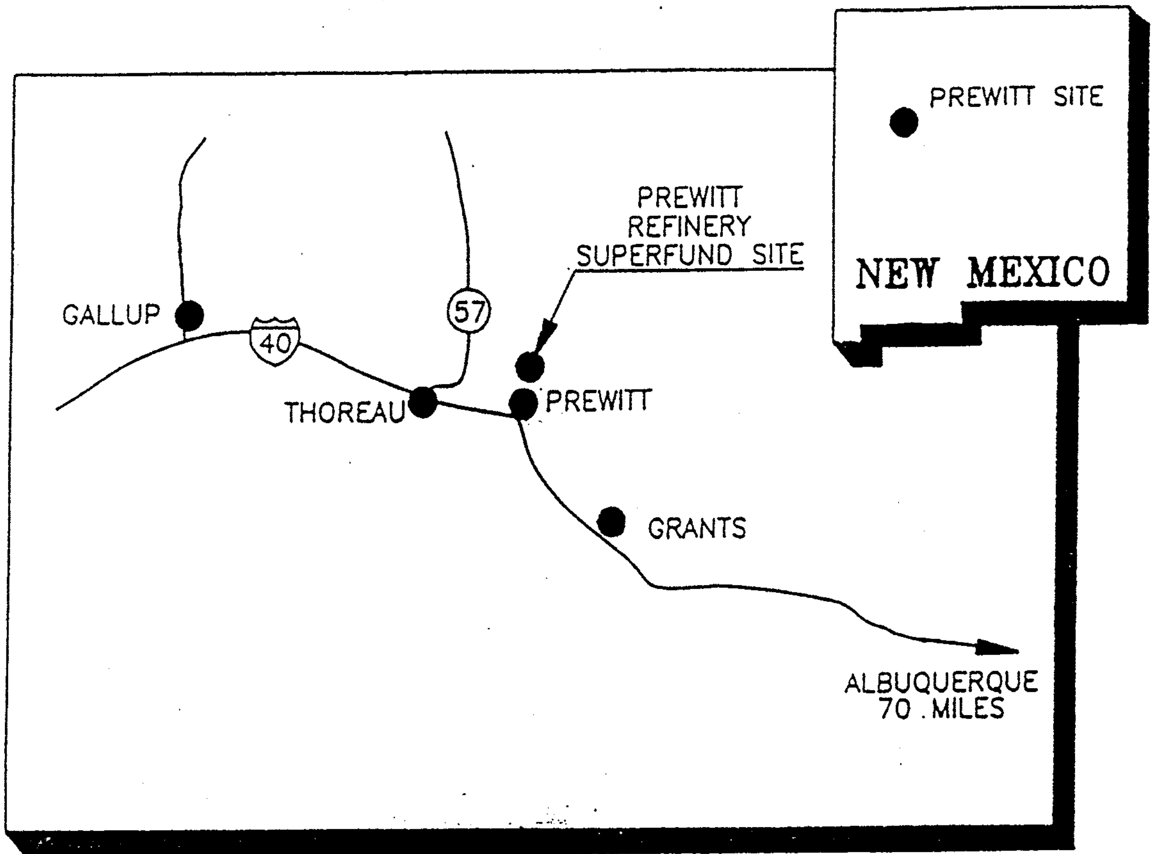
"Phase I Subsurface Remediation Completion Report for South and Miscellaneous NAPL Areas", Former Prewitt Refinery Superfund Site, Prewitt, New Mexico, December 2002.

"Petition for Ground Water Restoration ARARs Modification, F and G Sandstone Units", Former Prewitt Refinery Superfund Site, Prewitt, New Mexico, March 2003.

"Revised Ground Water Concentration Model, NAPL-Impacted Portions of the F and G Sandstone Units" Former Prewitt Refinery Site, Prewitt, New Mexico, March 31, 2004.

ATTACHMENT 2
Site Map and Figures

Figure 1
Attachment 2
Prewitt Superfund Site 2nd Five-Year Review Report
Site Location Map



MODIFIED FROM: CONCURRENCE DOCUMENTS FOR THE PREWITT ABANDONED REFINERY RECORD OF DECISION; EPA; 1992

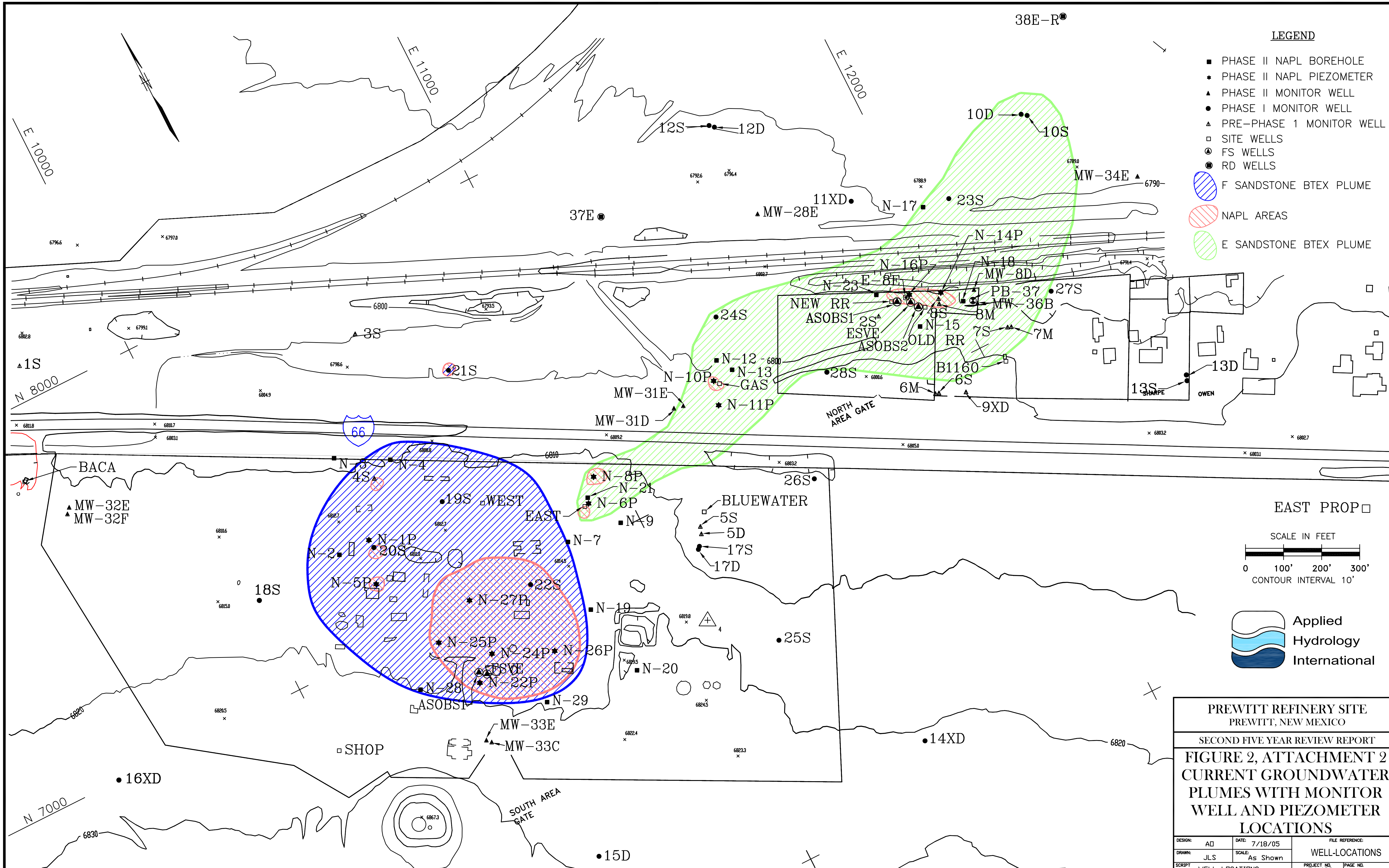
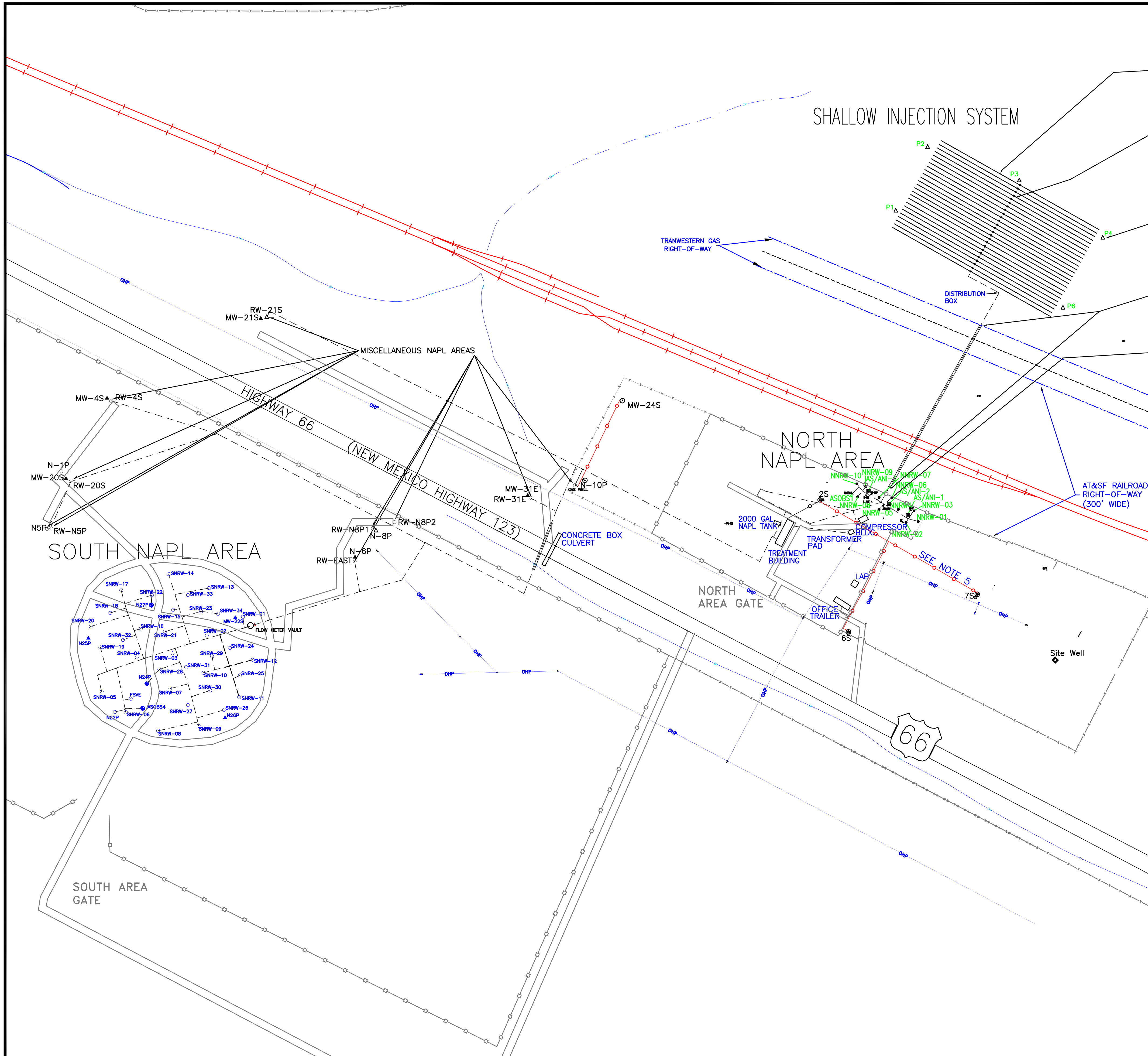


FIGURE 2, ATTACHMENT 2 CURRENT GROUNDWATER PLUMES WITH MONITOR WELL AND PIEZOMETER LOCATIONS



SHALLOW INJECTION SYSTEM CONSISTS OF 4 INCH PVC DISTRUBUTION PIPE FEEDING 4 INCH PVC PERFORATED LATERALS, INSTALLED IN GRAVEL BED COVERED BY GEOMEMBRANE (SEE DRAWING 4 FOR DETAILS)

HANCORE DISTRIBUTION DROP SUMP WITH RISER LOCATED AT INTERSECTION OF DISTRIBUTION PIPE WITH PERFORATED LATERALS (SEE DRAWING 4 FOR DETAILS)

SHALLOW INJECTION SYSTEM MONITORING PIEZOMETER– 2 INCH PVC (SEE DRAWING 4 FOR DETAILS)

2 INCH PVC TREATED WATER DISCHARGE PIPING INSTALLED IN 6–INCH STEEL CARRIER PIPE UNDER TRANWESTERN NATURAL GAS LINE ROW AND UNDER RAILROAD ROW

SEE DRAWING 5, YARD PIPING FOR DETAILED YARD PIPING INFORMATION

LEGEND

- SVE/PUMPING WELL (SVE/GW WELL)
- AIR INJECTION WELL
- AIR SPARGING/NUTRIENT INJECTION WELL
- MONITORING WELL/PIEZOMETER
- SHALLOW PIEZOMETER FOR MONITORING SHALLOW INJECTION SYSTEM
- NUTRIENT INJECTION/ MONITORING WELL
- CHAIN LINK FENCE LINE
- BARBED WIRE FENCE LINE
- RAILROAD TRACKS
- BURIED PIPE
- COMPRESSED AIR LINE
- OHP OVERHEAD POWER LINES
- BENCH MARK

CP–3 N 8680.89, E 32788.92, ELEV. 6867.14
POINT CP–3 IS LOCATED BETWEEN I–40 AND OLD US–66 ON A NATURAL ROCK OUTCROP SOUTH OF THE REFINERY SITE

AERO–4 N 8805.78, E 33715.71, ELEV. 6819.90
POINT AERO–4 IS A WOODEN HUB WITH A NAIL LOCATED EAST OF THE SOUTH NAPL AREA

NOTES:

1. 6–INCH SCH 80 PVC SVE HEADER, 1–INCH GALVANIZED COMPRESSED AIR HEADER, 2–INCH SCH 80 PVC UNTREATED GROUND WATER HEADER INSTALLED IN COMMON TRENCH
2. 2–INCH SCHED 80 PVC SVE LINE, 1/2–INCH GALVANIZED COMPRESSED AIR LINE, 1–INCH SCH 80 PVC UNTREATED GROUND WATER LINE INSTALLED IN COMMON TRENCH FROM THE MAIN HEADER TO EACH REMEDIATION WELL
3. 140 FOOT SECTION OF 4–INCH SCH 80 PVC SVE HEADER, 1/2–INCH GALVANIZED COMPRESSED AIR HEADER, 1–INCH SCH 80 PVC UNTREATED GROUND WATER HEADER INSTALLED IN HIGHWAY ROW THROUGH 90–FOOT SECTION OF 8" STEEL CARRIER PIPE UNDER OLD HIGHWAY 66 SEE FIGURE 4–3 FOR DETAILS
4. SOUTH NAPL SVE/GW REMEDIATION WELLS CAN BE CONVERTED TO AIR INJECTION SEE DRAWING 2 FOR DETAILS
5. NEW BURRIED PIPE– 1/2" STEEL COMPRESSED AIR LINE.

200' 0 200'
SCALE IN FEET

Applied Hydrology International

PREWITT REFINERY SITE
PREWITT, NEW MEXICO

SECOND FIVE YEAR REVIEW REPORT

FIGURE 3, ATTACHMENT 2 AS-BUILT SITE PLAN

DRAWN: JLS	DATE: 7/18/05	DRAWING NUMBER: PREWBILT.DWG
CHECKED: APO	SCALE: AS SHOWN	
APPROVED: SMITH ENVIRONMENTAL TECHNOLOGY, INC.		PROJECT NO. 52–1B
SCRIPT FILE: REM–SITE.scr		SHEET NO.

ATTACHMENT 3
Remediation System Monitoring
&
Ground Water Sampling Results Summary

SVE Recovery Data

	North NAPL Area				South NAPL Area				Miscelleneous NAPL Areas				Total	
	BTEX Recovery Rate lbs/day	BTEX Recovery Lbs	Hydrocarbon Recovery Rate lbs/day	Hydrocarbon Recovery lbs	BTEX Recovery Rate lbs/day	BTEX Recovery Lbs	Hydrocarbon Recovery Rate lbs/day	Hydrocarbon Recovery lbs	BTEX Recovery Rate lbs/day	BTEX Recovery Lbs	Hydrocarbon Recovery Rate lbs/day	Hydrocarbon Recovery lbs	BTEX Recovery Lbs	Hydrocarbon Recovery Lbs
Dec-95 &													0	0
Jan-96		5.20		113.00					34.00	233.75		0.00	239	113
Feb-96	7.58	166.76	127.26	2800.00	54.30	1194.60	1353.00	29766.00	28.45	625.90	428.27	9421.94	1987	41988
Mar-96	1.47	41.28	21.57	605.76	32.90	923.83	479.90	13475.59	13.72	385.26	283.22	7952.82	1350	22034
Apr-96	1.15	32.29	13.22	371.26	15.00	421.20	139.60	3919.97	4.29	120.46	76.84	2157.67	574	6449
May-96	0.19	5.46	2.96	85.06	24.20	695.44	1060.10	30464.09	7.22	207.48	272.63	7834.57	908	38384
Jun-96	0.86	22.52	10.58	277.09	29.00	759.51	403.90	10578.14	6.07	158.97	54.16	1418.45	941	12274
Jul-96	0.79	21.31	10.78	290.83	30.23	815.39	470.63	12692.98	5.15	138.99	61.92	1670.07	976	14654
Aug-96	0.72	18.21	10.99	277.92	31.47	795.98	537.37	13593.23	4.24	107.17	69.69	1762.79	921	15634
Sep-96	0.65	18.33	11.19	315.56	32.70	922.14	604.10	17035.62	3.32	93.62	77.45	2184.09	1034	19535
Oct-96	0.59	16.37	11.28	314.71	26.13	729.12	510.63	14246.67	3.09	86.21	91.55	2554.15	832	17116
Nov-96	0.52	14.92	11.37	324.05	19.57	557.65	417.17	11889.25	2.86	81.51	105.64	3010.84	654	15224
Dec-96	0.46	13.62	11.46	339.27	13.00	384.87	323.70	9583.14	2.63	77.86	119.74	3544.90	476	13467
Jan-97	0.41	11.46	10.71	299.38	10.53	294.53	256.10	7161.07	1.89	52.94	84.69	2368.10	359	9829
Feb-97	0.36	10.08	9.95	278.69	8.07	225.87	188.50	5278.00	1.16	32.39	49.64	1389.92	268	6947
Mar-97	0.31	9.48	9.20	281.21	5.60	171.17	120.90	3695.43	0.42	12.84	14.59	445.96	193	4423
Apr-97	0.31	8.93	9.20	264.96	5.59	160.99	120.92	3482.50	0.43	12.38	14.60	420.48	182	4168
May-97	1.48	44.59	28.76	868.38	4.93	148.96	115.10	3475.33	0.81	24.36	26.91	812.52	218	5156
Jun-97	2.06	58.90	38.54	1101.86	4.60	131.51	112.20	3207.80	1.00	28.59	33.07	945.47	219	5255
Jul-97	1.64	45.25	29.53	814.64	5.80	160.02	182.53	5036.09	1.82	50.21	37.08	1023.13	255	6874
Aug-97	1.22	36.53	20.51	614.29	7.00	209.62	252.87	7572.35	2.64	79.06	41.10	1230.68	325	9417
Sep-97	0.80	18.84	11.50	270.83	8.20	193.11	323.20	7611.36	3.46	81.48	45.11	1062.34	293	8945
Oct-97	0.74	22.54	12.18	369.17	6.97	211.22	339.80	10302.06	2.60	78.73	45.98	1394.02	312	12065
Nov-97	0.68	20.34	13.71	410.07	5.73	171.48	356.40	10659.92	1.73	51.84	46.85	1401.28	244	12471
Dec-97	0.63	19.30	13.53	414.40	4.50	137.83	373.00	11424.24	0.87	26.65	47.72	1461.57	184	13300
Jan-98	0.64	19.30	13.52	407.80	3.87	116.63	280.50	8460.72	0.78	23.53	42.94	1295.20	159	10164
Feb-98	0.59	16.14	8.30	226.96	3.23	88.45	188.00	5142.93	0.69	18.88	38.16	1043.90	123	6414
Mar-98	0.57	17.19	5.68	171.33	2.60	78.42	95.50	2880.57	0.60	18.10	33.38	1006.84	114	4059
Apr-98	0.57	16.71	5.68	166.48	2.60	76.21	95.50	2799.11	0.60	17.59	33.38	978.37	110	3944
May-98	0.37	11.08	4.13	123.78	2.91	87.04	90.55	2711.51	0.71	21.16	28.37	849.67	119	3685
Jun-98	0.27	8.06	3.36	100.30	3.06	91.34	88.07	2628.89	0.76	22.69	25.87	772.22	122	3501
Jul-98	0.34	10.29	5.17	155.08	7.33	219.73	202.79	6079.04	0.72	21.58	52.66	1578.59	252	7813
Aug-98	0.42	12.17	6.99	204.02	5.67	165.50	264.11	7712.54	0.67	19.66	53.48	1561.72	197	9478
Sep-98	0.49	14.57	8.80	261.62	6.97	207.25	284.92	8470.67	0.63	18.73	59.33	1763.88	241	10496
Oct-98	0.51	15.72	7.57	233.16	6.71	206.82	150.20	4628.26	0.62	19.07	56.74	1748.39	242	6610
Nov-98	0.53	15.90	6.33	190.00	6.45	193.59	155.02	4650.60	0.61	18.24	61.40	1842.00	228	6683
Dec-98	0.55	16.78	5.10	155.57	6.19	188.94	146.58	4471.28	0.60	18.21	30.37	926.41	224	5553
Jan-99	0.54	16.75	6.77	208.72	5.75	177.44	165.17	5094.67	0.59	18.08	30.68	946.32	212	6250
Feb-99	0.54	14.92	8.43	234.72	5.31	147.83	164.28	4572.24	0.58	16.00	36.60	1018.65	179	5826
Mar-99	0.53	16.30	10.10	311.22	4.87	150.06	162.30	5001.11	0.56	17.38	29.48	908.40	184	6221
Apr-99	0.53	15.81	10.10	301.79	4.87	145.52	164.17	4905.40	0.56	16.85	42.27	1263.03	178	6470
May-99	0.38	11.40	9.30	280.23	4.86	146.46	218.49	6583.44	0.67	20.15	50.09	1509.41	178	8373

SVE Recovery Data (Continued)

	North NAPL Area				South NAPL Area				Miscelleneous NAPL Areas				Total	
	BTEX Recovery Rate lbs/day	BTEX Recovery Lbs	Hydrocarbon Recovery Rate lbs/day	Hydrocarbon Recovery lbs	BTEX Recovery Rate lbs/day	BTEX Recovery Lbs	Hydrocarbon Recovery Rate lbs/day	Hydrocarbon Recovery lbs	BTEX Recovery Rate lbs/day	BTEX Recovery Lbs	Hydrocarbon Recovery Rate lbs/day	Hydrocarbon Recovery lbs	BTEX Recovery Lbs	Hydrocarbon Recovery Lbs
Jun-99	0.30	8.93	8.90	262.19	4.86	143.06	246.58	7264.25	0.72	21.24	60.40	1779.38	173	9306
Jul-99	0.37	10.56	9.30	264.95	7.33	208.82	187.51	5341.97	0.72	20.51	32.14	915.64	240	6523
Aug-99	0.44	9.69	9.70	214.40	6.67	147.35	243.38	5379.43	0.90	19.93	54.97	1214.93	177	6809
Sep-99	0.51	15.00	10.10	299.36	7.57	224.43	241.78	7166.36	0.99	29.40	52.25	1548.69	269	9014
Oct-99	0.42	12.86	8.33	258.23	6.54	202.66	297.25	9211.06	0.88	27.33	53.02	1642.96	243	11112
Nov-99	0.32	8.59	6.57	174.15	5.51	146.07	284.39	7542.02	0.77	20.47	48.82	1294.71	175	9011
Dec-99	0.23	7.12	4.80	146.72	4.48	136.81	230.07	7032.32	0.66	20.23	26.94	823.45	164	8002
Jan-00	0.17	5.18	3.48	106.80	4.59	140.99	202.67	6220.04	0.64	19.68	28.35	870.16	166	7197
Feb-00	0.10	3.01	2.16	62.23	4.71	135.75	165.75	4775.03	0.62	17.88	30.42	876.36	157	5714
Mar-00	0.04	1.21	0.84	25.47	4.83	146.44	147.88	4483.43	0.60	18.19	31.18	945.32	166	5454
Apr-00	0.04	1.06	0.84	22.35	4.83	128.53	143.72	3824.39	0.60	15.97	10.03	266.90	146	4114
May-00	0.04	1.23	0.84	25.73	4.83	147.93	150.46	4608.29	0.60	18.38	38.03	1164.78	168	5799
Jun-00	0.05	1.61	0.90	26.76	5.79	172.08	161.07	4788.61	1.60	47.57	37.71	1121.12	221	5936
Jul-00	0.05	1.59	0.73	21.85	7.33	218.37	136.19	4057.24	0.72	21.45	25.03	745.67	241	4825
Aug-00	0.05	1.61	0.57	17.30	5.61	171.42	115.61	3530.15	1.07	32.67	20.11	614.06	206	4162
Sep-00	0.05	1.53	0.40	11.77	5.53	162.66	151.25	4451.29	0.81	23.69	27.65	813.74	188	5277
Oct-00	0.03	1.07	0.27	8.23	5.53	170.74	143.70	4436.88	0.81	25.01	31.21	963.64	197	5409
Nov-00	0.02	0.36	0.13	2.80	5.53	116.13	284.39	5972.19	0.81	17.01	48.82	1025.22	134	7000
Dec-00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Jan-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Feb-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Mar-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Apr-01	0.00	0.00	0.00	0.00	3.86	55.03	128.95	1837.54	0.02	0.21	0.72	10.26	55	1848
May-01	0.00	0.00	0.00	0.00	3.86	65.93	128.95	2202.59	0.02	0.34	0.72	12.30	66	2215
Jun-01	0.00	0.00	0.00	0.00	3.97	116.72	143.19	4209.79	0.12	3.53	2.54	74.68	120	4284
Jul-01	0.01	0.31	2.12	62.70	3.43	101.75	121.93	3613.42	0.14	4.05	3.07	90.98	106	3767
Aug-01	0.02	0.58	0.50	14.48	2.90	83.87	100.66	2914.61	0.15	4.44	3.60	104.23	89	3033
Sep-01	0.03	0.83	0.50	13.77	2.36	64.99	79.40	2186.68	0.17	4.68	4.13	113.74	71	2314
Oct-01	0.03	0.66	0.60	15.18	3.89	98.32	50.75	1283.69	0.11	2.87	2.75	69.65	102	1369
Nov-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Dec-01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Jan-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Feb-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Mar-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
Apr-02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
2nd 5-yr Review	**lbs.**	**11**		**221**		**1,746**		**50,093**		**206**		**6,924**	**1,963**	**57,238**
	Gallons			**33**				**7,606**				**1,051**		**8,690**
Total	**lbs.**	**1,026**		**17,893**		**16,410**		**451,277**		**3,611**		**97,583**	**21,048**	**566,753**
	Gallons			**2,717**				**68,518**				**14,816**		**86,051**

Equilibrium Soil Vapor Testing

November, 2000 Equilibrium Soil Vapor Sampling Results
On-site BTEX Analysis

		Unit	Sample Date	Flow rate scfm	Measured ESV Concentrations, ppmv				Flow Weighted ESV Concentrations, ppmv			
					Benzene	Toluene	Ethylbenzene	Xylenes	Benzene	Toluene	Ethylbenzene	Xylenes
Target Level		F & G							25.0	N/A	N/A	390.0
Target Level		E							2.5	N/A	N/A	39.0
South NAPL Area	SN Area HDR @ 15 Min	F & G	11/30/2000	N/A	17.6	36.7	4.9	33.8	17.6	36.7	4.9	33.8
	SN Area HDR @ 30 Min		11/30/2000	N/A	17.7	35.3	4.5	31.2	17.7	35.3	4.5	31.2
	SN Area HDR @ 45 Min		11/30/2000	N/A	17.8	36.9	4.8	33.5	17.8	36.9	4.8	33.5
	SN Area HDR @ 60 Min		11/30/2000	N/A	16.4	32.1	3.8	27.1	16.4	32.1	3.8	27.1
Miscellaneous NAPL Areas	RW-04S	F & G	11/28/2000	16.5	2.5	4.6	2.3	7.8	16.0	20.7	4.2	24.5
	RW-20S		11/28/2000	4.0	34.9	29.9	9.3	38.1				
	RW-21S		11/28/2000	1.6	24.3	49.6	8.5	45.6				
	RW-N8P2		11/28/2000	18.0	19.1	27.0	3.9	30.9				
	RW-N-5P		11/28/2000	1.6	64.6	62.5	11.1	70.2				
	RW-East	E	11/28/2000	1.8	94.8	90.5	10.5	54.8	12.3	15.4	3.0	14.1
	RW-31E		11/28/2000	14.5	5.0	11.2	2.5	11.8				
	RW-GAS		11/28/2000	9.0	7.6	7.0	2.4	9.6				

November, 2000 Equilibrium Soil Vapor Sampling Results
Off-site BTEX Analysis

		Unit	Sample Date	Flow rate scfm	Measured ESV Concentrations, ppmv				Flow Weighted ESV Concentrations, ppmv			
					Benzene	Toluene	Ethylbenzene	Xylenes	Benzene	Toluene	Ethylbenzene	Xylenes
Target Level		F & G							25.0	N/A	N/A	390.0
Target Level		E							2.5	N/A	N/A	39.0
South NAPL Area	SN Area HDR @ 15 Min	F & G	11/30/2000	N/A	5.4	11.5	2.1	12.0	5.4	11.5	2.1	12.0
	SN Area HDR @ 30 Min		11/30/2000	N/A	5.8	12.1	2.3	12.5	5.8	12.1	2.3	12.5
	SN Area HDR @ 45 Min		11/30/2000	N/A	6.6	13.8	2.6	14.2	6.6	13.8	2.6	14.2
	SN Area HDR @ 60 Min		11/30/2000	N/A	6.6	15.1	3.1	17.4	6.6	15.1	3.1	17.4
Miscellaneous NAPL Areas	RW-04S	F & G	11/28/2000	16.5	10.5	23.6	4.3	24.5	8.8	16.9	4.5	24.8
	RW-20S		11/28/2000	4.0	2.9	7.9	4.6	17.9				
	RW-21S		11/28/2000	1.6	7.4	14.8	3.7	18.8				
	RW-N8P2		11/28/2000	18.0	5.8	9.5	3.1	19.7				
	RW-N-5P		11/28/2000	1.6	42.6	55.8	21.7	108.2				
	RW-East	E	11/28/2000	1.8	69.7	55.8	8.5	37.0	6.6	7.3	2.0	10.0
	RW-31E		11/28/2000	14.5	1.8	4.3	1.7	8.8				
	RW-GAS		11/28/2000	9.0	1.6	2.4	1.3	6.6				

Ground Water Extracted Volume, BTEX Concentration and BTEX Mass Recovery

			BTEX Concentrations in Groundwater Headers									
			Benzene, mg/l		Toluene, mg/l		Ethylbenzene, mg/l		Xylenes, mg/l			
	Groundwater Pumped South Header	Groundwater Pumped North Header	South Header	North Header	South Header	North Header	South Header	North Header	South Header	North Header	BTEX Mass Recovery South Header	BTEX Mass Recovery North Header
MONTH	(Gallons)	(Gallons)	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	lbs/day	lbs/day
Dec-95	4,044	11,255	9.60	9.60	11.00	11.00	1.10	1.10	6.10	6.10	0.03	0.09
Jan-96	2,297	42,958	6.45	6.45	6.55	6.55	1.00	1.00	5.75	5.75	0.01	0.23
Feb-96	47,039	86,500	4.50	4.50	4.70	4.70	0.76	0.76	3.80	3.80	0.18	0.33
Mar-96	50,450	67,400	2.50	2.50	5.40	5.40	0.68	0.68	4.40	4.40	0.18	0.24
Apr-96	65,046	79,817	2.80	2.80	5.00	5.00	0.72	0.72	5.00	5.00	0.24	0.30
May-96	25,000	68,745	3.20	3.20	4.60	4.60	0.64	0.64	4.50	4.50	0.09	0.24
Jun-96	25,700	46,870	2.00	2.00	3.30	3.30	0.49	0.49	3.60	3.60	0.07	0.12
Jul-96	22,000	33,000	3.30	3.30	4.50	4.50	0.56	0.56	4.60	4.60	0.08	0.12
Aug-96	31,200	34,000	2.30	2.30	3.10	3.10	0.37	0.37	3.70	3.70	0.08	0.09
Sep-96	31,100	43,200	3.90	3.90	4.90	4.90	0.49	0.49	4.10	4.10	0.11	0.16
Oct-96	21,870	28,570	1.60	1.60	2.20	2.20	0.29	0.29	2.90	2.90	0.04	0.05
Nov-96	20,850	30,250	2.10	2.10	2.50	2.50	0.30	0.30	3.00	3.00	0.05	0.07
Dec-96	25,000	45,800	3.10	3.10	3.70	3.70	0.38	0.38	3.40	3.40	0.07	0.13
Jan-97	22,050	35,850	2.30	3.00	4.30	4.30	0.83	1.10	5.80	5.00	0.08	0.13
Feb-97	17,937	30,268	1.60	4.50	2.90	4.30	0.47	0.78	3.80	3.90	0.04	0.11
Mar-97	25,550	36,270	1.90	4.00	4.90	4.20	0.66	0.77	5.40	4.30	0.09	0.13
Apr-97	34,410	31,500	6.10	3.00	11.00	3.10	1.20	0.68	7.60	3.10	0.24	0.09
May-97	29,670	30,160	3.20	2.30	6.50	4.90	0.74	0.59	5.00	4.00	0.13	0.10
Jun-97	21,800	25,340	5.40	3.50	12.00	4.50	1.20	0.69	9.30	4.50	0.17	0.09
Jul-97	17,761	30,826	4.30	2.90	8.90	3.10	0.94	0.63	6.20	3.30	0.10	0.08
Aug-97	26,310	28,096	5.20	2.60	7.60	3.00	0.79	0.48	4.80	2.70	0.13	0.07
Sep-97	19,043	19,337	5.20	5.10	9.40	4.30	0.11	0.83	6.80	4.20	0.11	0.08
Oct-97	29,722	29,310	6.10	3.70	11.00	3.30	1.30	0.66	8.10	3.60	0.22	0.09
Nov-97	16,360	25,240	3.70	2.00	6.00	2.50	0.66	0.50	4.10	2.70	0.06	0.05
Dec-97	19,183	25,561	5.20	3.50	12.00	4.10	1.30	0.73	8.20	4.20	0.14	0.09
Jan-98	21,560	23,862	5.30	2.80	12.00	3.80	1.30	0.71	8.30	4.10	0.16	0.07
Feb-98	18,100	21,917	6.40	3.70	12.00	4.00	1.40	0.87	8.00	4.50	0.14	0.08
Mar-98	16,753	22,852	8.30	2.10	14.00	2.40	1.50	0.46	9.10	2.50	0.15	0.05
Apr-98	16,426	25,686	3.80	3.80	9.90	4.40	1.20	0.86	7.20	4.70	0.10	0.10
May-98	14,815	21,806	3.30	3.20	5.90	3.40	1.00	0.81	6.90	3.90	0.07	0.07
Jun-98	17,901	22,233	2.40	2.50	4.90	2.80	0.81	0.75	4.50	3.60	0.06	0.06
Jul-98	14,397	25,885	2.20	2.40	5.50	2.60	0.84	0.68	6.20	3.40	0.06	0.06
Aug-98	8,554	26,051	2.80	2.50	4.90	2.60	0.69	0.83	3.90	3.50	0.03	0.07
Sep-98	6,254	29,624	1.50	3.30	1.90	3.10	0.45	0.83	3.70	3.70	0.01	0.09
Oct-98	8,883	30,614	0.57	2.40	0.86	2.70	0.22	0.76	2.40	3.70	0.01	0.08
Nov-98	11,670	30,881	1.20	1.80	2.20	1.40	0.31	0.42	2.07	2.34	0.02	0.05
Dec-98	7,090	35,777	1.30	1.80	1.60	1.40	0.25	0.23	1.81	2.26	0.01	0.06
Jan-99	8,515	26,753	1.60	2.50	2.30	2.10	0.27	0.42	1.90	2.50	0.01	0.06
Feb-99	7,740	23,300	0.90	2.20	0.58	1.90	0.07	0.32	1.10	2.00	0.01	0.04
Mar-99	6,852	29,989	1.80	2.10	1.60	1.80	0.24	0.31	2.40	2.60	0.01	0.06
Apr-99	6,987	24,910	0.89	1.80	0.69	0.91	0.19	0.23	1.80	2.00	0.01	0.03
May-99	8,453	21,357	1.00	1.70	1.30	1.20	0.17	0.13	1.90	1.76	0.01	0.03
Jun-99	9,437	20,186	1.00	0.03	1.30	0.02	0.10	0.01	1.09	0.21	0.01	0.00
Jul-99	8,766	24,853	1.20	0.00	2.70	0.00	0.28	0.00	2.82	0.19	0.02	0.00
Aug-99	9,938	20,768	0.02	0.33	0.09	0.31	0.02	0.06	0.50	0.93	0.00	0.01
Sep-99	10,977	32,655	2.50	1.20	3.90	1.00	0.65	0.20	4.50	1.38	0.03	0.03
Oct-99	10,068	39,498	2.90	0.70	5.10	0.60	0.57	0.08	3.80	1.20	0.03	0.03
Nov-99	14,151	23,822	0.73	0.22	1.70	0.23	0.35	0.05	2.60	1.40	0.02	0.01
Dec-99	11,280	26,637	0.95	0.18	0.80	0.20	0.19	0.04	2.00	0.64	0.01	0.01

Ground Water Extracted Volume, BTEX Concentration and BTEX Mass Recovery
(Continued)

	Groundwater Pumped South Header	Groundwater Pumped North Header	BTEX Concentrations in Groundwater Headers								BTEX Mass Recovery South Header	BTEX Mass Recovery North Header
			Benzene, mg/l		Toluene, mg/l		Ethylbenzene, mg/l		Xylenes, mg/l			
			South Header	North Header	South Header	North Header	South Header	North Header	South Header	North Header		
MONTH	(Gallons)	(Gallons)	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	lbs/day	lbs/day
Jan-00	9,581	26,505	1.20	1.20	2.20	0.61	0.27	0.15	2.40	0.93	0.02	0.02
Feb-00	12,726	25,015	1.20	0.10	2.20	0.08	0.33	0.02	2.40	0.24	0.02	0.00
Mar-00	8,162	36,701	1.10	0.33	2.90	0.19	0.55	0.05	3.70	0.57	0.02	0.01
Apr-00	10,409	34,188	0.72	0.64	0.89	0.59	0.13	0.06	1.20	1.10	0.01	0.02
May-00	9,530	37,369	0.56	0.44	0.49	0.33	0.07	0.04	1.50	1.30	0.01	0.02
Jun-00	14,593	24,053	0.68	1.20	0.68	1.10	0.05	0.12	1.20	1.80	0.01	0.03
Jul-00	15,014	24,129	0.85	0.16	1.10	0.14	0.14	0.03	1.70	0.57	0.02	0.01
Aug-00	12,889	26,497	0.56	0.51	0.61	0.24	0.08	0.02	1.10	1.10	0.01	0.01
Sep-00	12,164	18,663	0.39	1.70	0.52	1.00	0.07	0.20	1.20	1.60	0.01	0.02
Oct-00	12,357	21,462	0.22	0.58	0.50	0.35	0.02	0.11	0.72	0.89	0.00	0.01
Nov-00	12,497	11,203	0.15	1.00	0.30	0.60	0.08	0.16	1.50	0.96	0.01	0.01
Dec-00	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Jan-01	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Feb-01	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Mar-01	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Apr-01	4,411	(2)	0.54	(2)	1.20	(2)	0.21	(2)	2.19	(2)	0.00	(2)
May-01	2,808	(2)	1.93	(2)	3.20	(2)	0.19	(2)	1.95	(2)	0.01	(2)
Jun-01	5,194	(2)	1.48	(2)	2.73	(2)	0.24	(2)	2.16	(2)	0.01	(2)
Jul-01	4,976	22,232	1.60	1.20	3.80	0.50	0.42	0.05	1.71	1.14	0.01	0.02
Aug-01	6,126	27,028	1.70	1.20	4.40	0.50	0.56	0.05	3.60	1.14	0.02	0.02
Sep-01	6,217	26,812	0.01	0.73	0.07	0.41	0.02	0.02	0.26	1.16	0.00	0.02
Oct-01	9,422	22,488	0.02	0.02	0.05	0.06	0.01	0.02	0.15	1.16	0.00	0.01
Nov-01	851	10,406	0.02	1.70	0.05	1.20	0.02	0.40	0.22	1.57	0.00	0.01
Dec-01	(3)	12,998	(3)	0.88	(3)	0.47	(3)	0.04	(3)	1.20	(3)	0.01
Jan-02	(3)	14,272	(3)	1.50	(3)	0.66	(3)	0.15	(3)	1.80	(3)	0.02
Feb-02	(3)	11,868	(3)	0.19	(3)	0.05	(3)	0.01	(3)	0.17	(3)	0.00
Mar-02	(3)	13,597	(3)	1.20	(3)	1.20	(3)	0.12	(3)	1.62	(3)	0.02
Apr-02	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
May-02	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Jun-02	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Jul-02	13,845	(2)	0.06	(2)	0.19	(2)	0.08	(2)	0.70	(2)	0.00	0.00
Aug-02	933	(2)	0.06	(2)	0.19	(2)	0.08	(2)	0.70	(2)	0.00	0.00
Total	**1,111,664**	**2,045,525**	**2.89**	**2.33**	**5.01**	**2.70**	**0.61**	**0.45**	**4.34**	**2.91**	**119.09**	**142.91**

Note: South and Miscellaneous NAPL Area Wells on South Header
(1) Ground Water Pumping Suspended
(2) Ground Water Pumping in North Header Wells Suspended
(3) Ground Water Pumping in South Header Wells Suspended

Treated Water Discharge Monitoring Data

DATE	Concentration (mg/l)						
	Benzene	Toluene	Ethylbenzene	Xylene	Lead	Total Naphthalene's	1,2-DCA
Jan-96	<0.0002	<0.0002	0.0020	0.0250	<0.001	<0.020	<0.005
Feb-96	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.020	<0.005
Mar-96	<0.0002	<0.0002	<0.0002	0.0030	0.0100	<0.020	<0.005
Apr-96	<0.0002	0.0008	<0.0002	0.0030	0.0300	<0.020	<0.005
May-96	<0.0002	0.0010	0.0010	0.0070	<0.001	<0.020	<0.005
Jun-96	<0.0002	<0.0002	<0.0002	0.0020	<0.001	<0.020	<0.005
Jul-96	0.0006	0.0021	0.0011	0.0062	<0.001	<0.020	<0.005
Aug-96	<0.0002	<0.0002	<0.0002	0.0040	<0.001	<0.020	<0.005
Sep-96	<0.0002	<0.0002	0.0010	0.0033	<0.001	<0.020	<0.005
Oct-96	<0.0002	<0.0002	<0.0002	0.0016	<0.001	<0.020	<0.005
Nov-96	<0.0002	<0.0002	<0.0002	0.0045	<0.001	<0.020	<0.005
Dec-96	<0.0002	0.0011	<0.0002	0.0045	<0.001	<0.020	<0.005
Jan-97	<0.0002	<0.0002	<0.0002	0.0045	<0.001	<0.020	<0.005
Feb-97	<0.0002	0.0010	<0.0002	0.0059	<0.001	<0.020	N/S
Mar-97	<0.0002	0.0010	<0.0002	0.0006	<0.001	<0.020	N/S
Apr-97	<0.0002	<0.0002	<0.0002	0.0053	0.0190	<0.020	N/S
May-97	<0.0002	0.0050	0.0023	0.0048	0.0220	<0.020	N/S
Jun-97	<0.0002	0.0058	<0.0002	0.0052	0.0290	<0.020	N/S
Jul-97	<0.0002	0.0011	<0.0002	0.0066	0.0250	<0.020	N/S
Aug-97	<0.0002	0.0016	<0.0002	0.0100	0.0250	<0.020	N/S
Sep-97	<0.0002	0.0014	<0.0002	0.0055	0.0180	<0.020	N/S
Oct-97	<0.0002	0.0014	<0.0002	0.0100	0.0190	<0.020	N/S
Nov-97	<0.0002	0.0021	0.0011	0.0072	0.0270	<0.020	N/S
Dec-97	<0.0002	0.0033	0.0010	0.0110	0.0200	<0.020	N/S
Jan-98	<0.0002	0.0021	<0.0002	0.0069	0.0190	<0.020	N/S
Feb-98	<0.0002	0.0046	0.0017	0.0130	0.0210	<0.020	N/S
Mar-98	<0.0002	0.0290	0.0160	0.0410	0.0200	<0.020	N/S
Apr-98	0.0009	0.0013	0.0092	0.0150	0.0140	<0.020	N/S
May-98	<0.0002	0.0020	0.0055	0.0091	0.0200	<0.020	N/S
Jun-98	<0.0002	0.0010	0.0024	0.0051	0.0170	<0.020	N/S
Jul-98	0.0028	0.0029	<0.0002	0.0140	0.0210	<0.020	N/S
Aug-98	<0.0002	<0.0002	0.0011	0.0094	0.0120	<0.020	N/S
Sep-98	<0.0002	<0.0002	0.0026	0.0083	0.0090	<0.020	N/S
Oct-98	<0.0002	<0.0002	<0.0002	0.0042	0.0080	<0.020	N/S
Nov-98	0.0009	0.0026	0.0024	0.0074	0.0090	<0.020	N/S
Dec-98	0.0022	0.0024	0.0044	0.0064	0.0070	<0.020	N/S
Jan-99	0.0027	<0.0002	<0.0002	0.0027	0.0080	<0.020	N/S
Feb-99	0.0011	<0.0002	<0.0002	0.0056	<0.001	<0.004	N/S
Mar-99	<0.0002	0.0014	0.0031	0.0120	0.0160	<0.004	N/S
Apr-99	<0.0002	0.0023	<0.0002	0.0071	0.0150	<0.004	N/S
May-99	<0.0002	0.0011	<0.0002	0.0035	0.0200	<0.004	N/S
Jun-99	<0.0002	0.0014	0.0022	0.0035	0.0140	<0.004	N/S
Jul-99	<0.0002	0.0027	<0.0002	0.0027	0.0200	<0.004	N/S
Aug-99	<0.0002	0.0022	0.0026	0.0113	0.0310	<0.004	N/S
Sep-99	0.0075	0.0051	0.0037	0.0490	0.0250	<0.004	N/S
Oct-99	<0.0002	<0.0002	<0.0002	0.0043	0.0150	<0.004	N/S
Nov-99	0.0026	0.0022	0.0032	0.0150	0.0150	<0.004	N/S
Dec-99	<0.0002	<0.0002	0.0018	0.0087	0.0140	<0.004	N/S

Treated Water Discharge Monitoring Data (Continued)

DATE	Concentration (mg/l)						
	Benzene	**Toluene**	**Ethylbenzene**	**Xylene**	**Lead**	**Total Naphthalene's**	**1,2-DCA**
Jan-00	0.0008	0.0011	0.0010	0.0077	0.0100	<0.004	N/S
Feb-00	<0.0002	<0.0002	0.0022	0.0053	0.0100	<0.004	N/S
Mar-00	<0.0002	<0.0002	<0.0002	0.0038	0.0150	<0.004	N/S
Apr-00	<0.0002	<0.0002	0.0014	0.0064	0.0080	<0.004	N/S
May-00	.0002U	0.0021	0.0014	0.0100	0.0130	<0.004U	N/S
Jun-00	.0002U	0.0078	0.0067	0.0066	0.0250	<0.004U	N/S
Jul-00	.0002U	0.0057	.002U	0.0041	0.0120	<0.004U	N/S
Aug-00	0.0006	.0056J	0.0015	0.0055	0.0110	<0.004U	N/S
Aug-00	.0003J	.001J	0.0002	0.0070	0.0130	<0.004U	N/S
Sep-00	.0002U	0.0002U	.0005J	0.0030	.001B	<0.004U	N/S
Oct-00	.0002U	0.0002U	0.0010	0.0020	.002B	<0.004U	N/S
Nov-00	(2)						
Dec-00	(2)						
Jan-01	(2)						
Feb-01	(2)						
Mar-01	(2)						
Apr-01	0.0060	0.0050	0.0090	0.0095	0.1160	<0.02	N/S
May-01	.0008J	0.0026	0.0050	0.0039	0.0900	<0.03	N/S
Jun-01	0.0036	0.0022	0.0083	0.0242	0.0800	<0.02	N/S
Jul-01	<0.0001	0.0012	0.0045	0.0140	0.0740	<0.015	N/S
Aug-01	<0.0001	<0.0002	<0.0002	<.0008	0.0160	<0.01	N/S
Sep-01	<0.0001	<0.0001	0.0022	0.0051	0.0180	<0.002	N/S
Oct-01	<0.0001	<0.0001	0.0017	0.0034	0.0160	0.0054	N/S
Nov-01	0.0001	0.0015	0.0023	0.0018	0.0110	<0.003	N/S
Dec-01	<0.0001	.0007J	0.0044	0.0026	0.0070	<0.005	N/S
Jan-02	.0002J	0.0010	0.0014	.0011J	0.0050	<0.005	N/S
Feb-02	.0001U	0.0012	0.0003	0.0038	0.0130	0.0090	N/S
Mar-02	0.0006	0.0009	0.0017	0.0015	0.0040	<0.005	N/S
Apr-02	(2)						
May-02	(2)						
Jun-02	(2)						
Jul-02	0.0001	0.0006	0.0033	0.0022	0.0120	<0.005	N/S
Mean (1)	**0.0006**	**0.0019**	**0.0019**	**0.0075**	**0.0166**	**0.0134**	**<0.005**
Std. Deviation(1)	**0.0013**	**0.0036**	**0.0027**	**0.0079**	**0.0202**	**0.0080**	**----**
Treated Water Discharge Limits	**0.010**	**0.750**	**0.750**	**0.620**	**0.050**	**0.030**	**0.010**

Note : (1) When compound was not detected, method detection limit value was used for calculating mean and standard deviation
(2) System Operations Suspended

E Sandstone Unit Leading Edge Plume Well Monitoring Data

	E Sandstone Unit Leading Edge Plume Monitoring Well Benzene Concentration (ug/l)				
Month	MW-10S	MW-27S	MW-34E	MW-38ER	MW-37E
Apr-90	260	29	(1)	(1)	(1)
Jul-90	480	8	(1)	(1)	(1)
Oct-90	270	27	1 U	(1)	(1)
Jan-91	4	(1)	3 JB	(1)	(1)
Apr-91	130	15	1 U	(1)	(1)
Jul-91	44	(1)	(1)	(1)	(1)
Apr-92	190	(1)	0.5 U	(1)	(1)
Apr-93	240	(1)	1 U	(1)	(1)
Jun-94	310	51	4 U	35	0.4 U
Jul-94	(1)	(1)	(1)	(1)	5.4
Oct-94	390	(1)	(1)	16	(1)
Jan-95	980	44	0.4 U	27	0.9 U
May-95	1400	27	0.5 U	6.6	1.6
Aug-95	1300	34	0.5 U	16	0.9
Nov-95	1200	43	0.5 U	9	0.5 U
Dec-95	(1)	(1)	0.5 U	(1)	0.5 U
Mar-96	870	21	0.5 U	8	0.5 U
May-96	190	23	0.5 U	11	0.5 U
Aug-96	9.5	0.5 U	0.5 U	25	0.5 U
Sep-96	(1)	(1)	0.5 U	(1)	0.5 U
Nov-96	27	0.5	0.5 U	2.9	0.5 U
Feb-97	31	0.5 U	0.5 U	2.4	0.5 U
May-97	45	0.5 U	0.5 U	1.2	0.5 U
Aug-97	17	0.5 U	0.5 U	1.1	0.5 U
Nov-97	2.3	0.5 U	0.5 U	0.5 U	0.5 U
Feb-98	4.8	1.7	0.5 U	1.5	0.5 U
Apr-98	11	4.4	0.5 U	1.6	0.5 U
Aug-98	5.5	0.96	0.5 U	0.7	0.5 U
Nov-98	1.1	0.4 U	0.4 U	1.1	0.4 U
Feb-99	1.6	0.2 U	0.2 U	0.69	0.2 U
May-99	2.7	0.5 U	0.2 U	0.5	1 U
Aug-99	2.2	1 U	1 U	1	1 U
Nov-99	1.2	0.2 U	0.2 U	0.4 BJ	0.2 U
Feb-00	1.2	0.2 U	0.2 U	0.2 U	0.2 U
May-00	1.3	0.2 U	0.2 U	0.2 U	0.2 U
Aug-00	0.9	0.2 U	0.2 U	0.2 U	0.2 U
Nov-00	0.2	0.2 U	0.2 U	0.2 U	0.2 U
Mar-01	0.7	0.2 U	0.2 U	0.2 U	0.2 U
Apr-01	2.2	0.2 U	0.2 U	0.2 U	0.2 U
May-01	0.6	0.6 U	0.6 U	0.6 U	0.6 U
Jun-01	43	0.5 U	0.5 U	0.5 U	0.5 U
Jul-01	48	1.0 U	1.0 U	1.0 U	1.0 U
Aug-01	26	(2)	(2)	(2)	(2)
Sep-01	1	1.0 U	1.0 U	1.0 U	1.0 U

E Sandstone Unit Leading Edge Plume Well Monitoring Data (Continued)

	E Sandstone Unit Leading Edge Plume Monitoring Well Benzene Concentration (ug/l)				
Month	MW-10S	MW-27S	MW-34E	MW-38ER	MW-37E
Oct-01	33	(2)	(2)	(2)	(2)
Oct-01	18	(2)	(2)	(2)	(2)
Nov-01	0.7	(2)	(2)	(2)	(2)
Dec-01	1.1	0.1 U	0.1 U	0.1 U	0.1 U
Jan-02	48	(2)	(2)	(2)	(2)
Feb-02	130	0.7 U	0.7 U	0.7 U	0.7 U
Mar-02	480	(2)	(2)	(2)	(2)
Mar-02	410	(2)	(2)	(2)	(2)
Apr-02	500	(2)	(2)	(2)	(2)
May-02	650	0.7 U	0.7 U	0.7 U	0.7 U
May-02	730	(2)	(2)	(2)	(2)
Jun-02	600	(2)	(2)	(2)	(2)
Jul-02	400	(2)	(2)	(2)	(2)
Aug-02	620	0.7 U	0.7 U	0.7 U	0.7 U
Sep-02	520	(2)	(2)	(2)	(2)
Oct-02	850	(2)	(2)	(2)	(2)
Nov-02	760	0.7 U	0.7 U	0.7 U	0.7 U
Dec-02	890	(2)	(2)	(2)	(2)
Jan-03	870	(2)	(2)	(2)	(2)
Feb-03	850	0.7 U	0.7 U	0.7 U	0.7 U
May-03	870	0.7 U	0.7 U	0.7 U	0.7 U
Aug-03	680	0.7 U	0.7 U	0.7 U	0.7 U
Nov-03	550	0.7 U	0.7 U	0.7 U	0.7 U
Feb-04	850	0.7 U	0.7 U	0.7 U	0.7 U
May-04	680	0.7 U	0.7 U	0.7 U	0.7 U
Aug-04	640	0.7 U	0.7 U	0.7 U	0.7 U
Nov-04	980	0.7 U	0.7 U	0.7 U	0.7 U
Feb-05	710	1.0 U	1.0 U	1.0 U	1.0 U

Note: (1) No sample collected
(2) Quarterly sampling frequency

Organic Vapor Monitoring Data

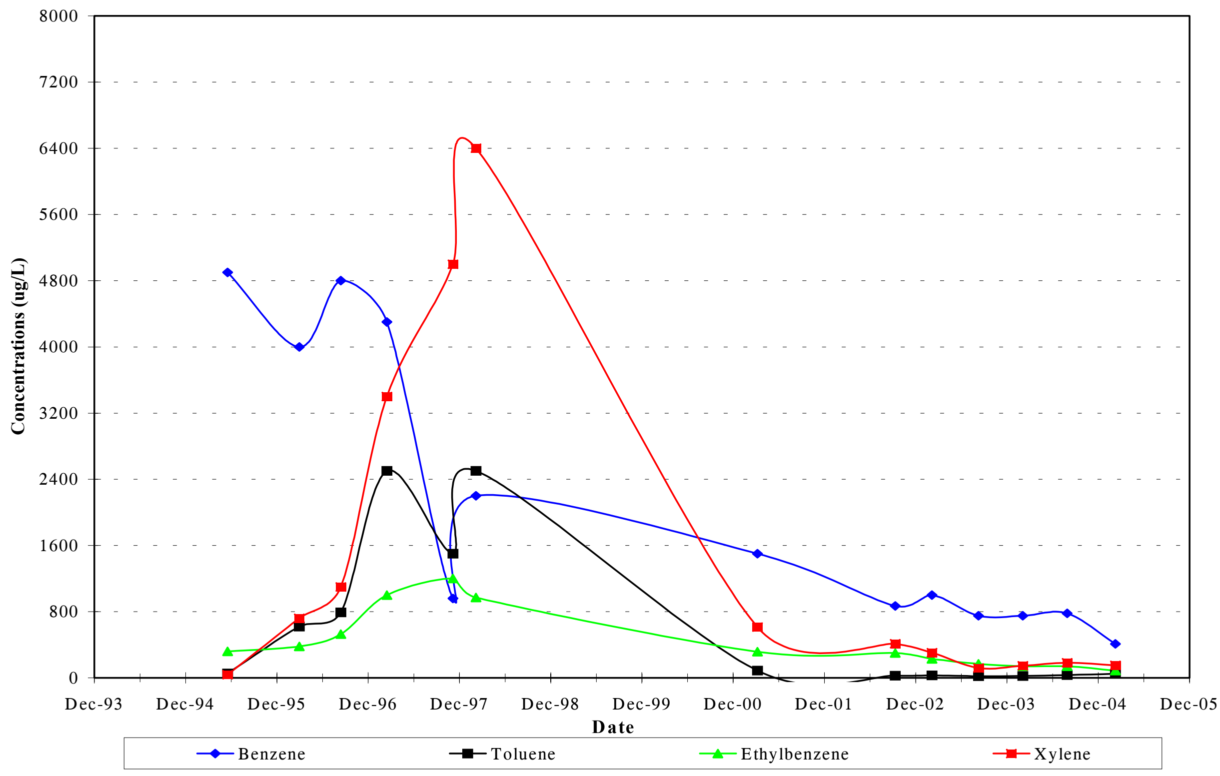
Concentration (ppm)				
Date	Vent Scrub	South Boundary	Boundary	Treatment Building
Aug-96	1.4	1.0	1.3	-
Sep-96	1.3	1.2	1.3	-
Oct-96	0.8	0.5	0.5	-
Nov-96	0.6	0.5	0.5	-
Dec-96	0.7	0.4	0.6	-
Jan-97	0.6	0.5	0.6	-
Feb-97	0.6	0.5	0.6	-
Mar-97	0.6	0.5	0.5	-
Apr-97	0.6	0.5	0.5	-
May-97	0.6	0.5	0.5	-
Jun-97	0.8	0.6	0.6	0.8
Jul-97	0.7	0.6	0.7	0.7
Aug-97	0.7	0.6	0.6	0.7
Sep-97	0.7	0.5	0.7	0.7
Oct-97	0.7	0.6	0.7	0.7
Nov-97	0.7	0.6	0.7	0.7
Dec-97	0.7	0.6	0.7	0.7
Jan-98	0.7	0.6	0.9	0.7
Feb-98	0.7	0.6	0.8	0.7
Mar-98	0.7	0.6	0.7	0.7
Apr-98	0.9	0.5	0.9	0.9
May-98	0.6	0.5	0.5	0.6
Jun-98	0.6	0.5	0.5	0.5
Jul-98	0.6	0.5	0.5	0.6
Aug-98	0.5	0.3	0.5	0.6
Sep-98	0.6	0.5	0.7	0.6
Oct-98	0.6	0.5	0.7	0.8
Nov-98	0.5	0.4	0.5	0.6
Dec-98	0.4	0.4	0.4	0.7
Jan-99	0.4	0.4	0.4	0.7
Feb-99	0.5	0.4	0.4	0.7
Mar-99	0.4	0.4	0.4	0.7
Apr-99	0.4	0.4	0.4	0.7
May-99	0.4	0.4	0.4	0.8
Jun-99	0.4	0.4	0.4	0.7
Jul-99	0.5	0.4	0.5	0.8
Aug-99	0.5	0.4	0.5	0.8
Oct-99	0.6	0.4	0.6	0.8
Nov-99	0.4	0.4	0.4	0.7
Dec-99	0.5	0.4	0.5	0.7

Organic Vapor Monitoring Data (Continued)

Concentration (ppm)				
Date	**Vent Scrub**	**South Boundary**	**Boundary**	**Treatment Building**
Jan-00	0.5	0.4	0.4	0.8
Feb-00	0.4	0.4	0.4	0.8
Mar-00	0.4	0.4	0.4	0.7
Apr-00	0.4	0.4	0.4	0.7
May-00	0.4	0.4	0.4	0.7
Jun-00	0.4	0.4	0.2	0.5
Jul-00	0.5	0.6	0.6	0.8
Aug-00	0.6	0.4	0.5	0.4
Sep-00	0.6	0.4	0.4	0.6
Oct-00	0.6	0.6	0.5	0.7
Nov-00	0.7	0.6	0.5	0.8
Dec-00	0.7	0.6	0.6	0.6
Jan-01	0.6	0.5	0.5	0.6
Feb-01	0.4	0.6	0.4	0.6
Mar-01	0.4	0.4	0.4	0.5
Apr-01	0.5	0.6	0.5	0.7
May-01	0.4	0.4	0.4	0.6
Jun-01	0.5	0.4	0.3	0.5
Jul-01	0.3	0.4	0.4	0.4
Aug-01	0.4	0.4	0.4	0.7
Sep-01	0.4	0.4	0.4	0.7
Oct-01	0.4	0.4	0.4	0.7
Nov-01	0.5	0.4	0.4	0.6
Dec-01	0.4	0.4	0.4	0.7
Jan-02	0.4	0.4	0.4	0.6
Feb-02	0.4	0.4	0.4	0.7
Mar-02	0.4	0.4	0.4	0.7
Apr-02	0.4	0.4	0.4	0.7
May-02	0.4	0.4	0.4	0.7
Jun-02	0.4	0.4	0.4	0.7
Jul-02	0.4	0.4	0.4	0.7
Aug-02	0.4	0.4	0.4	0.7
Sep-02	0.4	0.4	0.4	0.7
Oct-02	0.4	0.4	0.4	0.7
Nov-02	0.4	0.4	0.4	0.7
Dec-02	0.4	0.4	0.4	0.7
Jan-03	0.4	0.4	0.4	0.7
Mar-03	0.4	0.4	0.4	0.7
Jun-03	0.4	0.4	0.4	0.7
Sep-03	0.4	0.4	0.4	0.7
Nov-03	0.5	0.5	0.5	0.6
Dec-03	0.4	0.4	0.4	0.7
Mean	**0.6**	**0.5**	**0.6**	**0.7**
Std. Deviation	**0.2**	**0.2**	**0.2**	**0.1**

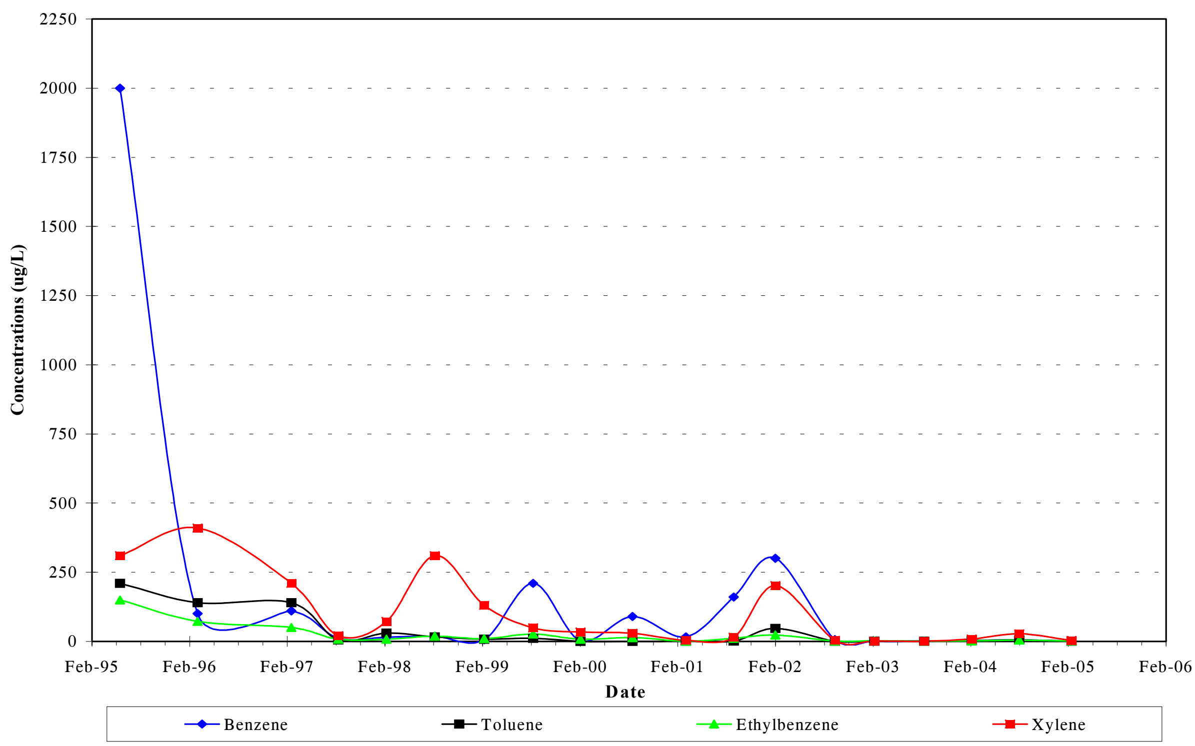
BTEX Sampling Results in the E Sandstone Unit Monitoring Well AS/OBS-1

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	4900	55	320	39
Mar-96	4000	620	380	720
Aug-96	4800	790	530	1100
Feb-97	4300	2500	1000	3400
Nov-97	960	1500	1200	5000
Feb-98	2200	2500	970	6400
Mar-01	1500	88	316	612
Sep-02	870	28	300	412
Feb-03	1000	30	230	305
Aug-03	750	21	170	119
Feb-04	750	23	140	146
Aug-04	780	33	140	182
Feb-05	410	50	87	150



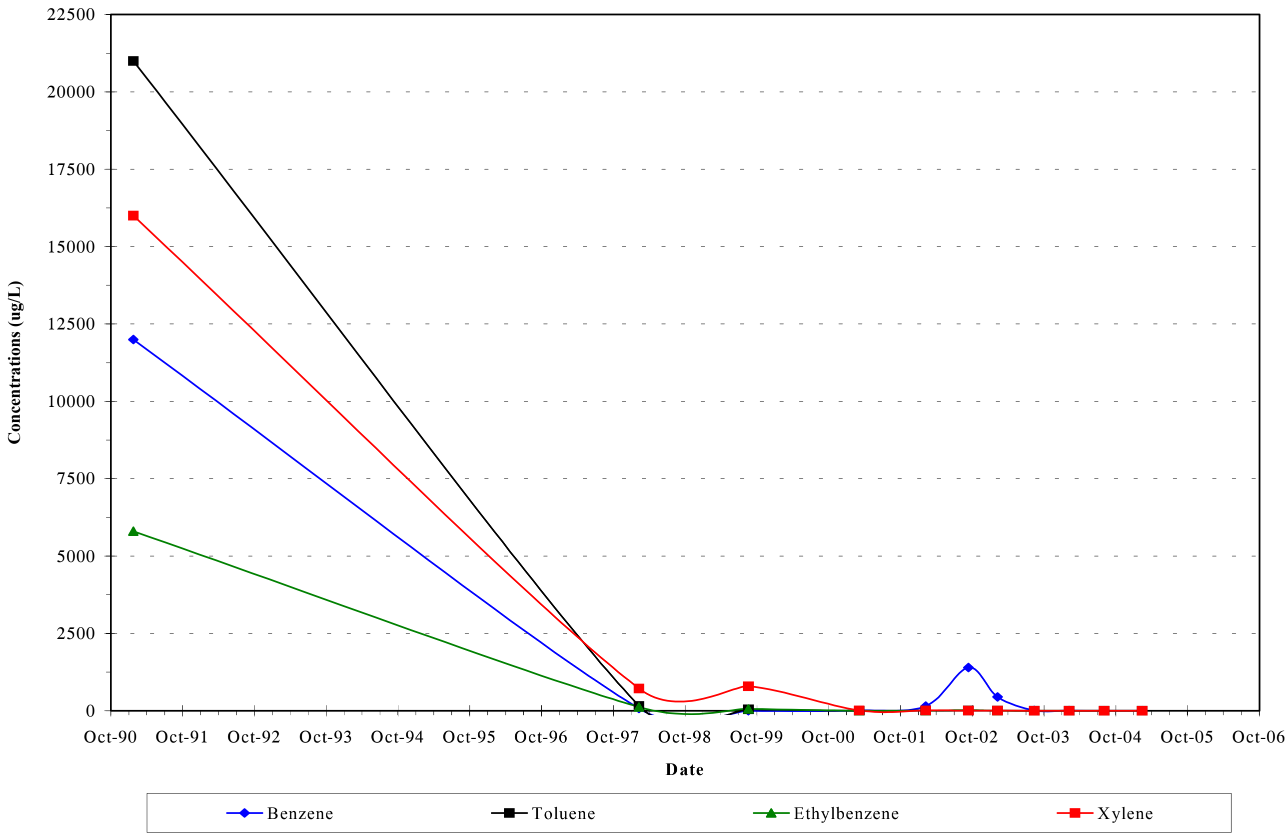
BTEX Sampling Results in the E Sandstone Unit Monitoring Well AS/OBS-2

Date	Concentrations, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	2000	210	150	310
Mar-96	100	140	72	410
Feb-97	110	140	50	210
Aug-97	12	5.1	8.1	21
Feb-98	15	30	8.1	72
Aug-98	18	16	19	310
Feb-99	6	7.7	10	130
Aug-99	210	11	27	49
Feb-00	2.4	0.2	7.5	34
Aug-00	90	0.2	14	29
Mar-01	16.3	0.8	0.9	3.7
Aug-01	160	1	11	15
Feb-02	300	47	23	202
Sep-02	6.7	0.4	1.5	3.6
Feb-03	0.8	0.4	2.2	1.4
Aug-03	0.7	0.4	0.4	0.9
Feb-04	3.4	2.5	1.9	8.5
Aug-04	5.2	5.4	4.5	27.1
Feb-05	0.6	0.9	1	3



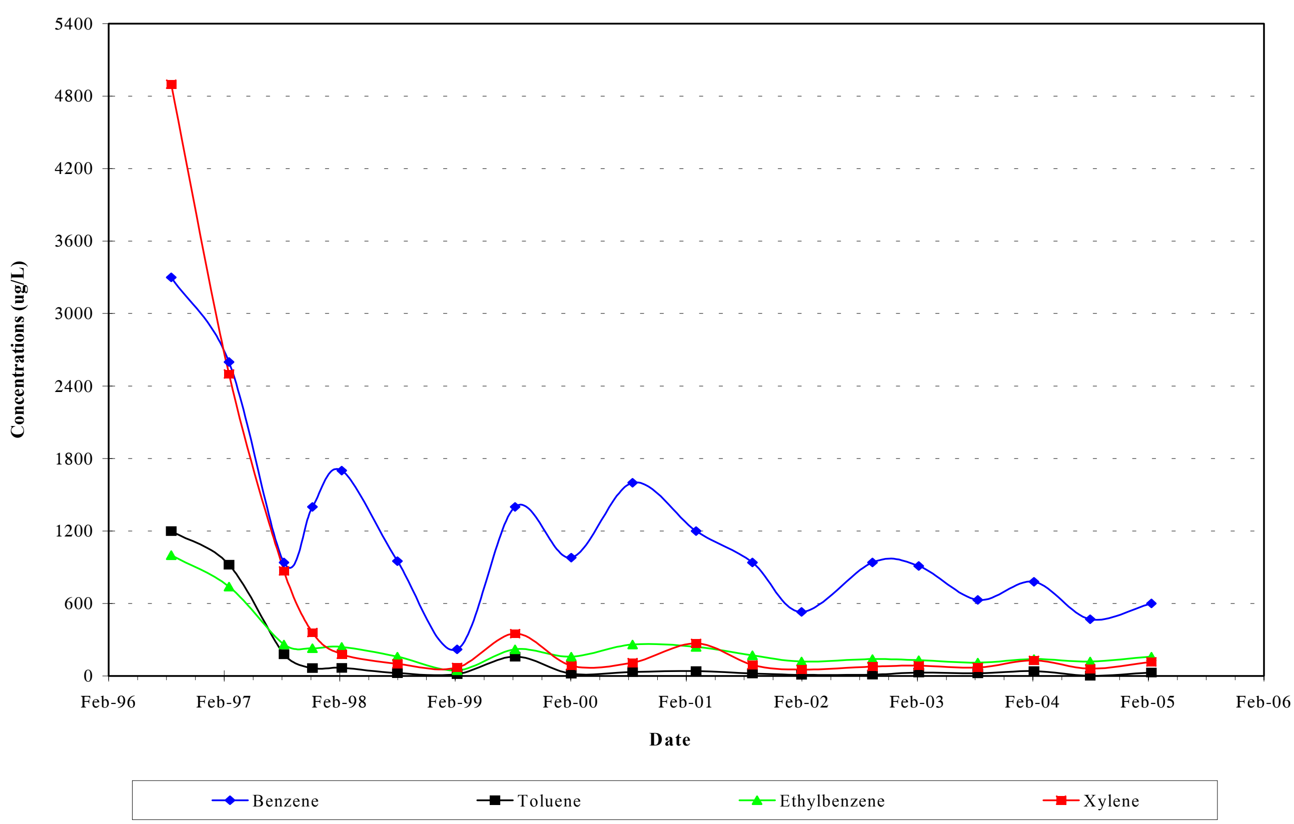
BTEX Sampling Results in the E Sandstone Unit Monitoring Well N-14P

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Jan-91	12000	21000	5800	16000
Feb-98	71	160	120	720
Aug-99	1	49	60	790
Mar-01	7.1	1.2	0.4	14.9
Feb-02	150	5.2	3.5	14.4
Sep-02	1400	9.9	19	6.7
Feb-03	450	5.6	1.9	4.8
Aug-03	15	0.4	0.4	1.1
Feb-04	8.8	0.5	0.4	1
Aug-04	0.7	0.5	0.4	1
Feb-05	1.1	1	1	3



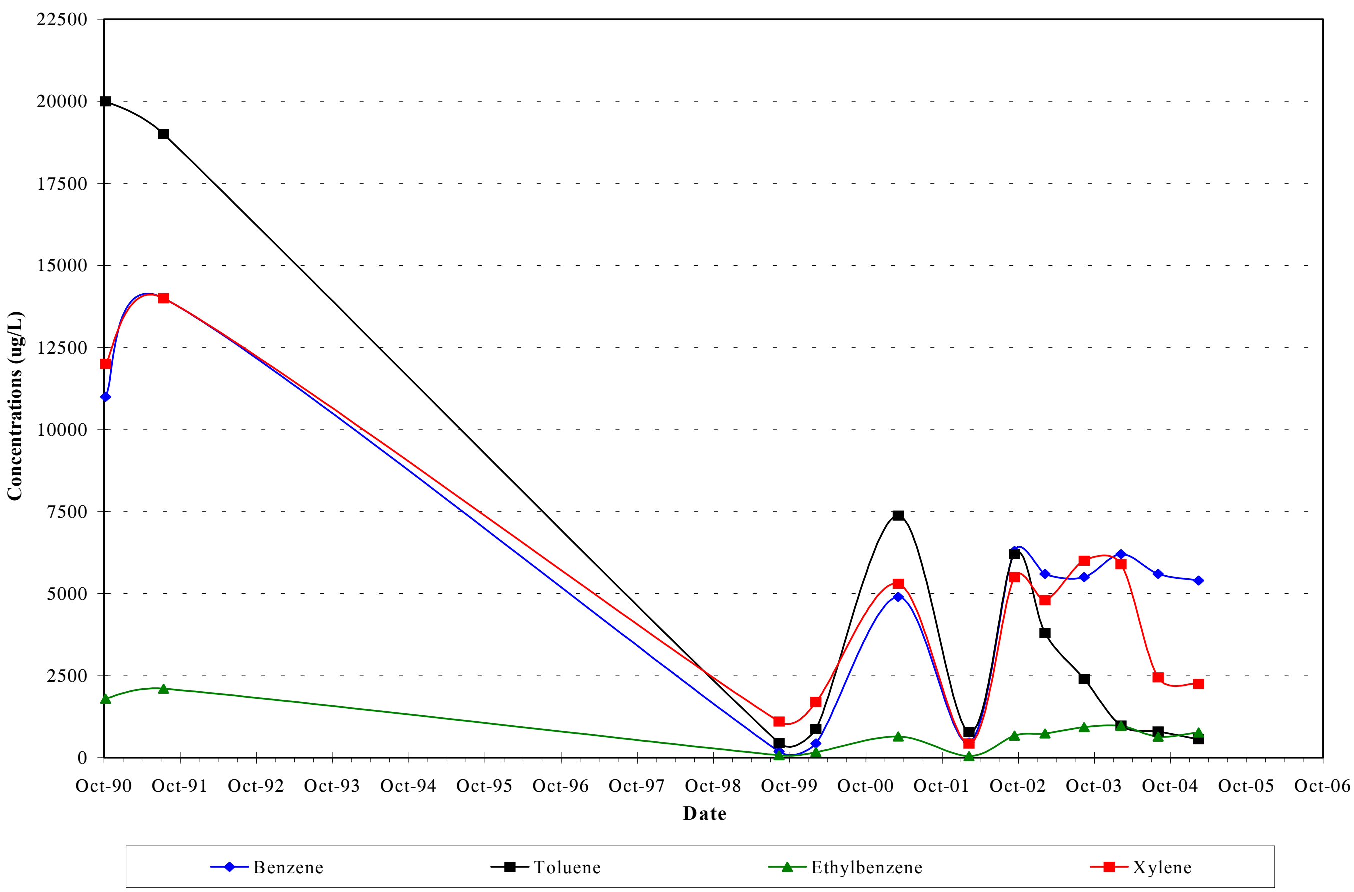
BTEX Sampling Results in the E Sandstone Unit Monitoring Well E8E

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Aug-96	3300	1200	1000	4900
Feb-97	2600	920	740	2500
Aug-97	940	180	260	870
Nov-97	1400	65	230	360
Feb-98	1700	66	240	180
Aug-98	950	24	160	100
Feb-99	220	15	47	69
Aug-99	1400	160	220	350
Feb-00	980	18	160	86
Aug-00	1600	33	260	110
Mar-01	1200	41	240	270
Aug-01	940	20	170	92
Feb-02	530	10	120	53.1
Sep-02	940	11	140	78
Feb-03	910	28	130	85
Aug-03	630	21	110	69
Feb-04	780	40	140	128
Aug-04	470	2.3	120	60.3
Feb-05	600	28	160	116



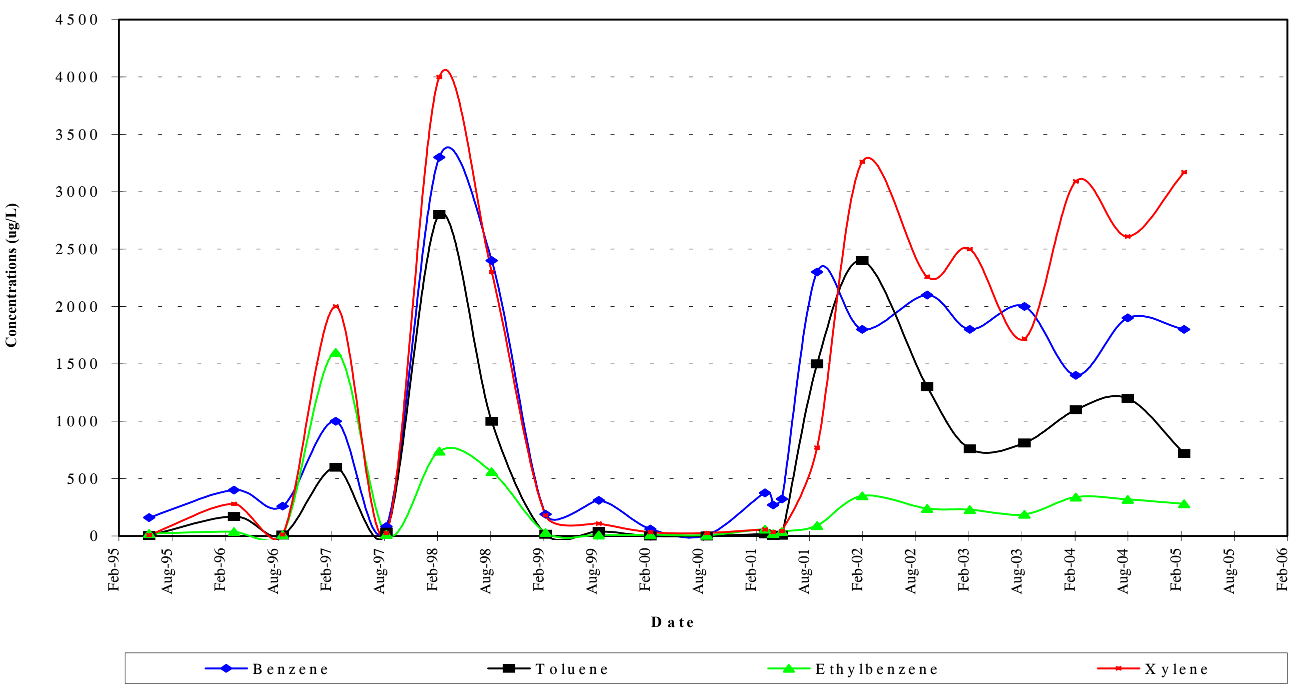
BTEX Sampling Results in the E Sandstone Unit Monitoring Well MW-8S

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Oct-90	11000	20000	1800	12000
Jul-91	14000	19000	2100	14000
Aug-99	190	450	74	1100
Feb-00	430	870	170	1700
Mar-01	4900	7380	645	5300
Feb-02	460	780	47	430
Sep-02	6300	6200	670	5500
Feb-03	5600	3800	740	4800
Aug-03	5500	2400	930	6000
Feb-04	6200	980	970	5900
Aug-04	5600	800	640	2450
Feb-05	5400	560	770	2250



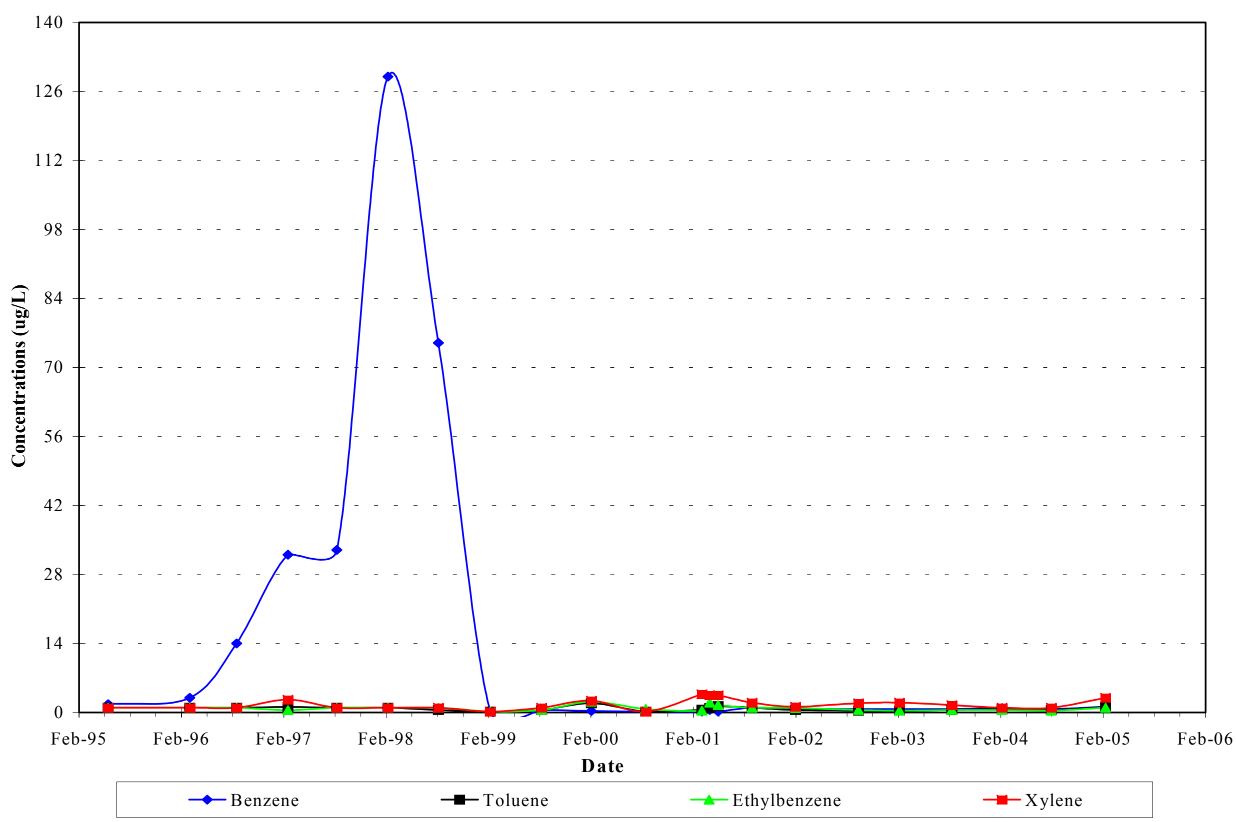
BTEX Sampling Results in the E Sandstone Unit Monitoring Well MW-2S

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	160	5	22	8
Mar-96	400	170	38	280
Aug-96	260	9.2	12	15
Feb-97	1000	600	1600	2000
Aug-97	83	34	15	28
Feb-98	3300	2800	740	4000
Aug-98	2400	1000	560	2300
Feb-99	190	16	30	180
Aug-99	310	41	8.9	109
Feb-00	61	0.2	11	33
Aug-00	7.5	0.2	7	26
Mar-01	376	18	59	57
Apr-01	270	5.2	20.1	35.4
May-01	322	7.1	39.3	44
Aug-01	2300	1500	91	770
Feb-02	1800	2400	350	3260
Sep-02	2100	1300	240	2260
Feb-03	1800	760	230	2500
Aug-03	2000	810	190	1720
Feb-04	1400	1100	340	3090
Aug-04	1900	1200	320	2610
Feb-05	1800	720	280	3170



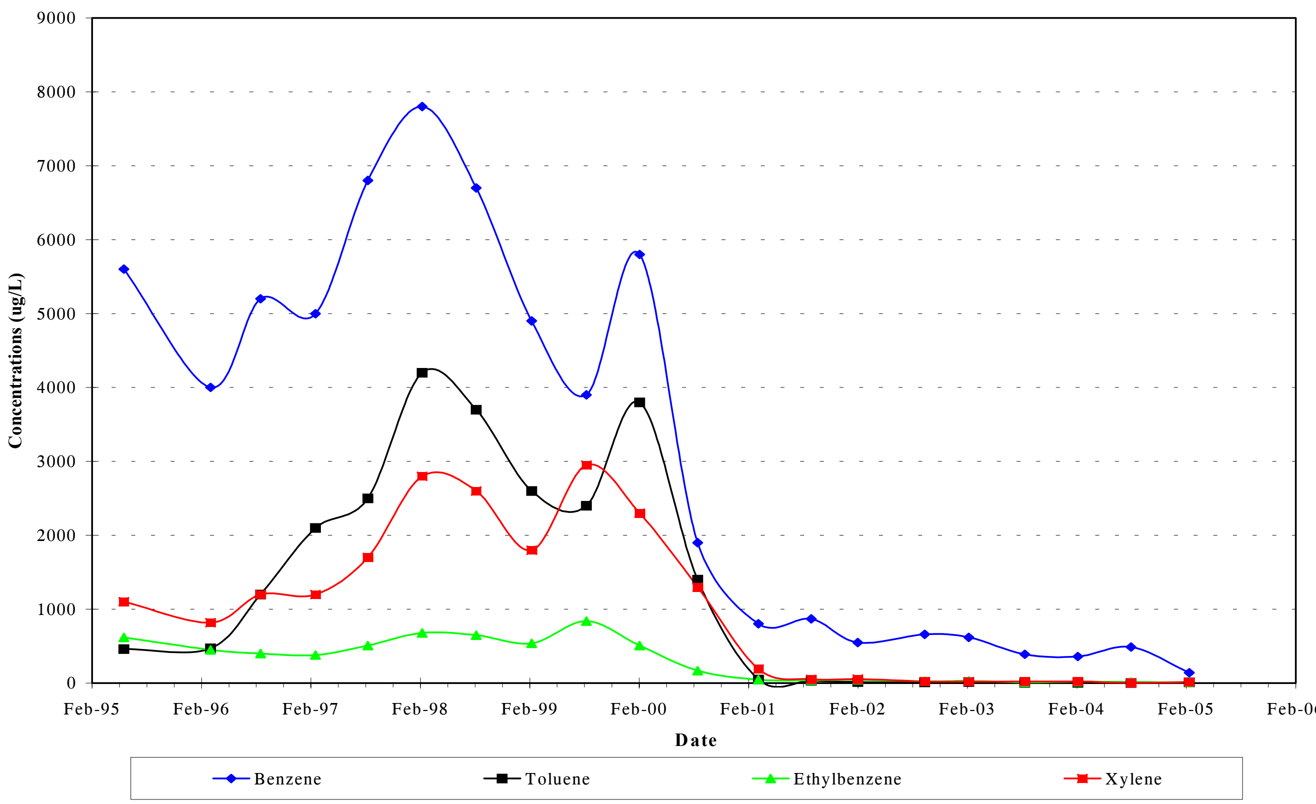
BTEX Sampling Results in the E Sandstone Unit Monitoring Well MW-7S

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	1.7	1	1	1
Mar-96	3	1	1	1
Aug-96	14	1	1	1
Feb-97	32	1.1	0.49	2.6
Aug-97	33	1	1	1
Feb-98	129	1	1	1
Aug-98	75	0.5	1	1
Feb-99	0.2	0.2	0.2	0.2
Aug-99	0.5	0.5	0.5	1
Feb-00	0.33	1.9	2.2	2.4
Aug-00	0.2	0.2	0.72	0.2
Mar-01	0.2	0.6	0.4	3.7
Apr-01	0.5	0.9	2	3.5
May-01	0.2	1.3	1.5	3.5
Aug-01	1	1	1	2
Feb-02	0.7	0.5	0.9	1.2
Sep-02	0.7	0.4	0.5	1.9
Feb-03	0.7	0.4	0.4	2
Aug-03	0.7	0.5	0.5	1.5
Feb-04	0.9	0.7	0.5	1
Aug-04	0.7	0.5	0.4	1
Feb-05	1.2	1.1	1	3



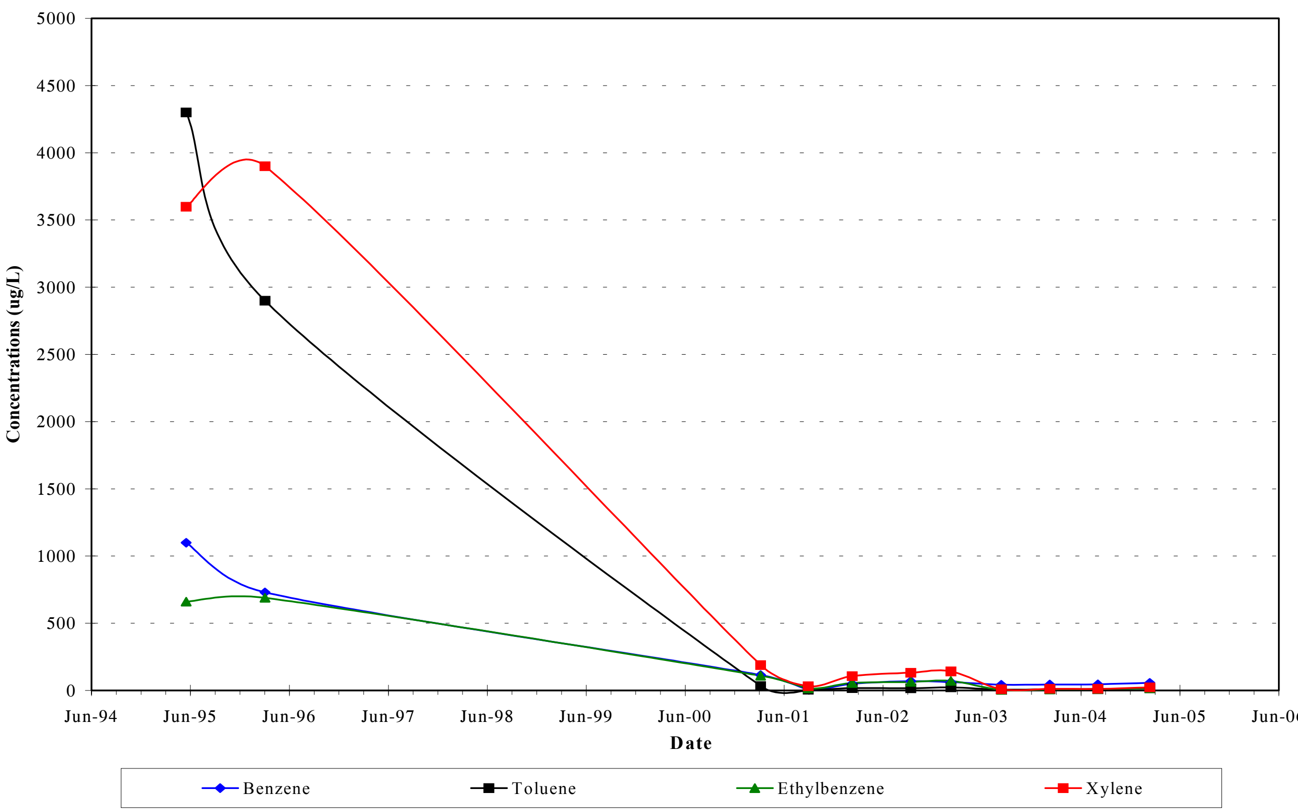
BTEX Sampling Results in the E Sandstone Unit Monitoring Well N-10P

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	5600	460	620	1100
Mar-96	4000	470	450	820
Aug-96	5200	1200	400	1200
Feb-97	5000	2100	380	1200
Aug-97	6800	2500	510	1700
Feb-98	7800	4200	680	2800
Aug-98	6700	3700	650	2600
Feb-99	4900	2600	540	1800
Aug-99	3900	2400	840	2950
Feb-00	5800	3800	510	2300
Aug-00	1900	1400	170	1300
Mar-01	804	50	48	192
Aug-01	870	32	40	53.8
Feb-02	550	14	45	55.5
Sep-02	660	9.9	26	22.4
Feb-03	620	16	29	21.3
Aug-03	390	3.9	12	22.7
Feb-04	360	3.9	19	23
Aug-04	490	2.3	14	4.7
Feb-05	140	9.2	13	15



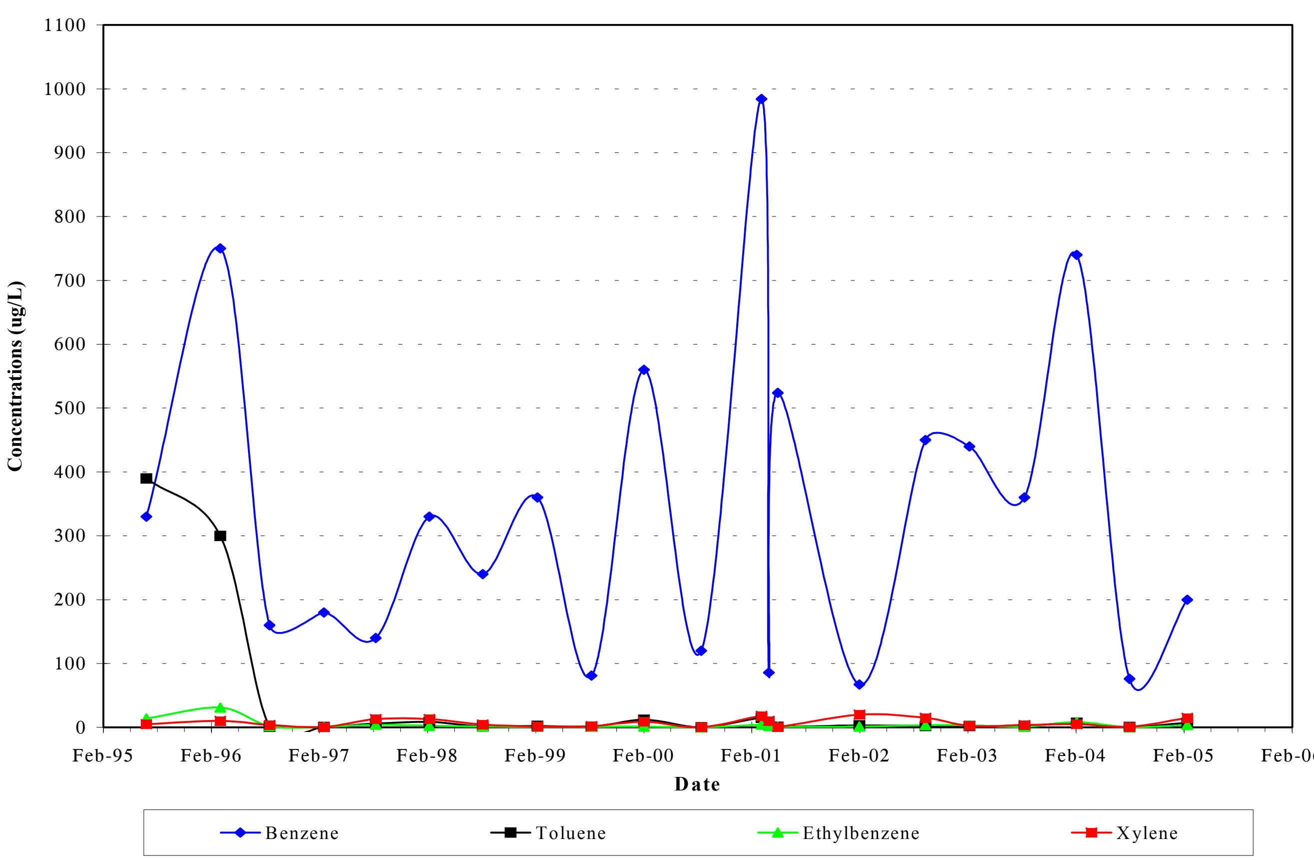
BTEX Sampling Results in the E Sandstone Unit Monitoring Well MW-31E

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	1100	4300	660	3600
Mar-96	730	2900	690	3900
Mar-01	115	34	110	190
Aug-01	6.4	5.2	16	31.7
Feb-02	50	18	56	107
Sep-02	70	17	64	132
Feb-03	63	23	71	142
Aug-03	43	6.5	4.1	9.6
Feb-04	45	10	8	12.8
Aug-04	46	9.8	11	13.1
Feb-05	57	17	17	24.3



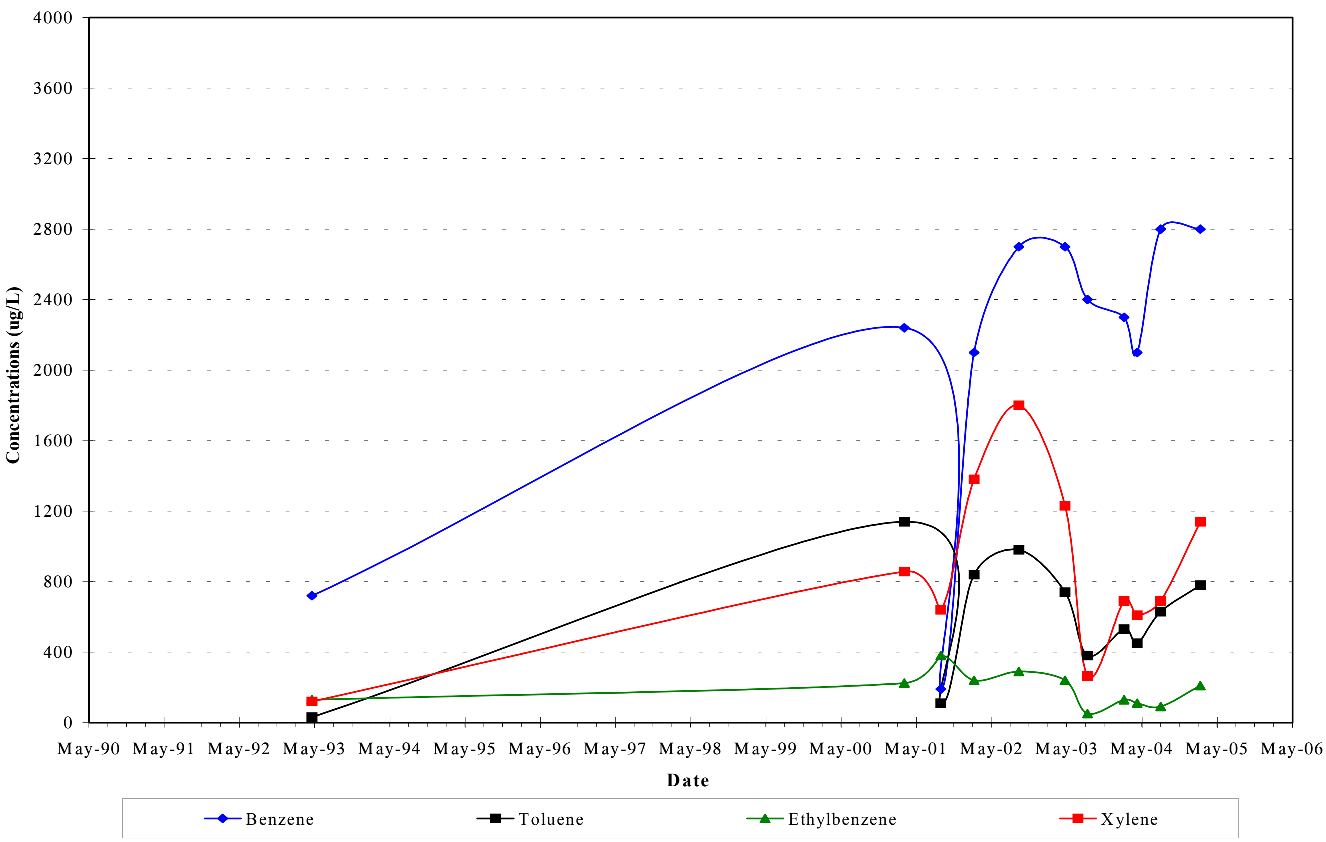
BTEX Sampling Results in the E Sandstone Unit Monitoring Well MW-24S

	Concentrations, ug/L			
Date	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**
Jun-95	330	390	14	5
Mar-96	750	300	31	10
Aug-96	160	1.1	1.8	3.7
Feb-97	180	0.6	1	0.7
Aug-97	140	5.9	4	13
Feb-98	330	8.4	2.5	13
Aug-98	240	1.6	1.3	4.4
Feb-99	360	2.4	1	1.7
Aug-99	81	1	1	2
Feb-00	560	12	1.3	9
Aug-00	120	0.3	0.2	0.2
Mar-01	984	15	4	18
Apr-01	85.8	4.1	2.2	10
May-01	524	1	1	1
Feb-02	67	3.2	1.4	20
Sep-02	450	2.3	3.6	14.8
Feb-03	440	2.3	3.3	2.6
Aug-03	360	2	1.1	3.7
Feb-04	740	7.4	8.2	5.2
Aug-04	76	0.5	0.4	1
Feb-05	200	7.4	3.8	15



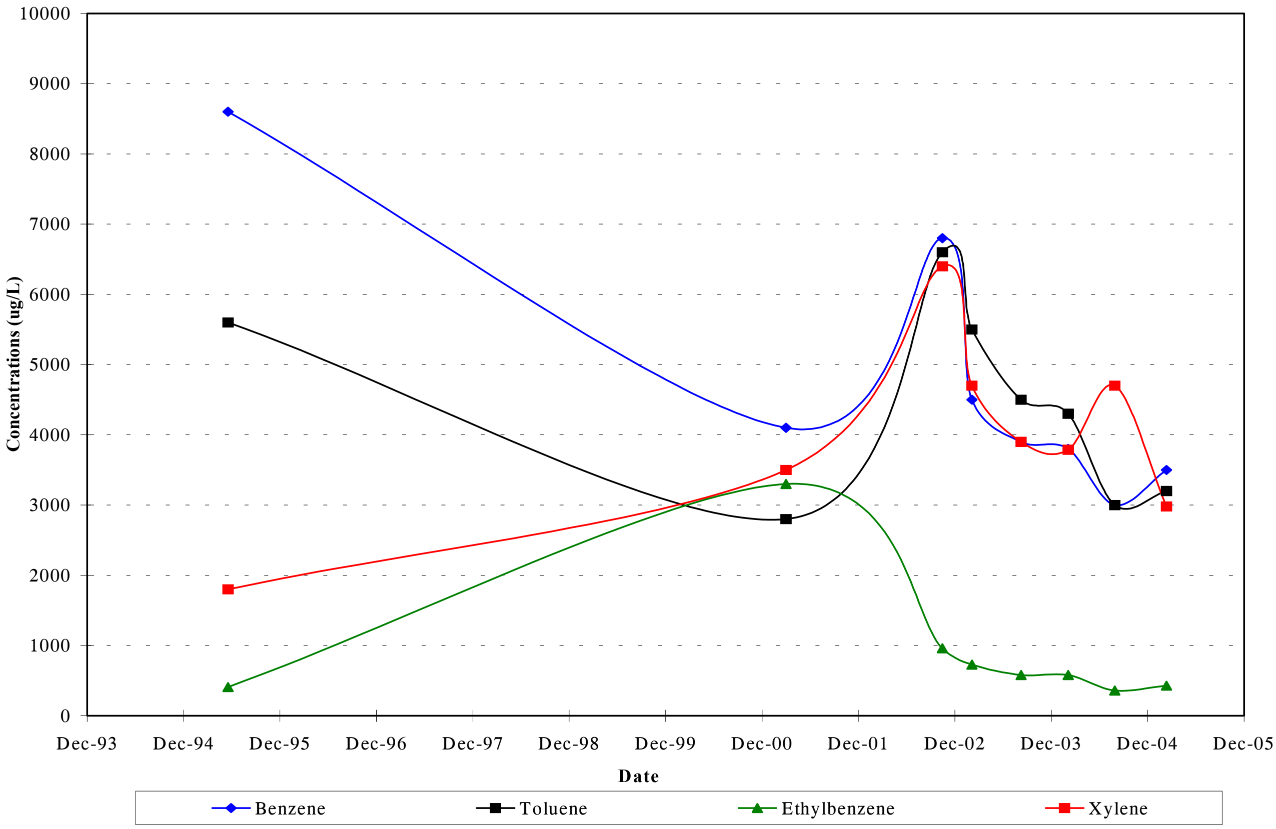
BTEX Sampling Results in the E Sandstone Unit Monitoring Well MW-21S

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Apr-93	720	31	130	120
Mar-01	2240	1140	224	857
Aug-01	190	110	380	640
Feb-02	2100	840	240	1380
Sep-02	2700	980	290	1800
Apr-03	2700	740	240	1230
Aug-03	2400	380	51	264
Feb-04	2300	530	130	690
Apr-04	2100	450	110	610
Aug-04	2800	630	91	690
Feb-05	2800	780	210	1140



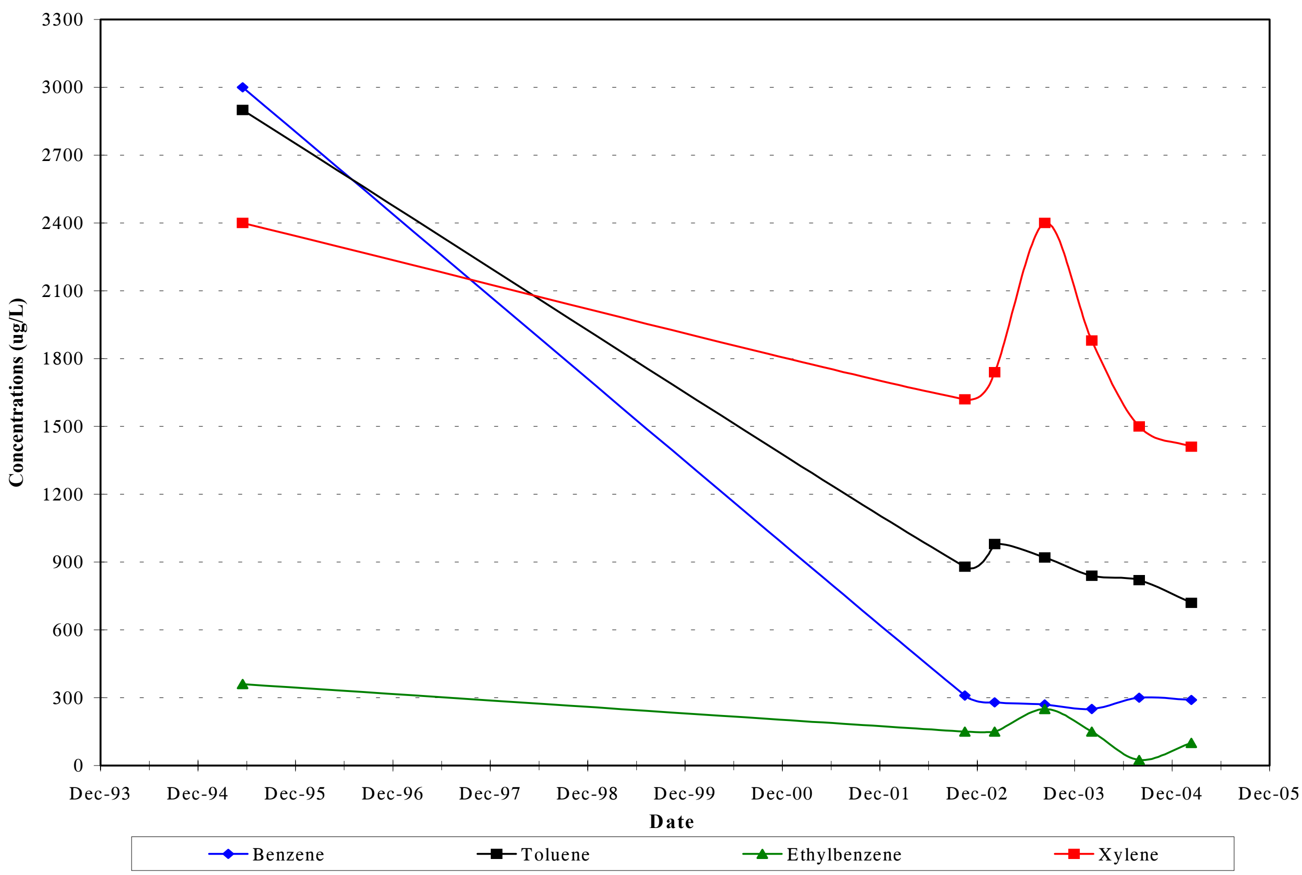
BTEX Sampling Results in the E Sandstone Unit Monitoring Well N-6P

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	8600	5600	410	1800
Mar-01	4100	2800	3300	3500
Oct-02	6800	6600	960	6400
Feb-03	4500	5500	730	4700
Aug-03	3900	4500	580	3900
Feb-04	3800	4300	580	3790
Aug-04	3000	3000	360	4700
Feb-05	3500	3200	430	2980



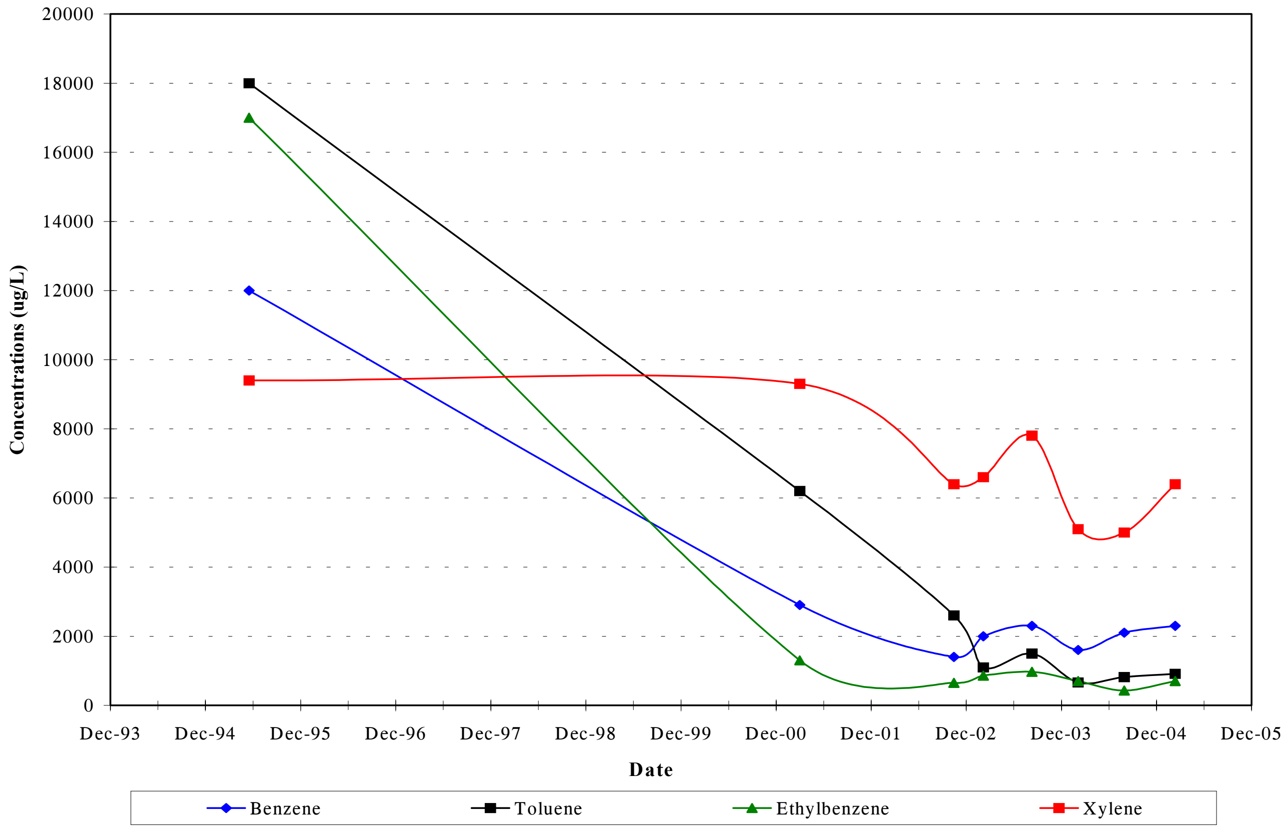
BTEX Sampling Results in the F Sandstone Unit Monitoring Well N-22S

Date	Concentrations, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	3000	2900	360	2400
Oct-02	310	880	150	1620
Feb-03	280	980	150	1740
Aug-03	270	920	250	2400
Feb-04	250	840	150	1880
Aug-04	300	820	25	1500
Feb-05	290	720	100	1410



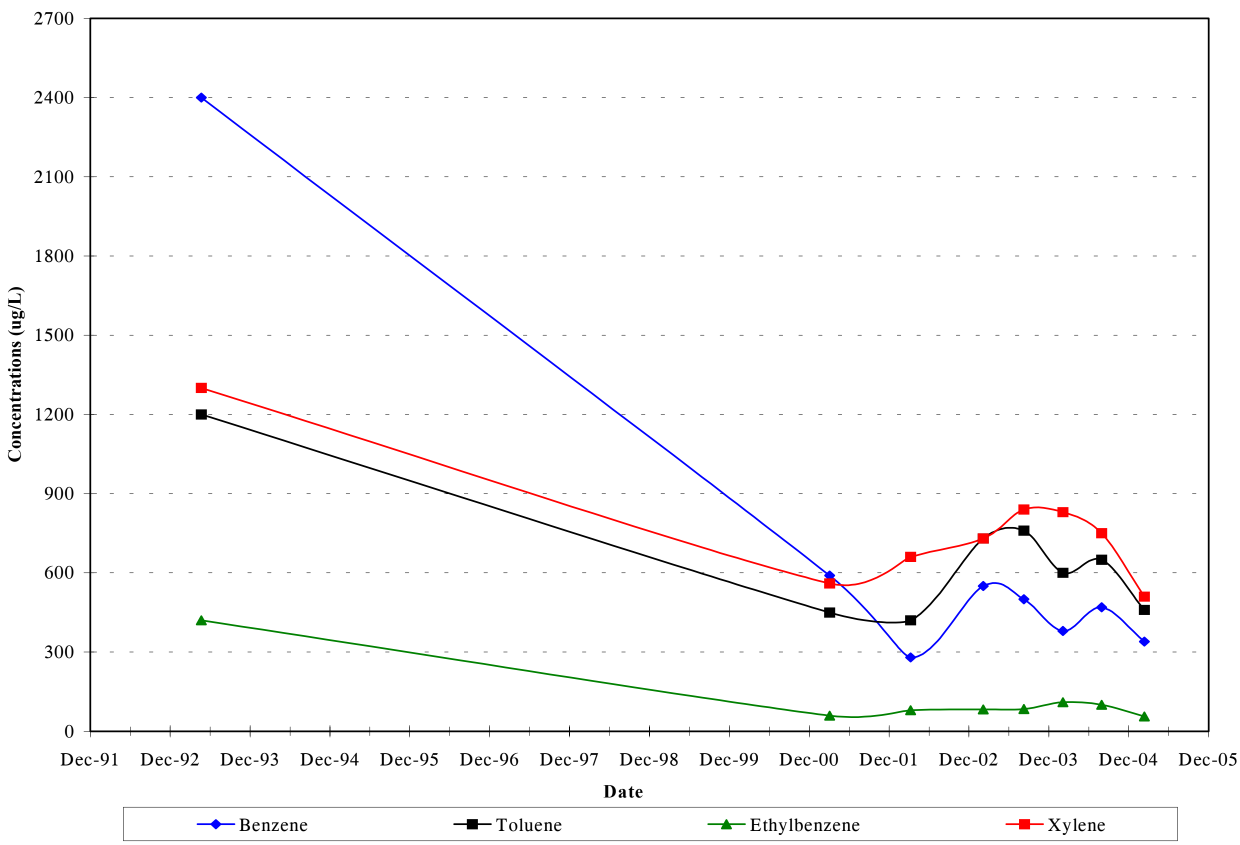
BTEX Sampling Results in the F Sandstone Unit Monitoring Well N-22P

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	12000	18000	17000	9400
Mar-01	2900	6200	1300	9300
Oct-02	1400	2600	650	6400
Feb-03	2000	1100	860	6600
Aug-03	2300	1500	970	7800
Feb-04	1600	660	700	5100
Aug-04	2100	820	430	5000
Feb-05	2300	910	700	6400



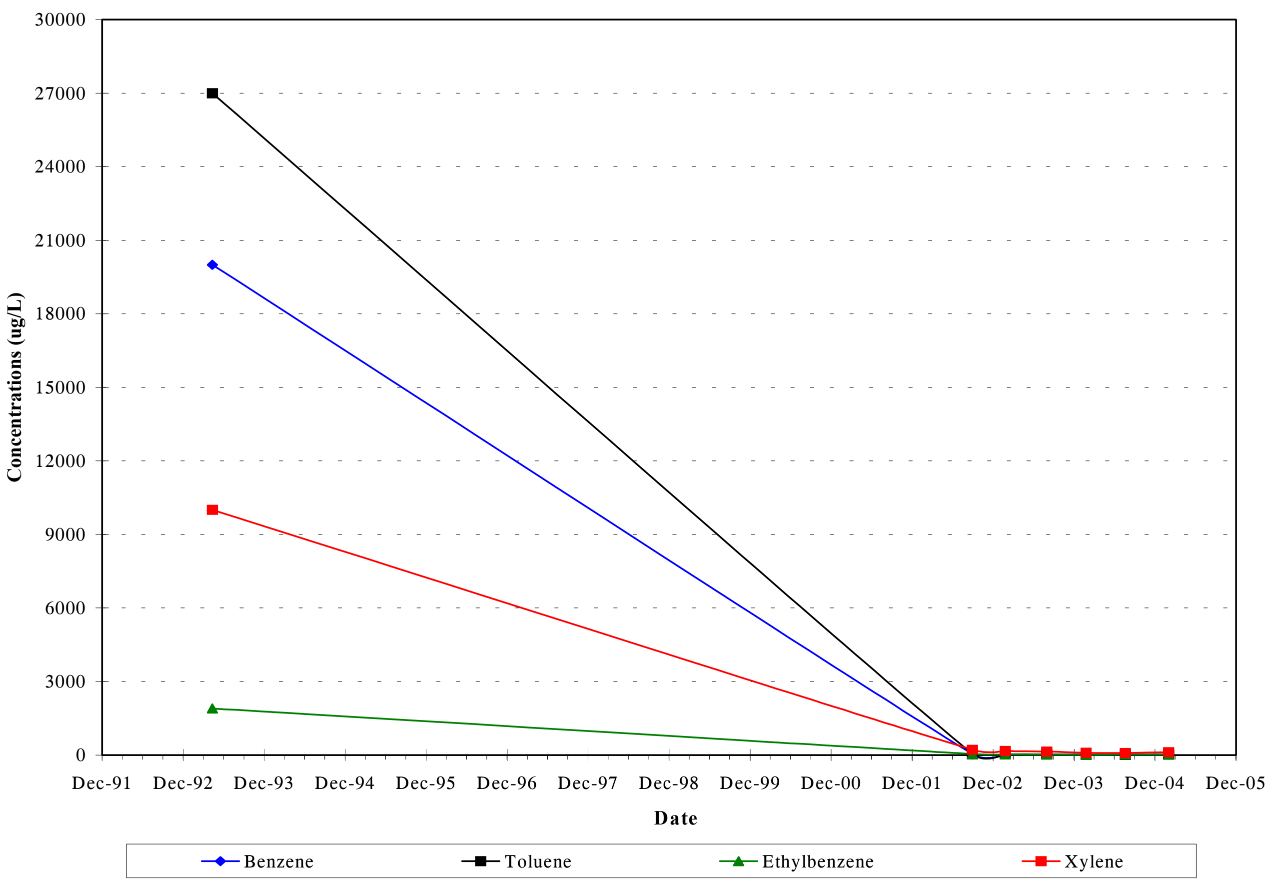
BTEX Sampling Results in the F Sandstone Unit Monitoring Well N-27P

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Apr-93	2400	1200	420	1300
Mar-01	590	450	59	560
Mar-02	280	420	80	660
Feb-03	550	730	83	730
Aug-03	500	760	84	840
Feb-04	380	600	110	830
Aug-04	470	650	100	750
Feb-05	340	460	56	510



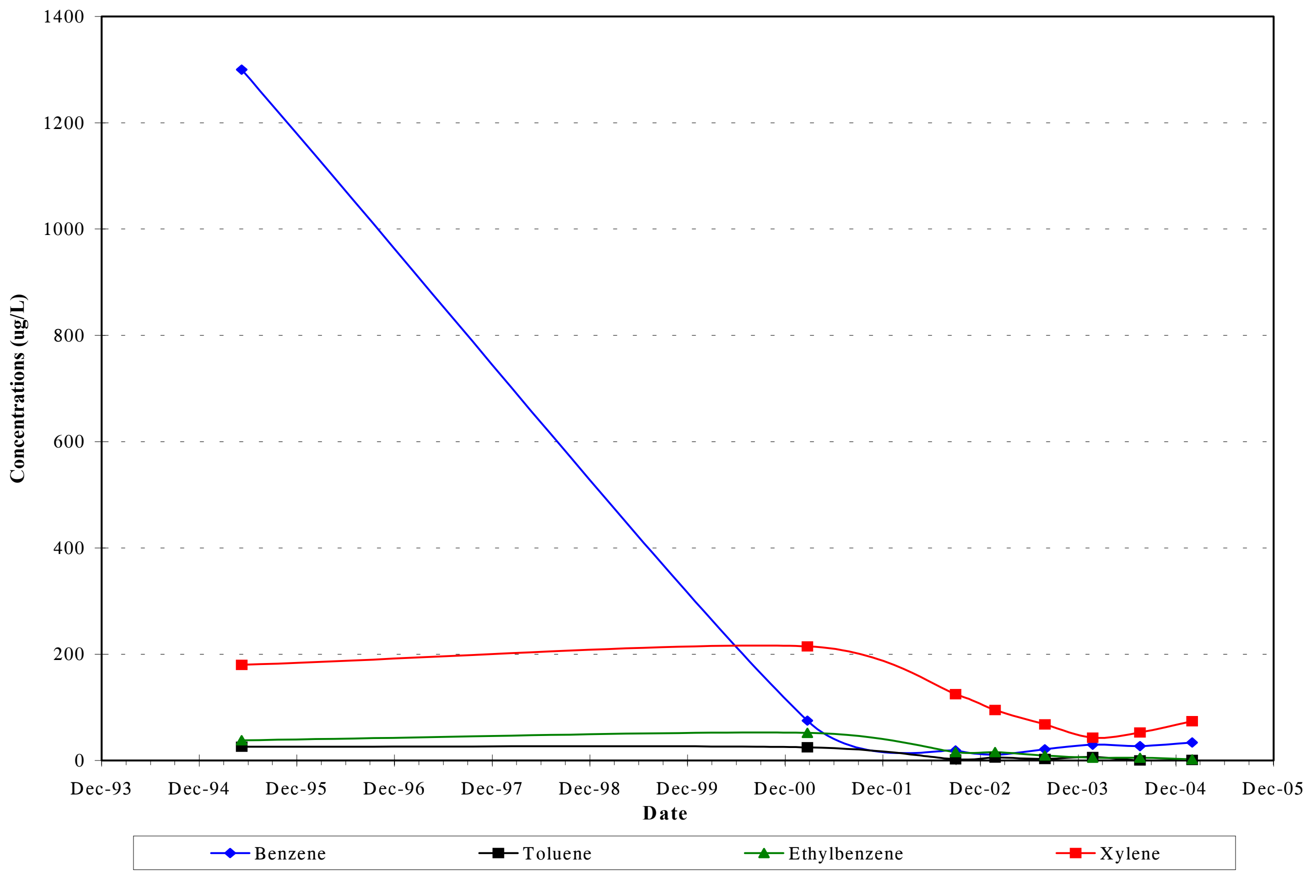
BTEX Sampling Results in the F Sandstone Unit Monitoring Well MW-20S

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Apr-93	20000	27000	1900	10000
Sep-02	35	34	41	216
Feb-03	25	35	24	164
Aug-03	22	22	20	138
Feb-04	9.6	10	11	88
Aug-04	12	7	13	85
Feb-05	14	14	14	116



BTEX Sampling Results in the F Sandstone Unit Monitoring Well N-1P

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
May-95	1300	26	38	180
Mar-01	75	25	52	215
Sep-02	19	2.3	16	125
Feb-03	11	5.7	16	95
Aug-03	21	2.9	9.4	68
Feb-04	30	6.9	5.2	43
Aug-04	27	0.5	5.4	53
Feb-05	34	1.2	2.3	74



BTEX Sampling Results in the G Sandstone Unit Monitoring Well MW-4S

Date	Concentration, ug/L			
	Benzene	Toluene	Ethylbenzene	Xylene
Apr-91	1800	28	580	3000
May-95	1300	25	420	38
Mar-01	423	11	7	38
Sep-02	540	2.3	16	125
Feb-03	510	3.1	7.2	8.8
Feb-04	48	2.3	1.9	6.7