# AP - 001

# STAGE 1 & 2 REPORTS

# DATE:

June 20, 1996

# Final Site Investigation Report For the Former Brickland Refinery Stage 1 Abatement Plan

## Volume 2: Appendices E - L

RECEIVED
JUN 21 1996
Environmental Bureau
Oil Conservation Division

*Prepared for:*

REXENE

Office of Environmental Affairs
5005 LBJ Freeway
Occidental Tower, 5th Floor
Dallas, Texas 75244

*June 20, 1996*

505 Marquette Avenue, NW
Suite 1100
Albuquerque, New Mexico 87102
(505) 842-0001
FAX: (505) 842-0595

## Appendix E

El Paso City-County Health Department and Texas Air Control Board Reports

# EPIDEMIC LEAD ABSORPTION NEAR AN ORE SMELTER:

# THE ROLE OF PARTICULATE LEAD

Philip J. Landrigan, M.D.[1]
Stephen H. Gehlbach, M.D.[1]
Bernard F. Rosenblum, M.D., M.P.H.[2]
Jimmie M. Shoults, P.E.[3]
Robert M. Candelaria[4]
William F. Barthel[5]
John A. Liddle, Ph.D.[6]
Ann L. Smrek[7]
Norman W. Staehling[8]
JoDean F. Sanders[9]
J. Julian Chisolm, Jr., M.D.[10]

1. Medical Epidemiologist, Field Services Branch, Epidemiology Program, Center for Disease Control, Atlanta, Georgia 30333
2. Director, El Paso City-County Health Department, El Paso, Texas 79901
3. Environmental Engineer, El Paso City-County Health Department, El Paso, Texas 79901
4. Laboratory Director, El Paso City-County Health Department, El Paso, Texas 79901
5. Chief, Toxicology Section, Clinical Chemistry Division, Bureau of Laboratories, Center for Disease Control, Atlanta, Georgia 30333
6. Supervisor, Research Chemist, Toxicology Section, Clinical Chemistry Division, Bureau of Laboratories, Center for Disease Control, Atlanta, Georgia 30333
7. Research Chemist, Toxicology Section, Clinical Chemistry Division, Bureau of Laboratories, Center for Disease Control, Atlanta, Georgia 30333
8. Chief, Data Services Section, Smallpox Eradication Program, Center for Disease Control, Atlanta, Georgia 30333
9. Statistical Assistant, Immunization Branch, Bureau of State Services, Center for Disease Control, Atlanta, Georgia 30333
10. Johns Hopkins University, School of Medicine, Department of Pediatrics, and Baltimore City Hospitals, Department of Pediatrics, Baltimore, Maryland

ABSTRACT

In December 1971, the City-County Health Department in El Paso, Texas discovered that an ore smelter there had discharged 1,116 tons of lead, 560 tons of zinc, 12 tons of cadmium, and 1.2 tons of arsenic into the atmosphere in the preceding 3 years; environmental concentrations of particulate lead adjacent to the smelter were 100 times background values, fell rapidly within 1-2 miles, but remained elevated for as far as 6.5 miles.

To determine the extent and mechanisms of human lead uptake, blood levels were determined for a random sample of all persons living within 4.1 miles of the smelter. Highest levels were found within 1 mile, and values $\geq$ 40 μg/100 ml were widespread, but most prevalent in 1-4 year old children. There was a close relationship between blood lead levels and concentrations of lead in household dust; within 1 mile children with levels $\geq$ 40 μg/100 ml were exposed to 3.1 times as much lead in dust as those with lower blood values (6447 ppm versus 2067), ($p < 0.0001$). Exposure to particulate lead in air was also substantial within 1 mile (annual mean 8-10 μg lead/$M^3$ air). Exposure to lead-based paint was less than half that in New York City, and exposure to lead in water, food, and pottery was negligible.

It was concluded that chronic uptake of particulate lead, principally from dust and air, had been the major mechanism of absorption and that within a 1-2 mile radius of itself the smelter had been the predominant source of lead in dust and thus of absorbed lead. The arid climate may have facilitated absorption from dust.

## INTRODUCTION

Particulate lead in contaminated dust, soil, and air has been recognized as a potentially widespread cause of chronic lead absorption among children in the United States.[1-4] Environmental concentrations of particulate lead may be especially high in the vicinity of point sources of lead emission such as smelters, and study of the mechanisms of lead uptake in such extreme environments might better define the extent to which particulate lead can contribute to human absorption.[5-8]

The present studies of lead uptake were conducted near an ore smelter on the outskirts of El Paso, Texas. In December 1971, the El Paso City-County Health Department found that this smelter had emitted 1,116 tons of lead, 560 tons of zinc, 12 tons of cadmium, and 1.2 tons of arsenic into the environment from 1969 through 1971.[9] Blood lead levels were determined in persons living throughout El Paso, and exposure to lead in dust, soil, air, paint, food, water, and pottery was measured. Our intents were (1) to ascertain the prevalence and severity of lead absorption in this locale, and (2) to evaluate the role of particulate lead in lead uptake.

## BACKGROUND

El Paso, population 322,261 (1970 U.S. Census) is located in the Rio Grande Valley in west Texas. It is surrounded to the north, northwest, and west by high mountains. The climate is arid (4 to 10 inches of rainfall per year),[10] and a fine gritty dust is present in the air on many days. Winds are light,? and calm is observed in 25% of hourly readings.[11] Thermal inversions occur on 70% of mornings.[11]

showed concentrations of lead to be highest in particles below 1 micron (Figure 2).*

Additional high-volume air samples were analyzed** for lead and bromine content[18] as a measure of the contribution of automotive sources; in commerical gasolines[19] and in automotive exhausts[20] the ratio of lead to bromine is 2.6/1.0. Samples taken in February 1972 at a site 600 feet from the smelter showed a mean lead/bromine ratio of 62.8 (Figure 3). Samples from the same location in May 1973 had a ratio of 11.2. Additional 1973 samples showed that ratio to decrease rapidly with distance from the smelter and to approach a baseline value of approximately 2.6 at 3 to 4 miles.

Dustfall (settleable particulate) samples were obtained from October 1970 through July 1971 at the smelter and at 10 other sites (Figure 4).[11] Dustfall was greatest at the smelter and decreased with distance. Likewise, the content of each metal was highest at the smelter (10-month means: 204 μg/M$^2$-month for lead, 86 for cadmium, 999 for zinc, 553 for arsenic, and 1511 for copper). In areas shielded by mountains, background levels were observed significantly closer to the smelter than in open areas of the valley.

## SOIL SAMPLING

Soil samples were collected from March 1972 through June 1973 at 99 sites

*Respiratory lead absorption is inversely proportional to particle size. Reports indicate that between 30 and 100% of particles below 2 μm in diameter are retained and subsequently absorbed in the lungs. Between 10 and 30% of 2-5 μm particles and almost none larger than 5 μm are retained.[1,16,17] Larger particles may, however, be swallowed and contribute to gastrointestinal absorption.

**Determinations kindly performed by Dr. Jimmy Payne of the Texas Air Control Board, Austin, Texas, using an X-ray fluorescence technique.

in El Paso and at 3 remote sites. Samples were taken at the surface and at depths of 1, 2, and 3 inches and analyzed for lead content by atomic absorption spectrophotometry. Only trace amounts of lead (< 50 ppm) were found at the remote sites. Within the city, highest levels in 1972 were found within 600 feet of the smelter (mean 3,457 ppm, range 560 - 11,450 for 54 samples); lead content was consistently highest at the surface. Levels fell rapidly in the first 1-2 miles from the smelter, but remained above background for as far as 6.5 miles (Figure 5). Similar though less extensive distributions were noted for zinc, cadmium, and arsenic. Distribution patterns for all of these metals in 1973 were virtually unchanged from 1972.

## DUST SAMPLING

Household dust samples were obtained once monthly from July 1972 through June 1973 at 51 locations. Highest values were obtained in Smeltertown, a village adjacent to the smelter; arithmetic mean lead content in 53 samples there was 36,853 ppm (Table 1). Zinc, cadmium, and arsenic levels were also highest in Smeltertown, and all levels declined rapidly with distance.

## FOOD AND WATER SAMPLING

Food and tap water samples were obtained in March 1972 from 13 homes, 9 of them in Smeltertown. No lead was detected in any of these samples; the lower limit of detection for lead was 0.05 μg/ml.

## HUMAN STUDIES

In preliminary testing programs conducted throughout El Paso from January to April 1972, whole blood lead levels ≥ 40 μg/100 ml* were found in 97

*A whole blood lead level of 40 μg or more per 100 ml is considered by the Surgeon General to be indicative of "undue lead absorption."[21]

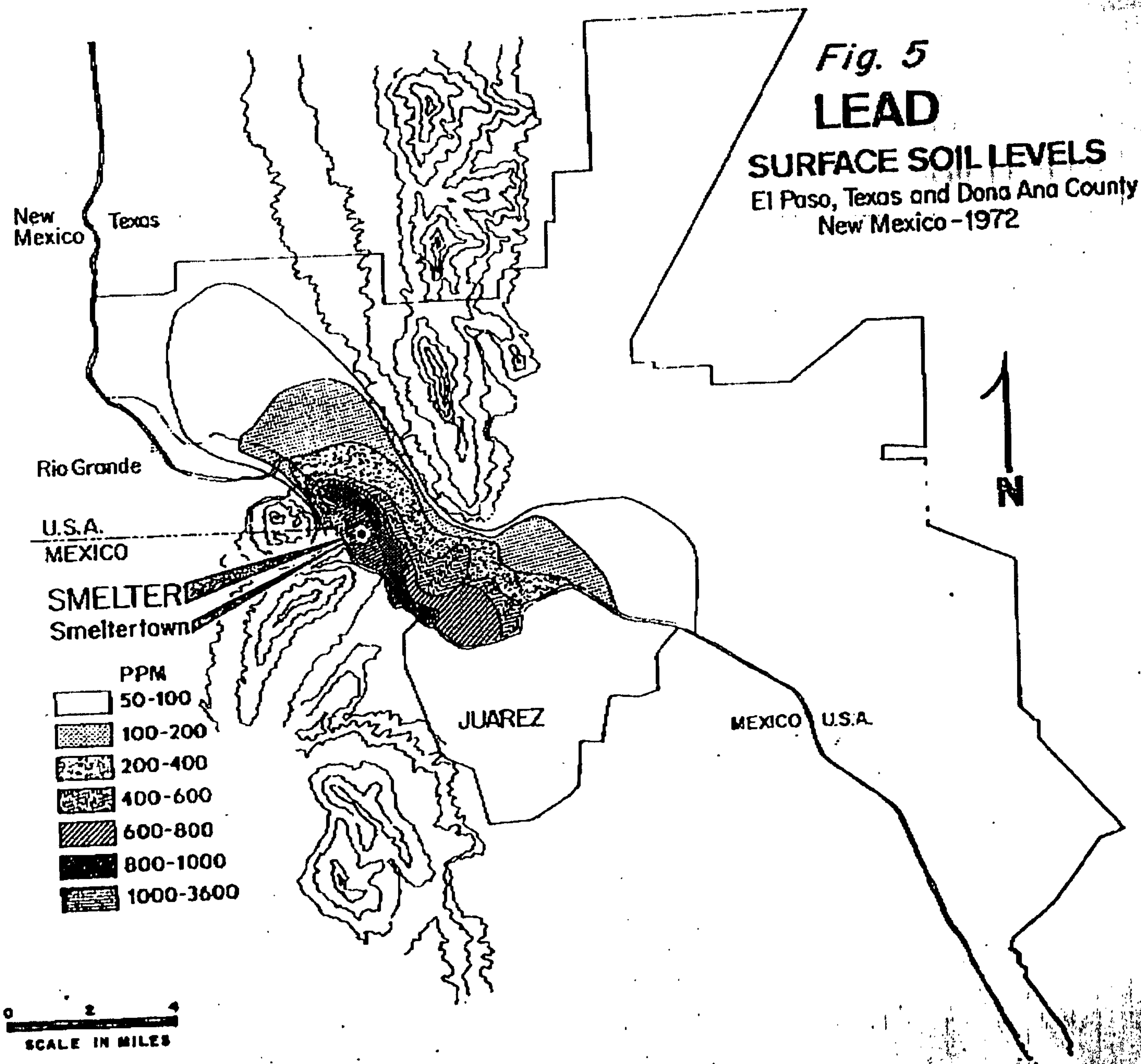
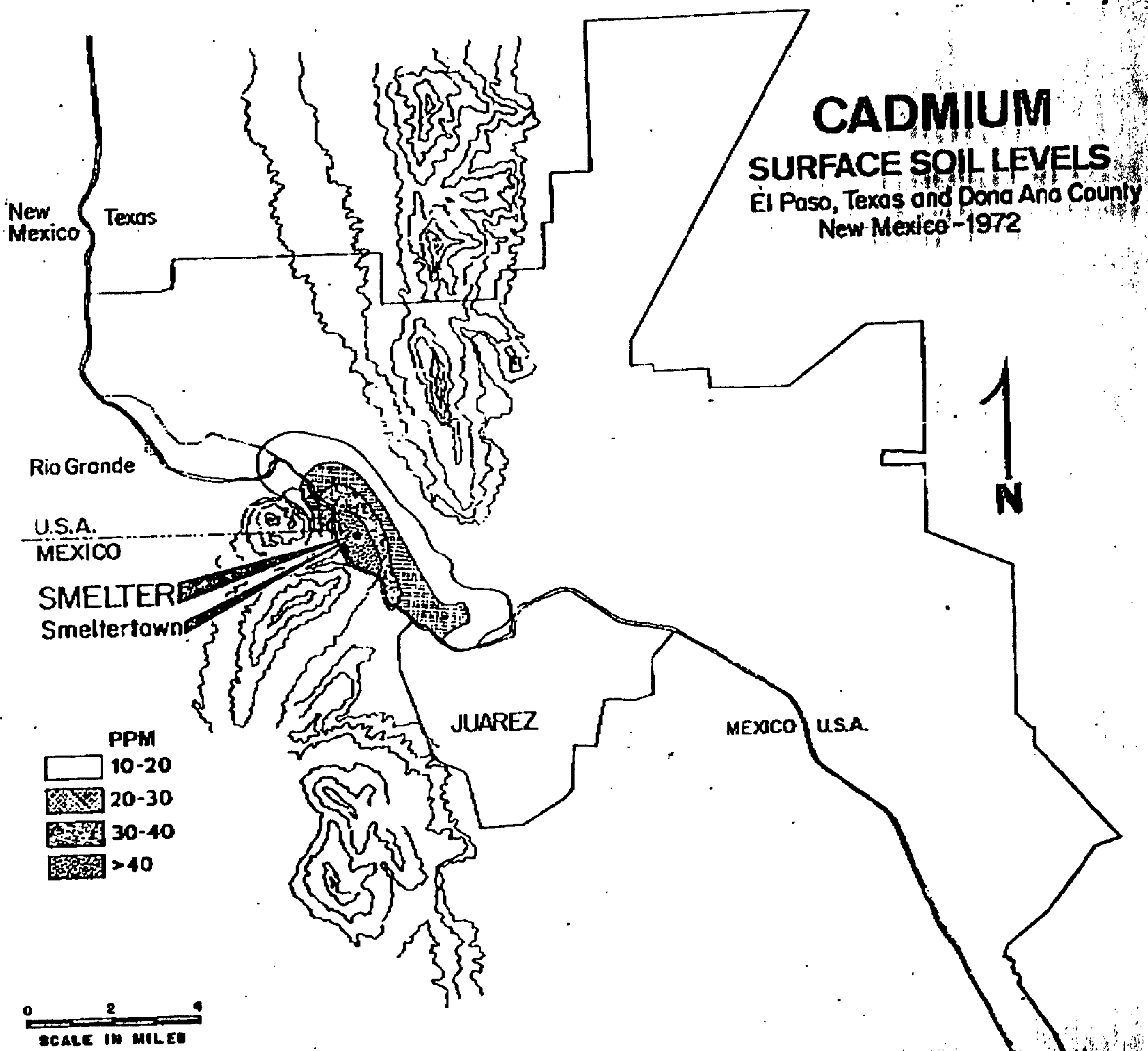


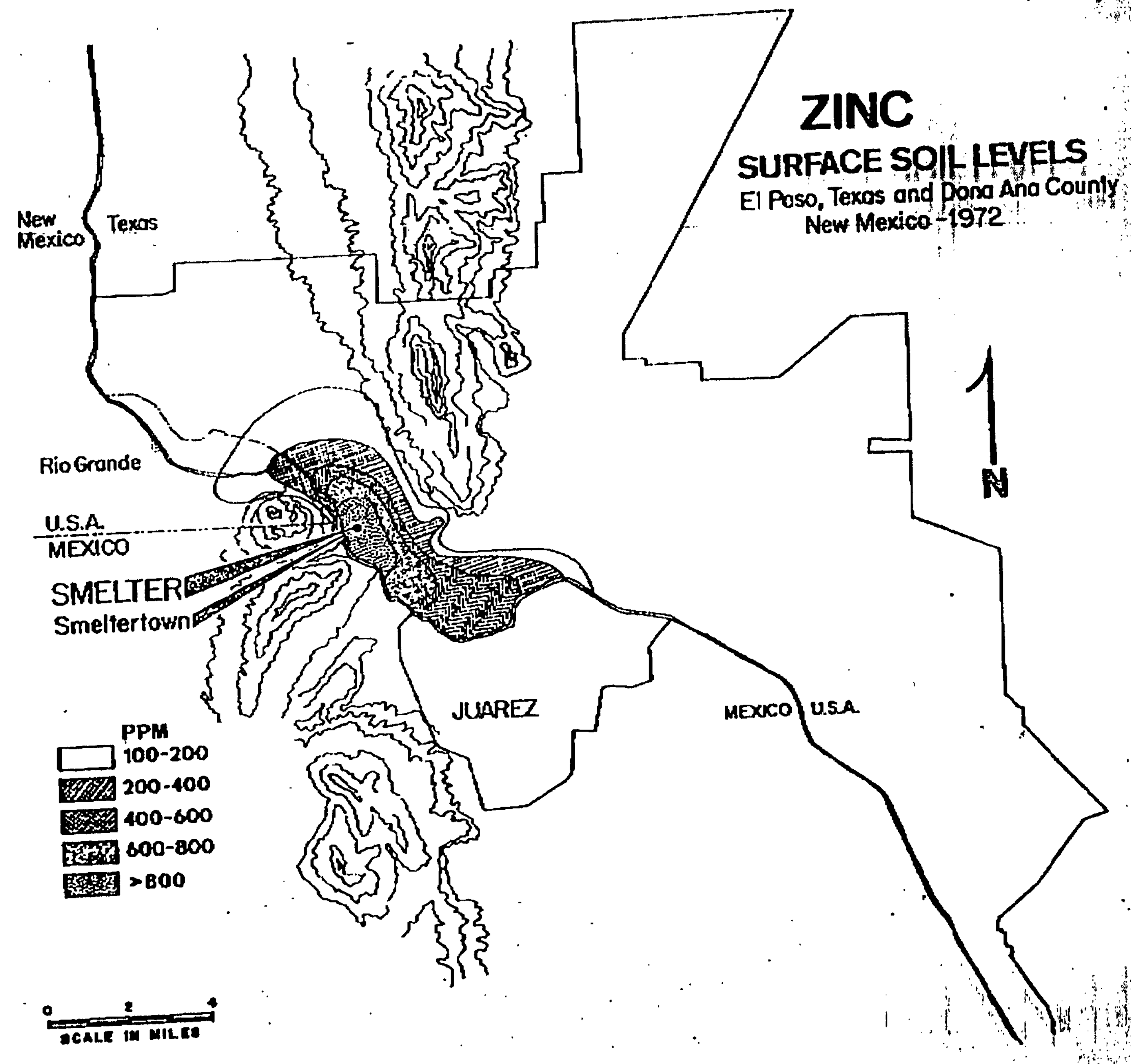

*Fig. 5*

**LEAD**

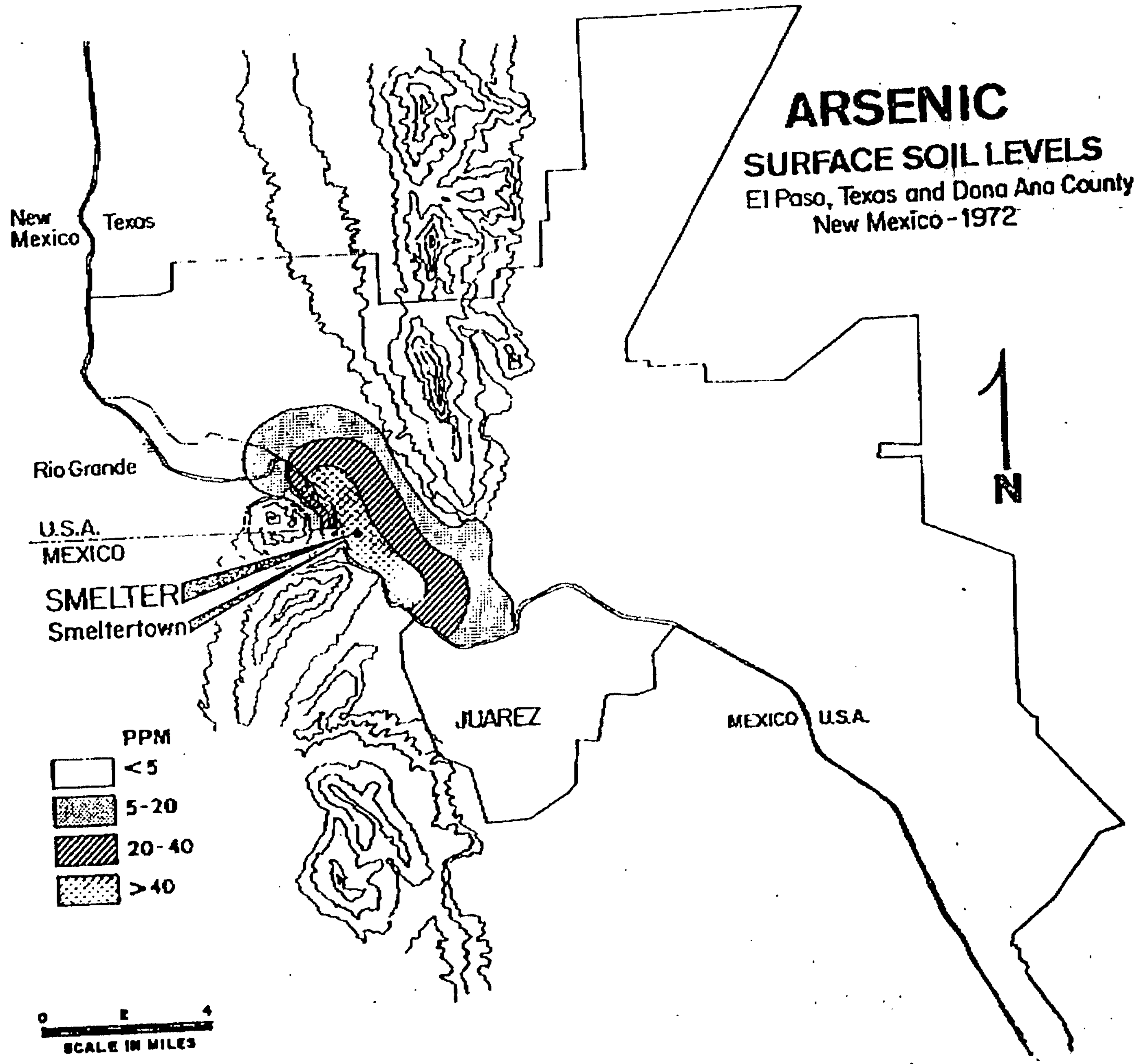
**SURFACE SOIL LEVELS**

El Paso, Texas and Dona Ana County
New Mexico - 1972


CADMIUM
SURFACE SOIL LEVELS
El Paso, Texas and Dona Ana County
New Mexico - 1972
New Mexico
Texas
Rio Grande
U.S.A.
MEXICO
SMELTER
Smeltertown
JUAREZ
MEXICO
U.S.A.
N
PPM
10-20
20-30
30-40
>40
0
2
4
SCALE IN MILES



ZINC
SURFACE SOIL LEVELS
El Paso, Texas and Dona Ana County
New Mexico - 1972
New Mexico
Texas
Rio Grande
U.S.A.
MEXICO
SMELTER
Smeltertown
JUAREZ
MEXICO
U.S.A.
N
PPM
100-200
200-400
400-600
600-800
>800
0
2
4
SCALE IN MILES


ARSENIC
SURFACE SOIL LEVELS
El Paso, Texas and Dona Ana County
New Mexico - 1972
New Mexico
Texas
Rio Grande
U.S.A.
MEXICO
SMELTER
Smeltertown
JUAREZ
MEXICO
U.S.A.
N
PPM
<5
5-20
20-40
>40
0
2
4
SCALE IN MILES

Archie Clouse
Region 11

# SAMPLING AND ANALYSIS OF SOIL IN THE VICINITY OF ASARCO IN EL PASO, TEXAS

## FINAL REPORT

David Carmichael
Texas Air Control Board
Sampling and Analysis Division
Source Sampling Section
August 1989

# 1. PROJECT DESCRIPTION

## 1.1 Origin of Project

In response to a request from the Research Division of the Texas Air Control Board (TACB), the Sampling and Analysis Division conducted soil sampling in the vicinity of ASARCO in El Paso, Region 11. The plant is located at 2301 West Paisano Drive in El Paso County. Personnel from the Source Sampling Section collected the soil samples on July 12 and 13, 1989.

## 1.2 Summary

The project was designed to document the levels of arsenic in the top one-half inch of soil at selected sites in the vicinity of ASARCO. The highest single value of arsenic detected was 1100 micrograms of arsenic/gram of soil (µg/g). It should be noted that the 1100 µg/g sample site at the International Boundary and Water Commission was the closest to the ASARCO plant and was located directly across from a brick manufacturing company in Mexico. Figure 1 is a map of the general distribution of arsenic levels found in the soil samples collected in the El Paso area. The minimum detection limit (MDL) for the analysis was 3 µg/g. The background samples were determined to have an arsenic concentration less than the MDL. The results of the analysis were sent to the Effects Evaluation Section for a health effects determination.

# 2. SAMPLING, BANKING, AND ANALYTICAL PROCEDURES

## 2.1 Sampling

Sampling locations were selected by the project leader using maps of the area and on-site observations. An emphasis was placed on collecting soil samples in the vicinity of schools and recreational parks. The general location and description of the sampling sites can be found in Figure 2. Background samples were taken at two locations selected by the project leader. The background sites were in the El Paso area but in areas unaffected by emissions from ASARCO. At each sampling site, twelve samples were taken at evenly spaced locations on the circumference of a circle having a diameter of two feet. Sampling sites on the circumference of the circle were located with an aluminum template with holes numbered 1-12 (See Figure 3). At each location, a soil sample was obtained using a stainless steel coring device capable of removing a soil core 7/8" in diameter and 1/2" in depth.

The six samples from holes 1, 3, 5, 7, 9, and 11 were composited, placed in a polyethylene bag, assigned a sample ID and labeled with a sample collection tag which was filled out by the field sampler. The six samples from holes 2, 4, 6, 8, 10, and 12 were composited, bagged and labeled similarly. The sample ID, sample collection tag number and information regarding the sampling location were noted in a field sample logbook. The sampling locations and background sampling sites were also noted on a map of the area in the logbook. A Polaroid photograph was taken of the sampling location, labeled with the sample ID and photographer signature and stapled to the relevant page of the logbook. The samples were stored in a box which remained in the custody of the project leader.

The sampling equipment was cleaned at each location when sampling was completed. Cleaning consisted of removing loose soil particles using paper towels and distilled deionized (DDI) water.

## 2.2 Banking

The samples and field sampling logbook were returned to the TACB Laboratory and transferred to the custody of the staff member in charge of the sample bank. Each sample was assigned a sample bank number, transferred to a new polyethylene sample bag and labeled with a sample bank tag. As a cross reference, the sample bank number was recorded on the appropriate page of the field sample logbook. The original sample collection bag and tag were stored at the sample bank. The sample bank was responsible for drying, sieving, grinding and mixing each soil sample. Each sample was placed in a beaker and dried in an oven at 100° C for eight hours or until dry. The sample was then sieved using a brass 16-mesh sieve. Once sieved, the sample was ground in a laboratory grinder to approximately 100-mesh. The sample was weighed, mixed and divided into three equal portions. Each portion was placed in an individual polyethylene bag, assigned a sample analysis number and labeled with a sample analysis tag. As a cross reference, the sample analysis number was recorded on the appropriate page of the field sample logbook. The samples used for analysis or quality assurance (QA) were then transferred to the custody of the laboratory analyst. The sieve and laboratory grinder were cleaned with DDI water and paper towel after each sample was prepared.

## 2.3 Analytical Procedures

All soil samples were analyzed similarly. Each sample was mixed in its polyethylene bag by tumbling the bag three to five times. Approximately 2.0 grams of the sample were dried at 100° C for one hour and then cooled and reweighed. The sample was extracted with nitric acid and hydrogen peroxide according to Environmental Protection Agency (EPA) Method 3050, which can be found in Test Methods for Evaluating Solid Waste, Volume IA: Laboratory Manual: Physical /Chemical

Methods (November 1986 SW-846 Third Edition). The filtered extract solution was then analyzed for arsenic by inductively coupled plasma spectroscopy (ICP) according to EPA Method 6010 found in SW-846. The results of the analysis in µg/g were reported to the sample bank. The data was matched to the sample ID and reported in Table 1.

Like the soil samples, any particulate matter in the field blanks (rinses) or in the DDI water blank was weighed, extracted according to EPA Method 3050 and analyzed for arsenic by ICP.

# 3. QUALITY ASSURANCE PROCEDURES

## 3.1 Sampling

A field blank was collected for each group of ten or fewer samples. The field blank consisted of DDI water that had come in contact with the previously cleaned surfaces of the sampling equipment. The field blank was placed in a polyethylene bag and documented and handled in the same manner as the soil samples. The sample bank repackaged, documented and relabeled each field blank and transferred custody to the laboratory analyst. The analyst transferred the entire contents of the polyethylene bag to a tared beaker and evaporated the water at 100° C. Any remaining particulate matter was weighed, extracted using EPA Method 3050 and analyzed for arsenic using ICP. The results were reported in the same manner as that for the soil samples. A DDI water blank was collected once during the day's sampling. The DDI water blank was placed in a polyethylene bag and documented, banked, evaporated, weighed, extracted, analyzed and reported in the same manner as that for the field blanks.

The even-numbered soil samples from each sampling location were composited and used as site duplicates. A site duplicate sample was submitted to the laboratory analyst by the sample bank for each group of ten or fewer samples processed.

## 3.2 Banking

A banking blank was prepared for each group of ten or fewer samples processed. The banking blanks consisted of DDI water that had come in contact with the previously cleaned surfaces of the sieve and laboratory grinder. The blank sample was placed in a polyethylene bag, documented, analyzed and reported in the same manner as that for the field blanks.

A blind duplicate sample was submitted to the laboratory analyst by the sample bank for each group of ten or fewer samples processed. A blind duplicate sample was one-third of an original soil sample as described in Section 2.2. The blind duplicate samples were documented, analyzed and reported in the same manner as that for the soil samples. The results are reported in Table 2.

A spiked sample blank was submitted to the laboratory analyst by the sample bank for each group of ten or fewer samples processed. The sample bank only labeled the sample as a spiked sample blank. The analyst performed the spiking procedure. The results are reported in Table 2.

### 3.3 Analysis

Calibration control standards, spiked samples, duplicate samples, split extracts and extract re-analyses were prepared by the analyst and analyzed for each group of ten or fewer samples analyzed. The Sampling and Analysis QA officer prepared the audits for the analyst for each group of ten or fewer samples analyzed. The results are reported in Table 2.

## 4. SAMPLE CUSTODY

Chain of sample custody was established by using a log. Each time a sample or set of samples changed possession and/or control, the date, time and personnel involved were noted. The log was used from the time the samples were collected until they were relinquished by the sample bank. A new chain of custody log was prepared by the sample bank before transferring samples to the laboratory analyst.

## 5. CALIBRATION PROCEDURES AND FREQUENCY

The analyst calibrated the ICP during each analytical run by using standards prepared from a Fisher Certified arsenic reference solution containing 1000 micrograms of arsenic per milliliter of solution.

## 6. DISTRIBUTION

### 6.1 Distribution of Report

Mr. Doyle R. Pendleton, Director, Monitoring Program
Mr. Jim Myers, P.E., Director, Enforcement Program
Mr. Les Montgomery, P.E., Director, Technical Support and Regulation Development Program
Mr. Walter Bradley, Director, Research and Special Projects
Mr. Manuel Aguirre, P.E., Regional Director, Region 11
Mr. John Key, P.E., Assistant to the Director, Monitoring Program
Mr. Scott Mgebroff, Director, Sampling and Analysis Division
Mr. James H. Price, Jr., Ph.D., Director, Research Division

# Arsenic Soil Concentrations in the Vicinity of ASARCO (µg/g)

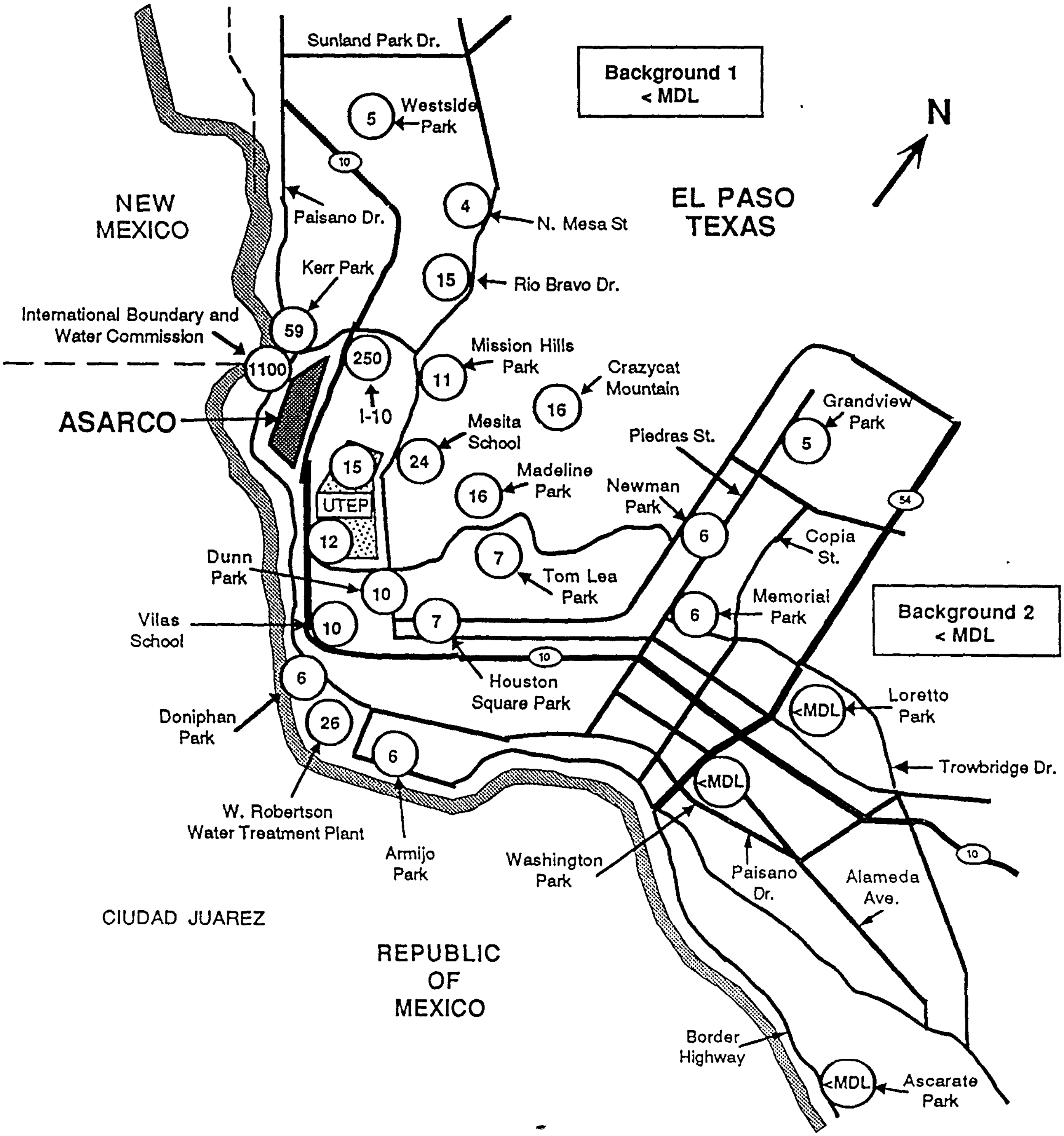



FIGURE 1

Mr. Paul W. Henry, P.E., Director, Technical Services Division
Mr. James P. Barta, Jr., P.E., Sampling and Analysis Division
Mr. Robert Brewer, Quality Assurance Division
Mr. Vince Anselmo, Ph.D., Sampling and Analysis Division
Mr. Wayne Burnop, P.E.,Technical Services Division
Ms. JoAnn Wiersema, Research Division
Mr. Tom Dydek, Ph.D., Research Division
Mr. George Dean, Sampling and Analysis Division
Mr. Dewayne Ehman, Ph.D., Sampling and Analysis Division
Ms. Peggy Zimmerman, Sampling and Analysis Division
Mr. Archie Clouse, Region 11

# ASARCO Soil Sampling Sites

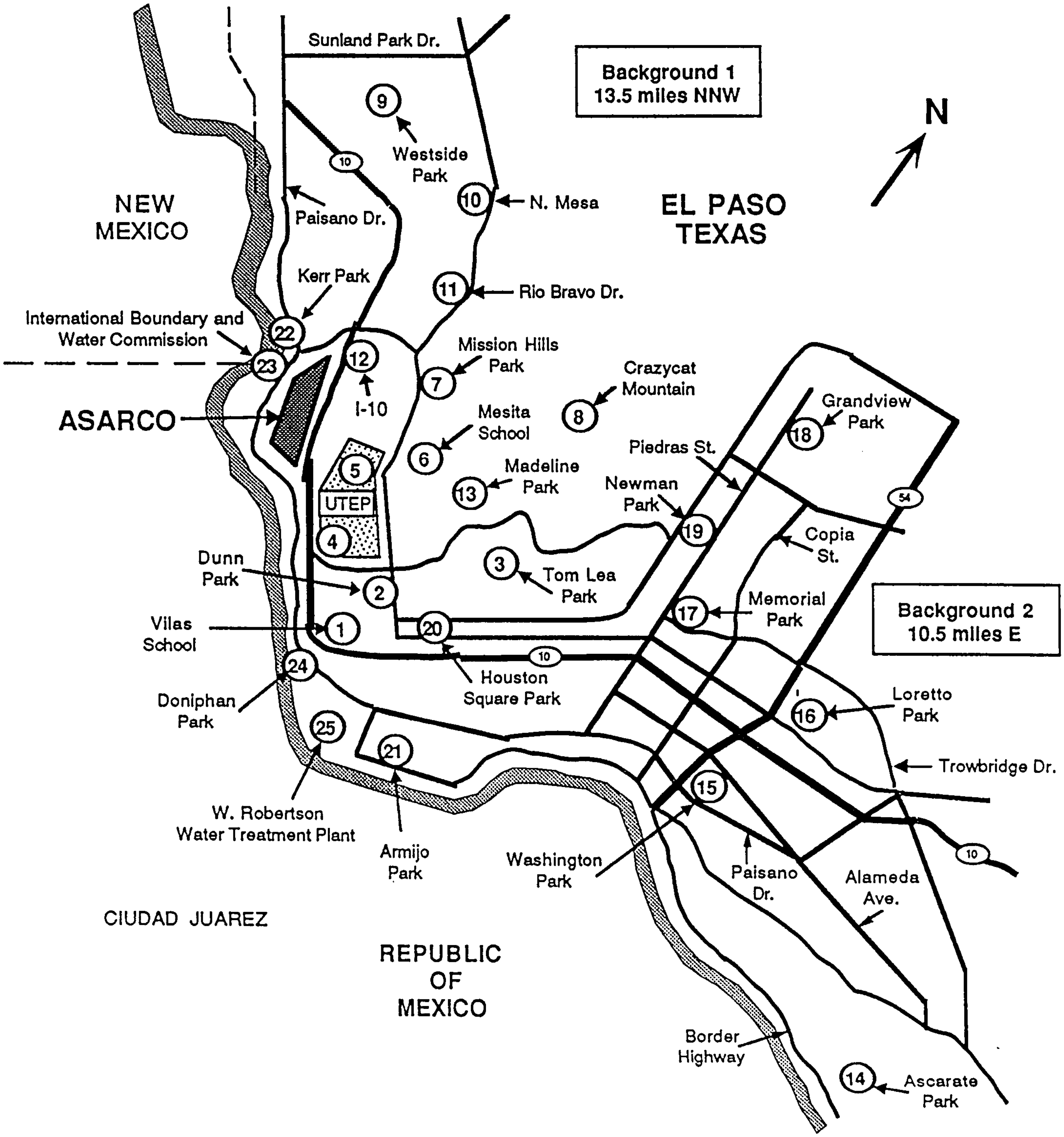



FIGURE 2

# Aluminum Template

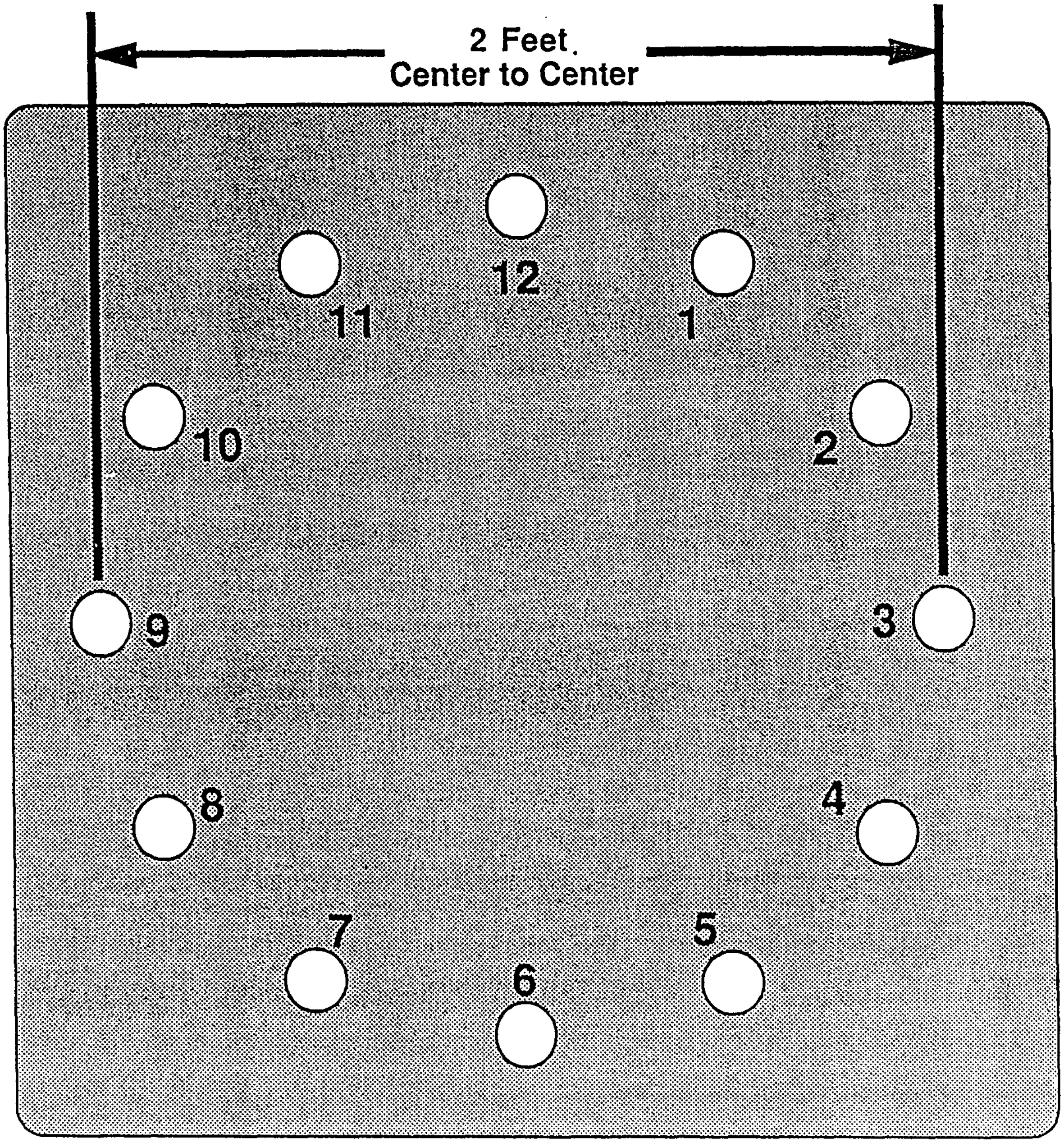



FIGURE 3

# Analytical Results of Arsenic Sampling Performed in the Vincinity of ASARCO

| Sampling Site | Location | Direction from ASARCO | Arsenic Concentration µg/g |
|---|---|---|---|
| 1 | Vilas Elem. School | 1.85 miles SE | 10 |
| 2 | Dunn Park | 1.75 miles ESE | 10 |
| 3 | Tom Lea Park | 1.85 miles E | 7 |
| 4 | UTEP | 1.40 miles SE | 12 |
| 5 | UTEP | 0.90 miles E | 15 |
| 6 | Mesita Elem. School | 1.10 miles ENE | 24 |
| 7 | Mission Hills Park | 1.25 miles NE | 11 |
| 8 | Crazycat Mountain | 1.75 miles NE | 16 |
| 9 | Westside Park | 2.30 miles NNW | 5 |
| 10 | N. Mesa Street | 1.75 miles NNE | 4 |
| 11 | Rio Bravo Drive | 1.00 miles NNE | 15 |
| 12 | Interstate Hwy. 10 | 0.60 miles NNE | 250 |
| 13 | Madeline Park | 1.55 miles ENE | 16 |
| 14 | Ascarte Park | 6.75 miles ESE | < MDL |
| 15 | Washington Park | 4.75 miles ESE | < MDL |
| 16 | Loretto Park | 5.10 miles E | < MDL |
| 17 | Memorial Park | 4.20 miles E | 6 |
| 18 | Grandview Park | 4.40 miles NE | 5 |
| 19 | Newman Park | 3.55 miles ENE | 6 |
| 20 | Houston Square Park | 2.50 miles ESE | 7 |
| 21 | Armijo Park | 3.25 miles SE | 6 |
| 22 | Kerr Park | 0.35 miles NW | 59 |
| 23 | IBWC [1] | 0.20 miles WNW | 1100 |
| 24 | Doniphan Park | 1.45 miles SSE | 6 |
| 25 | W. Robertson WTP [2] | 2.75 miles SE | 26 |
| Background 1 | City of Vinton, Tx. | 13.50 miles NNW | < MDL |
| Background 2 | Montana/Yarbrough | 10.50 miles E | < MDL |

Minimum detection limit (MDL) for this method of analysis is 3 µg/g.

Mileage is an approximation.

1. International Boundary and Water Commission
2. W. Robertson Water Treatment Plant

**TABLE 1**

# Quality Assurance Results

| DUPLICATES CHOSEN BY BANKER | AVERAGE % DIFFERENCE |
|---|---|
| Lab Duplicates | + 10.0 |
| Site Duplicates | - 2.5 |
| DUPLICATES CHOSEN BY ANALYST | - 8.2 |
| SPLIT EXTRACTS | + 0.5 |
| EXTRACT RE-ANALYSES | - 2.8 |
| STANDARDS AS UNKNOWNS | + 1.0 |

| | AVERAGE % RECOVERY |
|---|---|
| SPIKED SAMPLES | 97.8 |

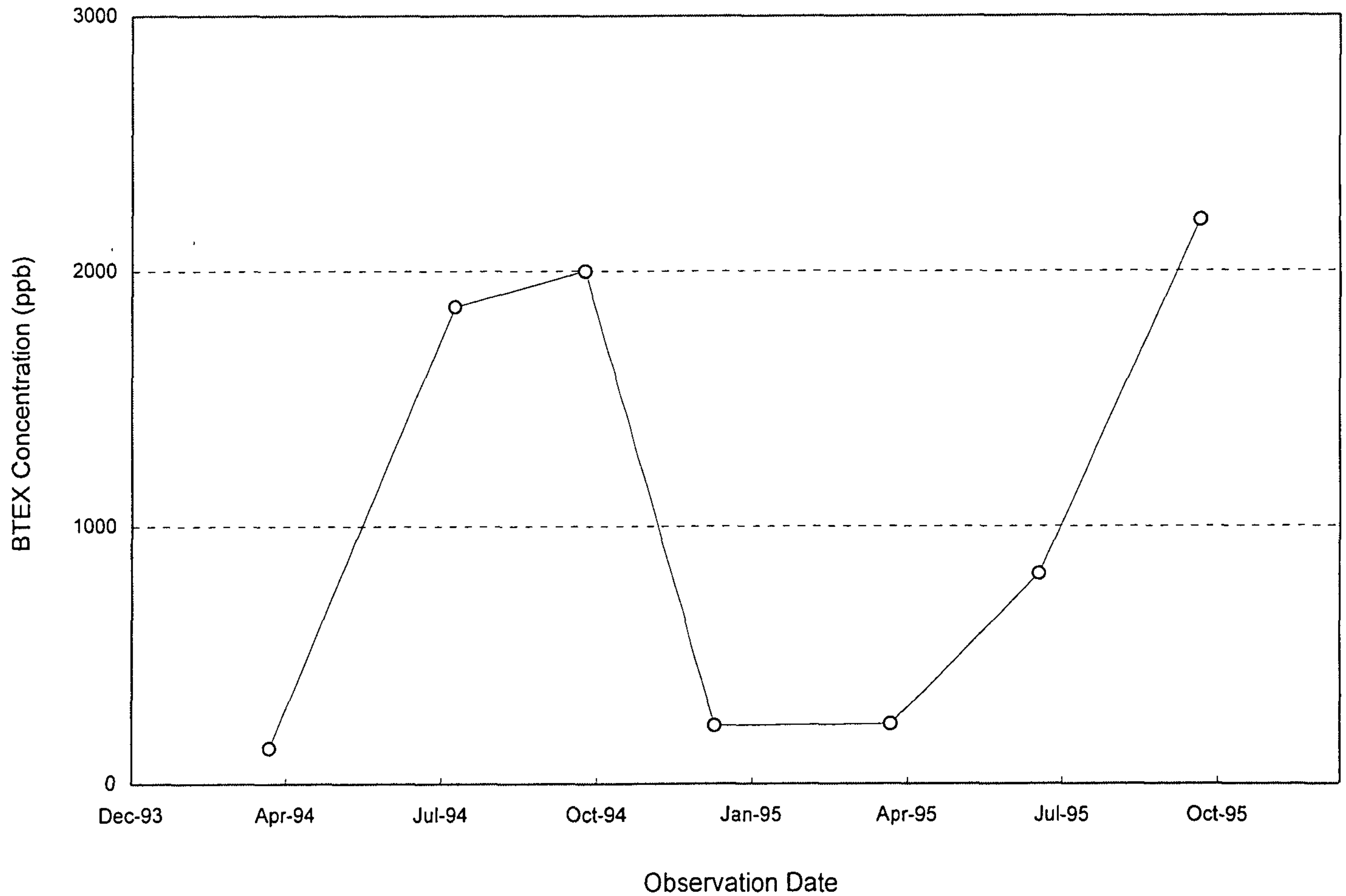
| | AVERAGE % DISCREPANCY |
|---|---|
| AUDIT SAMPLES | + 3.0 |

TABLE 2

# Appendix F

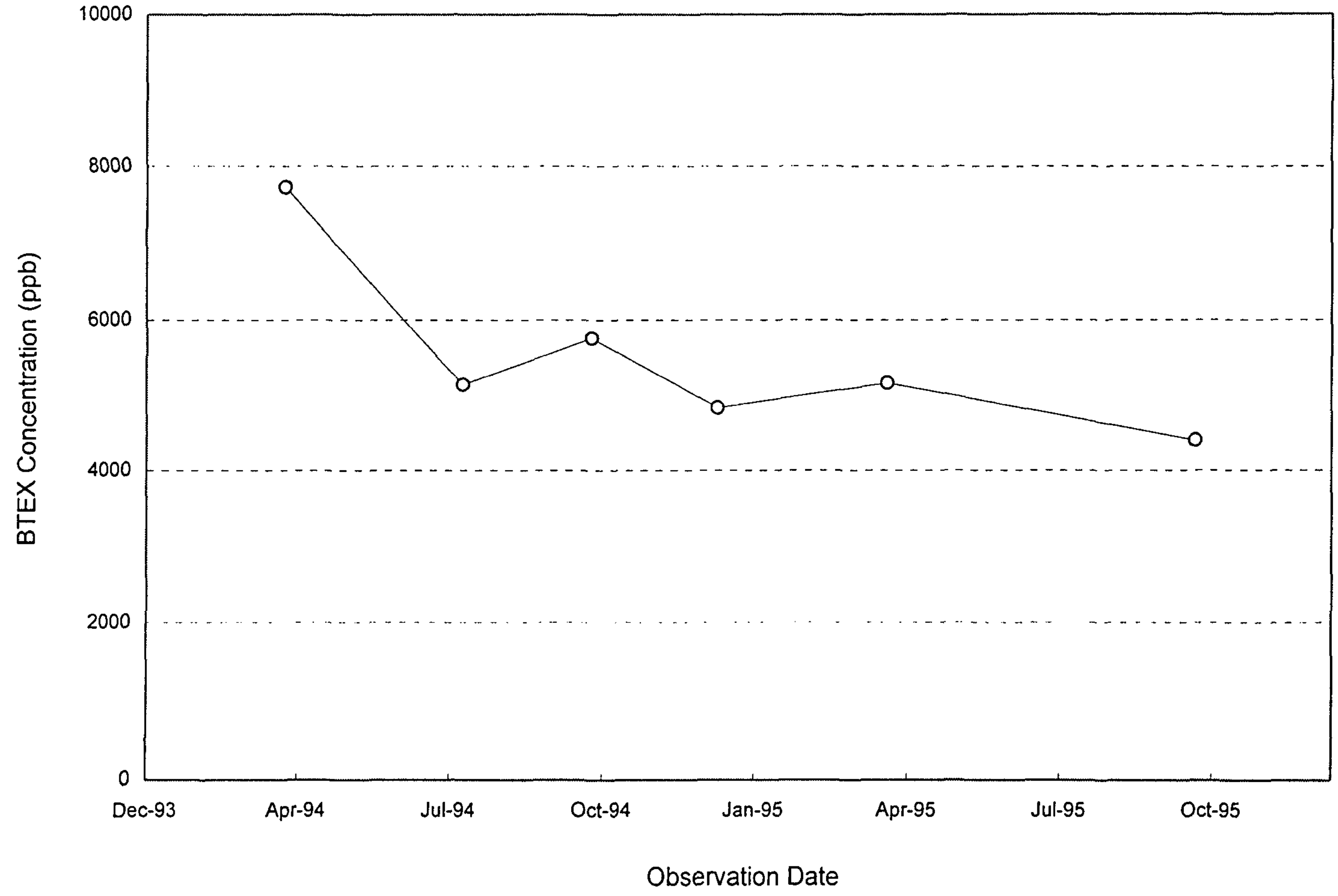
Total BTEX Concentration vs. Time for Selected Monitoring Wells

**Groundwater Monitoring Wells**
**Total BTEX Concentration vs Time (MW-4)**



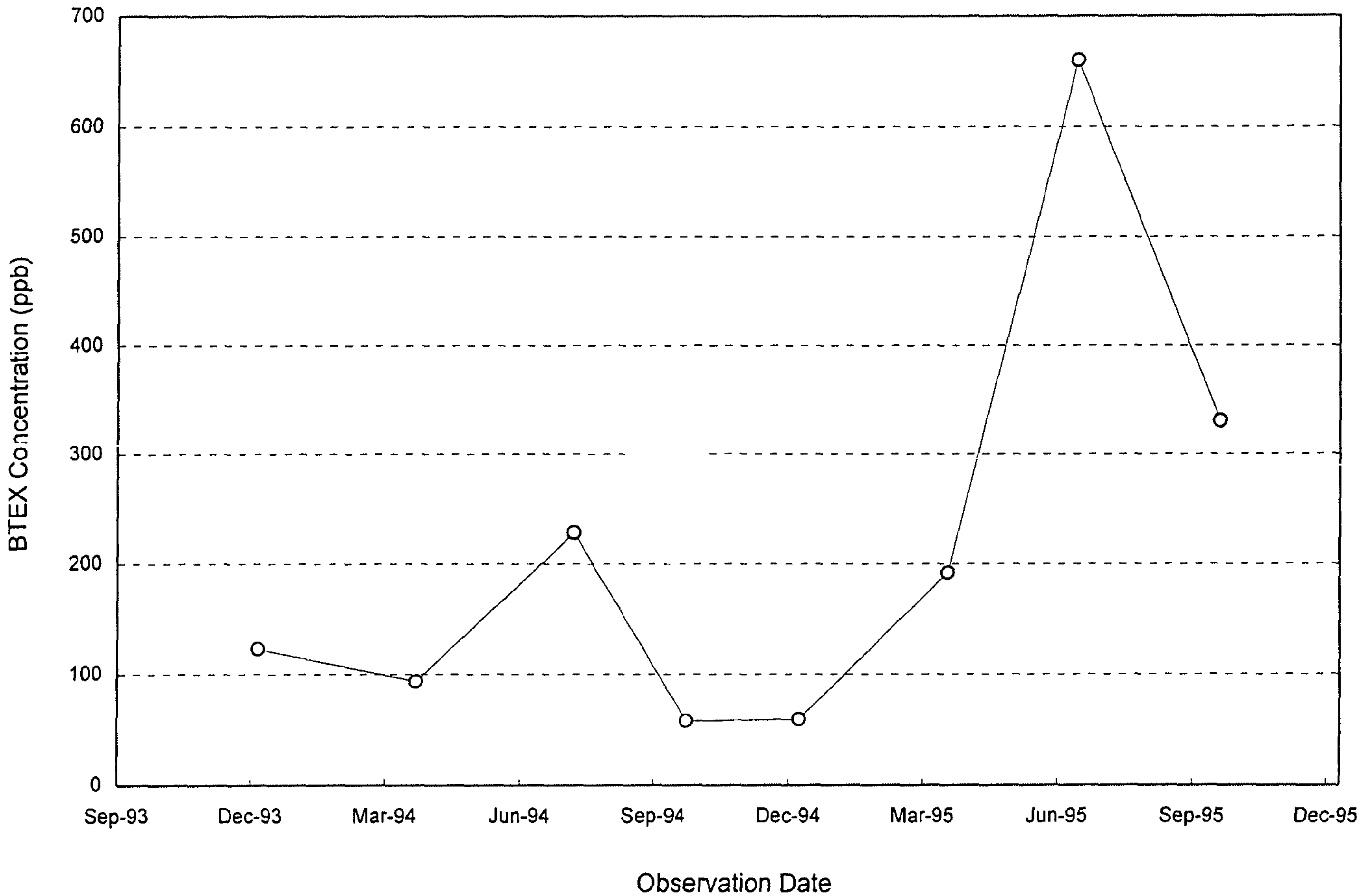

G:\REXWORK\FIGS.XLS

## Groundwater Monitoring Wells
## Total BTEX Concentration vs Time (MW-5)



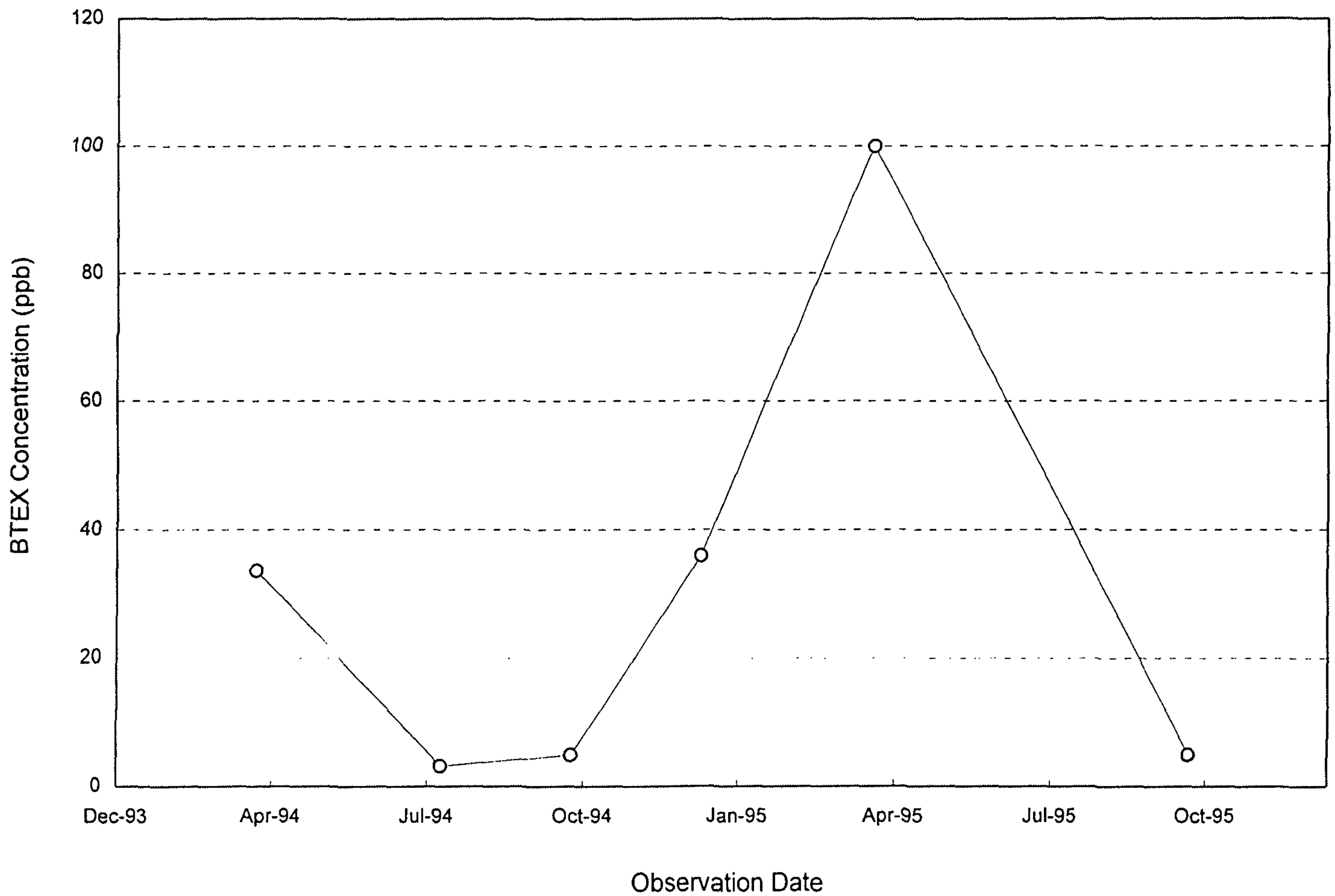

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total BTEX Concentration vs Time (MW-6S)**



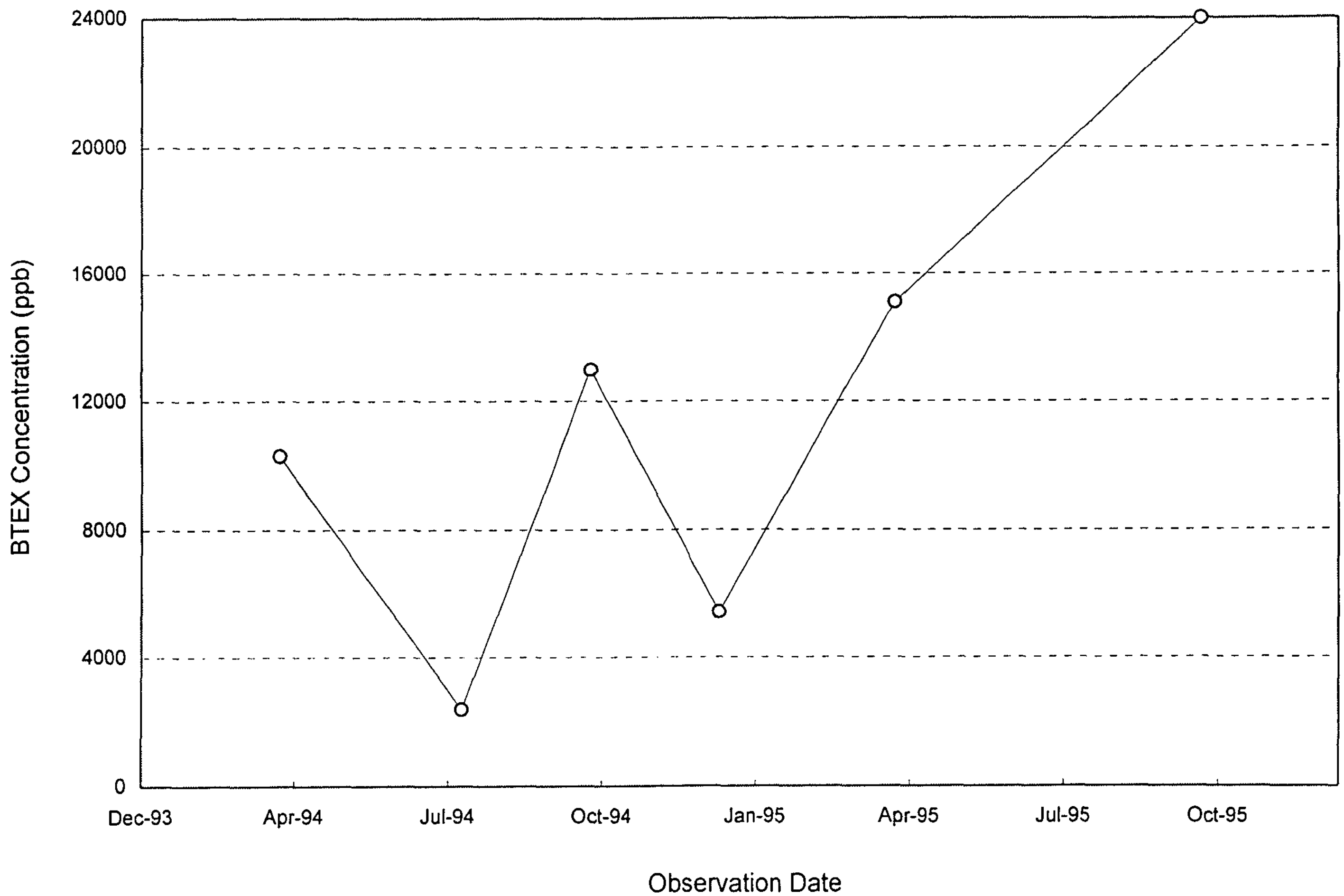

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
***Total BTEX Concentration vs Time (MW-7)***



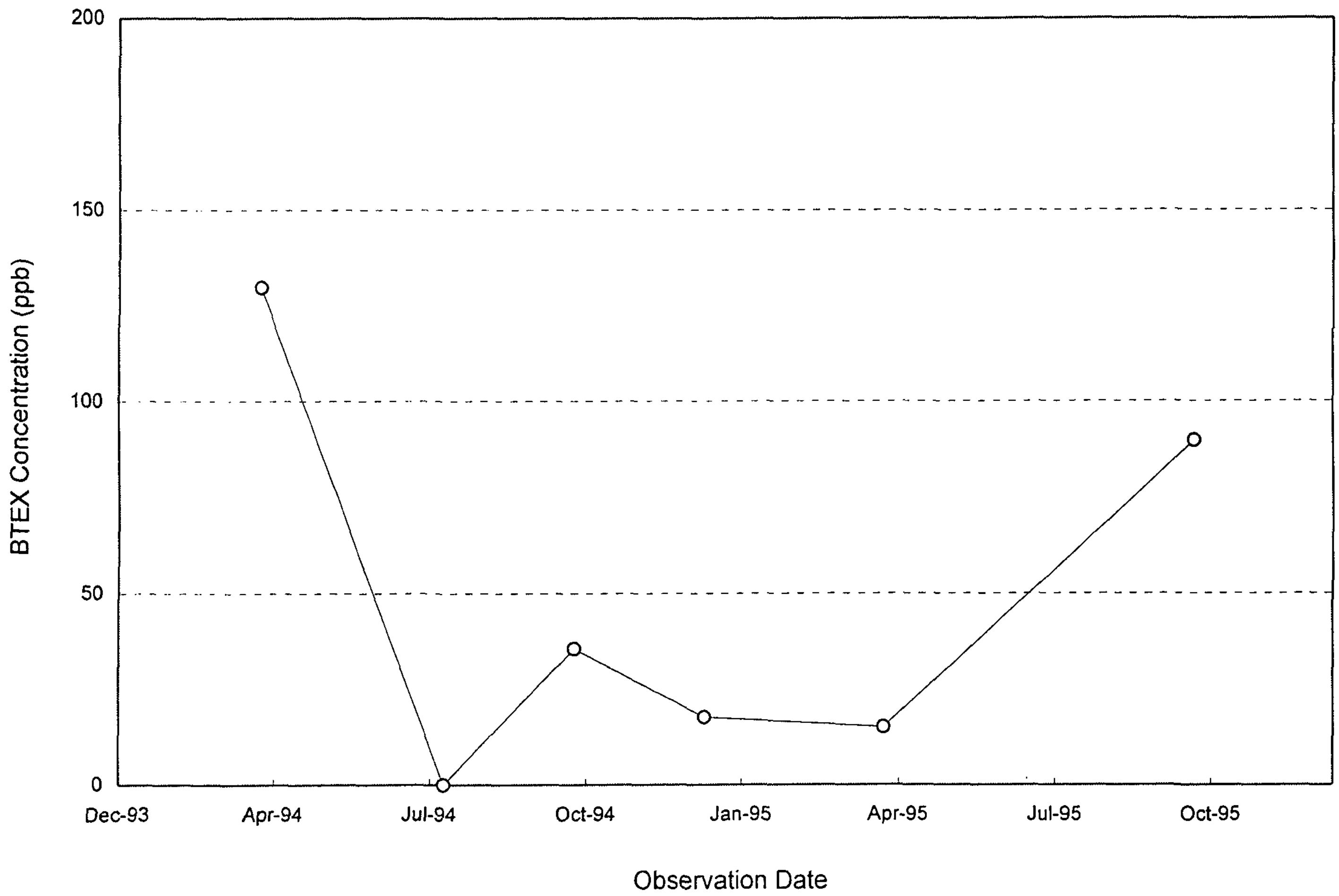

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total BTEX Concentration vs Time (MW-8)**



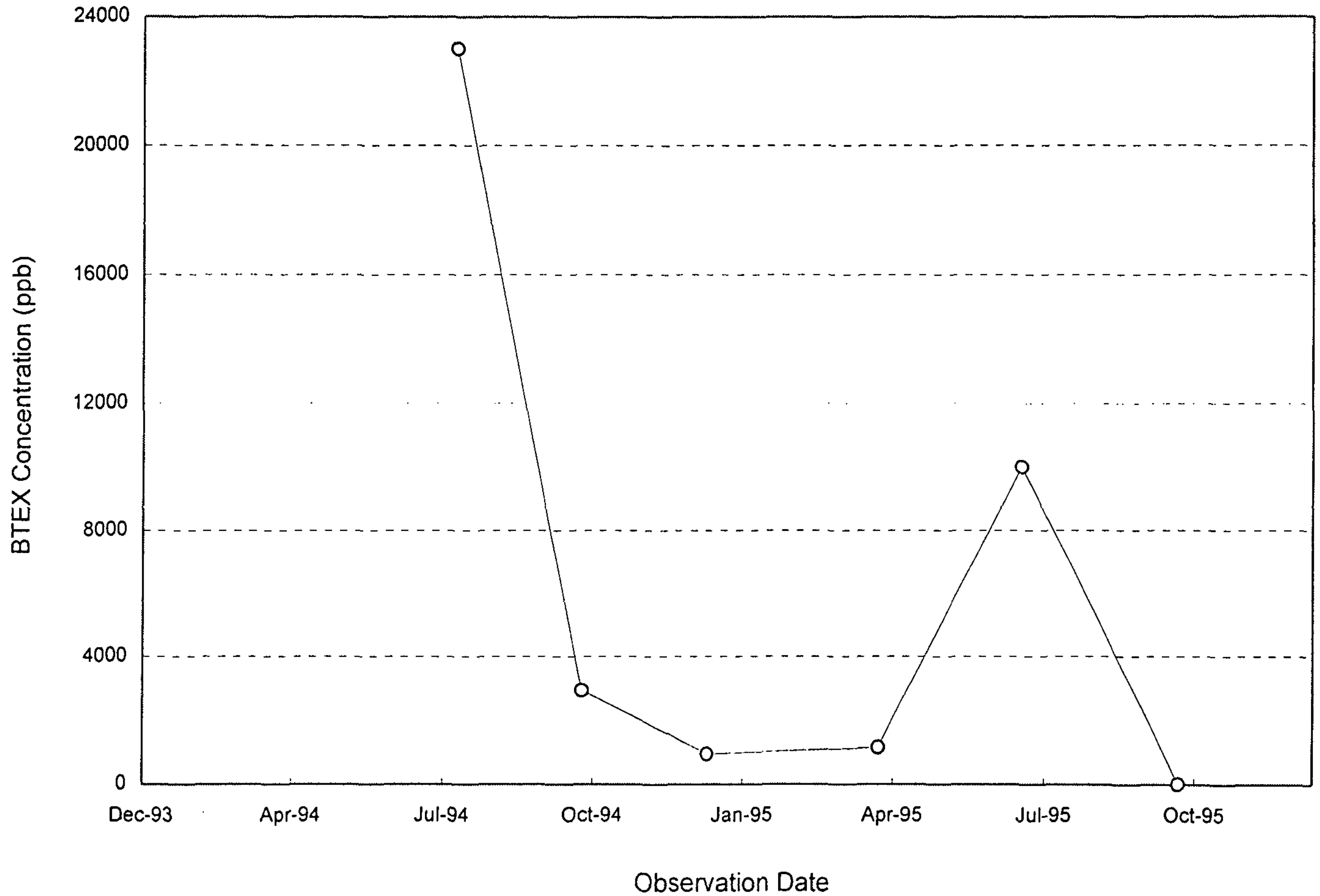

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total BTEX Concentration vs Time (MW-11)**



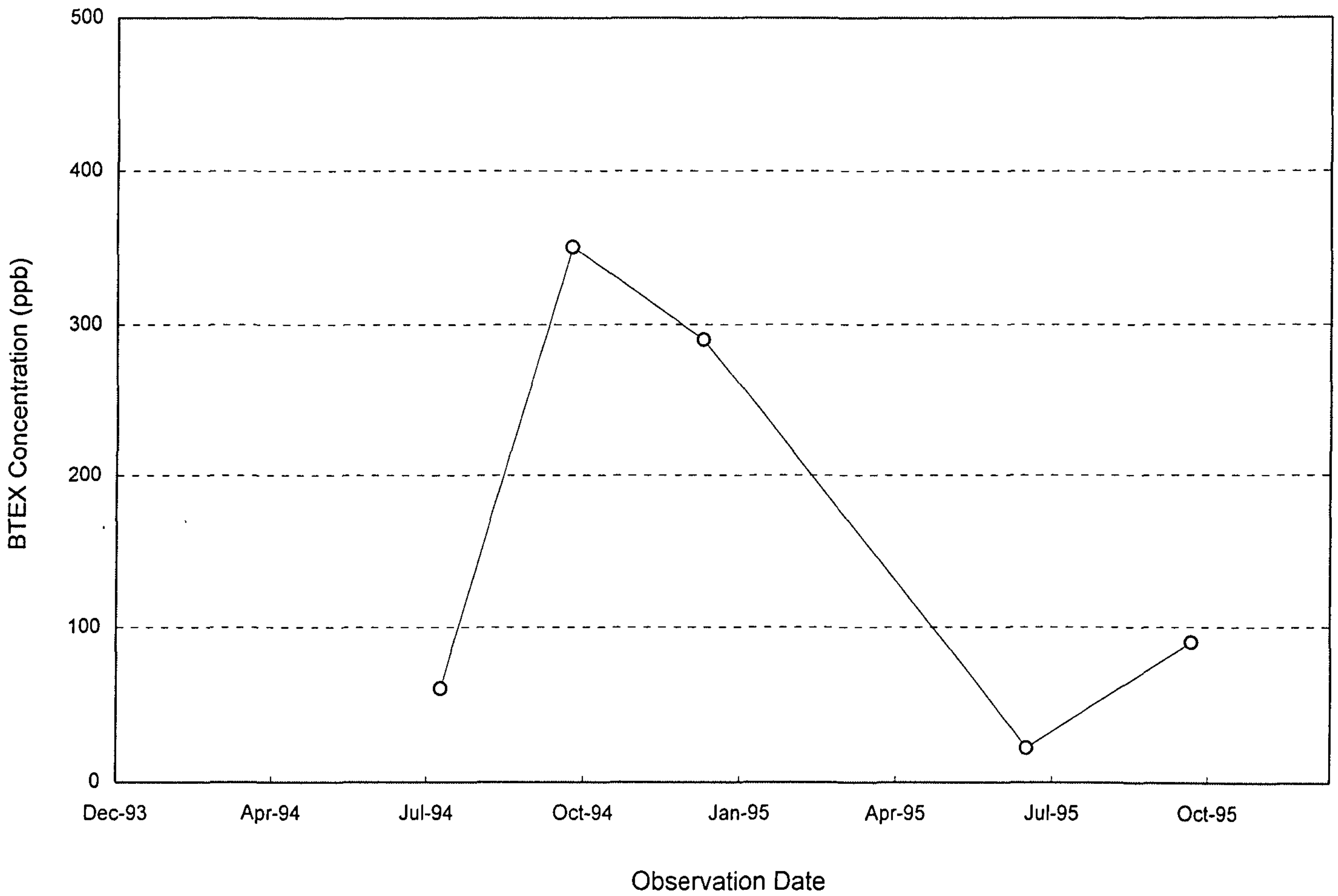

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total BTEX Concentration vs Time (MW-14)**



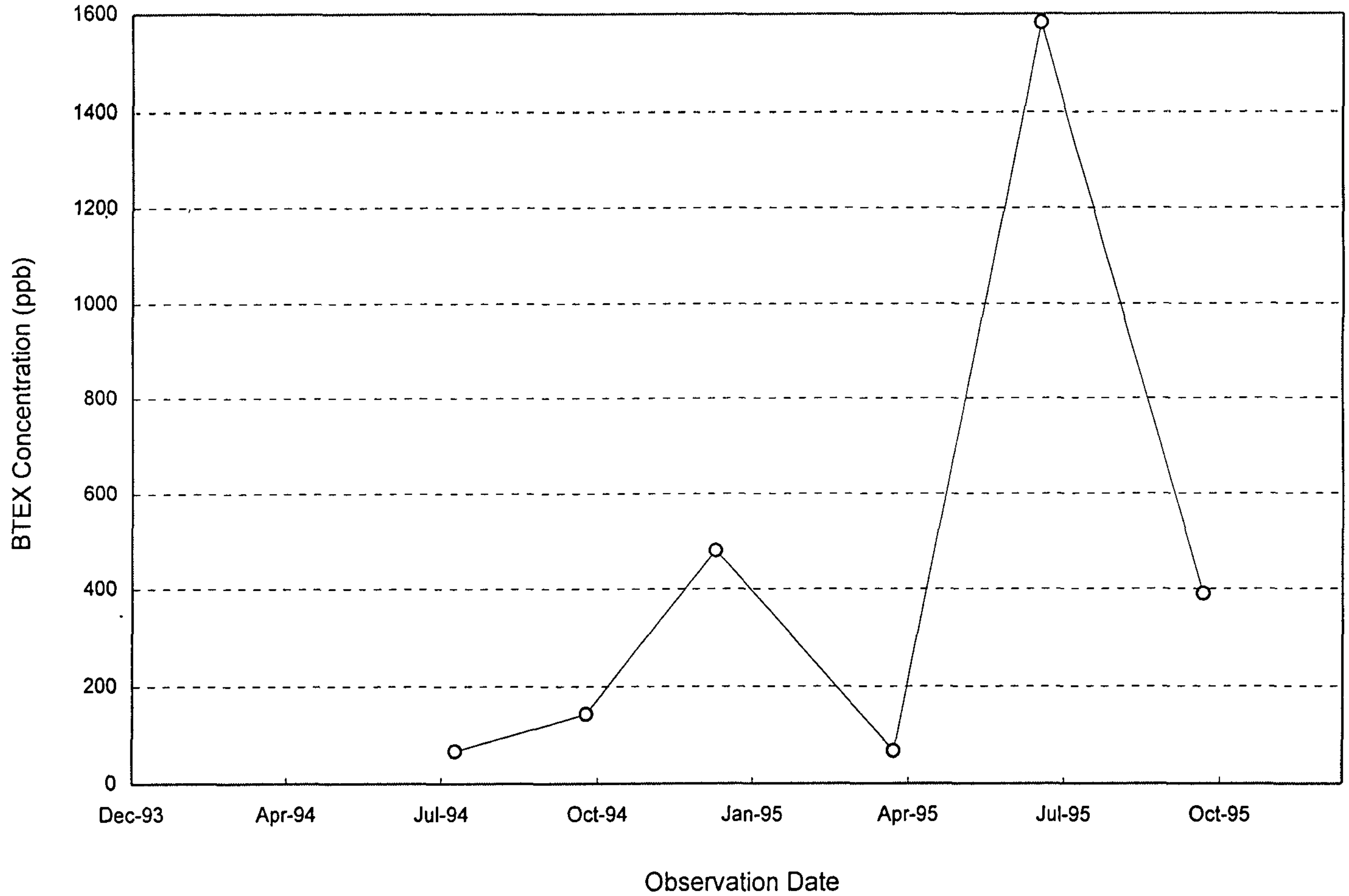

G:\REXWORK\FIGS.XLS

## Groundwater Monitoring Wells
## Total BTEX Concentration vs Time (MW-15)




G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total BTEX Concentration vs Time (MW-17)**




G:\REXWORK\FIGS.XLS

## Appendix G

PAH Analytical Results for Monitoring Wells

Groundwater Monitoring Wells
PAH Analytical Results ($\mu g/L$) from December 1993 Sampling Event

| Well ID | Analytes Detected | Results ($\mu g/l$) | Total PAH |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-9S | ND | - | ND |
| MW-12 | ND | - | ND |

Note: $\mu g/L$ = Micrograms per liter
ND = Not Detected
MW-2, MW-4, MW-5, MW-6, MW-7, MW-8 and MW-11 were not sampled.

Groundwater Monitoring Wells
PAH Analytical Results ($\mu g/L$) from March 1994 Sampling Event

| Well ID | Analytes Detected | Results ($\mu g/l$) | Total PAH |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND,ND | - | ND,ND |
| MW-5 | 1-Methylnaphthalene<br>Naphthalene | 79<br>28 | 107 |
| MW-6S | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | 1-Methylnaphthalene<br>2-Methylnaphthalene<br>Naphthalene | 46<br>64<br>140 | 250 |
| MW-9S | ND | - | ND |
| MW-11 | 1-Methylnaphthalene | 29 | 29 |
| MW-12 | ND | - | ND |

Note: $\mu g/L$ = Micrograms per liter
ND = Not Detected
MW-6D was not sampled for PAH.

**Groundwater Monitoring Wells**
**PAH Analytical Results ($\mu g/L$) from June 1994 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu g/l$) | Total PAH |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND | - | ND |
| MW-5 | 1-Methylnaphthalene | 78 | 117 |
| | 2-Methylnaphthalene | 12 | |
| | Naphthalene | 27 | |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | Naphthalene | 93 | 93 |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-12 | ND | - | ND |
| MW-14 | 1-Methylnaphthalene | 160 | 570 |
| | 2-Methylnaphthalene | 180 | |
| | Naphthalene | 230 | |
| MW-15 | 1-Methylnaphthalene | 61 | 117 |
| | 2-Methylnaphthalene | 41 | |
| | Naphthalene | 15 | |
| MW-16 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu g/L$ = Micrograms per liter
ND = Not Detected

**Groundwater Monitoring Wells**
**PAH Analytical Results ($\mu$g/L) from September 1994 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total PAH |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND | - | ND |
| MW-5 | 1-Methylnaphthalene | 110 | 191 |
| | 2-Methylnaphthalene | 32 | |
| | Naphthalene | 49 | |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | 1-Methylnaphthalene | 61 | 366 |
| | 2-Methylnaphthalene | 75 | |
| | Naphthalene | 230 | |
| MW-9S | ND | - | ND |
| MW-11 | Fluorene | 12 | 233 |
| | 1-Methylnaphthalene | 120 | |
| | 2-Methylnaphthalene | 18 | |
| | Naphthalene | 35 | |
| | Phenanthrene | 32 | |
| | Pyrene | 16 | |
| MW-12 | ND | - | ND |
| MW-14 | 1-Methylnaphthalene | 26 | 40 |
| | 2-Methylnaphthalene | 14 | |
| MW-15 | 1-Methylnaphthalene | 62 | 126 |
| | 2-Methylnaphthalene | 11 | |
| | Naphthalene | 53 | |
| MW-16 | ND | - | ND |
| MW-17 | 1-Methylnaphthalene | 20,14 | 58,37 |
| | 2-Methylnaphthalene | 14,10 | |
| | Naphthalene | 24,13 | |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected
20,14 = Duplicate samples

G:\REXWORK\TABLES.XLS

**Groundwater Monitoring Wells**
**PAH Analytical Results ($\mu$g/L) from December 1994 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total PAH |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND | - | ND |
| MW-5 | 1-Methylnaphthalene | 71 | 139 |
| | 2-Methylnaphthalene | 22 | |
| | Naphthalene | 46 | |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | 1-Methylnaphthalene | 42 | 236 |
| | 2-Methylnaphthalene | 54 | |
| | Naphthalene | 140 | |
| MW-9S | ND | - | ND |
| MW-11 | 1-Methylnaphthalene | 69 | 148 |
| | Phenanthrene | 21 | |
| | Pyrene | 58 | |
| MW-12 | ND | - | ND |
| MW-14 | ND | - | ND |
| MW-15 | 1-Methylnaphthalene | 47 | 84 |
| | Naphthalene | 37 | |
| MW-16 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected

**Groundwater Monitoring Wells**
**PAH Analytical Results ($\mu$g/L) from March 1995 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total PAH |
|---|---|---|---|
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-5 | 1-Methylnaphthalene | 65 | 117 |
| | 2-Methylnaphthalene | 15 | |
| | Naphthalene | 37 | |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-8 | 1-Methylnaphthalene | 50 | 180 |
| | 2-Methylnaphthalene | 42 | |
| | Naphthalene | 88 | |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-14 | ND | - | ND |
| MW-15 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected
MW-1, MW-2, MW-4, MW-7, MW-12 and MW-16 were not sampled for PAH.

**Groundwater Monitoring Wells**
**PAH Analytical Results ($\mu g/L$) from June 1995 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu g/l$) | Total PAH |
|---|---|---|---|
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-6S | Naphthalene | 15 | 15 |
| | Naphthalene | 10 | 10 |
| MW-6D | ND | - | ND |
| MW-9S | ND | - | ND |
| MW-14 | 1-Methylnaphthalene | 12 | 12 |
| MW-15 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu g/L$ = Micrograms per liter
ND = Not Detected
MW-1, MW-2, MW-4, MW-5, MW-7, MW-8, MW-11, MW-12 and MW-16 were not sampled for PAH.

Groundwater Monitoring Wells
PAH Analytical Results ($\mu$g/L) from September 1995 Sampling Event

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total PAH |
|---|---|---|---|
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-5 | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-8 | Naphthalene | 140 | 140 |
| MW-9S | ND | - | ND |
| MW-11 | 1-Methylnaphthalene | 140 | 140 |
| MW-14 | ND | - | ND |
| MW-15 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected
MW-1, MW-2, MW-4, MW-7, MW-12 and MW-16 were not sampled for PAH.

**Brickland Refinery Site PAH Sample Analytes and Detection Limits for EPA Method 8270**

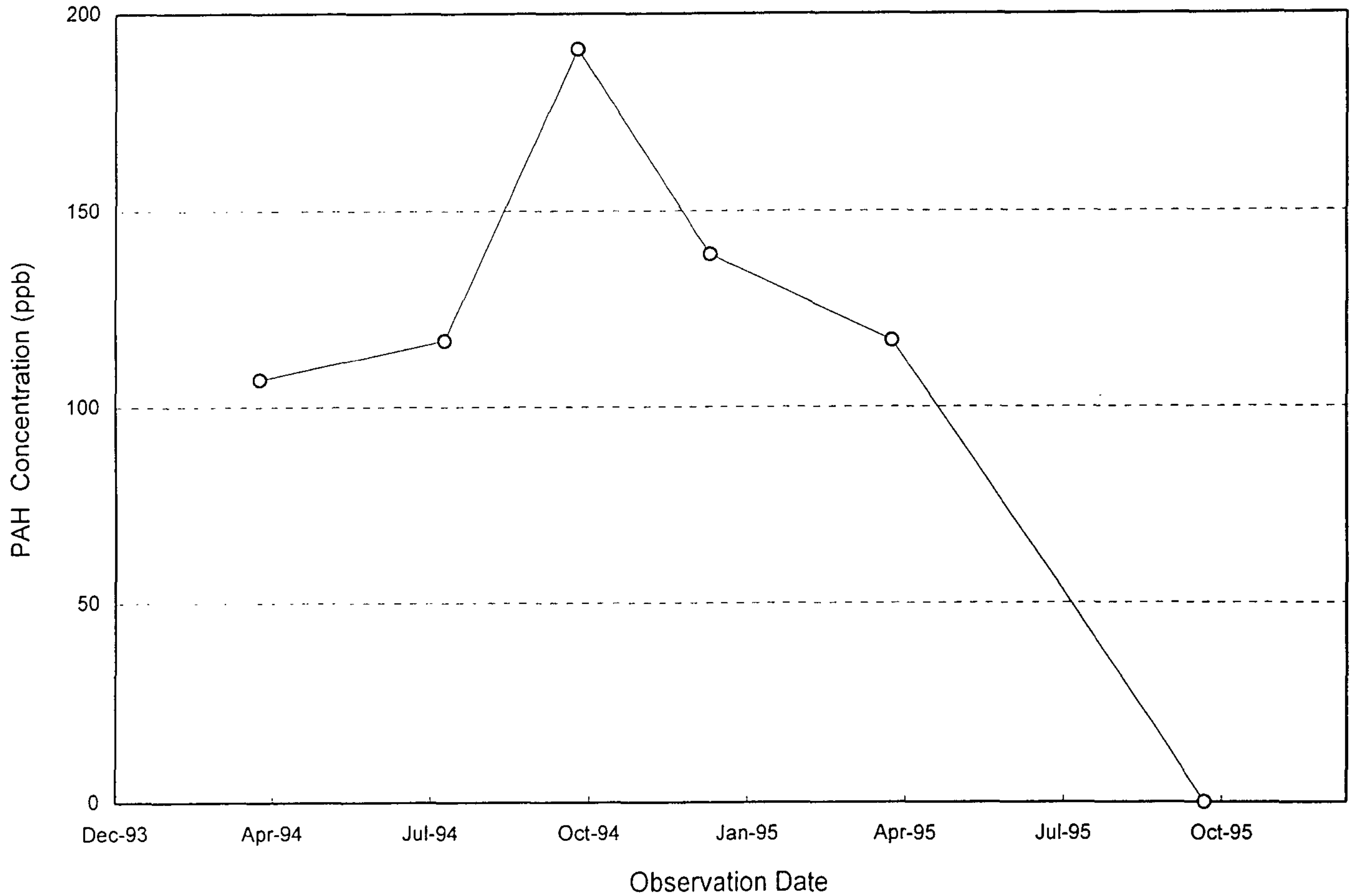
| Analyte | Detection Limits($\mu g/L$) |
|---|---|
| Acenaphthene | 10 |
| Acenaphthylene | 10 |
| Anthracene | 10 |
| Benzo(a)anthracene | 10 |
| Benzo(b)fluoranthene | 10 |
| Benzo(k)fluoranthene | 10 |
| Benzo(g,h,i)perylene | 10 |
| Benzo(a)pyrene | 10 |
| Chrysene | 10 |
| Dibenzo(a,h)anthracene | 10 |
| Fluoranthene | 10 |
| Fluorene | 10 |
| Indeno(1,2,3-cd)pyrene | 10 |
| 1-Methylnaphthalene | 10 |
| 2-Methylnaphthalene | 10 |
| Naphthalene | 10 |
| Phenanthrene | 10 |
| Pyrene | 10 |

Note: $\mu g/L$ = Micrograms per liter

**Appendix H**

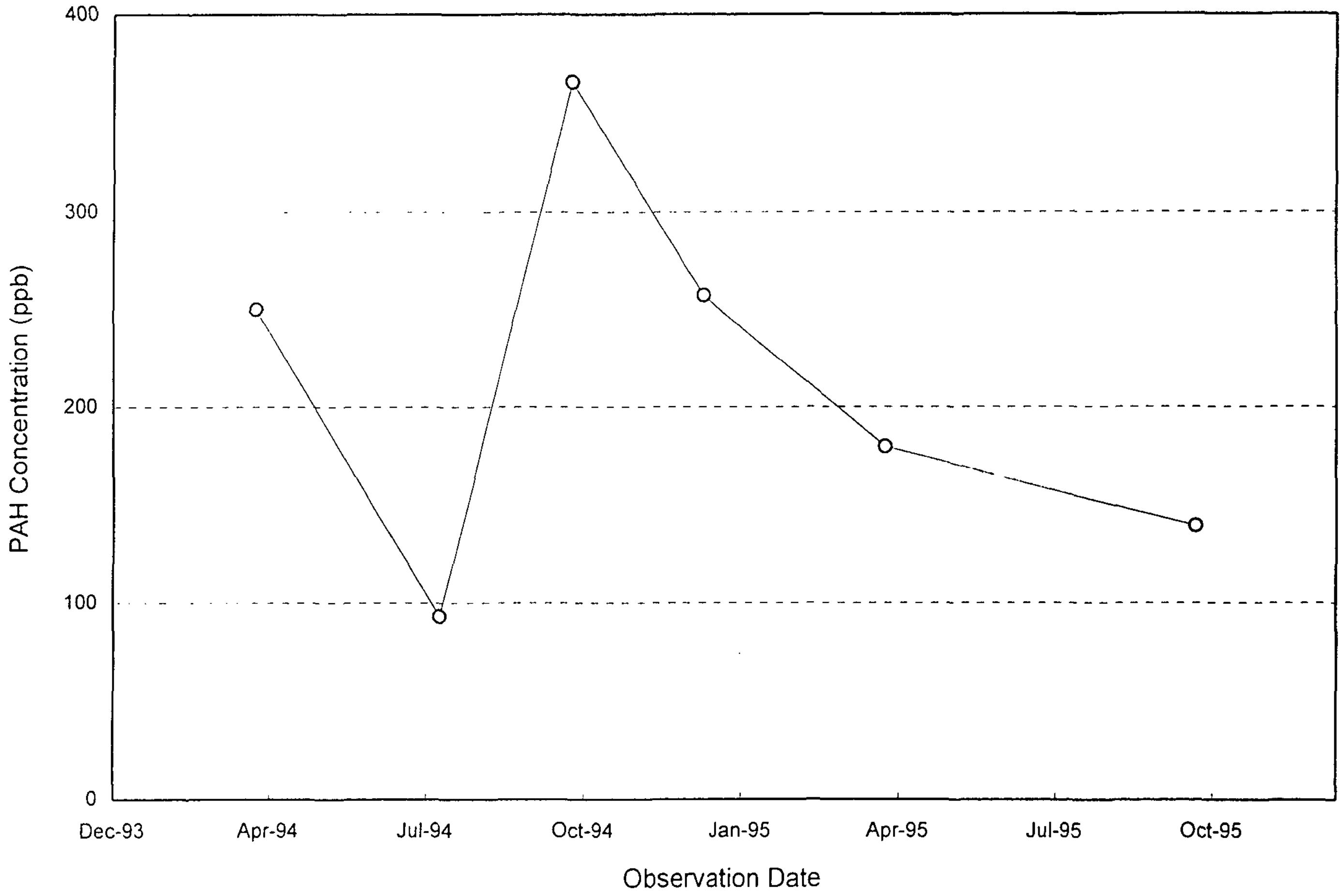
Total PAH Concentration vs. Time for Selected Monitoring Wells

**Groundwater Monitoring Wells**
**Total PAH Concentration vs. Time (MW-5)**



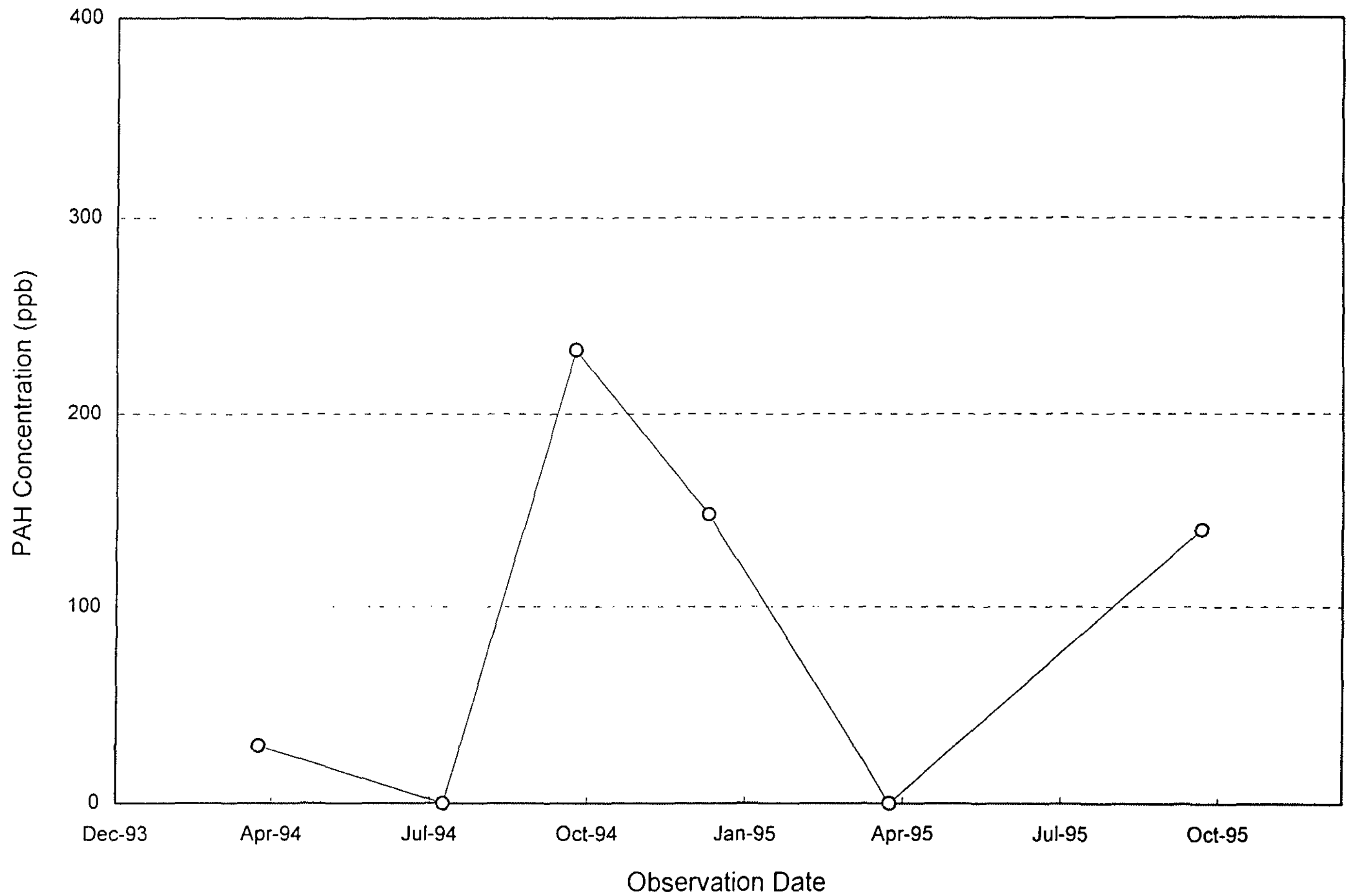

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total PAH Concentration vs. Time (MW-8)**



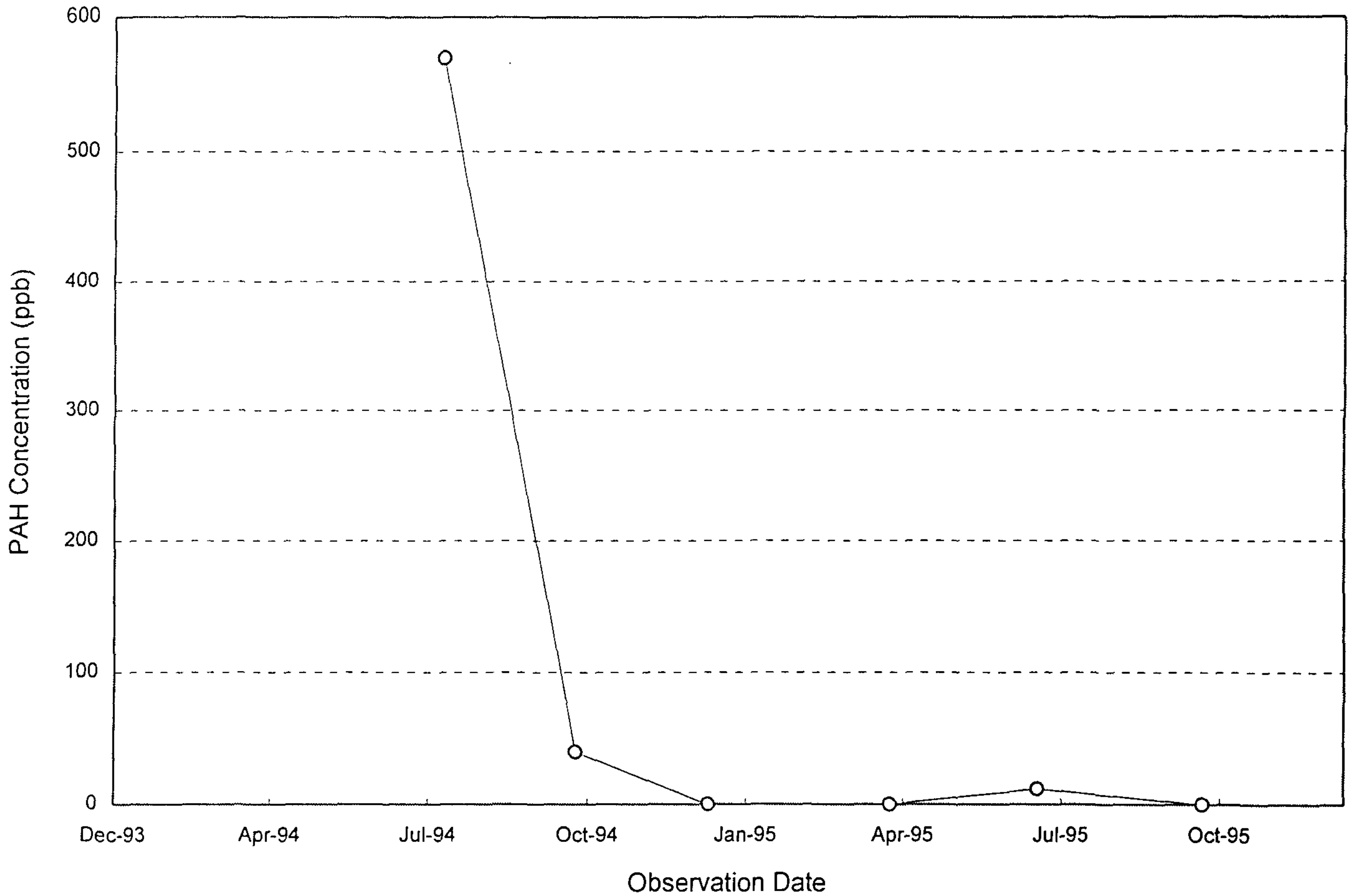

G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total PAH Concentration vs. Time (MW-11)**



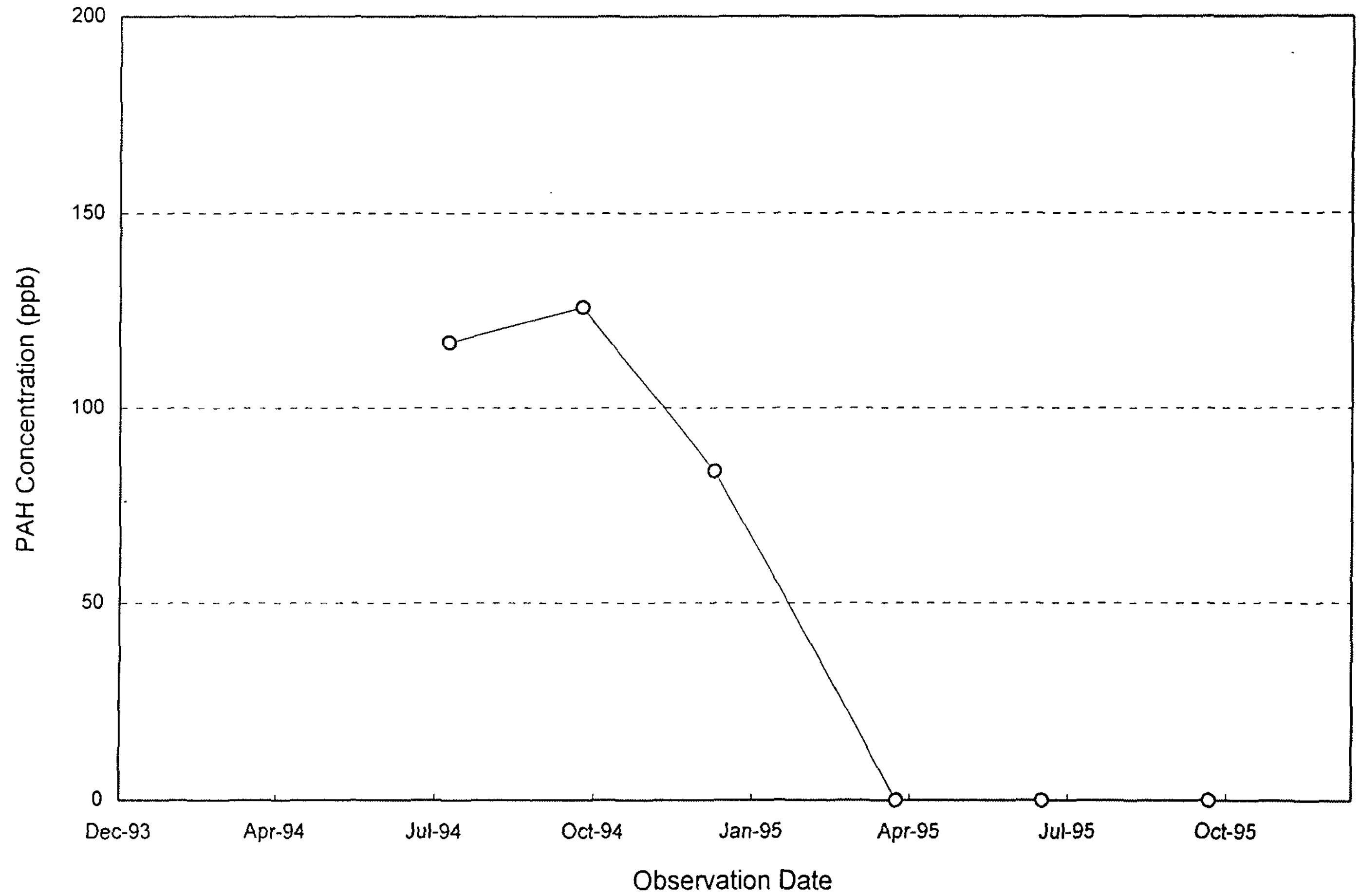

G:\REXWORK\FIGS.XLS

## Groundwater Monitoring Wells
## Total PAH Concentration vs. Time (MW-14)




G:\REXWORK\FIGS.XLS

**Groundwater Monitoring Wells**
**Total PAH Concentration vs. Time (MW-15)**




G:\REXWORK\FIGS.XLS

## Appendix I

Phenols Analytical Results for Monitoring Wells

**Groundwater Monitoring Wells**
**Phenols Analytical Results ($\mu$g/L) from March 1994 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total Phenols |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND,ND | - | ND,ND |
| MW-5 | 2,4-Dimethylphenol | 16 | 16 |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | 2,4-Dimethylphenol | 96 | 96 |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-12 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected

Groundwater Monitoring Wells
Phenols Analytical Results ($\mu$g/L) from June 1994 Sampling Event

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total Phenols |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND | - | ND |
| MW-5 | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | 2,4-Dimethylphenol<br>Phenol | 56<br>110 | 166 |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-12 | ND | - | ND |
| MW-14 | Phenol | 300 | 300 |
| MW-15 | ND | - | ND |
| MW-16 | ND,ND | - | ND,ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected

**Groundwater Monitoring Wells**
**Phenols Analytical Results ($\mu g/L$) from September 1994 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu g/l$) | Total Phenols |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | ND | - | ND |
| MW-5 | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | 2,4-Dimethylphenol | 110 | 110 |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-12 | ND | - | ND |
| MW-14 | Phenol | 20 | 20 |
| MW-15 | ND | - | ND |
| MW-16 | ND | - | ND |
| MW-17 | ND,ND | - | ND,ND |

Note: $\mu g/L$ = Micrograms per liter
ND = Not Detected

**Groundwater Monitoring Wells**
**Phenols Analytical Results ($\mu$g/L) from December 1994 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total Phenols |
|---|---|---|---|
| MW-1 | ND | - | ND |
| MW-2 | ND | - | ND |
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-4 | Phenol | 18 | 18 |
| MW-5 | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-7 | ND | - | ND |
| MW-8 | ND | - | ND |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-12 | ND | - | ND |
| MW-14 | Phenol | 54 | 54 |
| MW-15 | ND | - | ND |
| MW-16 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected

## Groundwater Monitoring Wells
## Phenols Analytical Results ($\mu$g/L) from March 1995 Sampling Event

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total Phenols |
|---|---|---|---|
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-5 | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-8 | 2,4-Dimethylphenol | 87 | 87 |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-14 | Phenol | 28 | 28 |
| MW-15 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected
MW-1, MW-2, MW-4, MW-7, MW-12 and MW-16 were not sampled for Phenols.

**Groundwater Monitoring Wells**
**Phenols Analytical Results ($\mu$g/L) from June 1995 Sampling Event**

| Well ID | Analytes Detected | Results ($\mu$g/l) | Total Phenols |
|---|---|---|---|
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-9S | ND | - | ND |
| MW-14 | Phenol | 19 | 19 |
| MW-15 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu$g/L = Micrograms per liter
ND = Not Detected
MW-1, MW-2, MW-4, MW-5, MW-7, MW-8, MW-11, MW-12 and MW-16 were not sampled for Phenols.

Groundwater Monitoring Wells
Phenols Analytical Results ($\mu g/L$) from September 1995 Sampling Event

| Well ID | Analytes Detected | Results ($\mu g/l$) | Total Phenols |
|---|---|---|---|
| MW-3S | ND | - | ND |
| MW-3D | ND | - | ND |
| MW-5 | ND | - | ND |
| MW-6S | ND | - | ND |
| MW-6D | ND | - | ND |
| MW-8 | ND | - | ND |
| MW-9S | ND | - | ND |
| MW-11 | ND | - | ND |
| MW-14 | ND | - | ND |
| MW-15 | ND | - | ND |
| MW-17 | ND | - | ND |

Note: $\mu g/L$ = Micrograms per liter
ND = Not Detected
MW-1, MW-2, MW-4, MW-7, MW-12 and MW-16 were not sampled for Phenols.

**Brickland Refinery Site Phenols Sample Analytes and Detection Limits for EPA Method 8270**

| Analyte | Detection Limits (μg/L) |
|---|---|
| 2,4,6-Trichlorophenol | 10 |
| 2,4-Dichlorophenol | 10 |
| 2,4-Dimethylphenol | 10 |
| 2,4-Dinitrophenol | 50 |
| 2-Chlorophenol | 10 |
| 2-Nitrophenol | 10 |
| 4,6-Dinitro-2-methylphenol | 50 |
| 4-Chloro-3-methylphenol | 10 |
| 4-Nitrophenol | 50 |
| Pentachlorophenol | 50 |
| Phenol | 10 |

Note: μg/L = Micrograms per liter

# Appendix J

WQCC Metals and Inorganics Analytical Results

## Groundwater Monitoring Wells
## WQCC Metals Analytical Results (mg/L) from December 1993 Sampling Event

| Well ID | Aluminum | Arsenic | Barium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | 5.0 | 0.1 | 1.0 | 0.01 | ND | ND | 1.0 | 1.0 | ND | 0.2 | 0.002 | ND | 0.2 | ND | 0.1 | 10.0 |
| Detection Limit | 0.05 | 0.05 | 0.01 | 0.005 | 0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.0002 | 0.05 | 0.04 | 0.1 | 0.01 | 0.01 |
| MW-1 | NA | 0.07 | 0.14 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-3S | NA | ND | 0.08 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | 0.1 | ND | NA |
| MW-3D | NA | ND | 0.04 | ND | ND | ND | 0.02 | NA | ND | NA | ND | ND | 0.04 | 0.1 | ND | 0.01 |
| MW-6S | NA | ND | 0.04 | ND | ND | ND | 0.02 | NA | ND | NA | ND | ND | 0.04 | 0.1 | ND | 0.01 |
| MW-6D | NA | ND | 0.05 | 0.029 | ND | ND | 0.02 | NA | ND | NA | ND | ND | 0.04 | ND | ND | 0.02 |
| MW-9S | NA | ND | 0.07 | 0.014 | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | 0.01 |
| MW-12 | NA | ND | 0.04 | 0.005 | ND | ND | ND | NA | ND | NA | ND | ND | 0.05 | ND | 0.03 | ND |

Note: ND = Not Detected
NA = Not Analyzed
mg/L = Milligrams per liter
MW-2, MW-4, MW-5, MW-7, MW-8 and MW-11 were not sampled.

## Groundwater Monitoring Wells
## WQCC Metals Analytical Results (mg/L) from March 1994 Sampling Event

| Well ID | Aluminum | Arsenic | Barium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | 5.0 | 0.1 | 1.0 | 0.01 | 0.05 | 0.05 | 1.0 | 1.0 | 0.05 | 0.2 | 0.002 | 1.0 | 0.2 | 0.05 | 0.05 | 10.0 |
| Detection Limit | 0.05 | 0.05 | 0.01 | 0.005 | 0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.0002 | 0.05 | 0.04 | 0.1 | 0.01 | 0.01 |
| MW-1 | NA | 0.07 | 0.11 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-2 | NA | ND | 0.01 | ND | 0.01 | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-3S | NA | ND | 0.08 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-3D | NA | ND | 0.04 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-4 | NA | 0.07 | 0.05 | ND | 0.01 | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| | NA | ND | 0.05 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-5 | NA | ND | 0.31 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | 0.1 | ND | ND |
| MW-6S | NA | 0.27 | 1.07 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-6D | NA | ND | 0.02 | ND | ND | ND | ND | NA | ND | NA | ND | ND | 0.04 | ND | ND | ND |
| MW-7 | NA | 0.08 | 0.22 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | 0.01 |
| MW-8 | NA | 0.22 | 0.52 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | 0.2 | ND | 0.01 |
| MW-9S | NA | ND | 0.04 | ND | ND | ND | ND | NA | ND | NA | 0.0002 | ND | ND | ND | ND | ND |
| MW-11 | NA | 0.1 | 1.0 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | ND | ND | ND |
| MW-12 | NA | 0.08 | 0.03 | ND | ND | ND | ND | NA | ND | NA | ND | ND | ND | 0.2 | ND | 0.02 |

Note: ND = Not Detected
NA = Not Analyzed
mg/L = Milligrams per liter

**Groundwater Monitoring Wells**
**WQCC Metals Analytical Results (mg/L) from June 1994 Sampling Event**

| Well ID | Aluminum | Arsenic | Barium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | 5.0 | 0.1 | 1.0 | 0.01 | 0.05 | 0.05 | 1.0 | 1.0 | 0.05 | 0.2 | 0.002 | 1.0 | 0.2 | 0.05 | 0.05 | 10.0 |
| Detection Limit | 0.05 | 0.05 | 0.01 | 0.005 | 0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.0002 | 0.05 | 0.04 | 0.1 | 0.01 | 0.01 |
| MW-1 | 1.2 | ND | 0.18 | ND | ND | ND | 0.01 | 1.96 | ND | 1.42 | ND | ND | ND | ND | ND | 0.01 |
| MW-2 | ND | ND | ND | ND | ND | ND | ND | 1.83 | ND | 7.47 | ND | ND | ND | ND | ND | ND |
| MW-3S | 2.32 | ND | 0.13 | ND | ND | ND | 0.01 | 3.91 | ND | 1.12 | ND | ND | ND | ND | ND | 0.09 |
| MW-3D | 0.23 | ND | 0.04 | ND | ND | ND | ND | 2.41 | ND | 3.25 | ND | ND | ND | ND | ND | ND |
| MW-4 | ND | ND | 0.2 | ND | ND | ND | ND | 1.78 | ND | 3.21 | ND | ND | ND | ND | ND | ND |
| MW-5 | ND | ND | 0.25 | ND | ND | ND | ND | 0.06 | ND | 0.01 | ND | ND | ND | ND | ND | ND |
| MW-6S | 0.08 | 0.08 | 1.16 | ND | ND | ND | ND | 4.78 | ND | 1.08 | ND | ND | ND | ND | ND | ND |
| MW-6D | 0.06 | ND | 0.03 | ND | ND | ND | ND | 1.30 | ND | 4.20 | ND | ND | ND | ND | ND | ND |
| MW-7 | 0.07 | ND | 0.35 | ND | ND | ND | ND | 1.92 | ND | 0.80 | ND | ND | ND | ND | 0.01 | ND |
| MW-8 | 0.12 | 0.08 | 0.70 | ND | ND | ND | 0.01 | 5.79 | ND | 0.23 | ND | ND | ND | ND | ND | 0.02 |
| MW-9S | ND | ND | 0.04 | ND | ND | ND | ND | 4.80 | ND | 3.20 | ND | ND | ND | ND | ND | ND |
| MW-11 | 0.10 | 0.07 | 1.10 | 0.009 | ND | ND | 0.01 | 4.68 | ND | 0.67 | ND | ND | ND | ND | 0.01 | 0.01 |
| MW-12 | ND | ND | 0.02 | ND | ND | ND | ND | 3.89 | ND | 5.90 | ND | ND | ND | ND | ND | 0.01 |
| MW-14 | ND | 0.05 | 0.67 | ND | ND | ND | ND | 4.78 | ND | 4.13 | ND | ND | 0.07 | ND | ND | ND |
| MW-15 | 0.32 | ND | 0.28 | ND | ND | ND | ND | 0.52 | ND | 1.06 | ND | ND | ND | ND | ND | ND |
| MW-16 | ND | ND | 0.31 | ND | ND | ND | ND | ND | ND | 2.77 | ND | ND | ND | ND | ND | ND |
| MW-17 | 0.05 | ND | 1.24 | ND | ND | ND | ND | 0.21 | ND | 3.16 | ND | ND | 0.05 | ND | ND | ND |

Note: ND = Not Detected
mg/L = Milligrams per liter

**Groundwater Monitoring Wells**
**WQCC Metals Analytical Results (mg/L) from September 1994 Sampling Event**

| Well ID | Aluminum | Arsenic | Barium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | 5.0 | 0.1 | 1.0 | 0.01 | 0.05 | 0.05 | 1.0 | 1.0 | 0.05 | 0.2 | 0.002 | 1.0 | 0.2 | 0.05 | 0.05 | 10.0 |
| Detection Limit | 0.05 | 0.05 | 0.01 | 0.005 | 0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.0002 | 0.05 | 0.04 | 0.1 | 0.01 | 0.01 |
| MW-1 | 0.11 | ND | 0.13 | ND | ND | ND | ND | 0.08 | ND | 1.12 | ND | ND | ND | 0.1 | ND | ND |
| MW-2 | 0.12 | 0.05 | 0.03 | ND | ND | ND | ND | 0.05 | ND | 8.07 | ND | ND | ND | ND | ND | 0.03 |
| MW-3S | 0.19 | 0.08 | 0.08 | ND | ND | ND | ND | 0.16 | ND | 0.51 | ND | ND | ND | ND | ND | ND |
| MW-3D | 0.1 | ND | 0.06 | ND | ND | ND | ND | 0.1 | ND | 2.75 | ND | ND | ND | ND | 0.01 | 0.02 |
| MW-4 | 0.11 | 0.11 | 0.39 | ND | ND | ND | ND | 0.86 | ND | 3.21 | ND | ND | ND | ND | ND | 0.01 |
| MW-5 | 0.12 | 0.08 | 0.18 | ND | ND | ND | ND | 0.17 | ND | 0.03 | ND | ND | ND | ND | ND | 0.02 |
| MW-6S | 0.1 | 0.48 | 0.98 | ND | ND | ND | ND | 4.68 | ND | 0.59 | 0.0003 | ND | ND | ND | 0.01 | 0.02 |
| MW-6D | 0.09 | ND | 0.05 | ND | ND | ND | ND | 0.28 | ND | 3.1 | ND | ND | ND | ND | ND | 0.02 |
| MW-7 | 0.11 | 0.28 | 0.36 | ND | ND | ND | ND | 0.97 | ND | 0.87 | 0.0005 | ND | ND | ND | ND | ND |
| MW-8 | 0.21 | 0.18 | 0.74 | ND | ND | ND | 0.01 | 5.1 | ND | 0.18 | ND | ND | ND | ND | 0.01 | 0.03 |
| MW-9S | 0.12 | ND | 0.06 | 0.006 | ND | ND | ND | 4.66 | ND | 3.11 | ND | ND | ND | ND | 0.01 | 0.01 |
| MW-11 | 0.12 | 0.15 | 1.03 | 0.009 | ND | ND | ND | 4.27 | ND | 0.75 | 0.0003 | ND | ND | ND | ND | 0.01 |
| MW-12 | 0.23 | ND | 0.11 | 0.009 | 0.05 | ND | 0.01 | 5.85 | ND | 10.8 | ND | 0.05 | ND | 0.4 | 0.03 | 0.04 |
| MW-14 | 0.2 | 0.17 | 0.78 | ND | ND | ND | ND | 13.1 | ND | 7.59 | 0.0009 | ND | ND | ND | 0.02 | 0.02 |
| MW-15 | 0.42 | 0.14 | 0.78 | ND | ND | ND | ND | 2.33 | ND | 2.9 | ND | ND | ND | ND | 0.02 | 0.01 |
| MW-16 | 0.12 | 0.05 | 0.09 | ND | ND | ND | ND | 2.05 | ND | 5.21 | ND | ND | 0.06 | ND | ND | 0.02 |
| MW-17 | 0.22 | 0.16 | 2.11 | ND | ND | 0.03 | ND | 9.7 | ND | 8.48 | ND | ND | ND | ND | 0.02 | 0.02 |
| | 0.20 | 0.44 | 1.81 | ND | 0.01 | 0.03 | 0.01 | 9.41 | ND | 7.64 | ND | ND | ND | 0.01 | 0.02 | 0.02 |

Note: ND = Not Detected
mg/L = Milligrams per liter

## Groundwater Monitoring Wells
## WQCC Metals Analytical Results (mg/L) from December 1994 Sampling Event

| Well ID | Aluminum | Arsenic | Barium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | 5.0 | 0.1 | 1.0 | 0.01 | 0.05 | 0.05 | 1.0 | 1.0 | 0.05 | 0.2 | 0.002 | 1.0 | 0.2 | 0.05 | 0.05 | 10.0 |
| Detection Limit | 0.05 | 0.05 | 0.01 | 0.005 | 0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.0002 | 0.05 | 0.04 | 0.1 | 0.01 | 0.01 |
| MW-1 | 0.10 | ND | 0.12 | ND | ND | ND | 0.02 | 0.03 | ND | 0.21 | 0.0002 | ND | ND | ND | ND | ND |
| MW-2 | ND | ND | ND | ND | ND | ND | 0.01 | 0.18 | ND | 1.95 | ND | ND | ND | ND | ND | ND |
| MW-3S | 0.13 | ND | 0.08 | ND | ND | ND | 0.01 | 0.12 | ND | 0.06 | ND | ND | ND | ND | ND | ND |
| MW-3D | 0.09 | ND | 0.04 | 0.006 | ND | ND | 0.01 | 0.08 | ND | 1.27 | ND | ND | ND | ND | ND | ND |
| MW-4 | 0.12 | ND | 0.17 | ND | ND | ND | ND | 1.99 | ND | 2.43 | ND | ND | ND | ND | ND | ND |
| MW-5 | 0.06 | 0.13 | 0.22 | ND | ND | ND | ND | 0.09 | ND | 0.03 | ND | ND | ND | ND | ND | ND |
| MW-6S | 0.08 | 0.08 | 0.73 | ND | ND | ND | ND | 1.88 | ND | 0.46 | ND | ND | ND | ND | ND | 0.01 |
| MW-6D | 0.07 | ND | 0.03 | ND | ND | ND | 0.01 | 0.11 | ND | 2.19 | ND | ND | ND | ND | ND | ND |
| MW-7 | 0.10 | ND | 0.41 | ND | ND | ND | ND | 0.45 | ND | 0.64 | 0.0006 | ND | ND | ND | ND | ND |
| MW-8 | 0.19 | 0.14 | 0.68 | ND | ND | ND | 0.02 | 2.06 | ND | 0.18 | ND | ND | ND | ND | ND | ND |
| MW-9S | 0.06 | ND | 0.04 | 0.005 | ND | ND | ND | 2.25 | ND | 2.30 | ND | ND | ND | ND | ND | ND |
| MW-11 | 0.09 | 0.05 | 0.84 | ND | ND | ND | ND | 1.58 | ND | 0.51 | ND | ND | ND | ND | ND | ND |
| MW-12 | 0.08 | ND | 0.03 | ND | ND | ND | 0.02 | 1.10 | ND | 6.18 | ND | ND | ND | ND | ND | ND |
| MW-14 | 0.08 | ND | 0.22 | ND | ND | ND | ND | 10.3 | ND | 5.46 | 0.0024 | ND | ND | ND | ND | ND |
| MW-15 | 0.36 | ND | 0.38 | ND | ND | ND | ND | 3.69 | ND | 1.66 | ND | ND | ND | ND | 0.09 | ND |
| MW-16 | 0.11 | ND | 0.07 | ND | ND | ND | ND | 1.70 | ND | 4.15 | ND | ND | 0.05 | ND | ND | ND |
| MW-17 | 0.10 | ND | 0.42 | ND | ND | ND | ND | 8.47 | ND | 3.37 | ND | ND | ND | ND | ND | ND |

Note: ND = Not Detected
mg/L = Milligrams per liter

## Groundwater Monitoring Wells
## WQCC Metals Analytical Results (mg/L) from September 1995 Sampling Event

| Well ID | Aluminum | Arsenic | Barium | Cadmium | Chromium | Cobalt | Copper | Iron | Lead | Manganese | Mercury | Molybdenum | Nickel | Selenium | Silver | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | 5.0 | 0.1 | 1.0 | 0.01 | 0.05 | 0.05 | 1.0 | 1.0 | 0.05 | 0.2 | 0.002 | 1.0 | 0.2 | 0.05 | 0.05 | 10.0 |
| Detection Limit | 0.05 | 0.05 | 0.01 | 0.005 | 0.01 | 0.03 | 0.01 | 0.03 | 0.05 | 0.01 | 0.0002 | 0.05 | 0.04 | 0.1 | 0.01 | 0.01 |
| MW-14 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | ND | NA | NA | NA | NA | NA |

Note: ND = Not Detected
mg/L = Milligrams per liter
Only MW-14 was sampled for metals.

**Groundwater Monitoring Wells**
**Major Cations/Anions Analytical Results (mg/L) from March 1994 Sampling Event**

| Well ID | Calcium | Magnesium | Potassium | Sodium | Bicarbonate | Chloride | Nitrate (N) | Sulfate |
|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | None | None | None | None | None | 250 | 10 | 600 |
| Detection Limit | 1.0 | 0.1 | 0.1 | 5.0 | 5.0 | 25 | 0.1 | 50 |
| MW-1 | 109 | 27.2 | 14 | 175 | 456 | 133 | ND | 123 |
| MW-2 | 1130 | 401 | 72 | 3750 | 728 | 5680 | ND | 2280 |
| MW-3S | 143 | 70.6 | 13.3 | 1390 | 624 | 2030 | ND | 720 |
| MW-3D | 473 | 246 | 36 | 3830 | 468 | 4720 | ND | 2630 |
| MW-4 | 740 | 262 | 57 | 2920 | 924 | 4010 | ND | 1820 |
| | 755 | 247 | 69 | 2930 | 908 | 4330 | ND | 2100 |
| MW-5 | 402 | 180 | 24.2 | 2880 | 1860 | 5280 | ND | 505 |
| MW-6S | 244 | 104 | 19.4 | 1550 | 1690 | 5280 | ND | 505 |
| MW-6D | 510 | 218 | 25 | 3520 | 475 | 5600 | ND | 2360 |
| MW-7 | 300 | 72.3 | 22.1 | 1620 | 1320 | 2220 | ND | 755 |
| MW-8 | 46.5 | 33.9 | 10.2 | 1560 | 2680 | 1210 | ND | 20 |
| MW-9S | 305 | 104 | 13.7 | 1450 | 628 | 1280 | ND | 1800 |
| MW-11 | 79 | 62.3 | 18.3 | 1050 | 1620 | 959 | 0.2 | ND |
| MW-12 | 1380 | 495 | 55 | 4340 | 532 | 8260 | ND | 1920 |

Note: ND = Not Detected
mg/L = Milligrams per liter

Groundwater Monitoring Wells
Major Cations/Anions Analytical Results (mg/L) from June 1994 Sampling Event

| Well ID | Calcium | Magnesium | Potassium | Sodium | Bicarbonate | Chloride | Nitrate (N) | Sulfate |
|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | None | None | None | None | None | 250 | 10 | 600 |
| Detection Limit | 1.0 | 0.1 | 0.1 | 5.0 | 5.0 | 25 | 0.1 | 50 |
| MW-1 | 106 | 31.0 | 13.7 | 105 | 488 | 39.3 | 0.3 | 150 |
| MW-2 | 1080 | 500 | 125 | 3040 | 769 | 6770 | 0.3 | 2790 |
| MW-3S | 157 | 75.9 | 28 | 1040 | 756 | 2630 | 0.4 | 1010 |
| MW-3D | 460 | 220 | 61 | 2760 | 473 | 6560 | 0.1 | 2550 |
| MW-4 | 430 | 217 | 66 | 2050 | 1350 | 4300 | 2.8 | 932 |
| MW-5 | 500 | 160 | 58 | 2230 | 1710 | 5450 | 0.3 | 962 |
| MW-6S | 259 | 101 | 40 | 1120 | 2020 | 2090 | 0.4 | 84 |
| MW-6D | 530 | 188 | 62 | 3100 | 739 | 3990 | 10 | 2420 |
| MW-7 | 248 | 66.8 | 37 | 710 | 1330 | 1210 | 0.3 | 575 |
| MW-8 | 89.9 | 36.1 | 20.0 | 1150 | 2670 | 1380 | 0.5 | 60 |
| MW-9S | 245 | 87.3 | 27 | 1090 | 820 | 1350 | 1.4 | 2010 |
| MW-11 | 116 | 69.5 | 29 | 820 | 1830 | 927 | 1.3 | 18 |
| MW-12 | 910 | 380 | 76 | 3300 | 672 | 7200 | 0.2 | 2350 |
| MW-14 | 165 | 81.3 | 11.4 | 730 | 1490 | 910 | ND | 200 |
| MW-15 | 57.7 | 16.4 | 23 | 458 | 723 | 436 | ND | 294 |
| MW-16 | 237 | 96.7 | 35 | 1500 | 1100 | 1910 | ND | 1510 |
| | 243 | 99.5 | 30 | 1490 | 1090 | 1870 | ND | 1780 |
| MW-17 | 218 | 63.8 | 38 | 610 | 1100 | 1350 | 0.3 | 318 |

Note: ND = Not Detected
mg/L = Milligrams per liter

## Groundwater Monitoring Wells
## Major Cations/Anions Analytical Results (mg/L) from September 1994 Sampling Event

| Well ID | Calcium | Magnesium | Potassium | Sodium | Bicarbonate | Chloride | Nitrate (N) | Sulfate |
|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | None | None | None | None | None | 250 | 10 | 600 |
| Detection Limit | 1.0 | 0.1 | 0.1 | 5.0 | 5.0 | 25 | 0.1 | 50 |
| MW-1 | 113 | 31.7 | 10.6 | 135 | 427 | 115 | ND | 136 |
| MW-2 | 985 | 470 | 98 | 3140 | 671 | 9600 | 0.3 | 2440 |
| MW-3S | 97.3 | 41.9 | 8.6 | 1050 | 692 | 1240 | 0.1 | 620 |
| MW-3D | 396 | 224 | 21 | 3230 | 460 | 4750 | ND | 2330 |
| MW-4 | 370 | 225 | 65 | 2340 | 1470 | 4360 | 0.4 | 364 |
| MW-5 | 620 | 186 | 60 | 3040 | 1630 | 4310 | ND | 904 |
| MW-6S | 155 | 125 | 25 | 2980 | 2550 | 1650 | ND | 130 |
| MW-6D | 411 | 190 | 21 | 3270 | 506 | 5000 | ND | 2150 |
| MW-7 | 320 | 73 | 41.5 | 1230 | 1300 | 1580 | 0.1 | 548 |
| MW-8 | 47.2 | 38.2 | 29.8 | 1550 | 2930 | 1450 | 0.1 | 73 |
| MW-9S | 322 | 95.6 | 32 | 1510 | 830 | 1500 | ND | 1760 |
| MW-11 | 201 | 72.2 | 39.4 | 950 | 2100 | 792 | 0.6 | 22 |
| MW-12 | 1380 | 585 | 104 | 4100 | 512 | 8860 | ND | 2140 |
| MW-14 | 625 | 154 | 42 | 1800 | 1160 | 3190 | ND | 986 |
| MW-15 | 99.1 | 16.8 | 23.1 | 950 | 2420 | 442 | 0.2 | 142 |
| MW-16 | 261 | 108 | 33.5 | 1510 | 1130 | 1950 | 0.9 | 2340 |
| MW-17 | 241 | 77 | 36.4 | 136 | 1590 | 2110 | 0.1 | 239 |
| | 237 | 76.3 | 36.7 | 800 | 1650 | 1930 | ND | 198 |

Note: ND = Not Detected
mg/L = Milligrams per liter

Groundwater Monitoring Wells
Major Cations/Anions Analytical Results (mg/L) from December 1994 Sampling Event

| Well ID | Calcium | Magnesium | Potassium | Sodium | Bicarbonate | Chloride | Nitrate (N) | Sulfate |
|---|---|---|---|---|---|---|---|---|
| NM WQCC Std. | None | None | None | None | None | 250 | 10 | 600 |
| Detection Limit | 1.0 | 0.1 | 0.1 | 5.0 | 5.0 | 25 | 0.1 | 50 |
| MW-1 | 86.9 | 25.8 | 5.7 | 137 | 464 | 116 | 0.3 | 139 |
| MW-2 | 950 | 391 | 37 | 3130 | 688 | 3240 | 0.3 | 2470 |
| MW-3S | 97.7 | 39.8 | 8.5 | 985 | 854 | 1250 | 0.3 | 573 |
| MW-3D | 367 | 207 | 17 | 3210 | 464 | 4800 | 0.7 | 2270 |
| MW-4 | 298 | 219 | 27 | 2360 | 1020 | 4680 | ND | 3060 |
| MW-5 | 503 | 184 | 21 | 3070 | 1830 | 2430 | 1.1 | 705 |
| MW-6S | 150 | 82.3 | 14 | 1840 | 2710 | 2180 | ND | 209 |
| MW-6D | 379 | 177 | 16 | 3410 | 525 | 5210 | 1 | 2490 |
| MW-7 | 229 | 77.4 | 15 | 1100 | 1500 | 1570 | 5.1 | 333 |
| MW-8 | 60 | 36.4 | 13.1 | 1870 | 2940 | 831 | 5.5 | 72 |
| MW-9S | 225 | 88.9 | 11 | 1520 | 866 | 1440 | 0.4 | 978 |
| MW-11 | 93.4 | 60.8 | 12 | 985 | 1980 | 924 | 0.2 | 35 |
| MW-12 | 975 | 366 | 27 | 4060 | 586 | 14000 | 3.1 | 2490 |
| MW-14 | 413 | 154 | 19 | 1720 | 1510 | 2430 | ND | 1460 |
| MW-15 | 68.5 | 18 | 11 | 1290 | 2700 | 379 | 0.2 | 92 |
| MW-16 | 224 | 98.3 | 15 | 1870 | 1160 | 1980 | ND | 1840 |
| MW-17 | 278 | 80 | 13 | 2090 | 1700 | 2430 | ND | 407 |

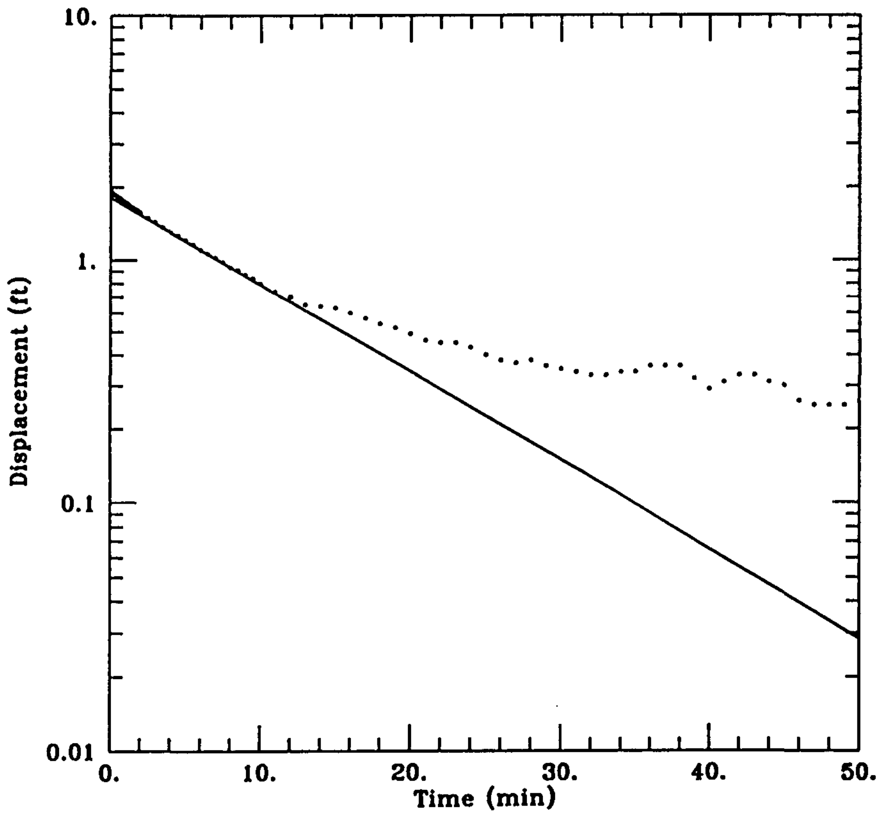
Note: ND = Not Detected
mg/L = Milligrams per liter

## Appendix K

Slug Test Results

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-1.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-1 (Falling-Head)

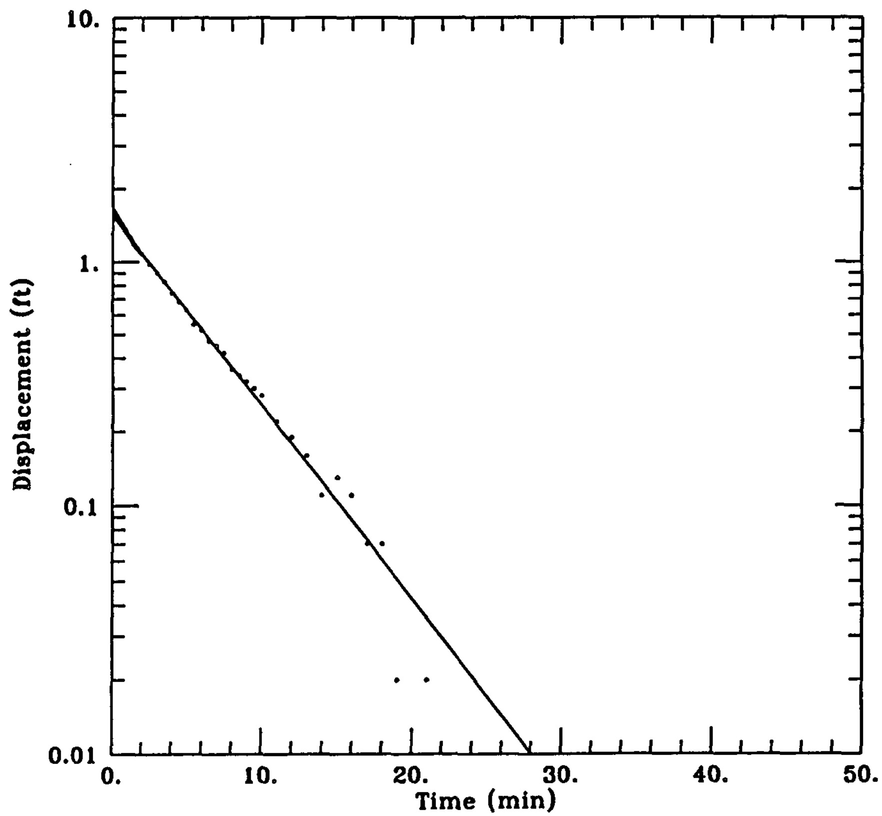
TEST DATA:
H0 = 1.94 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 12.26 ft

PARAMETER ESTIMATES:
K = 0.00069 ft/min
y0 = 1.81 ft

AQTESOLV

| Client: Rexene | Company: GCL |
|---|---|
| Location: Sunland Park, New Mexico | Project: 3031004 |

# Aquifer Slug Test




DATA SET:
MW-3S.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-3S (Falling-Head)

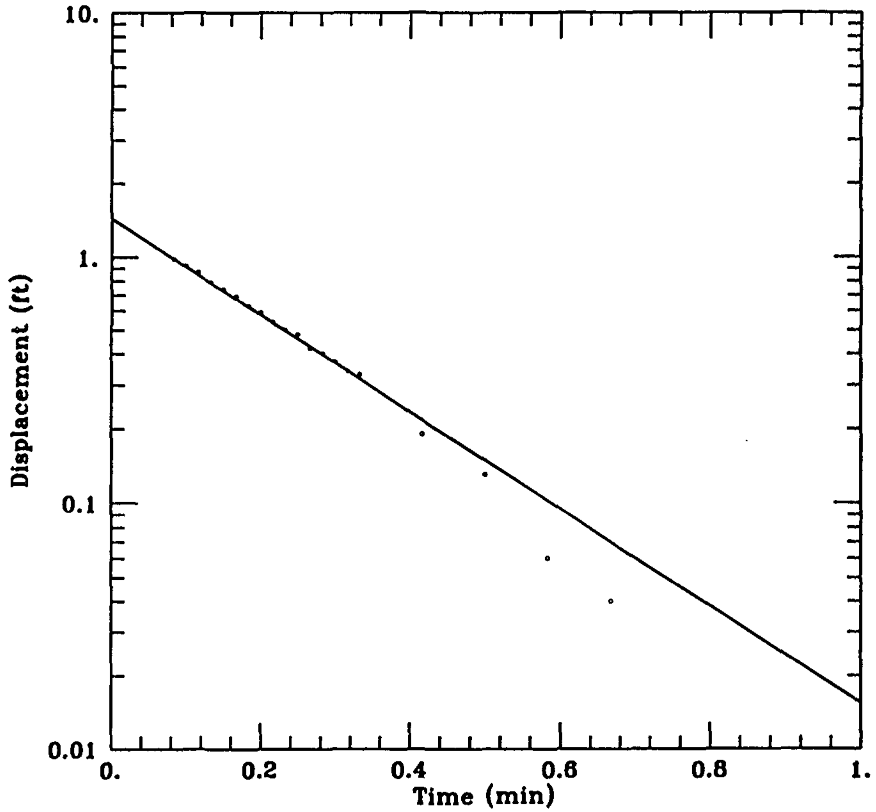
TEST DATA:
H0 = 1.64 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 12.59 ft

PARAMETER ESTIMATES:
K = 0.0015 ft/min
y0 = 1.55 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

## Aquifer Slug Test




DATA SET:
MW-3D.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-3D (Falling-Head)

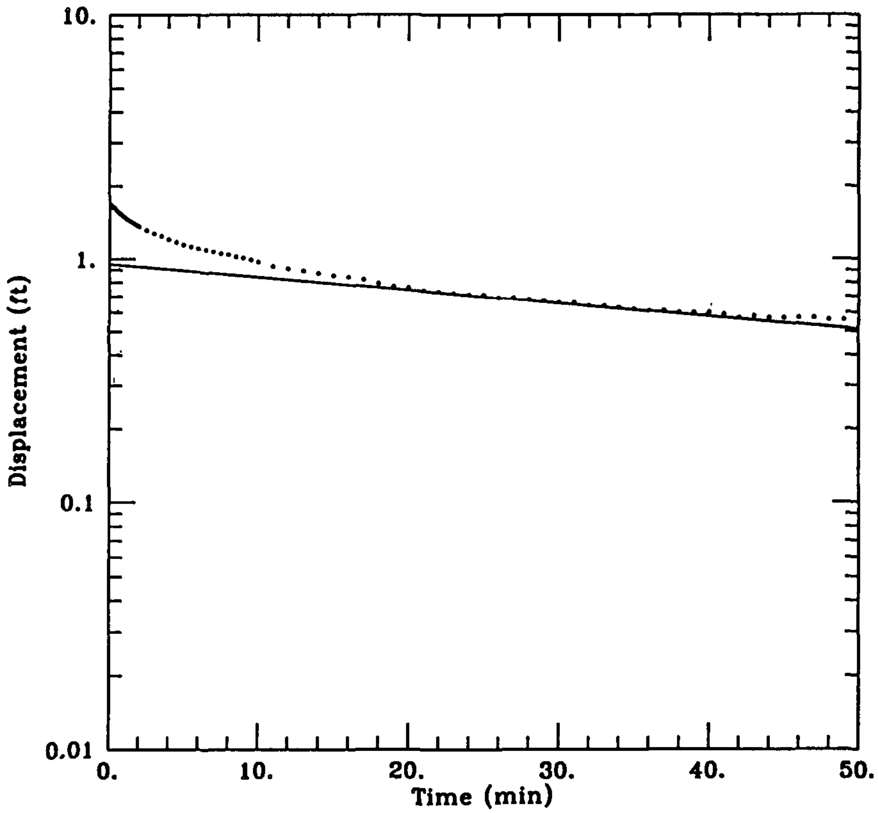
TEST DATA:
H0 = 0.98 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 33.43 ft

PARAMETER ESTIMATES:
K = 0.045 ft/min
y0 = 1.43 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-5.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-5 (Falling-Head)

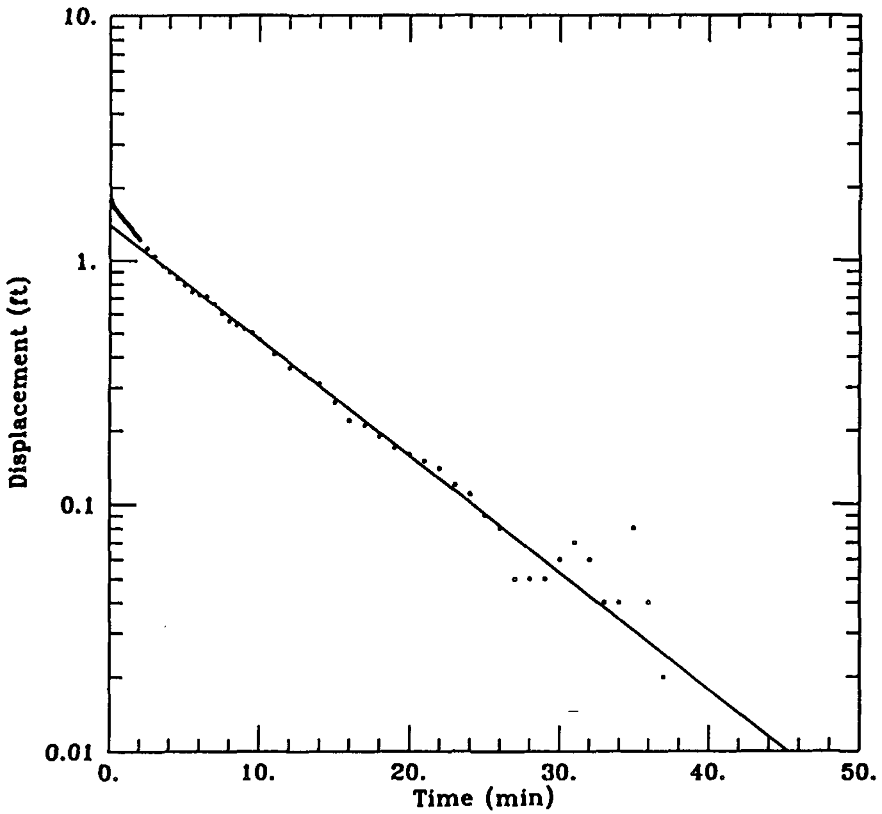
TEST DATA:
H0 = 1.68 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 10.65 ft

PARAMETER ESTIMATES:
K = 0.0001 ft/min
y0 = 0.95 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-6S.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-6-95
test well: MW-6S (Falling-Head)

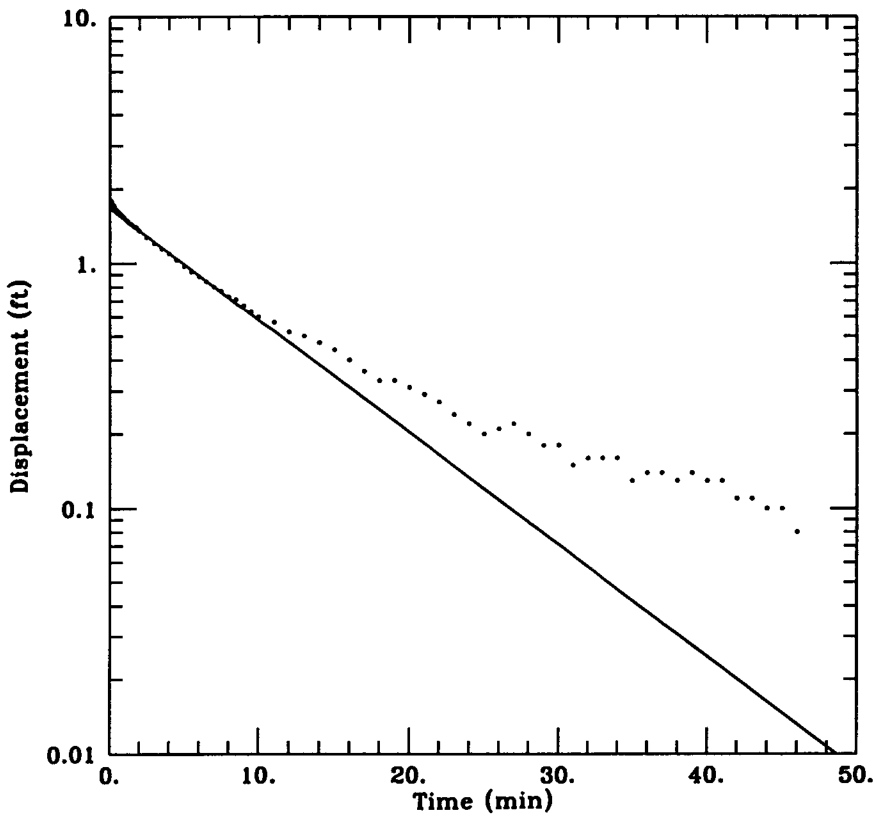
TEST DATA:
H0 = 1.78 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 11.89 ft

PARAMETER ESTIMATES:
K = 0.0009 ft/min
y0 = 1.4 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

## Aquifer Slug Test




DATA SET:
MW-6S-R.DAT
07/26/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-6-95
test well: MW-6S (Rising-Head)

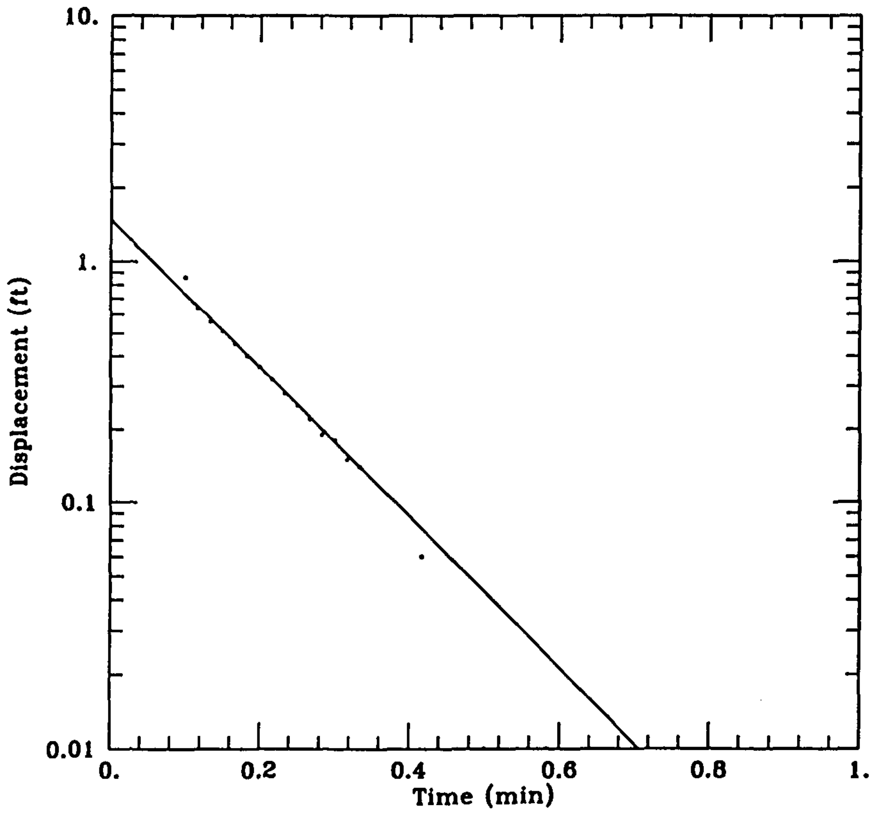
TEST DATA:
H0 = 1.8 ft
rc = 0.167 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 11.89 ft

PARAMETER ESTIMATES:
K = 0.00086 ft/min
y0 = 1.67 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-6D-F.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-6D (Falling-Head)

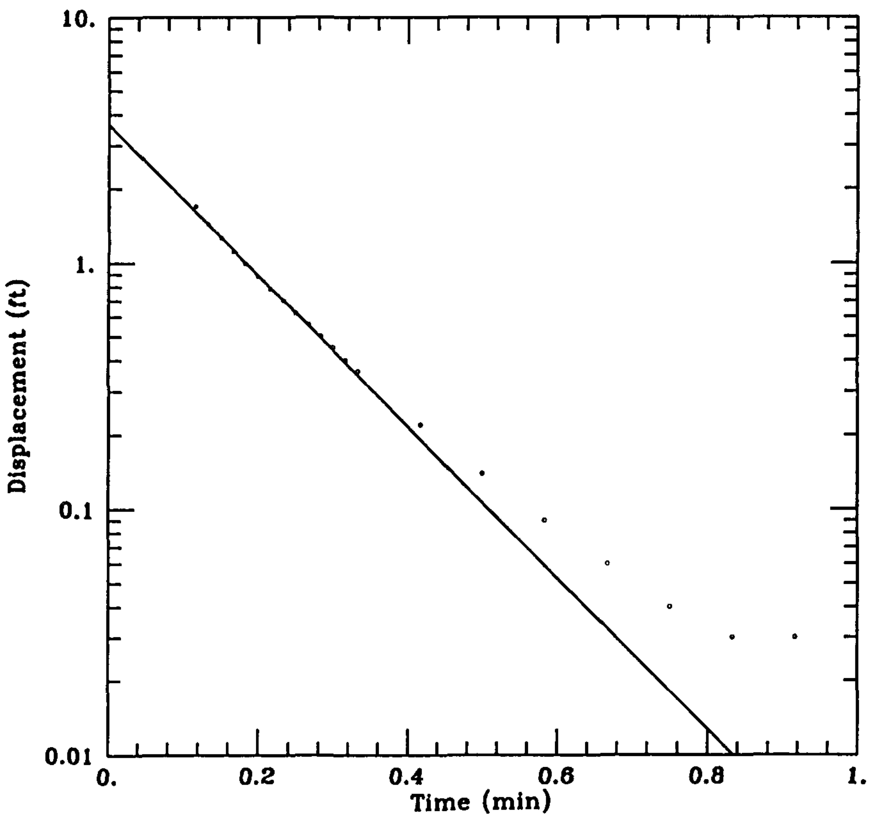
TEST DATA:
H0 = 0.86 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 32.6 ft

PARAMETER ESTIMATES:
K = 0.07 ft/min
y0 = 1.48 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-6D-R.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-6D (Rising-Head)

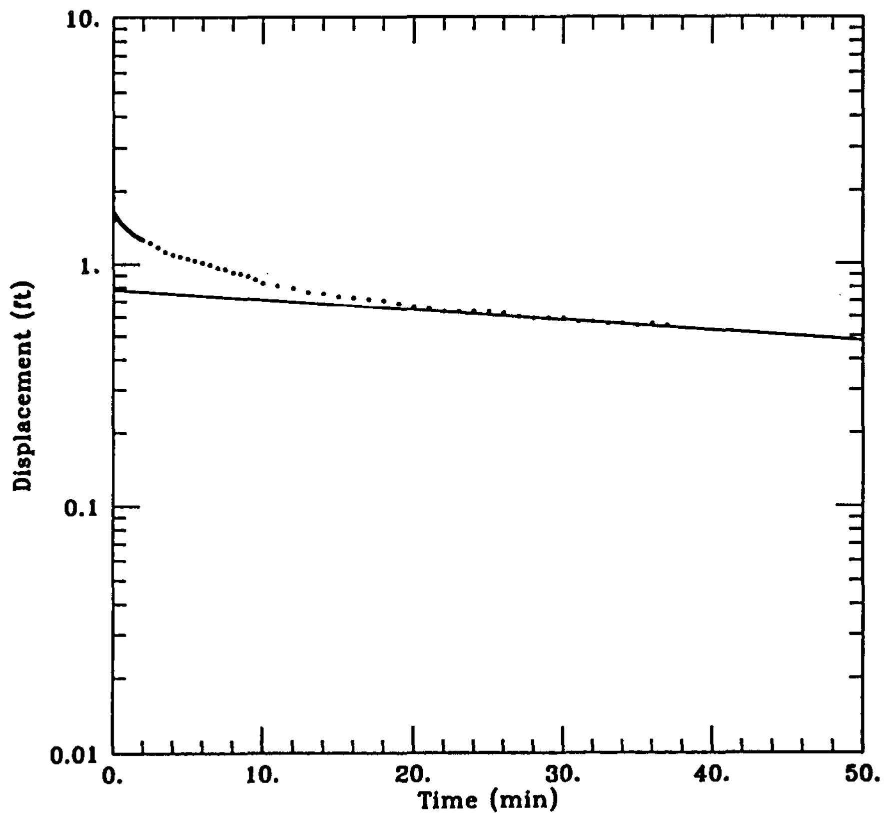
TEST DATA:
H0 = 1.69 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 32.6 ft

PARAMETER ESTIMATES:
K = 0.07 ft/min
y0 = 3.65 ft

AQTESOLV

| | |
|---|---|
| Client: **Rexene** | Company: **GCL** |
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-8.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-8 (Falling-Head)

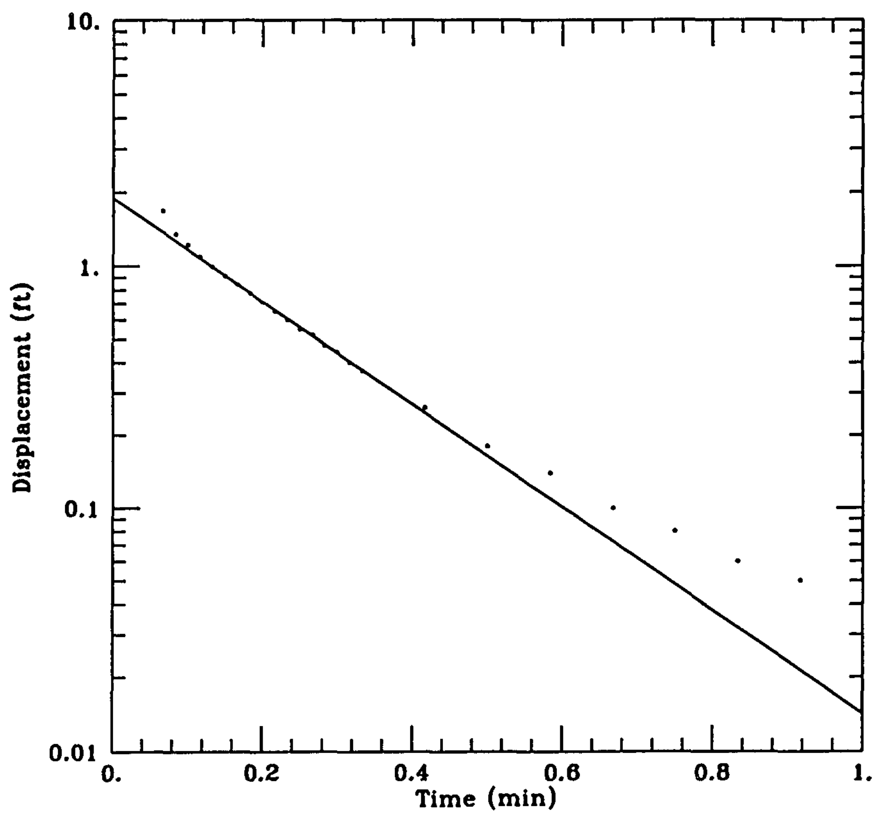
TEST DATA:
H0 = 2.08 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 11.25 ft

PARAMETER ESTIMATES:
K = 8.E-05 ft/min
y0 = 0.78 ft

AQTESOLV

| Client: **Rexene** | Company: **GCL** |
|---|---|
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-9S-F.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-6-95
test well: MW-9S (Falling-Head)

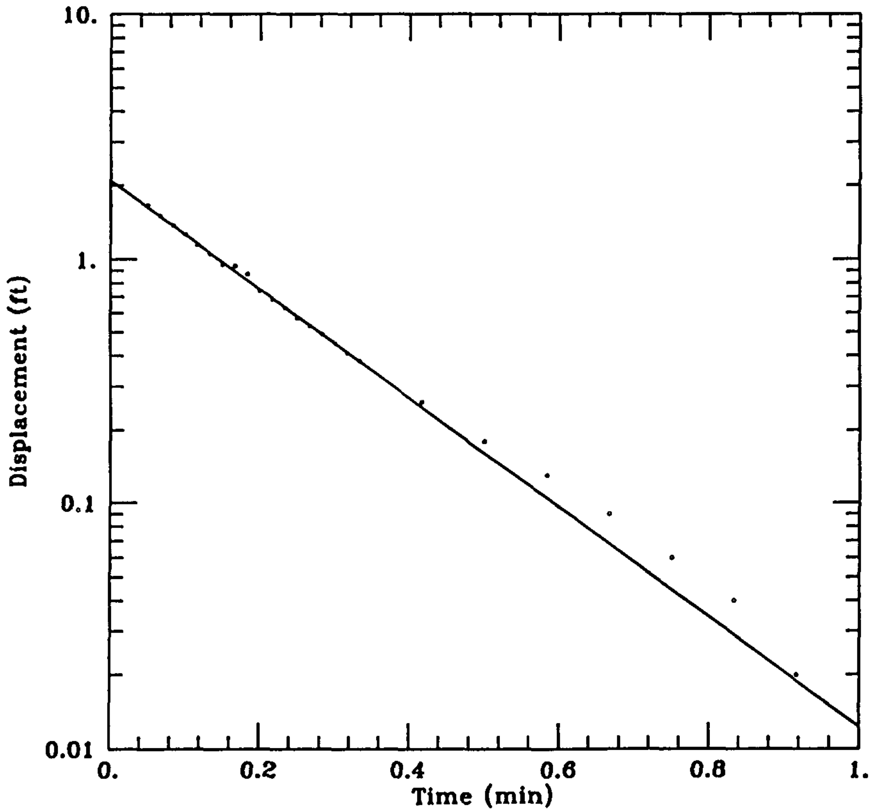
TEST DATA:
H0 = 1.68 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 11.39 ft

PARAMETER ESTIMATES:
K = 0.04 ft/min
y0 = 1.9 ft

AQTESOLV

| | |
|---|---|
| Client: **Rexene** | Company: **GCL** |
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

# Aquifer Slug Test




DATA SET:
MW-9S-R.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-6-95
test well: MW-9S (Rising-Head)

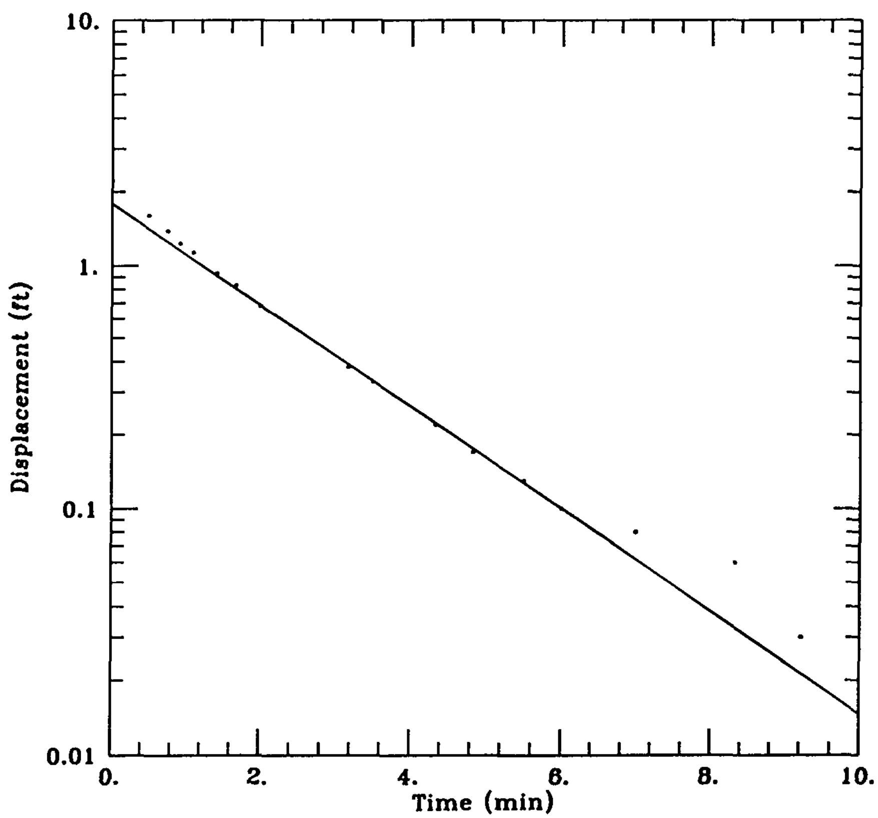
TEST DATA:
H0 = 1.66 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 11.39 ft

PARAMETER ESTIMATES:
K = 0.042 ft/min
y0 = 2.1 ft

AQTESOLV

| Client: Rexene | Company: GCL |
|---|---|
| Location: Sunland Park, New Mexico | Project: 3031004 |

# Aquifer Slug Test




DATA SET:
MW-10.DAT
08/23/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 8-15-95
test well: MW-10 (Rising-Head)

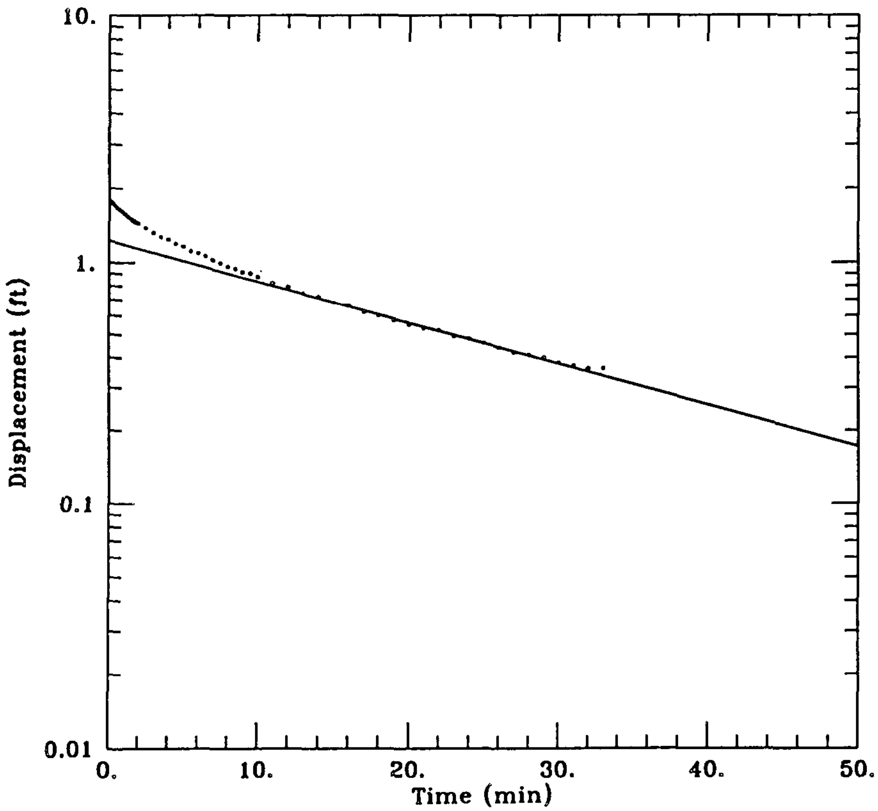
TEST DATA:
H0 = 2.22 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 12.48 ft

PARAMETER ESTIMATES:
K = 0.004 ft/min
y0 = 1.79 ft

AQTESOLV

| | |
|---|---|
| Client: **Rexene** | Company: **GCL** |
| Location: **Sunland Park, New Mexico** | Project: **3031004** |

## Aquifer Slug Test




DATA SET:
MW-11.DAT
07/25/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 7-7-95
test well: MW-11 (Falling-Head)

TEST DATA:
H0 = 1.77 ft
rc = 0.17 ft
rw = 0.5 ft
L = 10. ft
b = 80. ft
H = 14.94 ft

PARAMETER ESTIMATES:
K = 0.00034 ft/min
y0 = 1.23 ft

AQTESOLV

# Appendix L

Groundwater Modeling Input/Output

```
*******************************************************
*                                                     *
*   INTERNATIONAL GROUND WATER MODELING CENTER        *
*   INDIANAPOLIS, INDIANA - DELFT, NETHERLANDS        *
*                                                     *
*             S O L U T E   1-2-3                     *
*                                                     *
*    ANALYTICAL MODELS FOR SOLUTE TRANSPORT           *
*                                                     *
*******************************************************
```

PROJECT......... =
USER NAME....... =
DATE............ = 08-08-1995
DATA FILE....... = d:\rexene\model\CASE2.DAT

INPUT DATA:

GROUNDWATER (SEEPAGE) VELOCITY.... = .055 [ft/d]
AQUIFER THICKNESS................. = 15 [ft]
POROSITY.......................... = .25
LONGITUDINAL DISPERSIVITY......... = 100 [ft]
LATERAL DISPERSIVITY.............. = 10 [ft]
RETARDATION FACTOR................ = 1
HALF-LIFE......................... = 0 [d]
NUMBER OF POINT SOURCES........... = 4

SOURCE NO. 1

X-COORDINATE OF THE SOURCE..... = 0 [ft]
Y-COORDINATE OF THE SOURCE..... = 200 [ft]
SOURCE STRENGTH................ = 8.999999999999999D-03 [lb/d]
ELAPSED TIME................... = 10950 [d]

SOURCE NO. 2

X-COORDINATE OF THE SOURCE..... = 250 [ft]
Y-COORDINATE OF THE SOURCE..... = 300 [ft]
SOURCE STRENGTH................ = .025 [lb/d]
ELAPSED TIME................... = 10950 [d]

SOURCE NO. 3

X-COORDINATE OF THE SOURCE..... = 400 [ft]
Y-COORDINATE OF THE SOURCE..... = 550 [ft]
SOURCE STRENGTH................ = .017 [lb/d]
ELAPSED TIME................... = 10950 [d]

SOURCE NO. 4

X-COORDINATE OF THE SOURCE..... = 200 [ft]
Y-COORDINATE OF THE SOURCE..... = 100 [ft]
SOURCE STRENGTH................ = .002 [lb/d]
ELAPSED TIME................... = 10950 [d]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15 | 400.00 | [ft] | 3.1494 | 2.9164 | 2.6571 | $\boxed{2.3826}$ | 2.1031 |
| 16 | 450.00 | [ft] | 2.9637 | 2.8052 | 2.6046 | 2.3753 | 2.1294 |
| 17 | 500.00 | [ft] | 4.1014 | 3.7292 | 3.3558 | 2.9874 | 2.6297 |
| 18 | 550.00 | [ft] | 4.9343 | 4.3469 | 3.8195 | 3.3390 | 2.8984 |
| 19 | 600.00 | [ft] | 3.7536 | 3.3975 | 3.0461 | 2.7044 | 2.3762 |
| 20 | 650.00 | [ft] | 1.9136 | 1.8267 | 1.7106 | 1.5740 | 1.4244 |
| 21 | 700.00 | [ft] | 0.7548 | 0.7531 | 0.7339 | 0.6996 | 0.6532 |
| 22 | 750.00 | [ft] | 0.2474 | 0.2543 | 0.2551 | 0.2499 | 0.2393 |
| 23 | 800.00 | [ft] | 0.0688 | 0.0721 | 0.0737 | 0.0736 | 0.0718 |
| 24 | 850.00 | [ft] | 0.0162 | 0.0172 | 0.0178 | 0.0180 | 0.0179 |
| 25 | 900.00 | [ft] | 0.0032 | 0.0035 | 0.0036 | 0.0037 | 0.0037 |