

Mailing Address: **PO BOX 1410**
 City: **Paducah** State: **KY** Zip: **42001**
 Phone: (**502**) **441-6000** () No Phone

(3) WELL RECORD LABEL LOCATION:
 well casing () other

(4) WELL LOCATION:
 USGS Quadrangle Name: **Heath, KY.**
 County: **McCracken**
 Elevation: **382.06** ft. () map () altimeter () other
 Latitude: **37 06 50.5** Longitude: **88 48 39**
 Physiographic or Hydrologic Region:
 Blue Grass () Ohio River Alluvium () E. Coal Field
 Miss. Plateau Jackson Purchase () W. Coal Field

(7) WELL USE:
 domestic () public () irrigation
 industrial () livestock monitoring
 unused () other
 PWSID #:
 Water Withdrawal Permit #:

(10) TYPE OF TREATMENT SYSTEM:
 none
 water softener
 ultra violet
 chlorination
 aeration
 charcoal filter
 sand filter
 iron inhibitor
 other

(5) WELL CHARACTERISTICS:
 Is this a hand dug well? () yes no () unknown
 Who constructed well? **CH2M Hill, Inc** () unknown
 Address:
 City: **Oak Ridge** State: **TN** Zip:

(8) WELL SERVICE:
 Number of people served: **NA**
 Number of service connections:
 Any quantity problems? () yes () no
 Any quality problems? () yes () no
 Describe:

Is a treatment bypass available? () yes () no
 Describe water quality problem requiring treatment:

Date well was completed: **12** **14** **90** () unknown
 Month Day Year
 Total depth: **95** ft. () measured reported () unknown
 Does the casing extend above the ground? yes, **38** in. () no

(9) COMPLIANCE TO STANDARDS:
 Is this well in compliance with state water well construction standards? yes () no () unknown
 If no, describe deficiencies:

Casing Type(s)	Inside Diameter (in)	From	To	Casing Wall Thickness
1. steel	8 in	0' ft	47' ft.	
2. S. steel	2 in	-3'	83'	
3. .02" ss. screen	2"	63'	70'	
4.				

(11) INSPECTION INFORMATION:
 Date of Inspection: **9** **22** **92** Check one: original inspection
 Month Day Year () re-inspection
 Was a water quality sample taken as part of this inspection? () yes no
 Reason for inspection (check all that are applicable):
 general water quality analysis requested
 specific complaint investigation
 general survey
 ambient groundwater monitoring
 other
 Permit/Program Name
 Other ID #: **MW 156**
 Well Inventory #:

Is the well located in a pit? () yes no () unknown
 Is the water discharge pipe below ground surface? () yes no () unknown
 Is a pitless adapter used? () yes no () unknown
 Well yield: () gpm () gph () gpd
 measured () estimated () unknown
 Surface annular material: () clay () sand cement
 drill cuttings () gravel () open annulus () unknown
 other
 Well head (casing top): () well cap sanitary seal () open
 other
 Pump type: () jet () submersible () hand pump () turbine
 none () bailer/bucket other **bladder**
 Level of pump intake: **72** ft. () unknown
 Age of pump: yrs. () unknown
 Electric connection for pump: () 2 wire, 110V () 3 wire, 220V () unknown
 Static water level: **52.55** ft. below surface () measured reported
 If unknown: () can't be measured () not measured **5/92**
 Does the owner have any log or record concerning this well?
 yes () no If yes, specify: **drill log, monitoring data**

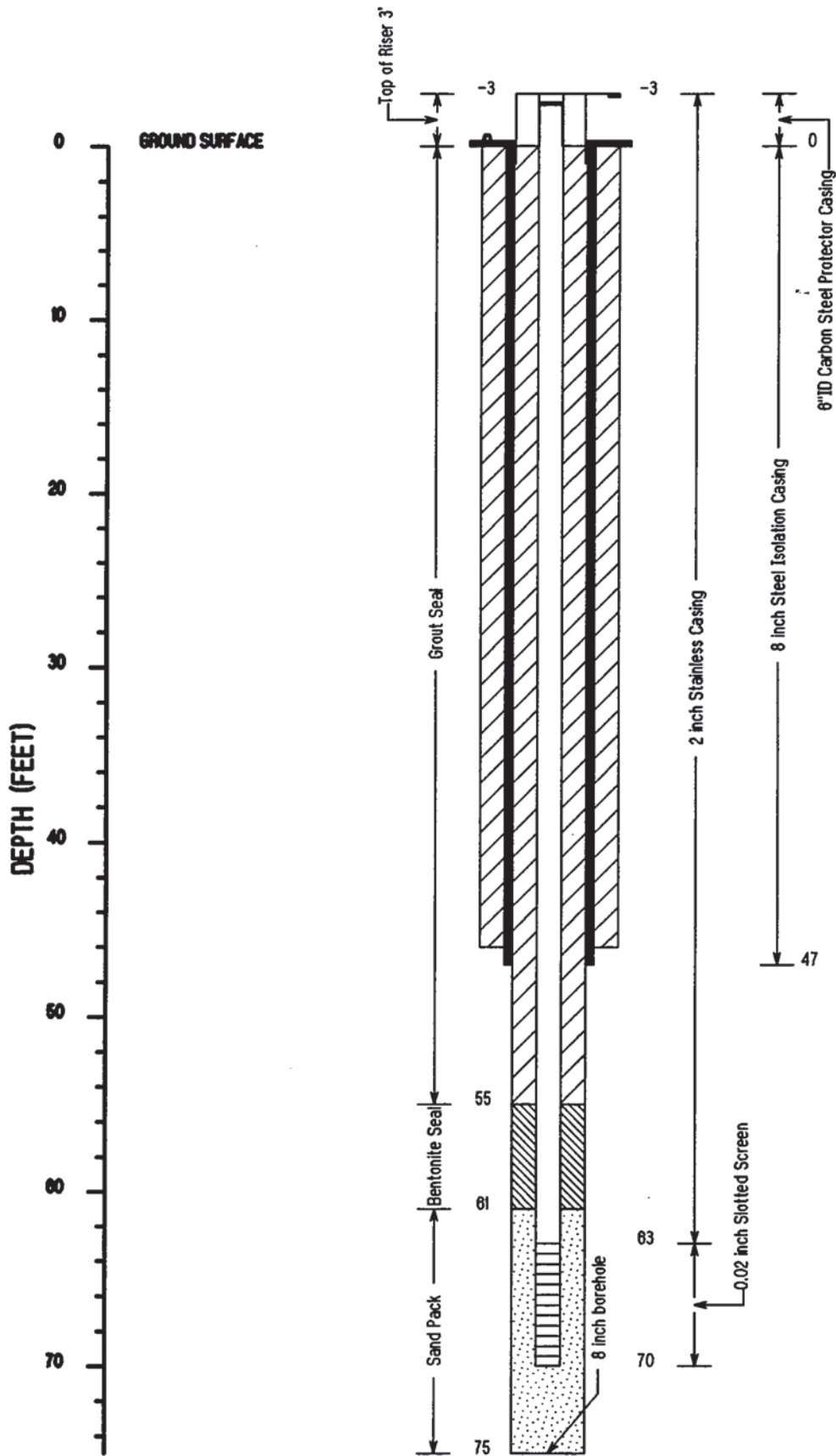
(12) OPTIONAL USE:
 Will well owner allow state monitoring? yes () no () unknown
 Extent of monitoring allowed: collect sample measure static water level
 pump well () remove well cap () other
 Monitoring feasibility: **high**

(13) COMMENTS:

(6) SKETCH MAP:
S.E. corner of C-400 bld.

(14) INSPECTOR IDENTIFICATION:
 Name: **Bell** **Jarrod** **C.** **3031**
 Last First MI Inspector ID #
 Agency: () CHR () DOW DWM () KGS () SOAP
 Other
 Signature of Inspector: **Jarrod C. Bell**
 Date: **9** **22** **92** Number of Attached pages:
 Month Day Year

(See Logbook # 19)



WELL CONSTRUCTION DETAILS

WELL MW-158

ELEVATION: 2" TOC 382.06 ft. MSL

**PGDP Phase II Site Investigation
SE Corner of C-400 Building**

Attachment 4-A Field Exploration Information

WELL GROUP NO. 1: WMU 11 - TCE Leak Site

MW-155	Equipment	Onsite Personnel
installation: 12-05-90/12-12-90	CME 75 rig 12 " continuous	J. Anderson (STL-CH) B. Souza (ST-CH)
development: 01-03-91/01-08-91	flight augers to 46'	A. Grigsby (IH/HP-EB) D. Spencer (escort-CH) C. Faus (BR)
Well TD = 92 ' below pad surface	7 3/4" O.D. CME augers to 95' 5' x 3" ID CME sampler	R. Holder (BR) R. Dependahl (BR) H. Fowler (escort-CH) E. Pomar (CH) D. Frain (IH/HP-EB) J. Houston (escort-CH) T. Boone (BR) M. Umfleet (BR)

MW-156	Equipment	Onsite Personnel
installation: 12-13-90/12-19-90	see MW-155, except 7 3/4" augers to 75'	(see MW-155) plus M. Kizilbash (BR)
development: 01-07-91/01-14-91		M. Jackson (escort-CH) C. Thompson (BR)
Well TD = 70 ' below pad surface		B. Moya (IH/HP-EB) P. Eggering (BR)

MW-157	Equipment	Onsite Personnel
installation: 12-19-90/12-19-90	CME 75 rig	(see MW-155) plus
development: 01-07-91/01-15-91	7 3/4" O.D. CME augers to 37'	C. Thompson (BR)
Well TD = 35 ' below pad surface	5' x 3" ID CME sampler	

Table 4-1
Stage A Monitoring Well Location Data
PGDP Phase II Site Investigation

Well Group Number	Well Group Location	Well No.	Plant Grid Coordinates		Top of 2" casing Elevation (ft msl)	Hydrogeologic Unit	Screened Interval (ft bgs)	Reasons for Well Locations
			N	E				
1	WMU 11 - TCE Leak Site	MW-155	S1669	W4025	381.25	Lower RGA ^a	87 - 92	Reported TCE leak in adjacent drain
		MW-156	S1704	W4026	382.06	Upper RGA	63 - 70	
		MW-157	S1689	W4026	381.56	Shallow gs ^b	30 - 35	
2	WMU 91- Cylinder Drop Test Area	MW-158	S0991	W6957	367 ^c	Lower RGA	102 - 108	TCE detected in Phase I soil boring to 36'
		MW-159	S0990	W6937	367 ^c	Upper RGA	63 - 68	
		MW-160	S0972	W6946	367 ^c	Shallow gs	20 - 25	
3	WMU 1- North Oil Landfarm	MW-161	S1667	W6917	373.55	Upper RGA ^d	65 - 70	Check for TCE in groundwater, since TCE in Phase I soil boring at 32'
		MW-161A MW-162	S1667	W6886	374.17	Upper RGA Shallow gs	78 - 83 18 - 24	
4	Eastern part of Plant	MW-163	S1401	W2041	386.14	Upper RGA	94 - 99	Monitoring point for contaminants moving to East (i.e., from C-400 building)
		MW-164	S1416	W2043	386.29	Shallow gs	42 - 47	
5	Northern part of plant	MW-165	N0898	W3136	379.74	Upper RGA	63 - 68	Monitoring point for contaminants moving to NE (i.e., from C-400 building)
		MW-166	N0893	W3152	380.07	Shallow gs	33 - 38	
6	AREA A- Diesel Spill	MW-167	S0909	W4822	376.36	Shallow gs	21 - 26	Monitoring point downgradient from the diesel spill
		MW-168	S0925	W4822	377.42	Upper RGA	63 - 68	
7	WMU 2 and 3- Downgradient	MW-169	S0191	W5558	373.41	Upper RGA	65 - 70	Evaluate water quality downgradient from WMU 2 and 3
		MW-170	S0176	W5558	373.98	Shallow gs	25 - 30	

Table 6-1
Stage A Well Construction Details
PGDP Phase II Site Investigation
 (page 1 of 2)

Well	Aquifer	Lithology	Location	Well Riser I.D.	Sanded Interval ^a	Screen Length	Top of Screen Elevation ^a	Water Elevation ^a	Test Method
MW-155	Lower RGA	LCD	C-400 Area	2 in.	82-95	5 ft	87	39.0	PDD
MW-156	Upper RGA	LCD	C-400 Area	2 in.	61-75	7 ft	63	47.5	PDD
MW-157	SGS	UCD	C-400 Area	2 in.	25-37	5 ft	30	29.1	DC
MW-158	Lower RGA	LCD	WMU-91	2 in.	97-110	6 ft	102	39.2	PDD
MW-159	Upper RGA	LCD	WMU-91	2 in.	58-70	5 ft	63	40.0	PDD
MW-160	SGS	UCD	WMU-91	2 in.	15-28	5 ft	20	5.4	PDD
MW-161	Upper RGA	LCD	WMU-1	2 in.	73-85	5 ft	78	39.8	PDD
MW-162	SGS	UCD	WMU-1	2 in.	14-25	5 ft	18	8.8	PDD
MW-163	Upper RGA	LCD	East Plant	2 in.	87-100	5 ft	94	51.5	PDD
MW-164	SGS	UCD	East Plant	2 in.	37-48	5 ft	42	40.2	DC
MW-165	Upper RGA	LCD	North Plant	2 in.	57.5-70	5 ft	63	46.4	PDD
MW-166	SGS	UCD	North Plant	2 in.	28-40	5 ft	33	32.9	DC
MW-167	SGS	UCD	10th St./Va. Ave.	2 in.	16-28	5 ft	21	5.7	PDD
MW-168	Upper RGA	LCD	10th st./Va. Ave.	2 in.	58-70	5 ft	63	43.0	PDD
MW-169	Upper RGA	LCD	001 Ditch	2 in.	59-70	5 ft	65	39.0	PDD
MW-170	SGS	UCD	001 Ditch	2 in.	20-30	5 ft	25	5.2	PDD
MW-175	Upper RGA	LCD	C-400 Area	2 in.	68-80	5 ft	75	47.1	PDD

Table 4-3
Stage A Monitoring Well Development Data
PGDP Phase II Site Investigation

Well No.	Well Screen Zone	Gals. Removed	Hrs. Surge/Bail	Hrs. Pump	Parameters			Color	Comments
					pH (SU)	Cond. (Umho)	Temp. (°C)		
MW-155	RGA ¹	45	5.5	2	6.3	180	10	Light pink-brown	Well developed 01-08-91 HNu up to 15 ppm in casing 0 ppm in breathing zone
MW-156	RGA	195	9.5	7	7.8 7.9 7.2	280 280 280	13 12 12	Light pink-brown	Well developed 01-14-91. HNu up to 150ppm in casing 0 ppm in breathing zone
MW-157	Shallow gs ²	24	3	0	6.7 6.7 LO BAT	190 200 200	10 11 10	No record	HNu=20 ppm in casing to 100ppm in bucket. Well developed on 01-15-91.
MW-158	RGA	1353	12	27	7.1 7.1 7.1	180 180 180	14 13 13	Very clear	Well developed on 02-26-91
MW-159	RGA	415	13.25	9.5	6.1 6.2 6.1	90 89 90	12 13 13	Cloudy	Well developed on 01-06-91 Grout flakes found in the well
MW-160	Shallow gs	23	2	0	6.7 6.7 6.6	360 365 370	14 14 14	Murky	Well developed on 02-26-91
MW-161 MW-161A	RGA RGA	22.5 677	2.25 7	0 9.5	7.5 7.5 7.5	192 192 190	16 16 16	Clear	Well was replaced with 161A Well developed on 2-18-91.
MW-162	Shallow gs	175	17	0	7.1 7.7 7.6	413 400 383	12 13 11	Moderate brown cloudy	Well developed on 02-18-91

Table 3-6
Flow Velocity from the Phase II Investigation
PGDP Phase II Site Investigation
 (page 1 of 2)

Well	Hydraulic Conductivity (cm/sec)	Unit Thickness (cm)	Horizontal Gradient (dimensionless)	Horizontal Flow Velocity	
				(cm/sec)	(ft/day)
Shallow Groundwater System					
MW-157	2.47×10^{-5}	259.0	.00174	2.15×10^{-7}	6.09×10^{-4}
MW-160	2.10×10^{-5}	655.3	.00640	6.72×10^{-7}	1.90×10^{-3}
MW-162	3.50×10^{-5}	487.6	.00828	1.45×10^{-6}	4.11×10^{-3}
MW-164	6.54×10^{-4}	259.0	.00083	2.75×10^{-6}	7.80×10^{-3}
MW-166	1.02×10^{-8}	228.6	.00291	1.49×10^{-10}	4.22×10^{-7}
MW-167	3.60×10^{-5}	670.5	.00373	6.72×10^{-7}	1.90×10^{-3}
MW-170	4.00×10^{-6}	762.0	.00442	8.84×10^{-8}	2.51×10^{-4}
MW-177	2.81×10^{-4}	213.3	.00291	4.09×10^{-5}	1.16×10^{-1}
MW-189	2.81×10^{-5}	396.2	.00958	2.01×10^{-6}	5.70×10^{-3}
MW-190	1.20×10^{-5}	685.8	.00744	4.47×10^{-7}	1.27×10^{-3}
MW-192	2.70×10^{-5}	746.7	.00676	9.14×10^{-7}	2.59×10^{-3}
MW-195	6.61×10^{-4}	289.5	.00880	2.91×10^{-5}	8.25×10^{-2}
MW-196	7.67×10^{-5}	762.0	.00356	1.37×10^{-6}	3.88×10^{-3}
MW-198	7.45×10^{-7}	228.6	.00071	2.67×10^{-9}	7.63×10^{-6}
MW-204	3.37×10^{-5}	563.8	.00392	6.61×10^{-7}	1.87×10^{-3}
Upper Regional Gravel Aquifer					
MW-156	3.23×10^{-3}	1280.1	.00097	1.58×10^{-5}	4.48×10^{-2}
MW-159	3.96×10^{-3}	1463.0	.00023	4.66×10^{-6}	1.32×10^{-2}
MW-161	2.29×10^{-2}	1463.0	.00030	3.44×10^{-5}	9.75×10^{-2}
MW-163	2.11×10^{-2}	762.0	.00013	1.41×10^{-5}	4.00×10^{-2}
MW-165	6.52×10^{-3}	1219.2	.00075	2.45×10^{-5}	6.94×10^{-2}
MW-168	1.10×10^{-3}	609.6	.00017	9.57×10^{-7}	2.71×10^{-3}
MW-169	6.61×10^{-3}	609.6	.00021	7.08×10^{-6}	2.01×10^{-2}
MW-175	3.05×10^{-2}	1280.1	.00056	8.54×10^{-5}	2.42×10^{-1}
MW-178	2.03×10^{-2}	1219.2	.00041	4.23×10^{-5}	1.20×10^{-1}

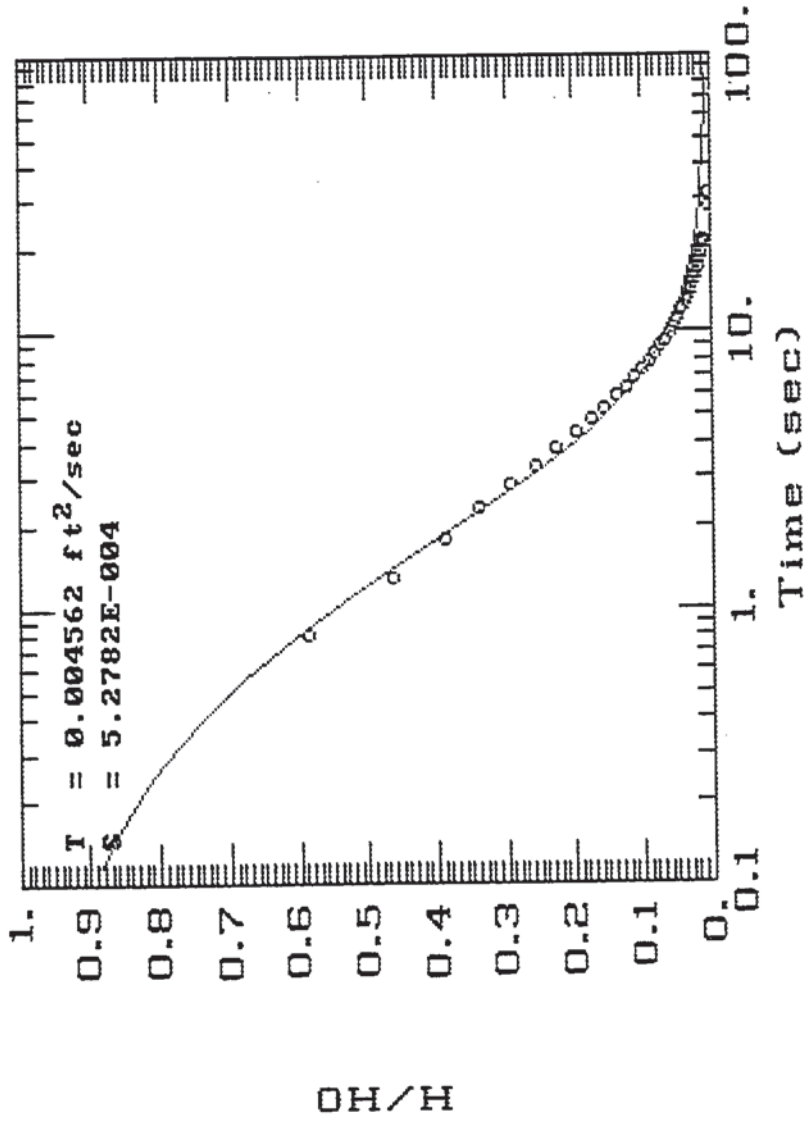
Table 6-3
Hydraulic Conductivities for All Tests Conducted on Stage A Wells at PGDP
PGDP Phase II Site Investigation
 (page 2 of 4)

Appendix A Fig No.	Well No., Test No.	K (cm/sec)	Data Analysis Method	Percent Recovery of Test	Total Displacement (ft)
A-16	MW190, RHT2	1.24 x 10 ⁻⁵	Cooper	98	5.09
UPPER RGA					
A-17	MW156, RHT1	3.31 x 10 ⁻³	Cooper	100	6.99
A-18	MW156, RHT2	3.20 x 10 ⁻³	Cooper	100	7.03
A-19	MW156, RHT3	3.17 x 10 ⁻³	Cooper	100	7.07
A-20	MW159, RHT1	3.95 x 10 ⁻³	Bouwer	100	7.28
A-21	MW159, RHT2	4.00 x 10 ⁻³	Bouwer	100	7.21
A-22	MW159, RHT3	3.93 x 10 ⁻³	Bouwer	100	7.13
A-23	MW161, RHT1	2.61 x 10 ⁻²	Bouwer	100	7.10
A-24	MW161, RHT2	2.63 x 10 ⁻²	Bouwer	100	7.07
A-25	MW161, RHT3	1.76 x 10 ⁻²	Bouwer	100	7.07
A-26	MW163, RHT1	4.76 x 10 ⁻²	Bouwer	100	7.12
A-27	MW163, RHT2	3.20 x 10 ⁻²	Bouwer	100	7.04
A-28	MW163, RHT3	6.13 x 10 ⁻³	Bouwer	100	7.07
A-29	MW165, RHT1	7.83 x 10 ⁻³	Cooper	100	7.22
A-30	MW165, RHT2	5.90 x 10 ⁻³	Bouwer	100	7.14
A-31	MW165, RHT3	5.99 x 10 ⁻³	Bouwer	100	7.14

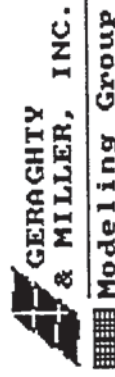
Table 6-5
Geometric Mean of Hydraulic Conductivities and Estimated
Transmissivities of Stage A and B Wells at PGDP
PGDP Phase II Site Investigation
(page 1 of 2)

Well No.	Geometric Average K (cm/sec)	K (gal/day/ft ²)	b (ft)	T (gal/day/ft)
Stage A Wells				
Shallow Groundwater System				
MW157	2.47 x 10 ⁻⁵	5.23 x 10 ⁻¹	8.5	4.45
MW160	2.1 x 10 ⁻⁵	4.53 x 10 ⁻¹	21.5	9.7
MW162	3.5 x 10 ⁻⁵	7.44 x 10 ⁻¹	16	11.9
MW164	6.54 x 10 ⁻⁴	13.87	8.5	118
MW166	1.02 x 10 ⁻⁸	2.16 x 10 ⁻⁴	7.5	0.0016
MW167	3.6 x 10 ⁻⁵	7.73 x 10 ⁻³	22	17.0
MW170	4.00 x 10 ⁻⁶	8.53 x 10 ⁻²	25	2.13
MW177	2.81 x 10 ⁻⁴	5.96	7	41.7
MW189	4.2 x 10 ⁻⁵	9.06 x 10 ⁻¹	13	11.8
MW190	1.2 x 10 ⁻⁵	2.55 x 10 ⁻¹	22.5	5.74
Upper RGA				
MW156	3.23 x 10 ⁻³	68.4	42	2,872
MW159	3.96 x 10 ⁻³	83.99	48	4,032
MW161	2.29 x 10 ⁻²	486.4	48	23,346
MW163	2.11 x 10 ⁻²	446.8	25	11,169
MW165	6.52 x 10 ⁻³	138.2	40	5,526
MW168	1.10 x 10 ⁻³	23.33	20	466.6
MW169	6.61 x 10 ⁻³	140.1	20	2,801
MW175	3.05 x 10 ⁻²	647.5	42	27,195
MW178	2.03 x 10 ⁻²	430.6	40	17,222
MW188	4.17 x 10 ⁻²	884.2	48	42,442
Lower RGA				
MW155	4.37 x 10 ⁻³	92.66	42	3,892
MW158	2.20 x 10 ⁻⁴	4.67	48	224.3

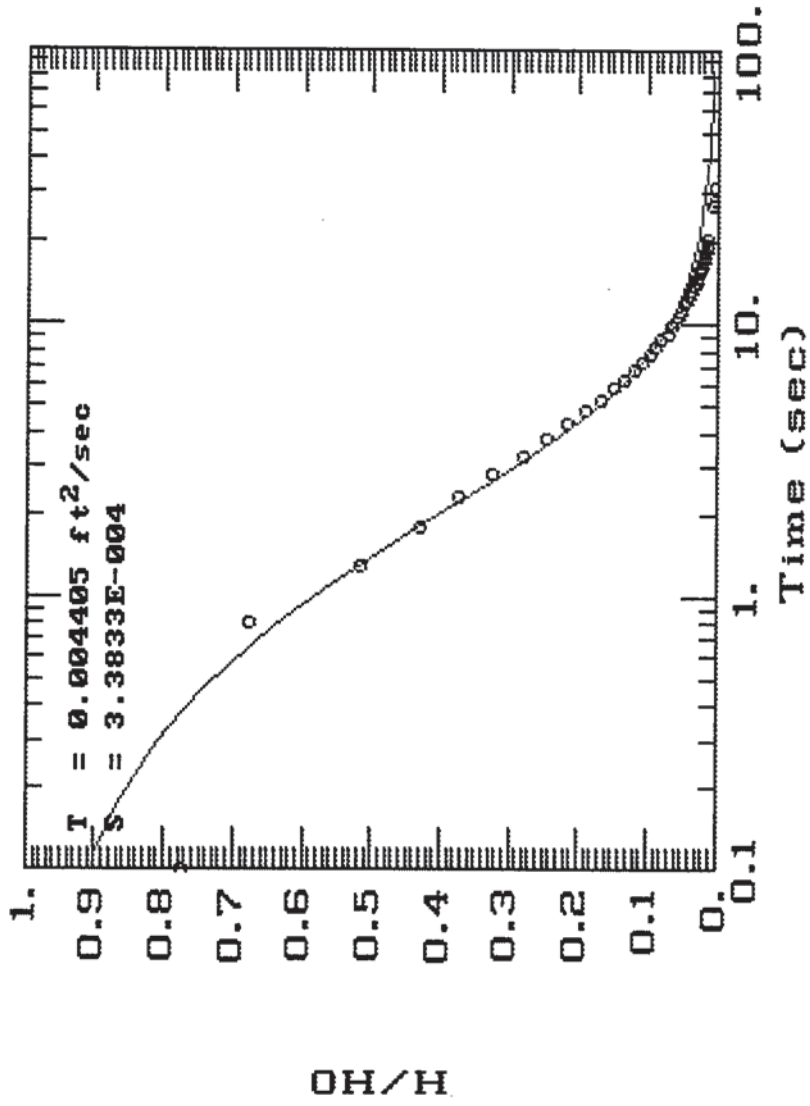
PGDP- WELL 156 RISING HEAD SLUG TEST # 1



AQTESOLV



PGDP- WELL 156 RISING HEAD SLUG TEST # 2



AQTESOLV

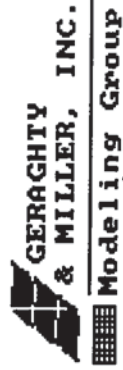
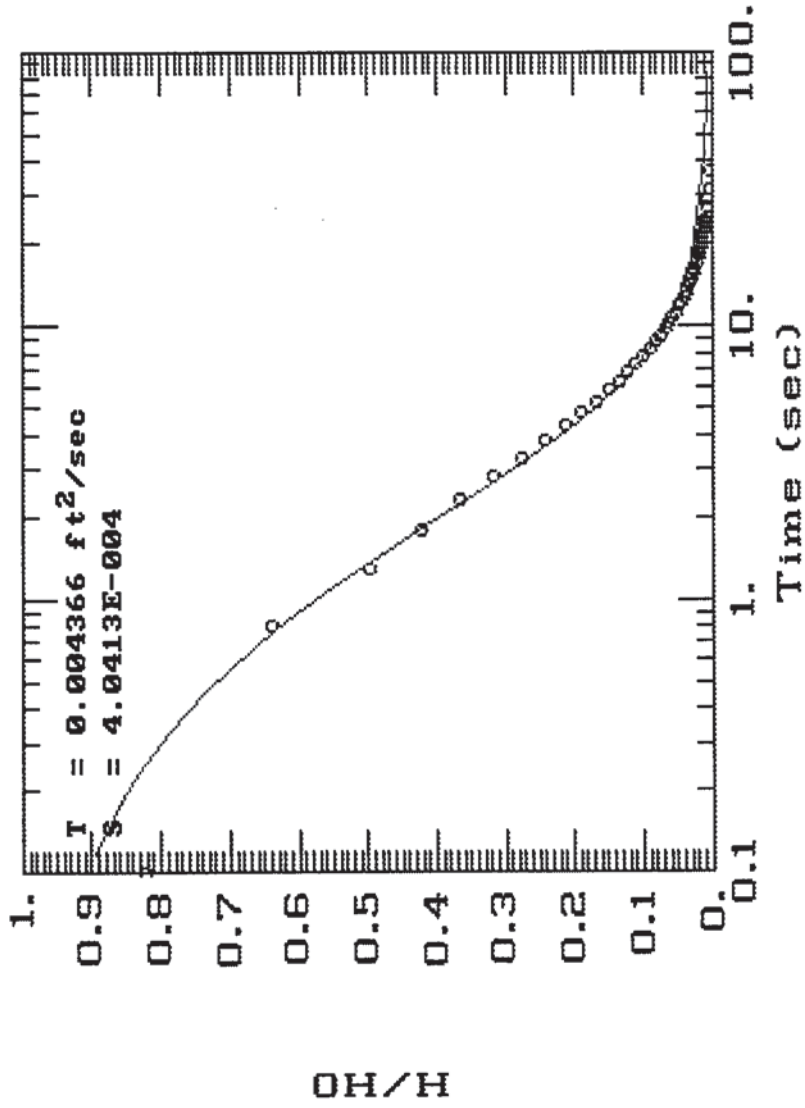


Figure A-18

PGDP- WELL 156 RISING HEAD SLUG TEST # 3



AQTESOLV



Figure A-19

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a REGION
b H219 IS

LEGEND

C-333

12

H219



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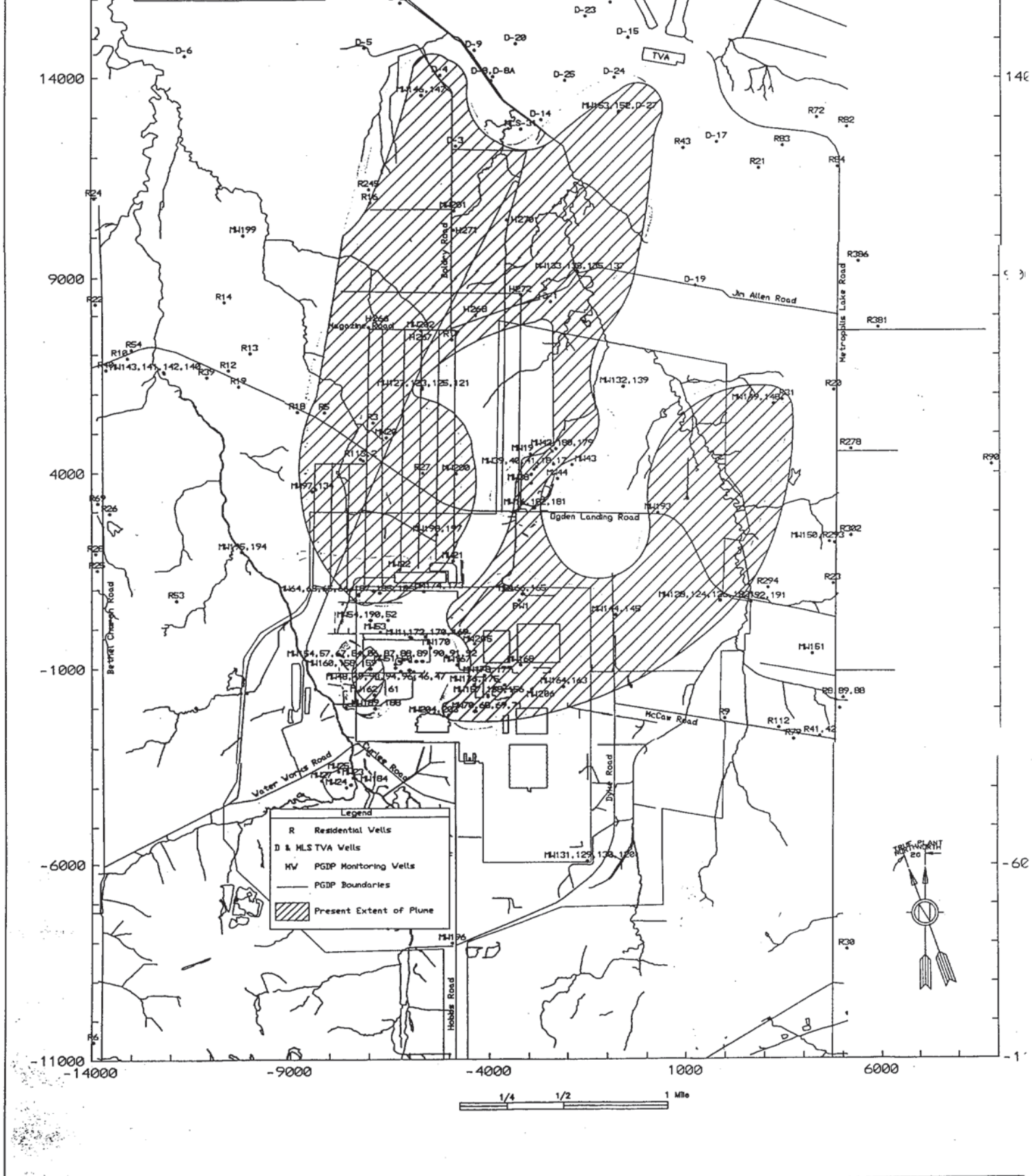


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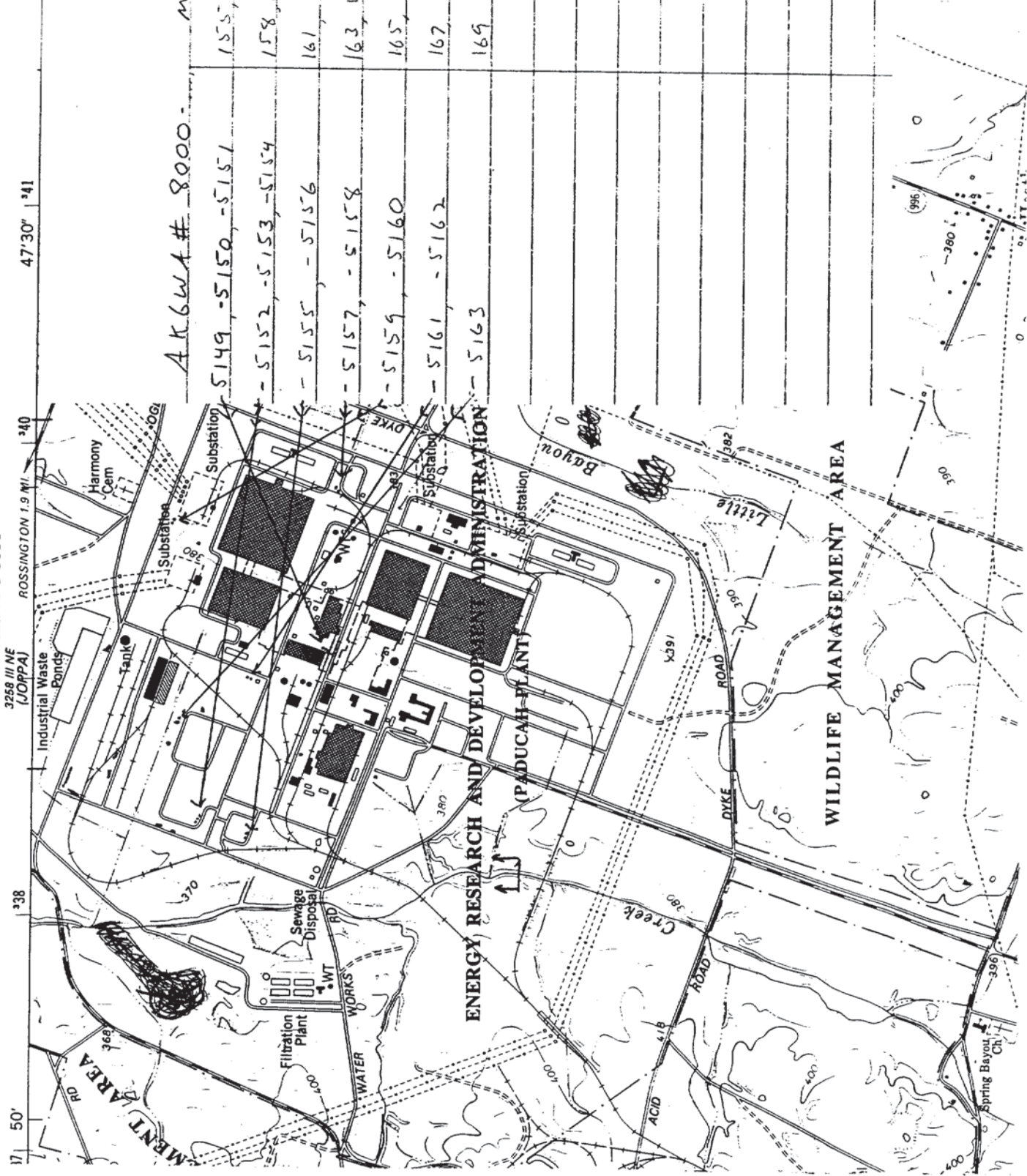
MW-160

STAGE
FO



STATE OF KENTUCKY
 KENTUCKY GEOLOGICAL SURVEY
 UNIVERSITY OF KENTUCKY

171 50' 338 3258 III/NE (OHPA) ROSSINGTON 1.9 MI 1340 47:30' 141



AK6WA # 8000 -
 5149 - 5150, - 5151
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