3 10 00252

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

Second Draft Report on

REMEDIAL INVESTIGATION
BLUFF ROAD SITE
RICHLAND COUNTY, SOUTH CAROLINA
VOLUME II OF II

Prepared For:

South Carolina Department of Environmental
and Health Control
2600 Bull Street
J. Marion Sims Building
Columbia, South Carolina 29201

DISTRIBUTION:

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January 1986
Revised April 1986

853-3079.11

10925820

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3 10 00254

APPENDIX D

Results of Chemical Analysis of Lagoon Samples

3 10 00255

RESULTS OF LAGOON
WATER AND SLUDGE SAMPLING
January, 1985

N.W. Walls
President
J.B. Hamilton
Vice President

ABI APPLIED BIOLOGY, INC.

641 DeKalb Industrial Way • Decatur, Georgia 30033 • Telephone (404) 296-3900

F.A. Williams
Secretary
W.P. Hillman
Comptroller

3 10 00256

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

RECEIVED
MAR 4 - 1985
GAI - ATL

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___ soil ___ tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test Required	Results
T1272	1A	To be determined	
T1273	1B	To be determined	
T1274	2A	To be determined	
T1275	2B	To be determined	
T1276	2C	To be determined	
T1277	3A	To be determined	
T1278	3B	To be determined	
T1279	3C	To be determined	
T1280	4A	To be determined	
T1281	4B	To be determined	
T1282	4C	To be determined	
T1283	5A	To be determined	
T1284	5B	To be determined	
T1285	5C	To be determined	
T1286	6C	To be determined	
T1287	7A	To be determined	
T1288	7B	To be determined	
T1289	7C	To be determined	

John B. Hamilton

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WEST COLUMBIA, SC 29169
TELEPHONE (803) 791-5458

1458 SUNVIEW TERRACE - P.O. BOX 974
JENSEN BEACH, FL 33457
TELEPHONE (305) 334-3729

T 10 00257

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.O. 85-0103

(Invoice to)

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Same

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample	Station	Test required	Results (ppm)
T1290	Composite A	INORGANICS	
		Specific conductance	492 µmhos
		pH	7.7 units
		TDS	2168
		Cyanide, total	<0.01

3 10 00258

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.O. 85-0103

(Invoice to)

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Same

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1290 (cont'd)	Composite A	GC/MS FRACTION-ACID COMPOUNDS	
		2-Chlorophenol	<10
		2,4-Dichlorophenol	<10
		2,4-Dimethylphenol	<10
		4,6-Dinitro-O-cresol	<5
		2,4-Dinitrophenol	<50
		2-Nitrophenol	<20
		4-Nitrophenol	<50
		P-chloro-M-cresol	<10
		Pentachlorophenol	<10
		Phenol	<10
		2,4,6-Trichlorophenol	<10

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.O. 85-0103

(Invoice to)

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Same

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1290 (cont'd)	Composite A	GC/MS FRACTION-BASE/NEUTRAL COMPOUNDS	
		Acenaphthene	<10
		Acenaphthylene	<10
		Anthracene	<10
		Benzidine	<40
		Benzo (a) anthracene	<10
		Benzo (a) pyrene	<20
		3,4-Benzo-fluoranthene	<20
		Benzo (ghi) perylene	<20
		Benzo (k) fluoranthene	<20
		Bis (2-chloroethoxy) methane	<20
		Bis (2-Chloroethyl) ether	<20
		Bis (2-Chloroisopropyl) ether	<20
		Bis (2-Ethyl-hexyl) phthalate	<10
		4-Bromophenyl phenyl ether	<10
		Butyl benzyl phthalate	<10
		2-Chloronaphthalene	<10
		4-Chlorophenyl phenyl ether	<10
		Chrysene	<20
		Dibenzo (a,h) anthracene	<20
		1,2-Dichlorobenzene	<10
		1,3-Dichlorobenzene	<10
		1,4-Dichlorobenzene	<10
		3,3'-Dichlorobenzidine	<20
		Diethyl phthalate	<10
		Dimethyl phthalate	<10
		Di-N-Butyl phthalate	<10
		2,4-Dinitrotoluene	<20
		2,6-Dinitrotoluene	<20
		Di-N-Octyl phthalate	<10
		1,2-Diphenylhydrazine	<20
		Fluoranthene	<10
		Fluorene	<10
		Hexachlorobenzene	<10
		Hexachlorobutadiene	<5
		Hexachlorocyclopentadiene	<5
		Hexachloroethane	<10
		Indeno (1,2,3-cd) pyrene	<10
		Isophorone	<10
		Naphthalene	<10
		Nitrobenzene	<10
		N-Nitrosodi-methylamine	<10
		N-Nitrosodi-N-Propylamine	<10
		N-Nitro-sodiphenylamine	<10
		Phenanthrene	<10
		Pyrene	<10
		1,2,4-Trichlorobenzene	<10

Z 10 00260

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1290 (cont'd)	Composite A	GC/MS FRACTION- PESTICIDES	
		Aldrin	<0.005
		BHC-alpha	<0.005
		BHC-beta	<0.005
		BHC-delta	<0.005
		BHC-gamma	<0.005
		Chlordane	<0.050
		4,4'-DDT	<0.010
		4,4'-DDE	<0.005
		4,4'-DDD	<0.010
		Dieldrin	<0.005
		Endosulfan-alpha	<0.005
		Endosulfan-beta	<0.005
		Endosulfan sulfate	<0.010
		Endrin	<0.005
		Endrin aldehyde	<0.010
		Heptachlor	<0.005
		Heptachlor epoxide	<0.005
		PCB-1242	<0.050
		PCB-1254	<0.100
		PCB-1221	<0.100
		PCB-1232	<0.100
		PCB-1248	<0.100
		PCB-1260	<0.200
		PCB-1016	<0.050
		Toxaphene	<0.050

3 10 00261

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1290	Composite A	GC/MS FRACTION-VOLATILE COMPOUNDS	
		Benzene	<5
		Bis (Chloromethyl) ether	<10
		Bromoform	<10
		Carbon tetrachloride	<5
		Chlorobenzene	<5
		Chlorodi-bromomethane	<5
		Chloroethane	<10
		2-Chloroethylvinyl ether	<10
		Chloroform	<5
		Dichlorobromomethane	<5
		Dichlorodifluoromethane	<10
		1,1-Dichloroethane	<5
		1,2-Dichloroethane	<1
		1,1-Dichloroethylene	<5
		1,2-Dichloropropane	<10
		1,2-Dichloropropylene	<10
		Ethylbenzene	<5
		Methyl bromide	<10
		Methyl chloride	<10
		Methylene chloride	<5
		1,1,2,2-Tetrachloroethane	<10
		Tetrachloroethylene	<5
		Toluene	<5
		1,2-Trans-Dichloroethylene	<5
		1,1,1-Trichloroethane	<5
		1,1,2-Trichloroethane	<5
		Trichloroethylene	<5
		Trichlorofluoromethane	<10
		Vinyl chloride	<10

3 10 00262

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

(Invoice to)

Client Number:
853-3079.5
85-0103

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample	Station	Test required	Results (ppm)
T1291	Composite B	METALS	
		Beryllium	<0.002
		Antimony	0.09
		Arsenic	0.005
		Cadmium	<0.001
		Chromium	0.011
		Copper	0.152
		Lead	<0.01
		Mercury	<0.002
		Nickel	<0.005
		Silver	0.010
		Thallium	<0.01
		Zinc	0.008
		Manganese	0.006
		Calcium	31.0
		Magnesium	0.12
		Sodium	23.5

Note: This page revised 6/7/85

3 10 00263

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample	Station	Test required	Results (ppm)
T1292	Composite C	INORGANICS	
		pH	11.5 units
		Specific conductance	6041 µmhos
		Cyanide, total	<0.1
		% moisture	55.9%

3 10 00264

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Same

****
* For In-House Use *
*
*
*

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1292 (cont'd)	Composite C	GC/MS FRACTION-ACID COMPOUNDS	
		2-Chlorophenol	<10
		2,4-Dichlorophenol	<10
		2,4-Dimethylphenol	<10
		4,6-Dinitro-O-cresol	<5
		2,4-Dinitrophenol	<50
		2-Nitrophenol	<20
		4-Nitrophenol	<50
		P-chloro-M-cresol	<10
		Pentachlorophenol	<10
		Phenol	<10
		2,4,6-Trichlorophenol	<10

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1292 (cont'd)	Composite C	GC/MS FRACTION-BASE/NEUTRAL COMPOUNDS	
		Acenaphthene	<10
		Acenaphthylene	<10
		Anthracene	<10
		Benzidine	<40
		Benzo (a) anthracene	<10
		Benzo (a) pyrene	<20
		3,4-Benzo-fluoranthene	<20
		Benzo (ghi) perylene	<20
		Benzo (k) fluoranthene	<20
		Bis (2-chloroethoxy) methane	<20
		Bis (2-Chloroethyl) ether	<20
		Bis (2-Chloroisopropyl) ether	<20
		Bis (2-Ethyl-hexyl) phthalate	<10
		4-Bromophenyl phenyl ether	<10
		Butyl benzyl phthalate	<10
		2-Chloronaphthalene	<10
		4-Chlorophenyl phenyl ether	<10
		Chrysene	<20
		Dibenzo (a,h) anthracene	<20
		1,2-Dichlorobenzene	<10
		1,3-Dichlorobenzene	<10
		1,4-Dichlorobenzene	<10
		3,3'-Dichlorobenzidine	<20
		Diethyl phthalate	<10
		Dimethyl phthalate	<10
		Di-N-Butyl phthalate	<10
		2,4-Dinitrotoluene	<20
		2,6-Dinitrotoluene	<20
		Di-N-Octyl phthalate	<10
		1,2-Diphenylhydrazine	<20
		Fluoranthene	<10
		Fluorene	<10
		Hexachlorobenzene	<10
		Hexachlorobutadiene	<5
		Hexachlorocyclopentadiene	<5
		Hexachloroethane	<10
		Indeno (1,2,3-cd) pyrene	<10
		Isophorone	<10
		Naphthalene	18
		Nitrobenzene	<10
		N-Nitrosodi-methylamine	<10
		N-Nitrosodi-N-Propylamine	<10
		N-Nitro-sodiphenylamine	<10
		Phenanthrene	<10
		Pyrene	<10
		1,2,4-Trichlorobenzene	<10

3 10 00266

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1292 (cont'd)	Composite C	GC/MS FRACTION- PESTICIDES	
		Aldrin	<0.005
		BHC-alpha	<0.005
		BHC-beta	<0.005
		BHC-delta	<0.005
		BHC-gamma	<0.005
		Chlordane	<0.050
		4,4'-DDT	<0.010
		4,4'-DDE	<0.005
		4,4'-DDD	<0.010
		Dieldrin	<0.005
		Endosulfan-alpha	<0.005
		Endosulfan-beta	<0.005
		Endosulfan sulfate	<0.010
		Endrin	<0.005
		Endrin aldehyde	<0.010
		Heptachlor	<0.005
		Heptachlor epoxide	<0.005
		PCB-1242	<0.050
		PCB-1254	<0.100
		PCB-1221	<0.100
		PCB-1232	<0.100
		PCB-1248	<0.100
		PCB-1260	<0.200
		PCB-1016	<0.050
		Toxaphene	<0.050

3 10 00267

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number:
853-3079.5
P.0.85-0103

(Invoice to)
Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample number	Station	Test required	Results (ppb)
T1292	Composite C	GC/MS FRACTION-VOLATILE COMPOUNDS	
		Benzene	<5
		Bis (Chloromethyl) ether	<10
		Bromoform	<10
		Carbon tetrachloride	<5
		Chlorobenzene	<5
		Chlorodi-bromomethane	<5
		Chloroethane	<10
		2-Chloroethylvinyl ether	<10
		Chloroform	<5
		Dichlorobromomethane	<5
		Dichlorodifluoromethane	<10
		1,1-Dichloroethane	<5
		1,2-Dichloroethane	<1
		1,1-Dichloroethylene	<5
		1,2-Dichloropropane	<10
		1,2-Dichloropropylene	<10
		Ethylbenzene	23
		Methyl bromide	<10
		Methyl chloride	<10
		Methylene chloride	<5
		1,1,2,2-Tetrachloroethane	<10
		Tetrachloroethylene	<5
		Toluene	<5
		1,2-Trans-Dichloroethylene	<5
		1,1,1-Trichloroethane	<5
		1,1,2-Trichloroethane	<5
		Trichloroethylene	<5
		Trichlorofluoromethane	<10
		Vinyl chloride	<10

3 10 00268

Client: Golder Associates

ABI Number: 202-239

Project: Sudhel/Bluff Road/SC

Client Number: 853-3079.5 P.0.85-0103

(Invoice to) Same

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: (A,B) water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge (C)

ABI Manager: Frank Gheesling

Sampled: 1/11/85 Received: 1/16/85 Required: 2/13/85 Completed: 2/26/85

Sample	Station	Test required	Results (ppm)
T1292 (cont'd)	Composite C	METALS	
		Beryllium	0.3
		Antimony	<2
		Arsenic	19.8
		Cadmium	<0.5
		Chromium	5.0
		Copper	3.8
		Lead	4.6
		Mercury	<0.2
		Nickel	17
		Silver	<0.1
		Thallium	<0.1
		Zinc	9.4
		Manganese	1.1
		Calcium	784.0
		Magnesium	170
		Sodium	~~77~~ 77.2
		INORGANICS	
T1293	Field Blank	pH	6.0 units
		Specific conductance	5.3 µmhos
		TDS	110
		Cyanide, total	<0.01
		METALS	
T1294	Field Blank	Beryllium	<0.0002
		Antimony	0.02
		Arsenic	<0.001
		Cadmium	<0.0001
		Chromium	<0.05
		Copper	0.107
		Lead	<0.001
		Mercury	<0.0002
		Nickel	<0.04
		Silver	<0.01
		Thallium	<0.001
		Zinc	<0.005
		Manganese	<0.002
		Calcium	0.293
		Magnesium	0.032
		Sodium	0.064

Note: This page revised 6/7/85

N.W. Walls
President
J.B. Hamilton
Vice President

ABI APPLIED BIOLOGY, INC.

641 DeKalb Industrial Way • Decatur, Georgia 30033 • Telephone (404) 296-3900

F.A. Williams
Secretary
W.P. Hillman
Comptroller

3 10 00269

Client: Golder Associates

ABI Number: 202-327

Project: Sudhel/Bluff Rd/SC

Client Number: 853-3079.5.4
P.O. No. 85-0103-0118

(Invoice to)

Address: 3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Same

For In-House Use

Attention: Mr. A.E. Stone, Jr.

Sample: ___water ___soil ___tissue

Sampled by: A.E. Stone, Jr.

Other: sludge

ABI Manager: F. Gheesling

Sample taken: 1/11/85

Sample Received: 1/16/85

Report Required: 4/30/85

Report issued: 6/7/85

Sample number	Book/page number	Station	Test required	Results (ppm)
T1276	85-005/10	2C	Copper	3.80
	85-005/33		Arsenic	6.00
	85-005/23		Chromium	1.69
T1279	85-005/10	3C	Copper	1.20
	85-005/33		Arsenic	6.60
	85-005/23		Chromium	2.36
T1282	85-005/10	4C	Copper	8.50
	85-005/33		Arsenic	10.6
	85-005/23		Chromium	10.6
T1285	85-005/10	5C	Copper	0.50
	85-005/33		Arsenic	8.90
	85-005/23		Chromium	7.71
T1286	85-005/10	6C	Copper	0.60
	85-005/33		Arsenic	7.20
	85-005/23		Chromium	2.00
T1289	85-005/10	7C	Copper	2.53
	85-005/33		Arsenic	7.70
	85-005/23		Chromium	5.86

metals analysis of selected lagoon sludge samples.

Austin Raabe
Dr. Austin Raabe
Director of Chemistry

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RALEIGH, NC 27609
TELEPHONE (919)787-2836

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TELEPHONE (305) 334-3729

3 10 00270

RESULTS OF LAGOON
WATER SAMPLE
November, 1985

3 10 00271

ACL

ADVANCED CHEMISTRY LABS, INC.

R. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: 8533079 (Bluff Rd.)
ACL Project No.: 0132
Date Received: 11/20/85
Report Date: 11/26/85

TEST REQUIRED	Sample Type : Water Station # : L-1 Sample #ACL : 1194 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION - ACID COMPOUNDS			
2-Chlorophenol	*		
2,4-Dichlorophenol	*		
2,4-Dimethylphenol	*		
4,6-Dinitro-O-cresol	*		
2,4-Dinitrophenol	*		
2-Nitrophenol	*		
4-Nitrophenol	*		
P-chloro-M-cresol	*		
Pentachlorophenol	*		
Phenol	*		
2,4,6-Trichlorophenol	*		

Steve N. Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

* If present, less than 5 ppb.

ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

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ACL Project No.: 0132
Date Received: 11/20/85
Report Date: 11/26/85

TEST REQUIRED	Sample Type : Water Station # : L-1 Sample #ACL : 1194 Results (ppb)	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )	Sample Type : ____ Station # : ____ Sample #ACL : ____ Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS			
Acenaphthene	*		
Acenaphthylene	*		
Anthracene	*		
Benzidine	*		
Benzo (a) anthracene	*		
Benzo (a) pyrene	*		
3,4- Benzo-fluoranthene	*		
Benzo (ghi) perylene	*		
Benzo (k) fluoranthene	*		
Bis (2-chloroethoxy) methane	*		
Bis (2-chloroethyl) ether	*		
Bis (2-chloroisopropyl) ether	*		
Bis (2-ethyl-hexyl) phthalate	*		
4-Bromophenyl phenyl ether	*		
Butyl benzyl phthalate	*		
2-Chloronaphthalene	*		
4-Chlorophenyl phenyl ether	*		
Chrysene	*		
Dibenzo (a,h) anthracene	*		
1,2-Dichlorobenzene	*		
1,3-Dichlorobenzene	*		
1,4-Dichlorobenzene	*		
3,3'-Dichlorobenzidine	*		
Diethyl phthalate	*		
Dimethyl phthalate	*		
Di-N-Butyl phthalate	*		
2,4-Dinitrotoluene	*		
2,6-Dinitrotoluene	*		
Di-N-Octyl phthalate	*		
1,2-Diphenylhydrazine	*		

* If present, less than 5 ppb.

ACL 3 10 0027 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
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Client: GOLDER ASSOCIATES
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Attention: Mr. Mike Finney

Client Project No.: 8533079 (Bluff Rd.)
ACL Project No.: 0132
Date Received: 11/20/85
Report Date: 11/26/85

TEST REQUIRED	Sample Type : Water Station # : L-1 Sample #ACL : 1194 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS (CONT'D)			
Fluoranthene	*		
Fluorene	*		
Hexachlorobenzene	*		
Hexachlorobutadiene	*		
Hexachlorocyclopentadiene	*		
Hexachloroethane	*		
Indeno (1,2,3,-cd) pyrene	*		
Isophorone	*		
Naphthalene	*		
Nitrobenzene	*		
N-Nitrosodi-methylamine	*		
N-Nitrosodi-N-propylamine	*		
N-Nitro-sodiphenylamine	*		
Phenanthrene	*		
Pyrene	*		
1,2,4-Trichlorobenzene	*		

* If present, less than 5 ppb.

ACL 3 10 00274 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
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Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: 8533079 (Bluff Rd.)
ACL Project No.: 0132
Date Received: 11/20/85
Report Date: 11/26/85

TEST REQUIRED	Sample Type : Water Station # : L-1 Sample #ACL : 1194 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION-PESTICIDES			
Aldrin	*		
BHC-alpha	*		
BHC-beta	*		
BHC-delta	*		
BHC-gamma	*		
Chlordane	*		
4,4'-DDT	*		
4,4'-DDE	*		
4,4'-DDD	*		
Dieldrin	*		
Endosulfan-alpha	*		
Endosulfan-beta	*		
Endosulfan sulfate	*		
Endrin	*		
Endrin aldehyde	*		
Heptachlor	*		
Heptachlor epoxide	*		
Toxaphene	*		
PCB-1242	*		
PCB-1254	*		
PCB-1221	*		
PCB-1232	*		
PCB-1248	*		
PCB-1260	*		
PCB-1016	*		

* If present, less than 0.1 ppb.

3 10 00275

APPENDIX E

Results of Chemical Analysis of Groundwater Samples

3 10 00276

RESULTS OF COMPLETE
WELL SAMPLING
March-April, 1985

3 10 00077

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0195 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0196 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0197 Results (ppb
	" Meyers Creek "	" Meyers Creek "	" DW 2 "
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	< 1.0	< 1.0	< 1.0
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	< 1.0	< 1.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0
Tetrachloroethylene	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

Steve N. Tsoukalas

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00278

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0198 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0199 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0201 Results (ppb
GC/MS FRACTION - VOLATILE COMPOUNDS	" DW 2 "	" Field Blank "	" DW 1 "
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	< 1.0	< 1.0	< 1.0
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	< 1.0	< 1.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0
Tetrachloroethylene	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

Steven N. Tsoukalas

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00279

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0202 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0204 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0205 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	" DW 3 "	" BP 2 " 7.5'	" BP 2 Black " 12.5'
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	< 1.0	< 1.0	< 1.0
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	< 1.0	< 1.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0
Tetrachloroethylene	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

Steve N. Tsoukalas

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Director of Chemistry

3 10 00280

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0206 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0207 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0208 Results (ppb
GC/MS FRACTION - VOLATILE COMPOUNDS	" BP 2 Blue " 37.5'	" BP 2 Yellow " 27.5'	" BP 2 Orange " 42.5'
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	< 1.0	< 1.0	< 1.0
bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	12.0	< 1.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0
Tetrachloroethylene	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

Steven N. Tsoukalas

Steve Tsoukalas, Ph.D.
Director of Chemistry

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0209 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0210 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0211 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	" BP 2 Green " 32.5'	" BP 2 Brown " 22.5'	" BP 2 Red " 17.5'
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	< 1.0	< 1.0	< 1.0
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	11.0	< 1.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0
Tetrachloroethylene	< 1.0	< 1.0	< 1.0
Toluene	< 1.0	< 1.0	< 1.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

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Director of Chemistry

3 10 00282

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0212 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0213 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0[illegible] Results (pp[illegible]
GC/MS FRACTION - VOLATILE COMPOUNDS	" BP 1 Brown " 24'	" BP 1 Black " 14'	" BP 1 Blue & yellow 1
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	< 1.0	60.0	28.0
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	371.0	687.0	488.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	83.0	163.0	136.0
1,2-Dichloroethane	< 1.0	12.0	2154.0
1,1-Dichloroethylene	127.0	208.0	194.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	36.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	2796.0	3659.0	3684.0
1,1,2,2-Tetrachloroethane	329.0	< 1.0	< 1.0
Tetrachloroethylene	< 1.0	548.0	318.0
Toluene	203.0	460.0	185.0
1,2-Trans-Dichloroethylene	1700.0	2267.0	1.0
1,1,1-Trichloroethane	150.0	319.0	229.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	1079.0	1942.0	1515.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0
1,3-Dichloropropene	28.0	63.0	35.0

Steve N. Tsoukalas

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00283 ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0215 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0216 Results (ppb)	Sample Type: Water Station # : Sample #AA : 0217 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	" BP 1 Yellow " 29'	" BP 1 Green " 34'	" BP 1 Red " 19'
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	26.0	13.0	30.0
(Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	393.0	314.0	773.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	100.0	< 1.0	140.0
1,2-Dichloroethane	< 1.0	58.0	< 1.0
1,1-Dichloroethylene	183.0	104.0	215.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	13.0	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	2739.0	2280.0	3625.0
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0
Tetrachloroethylene	312.0	173.0	513.0
Toluene	268.0	123.0	354.0
1,2-Trans-Dichloroethylene	1834.0	1134.0	2275.0
1,1,1-Trichloroethane	207.0	119.0	277.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	1412.0	824.0	1773.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0
1,3-Dichloropropene	26.0	15.0	35.0
1,1,2,2-Tetrachloroethane	390.0	227.0	571.0

Steven N. Tsoukalas

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Director of Chemistry

3 10 00284

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0037

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : Sample #AA : 0218 Results (ppb)	Sample Type: Station # : Sample #AA : Results ( )	Sample Type: Station # : Sample #AA : Results (
GC/MS FRACTION - VOLATILE COMPOUNDS	" BP 1 Blue " 39'		
Acrolein	< 1.0		
Acrylonitrile	< 1.0		
Benzene	< 1.0		
Bis (Chloromethyl) ether	< 1.0		
Bromoform	< 1.0		
Carbon tetrachloride	< 1.0		
Chlorobenzene	< 1.0		
Chlorodi-bromomethane	< 1.0		
Chloroethane	< 1.0		
2-Chloroethylvinyl ether	< 1.0		
Chloroform	< 1.0		
Dichlorobromomethane	< 1.0		
Dichlorodifluoromethane	< 1.0		
1,1-Dichloroethane	< 1.0		
1,2-Dichloroethane	< 1.0		
1,1-Dichloroethylene	< 1.0		
1,2-Dichloropropane	< 1.0		
1,2-Dichloropropylene	< 1.0		
Ethylbenzene	< 1.0		
Methyl bromide	< 1.0		
Methyl chloride	< 1.0		
Methylene chloride	7600.0		
1,1,2,2-Tetrachloroethane	< 1.0		
Tetrachloroethylene	< 1.0		
Toluene	< 1.0		
1,2-Trans-Dichloroethylene	1150.0		
1,1,1-Trichloroethane	< 1.0		
1,1,2-Trichloroethane	< 1.0		
Trichloroethylene	750.0		
Trichlorofluoromethane	< 1.0		
Vinyl chloride	< 1.0		

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Director of Chemistry

3 10 00285

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES INC. ---- (Project #853-3079)

AAL PROJECT #0024

ATTENTION: Ned Stone

DATE: 4/10/85

TEST REQUIRED	Sample Type: Water Station # : BP-1 Sample #AA : 0148 Results (ppb)	Sample Type: Water Station # : BP-2 Sample #AA : 0149 Results (ppb)	Sample Type: Station # : Sample #AA : Results ( )
	" 48 Ft."	" 46 Ft. "	
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	< 1.0	< 1.0	
Acrylonitrile	< 1.0	< 1.0	
Benzene	< 1.0	< 1.0	
Bis (Chloromethyl) ether	< 1.0	< 1.0	
Bromoform	< 1.0	< 1.0	
Carbon tetrachloride	< 1.0	< 1.0	
Chlorobenzene	< 1.0	< 1.0	
Chlorodi-bromomethane	< 1.0	< 1.0	
Chloroethane	< 1.0	< 1.0	
2-Chloroethylvinyl ether	< 1.0	< 1.0	
Chloroform	< 1.0	< 1.0	
Dichlorobromomethane	< 1.0	< 1.0	
Dichlorodifluoromethane	< 1.0	< 1.0	
1,1-Dichloroethane	< 1.0	< 1.0	
1,2-Dichloroethane	< 1.0	< 1.0	
1,1-Dichloroethylene	< 1.0	< 1.0	
1,2-Dichloropropane	< 1.0	< 1.0	
1,2-Dichloropropylene	< 1.0	< 1.0	
Ethylbenzene	< 1.0	< 1.0	
Methyl bromide	< 1.0	< 1.0	
Methyl chloride	< 1.0	< 1.0	
Methylene chloride	2.7	1.7	
1,1,2,2-Tetrachloroethane	3.4	< 1.0	
Tetrachloroethylene	9.3	< 1.0	
Toluene	< 1.0	< 1.0	
1,2-Trans-Dichloroethylene	24.6	< 1.0	
1,1,1-Trichloroethane	< 1.0	< 1.0	
1,1,2-Trichloroethane	< 1.0	< 1.0	
Trichloroethylene	9.3	< 1.0	
Trichlorofluoromethane	< 1.0	< 1.0	
Vinyl chloride	< 1.0	< 1.0	

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JUN 05 1985

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES GAI-ATL ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP 3-1 Sample #AA : 0361 Results (ppb)	Sample Type: Water Station # : BP 3-2 Sample #AA : 0364 Results (ppb)	Sample Type: Water Station # : BP 3-[illegible] Sample #AA : 036[illegible] Results (ppb
	43.3'-48.3'	33.9'-38.9'	12.7 - 2[illegible]
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	5.2	2.2	18.5
(Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	5.0	45.0
Chlorobenzene	< 1.0	< 1.0	9.2
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	2.7	7.5	34.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	2.2
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	17.8	17.4	237.2
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	< 1.0	1.7
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	3.1	1.4	< 1.0
1,1,2,2-Tetrachloroethane	1.8	4.9	37.7
Tetrachloroethylene	1.3	201.2	38.4
Toluene	3.0	< 1.0	56.5
1,2-Trans-Dichloroethylene	< 1.0	69.4	900.8
1,1,1-Trichloroethane	28.4	47.1	573.0
1,1,2-Trichloroethane	< 1.0	< 1.0	< 1.0
Trichloroethylene	4.1	7.0	151.1
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

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Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00287

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP 3-4 Sample #AA : 0370 Results (ppb)	Sample Type: Water Station # : BP 4-1 Sample #AA : 0373 Results (ppb)	Sample Type: Water Station # : BP 4-[illegible] Sample #AA : 0376 Results (ppb
GC/MS FRACTION - VOLATILE COMPOUNDS	10.2'-17.7	38.7-43.7	27.5-37.5
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	2092.0	< 1.0	2.5
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	4383.0	17.3	< 1.0
Chlorobenzene	105.7	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	1284.0	< 1.0	111.9
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	335.2	89.8
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	438.1	< 1.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	31.3	2.6	< 1.0
1,1,2,2-Tetrachloroethane	< 1.0	2.5	< 1.0
Tetrachloroethylene	2042.0	< 1.0	28.6
Toluene	63.0	1.7	11.6
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	5.6
1,1,1-Trichloroethane	17,929.0	1096.2	162.9
1,1,2-Trichloroethane	21.0	< 1.0	< 1.0
Trichloroethylene	5287.0	3.0	5.4
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

S.N.T

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00288

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP 4-3 Sample #AA : 0379 Results (ppb)	Sample Type: Water Station # : BP 4-4 Sample #AA : 0382 Results (ppb)	Sample Type: Water Station # : BP 5- Sample #AA : 0385 Results (ppb
GC/MS FRACTION - VOLATILE COMPOUNDS	16.5'-21.5'	10.0'-15.0'	40.0'-47.5
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	1641.0	1640.0	< 1.0
Bis (Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	1700.0	157.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	< 1.0	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	< 1.0	3393.0	< 1.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	< 1.0	< 1.0	2810.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	1274.3	366.0	< 1.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	214.4	191.0	< 1.0
1,1,2,2-Tetrachloroethane	509.2	1034.0	12.6
Tetrachloroethylene	757.1	1435.0	412.7
Toluene	< 1.0	< 1.0	< 1.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	777.9
1,1,1-Trichloroethane	< 1.0	30,635.0	3630.8
1,1,2-Trichloroethane	< 1.0	83.0	< 1.0
Trichloroethylene	1622.3	1868.0	68.3
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

S. N. T

Steve Tsoukalas, Ph.D.
Director of Chemistry

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ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP 5-2 Sample #AA : 0389 Results (ppb)	Sample Type: Water Station # : BP 5-3 Sample #AA : 0392 Results (ppb)	Sample Type: Water Station # : BP 5-4 Sample #AA : 0395 Results (ppb
GC/MS FRACTION - VOLATILE COMPOUNDS	27.6'-35.1'	17.5'-22.5'	10.0'-15.0'
Acrolein	< 1.0	< 1.0	< 1.0
Acrylonitrile	< 1.0	< 1.0	< 1.0
Benzene	17.3	319.0	81.0
(Chloromethyl) ether	< 1.0	< 1.0	< 1.0
Bromoform	< 1.0	< 1.0	< 1.0
Carbon tetrachloride	< 1.0	< 1.0	< 1.0
Chlorobenzene	< 1.0	< 1.0	< 1.0
Chlorodi-bromomethane	< 1.0	9.5	< 1.0
Chloroethane	< 1.0	< 1.0	< 1.0
2-Chloroethylvinyl ether	< 1.0	< 1.0	< 1.0
Chloroform	187.2	138.0	9.0
Dichlorobromomethane	< 1.0	< 1.0	< 1.0
Dichlorodifluoromethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	< 1.0	< 1.0	< 1.0
1,1-Dichloroethylene	3185.0	< 1.0	< 1.0
1,2-Dichloropropane	< 1.0	< 1.0	< 1.0
1,2-Dichloropropylene	< 1.0	< 1.0	< 1.0
Ethylbenzene	< 1.0	72.0	6.0
Methyl bromide	< 1.0	< 1.0	< 1.0
Methyl chloride	< 1.0	< 1.0	< 1.0
Methylene chloride	8.6	8.0	4.0
1,1,2,2-Tetrachloroethane	6.8	142.0	10.0
Tetrachloroethylene	7.7	< 1.0	162.0
Toluene	242.2	< 1.0	755.0
1,2-Trans-Dichloroethylene	< 1.0	< 1.0	525.0
1,1,1-Trichloroethane	1235.2	9804.0	2257.0
1,1,2-Trichloroethane	< 1.0	114.0	1687.0
Trichloroethylene	88.3	78.0	139.0
Trichlorofluoromethane	< 1.0	< 1.0	< 1.0
Vinyl chloride	< 1.0	< 1.0	< 1.0

S.N.T

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00290

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP3-4 Sample #AA : 0369 Results (ppb)	Sample Type: Station # : Sample #AA : Results ( )	Sample Type: Station # : Sample #AA : Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS	10.2-17.7		
Acenaphthene	< 5		
Acenaphthylene	< 5		
Anthracene	< 5		
Benzidine	< 5		
Benzo (a) anthracene	< 5		
Benzo (a) Pyrene	< 5		
3,4- Benzo-fluoranthene	< 5		
Benzo (ghi) perylene	< 5		
Benzo (k) fluoranthene	< 5		
Bis (2-chloroethoxy)methane	< 5		
Bis (2-Chloroethyl)ether	< 5		
Bis (2-Chloroisopropyl)ether	< 5		
Bis (2-Ethyl-hexyl)phthalate	< 5		
4-Bromophenyl phenyl ether	< 5		
Butyl benzyl phthalate	< 5		
2-Chloronaphthalene	< 5		
4-Chlorophenyl phenyl ether	< 5		
Chrysene	< 5		
Dibenzo (a,h) anthracene	< 5		
1,2-Dichlorobenzene	244		
1,3-Dichlorobenzene	< 5		
1,4-Dichlorobenzene	70		
3,3'-Dichlorobenzidine	< 5		
Diethyl phthalate	< 5		
Dimethyl phthalate	< 5		
Di-N-Butyl phthalate	5		
2,4-Dinitrotoluene	< 5		
2,6-Dinitrotoluene	< 5		
Di-N-Octyl Phthalate	< 5		
1,2-Diphenylhydrazine	< 5		

S.N.T

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00291

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP3-4 Sample #AA : 0369 Results (ppb)	Sample Type: Station # : Sample #AA : Results ( )	Sample Type: Station # : Sample #AA : Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS (CONT'D)	10.2'-17.7		
Fluoranthene	< 5		
Fluorene	< 5		
Hexachlorobenzene	< 5		
Hexachlorobutadiene	< 5		
Hexachlorocyclopentadiene	< 5		
Hexachloroethane	< 5		
Indeno (1,2,3-cd) pyrene	< 5		
Isophorone	< 5		
Naphthalene	< 5		
Nitrobenzene	< 5		
N-Nitrosodi-methylamine	< 5		
-Nitrosodi-N-Propylamine	< 5		
N-Nitro-sodiphenylamine	< 5		
Phenanthrene	< 5		
Pyrene	< 5		
1,2,4-Trichlorobenzene	< 5		
1,3,5-Trichlorobenzene	17		

S.N.T

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00292

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079)

AAL PROJECT #0054

ATTENTION: Ned Stone

DATE: 6/3/85

TEST REQUIRED	Sample Type: Water Station # : BP3-4 Sample #AA : 0369 Results (ppb)	Sample Type: Station # : Sample #AA : Results ( )	Sample Type: Station # : Sample #AA : Results ( )
GC/MS FRACTION -	10.2 - 17.7		
ACID COMPOUNDS			
2-Chlorophenol	220		
2,4-Dichlorophenol	< 5		
2,4-Dimethylphenol	4		
4,6-Dinitro-O-cresol	< 5		
2,4-Dinitrophenol	< 5		
2-Nitrophenol	< 5		
4-Nitrophenol	< 5		
P-chloro-M-cresol	< 5		
Pentachlorophenol	< 5		
Phenol	281		
2,4,6-Trichlorophenol	< 5		

S. N. T

Steve Tsoukalas, Ph.D.
Director of Chemistry

AAL

3 10 00293

ADVANCED ANALYTICAL LABS

P.O. Box 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

RECEIVED
JUN 07 1985
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Reported for: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

ATTN: Mr. Ned Stone

Project Identification: Project #853-3079
(AAL PROJECT #0054)

Date Received: 4/29/85

Report Date: 6/3/85

PH DETERMINATION

AAL #	STATION #	PH
0361	BP 3-1	5.0
0364	BP 3-2	5.0
0367	BP 3-3	5.1
0370	BP 3-4	5.0
0373	BP 4-1	5.5
0376	BP 4-2	4.6
0379	BP 4-3	4.5
0382	BP 4-4	5.5
0385	BP 5-1	4.9
0389	BP 5-2	6.0
0392	BP 5-3	4.6
0395	BP 5-4	5.3

Respectfully submitted,

Steve N. Tsoukalas
PhD Chemist

3 10 00294 ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079) - * ADD ON

ATTENTION: Ned Stone

DATE: 6/3/85

AAL PROJECT #0054

TEST REQUIRED	Sample Type: Water Station # : BP 3-4 Sample #AA : 0369 Results (ppb)	Sample Type: Station # : Sample #AA : Results ( )	Sample Type: Station # : Sample #AA : Results ( )
GC/MS FRACTION-PESTICIDES	10.2'-17.7'		
Aldrin	< 0.001		
BHC-alpha	< 0.001		
BHC-beta	< 0.001		
BHC-delta	< 0.001		
BHC-gamma	< 0.001		
Chlordane	< 0.001		
4,4'-DDT	< 0.001		
4,4'-DDE	< 0.001		
4,4'-DDD	< 0.001		
Dieldrin	< 0.001		
Endosulfan-alpha	< 0.001		
Endosulfan-beta	< 0.001		
Endosulfan sulfate	< 0.001		
Endrin	< 0.001		
ndrin aldehyde	< 0.001		
Heptachlor	< 0.001		
Heptachlor epoxide	< 0.001		
PCB-1242	< 0.01		
PCB-1254	< 0.01		
PCB-1221	< 0.01		
PCB-1232	< 0.01		
PCB-1248	< 0.01		
PCB-1260	< 0.01		
PCB-1016	< 0.01		
Toxaphene	< 0.01		

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00295

ADVANCED ANALYTICAL LABS-TEST REPORT

CLIENT: GOLDER ASSOCIATES ---- (Project #853-3079) - * ADD ON

ATTENTION: Ned Stone DATE: 6/3/85 AAL PROJECT #0054

TEST REQUIRED	Sample Type: Water Station # : BP 3-4 Sample #AA : 0368 Results (ppm)	Sample Type: Station # : Sample #AA : Results ( )	Sample Type: Station # : Sample #AA : Results (
	10.2-17.7		
METALS			
Aluminum	------		
Antimony	< 0.02		
Arsenic	< 0.02		
Barium	------		
Beryllium	< 0.005		
Borone	------		
Cadmium	< 0.01		
Chromium	< 0.04		
Cobalt	------		
Copper	0.04		
Iron	------		
Lead	0.06		
Magnesium	------		
Manganese	------		
Mercury	< 0.001		
Molybdenum	------		
Nickel	0.08		
Potassium	------		
Selenium	< 0.01		
Silicon	------		
Silver	< 0.04		
Sodium	------		
Sulfur	------		
Thallium	< 0.02		
Tin	------		
Titanium	------		
Vanadium	------		
Zinc	0.3		

Steve N Tsoukalas

Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00296

RESULTS OF COMPLETE
WELL SAMPLING
September, 1985

ACL 3 10 00297 ADVANCED CHEMISTRY LABS, INC.

R. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : Sample #ACL : 0862 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0863 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0864 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	" 1A thru 1G " BP-1	" 2A thru 2E " BP-2	" 3A thru 3D " BP-3
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	161	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	41	*	445
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	414	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	880	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	6827	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	149	*	55
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	10093	*	*
1,1,2,2-Tetrachloroethane	10328	*	1510
Tetrachloroethylene	5028	67	823
Toluene	2416	8	495
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	4462	8	1503
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	4496	31	1213
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

Steven N. Tsoukalas
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ACL 3 10 00298 ADVANCED CHEMISTRY LABS, INC.

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Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : 6AB Sample #ACL : 0865 Results (ppb)	Sample Type : WATER Station # : 7AB Sample #ACL : 0866 Results (ppb)	Sample Type : WATER Station # : 8AB Sample #ACL : 0867 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	P-6	P-7	P-8
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	409	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	*	105	5
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	1048	*
1,1,2-Trichloroethane	*	33	*
Trichloroethylene	*	591	18
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00299 **ADVANCED CHEMISTRY LABS, INC.**

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Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : 9AB Sample #ACL : 0868 Results (ppb)	Sample Type : WATER Station # : 10AB Sample #ACL : 0869 Results (ppb)	Sample Type : WATER Station # : 11AB Sample #ACL : 0870 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	P-9	P-10	P-11
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	115	2719	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	2152	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	136	1152	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	67	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	1973	*
1,1,2,2-Tetrachloroethane	*	902	*
Tetrachloroethylene	42	430	*
Toluene	*	122	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	191	1654	*
1,1,2-Trichloroethane	58	*	*
Trichloroethylene	29	679	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00300 ADVANCED CHEMISTRY LABS, INC.

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Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : 12AB Sample #ACL : 0871 Results (ppb)	Sample Type : WATER Station # : 13AB Sample #ACL : 0872 Results (ppb)	Sample Type : WATER Station # : 14AB Sample #ACL : 0873 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	P-12	P-13	P-14
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	23	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	1699	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	1393	167
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	928	2216
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	48	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	2986
1,1,2,2-Tetrachloroethane	*	*	636
Tetrachloroethylene	60	146	423
Toluene	*	177	178
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	986	2102
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	*	191	188
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00301

ADVANCED CHEMISTRY LABS, INC.

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ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : 15AB Sample #ACL : 0874 Results (ppb)	Sample Type : WATER Station # : 16AB Sample #ACL : 0875 Results (ppb)	Sample Type : WATER Station # : 20AB Sample #ACL : 0876 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	P-15	P-16	W-10
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	348	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	922	*
1,2-Dichloroethane	*	2155	*
1,1-Dichloroethylene	111	4828	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	223	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	*	1825	*
Tetrachloroethylene	43	1993	*
Toluene	*	1351	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	49	5843	*
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	*	2130	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00302 ADVANCED CHEMISTRY LABS, INC.

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Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : 28AB Sample #ACL : 0877 Results (ppb)	Sample Type : WATER Station # : 29AB Sample #ACL : 0878 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0879 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	W-8	W-9	" Field Blank 1 "
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	*	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	*	*
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	*	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00303 ADVANCED CHEMISTRY LABS, INC.

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Attention:

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ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : Sample #ACL : 0880 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0881 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0882 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	" Field Blank 2 "	" Blank 1 "	" Blank 2 "
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	*	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	*	*
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	*	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00304 **ADVANCED CHEMISTRY LABS, INC.**

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Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : Sample #ACL : 0883 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0891 Results (ppb)	Sample Type : WATER Station # : Sample #ACL : 0892 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	" Blank 3 "	" 4A thru 4D Comp." BP-4	" 5A thru 5D Comp. " BP-5
Acrolein	*	*	*
Acrylonitrile	*	*	*
Benzene	*	58	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	1774	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	705	65
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	152
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	78	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	3005	*
1,1,2,2-Tetrachloroethane	*	219	*
Tetrachloroethylene	*	174	7
Toluene	*	348	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	3745	20
1,1,2-Trichloroethane	*	*	11
Trichloroethylene	*	86	6
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00305 ADVANCED CHEMISTRY LABS, INC.

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Attention:

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 9/30/85

TEST REQUIRED	Sample Type : WATER Station # : Sample #ACL : 0893 Results (ppb)	Sample Type : WATER Station # : 4C Sample #ACL : 0910 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )
	Meyer's Creek " 50A , 50B "	BP 4-3	
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	*	*	
Acrylonitrile	*	*	
Benzene	*	113	
Bis (Chloromethyl) ether	*	*	
Bromoform	*	*	
Carbon tetrachloride	*	*	
Chlorobenzene	*	*	
Chlorodi-bromomethane	*	*	
Chloroethane	*	*	
2-Chloroethylvinyl ether	*	*	
Chloroform	*	1794	
Dichlorobromomethane	*	*	
Dichlorodifluoromethane	*	*	
1,1-Dichloroethane	*	1486	
1,2-Dichloroethane	*	*	
1,1-Dichloroethylene	*	*	
1,2-Dichloropropane	*	*	
1,2-Dichloropropylene	*	*	
Ethylbenzene	*	149	
Methyl bromide	*	*	
Methyl chloride	*	*	
Methylene chloride	*	6356	
1,1,2,2-Tetrachloroethane	*	321	
Tetrachloroethylene	*	121	
Toluene	*	555	
1,2-Trans-Dichloroethylene	*	*	
1,1,1-Trichloroethane	*	2202	
1,1,2-Trichloroethane	*	*	
Trichloroethylene	*	88	
Trichlorofluoromethane	*	*	
Vinyl chloride	*	*	

* If present, less than 5 ppb.

ACL 3 10 00306 ADVANCED CHEMISTRY LABS, INC.

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Suite 165
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Attention: Mr. Bill Lozier

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 10/3/85

Station # P-6 (water sample)
ACL #0884

METALS (ppm)

Antimony	< 0.01
Arsenic	< 0.01
Beryllium	< 0.01
Cadmium	< 0.01
Chromium	< 0.01
Copper	< 0.01
Lead	< 0.01
Mercury	< 0.01
Nickel	< 0.01
Selenium	< 0.01
Silver	< 0.01
Titanium	< 0.01
Zinc	< 0.01

Cyanide (ppm)	< 0.02
Phenols (ppm)	< 0.10

Steve N. Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

ACL 3 10 00307

ADVANCED CHEMISTRY LABS, INC.

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Attention: Bill Lozier

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 10/3/85

TEST REQUIRED	Sample Type : Water Station # : 10B Sample #ACL : 0869 Results (ppb)	Sample Type : Waste Station # : T-1 Sample #ACL : 0911 Results (ppm)	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS	"Duplicate" P-1C	TANK	
Acrolein	**	**	
Acrylonitrile	**	**	
Benzene	**	**	
Bis (Chloromethyl) ether	**	**	
Bromoform	**	**	
Carbon tetrachloride	**	**	
Chlorobenzene	**	**	
Chlorodi-bromomethane	**	**	
Chloroethane	**	**	
2-Chloroethylvinyl ether	**	**	
Chloroform	2797	**	
Dichlorobromomethane	**	**	
Dichlorodifluoromethane	**	**	
1,1-Dichloroethane	761	**	
1,2-Dichloroethane	**	**	
1,1-Dichloroethylene	390	**	
1,2-Dichloropropane	**	**	
1,2-Dichloropropylene	**	**	
Ethylbenzene	51	**	
Methyl bromide	**	**	
Methyl chloride	**	**	
Methylene chloride	1583	**	
1,1,2,2-Tetrachloroethane	1320	**	
Tetrachloroethylene	324	**	
Toluene	86	**	
1,2-Trans-Dichloroethylene	**	**	
1,1,1-Trichloroethane	1162	**	
1,1,2-Trichloroethane	**	**	
Trichloroethylene	523	122	
Trichlorofluoromethane	**	**	
Vinyl chloride	**	**	

* If present, less than 5.0.

ACL 3 10 00308 ADVANCED CHEMISTRY LABS, INC.

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Attention: Bill Lozier

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 10/3/85

TEST REQUIRED	Sample Type : WATER Station # : P-6 Sample #ACL : 0884 Results (ppb)	Sample Type : WASTE Station # : T-1 Sample #ACL : 0911 Results (ppm)	Sample Type : Station # : Sample #ACL : Results ( )
		TANK	
GC/MS FRACTION - ACID COMPOUNDS			
2-Chlorophenol	**	33300	
2,4-Dichlorophenol	**	511	
2,4-Dimethylphenol	**	**	
4,6-Dinitro-O-cresol	**	**	
2,4-Dinitrophenol	**	**	
2-Nitrophenol	**	**	
4-Nitrophenol	**	**	
P-chloro-M-cresol	**	**	
Pentachlorophenol	**	**	
Phenol	**	13774	
2,4,6-Trichlorophenol	**	1786	

** If present, less than 5.0.

ACL 3 10 00309 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Bill Lozier

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 10/3/85

TEST REQUIRED	Sample Type : WATER Station # : P-6 Sample #ACL : 0884 Results (ppb)	Sample Type : WASTE Station # : T-1 Sample #ACL : 0911 Results (ppm)	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS		TANK	
Acenaphthene	**	**	
Acenaphthylene	**	**	
Anthracene	**	**	
Benzidine	**	**	
Benzo (a) anthracene	**	**	
Benzo (a) pyrene	**	**	
3,4- Benzo-fluoranthene	**	**	
Benzo (ghi) perylene	**	**	
Benzo (k) fluoranthene	**	**	
Bis (2-chloroethoxy) methane	**	**	
Bis (2-chloroethyl) ether	**	**	
Bis (2-chloroisopropyl) ether	**	**	
Bis (2-ethyl-hexyl) phthalate	**	**	
4-Bromophenyl phenyl ether	**	**	
Butyl benzyl phthalate	**	**	
2-Chloronaphthalene	**	**	
4-Chlorophenyl phenyl ether	**	**	
Chrysene	**	**	
Dibenzo (a,h) anthracene	**	**	
1,2-Dichlorobenzene	**	**	
1,3-Dichlorobenzene	**	**	
1,4-Dichlorobenzene	**	**	
3,3'-Dichlorobenzidine	**	**	
Diethyl phthalate	**	**	
Dimethyl phthalate	**	**	
Di-N-Butyl phthalate	**	**	
2,4-Dinitrotoluene	**	**	
2,6-Dinitrotoluene	**	**	
Di-N-Octyl phthalate	**	**	
1,2-Diphenylhydrazine	**	**	

** If present, less than 5.0.

ACL 3 10 00310 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Bill Lozier

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 10/3/85

TEST REQUIRED	Sample Type : WATER Station # : P-6 Sample #ACL : 0884 Results (ppb)	Sample Type : WASTE Station # : T-1 Sample #ACL : 0911 Results (ppm)	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - BASE/ NEUTRAL COMPOUNDS (CONT'D)		TANK	
Fluoranthene	**	**	
Fluorene	**	**	
Hexachlorobenzene	**	**	
Hexachlorobutadiene	**	**	
Hexachlorocyclopentadiene	**	**	
Hexachloroethane	**	**	
Indeno (1,2,3,-cd) pyrene	**	**	
Isophorone	**	**	
Naphthalene	**	**	
Nitrobenzene	**	**	
N-Nitrosodi-methylamine	**	**	
N-Nitrosodi-N-propylamine	**	**	
N-Nitro-sodiphenylamine	**	**	
Phenanthrene	**	**	
Pyrene	**	**	
1,2,4-Trichlorobenzene	**	**	

** If present, less than 5.0.

ACL 3 10 00311

ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Bill Lozier

Client Project No.: #853-30798
ACL Project No.: #0101
Date Received: 9/20/85
Report Date: 10/3/85

TEST REQUIRED	Sample Type : WATER Station # : P-6 Sample #ACL : 0884 Results (ppb)	Sample Type : WASTE Station # : T-1 Sample #ACL : 0911 Results (ppm)	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION-PESTICIDES		TANK	
Aldrin	*	*	
BHC-alpha	*	*	
BHC-beta	*	*	
BHC-delta	*	*	
BHC-gamma	*	*	
Chlordane	*	*	
4,4'-DDT	*	*	
4,4'-DDE	*	*	
4,4'-DDD	*	*	
Dieldrin	*	*	
Endosulfan-alpha	*	*	
Endosulfan-beta	*	*	
Endosulfan sulfate	*	*	
Endrin	*	*	
Endrin aldehyde	*	*	
Heptachlor	*	*	
Heptachlor epoxide	*	*	
Toxaphene	*	*	
PCB-1242	*	*	
PCB-1254	*	*	
PCB-1221	*	*	
PCB-1232	*	*	
PCB-1248	*	*	
PCB-1260	*	*	
PCB-1016	*	*	

* If present, less than 1.0.

3 10 00312

RESULTS OF SELECTED WELL SAMPLINGS
October-November, 1985

3 10 00313

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION

REPORT OF ORGANIC ANALYSIS

Sample Location: BLUFF ROAD

Sample Type: GROUNDWATER

Date of Collection: 10/11/85

Collected by: ZUCCA JOHNSON

Sample Number: H 86-049, H 86-050, H 86-051

H 86-049 -- Volatile organics:

P6 #1

(1)	1,1-dichloroethene	3.82 µg/ℓ
(2)	carbontetrachloride	3.29 µg/ℓ
(3)	trichloroethene	7.47 µg/ℓ
(4)	1,1,1-trichloroethane	5.26 µg/ℓ

H 86-050 -- Volatile organics:

P6 #2

(1)	1,1-dichloroethene	4.0 µg/ℓ
(2)	carbon tetrachloride	3.4 µg/ℓ
(3)	trichloroethene	7.9 µg/ℓ
(4)	1,1,1-trichloroethane	5.49 µg/ℓ

H 86-051 -- Volatile organics:

P14 #1

(1)	dichloromethane	840 µg/ℓ
(2)	1,1-dichloroethene	904 µg/ℓ
(3)	1,1-dichloroethane	152 µg/ℓ
(4)	chloroform	851 µg/ℓ
(5)	carbontetrachloride	890 µg/ℓ
(6)	1,2-dichloropropane	29.7 µg/ℓ
(7)	trichloroethene	603 µg/ℓ
(8)	1,1,2-trichloroethane	15.2 µg/ℓ
(9)	tetrachloroethene	561 µg/ℓ
(10)	chlorobenzene	14.3 µg/ℓ
(11)	trans-1,2-dichloroethene	230 µg/ℓ
(12)	1,2-dichloroethane	27.4 µg/ℓ
(13)	1,1,1-trichloroethane	1,640 µg/ℓ
(14)	benzene	96.9 µg/ℓ
(15)	1,1,2,2-tetrachloroethane	966 µg/ℓ
(16)	toluene	342 µg/ℓ
(17)	ethyl benzene	12.6 µg/ℓ
(18)	dichlorofluoromethane	
(19)	thiobis-methane	
(20)	thiophene	
(21)	1,2-dibromoethane	
(22)	2-methyl-3-hexanol	

RECEIVED
NOV 05 1985
S. C. DEPT. OF HEALTH AND ENVIRONMENTAL CONTROL
Bureau of Solid & Hazardous Waste Management

RECEIVED
OCT 25 1985
GROUNDWATER PROTECTION DIVISION

Reported by Aow

Date 10/23/85

3·10 00314

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ANALYTICAL SERVICES DIVISION

REPORT OF ORGANIC ANALYSIS

Sample Location: BLUFF ROAD

Sample Type: GROUNDWATER

Date of Collection: 10/11/85

Collected by: ZUCCA JOHNSON

Sample Number: H 86-052 - P14 #2

H 86-052 -- VOLATILE ORGANICS

(1)	dichloromethane	838 µg/ℓ
(2)	1,1-dichloroethene	898 µg/ℓ
(3)	1,1-dichloroethane	149 µg/ℓ
(4)	chloroform	836 µg/ℓ
(5)	carbontetrachloride	929 µg/ℓ
(6)	1,2-dichloropropane	30.7µg/ℓ
(7)	trichloroethene	585 µg/ℓ
(8)	1,1,2-trichloroethane	16.1µg/ℓ
(9)	tetrachloroethene	491 µg/ℓ
(10)	chlorobenzene	13.0µg/ℓ
(11)	trans-1,2-dichloroethene	233 µg/ℓ
(12)	1,2-dichloroethane	27.4µg/ℓ
(13)	1,1,1-trichloroethane	1,564 µg/ℓ
(14)	benzene	98.1µg/ℓ
(15)	1,1,2,2-tetrachloroethane	961 µg/ℓ
(16)	toluene	319 µg/ℓ
(17)	ethyl benzene	11.0µg/ℓ
(18)	dichlorofluoromethane	
(19)	thiobis methane	
(20)	thiophene	
(21)	1,2-dibromoethane	
(22)	2-methyl-3-hexanol	

RECEIVED
NOV 05 1985
S.C. DEPT. OF HEALTH AND ENVIRONMENTAL CONTROL
Bureau of Solid & Hazardous Waste Management

RECEIVED
OCT 25 1985
GROUND-WATER
PROTECTION DIVISION

Reported by [illegible] Date 10/23/85

3 10 90315

SOUTH CAROLIN DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Environmental Quality Control
Analytical Services Data Sheet for Solid Waste and Hydrology

RECEIVED NOV 12 1985 GROUND PROTECTION

Sample Location BLUFF RD. County RICHLAND

Sample Type GROUND-WATER Comments RESULTS TO RAYMOND KNOX

Date 10-11-85 Collected by ZUCCA/JOHNSON An "X" in the small column indicates test requested

ime Collected (Milit.)	1045	1045	1430		1045	1045	143
Sample Point	P6 #1	P6 #2	P14 #1		P6 #1	P6 #2	P14
ab No. H	86-049	86-050	86-051		86-049	86-050	86-05
NH_3-N, mg/l				Calcium	X 5.0	X 5.0	X 6.7
NO_3/NO_2-N, mg/l				Magnesium	X 2.4	X 2.4	X 4.8
KN				Sodium	X 3.5	X 3.0	X 30
Nitrite, N, mg/l				Potassium			
-P,				Arsenic	X <0.005	X <0.005	X
Hardness, mg/l				Barium	X <0.5	X <0.5	X 0.75
l, mg/l	X 100*	X 14.5*	X 60*	Cadmium	X <0.010	X <0.010	X <0.01
SO_4 mg/l	X ☆	X ☆	X ☆	Chromium	X <0.05	X <0.05	X <0.0
lashpoint, °F				Copper	X <0.05	X <0.05	X <0.0
olids, Total, mg/l				Iron	X 0.8	X 1.0	X 1.4
olids, Tot. Diss, mg/l				Lead	X <0.05	X <0.05	X <0.0
s, %				Manganese	X <0.05	X <0.05	X 0.7
pH	X 5.5	X 5.6	X 5.9	Mercury	X 02	X 02	X 02
lkalinity mg/l				Nickel	X <0.05	X <0.05	X <0.05
Fluoride, mg/l				Selenium	X <0.005	X <0.005	X
OC	X 9.4	X 6.6	X 18.8	Silver	X <0.05	X <0.05	X <0.0
Phenols, µg/l				Zinc	X 0.07	X 0.08	X 0.3
OD							
yanide, mg/l					mg/l	mg/l	
MBAS, mg/l							
FIELD TEMP	X 23	X 23	X 23				
FIELD PH	X 5.0	X 5.0	X 5.2				
IELD SP. COND	X 60	X 60	X 180				

RECEIVED NOV 13 1985 S. C. DEPT. OF HE ENVIRONMENTAL C OL Bureau of Solid & Hazardous Waste Management

Remarks: METALS, TOC FILTERED AND PRESERVED IN FIELD. & Filtered

☆ lab accident

Date Received in Regional Laboratory _____ by _____

Date Released from Regional Laboratory _____ by _____

Date Received in Central Laboratory 10/14/85 by DDH

Date Released from Spec & A. A. Section _____ by _____

e Released from Metals Section 11/8/85 by CRH Harrison, AM Thompson

DHEC 40-89 (01/81) White - Program; Yellow - Program; Pink - Program; Gold - Lab

Environmental Quality Control
Analytical Services Data Sheet for Solid Waste and Hydrology

Sample 3 10 00316
Location BLUFF RD County RICHLAND
Sample Type GROUND-WATER Comments RESULTS TO RAYMOND KNOX
Date 10-11-85 Collected by ZUCCA/JOHNSON An "X" in the small column indicates test requested

Time Collected (Milit.)		1430						1430		
ample Point		P14#2						P14#2		
Lab No.	H	86-052				H		86-052		
NH_3-N, mg/l						Calcium	X	18		
O_3/NO_2-N, mg/l						Magnesium	X	2.5		
TKN						Sodium	X	29		
itrite, N, mg/l						Potassium				
T-P,						Arsenic	X	0.030		
ardness, mg/l						Barium	X	3.6		
Cl, mg/l	X	50*				Cadmium	X	0.010		
SO_4 mg/l	X	*				Chromium	X	0.39		
lashpoint, °F						Copper	X	0.17		
Solids, Total, mg/l						Iron	X	170		
olids, Tot. Diss, mg/l						Lead	X	0.87		
Solids, %						Manganese	X	2.7		
[redacted]	X	6.0				Mercury	[redacted]	02		
Alkalinity mg/l						Nickel	X	0.24		
luoride, mg/l						Selenium	X	<0.005		
TOC	X	23.0				Silver	X	<0.05		
henols, µg/l						Zinc	X	0.6		
COD										
Cyanide, mg/l								mg/l		
BAS, mg/l										
FIELD TEMP		23								
FIELD P.H.		5.2								
FIELD SP. COND		180								

RECEIVED
NOV 14 1985
GROUND WATER PROTECTION DIVISION

Remarks: TOC, METALS [redacted] NOT FILTERED OR PRESERVED.
* Filtered
* lab accident

Date Received in Regional Laboratory _____ by _____
Date Released from Regional Laboratory _____ by _____
Date Received in Central Laboratory 10/14/85 by DDH
Date Released from Spec & A. A. Section 11/12/85 by CRHarrison
Date Released from Metals Section 11/12/85 by AMThompson

DHEC 40-89 (01/81) White - Program; Yellow - Program; Pink - Program; Gold - Lab

ACL 3 10 00317 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

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TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: 8533079 (Bluff Rd.)
ACL Project No.: 0132
Date Received: 11/20/85
Report Date: 11/26/85

TEST REQUIRED	Sample Type : Water Station # : L-3 Sample #ACL : 1196 Results (ppb)	Sample Type : Water Station # : P-17-1 Sample #ACL : 1198 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS		SAMPLE TAKEN NOV. 19, 1985	
Acrolein	*	*	
Acrylonitrile	*	*	
Benzene	*	*	
Bis (Chloromethyl) ether	*	*	
Bromoform	*	*	
Carbon tetrachloride	*	*	
Chlorobenzene	*	*	
Chlorodi-bromomethane	*	*	
Chloroethane	*	*	
2-Chloroethylvinyl ether	*	*	
Chloroform	*	*	
Dichlorobromomethane	*	*	
Dichlorodifluoromethane	*	*	
1,1-Dichloroethane	*	*	
1,2-Dichloroethane	*	*	
1,1-Dichloroethylene	*	*	
1,2-Dichloropropane	*	*	
1,2-Dichloropropylene	*	*	
Ethylbenzene	*	*	
Methyl bromide	*	*	
Methyl chloride	*	*	
Methylene chloride	*	*	
1,1,2,2-Tetrachloroethane	*	*	
Tetrachloroethylene	*	*	
Toluene	*	*	
1,2-Trans-Dichloroethylene	*	*	
1,1,1-Trichloroethane	*	*	
1,1,2-Trichloroethane	*	*	
Trichloroethylene	*	*	
Trichlorofluoromethane	*	*	
Vinyl chloride	*	*	

* If present, less than 5 ppb.

DEC 4 1985

ACL CAI - ATL **ADVANCED CHEMISTRY LABS, INC.**

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

3 10 00318

RESULTS OF SAMPLE TAKEN NOV. 26, 1985

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Michael Finney

Client Project No.: #853-3079 "Bluff Road"
ACL Project No.: #0137
Date Received: 11/26/85
Report Date: 12/2/85

TEST REQUIRED	Sample Type : Water Station # : P-17 Sample #ACL : 1210 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---		
Acrylonitrile	---		
Benzene	5		
Bis (Chloromethyl) ether	*		
Bromoform	*		
Carbon tetrachloride	*		
Chlorobenzene	*		
Chlorodi-bromomethane	*		
Chloroethane	*		
2-Chloroethylvinyl ether	*		
Chloroform	*		
Dichlorobromomethane	*		
Dichlorodifluoromethane	*		
1,1-Dichloroethane	*		
1,2-Dichloroethane	*		
1,1-Dichloroethylene	*		
1,2-Dichloropropane	*		
1,2-Dichloropropylene	*		
Ethylbenzene	*		
Methyl bromide	*		
Methyl chloride	*		
Methylene chloride	*		
1,1,2,2-Tetrachloroethane	*		
Tetrachloroethylene	*		
Toluene	419		
1,2-Trans-Dichloroethylene	*		
1,1,1-Trichloroethane	605		
1,1,2-Trichloroethane	*		
Trichloroethylene	60		
Trichlorofluoromethane	*		
Vinyl chloride	*		

* If present, less than 5 ppb.

Steve N Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

3 10 00319

RESULTS OF COMPLETE
WELL SAMPLING
December, 1985

ACL 3 10 00320 **ADVANCED CHEMISTRY LABS, INC.**

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

RECEIVED DEC 13

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : P-6 Sample #ACL : 1213 Results (ppb)	Sample Type : Water Station # : P-7 Sample #ACL : 1214 Results (ppb)	Sample Type : Water Station # : P-8 Sample #ACL : 1215 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	93	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	*	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	400	*
1,1,2-Trichloroethane	*	10	*
Trichloroethylene	*	73	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

Steve N. Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

ACL 3 10 00321 **ADVANCED CHEMISTRY LABS, INC.**

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : P-9 Sample #ACL : 1216 Results (ppb)	Sample Type : Water Station # : P-10 Sample #ACL : 1217 Results (ppb)	Sample Type : Water Station # : P-11 Sample #ACL : 1218 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	1280	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	139	3425	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	114	1208	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	169	119	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	59	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	2008	*
1,1,2,2-Tetrachloroethane	*	600	*
Tetrachloroethylene	27	241	*
Toluene	9	94	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	87	1863	*
1,1,2-Trichloroethane	42	*	*
Trichloroethylene	25	469	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00322 **ADVANCED CHEMISTRY LABS, INC.**

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : P-12 Sample #ACL : 1219 Results (ppb)	Sample Type : Water Station # : P-13 Sample #ACL : 1220 Results (ppb)	Sample Type : Water Station # : P-14 Sample #ACL : 1221 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	883
Chlorobenzene	*	*	40
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	2063	3776
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	491	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	326	70
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	46
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	2921
1,1,2,2-Tetrachloroethane	*	75	824
Tetrachloroethylene	*	95	*
Toluene	*	13	542
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	1192	7335
1,1,2-Trichloroethane	*	*	34
Trichloroethylene	*	148	469
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00323

ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : P-15 Sample #ACL : 1222 Results (ppb)	Sample Type : Water Station # : P-16 Sample #ACL : 1223 Results (ppb)	Sample Type : Water Station # : P-17 Sample #ACL : 1224 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	3797	27
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	467	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	926	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	5238	*
1,1,2,2-Tetrachloroethane	*	756	*
Tetrachloroethylene	23	540	*
Toluene	*	357	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	103	3714	19
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	11	662	12
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00324

ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : P-18 Sample #ACL : 1225 Results (ppb)	Sample Type : Water Station # : P-19 Sample #ACL : 1226 Results (ppb)	Sample Type : Water Station # : P-20 Sample #ACL : 1227 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	293	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	217	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	168	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	61	*	*
Tetrachloroethylene	166	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	456	*	*
1,1,2-Trichloroethane	46	*	*
Trichloroethylene	32	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00325 **ADVANCED CHEMISTRY LABS, INC.**

R. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : P-22 Sample #ACL : 1229 Results (ppb)	Sample Type : Water Station # : F.B.#1 Sample #ACL : 1230 Results (ppb)	Sample Type : Water Station # : F.B.#3 Sample #ACL : 1231 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS		Blank	Blank
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	36	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	249	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	*	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	*	*
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	*	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00326

ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
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Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Ned Stone

Client Project No.: #853-3079
ACL Project No.: #0140
Date Received: 12/7/85
Report Date: 12/13/85

TEST REQUIRED	Sample Type : Water Station # : Sample #ACL : 1232 Results (ppb)	Sample Type : Water Station # : Sample #ACL : 1233 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS	"Field Blank - 12/3"	"Field Blank - 12/5"	
Acrolein	---	---	
Acrylonitrile	---	---	
Benzene	*	*	
Bis (Chloromethyl) ether	*	*	
Bromoform	*	*	
Carbon tetrachloride	*	*	
Chlorobenzene	*	*	
Chlorodi-bromomethane	*	*	
Chloroethane	*	*	
2-Chloroethylvinyl ether	*	*	
Chloroform	*	*	
Dichlorobromomethane	*	*	
Dichlorodifluoromethane	*	*	
1,1-Dichloroethane	*	*	
1,2-Dichloroethane	*	*	
1,1-Dichloroethylene	*	*	
1,2-Dichloropropane	*	*	
1,2-Dichloropropylene	*	*	
Ethylbenzene	*	*	
Methyl bromide	*	*	
Methyl chloride	*	*	
Methylene chloride	*	*	
1,1,2,2-Tetrachloroethane	*	*	
Tetrachloroethylene	*	*	
Toluene	*	*	
1,2-Trans-Dichloroethylene	*	*	
1,1,1-Trichloroethane	*	*	
1,1,2-Trichloroethane	*	*	
Trichloroethylene	*	*	
Trichlorofluoromethane	*	*	
Vinyl chloride	*	*	

* If present, less than 5 ppb.

ACL 3 10 00327

ADVANCED CHEMISTRY LABS, INC.

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CHIEF CHEMIST

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TELEPHONE (404) 455-1266

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DEC 23 1985
GAI - ATL

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention:

Client Project No.: " Bluff Road "
ACL Project No.: #0144
Date Received: 12/12/85
Report Date: 12/18/85

TEST REQUIRED	Sample Type : Water Station # : BP-5-1 Sample #ACL : 1243 Results (ppb)	Sample Type : Water Station # : BP-5-2 Sample #ACL : 1244 Results (ppb)	Sample Type : Water Station # : BP-5-4 Sample #ACL : 1245 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	14
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	46	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	692
1,2-Dichloroethane	*	*	274
1,1-Dichloroethylene	44	*	1375
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	21	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	29	*	71
Toluene	20	*	86
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	181	*	121
1,1,2-Trichloroethane	*	*	89
Trichloroethylene	17	*	36
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

Steve N. Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

ACL 3 10 00328

ADVANCED CHEMISTRY LABS, INC.

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Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention:

Client Project No.: " Bluff Road "
ACL Project No.: #0144
Date Received: 12/12/85
Report Date: 12/18/85

TEST REQUIRED	Sample Type : Water Station # : P-21 Sample #ACL : 1246 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---		
Acrylonitrile	---		
Benzene	*		
Bis (Chloromethyl) ether	*		
Bromoform	*		
Carbon tetrachloride	*		
Chlorobenzene	*		
Chlorodi-bromomethane	*		
Chloroethane	*		
2-Chloroethylvinyl ether	*		
Chloroform	*		
Dichlorobromomethane	*		
Dichlorodifluoromethane	*		
1,1-Dichloroethane	*		
1,2-Dichloroethane	*		
1,1-Dichloroethylene	*		
1,2-Dichloropropane	*		
1,2-Dichloropropylene	*		
Ethylbenzene	*		
Methyl bromide	*		
Methyl chloride	*		
Methylene chloride	*		
1,1,2,2-Tetrachloroethane	*		
Tetrachloroethylene	*		
Toluene	*		
1,2-Trans-Dichloroethylene	*		
1,1,1-Trichloroethane	*		
1,1,2-Trichloroethane	*		
Trichloroethylene	*		
Trichlorofluoromethane	*		
Vinyl chloride	*		

* If present, less than 5 ppb.

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P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

JAN 10 1986

GAI - ATL

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: #85-1728 "Bluff Road"
ACL Project No.: #0156
Date Received: 12/24/85
Report Date: 1/8/86

TEST REQUIRED	Sample Type : Water Station # : P-18A Sample #ACL : 1318 Results (ppb)	Sample Type : Water Station # : L-44 Sample #ACL : 1319 Results (ppb)	Sample Type : Water Station # : Pipe #44 Sample #ACL : 1320 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	Resampled P-18 on Dec. 21, 1985		
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	180	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	188	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	91	*	*
Tetrachloroethylene	115	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	404	*	*
1,1,2-Trichloroethane	38	*	*
Trichloroethylene	31	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

Steve N. Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

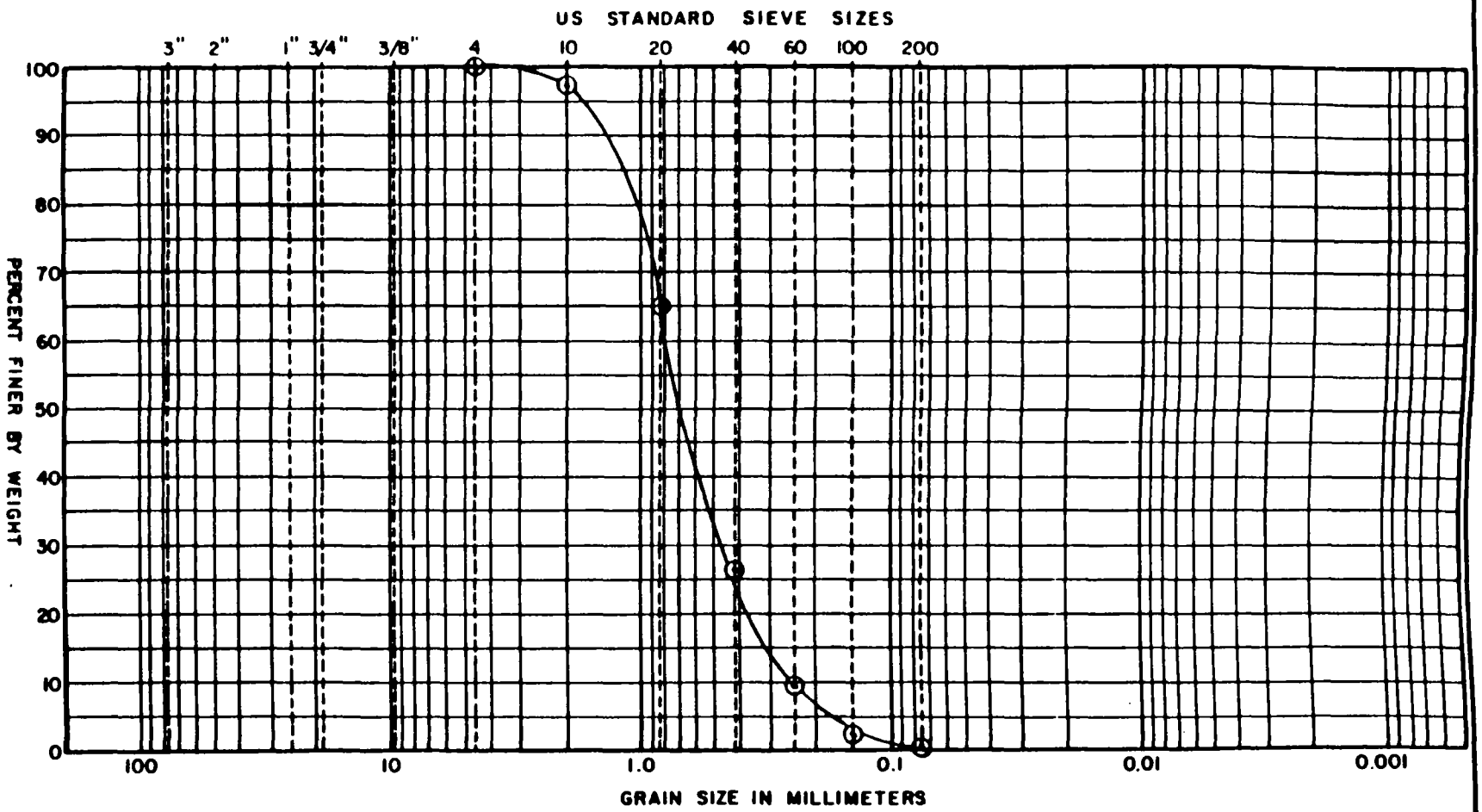
3 10 00330

APPENDIX F

Results of Grain-Size Analysis of Soil Samples

3 10 00331

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~BLOW OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
BP1 SA-8	18.5-20.0	--	--	--	--	Medium to fine SAND. (SP)

FIGURE F-1

Golder Associates

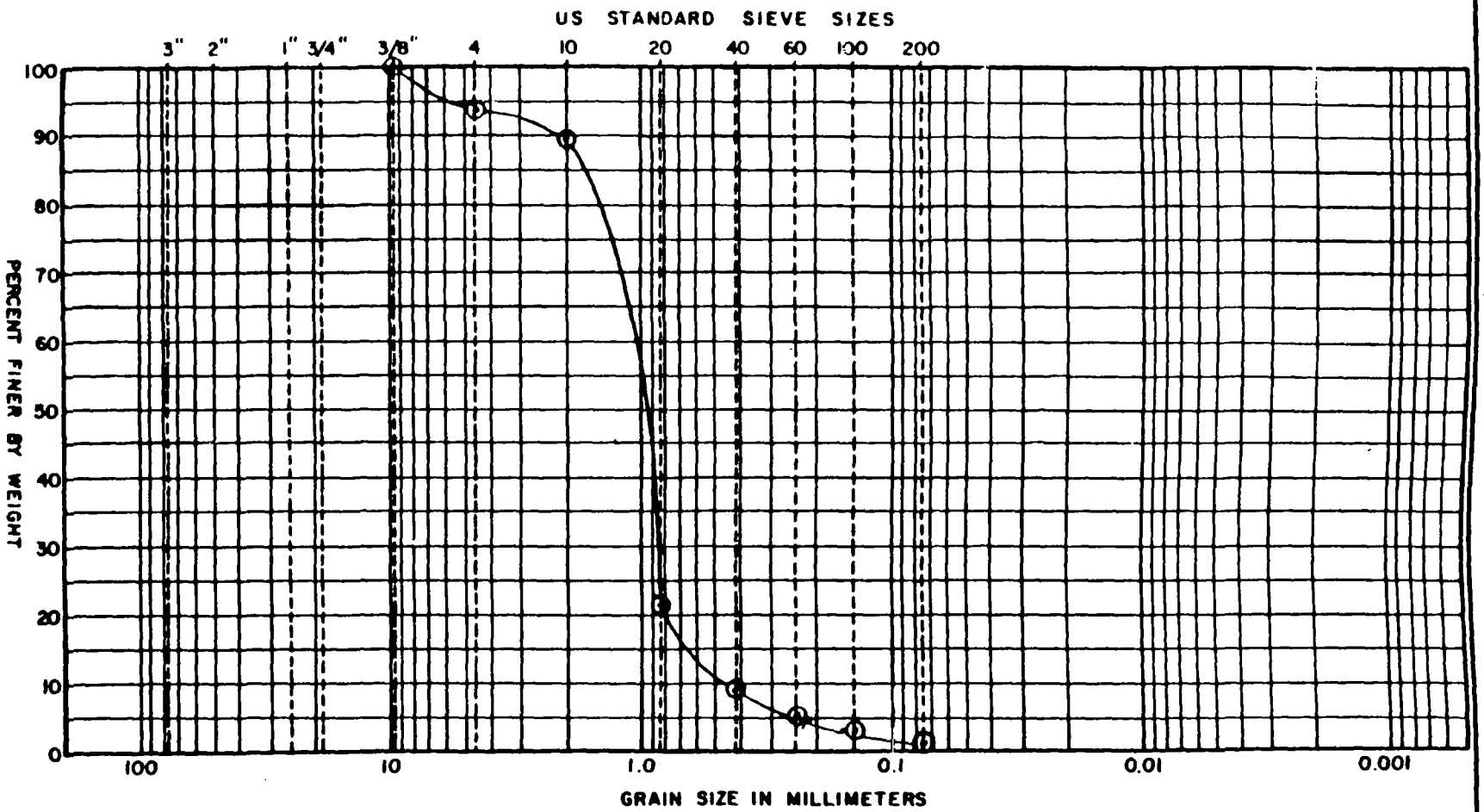
Date 7/11/85
Job No. 853-3079.10

Drawn JDC
Checked WDM
Reviewed WDM

AF 2881 SC

GRAIN SIZE DISTRIBUTION

3 10 00332



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SUBM-OR~~ DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
BP1 SA-11	33.5-35.0	--	--	--	--	Fine to medium SAND, little fine gravel, trace silt (SP)

FIGURE F-2

Golder Associates

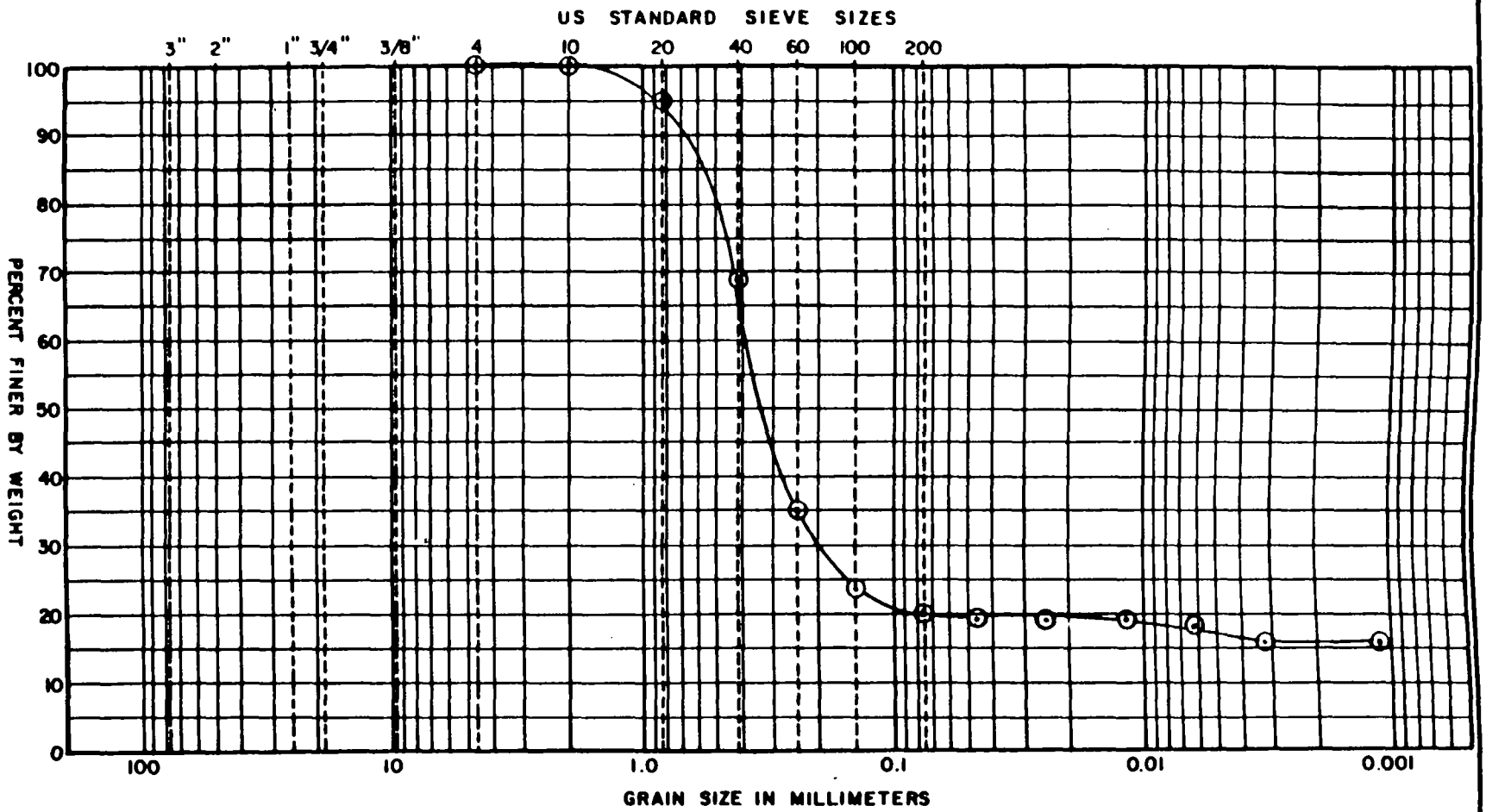
Date 7/11/85
Job No. 853-3079.10

Drawn JDC
Checked WDM
Reviewed WDM

AF 268156

3 10 00333

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SURV. OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
BP2 SA-4	8.5'-10.0'	--	--	--	--	Tan medium to fine SAND, some clay. (SC)

Date 4-3-85
Job No. 853-3079.10

Golder Associates

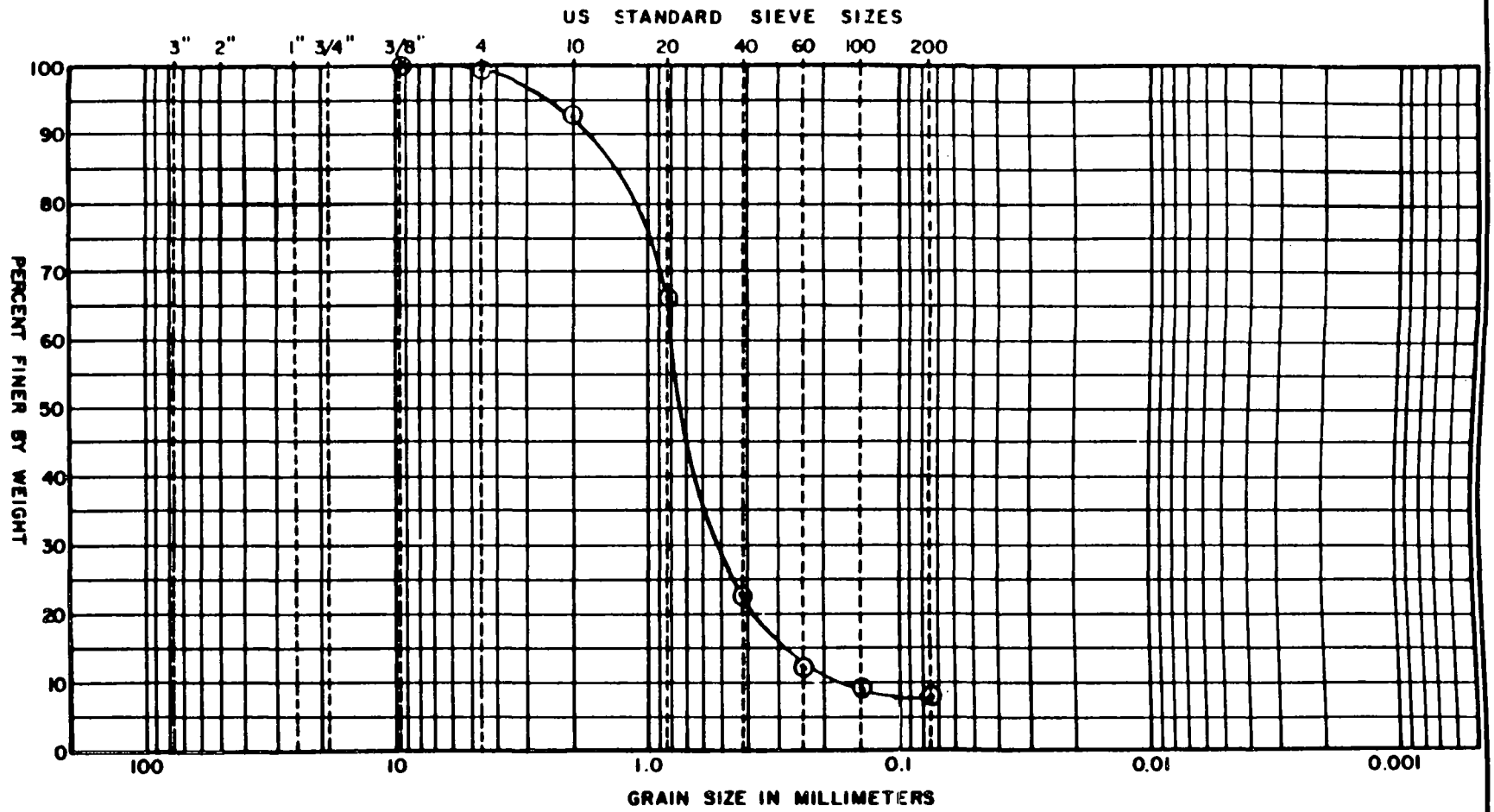
Drawn WDM
Checked GGR
Reviewed WDM

FIGURE F-3

AF 268165

3 10 00334

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SLEEVE OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
BP2 SA-11	38.5-40	--	--	--	--	White medium to fine SAND, little silt. (SP-SM)

FIGURE F-4

Date 4-7-85
Job No. 853-3079.10

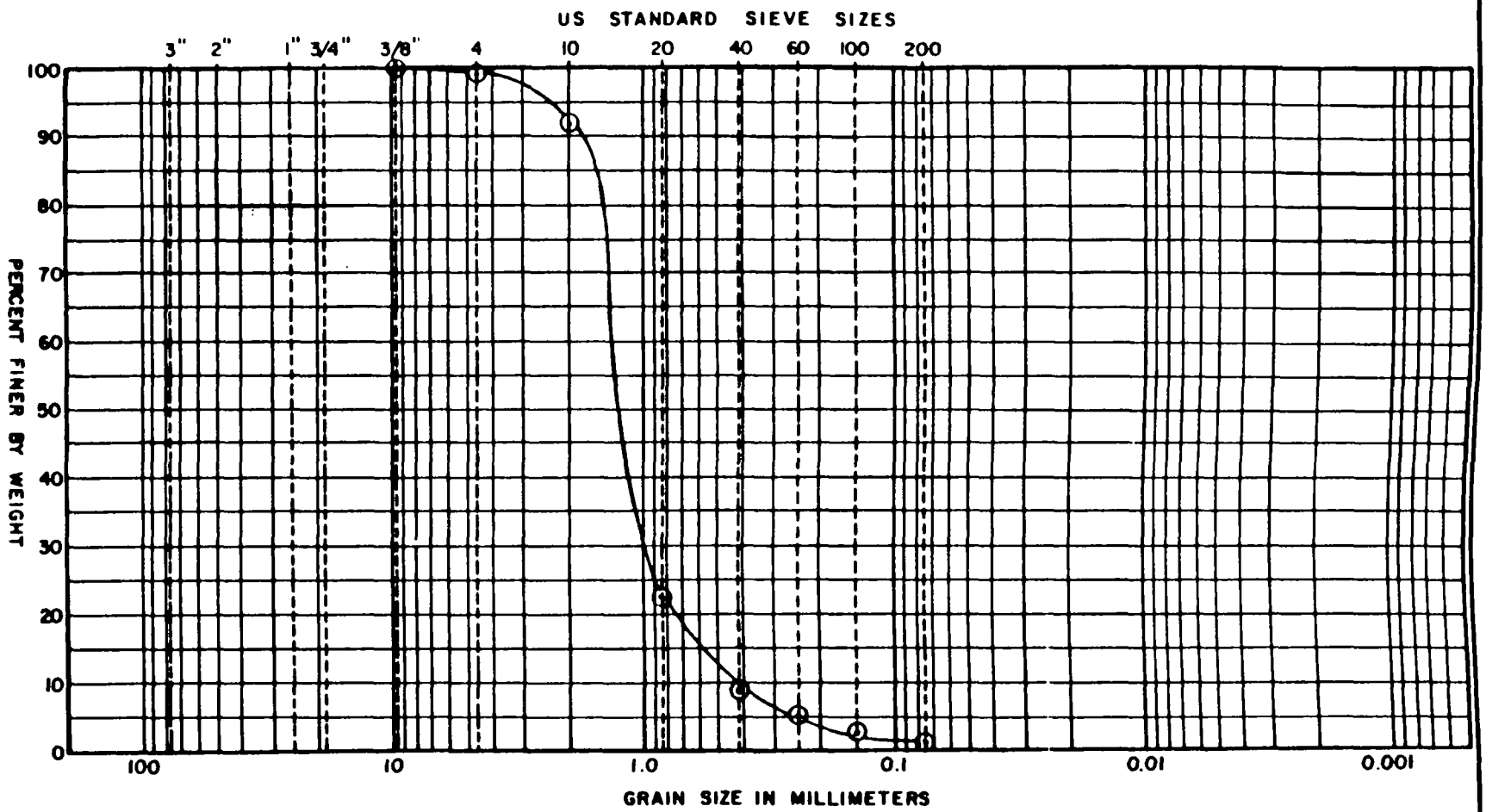
Golder Associates

Drawn WDM
Checked WDM
Reviewed WDM

AF 268162

3 10 00335

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~ELEV OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
BP3 SA-11	28.5-30.0	--	--	--	--	Medium SAND, trace silt (SP)

FIGURE F-5

Date 7/11/85
Job No. 853-3079.10

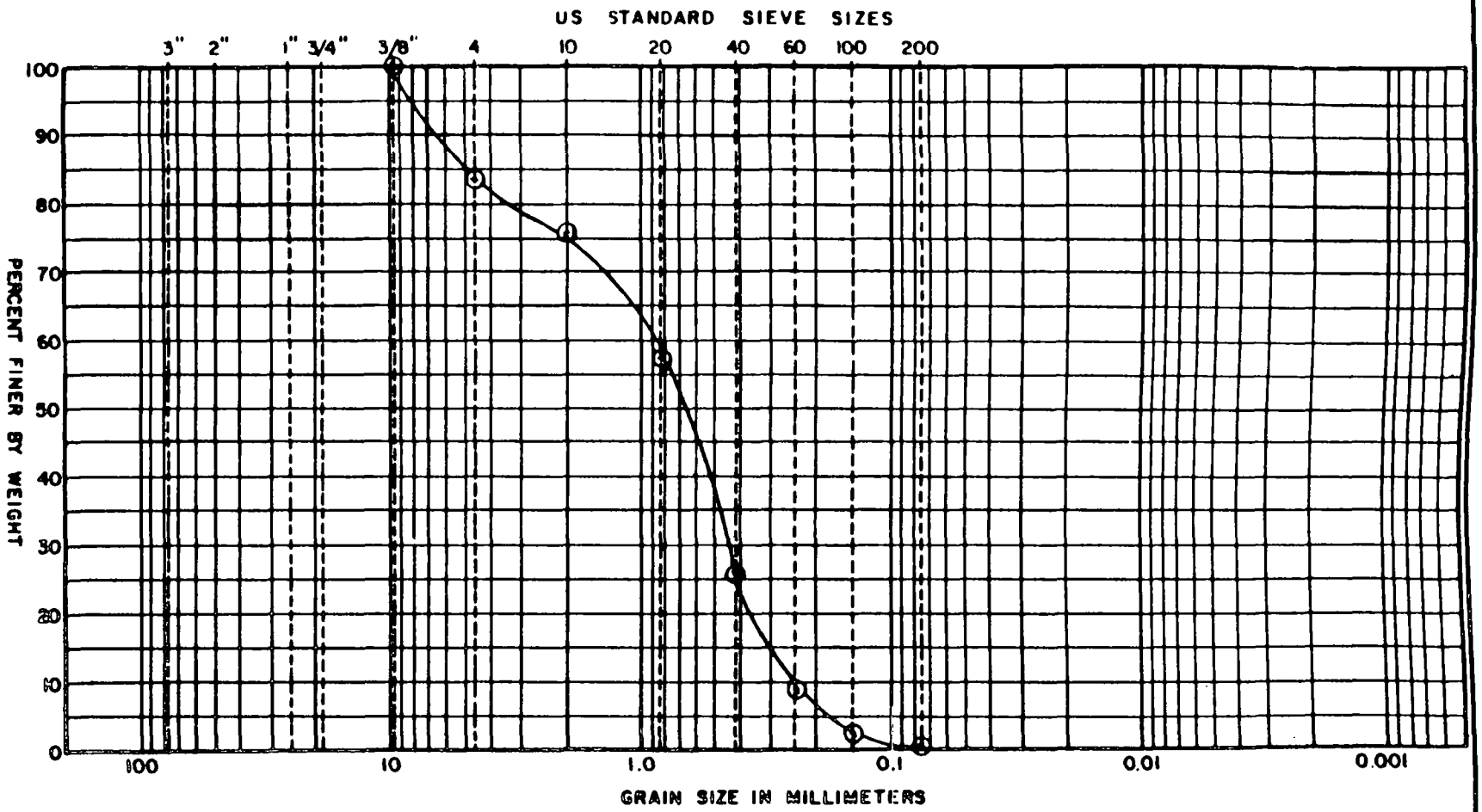
Golder Associates

Drawn JDC
Checked WDM
Reviewed WDM

AF 268 16C

3 10 00336

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~ELEV OR~~ DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
BP4 SA-10	33.5'-35.0'	--	--	--	--	Coarse to fine SAND, little fine gravel (SP)

Date 7/11/85
Job No. 853-3079.10

Golder Associates

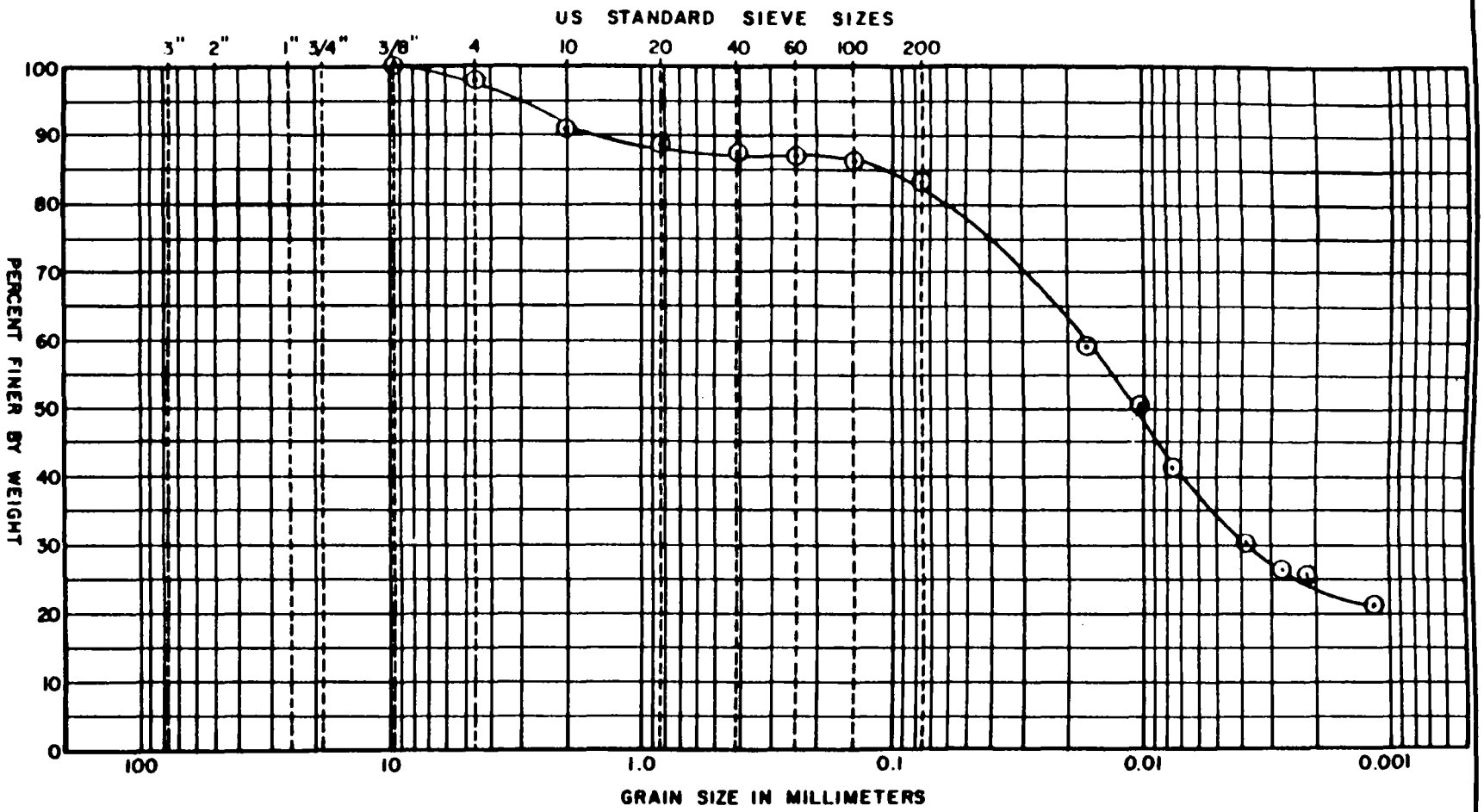
Drawn JDC
Checked WDM
Reviewed WDM

FIGURE F-8

AF 268 156

3 10 00337

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	Depth	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
BP4 SA-12	43.5'-45.0'	--	--	--	--	Hard black CLAY, some coarse to medium sand (CH)

FIGURE F-7

Date 7/12/85
Job No. 853-3079.10

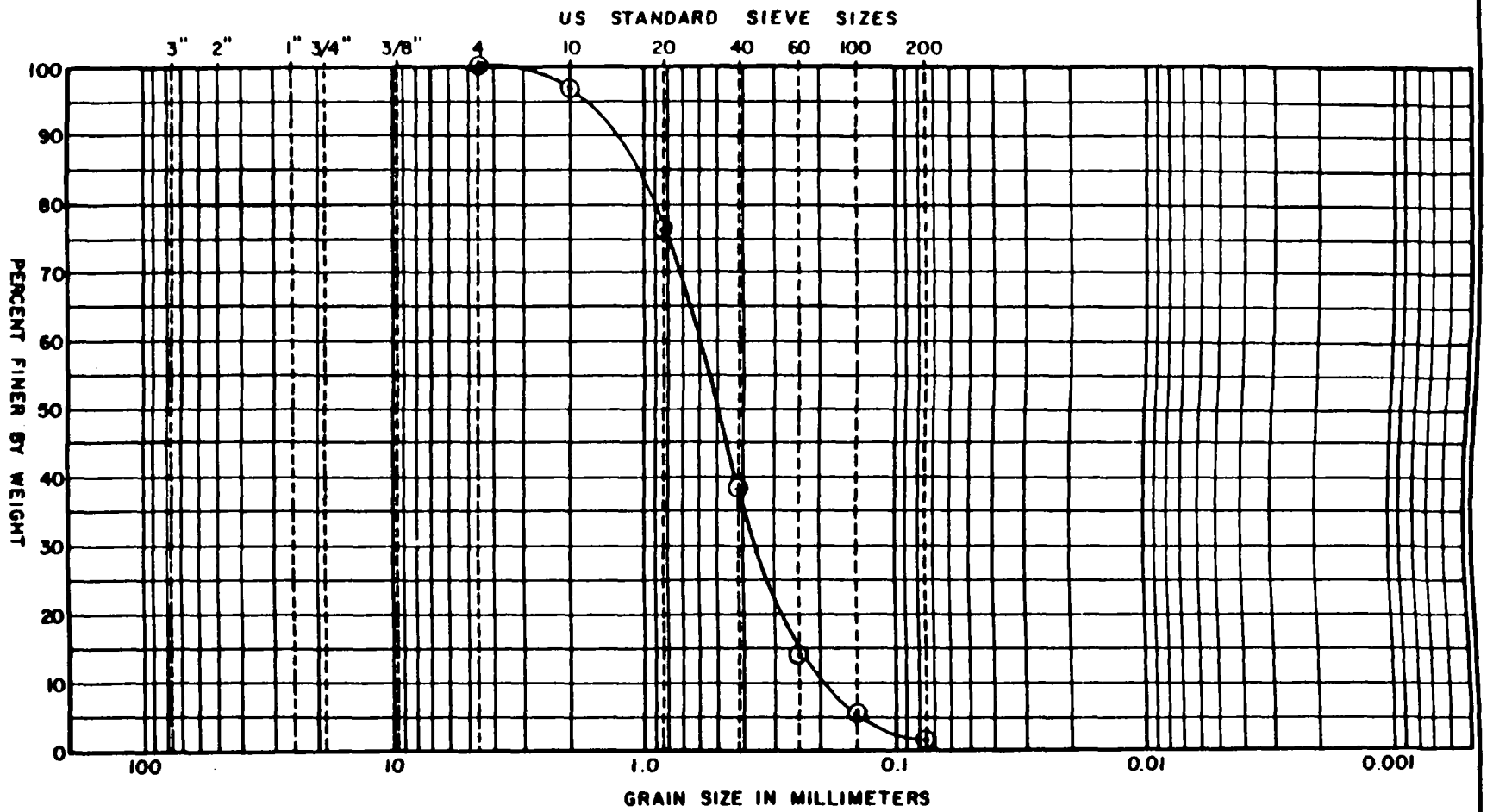
Golder Associates

Drawn JDC
Checked WDM
Reviewed WDM

AF 268166

3 10 00338

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SUCK OR~~ DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
BP5 SA-7	18.5'-20.5'	--	--	--	--	Medium to fine SAND, trace silt (SP)

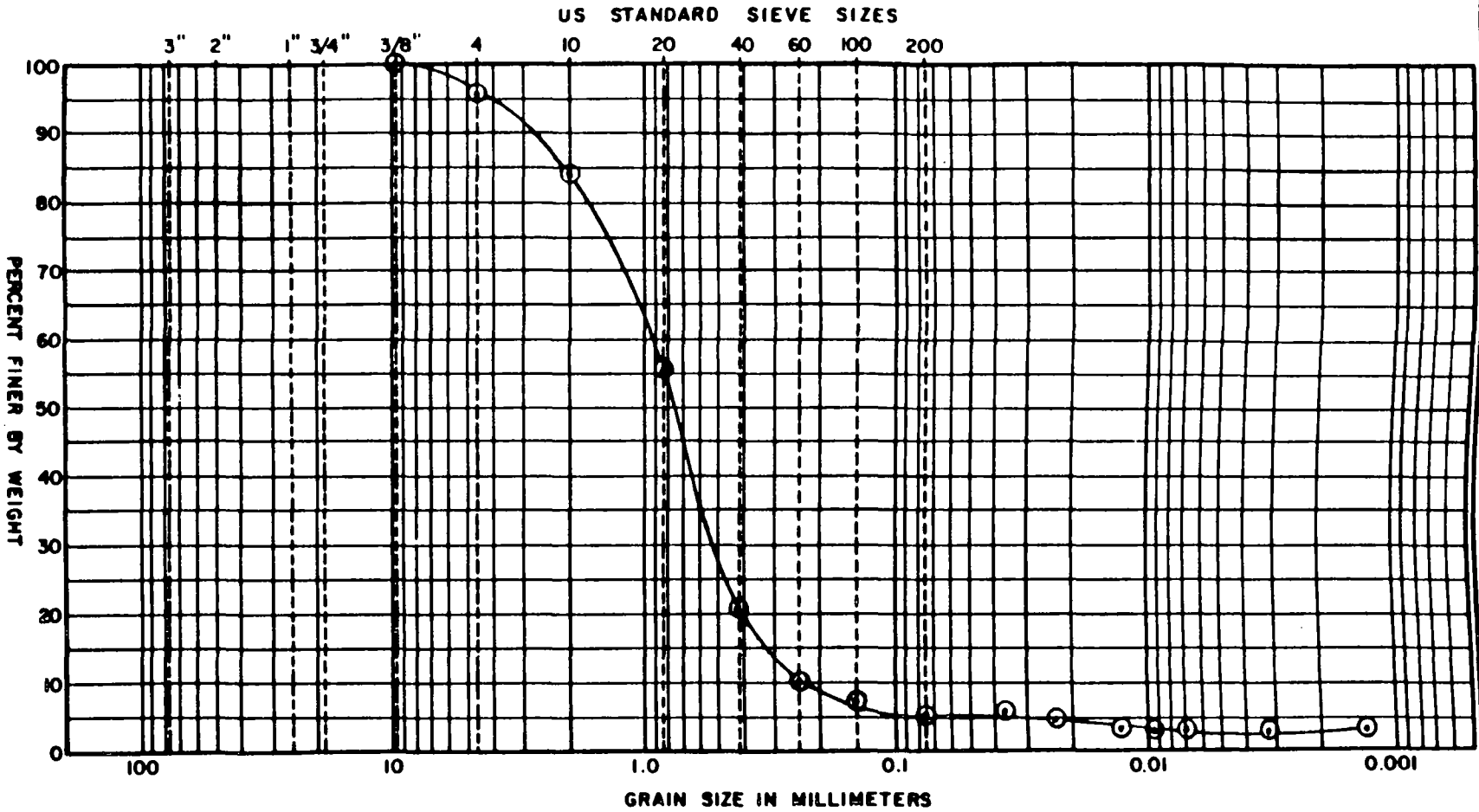
FIGURE F-8

Date 7/11/85
Job No. 853-3079.10

Golder Associates

Drawn JDC
Checked WDM
Reviewed WDM

AF 268 16C



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~ELEV OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P-8	45-46.5	--	--	--	--	Tan coarse to fine SAND, little silt.
SA-9						

Date 9/27/85
Job No. 853-3079.10

Golder Associates

Drawn BP
Checked BP
Reviewed WDM

FIGURE F-8

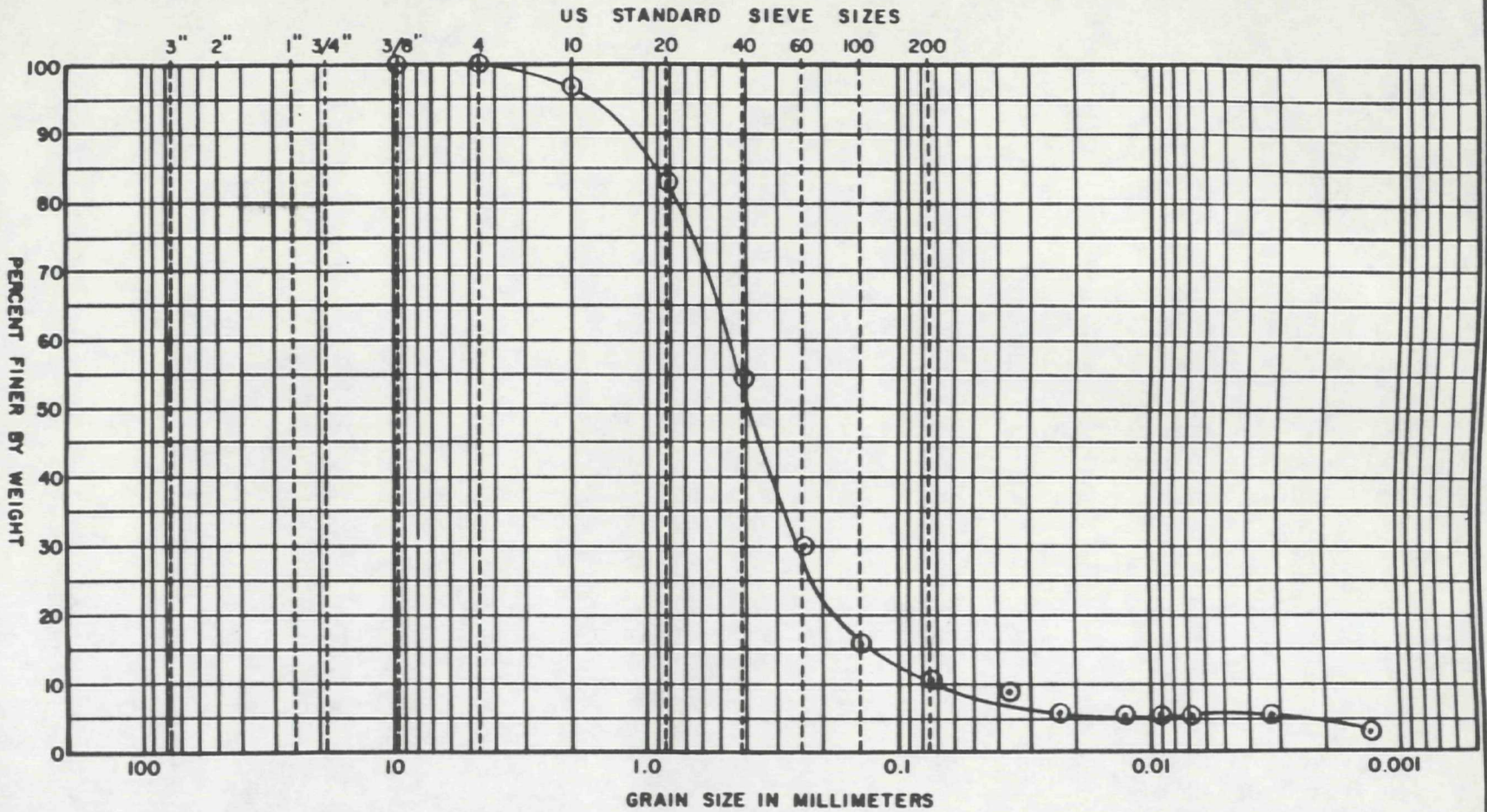
AF 26816C

AF 268165

Date 9/27/85
Job No. 853-3079.10

GRAIN SIZE DISTRIBUTION

3 10 00340



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

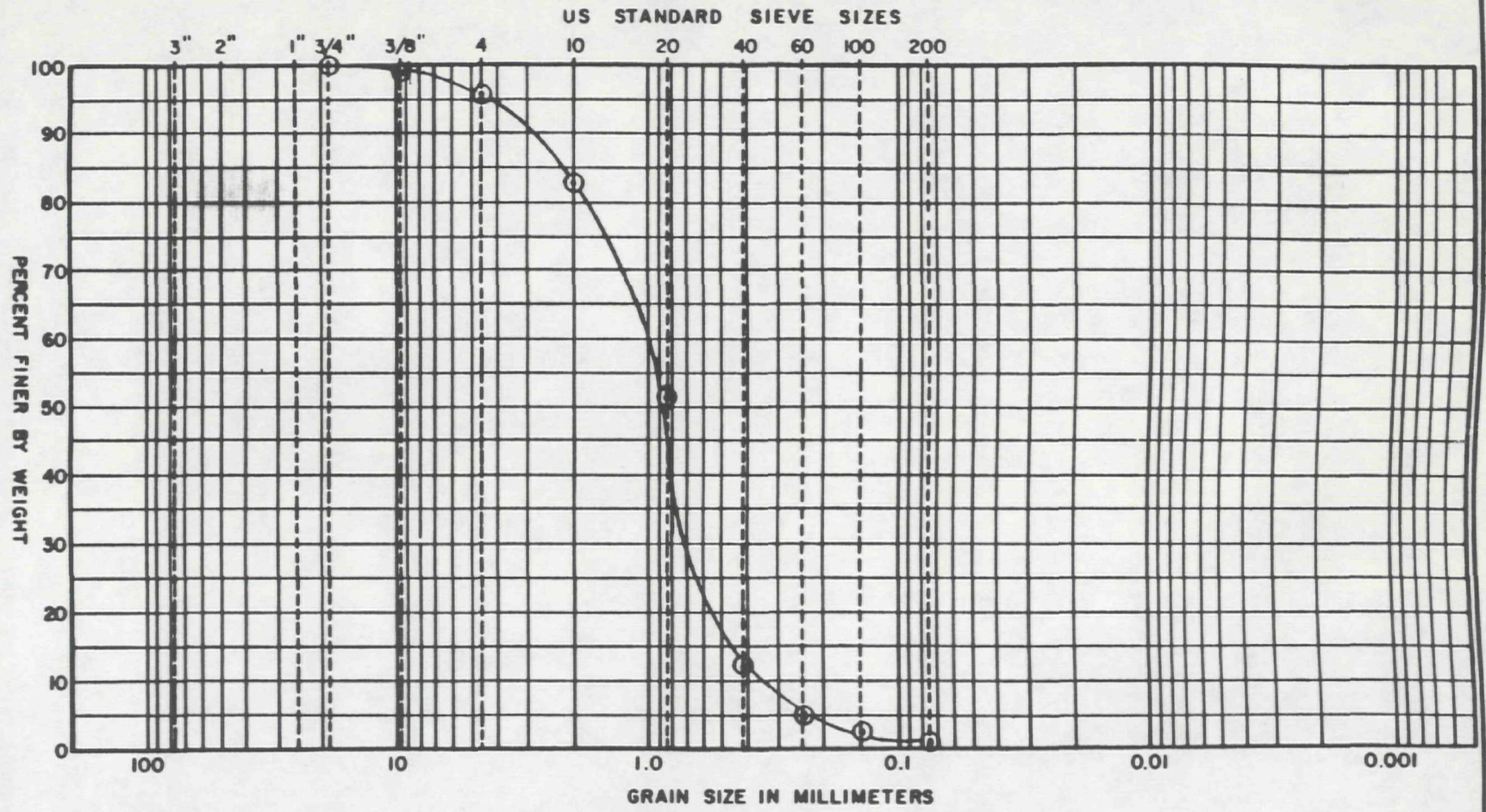
BORING NO.	~~SLEEVE OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P-13 SA-3	15-16.5	--	--	--	--	Tan medium to fine SAND, little silt.

Golder Associates

Drawn BP
Checked BP
Reviewed WDM

FIGURE F-10

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SLEV OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P-13 SA-9	45-46.5	--	--	--	--	Coarse to fine SAND, trace fine gravel, trace silt (SP)

Date 9/27/85
Job No. 853-3079.10

Golder Associates

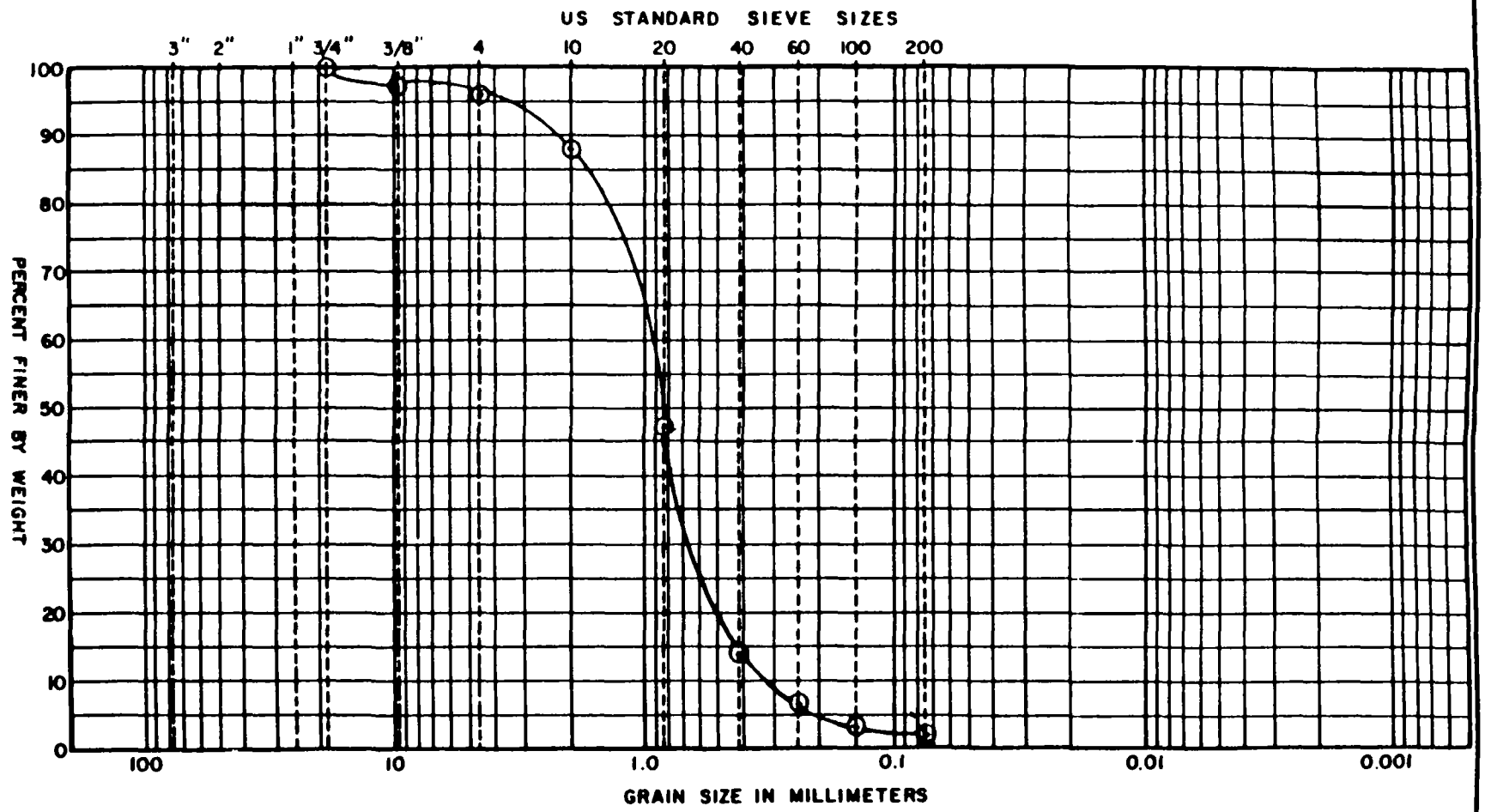
Drawn BP
Checked BP
Reviewed WDM

FIGURE F-11

AF 268165

GRAIN SIZE DISTRIBUTION

3 10 00342



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SLOW-OR~~ DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P-14 SA-5	25-26.5	--	--	--	--	Coarse to fine SAND, trace fine gravel, trace silt (SP)

FIGURE F-12

Golder Associates

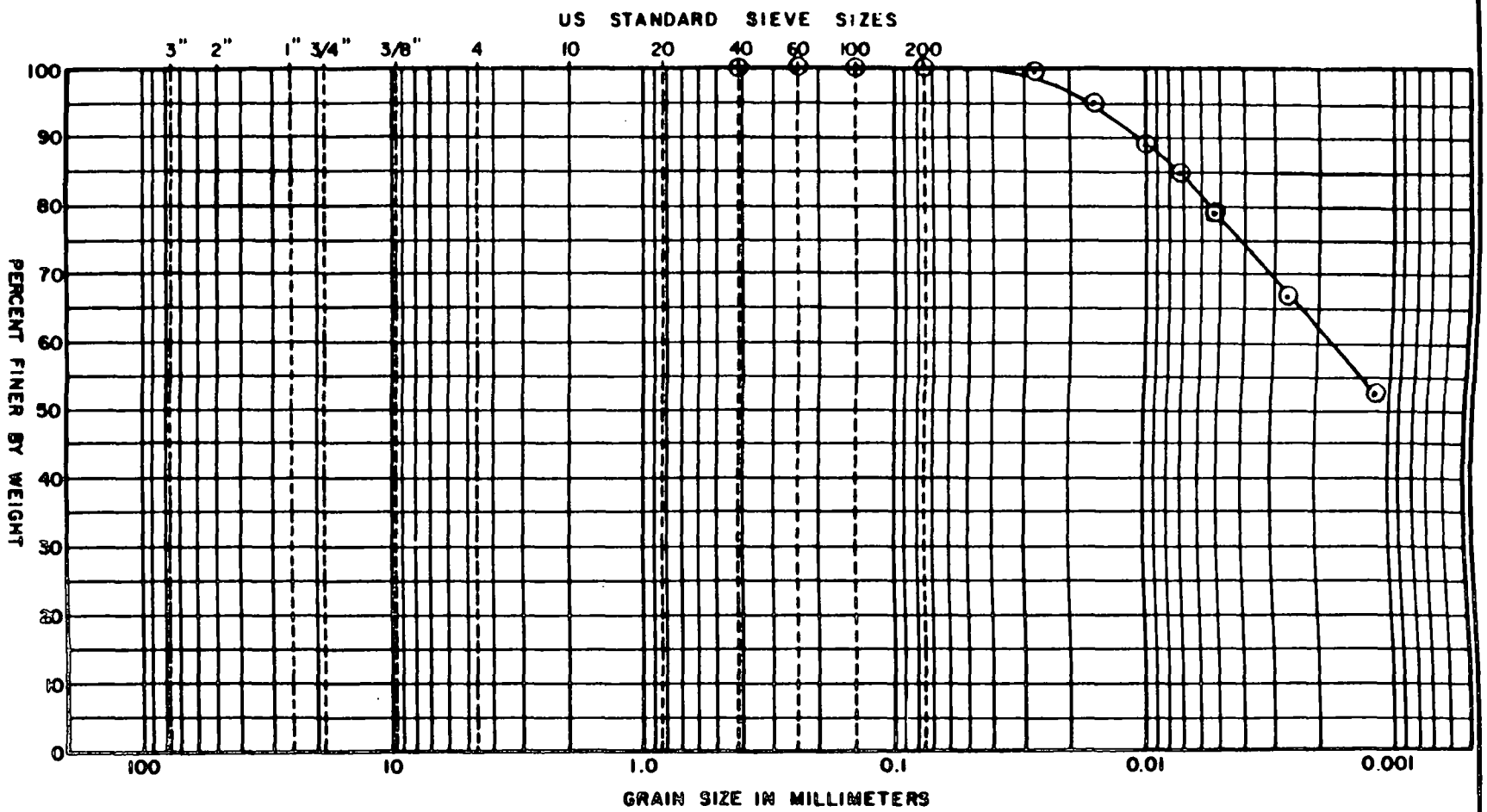
Date 9/27/85
Job No. 853-3079.10

Drawn BP
Checked BP
Reviewed WDM

AF 268156

3 10 00345

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~SAMPLE OR~~ DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
P-16 SA-3	49.5-50.9	26.1	60	31	29	Grayish black, plastic CLAY (CH)

FIGURE F-13

Date 10-2-85
Job No. 853-3079.8

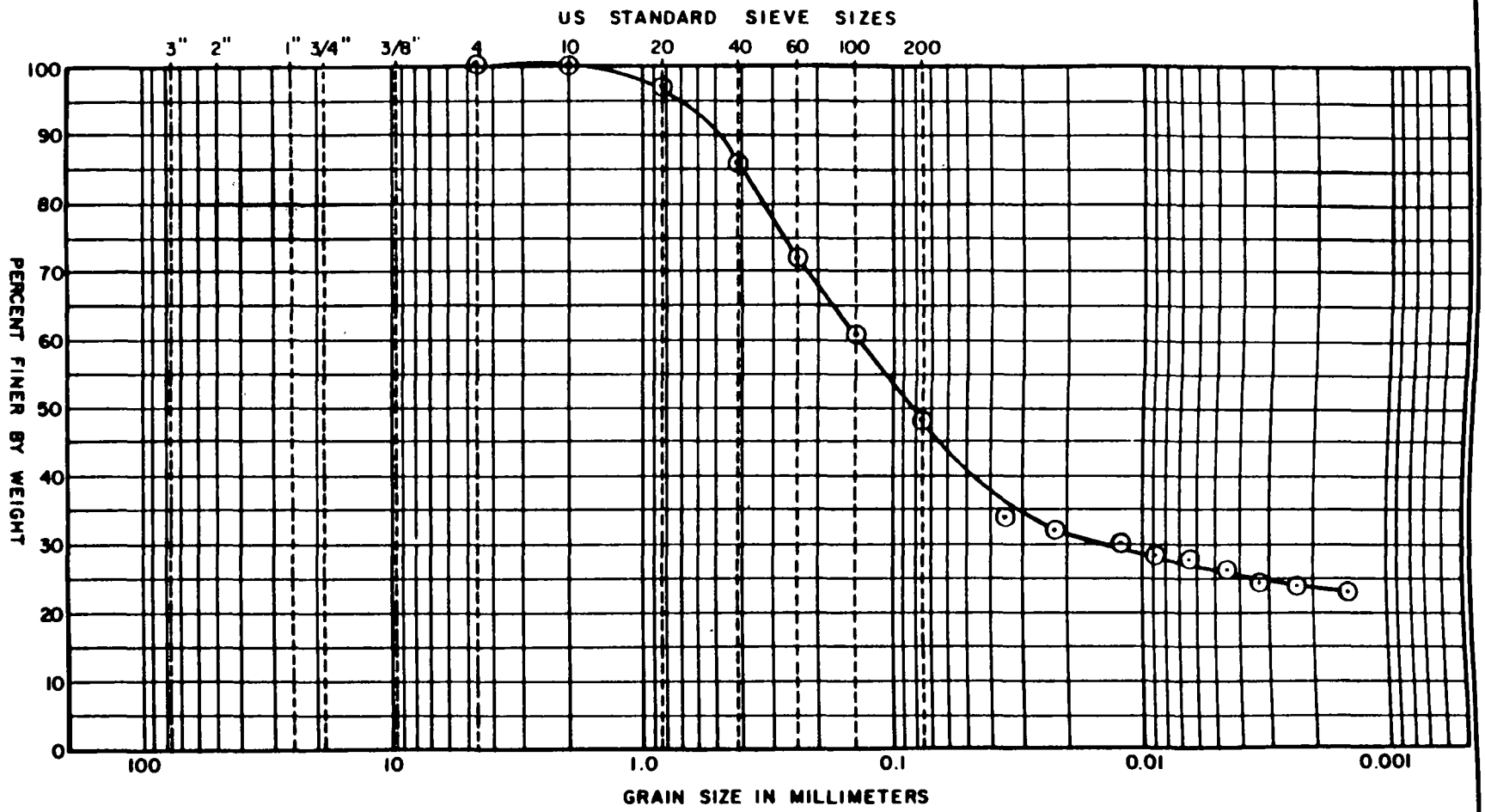
Golder Associates

Drawn BP
Checked WDM
Reviewed WDM

AF 268156

3 10 00344

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P-22 SA-4	18.5-20.0	---	--	--	--	Fine to medium SAND and clayey silt (SC)

FIGURE F-14

Golder Associates

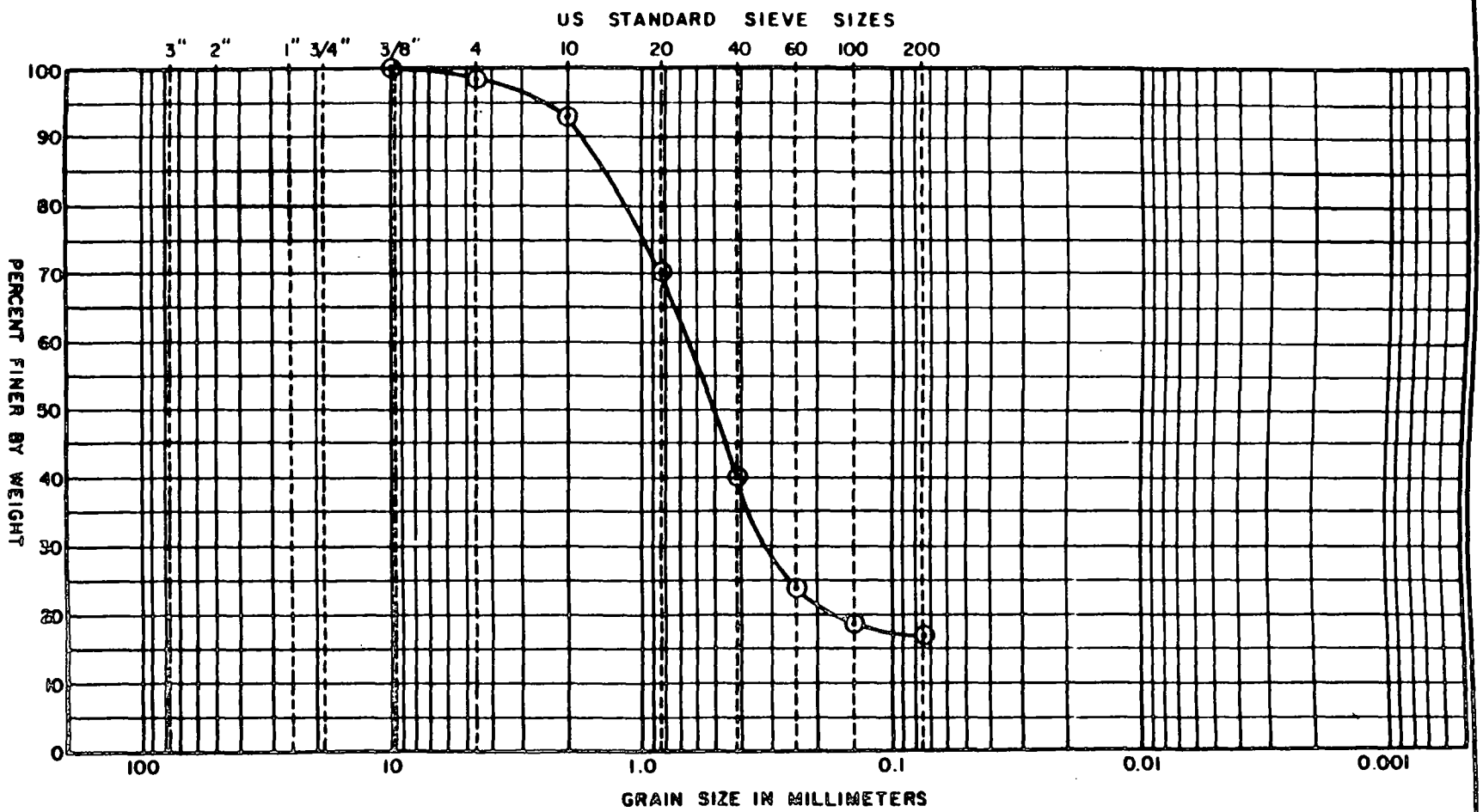
Date 12-18-85
Job No. 853-3079.8

Drawn BJP
Checked MTF
Reviewed MTF

AF 2681 SC

3 10 00345

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	ELEV. OR DEPTH	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
P-22 SA-5	28.5-30.0	---	--	--	--	Fine to medium SAND, some clayey silt (SM)

FIGURE F-18

Date 12-18-85
Job No. 853-3079.8

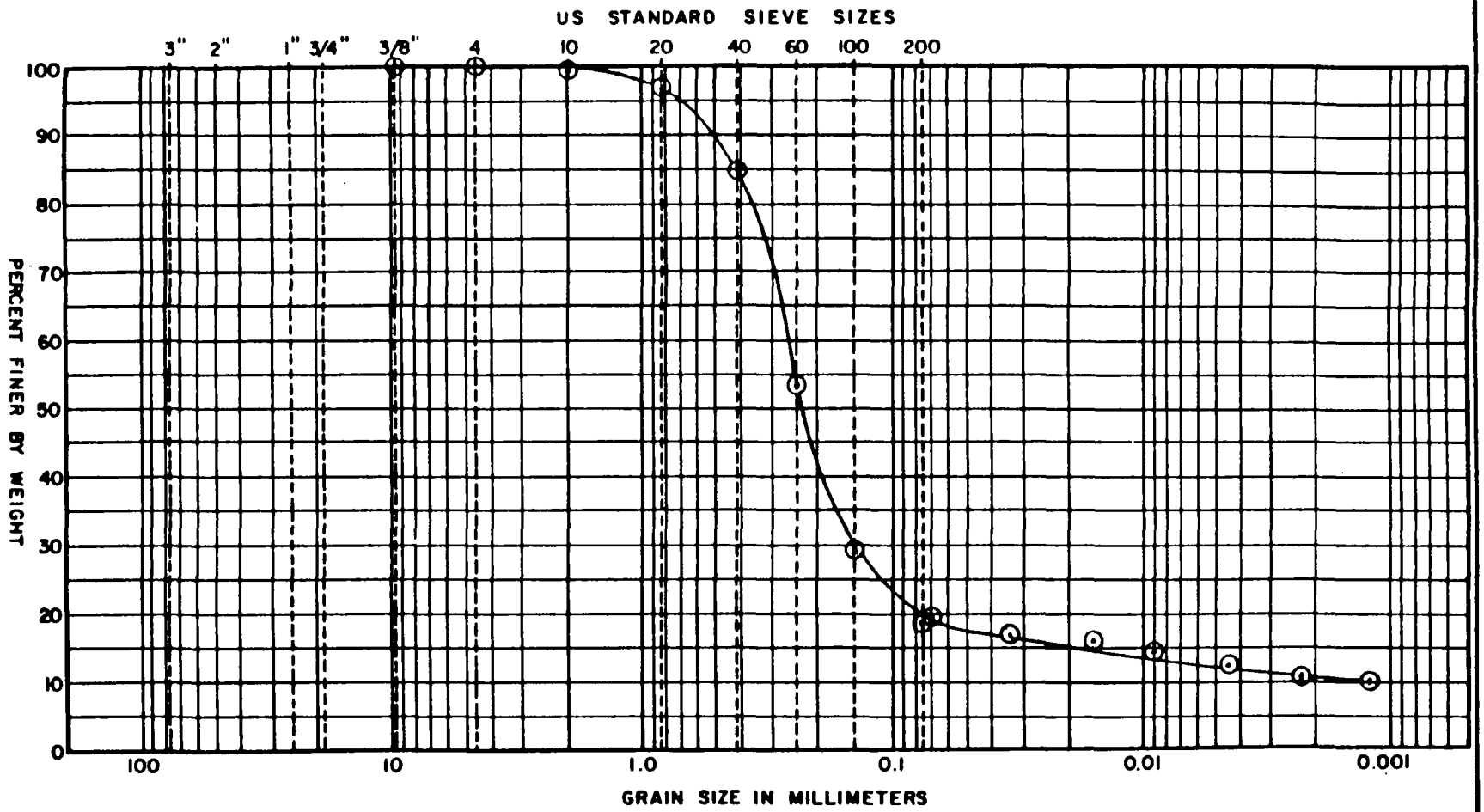
Golder Associates

Drawn BJP
Checked MTF
Reviewed MTF

AF 2581G

3 10 00346

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	Depth	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
DW 1 SA-7	103.0-104.5	--	--	--	--	Tan-light brown medium to fine SAND, some silty clay. (SC)

Date 4-3-85
Job No. 853-3079.10

Golder Associates

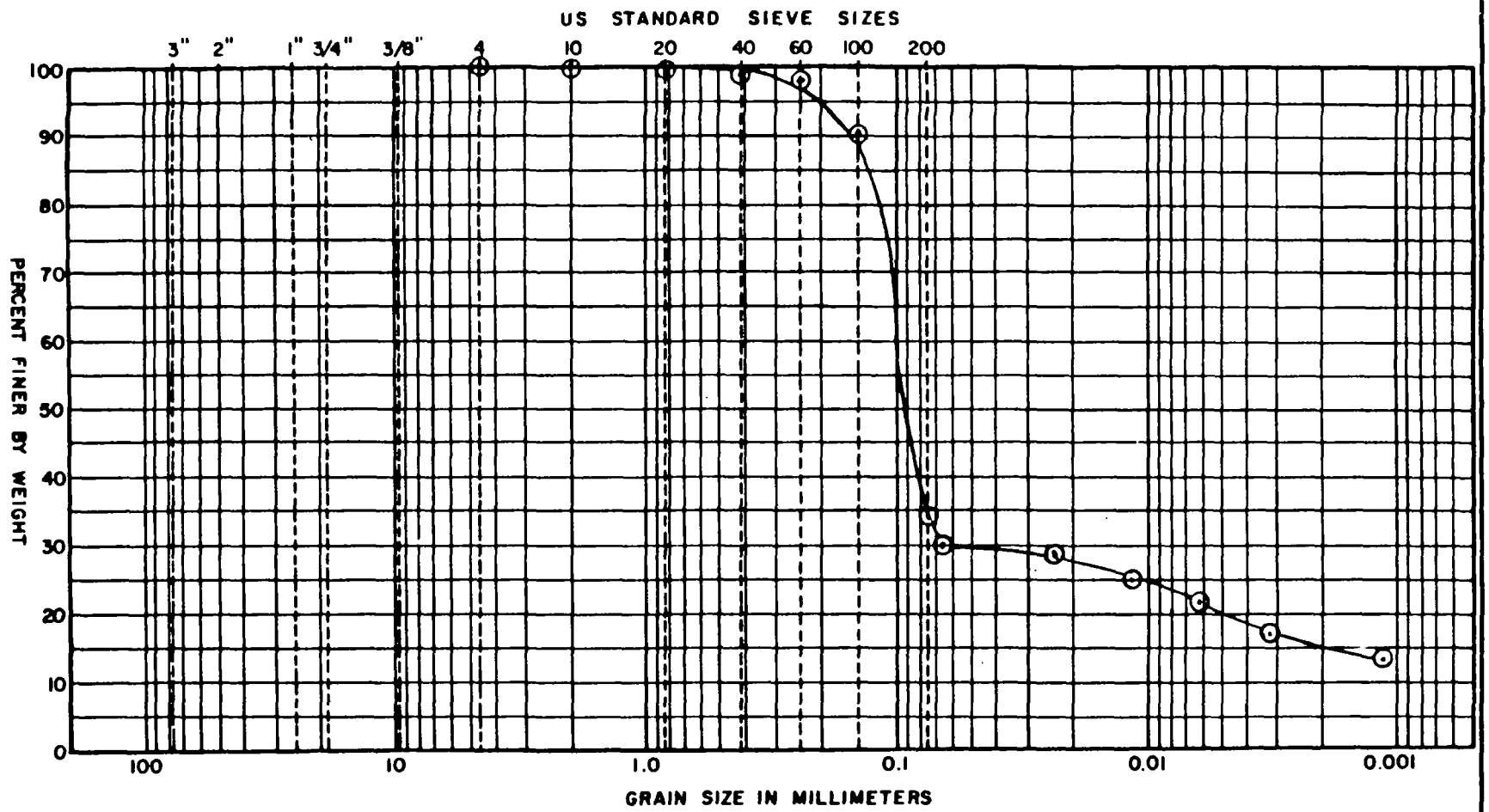
Drawn WDM
Checked GGR
Reviewed WDM

FIGURE F-16

AF 268166

GRAIN SIZE DISTRIBUTION

3 10 00347



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	Depth	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
DW 2 SA-7	84.0-85.0'	--	--	--	--	White-gray fine SAND, and clayey silt. (SM)

Date 4-3-85
Job No. 853-3079.10

Golder Associates

Drawn WDM
Checked GGR
Reviewed WDM

FIGURE F-17

AF 268196

AF 268156

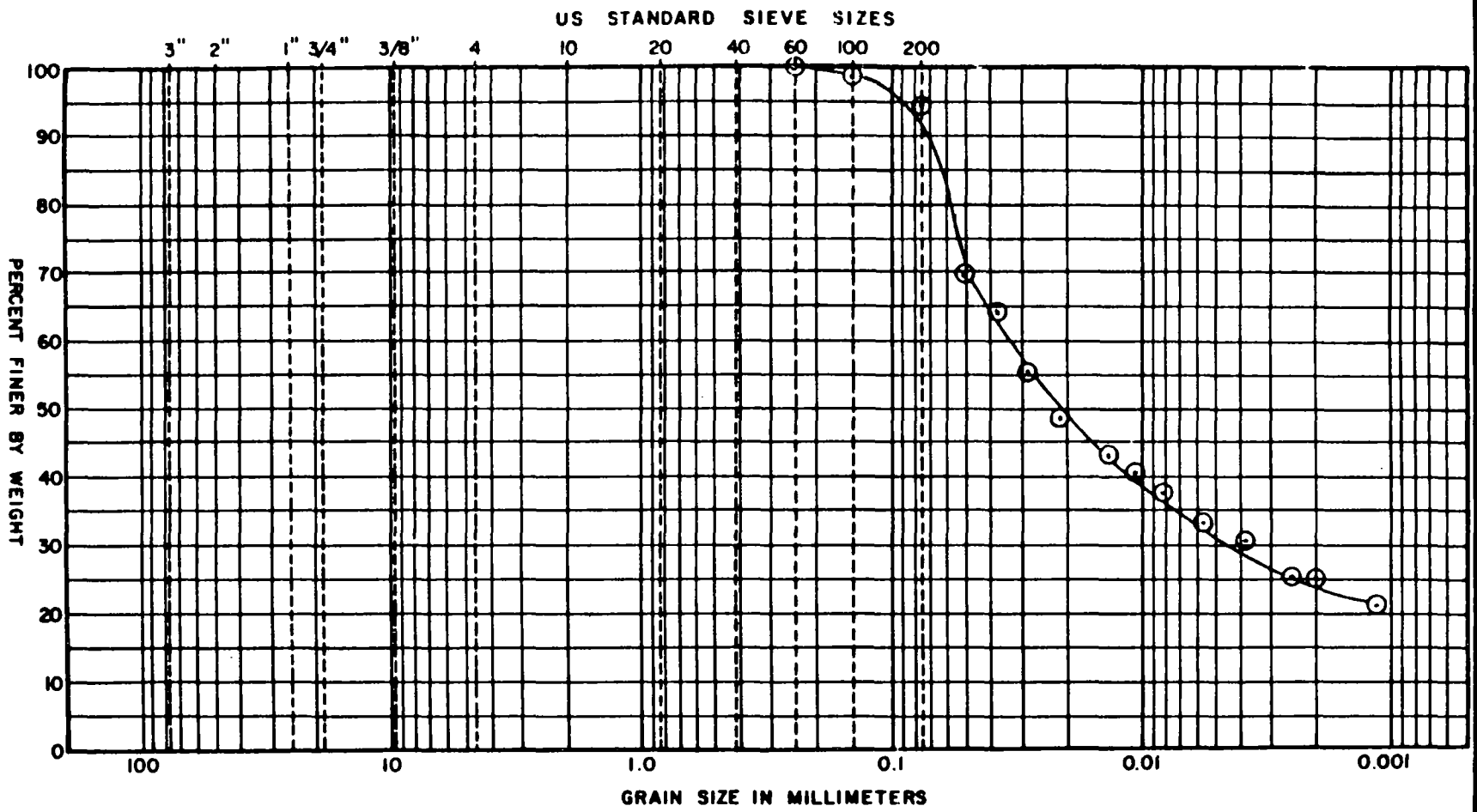
Date 5/8/85
Job No. 853-3079.10

Golder Associates

Drawn WDM
Checked WDM
Reviewed WDM

3 10 00348

GRAIN SIZE DISTRIBUTION



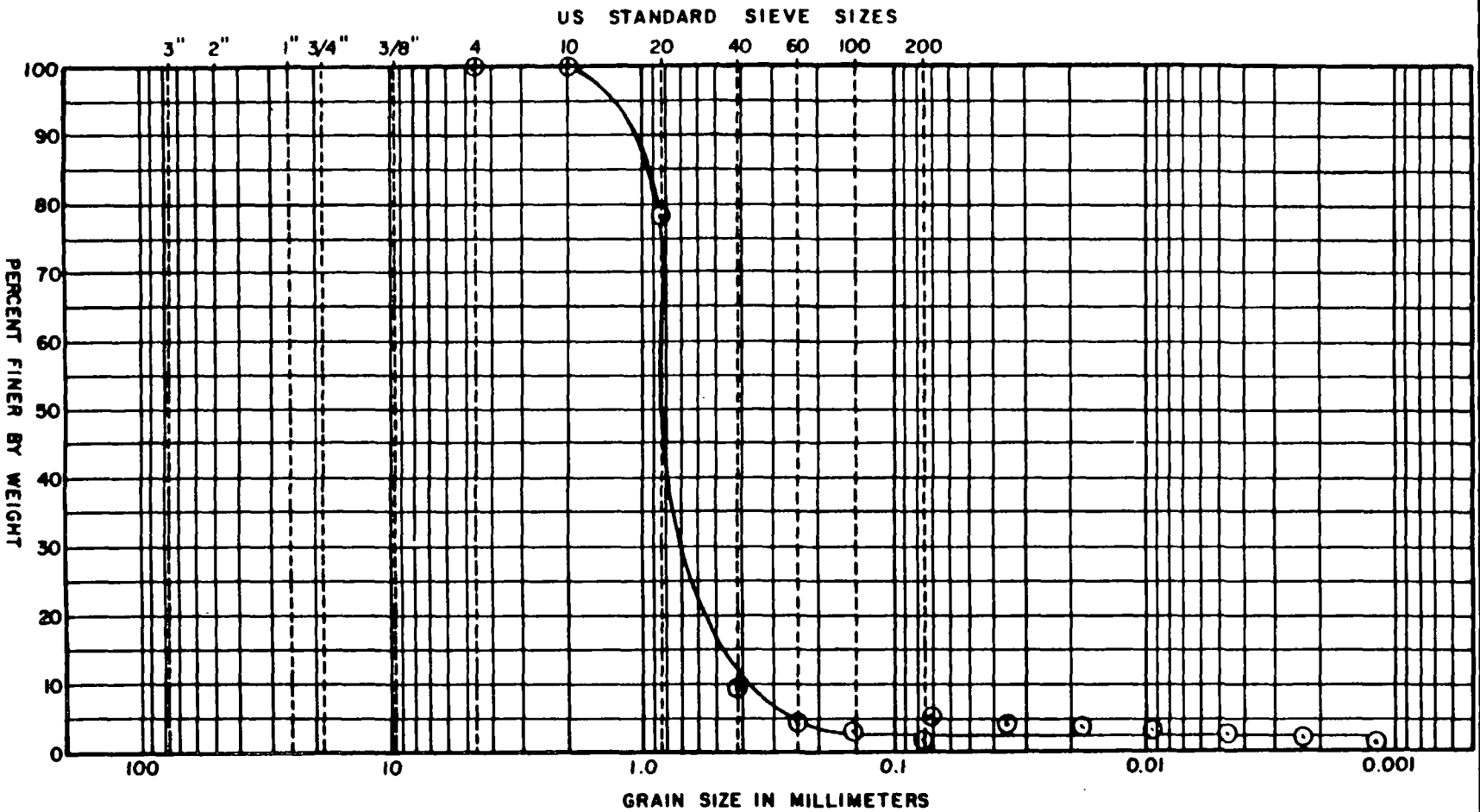
COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	Depth	W_n	W_L	W_p	I_p	DESCRIPTION OR CLASSIFICATION
DW3 SA-1	58'-60'	29.0	26	17	9	Gray CLAYEY SILT. (CL)

FIGURE F-18

3 10 00349

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~ELEV. OR~~ DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
DW3	110-110.5	--	--	--	--	Tan medium SAND, trace silt
SA-4						(SP)

Date 4-3-85
Job No. 853-3079.10

Golder Associates

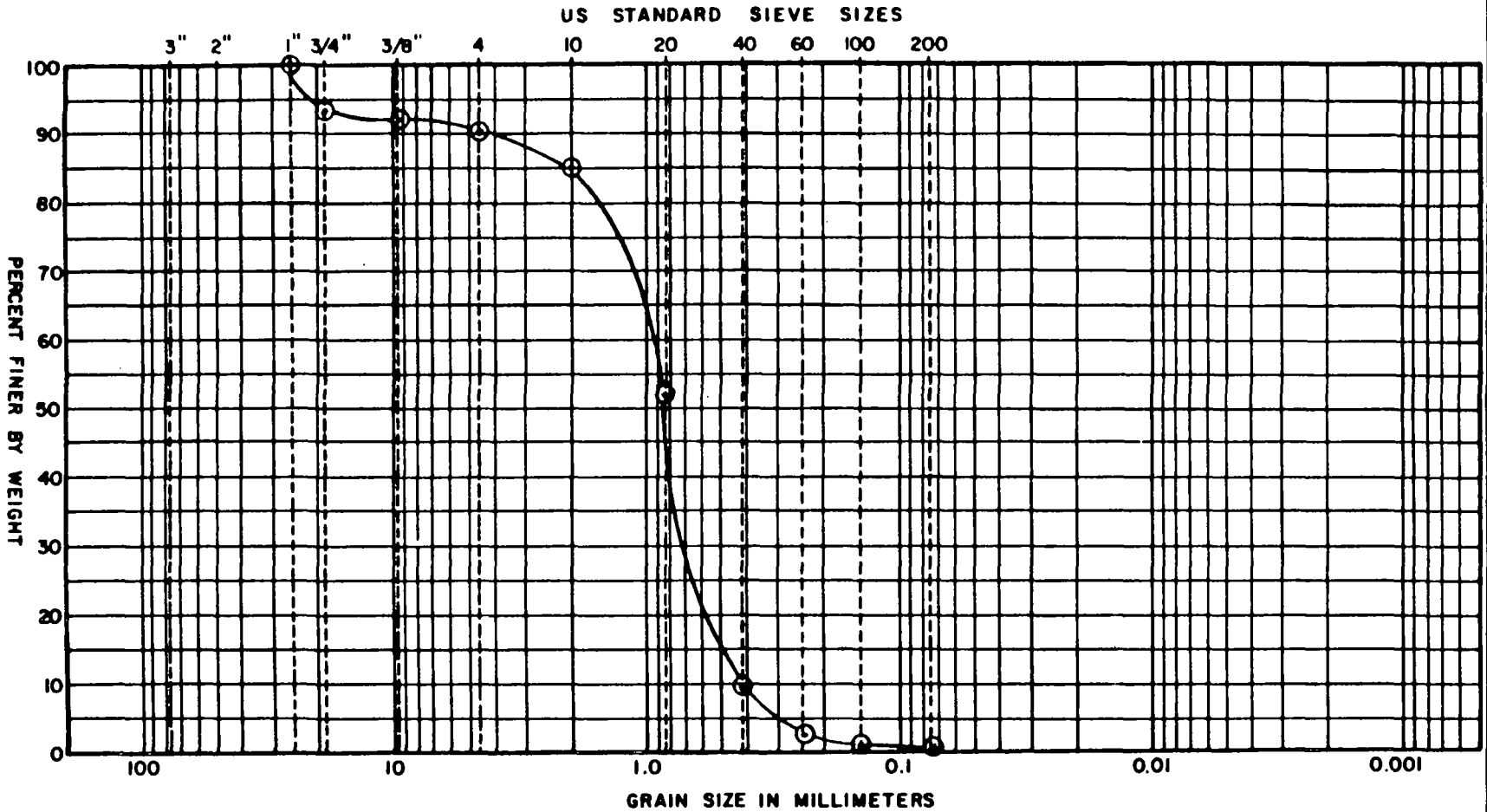
Drawn WDM
Checked GGR
Reviewed WDM

FIGURE F-19

AF 258160

3 10 00350

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO.	~~ELEV OR~~ DEPTH	W_n	W_L	W_P	I_P	DESCRIPTION OR CLASSIFICATION
T-6	40-41.5	--	--	--	--	Medium SAND, little coarse gravel
SA-4						(SP)

Date 9/27/85
Job No. 853-3079.10

Golder Associates

Drawn BP
Checked BP
Reviewed WDM

FIGURE F-20

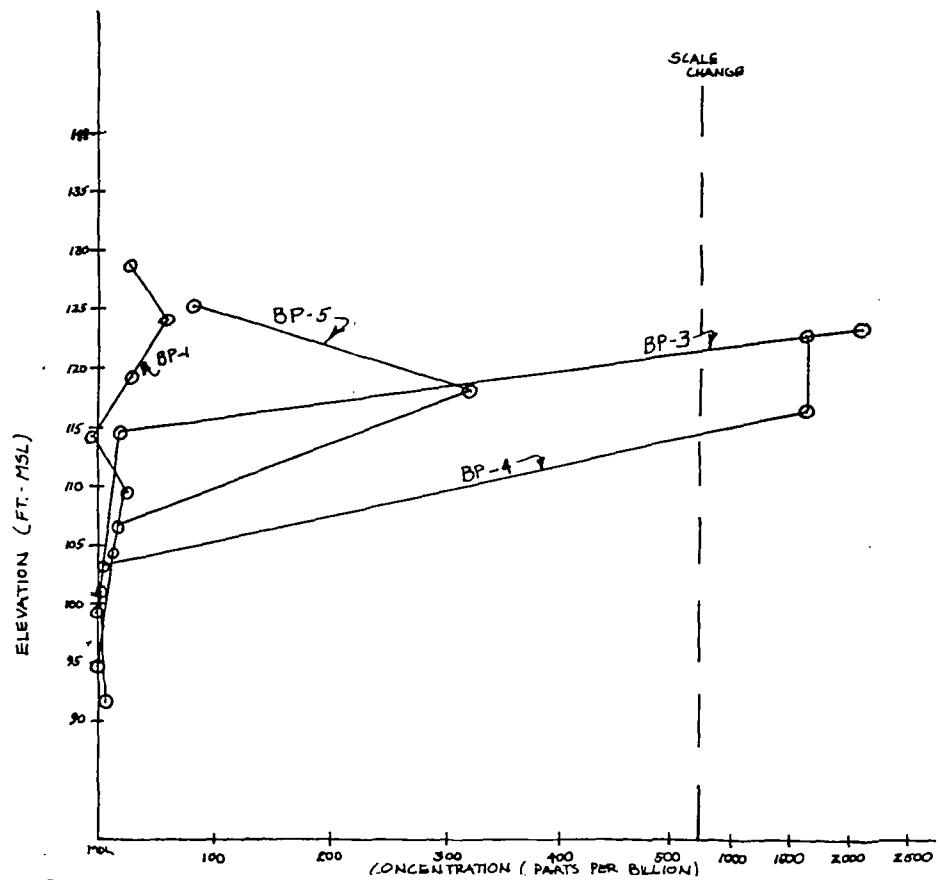
AF 268165

3 10 00351

APPENDIX G

Plots of Contamination vs Depth

3 10 00352

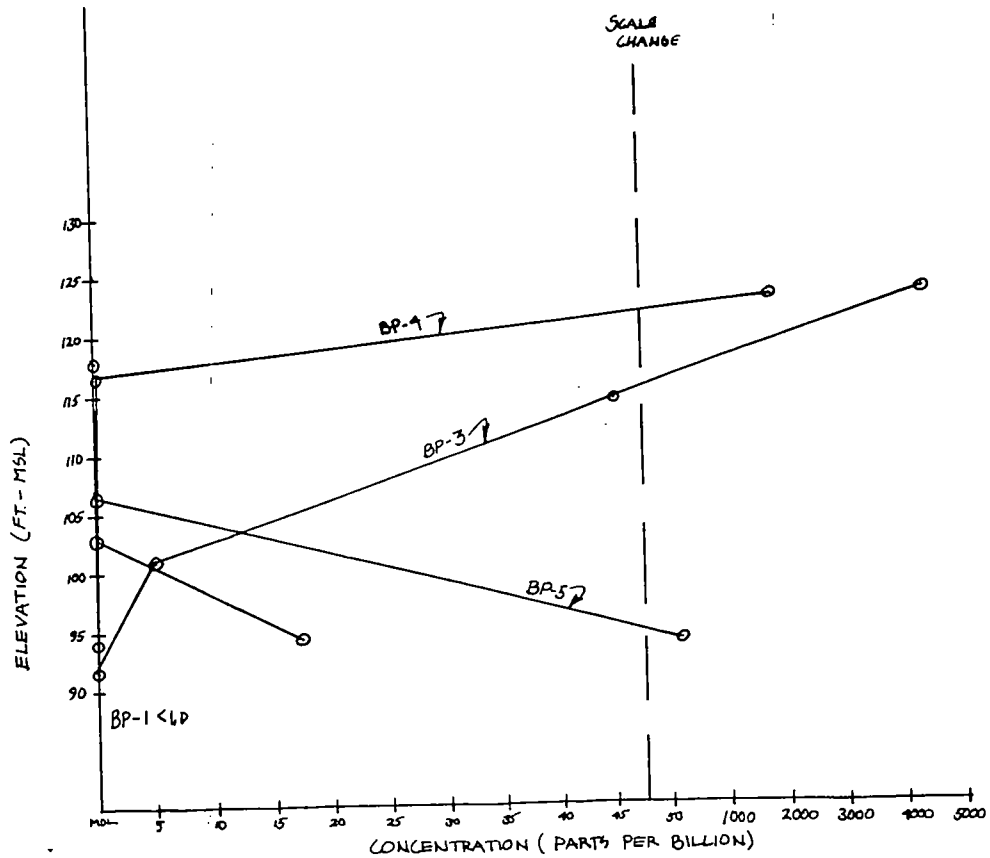


NOTE: DATA TAKEN FROM SAMPLES TAKEN BETWEEN 3/85 TO 5/85.

JOB NO 853-3079	SCALE AS SHOWN	BENZENE CONCENTRATION	
DRAWN JDC	DATE 7/1/85		
CHECKED MTF	DWG NO —		
Golder Associates		SCDHEC	FIGURE G-1

3 10 00353

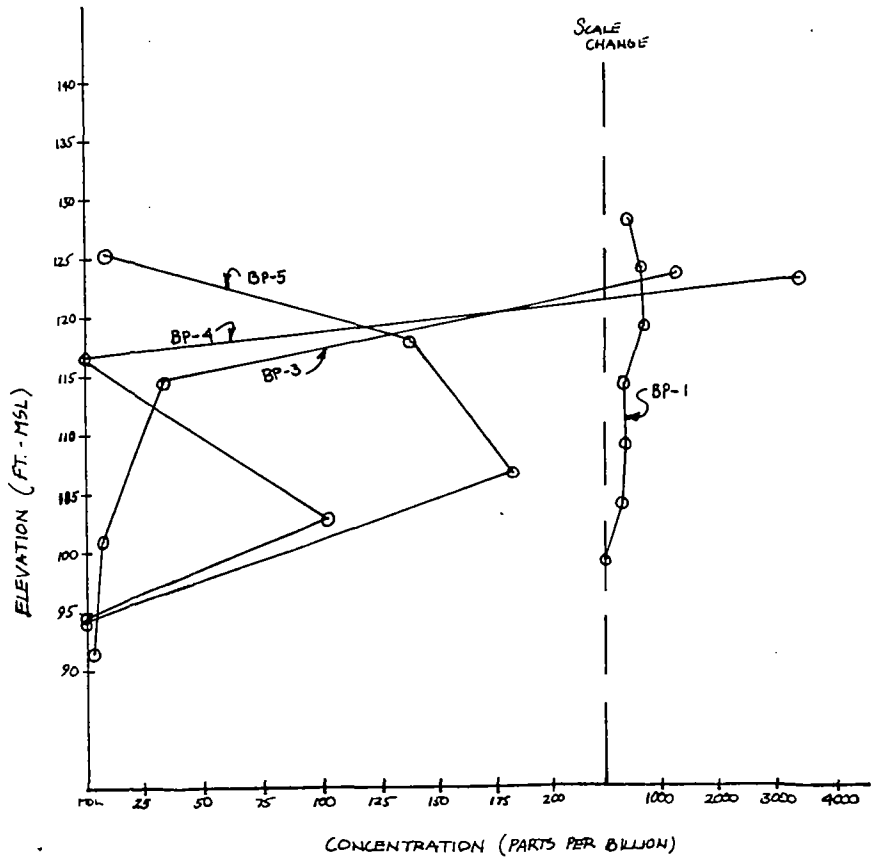
A : 20440C-D



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85.

JOB NO.	853-3079	SCALE	AS SHOWN	CARBON TETRACHLORIDE CONCENTRATION
DRAWN	JDC	DATE	7/1/85	
CHECKED	MTF	DWG. NO	—	
Golder Associates				SCDHEC — FIGURE G-2

3 10 00354

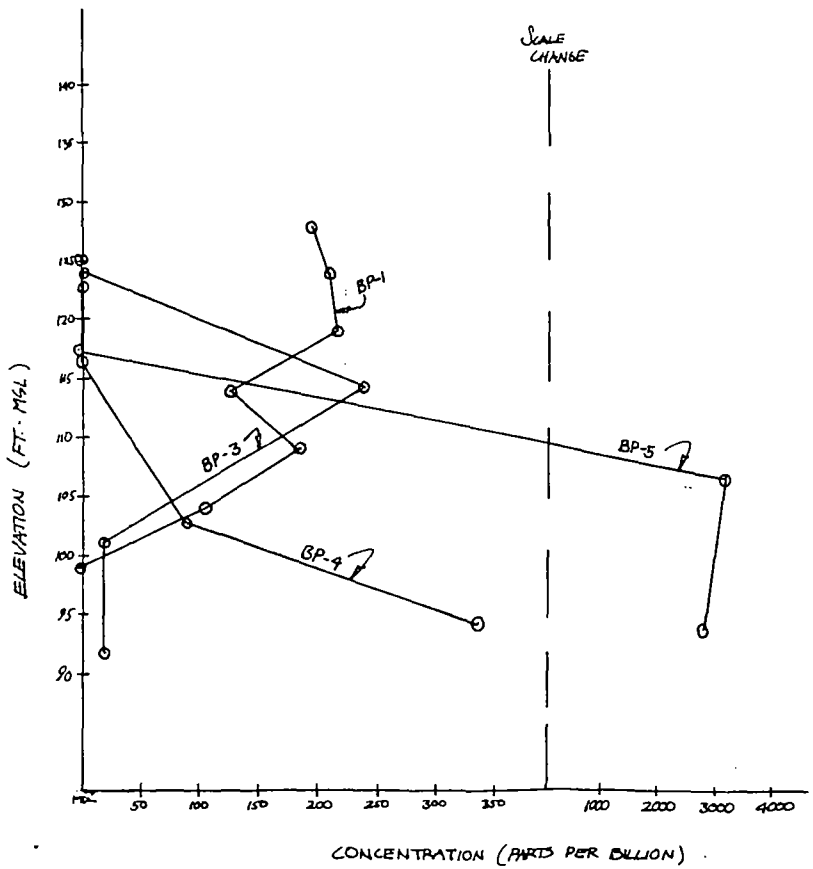


NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85.

JOB NO 853-3079	SCALE AS SHOWN	CHLOROFORM CONCENTRATION	
DRAWN JDC	DATE 7/1/85		
CHECKED MTF	DWG. NO —		
Golder Associates		SCDHEC	FIGURE G-3

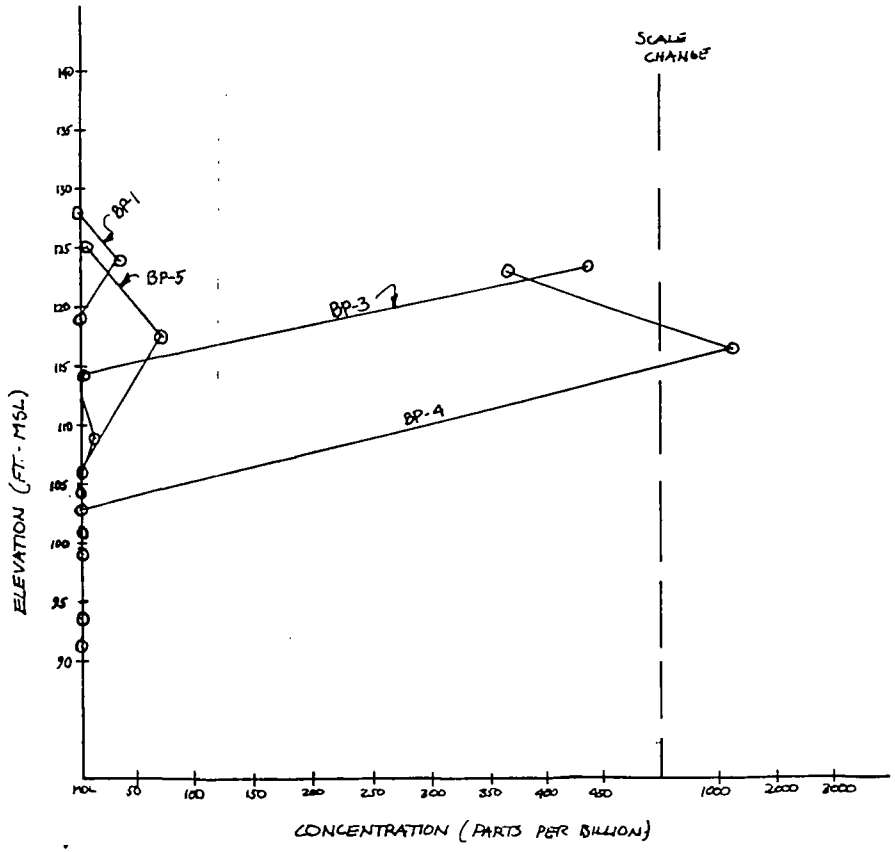
3 10 00355

A.F. 3440C-D



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

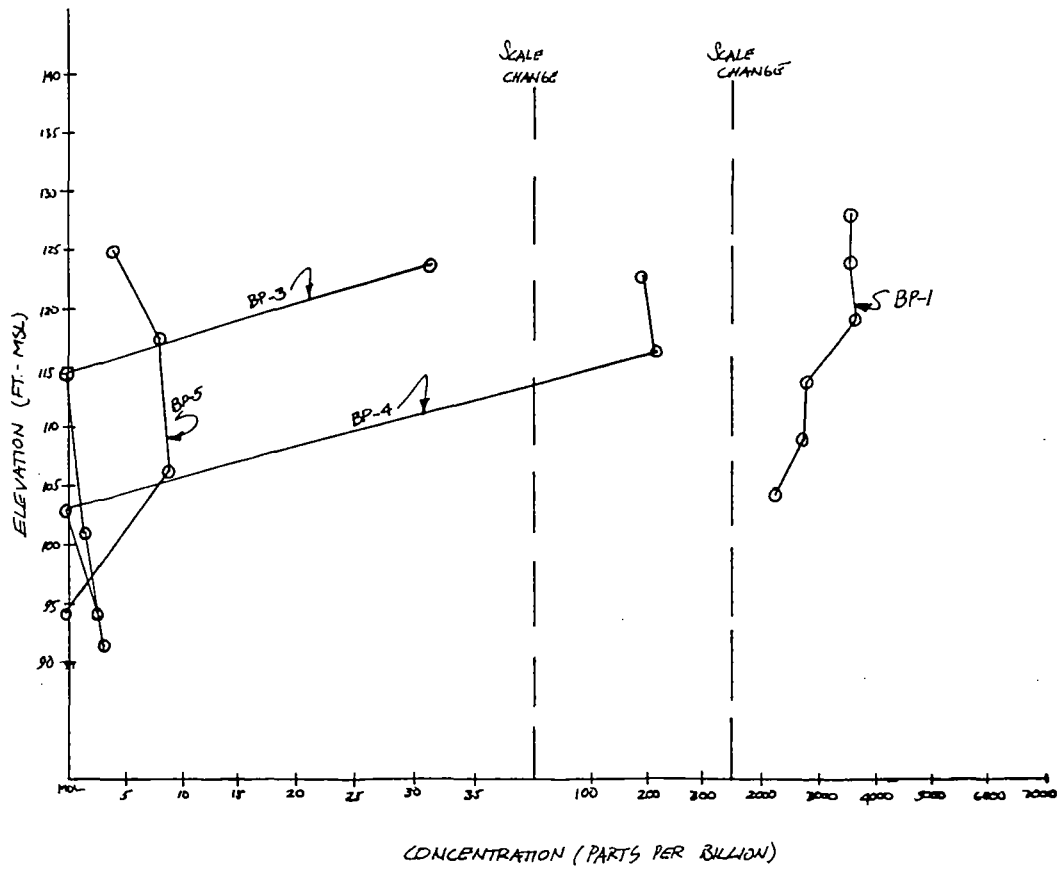
JOB NO	853-3079	SCALE	AS SHOWN	1, 1 DICHLOROETHYLENE CONCENTRATION
DRAWN	JDC	DATE	7/1/85	
CHECKED	MTF	DWG. NO	—	
Golder Associates				SCDHEC — FIGURE G-4



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85.

JOB NO	853-3079	SCALE	AS SHOWN	ETHYLBENZENE CONCENTRATION
DRAWN	JDC	DATE	7/1/85	
CHECKED	MTF	DWG. NO	—	
Golder Associates				SCDHEC — FIGURE G-5

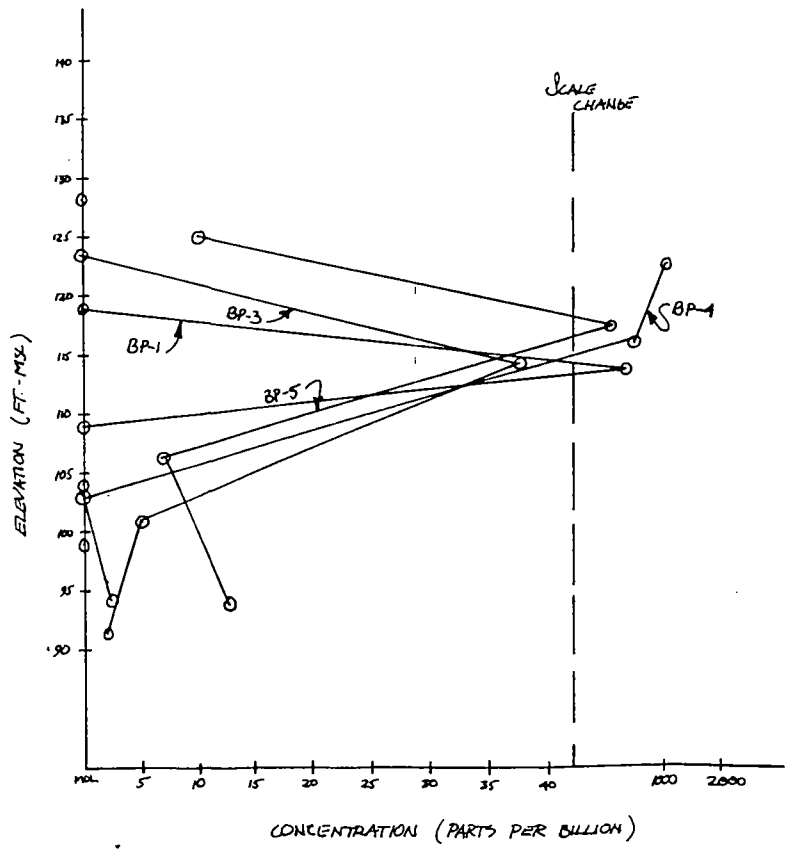
3 10 00357



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85.

JOB NO 853-3079	SCALE AS SHOWN	METHYLENE CHLORIDE CONCENTRATION	
DRAWN JDC	DATE 7/1/85		
CHECKED MTF	DWG. NO —		
Golder Associates		SCDHEC	FIGURE G-6

3 10 00358

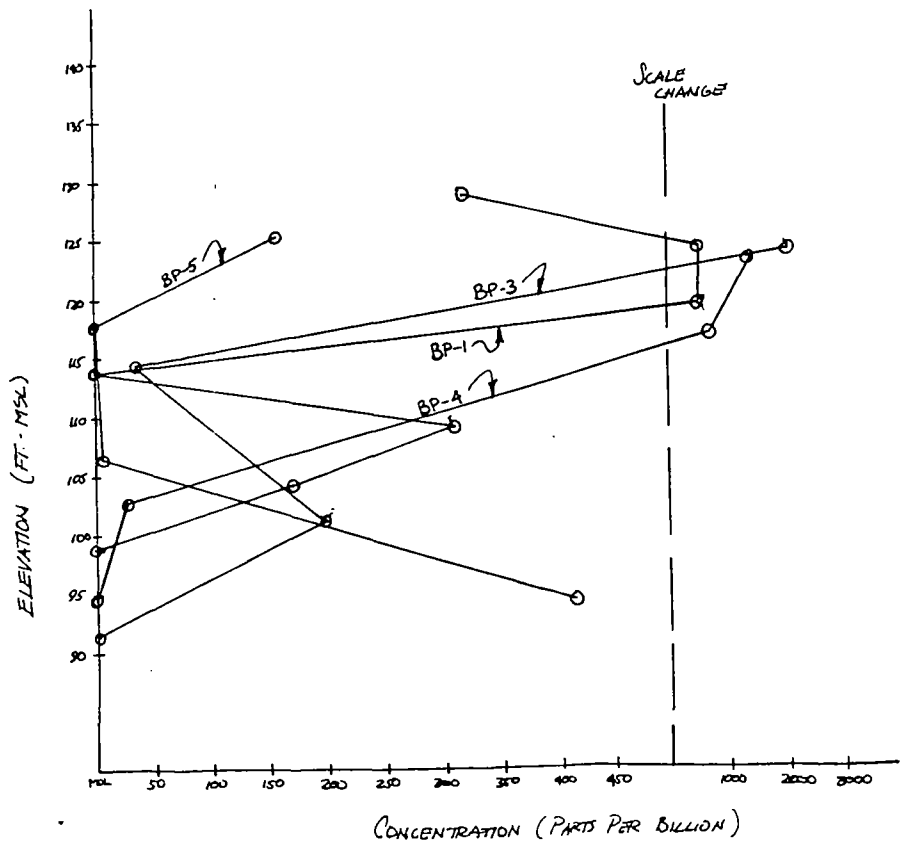


NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85.

JOB NO. 853-3079	SCALE AS SHOWN	1,1,2,2. TETRACHLOROETHANE CONCENTRATION
DRAWN JDC	DATE JULY 1, 1985	
CHECKED MTF	DWG. NO	
Golder Associates	SCDHEC	FIGURE G-7

3 10 00359

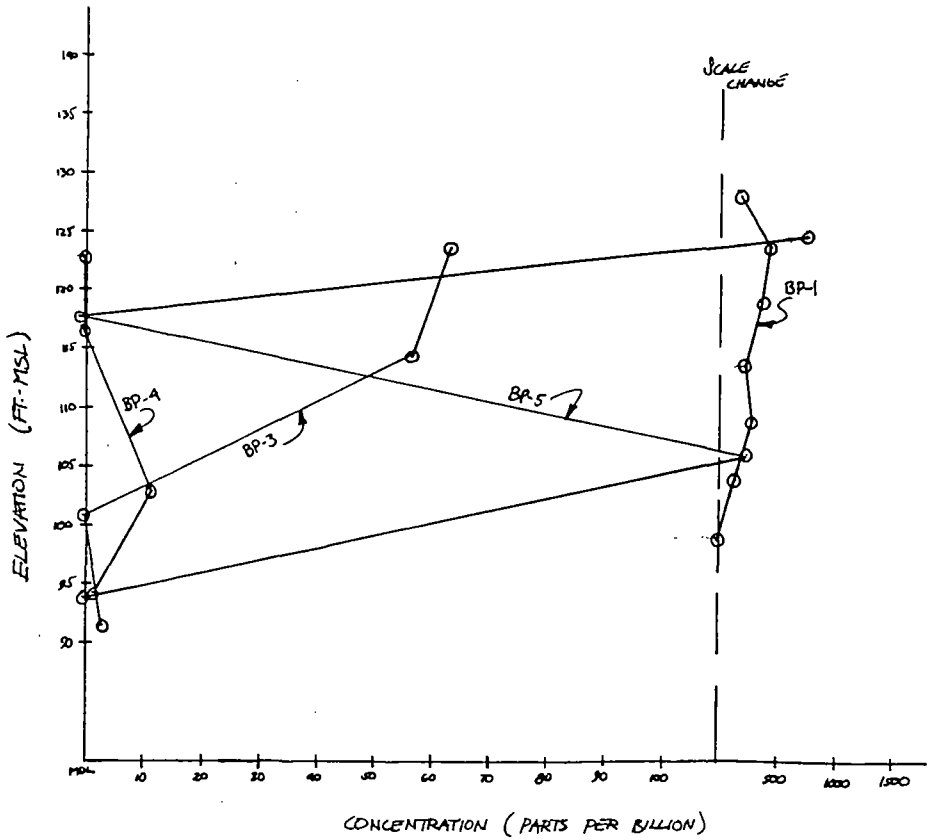
A F 10440C-D



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

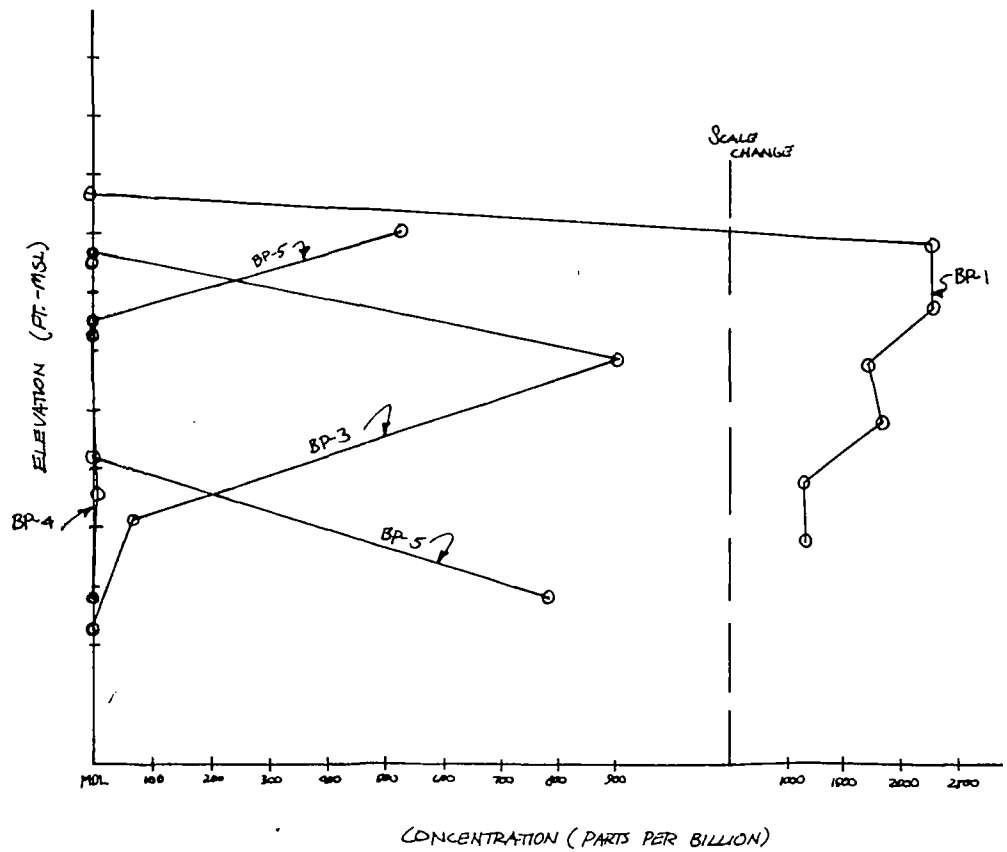
JOB NO 853-3079	SCALE AS SHOWN	TETRACHLOROETHYLENE CONCENTRATION	
DRAWN JDC	DATE JULY 1, 1985		
CHECKED MTF	DWG NO		
		SCDHEC	FIGURE G-8

3 10 00360



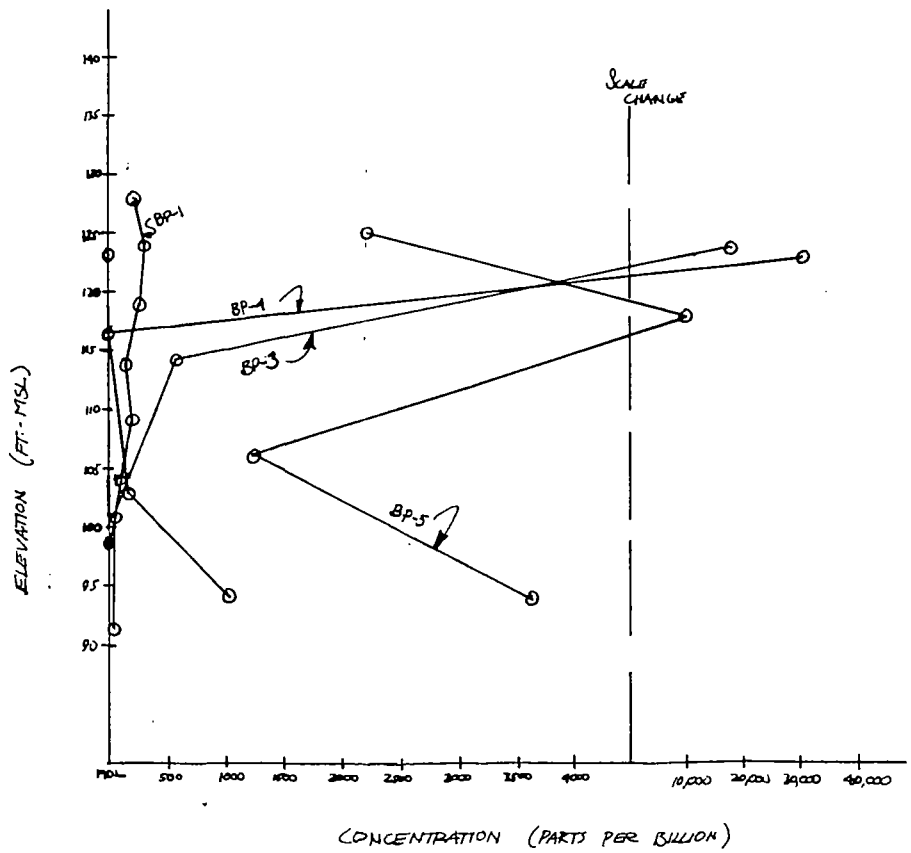
NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

JOB NO 853-3079	SCALE AS SHOWN	TOLUENE CONCENTRATION	
DRAWN JDC	DATE JULY 1, 1985		
CHECKED MTF	DWG. NO.		
Golder Associates		SCDHEC	FIGURE G-9



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

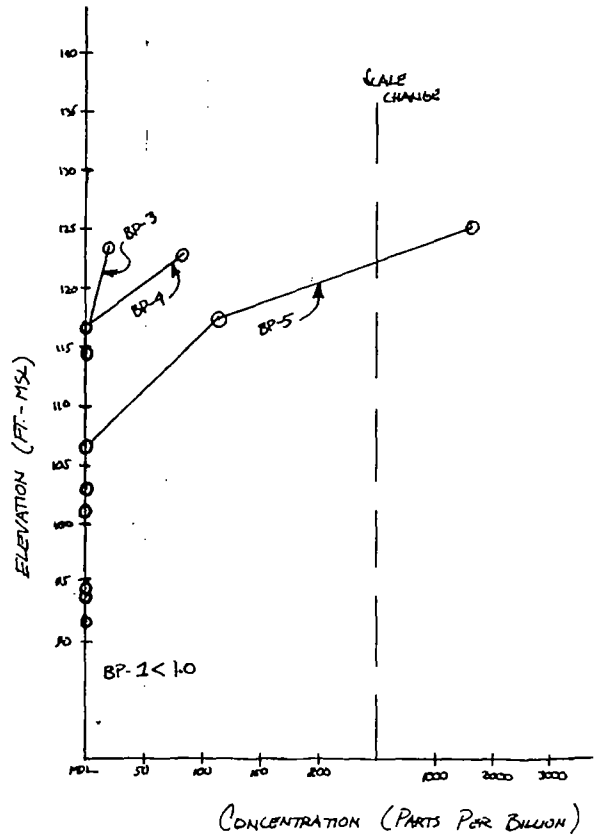
JOB NO 853-3079	SCALE AS SHOWN	1,2-TRANS-DICHLOROETHYLENE CONCENTRATION
DRAWN JOC	DATE JULY 1, 1985	
CHECKED MTF	DWG. NO	
Golder Associates		SCDHEC — FIGURE G-10



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

JOB NO 853-3079	SCALE AS SHOWN	1,1,1 TRICHLOROETHANE CONCENTRATION
DRAWN JDC	DATE JULY 1, 1985	
CHECKED MTF	DWG. NO. —	
Golder Associates	SCDHEC	FIGURE G-11

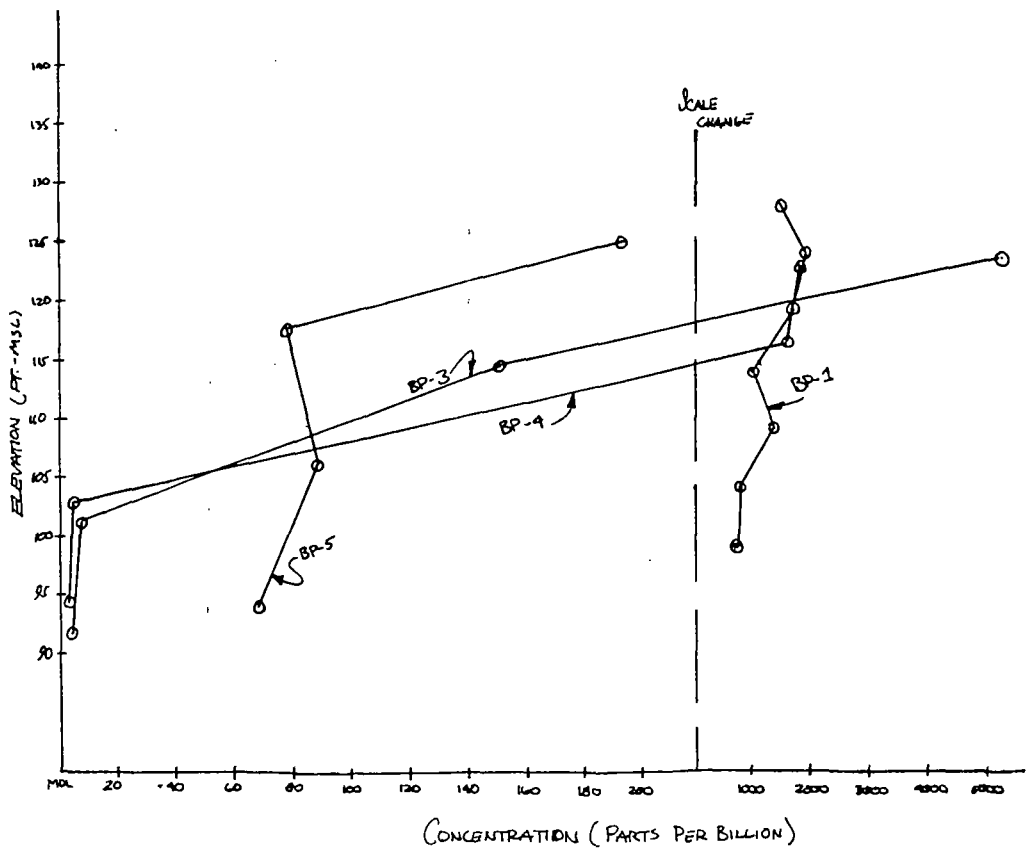
3 10 00363



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

JOB NO 853-3079	SCALE AS SHOWN	1,1,2 TRICHLOROETHANE CONCENTRATION	
DRAWN JDC	DATE JULY 1, 1985		
CHECKED MTF	DWG. NO —		
Golder Associates		SCDHEC	FIGURE G-12

3 10 00364



NOTE: DATA FROM SAMPLES TAKEN 3/85 TO 5/85

JOB NO 853-3079	SCALE AS SHOWN	TRICHLOROETHYLENE CONCENTRATION	
DRAWN JDC	DATE JULY 1, 1985		
CHECKED MTF	DWG. NO		
Golder Associates		SCDHEC	FIGURE G-13

3 10 00365

APPENDIX H

Results of Surficial Aquifer Pumping Test

3 10 00366

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

Final Report on

SURFICIAL AQUIFER PUMPING TEST BLUFF ROAD SITE RICHLAND COUNTY, SOUTH CAROLINA

Prepared For:

South Carolina Department of Environmental
and Health Control
2600 Bull Street
J. Marion Sims Building
Columbia, South Carolina 29201

DISTRIBUTION:

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April 1986 853-3079.11

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3 10 00367

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1.0 INTRODUCTION

Golder Associates has conducted a pumping test at the Bluff Road site in Richland County, South Carolina. The purpose of the pumping test was to determine the hydraulic characteristics of the surficial sand aquifer present at the site. The pumping test was conducted as part of the Remedial Investigation which Golder Associates conducted at this site under contract to the South Carolina Department of Health and Environmental Control (SCDHEC). This report is an appendix to the Remedial Investigation Report and describes the pumping test setup, operation, and results. The report also presents all data collected during the test. Other relevant information, such as detailed site stratigraphy, is presented in the main text of the Remedial Investigation Report.

The pumping test was conducted in December 1985. The pumping well was installed and developed between December 16 and December 19, 1985 and the pump test was conducted from December 21 to December 23, 1985. Analysis of the pump test results and determination of aquifer hydraulic properties was completed in January, 1986.

2.0 TEST SETUP

The pumping well, Well O-1, was located approximately 800 feet from Bluff Road in the area directly behind the former South Carolina Recycling and Disposal (SCR&D) facility. The pumping well was located so that a large number of existing wells could be used as observation wells and for easy access by a drill rig. Observation wells were located at various directions and distances surrounding the pumping well and consisted of the following selected groundwater monitoring wells: BP-1, BP-2, BP-4, BP-5, DW-1, P-6, P-7, P-8, P-9, P-13, P-15, P-18, W-6, W-7, W-8, W-10 and W-11. One additional observation well, Well O-2, was installed in order to obtain water level data close to the pumping well. The locations of the pumping and observation wells are shown on Figure H-1, attached.

The pumping well was installed using an outside surface casing of 10 inch diameter PVC, which extends to 11 feet below ground surface. Six inch galvanized steel well screen was used to screen the entire length of the aquifer, with 6 inch galvanized steel pipe extending from the top of the well screen to the surface. A sand pack was added around the screen and bentonite pellets were used to seal the borehole above the screen. The well installation log presented in Appendix H-1 of this report includes detailed well installation information and well development notes.

A step drawdown test was performed to find the approximate efficiency of the pumping well. It was determined that at a pumping rate of about 100 gpm well losses did not affect the results of the pump test. Appendix H-2 presents the step test results and well loss calculations.

Well 0-2 was installed 46 feet from the pumping well. It was screened the entire length of the aquifer using 2 inch diameter PVC well screen wrapped in filter fabric. All PVC pipe and screen, and filter fabric was steam cleaned prior to their use to insure that no contamination was introduced to the well. The natural formation was allowed to collapse around the screen, and some sand was added to the borehole around the upper portion of the screen. A bentonite seal was placed above the screen. Refer to the monitoring well installation log, included in Appendix H-1, for more detailed well installation information.

Water removed from the pumping well during well development, the step test, and the pump test, was pumped into the on-site surface lagoon shown in Figure H-1. A 3-inch PVC line with spray nozzle outlets was used to carry the water from the pumping well. The spray nozzle outlets were installed so that the water would be sprayed into the air before it entered the lagoon. The spary nozzles allowed Golder Associates to conduct a field experiment concerning the effectiveness of aeration in removing contaminants from water. The results of this experiment are discussed in Section 5.0 of this report.

Appendix H-3 contains plotted water level history data for each well monitored during the pump test. These graphs show the drawdown of each well during the pump test, and selected wells during the step test. Also, the general trend in groundwater elevations from December 13 through the end of the pump test can be seen. Refer to Appendix H-4 for the water level measurement data taken during this time. The tables in this Appendix were used to create the water level history plots, and log-log plots used to analyze the pump test (see Section 4.0).

3.0 TEST OPERATION

The drawdown portion of the pump test was started at 9:50 AM on December 21 and completed at 8:35 AM the following day, for a total pumping time of 22 hours, 45 minutes. The pumping rate during the test averaged 102.7 gallons per minute, and was monitored every 10 minutes during the first two hours of the test. Flow measurements were made less frequently after it was clear that the flow rate was stable. During the test, the pumping rate did not deviate more than 1.5 gpm from the overall average except during the first hour of the test. The deviation during the first hour of the test was due to freezing of the spray outlets before the test began causing the flow to be restricted. This did not have a significant effect on the results of the pump test because the flow was restricted only slightly, and once the outlets were unclogged, they did not freeze again.

The water levels in the observation wells close to the pumping well were measured at intervals of 5 minutes or less during the first hour of pumping. These wells were BP-2, O-2, P-8, and P-9. Water levels in observation wells BP-4, BP-5, DW-1, W-6, W-7, W-8, W-10, and W-11 were measured approximately every 15 minutes during the first hour. Levels in Wells P-7, P-13, P-15 and BP-1 were not measured during the first hour because they were not expected to respond during the early part of the test due to their greater distance from the pumping well. All of the observation

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wells were measured according to the following schedule after the first hour.

Time Since Start of Pump Test (hr.)	Time Increment Between Water Level Measurements (min.)
1-2	15
2-4	30
4-8	60
8-16	120
16-24	240

Water levels in Wells P-6 and P-18 were measured periodically during the test. The water levels are considered background data because these wells were outside of the area of influence of the pumping well. Water levels measured in these wells were used to determine the trend in the static water level during the pump test. See Appendix H-4 for tables showing the exact time that the water level measurements were taken.

The recovery portion of the test started at 8:35 AM on December 22 when pumping was stopped. Data was obtained during the recovery period to compare with that obtained during the the drawdown portion of the pump test. The drawdown and recovery portions of this test were not expected to be identical to each other because the surficial aquifer at the Bluff Road site was expected to have some delayed yield response. Also, it was thought that the wells near the surface lagoon would be effected by the recharge from the lagoon due to the water being pumped into the lagoon.

The procedure followed during the recovery portion of the test was similar to that of the drawdown portion. Observation wells close to the pumping well, Wells BP-2, BP 5-1, 0-2, P-8 and P-9 were measured more frequently during the first part of the test, and less frequently as the recovery period went on. After the first hour of recovery measurements were made using the same schedule used during pumping. See Appendix H-4 for the exact times of water level measurement.

Water levels in Wells BP-4, W-6, W-8, W-10, and W-11 recovered faster than they were drawndown. These wells were close enough to the lagoon to be affected by the recharge that it provides. Note that this lagoon was empty at the start of pumping and filled during the test with the discharge from the pumping well. The other observation wells that were monitored during this test recovered at approximately the same rate as they were drawn down. Any deviation in recovery vs. drawdown of wells not in the area of influence of the lagoon is caused by delayed yield, which will be discussed in the next section.

4.0 TEST RESULTS

The data that was obtained during the pump test was used to calculate the following hydraulic properties of the surficial sand aquifer: hydraulic conductivity, transmissivity, and specific yield. Appendix H-5 contains drawdown water level measurements at the observation wells plotted vs. time on a log-log scale. If the surficial aquifer at the Bluff Road site were fully unconfined, the curves would rise quickly at first, and then flatten out and converge to a steady state drawdown value. However, most of the curves in Appendix H-5 rise quickly at the start of the pump test, start to flatten out, but then start to rise again. This kind of response indicates a delayed yield effect which is caused when drainage from the top layer of soil is not immediate. This condition exists in the surficial aquifer at the Bluff Road site because the top 2-10 feet of the aquifer is sand with some silt or clay, while the deeper portions of the aquifer is sand with a trace of silt. The observation wells that did not display a delayed yield response, displayed a confined aquifer response. The reason for the two different types of responses will be discussed later in this section. To analyze the pump test, Boulton's method was chosen because it was developed to determine the hydraulic properties of aquifers that show either delayed yield or confined responses.

An assumption used to derive the Boulton method is that the aquifer properties are constant in the horizontal direction. Although this condition can never be fully satisfied in nature, it can be nearly satisfied. To determine that this assumption was satisfied on this project, a plot of maximum observed drawdown versus distance of observation well from the pumping well was made (see Figure H-2).

If the assumption of uniform horizontal properties is valid, the plot of maximum drawdown versus distance from the pumping well would be a smooth curve.

In Figure H-2, it can be seen that most of the "W" wells show less drawdown than would be expected. Three factors account for this difference. First, the wells are located near the on-site lagoon, a source of groundwater recharge. Second, these wells were in standing water during the pump test. This water is also a recharge source, especially since these wells do not have bentonite seals. Third, these wells are screened only in the top 2 feet to 12 feet of the surficial aquifer. This finer-grained portion of the aquifer drained slowly during pumping and resulted in the delayed yield effect. These factors appear to make the "W" wells show less drawdown than other observation wells that are the same distance from the pumping well. An exception is Well W-7, which does not appear to be affected by the above three factors.

The "BP" series of wells, in general, show more drawdown than expected. These wells are screened in the bottom 18 inches of the aquifer. This zone of the aquifer is more confined and more likely to reflect an immediate pressure drop than upper portions of the aquifer. Again, there is an exception with Well BP-4, which falls in line with the majority of the wells. Well BP-4 is located close the lagoon, so the recharge from the lagoon may have compensated for the factors that make the other "BP" wells appear to have more drawdown than the "P" wells that are the same distance from the pumping well. The "P" wells and Well O-2 extend to the bottom of the aquifer and are screened across the entire aquifer thickness. These wells show a typical

Theis curve when plotted, as shown in Figure H-2. Therefore, the surficial aquifer has been shown to be uniform in the horizontal direction.

Figure H-3 is a plan of well locations at the Bluff Road site that shows the maximum observed drawdown contours in the observation wells during the pump test. This figure shows how the surface lagoon effects the drawdown values of the observation wells. Also, it can be seen from this figure that the drawdown contours are nearly circular except near the lagoon. This figure strongly indicates that the surficial sand aquifer is homogeneous and isotropic in the horizontal direction.

After Boulton's method was selected as the method of analysis, the log-log plots in Appendix H-5 were matched with the Boulton type curves. The type curves have two portions. Data taken during the first 30 minutes of pumping is fitted to the "Early" portion of the curve. Data taken after the first 30 minutes is fitted to the "Late" portion. Match points are selected for both portions of the curve in order to calculate the hydraulic properties of the aquifer. The selected "Early" and "Late" match points are shown on each of the log-log figures in Appendix H-5. Plots with no "Early" match point had insufficient early data to fit the type curve, or showed a confined response. The wells that show a delayed yield response are: BP-2, BP-4, BP-5, O-2, P-8, P-9, P-13, W-7 and W-8. Wells that showed a confined response are: P-15, W-6, W-10, and W-11. The confined response wells can be matched to the Theis type curve, which is part of Boulton's "Late" curve. The reason these wells showed a confined response is evident in the boring logs taken when the wells were drilled. The wells have been drilled in an area overlain by silty clay rather

than sand with some silt. This silty clay may serve as an upper confining unit in the vicinity of the observation wells.

The data for Wells BP-1 and P-7 matches the theis type curve and suggests a confined type response. However, both of these wells are located in areas overlain by sand with little silt which would not be an effective confining layer. Also, data was not collectd on these wells during the first two hours of pumping. Were it available this data would probably have shown a delayed yield response.

After the Boulton type curves had been matched to the log-log plots, the hydraulic properties of the aquifer were calculated. Each Boulton curve has a corresponding value of r/B, where r is the distance from the observation well to the pumping well, and B is the discharge factor of an unconfined aquifer with delayed yield. These values are associated with the match points and listed in Table H-1. Also listed in Table H-1 are values of the "Early" and "Late" match point coordinates. These coordinates are defined as follows:

s	= drawdown at the match point
t	= time at the match point
1/u	= X coordinate of the type curve at the match point
W(u, r/B)	= Y coordinate of the type curve at the match point (also called the well function of Boulton)

Once these values are found, the hydraulic properties of the aquifer can be calculated using the following equations:

$$T = \frac{Q}{4s} W(u, r/B) \qquad (1)$$

$$S = \frac{u4Tt}{r^2} \qquad (2)$$

Where T is the transmissivity, Q is the pumping rate of the test (known value) and S is the specific yield. Once T is found, the hydraulic conductivity, K, can be found by the equation:

$$K = T/D \qquad (3)$$

Where D is the distance from the water table to the bottom of the aquifer. Table H-2 is a summary of the calculated hydraulic properties corresponding to the early and late data of each observation well. As noted, where there are no early values, there was insufficient early data to calculate them, or the well showed a confined response. Hydraulic conductivity values were calculated for every well and are very uniform.

The water level history at Well P-6 shows that the natural water level elevations tended to decrease 0.04 to 0.06 feet per day during the pump test. These differences were small compared to the drawdown in the wells. Therefore, no correction was made in the calculations for static water level changes during the test. To verify this assumption, Figure H-4 shows the relationship between hydraulic conductivity (K) at each well and distance from the pumping well. Hydraulic conductivity K values determined from later time data are used in Figure H-4 because they are considered to be more representative. This data was taken

later in the pump test and is less sensitive to variations in time measurements plotted on a log-log scale. Also, the late K values were used because there was sufficient late data taken on every observation well. If the natural groundwater elevations affected the K measurement, the wells farthest from the pumping well would be affected the most because the magnitude of the elevation change would be greater at these wells. As can be seen in Figure H-4, in the majority of the wells, the K values do not change with increasing distance from the pumping well. Two exceptions are Wells W-10 and P-7. It is suspected the Well W-10 is recharged from the surface, thus increasing the apparent K value in this well. The K value calculated at Well P-7 is a factor of 2 higher than the values at other wells. It may be P-7 is located in a higher permeability zone or that not enough data was taken at this well to obtain the representative hydraulic conductivity.

No water level changes were observed in Well DW-1 during the pumping test. Well DW-1 is screened in the underlying Black Mingo Formation which is a confined aquifer at the site.

5.0 FIELD AERATION STUDY

During the pumping test a field study was conducted to determine the effectiveness of aeration in removing volatile organic compounds from the groundwater at the Bluff Road site. The pumping well was located at the edge of the previously defined contaminant plume. Therefore it was expected that during the pumping test contaminated water would be drawn toward and pumped from the well. Golder Associates and SCDHEC proposed to determine the effectiveness of aeration by discharging the pump test water into the on-site lagoon through a system of spray nozzles.

Water discharged during pumping was pumped through a 3 inch diameter PVC pipeline to the on-site lagoon. The joints in the pipeline were solvent welded using PVC cement. The pipeline extended along the existing earth dike on the east side of the lagoon. Four spray nozzles, each with a one inch diameter, were installed in the pipeline along the dike at 40 foot intervals. A sampling port in the pipeline was located approximately 20 feet upstream of the first spray nozzle. Figure H-1 shows the approximate location of the pipeline, spray nozzles and sampling port.

During the pumping test, groundwater samples were periodically collected from the surface of the lagoon and from the sampling port in the pipeline. After the cessation of pumping an additional sample was taken from the lagoon and one sample was collected from the pumping well. The sample collected from the pumping well was taken from the 3 inch galvanized discharge pipe extending from the submersible pump to the ground surface. It was not possible to sample the pumping well directly because the bailer would not fit into the annular space between the well casing and the discharge pipe. Thus the sample from the well was

collected from water that had flowed into the well, through the submersible pump, and into the discharge pipe. A summary of sample locations and time is presented below.

Sample No.	Sample Date	Sample Time	Sample Location	pH	Specific Conductivity (umhos/cm)
L-1	12/20	1700	Lagoon Surface	*	*
L-2	12/21	1615	Lagoon Surface	6.2	190
Pipe 2	12/21	1615	Pipe Sample Port	4.9	90
L-3	12/21	2230	Lagoon Surface	5.7	145
Pipe 3	12/21	2230	Pipe Sample Port	4.8	90
L-44	12/22	0825	Lagoon Surface	*	*
Pipe 44	12/22	0825	Pipe Sample Port	*	*
L-4A	12/23	0841	Lagoon Surface	6.8	130
L-4B	12/23	0841	Lagoon Surface	7.2	130
O-1A	12/23	0825	Pumping Well	6.1	160

*Values not measured

All samples were placed in cleaned 40 milliliter glass vials prepared by Advanced Chemistry Labs. The vials were completely filled with the sample and no head space remained in the vial. Samples were refrigerated until their delivery to the laboratory. Values of pH and conductivity were measured in the field at the time of sampling.

Samples L-44, Pipe 44, L-4A, and O-1A were analyzed for each of the priority pollutant volatile organic compounds. None of these compounds were found at concentrations above the Method Detection Limit (5 ppb). Laboratory results presented in Appendix H-6 show no contamination in any of the samples. This result was unexpected. Golder Associates believes that because of the location of the pumping well in relation to the contaminant plume, contaminated groundwater was almost certainly flowing into the pumping well during the pump test. The lack of volatile organic compounds in any of the water samples could be due to dilution with uncontaminated groundwater, turbulence within the well

screen and the submersible pump, or a combination of these two factors. Because of the lack of conclusive data, Golder Associates considers that this test was not able to determine whether aeration is an effective method of removing volatile organic compounds from the groundwater at this site.

6.0 SUMMARY

Golder Associates has completed a pump test at the former South Carolina Recycling and Disposal (SCR&D) facility on Bluff Road south of Columbia, South Carolina, as part of a remedial investigation conducted under contract to the South Carolina Department of Health and Environmental Control (SCDHEC). The pump test was conducted from December 21, 1985 to December 23, 1985.

The surficial sand aquifer at the Bluff Road site was found to be of uniform thickness over the extent of the test area, and homogeneous and isotropic in nature. Boulton's method of analysis was used to determine the hydraulic characteristics because the aquifer displayed either a delayed yield or confined response. The average hydraulic conductivity was found to be 3.4×10^{-2} cm/s, and the specific yield is 2.4×10^{-2}. Also because no water level changes were observed during the test in Well DW-1, it was concluded that the clay layer between the surficial sand aquifer and the confined aquifer of the Black Mingo Formation is of much lower permeability than the surficial sand aquifer.

The experiment to determine if aeration was effective in removing volatile organic compounds from the groundwater was inconclusive.

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LIST OF SYMBOLS

I. GENERAL

$\pi = 3.1416$

e = base of natural logarithms 2.7183

$\log_e a$ or $\ln a$, natural logarithm of a

$\log_{10} a$ or $\log a$, logarithm of a to base 10

t	time
g	acceleration due to gravity
V	volume
W	weight
M	moment
F	factor of safety

II. STRESS AND STRAIN

u	pore pressure
σ	normal stress
σ'	normal effective stress ($\bar{\sigma}$ is also used)
τ	shear stress
ϵ	linear strain
ϵ_{xy}	shear strain
ν	Poisson's ratio (μ is also used)
E	modulus of linear deformation (Young's modulus)
G	modulus of shear deformation
K	modulus of compressibility
η	coefficient of viscosity

III. SOIL PROPERTIES

(a) *Unit weight*

γ	unit weight of soil (bulk density)
γ_s	unit weight of solid particles
γ_w	unit weight of water
γ_d	unit dry weight of soil (dry density)
γ'	unit weight of submerged soil
G_s	specific gravity of solid particles $G_s = \gamma_s/\gamma_w$
e	void ratio
n	porosity
w	water content
S_r	degree of saturation

(b) *Consistency*

w_L	liquid limit
w_P	plastic limit
I_P	plasticity index
w_S	shrinkage limit
I_L	liquidity index $= (w - w_P)/I_P$
I_C	consistency index $= (w_L - w)/I_P$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
D_r	relative density $= (e_{max} - e)/(e_{max} - e_{min})$

(c) *Permeability*

h	hydraulic head or potential
q	rate of discharge
v	velocity of flow
i	hydraulic gradient
k	coefficient of permeability
j	seepage force per unit volume

(d) *Consolidation (one-dimensional)*

m_v	coefficient of volume change $= -\Delta e/(1+e)\Delta\sigma'$
C_c	compression index $= -\Delta e/\Delta \log_{10} \sigma'$
c_v	coefficient of consolidation
T_v	time factor $\doteq c_v t/d^2$ (d, drainage path)
U	degree of consolidation

(e) *Shear strength*

τ_f	shear strength	
c'	effective cohesion intercept	in terms of effective stress $\tau_f = c' + \sigma' \tan \phi'$
ϕ'	effective angle of shearing resistance, or friction	
c_u	apparent cohesion*	in terms of total stress $\tau_f = c_u + \sigma \tan \phi_u$
ϕ_u	apparent angle of shearing resistance, or friction	
μ	coefficient of friction	
S_t	sensitivity	

*For the case of a saturated cohesive soil, $\phi_u = 0$ and the undrained shear strength $\tau_f = c_u$ is taken as half the undrained compressive strength.

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LIST OF ABBREVIATIONS

The abbreviations and terms commonly employed on each Boring Log, on the Figures, and in the text of the report, are as follows:

C	-	Coarse	RES	-	Residual
CA	-	Casing	RX	-	Rock
F	-	Fine	SA	-	Sample
FRAG	-	Fragments	SAT	-	Saturated
M	-	Medium	SM	-	Some
MIC	-	Micaceous	TR	-	Trace
NP	-	Non-plastic	WL	-	Water level
PH	-	Pressure hydraulic	WH	-	Weight of hammer
PM	-	Pressure manual			

TERMS AND DESCRIPTIONS

Soil Description	Range of Proportion
Trace (tr.)	0 - 5%
Little	5 - 12%
Some	12 - 30%
And	30 - 50%

Relative Density of Cohesionless Soils	N (blows/ft.)
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

Consistency of Cohesive Soils	Cu (psf)
Very soft	less than 250
Soft	250 to 500
Firm	500 to 1,000
Stiff	1,000 to 2,000
Very stiff	2,000 to 4,000

SAMPLE TYPES

AS	Auger Sample
CS	Chunk Sample
DO	Drive Open
DS	Denison sample
PS	Pitcher sample
RC	Rock core
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

SOIL TESTS

C	Consolidation test
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial
H	Hydrometer analysis
M	Sieve analysis
MH	Sieve & hydrometer analysis
U	Unconfined compression
UU	Unconsolidated undrained triaxial
V	Vane Shear

PENETRATION RESISTANCE

Standard Penetration Resistance, "N" = the number of blows required to drive a 2 in. OD splitspoon sampler one foot using a 140 lb. hammer falling 30 in.

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TABLE H-1

SUMMARY OF BOULTON CURVE
MATCH POINT VALUES

WELL	r/B	Early s (ft)	Late s (ft)	Early t (min)	Late t (min)	Early 1/u	Late 1/u	Early W(u,r/B)	Late W(u,r/B)
BP-1	(1)	(1)	.42	(1)	182.0	(1)	1	(1)	1
BP-2	0.4	.44	.44	1.3	8.9	1	1	1	1
BP-4-1	2.0	.63	.43	15.1	125.9	1	1	1	1
BP-5-1	0.4	(2)	.45	(2)	8.5	(2)	1	(2)	1
O-2	0.8	.46	.46	3.1	21.4	1	1	1	1
P-7	(1)	(1)	.24	(1)	389.1	(1)	1	(1)	1
P-8	1.5	.49	.39	5.3	22.4	1	1	1	1
P-9	1.5	.45	.39	4.8	31.6	1	1	1	1
P-13	3.0	(2)	.55	(2)	251.2	(2)	1	(2)	1
P-15	(1)	(1)	.43	(1)	223.9	1	1	1	1
W-6	(1)	(1)	.43	(1)	158.5	1	1	1	1
W-7	2.0	(2)	.59	(2)	107.2	(2)	1	(2)	1
W-8	2.0	.66	.43	16.6	151.4	1	1	1	1
W-10	(1)	(1)	.30	(1)	295.1	(1)	1	(1)	1
W-11	(1)	(1)	.47	(1)	251.1	(1)	1	(1)	1

(1) NO VALUE DUE TO CONFINED AQUIFER TYPE RESPONSE

(2) NO VALUE DUE TO INSUFFICENT AMOUNT OF DATA

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TABLE H-2

SUMMARY OF AQUIFER PROPERTIES

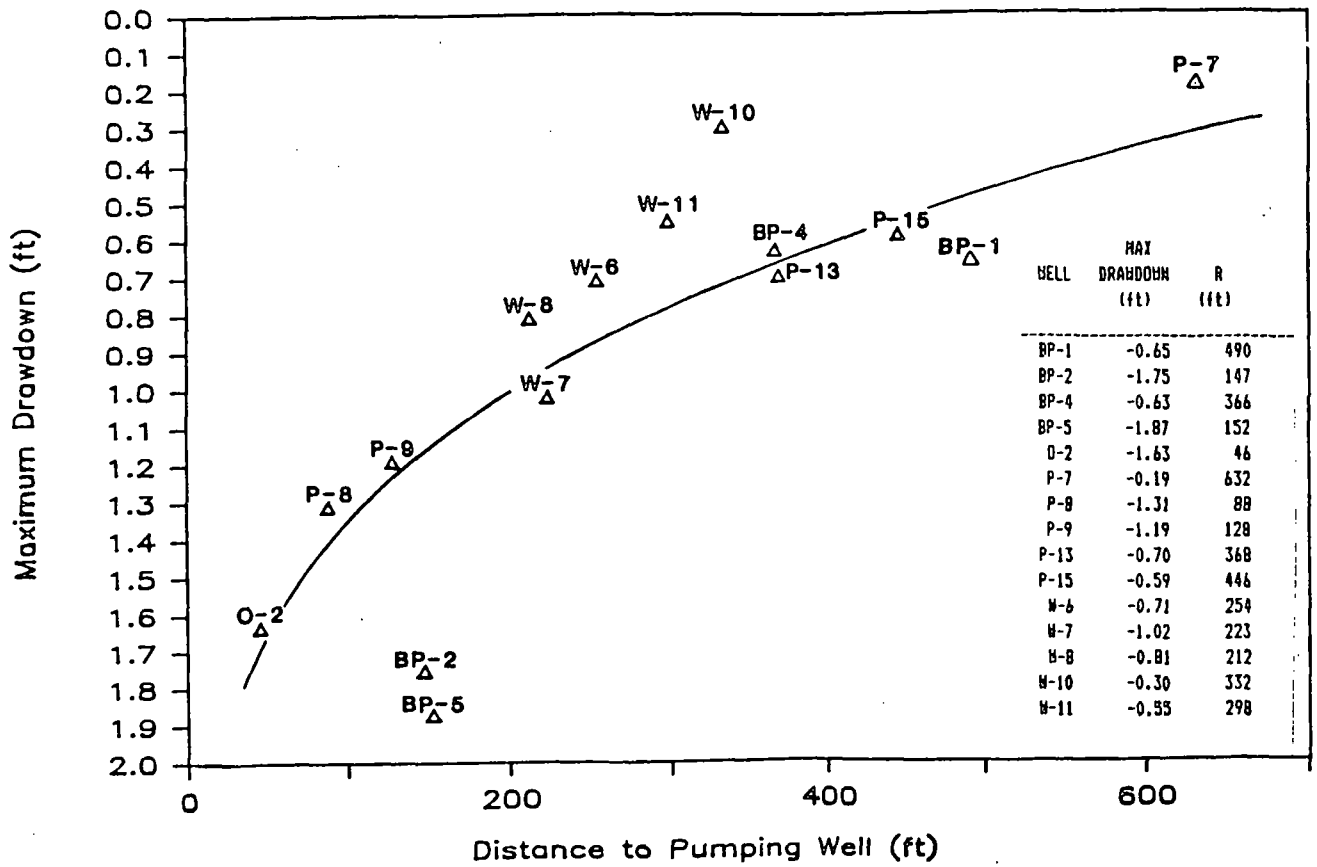
WELL	r (ft)	B (ft)	D (ft)	Early T (sq.cm/s)	Late T (sq.cm/s)	Early K (cm/s)	Late K (cm/s)	Early S	Late S
BP-1	490	(1)	40.0	(1)	40.3	(1)	3.2E-2	(1)	7.9E-3
BP-2	147	368	40.2	38.4	38.4	3.1E-2	3.1E-2	5.8E-4	4.1E-3
BP-4-1	366	183	40.3	26.9	39.3	2.2E-2	3.2E-2	7.8E-4	9.6E-3
BP-5-1	152	380	39.6	(2)	37.6	(2)	3.1E-2	(2)	3.6E-3
O-2	46	58	40.0	36.8	36.8	3.0E-2	3.0E-2	1.4E-2	9.6E-2
P-7	632	(1)	33.2	(1)	70.5	(1)	7.0E-2	(1)	1.8E-2
P-8	88	59	41.0	34.5	43.4	2.8E-2	3.5E-2	6.1E-3	3.2E-2
P-9	128	85	41.3	37.6	43.4	3.0E-2	3.4E-2	2.8E-3	2.2E-2
P-13	368	123	40.7	(2)	30.8	(2)	2.5E-2	(2)	1.5E-2
P-15	446	(1)	40.8	(1)	39.4	(1)	3.2E-2	(1)	1.1E-2
W-6	254	(1)	40.0	(1)	39.6	(1)	3.2E-2	(1)	2.5E-2
W-7	223	112	40.0	(2)	28.7	(2)	2.4E-2	(2)	1.6E-2
W-8	212	106	40.0	25.6	39.3	2.1E-2	3.2E-2	2.5E-3	3.4E-2
W-10	332	(1)	40.0	(1)	56.4	(1)	4.6E-2	(1)	3.9E-2
W-11	298	(1)	40.0	(1)	36.0	(1)	3.0E-2	(1)	2.6E-2
						AVE.=	3.4E-2	AVE.=	2.4E-2

(1) NO VALUE DUE TO CONFINED AQUIFER TYPE RESPONSE

(2) NO VALUE DUE TO INSUFFICENT AMOUNT OF DATA

MAXIMUM DRAWDOWN vs. DISTANCE

BLUFF ROAD SITE



WELL	MAX DRAWDOWN (ft)	R (ft)
BP-1	-0.65	490
BP-2	-1.75	147
BP-4	-0.63	366
BP-5	-1.87	152
O-2	-1.63	46
P-7	-0.19	632
P-8	-1.31	88
P-9	-1.19	128
P-13	-0.70	368
P-15	-0.59	446
W-6	-0.71	254
W-7	-1.02	223
W-8	-0.81	212
W-10	-0.30	332
W-11	-0.55	298

JOB NO.	853-3079	SCALE	AS SHOWN
DRAWN	SKB	DATE	4/16/86
CHECKED	MTF	DWG. NO.	

Golder Associates

MAX

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S.C. DEPT. O
AND ENVIRO

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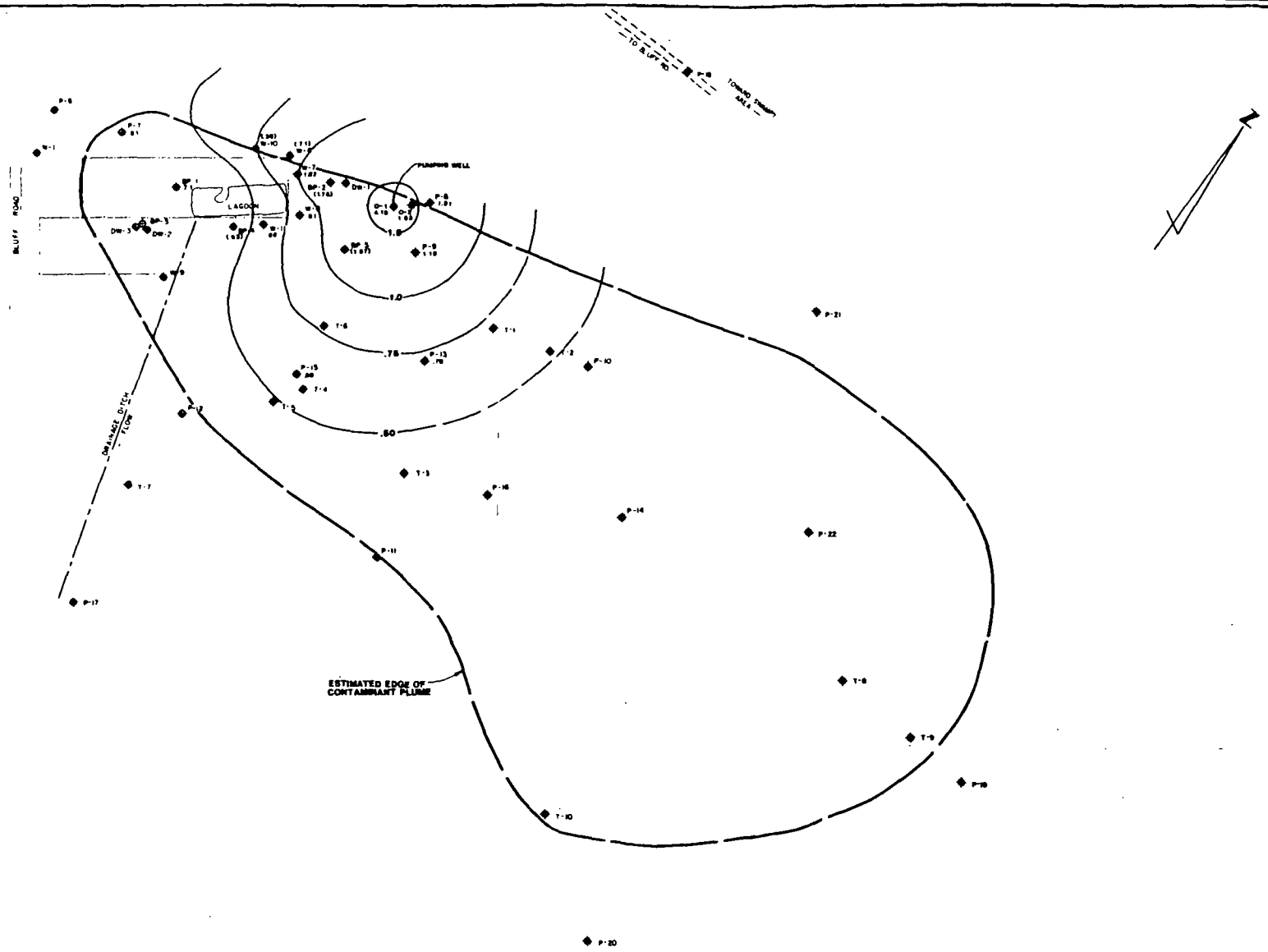

LEGEND

- DEEP WELL
- SCONEC WELL
- SURFICIAL AQUIFER WELL
- TEST BORING
- .50 — MAXIMUM OBSERVED DRAWDOWN CONTOUR
- P-9 1.10 MAXIMUM OBSERVED DRAWDOWN AT WELL

NOTES: (1) MAXI
WERE
AFTE

(2) MAXI
PARE
CONT

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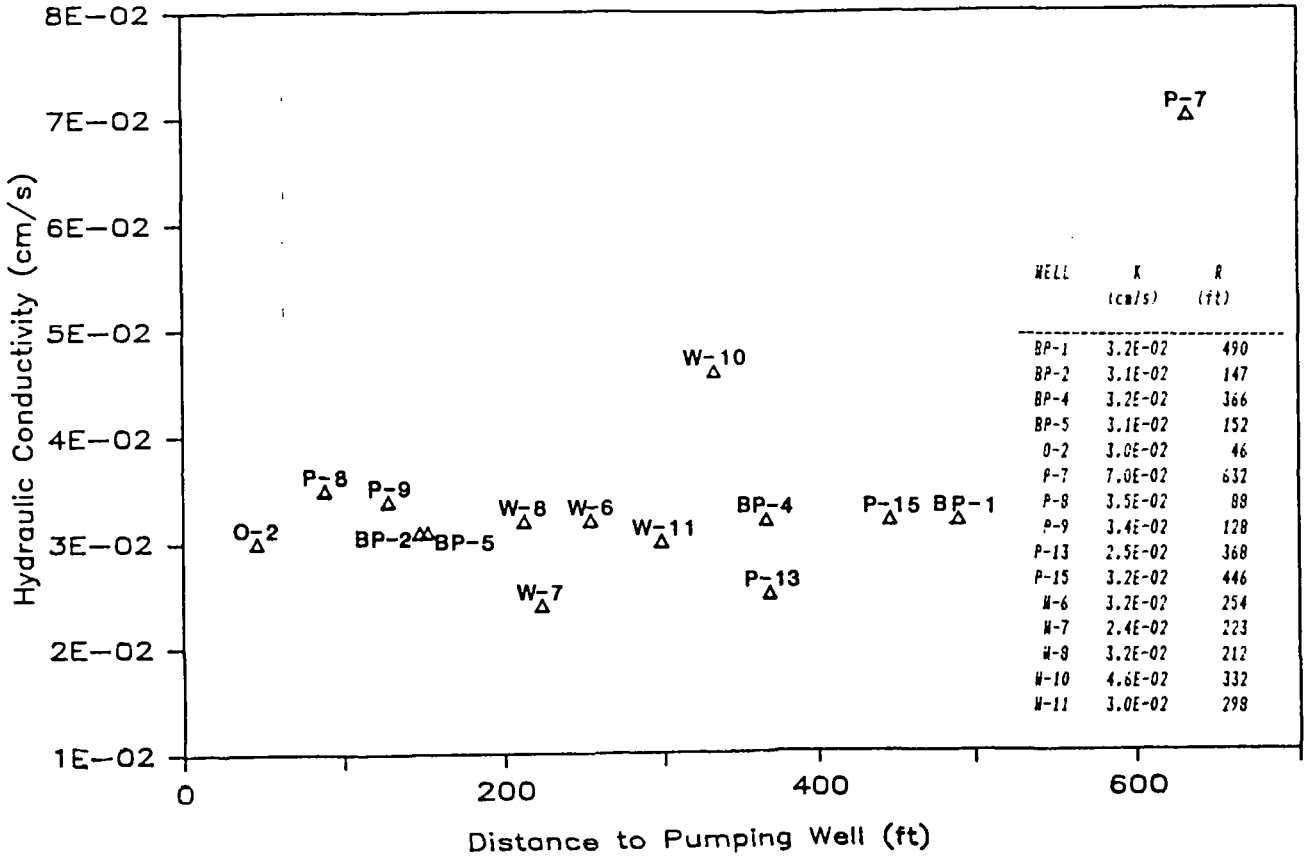
HYDRAULIC CONDUCTIVITY vs. DISTANCE

BLUFF ROAD SITE



WELL	K (cm/s)	R (ft)
BP-1	3.2E-02	490
BP-2	3.1E-02	147
BP-4	3.2E-02	366
BP-5	3.1E-02	152
O-2	3.0E-02	46
P-7	7.0E-02	632
P-8	3.5E-02	88
P-9	3.4E-02	128
P-13	2.5E-02	368
P-15	3.2E-02	446
W-6	3.2E-02	254
W-7	2.4E-02	223
W-8	3.2E-02	212
W-10	4.6E-02	332
W-11	3.0E-02	298

JOB NO. 853-3079	SCALE AS SHOWN	HY	
DRAWN SKB	DATE 4/16/86	DI	
CHECKED MTF	DWG. NO.		
Golder Associa		S.C. DEPT AND ENVI	

3 10 00390

3 10 00391

Appendix H-1

Well Installation Logs

MONITORING WELL INSTALLATION LOG

JOB NO. 853-3079 PROJECT SCDHEC / BLUFF RD / SC WELL NO. U-1 SHEET 1 OF 1

GA INSP. W.G.G. DRILLING METHOD ROTARY GROUND ELEV. 138.6 WATER DEPTH —

WEATHER LIGHT RAIN AND SUNNY DRILLING COMPANY AC BORINGS INC. COLLAR ELEV. 140.83 DATE/TIME —

TEMP. 30° TO 55° F DRILL RIG DAVEY DRILLER CHARLIE BURKE STARTED 10:30 / 12-16-85 (TIME / DATE) COMPLETED 2:00 / 12-17-85 (TIME / DATE)

MATERIALS INVENTORY

WELL CASING 6.0 ID. b.dia. 17.2 l.f. WELL SCREEN 6.0 b.dia. 35.3 l.f. BENTONITE SEAL PELLETS 4.0'

CASING TYPE GALVANIZED STEEL SCREEN TYPE GALVANIZED STEEL INSTALLATION METHOD GRAVITY / HAND POURED

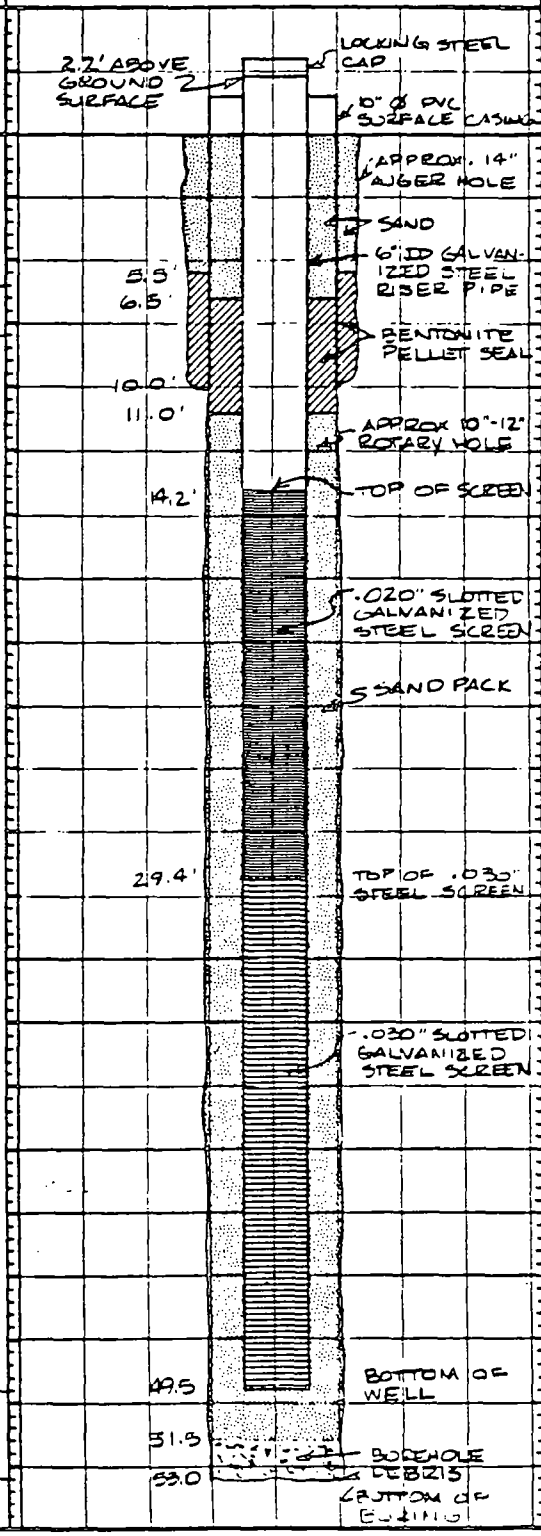
JOINT TYPE THREADED SLOT SIZE 20.1' OF #30 SLOT, 15.2' OF #20 SLOT FILTER PACK QTY. ≈ 200 GALS.

GROUT QUANTITY — CENTRALIZERS NONE FILTER PACK TYPE BUCKSHOT SILICA SAND

GROUT TYPE — DRILLING MUD TYPE JOHNSON REVERT INSTALLATION METHOD GRAVITY FALL - HAND POURED WHILE FLUSHING

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
	GROUND SURFACE
0.0	REDDISH BROWN, CLAYEY SILT SOME FINE SAND (ML)
6.0	WHITE, SLIGHTLY MICACEOUS FINE SAND, SOME SILT (SM)
8.0	WHITE, FINE TO COARSE SAND, TRACE SILT (SP)
49.5	BLACK TO GRAY CLAY (CL)
53.0	BOTTOM OF HOLE AT 53.0 FT.

WELL SKETCH



INSTALLATION NOTES

AUGERED ≈14" DIAM. (Ø) HOLE TO 10.0', INSERTED 10" Ø SURFACE CASING (CSG) AND ATTEMPTED TO PUSH. PUSHED CSG TO 11.0' BELOW GROUND SURFACE (BGS). ADDED 10 GALS. OF PELLETS BENTONITE SEAL IN ANNULAR SPACE FROM ≈10.0' TO 5.5' BGS. ROTARY DRILLED A 10" TO 12" Ø HOLE TO 53.0'. USED MUNICIPAL WATER. SOUNDED HOLE @ 46.5' BGS WHILE FLUSHING. TRIED NUMEROUS TIMES TO FLUSH HOLE TO 49.5'. UNSUCCESSFUL. MIXED JOHNSON REVERT AND REMOVED DEBRIS IN HOLE. CLEANED HOLE TO 51.5'. INSTALLED 6" Ø GALVANIZED STEEL SCREEN AND RISER CSG. COULD NOT USE CENTRALIZERS DUE TO CRIMP IN 10" Ø SURFACE CSG. ADDED SAND PACK WHILE FLUSHING WITH CLEAR MUNICIPAL WATER. ADDED APPROX 180 GALS. OF SAND. INSTALLED BENTONITE SEAL AROUND RISER. BACKFILLED TO TOP OF CSG WITH SAND. USED CONTRACTOR'S PUMP.

WELL DEVELOPMENT NOTES

PUMPED WELL @ ≈40 GPM FOR 1 HR. TO REMOVE SEDIMENT IN WELL. USED 1" PVC WITH FOOT VALVE ON BOTTOM. REMOVED ≈ 2,400 GALS. JETTED WELL @ ≈60-70 PSI WITH APPROX. 6,500 GALS OF MUNICIPAL WATER. INSTALLED SUBMERSIBLE PUMP WITH INTAKE @ ≈47.2' BGS. PUMPED 12,722 GALS FROM WELL DURING TESTING OF PUMP AND STOP TEST. ALL WATER REMOVED PUMPED INTO SURFACE LAGOON ON-SITE.

MONITORING WELL INSTALLATION LOG

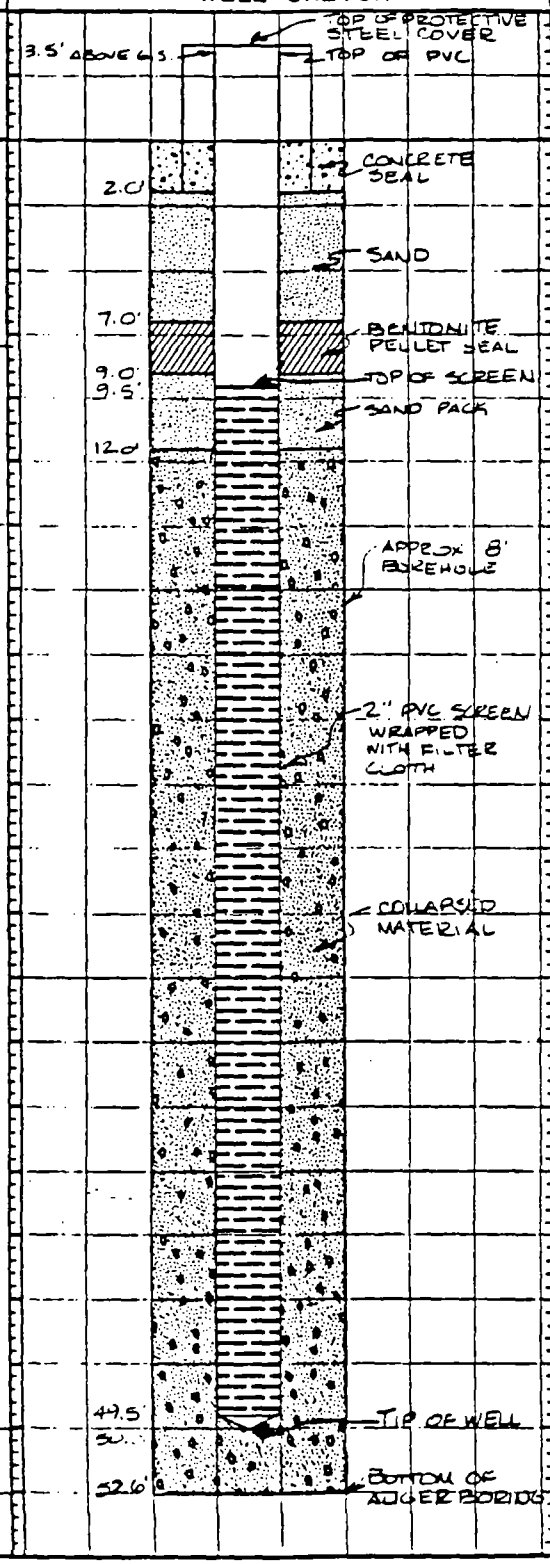
JOB NO. [illegible]	PROJECT [illegible]/BLUFF RD/S.C.	WELL NO. O-2	SHEET 1 OF 1
GA INSP. AES	DRILLING METHOD HOLLOW STEM AUGER	GROUND ELEV. 138.7	WATER DEPTH —
WEATHER FAIR	DRILLING COMPANY TRI-STATE	COLLAR ELEV 142.24	DATE/TIME —
TEMP 30's	DRILL RIG CME 550 DRILLER RICK	STARTED 10:00 / 12-3-85 (TIME / DATE)	COMPLETED 12:00 / 12-3-85 (TIME / DATE)

MATERIALS INVENTORY

WELL CASING 2" in. dia. 13.0 l.f.	WELL SCREEN 2" in. dia. 40 l.f.	BENTONITE SEAL 100#
CASING TYPE SCH 40 PVC	SCREEN TYPE MILLED SLOT PVC	INSTALLATION METHOD HAND POURED
JOINT TYPE FLUSH THREADED TEFLON WRAPPED	SLOT SIZE 0.020"	FILTER PACK QTY 500#
GROUT QUANTITY —	CENTRALIZERS —	FILTER PACK TYPE CHEROKEE FA13 SAND
GROUT TYPE —	DRILLING MUD TYPE —	INSTALLATION METHOD HAND POURED

ELEV./DEPTH	SOIL/ROCK DESCRIPTION
138.7	GROUND SURFACE
0.0	ORANGE BROWN SILTY CLAY AND FINE SAND (CL)
130.7 / 8.0	YELLOW BROWN FINE TO MEDIUM SAND, LITTLE CLAYEY SILT (SP-SM)
123.7 / 15.0	YELLOW-GRAY FINE TO COARSE SAND, LITTLE SILT (SP-SM)
88.6 / 50.1	STIFF DARK GRAY SILTY CLAY (CL)
86.1 / 52.6	BOTTOM OF HOLE AT 52.6 FT.

WELL SKETCH



INSTALLATION NOTES

ALL PVC AND FILTER FABRIC WAS STEAM CLEANED PRIOR TO USE.

INSTALLED: 40.0' SCREEN
13.0' CASING
0.5' WELL POINT

AFTER PULLING THE AUGERS, THE HOLE COLLAPSED TO 12.0'.

PLACED SAND PACK TO 9.0'
PLACED BENTONITE SEAL TO 7.0'.
PLACED SAND TO 2.0'
SET PROTECTIVE STEEL COVER IN CONCRETE SEAL.

NOTE:
ALL DOWNHOLE MEASUREMENTS MADE WITH A WEIGHTED TAPE.

WELL DEVELOPMENT NOTES

WELL NOT DEVELOPED.

0 00393

3 10 00394

Appendix H-2

Step Test Results

APPENDIX H-2
STEP TEST RESULTS

Introduction

A step-drawdown pumping test was performed at the Bluff Road site prior to starting the main aquifer pumping test. The results were used to estimate the pumping well efficiency to establish that adequate well development was attained.

The information gained from the test was also used in the final design of the pump test. In particular, the information allowed estimates of the likely permeability of the aquifer, and of a pumping rate that would ensure an adequate volume of aquifer was tested in a reasonable time frame without unduly drawing down the well or producing very large volumes of pumped water.

Test Procedures

The step-drawdown test involves pumping a well in a continuous series of relatively short duration time steps, while changing the pumping rate at each step. Declining water levels in the pumped well are measured at suitable time intervals during each step.

For the Bluff Road test, three steps were performed. The pumping rates used were about 25,50 and 100 gpm. The time steps used were about 60 minutes.

Test Analysis

The method of analysis chosen for this test is described by Jacob (1947). This method is a graphical method and is considered appropriate for this test in view of the limited numbers of time steps.

The analysis is based on the equation:

$$SW = BQ + CQ^2 \text{ --- } (1)$$

where SW = Total drawdown in the pumped well, ft.
B = Aquifer constant, sec/ft^2
C = Well loss constant, sec^2/ft^5
Q = Pumping rate per time step, ft^3/sec

It should be noted that the use of the square term in the right-hand side of equation (1) is a subject of considerable debate. It is used here since the flow rates are relatively low.

Equation (1) can be rewritten as:

$$\frac{SW}{Q} = B + CQ$$

The analysis is performed by plotting SW/Q versus Q, fitting a straight line to the plotted points and determining C from the slope of the line and B from the intercept with the vertical SW/Q axis.

Figure 1 is a semi-logarithmic plot of drawdown in the pumped well versus time for each test step. Values of SW for each step have been estimated at 100 minute steps by extending the slope, as shown. The values of SW, Q and SW/Q are tabulated in Table 1.

Figure 2 is a linear plot of SW/Q versus Q. From this plot the well loss coefficient, C, is estimated as 7.37 $sec^2/ft.^5$ and the aquifer constant as 21.95 sec/ft^2.

Application of the Test Results

The test results have been used to estimate the well efficiency, aquifer permeability, drawdown in the well and radius of influence of the major aquifer test.

Assumptions made were:

i) No more than 150,000 gallons should be removed from the aquifer. This was based on the estimated capacity of the holding pond.

ii) Drawdown in the well should be sufficient to test at least a radius of 100 feet to 200 feet in 12-24 hours. The well effective radius is taken as 0.25 ft.

iii) The aquifer is a semi-unconfined aquifer with a thickness, b, of 40 feet.

Calculations

Pumping Rate Estimate

A total test time of 24 hours was considered technically and economically adequate for this test. Pumping at a rate of 100 gpm, (0.214 ft^3/s) would remove some 144,000 gallons in 24 hours. Thus the criteria of a maximum pumpage of 150,000 gallons could be met.

Well Loss Estimate, SWL

From equation (1)

$$\text{Well loss, SWL} = CQ^2$$
$$= 7.37 \times 0.214^2$$
$$= \underline{0.34 \text{ ft.}}$$

Drawdown in the Well, SW

$$SW = BQ + CQ^2$$
$$= (21.95 \times 0.214) + (7.37 \times 0.714^2)$$
$$= 4.7 + 0.34$$
$$= \underline{5.04 \text{ ft.}}$$

Well Efficiency, Ew

$$Ew = \frac{SW - SWL}{SW} \times 100$$
$$= \frac{5.04 - 0.34}{5.04}$$
$$= \underline{93\%}$$

Aquifer Permeability Estimate, K

$$B = \frac{\ln(ro/rw)}{2 \cdot k \cdot b}$$

$$k = \frac{\ln(200/0.25)}{2 \times 21.95 \times 40}$$

$$= 1.212 \times 10^{-3} \text{ ft/sec } (3.7 \times 10^{-2} \text{ cm/sec})$$

Check for Radius of Influence

$$\ln(ro/rw) = \frac{2\pi kb(h - hw)}{Q}$$

$$= \frac{2 \times 1.212 \times 10^{-3} \times 40 \ (40-(40 - 4.7))}{0.214}$$

$$= 6.08$$

$$ro = 109.5 \text{ ft.}$$

Comparison of Step-drawdown Results with Pumping Results

The pump test was performed over a period of about 24 hours at a pumping rate of 103 gpm. Figure 3 is a semi-logarithmic plot of well and observation well drawdown versus distance to observation wells O-2, P-8, P-9 and P-13. From this Figure, Table 2 has been constructed in which the step-drawdown parameters calculated above are compared with the pump test data.

Conclusions

The step-drawdown test results showed that the pump well, O-1, was a very efficient well. This was subsequently confirmed by the pump test results. The results underestimated the radius of influence by an order of magnitude but approached the correct drawdown in the pumped well. Permeability estimates were comparable. Well losses were reasonably accurately estimated and did not significantly affect the aquifer pumping test.

TABLE 1

BLUFF ROAD STEP DRAWDOWN TEST

Step	Average Q	Average Q	Δ s (From Fig.1)	SW (From Fig.1)	SW/Q
	gpm	ft^3/sec	ft.	ft.	sec/ft^2
1	25.9	0.0553	1.22	1.22	22.00
2	48.2*	0.103	1.14	2.35	22.8
3	97.68	0.209	2.53	4.9	23.45

* Last two points in Figure 1 plot not used since flow rate rose by >10%.

TABLE 2

COMPARISON OF
STEP-DRAWDOWN TEST PREDICTIONS & PUMP TEST RESULTS

	Step-drawdown Prediction	Pump Test Result
Pump Well Loss, ft.	0.38	0.78*, 0.21**
Pump Well Total Drawdown, ft.	5.04	4.18
Aquifer Permeability, cm/sec	3.3×10^{-2}***	3.4×10^{-2}
Well Efficiency, %	93	81*, 95**
Radius of Influence, ft.	110	>500

Notes: * Analysis using in-line observation wells O-2 and P-8 only (see Figure 3).

** Analysis using observation wells O-2, P-8, P-9 and P-13, assuming a fully radial drawdown (see Figure 3).

*** Radius of influence assumed as 200 feet in calculation.

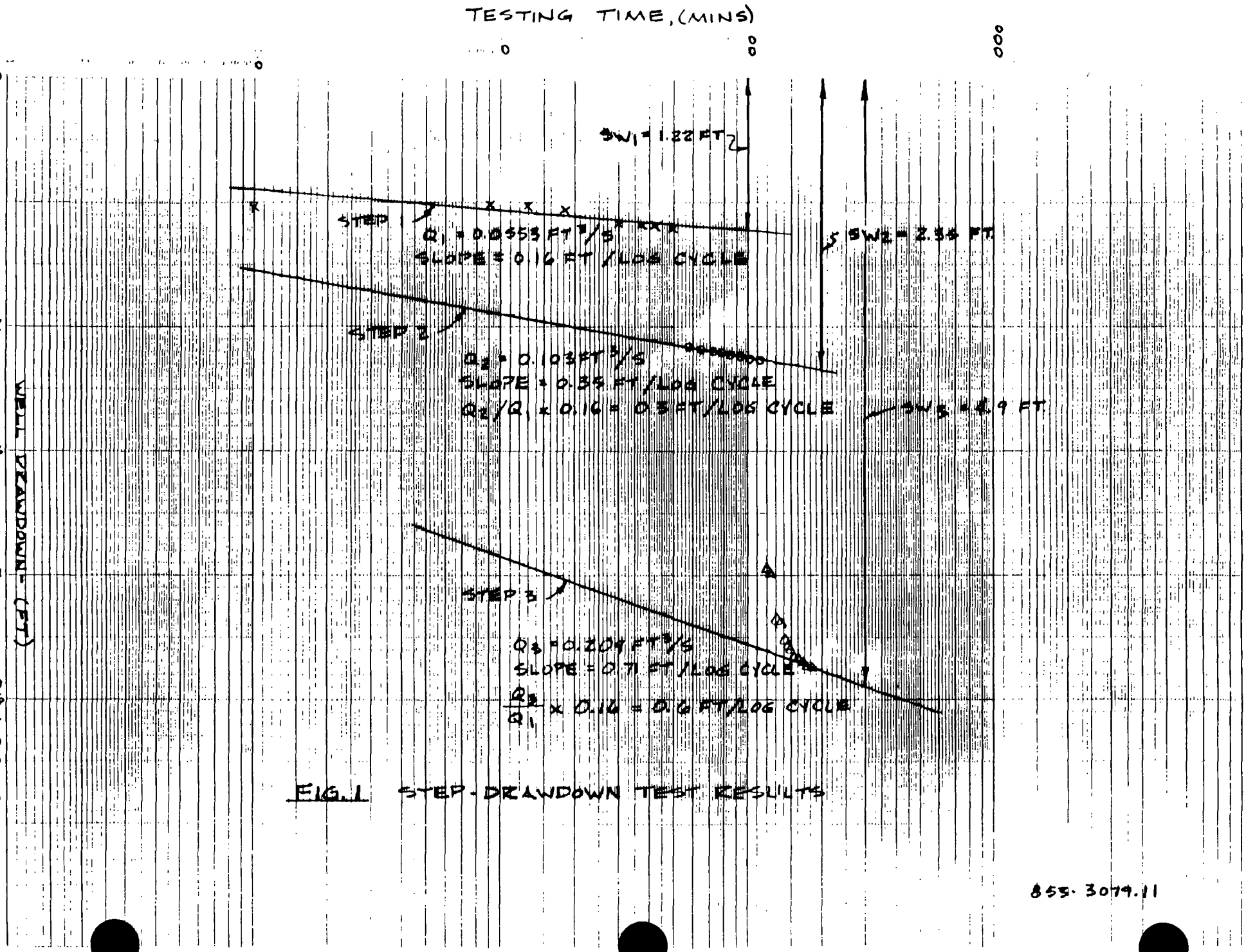
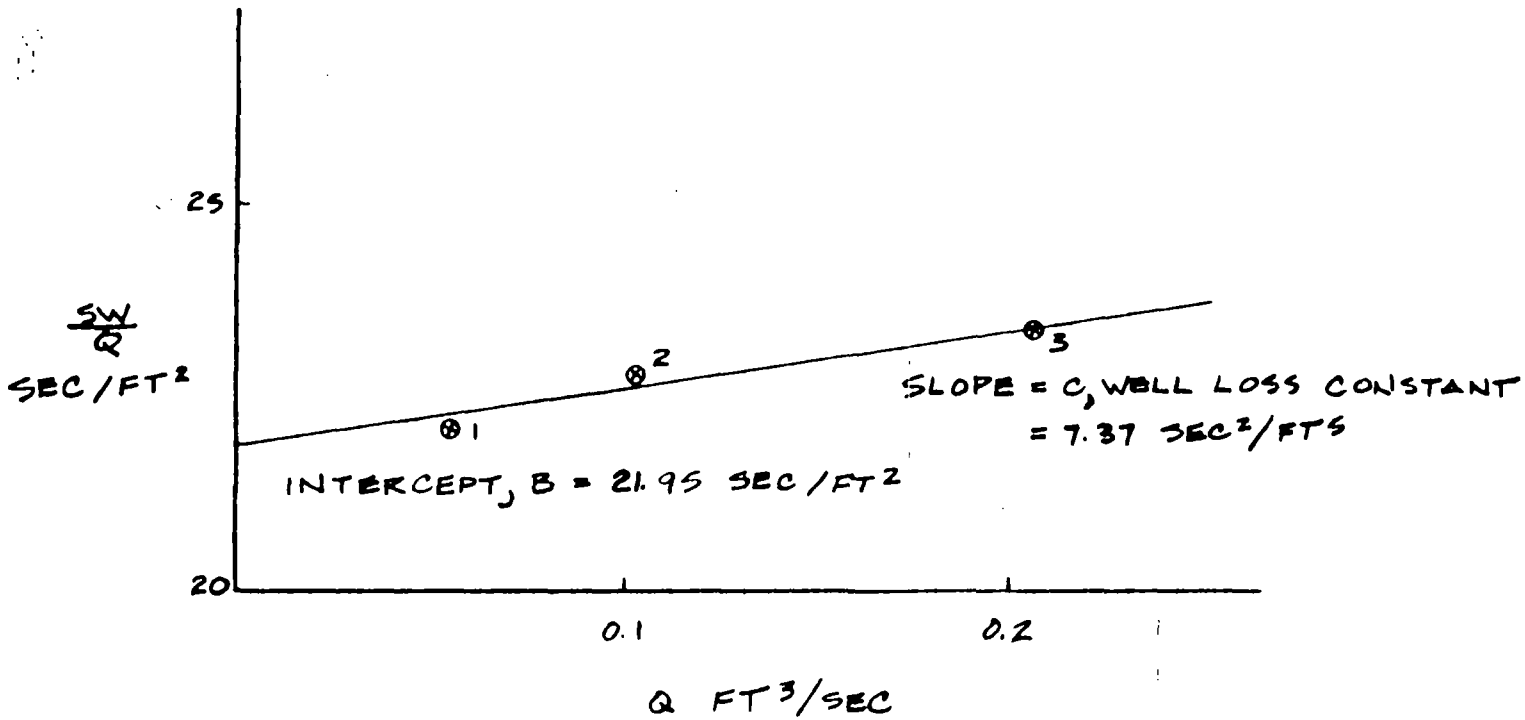


FIG. 1 STEP-DRAWDOWN TEST RESULTS

855-3079.11

3 10 00403

FIG. 2 DETERMINATION OF WELL LOSS AND AQUIFER CONSTANTS



3 10 00404

853-3079.11
4/26/86

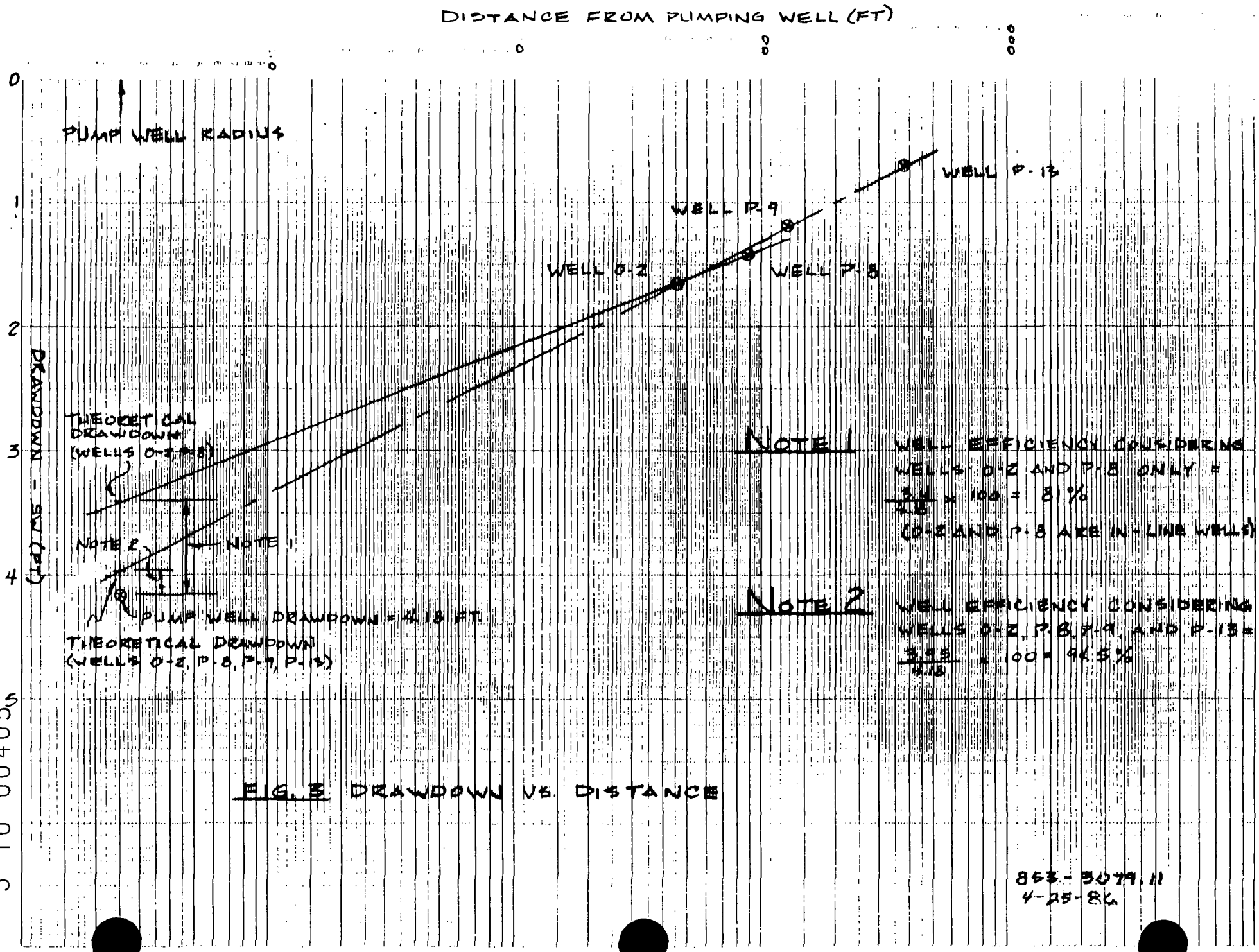


FIG. 3 DRAWDOWN VS. DISTANCE

3 10 00405

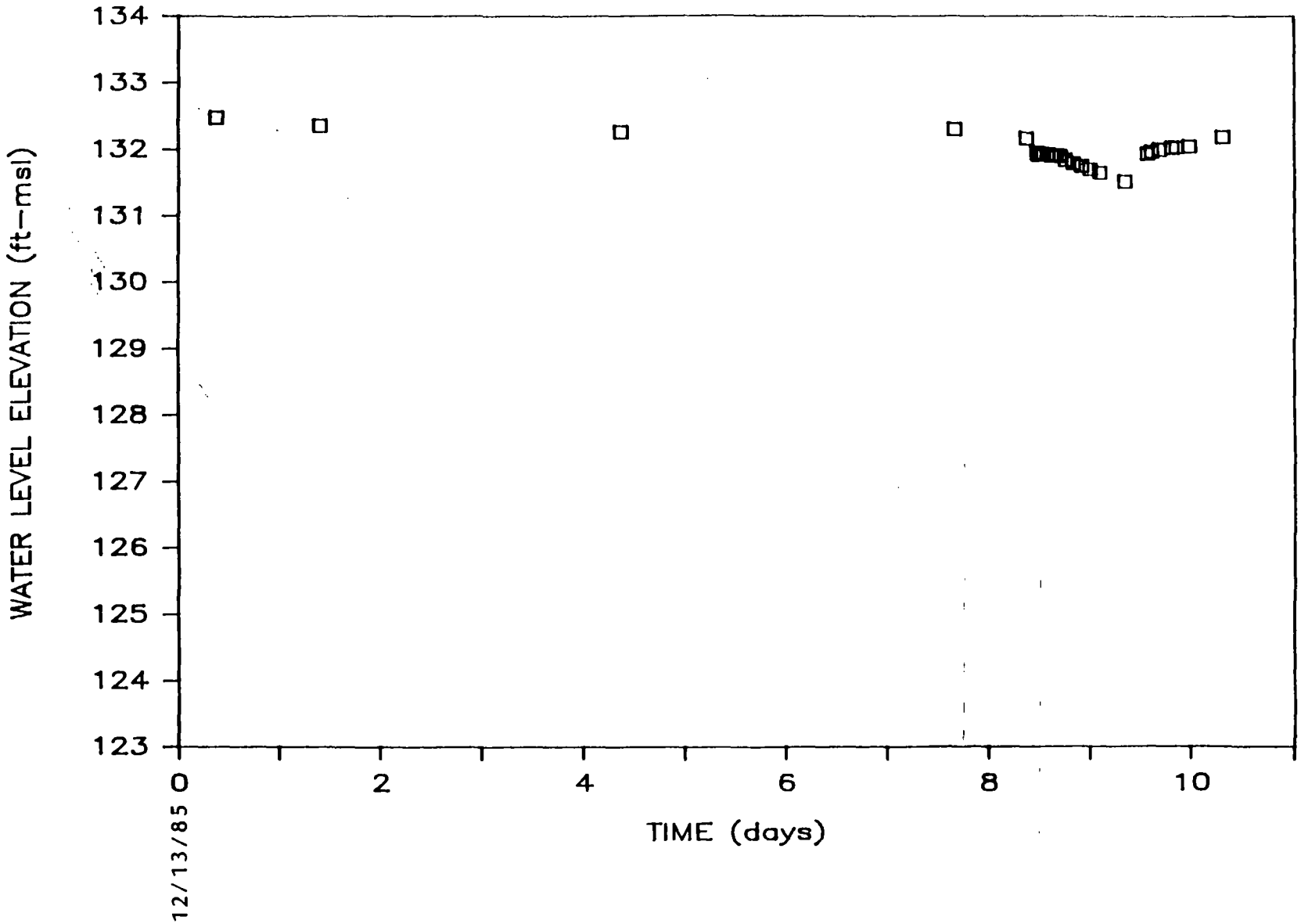
3 10 00406

Appendix H-3

Water Level History

WELL NO. BP-1

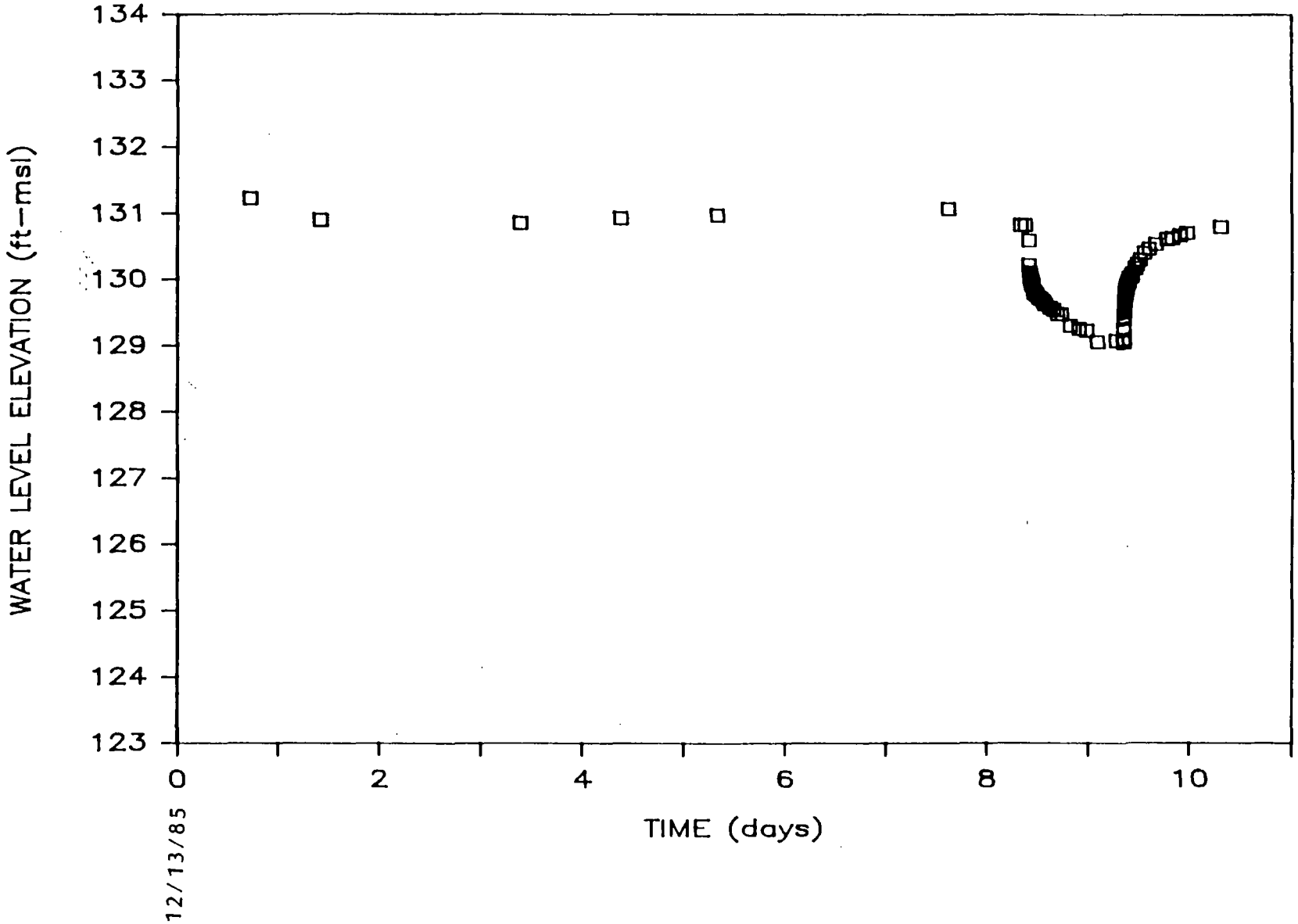
WATER LEVEL HISTORY



3 10 00407

WELL NO. BP-2

WATER LEVEL HISTORY

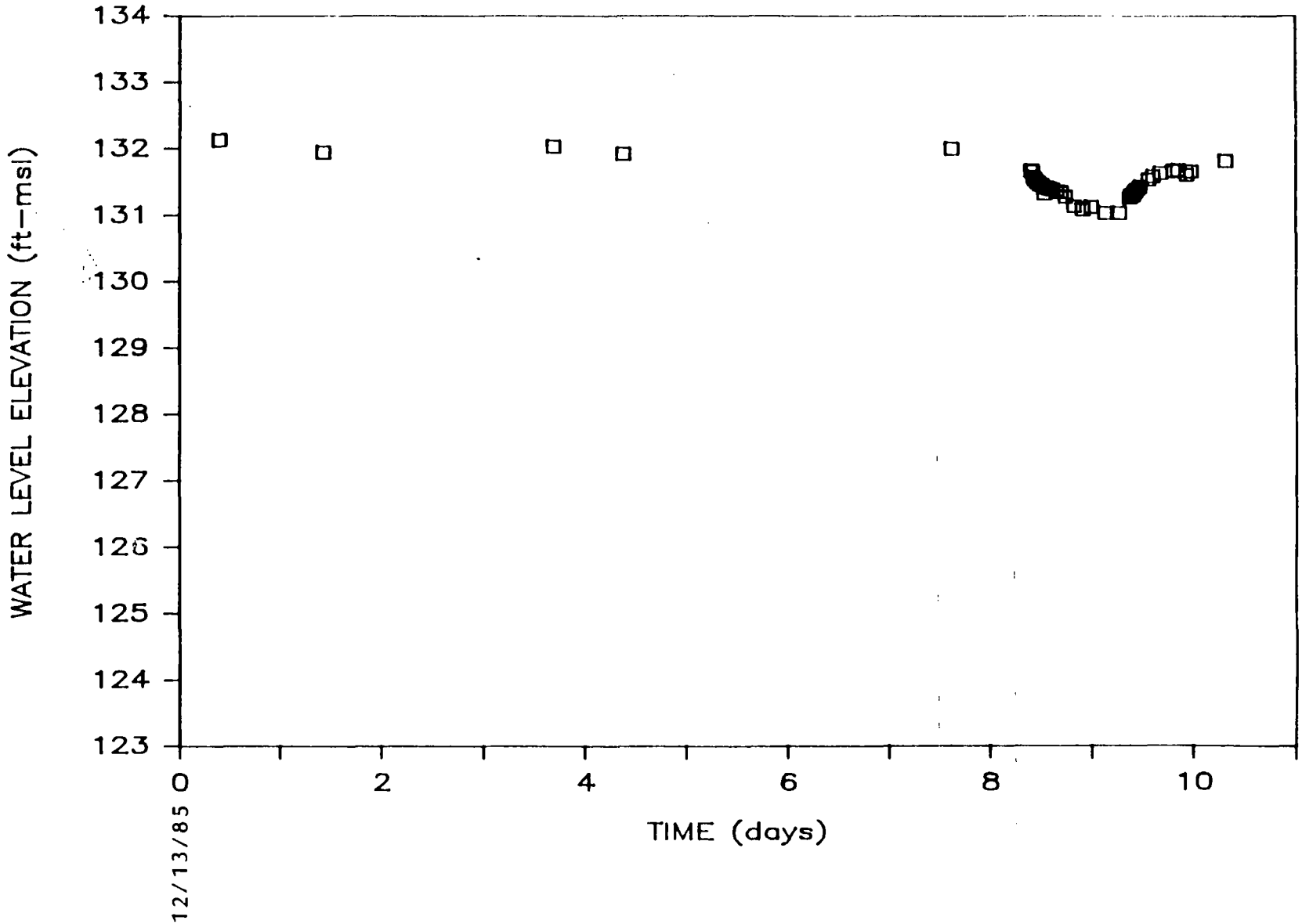


12/13/85

3 10 00408

WELL NO. BP-4-1

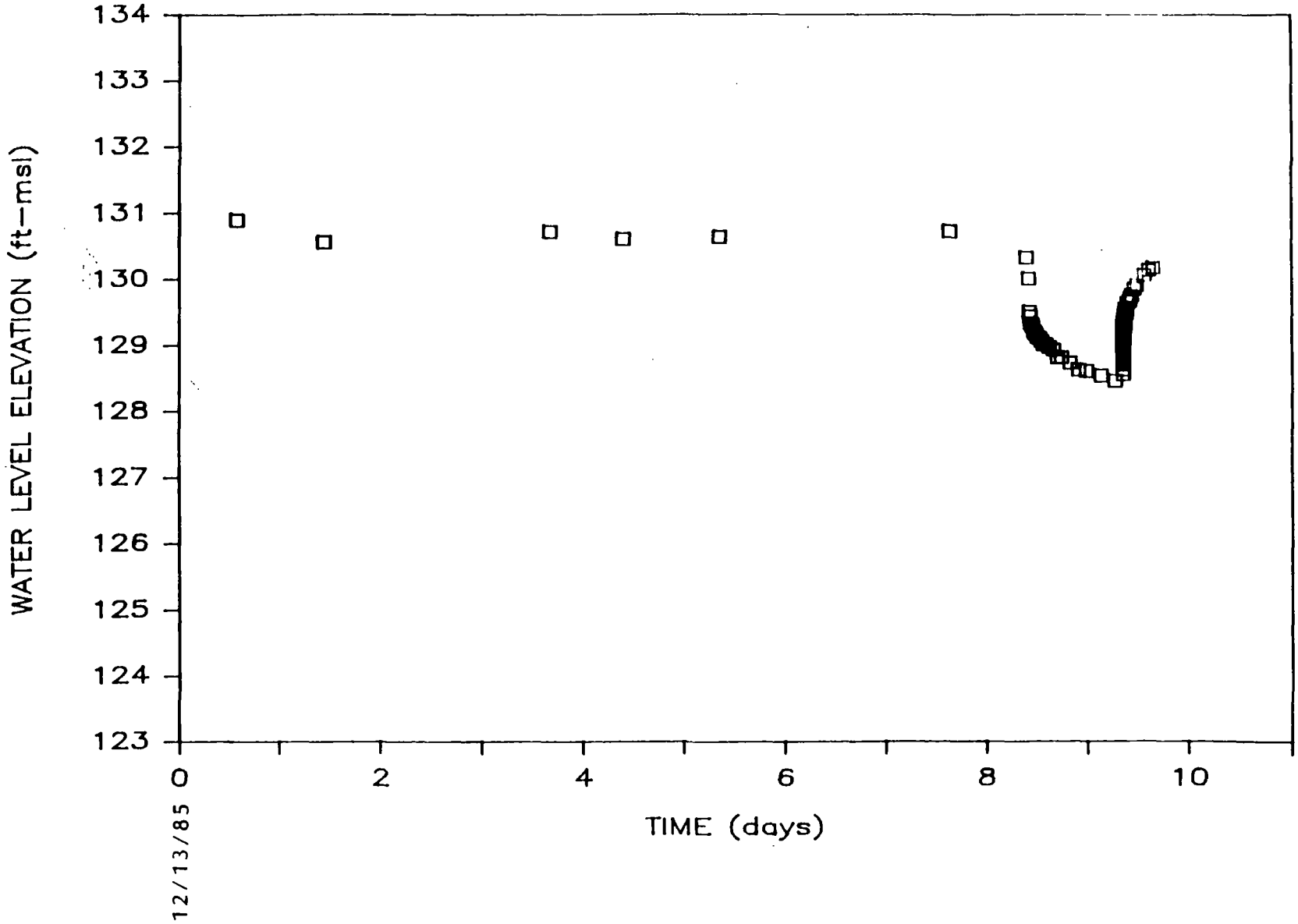
WATER LEVEL HISTORY



3 10 00409

WELL NO. BP-5-1

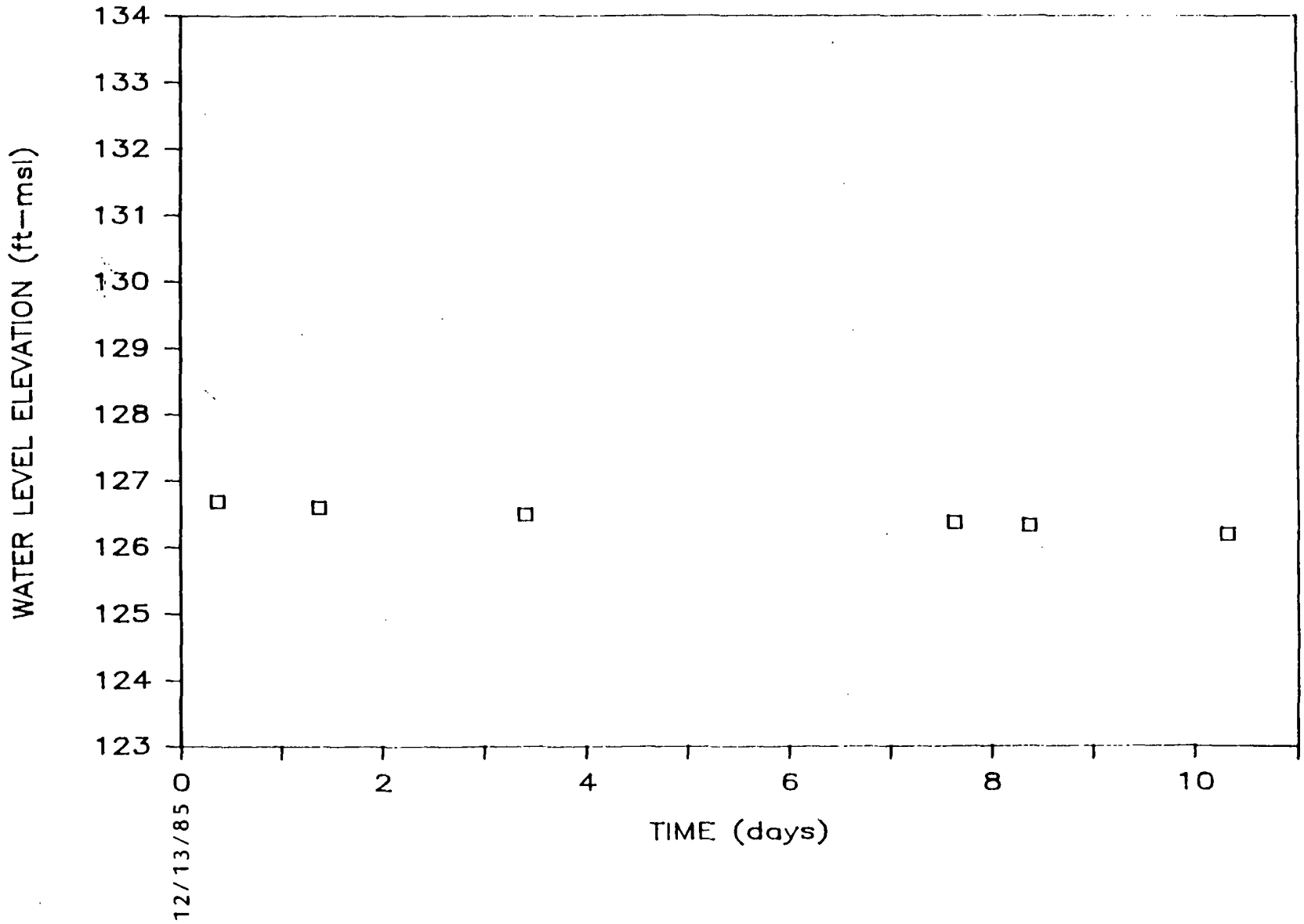
WATER LEVEL HISTORY



3 10 00410

WELL NO. P-6

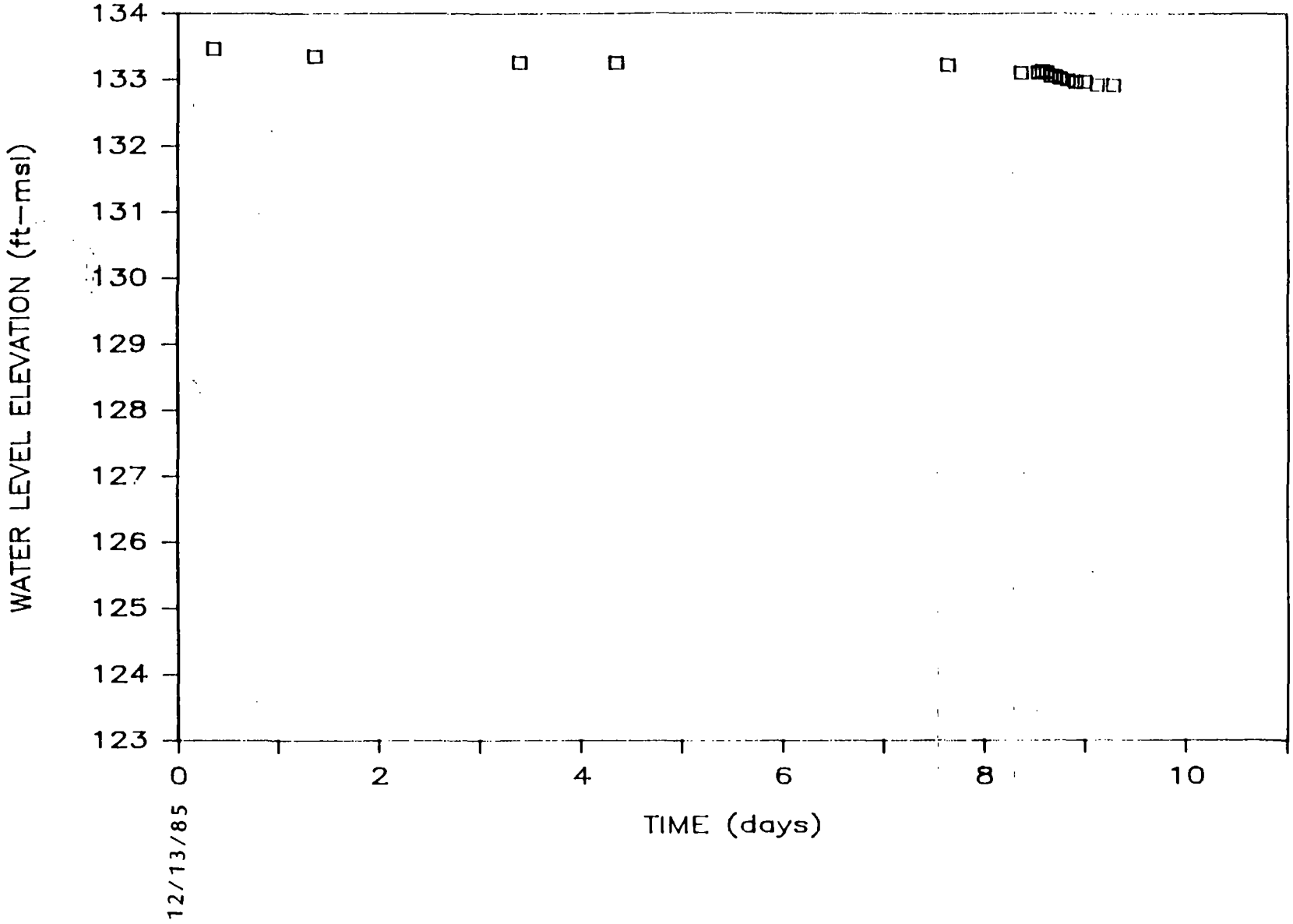
WATER LEVEL HISTORY



3 10 00411

WELL NO. P-7

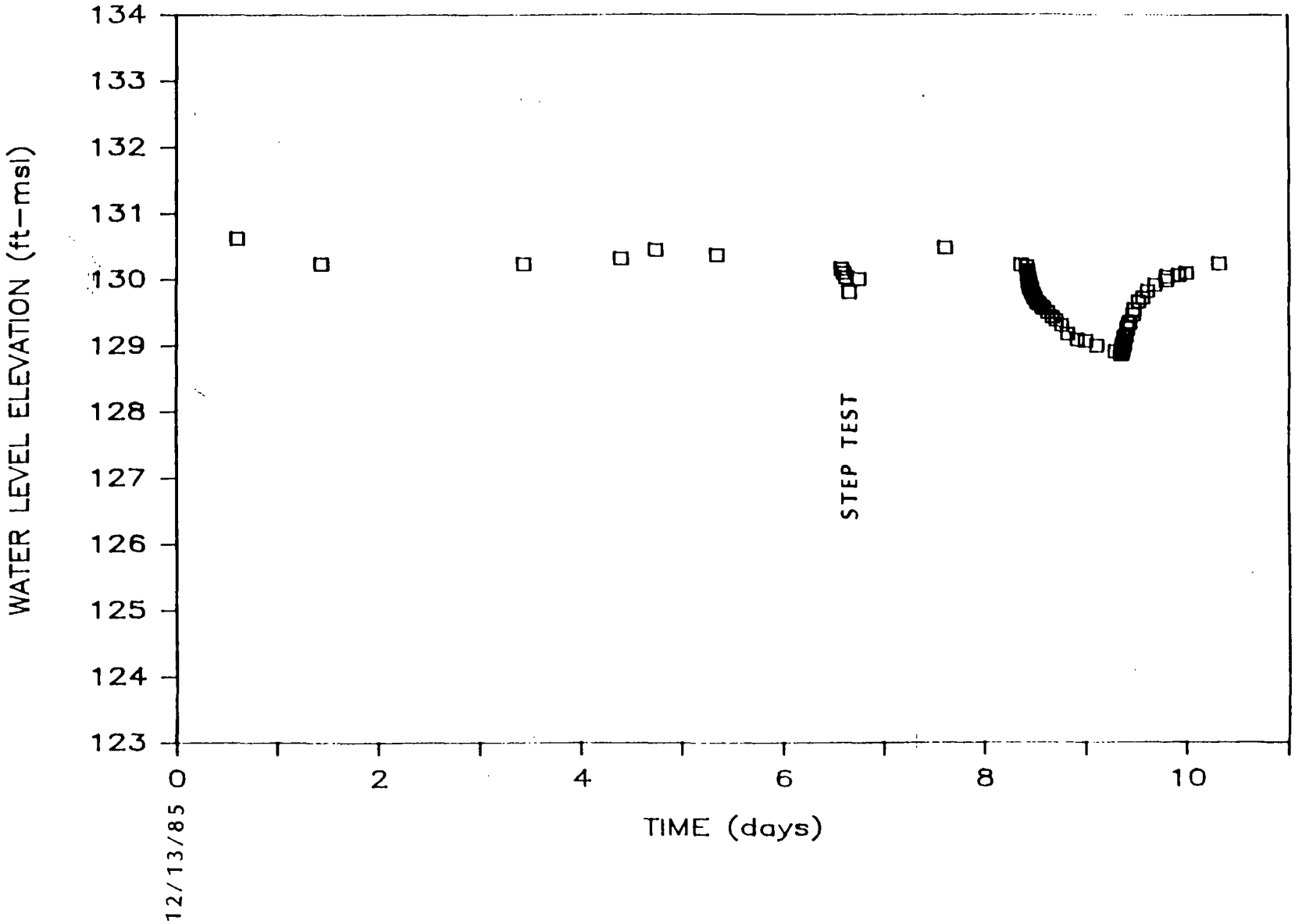
WATER LEVEL HISTORY



3 10 00412

WELL NO. P-8

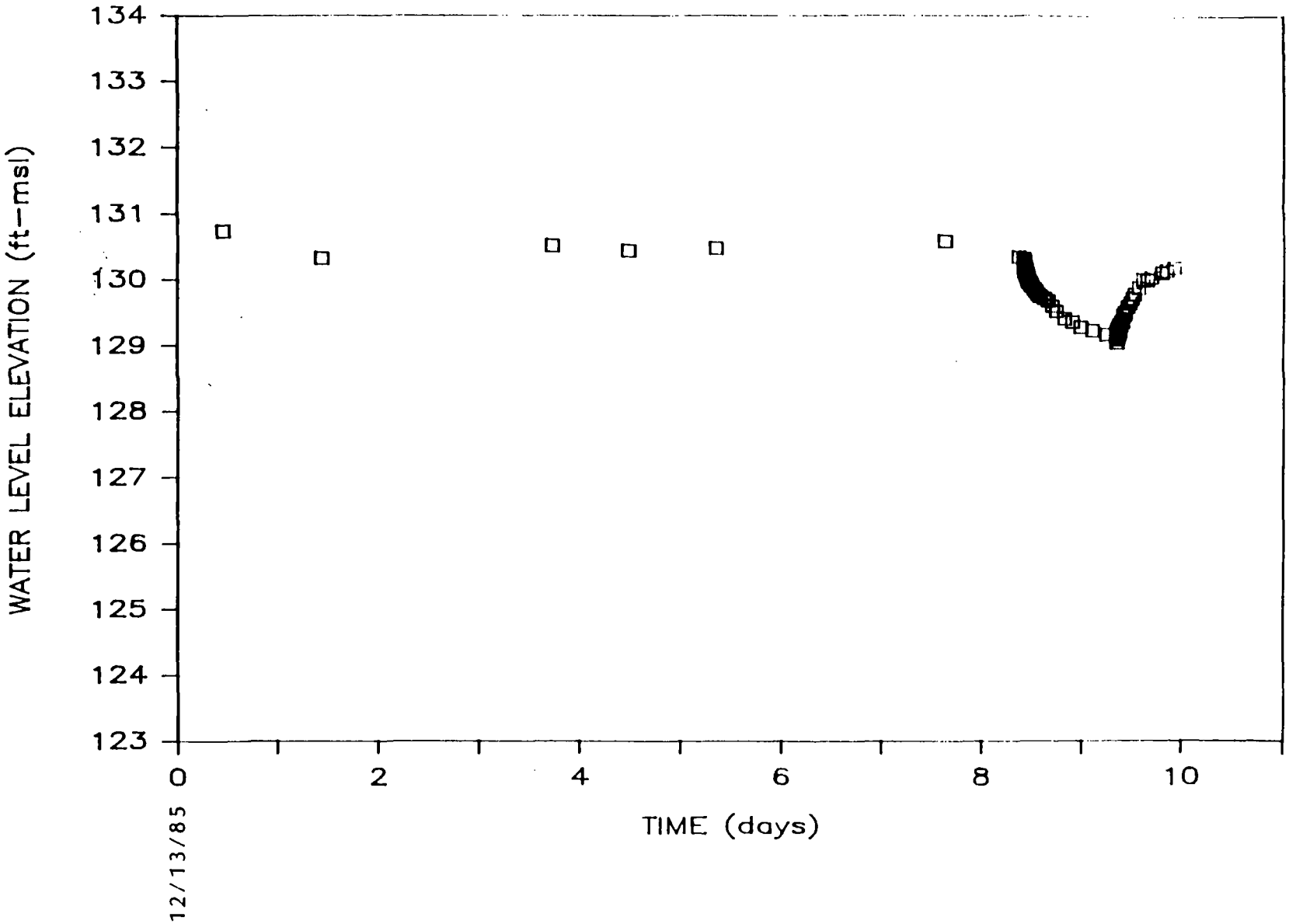
WATER LEVEL HISTORY



3 10 00413

WELL NO. P-9

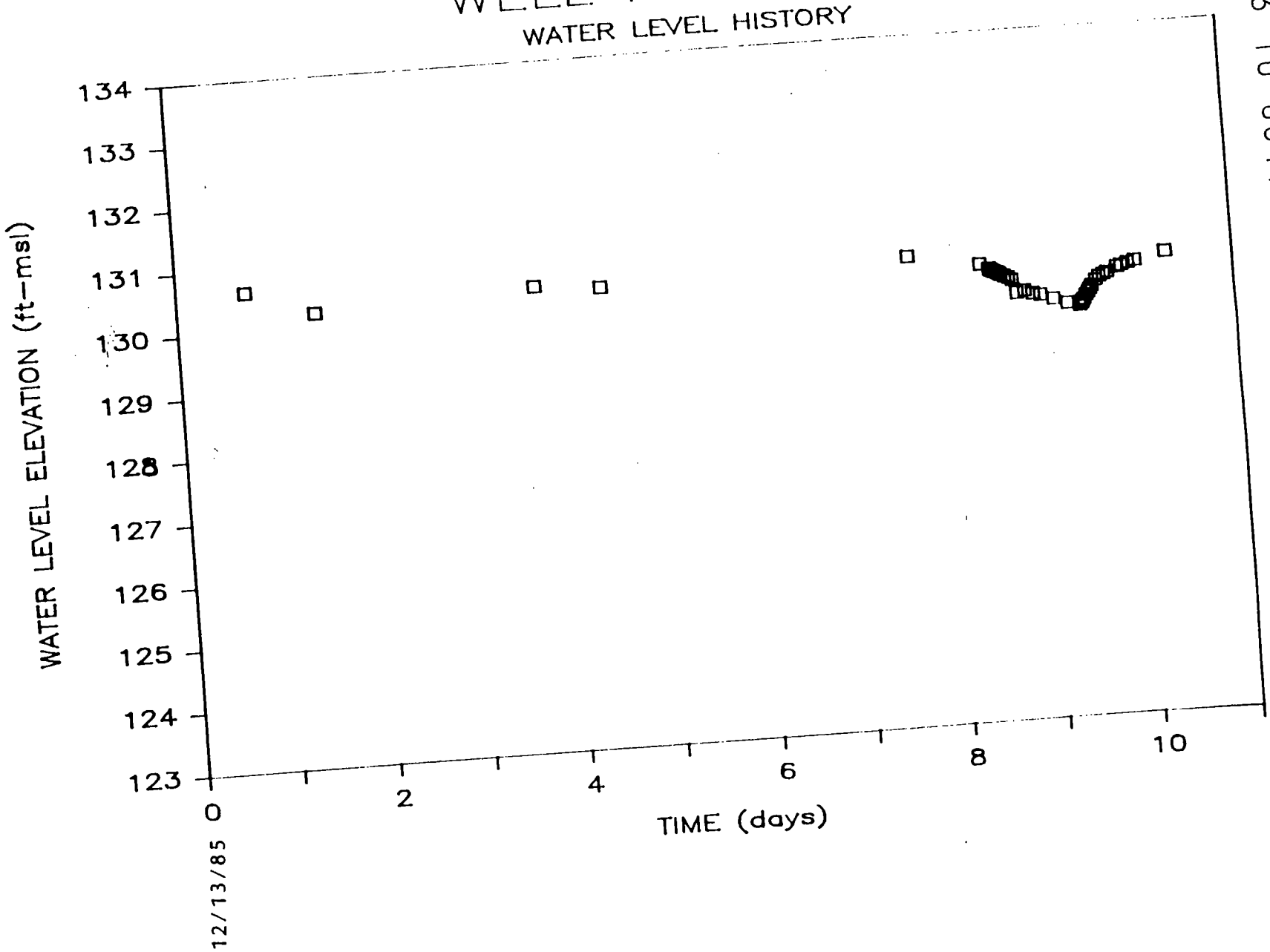
WATER LEVEL HISTORY



3 10 00414

WELL NO. P-13

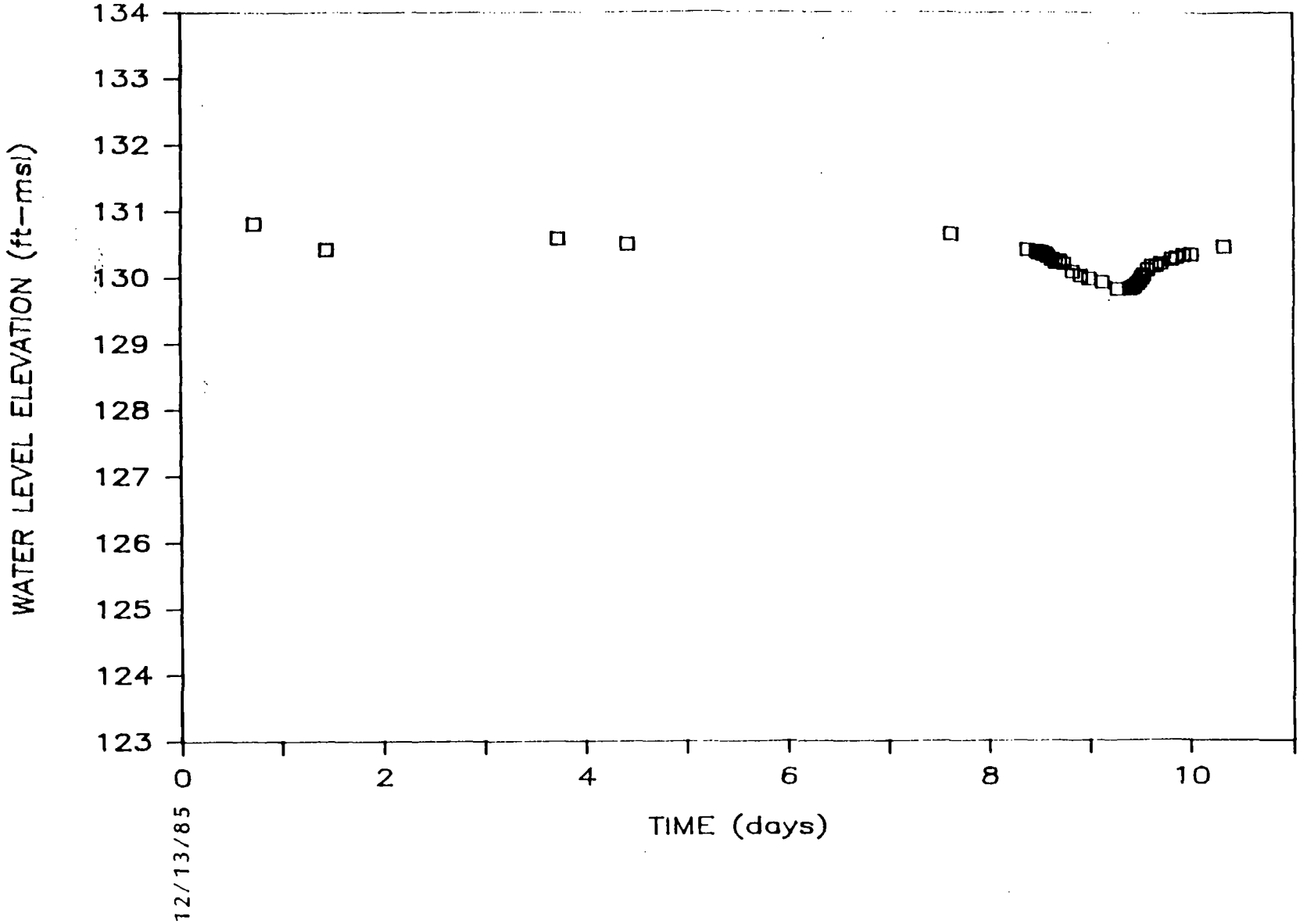
WATER LEVEL HISTORY



3 10 00415

WELL NO. P-15

WATER LEVEL HISTORY



3 10 00416

WELL NO. P-18

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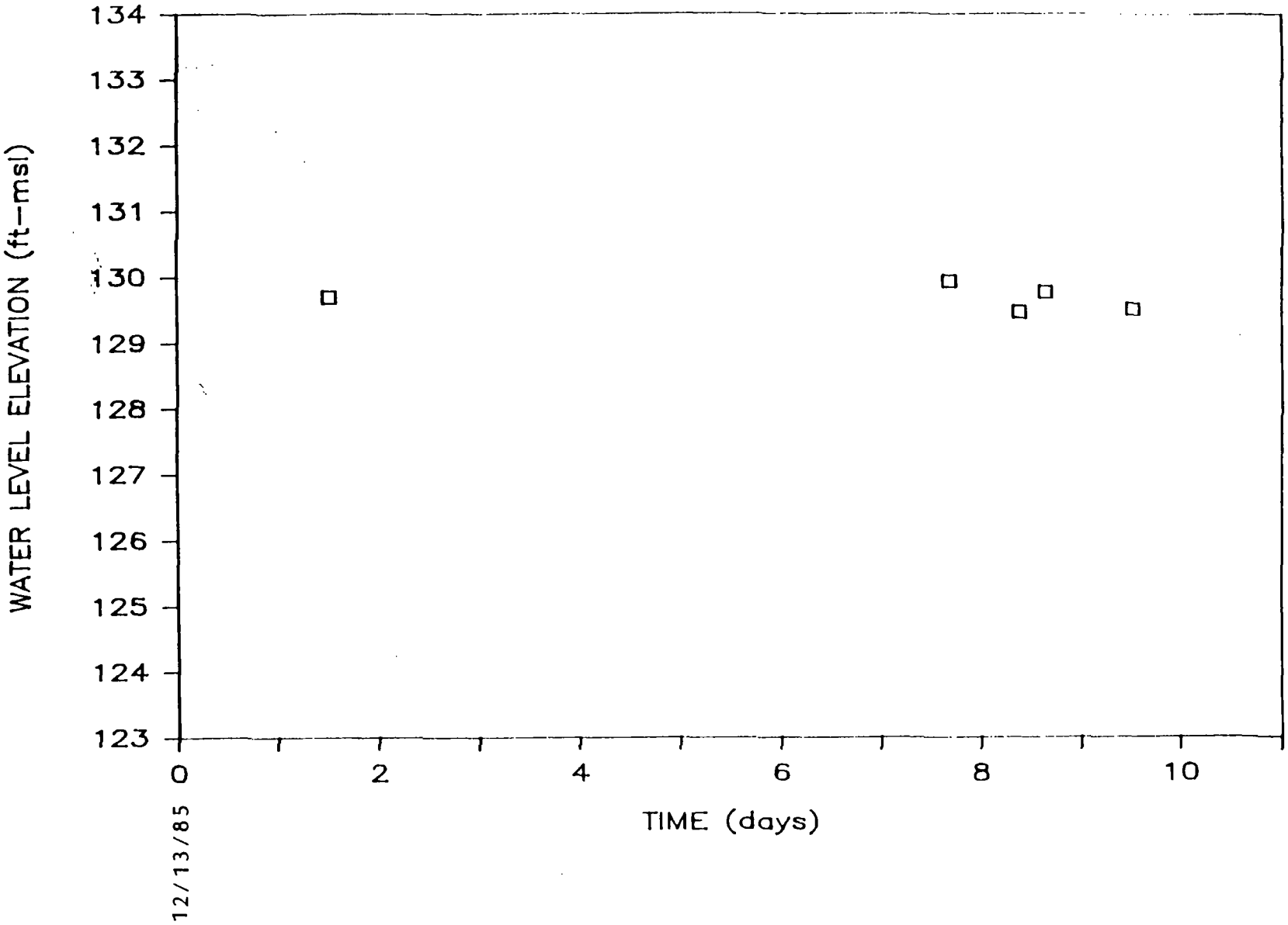
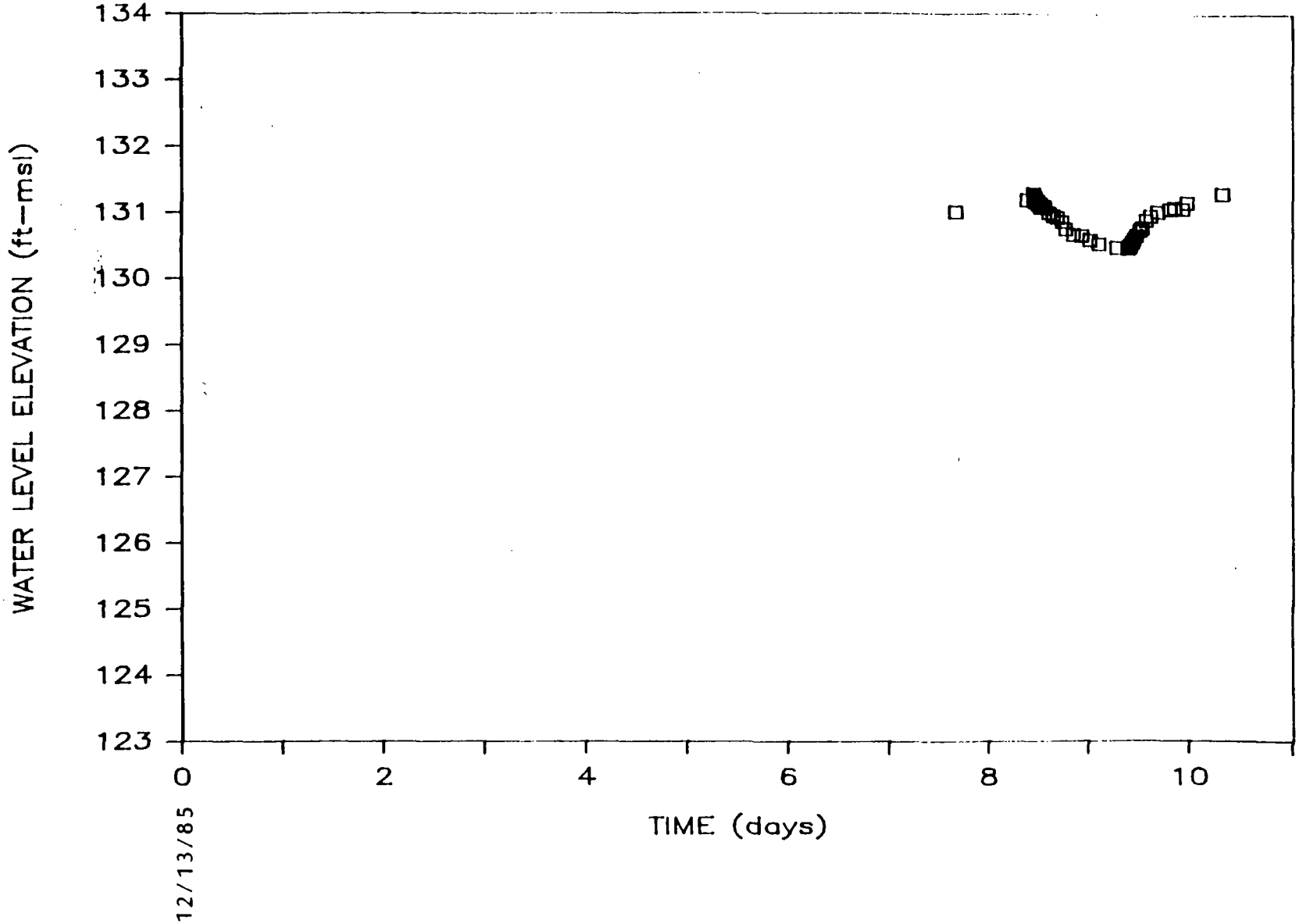


3 10 00417

WELL NO. W-6

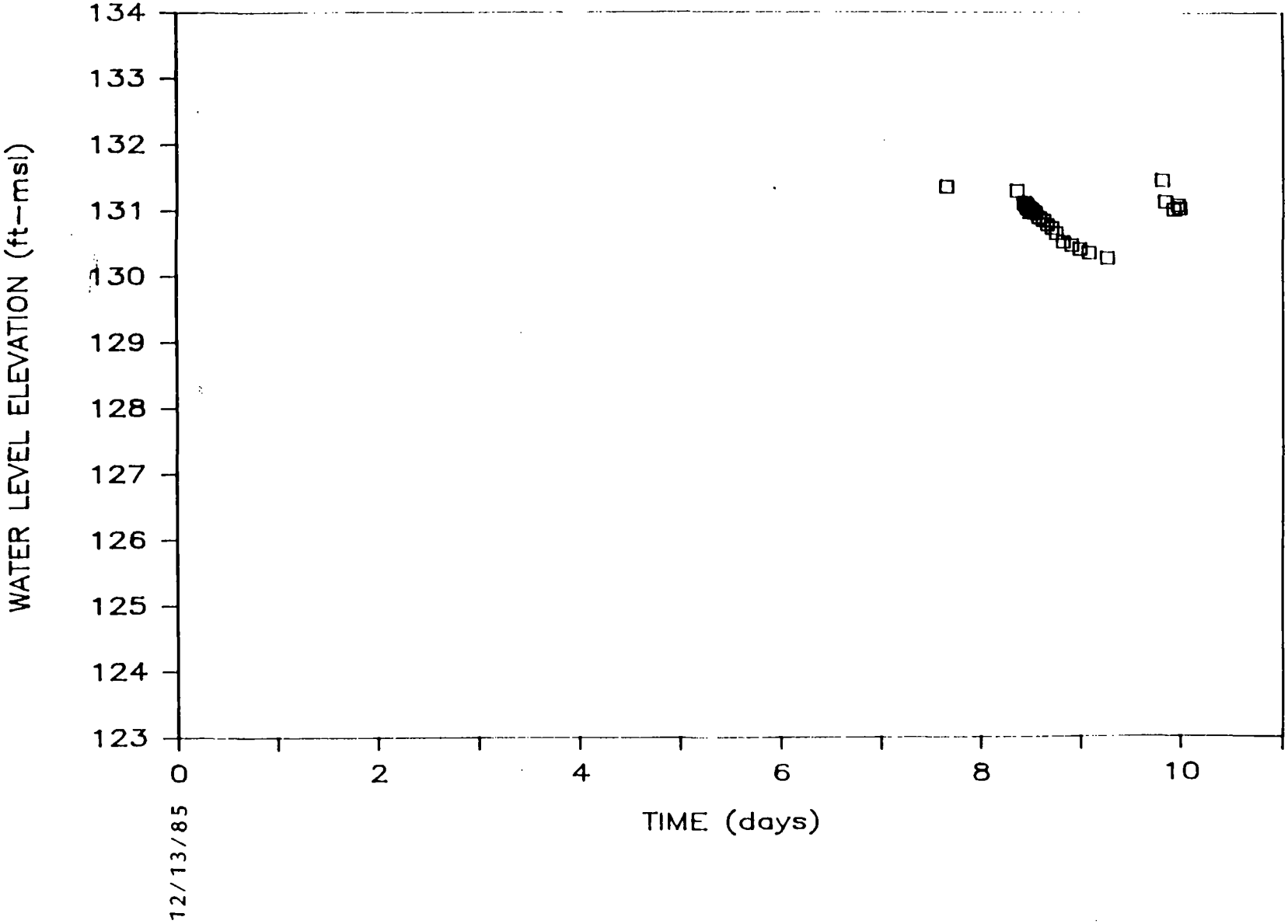
WATER LEVEL HISTORY



3 10 00418

WELL NO. W-7

WATER LEVEL HISTORY



3 10 00419

WELL NO. W-8

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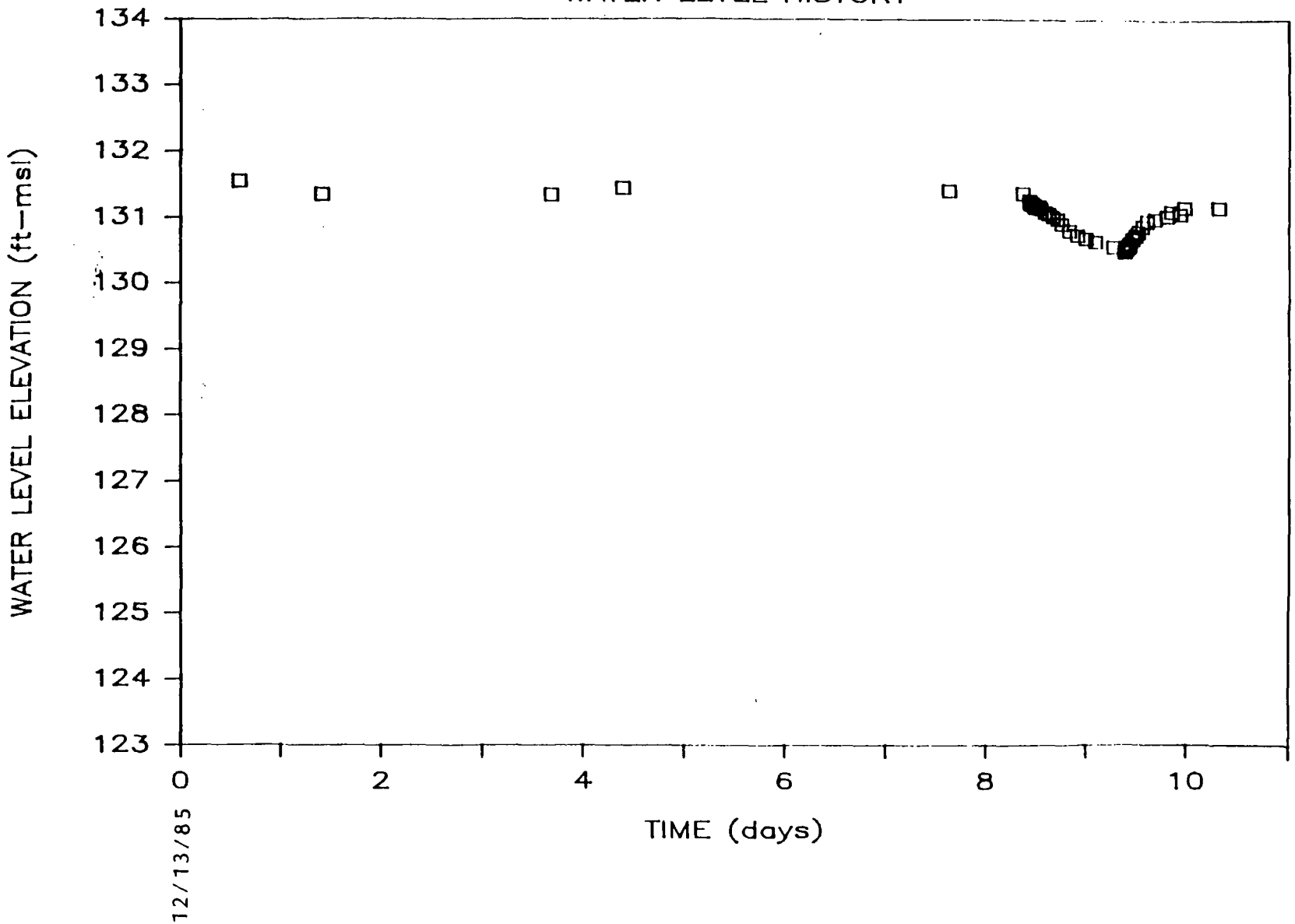
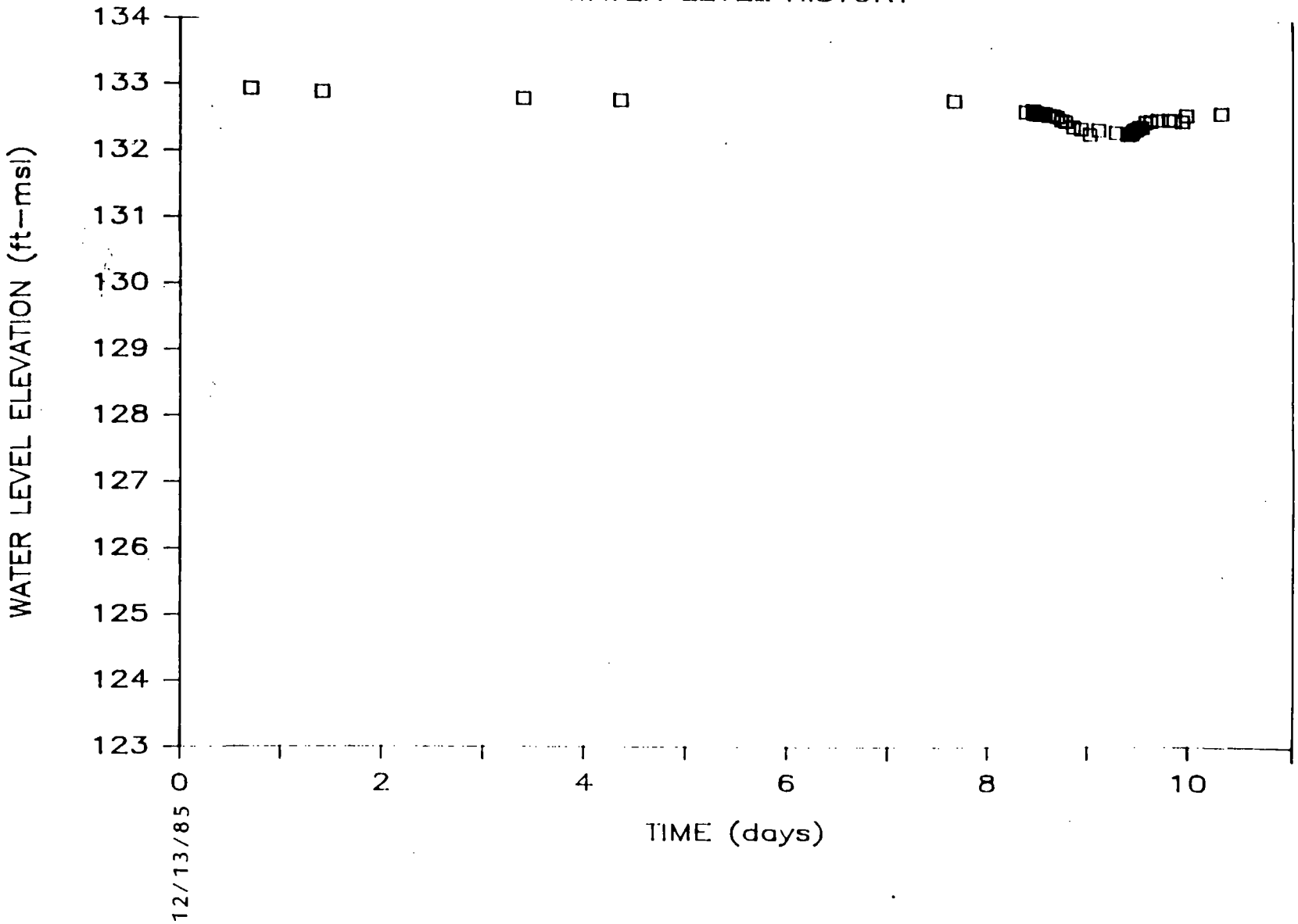


3 10 00420

WELL NO. W-10

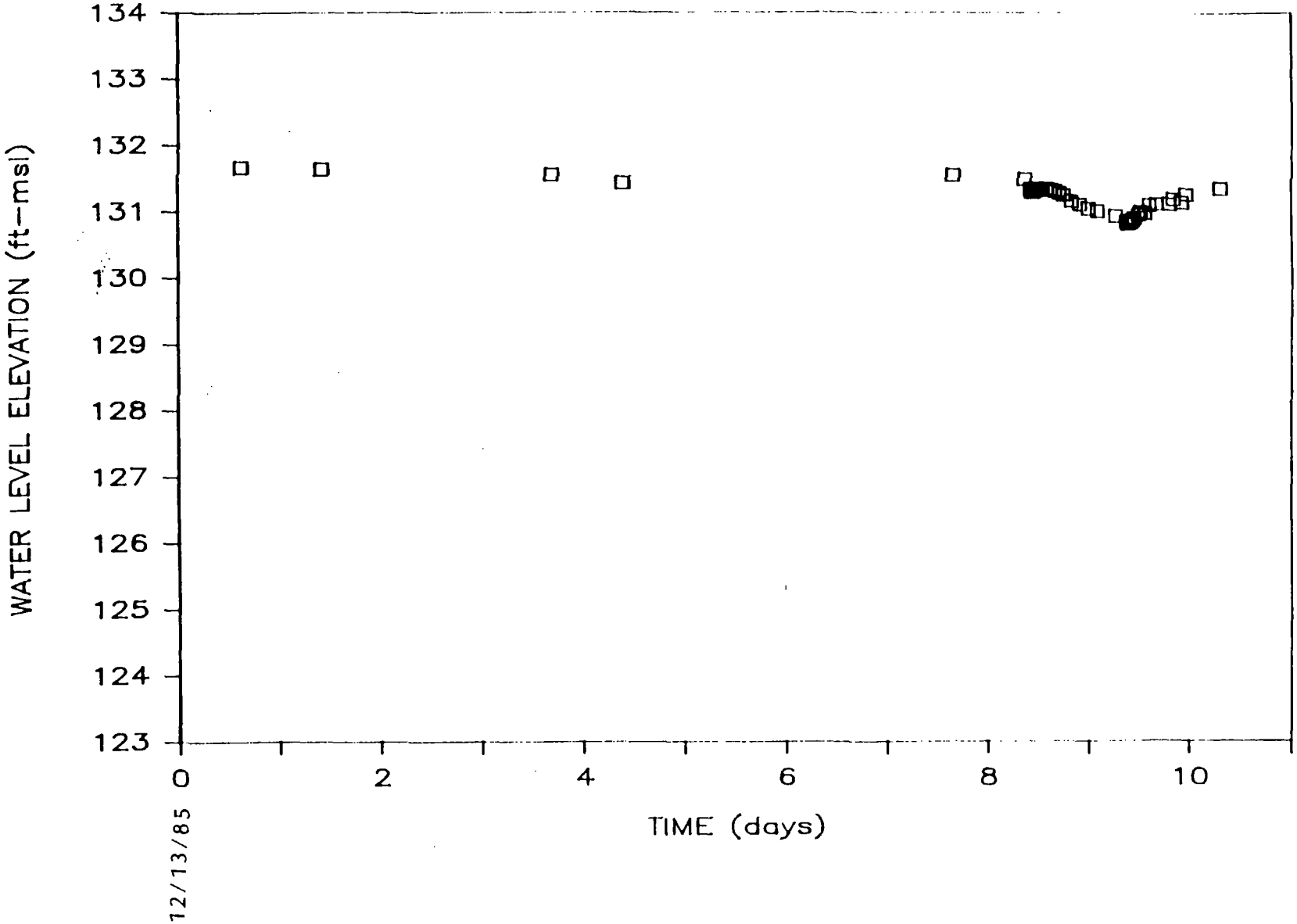
WATER LEVEL HISTORY



3 10 00421

WELL NO. W-11

WATER LEVEL HISTORY



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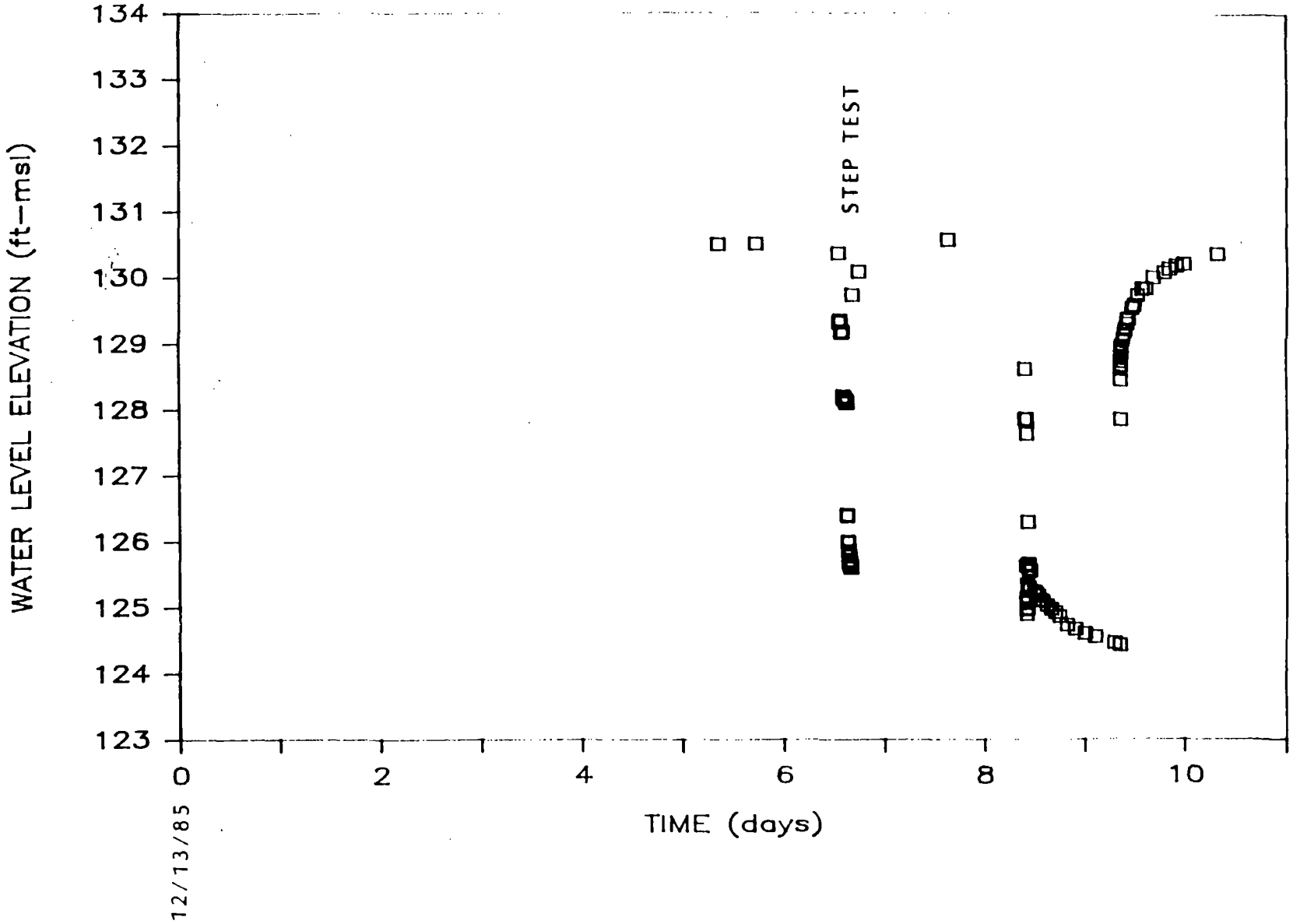
WELL NO. O-1

WATER LEVEL HISTORY



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WELL NO. O-2

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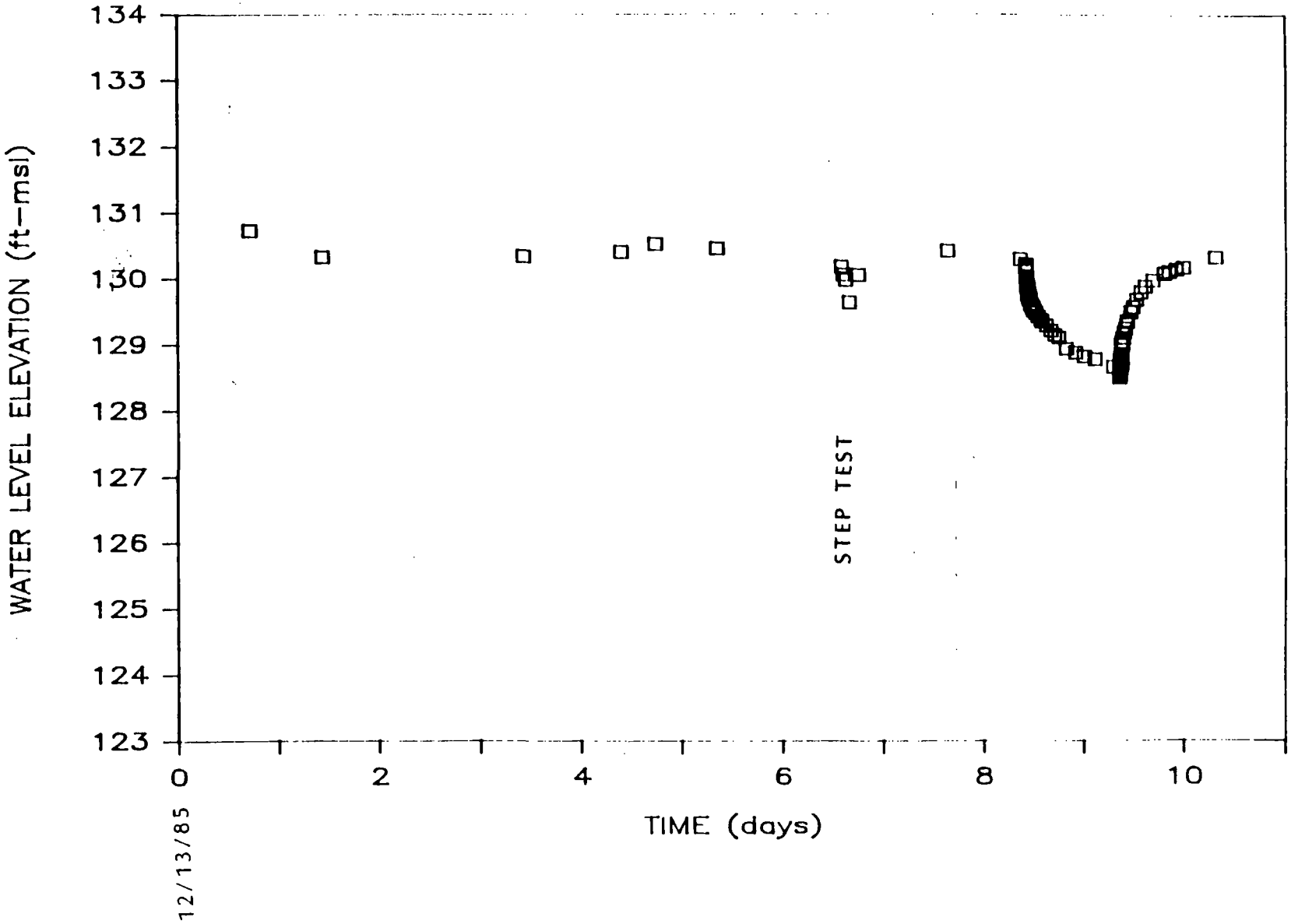
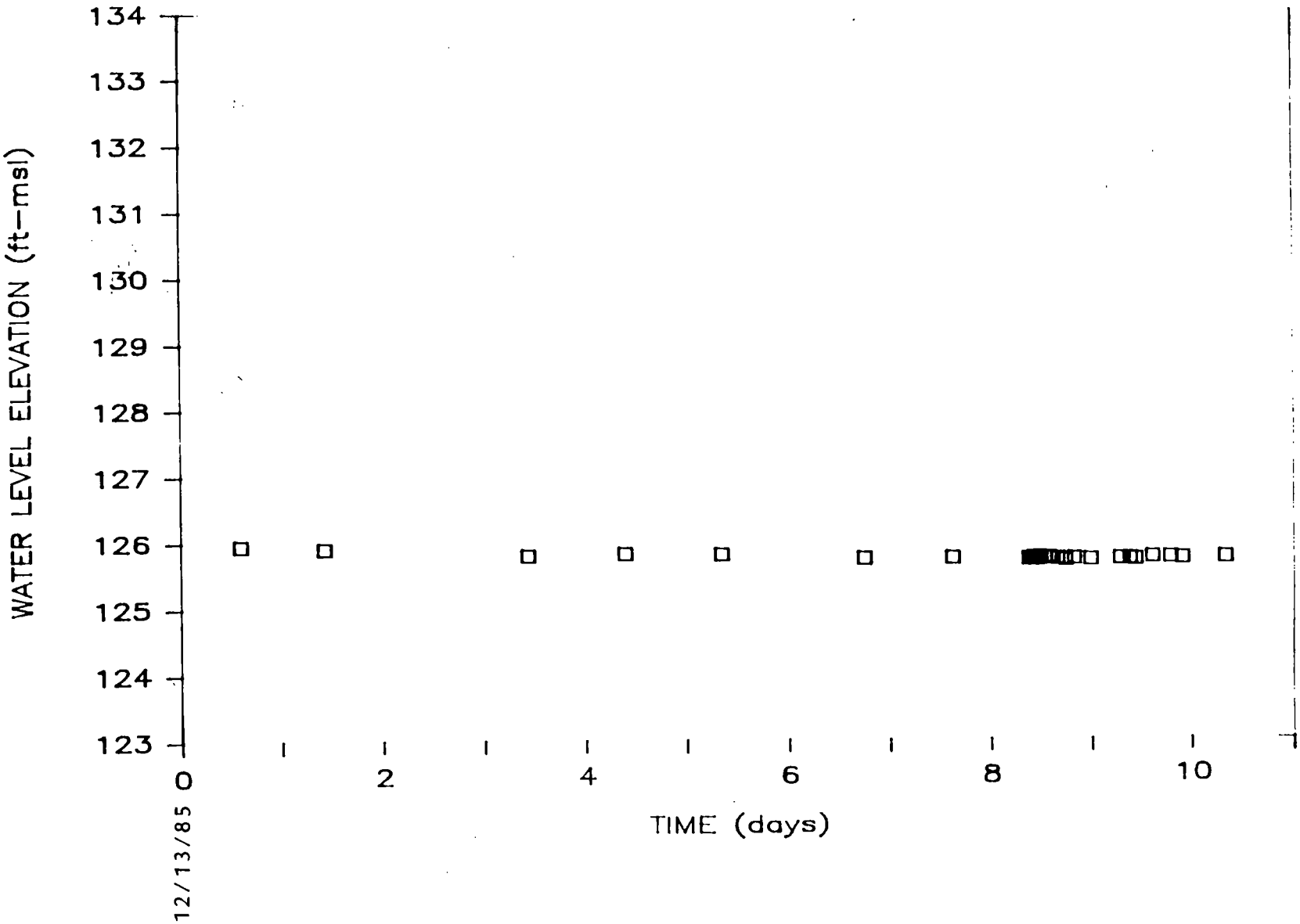


3 10 00424

WELL NO. DW-1

WATER LEVEL HISTORY



3 10 00425

3 10 00426

Appendix H-4

Water Level Measurements

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-1
DEPTH TO STATIC WATER LEVEL : 7.93
TOP OF CASING ELEV.(FT-MSL) : 140.09

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	9	7	0	7.61			132.48						
12	14	85	9	40	0	7.74			132.35						
12	17	85	8	50	0	7.83			132.26						
12	20	85	16	0	0	7.79			132.30						
12	21	85	8	56	0	7.93	0.00		132.16						
12	21	85	11	26	0	8.15	0.22		131.94	96.00		-0.6575773192		1.9822712330	
12	21	85	11	41	0	8.17	0.24		131.92	111.00		-0.6197887583		2.0453229788	
12	21	85	11	56	0	8.18	0.25		131.91	126.00		-0.6020599913		2.1003705451	
12	21	85	12	26	0	8.16	0.23		131.93	156.00		-0.6382721640		2.1931245984	
12	21	85	12	56	0	8.17	0.24		131.92	186.00		-0.6197887583		2.2695129442	
12	21	85	13	55	0	8.17	0.24		131.92	245.00		-0.6197887583		2.3891660844	
12	21	85	14	56	0	8.19	0.26		131.90	306.00		-0.5850266520		2.4857214265	
12	21	85	15	55	0	8.19	0.26		131.90	365.00		-0.5850266520		2.5622928645	
12	21	85	16	59	0	8.20	0.27		131.89	429.00		-0.5686362358		2.6324572922	
12	21	85	18	3	0	8.26	0.33		131.83	493.00		-0.4814860601		2.6928469193	
12	21	85	19	59	0	8.31	0.38		131.78	609.00		-0.4202164034		2.7846172926	
12	21	85	21	56	0	8.35	0.42		131.74	726.00		-0.3767507096		2.8609366207	
12	21	85	23	59	0	8.40	0.47		131.69	849.00		-0.3279021421		2.9289076902	
12	22	85	2	18	0	8.45	0.52		131.64	988.00		-0.2839966564		2.9947569446	
12	22	85	8	27	0	8.58	0.65	0	131.51	1357.00		-0.1870866434		3.1325798477	
12	22	85	13	52	0	8.16	0.23	0.42	131.93	1682.00	317.00		-0.3767507096		2.5010592622
12	22	85	14	56	0	8.13	0.20	0.45	131.96	1746.00	381.00		-0.3467874862		2.5809249757
12	22	85	16	45	0	6.10	0.17	0.48	131.99	1855.00	490.00		-0.3187587626		2.6901960800
12	22	85	19	48	0	8.07	0.14	0.51	132.02	2038.00	673.00		-0.2924298239		2.8280150642
12	22	85	20	50	0	8.06	0.13	0.52	132.03	2100.00	735.00		-0.2839966564		2.8662873391
12	22	85	23	57	0	8.05	0.12	0.53	132.04	2287.00	922.00		-0.2757241304		2.9647309211
12	23	85	7	46	0	7.91	-0.02	0.67	132.18	2756.00	1391.00		-0.1739251973		3.1433271300

3 10 00427

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-2
DEPTH TO S.W.L. 8.28
CASING ELEV. 139.1

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	17	35	0	7.87			131.23						
12	14	85	10	13	0	8.20			130.90						
12	16	85	9	17	0	8.25			130.85						
12	17	85	9	14	0	8.18			130.92						
12	18	85	8	0	0	8.13			130.97						
12	20	85	15	0	0	8.03			131.07						
12	21	85	8	0	0	8.28			130.82						
12	21	85	9	5	0	8.28	0.00		130.82						
12	21	85	9	55	0	8.52	0.24		130.58	5.00		-0.6197887583		0.6989700043	
12	21	85	10	0	0	8.89	0.61		130.21	10.00		-0.2146701650		1.0000000000	
12	21	85	10	6	0	9.00	0.72		130.10	16.00		-0.1426675036		1.2041199827	
12	21	85	10	10	0	9.08	0.80		130.02	20.00		-0.0969100130		1.3010299957	
12	21	85	10	14	0	9.02	0.74		130.08	24.00		-0.1307682803		1.3802112417	
12	21	85	10	18	0	9.03	0.75		130.07	28.00		-0.1249387366		1.4471580313	
12	21	85	10	23	0	9.09	0.81		130.01	33.00		-0.0915149811		1.5185139399	
12	21	85	10	27	0	9.12	0.84		129.98	37.00		-0.0757207139		1.5682017241	
12	21	85	10	31	0	9.13	0.85		129.97	41.00		-0.0705810743		1.6127838567	
12	21	85	10	36	0	9.16	0.88		129.94	46.00		-0.0555173278		1.6627578317	
12	21	85	10	40	0	9.18	0.90		129.92	50.00		-0.0457574906		1.6989700043	
12	21	85	10	44	0	9.19	0.91		129.91	54.00		-0.0409586077		1.7323937598	
12	21	85	10	49	0	9.20	0.92		129.90	59.00		-0.0362121727		1.7708520116	
12	21	85	11	3	0	9.30	1.02		129.80	73.00		0.0056001718		1.8633228601	
12	21	85	11	17	0	9.30	1.02		129.80	87.00		0.0086001718		1.9395192526	
12	21	85	11	27	0	9.32	1.04		129.78	97.00		0.0170333393		1.9867717343	
12	21	85	11	42	0	9.34	1.06		129.76	112.00		0.0253058653		2.0492180227	
12	21	85	12	14	0	9.38	1.10		129.72	144.00		0.0413926852		2.1583624921	
12	21	85	12	45	0	9.40	1.12		129.70	175.00		0.0492180227		2.2430380487	
12	21	85	13	17	0	9.44	1.16		129.66	207.00		0.0644579892		2.3159703455	
12	21	85	13	45	0	9.48	1.20		129.62	235.00		0.0791812460		2.3710678623	
12	21	85	14	55	0	9.53	1.25		129.57	305.00		0.0969100130		2.4842998393	
12	21	85	15	53	0	9.57	1.29		129.53	363.00		0.1105897103		2.5599066250	
12	21	85	16	46	0	9.63	1.35		129.47	416.00		0.1303337685		2.6190933306	
12	21	85	17	45	0	9.63	1.35		129.47	475.00		0.1303337685		2.6766936096	
12	21	85	19	55	0	9.80	1.52		129.30	605.00		0.1818435879		2.7817553747	
12	21	85	22	3	0	9.85	1.57		129.25	733.00		0.1958996524		2.8651039746	
12	21	85	23	54	0	9.88	1.60		129.22	844.00		0.2041199827		2.9263424466	
12	22	85	2	24	0	10.05	1.77		129.05	994.00		0.2479732664		2.9973863844	
12	22	85	6	54	0	10.03	1.75		129.07	1264.00		0.2430380487		3.1017470739	
12	22	85	8	33	0	10.06	1.78	0.00	129.04	1363.00		0.2504200023		3.1344958558	
12	22	85	8	35	30	10.01	1.73	0.05	129.09		0.50		-1.3010299957		-0.3010299957
12	22	85	8	36	30	9.88	1.60	0.18	129.22		1.50		-0.7447274949		0.1760912591
12	22	85	8	38	0	9.71	1.43	0.35	129.39		3.00		-0.4559319556		0.4771212547
12	22	85	8	39	0	9.67	1.39	0.39	129.43		4.00		-0.4089353930		0.6020599913
12	22	85	8	40	0	9.61	1.33	0.45	129.49		5.00		-0.3467874862		0.6989700043

3 10 00428

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-2
DEPTH TO S.W.L. 8.28
CASING ELEV. 139.1

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	8	41	0	9.57	1.29	0.49	129.53		6.00		-0.3098039200		0.7781512504
12	22	85	8	42	0	9.54	1.26	0.52	129.56		7.00		-0.2839966564		0.8450980400
12	22	85	8	43	0	9.51	1.23	0.55	129.59		8.00		-0.2596373105		0.9030899870
12	22	85	8	44	0	9.48	1.20	0.58	129.62		9.00		-0.2365720064		0.9542425094
12	22	85	8	45	0	9.46	1.18	0.60	129.64		10.00		-0.2218487496		1.0000000000
12	22	85	8	47	0	9.43	1.15	0.63	129.67		12.00		-0.2006594505		1.0791812460
12	22	85	8	49	0	9.40	1.12	0.66	129.70		14.00		-0.1804560645		1.1461280357
12	22	85	8	51	0	9.37	1.09	0.69	129.73		16.00		-0.1611509093		1.2041199827
12	22	85	8	53	0	9.34	1.06	0.72	129.76		18.00		-0.1426675036		1.2552725051
12	22	85	8	55	0	9.32	1.04	0.74	129.78		20.00		-0.1307632803		1.3010299957
12	22	85	8	57	0	9.30	1.02	0.76	129.80		22.00		-0.1191864077		1.3424226808
12	22	85	8	59	0	9.28	1.00	0.78	129.82		24.00		-0.1079053973		1.3802112417
12	22	85	9	1	0	9.26	0.98	0.80	129.84		26.00		-0.0969100130		1.4149733480
12	22	85	9	3	0	9.25	0.97	0.81	129.85		28.00		-0.0915149811		1.4471580313
12	22	85	9	5	0	9.25	0.97	0.81	129.85		30.00		-0.0915149811		1.4771212547
12	22	85	9	7	0	9.23	0.95	0.83	129.87		32.00		-0.0809219076		1.5051499783
12	22	85	9	9	0	9.22	0.94	0.84	129.88		34.00		-0.0757207139		1.5314789170
12	22	85	9	11	0	9.21	0.93	0.85	129.89		36.00		-0.0705810743		1.5563025008
12	22	85	9	13	0	9.20	0.92	0.86	129.90		38.00		-0.0655015488		1.5797835966
12	22	85	9	15	0	9.19	0.91	0.87	129.91		40.00		-0.0604807474		1.6020599913
12	22	85	9	20	0	9.18	0.90	0.88	129.92		45.00		-0.0555173278		1.6532125138
12	22	85	9	25	0	9.16	0.88	0.90	129.94		50.00		-0.0457574906		1.6989700043
12	22	85	9	30	0	9.15	0.87	0.91	129.95		55.00		-0.0409586077		1.7403626895
12	22	85	9	35	0	9.13	0.85	0.93	129.97		60.00		-0.0315170514		1.7781512504
12	22	85	9	40	0	9.12	0.84	0.94	129.98		65.00		-0.0268721464		1.8129133566
12	22	85	9	52	0	9.09	0.80	0.98	130.02		77.00		-0.0087739243		1.8864907252
12	22	85	10	21	0	9.07	0.79	0.99	130.03		106.00		-0.0043648054		2.0253058653
12	22	85	10	32	0	9.03	0.75	1.03	130.07		117.00		0.0128172247		2.0681858617
12	22	85	11	12	0	8.94	0.66	1.12	130.16		157.00		0.0492180227		2.1958996524
12	22	85	11	49	0	8.88	0.60	1.18	130.22		194.00		0.0718620073		2.2878017299
12	22	85	12	35	0	8.81	0.53	1.25	130.29		240.00		0.0969100130		2.3802112417
12	22	85	13	36	0	8.71	0.43	1.35	130.39		301.00		0.1303337685		2.4785664956
12	22	85	14	40	0	8.64	0.36	1.42	130.46		365.00		0.1522883444		2.5622928645
12	22	85	16	20	0	8.57	0.29	1.49	130.53		465.00		0.1731862684		2.6674529529
12	22	85	18	57	0	8.50	0.22	1.56	130.60		622.00		0.1931245984		2.7937903847
12	22	85	20	10	0	8.48	0.20	1.58	130.62		695.00		0.1986570870		2.8419848046
12	22	85	21	59	0	8.44	0.16	1.62	130.66		804.00		0.2095150145		2.9052560487
12	22	85	23	42	0	8.40	0.12	1.66	130.70		907.00		0.2201080980		2.9576072871
12	23	85	7	30	0	8.31	0.03	1.75	130.79		1375.00		0.2430380487		3.1383026982

3 10 00429

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-4-1
DEPTH TO STATIC WATER LEVEL : 4.24
TOP OF CASING ELEV.(FT-MSL) : 135.90

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	9	31	0	3.77			132.13						
12	14	85	10	7	0	3.96			131.94						
12	16	85	16	33	0	3.87			132.03						
12	17	85	9	0	0	3.98			131.92						
12	20	85	14	50	0	3.90			132.00						
12	21	85	9	37	0	4.24	0.00		131.66						
12	21	85	9	50	0	4.24	0.00		131.66	0.00					
12	21	85	10	1	0	4.25	0.01		131.65	11.00		-2.0000000000		1.0413926852	
12	21	85	10	10	0	4.33	0.09		131.57	20.00		-1.0457574906		1.3010299957	
12	21	85	10	20	0	4.35	0.11		131.55	30.00		-0.9586073148		1.4771212547	
12	21	85	10	34	0	4.37	0.13		131.53	44.00		-0.8860566477		1.6434526765	
12	21	85	10	47	0	4.38	0.14		131.52	57.00		-0.8538719643		1.7558748557	
12	21	85	11	4	0	4.41	0.17		131.49	74.00		-0.7695510786		1.8692317197	
12	21	85	11	16	0	4.41	0.17		131.49	86.00		-0.7695510786		1.9344984512	
12	21	85	11	33	0	4.43	0.19		131.47	103.00		-0.7212463990		2.0128372247	
12	21	85	11	50	0	4.45	0.21		131.45	120.00		-0.6777807053		2.0791812460	
12	21	85	12	20	0	4.45	0.21		131.45	150.00		-0.6777807053		2.1760912591	
12	21	85	12	50	0	4.58	0.34		131.32	180.00		-0.4685210830		2.2552725051	
12	21	85	13	23	0	4.49	0.25		131.41	213.00		-0.6020599913		2.3283796034	
12	21	85	13	53	0	4.51	0.27		131.39	243.00		-0.5686362358		2.3856062736	
12	21	85	14	53	0	4.52	0.28		131.38	303.00		-0.5528419687		2.4814426285	
12	21	85	15	53	0	4.56	0.32		131.34	363.00		-0.4948500217		2.5599066250	
12	21	85	16	53	0	4.56	0.32		131.34	423.00		-0.4948500217		2.6263403674	
12	21	85	17	53	0	4.63	0.39		131.27	483.00		-0.4089353930		2.6839471308	
12	21	85	19	56	0	4.77	0.53		131.13	606.00		-0.2757241304		2.7824726242	
12	21	85	21	56	0	4.82	0.58		131.08	726.00		-0.2365720064		2.8609366207	
12	21	85	23	56	0	4.78	0.54		131.12	846.00		-0.2676062402		2.9273703630	
12	22	85	3	12	0	4.87	0.63		131.03	1042.00		-0.2006594505		3.0178677190	
12	22	85	6	47	0	4.87	0.63	0.00	131.03	1257.00		-0.2006594505		3.0993352777	
12	22	85	9	14	0	4.64	0.40	0.23	131.26	1404.00	39.00		-0.6382721640		1.5910646070
12	22	85	9	15	0	4.64	0.40	0.23	131.26	1405.00	40.00		-0.6382721640		1.6020599913
12	22	85	9	22	0	4.63	0.39	0.24	131.27	1412.00	47.00		-0.6197887583		1.6720978579
12	22	85	9	29	0	4.62	0.38	0.25	131.28	1419.00	54.00		-0.6020599913		1.7323937598
12	22	85	9	36	0	4.61	0.37	0.26	131.29	1426.00	61.00		-0.5850266520		1.7853298350
12	22	85	10	4	0	4.60	0.36	0.27	131.30	1454.00	89.00		-0.5686362353		1.9493900066
12	22	85	10	19	0	4.57	0.33	0.30	131.33	1469.00	104.00		-0.5228787453		2.0170333393
12	22	85	10	42	0	4.54	0.30	0.33	131.36	1492.00	127.00		-0.4814860601		2.1038037210
12	22	85	11	24	0	4.50	0.26	0.37	131.40	1534.00	169.00		-0.4317982759		2.2278867046
12	22	85	11	46	0	4.48	0.24	0.39	131.42	1556.00	191.00		-0.4087353930		2.2810333672
12	22	85	13	48	0	4.37	0.13	0.50	131.53	1678.00	313.00		-0.3010299957		2.4955443375
12	22	85	14	52	0	4.32	0.08	0.55	131.58	1742.00	377.00		-0.2596373105		2.5763413502
12	22	85	16	39	0	4.27	0.03	0.60	131.63	1848.00	483.00		-0.2218487496		2.6839471308
12	22	85	19	40	0	4.24	0.00	0.63	131.66	2030.00	665.00		-0.2006594505		2.8228216453
12	22	85	20	44	0	4.23	-0.01	0.64	131.67	2094.00	729.00		-0.1938200260		2.8627275283

3 10 00430

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. BP-4-1
DEPTH TO STATIC WATER LEVEL : 4.24
TOP OF CASING ELEV.(FT-MSL) : 135.90

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	22	48	0	4.30	0.06	0.57	131.60	2218.00	853.00		-0.2441251443		2.9309490312
12	22	85	23	48	0	4.25	0.01	0.62	131.65	2278.00	913.00		-0.2076083105		2.9604707775
12	23	85	7	56	0	4.09	-0.15	0.78	131.81	2766.00	1401.00		-0.1079053973		3.1464381353

3 10 00431

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-5-1
DEPTH TO STATIC WATER LEVEL : 9.88
TOP OF CASING ELEV.(FT-MSL) : 140.20

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	13	57	0	9.31			130.89						
12	14	85	10	41	0	9.64			130.56						
12	16	85	16	8	0	9.49			130.71						
12	17	85	9	28	0	9.60			130.60						
12	18	85	8	21	0	9.56			130.64						
12	20	85	15	10	0	9.48			130.72						
12	21	85	9	27	0	9.88	0.00		130.32						
12	21	85	9	55	0	10.20	0.32		130.00	5.00		-0.4948500217		0.6989700043	
12	21	85	10	4	0	10.70	0.82		129.50	14.00		-0.0861861476		1.1461280357	
12	21	85	10	14	0	10.77	0.89		129.43	24.00		-0.0506099934		1.3802112417	
12	21	85	10	27	0	10.88	1.00		129.32	37.00		0.0000000000		1.5682017241	
12	21	85	10	39	0	10.89	1.01		129.31	49.00		0.0043213738		1.6901960800	
12	21	85	10	52	0	10.91	1.03		129.29	62.00		0.0128372247		1.7923916895	
12	21	85	11	10	0	10.99	1.11		129.21	80.00		0.0453229788		1.9030899870	
12	21	85	11	22	0	11.01	1.13		129.19	92.00		0.0530784435		1.9637878273	
12	21	85	11	37	0	11.03	1.15		129.17	107.00		0.0606978404		2.0293837777	
12	21	85	12	0	0	11.08	1.20		129.12	130.00		0.0791812460		2.1139433523	
12	21	85	12	30	0	11.10	1.22		129.10	160.00		0.0863598307		2.2041199827	
12	21	85	13	0	0	11.15	1.27		129.05	190.00		0.1038037210		2.2787536010	
12	21	85	13	33	0	11.20	1.32		129.00	223.00		0.1205739312		2.3483048630	
12	21	85	14	3	0	11.20	1.32		129.00	253.00		0.1205739312		2.4031205212	
12	21	85	14	48	0	11.24	1.36		128.96	298.00		0.1335389084		2.4742162641	
12	21	85	15	48	0	11.28	1.40		128.92	358.00		0.1461280357		2.5538830266	
12	21	85	16	48	0	11.40	1.52		128.80	418.00		0.1816435879		2.6211762818	
12	21	85	17	48	0	11.40	1.52		128.80	478.00		0.1818435879		2.6794278966	
12	21	85	19	48	0	11.48	1.60		128.72	598.00		0.2041199827		2.7767011840	
12	21	85	21	48	0	11.58	1.70		128.62	718.00		0.2304489214		2.8561244442	
12	21	85	23	48	0	11.60	1.72		128.60	838.00		0.2355284469		2.9232440186	
12	22	85	3	20	0	11.67	1.79		128.53	1050.00		0.2528530310		3.0211892991	
12	22	85	6	41	0	11.75	1.87	0.00	128.45	1251.00		0.2718416065		3.0972573097	
12	22	85	8	35	0	11.65	1.77	0.10	128.55		0.00		-1.0000000000		
12	22	85	8	36	10	11.58	1.70	0.17	128.62		1.17		-0.7695510786		0.0669467896
12	22	85	8	36	30	11.51	1.63	0.24	128.69		1.50		-0.6197887533		0.1760912591
12	22	85	8	36	43	11.44	1.56	0.31	128.76		1.72		-0.5086383062		0.2346859743
12	22	85	8	36	56	11.36	1.48	0.39	128.84		1.93		-0.4089353930		0.2863067388
12	22	85	8	37	9	11.33	1.45	0.42	128.87		2.15		-0.3767507096		0.3324384599
12	22	85	8	37	21	11.31	1.43	0.44	128.89		2.35		-0.3565473235		0.3710678623
12	22	85	8	37	30	11.29	1.40	0.47	128.92		2.50		-0.3279021421		0.3979400087
12	22	85	8	37	42	11.26	1.38	0.49	128.94		2.70		-0.3099039200		0.4313637642
12	22	85	8	37	54	11.25	1.37	0.50	128.95		2.90		-0.3010299957		0.4623979979
12	22	85	8	38	6	11.22	1.34	0.53	128.98		3.10		-0.2757241304		0.4913616938
12	22	85	8	38	18	11.21	1.33	0.54	128.99		3.30		-0.2676062402		0.5185139399
12	22	85	8	38	30	11.19	1.31	0.56	129.01		3.50		-0.2518119730		0.5440680444
12	22	85	8	38	42	11.18	1.30	0.57	129.02		3.70		-0.2441251443		0.5682017241

3 10 00432

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-5-1
DEPTH TO STATIC WATER LEVEL : 9.88
TOP OF CASING ELEV.(FT-MSL) : 140.20

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	8	38	44	11.17	1.29	0.58	129.03		3.73		-0.2365720064		0.5720967680
12	22	85	8	39	5	11.15	1.27	0.60	129.05		4.08		-0.2218487496		0.6110148340
12	22	85	8	39	30	11.13	1.25	0.62	129.07		4.50		-0.2076083105		0.6532125138
12	22	85	8	39	45	11.12	1.24	0.63	129.08		4.75		-0.2006594505		0.6766936096
12	22	85	8	40	1	11.10	1.22	0.65	129.10		5.02		-0.1870866434		0.7004152452
12	22	85	8	40	13	11.08	1.20	0.67	129.12		5.22		-0.1739251973		0.7173930872
12	22	85	8	40	25	11.08	1.20	0.67	129.12		5.42		-0.1739251973		0.7337321106
12	22	85	8	40	37	11.06	1.18	0.69	129.14		5.62		-0.1611509093		0.7494786505
12	22	85	8	40	49	11.06	1.18	0.69	129.14		5.82		-0.1611509093		0.7646741766
12	22	85	8	41	1	11.05	1.17	0.70	129.15		6.02		-0.1549019600		0.7793559515
12	22	85	8	41	20	11.04	1.16	0.71	129.16		6.33		-0.1487416513		0.8016323462
12	22	85	8	41	40	11.04	1.16	0.71	129.16		6.67		-0.1487416513		0.8239087409
12	22	85	8	41	55	11.02	1.14	0.73	129.18		6.92		-0.1366771399		0.8398968463
12	22	85	8	42	30	11.02	1.14	0.73	129.18		7.50		-0.1366771399		0.8750612634
12	22	85	8	43	10	10.98	1.10	0.77	129.22		8.17		-0.1135092748		0.9120448296
12	22	85	8	43	30	10.97	1.09	0.78	129.23		8.50		-0.1079053973		0.9294189257
12	22	85	8	43	50	10.96	1.08	0.79	129.24		8.83		-0.1023729087		0.9461246192
12	22	85	8	44	10	10.96	1.08	0.79	129.24		9.17		-0.1023729087		0.9622114391
12	22	85	8	44	25	10.95	1.07	0.80	129.25		9.42		-0.0969100130		0.9736971974
12	22	85	8	44	40	10.94	1.06	0.81	129.26		9.67		-0.0915149811		0.9852767432
12	22	85	8	44	55	10.93	1.05	0.82	129.27		9.92		-0.0861861476		0.9963657153
12	22	85	8	45	15	10.92	1.04	0.83	129.28		10.25		-0.0809219076		1.0107233654
12	22	85	8	45	45	10.91	1.03	0.84	129.29		10.75		-0.0757207139		1.0314084643
12	22	85	8	46	10	10.90	1.02	0.85	129.30		11.17		-0.0705810743		1.0479235523
12	22	85	8	46	30	10.90	1.02	0.85	129.30		11.50		-0.0705810743		1.0606978404
12	22	85	8	46	50	10.90	1.02	0.85	129.30		11.83		-0.0705810743		1.0731070983
12	22	85	8	47	10	10.89	1.01	0.86	129.31		12.17		-0.0655015488		1.0851716097
12	22	85	8	47	25	10.88	1.00	0.87	129.32		12.42		-0.0604807474		1.0940050224
12	22	85	8	47	40	10.88	1.00	0.87	129.32		12.67		-0.0604807474		1.1026623419
12	22	85	8	47	55	10.87	0.99	0.88	129.33		12.92		-0.0555173278		1.1111504521
12	22	85	8	48	4	10.87	0.99	0.88	129.33		13.07		-0.0555173278		1.1161648123
12	22	85	8	48	16	10.87	0.99	0.88	129.33		13.27		-0.0555173278		1.1227618174
12	22	85	8	48	28	10.86	0.98	0.89	129.34		13.47		-0.0506099934		1.1292601104
12	22	85	8	48	52	10.84	0.96	0.91	129.36		13.87		-0.0409586077		1.1419720759
12	22	85	8	49	50	10.84	0.96	0.91	129.36		14.83		-0.0409586077		1.1712387563
12	22	85	8	50	30	10.84	0.96	0.91	129.36		15.50		-0.0409586077		1.1903316982
12	22	85	8	51	5	10.82	0.94	0.93	129.38		16.08		-0.0315170514		1.2063760630
12	22	85	8	51	50	10.82	0.94	0.93	129.38		16.83		-0.0315170514		1.2261701234
12	22	85	8	52	45	10.81	0.93	0.94	129.39		17.75		-0.0268721464		1.2491983574
12	22	85	8	53	14	10.80	0.92	0.95	129.40		18.23		-0.0222763947		1.2608660716
12	22	85	8	53	38	10.79	0.91	0.96	129.41		18.63		-0.0177287670		1.2702905532
12	22	85	8	54	15	10.78	0.90	0.97	129.42		19.25		-0.0132282657		1.2844307338
12	22	85	8	55	5	10.78	0.90	0.97	129.42		20.08		-0.0132282657		1.3028357965
12	22	85	8	55	29	10.77	0.89	0.98	129.43		20.48		-0.0087739243		1.3114006325
12	22	85	8	55	53	10.77	0.89	0.98	129.43		20.88		-0.0087739243		1.3197998206

3 10 00433

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. BP-5-1
DEPTH TO STATIC WATER LEVEL : 9.88
TOP OF CASING ELEV.(FT-MSL) : 140.20

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	8	56	30	10.76	0.88	0.99	129.44		21.50		-0.0043648054		1.3324384599
12	22	85	8	57	5	10.76	0.88	0.99	129.44		22.08		-0.0043648054		1.3440646279
12	22	85	8	57	55	10.75	0.87	1.00	129.45		22.92		0.0000000000		1.3601514478
12	22	85	8	58	50	10.75	0.87	1.00	129.45		23.83		0.0000000000		1.3771847871
12	22	85	8	59	45	10.74	0.86	1.01	129.46		24.75		0.0043213738		1.3935752033
12	22	85	9	0	25	10.73	0.85	1.02	129.47		25.42		0.0086001718		1.4051185933
12	22	85	9	0	55	10.73	0.85	1.02	129.47		25.92		0.0086001718		1.4135791430
12	22	85	9	1	20	10.73	0.85	1.02	129.47		26.33		0.0086001718		1.4205058366
12	22	85	9	1	50	10.72	0.84	1.03	129.48		26.83		0.0128372247		1.4286746256
12	22	85	9	2	45	10.72	0.84	1.03	129.48		27.75		0.0128372247		1.4432629875
12	22	85	9	3	50	10.71	0.83	1.04	129.49		28.83		0.0170333393		1.4598948527
12	22	85	9	4	25	10.71	0.83	1.04	129.49		29.42		0.0170333393		1.4685934593
12	22	85	9	4	55	10.70	0.82	1.05	129.50		29.92		0.0211892991		1.4759132025
12	22	85	9	5	30	10.70	0.82	1.05	129.50		30.50		0.0211892991		1.4842998393
12	22	85	9	6	10	10.69	0.81	1.06	129.51		31.17		0.0253058653		1.4936903562
12	22	85	9	6	45	10.68	0.80	1.07	129.52		31.75		0.0293837777		1.5017437296
12	22	85	9	7	25	10.68	0.80	1.07	129.52		32.42		0.0293837777		1.5107683553
12	22	85	9	7	55	10.68	0.80	1.07	129.52		32.92		0.0293837777		1.5174158496
12	22	85	9	9	10	10.67	0.79	1.08	129.53		34.17		0.0334237555		1.5336026107
12	22	85	9	9	40	10.67	0.79	1.08	129.53		34.67		0.0334237555		1.5399120846
12	22	85	9	10	15	10.67	0.79	1.08	129.53		35.25		0.0334237555		1.5471591213
12	22	85	9	10	55	10.67	0.79	1.08	129.53		35.92		0.0334237555		1.5552960241
12	22	85	9	11	45	10.66	0.78	1.09	129.54		36.75		0.0374264979		1.5652573434
12	22	85	9	33	30	10.57	0.69	1.18	129.63		58.50		0.0718820073		1.7671558661
12	22	85	10	0	0	10.53	0.65	1.22	129.67		85.00		0.0863598307		1.9294189257
12	22	85	10	16	0	10.49	0.61	1.26	129.71		101.00		0.1003705451		2.0043213738
12	22	85	10	33	0	10.45	0.57	1.30	129.75		118.00		0.1139433523		2.0718820073
12	22	85	11	15	0	10.35	0.47	1.40	129.85		160.00		0.1461280357		2.2041199827
12	22	85	11	51	0	10.30	0.42	1.45	129.90		196.00		0.1613680022		2.2922560714
12	22	85	13	42	0	10.14	0.26	1.61	130.06		307.00		0.2068258760		2.4871383755
12	22	85	14	40	0	10.07	0.19	1.68	130.13		365.00		0.2253092817		2.5622928645
12	22	85	15	41	0	10.03	0.15	1.72	130.17		426.00		0.2355284469		2.6294095991
12	22	85	16	45	0	9.99	0.11	1.76	130.21		490.00		0.2455126678		2.6901960800
12	22	85	19	40	0	9.90	0.02	1.85	130.30		665.00		0.2671717284		2.8228716453
12	22	85	20	47	0	9.87	-0.01	1.88	130.33		732.00		0.2741578493		2.8645110811
12	22	85	22	31	0	9.80	-0.08	1.95	130.40		836.00		0.2900346114		2.9222062774
12	23	85	0	21	0	9.81	-0.07	1.94	130.39		946.00		0.2878017299		2.9758911364
12	23	85	7	34	0	9.69	-0.19	2.06	130.51		1379.00		0.3138672204		3.1395642662

3 10 00434

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. P-6
DEPTH TO STATIC WATER LEVEL : 9.58
TOP OF CASING ELEV.(FT-MSL) : 135.95

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft.)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	8	53	0	9.26			126.69						
12	14	85	8	54	0	9.36	-0.22		126.59						
12	16	85	9	30	0	9.46	-0.12		126.49						
12	20	85	15	0	0	9.58	0.00		126.37						
12	21	85	8	46	0	9.63	0.05		126.32						
12	23	85	7	42	0	9.76	0.18		126.19	2752.00					

3 10 00435

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO.P-7
DEPTH TO STATIC WATER LEVEL : 9.60
TOP OF CASING ELEV.(FT-MSL) : 142.70

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG REVOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	8	45	0	9.23			133.47						
12	14	85	8	48	0	9.35			133.35						
12	16	85	9	27	0	9.44			133.26						
12	17	85	8	24	0	9.45			133.25						
12	20	85	15	30	0	9.48			133.22						
12	21	85	8	50	0	9.60	0.00		133.10						
12	21	85	12	58	0	9.60	0.00		133.10	188				2.2741578493	
12	21	85	13	58	0	9.58	-0.02		133.12	248				2.3944516808	
12	21	85	14	58	0	9.59	-0.01		133.11	308				2.4885507165	
12	21	85	15	57	0	9.65	0.05		133.05	367		-1.3010299957		2.5646660643	
12	21	85	17	0	0	9.65	0.05		133.05	430		-1.3010299957		2.6334684556	
12	21	85	18	4	0	9.68	0.08		133.02	494		-1.0969100130		2.6937269489	
12	21	85	20	1	0	9.71	0.11		132.99	611		-0.9586073148		2.7860412102	
12	21	85	21	58	0	9.74	0.14		132.96	728		-0.8538719643		2.8621313793	
12	22	85	0	2	0	9.73	0.13		132.97	852		-0.8860566477		2.9304395948	
12	22	85	3	8	0	9.78	0.18		132.92	1038		-0.7447274949		3.0161973535	
12	22	85	7	5	0	9.79	0.19		132.91	1275		-0.7212463990		3.1055101848	

3 10 00436

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. P-8
DEPTH TO STATIC WATER LEVEL : 11.04
TOP OF CASING ELEV.(FT-MSL) : 141.25

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	14	29	0	10.63			130.62						
12	14	85	10	26	0	11.02			130.23						
12	16	85	10	19	0	11.02			130.23						
12	17	85	9	25	0	10.94			130.31						
12	17	85	17	36	0	10.81			130.44						
12	18	85	8	10	0	10.89			130.36						
12	19	85	13	47	0	11.10			130.15						
12	19	85	14	16	0	11.16			130.09						
12	19	85	14	51	0	11.23			130.02						
12	19	85	15	42	0	11.45			129.80						
12	19	85	17	55	0	11.25			130.00						
12	20	85	14	25	0	10.78			130.47						
12	21	85	8	32	0	11.04	0.00		130.21						
12	21	85	9	53	0	11.07	0.03		130.18	3.00		-1.5228787453		0.4771212547	
12	21	85	9	56	0	11.14	0.10		130.11	6.00		-1.0000000000		0.7781512504	
12	21	85	9	57	0	11.13	0.09		130.12	7.00		-1.0457574906		0.8450980400	
12	21	85	9	59	30	11.17	0.13		130.08	9.50		-0.8860566477		0.9777236053	
12	21	85	10	2	0	11.18	0.14		130.07	12.00		-0.8538719643		1.0791812460	
12	21	85	10	2	0	11.21	0.17		130.04	12.00		-0.7695510786		1.0791812460	
12	21	85	10	6	30	11.22	0.18		130.03	16.50		-0.7447274949		1.2174839442	
12	21	85	10	12	0	11.25	0.21		130.00	22.00		-0.6777807053		1.3424226808	
12	21	85	10	14	0	11.25	0.21		130.00	24.00		-0.6777807053		1.3802112417	
12	21	85	10	18	30	11.29	0.25		129.96	28.50		-0.6020599913		1.4548448600	
12	21	85	10	20	30	11.30	0.26		129.95	30.50		-0.5850266520		1.4842998393	
12	21	85	10	21	0	11.30	0.26		129.95	31.00		-0.5850266520		1.4913616938	
12	21	85	10	27	0	11.33	0.29		129.92	37.00		-0.5376020021		1.5682017241	
12	21	85	10	32	0	11.35	0.31		129.90	42.00		-0.5086383062		1.6232492904	
12	21	85	10	38	0	11.39	0.34		129.87	48.00		-0.4685210830		1.6812412374	
12	21	85	10	41	0	11.38	0.34		129.87	51.00		-0.4685210830		1.7075701761	
12	21	85	10	47	40	11.41	0.37		129.84	57.67		-0.4317982759		1.7609248484	
12	21	85	10	50	0	11.40	0.36		129.85	60.00		-0.4436974992		1.7781512504	
12	21	85	11	0	30	11.44	0.40		129.81	70.50		-0.3979400087		1.8481891170	
12	21	85	11	10	0	11.48	0.44		129.77	80.00		-0.3565473235		1.9030899870	
12	21	85	11	24	0	11.49	0.45		129.76	94.00		-0.3467874862		1.9731278536	
12	21	85	11	35	50	11.54	0.50		129.71	105.83		-0.3010299957		2.0246224749	
12	21	85	11	51	0	11.56	0.52		129.69	121.00		-0.2839966564		2.0827853703	
12	21	85	12	18	30	11.61	0.57		129.64	148.50		-0.2441251443		2.1717264537	
12	21	85	12	48	0	11.63	0.59		129.62	178.00		-0.2291479584		2.2504200023	
12	21	85	13	29	30	11.68	0.64		129.57	219.50		-0.1938200260		2.3414345246	
12	21	85	13	48	0	11.70	0.66		129.55	238.00		-0.1804560645		2.3765769571	
12	21	85	14	52	0	11.76	0.72		129.49	302.00		-0.1426675036		2.4800069430	
12	21	85	15	57	0	11.83	0.79		129.42	367.00		-0.1023729087		2.5646660643	
12	21	85	16	51	0	11.88	0.84		129.37	421.00		-0.0757207139		2.6242820958	
12	21	85	17	71	0	11.95	0.91		129.30	501.00		-0.0409586077		2.6998337259	

3 10 00437

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. P-8
DEPTH TO STATIC WATER LEVEL : 11.04
TOP OF CASING ELEV.(FT-MSL) : 141.25

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	21	85	19	45	0	12.08	1.04		129.17	595.00		0.0170333393		2.7745169657	
12	21	85	21	54	0	12.17	1.13		129.08	724.00		0.0530784435		2.8597385662	
12	21	85	23	58	0	12.19	1.15		129.06	848.00		0.0606978404		2.9283958523	
12	22	85	2	40	0	12.26	1.22		128.99	1010.00		0.0863598307		3.0043213738	
12	22	85	7	8	0	12.35	1.31		128.90	1278.00		0.1172712957		3.1065308538	
12	22	85	8	33	0	12.40	1.36		128.85	1363.00		0.1335389084		3.1344958558	
12	22	85	8	33	30	12.39	1.35	0.00	128.86	1363.50		0.1303337685		3.1346551423	
12	22	85	8	36	0	12.38	1.34	0.01	128.87	1366.00	1.00		-2.0000000000		0.0000000000
12	22	85	8	36	30	12.38	1.34	0.02	128.87	1366.50	1.50		-1.6989700043		0.1760912591
12	22	85	8	37	0	12.38	1.34	0.02	128.87	1367.00	2.00		-1.6989700043		0.3010299957
12	22	85	8	38	0	12.38	1.34	0.02	128.87	1368.00	3.00		-1.6989700043		0.4771212547
12	22	85	8	39	0	12.35	1.31	0.02	128.90	1369.00	4.00		-1.6989700043		0.6020599913
12	22	85	8	40	0	12.35	1.31	0.05	128.90	1370.00	5.00		-1.3010299957		0.6989700043
12	22	85	8	41	0	12.35	1.31	0.05	128.90	1371.00	6.00		-1.3010299957		0.7781512504
12	22	85	8	42	0	12.33	1.29	0.05	128.92	1372.00	7.00		-1.3010299957		0.8450980400
12	22	85	8	43	0	12.33	1.29	0.07	128.92	1373.00	8.00		-1.1549019600		0.9030899870
12	22	85	8	44	0	12.32	1.28	0.07	128.93	1374.00	9.00		-1.1549019600		0.9542425094
12	22	85	8	45	0	12.32	1.28	0.08	128.93	1375.00	10.00		-1.0969100130		1.0000000000
12	22	85	8	46	0	12.31	1.27	0.08	128.94	1376.00	11.00		-1.0969100130		1.0413926852
12	22	85	8	47	0	12.30	1.26	0.09	128.95	1377.00	12.00		-1.0457574906		1.0791812460
12	22	85	8	48	0	12.29	1.25	0.10	128.96	1378.00	13.00		-1.0000000000		1.1139433523
12	22	85	8	49	0	12.28	1.24	0.11	128.97	1379.00	14.00		-0.9586073148		1.1461280357
12	22	85	8	50	0	12.27	1.23	0.12	128.98	1380.00	15.00		-0.9208187540		1.1760912591
12	22	85	8	51	0	12.26	1.22	0.13	128.99	1381.00	16.00		-0.8860566477		1.2041199827
12	22	85	8	52	0	12.26	1.22	0.14	128.99	1382.00	17.00		-0.8538719643		1.2304489214
12	22	85	8	53	0	12.26	1.22	0.14	128.99	1383.00	18.00		-0.8538719643		1.2552725051
12	22	85	8	54	0	12.26	1.22	0.14	128.99	1384.00	19.00		-0.8538719643		1.2787536010
12	22	85	8	56	0	12.26	1.22	0.14	128.99	1386.00	21.00		-0.8538719643		1.3222192947
12	22	85	9	0	0	12.24	1.20	0.14	129.01	1390.00	25.00		-0.8538719643		1.3979400087
12	22	85	9	5	0	12.22	1.18	0.16	129.03	1395.00	30.00		-0.7958800173		1.4771212547
12	22	85	9	9	30	12.14	1.10	0.18	129.11	1399.50	34.50		-0.7447274949		1.5378190951
12	22	85	9	16	0	12.14	1.10	0.26	129.11	1406.00	41.00		-0.5850266520		1.6127838567
12	22	85	9	24	0	12.12	1.08	0.26	129.13	1414.00	49.00		-0.5850266520		1.6901960800
12	22	85	9	35	0	12.11	1.07	0.26	129.14	1425.00	60.00		-0.5528419687		1.7781512504
12	22	85	9	56	0	12.00	0.96	0.29	129.25	1446.00	81.00		-0.5376020021		1.9084850188
12	22	85	10	19	0	11.92	0.88	0.40	129.33	1469.00	104.00		-0.3979400087		2.0170333393
12	22	85	10	30	0	11.91	0.87	0.48	129.34	1480.00	115.00		-0.3187587626		2.0606978404
12	22	85	11	18	0	11.80	0.76	0.49	129.45	1528.00	163.00		-0.3098039200		2.2121876044
12	22	85	11	35	0	11.72	0.68	0.60	129.53	1545.00	180.00		-0.2218487496		2.2552725051
12	22	85	12	42	0	11.60	0.56	0.68	129.65	1612.00	247.00		-0.1674910873		2.3926969533
12	22	85	13	41	0	11.54	0.50	0.80	129.71	1671.00	306.00		-0.0969100130		2.4857214265
12	22	85	14	45	0	11.44	0.40	0.86	129.81	1735.00	370.00		-0.0655015468		2.5682017241
12	22	85	16	31	0	11.35	0.31	0.96	129.90	1841.00	476.00		-0.0177287670		2.6776069527
12	22	85	19	11	0	11.27	0.23	1.05	129.98	2001.00	636.00		0.0211892991		2.8034571155
12	22	85	19	23	0	11.22	0.18	1.13	130.03	2013.00	648.00		0.0530784435		2.8115750959

3 10 00438

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. P-8
DEPTH TO STATIC WATER LEVEL : 11.04
TOP OF CASING ELEV.(FT-MSL) : 141.25

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	22	9	0	11.19	0.15	1.18	130.06	2173.00	813.00		0.0719820073		2.9100905456
12	22	85	23	54	0	11.16	0.12	1.21	130.09	2284.00	919.00		0.0827853703		2.9633155114
12	23	85	7	39	0	11.02	-0.02	1.24	130.23	2748.00	1383.00		0.0934216852		3.1408221801

3 10 00439

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. P-9
DEPTH TO STATIC WATER LEVEL : 10.97
TOP OF CASING ELEV.(FT-MSL) : 141.32

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	10	58	0	10.59			130.74						
12	14	85	10	30	0	10.99			130.33						
12	16	85	17	19	0	10.80			130.52						
12	17	85	10	08	0	10.88			130.44						
12	18	85	8	16	0	10.84			130.48						
12	20	85	14	55	0	10.73			130.59						
12	21	85	8	37	0	10.97	0.00		130.35						
12	21	85	9	50	0	11.00	0.03		130.32	0.00					
12	21	85	9	51	0	11.01	0.04		130.31	1.00		-1.3979400087		0.0000000000	
12	21	85	9	52	0	11.01	0.04		130.31	2.00		-1.3979400087		0.3010299957	
12	21	85	9	53	0	11.01	0.04		130.31	3.00		-1.3979400087		0.4771212547	
12	21	85	9	55	0	11.04	0.07		130.28	5.00		-1.1549019600		0.6989700043	
12	21	85	9	56	0	11.06	0.09		130.26	6.00		-1.0457574906		0.7781512504	
12	21	85	9	57	0	11.08	0.11		130.24	7.00		-0.9586073148		0.8450980400	
12	21	85	9	58	0	11.10	0.13		130.22	8.00		-0.8860566477		0.9030899870	
12	21	85	9	59	0	11.10	0.13		130.22	9.00		-0.8860566477		0.9542425094	
12	21	85	10	0	0	11.11	0.14		130.21	10.00		-0.8538719643		1.0000000000	
12	21	85	10	1	0	11.12	0.15		130.20	11.00		-0.8239087409		1.0413926852	
12	21	85	10	2	0	11.12	0.15		130.20	12.00		-0.8239087409		1.0791812460	
12	21	85	10	3	0	11.13	0.16		130.19	13.00		-0.7958800173		1.1139433523	
12	21	85	10	4	0	11.13	0.16		130.19	14.00		-0.7958800173		1.1461280357	
12	21	85	10	5	0	11.14	0.17		130.18	15.00		-0.7695510786		1.1760912591	
12	21	85	10	6	0	11.14	0.17		130.18	16.00		-0.7695510786		1.2041199827	
12	21	85	10	8	0	11.15	0.18		130.17	18.00		-0.7447274949		1.2552725051	
12	21	85	10	9	0	11.16	0.19		130.16	19.00		-0.7212463990		1.2787536010	
12	21	85	10	10	0	11.18	0.21		130.14	20.00		-0.6777807053		1.3010299957	
12	21	85	10	11	0	11.18	0.21		130.14	21.00		-0.6777807053		1.3222192947	
12	21	85	10	16	0	11.19	0.22		130.13	26.00		-0.6575773192		1.4149733430	
12	21	85	10	20	0	11.20	0.23		130.12	30.00		-0.6382721640		1.4771212547	
12	21	85	10	22	0	11.21	0.24		130.11	32.00		-0.6197887593		1.5051499783	
12	21	85	10	26	0	11.22	0.25		130.10	36.00		-0.6020599913		1.5563025008	
12	21	85	10	28	0	11.23	0.26		130.09	38.00		-0.5850266520		1.5797835966	
12	21	85	10	32	0	11.24	0.27		130.08	42.00		-0.5686362358		1.6232492904	
12	21	85	10	36	0	11.25	0.28		130.07	46.00		-0.5528419687		1.6627578317	
12	21	85	10	38	0	11.26	0.29		130.06	48.00		-0.5376020021		1.6812412374	
12	21	85	10	42	0	11.27	0.30		130.05	52.00		-0.5228787453		1.7160033436	
12	21	85	10	44	0	11.28	0.31		130.04	54.00		-0.5086383062		1.7323937598	
12	21	85	10	48	0	11.29	0.32		130.03	58.00		-0.4948500217		1.7634279936	
12	21	85	10	53	0	11.31	0.34		130.01	63.00		-0.4685210930		1.7993405495	
12	21	85	10	54	0	11.31	0.34		130.01	64.00		-0.4685210930		1.8061799740	
12	21	85	10	59	0	11.34	0.37		129.98	69.00		-0.4317982759		1.8388490907	
12	21	85	11	11	0	11.36	0.39		129.96	81.00		-0.4089353930		1.9084850188	
12	21	85	11	22	0	11.37	0.40		129.95	92.00		-0.3979400087		1.9637878273	
12	21	85	11	37	0	11.40	0.43		129.92	107.00		-0.3665315444		2.0293837777	

3 10 00440

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. P-9
DEPTH TO STATIC WATER LEVEL : 10.97
TOP OF CASING ELEV.(FT-MSL) : 141.32

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	21	85	11	50	0	11.42	0.45		129.90	120.00		-0.3467874862		2.0791812460	
12	21	85	12	22	0	11.46	0.49		129.86	152.00		-0.3098039200		2.1818435679	
12	21	85	12	51	0	11.50	0.53		129.82	181.00		-0.2757241304		2.2576785749	
12	21	85	13	21	0	11.54	0.57		129.78	211.00		-0.2441251443		2.3242824553	
12	21	85	13	51	0	11.57	0.60		129.75	241.00		-0.2218487496		2.3820170426	
12	21	85	14	47	0	11.60	0.63		129.72	297.00		-0.2006594505		2.4727564493	
12	21	85	15	47	0	11.64	0.67		129.68	357.00		-0.1739251973		2.5526682161	
12	21	85	16	47	0	11.72	0.75		129.60	417.00		-0.1249387366		2.6201360550	
12	21	85	17	47	0	11.80	0.83		129.52	477.00		-0.0809219076		2.6785193790	
12	21	85	19	47	0	11.91	0.94		129.41	597.00		-0.0268721464		2.7759743311	
12	21	85	21	47	0	11.96	0.99		129.36	717.00		-0.0043648054		2.8555191557	
12	21	85	23	47	0	12.04	1.07		129.28	837.00		0.0293837777		2.9227254580	
12	22	85	2	45	0	12.09	1.12		129.23	1015.00		0.0492180227		3.0064660422	
12	22	85	6	13	0	12.16	1.19		129.16	1223.00		0.0755469614		3.0974264576	
12	22	85	8	34	0	12.28	1.31	0.00	129.04	1364.00		0.1172712957		3.1348143703	
12	22	85	8	35	30	12.23	1.26	0.05	129.09	1365.50	0.50		-1.3010299957		-0.3010299957
12	22	85	8	36	0	12.22	1.25	0.06	129.10	1366.00	1.00		-1.2218487496		0.0000000000
12	22	85	8	36	30	12.21	1.24	0.07	129.11	1366.50	1.50		-1.1549019600		0.1760912591
12	22	85	8	37	0	12.20	1.23	0.08	129.12	1367.00	2.00		-1.0969100130		0.3010299957
12	22	85	8	37	30	12.20	1.23	0.08	129.12	1367.50	2.50		-1.0969100130		0.3979400087
12	22	85	8	38	0	12.20	1.23	0.08	129.12	1368.00	3.00		-1.0969100130		0.4771212547
12	22	85	8	38	30	12.20	1.23	0.08	129.12	1368.50	3.50		-1.0969100130		0.5440680444
12	22	85	8	39	0	12.19	1.22	0.09	129.13	1369.00	4.00		-1.0457574906		0.6020599913
12	22	85	8	39	30	12.18	1.21	0.10	129.14	1369.50	4.50		-1.0000000000		0.6532125138
12	22	85	8	40	0	12.18	1.21	0.10	129.14	1370.00	5.00		-1.0000000000		0.6989700043
12	22	85	8	40	30	12.17	1.20	0.11	129.15	1370.50	5.50		-0.9586073148		0.7403626895
12	22	85	8	41	0	12.17	1.20	0.11	129.15	1371.00	6.00		-0.9586073148		0.7781512504
12	22	85	8	41	30	12.17	1.20	0.11	129.15	1371.50	6.50		-0.9586073148		0.8129133566
12	22	85	8	42	0	12.16	1.19	0.12	129.16	1372.00	7.00		-0.9208187540		0.8450980400
12	22	85	8	42	30	12.16	1.19	0.12	129.16	1372.50	7.50		-0.9208187540		0.8750612634
12	22	85	8	43	0	12.15	1.18	0.13	129.17	1373.00	8.00		-0.8860566477		0.9030899870
12	22	85	8	43	30	12.15	1.18	0.13	129.17	1373.50	8.50		-0.8860566477		0.9294189257
12	22	85	8	44	0	12.15	1.18	0.13	129.17	1374.00	9.00		-0.8860566477		0.9542425094
12	22	85	8	44	30	12.15	1.18	0.13	129.17	1374.50	9.50		-0.8860566477		0.9777236053
12	22	85	8	45	0	12.14	1.17	0.14	129.18	1375.00	10.00		-0.8538719643		1.0000000000
12	22	85	8	45	30	12.14	1.17	0.14	129.18	1375.50	10.50		-0.8538719643		1.0211892991
12	22	85	8	46	0	12.14	1.17	0.14	129.18	1376.00	11.00		-0.8538719643		1.0413926852
12	22	85	8	46	30	12.14	1.17	0.14	129.18	1376.50	11.50		-0.8538719643		1.0606978404
12	22	85	8	47	0	12.13	1.16	0.15	129.19	1377.00	12.00		-0.8239087409		1.0791812460
12	22	85	8	47	30	12.13	1.16	0.15	129.19	1377.50	12.50		-0.8239087409		1.0969100130
12	22	85	8	48	0	12.13	1.16	0.15	129.19	1378.00	13.00		-0.8239087409		1.1139433523
12	22	85	8	48	30	12.12	1.15	0.16	129.20	1378.50	13.50		-0.7958800173		1.1303337685
12	22	85	8	49	0	12.12	1.15	0.16	129.20	1379.00	14.00		-0.7958800173		1.1461280357
12	22	85	8	49	30	12.12	1.15	0.16	129.20	1379.50	14.50		-0.7958800173		1.1613680022
12	22	85	8	50	0	12.11	1.14	0.17	129.21	1380.00	15.00		-0.7695510786		1.1760912591

3 10 00441

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. P-9
DEPTH TO STATIC WATER LEVEL : 10.97
TOP OF CASING ELEV.(FT-MSL) : 141.32

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	8	50	30	12.11	1.14	0.17	129.21	1380.50	15.50		-0.7695510786		1.1903316982
12	22	85	8	51	0	12.11	1.14	0.17	129.21	1381.00	16.00		-0.7695510786		1.2041199827
12	22	85	8	51	30	12.11	1.14	0.17	129.21	1381.50	16.50		-0.7695510786		1.2174839442
12	22	85	8	52	0	12.11	1.14	0.17	129.21	1382.00	17.00		-0.7695510786		1.2304489214
12	22	85	8	52	30	12.11	1.14	0.17	129.21	1382.50	17.50		-0.7695510786		1.2430380487
12	22	85	8	53	0	12.10	1.13	0.18	129.22	1383.00	18.00		-0.7447274949		1.2552725051
12	22	85	8	53	30	12.10	1.13	0.18	129.22	1383.50	18.50		-0.7447274949		1.2671717284
12	22	85	8	54	0	12.10	1.13	0.18	129.22	1384.00	19.00		-0.7447274949		1.2787536010
12	22	85	8	54	30	12.10	1.13	0.18	129.22	1384.50	19.50		-0.7447274949		1.2900346114
12	22	85	8	55	0	12.10	1.13	0.18	129.22	1385.00	20.00		-0.7447274949		1.3010299957
12	22	85	8	59	0	12.09	1.12	0.19	129.23	1389.00	24.00		-0.7212463990		1.3802112417
12	22	85	9	3	0	12.07	1.10	0.21	129.25	1393.00	28.00		-0.6777807053		1.4471580313
12	22	85	9	7	0	12.05	1.08	0.23	129.27	1397.00	32.00		-0.6382721640		1.5051499783
12	22	85	9	11	0	12.03	1.06	0.25	129.29	1401.00	36.00		-0.6020599913		1.5563025008
12	22	85	9	15	0	12.02	1.05	0.26	129.30	1405.00	40.00		-0.5850266529		1.6020599913
12	22	85	9	19	0	12.01	1.04	0.27	129.31	1409.00	44.00		-0.5686362359		1.6434526765
12	22	85	9	37	0	11.97	1.00	0.31	129.35	1427.00	62.00		-0.5086383062		1.7923916895
12	22	85	9	51	0	11.96	0.99	0.32	129.36	1441.00	76.00		-0.4948500217		1.8808135923
12	22	85	10	8	0	11.87	0.90	0.41	129.45	1458.00	93.00		-0.3872161433		1.9684829486
12	22	85	10	24	0	11.84	0.87	0.44	129.48	1474.00	109.00		-0.3565473235		2.0374264979
12	22	85	10	30	0	11.82	0.85	0.46	129.50	1480.00	115.00		-0.3372421683		2.0606978404
12	22	85	11	7	0	11.74	0.77	0.54	129.58	1517.00	152.00		-0.2676062402		2.1818435879
12	22	85	11	43	0	11.68	0.71	0.60	129.64	1553.00	188.00		-0.2218487496		2.2741578493
12	22	85	12	14	0	11.61	0.64	0.67	129.71	1584.00	219.00		-0.1739251973		2.3404441148
12	22	85	12	45	0	11.55	0.58	0.73	129.77	1615.00	250.00		-0.1366771379		2.3979400087
12	22	85	13	46	0	11.45	0.48	0.83	129.87	1676.00	311.00		-0.0809219076		2.4927603890
12	22	85	14	46	0	11.32	0.35	0.96	130.00	1736.00	371.00		-0.0177287670		2.5693733096
12	22	85	15	46	0	11.33	0.36	0.95	129.99	1796.00	431.00		-0.0222763947		2.6344772702
12	22	85	16	51	0	11.29	0.32	0.99	130.03	1861.00	496.00		-0.0043648054		2.6954816765
12	22	85	19	22	0	11.22	0.25	1.06	130.10	2012.00	647.00		0.0253058653		2.8109042807
12	22	85	20	31	0	11.18	0.21	1.10	130.14	2081.00	716.00		0.0413926852		2.8549130223
12	22	85	22	16	0	11.14	0.17	1.14	130.18	2186.00	821.00		0.0569048513		2.9143431571
12	23	85	0	5	0	11.11	0.14	1.17	130.21	2295.00	930.00		0.0681858617		2.9684829486
12	23	85	7	44	0	10.97	0.00	1.31	130.35	2754.00	1389.00		0.1172712957		3.1427022457

3 10 00442

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. P-13
DEPTH TO STATIC WATER LEVEL : 12.4
TOP OF CASING ELEV.(FT-MSL) : 142.69

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FORM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	17	20	0	12.05			130.64						
12	14	85	10	34	0	12.44			130.25						
12	16	85	17	25	0	12.26			130.43						
12	17	85	9	52	0	12.35			130.34						
12	20	85	14	45	0	12.20			130.49						
12	21	85	8	44	0	12.40	0.00		130.29						
12	21	85	10	58	0	12.48	0.08		130.21	68.00		-1.0969100130		1.8325089127	
12	21	85	11	6	0	12.49	0.09		130.20	76.00		-1.0457574906		1.3808135923	
12	21	85	11	21	0	12.50	0.10		130.19	91.00		-1.0000000000		1.9590413923	
12	21	85	11	36	0	12.51	0.11		130.18	106.00		-0.9586073148		2.0253058653	
12	21	85	12	6	0	12.53	0.13		130.16	136.00		-0.8860566477		2.1335389084	
12	21	85	12	36	0	12.54	0.14		130.15	166.00		-0.8538719643		2.2201080890	
12	21	85	13	6	0	12.55	0.15		130.14	196.00		-0.8239087409		2.2922560714	
12	21	85	13	36	0	12.58	0.18		130.11	226.00		-0.7447274949		2.3541084391	
12	21	85	14	36	0	12.61	0.21		130.08	286.00		-0.6777807053		2.4563660331	
12	21	85	15	36	0	12.64	0.24		130.05	346.00		-0.6197887583		2.5390760998	
12	21	85	16	36	0	12.68	0.28		130.01	406.00		-0.5528419687		2.6095260336	
12	21	85	17	36	0	12.89	0.49		129.80	466.00		-0.3098039200		2.6683859167	
12	21	85	19	36	0	12.86	0.46		129.83	586.00		-0.3372421683		2.7678976160	
12	21	85	21	36	0	12.92	0.52		129.77	706.00		-0.2839966564		2.8488047011	
12	21	85	23	36	0	12.95	0.55		129.74	826.00		-0.2596373105		2.9169800473	
12	22	85	2	49	0	13.02	0.62		129.67	1019.00		-0.2076083105		3.0081741840	
12	22	85	6	18	0	13.10	0.70	0.00	129.59	1278.00		-0.1549019600		3.0891983666	
12	22	85	9	26	0	13.15	0.75	-0.05	129.54	1416.00	51.00				1.7075701761
12	22	85	9	54	0	13.12	0.72	-0.02	129.57	1444.00	79.00				1.8976270913
12	22	85	10	3	0	13.09	0.69	0.01	129.60	1453.00	88.00		-2.0000000000		1.9444826722
12	22	85	10	13	0	13.08	0.68	0.02	129.61	1463.00	98.00		-1.6989700043		1.9912260757
12	22	85	10	33	0	13.06	0.66	0.04	129.63	1483.00	118.00		-1.3979400087		2.0718820073
12	22	85	11	10	0	13.00	0.60	0.10	129.69	1520.00	155.00		-1.0000000000		2.1903316932
12	22	85	11	46	0	12.95	0.55	0.15	129.74	1556.00	191.00		-0.8239037409		2.2810333672
12	22	85	12	18	0	12.90	0.50	0.20	129.79	1588.00	223.00		-0.6989700043		2.3483048630
12	22	85	12	49	0	12.85	0.45	0.25	129.84	1619.00	254.00		-0.6020599913		2.4048337166
12	22	85	13	50	0	12.77	0.37	0.33	129.92	1680.00	315.00		-0.4814860601		2.4983105538
12	22	85	14	50	0	12.71	0.31	0.39	129.98	1740.00	375.00		-0.4089353930		2.5740312677
12	22	85	15	53	0	12.68	0.28	0.42	130.01	1803.00	438.00		-0.3767507096		2.6414741105
12	22	85	16	55	0	12.65	0.25	0.45	130.04	1865.00	500.00		-0.3467874862		2.6989700043
12	22	85	19	29	0	12.58	0.18	0.52	130.11	2019.00	654.00		-0.2839966564		2.8155777483
12	22	85	20	35	0	12.55	0.15	0.55	130.14	2085.00	720.00		-0.2596373105		2.8573324964
12	22	85	22	20	0	12.52	0.12	0.58	130.17	2190.00	825.00		-0.2365720064		2.9164537435
12	23	85	0	10	0	12.49	0.09	0.61	130.20	2300.00	935.00		-0.2146701650		2.9708115169
12	23	85	7	50	0	12.38	-0.02	0.72	130.31	2760.00	1395.00		-0.1426675036		3.1445742276

3 10 00443

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. P-15
DEPTH TO STATIC WATER LEVEL : 10.12
TOP OF CASING ELEV.(FT-MSL) : 140.53

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	17	25	0	9.72			130.81						
12	14	85	10	38	0	10.11			130.42						
12	16	85	17	29	0	9.94			130.59						
12	17	85	9	56	0	10.03			130.50						
12	20	85	14	35	0	9.88			130.65						
12	21	85	8	49	0	10.12	0.00		130.41						
12	21	85	11	2	0	10.14	0.02		130.39	72.00		-1.6989700043		1.8573324964	
12	21	85	11	11	0	10.15	0.03		130.38	81.00		-1.5228787453		1.9084850189	
12	21	85	11	26	0	10.16	0.04		130.37	96.00		-1.3979400087		1.9822712330	
12	21	85	11	41	0	10.16	0.04		130.37	111.00		-1.3979400087		2.0453229788	
12	21	85	12	11	0	10.16	0.04		130.37	141.00		-1.3979400087		2.1492191127	
12	21	85	12	41	0	10.18	0.06		130.35	171.00		-1.2218487496		2.2329961104	
12	21	85	13	11	0	10.18	0.06		130.35	201.00		-1.2218487496		2.3031960574	
12	21	85	13	41	0	10.22	0.10		130.31	231.00		-1.0000000000		2.3636119799	
12	21	85	14	41	0	10.27	0.15		130.26	291.00		-0.8239087409		2.4638929890	
12	21	85	15	41	0	10.31	0.19		130.22	351.00		-0.7212463990		2.5453071165	
12	21	85	16	41	0	10.29	0.17		130.24	411.00		-0.7695510786		2.6138418219	
12	21	85	17	41	0	10.33	0.21		130.20	471.00		-0.6777807053		2.6730209071	
12	21	85	19	41	0	10.45	0.33		130.08	591.00		-0.4814860601		2.7715874809	
12	21	85	21	41	0	10.51	0.39		130.02	711.00		-0.4089353930		2.8518696307	
12	21	85	23	41	0	10.55	0.43		129.98	831.00		-0.3665315444		2.9196010239	
12	22	85	2	53	0	10.60	0.48		129.93	1023.00		-0.3187587626		3.0098756337	
12	22	85	6	26	0	10.71	0.59	0.00	129.82	1236.00		-0.2291479884		3.0920184708	
12	22	85	9	31	0	10.71	0.59	0.00	129.82	1421.00	56.00				1.7481850270
12	22	85	9	59	0	10.69	0.57	0.02	129.84	1449.00	84.00		-1.6989700043		1.9242792961
12	22	85	10	18	0	10.68	0.56	0.03	129.85	1468.00	103.00		-1.5228787453		2.0128372247
12	22	85	10	37	0	10.67	0.55	0.04	129.86	1487.00	122.00		-1.3979400087		2.0863598307
12	22	85	11	13	0	10.63	0.51	0.08	129.90	1523.00	158.00		-1.0969100130		2.1986570870
12	22	85	11	50	0	10.59	0.47	0.12	129.94	1560.00	195.00		-0.9208187540		2.2900346114
12	22	85	12	23	0	10.54	0.42	0.17	129.99	1593.00	228.00		-0.7695510786		2.3579348470
12	22	85	12	51	0	10.50	0.38	0.21	130.03	1621.00	256.00		-0.6777807053		2.4082399653
12	22	85	13	53	0	10.42	0.30	0.29	130.11	1683.00	318.00		-0.5376020021		2.5024271200
12	22	85	14	53	0	10.36	0.24	0.35	130.17	1743.00	378.00		-0.4559319556		2.5774917998
12	22	85	15	56	0	10.36	0.24	0.35	130.17	1806.00	441.00		-0.4559319556		2.6444385895
12	22	85	17	0	0	10.32	0.20	0.39	130.21	1870.00	505.00		-0.4089353930		2.7032913781
12	22	85	19	32	0	10.26	0.14	0.45	130.27	2022.00	657.00		-0.3467874862		2.8175653656
12	22	85	20	40	0	10.24	0.12	0.47	130.29	2090.00	725.00		-0.3279021421		2.8603380066
12	22	85	22	25	0	10.20	0.08	0.51	130.33	2195.00	830.00		-0.2924298239		2.9199780924
12	23	85	0	15	0	10.19	0.07	0.52	130.34	2305.00	940.00		-0.2839966564		2.9731278536
12	23	85	7	56	0	10.07	-0.05	0.64	130.46	2766.00	1401.00		-0.1938200260		3.1464381353

3 10 00444

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. P-18
DEPTH TO STATIC WATER LEVEL : 12.05
TOP OF CASING ELEV.(FT-MSL) : 141.98

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft.)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	14	85	12	21	0	12.28	0.23		129.70						
12	20	85	16	20	0	12.05	0.00		129.93						
12	21	85	9	16	0	12.53	0.48		129.45			-0.3187587626			
12	21	85	15	30	0	12.22	0.17		129.76	340.00		-0.7695510786		2.5314789170	
12	22	85	12	48	0	12.48	0.43		129.50	1618.00		-0.3665315444		3.2089765173	

3 10 00445

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. W-6
DEPTH TO STATIC WATER LEVEL : 4.65
TOP OF CASING ELEV.(FT-MSL) : 135.83

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	20	85	15	30	0	4.83			131.00						
12	21	85	8	31	0	4.65	0.00		131.18						
12	21	85	10	6	0	4.55	-0.10		131.28	16.00				1.2041199827	
12	21	85	10	5	0	4.58	-0.07		131.25	15.00				1.1760912591	
12	21	85	10	21	0	4.61	-0.04		131.22	31.00				1.4913616938	
12	21	85	10	23	0	4.62	-0.03		131.21	33.00				1.5185139399	
12	21	85	10	35	0	4.67	0.02		131.16	45.00		-1.6989700043		1.6532125138	
12	21	85	10	42	0	4.67	0.02		131.16	52.00		-1.6989700043		1.7160033436	
12	21	85	10	51	0	4.66	0.01		131.17	61.00		-2.0000000000		1.7853298350	
12	21	85	11	6	0	4.68	0.03		131.15	76.00		-1.5228787453		1.8808135923	
12	21	85	11	21	0	4.71	0.06		131.12	91.00		-1.2218487496		1.9590413923	
12	21	85	11	36	0	4.71	0.06		131.12	106.00		-1.2218487496		2.0253058653	
12	21	85	11	51	0	4.75	0.10		131.08	121.00		-1.0000000000		2.0827853703	
12	21	85	12	21	0	4.74	0.09		131.09	151.00		-1.0457574906		2.1789769473	
12	21	85	12	51	0	4.76	0.11		131.07	181.00		-0.9586073148		2.2576785749	
12	21	85	13	51	0	4.84	0.19		130.99	241.00		-0.7212463990		2.3820170426	
12	21	85	14	51	0	4.88	0.23		130.95	301.00		-0.6382721640		2.4795664956	
12	21	85	15	51	0	4.91	0.26		130.92	361.00		-0.5850266520		2.5575072019	
12	21	85	16	55	0	4.97	0.32		130.86	425.00		-0.4948500217		2.6283889301	
12	21	85	17	55	0	5.08	0.43		130.75	485.00		-0.3665315444		2.6857417386	
12	21	85	19	49	0	5.17	0.52		130.66	599.00		-0.2839966564		2.7774268224	
12	21	85	21	48	0	5.18	0.53		130.65	718.00		-0.2757241304		2.8561244442	
12	21	85	23	52	0	5.25	0.60		130.58	842.00		-0.2218487496		2.9253120915	
12	22	85	2	5	0	5.30	0.65		130.53	975.00		-0.1870366434		2.9890046157	
12	22	85	6	27	0	5.36	0.71	0.00	130.47	1237.00		-0.1487416513		3.0923696996	
12	22	85	9	10	0	5.37	0.72	-0.01	130.46	1400.00	35.00				1.5440680444
12	22	85	9	21	0	5.36	0.71	0.00	130.47	1411.00	46.00				1.6627578317
12	22	85	9	30	0	5.35	0.70	0.01	130.48	1420.00	55.00		-2.0000000000		1.7403626895
12	22	85	9	36	0	5.35	0.70	0.01	130.48	1426.00	61.00		-2.0000000000		1.7853298350
12	22	85	9	51	0	5.32	0.67	0.04	130.51	1441.00	76.00		-1.3979400087		1.8808135923
12	22	85	10	6	0	5.28	0.63	0.08	130.55	1456.00	91.00		-1.0969100130		1.9590413923
12	22	85	10	21	0	5.28	0.63	0.08	130.55	1471.00	106.00		-1.0969100130		2.0253058653
12	22	85	10	37	0	5.23	0.58	0.13	130.60	1487.00	122.00		-0.8860566477		2.0863598307
12	22	85	11	14	0	5.18	0.53	0.18	130.65	1524.00	159.00		-0.7447274949		2.2013971243
12	22	85	12	1	0	5.10	0.45	0.26	130.73	1571.00	206.00		-0.5850266520		2.3138672204
12	22	85	12	38	0	5.06	0.41	0.30	130.77	1608.00	243.00		-0.5228787453		2.3856062736
12	22	85	13	41	0	4.95	0.30	0.41	130.88	1671.00	306.00		-0.3872161433		2.4857214265
12	22	85	14	48	0	4.88	0.23	0.48	130.95	1738.00	373.00		-0.3187587626		2.5717088318
12	22	85	16	33	0	4.82	0.17	0.54	131.01	1843.00	478.00		-0.2676062402		2.6794275866
12	22	85	19	28	0	4.78	0.13	0.58	131.05	2018.00	653.00		-0.2365720064		2.8149133813
12	22	85	20	33	0	4.75	0.10	0.61	131.08	2083.00	718.00		-0.2146701650		2.8561244442
12	22	85	22	33	0	4.77	0.12	0.59	131.06	2203.00	838.00		-0.2291479884		2.9232440186
12	22	85	23	33	0	4.68	0.03	0.68	131.15	2263.00	898.00		-0.1674910873		2.9532763367
12	23	85	7	50	0	4.55	-0.10	0.91	131.28	2760.00	1395.00		-0.0915149811		3.1445742076

3 10 00446

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 . 0

WELL NO. W-7
DEPTH TO STATIC WATER LEVEL : 4.67
TOP OF CASING ELEV.(FT-MSL) : 135.95

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	20	85	15	34	0	4.60			131.35						
12	21	85	8	34	0	4.67	0.00		131.28						
12	21	85	10	8	0	4.85	0.18		131.10	18.00		-0.7447274949		1.2552725051	
12	21	85	10	16	0	4.86	0.19		131.09	26.00		-0.7212463990		1.4149733480	
12	21	85	10	22	0	4.85	0.18		131.10	32.00		-0.7447274949		1.5051499783	
12	21	85	10	29	0	4.87	0.20		131.08	39.00		-0.6989700043		1.5910646070	
12	21	85	10	36	0	4.87	0.20		131.06	46.00		-0.6989700043		1.6627578317	
12	21	85	10	43	0	4.88	0.21		131.07	53.00		-0.6777507053		1.7242758696	
12	21	85	10	51	0	4.91	0.24		131.04	61.00		-0.6197887583		1.7853298350	
12	21	85	11	7	0	4.94	0.27		131.01	77.00		-0.5686362358		1.8864907252	
12	21	85	11	22	0	4.93	0.26		131.02	92.00		-0.5850266520		1.9637878273	
12	21	85	11	36	0	4.99	0.32		130.96	106.00		-0.4948500217		2.0253059653	
12	21	85	11	52	0	4.95	0.28		131.00	122.00		-0.5528419667		2.0863598307	
12	21	85	12	22	0	4.99	0.32		130.96	152.00		-0.4948500217		2.1818435879	
12	21	85	12	51	0	5.00	0.33		130.95	181.00		-0.4814860601		2.2576785749	
12	21	85	13	52	0	5.08	0.41		130.87	242.00		-0.3872161433		2.3838153660	
12	21	85	14	52	0	5.12	0.45		130.83	302.00		-0.3467874862		2.4800069430	
12	21	85	15	51	0	5.18	0.51		130.77	361.00		-0.2924298239		2.5575972019	
12	21	85	16	56	0	5.23	0.56		130.72	426.00		-0.2518119730		2.6294095591	
12	21	85	17	56	0	5.31	0.64		130.64	486.00		-0.1938200260		2.6856362693	
12	21	85	19	50	0	5.44	0.77		130.51	600.00		-0.1135092748		2.7781512504	
12	21	85	21	49	0	5.49	0.82		130.46	719.00		-0.0861861476		2.8567238904	
12	21	85	23	54	0	5.55	0.88		130.40	844.00		-0.0555173278		2.9263424466	
12	22	85	2	9	0	5.61	0.94		130.34	979.00		-0.0268721464		2.9907826918	
12	22	85	6	32	0	5.69	1.02	0.00	130.26	1242.00		0.0086001718		3.0941215958	
12	22	85	19	50	0	4.50	-0.17	1.19	131.45	2040.00	675.00		0.0755469614		2.8293037728
12	22	85	20	36	0	4.83	0.16	0.86	131.12	2086.00	721.00		-0.0655015488		2.8579352647
12	22	85	22	37	0	4.95	0.28	0.74	131.00	2207.00	842.00		-0.1397632803		2.9253120915
12	22	85	23	38	0	4.88	0.21	0.81	131.07	2268.00	903.00		-0.0915147811		2.9556877503
12	23	85	0	0	0	4.93	0.26	0.76	131.02	2290.00	925.00		-0.1191364077		2.9661417327

3 10 00447

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. W-8
DEPTH TO STATIC WATER LEVEL : 4.95
TOP OF CASING ELEV.(FT-MSL) : 136.31

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	14	15	0	4.76			131.55						
12	14	85	9	57	0	4.96			131.35						
12	16	85	16	17	0	4.97			131.34						
12	17	85	9	11	0	4.87			131.44						
12	20	85	15	0	0	4.91			131.40						
12	21	85	8	36	0	4.95	0.00		131.36						
12	21	85	10	9	0	5.06	0.11		131.25	19.00		-0.9586073148		1.2787536010	
12	21	85	10	17	0	5.06	0.11		131.25	27.00		-0.9586073148		1.4313637642	
12	21	85	10	24	0	5.10	0.15		131.21	34.00		-0.8239087409		1.5314789170	
12	21	85	10	30	0	5.10	0.15		131.21	40.00		-0.8239087409		1.6020599913	
12	21	85	10	37	0	5.10	0.15		131.21	47.00		-0.8239087409		1.6720978579	
12	21	85	10	45	0	5.11	0.16		131.20	55.00		-0.7958300173		1.7403626895	
12	21	85	10	52	0	5.11	0.16		131.20	62.00		-0.7958800173		1.7923916895	
12	21	85	11	8	0	5.12	0.17		131.19	78.00		-0.7695510786		1.8920946027	
12	21	85	11	23	0	5.14	0.19		131.17	93.00		-0.7212463990		1.9684829486	
12	21	85	11	37	0	5.16	0.21		131.15	107.00		-0.6777807053		2.0293837777	
12	21	85	11	53	0	5.15	0.20		131.16	123.00		-0.6989700043		2.0899051114	
12	21	85	12	24	0	5.14	0.19		131.17	154.00		-0.7212463990		2.1875207208	
12	21	85	12	53	0	5.18	0.23		131.13	183.00		-0.6382721640		2.2624510897	
12	21	85	13	53	0	5.23	0.28		131.08	243.00		-0.5528419686		2.3856062736	
12	21	85	14	53	0	5.26	0.31		131.05	303.00		-0.5086383062		2.4814426285	
12	21	85	15	53	0	5.30	0.35		131.01	363.00		-0.4559319556		2.5599066250	
12	21	85	16	57	0	5.34	0.39		130.97	427.00		-0.4389353930		2.6334278750	
12	21	85	17	57	0	5.41	0.46		130.90	487.00		-0.3372421683		2.6875289612	
12	21	85	19	54	0	5.51	0.56		130.80	604.00		-0.2518119730		2.7810369396	
12	21	85	21	51	0	5.58	0.63		130.73	721.00		-0.2006594505		2.8573352647	
12	21	85	23	55	0	5.63	0.68		130.68	845.00		-0.1674910373		2.9268567089	
12	22	85	2	12	0	5.68	0.73		130.63	982.00		-0.1366771399		2.9921114878	
12	22	85	6	37	0	5.76	0.81	0.00	130.55	1247.00		-0.0915149811		3.0958664535	
12	22	85	9	13	0	5.83	0.88	-0.07	130.48	1403.00	38.00				1.5797835966
12	22	85	9	23	0	5.83	0.88	-0.07	130.48	1413.00	48.00				1.6812412374
12	22	85	9	31	0	5.79	0.84	-0.03	130.52	1421.00	56.00				1.7481830270
12	22	85	9	37	0	5.79	0.84	-0.03	130.52	1427.00	62.00				1.7923916895
12	22	85	9	52	0	5.78	0.83	-0.02	130.53	1442.00	77.00				1.8864907752
12	22	85	10	8	0	5.75	0.80	0.01	130.56	1458.00	93.00		-2.0000000000		1.9684829486
12	22	85	10	23	0	5.74	0.79	0.02	130.57	1473.00	108.00		-1.6789700043		2.0334237555
12	22	85	10	30	0	5.71	0.76	0.05	130.60	1480.00	115.00		-1.3010299957		2.0606978404
12	22	85	11	15	0	5.64	0.69	0.12	130.67	1525.00	160.00		-0.9208137540		2.2041199827
12	22	85	12	5	0	5.59	0.64	0.17	130.72	1575.00	210.00		-0.7695510786		2.3222192947
12	22	85	12	40	0	5.53	0.58	0.23	130.78	1610.00	245.00		-0.6382721640		2.3891660844
12	22	85	13	43	0	5.45	0.50	0.31	130.86	1673.00	308.00		-0.5086383062		2.4835507185
12	22	85	14	50	0	5.37	0.42	0.39	130.94	1740.00	375.00		-0.4089353930		2.5740312677
12	22	85	16	36	0	5.33	0.38	0.43	130.98	1846.00	481.00		-0.3665315444		2.6821450764
12	22	85	19	35	0	5.29	0.34	0.47	131.02	2025.00	660.00		-0.3279021421		2.8195439355

3 10 00448

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. W-8
DEPTH TO STATIC WATER LEVEL : 4.95
TOP OF CASING ELEV.(FT-MSL) : 136.31

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	20	38	0	5.22	0.27	0.54	131.09	2088.00	723.00		-0.2676062402		2.8591392973
12	22	85	22	41	0	5.26	0.31	0.50	131.05	2211.00	846.00		-0.3010299957		2.9273703630
12	22	85	23	42	0	5.16	0.21	0.60	131.15	2272.00	907.00		-0.2218487496		2.9576072871
12	23	85	7	52	0	5.16	0.21	0.60	131.15	2762.00	1397.00		-0.2218487496		3.1451964061

3 10 00449

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. W-10
DEPTH TO STATIC WATER LEVEL : 3.85
TOP OF CASING ELEV.(FT-MSL) : 136.45

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	17	0	0	3.52			132.93						
12	14	85	9	51	0	3.57			132.88						
12	16	85	9	22	0	3.67			132.78						
12	17	85	8	15	0	3.70			132.75						
12	20	85	15	15	0	3.70			132.75						
12	21	85	8	26	0	3.85	0.00		132.60						
12	21	85	10	4	0	3.83	-0.02		132.62	14.00				1.1461280357	
12	21	85	10	13	0	3.87	0.02		132.58	23.00		-1.6989700043		1.3617278360	
12	21	85	10	20	0	3.87	0.02		132.58	30.00		-1.6989700043		1.4771212547	
12	21	85	10	27	0	3.87	0.02		132.58	37.00		-1.6989700043		1.5682017241	
12	21	85	10	33	0	3.85	0.00		132.60	43.00				1.6334684556	
12	21	85	10	41	0	3.88	0.03		132.57	51.00		-1.5228787453		1.7075701761	
12	21	85	10	50	0	3.87	0.02		132.58	60.00		-1.6989700043		1.7781512504	
12	21	85	11	5	0	3.87	0.02		132.58	75.00		-1.6989700043		1.8750612634	
12	21	85	11	20	0	3.88	0.03		132.57	90.00		-1.5228787453		1.9542425094	
12	21	85	11	35	0	3.89	0.04		132.56	105.00		-1.3979400087		2.0211892991	
12	21	85	11	50	0	3.87	0.02		132.58	120.00		-1.6989700043		2.0791812460	
12	21	85	12	20	0	3.89	0.03		132.57	150.00		-1.5228787453		2.1760912591	
12	21	85	12	50	0	3.87	0.02		132.58	180.00		-1.6989700043		2.2552725051	
12	21	85	13	50	0	3.90	0.05		132.55	240.00		-1.3010299957		2.3802112417	
12	21	85	14	50	0	3.90	0.05		132.55	300.00		-1.3010299957		2.4771212547	
12	21	85	15	50	0	3.92	0.07		132.53	360.00		-1.1549019600		2.5563025008	
12	21	85	16	53	0	3.97	0.12		132.48	423.00		-0.9208187540		2.6263403674	
12	21	85	17	54	0	3.99	0.14		132.46	484.00		-0.8538719643		2.6846453616	
12	21	85	19	48	0	4.07	0.22		132.38	598.00		-0.6575773192		2.7767011840	
12	21	85	21	47	0	4.10	0.25		132.35	717.00		-0.6020599913		2.8555191557	
12	21	85	23	50	0	4.18	0.33		132.27	840.00		-0.4814860601		2.9242792861	
12	22	85	2	0	0	4.11	0.26		132.34	970.00		-0.5850266520		2.9867717343	
12	22	85	6	17	0	4.15	0.30	0.00	132.30	1227.00		-0.5228787453		3.0888445627	
12	22	85	9	8	0	4.17	0.32	-0.02	132.28	1398.00	33.00				1.5185139399
12	22	85	9	19	0	4.18	0.33	-0.03	132.27	1409.00	44.00				1.6434526765
12	22	85	9	28	0	4.17	0.32	-0.02	132.28	1418.00	53.00				1.7242758696
12	22	85	9	35	0	4.17	0.32	-0.02	132.28	1425.00	60.00				1.7781512504
12	22	85	9	50	0	4.17	0.32	-0.02	132.28	1440.00	75.00				1.8750612634
12	22	85	10	5	0	4.16	0.31	-0.01	132.29	1455.00	90.00				1.9542425094
12	22	85	10	20	0	4.14	0.29	0.01	132.31	1470.00	105.00		-2.0000000000		2.0211892991
12	22	85	10	35	0	4.11	0.26	0.04	132.34	1485.00	120.00		-1.3979400037		2.0791812460
12	22	85	11	12	0	4.10	0.25	0.05	132.35	1522.00	157.00		-1.3010299957		2.1958996524
12	22	85	11	58	0	4.06	0.21	0.09	132.39	1568.00	203.00		-1.0457574906		2.3074360379
12	22	85	12	37	0	4.06	0.21	0.09	132.39	1607.00	242.00		-1.0457574906		2.3838153660
12	22	85	13	37	0	3.99	0.14	0.16	132.46	1667.00	302.00		-0.7958800173		2.4800069430
12	22	85	14	47	0	3.97	0.12	0.18	132.48	1737.00	372.00		-0.7447274949		2.5705429399
12	22	85	16	31	0	3.95	0.10	0.20	132.50	1841.00	476.00		-0.6989700043		2.6776069527
12	22	85	19	25	0	3.95	0.10	0.20	132.50	2015.00	650.00		-0.6989700043		2.8129133566

3 10 00450

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. W-10
DEPTH TO STATIC WATER LEVEL : 3.85
TOP OF CASING ELEV.(FT-MSL) : 136.45

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	20	31	0	3.95	0.10	0.20	132.50	2081.00	716.00		-0.6969700043		2.8549130223
12	22	85	22	31	0	3.97	0.12	0.18	132.48	2201.00	836.00		-0.7447274949		2.9222062774
12	22	85	23	30	0	3.88	0.03	0.27	132.57	2260.00	895.00		-0.5686362358		2.9518230353
12	23	85	7	48	0	3.85	0.00	0.30	132.60	2758.00	1393.00		-0.5228787453		3.1439511164

3 10 00451

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. W-11
DEPTH TO STATIC WATER LEVEL : 3.91
TOP OF CASING ELEV.(FT-MSL) : 135.39

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	14	55	0	3.72			131.67						
12	14	85	10	0	0	3.75			131.64						
12	16	85	16	20	0	3.83			131.56						
12	17	85	9	10	0	3.96			131.43						
12	20	85	15	30	0	3.85			131.54						
12	21	85	8	39	0	3.91	0.00		131.48						
12	21	85	10	11	0	4.06	0.15		131.33	21.00		-0.8239087409		1.3222192947	
12	21	85	10	18	0	4.08	0.17		131.31	28.00		-0.7695510786		1.4471580313	
12	21	85	10	25	0	4.10	0.19		131.29	35.00		-0.7212463990		1.5440680444	
12	21	85	10	31	0	4.10	0.19		131.29	41.00		-0.7212463990		1.6127838567	
12	21	85	10	39	0	4.08	0.17		131.31	48.00		-0.7695510786		1.6812412374	
12	21	85	10	46	0	4.08	0.17		131.31	56.00		-0.7695510786		1.7481880270	
12	21	85	10	46	0	4.10	0.19		131.29	56.00		-0.7212463990		1.7481880270	
12	21	85	11	9	0	4.07	0.16		131.32	79.00		-0.7958800173		1.8976270913	
12	21	85	11	24	0	4.06	0.15		131.33	94.00		-0.8239087409		1.9731278536	
12	21	85	11	39	0	4.07	0.16		131.32	109.00		-0.7958800173		2.0374264979	
12	21	85	11	54	0	4.07	0.16		131.32	124.00		-0.7958800173		2.0934216852	
12	21	85	12	24	0	4.06	0.15		131.33	154.00		-0.8239087409		2.1875207208	
12	21	85	12	54	0	4.07	0.16		131.32	184.00		-0.7958800173		2.2648178230	
12	21	85	13	54	0	4.06	0.15		131.33	244.00		-0.8239087409		2.3873398263	
12	21	85	14	54	0	4.07	0.16		131.32	304.00		-0.7958800173		2.4828735836	
12	21	85	15	54	0	4.09	0.18		131.30	364.00		-0.7447274949		2.5611013836	
12	21	85	16	58	0	4.12	0.21		131.27	428.00		-0.6777807053		2.6314437690	
12	21	85	17	58	0	4.15	0.24		131.24	488.00		-0.6197867583		2.6884198220	
12	21	85	19	56	0	4.24	0.33		131.15	606.00		-0.4814860601		2.7824726242	
12	21	85	21	53	0	4.29	0.38		131.10	723.00		-0.4202164034		2.8591382973	
12	21	85	23	57	0	4.35	0.44		131.04	847.00		-0.3565473235		2.9273834103	
12	22	85	2	15	0	4.39	0.48		131.00	985.00		-0.3187587626		2.9934362305	
12	22	85	6	42	0	4.46	0.55	0.00	130.93	1252.00		-0.2596373105		3.0976043289	
12	22	85	9	15	0	4.55	0.64	-0.09	130.84	1405.00	40.00				1.6020599913
12	22	85	9	26	0	4.55	0.64	-0.09	130.84	1416.00	51.00				1.7075701761
12	22	85	9	33	0	4.58	0.67	-0.12	130.81	1423.00	58.00				1.7634279936
12	22	85	9	39	0	4.55	0.64	-0.09	130.84	1429.00	64.00				1.8061799740
12	22	85	9	54	0	4.55	0.64	-0.09	130.84	1444.00	79.00				1.8976270913
12	22	85	10	9	0	4.56	0.65	-0.10	130.83	1459.00	94.00				1.9731278536
12	22	85	10	24	0	4.54	0.63	-0.08	130.85	1474.00	109.00				2.0374264979
12	22	85	10	39	0	4.53	0.62	-0.07	130.86	1489.00	124.00				2.0934216852
12	22	85	11	7	0	4.50	0.59	-0.04	130.89	1517.00	152.00				2.1818435879
12	22	85	12	7	0	4.44	0.53	0.02	130.95	1577.00	212.00		-1.6989700043		2.3263358609
12	22	85	12	41	0	4.40	0.49	0.06	130.99	1611.00	246.00		-1.2218487496		2.3909351071
12	22	85	13	45	0	4.42	0.51	0.04	130.97	1675.00	310.00		-1.3979400087		2.4913616938
12	22	85	14	51	0	4.30	0.39	0.16	131.09	1741.00	376.00		-0.7958800173		2.5751878449
12	22	85	16	37	0	4.28	0.37	0.18	131.11	1847.00	482.00		-0.7447274949		2.6830470382
12	22	85	19	38	0	4.28	0.37	0.18	131.11	2028.00	663.00		-0.7447274949		2.8215135284

3 10 00452

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. M-11
DEPTH TO STATIC WATER LEVEL : 3.91
TOP OF CASING ELEV.(FT-MSL) : 135.39

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	20	40	0	4.21	0.30	0.25	131.18	2090.00	725.00		-0.6020599913		2.9603360066
12	22	85	22	41	0	4.26	0.35	0.20	131.13	2211.00	846.00		-0.6989700043		2.9273703630
12	22	85	23	46	0	4.14	0.23	0.32	131.25	2276.00	911.00		-0.4948500217		2.9595183770
12	23	85	7	54	0	4.05	0.14	0.41	131.34	2764.00	1399.00		-0.3372161433		3.1458177145

3 10 00453

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. D-1
DEPTH TO STATIC WATER LEVEL : 14.24
TOP OF CASING ELEV.(FT-MSL) : 142.85

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME RECOVERY	LOG TIME RECOVERY
12	18	85	8	14	0	12.35			130.50						
12	18	85	17	17	0	12.34			130.51						
12	19	85	12	50	0	12.49			130.36						
12	19	85	13	1	0	13.54			129.31						
12	19	85	13	9	0	13.51			129.34						
12	19	85	13	13	0	13.51			129.34						
12	19	85	13	18	0	13.52			129.33						
12	19	85	13	29	0	13.67			129.18						
12	19	85	13	36	0	13.67			129.18						
12	19	85	13	42	0	13.68			129.17						
12	19	85	13	48	40	13.69			129.16						
12	19	85	13	57	20	14.65			128.20						
12	19	85	14	4	20	14.67			128.18						
12	19	85	14	9	30	14.67			128.18						
12	19	85	14	12	10	14.68			128.17						
12	19	85	14	18	0	14.69			128.16						
12	19	85	14	24	0	14.70			128.15						
12	19	85	14	33	30	14.71			128.14						
12	19	85	14	41	30	14.73			128.12						
12	19	85	14	48	10	14.75			128.10						
12	19	85	14	53	0	14.75			128.10						
12	19	85	15	0	30	16.45			126.40						
12	19	85	15	2	0	16.47			126.38						
12	19	85	15	12	0	16.86			125.99						
12	19	85	15	13	50	16.88			125.97						
12	19	85	15	21	0	17.00			125.85						
12	19	85	15	25	0	17.06			125.79						
12	19	85	15	28	0	17.08			125.77						
12	19	85	15	31	30	17.14			125.71						
12	19	85	15	35	0	17.16			125.69						
12	19	85	15	39	5	17.17			125.68						
12	19	85	15	44	30	17.19			125.66						
12	19	85	15	51	0	17.22			125.63						
12	19	85	15	57	0	17.24			125.61						
12	19	85	15	59	0	17.25			125.60						
12	19	85	16	5	0	13.12			129.73						
12	19	85	17	47	0	12.77			130.09						
12	20	85	15	0	0	12.28			130.57						
12	21	85	9	31	0	15.00			127.85						
12	21	85	9	32	0	14.24	0.00		128.61						
12	21	85	9	50	0	17.23	2.99		125.62	0.00		0.4756711883			
12	21	85	9	53	0	15.00	0.76		127.85	3.00		-0.1191864077		0.4771213547	
12	21	85	9	54	0	15.22	0.98		127.63	4.00		-0.0087739243		0.6020599913	
12	21	85	9	55	0	17.73	3.49		125.12	5.00		0.5428254270		0.6989700043	

3 10 00454

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. O-1
DEPTH TO STATIC WATER LEVEL : 14.24
TOP OF CASING ELEV.(FT-MSL) : 142.85

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME RECOVERY	LOG TIME RECOVERY
12	21	85	9	56	0	17.78	3.54		125.07	6.00		0.5490032620		0.7781512504	
12	21	85	9	57	0	17.80	3.56		125.05	7.00		0.5514499980		0.8450980400	
12	21	85	9	58	0	17.89	3.65		124.96	8.00		0.5622929645		0.9030999870	
12	21	85	10	0	0	17.96	3.72		124.89	10.00		0.5705429399		1.0000000000	
12	21	85	10	9	0	17.87	3.63		124.98	19.00		0.5599066250		1.2787536010	
12	21	85	10	16	0	16.56	2.32		126.29	26.00		0.3654879849		1.4147733480	
12	21	85	10	23	20	17.20	2.96		125.65	33.33		0.4712917111		1.5228787453	
12	21	85	10	30	0	17.23	2.99		125.62	40.00		0.4756711883		1.6020599913	
12	21	85	10	34	40	17.28	3.04		125.57	44.67		0.4828735836		1.6499835436	
12	21	85	10	44	40	17.30	3.06		125.55	54.67		0.4857214265		1.7377225933	
12	21	85	10	50	0	17.31	3.07		125.54	60.00		0.4871383755		1.7781512504	
12	21	85	10	5	0	17.52	3.28		125.33	15.00		0.5158738437		1.1760912591	
12	21	85	10	26	0	17.56	3.32		125.29	36.00		0.5211380837		1.5563025008	
12	21	85	10	41	33	17.60	3.36		125.25	51.55		0.5263392774		1.7122286696	
12	21	85	11	53	0	17.61	3.37		125.24	123.00		0.5276299009		2.0899051114	
12	21	85	12	16	0	17.65	3.41		125.20	146.00		0.5327543790		2.1643528558	
12	21	85	12	50	0	17.68	3.44		125.17	180.00		0.5365584426		2.2552725051	
12	21	85	13	30	0	17.75	3.51		125.10	220.00		0.5453071165		2.3424226808	
12	21	85	13	50	0	17.76	3.52		125.09	240.00		0.5465426635		2.3802112417	
12	21	85	14	50	0	17.82	3.58		125.03	300.00		0.5538830266		2.4771212547	
12	21	85	15	50	0	17.88	3.64		124.97	360.00		0.5611013836		2.5563025008	
12	21	85	16	54	0	17.93	3.69		124.92	424.00		0.5670263662		2.6273658566	
12	21	85	17	50	0	17.99	3.75		124.86	480.00		0.5740312677		2.6812412374	
12	21	85	19	40	0	18.12	3.88		124.73	590.00		0.5888317256		2.7708520116	
12	21	85	21	40	0	18.18	3.94		124.67	710.00		0.5954962218		2.8512583487	
12	21	85	23	59	0	18.25	4.01		124.60	849.00		0.6031443726		2.9289076902	
12	22	85	2	33	0	18.30	4.06		124.55	1003.00		0.6085260336		3.0013009330	
12	22	85	7	12	0	18.39	4.15		124.46	1282.00		0.6180480967		3.1078880252	
12	22	85	8	32	0	18.42	4.18	0.00	124.43	1362.00		0.6211762818		3.1341771076	
12	22	85	8	35	15	15.00	0.76	3.42	127.85	1365.25	0.25		0.5340261061		-0.6020599913
12	22	85	8	35	35	14.40	0.16	4.02	128.45	1365.58	0.58		0.6042260531		-0.2340832060
12	22	85	8	38	0	14.24	0.00	4.18	128.61	1368.00	3.00		0.6211762818		0.4771212547
12	22	85	8	39	0	14.18	-0.06	4.24	128.67	1369.00	4.00		0.6273658566		0.6020599913
12	22	85	8	40	0	14.12	-0.12	4.30	128.73	1370.00	5.00		0.6334684556		0.6989700043
12	22	85	8	42	30	14.07	-0.17	4.35	128.78	1372.50	7.50		0.6384992570		0.8750612634
12	22	85	8	44	0	14.05	-0.19	4.37	128.80	1374.00	9.00		0.6404814370		0.9542425094
12	22	85	8	46	0	14.00	-0.24	4.42	128.85	1376.00	11.00		0.6454222693		1.0413926852
12	22	85	8	49	0	13.95	-0.29	4.47	128.90	1379.00	14.00		0.6503075231		1.1461280357
12	22	85	8	51	0	13.94	-0.30	4.48	128.91	1381.00	16.00		0.6512780140		1.2041199827
12	22	85	8	56	0	13.90	-0.34	4.52	128.95	1386.00	21.00		0.6551384348		1.3222192947
12	22	85	9	12	0	13.79	-0.45	4.63	129.06	1402.00	37.00		0.6655809910		1.5682017241
12	22	85	9	27	0	13.71	-0.53	4.71	129.14	1417.00	52.00		0.6733209071		1.7160033436
12	22	85	9	38	0	13.64	-0.60	4.78	129.21	1428.00	63.00		0.6794278766		1.7993405495
12	22	85	9	59	0	13.55	-0.69	4.87	129.30	1449.00	84.00		0.6875289612		1.9242792861
12	22	85	10	16	0	13.48	-0.76	4.94	129.37	1466.00	101.00		0.6937269489		2.0043213738

3 10 00455

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. O-1
DEPTH TO STATIC WATER LEVEL : 14.24
TOP OF CASING ELEV.(FT-MSL) : 142.85

STOP PUMP
12 22 85 8 35 0

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME RECOVERY	LOG TIME RECOVERY
12	22	85	10	26	0	13.48	-0.76	4.94	129.37	1476.00	111.00		0.6937269489		2.0453229788
12	22	85	11	20	0	13.32	-0.92	5.10	129.53	1530.00	165.00		0.7075701761		2.2174839442
12	22	85	11	52	0	13.27	-0.97	5.15	129.58	1562.00	197.00		0.7118072290		2.2944662262
12	22	85	12	38	0	13.12	-1.12	5.30	129.73	1608.00	243.00		0.7242758696		2.3856062736
12	22	85	13	38	0	13.03	-1.21	5.39	129.82	1668.00	303.00		0.7315887652		2.4814426285
12	22	85	13	52	0	13.02	-1.22	5.40	129.83	1682.00	317.00		0.7323937598		2.5010592622
12	22	85	14	42	0	13.02	-1.22	5.40	129.83	1732.00	367.00		0.7323937598		2.5646660643
12	22	85	16	28	0	12.85	-1.39	5.57	130.00	1838.00	473.00		0.7458551952		2.6748611407
12	22	85	19	5	0	12.77	-1.47	5.65	130.08	1995.00	630.00		0.7520484478		2.7993405495
12	22	85	20	17	0	12.71	-1.53	5.71	130.14	2067.00	702.00		0.7566361082		2.8463371121
12	22	85	22	3	0	12.67	-1.57	5.75	130.18	2173.00	808.00		0.7596678447		2.9074113608
12	22	85	23	49	0	12.64	-1.60	5.78	130.21	2279.00	914.00		0.7619278384		2.9609463957
12	23	85	7	51	0	12.49	-1.75	5.93	130.36	2761.00	1396.00		0.7730546934		3.1448854183

3 10 00456

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. D-2
DEPTH TO STATIC WATER LEVEL : 11.95
TOP OF CASING ELEV.(FT-MSL) : 142.24

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	17	12	0	11.51			130.73						
12	14	85	10	24	0	11.91			130.33						
12	16	85	10	17	0	11.90			130.34						
12	17	85	9	21	0	11.83			130.41						
12	17	85	17	34	0	11.71			130.53						
12	18	85	8	7	0	11.78			130.46						
12	19	85	13	45	0	12.06			130.18						
12	19	85	14	14	0	12.18			130.06						
12	19	85	14	50	0	12.26			129.98						
12	19	85	15	41	0	12.60			129.64						
12	19	85	17	50	0	12.19			130.05						
12	20	85	15	0	0	11.82			130.42						
12	21	85	8	30	0	11.95	0.00		130.29						
12	21	85	9	51	0	12.02	0.07		130.22	1.00		-1.1549019600		0.0000000000	
12	21	85	9	51	30	12.02	0.07		130.22	1.50		-1.1549019600		0.1760912591	
12	21	85	9	52	0	12.04	0.09		130.20	2.00		-1.0457574906		0.3010299957	
12	21	85	9	54	0	12.08	0.13		130.16	4.00		-0.8860566477		0.6020599913	
12	21	85	9	55	0	12.12	0.17		130.12	5.00		-0.7695510786		0.6989700043	
12	21	85	9	58	0	12.24	0.29		130.00	8.00		-0.5376020021		0.9030899870	
12	21	85	9	58	30	12.24	0.29		130.00	8.50		-0.5376020021		0.9294189257	
12	21	85	10	0	0	12.27	0.32		129.97	10.00		-0.4948500217		1.0000000000	
12	21	85	10	3	0	12.31	0.36		129.93	13.00		-0.4436974992		1.1139433523	
12	21	85	10	4	0	12.31	0.36		129.93	14.00		-0.4436974992		1.1461280357	
12	21	85	10	7	0	12.35	0.40		129.89	17.00		-0.3979400087		1.2304489214	
12	21	85	10	11	0	12.37	0.42		129.87	21.00		-0.3767507096		1.3222192947	
12	21	85	10	13	0	12.37	0.42		129.87	23.00		-0.3767507096		1.3617278360	
12	21	85	10	15	30	12.37	0.42		129.87	25.50		-0.3767507096		1.4065401804	
12	21	85	10	17	30	12.38	0.43		129.86	27.50		-0.3665315444		1.4393326938	
12	21	85	10	19	30	12.41	0.46		129.83	29.50		-0.3372421683		1.4698220160	
12	21	85	10	22	0	12.42	0.47		129.82	32.00		-0.3279021421		1.5051499783	
12	21	85	10	24	0	12.46	0.51		129.78	34.00		-0.2924298239		1.5314789170	
12	21	85	10	26	0	12.46	0.51		129.78	36.00		-0.2924298239		1.5563025008	
12	21	85	10	29	0	12.47	0.52		129.77	39.00		-0.2839966564		1.5910646070	
12	21	85	10	31	0	12.49	0.54		129.75	41.00		-0.2676062402		1.6127839567	
12	21	85	10	33	0	12.48	0.53		129.76	43.00		-0.2757241304		1.6334684556	
12	21	85	10	33	45	12.47	0.54		129.75	43.75		-0.2676062402		1.6409750574	
12	21	85	10	37	0	12.50	0.55		129.74	47.00		-0.2596373105		1.6720978579	
12	21	85	10	39	30	12.53	0.58		129.71	49.50		-0.2365720064		1.6946051989	
12	21	85	10	42	0	12.53	0.58		129.71	52.00		-0.2365720064		1.7160033436	
12	21	85	10	46	20	12.55	0.60		129.69	56.33		-0.2218487496		1.7507654499	
12	21	85	10	49	0	12.56	0.61		129.68	59.00		-0.2146701650		1.7708520116	
12	21	85	11	2	0	12.62	0.67		129.62	72.00		-0.1739251973		1.8573324964	
12	21	85	11	8	45	12.64	0.69		129.60	78.75		-0.1611509093		1.8962505625	
12	21	85	11	23	0	12.66	0.71		129.58	93.00		-0.1437416513		1.9684829436	

3 10 00457

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. D-2 .
DEPTH TO STATIC WATER LEVEL : 11.95
TOP OF CASING ELEV.(FT-MSL) : 142.24

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	21	85	11	34	30	12.69	0.74		129.55	104.50		-0.1307682803		2.0191162904	
12	21	85	11	49	0	12.72	0.77		129.52	119.00		-0.1135092748		2.0755469614	
12	21	85	12	17	0	12.76	0.81		129.48	147.00		-0.0915149811		2.1673173347	
12	21	85	12	46	35	12.81	0.86		129.43	176.58		-0.0655015488		2.2469497107	
12	21	85	13	28	0	12.86	0.91		129.38	218.00		-0.0409586077		2.3384564936	
12	21	85	13	46	0	12.89	0.94		129.35	236.00		-0.0268721464		2.3729120030	
12	21	85	14	51	0	12.95	1.00		129.29	301.00		0.0000000000		2.4785664956	
12	21	85	15	55	0	13.03	1.08		129.21	365.00		0.0334237555		2.5622928645	
12	21	85	16	53	0	13.09	1.14		129.15	423.00		0.0569048513		2.6263403674	
12	21	85	17	50	0	13.13	1.18		129.11	480.00		0.0718820073		2.6812412374	
12	21	85	19	43	0	13.30	1.35		128.94	593.00		0.1303337685		2.7730546934	
12	21	85	21	58	0	13.36	1.41		128.88	728.00		0.1492191127		2.8621313793	
12	21	85	23	57	0	13.42	1.47		128.82	847.00		0.1673173347		2.9278834103	
12	22	85	2	38	0	13.46	1.51		128.78	1008.00		0.1789769473		3.0034605321	
12	22	85	7	6	0	13.58	1.63		128.66	1276.00		0.2121876044		3.1058506744	
12	22	85	8	33	0	13.74	1.79	0.00	128.50	1363.00		0.2528530310		3.1344958558	
12	22	85	8	35	15	13.70	1.75	0.04	128.54	1365.25	0.25		-1.3979400087		-0.6020599913
12	22	85	8	35	30	13.68	1.73	0.06	128.56	1365.50	0.50		-1.2218487496		-0.3010299957
12	22	85	8	36	0	13.65	1.70	0.09	128.59	1366.00	1.00		-1.0457574906		0.0000000000
12	22	85	8	36	30	13.65	1.70	0.09	128.59	1366.50	1.50		-1.0457574906		0.1760912591
12	22	85	8	37	0	13.63	1.68	0.11	128.61	1367.00	2.00		-0.9586073148		0.3010299957
12	22	85	8	37	30	13.62	1.67	0.12	128.62	1367.50	2.50		-0.9208187540		0.3979400087
12	22	85	8	38	0	13.59	1.64	0.15	128.65	1368.00	3.00		-0.8239087409		0.4771212547
12	22	85	8	39	0	13.59	1.64	0.15	128.65	1369.00	4.00		-0.8239087409		0.6020599913
12	22	85	8	40	0	13.57	1.62	0.17	128.67	1370.00	5.00		-0.7695510786		0.6989700043
12	22	85	8	40	30	13.56	1.61	0.18	128.68	1370.50	5.50		-0.7447274949		0.7403626395
12	22	85	8	41	0	13.55	1.60	0.19	128.69	1371.00	6.00		-0.7212463990		0.7781512504
12	22	85	8	42	0	13.54	1.59	0.20	128.70	1372.00	7.00		-0.6989700043		0.8450980400
12	22	85	8	43	0	13.54	1.59	0.20	128.70	1373.00	8.00		-0.6989700043		0.9030899870
12	22	85	8	44	0	13.53	1.58	0.21	128.71	1374.00	9.00		-0.6777807053		0.9542425094
12	22	85	8	45	0	13.52	1.57	0.22	128.72	1375.00	10.00		-0.6575773192		1.0000000000
12	22	85	8	46	0	13.50	1.55	0.24	128.74	1376.00	11.00		-0.6197887583		1.0413926852
12	22	85	8	47	0	13.49	1.54	0.25	128.75	1377.00	12.00		-0.6020599913		1.0791812460
12	22	85	8	48	30	13.46	1.51	0.28	128.78	1378.50	13.50		-0.5528419687		1.1303337685
12	22	85	8	49	0	13.46	1.51	0.28	128.78	1379.00	14.00		-0.5528419687		1.1461280357
12	22	85	8	50	0	13.46	1.51	0.28	128.78	1380.00	15.00		-0.5528419687		1.1760912591
12	22	85	8	51	0	13.47	1.52	0.27	128.77	1381.00	16.00		-0.5656362359		1.2041199827
12	22	85	8	53	0	13.44	1.49	0.30	128.80	1383.00	18.00		-0.5228787453		1.2552725051
12	22	85	8	54	0	13.44	1.49	0.30	128.80	1384.00	19.00		-0.5228787453		1.2787536010
12	22	85	8	55	0	13.42	1.47	0.32	128.82	1385.00	20.00		-0.4485000217		1.3010299957
12	22	85	8	57	0	13.45	1.50	0.29	128.79	1387.00	22.00		-0.5376020021		1.3424226308
12	22	85	8	59	0	13.25	1.30	0.49	128.99	1389.00	24.00		-0.3098039200		1.3802112417
12	22	85	9	0	0	13.24	1.29	0.50	129.00	1390.00	25.00		-0.3010299957		1.3979400087
12	22	85	9	1	0	13.23	1.28	0.51	129.01	1391.00	26.00		-0.2924298239		1.4149733480
12	22	85	9	2	0	13.24	1.29	0.50	129.00	1392.00	27.00		-0.3010299957		1.4313637642

3 10 00458

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

STOP PUMP
12 22 85 8 35 0

WELL NO. O-2
DEPTH TO STATIC WATER LEVEL : 11.95
TOP OF CASING ELEV.(FT-MSL) : 142.24

DATE NO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	22	85	9	4	0	13.23	1.28	0.51	129.01	1394.00	29.00		-0.2924298239		1.4623979979
12	22	85	9	8	0	13.20	1.25	0.54	129.04	1398.00	33.00		-0.2676062402		1.5185139399
12	22	85	9	15	0	13.14	1.19	0.60	129.10	1405.00	40.00		-0.2218487496		1.6020599913
12	22	85	9	23	0	13.14	1.19	0.60	129.10	1413.00	48.00		-0.2218487496		1.6812412374
12	22	85	9	37	0	13.06	1.11	0.68	129.18	1427.00	62.00		-0.1674910873		1.7923916895
12	22	85	9	54	0	13.00	1.05	0.74	129.24	1444.00	79.00		-0.1307682803		1.8976270913
12	22	85	10	18	0	12.90	0.95	0.84	129.34	1468.00	103.00		-0.0757207139		2.0128372247
12	22	85	10	28	0	12.89	0.94	0.85	129.35	1478.00	113.00		-0.0705810743		2.0530784435
12	22	85	11	16	0	12.75	0.80	0.99	129.49	1526.00	161.00		-0.0043648054		2.2068258760
12	22	85	11	54	0	12.67	0.72	1.07	129.57	1564.00	199.00		0.0293837777		2.2988530764
12	22	85	12	40	0	12.56	0.61	1.18	129.68	1610.00	245.00		0.0715920073		2.3891660944
12	22	85	13	40	0	12.45	0.50	1.29	129.79	1670.00	305.00		0.1105897103		2.4842998393
12	22	85	14	43	0	12.36	0.41	1.38	129.88	1733.00	368.00		0.1398790864		2.5653478187
12	22	85	16	29	0	12.27	0.32	1.47	129.97	1839.00	474.00		0.1673173347		2.6757783417
12	22	85	19	14	0	12.17	0.22	1.57	130.07	2004.00	639.00		0.1955996524		2.8055008582
12	22	85	20	21	0	12.14	0.19	1.60	130.10	2071.00	706.00		0.2041199827		2.8483047011
12	22	85	22	6	0	12.10	0.15	1.64	130.14	2176.00	811.00		0.2148438480		2.9090208542
12	22	85	23	51	0	12.07	0.12	1.67	130.17	2281.00	916.00		0.2227164711		2.9618954737
12	23	85	7	33	0	11.92	-0.03	1.82	130.32	2743.00	1378.00		0.2600713880		3.1392492176

3 10 00459

BLUFF ROAD PUMPING TEST

START PUMP
12 21 85 9 50 0

WELL NO. DW-1
DEPTH TO STATIC WATER LEVEL : 13.69
TOP OF CASING ELEV.(FT-MSL) : 139.4

STOP PUMP
12 22 85 8 35 0

DATE MO.	DA.	YR.	TIME HR.	MIN.	SEC.	DEPTH TO WATER (ft)	DRAWDOWN (ft)	RECOVERY (ft)	WATER ELEVATION (ft-msl)	TIME FROM START OF PUMPING (min)	TIME FROM START OF RECOVERY (min)	LOG DRAWDOWN	LOG RECOVERY	LOG TIME DRAWDOWN	LOG TIME RECOVERY
12	13	85	14	22	0	13.45			125.95						
12	14	85	10	15	0	13.50			125.90						
12	16	85	10	21	0	13.61			125.79						
12	17	85	9	18	0	13.59			125.81						
12	18	85	8	3	0	13.60			125.80						
12	19	85	18	4	0	13.67			125.73						
12	20	85	14	55	0	13.66			125.74						
12	21	85	9	0	0	13.69	0.00		125.71						
12	21	85	9	53	0	13.69	0.00		125.71	3.00					
12	21	85	10	4	0	13.68	-0.01		125.72	14.00					
12	21	85	10	12	0	13.67	-0.02		125.73	22.00					
12	21	85	10	21	0	13.68	-0.01		125.72	31.00					
12	21	85	10	29	0	13.69	0.00		125.71	39.00					
12	21	85	10	38	0	13.67	-0.02		125.73	48.00					
12	21	85	10	47	0	13.68	-0.01		125.72	57.00					
12	21	85	11	19	0	13.68	-0.01		125.72	89.00					
12	21	85	11	45	0	13.67	-0.02		125.73	115.00					
12	21	85	12	48	0	13.67	-0.02		125.73	178.00					
12	21	85	13	48	0	13.67	-0.02		125.73	238.00					
12	21	85	15	51	0	13.68	-0.01		125.72	361.00					
12	21	85	17	48	0	13.70	0.01		125.70	478.00					
12	21	85	19	53	0	13.68	-0.01		125.72	603.00					
12	21	85	23	51	0	13.70	0.01		125.70	841.00					
12	22	85	6	57	0	13.69	0.00	0.00	125.71	1267.00					
12	22	85	9	17	0	13.69	0.00	0.00	125.71	1407.00	42.00				
12	22	85	10	39	0	13.70	0.01	-0.01	125.70	1489.00	124.00				
12	22	85	14	39	0	13.66	-0.03	0.03	125.74	1729.00	364.00				
12	22	85	19	0	0	13.67	-0.02	0.02	125.73	1990.00	625.00				
12	22	85	21	56	0	13.68	-0.01	0.01	125.72	2166.00	801.00				
12	23	85	8	2	0	13.67	-0.02	0.02	125.73	2772.00	1407.00				

3 10 00460

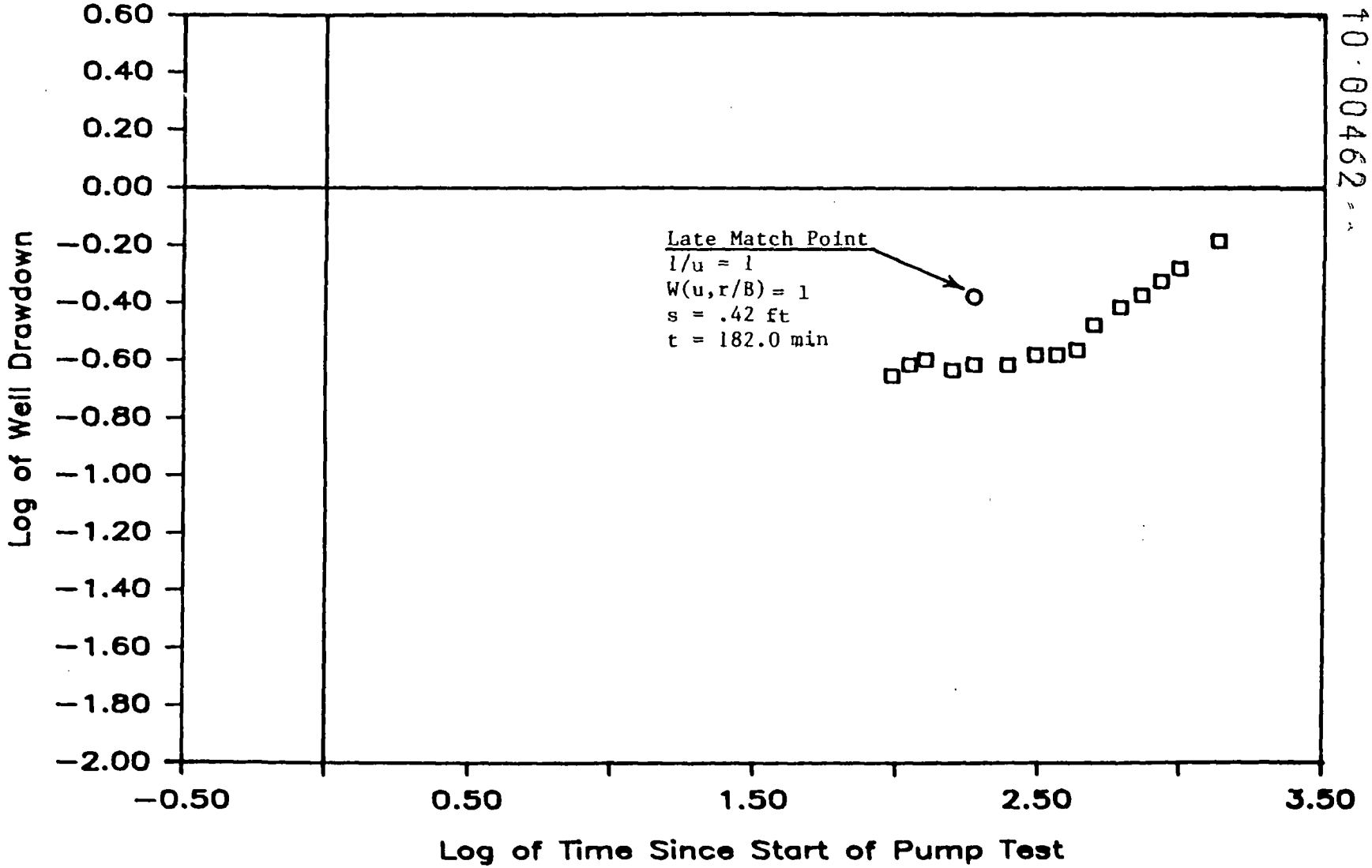
3 10 00461

Appendix H-5

Plots of Drawdown vs. Time

WELL NO. BP-1

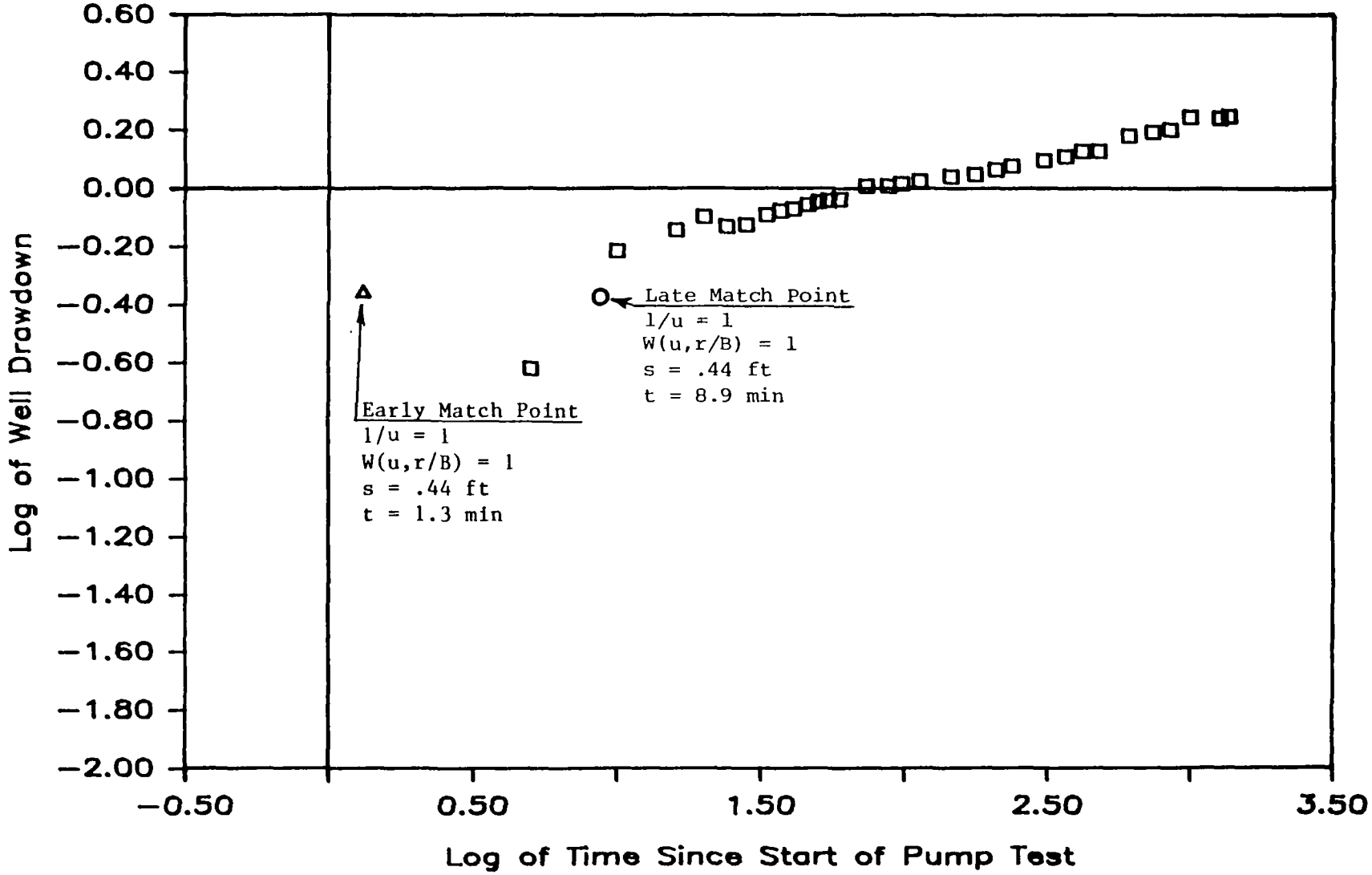
BLUFF ROAD SITE



3 10 00462

WELL NO. BP-2

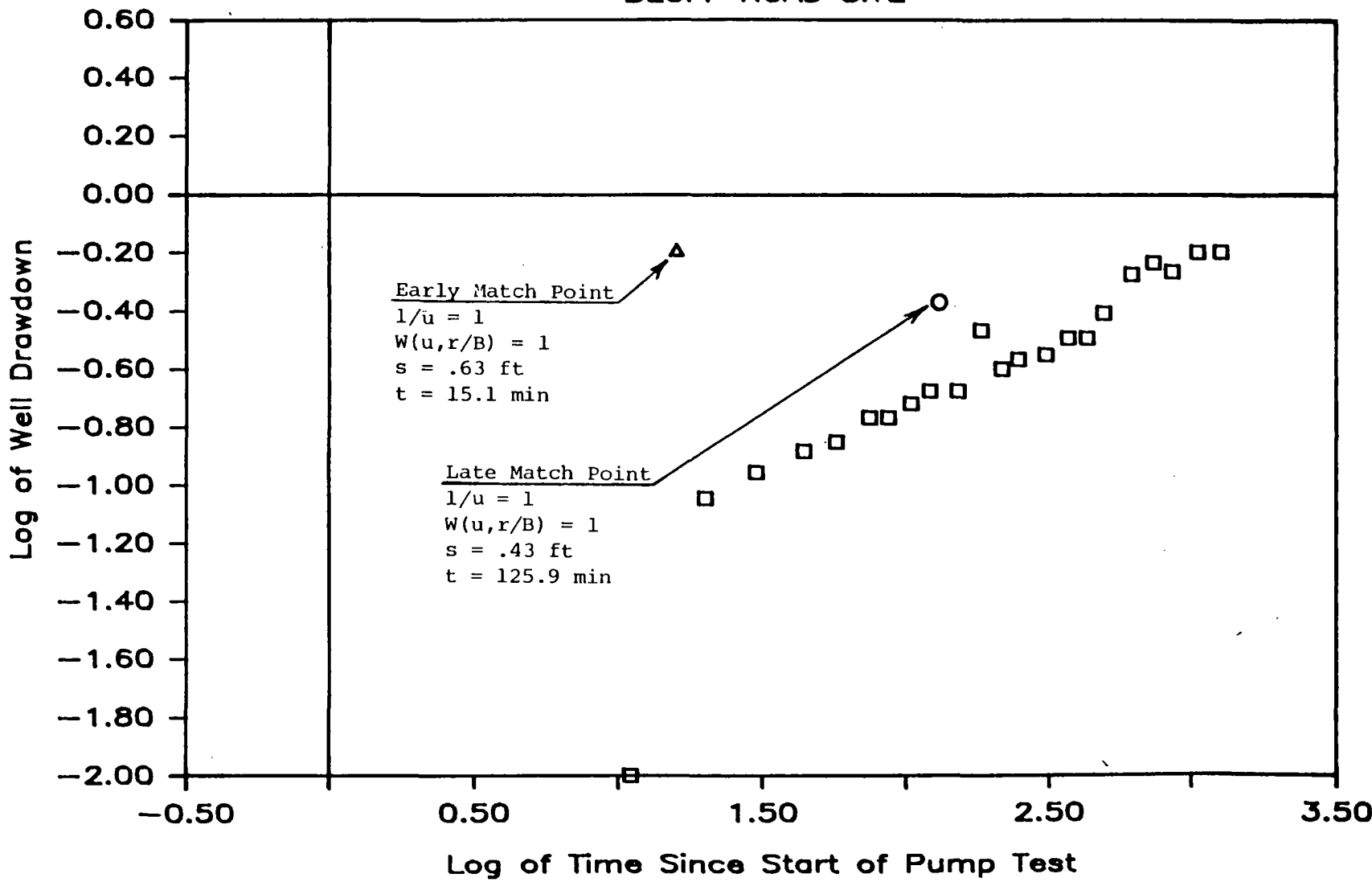
BLUFF ROAD SITE



3 10 00463

WELL NO. BP-4-1

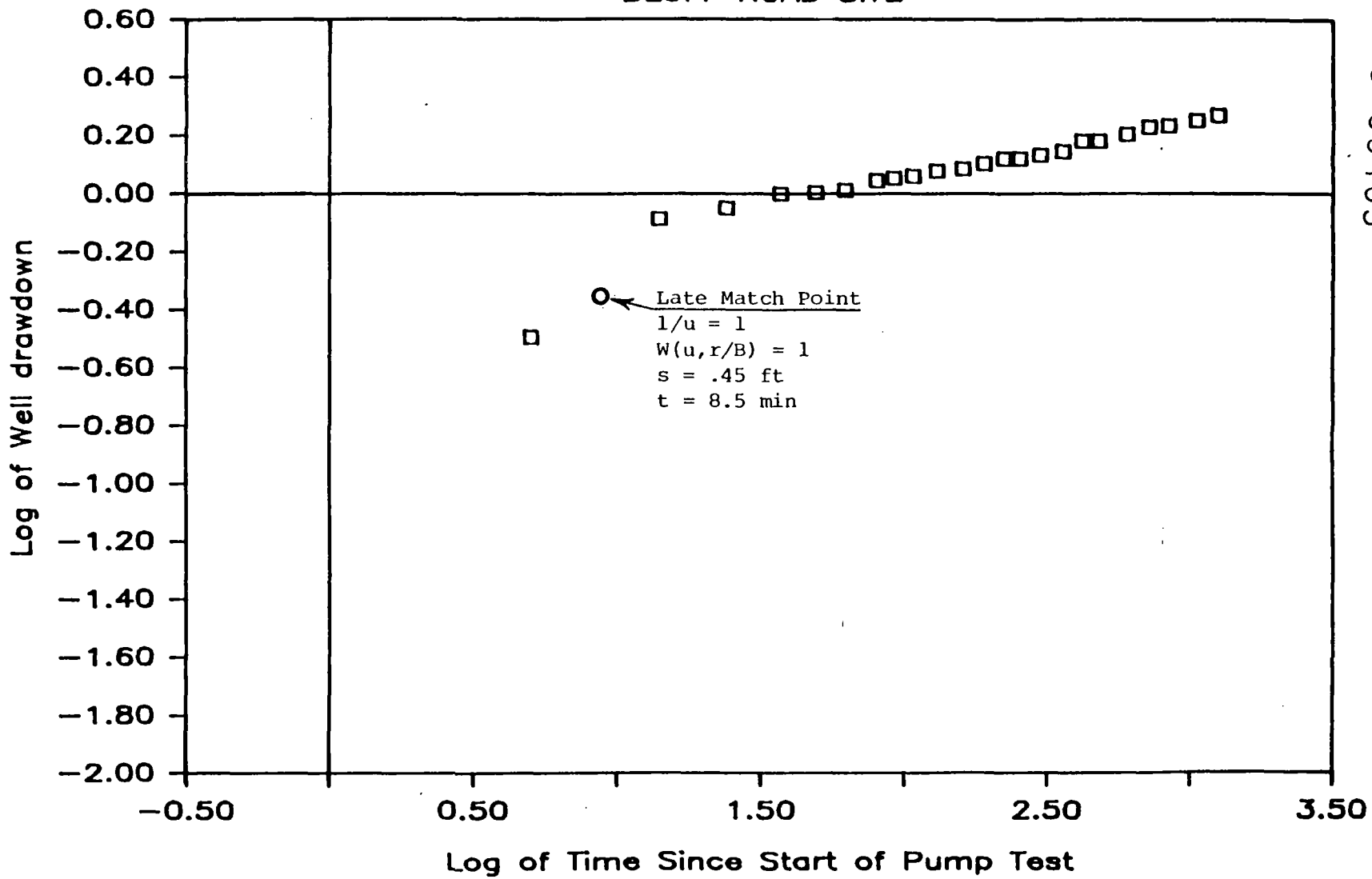
BLUFF ROAD SITE



3 10 00464

WELL NO.BP-5-1

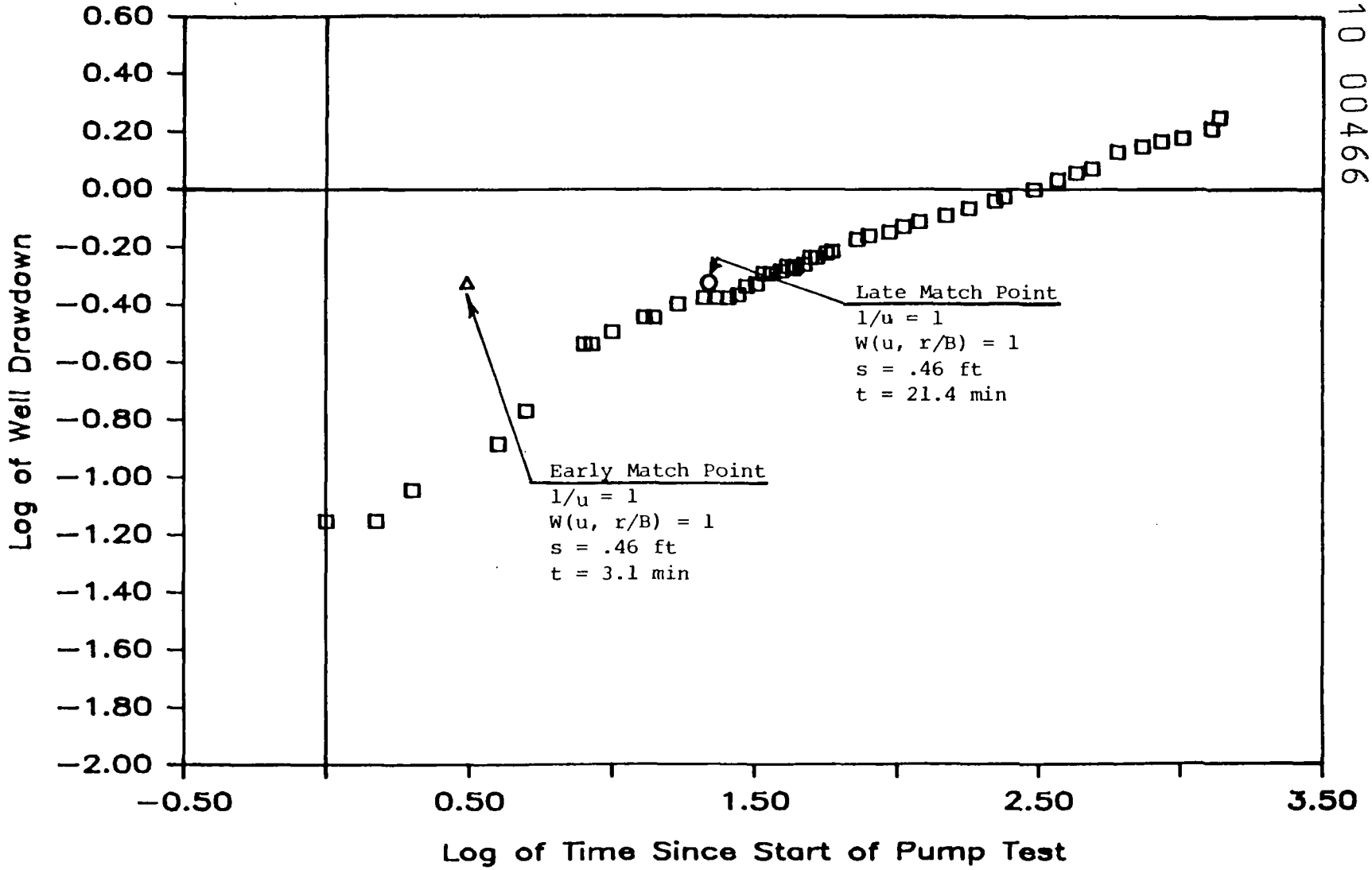
BLUFF ROAD SITE



3 10 00465

WELL NO.O-2

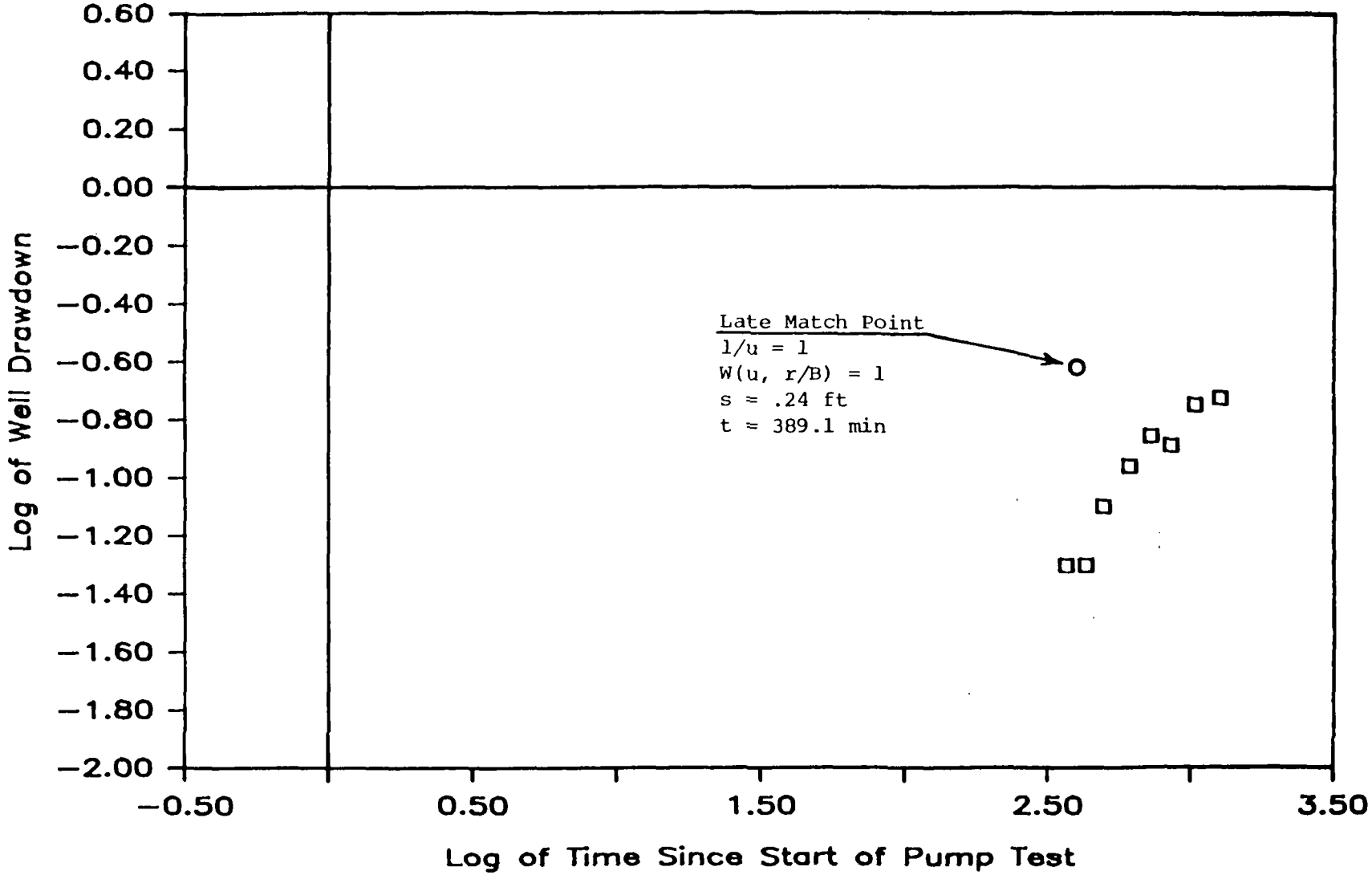
Drawdown Data



3 10 00466

WELL NO. P-7

BLUFF ROAD SITE



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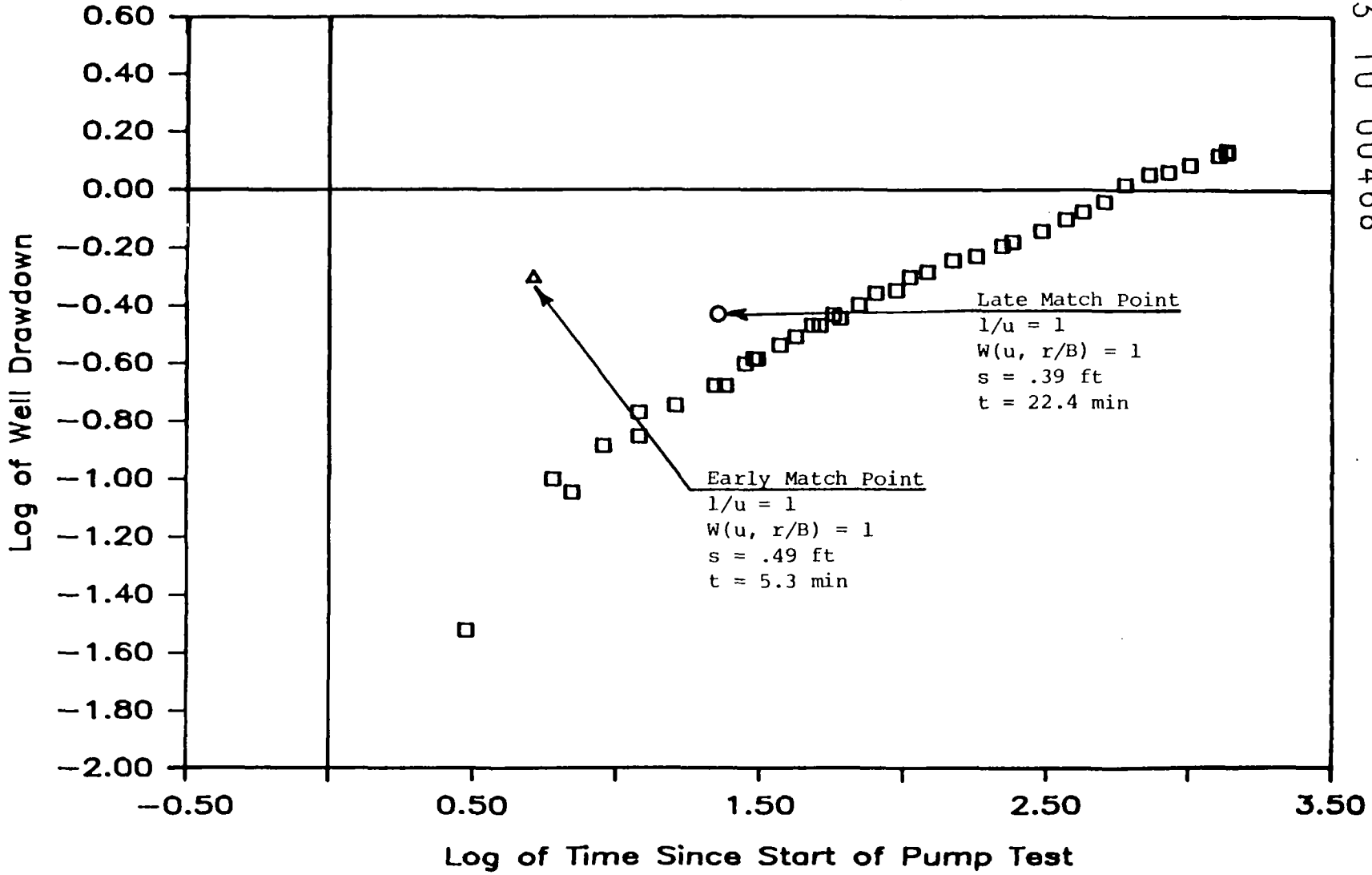

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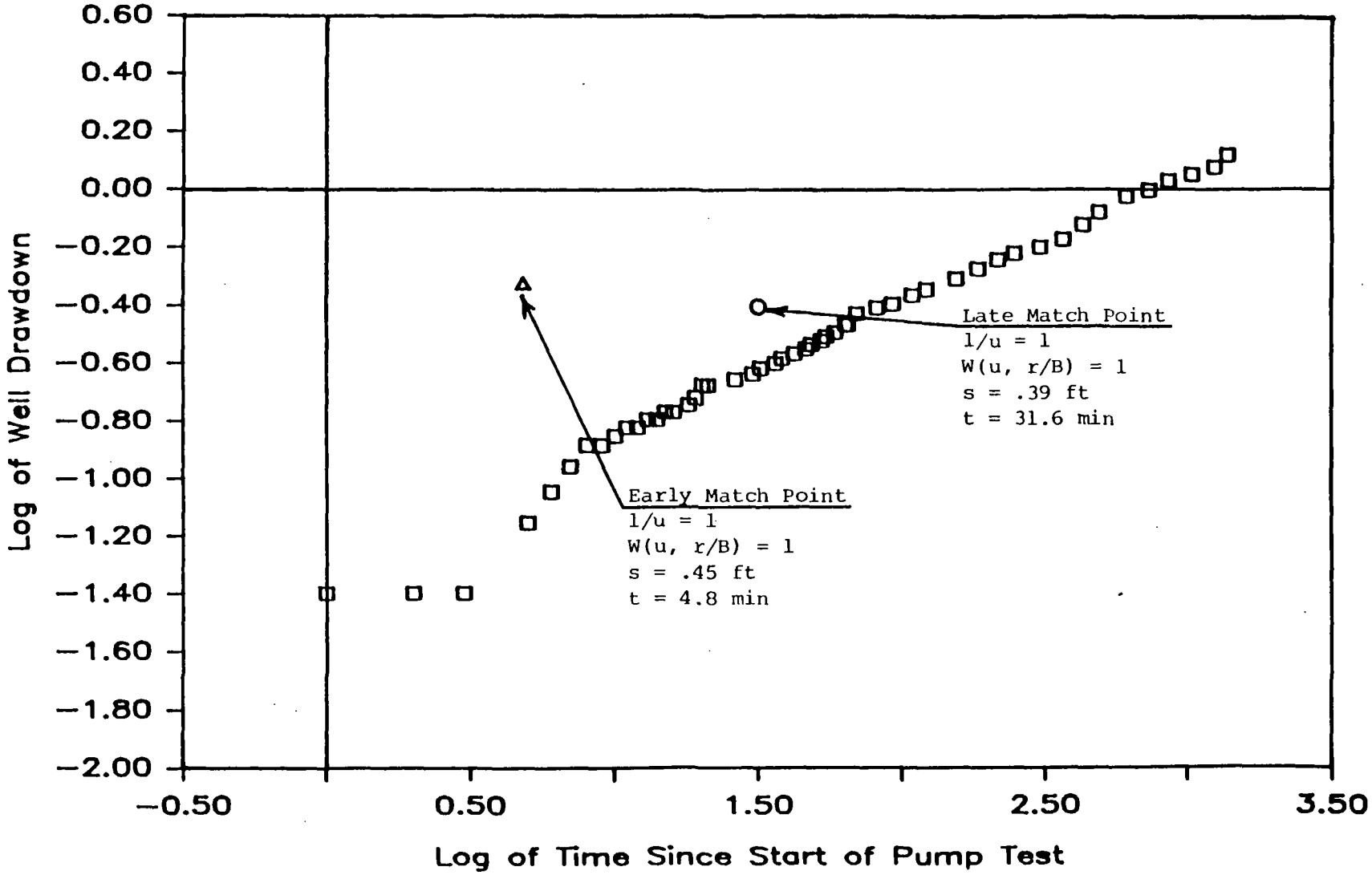

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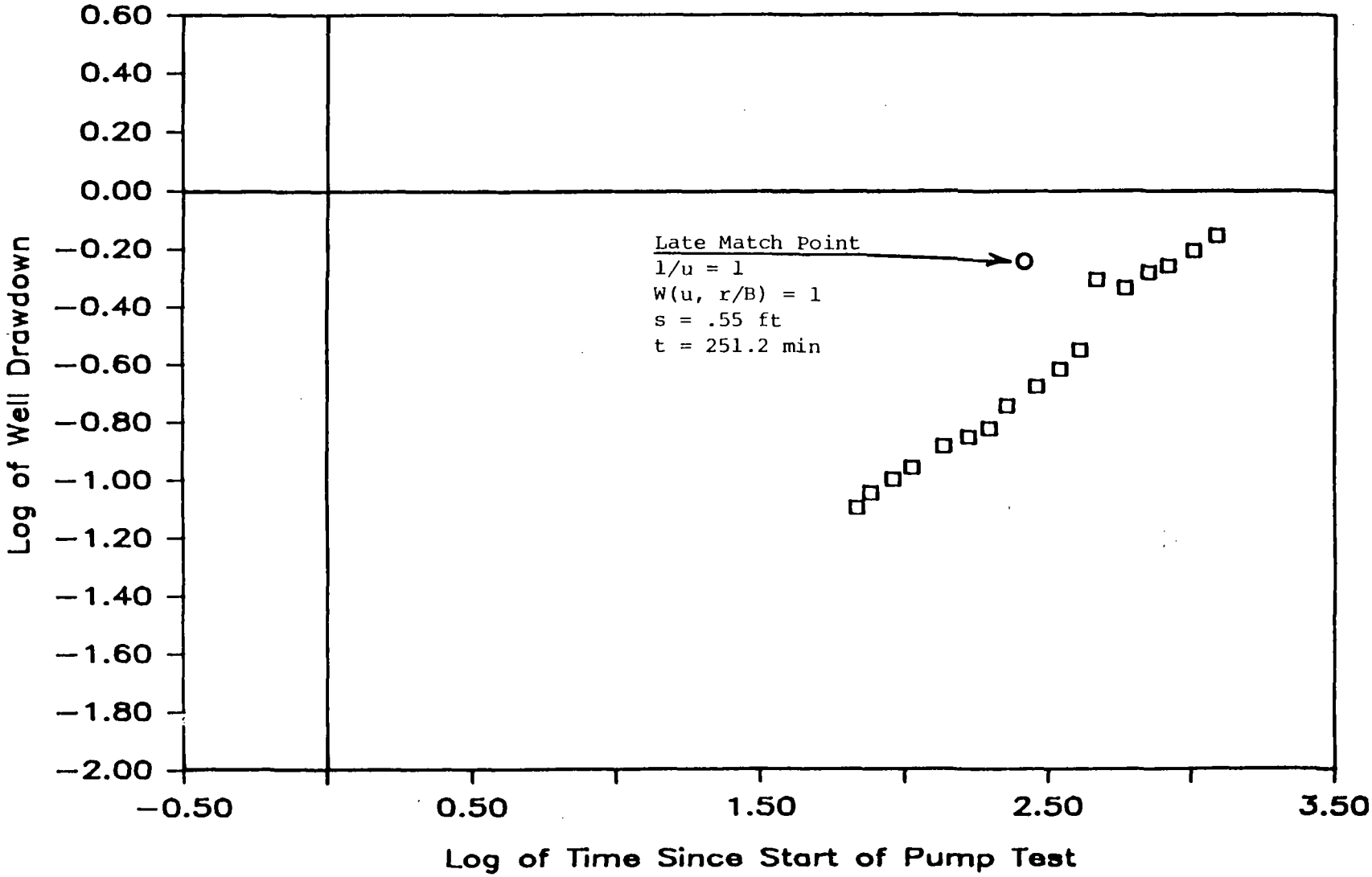

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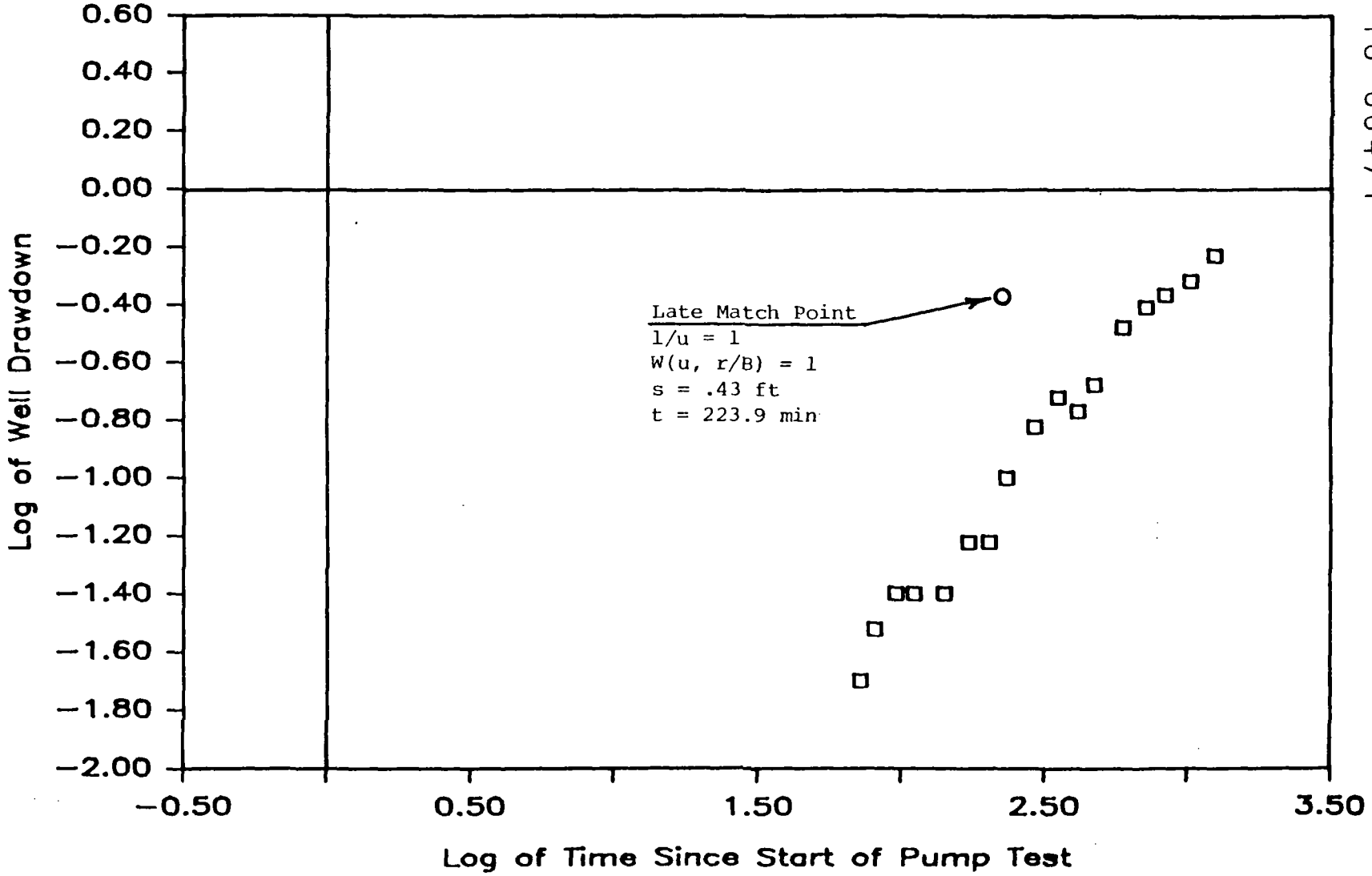

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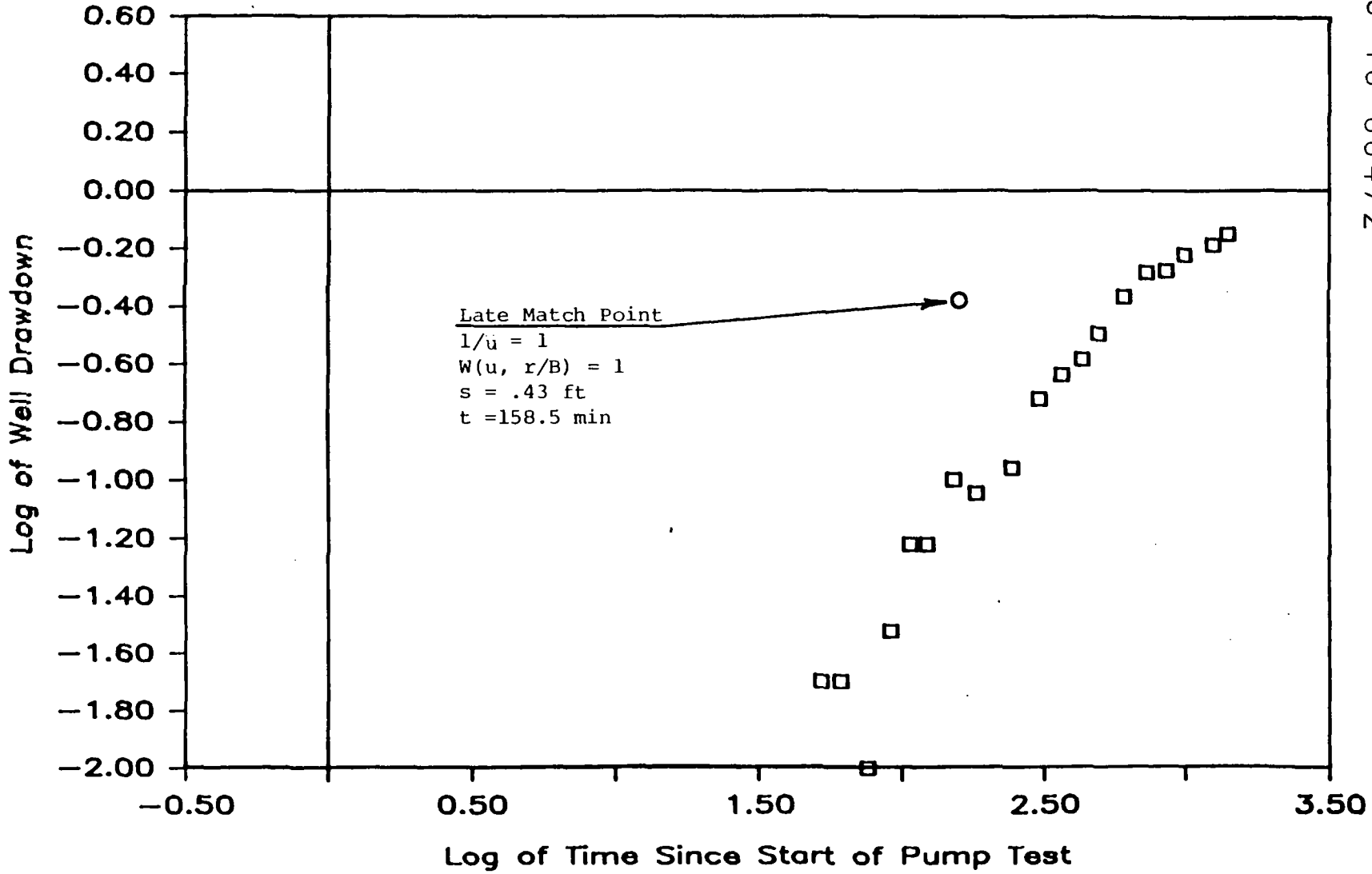
WELL NO. W-6

BLUFF ROAD SITE



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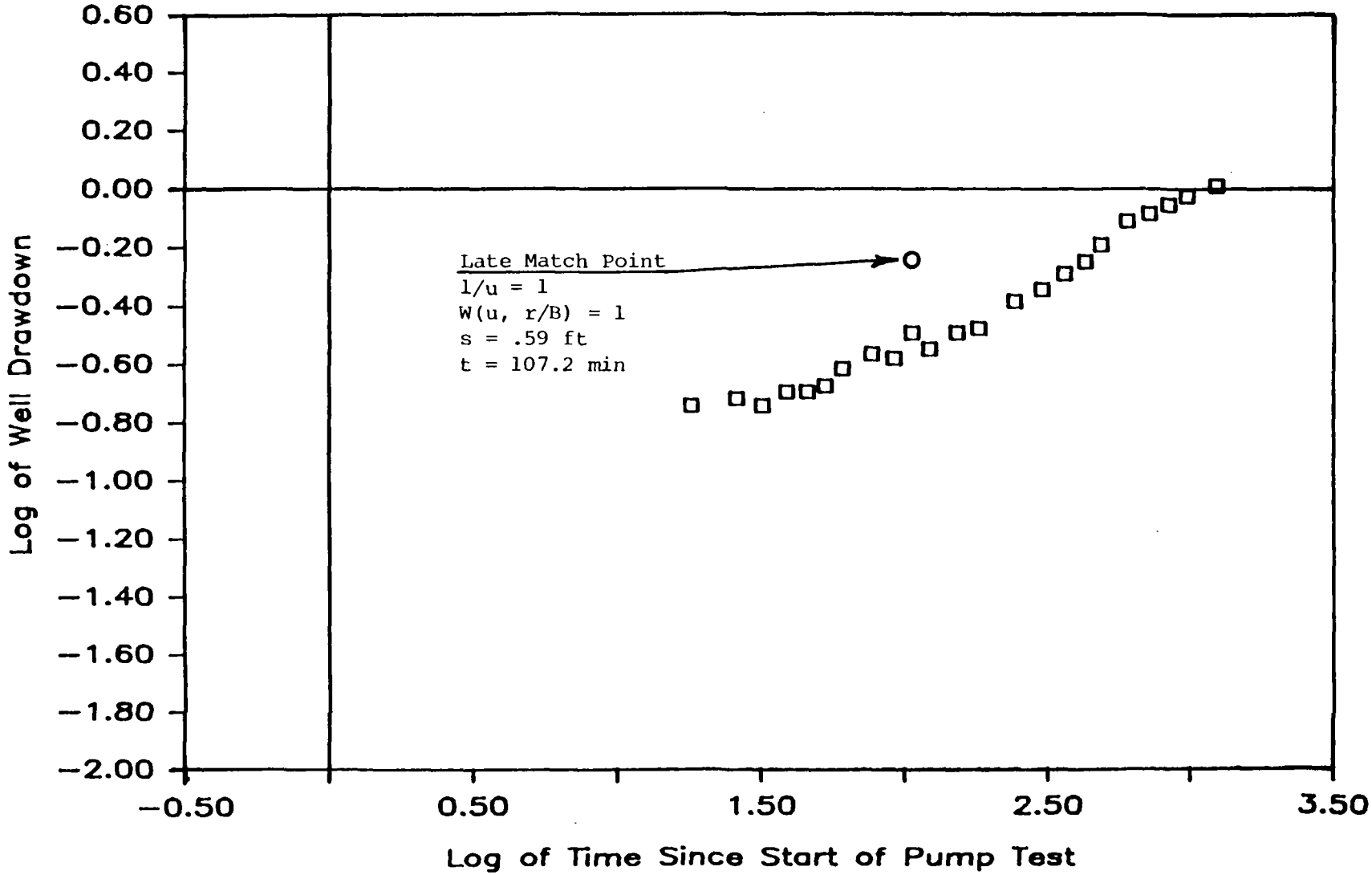

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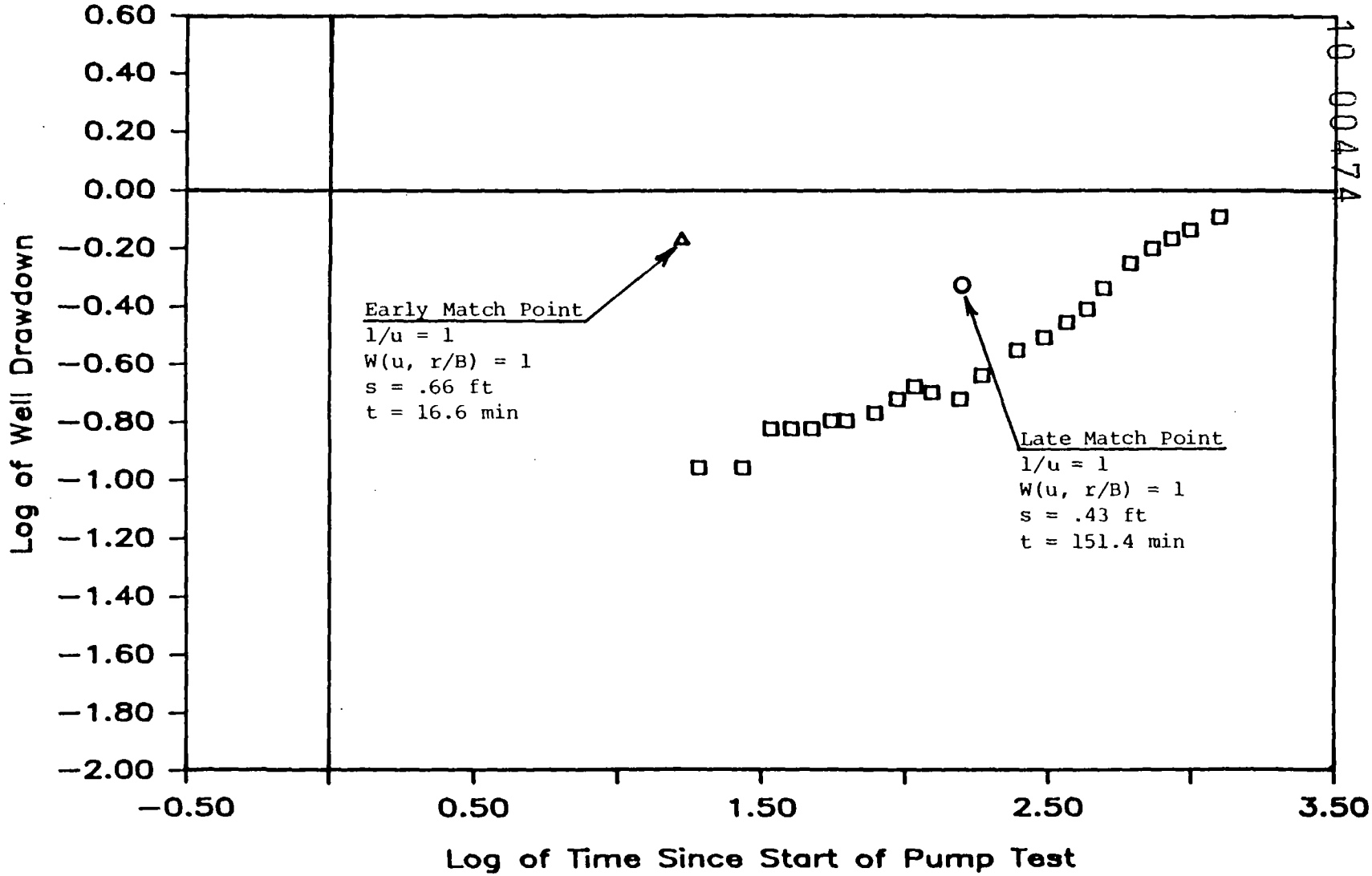

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WELL NO. W—10

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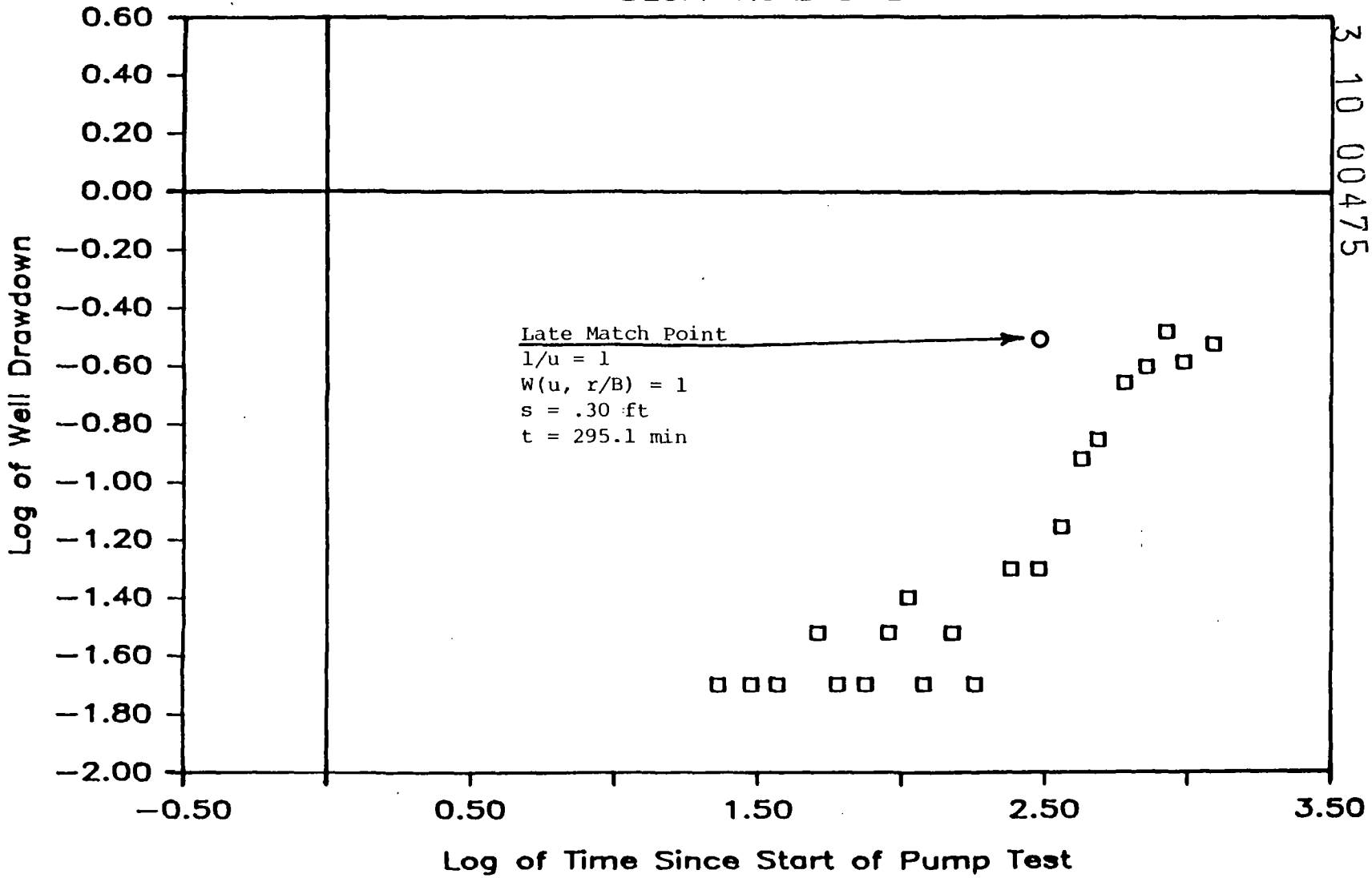

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WELL NO. W-11

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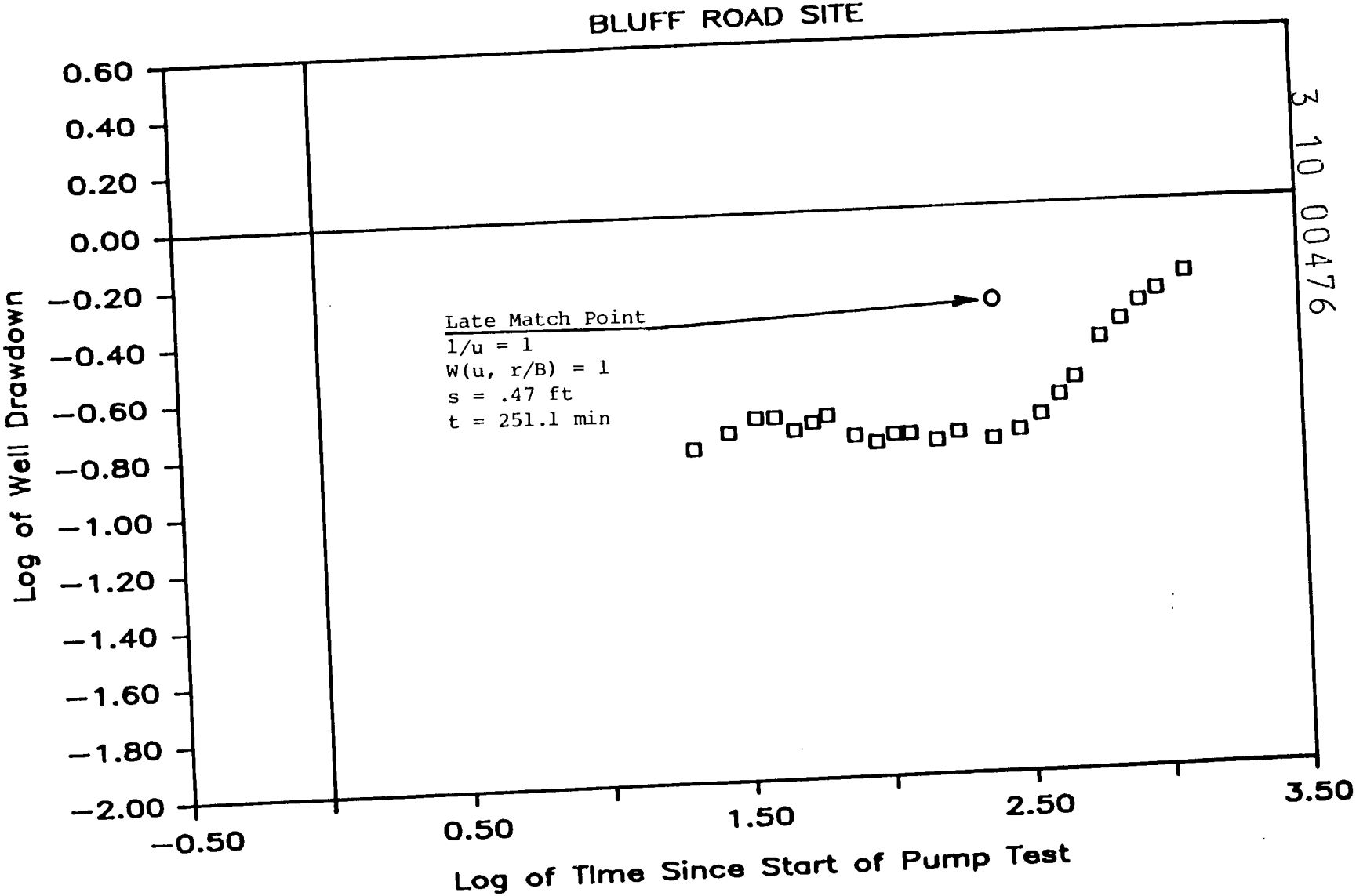

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Appendix H-6

Chemical Analyses Results

ACL 3 10 00478 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

JAN 10 1986

GAI - ATL

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: #85-1728 "Bluff Road"
ACL Project No.: #0156
Date Received: 12/24/85
Report Date: 1/8/86

TEST REQUIRED	Sample Type : Water Station # : P-18A Sample #ACL : 1318 Results (ppb)	Sample Type : Water Station # : L-44 Sample #ACL : 1319 Results (ppb)	Sample Type : Water Station # : Pipe #44 Sample #ACL : 1320 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS	Sample not associated with field aeration test		
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	180	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	188	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	91	*	*
Tetrachloroethylene	115	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	404	*	*
1,1,2-Trichloroethane	38	*	*
Trichloroethylene	31	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

Steve N. Tsoukalas
Steve Tsoukalas, Ph.D.
Director of Chemistry

ACL 3 10 00479 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
CHIEF CHEMIST

P.O. BOX 88610 • ATLANTA, GEORGIA 30356
TELEPHONE (404) 455-1266

Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: #85-1728 "Bluff Road"
ACL Project No.: #0156
Date Received: 12/24/85
Report Date: 1/8/86

TEST REQUIRED	Sample Type : Water Station # : L-4A Sample #ACL : 1321 Results (ppb)	Sample Type : Water Station # : O-1A Sample #ACL : 1322 Results (ppb)	Sample Type : Water Station # : F.B. #1 Sample #ACL : 1323 Results (ppb)
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---	---	---
Acrylonitrile	---	---	---
Benzene	*	*	*
Bis (Chloromethyl) ether	*	*	*
Bromoform	*	*	*
Carbon tetrachloride	*	*	*
Chlorobenzene	*	*	*
Chlorodi-bromomethane	*	*	*
Chloroethane	*	*	*
2-Chloroethylvinyl ether	*	*	*
Chloroform	*	*	*
Dichlorobromomethane	*	*	*
Dichlorodifluoromethane	*	*	*
1,1-Dichloroethane	*	*	*
1,2-Dichloroethane	*	*	*
1,1-Dichloroethylene	*	*	*
1,2-Dichloropropane	*	*	*
1,2-Dichloropropylene	*	*	*
Ethylbenzene	*	*	*
Methyl bromide	*	*	*
Methyl chloride	*	*	*
Methylene chloride	*	*	*
1,1,2,2-Tetrachloroethane	*	*	*
Tetrachloroethylene	*	*	*
Toluene	*	*	*
1,2-Trans-Dichloroethylene	*	*	*
1,1,1-Trichloroethane	*	*	*
1,1,2-Trichloroethane	*	*	*
Trichloroethylene	*	*	*
Trichlorofluoromethane	*	*	*
Vinyl chloride	*	*	*

* If present, less than 5 ppb.

ACL 3 10 00480 ADVANCED CHEMISTRY LABS, INC.

DR. STEVE N. TSOUKALAS
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Client: GOLDER ASSOCIATES
3772 Pleasantdale Road
Suite 165
Atlanta, GA 30340

Attention: Mr. Mike Finney

Client Project No.: #85-1728
ACL Project No.: #0156
Date Received: 12/24/85
Report Date: 1/8/86

TEST REQUIRED	Sample Type : Water Station # : F.B. #2 Sample #ACL : 1324 Results (ppb)	Sample Type : Station # : Sample #ACL : Results ( )	Sample Type : Station # : Sample #ACL : Results ( )
GC/MS FRACTION - VOLATILE COMPOUNDS			
Acrolein	---		
Acrylonitrile	---		
Benzene	*		
Bis (Chloromethyl) ether	*		
Bromoform	*		
Carbon tetrachloride	*		
Chlorobenzene	*		
Chlorodi-bromomethane	*		
Chloroethane	*		
2-Chloroethylvinyl ether	*		
Chloroform	*		
Dichlorobromomethane	*		
Dichlorodifluoromethane	*		
1,1-Dichloroethane	*		
1,2-Dichloroethane	*		
1,1-Dichloroethylene	*		
1,2-Dichloropropane	*		
1,2-Dichloropropylene	*		
Ethylbenzene	*		
Methyl bromide	*		
Methyl chloride	*		
Methylene chloride	*		
1,1,2,2-Tetrachloroethane	*		
Tetrachloroethylene	*		
Toluene	*		
1,2-Trans-Dichloroethylene	*		
1,1,1-Trichloroethane	*		
1,1,2-Trichloroethane	*		
Trichloroethylene	*		
Trichlorofluoromethane	*		
Vinyl chloride	*		

* If present, less than 5 ppb.

3 10 00481

APPENDIX J

Results of Laboratory Treatability Studies on Contaminated Soil and Groundwater

3 10 00482

LABORATORY TREATABILITY STUDIES

S.C.R.D. BLUFF ROAD SITE

RICHLAND COUNTY
SOUTH CAROLINA

PREPARED FOR

GOLDER ASSOCIATES
ATLANTA, GEORGIA

APRIL 9, 1986

CRS SIRRINE, INC.
ENVIRONMENTAL DIVISION
GREENVILLE, SOUTH CAROLINA

3 10 00483

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A. INTRODUCTION

The SCR&D (Bluff Road) site was utilized to store drums and other containers for the primary purpose of solvent recovery. Past investigations have determined that leakage of solvent material has released volatile organic constituents, primarily, into the environment. As a result of the Remedial Investigation (RI) completed by Golder Associates, several operable units have been identified as being subject to the development and screening of remedial alternatives. Of the several operable units identified, contamination of ground water and the unsaturated soil profile warrant significant consideration due to the nature and extent of contamination.

In support of Golder Associates, CRS Sirrine Environmental Division has completed laboratory treatability studies as a part of the technical screening of potential remedial alternatives. Specifically, laboratory studies have been performed as an initial technical screening tool to develop practical and cost effective remedial alternatives relative to contaminated ground water and the contaminated unsaturated soil profile. These laboratory studies consisted of the following:

1. Soil Leachability Study
2. Volatile Organics Stripping Study
3. Soil Aeration Study

This report details the purpose of the above investigations, the methods and procedures utilized, the analytical data, and major conclusions determined. The soil leachability and volatile organics stripping studies have been completed. Due to the interruption of the project, the soil aeration study was not completed. However, the proposed investigative methods for this study are included in this report.

B. SOIL LEACHABILITY STUDY

1. Purpose of Investigation

The extraction and treatment of contaminated ground water may be required to address that operable unit. After treatment to remove volatile organics, the ground water could be (1) discharged to surface water, (2) discharged to a POTW, or (3) applied to land via spray irrigation.

Recent investigations have determined that the application of treated ground water upon contaminated soils accelerates the flushing of contaminants from the unsaturated soil profile. Coupled with a ground water extraction/treatment system, the application of treated ground water to contaminated soils would create a "closed loop" system which would augment the flushing provided by precipitation.

Volatile organic compounds are characteristically relatively mobile in saturated and unsaturated soils. Therefore, the purpose of the soil leachability study is to determine the effect of spray irrigation (precipitation augmentation) upon the mobility of the volatile constituents.

2. Methods and Procedures

The soil leachability study involved (1) the collection of representative soil samples from the site, (2) exposing these samples to large volumes of water in a controlled laboratory apparatus, and (3) the collection and analysis of leachate to determine the effectiveness of flushing. To accomplish these tasks, the following methods and procedures were utilized:

a. Representative Shelby tube (30-inch) soil samples were collected by Golder Associates at site locations previously determined to be contaminated with volatile organics. The location of the soil samples, listed below, can be determined by referring to Figure 2 (On Site Sampling Locations) contained in Golder's January 28, 1986 Draft Remedial Investigation Report.

Soil Sample	Interval Below Surface
ST-9A (SA1)	1.0'-3.0'
ST-9A (SA2)	5.0'-7.0'
ST-11A (SA1)	1.0'-3.0'
ST-11A (SA2)	3.0'-5.0'
ST-11B (SA1)	1.0'-3.0'

b. Immediately after collection, the Shelby tubes were capped at both ends and liquid parafin was applied that quickly hardened to form a secure seal. The samples were then transferred to the laboratory and stored in an unheated storage building.

c. An apparatus was constructed in the laboratory (Figure 1) which allowed the top of the Shelby tube soil sample, standing vertically, to be exposed to an 18-inch column of water. The column of water created a driving head to force the liquid down through the Shelby tube soil sample.

d. An apparatus was constructed and attached to the lower end of the Shelby tube sample to collect water which percolated down through the soil column. This device also served as the sample collection port. After adding water to the upper 18-inch water column, the sampling port was

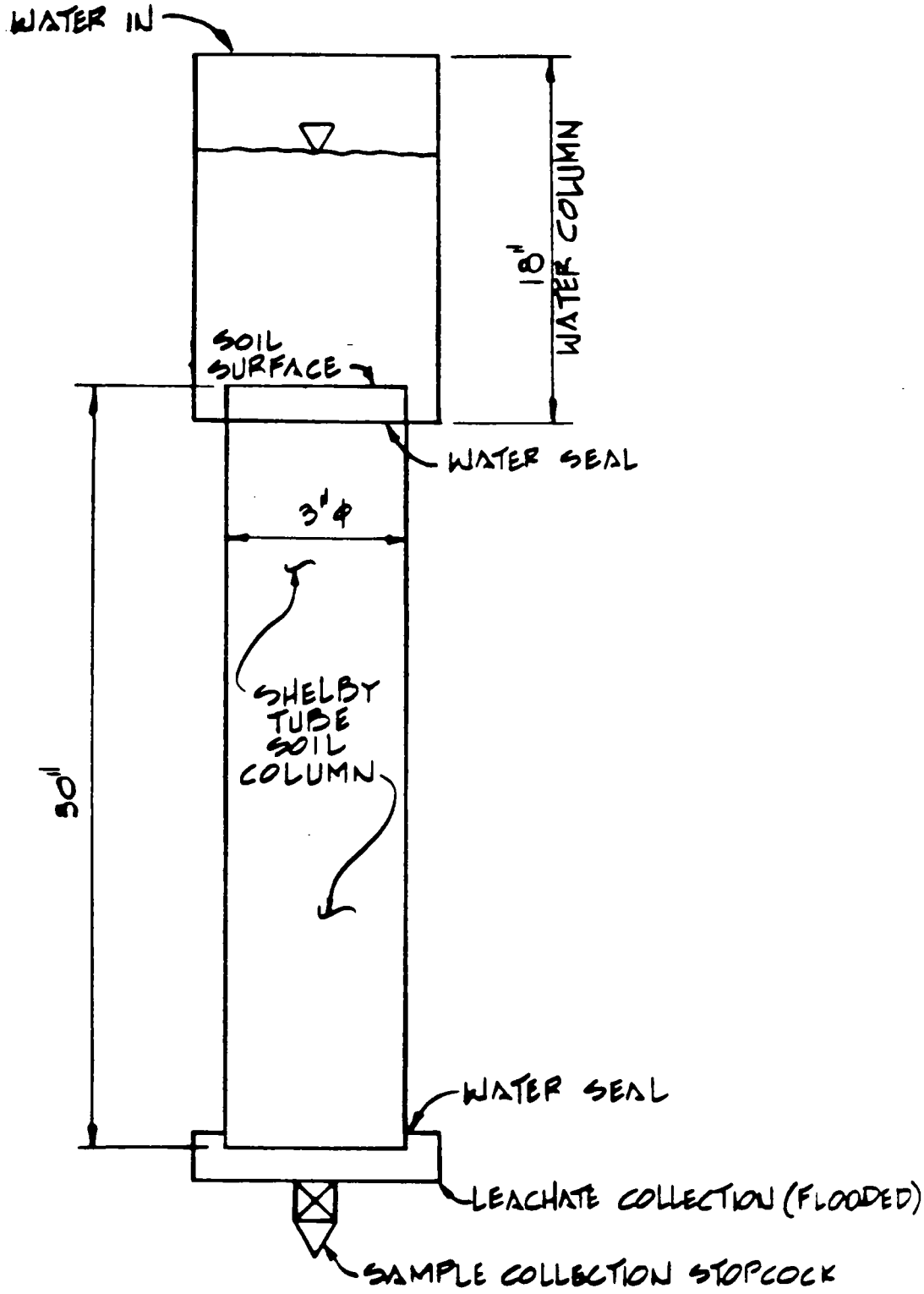

FIGURE I
SOIL LEACH STUDY APPARATUS
S.C.R.D. BLUFF ROAD SITE

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12/85

CRSS
CRS SIRRINE

Environmental Division
Greenville, S.C.

left open so that water could percolate freely through the soil column.

e. Two separate soil leachability trials were performed, i.e., the first was performed using sample ST-11B (SA1) which was collected from a depth interval of 1.0'-3.0' below the surface; a second test was performed using soil sample ST-11A (SA2) which was collected from a depth interval of 3.0'-5.0'. ST-11A and ST-11B represent separate borings made in the vicinity of Golder's ST-11 soil sampling location. The two trials were made using different depth intervals considering that the contaminants may have migrated below the near surface soils.

f. During each trial, several samples were taken over time from the lower collection drain and analyzed for volatile organics. An activity log was maintained for each leach trial to record the volume of water added, the sample collection times, etc. Tables 1 and 2 contain this information for the ST-11B (SA1) and ST-11A (SA2) samples, respectively.

3. Analytical Data

As the trials progressed, leachate samples were collected at selected intervals and analyzed for volatile organics. The analytical data for soil samples ST-11B (SA1) and ST-11A (SA2) is contained in Tables 3 and 4, respectively.

The analysis of the leachate indicates that both soil samples contain volatile organic constituents; including methylene chloride, several chlorinated volatiles, toluene, chloroform, benzene, and xylenes. Both leachability trials were

TABLE 1

SOIL LEACHABILITY STUDY
ACTIVITY LOG

SAMPLE ST-11B (SA1)
DEPTH INTERVAL 1.0'-3.0'

Time	Water Level	Total Water Through Column	Comments
10:30 a.m. (1-23-86)	18.0"	0	Water column filled Leach trial started
10:40 a.m.	15.5"	2.5"	
10:48 a.m.	14.75"	3.25"	First sample collected
11:13 a.m.	12.1"	5.9"	
11:18 a.m.	11.5"	6.5"	Second sample collected
11:56 a.m.	9.0"	9.0"	
11:57 a.m.	18.0"	9.0"	Column refilled to 18"
1:51 p.m.	9.0"	18.0"	Third sample collected
1:59 p.m.	18.0"	18.0"	Column refilled to 18"
4:11 p.m.	10.25"	25.75"	
4:26 p.m.	18.00"	26.00"	Column refilled to 18" Fourth sample collected
4:40 p.m.			Leach trial terminated

TABLE 2

SOIL LEACHABILITY STUDY
ACTIVITY LOG

SAMPLE ST-11A (SA2)
DEPTH INTERVAL 3.0'-5.0'

Time	Water Level	Total Water Through Column	Comments
2:30 p.m. (2-3-86)	18.0"	0	Water column filled Leach trial started
3:18 p.m.	15.0"	3.0"	
4:00 p.m.	12.0"	6.0"	
4:50 p.m.	9.0"	9.0"	First sample collected Closed bottom drain to prevent overnight percolation
7:45 a.m. (2-4-86)	18.0"	9.0"	Water column refilled to 18" Bottom drain opened
10:45 a.m.	9.0"	18.0"	
10:50 a.m.	18.0"	18.0"	Water column refilled to 18"
1:40 p.m.	9.0"	27.0"	
1:50 p.m.	18.0"	27.0"	Water column refilled to 18"
4:45 p.m.	9.0"	36.0"	Second sample collected
4:50 p.m.	18.0"	36.0"	Water column refilled to 18" Closed bottom drain to precent overnight percolation
7:45 a.m. (2-5-86)	18.0"	36.0"	Opened bottom drain
10:40 a.m.	9.0"	45.0"	

d. OVA measurements will be continuously recorded as each sample is broken up and volatiles liberated. This will simulate the action created by deep plowing.

3. Status of Investigation

The soil aeration study was not completed prior to project interruption. This investigation will yield valuable information toward selecting a practical remedial alternative for the unsaturated soil operable unit. Therefore, it will be completed when project funding is restored.

Time	Water Level	Total Water Through Column	Comments
10:50 a.m.	18.0"	45.0"	Water column refilled to 18"
12:45 p.m.	9.0"	54.0"	
12:50 p.m.	18.0"	54.0"	Water column refilled to 18"
3:05 p.m.	9.0"	63.0"	
3:10 p.m.	18.0"	63.0"	Water column refilled to 18"
5:45 p.m.	9.0"	72.0"	Third sample collected Leach trail terminated

TABLE 3

SOIL LEACHABILITY STUDY
ANALYTICAL DATA

SAMPLE ST-11B (SA1)
DEPTH INTERVAL 1.0'-3.0'

Leachate Sample	No. 1	No. 2	No. 3	No. 4
Elapsed Time*	18 Min.	48 Min.	3 Hour 21 Min.	5 Hour 56 Min.
Water Through Column	3.25"	6.5"	18.0"	26.0"
Volatile Compounds				
Chloroethane				
Methyl Chloride				
Methyl Bromide				
Vinyl Chloride				
Methylene Chloride	196	757	247	192
Trichloroflouromethane				
1,1-Dichloroethene	-	23.4	11.1	-
1,1-Dichloroethane	-	123	-	-
Trans 1,2-Dichloroethene				
1,2-Dichloroethane				
1,1,1-Trichloroethane	-	66.3	58.2	34.2
Dichlorobromomethane				
1,2-Dichloropropane				
1,3-Dichloropropene				
Trichloroethene	-	-	11.9	-
Chlorodibromomethane				
1,1,2-Trichloroethane				
1,3-Dichloropropene				
Benzene	27.7	143	82.8	43.7
2-Chloroethylvinyl ether				
Bromoform				
1,1,2,2,-Tetrachloroethane				
Tetrachloroethene	342	657	1,540	1,230
Toluene	-	45.2	58.7	39.4
Chlorobenzene				
Ethylbenzene				
Acrolein				
Acrylonitrile				
Chloroform	241	1,310	455	287
Carbon Tetrachloride				
Dichlorodiflouromethane				
bis-chloro methyl ether				
Total Volatiles	806.7	3,124.9	2,464.7	1,826.3

All Analyses ug/l
*Elapsed Time - time from initiation of leachability trial

TABLE 4

SOIL LEACHABILITY STUDY
ANALYTICAL DATA

SAMPLE ST-11A (SA2)
DEPTH INTERVAL 3.0'-5.0'

Leachate Sample	No. 1	No. 2	No. 3
Elapsed Time*	2 Hour 20 Min.	26 Hour 15 Min.	51 Hour 15 Min.
Water Through Column	9"	36.0"	72.0"
Volatile Compounds			
Chloroethane			
Chloromethane			
Bromomethane			
Vinyl Chloride			
Methylene Chloride	607	206	103
Trichlorofluoromethane			
1,1-Dichlorethene	26.7	-	-
1,1-Dichloroethane	67.9	-	-
Trans 1,2-Dichloroethene			
1,2-Dichloroethane			
1,1,1-Trichloroethane	154	57.5	36.2
Bromodichloromethane			
1,2-Dichloropropane			
Trans 1,2-Dichloropropene			
Trichloroethene	42.0	-	-
Dibromochloromethane			
1,1,2-Trichloroethane			
Cis-1,3-Dichloropropene			
Benzene	44.3	12.9	10.2
2-Chloroethylvinyl ether			
Bromoform			
1,1,2,2-Tetrachloroethane			
Tetrachloroethene	818	499	367
Toluene	20.0	13.7	-
Chlorobenzene			
Ethylbenzene			
Acrolein			
Acrylonitrile			
Chloroform	669	185	62.6
Acetone			
Carbon Tetrachloride			
Xylenes	124	75	39
Total Volatiles	2,572.9	1,049.1	618.0

All Analyses ug/l
*Elapsed Time - time from initiation of leachability trial

FIGURE 2

SOIL LEACHABILITY STUDY
TOTAL VOLATILE ORGANICS
VERSUS ELAPSED TIME

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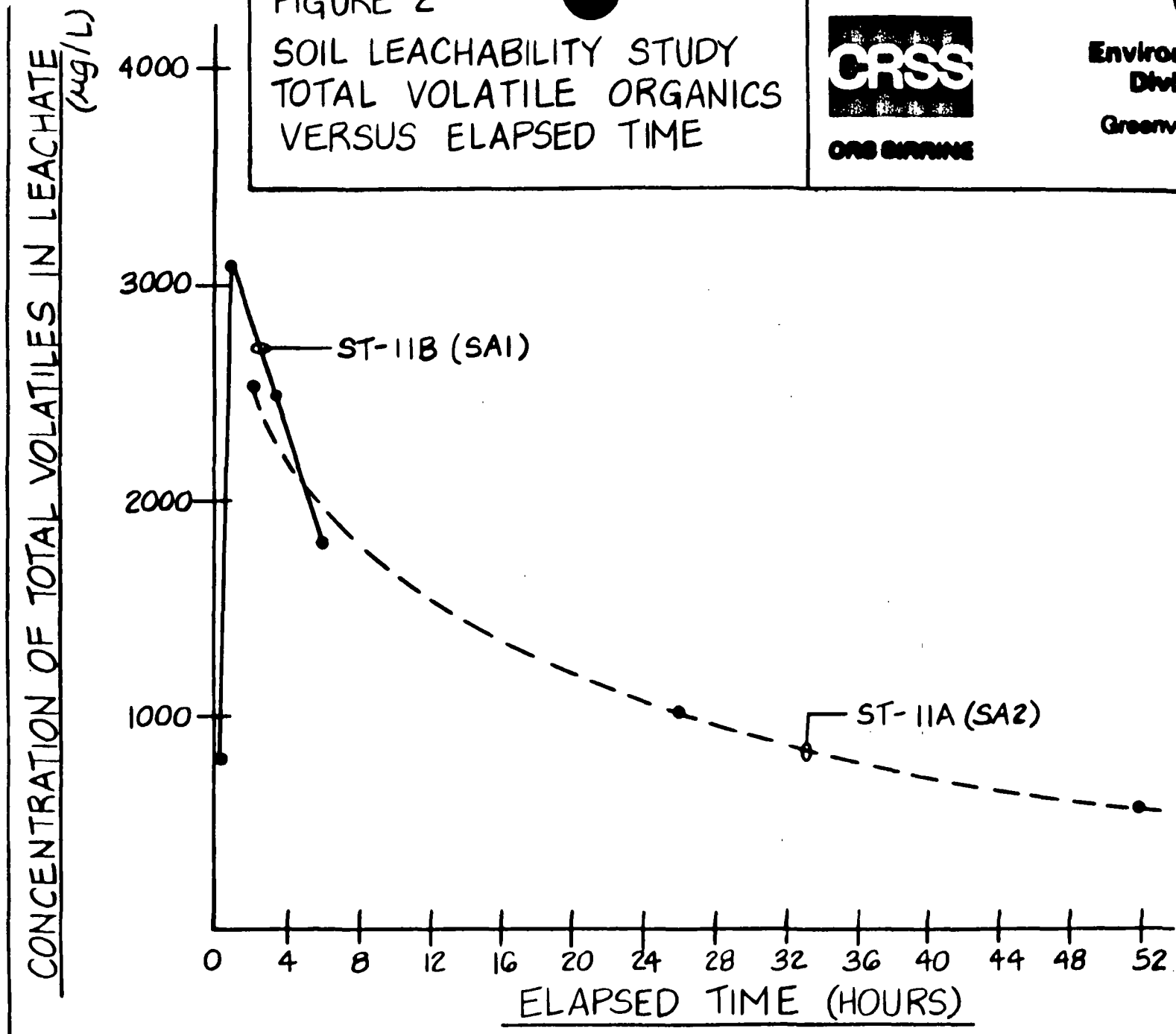

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successful in flushing these compounds from the soil column. Figure 2 is a graphical depiction of the total volatile organics in the leachate for the duration of each leachability trial. Both trials are similiar in that a pronounced decay in the concentration of total volatiles began after approximately the second hour. The first trial, involving soil sample ST-11B (SA1), was terminated after approximately six hours. For comparison purposes, the second trial (ST-11A-SA2) was extended to over 51 hours duration. In effect, the decay curve of ST-11A (SA2) could be considered an extension of the ST-11B (SA1) curve.

Both leachability trials produced classic decay curves for volatile organics, i.e., a significant early flush of constituents followed by a gradual decrease in concentration over time. In fact, the trial involving soil sample ST-11A (SA2) indicates that the decay curve is "flattening" as the volatile organic constituents become more difficult to flush from the soil column.

4. Conclusions

a. Volatile organic compounds are present at certain locations in the unsaturated soil profile of the Bluff Road site.

b. A variety of volatile organic compounds are present including methylene chloride, benzene, chlorinated constituents, toluene, chloroform, and xylenes.

c. The leachability trials determined that the volatile organics could be solubilized and transported through the soil profile by large volumes of water.

d. The leachability trials suggest that spray irrigation of treated ground water upon contaminated soils, i.e., augmenting natural precipitation, will accelerate the natural flushing process.

e. Spray irrigation is a remedial alternative which should be considered in the overall Feasibility Study (FS) matrix of clean-up options.

f. Spray irrigation could prove to be a practical and cost effective remedial alternative when compared to other potential options, including the removal and disposal of contaminated soils.

g. Additional technical and cost screening is required in the FS process to totally evaluate spray irrigation versus other alternatives.

C. VOLATILE ORGANICS STRIPPING STUDY

1. Purpose of Investigation

The extraction and treatment of ground water, containing volatile organics, may be required to address that operable unit. Stripping volatile organics, i.e., causing these constituents to become insoluble as a result of contact with air, is a commonly used treatment alternative. Stripping can be accomplished by mechanical aeration, diffused aeration, or the use of packed columns which utilize blowers for auxiliary air and various media to increase the air-water interface.

The purpose of the volatile organics stripping study is to determine if the ground water constituents at the site can be removed via stripping. Although the study was not intended to yield design data, it was intended to provide (1) a general indication of the ability of air stripping to remove volatiles, (2) an indication of the time required for removal, (3) an indication of the chemistry involved as certain volatiles are converted to other compounds before or during volatilization, and (4) as a technical and cost screening tool in the further evaluation of remedial treatment alternatives.

2. Methods and Procedures

The volatile organics stripping study involved the following methods and procedures:

a. Ground water was collected from Well P-16 to perform the stripping study. Previously, this well had exhibited one of the highest concentrations of volatile organics within the well network. The well was purged and allowed to

recover before sample collection. Extreme precautions were taken to eliminate the volatilization of constituents by (1) collecting the samples in containers which could be removed of all air bubbles, and (2) by cooling the samples to below 40°F during transportation. For QC purposes, a sample was also collected in the field in a 50 ml. vial for volatile organics analysis (prior to transporting).

b. The ground water samples, collected in quart size containers, were transferred to the laboratory and the air stripping study was immediately begun.

c. Sufficient ground water sample was transferred to fill a wide-mouth quart container. A 50 ml. vial sample was collected, immediately prior to initiating air stripping, for volatile organic analysis of the contents of the container.

d. Laboratory air was then introduced into the bottom of the container via an air stone (diffuser). Sufficient air was delivered to create vigorous aeration of the sample.

e. Samples were collected, in 50 ml. vials, for volatile organics analysis after 5 minutes, 15 minutes, 30 minutes, and 45 minutes of vigorous aeration.

3. Analytical Data

The analytical data for the stripping study is tabularized (Table 5) and is graphically depicted in Figure 3.

As stated, ground water from Well P-16 was obtained for this study based on previous analytical data from the well network.

TABLE 5

VOLATILE ORGANICS STRIPPING STUDY
ANALYTICAL DATA

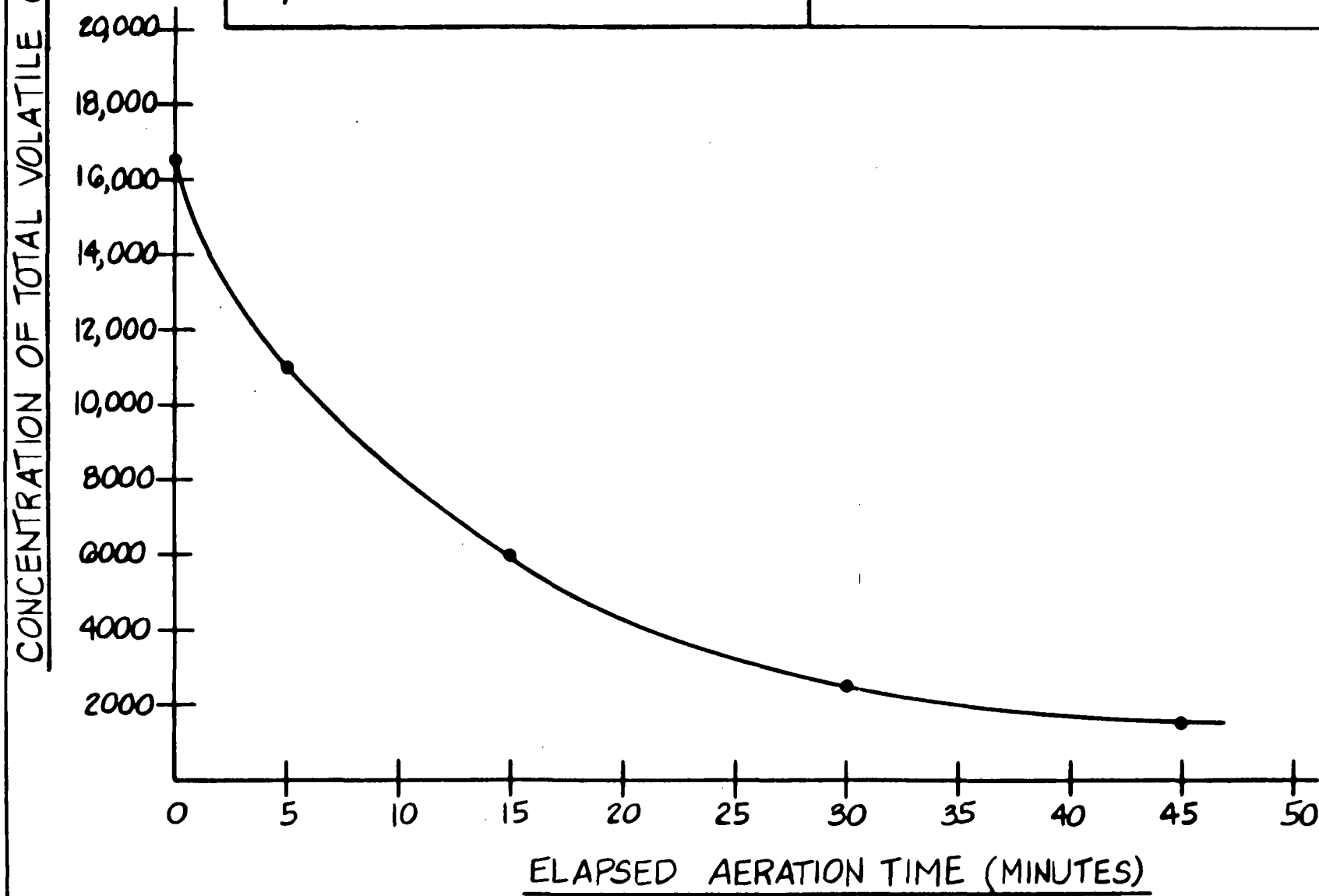
Volatile Compounds	Well P-16	Start Time 0	5 Min. Aer.	15 Min. Aer.	30 Min. Aer.	45 Min. Aer.
Chloroethane						
Methyl Chloride						
Methyl Bromide						
Vinyl Chloride						
Methylene Chloride	1,720	1,590	1,410	897	135	70.1
Trichloroflouromethane						
1,1-Dichloroethene	1,070	1,120	186	-	-	-
1,1-Dichloroethane	756	682	318	74.7	-	-
Trans 1,2-Dichloroethene	727	738	405	148	21.5	-
1,2-Dichloroethane	-	17.1	133	84.0	-	-
1,1,1-Trichloroethane	3,120	3,430	1,220	73.4	-	-
Dichlorobromomethane						
1,2-Dichloropropane	74.7	71.1	48.4	24.7	9.3	4.7
1,3-Dichloropropene						
Trichloroethene	1,190	1,230	539	88.5	12.0	7.4
Chlorodibromomethane						
1,1,2-Trichloroethane						
1,3-Dichloropropene						
Benzene	188	186	89.8	22.4	-	-
2-Chloroethyvinyl Ether						
Bromoform						
1,1,2,2-Tetrachloroethane						
Tetrachloroethene***	2,340	2,740	2,530	2,370	1,800	1,500
Toluene	940	991	475	109	-	-
Chlorobenzene						
Ethylbenzene	147	148	62.9	-	-	-
Acrolein						
Acrylonitrile						
Chloroform	3,520	3,530	3,470	2,260	560	98.8
Carbon Tetrachloride						
Dichlorodifluoromethane						
bis-chloro methyl ether						
Xylenes	286	299	155	18.6	-	-
Ethyl Mercaptan*	6,253	6,652	5,324	3,025	585	-
Dichlorobenzene*	-**	209	141	48	-	-
Total Volatiles (excluding *)	16,078	16,772	11,042	6,170	2,537	1,681

All Analysis ug/l
*Numbers are Base Peak Abundance (BPA) - no standard available.
**Scan run time not long enough to see dichlorobenzene.
***Changes in BP with time indicate that tetrachloroethene is being converted to 1,1,2,2-tetrachloroethane.

FIGURE 3
AIR STRIPPING STUDY
TOTAL VOLATILE ORGANICS
V/ ELAPSED AERATION TIME

CRS SIRRINE

Environmental Division
Greenville, S.C.



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Previous data suggested this location to contain approximately 20,000 ug/l total volatiles. The sample collected by CRS Sirrine (January 1986) contained approximately 16,000 ug/l total volatiles.

The concentration of total volatiles just before the start of aeration was 16,772 ug/l. After 45 minutes of vigorous aeration, the concentration was reduced to 1,681 ug/l. Continued aeration would have eventually rendered samples with no detectable levels of volatile organics.

The laboratory analyst reported that it was evident that tetrachloroethene was being converted to 1,1,2,2-tetrachloroethane during the aeration process. This assessment was based on changes in the gas chromatograph Base Peak (BP) with time. Tetrachloroethene and 1,1,2,2-tetrachloroethane cannot be readily distinguished with GC analysis and, therefore, the concentrations presented in Table 5 reflect a combination of these constituents. Based on an examination of the volatile constituents remaining after 45 minutes of aeration, it appears that the combined tetrachloroethene/1,1,2,2-tetrachloroethane (concentration 1,500 ug/l) is the primary indicator relative to developing a stripping system residence time.

The ground water collected from Well P-16 exhibited a strong sulfur odor. Based on GC analysis, the odor has been attributed to ethyl mercaptan, i.e., ethyl sulfhydrate. Concentration standards are not readily available for ethyl mercaptan. Therefore, the data in Table 5 reflects the Base Peak Abundance (BPA) from the GC analysis. The analyst estimated that these BPA's likely indicate that methyl mercaptan is present in the 2,000 - 5,000 ug/l range. However, based on the results of the aeration study, it

appears that the ethyl mercaptan is sufficiently volatile to be removed by stripping. No ethyl mercaptan was detected in the sample collected after 45 minutes of vigorous aeration.

4. Conclusions

a. Volatile organics are present near the center of the contaminant plume (Well P-16) at a total concentration of approximately 20,000 ug/l.

b. Ethyl mercaptan, which is primarily responsible for the strong odor of ground water near Well P-16, is present in the 2,000 - 5,000 ug/l range.

c. The stripping study indicates that all identified volatile organic compounds can be removed by air stripping.

d. The stripping study also indicates that the ethyl mercaptan is sufficient volatile to be removed by air stripping.

e. The combination of tetrachloroethene and 1,1,2,2-tetrachloroethane volatilized more slowly than any other constituent. This compound could, therefore, be used to indicate the residence time required for an air stripping process.

f. This study has proven that air stripping is a viable remedial alternative relative to ground water treatment. Additional technical and cost screening is required in the FS process to evaluate this process.

D. SOIL AERATION STUDY

1. Purpose of Investigation

Volatile organic compounds are quickly "flashed" when exposed to an unconfined atmosphere. A potential remedial alternative for the unsaturated soil operable unit involves soil aeration. In effect, it is possible to "deep plow" the soils at the site to a depth of 30-36 inches. By turning over the upper contaminated soils at the site several times, any volatile constituents trapped in the inter-particle stices would be liberated to the atmosphere. Therefore, the purpose of the soil aeration study would be to perform sufficient laboratory testing to simulate this process and determine its effectiveness.

2. Methods and Procedures

The soil aeration study will involve the following:

a. An enclosed apparatus (Figure 4) will be constructed in which undisturbed, near surface soil samples (Shelby tubes) can be placed.

b. After placing a soil sample inside the apparatus, continuous Organic Vapor Analyzer (OVA) measurements will be recorded as the sample is broken up and exposed to the atmosphere.

c. The organic vapors, which are heavier than air, will collect in the bottom of the apparatus. An OVA air sampling intake tube will extend to the bottom of the apparatus for maximum detection.

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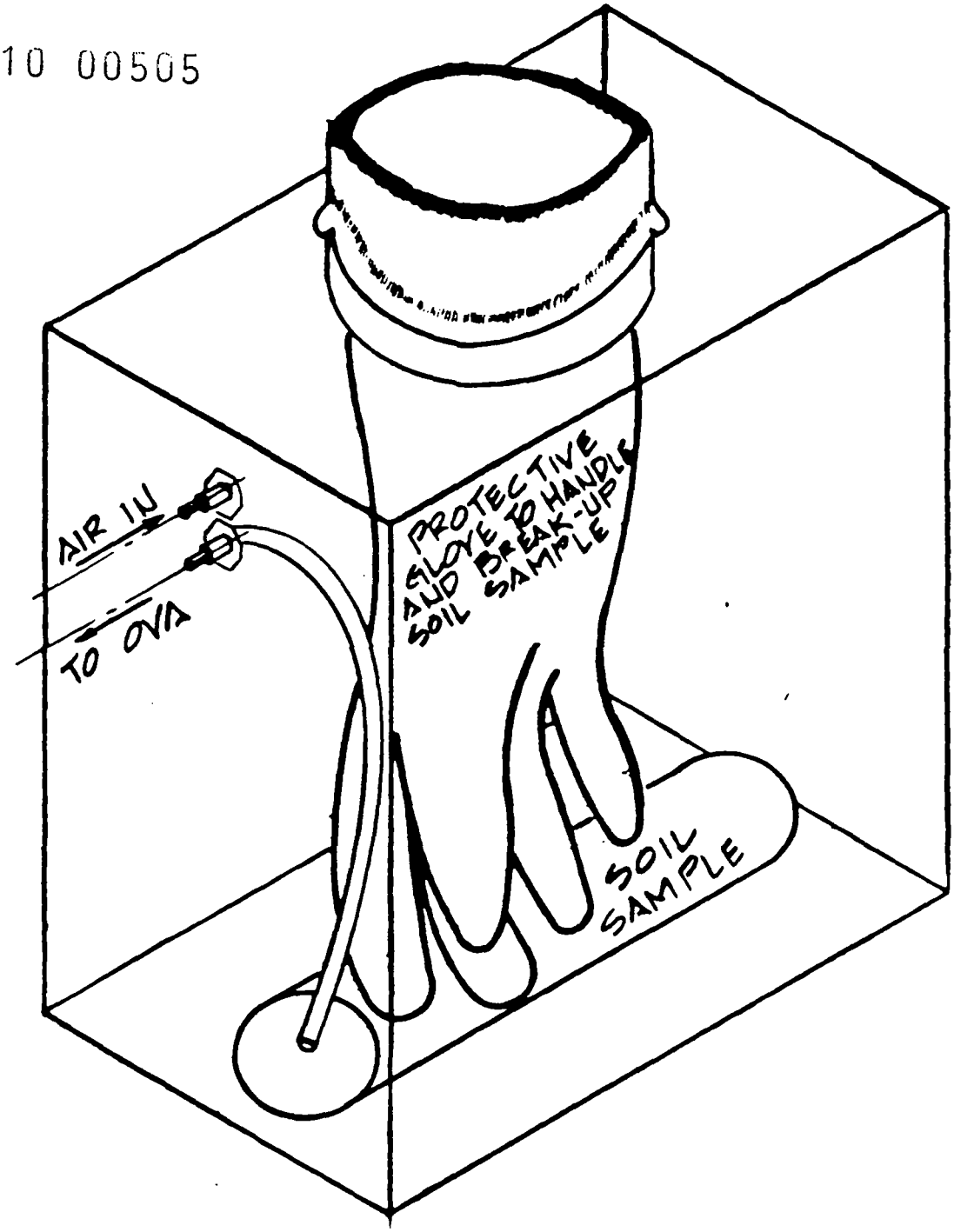

FIGURE 4
SOIL AERATION STUDY APPARATUS
S.C.R.D. BLUFF ROAD SITE

CRS SIRRINE
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CRSS
CRS SIRRINE

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Greenville, S.C.

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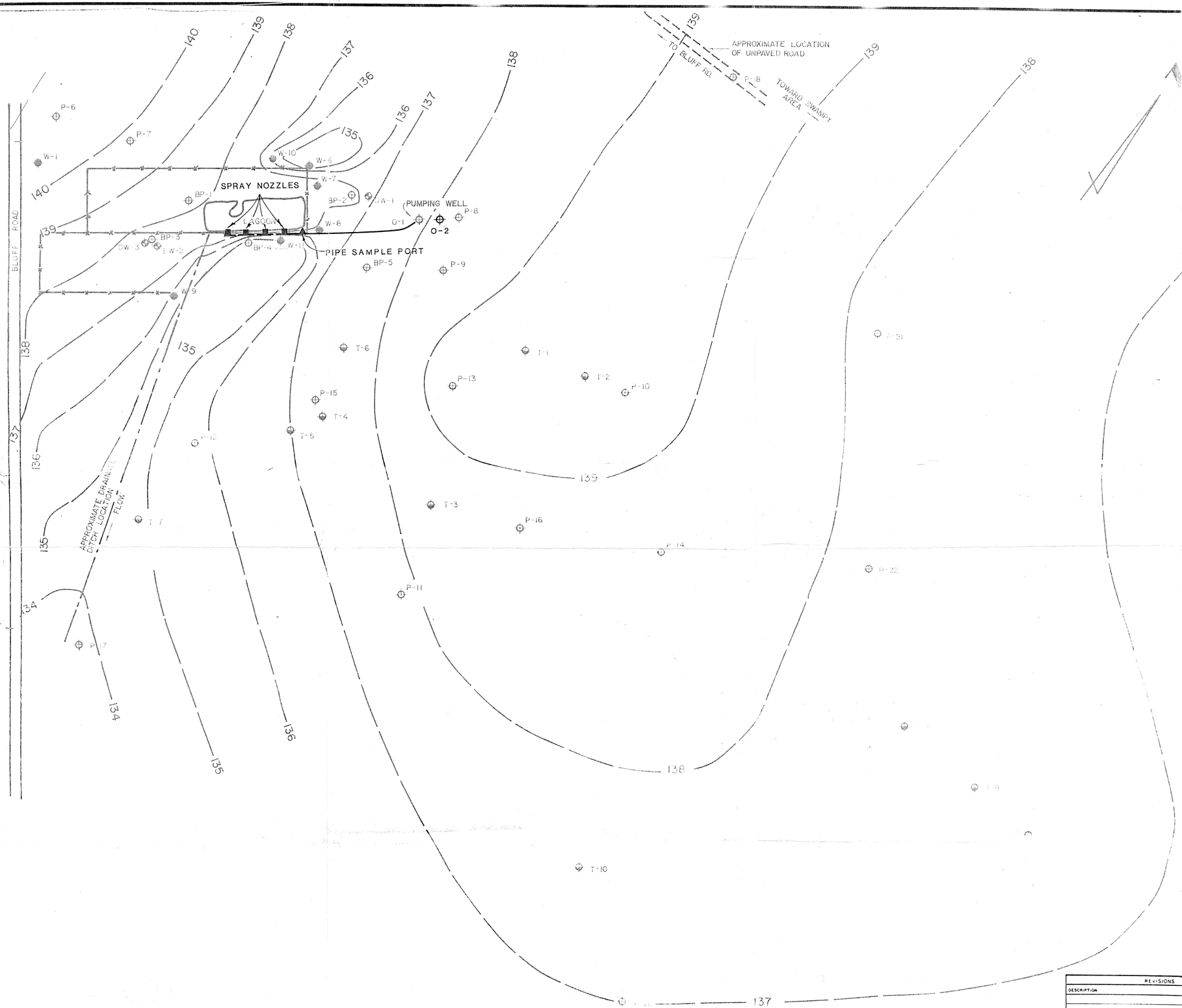
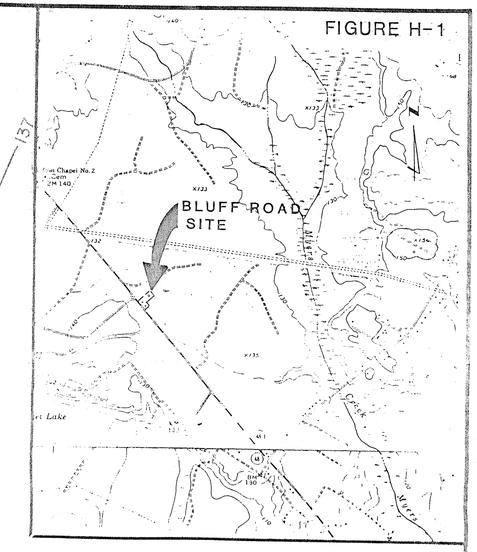


FIGURE H-1



SITE LOCATION MAP
N.T.S.

LEGEND

- DEEP WELL
- SCDHEC WELL
- SURFICIAL AQUIFER WELL
- TEST BORING

—137— APPROXIMATE GROUND ELEVATION (FT., MSL); TOPOGRAPHIC CONTOURS ESTIMATED FROM FROM SURVEYED BORING AND WELL INSTALLATION GROUND SURFACE ELEVATIONS

0 100 200 300 400
SCALE IN FEET

REVISIONS		
DESCRIPTION	BY	DATE

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
BLUFF ROAD SITE, RICHLAND COUNTY, S.C.

TITLE
BORING AND WELL LOCATION MAP

DRAWN	LJW	SCALE	AS SHOWN	DATE	4/16/86
CHECKED	MTP	REVIEWED	MTP	JOB NO.	853-3079
				DWG NO.	23

Golder Associates

FIGURE