GW - 15

REPORTS

YEAR(S):

1989

DANIEL B. STEPHENS & ASSOCIATES, INC.

CONSULTANTS IN GROUND-WATER HYDROLOGY ALBUQUERQUE, NEW MEXICO

MODELING OF CHROMIUM TRANSPORT AT THE NORTHERN NATURAL GAS COMPANY HOBBS PROCESSING PLANT

PREPARED FOR

NORTHERN NATURAL GAS COMPANY

OCTOBER 24, 1989

DANIEL B. STEPHENS & ASSOCIATES, INC.
CONSULTANTS IN GROUND-WATER HYDROLOGY

• GROUND-WATER CONTAMINATION • UNSATURATED ZONE INVESTIGATIONS • WATER SUPPLY DEVELOPMENT •

October 23, 1989

Mr. Earl Berdine
Agent and Attorney-in-Fact for
Northern Natural Gas Company
P.O. Box 1188
Houston, TX 77251-1188

Re: Northern Natural Gas Company's Hobbs Gas Processing Facility

Dear Mr. Berdine:

This letter serves as our report on the analysis of the potential impact to ground water from the loss of cooling system fluids at the Hobbs Facility. This report is based on analysis conducted by Daniel B. Stephens & Associates, Inc. (DBS&A) pursuant to your request to provide your office with estimates of the magnitude and extent of chromium within the ground water.

General

Over the period of June 25, 1989 through August 9, 1989, Northern Natural Gas Company's (NNGC) natural gas processing and compression plant located in Lea County near Hobbs, New Mexico, experienced a loss of lube-oil cooling system water due to a leak in a 2 inch water pipe. The total volume of water lost is estimated by NNGC to be approximately 15,400 gallons. A chronological summary of events surrounding the water loss at the Hobbs plant including volumes and chromium concentrations has been provided to the State of New Mexico's Environmental Improvement and Oil Conservation Divisions, and is included here as Attachment A.

Due to concern over possible adverse impacts to ground-water quality caused by the water leak at the Hobbs plant, NNGC retained Daniel B. Stephens & Associates, (DBS&A) to perform an assessment of possible water-quality impacts. Based on information provided DBS&A by NNGC, an analysis was carried out by DBS&A to provide information upon which judgment can be made on whether ground water could contain chromium at concentrations exceeding state standards as a result of NNGC's discharge.

Discharge Analysis

The NNGC Hobbs processing plant is located approximately 8 miles west of Hobbs. The plant overlies the Ogallala aquifer, and ground water is at a depth of approximately 50 to 60 feet below

ground surface. Since the product leak occurred below ground surface, it is reasonable to assume that all of the leaked material moved downward into the soil profile. Additionally, for the initial assessment, it was assumed that all chromium released was in the hexavalent state and moved conservatively with ground water. Finally, in order to be even more conservative, it was assumed that the released chromium directly entered the underlying aquifer without first traveling through an unsaturated soil profile. Of course, in reality, the chromium released was not all hexavalent, and the unsaturated soil profile would likely have a profound effect on reducing the chromium concentration actually entering ground water due to sorption.

It was decided to use an analytical, contaminant transport model to evaluate potential effects. The models used are contained in the SOLUTE modeling package which is put out by the Internation Ground Water Modeling Center, Holcomb Research Institute, Butler University, Indianapolis, Indiana; code descriptions and utilized assumptions are included in Attachment B. Analyses were performed for both slug (instantaneous solute injection) and point-source injection. Source data were those provided by NNGC (Attachment A).

Since site-specific characterization was not available an attempt was made to use input parameters considerably more conservative than those likely to be encountered in the field. For example, a darcy velocity beneath the site of one foot per day was utilized. The aquifer gradient in the site vicinity is approximately 0.003, which yields an assumed hydraulic conductivity of 1.18×10^{-1} cm/sec, conservatively higher than 2.83×10^{-3} cm/sec suggested by McAda (1984) as a reasonable average for the Ogallala aquifer in Lea County. The utilized dispersivities of 10 feet in the horizontal direction, 1 foot in the transverse direction and 0.1 foot in the vertical direction or lower than might be expected in a transmissive sandstone aquifer over distances of several hundred feet. In addition, the aquifer thickness was limited to 25 feet to minimize the mixing zone thickness. Table 1 summarizes the utilized source and aquifer data.

Results

These results give an estimate of how the released contaminants behave under what could be considered worst-case conditions. Although the model was run in both 2 and 3 dimensions, only the 2-dimensional data are presented in figures 1 through 4.

Table 1

Utilized Aquifer Data		Utilized Source Data	
Aquifer Thickness	25 ft.	Total solute mass released	0.56 lbs
Effective Porosity	0.20	Source Strength (for point-source analyses)	0.0156 lb/day
Darcy Velocity	1 ft/day	Elapsed time of source (for point source analyses)	36 days
Longitudinal Dispersivity	10 ft		
Transverse Dispersivity	1 ft		
Vertical Dispersivity	0.1 ft		

The 2-dimensional data show slightly higher concentrations in the aquifer at a given distance from the source and were therefore considered to be slightly more conservative. A complete listing of tabulated values for all model runs is included as Attachment C.

Figure 1 shows contaminant distribution in the aquifer after 36 days of point-source injection. The modeled chromium concentration reached 0.26 mg/l 100 feet down gradient of the source, but is below the 0.05 mg/l state standards at a 250-foot distance (0.02mg/l). Note at the 100 foot distance, in the lateral direction, chromium concentrations are below state standards only 30 feet from the plume axis.

The point source analysis is the most representative of actual conditions at early time.

Although the input of chromium was distributed over a 36 day period, Figure 2 shows modeled contaminant distribution 50 days after slug input of 0.56 pounds of chromium. The maximum concentration reached at this time interval is 0.18 mg/l at 250 feet, and concentration has dropped to 0.02 mg/l at 400 ft. distance. Figure 3 shows contaminant distribution 150 days after slug input. Note that the area of chromium concentration above 0.05 mg/l has reduced significantly from the 50-day analysis. The maximum chromium concentration at this time is 0.06 mg/l, 750 feet down gradient of the source. Chromium is below state standards at 850 feet in distance (0.04 mg/l).

Figure 4 shows contaminant distribution 250 days after slug input. At this time interval, there is no zone that contains chromium concentrations above state standards. The maximum observed concentration is 0.04 mg/l occurs at a point 1250 feet down gradient of the source input.

Summary

Based upon the assumptions and model input limitations described above, the results of the analysis show that it is unlikely that chromium concentration beyond 1000 feet from the source would ever exceed the state standards. The assumptions utilized are very conservative, such as injecting the solute directly into the aquifer. Actual contaminant concentrations in the aquifer are likely to be much lower than those presented herein.

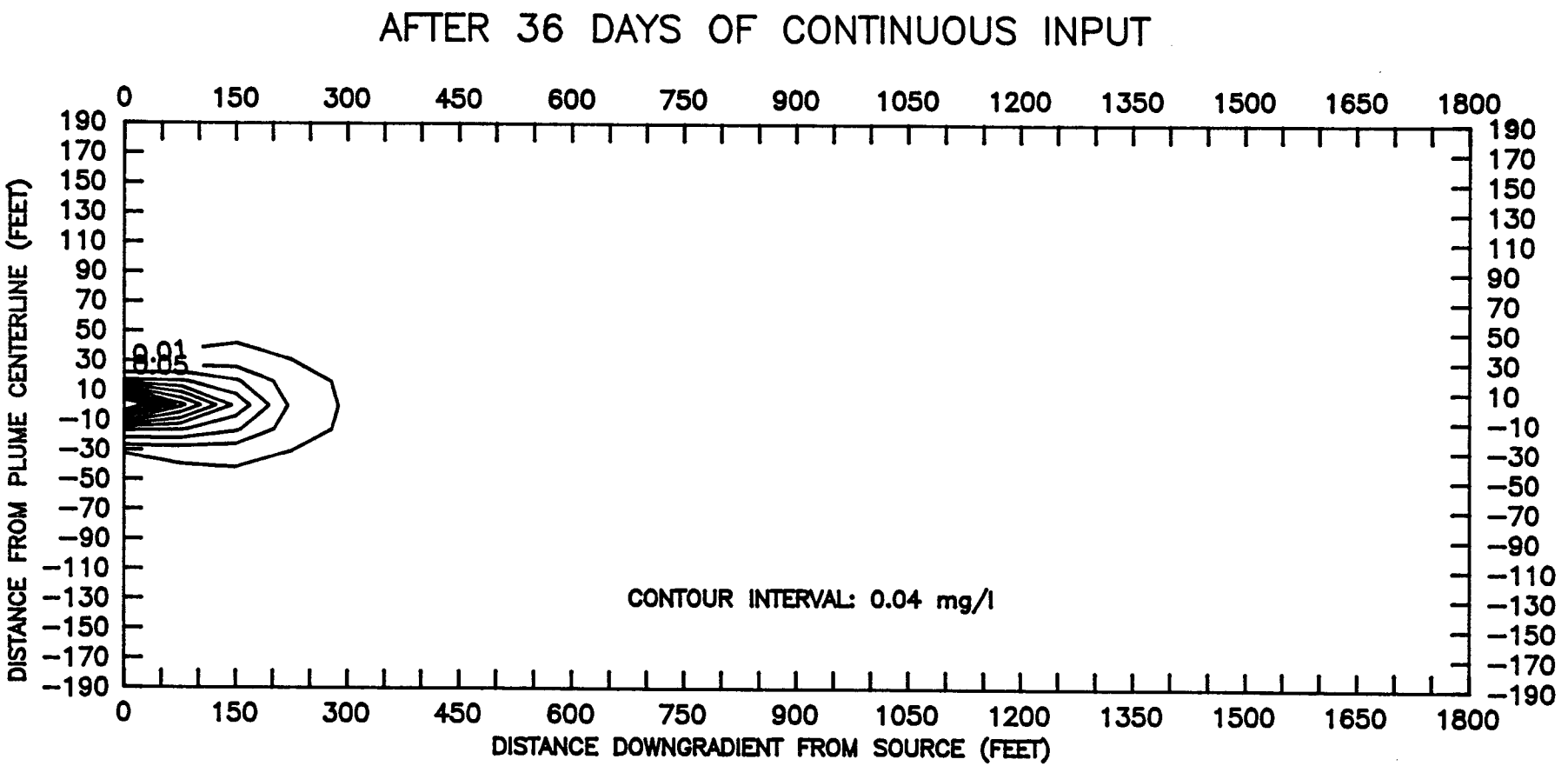

AFTER 36 DAYS OF CONTINUOUS INPUT
0 150 300 450 600 750 900 1050 1200 1350 1500 1650 1800
190 170 150 130 110 90 70 50 30 10 −10 −30 −50 −70 −90 −110 −130 −150 −170 −190
0.01
0.05
CONTOUR INTERVAL: 0.04 mg/l
DISTANCE FROM PLUME CENTERLINE (FEET)
DISTANCE DOWNGRADIENT FROM SOURCE (FEET)

Figure 1

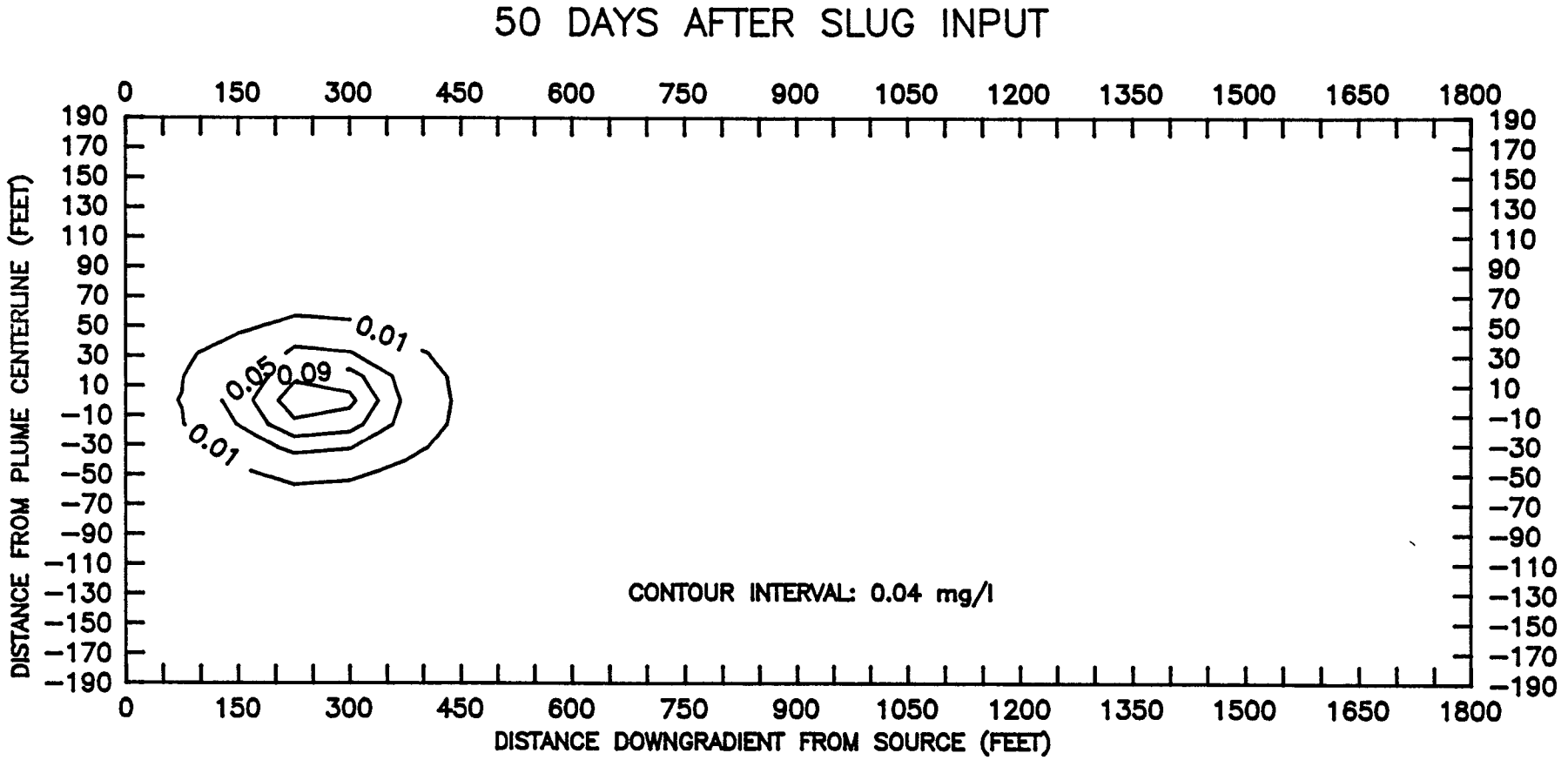

50 DAYS AFTER SLUG INPUT
0 150 300 450 600 750 900 1050 1200 1350 1500 1650 1800
190 170 150 130 110 90 70 50 30 10 −10 −30 −50 −70 −90 −110 −130 −150 −170 −190
DISTANCE FROM PLUME CENTERLINE (FEET)
0.01
0.05
0.09
0.01
CONTOUR INTERVAL: 0.04 mg/l
DISTANCE DOWNGRADIENT FROM SOURCE (FEET)

Figure 2

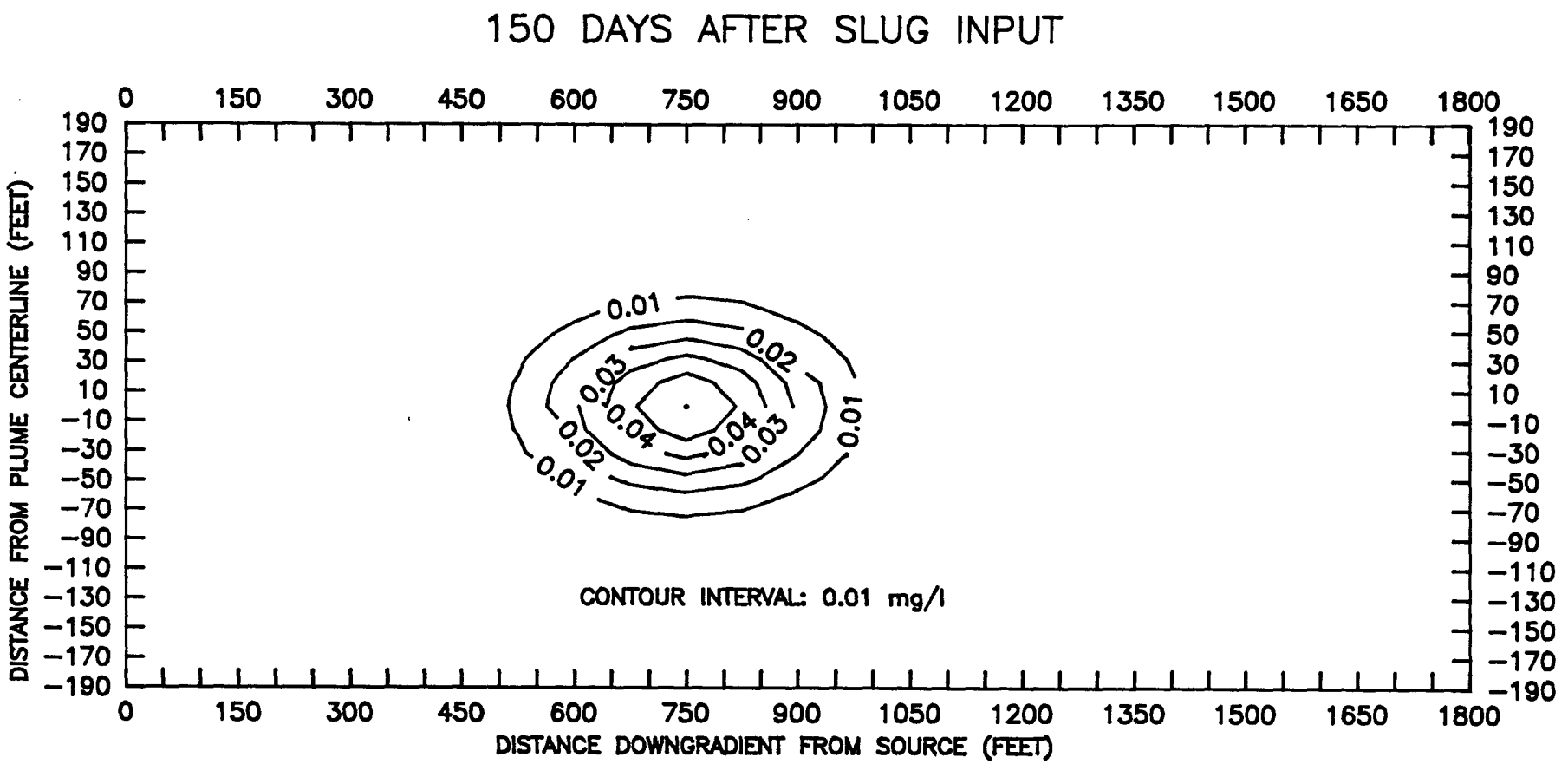

150 DAYS AFTER SLUG INPUT
0 150 300 450 600 750 900 1050 1200 1350 1500 1650 1800
190 170 150 130 110 90 70 50 30 10 −10 −30 −50 −70 −90 −110 −130 −150 −170 −190
DISTANCE FROM PLUME CENTERLINE (FEET)
0.01
0.02
0.03
0.04
CONTOUR INTERVAL: 0.01 mg/l
DISTANCE DOWNGRADIENT FROM SOURCE (FEET)

Figure 3

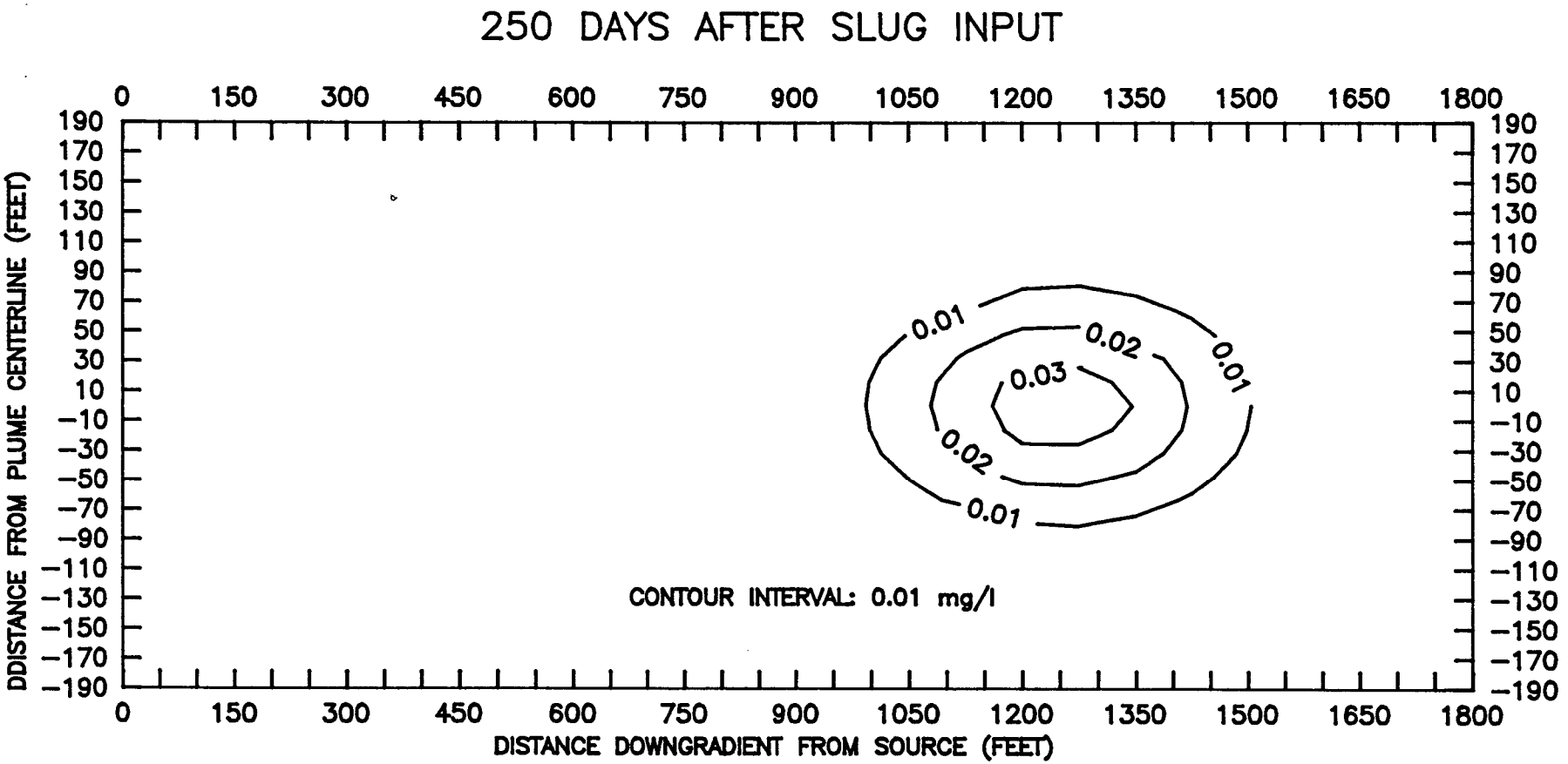

250 DAYS AFTER SLUG INPUT
0 150 300 450 600 750 900 1050 1200 1350 1500 1650 1800
190 170 150 130 110 90 70 50 30 10 −10 −30 −50 −70 −90 −110 −130 −150 −170 −190
DDISTANCE FROM PLUME CENTERLINE (FEET)
0.01
0.02
0.03
0.02
0.01
0.01
CONTOUR INTERVAL: 0.01 mg/l
DISTANCE DOWNGRADIENT FROM SOURCE (FEET)

Figure 4

The modeled results show, under worst-case conditions, that a small zone of chromium contamination above state standards exists for less than 200 days after input into the aquifer. The maximum horizontal distance of that zone is less than 1000 feet down gradient of the source input, far short of the nearest dow-gradient well, an irrigation well some 2500 feet from NNGC's plant boundary. However, considering the very conservative nature of the approach, it is our opinion that no contamination above allowable levels has occurred beyond 450 feet from the source at this time, and that contaminations would never exceed allowable levels beyond 1000 feet.

We hope that this letter report provides sufficient level of analysis to allow the proper response to be developed. If you have any questions, or require additional information, please do not hesitate to call.

Sincerely,

Daniel B. Stephens & Associates, Inc.

Jeffrey A. Havlena
Project Manager

JH/alm

Disk: 89-031
File: Berdine.023

References

1) McAda, D.P., 1984, Projected water-level declines in the Ogallala aquifer in Lea County, New Mexico. U.S. Geological Survey Water-Resources Investigations Report 84-4062, 84 pages.

ATTACHMENT A

ENRON
Northern Natural Gas Company

October 17, 1989
EDB: E38-89

Mr. David Baker
State of New Mexico
Environmental Improvement Division
Harold Runnels Building
1190 St. Francis Drive
Santa Fe, New Mexico 87503

Subject: HOBBS PROCESSING PLANT WATER LEAK

As we discussed on the telephone, attached is a brief chronology of the events surrounding a water leak that occurred at Hobbs.

Since we will be out your way on other business, I will stop by your office on October 18 to discuss the water leak and introduce Bill Janacek, Director of Environmental Affairs.

E. D. Berdine
Vice President, Environmental Affairs
and Administration
Agent and Attorney-in-Fact for
Northern Natural Gas Company

EDB/jc

NORTHERN NATURAL GAS COMPANY

HOBBS PROCESSING PLANT

SUBJECT: Chromate Water Leak

Northern Natural Gas Company operates a natural gas processing and compression plant near Hobbs, Lea County, New Mexico. The following sequence of events describes a water leak that occurred at the plant and the actions taken to locate and eliminate the leak.

May 12, 1989	OCD notified of use of chromates at Hobbs Plant (via Discharge Plan renewal application).
May 19	Annual plant shutdown and major maintenance program (turnaround) begun.
June 4	Engine jacket water and lubricating oil cooling systems drained.
June 5	OCD inspection of entire plant facility.
June 9	Completed draining and flushing the water systems. The total volume of water (90,300 gallons) was transferred to frac tanks for disposal.
June 12-16	Cleaned, hydroblasted, dried and inspected internals of below ground concrete storage cell (cold wells).
June 16	Letter to OCD providing status of cleaning and inspection of the cooling systems. No leaks were found.
June 18-24	Sandblasted and flakelined the cold wells.
June 25	Filled jacket water and lube oil cooling systems, chromate concentration in the lube oil system was 15ppm. During the evening shift a Maintenance Job Ticket (MJT) was written noting that the lube oil cooling system was losing water.
June 26	Chromate concentration in the lube oil cooling system was 8 ppm. Initiated action to determine reason for water loss.
June 27	Continued checking for cause of water loss. Chromate concentration 3.9 ppm.
June 28	Continued checking for cause of water loss. Chromate concentration 1.94 ppm.
June 29	Continued checking for cause of water loss. Chromate concentration 2.32 ppm.

June 30	Continued checking for cause of water loss. Chromate concentration 3.87 ppm.
July 1-17	Tested individual segments of the system for leak. No leaks found. Analyses of water during this period showed chromate concentrations as follows: July 5 1.55 ppm July 6 .77 ppm July 7 .77 ppm
July 18	Drained 2100 gallons of water to frac tank.
July 19-31	Cleaned and inspected cold well again. Discovered crack in sump behind forming lumber left during construction years ago. Filled sump with grout. During July 19-31 period there was no water in cold well.
August 1	Refilled cold well to 4 feet, blocked in all coolers and tested 16" line to 28 psig. Lost approximately one foot (1,077 gallons) of water. Concluded crack in sump was not responsible for water loss.
August 3	Dyed water in effort to find the leak. Opened the entire system. No leak was found.
August 4-9	Began excavating buried water lines in further effort to find leak. On August 9, a 2" line that tees into the 16" discharge line near the cold well was uncovered. The leak was discovered near the point of connection. The 2" line was cut and capped. System was filled with water.
August 10 to Present	No water lost.
September 19	Remaining 2" line was successfully tested to assure that no other leaks existed.

Summary: On October 10, 1989, a meeting was held in Hobbs with plant personnel to review all of the foregoing events. The following conclusions were drawn as a result of the meeting:

- o There was no evidence of water loss prior to June 25, 1989.
- o Total water loss, based on water levels in the cold well during the period was approximately 15,400 gallons.
- o Total chromium loss, based on periodic analyses of the water to determine chromate concentrations and the volumes of water lost, was calculated at .5649 lbs. See attached Table I.

Based on the above, the leak was judged insignificant, with no endangerment to human health or the environment because of the small quantity involved.

TABLE 1

HOBBS PROCESSING PLANT

Chromate Water Leak

Date	Water Volume (Gallons)	Chromium Concentration (PPM)	Pounds Of Chromium
6/26/89	3231	15.00	.4037
6/27	504	3.90	.0164
6/28	504	1.94	.0042
6/29	504	2.32	.0097
6/30-7/4	2520	3.87	.0810
7/5	504	1.55	.0042
7/6-7/17	6048	.77	.0388
8/1	1077	.77	.0069
Total	15,396		.5649

Notes:

1. Water volumes are based on level changes in the cold well which is 12'x12'x10'6" deep or 1077 gallons per foot.

2. The daily volume from 6/26 to 7/17 is based on a leak rate of 63 gallons per hour for 8 hours each day. The 63 GPH is computed from the one foot level drop (1077 gallons) in 17 hours on 8/1 and 8/2. The duration of the leak each day is conservatively overstated. The leak only occurred while the pump was in operation. The pump was operated only to provide pressure to locate the leak, which was not continuous each day during the period.

3. Chromium concentrations are based on actual laboratory analysis from 6/26 to 6/30 and from 7/5 to 7/7. Concentrations on other dates are assumed to be the same as the latest previous laboratory analysis.

ATTACHMENT B

IGWMC
International Ground Water Modeling Center

Groundwater Modeling Methodology and Application

US EPA REGIONAL TRAINING WORKSHOP

Holcomb Research Institute
Butler University
Indianapolis, Indiana 46208
USA

TNO-DGV Institute
of Applied Geoscience
P.O. Box 285, 2600 AG Delft
The Netherlands

I G W M C G R O U N D W A T E R M O D E L I N G S O F T W A R E S

A Program Package of Analytical Models for Solute Transport in Groundwater "SOLUTE"

Milovan S. Beljin

IGWMC-BAS15
Version: IBM-PC 1.0
Date: January 1985

I N T E R N A T I O N A L G R O U N D W A T E R M O D E L I N G C E N T E R

Holcomb Research Institute
Butler University, 4600 Sunset Avenue
Indianapolis, Indiana 46208

PROGRAMS IN "SOLUTE" PACKAGE

No.	Name	Description
1.	ONED1	One-dimensional solute transport in a semi-infinite column, constant concentrations as the inlet boundary condition.
2.	ONED3	One-dimensional solute transport in a semi-infinite column, specified mass flux as the inlet boundary condition. Retardation and decay options included.
3.	WMPLUME	Two-dimensional transport of a plume from continuous multiple point sources in a uniform groundwater flow field. Includes options for retardation and decay.
4.	SLUG	Two-dimensional transport of a slug from an instantaneous point source in a uniform groundwater flow field.
5.	RADIAL	Solute transport in a plane radial flow. This program calculates the concentration distribution along the radial coordinate from a recharge well.
6.	LTIRD	Same as RADIAL, but based on improved solution of solute transport equation in radial coordinates.
7.	PLUME3D	Three-dimensional solute transport of a plume from continuous multiple point sources in a uniform groundwater flow field. Decay option included.
8.	SLUG3D	Three-dimensional trasnport of a slug from an instantaneous point source in a uniform groundwater flow field. Decay option included.
9.	UNITS	This program converts ten most frequently used units in hydrogeology from English units to metric units and vice versa.
10.	ERFC	A subroutine to calculate the values of error function and complimentary error function for the given argument x.

PROGRAM IDENTIFICATION

1.1	Program Title:	Analytical Model for Transport of a Solute Plume from Point Sources in a Uniform Two-Dimensional Groundwater Flow Field
1.2	Program Code Name:	WMPLUME.BAS
1.3	Program Writer:	Milovan S. Beljin
1.4	Program Organization:	International Ground Water Modeling Center Holcomb Research Institute, Butler University Indianapolis, Indiana 46208, Tel: 317/283-9458
1.5	Date:	January 1985
1.6	Version:	IBM-PC 1.0
1.7	Source Language:	Microsoft BASIC
1.8	Memory Requirements:	64k
1.9	Availability:	WMPLUME.BAS is a non-proprietary code. It is distributed at cost by IGWMC. A copy of the program on 5¼" diskette is available
2.0	Abstract:	A program to calculate the concentration distribution of a plume from point sources in two-dimensional regional flow. It includes options for retardation and decay
2.1	Comments:	WMPLUME.BAS is based on Wilson and Miller (1978) equation

5.1. MATHEMATICAL MODEL

TRANSPORT FROM A POINT SOURCE IN A UNIFORM TWO-DIMENSIONAL FLOW FIELD

If the pollutant is continuously injected from a point source into an aquifer, a plume develops downstream of the source and spreads out to the sides and below. When the aquifer is relatively thin, vertical mixing occurs, and the concentration becomes uniform throughout the depth of the aquifer. In that case, the plume is two-dimensional. The governing equation and initial and boundary conditions for this problem are

$$D_{xx} \frac{\partial^2 C}{\partial x^2} + D_{yy} \frac{\partial^2 C}{\partial y^2} - \bar{v} \frac{\partial C}{\partial x} - \lambda RC + \frac{Q_c}{n} = R \frac{\partial C}{\partial t} \tag{5.1}$$

$$c\ (x, y, 0) = 0$$

$$Q_c(x, y, t) = QC_0\delta(x, y)$$

$$C\ (\pm\infty, \pm\infty, t) = 0$$

where

$Q_c[M/L^3T]$	the mass injection rate of solute per unit volume of aquifer;
$Q[L^3/T/L]$	the volumetric injection rate of fluid per unit aquifer thickness;
$C_0[M/L^3]$	concentration of the injected fluid;
$\delta(x, y)\ [L^{-2}]$	the Dirac delta function.

The analytical solution of the problem is given in the form (Wilson and Miller 1978)

$$C(x, y, t) = \frac{QC_o \exp\left(\frac{x}{B}\right)}{4\pi n(D_{xx}D_{yy})^{\frac{1}{2}}} W(u, {}^{r}/_{B}) \tag{5.2}$$

where

$$B = \frac{2D_{xx}}{\bar{v}}$$

$$r = [(x^2 + \frac{D_{xx}}{D_{yy}} y^2)\gamma]^{\frac{1}{2}}$$

$$\gamma = 1 + \frac{2B\lambda R}{\bar{v}}$$

$$u = \frac{r^2 R}{4\gamma D_{xx} t}$$

$$W(u, {}^{r}/_{B}) = \int_{u}^{\infty} \frac{1}{\theta} \exp\left[-\left(\theta + \frac{r^2}{4B^2\theta}\right)\right] d\theta.$$

$W(u, {}^{r}/_{B})$ corresponds to the Hantush well function for the problem of transient flow to a well in an infinite leaky aquifer. For many pollution problems, ${}^{r}/_{B}$ is large, and the tabulated values are insufficient. Willson and Miller (1978) give an approximation:

$$W(u, {}^{r}/_{B}) \cong \left(\frac{\pi B}{2r}\right)^{\frac{1}{2}} \exp\left(-\frac{r}{B}\right) \operatorname{erfc}\left(-\frac{\frac{r}{B} - 2u}{2u^{\frac{1}{2}}}\right). \qquad (5.3)$$

This approximation for $W(u, {}^{r}/_{B})$ is reasonably accurate (within 10%) for ${}^{r}/_{B} > 1$ and accurate (within 1%) for ${}^{r}/_{B} > 10$ (Wilson and Miller 1978). A minimum distance downstream from the source should be calculated before the approximation is applied.

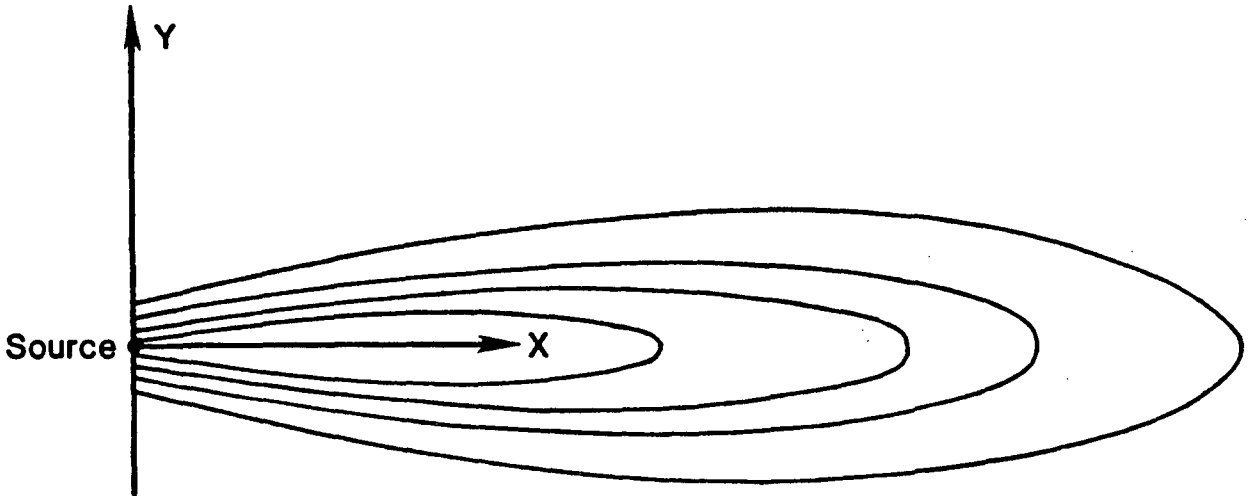
In practice the described problem corresponds to that involving the movement of the solute continuously injected into an aquifer from a recharge well (Figure 3).

As time approaches infinity, $t \to \infty$, and $u \to 0$, a balance occurs between the rate at which pollution disperses and the rate of injection

$$C(x, y, t) = \frac{QC_o \exp\left(\frac{x}{B}\right)}{2\pi n (D_{xx} D_{yy})^{\frac{1}{2}}} K_o\left(\frac{r}{B}\right) \qquad (5.4)$$

where K_o is the modified Bessel function of the second kind zeroth order.

Figure 3.



ASSUMPTIONS:

- uniformly porous confined aquifer,
- the aquifer is homogeneous, isotropic, infinite in areal extent, and constant in thickness,
- a fully penetraing solute injection well,
- recharge rates are negligible in relation to uniform regional flow rate,
- pollutants are distributed instantaneously to the entire aquifer thickness beneath the point source,
- injection is continuous and constant.

```
10  REM  ************************************************************
15  REM  *                                                          *
20  REM  *                  program:  "WMPLUME.BAS"                 *
25  REM  *                  version:   IBM-PC 1.0 <January,1985>    *
30  REM  *                                                          *
35  REM  *                       by:  MILOVAN S. BELJIN             *
40  REM  *                                                          *
45  REM  *            HOLCOMB RESEARCH INSTITUTE - IGWMC            *
50  REM  *            INDIANAPOLIS, INDIANA 46208                   *
55  REM  *                                                          *
60  REM  *  THIS PROGRAM CALCULATES THE CONCENTRATION DISTRIBUTION   *
65  REM  *  FOR DISPLACEMENT OF SOLUTE IN A HOMOGENEOUS, CONFINED    *
70  REM  *  AQUIFER WITH UNIFORM REGIONAL FLOW AND MULTIPLE, FULLY   *
75  REM  *  PENETRATING SOLUTE INJECTION WELLS (POINT SOURCES).      *
80  REM  *  BASED ON WILSON AND MILLER EQUATION (1978).              *
85  REM  *                                                          *
90  REM  ************************************************************
95  REM
100 DIM X(41),Y(21),C(21,41),Q(10),CW(10),TW(10)
105 SCREEN 0,0,0: WIDTH 80: COLOR 2,0,0: KEY OFF: CLS
110 LOCATE 3,18: PRINT "WMPLUME.BAS has several options: "
115 LOCATE 7,15: PRINT "1. INTERACTIVE"
120 LOCATE 8,15: PRINT "   For preliminary analysis."
125 LOCATE 10,15:PRINT "2. INTERACTIVE & PRINTER"
130 LOCATE 11,15:PRINT "   If you need a hard copy of input data"
135 LOCATE 12,15:PRINT "   and results."
140 LOCATE 14,15:PRINT "3. EXIT TO MAIN MENU"
145 LOCATE 20,22: INPUT "YOUR CHOICE  ";CH1%
150 IF CH1%=1 THEN A$="SCRN:"
155 IF CH1%=2 THEN A$="LPT1:"
160 IF CH1%=3 THEN RUN "MENU.BAS"
165 OPEN A$ FOR OUTPUT AS #1
170 REM ************************************************************************
175 REM                        ... ENTERING INPUT DATA ...
180 CLS: REM ----------------------------------------------------------------
185 LOCATE 10,10
190 INPUT "WHAT UNITS :   <1> METRIC  or  <2> ENGLISH  ";CH2%
195 IF CH2%=2 GOTO 205
200 UN1$=" kg/d": UN2$=" m ": UN4$=" d": UN5$="   1/d": UN6$=" m/d" :GOTO 210
205 UN1$=" lb/d": UN2$=" ft": UN4$=" d": UN5$="   1/d": UN6$=" ft/d
210 CLS: REM ----------------------------------------------------------------
215 PRINT TAB(9)"TRANSPORT FROM A POINT SOURCE IN TWO-DIMENSIONAL UNIFORM FLOW
220 PRINT TAB(9) STRING$(61,"*"): PRINT : PRINT : PRINT
225 IF CH1%=1 GOTO 250
230 LINE INPUT "  USER:       ";US$
235 LINE INPUT "  LOCATION:   ";L$
240 LINE INPUT "  DATE:       ";D$
245 PRINT :PRINT
250 REM
255 INPUT "  DARCY VELOCITY.....................[m/d ] or [ft/d]:";V
260 INPUT "  EFFECTIVE POROSITY.................................  :";N
265 INPUT "  AQUIFER THICKNESS..................................  :";M
270 INPUT "  LONGITUDINAL DISPERSIVITY.............[m ] or [ft]  :";AL
275 INPUT "  LATERAL DISPERSIVITY..................[m ] or [ft]  :";AT
280 INPUT "  RETARDATION FACTOR.................................  :";R
285 INPUT "  DECAY CONSTANT (lambda).....................[1/d]  :";LM
290 INPUT "  NUMBER OF POINT SOURCES.....................[max 10]  :";NW
295 LOCATE 24,9
300 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
```

```
305 IF CH3%=1 GOTO 210
310 FOR Z=1 TO NW
315 CLS
320 PRINT TAB(9)"TRANSPORT FROM A POINT SOURCE IN TWO-DIMENSIONAL UNIFORM FLOW
325 PRINT TAB(9) STRING$(61,"*"): PRINT
330 PRINT TAB(25) "ENTER POINT SOURCE DATA": PRINT: PRINT
335 PRINT "  SOURCE NO.";Z
340 PRINT "  ------------"
345 PRINT
350 INPUT "  X-COORDINATE  OF THE SOURCE.....[m] or [ft]  :";XW(Z)
355 INPUT "  Y-COORDINATE  OF THE SOURCE.....[m] or [ft]  :";YW(Z)
360 INPUT "  THE SOURCE STRENGTH.............[kg/d] or [lb/d]:";QC(Z)
365 INPUT "  ELAPSED TIME OF THE SOURCE ACTIVITY.....[d] :";TW(Z)
370 LOCATE 24,9
375 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
380 IF CH3%=1 THEN GOTO 315
385 NEXT Z
390 CLS
395 PRINT TAB(9)"TRANSPORT FROM A POINT SOURCE IN TWO-DIMENSIONAL UNIFORM FLOW
400 PRINT TAB(9) STRING$(61,"*"):    PRINT : PRINT
405 PRINT TAB(28) "ENTER GRID DATA": PRINT : PRINT
410 V=V/N: DX=AL*V: DY=AT*V: DXDY=DX*DY: DD=DX/DY: PI=3.14159265#
415 DOWN=4*PI*N*SQR(DXDY): B=2*DX/V: GMA=1+2*B*LM*R/V: GMAD=4*GMA*DX
420 XMIN=4*B/SQR(GMA)
425 PRINT "  NOTE:";
430 PRINT "  the error will be within 3% if you chose x-coordinate"
435 PRINT TAB(10)"of the grid origin to be";:PRINT XMIN;:PRINT UN2$;
440 PRINT " from the nearest source."
445 PRINT :PRINT
450 REM
455 INPUT "  X-COORDINATE OF THE GRID ORIGIN.....[m ] or [ft]  :";XO
460 INPUT "  Y-COORDINATE OF THE GRID ORIGIN.....[m ] or [ft]  :";YO
465 INPUT "  DISTANCE INCREMENT DELX.............[m ] or [ft]  :";DELX
470 INPUT "  DISTANCE INCREMENT DELY.............[m ] or [ft]  :";DELY
475 INPUT "  NUMBER OF NODES IN X-DIRECTION.....[ max 40   ]  :";NC
480 INPUT "  NUMBER OF NODES IN Y-DIRECTION.....[ max 20   ]  :";NR
485 LOCATE 24,9
490 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
495 IF CH3%=1 GOTO 390
500 CLS: REM ------------------------------------------------------------------
505 PRINT TAB(9)"TRANSPORT FROM A POINT SOURCE IN TWO-DIMENSIONAL UNIFORM FLOW
510 PRINT TAB(9) STRING$(61,"*"):    PRINT : PRINT
515 IF CH1%=1 GOTO 820
520 LPRINT TAB(12) "*********************************************
525 LPRINT TAB(12) "*                                           *
530 LPRINT TAB(12) "*   SOLUTE TRANSPORT FROM POINT SOURCES     *
535 LPRINT TAB(12) "*   IN TWO-DIMENSIONAL UNIFORM FLOW         *
540 LPRINT TAB(12) "*                                           *
545 LPRINT TAB(12) "*   MODEL: WMPLUME                          *
550 LPRINT TAB(12) "*                                           *
555 LPRINT TAB(12) "*********************************************
560 LPRINT: LPRINT
565 LPRINT TAB(12)"USER:      ";US$
570 LPRINT TAB(12)"-----"
575 LPRINT TAB(12)"LOCATION: ";L$
580 LPRINT TAB(12)"--------- "
585 LPRINT TAB(12)"DATE:      ";D$
590 LPRINT TAB(12)"-----"
595 LPRINT : LPRINT
600 LPRINT TAB(28)"INPUT DATA:":    PRINT #1,: PRINT #1,
```

```
605 LPRINT TAB(12)USING"DARCY VELOCITY.....:#####.##";V*N;
610 LPRINT UN6$
615 LPRINT TAB(12)     "EFFECTIVE POROSITY.....:    ";N
620 LPRINT TAB(12)USING"AQUIFER THICKNESS.....:#####.##";M;
625 LPRINT UN2$
630 LPRINT TAB(12)USING"LONGITUDINAL DISPERSIVITY.....:#####.##";AL;
635 LPRINT UN2$
640 LPRINT TAB(12)USING"LATERAL DISPERSIVITY.....:#####.##";AT;
645 LPRINT UN2$
650 LPRINT TAB(12)USING"RETARDATION FACTOR.....:#####.##";R
655 LPRINT TAB(12)     "DECAY CONSTANT (lambda).....:   ";LM;
660 LPRINT UN5$
665 LPRINT TAB(12)USING"NUMBER OF POINT SOURCES.....:   ##   ";NW
670 LPRINT : LPRINT
675 LPRINT TAB(26)"SOURCE DATA:"
680 FOR Z=1 TO NW
685 LPRINT: LPRINT
690 LPRINT TAB(12)"SOURCE NO.";Z
695 LPRINT TAB(12)"------------"
700 LPRINT
705 LPRINT TAB(12)USING"X-COORDINATE OF THE SOURCE.....:#####.##";XW(Z);
710 LPRINT UN2$
715 LPRINT TAB(12)USING"Y-COORDINATE OF THE SOURCE.....:#####.##";YW(Z);
720 LPRINT UN2$
725 LPRINT TAB(12)USING"THE SOURCE STRENGTH.....:#####.##";QC(Z);
730 LPRINT UN1$
735 LPRINT TAB(12)USING"ELAPSED TIME OF THE SOURCE ACTIVITY...:#####.##";TW(Z);
740 LPRINT UN4$
745 IF Z=2 THEN PRINT #1,CHR$(12);
750 NEXT Z
755 LPRINT : LPRINT
760 LPRINT TAB(28)"GRID DATA:"
765 LPRINT : LPRINT
770 LPRINT TAB(12)USING"X-COORDINATE OF THE GRID ORIGIN.....:#####.##";XO;
775 LPRINT UN2$
780 LPRINT TAB(12)USING"Y-COORDINATE OF THE GRID ORIGIN.....:#####.##";YO;
785 LPRINT UN2$
790 LPRINT TAB(12)USING"DISTANCE INCREMENT DELX.....:#####.##";DELX;
795 LPRINT UN2$
800 LPRINT TAB(12)USING"DISTANCE INCREMENT DELY.....:#####.##";DELY;
805 LPRINT UN2$
810 LPRINT TAB(12)USING"NUMBER OF NODES IN X-DIRECTION.....:   ##   ";NC
815 LPRINT TAB(12)USING"NUMBER OF NODES IN Y-DIRECTION.....:   ##   ";NR
820 REM ************************************************************************
825 REM                          ... THE MAIN PROGRAM ...
830 REM ------------------------------------------------------------------------
835 LOCATE 10,24: PRINT "... PLEASE WAIT FOR A MOMENT ..."
840 REM
845 A1=.07052307844#: A2=.0422820123#: A3=.0092705272#
850 A4=1.520143E-04: A5=2.765672E-04: A6=4.30638E-05
855 X(1)=XO: Y(1)=YO
860 FOR I=1 TO NR
865     FOR J=1 TO NC
870         FOR Z=1 TO NW
875             IF CH2%=1 THEN QCO=QC(Z)*1000/M ELSE QCO=QC(Z)*16018.3635#/M
880             X=X(J)-XW(Z)
885             IF X<0 THEN GOTO 925
890             Y=ABS(Y(I)-YW(Z))
895             IF (X=0) AND (Y=0) THEN C(I,J)=-1: GOTO 930
                ELSE RR=(X*X+Y*Y*DD)*GMA: RR=SQR(RR)
900             U=(RR*RR*R)/(GMAD*TW(Z))
```

```
905             RB=RR/B
910             GOSUB 1150
915             CW(Z)=QCO*EXP(X/B)/DOWN*WURB
920             C(I,J)=C(I,J)+CW(Z)
925         NEXT Z
930         LOCATE 13,20
935         PRINT "NOW PROCESSING ROW: ";I;:PRINT "  AND COLUMN: ";J
940         X(J+1)=X(J)+DELX
945     NEXT J
950     Y(I+1)=Y(I)+DELY
955 NEXT I
960 REM ************************************************************************
965 REM                        ... FORMATTING THE OUTPUT ...
970 CLS: REM ---------------------------------------------------------------
975 H=FIX(NC/5): P=H+1
980 R=NC-H*5: IF R=0 THEN P=H
985 PRINT #1,CHR$(12);
990 PRINT #1,STRING$(33,"*");" RESULTS ";STRING$(35,"*")
995 PRINT #1,
1000 PRINT #1,"+------> X-direction      CONCENTRATION in mg/l (ppm)"
1005 PRINT #1,"!": PRINT #1,"v Y"
1010 FOR S=1 TO P
1015     PRINT #1,: PRINT #1,: PRINT #1,
1020     IF S=P AND R>0 THEN L5=R ELSE L5=5
1025     PRINT #1,TAB(13) "";
1030     FOR K=1 TO L5
1035         F=F+1
1040         PRINT #1,USING " ######.##";X(F);: PRINT #1,UN2$;
1045     NEXT K
1050     PRINT #1,: PRINT #1,
1055     FOR I=1 TO NR
1060         J=(S-1)*5
1065         PRINT #1,USING "####.## ";Y(I);: PRINT #1,UN2$;
1070         FOR L=1 TO L5
1075             J=J+1
1080             PRINT #1,USING " #######.####";C(I,J);
1085         NEXT L
1090         PRINT #1,""
1095     NEXT I
1100     IF CH1%=2 GOTO 1130
1105 REM ------------------------------------------------------------------------
1110 LOCATE 24,23,0: COLOR 16,7,0
1115 PRINT "Press Space Bar to Continue...";:COLOR 2,0,0
1120 MT$=INKEY$:IF MT$="" THEN 1120 ELSE IF MT$=" " THEN GOTO 1125 ELSE 1120
1125 CLS: REM ---------------------------------------------------------------
1130 NEXT S
1135 CLS: PRINT #1,CHR$(12);
1140 CLOSE #1
1145 CLEAR: GOTO 100
1150 REM ********************** SUBROUTINE WURB ******************************
1155 ARG1=(PI*B)/(2*RR)
1160 ARG2=-RB
1165 ARG3=(-RB+2*U)/(2*SQR(U))
1170 REM ----------------------- ERFC FUNCTION -------------------------------
1175     G=ABS(ARG3):G2=G*G:G3=G2*G:G4=G3*G:G5=G4*G:G6=G5*G
1180     ERFC=1/(1+A1*G+A2*G2+A3*G3+A4*G4+A5*G5+A6*G6)^16
1185     IF ARG3<0 THEN ERFC=2-ERFC
1190 REM ------------------------------------------------------------------------
1195 WURB=SQR(ARG1)*EXP(ARG2)*ERFC
1200 RETURN
```

PROGRAM IDENTIFICATION

1.1	Program Title:	Analytical Model for Solute Transport of a Solute Slug in a Uniform Two-Dimensional Groundwater Flow Field
1.2	Program Code Name:	SLUG.BAS
1.3	Program Writer:	Milovan S. Beljin
1.4	Program Organization:	International Ground Water Modeling Center Holcomb Research Institute, Butler University Indianapolis, Indiana 46208, Tel: 317/283-9458
1.5	Date:	January 1985
1.6	Version:	IBM-PC 1.0
1.7	Source Language:	Microsoft BASIC
1.8	Memory Requirements:	64k
1.9	Availability:	SLUG.BAS is a non-proprietary code. It is distributed at cost by IGWMC. A copy of the program on 5¼" diskette is available
2.0	Abstract:	A program to calculate the concentration distribution of a slug from a point source in two-dimensional regional flow
2.1	Comments:	SLUG.BAS is based on Sauty (1980) equation

TRANSPORT OF A SOLUTE SLUG IN A UNIFORM GROUNDWATER FLOW FIELD

This problem considers slug injection of a conservative solute into a two-dimensional uniform flow field (Figure 4). It is similar to the plume problem except for the boundary condition at the source:

$$C(x, y, o) = \frac{m}{n}\delta(x, y) \tag{6.1}$$

where m(M/L) is a certain mass of solute introduced instantaneously per unit of aquifer thickness.

A general analytical solution of this problem was given by Sauty (1980):

$$C_R(a, t'_R) = \frac{t'_{Rmax}}{t'_R} \cdot \exp\left[\frac{a^2 + t'^2_{Rmax}}{4t'_{Rmax}} - \frac{a^2 + t'^2_R}{4t'_R}\right] \tag{6.2}$$

where

$$x_R = \frac{x}{\alpha_L} \text{ (Longitudinal Peclet number)} \quad x > 0$$

$$x_R = |x| + 2\bar{v}t \quad x < 0$$

$$a = \left(\frac{x^2}{\alpha_L^2} + \frac{y^2}{\alpha_L \alpha_T}\right)^{1/2} = (x_R^2 + y_R^2)^{1/2}$$

$$t'_{Rmax} = (a^2 + 4)^{1/2} - 2$$

$$t'_R = \frac{\bar{v}t}{\alpha_L}.$$

The concentration C is calculated as a product of the dimensionless concentration C_R and the peak concentration C_{max}:

$$C_{max}(x_R, y_R) = \frac{m}{4\pi n \alpha_L (\alpha_L \alpha_T)^{\frac{1}{2}}} \cdot f(x_R, y_R) \qquad (6.3)$$

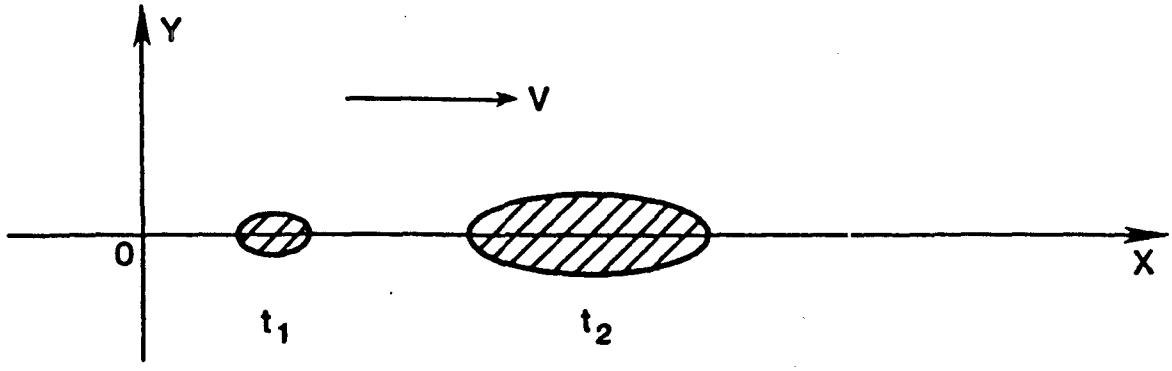
where

$$f(x_R, y_R) = \frac{1}{x_R \, t_{Rmax}} \exp \{ - \left[\frac{x_R \, (1-t_{Rmax})^2}{4 t_{Rmax}} + \frac{y_R^2}{4 x_R t_{Rmax}} \right] \}$$

with

$$t_{Rmax} = [1 + (^2/x_R)^2 + (^{y_R}/x_R)^2]^{\frac{1}{2}} - {}^2/x_R .$$

Figure 4.



ASSUMPTIONS:

- uniformly porous confined aquifer,
- the aquifer is homogeneous, isotropic, infinite in areal extent, and constant in thickness,
- a fully penetraing solute injection well,
- recharge rates are negligible in relation to uniform regional flow rate,
- pollutants are distributed instantaneously to the entire aquifer thickness beneath the point source,
- injection is of short duration in relation to transport time.

```
10  REM  ************************************************************
15  REM  *                                                          *
20  REM  *                program: "SLUG.BAS"                       *
25  REM  *                version:  IBM-PC 1.0 <January,1985>       *
30  REM  *                                                          *
35  REM  *                     by:  MILOVAN S. BELJIN               *
40  REM  *                                                          *
45  REM  *          HOLCOMB RESEARCH INSTITUTE - IGWMC              *
50  REM  *          INDIANAPOLIS, INDIANA 46208                     *
55  REM  *                                                          *
60  REM  *                                                          *
65  REM  *                                                          *
70  REM  *  THIS PROGRAM CALCULATES THE CONCENTRATION DISTRIBUTION  *
75  REM  *  FROM A SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW.  *
80  REM  *  BASED ON SAUTY (1980).                                  *
85  REM  *                                                          *
90  REM  ************************************************************
95  REM
100 DIM X(41),Y(21),C(21,41)
105 SCREEN 0,0,0: WIDTH 80: COLOR 2,0,0: KEY OFF: CLS
110 LOCATE 3,18: PRINT "SLUG.BAS has several options: "
115 LOCATE 7,15: PRINT "1. INTERACTIVE"
120 LOCATE 8,15: PRINT "   For preliminary analysis."
125 LOCATE 10,15:PRINT "2. INTERACTIVE & PRINTER"
130 LOCATE 11,15:PRINT "   If you need a hard copy of input data"
135 LOCATE 12,15:PRINT "   and results."
140 LOCATE 14,15:PRINT "3. EXIT TO MAIN MENU"
145 LOCATE 20,22: INPUT "YOUR CHOICE  ";CH1%
150 IF CH1%=1 THEN A$="SCRN:"
155 IF CH1%=2 THEN A$="LPT1:"
160 IF CH1%=3 THEN RUN "MENU.BAS"
165 OPEN A$ FOR OUTPUT AS #1
170 REM ************************************************************************
175 REM                      ... ENTERING INPUT DATA ...
180 CLS: REM ---------------------------------------------------------------
185 LOCATE 10,10
190 INPUT "WHAT UNITS :   <1> METRIC  or  <2> ENGLISH  ";CH2%
195 IF CH2%=2 GOTO 205
200 UN1$=" kg" : UN2$=" m ": UN3$=" m/d " : UN4$=" d": GOTO 210
205 UN1$=" lb" : UN2$=" ft": UN3$=" ft/d" : UN4$=" d"
210 CLS: REM ---------------------------------------------------------------
215 PRINT TAB(14)"SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW"
220 PRINT TAB(14) STRING$(46,"*"): PRINT : PRINT
225 IF CH1%=1 GOTO 250
230 LINE INPUT "  USER:       ";US$
235 LINE INPUT "  LOCATION:   ";L$
240 LINE INPUT "  DATE:       ";D$
245 PRINT :PRINT
250 INPUT "  TOTAL SOLUTE MASS INJECTED.............[kg] or [lb]  :";M
255 INPUT "  DARCY VELOCITY.....................[m/d ] or [ft/d]:";V
260 INPUT "  EFFECTIVE POROSITY.................................  :";N
265 INPUT "  LONGITUDINAL DISPERSIVITY..............[m ] or [ft]  :";AL
270 INPUT "  LATERAL DISPERSIVITY...................[m ] or [ft]  :";AT
275 INPUT "  AQUIFER THICKNESS......................[m ] or [ft]  :";B
280 INPUT "  X-COORDINATE OF THE GRID ORIGIN........[m ] or [ft]  :";XO
285 INPUT "  Y-COORDINATE OF THE GRID ORIGIN........[m ] or [ft]  :";YO
290 INPUT "  DISTANCE INCREMENT DELX................[m ] or [ft]  :";DELX
295 INPUT "  DISTANCE INCREMENT DELY................[m ] or [ft]  :";DELY
300 INPUT "  NUMBER OF NODES IN X-DIRECTION.........[ max 40   ]  :";NC
```

```
305 INPUT "  NUMBER OF NODES IN Y-DIRECTION.....[ max 20   ]  :";NR
310 INPUT "  TIME.....[d]  :";T
315 LOCATE 24,9
320 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
325 IF CH3%=1 GOTO 210
330 CLS: REM ------------------------------------------------------------------
335 PRINT TAB(16)"SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW"
340 PRINT TAB(16) STRING$(46,"*"): PRINT #1,: PRINT #1,
345 IF CH1%=1 GOTO 425
350 LPRINT TAB(12) "**********************************************************
355 LPRINT TAB(12) "*                                                        *
360 LPRINT TAB(12) "*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
365 LPRINT TAB(12) "*                                                        *
370 LPRINT TAB(12) "*  MODEL: SLUG.BAS                                       *
375 LPRINT TAB(12) "*                                                        *
380 LPRINT TAB(12) "**********************************************************
385 LPRINT :LPRINT
390 LPRINT TAB(12)"USER:      ";US$
395 LPRINT TAB(12)"-----"
400 LPRINT TAB(12)"LOCATION: ";L$
405 LPRINT TAB(12)"--------- "
410 LPRINT TAB(12)"DATE:      ";D$
415 LPRINT TAB(12)"-----"
420 LPRINT : LPRINT
425 PRINT #1,TAB(28)"INPUT DATA:":    PRINT #1,: PRINT #1,
430 PRINT #1,TAB(12)USING"TOTAL SOLUTE MASS INJECTED.....:#####.##";M;
435 PRINT #1,UN1$
440 PRINT #1,TAB(12)USING"DARCY VELOCITY.....:#####.##";V;
445 PRINT #1,UN3$
450 PRINT #1,TAB(12)      "EFFECTIVE POROSITY.....:     ";N
455 PRINT #1,TAB(12)USING"LONGITUDINAL DISPERSIVITY.....:#####.##";AL;
460 PRINT #1,UN2$
465 PRINT #1,TAB(12)USING"LATERAL DISPERSIVITY.....:#####.##";AT;
470 PRINT #1,UN2$
475 PRINT #1,TAB(12)USING"AQUIFER THICKNESS.....:#####.##";B;
480 PRINT #1,UN2$
485 PRINT #1,TAB(12)USING"X-COORDINATE OF THE GRID ORIGIN.....:#####.##";XO;
490 PRINT #1,UN2$
495 PRINT #1,TAB(12)USING"Y-COORDINATE OF THE GRID ORIGIN.....:#####.##";YO;
500 PRINT #1,UN2$
505 PRINT #1,TAB(12)USING"DISTANCE INCREMENT DELX.....:#####.##";DELX;

510 PRINT #1,UN2$
515 PRINT #1,TAB(12)USING"DISTANCE INCREMENT DELY.....:#####.##";DELY;

520 PRINT #1,UN2$
525 PRINT #1,TAB(12)USING"NUMBER OF NODES IN X-DIRECTION.....:#####   ";NC
530 PRINT #1,TAB(12)USING"NUMBER OF NODES IN Y-DIRECTION.....:#####   ";NR
535 PRINT #1,TAB(12)USING"TIME.....:#####.##";T;
540 PRINT #1,UN4$
545 IF CH1%=2 GOTO 585
550 REM ------------------------------------------------------------------------
555 LOCATE 24,23,0: COLOR 16,7,0
560 PRINT "Press Space Bar to Continue...";:COLOR 2,0,0
565 MT$=INKEY$:IF MT$="" THEN 565 ELSE IF MT$=" " THEN GOTO 580 ELSE 565
570 REM ************************************************************************
575 REM                          ... THE MAIN PROGRAM ...
580 CLS:REM -----------------------------------------------------------------
585 LOCATE 10,24: PRINT "... PLEASE WAIT FOR A MOMENT ..."
```

```
590 IF CH2%=1 THEN M=1000*M/B ELSE M=M*16018.36/B
595 U=V/N: PI=3.14159265#
600 X(1)=X0:  Y(1)=Y0
605 PRINT #1,
610 FOR I=1 TO NR
615     Y=Y(I)
620     FOR J=1 TO NC
625         X=X(J)
630         IF X<0 OR X=0 THEN X=ABS(X)+2*U*T
635         XR=X/AL: XR2=XR*XR: YR2=(Y*Y)/(AL*AT): A2=XR2+YR2
640         TRP=(U*T)/AL:  TRMAXP=SQR(A2+4)-2
645         K1=(A2+TRMAXP*TRMAXP)/(4*TRMAXP)
650         K2=(A2+TRP*TRP)/(4*TRP)
655         CR=(TRMAXP/TRP)*EXP(K1-K2)
660         TRMAX=SQR(1+4/XR2+YR2/XR2)-2/XR
665         E1=((XR/4)*(1-TRMAX)^2)/TRMAX
670         E2=YR2/(4*XR*TRMAX)
675         F=(1/(XR*TRMAX))*EXP(-E1-E2)
680         CMAX=((M/N)*F)/(4*PI*AL*SQR(AL*AT))
685         C(I,J)=CR*CMAX
690         LOCATE 13,20
695         PRINT "NOW PROCESSING ROW: ";I;:PRINT "  AND COLUMN: ";J
700         X(J+1)=X(J)+DELX
705     NEXT J
710     Y(I+1)=Y+DELY
715 NEXT I
720 REM ************************************************************************
725 REM                        ... FORMATTING THE OUTPUT ...
730 CLS: REM ---------------------------------------------------------------
735 H=FIX(NC/5): P=H+1
740 R=NC-H*5: IF R=0 THEN P=H
745 PRINT #1,CHR$(12);
750 PRINT #1,STRING$(33,"*");" RESULTS ";STRING$(35,"*")
755 PRINT #1,
760 PRINT #1,"+------> X-direction      CONCENTRATION in mg/l (ppm)"
765 PRINT #1,"!": PRINT #1,"v Y"
770 FOR S=1 TO P
775     PRINT #1,: PRINT #1,: PRINT #1,
780     IF S=P AND R>0 THEN L5=R ELSE L5=5
785     PRINT #1,TAB(13) "";
790     FOR K=1 TO L5
795         Z=Z+1
800         PRINT #1,USING "########.##";X(Z);: PRINT #1,UN2$;
805     NEXT K
810     PRINT #1,: PRINT #1,
815     FOR I=1 TO NR
820         J=(S-1)*5
825         PRINT #1,USING "####.## ";Y(I);: PRINT #1,UN2$;
830         FOR L=1 TO L5
835             J=J+1
840             IF C(I,J)<.0001 THEN C(I,J)=0
845             PRINT #1,USING "#########.#####";C(I,J);
850         NEXT L
855         PRINT #1,""
860     NEXT I
865     IF CH1%=2 GOTO 895
870 REM ---------------------------------------------------------------------
875 LOCATE 24,23,0: COLOR 16,7,0
```

```
880 PRINT "Press Space Bar to Continue...";:COLOR 2,0,0
885 MT$=INKEY$:IF MT$="" THEN 885 ELSE IF MT$=" " THEN GOTO 890 ELSE 885
890 CLS: REM ------------------------------------------------------------------
895 NEXT S
900 CLS: PRINT #1,CHR$(12);
905 CLOSE #1
910 CLEAR: GOTO 100
915 REM ------------------------------------------------------------------
```

PROGRAM IDENTIFICATION

1.1	Program Title:	Analytical Model for Transport of a Solute Plume from Point Sources in a Uniform Three-Dimensional Groundwater Flow Field
1.2	Program Code Name:	PLUME3D.BAS
1.3	Program Writer:	Milovan S. Beljin
1.4	Program Organization:	International Ground Water Modeling Center Holcomb Research Institute, Butler University Indianapolis, Indiana 46208, Tel: 317/283-9458
1.5	Date:	January 1985
1.6	Version:	IBM-PC 1.0
1.7	Source Language:	Microsoft BASIC
1.8	Memory Requirements:	64k
1.9	Availability:	PLUME3D.BAS is a non-proprietary code. It is distributed at cost by IGWMC. A copy of the program on 5¼" diskette is available
2.0	Abstract:	A program to calculate the concentration distribution of a plume from point sources in three-dimensional regional flow. It includes option for decay
2.1	Comments:	PLUME3D.BAS is based on Hunt (1978) equation

9.1. MATHEMATICAL MODEL

TRANSPORT FROM A POINT SOURCE IN A UNIFORM THREE-DIMENSIONAL FLOW FIELD

The advection-dispersion equation for a uniform three-dimensional flow field with a constant velocity, $\bar{v}$, in the x direction, is given as

$$D_{xx}\frac{\partial^2 C}{\partial x^2} + D_{yy}\frac{\partial^2 C}{\partial y^2} + D_{zz}\frac{\partial^2 C}{\partial z^2} - \bar{v}\frac{\partial C}{\partial x} - \lambda C + \frac{Q_c}{n} = \frac{\partial C}{\partial t} \tag{9.1}$$

If the pollutant is continuously injected from a point source into an aquifer, initial and boundary conditions are

$$c\ (x, y, 0) = 0$$

$$Q_c(x, y, z, t) = QC_0\delta(x, y, z)$$

$$C\ (\pm\infty, \pm\infty, \pm\infty, t) = 0$$

The analytical solution of the problem is given in the form (Hunt 1978)

$$C(x, y, z, t) = \frac{QC_0 \exp\left(\frac{x\bar{v}}{2D_{xx}}\right)}{8n\pi\sqrt{D_{yy}D_{zz}}}\left[\exp\left(-\frac{ar}{\sqrt{D_{xx}}}\right)\operatorname{erfc}\left(\frac{r}{2\sqrt{D_{xx}t}} - a\sqrt{t}\right)\right.$$

$$\left. + \exp\left(\frac{ar}{\sqrt{D_{xx}}}\right)\operatorname{erfc}\left(\frac{r}{2\sqrt{D_{xx}t}} + a\sqrt{t}\right)\right] \tag{9.2}$$

in which r and a are defined as

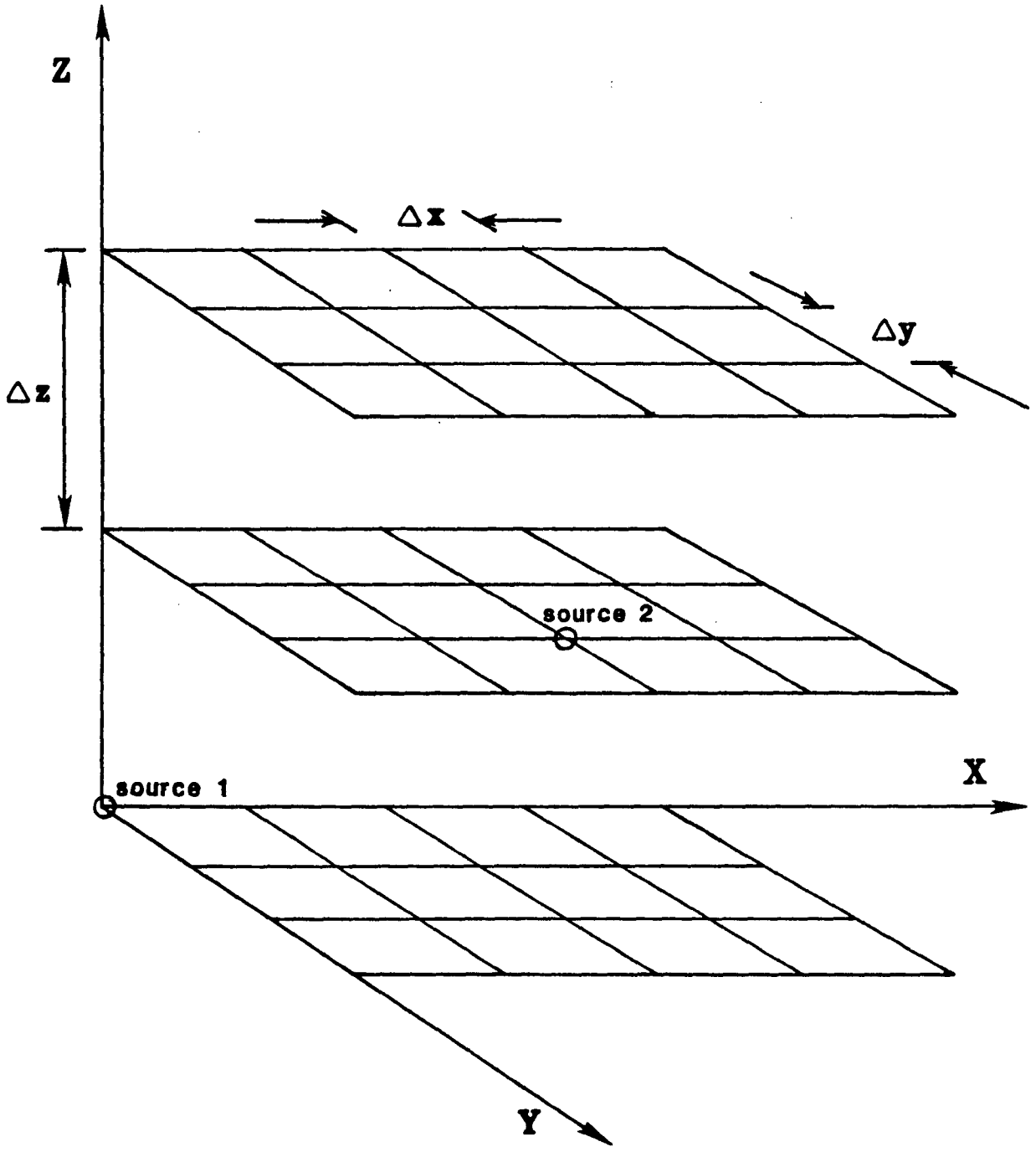
$$r = \sqrt{x^2 + y^2\frac{D_{xx}}{D_{yy}} + z^2\frac{D_{xx}}{D_{zz}}}$$

$$a = \sqrt{\lambda + \frac{\bar{v}^2}{4D_{xx}}}$$

The program PLUME3D.BAS uses the principle of superposition to calculate concentration distribution from multiple point sources.

The grid design of three-dimensional models is given in Figure 7.

Figure 7



```
10  REM  ************************************************************
15  REM  *                                                          *
20  REM  *                  program: "PLUME3D.BAS"                  *
25  REM  *                  version:  IBM-PC 1.0 (January,1985)     *
30  REM  *                                                          *
35  REM  *                       by:  MILOVAN S. BELJIN             *
40  REM  *                                                          *
45  REM  *           HOLCOMB RESEARCH INSTITUTE - IGWMC             *
50  REM  *           INDIANAPOLIS, INDIANA 46208                    *
55  REM  *                                                          *
60  REM  *  THIS PROGRAM CALCULATES THE CONCENTRATION DISTRIBUTION  *
65  REM  *  FOR DISPLACEMENT OF SOLUTE IN A HOMOGENEOUS, CONFINED  *
70  REM  *  AQUIFER WITH UNIFORM REGIONAL FLOW AND MULTIPLE, FULLY *
75  REM  *  PENETRATING SOLUTE INJECTION WELLS (POINT SOURCES).    *
80  REM  *  BASED ON HUNT (1983).                                  *
85  REM  *                                                          *
90  REM  ************************************************************
95  REM
100 DIM X(41),Y(21),C(21,41),Q(10),CW(10),TW(10)
105 SCREEN 0,0,0: WIDTH 80: COLOR 2,0,0: KEY OFF: CLS
110 LOCATE 3,18: PRINT "PLUME3D.BAS has several options: "
115 LOCATE 7,15: PRINT "1. INTERACTIVE"
120 LOCATE 8,15: PRINT "   For preliminary analysis."
125 LOCATE 10,15:PRINT "2. INTERACTIVE & PRINTER"
130 LOCATE 11,15:PRINT "   If you need a hard copy of input data"
135 LOCATE 12,15:PRINT "   and results."
140 LOCATE 14,15:PRINT "3. EXIT TO MAIN MENU"
145 LOCATE 20,22: INPUT "YOUR CHOICE  ";CH1%
150 IF CH1%=1 THEN A$="SCRN:"
155 IF CH1%=2 THEN A$="LPT1:"
160 IF CH1%=3 THEN RUN "MENU.BAS"
165 OPEN A$ FOR OUTPUT AS #1
170 REM ************************************************************
175 REM                      ... ENTERING INPUT DATA ...
180 CLS: REM ------------------------------------------------------
185 LOCATE 10,10
190 INPUT "WHAT UNITS :   <1> METRIC  or  <2> ENGLISH  ";CH2%
195 IF CH2%=2 GOTO 205
200 UN1$=" kg/d": UN2$=" m ": UN4$=" d": UN5$="   1/d": UN6$=" m/d" :GOTO 210
205 UN1$=" lb/d": UN2$=" ft": UN4$=" d": UN5$="   1/d": UN6$=" ft/d
210 CLS: REM ------------------------------------------------------
215 PRINT TAB(9)"TRANSPORT FROM POINT SOURCES IN THREE-DIMENSIONAL UNIFORM FLOW
220 PRINT TAB(9) STRING$(62,"*"): PRINT : PRINT : PRINT
225 IF CH1%=1 GOTO 250
230 LINE INPUT "  USER:       ";US$
235 LINE INPUT "  LOCATION:   ";L$
240 LINE INPUT "  DATE:       ";D$
245 PRINT :PRINT
250 REM
255 INPUT "  DARCY VELOCITY.....................[m/d ] or [ft/d]:";V
260 INPUT "  EFFECTIVE POROSITY.................................  :";N
265 INPUT "  LONGITUDINAL DISPERSIVITY..........[m ] or [ft]  :";AL
270 INPUT "  LATERAL DISPERSIVITY...............[m ] or [ft]  :";AT
275 INPUT "  VERTICAL DISPERSIVITY..............[m ] or [ft]  :";AZ
280 INPUT "  DECAY CONSTANT (lambda).....................[1/d]  :";LM
285 INPUT "  NUMBER OF POINT SOURCES.....................[max 10]  :";NW
290 LOCATE 24,9
295 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
300 IF CH3%=1 GOTO 210
```

```
305 FOR W=1 TO NW
310 CLS
315 PRINT TAB(9)"TRANSPORT FROM POINT SOURCES IN THREE-DIMENSIONAL UNIFORM FLOW
320 PRINT TAB(9) STRING$(62,"*"): PRINT
325 PRINT TAB(25) "ENTER POINT SOURCE DATA": PRINT: PRINT
330 PRINT "  SOURCE NO.";W
335 PRINT "  ------------"
340 PRINT
345 INPUT "  Y-COORDINATE  OF THE SOURCE.....[m] or [ft]  :";XW(W)
350 INPUT "  Y-COORDINATE  OF THE SOURCE.....[m] or [ft]  :";YW(W)
355 INPUT "  Z-COORDINATE  OF THE SOURCE.....[m] or [ft]  :";ZW(W)
360 INPUT "  THE SOURCE STRENGTH.....[kg/d] or [lb/d]:";QC(W)
365 INPUT "  ELAPSED TIME OF THE SOURCE ACTIVITY.....[d] :";TW(W)
370 LOCATE 24,9
375 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
380 IF CH3%=1 THEN GOTO 310
385 NEXT W
390 CLS
395 PRINT TAB(9)"TRANSPORT FROM POINT SOURCES IN THREE-DIMENSIONAL UNIFORM FLOW
400 PRINT TAB(9) STRING$(62,"*"):    PRINT : PRINT
405 PRINT TAB(28) "ENTER GRID DATA": PRINT : PRINT
410 PRINT :PRINT
415 INPUT "  X-COORDINATE OF THE GRID ORIGIN.....[m ] or [ft]  :";XO
420 INPUT "  Y-COORDINATE OF THE GRID ORIGIN.....[m ] or [ft]  :";YO
425 INPUT "  Z-COORDINATE OF THE GRID ORIGIN.....[m ] or [ft]  :";ZO
430 INPUT "  DISTANCE INCREMENT DELX.....[m ] or [ft]  :";DELX
435 INPUT "  DISTANCE INCREMENT DELY.....[m ] or [ft]  :";DELY
440 INPUT "  DISTANCE INCREMENT DELZ.....[m ] or [ft]  :";DELZ
445 INPUT "  NUMBER OF NODES IN X-DIRECTION.....[ max 40   ]  :";NC
450 INPUT "  NUMBER OF NODES IN Y-DIRECTION.....[ max 20   ]  :";NR
455 INPUT "  NUMBER OF NODES IN Z-DIRECTION.....[ max 20   ]  :";NZ
460 LOCATE 24,9
465 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
470 IF CH3%=1 GOTO 390
475 CLS: REM ------------------------------------------------------------------
480 PRINT TAB(9)"TRANSPORT FROM POINT SOURCES IN THREE-DIMENSIONAL UNIFORM FLOW
485 PRINT TAB(9) STRING$(62,"*"):    PRINT : PRINT
490 IF CH1%=1 GOTO 825
495 LPRINT TAB(12) "*********************************************
500 LPRINT TAB(12) "*                                           *
505 LPRINT TAB(12) "*   SOLUTE TRANSPORT FROM POINT SOURCES     *
510 LPRINT TAB(12) "*   IN THREE-DIMENSIONAL UNIFORM FLOW       *
515 LPRINT TAB(12) "*                                           *
520 LPRINT TAB(12) "*   MODEL: PLUME3D                          *
525 LPRINT TAB(12) "*                                           *
530 LPRINT TAB(12) "*********************************************
535 LPRINT: LPRINT
540 LPRINT TAB(12)"USER:      ";US$
545 LPRINT TAB(12)"-----"
550 LPRINT TAB(12)"LOCATION:  ";L$
555 LPRINT TAB(12)"---------- "
560 LPRINT TAB(12)"DATE:      ";D$
565 LPRINT TAB(12)"-----"
570 LPRINT : LPRINT
575 LPRINT TAB(28)"INPUT DATA:":    PRINT #1,: PRINT #1,
580 LPRINT TAB(12)USING"DARCY VELOCITY .....:#####.##";V;
585 LPRINT UN6$
590 LPRINT TAB(12)     "EFFECTIVE POROSITY.....:    ";N
595 LPRINT TAB(12)USING"LONGITUDINAL DISPERSIVITY.....:#####.##";AL;
600 LPRINT UN2$
```

```
605 LPRINT TAB(12)USING"LATERAL DISPERSIVITY.................:#####.##";AI;
610 LPRINT UN2$
615 LPRINT TAB(12)USING"VERTICAL DISPERSIVITY................:#####.##";AZ;
620 LPRINT UN2$
625 LPRINT TAB(12)      "DECAY CONSTANT (lambda)..............:    ";LM;
630 LPRINT UN5$
635 LPRINT TAB(12)USING"NUMBER OF POINT SOURCES..............:    ##    ";NW
640 LPRINT : LPRINT
645 LPRINT TAB(26)"SOURCE DATA:"
650 FOR W=1 TO NW
655 LPRINT: LPRINT
660 LPRINT TAB(12)"SOURCE NO.";W
665 LPRINT TAB(12)"------------"
670 LPRINT
675 LPRINT TAB(12)USING"X-COORDINATE OF THE SOURCE...........:######.##";XW(W);
680 LPRINT UN2$
685 LPRINT TAB(12)USING"Y-COORDINATE OF THE SOURCE...........:######.##";YW(W);
690 LPRINT UN2$
695 LPRINT TAB(12)USING"Y-COORDINATE OF THE SOURCE...........:######.##";ZW(W);
700 LPRINT UN2$
705 LPRINT TAB(12)USING"THE SOURCE STRENGTH..................:######.##";QC(W);
710 LPRINT UN1$
715 LPRINT TAB(12)USING"ELAPSED TIME OF THE SOURCE ACTIVITY...:######.##";TW(W);
720 LPRINT UN4$
725 IF W=2 THEN PRINT #1,CHR$(12);
730 NEXT W
735 LPRINT : LPRINT
740 LPRINT TAB(28)"GRID DATA:"
745 LPRINT : LPRINT
750 LPRINT TAB(12)USING"X-COORDINATE OF THE GRID ORIGIN.....:######.##";XO;
755 LPRINT UN2$
760 LPRINT TAB(12)USING"Y-COORDINATE OF THE GRID ORIGIN.....:######.##";YO;
765 LPRINT UN2$
770 LPRINT TAB(12)USING"Z-COORDINATE OF THE GRID ORIGIN.....:######.##";ZO;
775 LPRINT UN2$
780 LPRINT TAB(12)USING"DISTANCE INCREMENT DELX..............:######.##";DELX;
785 LPRINT UN2$
790 LPRINT TAB(12)USING"DISTANCE INCREMENT DELY..............:######.##";DELY;
795 LPRINT UN2$
800 LPRINT TAB(12)USING"DISTANCE INCREMENT DELZ..............:######.##";DELZ;
805 LPRINT UN2$
810 LPRINT TAB(12)USING"NUMBER OF NODES IN X-DIRECTION.......:    ##    ";NC
815 LPRINT TAB(12)USING"NUMBER OF NODES IN Y-DIRECTION.......:    ##    ";NR
820 LPRINT TAB(12)USING"NUMBER OF NODES IN Z-DIRECTION.......:    ##    ";NZ
825 REM ************************************************************************
830 REM                          ... THE MAIN PROGRAM ...
835 REM ------------------------------------------------------------------------
840 LOCATE 10,24: PRINT "... PLEASE WAIT FOR A MOMENT ..."
845 A1=.07052307847: A2=.04228201237: A3=.00927052727
850 A4=1.520143E-04: A5=2.765672E-04: A6=4.306387E-05
855 U=V/N: D1=AL*U: D2=AT*U: D3=AZ*U: PI=3.14159265#
860 D1D1=2*D1: D1D2=D1/D2: D1D3=D1/D3
865 A=SQR(LM+U*U/(4*D1)) : BM=8*N*PI*SQR(D2*D3)
870 FOR LAY=1 TO NZ
875 X(1)=XO: Y(1)=YO: Z(1)=ZO
880 FOR I=1 TO NR
885     FOR J=1 TO NC
890         C(I,J)=0
895         FOR W=1 TO NW
900             IF CH2%=1 THEN M=QC(W)*1000 ELSE M=QC(W)*16018.3635#
```

```
905             X=X(J)-XW(W)
910             IF X<0 THEN GOTO 1000
915             Y=ABS(Y(I)-YW(W))
920             Z=ABS(Z(LAY)-ZW(W))
925             IF (Z=0) AND (Y=0) THEN GOTO 930 ELSE GOTO 935
930             IF  X=0 THEN C(I,J)=-1: GOTO 1005 ELSE GOTO 935
935             DN=2*SQR(D1*TW(W)): AT=A*SQR(TW(W))
940             BY=M/PM
945             R=SQR(X*X+Y*Y*D1D2+Z*Z*D1D3)
950             ARG1=A*R/SQR(D1)
955             ARG2=R/DN-AT
960             GOSUB 1250
965             TRM1=EXP(-ARG1)*ERFC
970             ARG2=R/DN+AT
975             GOSUB 1250
980             TRM2=EXP(ARG1)*ERFC
985             TRM =TRM1+TRM2
990             CW(W)=BY*EXP(X*U/(D1D1))*TRM/R
995             C(I,J)=C(I,J)+CW(W)
1000          NEXT W
1005        LOCATE 13,13
1010        PRINT "NOW PROCESSING LAYER: ";LAY;
1015        PRINT "  ROW: ";I;:PRINT "  AND COLUMN: ";J
1020        X(J+1)=X(J)+DELX
1025    NEXT J
1030    Y(I+1)=Y(I)+DELY
1035 NEXT I
1040 REM ************************************************************************
1045 REM                      ... FORMATTING THE OUTPUT ...
1050 CLS: REM ---------------------------------------------------------------
1055 H=FIX(NC/5): P=H+1
1060 R=NC-H*5: IF R=0 THEN P=H
1065 PRINT #1,CHR$(12);
1070 PRINT #1,STRING$(33,"*");" RESULTS ";STRING$(35,"*")
1075 PRINT #1,
1080 PRINT #1,"+------> X-direction       CONCENTRATION in mg/l (ppm)"
1085 PRINT #1,"|": PRINT #1,"v Y"
1090 PRINT #1,"                                    Z = ";Z(LAY);:PRINT #1,UN1$
1095 F=0
1100 FOR S=1 TO P
1105    PRINT #1,: PRINT #1,: PRINT #1,
1110    IF S=P AND R<>0 THEN L5=R ELSE L5=5
1115    PRINT #1,TAB(13) "";
1120    FOR K=1 TO L5
1125        F=F+1
1130        PRINT #1,USING " ######.##";X(F);: PRINT #1,UN2$;
1135    NEXT K
1140    PRINT #1,: PRINT #1,
1145    FOR I=1 TO NR
1150        J=(S-1)*5
1155        PRINT #1,USING "####.## ";Y(I);: PRINT #1,UN2$;
1160        FOR L=1 TO L5
1165            J=J+1
1170            PRINT #1,USING " ########.####";C(I,J);
1175        NEXT L
1180        PRINT #1,""
1185    NEXT I
1190    IF CH1%=2 GOTO 1220
1195 REM ---------------------------------------------------------------------
1200 LOCATE 24,23,0: COLOR 16,7,0
```

```
1200 LOCATE 24,23,0: COLOR 16,7,0
1205 PRINT "Press Space Bar to Continue...";:COLOR 7,0,0
1210 MT$=INKEY$:IF MT$="" THEN 1210 ELSE IF MT$=" " THEN GOTO 1215 ELSE 1210
1215 CLS: REM ------------------------ ----------------------------------------
1220 NEXT S
1225 Z(LAY+1)=Z(LAY)+DELZ
1230 NEXT LAY
1235 PRINT #1,CHR$(12);
1240 CLOSE #1
1245 CLEAR: GOTO 100
1250 REM ********************* SUBROUTINE EREC *****************************
1255 G1=ABS(ARG2)
1260 IF G1<3 GOTO 1285
1265 G2=G1*G1:G3=G2*G1:G4=G3*G1:G5=G4*G1:G6=G5*G1
1270 EREC=1/(1+A1*G1+A2*G2+A3*G3+A4*G4+A5*G5+A6*G6)^16
1275 IF ARG2<0 THEN EREC=2-EREC
1280 RETURN
1285 EREC=.5641896*EXP(-G1*G1)/(G1+.5/(G1+1/(G1+1.5/(G1+2/(G1+2.5/(G1+1))))))
1290 IF ARG2<0 THEN EREC=2-EREC
1295 RETURN
```

PROGRAM IDENTIFICATION

1.1	Program Title:	Analytical Model for Solute Transport of a Solute Slug in a Uniform Three-Dimensional Groundwater Flow Field
1.2	Program Code Name:	SLUG3D.BAS
1.3	Program Writer:	Milovan S. Beljin
1.4	Program Organization:	International Ground Water Modeling Center Holcomb Research Institute, Butler University Indianapolis, Indiana 46208, Tel: 317/283-9458
1.5	Date:	January 1985
1.6	Version:	IBM-PC 1.0
1.7	Source Language:	Microsoft BASIC
1.8	Memory Requirements:	64k
1.9	Availability:	SLUG3D.BAS is a non-proprietary code. It is distributed at cost by IGWMC. A copy of the program on 5¼" diskette is available
2.0	Abstract:	A program to calculate the concentration distribution of a slug from a point source in three-dimensional regional flow
2.1	Comments:	SLUG3D.BAS is based on Hunt (1983) equation

TRANSPORT OF A SOLUTE SLUG IN A UNIFORM THREE-DIMENSIONAL GROUNDWATER FLOW FIELD

This problem is similar to the plume problem except for the boundary condition at the source:

$$C(x, y, z, o) = \frac{m}{n}\delta(x, y, z) \tag{10.1}$$

where $\delta(x, y, z)$ is the Dirac delta function, and m is the total mass of pollutant released at the coordinate origin at t = 0.

A general analytical solution of this problem was given by Hunt (1983):

$$C(x, y, z, t) = \frac{m}{8n\sqrt{\pi^3 t^3 D_{xx} D_{yy} D_{zz}}} \exp\left\{ - \lambda t - \frac{1}{4t}\left[\frac{(x-\bar{v}t)^2}{D_{xx}} + \frac{y^2}{D_{yy}} + \frac{z^2}{D_{zz}} \right] \right\} \tag{10.2}$$

```
10  REM  ************************************************************
15  REM  *                                                          *
20  REM  *                 program: "SLUG3D.BAS"                    *
25  REM  *                 version:  IBM-PC 1.0 <February,1985>      *
30  REM  *                                                          *
35  REM  *                      by:  MILOVAN S. BELJIN              *
40  REM  *                                                          *
45  REM  *           HOLCOMB RESEARCH INSTITUTE - IGWMC             *
50  REM  *           INDIANAPOLIS, INDIANA 46208                    *
55  REM  *                                                          *
60  REM  *                                                          *
65  REM  *                                                          *
70  REM  *  THIS PROGRAM CALCULATES THE CONCENTRATION DISTRIBUTION  *
75  REM  *  FROM A SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW *
80  REM  *  BASED ON HUNT (1983).                                   *
85  REM  *                                                          *
90  REM  ************************************************************
95  REM
100 DIM X(41),Y(21),C(21,41)
105 SCREEN 0,0,0: WIDTH 80: COLOR 2,0,0: KEY OFF: CLS
110 LOCATE 3,18: PRINT "SLUG3D.BAS has several options: "
115 LOCATE 7,15: PRINT "1. INTERACTIVE"
120 LOCATE 8,15: PRINT "   For preliminary analysis."
125 LOCATE 10,15:PRINT "2. INTERACTIVE & PRINTER"
130 LOCATE 11,15:PRINT "   If you need a hard copy of input data"
135 LOCATE 12,15:PRINT "   and results."
140 LOCATE 14,15:PRINT "3. EXIT TO MAIN MENU"
145 LOCATE 20,22: INPUT "YOUR CHOICE  ";CH1%
150 IF CH1%=1 THEN A$="SCRN:"
155 IF CH1%=2 THEN A$="LPT1:"
160 IF CH1%=3 THEN RUN "MENU.BAS"
165 OPEN A$ FOR OUTPUT AS #1
170 REM ************************************************************************
175 REM                        ... ENTERING INPUT DATA ...
180 CLS: REM ---------------------------------------------------------------
185 LOCATE 10,10
190 INPUT "WHAT UNITS :   <1> METRIC  or  <2> ENGLISH  ";CH2%
195 IF CH2%=2 GOTO 205
200 UN1$=" kg" : UN2$=" m ": UN3$=" m/d " : UN4$=" d": UN5$="   1/d": GOTO 210
205 UN1$=" lb" : UN2$=" ft": UN3$=" ft/d" : UN4$=" d": UN5$="   1/d"
210 CLS: REM ---------------------------------------------------------------
215 PRINT TAB(14)"SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW"
220 PRINT TAB(14) STRING$(48,"*"): PRINT
225 IF CH1%=1 GOTO 250
230 LINE INPUT "  USER:       ";US$
235 LINE INPUT "  LOCATION:   ";L$
240 LINE INPUT "  DATE:       ";D$
245 PRINT :PRINT
250 INPUT "  TOTAL SOLUTE MASS INJECTED.............[kg] or [lb]  :";M
255 INPUT "  DARCY VELOCITY.....................[m/d ] or [ft/d]:";V
260 INPUT "  EFFECTIVE POROSITY.....................................  :";N
265 INPUT "  LONGITUDINAL DISPERSIVITY..............[m ] or [ft]  :";AL
270 INPUT "  LATERAL DISPERSIVITY...................[m ] or [ft]  :";AT
275 INPUT "  VERTICAL DISPERSIVITY..................[m ] or [ft]  :";AZ
280 INPUT "  DECAY CONSTANT (lambda).....................[1/d ]  :";LAMB
285 INPUT "  DISTANCE INCREMENT DELX................[m ] or [ft]  :";DELX
290 INPUT "  DISTANCE INCREMENT DELY................[m ] or [ft]  :";DELY
295 INPUT "  DISTANCE INCREMENT DELZ................[m ] or [ft]  :";DELZ
300 INPUT "  NUMBER OF NODES IN X-DIRECTION.........[ max 40   ]  :";NC
```

```
305 INPUT "  NUMBER OF NODES IN Y-DIRECTION.....[ max 20   ]  :";NR
310 INPUT "  NUMBER OF NODES IN Z-DIRECTION.....[ max 10   ]  :";NZ
315 INPUT "  TIME.....[d]  :";T
320 LOCATE 24,9
325 INPUT "DO YOU WANT TO CHANGE THE DATA: <RETURN> NO; <1> YES ";CH3%
330 IF CH3%=1 GOTO 210
335 CLS: REM ------------------------------------------------------------------
340 PRINT TAB(16)"SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW"
345 PRINT TAB(16) STRING$(48,"*"): PRINT #1,: PRINT #1,
350 IF CH1%=1 GOTO 430
355 LPRINT TAB(12) "*************************************************
360 LPRINT TAB(12) "*                                                *
365 LPRINT TAB(12) "*  SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW  *
370 LPRINT TAB(12) "*                                                *
375 LPRINT TAB(12) "*  MODEL: SLUG3D.HAS                             *
380 LPRINT TAB(12) "*                                                *
385 LPRINT TAB(12) "*************************************************
390 LPRINT :LPRINT
395 LPRINT TAB(12)"USER:      ";US$
400 LPRINT TAB(12)"-----"
405 LPRINT TAB(12)"LOCATION:  ";L$
410 LPRINT TAB(12)"---------- "
415 LPRINT TAB(12)"DATE:      ";D$
420 LPRINT TAB(12)"-----"
425 LPRINT : LPRINT
430 PRINT #1,TAB(28)"INPUT DATA:":    PRINT #1,: PRINT #1,
435 PRINT #1,TAB(12)USING"TOTAL SOLUTE MASS INJECTED.....:#####.##";M;
440 PRINT #1,UN1$
445 PRINT #1,TAB(12)USING"DARCY VELOCITY.....:#####.##";V;
450 PRINT #1,UN3$
455 PRINT #1,TAB(12)      "EFFECTIVE POROSITY.....:     ";N
460 PRINT #1,TAB(12)USING"LONGITUDINAL DISPERSIVITY.....:#####.##";AL;
465 PRINT #1,UN2$
470 PRINT #1,TAB(12)USING"LATERAL DISPERSIVITY.....:#####.##";AT;
475 PRINT #1,UN2$
480 PRINT #1,TAB(12)USING"VERTICAL DISPERSIVITY.....:#####.##";AZ;
485 PRINT #1,UN2$
490 PRINT #1,TAB(12)      "DECAY CONSTANT (lambda).....:    ";LAMB;
495 PRINT #1,UN5$
500 PRINT #1,TAB(12)USING"DISTANCE INCREMENT DELX.....:#####.##";DELX;
505 PRINT #1,UN2$
510 PRINT #1,TAB(12)USING"DISTANCE INCREMENT DELY.....:#####.##";DELY;
515 PRINT #1,UN2$
520 PRINT #1,TAB(12)USING"DISTANCE INCREMENT DELZ.....:#####.##";DELZ;
525 PRINT #1,UN2$
530 PRINT #1,TAB(12)USING"NUMBER OF NODES IN X-DIRECTION.....:#####    ";NC
535 PRINT #1,TAB(12)USING"NUMBER OF NODES IN Y-DIRECTION.....:#####    ";NR
540 PRINT #1,TAB(12)USING"NUMBER OF NODES IN Z-DIRECTION.....:#####    ";NZ
545 PRINT #1,TAB(12)USING"TIME.....:#####.##";T;
550 PRINT #1,UN4$
555 IF CH1%=2 GOTO 595
560 REM ------------------------------------------------------------------
565 LOCATE 24,23,0: COLOR 16,7,0
570 PRINT "Press Space Bar to Continue...";:COLOR 2,0,0
575 MT$=INKEY$:IF MT$="" THEN 575 ELSE IF MT$=" " THEN GOTO 590 ELSE 575
580 REM ************************************************************
585 REM                        ... THE MAIN PROGRAM ...
590 CLS:REM ------------------------------------------------------------------
595 LOCATE 10,24: PRINT "... PLEASE WAIT FOR A MOMENT ..."
600 IF CH2%=1 THEN M=1000*M ELSE M=M*16018.36
```

```
605 U=V/N: PI=3.14159265#
610 LT=LAMH*T
615 D1=AL*U: D2=AT*U: D3=AZ*U
620 PID=PI*PI*PI: TD=T*T*T: D=D1*D2*D3
625 PTD=PID*TD*D
630 BIG=M/(8*N*SQR(PTD))
635 X(1)=0:  Y(1)=0: Z(1)=0
640 PRINT #1,
645 FOR LAY=1 TO NZ
650 Z=Z(LAY)
655 FOR I=1 TO NR
660     Y=Y(I)
665     FOR J=1 TO NC
670         X=X(J)
675         TRM1=(X-U*T)^2/D1
680         TRM2=Y*Y/D2
685         TRM3=Z*Z/D3
690         TRM =TRM1+TRM2+TRM3
695         ARG=LT+TRM/(4*T)
700         C(I,J)=BIG*EXP(-ARG)
705         LOCATE 13,13
710         PRINT "NOW PROCESSING LAYER: ";LAY;
715         PRINT "  ROW: ";I;:PRINT "  AND COLUMN: ";J
720         X(J+1)=X(J)+DELX
725     NEXT J
730     Y(I+1)=Y+DELY
735 NEXT I
740 REM ************************************************************************
745 REM                        ... FORMATTING THE OUTPUT ...
750 CLS: REM ------ ---------- ---- ---------------------------------------------
755 N=FIX(NC/5): P=N+1
760 R=NC-N*5: IF R=0 THEN P=N
765 PRINT #1,CHR$(12);
770 PRINT #1,STRING$(35,"*");" RESULTS ";STRING$(35,"*")
775 PRINT #1,
780 PRINT #1,"+-------> X-direction       CONCENTRATION in mg/l (ppm)"
785 PRINT #1,"!": PRINT #1,"v Y"
790 PRINT #1,"                                    Z = ";Z;:PRINT #1,UN2$
795 ZZ=0
800 FOR S=1 TO P
805     PRINT #1,: PRINT #1,: PRINT #1,
810     IF S=P AND R<>0 THEN L5=R ELSE L5=5
815     PRINT #1,TAB(13) "";
820     FOR K=1 TO L5
825         ZZ=ZZ+1
830         PRINT #1,USING "########.##";X(ZZ);: PRINT #1,UN2$;
835     NEXT I
840     PRINT #1,: PRINT #1,
845     FOR I=1 TO NR
850         J=(S-1)*5
855         PRINT #1,USING "#####.## ";Y(I);: PRINT #1,UN2$;
860         FOR L=1 TO L5
865             J=J+1
870             IF C(I,J)<.0001 THEN C(I,J)=0
875             PRINT #1,USING "#########.####";C(I,J);
880         NEXT L
885         PRINT #1,""
890     NEXT I
895     IF CH1$=2 GOTO 920
900 REM ------ ---------- ---- ---------------------------------------------- -------
```

```
905 LOCATE 24,23,0: COLOR 16,7,0
910 PRINT "Press Space Bar to Continue...";:COLOR 2,0,0
915 MT$=INKEY$:IF MT$="" THEN 915 ELSE IF MT$=" " THEN GOTO 920 ELSE 915
920 CLS: REM ------------------------------------------------------------
925 NEXT S
930 Z(LAY+1)=Z(LAY)+DELZ
935 NEXT LAY
940 PRINT #1,CHR$(12);
945 CLOSE #1
950 CLEAR: GOTO 100
955 REM ------------------------------------------------------------------
```

ATTACHMENT C

```
**************************************************
*                                                *
*   SOLUTE TRANSPORT FROM POINT SOURCES          *
*   IN TWO-DIMENSIONAL UNIFORM FLOW              *
*                                                *
*   MODEL: WMPLUME                               *
*                                                *
**************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
AQUIFER THICKNESS	25.00	ft
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
RETARDATION FACTOR	1.00	
DECAY CONSTANT (lambda)	0	1/d
NUMBER OF POINT SOURCES	1	

SOURCE DATA:

SOURCE NO. 1

X-COORDINATE OF THE SOURCE	0.00	ft
Y-COORDINATE OF THE SOURCE	0.00	ft
THE SOURCE STRENGTH	0.02	lb/d
ELAPSED TIME OF THE SOURCE ACTIVITY	36.00	d

GRID DATA:

X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	10	

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

	0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00 ft		0.3916	0.2555	0.1587	0.0735
10.00 ft	0.1022	0.2261	0.1925	0.1294	0.0618
20.00 ft	0.0146	0.0644	0.0877	0.0713	0.0369
30.00 ft	0.0023	0.0138	0.0274	0.0276	0.0159
40.00 ft	0.0004	0.0025	0.0065	0.0078	0.0050
50.00 ft	0.0001	0.0004	0.0012	0.0017	0.0012
60.00 ft	0.0000	0.0001	0.0002	0.0003	0.0002
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00 ft	0.0216	0.0037	0.0003	0.0000	0.0000
10.00 ft	0.0185	0.0032	0.0003	0.0000	0.0000
20.00 ft	0.0115	0.0020	0.0002	0.0000	0.0000
30.00 ft	0.0052	0.0009	0.0001	0.0000	0.0000
40.00 ft	0.0018	0.0003	0.0000	0.0000	0.0000
50.00 ft	0.0004	0.0001	0.0000	0.0000	0.0000
60.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000

2-Dimensional Slug Input Model After 50 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
*                                                        *
*  MODEL: SLUG.BAS                                       *
*                                                        *
**********************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	0.56	lb
DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
AQUIFER THICKNESS	25.00	ft
X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	20	
TIME	50.00	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

		Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØ3	Ø.ØØ33	Ø.Ø19Ø	Ø.Ø664	Ø.14Ø6
1Ø.ØØ	ft	Ø.ØØØ3	Ø.ØØ3Ø	Ø.Ø172	Ø.Ø6Ø1	Ø.1273
2Ø.ØØ	ft	Ø.ØØØ2	Ø.ØØ22	Ø.Ø128	Ø.Ø445	Ø.Ø943
3Ø.ØØ	ft	Ø.ØØØ1	Ø.ØØ13	Ø.ØØ77	Ø.Ø27Ø	Ø.Ø572
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØ7	Ø.ØØ38	Ø.Ø134	Ø.Ø284
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØ16	Ø.ØØ55	Ø.Ø115
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ5	Ø.ØØ18	Ø.ØØ38
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ5	Ø.ØØ1Ø
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ2
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ	ft	Ø.18Ø6	Ø.14Ø6	Ø.Ø664	Ø.Ø19Ø	Ø.ØØ33
1Ø.ØØ	ft	Ø.1634	Ø.1273	Ø.Ø6Ø1	Ø.Ø172	Ø.ØØ3Ø
2Ø.ØØ	ft	Ø.1211	Ø.Ø943	Ø.Ø445	Ø.Ø128	Ø.ØØ22
3Ø.ØØ	ft	Ø.Ø734	Ø.Ø572	Ø.Ø27Ø	Ø.ØØ77	Ø.ØØ13
4Ø.ØØ	ft	Ø.Ø365	Ø.Ø284	Ø.Ø134	Ø.ØØ38	Ø.ØØØ7
5Ø.ØØ	ft	Ø.Ø148	Ø.Ø115	Ø.ØØ55	Ø.ØØ16	Ø.ØØØ3
6Ø.ØØ	ft	Ø.ØØ49	Ø.ØØ38	Ø.ØØ18	Ø.ØØØ5	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØ13	Ø.ØØ1Ø	Ø.ØØØ5	Ø.ØØØ1	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØ3	Ø.ØØØ2	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000
110.00 ft	0.0000	0.0000

130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

2-Dimensional Slug Input Model After 90 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
*                                                        *
*  MODEL: SLUG.BAS                                       *
*                                                        *
**********************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	Ø.56	lb
DARCY VELOCITY	1.ØØ	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	1Ø.ØØ	ft
LATERAL DISPERSIVITY	1.ØØ	ft
AQUIFER THICKNESS	25.ØØ	ft
X-COORDINATE OF THE GRID ORIGIN	Ø.ØØ	ft
Y-COORDINATE OF THE GRID ORIGIN	Ø.ØØ	ft
DISTANCE INCREMENT DELX	5Ø.ØØ	ft
DISTANCE INCREMENT DELY	1Ø.ØØ	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	2Ø	
TIME	9Ø.ØØ	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0000	0.0001	0.0007	0.0031
10.00	ft	0.0000	0.0000	0.0001	0.0006	0.0029
20.00	ft	0.0000	0.0000	0.0000	0.0005	0.0025
30.00	ft	0.0000	0.0000	0.0000	0.0004	0.0019
40.00	ft	0.0000	0.0000	0.0000	0.0003	0.0013
50.00	ft	0.0000	0.0000	0.0000	0.0002	0.0008
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0004
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0002
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0109	0.0287	0.0576	0.0873	0.1003
10.00	ft	0.0103	0.0272	0.0545	0.0826	0.0949
20.00	ft	0.0087	0.0230	0.0461	0.0699	0.0803
30.00	ft	0.0066	0.0174	0.0349	0.0530	0.0609
40.00	ft	0.0045	0.0118	0.0237	0.0359	0.0412
50.00	ft	0.0027	0.0072	0.0144	0.0218	0.0250
60.00	ft	0.0015	0.0039	0.0078	0.0118	0.0136
70.00	ft	0.0007	0.0019	0.0038	0.0057	0.0066
80.00	ft	0.0003	0.0008	0.0016	0.0025	0.0029
90.00	ft	0.0001	0.0003	0.0006	0.0010	0.0011
100.00	ft	0.0000	0.0001	0.0002	0.0003	0.0004
110.00	ft	0.0000	0.0000	0.0000	0.0001	0.0001
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00	ft	0.0873	0.0576	0.0287	0.0109	0.0031
10.00	ft	0.0826	0.0545	0.0272	0.0103	0.0029
20.00	ft	0.0699	0.0461	0.0230	0.0087	0.0025
30.00	ft	0.0530	0.0349	0.0174	0.0066	0.0019
40.00	ft	0.0359	0.0237	0.0118	0.0045	0.0013

60.00	ft	0.0118	0.0078	0.0039	0.0015	0.0004
70.00	ft	0.0057	0.0038	0.0019	0.0007	0.0002
80.00	ft	0.0025	0.0016	0.0008	0.0003	0.0000
90.00	ft	0.0010	0.0006	0.0003	0.0001	0.0000
100.00	ft	0.0003	0.0002	0.0001	0.0000	0.0000
110.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0007	0.0001	0.0000	0.0000	0.0000
10.00	ft	0.0006	0.0001	0.0000	0.0000	0.0000
20.00	ft	0.0005	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0004	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0003	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0002	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000
110.00 ft	0.0000	0.0000

130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

2-Dimensional Slug Input Model After 150 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
*                                                        *
*  MODEL: SLUG.BAS                                       *
*                                                        *
**********************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	0.56	lb
DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
AQUIFER THICKNESS	25.00	ft
X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	20	
TIME	150.00	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
¦
v Y

		Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØ1Ø	Ø.ØØ3Ø
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØ1Ø	Ø.ØØ29
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØØ9	Ø.ØØ26
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ8	Ø.ØØ22
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ6	Ø.ØØ18
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ4	Ø.ØØ13
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØØ9
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ6
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ4
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØ75	Ø.Ø159	Ø.Ø284	Ø.Ø431	Ø.Ø554
1Ø.ØØ	ft	Ø.ØØ72	Ø.Ø153	Ø.Ø275	Ø.Ø417	Ø.Ø536
2Ø.ØØ	ft	Ø.ØØ66	Ø.Ø139	Ø.Ø249	Ø.Ø377	Ø.Ø485
3Ø.ØØ	ft	Ø.ØØ56	Ø.Ø118	Ø.Ø211	Ø.Ø32Ø	Ø.Ø41Ø
4Ø.ØØ	ft	Ø.ØØ44	Ø.ØØ93	Ø.Ø167	Ø.Ø253	Ø.Ø325

60.00	ft	0.0023	0.0048	0.0086	0.0130	0.0167
70.00	ft	0.0015	0.0031	0.0056	0.0084	0.0108
80.00	ft	0.0009	0.0019	0.0034	0.0051	0.0066
90.00	ft	0.0005	0.0011	0.0019	0.0029	0.0037
100.00	ft	0.0003	0.0006	0.0010	0.0015	0.0020
110.00	ft	0.0001	0.0003	0.0005	0.0008	0.0010
120.00	ft	0.0000	0.0001	0.0002	0.0004	0.0005
130.00	ft	0.0000	0.0000	0.0001	0.0002	0.0002
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0602	0.0554	0.0431	0.0284	0.0159
10.00	ft	0.0582	0.0536	0.0417	0.0275	0.0153
20.00	ft	0.0527	0.0485	0.0377	0.0249	0.0139
30.00	ft	0.0446	0.0410	0.0320	0.0211	0.0118
40.00	ft	0.0353	0.0325	0.0253	0.0167	0.0093
50.00	ft	0.0262	0.0241	0.0187	0.0124	0.0069
60.00	ft	0.0181	0.0167	0.0130	0.0086	0.0048
70.00	ft	0.0118	0.0108	0.0084	0.0056	0.0031
80.00	ft	0.0071	0.0066	0.0051	0.0034	0.0019
90.00	ft	0.0040	0.0037	0.0029	0.0019	0.0011
100.00	ft	0.0021	0.0020	0.0015	0.0010	0.0006
110.00	ft	0.0011	0.0010	0.0008	0.0005	0.0003
120.00	ft	0.0005	0.0005	0.0004	0.0002	0.0001
130.00	ft	0.0002	0.0002	0.0002	0.0001	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0075	0.0030	0.0010	0.0003	0.0000
10.00	ft	0.0072	0.0029	0.0010	0.0003	0.0000
20.00	ft	0.0066	0.0026	0.0009	0.0003	0.0000
30.00	ft	0.0056	0.0022	0.0008	0.0002	0.0000
40.00	ft	0.0044	0.0018	0.0006	0.0002	0.0000
50.00	ft	0.0033	0.0013	0.0004	0.0001	0.0000
60.00	ft	0.0023	0.0009	0.0003	0.0000	0.0000
70.00	ft	0.0015	0.0006	0.0002	0.0000	0.0000
80.00	ft	0.0009	0.0004	0.0001	0.0000	0.0000
90.00	ft	0.0005	0.0002	0.0000	0.0000	0.0000
100.00	ft	0.0003	0.0001	0.0000	0.0000	0.0000
110.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000
110.00 ft	0.0000	0.0000

130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

2-Dimensional Slug Input Model After 200 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
*                                                        *
*  MODEL: SLUG.BAS                                       *
*                                                        *
**********************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	0.56	lb
DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
AQUIFER THICKNESS	25.00	ft
X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	20	
TIME	200.00	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00	ft	0.0000	0.0003	0.0008	0.0021	0.0048
10.00	ft	0.0000	0.0003	0.0008	0.0021	0.0046
20.00	ft	0.0000	0.0003	0.0007	0.0019	0.0043
30.00	ft	0.0000	0.0002	0.0007	0.0017	0.0038
40.00	ft	0.0000	0.0002	0.0006	0.0014	0.0032

60.00	ft	0.0000	0.0001	0.0003	0.0009	0.0019
70.00	ft	0.0000	0.0000	0.0002	0.0006	0.0014
80.00	ft	0.0000	0.0000	0.0002	0.0004	0.0010
90.00	ft	0.0000	0.0000	0.0001	0.0003	0.0006
100.00	ft	0.0000	0.0000	0.0000	0.0002	0.0004
110.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0095	0.0166	0.0257	0.0352	0.0424
10.00	ft	0.0092	0.0162	0.0251	0.0343	0.0414
20.00	ft	0.0086	0.0150	0.0233	0.0318	0.0384
30.00	ft	0.0076	0.0133	0.0205	0.0281	0.0339
40.00	ft	0.0063	0.0111	0.0172	0.0236	0.0284
50.00	ft	0.0051	0.0089	0.0138	0.0188	0.0227
60.00	ft	0.0038	0.0068	0.0105	0.0143	0.0172
70.00	ft	0.0028	0.0049	0.0076	0.0103	0.0125
80.00	ft	0.0019	0.0034	0.0052	0.0071	0.0086
90.00	ft	0.0012	0.0022	0.0034	0.0046	0.0056
100.00	ft	0.0008	0.0014	0.0021	0.0029	0.0035
110.00	ft	0.0005	0.0008	0.0012	0.0017	0.0021
120.00	ft	0.0003	0.0005	0.0007	0.0010	0.0012
130.00	ft	0.0001	0.0002	0.0004	0.0005	0.0006
140.00	ft	0.0000	0.0001	0.0002	0.0003	0.0003
150.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0451	0.0424	0.0352	0.0257	0.0166
10.00	ft	0.0440	0.0414	0.0343	0.0251	0.0162
20.00	ft	0.0409	0.0384	0.0318	0.0233	0.0150
30.00	ft	0.0361	0.0339	0.0281	0.0205	0.0133
40.00	ft	0.0303	0.0284	0.0236	0.0172	0.0111
50.00	ft	0.0242	0.0227	0.0188	0.0138	0.0089
60.00	ft	0.0184	0.0172	0.0143	0.0105	0.0068
70.00	ft	0.0133	0.0125	0.0103	0.0076	0.0049
80.00	ft	0.0091	0.0086	0.0071	0.0052	0.0034
90.00	ft	0.0060	0.0056	0.0046	0.0034	0.0022
100.00	ft	0.0037	0.0035	0.0029	0.0021	0.0014
110.00	ft	0.0022	0.0021	0.0017	0.0012	0.0008
120.00	ft	0.0012	0.0012	0.0010	0.0007	0.0005
130.00	ft	0.0007	0.0006	0.0005	0.0004	0.0002
140.00	ft	0.0003	0.0003	0.0003	0.0002	0.0001
150.00	ft	0.0002	0.0002	0.0001	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0095	0.0048	0.0021	0.0008	0.0003
10.00 ft	0.0092	0.0046	0.0021	0.0008	0.0003
20.00 ft	0.0086	0.0043	0.0019	0.0007	0.0003
30.00 ft	0.0076	0.0038	0.0017	0.0007	0.0002
40.00 ft	0.0063	0.0032	0.0014	0.0006	0.0002
50.00 ft	0.0051	0.0025	0.0011	0.0004	0.0002
60.00 ft	0.0038	0.0019	0.0009	0.0003	0.0001
70.00 ft	0.0028	0.0014	0.0006	0.0002	0.0000
80.00 ft	0.0019	0.0010	0.0004	0.0002	0.0000
90.00 ft	0.0012	0.0006	0.0003	0.0001	0.0000
100.00 ft	0.0008	0.0004	0.0002	0.0000	0.0000
110.00 ft	0.0005	0.0002	0.0001	0.0000	0.0000
120.00 ft	0.0003	0.0001	0.0000	0.0000	0.0000
130.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000
110.00 ft	0.0000	0.0000

130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

2-Dimensional Slug Input Model After 250 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
*                                                        *
*  MODEL: SLUG.BAS                                       *
*                                                        *
**********************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	0.56	lb
DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
AQUIFER THICKNESS	25.00	ft
X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	20	
TIME	250.00	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0002	0.0006	0.0015	0.0031	0.0060
10.00	ft	0.0002	0.0006	0.0014	0.0031	0.0059
20.00	ft	0.0002	0.0006	0.0014	0.0029	0.0055
30.00	ft	0.0002	0.0005	0.0012	0.0026	0.0050
40.00	ft	0.0002	0.0005	0.0011	0.0023	0.0043
50.00	ft	0.0001	0.0004	0.0009	0.0019	0.0036
60.00	ft	0.0001	0.0003	0.0007	0.0015	0.0029
70.00	ft	0.0000	0.0002	0.0006	0.0012	0.0022
80.00	ft	0.0000	0.0002	0.0004	0.0009	0.0017
90.00	ft	0.0000	0.0001	0.0003	0.0006	0.0012
100.00	ft	0.0000	0.0000	0.0002	0.0004	0.0008
110.00	ft	0.0000	0.0000	0.0001	0.0003	0.0005
120.00	ft	0.0000	0.0000	0.0000	0.0002	0.0003
130.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0103	0.0162	0.0230	0.0296	0.0344
10.00	ft	0.0101	0.0159	0.0226	0.0290	0.0337
20.00	ft	0.0096	0.0150	0.0213	0.0273	0.0317
30.00	ft	0.0086	0.0136	0.0192	0.0247	0.0287
40.00	ft	0.0075	0.0118	0.0167	0.0215	0.0249
50.00	ft	0.0063	0.0098	0.0140	0.0179	0.0208
60.00	ft	0.0050	0.0079	0.0112	0.0144	0.0167
70.00	ft	0.0039	0.0061	0.0086	0.0111	0.0129
80.00	ft	0.0029	0.0045	0.0064	0.0082	0.0096
90.00	ft	0.0020	0.0032	0.0046	0.0059	0.0068
100.00	ft	0.0014	0.0022	0.0031	0.0040	0.0046
110.00	ft	0.0009	0.0014	0.0020	0.0026	0.0031
120.00	ft	0.0006	0.0009	0.0013	0.0017	0.0019
130.00	ft	0.0004	0.0006	0.0008	0.0010	0.0012
140.00	ft	0.0002	0.0003	0.0005	0.0006	0.0007
150.00	ft	0.0001	0.0002	0.0003	0.0003	0.0004
160.00	ft	0.0000	0.0000	0.0001	0.0002	0.0002
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0361	0.0344	0.0296	0.0230	0.0162
10.00 ft	0.0354	0.0337	0.0290	0.0226	0.0159
20.00 ft	0.0333	0.0317	0.0273	0.0213	0.0150
30.00 ft	0.0302	0.0287	0.0247	0.0192	0.0136
40.00 ft	0.0262	0.0249	0.0215	0.0167	0.0118
50.00 ft	0.0219	0.0208	0.0179	0.0140	0.0098
60.00 ft	0.0176	0.0167	0.0144	0.0112	0.0079
70.00 ft	0.0136	0.0129	0.0111	0.0086	0.0061
80.00 ft	0.0100	0.0096	0.0082	0.0064	0.0045
90.00 ft	0.0071	0.0068	0.0059	0.0046	0.0032
100.00 ft	0.0049	0.0046	0.0040	0.0031	0.0022
110.00 ft	0.0032	0.0031	0.0026	0.0020	0.0014
120.00 ft	0.0020	0.0019	0.0017	0.0013	0.0009
130.00 ft	0.0012	0.0012	0.0010	0.0008	0.0006
140.00 ft	0.0007	0.0007	0.0006	0.0005	0.0003
150.00 ft	0.0004	0.0004	0.0003	0.0003	0.0002
160.00 ft	0.0002	0.0002	0.0002	0.0001	0.0000
170.00 ft	0.0001	0.0001	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0103	0.0060	0.0031	0.0015	0.0006
10.00 ft	0.0101	0.0059	0.0031	0.0014	0.0006
20.00 ft	0.0096	0.0055	0.0029	0.0014	0.0006
30.00 ft	0.0086	0.0050	0.0026	0.0012	0.0005
40.00 ft	0.0075	0.0043	0.0023	0.0011	0.0005
50.00 ft	0.0063	0.0036	0.0019	0.0009	0.0004
60.00 ft	0.0050	0.0029	0.0015	0.0007	0.0003
70.00 ft	0.0039	0.0022	0.0012	0.0006	0.0002
80.00 ft	0.0029	0.0017	0.0009	0.0004	0.0002
90.00 ft	0.0020	0.0012	0.0006	0.0003	0.0001
100.00 ft	0.0014	0.0008	0.0004	0.0002	0.0000
110.00 ft	0.0009	0.0005	0.0003	0.0001	0.0000
120.00 ft	0.0006	0.0003	0.0002	0.0000	0.0000
130.00 ft	0.0004	0.0002	0.0001	0.0000	0.0000
140.00 ft	0.0002	0.0001	0.0000	0.0000	0.0000
150.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0002	0.0000
10.00 ft	0.0002	0.0000
20.00 ft	0.0002	0.0000
30.00 ft	0.0002	0.0000
40.00 ft	0.0002	0.0000
50.00 ft	0.0001	0.0000
60.00 ft	0.0001	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000
110.00 ft	0.0000	0.0000

130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

2-Dimensional Slug Input Model After 365 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN TWO-DIMENSIONAL UNIFORM FLOW        *
*                                                        *
*  MODEL: SLUG.BAS                                       *
*                                                        *
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USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	0.56	lb
DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
AQUIFER THICKNESS	25.00	ft
X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	20	
TIME	365.00	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
¦
v Y

		Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0003	0.0006	0.0011	0.0021	0.0036
10.00 ft	0.0003	0.0006	0.0011	0.0021	0.0036
20.00 ft	0.0003	0.0005	0.0011	0.0020	0.0034
30.00 ft	0.0002	0.0005	0.0010	0.0018	0.0032
40.00 ft	0.0002	0.0005	0.0009	0.0017	0.0029
50.00 ft	0.0002	0.0004	0.0008	0.0015	0.0026
60.00 ft	0.0002	0.0003	0.0007	0.0013	0.0022
70.00 ft	0.0001	0.0003	0.0006	0.0011	0.0018
80.00 ft	0.0001	0.0002	0.0005	0.0009	0.0015
90.00 ft	0.0000	0.0002	0.0004	0.0007	0.0012
100.00 ft	0.0000	0.0001	0.0003	0.0005	0.0009
110.00 ft	0.0000	0.0001	0.0002	0.0004	0.0007
120.00 ft	0.0000	0.0000	0.0002	0.0003	0.0005
130.00 ft	0.0000	0.0000	0.0001	0.0002	0.0004
140.00 ft	0.0000	0.0000	0.0000	0.0001	0.0002
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0002
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0001
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0058	0.0088	0.0124	0.0163	0.0200
10.00 ft	0.0057	0.0087	0.0122	0.0160	0.0197
20.00 ft	0.0055	0.0083	0.0117	0.0154	0.0189
30.00 ft	0.0051	0.0078	0.0109	0.0144	0.0177
40.00 ft	0.0047	0.0071	0.0099	0.0131	0.0160
50.00 ft	0.0041	0.0062	0.0088	0.0115	0.0142
60.00 ft	0.0036	0.0054	0.0076	0.0099	0.0122
70.00 ft	0.0030	0.0045	0.0063	0.0083	0.0102
80.00 ft	0.0024	0.0037	0.0051	0.0068	0.0083
90.00 ft	0.0019	0.0029	0.0041	0.0054	0.0066
100.00 ft	0.0015	0.0022	0.0031	0.0041	0.0051
110.00 ft	0.0011	0.0017	0.0024	0.0031	0.0038
120.00 ft	0.0008	0.0012	0.0017	0.0023	0.0028
130.00 ft	0.0006	0.0009	0.0012	0.0016	0.0020
140.00 ft	0.0004	0.0006	0.0008	0.0011	0.0014
150.00 ft	0.0003	0.0004	0.0006	0.0007	0.0009
160.00 ft	0.0002	0.0003	0.0004	0.0005	0.0006
170.00 ft	0.0001	0.0002	0.0002	0.0003	0.0004
180.00 ft	0.0000	0.0001	0.0001	0.0002	0.0002
190.00 ft	0.0000	0.0000	0.0000	0.0001	0.0001

	1750.00 ft	1800.00 ft
0.00 ft	0.0229	0.0245
10.00 ft	0.0226	0.0242
20.00 ft	0.0217	0.0232
30.00 ft	0.0202	0.0217
40.00 ft	0.0184	0.0197
50.00 ft	0.0163	0.0174
60.00 ft	0.0140	0.0150
70.00 ft	0.0117	0.0125
80.00 ft	0.0095	0.0102
90.00 ft	0.0076	0.0081
100.00 ft	0.0058	0.0062
110.00 ft	0.0044	0.0047

130.00	ft	0.0023	0.0024
140.00	ft	0.0016	0.0017
150.00	ft	0.0011	0.0011
160.00	ft	0.0007	0.0007
170.00	ft	0.0004	0.0005
180.00	ft	0.0003	0.0003
190.00	ft	0.0002	0.0002

3-Dimensional Plume Model After 36 Days of Continuous Input

```
**********************************************
*                                            *
*   SOLUTE TRANSPORT FROM POINT SOURCES      *
*   IN THREE-DIMENSIONAL UNIFORM FLOW        *
*                                            *
*   MODEL: PLUME3D                           *
*                                            *
**********************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

DARCY VELOCITY	1.00	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	10.00	ft
LATERAL DISPERSIVITY	1.00	ft
VERTICAL DISPERSIVITY	0.10	ft
DECAY CONSTANT (lambda)	0	1/d
NUMBER OF POINT SOURCES	1	

SOURCE DATA:

SOURCE NO. 1

X-COORDINATE OF THE SOURCE	0.00	ft
Y-COORDINATE OF THE SOURCE	0.00	ft
Z-COORDINATE OF THE SOURCE	0.00	ft
THE SOURCE STRENGTH	0.02	lb/d
ELAPSED TIME OF THE SOURCE ACTIVITY	36.00	d

GRID DATA:

X-COORDINATE OF THE GRID ORIGIN	0.00	ft
Y-COORDINATE OF THE GRID ORIGIN	0.00	ft
Z-COORDINATE OF THE GRID ORIGIN	0.00	ft
DISTANCE INCREMENT DELX	50.00	ft
DISTANCE INCREMENT DELY	10.00	ft
DISTANCE INCREMENT DELZ	1.00	ft
NUMBER OF NODES IN X-DIRECTION	10	
NUMBER OF NODES IN Y-DIRECTION	10	
NUMBER OF NODES IN Z-DIRECTION	12	

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = Ø ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	-1.ØØØØ	1.2469	Ø.591Ø	Ø.315Ø	Ø.1341
1Ø.ØØ ft	Ø.4Ø73	Ø.6641	Ø.4364	Ø.2549	Ø.1124
2Ø.ØØ ft	Ø.Ø415	Ø.1637	Ø.1895	Ø.1378	Ø.Ø666
3Ø.ØØ ft	Ø.ØØ55	Ø.Ø3Ø9	Ø.Ø56Ø	Ø.Ø52Ø	Ø.Ø284
4Ø.ØØ ft	Ø.ØØØ8	Ø.ØØ52	Ø.Ø125	Ø.Ø144	Ø.ØØ88
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ8	Ø.ØØ22	Ø.ØØ3Ø	Ø.ØØ21
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ3	Ø.ØØØ5	Ø.ØØØ4
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.Ø375	Ø.ØØ61	Ø.ØØØ6	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.Ø319	Ø.ØØ53	Ø.ØØØ5	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.Ø197	Ø.ØØ33	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ89	Ø.ØØ16	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØ3Ø	Ø.ØØØ5	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ7	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 1 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	3.8Ø25	1.1633	Ø.5729	Ø.3Ø84	Ø.1317
1Ø.ØØ ft	Ø.3594	Ø.6276	Ø.4237	Ø.2497	Ø.11Ø4
2Ø.ØØ ft	Ø.Ø394	Ø.1574	Ø.1846	Ø.1351	Ø.Ø655
3Ø.ØØ ft	Ø.ØØ53	Ø.Ø3Ø1	Ø.Ø547	Ø.Ø51Ø	Ø.Ø279
4Ø.ØØ ft	Ø.ØØØ7	Ø.ØØ5Ø	Ø.Ø123	Ø.Ø141	Ø.ØØ87
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ7	Ø.ØØ22	Ø.ØØ3Ø	Ø.ØØ2Ø
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ3	Ø.ØØØ5	Ø.ØØØ4
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.Ø369	Ø.ØØ61	Ø.ØØØ5	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.Ø314	Ø.ØØ52	Ø.ØØØ5	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.Ø194	Ø.ØØ33	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ88	Ø.ØØ15	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØ29	Ø.ØØØ5	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ7	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
¦
v Y

Z = 2 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	1.1526	Ø.9536	Ø.5225	Ø.2893	Ø.1249
1Ø.ØØ ft	Ø.2574	Ø.5327	Ø.388Ø	Ø.2345	Ø.1Ø48
2Ø.ØØ ft	Ø.Ø338	Ø.14Ø2	Ø.17Ø7	Ø.1272	Ø.Ø622
3Ø.ØØ ft	Ø.ØØ48	Ø.Ø276	Ø.Ø511	Ø.Ø482	Ø.Ø265
4Ø.ØØ ft	Ø.ØØØ7	Ø.ØØ47	Ø.Ø115	Ø.Ø134	Ø.ØØ83
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ7	Ø.ØØ21	Ø.ØØ28	Ø.ØØ19
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ3	Ø.ØØØ5	Ø.ØØØ3
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.Ø351	Ø.ØØ58	Ø.ØØØ5	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.Ø299	Ø.ØØ5Ø	Ø.ØØØ5	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.Ø185	Ø.ØØ31	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ84	Ø.ØØ15	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØ28	Ø.ØØØ5	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ7	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 3 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.4657	0.7033	0.4495	0.2604	0.1144
10.00	ft	0.1621	0.4120	0.3361	0.2114	0.0960
20.00	ft	0.0266	0.1163	0.1501	0.1151	0.0570
30.00	ft	0.0041	0.0240	0.0456	0.0439	0.0244
40.00	ft	0.0006	0.0042	0.0104	0.0122	0.0076
50.00	ft	0.0001	0.0006	0.0019	0.0026	0.0018
60.00	ft	0.0000	0.0001	0.0003	0.0004	0.0003
70.00	ft	0.0000	0.0000	0.0000	0.0001	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0324	0.0054	0.0005	0.0000	0.0000
10.00	ft	0.0276	0.0046	0.0004	0.0000	0.0000
20.00	ft	0.0171	0.0029	0.0003	0.0000	0.0000
30.00	ft	0.0077	0.0014	0.0001	0.0000	0.0000
40.00	ft	0.0026	0.0005	0.0000	0.0000	0.0000
50.00	ft	0.0006	0.0001	0.0000	0.0000	0.0000
60.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 4 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.2115	Ø.4796	Ø.3662	Ø.2249	Ø.1Ø12
1Ø.ØØ ft	Ø.Ø955	Ø.2957	Ø.2762	Ø.183Ø	Ø.Ø849
2Ø.ØØ ft	Ø.Ø195	Ø.Ø9Ø6	Ø.1258	Ø.1ØØ3	Ø.Ø5Ø6
3Ø.ØØ ft	Ø.ØØ33	Ø.Ø198	Ø.Ø391	Ø.Ø385	Ø.Ø217
4Ø.ØØ ft	Ø.ØØØ5	Ø.ØØ36	Ø.ØØ91	Ø.Ø1Ø8	Ø.ØØ68
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ6	Ø.ØØ17	Ø.ØØ23	Ø.ØØ16
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ2	Ø.ØØØ4	Ø.ØØØ3
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.Ø29Ø	Ø.ØØ48	Ø.ØØØ4	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.Ø247	Ø.ØØ41	Ø.ØØØ4	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.Ø153	Ø.ØØ26	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ69	Ø.ØØ12	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØ23	Ø.ØØØ4	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ6	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 5 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.1Ø24	Ø.3Ø95	Ø.284Ø	Ø.1868	Ø.Ø864
1Ø.ØØ ft	Ø.Ø545	Ø.2ØØ3	Ø.2163	Ø.1524	Ø.Ø726
2Ø.ØØ ft	Ø.Ø134	Ø.Ø668	Ø.1ØØ8	Ø.Ø841	Ø.Ø434
3Ø.ØØ ft	Ø.ØØ25	Ø.Ø156	Ø.Ø321	Ø.Ø326	Ø.Ø186
4Ø.ØØ ft	Ø.ØØØ4	Ø.ØØ29	Ø.ØØ76	Ø.ØØ92	Ø.ØØ59
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ5	Ø.ØØ14	Ø.ØØ2Ø	Ø.ØØ14
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ2	Ø.ØØØ3	Ø.ØØØ2
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.Ø251	Ø.ØØ42	Ø.ØØØ4	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.Ø214	Ø.ØØ36	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.Ø133	Ø.ØØ23	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ6Ø	Ø.ØØ11	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØ2Ø	Ø.ØØØ4	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ5	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 6 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.Ø515	Ø.1923	Ø.2106	Ø.1493	Ø.Ø714
1Ø.ØØ ft	Ø.Ø3Ø7	Ø.13ØØ	Ø.1621	Ø.1222	Ø.Ø6Ø1
2Ø.ØØ ft	Ø.ØØ89	Ø.Ø47Ø	Ø.Ø775	Ø.Ø68Ø	Ø.Ø36Ø
3Ø.ØØ ft	Ø.ØØ19	Ø.Ø117	Ø.Ø253	Ø.Ø266	Ø.Ø155
4Ø.ØØ ft	Ø.ØØØ3	Ø.ØØ23	Ø.ØØ61	Ø.ØØ76	Ø.ØØ49
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ4	Ø.ØØ12	Ø.ØØ16	Ø.ØØ12
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ2	Ø.ØØØ3	Ø.ØØØ2
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.Ø21Ø	Ø.ØØ35	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.Ø179	Ø.ØØ3Ø	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.Ø111	Ø.ØØ19	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ51	Ø.ØØØ9	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØ17	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ4	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 7 ft

	0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00 ft	0.0266	0.1163	0.1501	0.1151	0.0570
10.00 ft	0.0171	0.0817	0.1168	0.0945	0.0480
20.00 ft	0.0057	0.0319	0.0572	0.0530	0.0288
30.00 ft	0.0013	0.0085	0.0192	0.0210	0.0125
40.00 ft	0.0002	0.0018	0.0048	0.0061	0.0040
50.00 ft	0.0000	0.0003	0.0009	0.0013	0.0009
60.00 ft	0.0000	0.0000	0.0001	0.0002	0.0002
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00 ft	0.0171	0.0029	0.0003	0.0000	0.0000
10.00 ft	0.0146	0.0025	0.0002	0.0000	0.0000
20.00 ft	0.0091	0.0016	0.0001	0.0000	0.0000
30.00 ft	0.0041	0.0007	0.0001	0.0000	0.0000
40.00 ft	0.0014	0.0003	0.0000	0.0000	0.0000
50.00 ft	0.0003	0.0001	0.0000	0.0000	0.0000
60.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 8 ft

		Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ	ft	Ø.Ø14Ø	Ø.Ø69Ø	Ø.1Ø33	Ø.Ø857	Ø.Ø441
1Ø.ØØ	ft	Ø.ØØ95	Ø.Ø5ØØ	Ø.Ø812	Ø.Ø7Ø6	Ø.Ø372
2Ø.ØØ	ft	Ø.ØØ35	Ø.Ø2Ø9	Ø.Ø4Ø8	Ø.Ø4ØØ	Ø.Ø224
3Ø.ØØ	ft	Ø.ØØØ9	Ø.ØØ59	Ø.Ø141	Ø.Ø16Ø	Ø.ØØ98
4Ø.ØØ	ft	Ø.ØØØ2	Ø.ØØ13	Ø.ØØ36	Ø.ØØ47	Ø.ØØ31
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ7	Ø.ØØ1Ø	Ø.ØØØ7
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ2	Ø.ØØØ1
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ	ft	Ø.Ø135	Ø.ØØ23	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.Ø115	Ø.ØØ2Ø	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØ72	Ø.ØØ13	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØ33	Ø.ØØØ6	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØ11	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ	ft	Ø.ØØØ3	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ	ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 10 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0040	0.0233	0.0446	0.0431	0.0240
10.00	ft	0.0029	0.0178	0.0358	0.0357	0.0203
20.00	ft	0.0013	0.0083	0.0189	0.0206	0.0123
30.00	ft	0.0004	0.0026	0.0069	0.0084	0.0054
40.00	ft	0.0001	0.0006	0.0019	0.0025	0.0018
50.00	ft	0.0000	0.0001	0.0004	0.0006	0.0004
60.00	ft	0.0000	0.0000	0.0001	0.0001	0.0001
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft
0.00	ft	0.0076	0.0013	0.0001	0.0000
10.00	ft	0.0065	0.0012	0.0001	0.0000
20.00	ft	0.0041	0.0007	0.0001	0.0000
30.00	ft	0.0019	0.0003	0.0000	0.0000
40.00	ft	0.0006	0.0001	0.0000	0.0000
50.00	ft	0.0002	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 11 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØ21	Ø.Ø133	Ø.Ø282	Ø.Ø292	Ø.Ø169
1Ø.ØØ ft	Ø.ØØ16	Ø.Ø1Ø3	Ø.Ø228	Ø.Ø243	Ø.Ø143
2Ø.ØØ ft	Ø.ØØØ7	Ø.ØØ5Ø	Ø.Ø123	Ø.Ø141	Ø.ØØ87
3Ø.ØØ ft	Ø.ØØØ2	Ø.ØØ17	Ø.ØØ46	Ø.ØØ59	Ø.ØØ39
4Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØ4	Ø.ØØ13	Ø.ØØ18	Ø.ØØ13
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ3	Ø.ØØØ4	Ø.ØØØ3
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ1
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØ55	Ø.ØØ1Ø	Ø.ØØØ1	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØ47	Ø.ØØØ8	Ø.ØØØ1	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØ29	Ø.ØØØ5	Ø.ØØØ1	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØ14	Ø.ØØØ3	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØ5	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØ1	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

3-Dimensional Slug Input Model After 50 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW      *
*                                                        *
*  MODEL: SLUG3D.BAS                                     *
*                                                        *
**********************************************************

USER:      JEFF HAVLENA
-----
LOCATION:  ENRON-HOBBS
---------
DATE:      OCTOBER 23, 1989
-----

                INPUT DATA:

TOTAL SOLUTE MASS INJECTED.....:    Ø.56 lb
DARCY VELOCITY.................:    1.ØØ ft/d
EFFECTIVE POROSITY.............:     .2
LONGITUDINAL DISPERSIVITY......:   1Ø.ØØ ft
LATERAL DISPERSIVITY...........:    1.ØØ ft
VERTICAL DISPERSIVITY..........:    Ø.1Ø ft
DECAY CONSTANT (lambda)........:    Ø    1/d
DISTANCE INCREMENT DELX........:   5Ø.ØØ ft
DISTANCE INCREMENT DELY........:   1Ø.ØØ ft
DISTANCE INCREMENT DELZ........:    5.ØØ ft
NUMBER OF NODES IN X-DIRECTION.:   13
NUMBER OF NODES IN Y-DIRECTION.:   11
NUMBER OF NODES IN Z-DIRECTION.:    5
TIME...........................:   5Ø.ØØ d
```

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = Ø ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØ5	Ø.ØØ47	Ø.Ø268	Ø.Ø937	Ø.1984
1Ø.ØØ ft	Ø.ØØØ4	Ø.ØØ42	Ø.Ø243	Ø.Ø848	Ø.1795
2Ø.ØØ ft	Ø.ØØØ3	Ø.ØØ31	Ø.Ø18Ø	Ø.Ø628	Ø.133Ø
3Ø.ØØ ft	Ø.ØØØ2	Ø.ØØ19	Ø.Ø1Ø9	Ø.Ø381	Ø.Ø8Ø7
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ9	Ø.ØØ54	Ø.Ø189	Ø.Ø4Ø1
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ4	Ø.ØØ22	Ø.ØØ77	Ø.Ø163
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ7	Ø.ØØ26	Ø.ØØ54
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ7	Ø.ØØ15
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ3
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.2547	Ø.1984	Ø.Ø937	Ø.Ø268	Ø.ØØ47
1Ø.ØØ ft	Ø.23Ø5	Ø.1795	Ø.Ø848	Ø.Ø243	Ø.ØØ42
2Ø.ØØ ft	Ø.17Ø7	Ø.133Ø	Ø.Ø628	Ø.Ø18Ø	Ø.ØØ31
3Ø.ØØ ft	Ø.1Ø36	Ø.Ø8Ø7	Ø.Ø381	Ø.Ø1Ø9	Ø.ØØ19
4Ø.ØØ ft	Ø.Ø514	Ø.Ø4Ø1	Ø.Ø189	Ø.ØØ54	Ø.ØØØ9
5Ø.ØØ ft	Ø.Ø2Ø9	Ø.Ø163	Ø.ØØ77	Ø.ØØ22	Ø.ØØØ4
6Ø.ØØ ft	Ø.ØØ7Ø	Ø.ØØ54	Ø.ØØ26	Ø.ØØØ7	Ø.ØØØ1
7Ø.ØØ ft	Ø.ØØ19	Ø.ØØ15	Ø.ØØØ7	Ø.ØØØ2	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØ4	Ø.ØØØ3	Ø.ØØØ2	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft

10.00	ft	0.0004	0.0000	0.0000
20.00	ft	0.0003	0.0000	0.0000
30.00	ft	0.0002	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 5 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0004	0.0036	0.0209	0.0730	0.1545
10.00	ft	0.0003	0.0033	0.0189	0.0660	0.1398
20.00	ft	0.0003	0.0024	0.0140	0.0489	0.1036
30.00	ft	0.0002	0.0015	0.0085	0.0297	0.0628
40.00	ft	0.0000	0.0007	0.0042	0.0147	0.0312
50.00	ft	0.0000	0.0003	0.0017	0.0060	0.0127
60.00	ft	0.0000	0.0000	0.0006	0.0020	0.0042
70.00	ft	0.0000	0.0000	0.0002	0.0005	0.0012
80.00	ft	0.0000	0.0000	0.0000	0.0001	0.0003
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.1984	0.1545	0.0730	0.0209	0.0036
10.00	ft	0.1795	0.1398	0.0660	0.0189	0.0033
20.00	ft	0.1330	0.1036	0.0489	0.0140	0.0024
30.00	ft	0.0807	0.0628	0.0297	0.0085	0.0015
40.00	ft	0.0401	0.0312	0.0147	0.0042	0.0007
50.00	ft	0.0163	0.0127	0.0060	0.0017	0.0003
60.00	ft	0.0054	0.0042	0.0020	0.0006	0.0000
70.00	ft	0.0015	0.0012	0.0005	0.0002	0.0000
80.00	ft	0.0003	0.0003	0.0001	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft

10.00	ft	0.0003	0.0000	0.0000
20.00	ft	0.0003	0.0000	0.0000
30.00	ft	0.0002	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 10 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0002	0.0017	0.0099	0.0345	0.0730
10.00	ft	0.0002	0.0016	0.0089	0.0312	0.0660
20.00	ft	0.0001	0.0012	0.0066	0.0231	0.0489
30.00	ft	0.0000	0.0007	0.0040	0.0140	0.0297
40.00	ft	0.0000	0.0003	0.0020	0.0070	0.0147
50.00	ft	0.0000	0.0001	0.0008	0.0028	0.0060
60.00	ft	0.0000	0.0000	0.0003	0.0009	0.0020
70.00	ft	0.0000	0.0000	0.0000	0.0003	0.0005
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0937	0.0730	0.0345	0.0099	0.0017
10.00	ft	0.0848	0.0660	0.0312	0.0089	0.0016
20.00	ft	0.0628	0.0489	0.0231	0.0066	0.0012
30.00	ft	0.0381	0.0297	0.0140	0.0040	0.0007
40.00	ft	0.0189	0.0147	0.0070	0.0020	0.0003
50.00	ft	0.0077	0.0060	0.0028	0.0008	0.0001
60.00	ft	0.0026	0.0020	0.0009	0.0003	0.0000
70.00	ft	0.0007	0.0005	0.0003	0.0000	0.0000
80.00	ft	0.0002	0.0001	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft

10.00	ft	0.0002	0.0000	0.0000
20.00	ft	0.0001	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 15 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0005	0.0028	0.0099	0.0209
10.00	ft	0.0000	0.0004	0.0026	0.0089	0.0189
20.00	ft	0.0000	0.0003	0.0019	0.0066	0.0140
30.00	ft	0.0000	0.0002	0.0012	0.0040	0.0085
40.00	ft	0.0000	0.0000	0.0006	0.0020	0.0042
50.00	ft	0.0000	0.0000	0.0002	0.0008	0.0017
60.00	ft	0.0000	0.0000	0.0000	0.0003	0.0006
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0002
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0268	0.0209	0.0099	0.0028	0.0005
10.00	ft	0.0243	0.0189	0.0089	0.0026	0.0004
20.00	ft	0.0180	0.0140	0.0066	0.0019	0.0003
30.00	ft	0.0109	0.0085	0.0040	0.0012	0.0002
40.00	ft	0.0054	0.0042	0.0020	0.0006	0.0000
50.00	ft	0.0022	0.0017	0.0008	0.0002	0.0000
60.00	ft	0.0007	0.0006	0.0003	0.0000	0.0000
70.00	ft	0.0002	0.0002	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	500.00 ft	550.00 ft	600.00 ft

10.00	ft	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 20 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0000	0.0005	0.0017	0.0036
10.00	ft	0.0000	0.0000	0.0004	0.0016	0.0033
20.00	ft	0.0000	0.0000	0.0003	0.0012	0.0024
30.00	ft	0.0000	0.0000	0.0002	0.0007	0.0015
40.00	ft	0.0000	0.0000	0.0000	0.0003	0.0007
50.00	ft	0.0000	0.0000	0.0000	0.0001	0.0003
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0047	0.0036	0.0017	0.0005	0.0000
10.00	ft	0.0042	0.0033	0.0016	0.0004	0.0000
20.00	ft	0.0031	0.0024	0.0012	0.0003	0.0000
30.00	ft	0.0019	0.0015	0.0007	0.0002	0.0000
40.00	ft	0.0009	0.0007	0.0003	0.0000	0.0000
50.00	ft	0.0004	0.0003	0.0001	0.0000	0.0000
60.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft

10.00	ft	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000

3-Dimensional Slug Input Model After 150 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW      *
*                                                        *
*  MODEL: SLUG3D.BAS                                     *
*                                                        *
**********************************************************
```

USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	Ø.56	lb
DARCY VELOCITY	1.ØØ	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	1Ø.ØØ	ft
LATERAL DISPERSIVITY	1.ØØ	ft
VERTICAL DISPERSIVITY	Ø.1Ø	ft
DECAY CONSTANT (lambda)	Ø	1/d
DISTANCE INCREMENT DELX	5Ø.ØØ	ft
DISTANCE INCREMENT DELY	1Ø.ØØ	ft
DISTANCE INCREMENT DELZ	5.ØØ	ft
NUMBER OF NODES IN X-DIRECTION	25	
NUMBER OF NODES IN Y-DIRECTION	15	
NUMBER OF NODES IN Z-DIRECTION	5	
TIME	15Ø.ØØ	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 0 ft

	0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00 ft	0.0000	0.0000	0.0002	0.0008	0.0024
10.00 ft	0.0000	0.0000	0.0002	0.0008	0.0024
20.00 ft	0.0000	0.0000	0.0002	0.0007	0.0021
30.00 ft	0.0000	0.0000	0.0002	0.0006	0.0018
40.00 ft	0.0000	0.0000	0.0001	0.0005	0.0014
50.00 ft	0.0000	0.0000	0.0001	0.0004	0.0011
60.00 ft	0.0000	0.0000	0.0000	0.0002	0.0007
70.00 ft	0.0000	0.0000	0.0000	0.0002	0.0005
80.00 ft	0.0000	0.0000	0.0000	0.0000	0.0003
90.00 ft	0.0000	0.0000	0.0000	0.0000	0.0002
100.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00 ft	0.0061	0.0129	0.0232	0.0351	0.0451
10.00 ft	0.0059	0.0125	0.0224	0.0340	0.0436
20.00 ft	0.0053	0.0113	0.0203	0.0307	0.0395
30.00 ft	0.0045	0.0096	0.0172	0.0260	0.0334
40.00 ft	0.0036	0.0076	0.0136	0.0206	0.0265
50.00 ft	0.0027	0.0056	0.0101	0.0153	0.0196
60.00 ft	0.0018	0.0039	0.0070	0.0106	0.0136
70.00 ft	0.0012	0.0025	0.0045	0.0069	0.0088
80.00 ft	0.0007	0.0015	0.0027	0.0042	0.0053
90.00 ft	0.0004	0.0009	0.0016	0.0024	0.0030
100.00 ft	0.0002	0.0005	0.0008	0.0013	0.0016
110.00 ft	0.0001	0.0002	0.0004	0.0006	0.0008
120.00 ft	0.0000	0.0001	0.0002	0.0003	0.0004
130.00 ft	0.0000	0.0000	0.0000	0.0001	0.0002

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0490	0.0451	0.0351	0.0232	0.0129
10.00	ft	0.0474	0.0436	0.0340	0.0224	0.0125
20.00	ft	0.0429	0.0395	0.0307	0.0203	0.0113
30.00	ft	0.0363	0.0334	0.0260	0.0172	0.0096
40.00	ft	0.0288	0.0265	0.0206	0.0136	0.0076
50.00	ft	0.0213	0.0196	0.0153	0.0101	0.0056
60.00	ft	0.0148	0.0136	0.0106	0.0070	0.0039
70.00	ft	0.0096	0.0088	0.0069	0.0045	0.0025
80.00	ft	0.0058	0.0053	0.0042	0.0027	0.0015
90.00	ft	0.0033	0.0030	0.0024	0.0016	0.0009
100.00	ft	0.0017	0.0016	0.0013	0.0008	0.0005
110.00	ft	0.0009	0.0008	0.0006	0.0004	0.0002
120.00	ft	0.0004	0.0004	0.0003	0.0002	0.0001
130.00	ft	0.0002	0.0002	0.0001	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0061	0.0024	0.0008	0.0002	0.0000
10.00	ft	0.0059	0.0024	0.0008	0.0002	0.0000
20.00	ft	0.0053	0.0021	0.0007	0.0002	0.0000
30.00	ft	0.0045	0.0018	0.0006	0.0002	0.0000
40.00	ft	0.0036	0.0014	0.0005	0.0001	0.0000
50.00	ft	0.0027	0.0011	0.0004	0.0001	0.0000
60.00	ft	0.0018	0.0007	0.0002	0.0000	0.0000
70.00	ft	0.0012	0.0005	0.0002	0.0000	0.0000
80.00	ft	0.0007	0.0003	0.0000	0.0000	0.0000
90.00	ft	0.0004	0.0002	0.0000	0.0000	0.0000
100.00	ft	0.0002	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 5 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ8	Ø.ØØ22
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ7	Ø.ØØ22
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ7	Ø.ØØ2Ø
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ6	Ø.ØØ17
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ4	Ø.ØØ13
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØ1Ø
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ7
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ4
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØ56	Ø.Ø119	Ø.Ø213	Ø.Ø323	Ø.Ø415
1Ø.ØØ ft	Ø.ØØ54	Ø.Ø115	Ø.Ø2Ø6	Ø.Ø313	Ø.Ø4Ø1
2Ø.ØØ ft	Ø.ØØ49	Ø.Ø1Ø4	Ø.Ø186	Ø.Ø283	Ø.Ø363
3Ø.ØØ ft	Ø.ØØ42	Ø.ØØ88	Ø.Ø158	Ø.Ø239	Ø.Ø3Ø7
4Ø.ØØ ft	Ø.ØØ33	Ø.ØØ7Ø	Ø.Ø125	Ø.Ø19Ø	Ø.Ø243
5Ø.ØØ ft	Ø.ØØ24	Ø.ØØ52	Ø.ØØ93	Ø.Ø14Ø	Ø.Ø18Ø
6Ø.ØØ ft	Ø.ØØ17	Ø.ØØ36	Ø.ØØ64	Ø.ØØ97	Ø.Ø125
7Ø.ØØ ft	Ø.ØØ11	Ø.ØØ23	Ø.ØØ42	Ø.ØØ63	Ø.ØØ81
8Ø.ØØ ft	Ø.ØØØ7	Ø.ØØ14	Ø.ØØ25	Ø.ØØ38	Ø.ØØ49
9Ø.ØØ ft	Ø.ØØØ4	Ø.ØØØ8	Ø.ØØ14	Ø.ØØ22	Ø.ØØ28
1ØØ.ØØ ft	Ø.ØØØ2	Ø.ØØØ4	Ø.ØØØ8	Ø.ØØ12	Ø.ØØ15
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ4	Ø.ØØØ6	Ø.ØØØ7
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ3	Ø.ØØØ3
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ1

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0451	0.0415	0.0323	0.0213	0.0119
10.00	ft	0.0436	0.0401	0.0313	0.0206	0.0115
20.00	ft	0.0395	0.0363	0.0283	0.0186	0.0104
30.00	ft	0.0334	0.0307	0.0239	0.0158	0.0088
40.00	ft	0.0265	0.0243	0.0190	0.0125	0.0070
50.00	ft	0.0196	0.0180	0.0140	0.0093	0.0052
60.00	ft	0.0136	0.0125	0.0097	0.0064	0.0036
70.00	ft	0.0088	0.0081	0.0063	0.0042	0.0023
80.00	ft	0.0053	0.0049	0.0038	0.0025	0.0014
90.00	ft	0.0030	0.0028	0.0022	0.0014	0.0008
100.00	ft	0.0016	0.0015	0.0012	0.0008	0.0004
110.00	ft	0.0008	0.0007	0.0006	0.0004	0.0002
120.00	ft	0.0004	0.0003	0.0003	0.0002	0.0000
130.00	ft	0.0002	0.0001	0.0001	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0056	0.0022	0.0008	0.0002	0.0000
10.00	ft	0.0054	0.0022	0.0007	0.0002	0.0000
20.00	ft	0.0049	0.0020	0.0007	0.0002	0.0000
30.00	ft	0.0042	0.0017	0.0006	0.0002	0.0000
40.00	ft	0.0033	0.0013	0.0004	0.0001	0.0000
50.00	ft	0.0024	0.0010	0.0003	0.0000	0.0000
60.00	ft	0.0017	0.0007	0.0002	0.0000	0.0000
70.00	ft	0.0011	0.0004	0.0001	0.0000	0.0000
80.00	ft	0.0007	0.0003	0.0000	0.0000	0.0000
90.00	ft	0.0004	0.0002	0.0000	0.0000	0.0000
100.00	ft	0.0002	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 10 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ6	Ø.ØØ17
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ6	Ø.ØØ17
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ5	Ø.ØØ15
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ4	Ø.ØØ13
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØ1Ø
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ3	Ø.ØØØ8
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ5
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ3
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ2
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØ44	Ø.ØØ93	Ø.Ø166	Ø.Ø252	Ø.Ø323
1Ø.ØØ ft	Ø.ØØ42	Ø.ØØ9Ø	Ø.Ø16Ø	Ø.Ø243	Ø.Ø313
2Ø.ØØ ft	Ø.ØØ38	Ø.ØØ81	Ø.Ø145	Ø.Ø22Ø	Ø.Ø283
3Ø.ØØ ft	Ø.ØØ32	Ø.ØØ69	Ø.Ø123	Ø.Ø186	Ø.Ø239
4Ø.ØØ ft	Ø.ØØ26	Ø.ØØ54	Ø.ØØ97	Ø.Ø148	Ø.Ø19Ø
5Ø.ØØ ft	Ø.ØØ19	Ø.ØØ4Ø	Ø.ØØ72	Ø.Ø1Ø9	Ø.Ø14Ø
6Ø.ØØ ft	Ø.ØØ13	Ø.ØØ28	Ø.ØØ5Ø	Ø.ØØ76	Ø.ØØ97
7Ø.ØØ ft	Ø.ØØØ9	Ø.ØØ18	Ø.ØØ32	Ø.ØØ49	Ø.ØØ63
8Ø.ØØ ft	Ø.ØØØ5	Ø.ØØ11	Ø.ØØ2Ø	Ø.ØØ3Ø	Ø.ØØ38
9Ø.ØØ ft	Ø.ØØØ3	Ø.ØØØ6	Ø.ØØ11	Ø.ØØ17	Ø.ØØ22
1ØØ.ØØ ft	Ø.ØØØ2	Ø.ØØØ3	Ø.ØØØ6	Ø.ØØØ9	Ø.ØØ12
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØ2	Ø.ØØØ3	Ø.ØØØ4	Ø.ØØØ6
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1	Ø.ØØØ2	Ø.ØØØ3
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØ1

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0351	0.0323	0.0252	0.0166	0.0093
10.00	ft	0.0340	0.0313	0.0243	0.0160	0.0090
20.00	ft	0.0307	0.0283	0.0220	0.0145	0.0081
30.00	ft	0.0260	0.0239	0.0186	0.0123	0.0069
40.00	ft	0.0206	0.0190	0.0148	0.0097	0.0054
50.00	ft	0.0153	0.0140	0.0109	0.0072	0.0040
60.00	ft	0.0106	0.0097	0.0076	0.0050	0.0028
70.00	ft	0.0069	0.0063	0.0049	0.0032	0.0018
80.00	ft	0.0042	0.0038	0.0030	0.0020	0.0011
90.00	ft	0.0024	0.0022	0.0017	0.0011	0.0006
100.00	ft	0.0013	0.0012	0.0009	0.0006	0.0003
110.00	ft	0.0006	0.0006	0.0004	0.0003	0.0002
120.00	ft	0.0003	0.0003	0.0002	0.0001	0.0000
130.00	ft	0.0001	0.0001	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0044	0.0017	0.0006	0.0002	0.0000
10.00	ft	0.0042	0.0017	0.0006	0.0002	0.0000
20.00	ft	0.0038	0.0015	0.0005	0.0001	0.0000
30.00	ft	0.0032	0.0013	0.0004	0.0001	0.0000
40.00	ft	0.0026	0.0010	0.0003	0.0000	0.0000
50.00	ft	0.0019	0.0008	0.0003	0.0000	0.0000
60.00	ft	0.0013	0.0005	0.0002	0.0000	0.0000
70.00	ft	0.0009	0.0003	0.0001	0.0000	0.0000
80.00	ft	0.0005	0.0002	0.0000	0.0000	0.0000
90.00	ft	0.0003	0.0001	0.0000	0.0000	0.0000
100.00	ft	0.0002	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 15 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0000	0.0000	0.0001	0.0004	0.0012
10.00	ft	0.0000	0.0000	0.0001	0.0004	0.0011
20.00	ft	0.0000	0.0000	0.0000	0.0003	0.0010
30.00	ft	0.0000	0.0000	0.0000	0.0003	0.0009
40.00	ft	0.0000	0.0000	0.0000	0.0002	0.0007
50.00	ft	0.0000	0.0000	0.0000	0.0002	0.0005
60.00	ft	0.0000	0.0000	0.0000	0.0001	0.0003
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0002
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00	ft	0.0029	0.0061	0.0109	0.0166	0.0213
10.00	ft	0.0028	0.0059	0.0106	0.0160	0.0206
20.00	ft	0.0025	0.0053	0.0096	0.0145	0.0186
30.00	ft	0.0021	0.0045	0.0081	0.0123	0.0158
40.00	ft	0.0017	0.0036	0.0064	0.0097	0.0125
50.00	ft	0.0013	0.0027	0.0048	0.0072	0.0093
60.00	ft	0.0009	0.0018	0.0033	0.0050	0.0064
70.00	ft	0.0006	0.0012	0.0021	0.0032	0.0042
80.00	ft	0.0003	0.0007	0.0013	0.0020	0.0025
90.00	ft	0.0002	0.0004	0.0007	0.0011	0.0014
100.00	ft	0.0001	0.0002	0.0004	0.0006	0.0008
110.00	ft	0.0000	0.0001	0.0002	0.0003	0.0004
120.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0232	0.0213	0.0166	0.0109	0.0061
10.00	ft	0.0224	0.0206	0.0160	0.0106	0.0059
20.00	ft	0.0203	0.0186	0.0145	0.0096	0.0053
30.00	ft	0.0172	0.0158	0.0123	0.0081	0.0045
40.00	ft	0.0136	0.0125	0.0097	0.0064	0.0036
50.00	ft	0.0101	0.0093	0.0072	0.0048	0.0027
60.00	ft	0.0070	0.0064	0.0050	0.0033	0.0018
70.00	ft	0.0045	0.0042	0.0032	0.0021	0.0012
80.00	ft	0.0027	0.0025	0.0020	0.0013	0.0007
90.00	ft	0.0016	0.0014	0.0011	0.0007	0.0004
100.00	ft	0.0008	0.0008	0.0006	0.0004	0.0002
110.00	ft	0.0004	0.0004	0.0003	0.0002	0.0001
120.00	ft	0.0002	0.0002	0.0001	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0029	0.0012	0.0004	0.0001	0.0000
10.00	ft	0.0028	0.0011	0.0004	0.0001	0.0000
20.00	ft	0.0025	0.0010	0.0003	0.0000	0.0000
30.00	ft	0.0021	0.0009	0.0003	0.0000	0.0000
40.00	ft	0.0017	0.0007	0.0002	0.0000	0.0000
50.00	ft	0.0013	0.0005	0.0002	0.0000	0.0000
60.00	ft	0.0009	0.0003	0.0001	0.0000	0.0000
70.00	ft	0.0006	0.0002	0.0000	0.0000	0.0000
80.00	ft	0.0003	0.0001	0.0000	0.0000	0.0000
90.00	ft	0.0002	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 20 ft

		0.00 ft	50.00 ft	100.00 ft	150.00 ft	200.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
10.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
20.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
30.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
40.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		250.00 ft	300.00 ft	350.00 ft	400.00 ft	450.00 ft
0.00	ft	0.0000	0.0000	0.0000	0.0002	0.0006
10.00	ft	0.0000	0.0000	0.0000	0.0002	0.0006
20.00	ft	0.0000	0.0000	0.0000	0.0002	0.0006
30.00	ft	0.0000	0.0000	0.0000	0.0002	0.0005
40.00	ft	0.0000	0.0000	0.0000	0.0001	0.0004
50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0003
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0002
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		500.00 ft	550.00 ft	600.00 ft	650.00 ft	700.00 ft
0.00	ft	0.0016	0.0034	0.0061	0.0093	0.0119
10.00	ft	0.0016	0.0033	0.0059	0.0090	0.0115
20.00	ft	0.0014	0.0030	0.0053	0.0081	0.0104
30.00	ft	0.0012	0.0025	0.0045	0.0069	0.0088
40.00	ft	0.0009	0.0020	0.0036	0.0054	0.0070
50.00	ft	0.0007	0.0015	0.0027	0.0040	0.0052
60.00	ft	0.0005	0.0010	0.0018	0.0028	0.0036
70.00	ft	0.0003	0.0007	0.0012	0.0018	0.0023
80.00	ft	0.0002	0.0004	0.0007	0.0011	0.0014
90.00	ft	0.0001	0.0002	0.0004	0.0006	0.0008
100.00	ft	0.0000	0.0001	0.0002	0.0003	0.0004
110.00	ft	0.0000	0.0000	0.0001	0.0002	0.0002
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0129	0.0119	0.0093	0.0061	0.0034
10.00	ft	0.0125	0.0115	0.0090	0.0059	0.0033
20.00	ft	0.0113	0.0104	0.0081	0.0053	0.0030
30.00	ft	0.0096	0.0088	0.0069	0.0045	0.0025
40.00	ft	0.0076	0.0070	0.0054	0.0036	0.0020
50.00	ft	0.0056	0.0052	0.0040	0.0027	0.0015
60.00	ft	0.0039	0.0036	0.0028	0.0018	0.0010
70.00	ft	0.0025	0.0023	0.0018	0.0012	0.0007
80.00	ft	0.0015	0.0014	0.0011	0.0007	0.0004
90.00	ft	0.0009	0.0008	0.0006	0.0004	0.0002
100.00	ft	0.0005	0.0004	0.0003	0.0002	0.0001
110.00	ft	0.0002	0.0002	0.0002	0.0001	0.0000
120.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0016	0.0006	0.0002	0.0000	0.0000
10.00	ft	0.0016	0.0006	0.0002	0.0000	0.0000
20.00	ft	0.0014	0.0006	0.0002	0.0000	0.0000
30.00	ft	0.0012	0.0005	0.0002	0.0000	0.0000
40.00	ft	0.0009	0.0004	0.0001	0.0000	0.0000
50.00	ft	0.0007	0.0003	0.0000	0.0000	0.0000
60.00	ft	0.0005	0.0002	0.0000	0.0000	0.0000
70.00	ft	0.0003	0.0001	0.0000	0.0000	0.0000
80.00	ft	0.0002	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0001	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

3-Dimensional Slug Input Model After 250 Days

```
**********************************************************
*                                                        *
*  SLUG INJECTION IN THREE-DIMENSIONAL UNIFORM FLOW      *
*                                                        *
*  MODEL: SLUG3D.BAS                                     *
*                                                        *
**********************************************************
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USER: JEFF HAVLENA

LOCATION: ENRON-HOBBS

DATE: OCTOBER 23, 1989

INPUT DATA:

TOTAL SOLUTE MASS INJECTED	Ø.56	lb
DARCY VELOCITY	1.ØØ	ft/d
EFFECTIVE POROSITY	.2	
LONGITUDINAL DISPERSIVITY	1Ø.ØØ	ft
LATERAL DISPERSIVITY	1.ØØ	ft
VERTICAL DISPERSIVITY	Ø.1Ø	ft
DECAY CONSTANT (lambda)	Ø	1/d
DISTANCE INCREMENT DELX	5Ø.ØØ	ft
DISTANCE INCREMENT DELY	1Ø.ØØ	ft
DISTANCE INCREMENT DELZ	5.ØØ	ft
NUMBER OF NODES IN X-DIRECTION	37	
NUMBER OF NODES IN Y-DIRECTION	2Ø	
NUMBER OF NODES IN Z-DIRECTION	6	
TIME	25Ø.ØØ	d

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = Ø ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0002	0.0004	0.0009	0.0020	0.0038
10.00	ft	0.0002	0.0004	0.0009	0.0019	0.0037
20.00	ft	0.0001	0.0004	0.0009	0.0018	0.0035
30.00	ft	0.0001	0.0003	0.0008	0.0016	0.0031
40.00	ft	0.0001	0.0003	0.0007	0.0014	0.0027
50.00	ft	0.0000	0.0002	0.0006	0.0012	0.0023
60.00	ft	0.0000	0.0002	0.0005	0.0010	0.0018
70.00	ft	0.0000	0.0001	0.0003	0.0007	0.0014
80.00	ft	0.0000	0.0001	0.0003	0.0005	0.0010
90.00	ft	0.0000	0.0000	0.0002	0.0004	0.0007
100.00	ft	0.0000	0.0000	0.0001	0.0003	0.0005
110.00	ft	0.0000	0.0000	0.0000	0.0002	0.0003
120.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0065	0.0102	0.0145	0.0187	0.0217
10.00	ft	0.0064	0.0100	0.0142	0.0183	0.0212
20.00	ft	0.0060	0.0094	0.0134	0.0172	0.0200
30.00	ft	0.0055	0.0086	0.0121	0.0156	0.0181
40.00	ft	0.0047	0.0074	0.0105	0.0135	0.0157
50.00	ft	0.0040	0.0062	0.0088	0.0113	0.0131
60.00	ft	0.0032	0.0050	0.0071	0.0091	0.0105
70.00	ft	0.0024	0.0038	0.0055	0.0070	0.0081
80.00	ft	0.0018	0.0028	0.0040	0.0052	0.0060
90.00	ft	0.0013	0.0020	0.0029	0.0037	0.0043
100.00	ft	0.0009	0.0014	0.0020	0.0025	0.0029
110.00	ft	0.0006	0.0009	0.0013	0.0017	0.0019
120.00	ft	0.0004	0.0006	0.0008	0.0010	0.0012
130.00	ft	0.0002	0.0003	0.0005	0.0006	0.0007
140.00	ft	0.0001	0.0002	0.0003	0.0004	0.0004
150.00	ft	0.0000	0.0001	0.0002	0.0002	0.0002
160.00	ft	0.0000	0.0000	0.0000	0.0001	0.0001
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0228	0.0217	0.0187	0.0145	0.0102
10.00 ft	0.0223	0.0212	0.0183	0.0142	0.0100
20.00 ft	0.0210	0.0200	0.0172	0.0134	0.0094
30.00 ft	0.0190	0.0181	0.0156	0.0121	0.0086
40.00 ft	0.0165	0.0157	0.0135	0.0105	0.0074
50.00 ft	0.0138	0.0131	0.0113	0.0088	0.0062
60.00 ft	0.0111	0.0105	0.0091	0.0071	0.0050
70.00 ft	0.0086	0.0081	0.0070	0.0055	0.0038
80.00 ft	0.0063	0.0060	0.0052	0.0040	0.0028
90.00 ft	0.0045	0.0043	0.0037	0.0029	0.0020
100.00 ft	0.0031	0.0029	0.0025	0.0020	0.0014
110.00 ft	0.0020	0.0019	0.0017	0.0013	0.0009
120.00 ft	0.0013	0.0012	0.0010	0.0008	0.0006
130.00 ft	0.0008	0.0007	0.0006	0.0005	0.0003
140.00 ft	0.0005	0.0004	0.0004	0.0003	0.0002
150.00 ft	0.0003	0.0002	0.0002	0.0002	0.0001
160.00 ft	0.0001	0.0001	0.0001	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0065	0.0038	0.0020	0.0009	0.0004
10.00 ft	0.0064	0.0037	0.0019	0.0009	0.0004
20.00 ft	0.0060	0.0035	0.0018	0.0009	0.0004
30.00 ft	0.0055	0.0031	0.0016	0.0008	0.0003
40.00 ft	0.0047	0.0027	0.0014	0.0007	0.0003
50.00 ft	0.0040	0.0023	0.0012	0.0006	0.0002
60.00 ft	0.0032	0.0018	0.0010	0.0005	0.0002
70.00 ft	0.0024	0.0014	0.0007	0.0003	0.0001
80.00 ft	0.0018	0.0010	0.0005	0.0003	0.0001
90.00 ft	0.0013	0.0007	0.0004	0.0002	0.0000
100.00 ft	0.0009	0.0005	0.0003	0.0001	0.0000
110.00 ft	0.0006	0.0003	0.0002	0.0000	0.0000
120.00 ft	0.0004	0.0002	0.0001	0.0000	0.0000
130.00 ft	0.0002	0.0001	0.0000	0.0000	0.0000
140.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0002	0.0000
10.00 ft	0.0002	0.0000
20.00 ft	0.0001	0.0000
30.00 ft	0.0001	0.0000
40.00 ft	0.0001	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000

120.00	ft	0.0000	0.0000
130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

********** RESULTS **********

+-------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 5 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0001	0.0004	0.0009	0.0019	0.0036
10.00	ft	0.0001	0.0004	0.0009	0.0018	0.0035
20.00	ft	0.0001	0.0003	0.0008	0.0017	0.0033
30.00	ft	0.0001	0.0003	0.0007	0.0016	0.0030
40.00	ft	0.0001	0.0003	0.0006	0.0014	0.0026
50.00	ft	0.0000	0.0002	0.0005	0.0011	0.0022
60.00	ft	0.0000	0.0002	0.0004	0.0009	0.0017
70.00	ft	0.0000	0.0001	0.0003	0.0007	0.0013
80.00	ft	0.0000	0.0001	0.0002	0.0005	0.0010
90.00	ft	0.0000	0.0000	0.0002	0.0004	0.0007
100.00	ft	0.0000	0.0000	0.0001	0.0003	0.0005
110.00	ft	0.0000	0.0000	0.0000	0.0002	0.0003
120.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0062	0.0097	0.0138	0.0177	0.0206
10.00	ft	0.0061	0.0095	0.0135	0.0174	0.0202
20.00	ft	0.0057	0.0090	0.0128	0.0164	0.0190
30.00	ft	0.0052	0.0081	0.0115	0.0148	0.0172
40.00	ft	0.0045	0.0071	0.0100	0.0129	0.0150
50.00	ft	0.0038	0.0059	0.0084	0.0108	0.0125
60.00	ft	0.0030	0.0047	0.0067	0.0086	0.0100
70.00	ft	0.0023	0.0037	0.0052	0.0067	0.0077
80.00	ft	0.0017	0.0027	0.0038	0.0049	0.0057
90.00	ft	0.0012	0.0019	0.0027	0.0035	0.0041
100.00	ft	0.0008	0.0013	0.0019	0.0024	0.0028
110.00	ft	0.0006	0.0009	0.0012	0.0016	0.0018
120.00	ft	0.0003	0.0005	0.0008	0.0010	0.0012
130.00	ft	0.0002	0.0003	0.0005	0.0006	0.0007
140.00	ft	0.0001	0.0002	0.0003	0.0004	0.0004
150.00	ft	0.0000	0.0001	0.0002	0.0002	0.0002
160.00	ft	0.0000	0.0000	0.0000	0.0001	0.0001
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0217	0.0206	0.0177	0.0138	0.0097
10.00 ft	0.0212	0.0202	0.0174	0.0135	0.0095
20.00 ft	0.0200	0.0190	0.0164	0.0128	0.0090
30.00 ft	0.0181	0.0172	0.0148	0.0115	0.0081
40.00 ft	0.0157	0.0150	0.0129	0.0100	0.0071
50.00 ft	0.0131	0.0125	0.0108	0.0084	0.0059
60.00 ft	0.0105	0.0100	0.0086	0.0067	0.0047
70.00 ft	0.0081	0.0077	0.0067	0.0052	0.0037
80.00 ft	0.0060	0.0057	0.0049	0.0038	0.0027
90.00 ft	0.0043	0.0041	0.0035	0.0027	0.0019
100.00 ft	0.0029	0.0028	0.0024	0.0019	0.0013
110.00 ft	0.0019	0.0018	0.0016	0.0012	0.0009
120.00 ft	0.0012	0.0012	0.0010	0.0008	0.0005
130.00 ft	0.0007	0.0007	0.0006	0.0005	0.0003
140.00 ft	0.0004	0.0004	0.0004	0.0003	0.0002
150.00 ft	0.0002	0.0002	0.0002	0.0002	0.0001
160.00 ft	0.0001	0.0001	0.0001	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0062	0.0036	0.0019	0.0009	0.0004
10.00 ft	0.0061	0.0035	0.0018	0.0009	0.0004
20.00 ft	0.0057	0.0033	0.0017	0.0008	0.0003
30.00 ft	0.0052	0.0030	0.0016	0.0007	0.0003
40.00 ft	0.0045	0.0026	0.0014	0.0006	0.0003
50.00 ft	0.0038	0.0022	0.0011	0.0005	0.0002
60.00 ft	0.0030	0.0017	0.0009	0.0004	0.0002
70.00 ft	0.0023	0.0013	0.0007	0.0003	0.0001
80.00 ft	0.0017	0.0010	0.0005	0.0002	0.0001
90.00 ft	0.0012	0.0007	0.0004	0.0002	0.0000
100.00 ft	0.0008	0.0005	0.0003	0.0001	0.0000
110.00 ft	0.0006	0.0003	0.0002	0.0000	0.0000
120.00 ft	0.0003	0.0002	0.0001	0.0000	0.0000
130.00 ft	0.0002	0.0001	0.0000	0.0000	0.0000
140.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0001	0.0000
10.00 ft	0.0001	0.0000
20.00 ft	0.0001	0.0000
30.00 ft	0.0001	0.0000
40.00 ft	0.0001	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000

120.00	ft	0.0000	0.0000
130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 10 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0001	0.0003	0.0008	0.0016	0.0031
10.00	ft	0.0001	0.0003	0.0007	0.0016	0.0030
20.00	ft	0.0001	0.0003	0.0007	0.0015	0.0028
30.00	ft	0.0001	0.0003	0.0006	0.0013	0.0026
40.00	ft	0.0000	0.0002	0.0006	0.0012	0.0022
50.00	ft	0.0000	0.0002	0.0005	0.0010	0.0019
60.00	ft	0.0000	0.0002	0.0004	0.0008	0.0015
70.00	ft	0.0000	0.0001	0.0003	0.0006	0.0012
80.00	ft	0.0000	0.0000	0.0002	0.0004	0.0009
90.00	ft	0.0000	0.0000	0.0002	0.0003	0.0006
100.00	ft	0.0000	0.0000	0.0001	0.0002	0.0004
110.00	ft	0.0000	0.0000	0.0000	0.0001	0.0003
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0002
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0053	0.0084	0.0119	0.0153	0.0177
10.00	ft	0.0052	0.0082	0.0117	0.0150	0.0174
20.00	ft	0.0049	0.0077	0.0110	0.0141	0.0164
30.00	ft	0.0045	0.0070	0.0099	0.0128	0.0148
40.00	ft	0.0039	0.0061	0.0086	0.0111	0.0129
50.00	ft	0.0032	0.0051	0.0072	0.0093	0.0108
60.00	ft	0.0026	0.0041	0.0058	0.0074	0.0086
70.00	ft	0.0020	0.0031	0.0045	0.0057	0.0067
80.00	ft	0.0015	0.0023	0.0033	0.0042	0.0049
90.00	ft	0.0011	0.0017	0.0024	0.0030	0.0035
100.00	ft	0.0007	0.0011	0.0016	0.0021	0.0024
110.00	ft	0.0005	0.0007	0.0011	0.0014	0.0016
120.00	ft	0.0003	0.0005	0.0007	0.0009	0.0010
130.00	ft	0.0002	0.0003	0.0004	0.0005	0.0006
140.00	ft	0.0001	0.0002	0.0002	0.0003	0.0004
150.00	ft	0.0000	0.0000	0.0001	0.0002	0.0002
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0187	0.0177	0.0153	0.0119	0.0084
10.00 ft	0.0183	0.0174	0.0150	0.0117	0.0082
20.00 ft	0.0172	0.0164	0.0141	0.0110	0.0077
30.00 ft	0.0156	0.0148	0.0128	0.0099	0.0070
40.00 ft	0.0135	0.0129	0.0111	0.0086	0.0061
50.00 ft	0.0113	0.0108	0.0093	0.0072	0.0051
60.00 ft	0.0091	0.0086	0.0074	0.0058	0.0041
70.00 ft	0.0070	0.0067	0.0057	0.0045	0.0031
80.00 ft	0.0052	0.0049	0.0042	0.0033	0.0023
90.00 ft	0.0037	0.0035	0.0030	0.0024	0.0017
100.00 ft	0.0025	0.0024	0.0021	0.0016	0.0011
110.00 ft	0.0017	0.0016	0.0014	0.0011	0.0007
120.00 ft	0.0010	0.0010	0.0009	0.0007	0.0005
130.00 ft	0.0006	0.0006	0.0005	0.0004	0.0003
140.00 ft	0.0004	0.0004	0.0003	0.0002	0.0002
150.00 ft	0.0002	0.0002	0.0002	0.0001	0.0000
160.00 ft	0.0001	0.0001	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0053	0.0031	0.0016	0.0008	0.0003
10.00 ft	0.0052	0.0030	0.0016	0.0007	0.0003
20.00 ft	0.0049	0.0028	0.0015	0.0007	0.0003
30.00 ft	0.0045	0.0026	0.0013	0.0006	0.0003
40.00 ft	0.0039	0.0022	0.0012	0.0006	0.0002
50.00 ft	0.0032	0.0019	0.0010	0.0005	0.0002
60.00 ft	0.0026	0.0015	0.0008	0.0004	0.0002
70.00 ft	0.0020	0.0012	0.0006	0.0003	0.0001
80.00 ft	0.0015	0.0009	0.0004	0.0002	0.0000
90.00 ft	0.0011	0.0006	0.0003	0.0002	0.0000
100.00 ft	0.0007	0.0004	0.0002	0.0001	0.0000
110.00 ft	0.0005	0.0003	0.0001	0.0000	0.0000
120.00 ft	0.0003	0.0002	0.0000	0.0000	0.0000
130.00 ft	0.0002	0.0001	0.0000	0.0000	0.0000
140.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0001	0.0000
10.00 ft	0.0001	0.0000
20.00 ft	0.0001	0.0000
30.00 ft	0.0001	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000

110.00	ft	0.0000	0.0000
120.00	ft	0.0000	0.0000
130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 15 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0000	0.0003	0.0006	0.0013	0.0024
10.00	ft	0.0000	0.0002	0.0006	0.0012	0.0024
20.00	ft	0.0000	0.0002	0.0005	0.0012	0.0022
30.00	ft	0.0000	0.0002	0.0005	0.0010	0.0020
40.00	ft	0.0000	0.0002	0.0004	0.0009	0.0017
50.00	ft	0.0000	0.0002	0.0004	0.0008	0.0015
60.00	ft	0.0000	0.0001	0.0003	0.0006	0.0012
70.00	ft	0.0000	0.0000	0.0002	0.0005	0.0009
80.00	ft	0.0000	0.0000	0.0002	0.0003	0.0007
90.00	ft	0.0000	0.0000	0.0001	0.0002	0.0005
100.00	ft	0.0000	0.0000	0.0000	0.0002	0.0003
110.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0042	0.0065	0.0093	0.0119	0.0138
10.00	ft	0.0041	0.0064	0.0091	0.0117	0.0135
20.00	ft	0.0038	0.0060	0.0086	0.0110	0.0128
30.00	ft	0.0035	0.0055	0.0077	0.0099	0.0115
40.00	ft	0.0030	0.0047	0.0067	0.0086	0.0100
50.00	ft	0.0025	0.0040	0.0056	0.0072	0.0084
60.00	ft	0.0020	0.0032	0.0045	0.0058	0.0067
70.00	ft	0.0016	0.0024	0.0035	0.0045	0.0052
80.00	ft	0.0012	0.0018	0.0026	0.0033	0.0038
90.00	ft	0.0008	0.0013	0.0018	0.0024	0.0027
100.00	ft	0.0006	0.0009	0.0013	0.0016	0.0019
110.00	ft	0.0004	0.0006	0.0008	0.0011	0.0012
120.00	ft	0.0002	0.0004	0.0005	0.0007	0.0008
130.00	ft	0.0001	0.0002	0.0003	0.0004	0.0005
140.00	ft	0.0000	0.0001	0.0002	0.0002	0.0003
150.00	ft	0.0000	0.0000	0.0001	0.0001	0.0002
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0145	0.0138	0.0119	0.0093	0.0065
10.00 ft	0.0142	0.0135	0.0117	0.0091	0.0064
20.00 ft	0.0134	0.0128	0.0110	0.0086	0.0060
30.00 ft	0.0121	0.0115	0.0099	0.0077	0.0055
40.00 ft	0.0105	0.0100	0.0086	0.0067	0.0047
50.00 ft	0.0088	0.0084	0.0072	0.0056	0.0040
60.00 ft	0.0071	0.0067	0.0058	0.0045	0.0032
70.00 ft	0.0055	0.0052	0.0045	0.0035	0.0024
80.00 ft	0.0040	0.0038	0.0033	0.0026	0.0018
90.00 ft	0.0029	0.0027	0.0024	0.0018	0.0013
100.00 ft	0.0020	0.0019	0.0016	0.0013	0.0009
110.00 ft	0.0013	0.0012	0.0011	0.0008	0.0006
120.00 ft	0.0008	0.0008	0.0007	0.0005	0.0004
130.00 ft	0.0005	0.0005	0.0004	0.0003	0.0002
140.00 ft	0.0003	0.0003	0.0002	0.0002	0.0001
150.00 ft	0.0002	0.0002	0.0001	0.0001	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0042	0.0024	0.0013	0.0006	0.0003
10.00 ft	0.0041	0.0024	0.0012	0.0006	0.0002
20.00 ft	0.0038	0.0022	0.0012	0.0005	0.0002
30.00 ft	0.0035	0.0020	0.0010	0.0005	0.0002
40.00 ft	0.0030	0.0017	0.0009	0.0004	0.0002
50.00 ft	0.0025	0.0015	0.0008	0.0004	0.0002
60.00 ft	0.0020	0.0012	0.0006	0.0003	0.0001
70.00 ft	0.0016	0.0009	0.0005	0.0002	0.0000
80.00 ft	0.0012	0.0007	0.0003	0.0002	0.0000
90.00 ft	0.0008	0.0005	0.0002	0.0001	0.0000
100.00 ft	0.0006	0.0003	0.0002	0.0000	0.0000
110.00 ft	0.0004	0.0002	0.0001	0.0000	0.0000
120.00 ft	0.0002	0.0001	0.0000	0.0000	0.0000
130.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000

120.00	ft	0.0000	0.0000
130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
!
v Y

Z = 20 ft

		Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

		5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ	ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00 ft	0.0000	0.0002	0.0004	0.0009	0.0017
10.00 ft	0.0000	0.0002	0.0004	0.0009	0.0017
20.00 ft	0.0000	0.0002	0.0004	0.0008	0.0016
30.00 ft	0.0000	0.0001	0.0003	0.0007	0.0014
40.00 ft	0.0000	0.0001	0.0003	0.0006	0.0012
50.00 ft	0.0000	0.0001	0.0003	0.0005	0.0010
60.00 ft	0.0000	0.0000	0.0002	0.0004	0.0008
70.00 ft	0.0000	0.0000	0.0002	0.0003	0.0006
80.00 ft	0.0000	0.0000	0.0001	0.0002	0.0005
90.00 ft	0.0000	0.0000	0.0000	0.0002	0.0003
100.00 ft	0.0000	0.0000	0.0000	0.0001	0.0002
110.00 ft	0.0000	0.0000	0.0000	0.0000	0.0002
120.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00 ft	0.0029	0.0046	0.0065	0.0084	0.0097
10.00 ft	0.0029	0.0045	0.0064	0.0082	0.0095
20.00 ft	0.0027	0.0042	0.0060	0.0077	0.0090
30.00 ft	0.0024	0.0038	0.0055	0.0070	0.0081
40.00 ft	0.0021	0.0033	0.0047	0.0061	0.0071
50.00 ft	0.0018	0.0028	0.0040	0.0051	0.0059
60.00 ft	0.0014	0.0022	0.0032	0.0041	0.0047
70.00 ft	0.0011	0.0017	0.0024	0.0031	0.0037
80.00 ft	0.0008	0.0013	0.0018	0.0023	0.0027
90.00 ft	0.0006	0.0009	0.0013	0.0017	0.0019
100.00 ft	0.0004	0.0006	0.0009	0.0011	0.0013
110.00 ft	0.0003	0.0004	0.0006	0.0007	0.0009
120.00 ft	0.0002	0.0003	0.0004	0.0005	0.0005
130.00 ft	0.0000	0.0002	0.0002	0.0003	0.0003
140.00 ft	0.0000	0.0000	0.0001	0.0002	0.0002
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0001
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0102	0.0097	0.0084	0.0065	0.0046
10.00 ft	0.0100	0.0095	0.0082	0.0064	0.0045
20.00 ft	0.0094	0.0090	0.0077	0.0060	0.0042
30.00 ft	0.0086	0.0081	0.0070	0.0055	0.0038
40.00 ft	0.0074	0.0071	0.0061	0.0047	0.0033
50.00 ft	0.0062	0.0059	0.0051	0.0040	0.0028
60.00 ft	0.0050	0.0047	0.0041	0.0032	0.0022
70.00 ft	0.0038	0.0037	0.0031	0.0024	0.0017
80.00 ft	0.0028	0.0027	0.0023	0.0018	0.0013
90.00 ft	0.0020	0.0019	0.0017	0.0013	0.0009
100.00 ft	0.0014	0.0013	0.0011	0.0009	0.0006
110.00 ft	0.0009	0.0009	0.0007	0.0006	0.0004
120.00 ft	0.0006	0.0005	0.0005	0.0004	0.0003
130.00 ft	0.0003	0.0003	0.0003	0.0002	0.0002
140.00 ft	0.0002	0.0002	0.0002	0.0001	0.0000
150.00 ft	0.0001	0.0001	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0029	0.0017	0.0009	0.0004	0.0002
10.00 ft	0.0029	0.0017	0.0009	0.0004	0.0002
20.00 ft	0.0027	0.0016	0.0008	0.0004	0.0002
30.00 ft	0.0024	0.0014	0.0007	0.0003	0.0001
40.00 ft	0.0021	0.0012	0.0006	0.0003	0.0001
50.00 ft	0.0018	0.0010	0.0005	0.0003	0.0001
60.00 ft	0.0014	0.0008	0.0004	0.0002	0.0000
70.00 ft	0.0011	0.0006	0.0003	0.0002	0.0000
80.00 ft	0.0008	0.0005	0.0002	0.0001	0.0000
90.00 ft	0.0006	0.0003	0.0002	0.0000	0.0000
100.00 ft	0.0004	0.0002	0.0001	0.0000	0.0000
110.00 ft	0.0003	0.0002	0.0000	0.0000	0.0000
120.00 ft	0.0002	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000

120.00	ft	0.0000	0.0000
130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

********** RESULTS **********

+------> X-direction CONCENTRATION in mg/l (ppm)
|
v Y

Z = 25 ft

	Ø.ØØ ft	5Ø.ØØ ft	1ØØ.ØØ ft	15Ø.ØØ ft	2ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	25Ø.ØØ ft	3ØØ.ØØ ft	35Ø.ØØ ft	4ØØ.ØØ ft	45Ø.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
4Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
5Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
6Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
7Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
8Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
9Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1ØØ.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
11Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
12Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
13Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
14Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
15Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
16Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
17Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
18Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
19Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

	5ØØ.ØØ ft	55Ø.ØØ ft	6ØØ.ØØ ft	65Ø.ØØ ft	7ØØ.ØØ ft
Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
1Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
2Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ
3Ø.ØØ ft	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ	Ø.ØØØØ

50.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
60.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
70.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
80.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
90.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		750.00 ft	800.00 ft	850.00 ft	900.00 ft	950.00 ft
0.00	ft	0.0000	0.0001	0.0003	0.0006	0.0011
10.00	ft	0.0000	0.0001	0.0003	0.0006	0.0011
20.00	ft	0.0000	0.0001	0.0002	0.0005	0.0010
30.00	ft	0.0000	0.0000	0.0002	0.0005	0.0009
40.00	ft	0.0000	0.0000	0.0002	0.0004	0.0008
50.00	ft	0.0000	0.0000	0.0002	0.0003	0.0007
60.00	ft	0.0000	0.0000	0.0001	0.0003	0.0005
70.00	ft	0.0000	0.0000	0.0000	0.0002	0.0004
80.00	ft	0.0000	0.0000	0.0000	0.0002	0.0003
90.00	ft	0.0000	0.0000	0.0000	0.0001	0.0002
100.00	ft	0.0000	0.0000	0.0000	0.0000	0.0001
110.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
120.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
130.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

		1000.00 ft	1050.00 ft	1100.00 ft	1150.00 ft	1200.00 ft
0.00	ft	0.0019	0.0029	0.0042	0.0053	0.0062
10.00	ft	0.0018	0.0029	0.0041	0.0052	0.0061
20.00	ft	0.0017	0.0027	0.0038	0.0049	0.0057
30.00	ft	0.0016	0.0024	0.0035	0.0045	0.0052
40.00	ft	0.0014	0.0021	0.0030	0.0039	0.0045
50.00	ft	0.0011	0.0018	0.0025	0.0032	0.0038
60.00	ft	0.0009	0.0014	0.0020	0.0026	0.0030
70.00	ft	0.0007	0.0011	0.0016	0.0020	0.0023
80.00	ft	0.0005	0.0008	0.0012	0.0015	0.0017
90.00	ft	0.0004	0.0006	0.0008	0.0011	0.0012
100.00	ft	0.0003	0.0004	0.0006	0.0007	0.0008
110.00	ft	0.0002	0.0003	0.0004	0.0005	0.0006
120.00	ft	0.0001	0.0002	0.0002	0.0003	0.0003
130.00	ft	0.0000	0.0000	0.0001	0.0002	0.0002
140.00	ft	0.0000	0.0000	0.0000	0.0001	0.0001
150.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00	ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1250.00 ft	1300.00 ft	1350.00 ft	1400.00 ft	1450.00 ft
0.00 ft	0.0065	0.0062	0.0053	0.0042	0.0029
10.00 ft	0.0064	0.0061	0.0052	0.0041	0.0029
20.00 ft	0.0060	0.0057	0.0049	0.0038	0.0027
30.00 ft	0.0055	0.0052	0.0045	0.0035	0.0024
40.00 ft	0.0047	0.0045	0.0039	0.0030	0.0021
50.00 ft	0.0040	0.0038	0.0032	0.0025	0.0018
60.00 ft	0.0032	0.0030	0.0026	0.0020	0.0014
70.00 ft	0.0024	0.0023	0.0020	0.0016	0.0011
80.00 ft	0.0018	0.0017	0.0015	0.0012	0.0008
90.00 ft	0.0013	0.0012	0.0011	0.0008	0.0006
100.00 ft	0.0009	0.0008	0.0007	0.0006	0.0004
110.00 ft	0.0006	0.0006	0.0005	0.0004	0.0003
120.00 ft	0.0004	0.0003	0.0003	0.0002	0.0002
130.00 ft	0.0002	0.0002	0.0002	0.0001	0.0000
140.00 ft	0.0001	0.0001	0.0001	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1500.00 ft	1550.00 ft	1600.00 ft	1650.00 ft	1700.00 ft
0.00 ft	0.0019	0.0011	0.0006	0.0003	0.0001
10.00 ft	0.0018	0.0011	0.0006	0.0003	0.0001
20.00 ft	0.0017	0.0010	0.0005	0.0002	0.0001
30.00 ft	0.0016	0.0009	0.0005	0.0002	0.0000
40.00 ft	0.0014	0.0008	0.0004	0.0002	0.0000
50.00 ft	0.0011	0.0007	0.0003	0.0002	0.0000
60.00 ft	0.0009	0.0005	0.0003	0.0001	0.0000
70.00 ft	0.0007	0.0004	0.0002	0.0000	0.0000
80.00 ft	0.0005	0.0003	0.0002	0.0000	0.0000
90.00 ft	0.0004	0.0002	0.0001	0.0000	0.0000
100.00 ft	0.0003	0.0001	0.0000	0.0000	0.0000
110.00 ft	0.0002	0.0000	0.0000	0.0000	0.0000
120.00 ft	0.0001	0.0000	0.0000	0.0000	0.0000
130.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
140.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
150.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
160.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
170.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
180.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000
190.00 ft	0.0000	0.0000	0.0000	0.0000	0.0000

	1750.00 ft	1800.00 ft
0.00 ft	0.0000	0.0000
10.00 ft	0.0000	0.0000
20.00 ft	0.0000	0.0000
30.00 ft	0.0000	0.0000
40.00 ft	0.0000	0.0000
50.00 ft	0.0000	0.0000
60.00 ft	0.0000	0.0000
70.00 ft	0.0000	0.0000
80.00 ft	0.0000	0.0000
90.00 ft	0.0000	0.0000
100.00 ft	0.0000	0.0000

120.00	ft	0.0000	0.0000
130.00	ft	0.0000	0.0000
140.00	ft	0.0000	0.0000
150.00	ft	0.0000	0.0000
160.00	ft	0.0000	0.0000
170.00	ft	0.0000	0.0000
180.00	ft	0.0000	0.0000
190.00	ft	0.0000	0.0000

Dave,
These were left over
@ EID.
Thanx
Dave Baker
x2944

DANIEL B. STEPHENS & ASSOCIATES, INC.

CONSULTANTS IN GROUND-WATER HYDROLOGY ALBUQUERQUE, NEW MEXICO

HYDROGEOLOGY AND CHROMIUM TRANSPORT AT THE NORTHERN NATURAL GAS COMPANY HOBBS PROCESSING PLANT

PREPARED FOR

NORTHERN NATURAL GAS COMPANY

DECEMBER 7, 1989

December 7, 1989

Mr. Earl Berdine
Agent and Attorney-in-Fact for
Northern Natural Gas Company
P.O. Box 1188
Houston, TX 77251-1188

Re: Northern Natural Gas Company Hobbs Processing Facility

Dear Mr. Berdine:

This letter report serves as our final report on the hydrogeology in the vicinity of the Hobbs facility and analysis of the potential impact to ground water from the loss of cooling system fluids. This report was compiled pursuant to your request for information on the hydrogeology and water use near the facility, and for an analysis of the potential impact to the aquifer.

This report is based on:

i) Information supplied by your office regarding the nature and extent of the cooling system leak,

ii) Available literature on the hydrogeology of the area,

iii) Results of ground-water and soil sampling conducted by Daniel B. Stephens & Associates, Inc. (DBS&A).

INTRODUCTION

Over the period of June 25, 1989 through August 9, 1989, Northern Natural Gas Company's (NNGC) natural gas processing and compression plant near Hobbs in Lea County, New Mexico experienced a loss of lube-oil cooling system water due to a leak in a 2-inch pipe. The total volume of water cost is estimated by NNGC to be approximately 15,400 gallons. A chronological summary of events surrounding the water loss at the Hobbs plant is included as Appendix A.

In order to confirm NNGC's judgment that no adverse impact to water quality would result from the leak, NNGC retained Daniel B. Stephens & Associates (DBS&A) to perform a hydrologic assessment. In an October 24, 1989 report to NNGC, DBS&A performed an analytical contaminant transport modeling exercise to provide a

"worst-case" scenario for the fate of the released contaminants. In that exercise, the contamination was released directly into the aquifer without first travelling through the unsaturated zone.

In order to more accurately depict the actual conditions at the site, it was decided to evaluate what effect the soil profile may incur on chromium concentrations that may ultimately enter ground water. This evaluation includes a review of chromium behavior in geologic media, and analytical modeling of chromium in the soil profile. In addition, an investigation was conducted to determine the extent of use of on-site wells.

SITE HYDROGEOLOGY

The NNGC Hobbs processing plant is located approximately 8 miles west of Hobbs, NM, on U.S. Highway 62-180 (plate 1). The plant site directly overlies the Ogallala Formation of late Tertiary (Pliocene) age. The Ogallala is comprised chiefly of calcareous, unconsolidated sand with varying amounts of silt and gravel, and is vertically and laterally highly variable in composition. Sediments near the top of the formation are cemented by calcium carbonate over most of the Ogallala's out crop area (McAda, 1984). The degree of calcium carbonate cementation decreases with depth and becomes negligible at depths greater than 35 to 50 feet below ground surface (Ash, 1963). In the NNGC site vicinity, caliche extends to a depth of 22 to 25 feet below ground surface, based on driller's logs (Appendix B).

The Ogallala in the Hobbs area unconformably overlies late Triassic shales or "red beds" of the Dockum Group (Cronin, 1969). The Dockum Group ranges in thickness from 1400 to 2100 feet in northern Lea County (Ash, 1963), and forms a relatively impermeable boundary beneath the Ogallala Formation (Theis, 1939). The top of the Triassic sediments is an irregular, erosional surface that results in significant variations in the thickness of the overlying Ogallala Formation. Wells drilled at the plant site encountered approximately 160 to 170 feet of Ogallala Formation (Appendix B).

Ground-water movement within the Ogallala Formation in the Hobbs area is generally east-southeast, approximately following the

slope of the underlying erosional surface (Cronin, 1969). However, large volume pumping in Hobbs municipal wells has caused a water-table depression in the vicinity of Hobbs (Ash, 1963). Plate 2 is a water-level elevation map compiled from the most recent measurement data available. Table 1 is a listing of well inventory data for wells near the site, and was used to develop Plate 2. Depths to water for all on site wells were measured by DBS&A personnel in September, 1989. Depth to water below the top of well casing at the site ranged from 40 to 47 feet suggesting a saturated thickness of the Ogallala Formation of approximately 115 to 130 feet.

The Ogallala is the principal source of water in the Southern High Plains of Texas and New Mexico. It is everywhere unconfined, and is highly productive with hydraulic conductivities ranging from 3.5×10^{-3} cm/sec to 6.0×10^{-2} cm/sec and an average specific yield for Lea County of 0.20 (McAda, 1984).

WATER USE

In the October 24, 1989 meeting between NNGC, DBS&A and the New Mexico Oil Conservation Division (OCD), NNGC agreed to sample an existing water well on the plant site and provide water production information to the OCD. Afterward, NNGC decided to sample all of its existing wells, both on- and off-site, and to evaluate the potential for contaminant retardation and adsorption within the soil profile above the aquifer. The locations of all area wells are shown approximately on Plate 1, and on-site wells are shown in more detail on Figure 1. The supply well closest to the cooling water leak is well 3. This well is located approximately 230 feet northeast and hydraulically up gradient of the leak. In order for well 3 to be a suitable monitoring point, a considerable volume of water would need to be continually pumped from it to influence flow sufficiently to draw aquifer water from beneath the leak area to the well.

An investigation was conducted to establish how much water has been pumped from NNGC wells over the past 18 months. The pumping history records for NNGC wells 3, 4, 5 and 6 are included as

Table 1.

Hobbs Well Inventory
Proj #89-031

Site Number	Location	Owner	Depth To Water (ft)	Date Measured	Depth of Hole (ft)	Land Surface Elevation (ft > MSL)	Water Surface Elevation (ft > MSL)	Contrib Aquifer	Use	Source
1	18S 36E 13.144	NA	25.62	01/19/71	NA	3566	3540	OGLL	NA	USGS
2	18S 36E 14.144	NA	44.69	02/11/76	NA	3792	3747	OGLL	NA	USGS
3	18S 36E 15.144	NA	51.74	02/11/76	NA	3814	3762	OGLL	NA	USGS
4	18S 36E 16.411	NA	50.99	02/10/76	NA	3825	3774	OGLL	NA	USGS
5	18S 36E 21.411	NA	49.75	02/05/76	NA	3820	3770	OGLL	NA	USGS
6	18S 36E 22.144	NA	49.10	02/11/76	NA	3803	3754	OGLL	NA	USGS
7	18S 36E 22.433	NA	40.50	01/18/71	NA	3798	3757	OGLL	NA	USGS
8	18S 36E 23.111	NA	44.16	02/03/76	NA	3788	3744	OGLL	NA	USGS
9	18S 36E 23.322	NA	41.07	02/03/76	NA	3778	3737	OGLL	NA	USGS
10	18S 36E 24.233	NA	38.33	02/03/76	NA	3760	3722	OGLL	NA	USGS
11	18S 36E 24.313	NA	37.18	02/04/76	NA	3766	3729	OGLL	NA	USGS
12	18S 36E 25.234	NA	32.07	02/03/71	NA	3754	3722	OGLL	NA	USGS
13	18S 36E 25.334	NA	39.34	03/08/61	NA	3763	3724	OGLL	NA	USGS
14	18S 36E 25.423	NA	47.64	02/03/76	NA	3751	3703	OGLL	NA	USGS
15	18S 36E 26.233	NA	47.40	02/03/76	NA	3772	3725	OGLL	NA	USGS
16	18S 36E 27.111	NA	45.90	01/04/78	NA	3810	3764	OGLL	NA	USGS
17	18S 36E 27.233	NA	40.17	02/03/76	NA	3790	3750	OGLL	NA	USGS
18	18S 36E 28.411	NA	36.81	02/05/76	NA	3816	3779	OGLL	NA	USGS
19	18S 36E 33.313	NA	49.15	02/05/76	NA	3817	3768	OGLL	NA	USGS
20	18S 36E 34.322	NA	49.71	02/03/76	NA	3792	3742	OGLL	NA	USGS
21	18S 36E 35.233	NA	62.62	02/03/76	NA	3763	3700	OGLL	NA	USGS
22	18S 36E 35.444	NA	37.13	01/30/76	NA	3742	3705	OGLL	NA	USGS
23	18S 36E 36.422	NA	70.20	02/04/76	NA	3742	3672	OGLL	NA	USGS
24	18S 36E 36.442	NA	69.83	02/04/76	NA	3740	3670	OGLL	NA	USGS
25	18S 36E 36.444	NA	75.23	02/04/71	NA	3740	3665	OGLL	NA	USGS
26	18S 37E 18.413	G.A. Grahm	33.09	02/25/81	NA	3752	3719	OGLL	NA	SEO
27	18S 37E 20.323	NA	30.07	01/29/76	NA	3735	3705	OGLL	NA	USGS
28	18S 37E 20.341	Mrs. T. Shipp	34.41	02/25/81	NA	3738	3704	OGLL	NA	SEO
29	18S 37E 21.423	E. Shipp	25.18	04/01/81	NA	3722	3697	OGLL	NA	SEO
30	18S 37E 23.131	NA	24.72	02/24/81	NA	3688	3663	OGLL	NA	SEO

Table 1 continued

Hobbs Well Inventory
Proj #89-031

Site Number	Location	Owner	Depth To Water (ft)	Date Measured	Depth of Hole (ft)	Land Surface Elevation (ft > MSL)	Water Surface Elevation (ft > MSL)	Contrib Aquifer	Use	Source
31	18S 37E 23.441	J. Yates	24.52	02/24/81	NA	3674	3651	OGLL	NA	SEO
32	18S 37E 24.444	NA	32.09	02/24/81	NA	3663	3631	OGLL	NA	SEO
33	18S 37E 25.422	Humble Oil CO.	36.24	02/24/81	NA	3657	3621	OGLL	NA	SEO
34	18S 37E 27.133	W. Cochran	29.17	02/27/81	NA	3697	3670	OGLL	NA	SEO
35	18S 37E 29.222	Northern Nat. #6	34.53	02/25/81	NA	3724	3690	OGLL	NA	SEO
			44.90	09/21/89	NA	3724	3675	OGLL	NA	FIELD
36	18S 37E 29.242	NA	27.61	03/08/61	NA	3721	3693	OGLL	NA	USGS
37	18S 37E 29.313	NA	35.88	03/08/66	NA	3729	3693	OGLL	NA	USGS
38	18S 36E 29.343	NA	27.66	03/08/61	NA	3722	3694	OGLL	NA	USGS
39	18S 37E 30.133	J.L. Evans	46.14	02/25/81	NA	3744	3698	OGLL	NA	SEO
40	18S 37E 32.133	W. Carlin	45.13	04/01/81	NA	3723	3678	OGLL	STK	SEO
			36.16	09/20/89	NA	3723	3787	OGLL	STK	FIELD
41	18S 37E 32.212	V. Linam	35.79	02/25/81	NA	3716	3680	OGLL	STK	SEO
42	18S 37E 33.221	V. Linam	29.71	02/27/81	NA	3697	3667	OGLL	STK	SEO
43	18S 37E 34.313	E.W. Cox	29.20	02/27/81	NA	3688	3659	OGLL	STK	SEO
44	18S 37E 35.111	E.H. Klein	26.30	02/27/81	NA	3677	3651	OGLL	STK	SEO
45	18S 37E 36.242	City of Eunice	43.71	02/27/81	NA	3649	3605	OGLL	MUN	SEO
46	18S 38E 15.241	B. Randolf	78.37	02/20/86	121	3637	3559	OGLL	IRR	USGS
47	18S 38E 16.142	Del Norte Heights	80.95	02/20/86	140	3652	3571	OGLL	IRR	USGS
48	18S 38E 16.443	City of Hobbs	78.34	02/21/86	195	3638	3560	OGLL	MUN	USGS
49	18S 38E 17.232	NM Dept of G&F	71.53	02/27/86	160	3656	3584	OGLL	DTC	USGS
50	18S 38E 18.344	H.G. Huston	34.13	01/15/86	NA	3662	3628	OGLL	STK	USGS
51	18S 38E 19.413	C.B. Jones	35.28	04/02/81	110	3657	3622	OGLL	IRR	USGS
52	18S 38E 21.131	City of Eunice	52.99	02/18/76	130	3644	3591	OGLL	IRR	USGS
53	18S 38E 22.211	W.O. Spoonmore	89.54	04/02/81	165	3642	3553	OGLL	IRR	USGS
54	18S 38E 28.234	E.C. Bennett	66.46	02/21/86	80	3638	3572	OGLL	DOM	USGS
55	18S 38E 29.421	Tidewater Oil CO.	55.92	03/20/86	NA	3646	3590	OGLL	MTU	USGS
56	18S 38E 30.332	Ohio Oil CO.	39.87	01/15/86	NA	3652	3612	OGLL	NOT	USGS
57	18S 38E 31.322	Mobile Oil CO.	39.50	01/15/86	NA	3640	3601	OGLL	ABN.OWD	USGS
58	19S 36E 02.333	Climax Chem. CO.	80.41	01/24/86	170	3775	3695	OGLL	COM	USGS
59	19S 36E 03.144	Gulf Oil CO.	81.51	01/08/86	178	3781	3700	OGLL	SRO	USGS

Table 1 continued

Hobbs Well Inventory
Proj #89-031

Site Number	Location	Owner	Depth To Water (ft)	Date Measured	Depth of Hole (ft)	Land Surface Elevation (ft > MSL)	Water Surface Elevation (ft > MSL)	Contrib Aquifer	Use	Source
60	19S 36E 03.314	W. M. Snyder	36.62	03/02/61	NA	3785	3749	OGLL	DOM	USGS
61	19S 36E 04.222	J. V. Gibbs	45.39	03/02/61	107	3797	3752	OGLL	DOM	USGS
62	19S 36E 04.222	J. V. Gibbs	47.80	02/10/66	117	3798	3750	OGLL	COM	USGS
63	19S 36E 04.222	J. V. Gibbs	57.70	01/08/86	90	3797	3739	OGLL	DOM	USGS
64	19S 36E 10.232	W. M. Snyder	54.19	02/11/76	NA	3767	3714	OGLL	STK	USGS
65	19S 37E 11.333	Climax Chem. CO.	68.40	01/23/86	130	3751	3683	OGLL	MFG	USGS
66	19S 36E 13.111	El Paso Nat. Gas	51.63	01/21/81	110	3725	3665	OGLL	PPP	USGS
67	19S 36E 13.142	El Paso Nat. Gas	59.83	01/22/86	110	3708	3656	OGLL	PPP	USGS
68	19S 36E 13.442	El Paso Nat. Gas	51.93	03/18/54	NA	3758	3690	OGLL	NOT	USGS
69	19S 36E 22.122	Climax Chem. CO.	67.78	01/10/86	110	3690	3682	OGLL	NOT	USGS
70	19S 36E 22.414	NA	53.16	02/10/66	NA	3735	3673	ALVM	STK	USGS
71	19S 36E 23.123	Texaco	61.67	01/10/86	110	3673	3646	OGLL	OWD	USGS
72	19S 36E 24.323	Warren Petro. CO.	66.27	01/10/86	NA	3712	3646	ALVM	OCH	USGS
73	19S 36E 24.342	NA	65.73	02/11/76	NA	3712	3646	OGLL	NA	USGS
74	19S 37E 01.222	Hobbs Country Club	54.05	02/26/86	180	3643	3589	OGLL	REC	USGS
75	19S 37E 02.224	Lea County Airport	25.71	02/26/86	178	3645	3619	OGLL	MTU	USGS
76	19S 37E 04.113	Mrs. V. Linam	28.26	02/26/86	127	3692	3664	OGLL	DOM	USGS
77	19S 37E 04.113	Mrs. V. Linam			NA			OGLL	IRR	
78	19S 37E 04.213	E. W. Cox	38.94	02/26/86	137	3700	3661	OGLL	STK	USGS
79	19S 37E 04.231	E. W. Cox	35.00	02/11/76	NA	3695	3660	OGLL	STK	USGS
80	19S 37E 04.333	Cities Service Oil	34.72	01/15/71	50	3690	3655	OGLL	OWD	USGS
81	19S 37E 04.412	E. W. Cox	20.26	06/10/76	NA	3672	3652	OGLL	DOM	USGS
83	19S 37E 05.321	Mrs. V. Linam	38.93	01/08/86	128	3707	3668	OGLL	IRR	USGS
84	19S 37E 06.112	Northern Nat. #5	47.50	09/21/89	NA	3731	3683	OGLL	COM	FIELD
85	19S 37E 06.211	Northern Nat. #4	43.58	09/21/89	173	3727	3683	OGLL	COM	FIELD
86	19S 37E 06.212	Northern Nat. #3	53.82	01/12/86	177	3726	3672	OGLL	COM	USGS
			39.73	01/21/89		3726	3686	OGLL	COM	FIELD
87	19S 37E 06.213	Northern Nat. #1	47.41	09/21/89	173	3727	3680	OGLL	COM	FIELD
88	19S 37E 07.223	H. Huston	47.55	01/08/86	142	3708	3660	OGLL	NOT	USGS
89	19S 37E 07.313	Gulf-Warren	58.04	01/15/81	142	3719	3661	OGLL	PPP	USGS
90	19S 37E 08.112	Famariss	56.42	02/10/76	150	3721	3665	OGLL	PPP	USGS

Table 1 continued

Hobbs Well Inventory
Proj #89-031

Site Number	Location	Owner	Depth To Water (ft)	Date Measured	Depth of Hole (ft)	Land Surface Elevation (ft > MSL)	Water Surface Elevation (ft > MSL)	Contrib Aquifer	Use	Source
91	19S 37E 08.123	NA	56.42	02/10/76	NA	3719	3663	OGLL	NA	USGS
92	19S 37E 08.311	H. Huston	42.89	01/08/86	80	3698	3655	OGLL	STK	USGS
93	19S 37E 08.333	Famariss	56.14	01/08/86	142	3708	3652	OGLL	PPP	USGS
94	19S 37E 08.411	H. Huston	39.11	01/08/86	132	3681	3642	OGLL	OCH	USGS
95	19S 37E 10.243	H. Huston	30.59	02/26/86	133	3651	3620	OGLL	OCH	USGS
96	19S 37E 11.131	H. Huston	22.10	02/26/86	NA	3643	3621	OGLL	STK	USGS
97	19S 37E 11.232	H. Huston	21.49	01/21/81	NA	3637	3616	OGLL	STK	USGS
98	19S 37E 12.222	City of Eunice	39.26	02/26/86	142	3621	3582	OGLL	MUN	USGS
99	19S 37E 13.413	W.Terry	24.32	02/14/86	NA	3603	3579	OGLL	STK	USGS
100	19S 37E 15.111	Tidewater Oil CO.	39.56	02/26/86	72	3658	3618	OGLL	OWD	USGS
101	19S 37E 16.233	H. Huston	25.75	01/09/86	NA	3650	3624	OGLL	STK	USGS
103	19S 37E 17.134	W. M. Snyder	63.32	01/09/86	NA	3704	3641	OGLL	NOT	USGS
104	19S 37E 17.431	H. Huston	31.66	01/09/86	NA	3665	3633	OGLL	STK	USGS
105	19S 37E 18.111	Amerada Oil CO.	58.44	01/08/86	134	3715	3657	OGLL	MTU	USGS
106	19S 37E 18.331	NA	51.93	03/18/54	NA	3702	3650	OGLL	NA	USGS
107	19S 37E 19.111	NA	57.87	02/04/76	NA	3703	3645	OGLL	NA	USGS
108	19S 37E 19.113	Phillips Petro. CO	57.34	01/08/86	116	3703	3646	OGLL	OWD	USGS
109	19S 37E 19.321	NA	58.50	01/08/86	NA	3692	3633	OGLL	OFM	USGS
110	19S 37E 20.231	H. Huston	47.85	04/19/68	NA	3677	3629	OGLL	OFM	USGS
111	19S 37E 21.132	NA	24.42	01/09/86	NA	3636	3612	OGLL	STK	USGS
112	19S 37E 21.431	L. Arnspiger	16.19	01/09/86	55	3615	3599	OGLL	IRR	USGS
113	19S 37E 23.334	W. Terry	24.84	02/07/86	NA	3614	3589	OGLL	STK	USGS
114	19S 37E 25.424	McNeil	39.69	02/14/86	NA	3601	3561	OGLL	STK	USGS
115	19S 37E 28.424	D. Tidwell	18.74	02/13/86	NA	3584	3565	OGLL	STK	USGS
116	19S 37E 29.322	Monument Water Wks	17.50	01/06/81	70	3602	3584	OGLL	MUN	USGS
117	19S 38E 04.333	Texaco	17.23	02/26/86	83	3603	3586	OGLL	OWD	USGS
118	19S 38E 04.441	Amoco Prod. CO.	32.18	02/26/86	NA	3608	3576	OGLL	OWD	USGS
119	19S 38E 08.122	W. K. Byrom	19.40	02/26/86	NA	3604	3585	OGLL	OWD	USGS
120	19S 38E 09.233	W. Terry	18.52	02/26/86	NA	3595	3577	OGLL	STK	USGS
121	19S 38E 10.314	D. C. Thorp	39.92	02/26/86	125	3605	3565	OGLL	IRR	USGS
122	19S 38E 17.444	McNeil Ranch	39.15	02/14/86	NA	3599	3560	OGLL	STK	USGS

Table 1 continued

Hobbs Well Inventory
Proj #89-031

Site Number	Location	Owner	Depth To Water (ft)	Date Measured	Depth of Hole (ft)	Land Surface Elevation (ft > MSL)	Water Surface Elevation (ft > MSL)	Contrib Aquifer	Use	Source
123	19S 38E 19.344	A. F. Blakey	36.92	02/27/86	40	3598	3561	OGLL	DOM	USGS
124	19S 38E 19.424	G. M. Gregory	29.25	02/27/86	85	3588	3559	OGLL	IRR	USGS
125	19S 38E 21.213	S. P. Yates	40.58	02/14/86	102	3597	3556	OGLL	OCH	USGS
126	19S 38E 21.411	W. Terry	40.13	02/14/86	NA	3591	3551	OGLL	STK	USGS

*NA- not available

Aquifer:
ALV- alluvium
OGLL- Ogallala

Use:
COM- commercial
DOM- domestic
DTC- domestic type commercial
IRR- irrigation
MFG- manufacturing
MTU- municipal type use
MUN- municipal
NOT- not in use
OCH- open cased hole
OFM- oil field maintenance
OWD- oil well drilling
PPP- petroleum processing plant
REC- recreation
SRO- secondary recovery of oil
STK- stock

Source:
SEO- State Engineer Office
USGS- USGS database
FIELD- collected by DBS&A

Appendix C, and show that well 3 has not been pumped over the period in question except for eight hundred gallons purged in early November for collecting a water quality sample.

WATER QUALITY

On November 2, 1989, water-quality samples were collected from NNGC well numbers 3, 4, 4A (4 replicate), 5 and 6. Those water samples were analyzed for: purgeable organic compounds (EPA method 624, GC/MS); base/neutral and acid extractable organic compounds (EPA method 625, GC/MS); organochlorine pesticides and PCBs (EPA method 608, GC-Extraction-ECD detector), a complete total metals suite (EPA methods 3050 & 6010) and major ion chemistry. In addition, all samples were analyzed for hexavalent chromium. A complete listing of all analytical results is included as Appendix D.

The water quality from all wells is generally quite high. No base/neutral and acid extractable organic compounds organochlorine pesticides, or PCBs were detected. With respect to purgeable organic compounds, a trace of acetone was found in wells 4, 4a and 6 yielding concentrations of 5, 4, and 5 parts per billion, respectively. In addition, a trace of benzene was detected in wells 3, 4, and 4a, yielding concentrations of 4, 5, and 4 parts per billion, respectively. Wells 3, 4, 4a, 5 and 6 are all located hydraulically up gradient of the NNGC Hobbs plant, and should not be affected by operations there. All of these concentrations are very near the compound's detection limit for the method used, and benzene concentrations are well below the New Mexico Water Quality Control Commission numerical standard of 10 parts per billion (there is no NMWQCC numerical standard for acetone). Due to the low concentrations detected, DBS&A recommends confirmatory resampling to establish the presence of benzene and acetone if additional characterization is necessary.

Analyses for inorganic chemical constituents yielded results that indicate excellent quality water with no violations of NMWQCC numerical standards. Total chromium concentration is uniformly quite low, and is below detection in well 3, the well closest to

the leak source. In addition, analyses for hexavalent chromium yielded results below detection for all wells.

SOIL CHEMISTRY NEAR THE LEAK SOURCE

On October 4, 1989, soil samples were collected from beneath a shallow excavation at the leak source. The floor of the excavation was estimated by DBS&A field personnel to be approximately 3 feet below ground surface. Soil samples were collected at depths of 2 feet and 2.67 feet below the excavation floor. Samples were analyzed for: volatile organic compounds (EPA method 8240, GC/MS, P&T); semivolatile organic compounds (EPA method 8270, GC/MS, extraction); organichlorine pesticides and PCBs (EPA method 8080, GC-direct injection -ECD or HSD); chlorinated herbicides (EPA method 8150, GC-direct-injection-ECD); cyanide; phenols; hexavalent chromium; and total metals.

All organic analyses results were below detection except for semivolatile organics in the 2.67-foot sample. That sample contained low concentrations of several polynuclear aromatic compounds; specifically, phenanthrene (0.33 mg/kg), fluoranthrene (0.66 mg/kg), pyrene (0.33 mg/kg), benzo (b) fluoranthene (0.19 mg/kg), and benzo (a) pyrene (0.18 mg/kg). The source of these compounds has not been determined, though it has been postulated that they may originate from the coating placed on pipes at the plant. The concentrations are very near the detection limit for these compounds (0.17 mg/kg), and DBS&A does not believe they pose a significant threat to water quality.

Inorganic analyses results yielded no detectable concentrations of cyanide or hexavalent chromium. Total metals results show total chromium concentrations of 2 mg/kg at the 2-foot depth, and 10 mg/kg at the 2.67 foot depth. The five-fold increase in concentrations with depth may suggest impact from the leak source, but however, naturally occurring, background concentratrions in the soil are unknown. All detected metals are in higher concentrations in the deeper sample; however, there is considerable fill material at the site and samples at these shallow depths do not represent the natural soil profile. Moreover, metals

concentrations do not appear to be high enough to pose a threat to underlying water quality.

CHROMIUM MOVEMENT IN SOILS

The behavior of chromium leachate in the subsurface is of considerable interest because many reactions that can occur in the soil affect the resultant soil-water chromium concentration which may enter the underlying aquifer. Figure 2 is a schematic which summarizes the principal mechanisms of chromium behavior in a porous medium. Although aqueous chromium concentration in soils cannot be predicted without knowing the type of solid that will be precipitated, its solubility product, and relevant aqueous complexation constants (Rai et al., 1988), some general information about chromium behavior is known.

Chromium exists under two valence states, Cr^{3+} under reducing or moderately oxidizing conditions, and as Cr^{6+} under strongly oxidizing conditions. Under normal environmental pH ranges, the dominant Cr^{3+} species include $CrOH^{2+}$, $Cr(OH)_3^0$, and $Cr(OH)_4^-$. For Cr^{6+}, the dominant species include $HCrO_4^-$ and $CrO_4^=$ (Rai et al, 1988). In general, anionic species tend to be more mobile (behave conservatively) in a soil-water environment, and hence, the above Cr^{6+} compounds tend to be mobile, and move relatively rapidly in solution in the subsurface environment.

Aqueous chromium concentrations are controlled by the mechanisms shown in Figure 2. Precipitation and adsorption reactions can incorporate chromium into bulk solids and can occur at the solid/liquid interface to reduce aqueous chromium concentrations; conversely, complexation reactions may occur to decrease free metal concentrations and adsorption, and thus increase aqueous chromium concentrations. To accurately predict resultant Cr concentrations, the aforementioned reactions must be quantified.

With respect to chromium speciation in soil, Rai et al. found that Cr^{6+} reduction to Cr^{3+} was inversely proportional to soil pH. That is, as soil pH increases, the likelihood of chromium reduction

occurring is lessened. For tested soils with neutral to basic pH values, no chromium reduction was observed. Similarly, chromium oxidation from Cr^{3+} to Cr^{6+} is more likely to occur in soils with high pH. Due to the large amount of calcium carbonate caliche in soils at the NNGC Hobbs site, soil pH is basic, and would promote chromium existing in the Cr^{6+} state.

Adsorption of chromium species can be a significant mechanism for reducing soil water chromium concentrations. Batch experiments on a variety of soils conducted by Rai et al. 1988, showed adsorption to be strongly influenced by soil pH. Figure 3 shows aqueous Cr^{3+} concentration versus pH for tested soil NVN-17. This is the tested soil most similar to the that likely to be encountered at the NNGC Hobbs site (although it is finer grained). It is a calcareous silt with a soil-paste pH of 10.5, about 2 pH units more basic than what would be expected in the caliche horizon. Note that as pH increases, predicted Cr^{3+} solubility decreases. This suggests that adsorption could be a significant factor in the reduction of aqueous Cr^{3+} concentrations at the NNGC Hobbs site. Rai et al. found that the solubility of $(Fe,Cr)(OH)_3$ controls aqueous Cr^{3+} concentrations in contact with geologic materials, and those hydroxides are less soluble with increasing pH.

Increasing soil pH decreases the fraction of Cr^{6+} adsorbed. Figure 4 shows fractional adsorption of CrO_2^{2-} (Cr^{6+}) on subsurface soil horizons. In that figure, note the data for soil NVN 17, where virtually no adsorption took place. In addition, Cr^{6+} adsorption is reduced by the presence of sulfate ions, SO_4^{2-}, which compete for adsorption sites. Cr^{6+} adsorption is greatest in soils containing iron oxides and kaolinite at moderate to low pH values.

In summary, it is difficult to predict what reactions will occur to chromium in the subsurface at the NNGC Hobbs site. However, soil samples collected on October 4, 1989 from the pit in the leak area did not contain detectable (< 0.2 mg/kg) Cr^{6+} (Appendix E). Those soil samples did contain 2 mg/kg and 10 mg/kg total chromium at 2-foot and 2.67-foot depths, respectively, suggesting minor chromium contamination.

The lack of Cr^{6+} in the collected soil samples implies that the leaked solution did not contain appreciable Cr^{6+}, or that any leaked

Cr^{6+} has migrated downward into the soil profile. If the former is the case, the leaked solution contained principally Cr^{3+}, and, based on the references cited, adsorption may be expected to play a significant role in reducing aqueous Cr^{3+} concentrations. If the leaked solution did contain Cr^{6+} that has moved downward, existing research indicates that in the soil environment expected at the NNGC Hobbs site, very little, if any, attenuation of Cr^{6+} would occur, and it could be expected to move conservatively with the soil water.

SOLUTE TRANSPORT THROUGH THE UNSATURATED ZONE

In DBS&A's October 24, 1989 report to NNGC, an initial assessment of potential impacts to ground-water quality was performed. In that assessment, an analytical computer model was utilized to simulate the behavior of the chromium release in ground water. However, the simulation was extremely conservative because it did not consider contaminant migration through approximately 40 feet of unsaturated zone overlying the water table. The purpose of this study is to evaluate the potential for contaminant retardation and adsorption within the soil profile.

Owing to the lack of site-specific soil hydraulic properties data, the results presented herein provide only a possible scenario. Also, because chemistry data on the leak do not differentiate between Cr^{3+} and Cr^{6+}, the degree of adsorption cannot be accurately estimated as discussed in the above section.

In light of the lack of site specific data, all attempts were made to obtain results that can be considered conservative. Accordingly, it was assumed that all chromium released was in the hexavalent form. The basic nature of soils underlying the leak source suggest that minimal adsorption of Cr^{6+} will occur. A one-dimensional, analytical model of the convective-dispersive solute transport equation was utilized to describe solute migration within the unsaturated zone. An analytical code was utilized because, given the lack of soil properties data, the additional time and effort required to use a more complex numerical code were not

warranted. The code utilized (van Genuchten and Alves, 1982) is included as Appendix F.

Figure 5 is a schematic drawing which depicts the conceptualization used in the transport modeling. Table 2 lists utilized model parameters. Several runs of the model were performed to evaluate its sensitivity to input parameters, and the behavior of solute concentrations in the soil profile. At high pore-water velocities, that is , velocities that result in travel times through the unsaturated zone that are shorter than the input pulse (36 days), no reduction in source chromium concentration is realized at the water table, although the release time into the aquifer is delayed by the travel time through the soil.

It is likely that the caliche horizon may have a saturated hydraulic conductivity no higher than 1×10^{-5} cm/sec. Assuming that to be so, leaked solution would spread out on top of the caliche horizon and infiltrate at a rate equivalent to the caliche's saturated hydraulic conductivity. With the assumed hydraulic conductivity, leak volume and duration (Table 2), approximately 188 square meters (1688 sq. ft.) would be required to accommodate the flow. Because the relatively thick caliche horizon is controlling the rate of infiltration, flow through the underlying sand will occur under unsaturated conditions. The utilized value of saturation in the sand (7.5%) was obtained from a tabular relative hydraulic conductivity versus moisture content for Del Monte Fine Sand (Mualem, 1976) (Appendix G).

Figure 6 depicts the contaminant migration through the soil profile at selected time values. At 36.5 days, one-half day after cessation of the source, chromium concentration is approximately 0.01 mg/l at the water table and that input chromium concentration (4.4 mg/l) has not migrated below approximately 100 cm. At 73 days from start of leak, the center of the pulse has moved to approximately 700 cm, but the maximum concentration is now only slightly over 2 mg/l. The concentration of solute entering the aquifer is approximately 1 mg/l. Curves at 182.5 and 255.5 days show a continual decline of solute concentration at the water table. At 255.5 days after the leak, the solute entering ground water is approximately at the NMWQCC numerical standard of 0.05 mg/l.

Table 2

Utilized Soil Profile Data

Depth of Profile	1200 cm
Depth of Caliche	700 cm
Caliche Saturated Hydraulic Conductivity (k)	1 x 10^{-5} cm/sec
Caliche effective porosity	7.5%
Ogallala Sand	
Hydraulic Conductivity K (θ)	1 x 10^{-5} cm/sec
θ	7.5%
Pore Water Velocity in Profile K(θ)	= 1.33 x 10^{-4} cm/sec
θ	= 7.5%
Dispersivity	100 cm

Utilized Source Data

Estimated total discharge	58,351 liters (15,400 gallons)
Estimated total chromium mass released	255 grams
Average total chromium concentration	4.4 mg/l
Elapsed time of source	36 days

Based on this analysis the peak concentration entering the aquifer would be about 1.0 mg/l. By contrast, in the ground-water flow and transport model the input concentration to the aquifer was assumed to be 4.4 mg/l. Therefore, the aquifer plume is likely to be much smaller than we predicted, because of dispersion in the soil.

SUMMARY

The results of this investigation may be summarized as follows:

- A zone of caliche approximately 700 cm thick forms a cap on the Ogallala in the vicinity of the Hobbs plant. The caliche most likely has a hydraulic conductivity much lower than the Ogallala Sand.
- On-site wells receive extremely limited usage at the Hobbs plant. Therefore, any subsurface contamination would not have been pulled toward the wells.
- Water quality in all tested wells is excellent, and conforms to all WQCC numerical standards.
- Soil chemistry near the leak source contains no detectable hexavalent chromium, and total chromium concentrations are very low. Trace concentrations of polynuclear aromatic hydrocarbons in the deeper soil sample do not appear to be related to the water leak.
- Analytical solute transport modeling of the soil profile with assumed soil properties suggests that contaminant concentrations may be reduced significantly prior to reaching the water table.

The modeled results indicate a maximum chromium concentration entering the water table of approximately 1 mg/l. Based on the generated data, it appears that the leaked chromium solution will not have a significant impact on underlying water quality.

We hope that the letter report fulfills your request. If you have any questions, or require additional information, please do not hesitate to call.

Sincerely,

Daniel B. Stephens & Associates, Inc.

Jeffrey A. Havlena
Project Manager

JAH/alm

Disk: 89-030 4
File: Hobbrep1.N89

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FIGURES

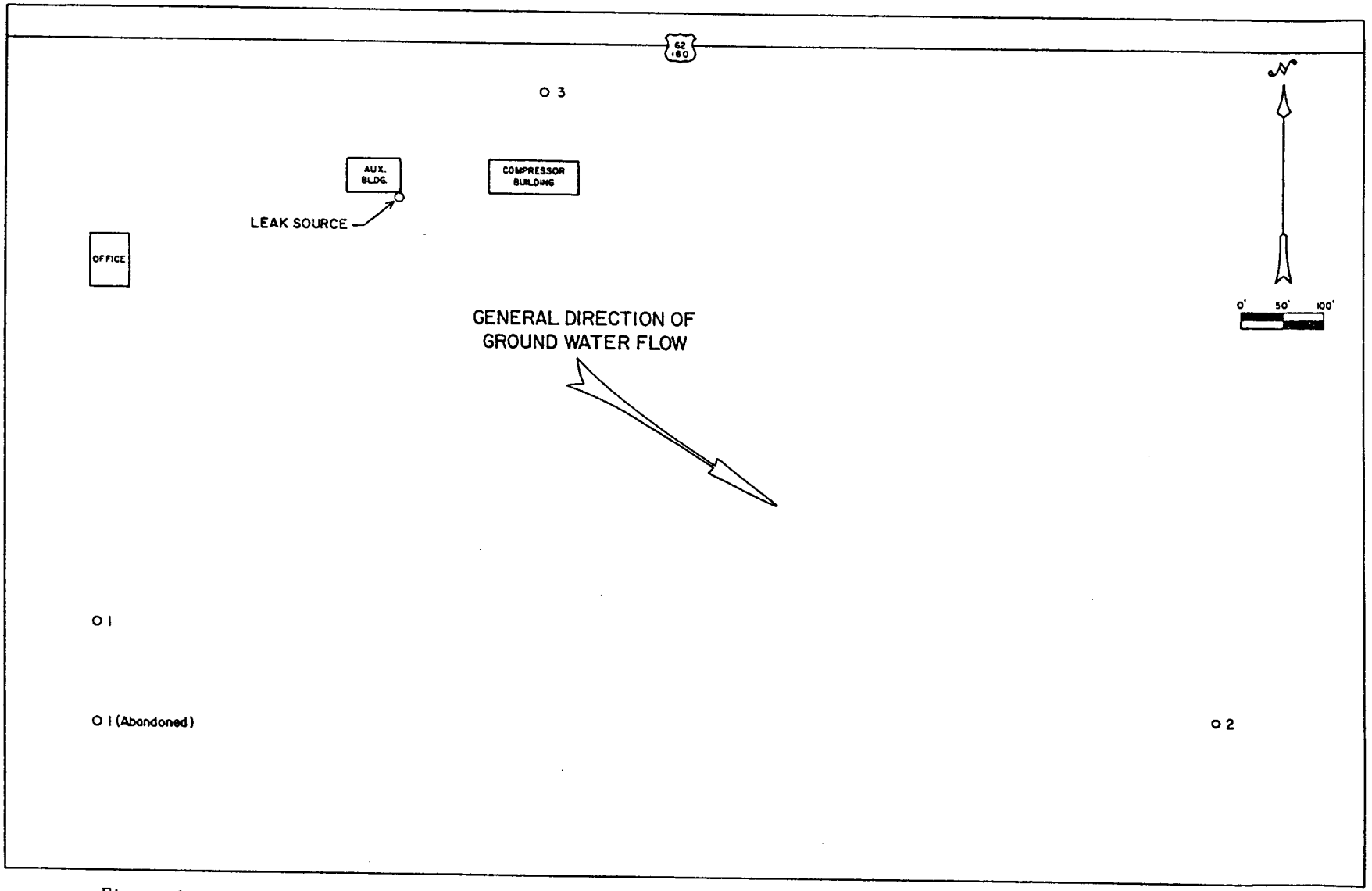


Figure 1. Plant Site Map Showing Wells on the Property.

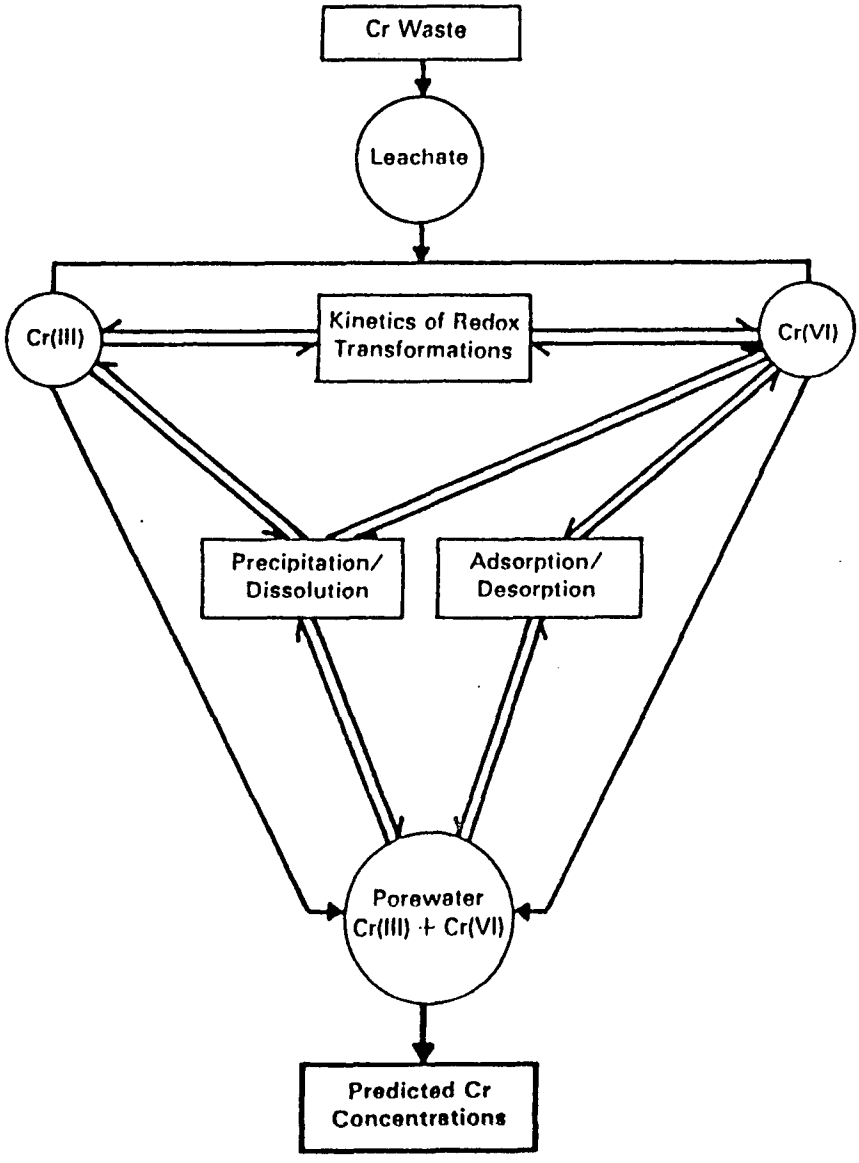


Figure 2. Schematic Drawing of Dominant Cr Mechanisms and of Cr Behavior in the Geologic Environment (after Rai et al. 1988)

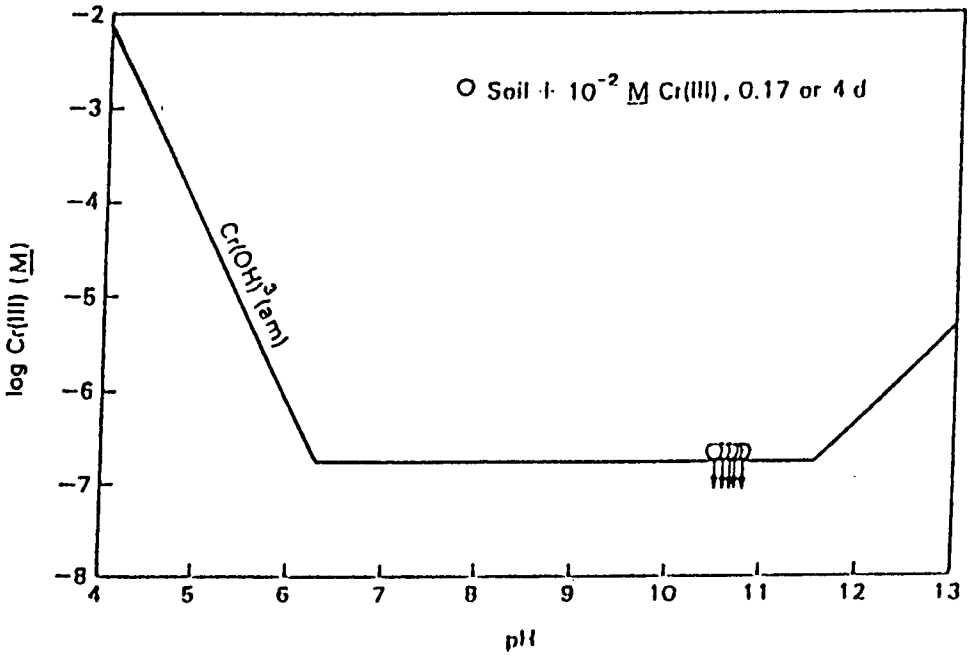


Figure 3. Aqueous Cr(III) Concentrations in 0.0018 micrometer Filtrates in Equilibrated Suspensions of 10 g NVN17 in 30 ml of 10^{-2} M Cr(III) Solution. The arrows on data points indicate that Cr(III) concentrations are at detection limits. The $Cr(OH)_3(am)$ solubility calculated from thermochemical data (Rai et al. 1988) is plotted for reference.

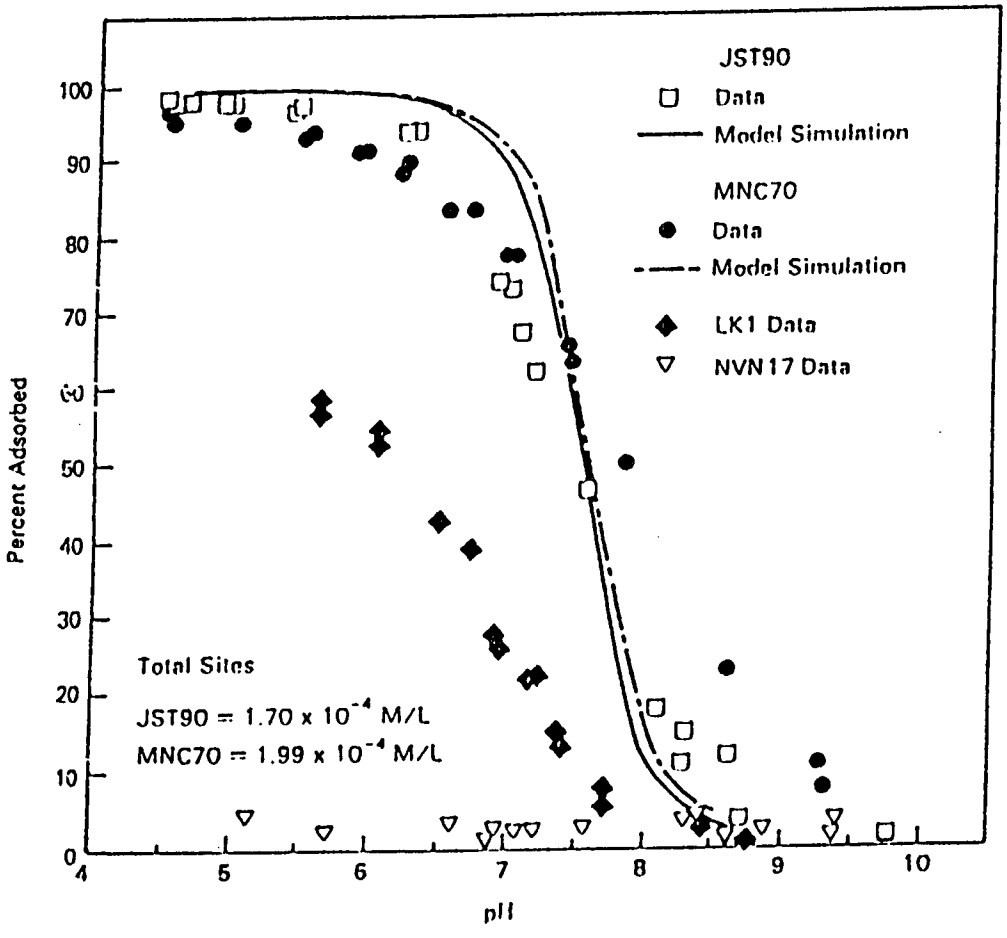


Figure 4. Fractional Adsorption of CrO_4^{2-} on Subsurface Soil Horizons at a 1:20 Solid-to-Solution Ratio in 0.1 M $NaNO_3$. Triple-layer model (TLM) calculations are given by solid and solid-dashed lines. The estimated site concentrations, based on clay content and surface area, are JST90 = 1.70×10^{-4} moles sites/L and MNC70 = 1.99×10^{-4} moles sites/L. (Rai et al. 1988)

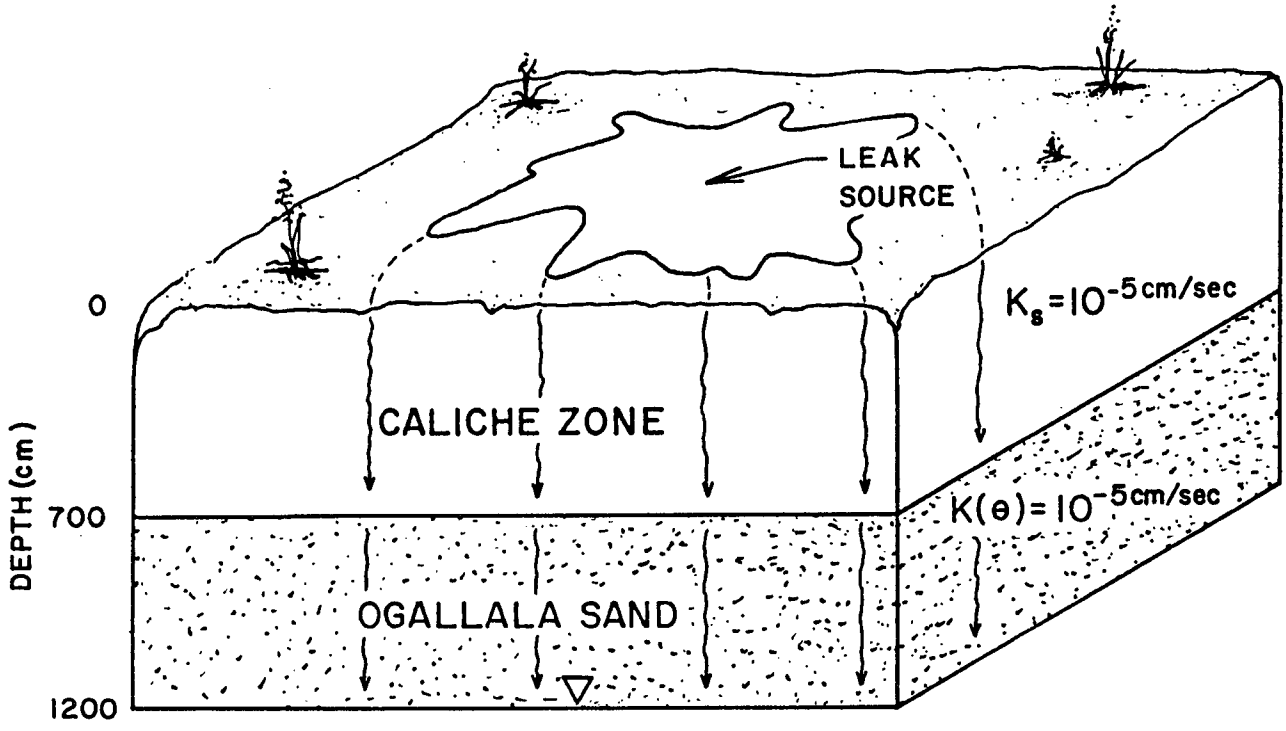


Figure 5. Conceptual Model of Seepage Through the Profile

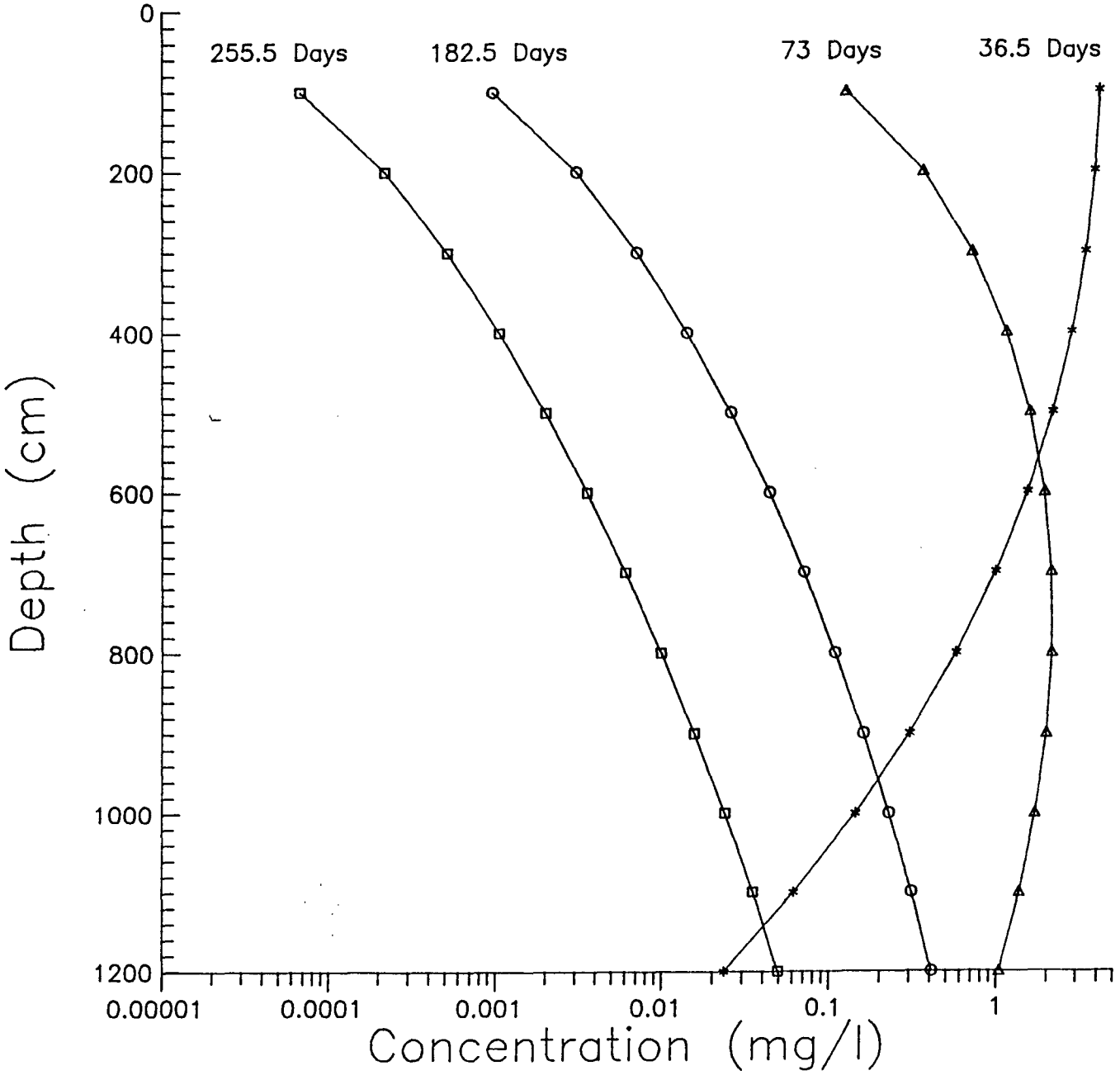


Figure 6. Model predicted concentration of total chromium in soil above the water table. Maximum concentration at the source is 4.4 mg/l.

APPENDIX A

NORTHERN NATURAL GAS COMPANY

HOBBS PROCESSING PLANT

SUBJECT: Chromate Water Leak

Northern Natural Gas Company operates a natural gas processing and compression plant near Hobbs, Lea County, New Mexico. The following sequence of events describes a water leak that occurred at the plant and the actions taken to locate and eliminate the leak.

May 12, 1989	OCD notified of use of chromates at Hobbs Plant (via Discharge Plan renewal application).
May 19	Annual plant shutdown and major maintenance program (turnaround) begun.
June 4	Engine jacket water and lubricating oil cooling systems drained.
June 5	OCD inspection of entire plant facility.
June 9	Completed draining and flushing the water systems. The total volume of water (90,300 gallons) was transferred to frac tanks for disposal.
June 12-16	Cleaned, hydroblasted, dried and inspected internals of below ground concrete storage cell (cold wells).
June 16	Letter to OCD providing status of cleaning and inspection of the cooling systems. No leaks were found.
June 18-24	Sandblasted and flakelined the cold wells.
June 25	Filled jacket water and lube oil cooling systems, chromate concentration in the lube oil system was 15ppm. During the evening shift a Maintenance Job Ticket (MJT) was written noting that the lube oil cooling system was losing water.
June 26	Chromate concentration in the lube oil cooling system was 8 ppm. Initiated action to determine reason for water loss.
June 27	Continued checking for cause of water loss. Chromate concentration 3.9 ppm.
June 28	Continued checking for cause of water loss. Chromate concentration 1.94 ppm.
June 29	Continued checking for cause of water loss. Chromate concentration 2.32 ppm.

June 30	Continued checking for cause of water loss. Chromate concentration 3.87 ppm.
July 1-17	Tested individual segments of the system for leak. No leaks found. Analyses of water during this period showed chromate concentrations as follows: July 5 1.55 ppm July 6 .77 ppm July 7 .77 ppm
July 18	Drained 2100 gallons of water to frac tank.
July 19-31	Cleaned and inspected cold well again. Discovered crack in sump behind forming lumber left during construction years ago. Filled sump with grout. During July 19-31 period there was no water in cold well.
August 1	Refilled cold well to 4 feet, blocked in all coolers and tested 16" line to 28 psig. Lost approximately one foot (1,077 gallons) of water. Concluded crack in sump was not responsible for water loss.
August 3	Dyed water in effort to find the leak. Opened the entire system. No leak was found.
August 4-9	Began excavating buried water lines in further effort to find leak. On August 9, a 2" line that tees into the 16" discharge line near the cold well was uncovered. The leak was discovered near the point of connection. The 2" line was cut and capped. System was filled with water.
August 10 to Present	No water lost.
September 19	Remaining 2" line was successfully tested to assure that no other leaks existed.

Summary: On October 10, 1989, a meeting was held in Hobbs with plant personnel to review all of the foregoing events. The following conclusions were drawn as a result of the meeting:

- o There was no evidence of water loss prior to June 25, 1989.
- o Total water loss, based on water levels in the cold well during the period was approximately 15,400 gallons.
- o Total chromium loss, based on periodic analyses of the water to determine chromate concentrations and the volumes of water lost, was calculated at .5649 lbs. See attached Table I.

Based on the above, the leak was judged insignificant, with no endangerment to human health or the environment because of the small quantity involved.

TABLE 1

HOBBS PROCESSING PLANT

Chromate Water Leak

Date	Water Volume (Gallons)	Chromium Concentration (PPM)	Pounds Of Chromium
6/26/89	3231	15.00	.4037
6/27	504	3.90	.0164
6/28	504	1.94	.0042
6/29	504	2.32	.0097
6/30-7/4	2520	3.87	.0810
7/5	504	1.55	.0042
7/6-7/17	6048	.77	.0388
8/1	1077	.77	.0069
Total	15,396		.5649

Notes:

1. Water volumes are based on level changes in the cold well which is 12'x12'x10'6" deep or 1077 gallons per foot.

2. The daily volume from 6/26 to 7/17 is based on a leak rate of 63 gallons per hour for 8 hours each day. The 63 GPH is computed from the one foot level drop (1077 gallons) in 17 hours on 8/1 and 8/2. The duration of the leak each day is conservatively overstated. The leak only occurred while the pump was in operation. The pump was operated only to provide pressure to locate the leak, which was not continuous each day during the period.

3. Chromium concentrations are based on actual laboratory analysis from 6/26 to 6/30 and from 7/5 to 7/7. Concentrations on other dates are assumed to be the same as the latest previous laboratory analysis.

APPENDIX B

Irrig. Co.

#1 onsite

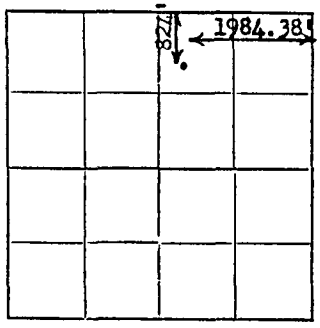
Form WR-23

STATE ENGINEER OFFICE

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1



(Plat of 640 acres)

(A) Owner of well Permian Basin Pipeline Company

Street and Number 2223 Dodge Street

City Omaha State Nebraska

Well was drilled under Permit No. L-2201 and is located in the

¼ S½N½ ¼ NE ¼ of Section 6 Twp. 19S Rge. 37E

(B) Drilling Contractor Layne-Texas Company License No. WD 180

Street and Number 221 South Colorado Street

City Midland State Texas

Drilling was commenced 8-15-54 19

Drilling was completed September 10 19 54

Elevation at top of casing in feet above sea level 3727.4 Total depth of well 167'

State whether well is shallow or artesian shallow Depth to water upon completion 33'

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1	112'	140'	30'	Brown sand
2	140	150'	10'	Brown sand - some gravel
3	150	162'	12'	Brown sand
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To
16" OD			0	64	64	None		
~~10"~~			~~0~~	~~64~~	~~64~~	~~None~~		
10-3/4"			0	112	112	None		
10-3/4"			112	162	50	None	112	162'
10-3/4"			162	167	5	None		

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
0	64'	—	—	135	By hand between 16" and 10" casings
				3	Bottom of well plugged.

Section 5 PLUGGING RECORD

FEB 7 1955
OFFICE
STATE ENGINEER

Name of Plugging Contractor License No.

Street and Number City State

Tons of Clay used Tons of Roughage used Type of roughage

Plugging method used Date Plugged 19

Plugging approved by: James D. Wright
Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

Date Received February 7, 1955

File No. L-2201 Use Ind. Location No. 19.37.6.213'''

Section 6

LOG OF WELL

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered
1	22	22	-	Caliche
22	24	2	-	Hard lime
24	60	36	-	Sand rock
60	62	2	-	Lime
62	64	2	-	Lime
64	78	14	-	Sand - caving
78	81	3	-	Lime
81	95	14	Gray	Sand
95	105	10	Brown	Sand
105	110	5	Yellow	Sand and gravel
110	140	30	Brown	Sand
140	150	10	Brown	Sand - some gravel
150	162	12	Brown	Sand
162	166	4	Red	Shale
				L.S. Elev 3777
				Depth to K ____ Trc ____
				Elev of K ____ Trc ____
				Loc. No. 19.37.6. 333 25
				Hydro. Survey X Field Check
				SOURCE OF ALTITUDE GIVEN
				Interpolated from Topo. Sheet ____
				Determined by Inst. Leveling X
				Other ____

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

LAYNE-TEXAS COMPANY

By Mgr. Lic. Eng. Dist. [signature]

Well Driller

(This form to be executed in triplicate)

WELL RECORD

Well #1

Date of Receipt October 19, 1953 (Permian Basin Pipeline) Permit No. L-2201

Name of permittee, Northern Natural Gas Company

Street or P. O., 2223 Dodge Street, City and State Omaha, Nebraska

1. Well location and description: The shallow (shallow or artesian) well is located in S½ ¼, N½ ¼, NE ¼ of Section 6, Township 19S, Range 36E; Elevation of top of casing above sea level, ~~3720.27~~ 3727.2 feet; diameter of hole, 20 inches; total depth, 173 feet; depth to water upon completion, 29' 6" feet; drilling was commenced August 5, 19 53, and completed September 26, 19 53; name of drilling contractor Layne-Western Company; Address, 4430 Commercial Avenue Omaha, Nebraska; Driller's License No. WD-142

2. Principal Water-bearing Strata:

	Depth in Feet From	To	Thickness	Description of Water-bearing Formation
No. 1	34	173	139	Sand, sandrock, limestone and gravel
No. 2				
No. 3				
No. 4				
No. 5				

3. Casing Record:

Diameter in Inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner Top	Bottom	Feet of Casing	Type of Shoe	Perforation From	To
10" I.D.	32#	8	2' above ground	133'	135'	concrete	133	173

4. If above construction replaces old well to be abandoned, give location: — ¼, ¼, ¼ of Section, Township, Range; name and address of plugging contractor,

date of plugging, 19; describe how well was plugged:

RECEIVED
OCT 19 1953
GROUND WATER BRANCH

12137

5. Log of Well:

Depth in feet From	Depth in feet To	Thickness in feet	Description of Formation
0	1		Top soil and boulders
1	7		Rock
7	15		Sandrock and boulders
15	21		Sandrock, limestone and boulders
21	34		Fine sand, sandrock
34	50		Sand, sandrock and boulders
50	65		Sand
65	69		Sandrock and limestone
69	74		Sand
74	75		Sandrock, very hard
75	85		Sand and sandrock
85	85' 6"		Sandrock, very hard
85' 6"	101		Sand and some sandrock
101	103		Sandrock,and limestone, some sand
103	111		Sand with some sandrock and limestone
111	113		Sandstone, limestone, some sand
113	173 ✓		Sand with streaks of sandrock and red shale
173	205		Red bed

L S Elev 3727 ✓
Depth to K Trc 113? ✓
Elev of K Trc 3614 ✓

Loc. No. 19.37.6. 21324 ✓
Hydro. Survey Field Check X

SOURCE OF ALTITUDE GIVEN
Interpolated from Topo. Sheet
Determined by Inst. Leveling X

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Date Interpolated from Basic Levels
Layne-Western Co.
Omaha, Nebr

Licensed Well Driller

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

Well # 2
onite

(This form to be executed in triplicate)

WELL RECORD

Date of Receipt Oct. 19, 1953 Permit No. L-2200

Name of permittee, Permian Basin Pipeline ~~Northern Natural Gas~~ Company

Street or P. O., 2223 Dodge Street, City and State Omaha, Nebraska

1. Well location and description: The shallow (shallow or artesian) well is located in S½ ¼, N½ ¼, NE ¼ of Section 6, Township 19S, Range 36E; Elevation of top of casing above sea level, 3720.27 feet; diameter of hole, 20 inches; total depth, 163 feet; depth to water upon completion, 24 feet; drilling was commenced June 7, 19 53, and completed July 11, 19 53; name of drilling contractor Layne-Western Company; Address, 4430 Commercial Avenue Omaha, Nebraska; Driller's License No. WD-142

2. Principal Water-bearing Strata:

	Depth in Feet From	To	Thickness	Description of Water-bearing Formation
No. 1	26	163	137'	Sand, sandrock, limestone and gravel
No. 2				
No. 3				
No. 4				
No. 5				

3. Casing Record:

Diameter in inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner Top	Bottom	Feet of Casing	Type of Shoe	Perforation From	To
10" I.D.	32 #	8	2' above ground	123	125	Concrete	123	163

4. If above construction replaces old well to be abandoned, give location: ~~SW~~ ¼, ¼, ¼ of Section, Township, Range; name and address of plugging contractor,

date of plugging, 19; describe how well was plugged:

OCT 19 [illegible]

22325 N.

5. Log of Well:

Depth in feet From	Depth in feet To	Thickness in feet	Description of Formation
0	2		Top soil
2	5		Rock and boulder
5	17		Hard caliche and sandrock
17	22		Sandrock and caliche
22	26		Sand
26	50		Sand and boulder
50	58		Sandrock
58	74		Very fine sand with sandrock
74	78		Sandrock with some sand
78	98		Sandrock, limerock, granite
98	108		Sandrock with some granite, limerock & showing of sand&gravel
108	113		Limerock, sand and gravel
113	128		Limerock, sand and gravel with trace of granite and sandrock
128	153		Sandrock, sand and gravel
153	163 ✓		Sand
163	205		Red bed

3724 ✓
L S Elev
Depth to K Trc 163 ✓
Elev of K Trc 3561 ✓

Loc. No. 19.31.6.22323 ✓

Hydro. Survey ____ Field Check X

SOURCE OF ALTITUDE GIVEN

Interpolated from Topo. Sheet X

Determined by Inst. Leveling ____

Other ____

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

LAYNE-WESTERN COMPANY

By _____
Licensed Well Driller

Instructions

This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

Orig. to S.F

(This form is to be executed in triplicate)

Well # 3

WELL RECORD

4L-2201

Date of Receipt April 23, 1954 Permit No. L-2200 Combine S

Name of permitee, Permian Basin Pipeline Company

Street or P. O. 2223 Dodge Street, City and State Omaha, Nebraska

1. Well location and description: The shallow (shallow or artesian) well is located in ~~Lea Co., S~~ NE ¼, ~~N 1/2~~ NW ¼, ~~NW~~ NE ¼ of Section 6 21S, Township 19S Range 37E; Elevation of top of 19" to 66' 8" casing above sea level, ... feet; diameter of hole, 16" T.D. inches; total depth, 178 feet; depth to water upon completion, 36 feet; drilling was commenced July 2, 19 54, and completed July 21, 19 54, name of drilling contractor Layne-Texas Company; Address, Midland, Texas; Driller's License No. Contractors A-7247 Temp. Permit.

2. Principal Water-bearing Strata:

	Depth in Feet From	To	Thickness	Description of Water-bearing Formation
No. 1	123	173'	50'	Ogallala sandstone
No. 2				
No. 3				
No. 4				
No. 5				

3. Casing Record:

Diameter in Inches	Pounds per ft.	Threads per inch	Depth of Casing or Liner Top	Bottom	Feet of Casing	Type of Shoe	Perforation From	To
16" OD	53#	PE	0	66'8"	66'8"	Band		
10"	32#	8	0	123'	123'			
10"	23#	PE	123	173'	50'		123'	173'
10"	32#	PE	173	178'	5'			

4. If above construction replaces old well to be abandoned, give location: ....¼, ...¼, ...¼ of Section ...., Township ...., Range....; name and address of plugging contractor,

.....

.....

date of plugging ....., 19....; describe how well was plugged: .....

.....

.....

.....

SEP 20 1954

OFFICE

GROUND WATER SUPERVISOR

ROSWELL, NEW MEXICO

1437 FNL
170 FWL

5. Log of Well:

Depth in Feet From	Depth in Feet To	Thickness in feet	Description of Formation
0	1	1	soil and rocks
1	10	9	caliche
10	40	30	caliche and sand
40	60	20	sand (caving)
60	65	5	Quick sand
65	67	2	lime
67	70	3	sandy shale
70	92	22	brown sand
92	94	2	lime
94	100	6	Brown sand
100	112	12	Sand - little gravel
112	122	10	Loose sand - few hard layers
122	171 ✓	49	Sand (could wash down)
171	177	6	Red bed (TD)
			L S Elev ____ 3[illegible] ✓
			Depth to K____Trc 17[illegible] ✓
			Elev of K____Trc 3[illegible] ✓
			Loc. No. [illegible] ✓
			Hydro. Survey ✓ Field Check____
			SOURCE OF ALTITUDE GIVEN
			Interpolated from Topo. Sheet ✓
			Determined by Inst. Leveling____
			Other____

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

LAYNE TEXAS COMPANY
By M. F. Loveland
Licensed Well Driller

Instructions

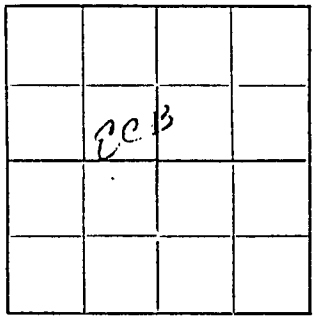
This form shall be executed, preferably typewritten, in triplicate and filed with the State Engineer's Office at Roswell, New Mexico, within 10 days after drilling has been completed. Data on water-bearing strata and on all formations encountered should be as complete and accurate as possible.

Form WR-23 STATE ENGINEER OFFICE FIELD ENGR. LOG

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1



(Plat of 640 acres)

(A) Owner of well NORTHERN NATURAL GAS CO. COMPANY

Street and Number BOX 2370

City HOBBS, N.M. 88240 State

Well was drilled under Permit No. L-2200-01 S 2 and is located in the NW ¼ NE ¼ NW ¼ of Section 6 Twp. 19S Rge. 37½ E

(B) Drilling Contractor ARNETT BROS. License No. WD-46

Street and Number BOX 637

City HOBBS, N.M. 88240 State

Drilling was commenced OCT. 15, 1970 19

Drilling was completed OCT. 26, 1970 19

Elevation at top of casing in feet above sea level Total depth of well 182

State whether well is shallow or artesian shallow Depth to water upon completion 122

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1	62	111	49	sand water
2				
3				
4				
5				

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads in	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To
10 3/4	43	welded	1	182	182	none	120	182

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used

Section 5 PLUGGING RECORD

Name of Plugging Contractor License No.

Street and Number City State

Tons of Clay used Tons of Roughage used Type of roughage

Plugging method used Date Plugged 19

Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

Date Received

L-2200-A

File No. Use Location No.

Section 6

LOG OF WELL

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered
0	1	1	gray	subsoil
1	25	24	gray	caliche
25	42	17	brown	sand rock
42	62	20	brown	sand (tight)
62	111	49	brown	sand water
111	112	1	red	red clay
112	128	16	brown	sand tight
128	140	12	brown	gravel
140	142	2	red	red clay
142	168	26	brown	sand
168	172	4	brown	sand clay
172	182	10	red	clay

U S Elev 3728'

Depth to K ..... Is 172' ?

Elev of K ..... Is 3556' ?

Loc No 19.37.6.21211

Hydro Survey Field Check X

Source of Altitude Given

Interpolated from Topo. Sheet X

Determined by Inst. Leveling

Other

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Well Driller

#6 -offsite

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG

Section 1. GENERAL INFORMATION

(A) Owner of well Northern Natural Gas Co. Owner's Well No. 6

Street or Post Office Address P.O. Box 2300

City and State Midland, Texas 79702

Well was drilled under Permit No. L-7680 and is located in the:

a. ___ ¼ NE ¼ NE ¼ NE ¼ of Section 29 Township 18S Range 37E N.M.P.M.

b. Tract No. ___ of Map No. ___ of the ___

c. Lot No. ___ of Block No. ___ of the ___

Subdivision, recorded in Lea County.

d. X= ___ feet, Y= ___ feet, N.M. Coordinate System ___ Zone in the ___ Grant.

(B) Drilling Contractor Abbott Bros. License No. WD-46

Address P.O. Box 637, Hobbs, New Mexico 88240

Drilling Began 8/2/77 Completed 8/10/77 Type tools Cable Size of hole 24 & 19 in.

Elevation of land surface or ___ at well is ___ ft. Total depth of well 199 ft.

Completed well is ☐ shallow ☐ artesian. Depth to water upon completion of well ___ ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
Casing and screen was pulled, well abandon and plugged								

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 5. PLUGGING RECORD

Plugging Contractor Abbott Bros.

Address P.O. Box 637, Hobbs, New Mexico

Plugging Method Ruble filled, steel plate on top.

Date Well Plugged 8/26/77

Plugging approved by:

State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received August 29, 1977

Quad. ___ FWL ___ FSL ___

Plugging WR

File No. L-7680 Use IND. Location No. 18.37.29. 22232

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	1	1	Soil
1	22	21	Caliche
22	50	28	Sand
50	55	5	Sand rock
55	65	10	Sand and gravel
65	85	20	Water sand
85	100	15	Coarse sand
100	120	20	Coarse water sand
120	160	40	Water sand
160	180	20	sand and gravel
180	195	15	Sandy clay
195	199	4	Red clay
			L S Elev 3720 Depth to K Trc 180 Elev of K Trc 3540
			L S Elev 3720 Depth to K Trc 195 Elev of K Trc 3525
			Loc. No. 18.37.29.22232
			Hydro. Survey Field Check FB
			SOURCE OF ALTITUDE GIVEN
			Interpolated from Topo. Sheet X
			Determined by Inst. Leveling
			Other

Section 7. REMARKS AND ADDITIONAL INFORMATION

'77 NOV 29 AM 8 52

...R OFFICE

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Murrell Abbott
Driller

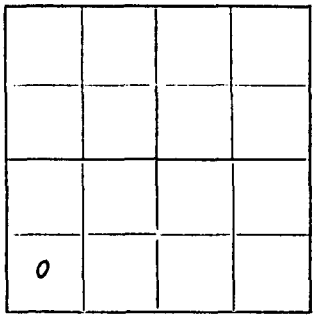
INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All ...ons, except Section 5, shall be answered as completely and accurat... possible when any well is drilled, repaired or deepene... ...en this form is used as a plugging record, only Section 1(a) and Section ... shall be completed.

Form WR-23 FIELD E[illegible] LOG STATE ENGINEER OFFICE Northern ural Gas Co. well No. 4

WELL RECORD

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the nearest district office of the State Engineer. All sections, except Section 5, shall be answered as completely and accurately as possible when any well is drilled, repaired or deepened. When this form is used as a plugging record, only Section 1A and Section 5 need be completed.

Section 1



(Plat of 640 acres)

(A) Owner of well Northern Natural Gas Co.
Street and Number P. O. Box 3316
City Midland State Texas
Well was drilled under Permit No. L-2200 and is located in the NW ¼ NW ¼ NE ¼ of Section 6 Twp. 19S. Rge. 37E.
(B) Drilling Contractor Abbott Brothers License No. WD-46
Street and Number P. O. Box 637
City Hobbs State New Mexico
Drilling was commenced February 1, 19
Drilling was completed February 4, 1967

Elevation at top of casing in feet above sea level ..... Total depth of well 177
State whether well is shallow or artesian shallow Depth to water upon completion 48

Section 2 PRINCIPAL WATER-BEARING STRATA

No.	Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation
1	65	70	5	Sand
2	82	92	10	Sand
3	100	150	50	Sand
4	150	158	8	Gravel
5	162	173	11	Gravel

Section 3 RECORD OF CASING

Dia in.	Pounds ft.	Threads In	Depth Top	Depth Bottom	Feet	Type Shoe	Perforations From	Perforations To
10/34	32	Weld.	0	177	177	Open	123	173

Section 4 RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Diameter Hole in in.	Tons Clay	No. Sacks of Cement	Methods Used
65 feet of surface nipple, 20 inches cemented with 60 sacks of cement then the 0 3/4" was set inside of 20" nipple.					

Section 5 PLUGGING RECORD

Name of Plugging Contractor ..... License No. .....
Street and Number ..... City ..... State .....
Tons of Clay used ..... Tons of Roughage used ..... Type of roughage .....
Plugging method used ..... Date Plugged ..... 19.....
Plugging approved by:

Basin Supervisor

Cement Plugs were placed as follows:

No.	Depth of Plug From	Depth of Plug To	No. of Sacks Used

FOR USE OF STATE ENGINEER ONLY

Date Received [illegible]

1967 FEB -8 AM 11:11

File No. L-2200 Use Ind. Location No. [illegible]

Section 6

LOG OF WELL

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color	Type of Material Encountered
0	1	1		Soil
1	16	15		Caliche
16	25	9		Sand rock
25	59	34	Brown	Sand
59	65	6		Sand rock
65	70	5		Sand
70	82	12		Sand rock
82	92	10		Sand
92	100	8		Sand rock
100	150	50		Sand
150	158	8		Gravel
158	162	4	Red	Shale
162	173	11		Gravel
173	177	4		Sandy shale
				L S Elev
				Depth to K Trc
				Elev of K Trc
				Loc. No.
				Hydro. Survey Field Check
				SOURCE OF ALTITUDE GIVEN
				Interpolated from Top
				Determined by Inst.
				Other

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described well.

Murrell Wyatt Jr

Well Driller

#6 offsite

Revised June 1972

STATE ENGINEER OFFICE

WELL RECORD

FIELD ENGR. LOG
LOG FILED

Section 1. GENERAL INFORMATION

(A) Owner of well Northern Natural Gas Co. Owner's Well No. 6-A
Street or Post Office Address P.O. Box 2300
City and State Midland, Texas 79701

Well was drilled under Permit No. L-7680 and is located in the:

a. ___ ¼ NE ¼ NE ¼ NE ¼ of Section 29 Township 18S Range 37E N.M.P.M.

b. Tract No. ___ of Map No. ___ of the ___

c. Lot No. ___ of Block No. ___ of the ___
Subdivision, recorded in Lea County.

d. X= ___ feet, Y= ___ feet, N.M. Coordinate System ___ Zone in the ___ Grant.

(B) Drilling Contractor Abbott Bros. License No. WD-46

Address P.O. Box 637, Hobbs, New Mexico 88240

Drilling Began 8/24/77 Completed 9/8/77 Type tools Cable Size of hole 24 & 19 in.

Elevation of land surface or ___ at well is ___ ft. Total depth of well 200 ft.

Completed well is ☒ shallow ☐ artesian. Depth to water upon completion of well 55 ft.

Section 2. PRINCIPAL WATER-BEARING STRATA

Depth in Feet From	Depth in Feet To	Thickness in Feet	Description of Water-Bearing Formation	Estimated Yield (gallons per minute)
55	200	145	Sand	300

Section 3. RECORD OF CASING

Diameter (inches)	Pounds per foot	Threads per in.	Depth in Feet Top	Depth in Feet Bottom	Length (feet)	Type of Shoe	Perforations From	Perforations To
10 3/4	33	Welded	0	130	130	Screen	130	200

Section 4. RECORD OF MUDDING AND CEMENTING

Depth in Feet From	Depth in Feet To	Hole Diameter	Sacks of Mud	Cubic Feet of Cement	Method of Placement

Section 5. PLUGGING RECORD

Plugging Contractor ___
Address ___
Plugging Method ___
Date Well Plugged ___
Plugging approved by:
___
State Engineer Representative

No.	Depth in Feet Top	Depth in Feet Bottom	Cubic Feet of Cement
1			
2			
3			
4			

FOR USE OF STATE ENGINEER ONLY

Date Received September 23, 1977

Quad ___ FWL ___ FSL ___

2nd WR filed

File No. L-7680 Use IND. Location No. 18.37.29. 22232

22232

Section 6. LOG OF HOLE

Depth in Feet From	Depth in Feet To	Thickness in Feet	Color and Type of Material Encountered
0	1	1	Soil
1	22	21	Caliche
22	35	13	Sand
35	40	5	Sand rock
40	56	16	Sand
56	80	24	Coarse sand
80	100	20	Sand
100	105	5	White rock
105	190	85	Sand
190	195	5	Sandy clay
195	200	5	Clay
			L S Elev 3720
			Depth to K Trc 195
			Elev of K Trc 3525
			Loc. No. 18.37.29.22232
			Hydro. Survey Field Check FB
			~~SOURCE OF ALTITUDE GIVEN~~
			Interpolated from Topo. Sheet X
			Determined by Inst. Leveling
			Other

77 SEP 23 AM 8 31
STATE ENGINEER OFFICE
ROSWELL, N. M.

Section 7. REMARKS AND ADDITIONAL INFORMATION

The undersigned hereby certifies that, to the best of his knowledge and belief, the foregoing is a true and correct record of the above described hole.

Murrell Abbott
Driller N.B.

INSTRUCTIONS: This form should be executed in triplicate, preferably typewritten, and submitted to the appropriate district office of the State Engineer. All ons, except Section 5, shall be answered as completely and accurate ossible when any well is drilled, repaired or deepened. hen this form is used as a plugging record, only Section 1(a) and Section ed be completed.

APPENDIX C

YOUR COPY _____
PROJECT COPY 89-031
FILE COPY _____

ENRON PIPELINE OPERATING CO.

ENRON GAS PIPELINE OPERATING COMPANY
11525 WEST CARLSBAD, HIGHWAY
HOBBS, NEW MEXICO 88240
(505)393-5109

TELECOPY (FAX) TRANSMITTAL INFORMATION

TO THE ATTENTION OF: Greg Lewis

FROM: Bob Anderson

DATE: 11-27-89 TIME: 2:35 PM

NUMBER OF PAGES SENT INCLUDING THIS COVER SHEET: _____

SENT ON: OMNIFAX G93 (505)397-1768 (FAX MACHINE)

VERIFICATION NUMBER: (505)393-5109 (VOICE)

PLEASE CALL VERIFICATION NUMBER IF TRANSMISSION IS IMPAIRED.

THANK YOU

_____

_____

_____

_____

_____

08-5-87

NEW MEXICO STATE ENGINEER
TOTALIZING METER REPORT

State Engineer Office
P. O. Box 1717
Roswell, New Mexico 88201

Attention: Basin Supervisor

Dear Sir:

In accordance with the State Engineer regulation which requires that quarterly reports of meter readings be submitted on or before the 10th of January, April, July and October, the following information is submitted.

1. FILE NO. L2200 ETC DATE:

NAME: ENRON GAS PIPELINE OPERATING COMPANY

ADDRESS: 11525 W. CARLSBAD HIGHWAY

2. WELL DESCRIPTION

S. E. File No. L200 ETC Company Well No. 3

Location: Subdv NE¼/NW¼/NE¼ Sec. 6 Twp. 19-S Rge. 37-E

3. TOTALIZING METER

Serial No. 109670 Units GALLONS

Make SPARLING Multiplier 10

4. READING

Date: Reading

Quantity of water used Quarter, 19___, _____

5. REMARKS:
METER INSTALLED ON 4-21-78

ENRON GAS PIPELINE OPERATING COMPANY

By:

INSTRUCTIONS:
Specific questions should be answered as follows:
(1) State Engineer's File No. or No. of well reported and name and address of owner. (2) Description of well to which meter attached. (3) Description of meter, including multiplier or constant by which reading must be multiplied to obtain actual quantity of water. Units refers to units of measurement such as acre feet, gallons, barrels, etc. (4) Reading of figures on the meter and amount obtained by multiplying reading by multiplier. (5) Under Remarks, give any pertinent information such as reading and date of installation of meter if a first report, information concerning repair of meter and dates out of service, etc.

FILE NO. LOCATION NO.

WATER WELL # 3

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
06-27-89	131912	131912	0	10791.5
07-1-89	131912	131912	0	10791.5
7 9 89	131912	131912	0	10791.5
7-16-89	131912	131912	0	10791.5
7-23-89	131912	131912	0	10791.5
7-29-89	131912	131912	0	10791.5
8-5-89	131912	131912	0	10791.5
8-13-89	131912	131912	0	10791.5
8-26-89	131912	131912	0	10791.5
9-3-89	131912	131912		107915
9-18-89	131912	131912	0	107915
9-24-89	131912	131912	0	107923
10-5-89	131912	131912		10792.3
10-8-89	131912	131912	0	10792.3
10-18-89	131912	131912	0	10792 3
10-22-89	131912	131912	0	10792.3
10-29-89	131922	131922	0	10792 3
11-5-89	131912	132748	836	10792.3
11-20-89	132748	132748	0	10792.3
11-25-89	132748	132748	0	107923

1113.1

WATER WELL # 3

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
10-30-88	131912.0	131912.0	0	10791.5
11-6-88	131912.0	131912.0	0	10791.5
11-20-88	131912.0	131912.0	0	10791.5
11-26-88	131912.0	131912.0	0	10791.5
12-4-88	131912.0	131912.0	0	10791.5
12-11-88	131912.0	131912.0	0	10791.5
12-18-88	131912.0	131912.0	0	10791.5
12-25-88	131912.0	131912.0	0	10791.5
01-01-89	131912.0	131912.0	0	10791.5
01-08-89	131912.0	131912.0	0	10791.5
1-15-89	131912.0	131912.0	0	10791.5
1-22-89	131912.0	131912.0	0	10791.5
1-29-89	131912.0	131912.0	0	10791.5
2-12-89	131912.0	131912.0	0	10791.5
2-19-89	131912.0	131912.0	0	10791.5
2-25-89	131912.0	131912.0	0	10791.5
3-12-89	131912.0	131912.0	0	10791.5
3-25-89	131912.0	131912.0	0	10791.5
4-8-89	131912.0	131912.0	0	10791.5
4-15-89	131912.0	131912.0	0	10791.5
4-22-89	131912.0	131912.0	0	10791.5
5-7-89	131912.0	131912.0	0	10791.5
5-13-89	131912.0	131912.0	0	10791.5
5-21-89	131912.0	131912.0	0	10791.5
	131912.0	131912.0	0	10791.6
6-18-89	131912.0	131912.0	0	10791.6

NEW MEXICO STATE ENGINEER
TOTALIZING METER REPORT

State Engineer Office
P. O. Box 1717
Roswell, New Mexico 88201

Attention: Basin Supervisor

Dear Sir:

In accordance with the State Engineer regulation which requires that quarterly reports of meter readings be submitted on or before the 10th of January, April, July and October, the following information is submitted.

1. FILE NO. L2200 DATE: _____

   NAME: ENORN GAS PIPELINE OPERATING COMPANY

   ADDRESS: 11525 W. CARLSBAD HIGHWAY

2. WELL DESCRIPTION

   S. E. File No. L2200 Company Well No. 4

   Location: Subdv. NE¼ Sec. 6 Twp. 19S Rge. 37E

3. TOTALIZING METER

   Serial No. 109667 Units GALLONS

   Make SPARLING Multiplier 10

4. READING

   Date: _____ Reading _____

   Quantity of water used _____ Quarter, 19___, _____

5. REMARKS: _____

ENRON GAS PIPELINE OPERATING COMPANY

By: _____

INSTRUCTIONS:
Specific questions should be answered as follows:
(1) State Engineer's File No. or No. of well reported and name and address of owner. (2) Description of well to which meter attached. (3) Description of meter, including multiplier or constant by which reading must be multiplied to obtain actual quantity of water. Units refers to units of measurement such as acre feet, gallons, barrels, etc. (4) Reading of figures on the meter and amount obtained by multiplying reading by multiplier. (5) Under Remarks, give any pertinent information such as reading and date of installation of meter if a first report, information concerning repair of meter and dates out of service, etc.

FILE NO. _____ LOCATION NO. _____

WATER WELL # 4

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
06-27-89	953395	959493	6,098	33531.
07-1-89	959493	972292	12,799	33665
7-9-89	972292	973333	1041	3393.2
7-16-89	973333	005740.0	32,407	3402.4
7-23-89	005740	026013	20,273	3424.1
7-29-89	026013	035926	9,913	3434.8
8-4-89	035926	046677		3446.5
8-12-89	046677	060590	13,913	3455.7
8-26-89	055150.0			3506.1
9-3-89	060400			3506.1
9-18-89	102040	125748	23708	35315
9-24-89	125748	125768	20	35315
10-5-89	129448			3335.5
10-8-89	125768	131170.0	5402	3537.4
10-18-89	131170.	139401.	8,231	3546.4
10-22-89	139401	141393	1992	3548.6
10-29-89	141393	145607	4214	3553.4
11-5-89	145607	150414	4807	3558.2
11-20-89	150414	157861	7447	3566.3
11-25-89	157861	159505	1644	3571

WATER WELL # 4

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
10-30-88	838332.0	840632.0	2300.0	3225.6
11-6-88	840632.0	844905.0	4273.0	3230.3
11-20-88	844905.0	849055.0	4150.0	3235.0
11-26-88	849055.0	849055.0	-0-	3235.0
12-4-88	849055.0	849055.0	-0-	3235.0
12-11-88	849055.0	849055.0	-0-	32350
12-18-88	849055.0	850442.0	1387	32365
12-25-88	850442.0	851568.0	1126	3237.7
01-01-89	851568.0	853412.0	1844	3239.2
01-08-89	853412.0	854171.0	759.	3240.7
01-15-89	854171.0	854171.0	0	3240.7
1-22-89	854171.0	863518.0	9347	3251.0
1-29-89	863518.0	864637.0	1119	3252.3
2-12-89	864637.0	870126.0	5489.0	3259.5
2-19-89	870126.0	877335.0	7209	3260.8
2-25-89	877335.0	877906.0	571	3261.7
3-12-89	877906.0	885482.0	7576	3275.6
3-25-89	885482.0	905141.0	19,659	3285.5
4-8-89	905141.0	934819	29,678	3326.3
4-15-89	934819.0	936531.0	17,120	3328.1
4-22-89	936531.0	941054.0	4,523	3332.1
5-7-89	941054.0	948575.0	7521	3341.2
[illegible]	948575.0	951732.0	3157	3344.6
5-21-89	951732.0	953395.0	1663	3346.4
	953395.0	953395.0		3346.4
6-18-89	953395.0	953395.0		3346.4

NEW MEXICO STATE ENGINEER
TOTALIZING METER REPORT

State Engineer Office
P. O. Box 1717
Roswell, New Mexico 88201

Attention: Basin Supervisor

Dear Sir:

In accordance with the State Engineer regulation which requires that quarterly reports of meter readings be submitted on or before the 10th of January, April, July and October, the following information is submitted.

1. FILE NO. L-7680 DATE:

NAME: ENRON GAS PIPELINE OPERATING COMPANY

ADDRESS: 11525 W. CARLSBAD HIGHWAY

2. WELL DESCRIPTION

S. E. File No. L-7860 Company Well No. 6

Location: Subdv. NE¼/NE¼/NE¼ Sec. 29 Twp. 18S Rge. 37E

3. TOTALIZING METER

Serial No. 86139 Units GALLONS

Make FOXBORO Multiplier 100

4. READING

Date: Reading

Quantity of water used Quarter, 19__,

5. REMARKS:

ENRON GAS PIPELINE OPERATING COMPANY

By:

INSTRUCTIONS:
Specific questions should be answered as follows:
(1) State Engineer's File No. or No. of well reported and name and address of owner. (2) Description of well to which meter attached. (3) Description of meter, including multiplier or constant by which reading must be multiplied to obtain actual quantity of water. Units refers to units of measurement such as acre feet, gallons, barrels, etc. (4) Reading of figures on the meter and amount obtained by multiplying reading by multiplier. (5) Under Remarks, give any pertinent information such as reading and date of installation of meter if a first report, information concerning repair of meter and dates out of service, etc.

FILE NO. LOCATION NO.

WATER WELL # 6

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
06-27-89	842630	854851	12,221	03623
07-01-89	854851	856629	1,778	03944
7-9-89	856629	858415		0432.4
7-16-89	858415	867833.00	9,388	0593.5
7-23-89	867833	870624	2,791	0643.0
7-29-89	870624	877313	6,689	0761.2
8-[illegible]-89	877313.00	886934.00		0931.2
2-[illegible]-89	886934.00	897754.00	10,820	1122.5
F-25-89	897754.00			1326.1
9-3-89	89975400	909275.00		1326.1
9-18-89	90927500	92977800	20,503	1689.9
9-24-89	92977800	937316	7538	18241
10-5-89	95 1999 00			2084.7
10-8-89	95,999.00	956149.00	4,150	2156.6
10-18-89	956149.00	970165.00	14,016	23994
10-22-89	970165.00	975567.00	5402	2493.1
10-29-89	975567.00	985265.00	9698	2661.5
11-5-89	985265.00	994665.00	9400	2825.0
11-10-89	994665.00	1015361.00	20,696	3184.1
11-25-89	1015361.	1022460.00	13,121	3306.0

WATER WELL # 6

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
10-3-88	562333.00	572137.00	9804.00	34949.1
11-6-88	572137.00	581701.00	9564.00	35124.0
11-20-88	581701.00	600818.00	19117.00	35466.4
11-26-88	600818.00	609012.00	8194.00	35613.7
12-4-88	609012.00	619990.00	10978.00	35810.6
12-11-88	619990.00	629650.00	9660.00	35984.1
12-18-88	629650.00	639324	9674	36155.1
12-25-88	639324.00	648910.00	9,586	36326.2
01-01-89	648910.00	658255.00	9,345	36498.8
01-08-89	658755.00	668145.00	9,390	36665.5
1-15-89	668145.00	677787.00	9,642	36838.4
1-22-89	677787.00	685022.00	7,235	36965.5
1-29-89	685022.00	694581.00	9,559	37122.5
2-12-89	694581.00	713716.00	19135	37458.1
2-19-89	713716.00	723520.00	9804	37638.6
2-25-89	723520.00	731543.00	8,023	37782.4
3-12-89	731543.00	751983.00	20440	38134.3
3-25-89	751983.00	769615.00	17,632	38450.2
4-8-89	769615	781777.00	12,162	38682.4
4-15-89	781777.00	791145.00	9368	38854.0
4-22-89	791145.00	800530.00	9,385	39015.9
5-7-89	800530.00	820359.00	19829	39304.8
5-13-89	820359.00	828601.00	8245	39304.8
5-17-89	120 gals	120 gals		
5-21-89	120 Gals	839550.00		20925
5-30-89		742630.00		01462

NEW MEXICO STATE ENGINEER
TOTALIZING METER REPORT

State Engineer Office
P. O. Box 1717
Roswell, New Mexico 88201

Attention: Basin Supervisor

Dear Sir:

In accordance with the State Engineer regulation which requires that quarterly reports of meter readings be submitted on or before the 10th of January, April, July and October, the following information is submitted.

1. FILE NO. L2201 DATE: _____

   NAME: ENRON GAS PIPELINE OPERATING COMPANY

   ADDRESS: 11525 W. CARLSBAD HIGHWAY

2. WELL DESCRIPTION

   S. E. File No. L2201 Company Well No. 5

   Location: Subdv. NW¼/NE¼ Sec. 6 Twp. 19S Rge. 37E

3. TOTALIZING METER

   Serial No. 109666 Units GALLONS

   Make SPARLING Multiplier 10

4. READING

   Date: _____ Reading _____

   Quantity of water used _____ Quarter, 19___, _____

5. REMARKS: _____

ENRON GAS PIPELINE OPERATING COMPANY

By: _____

INSTRUCTIONS:
Specific questions should be answered as follows:
(1) State Engineer's File No. or No. of well reported and name and address of owner. (2) Description of well to which meter attached. (3) Description of meter, including multiplier or constant by which reading must be multiplied to obtain actual quantity of water. Units refers to units of measurement such as acre feet, gallons, barrels, etc. (4) Reading of figures on the meter and amount obtained by multiplying reading by multiplier. (5) Under Remarks, give any pertinent information such as reading and date of installation of meter if a first report, information concerning repair of meter and dates out of service, etc.

FILE NO. _____ LOCATION NO. _____

WATER WELL # 5

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
06-29-89	4158325	481000	22,675	30271.4
07-1-89	481000	532764	51,764	30809.0
7-9-89	532764	577240		30908.8
7-16-89	577240	715469.0	37,629	30934.8
7-23-89	715469	818553	103,084	31002.2
7-29-89	818553	862208	43655	31032.1
8-5-89	862208	907649		31063.8
8-12-89	907649	942382.0	34,733	31088.0
8-26-89	942382.0			
9-3-89	176469.0			31241.9
9-18-89	176469.0	252074	75,605	31294.1
9-24-89	252074	252110	36	31294.2
10-5-89	266901.0			31304.2
10-8-89	266901.0	272830.0	5,929	31308.5
10-18-89	272830	308261	35,431	31331.3
10-22-89	308261	316581	8320	31337.5
10-29-89	316581	334041	17460	31348.7
11-5-89	334041	368710	34669	31355.9
11-20-89	368710	375770	7060.0	31377.4
11 25	375770	381761	599.0	31381.7

WATER WELL # 5

DATE OF READING	BEGINNING READING	ENDING READING	GALLONS USED	HR. METER
10-30-88	921410.0	924653.0	3243.0	30396.4
11-6-88	924653.0	930700.0	6047.0	30400.4
11-20-88	930700.0	936624.0	5924.0	30404.3
11-26-88	936624.0	936624.0	0	30404.3
12-4-88	936624.0	936624.0	0	30404.3
12-11-88	936624	936624	0	30404.3
12-18-88	936624	938609	1985	30405.7
12-25-88	938605.0	940198.0	1589	30406.9
01-01-89	940198.0	942794.0	2,596	30408.8
01-08-89	942794.0	943866.0	1,072	30409.7
1-15-89	943866.0	943866.0	0	30409.7
1-22-89	943866.0	957122.0	13'256	30418.9
1-29-89	957122.0	958713.0	1591	30420.2
2-12-89	958713.0	967981.0	9268	30426.5
2-19-89	967981.0	971916.0	3935	30428.2
2-25-89	971916.0	980926.0	9,010	30434.6
3-12-89	980926.0	000997.0	20071	30449.4
3-25-89	000992.0	025904.0	24,907	30466.2
4-8-89	025904.0	004177	21,727	30515.1
4-15-89	004177	111451.0		30520.5
4-22-89	111451.0	130727.0	19,276	30531.0
5-7-89	130727.0	176565.0	45838	30562.8
[illegible]	176565.0	195492.0	18927	30575.5
5-21-89	195492.0	221380.0	25,888	30594.0
	221380.0	368388.0		30694.5
6-18-89	368388.0	458325.5		30755.6

APPENDIX D

YOUR COPY _____
PROJECT COPY 89-031
FILE COPY _____ RECEIVED NOV 24 1989

COMBUSTION ENGINEERING

November 20, 1989 In reply refer to 89-1670

Jeff Havlena
D.B. Stephens & Associates
4415 Hawkins NE
Albuquerque, NM 87109

Dear Mr. Havlena:

Enclosed are the results for the analysis of six (6) water samples (Project: Enron Hobbs), that were submitted to our laboratory on November 3, 1989 for the analyses of volatile and semi-volatile organics, PCB, pesticides, alkalinity, bicarbonate, carbonate, total dissolved solids (TDS), MBAS, nitrate (NO2), nitrite (NO3), sulfate (SO4), chloride (Cl), total hardness, lab pH, Lab cond, total metals, selenium (Se) and mercury (Hg).

An aliquot of sample was analyzed for volatile organics according to EPA Method 624, employing combined GC/MS.

An aliquot of sample was analyzed for semivolatile organics according to EPA Method 625, employing combined gas chromatography/mass spectrometry.

An aliquot of sample was analyzed for organochlorine pesticides and PCB's according to EPA Method 608, employing capillary GC, electron capture detector.

An aliquot of sample was digested for total metals by EPA 3050 and analyzed by EPA Method 6010, employing inductively coupled plasma spectroscopy.

Drinking water samples were analyzed for the State of California general mineral and inorganic constituents according to the methodologies reported in the results section of this report.

If you have any questions, or if I may be of any further service, please do not hesitate to call.

Sincerely,

Joseph F. Matta
Analytical Services Representative
JFM:sac

Enclosures as noted
File: 90805

C-E Environmental, Inc.
A Subsidiary of
Combustion Engineering, Inc.
4765 Calle Quetzal
Camarillo, California 93010
(805) 388-5700

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D. B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
METHOD BLANK	DNA	DNA	Orig.	EPA 608	alpha-BHC	ND	0.05	UG/L	11/07/89	1.0
					beta-BHC	ND	0.05			
					delta-BHC	ND	0.05			
					gamma-BHC (Lindane)	ND	0.05			
					Heptachlor	ND	0.05			
					Aldrin	ND	0.05			
					Heptachlor epoxide	ND	0.05			
					Endosulfan I	ND	0.05			
					Dieldrin	ND	0.10			
					4,4'-DDE	ND	0.10			
					Endrin	ND	0.10			
					Endosulfan II	ND	0.10			
					4,4'-DDD	ND	0.10			
					Endosulfan sulfate	ND	0.10			
					4,4'-DDT	ND	0.10			
					Methoxychlor	ND	0.5			
					Endrin ketone	ND	0.10			
					alpha-Chlordane	ND	0.5			
					gamma-Chlordane	ND	0.5			
					Toxaphene	ND	1.0			
					Aroclor-1016	ND	0.5			
					Aroclor-1221	ND	0.5			
					Aroclor-1232	ND	0.5			
					Aroclor-1242	ND	0.5			
					Aroclor-1248	ND	0.5			
					Aroclor-1254	ND	1.0			
					Aroclor-1260	ND	1.0			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F06.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D. B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #6	CAU-890082	11/03/89	Orig.	EPA 608	alpha-BHC	ND	0.05	UG/L	11/07/89	1.0
					beta-BHC	ND	0.05			
					delta-BHC	ND	0.05			
					gamma-BHC (Lindane)	ND	0.05			
					Heptachlor	ND	0.05			
					Aldrin	ND	0.05			
					Heptachlor epoxide	ND	0.05			
					Endosulfan I	ND	0.05			
					Dieldrin	ND	0.10			
					4,4'-DDE	ND	0.10			
					Endrin	ND	0.10			
					Endosulfan II	ND	0.10			
					4,4'-DDD	ND	0.10			
					Endosulfan sulfate	ND	0.10			
					4,4'-DDT	ND	0.10			
					Methoxychlor	ND	0.5			
					Endrin ketone	ND	0.10			
					alpha-Chlordane	ND	0.5			
					gamma-Chlordane	ND	0.5			
					Toxaphene	ND	1.0			
					Aroclor-1016	ND	0.5			
					Aroclor-1221	ND	0.5			
					Aroclor-1232	ND	0.5			
					Aroclor-1242	ND	0.5			
					Aroclor-1248	ND	0.5			
					Aroclor-1254	ND	1.0			
					Aroclor-1260	ND	1.0			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

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John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D. B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #4	CAU-890083	11/03/89	Orig.	EPA 608	alpha-BHC	ND	0.05	UG/L	11/07/89	1.0
					beta-BHC	ND	0.05			
					delta-BHC	ND	0.05			
					gamma-BHC (Lindane)	ND	0.05			
					Heptachlor	ND	0.05			
					Aldrin	ND	0.05			
					Heptachlor epoxide	ND	0.05			
					Endosulfan I	ND	0.05			
					Dieldrin	ND	0.10			
					4,4'-DDE	ND	0.10			
					Endrin	ND	0.10			
					Endosulfan II	ND	0.10			
					4,4'-DDD	ND	0.10			
					Endosulfan sulfate	ND	0.10			
					4,4'-DDT	ND	0.10			
					Methoxychlor	ND	0.5			
					Endrin ketone	ND	0.10			
					alpha-Chlordane	ND	0.5			
					gamma-Chlordane	ND	0.5			
					Toxaphene	ND	1.0			
					Aroclor-1016	ND	0.5			
					Aroclor-1221	ND	0.5			
					Aroclor-1232	ND	0.5			
					Aroclor-1242	ND	0.5			
					Aroclor-1248	ND	0.5			
					Aroclor-1254	ND	1.0			
					Aroclor-1260	ND	1.0			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

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John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D. B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #4A	CAU-890084	11/03/89	Orig.	EPA 608	alpha-BHC	ND	0.05	UG/L	11/07/89	1.0
					beta-BHC	ND	0.05			
					delta-BHC	ND	0.05			
					gamma-BHC (Lindane)	ND	0.05			
					Heptachlor	ND	0.05			
					Aldrin	ND	0.05			
					Heptachlor epoxide	ND	0.05			
					Endosulfan I	ND	0.05			
					Dieldrin	ND	0.10			
					4,4'-DDE	ND	0.10			
					Endrin	ND	0.10			
					Endosulfan II	ND	0.10			
					4,4'-DDD	ND	0.10			
					Endosulfan sulfate	ND	0.10			
					4,4'-DDT	ND	0.10			
					Methoxychlor	ND	0.5			
					Endrin ketone	ND	0.10			
					alpha-Chlordane	ND	0.5			
					gamma-Chlordane	ND	0.5			
					Toxaphene	ND	1.0			
					Aroclor-1016	ND	0.5			
					Aroclor-1221	ND	0.5			
					Aroclor-1232	ND	0.5			
					Aroclor-1242	ND	0.5			
					Aroclor-1248	ND	0.5			
					Aroclor-1254	ND	1.0			
					Aroclor-1260	ND	1.0			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

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Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D. B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #3	CAU-890085	11/03/89	Orig.	EPA 608	alpha-BHC	ND	0.05	UG/L	11/07/89	1.0
					beta-BHC	ND	0.05			
					delta-BHC	ND	0.05			
					gamma-BHC (Lindane)	ND	0.05			
					Heptachlor	ND	0.05			
					Aldrin	ND	0.05			
					Heptachlor epoxide	ND	0.05			
					Endosulfan I	ND	0.05			
					Dieldrin	ND	0.10			
					4,4'-DDE	ND	0.10			
					Endrin	ND	0.10			
					Endosulfan II	ND	0.10			
					4,4'-DDD	ND	0.10			
					Endosulfan sulfate	ND	0.10			
					4,4'-DDT	ND	0.10			
					Methoxychlor	ND	0.5			
					Endrin ketone	ND	0.10			
					alpha-Chlordane	ND	0.5			
					gamma-Chlordane	ND	0.5			
					Toxaphene	ND	1.0			
					Aroclor-1016	ND	0.5			
					Aroclor-1221	ND	0.5			
					Aroclor-1232	ND	0.5			
					Aroclor-1242	ND	0.5			
					Aroclor-1248	ND	0.5			
					Aroclor-1254	ND	1.0			
					Aroclor-1260	ND	1.0			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D. B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #5	CAU-890086	11/03/89	Orig.	EPA 608	alpha-BHC	ND	0.05	UG/L	11/07/89	1.0
					beta-BHC	ND	0.05			
					delta-BHC	ND	0.05			
					gamma-BHC (Lindane)	ND	0.05			
					Heptachlor	ND	0.05			
					Aldrin	ND	0.05			
					Heptachlor epoxide	ND	0.05			
					Endosulfan I	ND	0.05			
					Dieldrin	ND	0.10			
					4,4'-DDE	ND	0.10			
					Endrin	ND	0.10			
					Endosulfan II	ND	0.10			
					4,4'-DDD	ND	0.10			
					Endosulfan sulfate	ND	0.10			
					4,4'-DDT	ND	0.10			
					Methoxychlor	ND	0.5			
					Endrin ketone	ND	0.10			
					alpha-Chlordane	ND	0.5			
					gamma-Chlordane	ND	0.5			
					Toxaphene	ND	1.0			
					Aroclor-1016	ND	0.5			
					Aroclor-1221	ND	0.5			
					Aroclor-1232	ND	0.5			
					Aroclor-1242	ND	0.5			
					Aroclor-1248	ND	0.5			
					Aroclor-1254	ND	1.0			
					Aroclor-1260	ND	1.0			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F06.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.: METHOD BLANK
C-EE Number: DNA
Date Received: DNA

Replicate: Original
Method: EPA 625
Date Analyzed: 11/10/89

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Phenol	ND	10	UG/L	1.0
bis(2-Chloroethyl)ether	ND	2		
2-Chlorophenol	ND	10		
1,3-Dichlorobenzene	ND	2		
1,4-Dichlorobenzene	ND	2		
Benzyl alcohol	ND	5		
1,2-Dichlorobenzene	ND	2		
2-Methylphenol	ND	5		
bis(2-Chloroisopropyl)ether	ND	2		
4-Methylphenol	ND	5		
N-Nitroso-di-n-propylamine	ND	2		
Hexachloroethane	ND	2		
Nitrobenzene	ND	2		
Isophorone	ND	2		
2-Nitrophenol	ND	20		
2,4-Dimethylphenol	ND	5		
Benzoic acid	ND	20		
bis(2-Chloroethoxy)methane	ND	2		
2,4-Dichlorophenol	ND	10		
1,2,4-Trichlorobenzene	ND	2		
Naphthalene	ND	2		
4-Chloroaniline	ND	20		
Hexachlorobutadiene	ND	5		
4-Chloro-3-methylphenol	ND	10		
2-Methylnaphthalene	ND	2		
Hexachlorocyclopentadiene	ND	5		
2,4,6-Trichlorophenol	ND	10		
2,4,5-Trichlorophenol	ND	10		
2-Chloronaphthalene	ND	2		
2-Nitroaniline	ND	2		
Dimethyl phthalate	ND	10		
Acenaphthylene	ND	2		
3-Nitroaniline	ND	20		

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Acenaphthene	ND	2	UG/L	1.0
2,4-Dinitrophenol	ND	20		
4-Nitrophenol	ND	20		
Dibenzofuran	ND	2		
2,4-Dinitrotoluene	ND	2		
2,6-Dinitrotoluene	ND	2		
Diethylphthalate	ND	5		
4-Chlorophenyl-phenylether	ND	2		
Fluorene	ND	2		
4-Nitroaniline	ND	20		
4,6-Dinitro-2-methylphenol	ND	20		
N-Nitrosodiphenylamine (1)	ND	2		
4-Bromophenyl-phenylether	ND	2		
Hexachlorobenzene	ND	2		
Pentachlorophenol	ND	20		
Phenanthrene	ND	2		
Anthracene	ND	2		
Di-n-butylphthalate	ND	5		
Fluoranthene	ND	2		
Pyrene	ND	2		
Butylbenzylphthalate	ND	5		
3,3'-Dichlorobenzidine	ND	50		
Benzo(a)anthracene	ND	2		
bis(2-Ethylhexyl)phthalate	ND	2		
Chrysene	ND	2		
Di-n-Octyl phthalate	ND	2		
Benzo(b)fluoranthene	ND	2		
Benzo(k)fluoranthene	ND	2		
Benzo(a)pyrene	ND	2		
Indeno(1,2,3-cd)pyrene	ND	2		
Dibenz(a,h)anthracene	ND	2		
Benzo(g,h,i)perylene	ND	2		

(1) - Cannot be separated from diphenylamine.
* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F09.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.: WELL #6
C-EE Number: CAU-890082
Date Received: 11/03/89

Replicate: Original
Method: EPA 625
Date Analyzed: 11/10/89

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Phenol	ND	10	UG/L	1.0
bis(2-Chloroethyl)ether	ND	2		
2-Chlorophenol	ND	10		
1,3-Dichlorobenzene	ND	2		
1,4-Dichlorobenzene	ND	2		
Benzyl alcohol	ND	5		
1,2-Dichlorobenzene	ND	2		
2-Methylphenol	ND	5		
bis(2-Chloroisopropyl)ether	ND	2		
4-Methylphenol	ND	5		
N-Nitroso-di-n-propylamine	ND	2		
Hexachloroethane	ND	2		
Nitrobenzene	ND	2		
Isophorone	ND	2		
2-Nitrophenol	ND	20		
2,4-Dimethylphenol	ND	5		
Benzoic acid	ND	20		
bis(2-Chloroethoxy)methane	ND	2		
2,4-Dichlorophenol	ND	10		
1,2,4-Trichlorobenzene	ND	2		
Naphthalene	ND	2		
4-Chloroaniline	ND	20		
Hexachlorobutadiene	ND	5		
4-Chloro-3-methylphenol	ND	10		
2-Methylnaphthalene	ND	2		
Hexachlorocyclopentadiene	ND	5		
2,4,6-Trichlorophenol	ND	10		
2,4,5-Trichlorophenol	ND	10		
2-Chloronaphthalene	ND	2		
2-Nitroaniline	ND	2		
Dimethyl phthalate	ND	10		
Acenaphthylene	ND	2		
3-Nitroaniline	ND	20		

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Acenaphthene	ND	2	UG/L	1.0
2,4-Dinitrophenol	ND	20		
4-Nitrophenol	ND	20		
Dibenzofuran	ND	2		
2,4-Dinitrotoluene	ND	2		
2,6-Dinitrotoluene	ND	2		
Diethylphthalate	ND	5		
4-Chlorophenyl-phenylether	ND	2		
Fluorene	ND	2		
4-Nitroaniline	ND	20		
4,6-Dinitro-2-methylphenol	ND	20		
N-Nitrosodiphenylamine (1)	ND	2		
4-Bromophenyl-phenylether	ND	2		
Hexachlorobenzene	ND	2		
Pentachlorophenol	ND	20		
Phenanthrene	ND	2		
Anthracene	ND	2		
Di-n-butylphthalate	ND	5		
Fluoranthene	ND	2		
Pyrene	ND	2		
Butylbenzylphthalate	ND	5		
3,3'-Dichlorobenzidine	ND	50		
Benzo(a)anthracene	ND	2		
bis(2-Ethylhexyl)phthalate	ND	2		
Chrysene	ND	2		
Di-n-Octyl phthalate	ND	2		
Benzo(b)fluoranthene	ND	2		
Benzo(k)fluoranthene	ND	2		
Benzo(a)pyrene	ND	2		
Indeno(1,2,3-cd)pyrene	ND	2		
Dibenz(a,h)anthracene	ND	2		
Benzo(g,h,i)perylene	ND	2		

(1) - Cannot be separated from diphenylamine.
* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F09.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.: WELL #4
C-EE Number: CAU-890083
Date Received: 11/03/89

Replicate: Original
Method: EPA 625
Date Analyzed: 11/10/89

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Phenol	ND	10	UG/L	1.0
bis(2-Chloroethyl)ether	ND	2		
2-Chlorophenol	ND	10		
1,3-Dichlorobenzene	ND	2		
1,4-Dichlorobenzene	ND	2		
Benzyl alcohol	ND	5		
1,2-Dichlorobenzene	ND	2		
2-Methylphenol	ND	5		
bis(2-Chloroisopropyl)ether	ND	2		
4-Methylphenol	ND	5		
N-Nitroso-di-n-propylamine	ND	2		
Hexachloroethane	ND	2		
Nitrobenzene	ND	2		
Isophorone	ND	2		
2-Nitrophenol	ND	20		
2,4-Dimethylphenol	ND	5		
Benzoic acid	ND	20		
bis(2-Chloroethoxy)methane	ND	2		
2,4-Dichlorophenol	ND	10		
1,2,4-Trichlorobenzene	ND	2		
Naphthalene	ND	2		
4-Chloroaniline	ND	20		
Hexachlorobutadiene	ND	5		
4-Chloro-3-methylphenol	ND	10		
2-Methylnaphthalene	ND	2		
Hexachlorocyclopentadiene	ND	5		
2,4,6-Trichlorophenol	ND	10		
2,4,5-Trichlorophenol	ND	10		
2-Chloronaphthalene	ND	2		
2-Nitroaniline	ND	2		
Dimethyl phthalate	ND	10		
Acenaphthylene	ND	2		
3-Nitroaniline	ND	20		
Acenaphthene	ND	2	UG/L	1.0
2,4-Dinitrophenol	ND	20		
4-Nitrophenol	ND	20		
Dibenzofuran	ND	2		
2,4-Dinitrotoluene	ND	2		
2,6-Dinitrotoluene	ND	2		
Diethylphthalate	ND	5		
4-Chlorophenyl-phenylether	ND	2		
Fluorene	ND	2		
4-Nitroaniline	ND	20		
4,6-Dinitro-2-methylphenol	ND	20		
N-Nitrosodiphenylamine (1)	ND	2		
4-Bromophenyl-phenylether	ND	2		
Hexachlorobenzene	ND	2		
Pentachlorophenol	ND	20		
Phenanthrene	ND	2		
Anthracene	ND	2		
Di-n-butylphthalate	ND	5		
Fluoranthene	ND	2		
Pyrene	ND	2		
Butylbenzylphthalate	ND	5		
3,3'-Dichlorobenzidine	ND	50		
Benzo(a)anthracene	ND	2		
bis(2-Ethylhexyl)phthalate	ND	2		
Chrysene	ND	2		
Di-n-Octyl phthalate	ND	2		
Benzo(b)fluoranthene	ND	2		
Benzo(k)fluoranthene	ND	2		
Benzo(a)pyrene	ND	2		
Indeno(1,2,3-cd)pyrene	ND	2		
Dibenz(a,h)anthracene	ND	2		
Benzo(g,h,i)perylene	ND	2		

(1) - Cannot be separated from diphenylamine.
* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F09.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.: WELL #4A
C-EE Number: CAU-890084
Date Received: 11/03/89

Replicate: Original
Method: EPA 625
Date Analyzed: 11/10/89

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Phenol	ND	10	UG/L	1.0
bis(2-Chloroethyl)ether	ND	2		
2-Chlorophenol	ND	10		
1,3-Dichlorobenzene	ND	2		
1,4-Dichlorobenzene	ND	2		
Benzyl alcohol	ND	5		
1,2-Dichlorobenzene	ND	2		
2-Methylphenol	ND	5		
bis(2-Chloroisopropyl)ether	ND	2		
4-Methylphenol	ND	5		
N-Nitroso-di-n-propylamine	ND	2		
Hexachloroethane	ND	2		
Nitrobenzene	ND	2		
Isophorone	ND	2		
2-Nitrophenol	ND	20		
2,4-Dimethylphenol	ND	5		
Benzoic acid	ND	20		
bis(2-Chloroethoxy)methane	ND	2		
2,4-Dichlorophenol	ND	10		
1,2,4-Trichlorobenzene	ND	2		
Naphthalene	ND	2		
4-Chloroaniline	ND	20		
Hexachlorobutadiene	ND	5		
4-Chloro-3-methylphenol	ND	10		
2-Methylnaphthalene	ND	2		
Hexachlorocyclopentadiene	ND	5		
2,4,6-Trichlorophenol	ND	10		
2,4,5-Trichlorophenol	ND	10		
2-Chloronaphthalene	ND	2		
2-Nitroaniline	ND	2		
Dimethyl phthalate	ND	10		
Acenaphthylene	ND	2		
3-Nitroaniline	ND	20		

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Acenaphthene	ND	2	UG/L	1.0
2,4-Dinitrophenol	ND	20		
4-Nitrophenol	ND	20		
Dibenzofuran	ND	2		
2,4-Dinitrotoluene	ND	2		
2,6-Dinitrotoluene	ND	2		
Diethylphthalate	ND	5		
4-Chlorophenyl-phenylether	ND	2		
Fluorene	ND	2		
4-Nitroaniline	ND	20		
4,6-Dinitro-2-methylphenol	ND	20		
N-Nitrosodiphenylamine (1)	ND	2		
4-Bromophenyl-phenylether	ND	2		
Hexachlorobenzene	ND	2		
Pentachlorophenol	ND	20		
Phenanthrene	ND	2		
Anthracene	ND	2		
Di-n-butylphthalate	ND	5		
Fluoranthene	ND	2		
Pyrene	ND	2		
Butylbenzylphthalate	ND	5		
3,3'-Dichlorobenzidine	ND	50		
Benzo(a)anthracene	ND	2		
bis(2-Ethylhexyl)phthalate	ND	2		
Chrysene	ND	2		
Di-n-Octyl phthalate	ND	2		
Benzo(b)fluoranthene	ND	2		
Benzo(k)fluoranthene	ND	2		
Benzo(a)pyrene	ND	2		
Indeno(1,2,3-cd)pyrene	ND	2		
Dibenz(a,h)anthracene	ND	2		
Benzo(g,h,i)perylene	ND	2		

(1) - Cannot be separated from diphenylamine.
* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.: WELL #3
C-EE Number: CAU-890085
Date Received: 11/03/89

Replicate: Original
Method: EPA 625
Date Analyzed: 11/10/89

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Phenol	ND	10	UG/L	1.0
bis(2-Chloroethyl)ether	ND	2		
2-Chlorophenol	ND	10		
1,3-Dichlorobenzene	ND	2		
1,4-Dichlorobenzene	ND	2		
Benzyl alcohol	ND	5		
1,2-Dichlorobenzene	ND	2		
2-Methylphenol	ND	5		
bis(2-Chloroisopropyl)ether	ND	2		
4-Methylphenol	ND	5		
N-Nitroso-di-n-propylamine	ND	2		
Hexachloroethane	ND	2		
Nitrobenzene	ND	2		
Isophorone	ND	2		
2-Nitrophenol	ND	20		
2,4-Dimethylphenol	ND	5		
Benzoic acid	ND	20		
bis(2-Chloroethoxy)methane	ND	2		
2,4-Dichlorophenol	ND	10		
1,2,4-Trichlorobenzene	ND	2		
Naphthalene	ND	2		
4-Chloroaniline	ND	20		
Hexachlorobutadiene	ND	5		
4-Chloro-3-methylphenol	ND	10		
2-Methylnaphthalene	ND	2		
Hexachlorocyclopentadiene	ND	5		
2,4,6-Trichlorophenol	ND	10		
2,4,5-Trichlorophenol	ND	10		
2-Chloronaphthalene	ND	2		
2-Nitroaniline	ND	2		
Dimethyl phthalate	ND	10		
Acenaphthylene	ND	2		
3-Nitroaniline	ND	20		

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Acenaphthene	ND	2	UG/L	1.0
2,4-Dinitrophenol	ND	20		
4-Nitrophenol	ND	20		
Dibenzofuran	ND	2		
2,4-Dinitrotoluene	ND	2		
2,6-Dinitrotoluene	ND	2		
Diethylphthalate	ND	5		
4-Chlorophenyl-phenylether	ND	2		
Fluorene	ND	2		
4-Nitroaniline	ND	20		
4,6-Dinitro-2-methylphenol	ND	20		
N-Nitrosodiphenylamine (1)	ND	2		
4-Bromophenyl-phenylether	ND	2		
Hexachlorobenzene	ND	2		
Pentachlorophenol	ND	20		
Phenanthrene	ND	2		
Anthracene	ND	2		
Di-n-butylphthalate	ND	5		
Fluoranthene	ND	2		
Pyrene	ND	2		
Butylbenzylphthalate	ND	5		
3,3'-Dichlorobenzidine	ND	50		
Benzo(a)anthracene	ND	2		
bis(2-Ethylhexyl)phthalate	ND	2		
Chrysene	ND	2		
Di-n-Octyl phthalate	ND	2		
Benzo(b)fluoranthene	ND	2		
Benzo(k)fluoranthene	ND	2		
Benzo(a)pyrene	ND	2		
Indeno(1,2,3-cd)pyrene	ND	2		
Dibenz(a,h)anthracene	ND	2		
Benzo(g,h,i)perylene	ND	2		

(1) - Cannot be separated from diphenylamine.
* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.: WELL #5
C-EE Number: CAU-890086
Date Received: 11/03/89

Replicate: Original
Method: EPA 625
Date Analyzed: 11/10/89

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Phenol	ND	10	UG/L	1.0
bis(2-Chloroethyl)ether	ND	2		
2-Chlorophenol	ND	10		
1,3-Dichlorobenzene	ND	2		
1,4-Dichlorobenzene	ND	2		
Benzyl alcohol	ND	5		
1,2-Dichlorobenzene	ND	2		
2-Methylphenol	ND	5		
bis(2-Chloroisopropyl)ether	ND	2		
4-Methylphenol	ND	5		
N-Nitroso-di-n-propylamine	ND	2		
Hexachloroethane	ND	2		
Nitrobenzene	ND	2		
Isophorone	ND	2		
2-Nitrophenol	ND	20		
2,4-Dimethylphenol	ND	5		
Benzoic acid	ND	20		
bis(2-Chloroethoxy)methane	ND	2		
2,4-Dichlorophenol	ND	10		
1,2,4-Trichlorobenzene	ND	2		
Naphthalene	ND	2		
4-Chloroaniline	ND	20		
Hexachlorobutadiene	ND	5		
4-Chloro-3-methylphenol	ND	10		
2-Methylnaphthalene	ND	2		
Hexachlorocyclopentadiene	ND	5		
2,4,6-Trichlorophenol	ND	10		
2,4,5-Trichlorophenol	ND	10		
2-Chloronaphthalene	ND	2		
2-Nitroaniline	ND	2		
Dimethyl phthalate	ND	10		
Acenaphthylene	ND	2		
3-Nitroaniline	ND	20		

Analyte	Result	Detection Limit (*)	Units	Dil Factor
Acenaphthene	ND	2	UG/L	1.0
2,4-Dinitrophenol	ND	20		
4-Nitrophenol	ND	20		
Dibenzofuran	ND	2		
2,4-Dinitrotoluene	ND	2		
2,6-Dinitrotoluene	ND	2		
Diethylphthalate	ND	5		
4-Chlorophenyl-phenylether	ND	2		
Fluorene	ND	2		
4-Nitroaniline	ND	20		
4,6-Dinitro-2-methylphenol	ND	20		
N-Nitrosodiphenylamine (1)	ND	2		
4-Bromophenyl-phenylether	ND	2		
Hexachlorobenzene	ND	2		
Pentachlorophenol	ND	20		
Phenanthrene	ND	2		
Anthracene	ND	2		
Di-n-butylphthalate	ND	5		
Fluoranthene	ND	2		
Pyrene	ND	2		
Butylbenzylphthalate	ND	5		
3,3'-Dichlorobenzidine	ND	50		
Benzo(a)anthracene	ND	2		
bis(2-Ethylhexyl)phthalate	ND	2		
Chrysene	ND	2		
Di-n-Octyl phthalate	ND	2		
Benzo(b)fluoranthene	ND	2		
Benzo(k)fluoranthene	ND	2		
Benzo(a)pyrene	ND	2		
Indeno(1,2,3-cd)pyrene	ND	2		
Dibenz(a,h)anthracene	ND	2		
Benzo(g,h,i)perylene	ND	2		

(1) - Cannot be separated from diphenylamine.
* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
TRIP BLANK	CAU-890087	11/03/89	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	3	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	ND	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
METHOD BLANK	DNA	DNA	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	ND	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	ND	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F07.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #6	CAU-890082	11/03/89	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	5	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	ND	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F07.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #4	CAU-890083	11/03/89	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	5	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	4	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F07.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #4A	CAU-890084	11/03/89	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	4	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	5	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F07.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #3	CAU-890085	11/03/89	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	5	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	4	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

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C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
RFS # 90805
Job Site: ENRON HOBBS

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #5	CAU-890086	11/03/89	Orig.	EPA 624	Chloromethane	ND	2	UG/L	11/07/89	1.0
					Bromomethane	ND	2			
					Vinyl chloride	ND	2			
					Chloroethane	ND	2			
					Methylene chloride	ND	2			
					Acetone	ND	2			
					Carbon disulfide	ND	2			
					1,1-Dichloroethene	ND	2			
					1,1-Dichloroethane	ND	2			
					1,2-Dichloroethene (total)	ND	2			
					Chloroform	ND	2			
					1,2-Dichloroethane	ND	2			
					2-Butanone	ND	10			
					1,1,1-Trichloroethane	ND	2			
					Carbon tetrachloride	ND	2			
					Vinyl acetate	ND	2			
					Bromodichloromethane	ND	2			
					1,2-Dichloropropane	ND	2			
					cis-1,3-Dichloropropene	ND	2			
					Trichloroethene	ND	2			
					Dibromochloromethane	ND	2			
					1,1,2-Trichloroethane	ND	2			
					Benzene	ND	2			
					trans-1,3-Dichloropropene	ND	2			
					Bromoform	ND	2			
					4-Methyl-2-pentanone	ND	2			
					2-Hexanone	ND	2			
					Tetrachloroethene	ND	2			
					1,1,2,2-Tetrachloroethane	ND	2			
					Toluene	ND	2			
					Chlorobenzene	ND	2			
					Ethylbenzene	ND	2			
					Styrene	ND	2			
					Xylene (total)	ND	2			
					1,4-Dichlorobenzene	ND	10			
					1,3-Dichlorobenzene	ND	10			
					1,2-Dichlorobenzene	ND	10			
					Trichlorofluoromethane	ND	5			

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the indicated detection limit.

Approved by: John C. McVoy
John C. McVoy
Laboratory QC Coordinator

F07.132

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
ENRON-HOBBS
RFS: 90805

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #6	CAU-890082	11/03/89	Orig	EPA 6010	Ag **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	Alk	167.	1.00	mg/L CaCO3	11/06/89	1.0
				EPA 6010	As	.009	.002	mg/L	11/15/89	1.0
				EPA 310.1	BICARB	203.	1.00	mg/L	11/06/89	1.0
				EPA 6010	Be **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	CARBONATE	ND	1.00	mg/L	11/06/89	1.0
				EPA 6010	Ca	82.0	.025	mg/L	11/16/89	10.0
				EPA 6010	Cd **	ND	.001	mg/L	11/16/89	1.0
				EPA 300.0	Cl	33.3	.010	mg/L	11/13/89	10.0
				EPA 6010	Cr	.012	.010	mg/L	11/16/89	1.0
				EPA 6010	Cu	.013	.010	mg/L	11/16/89	1.0
				EPA 6010	Fe	.045	.010	mg/L	11/16/89	1.0
				EPA 7470	Hg	ND	.0001	mg/L	11/07/89	1.0
				EPA 6010	K	1.82	.025	mg/L	11/16/89	1.0
				EPA 120.1	LAB COND	553.	.100	umhos/cm	11/06/89	1.0
				EPA 150.1	LAB pH	7.31	.100	pH	11/06/89	1.0
				EPA 425.1	MBAS	ND	.080	mg/L	11/13/89	2.0
				EPA 6010	Mg	9.70	.010	mg/L	11/16/89	10.0
				EPA 6010	Mn	ND	.010	mg/L	11/16/89	1.0
				EPA 300.0	NO2	1.14	.010	mg/L	11/13/89	100.0
				EPA 300.0	NO3	9.74	.020	mg/L	11/13/89	1.0
				EPA 6010	Na	31.5	.025	mg/L	11/16/89	10.0
				EPA 6010	Ni	ND	.020	mg/L	11/16/89	1.0
				EPA 6010	Pb	ND	.002	mg/L	11/15/89	1.0
				EPA 300.0	SO4	56.6	.050	mg/L	11/13/89	10.0
				EPA 6010	Sb	ND	.002	mg/L	11/16/89	1.0
				EPA 7740	Se	ND	.0025	mg/L	11/15/89	1.0
				EPA 160.1	TDS	378.	10.0	mg/L	11/07/89	1.0
				EPA 130.1	TOT HARD	205.	1.00	mg/L	11/16/89	1.0
				EPA 6010	Tl	ND	.002	mg/L	11/16/89	1.0
				EPA 6010	Zn	ND	.010	mg/L	11/16/89	1.0
WELL #4	CAU-890083	11/03/89	Orig	EPA 6010	Ag **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	Alk	204.	1.00	mg/L CaCO3	11/06/89	1.0
				EPA 6010	As	.004	.002	mg/L	11/15/89	1.0
				EPA 310.1	BICARB	250.	1.00	mg/L	11/06/89	1.0
				EPA 6010	Be **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	CARBONATE	ND	1.00	mg/L	11/06/89	1.0
				EPA 6010	Ca	72.9	.025	mg/L	11/16/89	10.0
				EPA 6010	Cd **	ND	.001	mg/L	11/16/89	1.0
				EPA 300.0	Cl	82.6	.010	mg/L	11/13/89	100.0
				EPA 6010	Cr	ND	.010	mg/L	11/16/89	1.0
				EPA 6010	Cu	ND	.010	mg/L	11/16/89	1.0
				EPA 6010	Fe	.077	.010	mg/L	11/16/89	1.0
				EPA 7470	Hg	ND	.000	mg/L	11/07/89	1.0
				EPA 6010	K	2.62	.025	mg/L	11/16/89	1.0
				EPA 120.1	LAB COND	805.	.100	umhos/cm	11/06/89	1.0

** - ICP with ultrasonic nebulizer.

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.

ND - Not detected at the true detection limit.

Approved by: John C. McVoy

John C. McVoy
Laboratory QC Coordinator

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
ENRON-HOBBS
RFS: 90805

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #4	CAU-890083	11/03/89	Orig	EPA 150.1	LAB pH	7.03	.100	pH	11/06/89	1.0
				EPA 425.1	MBAS	ND	.080	mg/L	11/13/89	2.0
				EPA 6010	Mg	11.2	.010	mg/L	11/16/89	10.0
				EPA 6010	Mn	ND	.010	mg/L	11/16/89	1.0
				EPA 300.0	NO2	ND	.010	mg/L	11/13/89	1.0
				EPA 300.0	NO3	13.4	.020	mg/L	11/13/89	1.0
				EPA 6010	Na	53.5	.025	mg/L	11/16/89	10.0
				EPA 6010	Ni	ND	.020	mg/L	11/16/89	1.0
				EPA 6010	Pb	ND	.002	mg/L	11/15/89	1.0
				EPA 300.0	SO4	70.7	.050	mg/L	11/13/89	10.0
				EPA 6010	Sb	ND	.002	mg/L	11/16/89	1.0
				EPA 7740	Se	ND	.0025	mg/L	11/15/89	1.0
				EPA 160.1	TDS	504.	10.0	mg/L	11/07/89	1.0
				EPA 130.1	TOT HARD	228.	1.00	mg/L	11/16/89	1.0
				EPA 6010	Tl	ND	.002	mg/L	11/16/89	1.0
				EPA 6010	Zn	ND	.010	mg/L	11/16/89	1.0
			Dup	EPA 300.0	Cl	83.0	.010	mg/L	11/13/89	100.0
				EPA 6010	Na	56.8	.025	mg/L	11/16/89	10.0
WELL #4A	CAU-890084	11/03/89	Orig	EPA 6010	Ag **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	Alk	202.	1.00	mg/L CaCO3	11/06/89	1.0
				EPA 6010	As	.008	.002	mg/L	11/15/89	1.0
				EPA 310.1	BICARB	246.	1.00	mg/L	11/06/89	1.0
				EPA 6010	Be **	ND	.001	mg/L	11/16/89	1.0
				EPA 6010	Ca	111.	.025	mg/L	11/16/89	10.0
				EPA 6010	Cd **	ND	.001	mg/L	11/16/89	1.0
				EPA 300.0	Cl	84.0	.010	mg/L	11/13/89	100.0
				EPA 6010	Cr	.011	.010	mg/L	11/16/89	1.0
				EPA 6010	Cu	ND	.010	mg/L	11/16/89	1.0
				EPA 6010	Fe	.050	.010	mg/L	11/16/89	1.0
				EPA 7470	Hg	ND	.0001	mg/L	11/07/89	1.0
				EPA 6010	K	2.59	.025	mg/L	11/16/89	1.0
				EPA 120.1	LAB COND	819.	.100	umhos/cm	11/06/89	1.0
				EPA 150.1	LAB pH	7.14	.100	pH	11/06/89	1.0
				EPA 425.1	MBAS	ND	.080	mg/L	11/13/89	2.0
				EPA 6010	Mg	11.3	.010	mg/L	11/16/89	10.0
				EPA 6010	Mn	ND	.010	mg/L	11/16/89	1.0
				EPA 300.0	NO2	ND	.010	mg/L	11/13/89	1.0
				EPA 300.0	NO3	13.4	.020	mg/L	11/13/89	1.0
				EPA 6010	Na	54.8	.025	mg/L	11/16/89	10.0
				EPA 6010	Ni	ND	.020	mg/L	11/16/89	1.0
				EPA 6010	Pb	ND	.002	mg/L	11/15/89	1.0
				EPA 300.0	SO4	71.9	.050	mg/L	11/13/89	10.0
				EPA 6010	Sb	ND	.002	mg/L	11/16/89	1.0
				EPA 7740	Se	ND	.0025	mg/L	11/15/89	1.0

** - ICP with ultrasonic nebulizer.

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.

ND - Not detected at the true detection limit.

Approved by: John C. McVoy

John C. McVoy
Laboratory QC Coordinator

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
ENRON-HOBBS
RFS: 90805

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #4A	CAU-890084	11/03/89	Orig	EPA 160.1	TDS	524.	10.0	mg/L	11/07/89	1.0
				EPA 130.1	TOT HARD	324.	1.00	mg/L	11/16/89	1.0
				EPA 6010	Tl	ND	.002	mg/L	11/16/89	1.0
				EPA 6010	Zn	ND	.010	mg/L	11/16/89	1.0
WELL #3	CAU-890085	11/03/89	Orig	EPA 6010	Ag **	.004	.001	mg/L	11/16/89	1.0
				EPA 310.1	Alk	220.	1.00	mg/L CaCO3	11/06/89	1.0
				EPA 6010	As	.036	.002	mg/L	11/15/89	1.0
				EPA 310.1	BICARB	269.	1.00	mg/L	11/06/89	1.0
				EPA 6010	Be **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	CARBONATE	ND	1.00	mg/L	11/06/89	1.0
				EPA 6010	Ca	63.5	.025	mg/L	11/16/89	10.0
				EPA 6010	Cd **	.001	.001	mg/L	11/16/89	1.0
				EPA 300.0	Cl	47.2	.010	mg/L	11/13/89	10.0
				EPA 6010	Cr	ND	.010	mg/L	11/16/89	1.0
				EPA 6010	Cu	.010	.010	mg/L	11/16/89	1.0
				EPA 6010	Fe	.968	.010	mg/L	11/16/89	1.0
				EPA 7470	Hg	ND	.0001	mg/L	11/07/89	1.0
				EPA 6010	K	2.19	.025	mg/L	11/16/89	1.0
				EPA 120.1	LAB COND	674.	.100	umhos/cm	11/06/89	1.0
				EPA 150.1	LAB pH	7.03	.100	pH	11/06/89	1.0
				EPA 425.1	MBAS	ND	.080	mg/L	11/13/89	2.0
				EPA 6010	Mg	10.5	.010	mg/L	11/16/89	10.0
				EPA 6010	Mn	.750	.010	mg/L	11/16/89	1.0
				EPA 300.0	NO2	ND	.010	mg/L	11/13/89	10.0
				EPA 300.0	NO3	6.29	.020	mg/L	11/13/89	10.0
				EPA 6010	Na	41.1	.025	mg/L	11/16/89	10.0
				EPA 6010	Ni	ND	.020	mg/L	11/16/89	1.0
				EPA 6010	Pb	ND	.002	mg/L	11/15/89	1.0
				EPA 300.0	SO4	51.7	.050	mg/L	11/13/89	10.0
				EPA 6010	Sb	ND	.002	mg/L	11/16/89	1.0
				EPA 7740	Se	ND	.0025	mg/L	11/15/89	1.0
				EPA 160.1	TDS	440.	10.0	mg/L	11/07/89	1.0
				EPA 130.1	TOT HARD	202.	1.00	mg/L	11/16/89	1.0
				EPA 6010	Tl	ND	.002	mg/L	11/16/89	1.0
				EPA 6010	Zn	ND	.010	mg/L	11/16/89	1.0
			Dup	EPA 310.1	CARBONATE	ND	1.00	mg/L	11/06/89	1.0
WELL #5	CAU-890086	11/03/89	Orig	EPA 6010	Ag **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	Alk	177.	1.00	mg/L CaCO3	11/06/89	1.0
				EPA 6010	As	.005	.002	mg/L	11/15/89	1.0
				EPA 310.1	BICARB	216.	1.00	mg/L	11/06/89	1.0
				EPA 6010	Be **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	CARBONATE	ND	1.00	mg/L	11/06/89	1.0

** - ICP with ultrasonic nebulizer.

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.

ND - Not detected at the true detection limit.

Approved by: John C. McVoy

John C. McVoy
Laboratory QC Coordinator

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #5	CAU-890086	11/03/89	Orig	EPA 6010	Ca	79.6	.025	mg/L	11/16/89	10.0
				EPA 6010	Cd **	ND	.001	mg/L	11/16/89	1.0
				EPA 300.0	Cl	25.0	.010	mg/L	11/13/89	10.0
				EPA 6010	Cr	ND	.010	mg/L	11/16/89	1.0
				EPA 6010	Cu	.015	.010	mg/L	11/16/89	1.0
				EPA 6010	Fe	.036	.010	mg/L	11/16/89	1.0
				EPA 7470	Hg	ND	.0001	mg/L	11/07/89	1.0
				EPA 6010	K	1.89	.025	mg/L	11/16/89	1.0
				EPA 120.1	LAB COND	537.	.100	umhos/cm	11/06/89	1.0
				EPA 150.1	LAB pH	7.13	.100	pH	11/06/89	1.0
				EPA 425.1	MBAS	ND	.080	mg/L	11/13/89	2.0
				EPA 6010	Mg	8.56	.010	mg/L	11/16/89	10.0
				EPA 6010	Mn	ND	.010	mg/L	11/16/89	1.0
				EPA 300.0	NO2	ND	.010	mg/L	11/13/89	10.0
				EPA 300.0	NO3	10.0	.020	mg/L	11/13/89	10.0
				EPA 6010	Na	30.4	.025	mg/L	11/16/89	10.0
				EPA 6010	Ni	ND	.020	mg/L	11/16/89	1.0
				EPA 6010	Pb	ND	.002	mg/L	11/15/89	1.0
				EPA 300.0	SO4	47.4	.050	mg/L	11/13/89	10.0
				EPA 6010	Sb	ND	.002	mg/L	11/16/89	1.0
				EPA 7740	Se	.003	.0025	mg/L	11/15/89	1.0
				EPA 160.1	TDS	354.	10.0	mg/L	11/07/89	1.0
				EPA 130.1	TOT HARD	234.	1.00	mg/L	11/16/89	1.0
				EPA 6010	Tl	.005	.002	mg/L	11/16/89	1.0
				EPA 6010	Zn	ND	.010	mg/L	11/16/89	1.0
			Dup	EPA 6010	Ag **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	Alk	177.	1.00	mg/L CaCO3	11/06/89	1.0
				EPA 6010	As	.007	.002	mg/L	11/15/89	1.0
				EPA 310.1	BICARB	216.	1.00	mg/L	11/06/89	1.0
				EPA 6010	Be **	ND	.001	mg/L	11/16/89	1.0
				EPA 310.1	CARBONATE	ND	1.00	mg/L	11/06/89	1.0
				EPA 6010	Ca	79.5	.025	mg/L	11/16/89	10.0
				EPA 6010	Cd **	ND	.001	mg/L	11/16/89	1.0
				EPA 300.0	Cl	25.4	.010	mg/L	11/13/89	10.0
				EPA 6010	Cr	.010	.010	mg/L	11/16/89	1.0
				EPA 6010	Cu	.010	.010	mg/L	11/16/89	1.0
				EPA 6010	Fe	.024	.010	mg/L	11/16/89	1.0
				EPA 6010	K	2.28	.025	mg/L	11/16/89	1.0
				EPA 120.1	LAB COND	536.	.100	umhos/cm	11/06/89	1.0
				EPA 150.1	LAB pH	7.12	.100	pH	11/06/89	1.0
				EPA 6010	Mg	8.73	.010	mg/L	11/16/89	10.0
				EPA 6010	Mn	ND	.010	mg/L	11/16/89	1.0
				EPA 300.0	NO2	ND	.010	mg/L	11/13/89	10.0
				EPA 300.0	NO3	10.1	.020	mg/L	11/13/89	10.0
				EPA 6010	Na	31.4	.025	mg/L	11/16/89	10.0
				EPA 6010	Ni	ND	.020	mg/L	11/16/89	1.0

** - ICP with ultrasonic nebulizer.

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.

ND - Not detected at the true detection limit.

Approved by: John C. McVoy

John C. McVoy
Laboratory QC Coordinator

C-E ENVIRONMENTAL, INC.
Analytical Results Summary for D.B. STEPHENS & ASSOCIATES
ENRON-HOBBS
RFS: 90805

Client Sample I.D.	C-EE Number	Date Received	Rep	Method	Analyte	Result	Detection Limit (*)	Units	Date Analyzed	Dil Factor
WELL #5	CAU-890086	11/03/89	Dup	EPA 6010	Pb	ND	.002	mg/L	11/15/89	1.0
				EPA 300.0	SO4	47.7	.050	mg/L	11/13/89	10.0
				EPA 6010	Sb	ND	.002	mg/L	11/16/89	1.0
				EPA 7740	Se	.004	.0025	mg/L	11/15/89	1.0
				EPA 160.1	TDS	354.	10.0	mg/L	11/07/89	1.0
				EPA 130.1	TOT HARD	234.	1.00	mg/L	11/16/89	1.0
				EPA 6010	Tl	.004	.002	mg/L	11/16/89	1.0
				EPA 6010	Zn	ND	.010	mg/L	11/16/89	1.0

* - To obtain the true detection limit, multiply this value by the value under the "Dil Factor" column.
ND - Not detected at the true detection limit.

Approved by: John C. McVoy

John C. McVoy
Laboratory QC Coordinator

DANIEL B. STEPHENS & ASSOC.
4415 HAWKINS NE
ALBUQUERQUE, NM 87109
(505) 345-4567

CHAIN OF CUSTODY RECORD

Proj No. 89.031 | Project Name ENRON HOBBS | Samplers (Signature) K.C. Morgan

Sta. No.	Date	Time	Comp.	Grab	Station Location	No. of Containers	EPA 601 PCB	EPA 624 VOC	EPA 625 B/N/A	BEN. MINERAL	NITRATE/NITRITE	RADIOACTIVITY (GROSS ALPHA)	Remarks
3	11-2-89	2:00			WELL #3			3					
	"	2:05					1						
		2:10							2				
		2:20								2			
		2:25									1		
		2:27										1	
5					WELL #5								
		3:00						3					
		3:15					1						
		3:??							2				
		3:29								2			
		3:30									1		
		3:37										1	
TB								1					

Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
K.C. Morgan		Ronnie Pugh	10:30 AM 11-03-1989		
Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Relinquished by: (Signature)	Date Time	Received for Laboratory by: (Signature)			

Remarks: Common Ions - Field Filtered
Nitrate - Preserved w/ H_2SO_4
Trace Metals - Filtered & Preserved w/ HNO_3
VOC - Preserved w/ HCl

DANIEL B. STEPHENS & ASSOC.
4415 HAWKINS NE
ALBUQUERQUE, NM 87109
(505) 345-4567

CHAIN OF CUSTODY RECORD

Proj No.	Project Name
89-031	ENRON-HOBBS

Samplers (Signature): KC

Sta. No.	Date	Time	Comp.	Grab	Station Location	No. of Containers	EPA 608 FLD	EPA 624 VOC	EPA 625 B/N/A	GEN. MINERALS	NITRATE/NITRITE	METALS DISSOLVED	[illegible]	Remarks
4C	11-2-89	8:10						3						
		8:30					1							
		9:05							2					
		9:00								2				
		9:30									1			
		9:45										1		
#4		11:30						3						
		11:35					1							
		11:45							2					
		12:00								2				
		12:05									1			
		12:10										1		
4A		1:00						3						
		1:06					1							
		1:09							2					
		1:15								2				
		1:20									1			
												1		

Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
KC Thompson					
Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Relinquished by: (Signature)	Date Time	Received for Laboratory by: (Signature)			

Remarks: Common Ions - Field Filtered
Nitrate - Preserved w/ H_2SO_4
TRACE - Filtered/Preserved w/ HNO_3
VOC - Preserved w/ HCl

ASSAIGAI
ANALYTICAL
LABORATORIES

TO: Daniel B. Stephens and Associates
4415 Hawkins, NE
Albuquerque, NM 87109
ATTN: Jeff Havalena

DATE: 3 November 1989
WORK ORDER NO: 2116

YOUR COPY _____
PROJECT COPY 89-031
FILE COPY _____

SAMPLE SITE: Enron - Hobbs
RECEIVED: 3 November 1989

ANALYTE REQUESTED: Hexavalent Chromium

SAMPLE ID	ANALYTICAL RESULTS
Well #3	<0.01 mg/L
Well #6	<0.01 mg/L
Well #5	<0.01 mg/L
Well #4	<0.01 mg/L
Well #4A	<0.01 mg/L

NOMINAL DETECTION LIMIT FOR HEXAVALENT CHROMIUM: 0.01 mg/L

An invoice for services is enclosed. Thank you for contacting Assaigai Laboratories.

Sincerely,

Balwant Chauhan, Ph.D.
Laboratory Director

APPENDIX E

AnalyticalTechnologies, Inc. 2113 S. 48th Street Suite 107 Tempe, AZ 85282 (602) 438-1530

NOVEMBER 9, 1989

DANIEL B. STEPHENS & ASSOCIATES
4415 HAWKINS NE
ALBUQUERQUE, NM 87109

Accession: 910550

Date Received: 10/06/89

Attention: JEFF HAVLENA

Project: 89-031/EHROT-HOBBS

Note: METHOD 8150, CYANIDE, AND PHENOLS ANALYSES PERFORMED BY ATI-SAN DIEGO.

M. Barry
Michael G. Barry
Project Manager

Robert V. Woods
Robert V. Woods
Laboratory Manager

RVW/clf
MM-28

Note: Samples will be disposed of within 30 days unless otherwise notified.

Analytical Technologies, Inc

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

DATE RECEIVED : 10/06/89
REPORT DATE : 11/08/89

ATI I.D. : 910550

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	2'	NON-AQUEOUS	10/04/89
02	2'8"	NON-AQUEOUS	10/04/89

----- TOTALS -----

MATRIX	# SAMPLES
NON-AQUEOUS	2

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc

GENERAL CHEMISTRY RESULTS

ATI I.D. : 910550

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

DATE RECEIVED : 10/06/89
REPORT DATE : 11/08/89

PARAMETER	UNITS	01	02
CYANIDE, TOTAL	MG/KG	<0.2	<0.2
CHROMIUM HEXAVALENT	MG/KG	<0.2	<0.2
PHENOLICS, TOTAL	MG/KG	<0.8	2.9

Analytical Technologies, Inc

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE) ATI I.D. : 910550

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
CYANIDE, TOTAL	MG/KG	91099925	<0.2	0.4	NA	3.4	4.0	85
CHROMIUM HEXAVALENT	MG/KG	91055001	<0.2	<0.2	NA	5.0	5.0	100
PHENOLICS, TOTAL	MG/KG	91099926	<0.2	<0.2	NA	0.8	0.8	100

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc

METALS RESULTS

ATI I.D. : 910550

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

DATE RECEIVED : 10/06/89
REPORT DATE : 11/08/89

PARAMETER	UNITS	01	02
SILVER	MG/KG	<1.0	1.2
ARSENIC	MG/KG	1.8	2.9
BERYLLIUM	MG/KG	<0.5	<0.5
CADMIUM	MG/KG	0.8	1.4
CHROMIUM	MG/KG	2	10
COPPER	MG/KG	3.0	6.9
MERCURY	MG/KG	<0.02	0.02
NICKEL	MG/KG	<3	8
LEAD	MG/KG	5	14
ANTIMONY	MG/KG	<1.0	<1.0
SELENIUM	MG/KG	<0.5	<0.5
THALLIUM	MG/KG	<0.5	<0.5
ZINC	MG/KG	6.6	33.0

Analytical Technologies, Inc

METALS - QUALITY CONTROL

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE) ATI I.D. : 910550

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
SILVER	MG/KG	91055001	<1.0	<1.0	NA	25.0	25.0	100
ARSENIC	MG/KG	91055001	1.8	1.6	12	6.7	5.0	98
BERYLLIUM	MG/KG	91055001	<0.5	<0.5	NA	STDA	CC=	0.99
CADMIUM	MG/KG	91055001	0.8	0.8	0	23.5	25.0	91
CHROMIUM	MG/KG	91055001	2	2	0	89	100	87
COPPER	MG/KG	91055001	3.0	3.3	10	29.0	25.0	104
MERCURY	MG/KG	91056006	<0.02	<0.02	NA	0.49	0.50	98
NICKEL	MG/KG	91055001	<3	<3	NA	115	125	92
LEAD	MG/KG	91055001	5	5	0	272	250	107
ANTIMONY	MG/KG	91055001	<1.0	<1.0	NA	STDA	CC=	.999
SELENIUM	MG/KG	91055001	<0.5	<0.5	NA	4.5	5.0	90
THALLIUM	MG/KG	91055001	<0.5	<0.5	NA	STDA	CC=	.999
ZINC	MG/KG	91055001	6.6	7.0	6	25.1	20.0	92

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc

GAS CHROMATOGRAPHY - RESULTS

ATI I.D. : 91055001

TEST : ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: 2'	DATE ANALYZED	: 10/13/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
ALDRIN	<0.005
ALPHA - BHC	<0.005
BETA - BHC	<0.005
GAMMA - BHC	<0.005
DELTA - BHC	<0.005
CHLORDANE	<0.05
4,4'-DDD	<0.01
4,4'-DDE	<0.01
4,4'-DDT	<0.01
DIELDRIN	<0.01
ENDOSULFAN I	<0.01
ENDOSULFAN II	<0.01
ENDOSULFAN SULFATE	<0.01
ENDRIN	<0.01
ENDRIN ALDEHYDE	<0.01
ENDRIN KETONE	<0.01
HEPTACHLOR	<0.005
HEPTACHLOR EPOXIDE	<0.005
METHOXYCHLOR	<0.05
TOXAPHENE	<0.1
AROCLOR 1016	<0.05
AROCLOR 1221	<0.05
AROCLOR 1232	<0.05
AROCLOR 1242	<0.05
AROCLOR 1248	<0.05
AROCLOR 1254	<0.05
AROCLOR 1260	<0.05
SURROGATE PERCENT RECOVERIES	
ISODRIN (%)	84

Analytical Technologies, Inc

GAS CHROMATOGRAPHY - RESULTS

ATI I.D. : 91055002

TEST : ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: 2'8"	DATE ANALYZED	: 10/17/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 100

COMPOUNDS	RESULTS
ALDRIN	<0.50
ALPHA - BHC	<0.50
BETA - BHC	<0.50
GAMMA - BHC	<0.50
DELTA - BHC	<0.50
CHLORDANE	<5.0
4,4'-DDD	<1.0
4,4'-DDE	<1.0
4,4'-DDT	<1.0
DIELDRIN	<1.0
ENDOSULFAN I	<1.0
ENDOSULFAN II	<1.0
ENDOSULFAN SULFATE	<1.0
ENDRIN	<1.0
ENDRIN ALDEHYDE	<1.0
ENDRIN KETONE	<1.0
HEPTACHLOR	<0.50
HEPTACHLOR EPOXIDE	<0.50
METHOXYCHLOR	<5.0
TOXAPHENE	<10
AROCLOR 1016	<5.0
AROCLOR 1221	<5.0
AROCLOR 1232	<5.0
AROCLOR 1242	<5.0
AROCLOR 1248	<5.0
AROCLOR 1254	<5.0
AROCLOR 1260	<5.0

SURROGATE PERCENT RECOVERIES

ISODRIN (%)	**

** Due to the necessary dilution of the sample, result was not attainable

Analytical Technologies, Inc

GAS CHROMATOGRAPHY - RESULTS

REAGENT BLANK

TEST : ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

CLIENT	: D.B. STEPHENS & ASSOCIATES	ATI I.D.	: 910550
PROJECT #	: 89-031	DATE EXTRACTED	: 10/09/89
PROJECT NAME	: (NONE)	DATE ANALYZED	: 10/11/89
CLIENT I.D.	: REAGENT BLANK	UNITS	: MG/KG
		DILUTION FACTOR	: N/A

COMPOUNDS	RESULTS
ALDRIN	<0.005
ALPHA - BHC	<0.005
BETA - BHC	<0.005
GAMMA - BHC	<0.005
DELTA - BHC	<0.005
CHLORDANE	<0.05
4,4'-DDD	<0.01
4,4'-DDE	<0.01
4,4'-DDT	<0.01
DIELDRIN	<0.01
ENDOSULFAN I	<0.01
ENDOSULFAN II	<0.01
ENDOSULFAN SULFATE	<0.01
ENDRIN	<0.01
ENDRIN ALDEHYDE	<0.01
ENDRIN KETONE	<0.01
HEPTACHLOR	<0.005
HEPTACHLOR EPOXIDE	<0.005
METHOXYCHLOR	<0.05
TOXAPHENE	<0.1
AROCLOR 1016	<0.05
AROCLOR 1221	<0.05
AROCLOR 1232	<0.05
AROCLOR 1242	<0.05
AROCLOR 1248	<0.05
AROCLOR 1254	<0.05
AROCLOR 1260	<0.05

SURROGATE PERCENT RECOVERIES

ISODRIN (%)	78

Analytical Technologies, Inc

QUALITY CONTROL DATA

ATI I.D. : 910550

TEST : ORGANOCHLORINE PESTICIDES AND PCB'S (EPA 8080)

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

REF. I.D. : 91099904
DATE ANALYZED : 10/12/89
SAMPLE MATRIX : SOIL
UNITS : MG/KG

COMPOUNDS	SAMPLE RESULT	CONC. SPIKED	SPIKED SAMPLE	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
GAMMA BHC	ND	0.067	0.042	62	0.043	64	2
HEPTACHLOR	ND	0.067	0.041	61	0.044	66	7
ALDRIN	ND	0.067	0.043	64	0.044	66	2
DIELDRIN	ND	0.067	0.055	82	0.049	73	12
ENDRIN	ND	0.067	0.063	94	0.057	85	10
DDT	ND	0.067	0.064	96	0.059	88	8

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Spiked Sample Result} - \text{Duplicate Spike Sample Result})}{\text{Average of Spiked Sample}} \times 100$$

Analytical Technologies, Inc

GAS CHROMATOGRAPHY - RESULTS

ATI I.D. : 91055001

TEST : CHLORINATED HERBICIDES (EPA METHOD 8150)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/20/89
CLIENT I.D.	: 2'	DATE ANALYZED	: 10/14/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
2,4-D	<0.004
2,4,5-TP (SILVEX)	<0.002
2,4,5-T	<0.002
DINOSEB	<0.004
2,4-DB	<0.004
DICAMBA	<0.004
DICHLOROPROP	<0.004
MCPP	NA
MCPA	NA
DALAPON	NA

Analytical Technologies, Inc

GAS CHROMATOGRAPHY - RESULTS

ATI I.D. : 91055002

TEST : CHLORINATED HERBICIDES (EPA METHOD 8150)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/20/89
CLIENT I.D.	: 2'8"	DATE ANALYZED	: 10/14/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
2,4-D	<0.004
2,4,5-TP (SILVEX)	<0.002
2,4,5-T	0.0066 ←
DINOSEB	<0.004
2,4-DB	<0.004
DICAMBA	<0.004
DICHLOROPROP	<0.004
MCPP	NA
MCPA	NA
DALAPON	NA

Analytical Technologies, Inc

GAS CHROMATOGRAPHY - RESULTS

REAGENT BLANK

TEST : CHLORINATED HERBICIDES (EPA METHOD 8150)

CLIENT	: D.B. STEPHENS & ASSOCIATES	ATI I.D.	: 910550
PROJECT #	: 89-031	DATE EXTRACTED	: 10/11/89
PROJECT NAME	: (NONE)	DATE ANALYZED	: 10/11/89
CLIENT I.D.	: REAGENT BLANK	UNITS	: MG/KG
		DILUTION FACTOR	: N/A

COMPOUNDS	RESULTS
2,4-D	<0.004
2,4,5-TP (SILVEX)	<0.002
2,4,5-T	<0.002
DINOSEB	<0.004
2,4-DB	<0.004
DICAMBA	<0.004
DICHLOROPROP	<0.004
MCPP	NA
MCPA	NA
DALAPON	NA

Analytical Technologies, Inc

QUALITY CONTROL DATA

ATI I.D. : 910550

TEST : CHLORINATED HERBICIDES (EPA METHOD 8150)

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

REF. I.D. : 91099926
DATE ANALYZED : 10/12/89
SAMPLE MATRIX : SOIL
UNITS : MG/KG

COMPOUNDS	SAMPLE RESULT	CONC. SPIKED	SPIKED SAMPLE	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
2,4-D	ND	0.033	0.030	91	0.031	94	3
2,4,5-TP (SILVEX)	ND	0.033	0.024	73	0.023	70	4

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Spiked Sample Result} - \text{Duplicate Spike Sample Result})}{\text{Average of Spiked Sample}} \times 100$$

Analytical Technologies, Inc.

GCMS - RESULTS

ATI I.D. : 91055001

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/11/89
CLIENT I.D.	: 2'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4 (%)	96
BROMOFLUOROBENZENE (%)	113
TOLUENE-D8 (%)	98

Analytical Technologies, Inc

ADDITIONAL MAJOR COMPOUNDS

ATI I.D. : 91055001

ADDITIONAL MAJOR COMPOUNDS	RESULTS
NO ADDITIONAL COMPOUNDS	-

Analytical Technologies, Inc

GCMS - RESULTS

ATI I.D. : 91055002

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/11/89
CLIENT I.D.	: 2'8"	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	<0.3
ACETONE	<0.50
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4 (%)	110
BROMOFLUOROBENZENE (%)	106
TOLUENE-D8 (%)	104

Analytical Technologies, Inc

ADDITIONAL MAJOR COMPOUNDS

ATI I.D. : 91055002

ADDITIONAL MAJOR COMPOUNDS	RESULTS
NO ADDTIONAL COMPOUNDS	-

Analytical Technologies, Inc

GCMS - RESULTS

REAGENT BLANK

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT	: D.B. STEPHENS & ASSOCIATES	ATI I.D.	: 910550
PROJECT #	: 89-031	DATE EXTRACTED	: 10/11/89
PROJECT NAME	: (NONE)	DATE ANALYZED	: 10/11/89
CLIENT I.D.	: REAGENT BLANK	UNITS	: MG/KG
		DILUTION FACTOR	: N/A

COMPOUNDS	RESULTS
CHLOROMETHANE	<0.50
BROMOMETHANE	<0.50
VINYL CHLORIDE	<0.05
CHLOROETHANE	<0.05
METHYLENE CHLORIDE	0.4
ACETONE	0.5
CARBON DISULFIDE	<0.05
1,1-DICHLOROETHENE	<0.05
1,1-DICHLOROETHANE	<0.05
1,2-DICHLOROETHENE (TOTAL)	<0.05
CHLOROFORM	<0.05
1,2-DICHLOROETHANE	<0.05
2-BUTANONE (MEK)	<0.50
1,1,1-TRICHLOROETHANE	<0.05
CARBON TETRACHLORIDE	<0.05
VINYL ACETATE	<0.50
BROMODICHLOROMETHANE	<0.05
1,1,2,2-TETRACHLOROETHANE	<0.05
1,2-DICHLOROPROPANE	<0.05
TRANS-1,3-DICHLOROPROPENE	<0.05
TRICHLOROETHENE	<0.05
DIBROMOCHLOROMETHANE	<0.05
1,1,2-TRICHLOROETHANE	<0.05
BENZENE	<0.05
CIS-1,3-DICHLOROPROPENE	<0.05
2-CHLOROETHYLVINYLETHER	<0.50
BROMOFORM	<0.3
2-HEXANONE (MBK)	<0.50
4-METHYL-2-PENTANONE (MIBK)	<0.50
TETRACHLOROETHENE	<0.05
TOLUENE	<0.05
CHLOROBENZENE	<0.05
ETHYLBENZENE	<0.05
STYRENE	<0.05
TOTAL XYLENES	<0.05

SURROGATE PERCENT RECOVERIES

1,2-DICHLOROETHANE-D4 (%)	102
BROMOFLUOROBENZENE (%)	105
TOLUENE-D8 (%)	97

Analytical Technologies, Inc

QUALITY CONTROL DATA

ATI I.D. : 910550

TEST : VOLATILE ORGANICS (EPA 8240)

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

REF. I.D. : 91055001
DATE ANALYZED : 10/11/89
SAMPLE MATRIX : NON-AQUEOUS
UNITS : MG/KG

COMPOUNDS	SAMPLE RESULT	CONC. SPIKED	SPIKED SAMPLE	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
1,1-DICHLOROETHENE	ND	2.5	2.7	108	2.7	108	0
TRICHLOROETHENE	ND	2.5	2.6	104	2.7	108	4
CHLOROBENZENE	ND	2.5	2.6	104	2.8	112	7
TOLUENE	ND	2.5	2.5	100	2.7	108	8
BENZENE	ND	2.5	2.8	112	2.8	112	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Spiked Sample Result} - \text{Duplicate Spike Sample Result})}{\text{Average of Spiked Sample}} \times 100$$

Analytical Technologies, Inc

GCMS - RESULTS

ATI I.D. : 91055001

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: 2'	DATE ANALYZED	: 10/14/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.17
PHENOL	<0.17
ANILINE	<0.17
BIS(2-CHLOROETHYL)ETHER	<0.17
2-CHLOROPHENOL	<0.17
1,3-DICHLOROBENZENE	<0.17
1,4-DICHLOROBENZENE	<0.17
BENZYL ALCOHOL	<0.17
1,2-DICHLOROBENZENE	<0.17
2-METHYLPHENOL	<0.17
BIS(2-CHLOROISOPROPYL)ETHER	<0.17
4-METHYLPHENOL	<0.17
N-NITROSO-DI-N-PROPYLAMINE	<0.17
HEXACHLOROETHANE	<0.17
NITROBENZENE	<0.17
ISOPHORONE	<0.17
2-NITROPHENOL	<0.17
2,4-DIMETHYLPHENOL	<0.17
BENZOIC ACID	<0.85
BIS(2-CHLOROETHOXY)METHANE	<0.17
2,4-DICHLOROPHENOL	<0.17
1,2,4-TRICHLOROBENZENE	<0.17
NAPHTHALENE	<0.17
4-CHLOROANILINE	<0.17
HEXACHLOROBUTADIENE	<0.17
4-CHLORO-3-METHYLPHENOL	<0.17
2-METHYLNAPHTHALENE	<0.17
HEXACHLOROCYCLOPENTADIENE	<0.17
2,4,6-TRICHLOROPHENOL	<0.17
2,4,5-TRICHLOROPHENOL	<0.85
2-CHLORONAPHTHALENE	<0.17
2-NITROANILINE	<0.85
DIMETHYLPHTHALATE	<0.17
ACENAPHTHYLENE	<0.17
3-NITROANINLINE	<0.85
ACENAPHTHENE	<0.17
2,4-DINITROPHENOL	<0.85
4-NITROPHENOL	<0.85
DIBENZOFURAN	<0.17
2,4-DINITROTOLUENE	<0.17
2,6-DINITROTOLUENE	<0.17

(CONTINUED NEXT PAGE)

Analytical Technologies, Inc

GCMS - RESULTS

ATI I.D. : 91055001

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

COMPOUNDS	RESULTS
DIETHYLPHTHALATE	<0.17
4-CHLOROPHENYL-PHENYLETHER	<0.17
FLUORENE	<0.17
4-NITROANILINE	<0.85
4,6-DINITRO-2-METHYLPHENOL	<0.85
N-NITROSODIPHENYLAMINE	<0.17
4-BROMOPHENYL-PHENYLETHER	<0.17
HEXACHLOROBENZENE	<0.17
PENTACHLOROPHENOL	<0.85
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
DI-N-BUTYLPHTHALATE	<0.17
FLUORANTHENE	<0.17
BENZIDINE	<1.7
PYRENE	<0.17
BUTYLBENZYLPHTHALATE	<0.17
3,3-DICHLOROBENZIDINE	<0.34
BENZO(a)ANTHRACENE	<0.17
BIS(2-ETHYLHEXYL)PHTHALATE	<0.17
CHRYSENE	<0.17
DI-N-OCTYLPHTHALATE	<0.17
BENZO(b)FLUORANTHENE	<0.17
BENZO(k)FLUORANTHENE	<0.17
BENZO(a)PYRENE	<0.17
INDENO(1,2,3-cd)PYRENE	<0.17
DIBENZO(a,h)ANTHRACENE	<0.17
BENZO(g,h,i)PERYLENE	<0.17

SURROGATE PERCENT RECOVERIES

NITROBENZENE-D5 (%)	58
2-FLUOROBIPHENYL (%)	56
TERPHENYL (%)	67
PHENOL-D5 (%)	49
2-FLUOROPHENOL (%)	51
2,4,6-TRIBROMOPHENOL (%)	54

Analytical Technologies, Inc

ADDITIONAL MAJOR COMPOUNDS

ATI I.D. : 91055001

ADDITIONAL MAJOR COMPOUNDS	RESULTS
NO ADDITIONAL COMPOUNDS	

Analytical Technologies, Inc

GCMS - RESULTS

ATI I.D. : 91055002

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

CLIENT	: D.B. STEPHENS & ASSOCIATES	DATE SAMPLED	: 10/04/89
PROJECT #	: 89-031	DATE RECEIVED	: 10/06/89
PROJECT NAME	: (NONE)	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: 2'8"	DATE ANALYZED	: 10/14/89
SAMPLE MATRIX	: NON-AQUEOUS	UNITS	: MG/KG
		DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.17
PHENOL	<0.17
ANILINE	<0.17
BIS(2-CHLOROETHYL)ETHER	<0.17
2-CHLOROPHENOL	<0.17
1,3-DICHLOROBENZENE	<0.17
1,4-DICHLOROBENZENE	<0.17
BENZYL ALCOHOL	<0.17
1,2-DICHLOROBENZENE	<0.17
2-METHYLPHENOL	<0.17
BIS(2-CHLOROISOPROPYL)ETHER	<0.17
4-METHYLPHENOL	<0.17
N-NITROSO-DI-N-PROPYLAMINE	<0.17
HEXACHLOROETHANE	<0.17
NITROBENZENE	<0.17
ISOPHORONE	<0.17
2-NITROPHENOL	<0.17
2,4-DIMETHYLPHENOL	<0.17
BENZOIC ACID	<0.85
BIS(2-CHLOROETHOXY)METHANE	<0.17
2,4-DICHLOROPHENOL	<0.17
1,2,4-TRICHLOROBENZENE	<0.17
NAPHTHALENE	<0.17
4-CHLOROANILINE	<0.17
HEXACHLOROBUTADIENE	<0.17
4-CHLORO-3-METHYLPHENOL	<0.17
2-METHYLNAPHTHALENE	<0.17
HEXACHLOROCYCLOPENTADIENE	<0.17
2,4,6-TRICHLOROPHENOL	<0.17
2,4,5-TRICHLOROPHENOL	<0.85
2-CHLORONAPHTHALENE	<0.17
2-NITROANILINE	<0.85
DIMETHYLPHTHALATE	<0.17
ACENAPHTHYLENE	<0.17
3-NITROANINLINE	<0.85
ACENAPHTHENE	<0.17
2,4-DINITROPHENOL	<0.85
4-NITROPHENOL	<0.85
DIBENZOFURAN	<0.17
2,4-DINITROTOLUENE	<0.17
2,6-DINITROTOLUENE	<0.17

(CONTINUED NEXT PAGE)

Analytical Technologies, Inc

GCMS - RESULTS

ATI I.D. : 91055002

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

COMPOUNDS	RESULTS
DIETHYLPHTHALATE	<0.17
4-CHLOROPHENYL-PHENYLETHER	<0.17
FLUORENE	<0.17
4-NITROANILINE	<0.85
4,6-DINITRO-2-METHYLPHENOL	<0.85
N-NITROSODIPHENYLAMINE	<0.17
4-BROMOPHENYL-PHENYLETHER	<0.17
HEXACHLOROBENZENE	<0.17
PENTACHLOROPHENOL	<0.85
PHENANTHRENE	0.33
ANTHRACENE	<0.17
DI-N-BUTYLPHTHALATE	<0.17
FLUORANTHENE	0.66
BENZIDINE	<1.7
PYRENE	0.33
BUTYLBENZYLPHTHALATE	<0.17
3,3-DICHLOROBENZIDINE	<0.34
BENZO(a)ANTHRACENE	0.25
BIS(2-ETHYLHEXYL)PHTHALATE	0.17
CHRYSENE	TR
DI-N-OCTYLPHTHALATE	<0.17
BENZO(b)FLUORANTHENE	0.19
BENZO(k)FLUORANTHENE	TR
BENZO(a)PYRENE	0.18
INDENO(1,2,3-cd)PYRENE	<0.17
DIBENZO(a,h)ANTHRACENE	<0.17
BENZO(g,h,i)PERYLENE	<0.17

SURROGATE PERCENT RECOVERIES

NITROBENZENE-D5 (%)	54
2-FLUOROBIPHENYL (%)	51
TERPHENYL (%)	50
PHENOL-D5 (%)	42
2-FLUOROPHENOL (%)	41
2,4,6-TRIBROMOPHENOL (%)	44

TR - Compound detected at an unquantifiable trace level

Analytical Technologies, Inc

ADDITIONAL MAJOR COMPOUNDS

ATI I.D. : 91055002

ADDITIONAL MAJOR COMPOUNDS	RESULTS
NO ADDITIONAL COMPOUNDS	

Analytical Technologies, Inc

GCMS - RESULTS

REAGENT BLANK

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

CLIENT	: D.B. STEPHENS & ASSOCIATES	ATI I.D.	: 910550
PROJECT #	: 89-031	DATE EXTRACTED	: 10/11/89
PROJECT NAME	: (NONE)	DATE ANALYZED	: 10/14/89
CLIENT I.D.	: REAGENT BLANK	UNITS	: MG/KG
		DILUTION FACTOR	: N/A

COMPOUNDS	RESULTS
N-NITROSODIMETHYLAMINE	<0.17
PHENOL	<0.17
ANILINE	<0.17
BIS(2-CHLOROETHYL)ETHER	<0.17
2-CHLOROPHENOL	<0.17
1,3-DICHLOROBENZENE	<0.17
1,4-DICHLOROBENZENE	<0.17
BENZYL ALCOHOL	<0.17
1,2-DICHLOROBENZENE	<0.17
2-METHYLPHENOL	<0.17
BIS(2-CHLOROISOPROPYL)ETHER	<0.17
4-METHYLPHENOL	<0.17
N-NITROSO-DI-N-PROPYLAMINE	<0.17
HEXACHLOROETHANE	<0.17
NITROBENZENE	<0.17
ISOPHORONE	<0.17
2-NITROPHENOL	<0.17
2,4-DIMETHYLPHENOL	<0.17
BENZOIC ACID	<0.85
BIS(2-CHLOROETHOXY)METHANE	<0.17
2,4-DICHLOROPHENOL	<0.17
1,2,4-TRICHLOROBENZENE	<0.17
NAPHTHALENE	<0.17
4-CHLOROANILINE	<0.17
HEXACHLOROBUTADIENE	<0.17
4-CHLORO-3-METHYLPHENOL	<0.17
2-METHYLNAPHTHALENE	<0.17
HEXACHLOROCYCLOPENTADIENE	<0.17
2,4,6-TRICHLOROPHENOL	<0.17
2,4,5-TRICHLOROPHENOL	<0.85
2-CHLORONAPHTHALENE	<0.17
2-NITROANILINE	<0.85
DIMETHYLPHTHALATE	<0.17
ACENAPHTHYLENE	<0.17
3-NITROANINLINE	<0.85
ACENAPHTHENE	<0.17
2,4-DINITROPHENOL	<0.85
4-NITROPHENOL	<0.85
DIBENZOFURAN	<0.17
2,4-DINITROTOLUENE	<0.17
2,6-DINITROTOLUENE	<0.17
DIETHYLPHTHALATE	<0.17
4-CHLOROPHENYL-PHENYLETHER	<0.17

(CONTINUED NEXT PAGE)

Analytical Technologies, Inc

GCMS - RESULTS

REAGENT BLANK

ATI I.D. : 910550

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

COMPOUNDS	RESULTS
FLUORENE	<0.17
4-NITROANILINE	<0.85
4,6-DINITRO-2-METHYLPHENOL	<0.85
N-NITROSODIPHENYLAMINE	<0.17
4-BROMOPHENYL-PHENYLETHER	<0.17
HEXACHLOROBENZENE	<0.17
PENTACHLOROPHENOL	<0.85
PHENANTHRENE	<0.17
ANTHRACENE	<0.17
DI-N-BUTYLPHTHALATE	<0.17
FLUORANTHENE	<0.17
BENZIDINE	<1.7
PYRENE	<0.17
BUTYLBENZYLPHTHALATE	<0.17
3,3-DICHLOROBENZIDINE	<0.34
BENZO(a)ANTHRACENE	<0.17
BIS(2-ETHYLHEXYL)PHTHALATE	<0.17
CHRYSENE	<0.17
DI-N-OCTYLPHTHALATE	<0.17
BENZO(b)FLUORANTHENE	<0.17
BENZO(k)FLUORANTHENE	<0.17
BENZO(a)PYRENE	<0.17
INDENO(1,2,3-cd)PYRENE	<0.17
DIBENZO(a,h)ANTHRACENE	<0.17
BENZO(g,h,i)PERYLENE	<0.17

SURROGATE PERCENT RECOVERIES

NITROBENZENE-D5 (%)	60
2-FLUOROBIPHENYL (%)	60
TERPHENYL (%)	72
PHENOL-D5 (%)	47
2-FLUOROPHENOL (%)	46
2,4,6-TRIBROMOPHENOL (%)	51

Analytical Technologies, Inc

QUALITY CONTROL DATA

ATI I.D. : 910550

TEST : SEMI-VOLATILE ORGANICS (EPA 8270)

CLIENT : D.B. STEPHENS & ASSOCIATES
PROJECT # : 89-031
PROJECT NAME : (NONE)

REF. I.D. : 91099911
DATE ANALYZED : 10/13/89
SAMPLE MATRIX : SOIL
UNITS : MG/KG

COMPOUNDS	SAMPLE RESULT	CONC. SPIKED	SPIKED SAMPLE	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
1,2,4-TRICHLOROBENZENE	ND	1.67	1.26	75	1.10	66	13
ACENAPHTHENE	ND	1.67	0.90	54	0.80	48	12
2,4-DINITROTOLUENE	ND	1.67	0.93	56	0.83	50	11
PYRENE	ND	1.67	1.36	82	1.12	67	20
N-NITROSO-DI-N-PROPYLAMINE	ND	1.67	0.77	46	0.63	38	19
1,4-DICHLOROBENZENE	ND	1.67	1.43	86	1.27	76	12
PENTACHLOROPHENOL	ND	3.33	1.63	49	1.73	52	6
PHENOL	ND	3.33	1.93	58	1.60	48	19
2-CHLOROPHENOL	ND	3.33	2.02	61	1.70	51	18
4-CHLORO-3-METHYLPHENOL	ND	3.33	2.33	70	1.87	56	22
4-NITROPHENOL	ND	3.33	1.20	36	1.07	32	12

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Spiked Sample Result} - \text{Duplicate Spike Sample Result})}{\text{Average of Spiked Sample}} \times 100$$

DANIEL B. STEPHENS & ASSOCIATES, INC.

CHAIN OF CUSTODY RECORD

Proj No.	Project Name													
89-031	Enecal-Hobbs													
Samplers (Signature)														
Sta. No.	Date	Time	Grab	Comp.	Station Location	No. of Containers	Priority Pollutants Scan	8240						Remarks
	10/4/89	1455	SOIL		2'	2	X	X						REFER TO PO No 1003-03
	10/4/89	15--	SOIL		6'	2								

Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Paul Simpson	10/5/89 8:20	E Goodrich			
Relinquished by: (Signature)	Date Time	Received by: (Signature)	Relinquished by: (Signature)	Date Time	Received by: (Signature)
Relinquished by: (Signature)	Date Time	Received for Laboratory by: (Signature)		Remarks	address from casing: 510 S. Hwy 83 Socorro NM 87801

Figure 2

APPENDIX F

4108 DEL MONTE FINE SAND

LIAROPOULOS,A.C.,(1968).THEORETICAL APPROACH OF THE INFILITRATION PROBLEM. BULL. OF IASH,VOL.11,1

DESCRIPTION OF SOIL AND EXPERIMENTS

BULK DENS.=1.724 GR/CM**3 THETA SAT=29.3 KSAT=4.39E-04 CM/SEC

UNITS:PSI(CM H20),K (CM/SEC)

	FIRST DRYING		MAIN WETTING		WETTING=DRYING	
	THETA	PSI	THETA	PSI	THETA	K/KSAT
1	4.000E 00	3.980E 02	4.000E 00	3.980E 02	5.000E 00	7.620E-03
2	4.800E 00	3.125E 02	4.800E 00	3.125E 02	7.500E 00	1.825E-02
3	5.000E 00	3.000E 02	5.000E 00	3.000E 02	1.000E 01	3.800E-02
4	5.500E 00	2.825E 02	5.500E 00	2.500E 02	1.250E 01	9.500E-02
5	6.100E 00	2.600E 02	6.500E 00	2.000E 02	1.500E 01	1.630E-01
6	7.500E 00	2.250E 02	7.500E 00	1.495E 02	1.750E 01	2.470E-01
7	9.000E 00	2.000E 02	9.000E 00	1.000E 02	2.000E 01	3.770E-01
8	1.000E 01	1.850E 02	1.000E 01	9.000E 01	2.250E 01	5.230E-01
9	1.250E 01	1.600E 02	1.250E 01	8.000E 01	2.500E 01	6.845E-01
10	1.500E 01	1.425E 02	1.500E 01	7.400E 01	2.750E 01	9.560E-01
11	1.750E 01	1.295E 02	1.750E 01	6.900E 01	2.975E 01	1.000E 00
12	2.000E 01	1.200E 02	2.000E 01	6.200E 01		
13	2.250E 01	1.100E 02	2.250E 01	5.500E 01		
14	2.500E 01	1.000E 02	2.500E 01	4.550E 01		
15	2.750E 01	8.750E 01	2.750E 01	3.850E 01		
16	2.800E 01	8.000E 01	2.800E 01	3.550E 01		
17	2.850E 01	6.500E 01	2.850E 01	3.250E 01		
18	2.900E 01	5.250E 01	2.900E 01	2.950E 01		
19	2.950E 01	2.500E 01	2.950E 01	2.300E 01		
20	2.975E 01	1.225E 01	2.975E 01	1.225E 01		
21	2.980E 01	5.000E 00	2.980E 01	5.000E 00		

	MAIN WETTING		MAIN DRYING	
	THETA	D	THETA	D
1	1.250E-02	6.400E-01	1.250E-02	4.100E-01
2	2.500E-02	9.000E-01	2.500E-02	5.000E-01
3	3.750E-02	1.300E 00	3.750E-02	6.200E-01
4	5.000E-02	1.800E 00	5.000E-02	7.600E-01
5	6.250E-02	2.400E 00	6.250E-02	9.000E-01
6	7.500E-02	2.900E 00	7.500E-02	1.100E 00
7	8.750E-02	2.300E 00	8.750E-02	1.300E 00
8	9.000E-02	1.800E 00	9.000E-02	1.325E 00
9	1.000E-01	8.000E-01	1.000E-01	1.500E 00
10	1.125E-01	6.800E-01	1.125E-01	1.800E 00
11	1.250E-01	7.500E-01	1.250E-01	2.100E 00
12	1.500E-01	1.100E 00	1.500E-01	2.700E 00
13	1.750E-01	1.600E 00	1.750E-01	3.100E 00
14	1.875E-01	1.950E 00	1.875E-01	3.400E 00
15	2.000E-01	2.250E 00	2.000E-01	3.700E 00
16	2.250E-01	2.400E 00	2.250E-01	4.000E 00
17	2.400E-01	4.300E 00	2.400E-01	6.000E 00
18	2.500E-01	4.900E 00	2.500E-01	7.400E 00
19	2.625E-01	6.000E 00	2.625E-01	1.200E 01
20	2.750E-01	9.000E 00	2.750E-01	2.500E 01
21	2.800E-01	1.250E 01	2.800E-01	3.500E 01
22	2.850E-01	2.000E 01	2.850E-01	5.500E 01
23	2.875E-01	2.300E 01	2.875E-01	8.000E 01
24	2.900E-01	4.000E 01	2.900E-01	1.100E 02
25	2.950E-01	2.400E 02	2.950E-01	2.400E 02

APPENDIX G

A2. Governing Equation $R\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2} - v\frac{\partial c}{\partial x}$

Initial and Boundary Conditions

$c(x,0) = C_i$

$$(-D\frac{\partial c}{\partial x} + vc)\Big|_{x=0} = \begin{cases} vC_o & 0 < t \leq t_o \\ 0 & t > t_o \end{cases}$$

$$\frac{\partial c}{\partial x}(\infty,t) = 0$$

Analytical Solution (Mason and Weaver *1924*, Lindstrom et al. *1967*, Gershon and Nir *1969*).

$$c(x,t) = \begin{cases} C_i + (C_o - C_i)\,A(x,t) & 0 < t \leq t_o \\ C_i + (C_o - C_i)\,A(x,t) - C_o\,A(x,t-t_o) & t > t_o \end{cases}$$

where

$$A(x,t) = \frac{1}{2}\,\mathrm{erfc}\left[\frac{Rx - vt}{2(DRt)^{1/2}}\right] + \left(\frac{v^2 t}{\pi DR}\right)^{1/2} \exp\left[-\frac{(Rx - vt)^2}{4DRt}\right]$$

$$- \frac{1}{2}\left(1 + \frac{vx}{D} + \frac{v^2 t}{DR}\right) \exp(vx/D)\,\mathrm{erfc}\left[\frac{Rx + vt}{2(DRt)^{1/2}}\right]$$

A3. Governing Equation $R\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2} - v\frac{\partial c}{\partial x}$

Initial and Boundary Conditions

$c(x,0) = C_i$

$$c(0,t) = \begin{cases} C_o & 0 < t \leq t_o \\ 0 & t > t_o \end{cases}$$

$$\frac{\partial c}{\partial x}(L,t) = 0$$

Analytical Solution (Cleary and Adrian *1973*).

$$c(x,t) = \begin{cases} C_i + (C_o - C_i)\,A(x,t) & 0 < t \leq t_o \\ C_i + (C_o - C_i)\,A(x,t) - C_o\,A(x,t-t_o) & t > t_o \end{cases}$$

where

$$A(x,t) = 1 - \sum_{m=1}^{\infty} \frac{2\beta_m \sin(\frac{\beta_m x}{L}) \exp[\frac{vx}{2D} - \frac{v^2 t}{4DR} - \frac{\beta_m^2 Dt}{L^2 R}]}{[\beta_m^2 + (\frac{vL}{2D})^2 + \frac{vL}{2D}]}$$

and where the eigenvalues β_m are the positive roots of the equation

$$\beta_m \cot(\beta_m) + \frac{vL}{2D} = 0$$

Approximate Solution

$$A(x,t) = \frac{1}{2}\,\mathrm{erfc}\left[\frac{Rx - vt}{2(DRt)^{1/2}}\right] + \frac{1}{2}\exp(vx/D)\,\mathrm{erfc}\left[\frac{Rx + vt}{2(DRt)^{1/2}}\right]$$

$$+ \frac{1}{2}\left[2 + \frac{v(2L - x)}{D} + \frac{v^2 t}{DR}\right]\exp(vL/D)\,\mathrm{erfc}\left[\frac{R(2L-x) + vt}{2(DRt)^{1/2}}\right]$$

$$- \left(\frac{v^2 t}{\pi DR}\right)^{1/2}\exp\left[\frac{vL}{D} - \frac{R}{4Dt}(2L - x + \frac{vt}{R})^2\right]$$

A4. Governing Equation

$$R\frac{\partial c}{\partial t} = D\frac{\partial^2 c}{\partial x^2} - v\frac{\partial c}{\partial x}$$

Initial and Boundary Conditions

$$c(x,0) = C_i$$

$$\left(-D\frac{\partial c}{\partial x} + vc\right)\Big|_{x=0} = \begin{cases} vC_o & 0 < t < t_o \\ 0 & t > t_o \end{cases}$$

$$\frac{\partial c}{\partial x}(L,t) = 0$$

Analytical Solution (Brenner *1962*, see also Bastian and Lapidus *1956*).

$$c(x,t) = \begin{cases} C_i + (C_o - C_i)\,A(x,t) & 0 < t < t_o \\ C_i + (C_o - C_i)\,A(x,t) - C_o\,A(x,t-t_o) & t > t_o \end{cases}$$

where

$$A(x,t) =$$

$$1 - \sum_{m=1}^{\infty} \frac{\frac{2vL}{D}\,\beta_m\left[\beta_m \cos(\frac{\beta_m x}{L}) + \frac{vL}{2D}\sin(\frac{\beta_m x}{L})\right]\exp\left[\frac{vx}{2D} - \frac{v^2 t}{4DR} - \frac{\beta_m^2 Dt}{L^2 R}\right]}{\left[\beta_m^2 + (\frac{vL}{2D})^2 + \frac{vL}{D}\right]\left[\beta_m^2 + (\frac{vL}{2D})^2\right]}$$

and where the eigenvalues β_m are the positive roots of

$$\beta_m \cot(\beta_m) - \frac{\beta_m^2 D}{vL} + \frac{vL}{4D} = 0$$

```
************************************************************************
*                                                                      *
*        ONE-DIMENSIONAL CONVECTIVE-DISPERSIVE EQUATION                *
*                                                                      *
*        SEMI-INFINITE PROFILE                                         *
*        NO PRODUCTION AND DECAY                                       *
*        LINEAR ADSORPTION (R)                                         *
*        CONSTANT INITIAL CONCENTRATION (CI)                           *
*        INPUT CONCENTRATION = CO (T.LE.TO)                            *
*                            =  0 (T.GT.TO)                            *
*                                                                      *
*        EXAMPLE A1-2                                                  *
*                                                                      *
************************************************************************

INPUT PARAMETERS
================

V  =    25.0000          D  =    37.5000
R  =     3.0000          TO =     5.0000
CI =     0.0             CO =     1.0000
```

DISTANCE (X)	TIME (T)	PORE VOLUME (VVO)	CONCENTRATION FIRST-TYPE BC	CONCENTRATION THIRD-TYPE BC
100.0000	1.0000	0.2500	0.0000	0.0000
100.0000	2.0000	0.5000	0.0000	0.0000
100.0000	3.0000	0.7500	0.0000	0.0000
100.0000	4.0000	1.0000	0.0000	0.0000
100.0000	5.0000	1.2500	0.0000	0.0000
100.0000	6.0000	1.5000	0.0000	0.0000
100.0000	7.0000	1.7500	0.0010	0.0008
100.0000	8.0000	2.0000	0.0113	0.0088
100.0000	9.0000	2.2500	0.0563	0.0465
100.0000	10.0000	2.5000	0.1655	0.1439
100.0000	11.0000	2.7500	0.3378	0.3059
100.0000	12.0000	3.0000	0.5332	0.4987
100.0000	13.0000	3.2500	0.6975	0.6700
100.0000	14.0000	3.5000	0.7602	0.7684
100.0000	15.0000	3.7500	0.7509	0.7592
100.0000	16.0000	4.0000	0.6228	0.6474
100.0000	17.0000	4.2500	0.4485	0.4795
100.0000	18.0000	4.5000	0.2840	0.3124
100.0000	19.0000	4.7500	0.1607	0.1816
100.0000	20.0000	5.0000	0.0825	0.0956
100.0000	21.0000	5.2500	0.0389	0.0462
100.0000	22.0000	5.5000	0.0171	0.0208
100.0000	23.0000	5.7500	0.0071	0.0088
100.0000	24.0000	6.0000	0.0028	0.0035
100.0000	25.0000	6.2500	0.0010	0.0013
100.0000	26.0000	6.5000	0.0004	0.0005
100.0000	27.0000	6.7500	0.0001	0.0002
100.0000	28.0000	7.0000	0.0000	0.0001
100.0000	29.0000	7.2500	0.0000	0.0000
100.0000	30.0000	7.5000	0.0000	0.0000

Table 7.—Fortran listing of computer program A3. The function EXF is listed in table 4

MAIN

```
C
C
C
C    ****************************************************************
C    *                                                              *
C    *    ONE-DIMENSIONAL CONVECTIVE DISPERSIVE EQUATION       A3   *
C    *                                                              *
C    *    FIRST-TYPE BOUNDARY CONDITION                             *
C    *    FINITE PROFILE                                            *
C    *                                                              *
C    *    NO PRODUCTION OR DECAY                                    *
C    *    LINEAR ADSORPTION (R)                                     *
C    *    CONSTANT INITIAL CONCENTRATION (CI)                       *
C    *    INPUT CONCENTRATION    = CO (T.LE.TO)                     *
C    *                           =  0 (T.GT.TO)                     *
C    *                                                              *
C    ****************************************************************
C
      IMPLICIT REAL*8 (A-H,C-Z)
      COMMON G(20)
      DIMENSION TITLE(20)
C
C     ----- READ NUMBER OF CURVES TO BE GENERATED -----
      READ(5,1000) NC
      DO 4 K=1,NC
      READ(5,1001) TITLE
      WRITE(6,1002) TITLE
C     ----- READ AND WRITE INPUT PARAMETERS -----
      READ(5,1003) V,D,R,TO,CI,CO,TOL
      READ(5,1003) XI,DX,XM,XL,TI,DT,TM
      WRITE(6,1004) V,D,R,TO,CI,CO,XL,TOL
C
C     ---------------
      D=D/R
      V=V/R
      IF(DX.EQ.0.) DX=1.0
      IF(DT.EQ.0.) DT=1.0
      XM=DMIN1(XM,XL)
      P=V*XL/D
      IMAX=(XM+DX-XI)/DX
      JMAX=(TM+DT-TI)/DT
      IF(P.LE.100.) CALL EIGEN1(P)
      DO 4 J=1,JMAX
      TIME=TI+(J-1)*DT
      IF(IMAX.GE.J) WRITE(6,1005)
      DO 4 I=1,IMAX
      X=XI+(I-1)*DX
```

```
      VVO=0.0
      IF(X.EQ.0.) GO TO 1
      VVO=V*R*TIME/X
    1 DO 2 M=1,2
      C=0.0
      T=TIME+(1-M)*TO
      IF(T.LE.0.) GO TO 2
      CALL CONS(C,V,D,X,T,XL,TOL,N)
      IF(M.EQ.2) GO TO 3
      CONC=CI+(CO-CI)*C
    2 CONTINUE
    3 CONC=CONC-CO*C
    4 WRITE(6,1006) X,TIME,VVC,CONC,N
C
C     ----------------
 1000 FORMAT(I5)
 1001 FORMAT(20A4)
 1002 FORMAT(1H1,10X,82(1H*)/11X,1H*,80X,1H*/11X,1H*,9X,'ONE-DIMENSIONAL
     1 CONVECTIVE-DISPERSIVE EQUATION',25X,1H*/11X,1H*,80X,1H*/11X,1H*,9
     2X,'FIRST-TYPE BOUNDARY CONDITION',42X,1H*/11X,1H*,9X,'FINITE PROFI
     3LE',57X,1H*/11X,1H*,80X,1H*/11X,1H*,9X,'NO PRODUCTION OR DECAY',49
     4X,1H*/11X,1H*,9X,'LINEAR ADSORPTION (R)',50X,1H*/11X,1H*,9X,'CONST
     5ANT INITIAL CONCENTRATION (CI)',36X,1H*/11X,1H*,9X,'INPUT CONCENTR
     6ATION = CO (T.LE.TO)',37X,1H*/11X,1H*,29X,'=  0 (T.GT.TO)',37X,1H*
     7/11X,1H*,80X,1H*/11X,1H*,20A4,1H*/11X,1H*,80X,1H*/11X,82(1H*))
 1003 FORMAT(8F10.0)
 1004 FORMAT(//11X,'INPUT PARAMETERS'/11X,16(1H=)//11X,'V =',F12.4,15X,'
     1D =',F12.4/11X,'R =',F12.4,15X,'TO =',F11.4/11X,'CI =',F11.4,15X,'
     2CO =',F11.4/11X,'XL =',F11.4,15X,'TOL =',F10.6)
 1005 FORMAT(///11X,'DISTANCE',11X,'TIME',7X,'PORE VOLUME',6X,'CONCENTRA
     1TION',3X,'NUMBER'/14X,'(X)',13X,'(T)',11X,'(VVO)',14X,'(C)',7X,'OF
     2 TERMS')
 1006 FORMAT(4X,3(5X,F10.4),8X,F10.4,7X,I4)
      STOP
      END
```



```
      SUBROUTINE EIGEN1(P)
C
C     PURPOSE: TO CALCULATE THE EIGENVALUES
C
      IMPLICIT REAL*8 (A-H,O-Z)
      COMMON G(20)
      BETA=0.1
      DO 4 I=1,20
      J=0
    1 J=J+1
      IF(J.GT.15) GO TO 3
      DELTA=-0.2*(-0.5)**J
    2 BET2=BETA
      BETA=BETA+DELTA
      A=BET2*DCOS(BET2)+0.5*P*DSIN(BET2)
      B=BETA*DCOS(BETA)+0.5*P*DSIN(BETA)
      IF(A*B) 1,3,2
    3 G(I)=(BET2*B-BETA*A)/(B-A)
    4 BETA=BETA+0.2
      WRITE(6,1000) (G(I),I=1,20)
 1000 FORMAT(//11X,'CALCULATED EIGENVALUES'/11X,22(1H=)/(8X,5F12.6/))
      RETURN
      END
```

CONS

```
      SUBROUTINE CONS(C,V,D,X,T,XL,TOL,I)
C
C     PURPOSE: TO CALCULATE CONCENTRATION C
C
      IMPLICIT REAL*8 (A-H,C-Z)
      COMMON G(20)
      I=0
      P=V*XL/D
      Q=V*X/D
      APRX=X/XL-0.9+8./P
      IF(APRX.LT.0.) GO TO 4
      IF((P.GT.100.).OR.((P-40.*V*T/XL).GT.5.)) GO TO 4
      EX=0.5*Q-0.25*V*V*T/D
C
C     -----SERIES SOLUTION-----
      SUM=0.0
      IF(X.EQ.0.) GO TO 3
      DO 2 J=1,10
      DSUM=0.0
      DO 1 K=1,2
      I=2*J+K-2
      A=G(I)*DSIN(G(I)*X/XL)
      IF(DABS(A).LT.1.D-10) A=0.0
      EXP=EX-(G(I)/XL)**2*D*T
      IF(DABS(EXP).GT.160.) EXP=-160.
    1 DSUM=DSUM+DEXP(EXP)*A/(G(I)**2+0.25*P*P+0.5*P)
      SUM=SUM+DSUM
      IF(DABS(DSUM/SUM).LT.TOL) GO TO 3
    2 CONTINUE
      GO TO 4
    3 C=1.-2.*SUM
      RETURN
C
C     ----- APPROXIMATE SOLUTION -----
    4 S=DSQRT(4.*D*T)
      E=0.0
      C=0.5*(ERFC(E,(X-V*T)/S)+EXP(Q,(X+V*T)/S))
      IF(APRX.LT.0.) RETURN
      A=2.*D*T/(2.*XL-X+V*T)**2
      B=2.*V*T/(2.*XL-X)
      C=C+(2.*XL-X)*A*EXP(P-0.5/A,E)*(1.-A*((1.-B)-3.*A*((1.-2.*B)-5.*A*
     1((1.-3.*B)-7.*A*(1.-4.*B)))))/DSQRT(3.141593*D*T)
      RETURN
      END
```


Table 8.--Sample output from computer program A3

```
*****************************************************************************
*                                                                           *
*         ONE-DIMENSIONAL CONVECTIVE-DISPERSIVE EQUATION                    *
*                                                                           *
*         FIRST-TYPE BOUNDARY CONDITION                                     *
*         FINITE PROFILE                                                    *
*                                                                           *
*         NO PRODUCTION OR DECAY                                            *
*         LINEAR ADSORPTION (R)                                             *
*         CONSTANT INITIAL CONCENTRATION (CI)                               *
*         INPUT CONCENTRATION = CO (T.LE.TO)                                *
*                             =  0 (T.GT.TO)                                *
*                                                                           *
*         EXAMPLE A3-1    (P=5)                                             *
*                                                                           *
*****************************************************************************


INPUT PARAMETERS
================

V =       1.0000                D =       4.0000
R =       1.0000                TO =   1000.0000
CI =      0.0                   CO =      1.0000
XL =     20.0000                TOL =     0.000100


CALCULATED EIGENVALUES
======================

 2.380644     5.163306     8.151564    11.214906    14.310123

17.421289    20.541462    23.667186    26.796564    29.926469

33.062194    36.197272    39.333382    42.470298    45.607854

48.745928    51.884426    55.023276    58.162421    61.301816


 DISTANCE          TIME          PORE VOLUME       CONCENTRATION      NUMBER
    (X)             (T)             (VVO)              (C)          OF TERMS
      0.0         5.0000            C.0              1.0000             0
   2.0000         5.0000          2.5000             0.9036             6
   4.0000         5.0000          1.2500             0.7731             6
   6.0000         5.0000          C.8333             0.6209             6
   8.0000         5.0000          C.6250             0.4648             6
  10.0000         5.0000          C.5000             0.3225             6
  12.0000         5.0000          0.4167             0.2064             6
  14.0000         5.0000          C.3571             0.1216             6
  16.0000         5.0000          C.3125             0.0661             6
  18.0000         5.0000          C.2778             0.0348             6
  20.0000         5.0000          C.2500             0.0240             6


 DISTANCE          TIME          PORE VOLUME       CONCENTRATION      NUMBER
    (X)             (T)             (VVO)              (C)          OF TERMS
      0.0        10.0000            C.0              1.0000             0
   2.0000        10.0000          5.0000             0.9626             6
   4.0000        10.0000          2.5000             0.9086             6
```

6.0000	10.0000	1.6667	0.8378	6
8.0000	10.0000	1.2500	0.7520	6
10.0000	10.0000	1.0000	0.6553	6
12.0000	10.0000	0.8333	0.5536	6
14.0000	10.0000	0.7143	0.4544	6
16.0000	10.0000	0.6250	0.3666	6
18.0000	10.0000	0.5556	0.3013	6
20.0000	10.0000	0.5000	0.2747	6

DISTANCE (X)	TIME (T)	PORE VOLUME (VVO)	CONCENTRATION (C)	NUMBER OF TERMS
0.0	15.0000	0.0	1.0000	0
2.0000	15.0000	7.5000	0.9819	6
4.0000	15.0000	3.7500	0.9553	6
6.0000	15.0000	2.5000	0.9189	4
8.0000	15.0000	1.8750	0.8726	4
10.0000	15.0000	1.5000	0.8170	4
12.0000	15.0000	1.2500	0.7544	4
14.0000	15.0000	1.0714	0.6889	4
16.0000	15.0000	0.9375	0.6271	4
18.0000	15.0000	0.8333	0.5788	4
20.0000	15.0000	0.7500	0.5586	6

DISTANCE (X)	TIME (T)	PORE VOLUME (VVO)	CONCENTRATION (C)	NUMBER OF TERMS
0.0	20.0000	0.0	1.0000	0
2.0000	20.0000	10.0000	0.9905	4
4.0000	20.0000	5.0000	0.9764	4
6.0000	20.0000	3.3333	0.9569	4
8.0000	20.0000	2.5000	0.9316	4
10.0000	20.0000	2.0000	0.9005	4
12.0000	20.0000	1.6667	0.8648	4
14.0000	20.0000	1.4286	0.8266	4
16.0000	20.0000	1.2500	0.7899	4
18.0000	20.0000	1.1111	0.7608	4
20.0000	20.0000	1.0000	0.7485	4

DISTANCE (X)	TIME (T)	PORE VOLUME (VVO)	CONCENTRATION (C)	NUMBER OF TERMS
0.0	25.0000	0.0	1.0000	0
2.0000	25.0000	12.5000	0.9949	4
4.0000	25.0000	6.2500	0.9872	4
6.0000	25.0000	4.1667	0.9766	4
8.0000	25.0000	3.1250	0.9626	4
10.0000	25.0000	2.5000	0.9455	4
12.0000	25.0000	2.0833	0.9255	4
14.0000	25.0000	1.7857	0.9041	4
16.0000	25.0000	1.5625	0.8833	4
18.0000	25.0000	1.3889	0.8668	4
20.0000	25.0000	1.2500	0.8598	4


```
*******************************************************************************
*                                                                             *
*         ONE-DIMENSIONAL CONVECTIVE-DISPERSIVE EQUATION                      *
*                                                                             *
*         FIRST-TYPE BOUNDARY CONDITION                                       *
*         FINITE PROFILE                                                      *
*                                                                             *
*         NO PRODUCTION OR DECAY                                              *
*         LINEAR ADSORPTION (R)                                               *
*         CONSTANT INITIAL CONCENTRATION (CI)                                 *
*         INPUT CONCENTRATION = CO (T.LE.TO)                                  *
*                             = 0 (T.GT.TO)                                   *
*                                                                             *
*         EXAMPLE A3-2                                                        *
*                                                                             *
*******************************************************************************
```

INPUT PARAMETERS
==========

V =	25.0000	D =	37.5000
R =	3.0000	TO =	5.0000
CI =	0.0	CO =	1.0000
XL =	100.0000	TOL =	0.000100

CALCULATED EIGENVALUES
==========

3.050337	6.102126	9.156690	12.215114	15.278191
18.346412	21.419593	24.498930	27.583053	30.672063
33.765676	36.863467	39.965076	43.070143	46.178327
49.289314	52.402819	55.518585	58.636381	61.756003

DISTANCE (X)	TIME (T)	PORE VOLUME (VVO)	CONCENTRATION (C)	NUMBER OF TERMS
100.0000	1.0000	0.2500	0.0000	0
100.0000	2.0000	0.5000	0.0000	0
100.0000	3.0000	0.7500	0.0000	0
100.0000	4.0000	1.0000	0.0000	0
100.0000	5.0000	1.2500	0.0000	0
100.0000	6.0000	1.5000	0.0000	0
100.0000	7.0000	1.7500	0.0013	0
100.0000	8.0000	2.0000	0.0138	0
100.0000	9.0000	2.2500	0.0660	0
100.0000	10.0000	2.5000	0.1672	0
100.0000	11.0000	2.7500	0.3097	0
100.0000	12.0000	3.0000	0.5077	0
100.0000	13.0000	3.2500	0.7250	0
100.0000	14.0000	3.5000	0.7920	0
100.0000	15.0000	3.7500	0.7427	0
100.0000	16.0000	4.0000	0.5983	0
100.0000	17.0000	4.2500	0.4174	0
100.0000	18.0000	4.5000	0.2557	0
100.0000	19.0000	4.7500	0.1399	0

APPENDIX H

HOBB

INPUT PARAMETERS
==========

Pore Water Velocity,	V(cm/day)	=	0.1149E+02
Dispersion Coefficent,	D (sq cm/day)	=	1149.0000
Retardation Coefficient,	R	=	1.0000
Duration of Solute Pulse,	TO (days)	=	0.3600E+02
Initial Concentration,	CI (mg/l)	=	0.0000
Input Concentration,	CO (mg/l)	=	4.4000
Column Length,	XL (cm)	=	1500.0000
Convergence Criterion,	TOL	=	0.000100

CALCULATED EIGENVALUES
==========

2.785931	5.638531	8.572736	11.570676	14.611396
17.679960	20.766927	23.866422	26.974726	30.089410
33.208840	36.331886	39.457744	42.585828	45.715702
48.847037	51.979577	55.113124	58.247520	61.382638

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.3650E+02	0.0000	0.0000E+00	0
100.0000	0.3650E+02	4.1939	0.4219E+01	0
200.0000	0.3650E+02	2.0969	0.3940E+01	0
300.0000	0.3650E+02	1.3980	0.3478E+01	0
400.0000	0.3650E+02	1.0485	0.2878E+01	0
500.0000	0.3650E+02	0.8388	0.2208E+01	0
600.0000	0.3650E+02	0.6990	0.1556E+01	0
700.0000	0.3650E+02	0.5991	0.9996E+00	0
800.0000	0.3650E+02	0.5242	0.5825E+00	0
900.0000	0.3650E+02	0.4660	0.3065E+00	0
1000.0000	0.3650E+02	0.4194	0.1452E+00	0
1100.0000	0.3650E+02	0.3813	0.6174E-01	0
1200.0000	0.3650E+02	0.3495	0.2353E-01	0

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.7300E+02	0.0000	0.0000E+00	0
100.0000	0.7300E+02	8.3877	0.1280E+00	0
200.0000	0.7300E+02	4.1939	0.3679E+00	0
300.0000	0.7300E+02	2.7959	0.7252E+00	0

400.0000	0.7300E+02	2.0969	0.1164E+01	0
500.0000	0.7300E+02	1.6775	0.1608E+01	0
600.0000	0.7300E+02	1.3980	0.1965E+01	10
700.0000	0.7300E+02	1.1982	0.2162E+01	10
800.0000	0.7300E+02	1.0485	0.2169E+01	10
900.0000	0.7300E+02	0.9320	0.2002E+01	8
1000.0000	0.7300E+02	0.8388	0.1716E+01	10
1100.0000	0.7300E+02	0.7625	0.1375E+01	10
1200.0000	0.7300E+02	0.6990	0.1036E+01	10

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.1095E+03	0.0000	0.0000E+00	0
100.0000	0.1095E+03	12.5816	0.1969E-01	0
200.0000	0.1095E+03	6.2908	0.6016E-01	0
300.0000	0.1095E+03	4.1939	0.1311E+00	0
400.0000	0.1095E+03	3.1454	0.2414E+00	0
500.0000	0.1095E+03	2.5163	0.3964E+00	0
600.0000	0.1095E+03	2.0969	0.5948E+00	8
700.0000	0.1095E+03	1.7974	0.8261E+00	8
800.0000	0.1095E+03	1.5727	0.1071E+01	8
900.0000	0.1095E+03	1.3980	0.1302E+01	8
1000.0000	0.1095E+03	1.2582	0.1493E+01	8
1100.0000	0.1095E+03	1.1438	0.1619E+01	8
1200.0000	0.1095E+03	1.0485	0.1668E+01	8

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.1460E+03	0.0000	0.0000E+00	0
100.0000	0.1460E+03	16.7754	0.4092E-02	0
200.0000	0.1460E+03	8.3877	0.1280E-01	0
300.0000	0.1460E+03	5.5918	0.2897E-01	0
400.0000	0.1460E+03	4.1939	0.5627E-01	0
500.0000	0.1460E+03	3.3551	0.9893E-01	0
600.0000	0.1460E+03	2.7959	0.1612E+00	6
700.0000	0.1460E+03	2.3965	0.2467E+00	6
800.0000	0.1460E+03	2.0969	0.3572E+00	6
900.0000	0.1460E+03	1.8639	0.4918E+00	6
1000.0000	0.1460E+03	1.6775	0.6463E+00	6
1100.0000	0.1460E+03	1.5250	0.8132E+00	6
1200.0000	0.1460E+03	1.3980	0.9819E+00	6

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.1825E+03	0.0000	0.0000E+00	0
100.0000	0.1825E+03	20.9693	0.9755E-03	0

200.0000	0.1825E+03	10.4846	0.3088E-02	0
300.0000	0.1825E+03	6.9898	0.7134E-02	0
400.0000	0.1825E+03	5.2423	0.1426E-01	0
500.0000	0.1825E+03	4.1939	0.2600E-01	0
600.0000	0.1825E+03	3.4949	0.4433E-01	6
700.0000	0.1825E+03	2.9956	0.7149E-01	6
800.0000	0.1825E+03	2.6212	0.1099E+00	6
900.0000	0.1825E+03	2.3299	0.1619E+00	6
1000.0000	0.1825E+03	2.0969	0.2293E+00	6
1100.0000	0.1825E+03	1.9063	0.3125E+00	6
1200.0000	0.1825E+03	1.7474	0.4098E+00	6

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.2190E+03	0.0000	0.0000E+00	0
100.0000	0.2190E+03	25.1631	0.2518E-03	0
200.0000	0.2190E+03	12.5816	0.8031E-03	0
300.0000	0.2190E+03	8.3877	0.1879E-02	0
400.0000	0.2190E+03	6.2908	0.3823E-02	0
500.0000	0.2190E+03	5.0326	0.7128E-02	0
600.0000	0.2190E+03	4.1939	0.1251E-01	6
700.0000	0.2190E+03	3.5947	0.2083E-01	6
800.0000	0.2190E+03	3.1454	0.3323E-01	6
900.0000	0.2190E+03	2.7959	0.5099E-01	6
1000.0000	0.2190E+03	2.5163	0.7543E-01	6
1100.0000	0.2190E+03	2.2876	0.1076E+00	4
1200.0000	0.2190E+03	2.0969	0.1477E+00	6

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.2555E+03	0.0000	0.0000E+00	0
100.0000	0.2555E+03	29.3570	0.6844E-04	0
200.0000	0.2555E+03	14.6785	0.2195E-03	0
300.0000	0.2555E+03	9.7857	0.5180E-03	0
400.0000	0.2555E+03	7.3392	0.1066E-02	0
500.0000	0.2555E+03	5.8714	0.2024E-02	0
600.0000	0.2555E+03	4.8928	0.3607E-02	6
700.0000	0.2555E+03	4.1939	0.6134E-02	6
800.0000	0.2555E+03	3.6696	0.1002E-01	6
900.0000	0.2555E+03	3.2619	0.1577E-01	6
1000.0000	0.2555E+03	2.9357	0.2397E-01	6
1100.0000	0.2555E+03	2.6688	0.3513E-01	4
1200.0000	0.2555E+03	2.4464	0.4947E-01	6

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS

0.0000	0.2920E+03	0.0000	0.0000E+00	0
100.0000	0.2920E+03	33.5508	0.1930E-04	0
200.0000	0.2920E+03	16.7754	0.6195E-04	0
300.0000	0.2920E+03	11.1836	0.1473E-03	0
400.0000	0.2920E+03	8.3877	0.3073E-03	0
500.0000	0.2920E+03	6.7102	0.5889E-03	0
600.0000	0.2920E+03	5.5918	0.1057E-02	4
700.0000	0.2920E+03	4.7930	0.1824E-02	6
800.0000	0.2920E+03	4.1939	0.3024E-02	6
900.0000	0.2920E+03	3.7279	0.4838E-02	6
1000.0000	0.2920E+03	3.3551	0.7476E-02	6
1100.0000	0.2920E+03	3.0501	0.1114E-01	4
1200.0000	0.2920E+03	2.7959	0.1593E-01	6

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.3285E+03	0.0000	0.0000E+00	0
100.0000	0.3285E+03	37.7447	0.5551E-05	0
200.0000	0.3285E+03	18.8723	0.1815E-04	0
300.0000	0.3285E+03	12.5816	0.4328E-04	0
400.0000	0.3285E+03	9.4362	0.9048E-04	0
500.0000	0.3285E+03	7.5489	0.1749E-03	0
600.0000	0.3285E+03	6.2908	0.3136E-03	4
700.0000	0.3285E+03	5.3921	0.5457E-03	4
800.0000	0.3285E+03	4.7181	0.9140E-03	4
900.0000	0.3285E+03	4.1939	0.1478E-02	4
1000.0000	0.3285E+03	3.7745	0.2307E-02	4
1100.0000	0.3285E+03	3.4313	0.3472E-02	4
1200.0000	0.3285E+03	3.1454	0.5009E-02	4

DISTANCE (cm)	TIME (days)	PORE VOLUME (VVO)	CONCENTRATION (mg/l)	NUMBER OF TERMS
0.0000	0.3650E+03	0.0000	0.0000E+00	0
100.0000	0.3650E+03	41.9385	0.1695E-05	0
200.0000	0.3650E+03	20.9693	0.5424E-05	0
300.0000	0.3650E+03	13.9795	0.1295E-04	0
400.0000	0.3650E+03	10.4846	0.2714E-04	0
500.0000	0.3650E+03	8.3877	0.5280E-04	0
600.0000	0.3650E+03	6.9898	0.9372E-04	4
700.0000	0.3650E+03	5.9912	0.1641E-03	4
800.0000	0.3650E+03	5.2423	0.2766E-03	4
900.0000	0.3650E+03	4.6598	0.4500E-03	4
1000.0000	0.3650E+03	4.1939	0.7073E-03	4
1100.0000	0.3650E+03	3.8126	0.1071E-02	4
1200.0000	0.3650E+03	3.4949	0.1554E-02	4

PLATES

R36E
R37E

R37E
R38E

T18S
T19S

NORTHERN
NATURAL GAS
PROCESSING PLANT

(NNG4)
(NNG5)
(NNG3)
(NNG1)
(NNG2)
(NNG6)

HOBBS

BROADWAY

MARLAND

LEA COUNTY
HOBBS AIRPORT

MONUMENT ROAD

18

62

8

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61,62,63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126

1000 0 1000 7000ft

DANIEL B. STEPHENS & ASSOCIATES, INC.

PLATE 1

WELL LOCATIONS

R36E R37E R37E R38E

T18S T19S

NORTHERN NATURAL GAS PROCESSING PLANT

LEA COUNTY HOBBS AIRPORT

HOBBS

BROADWAY

MARLAND

MONUMENT ROAD

18 8 8

3710 3690 3670 3650 3630 3610 3590 3570

1 3762 2 3747 3 3540 4 3774 5 3770 6 3754 7 3757 8 3744 9 3737 10 3722 11 3729 12 3722 13 3724 14 3702 15 3725 16 3764 17 3757 18 3779 19 3768 20 3742 21 3700 22 3705 23 3672 24 3670 25 3665 26 3719 27 3705 28 3704 29 3697 30 3663 31 3651 32 3631 33 3621 34 3670 35 3690 3675* 36 3693 37 3693 38 3694 39 3698 40 3684* 41 3680 42 3667 43 3676 44 3651 45 3605 46 3559 47 3571 48 3560 49 3584 50 3628 51 3622 52 3591 53 3553 54 3579 55 3590 56 3612 57 3601 58 3695 59 3700 60 3749 61,62,63 3769 64 3714 65 3683 66 3676 67 3665 68 3656 69 3690 70 3682 71 3673 72 3646 73 3646 74 3589 75 3619 76 3659 77 3664 78 3661 79 3660 80 3673 81 3655 82 3652 83 3668 84 3684* (NNG 5) 85 *3683 86 3686* (NNG 3) 87 3680* (NNG 1) 88 3679 (NNG 2) (NNG 4) 89 3660 90 3661 91 3665 92 3663 93 3655 94 3652 95 3642 96 3620 97 3621 98 3616 99 3582 100 3579 101 3618 102 3624 103 3640 104 3633 105 3657 106 3658 107 3645 108 3646 109 3633 110 3629 111 3612 112 3599 113 3589 114 3561 115 3565 116 3582 117 3586 118 3576 119 3585 120 3577 121 3565 122 3560 123 3561 124 3559 125 3556 126 3551 (NNG 6) 35 3690 3675*

1000 0 1000 7000 ft

* FIELD MEASURED by DBS&A 9/89

DANIEL B. STEPHENS & ASSOCIATES, INC.

PLATE 2

WATER LEVEL ELEVATION MAP