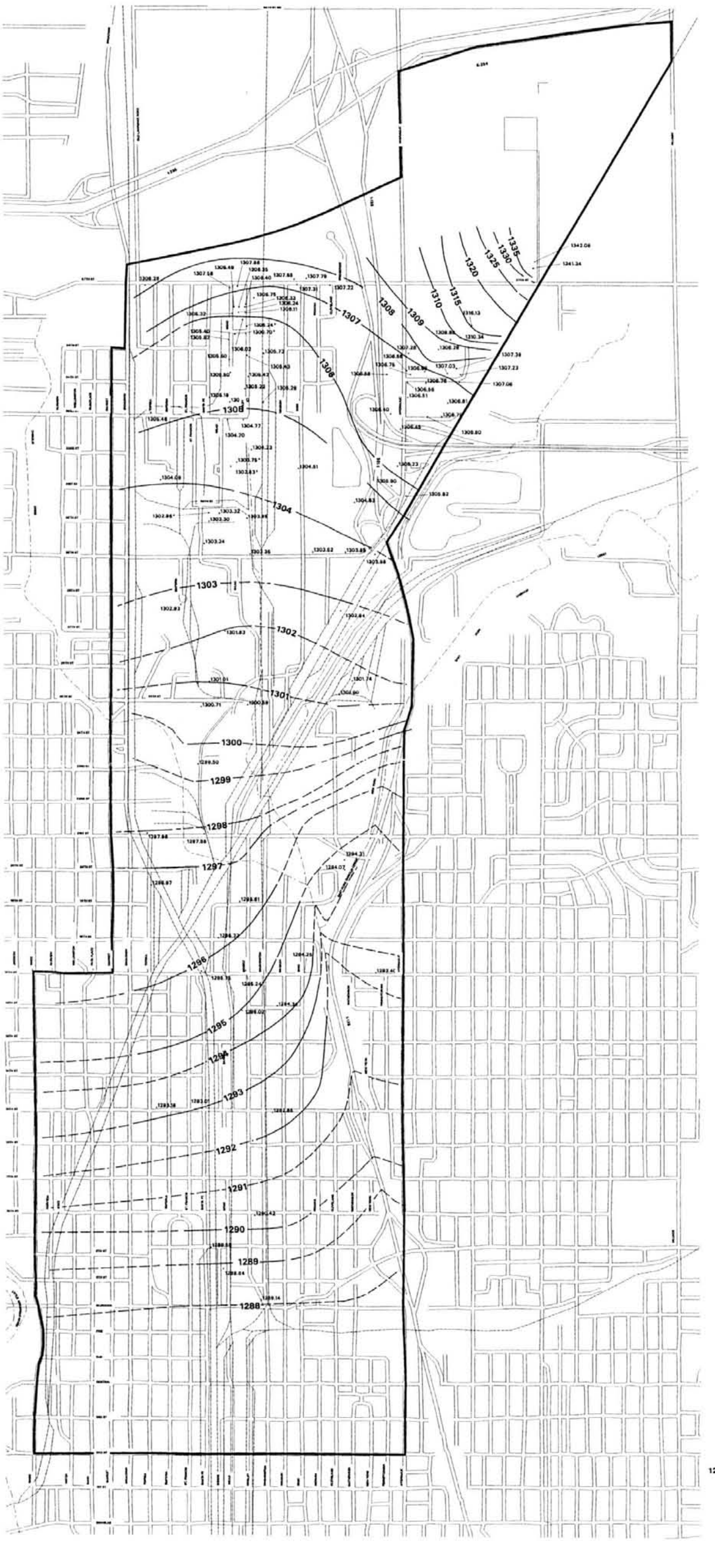
Appendix G
NIC Site Hydrogeological Data

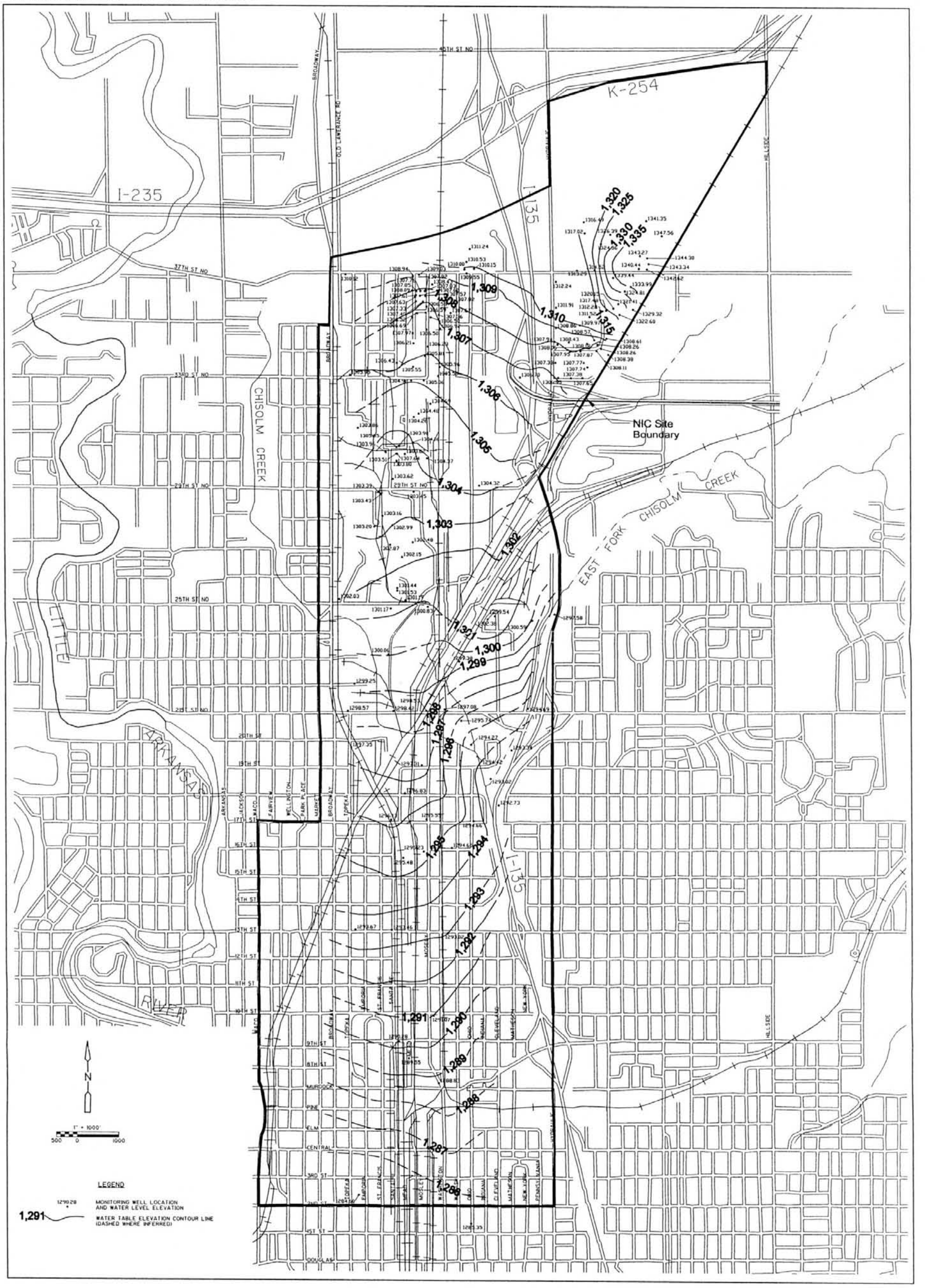
Appendix G-1
Phase 1 Potentiometric Surface Maps
October 1997/April 1998



CDM Camp Dresser & McKee

Plate 4-1
Potentiometric Surface Contour Map, October, 1997
North Industrial Corridor

S:\2395\20456\ WI598 12/02/99 21:30 Cameronk XREFS: WI_BASE



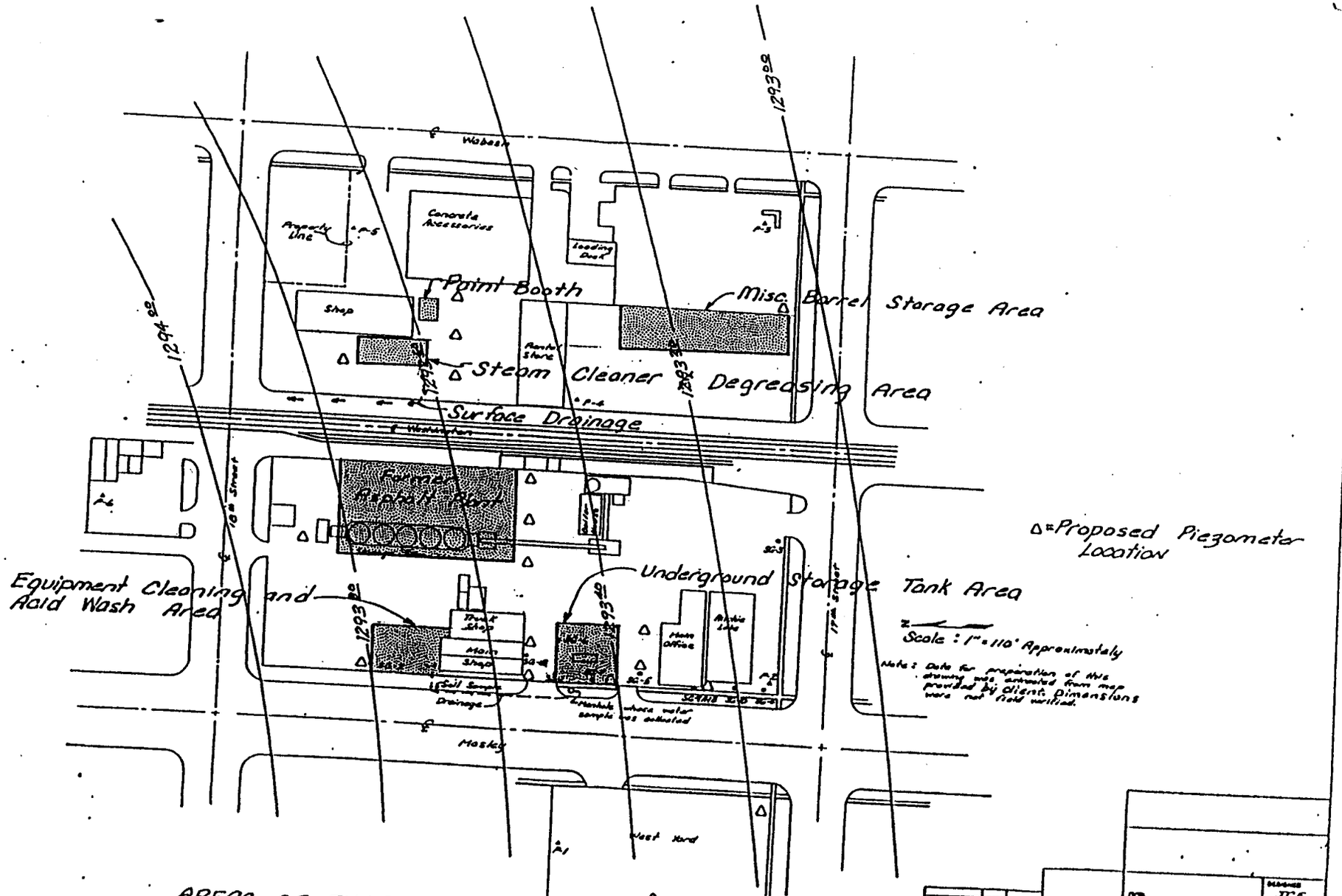
CDM Camp Dresser & McKee

Plate 4-2
Potentiometric Surface Contour Map, April/May 1998
North Industrial Corridor

Appendix G-2
Potentiometric Surface Maps from Selected Facilities

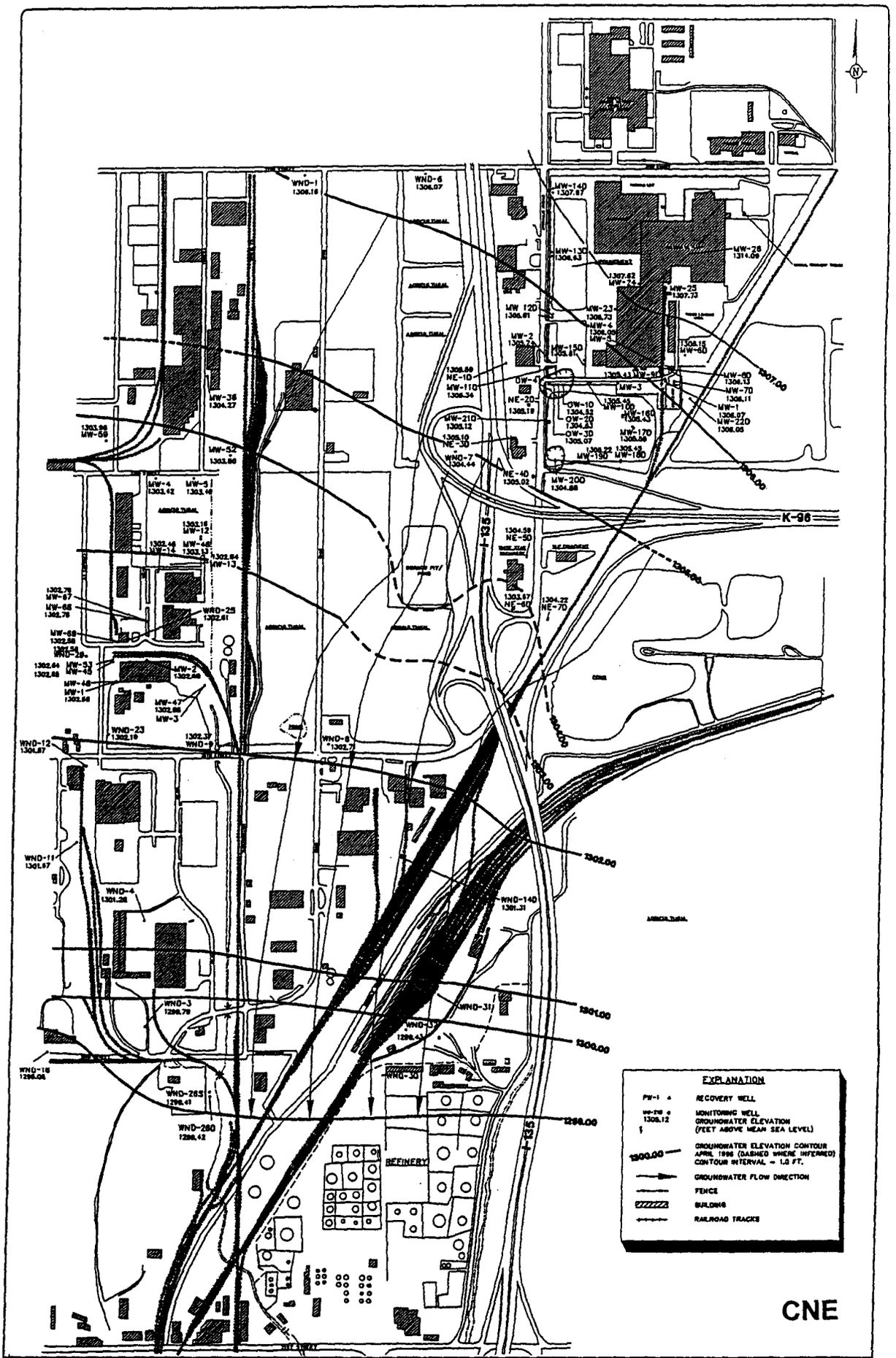
North Industrial Corridor (NIC) Site
Appendix G-2, List of Facilities

Abbreviation	Facility
AC	Allens Concrete
CNE	Coleman Northeast
CSI	Christopher Steel Inc.
DRB	Coastal Derby Refinery
GRR	Former Golden Rule Refinery
GPC	Glacier Park Company
HOC	House Oil Company
JRC	J.R. Custom
KGE	Kansas Gas & Electric
KRE	Kreonite
NBPS	National Byproducts (South)
OHSE	Ohse Meats
PPL	Phillips Pipe Line
SDF	Steffens Dairy Farm
SK	Safety-Kleen
SOC	Security Oil Company
UCL	Unocal Chemicals
ULI	Universal Lubricants
UPRR	Union Pacific Rail Road
USD	USD 259
VWRN	Former Van Waters and Rogers (North)
29M	29th and Mead Site



AREAS OF ENVIRONMENTAL CONCERN @ ALLEN'S CONCRETE

AC



GERAGHTY & MILLER, INC.
Environmental Services

DRAWING CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS AND SHALL REMAIN THE PROPERTY OF GERAGHTY & MILLER, INC. AS AN INSTRUMENT OF PROFESSIONAL SERVICE. THIS INFORMATION SHALL NOT BE USED IN WHOLE OR IN PART WITHOUT THE FINAL INTERPRETATION AND PRIOR WRITTEN CONSENT OF GERAGHTY & MILLER, INC.

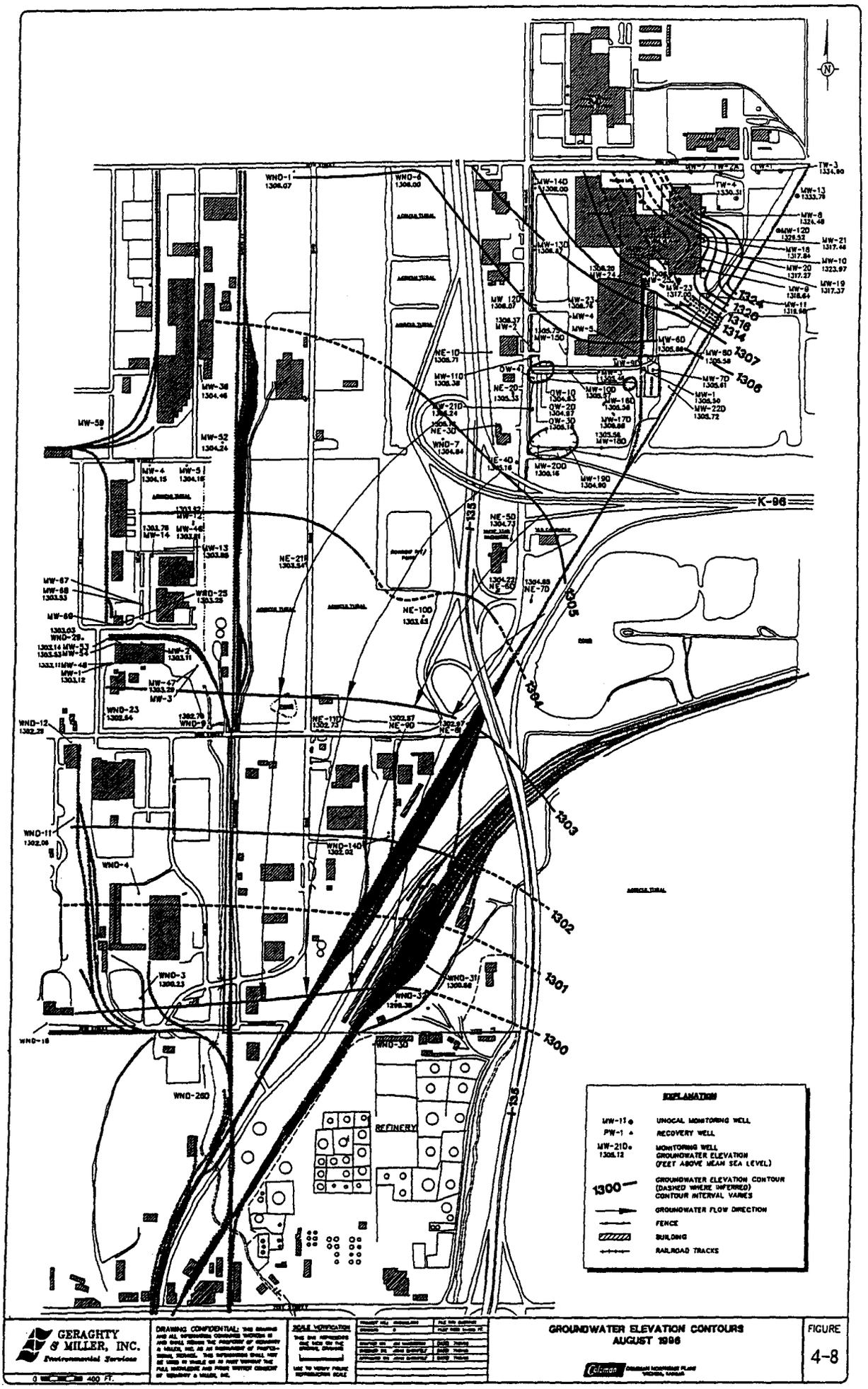
ISSUE VERIFICATION

USE TO VERIFY ISSUE INFORMATION TONIC

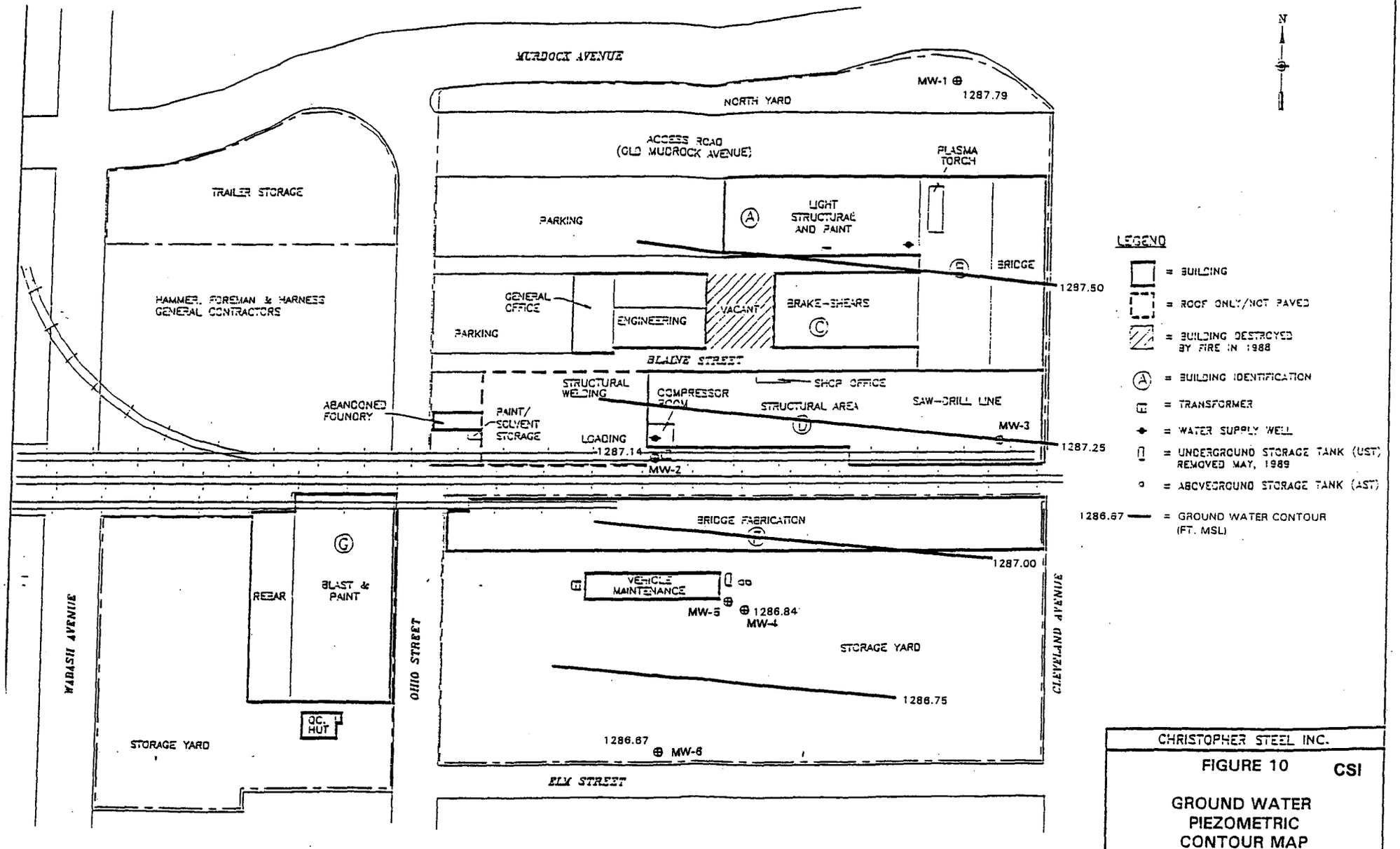
GROUNDWATER ELEVATION CONTOURS
APRIL 1996

Coleman

FIGURE
4-7


K-96
REFINERY
1324
1326
1316
1314
1307
1306
1305
1304
1303
1302
1301
1300
EXPLANATION
MW-11 UNOCAL MONITORING WELL
PW-1 RECOVERY WELL
MW-210 1305.12 MONITORING WELL GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
1300 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED) CONTOUR INTERVAL VARIES
GROUNDWATER FLOW DIRECTION
FENCE
BUILDING
RAILROAD TRACKS
GERAGHTY & MILLER, INC.
Environmental Services
0 400 FT.
GROUNDWATER ELEVATION CONTOURS
AUGUST 1986
FIGURE
4-8

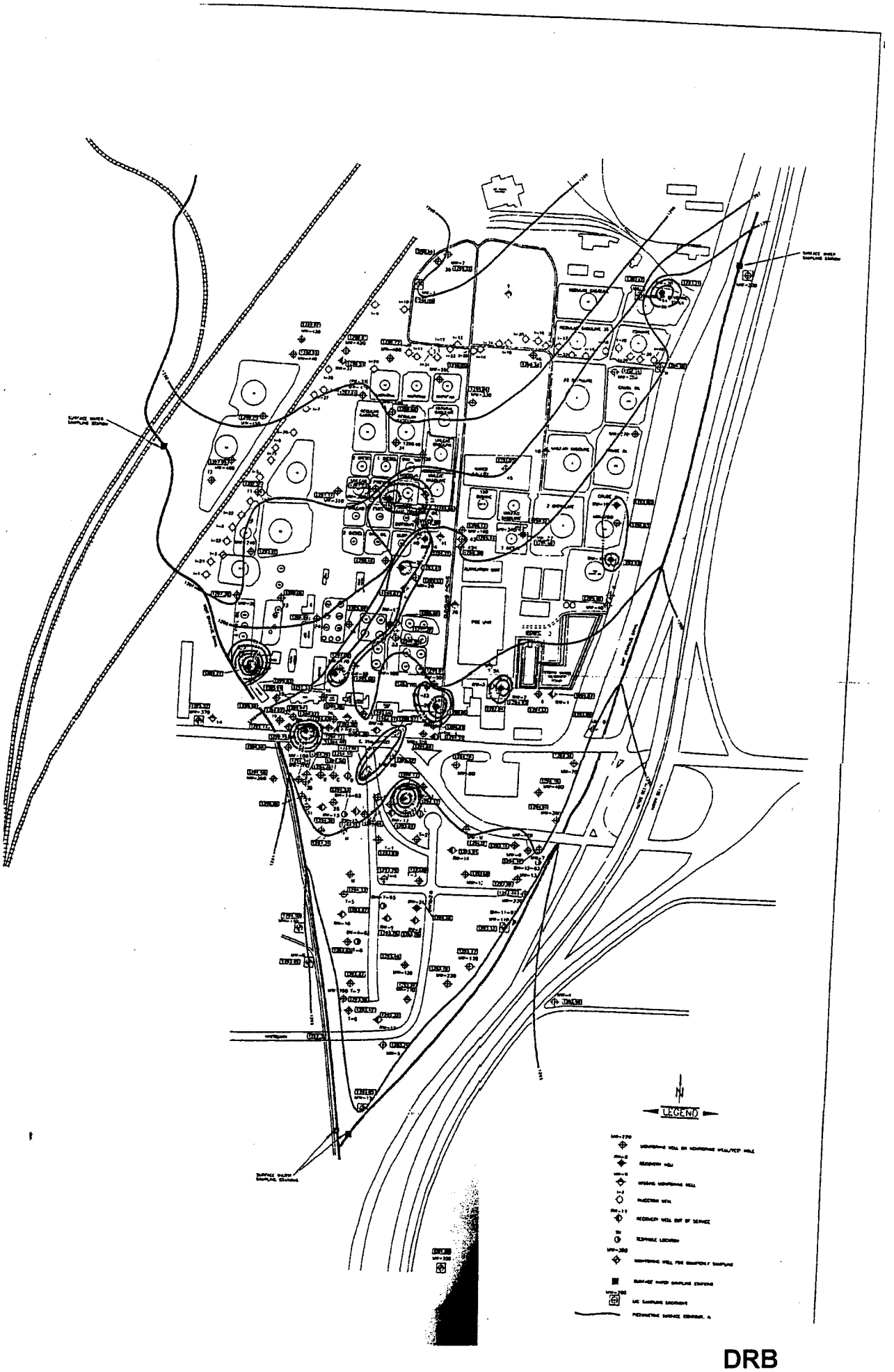
CNE



CHRISTOPHER STEEL INC.

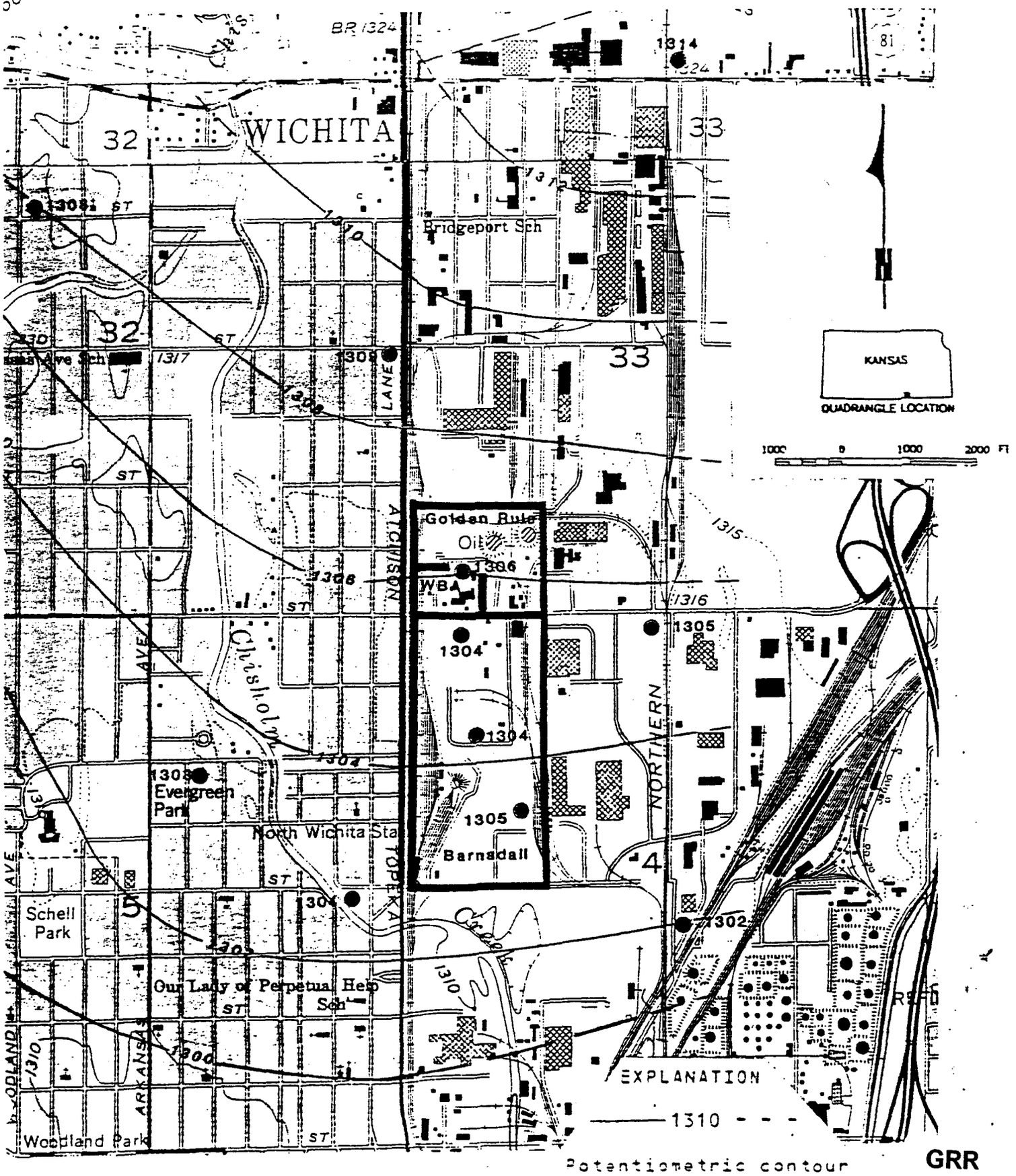
FIGURE 10 CSI

GROUND WATER PIEZOMETRIC CONTOUR MAP



DRB

Figure 6. Potentiometric surface for the alluvial aquifer during October 30, 1985.

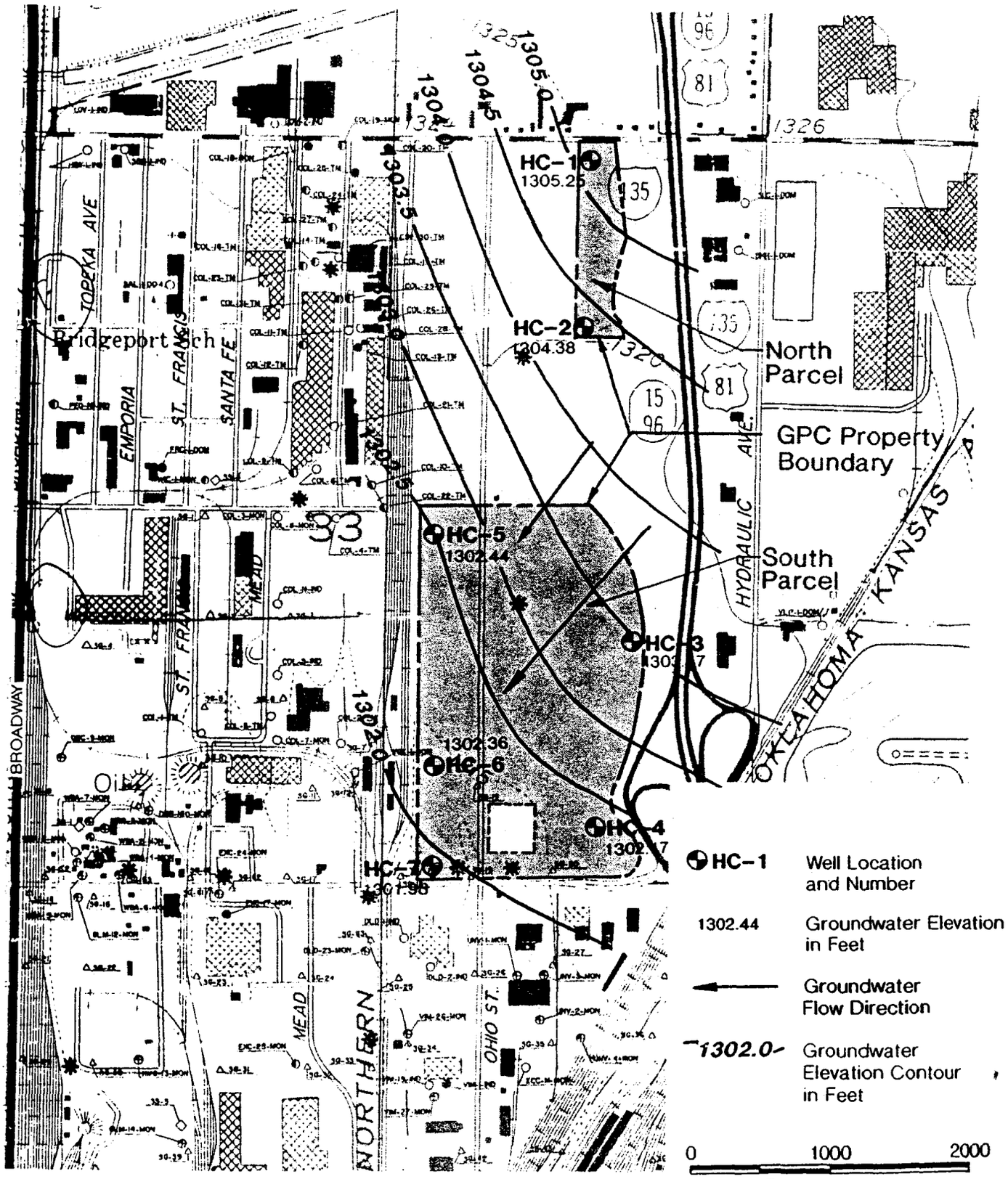


● Measured water level (altitude).

Shows altitude of potentiometric surface. Contour interval 2 feet. National Geodetic Vertical Datum of 1929.

Groundwater Elevation Contour Map April 14, 1991

GPC Wichita, Kansas Properties

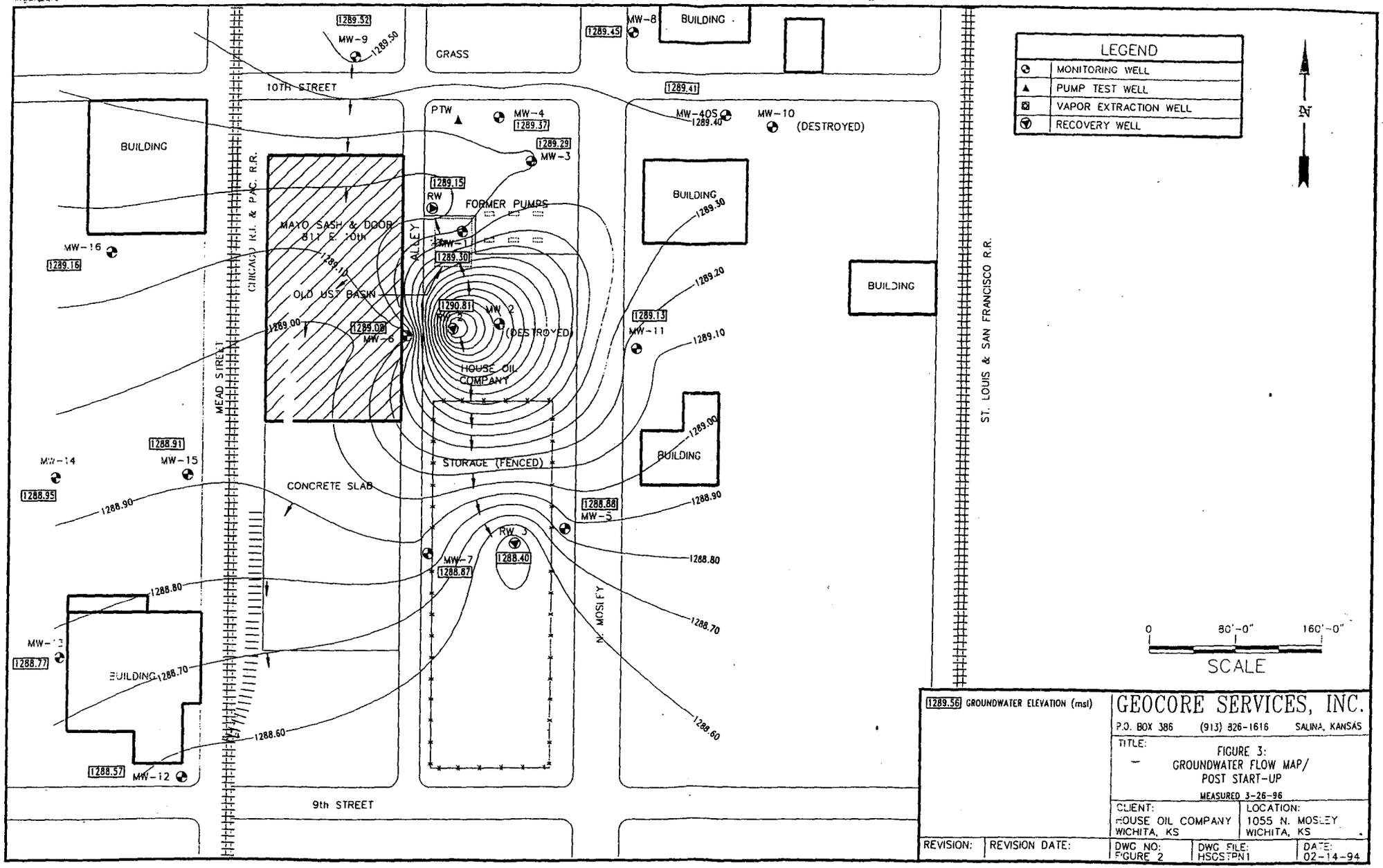


GPC

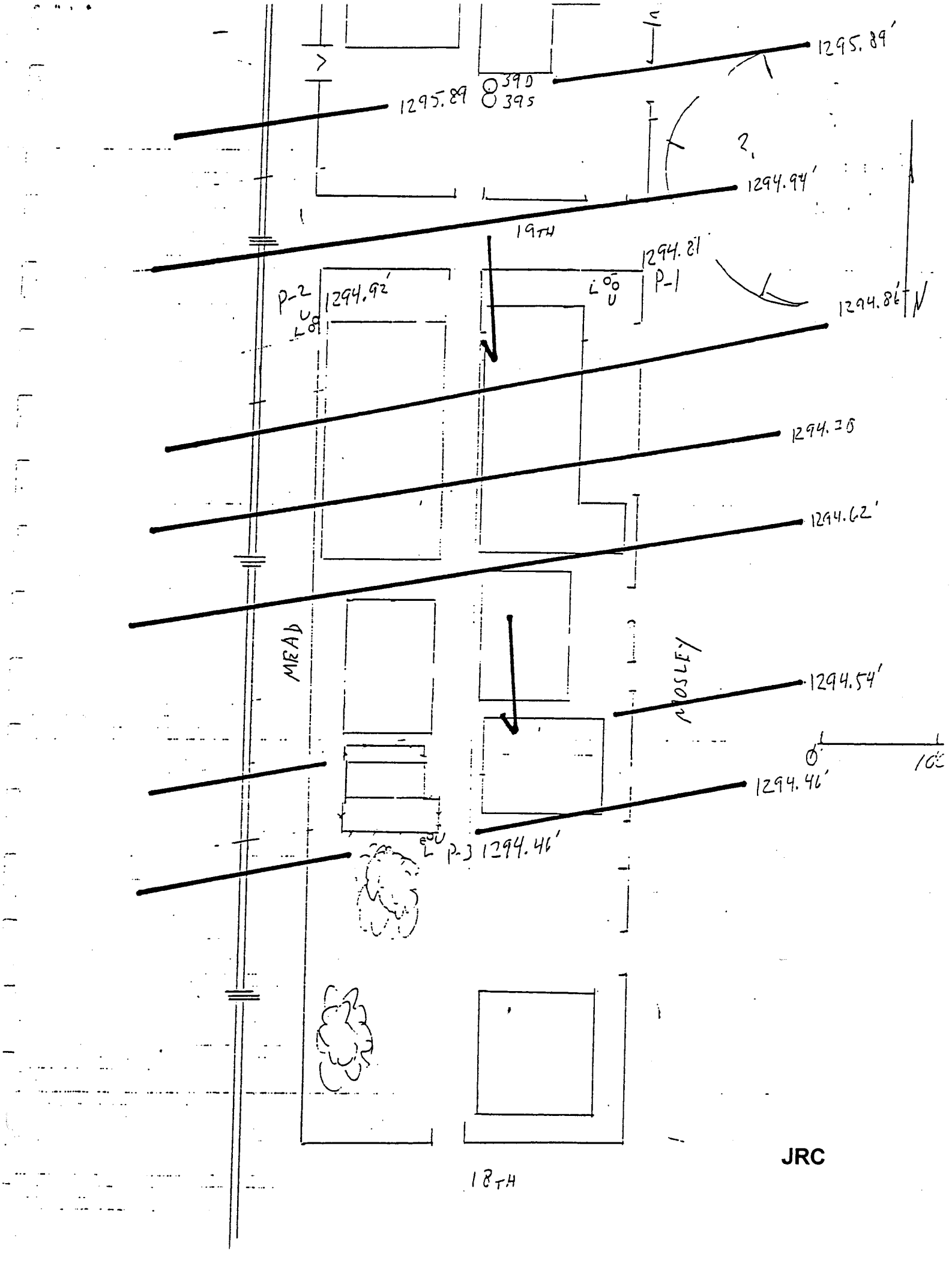
HARTCROWSER

J-3221 6/91

Figure 6


LEGEND
MONITORING WELL
PUMP TEST WELL
VAPOR EXTRACTION WELL
RECOVERY WELL
N
0
80'-0"
160'-0"
SCALE
1289.56 GROUNDWATER ELEVATION (msl)
GEOCORE SERVICES, INC.
P.O. BOX 386 (913) 826-1616 SALINA, KANSAS
TITLE:
FIGURE 3:
GROUNDWATER FLOW MAP/
POST START-UP
MEASURED 3-26-96
CLIENT:
HOUSE OIL COMPANY
WICHITA, KS
LOCATION:
1055 N. MOSLEY
WICHITA, KS
REVISION:
REVISION DATE:
DWG NO:
FIGURE 2
DWG FILE:
HSOSTPN1
DATE:
02-14-94
10TH STREET
9th STREET
MEAD STREET
CHICAGO R.I. & PAC. R.R.
ST. LOUIS & SAN FRANCISCO R.R.
N. MOSLEY
ALLEY
GRASS
BUILDING
MAYO SASH & DOOR
811 E. 10th
OLD UST BASIN
HOUSE OIL COMPANY
FORMER PUMPS
STORAGE (FENCED)
CONCRETE SLAB
PTW
RW 1
RW 2
RW 3
MW-1
MW-2 (DESTROYED)
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10 (DESTROYED)
MW-11
MW-12
MW-13
MW-14
MW-15
MW-16
MW-40S
1289.52
1289.50
1289.45
1289.41
1289.37
1289.29
1289.15
1289.30
1290.81
1289.08
1289.16
1288.91
1288.95
1288.77
1288.57
1288.88
1288.87
1288.40
1289.40
1289.13
1289.00
1288.90
1288.80
1288.70
1288.60

HOC


1295.89'
390
395
1295.89
1294.94'
19TH
1294.81'
P-1
1294.86'
N
P-2
1294.92'
1294.30
1294.62'
MEAD
MOSLEY
1294.54'
0'
10
1294.46'
P-3 1294.46'
18TH
JRC

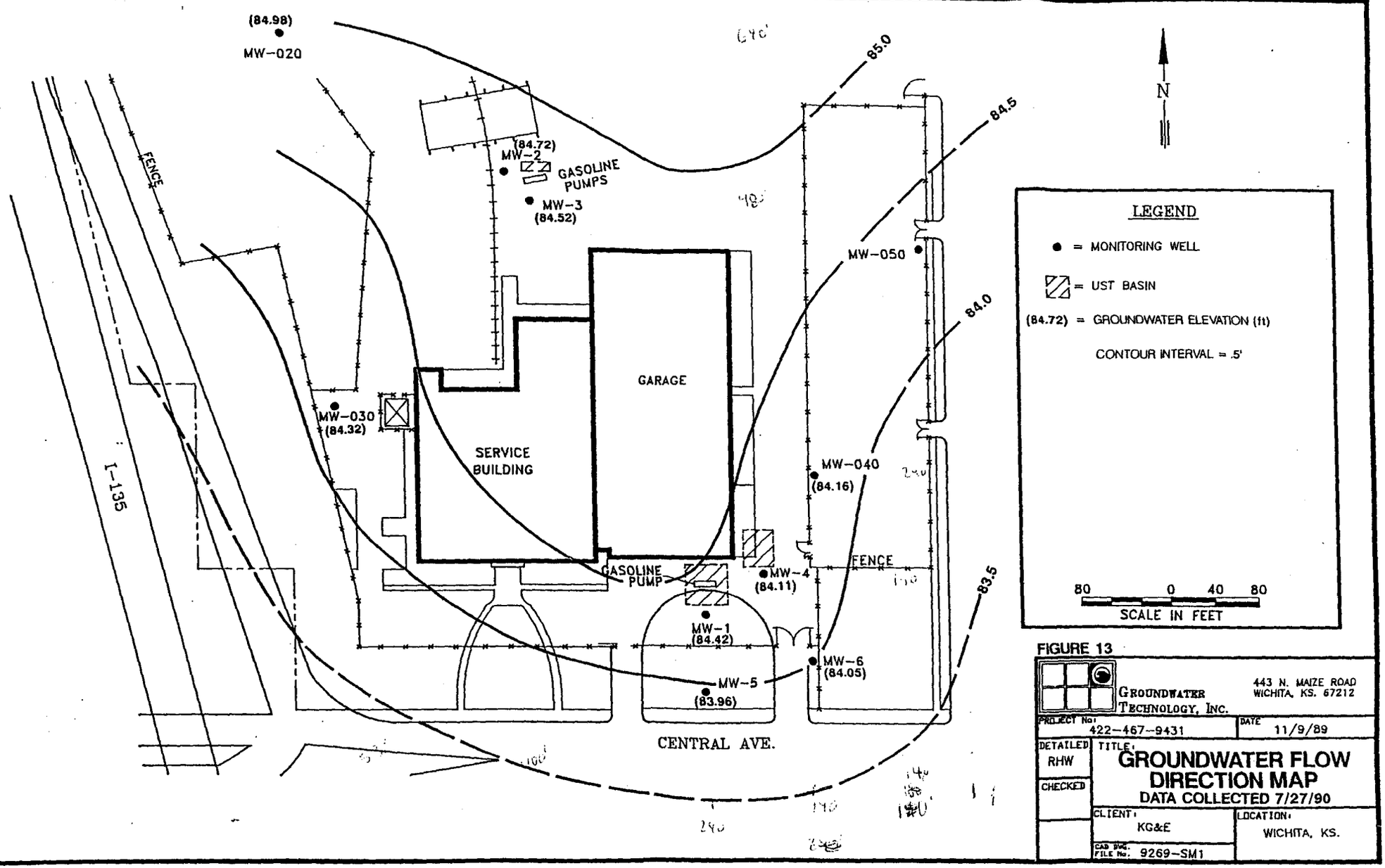


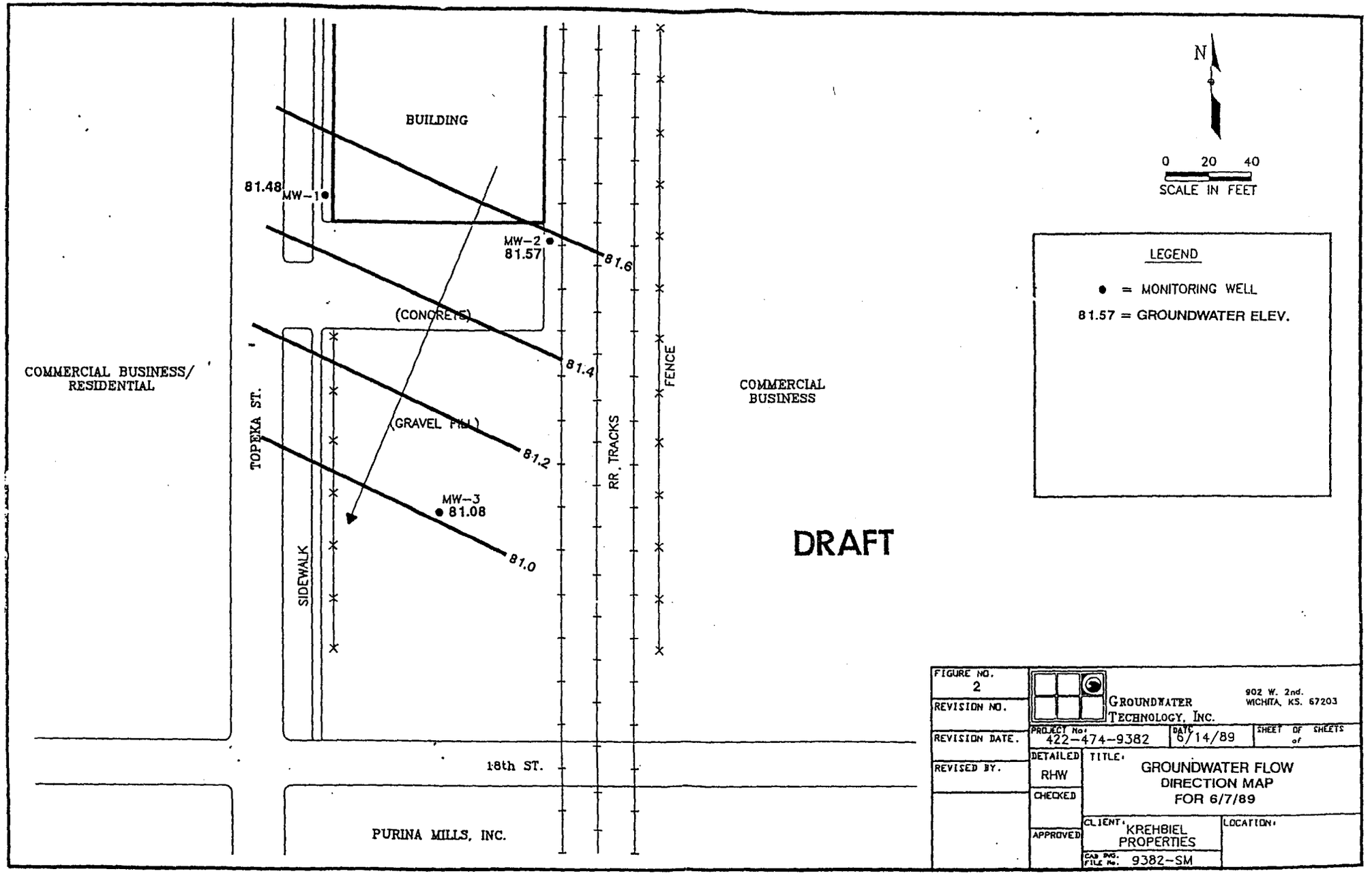
FIGURE 13

GROUNDWATER TECHNOLOGY, INC.
443 N. MAIZE ROAD
WICHITA, KS. 67212

PROJECT No: 422-467-9431	DATE 11/9/89
DETAILED RHW	TITLE: GROUNDWATER FLOW DIRECTION MAP DATA COLLECTED 7/27/90
CHECKED	
CLIENT: KG&E	LOCATION: WICHITA, KS.
CAD DWG. FILE No. 9269-SM1	

KGE

no. 9269-SM1 WICHITA, KS.


BUILDING
81.48
MW-1
MW-2
81.57
81.6
(CONCRETE)
81.4
(GRAVEL FILL)
81.2
MW-3
81.08
81.0
COMMERCIAL BUSINESS/
RESIDENTIAL
TOPEKA ST.
SIDEWALK
RR. TRACKS
FENCE
COMMERCIAL
BUSINESS
18th ST.
PURINA MILLS, INC.
N
0 20 40
SCALE IN FEET
LEGEND
● = MONITORING WELL
81.57 = GROUNDWATER ELEV.
DRAFT
FIGURE NO. 2
REVISION NO.
REVISION DATE.
REVISED BY.
GROUNDWATER TECHNOLOGY, INC.
902 W. 2nd.
WICHITA, KS. 67203
PROJECT No: 422-474-9382
DATE 6/14/89
SHEET OF SHEETS
of
DETAILED RHW
CHECKED
APPROVED
TITLE: GROUNDWATER FLOW DIRECTION MAP FOR 6/7/89
CLIENT: KREHBIEL PROPERTIES
LOCATION:
CAD DWG. FILE No. 9382-SM

KRE

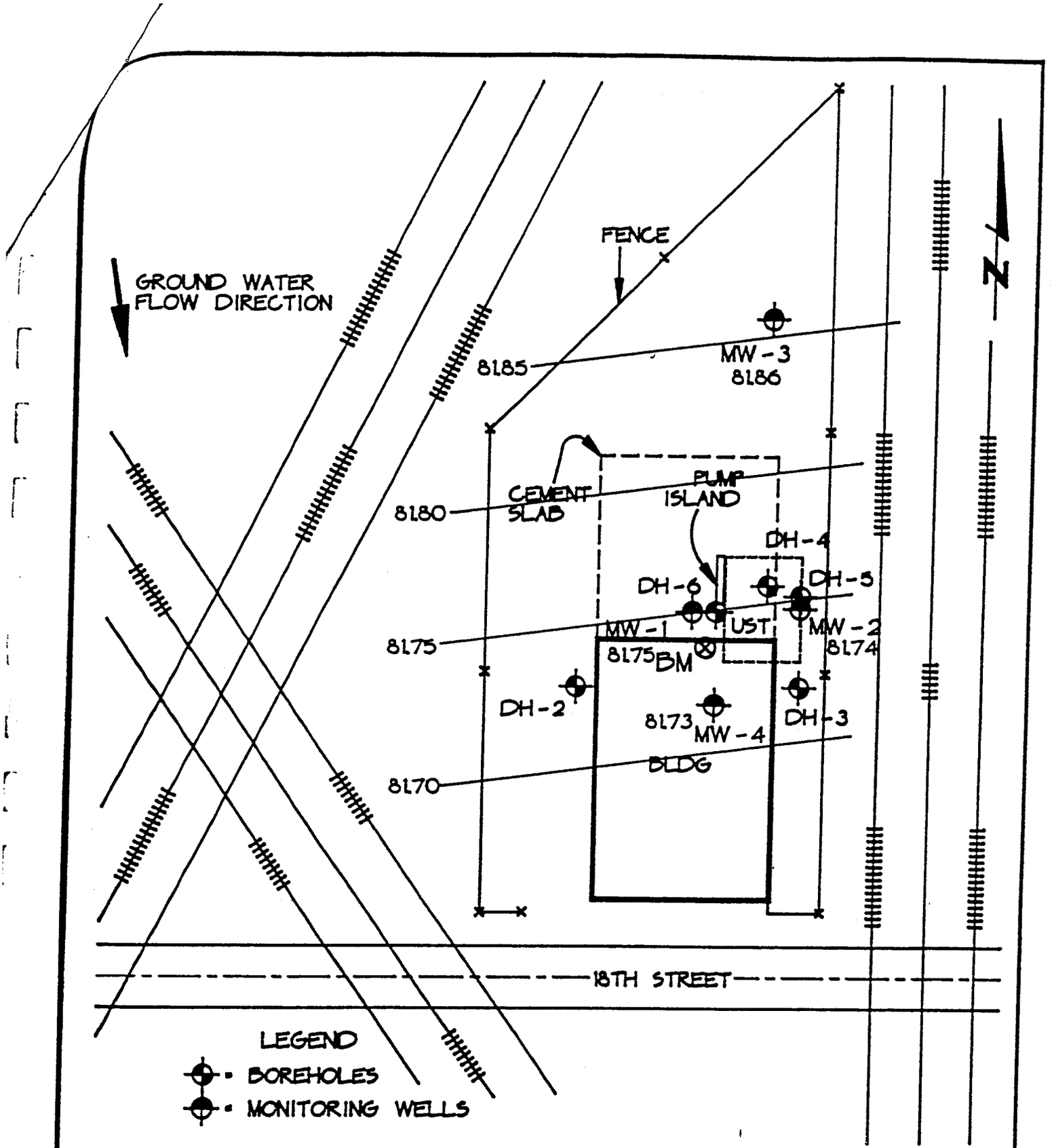


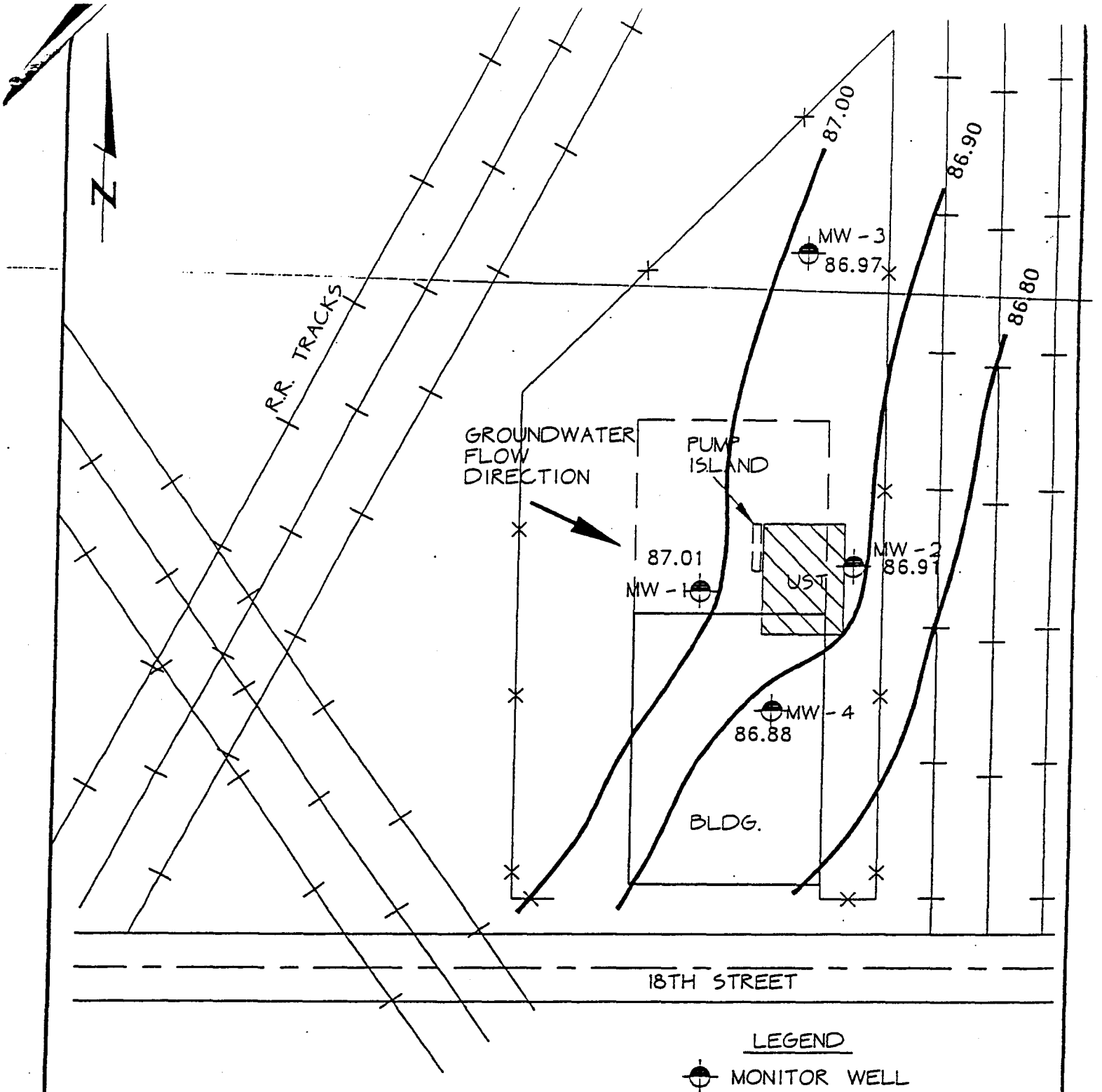
FIGURE 5
GROUND WATER
CONTOUR MAP

0 50
SCALE IN FEET

Geotechnical
Services Inc.

PROJECT
NATIONAL BY-PRODUCTS
WICHITA, KS
NBPS

JOB NO.	REV. NO.	DATE	DRAWN
1911001		8/15/91	GLG



LEGEND

MONITOR WELL

MEASURED AND SAMPLED ON 7-14-93.

GROUNDWATER GRADIENT MAP

0 50

SCALE IN FEET

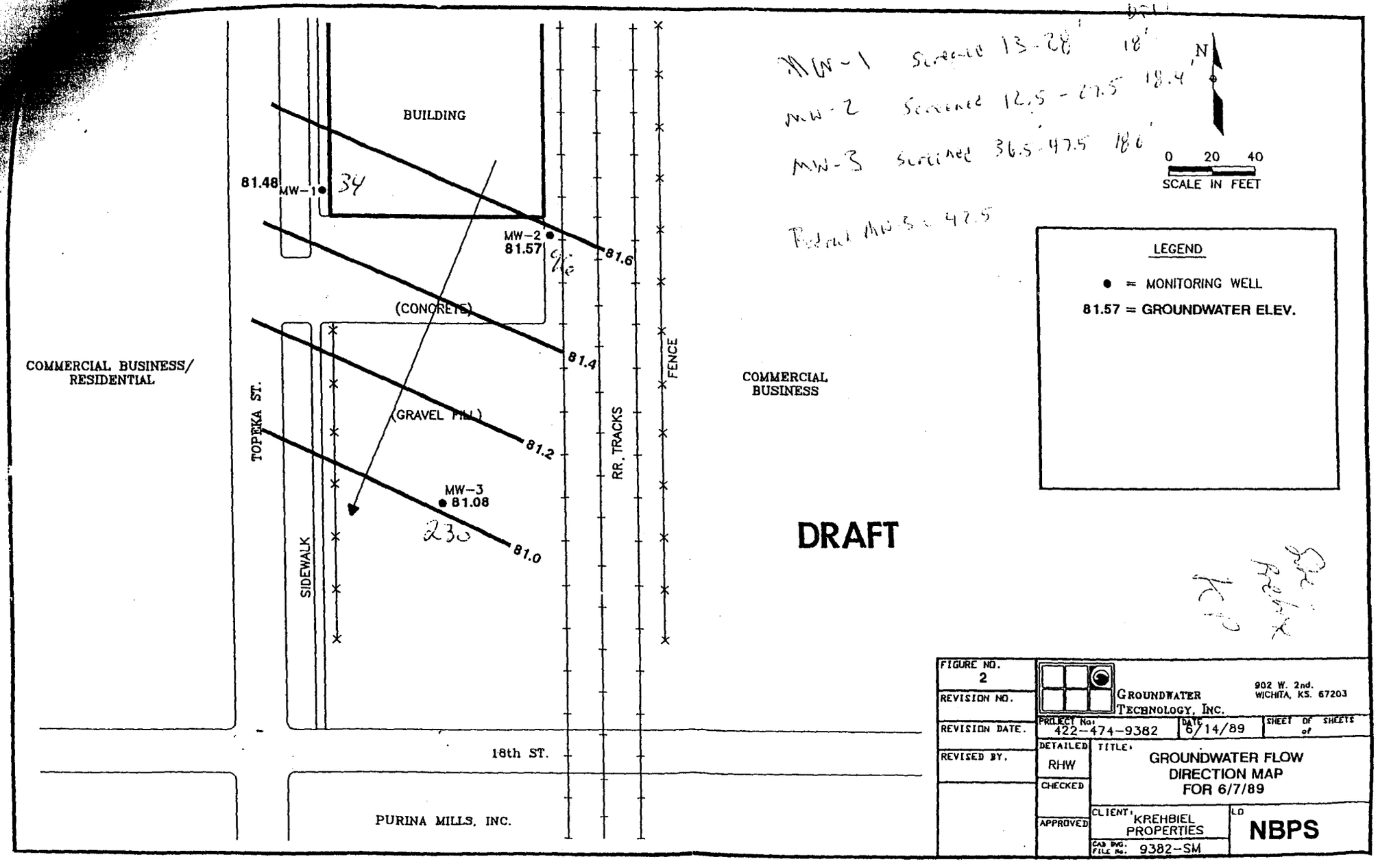
Geotechnical Services Inc.

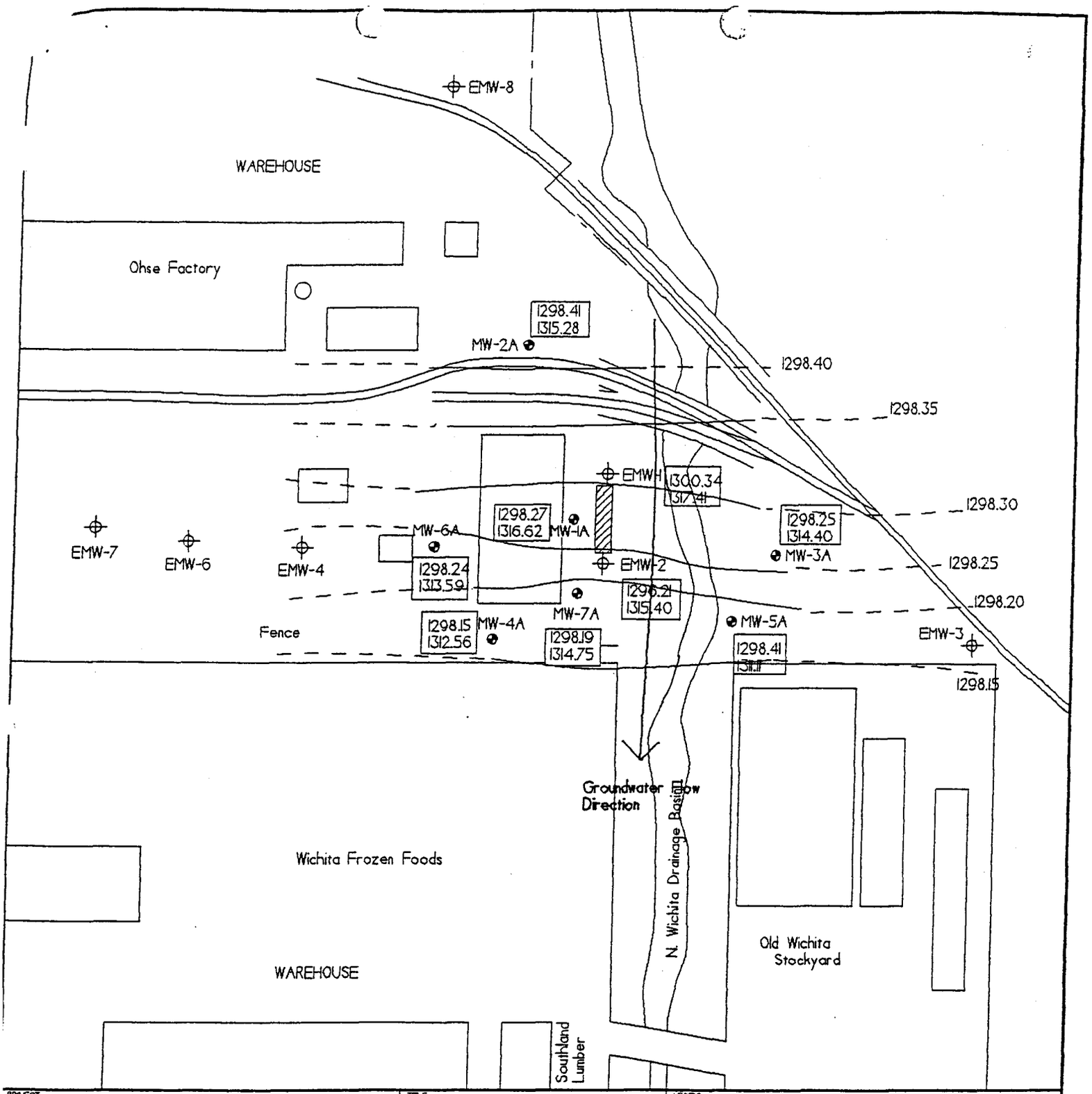
PROJECT

NATIONAL BY-PRODUCTS
WICHITA, KANSAS

NBPS

JOB NO.	DWG. NO.	DATE	DRAWN
1911001		8-19-93	SAL


BUILDING
81.48
MW-1
34
MW-2
81.57
81.6
(CONCRETE)
81.4
(GRAVEL FILL)
81.2
MW-3
81.08
230
81.0
COMMERCIAL BUSINESS/
RESIDENTIAL
TOPEKA ST.
SIDEWALK
RR. TRACKS
FENCE
COMMERCIAL
BUSINESS
18th ST.
PURINA MILLS, INC.
DRAFT
MW-1 Screened 13-28' 18'
MW-2 Screened 12.5-27.5 18.4'
MW-3 Screened 36.5-47.5 18.6'
Pulled MW-3 @ 42.5
N
0 20 40
SCALE IN FEET
LEGEND
● = MONITORING WELL
81.57 = GROUNDWATER ELEV.
FIGURE NO. 2
REVISION NO.
REVISION DATE.
REVISED BY.
GROUNDWATER TECHNOLOGY, INC.
902 W. 2nd.
WICHITA, KS. 67203
PROJECT No: 422-474-9382
DATE 6/14/89
SHEET OF SHEETS of
DETAILED RHW
CHECKED
APPROVED
TITLE: GROUNDWATER FLOW DIRECTION MAP FOR 6/7/89
CLIENT: KREHBIEL PROPERTIES
CAD DWG. FILE No: 9382-SM
LD NBPS



PROJECT:	Ohse Meats
ADDRESS:	2300 N. Broadway
LOCATION:	Wichita, KS
DRAWN BY:	A. Duncan — DATE: 02\27\97
REVIEWED BY:	B. Johnson — DATE: 03\01\97
AE	TF137 — KDHE JOB #: U2 087 1274
	1"=100'-0" (0 50 100)

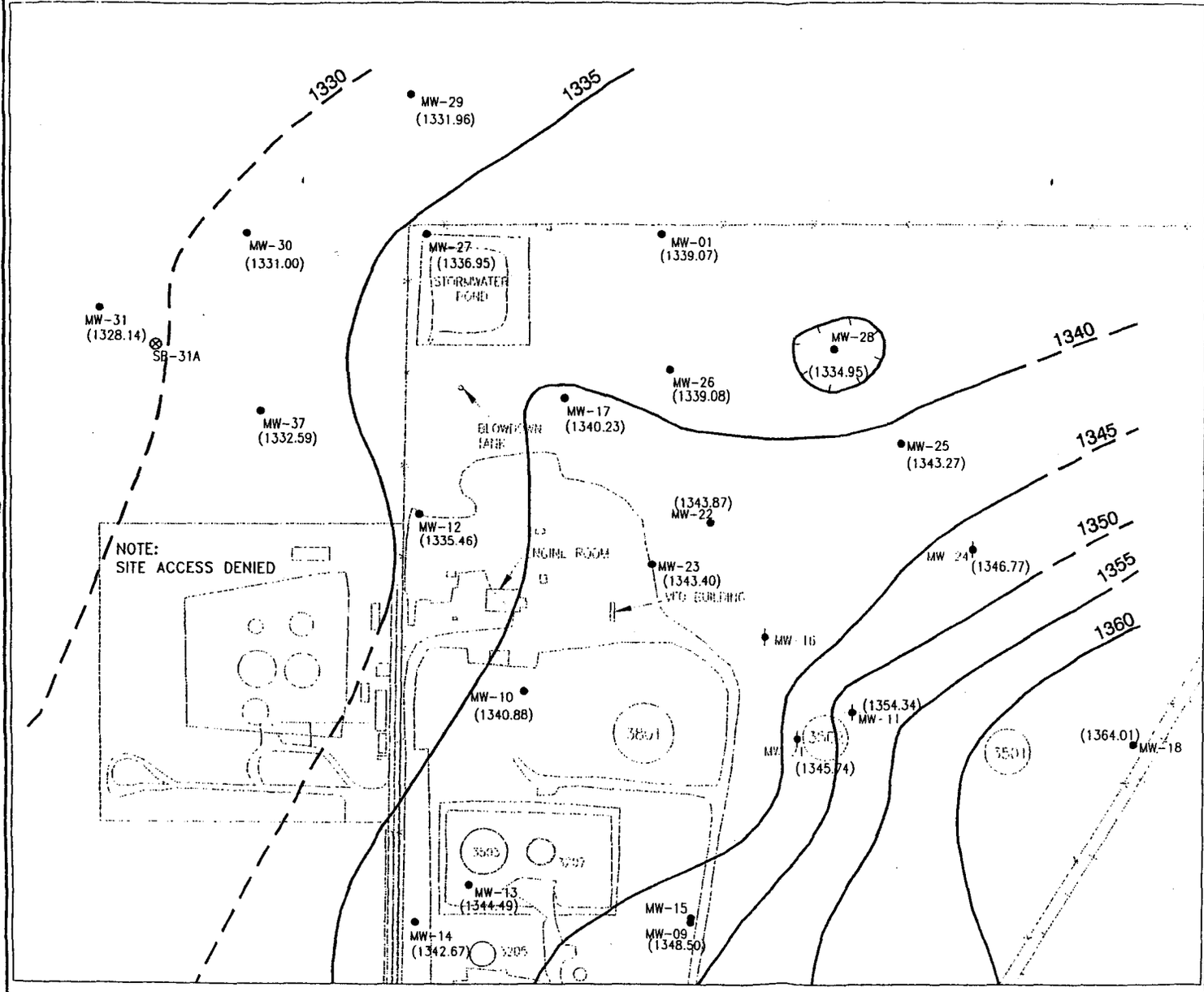
TITLE: **Figure 1 Groundwater Flow Map**

ASSOCIATED ENVIRONMENTAL INC.

NOTES: Quarterly Monitoring
Third Quarter: Sampling Date 2\27\97

LEGEND:
- Abandonned UST: 75,000 gallon concrete fuel oil
- Monitoring well locations
- Pre-existing monitoring well locations
- 1298.25 / 1314.40 - Static groundwater elevation (ft) / Top of casing elevation (ft)

OHSE



EXPLANATION

- EXISTING TANK LOCATION
- FORMER TANK LOCATION
- MW-26 MONITORING WELL
- SB-31A BOREHOLE
- 1360 GROUNDWATER ELEVATION CONTOUR
- CONTOUR INTERVAL = 5'
- MW 11 THESE WELLS WERE PLUGGED AND ABANDONED FOLLOWING GAUGING AND SAMPLING TO ALLOW FOR CONSTRUCTION OF NEW TANKS

NOTE:
MONITORING WELL LOCATIONS HAVE BEEN SURVEYED; BUILDINGS, TANKS AND ROADS HAVE BEEN DIGITIZED FROM 1974 AERIAL PHOTOGRAPHS.

N

0 200 400
Scale (ft)

HIGGINS AND ASSOCIATES, L.L.C

Project No.:	Date Map Generated:	Date Data Collected:	Figure No.
			1

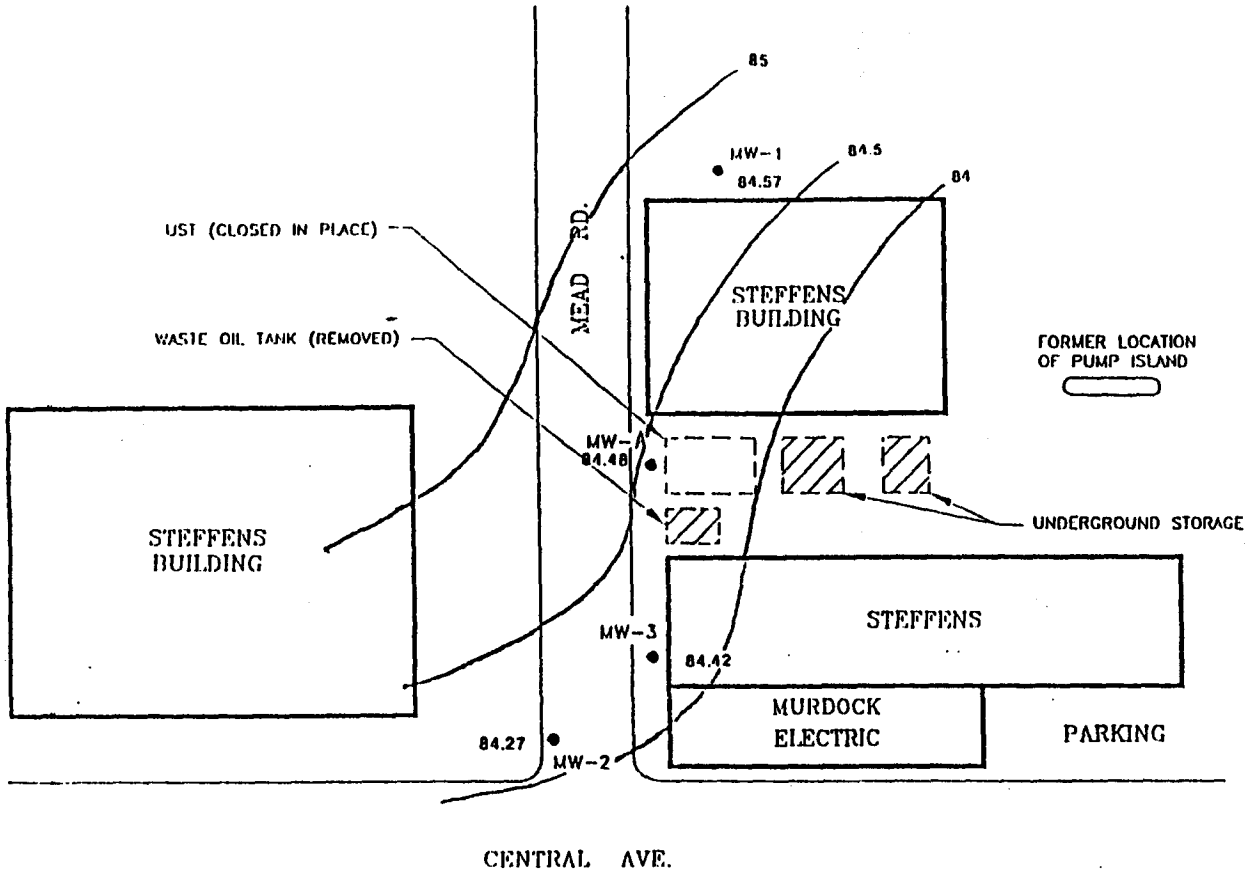
Authored
Checked
Detailed

Title:
GROUNDWATER POTENTIOMETRIC SURFACE - APRIL 1997
PPL

Client: Phillips Pipe Line Company

Client: Wichita Terminal Wichita, Kansas

ACAD File: 061.dwg



N

LEGEND

● = MONITORING WELL

NOT TO SCALE

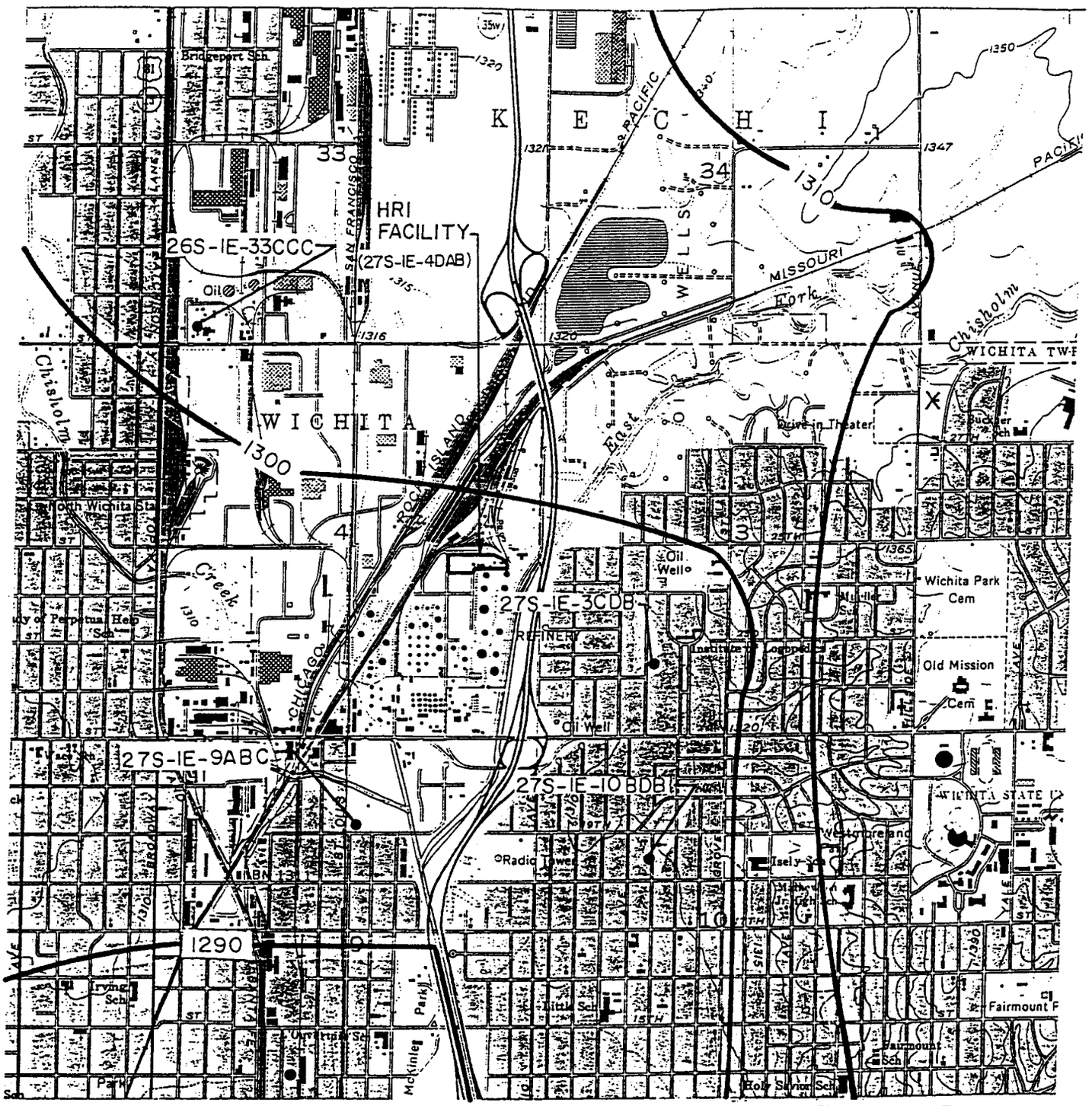
FIG. 2

GROUNDWATER TECHNOLOGY, INC.

443 N. MAIZE ROAD
WICHITA, KS. 67212

PROJECT No: 422-029-9502	DATE: 9/20/90
DETAILED: RHW	TITLE: GROUNDWATER FLOW MAP FOR 7/31/90
CHECKED:	
	CLIENT: STEFFENS
	LOCATION: WICHITA, KS.
	CAD DWG. FILE No. 9502-SM

SDF



TOWNSHIP 27S, RANGE IE, SECTION 6

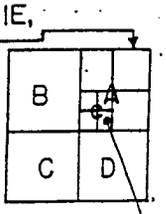
SCALE:

1000 0 1000 2000 3000

FEET

N

WELL NUMBERING CONVENTION



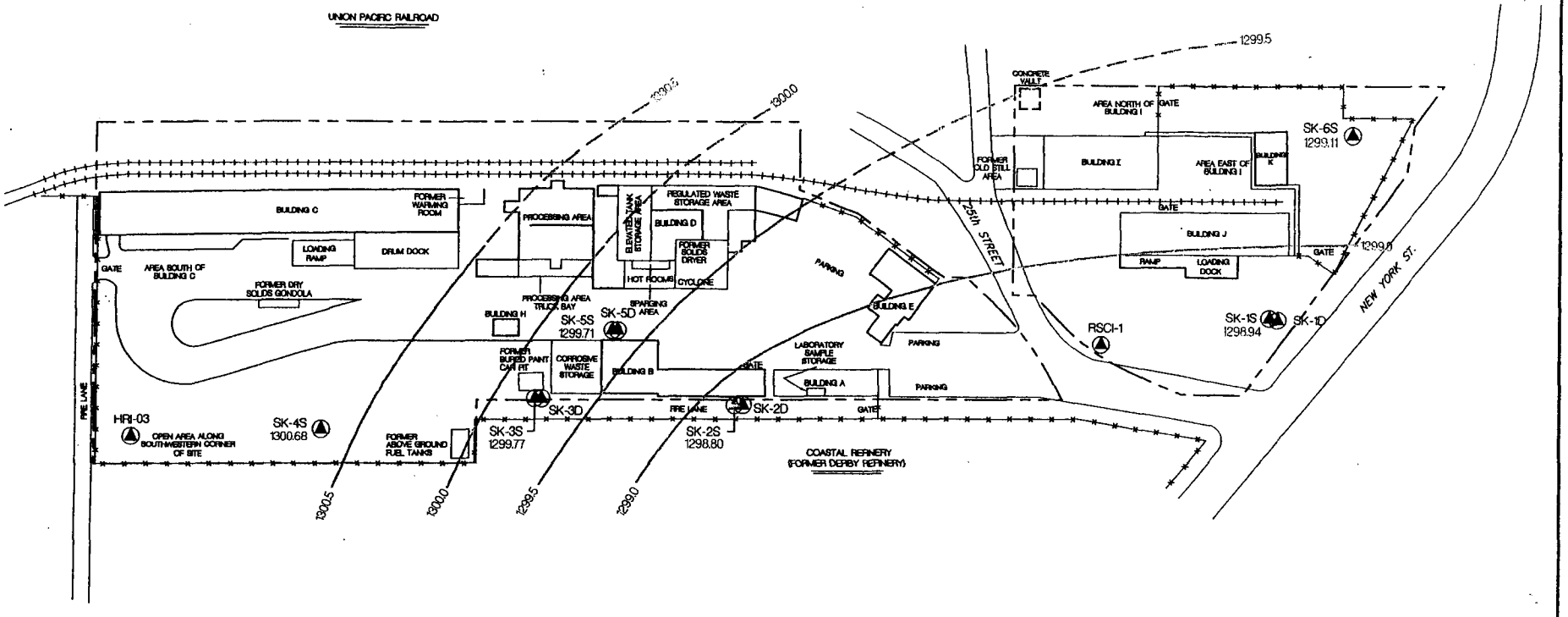
27S-IE-6ACD

NOTE: CONTOUR INTERVAL IS 10 FEET.

SOURCE: U.S. GEOLOGICAL SURVEY, 7.5 MINUTE SERIES (TOPOGRAPHIC) WICHITA EAST QUADRANGLE, KANSAS, 1961 AND "WATER RESOURCES OF SEDGWICK COUNTY, KANSAS", HUGH E. BEVANS, USGS, 1989, PLATE 2.

FIGURE 2-3
EXISTING WELLS AND GROUND WATER CONTOURS FOR THE HRI AREA
HRI FACILITY
RCRA FACILITY ASSESSMENT

SK



LEGEND

- : SWMU Locations
- : AOC Locations
- MONITORING WELL LOCATIONS
- 1300.68 SHALLOW GROUNDWATER ELEVATION (FT. MSL)
- GROUNDWATER ELEVATION CONTOUR

NOTE: SURVEYED TO STATE PLANE COORDINATE SYSTEM
CONTOURS BASED ON SHALLOW GROUNDWATER MEASUREMENTS

North

0 100
FEET

SK

FIGURE 5

BY	DATE
DRAWN CJJ	6-12-01
DESIGNED	
APPROVED	
APPROVED	
APPROVED	

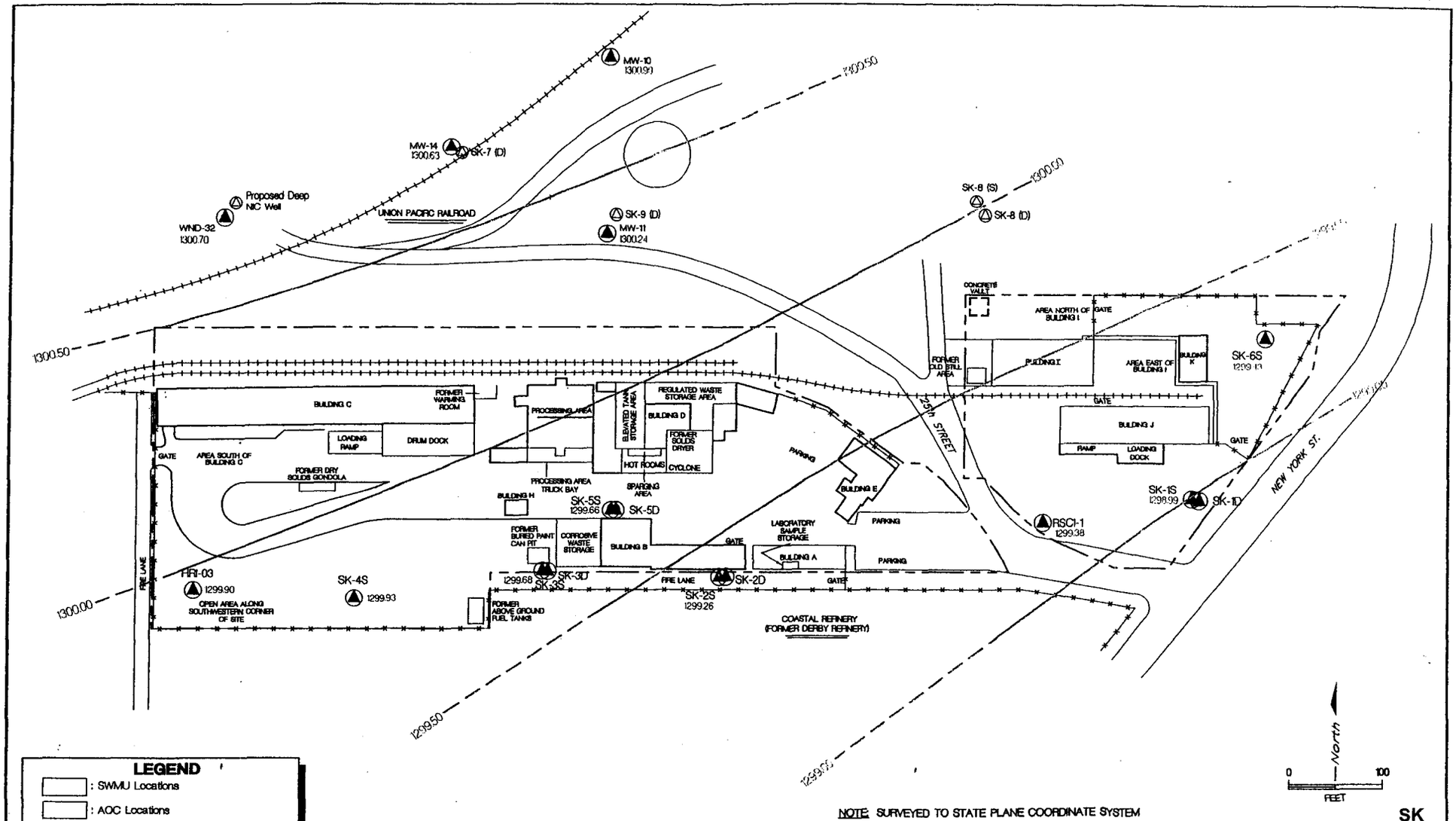
safety-kleen consulting

SAFETY-KLEEN - (WICHITA) FACILITY

CONTOURED GROUNDWATER ELEVATION MAP FOR THE SHALLOW ZONE - OCTOBER 25, 2000

SCALE: 1" = 100'

DWG. NO: 963231-0026



NOTE: SURVEYED TO STATE PLANE COORDINATE SYSTEM

SK

FIGURE 6

BY	DATE
DRAWN CJJ	6-11-01
CHECKED	
APPROVED	
APPROVED	
APPROVED	

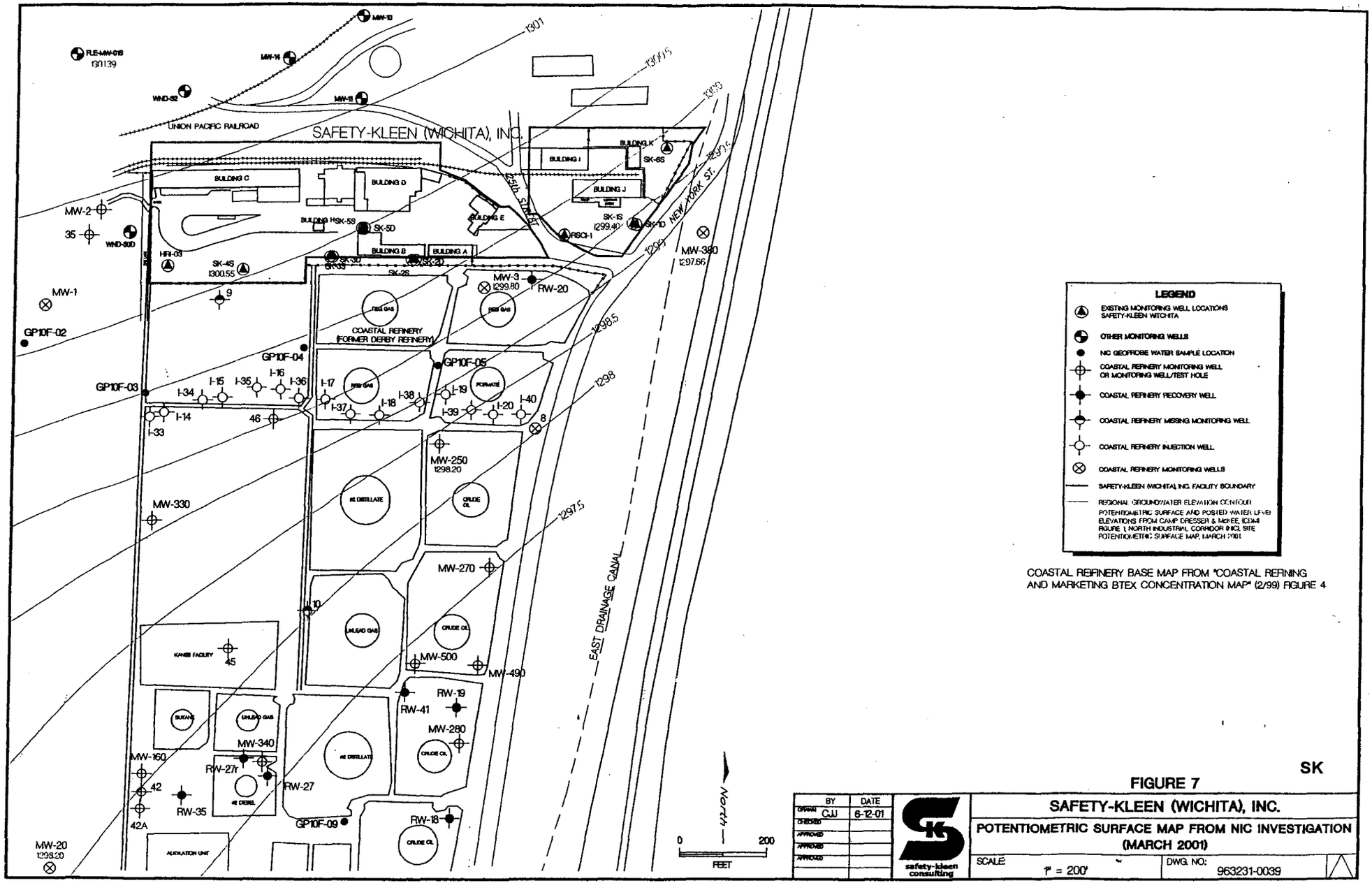
safety-kleen consulting

SAFETY-KLEEN - (WICHITA) FACILITY

CONTOURED GROUNDWATER ELEVATION MAP FOR THE SHALLOW ZONE - APRIL 25, 2001

SCALE: 1" = 100'

DWG. NO: 963231-0036



COASTAL REFINERY BASE MAP FROM "COASTAL REFINING AND MARKETING BTEX CONCENTRATION MAP" (2/99) FIGURE 4

SK

FIGURE 7

BY	DATE
DRAWN CJJ	6-12-01
CHECKED	
APPROVED	
APPROVED	
APPROVED	

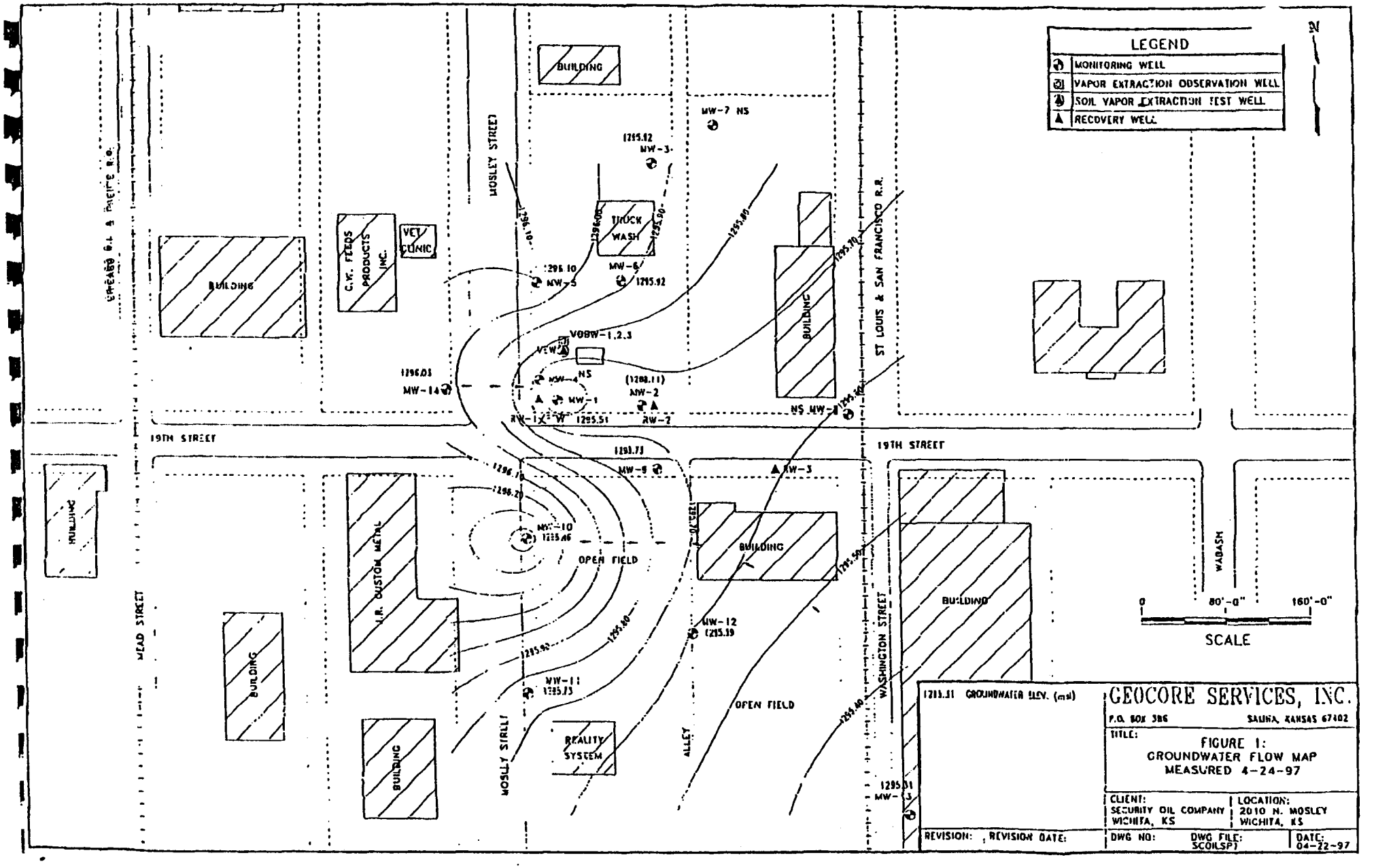
safety-kleen consulting

SAFETY-KLEEN (WICHITA), INC.

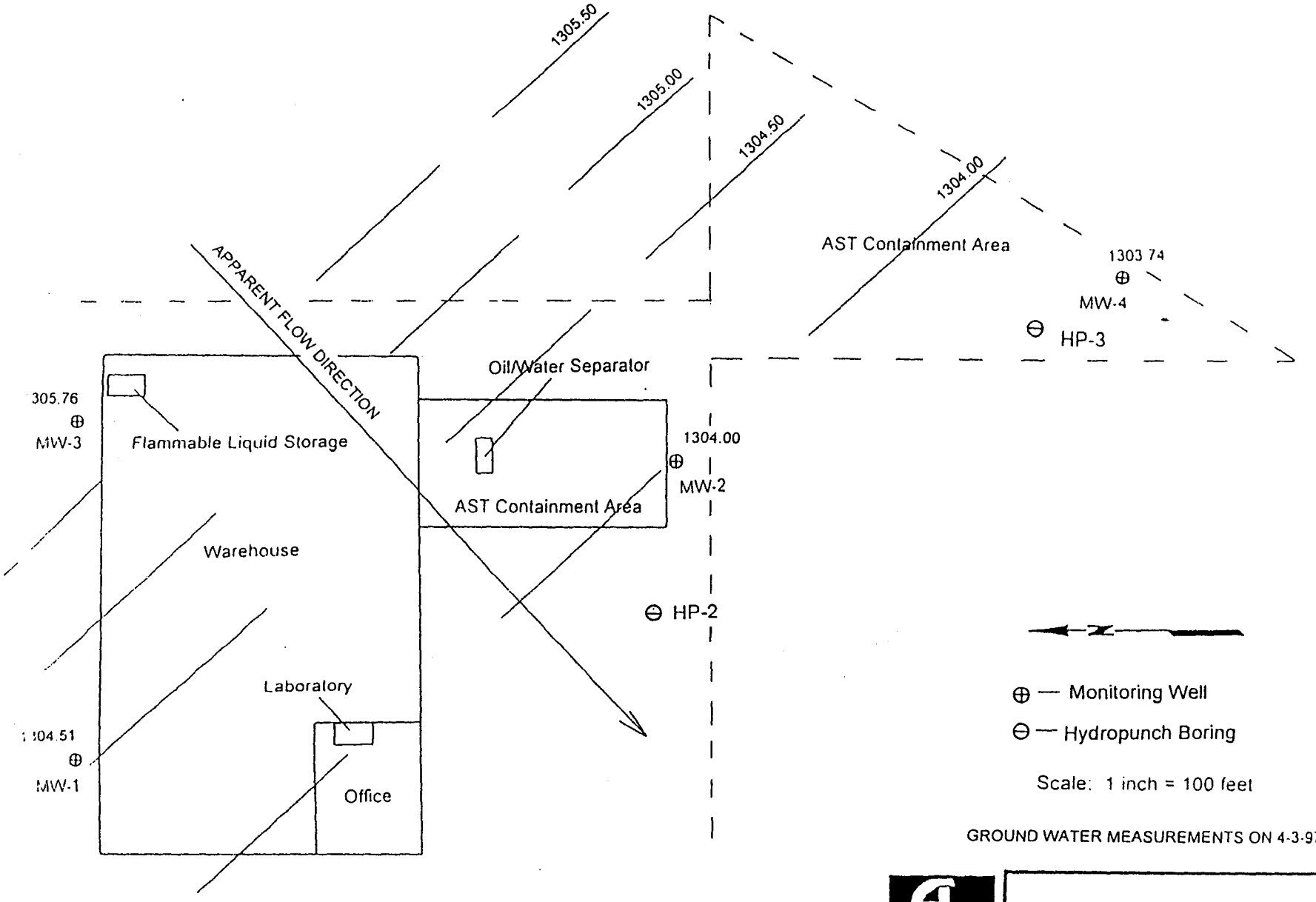
POTENTIOMETRIC SURFACE MAP FROM NIC INVESTIGATION (MARCH 2001)

SCALE 1" = 200'

DWG. NO: 963231-0039


LEGEND
MONITORING WELL
VAPOR EXTRACTION OBSERVATION WELL
SOIL VAPOR EXTRACTION TEST WELL
RECOVERY WELL
N
BUILDING
C.V. FEEDS PRODUCTS INC.
VET CLINIC
MOSLEY STREET
TRUCK WASH
MW-7 NS
MW-3
MW-5
MW-6
VOBW-1,2,3
VEW
MW-4
MW-1
MW-2
MW-14
RW-1
RW-2
RW-3
MW-8
MW-10
MW-11
MW-12
MW-13
OPEN FIELD
ST LOUIS & SAN FRANCISCO R.R.
19TH STREET
MEAD STREET
WASHINGTON STREET
WABASH
ALLEY
REALITY SYSTEM
J.R. CUSTOM METAL
0
80'-0"
160'-0"
SCALE
1295.51 GROUNDWATER ELEV. (msl)
GEOCORE SERVICES, INC.
P.O. BOX 386
SALINA, KANSAS 67402
TITLE:
FIGURE 1:
GROUNDWATER FLOW MAP
MEASURED 4-24-97
CLIENT:
SECURITY OIL COMPANY
WICHITA, KS
LOCATION:
2010 N. MOSLEY
WICHITA, KS
REVISION:
REVISION DATE:
DWG NO:
DWG FILE:
SCOILSP1
DATE:
04-22-97

SOC

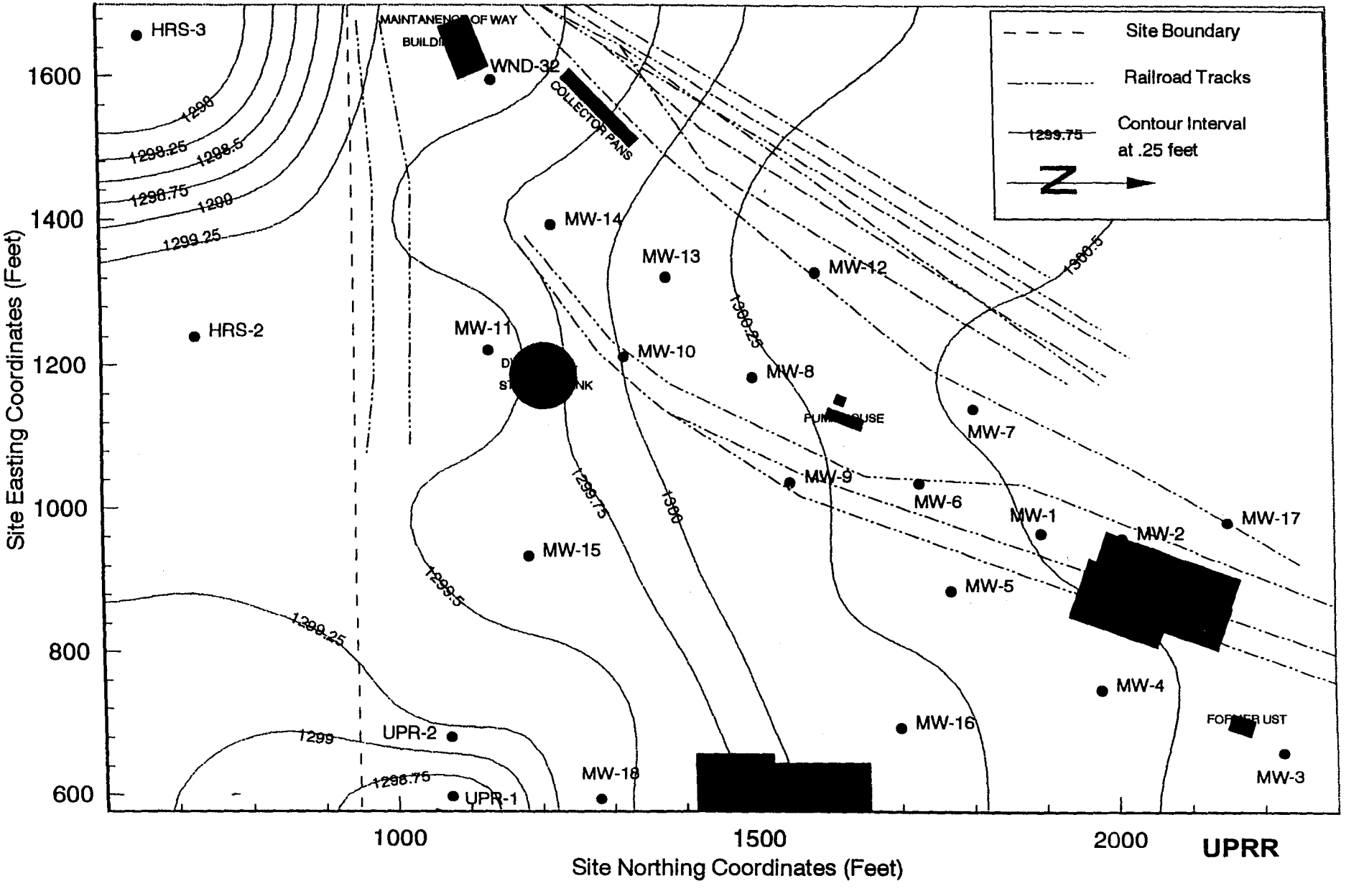


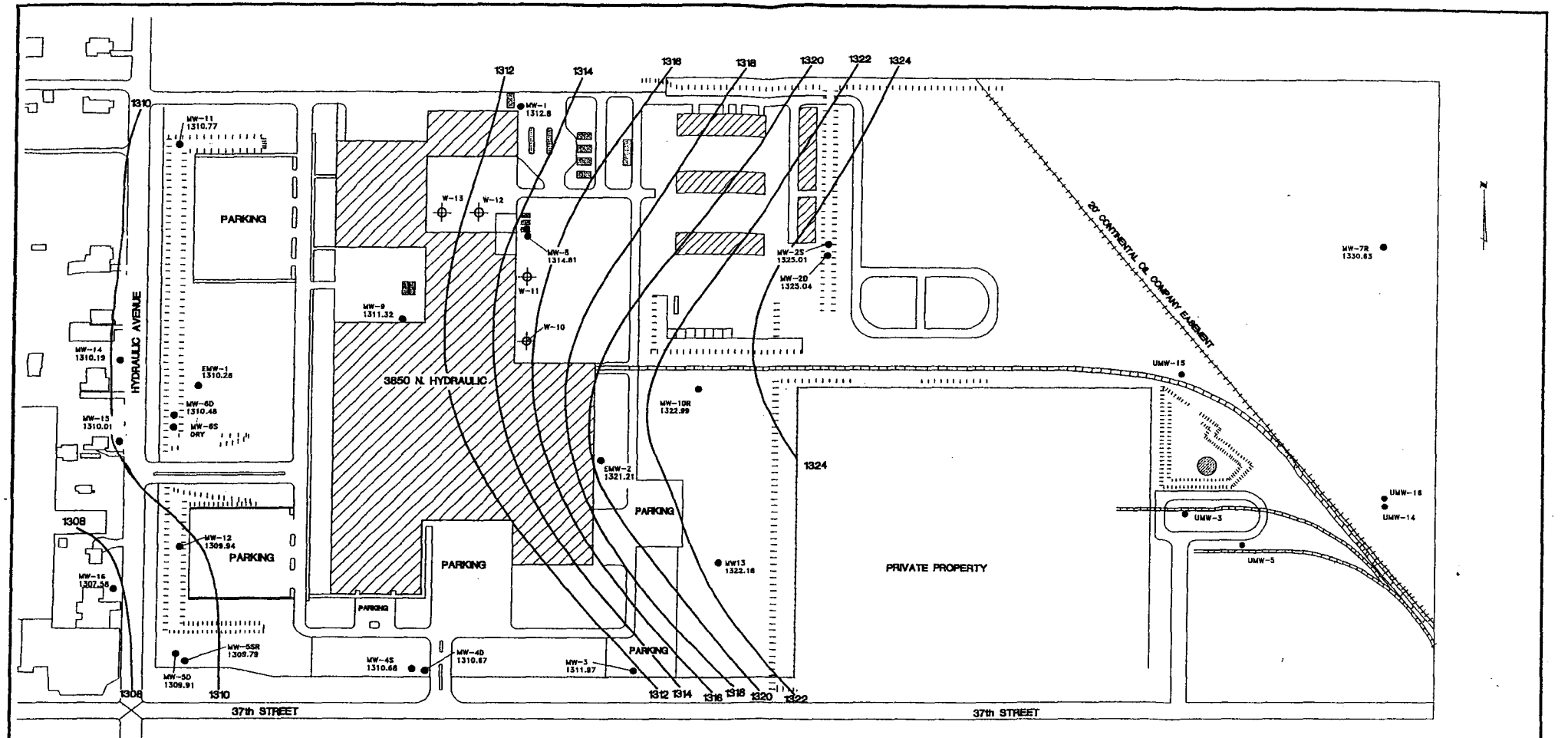
UNIVERSAL LUBRICANTS

FIGURE 2
SITE DIAGRAM

ULI

Figure 7: Potentiometric Surface Map, October 1994, Wichita Fueling Area, Wichita, Kansas





LEGEND

WELL LOCATION AND POTENTIOMETRIC ELEVATION (FT. MSL)

● MW-9
1311.32

JANUARY 1999 GEOPROBE LOCATION

⊕ W-10

NOTE:

1. WATER LEVELS MEASURED FEBRUARY 7, 1999.

SCALE IN FEET

200 0 200 400

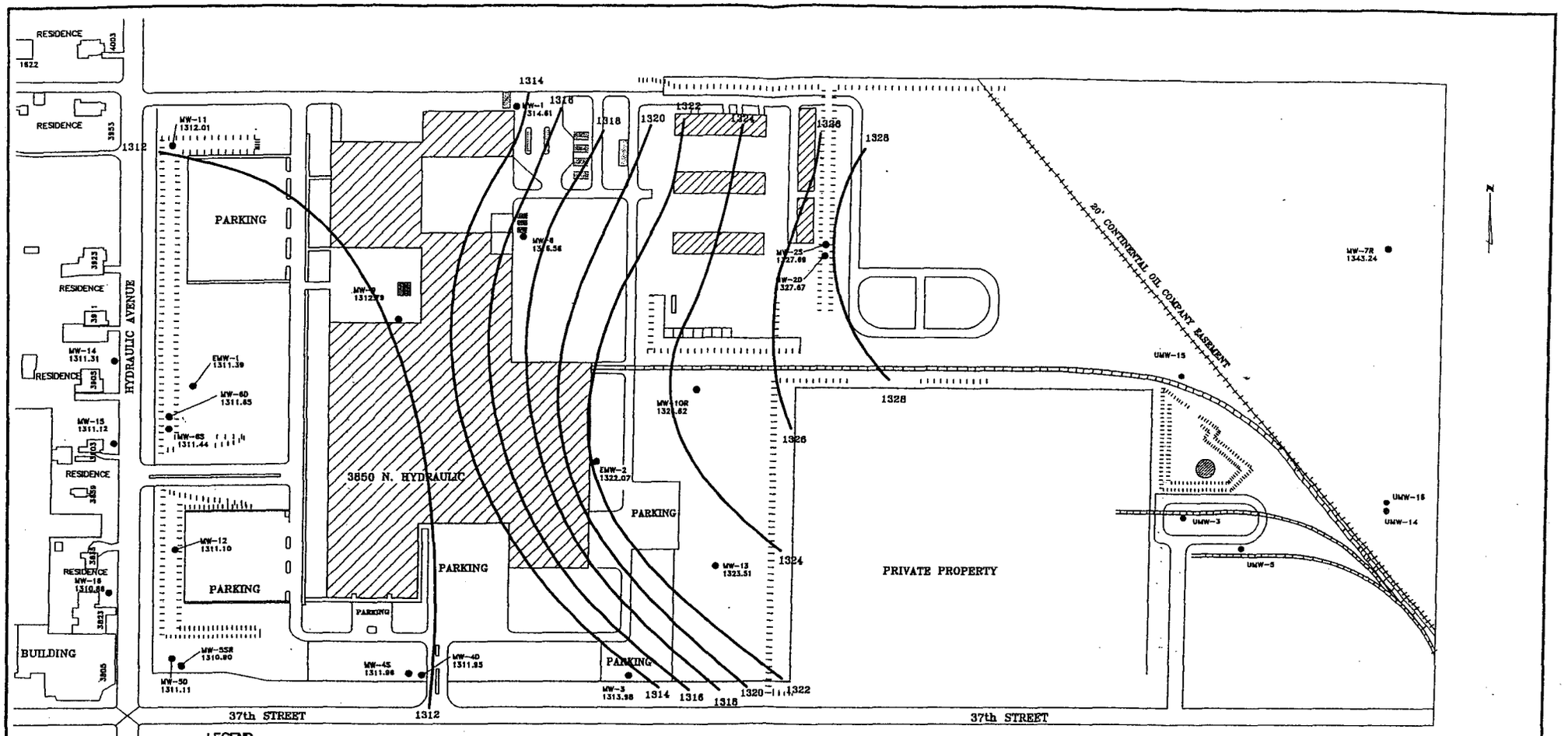
Golder Associates — St. Louis, Missouri

USD 259
SCHOOL SERVICE CENTER
WICHITA, KANSAS

TITLE
POTENTIOMETRIC SURFACE MAP
FEBRUARY 1999

DRAWN	JTL	DATE	MARCH 1999	JOB NO.	9
CHECKED	MRS	SCALE	AS SHOWN	DWG. NO.	2
REVIEWED	FMB	FILE NO.		FIGURE NO.	3

USD



LEGEND

● MW-3 1313.98 WELL LOCATION AND POTENTIOMETRIC ELEVATION (FT. MSL)

NOTE:

1. WATER LEVELS MEASURED JUNE 21, 1999.
2. UNOCAL DATA COLLECTED MARCH 1999.

SCALE IN FEET

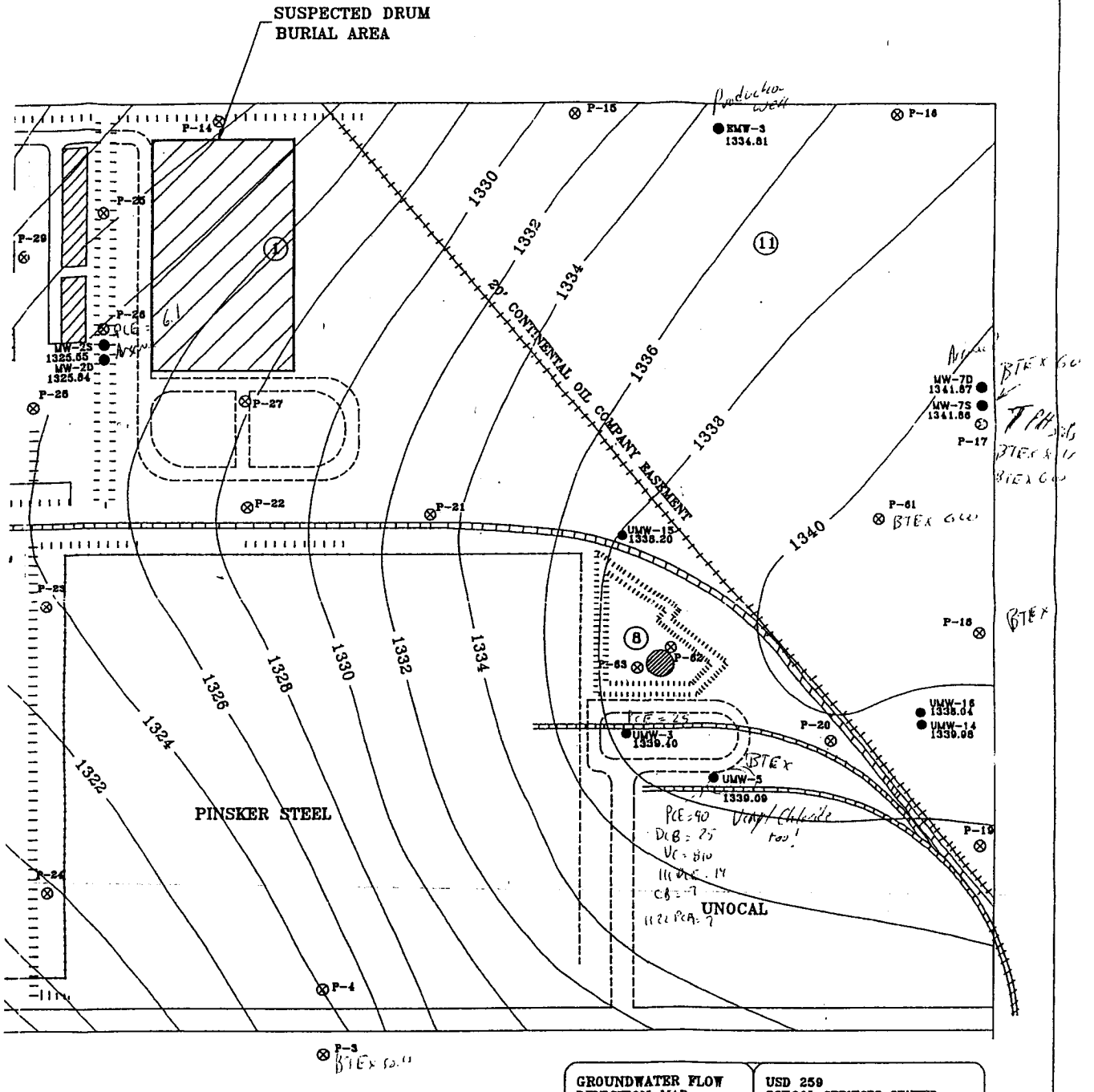
200 0 200 400

Golder Associates St. Louis, Missouri

USD 259
SCHOOL SERVICE CENTER
WICHITA, KANSAS

TITLE
POTENTIOMETRIC SURFACE MAP
SEPTEMBER 1999

DRAWN ML	DATE NOVEMBER 1999	JOB NO.	USD
CHECKED MRS	SCALE AS SHOWN	DWG. NO.	
REVIEWED FMB	FILE NO.	FIGURE NO.	2



LEGEND	
●	EXISTING WELL
⊗	PROBE LOCATIONS
●	MONITOR WELL LOCATIONS
D = DEEP WELL S = SHALLOW WELL	CI = 2 FEET 1338.20 = GROUNDWATER ELEVATION

GROUNDWATER FLOW DIRECTION MAP (11/14/95)	USD 259 SCHOOL SERVICES CENTER 3850 N. HYDRAULIC WICHITA, KS

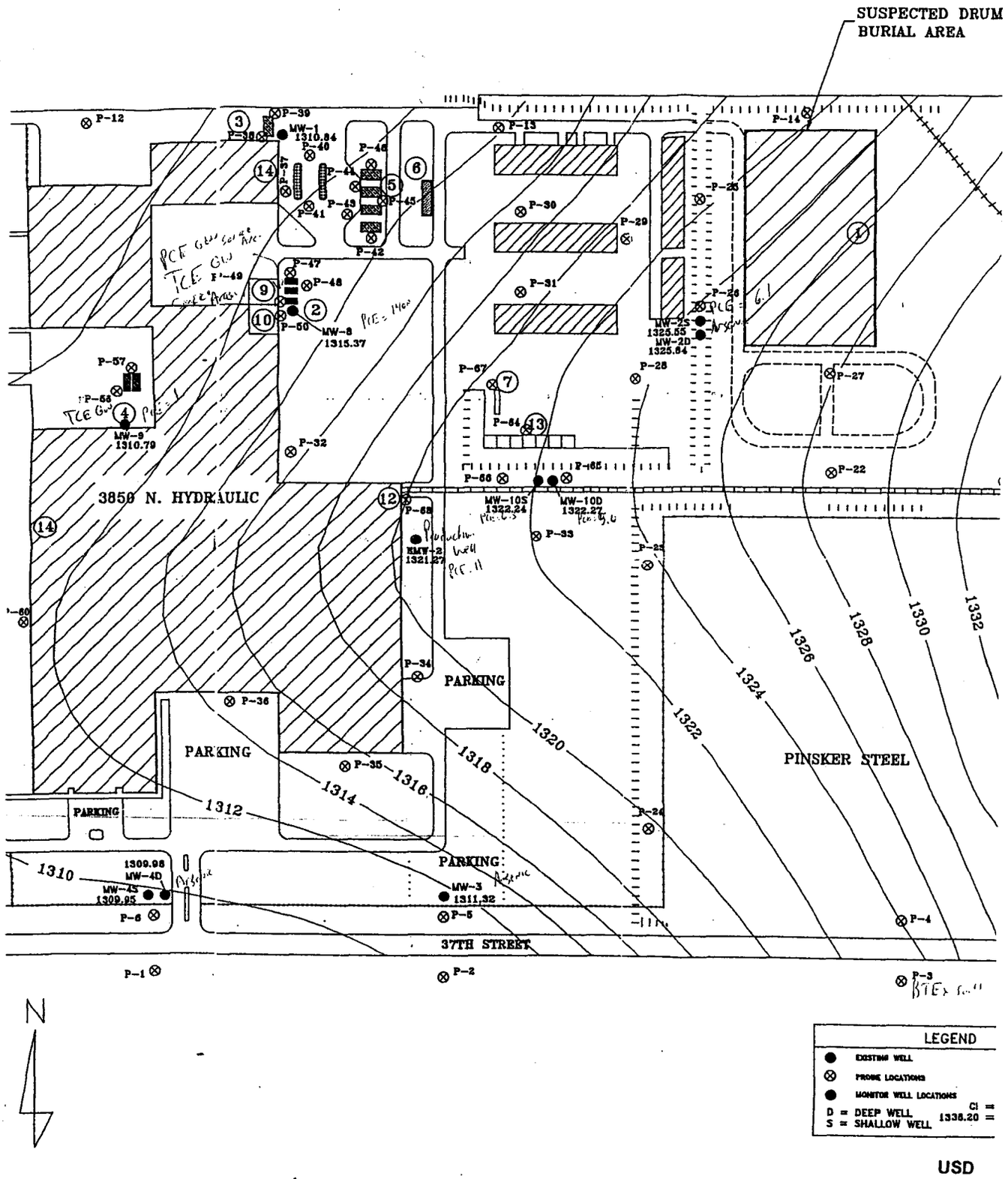
PROJECT NO. 52935037	SCALE: NTS	DESIGNED BY:	DATE:
FILE NAME 935037.DWG	DRAWN BY: MEK	CHECKED BY:	DATE:
DATE: OCT. 1995	PROJECT MNGR: KCW	APPROVED BY:	DATE:

2111 W. HARRY
WICHITA, KANSAS 67213
PHONE: (316) 262-0281
FAX: (316) 262-6997

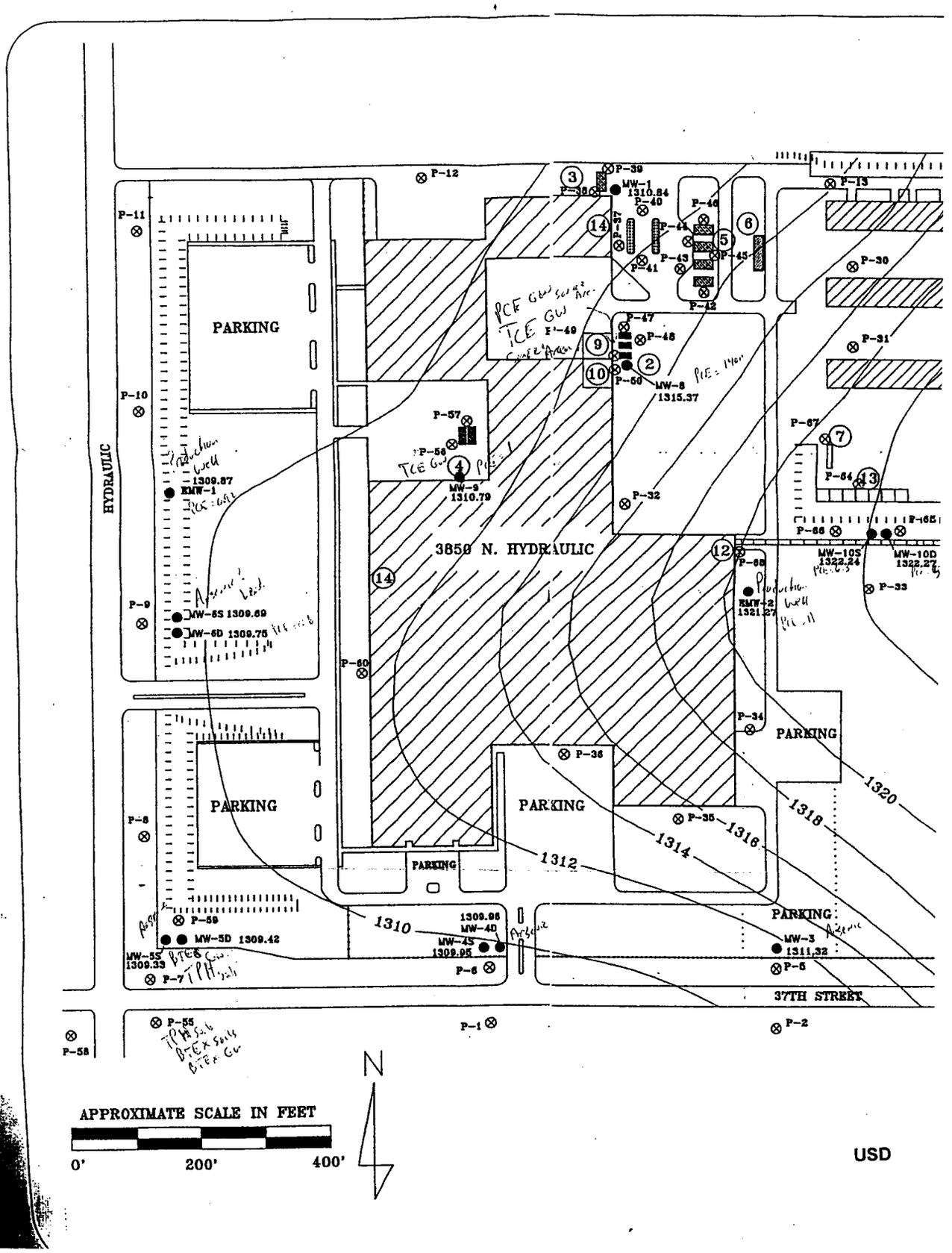
Terracon ENVIROMENTAL, INC.

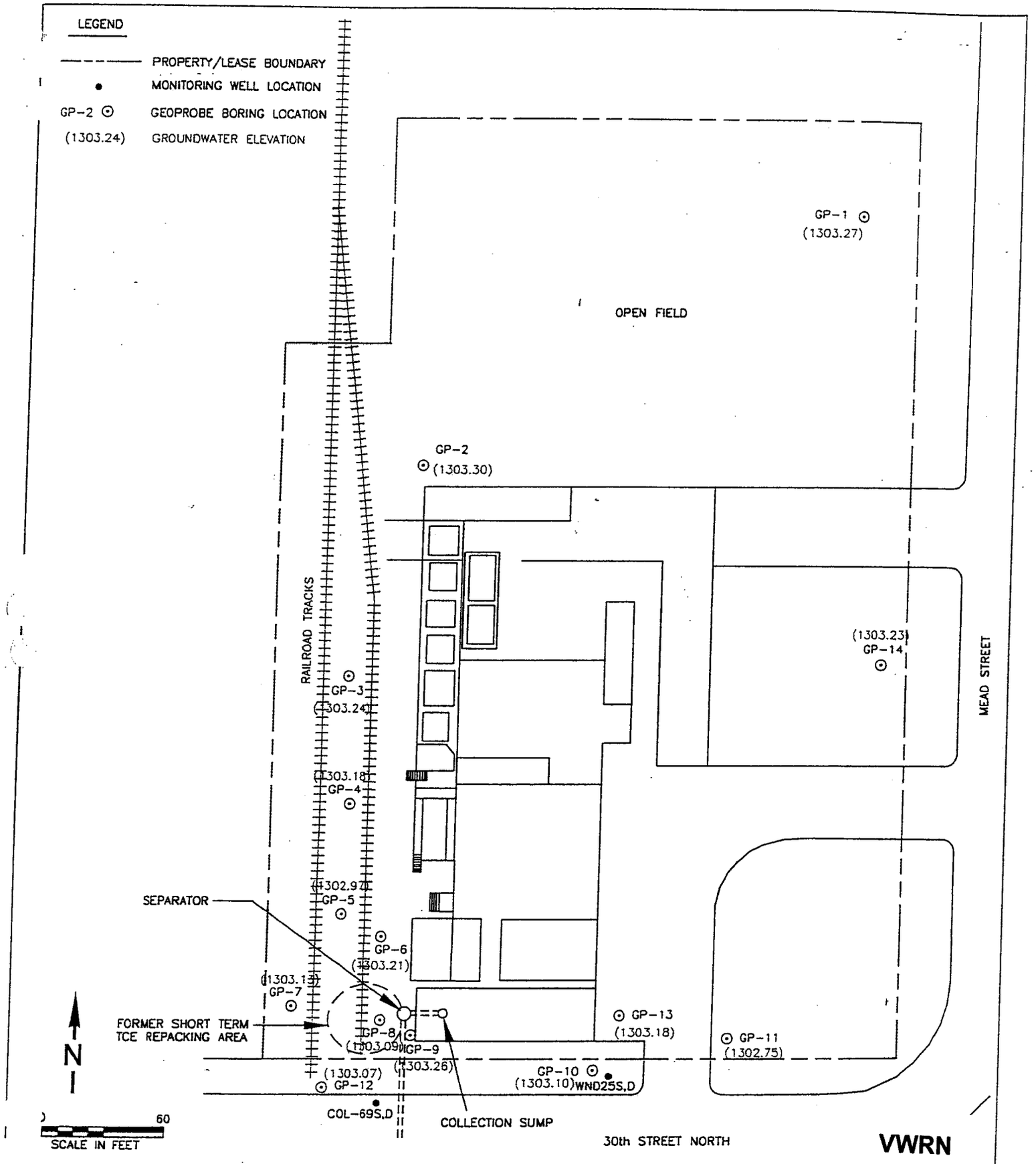
FIGURE 7

USD


SUSPECTED DRUM BURIAL AREA
3850 N. HYDRAULIC
PARKING
PINSKER STEEL
37TH STREET
MW-1 1310.84
MW-8 1315.37
MW-9 1310.79
MW-2 1321.27
MW-10S 1322.24
MW-10D 1322.27
MW-2S 1325.55
MW-2D 1325.54
MW-4D 1309.98
MW-4S 1309.95
MW-3 1311.32
1310
1312
1314
1316
1318
1320
1322
1324
1326
1328
1330
1332
N
LEGEND
EXISTING WELL
PROBE LOCATIONS
MONITOR WELL LOCATIONS
D = DEEP WELL
S = SHALLOW WELL
CI =
1336.20 =

USD


HYDRAULIC
PARKING
3850 N. HYDRAULIC
37TH STREET
MW-1 1310.84
MW-8 1315.37
MW-9 1310.79
EMW-1 1309.87
MW-5S 1309.69
MW-5D 1309.75
MW-5D 1309.42
MW-5S 1309.33
MW-4D 1309.96
MW-4S 1309.95
MW-3 1311.32
EMW-2 1321.27
MW-10S 1322.24
MW-10D 1322.27
1310
1312
1314
1316
1318
1320
N
APPROXIMATE SCALE IN FEET
0'
200'
400'
USD

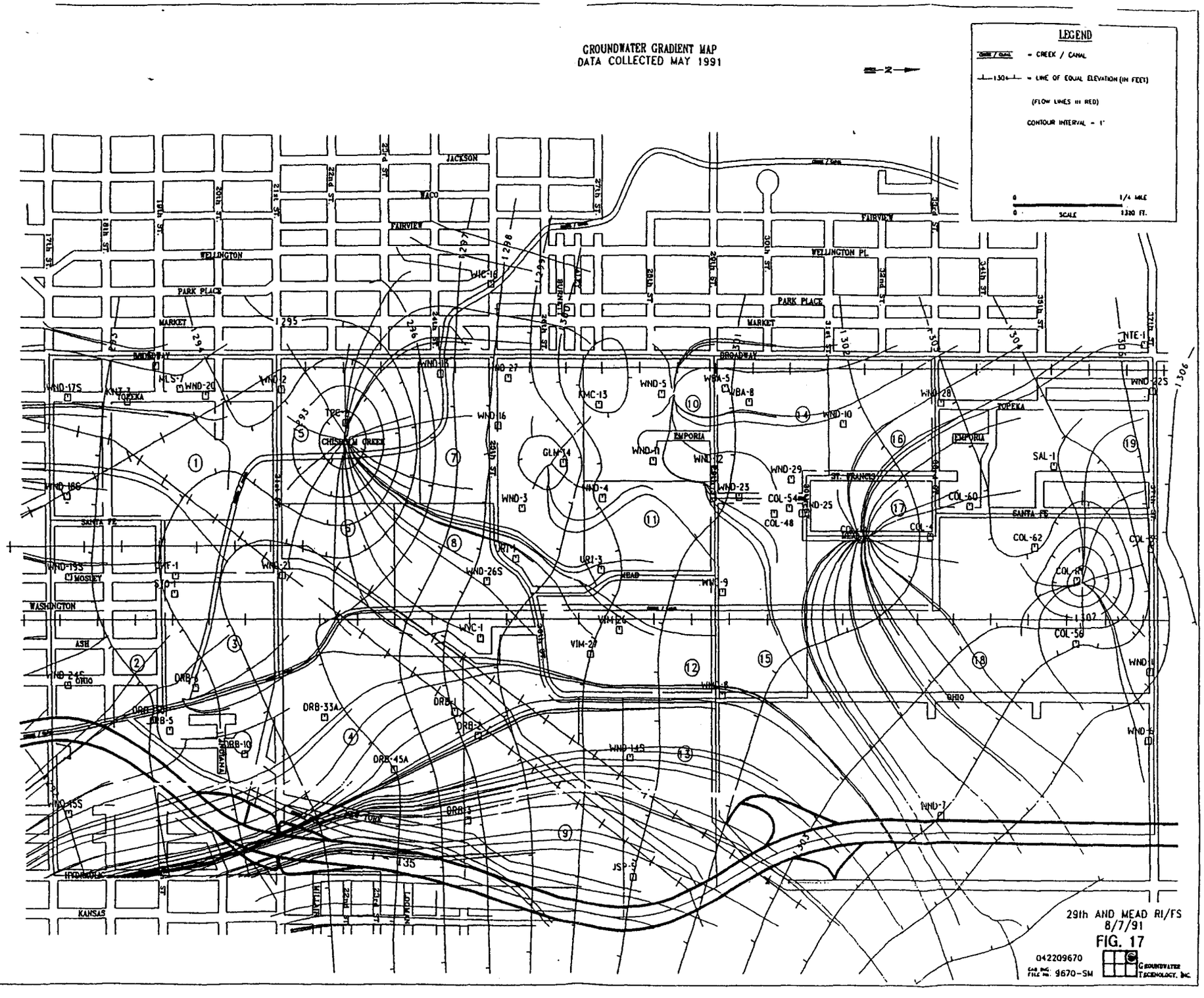


SECOR
INTERNATIONAL INCORPORATED
4463 WHITE BEAR PARKWAY
SUITE 106

FORMER VW&R MEAD STREET FACILITY
WICHITA, KANSAS

GROUNDWATER ELEVATION DATA MAP
(SEPTEMBER 2000)

FIGURE
6


GROUNDWATER GRADIENT MAP
DATA COLLECTED MAY 1991
LEGEND
= CREEK / CANAL
= LINE OF EQUAL ELEVATION (IN FEET)
(FLOW LINES IN RED)
CONTOUR INTERVAL = 1'
0
1/4 MILE
SCALE
1320 FT.
JACKSON
WACO
FAIRVIEW
WELLINGTON
WELLINGTON PL
PARK PLACE
MARKET
BROADWAY
TOPEKA
EMPORIA
ST. FRANCIS
SANTA FE
MOSLEY
WASHINGTON
OHIO
KANSAS
HYDRAULIC
CHISHOLM CREEK
I-35
29th AND MEAD RI/FS
8/7/91
FIG. 17
042209670
FILE NO. 9670-SM
GROUNDWATER TECHNOLOGY, INC.

29M

Appendix G-3
Hydraulic Conductivity Data

COMPREHENSIVE REMEDIAL INVESTIGATION REPORT

FORMER UNOCAL CHEMICALS DIVISION DISTRIBUTION FACILITY WICHITA, KANSAS

Prepared For:

Unocal Environmental Remediation Services
parachute, Colorado

Presented To:

Kansas Department of Health and Environment
Topeka, Kansas

June 28, 1996

Prepared By:

Woodward-Clyde Consultants
7600 W. Tidwell, Suite 6f00
Houston, TX 77040

WC: 95T235

APPENDIX A

FATE & TRANSPORT MODELING RESULTS

FATE AND TRANSPORT MODELING RESULTS

UNOCAL'S FORMER CHEMICAL DISTRIBUTION FACILITY
WICHITA, KANSAS
FEBRUARY 8, 1996
REVISED: MARCH 12, 1996

FATE AND TRANSPORT MODELING

This modeling effort was undertaken to evaluate the source and fate and transport of a subsurface chemical releases which may have occurred at the Unocal Site. The relevant geology and site conditions have been investigated and are reported in the Comprehensive Remedial Investigation Report (CRIR).

Model Description

The fate and transport model used for this modeling effort is the Solute Plume 2-D model with a continuous point source. This model is based on the International Groundwater Modeling Center's (IGWMC) Solute Program Package, Analytical model for Solute Transport.

The assumptions of this model are as follows.

- The aquifer is infinite in aerial extent, and of a constant thickness.
- The groundwater flow regime is fully saturated.
- The aquifer is of a uniform porosity.
- The aquifer is homogeneous and isotropic with respect to its hydraulic and transport characteristics.
- The source fully penetrates the aquifer.
- There is one-dimensional, steady-state, uniform regional flow and recharge from the release source is small and does not influence the flow field.
- The released constituents are distributed instantaneously over the entire aquifer thickness beneath the source.
- The release rate is continuous and constant.
- The density and viscosity of the solute and in the aquifer are identical and do not change with time.
- There is no solute advection or dispersion into or out of the confining layers.

The conservative assumptions with respect to VOH releases should be noted.

Chemicals of Concern

Chemicals for which fate and transport modeling was performed are:

Vinyl chloride,
Benzene,
Trichloroethene,
1,1-Dichloroethene,
1,2-Dichloroethene,
Tetrachloroethene,
1,1,1-Trichloroethane,
1,1-Dichloroethane, and
Toluene.

These chemicals were identified because they were the most consistently and frequently encountered through all phases of the assessment activities to date.

Model Inputs

This modeling effort was performed for the historically investigated Upland area reported further in the CRIR. Accordingly, the input parameters discussed below are for the geologic conditions of the Upland and not the alluvial aquifer area.

The input variables for the fate and transport model are porosity, seepage velocity, aquifer thickness, longitudinal and lateral dispersivity, retardation factor, contaminant half-life, and the source strength. These input parameters are summarized in Table 1.

An effective porosity value of 43 percent was used. This value was determined by taking an arithmetic average porosity values determined from field samples collected at the site (Delta, September 25 1995). Porosity for the field samples ranged from 39 percent to 62 percent. The 62 percent porosity value is a statistical outlier and was not used in calculating the arithmetic average. Table 2 lists the porosity values used in calculating the arithmetic average.

The parameters required to calculate seepage velocity are porosity, hydraulic gradient and hydraulic conductivity. The hydraulic gradient across the site was determined from a potentiomentric surface map created from an average of water elevations from each well, for all measurements, taken prior to October 1994 (i.e., prior to start up of the IRM). A table of the

calculated averages are included as Table 3. The potentiometric surface map created from these data and used to calculate the time average hydraulic gradient is included as Figure 1. The distance between the equipotential lines was measured on the map and the gradient then calculated for the upland area. The calculated hydraulic gradient at the site was 0.015 feet/foot.

Numerous hydraulic conductivity values have been calculated from slug and pump test data from wells investigations. The most representative hydraulic conductivity values for the area of the NE Plume (originating from the UNOCAL site and moving towards the Coleman Shipping Warehouse Building) are those values calculated from wells installed within that area. For the area between the UNOCAL site and the Coleman building, wells MW-2, MW-4 and UNO-RW-3 had either slug tests or pump tests conducted to calculate hydraulic conductivity.

Slug tests were conducted on wells MW-2 and MW-4 with calculated hydraulic conductivity values of 0.783 feet/day and 0.049 feet/day, respectively (Woodward-Clyde Consultants, November 1991). A pump test was conducted on MW-2 using observation piezometers. The calculated hydraulic conductivity values from the MW-2 pump test ranged from 2.43 feet/day to 7.39 feet/day (Maude Environmental Inc., November 11, 1993) with an arithmetic mean value of 5.1 feet/day. A pump test was conducted at UNO-RW-3 using two monitor wells and one piezometer as observation wells. The hydraulic conductivity was calculated for each well by three methods (Theis Curve-Matching Method, Cooper-Jacob Straight Line Method and Residual-Drawdown Method). The resulting calculated hydraulic conductivity values ranged from 0.21 to 38.6 feet/day (Smith Environmental Technologies Corp., February 1996) Since the hydraulic conductivity values ranged over three orders of magnitude, a geometric mean value of 5.2 feet/day was calculated using all the hydraulic conductivity values from all calculation methods. This average hydraulic conductivity is consistent with the average conductivity calculated for MW-2 (5.1 feet/day). The mean value of hydraulic conductivity for the area within the plume was then determined by taking the mean of the two calculated means which resulted in an overall mean value of 5.2 feet/day. Since pump test data was available for MW-2, which is considered more accurate than slug test data, the slug test results are not included in this calculation.

Based on collective review of the hydraulic conductivity data and comparison with arithmetic mean values, a higher value of 8.5 feet/day was used for modeling in order to be conservative. The value used is approximately 1.6 times the correct average of 5.2 feet/day. Therefore, with a factor of safety of about 1.6, the hydraulic conductivity used for the modeling conservatively represents this site parameter for the area through which transport is occurring.

The groundwater (seepage) velocity is the rate of groundwater movement. This value is determined using Darcy's law which states that:

$$q = K\left(\frac{\Delta h}{\Delta l}\right)$$

where:

q	=	Darcy velocity
K	=	saturated hydraulic conductivity
$\frac{\Delta h}{\Delta l}$	=	groundwater gradient

The seepage velocity is:

$$Vseepage = \frac{q}{n}$$

where:

$V_{seepage}$	=	seepage velocity
n	=	effective porosity

Seepage velocity at the site has been calculated to be 0.297 feet/day.

Longitudinal dispersivity is a scale-dependent parameter which is generally larger as the scale of the contaminant plume increases. Longitudinal dispersivity represents the spreading of the contaminant plume in the direction of groundwater flow. A value of 20 feet had been previously calibrated for this site as discussed in [Maude, November 11, 1993] and was the value used for this modeling effort.

Transverse dispersivity represents spreading of the contaminant plume perpendicular to the flow direction. A value of 2 feet was had been previously calibrated for this site as discussed in [Maude, November 11, 1993] and was the value used for this modeling effort.

Half-life values for each chemical used in this modeling effort were the longest half-life values from a range of anaerobic biodegradation half-life's presented in the Handbook of Environmental Biodegradation Rates (Howard, 1991). Biodegradation values were used for comparison purposes and only for the longest time interval modeled.

The retardation factor for each chemical is calculated by using the following relationship (Hathaway and Andrews, 1990):

$$R = 1 + \frac{pb}{n} * Kd$$

GROUNDWATER TECHNOLOGY

Groundwater Technology, Inc.
443 N. Maize Rd., Wichita, KS 67212
Tel: (316) 722-2266 Fax: (316) 722-9327

REPORT OF REMEDIAL INVESTIGATION ACTIVITIES COLEMAN OPERABLE UNIT WICHITA, KANSAS

September 3, 1991

Revision I: November 22, 1991
Revision II: February 12, 1992
Revision III: April 13, 1992
Revision IV: May 7, 1992

Volume I of III

Prepared For:

Harold J. Pfountz
The Coleman Company
250 North St. Francis
Wichita, Kansas 67202

Prepared By:

Groundwater Technology, Inc.

Reviewed By:

Donn V. Lentz
Sr. Project Manager
Groundwater Technology, Inc.

Albert E. Stout
District Hydrogeologist
Groundwater Technology, Inc.

Richard Lewis
Principal Hydrogeologist
Groundwater Technology, Inc.

doc id\c:coleman\42209733.rif\nim

- Water-Filled Porosity

  A total porosity of 30 to 35% and a specific yield of 0.2 indicates a water-filled porosity of 10 to 15% of bulk volume found in sand. Clay has a total porosity of 45 to 55% and a specific yield of 0.01 to 0.10.

- Ambient Air Pressure

  Ambient air pressure is assumed to be 750 millimeters of mercury (mm Hg).

- Design Rate of Vapor Extraction

  Air flow rate from each well is assumed to be 15.3 cfm, with an associated vacuum pressure of 30 inches of water measured at each well head. These operating pressure and flow values are based on VOC recovery optimization, determined from pilot test results.

- Desired Effective Radius

  The achievable effective ROI for the VEWs is 30 feet.

- Air Pressure At Effective Radius

  The air reduction pressure below ambient conditions at the estimated effective ROI is 0.05 inches of water.

3.8 AQUIFER PUMPING TEST RESULTS

3.8.1 Step-Rate Drawdown Test

The step-rate drawdown test was conducted in three 1-hour intervals at pumping rates of 5, 10, and 14.5 gpm. Pumping was continuous, and the test well was not allowed to recover between each of the steps. Figure 1 in Appendix F graphically illustrates the drawdown in TW-1 that occurred during this test. Table 1 in Appendix F provides the data utilized in Figure 1. Due to the poor well efficiency of TW-1, drawdown in the well at 15 gpm was sufficient to cause air to be drawn into the intake of the pump. Based on the step-rate test results, a constant rate of approximately 14 gpm was selected for performing the aquifer pumping test.

3.8.2 Constant-Rate Aquifer Pumping Test

During the constant-rate aquifer pumping test, 60,310 gallons of water were pumped from TW-1, for an average flow rate of 13.8 gpm.

Analysis of the data assembled during the aquifer pumping test (July 24 through 27, 1991) revealed a transmissivity of approximately 20,000 gpd/ft and an estimated storage coefficient of approximately 0.2. **Appendix F** contains detailed tables, figures, and calculations related to the pumping test.

RW-1 was to remain running prior to, during, and after the pumping test. This would allow continuous operation of the on-site recovery system. During computation of the test data, adjustments would be made to correct any interference from RW-1. Analysis of the pumping test data, and daily meter readings of RW-1 indicated that RW-1 shut off, probably due to weather, approximately 10 hours prior to the test. A review of MW-34 hydrograph (**Appendix F, Figure 2** and **Table 2**) shows the recharge of the aquifer prior to initiating the aquifer pumping test. It is assumed that static conditions of the aquifer were reached in the 10-hour period prior to the test. Evcon personnel inadvertently restarted RW-1 about 6 hours after the test started. Due to the effects of operation of RW-1 on the pumping test only, the data obtained during the early portion of the test were analyzed for the upper aquifer properties. Analysis of data for the abbreviated test resulted in a good early curve for matching and calculation of transmissivity. However, the storage coefficients obtained may be lower than if data representing a longer test were analyzed by this method.

The first step in the analysis process was to plot an arithmetic scale hydrograph showing depth-to-water versus time for MW-34 during the test. The hydrograph of MW-34 is presented in **Appendix F**, along with the data tables showing the actual measurements plotted. With the exception of the water level rise caused by the shutdown of RW-1, the antecedent and the post-test water level trends were similar. Therefore, no corrections to the drawdown data were made during the analysis.

Analysis of the drawdown data to determine aquifer parameters was completed using the method outlined by Neuman (1975). This method allows for the calculation of aquifer parameters from unconfined aquifers which experience delayed yield during an aquifer test. Curve matching was performed on only data from the early part of the test, due to the effects of RW-1 on the pumping test. The Neuman analysis was performed using the GWAP, a computer-aided analysis method.

Plots generated for OB-1 and OB-2 using this analytical method are presented in **Appendix F - Figures 3** and **4**, respectively, with the data included in **Table 3**.

The results of this analysis provided estimates of aquifer transmissivity for OB-1 and OB-2 of 17,600 gpd/ft and 19,700 gpd/ft, respectively. The storage coefficients for OB-1 and OB-2 are 0.028 and 0.03, respectively. In general, the storage coefficients recorded at early times are one to two orders

of magnitude lower than those recorded at later times, and, due to the recorded data used for analysis, these storage coefficients are considered low.

The results from the Neuman method were compared with results from a distance drawdown analysis method developed by Jacob (1946). The distance drawdown plot, utilizing data collected 450 minutes after starting the test in the observation wells, is shown in **Appendix F, Figure 5**. The distance drawdown plot yields a transmissivity of approximately 21,900 gpd/ft and a storage coefficient of 0.38. The transmissivity value is similar to the result obtained by the Neuman method.

For the Jacob straight-line method of time versus drawdown to be most valid, the value of u should be less than 0.01 in the equation:

$$u = \frac{1.87r^2S}{Tt}$$

When using a transmissivity of 20,000 gpd/ft and a storage coefficient of 0.2, u does not meet these requirements until almost 600 minutes into the test for OB-1 at a distance of 15 feet from TW-1. Because the data analyzed represented a short test duration, the Neuman method is considered more accurate than the Jacob method for analysis of transmissivity of the aquifer.

Considering the results of the aquifer analysis by both methods outlined above, a transmissivity of 20,000 gpd/ft and a storage coefficient of 0.2 are considered representative values for the upper part of the aquifer in this area. Assuming a saturated thickness of 10 feet, the hydraulic conductivity is estimated at 2,000 gpd/ft^2.

Water samples were collected prior to treatment at the start and finish of the pumping test. The samples were collected for laboratory analysis of VOCs and for field GC analysis, and the results are presented in **Appendix F, Table 4**.

As the final step in the pumping test data analysis, the efficiency of the pumping well was calculated based on standard equations, with a result of 20%.

The results of other aquifer pumping tests in the vicinity have indicated transmissivities ranging from 10,000 gpd/ft to 96,000 gpd/ft. Other aquifer tests in the area which were reviewed include:

- Coleman RW-1, located approximately 335 feet south of TW-1. RW-1 is screened from 5 to 45 feet and set at a total depth of 45 feet at the bottom of the aquifer (shale bedrock) with a static water level of 14 feet below land surface. An aquifer test conducted in March 1988 by Groundwater Technology indicated a transmissivity of 96,000 gpd/ft for the aquifer in this location (Groundwater Technology, Inc. May 1988).

- Hydrocarbon Recyclers, located on the east edge of the 29th and Mead Site, is approximately 1.5 miles southeast from TW-1. The test well is screened from 20 to 35 feet and set at a total depth of 35 feet in medium sand with a static water level of 14 feet below land surface. An aquifer test conducted in November 1990 by HWS Technologies, of Wichita, Kansas, indicated a transmissivity of 10,000 gpd/ft for the aquifer at this location (HWS Technologies. December 1990).

- Thies Companies, located on the west edge of the 29th and Mead Site, is approximately 1.8 miles southwest from TW-1. The test well is screened from 29 to 49 feet and set at a total depth of 49 feet at the bottom of the aquifer (shale bedrock) with a static water level of 14 feet below land surface. An aquifer test conducted in June 1987 by Ground Water Associates, Wichita, Kansas, indicated a transmissivity of 50,000 gpd/ft for the aquifer at this location.

The test conducted by HWS at Hydrocarbon Recyclers would be indicative of the finer-grained sands encountered in the upper part of the aquifer that was penetrated by TW-1. Based on the range of transmissivities in the area for the aquifer, a transmissivity of 20,000 gpd/ft is representative of the materials screened in TW-1.

3.9 AQUIFER SPARGING TEST RESULTS

3.9.1 Sparge Only Test

Appendix G, Figure 1 shows the ROI of the AS system at each flow rate. The log of the pressure is plotted versus distance from the sparge (air injection) point. A best fit straight line is drawn through the plotted data points and an effective ROI determined at a minimum pressure. The minimum pressure is chosen by standard operating procedures and reflects a reliable vacuum reading. At 8.05 cfm, the corresponding ROI was about 55 feet; at 26.8 cfm, ROI was approximately 75 feet; and at 37.6 cfm the ROI was about 120 feet. These results are consistent with the type of geologic formations present at the site.

Appendix G, Figures 2, 3, and 4 represent the changes in pressure over time. All shallow and intermediate monitors showed steady pressure increases in response to the air injection and increases in injection rates. The deep monitors in VMP-8 and VMP-9 varied because they were screened below the top of the water table. Upon increasing the flow to 37.6 cfm at the injection point, water started spurting out of the tubing of the deep monitor for VMP-9. This is a result of the very strong aeration influence from the AS system.

Appendix G, Figures 5, 6, and 7 present a profile of pressure response at each flow rate by depth below surface. This was used to evaluate differences in air movement at varying horizons in the

TERRATECH
ENVIRONMENTAL SERVICE, INC.

212 South Hydraulic, Suite #400, Wichita, Kansas 67211
Office: (316) 262-0735 Fax: (316) 262-6860

FINAL REPORT

LIMITED - PHASE I AND PHASE II ENVIRONMENTAL SITE INVESTIGATION

Kansas Plating, Inc.
1110 North Mosley
Wichita, Kansas

September 1996

Prepared For:

Mr. Chris Steincamp
Depew & Gillen, L.L.C.
Wichita, Kansas

Prepared By:

TerraTech Environmental Service, Inc.

CONFIDENTIAL

PLEASE RECYCLE!

II-4. Aquifer Pump Test

Based upon the substantial volume of groundwater pumped on a daily basis at the facility, a pump test on an existing well was performed. The objective of the pump test was to estimate radius of influence data (capture zone) of a singular well application.

Facility waterwell designation "#8" (Figure-6) was selected as the test location. Waterwell #8 was in large part selected due to accessibility, however, the findings of the groundwater survey and previously documented 1,1,1-TCA concentration within the well assisted in the determination process. Most importantly, well #8 contained a dual pump apparatus capable of maintaining a high pump rate which would benefit the overall pump test.

Waterwell designation #9 (located approximately 20' northwest of #8), presently idle, was selected as an observation location. Two (2) one inch diameter piezometer were installed by TerraTech as additional observation locations prior to conducting the pump test. Each piezometer was constructed of one inch nominal PVC casing and 0.010 inch sized slotted screen. Piezometer location OB-1, located approximately 80 feet northwest of waterwell #8, was terminated at a total depth of 29.5' and contained 12 feet of perforation. Piezometer OB-2, located approximately 50 feet south of waterwell #8, was terminated at a total depth of 27.0'. Bedrock (Wellington Shale Formation) was encountered at approximately 28.5' during the installation of OB-2. OB-2 contained 12' feet of perforation. Each piezometer was completed by placing granular bentonite around the annulus portion of the probe hole and piezometer casing from approximately 14.0' below grade level to actual grade, sealing the installation.

Equipment utilized for data acquisition included slope indicators and timing devices. Three TerraTech personnel were utilized during the pump test.

II-4-A. Pump Test Results

Prior to initiating the test, TerraTech instructed Kansas Plating, Inc., personnel assigned to this area of the facility to open all available outlet taps to eliminate pressure shut down of the pumps. Due to the fact that the well contained the dual pump arrangement, it was decided to conduct two (2) individual tests.

The first test was conducted for approximately thirty minutes, producing limited information. The highest degree of water level drawdown was noted at observation location #9.

The second pump test, conducted for 1-hour, involved the utilization of both pumps at full capacity (40 gpm). Water level decreases were noted at all three observation locations. The field data was then submitted to Mr. Tom Hansen, Consulting Hydrogeologist, Wichita, for interpretation. Figure-13, pages 21-25, contains the interpretation of the findings.

FIGURE-13.

BITTERSWEET ENERGY, INC.
10110 ALAMO
WICHITA, KANSAS
67212

TerraTech Environmental Service, Inc.
Attn: Mr. Bruce Reed
212 S. Hydraulic
Wichita, Kansas 67214

August 6, 1996

RE: Aquifer Data
K.P.I. Site

Dear Mr. Reed:

Data from the 1 hour pumping test conducted at Kansas Plating Inc. was entered into the Aqtesolv program by Geraghty & Miller, Inc. Also, the drawdown data from each water well and observation well was graphed. The graphs are attached.

Water well # 8 was pumped for 1 hour by TerraTech Environmental Service, Inc. and water level measurements were recorded in water well # 8 (pumping well), water well # 9, observation well # 1, and observation well # 2. Water level measurements in each well were recorded on an "Aquifer Test Data Sheet" (see attached). Water well # 8 was pumped at 20 gallons per minute for thirty minutes and then pumped for 1 hour at a pumping rate of 40 gallons per minute. No water levels were recorded after the pumps were turned off in water well # 8. It was noted, water well # 8 returned to static water level in nine minutes and was within .03 feet of static water level in one minute upon shutting the pumps off.

Water well # 9 is approximately 19 feet northwest of water well # 8. Observation well # 1 is located approximately 75 feet northwest of water well # 8 (pumping well), and observation well # 2 is located approximately 47 feet southeast of water well # 8. Drawdown in each well at the end of 70 minutes before the pumps were turned off in water well # 8 was as follows:

TABLE 1

WELL #	DRAWDOWN
Water well # 8	6.51'
Water Well # 9	.71'
OB-1	.20'
OB-2	.10'

Based upon the information provided, the cone of depression created by pumping water well # 8 at 40 gallons per minute extends at least 75 feet northwest of water well # 8. Observation well # 2 indicates the cone of depression extends at least 47 feet to the southeast of water well # 8. Based upon information provided to me by Mr. Rick Stone these wells are located parallel to the hydraulic gradient at the site. The observation wells should be perpendicular to the hydraulic gradient, if a pumping test was being designed from scratch. The radius of influence of the cone of depression should expand if the pumping rate was increased. The radius of influence will expand with time if the pumping is continuous at the site until the amount of water entering the well from the aquifer equals the pumping rate of the water well. This may occur within a few hours or after days if the water well was pumped continuously at a pumping rate of 40 gallons per minute. The maximum pumping rate which water well # 8 could sustain if pumped continuously is unknown.

A pumping test conducted at the House Oil Company site, located southwest of the KPI site, calculated the cone of depression extended at least 48 feet (graph attached) from the pumping well. Pumping rate of the well was 12 gallons per minute. The distance-drawdown calculations were made using the drawdown data after pumping the well for 220 minutes.

Groundwater Technology, Inc. in the "Model Simulation of Long-Term Contaminant Fate and Transport From On-Site Sources - Coleman Downtown Wichita Facility - Wichita, Kansas" report demonstrated the cone of depression extended 950 feet from the pumping well at the Coleman site. The pumping rate of the well was 30 gallons per minute. The distance-drawdown was calculated after 3.67 days of pumping (graph attached). Transmissivity of the aquifer at the Coleman site was calculated at 54,000 gpd/ft from the distance-drawdown graph.

Transmissivity of the aquifer estimated by the Aqtesolv program is 9.681 ft^2/min or 104,286 gpd/ft at the KPI site. Assuming the saturated thickness is 15 feet, the hydraulic conductivity is 6952 gpd/ft^2. Hydraulic conductivity values reported in the Gilbert-Mosley investigation ranged from 2842.6 gpd/ft^2 to 6051.7 gpd/ft^2. Hydraulic conductivity calculated from the pumping test performed at the House Oil Company site was 167 ft/day (1249 gpd/ft^2). Transmissivity at the House Oil Company site was determined to be 24,369 gpd/ft by distance-drawdown calculations and 13,200 gpd/ft by time-drawdown calculations. The transmissivity and hydraulic conductivity values obtained from the 1 hour pumping test at the KPI site are probably not valid. A 24 or 72 hour pumping test using a larger pumping rate would be needed to determine more realistic aquifer parameters (transmissivity and hydraulic conductivity) for the site.

Table 2 is a summary of the transmissivity and hydraulic conductivity values based upon the various pumping tests conducted at the sites discussed in this letter. The transmissivity value at the KPI site based upon the "Geohydrology of Sedgwick County, Kansas" by Charles W. Lane and Don E. Miller is estimated to be approximately 50,000 gpd/ft. Based upon their report it would appear the transmissivity from the pumping test at the House Oil Company site is low and the transmissivity at the KPI site is high. A continuous pumping well at the KPI site will have a radius of influence of at least fifty feet or greater. Pump test data at the Coleman site demonstrates the radius of influence of a well pumping 30 gallons per minute is 950 feet after 3.67 days of pumping an aquifer with comparable transmissivity values based upon the Lane & Miller report.

TABLE 2

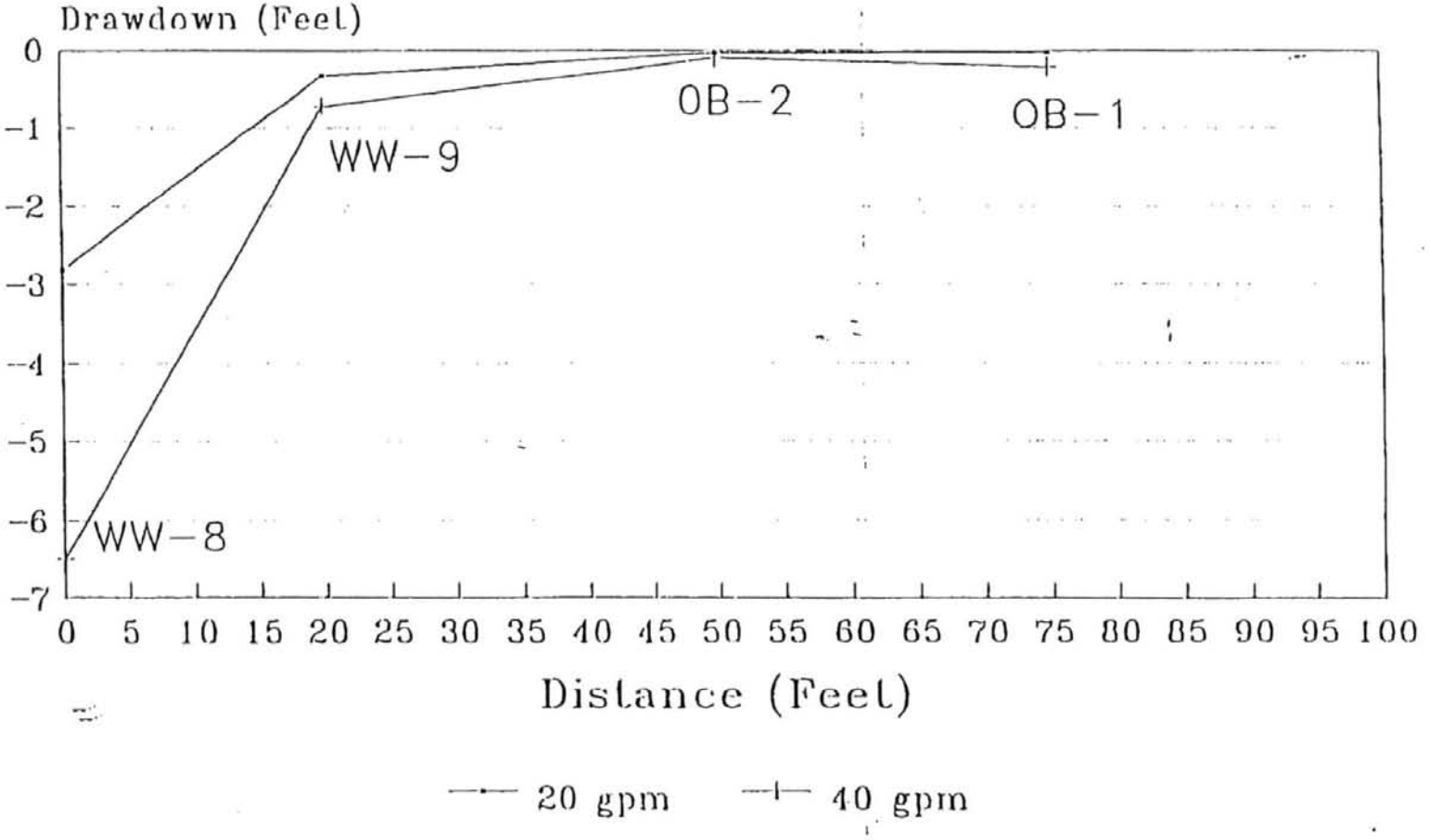
SITE	TRANSMISSIVITY	HYDRAULIC CONDUCTIVITY
KPI	104,286 gpd/ft	6952 gpd/ft^2
House Oil	13,200-24,369 gpd/ft	1249 gpd/ft^2
Coleman	54,000 gpd/ft	NA
Gilbert-Mosley	47,073-115,709 gpd/ft	2843 to 6052 gpd/ft^2

If you have any additional questions, please call me.

Sincerely,

Thomas J. Hansen
Consulting Hydrogeologist
CPG-AIPG # 3339

KPI SITE
PUMPING TEST



Appendix G-4
Permitted Pumping Wells Table

North Industrial Corridor (NIC) Site
Permitted Pumping Wells

Well ID	File Number	Well Use*	1/4	1/4	1/4	Distance North	Distance West	Section	Twnshp	Range	In Site	Maximum Rate (gpm)	Annual Permitted Rate (acre-ft/yr)	Annual Permitted Rate (gpm)	Correspondent
APEX 2-WELL BATTERY	42030	IND	--	--	--	4151 N	1006 W	17	27	1E	YES	12	6	4	Apex Engineering
APEX-1	42030	IND	--	--	--	4120 N	1002 W	17	27	1E	YES				Apex Engineering
APEX-2	42030	IND	--	--	--	4181 N	1009 W	17	27	1E	YES				Apex Engineering
CHISHOLM-1	23	MUN	NW	NE	NW	4944 N	3574 W	29	26	1E	ADJ	970	1531	949	Chisholm Creek Utility
CHISHOLM-2	23449	MUN	SE	NW	NW	4020 N	4474 W	29	26	1E	ADJ	600	729	452	Chisholm Creek Utility
CITY-1	30381	IRR	NE	NW	SE	2310 N	1650 W	9	27	1E	YES	200	17	11	City Parks & Recreation
CITY-2	45599	REC	SE	NE	SW	1400 N	2840 W	17	27	1E	ADJ	200	14	9	City Parks & Recreation
CITY-3	97	IRR	NE	SE	SW	--	--	20	27	1E	ADJ	175	18	11	City of Wichita Public Works
CITY-4	7493	IRR	SW	NW	NW	4500 N	5150 W	17	27	1E	ADJ	350	44	27	City Parks & Recreation
CITY-5	7493	REC	SW	NW	NW	4500 N	5150 W	17	27	1E	ADJ	55	4	2	City Parks & Recreation
CITY-6	54	THX	--	--	--	2120 N	5160 W	21	27	1E	ADJ	325	390	242	City of Wichita Water Production
CITY-7	94	IRR	NW	SE	SW	--	--	17	27	1E	ADJ	251	87	54	City Parks & Recreation
CITY-8	71	THX	--	--	--	2480 N	4240 W	21	27	1E	ADJ	100	15	9	City of Wichita Water Production
COASTAL 2-WELL BATTERY	939029	CON	SE	SW	SE	475 N	1775 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-1	939029	CON	SE	SW	SE	600 N	1600 W	4	27	1E	YES				Coastal Refining
COASTAL-2	939029	CON	SE	SW	SE	350 N	1950 W	4	27	1E	YES				Coastal Refining
COASTAL-3	949027	CON	NE	SE	SE	1200 N	100 W	4	27	1E	YES	100	160	99	Coastal Refining
COASTAL-4	949028	CON	NE	SE	SE	1300 N	100 W	4	27	1E	YES	100	160	99	Coastal Refining
COASTAL-5	949128	CON	NE	NE	SE	2250 N	400 W	4	27	1E	YES	30	50	31	Coastal Refining
COASTAL-6	949171	CON	SE	SW	SE	275 N	1400 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-7	949172	CON	NW	NE	SE	4750 N	1600 W	9	27	1E	YES	60	97	60	Coastal Refining
COASTAL-8	949173	CON	SW	SW	SE	325 N	2300 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-9	949174	CON	SE	SW	SE	25 N	1400 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-10	949175	CON	SW	SE	SE	350 N	975 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-11	949176	CON	NE	SW	SE	1275 N	1750 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-12	949177	CON	SE	SW	SE	75 N	1900 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-13	949178	CON	NE	SW	SE	775 N	1475 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-14	949179	CON	SE	NW	NE	4500 N	1400 W	9	27	1E	YES	60	97	60	Coastal Refining
COASTAL-15	949180	CON	NW	SE	SE	1125 N	1075 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-16	949181	CON	NE	SW	SE	1075 N	1550 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-17	959036	CON	--	--	--	1940 N	850 W	4	27	1E	YES	80	113	70	Coastal Refining
COASTAL-18	969033	CON	SW	NE	SE	1790 N	750 W	4	27	1E	YES	80	100	62	Coastal Refining
COASTAL-19	989063	CON	NE	SW	SE	1000 N	1800 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-20	989063	CON	NE	SW	SE	1000 N	1800 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-21	989064	CON	NW	NE	NE	5230 N	750 W	9	27	1E	YES	60	97	60	Coastal Refining
COASTAL-22	989065	CON	SW	SE	SE	500 N	1250 W	4	27	1E	YES	60	97	60	Coastal Refining

North Industrial Corridor (NIC) Site
Permitted Pumping Wells

Well ID	File Number	Well Use*	1/4	1/4	1/4	Distance North	Distance West	Section	Twnshp	Range	In Site	Maximum Rate (gpm)	Annual Permitted Rate (acre-ft/yr)	Annual Permitted Rate (gpm)	Correspondent
COASTAL-23	989066	CON	NW	SE	SE	1075 N	1300 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-24	989067	CON	SE	SW	SE	150 N	1750 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-25	989068	CON	NW	NW	NE	5230 N	2000 W	9	27	1E	YES	60	97	60	Coastal Refining
COASTAL-26	989069	CON	SW	SW	SE	450 N	2200 W	4	27	1E	YES	60	97	60	Coastal Refining
COASTAL-27	989079	CON	SE	NE	SE	1750 N	650 W	4	27	1E	YES	60	97	60	Coastal Refining
COLEMAN 3-WELL BATTERY	919043	CON	NE	SW	NW	3570 N	3990 W	21	27	1E	ADJ	180	286	177	Coleman Co.
COLEMAN-S-1	919043	CON	NE	SW	NW	3685 N	3965 W	21	27	1E	ADJ				Coleman Co.
COLEMAN-S-2	919043	CON	NE	SW	NW	3515 N	4063 W	21	27	1E	ADJ				Coleman Co.
COLEMAN-S-3	919043	CON	NW	SE	NW	3780 N	3784 W	21	27	1E	ADJ				Coleman Co.
COLEMAN-S-4	929082	CON	NW	SE	NW	3500 N	3500 W	21	27	1E	ADJ	60	96	59	Coleman Co.
COLEMAN-1	949164	CON	NW	SE	NW	3360 N	3450 W	34	26	1E	YES	50	81	50	Coleman Co.
COLEMAN-2	949165	CON	SW	SW	NW	2700 N	4900 W	34	26	1E	YES	50	81	50	Coleman Co.
COLEMAN-3	949166	CON	NW	SW	NW	3360 N	5184 W	34	26	1E	YES	50	81	50	Coleman Co.
EVCON 2-WELL BATTERY	939015	CON	NW	NE	SW	2055 N	3450 W	33	26	1E	YES	273	368	228	Evcon Industries
EVCON-1	939015	CON	SW	NE	SW	1860 N	3450 W	33	26	1E	YES				Evcon Industries
EVCON-2	939015	CON	NW	NE	SW	2250 N	3450 W	33	26	1E	YES				Evcon Industries
EVCON-3	969073	CON	SE	SW	SW	330 N	4290 W	33	26	1E	YES	40	18	11	Evcon Industries
EVCON-4	969073	CON	SE	NE	NW	4450 N	3100 W	33	26	1E	YES	250	350	217	Evcon Industries
FARM-1	36615	THX	--	--	--	3850 N	2220 W	20	27	1E	ADJ	230	18	11	Farm Credit Bank
FARM-2	36616	THX	--	--	--	3880 N	2330 W	20	27	1E	ADJ	230	18	11	Farm Credit Bank
CHURCH-1	36767	DEW	--	--	--	4200 N	5220 W	21	27	1E	YES	320	189	117	First United Methodist Church
INTRUST-1	40020	THX	SW	SE	NE	2840 N	710 W	20	27	1E	ADJ	130	14	9	Intrust Bank
INTRUST-2	39757	THX	SW	SE	NE	2840 N	675 W	20	27	1E	ADJ	175	85	53	Intrust Bank
INTRUST-3	31635	THX	SW	SE	NE	2840 N	710 W	20	27	1E	ADJ	150	71	44	Intrust Bank
KAMEN-1	29	IND	--	SE	SW	--	--	4	27	1E	YES	49	64	40	Kamen Inc.
KAMEN-2	32	IND	SE	SE	SW	--	--	4	27	1E	YES	265	107	66	Kamen Inc.
KLONDIKE-1	36534	THX	NE	SE	SE	980 N	165 W	20	27	1E	ADJ	150	22	14	Klondike Building Company
KUHLMAN-1	61	THX	--	--	--	2480 N	520 W	20	27	1E	ADJ	200	46	29	Kuhlman, J.L.
LAW-1	36164	THX	SW	NW	NE	4540 N	2490 W	20	27	1E	ADJ	195	93	58	Law Company Building Assoc.
LAW-2	36196	THX	SW	NW	NE	4570 N	2490 W	20	27	1E	ADJ	305	116	72	Law Company Building Assoc.
ROCK-1	69	THX	--	NE	NW	--	--	21	27	1E	YES	150	181	112	Rock Island Enterprises
NEWCOLEMAN-1	969023	CON	NW	SE	SW	875 N	3750 W	33	26	1E	YES	100	161	100	Shaw Environmental Inc.
ST.FRANCIS-1	959144	DEW	SE	NW	SW	1860 N	4070 W	16	27	1E	YES	155	242	150	St Francis Via Christi
TREATCO-1	38578	IND	NE	SW	SW	820 N	4500 W	4	27	1E	YES	700	445	276	Treatco
SCHOOL-1	39256	MUN	--	NE	NW	4250 N	2890 W	29	26	1E	ADJ	44	6	4	Unified School District #259
UNOCAL-1	949115	CON	SE	SE	SW	200 N	2700 W	27	26	1E	YES	9	14	9	Unocal Corporation

North Industrial Corridor (NIC) Site
Permitted Pumping Wells

Well ID	File Number	Well Use*	1/4	1/4	1/4	Distance North	Distance West	Section	Twnshp	Range	In Site	Maximum Rate (gpm)	Annual Permitted Rate (acre-ft/yr)	Annual Permitted Rate (gpm)	Correspondent
UNOCAL 4-WELL BATTERY	949116	CON	NE	NE	NW	4700 N	2700 W	34	26	1E	YES	9	14	9	Unocal Corporation
UNOCAL-2	949116	CON	NE	NE	NW	4700 N	2670 W	34	26	1E	YES				Unocal Corporation
UNOCAL-3	949116	CON	NE	NE	NW	4700 N	2730 W	34	26	1E	YES				Unocal Corporation
UNOCAL-4	949116	CON	NE	NE	NW	4700 N	2790 W	34	26	1E	YES				Unocal Corporation
UNOCAL-5	949116	CON	NW	NW	NE	4700 N	2610 W	34	26	1E	YES				Unocal Corporation
UNOCAL 4-WELL BATTERY	949117	CON	NE	NE	NW	5000 N	2700 W	34	26	1E	YES	9	14	9	Unocal Corporation
UNOCAL-6	949117	CON	NW	NW	NE	5000 N	2610 W	34	26	1E	YES				Unocal Corporation
UNOCAL-7	949117	CON	NE	NE	NW	5000 N	2670 W	34	26	1E	YES				Unocal Corporation
UNOCAL-8	949117	CON	NE	NE	NW	5000 N	2730 W	34	26	1E	YES				Unocal Corporation
UNOCAL-9	949117	CON	NE	NE	NW	5000 N	2790 W	34	26	1E	YES				Unocal Corporation
UNOCAL-10	949145	CON	SE	NE	NW	4500 N	2725 W	34	26	1E	YES	9	14	9	Unocal Corporation
WESTAR-1	2424	IND	SE	SW	SW	171 N	4413 W	15	27	1E	ADJ	25	20	12	Westar Energy
WESTAR-2	47	IND	--	--	--	3444 N	550 W	20	27	1E	ADJ	233	153	95	Westar Energy

Data Source: Kansas Bureau of Agriculture, 2002
YES = Within NIC Site Boundary
ADJ = Adjacent to NIC Site
-- = Information not reported.
*Well Use:
CON = Contamination remediation
DEW = Dewatering
IND = Industrial
IRR = Irrigation
MUN = Municipal irrigation
REC = Recreation/pond fill
THX = Thermal exchange unit

Appendix G-5
Nested Well Differences

North Industrial Corridor (NIC) Site
Phase 2 Nested Well Differences (Mar 2001-Aug 2001)

Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
CN-MW-12	D	3/20/2001	1319.15	14.62	1304.53		
CN-MW-12	D	8/21/2001	1319.15				Destroyed by facility construction
CN-MW-46	S	3/20/2001	1318.36	13.85	1304.51	-0.02	
CN-MW-46	S	8/21/2001	1318.36			--	Destroyed by facility construction
CN-MW-56	D	3/20/2001	1321.76	13.88	1307.88		
CN-MW-56	D	8/21/2001	1321.76	15.79	1305.97		
CN-MW-55	S	3/20/2001	1321.19	13.29	1307.90	0.02	
CN-MW-55	S	8/21/2001	1321.19	15.20	1305.99	0.02	
CN-MW-59	D	3/20/2001	1320.44	14.55	1305.89		
CN-MW-59	D	8/21/2001	1320.44	15.38	1305.06		
CN-MW-60	S	3/20/2001	1319.90	14.01	1305.89	0.00	
CN-MW-60	S	8/21/2001	1319.90	14.83	1305.07	0.01	
CNE-MW-07D	D	3/20/2001	1323.45	15.21	1308.24		
CNE-MW-07D	D	8/20/2001	1323.45	17.69	1305.76		
CNE-MW-07S	S	3/20/2001	1323.21	15.02	1308.19	-0.05	
CNE-MW-07S	S	8/20/2001	1323.21	17.48	1305.73	-0.03	
CNE-MW-12D	D	3/20/2001	1323.67	14.39	1309.28		
CNE-MW-12D	D	8/20/2001	1323.67	17.11	1306.56		
CNE-MW-12S	S	3/20/2001	1323.49	14.11	1309.38	0.10	
CNE-MW-12S	S	8/20/2001	1323.49	16.95	1306.54	-0.02	
CNE-NE-04D	D	3/20/2001	1320.78	13.92	1306.86		
CNE-NE-04D	D	8/20/2001	1320.78	15.61	1305.17		
CNE-NE-04S	S	3/20/2001	1320.60	13.72	1306.88	0.02	
CNE-NE-04S	S	8/20/2001	1320.60	15.42	1305.18	0.01	
CNE-NE-06D	D	3/20/2001	1319.11	13.79	1305.32		
CNE-NE-06D	D	8/20/2001	1319.11	14.63	1304.48		
CNE-NE-06S	S	3/20/2001	1318.88	13.19	1305.69	**0.37**	
CNE-NE-06S	S	8/20/2001	1318.88	14.15	1304.73	**0.25**	
CNE-NE-07D	D	3/20/2001	1320.75	14.42	1306.33		
CNE-NE-07D	D	8/20/2001	1320.75	15.83	1304.92		
CNE-NE-07S	S	3/20/2001	1320.66	14.44	1306.22	**-0.11**	
CNE-NE-07S	S	8/20/2001	1320.66	15.78	1304.88	-0.04	
CNE-NE-09D	D	3/20/2001	1317.43	12.90	1304.53		
CNE-NE-09D	D	8/21/2001	1317.43	14.00	1303.43		
CNE-NE-09S	S	3/20/2001	1317.66	13.50	1304.16	**-0.37**	
CNE-NE-09S	S	8/21/2001	1317.66	14.15	1303.51	0.08	
CNE-NE-10D	D	3/20/2001	1319.37	14.23	1305.14		
CNE-NE-10D	D	8/21/2001	1319.37	15.26	1304.11		
CNE-NE-10S	S	3/20/2001	1319.21	14.08	1305.13	-0.01	
CNE-NE-10S	S	8/21/2001	1319.21	15.15	1304.06	-0.05	
CTC-MW-01	D	3/19/2001	1327.13	16.94	1310.19		
CTC-MW-01	D	8/21/2001	1327.13				
CTC-MW-07S	S	3/19/2001	1326.12	15.98	1310.14	-0.05	
CTC-MW-07S	S	8/21/2001	1326.12	18.78	1307.34	--	
CTC-MW-06D	D	3/19/2001	1324.61	15.34	1309.27		
CTC-MW-06D	D	8/21/2001	1324.61	17.84	1306.77		
CTC-MW-06S	S	3/19/2001	1324.61	15.30	1309.31	0.04	
CTC-MW-06S	S	8/21/2001	1324.61	17.80	1306.81	0.04	
NMW-46D	D	8/21/2001	1309.30	14.32	1294.98		
DRB-MW-11	S	3/25/2001	1307.85	12.75	1295.75		Product Present
DRB-MW-11	S	8/21/2001	1307.85	13.78	1294.07	**-0.91**	Product Present

North Industrial Corridor (NIC) Site
Phase 2 Nested Well Differences (Mar 2001-Aug 2001)

Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
NMW-45D	D	8/21/2001	1319.07	17.38	1301.69		
DRB-MW-20	S	3/25/2001	1312.39	14.20	1298.20		Product Present
DRB-MW-20	S	8/21/2001	1312.39	16.52	1295.87	**-5.82**	Product Present
NMW-44D	D	8/21/2001	1315.81	17.22	1298.59		
DRB-MW-250	D	3/27/2001	1314.20	16.00	1298.20		
DRB-MW-250	D	8/21/2001	1314.20	16.33	1297.87	**-0.72**	Intermediate clay present
NMW-43D	D	8/21/2001	1314.24	16.90	1297.34		
DRB-MW-30	S	3/27/2001	1312.72	13.94	1298.78		
DRB-MW-30	S	8/21/2001	1312.72	15.34	1297.38	0.04	
EXC-MW-02A	S	3/19/2001	1314.74	11.10	1303.64		
EXC-MW-02A	S	8/22/2001	1314.74	11.85	1302.89		
EXC-MW-02B	D	3/19/2001	1315.00	11.31	1303.69	0.05	
EXC-MW-02B	D	8/22/2001	1315.00	12.08	1302.92	0.03	
EXC-MW-04A	S	8/22/2001	1317.39	15.01	1302.38		
EXC-MW-04B	D	8/22/2001	1317.75	15.34	1302.41	0.03	
EXC-MW-06A	S	3/19/2001	1313.17	10.76	1302.41		
EXC-MW-06A	S	8/22/2001	1313.17	11.53	1301.64		
EXC-MW-06B	D	3/19/2001	1313.12	10.70	1302.42	0.01	
EXC-MW-06B	D	8/22/2001	1313.12	11.46	1301.66	0.02	
FLE-MW-01D	D	3/20/2001	1318.19	16.78	1301.41		
FLE-MW-01D	D	8/20/2001	1318.19	17.65	1300.54		
FLE-MW-01S	S	3/20/2001	1318.05	16.66	1301.39	-0.02	
FLE-MW-01S	S	8/20/2001	1318.05	17.54	1300.51	-0.03	
FLE-MW-02D	D	3/20/2001	1318.16	16.00	1302.16		
FLE-MW-02D	D	8/20/2001	1318.16	16.99	1301.17		
FLE-MW-02S	S	3/20/2001	1318.13	15.97	1302.16	0.00	
FLE-MW-02S	S	8/20/2001	1318.13	16.97	1301.16	-0.01	
NMW-01D	D	3/20/2001	1328.72	16.97	1311.75		
NMW-01D	D	8/20/2001	1328.72	20.43	1308.29		
NMW-01S	S	3/20/2001	1328.75	17.02	1311.73	-0.02	
NMW-01S	S	8/20/2001	1328.75	20.45	1308.30	0.01	
NMW-02D	D	3/19/2001	1315.77	13.09	1302.68		
NMW-02D	D	8/20/2001	1315.77	13.85	1301.92		
NMW-02S	S	3/19/2001	1315.65	12.91	1302.74	0.06	
NMW-02S	S	8/20/2001	1315.65	13.70	1301.95	0.03	
NMW-03D	D	3/19/2001	1315.88	14.62	1301.26		
NMW-03D	D	8/20/2001	1315.88	15.53	1300.35		
NMW-03S	S	3/19/2001	1315.98	15.38	1300.60	**-0.66**	Intermediate clay present
NMW-03S	S	8/20/2001	1315.98	16.30	1299.68	**-0.67**	Intermediate clay present
NMW-04D	D	3/19/2001	1316.14	15.85	1300.29		
NMW-04D	D	8/22/2001	1316.14	16.65	1299.49		
NMW-04S	S	3/19/2001	1316.30	15.99	1300.31	0.02	
NMW-04S	S	8/22/2001	1316.30	16.80	1299.50	0.01	
NMW-05D	D	3/19/2001	1316.21	13.55	1302.66		
NMW-05D	D	8/20/2001	1316.21	14.22	1301.99		
NMW-05S	S	3/19/2001	1316.08	13.40	1302.68	0.02	
NMW-05S	S	8/20/2001	1316.08	14.09	1301.99	0.00	
NMW-06D	D	3/19/2001	1314.92	17.11	1297.81		
NMW-06D	D	8/21/2001	1314.92	18.13	1296.79		
NMW-06S	S	3/19/2001	1314.82	17.00	1297.82	0.01	
NMW-06S	S	8/21/2001	1314.82	18.00	1296.82	0.03	

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Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
NMW-07D	D	3/19/2001	1313.33	16.45	1296.88		
NMW-07D	D	8/21/2001	1313.33	16.77	1296.56		
NMW-07S	S	3/19/2001	1313.18	16.35	1296.83	-0.05	
NMW-07S	S	8/21/2001	1313.18	16.66	1296.52	-0.04	
NMW-08D	D	3/19/2001	1306.90	11.02	1295.88		
NMW-08D	D	8/21/2001	1306.90	11.78	1295.12		
NMW-08S	S	3/19/2001	1306.90	11.07	1295.83	-0.05	
NMW-08S	S	8/21/2001	1306.90	11.83	1295.07	-0.05	
NMW-09D	D	3/19/2001	1306.87	11.77	1295.10		
NMW-09D	D	8/21/2001	1306.87	12.32	1294.55		
NMW-09S	S	3/19/2001	1306.89	11.81	1295.08	-0.02	
NMW-09S	S	8/21/2001	1306.89	12.36	1294.53	-0.02	
NMW-10D	D	8/21/2001	1309.71	15.13	1294.58		
NMW-10S	S	3/19/2001	1309.63	14.53	1295.10		
NMW-10S	S	8/21/2001	1309.63	15.03	1294.60	0.02	
NMW-11D	D	3/19/2001	1305.58	13.75	1291.83		
NMW-11D	D	8/20/2001	1305.58	14.60	1290.98		
NMW-11S	S	3/19/2001	1306.24	14.18	1292.06	**0.23**	
NMW-11S	S	8/20/2001	1306.24	15.17	1291.07	0.09	
NMW-12D	D	3/19/2001	1305.08	13.14	1291.94		
NMW-12D	D	8/20/2001	1305.08	13.90	1291.18		
NMW-12S	S	3/19/2001	1304.83	12.88	1291.95	0.01	
NMW-12S	S	8/20/2001	1304.83	13.65	1291.18	0.00	
NMW-13D	D	3/20/2001	1304.55	13.67	1290.88		
NMW-13D	D	8/20/2001	1304.55	14.49	1290.06		
NMW-13S	S	3/20/2001	1304.34	13.51	1290.83	-0.05	
NMW-13S	S	8/20/2001	1304.34	14.30	1290.04	-0.02	
NMW-14D	D	3/20/2001	1302.89	11.48	1291.41		
NMW-14D	D	8/20/2001	1302.89	12.28	1290.61		
NMW-14S	S	3/20/2001	1302.78	11.36	1291.42	0.01	
NMW-14S	S	8/20/2001	1302.78	12.17	1290.61	0.00	
NMW-15D	D	3/20/2001	1303.53	13.83	1289.70		
NMW-15D	D	8/20/2001	1303.53	14.42	1289.11		
NMW-15S	S	3/20/2001	1303.40	13.73	1289.67	-0.03	
NMW-15S	S	8/20/2001	1303.40	14.32	1289.08	-0.03	
NMW-16D	D	3/20/2001	1306.28	17.44	1288.84		
NMW-16D	D	8/20/2001	1306.28	18.10	1288.18		
NMW-16S	S	3/20/2001	1306.19	17.35	1288.84	0.00	
NMW-16S	S	8/20/2001	1306.19	17.98	1288.21	0.03	
NMW-17D	D	3/19/2001	1312.55	17.06	1295.49		
NMW-17D	D	8/20/2001	1312.55	17.37	1295.18		
NMW-17S	S	3/19/2001	1312.63	17.17	1295.46	-0.03	
NMW-17S	S	8/20/2001	1312.63	17.43	1295.20	0.02	
NMW-18D	D	3/19/2001	1307.89	13.99	1293.90		
NMW-18D	D	8/20/2001	1307.89	14.08	1293.81		
NMW-18S	S	3/19/2001	1307.78	13.91	1293.87	-0.03	
NMW-18S	S	8/20/2001	1307.78	14.03	1293.75	-0.06	
NMW-19D	D	3/19/2001	1308.10	13.15	1294.95		
NMW-19D	D	8/20/2001	1308.10	13.43	1294.67		
NMW-19S	S	3/19/2001	1308.13	13.16	1294.97	0.02	
NMW-19S	S	8/20/2001	1308.13	13.42	1294.71	0.04	

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Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
NMW-20D	D	3/20/2001	1306.48	15.38	1291.10		
NMW-20D	D	8/20/2001	1306.48	15.54	1290.94		
NMW-20S	S	3/20/2001	1306.65	15.35	1291.30	**0.20**	Bad Survey
NMW-20S	S	8/20/2001	1306.65	15.50	1291.15	**0.21**	Bad Survey
NMW-21D	D	3/20/2001	1306.10	15.88	1290.22		
NMW-21D	D	8/20/2001	1306.10	16.08	1290.02		
NMW-21S	S	3/20/2001	1306.03	15.81	1290.22	0.00	
NMW-21S	S	8/20/2001	1306.03	15.96	1290.07	0.05	
NMW-22D	D	3/20/2001	1304.53	14.57	1289.96		
NMW-22D	D	8/20/2001	1304.53	14.74	1289.79		
NMW-22S	S	3/20/2001	1304.40	14.48	1289.92	-0.04	
NMW-22S	S	8/20/2001	1304.40	14.64	1289.76	-0.03	
NMW-23D	D	3/20/2001	1304.77	13.53	1291.24		
NMW-23D	D	8/20/2001	1304.77	13.66	1291.11		
NMW-23S	S	3/20/2001	1304.68	13.48	1291.20	-0.04	
NMW-23S	S	8/20/2001	1304.68	13.57	1291.11	0.00	
NMW-24D	D	3/21/2001	1303.79	13.70	1290.09		
NMW-24D	D	8/20/2001	1303.79	13.99	1289.80		
NMW-24S	S	3/21/2001	1303.06	13.59	1289.47	**-0.62**	Bad Survey
NMW-24S	S	8/20/2001	1303.06	13.88	1289.18	**-0.62**	Bad Survey
NMW-25D	D	3/20/2001	1300.65	15.00	1285.65		
NMW-25D	D	8/20/2001	1300.65	15.65	1285.00		
NMW-25S	S	3/20/2001	1300.66	15.05	1285.61	-0.04	
NMW-25S	S	8/20/2001	1300.66	15.68	1284.98	-0.02	
NMW-26D	D	3/20/2001	1298.76	14.94	1283.82		
NMW-26D	D	8/20/2001	1298.76	15.50	1283.26		
NMW-26S	S	3/20/2001	1298.71	14.90	1283.81	-0.01	
NMW-26S	S	8/20/2001	1298.71	15.35	1283.36	**0.10**	Bad DTW?
NMW-27D	D	3/20/2001	1299.85	14.52	1285.33		
NMW-27D	D	8/20/2001	1299.85	15.04	1284.81		
NMW-27S	S	3/20/2001	1299.89	14.58	1285.31	-0.02	
NMW-27S	S	8/20/2001	1299.89	15.10	1284.79	-0.02	
NMW-28D	D	3/20/2001	1299.33	12.61	1286.72		
NMW-28D	D	8/20/2001	1299.33	13.05	1286.28		
NMW-28S	S	3/20/2001	1299.25	12.53	1286.72	0.00	
NMW-28S	S	8/20/2001	1299.25	12.96	1286.29	0.01	
NMW-29D	D	3/20/2001	1300.00	15.10	1284.90		
NMW-29D	D	8/20/2001	1300.00	15.34	1284.66		
NMW-29S	S	3/20/2001	1300.13	15.23	1284.90	0.00	
NMW-29S	S	8/20/2001	1300.13	15.47	1284.66	0.00	
NMW-30D	D	3/20/2001	1299.62	13.20	1286.42		
NMW-30D	D	8/20/2001	1299.62	13.48	1286.14		
NMW-30S	S	3/20/2001	1299.73	13.36	1286.37	-0.05	
NMW-30S	S	8/20/2001	1299.73	13.62	1286.11	-0.03	
NMW-31D	D	3/20/2001	1303.55	12.12	1291.43		
NMW-31D	D	8/20/2001	1303.55	12.43	1291.12		
NMW-31S	S	3/20/2001	1303.69	12.27	1291.42	-0.01	
NMW-31S	S	8/20/2001	1303.69	12.57	1291.12	0.00	
NMW-32D	D	3/20/2001	1303.78	13.38	1290.40		
NMW-32D	D	8/20/2001	1303.78	13.87	1289.91		
NMW-32S	S	3/20/2001	1303.61	13.16	1290.45	0.05	
NMW-32S	S	8/20/2001	1303.61	13.59	1290.02	**0.11**	Bad DTW?

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Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
NMW-33D	D	3/20/2001	1322.59	15.63	1306.96		
NMW-33D	D	8/20/2001	1322.59	16.43	1306.16		
NMW-33S	S	3/20/2001	1322.43	15.44	1306.99	0.03	
NMW-33S	S	8/20/2001	1322.43	16.21	1306.22	0.06	
NMW-34D	D	3/19/2001	1314.59	11.45	1303.14		
NMW-34D	D	8/20/2001	1314.59	12.09	1302.50		
NMW-34S	S	3/19/2001	1314.69	11.48	1303.21	0.07	
NMW-34S	S	8/20/2001	1314.69	12.15	1302.54	0.04	
NMW-35D	D	3/20/2001	1303.73	12.05	1291.68		
NMW-35D	D	8/20/2001	1303.73	12.33	1291.40		
NMW-35S	S	3/20/2001	1303.74	12.07	1291.67	-0.01	
NMW-35S	S	8/20/2001	1303.74	12.25	1291.49	0.09	
NMW-39D	D	3/19/2001	1308.25	11.98	1296.27		
NMW-39D	D	8/21/2001	1308.25	12.80	1295.45		
NMW-39S	S	3/19/2001	1308.19	11.93	1296.26	-0.01	
NMW-39S	S	8/21/2001	1308.19	12.74	1295.45	0.00	
NMW-40D	D	3/19/2001	1313.86	16.46	1297.40		
NMW-40D	D	8/21/2001	1313.86	17.39	1296.47		
NMW-40S	S	3/19/2001	1313.97	16.60	1297.37	-0.03	
NMW-40S	S	8/21/2001	1313.97	17.55	1296.42	-0.05	
NMW-41D	D	3/20/2001	1305.27	11.67	1293.60		
NMW-41D	D	8/20/2001	1305.27	12.22	1293.05		
NMW-41S	S	3/20/2001	1305.13	11.53	1293.60	0.00	
NMW-41S	S	8/20/2001	1305.13	12.10	1293.03	-0.02	
NMW-42D	D	8/21/2001	1315.79	16.02	1299.77		
NMW-42S	S	8/21/2001	1315.68	15.90	1299.78	0.01	
NMW-47D	D	3/19/2001	1310.54	9.70	1300.84		
NMW-47D	D	8/21/2001	1310.54	10.39	1300.15		
NMW-47S	S	3/19/2001	1310.59	9.69	1300.90	0.06	
NMW-47S	S	8/21/2001	1310.59	10.43	1300.16	0.01	
NMW-48D	D	8/20/2001	1311.51	13.06	1298.45		
NMW-48S	S	8/20/2001	1311.29	12.85	1298.44	-0.01	
NWL-01D	D	3/19/2001	1313.01	13.45	1299.56		
NWL-01D	D	8/20/2001	1313.01	14.40	1298.61		
NWL-01S	S	3/19/2001	1313.10	13.50	1299.60	0.04	
NWL-01S	S	8/20/2001	1313.10	14.49	1298.61	0.00	
NWL-02D	D	3/19/2001	1309.35	11.09	1298.26		
NWL-02D	D	8/21/2001	1309.35	12.02	1297.33		
NWL-02S	S	3/19/2001	1309.32	11.07	1298.25	-0.01	
NWL-02S	S	8/21/2001	1309.32	12.03	1297.29	-0.04	
NWL-07D	D	3/19/2001	1307.24	13.88	1293.36		
NWL-07D	D	8/20/2001	1307.24	14.45	1292.79		
NWL-07S	S	3/19/2001	1307.48	14.36	1293.12	**-0.24**	Intermediate clay present
NWL-07S	S	8/20/2001	1307.48	15.00	1292.48	**-0.31**	Intermediate clay present
NWL-08D	D	3/19/2001	1308.48	15.61	1292.87		
NWL-08D	D	8/20/2001	1308.48	16.23	1292.25		
NWL-08S	S	3/19/2001	1308.47	15.56	1292.91	0.04	
NWL-08S	S	8/20/2001	1308.47	16.18	1292.29	0.04	
NWL-09D	D	3/19/2001	1310.59	12.67	1297.92		
NWL-09D	D	8/21/2001	1310.59	14.40	1296.19		
NWL-09S	S	3/19/2001	1310.60	12.64	1297.96	0.04	
NWL-09S	S	8/21/2001	1310.60	14.45	1296.15	-0.04	

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Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
SK-MW-01D	D	3/21/2001	1315.61	15.40	1300.20		
SK-MW-01D	D	8/20/2001	1315.61	16.13	1299.48		
SK-MW-01S	S	3/21/2001	1315.43	16.03	1299.40	**-0.80**	Intermediate clay present
SK-MW-01S	S	8/20/2001	1315.43	16.87	1298.56	**-0.92**	Intermediate clay present
UCL-MW-12D	D	3/20/2001	1348.39	16.95	1331.44		
UCL-MW-12D	D	8/20/2001	1348.39	19.39	1329.00		
UCL-MW-12S	S	3/20/2001	1348.49	16.26	1332.23	**0.79**	
UCL-MW-12S	S	8/20/2001	1348.49	19.53	1328.96	-0.04	
NMW-36D	D	8/20/2001	1318.44	16.98	1301.46		
UPRF-MW-03		8/20/2001	1318.07	17.20	1300.87	**-0.59**	Intermediate clay present
NMW-37D	D	8/20/2001	1318.15	17.40	1300.75		
UPRF-MW-09		8/20/2001	1317.83	17.22	1300.61	**-0.14**	Intermediate clay present
NMW-38D	D	8/20/2001	1319.83	19.05	1300.78		
UPRF-MW-16		8/20/2001	1319.90	19.50	1300.40	**-0.38**	Intermediate clay present
USD-MW-05D	D	8/21/2001	1327.80	18.58	1309.22		
USD-MW-05SR	S	8/21/2001	1327.96	18.82	1309.14	-0.08	
VCM-MW-04	D	3/20/2001	1303.12	15.34	1287.78		
VCM-MW-04	D	8/21/2001	1303.12	15.77	1287.35		
VCM-MW-01	S	3/20/2001	1303.09	15.31	1287.78	0.00	
VCM-MW-01	S	8/21/2001	1303.09	15.79	1287.30	-0.05	
VCM-MW-06	D	3/20/2001	1307.00	16.08	1290.92		
VCM-MW-06	D	8/21/2001	1307.00	16.32	1290.68		
VCM-MW-02B	S	3/20/2001	1306.44	15.54	1290.90	-0.02	
VCM-MW-02B	S	8/21/2001	1306.44	15.80	1290.64	-0.04	
VCM-MW-07	D	3/20/2001	1304.66	13.61	1291.05		
VCM-MW-07	D	8/21/2001	1304.66	13.87	1290.79		
VCM-MW-03	S	3/20/2001	1304.63	13.62	1291.01	-0.04	
VCM-MW-03	S	8/21/2001	1304.63	13.89	1290.74	-0.05	
VWRS-MW-02D	D	3/19/2001	1313.42	16.17	1297.25		
VWRS-MW-02D	D	8/22/2001	1313.42	17.24	1296.18		
VWRS-MW-02S	S	3/19/2001	1313.33	16.09	1297.24	-0.01	
VWRS-MW-02S	S	8/22/2001	1313.33	17.14	1296.19	0.01	
VWRS-MW-07D	D	3/19/2001	1309.52	12.34	1297.18		
VWRS-MW-07D	D	8/22/2001	1309.52	13.39	1296.13		
VWRS-MW-07S	S	3/19/2001	1309.54	12.42	1297.12	-0.06	
VWRS-MW-07S	S	8/22/2001	1309.54			--	Well covered by drums, couldn't measure
VWRS-MW-09D	D	3/19/2001	1309.38	12.36	1297.02		
VWRS-MW-09D	D	8/22/2001	1309.38	13.37	1296.01		
VWRS-MW-09S	S	3/19/2001	1309.20	12.25	1296.95	-0.07	
VWRS-MW-09S	S	8/22/2001	1309.20	13.25	1295.95	-0.06	
WND-02D	D	3/19/2001	1311.66	13.21	1298.45		
WND-02D	D	8/20/2001	1311.66	13.85	1297.81		
WND-02S	S	3/19/2001	1311.53	13.04	1298.49	0.04	
WND-02S	S	8/20/2001	1311.53	13.65	1297.88	0.07	
WNC-05D	D	3/19/2001	1318.20	15.00	1303.20		
WNC-05D	D	8/20/2001	1318.20	15.61	1302.59		
WND-05S	S	3/19/2001	1317.74	14.54	1303.20	0.00	
WND-05S	S	8/20/2001	1317.74	15.16	1302.58	-0.01	
WNC-06D	D	8/20/2001	1328.12	20.62	1307.50		
WND-06S	S	8/20/2001	1327.75	20.34	1307.41	-0.09	
WNC-09D	D	3/19/2001	1315.16	11.31	1303.85		
WNC-09D	D	8/20/2001	1315.16	11.85	1303.31		

North Industrial Corridor (NIC) Site
Phase 2 Nested Well Differences (Mar 2001-Aug 2001)

Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
WNC-09SR	S	3/19/2001	1315.14	11.37	1303.77	-0.08	
WNC-09SR	S	8/20/2001	1315.14	11.89	1303.25	-0.06	
WNC-10D	D	3/20/2001	1316.81	12.18	1304.63		
WNC-10D	D	8/20/2001	1316.81	13.06	1303.75		
WND-10S	S	3/20/2001	1318.58	13.84	1304.74	**0.11**	
WND-10S	S	8/20/2001	1318.58			--	Tree roots, no water
WNC-11D	D	3/19/2001	1314.36	11.30	1303.06		
WNC-11D	D	8/20/2001	1314.36	11.88	1302.48		
WND-11S	S	3/19/2001	1316.77	13.66	1303.11	0.05	
WND-11S	S	8/20/2001	1316.77	14.30	1302.47	-0.01	
WND-12D	D	3/19/2001	1315.84	12.21	1303.63		
WND-12D	D	8/20/2001	1315.84	12.96	1302.88		
WND-12S	S	3/19/2001	1315.76	12.11	1303.65	0.02	
WND-12S	S	8/20/2001	1315.76	12.84	1302.92	0.04	
WND-14D	D	3/20/2001	1317.53	14.45	1303.08		
WND-14D	D	8/20/2001	1317.53	15.49	1302.04		
WND-14S	S	3/20/2001	1317.70	14.55	1303.15	0.07	
WND-14S	S	8/20/2001	1317.70	15.66	1302.04	0.00	
WND-15D	D	3/21/2001	1306.41	12.95	1293.46		
WND-15D	D	8/20/2001	1306.41	13.90	1292.51		
WND-15S	S	3/21/2001	1306.76	13.31	1293.45	-0.01	
WND-15S	S	8/20/2001	1306.76	14.28	1292.48	-0.03	
WNC-16D	D	3/19/2001	1313.61	11.95	1301.66		
WNC-16D	D	8/21/2001	1313.61	13.04	1300.57		
WND-16S	S	3/19/2001	1313.47	14.90	1301.19	**-0.47**	Product present
WND-16S	S	8/21/2001	1313.47	15.18	1298.29	**-2.28**	Product present
WND-18D	D	3/19/2001	1310.90	14.71	1296.19		
WND-18D	D	8/20/2001	1310.90	15.26	1295.64		
WND-18S	S	3/19/2001	1310.95	14.82	1296.13	-0.06	
WND-18S	S	8/20/2001	1310.95	15.35	1295.60	-0.04	
WND-19D	D	3/19/2001	1306.76	11.09	1295.67		
WND-19D	D	8/20/2001	1306.76	11.70	1295.06		
WND-19S	S	3/19/2001	1306.73	11.06	1295.67	0.00	
WND-19S	S	8/20/2001	1306.73	11.66	1295.07	0.01	
WND-21D	D	3/19/2001	1309.33	11.20	1298.13		
WND-21D	D	8/20/2001	1309.33	12.12	1297.21		
WND-21S	S	3/19/2001	1309.31	11.14	1298.17	0.04	
WND-21S	S	8/20/2001	1309.31	12.08	1297.23	0.02	
WND-22D	D	3/20/2001	1323.58	14.12	1309.46		
WND-22D	D	8/20/2001	1323.58	15.76	1307.82		
WND-22S	S	3/20/2001	1323.36	13.34	1310.02	**0.56**	
WND-22S	S	8/20/2001	1323.36	15.25	1308.11	**0.29**	Confirmed
WNC-23D	D	3/19/2001	1318.61	14.82	1303.79		
WNC-23D	D	8/20/2001	1318.61	15.70	1302.91		
WND-23S	S	3/19/2001	1317.73	13.91	1303.82	0.03	
WND-23S	S	8/20/2001	1317.73	14.80	1302.93	0.02	
WND-24D	D	3/19/2001	1306.77	11.95	1294.82		
WND-24D	D	8/20/2001	1306.77	12.68	1294.09		
WND-24S	S	3/19/2001	1306.88	12.08	1294.80	-0.02	
WND-24S	S	8/20/2001	1306.88	12.80	1294.08	-0.01	

North Industrial Corridor (NIC) Site
Phase 2 Nested Well Differences (Mar 2001-Aug 2001)

Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
WND-25D	D	3/21/2001	1318.75	14.58	1304.17		
WND-25D	D	8/20/2001	1318.75	15.77	1302.98		
WND-25S	S	8/20/2001	1318.73	15.73	1303.00	0.02	
WND-26D	D	3/19/2001	1315.53	14.48	1301.05		
WND-26D	D	8/21/2001	1315.53	15.19	1300.34		
WND-26S	S	3/19/2001	1315.61	14.55	1301.06	0.01	
WND-26S	S	8/21/2001	1315.61	15.28	1300.33	-0.01	
WND-29D	D	3/20/2001	1320.04	15.89	1304.15		
WND-29D	D	8/20/2001	1320.04	17.05	1302.99		
WND-29S	S	3/20/2001	1319.64	15.45	1304.19	0.04	
WND-29S	S	8/20/2001	1319.64	16.62	1303.02	0.03	
WND-30D	D	8/21/2001	1315.70	15.58	1300.12		
DRB-MW-02	S	8/21/2001	1313.50	13.90	1299.60	**-0.52**	Intermediate clay present
WNC-31D	D	8/20/2001	1318.31	17.42	1300.89		
WND-31S	S	8/20/2001	1317.26	16.97	1300.29	**-0.60**	Intermediate clay present
WNC-32D	D	8/20/2001	1318.82	18.32	1300.50		
WND-32S	S	8/20/2001	1317.68	17.70	1299.98	**-0.52**	Intermediate clay present
WND-33D	D	3/19/2001	1310.65	11.94	1298.71		
WND-33D	D	8/20/2001	1310.65	12.84	1297.81		
WND-33S	S	3/19/2001	1310.58	11.95	1298.63	-0.08	
WND-33S	S	8/20/2001	1310.58	12.86	1297.72	-0.09	
WND-34D	D	3/19/2001	1314.40	14.31	1300.09		
WND-34D	D	8/21/2001	1314.40	15.25	1299.15		
WND-34S	S	3/19/2001	1314.34	14.27	1300.07	-0.02	
WND-34S	S	8/21/2001	1314.34	15.23	1299.11	-0.04	
WND-36D	D	3/19/2001	1314.69	13.55	1301.14		
WND-36D	D	8/21/2001	1314.69	14.41	1300.28		
WND-36S	S	3/19/2001	1314.75	13.63	1301.12	-0.02	
WND-36S	S	8/21/2001	1314.75	14.49	1300.26	-0.02	
WND-37DR	D	3/19/2001	1314.75	15.17	1299.58		
WND-37DR	D	8/20/2001	1314.75	16.14	1298.61		
WNC-37SR	S	3/19/2001	1315.18	15.63	1299.55	-0.03	
WNC-37SR	S	8/20/2001	1315.18	16.59	1298.59	-0.02	
WND-38D	D	3/21/2001	1307.62	10.90	1296.72		
WND-38D	D	8/21/2001	1307.62	11.72	1295.90		
WND-38S	S	3/21/2001	1307.48	10.70	1296.78	0.06	
WND-38S	S	8/21/2001	1307.48	11.53	1295.95	0.05	
WND-39D	D	3/19/2001	1308.29	11.40	1296.89		
WND-39D	D	8/21/2001	1308.29	12.35	1295.94		
WND-39S	S	3/19/2001	1308.31	11.40	1296.91	0.02	
WND-39S	S	8/21/2001	1308.31	12.35	1295.96	0.02	
WND-40D	D	3/20/2001	1302.38	11.68	1290.70		
WND-40D	D	8/20/2001	1302.38	11.97	1290.41		
WND-40S	S	3/20/2001	1302.64	11.82	1290.82	**0.12**	
WND-40S	S	8/20/2001	1302.64	12.13	1290.51	**0.10**	Confirmed
WND-41D	D	3/19/2001	1306.94	11.88	1295.06		
WND-41D	D	8/20/2001	1306.94	12.36	1294.58		
WND-41S	S	3/19/2001	1306.97	11.94	1295.03	-0.03	
WND-41S	S	8/20/2001	1306.97	12.45	1294.52	-0.06	
WND-42D	D	3/20/2001	1303.79	14.32	1289.47		
WND-42D	D	8/20/2001	1303.79	14.65	1289.14		

North Industrial Corridor (NIC) Site
Phase 2 Nested Well Differences (Mar 2001-Aug 2001)

Well ID	Nested Well Depth Zone	Date	Measuring Point Elevation* (feet msl)	Depth to Water (feet bmp)	Water Level Elevation (feet msl)	Nested Well Difference*	Nested Difference Comments
WND-42S	S	3/20/2001	1303.64	14.19	1289.45	-0.02	
WND-42S	S	8/20/2001	1303.64	14.52	1289.12	-0.02	
WND-43D	D	3/19/2001	1307.40	12.83	1294.57		
WND-43D	D	8/20/2001	1307.40	13.45	1293.95		
WND-43S	S	3/19/2001	1307.54	12.89	1294.65	0.08	
WND-43S	S	8/20/2001	1307.54	13.51	1294.03	0.08	
WND-44D	D	3/20/2001	1303.52	13.49	1290.03		
WND-44D	D	8/20/2001	1303.52	13.78	1289.74		
WND-44S	S	3/20/2001	1303.27	13.22	1290.05	0.02	
WND-44S	S	8/20/2001	1303.27	13.55	1289.72	-0.02	
WND-45D	D	3/21/2001	1305.54	12.01	1293.53		
WND-45D	D	8/20/2001	1305.54	12.36	1293.18		
WND-45S	S	3/21/2001	1305.66	12.26	1293.40	**-0.13**	Bad Survey
WND-45S	S	8/20/2001	1305.66	12.62	1293.04	**-0.14**	Bad Survey
WND-46D	D	3/19/2001	1304.87	11.75	1293.12		
WND-46D	D	8/20/2001	1304.87	12.02	1292.85		
WND-46S	S	3/19/2001	1304.98	11.85	1293.13	0.01	
WND-46S	S	8/20/2001	1304.98	12.14	1292.84	-0.01	
WND-47D	D	3/19/2001	1304.63	12.02	1292.61		
WND-47D	D	8/20/2001	1304.63	12.34	1292.29		
WND-47S	S	3/19/2001	1304.81	11.98	1292.83	**0.22**	Bad Survey
WND-47S	S	8/20/2001	1304.81	12.30	1292.51	**0.22**	Bad Survey
WND-48D	D	3/20/2001	1301.21	12.19	1289.02		
WND-48D	D	8/20/2001	1301.21	12.72	1288.49		
WND-48S	S	3/20/2001	1301.01	12.01	1289.00	-0.02	
WND-48S	S	8/20/2001	1301.01	12.53	1288.48	-0.01	
WND-49D	D	3/19/2001	1308.14	12.72	1295.42		
WND-49D	D	8/20/2001	1308.14	13.23	1294.91		
WNC-49SR	S	3/19/2001	1308.22	12.80	1295.42	0.00	
WNC-49SR	S	8/20/2001	1308.22	13.33	1294.89	-0.02	
WU-MW-04D	D	3/20/2001	1307.36	12.30	1295.06		
WU-MW-04D	D	8/21/2001	1307.36	12.88	1294.48		
WU-MW-04S	S	3/20/2001	1307.23	12.26	1294.97	-0.09	
WU-MW-04S	S	8/21/2001	1307.23	12.81	1294.42	-0.06	
WU-MW-05D	D	3/20/2001	1307.65	11.96	1295.69		
WU-MW-05D	D	8/21/2001	1307.65	12.59	1295.06		
WU-MW-05S	S	3/20/2001	1307.38	11.67	1295.71	0.02	
WU-MW-05S	S	8/21/2001	1307.38	12.30	1295.08	0.02	

Note: Table includes measurements taken at nested wells by CDM (March 2001and August 2001) and measurements taken by Coastal-Derby in March 2001.

msl = Mean Sea Level Elevation

bmp = Below measuring point

* The Nested Well Difference is the shallow well water level elevation minus the deep well water level elevation. A positive nested well difference indicates a downward gradient and a negative nested well difference indicated an upward gradient.