First Combined Five-Year Review Report
for the
Double Eagle and Fourth Street Refinery Sites
Oklahoma City, Oklahoma County, Oklahoma

June 2002

United States Environmental Protection Agency
Region 6
Dallas, Texas

Appendix F and the Attachment (Second Semi-annual Sampling Event Report) have been removed from this version in order to reduce the file size for web posting. You may view a complete copy at the site repository located at the Ralph Ellison Library, 2000 Northeast 23rd, Oklahoma City, OK 73111 or request a copy from the EPA Region 6 Freedom of Information Act Officer who can be reached at 214-665-6597.

FIRST COMBINED FIVE-YEAR REVIEW FOR
DOUBLE EAGLE AND FOURTH STREET REFINERY SITES
OKLAHOMA CITY, OKLAHOMA

This memorandum documents approval of the first combined Five-Year Review Report for the Double Eagle and Fourth Street Superfund Sites by the U.S. Environmental Protection Agency (EPA).

Summary of Five-Year Review Findings

The selected remedy for soils at the Double Eagle and Fourth Street sites was solidification and stabilization then off-site disposal. The combined remedy for contaminated ground water beneath both sites included: installing warning signs requiring notification of Oklahoma Department of Environmental Quality (ODEQ) prior to drilling in the area; filing a deed notice to notify future land owners of contaminated ground water in the area of the sites; installing additional deeper monitoring wells further down gradient to verify contaminants are not migrating deeper or off-site and determine if an off-site source of contamination exists; establishing a program to monitor contaminant concentrations in ground water and model contaminant reductions following removal of the contaminant source; routine inspections to ensure no public use of the contaminated portion of the Garber-Wellington aquifer occurs prior to attainment of remedial action objectives; and contingency measures that may be implemented if contaminant concentrations increase either vertically or horizontally in the Garber-Wellington aquifer above established action levels. The remedy appears to be performing as intended and is currently protective of human health and the environment.

The following issues were identified during this review. Site contaminants have been detected in the deeper monitoring wells and are above action levels in some upper monitoring wells. The current well system may not be providing sufficient data to assess the effect of off-site contaminant sources, horizontal migration of site-related contaminants, and natural attenuation. Recent USGS data indicate high density brine water significantly affects the calculated potentiometric heads in monitoring wells and previous calculations have not considered this effect. Warning signs are installed on monitoring wells but not around the perimeter of the site.

Actions Needed

Action levels set in the ROD to initiate the evaluation of the need for further ground water remediation should be reviewed and revised if appropriate. Evaluation of the need to implement contingency measures should be completed. Direction of ground water flow on-site should be verified using revised ground water surface potentiometric maps which reflect the effect of high density saline water on ground water heads. Investigation into possible off-site sources of contamination should be completed. Warning signs with language meeting the requirements in the Record of Decision (ROD) should be installed at appropriate locations around the perimeter of the site. The ground water remedy is currently protective because institutional controls performed by the ODEQ ensure the upper zone of the Garber-Wellington aquifer is not being used by the public, however, evaluation of the need to implement contingency measures specified in the ROD should be completed for the remedy to remain protective.

Determination

I have determined the remedies for the Double Eagle and Fourth Street Refinery sites are performing as intended and are protective of human health and the environment.

Pamela Phillips, Acting 7/29/02

Myron O. Knudson, P.E. Date
Director
Superfund Division
U.S. Environmental Protection Agency, Region 6

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FIRST COMBINED FIVE-YEAR REVIEW REPORT FOR

DOUBLE EAGLE AND FOURTH STREET REFINERY SITES

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CONTENTS

Section			Page
ACRONYMS AND ABBREVIATIONS			v
EXECUTIVE SUMMARY			ES-1
1.0	INTRODUCTION		1
2.0	SITE CHRONOLOGY		2
3.0	BACKGROUND		2
	3.1	CHARACTERISTICS	2
	3.2	CONTAMINANTS OF CONCERN	14
4.0	REMEDIAL ACTIONS		17
	4.1	REMEDY SELECTION	17
	4.2	REMEDY IMPLEMENTATION	21
	4.3	SYSTEM OPERATIONS	23
	4.4	OPERATION AND MAINTENANCE COSTS	23
	4.5	PROGRESS SINCE THE LAST FIVE-YEAR REVIEW	23
5.0	FIVE-YEAR REVIEW PROCESS		25
6.0	FIVE-YEAR REVIEW FINDINGS		25
	6.1	INTERVIEWS	25
	6.2	FIVE-YEAR REVIEW SITE INSPECTION	26
	6.3	RISK INFORMATION REVIEW	28
		6.3.1 Chemical-specific ARARs	31
		6.3.2 Location-specific ARARs	32
		6.3.3 Action-specific ARARS	32
	6.4	GROUND WATER SAMPLING DATA REVIEW	33
		6.4.1 Upper Monitoring Wells	34
		6.4.2 Deep Monitoring Wells	48
7.0	ASSESSMENT		56
	7.1	DER AND FSR SCOUs	56
	7.2	DER AND FSR GOU	57

CONTENTS (Continued)

Section		Page
8.0	ISSUES	64
9.0	RECOMMENDATIONS AND FOLLOW-UP ACTIONS	66
10.0	PROTECTIVENESS STATEMENTS	67
11.0	NEXT REVIEW	68
REFERENCES		73

Appendices

A	DOCUMENTS REVIEWED FOR FIVE-YEAR REVIEW
B	SUPERFUND SITE SURVEY FORMS
C	CERCLIS SITE INFORMATION
D	DAILY OKLAHOMAN PUBLICATION
E	FIVE YEAR REVIEW SITE INSPECTION REPORT
F	SITE INSPECTION PHOTOLOG
G	FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

Attachment

SECOND SEMI-ANNUAL SAMPLING EVENT 3/05/01 THROUGH 3/06/01, FOURTH STREET/DOUBLE EAGLE SUPERFUND SITES

TABLES

Table		Page
1	SITE CHRONOLOGY FOR DOUBLE EAGLE AND FOURTH STREET REFINERIES SITES	3
2	CONTAMINANTS OF CONCERN FOR THE DOUBLE EAGLE/FOURTH STREET GROUND WATER OPERABLE UNIT	15
3	COSTS FOR ACTIVITIES ASSOCIATED WITH THE SITES	24
4	DOUBLE EAGLE AND FOURTH STREET REFINERIES SITES GROUND WATER RESULTS	35
5	SELECT UPPER MONITORING WELL RESULTS	61
6	SELECT DEEP MONITORING WELL RESULTS	62
7	IDENTIFIED ISSUES	65
8	RECOMMENDATIONS AND FOLLOW-UP ACTIONS	69
9	SAMPLE RESULTS THAT EXCEED BASELINE CONCENTRATIONS	70

FIGURES

Figure		Page
1	SITES LOCATION	8
2	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-1	40
3	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-2	41
4	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-(3 and 3A)	42
5	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-4	43
6	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-5	44
7A	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-6A	45
7B	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-6A (0-200)	46
8	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMW-7	47
9	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMWD-1	50
10	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMWD-2	51
11	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMWD-3	52
12	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMWD-4	53

FIGURES (Continued)

Figure		Page
13	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMWD-5	54
14	DOUBLE EAGLE AND FOURTH STREET REFINERY SITES GROUND WATER RESULTS—BMWD-6	55

ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of concern
DCA	Dichloroethane
DCE	Dichloroethene
DER	Double Eagle Refinery
EPA	United States Environmental Protection Agency
ESD	Explanation of significant differences
Fluor Daniel	Fluor Daniel Environmental Services, Inc.
FS	Feasibility study
FSR	Fourth Street Refinery
GOU	Ground water operable unit
HASP	Health and safety plan
IDW	Investigation-derived waste
MCL	Maximum contaminant level
mg/L	Milligram per liter
MLK	Martin Luther King Boulevard
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
ODEQ	Oklahoma Department of Environmental Quality
O&M	Operation and maintenance
OU	Operable Unit
OWRB	Oklahoma Water Resources Board
PAH	Polycyclic Aromatic Hydrocarbon
ppb	Part per billion
ppm	Part per million
QAPP	Quality Assurance Project Plan
RA	Remedial action
RAG	Remedial action goal
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RI	Remedial investigation
ROD	Record of decision
SCOU	Source control operable unit
su	Standard unit
TAG	Technical assistance grant
TAL	Target analyte list
TCE	Trichloroethene
TCLP	Toxicity characteristic leaching procedure
TDS	Total dissolved solids

ACRONYMS AND ABBREVIATIONS (Continued)

Tetra Tech	Tetra Tech EM Inc.
TTHM	Total trihalomethane
µg/L	Microgram per liter
VOC	Volatile organic compound

EXECUTIVE SUMMARY

This report documents the five-year review conducted from June through August 2001 by the U.S. Environmental Protection Agency Region 6 (EPA), with the assistance of Tetra Tech EM Inc. (Tetra Tech) , of the Double Eagle Refinery (DER) and Fourth Street Refinery (FSR) sites in Oklahoma City, Oklahoma, hereinafter collectively called the Sites. This review covers both sites since the DER and FSR sites had similar Source Control Operable Units (SCOU), and share a single Ground Water Operable Unit (GOU). The purpose of this five-year review is to determine whether the remedies at each site are protective of human health and the environment. This report documents the methods, findings, and conclusions of the review.

The EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This review is required by statute because hazardous substances, pollutants, or contaminants remain in the ground water at both the DER and FSR sites at concentrations that do not allow for unrestricted use and unlimited exposure.

The EPA, with assistance from Tetra Tech, performed a five-year review of the FSR site in 2000. Since DER and FSR have a common GOU, and CERCLA requires a five-year review at every site where the remedy for any individual OU leaves contaminants onsite at concentrations that do not permit unlimited use and unrestricted exposure to be completed on all operable units (OUs), the GOU addressed during the FSR Five-Year Review must again be addressed under the DER Five-Year Review. In order to minimize future confusion and redundancy, this review covered the DER and FSR sites. Covering both sites in this report resets the statutory time line so that subsequent five-year reviews of the DER and FSR sites coincide. It also allows findings and issues from the FSR review to be incorporated and addressed in this review.

The remedial action objectives (RAOs) stated in the Record of Decisions (ROD) for the GOU are to ensure future potential users of the deep Garber-Wellington aquifer will not be exposed to

contaminants from the sites and the North Canadian River will not be impacted by contaminants from the sites. The selected remedy for the GOU at the Sites included: (1) installation of warning signs that require notification prior to drilling in the area; (2) filing a deed notice to notify future land owners of the hazards associated with the contaminated ground water in the area of the Sites; (3) installation of additional deeper monitoring wells further downgradient to verify that contaminants are not migrating deeper, or to a receptor point off-site, and to determine if an off-site source of contamination exists; (4) establishment of a routine monitoring and maintenance program for ground water sampling and modeling to evaluate contaminant level reductions following removal of the contaminant source; (5) routine inspections to ensure that public use of the upper portion of the Garber-Wellington aquifer does not occur prior to attainment of the RA objectives; (6) a five-year review of the site to determine if further actions need to be taken with regard to the ground water; and (7) contingency measures that can be implemented if ground water monitoring indicates either a vertical or horizontal increase in contaminant concentrations in the Garber-Wellington aquifer (EPA 1993, EPA 1994).

The remedial designs for the sites were completed by Fluor Daniel Environmental Services, Inc. (Fluor Daniel) in March 1995. The RA for the FSR site GOU was combined with the RA for the DER site GOU since the ground water contaminant plumes for both sites were combined. Phase I of the RA included the installation of piezometers and speed borings, geophysical logging, and removal of the DER site deep production well. Data collected during Phase I was used to determine monitoring well locations and depths needed to establish a long-term ground water monitoring network. Phase II included installation of ground water monitoring wells, abandonment of alluvial wells and piezometers, and installation of warning signs. The ground water monitoring wells include "upper" monitoring wells screened in the Garber-Wellington formation (bedrock) just below the overlying alluvial deposits and "deeper" monitoring wells screened at least 75 feet deeper in the Garber-Wellington formation.

The ROD identified the following applicable or relevant and appropriate requirements (ARARs) for the GOU RA: (1) Safe Drinking Water Act Maximum Contaminant Levels

(MCLs) for the contaminants of concern (COC); (2) long-term monitoring program requirements in accordance with Title 40 of the Code of Federal Regulations, Part 264, Subpart F; and (3) standards for the installation of wells and disposal of miscellaneous wastes associated with implementation of the remedy (also in accordance with Title 40 of the Code of Federal Regulations, Part 264, Subpart F). The only new requirements applicable to the GOU RA at the sites are newly promulgated MCLs.

The Oklahoma Department of Environmental Quality (ODEQ) collected ground water samples in December 1996, March 1997, June 1997, September 1997, December 1997, March 1998, July 1998, September 1998, June 1999, October 1999, December 1999, April 2000, September 2000, and March 2001. Ground water samples were collected from the 13 monitoring wells located in the area of the sites. These monitoring wells include seven upper monitoring wells (BMW-1 through BMW-7) screened 40 to 70 feet below ground surface in the upper bedrock portion of the Garber-Wellington aquifer and six deeper monitoring wells (BMWD-1 through BMWD-6) screened deeper in the Garber-Wellington aquifer at approximately 150 below ground surface. The ground water samples were analyzed for volatile organic compounds (VOC), target analyte list (TAL) metals, sulfate, total dissolved solids (TDS) and cyanide.

Two sampling events have occurred since ODEQ established baseline concentrations for ground water contaminants (April 2000). Several contaminants identified on the COC list were detected in upper monitoring wells above MCLs or Remedial Action Goals. Since confirmation sampling, as outlined in the ROD and the ODEQ Quality Assurance Project Plan, has not been performed and the direction of ground water flow is not well established, it is difficult to determine whether action levels have been exceeded in some wells at this time.

Information provided in the RODs describes the ground water flow direction in the upper portion of the Garber-Wellington aquifer as being generally to the south. Based on this information, monitoring well BMW-6A, as seen in Figure 1, should be upgradient from DER and crossgradient of FSR. However, the average reported ground water elevation for BMW-6A was

1151.405 feet above sea level, the lowest average elevation of the seven upper monitoring wells. Available potentiometric surface information provided with the second semi-annual sampling event report (ODEQ 2001c) showed monitoring well BMW-6A as partially downgradient of the DER site. Since the actual direction of ground water flow is uncertain based on current data, and it is possible site contaminants are migrating to the monitoring well, an accurate assessment of horizontal migration and/or off-site contamination can not be made at this time.

Also, several contaminants were detected in the deeper monitoring wells above MCLs. The VOCs detected above MCLs in the ground water samples from the deep monitoring wells include benzene, 1,1-dichloroethene (DCE), trichloroethene (TCE), and vinyl chloride. Benzene was detected in ground water samples collected from five of the six deeper monitoring wells (BMWD-1 through BMWD-5) above the MCL of 5 micrograms per liter (µg/L). In samples from monitoring well BMWD-1 located west of the FSR site and north of the Double Eagle Refinery site, the benzene concentrations increased from below detection limits in December 1996 and March 1997 to 64 µg/L in December 1997, 160 µg/L in July 1998, then down to 130 ug/L most recently in March 2001. Benzene concentrations in samples from monitoring well BMWD-2 located south of the Double Eagle Refinery site fluctuated from 68 µg/L during the March 1997 sampling event to 5 µg/L during the June 1999 sampling event, and then between not detected and 23 ug/L since. The benzene concentrations detected in samples from monitoring well BMWD-3 located south of the FSR site fluctuated from 160 µg/L to 10 µg/L during the 14 sampling events. The benzene concentrations detected in monitoring well BMWD-4 located southeast of the FSR site fluctuated between 24 µg/L (March 1997) and 168 µg/L (June 1999). Benzene was not detected above the MCL in samples from monitoring well BMWD-5 located east of the FSR site until the September 1998 sampling event (26 µg/L). Since detection, benzene concentrations have fluctuated from 50 µg/L to not detected. However cis-1,2-dichloroethene (DCE), not previously known to be present in the lower aquifer, was detected above the MCL in the March 1997 sampling event. No COCs have been detected above MCLs in BMWD-6.

Issues discovered during this review are presented in Section 8.3. The main issue noted is that site-related contaminants have been detected in the deeper monitoring wells therefore the evaluation of the need to implement contingency measures needs to be completed. This evaluation is expected to be completed by the end of 2003.

The current well system may not be providing sufficient information to assess the effects of off-site contaminant sources, horizontal migration of site-related contaminants, and natural attenuation. They also provide little information on vertical migration of contaminants in the aquifer or depth to useable ground water at the site.

Ground water samples are not currently analyzed for nine contaminants of concern listed in the GOU ROD. They are: aldrin, bis (2-chloroethyl) ether, chlordane, 4,4-DDE, 1,4-dichlorobenzene, heptachlor, heptachlor epoxide, endosulfan, and phenol. All of these compounds, with the exception of bis(2-chloroethyl) ether and phenol, are semi-volatile organic compounds.

As required in the ROD, warning signs with language prescribed in the ROD have been posted on monitoring wells, however, no signs meeting the requirements in the ROD have been posted around the perimeter of the site.

These issues, however, do not currently affect the protectiveness of the remedy because routine site and permit application inspections are performed by the ODEQ to ensure no water wells are drilled into the upper zone of the Garber-Wellington aquifer on or near the site.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name (from WasteLAN): Double Eagle and Fourth Street Refinery Sites

EPA ID (from WasteLAN): **OKD 007188717**
OKD 980696470

Region: 6	**State:** OK	**City/County:** Oklahoma City/Oklahoma

SITE STATUS

NPL Status: ☒ Final ☐ Deleted ☐ Other (specify) _____

Remediation Status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete

Multiple OUs?* ☒ YES ☐ NO	**Construction Completion Date:** 2/97 Source Control Operable Unit removed

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Reviewing Agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author Name: Craig Carroll

Author Title: Remedial Project Manager	**Author Affiliation:** U.S. EPA, Region 6

Review Period:** 6/01 to 8/01

Date(s) of Site Inspection: 8/07/2001

Type of review:*** ☒ Statutory
☐ Policy (☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site
☐ NPL State/Tribe-lead ☐ Regional Discretion)

Review Number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☒ Other (specify)
First review for Double Eagle Refinery Site, second review for Fourth Street Refinery Site

Triggering Action:****
☒ Actual RA Onsite Construction at OU # 2 ☐ Actual RA Start at OU #__
☐ Construction Completion ☐ Previous Five-Year Review Report
☒ Other (specify) Shared Ground water operable unit

Triggering Action Date (from WasteLAN): 07/95 (DER)

Due Date (Five Years After Triggering Action Date): 08/01

Five-Year Review Summary Form

Issues:

- Site contaminants were detected in the deeper monitoring wells and an evaluation of the subsequent contingency measures has not yet been completed.
- Sampling results from five of the six wells installed into the deeper Garber/Wellington aquifer during the remedial action phase show the deeper aquifer is also considered a Class III non-potable aquifer, rather than Class II, under Federal Ground Water Classification Guidelines.
- Current well locations do not appear to provide enough information to differentiate between off-site contaminant sources, horizontal migration, and natural attenuation prior to contamination of the lower aquifer (i.e. ground water flow at question).
- Ground water samples are not currently analyzed for nine contaminants of concern listed in the GOU ROD. They are: aldrin, bis (2-chloroethyl) ether, chlordane, 4,4-DDE, 1,4-dichlorobenzene, heptachlor, heptachlor epoxide, endosulfan, and phenols. All of these compounds, with the exception of bis(2-chloroethyl) ether and phenol, are semi-volatile organic compounds.
- Warning signs with language prescribed in the ROD are not posted around the site perimeter.

Recommendations and Follow-up Actions:

- The ROD and Quality Assurance Project Plan (QAPP) establish the action level for deeper wells as "detectable concentrations" of site-related contaminants. Due to advances in technology, the action levels for COCs in the deeper wells should be re-evaluated and quantified if appropriate.
- Investigation into potential off-site sources of COC and non-COC contamination detected in ground water samples should be completed, including further evaluation of the Garber-Wellington aquifer.
- Prior to initiating any contingency measures outlined in the ROD, the revised classification of the deeper aquifer should be taken into consideration. The agency anticipates this review process will be completed by the end of 2003.
- The list of compounds analyzed for under the current ground water sampling plan should be reviewed to ensure sufficient data is being collected to determine the effectiveness of the selected ground water remedy which is monitored natural attenuation.
- Warning signs with language prescribed in the ROD should be posted at appropriate locations around the perimeter of the site.

Protectiveness Statement(s):

The remedy is protective of human health and the environment.

1.0 INTRODUCTION

The U.S. Environmental Protection Agency Region 6 (EPA), with the assistance of Tetra Tech EM Inc. (Tetra Tech), conducted a five-year review of the remedial actions (RA) implemented at the Double Eagle Refinery (DER) and Fourth Street Refinery (FSR) sites in Oklahoma City, Oklahoma. Both sites had similar Source Control Operable Units (SCOU), and share a common Ground Water Operable Unit (GOU). The purpose of the five-year review is to determine whether the remedies at each site are protective of human health and the environment. This report documents the methods, findings, and conclusions of the review which was conducted from June through August 2001.

This review was required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c), as amended, 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.

NCP Part 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.

Remedial actions at the SCOUs were conducted under separate Records of Decision (RODs) and did leave contaminants on-site above concentrations that restricted use. Therefore they did not trigger a five-year review. Due to the fact that hazardous substances, pollutants, or contaminants remain in the ground water beneath both the DER and FSR above concentrations that allow for unrestricted use and unlimited exposure, a five-year review is required for these sites.

The EPA, with assistance from Tetra Tech, performed a five-year review of the FSR site in 2000. This is the first five-year review for the Double Eagle Refinery site. Remedial actions of the SCOU were conducted under a separate Record of Decision (ROD) and did not leave contaminants on-site above concentrations that restrict use. Therefore it did not trigger a five-year review. The triggering action for this statutory review is the initiation of the remedial action on July 17, 1997 to clean-up the GOU. Since DER and FSR have a common GOU which triggers a five-year review under CERCLA, the GOU addressed during the FSR Five-Year Review must again be addressed under the DER Five-Year Review. In order to streamline future reviews, this review covered the DER site and the FSR site. Reviewing both sites concurrently resets the statutory time line so subsequent five-year reviews of both sites will coincide. It also allows findings and issues from the FSR review to be incorporated and addressed in this review.

2.0 SITE CHRONOLOGY

Table 1 presents a chronology of events for the DER and FSR sites.

3.0 BACKGROUND

Site background information presented herein includes the physical characteristics of both sites, including the location, the history, the geology/hydrogeology, and the site hydrogeologic conditions. The contaminants of concern (COC) listed in the Record of Decision (ROD) for the sites are also discussed in this section.

3.1 CHARACTERISTICS

In this section, the characteristics of both sites will be presented.

TABLE 1

SITE CHRONOLOGY DOUBLE EAGLE AND FOURTH STREET REFINERIES SITES

		FOURTH STREET REFINERY	DOUBLE EAGLE REFINERY
Action Name	**Operable Unit**	**Actual Completion**	**Actual Completion**
PRELIMINARY ASSESSMENT	Sitewide	May 1, 1985	May 1, 1980
DISCOVERY	Sitewide	July 1, 1980	June 1, 1980
PROPOSAL TO NPL	Sitewide	June 24, 1988	June 24, 1988
ADMIN ORDER ON CONSENT	Sitewide		December 7, 1988
FINAL LISTING ON NPL	Sitewide	March 31, 1989	March 31, 1989
RI/FS NEGOTIATIONS	Sitewide	October 6, 1989	November 29, 1989
ADMINISTRATIVE RECORDS	Sitewide	September 28, 1992	September 28, 1992
REMOVAL	Sitewide	September 27, 1989	April 3, 1994
COMMUNITY INVOLVEMENT	Sitewide	September 1, 1999	September 1, 1999
FIVE YEAR REMEDY ASSESSMENT	Sitewide	October 18, 2000	July 2002
COMBINED RI/FS	SCOU	September 28, 1992	September 28, 1992
RECORD OF DECISION	SCOU	September 28, 1992	September 28, 1992

TABLE 1 (Continued)

SITE CHRONOLOGY DOUBLE EAGLE AND FOURTH STREET REFINERIES SITES

		FOURTH STREET REFINERY	DOUBLE EAGLE REFINERY
Action Name	**Operable Unit**	**Actual Completion**	**Actual Completion**
TREATABILITY STUDY	SCOU	September 28, 1992	September 28, 1992
REMEDIAL DESIGN	SCOU	August 10, 1994	April 30, 1997
COMMUNITY INVOLVEMENT	SCOU	December 1, 1999	December 21, 1999
REMEDIAL ACTION	SCOU	March 21, 1996	March 29, 2000
COMBINED RI/FS	GOU	September 30, 1993	July 28, 1993
RECORD OF DECISION	GOU	September 30, 1993	April 19, 1994
REMEDIAL DESIGN	GOU	March 17, 1995	March 17, 1995
REMEDIAL ACTION	GOU	February 20, 1997	February 20, 1997
GROUND WATER SAMPLING EVENT	GOU	April 14, 2000	April 14, 2000

TABLE 1 (Continued)

SITE CHRONOLOGY DOUBLE EAGLE AND FOURTH STREET REFINERIES SITES

		FOURTH STREET REFINERY	DOUBLE EAGLE REFINERY
Action Name	**Operable Unit**	**Actual Completion**	**Actual Completion**
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	March-97	March-97
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	June-97	June-97
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	September-97	September-97
QUARTERLY GROUND WATER SAMPLING EVENT	OU	December-97	December-97
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	March-98	March-98
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	July-98	July-98
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	September-98	September-98

TABLE 1 (Continued)

SITE CHRONOLOGY DOUBLE EAGLE AND FOURTH STREET REFINERIES SITES

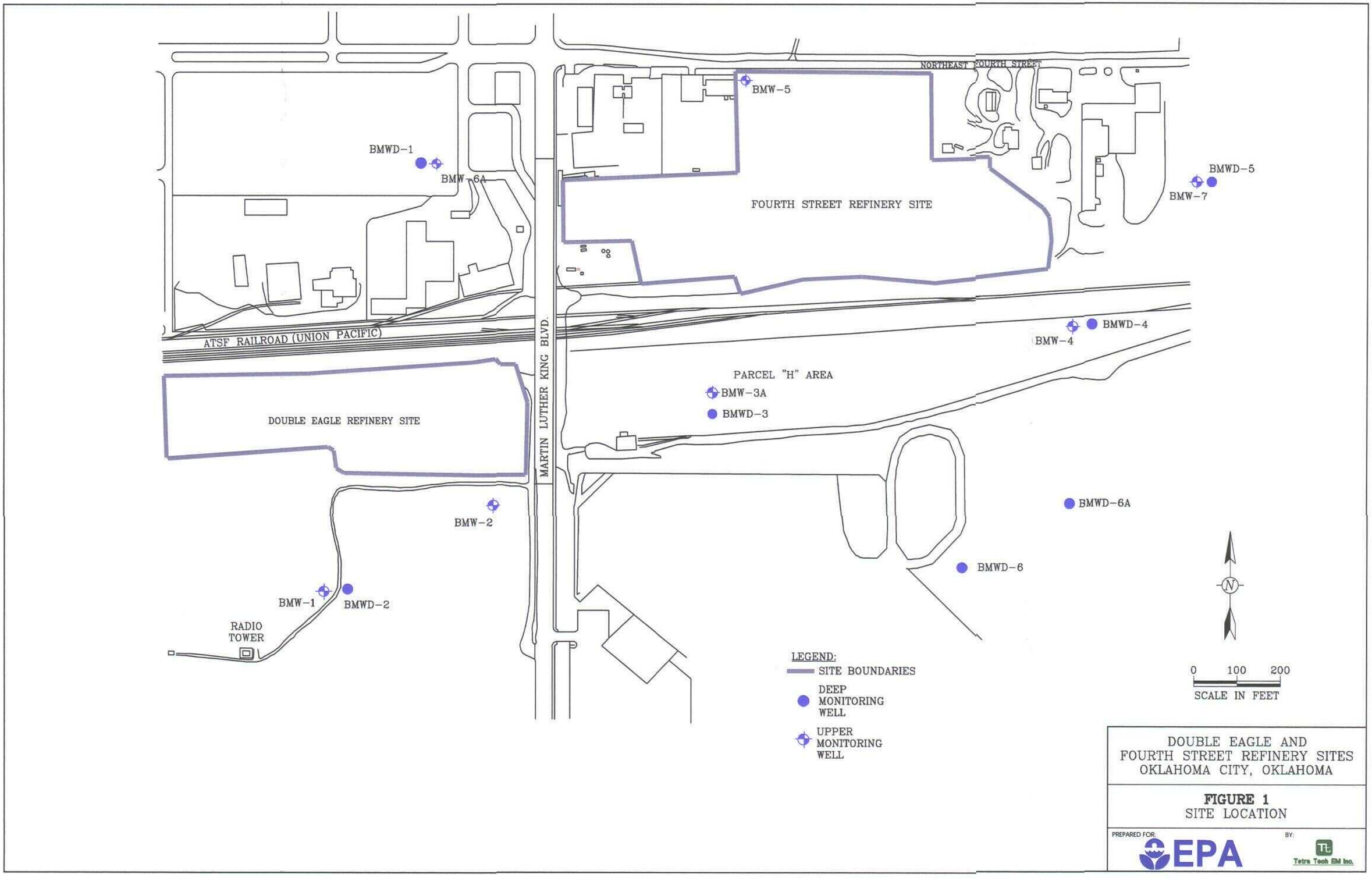
		FOURTH STREET REFINERY	DOUBLE EAGLE REFINERY
Action Name	**Operable Unit**	**Actual Completion**	**Actual Completion**
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	June-99	June-99
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	October-99	October-99
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	December-99	December-99
QUARTERLY GROUND WATER SAMPLING EVENT	GOU	April-00	April-00
SEMIANNUAL GROUND WATER SAMPLING EVENT	GOU	September-00	September-00
SEMIANNUAL GROUND WATER SAMPLING EVENT	GOU	March-01	March-01

Double Eagle Refinery

The DER Site is located at 1900 NE First Street in southeastern Oklahoma City, Oklahoma County, Oklahoma and extends over approximately 12 acres as shown on Figure 1. The immediate area of the site is zoned for industrial use. Given the current land use patterns, the Double Eagle Refinery site and surrounding areas are likely to remain zoned for industrial use. The site is bounded to the north by Union Pacific Railroad tracks and to the east, west, and south by vacant lots also zoned for industrial land use. Martin Luther King Boulevard (MLK) lies to the east of the site as a bridge over the Union Pacific railroad tracks. The DER SCOU refers to the contaminated area above the water table where the former used oil refinery was located. The SCOU includes (1) contamination above the water table at the DER Site, (2) half of the Parcel H Area (located east of the site), and (3) the Radio Tower Area (located south of the site).

During operations from 1929 to the early 1970's, DER recycled approximately 500,000 to 600,000 gallons of used motor oil per month into finished lubricating oil. The process used in oil refining and reclamation included the use of sulfuric acid and bleaching clays. Acid and bleaching clays were added to clarify and separate the desired oil product from the heavy tars. As a result, the waste sludge at the site consisted primarily of acidic tar material mixed with clay and native soil. The resulting tank bottoms and sludges were initially sent to an off-site disposal facility, now the Hardage Criner Superfund Site located in Criner, Oklahoma. This recycling process generated approximately 80,000 gallons of oily sludge per month.

Since the facility recycled used oils, a number of metals and organic contaminants were detected in samples collected from the site. Site wastes were hazardous waste under the Resource Conservation and Recovery Act (RCRA) due to their corrosivity and toxicity. The wastes on site often had a pH of 2 standard units (su) or less and failed the toxicity characteristic leaching procedure (TCLP) for lead. From the late 1960's to early 1970's, sludges were disposed of in impoundments and a sludge lagoon on-site. DER continued to accept waste oil for storage until 1980.



DOUBLE EAGLE AND
FOURTH STREET REFINERY SITES
OKLAHOMA CITY, OKLAHOMA

FIGURE 1
SITE LOCATION

PREPARED FOR: EPA

BY: Tetra Tech EM Inc.

On-site and off-site visual inspections conducted by the EPA Field Investigation Team in May 1985, prompted a preliminary sampling inspection at DER (EPA 1992b). An aerial photograph, dated 1979, showed vehicle tracks from the site leading to the Radio Tower Area, approximately 800 feet south of the DER site, where contamination similar to that found on site was observed. The historical aerial photographs and other file information indicate that this area may have been used for off-site disposal of contaminated waste materials from the DER site. Off-site sampling conducted in the Radio Tower Area during January 1986 detected elevated levels of target compounds that were also found in the waste impoundments on site (EPA 1992b).

Based on information and observations from a 1987 - 88 EPA Expanded Site Inspection, the DER Site was ranked for inclusion on the National Priorities List (NPL) (EPA 1992b). In March 1989, the DER Site was added to the NPL, pursuant to Section 105 of the CERCLA, 42 U.S.C. Section 9605, as amended.

Prior to initiating a remedial investigation and feasibility study (RI/FS) for the site, a review of the historical topography of the site and surrounding area revealed that drainage from the DER Site had migrated onto the Parcel H Area. A site scoping visit was conducted to determine possible Parcel H Area contamination (EPA 1992b).

Physical dumping at the edge of the eastern-most pond on the Parcel H Area appeared likely. Wastes may also have run onto the Parcel H Area from the nearby FSR Superfund site. However, it was determined that drainage from the nearby FSR site to the Parcel H Area was not likely due to the diking on each side of the railroad tracks. Historical aerial photographs were the only source of information for the FSR site operations. During periods of heavy rainfall, drainage from the DER Site occurred. Further sampling conducted at the Parcel H Area in April 1990 detected elevated levels of lead in the pond located on this parcel. Due to the similar waste characteristics of both sites, one objective of the RI/FS was to sample the waste in the Parcel H Area to determine the contribution of contamination in relation to either, or both, the DER and FSR sites (EPA 1992b).

The RI/FS was initiated in May 1990 for the DER Site. The RI and FS were completed in May and June 1992, respectively. The extent of on-site waste sludges was delineated as part of the "Remedial Investigation Report Double Eagle Superfund Site, Revision 1" by Fluor Daniel in 1992. The ROD for the SCOU was signed on September 28, 1992.

As specified in the 1992 ROD, the remedy for cleanup of contaminated waste material at the DER site involved (1) solidifying, neutralizing, and stabilizing contaminated waste material that contained contaminant concentrations above the RA treatment standards; (2) removing contaminated waste material that had concentrations in excess of the remedial action goals (RAG); and (3) disposing of those contaminated waste materials at a permitted facility. This RA also included clearing and grubbing, air monitoring, asbestos abatement, demolition, off-site disposal of debris, on-site disposal of clean concrete, and site restoration.

The RI/FS for the GOU was initiated in June 1992 for the DER site; and the RI and FS were both completed in July 1993. Due to the proximity of the DER and FSR sites, and due to the similar types of wastes present at both sites, EPA assigned one contractor to conduct the RI/FS projects concurrently. Therefore, distinguishable characteristics of each site could be easily identified, and mobilization and remedial alternative development efforts would not be duplicated for the overall study area.

During the RI/FS project for the SCOU for the DER site, the issues related to ground water beneath the site were acknowledged as complex in comparison to those obvious with respect to the surface contamination. Since determination of vertical and lateral migration of ground water contaminants required more than the information provided by the shallow and deep alluvial wells installed during the RI for the SCOU, the site was separated into two operable units to address the surface contamination and the ground water problems (i.e. the impact of the migration of contaminants in ground water and possibly to the North Canadian River) individually.

A separate ROD was signed and a separate RA has been completed for the DER site GOU (EPA 1994). The GOU was established to address the potential migration of site contaminants through the ground water pathway from the site. Currently, the ground water sampling and monitoring is conducted by the Oklahoma Department of Environmental Quality (ODEQ) as part of the RA for the GOU.

Fourth Street Refinery

The FSR site is located at 2200 Northeast Fourth Street and covers approximately 22 acres in the southwest quarter of Section 36, Township 12 North, Range 3 West, Indian Meridian, Oklahoma County, Oklahoma City, Oklahoma. The site is bounded to the south by Union Pacific Railroad tracks, which include the Santa Fe Railroad tracks, and to the north by Northeast Fourth Street. MLK lies on the west side of the site as an overpass to the railroad tracks. An area located approximately 400 feet south of the FSR site and referred to as the "Parcel H Area" is considered to be an off-site waste disposal area resulting from former site activities from both sites. The immediate area of the site is zoned for industrial use. Given the current land use patterns, the Double Eagle Refinery site and surrounding areas are likely to remain zoned for industrial use.

Industrial areas surround the site but the land use within a 1 mile radius of the FSR site is mixed industrial and residential. One uninhabitable residence (due to fire) is located adjacent to the Pipe Storage Yard, just north of the railroad tracks and to the east of MLK. A small neighborhood is located about one-quarter mile to the northwest of the MLK and Northeast Fourth Street intersection. Four schools, Douglas High School, Dunbar School, Bath School, and Edwards School are located within a 1-mile radius of the site. Recreational areas close to the site include the Douglas Community Center, Douglas Community Park, and Washington Park. Drug Recovery, Inc. is the only medical facility located within a 1-mile radius of the site. The Double Eagle Refinery site is located about 500 feet southwest of the FSR site. The North Canadian River is located approximately one-half mile south of the site.

The former FSR collected, stored, and re-refined used oils and distributed the recycled product. The refinery was active from the early 1940s to the late 1960s. Planet Oil and Refining Company, Elliot Refining Company, and Salyer Refining Company all participated in waste oil reclamation activities at the site. Refinery operations included the recycling of waste oil using sulfuric acid for clarification. The waste sludges from the process were deposited in on-site impoundments and were later spread on the ground surface forming a tar mat.

A preliminary assessment of the site was completed in April 1984, and a site inspection was conducted in October 1984. Subsequent soil and water sampling was performed in June and December of 1985, in the main site area. Further soil and off-site municipal water well sampling was conducted in 1986, along with the installation of ground water monitoring wells. An expanded site inspection was conducted from 1987 through 1988, which confirmed that the site should be ranked for inclusion on the NPL. In March 1989, the FSR site was included on the NPL, pursuant to Section 105 of the CERCLA, 42 U.S.C. Section 9605, as amended.

The extent of on-site waste sludge was delineated as part of the SCOU remedial investigation (RI) at the site, and the extent of ground water contamination was assessed as part of the GOU RI. The GOU RI/FS study was initiated in June 1992, and the RI and feasibility study (FS) reports were both completed in July 1993. The RA for the SCOU at the FSR site was completed in 1996.

General Geology and Hydrogeology

Both the DER and FSR sites are situated on Quaternary alluvial deposits, which represent recent deposition by the nearby North Canadian River. The flood plain deposits typically consist of unconsolidated and interfingering lenses of sand, silt, clay, and gravel. These alluvial sediments are predicted to have relatively high permeability and porosity.

Directly below the alluvial deposits are the Garber and Wellington formations. Collectively, the Garber-Wellington consists of massive, cross-bedded sandstones irregularly interbedded with siltstones and shales. Since the "red bed" sandstones and shales of the Garber and Wellington formations are similar in lithology and conform in grade they are commonly mapped as a single lithologic unit and classified as a single aquifer. These lithified strata below the alluvial deposits, referred to herein as the bedrock formations, have a gentle westward homoclinal dip of 30 to 40 feet per mile in the region. However, both sites are located on the northeast flank of the Oklahoma City oil field surface anticline. Beneath the sites, the Garber sandstone or "bedrock" dips to the east-northeast, which is opposite of the regional dip. The bedrock formation beneath the sites begins approximately 25 to 57 feet below ground surface.

The Garber-Wellington aquifer constitutes the most important source of ground water in Oklahoma County. The depths of municipal, institutional, and industrial wells screened in the Garber-Wellington aquifer range from 100 to approximately 1,000 feet in Oklahoma County. The principal hydrologic factor controlling the development of the aquifer for fresh water supply is the presence of high concentrations of total dissolved solids (TDS) in the ground water. Shallow ground water in the area is not used as a water supply due to TDS levels in excess of 10,000 parts per million (ppm). The high TDS content in the ground water is attributed to past oil and gas production activities in the area.

Site Geology and Hydrogeology

The sites are underlain by unconsolidated deposits of alluvial material consisting of about 1 to 3 feet of topsoil, beneath which is a mixture of mostly sandy material mixed with silt and clayey gravel. The alluvium varies from about 25 to 57 feet thick below the ground surface. Underlying the alluvial deposits is the bedrock material. The uppermost bedrock formation is the Garber Sandstone.

The Hennessey Group formation, predominantly reddish-brown shale containing some layers of siltstone and fine-grained sandstone, overlies the Garber-Wellington Formation in parts of the region. This shale material was originally believed to have been a continuous layer beneath the site, which acted as an "aquitard" to separate the alluvial aquifer from the upper portion of the Garber-Wellington aquifer. However, this shale layer was not encountered above the Garber-Wellington aquifer in the area of the sites therefore the alluvial aquifer and upper portion of the Garber-Wellington aquifer are hydraulically connected. The GOU RI/FS and RA were implemented to address the vertical migration and potential impact of site contaminants to the deeper portion of the Garber-Wellington aquifer, as well as the lateral migration and potential impact of the site contaminants in the ground water on the nearby North Canadian River. Based on potentiometric elevation data presented in the RA report for the FSR site, ground water in the alluvial and upper portion of the Garber-Wellington aquifer flows to the east and the southeast.

3.2 CONTAMINANTS OF CONCERN

The types of contaminants detected in the ground water beneath the sites are similar to those detected in the sludges, sediments, and soils during the RI of the DER and FSR sites. The contaminants detected were primarily organic chemicals and heavy metals related to the refinery process. The most commonly detected organic chemicals were chlorinated hydrocarbons and benzene compounds. Lead and arsenic were the primary metals found in the ground water samples taken during the investigation. Two pesticides, chlordane and heptachlor, were also detected. The COCs identified in the DER GOU ROD are listed in Table 2.

The ground water quality of the deeper aquifer was unknown at the time the ROD was written. Data collected subsequently indicates the currently monitored deeper section of the Garber-Wellington aquifer should be considered unuseable for domestic purposes Class III non-potable due to high TDS concentrations. Therefore, MCLs presented in the ROD as monitoring parameters and potential remedial action objectives may not be applicable. Also, analytical data

TABLE 2

CONTAMINANTS OF CONCERN
FOR
DOUBLE EAGLE/FOURTH STREET
GROUND WATER OPERABLE UNIT*

Contaminant of Concern	Maximum Contaminant Level (mg/L)	Maximum Contaminant Level Excursion
CARCINOGENS		
Aldrin	NA	NA
Arsenic[1]	0.01	—
Benzene[1]	0.005	✓
Bis(2-chloroethyl)ether	NA	NA
Chlordane	0.002[2]	
Chloroform[1]	0.080	—
4,4-DDE	NA	NA
1,4-Dichlorobenzene	0.075	—
1,2-Dichloroethane[1]	0.005	✓
1,1-Dichloroethene[1]	0.007	—
Heptachlor	0.0004	✓
Heptachlor Epoxide	0.0002	—
Methylene Chloride[1]	NA	NA
Trichloroethene[1]	0.005	✓
Vinyl Chloride[1]	0.002	✓
NON-CARCINOGENS		
Acetone[1]	NA	NA
Barium[1]	2.0	✓
2-Butanone[1] (Methyl Ethyl Ketone)	NA	NA

TABLE 2

CONTAMINANTS OF CONCERN
FOR
DOUBLE EAGLE/FOURTH STREET
GROUND WATER OPERABLE UNIT*

Contaminant of Concern	Maximum Contaminant Level (mg/L)	Maximum Contaminant Level Excursion
Cadmium[1]	0.005	—
Chlorobenzene[1]	0.10	NA
1,1-Dichloroethane[1]	NA	NA
trans 1,2-Dichloroethene[1]	0.10	—
Endosulfan	NA	NA
Ketones[1,3]	NA	NA
Lead[1]	NA	—
Manganese[1]	NA	✓
2-Methyl-4-Pentanone[1]	NA	NA
Phenol	NA	NA
Thallium[1]	0.002	✓
Toluene[1]	1.000	✓
Xylene[1]	10.000	—

*See Section 6.3 for a discussion of MCLs that have changed since the ROD was approved.
NA = MCL not promulgated
— = Maximum concentration did not exceed MCL
✓ = Maximum concentration exceeded MCL
1 = monitored under ground water sampling plan
2 = no established MCL at time of baseline risk assessment
3 = represented by acetone, 2-hexanone, 2-butanone, 4-methyl-2-pentanone

for the deeper aquifer shows several COCs, in particular benzene, have been present in the deeper section since the initial sampling event.

4.0 REMEDIAL ACTIONS

The SCOUs at DER and FSR, which included surface sludges, contaminated surface water and sediment, and contaminated soil and debris, were treated as separate operable units but utilized the same selected remedy. Since the DER and FSR sites are separated only by the MLK overpass, and contain very similar waste material since both sites recycled used oils, migration of contaminants in certain cases overlap and cannot be separated.

Therefore, the GOUs at DER and FSR were combined, and a network of wells was established across both sites in order to implement the selected remedy. Since the GOU is considered one operable unit, it will also be addressed during this review as one unit when appropriate.

4.1 REMEDY SELECTION

Double Eagle Refinery Site SCOU

As specified in the 1992 DER ROD, the remedy for cleanup of contaminated waste material at the DER site involved excavation of the contaminated material in the Radio Tower area and Parcel "H," consolidation of this material with the contaminated material on the DER property, demolition of the on-site structures and disposal of the asbestos insulation, on-site stabilization of the consolidated material to immobilize and address the hazardous characteristics of the contaminants, and disposal of the stabilized material in a fully permitted off-site landfill.

The principal threat at the DER site was posed by direct contact and inhalation of contaminants in site soils and sludges, and the potential for migration of lead and Polycyclic Aromatic Hydrocarbons (PAHs) to the ground water. The remedial objectives were to minimize potential

exposure by direct contact or inhalation, and to reduce the potential for migration of contaminants into the surface waters and ground waters (EPA 1992b).

Fourth Street Refinery Site SCOU

As specified in the 1992 FSR ROD, the remedy for cleanup of contaminated waste material at the FSR site involved excavation of the contaminated material on Parcel "H," consolidation of this material with the contaminated material on the FSR property, demolition of on-site structures and disposal of the asbestos insulation, on-site stabilization of the consolidated material, and disposal of the stabilized material in a fully permitted off-site landfill.

Similar to DER, the principal threat at the FSR site was posed by direct contact and inhalation of contaminants in site soils and sludges, and the potential for migration of contaminants to the ground water. The remedial objectives were to minimize potential exposure by direct contact or inhalation, and to reduce the potential for migration of contaminants into the surface waters and ground waters. (EPA 1992a). As with the RA implemented at DER for the SCOU, after completing the RA of the SCOU at FSR, future source control operation and maintenance activities were not required since all of the wastes were removed from the site.

Double Eagle and Fourth Street Refinery GOU

The RODs for the DER and FSR GOU were signed on April 19, 1994, and September 30, 1993, respectively. The following information concerning the GOU remedy selection for the sites was presented in both RODs.

The RA objectives were as follows:

- Ensure that future potential users of the lower Garber-Wellington aquifer are not exposed to contaminants from the site; and

- Ensure that the North Canadian River is not impacted by contaminants from the site.

Transport of contaminants through the alluvial aquifer to the river was investigated as a migration pathway; however, the resultant contaminant concentrations in the river were below concentrations that would warrant establishing RA goals. Based on the results of the risk assessments and review of the applicable or relevant and appropriate requirements (ARARs), the affected medium was identified as the upper portion of the Garber-Wellington aquifer. The exposure scenario was based on the assumption a residential well would be installed at the boundary of the site. Five organics exceeded MCLs, including benzene, 1,2-DCA, heptachlor, trichloroethane, and vinyl chloride. These five were also the major contributors to the cancer risks calculated for the exposure pathways.

Although several contaminant concentrations in the alluvial aquifer and upper portion of the Garber-Wellington aquifer exceed MCLs, the affected portions are categorized as Class III sources (i.e. non-potable) to a depth of about 100 feet. MCLs presented in the ROD as monitoring parameters and potential remedial action objectives are generally only applicable to drinking water sources. Therefore, no further action would typically be required. However, in this case a confining "aquitard" does not exist between the contaminated zone and the useable portion of the aquifer (below 100 feet) to prevent the downward migration of contaminants.

The selected remedy for the DER and FSR GOU included the following components:

- Installation of warning signs to require notification prior to drilling in the area
- A deed notice filed to notify future land owners of the hazards associated with the contaminated ground water in the area of the site
- Installation of additional deeper monitoring wells further downgradient to ensure that contaminants do not migrate deeper, or to a receptor point off-site, and determine if an off-site source of contamination exists

- Establishment of a routine monitoring and maintenance program for ground water sampling and modeling to evaluate contaminant concentration reductions following removal of the contaminant source

- Routine inspections to ensure that public use of the upper portion of the Garber-Wellington aquifer does not occur prior to attainment of the RA objectives

- Five-year review of the site to determine if further actions need to be taken with regard to the ground water (the five-year review includes data analysis and ground water modeling to assess the adequacy of the monitoring and maintenance plan)

- Contingency measures (which include active treatment) that can be implemented if the ground water monitoring indicates an increase in contaminant concentrations (either vertically or horizontally). Possible contingency measures are described below.

The ROD also determined that if monitoring identified detectable concentrations of site contaminants in deeper Garber-Wellington monitoring wells, or if a contaminant concentration increased by 30 percent in any of the upper Garber-Wellington monitoring wells, then the well showing the increase in concentration would be resampled immediately. If the second analysis confirmed an action level exceedance, then EPA would evaluate the impacts of potential off-site sources of contamination, and the need for additional RA to address site-related contaminants. Based on these evaluations, EPA may require implementation of any or all of the following actions:

- Installation of additional monitoring wells to determine if the contamination is increasing in concentration or migrating.

- Increasing the frequency of sampling to assure that a complete exposure pathway does not develop.

- Construction of a containment measure such as a slurry wall.

- Implementation of an RA plan for extraction, treatment, and disposal of contaminated ground water.

4.2 REMEDY IMPLEMENTATION

Treatment reagents and the treatment method for the DER SCOU were first addressed in the Draft Bench Scale Treatability Study by Fluor Daniel in 1992. The final remedy, which involved adding cement kiln dust and lime to the waste, was included in the DER ROD and was described in detail in Fluor Daniel's remedial design (RD). During the Pilot Waste Treatment Demonstration, conducted during the RA, problems were encountered with stabilizing leachable lead and generating sulfur dioxide. As a result, additional reagents were evaluated and tested. Eventually, Portland cement and Class C fly ash were utilized as the treatment reagents for most of the contaminated waste material treated. Cement kiln dust was used to a lesser extent. These reagents were mixed with the acid sludges to (1) solidify the contaminated waste material into a workable material, (2) neutralize the sulfuric acid in the contaminated waste material, and (3) stabilize the leachable lead in the contaminated waste material. Both the treated waste and the contaminated waste material exceeding the Remedial Action Goals (RAGs) were transported and disposed of off-site at the East Oak Landfill in Oklahoma City, Oklahoma, which was permitted to accept these wastes. Future source control operation and maintenance activities are not required since all soils above RAOs were removed from the site.

The RA for the SCOU at FSR consisted of on-site neutralization and stabilization of wastes containing lead and/or acid exceeding the RA goals. Hydrated lime and cement kiln were mixed with wastes materials to neutralize the sulfuric acid and stabilize the lead. The treated wastes materials were transported and disposed at an off-site disposal facility. The SCOU RA also included the restoration of areas affected by remedial activities and the cleaning and disposing of contaminated equipment and structures. Future source control operation and maintenance activities are not required since all soil above RAOs were removed from the site.

The RD for the GOU at both sites was completed by Fluor Daniel Environmental Services, Inc. (Fluor Daniel) in March 1995. The RA for the FSR site GOU was combined with the RA for the

DER site GOU since the ground water contaminant plumes for both sites were combined. Fluor Daniel implemented the RA in two phases. Phase I included the installation of piezometers and speed borings, geophysical logging, and removal of the DER site (deep) production well. Data collected during Phase I was used to determine monitoring well locations and depths needed to establish a long-term ground water monitoring well network. Phase II included installation of ground water monitoring wells, abandonment of alluvial wells and piezometers, and installation of warning signs.

During Phase I of the RA, the following activities were performed:

- Five speed borings were advanced and geophysically logged to a depth of 200 feet.
- Nineteen piezometers were installed to a depth approximately 5 feet into the ground water. The piezometers were developed and water levels were measured weekly for a month.
- The 938-foot deep production well that existed on the DER property was plugged and abandoned to eliminate the possibility of downward migration of site-related contaminants.

After the completion of Phase I activities, the data were analyzed and the locations and depths of the Phase II monitoring wells were determined. The Phase II monitoring wells included two upper monitoring wells installed 10 feet into the top of the bedrock (approximately 60 feet below ground surface) and six deep monitoring wells installed to a depth just above the significant shale layer detected during the speed borings (approximately 150 to 175 feet below ground surface). The shallower monitoring wells were identified as "upper" monitoring wells, and the deeper monitoring wells were identified as "deep" monitoring wells. In order to be consistent, this terminology is used for the discussion of the five-year review data.

During the evaluation of the Phase I data, a monitoring well network to be sampled during the RA was also determined. The monitoring well network consists of five upper monitoring wells (BMW-1 through BMW-5) and the eight Phase II monitoring wells (upper monitoring wells

BMW-6A and BMW-7 and deep monitoring wells BMWD-1 through BMWD-6A). The locations of the monitoring wells are shown on Figure 1. The 22 existing alluvial wells, BMW-6, and the 19 piezometers were abandoned during the Phase II activities.

4.3 SYSTEM OPERATIONS

The ODEQ Waste Management Division has been conducting ground water sampling as part of the RA for the GOUs at the DER and FSR sites. Monitoring wells were sampled quarterly for over three years to establish a baseline contaminant concentration in each well. Sampling frequency was then reduced to semi-annual to monitor natural attenuation. Quarterly sampling was completed in May 2000. Semi-annual sampling began in September 2000 and will continue for three years. Quarterly ground water samples have been collected in December 1996, March 1997, June 1997, September 1997, December 1997, March 1998, July 1998, September 1998, June 1999, October 1999, December 1999, and April 2000. Semi-annual ground water sampling events have been conducted in September 2000 and March 2001.

4.4 OPERATION AND MAINTENANCE COSTS

Table 3 shows the costs to the State of Oklahoma that were incurred due to activities associated with the sites.

4.5 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the first five-year review to be conducted for the DER site. However, as mentioned previously, Tetra Tech performed a five-year review on the FSR site in 2000 and the results of that review have been incorporated into this review since this review covers both the DER and FSR sites. The next combined Five-Year Review is schedule to occur in 2006.

TABLE 3

COSTS FOR ACTIVITIES ASSOCIATED WITH THE SITES

Cumulative Cost	Double Eagle Refinery	Fourth Street Refinery
July 1993 – June 1994	$793.54	$1,292.38
July 1994 – June 1995	$5,057.07	$168,363.54 (includes $165,000 in RA funding)
July 1995 – June 1996	$4,795.96	$334,718.01 (includes $330,000 in RA funding)
July 1996 – June 1997	$16,897.34	$10,076.13
July 1997 – June 1998	$30,072.67	$67,871.08 (includes $57,663 in RA funding)
July 1998 – June 1999	$48,185.88 (includes $12,898 in RA funding)	$35,036.12 (includes $12,976 in RA funding)
July 1999 – June 2000	$30,468.13	$13,114.55
July 2000 – June 2001	Not Provided	$26,903.65

Notes:

RA Remedial action

5.0 FIVE-YEAR REVIEW PROCESS

The first five-year review of the GOU at FSR was led by Carlos Sanchez, EPA Remedial Project Manager for the FSR site.

This review was led by Craig Carroll, EPA Remedial Project Manager. Based on information presented in the FSR Five-Year Review Report, this review consisted of a review of relevant documents (see Appendix A), review of standards, interviews, and a site inspection. A copy of the completed report will be available in the local site information repository at the Ralph Ellison Branch Library, 2300 NE 23rd Street in Oklahoma City. Notice of its completion will be placed in the local newspaper (Daily Oklahoman), and local contacts notified by letter.

6.0 FIVE-YEAR REVIEW FINDINGS

The following sections present the findings from interviews, site inspection, and review of site documents and sampling results.

6.1 INTERVIEWS

In accordance with Five-Year Review guidance, several key individuals were contacted by mail and phone in order to obtain their opinions with regard to issues associated with the sites. Questionnaires were provided to following people based on their knowledge and association with the sites:

- Chon Rouce, East Side Environmental Coalition
- Carlos Sanchez, EPA
- Donn Walters, EPA
- Philip Allen, EPA

- Kathy Buckley, ODEQ
- John Herrington, Association of Central Oklahoma Governments

The Superfund Site Survey Forms are included in Appendix B. No continuing or unresolved issues were discovered during the interview process. Most comments received were positive and commended the efforts of everyone involved in the remedial process.

With respect to the community, Ms. Rouce suggested that more prominent signs and more media coverage to inform the public of what was taking place would enhance the site's management and operation.

Information on Superfund sites is made available at, but not limited to, EPA's website (see Appendix C), publishings (see Appendix D), and mail out fact sheets.

6.2 FIVE-YEAR REVIEW SITE INSPECTION

A site visit was conducted on August 7, 2001, to assess the conditions of the remedy implemented to protect human health and the environment from the contaminants still present at the sites. The following individuals attended the site inspection:

- Kathleen T. Buckley, ODEQ
- Suzanne Dunn, ODEQ
- Chon Rouce, East Side Environmental Coalition
- Barbara Burton of Douglas High School
- Craig Carroll, EPA
- Bart Cañellas, EPA
- Mark H. Taylor, Tetra Tech

The ODEQ invited community members Chon Rouce and Barbara Burton to participate in the site visit. During the site visit, Ms. Rouce and Ms. Burton were briefed by representatives from the EPA and ODEQ about historical site conditions, remedial actions, and current ground water monitoring activities.

The condition of the monitoring wells, backfill coverage, postings, and site fencing were evaluated during the site inspection. Photographs taken during the site visit, as well as the completed site inspection checklist, are contained in the Five-Year Review Site Inspection Report (Appendix E).

The weather conditions during the inspection were partly cloudy, dry, and hot (no wind and a temperature in the upper 90s). There was no evidence of ponding on the site.

The cover at all of the areas associated with SCOU RAs—DER, FSR, Parcel H, and Radio Tower Area—appears similar in vegetative type, plant health, and density to typical areas adjacent to, but not associated with, the CERCLA sites. Visually, there is no sign or evidence of contamination or stressed vegetation on either site. Since the selected SCOU remedy for both sites—neutralization, stabilization, and off-site landfill disposal—did not require long-term operation and maintenance, there were no engineered systems to be evaluated.

Information provided by the ODEQ during the site visit confirms compliance with several of the major components of the remedy. As required by the RODs, (1) notices detailing the remediation of both sites have been drafted and posted in the land records of the county in which the sites are located; (2) the routine monitoring and maintenance program has been established and is outlined in "Groundwater Sampling Plan For Fourth Street and Double Eagle Refinery Sites, Oklahoma County, Oklahoma"; (3) routine inspections to ensure there is no public use of the upper zone of the Garber-Wellington Aquifer are completed quarterly by reviewing the Oklahoma Water Resources Board (OWRB) records; (4) the method by which the ODEQ will evaluate the contaminant concentrations has been formally documented and is presented in the

"Quality Assurance Project Plan, Fourth Street and Double Eagle Refinery Sites, Oklahoma City, Oklahoma County, Oklahoma"; and (5) contaminant concentration baselines and action levels to initiate evaluation of contingency measures were set after the April 2000 sampling event for both the upper and lower Garber-Wellington aquifers.

All monitoring wells visually inspected appeared in good condition, clearly labeled, generally protected from impact, and securely encased with lock and cover. Monitoring wells BMW-2, BMW-7, BMWD-5, and BMWD-6 were not visually inspected due to dense vegetation and access considerations.

As noted in the FSR Five-Year Review Report, the site perimeter is not encompassed by a distinct boundary or fence which can easily be posted with signs as required by the ROD. Therefore, no warning signs were posted around the perimeter of the site. Warning signs on the monitoring wells noted during the FSR Review were still in place. However, the language on these signs did not meet the requirements prescribed in the ROD and more informative labels with ODEQ contact information have been affixed to each well since the site inspection.

Photographs taken during the site visit are included in the Site Inspection Photolog in Appendix F. The completed Five-Year Review Site Inspection Checklist is included in Appendix G.

6.3 RISK INFORMATION REVIEW

The selected sediment, sludge, and surface soil remedy of excavation, consolidation, neutralization and stabilization, followed by off-site disposal as outlined in the RODs for DER and FSR, cited the following chemical-specific ARARs for soils and sediments:

- Identification and listing of hazardous waste (40 Code of Federal Regulations (CFR) Part 261, Subpart C - Characteristics of Hazardous Waste and Subpart D - Lists of Hazardous Waste).
- National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61).

- Air Pollution Permits (Oklahoma Air Pollution Control Rules, (OAC) 310:200-7).
- Control of Emissions of Organic Materials (OAC 310:200-37).
- Control of Emissions of Hazardous and Toxic Air Contaminants (OAC 310:200-41).

The selected remedy also cited the following action-specific ARAR for soils, sludges, and sediments:

- Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR Part 264).

The soils, sludges, and sediments ARARs associated with the SCOUs at DER and FSR were only applicable or relevant and appropriate while the hazardous soils, sludges, and sediments were being managed or during the excavation, neutralization, and stabilization processes. At completion of the RA, the SCOU ARARs no longer applied, since all wastes were removed from the site. Therefore, the rest of this section is applies only to the GOU ARARs.

The RODs identified the following ARARs for the GOU RA:

- Safe Drinking Water Act MCLs for the COCs
- Long-term monitoring program requirements in accordance with Title 40 of the Code of Federal Regulations Part 264, Subpart F (40 CFR 264 Subpart F).
- Standards for the installation of wells and disposal of miscellaneous wastes associated with implementation of the remedy.

In addition to the two changes in the chemical-specific ARARs listed in the FSR First Five-Year Review (adding an MCL for chlorobenzene of 0.1 mg/L and for methylene chloride of 0.005 mg/L), some additional minor changes to chemical-specific ARARs have occurred since completion of the FSR review. They are as follow.

Arsenic

In January 2001, EPA published a new standard for arsenic in drinking water that would require public water supplies to reduce arsenic to 10 parts per billion (ppb) by 2006. The MCL for arsenic of 0.050 mg/L cited in each of the GOU RODs has been revised and is now set at 0.010 mg/L. Because arsenic may be naturally occurring in some ground water and is not expected to naturally attenuate over time, this change in MCL is not likely to materially affect the protectiveness of the selected GOU remedy.

Chlordane

Chlordane was not listed with a primary Federal MCL in either of the RODs. However, chlordane does have an MCL of 0.002 mg/L. Because chlordane is not suspected of being a refinery-related contaminant, correcting the omission of the chlordane MCL from the ROD would not affect the protectiveness of the selected GOU remedy.

Chloroform

Chloroform is regulated as part of the "total trihalomethane" (TTHM) group which is the sum of the concentrations of the trihalomethanes (including bromodichloromethane, bromoform, dibromochloromethane, and chloroform). This sum should not exceed 0.1 mg/L. However, on January 1, 2002, the Federal MCL for TTHM was lowered to 0.08 mg/L. Modeling of monitored natural attenuation predicted none of the TTHM group chemicals will drop below MCL concentrations within the next 30 years. Further, it will take approximately 100 years for most contaminant concentrations in the ground water to drop below MCL concentrations. Therefore, this change may extend the time required to reduce TTHM concentrations below the MCL but should not increase the overall predicted time of 100 years for most contaminant concentrations to drop below their MCLs.

Nickel

The previous MCL for nickel has been remanded by the EPA. However, nickel concentrations have never exceeded the MCL at the site, therefore this change does not affect the protectiveness of the selected remedy.

6.3.1 Chemical-specific ARARs

Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. If more than one chemical-specific ARAR exists for a COC, the most stringent level will be identified as an ARAR for the RA. The only chemical-specific ARARs for the DER/FSR site GOU are MCLs for organic and inorganic compounds in the ground water.

The remedy allows for monitored natural attenuation of the contaminants in ground water. In accordance with the September 1996, "Groundwater Sampling Plan for Fourth Street and Double Eagle Refinery Sites," ground water was to be monitored quarterly for two consecutive years and thereafter semi-annually for three years. The data from these monitoring events will be used to determine whether natural attenuation is reducing the aquifer contamination level; if contamination is migrating to usable portions of the Garber-Wellington aquifer or toward the North Canadian River; and if contingency measures are necessary to eliminate health risks associated with ground water use. In accordance with the February 2001, "Groundwater Sampling Plan for Fourth Street and Double Eagle Refinery Sites," quarterly sampling was completed with the May 2000 sampling event, and semi-annual sampling began with the September 2000 sampling event and will continue for a minimum of 3 years (ODEQ 2001a).

Sampling data were collected 14 times (12 quarterly sampling events and 2 semi-annual sampling events) over the course of 52 months (December 1996 through March 2001). According to the sampling data from these events, several contaminant concentrations exceeded their associated MCLs in both the upper and deep wells.

6.3.2 Location-specific ARARs

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in special locations. Some examples of locations that might prompt a location-specific ARAR include wetlands, sensitive ecosystems or habitats, flood plains, and areas of historical significance. The RODs did not identify any location-specific ARARs.

6.3.3 Action-specific ARARs

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes or requirements to conduct certain actions to address particular site circumstances. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Because there are usually several alternative actions for any remedial site, very different requirements can come into play. These action-specific requirements do not themselves determine the remedial alternative; rather, they indicate how a selected alternative must be achieved.

Four action-specific ARARs were identified in the RODs for the GOU and one was determined to be applicable. The long-term monitoring requirements of 40 CFR 264 Subpart F were determined to be applicable. The substantive requirements and the compliance status are discussed below:

- Establish ground water protection standards and concentration limits (40 CFR 264.92 and 264.94). The RA complies with these requirements by establishing MCLs as ground water cleanup standards.

- Specify the hazardous constituents to which the ground water protection standard applies (40 CFR 264.93). The RA complies with this requirement. The ground water sampling plan lists the constituents for which ground water must be analyzed. The list includes 30 volatile organic compounds (VOC), 23 metals, 3 anions, and 4 cations.

Recent ground water data have introduced an uncertainty regarding the direction of ground water flow at the site. This also creates uncertainty as to the source of contaminants in the up-gradient well. Based on the available data, the remedy complies with the general ground water monitoring requirements found at 40 CFR 264.97 (background wells, well construction, sample collection, determining ground water surface elevations, and statistical analysis of ground water data). However, the most recent ground water surface elevation data indicate the background wells thought to be upgradient of the sites are possibly being contaminated by pollutants from the DER site. Well surveys should be verified and a new potentiometric map generated based on the most recent ground water data provided by the USGS in order to determine if the pollutants detected in up-gradient wells are site related or non-site related.

6.4 GROUND WATER SAMPLING DATA REVIEW

The ODEQ collected ground water samples in December 1996, March 1997, June 1997, September 1997, December 1997, March 1998, July 1998, September 1998, June 1999, October 1999, December 1999, April 2000, September 2000, and March 2001. Ground water samples were collected from the 13 monitoring wells located in the site area. These monitoring wells include seven monitoring wells (BMW-1 through BMW-7) screened in the upper bedrock of the Garber-Wellington aquifer (40 to 70 feet below ground surface) and six monitoring wells (monitoring wells BMWD-1 through BMWD-6) screened deeper in the Garber-Wellington aquifer (approximately 150 feet below ground surface). The locations of the monitoring wells are shown on Figure 1. The ground water samples were analyzed for VOCs, target analyte list

(TAL) metals, sulfate, TDS and cyanide. A summary of the analytical results is presented in Table 4.

Ground water sampling began in late 1996. RA activities largely occurred at the FSR site from April 1995 through February 1996, and at the DER site from March 1998 through December 1999 (ODEQ 2001c). The DER final inspection, which marked completion of contaminant source removal, occurred on June 29, 1999. According to modeling done during the Feasibility Study, once the contaminated soils are removed from the Double Eagle site, it will take 10 to 20 years for contaminant concentrations to decrease by more than 50 percent from their steady state concentrations in the alluvial aquifer. Therefore, contaminant concentrations in the bedrock should remain relatively constant 10 to 20 years, after which they should begin to decrease.

6.4.1 Upper Monitoring Wells

As shown in Table 4 and associated Figures 2 through 8, several contaminants identified on the COC list were detected above MCLs in many of the wells. Wells with contaminant concentrations exceeding action levels were not immediately re-sampled therefore exceedences have not been formally established as per the quality assurance project plan (QAPP). However, data collected from the upper monitoring wells during the two semi-annual sampling events show contaminant concentrations are decreasing in monitoring well BMW-2; monitoring well BMW-5 (Figure 6) has an increasing concentration of chlorobenzene; and monitoring well BMW-6 (Figures 7a and 7b) has an increasing concentration of trichloroethene. Maximum concentrations were found in BMW-1 (0.059 mg/L of cadmium) on April 14, 2000; BMW-2 (7 ug/L of methylene chloride) on March 6, 1997; BMW-3 (5.64 mg/L of barium) on June 1, 1997; BMW-4 (0.732 mg/L lead) on April 10, 2000; BMW-5 (630 ug/L of vinyl chloride, 220 ug/L of benzene, 400 ug/L of chlorobenzene) on December 1, 1997, September 1, 1997, and March 6, 2001; and BMW-6A (434 ug/L of 1,2-dichloroethene, 1300 ug/L trichloroethene, and 67 ug/L of 1,1-dichloroethene) on June 10, 1999, October 5, 1999, and March 5, 2001; BMW-7 (7 ug/L of trichloroethene) on October 5, 1999; BMW-8 (650 ug/L of vinyl chloride) on December 1, 1997.

FIGURE 2
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-1

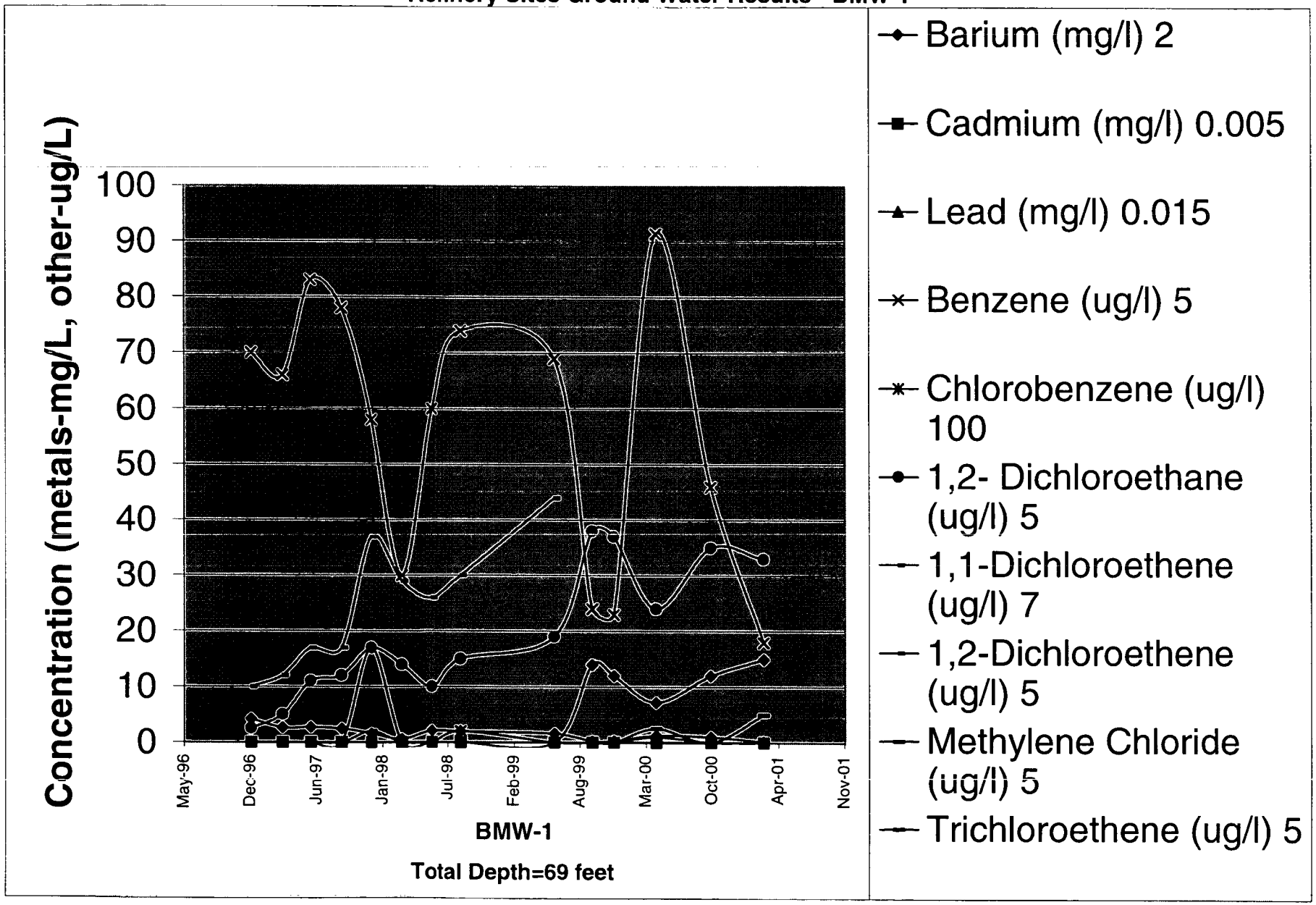


FIGURE 3
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-2

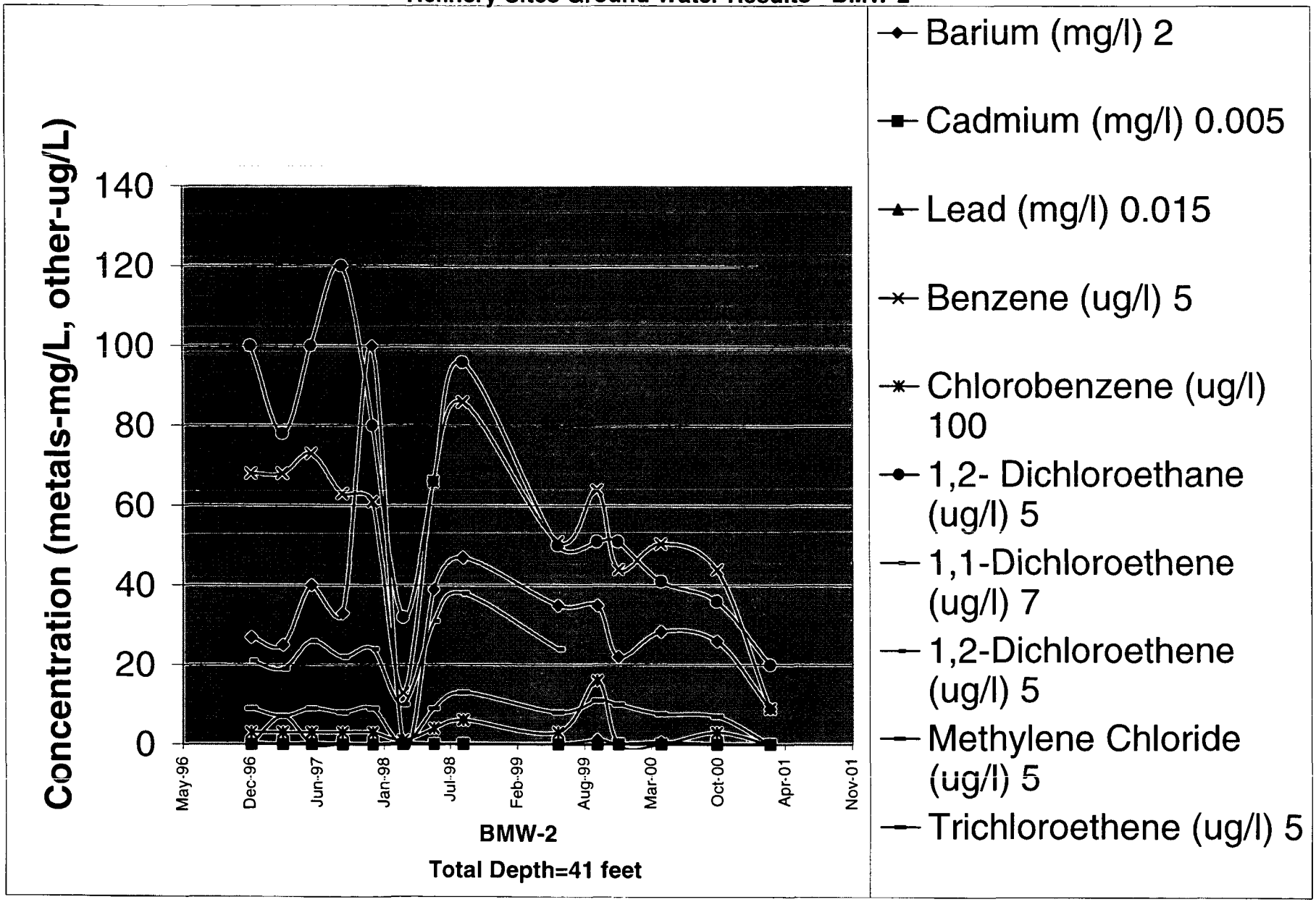


FIGURE 4
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-(3 and 3A)

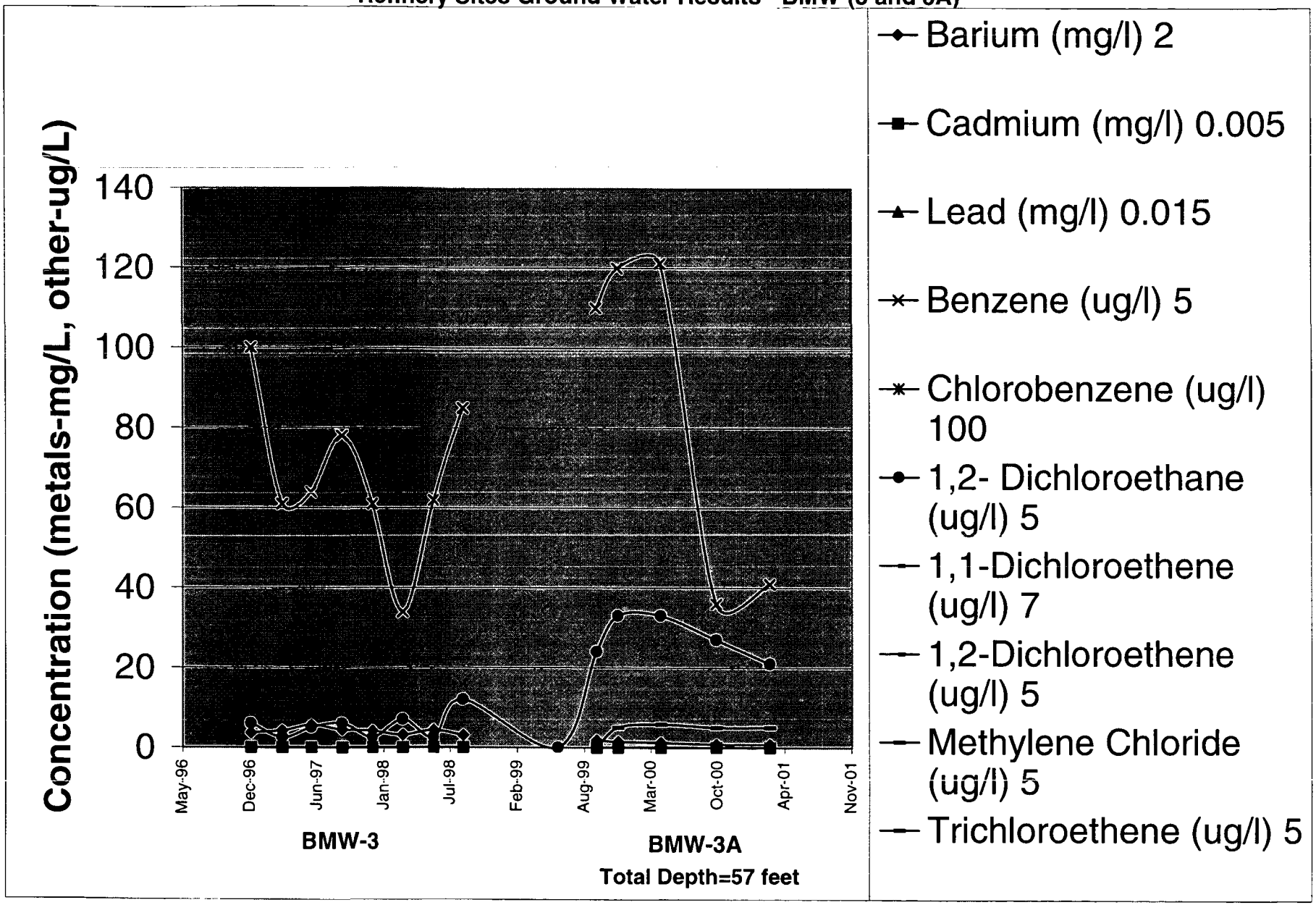


FIGURE 5
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-4

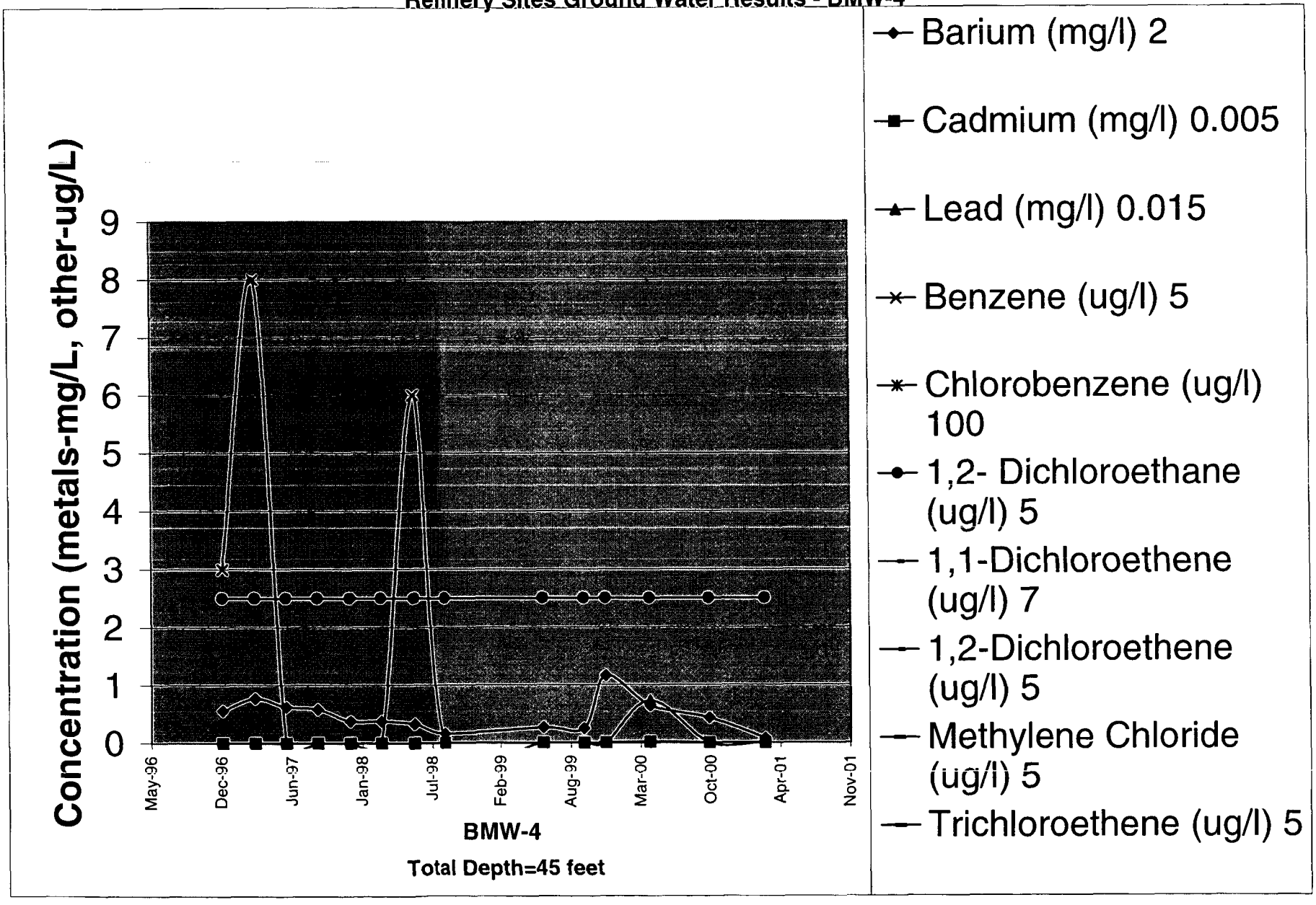


FIGURE 6
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-5

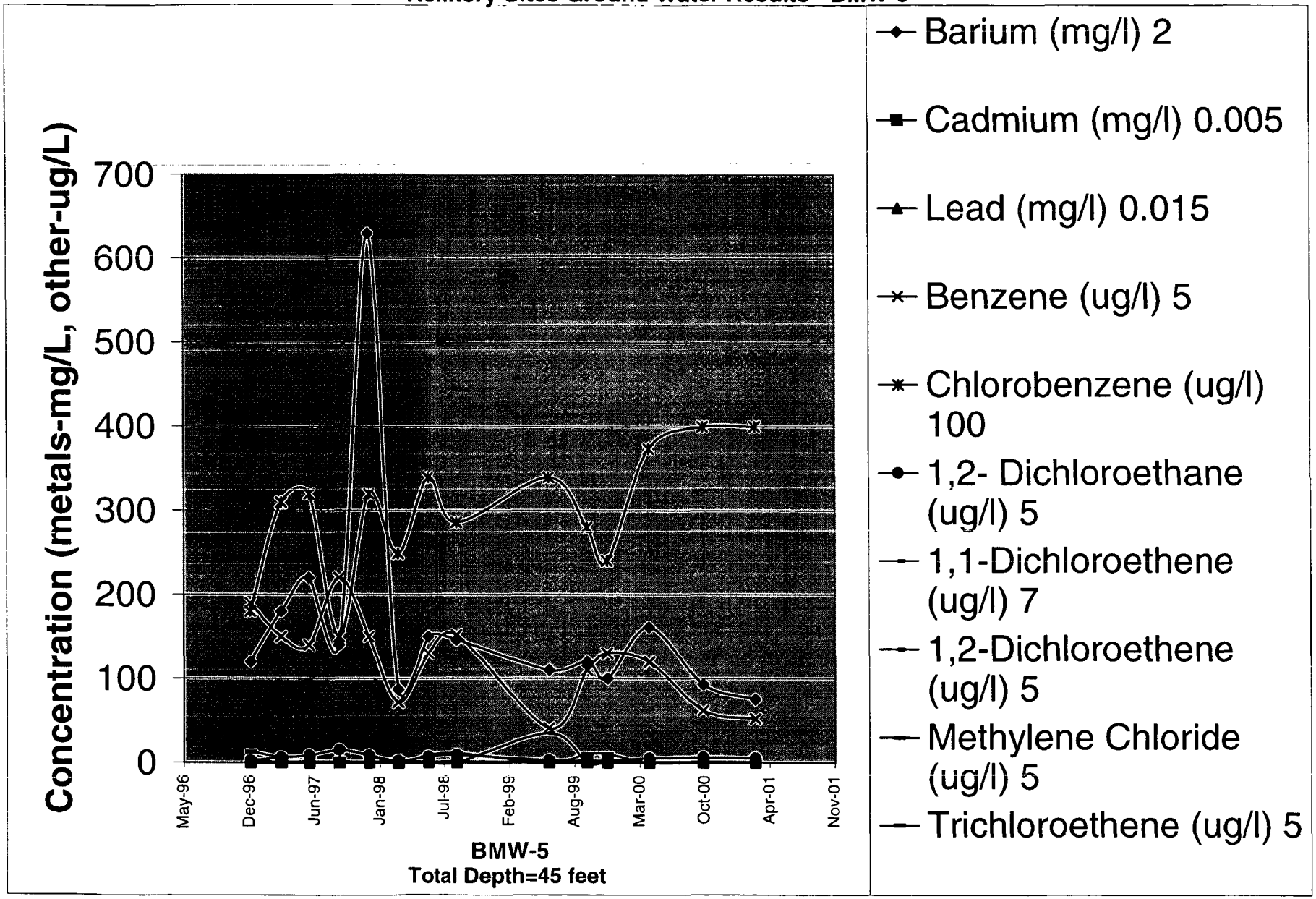


FIGURE 7A
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-6A

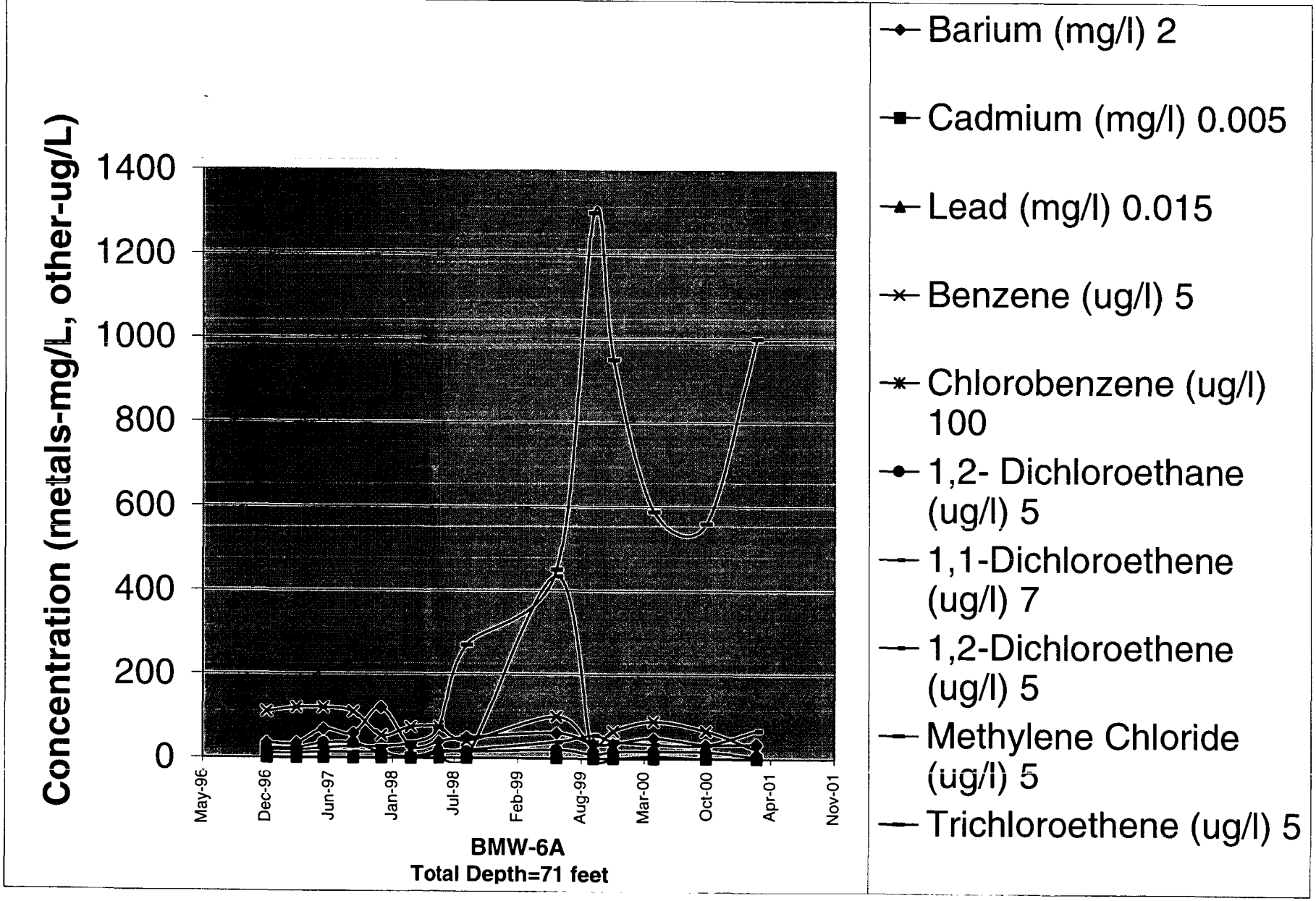


FIGURE 7B
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-6A (0-200)

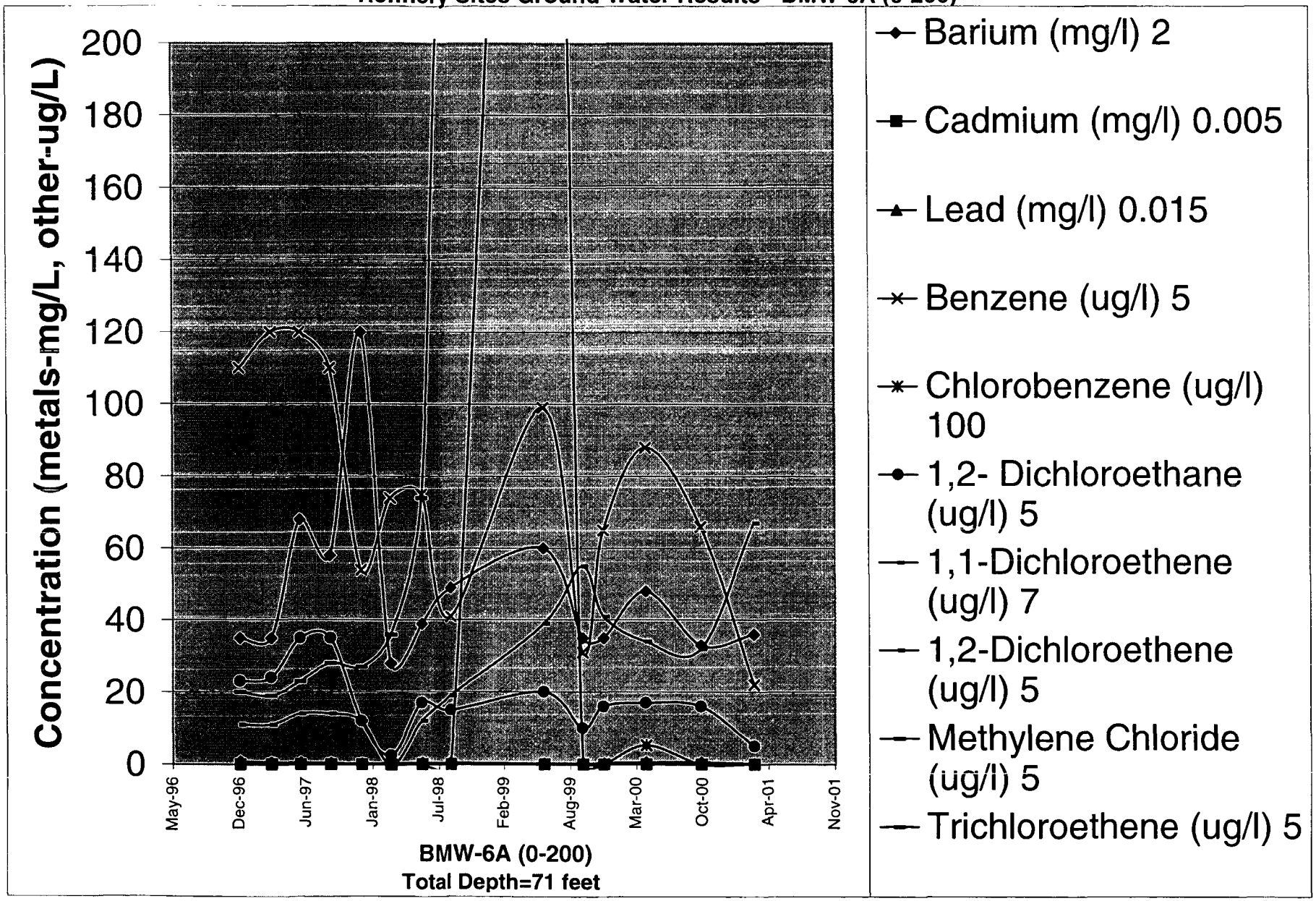
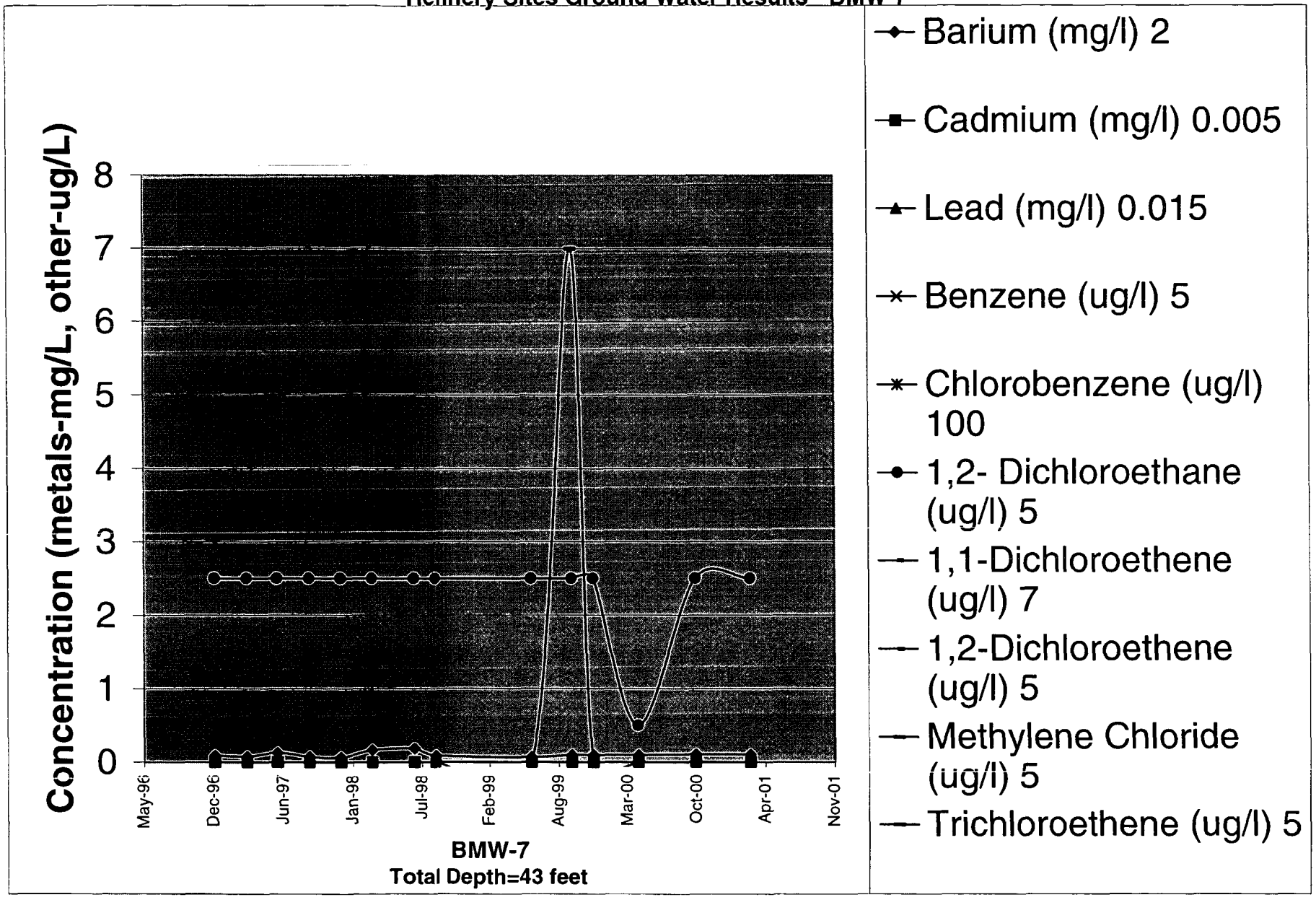


FIGURE 8
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMW-7



Information provided in the RODs notes that the ground water in the upper portion of the Garber-Wellington aquifer generally flows to the south (See Attachment 1 for ground water flow figures). Based on this information, monitoring well BMW-6A should be upgradient from the sites. However, the average reported ground water elevation for BMW-6A was 1,151.405 feet above sea level, the lowest average elevation of the seven upper monitoring wells. Available potentiometric surface information provided with the second semi-annual sampling event report (ODEQ 2001c) shows monitoring well BMW-6A as partially downgradient of the DER site. Since the direction of flow is still being confirmed, it is not possible at this time to determine whether or not horizontal migration of off-site contamination onto the site is occurring.

Completion of the RA removing the contaminant source occurred on June 29, 1999 (Tetra Tech 2000). Under the DER ROD, a routine ground water monitoring and maintenance program (quarterly sampling for the first two years, then semi-annually for the following three years), including modeling, was established to evaluate the reduction of contaminant concentrations following removal of the contaminant source (EPA 1994). If site-related contaminants are detected during routine monitoring of the deeper Garber-Wellington wells, or if a contaminant concentration increases 30 percent above the established baseline in any of the upper Garber-Wellington wells, then the well(s) showing and increase will be immediately resampled. Based on the results of the resampling, a determination will be made as to whether an action level has been exceeded and evaluation of contingency measures should begin. Once an exceedance has been confirmed, the well will continue to be sampled on the regular schedule but will not be continually resampled after the scheduled sampling to confirm the exceedance.

6.4.2 Deep Monitoring Wells

As shown in Table 4 and associated Figures 9 through 14, several contaminants were detected in many of the deep monitoring wells above MCLs. The VOC COCs detected above MCLs in the ground water samples from the deep monitoring wells include benzene, 1,1-DCE, cis-1,2-DCE TCE, and vinyl chloride.

Benzene, the most prevalent VOC, was detected in ground water samples collected from five of the six deep monitoring wells (BMWD-1 through BMWD-5) above the MCL of 5 µg/L. In samples from monitoring well BMWD-1 located west of the FSR site and north of the Double Eagle Refinery site, the benzene concentrations increased from below detection limits in December 1996 and March 1997 to 64 µg/L in December 1997 to 160 µg/L in July 1998, and down to 130 ug/L most recently in March 2001. In samples from monitoring well BMWD-2 located south of the Double Eagle Refinery site, the benzene concentrations fluctuated from 68 µg/L during the March 1997 sampling event to 5 µg/L during the June 1999 sampling event, and then between not detected and 23 ug/L since June 1999. The benzene concentrations detected in samples from monitoring well BMWD-3 located south of the FSR site, fluctuated from 160 µg/L to 10 µg/L during the 14 sampling events. The benzene concentrations detected in monitoring well BMWD-4 located southeast of the FSR site, fluctuated anywhere from 24 µg/L (March 1997) to 168 µg/L (June 1999). In samples from monitoring well BMWD-5 located east of the FSR site, benzene was not detected until the September 1998 sampling event (26 µg/L). Since detection, benzene concentrations have fluctuated from 50 µg/L to not detected. In addition to benzene, monitoring well BMWD-1 has had levels of vinyl chloride, 1,1-dichloroethene, and trichloroethene reported above MCLs since removal of all sources. MCL exceedances for barium have been recorded in monitoring wells BMWD-2, BMWD-3, and BMWD-4; MCL exceedances for vinyl chloride have been recorded in monitoring wells BMWD-1 and BMWD-2; an MCL exceedance for 1,1-dichloroethene has been recorded in monitoring well BMWD-1; and MCL exceedances for trichloroethene have been recorded in monitoring well BMWD-1, BMWD-3, and BMWD-5.

FIGURE 9
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMWD-1

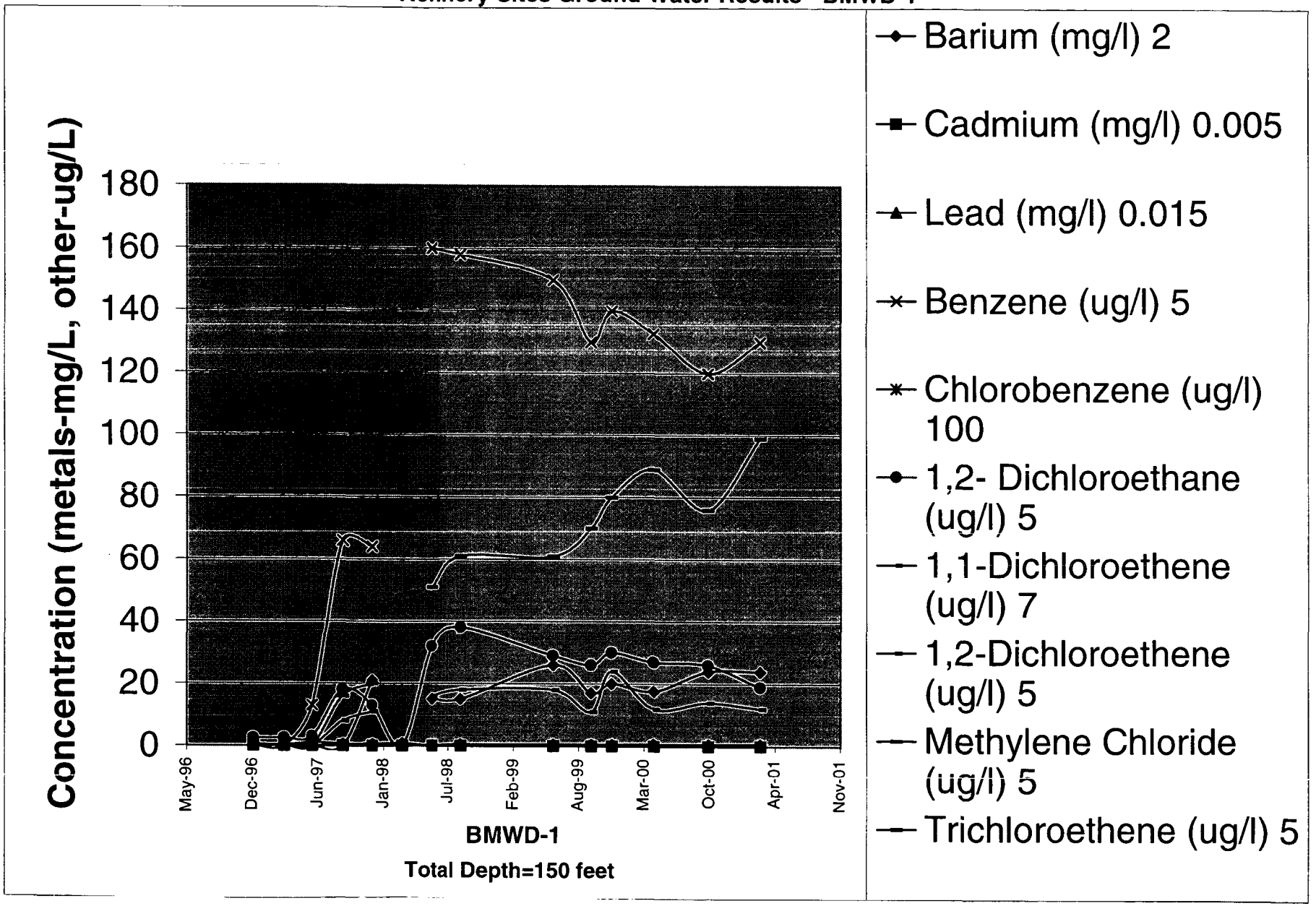


FIGURE 10
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMWD-2

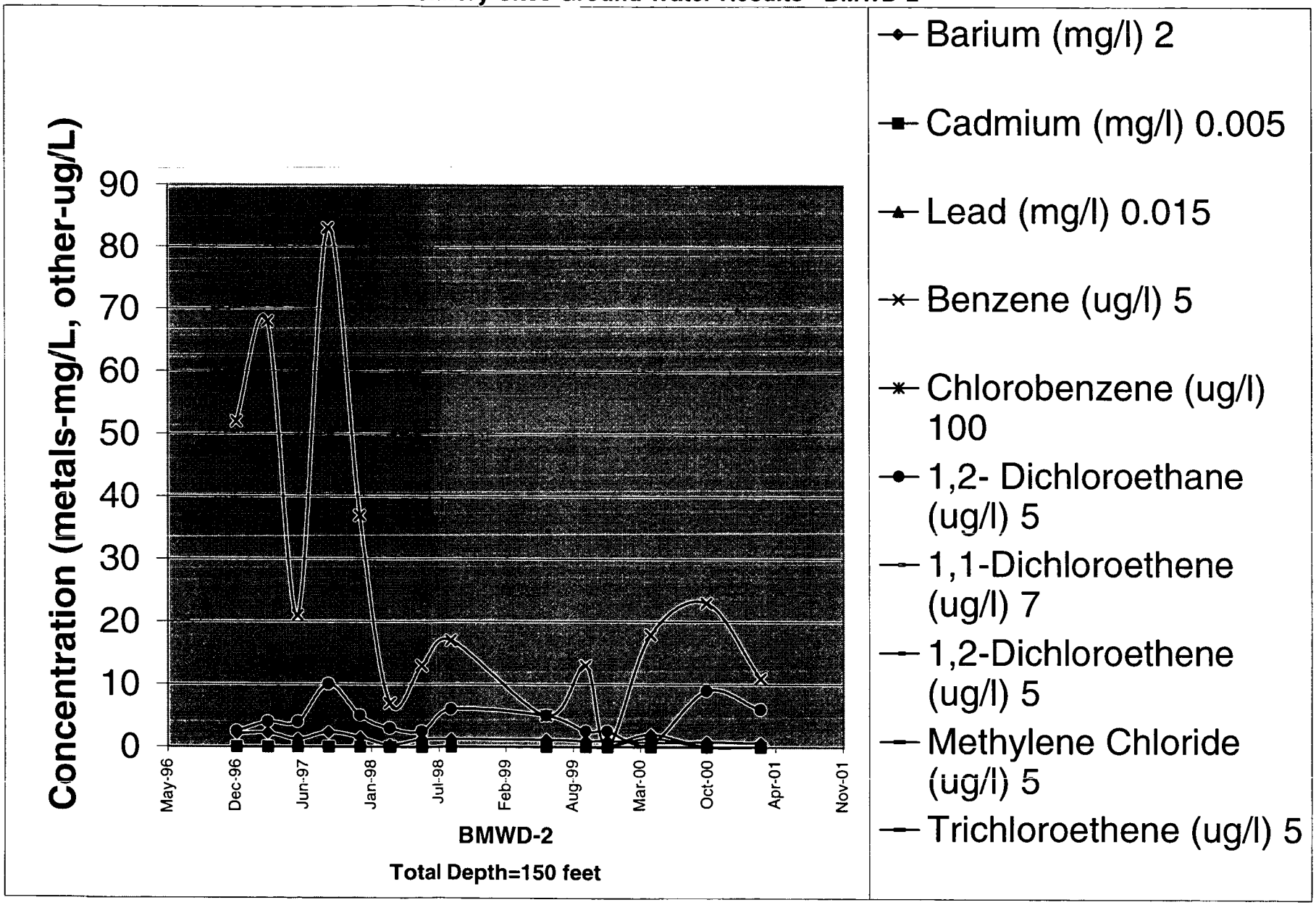


FIGURE 11
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMWD-3

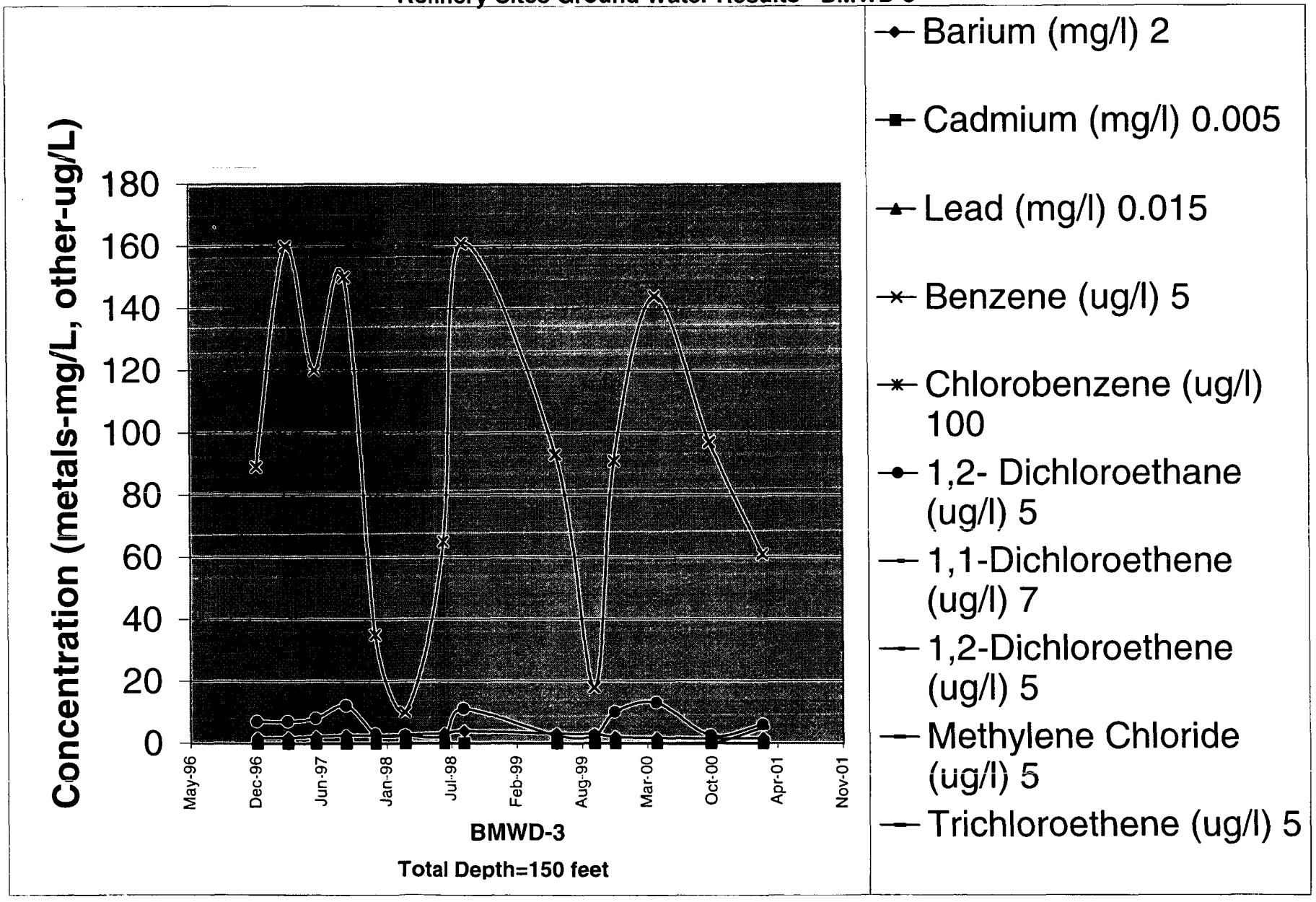


FIGURE 12
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMWD-4

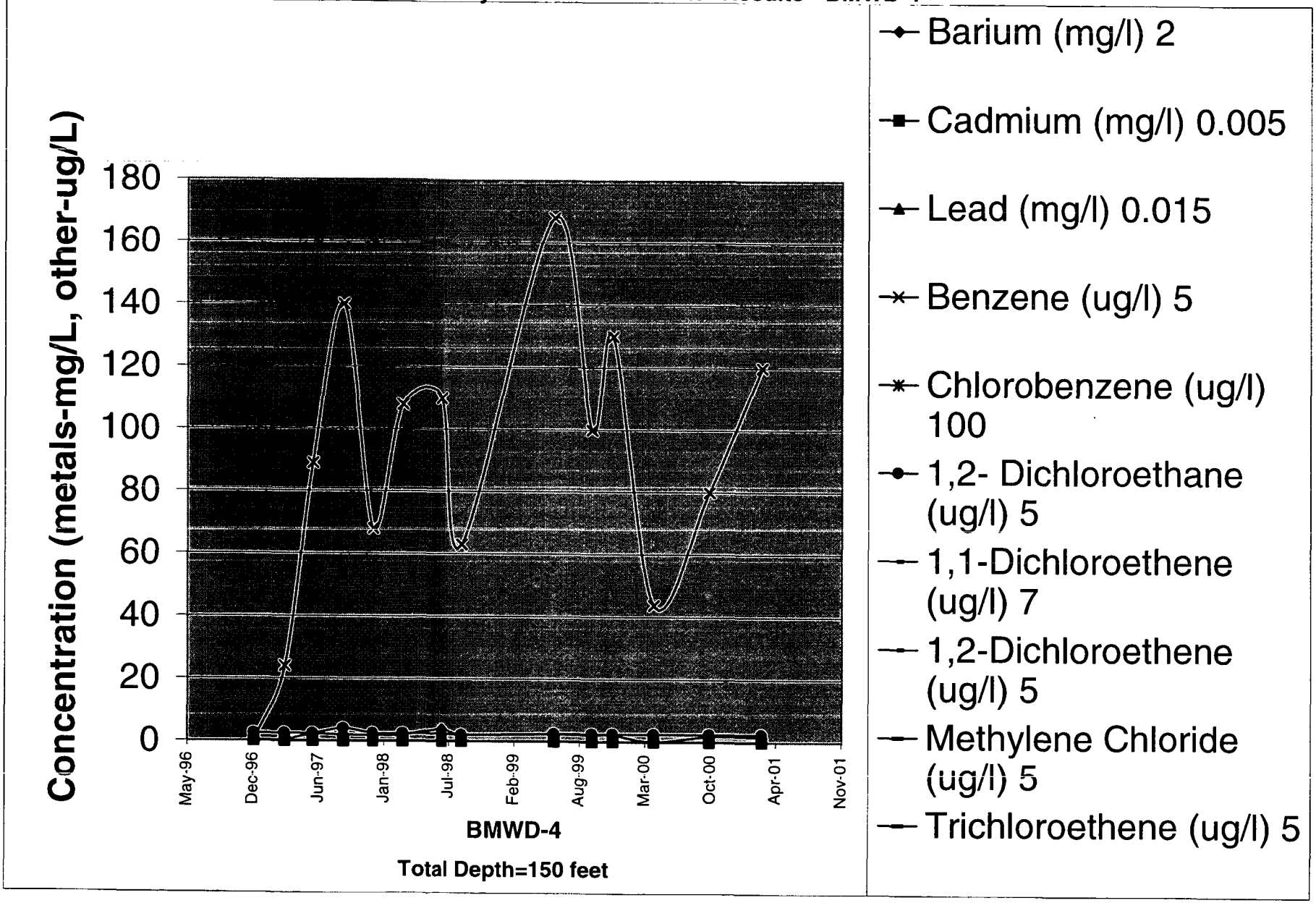


FIGURE 13
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMWD-5

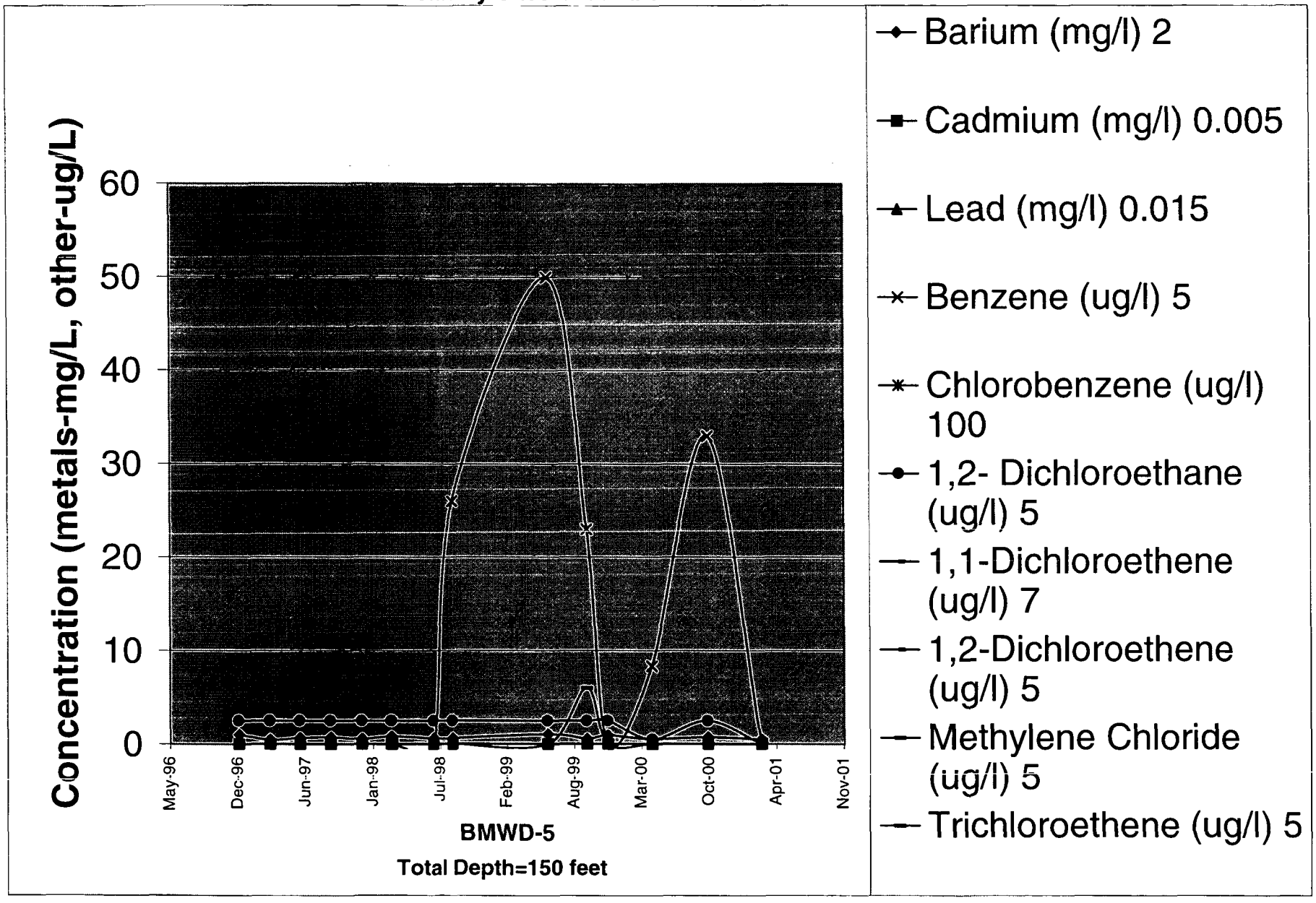
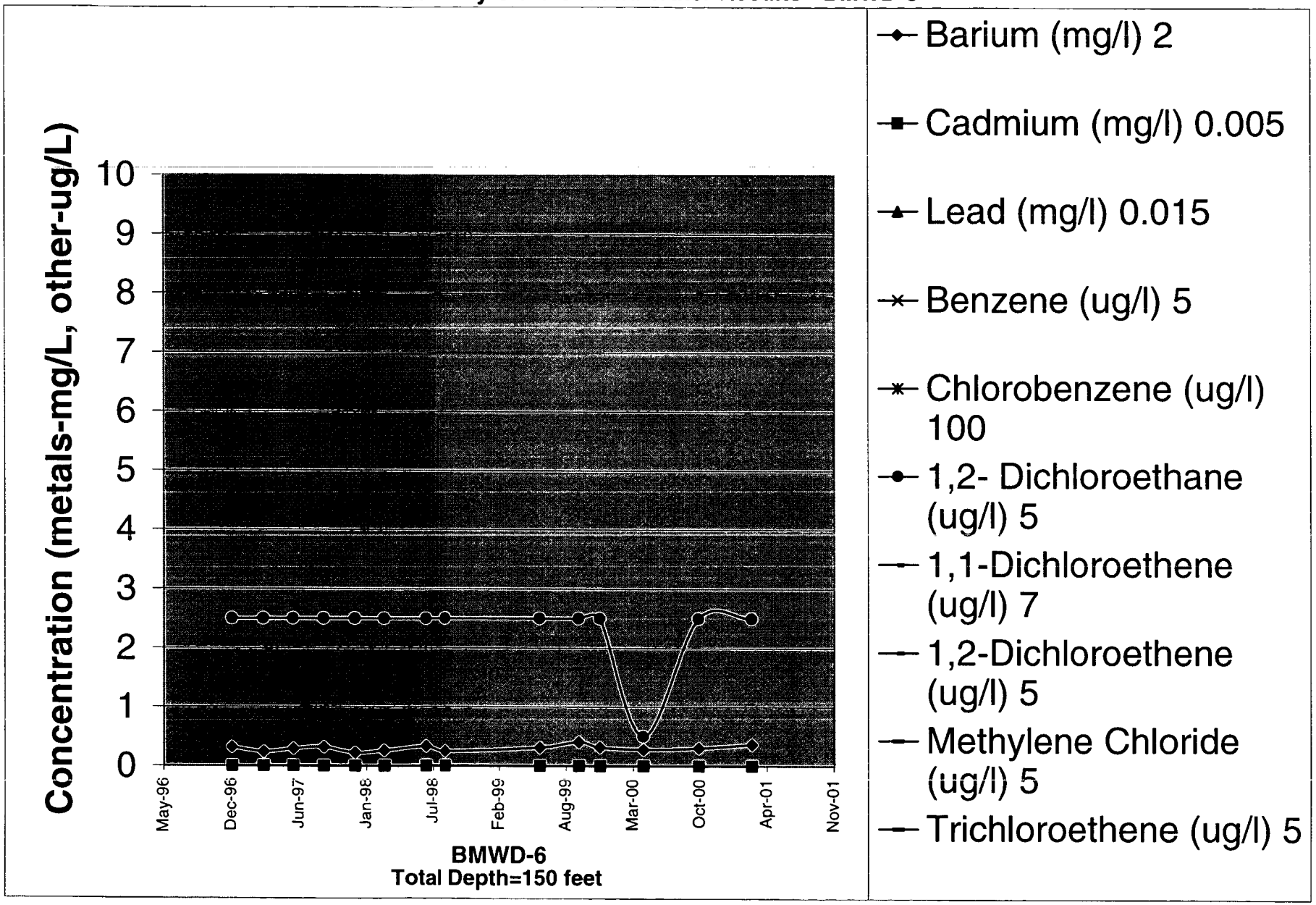


FIGURE 14
Double Eagle and Fourth Street
Refinery Sites Ground Water Results - BMWD-6



7.0 ASSESSMENT

This section presents an assessment of the remedy for the sites in the question and answer format specified by the EPA Five-Year Review Guidance. Section 7.1 pertains to the SCOUs at both DER and FSR, and Section 7.2 pertains to the GOU.

7.1 DER and FSR SCOUs

Question A: Is the remedy functioning as intended by the decision documents? Yes, removal of the sources has minimized the potential exposure by direct contact or inhalation, and reduced the potential for migration of contaminants into the surface waters and ground waters.

- **Implementation of Institutional Controls and Other Measures**—Upon completion of the remedial action, future source control institutional controls and other measures were not required since all of the wastes were removed.
- **Remedial Action Performance**—Since all of the material contaminated above EPA's remedial action goals (lead 500 ppm, PAHs 30 ppm, polychlorinated biphenyls 25 ppm) underwent treatment and was shipped to an off-site landfill for disposal, the remedial action is protective of human health and the environment.
- **System Operations/O&M**—Upon completion of the remedial action, future source control operations and maintenance activities were not required since all of the wastes were removed.
- **Cost of System Operations/O&M**—Upon completion of the remedial action, future source control operations and maintenance costs did not accumulate since all of the wastes were removed.
- **Opportunities for Optimization**—Since all of the wastes were removed, there should be no further opportunities for optimization.
- **Early Indicators of Potential Remedy Failure**—There is no evidence to date of potential remedy failure.

Question B: Are the assumptions used at the time of remedy selection still valid? Yes, standards identified in the ROD have been revised but these revisions do not affect the protectiveness of the remedy since the standards were raised and all wastes were disposed of off-site.

- **Changes in Standards and to be Considered**—As discussed in Section 6.3, standards identified in the ROD have been revised but these revisions do not affect the protectiveness of the remedy since the standards were raised and all wastes were disposed of off-site.

- **Changes in Exposure Pathways**—Removal of the contaminant source eliminates the exposure pathway.

- **Changes in Toxicity and Other Contaminant**—While some toxicity factors for COCs may have changed since the DER and FSR SCOU RODs were implemented, the changes are not expected to significantly impact the protectiveness of the remedy which was source removal.

- **Changes in Risk Assessment Methodologies**—Changes in risk assessment methodologies since the time of the DER and FSR SCOU RODs do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy? No, because the waste no longer resides at either of the sites.

7.2 DER and FSR GOU

Question A: Is the remedy functioning as intended by the decision documents? Yes, routine monitoring of all existing site wells is occurring. However, to determine if natural attenuation is reducing contaminant concentrations in the ground water aquifers, or if the contamination has migrated vertically or horizontally, additional samples need to be taken and the direction of ground water flow verified.

- **Implementation of Institutional Controls and Other Measures**—The institutional controls and other measures for the sites, as listed in the ROD and the related implementation activities, are as follows:

(1) Installation of warning signs to require notification prior to drilling in the area.

After installation of the monitoring wells, the RA contractor placed warning signs on all of the monitoring wells. The signs read "WARNING MONITOR WELL NOT FOR PUBLIC CONSUMPTION."

The text on warning signs should be modified to meet the requirements of the RODs and signs also placed around the perimeter of the site at appropriate points.

(2) A deed notice filed to notify future land owners of the hazards associated with the contaminated ground water in the area of the site.

Deed notices were filed.

(3) Installation of additional deeper monitoring wells further downgradient to ensure that contaminants do not migrate deeper, or to a receptor point off site, and determine if an off-site source of contamination exists.

Additional deep monitoring wells were installed "downgradient" of the site and an upper monitoring well and a deep monitoring well were installed "upgradient" of the site based on ground water flow determinations made at the time of installation. The ground water sampling data from the deep monitoring wells indicates the presence of benzene above the MCL in the "downgradient" monitoring wells. The ground water sampling data also indicates the portion of the Garber-Wellington aquifer monitored by the deep monitoring wells has brine contamination from past oil production activities making this portion of the aquifer non-useable.

The ground water sampling data also indicates the presence of benzene, 1,1-DCE, 1,2-DCE, TCE and vinyl chloride above MCLs in the upgradient upper and deep monitoring wells (BMW-6A and BMWD-1). The presence of these constituents in the upgradient monitoring wells indicates an off-site contamination source may exist. The locations of upgradient and downgradient wells were selected based on data obtained from 19 piezometers installed during Phase I of the RA. However, according to recent ground water elevation data in the Second Semi-Annual Sampling Event (ODEQ 2001c) and also referenced in ODEQ's May 18, 2001, correspondence letter to EPA (ODEQ 2001d), monitoring well BMW-6a and BMWD-1 are in a slightly upgradient valley between DER and FSR, and may be receiving contamination from the sites. Until the direction of ground water flow is verified, off-site contaminant sources and/or horizontal migration cannot be reliably determined.

(4) Routine inspections to ensure that public use of the upper zone of the Garber-Wellington aquifer does not occur prior to attainment of the RA objectives.

As stated in the Second Semi-Annual Sampling Event Report (ODEQ 2001c), Oklahoma Water Resource Board (OWRB) records are routinely checked for applications to drill public or private wells on or near the site. The site is also inspected during routine sampling events and results documented in the ground water sampling reports. Notification of the ODEQ by the OWRB of an application to drill on or near the site would be a more efficient method of ensuring the upper zone of the Garber-Wellington aquifer is not being used by the public.

(5) Five-year review of the site to determine if further actions need to be taken with regard to the ground water. As part of the five-year review, data analysis and ground water modeling is included to assess the adequacy of the monitoring and maintenance plan.

This is the first combined five-year review for both the DER and FSR sites. A previous five-year review was completed 1 year ago on the FSR site. This review includes data analysis to assess the adequacy of the monitoring and maintenance plan. Ground water modeling has not been performed as part of this review but should be performed when results of the USGS study on the effects of high density saline water on potentiometric elevations in site wells are available.

(6) Contingency measures, including active treatment, that can be implemented if ground water monitoring indicates either a vertical or horizontal increase in contaminant concentrations.

According to the ROD, detection of site-related contaminants in the deep wells indicates vertical migration of contaminants is occurring. Ground water monitoring data for the lower Garber-Wellington aquifer shows detectable concentrations of site-related contaminants. Benzene was the most notable contaminant concentration measured in the deep monitoring wells. It was detected in wells BMWD-1 through BMWD-5. Trichloroethene has also been detected in monitoring wells BMWD-1, BMWD-2, BMWD-3, and BMWD-5.

***contingency measures**—according to the ROD, the need to evaluate contingency measures is triggered when the following occur, "...detectable concentrations of site contaminants are found in the deep Garber-Wellington*

monitoring wells, or if the contaminated portions of the ground water show an increase of 30 percent in any of the alluvial or upper Garber-Wellington monitoring wells..." and a "second analysis confirms that there has been a 30 percent increase in contaminant concentration, or resampling of the deeper Garber-Wellington aquifer confirms detection...". As specified in the RODs and the QAPP (ODEQ 2001b), contingency measures include an evaluation of the impacts of any off-site sources of contamination, and the need for additional remedial action to address site-related contaminants, as well as the possibility of further actions such as installing additional monitoring wells to determine if the contamination is increasing in concentration or migrating, increasing the sampling frequency to assure that a complete exposure pathway does not develop, constructing a containment measure such as a slurry wall, or implementing a remedial action plan for extraction, treatment, and disposal of contaminated ground water.

- **RA Performance**—The remedy provides for natural attenuation to reduce contamination concentrations in the alluvial aquifer and the upper portion of the Garber-Wellington aquifer, and to prevent migration of contaminants from the alluvial aquifer and the upper portion of the Garber-Wellington aquifer to the deeper portion of the Garber-Wellington aquifer. Based on the action levels for the upper aquifer defined in the Remedial Action Management Plan (EPA 1995) and the Data Quality Objectives for Measurement Data section of the QAPP (ODEQ 2001), two of the seven upper aquifer wells exhibited contaminant concentration above action levels during at least one of the last two sampling events (September 2000, and March 2001). The overages are listed in Table 5.

  Based on the action levels for the deep aquifer defined in the Data Quality Objectives for Measurement Data section of the QAPP (ODEQ 2001), all of the six deeper aquifer wells exhibited contaminant concentration above detection limits during at least one of the last two sampling events (September 2000, and March 2001). The overages are shown in Table 6.

Routine monitoring has been sufficient to determine the condition of the deeper Garber-Wellington aquifer. As shown above, many contaminants are present above their MCLs in the lower Garber-Wellington aquifer at and near the sites. The baseline established from the quarterly sampling events should be used to determine what contingency measures should be employed.

- **Cost of System Operations/O&M**—Information related to the cost of system operations/O&M was presented in Section 4.4.

TABLE 5

SELECT UPPER MONITORING WELL RESULTS

Contaminant	Monitoring Well (Baseline in ppb)	Reported Concentration (ppb)	Date
1,1-dichloroethene	BMW-6A (39.03)	67	March 5, 2001
Trichloroethene	BMW-1 (3.63)	4	September 27, 2000
Trichloroethene	BMW-1 (3.63)	5	March 5, 2001
Trichloroethene	BMW-6A (687.36)	1,000	March 5, 2001
Vinyl chloride	BMW-1 (12.35)	15	March 5, 2001

TABLE 6

SELECT DEEP MONITORING WELL RESULTS

Ground Water Well Number	Sample Date	Barium (mg/L) MCL=2	Benzene (µg/L) MCL=5	1,1-Dichloroethene (µg/L) MCL=7	trans-1,2-Dichloro-ethene (µg/L) MCL=100	cis-1,2-Di-chloro-ethene (µg/L) MCL=70	Trichloro-ethene (µg/L) MCL=5	Toluene (µg/L) MCL=1,000	Vinyl Chloride (ug/l) MCL=2
BMWD-1	9/26/2000	0.572	120	14	4	230	76		24
	3/5/2001	0.655	130	12	4	230	99	4	24
BMWD-2	9/27/2000	0.806	23			15			
	3/5/2001	0.662	11			11			
BMWD-3	9/26/2000	1.484	97		1	17	4		
	3/5/2001	1.637	61			13	5		
BMWD-4	9/26/2000	1.848	80			11			
	3/6/2001	1.75	120			13	3		
BMWD-5	9/27/2000	0.724	33						
	3/6/2001	0.488				<5			
BMWD-6	9/26/2000	0.302							
	3/5/2001	0.365				<5			

- **Early Indicators of Potential Remedy Failure**—The remedy for the GOU is long-term monitoring. The monitoring remedy could be considered failing if the remedy does not provide enough information to determine occurrence or rate of natural attenuation, vertical or horizontal migration of contaminants, or base a contingency measure decision on in a timely fashion before the RA goal to prevent migration of contaminants from the shallow aquifer to useable portions of the deeper aquifer is lost. Early indicators of potential remedy failure are: contaminants from the shallow aquifer appear to have migrated vertically into the deeper aquifer; the effectiveness of monitored natural attenuation cannot be assessed due to the influence of an off-site contaminant source; and current monitoring will not provide a timely indication of contaminant migration into useable portions of the deeper aquifer (650-700 feet bgs).

Question B: Are the assumptions used at the time of remedy selection still valid? Yes.

- **Changes in Standards and To Be Considered**—The new requirements promulgated since the ROD and applicable to the ground water monitoring program are MCLs for chlorobenzene, methylene chloride, and arsenic. The new MCL for chlorobenzene is 100 µg/L, and the new MCL for methylene chloride is 5 µg/L. The arsenic MCL of 0.050 mg/L, cited in each of the GOU RODs, has been lowered by EPA to 0.010 mg/L. Public water supplies must be in compliance with the new arsenic standard by 2006.

- **Changes in Exposure Pathways**—Changes include a possible change in the direction of ground water flow from that stated in the ROD, and the presence of contamination in the deeper monitoring wells.

- **Change in the Classification of the Deeper Aquifer**—The deeper aquifer presently monitored at the site is not a Class II aquifer, as was previously thought. Based on the TDS concentrations in samples from the deeper wells, this portion of the aquifer is considered a Class III non-potable source under the Federal Guidelines for Ground Water Classification. This is most likely due to historical oil production in the area.

- **Changes in Toxicity and Other Contaminants**—While some toxicity factors for COCs have changed (for example, for benzene and vinyl chloride) since the GOU RODs were implemented, the changes are not expected to significantly impact either the projected baseline risks for the DER and FSR sites or the protectiveness of the remedy. Specifically, benzene cancer risk factors have changed, but less than an order of magnitude for oral carcinogenicity, and are actually decreasing slightly for benzene carcinogenicity. For vinyl chloride, both oral and inhalation

toxicity factors decreased, thus indicating that the baseline risks would be projected to have less risk to human health than initially assumed. For these reasons, none of the toxicity changes would affect the protectiveness of the selected GOU remedy.

- **Changes in Risk Assessment Methodologies**—Changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy? No.

8.0 ISSUES

Issues identified during the five-year review are outlined in Table 7. The main issue discovered during the five-year review is that site contaminants were detected in the deep monitoring wells and data from the first semi-annual sampling event indicated contaminant concentrations are above action levels in some of the upper monitoring wells but evaluation of contingency measures has not been completed to date.

Data from current well locations may not provide sufficient information to assess the influence of off-site contaminant sources, horizontal migration of site-related contaminants, or natural attenuation of contaminants.

Ground water samples are not currently analyzed for nine contaminants of concern listed in the GOU ROD. They are: aldrin, bis (2-chloroethyl) ether, chlordane, 4,4-DDE, 1,4-dichlorobenzene, heptachlor, heptachlor epoxide, endosulfan, and phenols. All of these compounds, with the exception of bis(2-chloroethyl) ether and phenol, are semi-volatile organic compounds.

TABLE 7

IDENTIFIED ISSUES

Issues	Currently Affects Protectiveness (Y/N)
Evaluation and implementation of contingency measures	N
Determination of contaminant source(s)	N
Re-establish baseline contaminant levels in lower aquifer	N
Groundwater samples are not currently analyzed for nine contaminants of concern listed in the GOU ROD.	N
Language on warning signs did not meet requirement in the ROD	N

As noted in the FSR Five-Year Review Report, there is no fence around the site perimeter which can easily be posted with signs. Therefore, no warning signs are posted around the site perimeter as required by the ROD. The presence of construction equipment, well heads, manholes, and improved access roads adjacent to the sites, noted during the site inspection indicate significant human activity in the area. During the site inspection, warning signs on the monitoring wells noted during the FSR Review were still in place. The language on these signs did not meet the requirements prescribed in the ROD, however, more informative labels with ODEQ contact information have been affixed to each well since the site inspection.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Based on review of available information, the following recommendations are made to strengthen the protectiveness of the selected remedy:

- For the deeper wells, the ROD establishes the action level for initiating the evaluation of contingency measures as "detectable concentrations" of site-related contaminants. However, contaminants have been present in the deeper wells since the initial post-ROD sampling event. Therefore, the action levels for COCs in the deeper wells should be re-evaluated and quantified if appropriate.

- Results of the recent USGS study should be used to assess the effect of high-density saline water on potentiometric levels in monitoring wells and the direction of ground water flow verified based on this assessment.

- Investigation into potential off-site sources of COC and non-COC contaminants detected in ground water samples should be completed, including further evaluation of the Garber-Wellington aquifer.

- The deeper aquifer presently monitored at the site is not a Class II aquifer, as was assumed in the ROD. The aquifer contains TDS concentrations greater than 10,000 ppm and is therefore considered a Class III, non-potable source under EPA guidelines. Prior to initiating any contingency measures outlined in the ROD, the revised classification of the deeper aquifer should be taken into consideration.

- Site-related contaminants in the deep monitoring wells indicate downward migration is occurring near the site. Replicated elevated levels of COCs (benzene, trichloroethene, vinyl chloride, and 1,1-dichloroethene) continue to be present in BMWD-1 and a possible off-site source of this contamination exists. Therefore, evaluation of the impacts of any off-site sources of contamination, and the need for contingency measures to address site-related contaminants should be completed. Investigations into potential sources of contamination have been ongoing since July 2001 and should be concluded by the end of 2003.

- The list of compounds analyzed for under the current ground water sampling plan should be reviewed to ensure sufficient data is being collected to determine the effectiveness of the selected ground water remedy which is monitored natural attenuation.

- Warning signs with language meeting the requirement in the ROD should be posted around the perimeter of the site.

These issues do not currently affect the protectiveness of the selected remedy because routine well completion inspections, are performed by the ODEQ to ensure the upper zone of the Garber-Wellington aquifer is not being used by the public. However, as detectable concentrations increase in the deeper aquifer, the protectiveness of the selected remedy decreases.

The recommendations and follow-up actions are outlined in Table 8. Table 9 outlines sample results that exceed baseline concentrations.

10.0 PROTECTIVENESS STATEMENTS

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through natural attenuation, which is expected to require 60 to 150 years. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater. All direct contact threats from site soils and sediments have been addressed through solidification and stabilization followed by off-site disposal of contaminated soil and sediments. Long-term protectiveness of the remedial action will be verified by continuing the routine ground water monitoring and maintenance program to monitor natural attenuation and the

migration of contaminants. Current monitoring data indicate that the remedy is functioning as required to achieve groundwater cleanup goals.

11.0 NEXT REVIEW

This site requires ongoing five-year reviews by statute. The next review will be conducted within five years of the completion of this five-year review report. The completion date is the date of the signature shown on the signature cover attached to the front of this report.

TABLE 8

RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Issues	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)
Contingency measures have not been evaluated	Evaluate risk associated with increasing concentrations, devise and implement contingency plan.	EPA	EPA		Y
Potential source(s) of off-site contamination for upper and lower aquifers not investigated	Further evaluate the properties of the Garber-Wellington aquifer near the sites	ODEQ	EPA	2003	Y
Re-establish baseline contamination levels for the lower aquifer	Communicate with EPA reasons for deviation	ODEQ	EPA	2002	N
Groundwater samples not analyzed for all COCs listed in the GOU ROD.	Review current ground water sampling plan	EPA/ODEQ	EPA	2002	N
Language on warning signs does not satisfy ROD requirements	Implement warning signs according to the ROD	ODEQ	EPA	2002	N

Notes:

EPA U.S. Environmental Protection Agency
ROD Record of decision

TABLE 9

SAMPLE RESULTS THAT EXCEED ACTION LEVELS

Well	Compound	Action Level	9/27/2000 Results Exceeding Action Levels	3/6/2001 Results Exceeding Action Levels
BMW-1	Sulfate	1,211 mg/L	–	1,696 mg/L
BMW-1	1,1-Dichloroethane	5.7 µg/L	7 µg/L	10 µg/L
BMW-1	1,2-Dichloroethane	29.4 µg/L	35 µg/L	33 µg/L
BMW-1	cis 1,2-Dichloroethene	52.9 µg/L	55 µg/L	60 µg/L
BMW-1	Trichloroethene	3.6 µg/L	4 µg/L	5 µg/L
BMW-1	Vinyl Chloride	12.3 µg/L	–	15 µg/L
BMW-2	Manganese	5.955 mg/L	–	6.486 mg/L
BMW-2	Sulfate	1,211 mg/L	1,234 mg/L	–
BMW-3A	Carbon Disulfide	3.25 µg/L	6 µg/L	–
BMW-5	Alkalinity	1,363 mg/L	1,666 mg/L	–
BMW-6A	Calcium	3,190 mg/L	3,434 mg/L	–
BMW-6A	Magnesium	665 mg/L	773 mg/L	–
BMW-6A	Sodium	15,558 mg/L	17,992 mg/L	–
BMW-6A	Manganese	9.6 mg/L	10.3 mg/L	–
BMW-6A	Zinc	0.08 mg/L	0.16 mg/L	–
BMW-6A	1,1-Dichloroethane	37.4 µg/L	–	58 µg/L
BMW-6A	1,1-Dichloroethene	39.0 µg/L	–	67 µg/L
BMW-6A	cis-1,2-Dichloroethene	548 µg/L	–	1,200 µg/L

TABLE 9 (Continued)

SAMPLE RESULTS THAT EXCEED ACTION LEVELS

Well	Compound	Action Level	9/27/2000 Results Exceeding Action Levels	3/6/2001 Results Exceeding Action Levels
BMW-6A	trans-1,2-Dichloroethene	14.6 µg/L	16 µg/L	39 µg/L
BMW-6A	Trichloroethene	687 µg/L	–	1,000 µg/L
BMW-8	Bromoform	3.99 µg/L	–	5 µg/L
BMW-8	Carbon Disulfide	3.99 µg/L	–	5 µg/L
BMW-8	Carbon Tetrachloride	3.99 µg/L	–	5 µg/L
BMW-8	Chlorobenzene	409.7 µg/L	–	410 µg/L
BMWD-1	Sodium	17,650 mg/L	17,932 mg/L	–
BMWD-1	Zinc	0.09 mg/L	0.14 mg/L	–
BMWD-1	trans-1,2-Dichloroethene	3.4 µg/L	4 µg/L	4(J) µg/L
BMWD-1	Trichloroethene	76.4 µg/L	–	99 µg/L
BMWD-2	Sulfate	309 mg/L	319 mg/L	378 mg/L
BMWD-2	1,2-Dichloroethane	6.7 µg/L	9 µg/L	–
BMWD-2	cis 1,2-Dichloroethene	11.6 µg/L	15 µg/L	–
BMWD-3	Trichloroethene	3.8 µg/L	4 µg/L	–
BMWD-4	Sulfate	115 mg/L	149 mg/L	158 mg/L
BMWD-4	Iron	22 mg/L	23 mg/L	–
BMWD-4	Lead	0.355mg/L	0.4mg/L	–

TABLE 9 (Continued)

SAMPLE RESULTS THAT EXCEED ACTION LEVELS

Well	Compound	Action Level	9/27/2000 Results Exceeding Action Levels	3/6/2001 Results Exceeding Action Levels
BMWD-4	Mercury	0.003 mg/L	0.005 mg/L	–
BMWD-4	Zinc	0.300 mg/L	0.392 mg/L	–
BMWD-4	cis 1,2-Dichloroethene	7.5 µg/L	11 µg/L	13 µg/L
BMWD-5	Chloride	39,682 mg/L	39,852 mg/L	–
BMWD-5	Sulfate	71.4 mg/L	79.1 mg/L	–
BMWD-5	Potassium	87 mg/L	112 mg/L	–
BMWD-5	Benzene	23.4 µg/L	33 µg/L	–
BMWD-6	TDS	3,513 mg/L	–	3,633 mg/L
BMWD-6	Chloride	1,484 mg/L	1,972 mg/L	2,110 mg/L
BMWD-6	Calcium	228 mg/L	240 mg/L	–
BMWD-6	Magnesium	79.7 mg/L	83 mg/L	–
BMWD-6	Sodium	676 mg/L	811 mg/L	–

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ODEQ. 2001b. "Quality Assurance Project Plan, Fourth Street and Double Eagle Refinery Sites, Oklahoma City, Oklahoma County, Oklahoma, OKD980696470 (Fourth Street), OKD007188717 (Double Eagle). February 2001.

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Tetra Tech EM Inc. 2000. "Remedial Action Completion Report For The Double Eagle Refinery Site, Oklahoma City, Oklahoma, EPA ID NO. OK007188717." February 28, 2000.

U.S. Environmental Protection Agency (EPA). 1992a. "Record of Decision, Fourth Street Refinery Site, Oklahoma City, Oklahoma." September 1992.

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APPENDIX A

DOCUMENTS REVIEWED FOR FIVE-YEAR REVIEW

(One Page)

Oklahoma Department of Environmental Quality (ODEQ). 2001. "Groundwater Sampling Plan for Fourth Street and Double Eagle Refinery Sites, Oklahoma County, Oklahoma." February.

ODEQ. 2001. "Quality Assurance Project Plan, Fourth Street and Double Eagle Refinery Sites, Oklahoma City, Oklahoma County, Oklahoma, OKD980696470 (Fourth Street), OKD007188717 (Double Eagle)". February.

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ODEQ. 2001. "First Semi-Annual Sampling Event 9/25/01 through 9/26/01, Fourth Street/Double Eagle Superfund Sites." From Kathleen Buckley, DEQ Project Manager. April 26.

ODEQ. 2001. "Twelfth Quarterly Sampling Event 4/10/00 through 4/14/00 Fourth Street/Double Eagle Superfund Site." From Kathleen Buckley, DEQ Project Manager. April 26.

ODEQ. 2001. "RE: Fourth Street Refinery, Five-Year Review Report." May 18.

Tetra Tech EM Inc. (Tetra Tech). 2000. "Remedial Action Completion Report for the Double Eagle Refinery Site, Oklahoma City, Oklahoma, EPA ID No. OK007188717." Prepared by Keith Westberry, Project Manager. February.

Tetra Tech. 2000. "Five-Year Review Report for the Fourth Street Refinery Site Ground Water Operable Unit, Oklahoma City, Oklahoma." September 22.

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EPA. 1994. "Record of Decision, Double Eagle Refinery Site, Groundwater Operable Unit, Oklahoma City, Oklahoma." April.

EPA. 2000. "Money Matters and Jobs." On-Line Address: http://www.epa.gov/epahome/money_1017.htm. October 17.

EPA. 2001. "Five Year Review. Site Assessment Worksheet." May 18.

APPENDIX B

SUPERFUND SITE SURVEY FORMS

(8 Pages)

SUPERFUND SITE SURVEY - FORM A		
Site Name: Double Eagle Refinery		**EPA Work Assignment No.:** 034-FRFE-06B1
Subject: 5-Year Review Background Information Survey		**Date:** August 29, 2001
Contact Made By:		
Name: Craig Carroll	**Title:** Remedial Project Manager	**Organization:** EPA
Telephone No.: (214) 665-2220 **E-Mail:** carroll.craig@epa.gov	**Street Address:** U.S. EPA 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Mark H. Taylor	**Title:** Site Project Manager	**Organization:** Tetra Tech EM Inc.
Telephone No.: (214) 740-2028 **E-Mail:** taylorm@ttemi.com	**Street Address:** 350 N. St. Paul St., Suite 2600 **City, State, Zip:** Dallas, Texas 75201	
Individual Contacted:		
Name: Chon Rouce	**Title:** Grant Administrator	**Organization:** Eastside Environmental Coalition, Inc.
Telephone No.: 405 427-1337 **E-Mail Address:**	**Street Address:** 5660 N Everest Ave. **City, State, Zip:** Oklahoma City, OK 73111-6730	

Survey Questions

Please return your survey in the enclosed envelope to Mark H. Taylor by July 31, 2001.

1. What is your impression of the project (general sentiment)?

   Good.

2. What effect have site operations had on the surrounding community?

   Odors were a problem during remediation

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

   No.

SUPERFUND SITE SURVEY - FORM A (continued)	
Site Name: Double Eagle Refinery	EPA Work Assignment No.: 034-FRFE-06B1
Subject: 5-Year Review Background Information Survey	Date: August 29 2001

Survey Questions (Cont.)

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

Douglass High School had to be evacuated in Spring of 1999 because of accidental release of hydrogen Sulfide. School administrators completely unaware of activities at the ~~sig~~ site.

5. Do you feel well informed about the site's activities and progress?

Yes, I feel well informed, but the general public was not.

6. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

More prominent signs.
More media coverage to inform public of what was taking place.

SUPERFUND SITE SURVEY - FORM B		
Site Name: Double Eagle Refinery	**EPA Work Assignment No.:** 034-FRFE-06B1	
Subject: 5-Year Review Local Authority Survey	**Date:** August 9, 2001	
Contact Made By:		
Name: Craig Carroll	**Title:** Remedial Project Manager	**Organization:** EPA
Telephone No.: (214) 665-2220 **E-Mail:** carroll.craig@epa.gov	**Street Address:** U.S. EPA 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Mark H. Taylor	**Title:** Site Project Manager	**Organization:** Tetra Tech EM Inc.
Telephone No.: (214) 740-2028 **E-Mail:** taylorm@ttemi.com	**Street Address:** 350 N. St. Paul St., Suite 2600 **City, State, Zip:** Dallas, Texas 75201	
Individual Contacted:		
Name: KATHLEEN BUCKLEY	**Title:** ENV. PROG. SPEC.	**Organization:** ODEQ
Telephone No.: 405-703-5121 **E-Mail Address:** Kathy.Buckley@deq.state.ok.us	**Street Address:** 707 N Robinson **City, State, Zip:** OKLAHOMA CITY, OK 73102	

Survey Questions

Please return your survey in the enclosed envelope to Mark H. Taylor by July 31, 2001.

1. What is your impression of the project (general sentiment)?
The site is an example of how communities can benefit from environmental cleanup efforts. Several businesses have relocated in this area providing new jobs and a better economy.

2. Has your office conducted routine communications or activities (site visits, inspections, reporting activities, etc.) regarding the site? If so, please give purpose and results.
Yes - Semi annual monitoring is in place and will continue for two more years. Thirteen wells are monitored. A report on the results of each sampling is submitted to EPA.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.
Monitor wells are located on private property. One parcel sold recently and the new owners do not want to grant access as needed. EPA has agreed to continue negotiations

SUPERFUND SITE SURVEY - FORM B (continued)	
Site Name: Double Eagle Refinery	EPA Work Assignment No.: 034-FRFE-06B1
Subject: 5-Year Review Local Authority Survey	**Date:**

Survey Questions (Cont.)

4. Do you feel well informed about the site's activities and progress?

Yes, EPA has been very helpful and responsive. They have provided guidance and timely response to the State and its assistance with access and plan approval.

5. Have there been any changes in State laws and regulations that may impact the protectiveness of the ground water or soil remedies?

No

6. Has the site been in compliance with permitting and reporting requirements?

YES

7. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The State would like an opportunity to comment on the funding of the five year reviews before it is finalized.

SUPERFUND SITE SURVEY - FORM B		
Site Name: Double Eagle Refinery	**EPA Work Assignment No.:** 034-FRFE-06B1	
Subject: 5-Year Review Local Authority Survey	**Date:**	
Contact Made By:		
Name: Craig Carroll	**Title:** Remedial Project Manager	**Organization:** EPA
Telephone No.: (214) 665-2220 **E-Mail:** carroll.craig@epa.gov	**Street Address:** U.S. EPA 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Mark H. Taylor	**Title:** Site Project Manager	**Organization:** Tetra Tech EM Inc.
Telephone No.: (214) 740-2028 **E-Mail:** taylorm@ttemi.com	**Street Address:** 350 N. St. Paul St., Suite 2600 **City, State, Zip:** Dallas, Texas 75201	
Individual Contacted:		
Name: Donn Walters	**Title:**	**Organization:**
Telephone No.: **E-Mail Address:**	**Street Address:** **City, State, Zip:**	

Survey Questions

Please return your survey in the enclosed envelope to Mark H. Taylor by July 31, 2001.

1. What is your impression of the project (general sentiment)?

Timely, well managed, kept close coordination with State officials. Community outreach program focused on a TAG representative because of their proactive involvement with the site.

2. Has your office conducted routine communications or activities (site visits, inspections, reporting activities, etc.) regarding the site? If so, please give purpose and results.

Superfund community relations over the years has provided ongoing community outreach plans that include working with numerous site stakeholders.

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

Yes, however the case was due to an adjacent facility

SUPERFUND SITE SURVEY - FORM B (continued)	
Site Name: Double Eagle Refinery	**EPA Work Assignment No.:** 034-FRFE-06B1
Subject: 5-Year Review Local Authority Survey	**Date:**

Survey Questions (Cont.)

4. Do you feel well informed about the site's activities and progress?

Yes

5. Have there been any changes in State laws and regulations that may impact the protectiveness of the ground water or soil remedies?

Not at this time

6. Has the site been in compliance with permitting and reporting requirements?

Yes, as far as community relations, the TAG has been in compliance and reporting Activities fulfilled

7. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

None, other than being aware of the comprehensive redevelopment Oklahoma City economic development program.

SUPERFUND SITE SURVEY - FORM B		
Site Name: Double Eagle Refinery	**EPA Work Assignment No.:** 034-FRFE-06B1	
Subject: 5-Year Review Local Authority Survey	**Date:** 8/21/01	
Contact Made By:		
Name: Craig Carroll	**Title:** Remedial Project Manager	**Organization:** EPA
Telephone No.: (214) 665-2220 **E-Mail:** carroll.craig@epa.gov	**Street Address:** U.S. EPA 1455 Ross Avenue, Suite 1200 **City, State, Zip:** Dallas, Texas 75202	
Name: Mark H. Taylor	**Title:** Site Project Manager	**Organization:** Tetra Tech EM Inc.
Telephone No.: (214) 740-2028 **E-Mail:** taylorm@ttemi.com	**Street Address:** 350 N. St. Paul St., Suite 2600 **City, State, Zip:** Dallas, Texas 75201	
Individual Contacted:		
Name: Philip Allen	**Title:** RPM	**Organization:** 6SF-AP
Telephone No.: (214) 665-8516 **E-Mail Address:**	**Street Address:** 1445 Ross Ave. **City, State, Zip:** Dallas, Texas 75202	

Survey Questions

Please return your survey in the enclosed envelope to Mark H. Taylor by ~~July 31, 2001~~. Aug-21, 2001

1. What is your impression of the project (general sentiment)?

   Complete success at achieving cleanup goals.

2. Has your office conducted routine communications or activities (site visits, inspections, reporting activities, etc.) regarding the site? If so, please give purpose and results.

   No

3. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

   No

SUPERFUND SITE SURVEY - FORM B (continued)	
Site Name: Double Eagle Refinery	**EPA Work Assignment No.:** 034-FRFE-06B1
Subject: 5-Year Review Local Authority Survey	**Date:**

Survey Questions (Cont.)

4. Do you feel well informed about the site's activities and progress?

YES.

5. Have there been any changes in State laws and regulations that may impact the protectiveness of the ground water or soil remedies?

NO

6. Has the site been in compliance with permitting and reporting requirements?

YES.

7. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

NO

APPENDIX C

CERCLIS SITE INFORMATION

(Four Pages)

EPA United States Environmental Protection Agency

Superfund

CERCLIS Hazardous Waste Sites

DOUBLE EAGLE REFINERY CO.

Actions

OU	Action Name	Qualifier	Lead	Actual Start	Actual Completion
00	PRELIMINARY ASSESSMENT	H	S	05/01/1980	05/01/1980
00	SITE INSPECTION	H	S	05/01/1980	05/01/1980
00	DISCOVERY		F		06/01/1980
00	PROPOSAL TO NPL		F		06/24/1988
00	ADMIN ORDER ON CONSENT		FE		12/07/1988
00	NPL RP SEARCH		FE	11/15/1988	12/31/1988
00	PRP REMOVAL	S	RP	01/23/1989	02/16/1989
00	REMOVAL ASSESSMENT		F	01/23/1989	02/16/1989
00	FINAL LISTING ON NPL		F		03/31/1989
00	RI/FS NEGOTIATIONS		FE	09/29/1989	11/29/1989
00	NPL RP SEARCH	NP	FE	01/04/1990	06/25/1990
00	REMOVAL ASSESSMENT		F	03/21/1990	06/28/1990
01	HUMAN HEALTH RISK ASSESSMENT		F		06/02/1992
01	ECOLOGICAL RISK ASSESSMENT		F		06/02/1992
00	ADMINISTRATIVE RECORDS	V	F	01/10/1991	09/28/1992

01	COMBINED RI/FS	M	F	12/29/1989	09/28/1992
01	RECORD OF DECISION		F		09/28/1992
01	TREATABILITY STUDY		F	09/25/1991	09/28/1992
00	REMOVAL ASSESSMENT		F	10/28/1992	11/30/1992
01	HUMAN HEALTH RISK ASSESSMENT		F		05/15/1993
01	ECOLOGICAL RISK ASSESSMENT		F		05/15/1993
02	COMBINED RI/FS		F	06/29/1992	07/28/1993
00	NPL RP SEARCH		FE	10/05/1992	01/24/1994
00	NPL RP SEARCH		FE	01/11/1994	01/24/1994
00	REMOVAL	S	F	03/29/1994	04/03/1994
02	RECORD OF DECISION		F		04/19/1994
00	RD/RA NEGOTIATIONS		FE	12/16/1992	12/16/1994
02	REMEDIAL DESIGN		F	06/02/1994	03/17/1995
02	REMEDIAL ACTION		F	07/17/1995	02/20/1997 ← 610
01	REMEDIAL DESIGN		F	06/21/1993	04/30/1997
00	RD/RA NEGOTIATIONS		FE	12/16/1994	09/30/1997
00	COMMUNITY INVOLVEMENT		F	04/01/1991	09/01/1999
01	COMMUNITY INVOLVEMENT		F	11/01/1999	12/21/1999
01	REMEDIAL ACTION		F	09/30/1997	03/29/2000 ← 500

[Back to TOP]

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Site maintained by: Office of Emergency and Remedial Response
brown.margret@epa.gov

EPA United States Environmental Protection Agency

Superfund

CERCLIS Hazardous Waste Sites

FOURTH STREET ABANDONED REFINERY

Actions

OU	Action Name	Qualifier	Lead	Actual Start	Actual Completion
00	DISCOVERY		F		07/01/1980
00	PRELIMINARY ASSESSMENT	H	F	05/01/1985	05/01/1985
00	SITE INSPECTION	H	F	05/01/1985	05/01/1985
00	NPL RP SEARCH		FE	10/01/1987	04/01/1988
00	PROPOSAL TO NPL		F		06/24/1988
00	SITE INSPECTION	H	F	11/01/1986	09/01/1988
00	FINAL LISTING ON NPL		F		03/31/1989
00	REMOVAL ASSESSMENT		F	09/05/1989	09/05/1989
00	REMOVAL	S	F	09/05/1989	09/27/1989
00	RI/FS NEGOTIATIONS		FE	10/06/1989	10/06/1989
00	REMOVAL ASSESSMENT		F	12/13/1989	06/28/1990
00	NPL RP SEARCH		FE	05/23/1990	10/01/1990
00	REMOVAL ASSESSMENT		F	02/15/1991	02/15/1991
01	HUMAN HEALTH RISK ASSESSMENT		F		05/02/1992
01	ECOLOGICAL RISK ASSESSMENT		F		05/02/1992
00	ADMINISTRATIVE	V	F	01/10/1991	09/28/1992

	RECORDS			
01	COMBINED RI/FS	F	12/29/1989	09/28/1992
01	RECORD OF DECISION	F		09/28/1992
01	TREATABILITY STUDY	F	09/25/1991	09/28/1992
00	NPL RP SEARCH	FE	03/25/1992	10/13/1992
00	RD/RA NEGOTIATIONS	FE	03/12/1993	06/10/1993
01	HUMAN HEALTH RISK ASSESSMENT	F		07/15/1993
01	ECOLOGICAL RISK ASSESSMENT	F		07/15/1993
00	REMOVAL ASSESSMENT	F	09/30/1993	09/30/1993
02	COMBINED RI/FS	F	06/29/1992	09/30/1993
02	RECORD OF DECISION	F		09/30/1993
00	RD/RA NEGOTIATIONS	FE	01/20/1994	03/28/1994
01	REMEDIAL DESIGN	F	06/21/1993	08/10/1994
02	REMEDIAL DESIGN	F	03/28/1994	03/17/1995
01	REMEDIAL ACTION	F	09/20/1994	03/21/1996
02	REMEDIAL ACTION	F	07/17/1995	02/20/1997
01	OPERATIONS AND MAINTENANCE	F	09/27/1997	09/27/1997
01	COMMUNITY INVOLVEMENT	F	09/29/1989	12/01/1999
00	FIVE YEAR REMEDY ASSESSMENT	F		10/18/2000

[Back to TOP]

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brown.margret@epa.gov

APPENDIX D

DAILY OKLAHOMAN PUBLISHING

(One Page)

The U.S. Environmental Protection Agency is currently conducting a combined Five-Year Review of the Double Eagle Refinery Superfund site located at 1800 Northeast First Street in southeastern Oklahoma City, Oklahoma County, Oklahoma, and the Fourth Street Refinery superfund site located at the 2200 block of Northeast Fourth street. The purpose of a Five-Year Review is to determine whether the remedies chosen are protective of human health and the environment. The results of this Five-Year Review will be made available to the public in December 2001 at the Ralph Ellison Branch Library repository. If you have any input or concerns regarding the activities taking place at either site, please contact Craig Carroll, EPA Remedial Project Manager, at 214-665-2220, or carroll.craig@epa.gov.

STATE OF OKLAHOMA, } SS.
COUNTY OF OKLAHOMA }

Affidavit of Publication

Roger H. Hoffman, Jr., of lawful age, being first duly sworn, upon oath deposes and says that he is the Classified Manager of The Oklahoma Publishing Company, a corporation, which is the publisher of the

The Daily Oklahoman which is a daily newspaper of general circulation in the State of Oklahoma, and which is a daily newspaper published in Oklahoma County and having paid general circulation therein; that said newspaper has been continuously and uninterruptedly published in said county and state for a period of more than one hundred and four consecutive weeks next prior to the first publication of the notice attached hereto, and that said notice was published in the following issues of said newspaper, namely:

August 4, 5, 2001

Subscribed and sworn to before me this 6th

day of September 20 01

Cathy A. Kellen
Notary Public

My commission expires 9-20-04

Roger H Hoffman

1031

APPENDIX E

FIVE-YEAR REVIEW SITE INSPECTION REPORT
FOR
DOUBLE EAGLE AND FOURTH STREET REFINERY SITES
OKLAHOMA CITY, OKLAHOMA

(10 Pages)

Five-Year Review Site Inspection Report
for
Double Eagle and Fourth Street Refinery Sites
Oklahoma City, Oklahoma

August 14, 2001

PREPARED BY:

Region 6
United States Environmental Protection Agency
Dallas, TX 75202-2733

Work Assignment No.	:	034-FR-FE-06B1/E5
EPA Region	:	6
Date Prepared	:	August 14, 2001
Contract No.	:	68-W6-0037
Prepared by	:	Tetra Tech EM Inc.
Telephone No.	:	214-754-8765
EPA Work Assignment Manager	:	Ms. Linda Carter
EPA Remedial Project Manager	:	Mr. Craig Carroll
Telephone No.	:	(214) 665-2220

FIVE-YEAR REVIEW SITE INSPECTION REPORT

CONTENTS

Section		Page
ACRONYMS AND ABBREVIATIONS		
1.0	INTRODUCTION	E-1
2.0	BACKGROUND	E-1
3.0	SITE VISIT ACTIVITIES	E-3
4.0	FINDINGS	E-5
5.0	REFERENCES	E-7

ACRONYMS AND ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminants of concern
DER	Double Eagle Refinery
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FSR	Fourth Street Refinery
GOU	Ground water operable unit
MLK	Martin Luther King Boulevard
ODEQ	Oklahoma Department of Environmental Quality
OSWER	Office of Solid Waste and Emergency Response
QAPP	Quality Assurance Project Plan
RA	Remedial action
RAC	Response Action Contract
RAG	Remedial action goal
RI	Remedial investigation
ROD	Record of decision
SCOU	Source control operable unit
TAG	Technical Assistance Grant
TDS	Total dissolved solids
Tetra Tech	Tetra Tech EM Inc.

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) received Work Assignment Nos. 034-FR-FE-06B1 and 034-FR-FE-06E5 from the U.S. Environmental Protection Agency (EPA) under Response Action Contract (RAC) No. 68-W6-0037. Under this work assignment, Tetra Tech is authorized to conduct a five-year review of the remedial action (RA) implemented at the following refineries, hereinafter collectively called the sites:

1. Double Eagle Refinery (DER)
2. Fourth Street Refinery (FSR)

Tetra Tech visited the sites to verify that all components of the remedies are operating in accordance with criteria established in the respective Record of Decisions (ROD). This report summarizes the results of that visit.

2.0 BACKGROUND

Background information presented herein includes a brief discussion of the physical characteristics overview, location, and history of the sites. A complete description, which includes a discussion on the geology/hydrogeology, and contaminants of concern (COC) listed in the ROD for the ground water operable unit (GOU), common to both sites, can be found in the COMBINED FIVE-YEAR REVIEW REPORT for DOUBLE EAGLE and FOURTH STREET REFINERY SITES.

Double Eagle Refinery

The DER Site is located at 1900 NE First Street in southeastern Oklahoma City, Oklahoma County, Oklahoma, as shown on Figure 1. The DER site extends over approximately 12 acres (7 acres fenced) and is located in the Southeast Quarter of Section 35, Township 12 North, Range 3 West, Indian Meridian. The site is bounded to the north by Union Pacific Railroad tracks and to the east, west, and south by vacant lots zoned for industrial land use. Martin Luther King Boulevard (MLK) lies to the east of the site as a bridge over the Union Pacific railroad tracks. The Source Control Operable Unit (SCOU) at the DER site includes contamination above the water table at (1) the DER Site, (2) half of the Parcel H Area (located west of the site), and (3) the Radio Tower Area (located south of the site) (EPA 1992b).

Fourth Street Refinery

The FSR site, located at 2200 NE 4th street, occupies an area of approximately 22 acres in the southwest quarter of Section 36, Township 12 North, Range 3 West, Indian Meridian, Oklahoma County, Oklahoma City, Oklahoma. The site is bounded to the south by the Union Pacific Railroad tracks, which include the Santa Fe Railroad tracks; and to the north by Northeast Fourth Street. MLK lies on the west side of the site as an overpass to the railroad tracks. An area located approximately 400 feet south of the FSR site and referred to as the "Parcel H Area" is considered to be an off-site waste disposal area resulting from former site activities. (EPA 1992a)

The Double Eagle Refinery site is located about 500 feet southwest of the FSR site. The North Canadian River is located approximately one-half mile south of the site.

As specified in the RODs for each site, the remedy for cleanup of contaminated waste material at the sites involved (1) solidifying, neutralizing, and stabilizing contaminated waste material that contained contaminant concentrations above the RA treatment standards; (2) removing contaminated waste material that had concentrations in excess of the remedial action goals (RAG); and (3) disposing of those contaminated waste materials at a permitted facility. This RA also included clearing and grubbing, air monitoring, asbestos abatement, demolition, off-site disposal of debris, on-site disposal of clean concrete, and site restoration (EPA 1992a).

A separate ROD was signed and a separate RA was completed for the sites' GOU (EPA 1993, EPA 1994). The GOU was established to address the potential migration of site contaminants through the ground water pathway from the sites. Currently, the ground water sampling and monitoring is conducted by the Oklahoma Department of Environmental Quality (ODEQ) as part of the RA for the GOU.

Since hazardous substances above health-based levels remained at the site after the completion of the RA, EPA must conduct a statutory review pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CLERCLA) section 121(c) and as provided in OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews, May 23, 1991, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-02A, Supplemental Five-Year Review Guidance, July

26, 1994, Second Supplemental Five Year Review Guidance dated December 21, 1996, and OSWER Directive 9355.7-03B-P Draft Comprehensive Five-Year Review Guidance, October 1999.

This site inspection is being conducted as part of the five-year review process.

3.0 SITE VISIT ACTIVITIES

A site visit was conducted on August 7, 2001, to assess the condition of the site and of the protective measures employed to protect human health and the environment from the contaminants still present at the sites.

Recognizing the importance of community involvement and the need for citizens living near National Priority List (NPL) sites to be well informed, Congress included provisions in the Superfund Reauthorization Act of 1986 to establish the Technical Assistance Grant (TAG) program to promote citizen involvement in decisions on site-specific cleanup strategies under Superfund. TAGs provides money for activities that help communities participate in decision making at eligible Superfund sites (EPA 2000). The community representative and TAG grantee asked to participate in the site visit was Ms. Rouce (accompanied by Ms. Burton). During the site visit, Ms. Rouce was briefed by representatives from EPA and ODEQ about historical site conditions, RAs, and current ground water monitoring activities. Ms. Rouce's community representing opinions were requested via an interview form for which she was asked to complete and return for incorporation into in the DER/FSR five-yr review report.

The following individuals, including the aforementioned representatives of the surrounding community, attended the site inspection:

- Kathleen T. Buckley, ODEQ
- Suzanne Dunn, ODEQ
- Chon Rouce of East Side Environmental Coalition
- Barbara Burton of the Douglas High School

- Craig Carroll, EPA
- Bart Cañellas, EPA
- Mark H. Taylor, Tetra Tech

The inspection evaluated the condition of the monitoring wells, condition of the backfill coverage, postings, and site fencing. Photographs taken during the site visit are presented in Appendix F, and the completed five-year review site inspection checklist is presented in Appendix G. A summary of the findings from the site visit follows.

The weather conditions during the inspections were partly cloudy, dry, and hot (no wind and a temperature in the upper 90s). Evidence, such as ponding, of recent precipitation was not evident, and not forecasted.

All monitoring wells visually inspected appeared in good condition, clearly labeled, protected from impact, and securely encased (lock and cover). Monitoring wells BMW-2, BMW-7, BMWD5, and BMWD6 were not visually inspected. BMW-2 was obscured from sight by dense vegetation, and access to BMWD6 was denied by the land owner.

The cover at all of the areas associated with SCOU RAs -DER, FSR, Parcel H, and Radio Tower Area- appears similar in vegetative type, and plant health, and density, to typical areas adjacent to but not associated with the CERCLA sites.

As stated in Section X. of each ROD (EPA 1994 and EPA 1993), one of the major components of the remedy was to install warning signs to require notification prior to drilling in the area. As noted in the first five-year report for FSR, warnings were installed on the monitoring wells; however, the language used in the warning did not match what was used in the ROD. Since no distinct boundary, fence, or other identifier outlining the "no drilling" area exists, which could be effectively placarded with the language outlined in the ROD, a warning label discouraging consumption of water removed from the monitoring well was affixed to each monitoring well. Larger, more informative labels were being developed.

4.0 FINDINGS

Visually, there is no sign or evidence of contamination at either of the sites. The vegetation on both sites appears similar in type and density as the typical surrounding environment. Since the selected SCOU remedy for both sites - neutralization, stabilization, and off-site landfill disposal - did not require long-term operation and maintenance, there were no engineered systems to be evaluated.

Several pieces of information were obtained from the ODEQ as a result of the site visit with regard to the GOU. Much of the information obtained confirms compliance with the major components of the remedy. As required by the RODs developed for both sites, notices detailing the remediation of both sites have been drafted and posted in the land records of the county in which the sites are located. The routine monitoring and maintenance program has been established and is outlined in document titled, "Groundwater Sampling Plan For Fourth Street and Double Eagle Refinery Sites, Oklahoma County, Oklahoma" (ODEQ 2001a). Routine inspections to ensure that public use of the upper zone of the Garber-Wellington Aquifer are completed quarterly by reviewing the Oklahoma Water Resources Board records. The methods by which the ODEQ will evaluate the contaminant level reductions has been formally documented and is presented in the, "Quality Assurance Project Plan, Fourth Street and Double Eagle Refinery Sites, Oklahoma City, Oklahoma County, Oklahoma." Baselines and action levels for COCs were set after the April 2000 sampling event.

It is not possible at this time, based on the method of determining baseline contaminant concentrations as presented in the Quality Assurance Project Plan (QAPP) (ODEQ 2001b), to determine whether or not natural attenuation is working to reduce the contamination level in the ground water aquifers. At the time of the site visit, the minimum sample size requirement (3 years of data) had just recently been met. Baseline contaminant concentration levels and action levels will be applied to future sampling events for the upper aquifer. However, vertical migration of COCs into a usable water supply can be assessed due to the baseline of comparison being set to "confirmed detection" as stated in the RODs (EPA 1994, EPA 1993).

The following costs according to the State of Oklahoma were incurred due to activities associated with the sites.

Cumulative Cost Reporting Period	Double Eagle Refinery	Fourth Street Refinery
7/93 through 6/94	$793.54	$1,292.38
7/94 through 6/95	$5,057.07	$168,363.54
7/95 through 6/96	$4,795.96	$334,718.01
7/96 through 6/97	$16,897.34	$10,076.13
7/97 through 6/98	$30,072.67	$67,871.08
7/98 through 6/99	$48,185.88	$35,036.12
7/99 through 6/00	$30,468.13	$13,114.55
7/00 through 6/01	Not Available	$26,903.65

REFERENCES

U.S. Environmental Protection Agency (EPA). 1992a. "Record of Decision, Fourth Street Refinery Site, Oklahoma City, Oklahoma." September.

EPA. 1992b. "Superfund Record of Decision, Double Eagle Refinery, Ok." September.

EPA. 1993. "Record of Decision, Fourth Street Refinery Site, Groundwater Operable Unit, Oklahoma City, Oklahoma." September.

EPA. 1994. "Record of Decision, Double Eagle Refinery Site, Groundwater Operable Unit, Oklahoma City, Oklahoma." April.

EPA. 2000. "Money Matters and Jobs." On-Line Address: http://www.epa.gov/epahome/money_1017.htm. October 17.

Oklahoma Department of Environmental Quality. 2001a. "Groundwater Sampling Plan for Fourth Street and Double Eagle Refinery Sites, Oklahoma County, Oklahoma." February.

ODEQ. 2001b. "Quality Assurance Project Plan, Fourth Street and Double Eagle Refinery Sites, Oklahoma City, Oklahoma County, Oklahoma, OKD980696470 (Fourth Street), OKD007188717 (Double Eagle). February.

APPENDIX G

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

(15 Pages)

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable."

I. SITE INFORMATION	
Site Name: Double Eagle Refinery and Fourth Street Refinery Sites	**Date of Inspection:** 8/07/01
Location and Region: Oklahoma City, Oklahoma, Region 6	**EPA ID:** OKD007188717 OKD980696470
Agency, office, or company leading the five-year review: Tetra Tech EM Inc.	**Weather/temperature:** Partly Cloudy/ 95+ °F

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Ground water pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M Site Manager** Kathy Buckley (Name) | Environmental Program Specialist (Title) | 8/07/01 (Date)
   Interviewed: ☒ by mail ☐ at office ☐ by phone Phone no.
   Problems, suggestions: ☒ Report attached See Appendix E of the Five-Year Review Report

2. **O&M Staff** Suzanne Dunn (Name) | Environmental Program Specialist (Title) | 8/07/01 (Date)
   Interviewed: ☐ by mail ☐ at office ☐ by phone Phone no.
   Problems, suggestions: ☐ Report attached Not Interviewed

3. Local regulatory authorities and response agencies (i.e.; State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.). Fill in all that apply.

Agency Oklahoma Department of Environmental Quality
Contact Kathy Buckley Environmental Program Specialist
Name Title Date Phone no.
Problems, suggestions: ☒ Report attached See interview

Agency
Contact
Name Title Date Phone no.

Problems, suggestions: ☐ Report attached

4. Other interviews (optional): ☒ Report attached to Five-Year Review Report

Chon Rouce of East Side Environmental Coalition

Barbara Burton of the Douglas High School

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A

Remarks: Ground water Sampling Plan (2/15/01), Quality Assurance Project Plan (2/15/01).

2. Site-Specific Health and Safety Plan ☐ Readily available ☒ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks: _____

3. O&M and OSHA Training Records	☐ Readily available	☒ Up to date	☐ N/A	
Remarks: According to the Quality Assurance Project Plan, samplers will have the OSHA HAZWOPER training.				
4. Permits and Service Agreements				
☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A	
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A	
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A	
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A	
Remarks:				
5. Gas Generation Records	☐ Readily available	☐ Up to date	☒ N/A	
6. Settlement Monument Records	☐ Readily available	☐ Up to date	☒ N/A	
7. Ground Water Monitoring Records	☒ Readily available	☒ Up to date	☐ N/A	
8. Leachate Extraction Records	☐ Readily available	☐ Up to date	☒ N/A	
9. Discharge Compliance Records				
☐ Air	☐ Readily available	☐ Up to date	☒ N/A	
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A	
Remarks: No discharge from the site other than surficial stormwater runoff.				
10. Daily Access/Security Logs	☐ Readily available	☐ Up to date	☒ N/A	
Remarks: Access to the site not addressed in ROD.				

IV. O&M COSTS

1. O&M Organization	
☒ State in-house	☐ Contractor for State
☐ PRP in-house	☐ Contractor for PRP
☐ Other	

2. O&M Cost Records

☒ Readily available ☒ Up to date

☒ Funding mechanism/agreement in place

Original O&M cost estimate ☐ Breakdown attached

Total annual cost by year for review period, if available

	Date		Date	Total Cost	
From	7/93	to	6/94	$2,086	☐ Breakdown attached
From	7/94	to	6/95	$173,420	☐ Breakdown attached
From	7/95	to	6/96	$339,514	☐ Breakdown attached
From	7/96	to	6/97	$26,973	☐ Breakdown attached
From	7/97	to	6/98	$97,944	☐ Breakdown attached
From	7/98	to	6/99	$83,222	☐ Breakdown attached
From	7/99	to	6/00	$43,583	☐ Breakdown attached
From	7/00	to	6/01	$26,903	☐ Breakdown attached

3. Unanticipated or Unusually High O&M Costs During Review Period

Nothing was noted.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks:

B. Other Access Restrictions

1. Signs and other security measures ☐ Location shown on site map ☐ N/A
Remarks: Warning signs posted on monitoring wells. Monitoring wells closed and locked.

C. Institutional Controls

1. Implementation and enforcement
Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by) Ground water monitoring
Frequency Semi-annual
Responsible party/agency ODEQ
Contact

Name	Title	Date	Phone no.
Kathy Buckley	Environmental Program Specialist	8/7/01	405-665-6662

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☒ Report attached
Background monitoring well reporting high levels of contaminants. Contaminants remain unexplained

2. Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:
The only institutional controls outlined in the respective RODs is deed notification of remediation and ground water contamination, and public restrictions to ground water use.

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident
Remarks: Trespassing apparent

2. Land use changes onsite ☐ N/A
Remarks: Parts of parcel "H" have changed ownership, access to monitoring well in that area denied.

3. Land use changes offsite ☒ N/A Remarks:	

VI. GENERAL SITE CONDITIONS

A. Roads	☒ Applicable	☐ N/A	
1. Roads damaged Remarks:	☐ Location shown on site map	☒ Roads adequate	☐ N/A

B. Other Site Conditions

Remarks: Site was in good condition during visit. The vegetation in the areas remediated appear very similar in nature and in health as the vegetation in the surrounding environment that was not part of the remediation.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. Settlement (Low spots) Areal extent Remarks:	☐ Location shown on site map Depth	☐ Settlement not evident
2. Cracks Lengths Remarks:	☐ Location shown on site map Widths	☐ Cracking not evident Depths
3. Erosion Areal extent Remarks:	☐ Location shown on site map Depth	☐ Erosion not evident
4. Holes Areal extent Remarks:	☐ Location shown on site map Depth	☐ Holes not evident

5. Vegetative Cover ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks:

6. Alternative Cover (armored rock, concrete, etc.) ☐ N/A
Remarks:

7. Bulges ☐ Location shown on site map ☐ Bulges not evident
Areal extent Depth
Remarks:

8. Wet Areas/Water Damage ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map ☐ Areal extent
☐ Ponding ☐ Location shown on site map ☐ Areal extent
☐ Seeps ☐ Location shown on site map ☐ Areal extent
☐ Soft subgrade ☐ Location shown on site map ☐ Areal extent
Remarks:

9. Slope Instability ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent
Remarks:

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. Flows Bypass Bench ☐ Location shown on site map ☐ N/A or okay
Remarks:

2. Bench Breached ☐ Location shown on site map ☐ N/A or okay
Remarks:

3. Bench Overtopped ☐ Location shown on site map ☐ N/A or okay
Remarks:

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, rip rap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. Settlement Areal extent Remarks:	☐ Location shown on site map ☐ No evidence of settlement Depth
2. Material Degradation Material type Remarks:	☐ Location shown on site map ☐ No evidence of degradation Areal extent
3. Erosion Areal extent Remarks:	☐ Location shown on site map ☐ No evidence of erosion Depth
4. Undercutting Areal extent Remarks:	☐ Location shown on site map ☐ No evidence of undercutting Depth
5. Obstructions ☐ Location shown on site map Size Remarks:	Type ☐ No obstructions Areal extent
6. Excessive Vegetative Growth ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Remarks:	Type Areal extent
D. Cover Penetrations	☐ Applicable ☒ N/A
1. Gas Vents ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A Remarks:	
2. Gas Monitoring Probes ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A Remarks:	

3. Monitoring Wells (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks:

4. Leachate Extraction Wells
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks:

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks:

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. Gas Treatment Facilities
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O&M
Remarks:

2. Gas Collection Wells, Manifolds, and Piping
☐ Good condition ☐ Needs O&M
Remarks:

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs O&M ☐ N/A
Remarks:

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. Outlet Pipes Inspected ☐ Functioning ☐ N/A
Remarks:

2. Outlet Rock Inspected ☐ Functioning ☐ N/A
Remarks:

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. Siltation	Areal extent	Depth	☐ N/A
☐ Siltation not evident Remarks:			
2. Erosion	Areal extent	Depth	
☐ Erosion not evident Remarks:			
3. Outlet Works	☐ Functioning	☐ N/A	
Remarks:			
4. Dam	☐ Functioning	☐ N/A	
Remarks:			

H. Retaining Walls	☐ Applicable ☒ N/A	
1. Deformations	☐ Location shown on site map ☐ Deformation not evident	
Horizontal displacement Rotational displacement Remarks:	Vertical displacement	
2. Degradation	☐ Location shown on site map ☐ Degradation not evident	
Remarks:		
I. Perimeter Ditches/Off-Site Discharge	☐ Applicable ☒ N/A	
1. Siltation	☐ Location shown on site map ☐ Siltation not evident	
Areal extent Remarks:	Depth	
2. Vegetative Growth	☐ Location shown on site map ☐ N/A	
☐ Vegetation does not impede flow Areal extent Remarks:	Type	
3. Erosion	☐ Location shown on site map ☐ Erosion not evident	
Areal extent Remarks:	Depth	

4. Discharge Structure ☐ Functioning ☐ N/A
Remarks:

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. Settlement ☐ Location shown on site map ☐ Settlement not evident
Areal extent ☐ Depth
Remarks:

2. Performance Monitoring Type of monitoring
☐ Performance not monitored
Frequency ☐ Evidence of breaching
Head differential
Remarks:

IX. GROUND WATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Ground Water Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Pumps, Wellhead Plumbing, and Electrical
☐ Good condition ☐ All required wells located ☐ Needs O&M ☐ N/A
Remarks:

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances
☐ Good condition ☐ Needs O&M
Remarks:

3. Spare Parts and Equipment
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks:

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Collection Structures, Pumps, and Electrical
☐ Good condition ☐ Needs O&M
Remarks:

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good condition ☐ Needs O&M

Remarks:

3. Spare Parts and Equipment

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks:

C. Treatment System ☐ Applicable ☒ N/A

1. Treatment Train (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon absorbers

☐ Filters

☐ Additive (e.g., chelation agent, flocculent)

☐ Others

☐ Good condition ☐ Needs O&M

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of ground water treated annually

☐ Quantity of surface water treated annually

Remarks:

2. Electrical Enclosures and Panels (Properly rated and functional)

☐ N/A ☐ Good condition ☐ Needs O&M

Remarks:

3. Tanks, Vaults, Storage Vessels

☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs O&M

Remarks:

4. Discharge Structure and Appurtenances

☐ N/A ☐ Good condition ☐ Needs O&M

Remarks:

5. Treatment Building(s)

☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks:

6. Monitoring Wells (Pump and treatment remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs O&M ☐ N/A
Remarks:

D. Monitored Natural Attenuation

1. Monitoring Wells (Natural attenuation remedy)

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs O&M ☐ N/A
Remarks: At the time of the inspection, transfer of ownership of parcel "H" has blocked access to some of the monitoring wells.

X. OTHER REMEDIES

If there are remedies applied at the site that are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The potential threat still remaining at both the sites is the contamination in the ground water. The objective of the remedy is to decrease contamination through natural attenuation and monitor vertical migration of contamination. Up until the March 2001 semi-annual sampling event (which was not available at the time of the inspection) and in accordance with the QAPP, baseline ground water contamination levels were still being established. Therefore, the calculated action levels presented in the First Semi-Annual Sampling Event 9/25/00 through 9/26/00 Memorandum only apply to samples retrieved after the sampling event completed in September 2000. Since the comparison of current ground water contamination levels to baseline ground water contamination levels is what will determine whether or not natural attenuation of contamination is taking place, a few more sampling events need to occur prior to making this determination. However, since the baseline for monitoring vertical migration of contamination is zero (or non-detect), the remedy is effectively monitoring the vertical migration of the contamination into the lower Garber-Wellington Aquifer.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

There are no O&M issues at either site.

C. Early Indicators of Potential Remedy Failure
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Monitoring well information obtained during the site visit eludes to the possibility of contamination entering the lower aquifer. The monitoring well information will be addressed in the associated five-year review. If, after thoroughly reviewing the data and records of the site, it appears that the lower aquifer is receiving contamination from somewhere, any one of the suggested contingency measures outlined in the ROD would change the scope of the remedy, the frequency of sampling, the number of sampling wells, or the remedial action.
D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None were suggested, nor were any readily evident.

APPENDIX H

DEED NOTICES

(Six Pages)

NOTICE OF

REMEDIATION AND GROUNDWATER CONTAMINATION

FOURTH STREET REFINERY SUPERFUND SITE

This Notice is made pursuant to Oklahoma Statutes, Title 27A (2000 Supp.), Section 2-7-123(B) concerning the former Fourth Street Refinery site. It is also noticed that groundwater contamination exists at this site in the upper alluvial aquifer and upper Garber-Wellington, approximately 50'-150' below ground surface level. Attempts to use groundwater for human consumption is not advised.

SITE DESCRIPTIONS: THE FOURTH STREET (4ST) SITE is located in the 2200 block of Northeast Fourth Street, in Oklahoma City, Oklahoma. The site is within an area occupying a portion of the southwest Quarter (SW1/4) of Section 36, Township 12 North, Range 3 West, Oklahoma County, Oklahoma. This site is bounded to the north by Northeast Fourth Street, on the east by Interstate 35, on the west by Martin Luther King Blvd., and on the south by ATSF (Union Pacific) Railroad tracks and comprises approximately 22 acres.

FOURTH STREET REFINERY collected, stored and refined used oil during the early 1940s until the 1960s or early 1970s. The recycling process included the use of sulfuric acid (H_2SO_4) and bleaching clays. Crude oil or waste oil was steam heated in tanks. Acid and bleaching clay were added to clarify and separate the desired oil product from the heavy tars. Waste consisted primarily of acidic tar material mixed with clay deposited in on-site impoundments and later spread forming tar mats. Site wastes contained a number of metals and organic contaminants. These wastes were considered hazardous because they were found to be corrosive and toxic. Contaminants were presumed to be cumulative, results of several previous oil reclaiming and refining operations operated at the site. Clean up levels were based on risk based levels established for industrial waste sites.

REMEDIATION ACTION: Remediation took place under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Administrative Record for the Fourth Street Refinery site is available for review at the following locations in Oklahoma City: Ralph Ellison Library and Oklahoma Department of Environmental Quality.

Remediation activities (RA) were completed under two operable units:

Surface Contamination Operable Unit (SCOU): Work was performed for EPA under Work Assignment No. 51-6RE5 of Response Action No. 68-W9-0013 in accordance with specifications of the remedial design approved by EPA in 1994, prepared as a result of the September 1992 Record of Decision (ROD). The 4ST Site refers to the contaminated area above the water table located in four areas referred to as Tar Mat Area, Parcel H Pond, Eastern Drainage Area and Surface Impoundments. Remedial Activities included: Removal of above

ground structures associated with the refinery, asbestos abatement, and the excavation, treatment, and removal for off-site disposal of treated waste materials containing lead and acid. Waste material was excavated down to the water table. Excavated areas were backfilled, regraded, and revegetated to prevent erosion. The remedial action was completed in April 30, 1996.

Ground Water Contamination Operable Unit (GWOU): Work was performed for EPA under Work Assignment No. 57-6NE5 and 58-6NB1 in accordance with specifications of the remedial design prepared as a result of the October 1993 Record of Decision (ROD). Contaminants found in the ground water are similar to those found in the on-site sludges. Contaminants of Concern include lead, arsenic, and organic chemicals such as chlorinated hydrocarbons and benzene compounds. The intent of the RA was to prevent migration of contaminants from the shallow aquifer to the deeper aquifer, and to prevent migration of contaminants to the North Canadian River. The selected remedy for the site is natural attenuation. Remediation activities were performed in two phases. Phase One: the installation of piezometers and speed borings, geophysical logging and removal of a Deep Well. Phase Two: installation of ground water monitor wells to monitor the upper alluvial aquifer (approx. 50'-60' bgs) and upper portion of the Garber-Wellington (140'-150' bgs), abandonment of alluvial wells and piezometers, and installation of warning signs. Ground water monitoring of the upper alluvial aquifer and upper portion of the Garber-Wellington aquifer continues.

Appropriate Land Uses: The site is considered appropriate for activities associated with industrial/commercial uses. Cleanup levels met during remediation are not conducive for residential uses.

Dated this 19th day of June, 2001.

Mark S. Coleman, Executive Director
Department of Environmental Quality

ACKNOWLEDGMENT

STATE OF OKLAHOMA)
) SS:
COUNTY OF OKLAHOMA)

Before me, the undersigned, a Notary Public in and for said County and State on this 19th day of June, 2001 personally appeared Mark D. Coleman to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me that he executed the same as his free and voluntary act and deed for the uses and purposes therein set forth.

Given under my hand and seal the day and year last above written.

Linda Lane

My Commission expires 2-18-05.

NOTICE OF

REMEDIATION & GROUNDWATER CONTAMINATION

DOUBLE EAGLE REFINERY SUPERFUND SITE

This Notice is made pursuant to Oklahoma Statutes, Title 27A (2000 Supp.), Section 2-7-123(B), concerning the former Double Eagle Refinery site. It is also noticed that groundwater contamination exists at this site in the upper alluvial aquifer and the upper Garber Wellington, approximately 50'-150' below ground surface level. Attempts to use groundwater for human consumption is not advised.

SITE DESCRIPTIONS: THE DOUBLE EAGLE REFINERY (DER) SITE is located at 1900 Northeast First Street, in Oklahoma City, Oklahoma. The aerial extent of the site is approximately 12 acres and occupies the southeast Quarter (SE1/4) of Section 35, Township 12 North, Range 3 West, Oklahoma County, Oklahoma. It is bounded on the north by ATSF Railroad (Union Pacific) tracks and on the east by Martin Luther King Blvd.

DOUBLE EAGLE REFINERY recycled used motor oil into finished lubricating oil. The refinery was active as early as 1929, and is known to have accepted waste oil for storage until 1980. The recycling process included the use of sulfuric acid (H_2SO_4) and bleaching clays. Crude oil or waste oil was steam heated in tanks. Acid and bleaching clay were added to clarify and separate the desired oil product from the heavy tars. Waste consisted primarily of acidic tar material mixed with clay. Site wastes contained a number of metals and organic contaminants. These wastes were considered hazardous because they were found to be corrosive and toxic. Clean up levels were based on risk based levels established for industrial waste sites.

REMEDIATION ACTION: Remediation took place under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Administrative Record for the Double Eagle Refinery site is available for review at the following locations in Oklahoma City: Ralph Ellison Library and Oklahoma Department of Environmental Quality.

Remediation activities (RA) were completed under two operable units:

Surface Contamination Operable Unit (SCOU): Work was performed for EPA under Work Assignment No. 013-RA-RA-06B1 of Response Action No. 68-W6-0037 in accordance with specifications of the remedial design prepared as a result of the September 1992 Record of Decision (ROD). The DER Site refers to the contaminated area above the water table where the former used oil refinery was located west of parcel H and North of the Radio Tower.

Remedial Activities included: Asbestos abatement, and the excavation, treatment, and removal for off site disposal of 44,186 yd^3 of contaminated waste materials containing lead and acid. Waste material was excavated down to the water table. Excavated areas were backfilled, regraded, and revegetated to prevent erosion. The remedial action was completed in June 29, 1999.

Ground Water Contamination Operable Unit (GWOU): Work was performed for EPA under Work Assignment No. 57-6NE5 and 58-6NB1 in accordance with specifications of the remedial design prepared as a result of the October 1993 Record of Decision (ROD). Contaminants found in the ground water are similar to those found in the on-site sludges. Contaminants of Concern include lead, arsenic, and organic chemicals such as chlorinated hydrocarbons and benzene compounds. The intent of the RA was to prevent migration of contaminants from the shallow aquifer to the deeper aquifer, and to prevent migration of contaminants to the North Canadian River. The selected remedy for the site is natural attenuation. Remediation activities were performed in two phases. Phase One: the installation of piezometers and speed borings, geophysical logging and removal of the DER Deep Well. Phase Two: installation of ground water monitor wells to monitor the upper alluvial aquifer (approx. 50'-60' bgs) and upper portion of the Garber-Wellington (140'-150' bgs), abandonment of alluvial wells and piezometers, and installation of warning signs. Ground water monitoring of the upper alluvial aquifer and upper portion of the Garber-Wellington aquifer continues.

Appropriate Land Uses: The site is considered appropriate for activities associated with industrial/commercial uses. Cleanup levels met during remediation are not conducive for residential uses.

Dated this 19th day of June, 2001.

Mark S. Coleman, Executive Director
Department of Environmental Quality

ACKNOWLEDGMENT

STATE OF OKLAHOMA)
) SS:
COUNTY OF OKLAHOMA)

Before me, the undersigned, a Notary Public in and for said County and State on this 19th day of June, 2002 personally appeared _____ to me known to be the identical person who executed the within and foregoing instrument and acknowledged to me that he executed the same as his free and voluntary act and deed for the uses and purposes therein set forth.

Given under my hand and seal the day and year last above written.

Linda Lane

My Commission expires 2-18-05.