APPENDIX N

CONSTANT RATE PACKER FLOW

TABLE C1

HYDRAULIC CONDUCTIVITY TEST RESULTS
FORMER LAGOON SITE
HAMPTONBURGH, NEW YORK

Location	Sandpack Interval (ft bgs)	Single-Well Response Test			Short Duration Pumping Tests				Water Injection Tests				Packer Tests			Formation Tested
		Falling Head (cm/sec)	Rising Head (cm/sec)	Geometric Mean (cm/sec)	Saturated Thickness (ft)	Draw Down (cm/s)	Recovery (cm/s)	Geometric Mean (cm/s)	Test Interval (ft BGS)	(ft AMSL)	Conductivity (cm/s)	Geometric Mean (cm/s)	Interval (ft BGS)	Conductivity (cm/s)	Geometric Mean (cm/s)	
Shallow Aquifer - Northern Portion:																
MW-2	9-15	8.81E-03	7.85E-03	6.66E-03	–	–	–	–	–	–	–	–	–	–	–	Overburden
		3.32E-03	4.62E-03		–	–	–	–	–	–	–	–	–	–	–	
		9.86E-03	8.35E-03		–	–	–	–	–	–	–	–	–	–	–	
MW-3	11-15.7	4.93E-04	7.13E-04	5.93E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
SW-2	6.4-17.4	1.10E-03	8.70E-04	8.47E-04	–	–	–	–	–	–	–	–	–	–	–	
			6.32E-04		–	–	–	–	–	–	–	–	–	–	–	
SW-3	4.4-15.4	-	3.37E-03	3.37E-03	–	–	–	–	–	–	–	–	–	–	–	Overburden
SW-10	6.2-17.2	-	4.25E-03	8.19E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
			1.58E-04		–	–	–	–	–	–	–	–	–	–	–	
MW-5U-9	6-19.6	4.08E-04	4.64E-04	4.35E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
MW-8U-9	4-10.2	2.07E-04	2.42E-04	2.24E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
Geometric Mean = 9.85E-04																
Shallow Aquifer - Southern Portion:																
MW-7	8.5-14	1.01E-03	1.91E-03	1.39E-03	–	–	–	–	–	–	–	–	–	–	–	Overburden
SW-8	4.6-15.6	-	5.23E-04	5.23E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
SW-9	3.7-14.7	-	2.21E-04	2.21E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
MW-1U-9	7-13.3	2.99E-03	4.09E-03	3.66E-03	–	–	–	–	–	–	–	–	–	–	–	Overburden
		3.85E-03	3.89E-03		–	–	–	–	–	–	–	–	–	–	–	
		3.82E-03	3.41E-03		–	–	–	–	–	–	–	–	–	–	–	
MW-4D-9	21-24.0	7.74E-03	7.92E-03	7.83E-03	9.43	2.63E-03	1.97E-03	2.27E-03	–	–	–	–	–	–	–	Bedrock
Geometric Mean = 1.48E-03																
Shallow Aquifer - Former Lagoon Area:																
SW-4	6.2-17.2	-	1.07E-04	1.07E-04	–	–	–	–	–	–	–	–	–	–	–	Overburden
MW-1D-9	13-32.5	3.11E-03	4.70E-03	3.82E-03	17.00	5.82E-04	3.60E-04	4.58E-04	–	–	–	–	10-21	0.0004	2.00E-03	Bedrock
													21-32	0.002		
Geometric Mean = 7.82E-04																

TABLE C1

HYDRAULIC CONDUCTIVITY TEST RESULTS
FORMER LAGOON SITE
HAMPTONBURGH, NEW YORK

Location	Sandpack Interval	Single-Well Response Test			Short Duration Pumping Tests				Water Injection Tests				Packer Tests			Formation Tested
		Falling Head	Rising Head	Geometric Mean	Saturated Thickness	Draw Down	Recovery	Geometric Mean	Test Interval		Conductivity	Geometric Mean	Interval	Conductivity	Geometric Mean	
	(ft bgs)	(cm/sec)	(cm/sec)	(cm/sec)	(ft)	(cm/s)	(cm/s)	(cm/s)	(ft BGS)	(ft AMSL)	(cm/s)	(cm/s)	(ft BGS)	(cm/s)	(cm/s)	
Bedrock Aquifer - Northern Portion:																
DW-2-95	96-106	-	5.22E-07	5.22E-07	–	–	–	–	–	–	–	–	–	–		Bedrock
MW-5D-9	36-97	1.98E-05	1.92E-05	1.95E-05	–	–	–	–	–	–	–	–	34-45	0.0002-0.0007	4.50E-04	Bedrock
													42-53	0.0002-0.0007		
													53-64	0.0002-0.0007		
													64-75	0.0002-0.0007		
													75-86	0.0002-0.0007		
													86-97	0.0002-0.0007		
Geometric Mean = 1.66E-05																
Bedrock Aquifer - Southern Portion:																
DW-1-95	112-123	-	2.87E-06	2.87E-06	–	–	–	–	100 - 105.5	267.4 - 261.9	3.98E-07	6.60E-07	–	–	–	Bedrock
		–	–	–	–	–	–	–	105 - 110.5	262.4 - 256.9	4.78E-07		–	–	–	
		–	–	–	–	–	–	–	110 - 115.5	257.4 - 251.9	1.00E-06		–	–	–	
		–	–	–	–	–	–	–	115 - 120.5	252.4 - 246.9	1.00E-06		–	–	–	
MW-3D-9	28-50.7	1.65E-04	2.13E-04	1.87E-04	27.47	9.67E-04	2.46E-04	4.87E-04	–	–	–	–	20-31	No recovery	6.00E-04	Bedrock
													31-42	No recovery		
													42-52	0.0006		
MW-6D-9	63-72	3.58E-05	6.02E-05	4.64E-05	–	–	–	–	–	–	–	–	–	–	–	Bedrock
Geometric Mean = 4.11E-05																
Bedrock Aquifer - Former Lagoon Area:																
MW-2D-9	24-51.3	4.06E-05	3.11E-05	4.81E-05	34.61	5.43E-05	4.46E-05	4.92E-05	–	–	–	–	22-33	No recovery	8.00E-04	Bedrock
		4.94E-05	8.58E-05		–	–	–	–	–	–	–	–	30-41	No recovery		
													41-52	0.0008		
Geometric Mean = 1.24E-04																

Notes:

(1) - ft bgs - feet below ground surface
(2) - All single well response tests were conducted between June 14, 1995 and July 27, 1995 with the exception of MW-1U-91, conducted on May 12, 1993.
(3) - All single well response test were analyzed using the Bouwer and Rice (1976).
(4) - All pumping tests were conducted between June 14, 1995 and July 27, 1995
(5) - All pumping test data were analyzed using the Theis Method (1935).
(6) - All Water injection tests were conducted on May 18 and May 19, 1995.
(7) - All Packer tests were conducted on July 21, 2001 with the exception of MW-5D-95, conducted on July 26 2001
(8) - Only packer test results for the well screen interval were used for Geometric Mean calculations
(9) - Sandpack interval is based on measured well depths obtained on January 10, 1995.

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MEMORANDUM

TO:	Randy Moore	REF. NO.:	3698
FROM:	Brad Trytten	DATE:	September 14, 2001
C.C.:	Gary Lagos, Joanne Ing		
RE:	**Constant Rate Packer Flow Testing Analysis Results MW1D-91, Maybrook Site**		

This memorandum summarizes the packer testing activities and hydraulic conductivity results for MW1D-91 conducted June 14, 2001. MW1D-91 was completed as an open borehole to a total depth of 32 feet bgs.

Packer Test Information
Static Water Level = 7 feet bgs
Pressure transducer set 7.5 feet below top packer
Packers set up with 11 feet between top and bottom packers
Borehole Diameter = 0.375 feet
Steel casing to 13 feet bgs

Interval Tested	10 to 21 feet bgs	21 to 32 feet bgs
Step Test Flow Rates and Duration	1 gpm (12 minutes), 2 gpm (4 minutes) (dewatered), 1.5 gpm (2 minutes) (dewatered)	1 gpm (11 minutes), 2 gpm (7 minutes), 3 gpm (6 minutes), 4 gpm (7 minutes) (dewatered)
Constant Rate Test Flow Rate and Duration	1 gpm (64 minutes) (initial transducer data lost due to equipment malfunction), recovery data recorded for 33 minutes	2 gpm (55 minutes) no recovery data recorded due to packer deflation
Saturated Thickness of Aquifer Aquifer Type Aquifer Thickness	25 feet Unconfined 8 feet	25 feet Confined 11 feet
Transmissivity (Estimated) (cm^2/sec)	0.09378 (Cooper-Jacob) 0.09987 (Theis) 0.1308 (Theis recovery – confined)	0.5911 (Cooper-Jacob) 0.4487 (Theis) no recovery data
Hydraulic conductivity (Estimated) (cm/sec)	3.8×10^{-4} (Cooper-Jacob) 4.1×10^{-4} (Theis) 5.4×10^{-4} (Theis recovery - confined)	1.8×10^{-3} (Cooper-Jacob) 1.3×10^{-3} (Theis) no recovery data

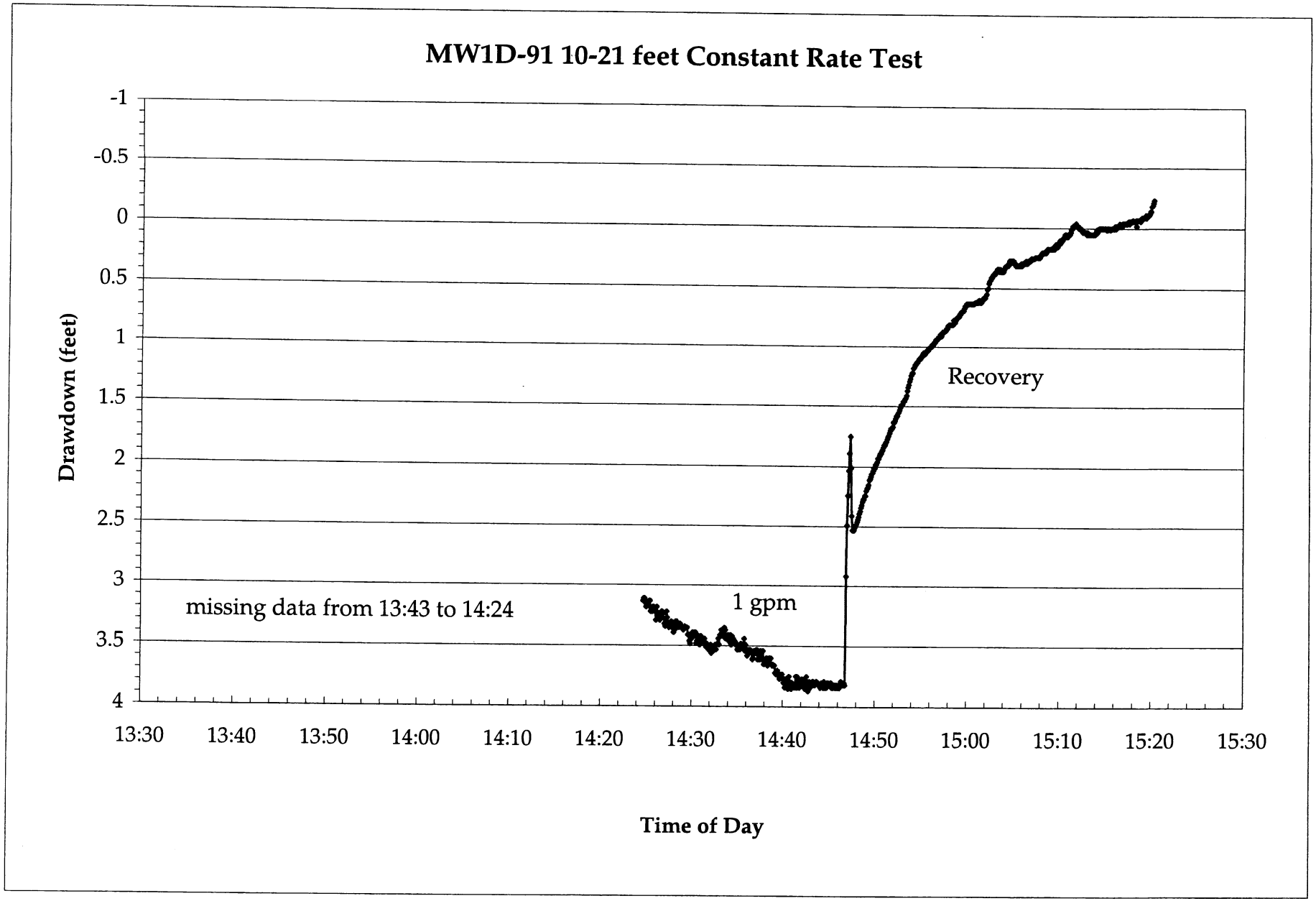
REGISTERED COMPANY FOR ISO 9001 ENGINEERING DESIGN

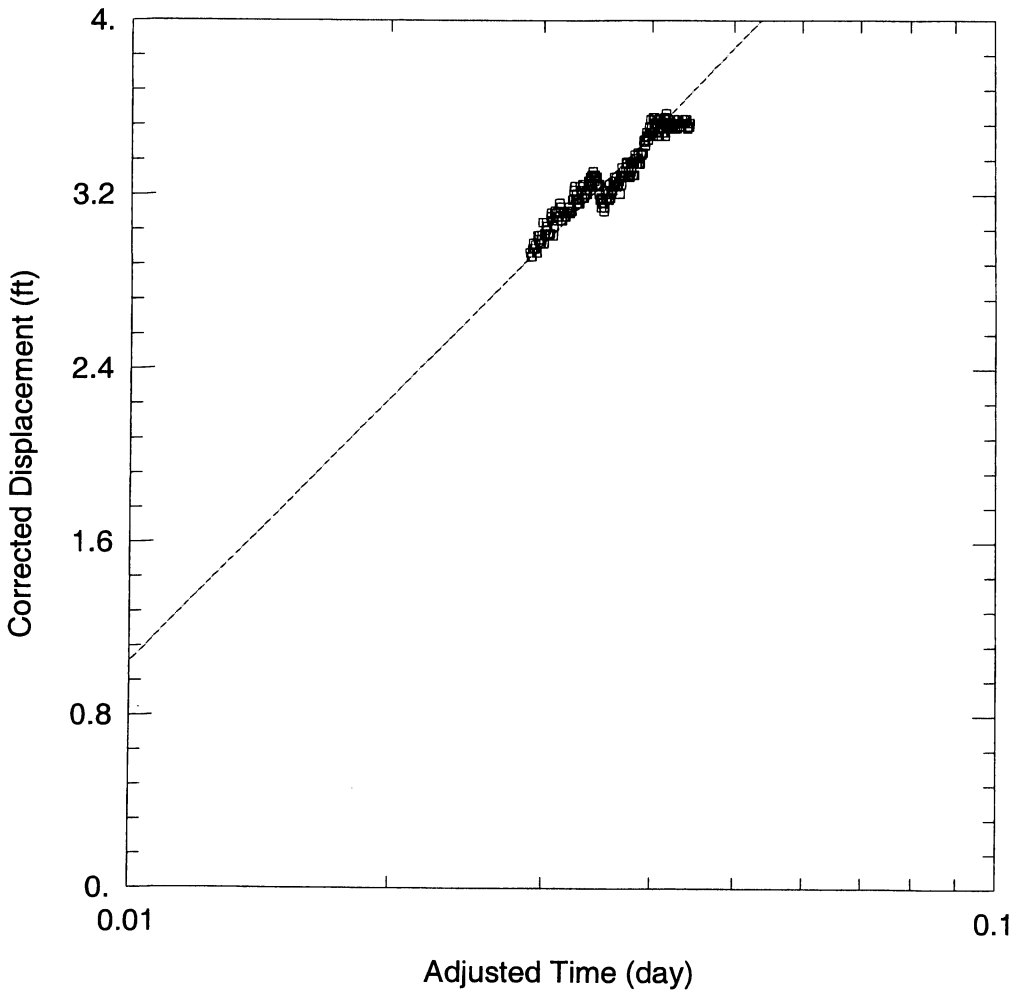
Assumptions

- Aquifer is confined for tests below the water table, aquifer is unconfined for test intervals beginning at the water table;
- Packer test interval is assumed to be a fully penetrating well;
- Aquifer is homogeneous, isotropic, and of uniform thickness;
- Groundwater flow is horizontal to the well;
- Well storage is insignificant;
- Elapsed time is large (Cooper-Jacob method assumption);
- Aquifer is confined (Theis recovery method assumption); and
- Well radius is small compared to aquifer.

For the purposes of analyzing the packer flow testing data, an observation well was assumed to be present at a distance equal to the radius of the borehole. This assumption invalidates the calculation of a storativity. In addition, the calculated transmissivity (hydraulic conductivity) is a bulk value, a combination of the transmissivity of the water producing fractures and the matrix.

Attached are AQTESOLV plots and hydrographs.


MW1D-91 10-21 feet Constant Rate Test
Drawdown (feet)
-1
-0.5
0
0.5
1
1.5
2
2.5
3
3.5
4
13:30
13:40
13:50
14:00
14:10
14:20
14:30
14:40
14:50
15:00
15:10
15:20
15:30
Time of Day
missing data from 13:43 to 14:24
1 gpm
Recovery



WELL TEST ANALYSIS

Data Set: I:\...\MW1D 10-21 cj.aqt
Date: 03/11/03 Time: 15:13:35

PROJECT INFORMATION

Company: CRA
Project: Maybrook
Test Well: MW1D 10-21'
Test Date: June 14/01

AQUIFER DATA

Saturated Thickness: 25. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1D 10-21'	0	0

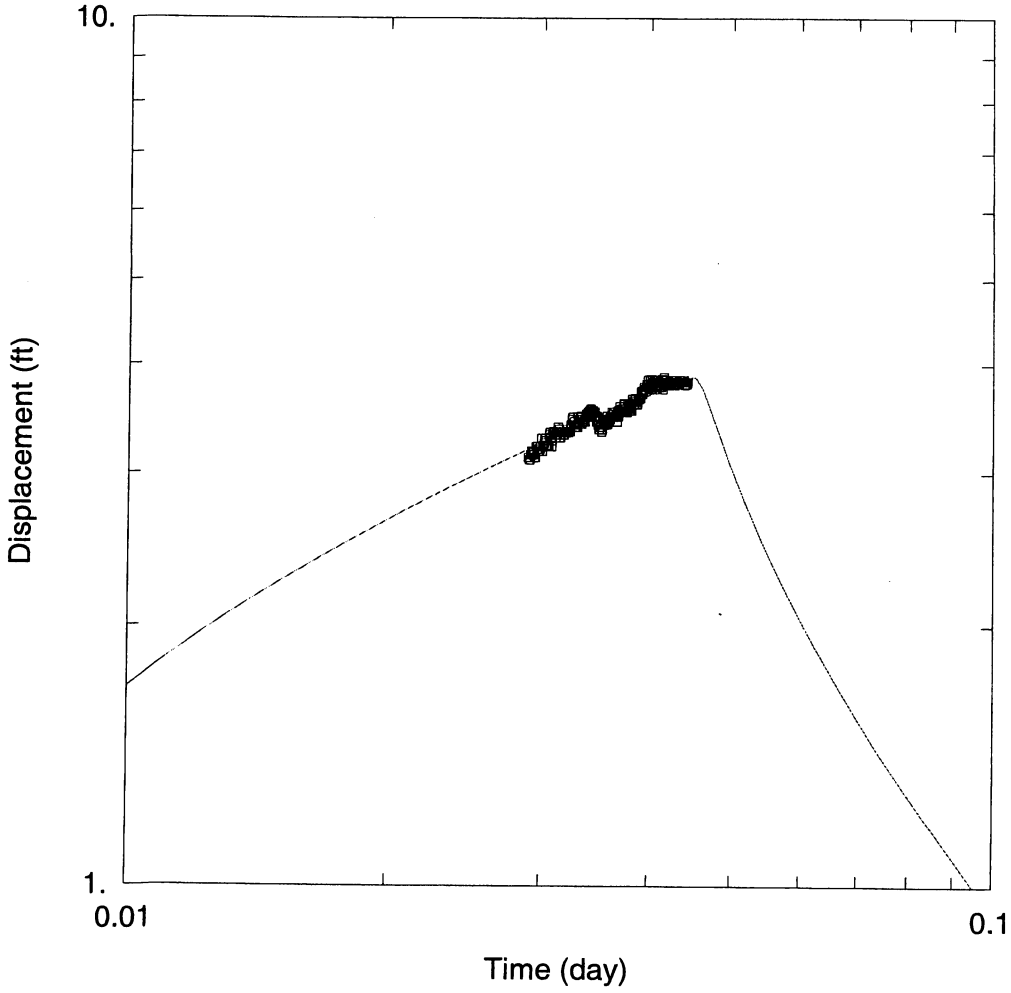
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW1D 10-21'	0.1625	0.1625

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 0.09378 cm^2/sec S = 2.043



WELL TEST ANALYSIS

Data Set: I:\...\MW1D 10-21 theis.aqt
Date: 03/11/03 Time: 15:14:14

PROJECT INFORMATION

Company: CRA
Project: Maybrook
Test Well: MW1D 10-21'
Test Date: June 14/01

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1D 10-21'	0	0

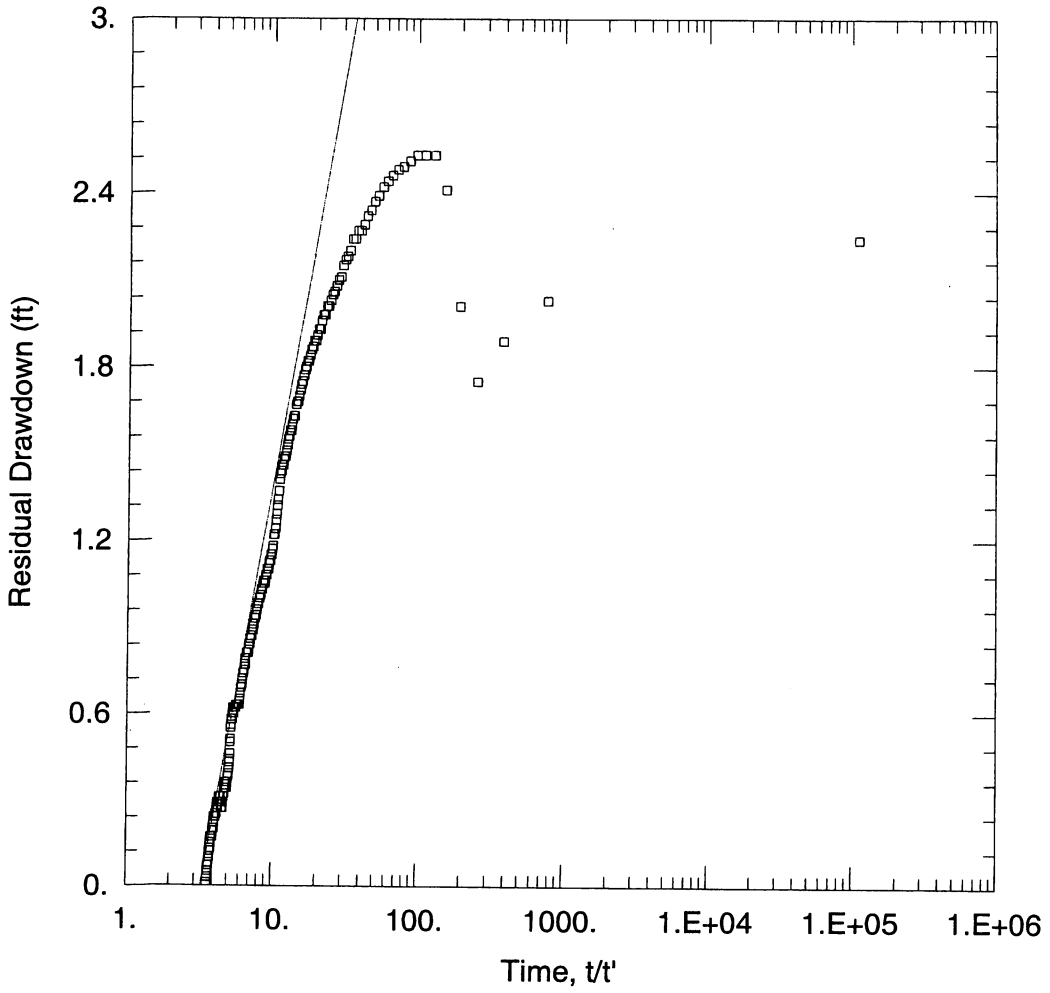
Observation Wells

Well Name	X (ft)	Y (ft)
MW1D 10-21'	0.1625	0.1625

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.09987 cm^2/sec
S = 1.79
Kz/Kr = 1.
b = 25. ft



WELL TEST ANALYSIS

Data Set: I:\...\MW1D 10-21 recovery.aqt
Date: 03/11/03 Time: 15:14:02

PROJECT INFORMATION

Company: CRA
Project: Maybrook
Test Well: MW1D 10-21'
Test Date: June 14/01

AQUIFER DATA

Saturated Thickness: 25. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1D 10-21'	0	0

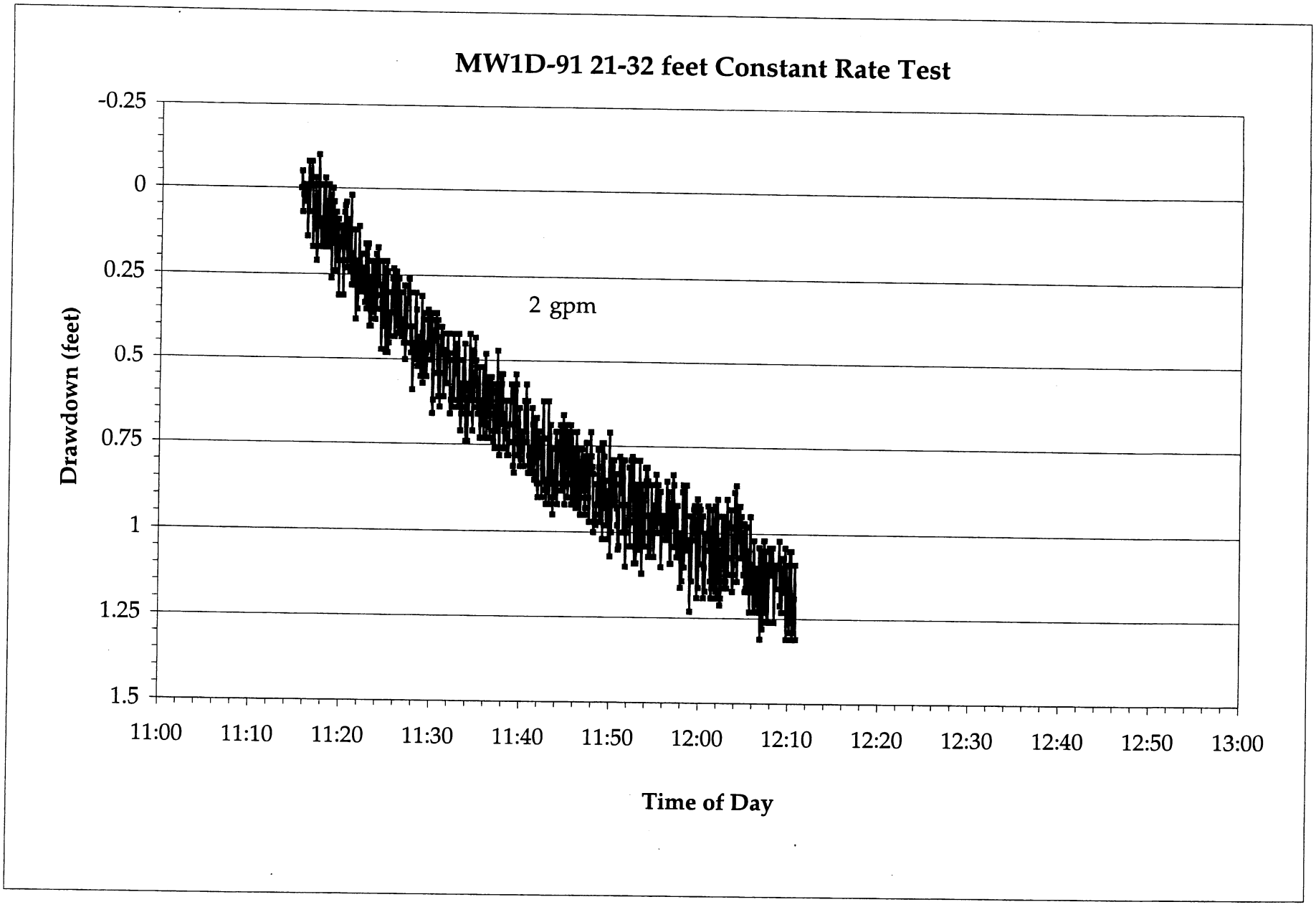
Observation Wells

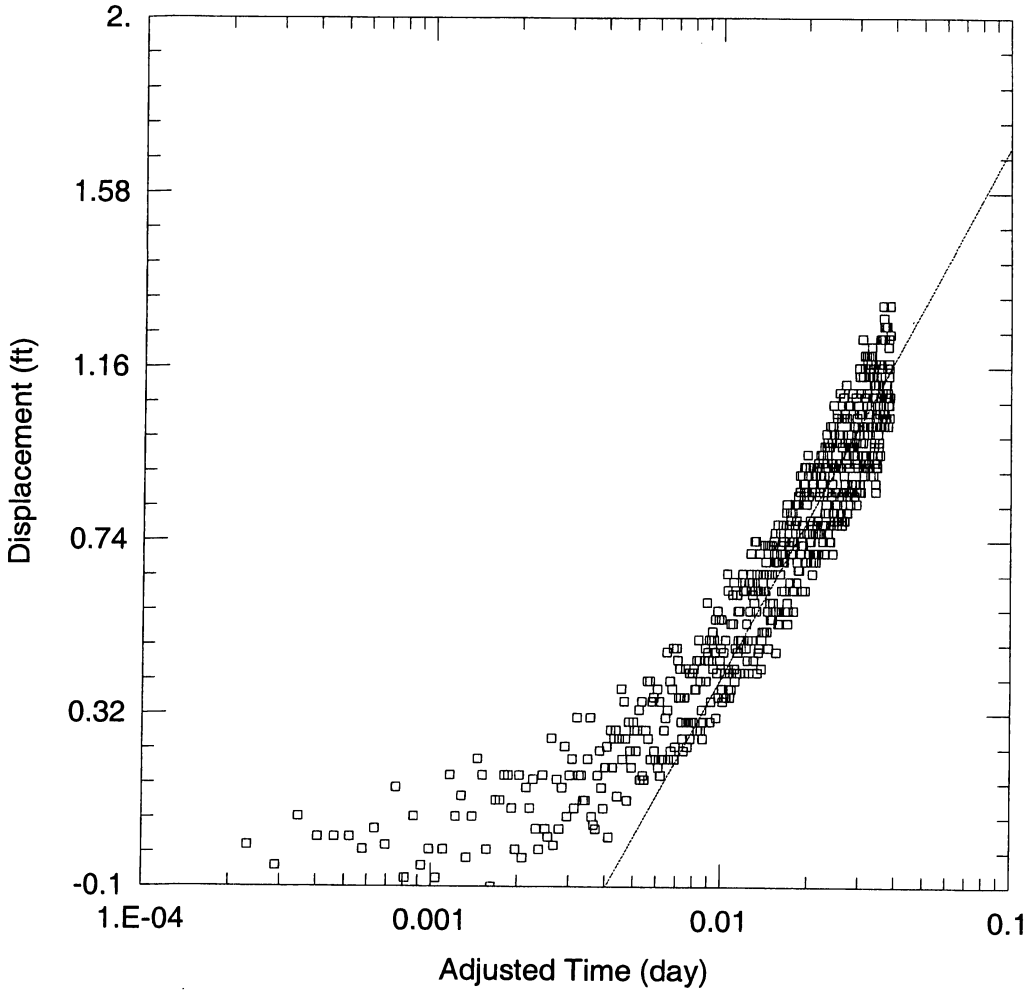
Well Name	X (ft)	Y (ft)
□ MW1D 10-21'	0.1625	0.1625

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.1308 cm^2/sec S/S' = 3.306


MW1D-91 21-32 feet Constant Rate Test
-0.25
0
0.25
0.5
0.75
1
1.25
1.5
Drawdown (feet)
2 gpm
11:00
11:10
11:20
11:30
11:40
11:50
12:00
12:10
12:20
12:30
12:40
12:50
13:00
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW1D 21-32 cj.aqt
Date: 03/11/03 Time: 15:29:07

PROJECT INFORMATION

Company: CRA
Project: Maybrook
Test Well: MW1D 21-32'
Test Date: June 14/01

AQUIFER DATA

Saturated Thickness: 25. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1D 21-32'	0	0

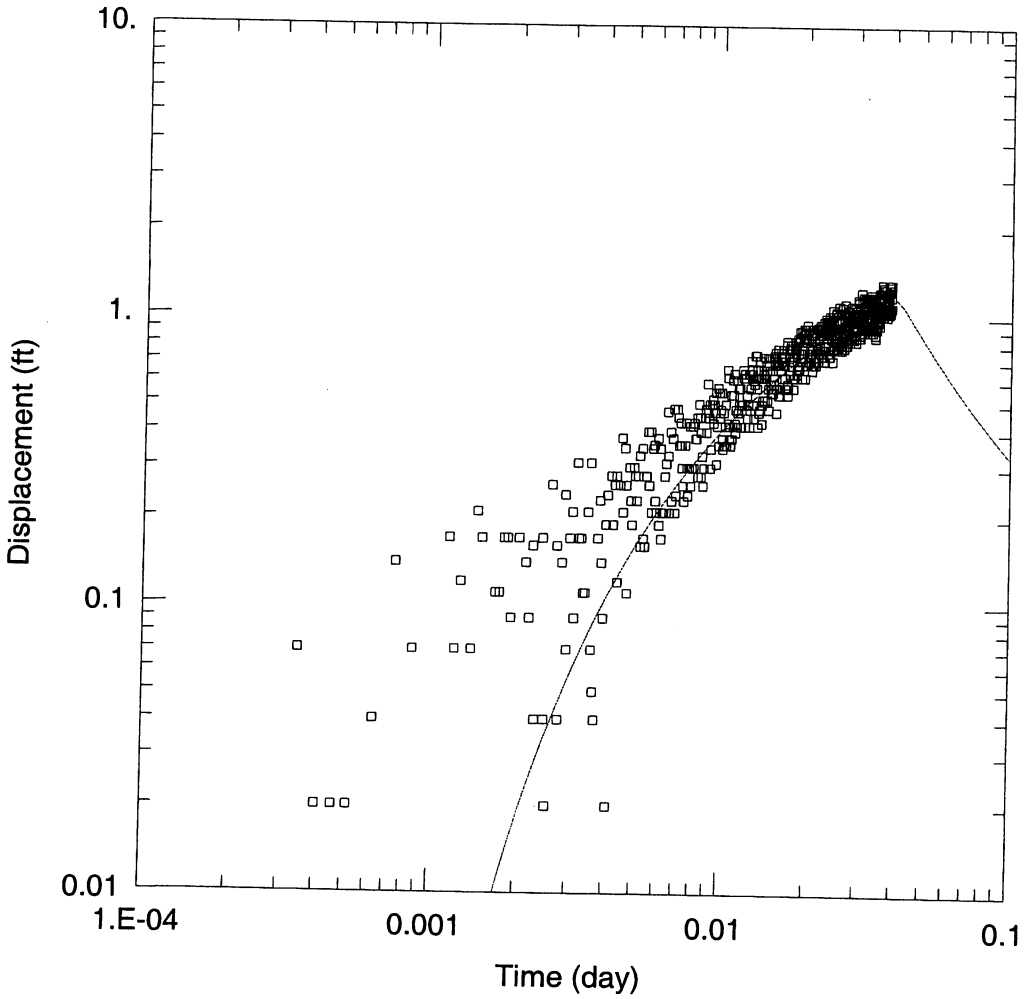
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW1D 21-32'	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.5911 cm^2/sec S = 22.5



WELL TEST ANALYSIS

Data Set: I:\...\MW1D 21-32 theis.aqt
Date: 03/11/03 Time: 15:14:24

PROJECT INFORMATION

Company: CRA
Project: Maybrook
Test Well: MW1D 21-32'
Test Date: June 14/01

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW1D 21-32'	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW1D 21-32'	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.4487 cm^2/sec
Kz/Kr = 1.

S = 31.94
b = 25. ft

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MEMORANDUM

TO: Randy Moore

REF. NO.: 3698

FROM: Brad Trytten

DATE: September 14, 2001

C.C.: Gary Lagos, Joanne Ing

RE: Constant Rate Packer Flow Testing Analysis Results MW2D-91, Maybrook Site

This memorandum summarizes the packer testing activities and hydraulic conductivity results for MW2D-91 conducted June 15, 2001. MW2D-91 was completed as an open borehole to a total depth of 52 feet bgs.

Packer Test Information
Static Water Level = 7 feet bgs
Pressure transducer set 7.5 feet below top packer
Packers set up with 11 feet between top and bottom packers
Borehole Diameter = 0.375 feet
Steel casing to 24 feet bgs

Interval Tested	22 to 33 feet bgs	30 to 41 feet bgs	41 to 52 feet bgs
Step Test Flow Rates and Duration	0.5 gpm (9 minutes), 1 gpm (3 minutes) (dewatered), no recovery	<1 gpm (10 minutes), 1gpm (4 minutes) (dewatered)	1 gpm (10 minutes), 2 gpm (3 minutes) (dewatered), 1.5 gpm (7 minutes)
Constant Rate Test Flow Rate and Duration	No test conducted as water level did not recover after step test	0.5 gpm (dewatered after 6 minutes)	1 gpm (65 minutes) (initial transducer data lost due to equipment malfunction), recovery data recorded for 10 minutes
Saturated Aquifer Thickness Aquifer Type Aquifer Thickness	45 feet Confined 9 feet	45 feet Confined 11 feet	45 feet Confined 11 feet
Transmissivity (Estimated) (cm^2/sec)	Not Calculated	Not Calculated	0.2678 (Cooper-Jacob) 0.1689 (Theis)
Hydraulic conductivity (Estimated) (cm/sec)	Not Calculated	Not Calculated	8×10^{-4} (Cooper-Jacob) 5×10^{-4} (Theis)

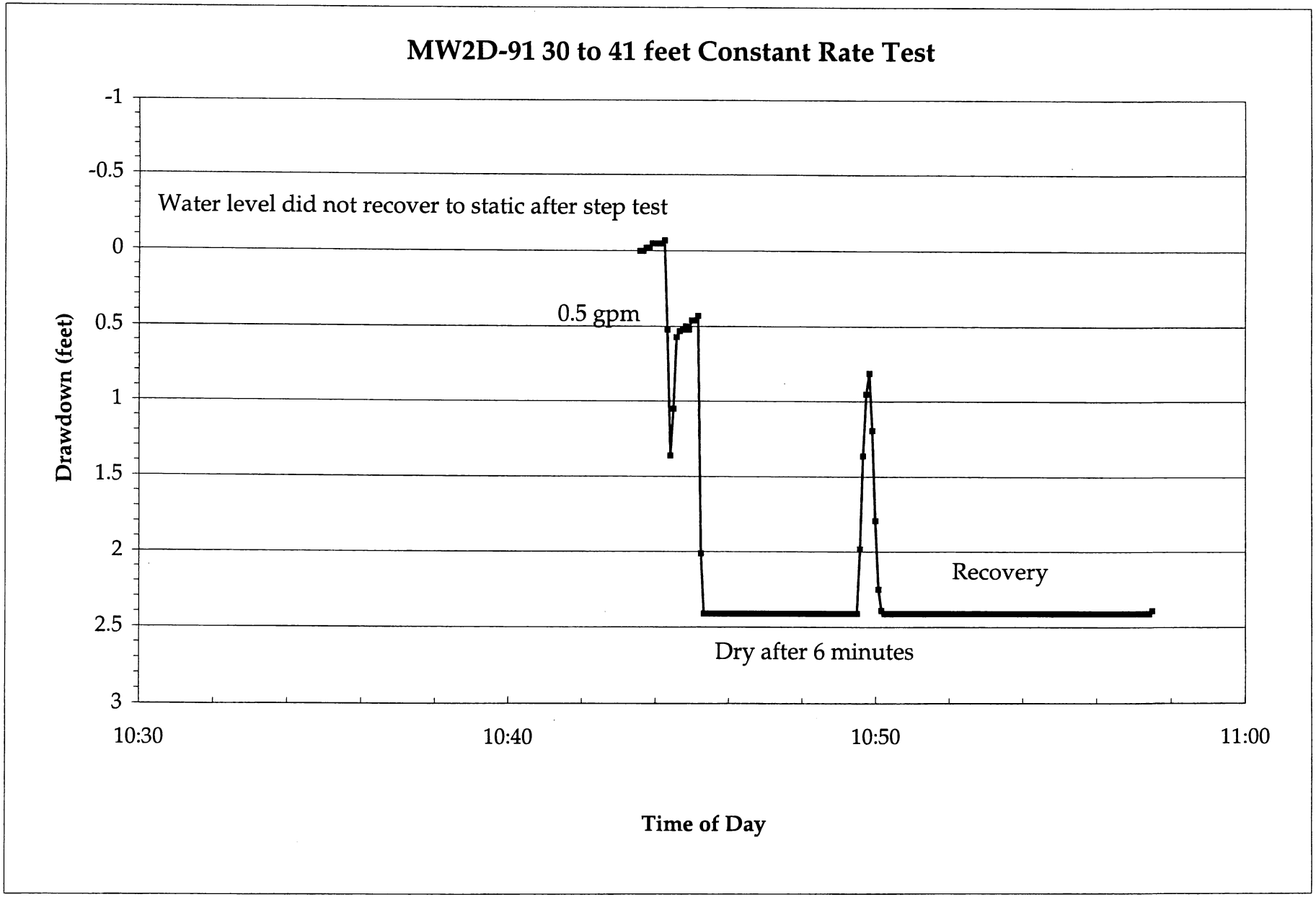
REGISTERED COMPANY FOR ISO 9001 ENGINEERING DESIGN

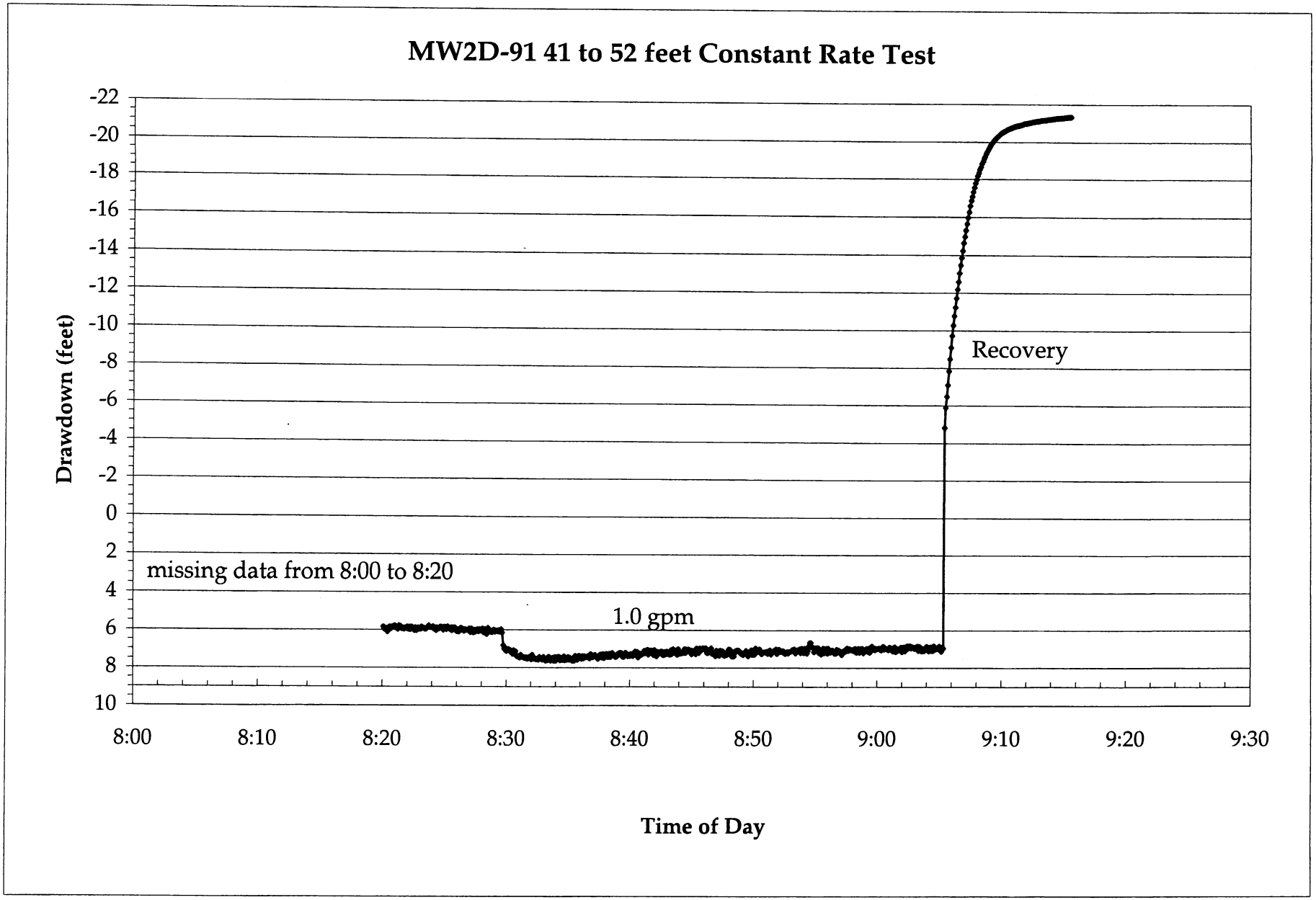
Assumptions

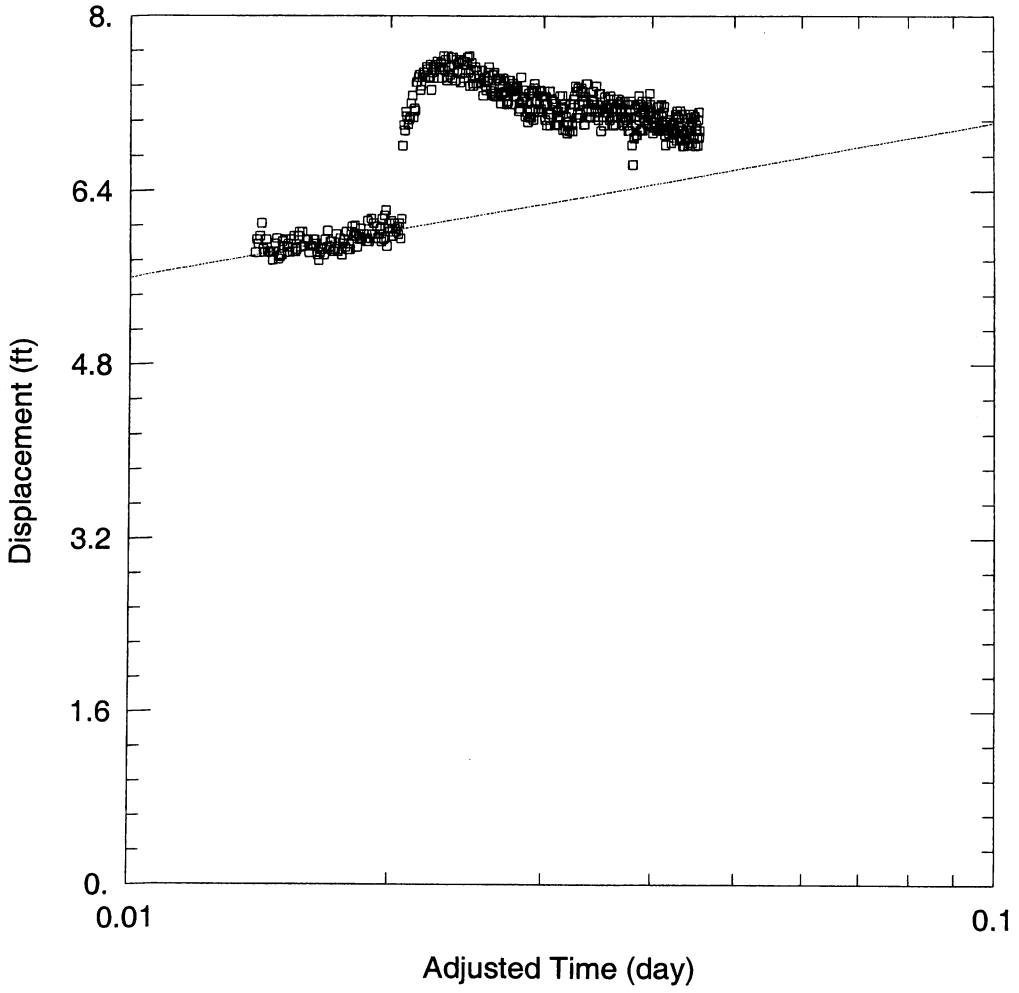
- Aquifer is confined for tests below the water table;
- Packer test interval is assumed to be a fully penetrating well;
- Aquifer is homogeneous, isotropic, and of uniform thickness;
- Groundwater flow is horizontal to the well;
- Well storage is insignificant;
- Elapsed time is large (Cooper-Jacob method assumption); and
- Well radius is small compared to aquifer.

For the purposes of analyzing the packer flow testing data, an observation well was assumed to be present at a distance equal to the radius of the borehole. This assumption invalidates the calculation of a storativity. In addition, the calculated transmissivity (hydraulic conductivity) is a bulk value, a combination of the transmissivity of the water producing fractures and the matrix.

Attached are AQTESOLV plots and hydrographs.


MW2D-91 30 to 41 feet Constant Rate Test
-1
-0.5
0
0.5
1
1.5
2
2.5
3
Drawdown (feet)
Water level did not recover to static after step test
0.5 gpm
Recovery
Dry after 6 minutes
10:30
10:40
10:50
11:00
Time of Day


MW2D-91 41 to 52 feet Constant Rate Test
Drawdown (feet)
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
Recovery
missing data from 8:00 to 8:20
1.0 gpm
8:00
8:10
8:20
8:30
8:40
8:50
9:00
9:10
9:20
9:30
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW2D 41-52 cj.aqt
Date: 03/11/03 Time: 15:24:09

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW2D-91 41-52'
Test Date: June 15, 2001

AQUIFER DATA

Saturated Thickness: 45. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW2D 41-52'	0	0

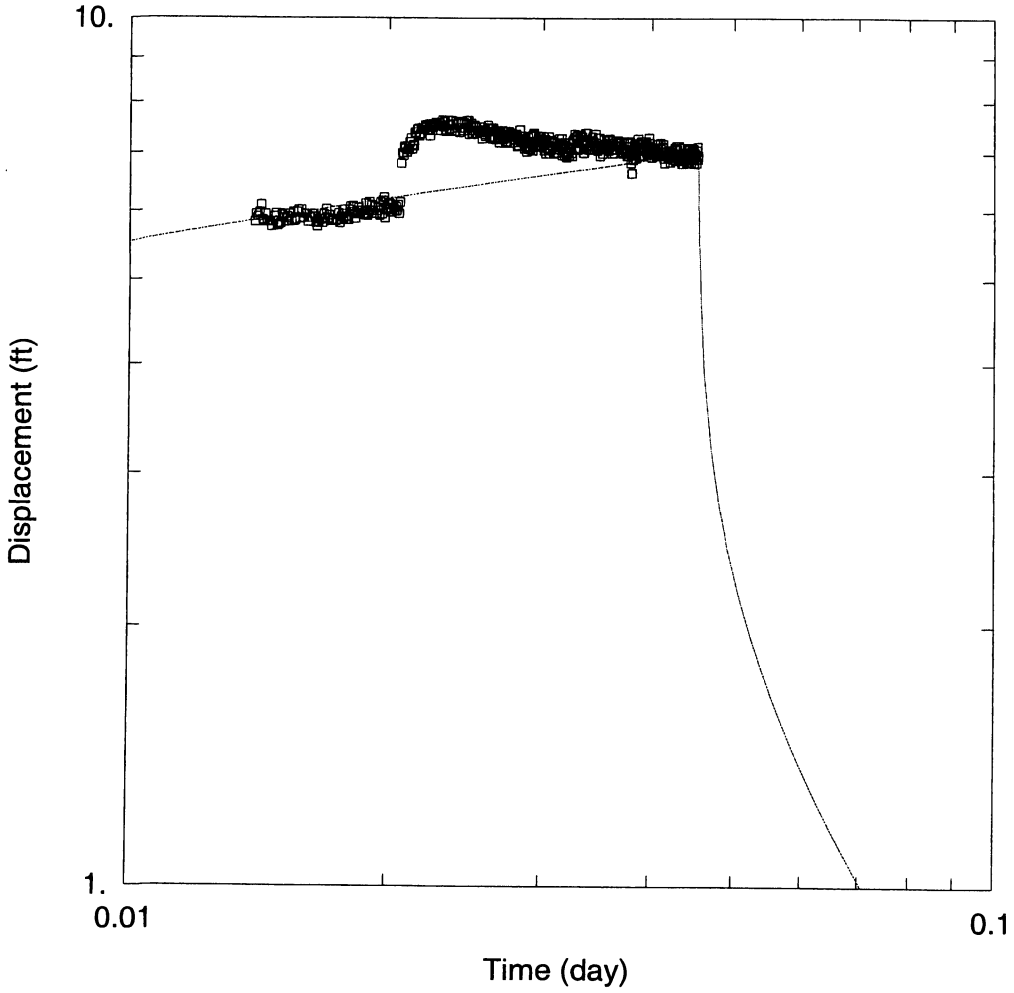
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW2D 41-52'	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.2678 cm^2/sec S = 0.002342



WELL TEST ANALYSIS

Data Set: I:\...\MW2D 41-52 theis.aqt
Date: 03/11/03 Time: 15:27:55

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW2D-91 41-52'
Test Date: June 15, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW2D 41-52'	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW2D 41-52'	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.1689 cm^2/sec
S = 0.04585
Kz/Kr = 1.
b = 45. ft

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MEMORANDUM

TO: Randy Moore

REF. NO.: 3698

FROM: Brad Trytten

DATE: September 14, 2001

C.C.: Gary Lagos, Joanne Ing

RE: Constant Rate Packer Flow Testing Analysis Results MW3D-91, Maybrook Site

This memorandum summarizes the packer testing activities and hydraulic conductivity results for MW3D-91 conducted June 20, 2001. MW3D-91 was completed as an open borehole to a total depth of 53 feet bgs.

Packer Test Information
Static Water Level = 22.66 feet bgs
Pressure transducer set 7.5 feet below top packer
Packers set up with 11 feet between top and bottom packers
Borehole Diameter = 0.375 feet
Steel Casing to 28.5 feet bgs

Interval Tested	20 to 31 feet bgs	31 to 42 feet bgs	42 to 53 feet bgs
Step Test Flow Rates and Duration	0.75 gpm (3 minutes) (dewatered), 0.5 gpm (3 minutes) (dewatered)	1.5 gpm (6 minutes) (dewatered) (pump tripped out at lower flow rates), no recovery for 25 minutes	1 gpm (6 minutes), 2 gpm (5 minutes) (dewatered), 3 gpm (7 minutes) (dewatered)
Constant Rate Test Flow Rate and Duration	No test conducted	No test conducted	1 gpm (60 minutes), no recovery data recorded due to electrical storm
Saturated Aquifer Thickness	30 feet	30 feet	30 feet
Aquifer Type	Unconfined	Confined	Confined
Aquifer Thickness	3 feet	11 feet	11 feet
Transmissivity (Estimated) (cm^2/sec)	Not Calculated	Not Calculated	0.1857 (Cooper-Jacob) 0.1514 (Theis)
Hydraulic conductivity (Estimated) (cm/sec)	Not Calculated	Not Calculated	6×10^{-4} (Cooper-Jacob) 5×10^{-4} (Theis)

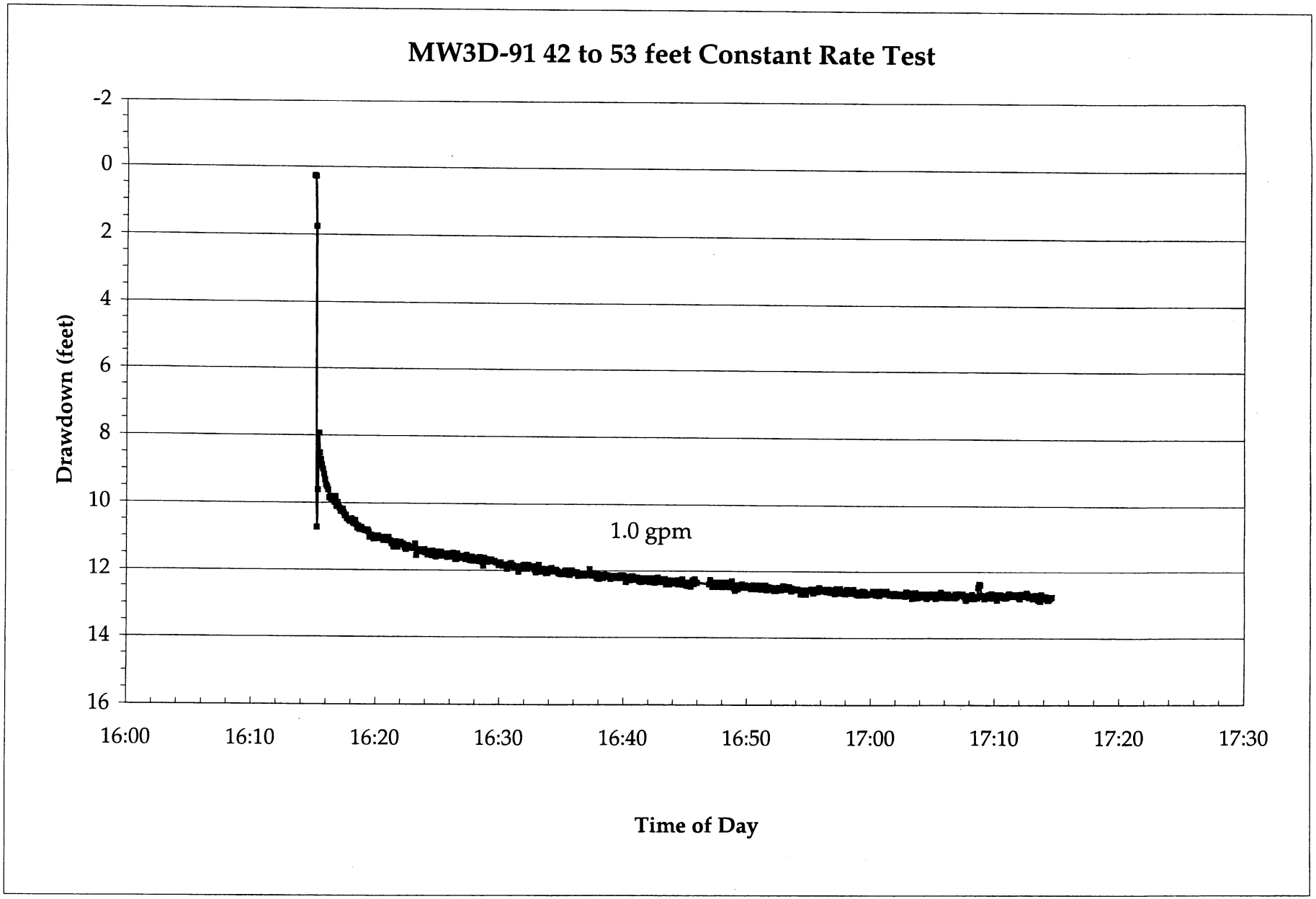
REGISTERED COMPANY FOR ISO 9001 ENGINEERING DESIGN

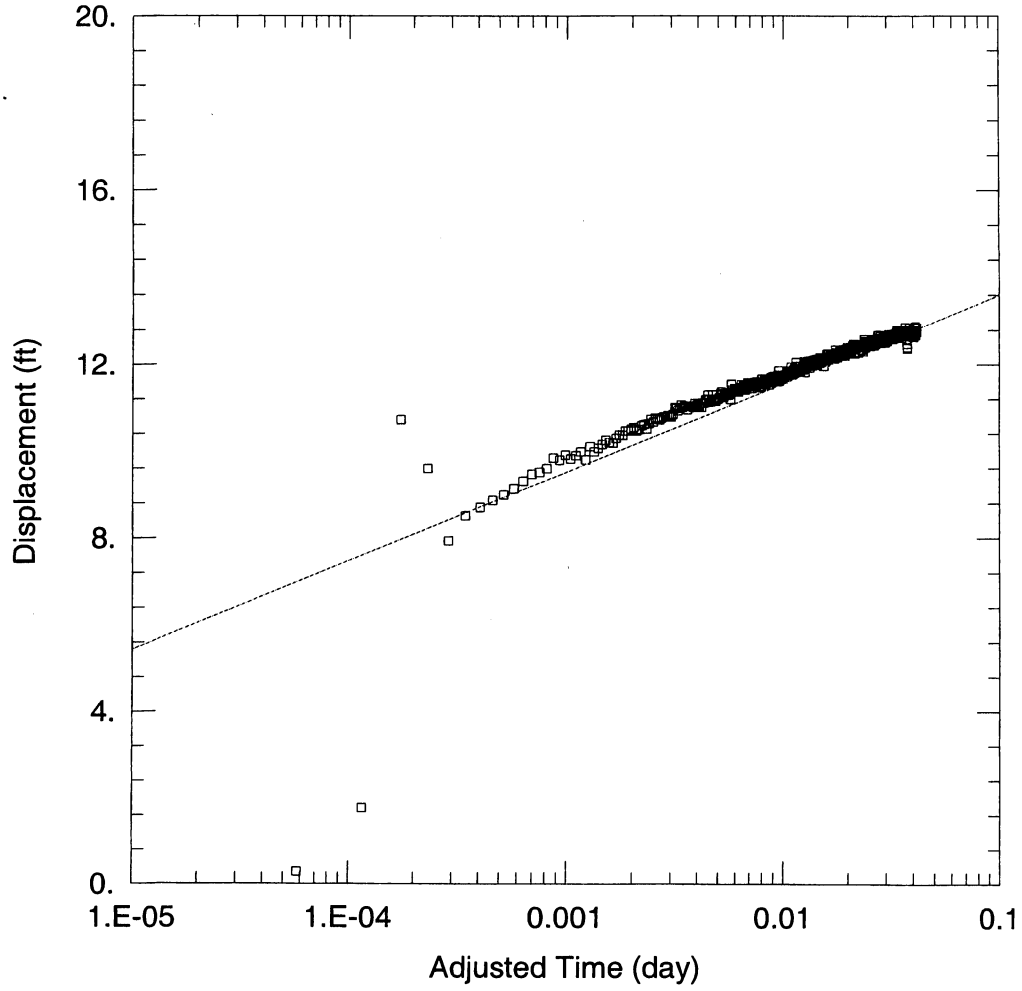
Assumptions

- Aquifer is confined for tests below the water table;
- Packer test interval is assumed to be a fully penetrating well;
- Aquifer is homogeneous, isotropic, and of uniform thickness;
- Groundwater flow is horizontal to the well;
- Well storage is insignificant;
- Elapsed time is large (Cooper-Jacob method assumption);
- Aquifer is confined (Theis recovery method assumption); and
- Well radius is small compared to aquifer.

For the purposes of analyzing the packer flow testing data, an observation well was assumed to be present at a distance equal to the radius of the borehole. This assumption invalidates the calculation of a storativity. In addition, the calculated transmissivity (hydraulic conductivity) is a bulk value, a combination of the transmissivity of the water producing fractures and the aquifer matrix.

Attached are AQTESOLV plots and hydrographs.


MW3D-91 42 to 53 feet Constant Rate Test
Drawdown (feet)
-2
0
2
4
6
8
10
12
14
16
1.0 gpm
16:00
16:10
16:20
16:30
16:40
16:50
17:00
17:10
17:20
17:30
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW3D 42-53 cj.aqt
Date: 03/11/03 Time: 15:39:59

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW3D-91 42 to 53 ft
Test Date: June 20, 2001

AQUIFER DATA

Saturated Thickness: 30. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW3D 42-53	0	0

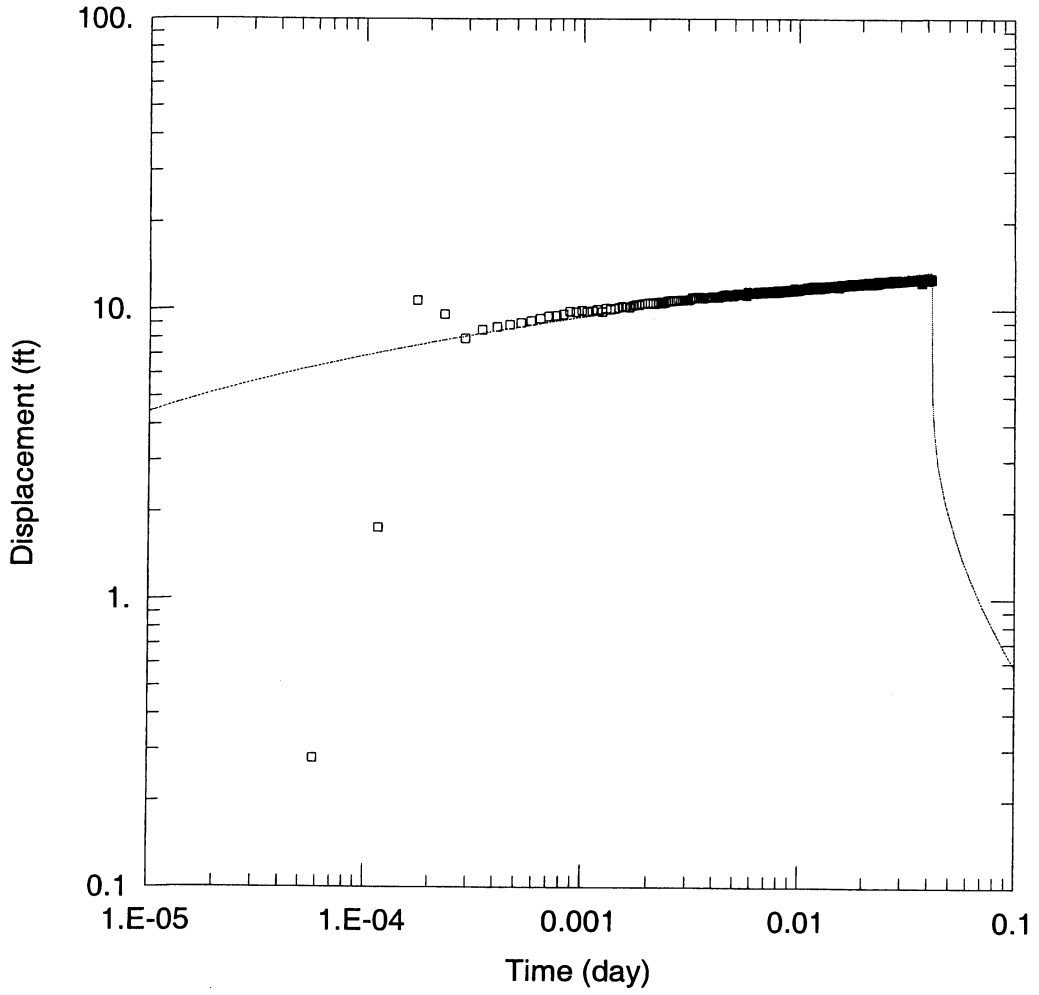
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW3D 42-53	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.1857 cm^2/sec S = 3.204E-05



WELL TEST ANALYSIS

Data Set: I:\...\MW3D 42-53 theis.aqt
Date: 03/11/03 Time: 15:40:07

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW3D-91 42 to 53 ft
Test Date: June 20, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW3D 42-53	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW3D 42-53	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.1514 cm^2/sec
S = 0.0002074
Kz/Kr = 1.
b = 30. ft

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO: Randy Moore

REF. NO.: 3698

FROM: Brad Trytten

DATE: September 14, 2001

C.C.: Gary Lagos, Joanne Ing

RE: Constant Rate Packer Flow Testing Analysis Results MW5D-95, Maybrook Site

This memorandum summarizes the packer testing activities and hydraulic conductivity results for MW5D-95 conducted June 18 to 20, 2001. MW5D-95 was completed as an open borehole to a total depth of 97 feet bgs.

Packer Test Information
Static Water Level = 3.65 feet bgs
Pressure transducer set 7.5 feet below top packer
Packers set up with 11 feet between top and bottom packers
Borehole Diameter = 0.375 feet
Steel Casing to 36 feet bgs

Interval Tested	34 to 45 feet bgs	42 to 53 feet bgs	53 to 64 feet bgs
Step Test Flow Rates and Duration	1 gpm (6 minutes), 2 gpm (8 minutes) (dewatered), 3 gpm (1 minute) (dewatered)	1 gpm (6 minutes), 2 gpm (6 minutes), 3 gpm (4 minutes) (dewatered)	1 gpm (6 minutes), 2 gpm (6 minutes), 3 gpm (6 minutes)
Constant Rate Test Flow Rate and Duration	1 gpm (61 minutes), recovery data recorded for 6 minutes	1 gpm (60 minutes), recovery data recorded for 11 minutes	1 gpm (61 minutes), recovery data recorded for 10 minutes
Saturated Aquifer Thickness	93 feet	93 feet	93 feet
Aquifer Type	Confined	Confined	Confined
Aquifer Thickness	9 feet	11 feet	11 feet
Transmissivity (Estimated) (cm^2/sec)	0.1622 (Cooper-Jacob) 0.1622 (Theis) 0.04895 (Theis recovery)	0.1672 (Cooper-Jacob) 0.1434 (Theis) 0.04011 (Theis recovery)	0.1459 (Cooper-Jacob) 0.179 (Theis) 0.03637 (Theis recovery)
Hydraulic conductivity (Estimated) (cm/sec)	6×10^{-4} (Cooper-Jacob) 6×10^{-4} (Theis) 2×10^{-4} (Theis recovery)	5×10^{-4} (Cooper-Jacob) 4×10^{-4} (Theis) 1×10^{-4} (Theis recovery)	4×10^{-4} (Cooper-Jacob) 5×10^{-4} (Theis) 1×10^{-4} (Theis recovery)

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Interval Tested	64 to 75 feet bgs	75 to 86 feet bgs (test #1)	75 to 86 feet bgs (test#2)
Step Test Flow Rates and Duration	1 gpm (6 minutes), 2 gpm (6 minutes), 3 gpm (5 minutes) (dewatered)	1 gpm (6 minutes), 2 gpm (6 minutes) , 3 gpm (4 minutes) (dewatered)	See Previous Test Results
Constant Rate Test Flow Rate and Duration	1 gpm (61 minutes), recovery data recorded for 8 minutes	1 gpm (64 minutes) (initial transducer data lost due to equipment malfunction), recovery data recorded for 20 minutes	1 gpm (53 minutes) (initial transducer data lost due to equipment malfunction), no recovery data
Saturated Aquifer Thickness	93 feet	93 feet	93 feet
Aquifer Type	Confined	Confined	Confined
Aquifer Thickness	11 feet	11 feet	11 feet
Transmissivity (Estimated) (cm^2/sec)	0.2207 (Cooper-Jacob) 0.2207 (Theis) 0.0517 (Theis recovery)	0.2234 (Cooper-Jacob) 0.2234 (Theis) 0.04878 (Theis recovery)	0.1326 (Cooper-Jacob) 0.05144 (Theis)
Hydraulic conductivity (Estimated) (cm/sec)	7×10^{-4} (Cooper-Jacob) 7×10^{-4} (Theis) 1×10^{-4} (Theis recovery)	7×10^{-4} (Cooper-Jacob) 7×10^{-4} (Theis) 1×10^{-4} (Theis recovery)	2×10^{-4} (Cooper-Jacob) 2×10^{-4} (Theis)

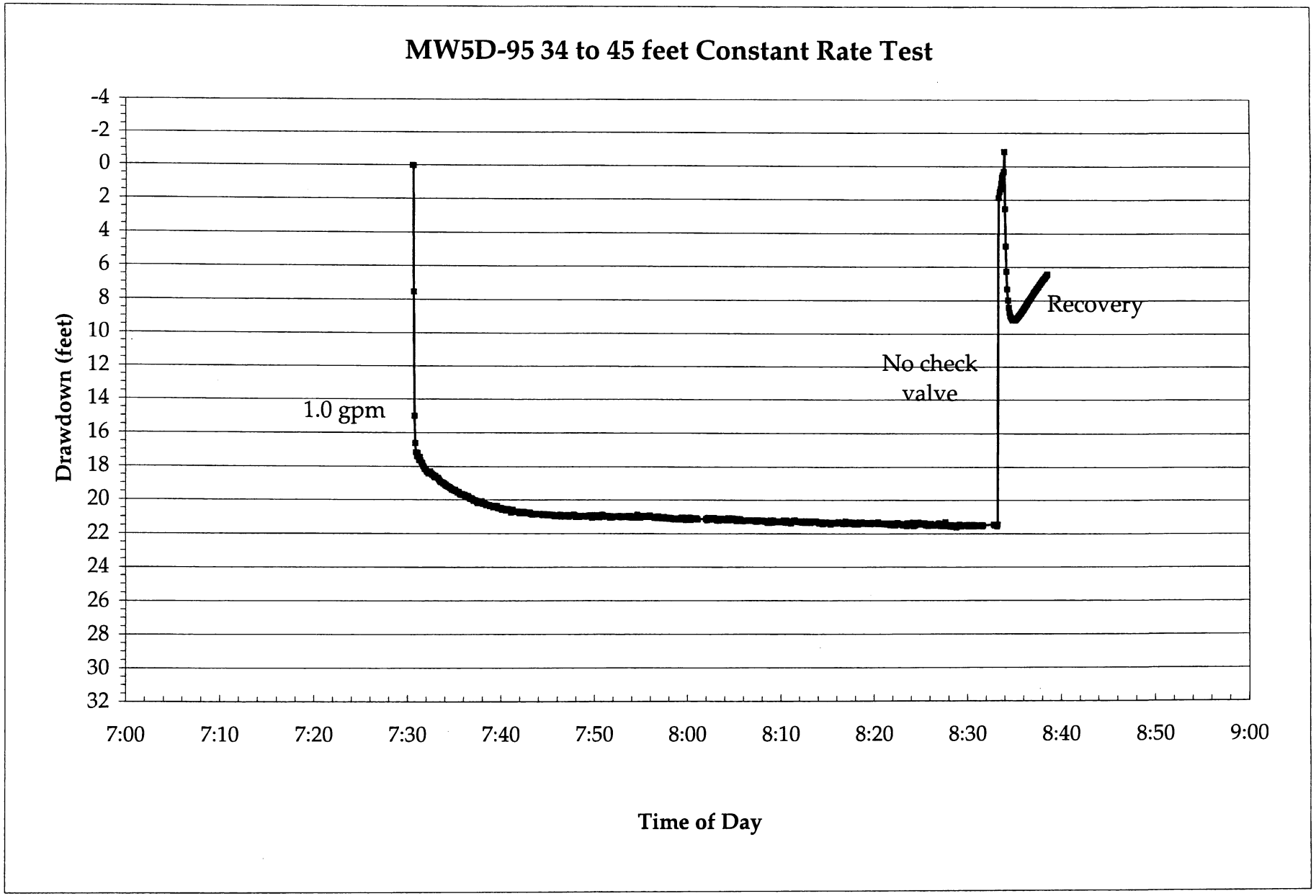
Interval Tested	86 to 97 feet bgs
Step Test Flow Rates and Duration	0.5 gpm (9 minutes), 1 gpm (5 minutes), 4 gpm (7 minutes) (leakage from above upper packer)
Constant Rate Test Flow Rate and Duration	1 gpm (55 minutes), after 11 minutes, water levels rose above upper packer, 2 minutes of recovery data recorded
Saturated Aquifer Thickness	93 feet
Aquifer Type	Confined
Aquifer Thickness	11 feet
Transmissivity (Estimated) (cm^2/sec)	0.05729 (Cooper-Jacob) 0.03434 (Theis)
Hydraulic conductivity (Estimated) (cm/sec)	2×10^{-4} (Cooper-Jacob) 1×10^{-4} (Theis)

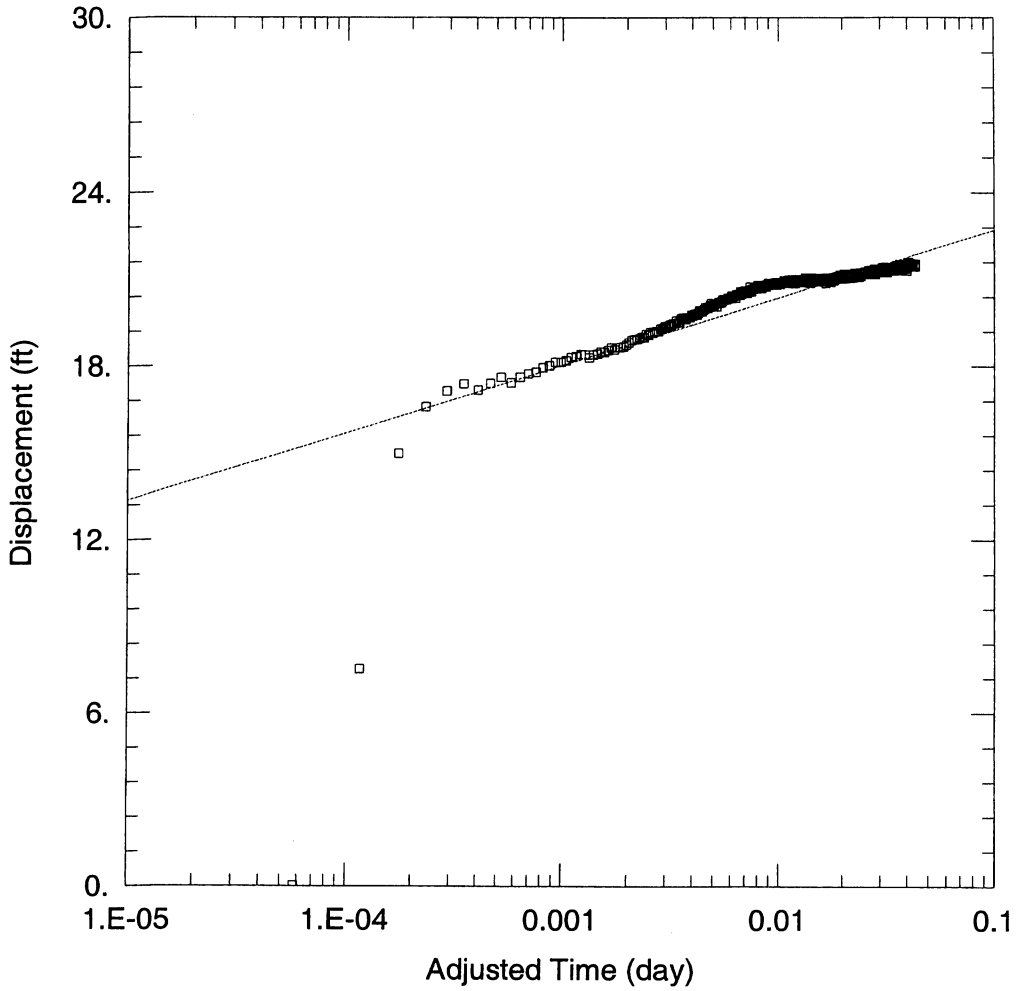
Assumptions

- Aquifer is confined for tests below the water table, aquifer is unconfined for test intervals beginning at the water table;
- Packer test interval is assumed to be a fully penetrating well;
- Aquifer is homogeneous, isotropic, and of uniform thickness;
- Groundwater flow is horizontal to the well;
- Well storage is insignificant;
- Elapsed time is large (Cooper-Jacob method assumption);
- Aquifer is confined (Theis recovery method assumption); and
- Well radius is small compared to aquifer.

For the purposes of analyzing the packer flow testing data, an observation well was assumed to be present at a distance equal to the radius of the borehole. This assumption invalidates the calculation of a storativity. In addition, the calculated transmissivity (hydraulic conductivity) is a bulk value, a combination of the transmissivity of the water producing fractures and the matrix.

Attached are AQTESOLV plots and hydrographs. For the majority of these tests, the recovery was very rapid, followed by a drop in water levels, followed by a more gradual water level rise. This is most likely due to a lack of a check valve on the pump allowing water within the discharge line to rapidly drain, fill the borehole partially and then true aquifer recovery begins.


MW5D-95 34 to 45 feet Constant Rate Test
Drawdown (feet)
-4
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
1.0 gpm
No check valve
Recovery
7:00
7:10
7:20
7:30
7:40
7:50
8:00
8:10
8:20
8:30
8:40
8:50
9:00
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 34-45 cj.aqt
Date: 03/11/03 Time: 15:43:39

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 34 to 45 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 34-45	0	0

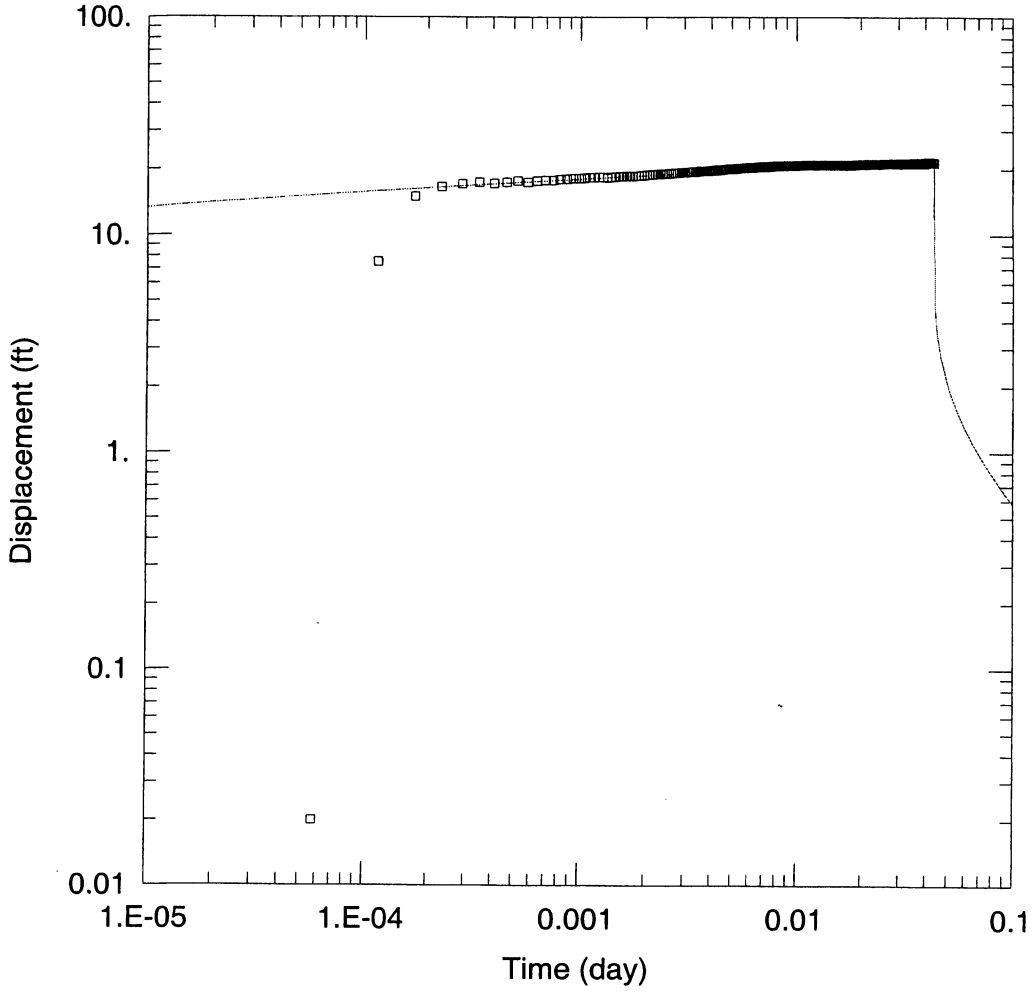
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 34-45	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.1622 cm^2/sec S = 2.479E-08



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 34-45 theis.aqt
Date: 03/11/03 Time: 15:43:52

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 34 to 45 ft
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 34-45	0	0

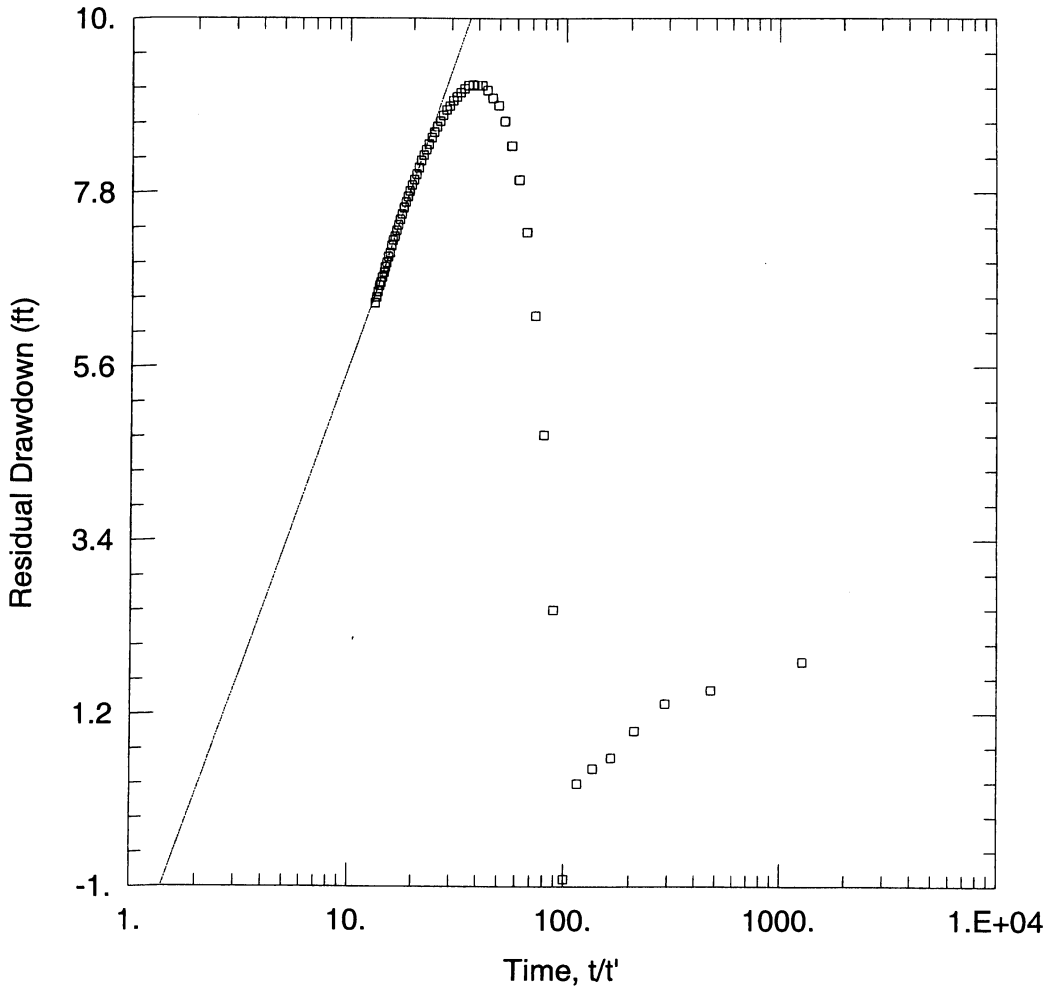
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 34-45	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.1622 cm^2/sec
S = 2.479E-08
Kz/Kr = 1.
b = 93. ft



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 34-45 th rec.aqt
Date: 03/11/03 Time: 15:44:02

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 34 to 45 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 34-45	0	0

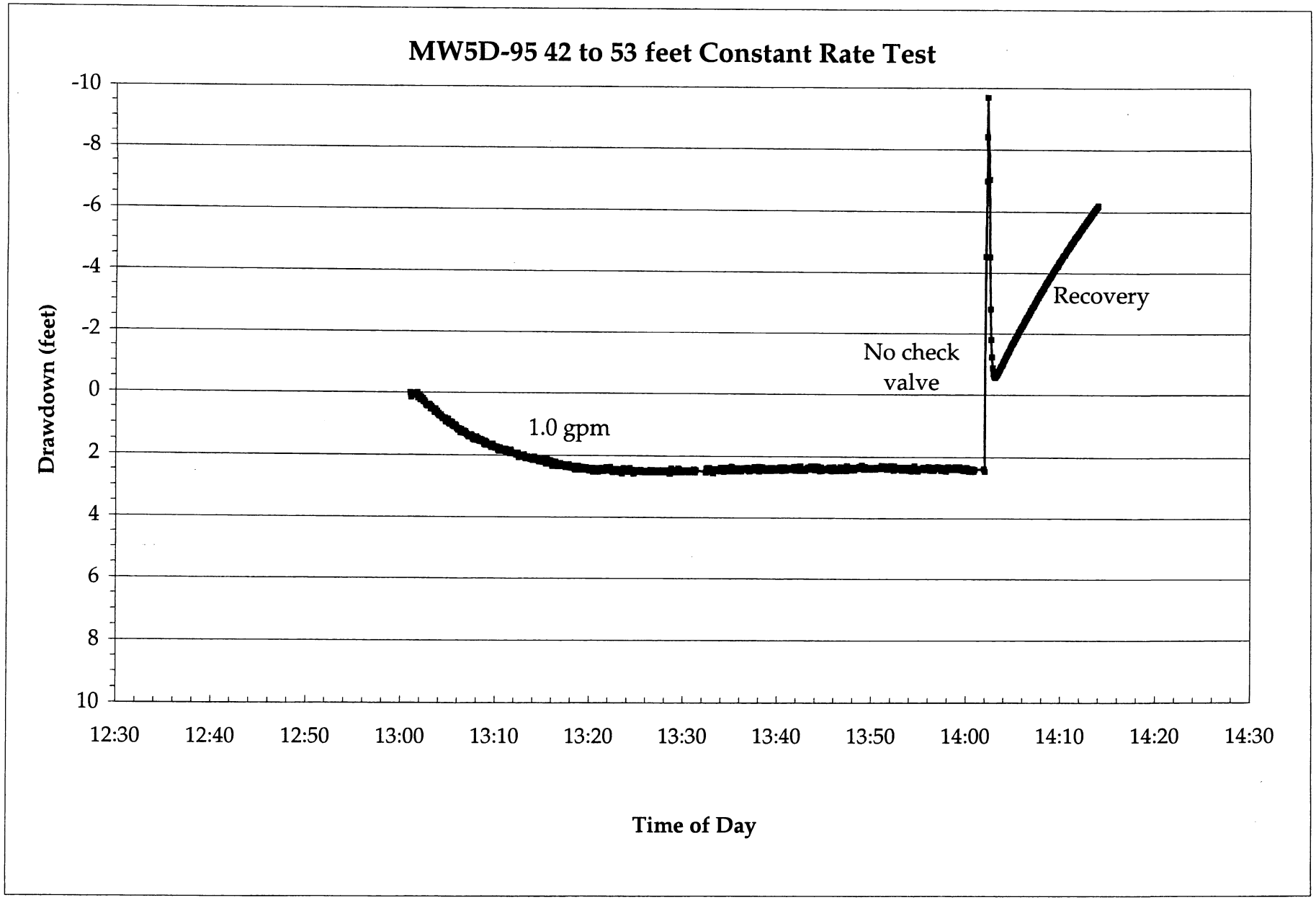
Observation Wells

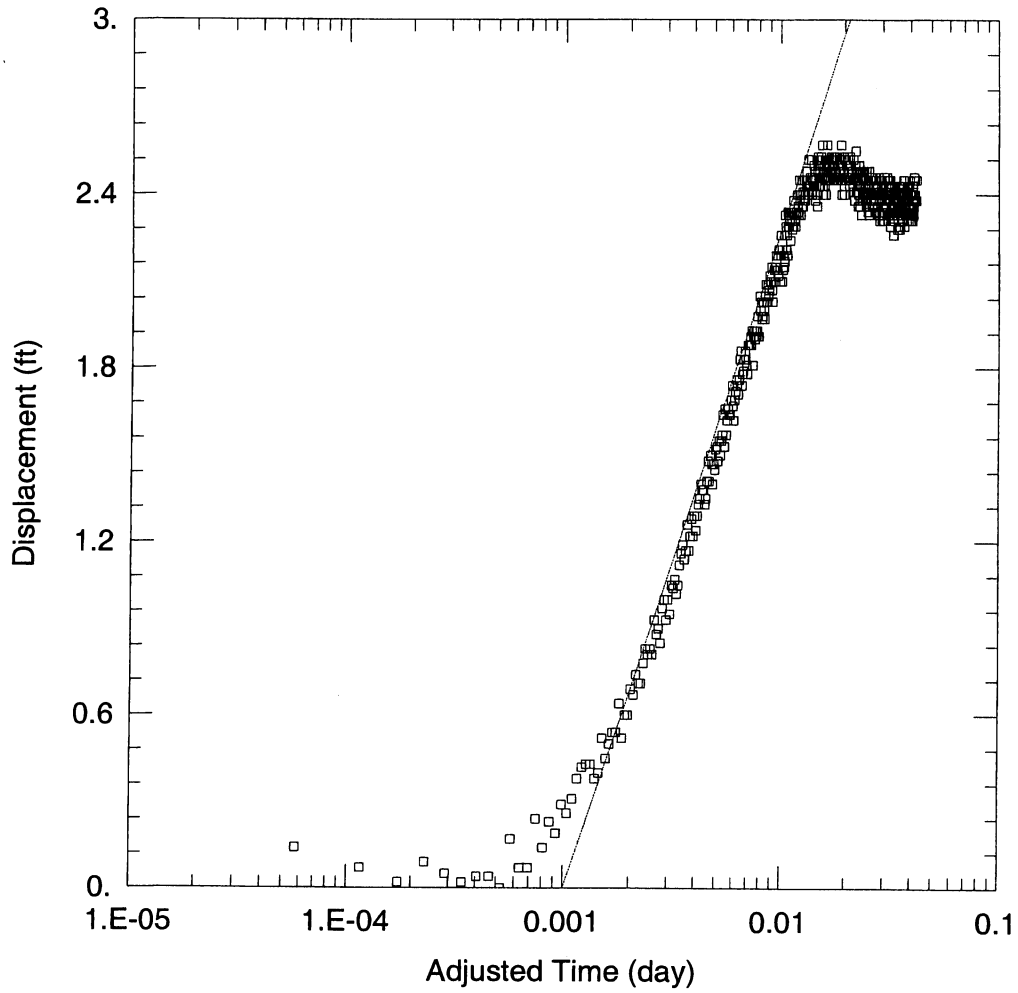
Well Name	X (ft)	Y (ft)
MW5D 34-45	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.04895 cm^2/sec S/S' = 1.877


MW5D-95 42 to 53 feet Constant Rate Test
Drawdown (feet)
-10
-8
-6
-4
-2
0
2
4
6
8
10
12:30
12:40
12:50
13:00
13:10
13:20
13:30
13:40
13:50
14:00
14:10
14:20
14:30
1.0 gpm
No check valve
Recovery
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 42-53 cj.aqt
Date: 03/11/03 Time: 15:44:13

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 42 to 53 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 42-53	0	0

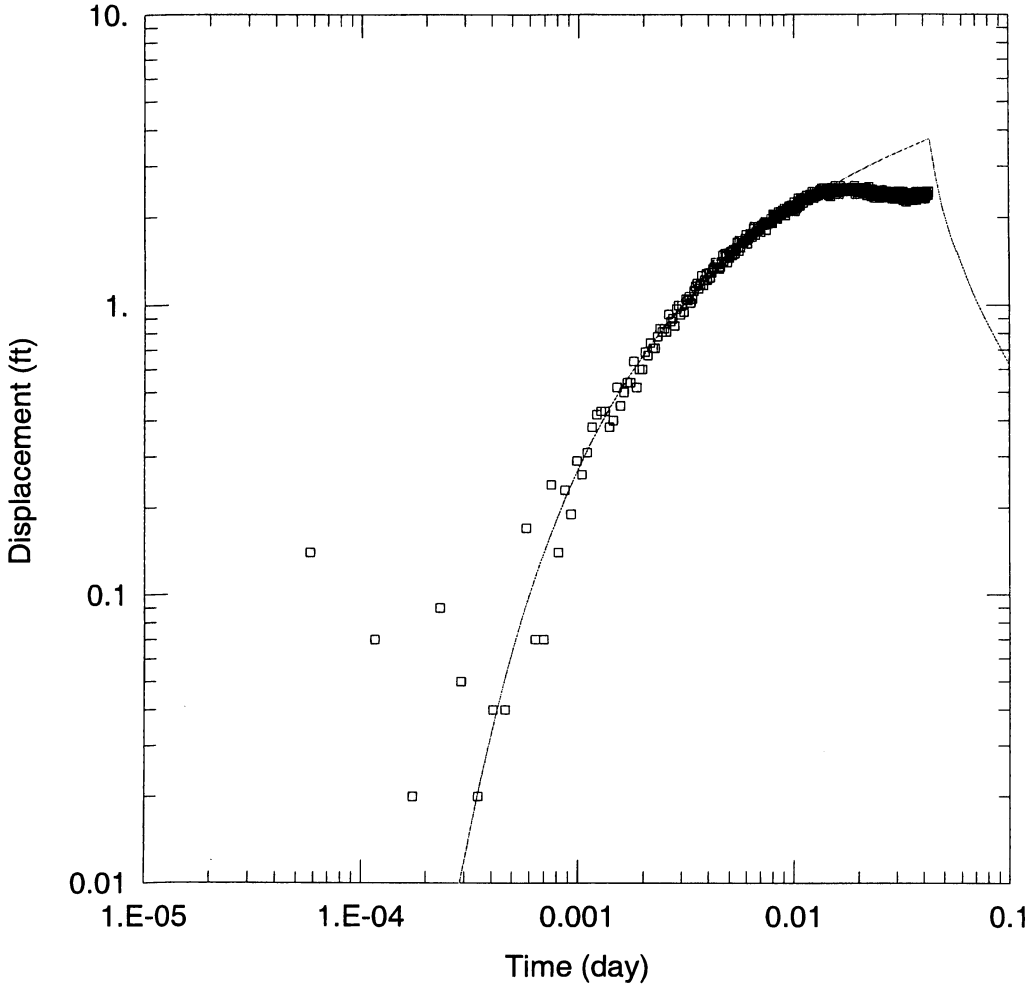
Observation Wells

Well Name	X (ft)	Y (ft)
MW5D 42-53	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.1672 cm^2/sec S = 1.321



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 42-53 theis.aqt
Date: 03/11/03 Time: 15:44:23

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 42 to 53 ft
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 42-53	0	0

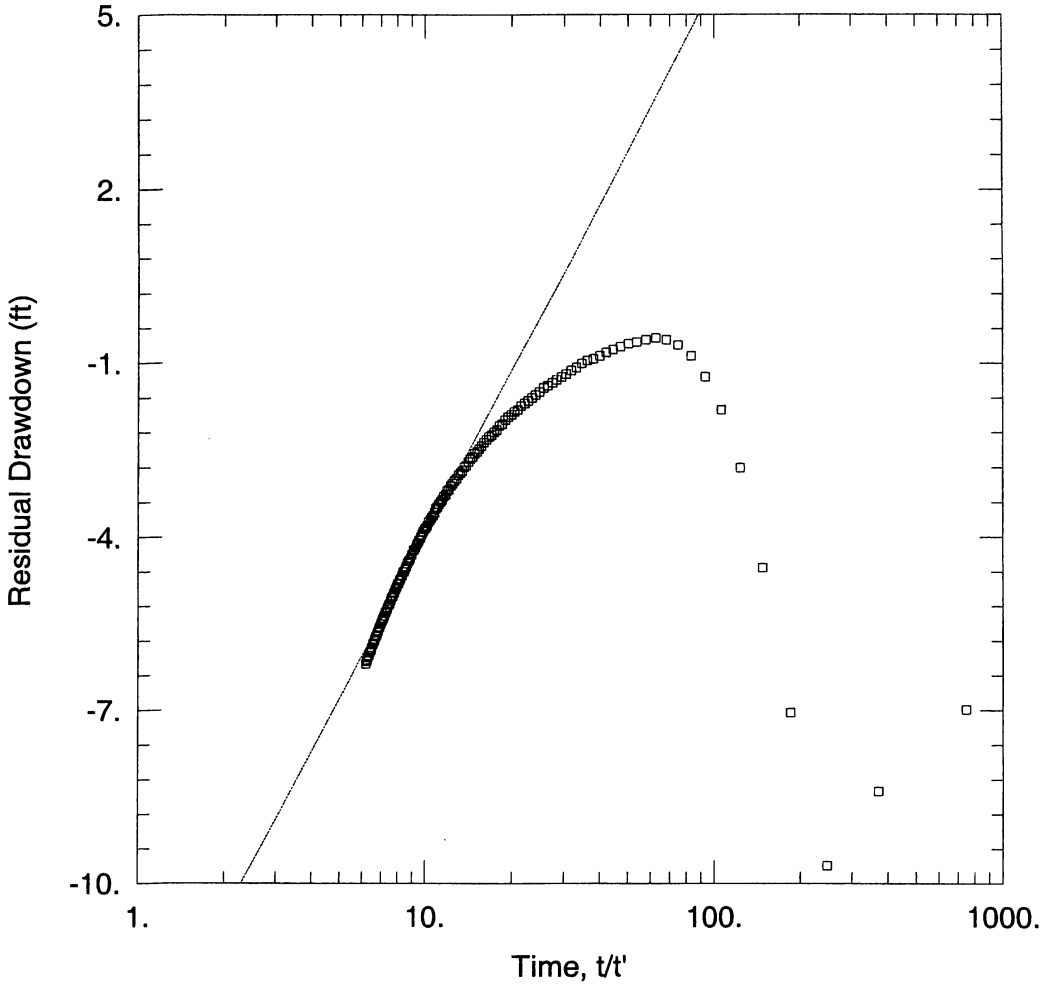
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 42-53	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.1434 cm^2/sec
S = 1.924
Kz/Kr = 1.
b = 93. ft



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 42-53 th rec.aqt
Date: 03/11/03 Time: 16:21:21

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 42 to 53 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 42-53	0	0

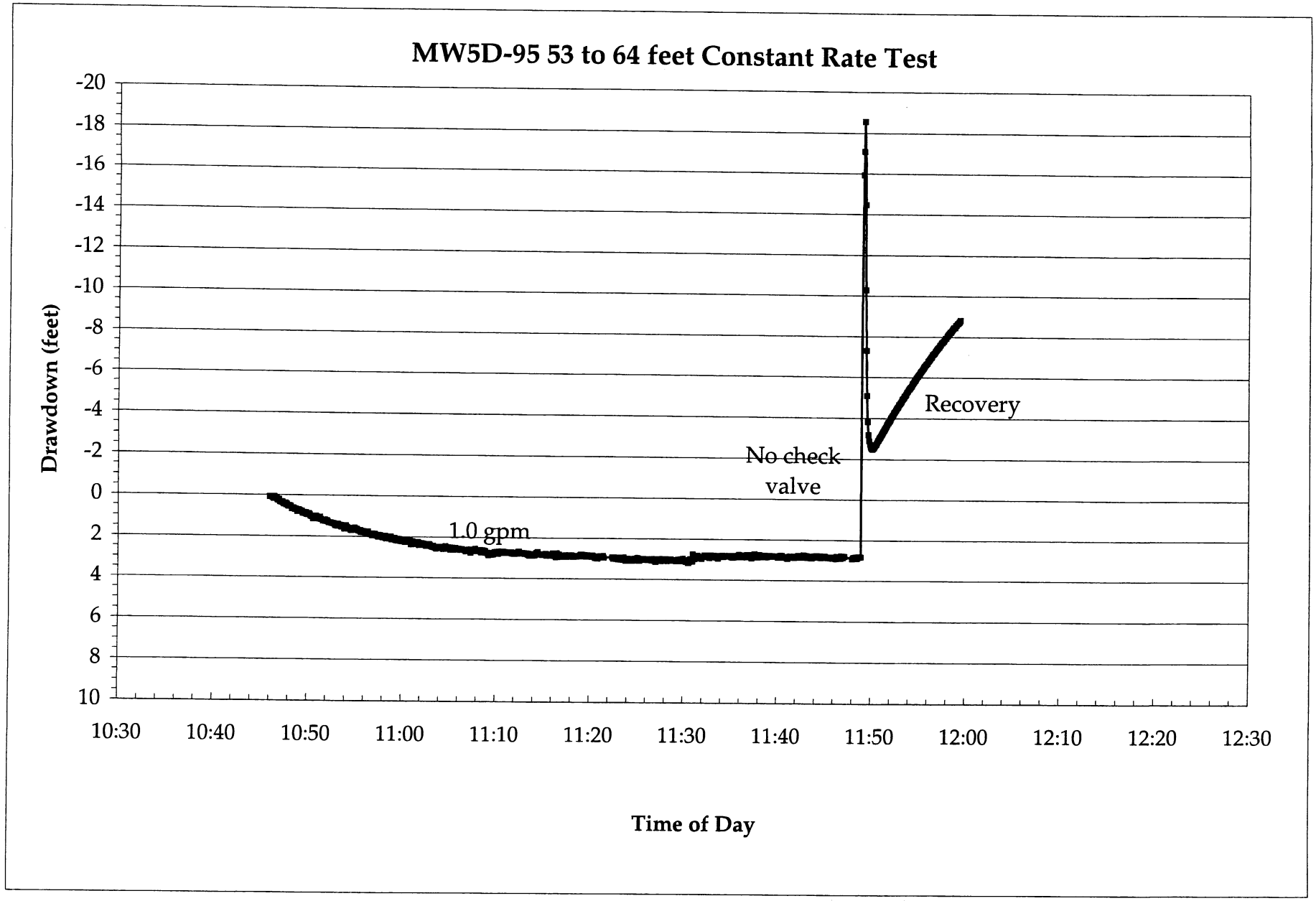
Observation Wells

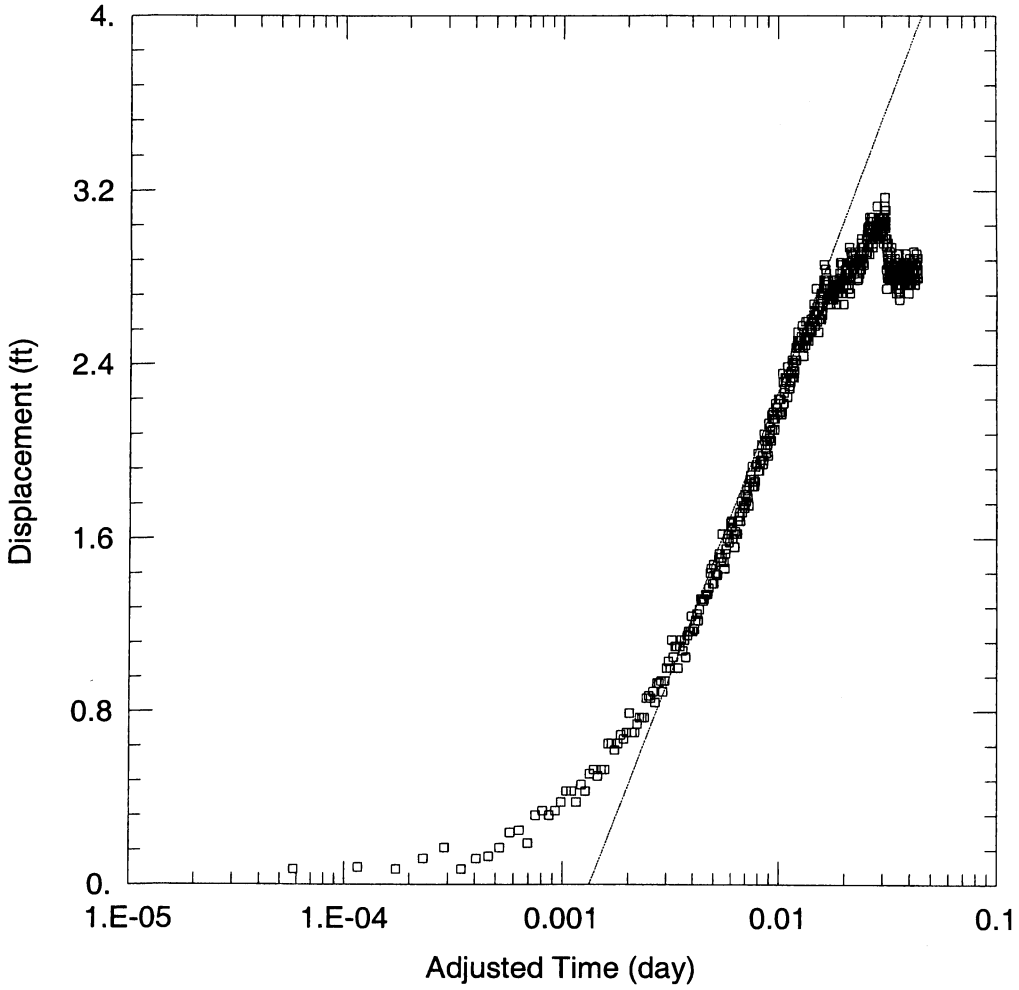
Well Name	X (ft)	Y (ft)
□ MW5D 42-53	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.04011 cm^2/sec S/S' = 26.07


MW5D-95 53 to 64 feet Constant Rate Test
Drawdown (feet)
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
10:30
10:40
10:50
11:00
11:10
11:20
11:30
11:40
11:50
12:00
12:10
12:20
12:30
Recovery
No check valve
1.0 gpm
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 53-64 cj.aqt
Date: 03/11/03 Time: 15:45:33

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 53 to 64 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 53-64	0	0

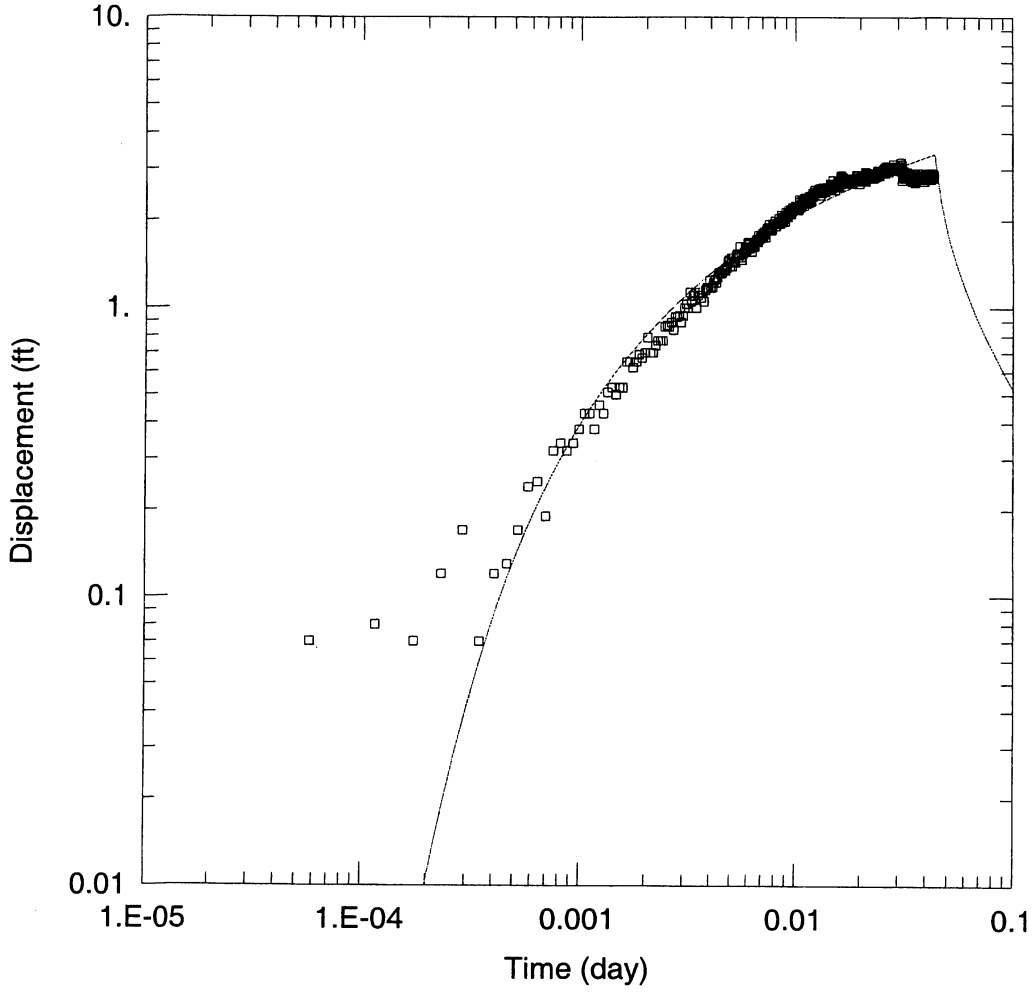
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 53-64	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.1459 cm^2/sec S = 1.531



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 53-64 theis.aqt
Date: 03/11/03 Time: 15:45:42

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 53 to 64 ft
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 53-64	0	0

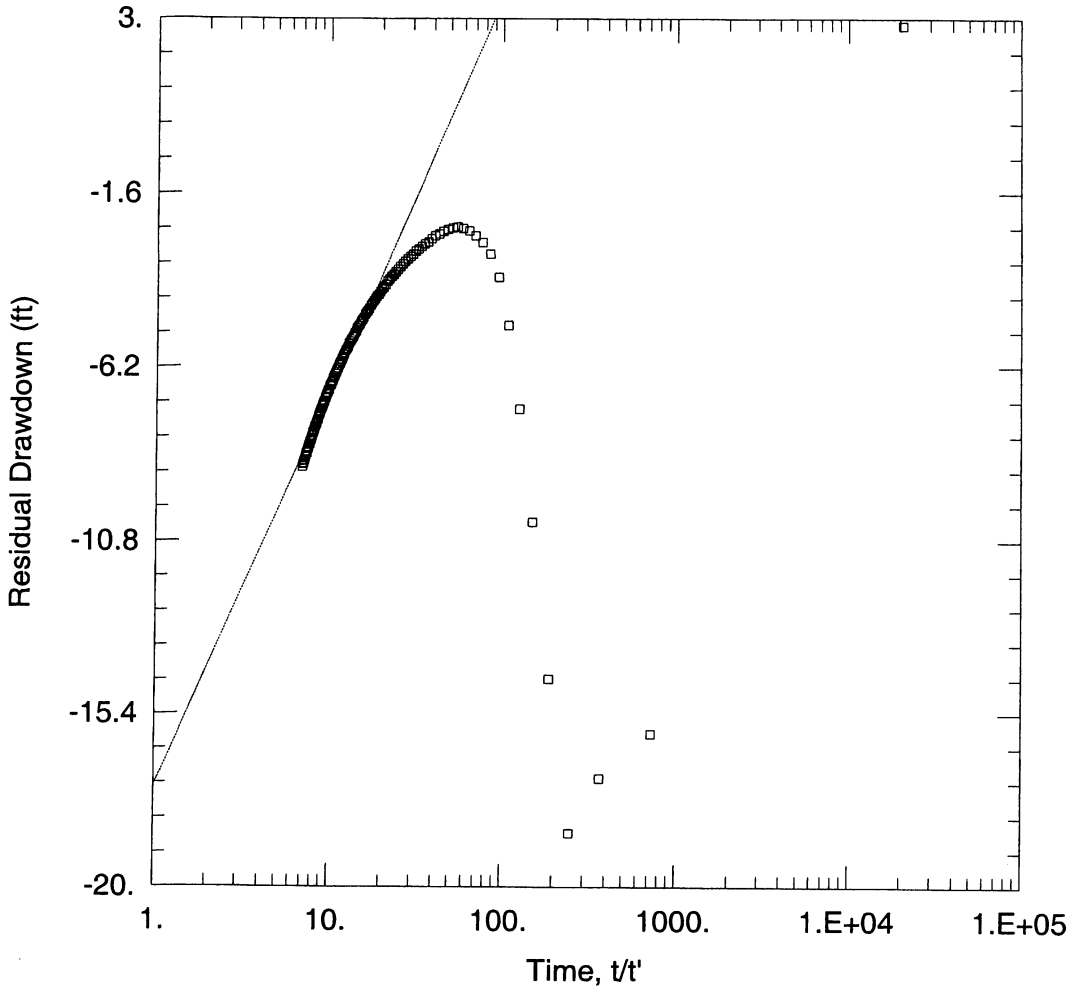
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 53-64	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.179 cm^2/sec
S = 1.571
Kz/Kr = 1.
b = 93. ft



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 53-64 th rec.aqt
Date: 03/11/03 Time: 15:45:58

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 53 to 64 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 53-64	0	0

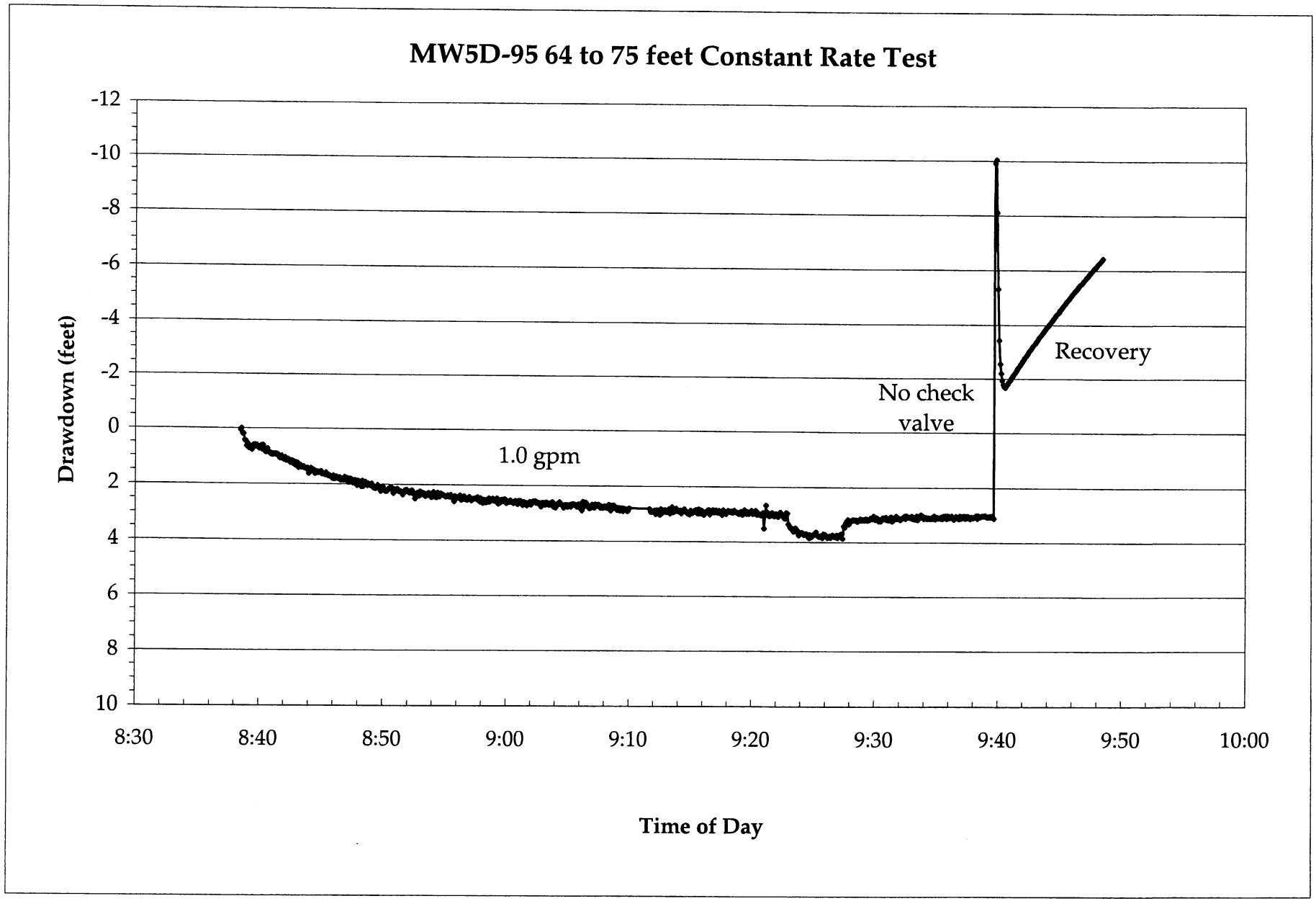
Observation Wells

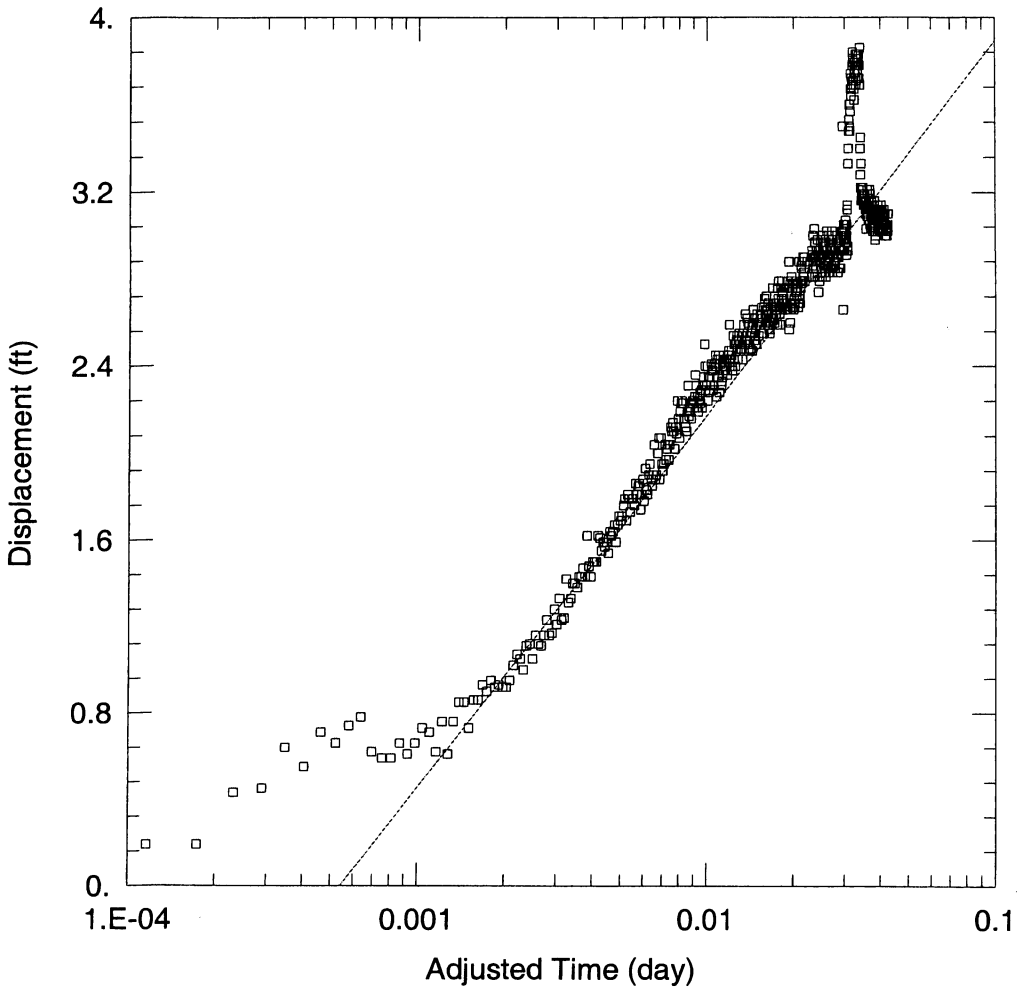
Well Name	X (ft)	Y (ft)
▫ MW5D 53-64	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.03637 cm^2/sec S/S' = 45.69


MW5D-95 64 to 75 feet Constant Rate Test
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
Drawdown (feet)
8:30
8:40
8:50
9:00
9:10
9:20
9:30
9:40
9:50
10:00
Time of Day
1.0 gpm
No check valve
Recovery



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 64-75 cj.aqt
Date: 03/11/03 Time: 15:46:13

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 64 to 75 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 64-75	0	0

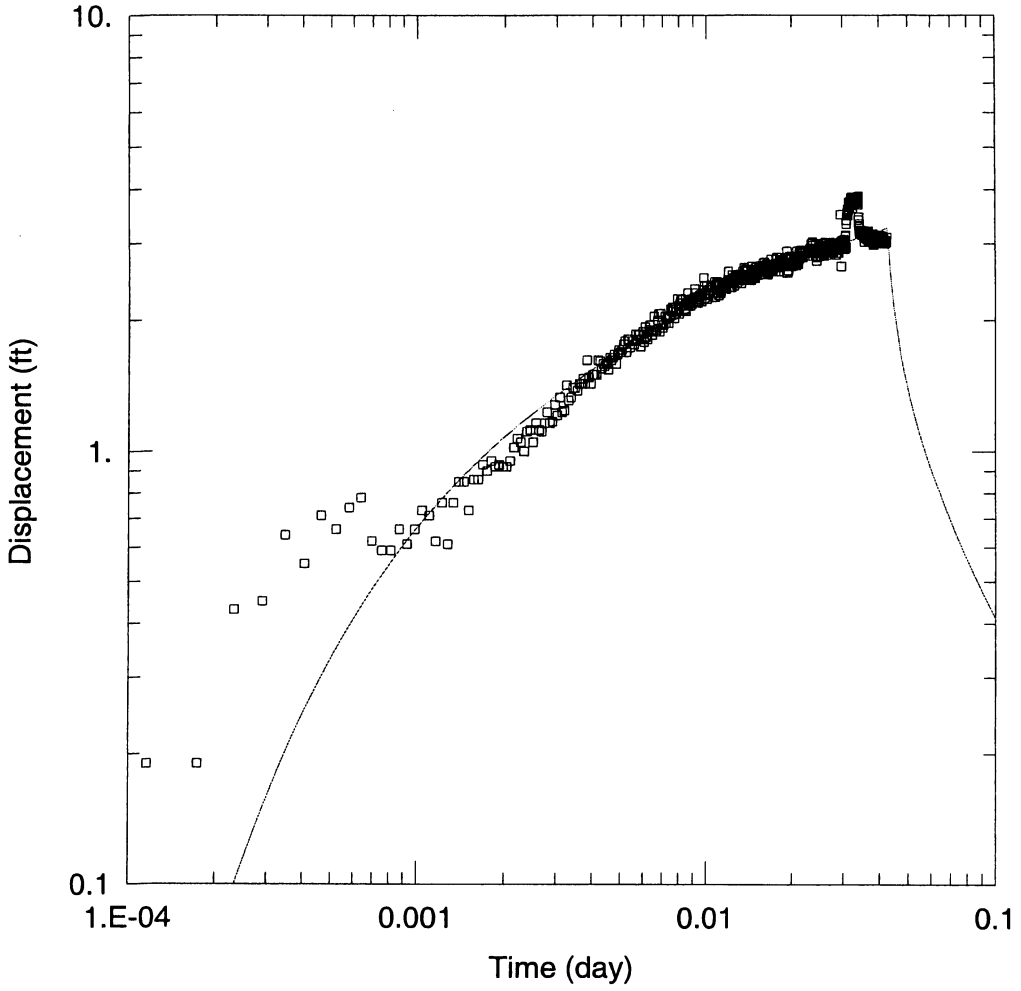
Observation Wells

Well Name	X (ft)	Y (ft)
MW5D 64-75	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.2207 cm^2/sec S = 0.9469



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 64-75 theis.aqt
Date: 03/11/03 Time: 15:46:24

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 64 to 75 ft
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 64-75	0	0

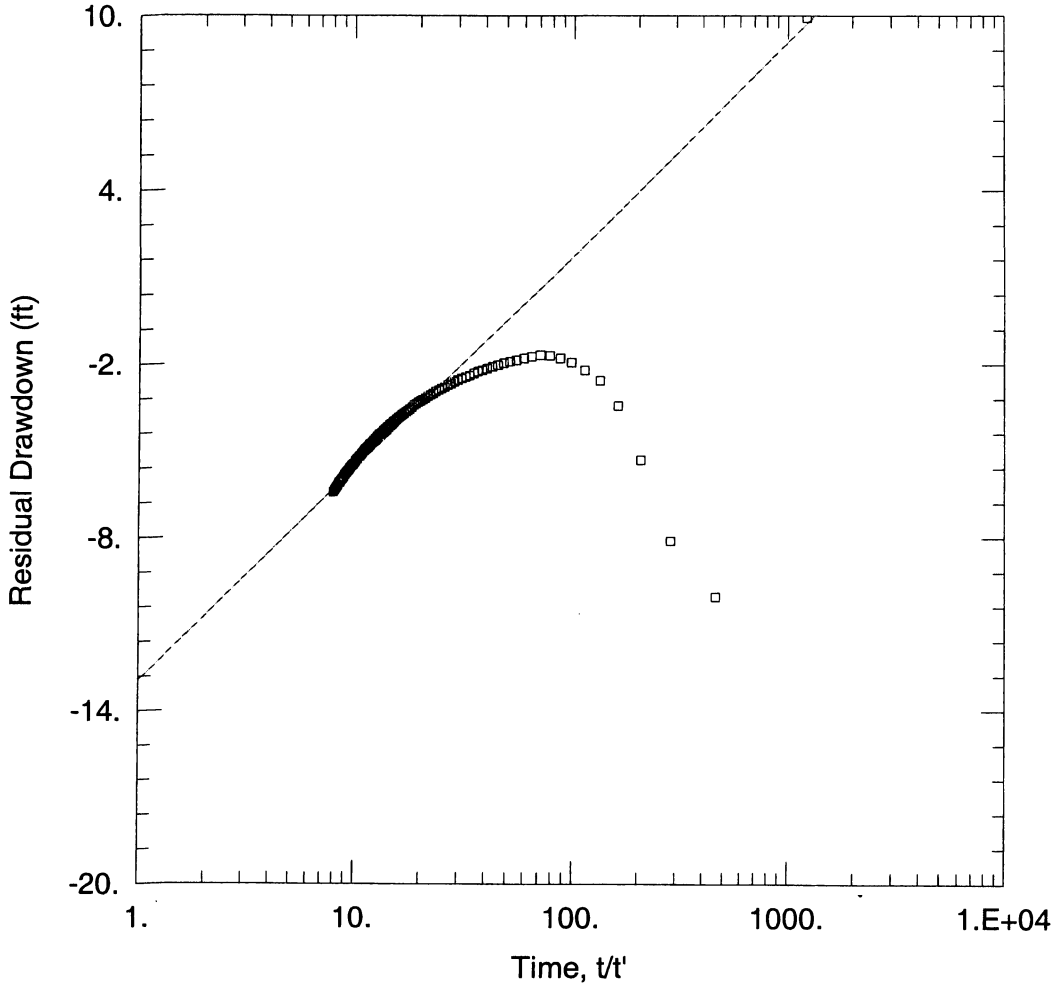
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 64-75	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.2207 cm^2/sec
S = 0.9469
Kz/Kr = 1.
b = 93. ft



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 64-75 th rec.aqt
Date: 03/11/03 Time: 16:22:26

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 64 to 75 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 64-75	0	0

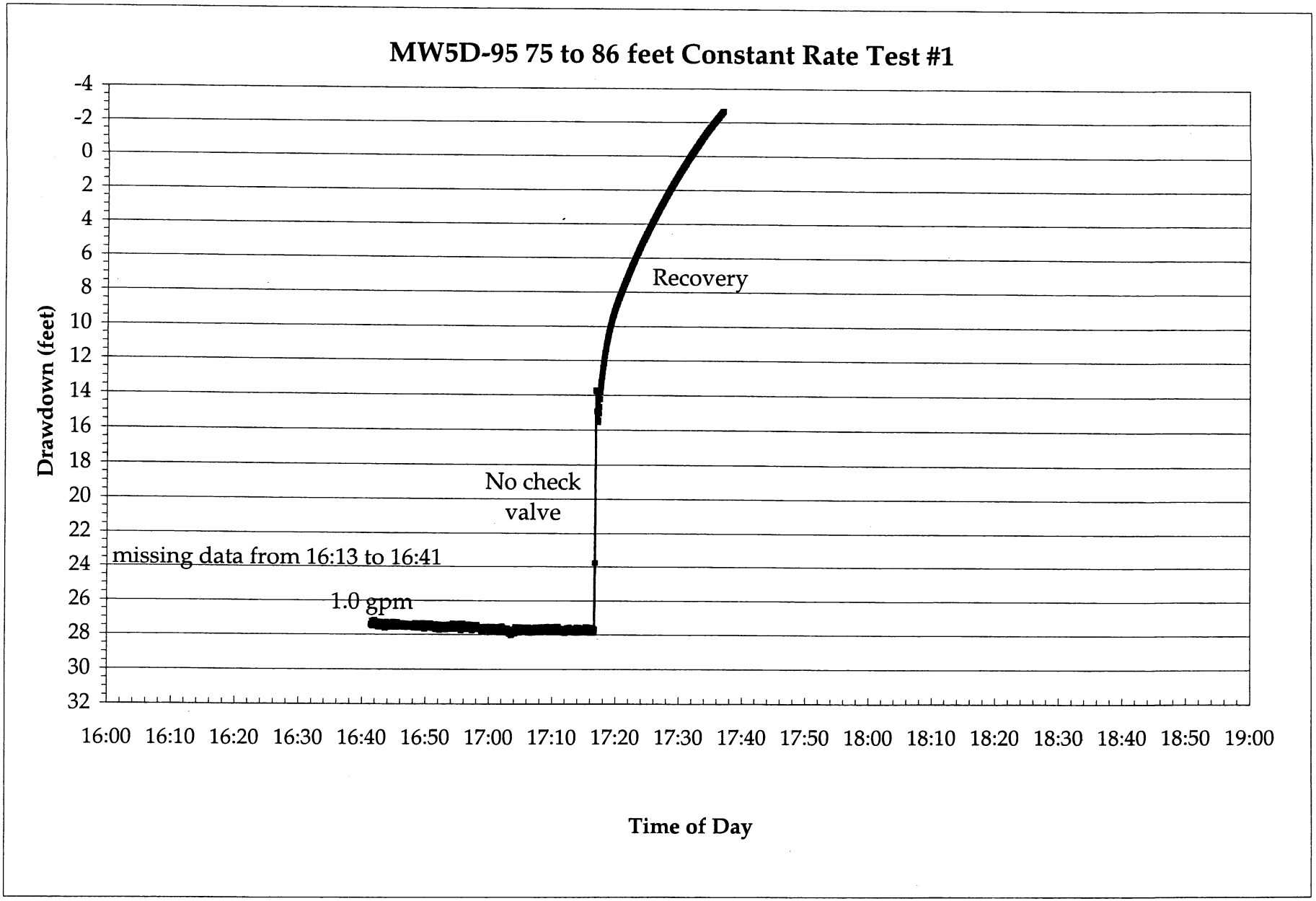
Observation Wells

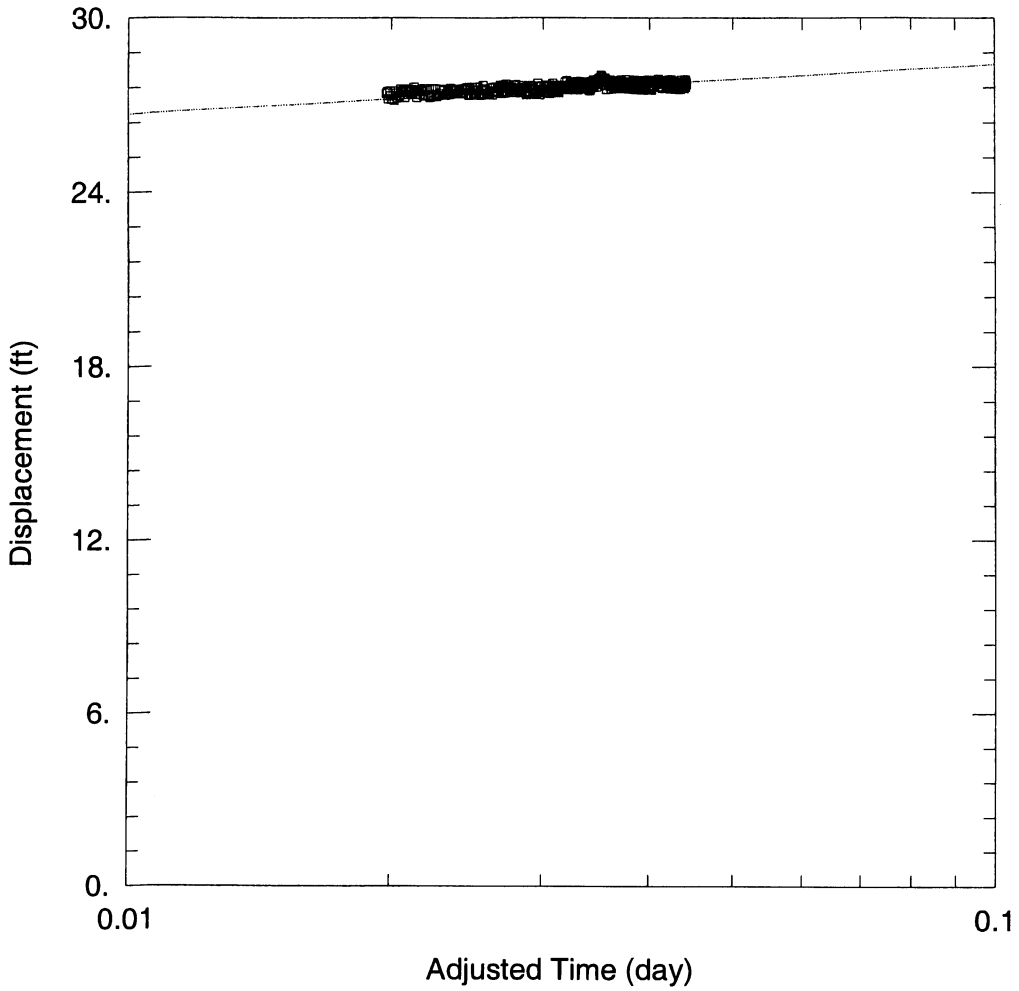
Well Name	X (ft)	Y (ft)
□ MW5D 64-75	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.0517 cm^2/sec S/S' = 57.83


MW5D-95 75 to 86 feet Constant Rate Test #1
Drawdown (feet)
-4
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
Recovery
No check valve
missing data from 16:13 to 16:41
1.0 gpm
16:00
16:10
16:20
16:30
16:40
16:50
17:00
17:10
17:20
17:30
17:40
17:50
18:00
18:10
18:20
18:30
18:40
18:50
19:00
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 75-86 #1.aqt
Date: 03/11/03 Time: 15:47:13

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 75 to 86 ft #1
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 75-86	0	0

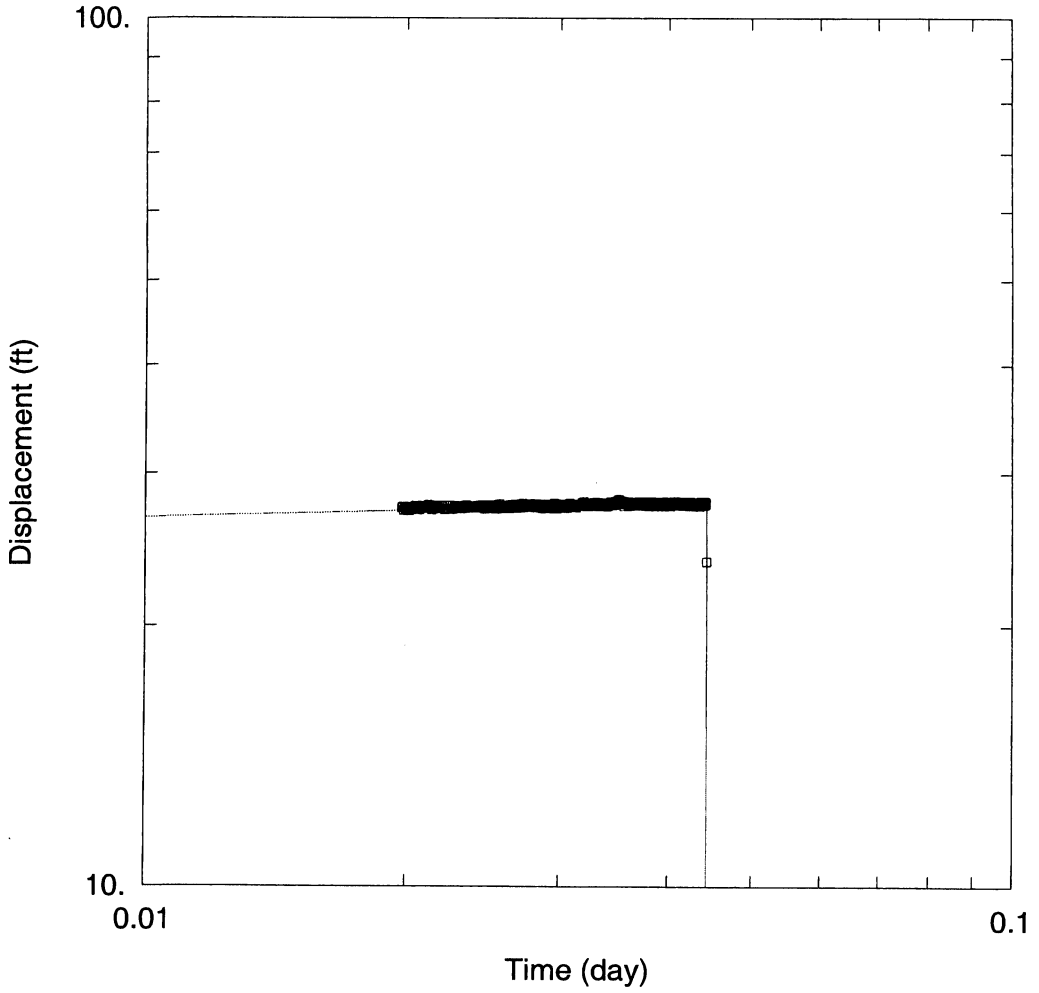
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 75-86	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.2234 cm^2/sec S = 3.35E-15



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 75-86 #1 theis.aqt
Date: 03/11/03 Time: 15:47:00

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 75 to 86 ft #1
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 75-86	0	0

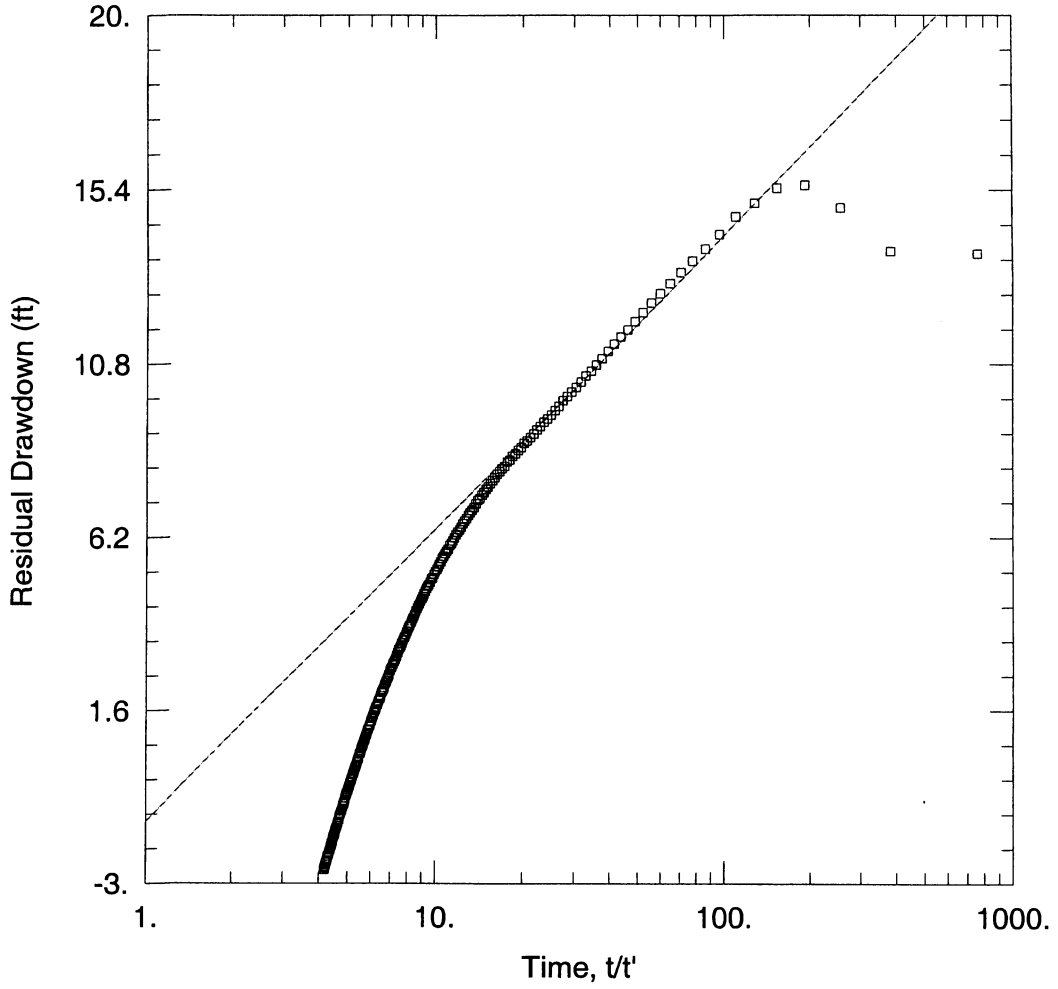
Observation Wells

Well Name	X (ft)	Y (ft)
MW5D 75-86	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.2234 cm^2/sec
S = 3.35E-15
Kz/Kr = 1.
b = 93. ft



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 75-86 #1 th rec.aqt
Date: 03/11/03 Time: 15:46:50

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 75 to 86 ft #1
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 75-86	0	0

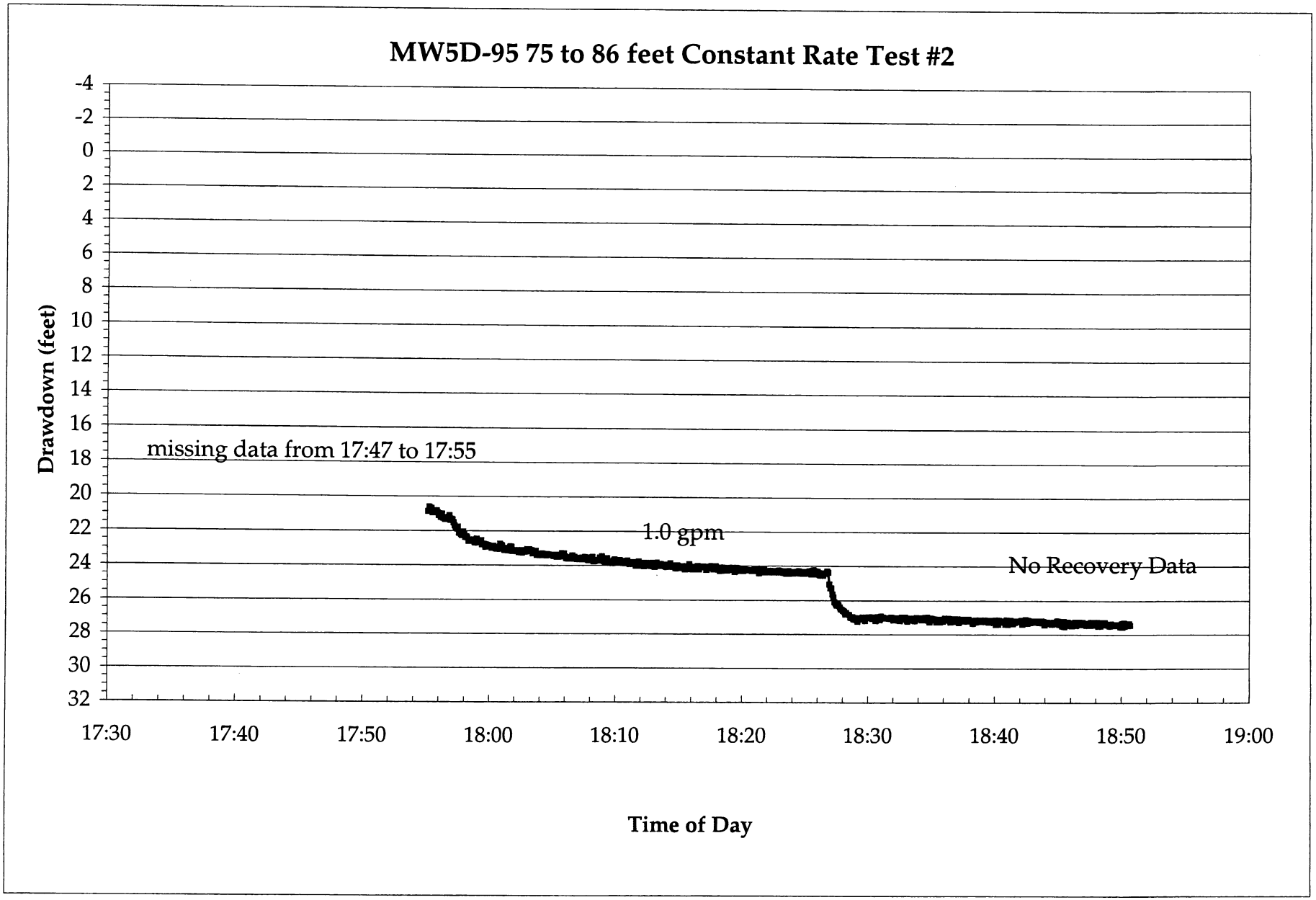
Observation Wells

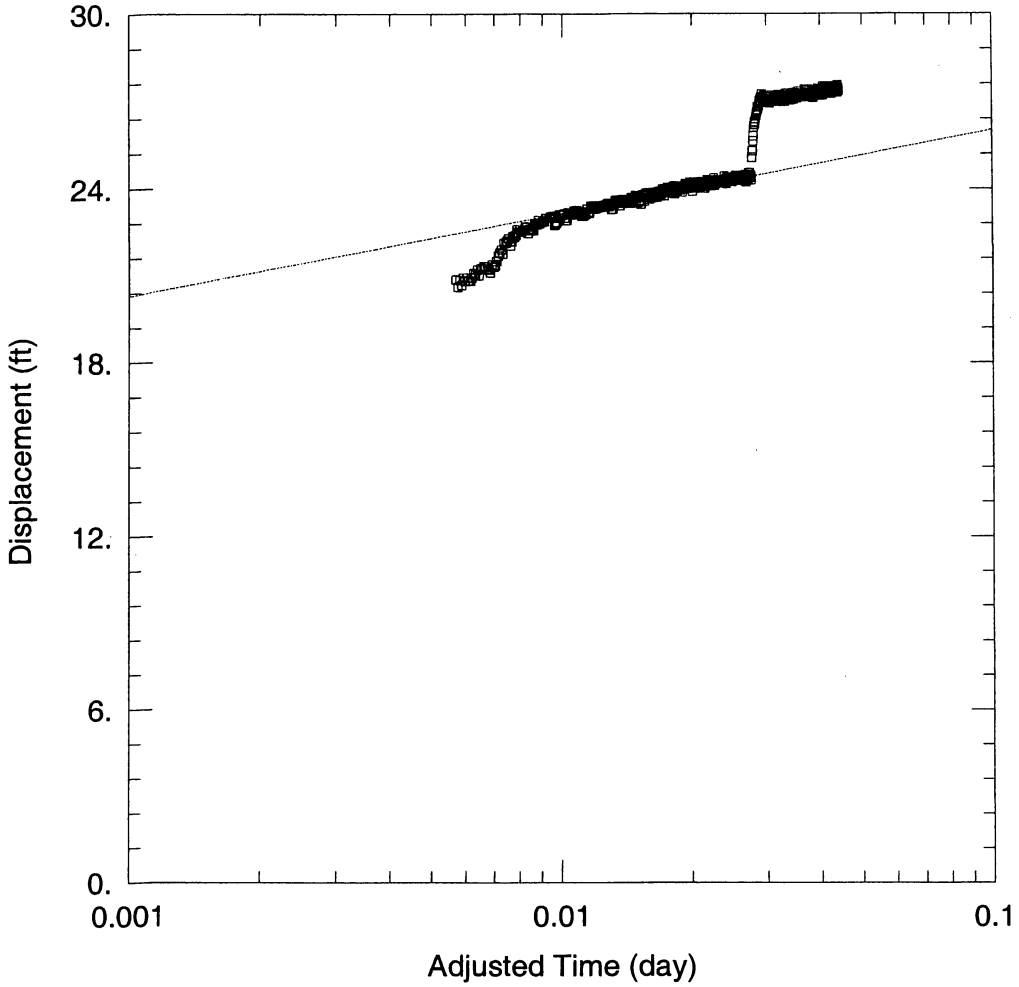
Well Name	X (ft)	Y (ft)
▫ MW5D 75-86	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 0.04878 cm^2/sec S/S' = 1.491


MW5D-95 75 to 86 feet Constant Rate Test #2
Drawdown (feet)
-4
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
missing data from 17:47 to 17:55
1.0 gpm
No Recovery Data
17:30
17:40
17:50
18:00
18:10
18:20
18:30
18:40
18:50
19:00
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 75-86 #2.aqt
Date: 03/11/03 Time: 15:47:58

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 75 to 86 ft #2
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 75-86	0	0

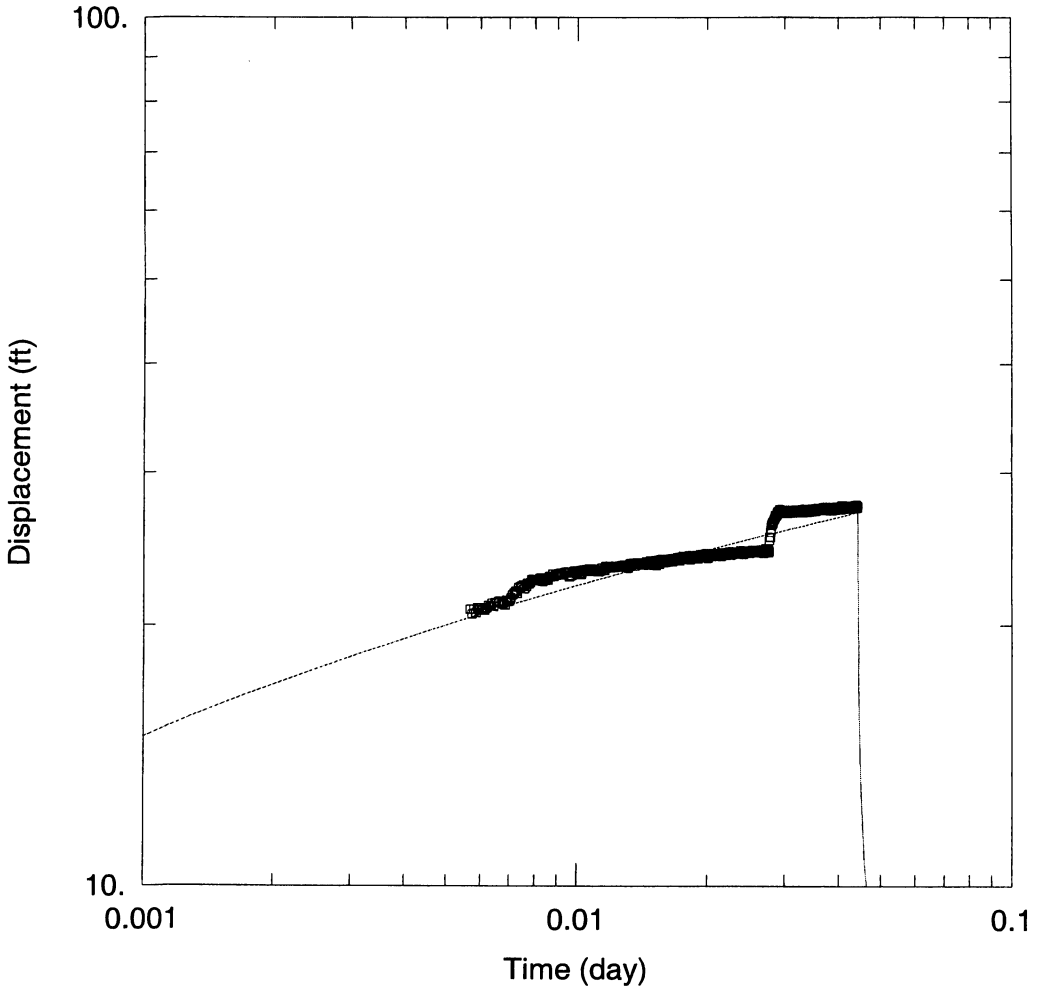
Observation Wells

Well Name	X (ft)	Y (ft)
▫ MW5D 75-86	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.1326 cm^2/sec S = 8.469E-08



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 75-86 #2 theis.aqt
Date: 03/11/03 Time: 15:47:50

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 75 to 86 ft #2
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 75-86	0	0

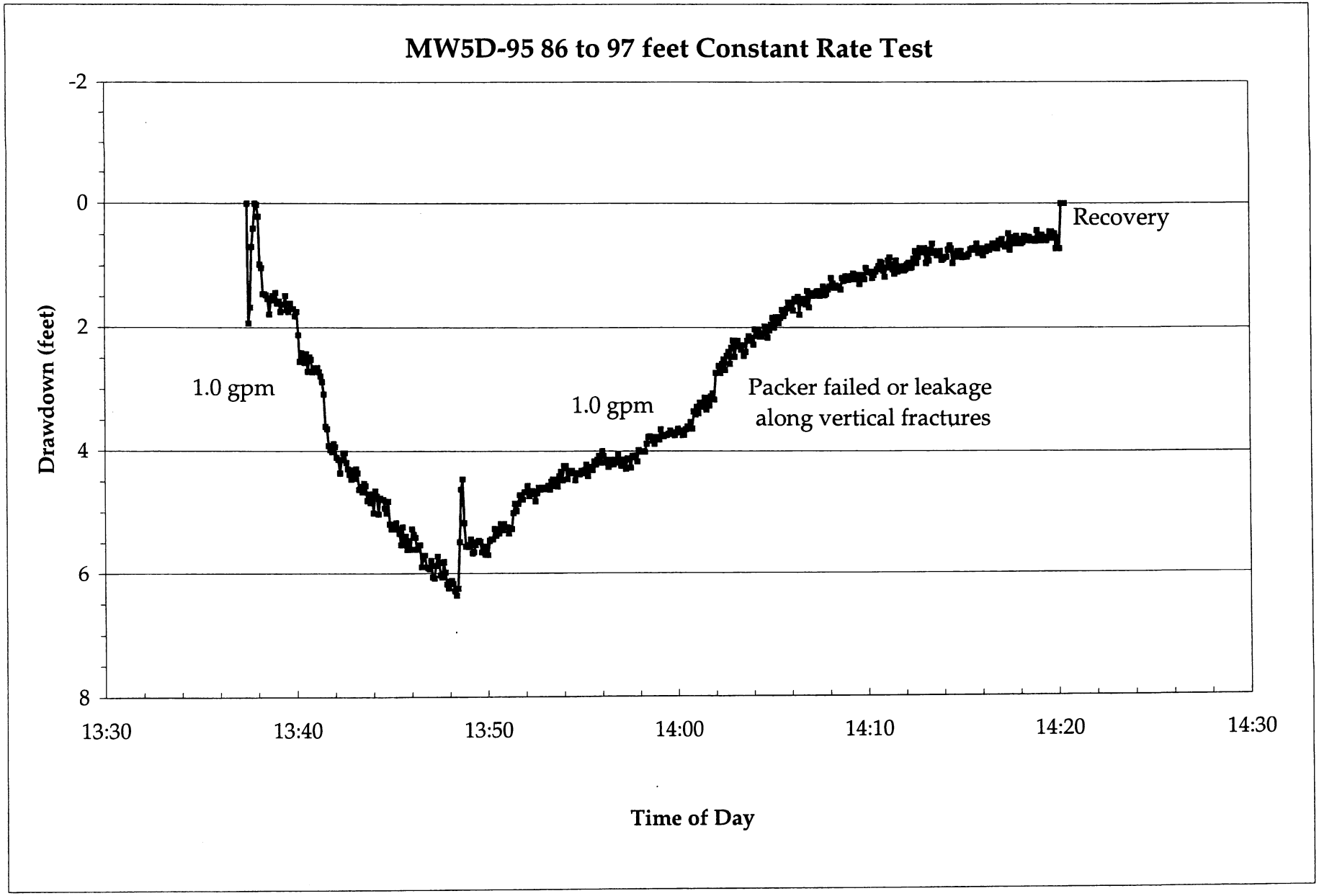
Observation Wells

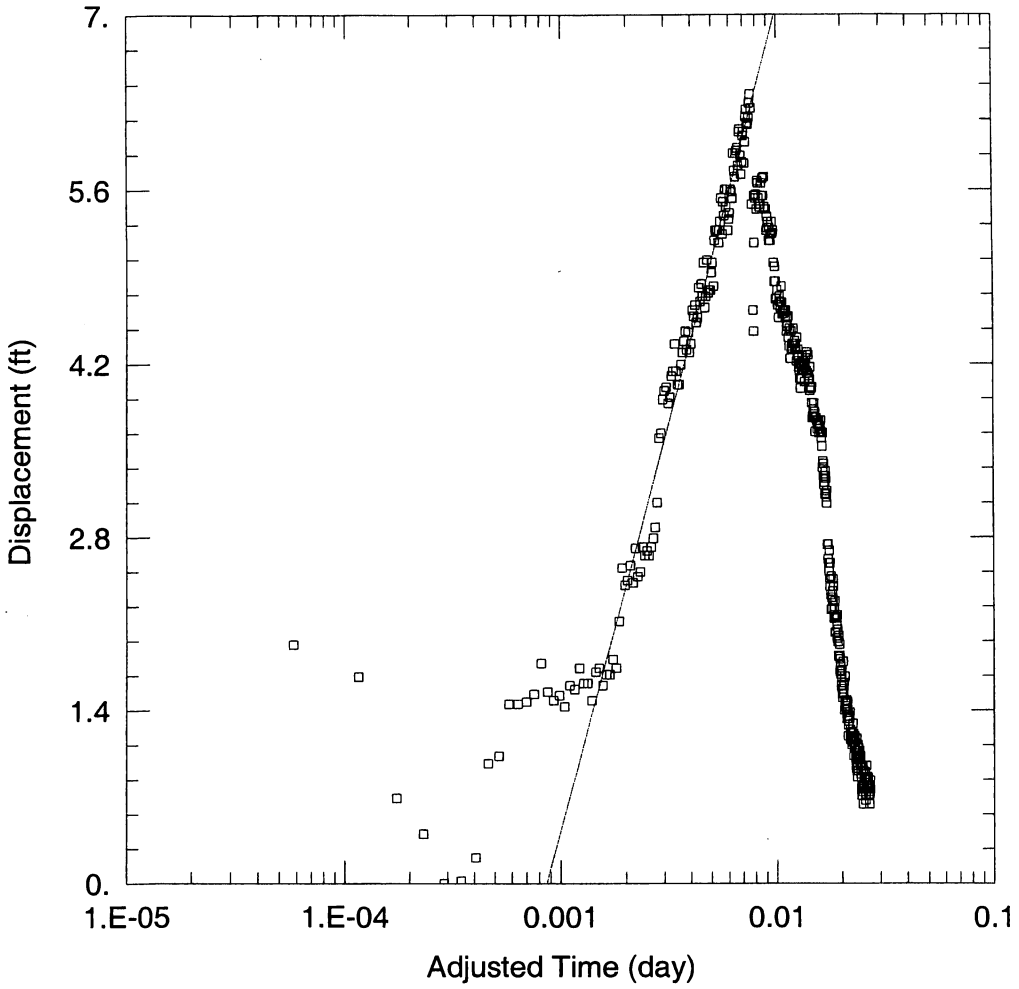
Well Name	X (ft)	Y (ft)
▫ MW5D 75-86	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.05144 cm^2/sec
S = 0.003931
Kz/Kr = 1.
b = 93. ft


MW5D-95 86 to 97 feet Constant Rate Test
-2
0
2
4
6
8
Drawdown (feet)
1.0 gpm
1.0 gpm
Packer failed or leakage
along vertical fractures
Recovery
13:30
13:40
13:50
14:00
14:10
14:20
14:30
Time of Day



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 86-97 cj.aqt
Date: 03/11/03 Time: 15:48:08

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 86 to 97 ft
Test Date: June 18, 2001

AQUIFER DATA

Saturated Thickness: 93. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 86-97	0	0

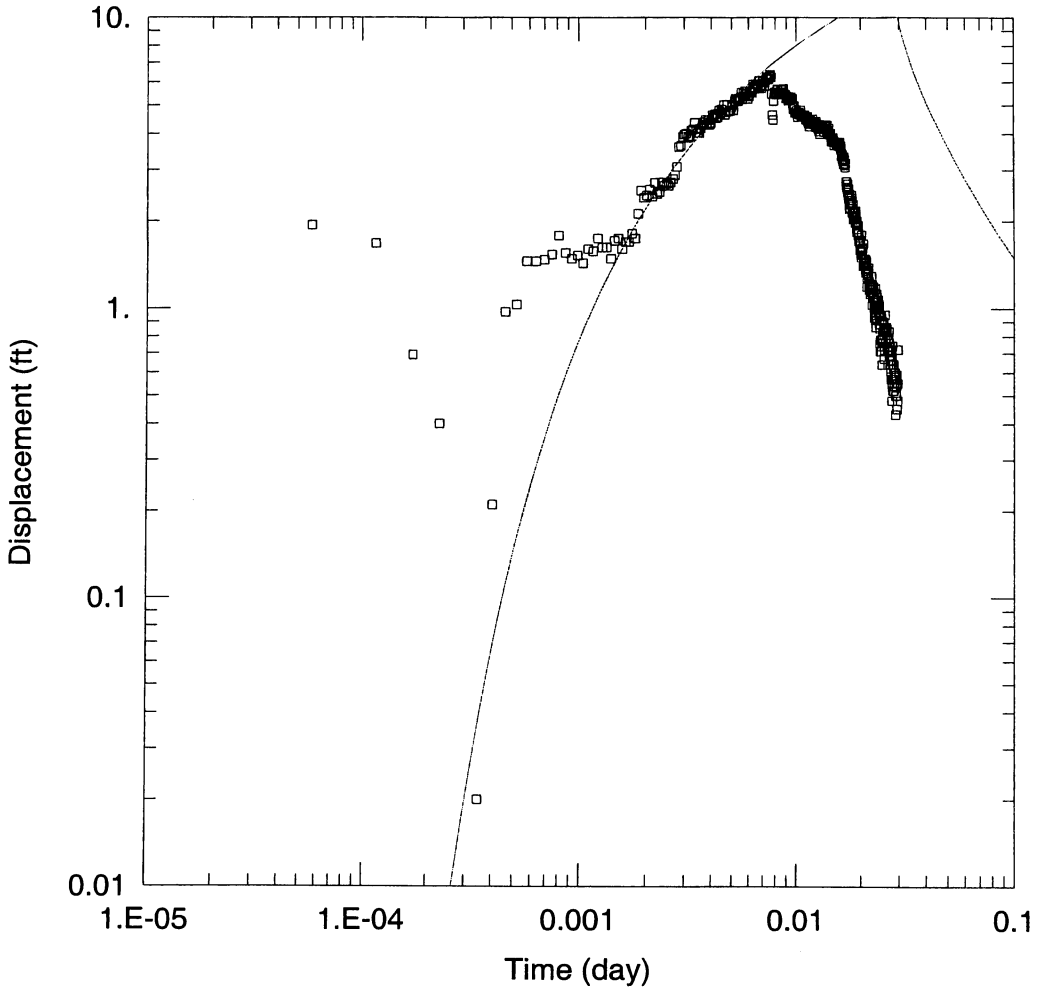
Observation Wells

Well Name	X (ft)	Y (ft)
MW5D 86-97	0.1625	0

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 0.05729 cm^2/sec S = 0.3901



WELL TEST ANALYSIS

Data Set: I:\...\MW5D 86-97 theis.aqt
Date: 03/11/03 Time: 15:48:16

PROJECT INFORMATION

Company: CRA
Project: 3698
Location: Maybrook
Test Well: MW5D-95 86 to 97 ft
Test Date: June 18, 2001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
MW5D 86-97	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
MW5D 86-97	0.1625	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 0.03434 cm^2/sec
S = 0.5725
Kz/Kr = 1.
b = 93. ft