SITE CHARACTERIZATION REPORT – HYDROLOGIC CHARACTERIZATION

HYDE PARK LANDFILL SITE
TOWN OF NIAGARA, NEW YORK

APPENDIX A – HYDRAULIC TESTING

Note: Microsoft Access is required to open the database.

Prepared For:
Miller Springs Remediation Management, Inc.
Glenn Springs Holdings, Inc.

Prepared By:
Services Environmental, Inc.
S.S. Papadopulos & Associates, Inc.
Conestoga-Rovers & Associates

A1. Overburden Hydraulic Conductivity

Memorandum

Date: February 20, 2003

From: Hyde Park Technical Team

To: George Luxbacher and Rick Passmore, Glenn Springs Holdings, Inc.

SSPA Project: 610

Re: **Overburden Hydraulic Conductivity**
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1. Summary

We have reviewed the available estimates of hydraulic conductivity for the Overburden sediments. Estimates of hydraulic conductivities are available from slug tests in wells, and from laboratory permeameter tests. The hydraulic conductivity values derived from these two confirm that the Overburden materials have low permeability at the Site, and represent an aquitard overlying the bedrock flow system.

2. Available data and analysis

1. There are 38 estimates derived from slug tests, 37 of which were conducted between 1987 and 1990. A slug test was conducted during the Site Hydrologic Recharacterization in September 2002, in a 1-inch diameter well installed temporarily near I1.

   The slug test estimates of hydraulic conductivity have been analyzed statistically. The hydraulic conductivity estimates have a wide range, from about 7×10^{-4} ft/day to 0.9 ft/day. The probability plot shown in Figure 1 confirms that the hydraulic conductivities are log-normally distributed. The median hydraulic conductivity is about 0.03 ft/day.

2. Laboratory permeameter tests were conducted on 8 samples collected during the Site Hydrologic Recharacterization. The Overburden samples were collected at the locations of the new multiple-completion wells C3, F6, I1, and J6.

   The estimates of hydraulic conductivity derived from the permeameter tests range from about 7×10^{-5} ft/day to 0.03 ft/day. This range is consistent with the results of the slug testing.

3. Grain size distributions were also developed for 24 sediment samples collected during the Site Hydrologic Recharacterization. The samples were collected at the locations of the new multiple-completion wells C3, F6, I1, and J6. The grain size analyses show fines content ranging from 50% to 98%. Based on past experience, the content of fines, e.g., silt and clay, control the permeability of sediments. Very low permeability (<0.01 ft/day) is expected for sediments having greater than 20% fines. The grain size analyses therefore provide qualitative confirmation of the low permeability of the Overburden at the Site.

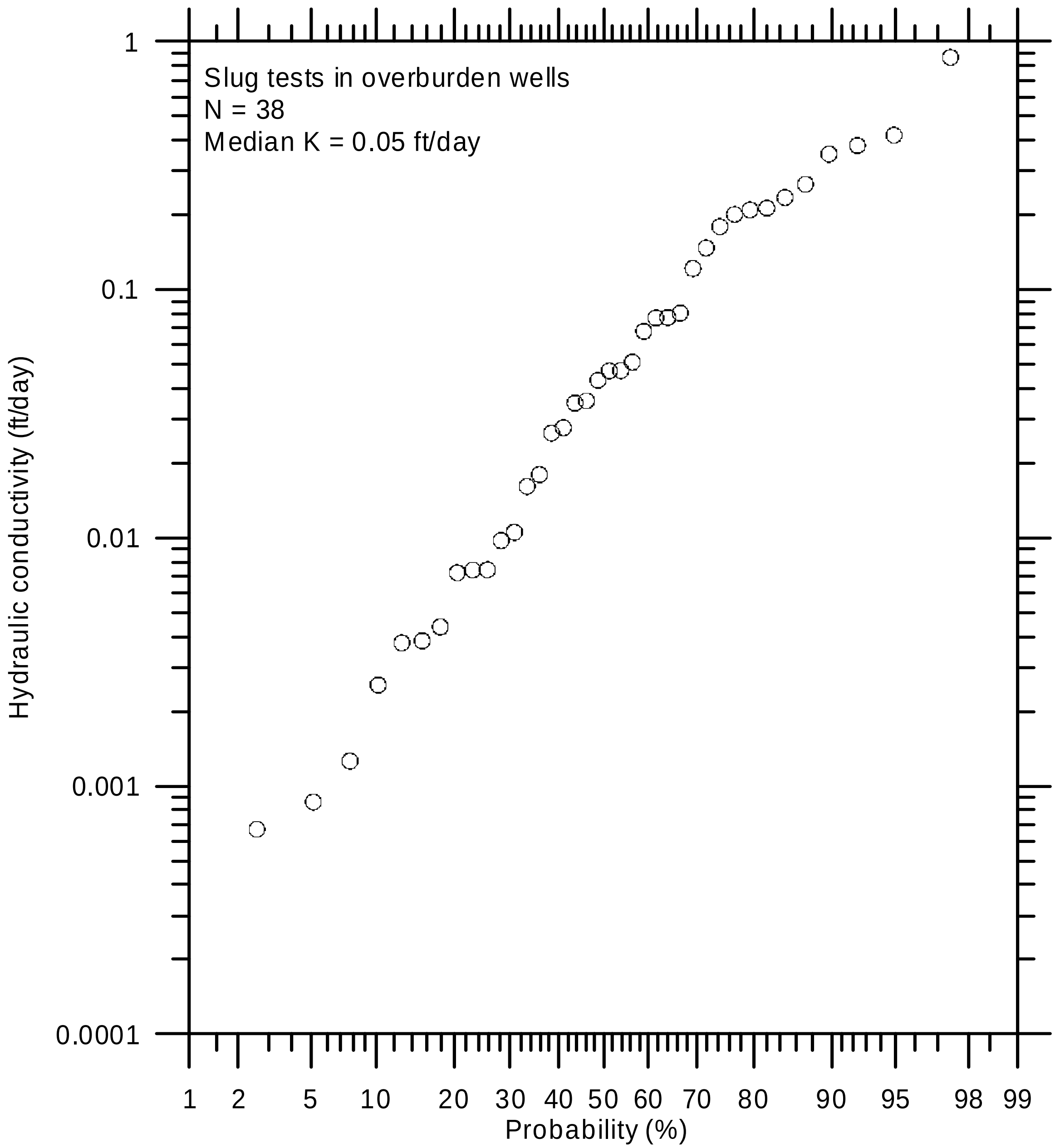

Figure 1 Probability plot of slug test results in Overburden wells

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: HYDE PARK RRT PROGRAM, 01069-30
LOCATION: NIAGARA FALLS, NEW YORK
PROJECT NO. 1300.92

CLIENT: CONESTOGA-ROVERS & ASSOCIATES

MATERIAL SOURCE: TEST BORINGS
DATE REPORTED: JANUARY 28, 2003

WORK ORDER NO. 4239

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
EXPLOR. NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
SHELBY TUBE	C3-01	0.0-2.0					99	11			7.8E-06	K	720	99.1	18.3	Brown Silt (ML)
SHELBY TUBE	C3-02	2.0-4.0					98	10								Strong Brown Silt (ML)
SHELBY TUBE	C3-03	4.0-6.0					94	27								Strong Brown Silty Clay (CL-ML)
SHELBY TUBE	C3-04	6.0-8.0					89	38								Strong Brown Lean Clay (CL)
SHELBY TUBE	C3-05	8.0-10.0					89	36								Strong Brown Silty Clay (CL-ML)
SHELBY TUBE	C3-06	10.0-12.0					88	31			1.8E-08	K	1296	108.1	21.0	Dark Brown Lean Clay (CL)
SHELBY TUBE	C3-07	12.0-14.0					91	35								Dark Brown Lean Clay (CL)
SHELBY TUBE	C3-08	14.0-16.0					100	58								Dark Brown Fat Clay (CH)
SHELBY TUBE	C3-09	16.0-18.0					98	65								Dark Brown Fat Clay (CH)
SHELBY TUBE	C3-10	18.0-20.0					97	33								Brown Lean Clay (CL)
SHELBY TUBE	C3-11	20.0-22.0					68	12			8.1E-08	K	2592	96.8	27.0	Dark Brown Sandy Silty Clay (CL-ML)
BAG SAMPLE	C3-12	22.0-24.0					45	10								Dark Brown Silty Clayey Gravel with Sand (GC-GM)
BAG SAMPLE	C3-13	24.0-26.0					43	6								Light Brown Silty Clayey Sand with Gravel (SC-SM)
SHELBY TUBE	J6-01	0.0-2.0					81	30			1.1E-06	K	720	109.2	19.3	Dark Brown Silty Clay with Sand (CL-ML)
SHELBY TUBE	J6-02	2.0-4.0					95	23								Brown Silty Clay (CL-ML)

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: HYDE PARK RRT PROGRAM, 01069-30
LOCATION: NIAGARA FALLS, NEW YORK
PROJECT NO. 1300.92

CLIENT: CONESTOGA-ROVERS & ASSOCIATES

MATERIAL SOURCE: TEST BORINGS
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EXPLOR. NUMBER	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERMEABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
SHELBY TUBE	J6-03	4.0-6.0					82	28								Strong Brown Silty Clay with Sand (CL-ML)
SHELBY TUBE	J6-04	6.0-8.0					83	34								Brown Silty Clay with Sand (CL-ML)
SHELBY TUBE	J6-05	8.0-10.0					87	34			2.2E-07	K	1152	110.4	17.6	Brown Silty Clay (CL-ML)
SHELBY TUBE	J6-06	10.0-12.0					71	23								Strong Brown Silty Clay with Sand (CL-ML)
SHELBY TUBE	J6-07	12.0-14.0					79	14			7.2E-08	K	1584	95.6	24.7	Strong Brown Silt with Sand (ML)
SHELBY TUBE	I1-01	8.0-10.0					53	8			8.4E-07	K	1152	110.7	19.6	Strong brown Sandy Silt (ML)
SHELBY TUBE	F6-01	4.0-6.0					97	9								Strong Brown Silt (ML)
SHELBY TUBE	F6-02	6.0-8.0					97	15								Strong Brown Silty Clay (CL-ML)
SHELBY TUBE	F6-03	8.0-10.0					98	18			8.0E-07	K	1296	100.3	21.8	Strong Brown Silty Clay (CL-ML)

GZA GeoEnvironmental of New York
Engineers and Scientists

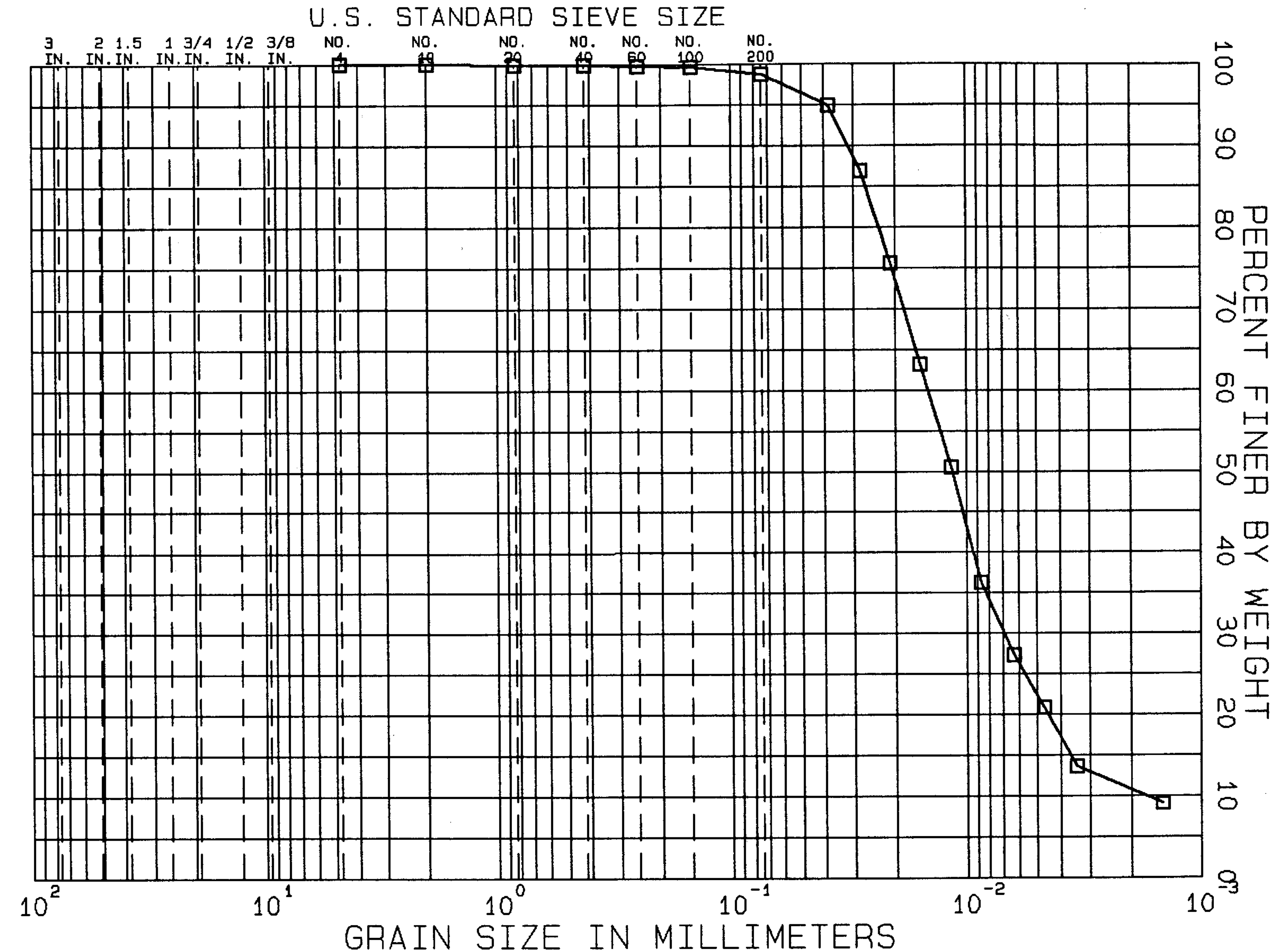
Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK RRT PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-01
DEPTH 0'-2'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4230
DATE 1/23/03
FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
1.1	SHELBY TUBE SAMPLE	Brown Silt (ML)

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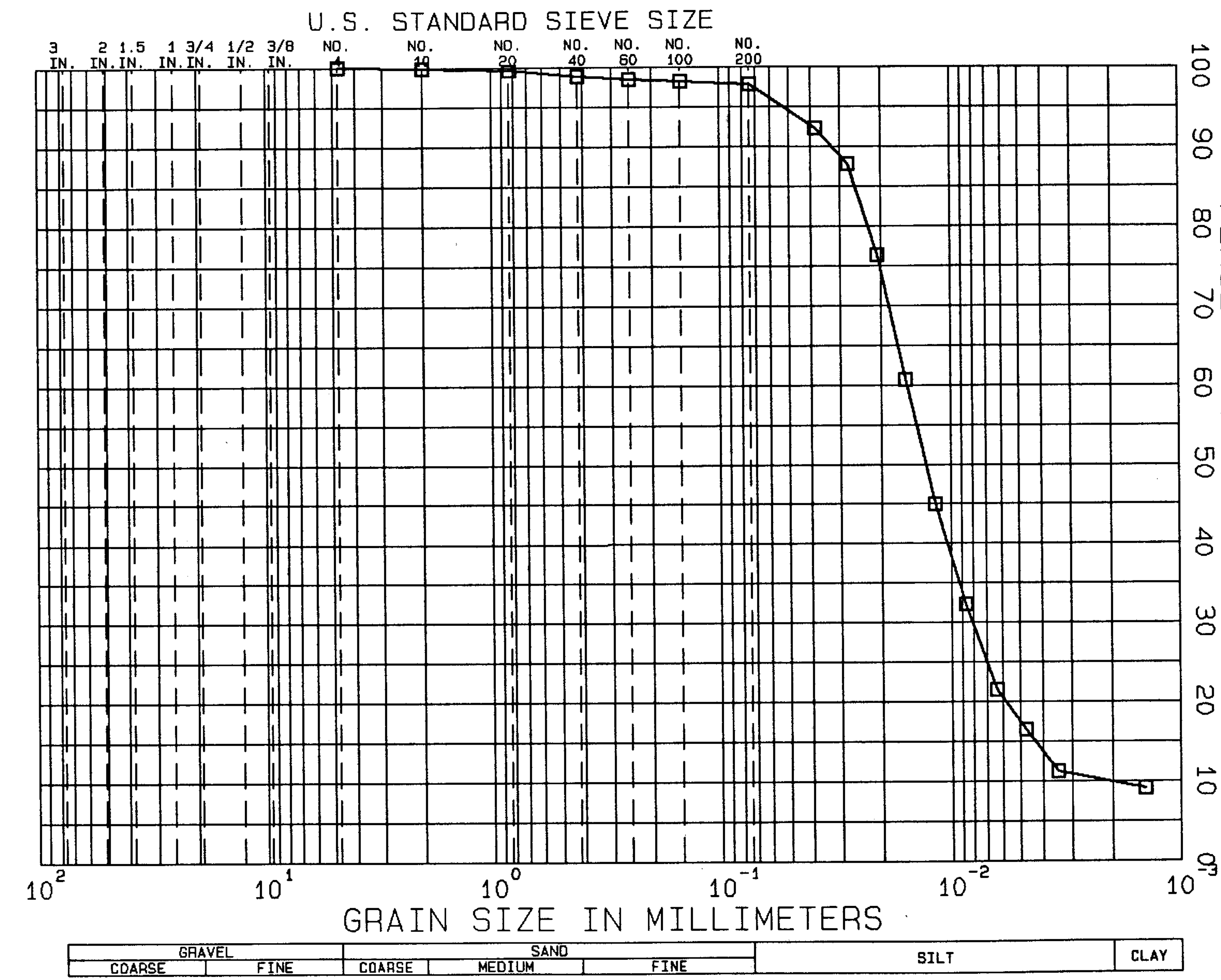
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-02
DEPTH 2'-4'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
2.1	SHELBY TUBE SAMPLE	Strong Brown Silt (ML)

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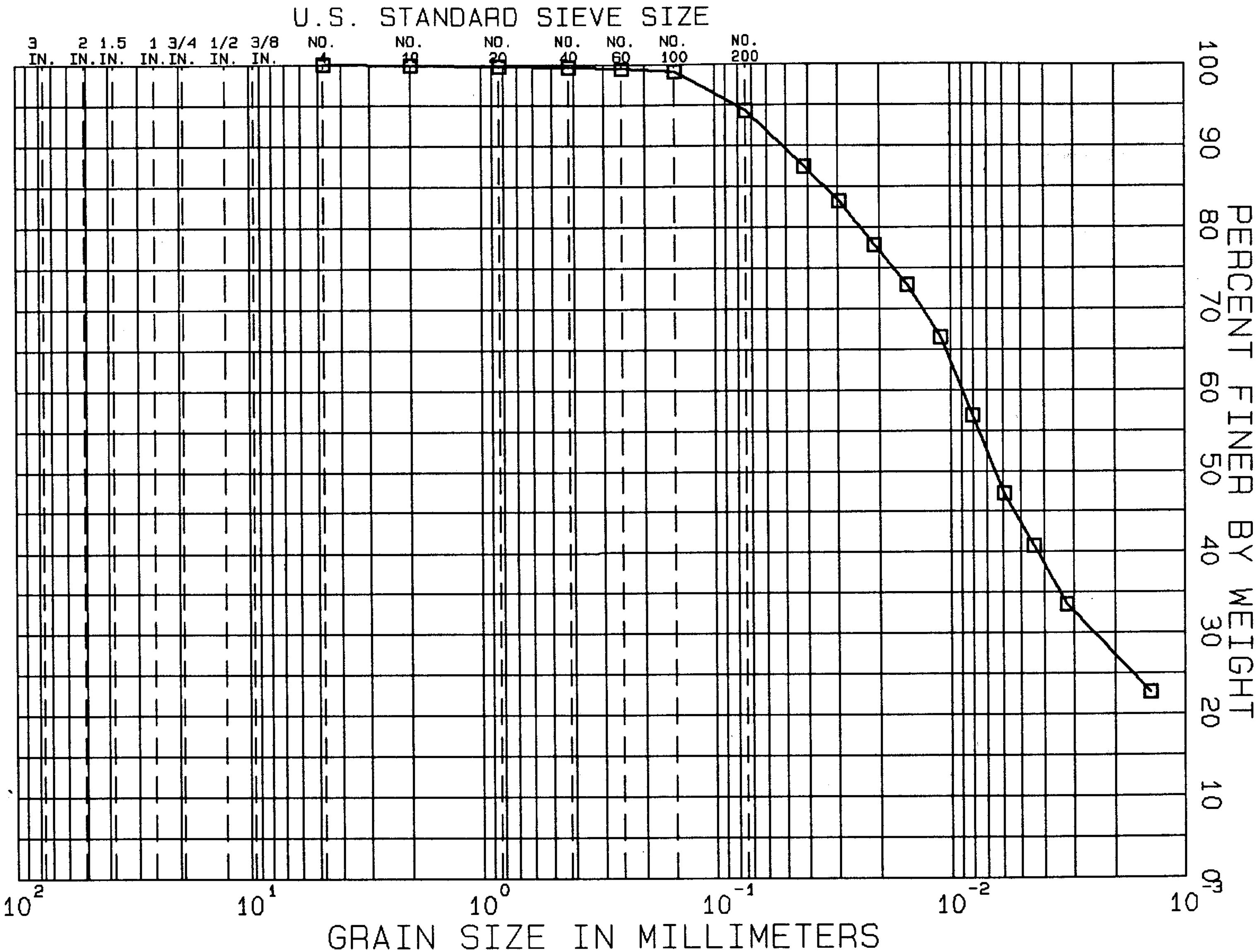
Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-03
DEPTH 4'-6'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4239
DATE 1/23/03
FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
3.1	SHELBY TUBE SAMPLE	Strong Brown Silty Clay (CL-ML)

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Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

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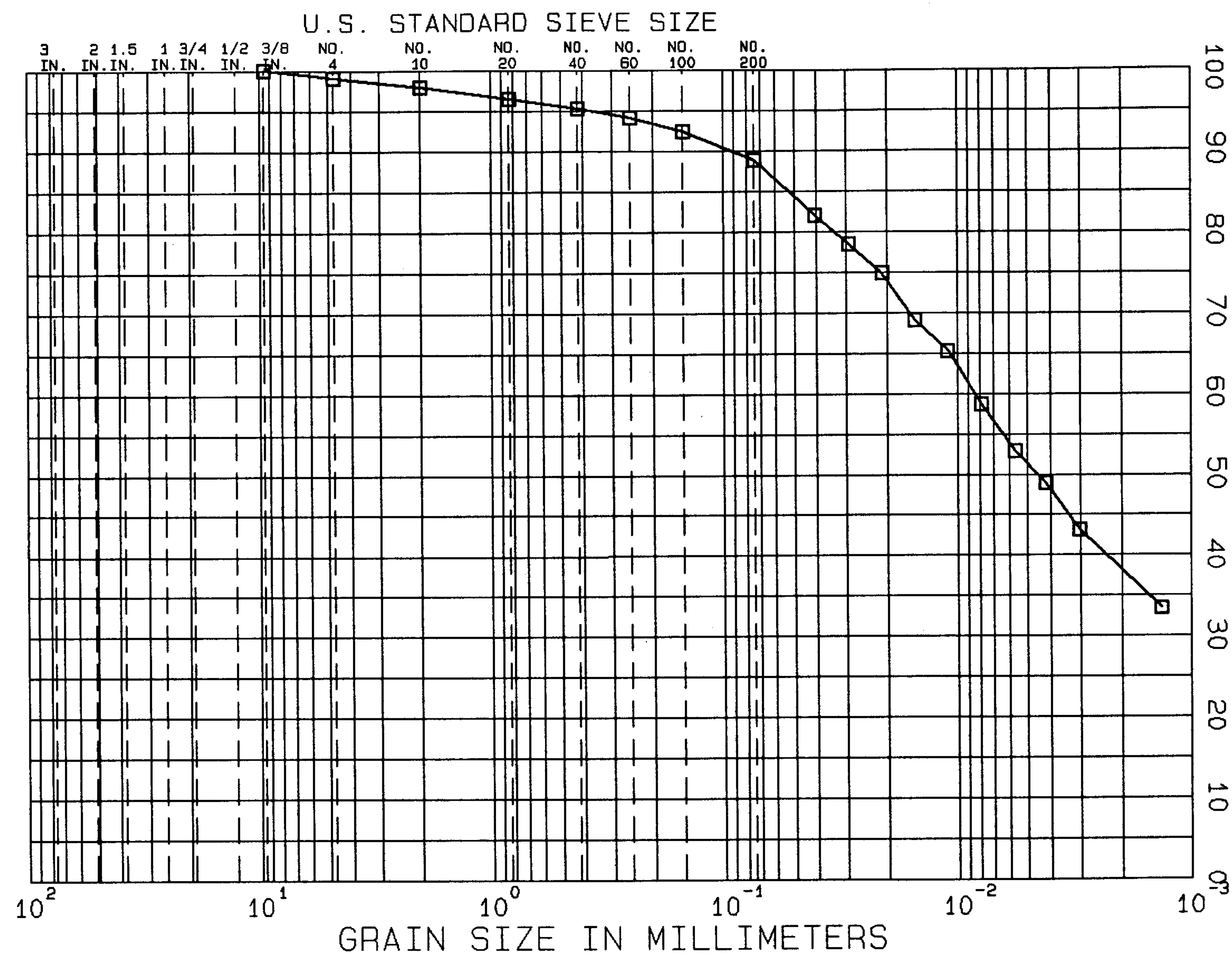
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. C3-04
SAMPLE NO.
DEPTH 6'-8'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
4.1	SHELBY TUBE SAMPLE	Strong Brown Lean Clay (CL)

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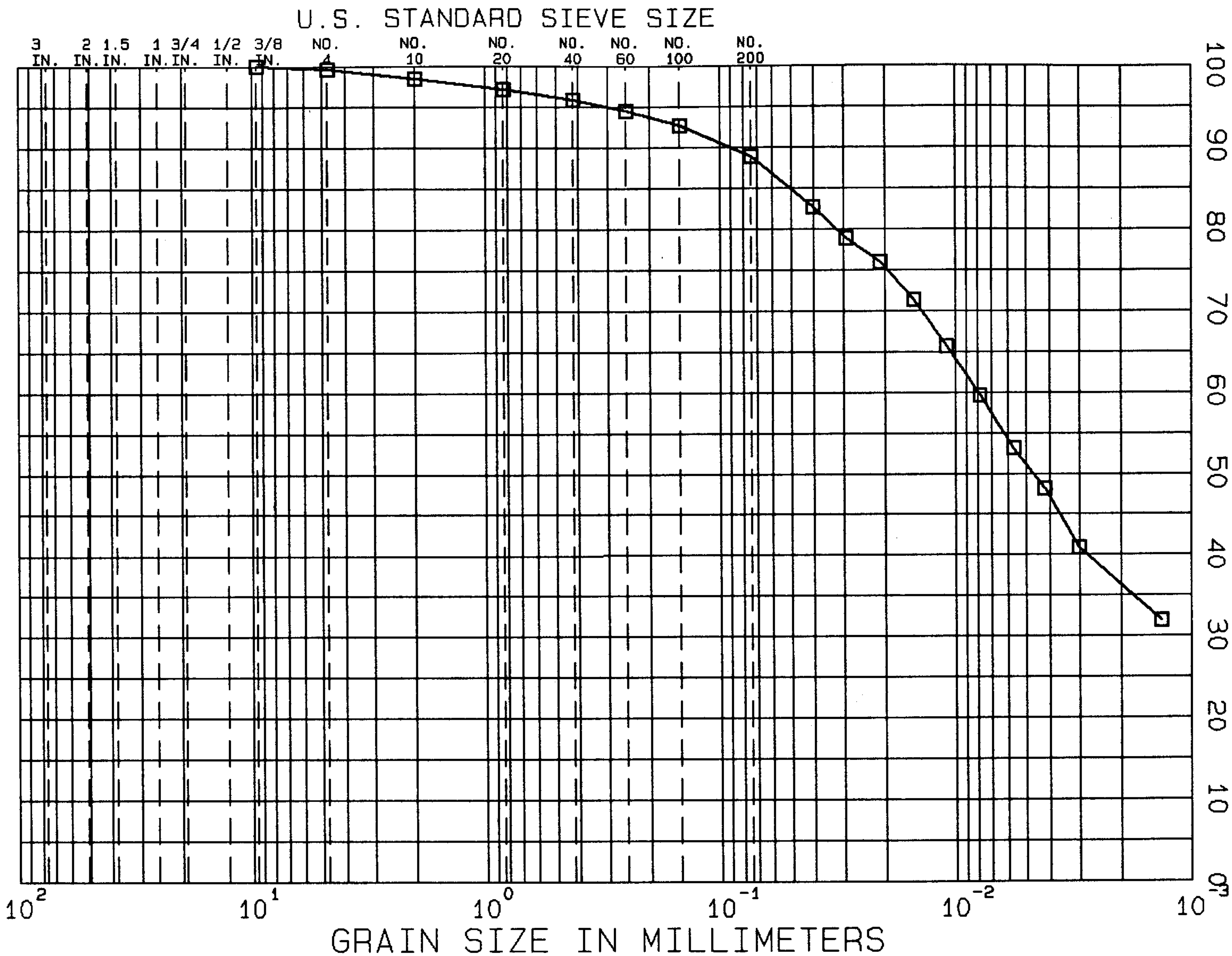
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-05
DEPTH 8'-10'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
5.1	SHELBY TUBE SAMPLE	Strong Brown Silty Clay (CL-ML)

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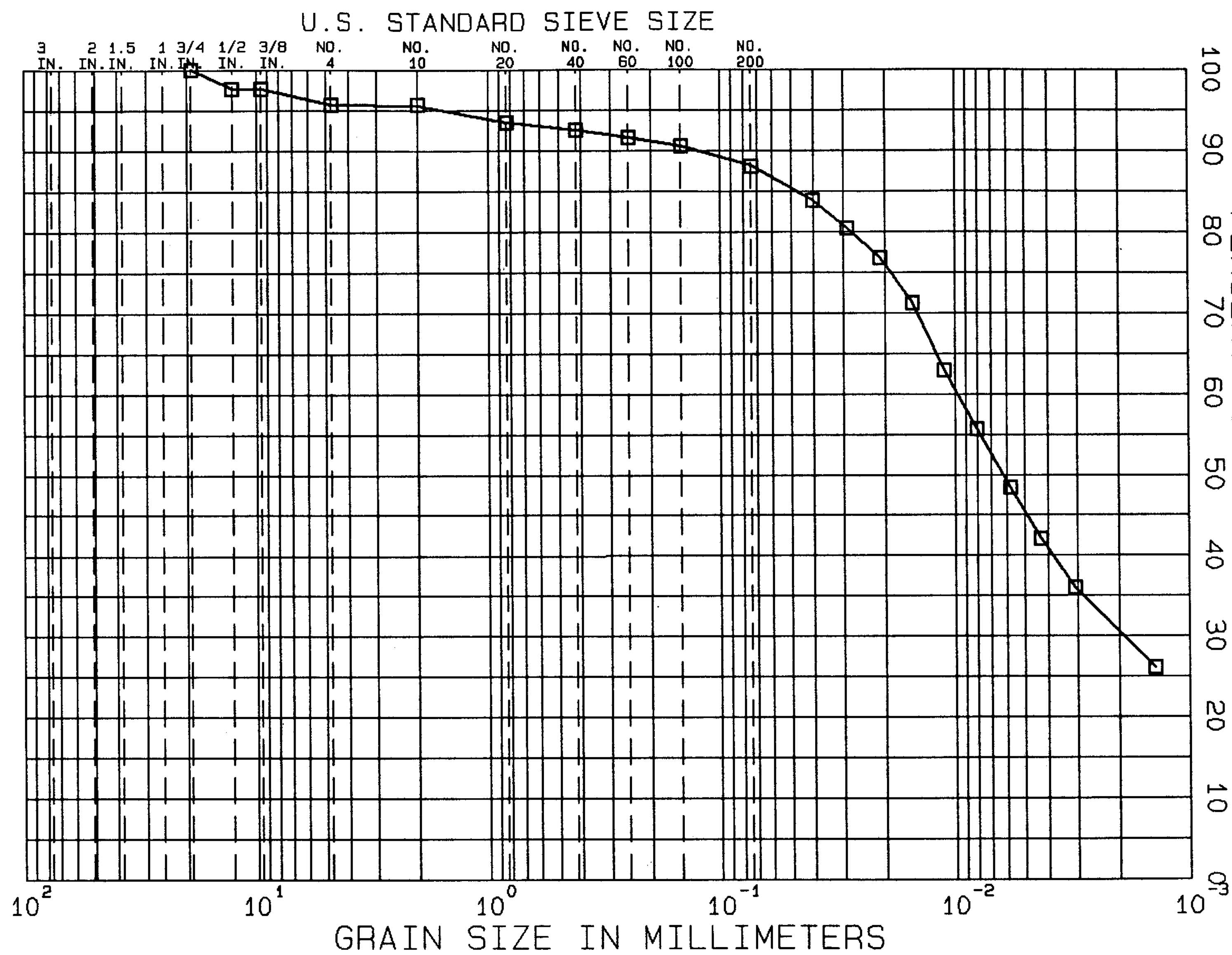
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. **C3-06**
SAMPLE NO.
DEPTH **10'- 12'**
TECH. **JB**
REVIEWER **DEW**

WORK ORDER
NO. **4239**
DATE **1/23/03**

FILE **1300.92**



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
6.1	**SHELBY TUBE SAMPLE**	**Dark Brown Lean Clay (CL)**

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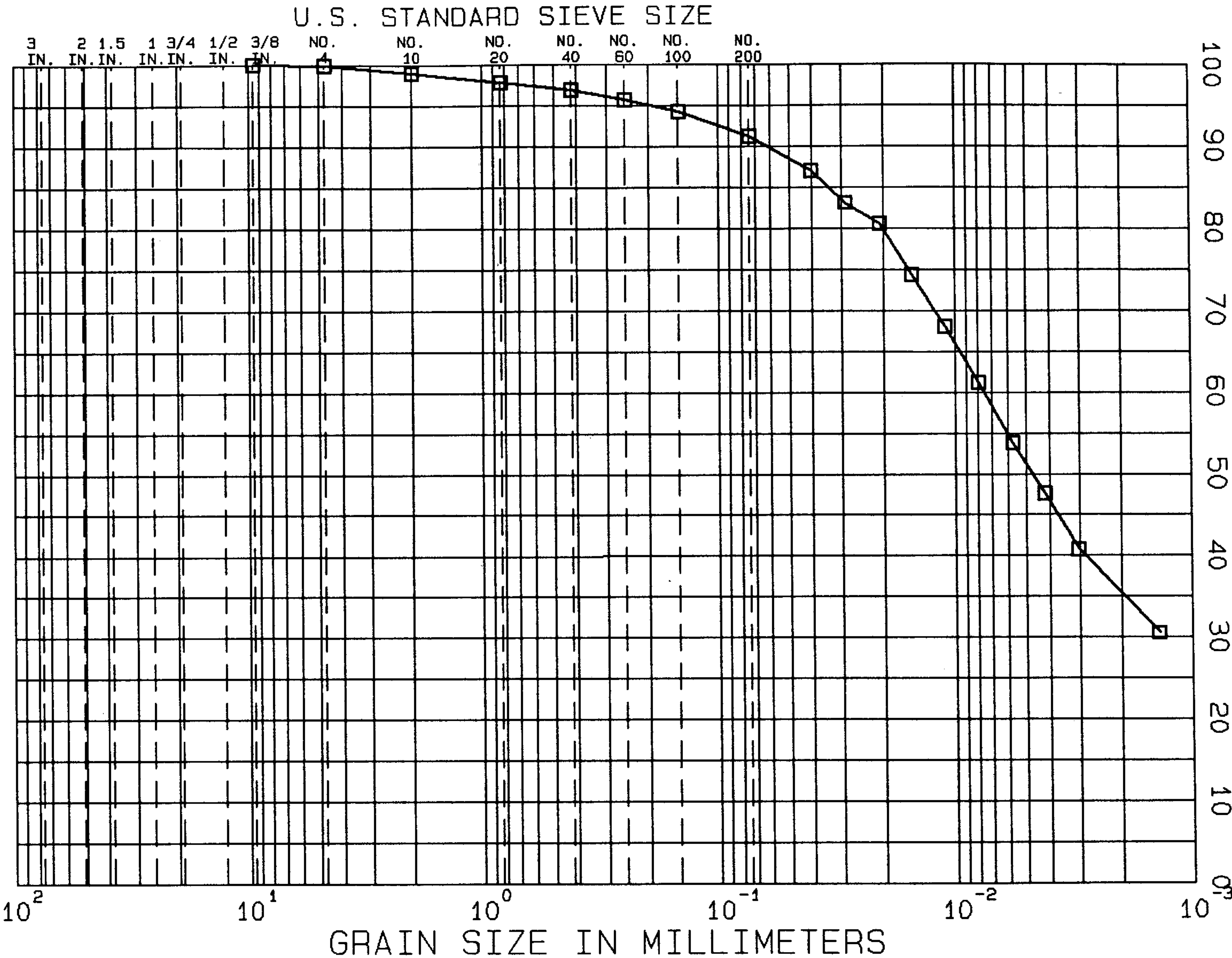
Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
7.1	SHELBY TUBE SAMPLE	Dark Brown Lean Clay (CL)

HYDE PARK RRT PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK

PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-07
DEPTH 12'-14'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4239
DATE 1/23/03
FILE 1300.92

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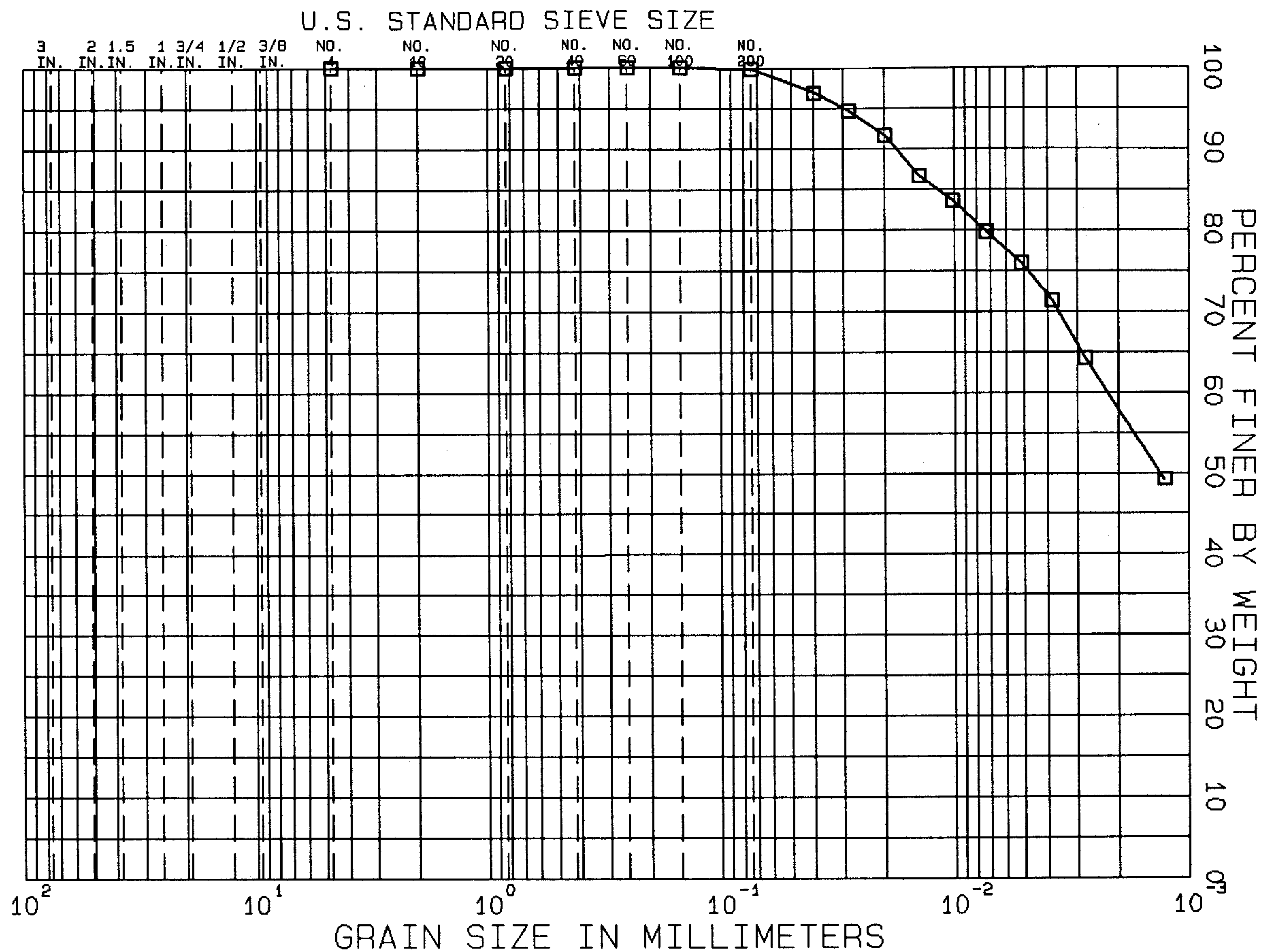
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-08
DEPTH 14'-16'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
8.1	SHELBY TUBE SAMPLE	Dark Brown Fat Clay (CH)

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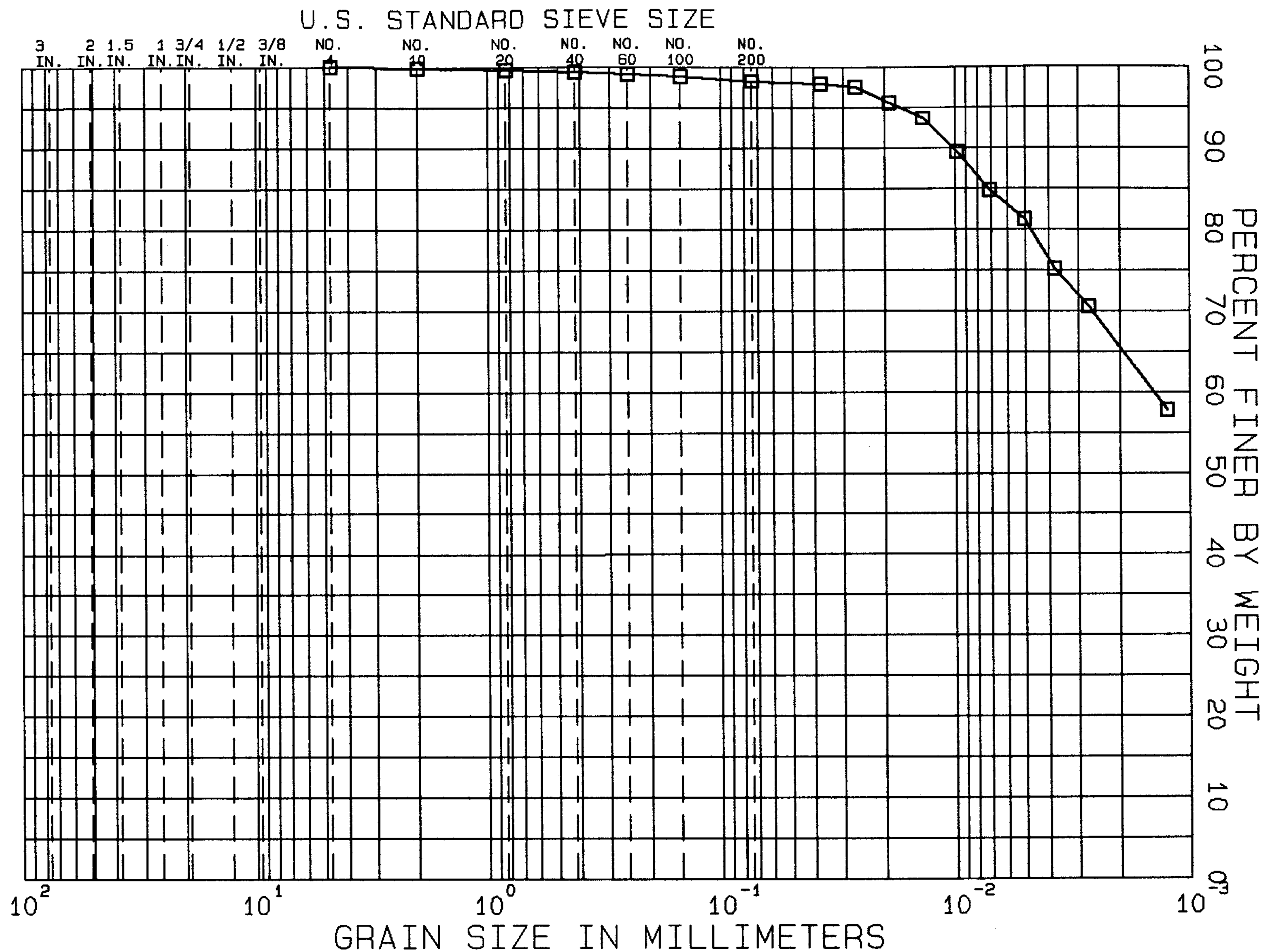
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-09
DEPTH 16'- 18'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
9.1	SHELBY TUBE SAMPLE	Dark Brown Fat Clay (CL)

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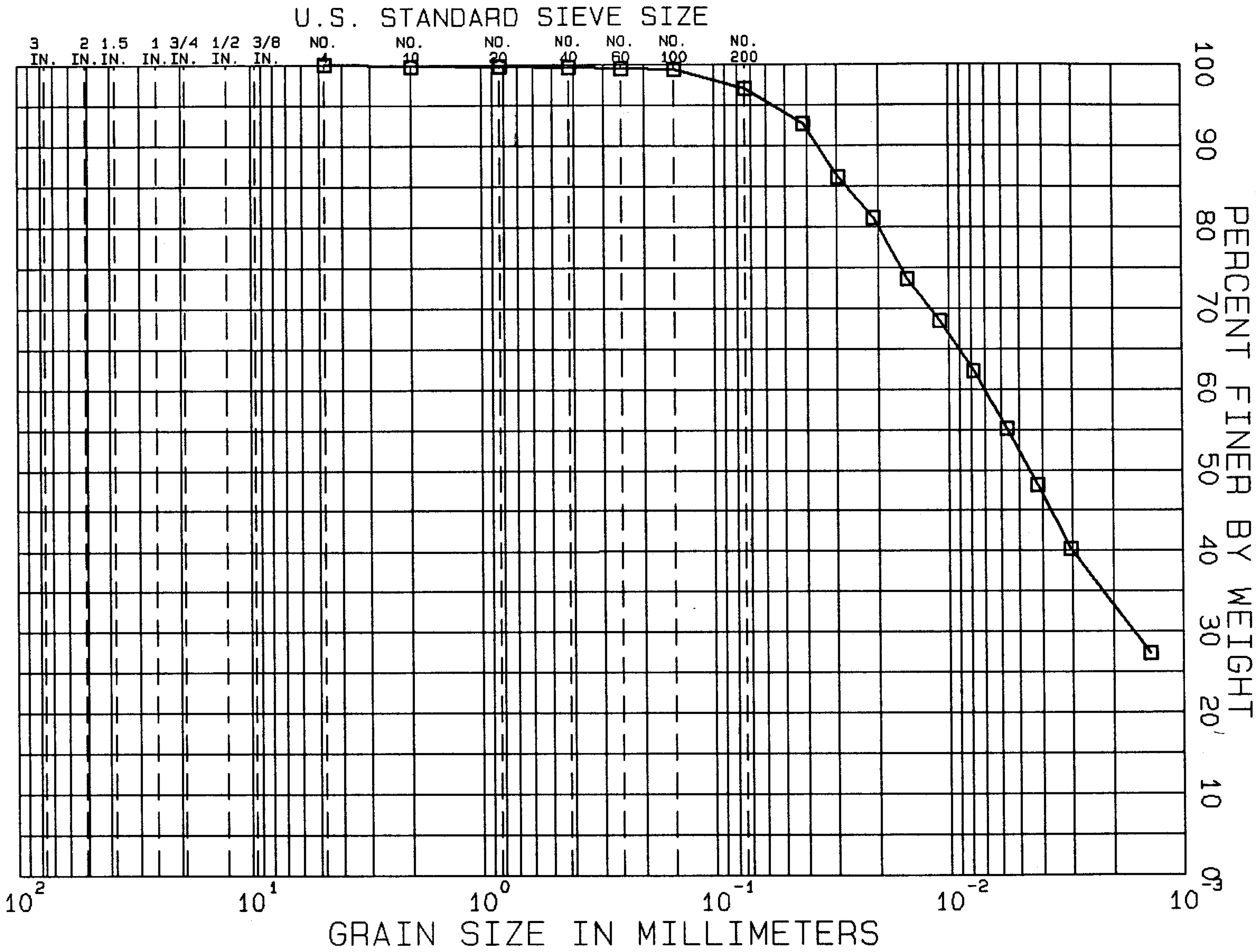
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
10.1	SHELBY TUBE SAMPLE	Brown Lean Clay (CL)

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-10
DEPTH 18'-20'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92

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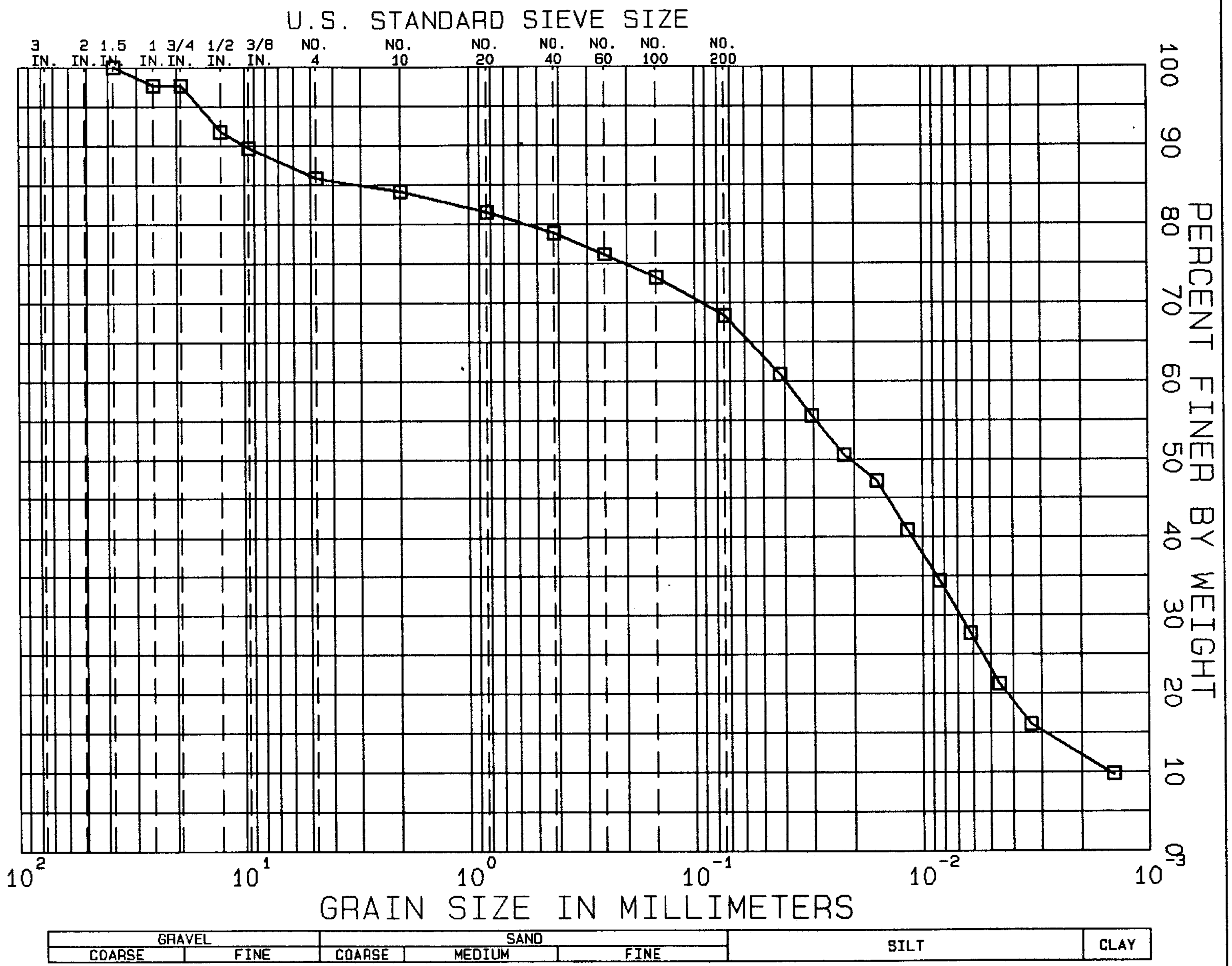
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. C3-11
SAMPLE NO.
DEPTH 20'-22'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
11.1	SHELBY TUBE SAMPLE	Dark Brown Sandy Silty Clay (CL-ML)

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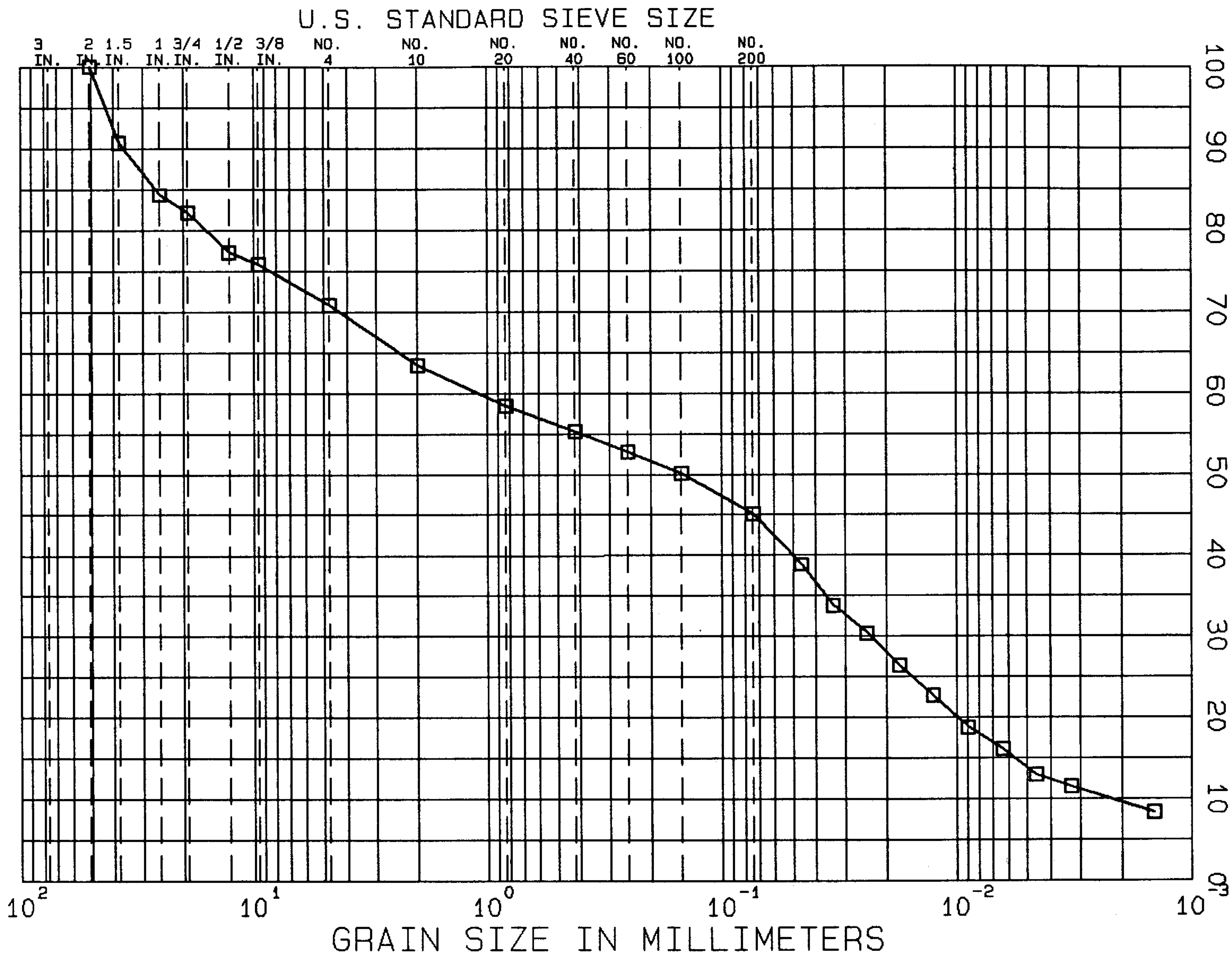
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-12
DEPTH 22'- 24'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/23/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
12.1	BAG SAMPLE	Dark Brown Silty Clayey Gravel with Sand (GC-GM)

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Test Procedure Information:

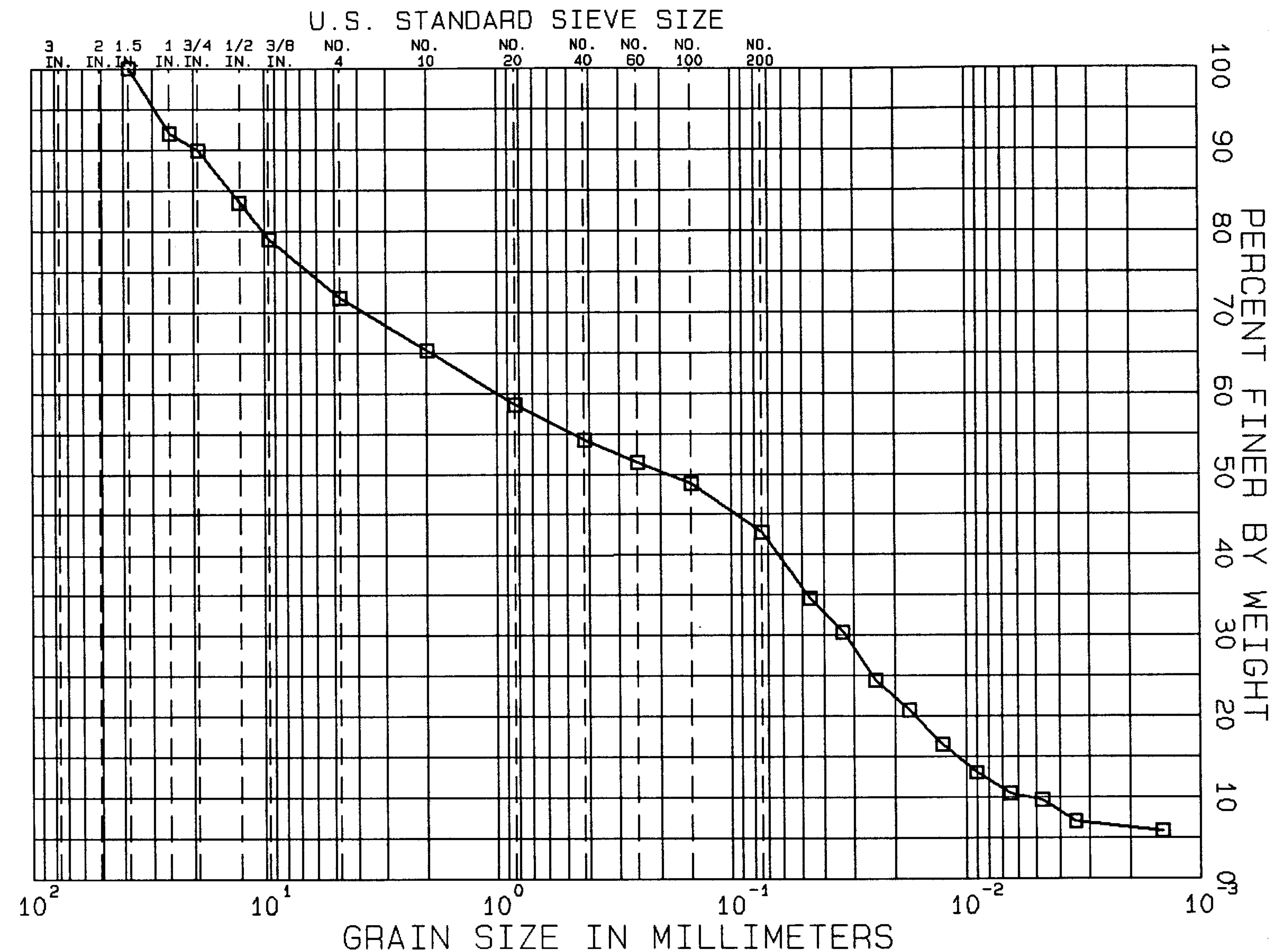
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. C3-13
DEPTH 24'- 26'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/24/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
13.1	BAG SAMPLE	Light Brown Silty Clayey Sand with Gravel (SC-SM)

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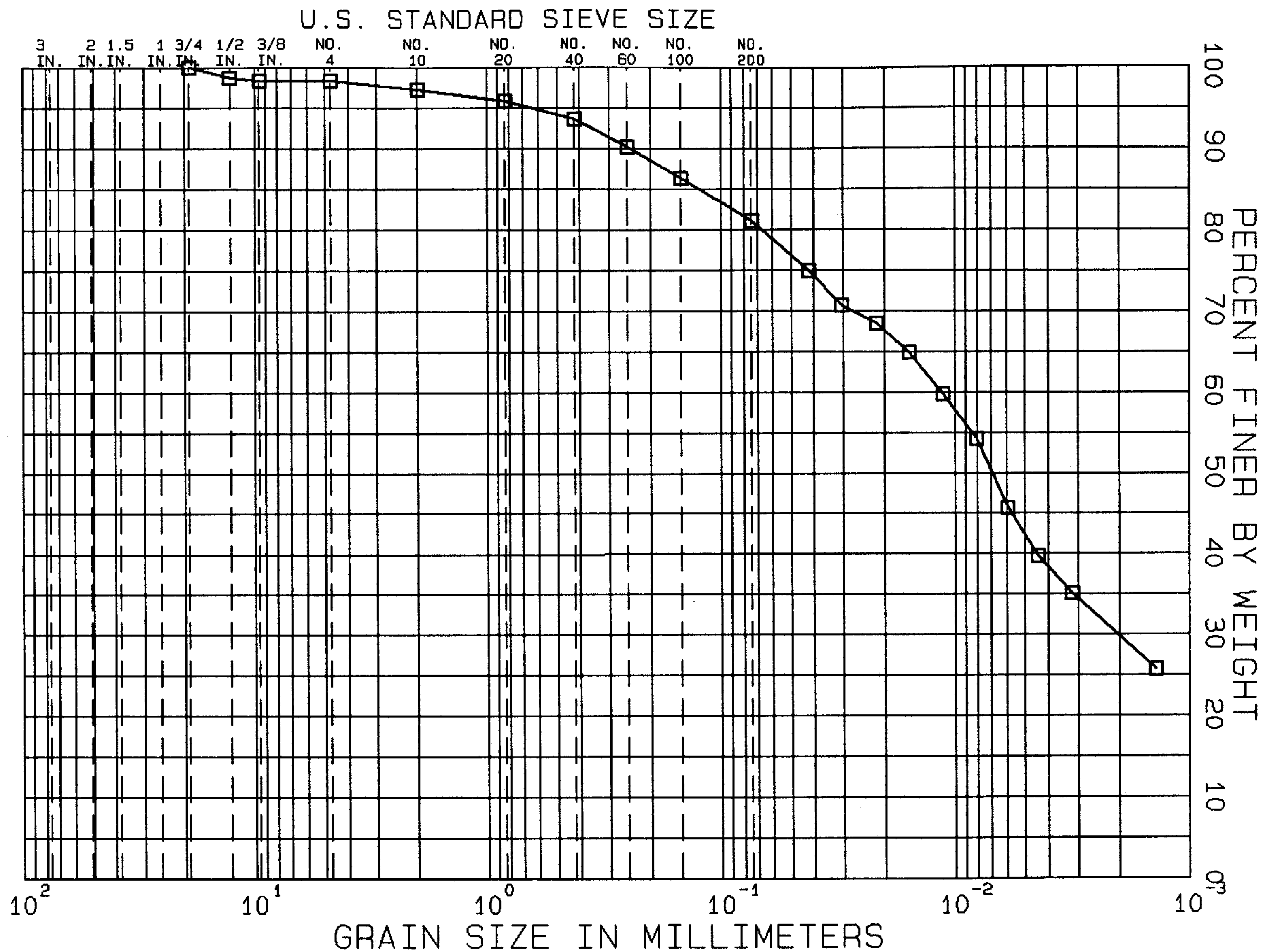
Engineers and Scientists

Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
14.1	SHELBY TUBE SAMPLE	Dark Brown Silty Clay with Sand (CL-ML)

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

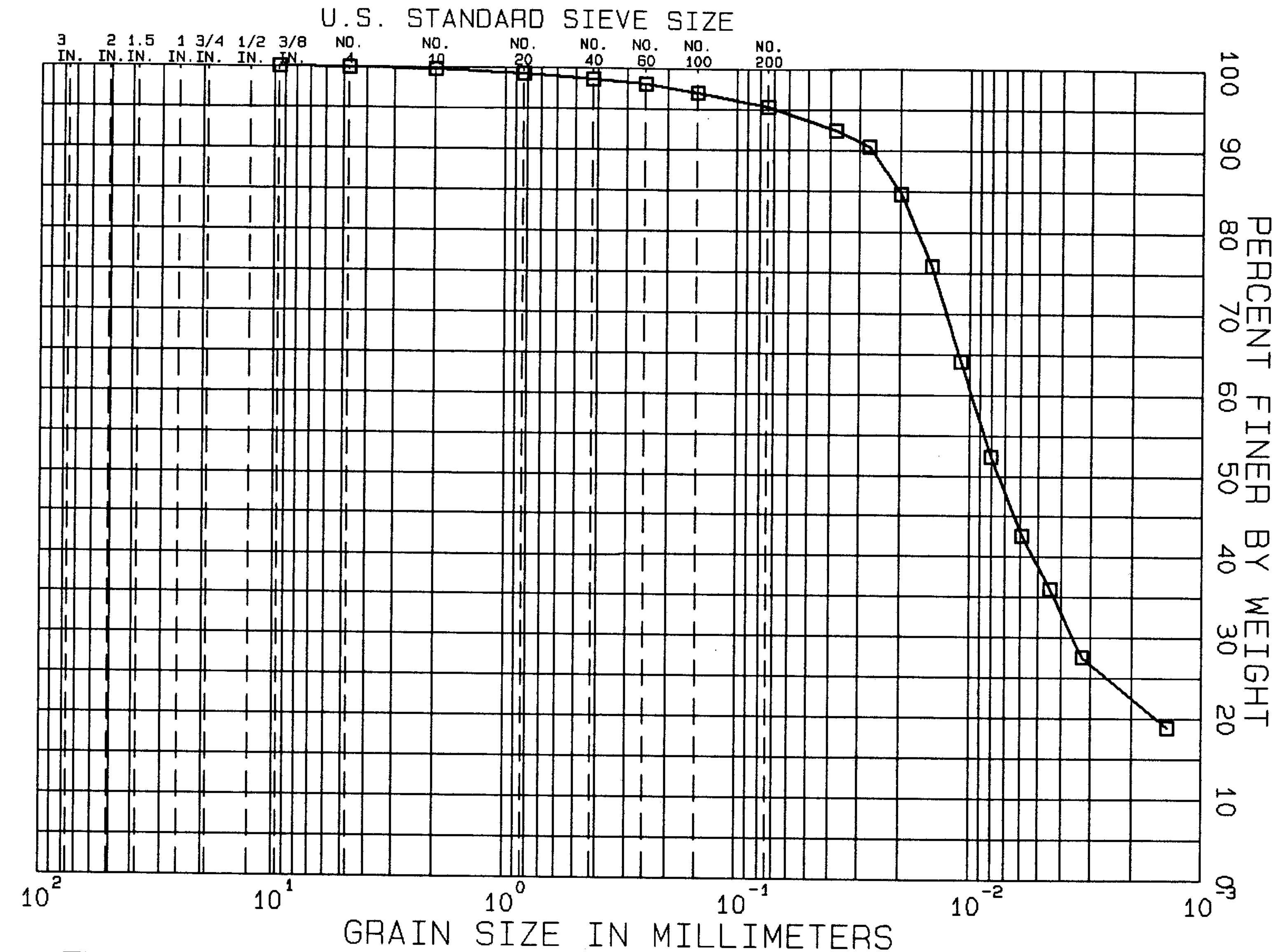
EXPLOR. NO.
SAMPLE NO. J6-01
DEPTH 0'-2'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/24/03

FILE 1300.92

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
15.1	SHELBY TUBE SAMPLE	Brown Silty Clay (CL-ML)

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. J6-02
DEPTH 2'- 4'
TECH. JB
REVIEWER DEW

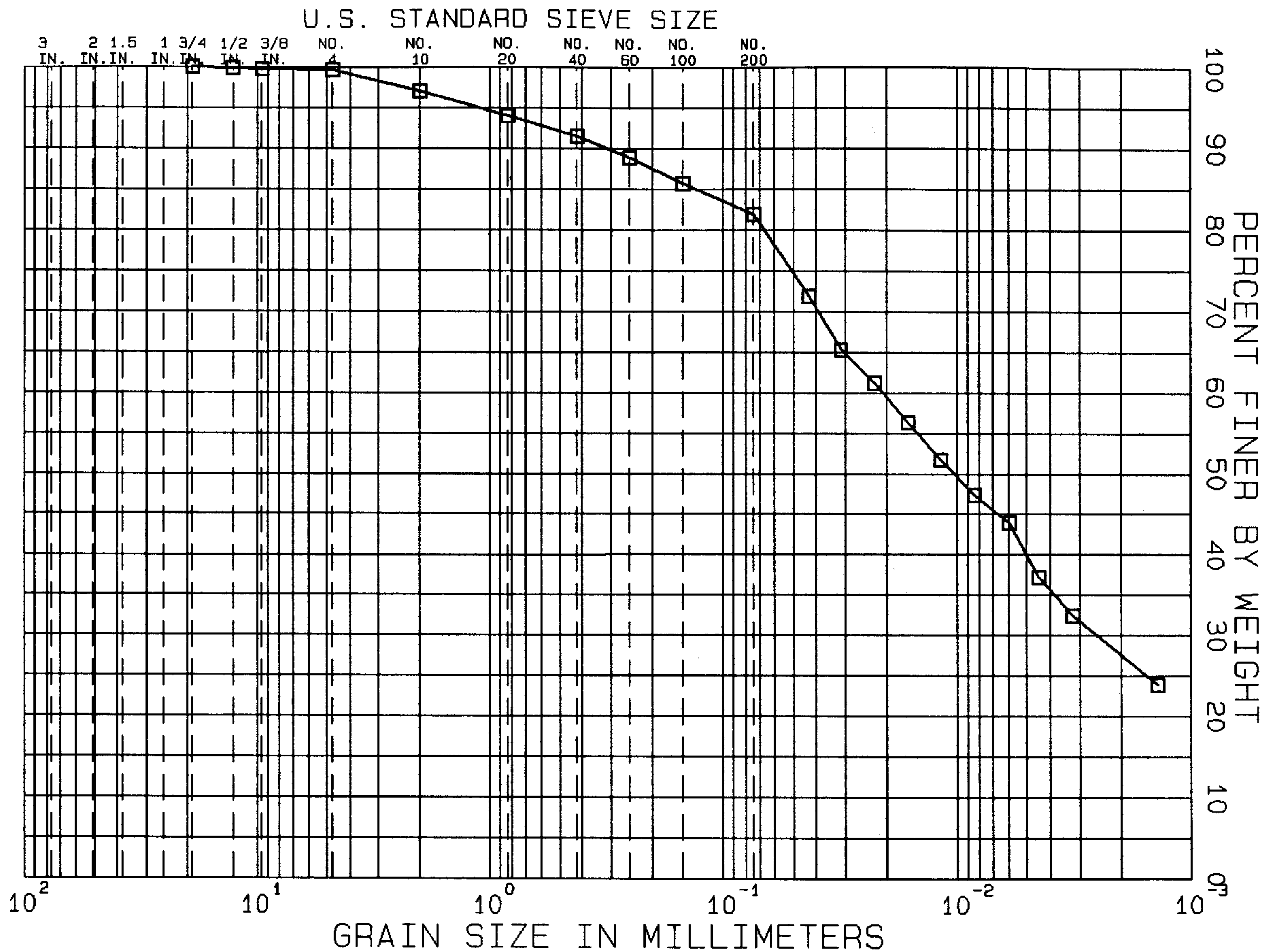
WORK ORDER
NO. 4239
DATE 1/24/03

FILE 1300.92

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
16.1	SHELBY TUBE SAMPLE	Strong Brown Silty Clay with Sand (CL-ML)

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. J6-03
SAMPLE NO.
DEPTH 4'-6'
TECH. JB
REVIEWER DEW

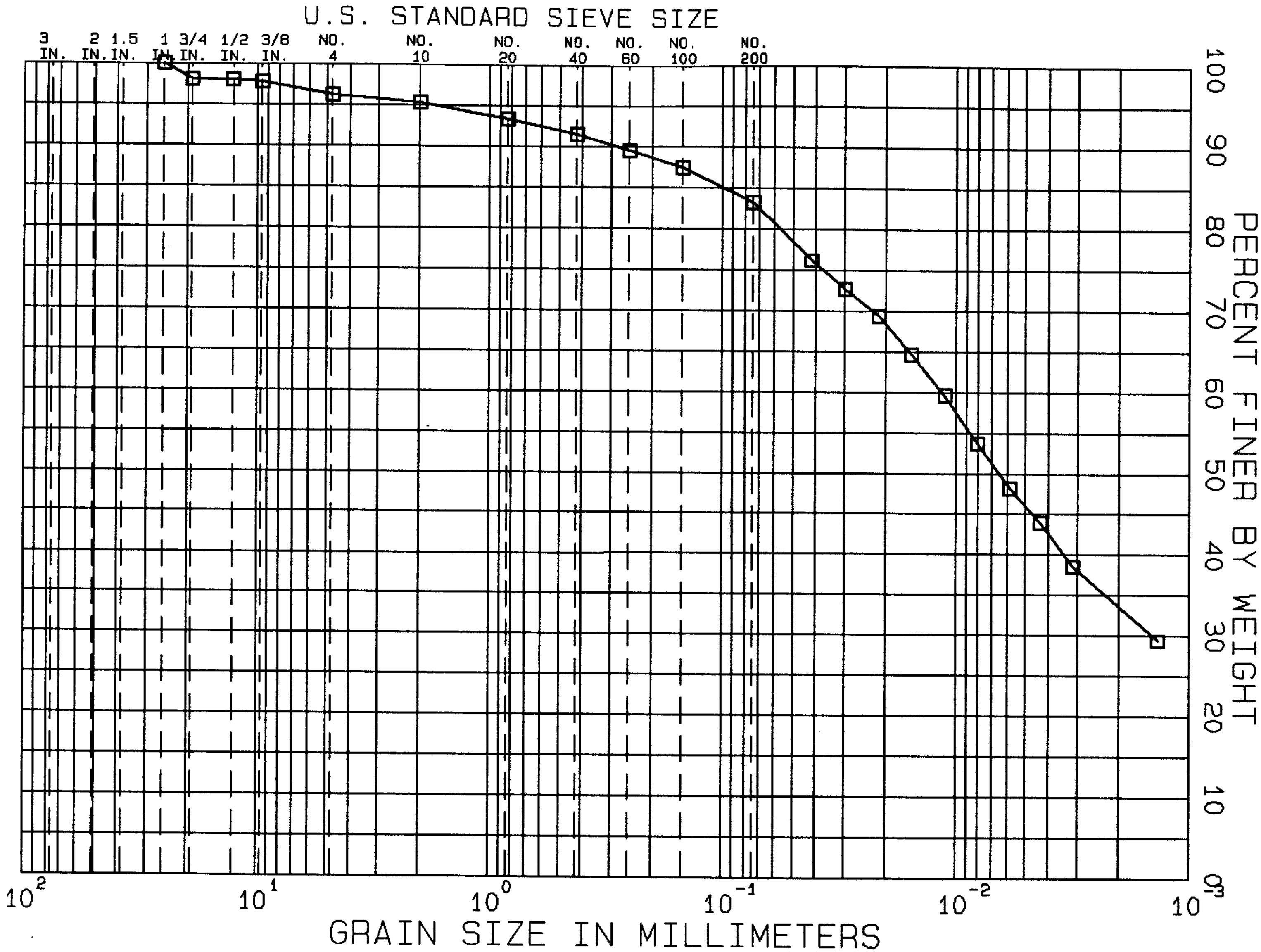
WORK ORDER NO. 4239
DATE 1/24/03

FILE 1300.92

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
17.1	SHELBY TUBE SAMPLE	Brown Silty Clay with Sand (CL-ML)

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. J6-04
DEPTH 6'-8'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4239
DATE 1/24/03

FILE 1300.92

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:

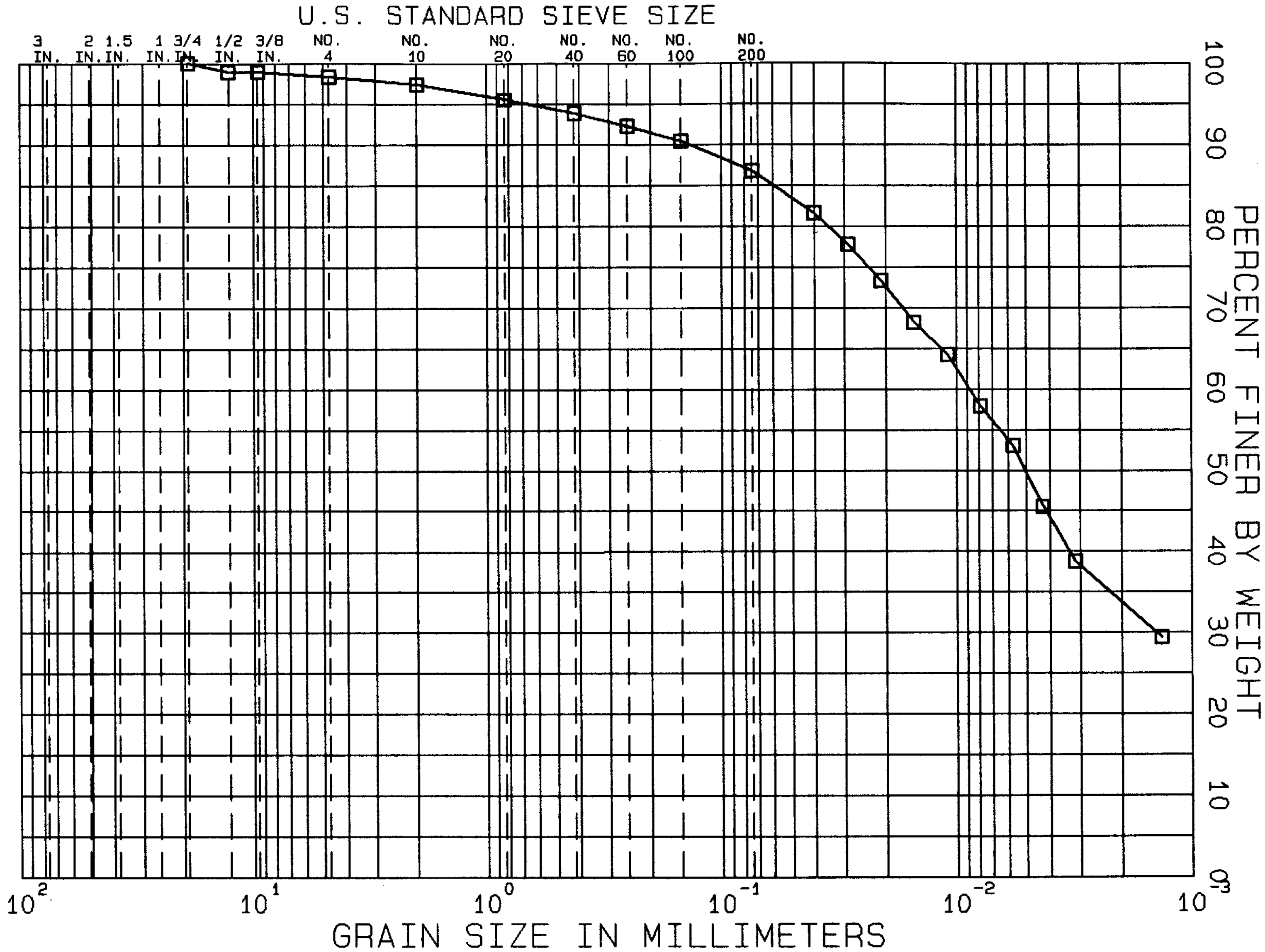
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. J6-05
DEPTH 8'- 10'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4239
DATE 1/24/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
18.1	SHELBY TUBE SAMPLE	Brown Silty Clay (CL-ML)

GZA GeoEnvironmental of New York
Engineers and Scientists

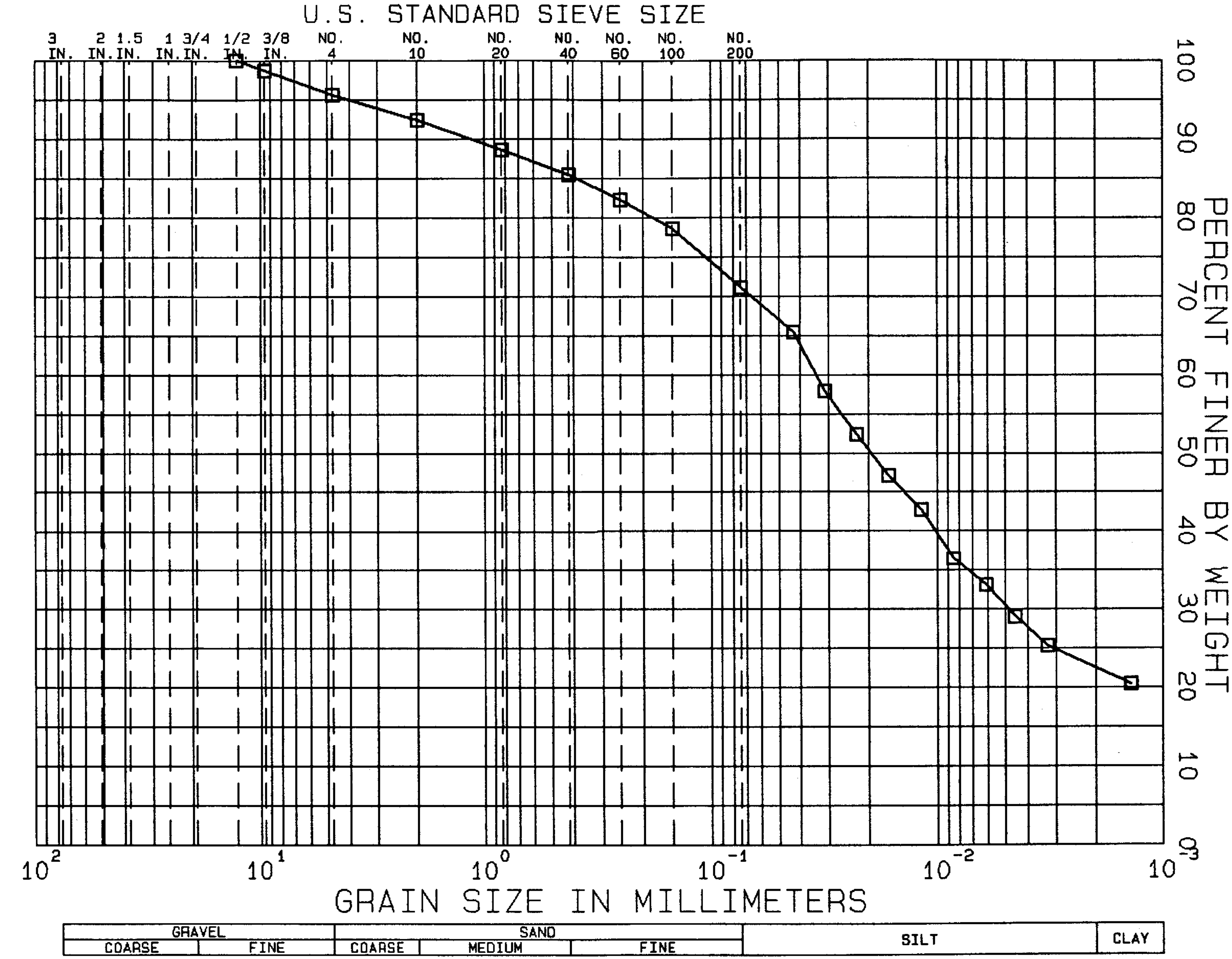
Test Procedure Information:

Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.
SAMPLE NO. J6-06
DEPTH 10'-12'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4239
DATE 1/24/03
FILE 1300.92



TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
19.1	SHELBY TUBE SAMPLE	Strong Brown Silty Clay with Sand (CL-ML)

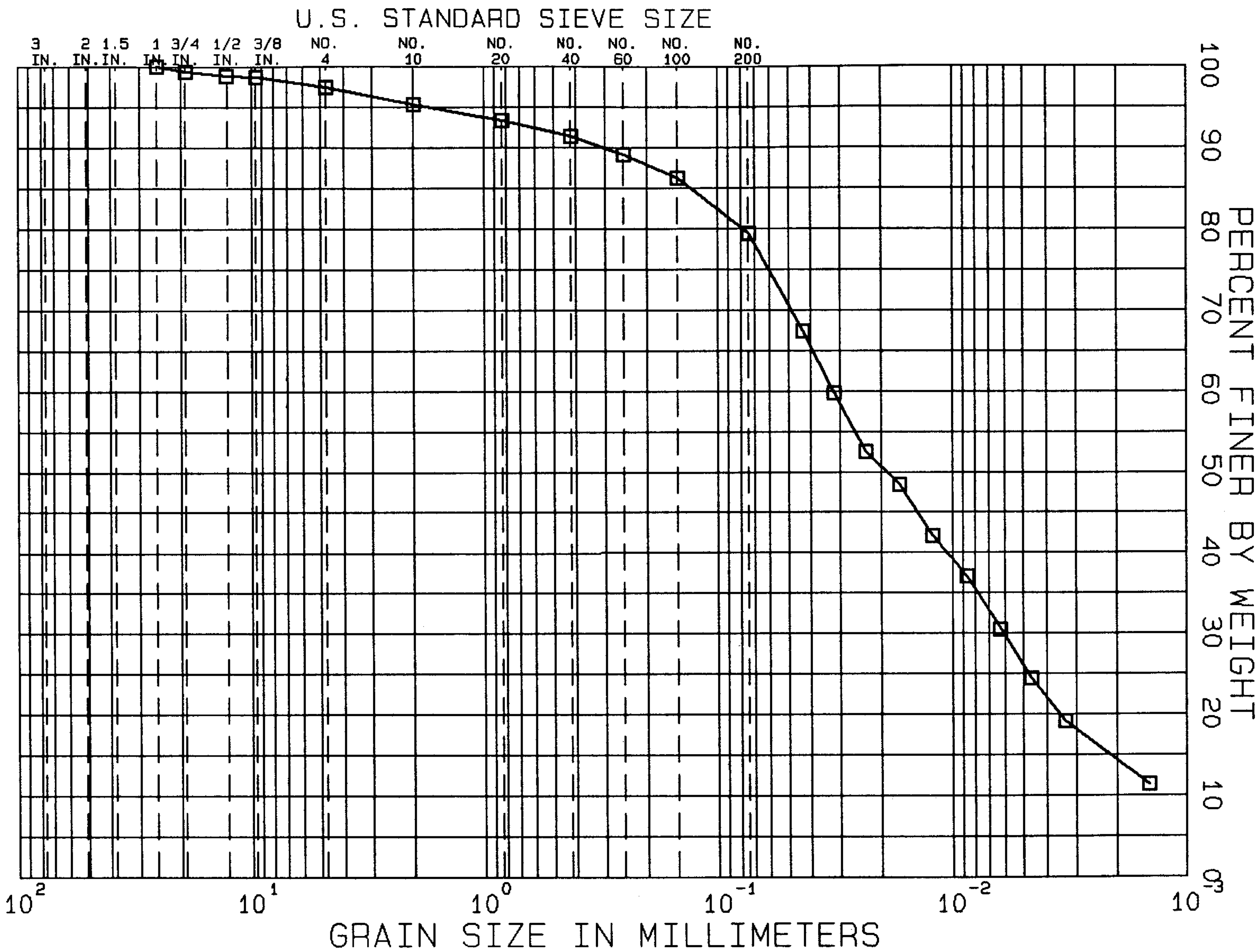
GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. J6-07
SAMPLE NO.
DEPTH 12'- 14'
TECH. JB
REVIEWER DEW

WORK ORDER NO. 4239
DATE 1/24/03
FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
20.1	SHELBY TUBE SAMPLE	Strong Brown Silt with Sand (ML)

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:

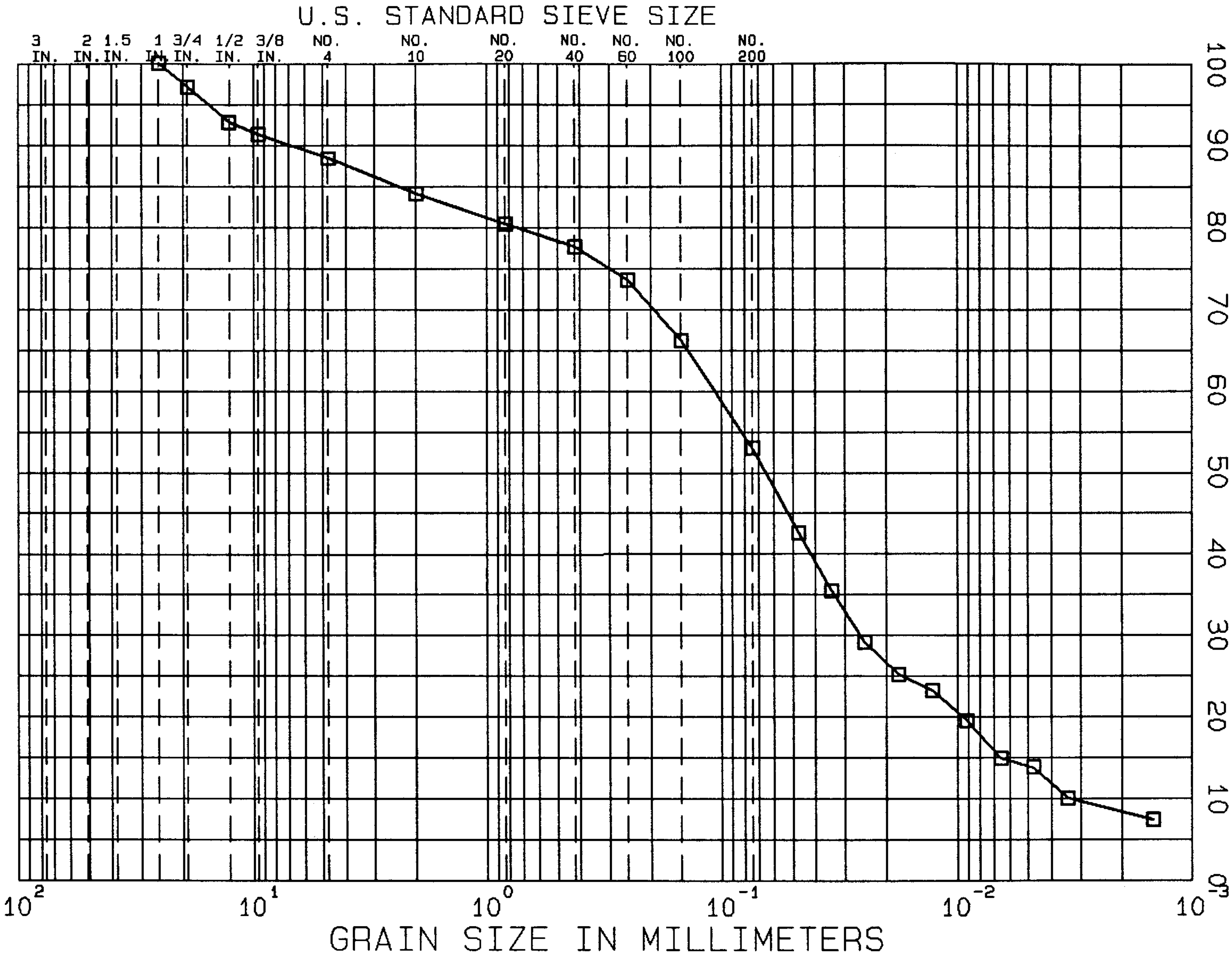
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. I1-01
SAMPLE NO. 8'-10'
DEPTH
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/24/03

FILE 1300.92

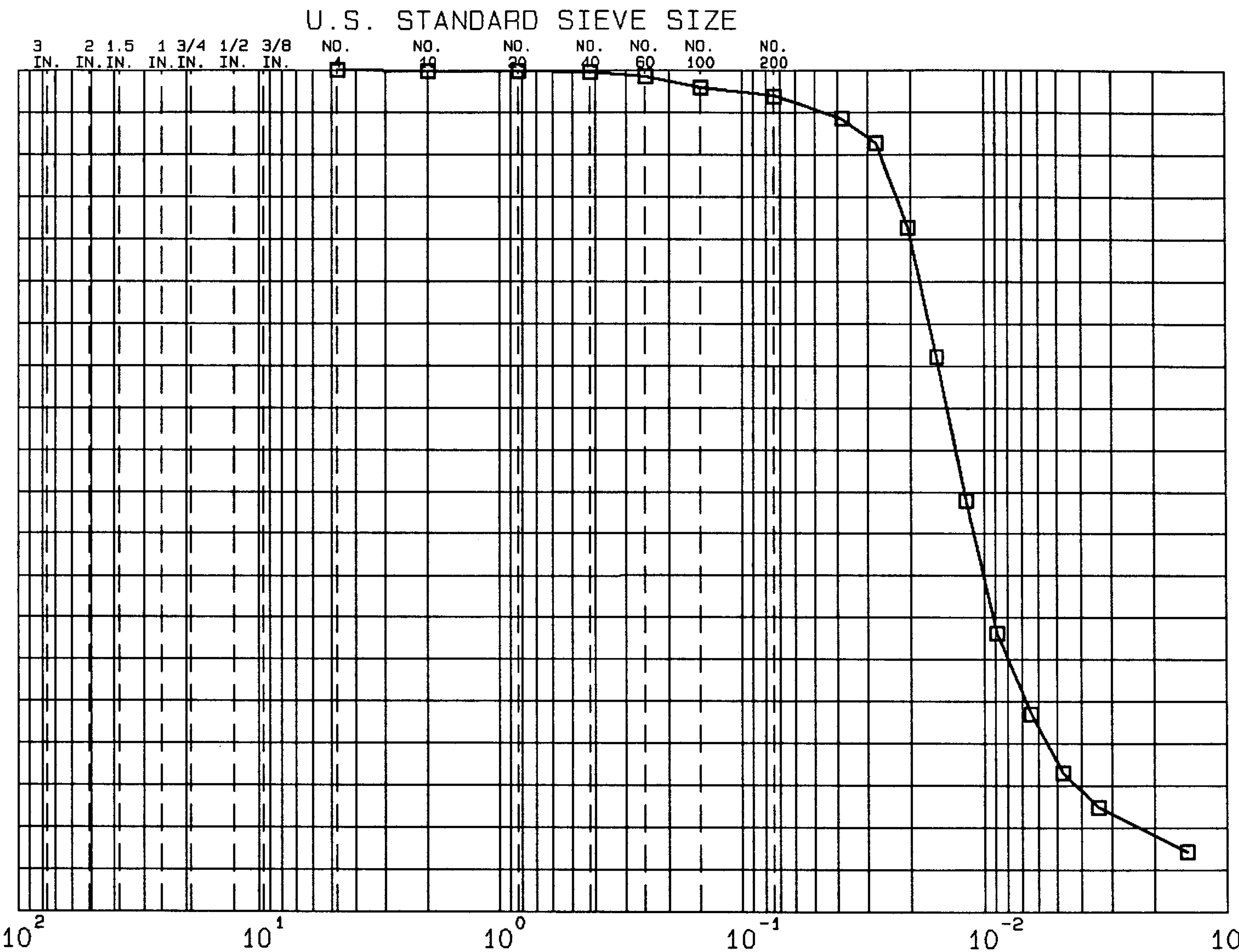


GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
21.1	SHELBY TUBE SAMPLE	Strong Brown Sandy Silt (ML)

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device. Type A, for 1 minute.



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
22.1	SHELBY TUBE SAMPLE	Strong Brown Silt (ML)

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. FB-01
SAMPLE NO.
DEPTH 4'-6'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/24/03

FILE 1300.92

GZA GeoEnvironmental of New York
Engineers and Scientists

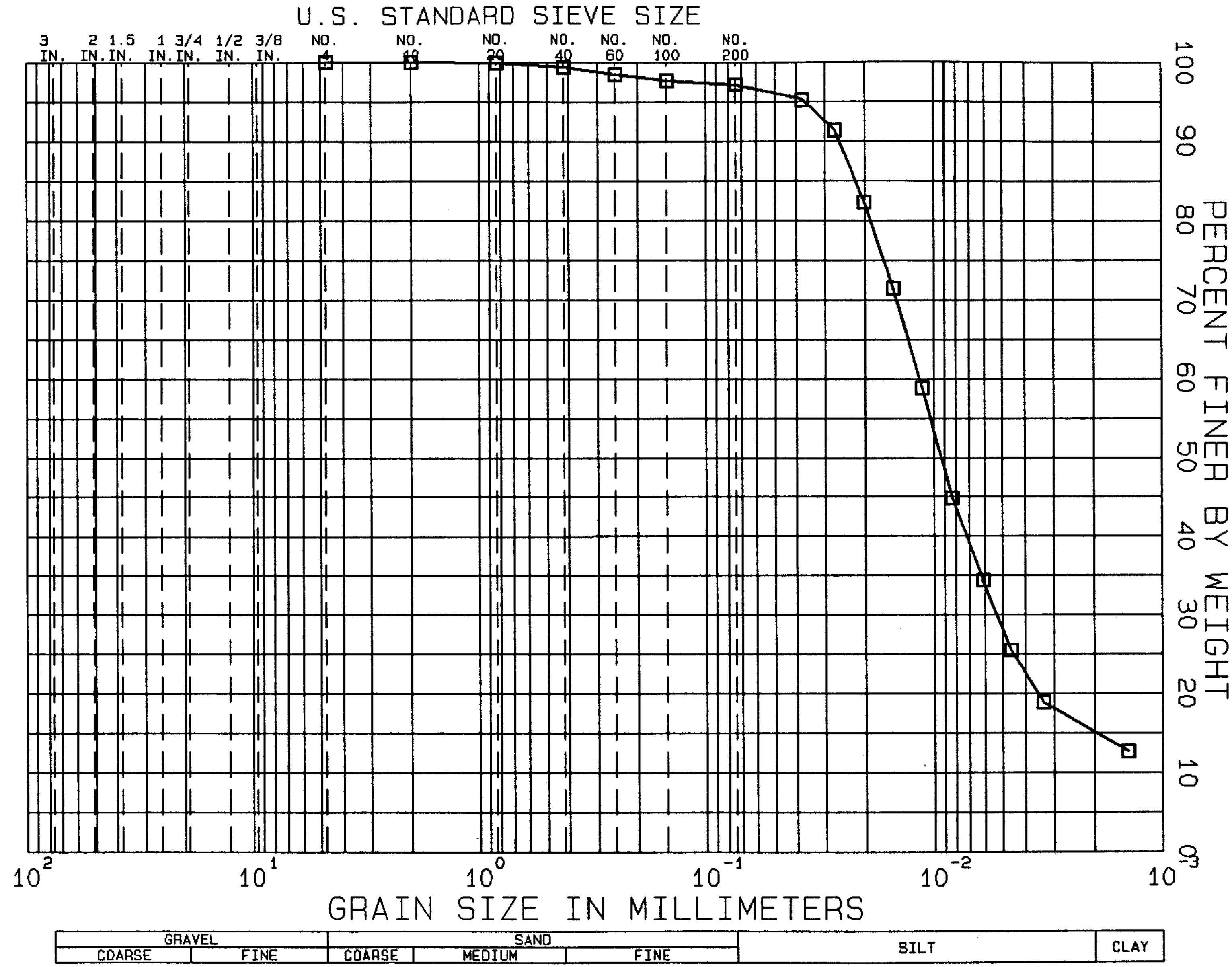
Test Procedure Information:
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK ART PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO. F6-02
SAMPLE NO.
DEPTH 6'-8'
TECH. JB
REVIEWER DEW

WORK ORDER
NO. 4239
DATE 1/24/03

FILE 1300.92



TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
23.1	SHELBY TUBE SAMPLE	Strong Brown Silty Clay (CL-ML)

GZA GeoEnvironmental of New York
Engineers and Scientists

Test Procedure Information:

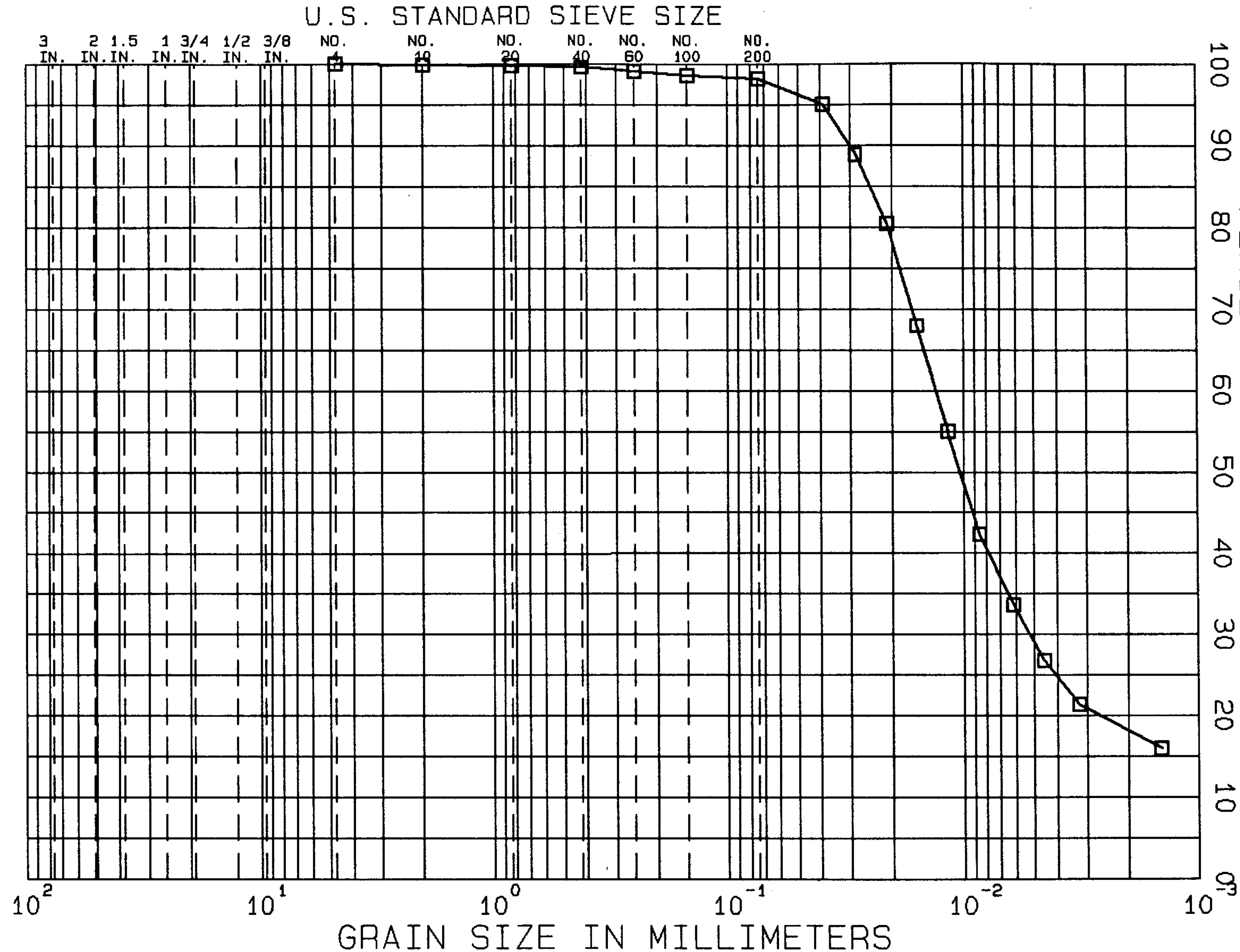
Sample separated on a No. 4 sieve. Sample dispersed with a mechanical stirring device, Type A, for 1 minute.

HYDE PARK RRT PROGRAM, 01069-30
NIAGARA FALLS, NEW YORK
PARTICLE-SIZE ANALYSIS

EXPLOR. NO.	
SAMPLE NO.	F6-03
DEPTH	8' - 10'
TECH.	JB
REVIEWER	DEW

WORK ORDER NO.	4239
DATE	1/24/03

FILE 1300.92



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
24.1	SHELBY TUBE SAMPLE	Strong Brown Silty Clay (CL-ML)

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	C3-01
INITIAL DIAMETER (IN)	2.836	DEPTH:	0'- 2'
INITIAL LENGTH (IN)	1.930	LAB No.:	K1.1
INITIAL WEIGHT (GM)	375.07		
FINAL DIAMETER (IN)	2.835		
FINAL LENGTH (IN)	1.908		
SAT WEIGHT+TARE (GM)	443.33		
DRY WEIGHT+TARE (GM)	368.18		
TARE WEIGHT (GM)	51.19		
INITIAL MOISTURE (%)	18.3	FINAL MOISTURE (%)	23.7
INITIAL DENSITY (PCF)	99.1	FINAL DENSITY (PCF)	100.3
CELL PRESSURE (PSI)	85	SATURATED Gs	2.59
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	81.0		
MAX EFFECTIVE STRESS (PSI)	5	MIN EFF STRS (PSI)	4

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		18	
1	0.53	0.25	0.05	15.0	17	4.6E-06
2	0.90	0.32	0.10	15.0	17	3.9E-06
3	1.08	0.38	0.15	15.0	17	7.8E-06
4	1.25	0.43	0.20	15.0	17	8.0E-06
5	1.45	0.58	0.25	15.0	17	9.8E-06
6	1.63	0.63	0.30	15.0	16	7.7E-06
7	1.82	0.68	0.35	15.0	16	7.4E-06
8	2.00	0.73	0.40	15.0	16	7.9E-06
9	2.20	0.78	0.45	15.0	16	7.2E-06
10	2.37	0.83	0.50	15.0	16	8.5E-06
11	2.57	0.88	0.55	15.0	16	7.3E-06
12	2.75	0.93	0.60	15.0	16	8.2E-06
13	2.93	0.98	0.65	15.0	15	8.3E-06
14	3.13	1.03	0.70	15.0	15	7.5E-06
15					18	#VALUE!
AVERAGE K BETWEEN READINGS			6	AND	14	**7.8E-06**
ACCEPTABLE RANGE OF READINGS AVERAGED					5.8E-06	9.7E-06

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	C3-06
INITIAL DIAMETER (IN)	2.837	DEPTH:	10'- 12'
INITIAL LENGTH (IN)	1.958	LAB No.:	K6.1
INITIAL WEIGHT (GM)	424.84		
FINAL DIAMETER (IN)	2.824		
FINAL LENGTH (IN)	1.935		
SAT WEIGHT+TARE (GM)	471.55		
DRY WEIGHT+TARE (GM)	402.19		
TARE WEIGHT (GM)	51.09		
INITIAL MOISTURE (%)	21.0	FINAL MOISTURE (%)	19.8
INITIAL DENSITY (PCF)	108.1	FINAL DENSITY (PCF)	110.4
CELL PRESSURE (PSI)	89	SATURATED Gs	2.72
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	82.0		
MAX EFFECTIVE STRESS (PSI)	9	MIN EFF STRS (PSI)	7

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		31	
1	57	0.22	0.05	15.4	31	2.2E-08
2	98	0.27	0.10	16.2	31	1.8E-08
3	137	0.32	0.15	16.7	31	1.8E-08
4	176	0.37	0.20	17.0	31	1.8E-08
5	215	0.42	0.25	17.3	31	1.8E-08
6	254	0.47	0.30	17.5	30	1.8E-08
7	293	0.52	0.35	17.5	30	1.8E-08
8	332	0.57	0.40	17.5	30	1.8E-08
9	371	0.62	0.45	17.5	30	1.8E-08
10					31	#VALUE!
11					31	#VALUE!
12					31	#VALUE!
13					31	#VALUE!
14					31	#VALUE!
15					31	#VALUE!
AVERAGE K BETWEEN READINGS			2	AND	9	**1.8E-08**
ACCEPTABLE RANGE OF READINGS AVERAGED					1.4E-08	2.3E-08

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	C3-11
INITIAL DIAMETER (IN)	2.838	DEPTH:	20'- 22'
INITIAL LENGTH (IN)	2.067	LAB No.:	K11.1
INITIAL WEIGHT (GM)	421.59		
FINAL DIAMETER (IN)	2.775		
FINAL LENGTH (IN)	2.021		
SAT WEIGHT+TARE (GM)	459.85		
DRY WEIGHT+TARE (GM)	382.74		
TARE WEIGHT (GM)	50.68		
INITIAL MOISTURE (%)	27.0	FINAL MOISTURE (%)	23.2
INITIAL DENSITY (PCF)	96.8	FINAL DENSITY (PCF)	103.5
CELL PRESSURE (PSI)	98	SATURATED Gs	2.70
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	82.0		
MAX EFFECTIVE STRESS (PSI)	18	MIN EFF STRS (PSI)	16

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		30	
1	30	0.66	0.05	18.4	29	8.8E-08
2	39	0.78	0.10	18.6	29	1.1E-07
3	48	0.90	0.15	18.8	29	1.1E-07
4	58	1.03	0.20	18.8	29	1.0E-07
5	67	1.11	0.25	18.8	29	9.4E-08
6	76	1.21	0.30	18.8	28	1.0E-07
7	85	1.26	0.35	18.9	28	8.4E-08
8	94	1.31	0.40	18.9	28	8.5E-08
9	104	1.36	0.45	18.9	28	7.7E-08
10	114	1.41	0.50	18.9	28	7.7E-08
11					30	#VALUE!
12					30	#VALUE!
13					30	#VALUE!
14					30	#VALUE!
15					30	#VALUE!
AVERAGE K BETWEEN READINGS			7	AND	10	**8.1E-08**
ACCEPTABLE RANGE OF READINGS AVERAGED					6.0E-08	1.0E-07

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	J6-01
INITIAL DIAMETER (IN)	2.848	DEPTH:	0'- 2'
INITIAL LENGTH (IN)	2.050	LAB No.:	K14.1
INITIAL WEIGHT (GM)	446.65		
FINAL DIAMETER (IN)	2.822		
FINAL LENGTH (IN)	2.041		
SAT WEIGHT+TARE (GM)	498.32		
DRY WEIGHT+TARE (GM)	428.23		
TARE WEIGHT (GM)	53.98		
INITIAL MOISTURE (%)	19.3	FINAL MOISTURE (%)	18.7
INITIAL DENSITY (PCF)	109.2	FINAL DENSITY (PCF)	111.7
CELL PRESSURE (PSI)	85	SATURATED Gs	2.69
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	81.0		
MAX EFFECTIVE STRESS (PSI)	5	MIN EFF STRS (PSI)	4

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		17	
1	2.62	0.18	0.10	18.4	16	1.2E-06
2	3.80	0.24	0.15	18.4	16	1.2E-06
3	5.00	0.30	0.20	18.4	16	1.2E-06
4	6.17	0.36	0.25	18.4	16	1.2E-06
5	7.40	0.41	0.30	18.4	16	1.1E-06
6	8.62	0.47	0.35	18.4	15	1.2E-06
7	9.90	0.52	0.40	18.4	15	1.1E-06
8	11.20	0.57	0.45	18.4	15	1.1E-06
9	12.48	0.62	0.50	18.4	15	1.1E-06
10					17	#VALUE!
11					17	#VALUE!
12					17	#VALUE!
13					17	#VALUE!
14					17	#VALUE!
15					17	#VALUE!
AVERAGE K BETWEEN READINGS			3	AND	9	**1.1E-06**
ACCEPTABLE RANGE OF READINGS AVERAGED					8.5E-07	1.4E-06

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	J6-05
INITIAL DIAMETER (IN)	2.830	DEPTH:	8'- 10'
INITIAL LENGTH (IN)	1.972	LAB No.:	K18.1
INITIAL WEIGHT (GM)	422.37		
FINAL DIAMETER (IN)	2.834		
FINAL LENGTH (IN)	1.961		
SAT WEIGHT+TARE (GM)	475.40		
DRY WEIGHT+TARE (GM)	407.38		
TARE WEIGHT (GM)	48.07		
INITIAL MOISTURE (%)	17.6	FINAL MOISTURE (%)	18.9
INITIAL DENSITY (PCF)	110.4	FINAL DENSITY (PCF)	110.7
CELL PRESSURE (PSI)	88	SATURATED Gs	2.67
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	81.0		
MAX EFFECTIVE STRESS (PSI)	8	MIN EFF STRS (PSI)	7

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		17	
1	9	0.20	0.05	18.4	17	2.3E-07
2	16	0.27	0.10	18.4	17	1.9E-07
3	22	0.33	0.15	18.5	17	2.2E-07
4	28	0.38	0.20	18.6	16	2.1E-07
5	34	0.43	0.25	18.7	16	2.1E-07
6	40	0.49	0.30	18.7	16	2.2E-07
7	46	0.54	0.35	18.8	16	2.2E-07
8	52	0.59	0.40	18.8	16	2.2E-07
9	58	0.64	0.45	18.8	16	2.2E-07
10	64	0.69	0.50	18.8	16	2.2E-07
11					17	#VALUE!
12					17	#VALUE!
13					17	#VALUE!
14					17	#VALUE!
15					17	#VALUE!
AVERAGE K BETWEEN READINGS			3	AND	10	**2.2E-07**
ACCEPTABLE RANGE OF READINGS AVERAGED					1.6E-07	2.7E-07

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	J6-07
INITIAL DIAMETER (IN)	2.845	DEPTH:	12'- 14'
INITIAL LENGTH (IN)	2.096	LAB No.:	K20.1
INITIAL WEIGHT (GM)	417.04		
FINAL DIAMETER (IN)	2.839		
FINAL LENGTH (IN)	1.979		
SAT WEIGHT+TARE (GM)	466.94		
DRY WEIGHT+TARE (GM)	384.51		
TARE WEIGHT (GM)	50.01		
INITIAL MOISTURE (%)	24.7	FINAL MOISTURE (%)	24.6
INITIAL DENSITY (PCF)	95.6	FINAL DENSITY (PCF)	101.7
CELL PRESSURE (PSI)	91	SATURATED Gs	2.72
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	82.0		
MAX EFFECTIVE STRESS (PSI)	11	MIN EFF STRS (PSI)	9

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		29	
1	21	0.29	0.05	18.4	29	6.6E-08
2	32	0.37	0.10	18.5	29	7.1E-08
3	41	0.44	0.15	18.6	29	8.3E-08
4	51	0.50	0.20	18.7	29	7.2E-08
5	61	0.56	0.25	18.8	28	7.2E-08
6	71	0.62	0.30	18.8	28	7.3E-08
7	81	0.68	0.35	18.8	28	7.3E-08
8	91	0.74	0.40	18.9	28	7.3E-08
9	101	0.79	0.45	18.9	28	7.1E-08
10	111	0.84	0.50	18.9	28	7.1E-08
11					29	#VALUE!
12					29	#VALUE!
13					29	#VALUE!
14					29	#VALUE!
15					29	#VALUE!
AVERAGE K BETWEEN READINGS			4	AND	10	**7.2E-08**
ACCEPTABLE RANGE OF READINGS AVERAGED					5.4E-08	9.0E-08

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	I1-01
INITIAL DIAMETER (IN)	2.850	DEPTH:	8'- 10'
INITIAL LENGTH (IN)	2.063	LAB No.:	K21.1
INITIAL WEIGHT (GM)	457.44		
FINAL DIAMETER (IN)	2.836		
FINAL LENGTH (IN)	2.038		
SAT WEIGHT+TARE (GM)	502.91		
DRY WEIGHT+TARE (GM)	432.88		
TARE WEIGHT (GM)	50.37		
INITIAL MOISTURE (%)	19.6	FINAL MOISTURE (%)	18.3
INITIAL DENSITY (PCF)	110.7	FINAL DENSITY (PCF)	113.2
CELL PRESSURE (PSI)	88	SATURATED Gs	2.71
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	81.0		
MAX EFFECTIVE STRESS (PSI)	8	MIN EFF STRS (PSI)	7

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		16	
1	1.60	0.06	0.05	18.0	16	8.5E-07
2	3.22	0.10	0.10	18.0	16	7.7E-07
3	4.82	0.15	0.15	18.0	16	8.3E-07
4	6.47	0.20	0.20	18.0	16	8.1E-07
5	8.08	0.25	0.25	18.0	16	8.4E-07
6	9.67	0.30	0.30	18.0	16	8.5E-07
7	11.30	0.35	0.35	18.0	15	8.4E-07
8	12.93	0.40	0.40	18.0	15	8.5E-07
9	14.53	0.45	0.45	18.0	15	8.7E-07
10	16.20	0.50	0.50	18.0	15	8.4E-07
11					16	#VALUE!
12					16	#VALUE!
13					16	#VALUE!
14					16	#VALUE!
15					16	#VALUE!
AVERAGE K BETWEEN READINGS			3	AND	10	**8.4E-07**
ACCEPTABLE RANGE OF READINGS AVERAGED					6.3E-07	1.1E-06

FALLING HEAD PERMEABILITY TEST

PROJECT	HYDE PARK RRT PROGRAM, 01069-30	FILE NO.	1300.92
WORK ORDER NO.	4239	SAMPLE NO.	F6-03
INITIAL DIAMETER (IN)	2.827	DEPTH:	8'- 10'
INITIAL LENGTH (IN)	1.838	LAB No.:	K24.1
INITIAL WEIGHT (GM)	369.81		
FINAL DIAMETER (IN)	2.814		
FINAL LENGTH (IN)	1.800		
SAT WEIGHT+TARE (GM)	423.25		
DRY WEIGHT+TARE (GM)	357.08		
TARE WEIGHT (GM)	53.46		
INITIAL MOISTURE (%)	21.8	FINAL MOISTURE (%)	21.8
INITIAL DENSITY (PCF)	100.3	FINAL DENSITY (PCF)	103.3
CELL PRESSURE (PSI)	89	SATURATED Gs	2.59
BACK PRESSURE (PSI)	80		
DRIVING PRESSURE (PSI)	81.0		
MAX EFFECTIVE STRESS (PSI)	9	MIN EFF STRS (PSI)	8

READING NO.	TIME (MIN)	INFLOW (CC)	OUTFLOW (CC)	TEMP	GRADIENT	PERMEABILITY (CM/SEC)
	0	0.00	0.00		18	
1	1.97	0.13	0.05	20.6	18	7.4E-07
2	3.42	0.18	0.10	20.6	18	7.6E-07
3	4.77	0.23	0.15	20.6	18	8.3E-07
4	6.17	0.28	0.20	20.6	18	8.0E-07
5	7.58	0.33	0.25	20.6	18	8.1E-07
6	9.08	0.38	0.30	20.6	17	7.6E-07
7	10.53	0.43	0.35	20.6	17	8.0E-07
8	11.98	0.48	0.40	20.6	17	8.0E-07
9	13.55	0.53	0.45	20.6	17	7.5E-07
10	15.00	0.58	0.50	20.6	17	8.2E-07
11					18	#VALUE!
12					18	#VALUE!
13					18	#VALUE!
14					18	#VALUE!
15					18	#VALUE!
AVERAGE K BETWEEN READINGS			3	AND	10	**8.0E-07**
ACCEPTABLE RANGE OF READINGS AVERAGED					6.0E-07	1.0E-06

A2. Lower Well Slug Testing

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Executive Summary

This report presents the results of slug tests conducted on Lower wells at the Hyde Park Landfill Site in 2002. The testing started in April and concluded in September 2002. The slug testing was conducted as part of a hydrologic characterization of the Site. The elements of the testing are described briefly in *Work Plan for the Site Characterization-Hydrological Characterization*, submitted to the U.S. EPA and New York State Department of Environmental Conservation, on April 16, 2002 (SEI, SSP&A, and CRA, 2002b).

The slug testing reported provided an opportunity to obtain a comprehensive impression of the transmissivity of the Lower zone as the Site, using consistent testing and interpretation methods. The results of the Lower well slug testing may be used to assess the relative significance of groundwater flow in Flow Zones 10 and 11, and to define areas with similar transmissivities in these zones. The compilation of Lower well slug tests may also be useful as a "catalog" of well performance, comparable to the hydrograph records assembled during the 2001 system shutdown.

Acknowledgements

The slug tests described in this report have been conducted by:

- Jonathan Keizer, S. S. Papadopulos & Associates, Inc.;
- John Raby, Conestoga-Rovers & Associates; and
- Jon Williams, Conestoga-Rovers & Associates.

The results of the slug tests have been interpreted by:

- Jonathan Keizer, S. S. Papadopulos & Associates, Inc.;
- Mark Kuhl, S. S. Papadopulos & Associates, Inc.; and
- Christopher Neville, S. S. Papadopulos & Associates, Inc.

Steven P. Sayko, Services Environmental, Inc. provided continuous peer review.

Section 1.
Introduction

Scope

This report presents the results of slug tests conducted on Lower wells at the Hyde Park Landfill Site in 2002. The testing started in April and concluded in September 2002. The slug testing was conducted as part of a refined hydrologic characterization of the Site. The elements of the testing are described briefly in *Work Plan for the Site Characterization-Hydrological Characterization*, submitted to the U.S. EPA and New York State Department of Environmental Conservation, on April 16, 2002 (SEI, SSP&A, and CRA, 2002b).

Motivation

Wells at the Site are being retrofit as part of the refined hydrologic characterization. We anticipate that the existing wells that are not eventually retrofit will be abandoned altogether, as they confound water level measurements in discrete intervals and act as conduits for the vertical migration of contaminants. Not all Lower wells have been tested previously, and the testing has not been systematic. Therefore, the slug testing reported here is particularly important, as it provides a final opportunity to obtain a comprehensive quantification of the transmissivity of the Lower zone as the Site, using consistent testing and interpretation methods.

The Lower wells have intervals open across Flow Zones 10 and 11 (CRA, SEI, and SSP&A, 2002a). The results of the Lower well slug testing may therefore be useful in assessing the relative significance of groundwater flow in these two flow zones. The USGS evaluation of regional groundwater flow considered Flow Zones 10 and 11 to be insignificant contributors to the total transmissivity of the rock above the Rochester in the Niagara Falls region (Yager, 1996). We anticipate that the results of the Lower well slug testing will assist in establishing appropriate future monitoring requirements for these flow zones.

The results of the Lower well slug testing will also support the definition of areas with similar transmissivities in Flow Zones 10 and 11. Finally, we anticipate that a compilation of Lower well slug tests may be useful as a "catalog" of well performance, comparable to the hydrograph records assembled during the 2001 system shutdown.

Testing summary

The summary statistics of the 2002 Lower well slug testing are listed below.

Statistic	Value
Number of Lower wells existing at the Site at the start of slug testing	41
Number of wells tested	38
Number of wells not tested	3
Number of successful slug tests	43
Number of unsuccessful slug tests	1

1. Wells F4L and PMW-1L were retrofit before they were slug tested, and AGW-3L was not accessible.
2. Wells that exhibited irregular or atypical responses were tested twice. A total of 6 of the 43 successful slug tests represent re-tests (AB1L, BC3L, C1L, D5L, J1L, and J2L).
3. The transducer used for J5L was faulty, and the well was retrofit before it could be re-tested.

Reporting of slug test results

The results from the 2002 Lower well slug testing are presented in a consistent format. For each well, we report the:

- Previous determination of the representativeness of the well (SEDA, 2001);
- Effective initial displacement following the addition of the 2 gallons of water;
- Qualitative observations regarding the rate of recovery;
- Plots showing the estimation of the effective initial displacement and the test analysis;
- Best-estimate of the transmissivity of the test;
- Results of a sensitivity analysis with respect to the storativity;
- Comparison of the results of the 2002 slug tests with transmissivity values reported previously; and
- Assessment of the relative transmissivity of the well.

For the purposes of this assessment, the transmissivity estimates are qualified according to the following scale:

- Low: $T < 1$ ft^2/day;
- Moderate: $1 < T < 100$ ft^2/day; and
- High: $T > 100$ ft^2/day.

Section 2. Methodology

2.1 Execution of the slug tests

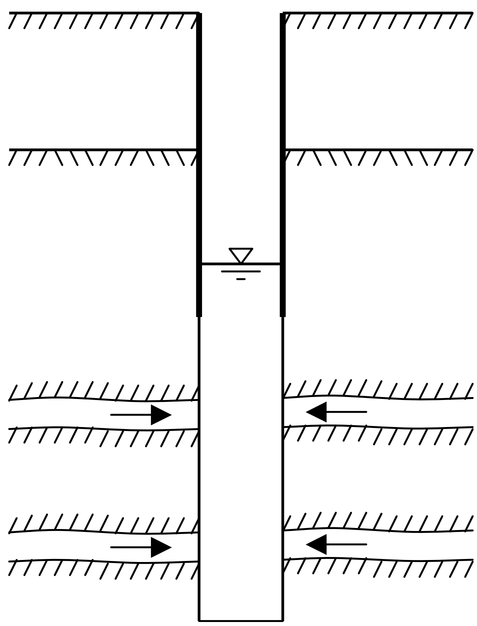
The slug tests were executed by adding 2 gallons of potable water to a well, and monitoring the recovery with a pressure transducer and Telog datalogger. Manual water level measurements were also made occasionally.

The “classical” methods of analysis for slug tests presume that the initial displacement of the water level in the well is executed instantaneously. Most of the Lower wells have an open-hole diameter of 3⅞-inches and the theoretical initial displacement corresponding to an addition of 2 gallons of water is 3.3 feet. Significantly smaller head rises were observed at the start of most of the slug tests. Although the water was poured down the well as quickly as possible, it could not be done instantly, as care was required to ensure that the entire volume of water went down the well. Therefore, the resulting initial displacements were in most cases gradual rather than instantaneous. We refer to the typical observed response as a “gradual slug test”.

As far as we are aware, no theoretical approaches have been developed to analyze the results of gradual slug tests. Although a gradual slug test may be conceived as a very brief constant-rate pumping test following by monitoring of the recovery, the duration of the period of injection and hence the injection rate, is not controlled. Furthermore, the initial period of water level rise is relatively brief compared to the transducer recording frequency. Therefore, it is not feasible to evaluate these data using methods developed for pumping tests. The approach we have adopted here adapts the methods available to interpret conventional slug tests, and applies an adjustment of the data to account for the gradual start of the test.

2.2 Interpretation of the slug tests

The slug tests are interpreted using the analysis of Cooper, Bredehoeft and Papadopulos (1967), as implemented in the well test interpretation package AQTESOLV (HydroSOLVE, 2000). This analysis conceives of the test interval as a horizontal, perfectly confined aquifer of infinite lateral extent. The conceptual model is illustrated below. The conceptual model is appropriate for a setting consisting of discrete near-horizontal flow zones separated by layers of low conductivity. The analysis yields estimates of transmissivity and storage coefficient.



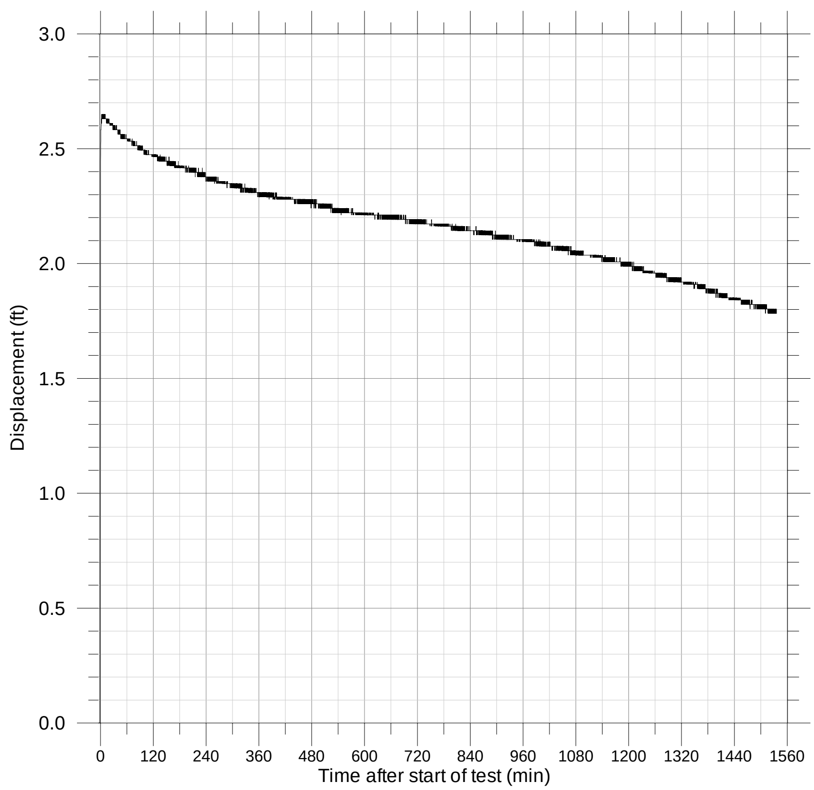
As indicated by National Research Council (1996, p. 244), transmissivity is more appropriate than hydraulic conductivity as a measure of the properties of a rock mass with horizontal flow zones. This is because transmissivity estimates do not require any assumptions regarding the thickness of the permeable interval. In contrast, hydraulic conductivity estimates are typically derived from transmissivity values by dividing by the length of the open interval – this approach will be consistent only if the length of the open interval is the same in all wells. This is not the case at the Site. Furthermore if the initial displacement is a relatively small portion of the length of the open interval, analyses cast in terms of transmissivity do not have to be corrected to account for the fact that the water level changes may take place in the open interval itself. This condition is satisfied for the present set of slug tests, as the initial displacement is about 3 feet, and the typical length of an open interval is 30 feet.

Section 3.
Slug test responses and analyses

3.1 AB1L

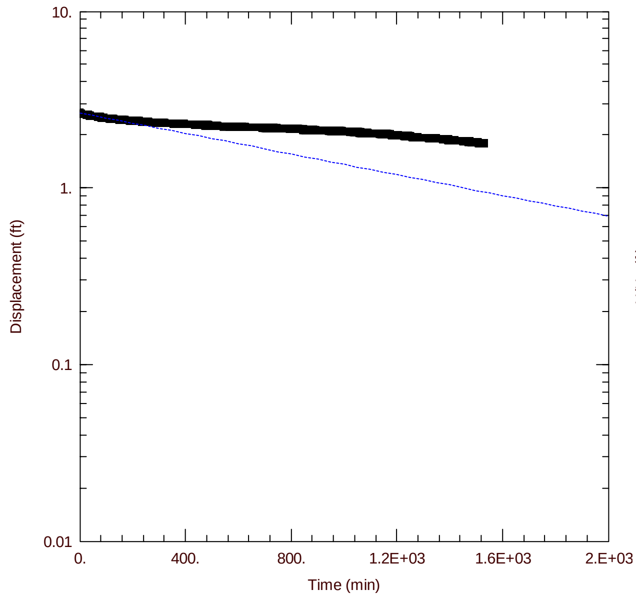
Based on a review of the estimated flow zone locations, AB1L intersects FZ-10 and FZ-11. This well was installed in June 2001, several months after the other wells at the site were assessed.

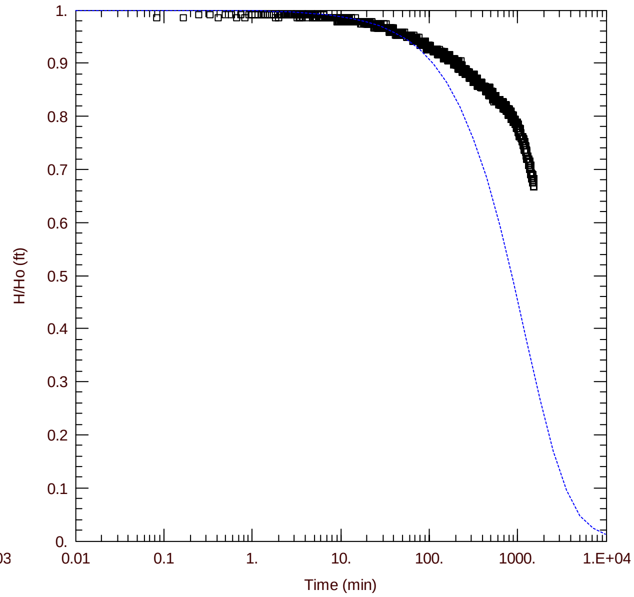
The response to the addition of the 2 gallons of water for the test is shown on the following plot:



The initial displacement estimated from the displacement record is about 2.7 ft, lower than the theoretical value of 3.3 ft. The initial displacement was smaller because some of the initial slug of water entered the space between the well riser and the outside casing. Only about 35% recovery is observed 24 hours after the start of the test.

The initial portion of the response indicates a gradual increase in the water level; this increase occurs over the time interval required to add the slug to the well. Since the classical methods of interpretation assume that the slug is inserted instantaneously, the initial portion is neglected. It is not possible to fit the solution to the entire data set; therefore, only the earlier portion of the data beyond the period of increasing water level. Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity from the fit to the early time data is 0.11 ft^2/day.





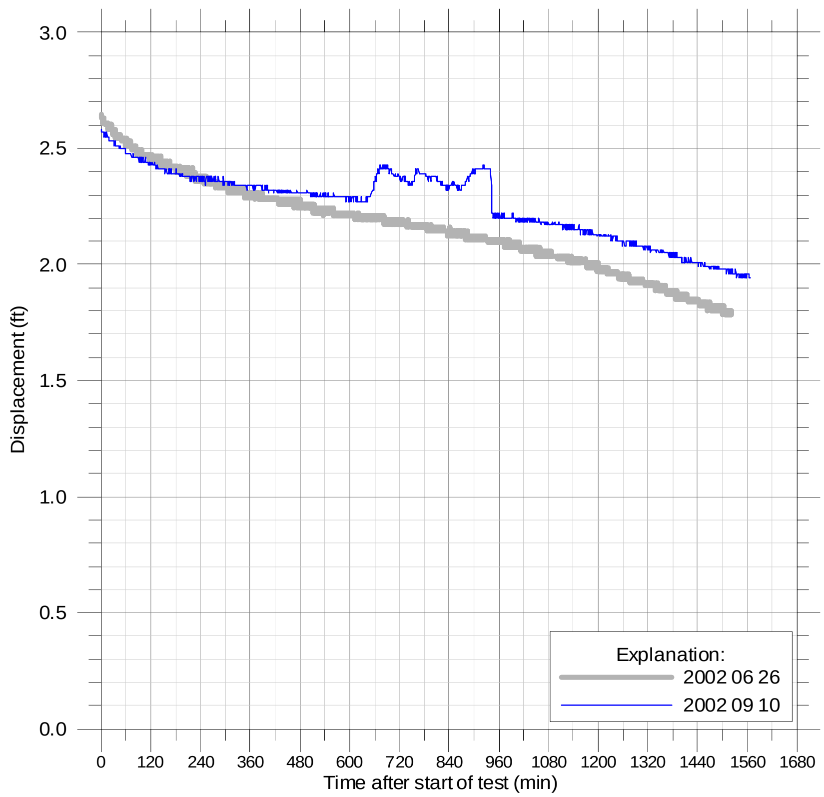
A range of storativities has been considered in the analysis. As shown in the table below, the assumed storativity has only a minor effect on the estimation of the transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.09
10^{-6}	0.11
10^{-7}	0.13

The response observed during the test is atypical, and the largest portion of the data has been neglected in the analysis. Therefore, the estimate of transmissivity has relatively low reliability. To confirm the response, the well was re-tested on September 10, 2002. The results of the re-test are presented in the next section.

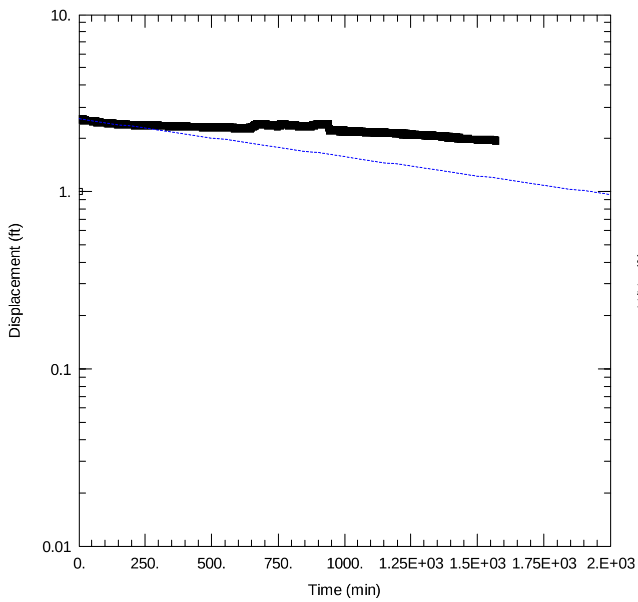
AB1L re-test

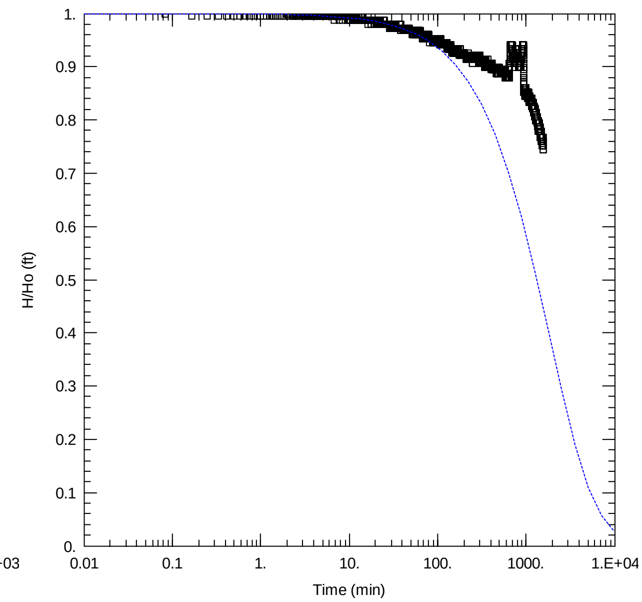
The response to the addition of 2 gallons of water for the re-test is shown below. The response for the original test is also included for comparison. The transducer readings in the middle of the re-test show the effects of local thundershower activity. When these data are discarded, the results of the re-test appear to be very similar to the original test. The portion of the response that departed from the ideal response in the original test also appears in the second test. This suggests that this response is not a problem with the test, but is a true reflection of the aquifer response.



The initial displacement estimated from the transducer record is 2.6 ft, less than the theoretical value of 3.3 ft. Approximately 75% recovery is observed within 26 hours of the start of the test.

As for the original test, it is not possible to match the theoretical solution to the entire response record, even when the irregular portion of the response is ignored. A fit to the early portion of the response was adopted for the original test of June 26, 2002, and this approach is applied here as well. This approach tends to overestimate the transmissivity. The match to the data is shown below. The estimated transmissivity from the fit to the data is 0.07 ft^2/day, for an assumed storativity of 10^{-6}.





As shown below, the assumed storativity value has little effect on the transmissivity estimate:

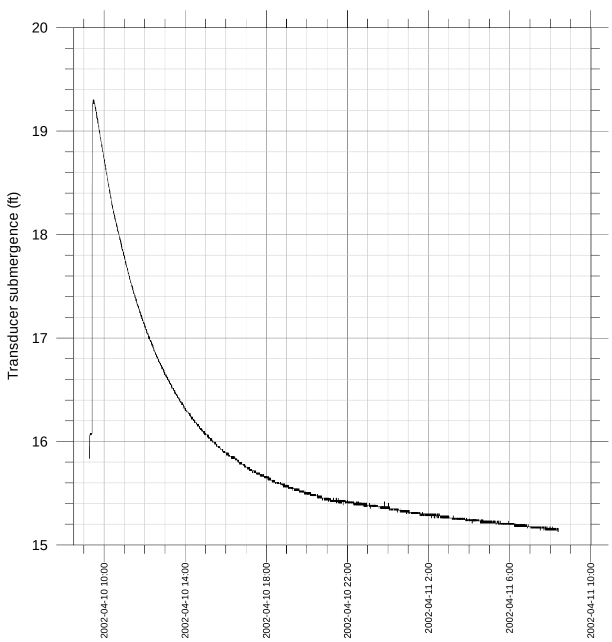
Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	0.05
10^{-6}	0.07
10^{-7}	0.08

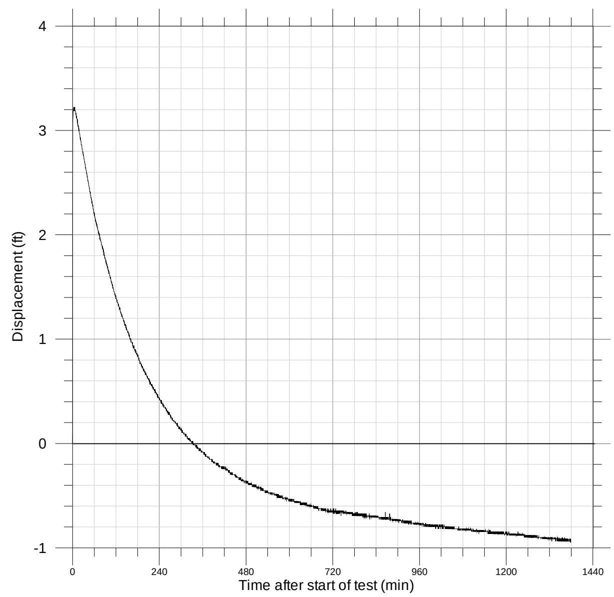
The transmissivity estimate from the June 26, 2002 slug test is 0.1 ft^2/day. The current estimate is consistent with this previous estimate. The results of the 2002 slug testing confirm that the transmissivity of the Lower interval (FZ-10/11) is low at AB1L.

3.2 AFW-1L

Based on a review of the estimated flow zone locations, AFW-1L intersects both FZ-10 and FZ-11. This well was classified previously as representative (SEDA, 2001).

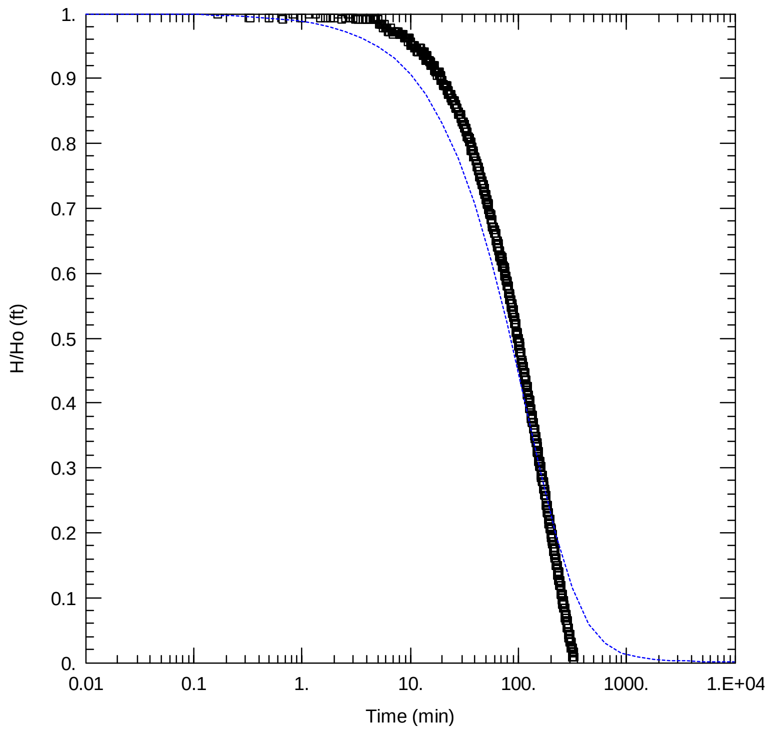
The response to the addition of the 2 gallons of water is shown on the following plots:





The 2-gallon slug of water was added at approximately 9:15 AM. The transducer submergence at this time was approximately 16.1 ft. The initial displacement inferred from the transducer record is about 3.2 ft, very close to the theoretical value of 3.3 ft. However, the water level continued to recover below the initial water level, to a transducer submergence of about 15.1 ft. Although the installation of a transducer in a well does cause a slight rise in the water level in a well, an increase of 1 ft is unrealistic. The response data suggest that the ambient aquifer conditions changed over the course of the test.

The plot of normalized displacement (using ΔH_0 = 3.2 ft) versus time is plotted below. It is not possible to match the full response. The approach adopted here is to match the middle of the response. The estimated transmissivity is 1 ft^2/day.



A range of storativities has been considered in the analysis, and the assumed storativity has relatively small effect the transmissivity estimation:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	1.0
10^{-6}	1.2
10^{-7}	1.3

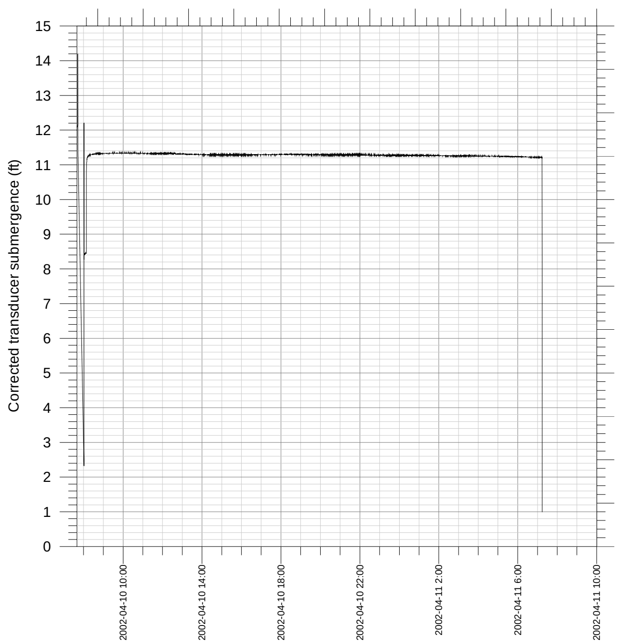
The transmissivity estimated from the 2002 slug test is consistent with the value reported from the 1991 packer testing (0.6 ft^2/day estimated for the interval from 516.9 to 490.3 ft AMSL). However, the transmissivity of 0.03 ft^2/day reported in the CRA database for a previous slug test does not appear to be reliable.

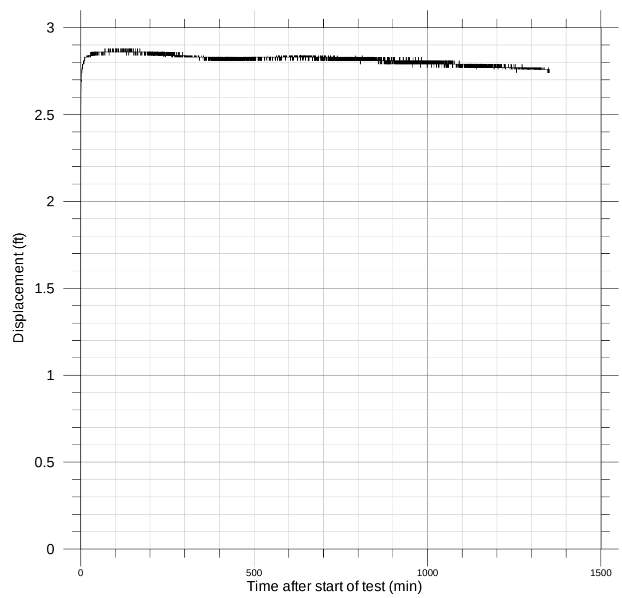
The 2002 slug tests suggest that transmissivity of the Lower zone at AFW-1L is moderate.

3.3 AFW-2L

Based on a review of the estimated flow zone locations, AFW-2L intersects FZ-11. This well was previously designated as non-representative, based on a low estimate of hydraulic conductivity from a previous slug test and anomalous water levels (SEDA, 2001). The well also did not respond during the May 2001 shutdown.

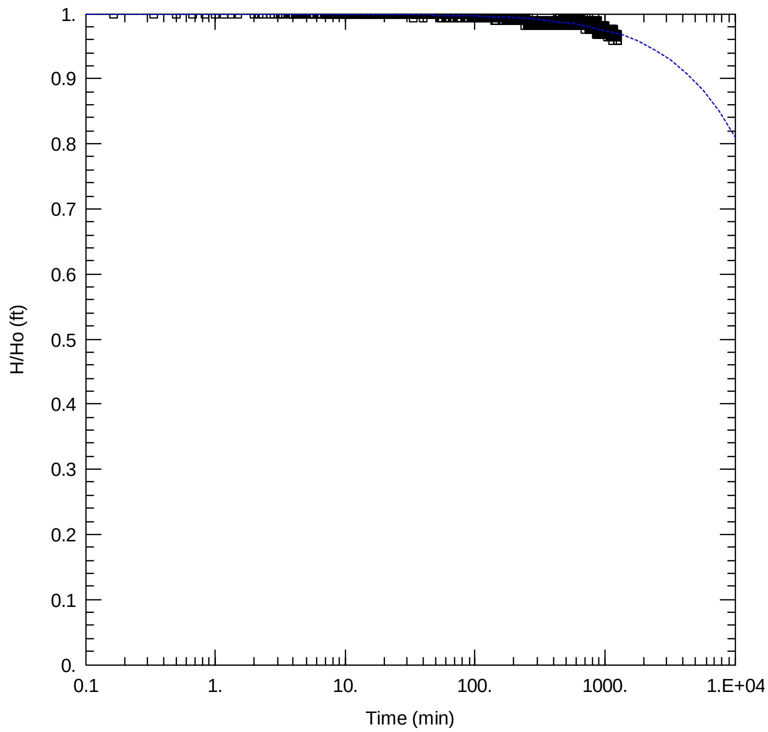
The response to the addition of the 2 gallons of water is shown on the following plots:





The initial displacement inferred from the transducer record is about 2.9 ft, relatively close to the theoretical value of 3.3 feet. Approximately 5% recovery is observed 22 hours after the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 0.0025 ft^2/d for an assumed storativity of 10^{-6}.



A range of storativities has been considered in the analysis, and the assumed storativity has relatively small effect the transmissivity estimation:

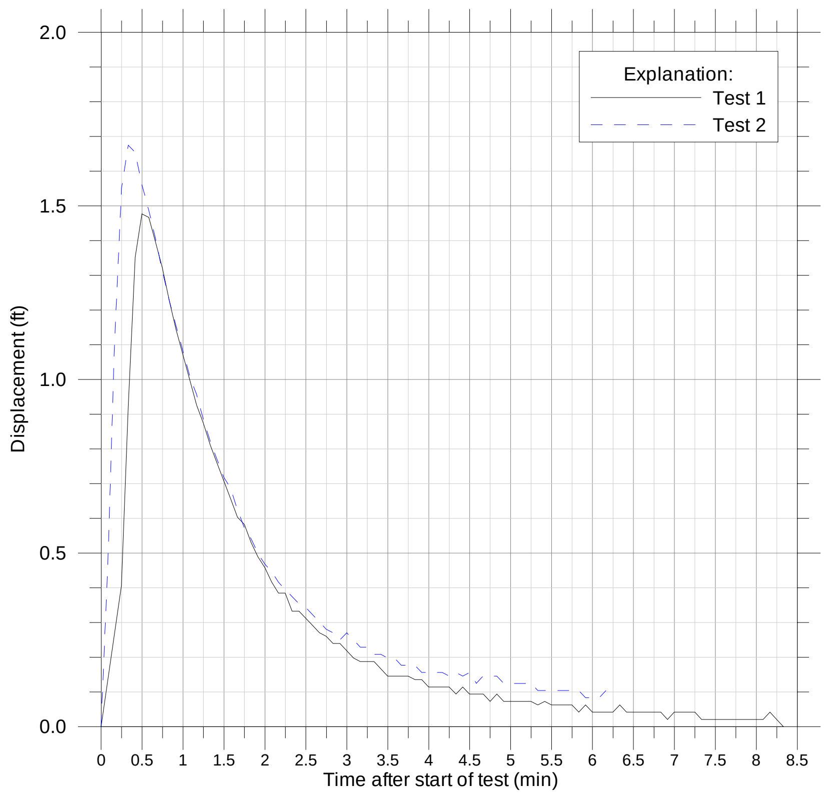
Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.002
10^{-6}	0.0025
10^{-7}	0.003

The 2002 slug tests suggest that transmissivity of the Lower interval (FZ-11) is low at AFW-2L, confirming the previous designation of this well as non-representative.

3.4 AFW-3L

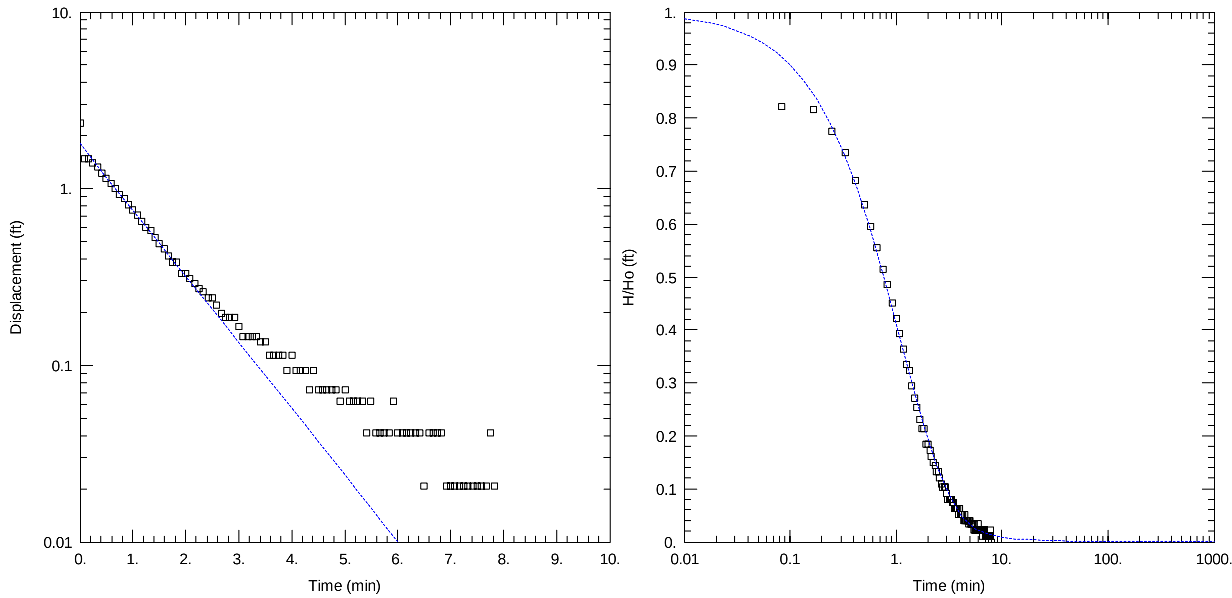
Based on a review of the estimated flow zone locations, AFW-3L intersects FZ-10 and FZ-11. Insufficient data were available to determine whether this well was representative (SEDA, 2001).

Two replicate tests were conducted at this well. The responses to the addition of the 2 gallons of water for both tests are shown on the following plot. The responses are similar and since the data from Test 1 show the full recovery only the details of the analysis of this test are presented here.



The effective initial displacement estimated from the transducer record of Test 1 is about 1.80 ft, less than half the theoretical value of 3.3 ft. The difference between the effective and theoretical initial displacements reflects the fact that the slug of water is not introduced instantaneously. Recovery is essentially complete after about 8 minutes.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity for Test 1 is 130 ft^2/day, for an assumed storativity of 10^{-6}.



A range of storativities has been considered in the analysis. As indicated in the table below, the assumed storativity has little effect on the transmissivity estimate:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	110
10^{-6}	130
10^{-7}	150

The second slug test yields a transmissivity estimate of 120 ft^2/day, for an assumed storativity of 10^{-6}. The results from the second slug test suggest that the interpretations are reproducible.

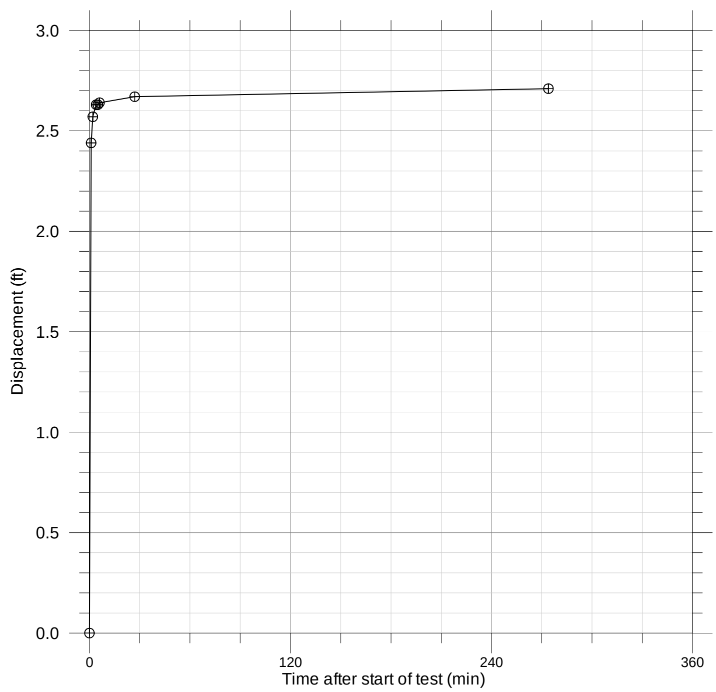
The transmissivity estimates derived from the 2002 slug tests are three orders-of-magnitude higher than the range of values reported previously (0.4 ft^2/day from the CRA database, and 0.2 ft^2/day from the 1991 packer testing of the interval from 504.6 to 483.4 ft AMSL).

The results of the 2002 slug tests suggest that the transmissivity of the Lower interval (FZ-10/11) is high at AFW-3L.

3.5 AGW-1L

Based on a review of the estimated flow zone locations, AGW-1L intersects FZ-11. This well was classified by SEDA (2001) as non-representative, as the water levels in this well are consistently higher than those observed in the Middle well, AGW-1M.

According to John Raby, CRA, the pressure transducer used for test was faulty. However, manual measurements of the water level in the well were also made for about 4 hours following the addition of the slug. The response to the addition of the 2 gallons of water for the tests is shown below:



The initial displacement could not be estimated from the slug test record, as the test was not run sufficiently long to observe a decline in the water level. No recovery is observed.

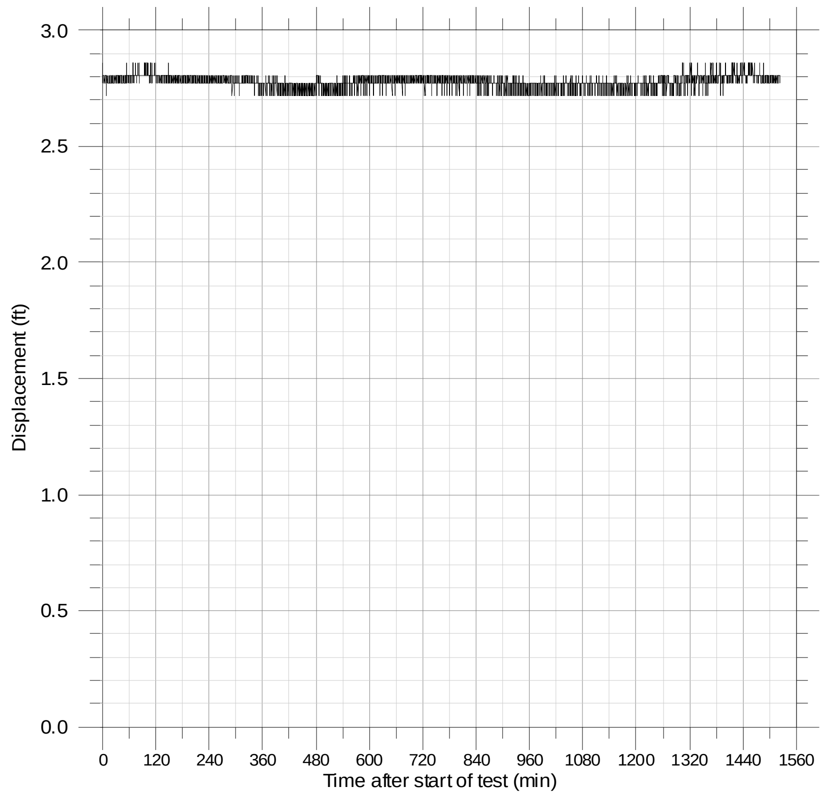
Due to the lack of recovery at this well, it is not possible to estimate the transmissivity. However, in our experience, the gradual rise in the water level following the addition of the slug of water appears to be typical of a well with low transmissivity.

The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-11) is low at AGW-1L, confirming the SEDA (2001) designation of this well as non-representative.

3.6 AGW-2L

Based on a review of the estimated flow zone locations, AGW-2L intersects FZ-10 and FZ-11. This well was classified in SEDA (2001) as non-representative, due to higher water levels in this well compared to the Middle well, AGW-2M.

The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement estimated from the transducer record is 2.80 ft, less than the theoretical value of 3.3 ft. No recovery of the extrapolated initial displacement is observed during the 25 hours of observations following the start of the test.

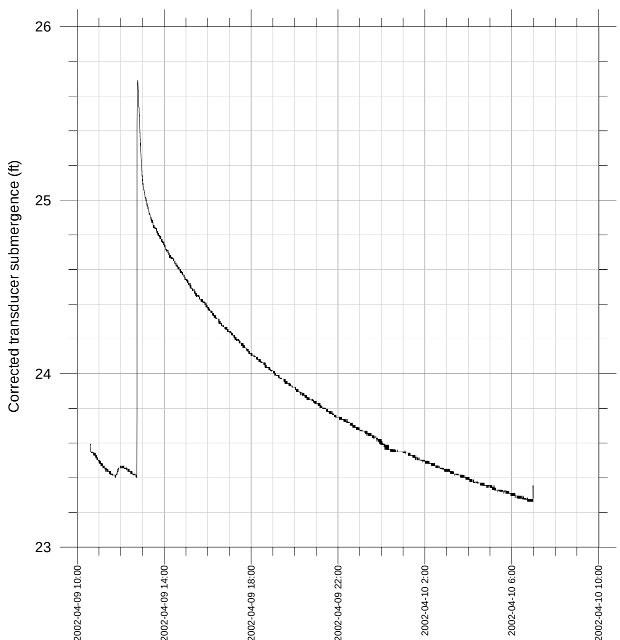
Due to the lack of recovery at this well, it is not possible to estimate the transmissivity. It is possible, however, to conclude that the transmissivity for this well is very low. The results of the analysis confirm the SEDA (2001) designation of this well as non-representative.

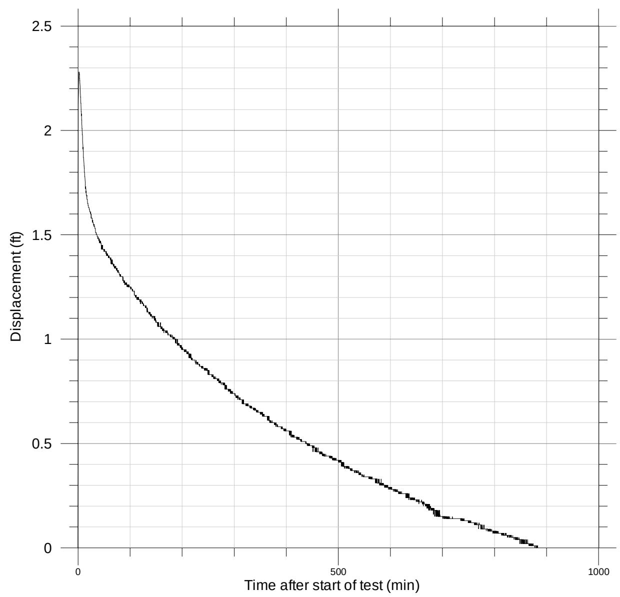
The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is low at AGW-2L.

3.7 B1L

Based on a review of the estimated flow zone locations, B1L intersects FZ-10 and FZ-11. This well was classified previously as a representative well (SEDA, 2001).

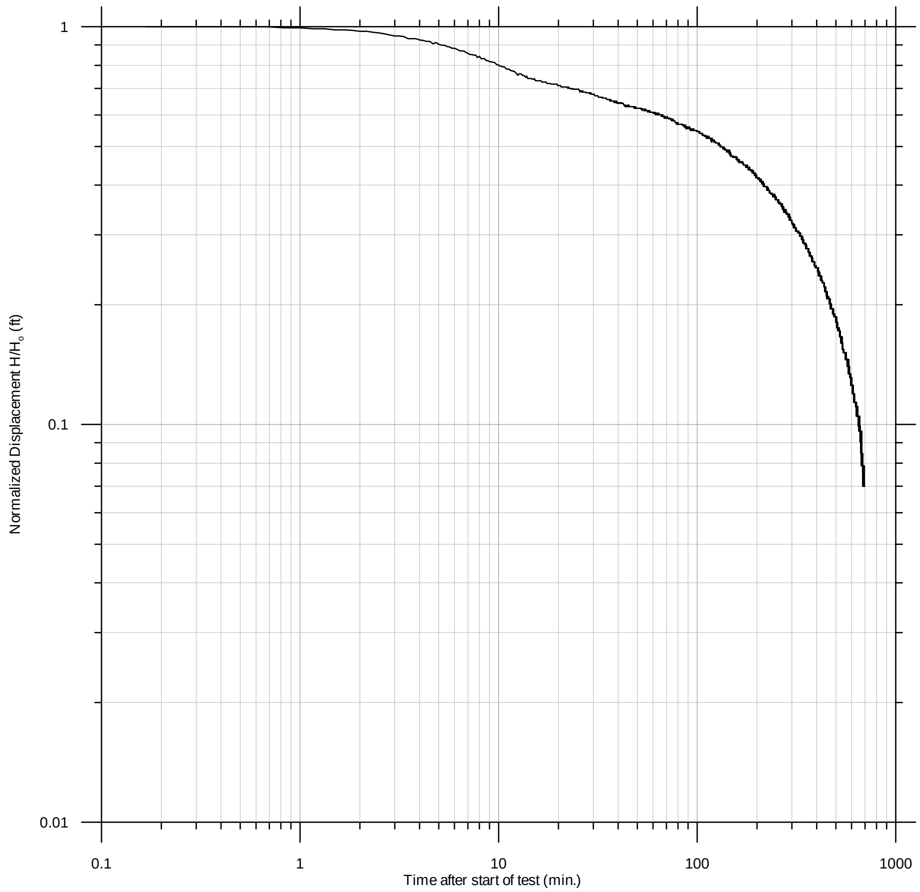
The response to the addition of the 2 gallons of water is shown on the following plots:





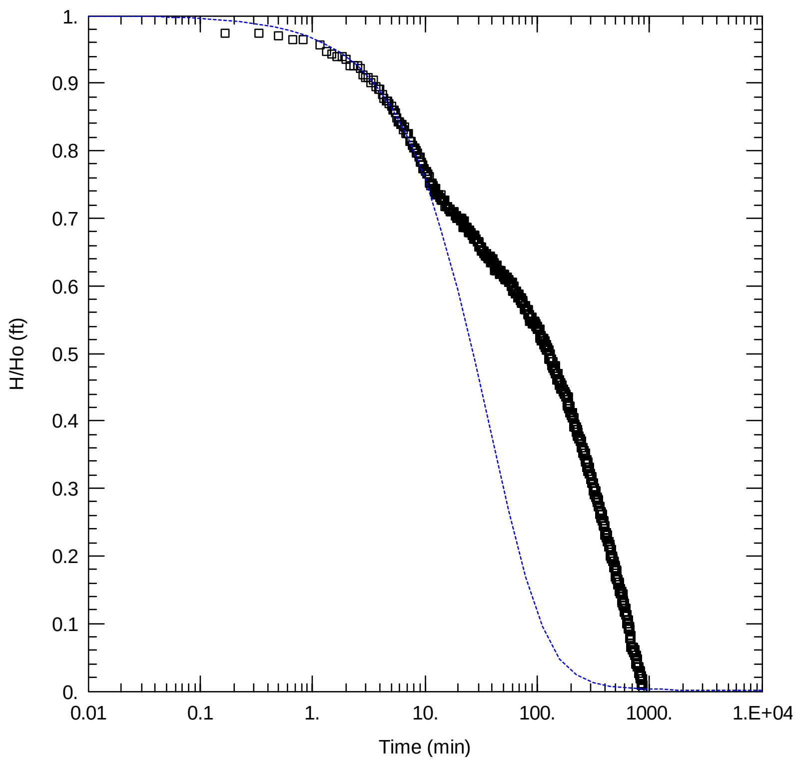
The initial displacement inferred from the transducer record is about 2.3 ft, less than the theoretical value of 3.3 feet. The inferred initial displacement is very sensitive to the rate of recovery of the formation. While the slug is being introduced gradually by pouring water into the well, the formation is accepting water, so that the theoretical initial displacement is never achieved.

The plot of normalized displacement versus time on a log-log scale below shows clearly two distinct regions of response.



B1L Slug Testing - Normalized Displacement versus Time

The slug test response is very similar to responses presented by Grader and Ramey (1988) for double-porosity reservoirs, where the initial response is reflects flow processes in horizontal fractures and the later response is a function of the matrix or vertical fractures. Therefore, an estimate of the fracture transmissivity is obtained by analyzing the early-time data. The best-fit match is shown below. The estimated transmissivity is 4 ft^2/day.



A range of storativities has been considered in the analysis. As shown in the table below, the assumed storativity has only a small effect on the transmissivity estimate:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	2.9
10^{-6}	3.6
10^{-7}	4.2

The current estimate falls in the middle of the range of transmissivity estimates obtained from previous tests at this well:

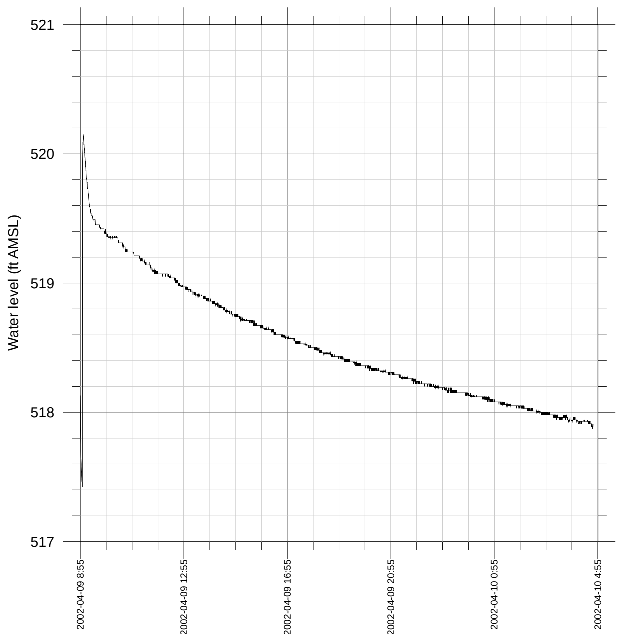
- 14 ft^2/day estimated from slug testing (date unknown, from CRA database): and
- 0.14 ft^2/day derived from 1991 packer testing for the interval of 488.7-508.7 ft MSL.

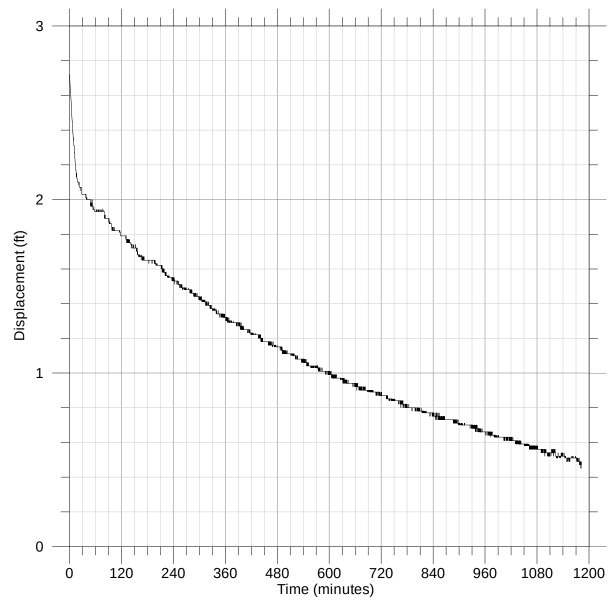
The 2002 slug tests suggest that the Lower zone has moderate transmissivity at B1L.

3.8 B2L

Based on a review of the estimated flow zone locations, B2L intersects FZ-10 and FZ-11. This well was characterized previously as representative (SEDA, 2001).

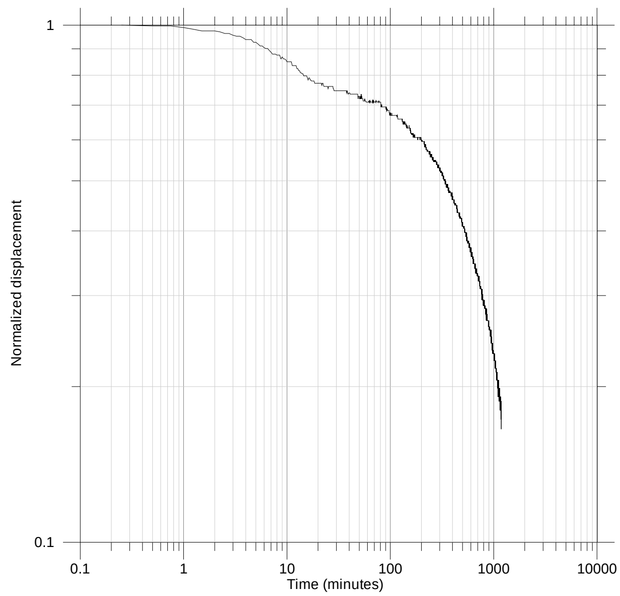
The response to the addition of the 2 gallons of water is shown on the following figures:



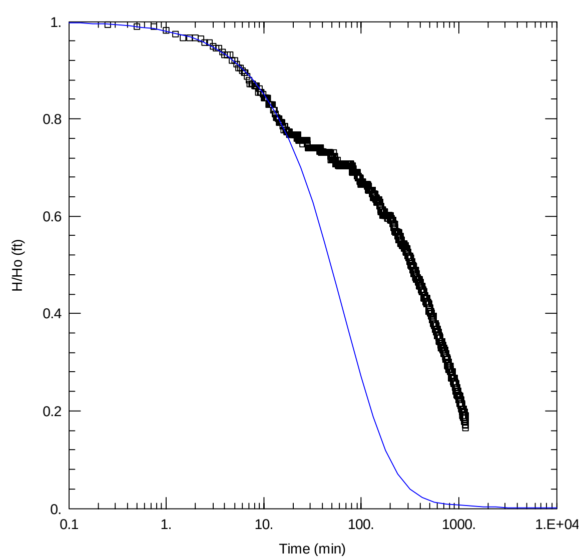


Well B2L has a 3⅞-inch diameter, and the theoretical displacement for an initial slug of 2 gallons is 3.3 ft. The initial displacement inferred from the transducer record is about 2.7 ft, smaller than the theoretical value.

The plot of normalized displacement versus time on a log-log scale below shows clearly two distinct regions of response.



This response is very similar to responses presented by Grader and Ramey (1988) for double-porosity reservoirs, where the initial response is related to a fracture and the later response is a function of the matrix or vertical fractures. Therefore, an estimate of the fracture transmissivity is obtained by analyzing only the early-time data. The match of the analytical solution to the early portion of the data is shown below. The estimated transmissivity is 2.0 ft^2/day for an assumed storage coefficient of 10^{-6}.



A range of storativities has been considered in the analysis; however, as indicated in the table below, the assumed storativity has little effect on the transmissivity estimate:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	1.7
10^{-6}	2.0
10^{-7}	2.4

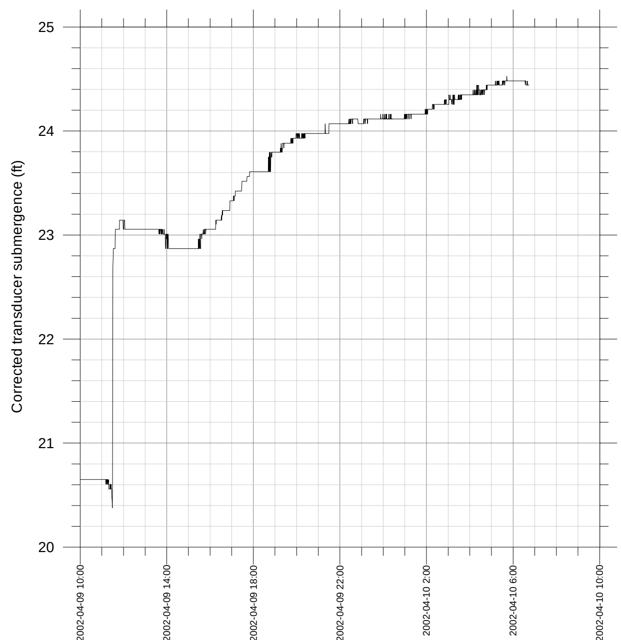
The transmissivity estimate derived from the 2002 slug test is somewhat lower than the value of 10 ft^2/day reported previously for this well (Site database [eDAT]).

The 2002 slug test suggests that transmissivity of the Lower zone at B2L is moderate.

3.9 BC3L

Based on a review of the estimated flow zone locations, BC3L intersects FZ-10 and FZ-11. This well was classified previously as non-representative (SEDA, 2001), based on a low estimate of hydraulic conductivity from a previous slug test, and anomalous water levels.

The response to the addition of the 2 gallons of water is shown on the following plot:

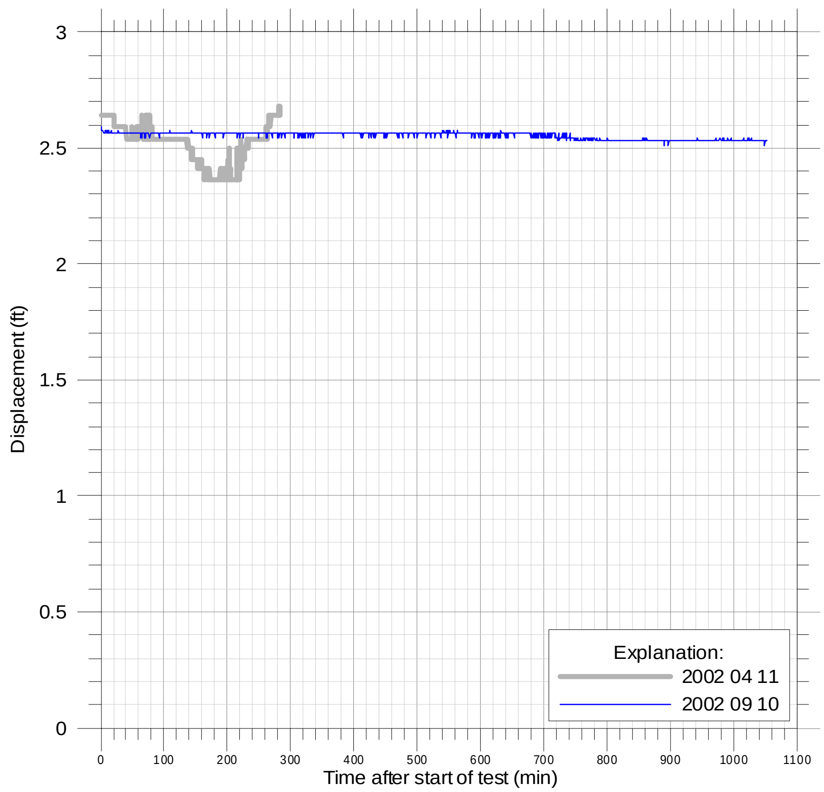


The response cannot be analyzed, as the water level continues to rise in the borehole after the addition of the slug. The cause of the water level rise is not known.

Upon review of the results of the slug test data we recommended that BC3L be tested again. The well was re-tested on September 10, 2002 and the results are presented in the next section.

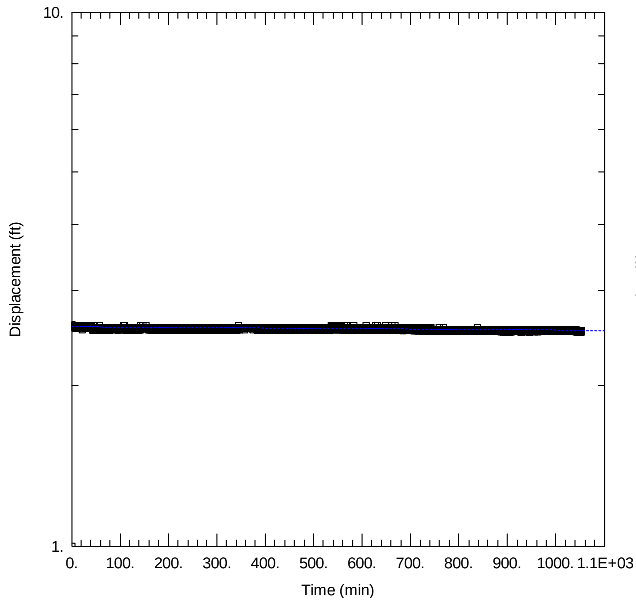
BC3L re-test

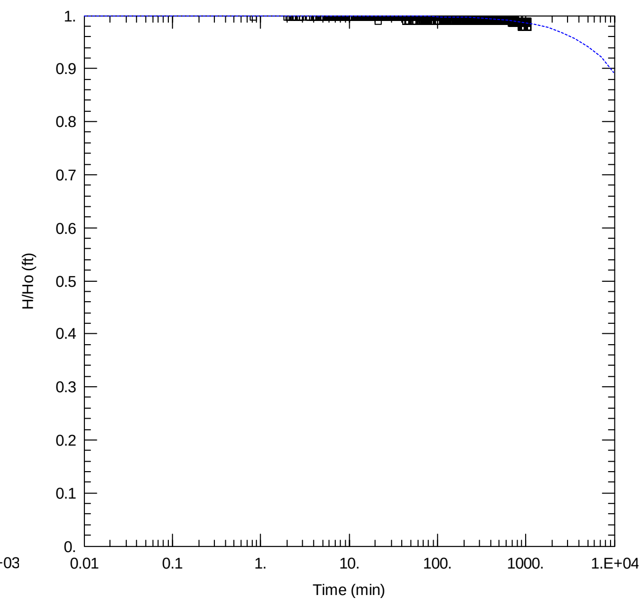
The response to the addition of 2 gallons of water for the re-test is shown below. The response for the original test is also included for comparison. The re-test response does not exhibit the irregularity observed in the original test, suggesting that there pressure transducer was faulty.



The initial displacement estimated from the transducer record is 2.6 ft, less than the theoretical value of 3.3 ft. Less than 1% recovery is observed 18 hours after the start of the test.

Plots showing the estimation of the effective initial displacement and the theoretical match with the Cooper and others (1967) are shown below. The estimated transmissivity from the fit to the data is 0.0013 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated below, the assumed value for the storativity has little effect on the estimated transmissivity:

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	0.0010
10^{-6}	0.0013
10^{-7}	0.0017

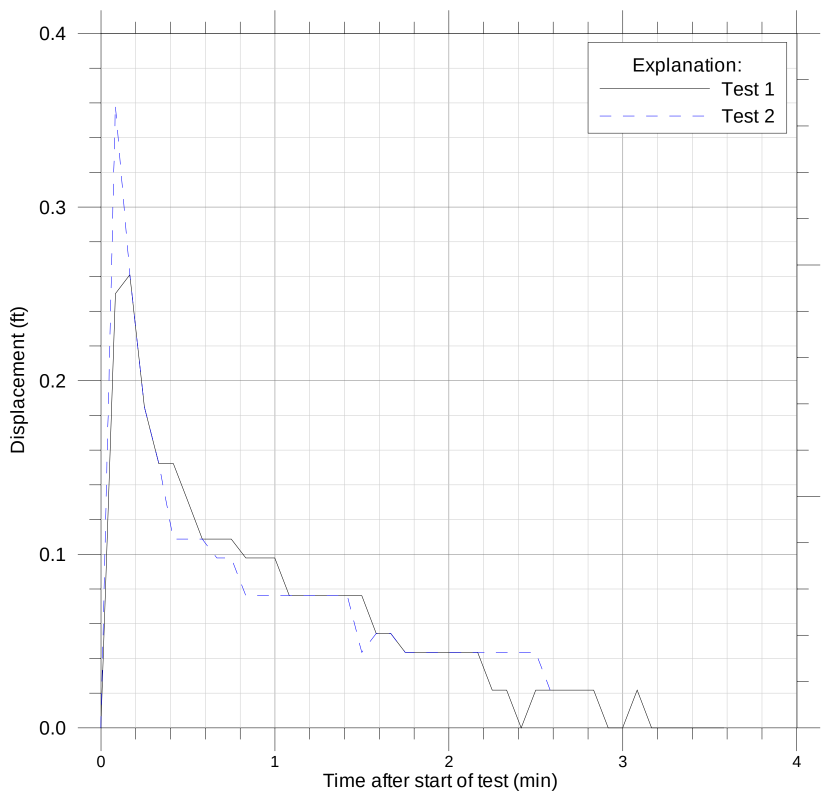
No previous estimates of transmissivity are available for this well for comparison.

The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-11 and possibly FZ-10) is very low at BC3L.

3.10 C1L

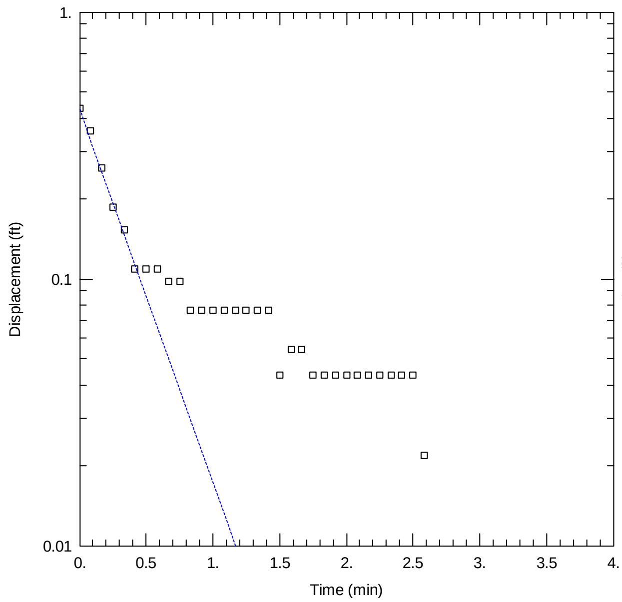
Based on a review of the estimated flow zone locations, C1L intersects FZ-10 and FZ-11. This well was classified previously as representative (SEDA, 2001).

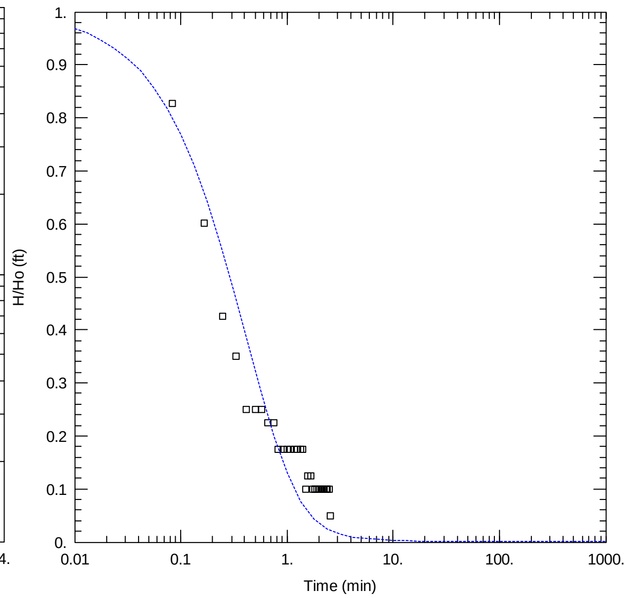
Two replicate tests were conducted at this well. The responses to the addition of the 2 gallons of water for both tests are shown on the following plot. The responses are similar and only the details of the analysis for Test 2 are presented here.



The effective initial displacement estimated from the transducer record for Test 2 is about 0.44 ft, significantly less than the theoretical value of 3.3 ft. The difference between the effective and theoretical initial displacements reflects the fact that the Lower zone is sufficiently transmissive at this location that the water level recovers while the test is still being executed. Complete recovery is observed about 3 minutes after the start of each test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity from the fit to the data is 340 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated in the table below, the assumed storativity has a relatively small effect on the transmissivity estimate:

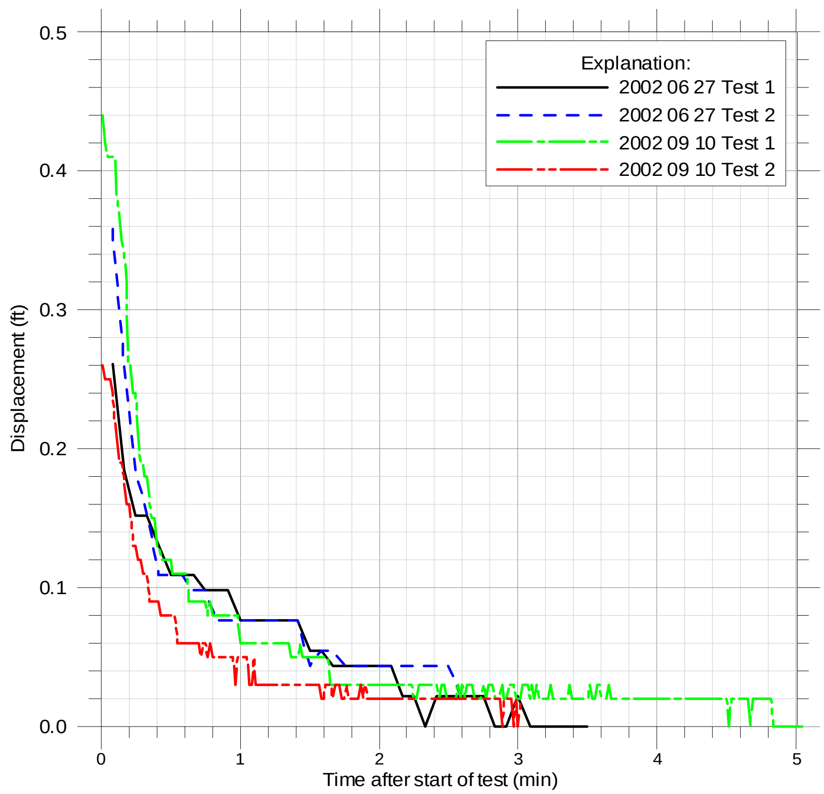
Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	290
10^{-6}	340
10^{-7}	390

Test 1 yielded a transmissivity estimate of 380 ft^2/day, for an assumed storativity of 10^{-6}. The results from the first slug test suggest that the results for C1L reported here are repeatable.

Upon review of the slug test results we decided that the transmissivity estimation could be improved by increasing the frequency of water level recording. Therefore, the well was re-tested on September 10, 2002, using a 1-second recording frequency, the minimum time possible.

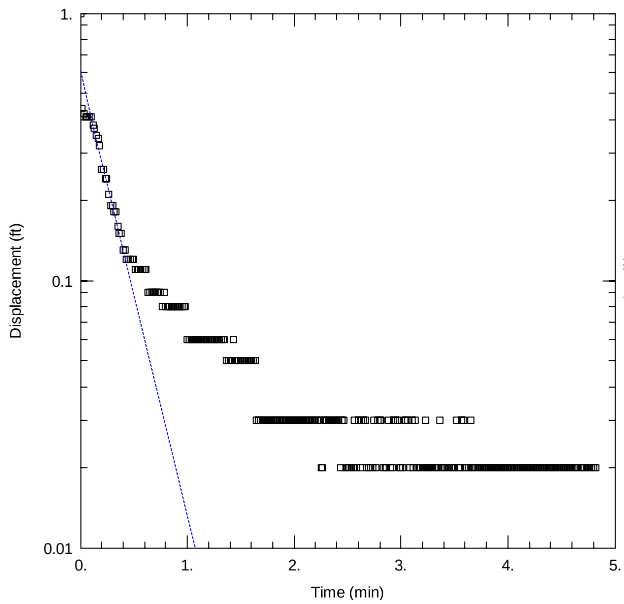
C1L re-test

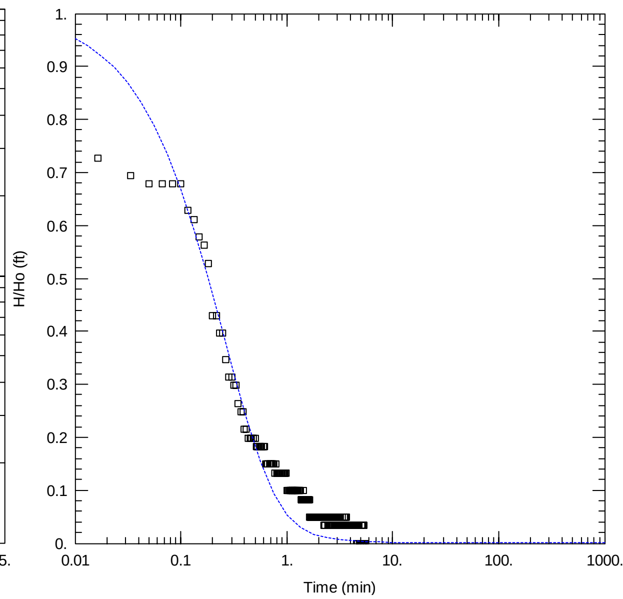
Two slug tests were conducted during the re-testing of this well, one test in which 2 gallons were added, and a second in which 1 gallon was added. The results of all four tests are shown below. Since the responses are consistent, only the details of the analysis for Re-test 1 are presented here.



For Re-test 1, the initial displacement estimated from the transducer record is 0.6 ft, much less than the theoretical value of 3.3 ft. Complete recovery is observed within 5 minutes of the start of the test. Both observations are consistent with a high transmissivity.

The estimated transmissivity from the fit to the data from Test 1 is 540 ft^2/day, for an assumed storativity of 10^{-6}. The match to the data is shown below.





A range of storativities has been considered in the analysis. The results tabulated below demonstrate the transmissivity estimate is relatively insensitive to the assumed storativity:

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	460
10^{-6}	540
10^{-7}	630

Re-test 2 yields a transmissivity estimate of 530 ft^2/day, for an assumed storativity of 10^{-6}. The results from the second slug test suggest that the results are repeatable. The transmissivities estimated from the June 27, 2002 slug tests were 340 to 380 ft^2/day. Although the responses to the addition of the slugs were repeatable, both were poorly resolved, and provided only limited data to fit the theoretical solution to the response. Therefore, we consider the current estimates to be more reliable.

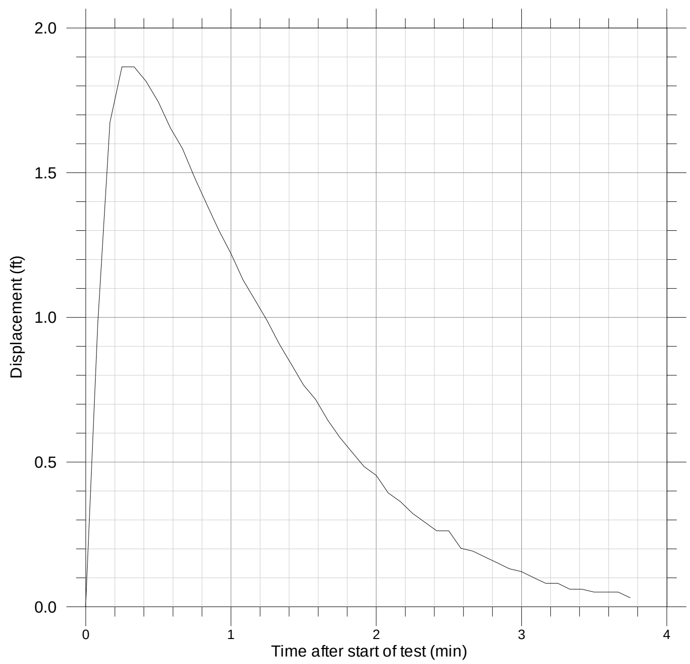
The estimates of transmissivity derived from the 2002 slug tests are somewhat higher than the value of 140 ft^2/day reported for a previous test at this well (Site database [eDAT]), and the value of 130 ft^2/day derived from the 1991 packer testing of the interval from 510.5 to 487.5 ft AMSL.

The results of the 2002 slug tests suggest that the transmissivity for the Lower interval (FZ-10/11) is high at C1L.

3.11 C2L

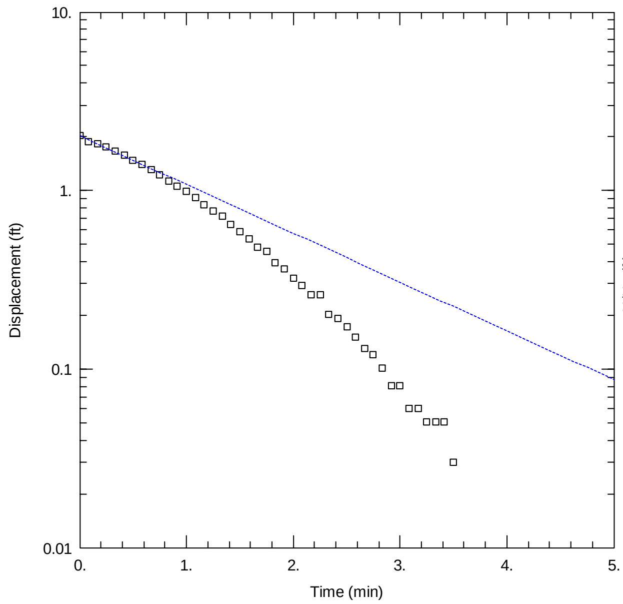
Based on a review of the estimated flow zone locations, C2L intersects FZ-10 and FZ-11. This well was classified previously as representative (SEDA, 2001).

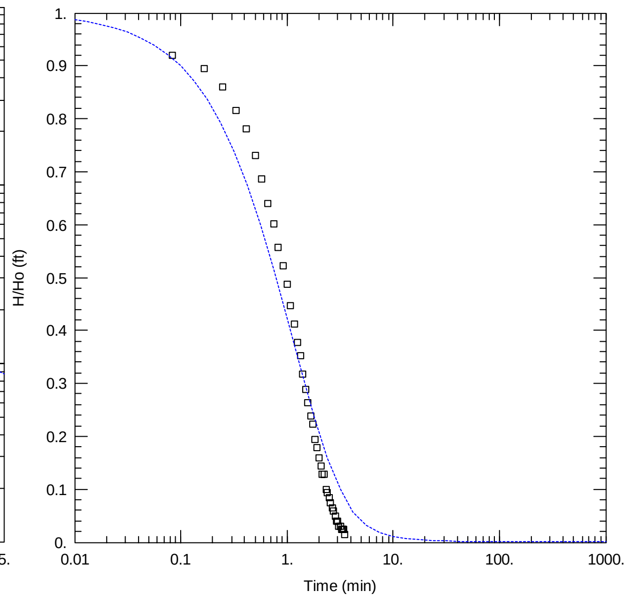
The response to the addition of the 2 gallons of water for the test is shown on the following plot:



The initial displacement estimated from the transducer record is about 1.8 ft, less than the theoretical value of 3.3 ft. Approximately 95% recovery is observed within 4 minutes of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity from the fit to the data is 125 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated on the following table, the assumed storativity has only a minor effect on the estimation of the transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	110
10^{-6}	125
10^{-7}	140

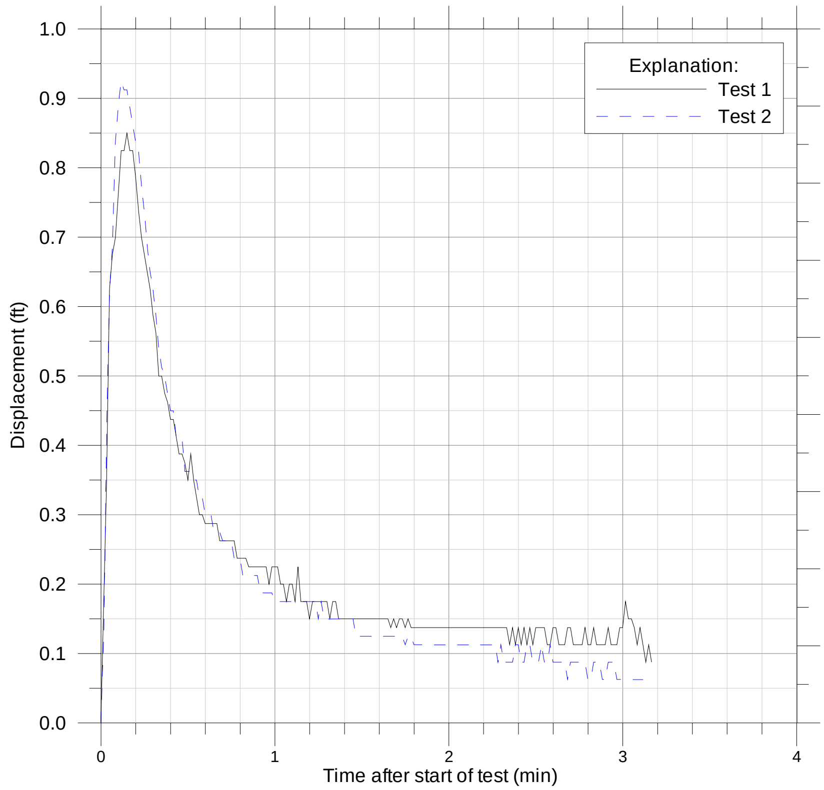
The results of the 2002 slug test are consistent with the transmissivity of 90 ft^2/day reported for a previous test at this well (Site database [eDAT]).

The results of the 2002 slug tests suggest that the transmissivity for the Lower interval (FZ-10/11) is high at C2L.

3.12 CD1L

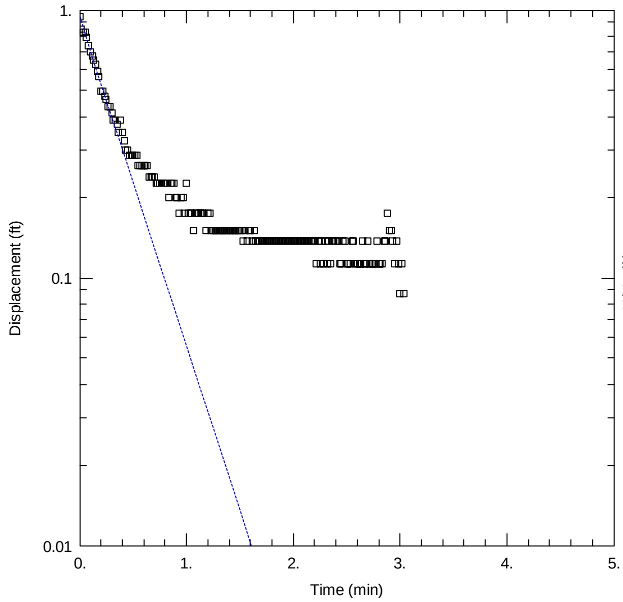
Based on a review of the estimated flow zone locations, CD1L intersects FZ-10 and FZ-11. Due to limited data, this well was not classified in SEDA (2001).

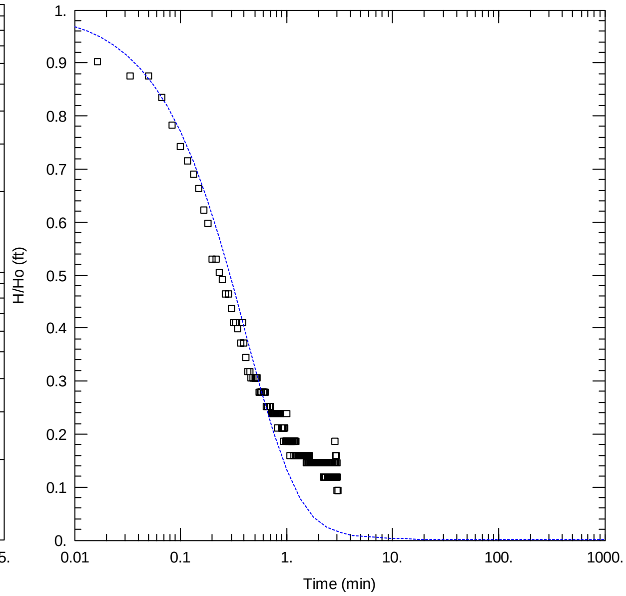
Two replicate tests were conducted at this well. The responses to the addition of the 2 gallons of water for both tests are shown on the following plot. The responses are similar and only the details of the analysis of Test 1 are presented here.



The initial displacement estimated from the transducer record for Test 1 is about 0.9 ft, significantly less than the theoretical value of 3.3 ft. Approximately 90% recovery is observed within 3 minutes of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity for this test is 330 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated in the table below, the assumed storativity has a relatively small effect on the estimate of transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	300
10^{-6}	330
10^{-7}	400

The results from the second slug test yield similar results. Test 2 yields a transmissivity estimate of 310 ft^2/day for an assumed storativity of 10^{-6}.

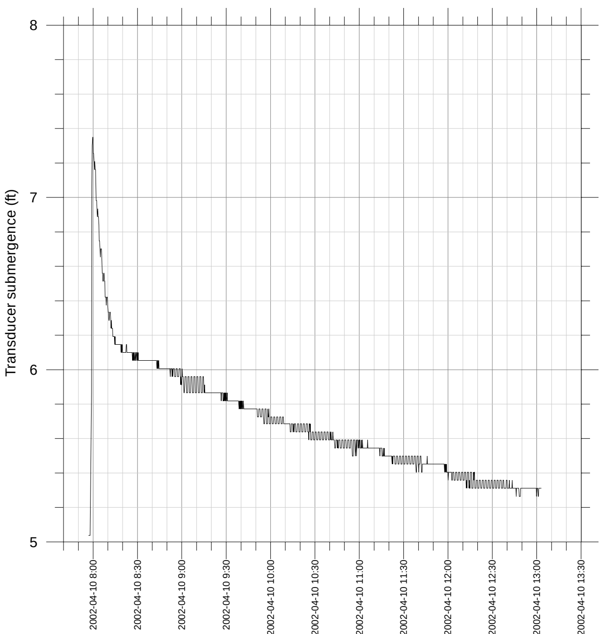
No previous testing for the transmissivity have been reported for this well.

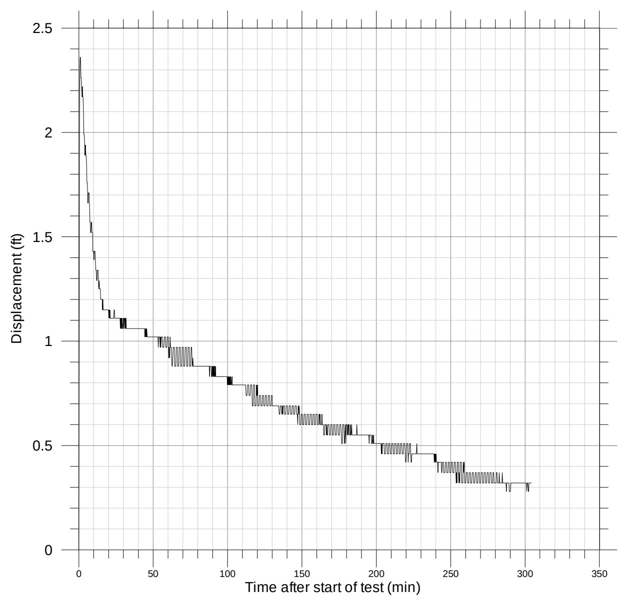
The results of the 2002 slug tests suggest that the transmissivity for the Lower interval (FZ-10/11) is high at CD1L.

3.13 D1L

Based on a review of the estimated flow zone locations, D1L intersects FZ-10 and FZ-11. This well was designated previously as representative (SEDA, 2001).

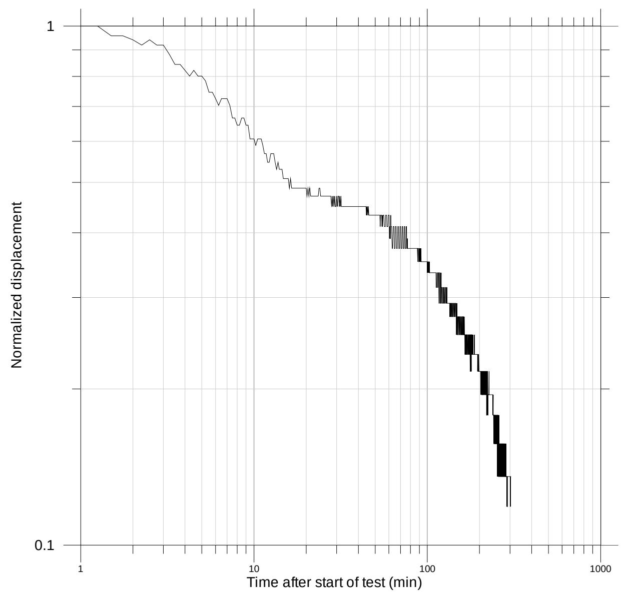
The response to the addition of the 2 gallons of water is shown on the following plots:



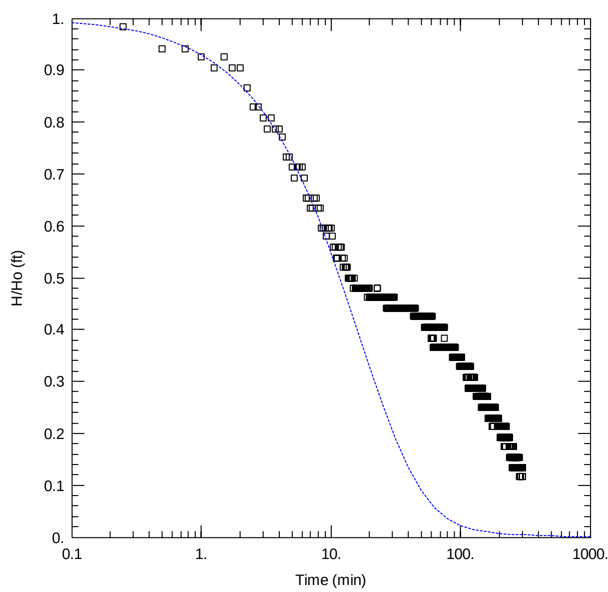


The initial displacement inferred from the transducer record is about 2.4 ft, less than the theoretical displacement of 3.3 ft. As was the case for well B1L, this is likely caused by the well starting to respond before the entire slug could be added.

The plot of normalized displacement versus time on a log-log plot below shows clearly two distinct regions of response. This response is very similar to responses presented by Grader and Ramey (1988) for double-porosity reservoirs, where the initial response is related to the fracture and the later response is a function of the matrix or vertical fractures. Therefore, an estimate of the fracture transmissivity is obtained by analyzing only the early-time response data.



The match of the Cooper et al. (1967) solution to the early portion of the response is shown below. The estimated transmissivity is 8 ft^2/day, for an assumed storativity of 10^{-6}.



As indicated in the table below, the assumed storativity has relatively little effect on the estimation of the transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	6
10^{-6}	8
10^{-7}	10

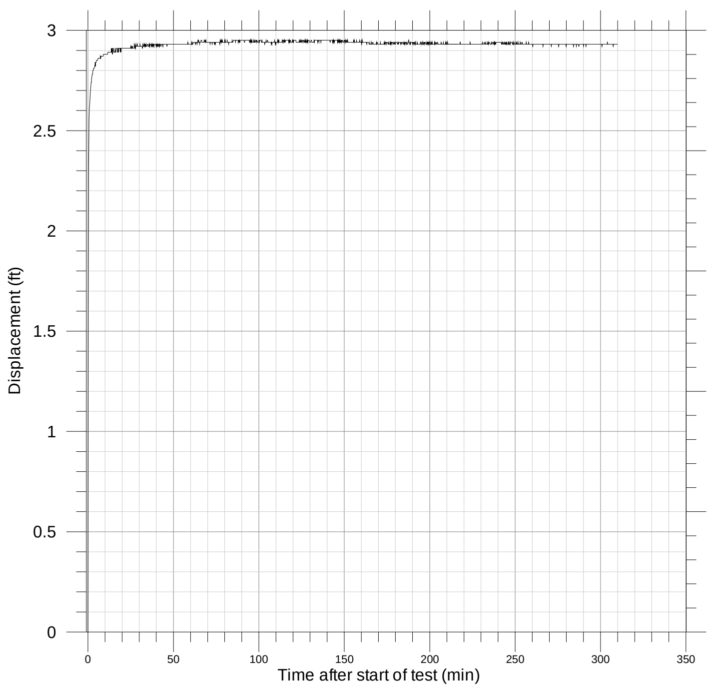
The transmissivity estimated from this test is consistent with the results of previous testing. A value of 11 ft^2/d was reported for a slug test over the interval from 506.2 to 482.7 ft AMSL (Site database [eDAT]).

The 2002 slug tests suggest that the Lower zone has moderate transmissivity at D1L.

3.14 D2L

Based on a review of the estimated flow zone locations, D2L intersects FZ-10 and FZ-11. This well was designated previously as non-representative, based on a low estimate of hydraulic conductivity from a previous slug test and anomalous water levels (SEDA, 2001). The well also did not respond during the May 2001 shutdown.

The response to the addition of the 2 gallons of water is shown on the following plot:



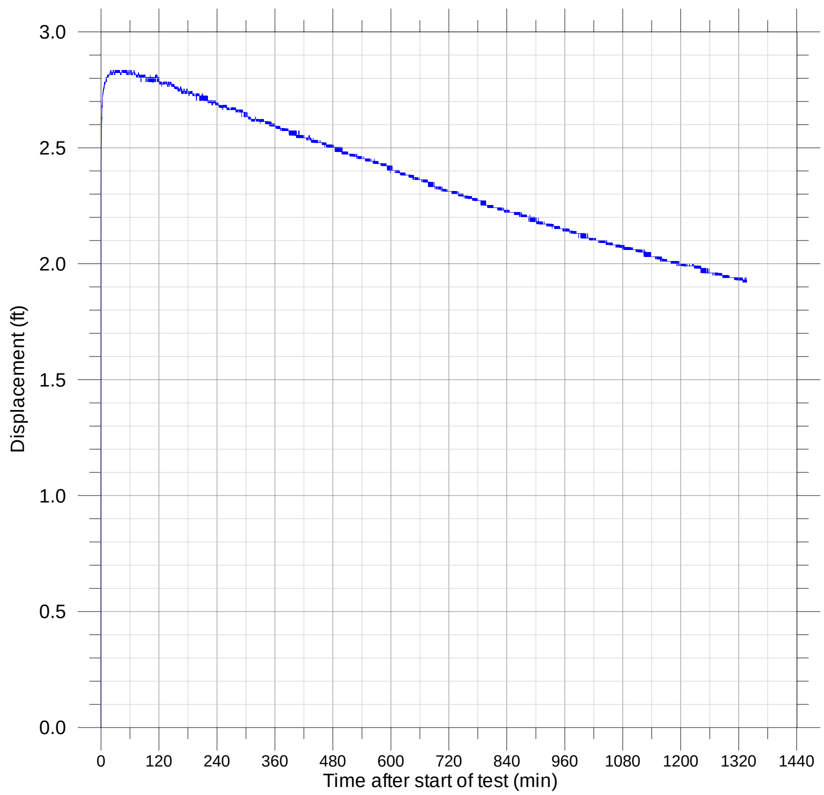
The initial displacement inferred from the transducer record is about 2.3 ft, and reaches a maximum of approximately 2.8 ft.

The slug test data cannot be interpreted to quantitatively estimate the transmissivity. However, we can infer from the lack of recovery of the response that the transmissivity for this well is low. The lack of recovery also confirms the previous designation of D2L as non-representative.

3.15 D4L

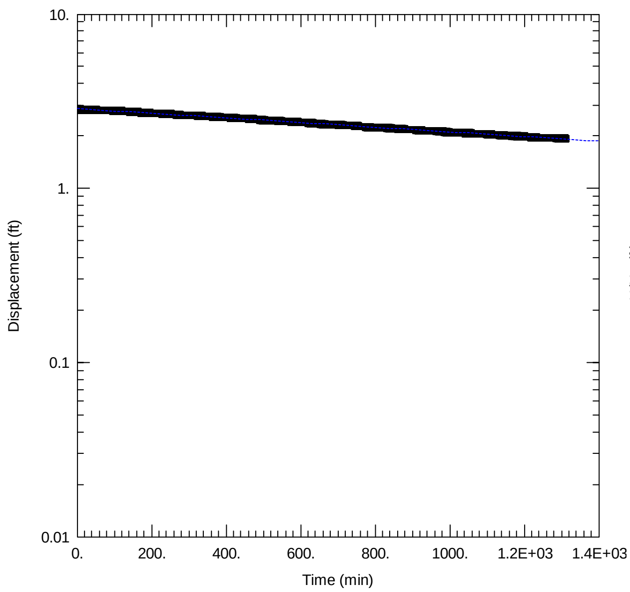
Based on a review of the estimated flow zone locations, D4L intersects FZ-10 and FZ-11. This well was classified previously as representative (SEDA, 2001).

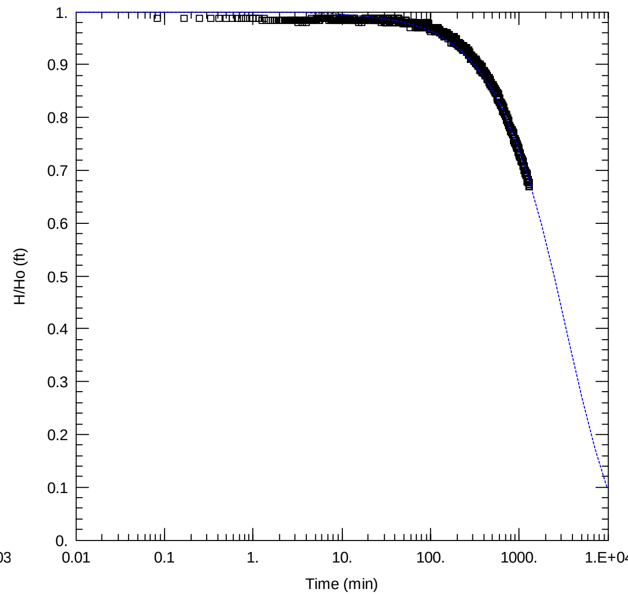
The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement inferred from the transducer record is about 2.8 ft, slightly less than the theoretical value of 3.3 ft. Less than 35% recovery is observed after 24 hours of monitoring from the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 0.04 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated below, estimation of the transmissivity is not very sensitive to the assumed storativity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.03
10^{-6}	0.04
10^{-7}	0.05

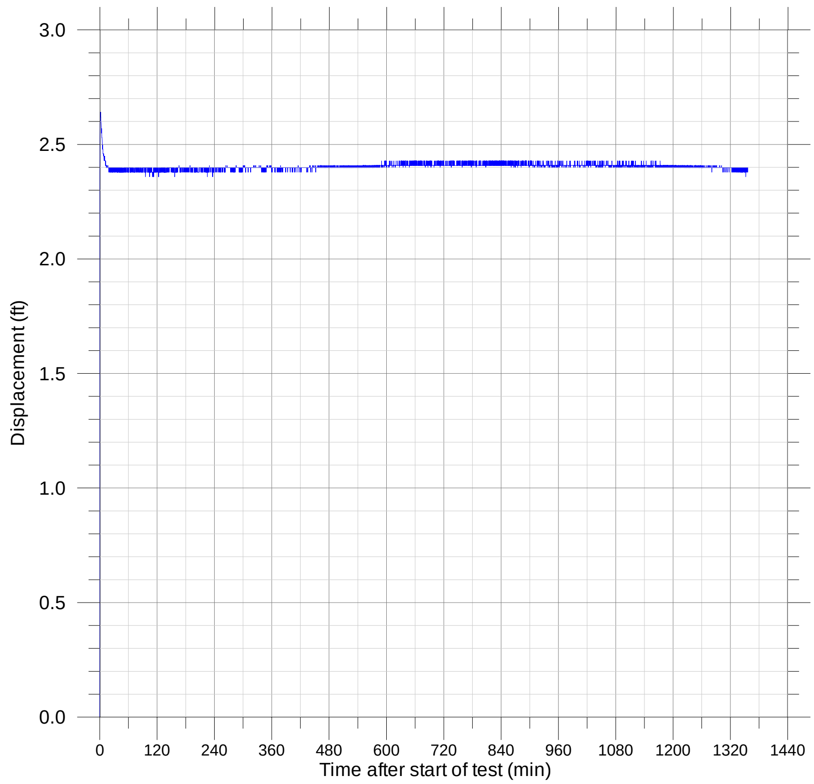
The results of the 2002 slug test are consistent with the transmissivity of 0.1 ft^2/day reported for a previous test (Site database [eDAT]).

The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is low at D4L.

3.16 D5L

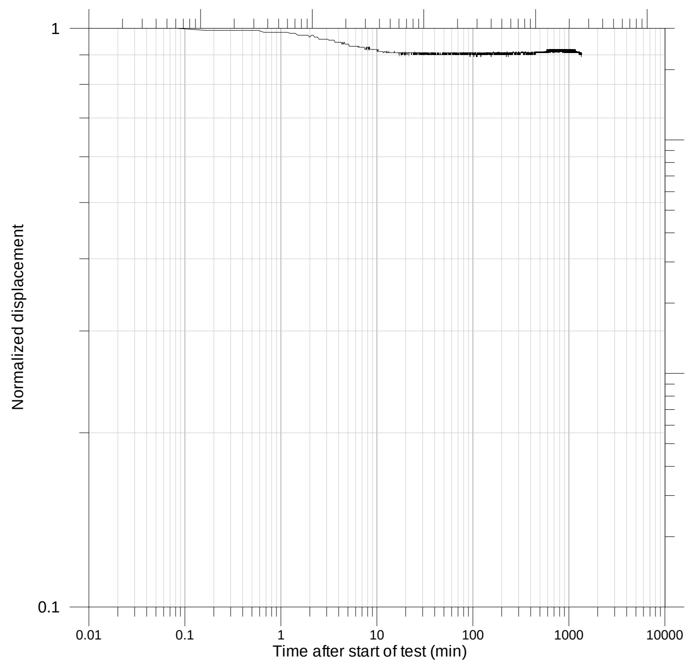
Based on a review of the estimated flow zone locations, D5L intersects FZ-10 and FZ-11. This well was not classified previously by SEDA (2001), due to limited data.

The response to the addition of the 2 gallons of water for the test is shown below:

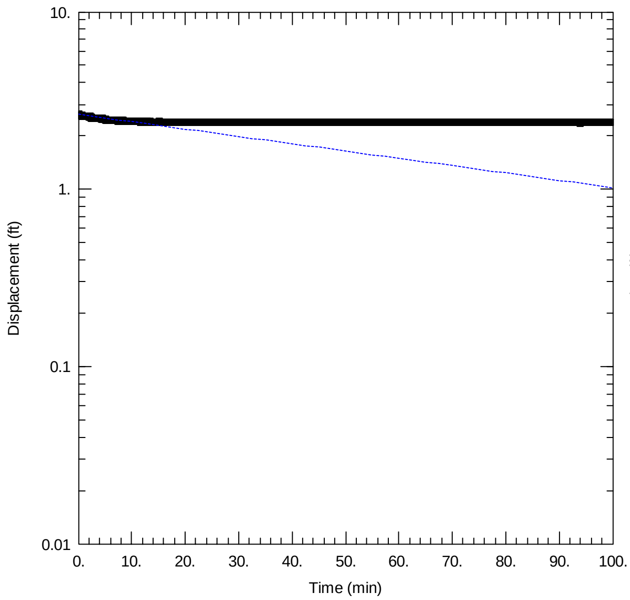


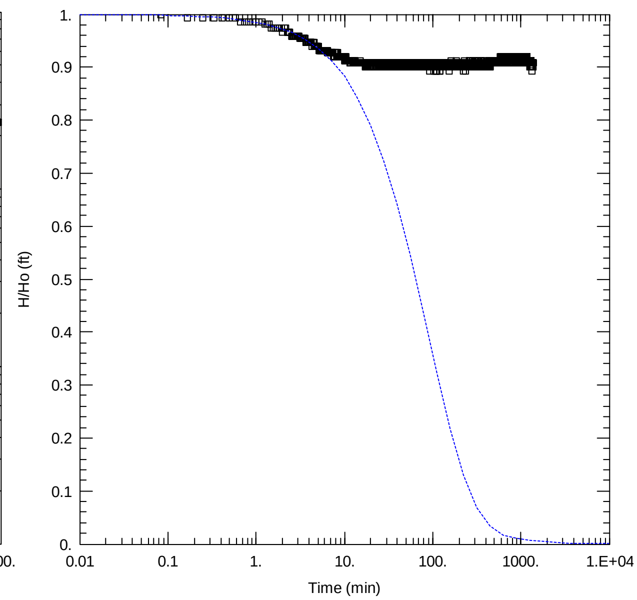
The initial displacement estimated from the transducer record is about 2.6 ft, less than the theoretical value of 3.3 ft. Less than 15% recovery is observed 24 hours after the start of the test.

The slug test response changes after the first 10 minutes of relatively rapid recovery. The plot of normalized displacement versus time on a log-log scale shows clearly two distinct regions of response. This response is similar to responses presented by Grader and Ramey (1988) for double-porosity reservoirs, where the initial response is related to a fracture, and the later response is a function of the matrix or vertical fractures. Therefore, only the early-time data are used to estimate the fracture transmissivity.



Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity from the fit to the early-time data is 1.5 ft^2/day, for an assumed storativity of 10^{-6}.





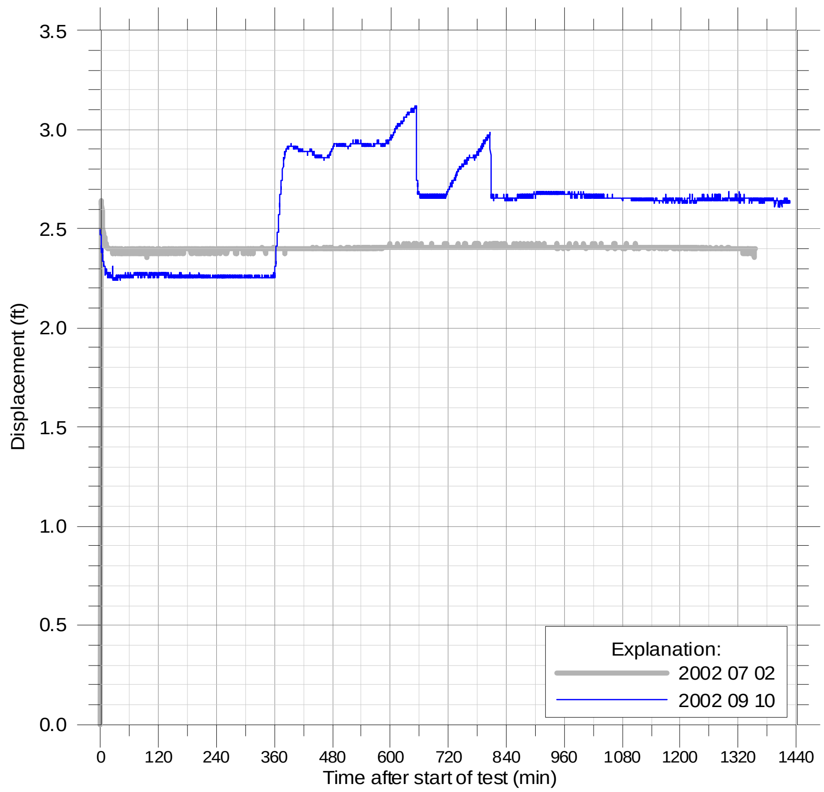
As shown in the table below, the assumed storativity has little effect on the estimation of transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	1.2
10^{-6}	1.5
10^{-7}	1.9

Upon review of the slug test results, we decided that the test response was irregular, and the well should be re-tested. The well was re-tested on September 10, 2002, and the results are described in the next section.

D5L re-test

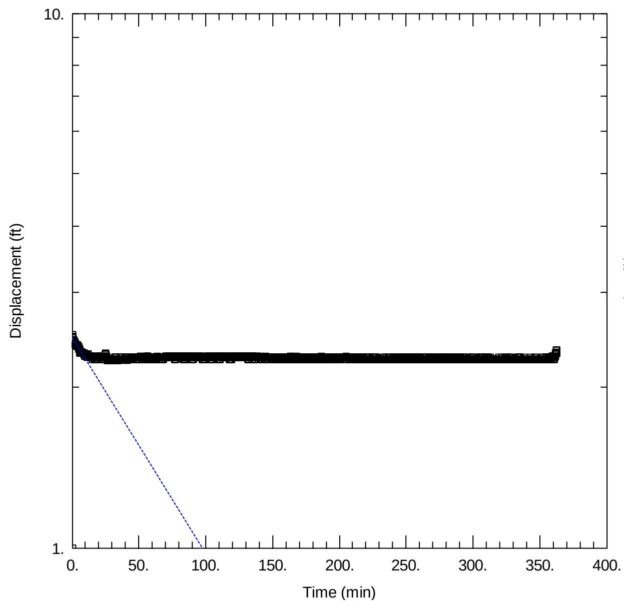
The response to the addition of 2 gallons of water is shown below. The response for the original test is also included for comparison. The irregularities in the re-test response are erroneous transducer recordings that we believe are due to the effects of thunderstorms in the area that occurred about 6 hours into the test. The first six hours of the re-test appear to be reliable, and are analyzed here.

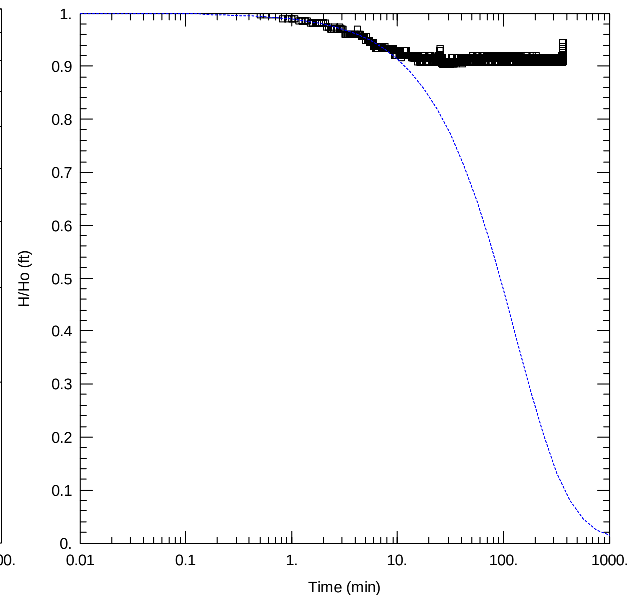


The initial displacement estimated from the transducer record is 2.5 ft, less than the theoretical value of 3.3 ft. Approximately 10% recovery is observed about 6 hours after the start of the slug test.

As with the original slug test, the re-test of the well exhibits two distinct regions of response. A brief period of rapid recovery is followed by almost complete stabilization. We believe that the initial portion represents the response of fractures, and we limit our analysis to this portion.

The analysis of the test is shown below. The estimated transmissivity from the fit to the early-time data is 1.1 ft^2/day, for an assumed storativity of 10^{-6}.





A range of storativities has been considered in the analysis. As indicated in the table below, the assumed storativity has a minor effect on the estimate of the transmissivity.

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	0.8
10^{-6}	1.1
10^{-7}	1.3

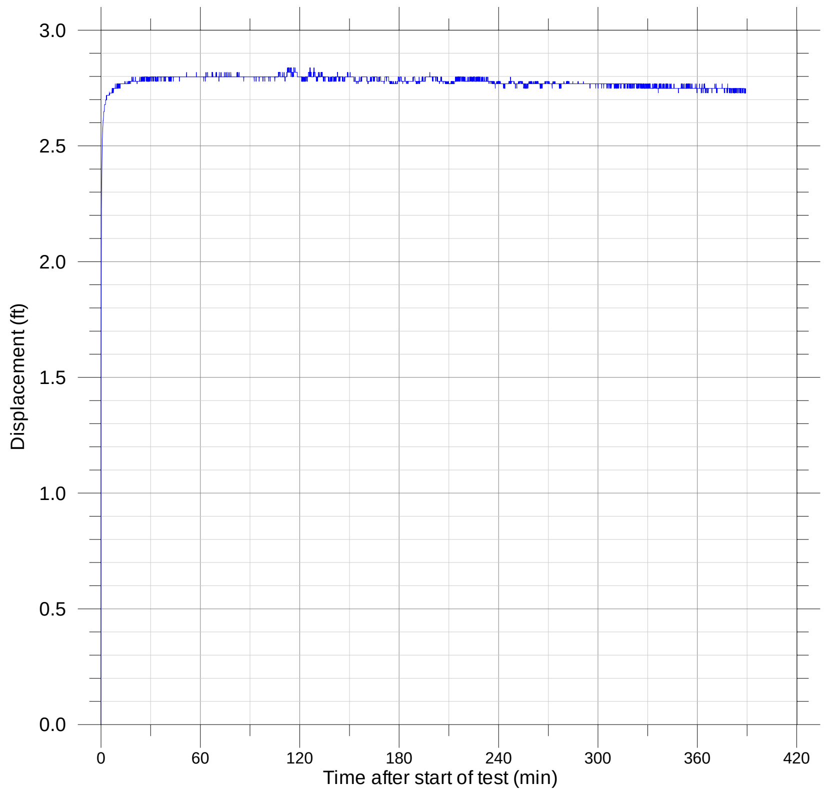
The transmissivity estimated from the July 2, 2002 slug test is 1.5 ft^2/day. The current estimate is consistent with this previous estimate.

No previous estimates of transmissivity are available for comparison. The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is moderate at D5L.

3.17 E1L

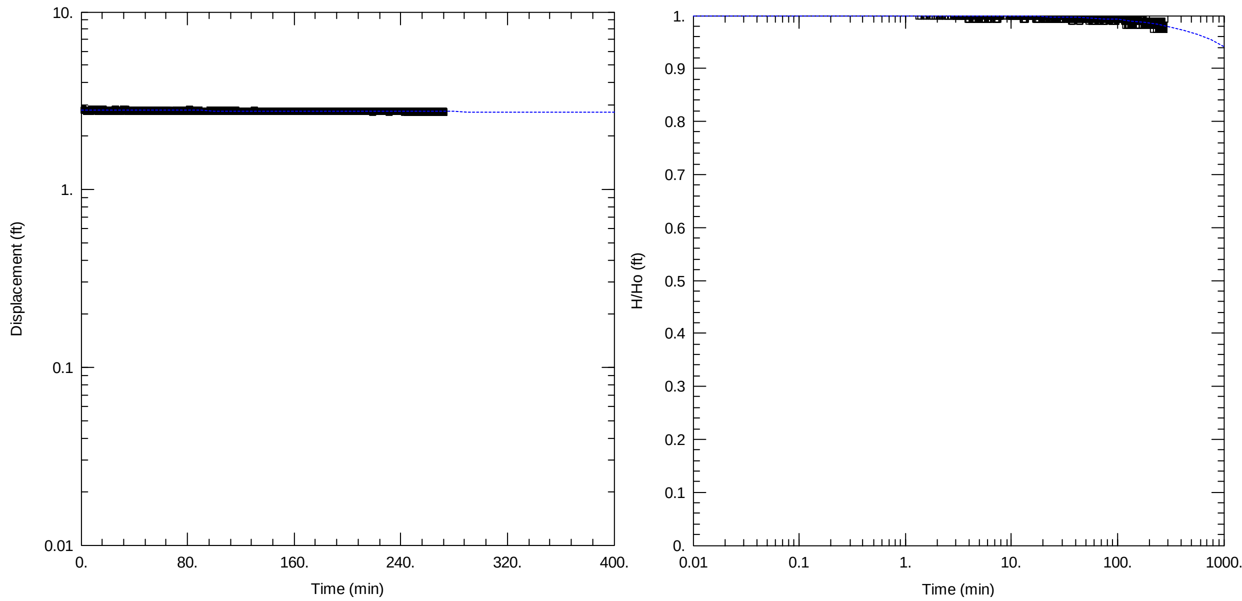
Based on a review of the estimated flow zone locations, E1L intersects FZ-10 and FZ-11. This well was classified previously as non-representative, based on low hydraulic conductivity estimates from previous slug testing, as well as higher than expected water levels (SEDA, 2001).

The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement estimated from the transducer record is about 2.8 ft, slightly less than the theoretical value of 3.3 ft. Only about 5% recovery is observed 6 hours after the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity from the fit to the data is 0.007 ft^2/day for an assumed storativity of 10^{-6}.



As shown in the table below, the assumed storativity has only a minor effect on the estimation of transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.005
10^{-6}	0.007
10^{-7}	0.009

The results of the 2002 slug tests are consistent with estimates of transmissivity reported previously:

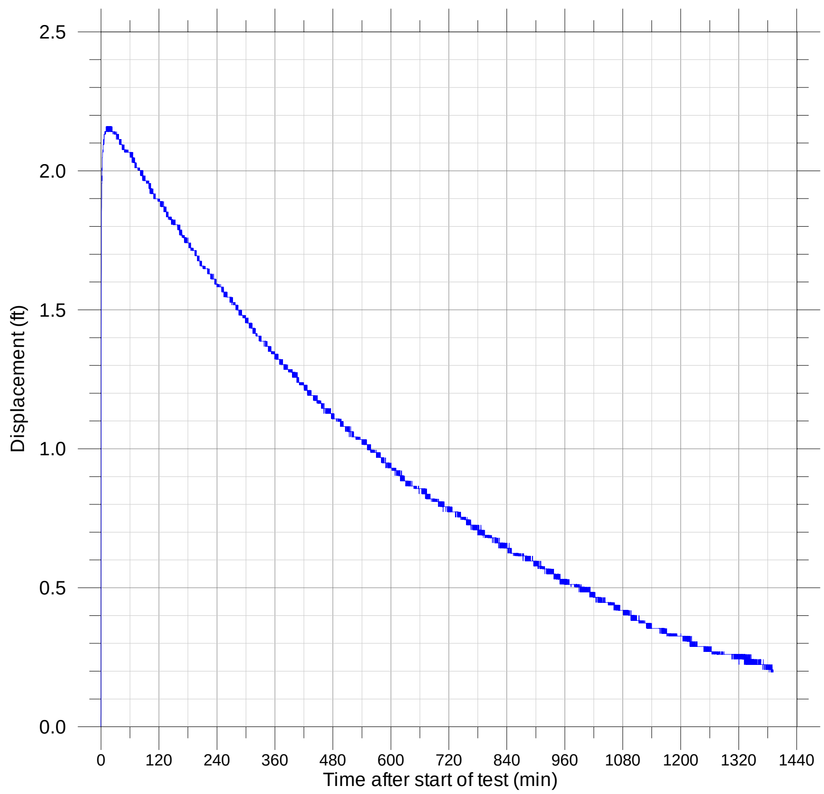
- 0.005 ft^2/day from the CRA database (date unknown) for the interval from 499.0 to 475.3 ft AMSL; and
- 0.4 ft^2/day from the 1991 packer testing for the interval from 516.7 to 498.0 ft AMSL.

The results of the 2002 slug testing suggest that the transmissivity of the Lower interval (FZ-10/11) is low at E1L.

3.18 E2L

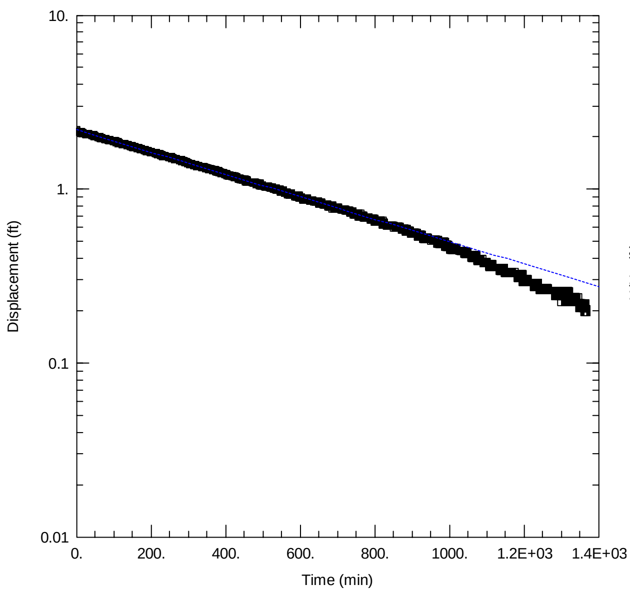
Based on a review of the estimated flow zone locations, E2L intersects FZ-10 and FZ-11. This well was classified previously as representative (SEDA, 2001).

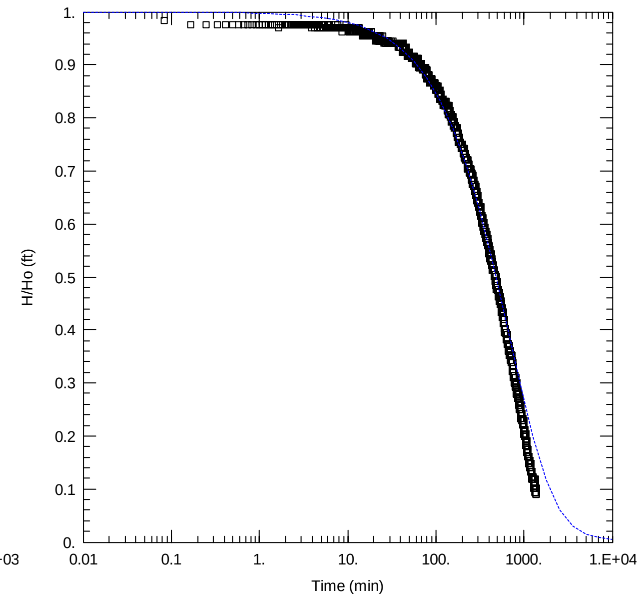
The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement estimated from the transducer record is about 2.2 ft, less than the theoretical value of 3.3 ft. Approximately 90% recovery is observed within 23 hours of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 0.20 ft^2/day, for an assumed storativity of 10^{-6}.





As shown in the table below, the assumption regarding the storativity has little effect on the estimated transmissivity:

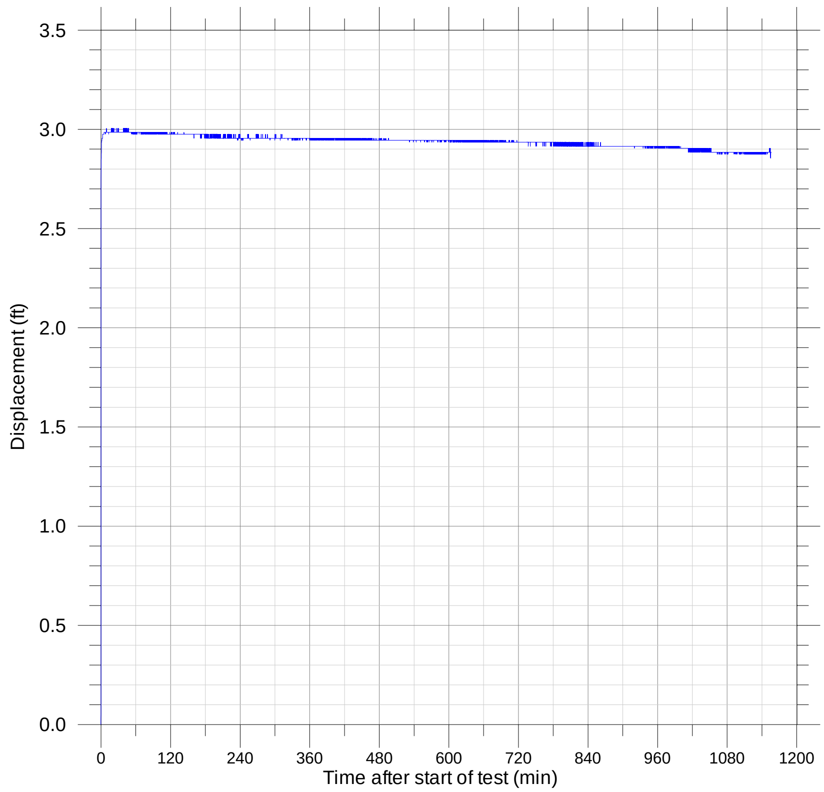
Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.17
10^{-6}	0.20
10^{-7}	0.22

No previous estimates of transmissivity are available for comparison. The results of the 2002 slug testing suggest that the transmissivity of the Lower interval (FZ-10/11) is low at E2L.

3.19 E3L

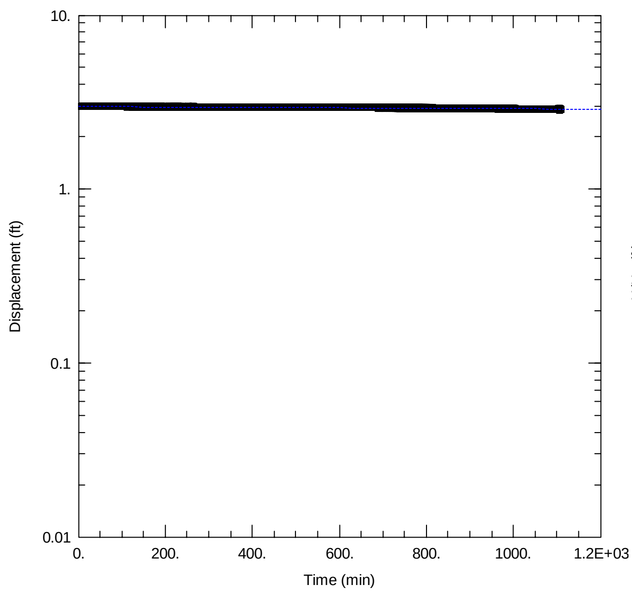
Based on a review of the estimated flow zone locations, E3L intersects FZ-10 and FZ-11. This well was classified previously as non-representative, due to low hydraulic conductivity estimates from previous slug testing, as well as higher than expected water levels (SEDA, 2001).

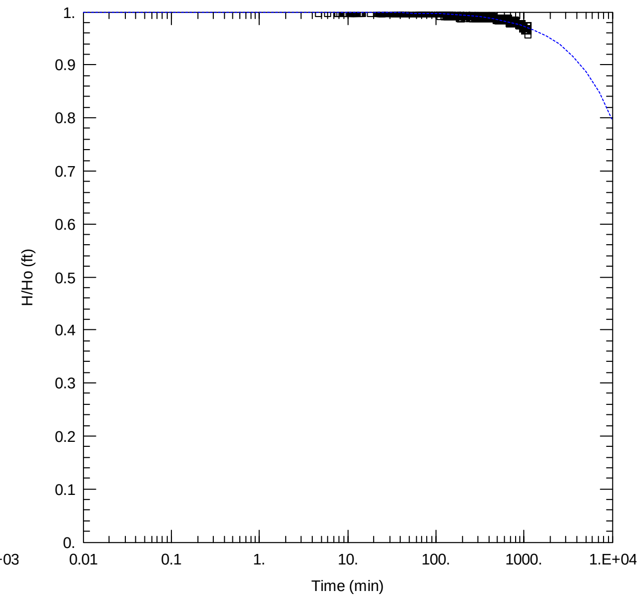
The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement estimated from the transducer record is about 3.0 ft, slightly less than the theoretical value of 3.3 ft. Less than 5% recovery is observed 18 hours after the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 0.003 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated in the table below, the assumed storativity has little effect on the transmissivity estimate:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.002
10^{-6}	0.003
10^{-7}	0.004

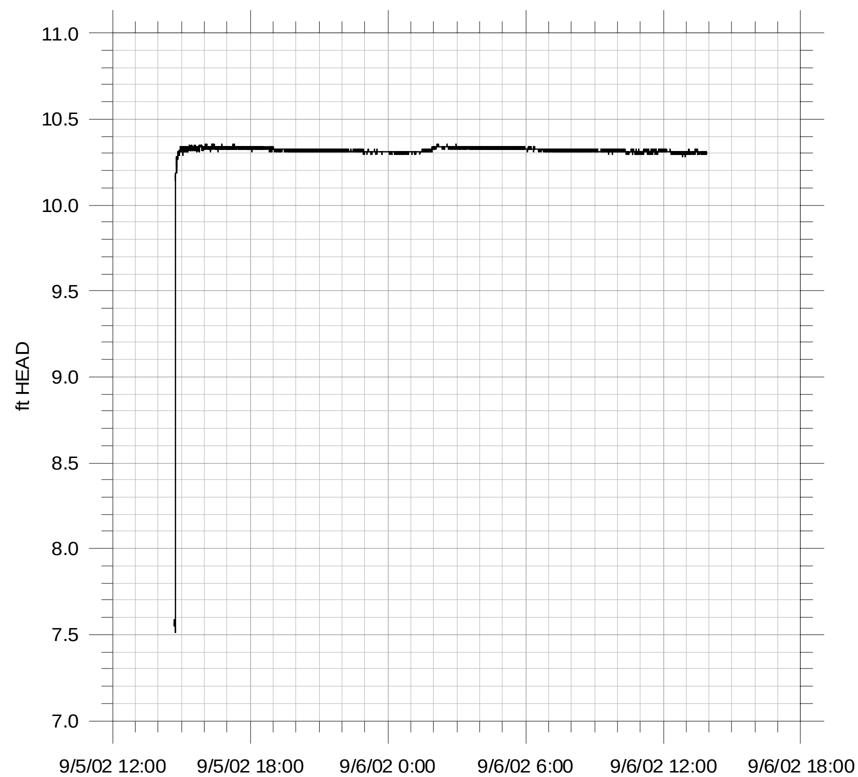
The result of the 2002 slug test is consistent with a transmissivity value of 0.007 ft^2/day reported previously (Site database [eDAT]).

The results of the 2002 slug testing suggest that the transmissivity of the Lower interval (FZ-10/11) is very low at E3L.

3.20 E4L

Based on a review of the estimated flow zone locations, E4L intersects FZ-10 and FZ-11. This well was classified previously as non-representative by SEDA (2001), due to a very slow recovery observed for a previous slug test, and because the water levels in the well are higher than in the Middle well E4M.

The response to the addition of the 2 gallons of water for the tests is shown below:

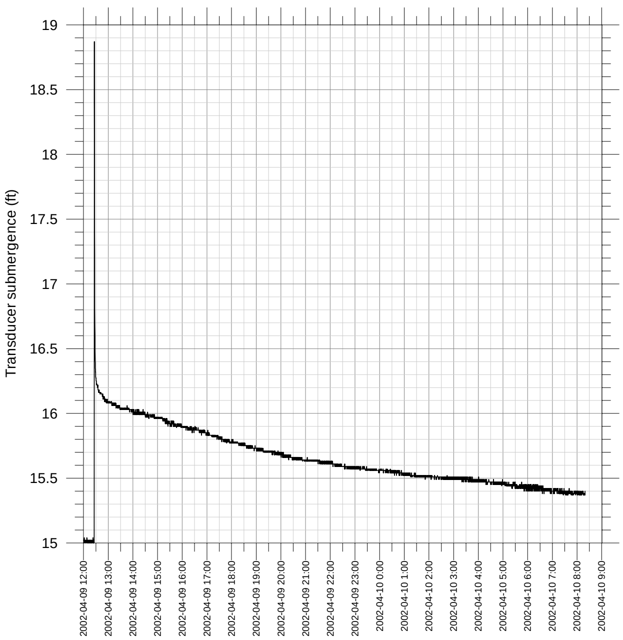


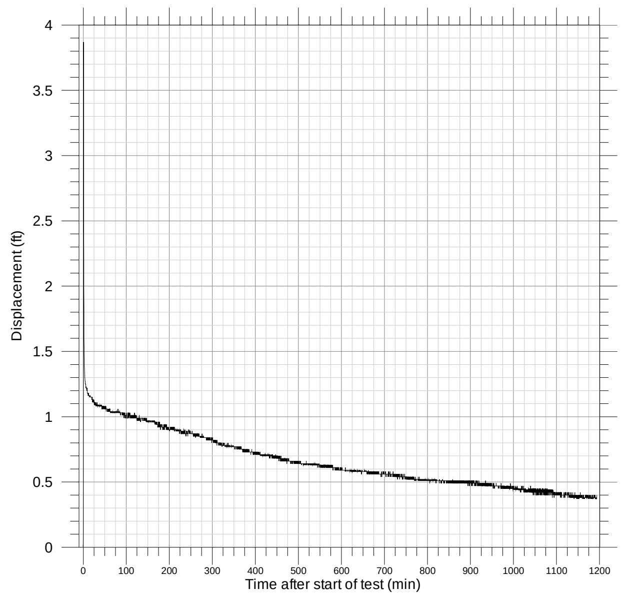
The initial displacement estimated from the transducer record is 2.8 ft, less than the theoretical value of 3.3 ft. No recovery is observed after 24 hours of the start of the test. Therefore, no quantitative estimate of the transmissivity is possible at this well. However, it is possible to conclude that the transmissivity of the Lower interval (FZ-10/11) is very low at E4L.

3.21 F1L

Based on a review of the estimated flow zone locations, F1L intersects FZ-10 and FZ-11. This well was previously characterized as non-representative based on a low estimate of hydraulic conductivity from a previous slug test, anomalously high water levels, and a lack of response to the system shutdown in May 2001.

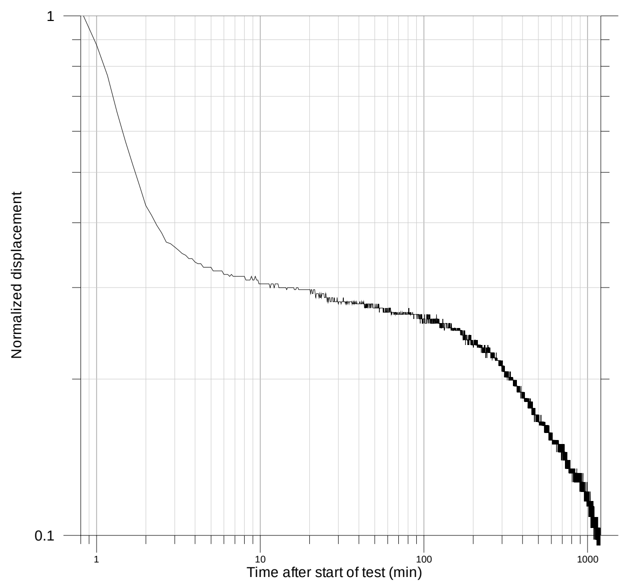
The response to the addition of the 2 gallons of water is shown below:



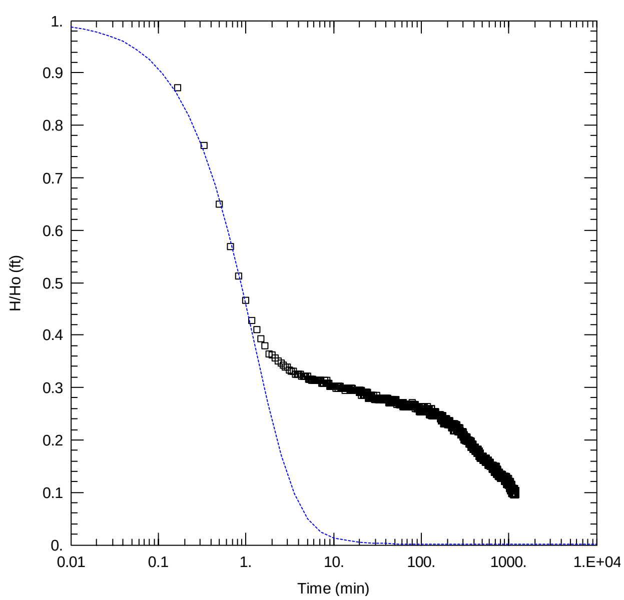


The diameter of the open-hole portion of F1L is 3 inches, and the theoretical displacement is 5.4 ft. The initial displacement inferred from the transducer record is about 3.9 ft, smaller than the theoretical value.

The plot of normalized displacement versus time on a log-log scale below shows clearly two distinct regions of response.



This response is very similar to responses presented by Grader and Ramey (1988) for double-porosity reservoirs, where the initial response is related to a fracture and the later response is a function of the matrix or vertical fractures. Therefore, an estimate of the fracture transmissivity is obtained by analyzing only the early-time data. The estimated transmissivity is 100 ft^2/day for an assumed storage coefficient of 10^{-6}. The match of the analytical solution to the early portion of the data is shown below.



As shown in the table below, the assumed storativity has relatively little effect on the transmissivity estimate:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	90
10^{-6}	100
10^{-7}	130

The transmissivity estimate derived from the 2002 slug tests is significantly higher than the range of values reported previously:

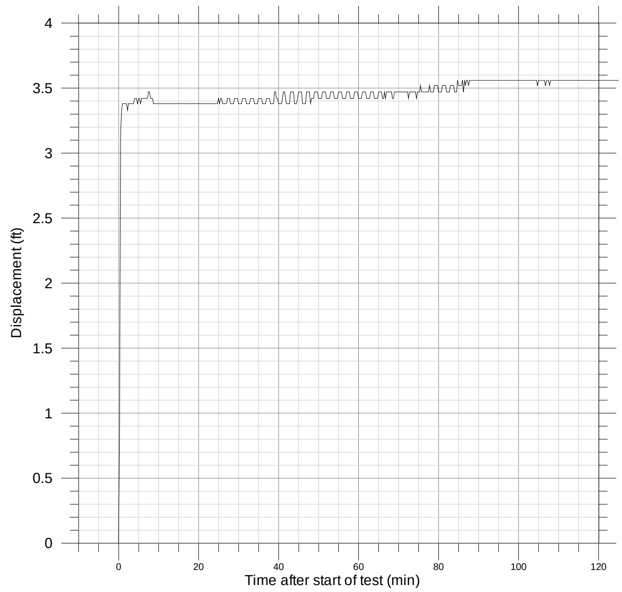
- 0.04 ft^2/day estimated from the 1991 packer testing for the interval from 490.6 to 470.2 ft AMSL; and
- 0.06 ft^2/day estimated from slug testing for the interval from 490.6 to 470.2 ft AMSL (Site database [eDAT]).

The 2002 slug test results suggest that the Lower zone has high transmissivity at F1L.

3.22 F2L

Based on a review of the estimated flow zone locations, F2L intersects FZ-10 and FZ-11. This well was designated previously as non-representative, based on a low estimate of hydraulic conductivity from a previous slug test and anomalous water levels (SEDA, 2001). The transmissivity reported for a previous slug test was 0.007 ft^2/day. The well did not respond to the May 2001 system shutdown.

The response to the addition of the 2 gallons of water is shown on the following plot:



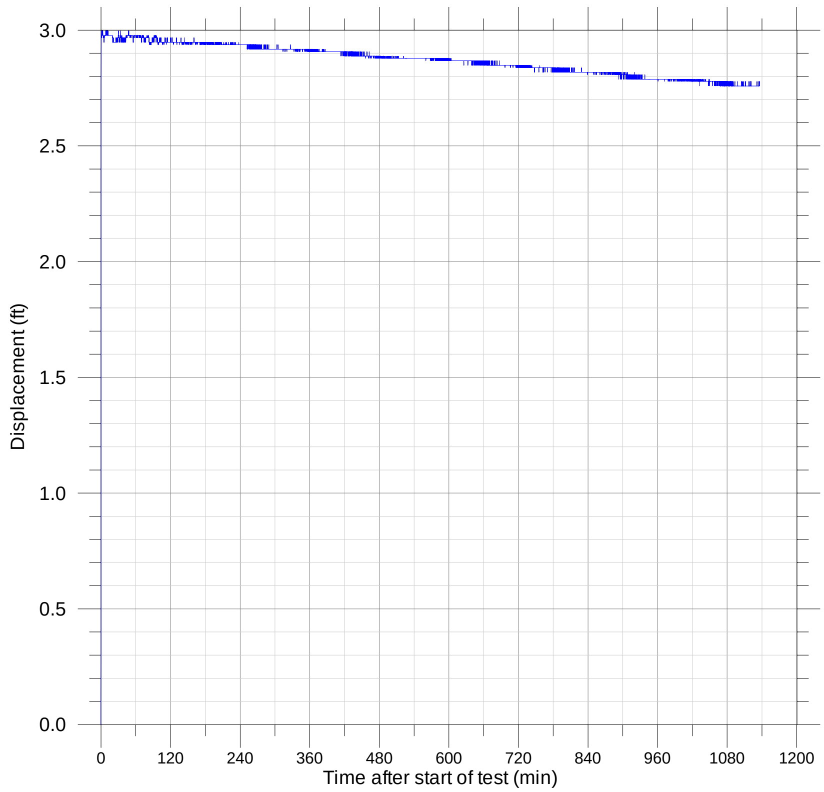
The initial displacement inferred from the transducer record is about 3.5 ft, and reaches a maximum of approximately 3.6 ft. The maximum displacement is higher than the theoretical value of 3.3 feet, but does not occur until 90 minutes after the addition of the initial slug of water.

No transmissivity estimate can be derived from this test. However, the lack of recovery of F2L suggests that the transmissivity is very low, and confirms the previous designation of this well as non-representative.

3.23 F3L

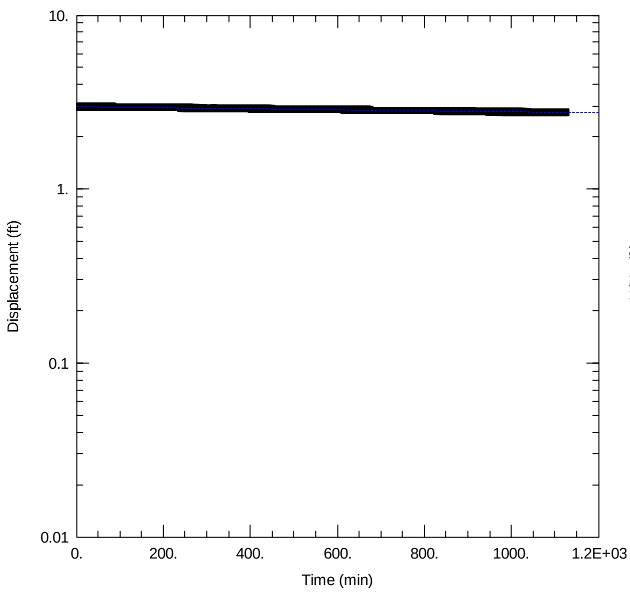
Based on a review of the estimated flow zone locations, F3L intersects FZ-11. This well was classified previously as non-representative, due to lack of response to pumping, as well as higher than expected water levels (SEDA, 2001).

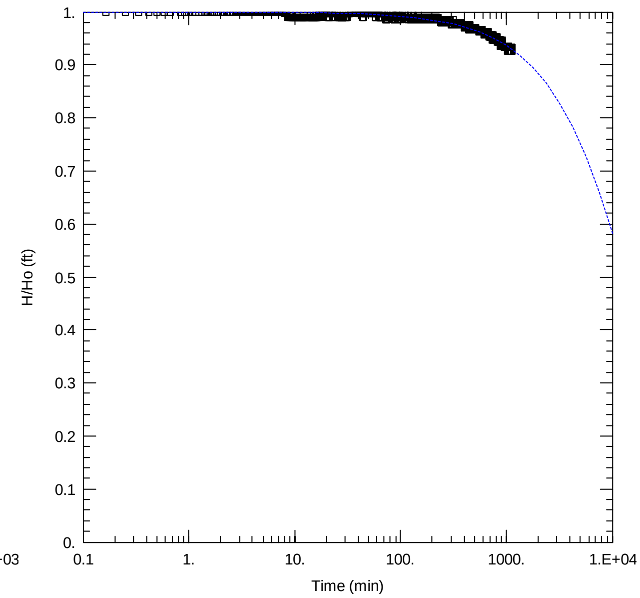
The response following the addition of the 2 gallons of water for the test is shown below:



The initial displacement estimated from the transducer record is about 3.0 ft, slightly less than the theoretical value of 3.3 ft. Only 10% recovery is observed 18 hours after the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 0.007 ft^2/day, for an assumed storativity of 10^{-6}.





As shown on the table below, the assumed storativity has little effect on the transmissivity estimation:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.006
10^{-6}	0.007
10^{-7}	0.009

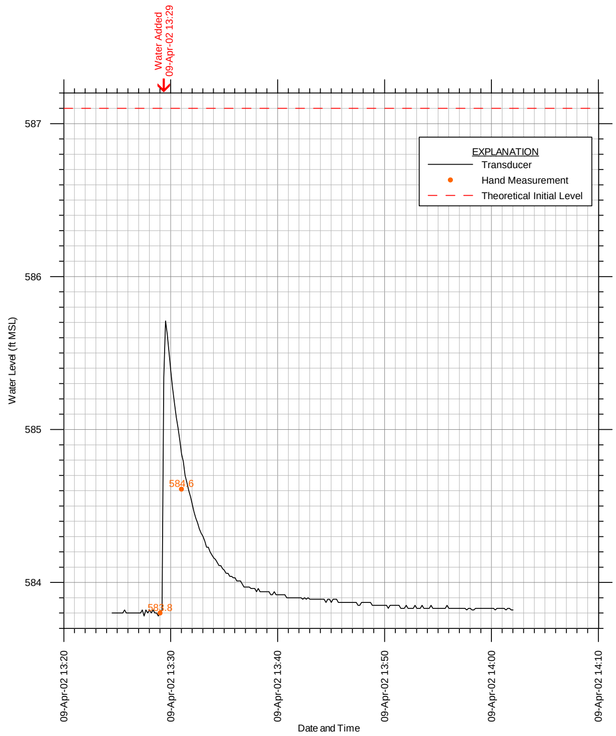
The results of the 2002 slug test are consistent with a transmissivity value of 0.008 ft^2/day reported previously (Site database [eDAT]).

The results of the 2002 slug test confirm that the transmissivity of the Lower interval (FZ-11) is low at F3L.

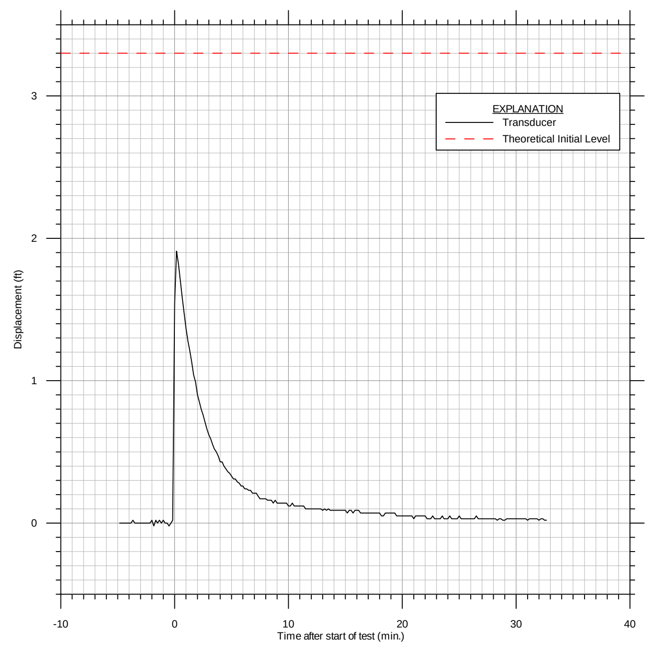
3.24 G1L

Based on a review of the estimated flow zone locations, G1L intersects FZ-10 and FZ-11. This well was designated previously as non-representative, based on a high water level (SEDA, 2001).

The response to the addition of the 2 gallons of water is shown on the following plots:



G1L Slug Testing - Water Level versus Time

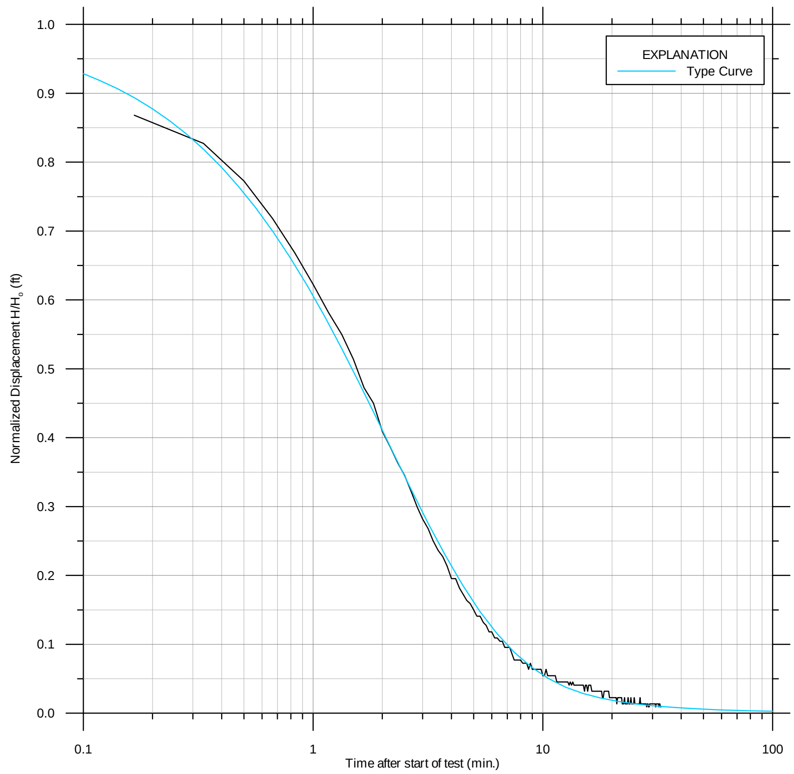


G1L Slug Testing - Displacement versus Time

Two hand measurements of the water level were made during the test; one immediately prior to adding the 2 gallons of water, the other while the water level in the well was recovering. The first hand measurement matches the transducer measurement exactly, but the second hand measurement is 3 inches lower than the transducer measurement. The disagreement may be because the water level in the well was declining rapidly as it was being measured.

The initial displacement inferred from the recovery plot is about 1.9 feet, less than the theoretical value of 3.3 feet. The discrepancy between the "effective" and theoretical initial displacements suggests that not all of the added 2 gallons of water went into instantaneously raising the water level in the well.

The match of the Cooper et al. (1967) theoretical solution the response data is shown below. The estimated transmissivity and storativity are 40 ft^2/day and 6×10^{-4}, respectively.



G1L Slug Testing - Cooper, Bredehoeft, Papadopulos Analysis
T=38.3 ft^2/d, S=6×10^{-4}

A range of storativities has been considered in the analysis. As indicated in the table below, the assumption regarding the storativity has little effect on the estimation of the transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-3}	35.9
10^{-4}	45.8
10^{-5}	55.6
10^{-6}	65.3

The transmissivity estimate of 40 ft^2/day is somewhat higher than values reported for previous tests:

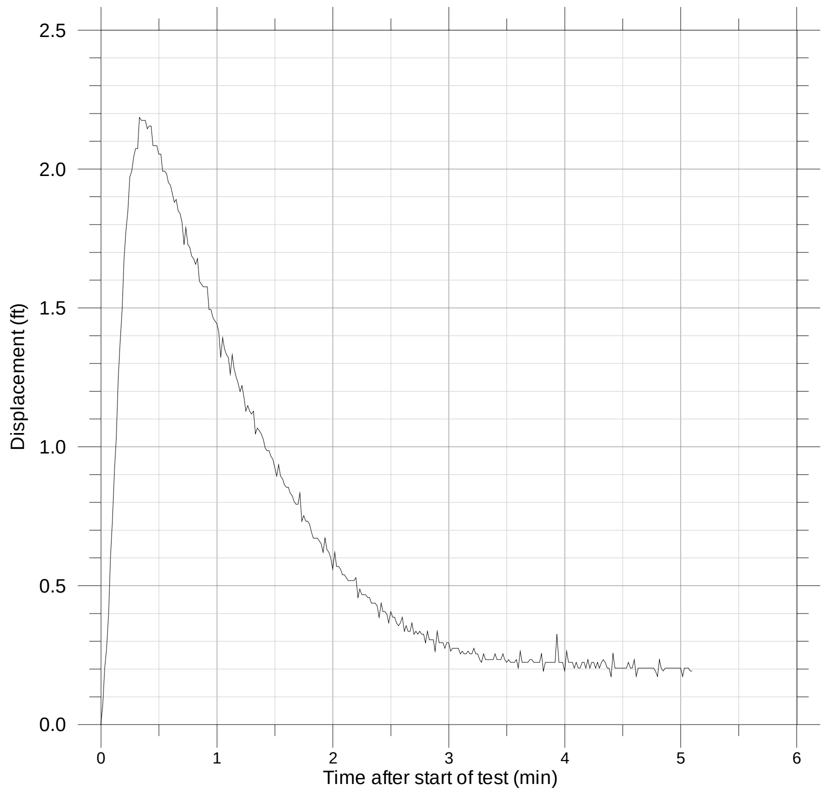
- 16 ft^2/day estimated from slug testing (date unknown, from CRA database); and
- 4 ft^2/day derived from 1991 packer testing for the interval of 468.6-489.6 ft MSL.

The 2002 slug tests suggest that the Lower zone has moderate transmissivity at G1L.

3.25 G2L

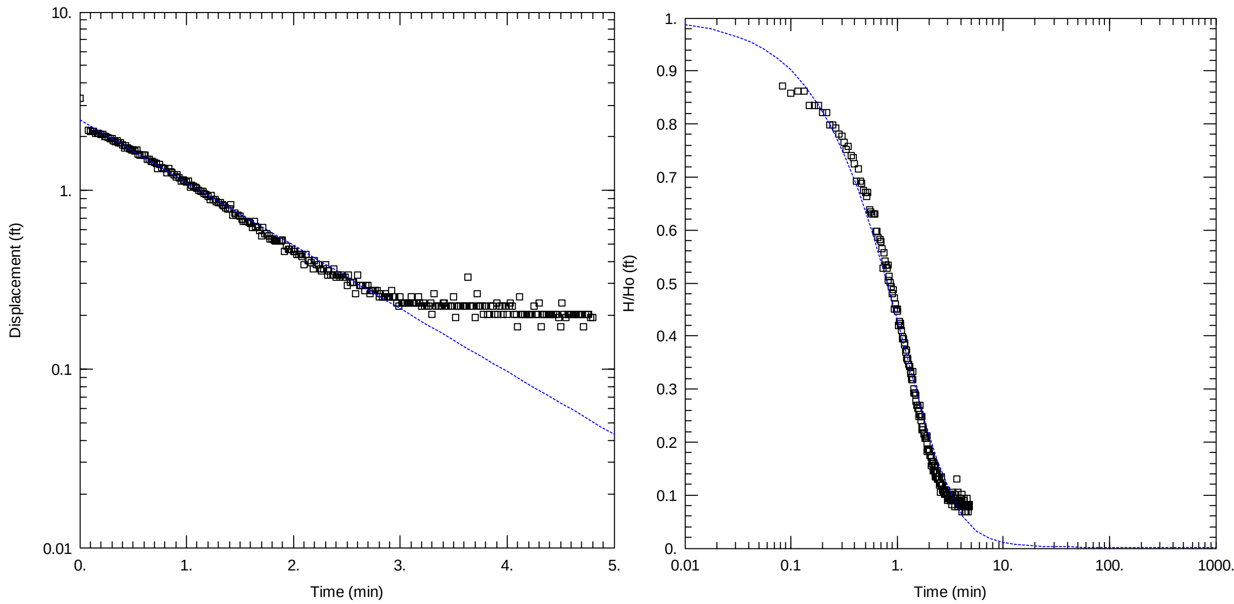
Based on a review of the estimated flow zone locations, G2L intersects FZ-10. This well was classified previously as non-representative, based on higher than expected water levels (SEDA, 2001).

The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement estimated from the transducer record is 2.5 ft, slightly lower than the theoretical value of 3.3 ft. About 95% recovery is observed within 5 minutes of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 120 ft^2/day, for an assumed storativity of 10^{-6}.



As indicated in the following table, the assumption regarding the storativity has little influence on the estimation of transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	100
10^{-6}	120
10^{-7}	140

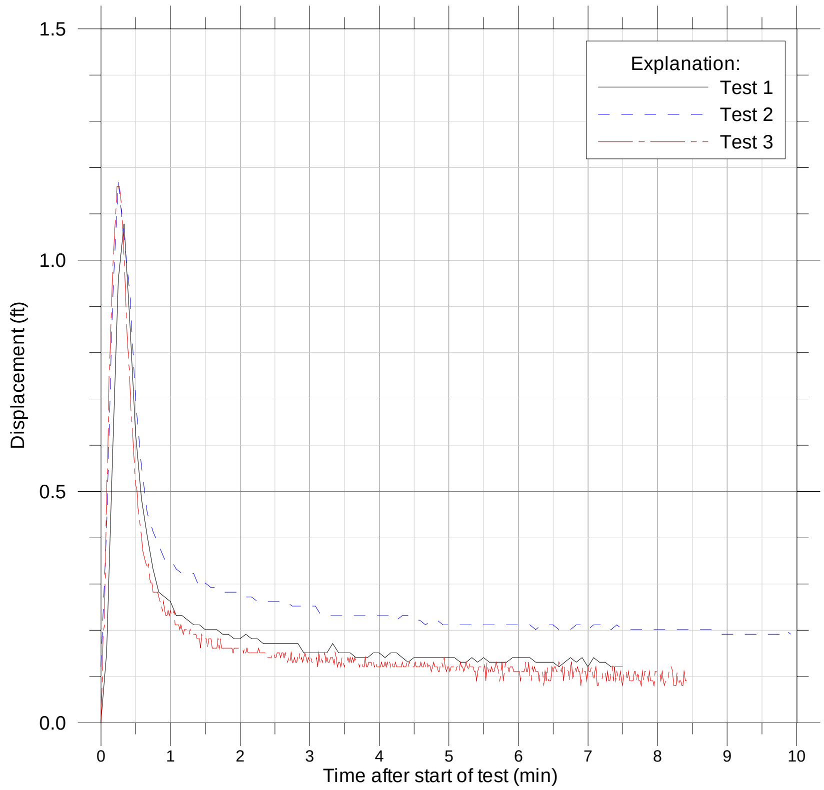
The results of the 2002 slug test are an order-of-magnitude higher than the value of 6 ft^2/day reported for a previous slug test (Site database [eDAT]).

The results of the 2002 slug test suggest that the transmissivity of the Lower interval (FZ-10) is high at G2L.

3.26 G3L

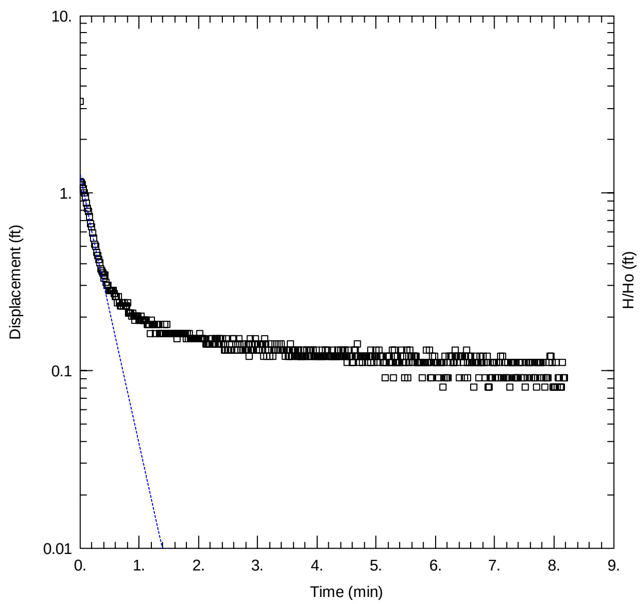
Based on a review of the estimated flow zone locations, G3L intersects FZ-10 and FZ-11. This well was classified previously as non-representative, based on higher than expected water levels (SEDA, 2001).

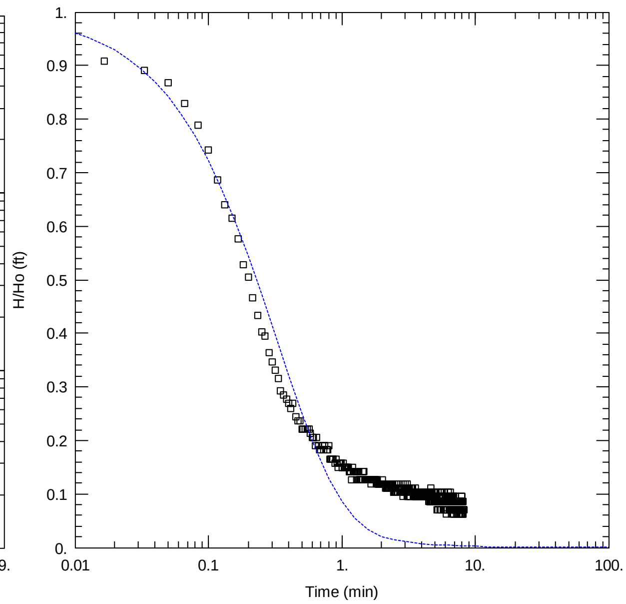
Due to the rapid recovery of this well, three replicate slug tests were conducted. The pressure transducer readings were recorded every 5 seconds for the first two tests, and every second for the third test. The responses to the addition of the 2 gallons of water for all tests are shown below. The responses for the 3 tests are similar. Only the details of the analysis of Test 3 are presented here because the data for this test are available at 1-second intervals.



The initial displacement estimated from the transducer record for Test 3 is the same as the theoretical value of 3.3 ft. Approximately 90% recovery is observed within 10 minutes of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 430 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated below, the assumed storativity has relatively little effect on the estimated transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	390
10^{-6}	430
10^{-7}	480

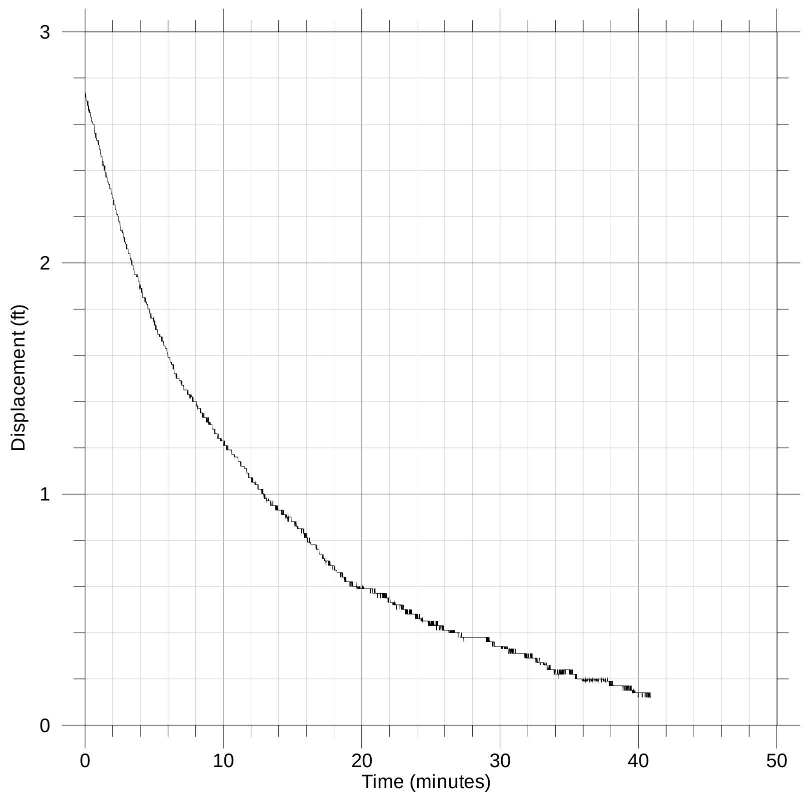
Tests 1 and 2 yielded transmissivity estimates of 400 and 430 ft^2/day, respectively, for assumed storativities of 10^{-6}. The results from the first and second slug tests suggest that the results of the G3L slug test are repeatable.

No previous estimates of transmissivity are available for comparison. The results of the 2002 slug tests indicate that the transmissivity of the Lower interval (FZ-10/11) is high at G3L.

3.27 G5L

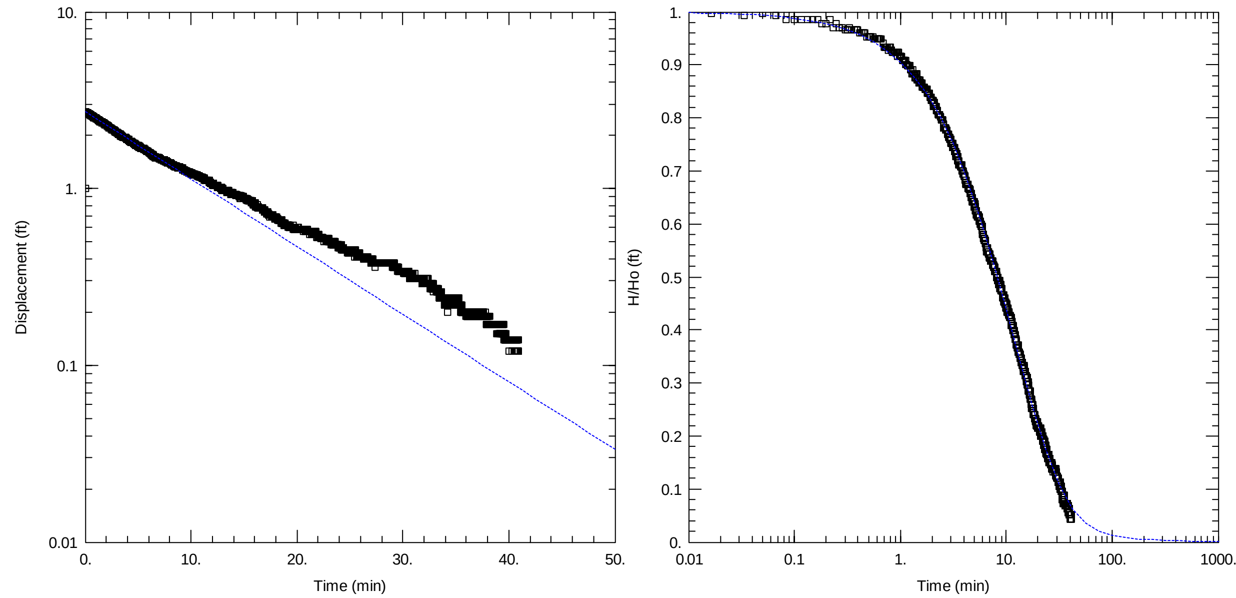
Based on a review of the estimated flow zone locations, G5L intersects FZ-11. Data were not sufficient to permit classification of this well (SEDA, 2001).

The response to the addition of the 2 gallons of water for the tests is shown below:



The initial displacement estimated from the transducer record is 2.7 ft, less than the theoretical value of 3.3 ft. Approximately 95% recovery is observed within 40 minutes of the start of the test.

Plots showing the estimation of the effective initial displacement and the match to the observed data are presented below. The estimated transmissivity is 12 ft^2/day, for an assumed storativity of 10^{-6}.



As indicated below, the assumed storativity has only a small influence on the transmissivity estimate:

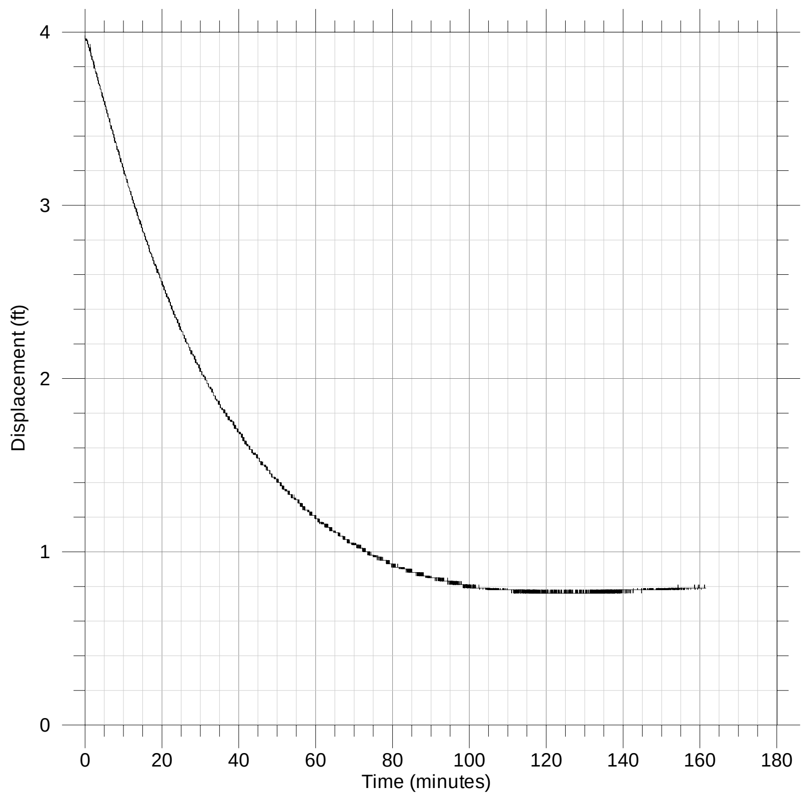
Storativity	Transmissivity, T (ft^2/d)
10^{-5}	10
10^{-6}	12
10^{-7}	14

No previous estimates of transmissivity are available for comparison. The results of the 2002 slug testing indicate that the transmissivity of the Lower interval is moderate at G5L.

3.28 H1L

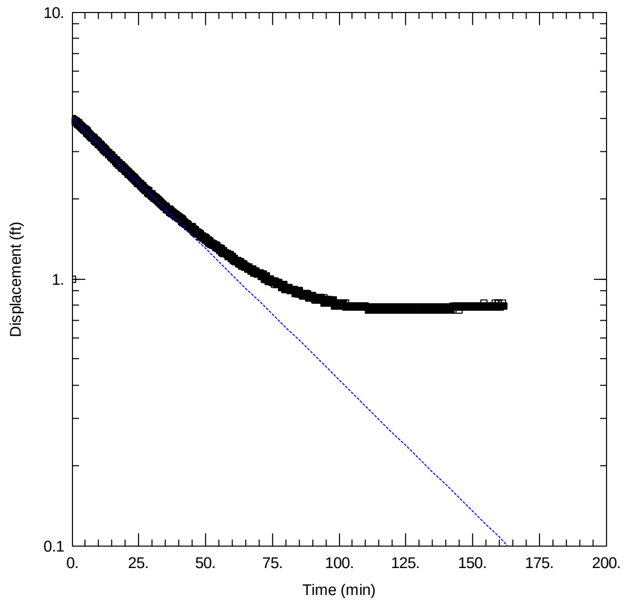
Based on a review of the estimated flow zone locations, H1L intersects FZ-11. This well was classified previously as non-representative by SEDA (2001), because the water levels in the well are about the same as in the Middle well H1M.

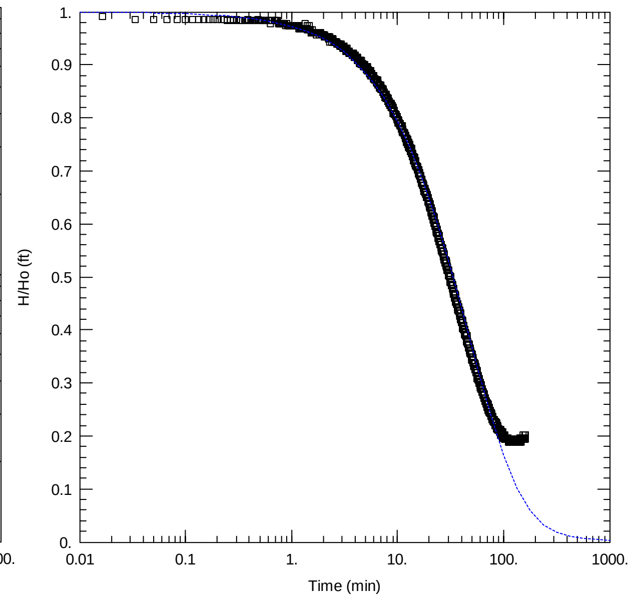
The response to the addition of the 3 gallons of water for the tests is shown below:



The instantaneous addition of 3 gallons of water gives rise to a theoretical head rise of 4.9 ft. The initial displacement estimated from the transducer record is 4.0 ft, less than the theoretical value. Approximately 80% recovery is observed within 120 minutes of the start of the test.

Plots showing the estimation of the effective initial displacement and the match to the observed data are presented below. The estimated transmissivity is 2.9 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated below, the transmissivity estimate is relatively insensitive to the value assumed for the storativity:

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	2.4
10^{-6}	2.9
10^{-7}	3.4

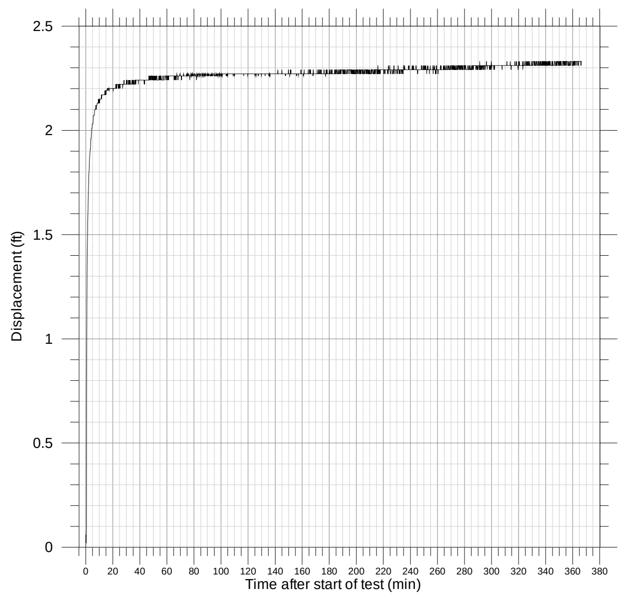
The transmissivity estimated from the 2002 slug test is about 2 orders of magnitude higher than the value of 0.01 ft^2/d estimated from the 1991 Packer testing for the interval from 489.1 to 475.9 ft AMSL.

The results of the 2002 slug test indicate that the transmissivity of the Lower interval (FZ-11) is moderate at H1L.

3.29 H2L

Based on a review of the estimated flow zone locations, H2L intersects FZ-10 and FZ-11. This well was designated previously as non-representative (SEDA, 2001).

The response to the addition of the 2 gallons of water is shown on the following plot:



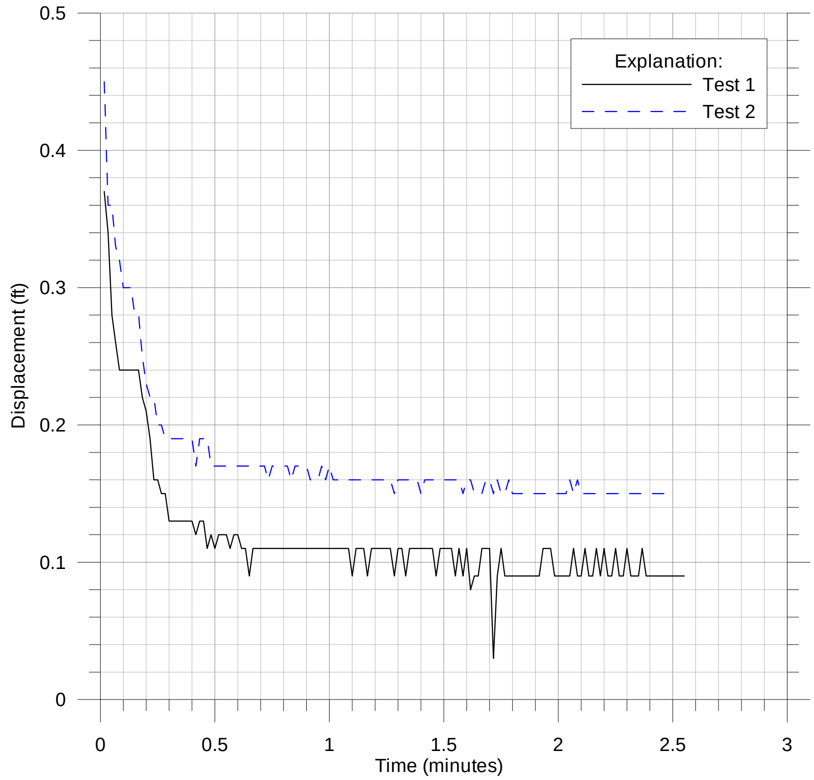
The initial displacement inferred from the transducer record is about 2.2 ft, and reaches a maximum of approximately 2.3 ft. The maximum displacement is higher than the theoretical value of 3.3 feet, but does not occur until 200 minutes after the addition of the slug.

The transmissivity at H2L cannot be estimated from the slug test. The lack of recovery indicates that the transmissivity of the Lower zone is low at H2L, and confirms the previous designation of the well as non-representative.

3.30 H3L

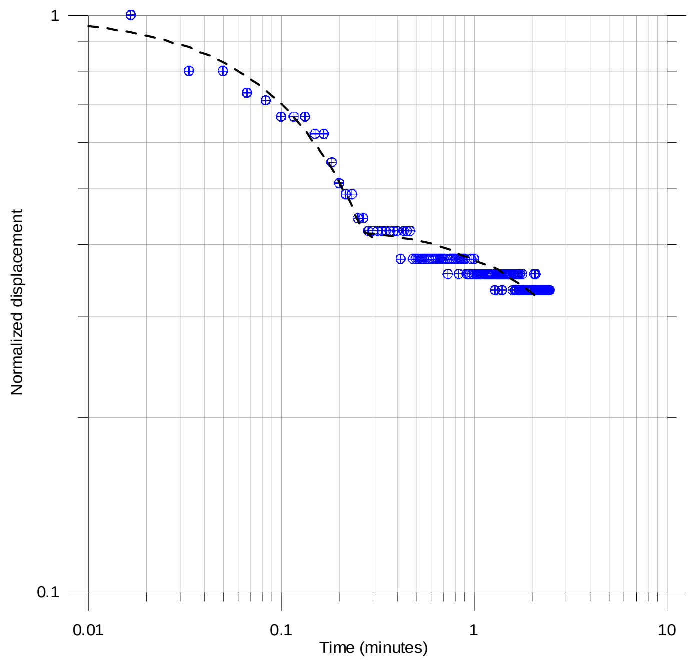
Based on a review of the estimated flow zone locations, H3L intersects FZ-10 and FZ-11. This well was classified previously as non-representative, as the water levels are approximately the same as the water levels in the Middle bedrock well, H3M (SEDA, 2001).

Due to a rapid response, two replicate tests have been conducted at this well. The responses to the addition of the 2 gallons of water for the first test, and 3 gallons of water for the second test are shown below. The responses are similar and only the details of the analysis of Test 2 are presented here. Test 2 was selected due to the larger initial displacement.

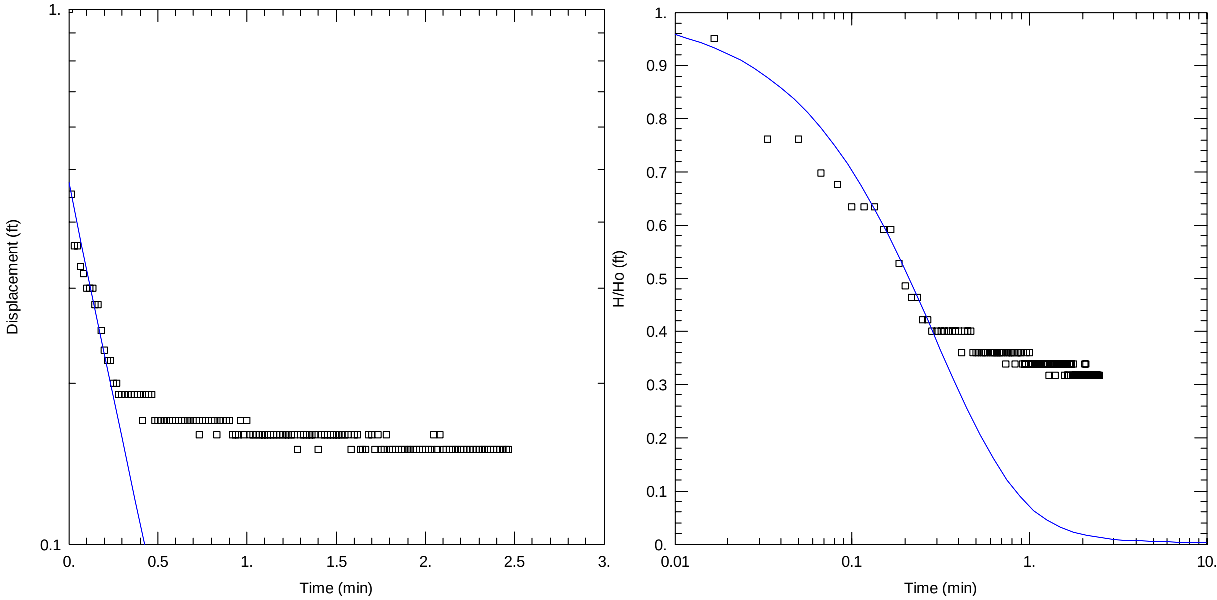


The effective initial displacement estimated from the transducer record of Test 2 is about 0.5 ft, much less than the theoretical value of 4.9 ft. The difference between the effective and theoretical initial displacements reflects the gradual introduction of the slug of water at a location with relatively high transmissivity. Approximately 65% recovery is observed within about 1 minute of the start of the test.

After an initial 20 seconds of very fast recovery, the response changes. The plot of normalized displacement versus time on a log-log scale shows clearly two distinct regions of response. The dashed lines on the plot below indicate the two regions. This response is similar to responses presented by Grader and Ramey (1988) for double-porosity reservoirs, where the initial response is related to a fracture, and the later response is a function of the matrix or vertical fractures. Therefore, an estimate of the fracture transmissivity is obtained by analyzing only the early-time data.



Plots showing the estimation of the effective initial displacement and the match to the observed data are presented below. The transmissivity estimated from Test 1 is 470 ft^2/day, for an assumed storativity of 10^{-6}.



A range of storativities have been considered in the analysis, and the results tabulated below demonstrate that the transmissivity estimate is not sensitive to the assumed storativity:

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	400
10^{-6}	470
10^{-7}	550

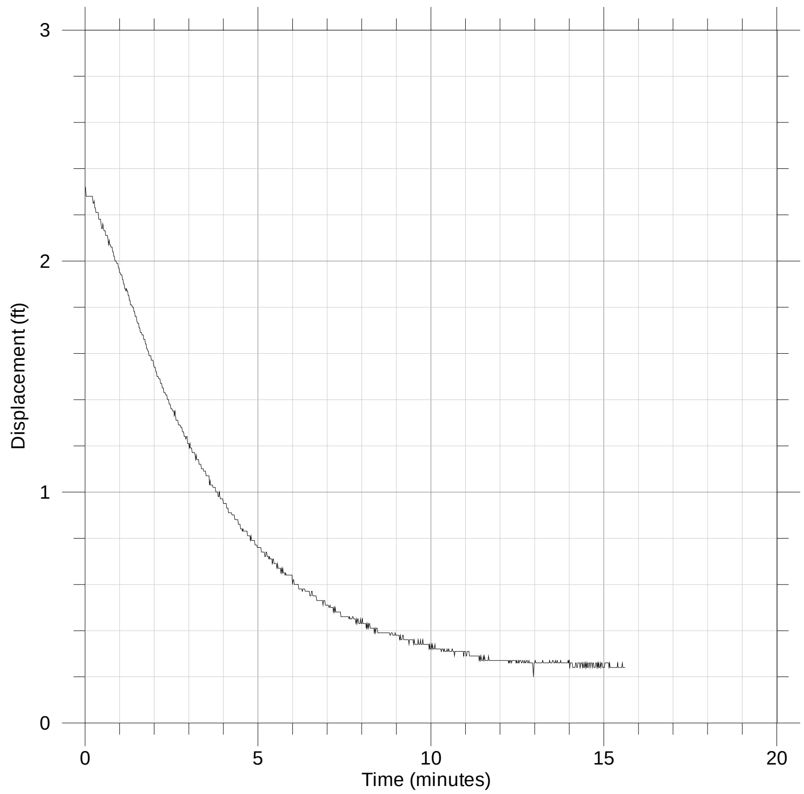
Slug test #1 yields a transmissivity estimate of 470 ft^2/d, for an assumed storativity of 10^{-6}. The analysis of the first slug test demonstrates that the results of the test are repeatable.

No previous estimates of transmissivity are available for comparison. The results of the 2002 slug tests suggest that the transmissivity for the Lower interval (FZ-10/11) is high at H3L.

3.31 H4L

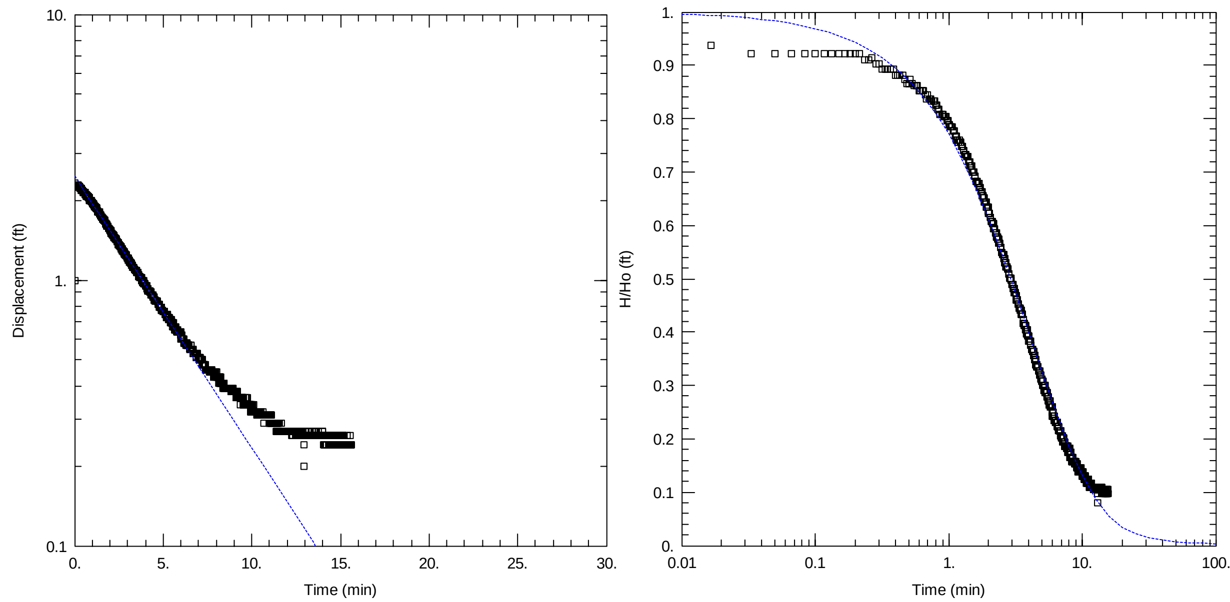
Based on a review of the estimated flow zone locations, H4L intersects FZ-10 and FZ-11. This well was classified previously as non-representative by SEDA (2001), as the water levels have been approximately the same as the water levels in the Middle bedrock well H4M.

The response to the addition of the 2 gallons of water for the tests is shown below:



The initial displacement back extrapolated from the transducer record is 2.5 ft, less than the theoretical value of 3.3 ft. About 90% recovery is observed within 15 minutes of the start of the test.

Plots showing the estimation of the effective initial displacement and the match to the observed data are presented below. The estimated transmissivity is 34 ft^2/day, for an assumed storativity of 10^{-6}.



As shown below, the assumed storativity has only a minor effect on the estimation of the transmissivity:

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	28
10^{-6}	34
10^{-7}	38

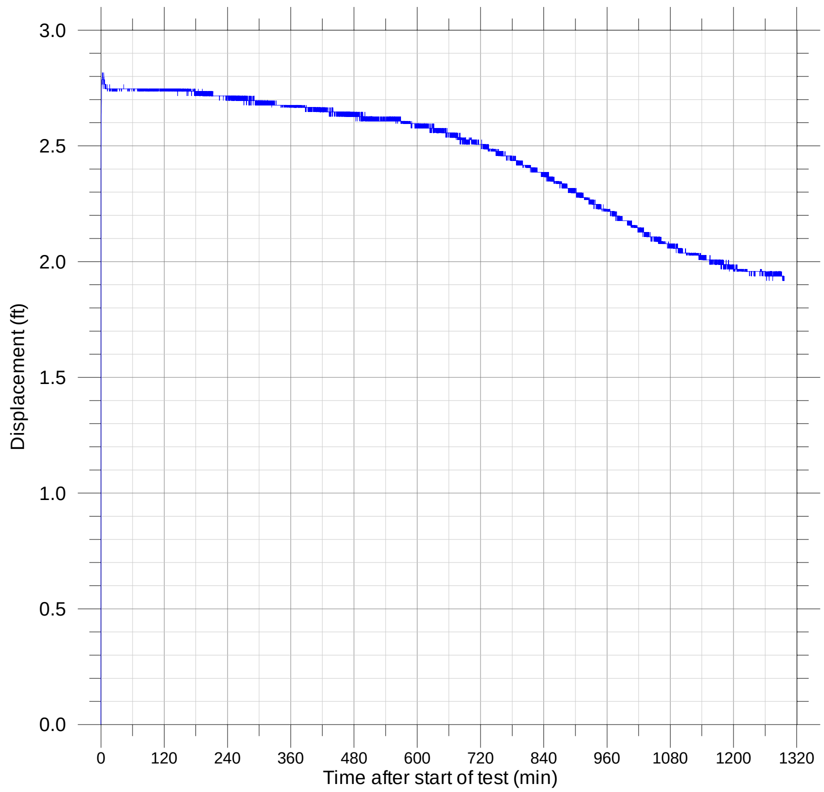
The results of the 2002 slug test are about an order of magnitude higher than the value of 3.2 ft^2/d reported for a previous test (Site database [eDAT]).

The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is moderate at H4L.

3.32 J1L

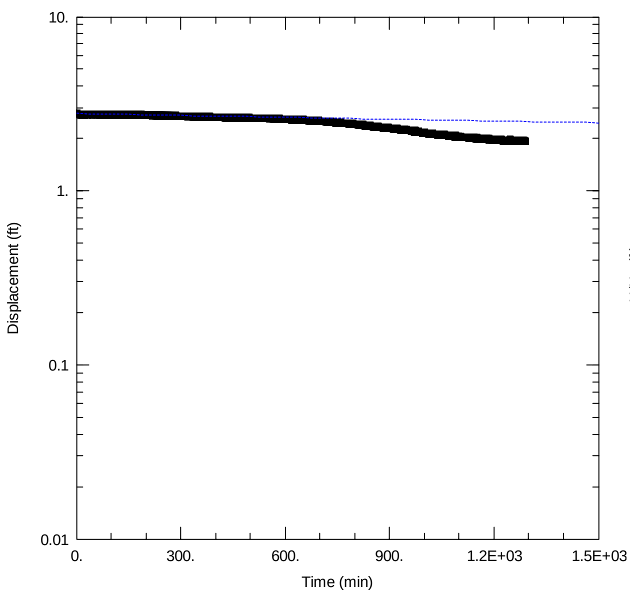
Based on a review of the estimated flow zone locations, J1L intersects FZ-10 and FZ-11. This well was classified previously as non-representative, based on its lack of response to pumping, as well as higher than expected water levels (SEDA, 2001).

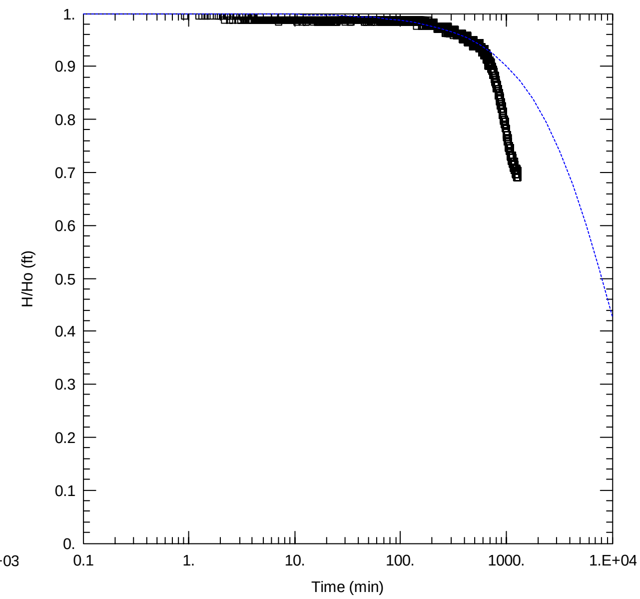
The response to the addition of the 2 gallons of water for the test is shown below:



The initial displacement inferred from the transducer record is about 2.8 ft, less than the theoretical value of 3.3 ft. Less than 30% recovery is observed 22 hours after the start of the test.

A sudden change in the response occurred about 500 minutes into the test, and it is not possible to match the entire data set. Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. Emphasis is placed on the early portion of the test response. The estimated transmissivity is 0.012 ft^2/day, for an assumed storativity of 10^{-6}.





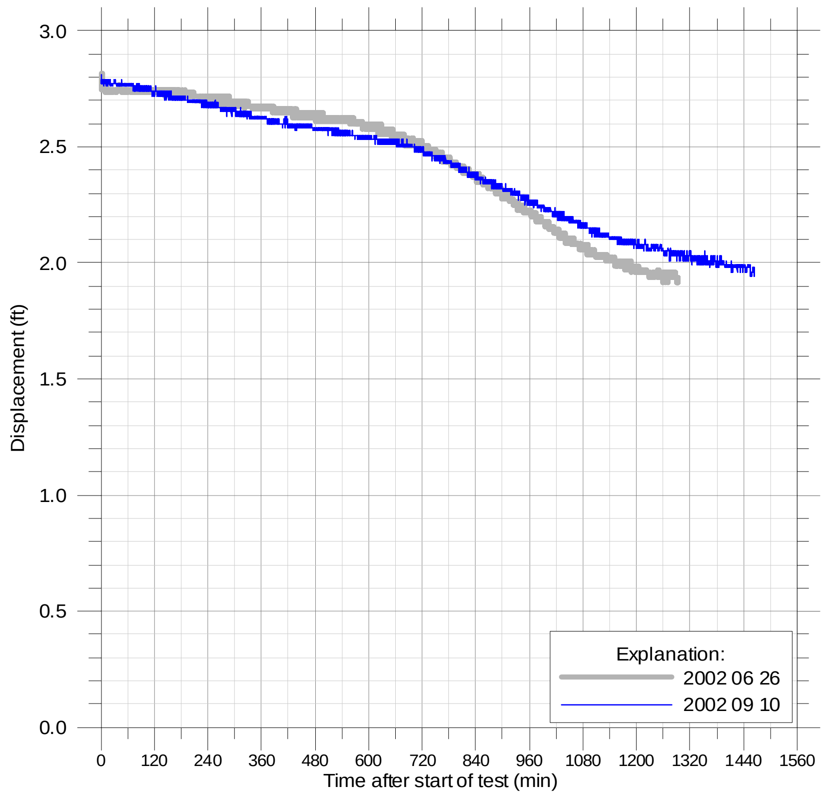
As indicated below, the transmissivity estimate is relatively insensitive to the assumed storativity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	0.010
10^{-6}	0.012
10^{-7}	0.015

Upon review of the slug test results, we decided that the test response was irregular, and the well should be re-tested. The well was re-tested on September 10, 2002, and the results are described in the next section.

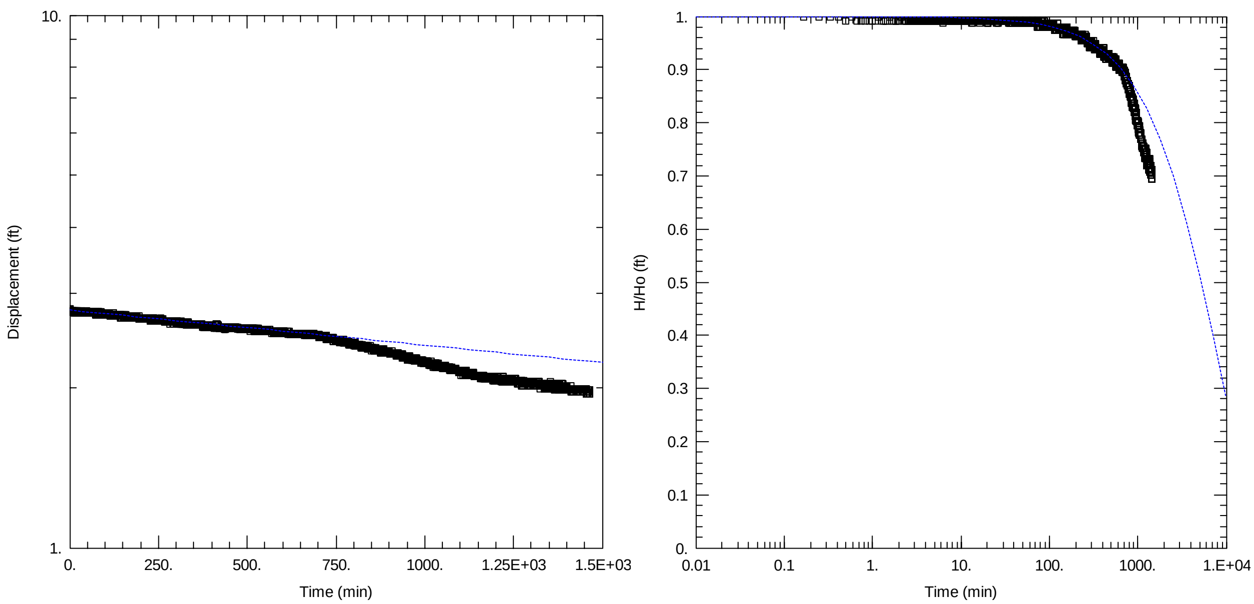
J1L re-test

The response to the addition of 2 gallons of water for the re-test is shown below. The response for the original test is also included for comparison. The results of the re-test appear to be very similar to the original test. The portion of the response that was difficult to fit in the original test also appears in the second test. This suggests that this response is not a problem with the test, but is rather a true indication of the aquifer response.



The initial displacement estimated from the transducer record is 2.8 ft, less than the theoretical value of 3.3 ft. Approximately 30% recovery is observed within 25 hours of the start of the test.

It is not possible to match the theoretical solution to the entire response record. Only the early portion of the response from the original June 26, 2002 was analyzed, and this approach is also adopted for the re-test. Plots showing the analysis are presented below. The estimated transmissivity from the fit to the data is 0.02 ft^2/day, for an assumed storativity of 10^{-6}.



A range of storativities has been considered in the analysis. As indicated in the table below, the assumed storativity has little effect on the transmissivity estimate.

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	0.015
10^{-6}	0.019
10^{-7}	0.023

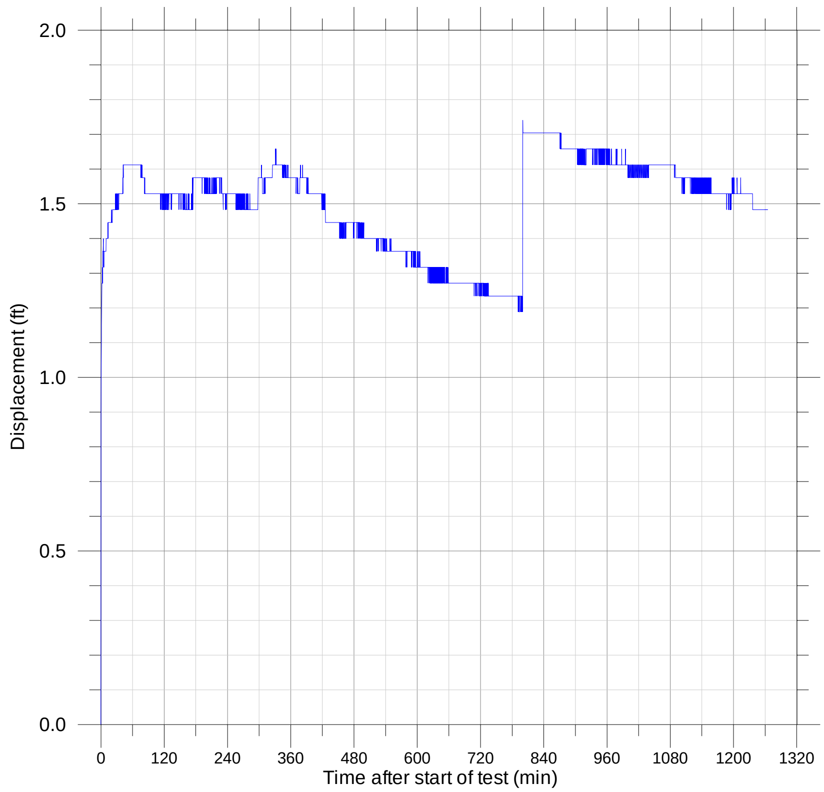
The transmissivity estimated from the re-test is similar to the estimate from the June 26, 2002 test (0.012 ft^2/day). The transmissivities estimate derived from the 2002 slug test are consistent with the range indicated from values reported previously, 0.018 ft^2/day from the CRA database, and 0.025 ft^2/day from the 1991 packer testing for the interval from 502.2 to 484.3 ft AMSL.

The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is low at J1L.

3.33 J2L

Based on a review of the estimated flow zone locations, J2L intersects FZ-10 and FZ-11. This well was classified previously as non-representative, due to lack of response to pumping (SEDA, 2001).

The response to the addition of the 2 gallons of water for the test is shown below:

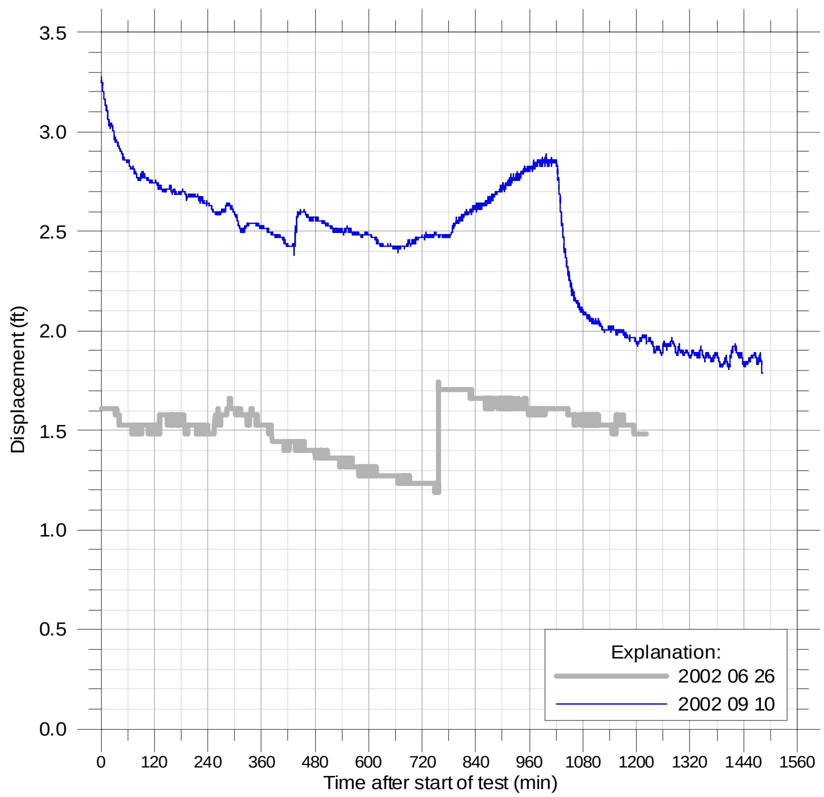


A rise in the displacement occurs after approximately 800 minutes. This is not believed to be a result of a change in the hydraulics of the system. Instead, it probably indicates a problem with the pressure transducer.

Upon review of the slug test results, we decided that the well should be re-tested. The well was re-tested on September 10, 2002, and the results are described in the next section.

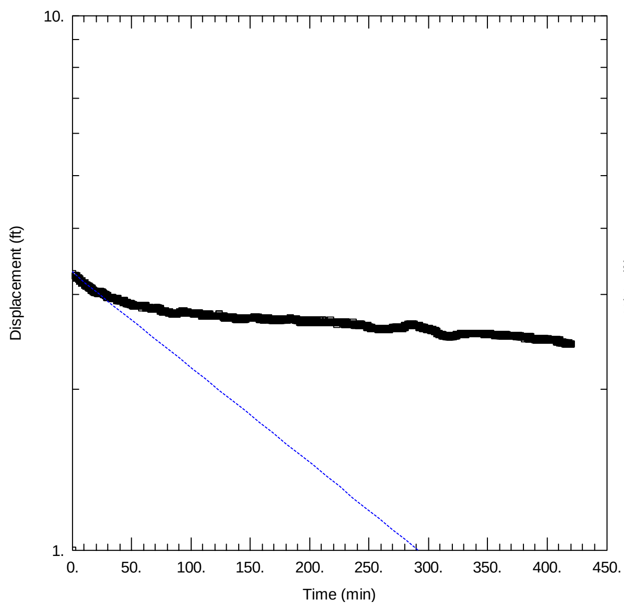
J2L re-test

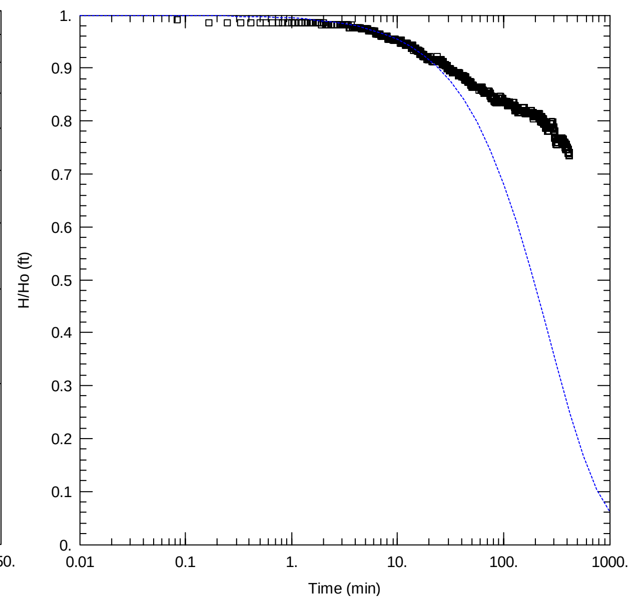
The response to the addition of 2 gallons of water for the re-test is shown below. The response for the original test is also included for comparison. The irregularities in the water level recordings are likely due to the effects of thunderstorms on the pressure transducer. The first seven hours of the record appear to be reliable, and are analyzed here.



The initial displacement estimated from the transducer record is 3.3 ft, the same as the theoretical value. Approximately 25% recovery is observed 7 hours after the start of the test.

It is not possible to fit the theoretical solution to the entire record. A fit to the early time portion of the response is attempted. This yields an upper-bound estimate of the transmissivity. The estimated transmissivity from the fit to the early-time data is 0.5 ft^2/day, for an assumed storativity of 10^{-6}. The match to the data is shown below.





A range of storativities has been considered in the analysis. As indicated by the results tabulated below, the assumed storativity has little effect on the transmissivity estimate.

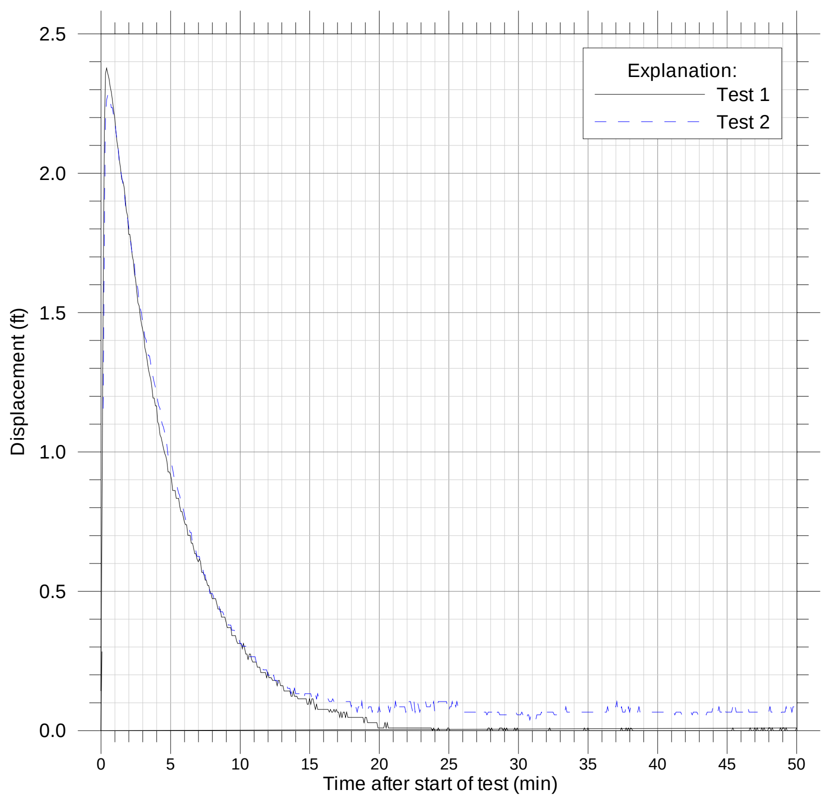
Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	0.4
10^{-6}	0.5
10^{-7}	0.6

The transmissivity estimated here is about 2 orders of magnitude higher than the value of 0.002 ft^2/day reported previously for this well (Site database [eDAT]). This is not materially significant, as the results of the 2002 slug testing still indicate that the transmissivity of the Lower interval (FZ-10/11) is low at J2L.

3.34 J3L

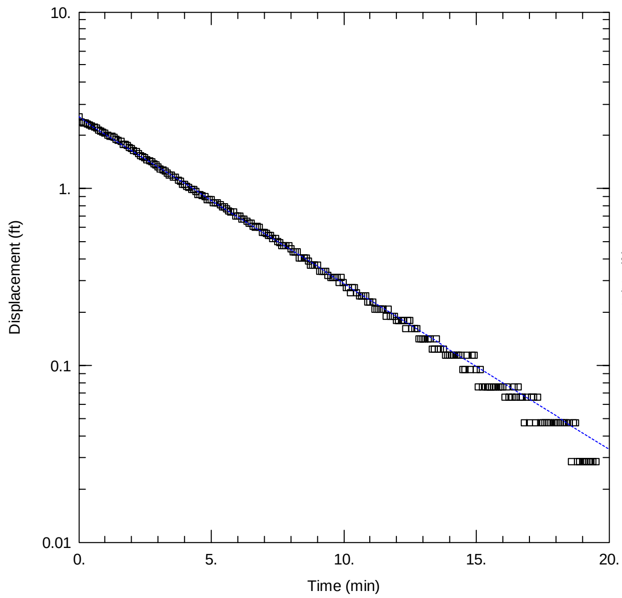
Based on a review of the estimated flow zone locations, J3L intersects FZ-11. This well was classified previously as non-representative, based on higher than expected water levels (SEDA, 2001).

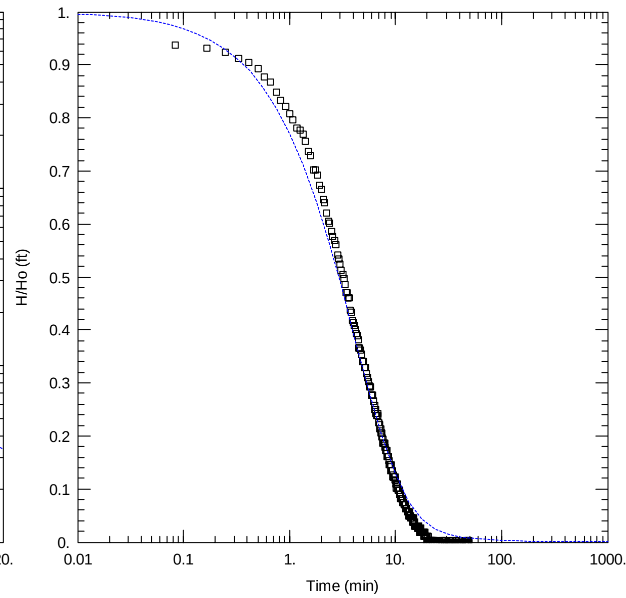
Due to rapid recovery, two replicate slug tests were conducted at this well. The pressure transducer readings were recorded every 5 seconds for both tests. The responses to the addition of the 2 gallons of water for both tests are shown below. The responses are similar and only the details of the analysis of Test 1 are presented.



The initial displacement inferred from the transducer record is about 2.4 ft, less than the theoretical value of 3.3 ft. Complete recovery is observed about 20 minutes after the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 34 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated on the table below, the transmissivity estimate is relatively insensitive to the value assumed for the storativity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	29
10^{-6}	34
10^{-7}	39

The transmissivity estimate from the 2002 slug test is somewhat higher than a value of 9 ft^2/day reported for a previous test (Site database [eDAT]).

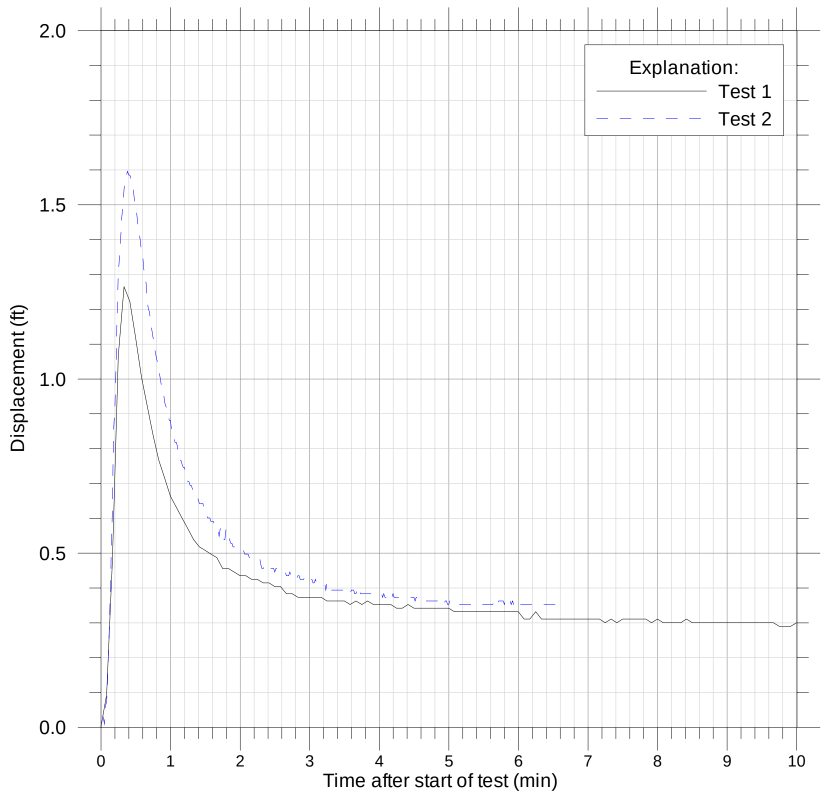
Test 2 yields a transmissivity estimate of 31 ft^2/day, for an assumed storativity of 10^{-6}. The results from the second slug test demonstrate that the results for J3L are repeatable.

The results of the 2002 slug test suggest that the transmissivity of the Lower interval (FZ-11 and possibly FZ-10) is moderate at J3L.

3.35 J4L

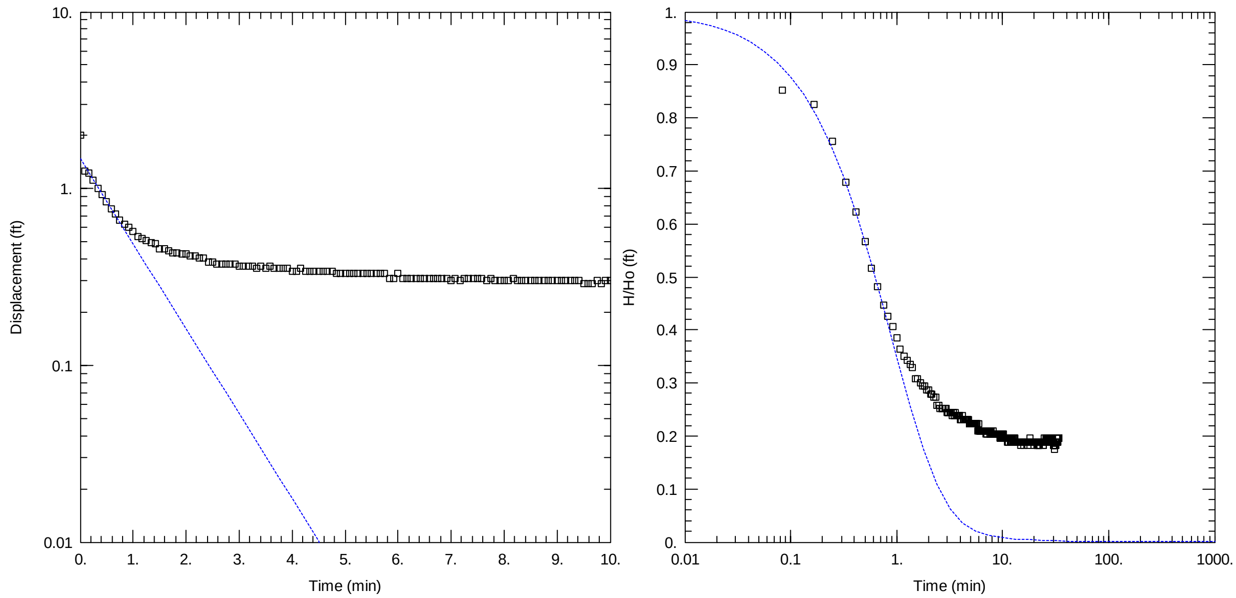
Based on a review of the estimated flow zone locations, J4L intersects FZ-11. This well has been classified previously as non-representative, due to anomalously high water levels (SEDA, 2001).

Due to rapid recovery, two replicate slug tests were conducted for this well. The pressure transducer readings were recorded every 5 seconds for both tests. The responses to the addition of the 2 gallons of water for both tests are shown below. The responses are similar and only the details of the analysis of Test 1 are presented here.



The initial displacement inferred from the transducer record is about 1.5 ft, lower than the theoretical value of 3.3 ft. The water level recovers 85%, to a level 0.3 ft above the initial water level, within 10 minutes of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 160 ft^2/day, for an assumed storativity of 10^{-6}.



As indicated in the table below, the assumed storativity has only a minor effect of the transmissivity estimate:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	140
10^{-6}	160
10^{-7}	190

The transmissivities estimated from the 2002 slug tests are significantly higher than the value of 6 ft^2/day reported for a previous slug test at this well (Site database [eDAT]).

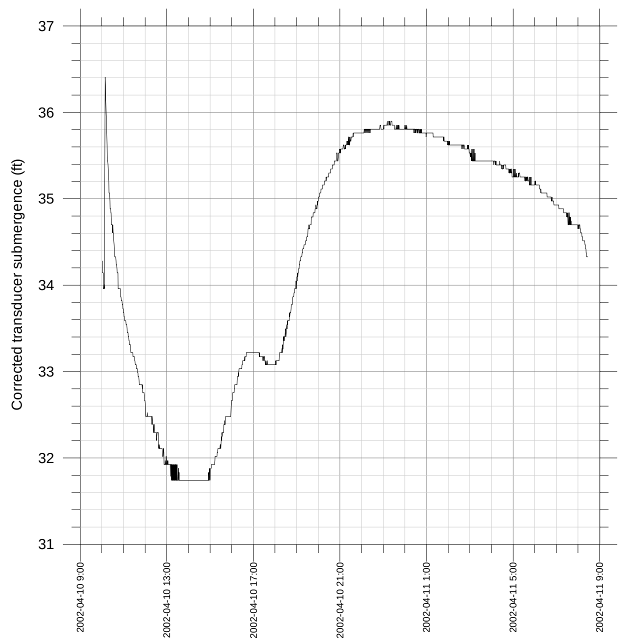
Test 2 yields a transmissivity estimate of 150 ft^2/day, for an assumed storativity of 10^{-6}. The results from the second test demonstrate that the slug test results for J4L are repeatable.

The results of the 2002 slug test indicate that the transmissivity of the Lower interval (FZ-11) is high at J4L.

3.36 J5L

Based on a review of the estimated flow zone locations, J5L intersects both FZ-10 and FZ-11. This well was not classified by SEDA (2001).

The response to the addition of the 2 gallons of water is shown on the following plot:



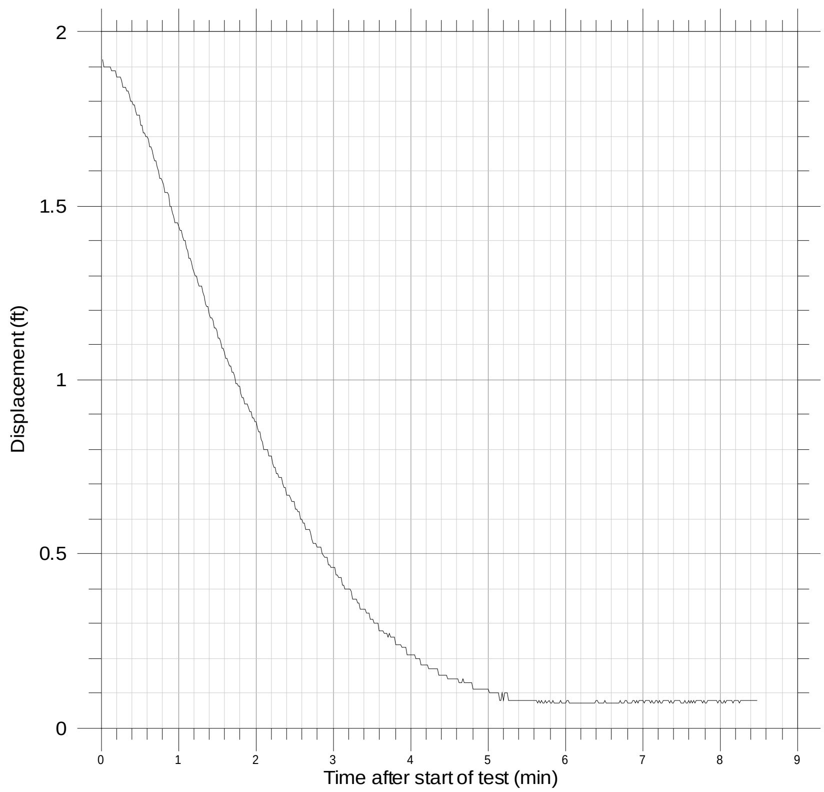
The water level appears to follow a typical slug test response during early time. However, the water level unexpectedly begins to rise again following the recovery, to a level close to the initial displacement. The oscillation is irregular; and therefore cannot be analyzed quantitatively. Unlike typical underdamped responses, the data shown here do not suggest a very high transmissivity, as they do not show a rapid decline of the average water level following the start of the test.

We recommended that J5L be tested again, however, this well was retrofit before a second test could be conducted. Therefore, no estimate of transmissivity is possible from this test.

3.37 JH1L

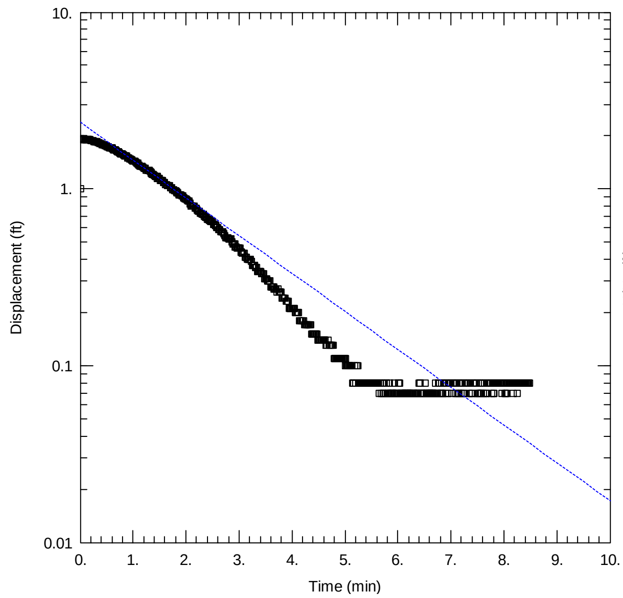
Based on a review of the estimated flow zone locations, JH1L intersects FZ-10 and FZ-11. This well was not classified by SEDA (2001).

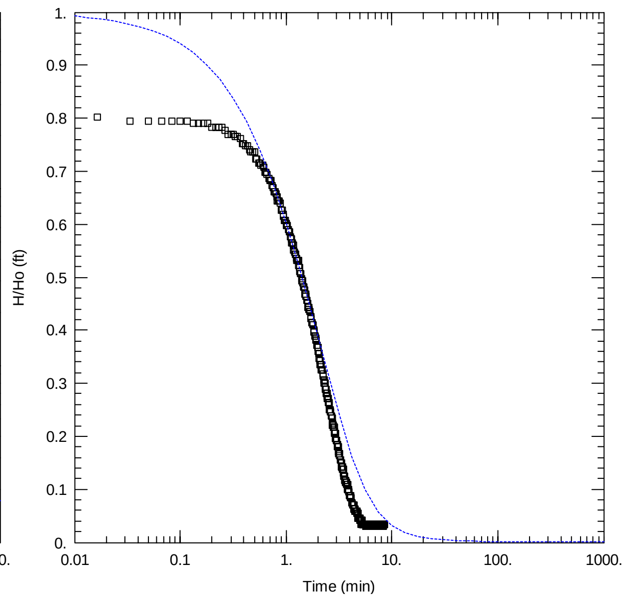
The response to the addition of the 2 gallons of water for the tests is shown below:



The initial displacement estimated from the transducer record is 2.4 ft, less than the theoretical value of 3.3 ft. Approximately 98% recovery is observed within 6 minutes of the start of the test.

It is not possible to match the theoretical solution to the entire response. If the later-time portion of the data (between 3 and 5 minutes) is used to extrapolate the initial displacement, the inferred initial displacement is approximately 4.5 ft, much larger than the theoretical maximum value of 3.3 ft. If the initial displacement is assumed to be the maximum observed in the transducer record (1.92 ft), the storativity required to fit the entire dataset is much too small. The analysis approach taken here is to estimate the transmissivity by matching the middle portion of the test. Plots showing the estimation of the effective initial displacement and the match to the observed data are presented below. The estimated transmissivity from the fit is 70 ft^2/day, for an assumed storativity of 10^{-6}.





As indicated in the table below, the assumed storativity has a relatively small effect on the estimated transmissivity:

Storativity, S	Transmissivity, T (ft^2/d)
10^{-5}	60
10^{-6}	70
10^{-7}	80

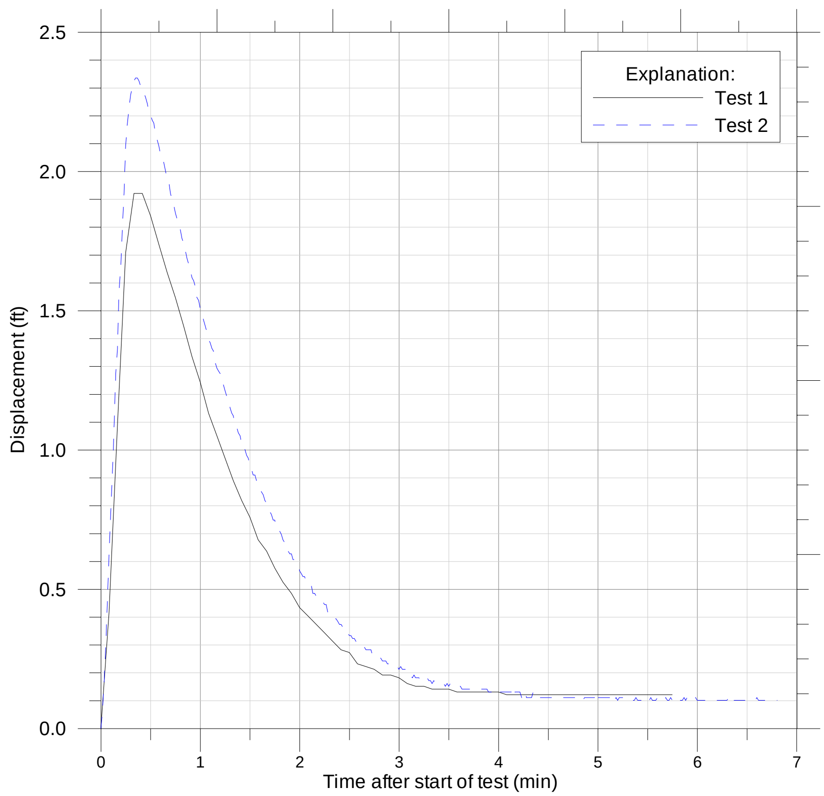
The transmissivity estimated here is about an order of magnitude higher than the value of 6 ft^2/day reported previously for this well (Site database [eDAT]).

The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is moderate at JH1L.

3.38 PMW-3L

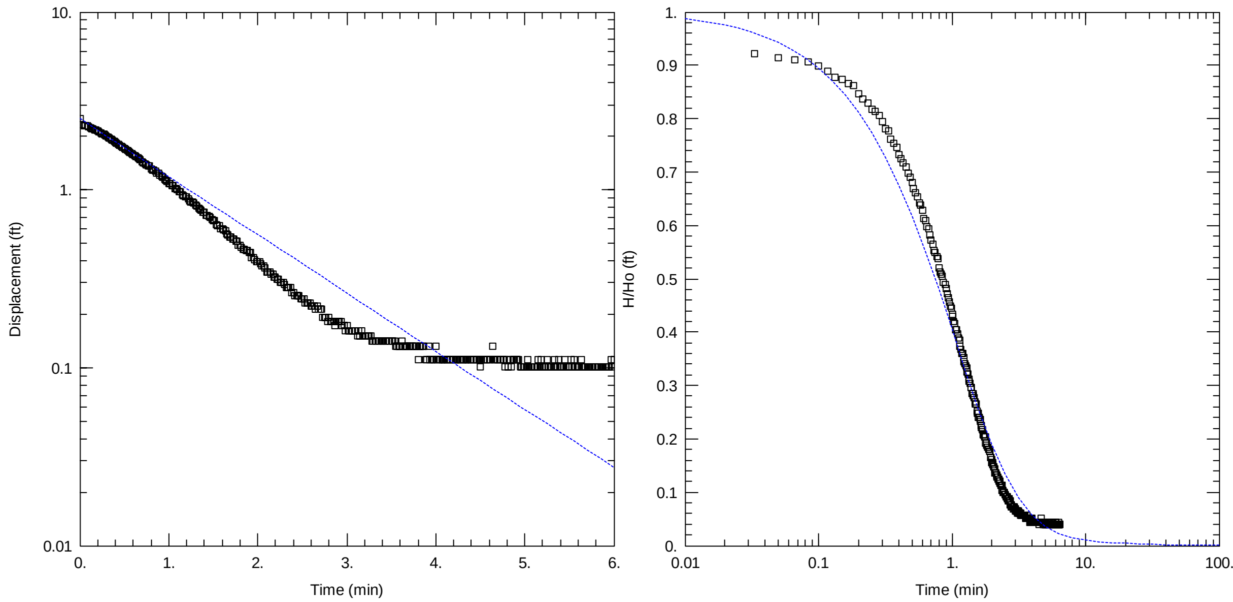
Based on a review of the estimated flow zone locations, PMW-3L intersects FZ-10 and FZ-11. This well was not classified previously by SEDA (2001), due to limited data.

Due to fast recovery, two replicate slug tests were conducted at this well. The pressure transducer readings were recorded every 5 seconds for the first test, and every 1 second for the second test. The responses to the addition of the 2 gallons of water for both tests are shown below. The responses are similar and only the details of the analysis of Test 2 are shown here.



The initial displacement estimated from the transducer record is 2.5 ft, somewhat less than the theoretical value of 3.3 ft. Approximately 90% recovery is observed within 5 minutes of the start of the test.

Plots showing the estimation of the initial displacement and the match with the theoretical solution are presented below. The estimated transmissivity is 130 ft^2/day, for an assumed storativity of 10^{-6}.



As indicated in the following table, the assumed storativity has little effect on the estimated transmissivity:

Storativity, S	Transmissivity, T (ft^2/day)
10^{-5}	110
10^{-6}	130
10^{-7}	150

Test 1 yielded a transmissivity estimate of 140 ft^2/day, for an assumed storativity of 10^{-6}. The results from the first slug test suggest that the slug test results for PMW-3L are repeatable.

No estimates of transmissivity are available from previous testing for comparison. The results of the 2002 slug testing indicate that the transmissivity of the Lower interval (FZ-10/11) is high at PMW-3L.

Section 4. Summary of slug test results

The results of the Lower well slug testing are summarized on Table 1. The transmissivity estimates vary over a wide range, from less than 0.001 to over 500 ft^2/day.

The distribution of the transmissivities is shown in Figure 1. We have adopted a simple classification to identify wells having significant transmissivity. The hollow circles in Figure 1 designate wells where the transmissivity was estimated to be less than 0.1 ft^2/day. The filled circles designate wells having transmissivities greater than 0.1 ft^2/day. A value of 0.1 ft^2/day represents about 1/10,000th of the total transmissivity of the bedrock above the Rochester.

As shown on Figure 1, there are large areas in the vicinity of the Site where flow zones 10 and 11 have very low transmissivity. The results also suggest that a band of relatively high transmissivity (~100 ft^2/day) extends from G2L north to J3L, across the middle of the landfill.

Table 1 Lower Well Slug Testing Results

Well	Easting	Northing	Transmissivity (ft^2/d)
AB1L	1026738	1142109	0.1
AFW-1L	1024227	1141672	1.2
AFW-2L	1023266	1140403	0.002
AFW-3L	1022423	1139289	130
AGW-1L	1027377	1142330	0
AGW-2L	1028550	1141886	0
B1L	1025411	1142307	3.6
B2L	1026364	1142058	2
BC3L	1026406	1141592	0.001
C1L	1025938	1141776	540
C2L	1025654	1141885	125
CD1L	1026494	1141424	330
D1L	1026237	1140919	8
D2L	1025949	1140928	0
D4L	1026745	1141125	0.04
D5L	1026908	1140919	1.5
E1L	1026156	1139978	0.007
E2L	1025864	1139981	0.2
E3L	1026600	1140304	0.003
E4L	1026973	1140568	0
F1L	1026698	1139605	100
F2L	1026324	1139433	0
F3L	1026722	1140066	0.007
G1L	1027673	1139277	65
G2L	1027819	1138957	120
G3L	1027705	1139921	430
G5L	1027746	1140422	12
H1L	1028417	1140738	2.9
H2L	1028605	1140547	0
H3L	1028182	1140654	470
H4L	1027938	1140622	33
J1L	1028114	1141838	0.019
J2L	1028321	1141927	0.5
J3L	1027758	1141661	34
J4L	1027772	1141483	160
JH1L	1028476	1141249	70
PMW-3L	1027709	1140896	130

Note: 0 transmissivity means $T < 0.001$ ft^2/d

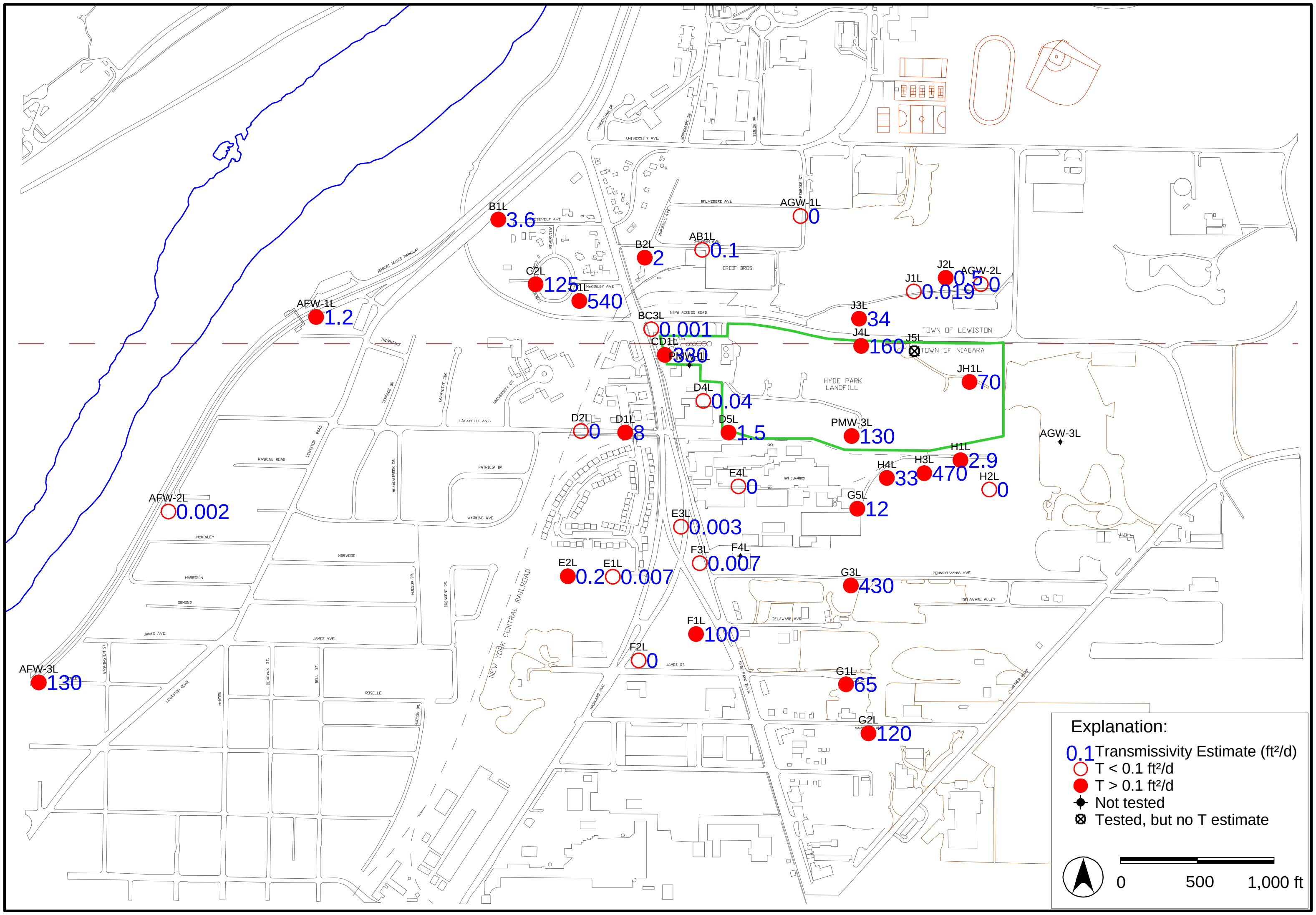


Figure 1 Distribution of Lower Zone Transmissivities from 2002 Slug Tests

Section 5.
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The Interpretation of "Gradual" Slug Tests

C. J. Neville and J.P. Keizer
S.S. Papadopulos & Associates, Inc.
February 20, 2003

1. Introduction

The classical methods for interpreting slug tests assume that the initial change in the water level in the well occurs instantaneously (Hvorslev, 1951; Cooper and others, 1967). An example of the response following an "ideal" initial displacement is shown on Figure 1. For this test, executed during the 2002 packer testing, the initial displacement was created by rapidly opening a valve above the packed-off interval.

We have recently analyzed data from slug tests in which the initial displacement was created by pouring a known volume of water down a well. Although the water was poured down the well as quickly as possible, it could not be done instantly. Care was required to ensure that the entire volume of water went down the well. An example of the response following the pouring of water down the well is shown on Figure 2. We refer to this response as a "gradual slug test".

As far as we are aware, no theoretical approaches have been developed to analyze the results of gradual slug tests. Although a gradual slug test can be conceived as a very brief constant-rate pumping test following by monitoring of the recovery, the duration of the period of injection and hence the injection rate, is not controlled. Furthermore, the initial period of water level rise is relatively brief compared to the transducer recording frequency. Therefore, it is not feasible to evaluate these data using methods developed for pumping tests. In this note we describe our approach for estimating the formation transmissivity from these data. The approach we have adopted here adapts the methods available to interpret conventional slug tests, and applies an adjustment of the data to account for the gradual start of the test. We assess the reliability of two alternative approaches for adjusting the data.

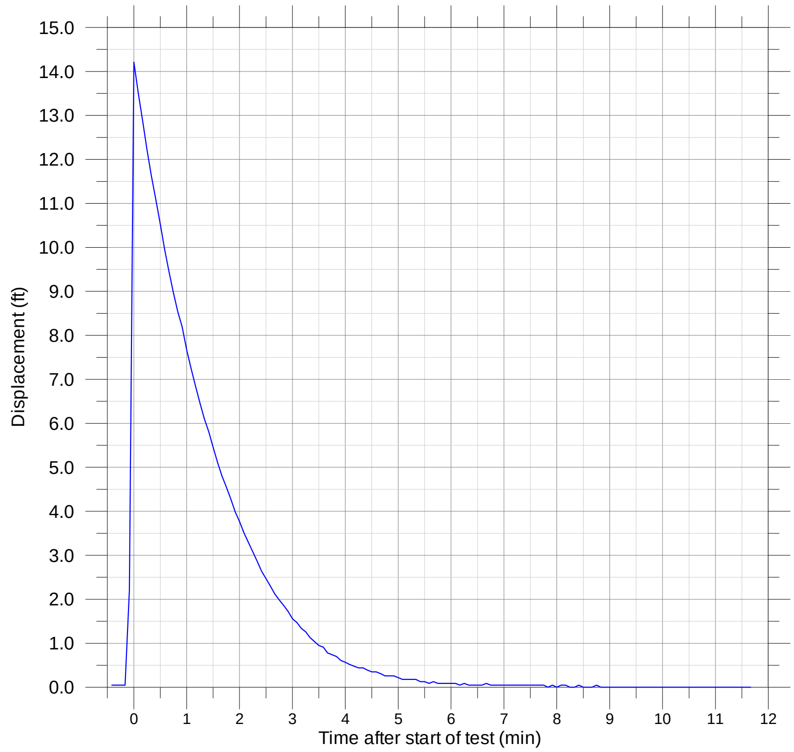


Figure 1. Instantaneous slug test

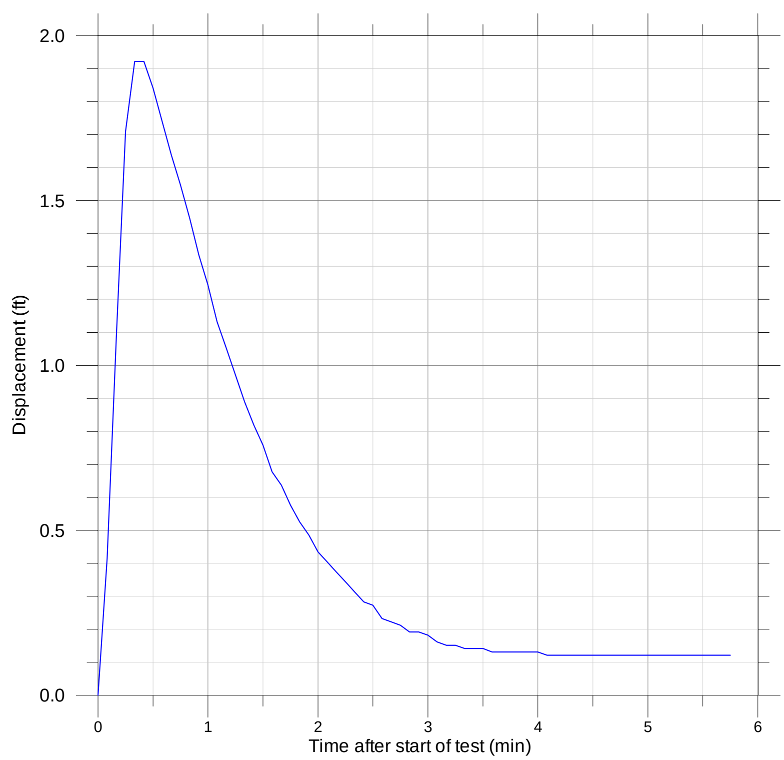


Figure 2. Gradual slug test

2. Approaches for interpreting gradual slug tests

In this note we evaluate two approaches for interpreting gradual slug tests. Both approaches are heuristic. They start from the theory developed for conventional slug tests, and adjust the start of the test and the effective initial displacement to account for the gradual rather than instantaneous rise in the water level at the start of the test.

The "ideal" response during a gradual slug test is illustrated conceptually on Figure 3. The initial rise is generally rapid compared to the recovery, and its duration has been exaggerated on Figure 3.

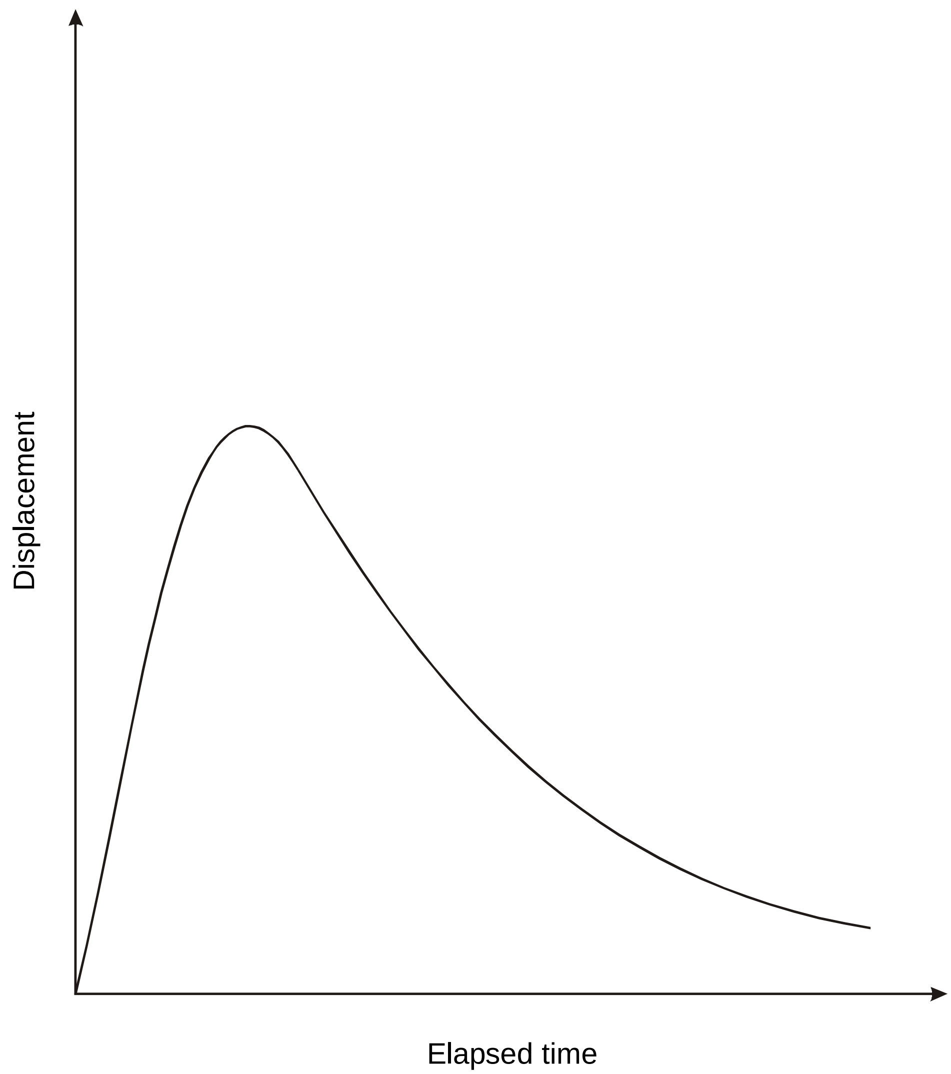


Figure 3. Conceptual response from a gradual slug test

Adjustment approach #1

For the first adjustment approach, we assume that the test starts at the beginning of the initial head rise. The "effective" initial displacement is estimated by extrapolating the observed water level changes back to the start. The approach is illustrated on Figure 4.

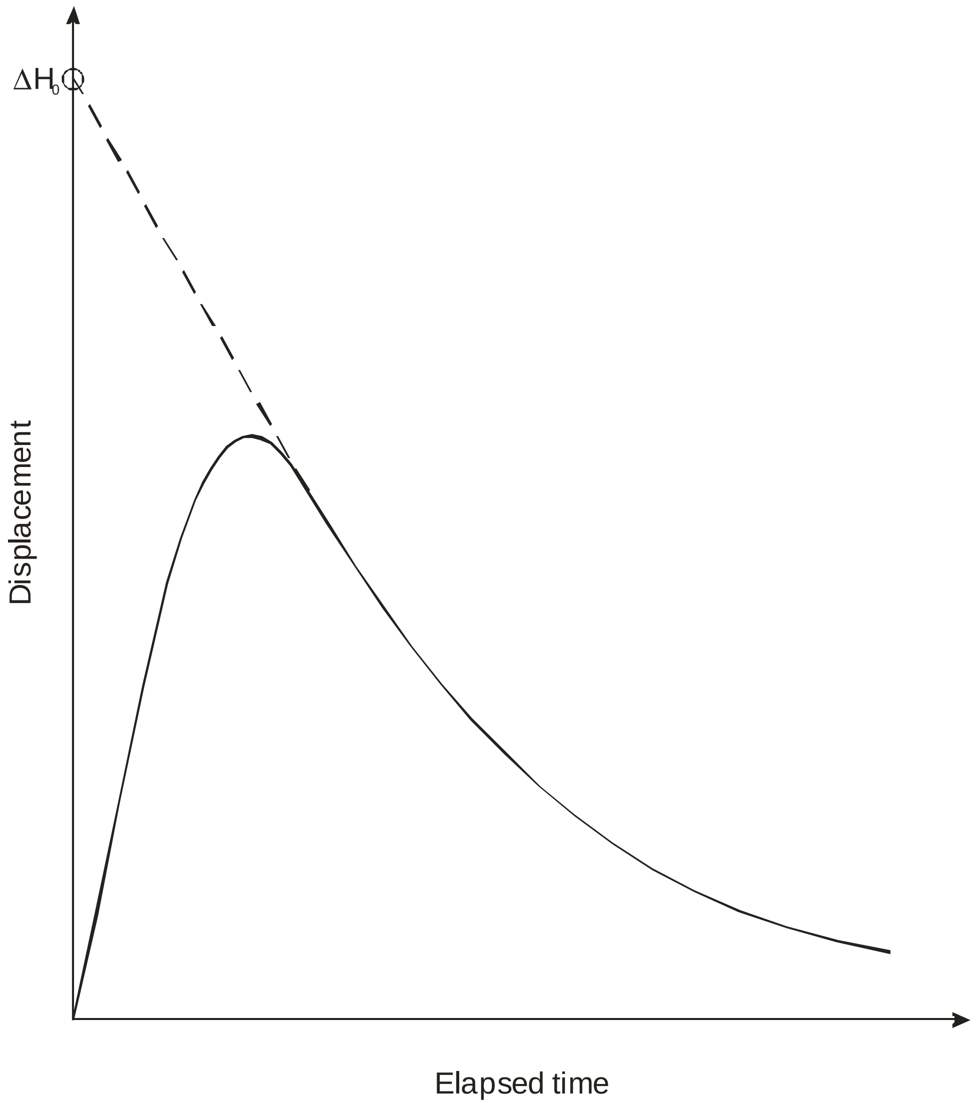


Figure 4. Interpretation Approach #1

The extrapolation of the initial effective displacement is most easily accomplished by plotting the data on a logarithmic time axis. We adopt this approach simply because it magnifies the earliest portion of the response, and not as an implicit judgment on the validity of zero-storage models for slug tests. With this approach, any displacements below the dashed line on Figure 4 are removed from the record before analyzing the test.

Adjustment approach #2

For the second adjustment approach, we assume that the test starts at the point of the maximum initial head rise. The "effective" initial displacement is estimated by extrapolating the observed water level changes back to the revised start time. The approach is illustrated on Figure 6.

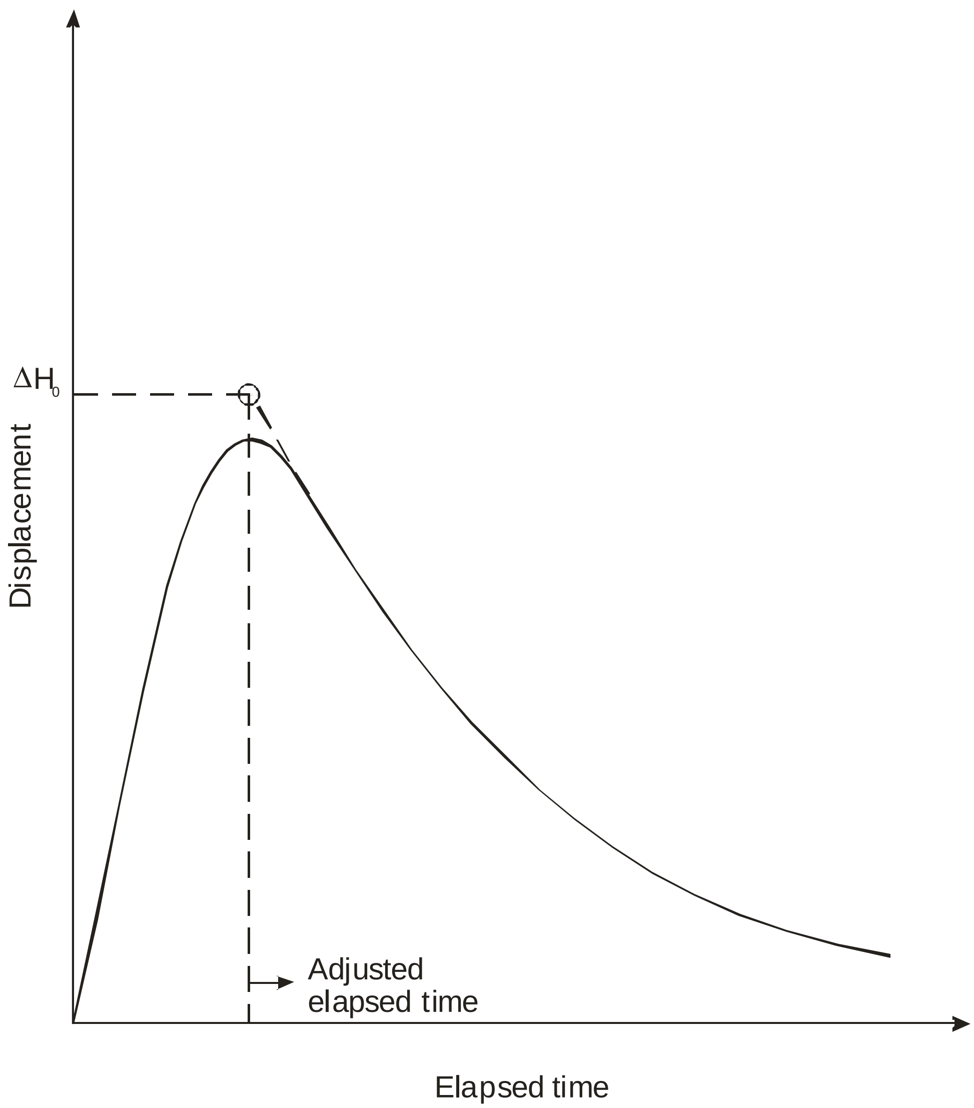


Figure 5. Interpretation Approach 2

The extrapolation of the initial effective displacement is again accomplished by plotting the data on a logarithmic time axis. With the second approach, any data before the adjusted start of the test are removed from the record before analyzing the test.

3. Example calculations

To investigate the performance of the two adjustment approaches, we generate "perfect" response data using typical parameters for the Hyde Park Landfill Site. The response data are calculated using the exact solution of Papadopulos and Cooper (1967), modified to simulate brief pumping followed by recovery. The solution of Papadopulos and Cooper, (1967) incorporates wellbore storage, and shares the conceptual foundation of the slug test solution of Cooper and others (1967).

We consider a well that has a moderate transmissivity and a typical storage coefficient for fracture rock. The problem parameters are:

- Transmissivity (T): 40 ft^2/day
- Storativity (S): 10^{-6}
- Casing and borehole diameter: 3-7/8 inches

The wells are completed in completed as open holes in competent bedrock; therefore, the diameter of the well is very close to the casing and borehole diameters.

The initial displacement for the slug tests at the Hyde Park Site were created by pouring 2 US gallons of water down the well. This corresponds to an initial theoretical head rise of 3.26 ft:

$$V_0 = 2\ gallons \left| \frac{ft^3}{7.481\, gallons} \right| = 0.2673\ ft^3$$

$$d_c = 3\tfrac{7}{8}\ in \left| \frac{ft}{12\ in} \right| = 0.3229\ ft$$

$$\rightarrow \Delta H_0 = \frac{V_0}{\frac{\pi}{4} {d_c}^2} = \frac{0.2673\ ft^3}{\frac{\pi}{4}\left(0.3229\ ft\right)^2} = 3.264\ ft$$

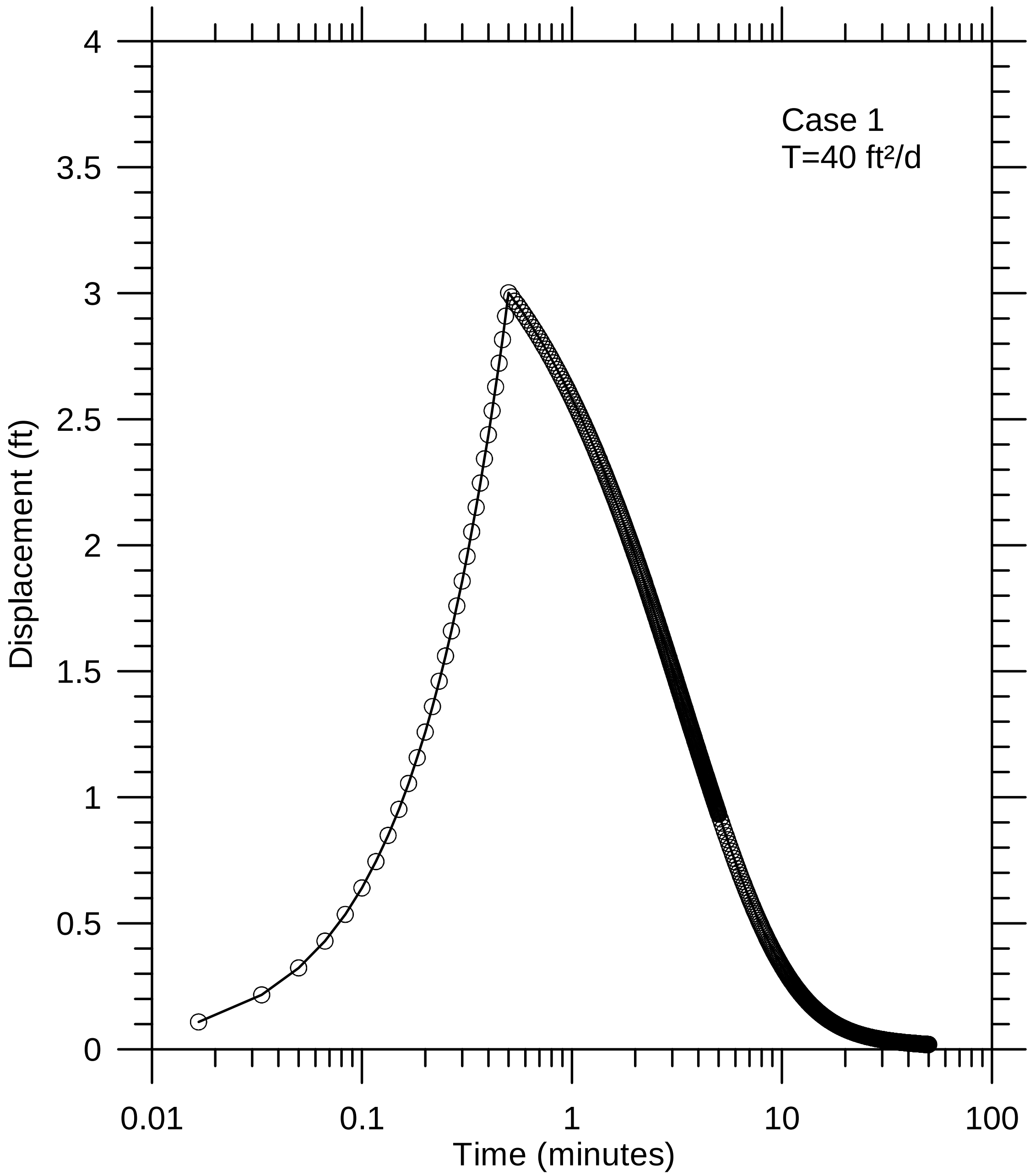
We consider three durations of the initial injection:

- Case 1: 0.5 minutes
- Case 2: 0.25 minutes
- Case 3: 1.0 minutes

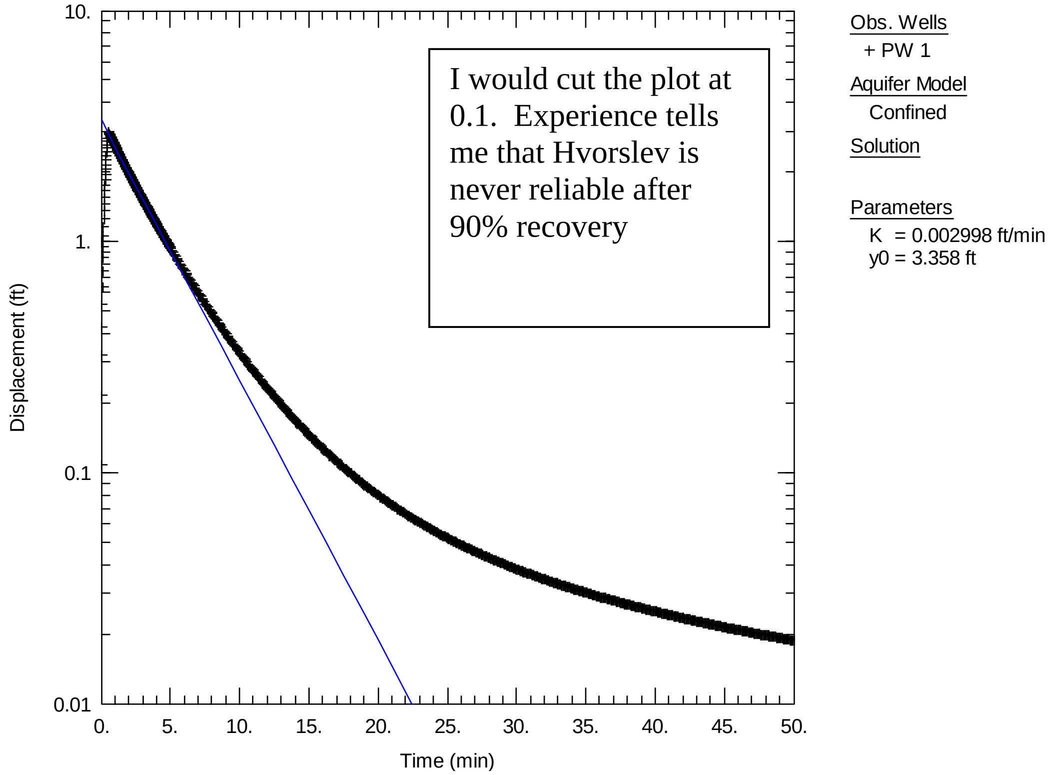
The three cases correspond to the following equivalent pumping rates.

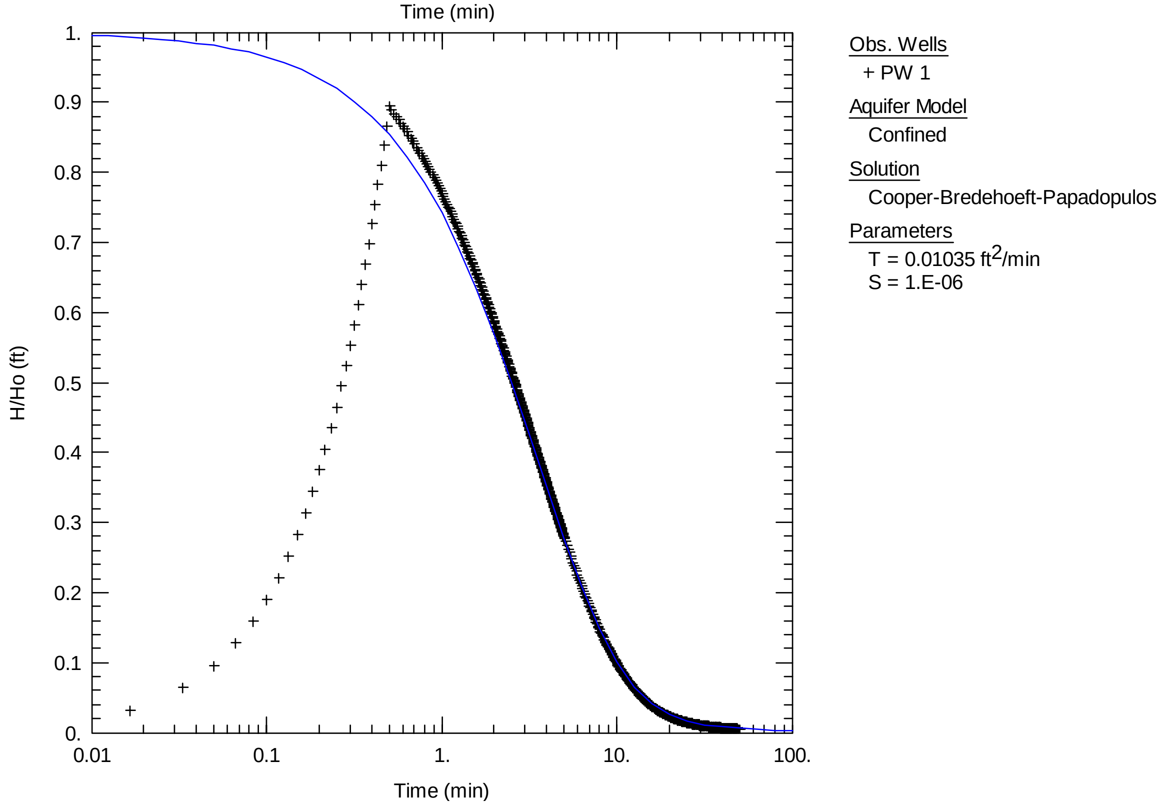
Case	**Duration of injection (minutes)**	**Equivalent pumping rate (ft^3/min)**
1	0.5	0.5346
2	0.25	1.0692
3	1.0	0.2673

Case 1: **$t_{pumping}$ = 0.5 minutes**

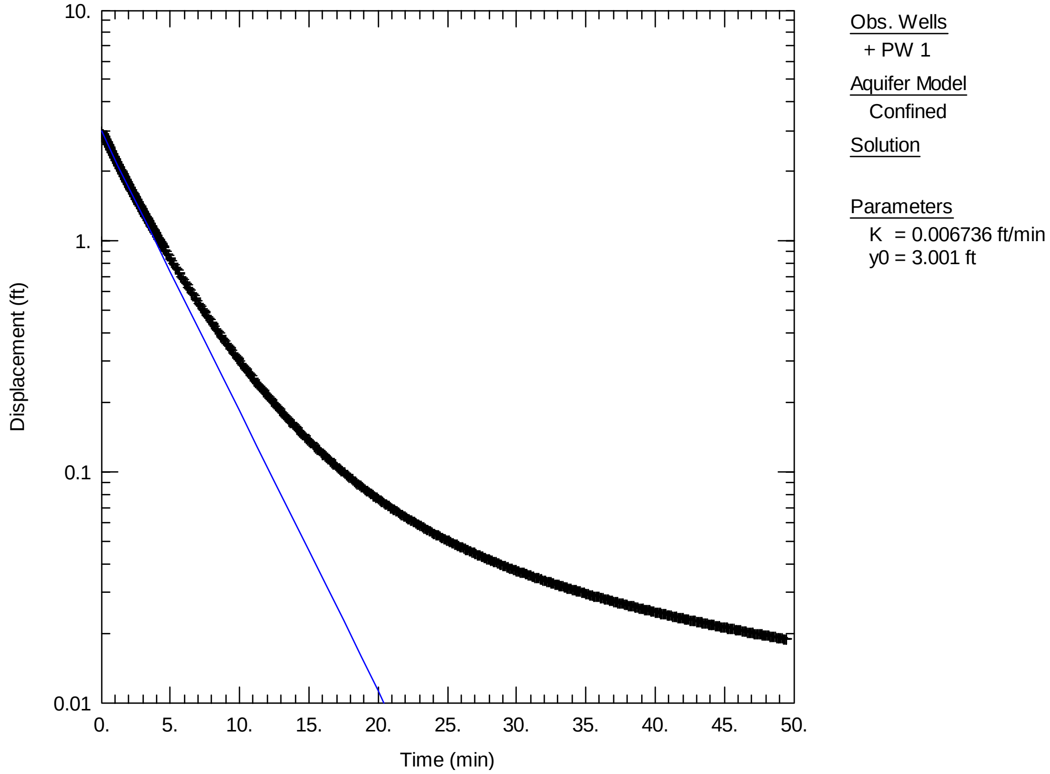


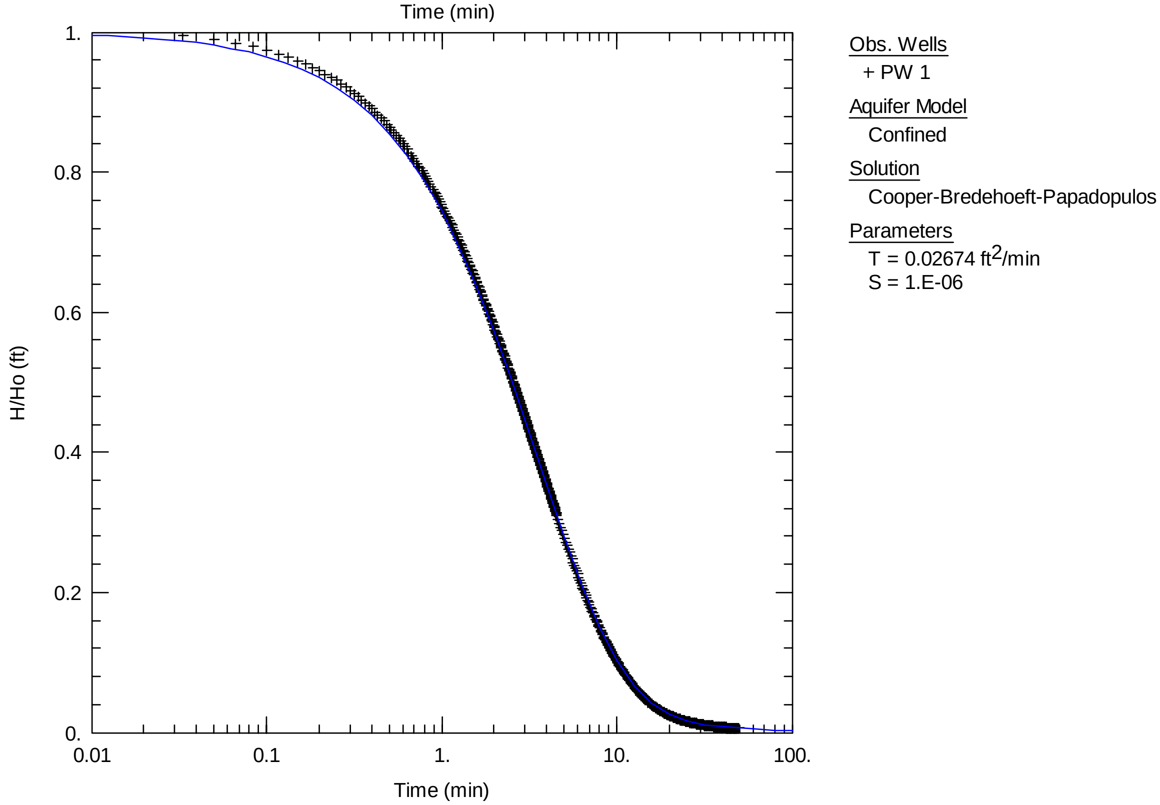
Case 1: Approach 1



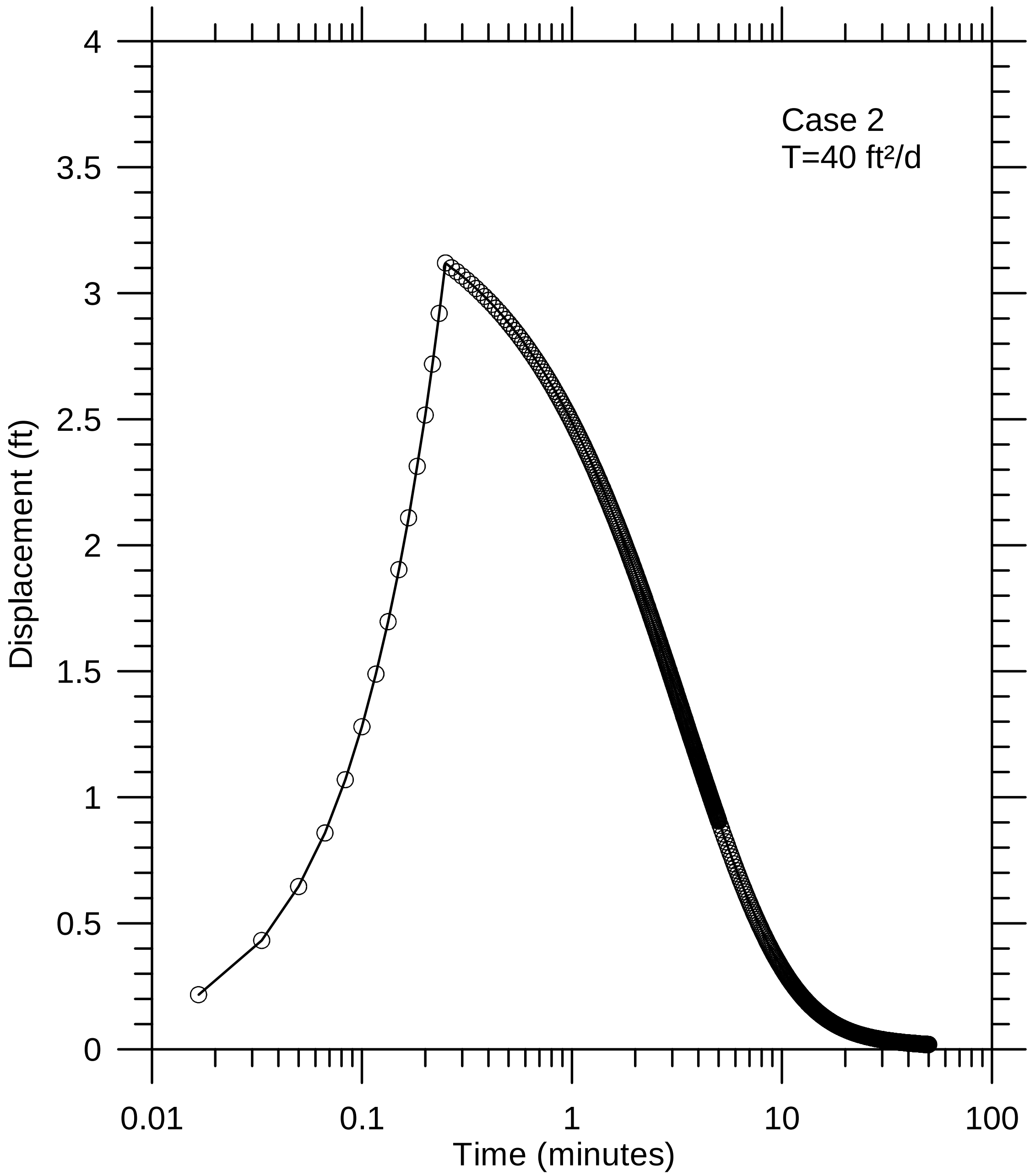


Case 1: Approach 2

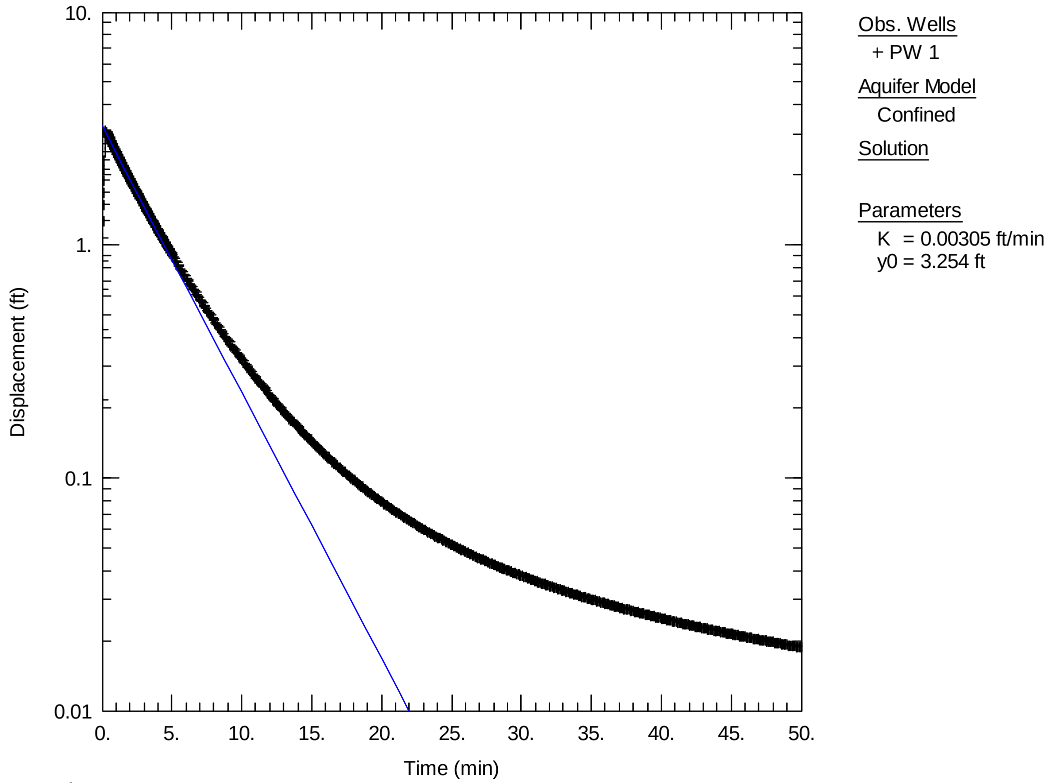


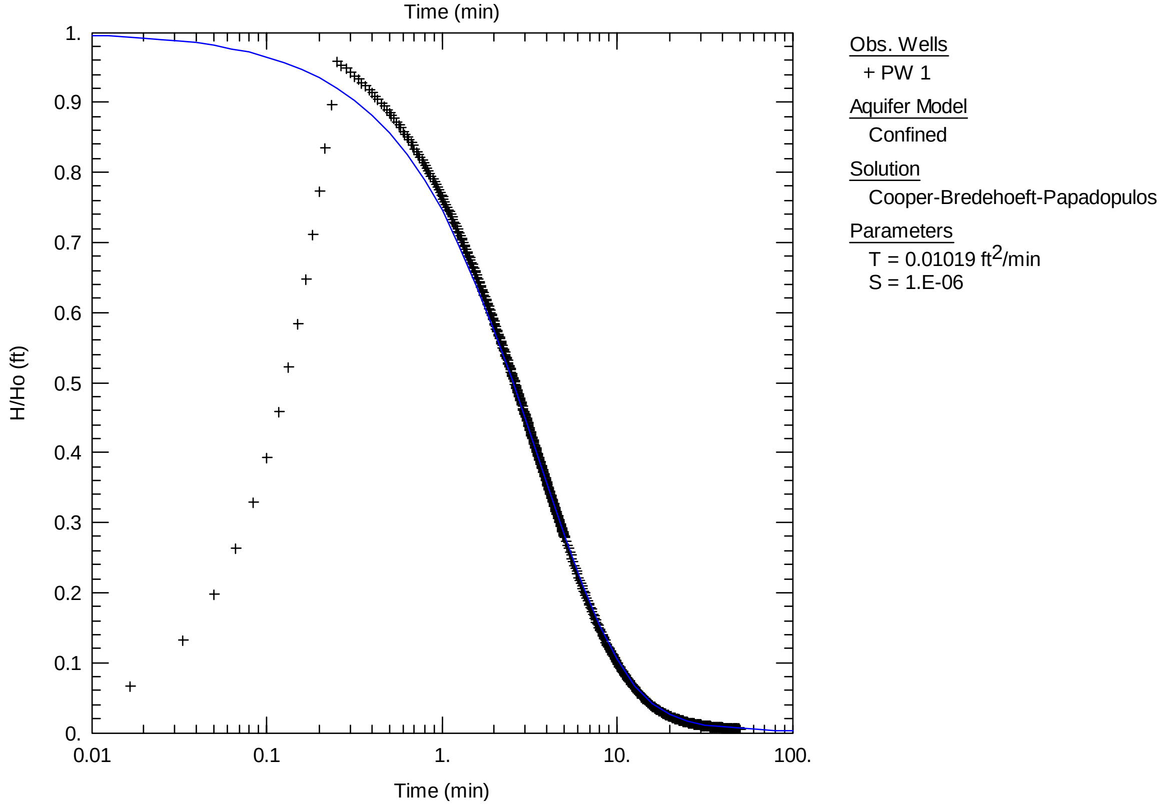


Case 2: $t_{pumping} = 0.25$ **minutes**

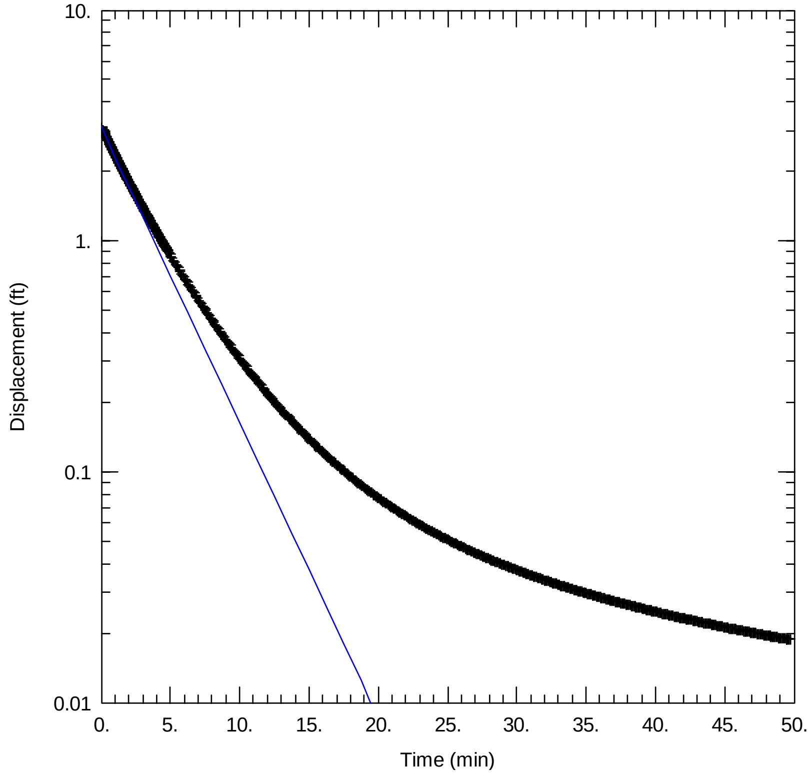


Case 2: Approach 1



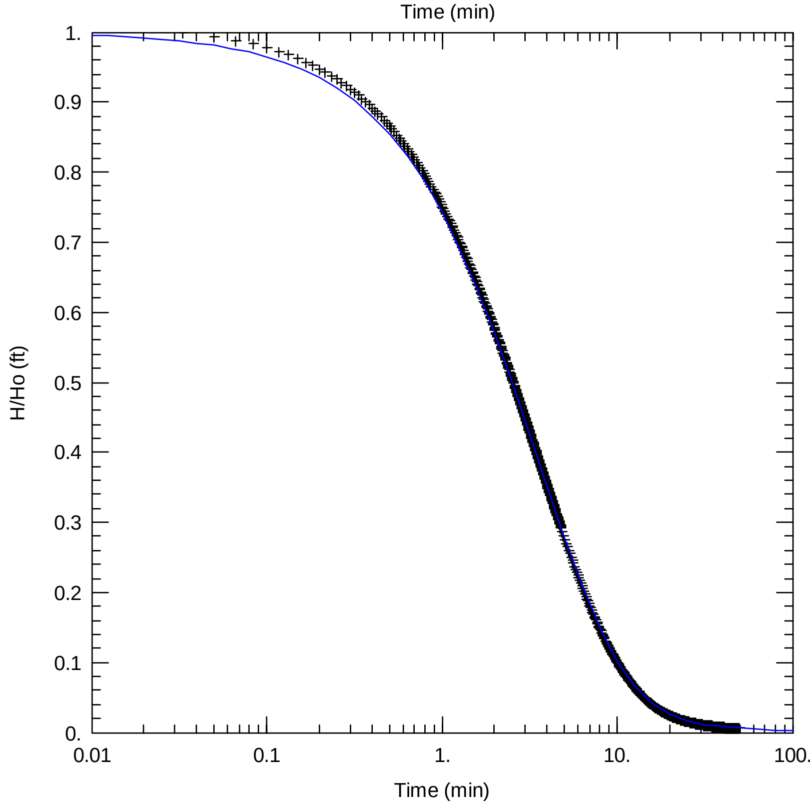


Case 2: Approach 2



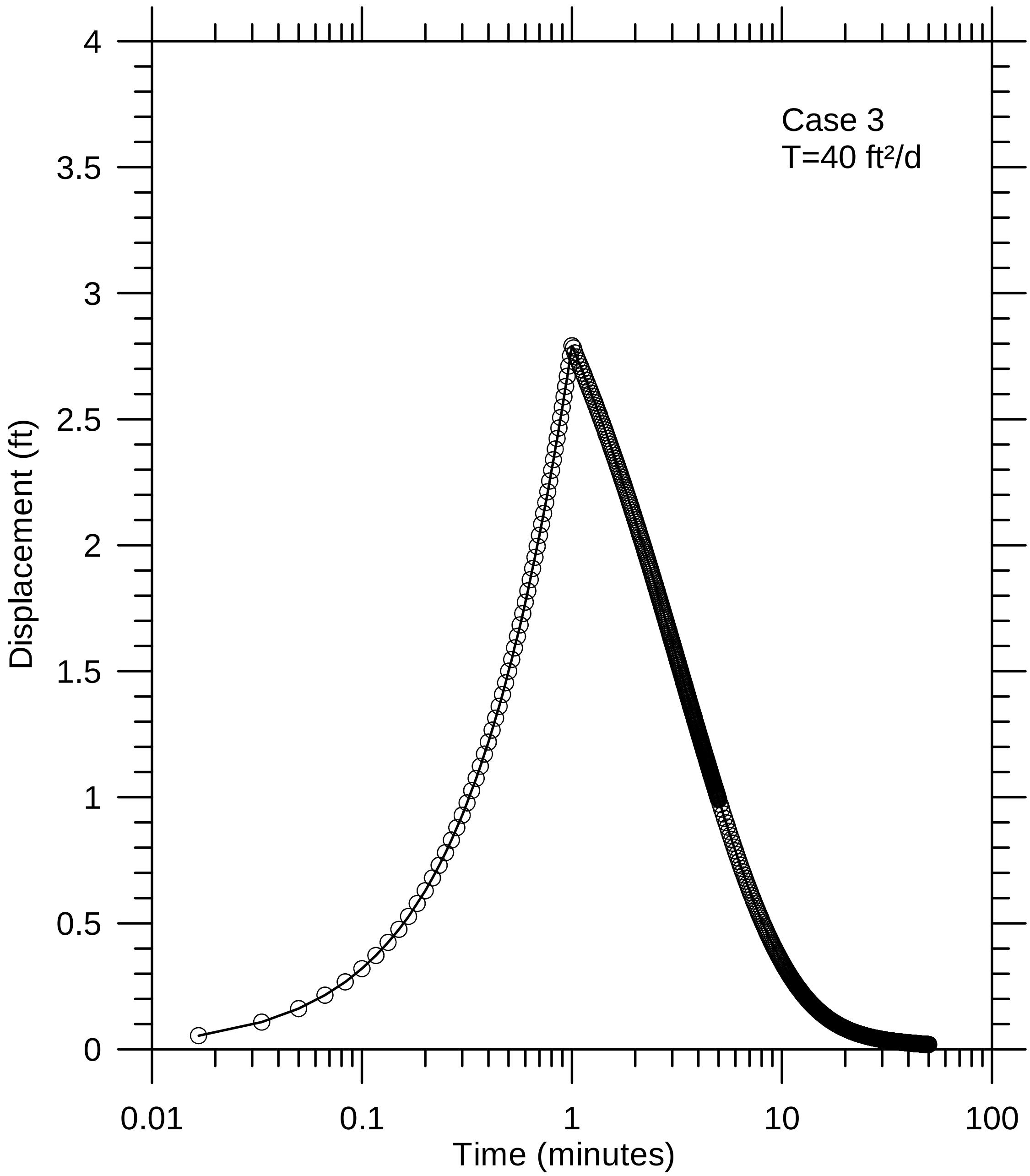
Obs. Wells
+ PW 1
Aquifer Model
Confined
Solution

Parameters
K = 0.007096 ft/min
y0 = 3.104 ft

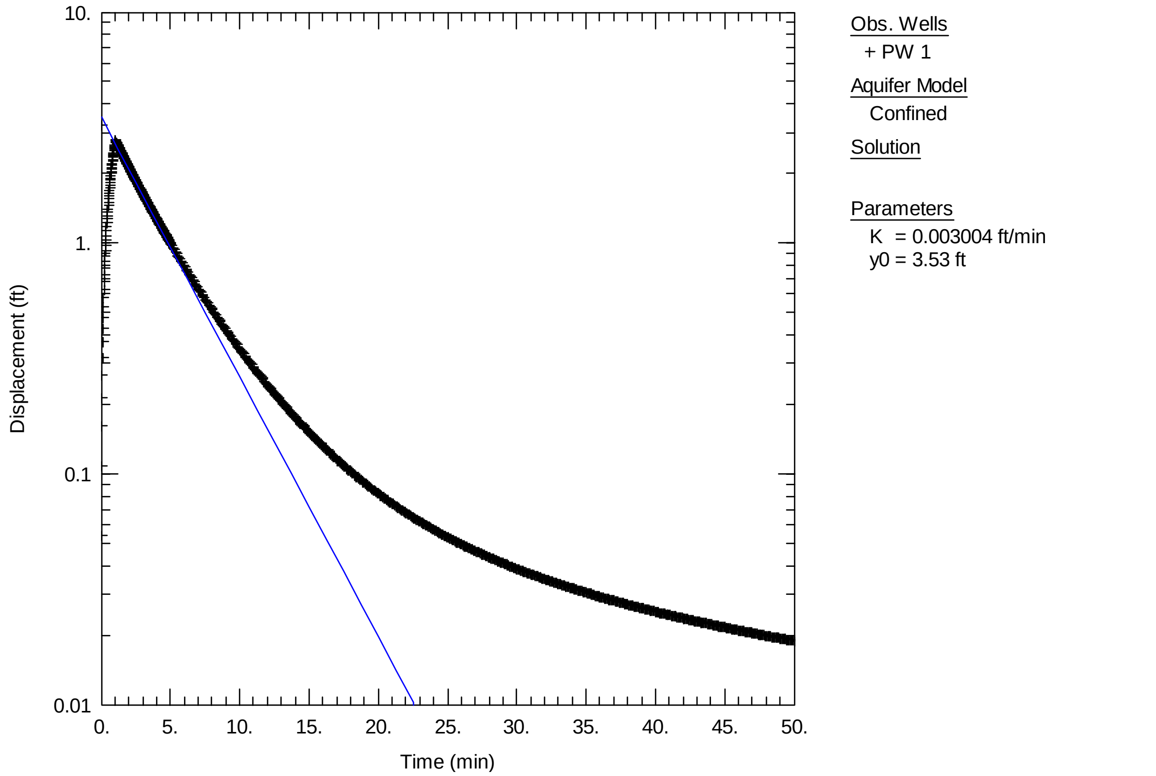


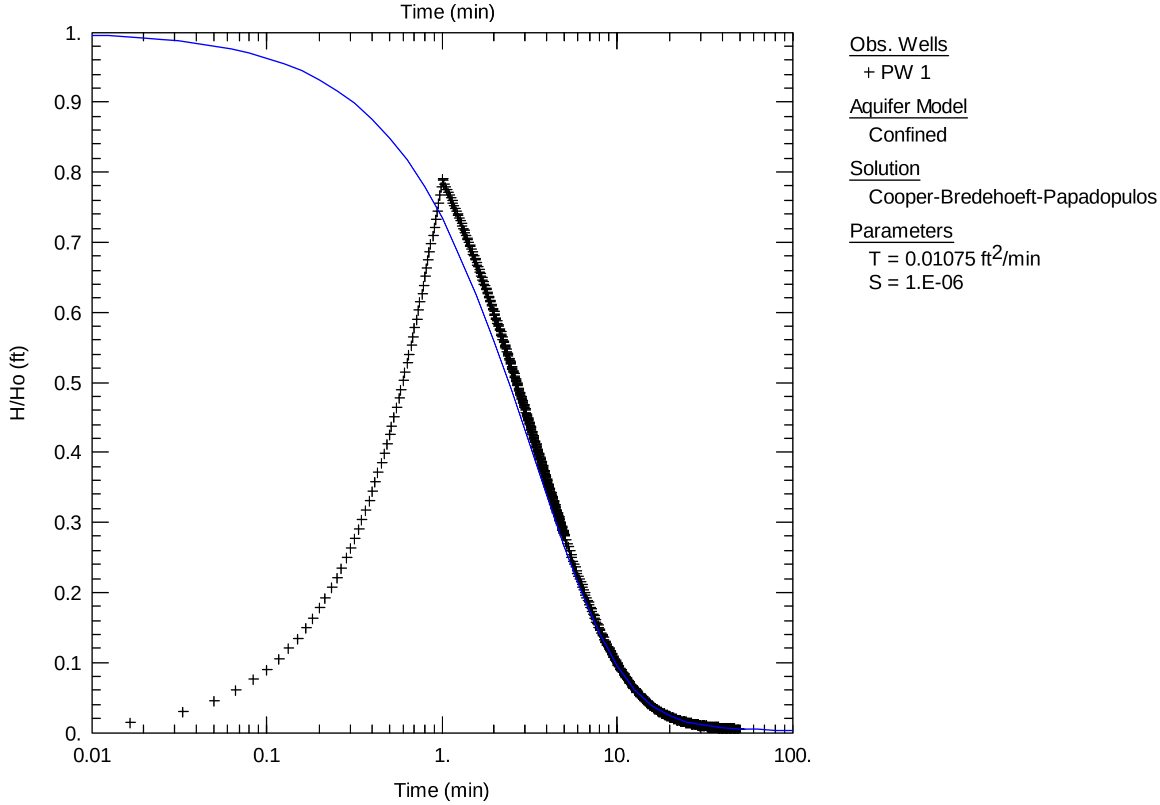
Obs. Wells
+ PW 1
Aquifer Model
Confined
Solution
Cooper-Bredehoeft-Papadopulos
Parameters
T = 0.02688 ft^2/min
S = 1.E-06

Case 3: **$t_{pumping}$ = 1.0 minutes**

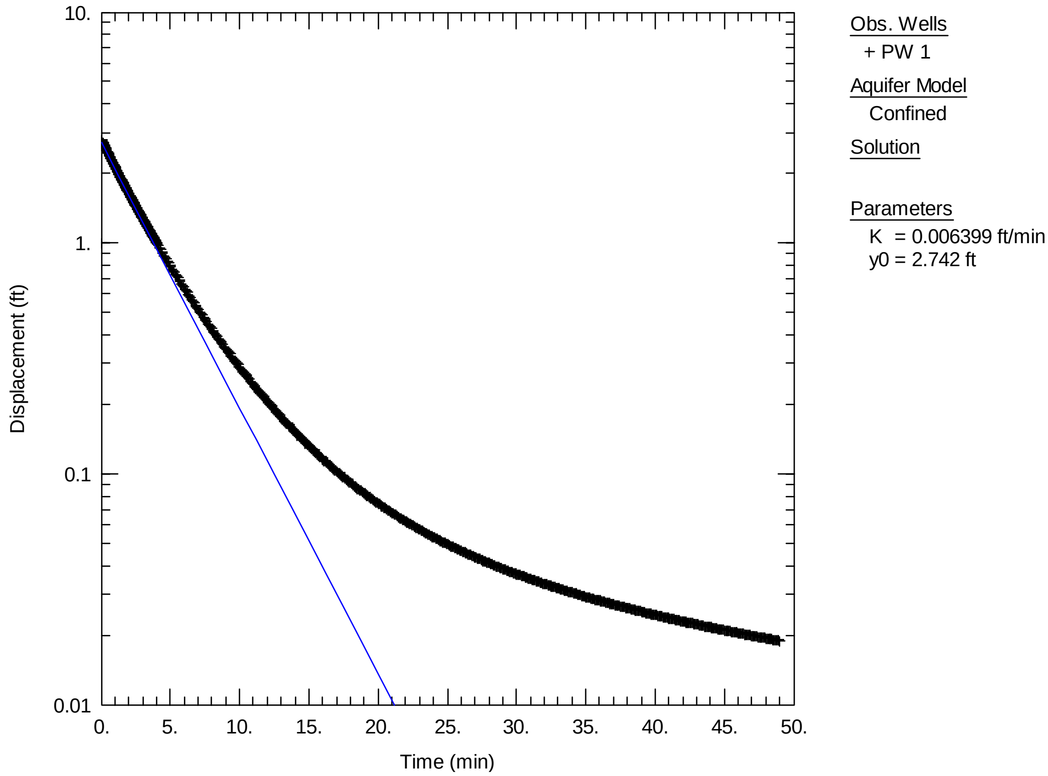


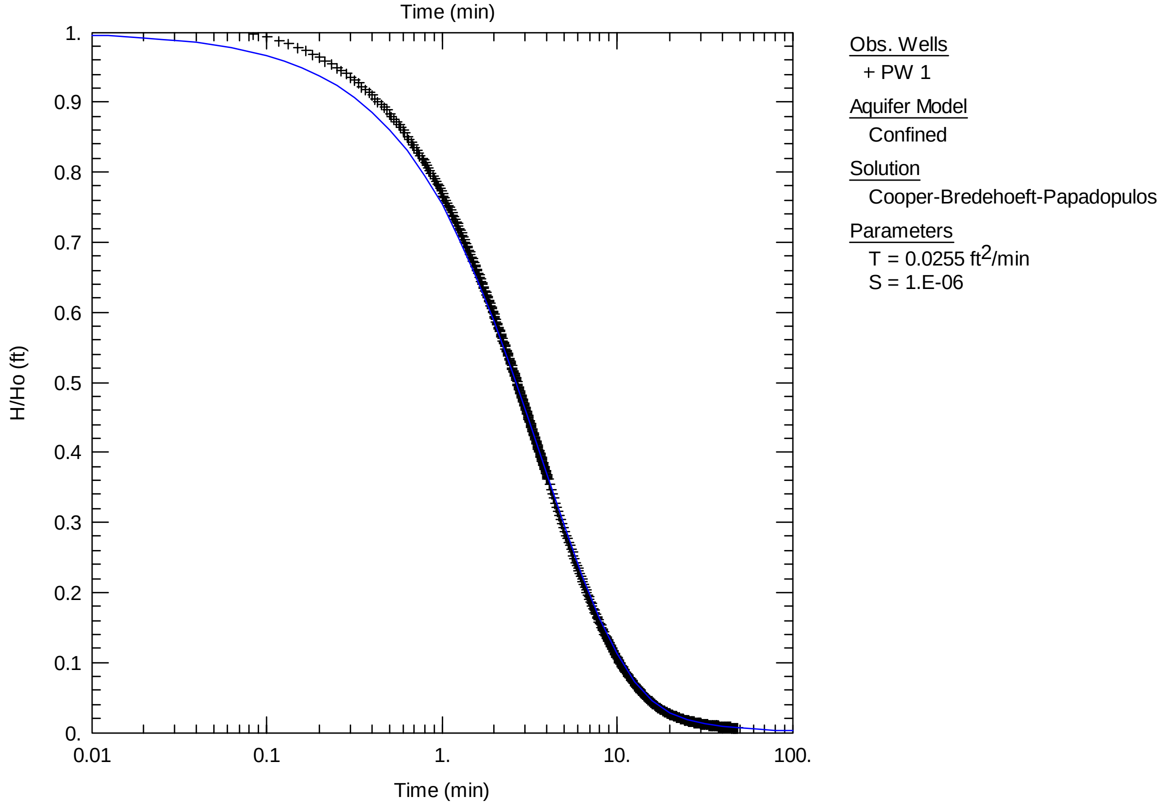
Case 3: Approach 1





Case 3: Approach 2





4. Additional results

We have repeated the example calculations for two other values of transmissivity, 4 and 400 ft^2/day. These values span the range of transmissivities of interest at the Hyde Park Site.

Table 1. Maximum Head Rises and Estimated Transmissivities

Case	Actual T (ft²/d)	$t_{pumping}$ (min)	Equivalent Q (ft^3/min)	ΔH_{max} (ft)	Estimated T Approach 1 (ft²/d)	Estimated T Approach 2 (ft²/d)
1-1	4	0.5	0.5346	3.22988	1.5696	3.97
1-2	4	0.25	1.0692	3.24425	2.4048	4.06
1-3	4	1	0.2673	3.20366	1.5753	4.00
2-1	40	0.5	0.5346	3.00189	14.904	38.51
2-2	40	0.25	1.0692	3.12010	14.674	38.71
2-3	40	1	0.2673	2.79160	15.480	36.72
3-1	400	0.5	0.5346	1.75154	165.31	326.88
3-2	400	0.25	1.0692	2.30029	162.29	345.74
3-3	400	1	0.2673	1.14503	171.22	298.51

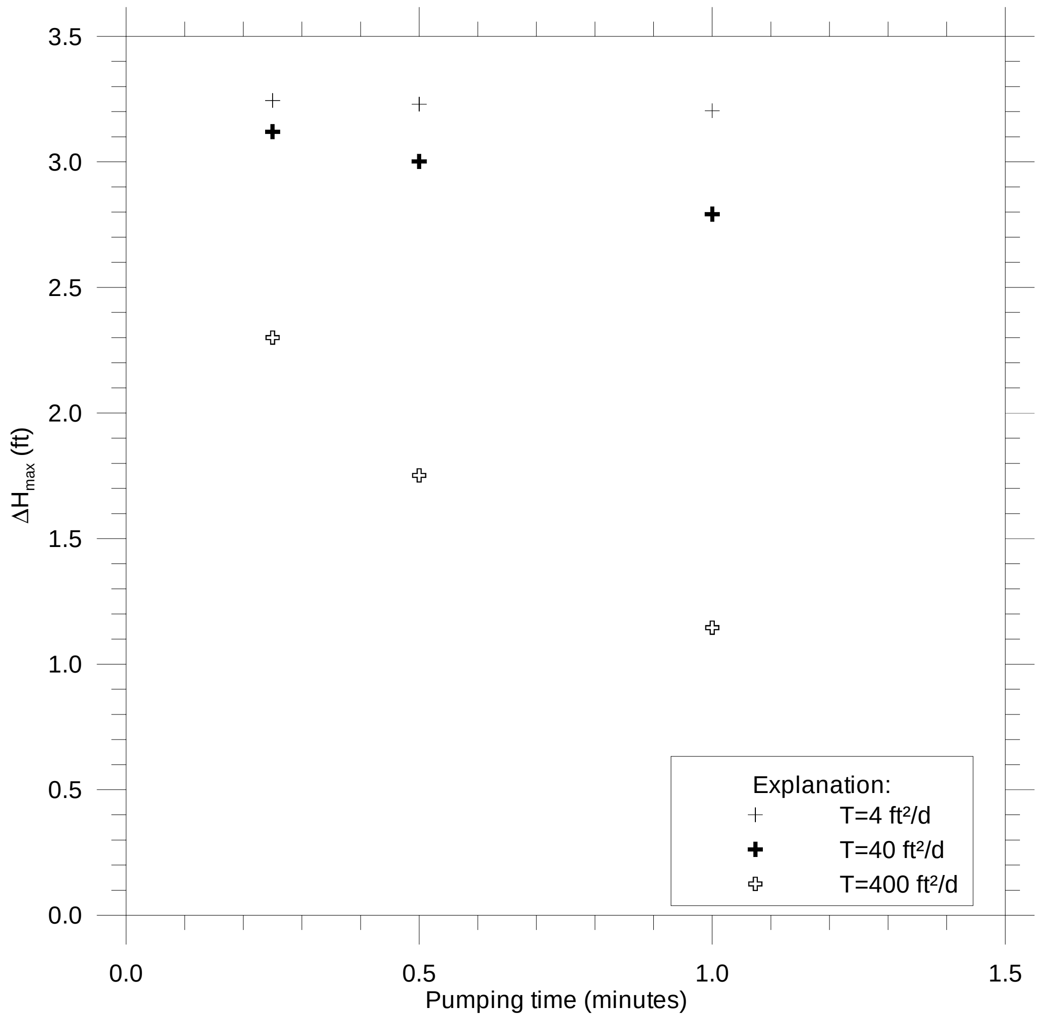


Figure 6. Estimates of the Initial Displacement

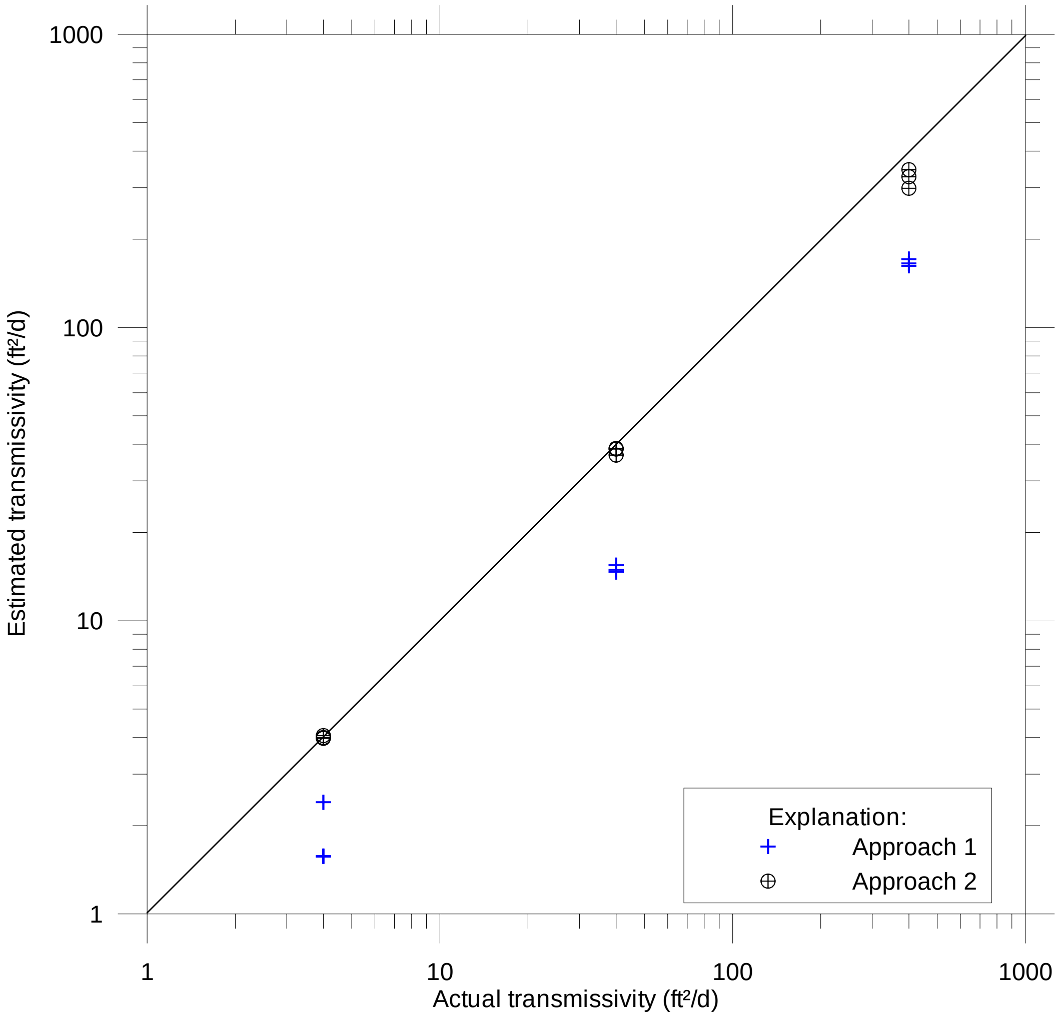


Figure 7. Comparison of Transmissivity Estimates

5. Conclusions

In this note we have examined the interpretation of slug tests in which the initial displacement is introduced more gradually than a "classic" slug test. As far as we are aware, no theoretical approaches have been developed to analyze the results of what we have called gradual slug tests. Although a gradual slug test can be conceived as a very brief constant-rate pumping test following by monitoring of the recovery, the duration of the period of injection and hence the injection rate, is not controlled. Furthermore, the initial period of water level rise is relatively brief compared to the transducer recording frequency. Therefore, it is not feasible to evaluate these data using methods developed for pumping tests.

Two heuristic approaches for interpreting gradual slug tests have been evaluated. Both approaches adapt conventional slug test analysis methods and adjust the data to account for the gradual start of the test. Through numerical experiments we have demonstrated that Approach #2 yields more reliable estimates of formation transmissivities. Approach #2 consists of adjusting the effective start of the test to the time when the maximum water level rise occurs. The effective initial displacement, ΔH_o, is estimated by extrapolating the displacement record to the effective start of the test.

6. References

Butler, J.J., 1998: **The Design, Performance, and Analysis of Slug Tests**, Lewis Publishers, Boca Raton, FL.

Cooper, H.H., J.D. Bredehoeft, and I.S. Papadopulos, 1967: Response of a finite-diameter well to an instantaneous charge of water, *Water Resources Research*, *3*(1), pp. 263-269.

Hvorslev, M.J., 1951: Time lag and soil permeability in ground-water observations, Bulletin No. 36, Waterways Experiment Station, U.S. Army Corps of Engineers, Vicksburg MI.

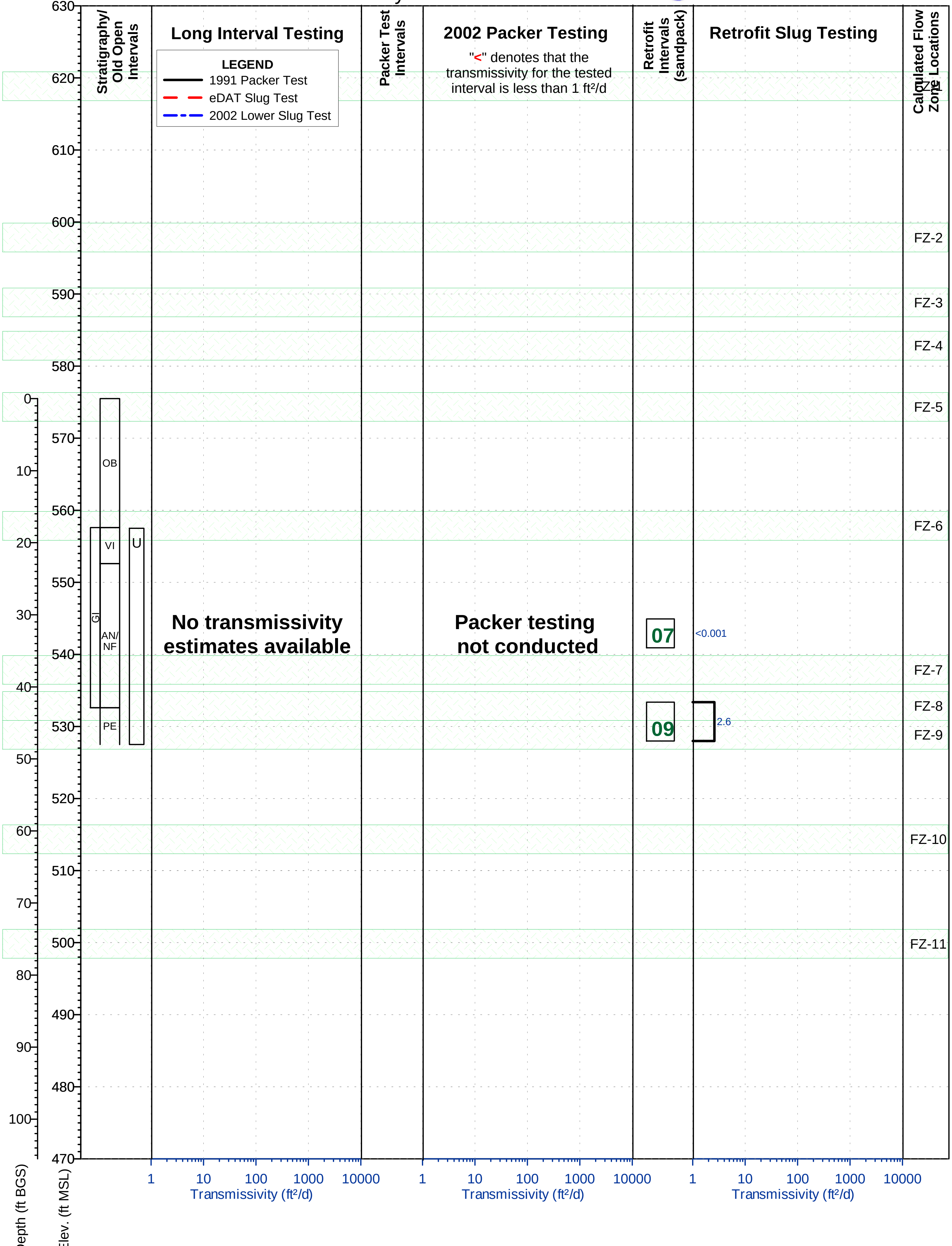
HydroSOLVE Inc., 2000: AQTESOLV for Windows User's Guide.

Papadopulos, I.S., and H.H. Cooper, 1967: Drawdown in a well of large diameter, *Water Resources Research*, *3*(1), pp. 241-244.

A3. Transmissivity Profiles

ABP-1 Cluster Transmissivity Estimates

Miller Springs Remediation Management, Inc.



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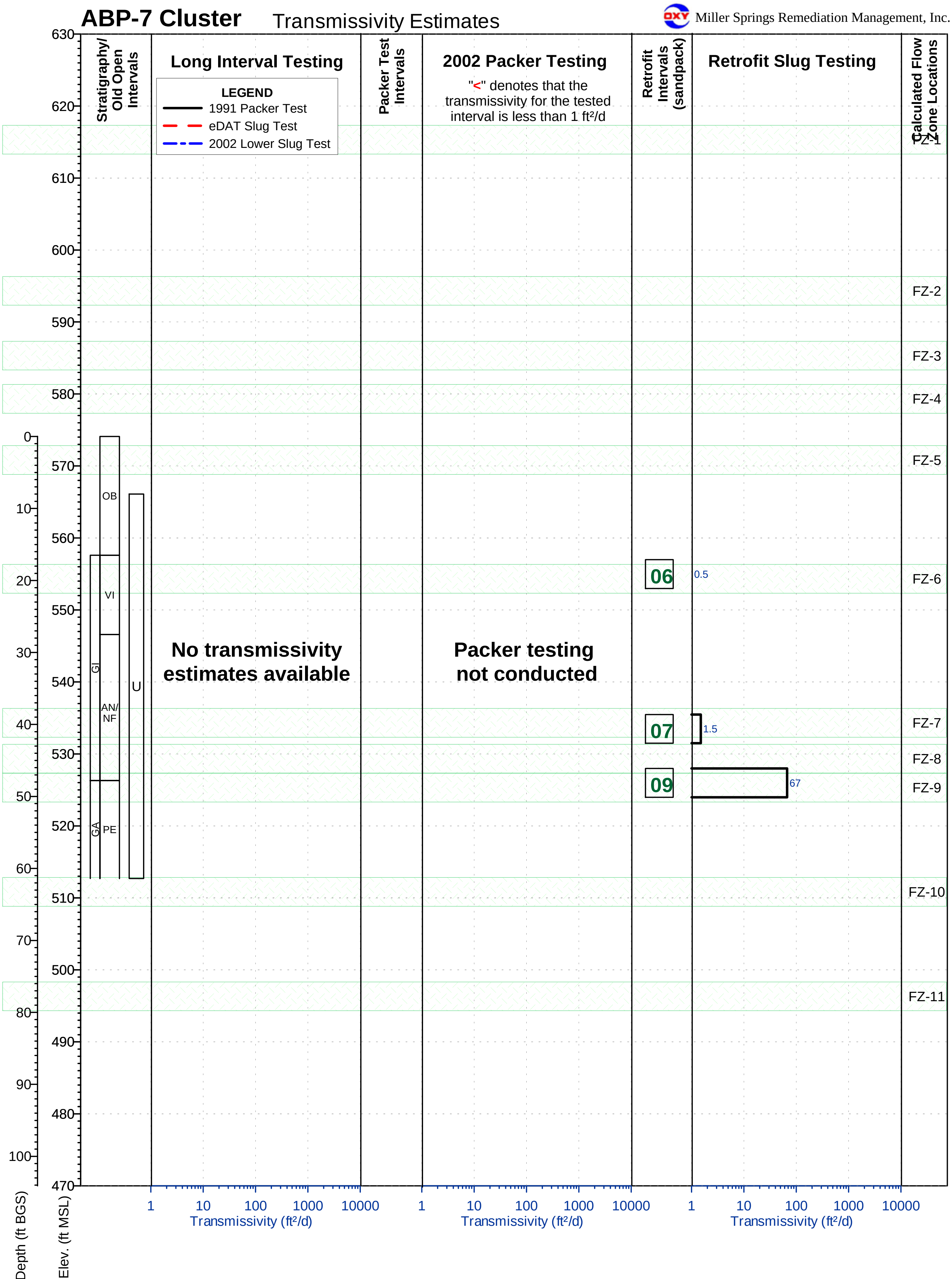

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AFW-1 Cluster Transmissivity Estimates

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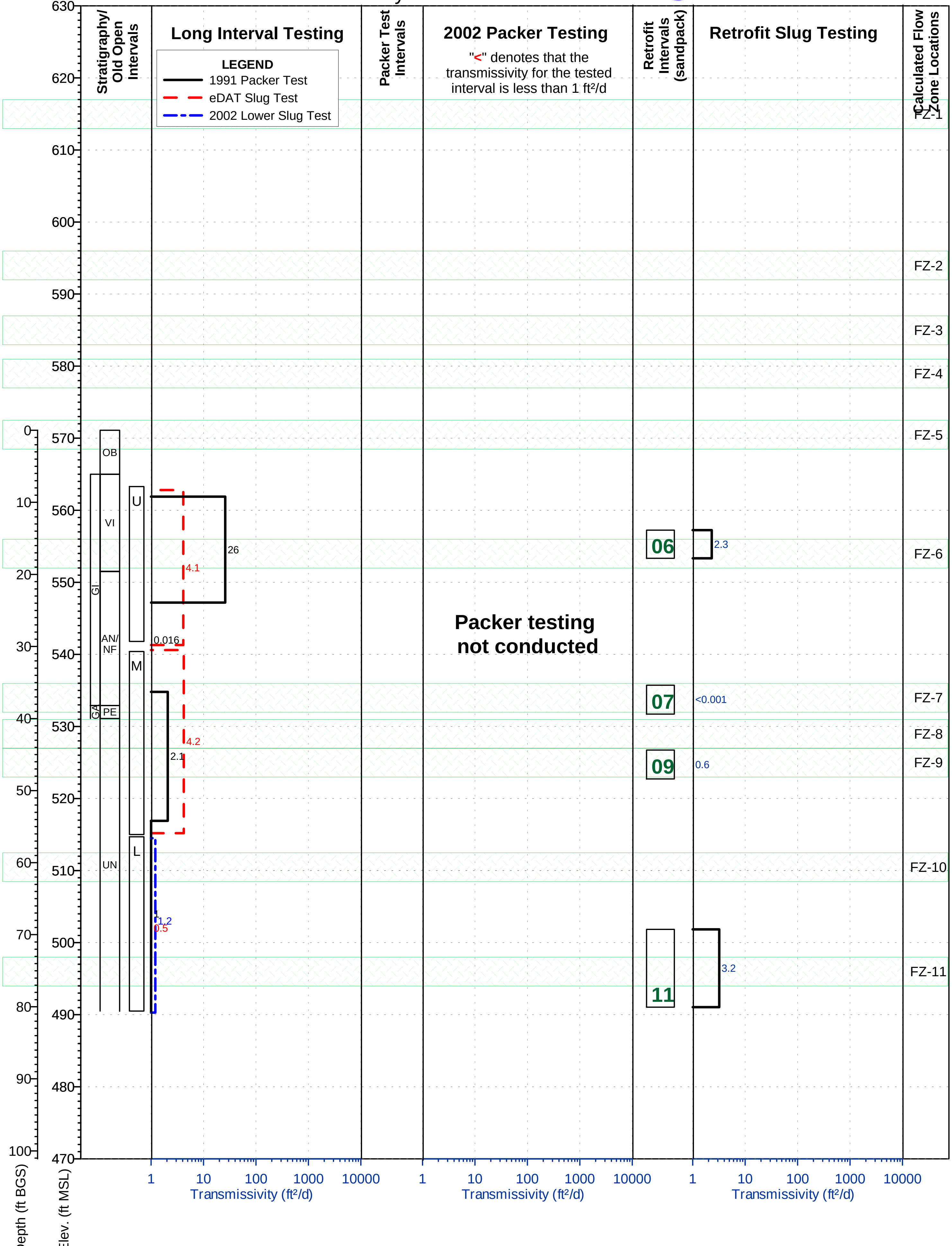

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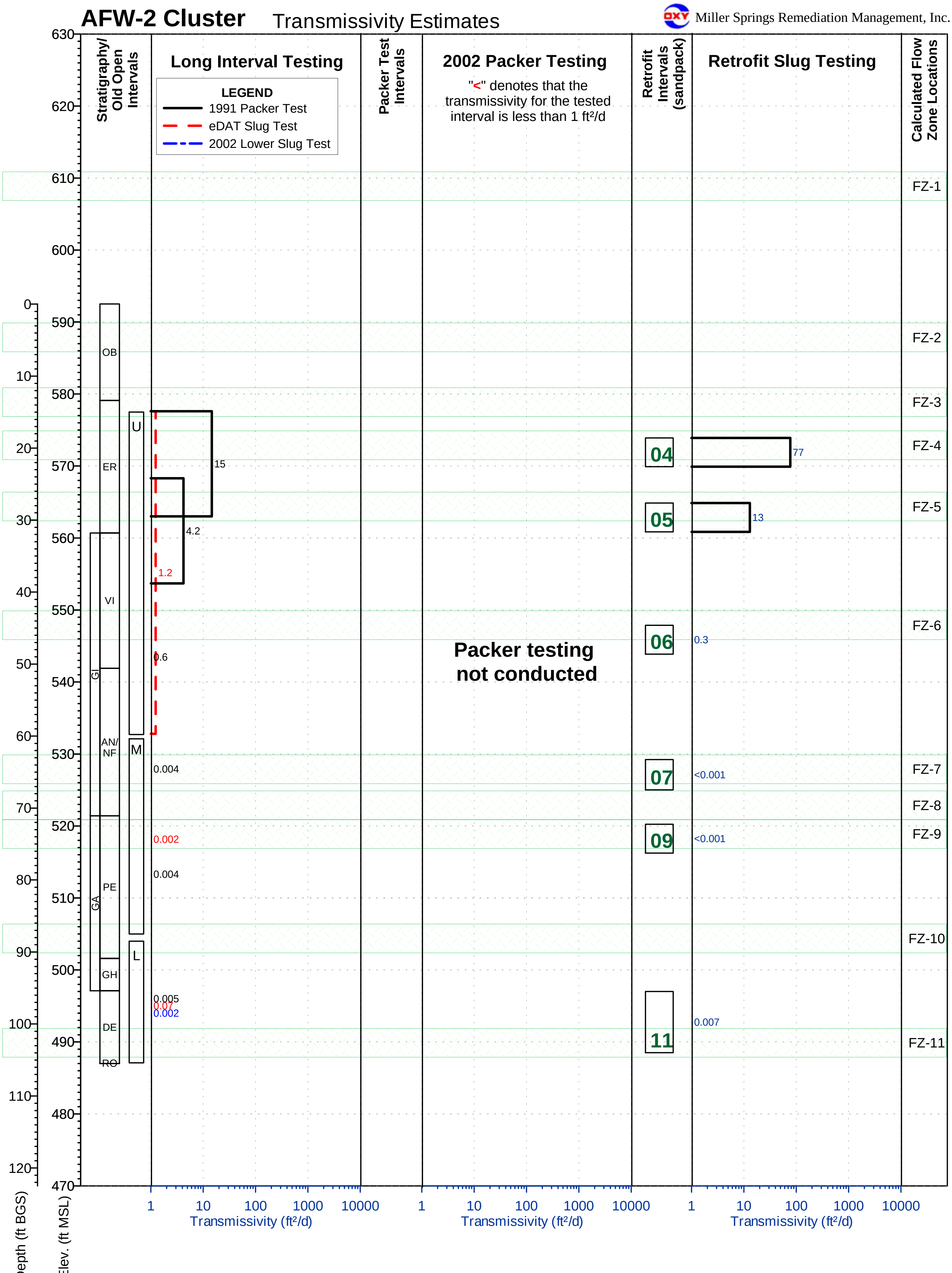

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AGW-1 Cluster Transmissivity Estimates

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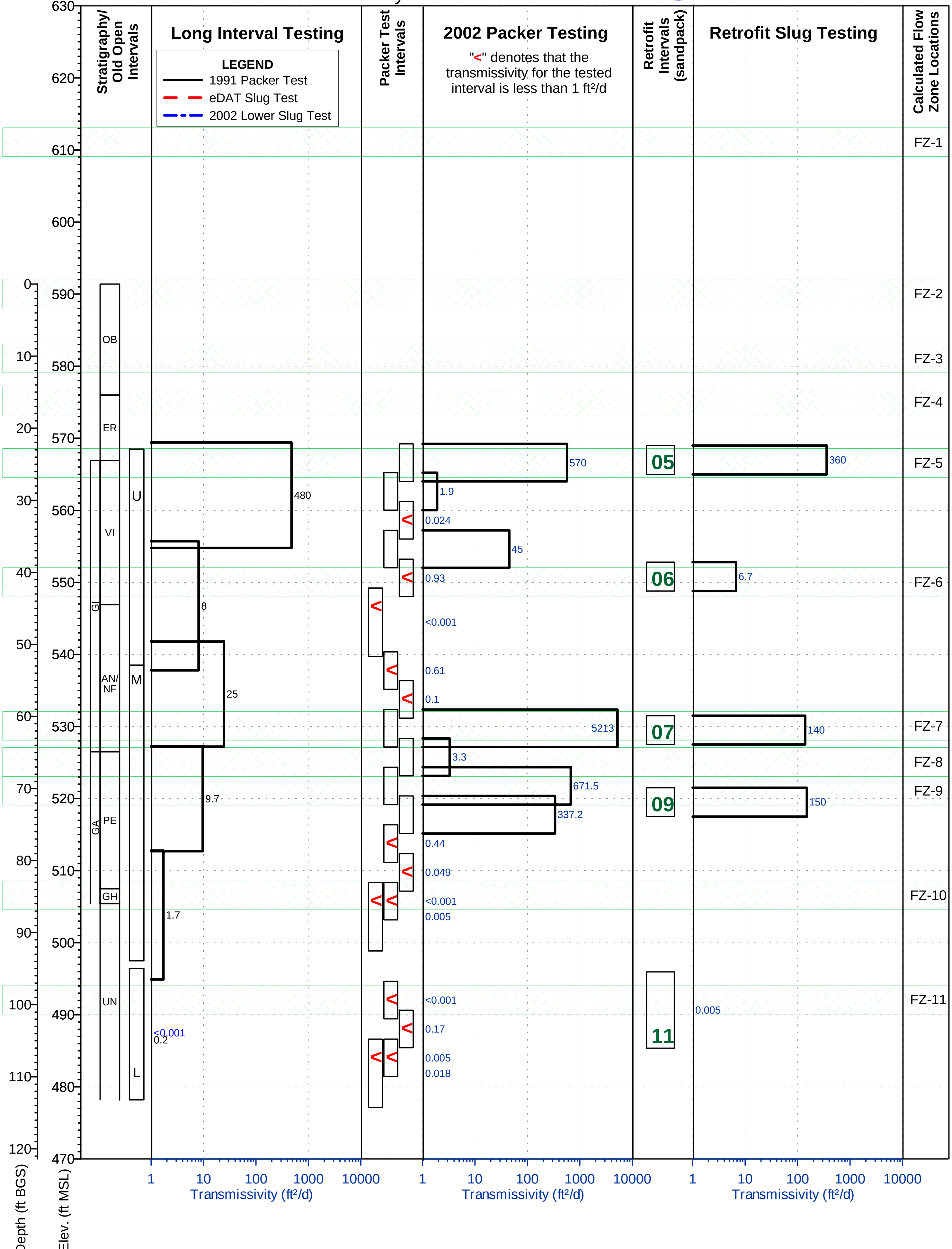

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AGW-2 Cluster Transmissivity Estimates

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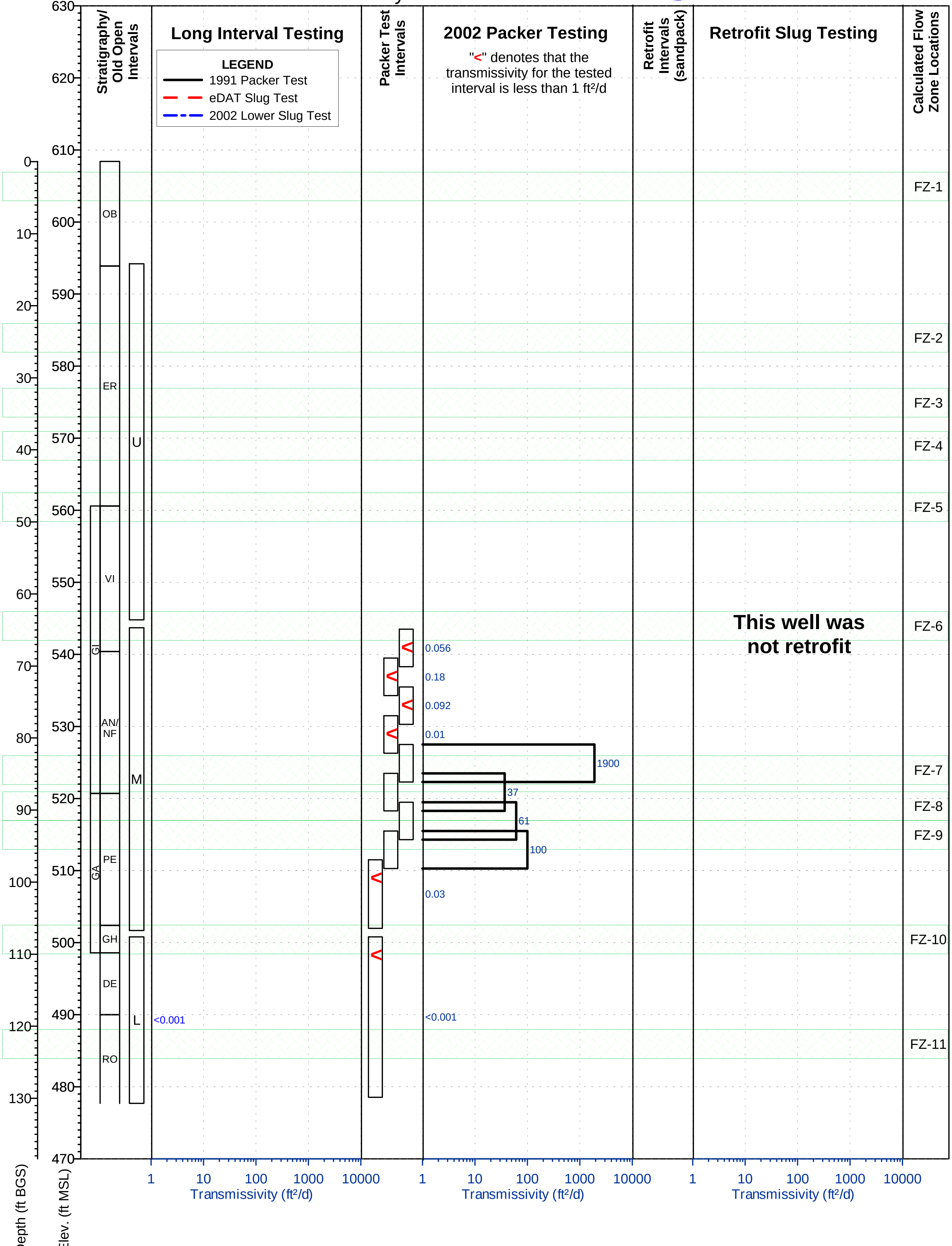

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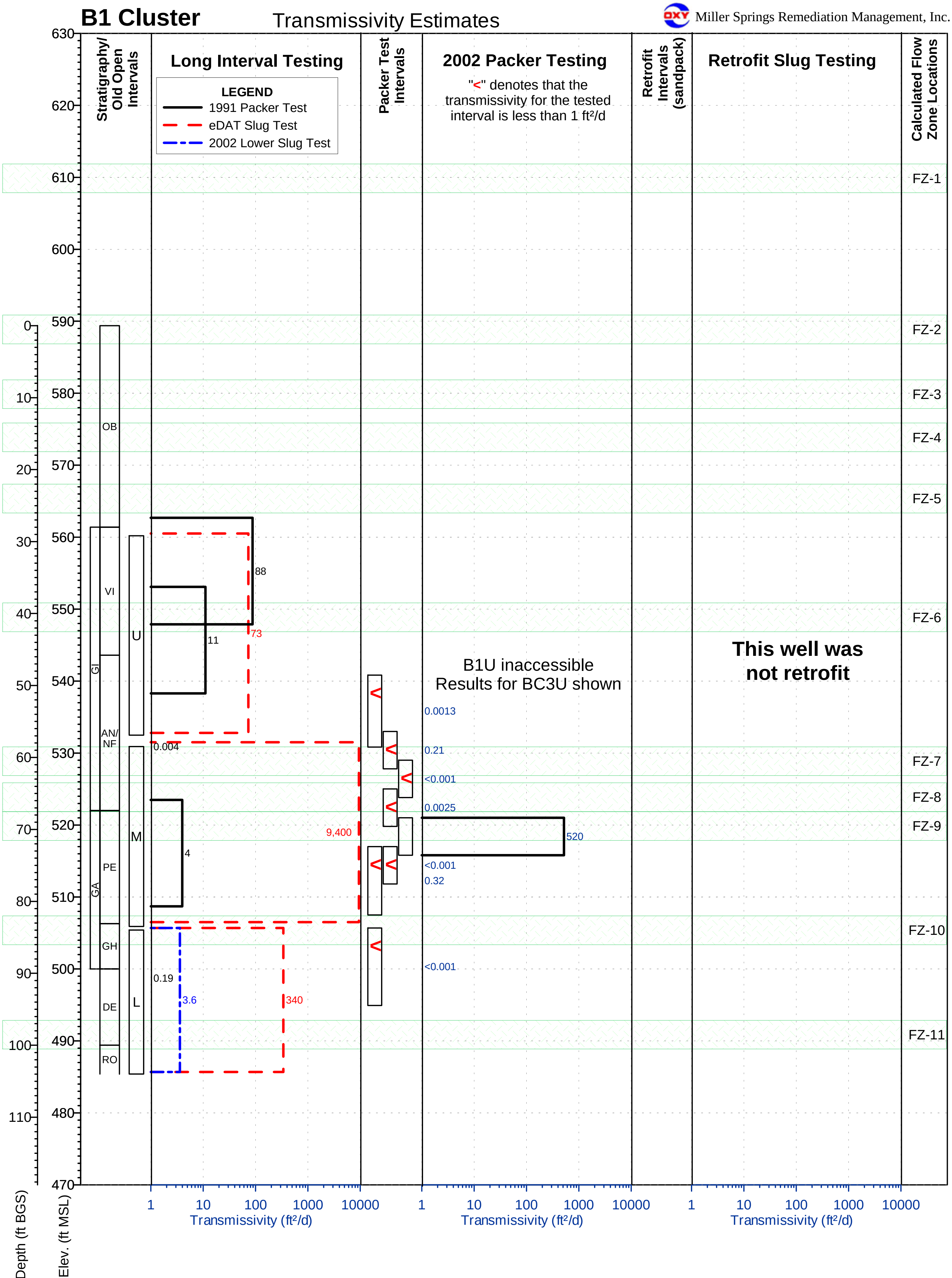

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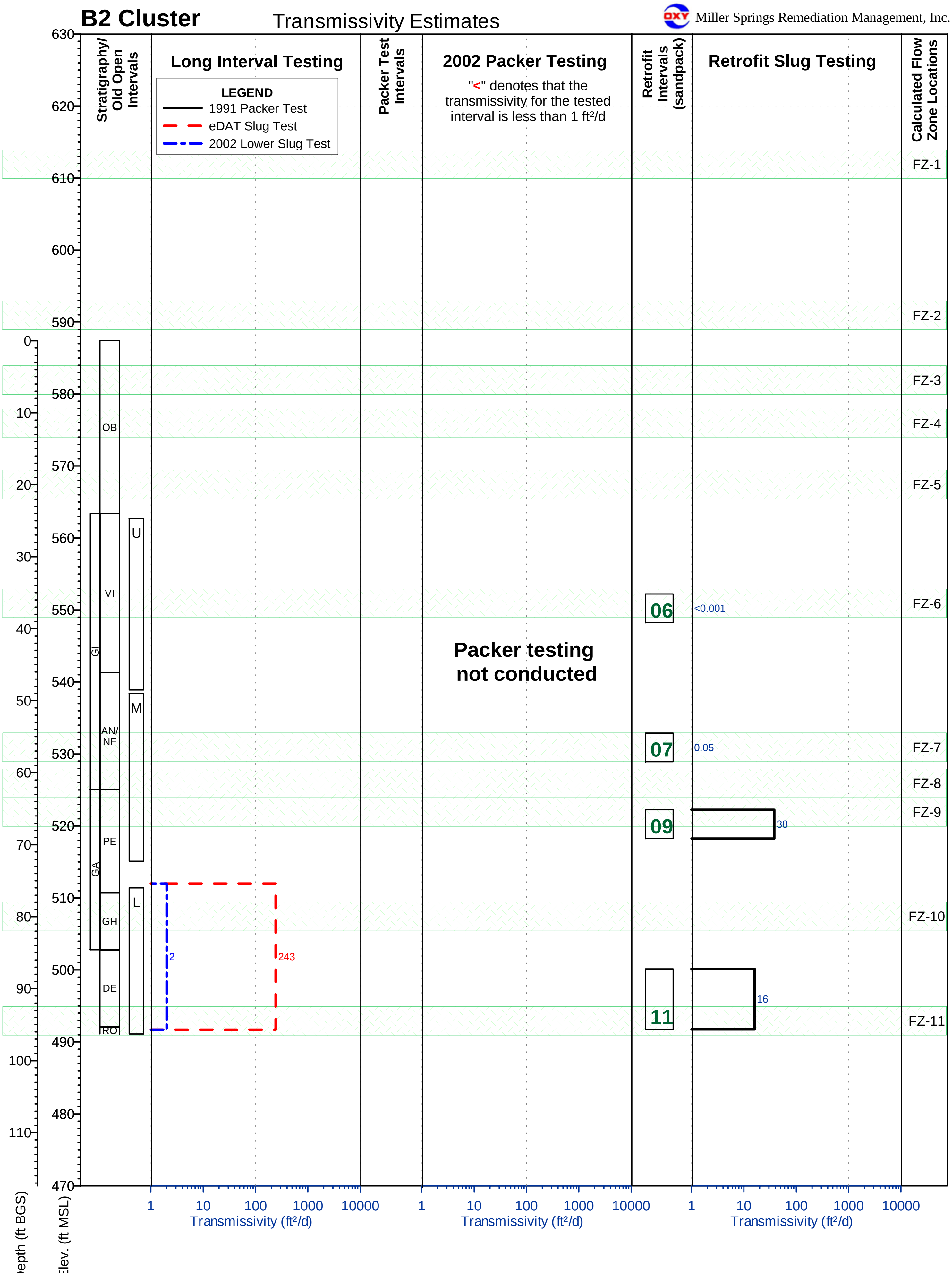

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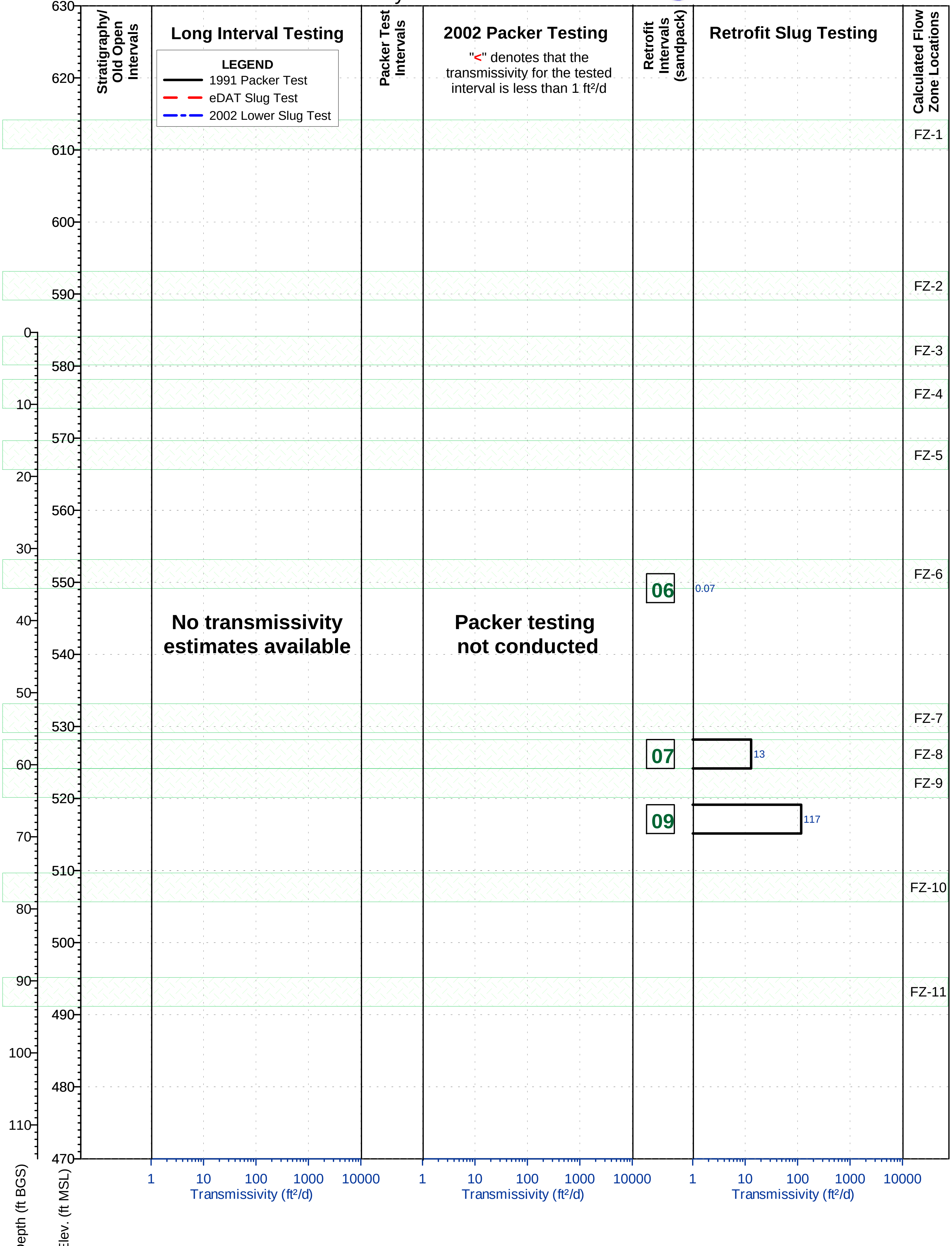
C3 Cluster

Transmissivity Estimates

Miller Springs Remediation Management, Inc.



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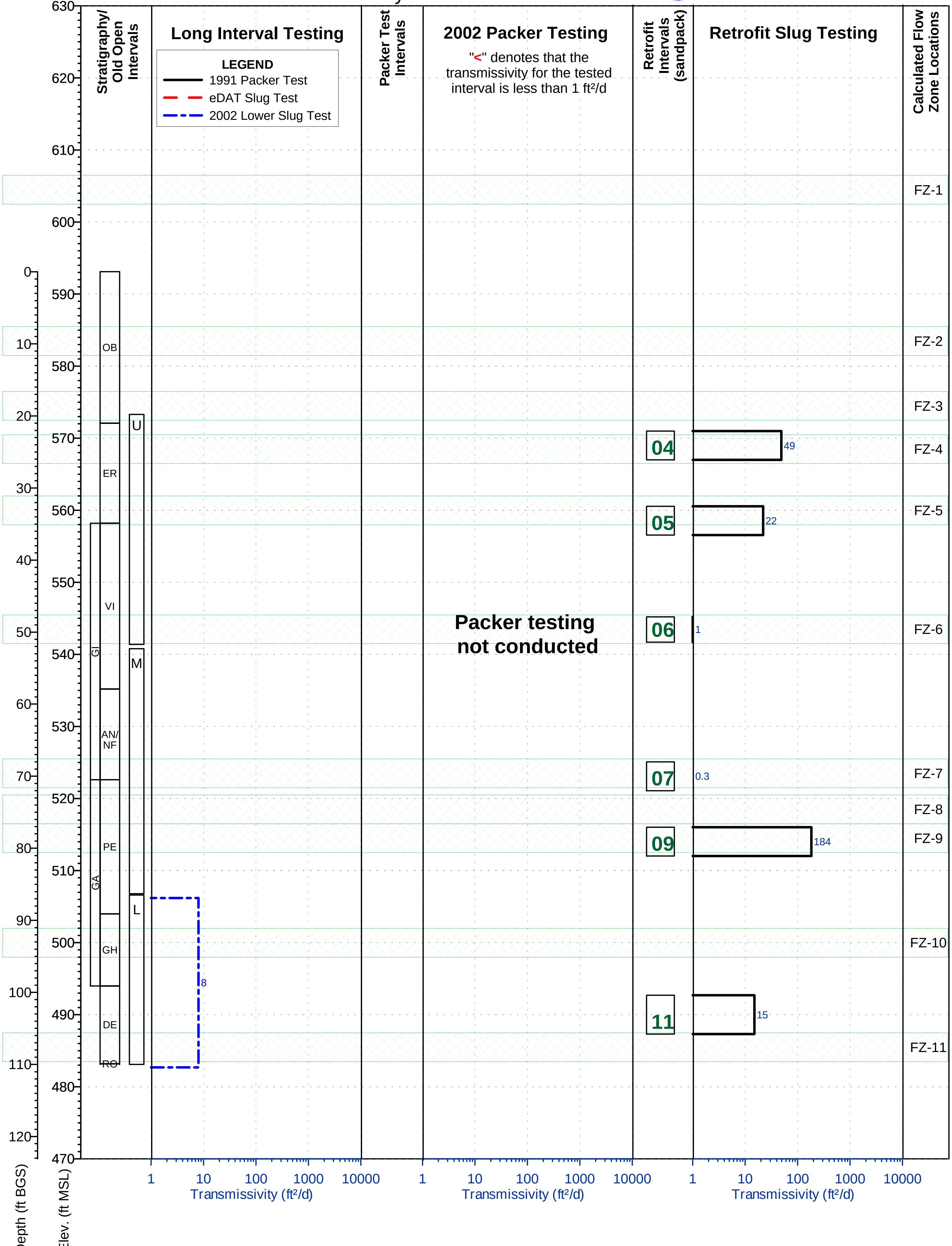
D1 Cluster

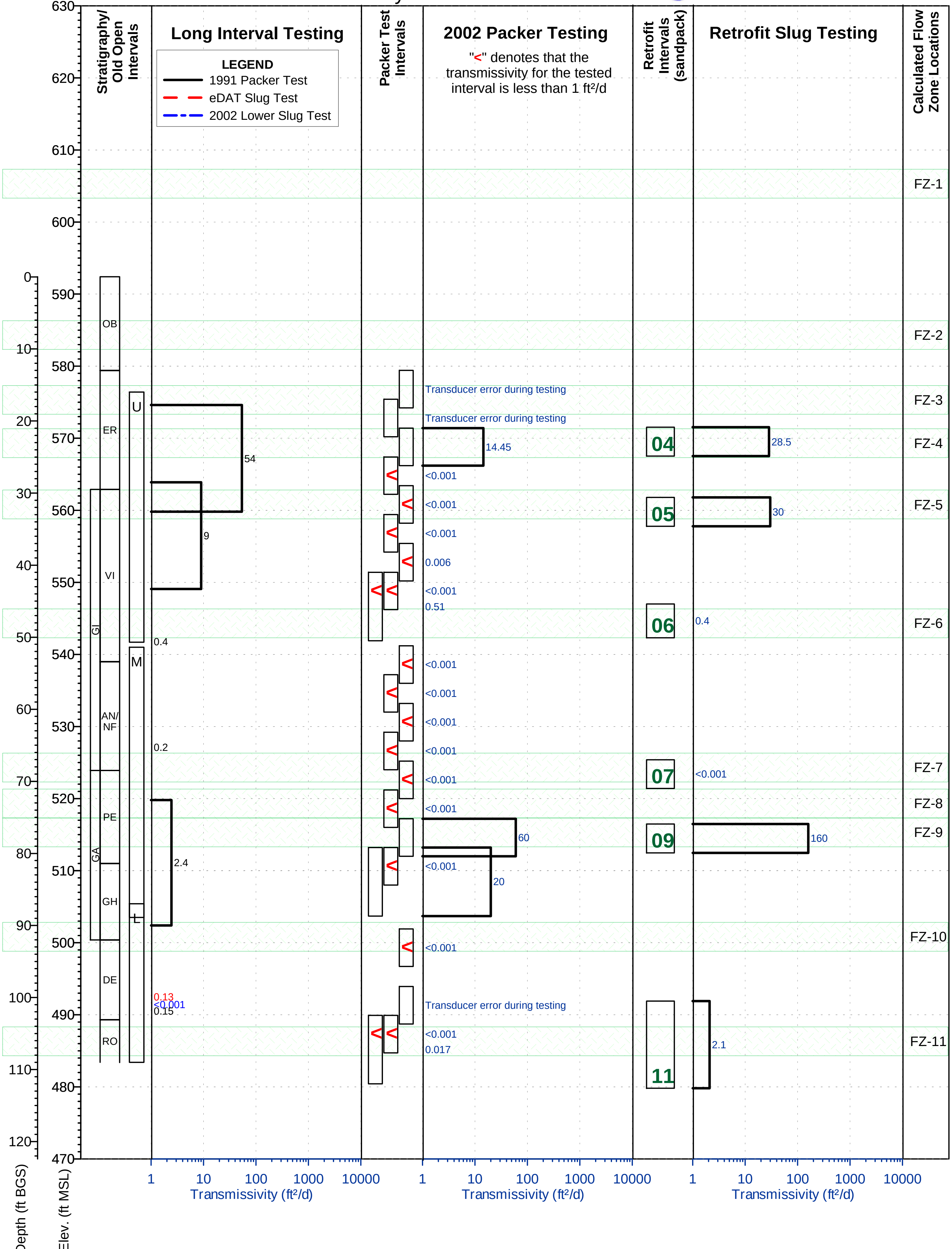
Transmissivity Estimates

Miller Springs Remediation Management, Inc.



D2 Cluster Transmissivity Estimates

Miller Springs Remediation Management, Inc.



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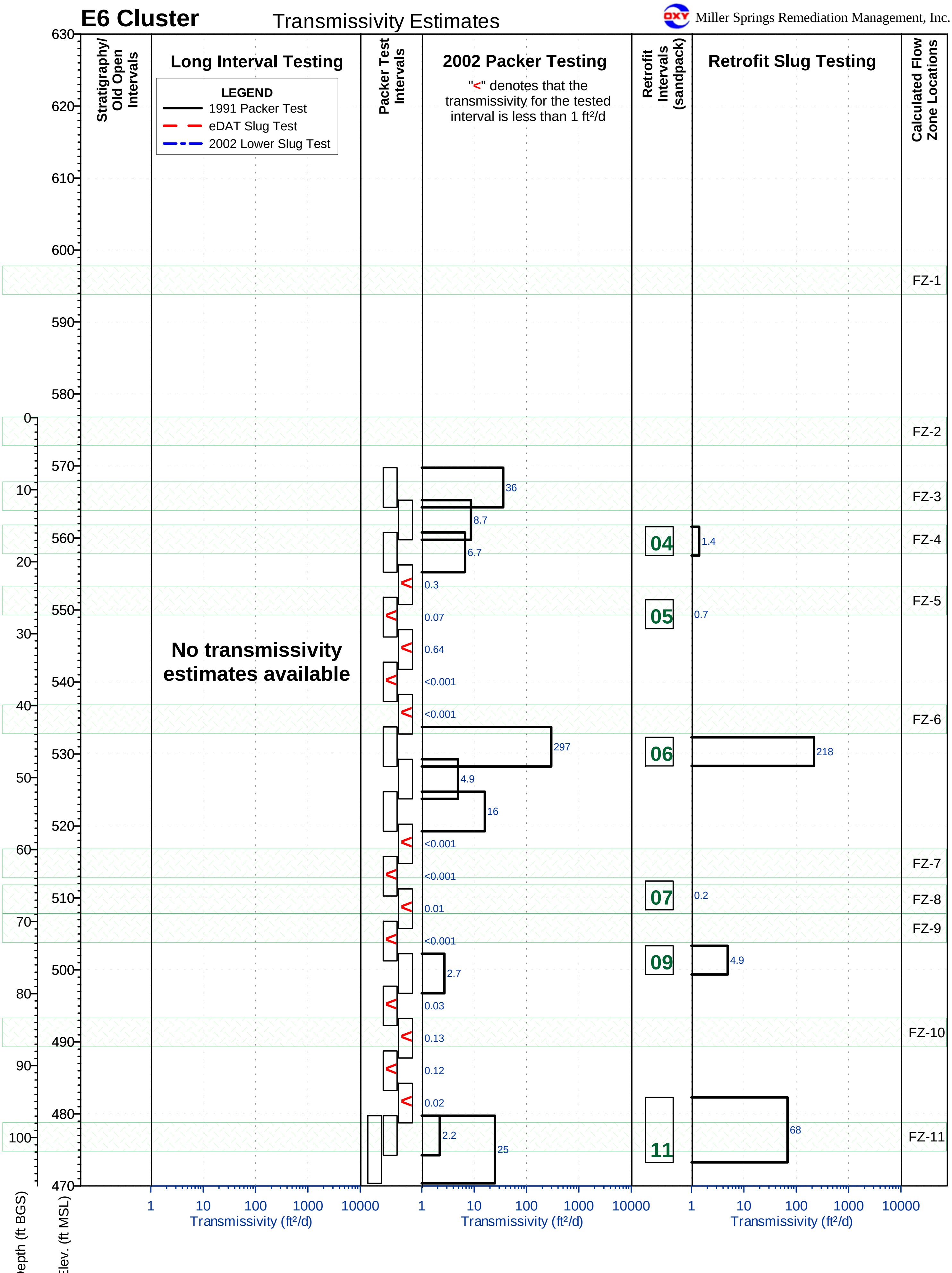

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F1 Cluster

Transmissivity Estimates

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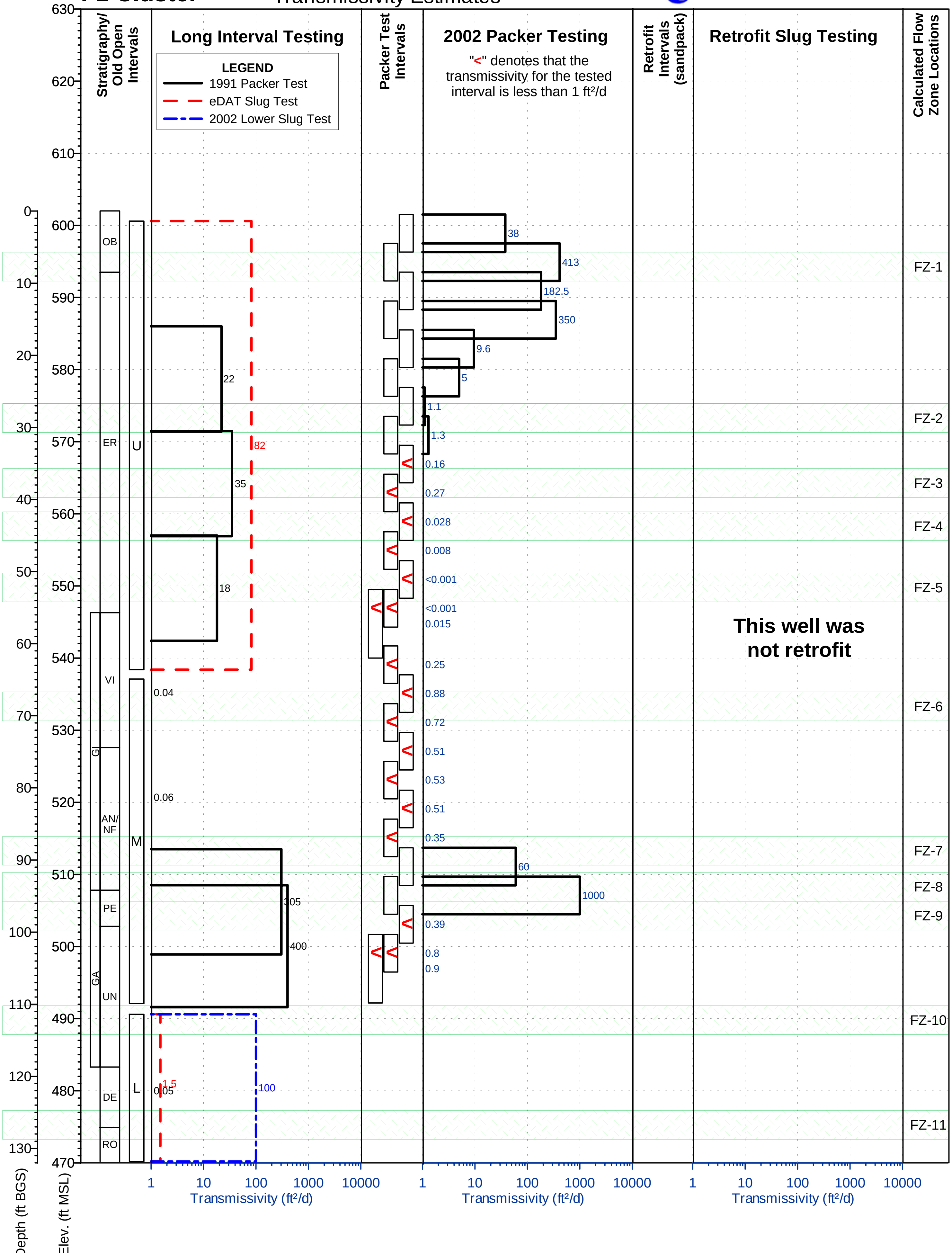

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Transmissivity Estimates

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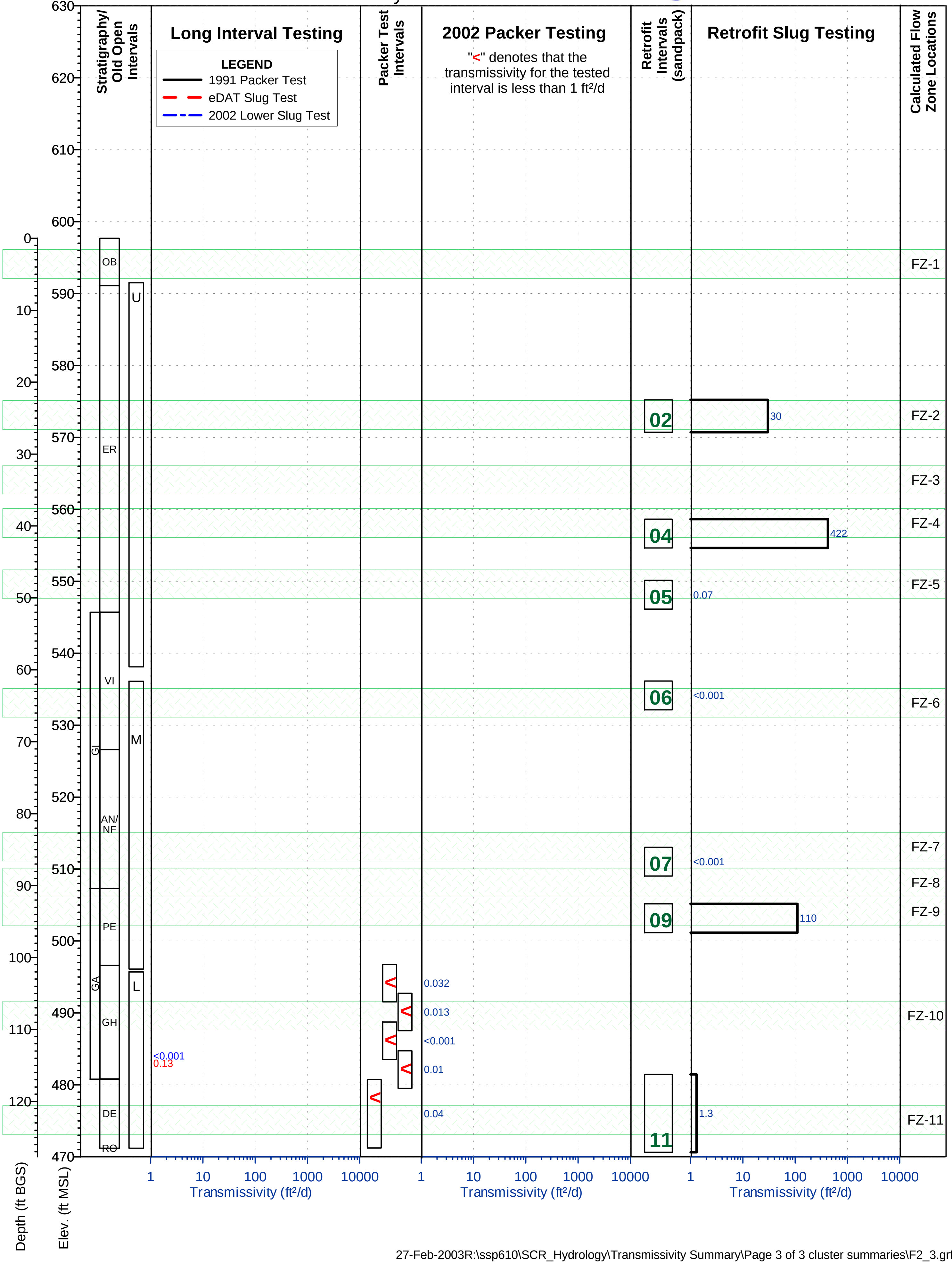

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F4 Cluster Transmissivity Estimates

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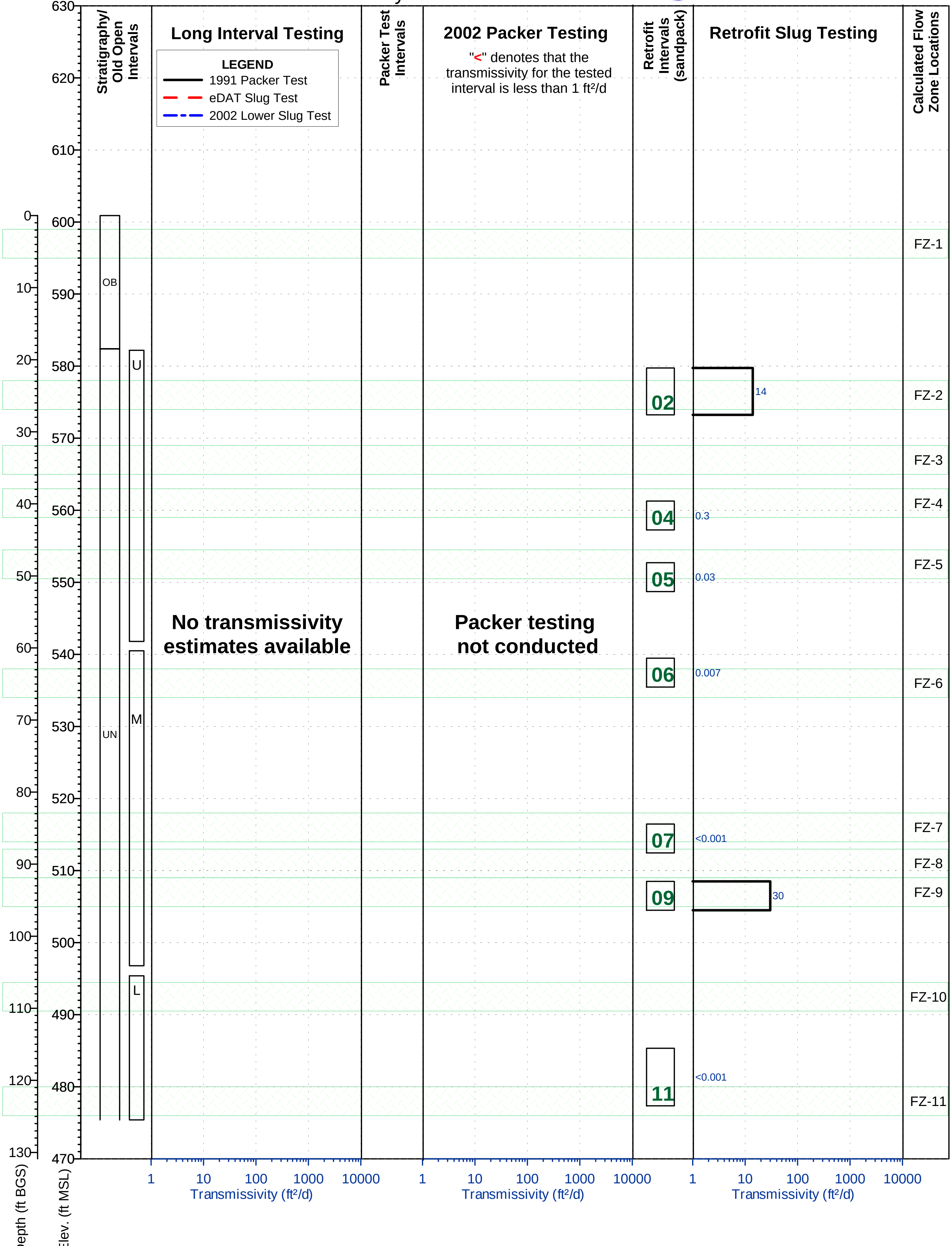

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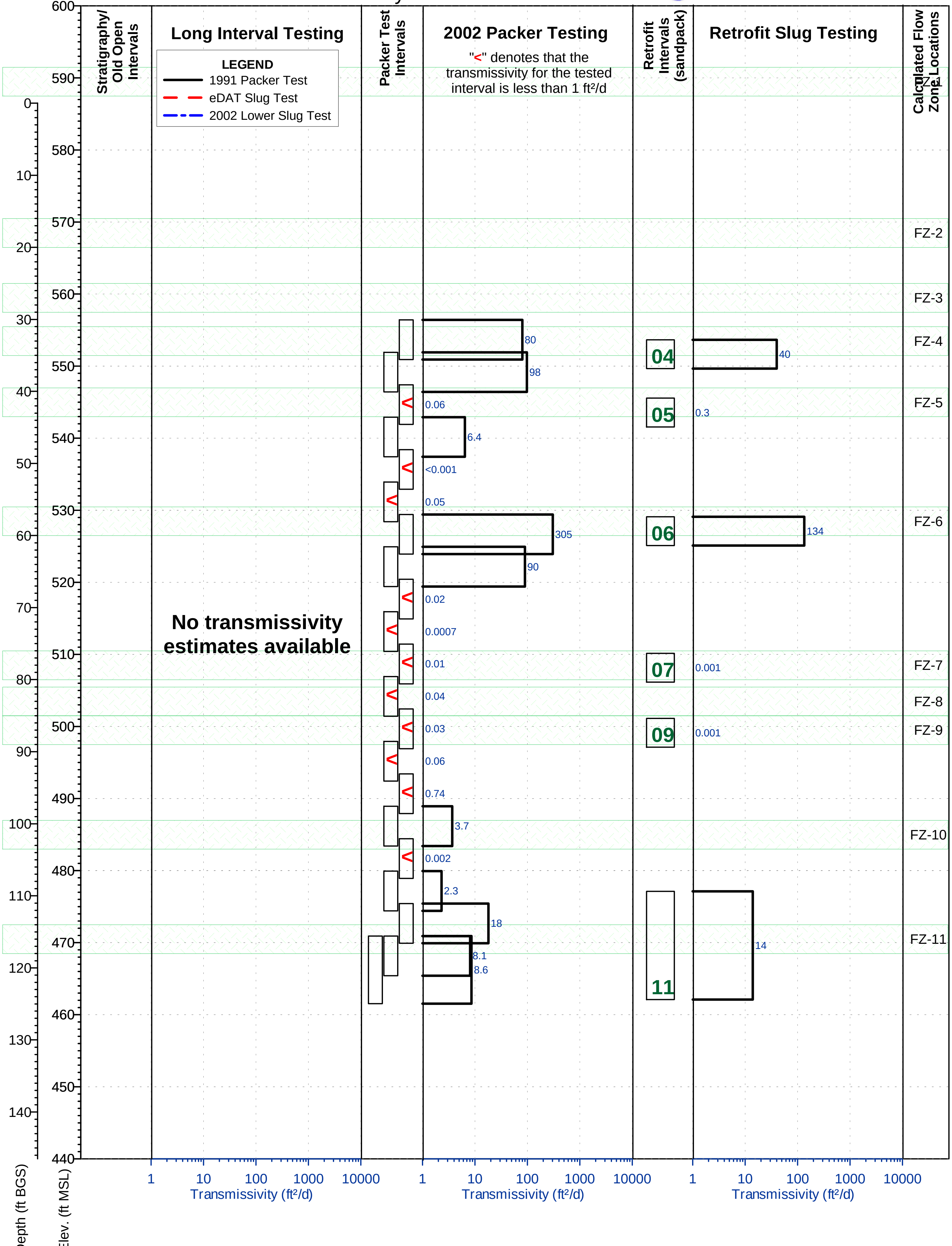
F6 Cluster

Transmissivity Estimates



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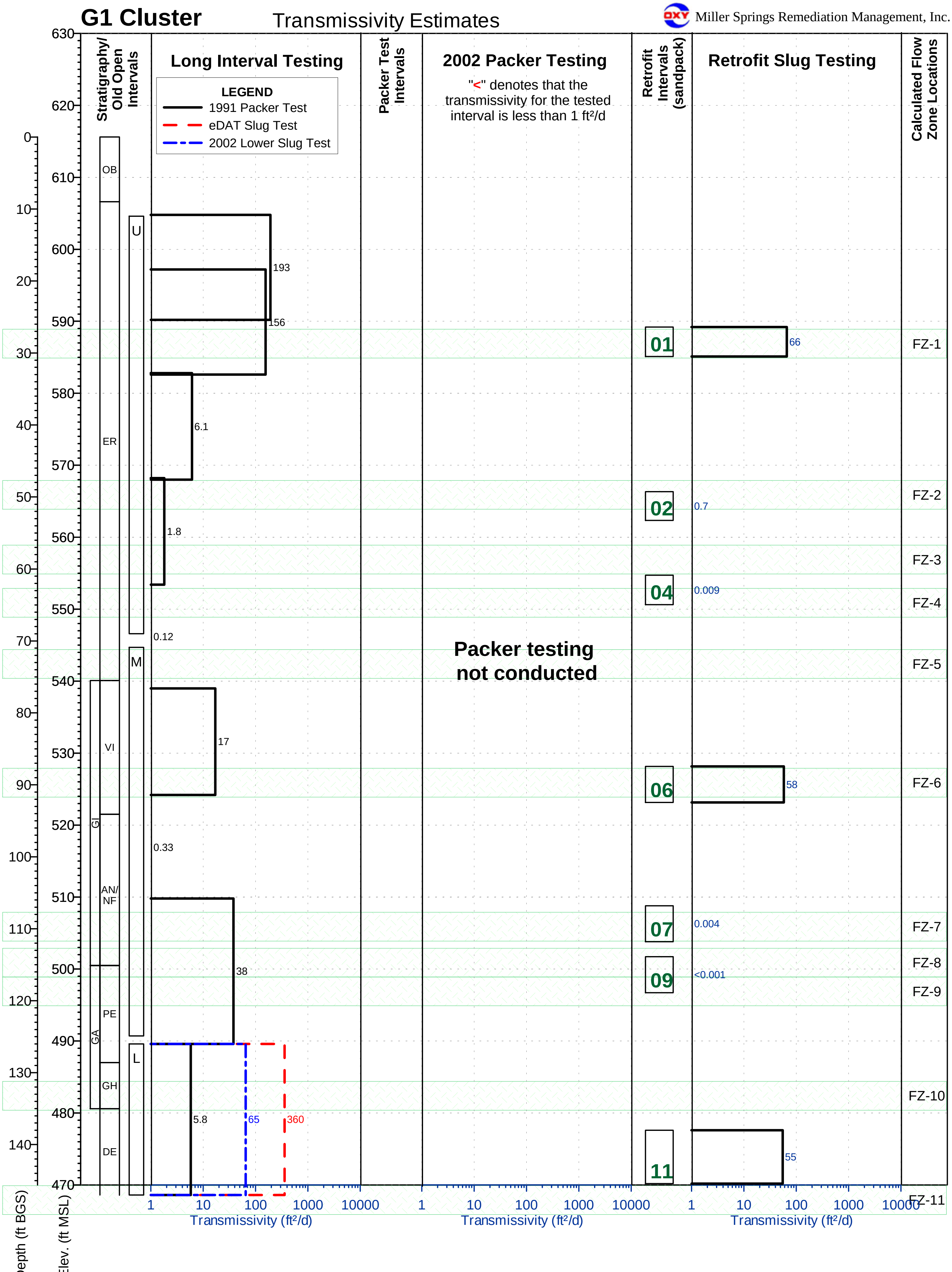

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H1 Cluster

Transmissivity Estimates

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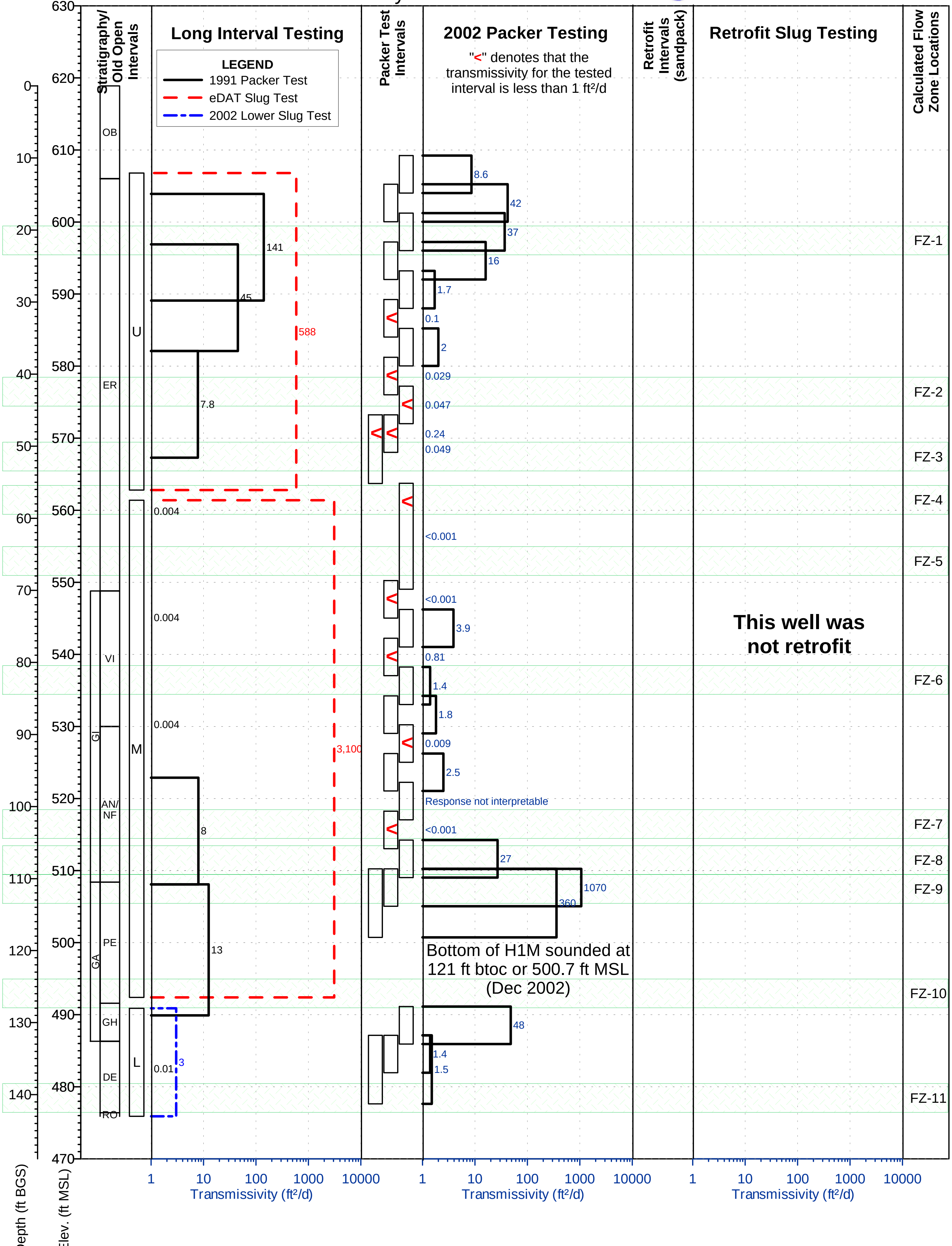

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H2 Cluster

Transmissivity Estimates

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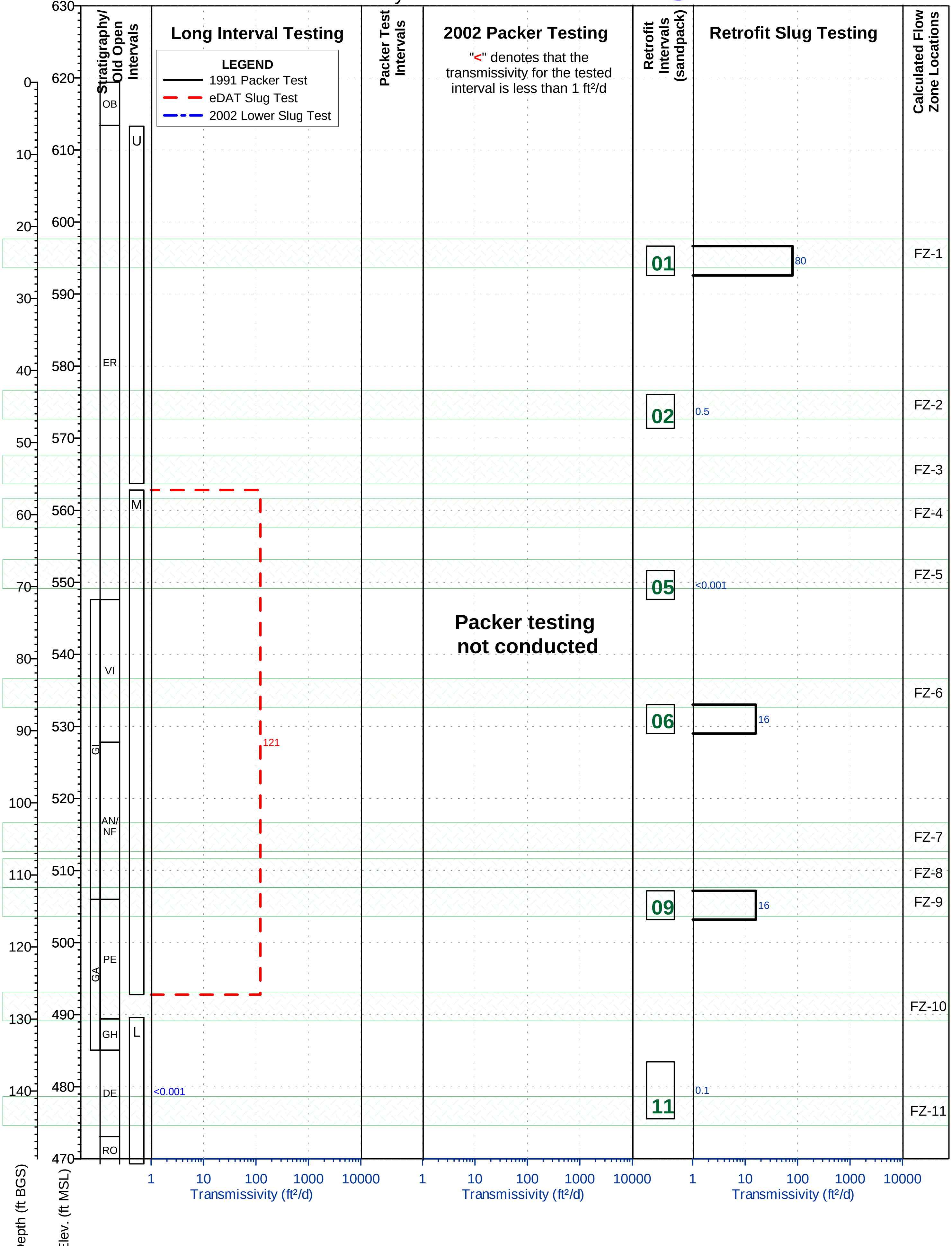

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H5 Cluster

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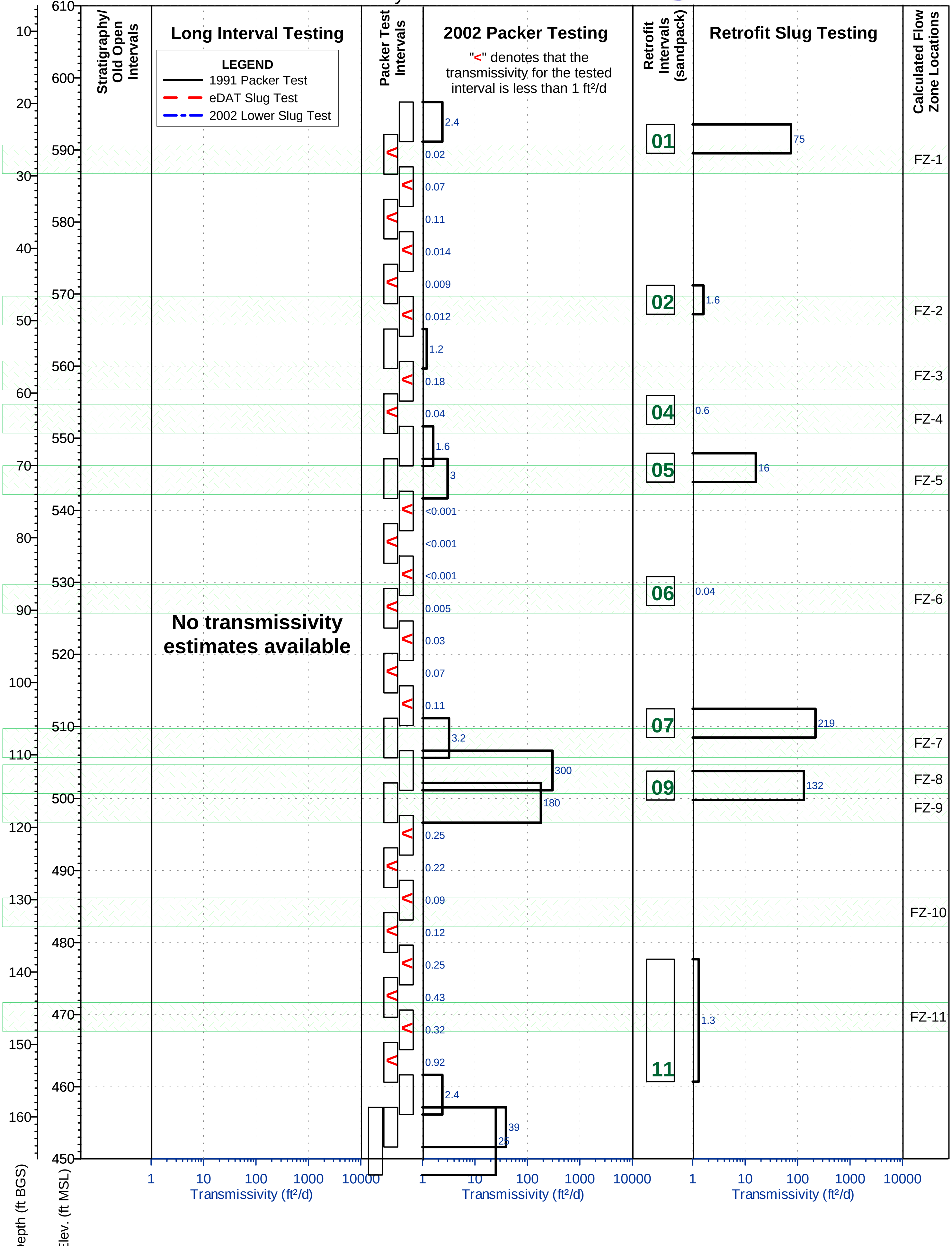

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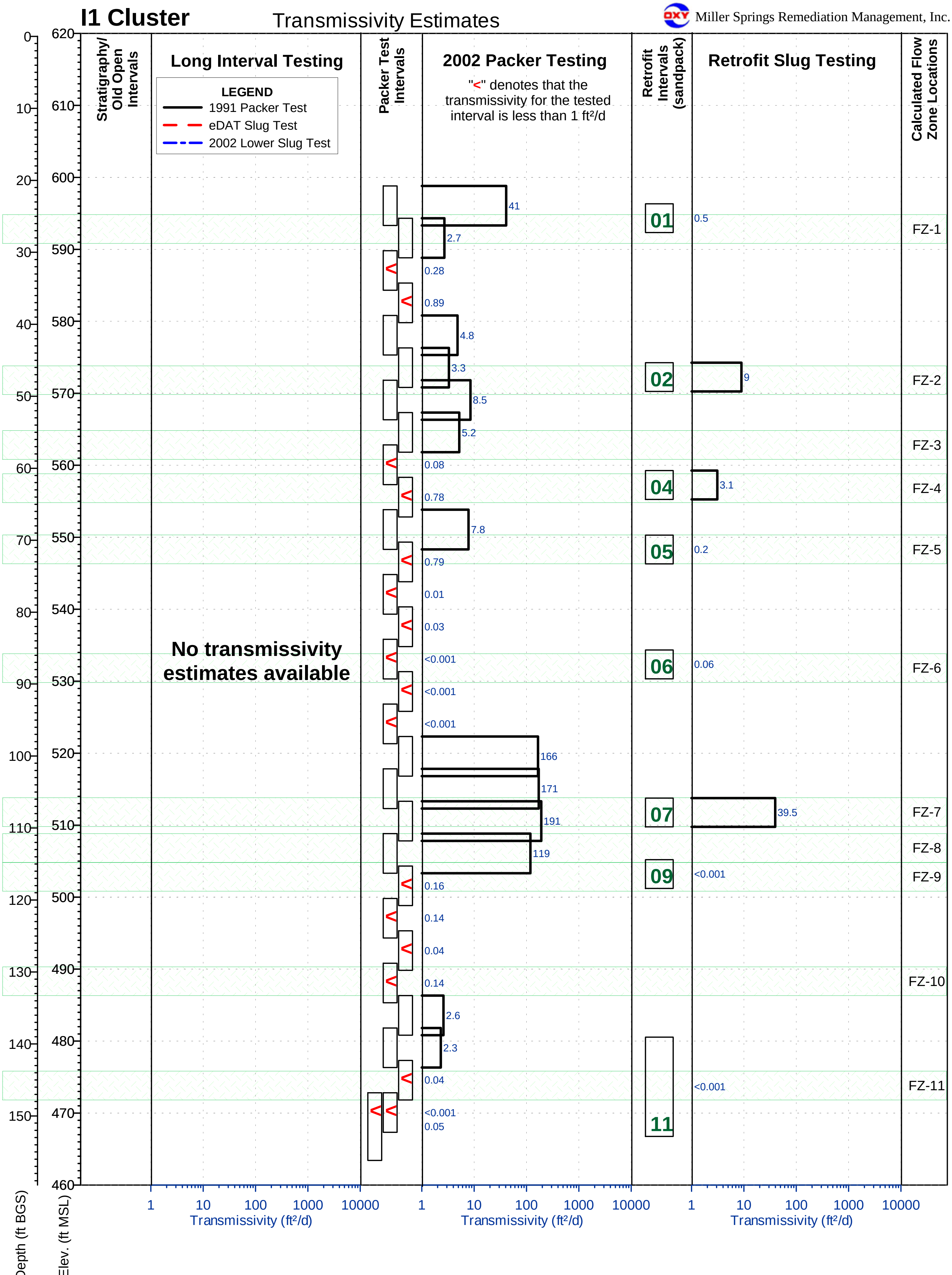

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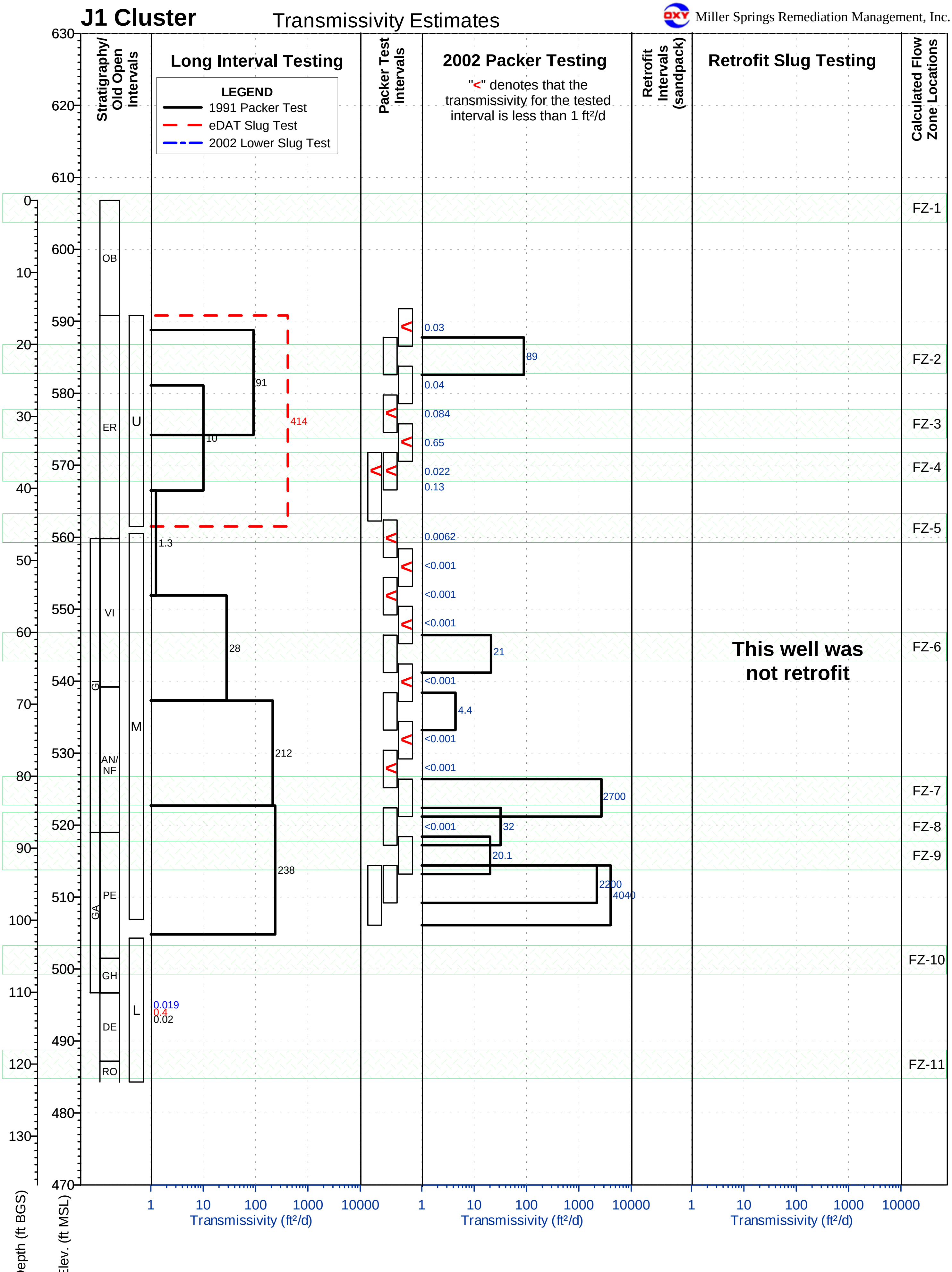

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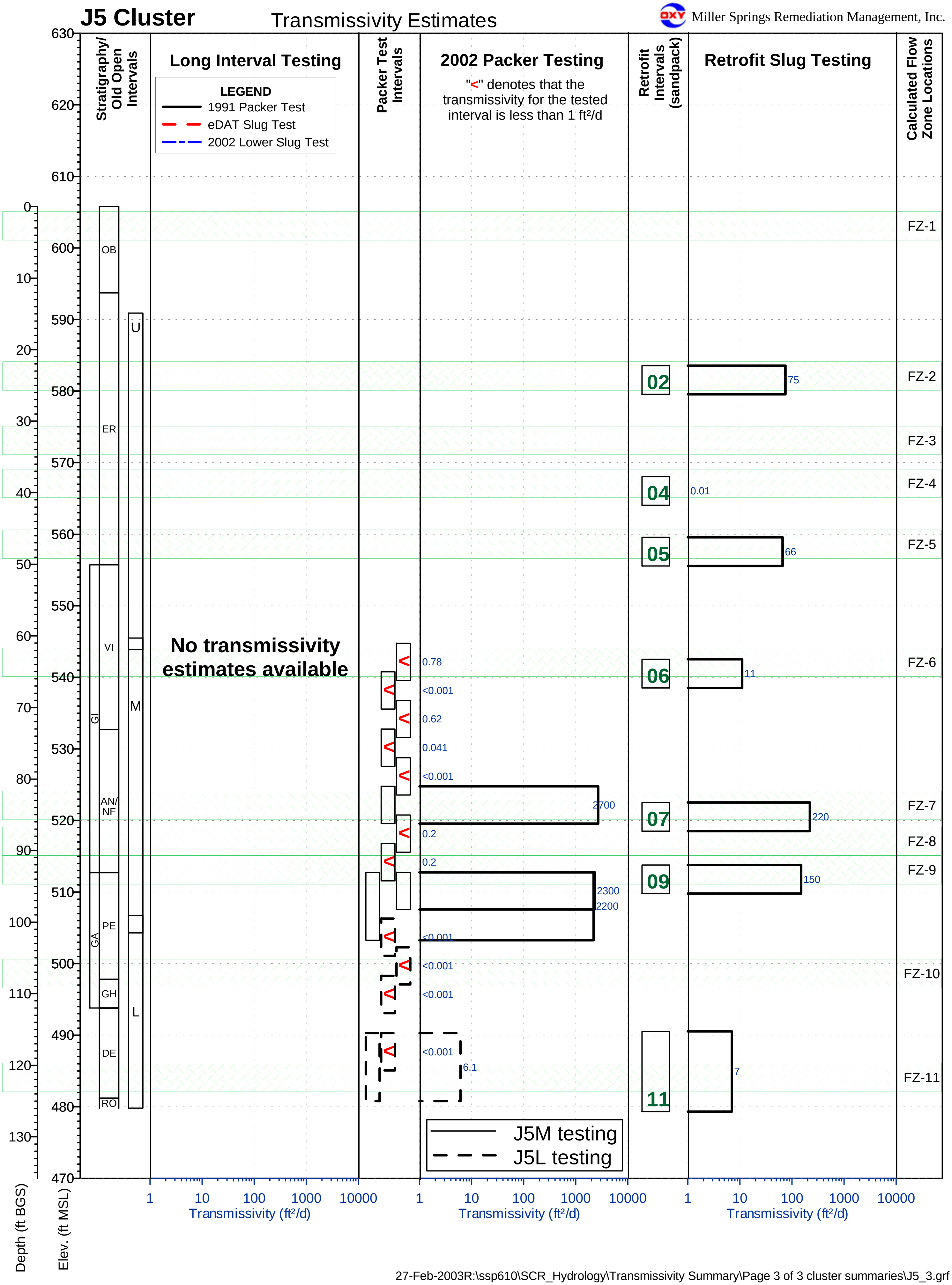

J5 Cluster
Transmissivity Estimates
Miller Springs Remediation Management, Inc.
Stratigraphy/ Old Open Intervals
Long Interval Testing
LEGEND
1991 Packer Test
eDAT Slug Test
2002 Lower Slug Test
No transmissivity estimates available
Packer Test Intervals
2002 Packer Testing
"<" denotes that the transmissivity for the tested interval is less than 1 ft²/d
Retrofit Intervals (sandpack)
Retrofit Slug Testing
Calculated Flow Zone Locations
OB
ER
VI
GI
AN/ NF
PE
GA
GH
DE
RO
U
M
L
0.78
<0.001
0.62
0.041
<0.001
2700
0.2
0.2
2300
2200
<0.001
<0.001
<0.001
<0.001
6.1
02
04
05
06
07
09
11
75
0.01
66
11
220
150
7
FZ-1
FZ-2
FZ-3
FZ-4
FZ-5
FZ-6
FZ-7
FZ-8
FZ-9
FZ-10
FZ-11
J5M testing
J5L testing
Transmissivity (ft²/d)
Depth (ft BGS)
Elev. (ft MSL)
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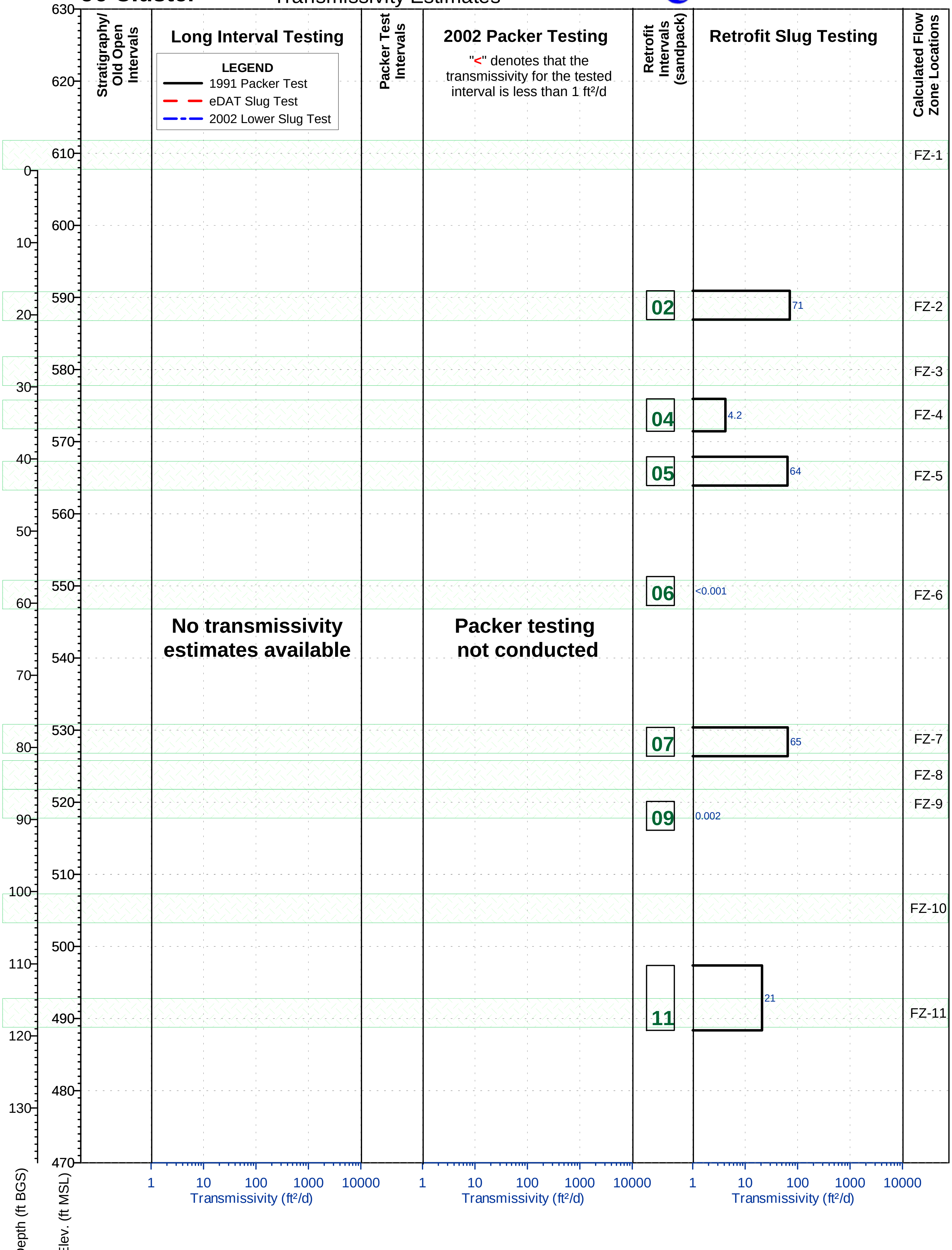
J6 Cluster

Transmissivity Estimates

Miller Springs Remediation Management, Inc.



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PMW-1 Cluster Transmissivity Estimates

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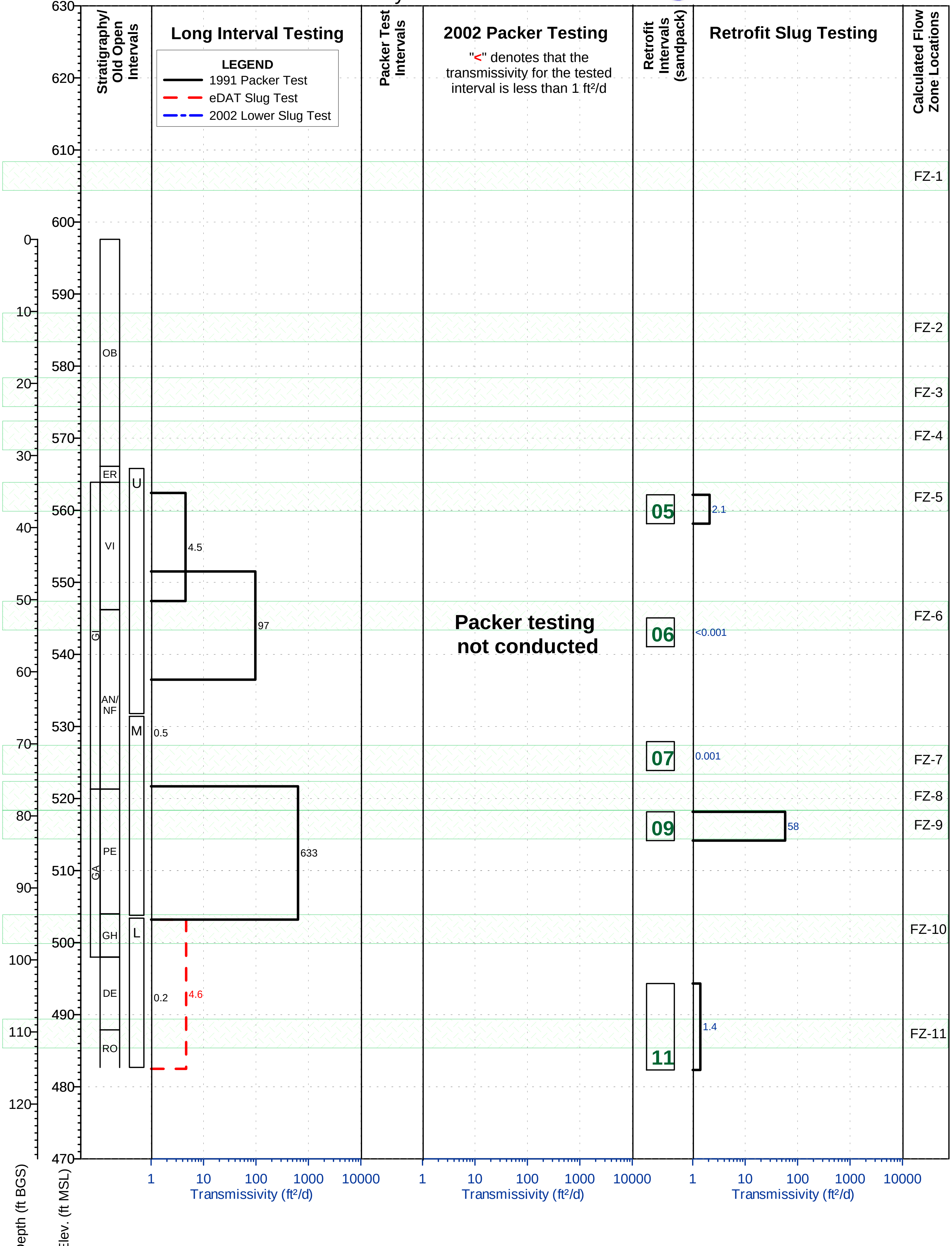

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A4. Packer Testing

Table of Contents

List of Figures

Executive Summary

This report describes the equipment, procedures and results of packer testing undertaken in bedrock wells at the Hyde Park Landfill Site in 2002. This work was conducted in accordance with procedures described in the *Workplan for the Site Characterization Report–Hydrologic Characterization* (Services Environmental, Inc., S.S. Papadopulos & Associates, Inc., and Conestoga-Rovers & Associates, 2002). The results of the packer testing are presented in summary form. The complete set of response data and analyses is included as an appendix to this report.

An innovative two-stage testing approach was adopted for the Site. The stages consisted of:

- A screening-level assessment; and
- Immediate follow-up with more detailed testing when warranted.

This approach has made it feasible to investigate long intervals efficiently, thereby permitting testing of more wells.

The initial packer testing was conducted at 21 wells between April 4, 2002 and May 2, 2002. Packer testing resumed in October 2002, when complete transmissivity profiles were developed for four new wells E6, F6, H5 and I1. A total of 268 packer tests were conducted, of which 259 (97%) could be analyzed. Complete details of the results and analyses for each test are included in an Adobe Acrobat file that accompanies this report.

The results of the packer testing provided direct hydraulic evidence of the discrete flow zones at the Site and quantified their transmissivity. In addition to providing important direct and quantitative hydraulic data for the Site hydrologic characterization, the packer testing provided an opportunity to revisit the testing that formed the basis for the previous conceptualization of the Site and provided checks on the reliability of other hydraulic tests being conducted at the Site. The packer testing also supported the locating of the screened intervals of the multi-level completions, and quantified the properties of the intact rock between the flow zones.

Acknowledgements

Jon Williams and John Raby, Conestoga-Rovers & Associates, conducted the packer testing described in this report. Jonathan Keizer, S. S. Papadopulos & Associates, Inc interpreted the results of the tests. Steven P. Sayko, Services Environmental, Inc. provided continuous peer review.

Section 1
Introduction

1.1 Scope

This report describes the equipment, procedures and results of packer testing undertaken in bedrock wells at the Hyde Park Landfill Site in 2002. This work was conducted in accordance with procedures described in the *Workplan for the Site Characterization Report–Hydrologic Characterization* (Services Environmental, Inc., S.S. Papadopulos & Associates, Inc., and Conestoga-Rovers & Associates, 2002). The results of the packer testing are presented in summary form. The complete set of response data and analyses is included as Appendix A to this report.

Conestoga-Rovers & Associates conducted the packer testing. Phil Bence, C&W Environmental, operated the drill rig. The test results were interpreted by S.S. Papadopulos & Associates, Inc., with continuous peer review from Services Environmental, Inc.

1.2 Overview

A detailed geologic and hydrogeologic characterization of the Hyde Park Landfill Site was completed at the beginning of 2002 (Conestoga-Rovers & Associates, Services Environmental, Inc., and S.S. Papadopulos & Associates, Inc., 2002). The characterization confirmed that the laterally extensive, discrete flow zones identified in regional studies extended to the Site. The existence of the discrete flow zones at the Site was confirmed by the examination of nearby outcrops, the logging of continuous cores, conducting borehole video and EM borehole flowmeter profiling, and with a variety of geophysical tools. The final result of the Site Hydrogeologic Characterization was the identification of 11 primary bedding-parallel flow zones at the Site. The flow zones are separated by massive rock with low matrix permeability.

Extensive additional investigations have been conducted in 2002 and 2003 to extend the findings of the Site Hydrogeologic Characterization. In particular, investigations were conducted to characterize the properties of the discrete flow zones and to monitor the hydrologic conditions within them. The results of these investigations have been assembled in the Site Hydrologic Characterization Report.

The investigations included:

- Hydraulic testing of existing wells;
- Retrofitting existing wells as multi-level completions;
- Drilling new wells and installing multi-level completions;
- Hydraulic testing of the multi-level completions; and
- Monitoring water levels in the multi-level completions.

The packer testing formed an integral part of the hydraulic testing of existing wells. The results of the packer testing were also used to assist in the design of the multi-level completions at some of the new wells.

1.3 Motivation for packer testing

Packer testing at the Site was motivated by the need to quantify the transmissivity of the flow zones that were mapped at the regional scale and identified at the Site. Packer testing provides direct hydraulic evidence and a level of detail of characterization that is either not available or is not feasible with other methods. The testing therefore provides "hard" data to support the Site hydrologic characterization.

In addition to providing important direct and quantitative hydraulic data for the Site hydrologic characterization, the packer testing was designed to achieve four other objectives:

- Provide an opportunity to revisit the testing that formed the basis for the previous conceptualization of the Site.
- Check the reliability of other hydraulic tests being conducted at the Site;
- Provide additional support for locating the screened intervals of the multi-level completions; and
- Quantify the properties of the intact rock between the flow zones.

Section 2
Packer Testing Equipment

The packer testing equipment was developed by the specialist fabricator Baski, Inc., located in Denver, Colorado. The equipment was customized for application at Hyde Park, as the diameter of the boreholes and the length of test interval were smaller than for typical applications. The packer testing apparatus and dimensions are shown schematically on Figure 1. Additional details on the packer testing equipment can be obtained from the Baski web site, www.baski.com.

The length of the test interval between the packers was not fixed. The observation wells at the Site typically have an open-hole diameter of $3^7/_8$ inches, and when the packers are inflated the open interval was 5.2 feet long. The new wells E6, F6, H5, and I1 were drilled with a larger diameter of $5^7/_8$ inches, and the open interval was 5.5 feet long.

The key element of the packer testing equipment is the Access Port Valve (APV). When the APV is closed, the test interval is isolated. When the APV is opened, the interval between the packers is connected hydraulically to a 1-inch diameter riser pipe.

The water level between the packers was measured with a Druck pneumatic pressure transducer and Telog datalogger.

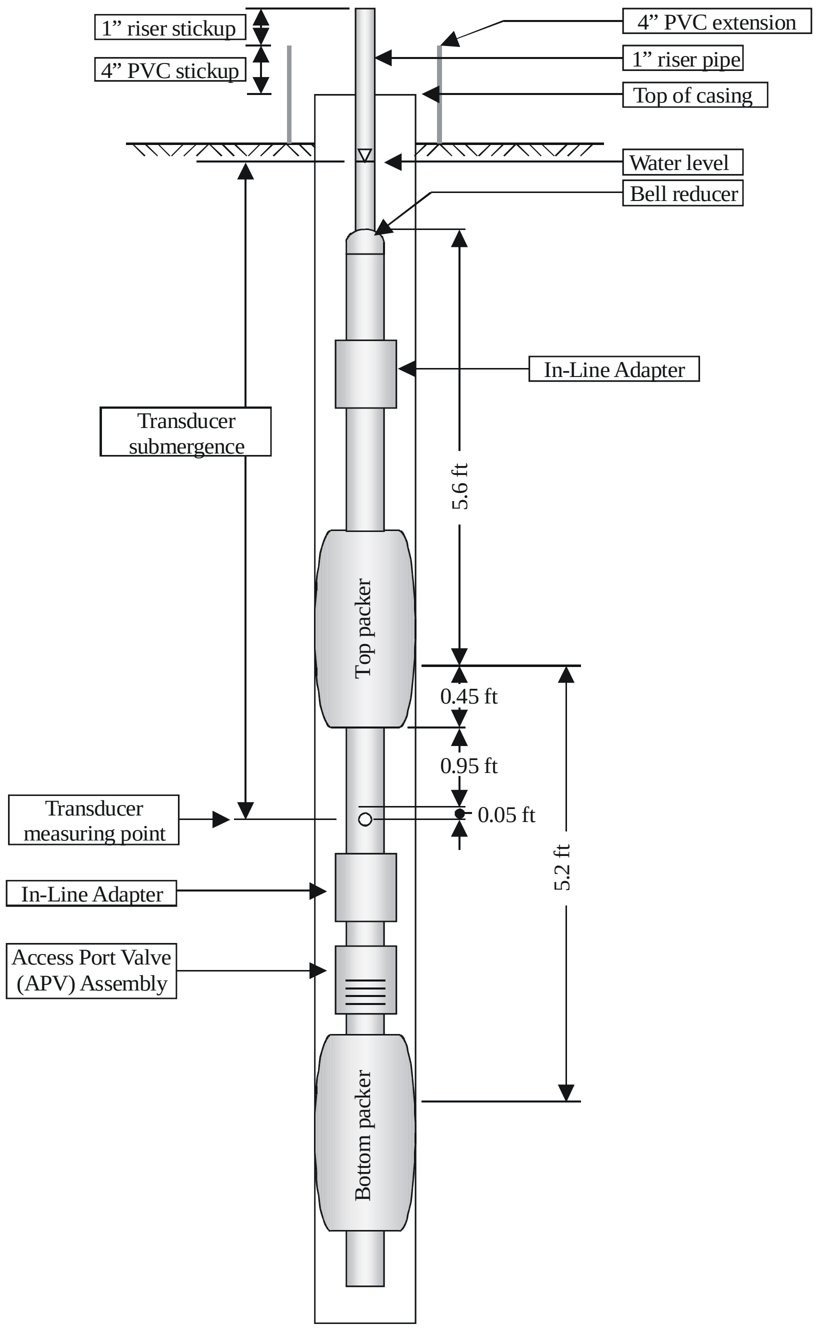


Figure 1. Packer Testing Assembly and Dimensions

Section 3
Packer Testing Procedures

An example of a complete record of testing of a well is shown on Figure 2. Testing started at the bottom of each well and proceeded upwards. To test the lowermost portion of each well, only the upper packer was inflated. Both packers were inflated for every subsequent test.

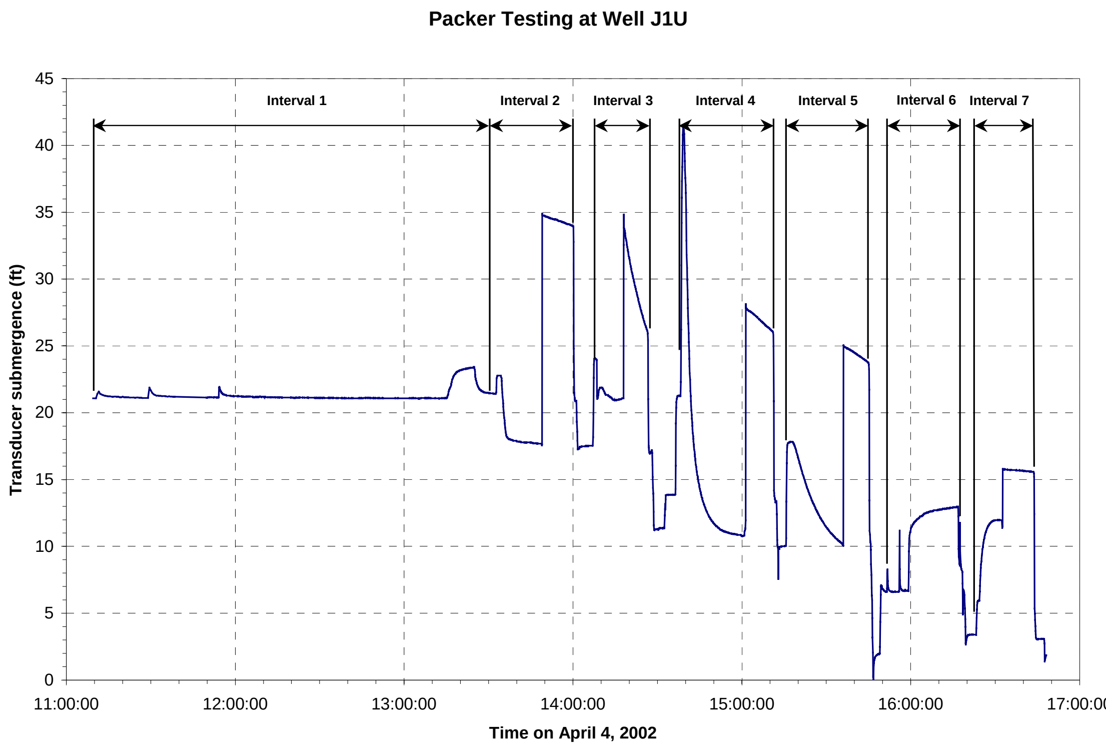


Figure 2. Packer Testing Response Record for J1U

An innovative two-stage testing approach was adopted for the Site. The stages consisted of:

- A screening-level assessment; and
- Immediate follow-up with more detail testing when warranted.

This approach has made it feasible to investigate long intervals efficiently, thereby permitting testing of more wells.

3.1 Screening-level assessment

The first portion of the testing sequence at each well was the same. After the packer string was set at the specified testing interval, the depth to water in the 1-inch riser pipe was measured manually with an electric water level tape. The transducer submergence was also recorded at this time. The Access Port Valve (APV) was kept in the open position for these initial water level measurements. The packers were then inflated and the transducer submergence was recorded again. The APV was then closed. The elevation of the top of the riser pipe was recorded and the riser pipe is then filled with water. After the transducer submergence stabilizes, the APV was opened to initiate a slug insertion test.

The recovery of the water level was monitored following the opening of the APV. Three general responses were observed:

- Negligible to very slow recovery;
- Moderately fast recovery; and
- Very fast recovery.

A very slow recovery indicated an interval in which there were either no flow zones, or the flow zones were not transmissive. For these intervals, recovery was monitored long enough to confirm this diagnosis.

A moderately fast recovery indicated the presence of a minor but transmissive flow zone. The recovery was monitored for a sufficient duration to allow for a quantitative interpretation of the response using the "classical" methods of slug test analysis.

A very fast recovery was diagnostic of an interval that was open across a transmissive flow zone. The recovery was often so fast that the first transducer reading after the APV was opened was already close to the level prior to the start of the slug test. For these cases, the results of the slug test were analyzed whenever possible, but more reliable transmissivity estimates were derived from a follow-up pumping test.

Examples of the three general responses observed at the Site are presented below.

Slow recovery response

An example of a slow recovery following the slug insertion is shown on Figure 3. At a time of approximately 16:32, the APV was opened to initiate the slug test. The recovery response was monitored between 16:32 and 16:43. This was sufficiently long to confirm that the interval had low transmissivity. The test was stopped by deflating the packers at 16:43.

A very gradual, but nonetheless perceptible recovery was observed after the opening of the APV. In this instance there was sufficient response data to support the analysis of the recovery response, and a relatively low transmissivity of 0.03 ft^2/day was estimated.

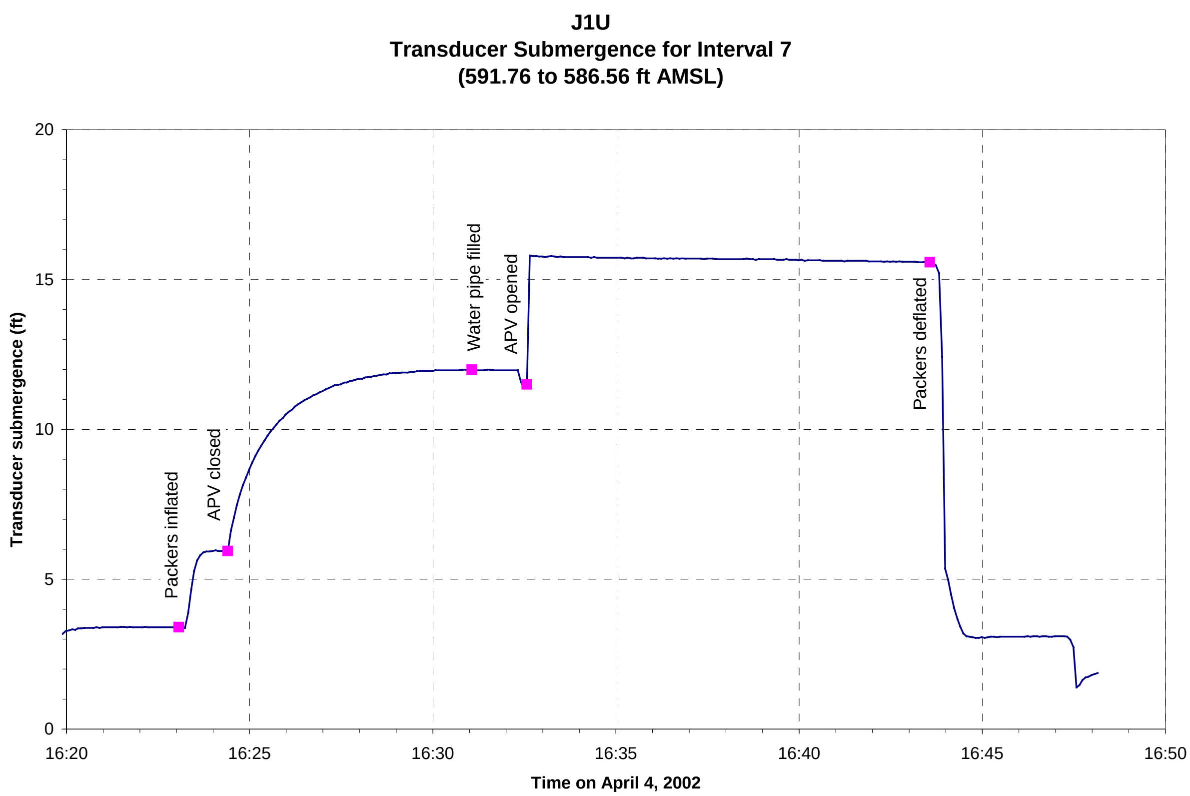


Figure 3. Packer Test Response for a Non-Transmissive Interval

Moderately fast recovery response

An example of a slug test with a moderately fast recovery is shown on Figure 4. The slug test was started at approximately 14:18 by opening the APV. The recovery was monitored until 14:26, at which time about 60% of the initial displacement had dissipated. This was sufficient duration to support the analysis of the recovery response for the estimation of the transmissivity. A transmissivity of 0.65 ft^2/day was estimated for this test.

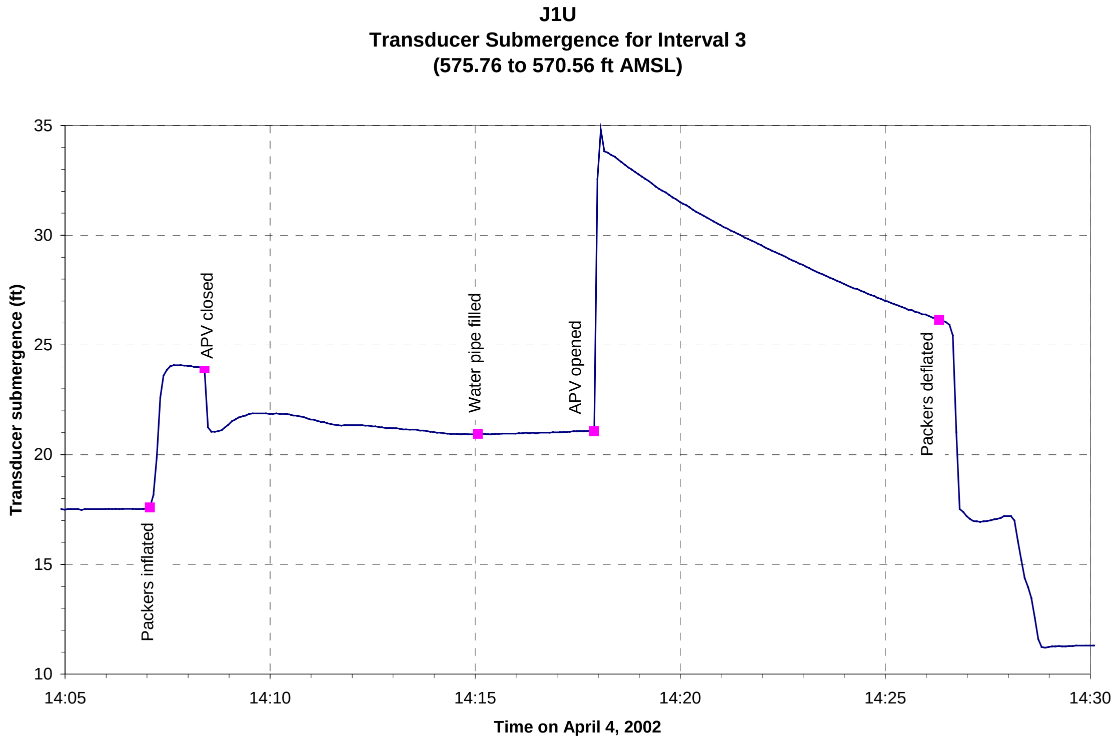


Figure 4. Packer Test Response for a Moderately Transmissive Interval

Fast recovery response

An example of a slug test with very fast recovery is shown on Figure 5. This test was started by opening the APV at approximately 15:56. More than 50% of the recorded initial displacement was recovered in the first 5 seconds of the test, and complete recovery occurred within 1 minute of the start of the test. In this case, there were not enough data to support a reliable slug test analysis of this very fast recovery response. However, the data were sufficient to indicate that this interval should be tested in further detail with a method better suited to high transmissivity zones.

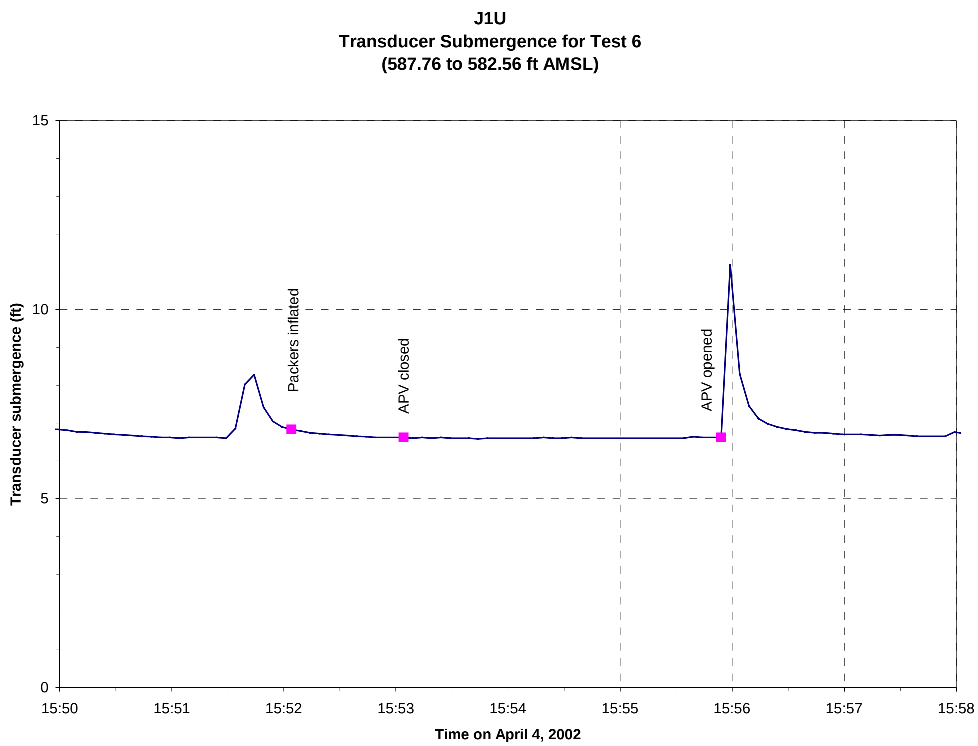


Figure 5. Packer Test Response for a Highly Transmissive Interval

3.2 Detailed follow-up testing of transmissive intervals

Constant-rate pumping tests were conducted only for those intervals that exhibited very fast recoveries during the slug tests. This reduced significantly the time required for testing, thereby allowing more intervals to be tested.

At the start of the pumping test, the injection lines were hooked up and the transducer submergence and totalizing flowmeter reading were recorded. The time of the start of pumping was also recorded. At the end of pumping, the time and the corresponding reading on the totalizing flowmeter were recorded. The water level recovery was monitored briefly after pumping was stopped, followed by deflation of the packers to conclude the test.

The average pumping rate was calculated from the totalizing flowmeter readings:

$$\bar{Q} = \frac{Totalizer_{end} - Totalizer_{start}}{Time_{end} - Time_{start}}$$

An example of a pumping test is shown on Figure 6, which is a continuation of the testing plotted on Figure 5. A transmissivity of 89 ft^2/day was estimated for this test.

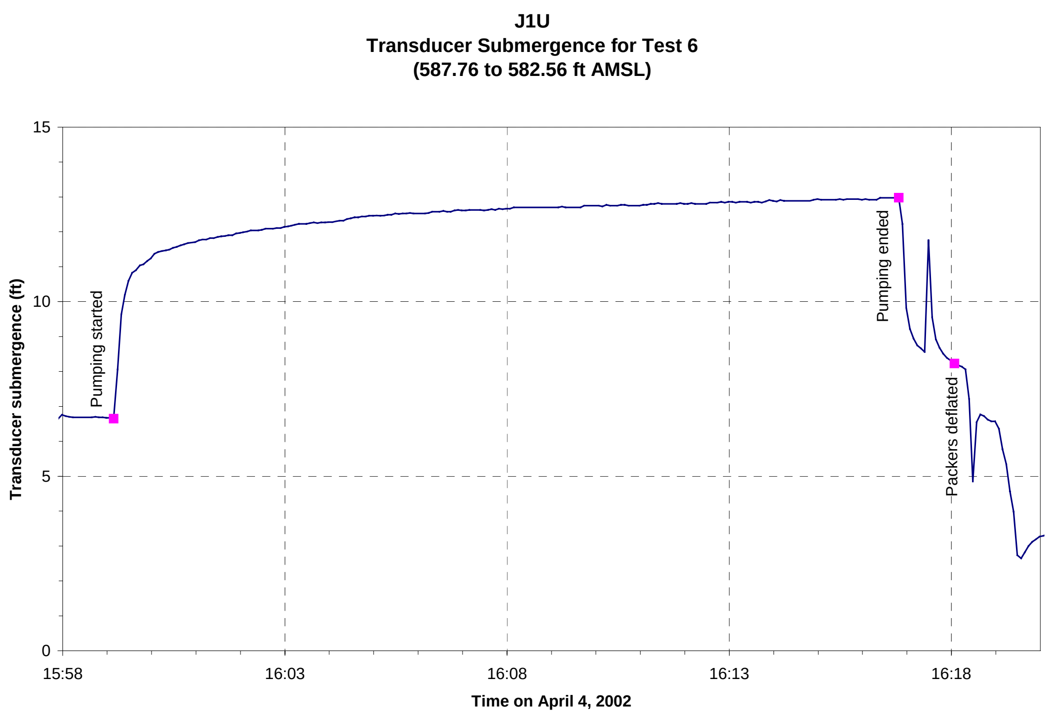


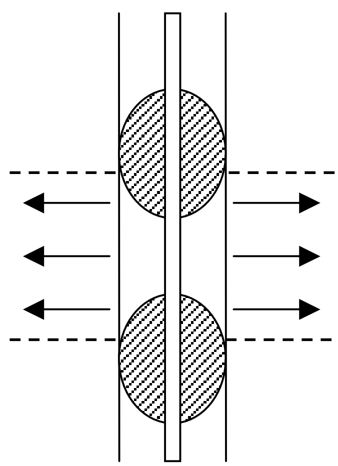
Figure 6. Example Pumping Test Record

Section 4
Interpretation of Slug Tests

Attempts were made to analyze all packer testing results. In many cases, it was found that no recovery could be detected after the injection of a slug of water into the test interval. Although the data from these tests could not be interpreted to estimate the transmissivity, the response provided direct evidence that the intervals were so tight that no groundwater flow could be detected.

The slug tests were interpreted with the analysis of Cooper and others (1967). Computer-assisted interpretations were made using AQTESOLV for Windows (HydroSOLVE Inc., 2000).

In the Cooper and others (1976) analysis, the interval isolated between the packers is conceived of as a perfectly confined horizontal aquifer, and the initial head rise is dissipated by purely radial flow into the formation. The conceptual model for the interpretation is illustrated below.



The Cooper and others (1967) slug test analysis yields estimates of the apparent transmissivity and storage coefficient. However, it assumes that the initial displacement of the water level is known. The slug test data were also plotted following the approach of Hvorslev (1951), to confirm the value of the initial displacement assumed in the analysis.

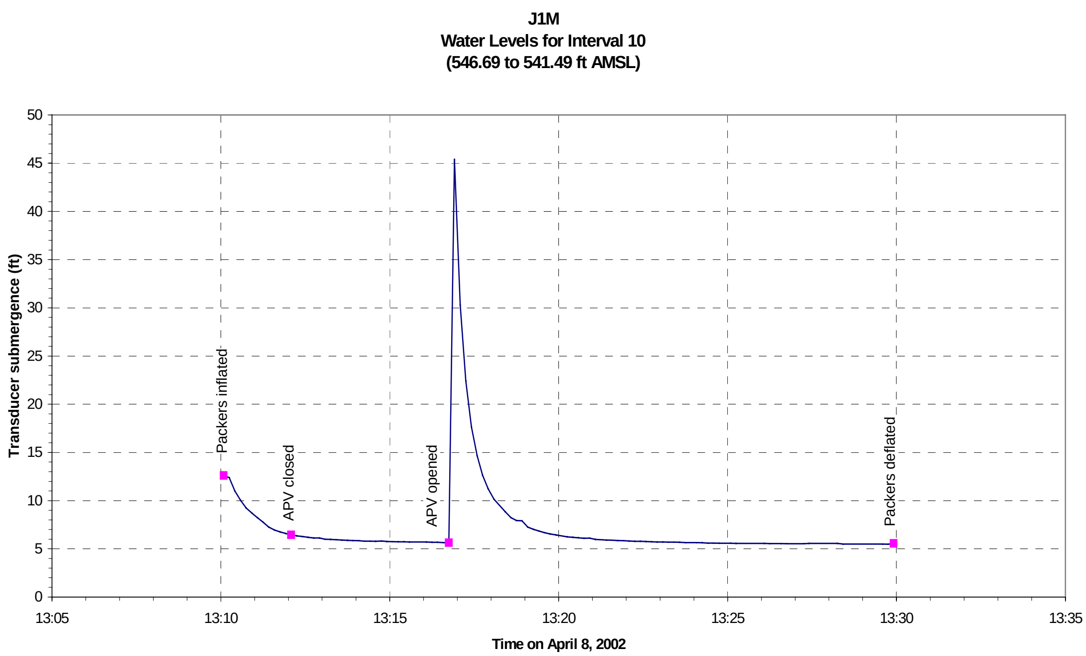
Our approach to interpreting slug tests is illustrated by describing the analyses of two examples.

Example 1

J1M, Test 11; elevation 546.69 to 541.49 ft MSL.

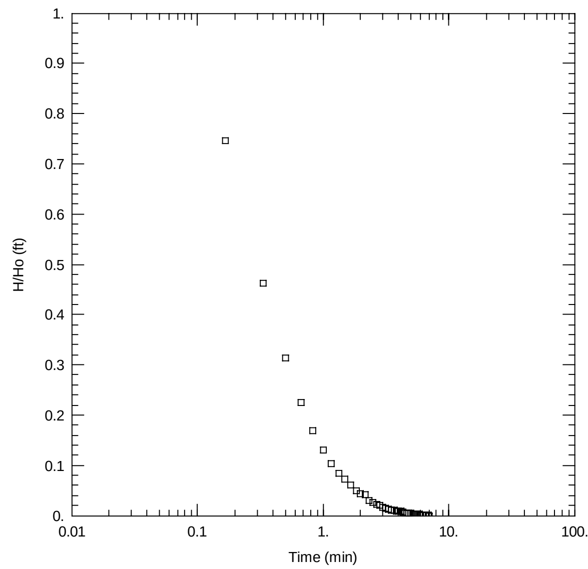
1. Raw data

   The response record for the slug test is shown below.

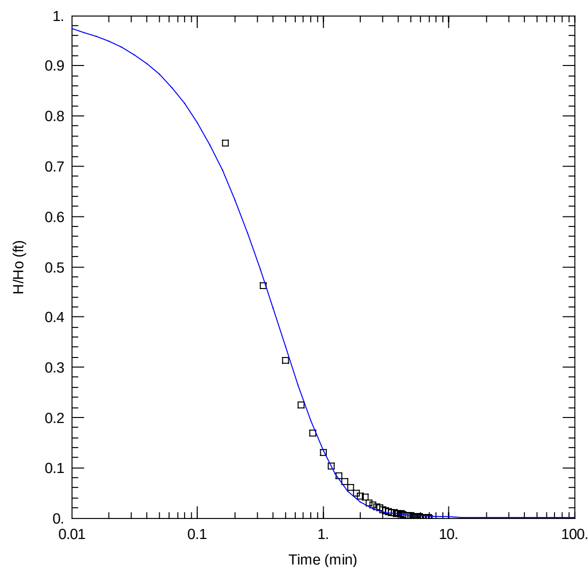


2. In this example, the initial displacement was executed abruptly and complete recovery was monitored. We estimated an initial displacement, ΔH_0, of 53.3 ft. The initial displacement represents the difference between the elevation of the top of the rise pipe and the pre-test water level in the interval.

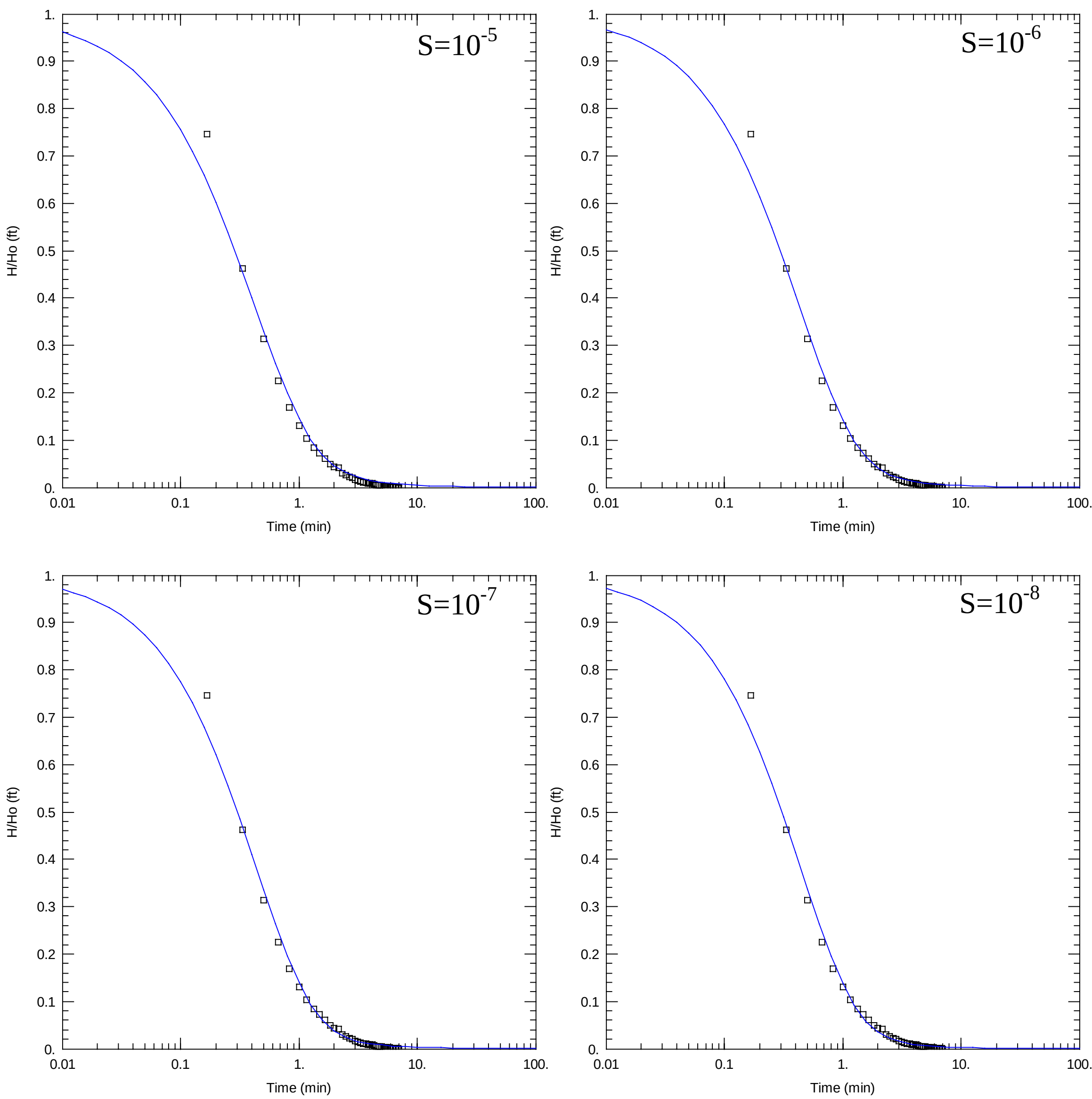
3. The response data were re-plotted by normalizing the observed displacement (H-H_0) with respect to the estimated initial displacement, ΔH_0. As shown on the plot below, 40% of the recovery occurred prior to the first measurement of recovery, 10 seconds after the opening of the APV. The sampling period was reduced to 5 seconds for subsequent tests.



4. For this test, the recovery data were sufficient to support a reliable estimation of the transmissivity using the slug test analysis of Cooper and others (1967). A computer-assisted fit to the data yielded transmissivity (T) and storage coefficient (S) estimates of 29 ft^2/day 2×10^{-10}, respectively. The match of the theoretical solution to the data is shown below.



Cooper and others (1967) first suggested that recovery responses during slug tests are relatively insensitive to the storativity. Therefore, any estimates of storativity derived from slug tests cannot be considered precise. As indicated in the plots below, it is possible to obtain equally good matches to the data by fixing the storativity at different values and fitting only the transmissivity. In this example, the resulting estimates of transmissivity vary over a relatively narrow range, from about 15 to 24 ft^2/day.

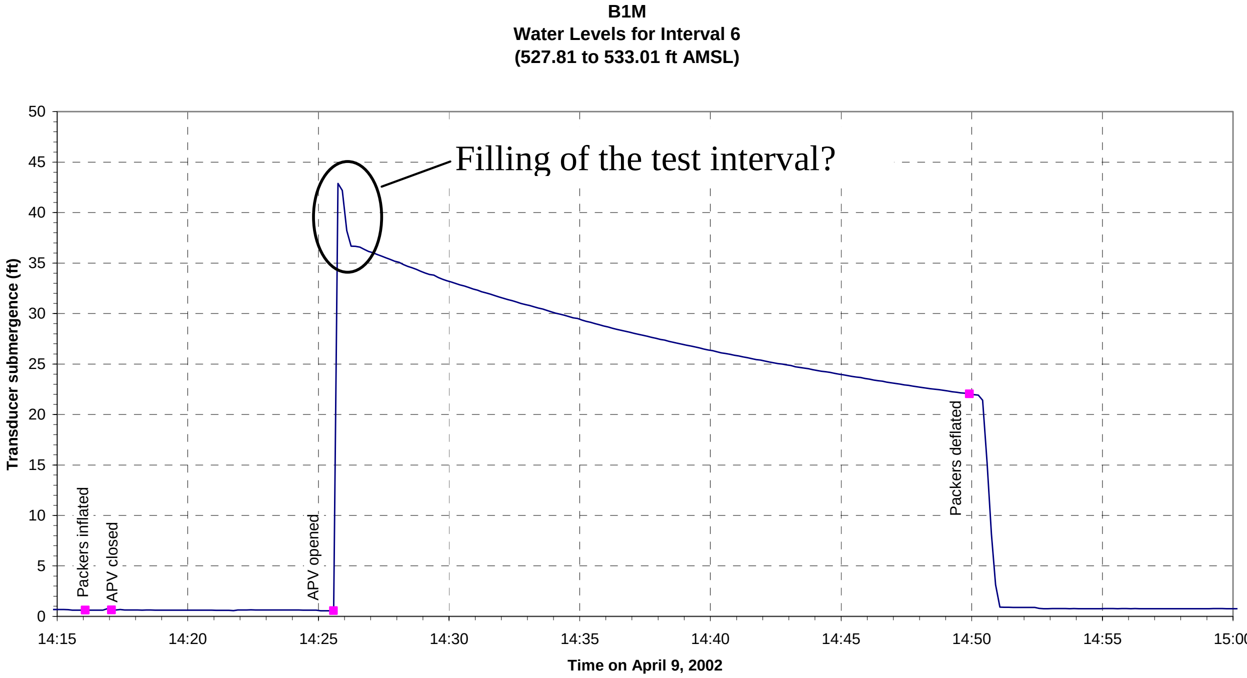


Example 2

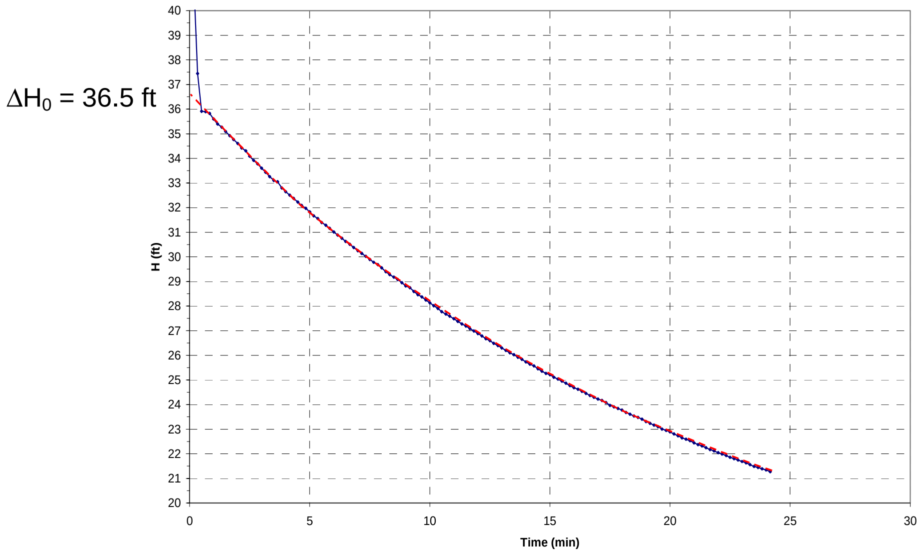
B1M, Test 6; elevation 533.01 to 527.81 ft MSL.

1. Raw data

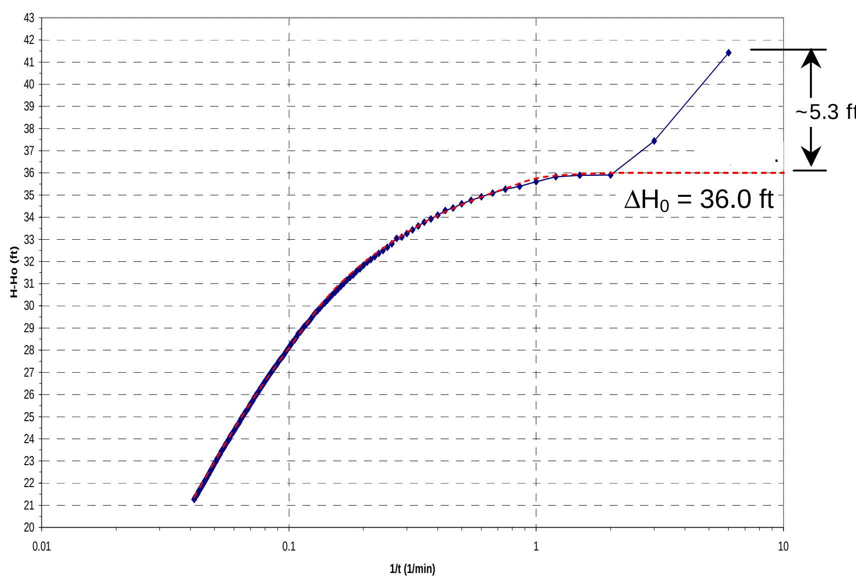
   The response record for the slug test is shown below.



2. For this test an irregularity at the start of the test had to "filtered" to estimate the "effective" initial displacement. We considered two approaches to accomplish the filtering. For the first approach, we extrapolated the displacement back to the start of the test, taken as the time of the opening of the APV (14:25:35). This approach yielded an initial displacement of 36.5 ft.



3. As an alternative approach, we plotted the displacement (H-H_0) against 1/t, and identified the "effective" initial water level displacement from the asymptote as 1/t →∞. This approach yielded an estimate of 36.0 ft for the initial displacement.



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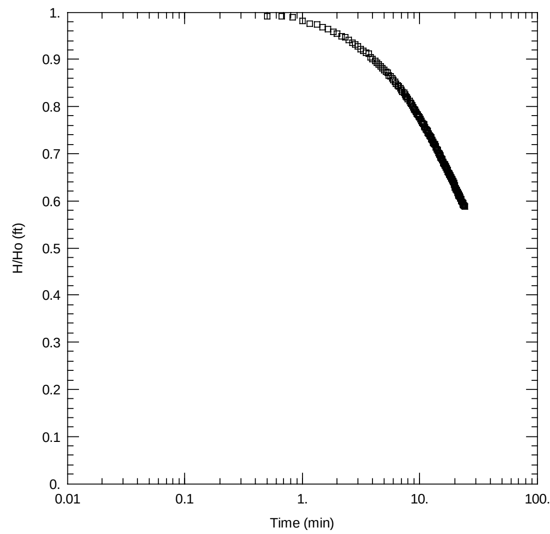
4. The plot of normalized displacements is shown below.

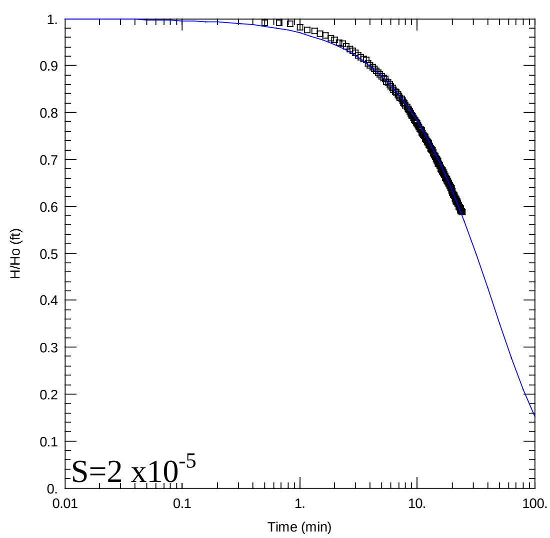


5. Analysis

The following parameters are estimated using the analysis of Cooper and others (1967):

T = 0.12 ft^2/day
S = 2 x 10^{-5}

For this analysis, both the transmissivity and storativity were allowed to vary. The fit between the theoretical solution and the data is shown below.



As indicated previously, estimates of storativity derived from slug tests cannot be considered precise. For this example it is possible to obtain equally good matches to the data by fixing the storativity at different values and fitting only the transmissivity. Alternative parameter combinations that yielded approximately equivalent matches to the data are listed below.

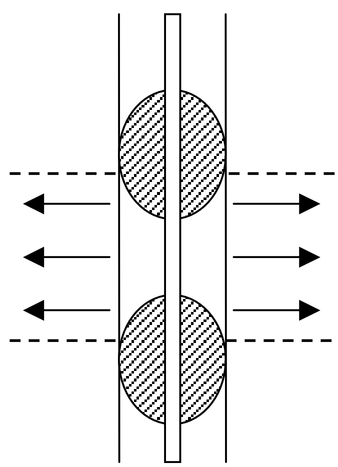
Assumed Storativity *S* (dimensionless)	Fitted Transmissivity *T* (ft^2/d)
10^{-7}	0.21
10^{-6}	0.17
10^{-5}	0.14
10^{-4}	0.09

Section 5
Interpretation of Pumping Tests

1. Methodology

The pumping tests were interpreted with a generalized step-test analysis that integrates the methods of Theis (1935), Jacob (1947), Rorabaugh (1953), and Ramey (1982). The computer-assisted interpretation package AQTESOLV for Windows (HydroSOLVE Inc., 2000) was used for the analysis.

For the analysis of the pumping tests the interval isolated between the packers was idealized as a perfectly confined horizontal aquifer, and the injected water was assumed to flow into the formation in a radial pattern. The conceptual model for the interpretation is illustrated below.



The drawdown in the pumping interval is interpreted as the sum of the drawdown due to laminar head losses in the formation, additional head losses due to friction within the test interval itself, and losses around a zone of altered material surrounding the well (referred to as the “skin”). Both drilling and development of the well, as well as long-term chemical processes such as local dissolution frequently give rise to changes in the hydraulic properties of the formation around a well. These changes may be exhibited as either a decrease or an increase in the apparent transmissivity, referred to positive and negative skin effects, respectively.

The laminar head losses in the formation are estimated by evaluating the Theis (1935) solution at the outside radius of the well:

$$s_{wAQ} = \frac{Q}{4\pi T} W\left(\frac{r_w^2 S}{4Tt}\right) \tag{1}$$

where Q is the pumping rate, T is the transmissivity, S is the storage coefficient, r_w is the radius of the well and t is the elapsed time of pumping.

The friction losses in the test interval itself are estimated with the Rorabaugh (1953) generalization of the Jacob (1947) approximation for well losses:

$$s_{w\,W} = CQ^P \tag{2}$$

where C is the well loss coefficient and P is the well loss exponent.

The additional losses across a skin are estimated with the Ramey (1982) approximation:

$$s_{w\,SK} = \frac{Q}{4\pi T} 2S_w \tag{3}$$

where S_w is the dimensionless wellbore skin factor.

The total drawdown in the well is given by the sum of (1) through (3):

$$s_w = \frac{Q}{4\pi T} W\left(\frac{r_w^2 S}{4Tt}\right) + CQ^P + \frac{Q}{4\pi T} 2S_w \tag{4}$$

The parameters T, S, C, P, and S_w are estimated by fitting the entire drawdown and recovery record using a combination of manual fitting and nonlinear regression techniques.

As a check on the transient analyses, the results of the packer-pumping tests were also analyzed using two approximate methods. The first method is based on a correlation between the specific capacity and the transmissivity. We have found for the Hyde Park wells, a rough estimate of the transmissivity can be calculated from:

$$T \approx 250 \frac{Q}{s_w} \tag{5}$$

The drawdown in (5) corresponds to the final drawdown observed at the end of pumping. The units of transmissivity in (5) are ft^2/day, and the pumping rate and drawdown are specified in U.S. gallons per minute (gpm) and feet, respectively.

The second method assumes that approximately steady conditions are reached at the end of pumping. For steady-state conditions, the transmissivity can be estimated from the Thiem solution:

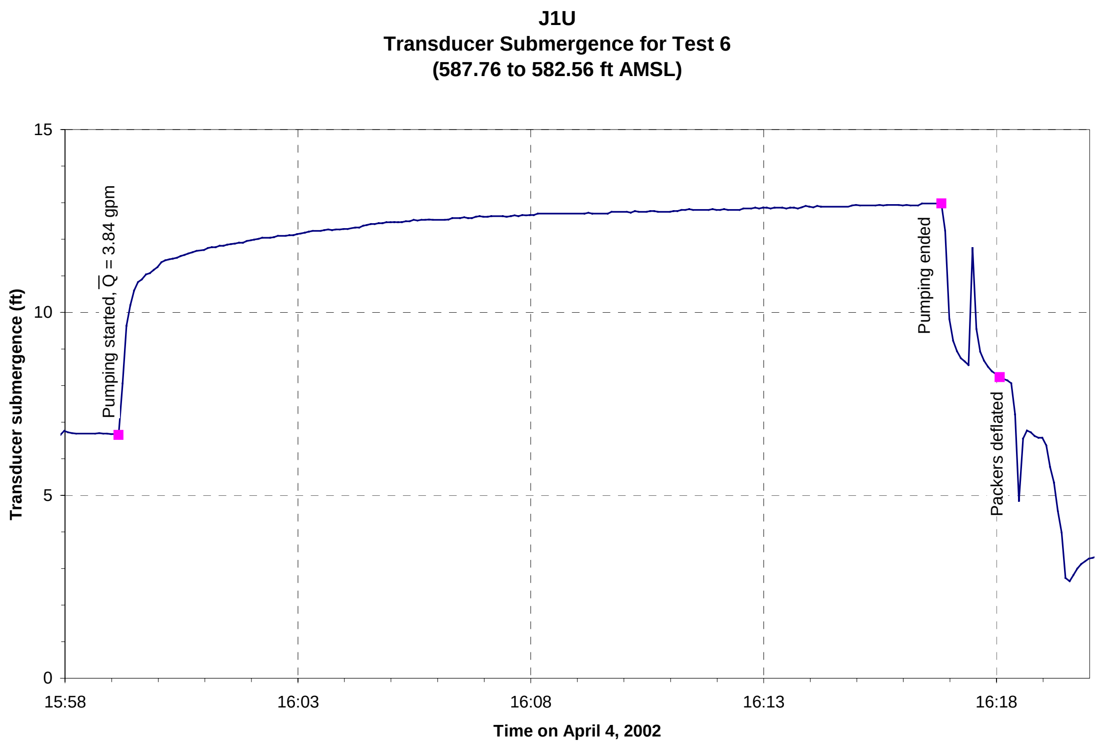
$$T \approx \frac{Q}{2\pi} \frac{\ln\left(\frac{R}{r_w}\right)}{s_w} \tag{6}$$

The term R represents the radius of influence for the test. For this analysis we have assumed a radius of influence of 10 m (32.8 ft), following the guidance of Novakowski and others (1999). Since R appears in a natural logarithm term, the estimated transmissivity is not very sensitive to its assumed value. The pumping rate in (6) is converted from units of gpm to ft^3/day to yield an estimate of transmissivity in units of ft^2/day.

Our approach to interpreting pumping tests is illustrated by describing the analysis of J1U, Test 6; elevation 587.76 to 582.56 ft MSL.

1. Raw data

   The response record for the pumping test is shown below.



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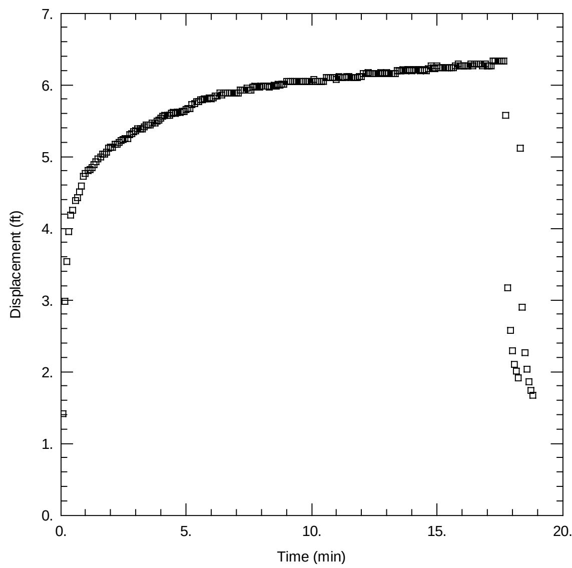
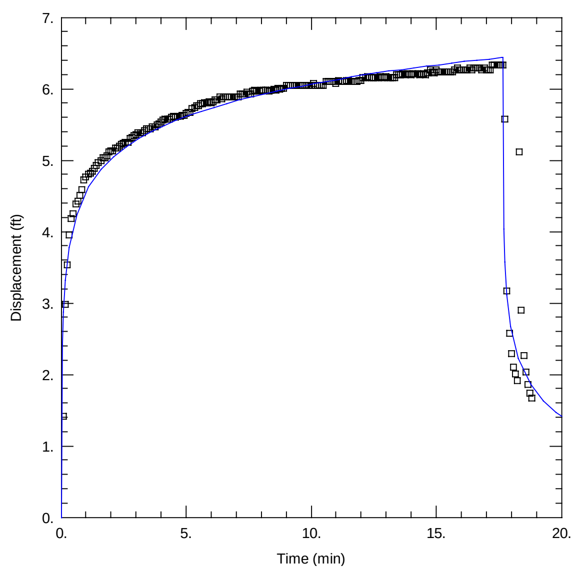
2. In this example, water was injected for 18 minutes at an average rate of 3.8 gpm. The water level rise during pumping and decline after pumping is plotted below. We observe that the drawdown was still increasing at the end of pumping, and that the packers were deflated before the water level had recovered to static conditions. The water level rise after 18 minutes was about 6.3 feet.



3. The data are analyzed using the solution of Theis (1935), Jacob (1947) and Rorabaugh (1953), and Ramey (1982). A computer-assisted fit to the data yields transmissivity (T), storage coefficient (S), and well skin coefficient (S_w) estimates of 90 ft^2/day, 1×10^{-6}, and -4.253, respectively. The match of the theoretical solution to the data is shown below.



2. Checks on the internal consistency of the transmissivity estimates derived from the packer tests

The high-transmissivity intervals are of critical interest at the Hyde Park Site. These intervals will control groundwater flow patterns and the response to pumping. In the context of the packer testing, the high transmissivity zones correspond to those intervals for which pumping tests were conducted. Special care has been taken to ensure, to the extent possible, that the results of the packer-pumping tests have yielded reliable transmissivity estimates.

We have compared the results of packer slug and pumping tests conducted in the same interval. The results of our comparison are shown in Figure 7. The results shown on the figure confirm that transmissivity estimates derived from the slug and pumping tests are within the same order-of-magnitude. The results further demonstrate that slug tests tend to underestimate the transmissivity of highly permeable intervals. This is consistent with our experience at other sites, and with the findings of Butler and Healey (1998). The radius of influence of a slug test is small compared to a pumping test, and the presence of local zones of lower transmissivity tend to dominate the response to a slug test.

We have also applied multiple methods of analysis to check the interpretation of the pumping tests. In particular, transmissivities have been derived from the pumping tests with transient analyses, specific capacity calculations, and with steady-state analyses. The results of our comparison are presented in Figure 8. The results plotted confirm that the transmissivity estimates derived from the packer pumping tests are consistent between the different methods of interpretation.

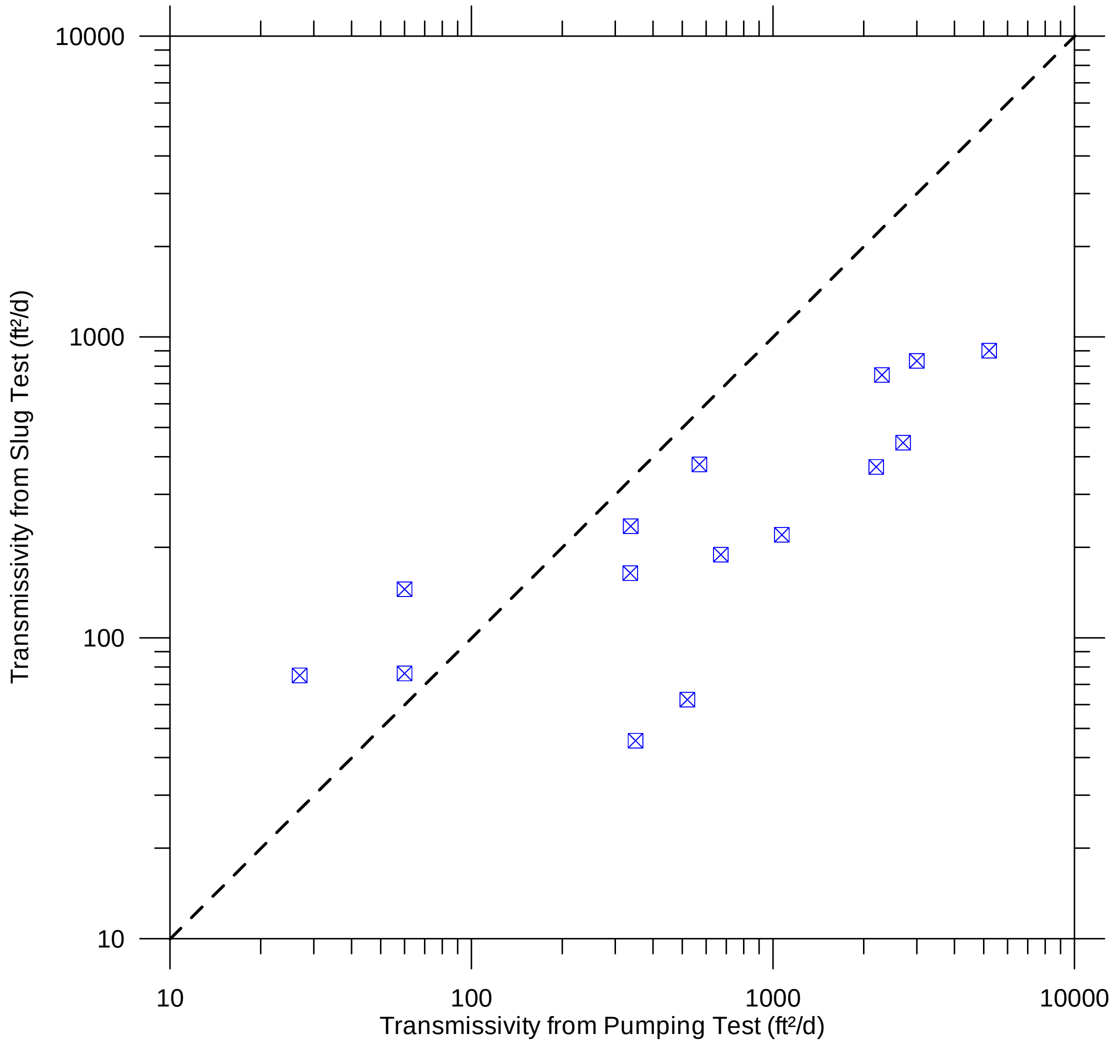


Figure 7. Comparison of Transmissivity Estimates from Packer Slug and Pumping Tests

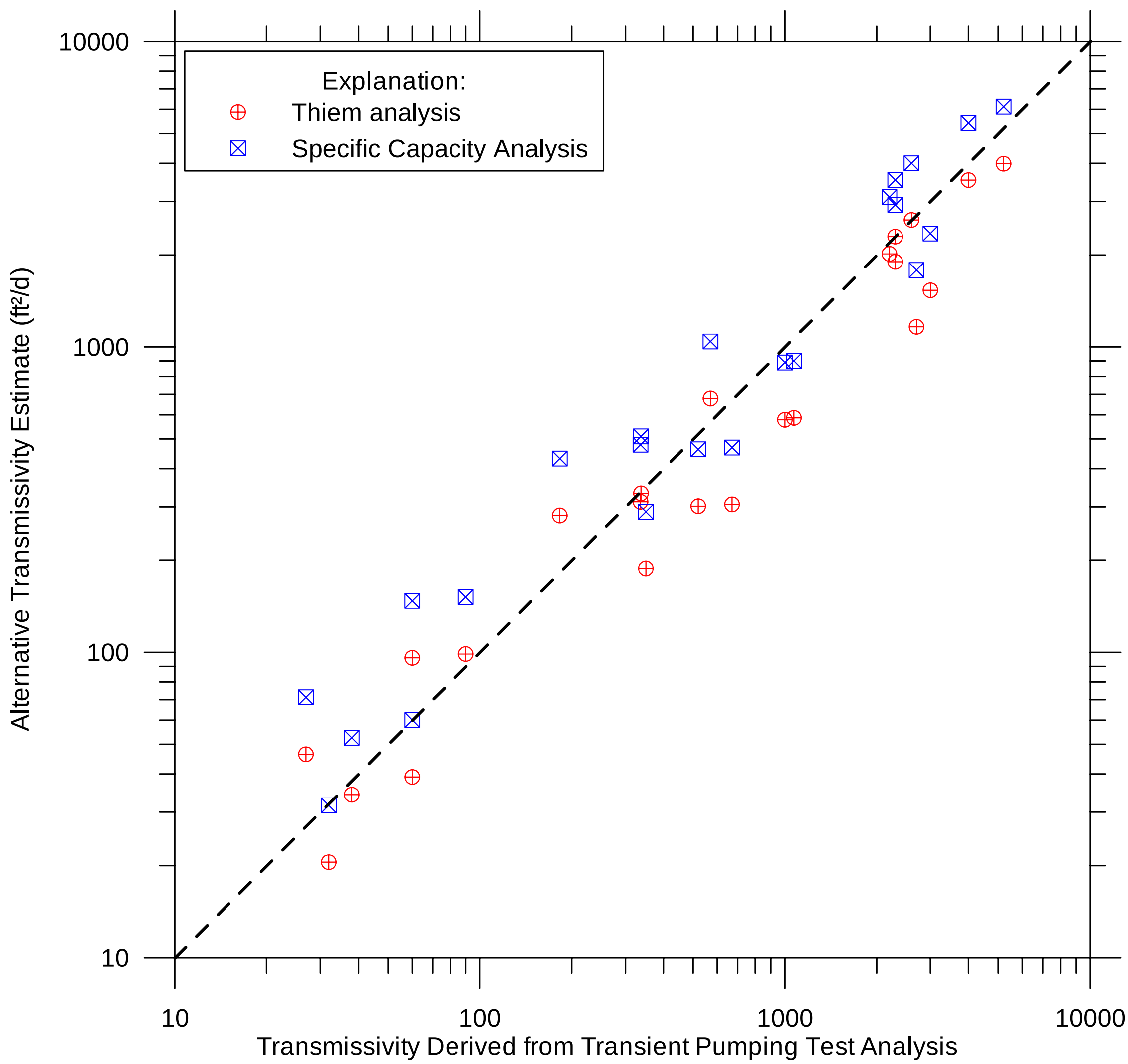


Figure 8. Comparison of Transmissivity Estimates Derived from Packer-Pumping Tests

Section 6
Summary of Transmissivity Estimates

The initial packer testing was conducted at 21 wells between April 4, 2002 and May 2, 2002. An attempt was made to achieve coverage over a relatively large area. Packer testing was resumed in October 2002, with the testing of the entire open intervals of four new wells E6, F6, H5 and I1. The wells and testing dates are listed below. The locations of the packer tests are shown in Figure 9.

Well	**Testing date**
AGW-1U	April 25-26, 2002
AGW-1M	April 26, 2002
AGW-1L	April 29, 2002
AGW-2M	April 29-30, 2002
AGW-2L	April 9, 2002
BC3U (tested in place of B1U)	April 10, 2002
B1M	April 9, 2002 (Test 1 repeated April 15, 2002)
B1L	April 10, 2002
D2U	April 11, 2002
D2M	April 11, 19 and 22, 2002
D2L	April 12, 2002
E6 (new well)	November 11-12, 2002
F1U	April 16 and 18, 2002
F1M	April 17, 2002
F2L (tested in place of F1L)	April 18, 2002
F6 (new well)	November 5-7, 2002
H1U	April 23, 2002
H1M	April 24, 2002
H1L	April 25, 2002
H5 (new well)	October 21-24, 2002 and November 7, 2002
I1	October 24-25, and 28-30, 2002
J1U	April 4, 2002 (Test 1 repeated April 15, 2002)
J1M	April 5 and 8, 2002 (Test 1 repeated April 15, 2002)
J5M	May 1, 2002
J5L	May 2, 2002

The transmissivities estimated for the packer test intervals are listed in Table 1. A total of 268 packer tests were conducted, of which 259 (97%) could be analyzed. The remaining nine tests could not be analyzed due to either packer or transducer malfunction.

The results of the packer testing have been assembled in summary plots that supplement the 2-page summaries of the geophysical data developed previously. Complete details of the results and analyses for each test are included in an Adobe Acrobat file that accompanies this report.

The transmissivity estimates derived from the 259 packer tests have also been analyzed statistically. A probability plot of the results is shown in Figure 10. The results shown in Figure 10 provide a clear illustration of the large range of the transmissivities at the Site. The transmissivity estimates have a large range, from 0.001 ft^2/day up to almost 10,000 ft^2/day. This reflects the fact that the packer intervals spanned both flow zones and the aquitards between them.

The linearity of the central portion of the probability plot suggests that the log-transformed transmissivities are normally distributed. For a log-normal distribution, the transmissivity having the maximum likelihood is the median transmissivity, which corresponds to the geometric mean. The median estimated for all tests is 0.2 ft^2/day. This value represents a composite average from all of the transmissivity values, and is heavily weighted by the properties of the intact rock between the flow zones. As shown on the profiles for each well, the transmissivities estimated between the flow zones are generally very low, typically much less than 1.0 ft^2/day.

A separate statistical analysis has been developed for the transmissivity results for the aquitards between the flow zones. A separate set of transmissivities was extracted from the packer tests results, corresponding to the results from those intervals that did not intersect the predicted elevation of a flow zone (±2 feet). This set comprised 120 of the 259 packer tests. The results of a statistical analysis of these results are presented in Figure 11. The probability plot of the aquitard tests indicates that the majority of the aquitard transmissivities follow a log-normal distribution. Although the transmissivities have a wide range, the majority of values are well below 1 ft^2/day. There are a few values of transmissivity above 1 ft^2/day, but they start to appear as outliers of the log-normal distribution.

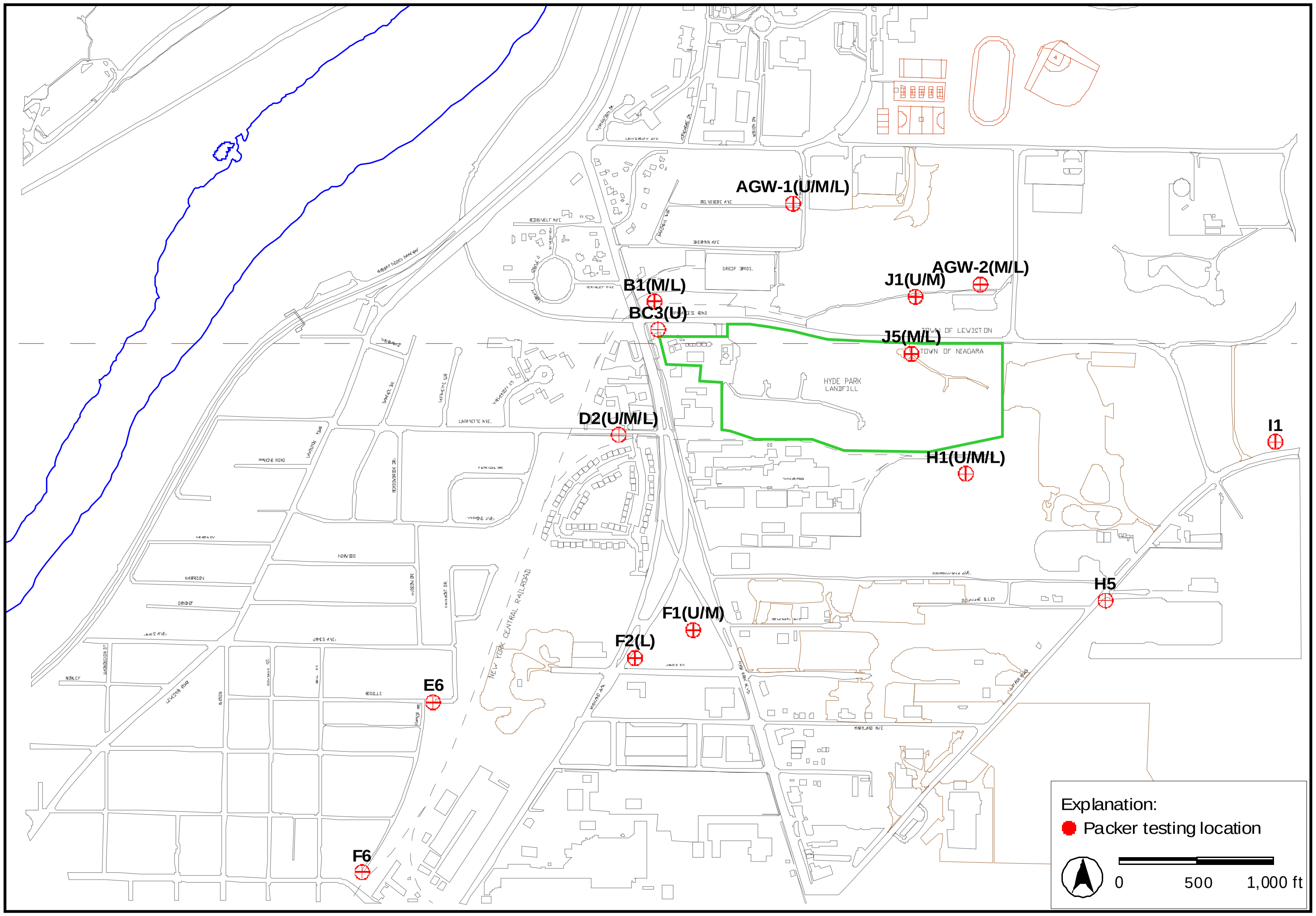


Figure 9. Packer Testing Locations

Table 1. Summary of Packer Testing Results

Well	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Date	Alternate name
AGW-1L	486.64	477.14	0.018	2002 Apr 29	Test 1
AGW-1L	486.64	481.44	0.005	2002 Apr 29	Test 2
AGW-1L	490.64	485.44	0.17	2002 Apr 29	Test 3
AGW-1L	494.64	489.44	<0.001	2002 Apr 29	Test 4
AGW-1M	508.36	498.86	0.005	2002 Apr 26	Test 1
AGW-1M	508.36	503.16	<0.001	2002 Apr 26	Test 2
AGW-1M	512.36	507.16	0.049	2002 Apr 26	Test 3
AGW-1M	516.36	511.16	0.44	2002 Apr 26	Test 4
AGW-1M	520.36	515.16	337.2	2002 Apr 26	Test 5p
AGW-1M	524.36	519.16	671.5	2002 Apr 26	Test 6p
AGW-1M	528.36	523.16	3.3	2002 Apr 26	Test 7
AGW-1M	532.36	527.16	5213	2002 Apr 26	Test 8p
AGW-1M	536.36	531.16	0.1	2002 Apr 26	Test 9
AGW-1M	540.36	535.16	0.61	2002 Apr 26	Test 10
AGW-1U	549.22	539.72	<0.001	2002 Apr 25	Test 1
AGW-1U	549.22	544.02	NIR	2002 Apr 25	Test 2
AGW-1U	553.22	548.02	0.93	2002 Apr 25	Test 3
AGW-1U	557.22	552.02	45	2002 Apr 25	Test 4
AGW-1U	561.22	556.02	0.024	2002 Apr 25	Test 5
AGW-1U	565.22	560.02	1.9	2002 Apr 26	Test 6
AGW-1U	569.22	564.02	570	2002 Apr 26	Test 7p
AGW-2L	500.8	482.84	<0.001	2002 Apr 09	Test 1p
AGW-2M	511.49	501.99	0.03	2002 Apr 29	Test 1
AGW-2M	515.49	510.29	100	2002 Apr 29	Test 2s
AGW-2M	519.49	514.29	61	2002 Apr 30	Test 3p
AGW-2M	523.49	518.29	37	2002 Apr 30	Test 4
AGW-2M	527.49	522.29	1900	2002 Apr 30	Test 5
AGW-2M	531.49	526.29	0.01	2002 Apr 30	Test 6
AGW-2M	535.49	530.29	0.092	2002 Apr 30	Test 7
AGW-2M	539.49	534.29	0.18	2002 Apr 30	Test 8
AGW-2M	543.49	538.29	0.056	2002 Apr 30	Test 9
B1L	505.7	494.94	<0.001	2002 Apr 10	Test 1
B1L	505.7	495.24	<0.001	2002 Apr 10	Test 2
B1L	505.7	497.24	<0.001	2002 Apr 10	Test 3
B1L	505.7	501.04	<0.001	2002 Apr 10	Test 4p
B1M	517.01	507.51	0.32	2002 Apr 15	Test 1
B1M	517.01	511.81	<0.001	2002 Apr 09	Test 2
B1M	521.01	515.81	520	2002 Apr 09	Test 3p
B1M	525.01	519.81	0.002496	2002 Apr 09	Test 4
B1M	529.01	523.81	<0.001	2002 Apr 09	Test 5
B1M	533.01	527.81	0.21	2002 Apr 09	Test 6
BC3U	540.83	530.83	0.0013	2002 Apr 10	Test 1
D2L	489.92	480.42	0.017	2002 Apr 12	Test 1

Well	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Date	Alternate name
D2L	489.92	484.72	<0.001	2002 Apr 12	Test 2
D2L	493.92	488.72	NIR (TE)	2002 Apr 12	Test 3
D2L	497.92	492.72	NIR	2002 Apr 12	Test 4
D2L	501.92	496.72	<0.001	2002 Apr 12	Test 5
D2M	513.2	503.7	20	2002 Apr 11	Test 1
D2M	513.2	508	<0.001	2002 Apr 11	Test 2
D2M	517.2	512	59	2002 Apr 11	Test 3
D2M	521.2	516	<0.001	2002 Apr 11	Test 4
D2M	525.2	520	0.003	2002 Apr 11	Test 5
D2M	529.2	524	<0.001	2002 Apr 11	Test 6
D2M	533.2	528	<0.001	2002 Apr 11	Test 7
D2M	537.2	532	<0.001	2002 Apr 11	Test 8
D2M	541.2	536	<0.001	2002 Apr 11	Test 9
D2U	551.41	541.91	0.51	2002 Apr 11	Test 1
D2U	551.41	546.21	<0.001	2002 Apr 11	Test 2
D2U	555.41	550.21	0.0058	2002 Apr 11	Test 3
D2U	559.41	554.21	<0.001	2002 Apr 11	Test 4
D2U	563.41	558.21	<0.001	2002 Apr 12	Test 5
D2U	567.41	562.21	0.000002	2002 Apr 12	Test 6
D2U	571.41	566.21	14.45	2002 Apr 12	Test 7
D2U	575.41	570.21	NIR (TE)	2002 Apr 12	Test 8
D2U	579.41	574.21	NIR (TE)	2002 Apr 12	Test 9
F1M	501.68	492.18	0.9	2002 Apr 17	Test 1
F1M	501.68	496.48	0.8	2002 Apr 17	Test 2
F1M	505.68	500.48	0.39	2002 Apr 17	Test 3
F1M	509.68	504.48	1000	2002 Apr 17	Test 4p
F1M	513.68	508.48	145	2002 Apr 17	Test 5
F1M	517.68	512.48	0.35	2002 Apr 17	Test 6
F1M	521.68	516.48	0.51	2002 Apr 17	Test 7
F1M	525.68	520.48	0.53	2002 Apr 17	Test 8
F1M	529.68	524.48	0.51	2002 Apr 17	Test 9
F1M	533.68	528.48	0.72	2002 Apr 17	Test 10
F1M	537.68	532.48	0.88	2002 Apr 17	Test 11
F1M	541.68	536.48	0.25	2002 Apr 17	Test 12
F1U	549.51	540.01	0.015	2002 Apr 16	Test 1
F1U	549.51	544.31	<0.001	2002 Apr 16	Test 2
F1U	553.51	548.31	<0.001	2002 Apr 16	Test 3
F1U	557.51	552.31	0.008	2002 Apr 16	Test 4
F1U	561.51	556.31	0.028	2002 Apr 16	Test 5
F1U	565.51	560.31	0.27	2002 Apr 16	Test 6
F1U	569.51	564.31	0.16	2002 Apr 16	Test 7
F1U	573.51	568.31	1.3	2002 Apr 16	Test 8
F1U	577.51	572.31	1.1	2002 Apr 16	Test 9
F1U	581.51	576.31	5	2002 Apr 16	Test 10
F1U	585.51	580.51	9.6	2002 Apr 18	Test 11

Well	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft²/d)	Date	Alternate name
F1U	589.51	584.31	350	2002 Apr 18	Test 12p
F1U	593.51	588.31	182.5	2002 Apr 18	Test 13
F1U	597.51	592.31	413	2002 Apr 18	Test 14
F1U	601.51	596.31	38	2002 Apr 18	Test 15
F2L	480.73	471.23	0.04	2002 Apr 18	Test 1
F2L	480.73	475.53	NIR	2002 Apr 18	Test 2
F2L	484.73	479.53	0.01	2002 Apr 18	Test 3
F2L	488.73	483.53	<0.001	2002 Apr 18	Test 4
F2L	492.73	487.53	0.013	2002 Apr 18	Test 5
F2L	496.73	491.53	0.032	2002 Apr 18	Test 6
H1L	487.14	477.64	1.5	2002 Apr 25	Test 1
H1L	487.14	481.94	1.4	2002 Apr 25	Test 2
H1L	491.14	485.94	48	2002 Apr 25	Test 3
H1M	510.24	500.74	360	2002 Apr 24	Test 1
H1M	510.24	505.04	1070	2002 Apr 24	Test 2p
H1M	514.24	509.04	27	2002 Apr 24	Test 3p
H1M	518.24	513.04	<0.001	2002 Apr 24	Test 4
H1M	522.24	517.04	NIR	2002 Apr 24	Test 5
H1M	526.24	521.04	2.5	2002 Apr 24	Test 6
H1M	530.24	525.04	0.009	2002 Apr 24	Test 7
H1M	534.24	529.04	1.8	2002 Apr 24	Test 8
H1M	538.24	533.04	1.4	2002 Apr 24	Test 9
H1M	542.24	537.04	0.81	2002 Apr 24	Test 10
H1M	546.24	541.04	3.9	2002 Apr 24	Test 11
H1M	550.24	545.04	<0.001	2002 Apr 24	Test 12
H1M	563.74	549.04	<0.001	2002 Apr 24	Test 13
H1U	573.23	563.73	0.049	2002 Apr 23	Test 1
H1U	573.23	568.03	0.24	2002 Apr 23	Test 2
H1U	577.23	572.03	0.047	2002 Apr 23	Test 3
H1U	581.23	576.03	0.029	2002 Apr 23	Test 4
H1U	585.23	580.03	2	2002 Apr 23	Test 5
H1U	589.23	584.03	0.1	2002 Apr 23	Test 6
H1U	593.23	588.03	1.7	2002 Apr 23	Test 7
H1U	597.23	592.03	16	2002 Apr 23	Test 8
H1U	601.23	596.03	37	2002 Apr 23	Test 9
H1U	605.23	600.03	42	2002 Apr 23	Test 10
H1U	609.23	604.03	8.6	2002 Apr 23	Test 11
J1M	515.59	506.09	4040	2002 Apr 15	Test 1p
J1M	514.39	509.19	2200	2002 Apr 05	Test 2p
J1M	518.39	513.19	20.1	2002 Apr 05	Test 3
J1M	522.39	517.19	32	2002 Apr 08	Test 5
J1M	526.59	521.39	2600	2002 Apr 08	Test 6p
J1M	530.59	525.39	<0.001	2002 Apr 08	Test 7
J1M	534.59	529.39	<0.001	2002 Apr 08	Test 8
J1M	538.59	533.39	4.4	2002 Apr 08	Test 9

Well	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Date	Alternate name
J1M	542.69	537.49	<0.001	2002 Apr 08	Test 10
J1M	546.69	541.49	21	2002 Apr 08	Test 11
J1M	550.69	545.49	<0.001	2002 Apr 08	Test 12
J1M	554.69	549.49	<0.001	2002 Apr 08	Test 13
J1M	558.69	553.49	<0.001	2002 Apr 08	Test 14
J1M	562.69	557.49	0.0062	2002 Apr 08	Test 15
J1U	571.76	562.26	0.13	2002 Apr 15	Test 1
J1U	571.76	566.56	0.022	2002 Apr 04	Test 2
J1U	575.76	570.56	0.65	2002 Apr 04	Test 3
J1U	579.76	574.56	0.084	2002 Apr 04	Test 4
J1U	583.76	578.56	0.04	2002 Apr 04	Test 5
J1U	587.76	582.56	89	2002 Apr 04	Test 6p
J1U	591.76	586.56	0.03	2002 Apr 04	Test 7
J5L	490.29	480.79	6.1	2002 May 02	Test 1
J5L	490.29	485.09	<0.001	2002 May 02	Test 2
J5L	494.29	489.09	NIR	2002 May 02	Test 3
J5L	498.29	493.09	<0.001	2002 May 02	Test 4
J5L	502.29	497.09	<0.01	2002 May 02	Test 5
J5L	506.29	501.09	<0.01	2002 May 02	Test 6
J5M	512.77	503.27	2200	2002 May 01	Test 1p
J5M	512.77	507.57	2300	2002 May 01	Test 2p
J5M	516.77	511.57	0.2	2002 May 01	Test 3
J5M	520.77	515.57	0.2	2002 May 01	Test 4
J5M	524.77	519.57	2700	2002 May 01	Test 5
J5M	528.77	523.57	<0.001	2002 May 01	Test 6
J5M	532.77	527.57	0.041	2002 May 01	Test 7
J5M	536.77	531.57	0.62	2002 May 01	Test 8
J5M	540.77	535.57	<0.001	2002 May 01	Test 9
J5M	544.77	539.57	0.78	2002 May 01	Test 10
E6	479.76	470.36	25	2002 Nov 11	Test 1
E6	479.76	474.26	2.2	2002 Nov 11	Test 2
E6	484.26	478.76	0.02	2002 Nov 11	Test 3
E6	488.76	483.26	0.12	2002 Nov 11	Test 4
E6	493.26	487.76	0.13	2002 Nov 11	Test 5
E6	497.76	492.26	0.03	2002 Nov 11	Test 6
E6	502.26	496.76	2.7	2002 Nov 11	Test 7
E6	506.76	501.26	<0.001	2002 Nov 11	Test 8
E6	511.26	505.76	0.01	2002 Nov 11	Test 9
E6	515.76	510.26	<0.001	2002 Nov 12	Test 10
E6	520.26	514.76	<0.001	2002 Nov 12	Test 11
E6	524.76	519.26	16	2002 Nov 12	Test 12
E6	529.26	523.76	4.9	2002 Nov 12	Test 13
E6	533.76	528.26	297	2002 Nov 12	Test 14
E6	538.26	532.76	<0.001	2002 Nov 12	Test 15
E6	542.76	537.26	<0.001	2002 Nov 12	Test 16

Well	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Date	Alternate name
E6	547.26	541.76	0.64	2002 Nov 12	Test 17
E6	551.76	546.26	0.07	2002 Nov 12	Test 18
E6	556.26	550.76	0.3	2002 Nov 12	Test 19
E6	560.76	555.26	6.7	2002 Nov 12	Test 20
E6	565.26	559.76	8.7	2002 Nov 12	Test 21
E6	569.76	564.26	36	2002 Nov 12	Test 22
F6	470.92	461.52	8.6	2002 Nov 05	Test 1
F6	470.92	465.42	8.1	2002 Nov 05	Test 2
F6	475.42	469.92	18	2002 Nov 05	Test 3
F6	479.92	474.42	2.3	2002 Nov 05	Test 4
F6	484.42	478.92	0.002	2002 Nov 05	Test 5
F6	488.92	483.42	3.7	2002 Nov 05	Test 6
F6	493.42	487.92	0.74	2002 Nov 05	Test 7
F6	497.92	492.42	0.06	2002 Nov 05	Test 8
F6	502.42	496.92	0.03	2002 Nov 06	Test 9
F6	506.92	501.42	0.04	2002 Nov 06	Test 10
F6	511.42	505.92	0.01	2002 Nov 06	Test 11
F6	515.92	510.42	0.0007	2002 Nov 06	Test 12
F6	520.42	514.92	0.02	2002 Nov 06	Test 13
F6	524.92	519.42	90	2002 Nov 06	Test 14
F6	529.42	523.92	305	2002 Nov 06	Test 15
F6	533.92	528.42	0.05	2002 Nov 06	Test 16
F6	538.42	532.92	<0.002	2002 Nov 06	Test 17
F6	542.92	537.42	6.4	2002 Nov 06	Test 18
F6	547.42	541.92	0.06	2002 Nov 07	Test 19
F6	551.92	546.42	98	2002 Nov 07	Test 20
F6	556.42	550.92	80	2002 Nov 07	Test 21
I1	472.82	463.42	0.05	2002 Oct 24	Test 1
I1	472.82	467.32	NIR	2002 Oct 24	Test 2
I1	477.32	471.82	0.04	2002 Oct 24	Test 3
I1	481.82	476.32	2.3	2002 Oct 24	Test 4
I1	486.32	480.82	2.6	2002 Oct 25	Test 5
I1	490.82	485.32	0.14	2002 Oct 25	Test 6
I1	495.32	489.82	0.04	2002 Oct 25	Test 7
I1	499.82	494.32	0.14	2002 Oct 25	Test 8
I1	504.32	498.82	0.16	2002 Oct 25	Test 9
I1	508.82	503.32	119	2002 Oct 28	Test 10
I1	513.32	507.82	191	2002 Oct 28	Test 11
I1	517.82	512.32	171	2002 Oct 28	Test 12
I1	522.32	516.82	166	2002 Oct 28	Test 13
I1	526.82	521.32	<0.001	2002 Oct 28	Test 14
I1	531.32	525.82	<0.001	2002 Oct 28	Test 15
I1	535.82	530.32	<0.001	2002 Oct 28	Test 16
I1	540.32	534.82	0.03	2002 Oct 28	Test 17
I1	544.82	539.32	0.01	2002 Oct 28	Test 18

Well	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Date	Alternate name
I1	549.32	543.82	0.79	2002 Oct 28	Test 19
I1	553.82	548.32	7.8	2002 Oct 29	Test 20
I1	558.32	552.82	0.78	2002 Oct 29	Test 21
I1	562.82	557.32	0.08	2002 Oct 29	Test 22
I1	567.32	561.82	5.2	2002 Oct 29	Test 23
I1	571.82	596.32	8.5	2002 Oct 29	Test 24
I1	576.32	570.82	3.3	2002 Oct 29	Test 25
I1	580.82	575.32	4.8	2002 Oct 29	Test 26
I1	585.32	579.82	0.89	2002 Oct 30	Test 27
I1	589.82	584.32	0.28	2002 Oct 30	Test 28
I1	594.32	588.82	2.7	2002 Oct 30	Test 29
I1	598.82	593.32	41	2002 Oct 30	Test 30
H5	457.15	447.75	25	2002 Oct 21	Test 1
H5	457.15	451.65	39	2002 Oct 21	Test 2
H5	461.65	456.15	2.4	2002 Oct 21	Test 3
H5	466.15	460.65	0.92	2002 Oct 21	Test 4
H5	470.65	465.15	0.32	2002 Oct 21	Test 5
H5	475.15	469.65	0.43	2002 Oct 21	Test 6
H5	479.65	474.15	0.25	2002 Oct 21	Test 7
H5	484.15	478.65	0.12	2002 Oct 22	Test 8
H5	488.65	483.15	0.09	2002 Oct 22	Test 9
H5	493.15	487.65	0.22	2002 Oct 22	Test 10
H5	497.65	492.15	0.25	2002 Oct 22	Test 11
H5	502.15	496.65	180	2002 Oct 22	Test 12
H5	506.65	501.15	300	2002 Oct 22	Test 13
H5	511.15	505.65	3.2	2002 Oct 22	Test 14
H5	515.65	510.15	0.11	2002 Oct 22	Test 15
H5	520.15	514.65	0.07	2002 Oct 22	Test 16
H5	524.65	519.15	0.03	2002 Oct 23	Test 17
H5	529.15	523.65	0.005	2002 Oct 23	Test 18
H5	533.65	528.15	<0.001	2002 Oct 23	Test 19
H5	538.15	532.65	<0.001	2002 Oct 23	Test 20
H5	542.65	537.15	<0.001	2002 Oct 23	Test 21
H5	529.15	541.65	3	2002 Oct 23	Test 22
H5	551.65	546.15	1.6	2002 Oct 23	Test 23
H5	556.15	550.65	0.04	2002 Oct 23	Test 24
H5	560.65	555.15	0.18	2002 Nov 07	Retest 25
H5	565.15	559.65	1.2	2002 Nov 07	Retest 26
H5	569.65	564.15	0.012	2002 Nov 07	Retest 27
H5	574.15	568.65	0.009	2002 Nov 07	Retest 28
H5	578.65	573.15	0.014	2002 Oct 24	Test 29
H5	583.15	577.65	0.11	2002 Oct 24	Test 30
H5	587.65	582.15	0.07	2002 Oct 24	Test 31
H5	592.15	586.65	0.02	2002 Nov 07	Test 32
H5	596.65	591.15	2.4	2002 Nov 07	Test 33

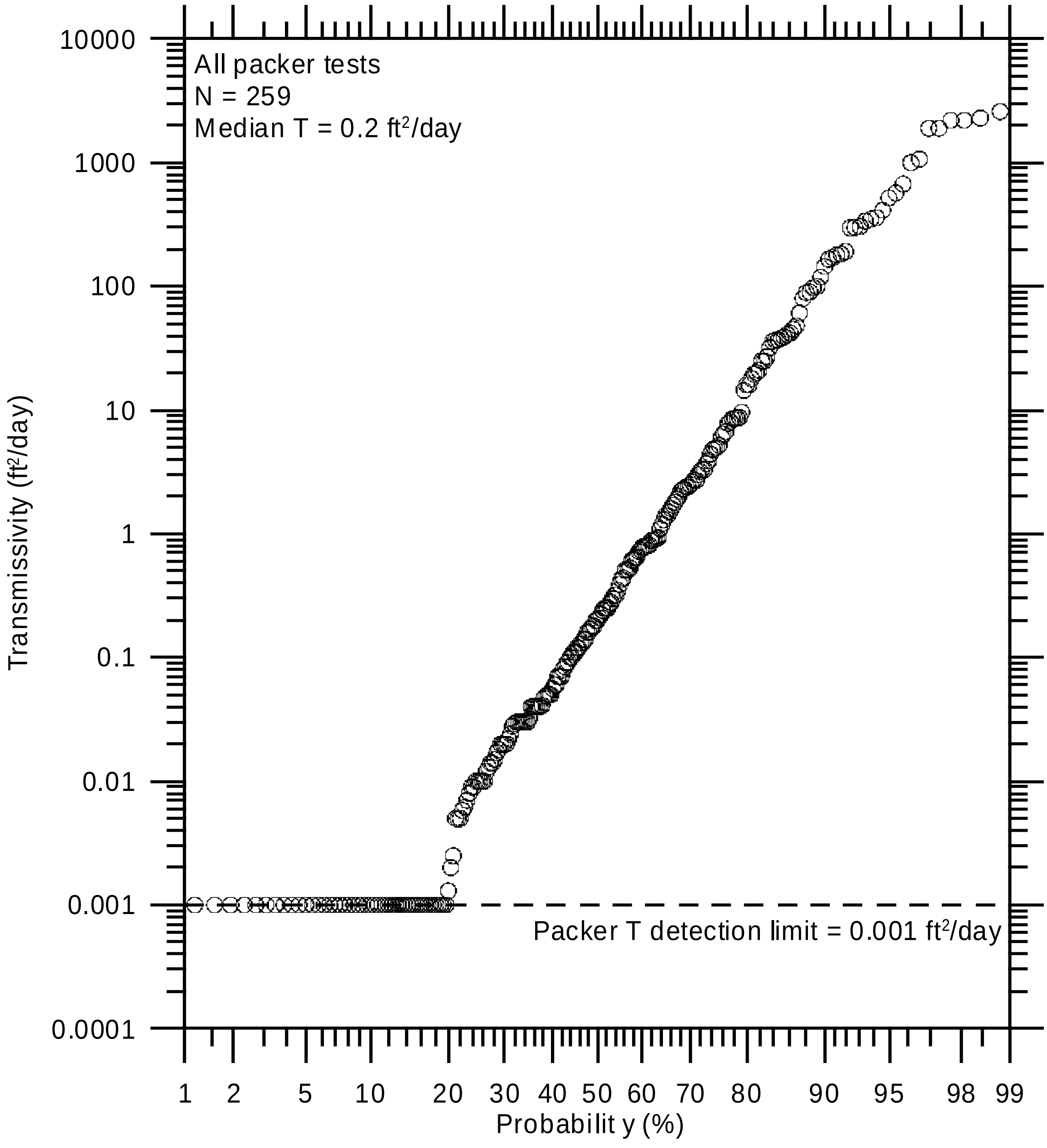


Figure 10. Probability Plot of All Packer Test Results

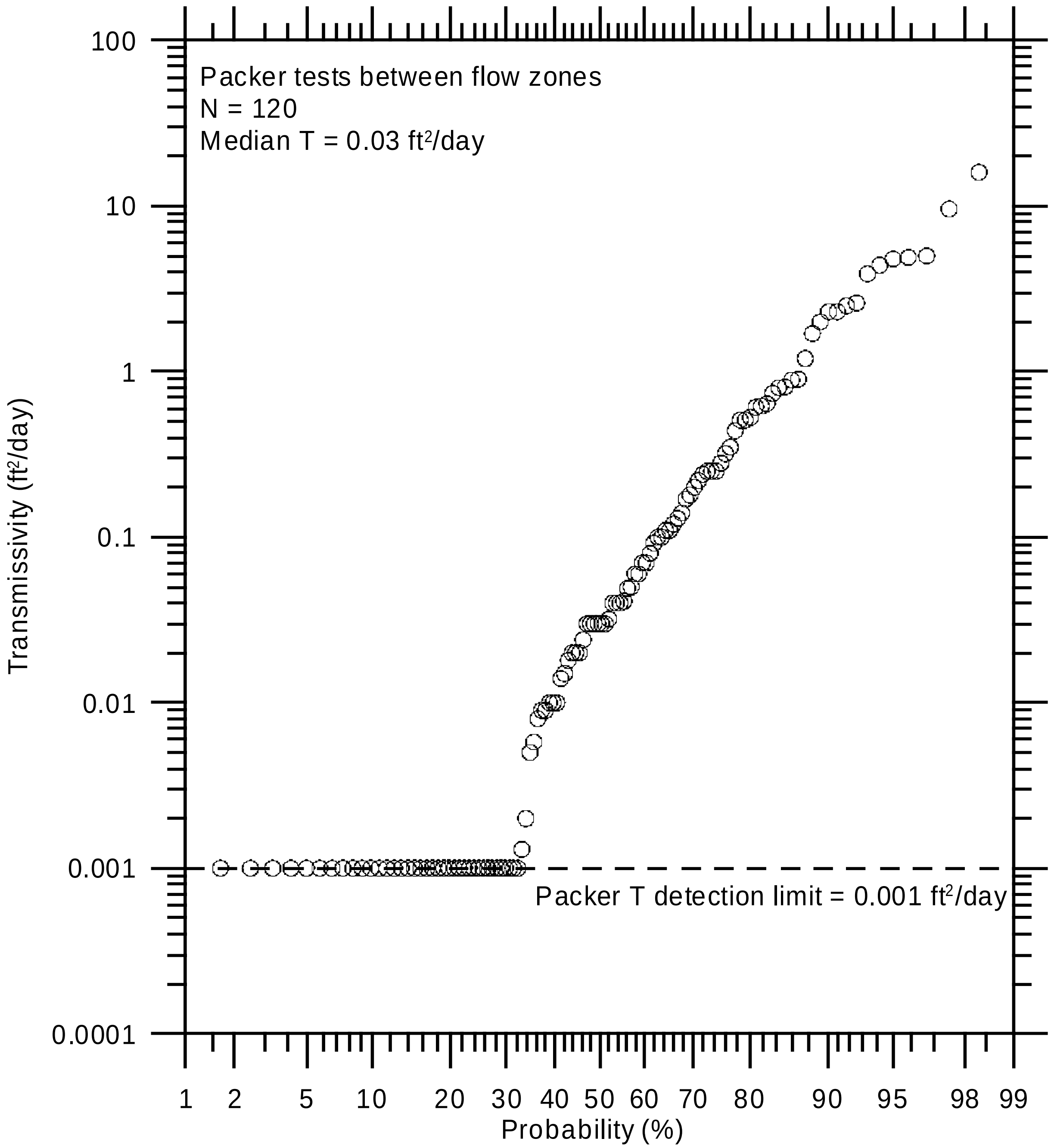


Figure 11. Probability Plot of Packer Test Results Between Flow Zones (Aquitards)

Section 7
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APPENDICES

Appendix A

Estimation of Transmissivity from Specific Capacity Measurements During the Packer Pumping Tests

Memorandum

Date: January 14, 2003

From: Christopher J. Neville

To: File

SSPA Project: 610

Re: **Estimation of transmissivity from specific capacity measurements during the packer pumping tests**

R:\ssp610\SCR_Hydrology\Packer testing\Specific capacity\SSP-610_Specific capacity (CJN 2003-Jan-14).doc

1. Introduction

During the packer testing carried out for the Hyde Park Site Hydrologic Characterization, pumping tests have been conducted in the most transmissive intervals. We have analyzed the results of the pumping tests using conventional methods of interpretation (that is, the Theis solution incorporating skin and wellbore losses). We have also checked our interpretations with the specific capacity values derived from the pumping tests. Analyses of the specific capacity provide an approximate alternative estimate of the transmissivity; this alternative estimate serves as a simple and rapid check on the interpretations. This memorandum describes our methodology for analyzing the specific capacity.

2. Theory of specific capacity

The specific capacity is defined as the ratio of the pumping rate (Q) and the drawdown in the pumping well (s_w):

$$SC = \frac{Q}{s_w} \tag{1}$$

If well losses and any effects of wellbore storage are neglected, the drawdown in the pumping well can be estimated by evaluating the Theis solution at the radius of the wellbore, r_w:

$$s_w = \frac{Q}{4\pi T} W\left(\frac{r_w^2 S}{4Tt}\right) \tag{2}$$

In Equation (2), T and S designate the transmissivity and storage coefficient, t denotes the elapsed time of pumping at which the drawdown is measured, and W(•) is the Theis function, or exponential integral.

We can rearrange (2) to obtain an expression for the specific capacity:

$$SC = \frac{Q}{s_w} = \frac{4\pi T}{W\left(\frac{r_w^2 S}{4Tt}\right)} \tag{3}$$

In theory, by specifying the well radius and storage coefficient, we can derive an estimate of the transmissivity from a known value of the specific capacity.

3. Methodology for estimating transmissivity from the specific capacity at the Hyde Park site

Equation (3) is an implicit function of the transmissivity *T*. Although it is possible to estimate *T* using a root-finding algorithm, Theis and co-workers (1963) developed a simple graphical method to estimate *T*. For a particular well size and duration of pumping, it is possible to use Equation (3) directly to plot the relation between the *SC* and *T*. The transmissivity can then be estimated directly from the plot.

For the Hyde Park packer testing, the diameter of an open holes is typically $3^{7}/_{8}$-inches (r_w = 0.162 ft), and the duration of pumping (t) is 10 minutes. The relationship between transmissivity and specific capacity for these values of r_w and t is plotted on Figure 1, for a likely range of storage coefficients ($S = 10^{-6}$ to 10^{-4}). The results plotted on Figure 1 demonstrate that the specific capacity is relatively insensitive to the value assumed for the storage coefficient.

The results shown on Figure 1 further demonstrate that the specific capacity relation is nearly linear over the transmissivity range of 10 to 10,000 ft^2/day. This suggests that it may not even be necessary to use Figure 1 to estimate the transmissivity given the specific capacity. This idea is examined in the next section.

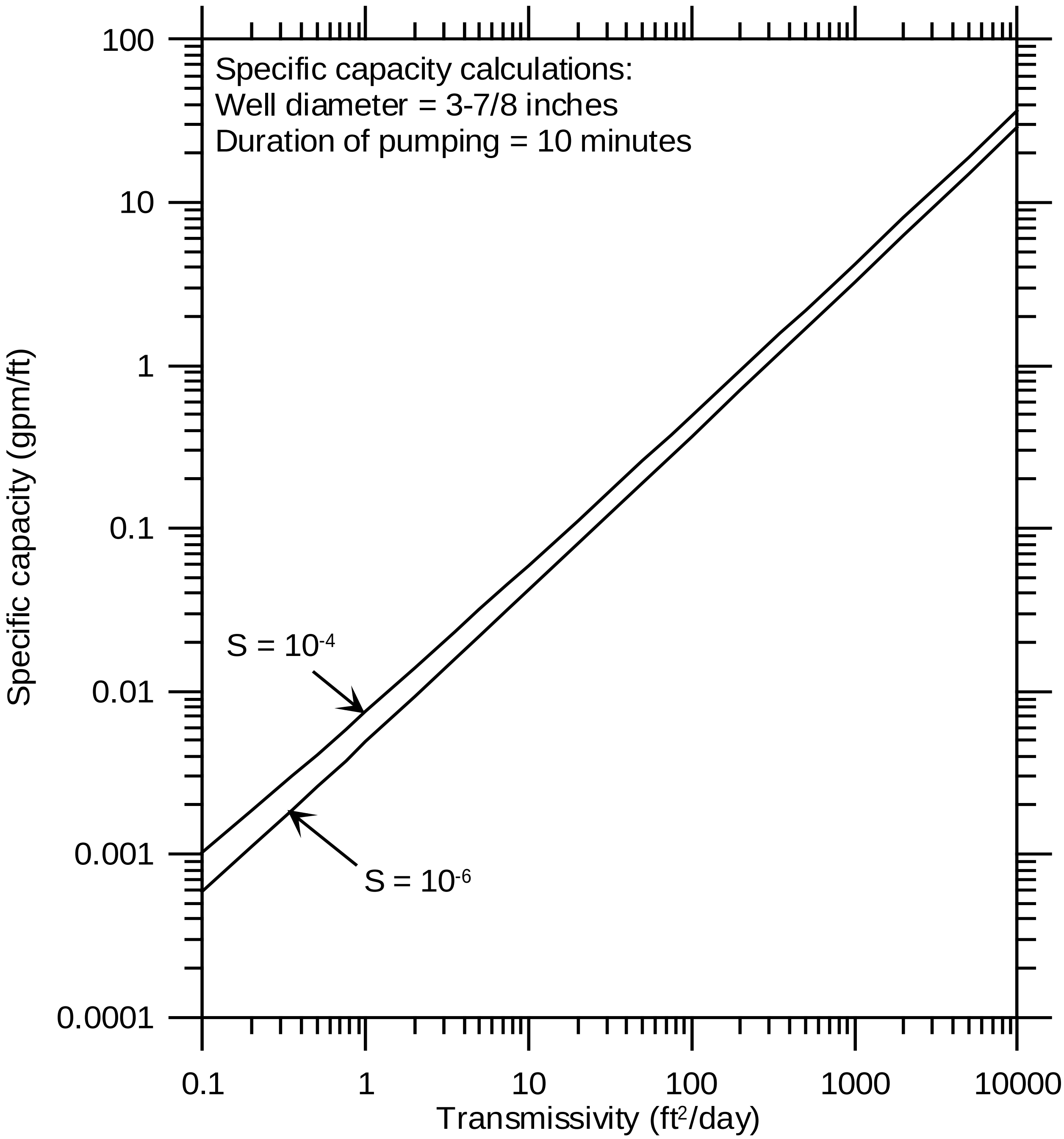


Figure 1. Specific capacity-transmissivity relation (typical Hyde Park parameters)

4. First-approximation of transmissivity from the specific capacity

Over the transmissivity range of 10 to 10,000 ft^2/day we estimate that:

$$T = (200 \; to \; 300) \; SC \tag{4}$$

This relation requires that the pumping rate be expressed in units of U.S. gallons per minute (gpm), the drawdown be expressed in units of feet, and the transmissivity be expressed in units of ft^2/day.

As a first-order approximation, we suggest using the following simple relation to check the interpretations of the pumping tests:

$$T = 250 \; SC \tag{5}$$

The simplified relation (5) is superimposed on the exact results on Figure 2. The good match between Equation (5) and the exact results suggests that Equation (5) is a reasonable estimator.

The leading coefficient is somewhat smaller than values adopted for typical production well tests (Walton, 1970, p. 317-318). However, it should be noted that the figures of Walton that are generally cited presume larger diameter wells (12 inches) and much longer durations of pumping (8 to 24 hours). The leading coefficient is very close to that inferred from Walton's plot that most closely matches the Hyde Park conditions (his Figure 5.5, p. 316, which assumes a 12 inch diameter well and 10 minutes of pumping).

5. References

Theis, C.V., R.H. Brown, and R.R. Meyer, 1963: Estimating the transmissibility of aquifers from the specific capacity of wells, in *Methods of Determining Permeability, Transmissivity,and Drawdown*, R. Bentall (ed.), United States Geological Survey Water Supply Paper 1536-I pp. 331-341.

Walton, W.C., 1970: **Groundwater Resource Evaluation**, McGraw-Hill, New York, New York.

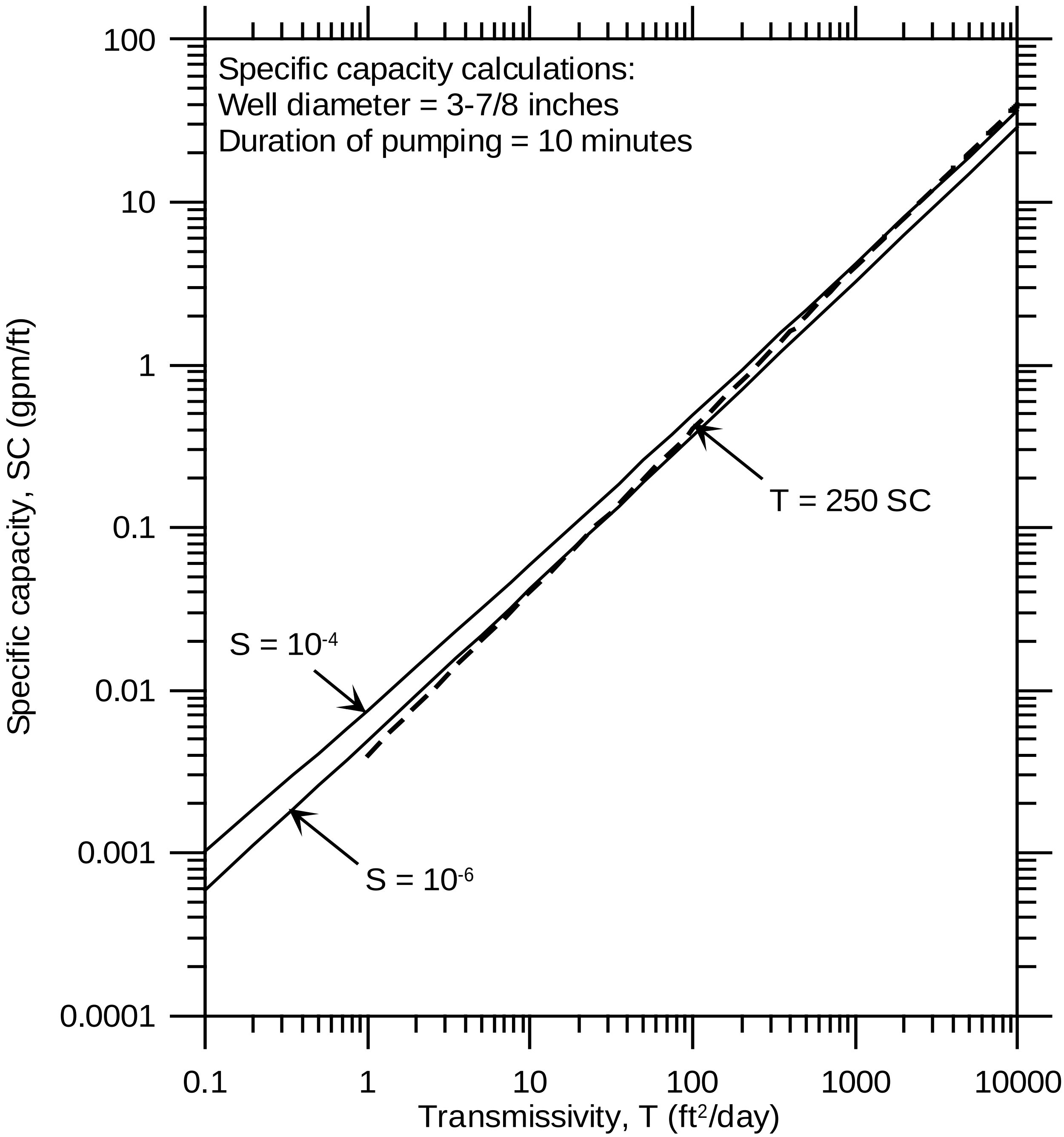


Figure 2. Simplified specific capacity-transmissivity relation

Appendix B

Analyses of "Uncharacteristic" Responses to Pumping

Memorandum

Date: January 15, 2003

From: J. P. Keizer and C.J. Neville

To: File

SSPA Project: 610

Subject: Analyses of "Uncharacteristic" Responses to Pumping

R:\ssp610\SCR_Hydrology\Packer testing\Notes\SSP-610 Memo_Diagnosis of uncharacteristic responses to pumping.doc

1. Introduction

In this memorandum we present the results from packer tests for which the responses during the pumping test are irregular. Irregular responses were observed for five tests:

- AGW-2M (Test 5; 527.5 to 522.3 ft MSL);
- F1M (Test 5; 513.7 to 508.5 ft MSL);
- H1M (Test 1; 510.2 to 500.7 ft MSL);
- J1M (Test 2; 514.4 to 509.2 ft MSL); and
- J5M (Test 5; 524.8 to 519.6 ft MSL).

The responses for these five tests share two features:

1. Water can be injected at a relatively high rate without causing a very large increase in the pressure in the packed-off interval; and
2. Injection is followed by little or no recovery.

The responses to pumping observed during these tests suggest that the intervals are transmissive, but the recovery responses are more typical of tight intervals. We have called these responses “uncharacteristic”, as they do not conform to the typical responses observed for either transmissive or non-transmissive intervals.

This memorandum has been prepared to achieve two objectives. First, the memorandum contains a summary of the responses that are unusual and for which the transmissivity estimates are less reliable. These responses may be characteristic of a special condition in the bedrock. Second, this memorandum provides background information on how the data from these intervals were interpreted to estimate the transmissivity.

2. Characteristic Responses to Pumping

Prior to examining the unusual responses, we should have an idea of what we believe are representative responses to pumping.

Injection in transmissive intervals

The response for a packer interval that straddles a transmissive flow zone is shown below. The injection causes a rise in the water level that dissipates relatively soon after pumping stops.

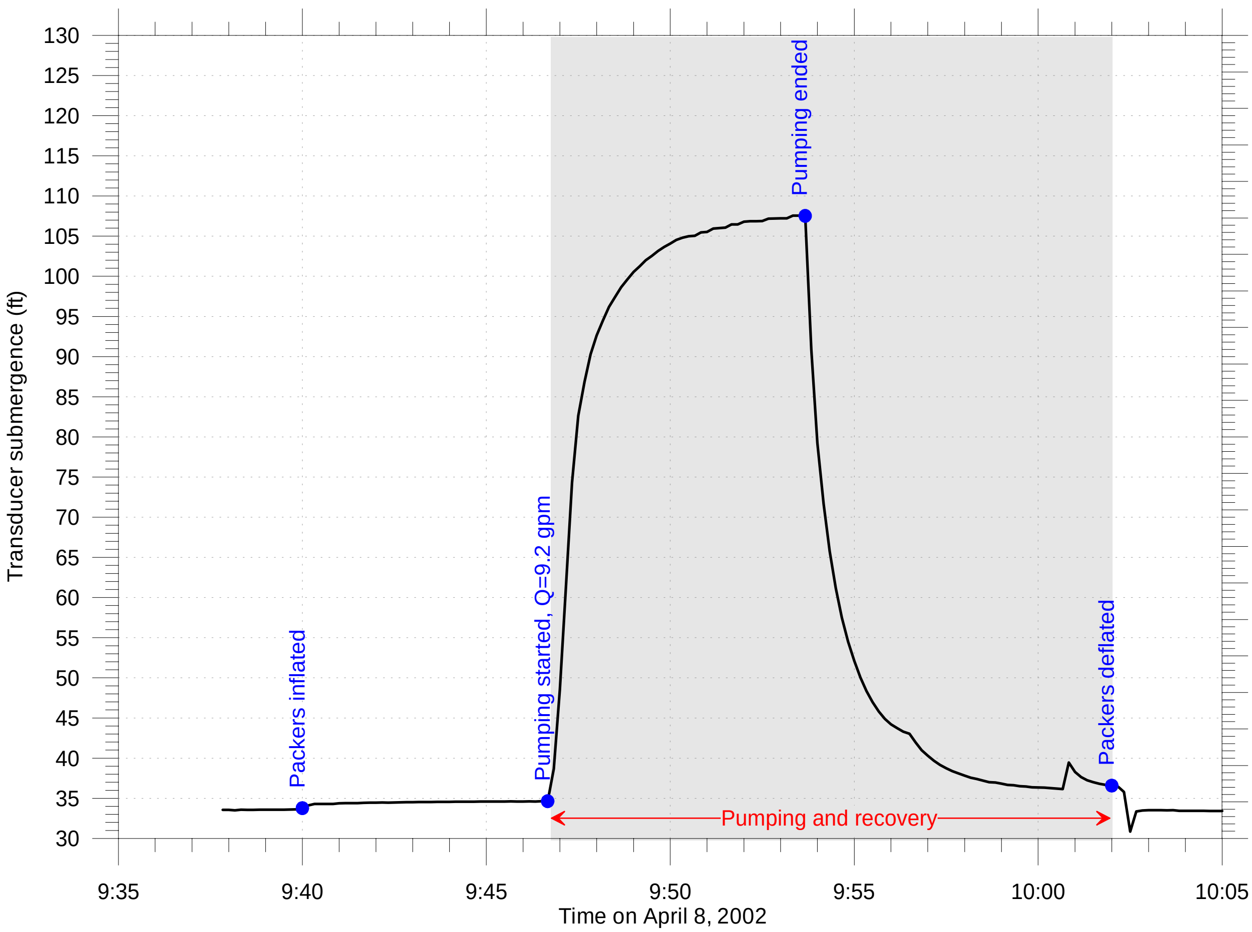


Figure 2.1. Pumping test at J1M, Test 5 (522.4 to 517.2 ft MSL)

Injection in non-transmissive intervals

If a packed-off interval does not intersect a flow zone, then we expect the pressure in the interval to rise quickly during pumping, following by little or no dissipation after pumping stops. An example of this response is plotted below. For this test in H1M, the head rise is consistent with no loss of injected water to the formation.

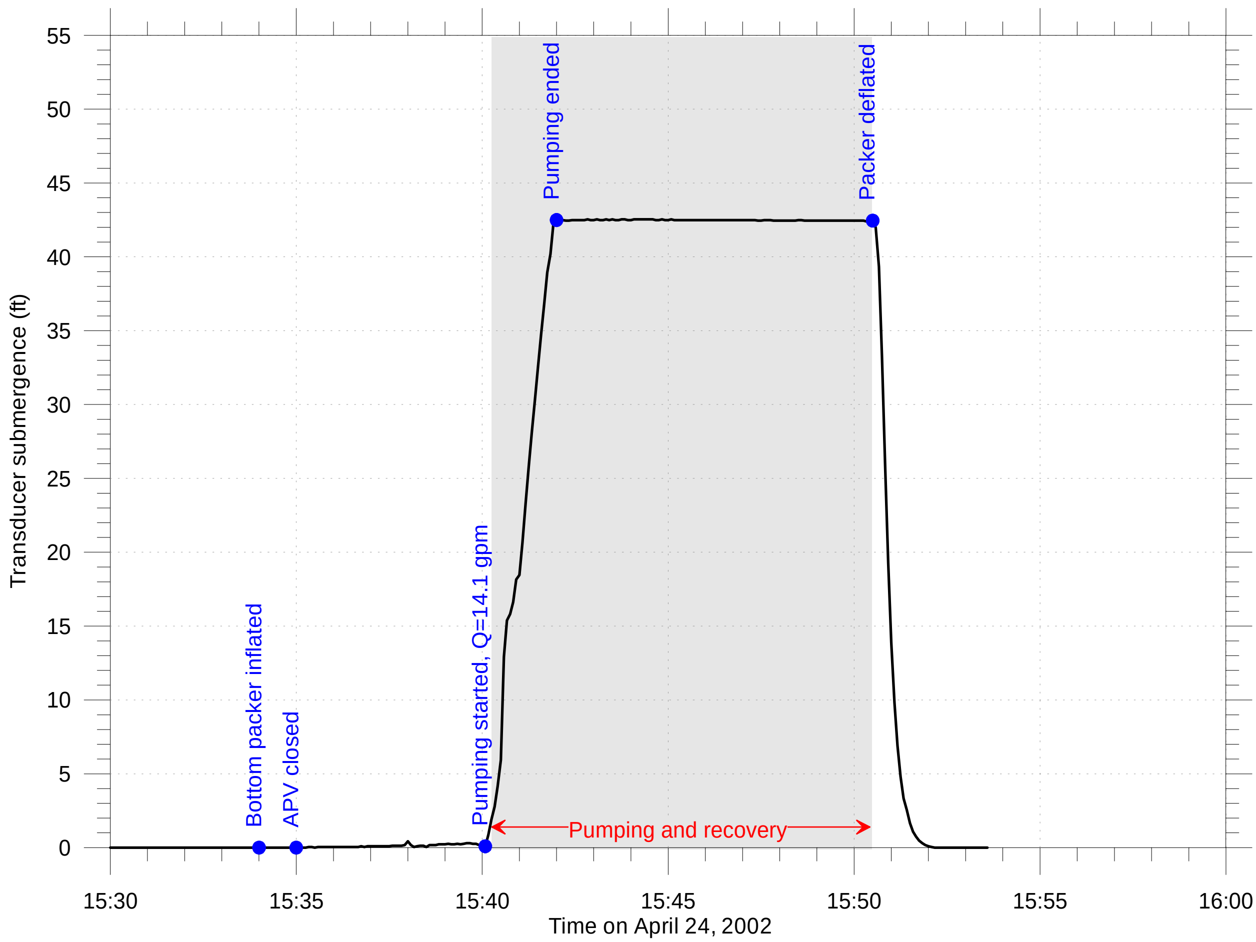


Figure 2.2. Pumping test at H1M, Test 13 (563.7 to 549.0 ft MSL)

We note that the recorded transducer submergence at the start of pumping is ~0, indicating that the interval was dry prior to injection. This does not materially affect the conclusion that the interval is tight.

3. Uncharacteristic test responses

3.1. AGW-2M (Test 5; 527.5 to 522.3 ft MSL)

The pumping test is indicated by the gray box on Figure 3.1.

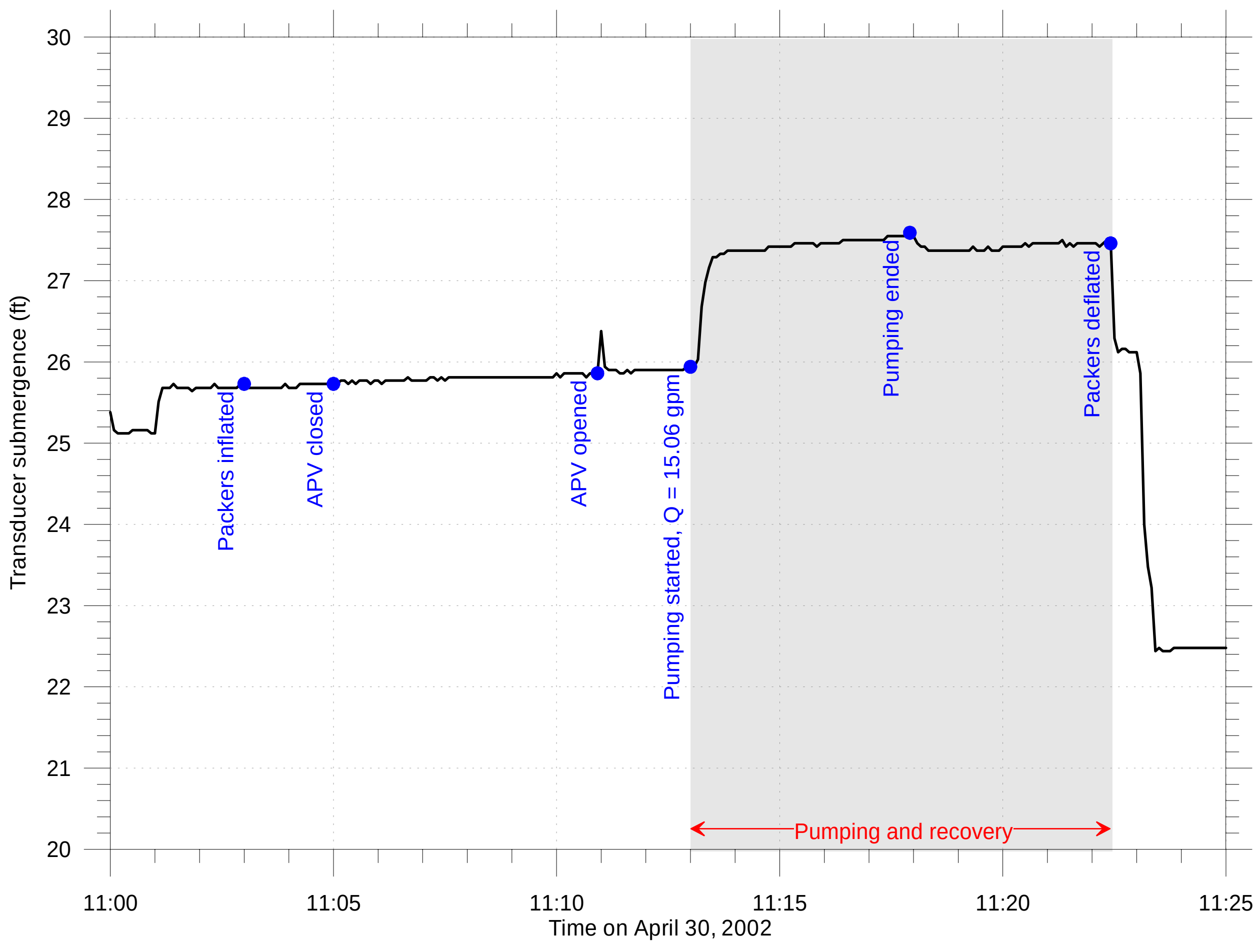


Figure 3.1. Packer testing at AGW-2M, Test 5 (527.5 to 522.3 ft MSL)

According to the field notes, the pumping test was started at 11:13, and pumping was stopped at 11:18. These times are consistent with the transducer record. The uncharacteristic portion of the test follows the end of pumping. As shown on Figure 3.1, the water level remains approximately constant, with only 0.2 ft recovery from a pumping drawdown of about 1.5 ft.

3.2. F1M (Test 5; 513.7 to 508.5 ft MSL)

The pumping test is indicated by the gray box on Figure 3.2.

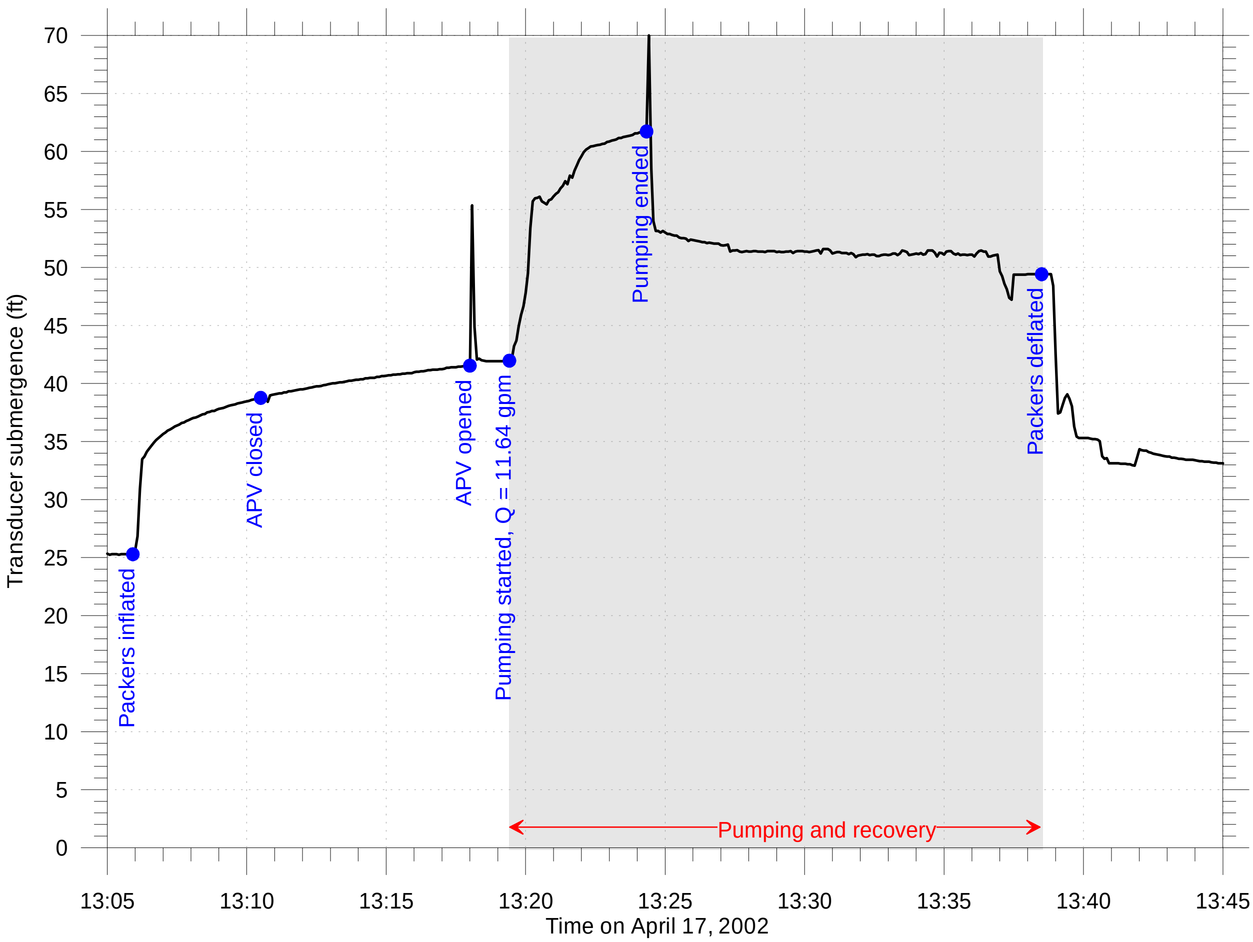


Figure 3.2. Packer testing at F1M, Test 5 (513.7 to 508.5 ft MSL)

According to the field notes, the pumping test was started at 13:21, and pumping stopped at 13:26. The rapid water level rise starting at 13:19:33 suggests that pumping started slightly earlier. The transducer record also suggests that pumping stopped earlier, at 13:24:23. The spike in the pressure response immediately following the end of pumping is likely an artifact due to the shutting down of the pump as it commonly appears in the responses to pumping. The uncharacteristic portion of the test follows the end of pumping. As shown on Figure 3.2, after pumping stops the water level stabilizes immediately at a level 10 ft higher than that observed prior to pumping.

3.3. H1M (Test 1; 510.2 to 500.7 ft MSL)

The pumping test is indicated by the gray box on Figure 3.3.

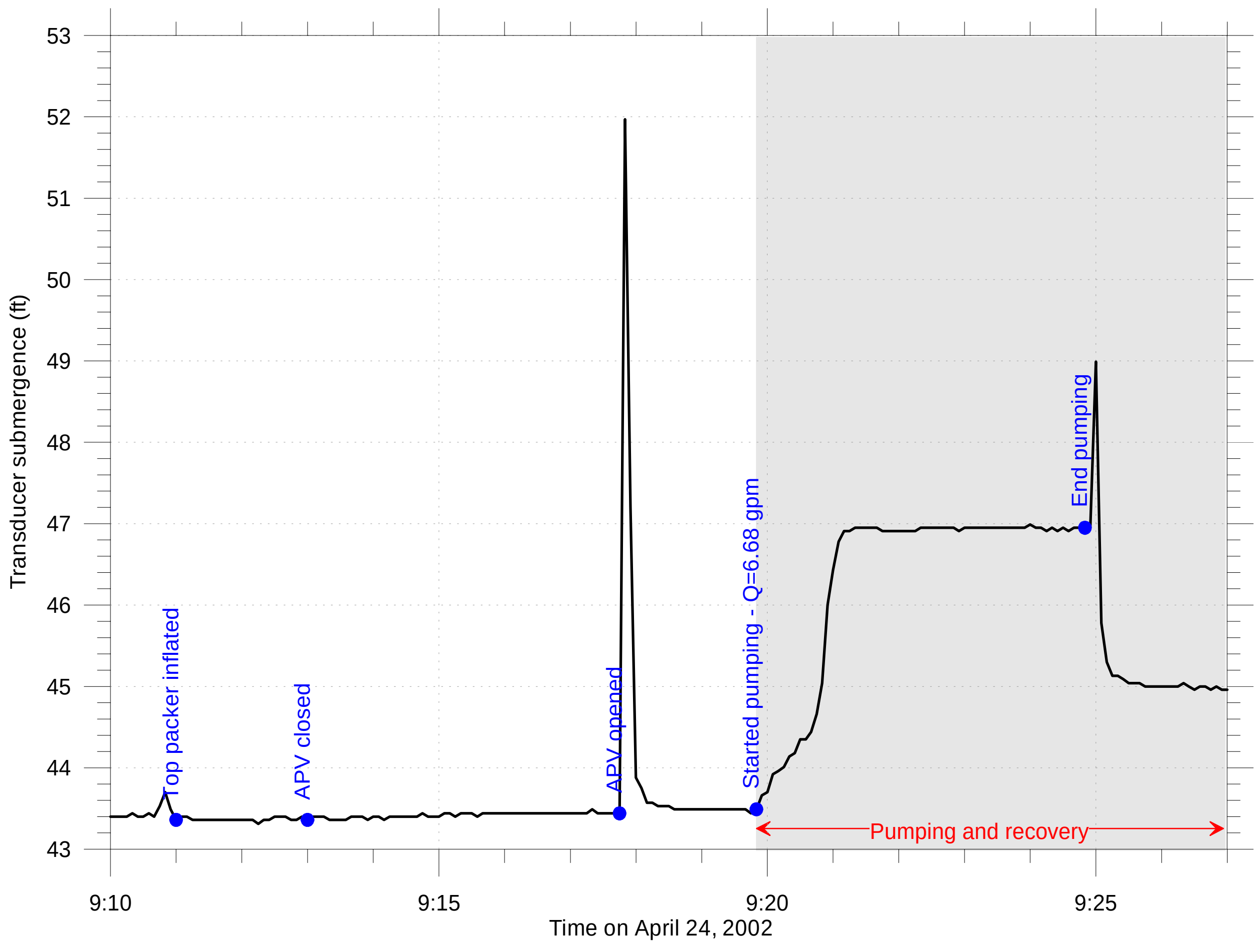


Figure 3.3. Packer testing at H1M, Test 1 (510.2 to 500.7 ft MSL)

According to the field notes, the pumping test was started at 09:20, and pumping was stopped at 09:25. The rapid increase in the water level is consistent with this starting time. A spike in the water level, likely due to the pump itself, immediately follows the end of pumping. The uncharacteristic portion of the test follows the end of pumping. As shown on the Figure 3.3, the water level recovers to a level about 1.6 ft higher than that observed prior to pumping.

3.4. J1M (Test 2; 514.4 to 509.2 ft MSL)

The pumping test is indicated by the gray box on Figure 3.4.

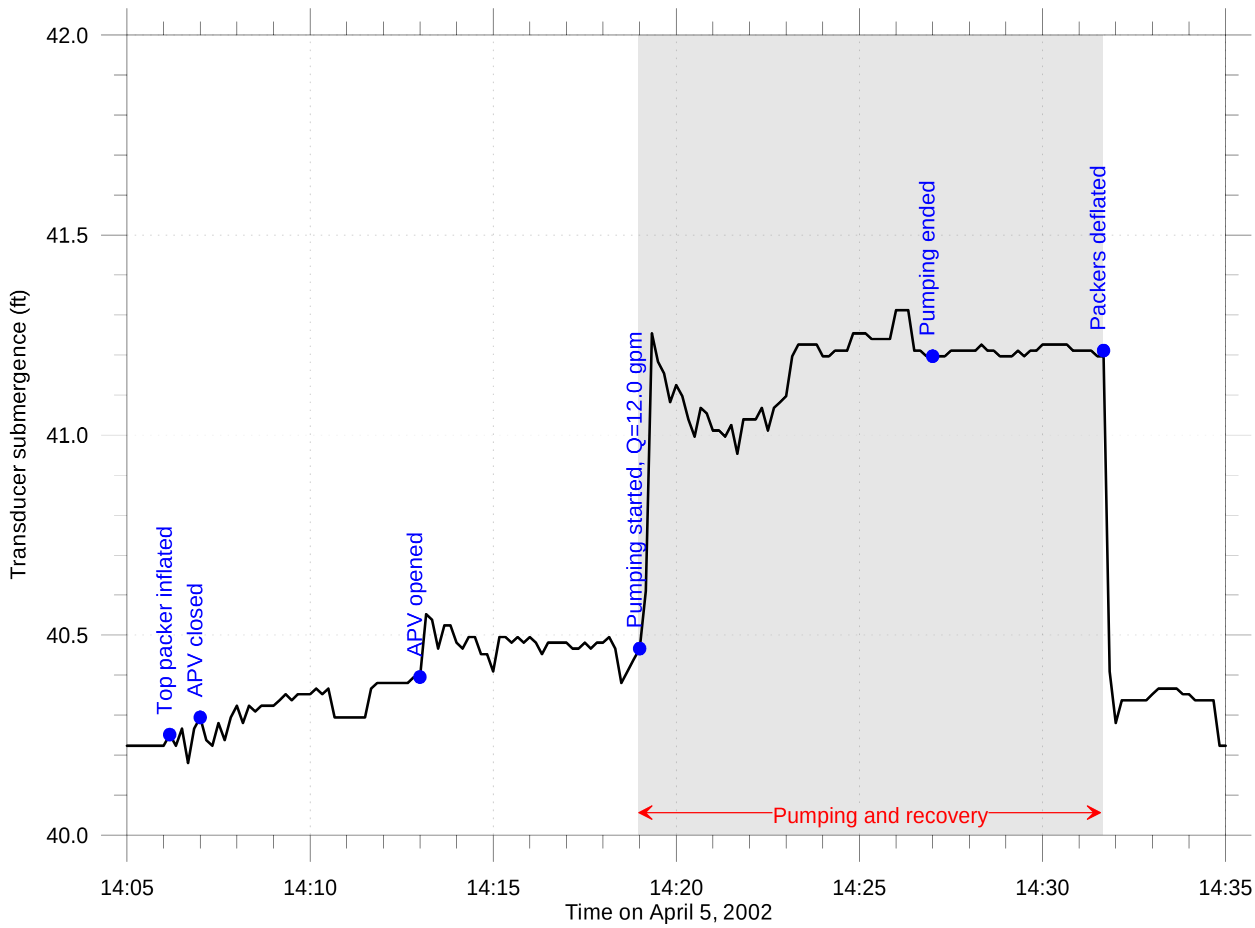


Figure 3.4. Packer testing at J1M, Test 2 (514.4 to 509.2 ft MSL)

According to the field notes, the pumping test was started at 14:18. Because of the noise in the record, it is not possible to confirm the exact start of pumping. The rapid rise in the water level suggests that pumping actually started about one minute later. The field notes indicate that pumping stopped at 14:27, which is consistent with the transducer record. As with the other tests, the recovery portion of the response is not characteristic of a transmissive interval. As shown on Figure 3.4, the water level remains approximately constant after pumping is stopped, with no detectable recovery.

3.5. J5M (Test 5; 524.8 to 519.6 ft MSL)

The pumping test is indicated by the gray box on Figure 3.5.

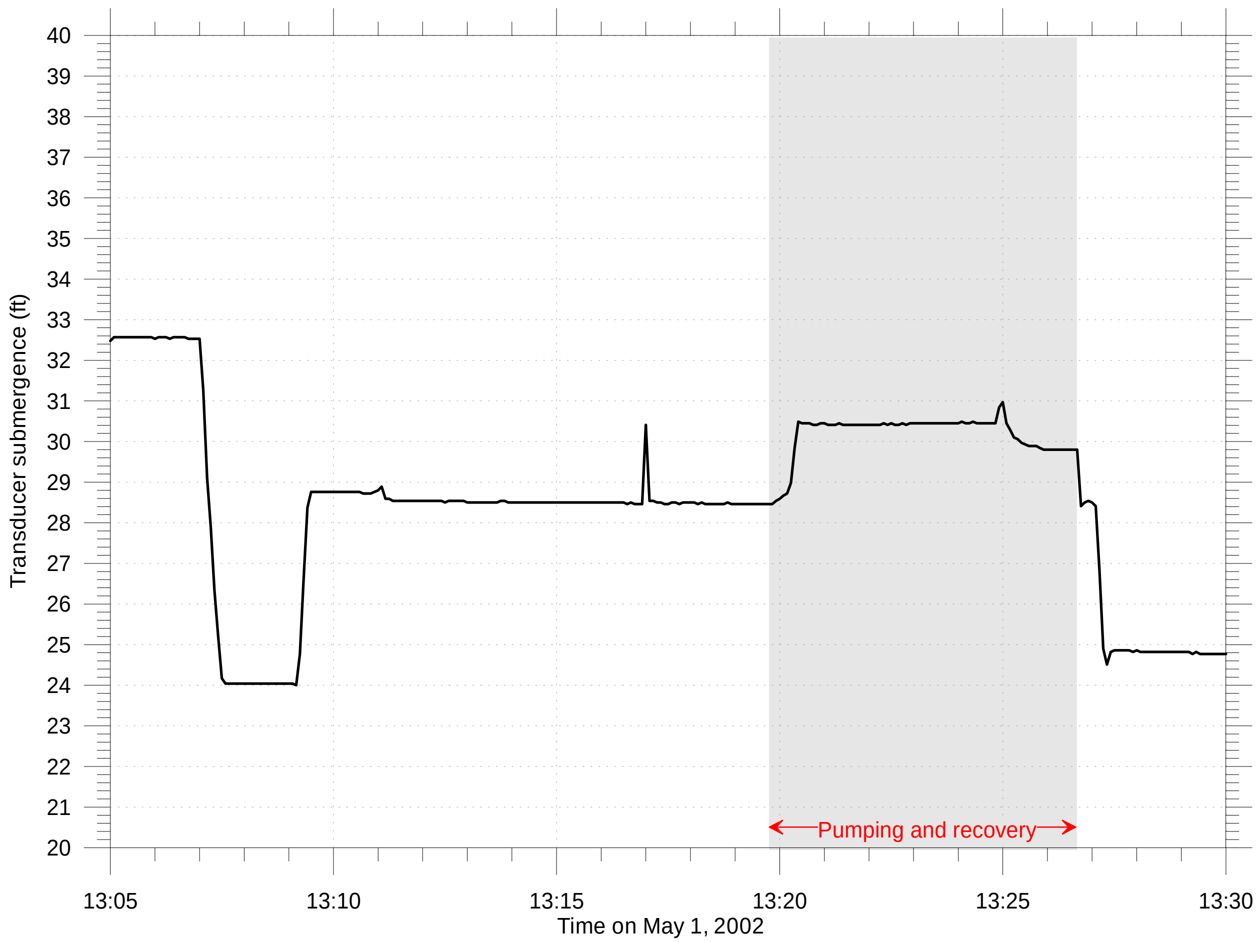


Figure 3.5. Packer testing at J5M, Test 5 (524.8 to 519.6 ft MSL)

According to the field notes, pumping started at 13:20, and stopped at 13:25. These times are consistent with the transducer record. The uncharacteristic portion of the test follows the end of pumping. As shown on Figure 3.5, the water level rises immediately after pumping stops, and then remains approximately constant, with recovery of only about 0.65 ft of the 2 ft drawdown.

4. Estimation of transmissivity from the uncharacteristic responses

4.1. AGW-2M (Test 5; 527.5 to 522.3 ft MSL)

The pumping test was analyzed using the Theis solution, and the transmissivity was estimated at 2300 ft^2/day. The theoretical fit to the data is Figure 4.1. Only the drawdown portion of the test was fit. It was necessary to supplement the Theis solution with the well skin model of Ramey (1982) to obtain a reasonable match to the drawdown record. The fitted dimensionless well skin parameter (S_w) was –2.1; negative values suggest the presence of a zone of enhanced permeability around the well.

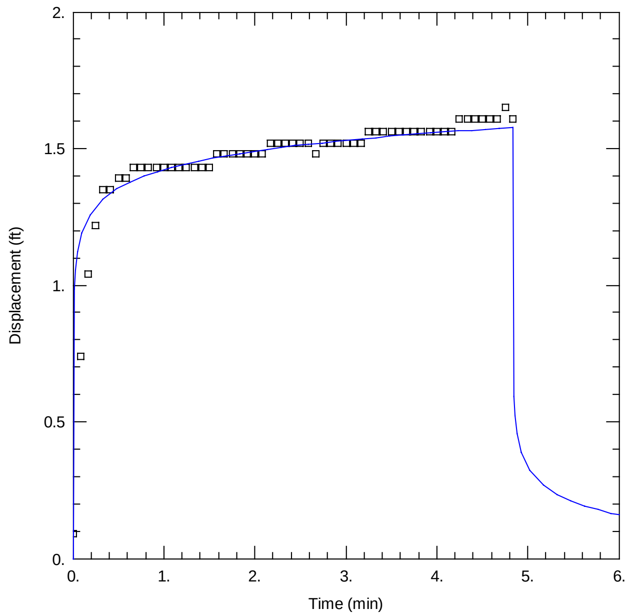


Figure 4.1. AGW-2M (Test 5) - Fit of drawdown portion of pumping test

Alternate analysis

An alternate estimate of the transmissivity can be obtained by using a steady-state analysis. For this test we will assume that near-steady conditions are achieved at the end of the test. The Thiem solution for the transmissivity is written as:

$$T = \frac{Q}{2\pi} \frac{\ln\left(\frac{R}{r_w}\right)}{\Delta H}$$

where T is the transmissivity, R is the radius of influence of the test, r_w is the radius of the well, Q is the pumping rate, and ΔH is the steady-state water level rise due to injection. The average rate of injection during the test was 15.1 gpm, which caused a maximum water level increase of 1.6 ft. Assuming a radius of influence of 10 m (Novakowski et al., 1999), and specifying r_w of 0.162 ft ($3^7/_8$-inch diameter well) yields a transmissivity of 1500 ft^2/day. This value is consistent with the transmissivity estimated with the Theis transient analysis.

Our final estimate of the transmissivity is the average value from the transient and steady-state analyses, 1900 ft^2/day.

4.2. F1M (Test 5; 513.7 to 508.5 ft MSL)

The average rate of injection during the pumping test was 11.6 gpm, which resulting in a head rise in the well of approximately 6.5 ft. It is not possible to estimate the transmissivity for this interval by matching the entire response to pumping, as the water level stabilized during the recovery period instead of returning to the pre-test level. The test was analyzed by ignoring the data from the recovery portion of the test.

Additional hydraulic mechanisms had to be invoked to obtain a good fit to the drawdown record. The Theis solution was supplemented by considering a skin around the well. A transmissivity of 60 ft^2/day and storage coefficient of 10^{-6} were estimated from a computer-assisted fit of the drawdown portion of the data. The fitted dimensionless well skin parameter (S_w) was –5. A negative well skin parameter indicates the presence of a zone of enhanced permeability around the well. The match to the data is shown on Figure 4.2.

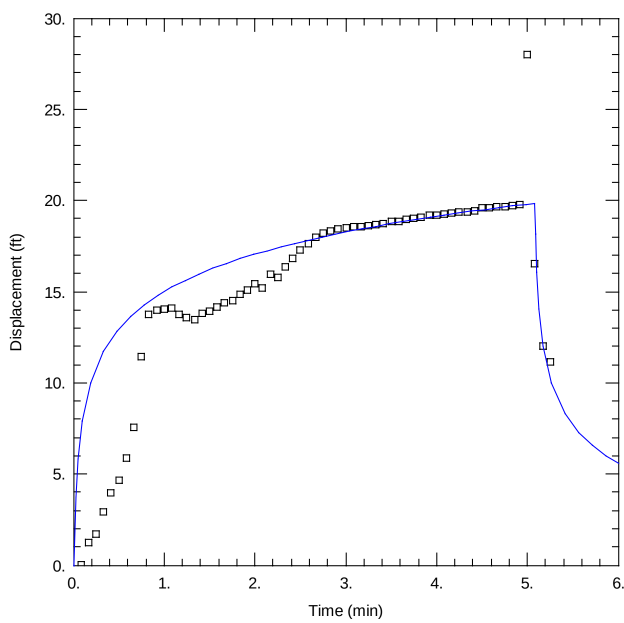


Figure 4.2. F1M (Test 5) - Fit of pumping portion of pumping test

Alternate analysis

The transducer record suggests that the conditions began stabilizing about 2.5 minutes after pumping started. Assuming that the head rise of 6.5 ft is the steady condition from pumping at 11.6 gpm, transmissivity may be estimated using the Thiem solution for steady flow applied in the immediate vicinity of the well:

Assuming a radius of influence *R* of 10 m (Novakowski et al., 1999) and using $r_w = 0.162$ ft ($3\ ^7/_8$-inch diameter well), we calculate a transmissivity of 290 ft^2/day. This alternate estimate of the transmissivity is considerably higher than the transmissivity estimated from the transient data.

Our final estimate of the transmissivity for this interval is taken as the average result from the transient and steady-state analyses, 145 ft^2/day. This is an approximate value because the recovery portion of the response was irregular.

4.3. H1M (Test 1; 510.2 to 500.7 ft MSL)

The pumping test was analyzed using the Theis solution, matching only the drawdown portion of the response. A transmissivity of 560 ft^2/day was estimated. The theoretical fit to the data is shown on Figure 4.3.

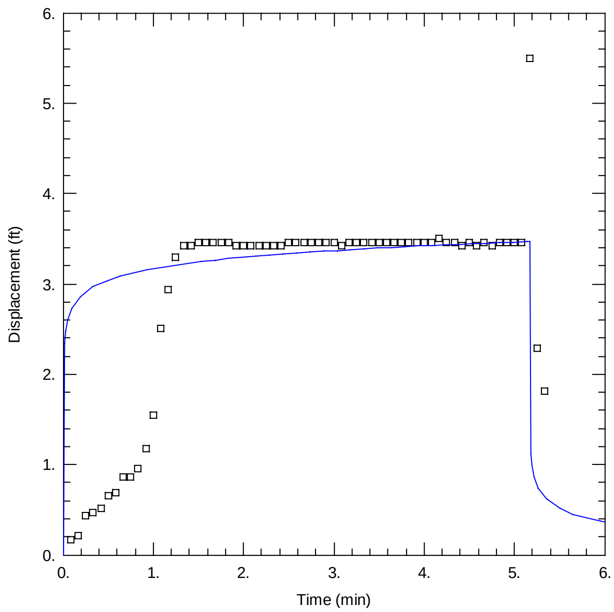


Figure 4.3. H1M (Test 1) - Fit of drawdown portion of pumping test

Alternate analysis

The results of the pumping phase can also be interpreted using a steady-state analysis, assuming that near-steady conditions were achieved at the end of the test. For an average rate of injection of 6.7 gpm, and a steady-state head rise of approximately 3.5 ft in the well, the Thiem solution yields a transmissivity of 310 ft^2/day.

Our final estimate of the transmissivity for this interval is 360 ft^2/day. This value corresponds to the approximate mean of all available tests, including a slug test conducted prior to the pumping test.

4.4. J1M (Test 2; 514.4 to 509.2 ft MSL)

The average rate of injection during the pumping test was 12.0 gpm, which resulted in a head rise in the well of about 0.85 ft. It is not possible to estimate the transmissivity for this interval by matching the entire response to pumping, as no recovery is observed following the end of pumping. The test was analyzed by ignoring the data from the recovery portion of the test.

Additional hydraulic mechanisms had to be invoked to obtain a good fit to the drawdown record. First, the Theis solution was supplemented with turbulent head losses of the form CQ^2. This did not yield a noticeable improvement in the match. A reasonable match to the drawdown pattern was achieved with the well skin model of Ramey (1982). A transmissivity of 2100 ft^2/day and storage coefficient of 3 x 10^{-5} were estimated from a computer-assisted fit of the drawdown portion of the data, along with a dimensionless well skin parameter (S_w) of –5. A negative well skin parameter indicates the presence of a zone of enhanced permeability around the well. The match to the data is shown on Figure 4.4.

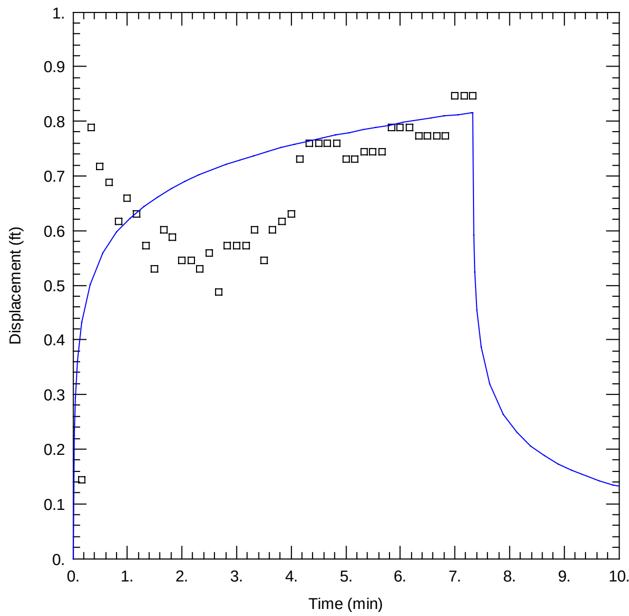


Figure 4.4. J1M (Test 2) - Fit of drawdown portion of pumping test

Alternate analysis

The results of the pumping phase can also be interpreted using a steady-state analysis, assuming that near-steady conditions were achieved at the end of the test. For an average rate of injection of 12.0 gpm, and a steady-state head rise of 0.85 ft in the well, the Thiem solution yields a transmissivity of 2300 ft^2/day.

This alternate estimate of the transmissivity agrees well with the value estimated from the transient flow analysis.

Our final estimate of the transmissivity for this interval is 2200 ft^2/day. This is an approximate value because:

- The entire testing response was very noisy; and
- There was no recovery observed following the end of the pumping.

4.5. J5M (Test 5; 524.8 to 519.6 ft MSL)

The pumping test was analyzed using the Theis solution. Only the drawdown portion of the data was considered in the analysis. The Ramey (1982) model of a well skin had to be invoked to yield an acceptable match to the data. The fitted transmissivity is 1800 ft^2/day and the dimensionless skin parameter S_w is –2. The negative value of the skin parameter suggests a zone of enhanced permeability around the well.

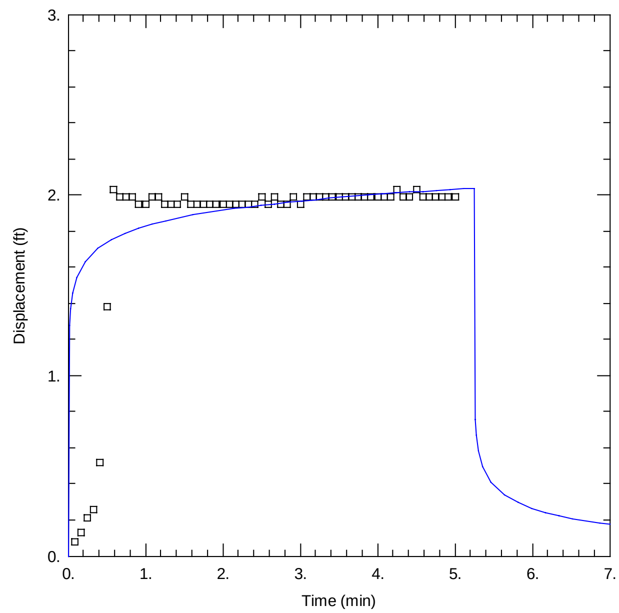


Figure 4.5. J5M - Fit of drawdown portion of pumping test

Alternate analysis

The results of the pumping phase can also be interpreted using a steady-state analysis, assuming that near-steady conditions were achieved at the end of the test. For an average rate of injection of 15.0 gpm, and a steady-state head rise of 2.1 ft in the well, the Thiem solution yields a transmissivity of 1200 ft^2/day.

This alternate estimate of the transmissivity is relatively close to the value estimated from the transient flow analysis.

Our final estimate of the transmissivity for this interval is 1900 ft^2/day. This is an approximate value because the recovery portion of the test could not be matched.

5. Conclusions

Irregular responses during the packer-pumping tests were observed for five tests:

- AGW-2M (Test 5);
- F1M (Test 5);
- H1M (Test 1);
- J1M (Test 2); and
- J5M (Test 5).

The responses to pumping observed during these tests suggest that the intervals are transmissive. The data for the five pumping tests that yielded uncharacteristic responses are tabulated below. The parameter Q designates the average injection rate during the test, and ΔH represents the approximate maximum rise in the water level.

Test	***Q*** **(gpm)**	***ΔH*** **(ft)**
AGW-2M (Test 5)	15.1	1.6
F1M (Test 5)	11.6	6.5
H1M (Test 1)	6.7	3.5
J1M (Test 2)	12.0	0.8
J5M (Test 5)	15.0	2.1

The relatively high injection rates that were achieved indicate that these intervals are transmissive. Based on a correlation with specific capacity, we estimate that the transmissivity of the intervals ranges from about 450 ft^2/day up to 3800 ft^2/day.

Transmissivity estimates have been developed for each of the uncharacteristic tests, by neglecting the recovery portion of the response. Two estimates have been derived for each interval, a transient analysis that attempts to match the entire pumping record, and a steady-state analysis that makes use of only the water level rise at the end of pumping. In general, the estimates derived from the two analyses are consistent.

Limited recovery was observed after pumping stopped for each of these tests. No recovery at all was observed for tests AGW-2M (5) and J1M (2). This lack of recovery is typical of non-transmissive intervals at the Site. The inconsistency between the pumping and recovery portions of the responses may be indicative of a unique condition in the vicinity of these wells.

Appendix C

Complete Test Results

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

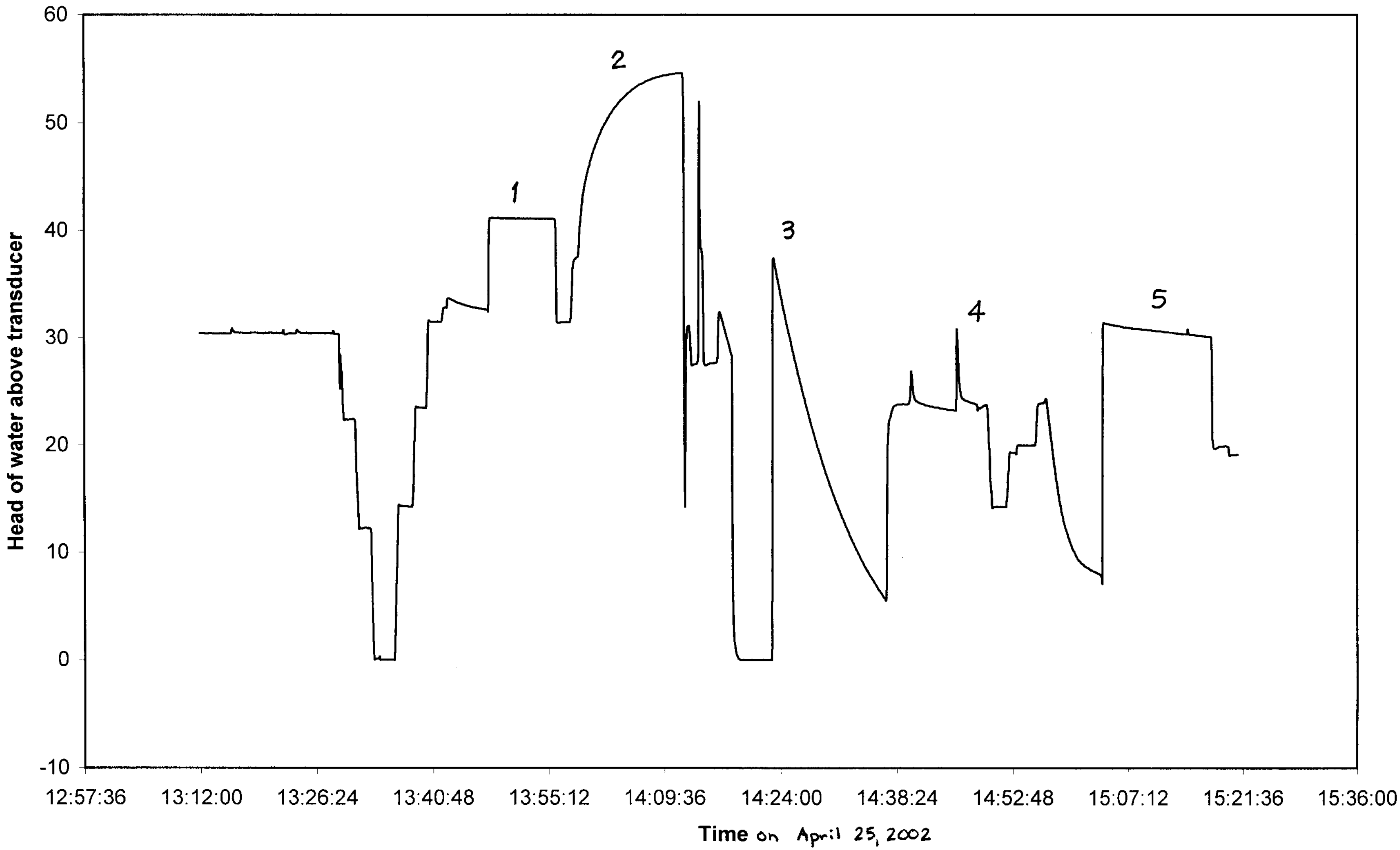
AGW-1U

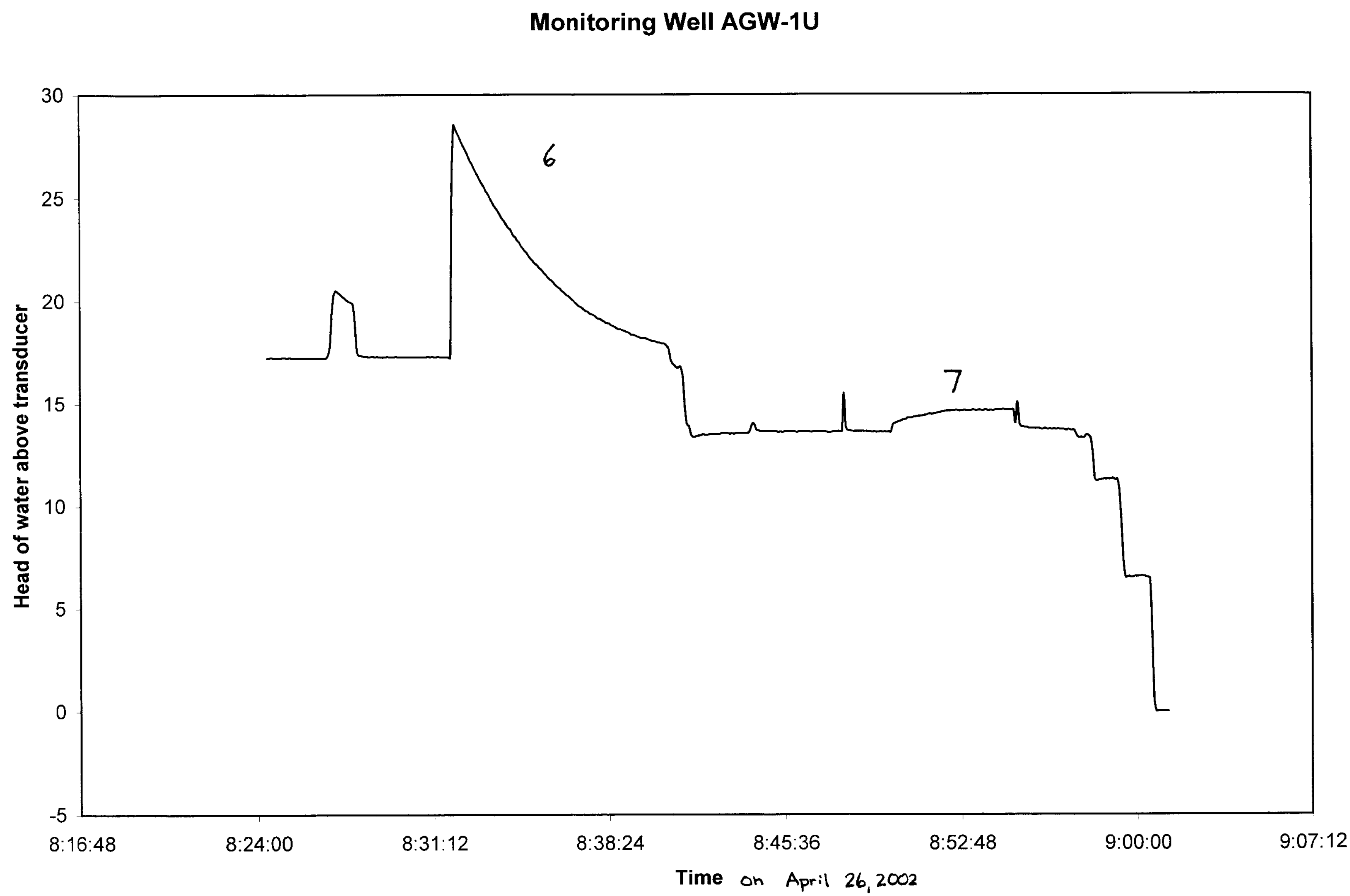
Testing Dates: April 25 & 26, 2002

Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
AGW-1U	1	549.22	539.72	<0.001	
AGW-1U	2	549.22	544.02	NIR	see PT Memo
AGW-1U	3	553.22	548.02	0.93	
AGW-1U	4	557.22	552.02	45	
AGW-1U	5	561.22	556.02	0.024	
AGW-1U	6	565.22	560.02	1.9	
AGW-1U	7P	569.22	564.02	570	

Monitoring Well AGW-1U

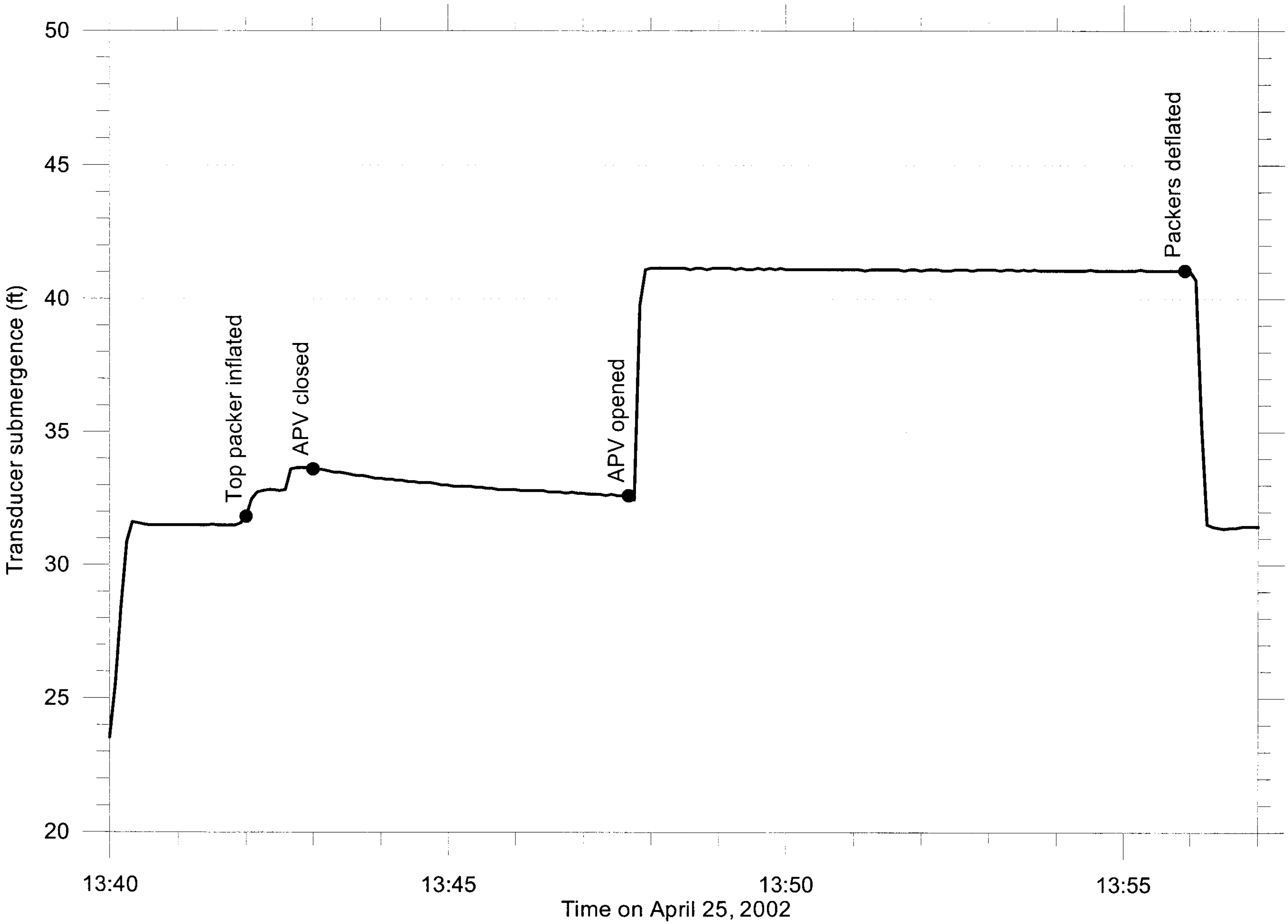


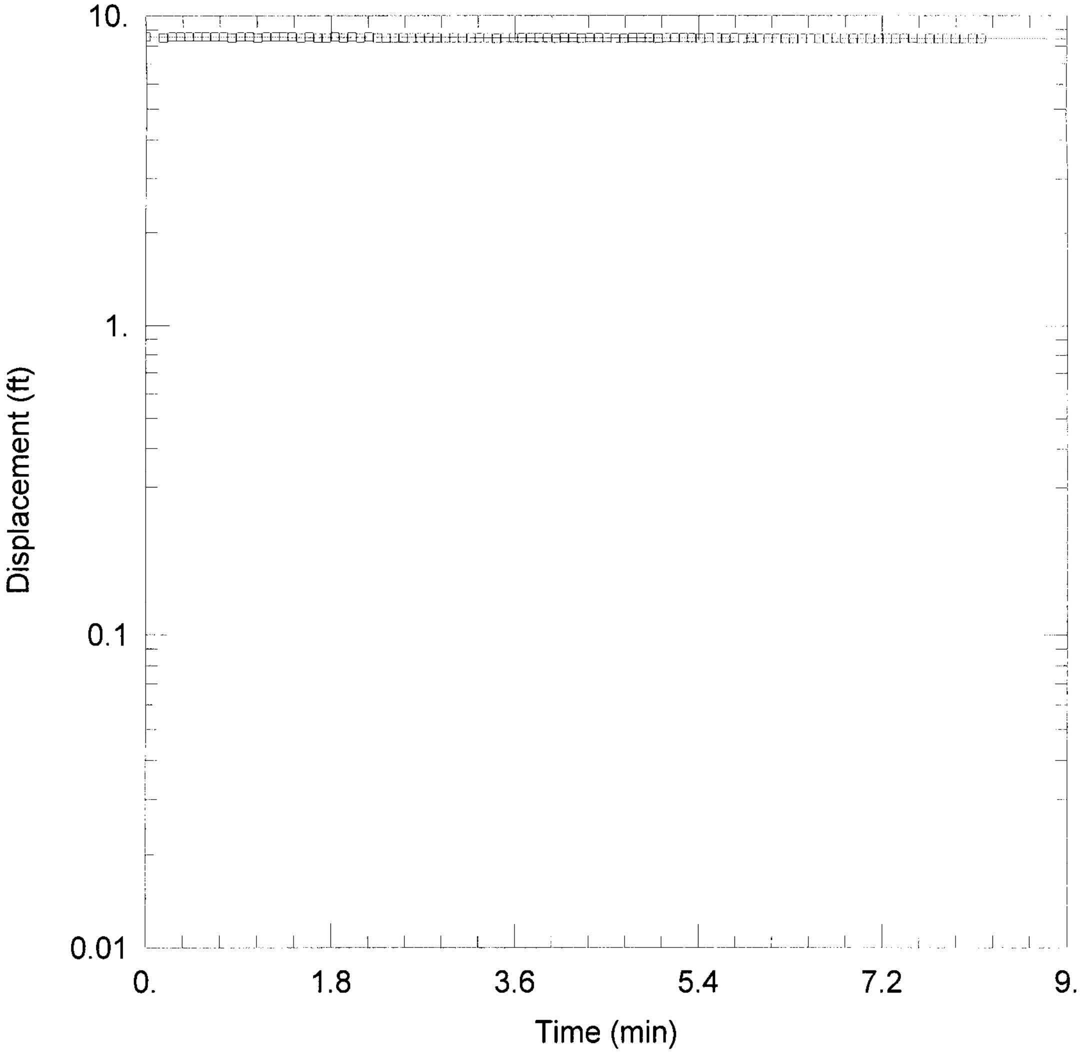


Monitoring Well AGW-1U
Head of water above transducer
30
25
20
15
10
5
0
-5
6
7
8:16:48
8:24:00
8:31:12
8:38:24
8:45:36
8:52:48
9:00:00
9:07:12
Time on April 26, 2002

AGW-1U Packer Testing

Test 1 (549.22 to 539.72 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-1.aqt
Date: 11/25/02 Time: 12:19:45

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1U-1)

Initial Displacement: 8.54 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

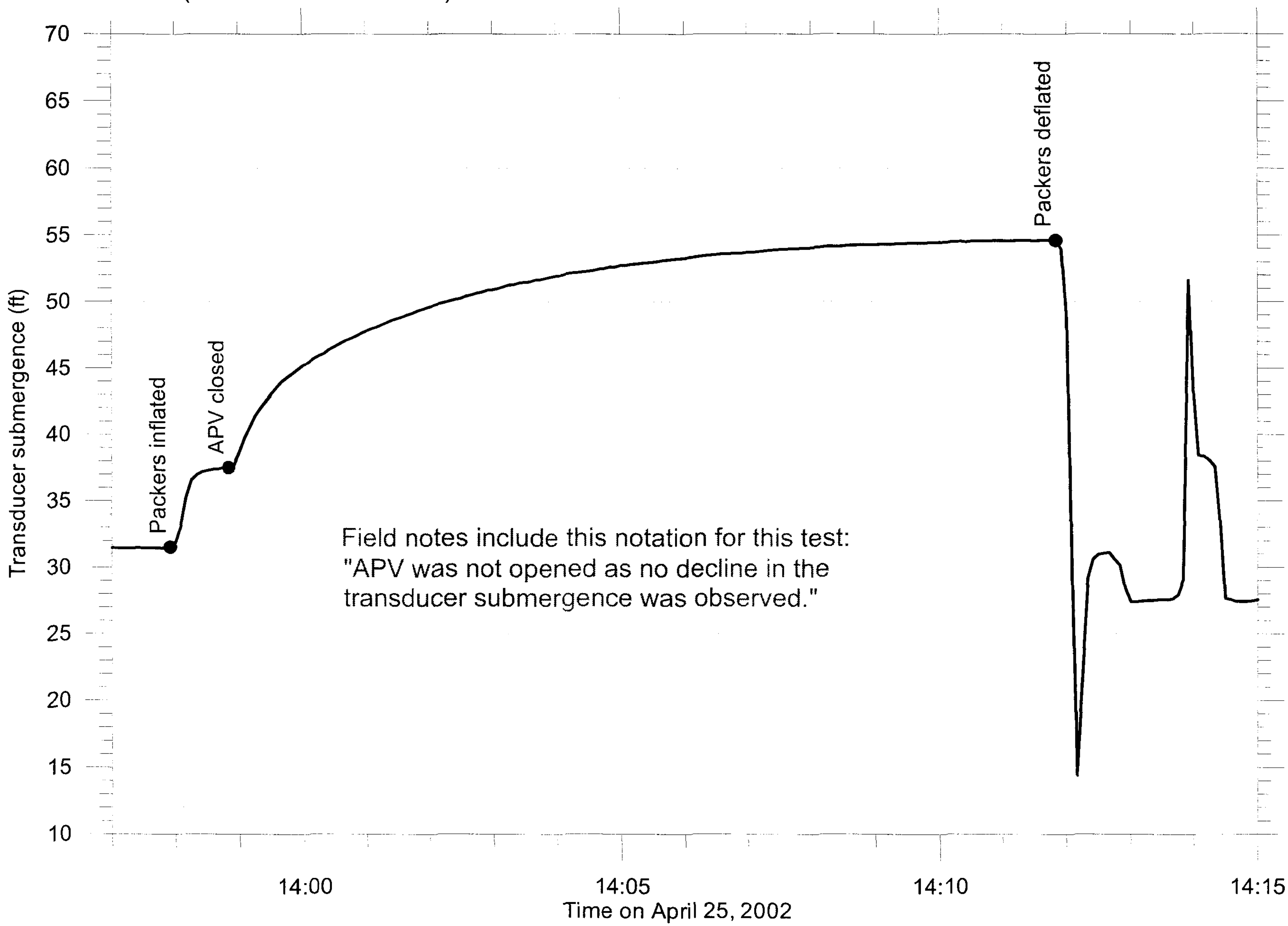
SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.001066 ft/day
y0 = 8.53 ft

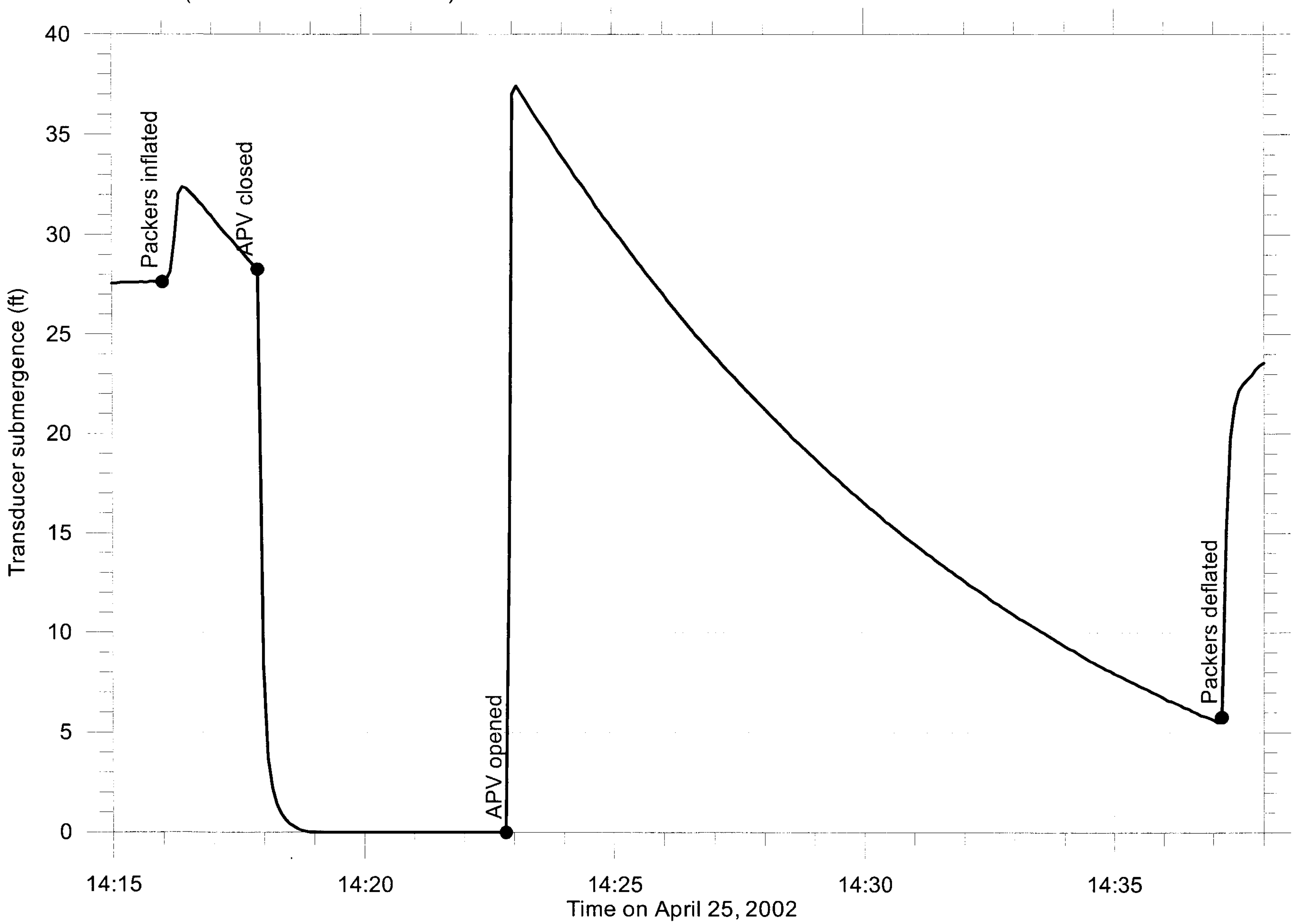
AGW-1U Packer Testing

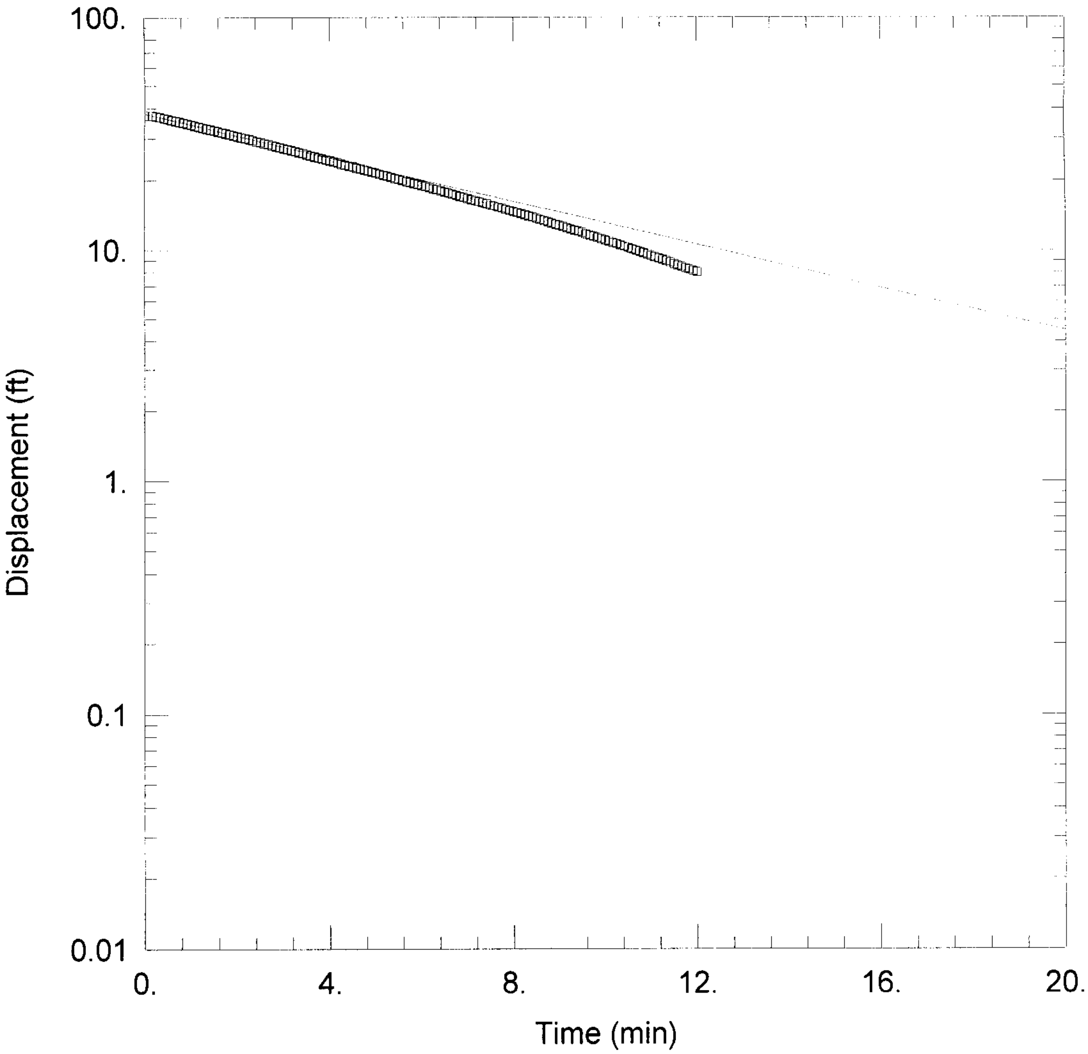
Test 2 (549.22 to 544.02 ft AMSL)



AGW-1U Packer Testing

Test 3 (553.22 to 548.02 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-3a.aqt
Date: 11/25/02 Time: 12:19:41

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

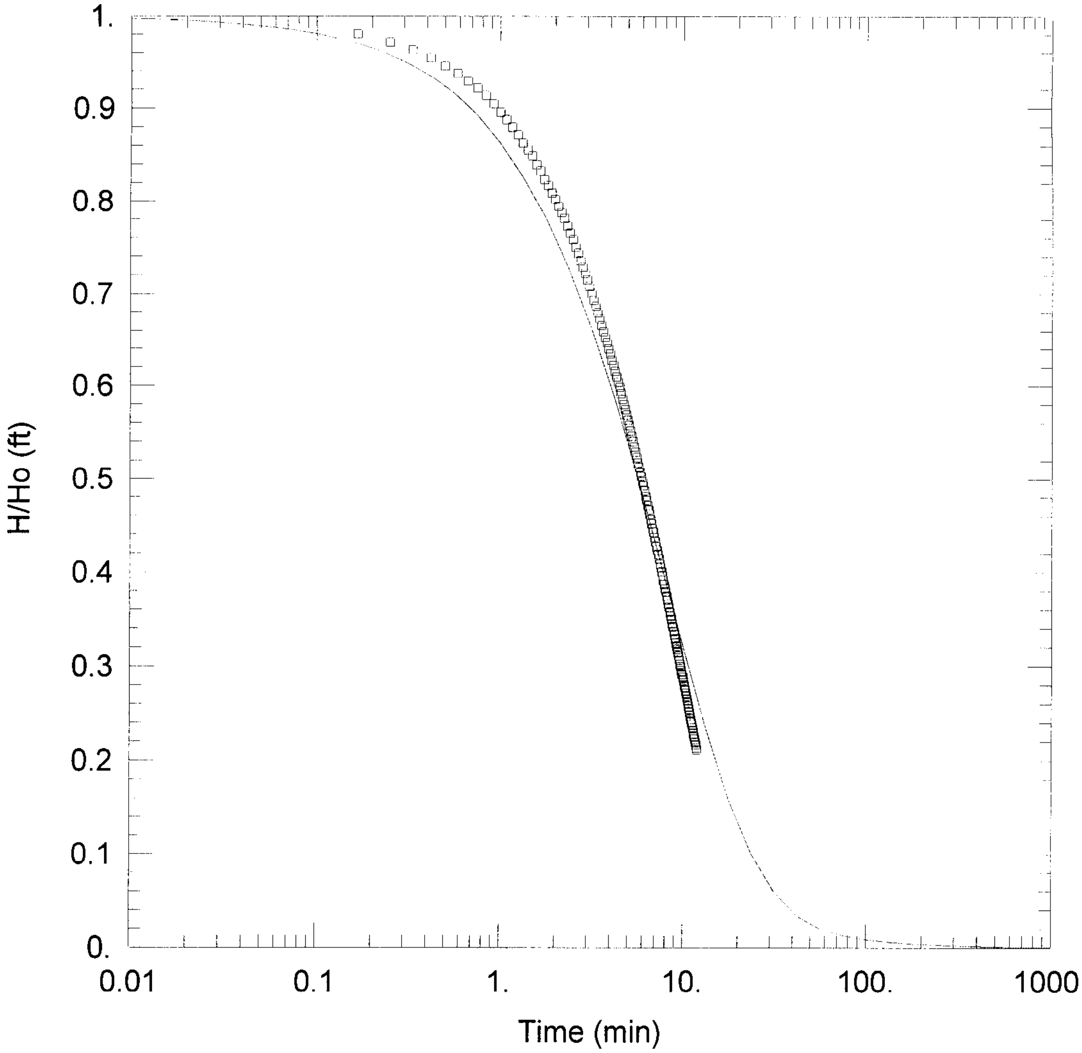
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1U-3)

Initial Displacement: 37.42 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
= 1.415 ft/day
Solution Method:
y0 = 38.16 ft



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-3b.aqt
Date: 11/25/02 Time: 12:19:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1U-3)

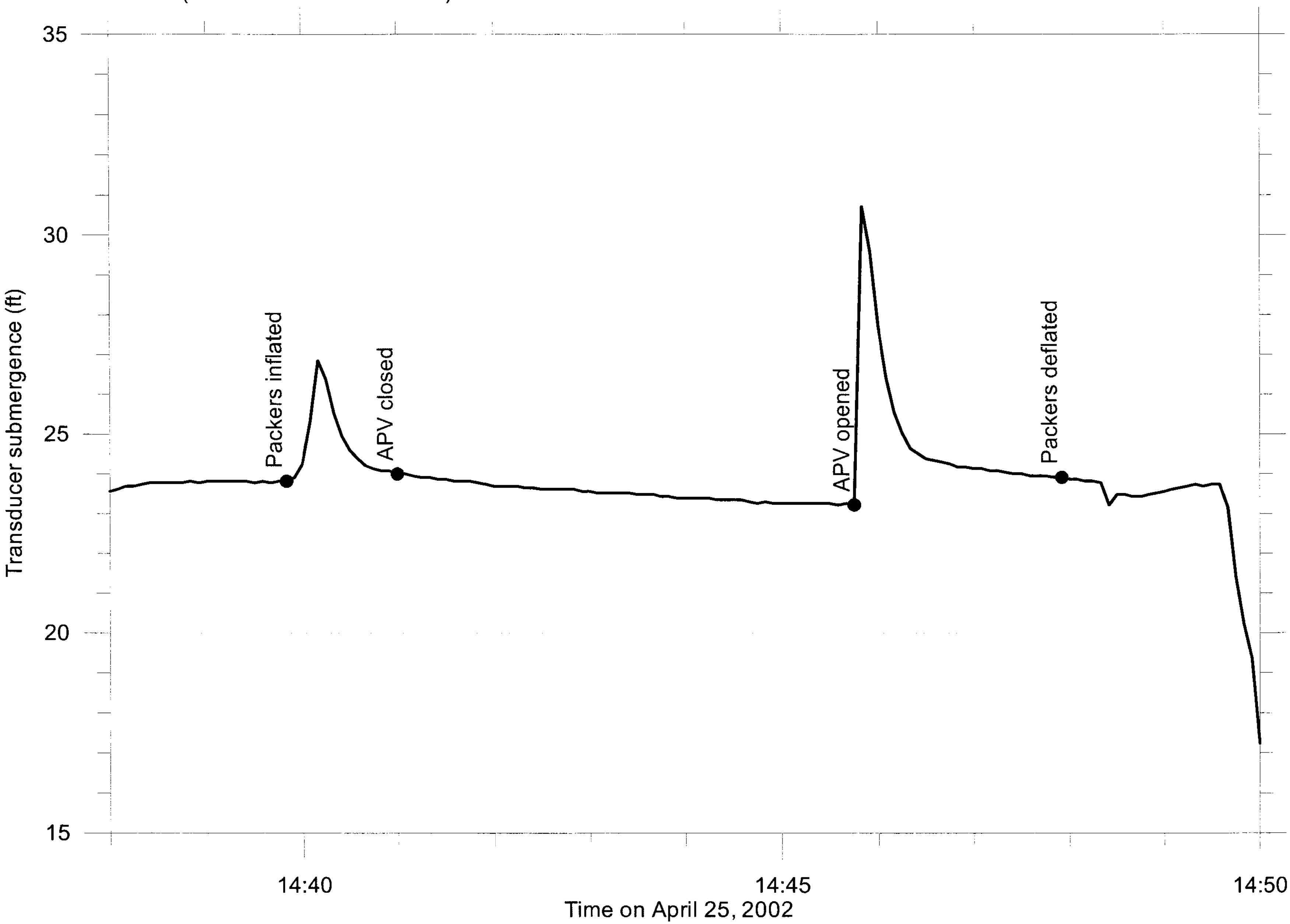
Initial Displacement: 38.16 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

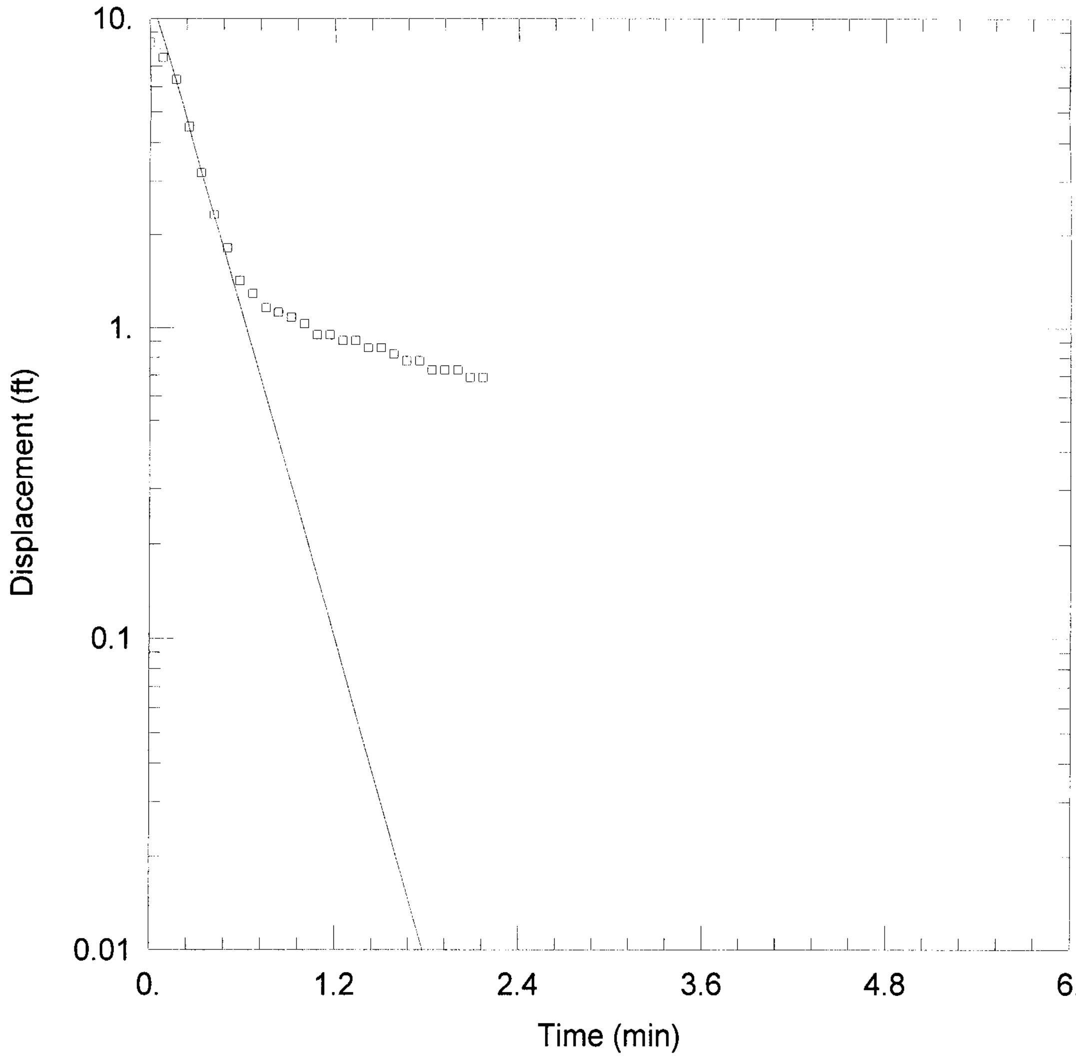
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.928 ft^2/day
S = 1.E-06

AGW-1U Packer Testing
Test 4 (557.22 to 552.02 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-4a.aqt
Date: 11/25/02 Time: 12:19:26

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

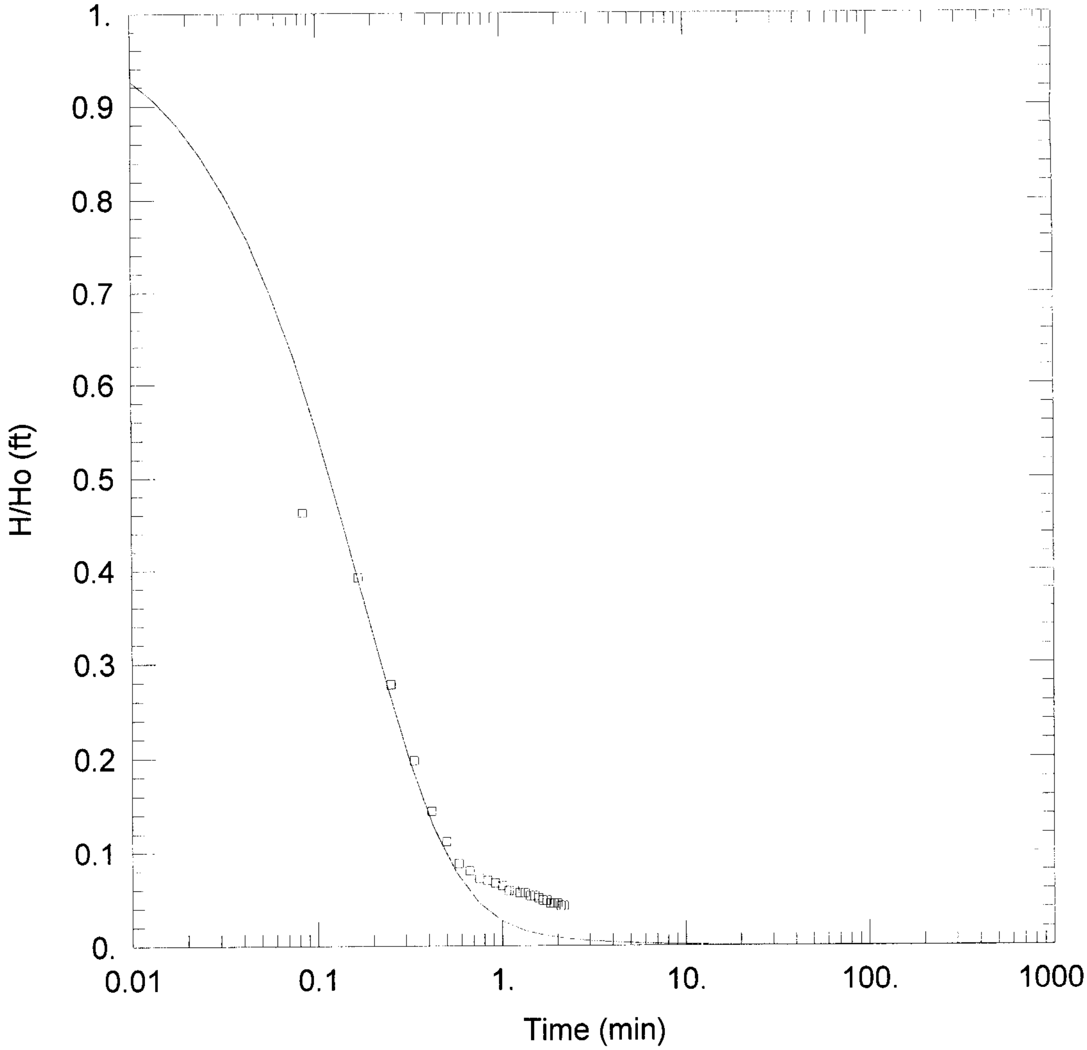
WELL DATA (AGW1U-4)

Initial Displacement: 8.37 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

' = 53. ft/day
y0 = 12.21 ft



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-4b.aqt
Date: 11/25/02 Time: 12:19:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

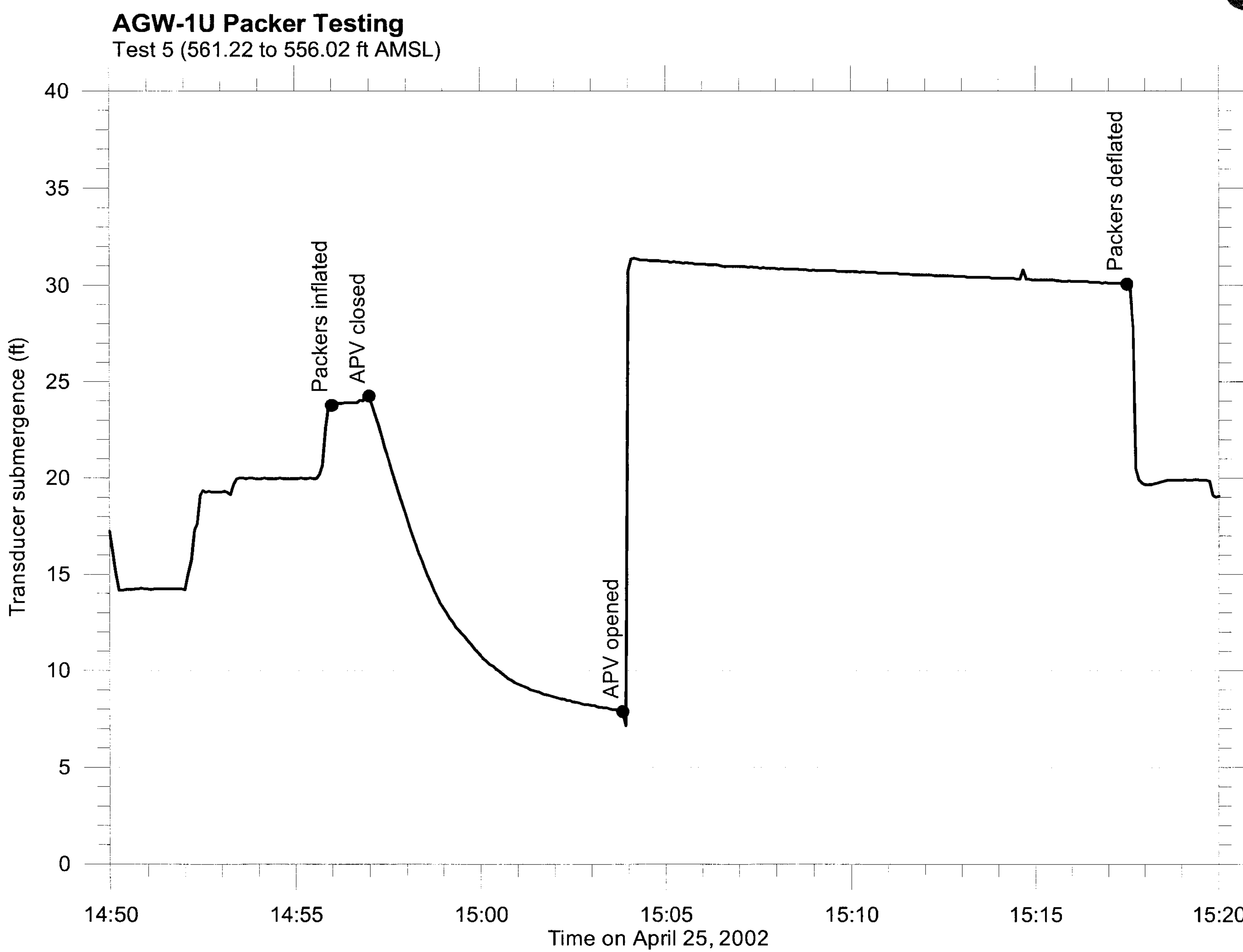
WELL DATA (AGW1U-4)

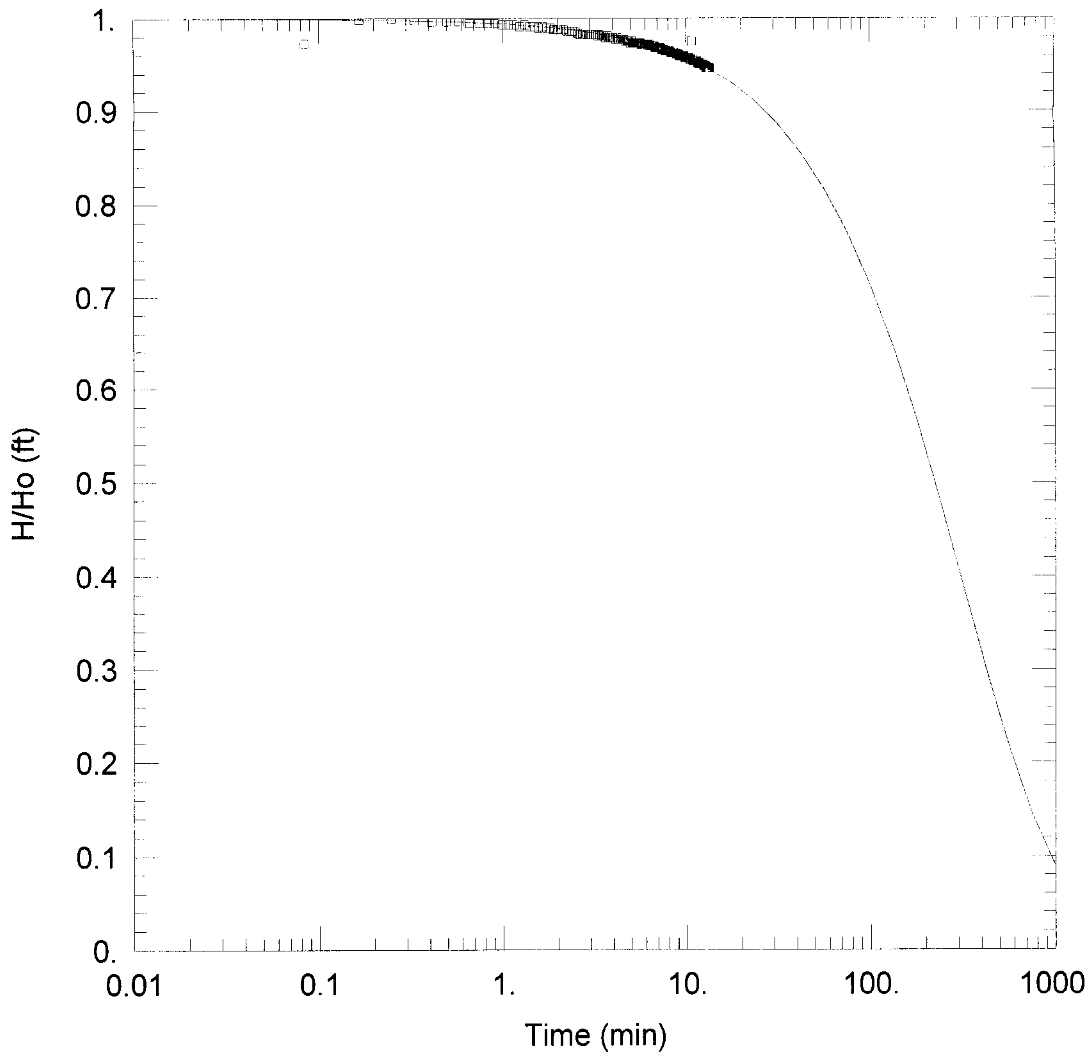
Initial Displacement: 16.2 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 44.94 ft^2/day
S = 1.E-06


AGW-1U Packer Testing
Test 5 (561.22 to 556.02 ft AMSL)
Transducer submergence (ft)
40
35
30
25
20
15
10
5
0
Packers inflated
APV closed
APV opened
Packers deflated
14:50
14:55
15:00
15:05
15:10
15:15
15:20
Time on April 25, 2002



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-5.aqt
Date: 11/25/02 Time: 12:19:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1U-5)

Initial Displacement: 24.25 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

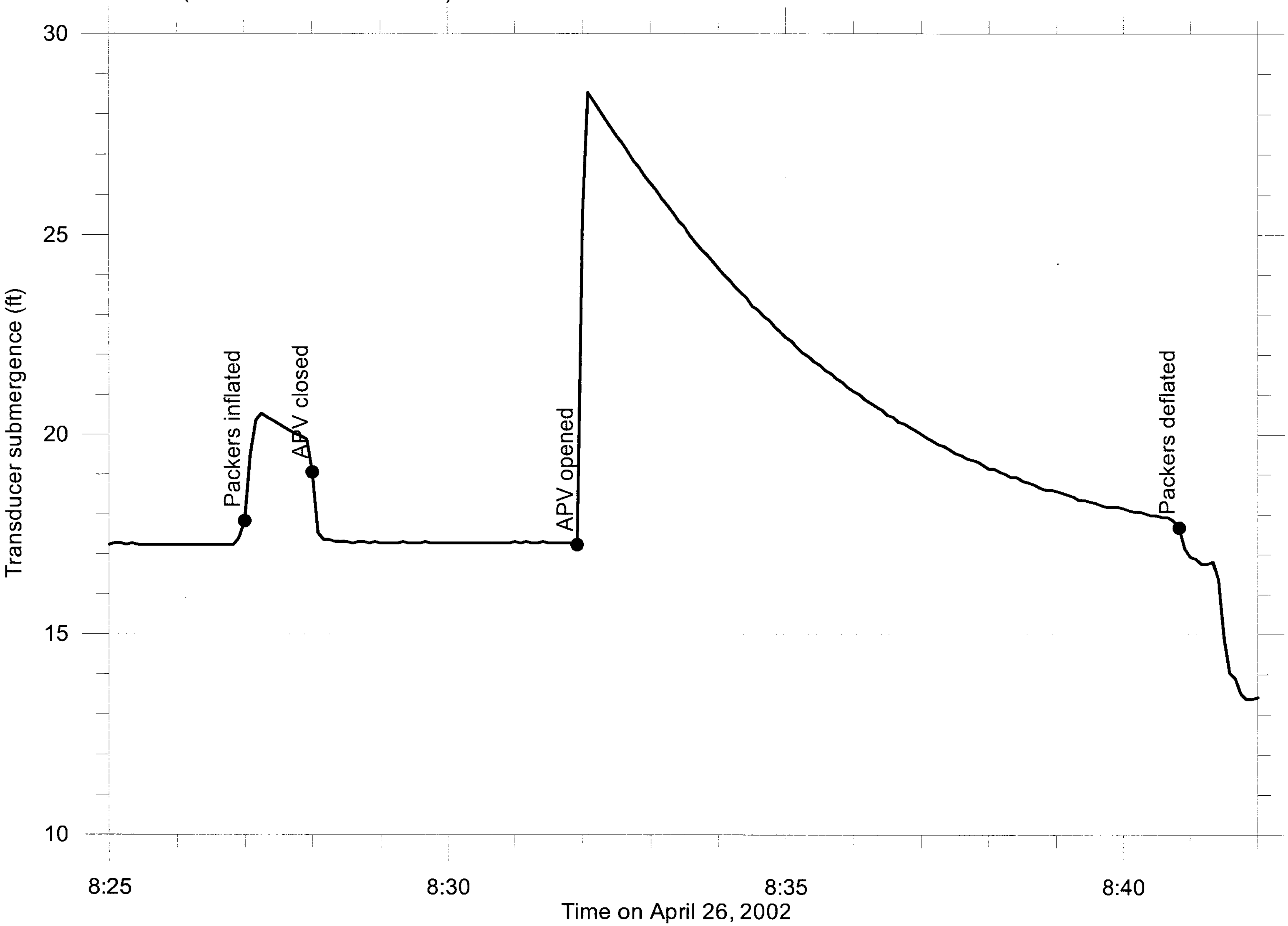
SOLUTION

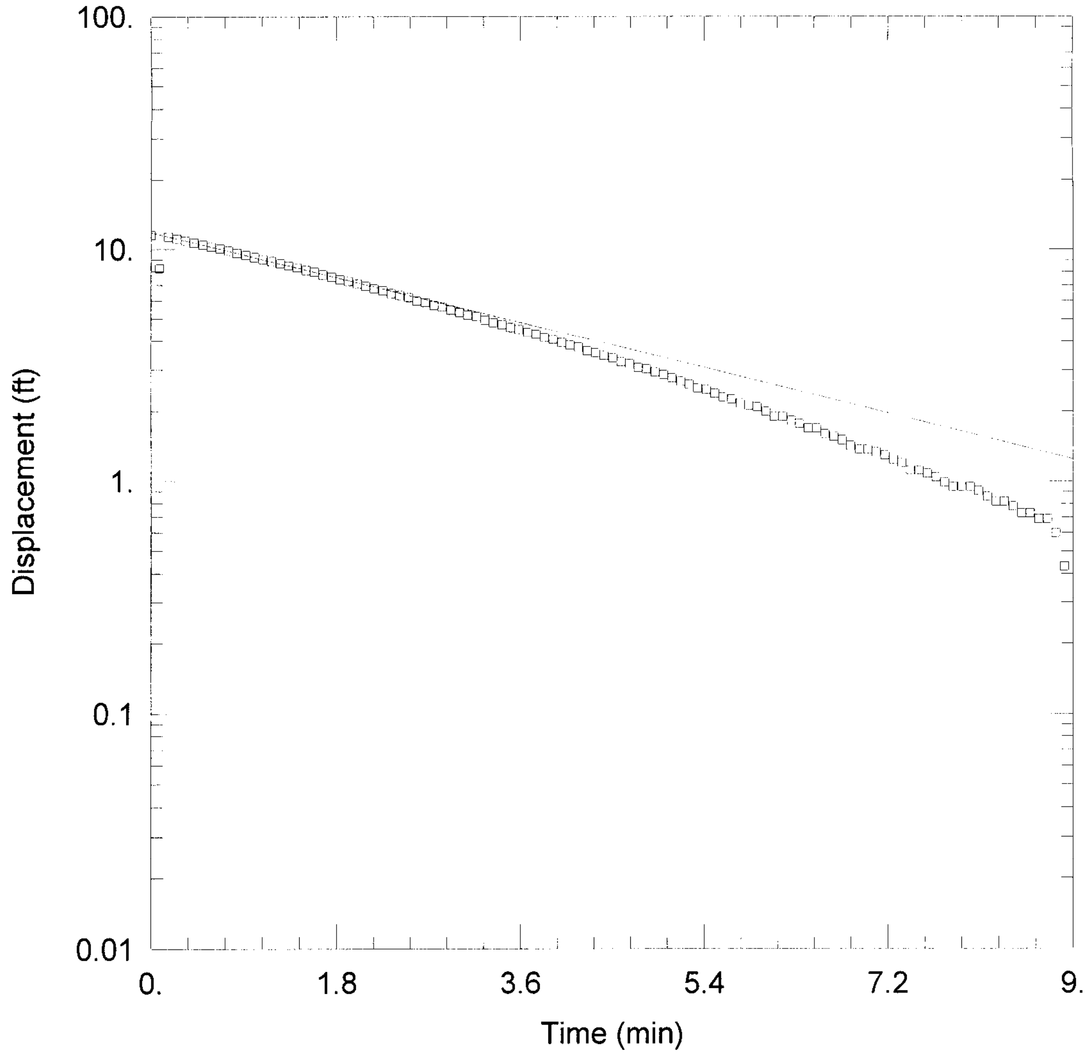
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.02357 ft^2/day
S = 1.E-06

AGW-1U Packer Testing

Test 6 (565.22 to 560.02 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-6a.aqt
Date: 11/25/02 Time: 12:19:04

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

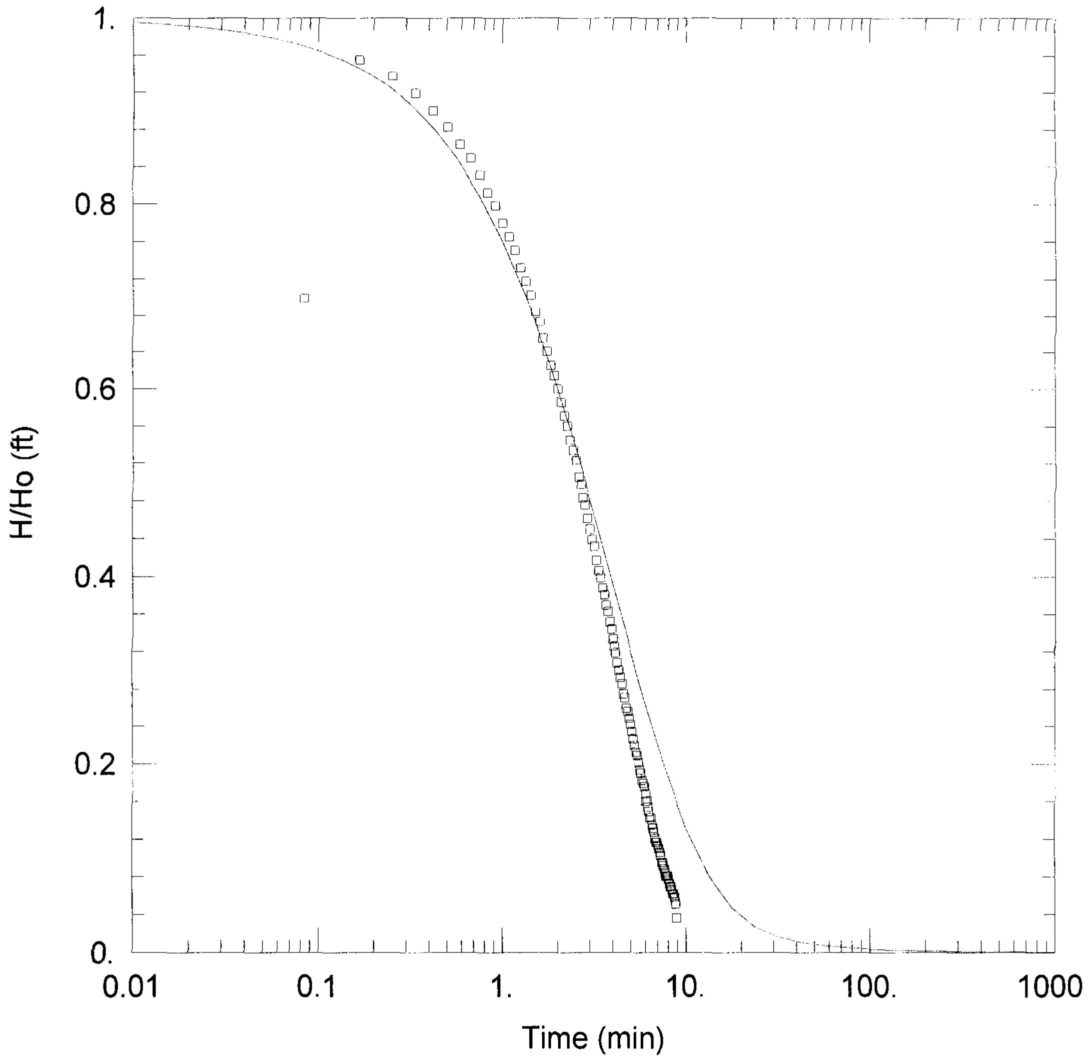
WELL DATA (AGW1U-6)

Initial Displacement: 11.5 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 3.297 ft/day
y0 = 11.83 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1U\AGW1U-6b.aqt
Date: 11/26/02 Time: 09:52:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

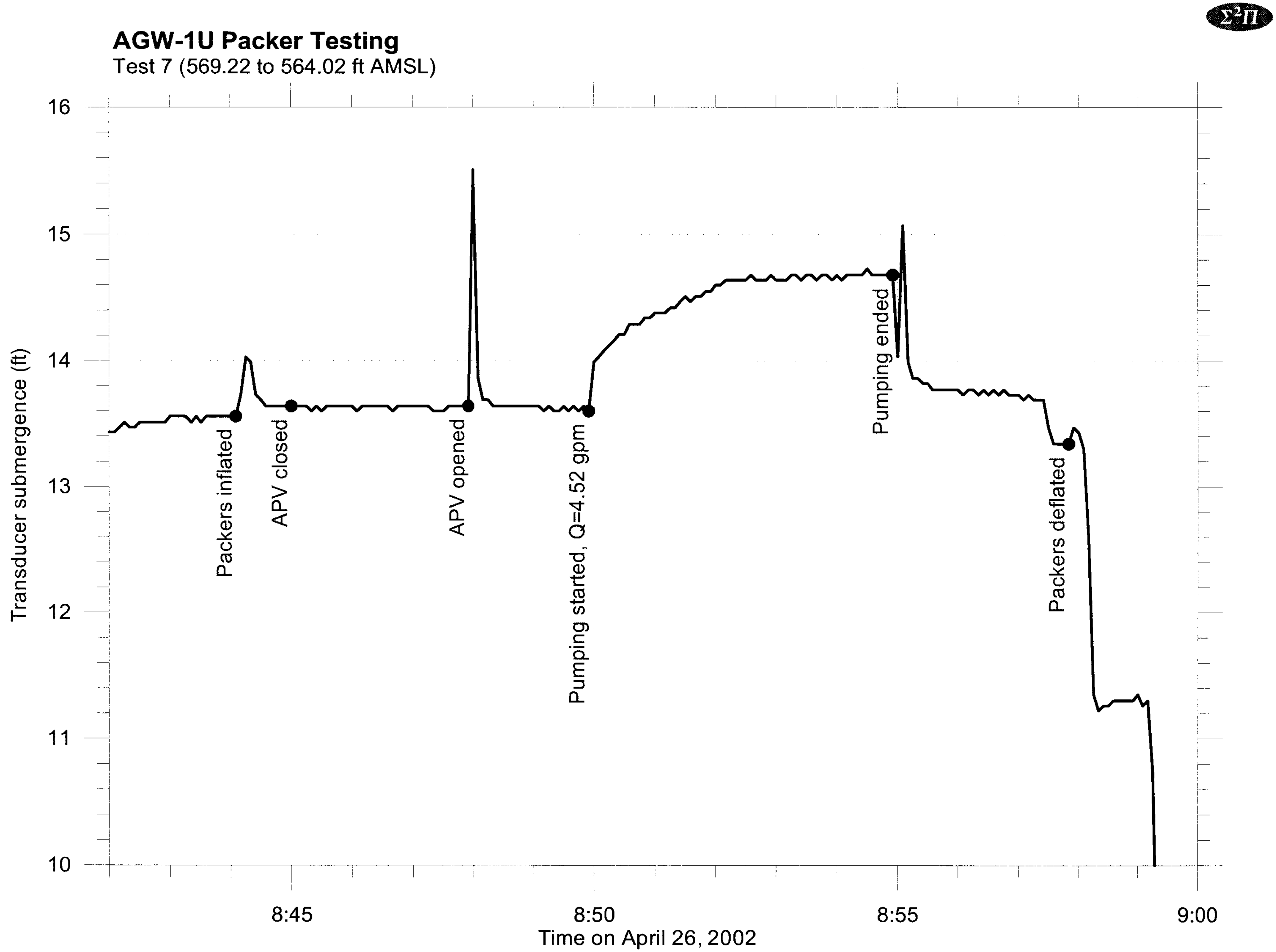
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

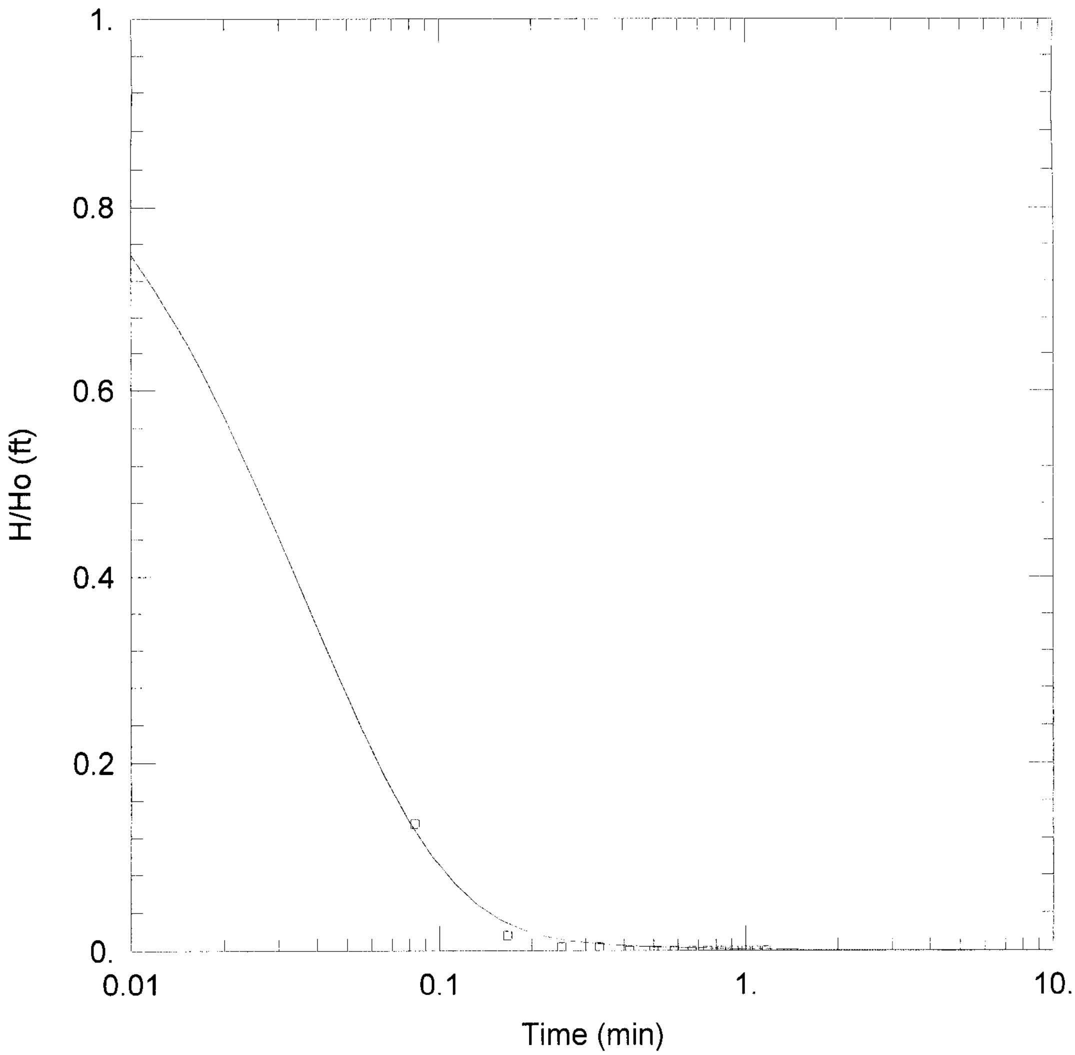
WELL DATA (AGW1U-6)

Initial Displacement: 11.83 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
= 1.865 ft^2/day S = 1.E-06


AGW-1U Packer Testing
Test 7 (569.22 to 564.02 ft AMSL)
Transducer submergence (ft)
16
15
14
13
12
11
10
8:45
8:50
8:55
9:00
Time on April 26, 2002
Packers inflated
APV closed
APV opened
Pumping started, Q=4.52 gpm
Pumping ended
Packers deflated



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1U\AGW1U-7Sb.aqt
Date: 01/13/03 Time: 10:27:07

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

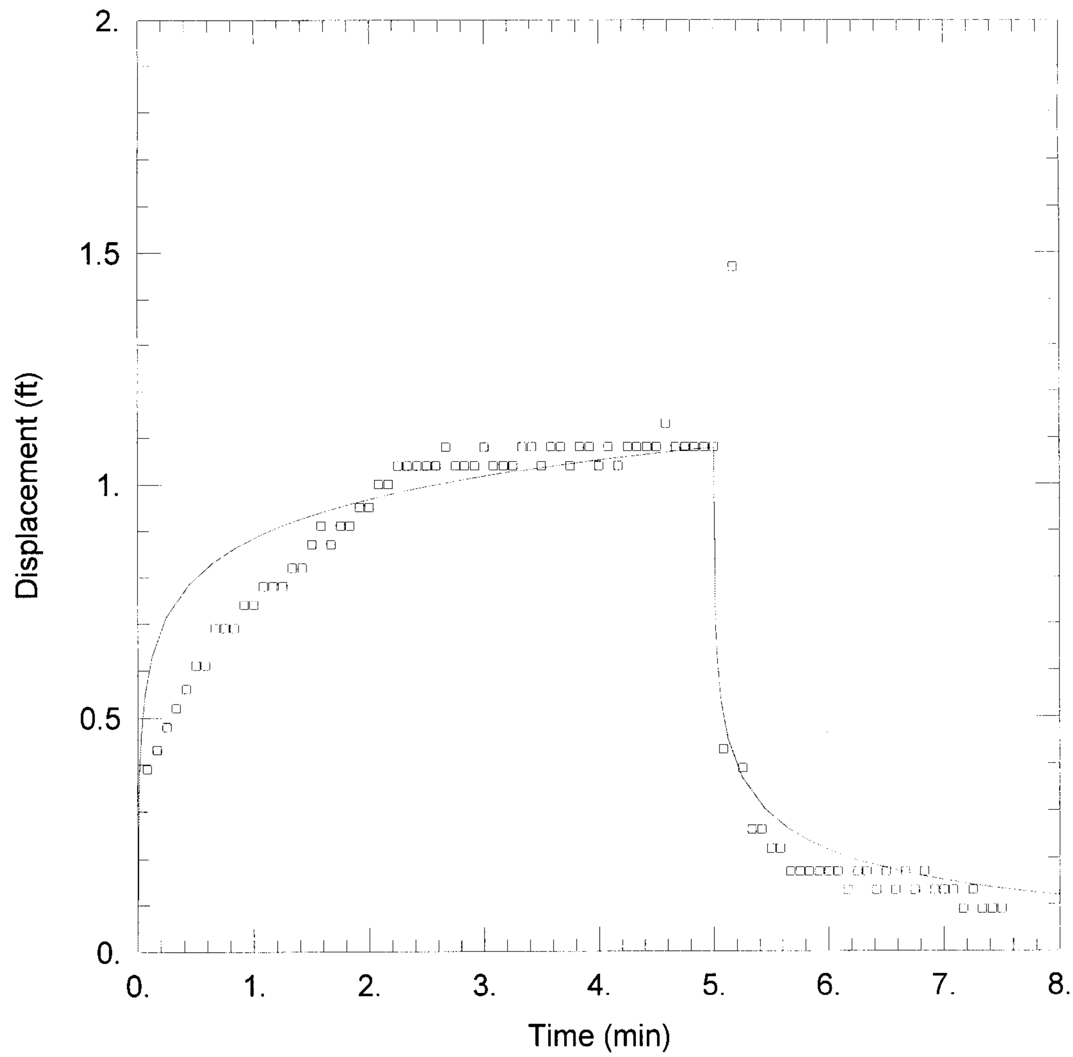
WELL DATA (AGW1U-7S)

Initial Displacement: 13.82 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 376.8 ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1U\AGW1U-7.aqt
Date: 11/25/02 Time: 12:18:57

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells		
Well Name	X (ft)	Y (ft)
AGW1U-7	0	0

Observation Wells		
Well Name	X (ft)	Y (ft)
□ AGW1U-7	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

= 570.5 ft^2/day
Sw = -5.
P = 2.

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 1.463Q + 0.$Q^{2.}$
W.E. = 237.3%

AGW-1U, Test 7P

Alternative analyses

Average Q: 4.5 gpm
"Drawdown" (s or ΔH): 1.08 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 1042\ ft^2/d}}$

<u>T by Thiem solution:</u>

$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

$\underline{\underline{T = 678\ ft^2/d}}$

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

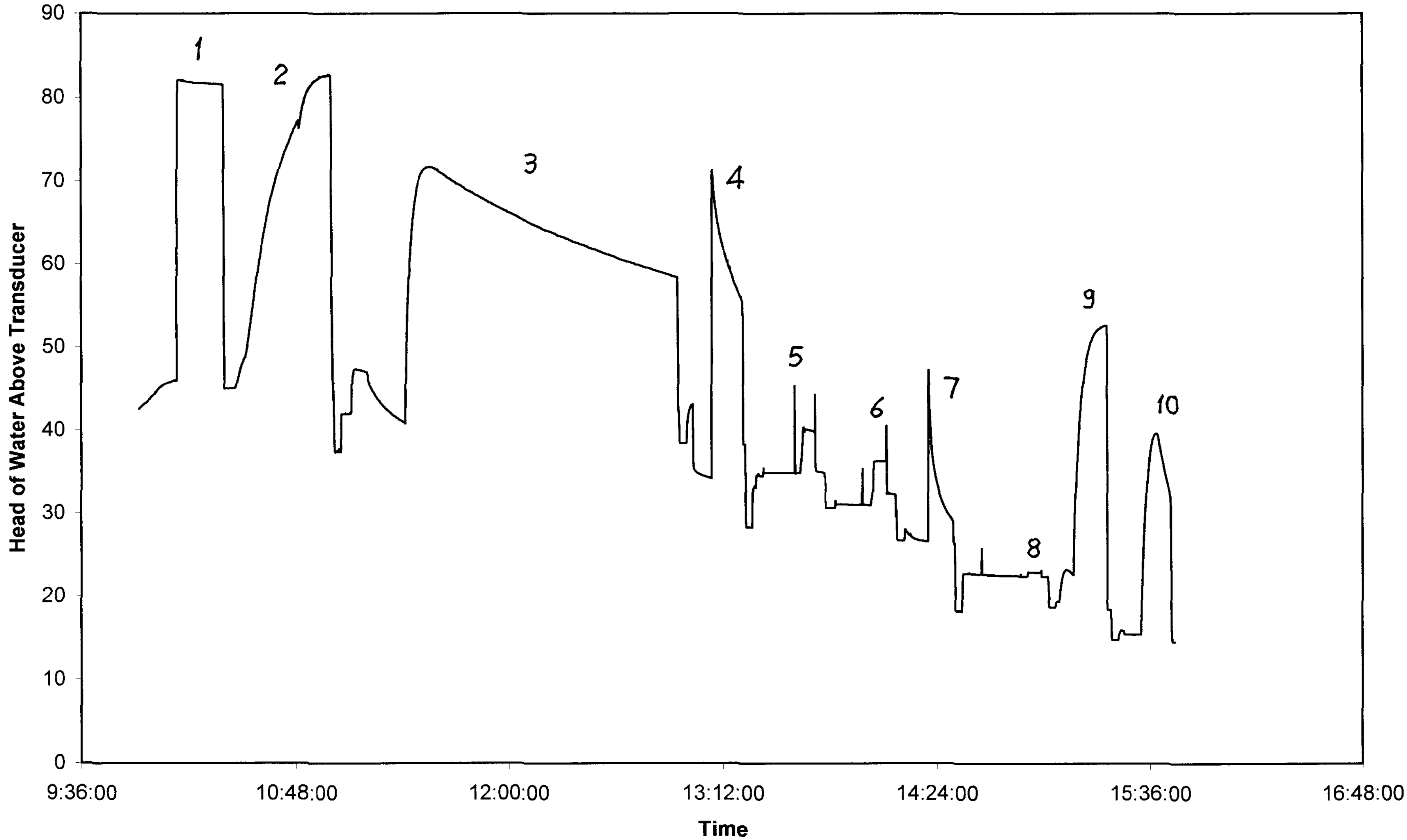
AGW-1M

Testing Dates: April 26, 2002

Summary of Tests:

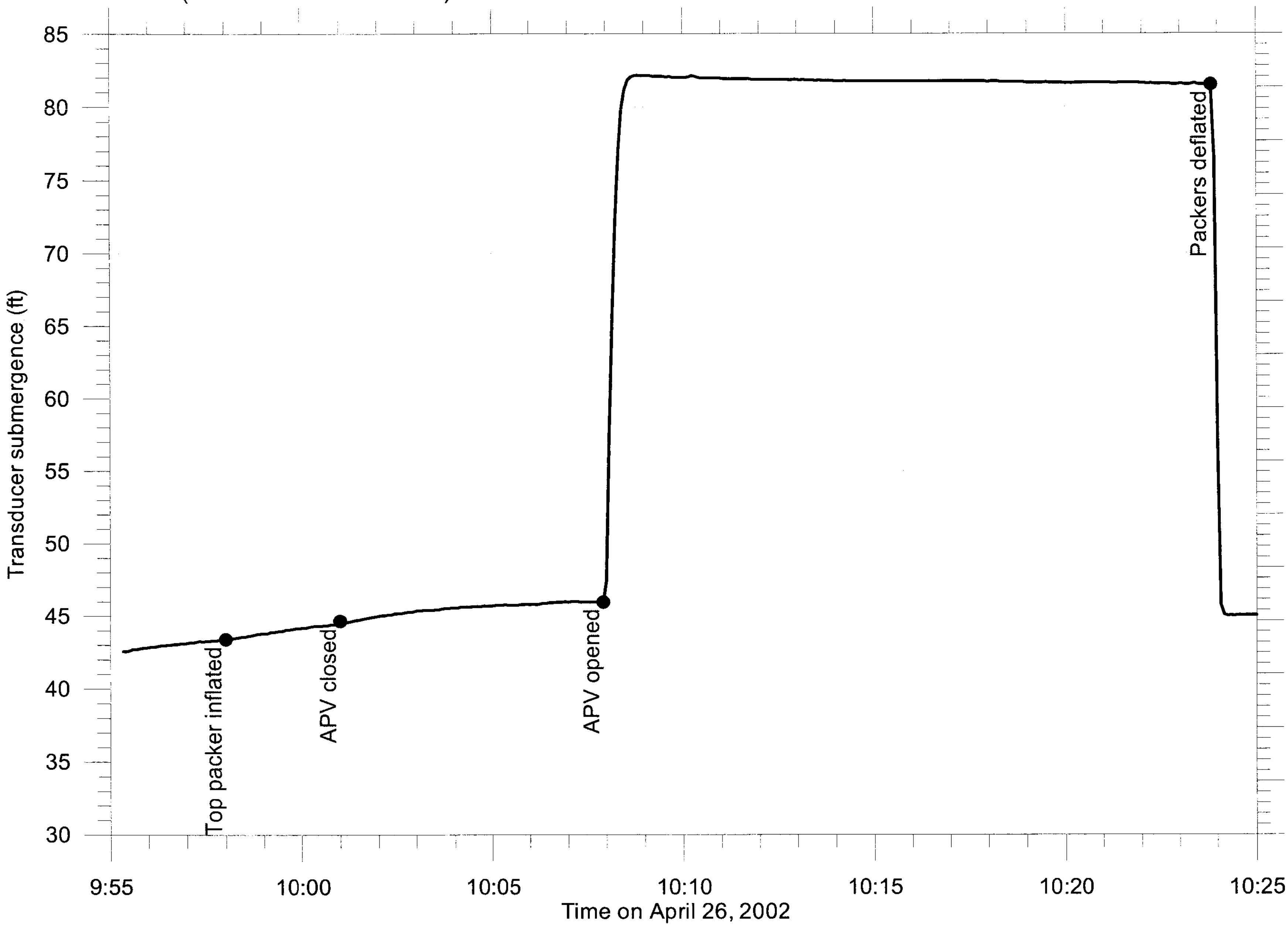
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
AGW-1M	1	508.36	498.86	0.005	
AGW-1M	2	508.36	503.16	<<1	see PT Memo
AGW-1M	3	512.36	507.16	0.049	
AGW-1M	4	516.36	511.16	0.44	
AGW-1M	5P	520.36	515.16	337.2	
AGW-1M	6P	524.36	519.16	671.5	
AGW-1M	7	528.36	523.16	3.3	
AGW-1M	8P	532.36	527.16	5213	
AGW-1M	9	536.36	531.16	0.1	see PT Memo
AGW-1M	10	540.36	535.16	0.61	

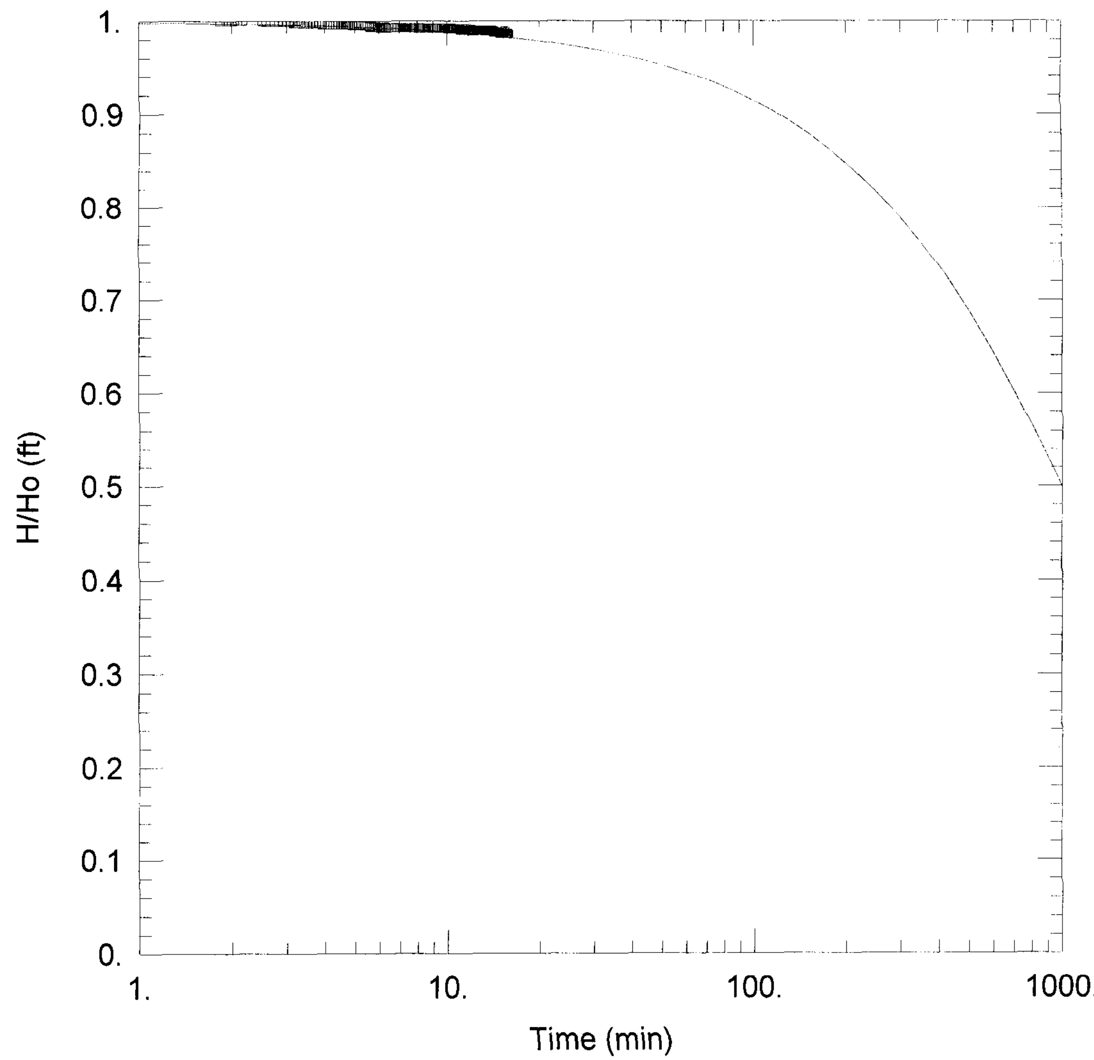
Monitoring Well AGW-1M



AGW-1M Packer Testing

Test 1 (508.36 to 498.86 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1M\AGW1M-1.aqt
Date: 11/25/02 Time: 11:52:11

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

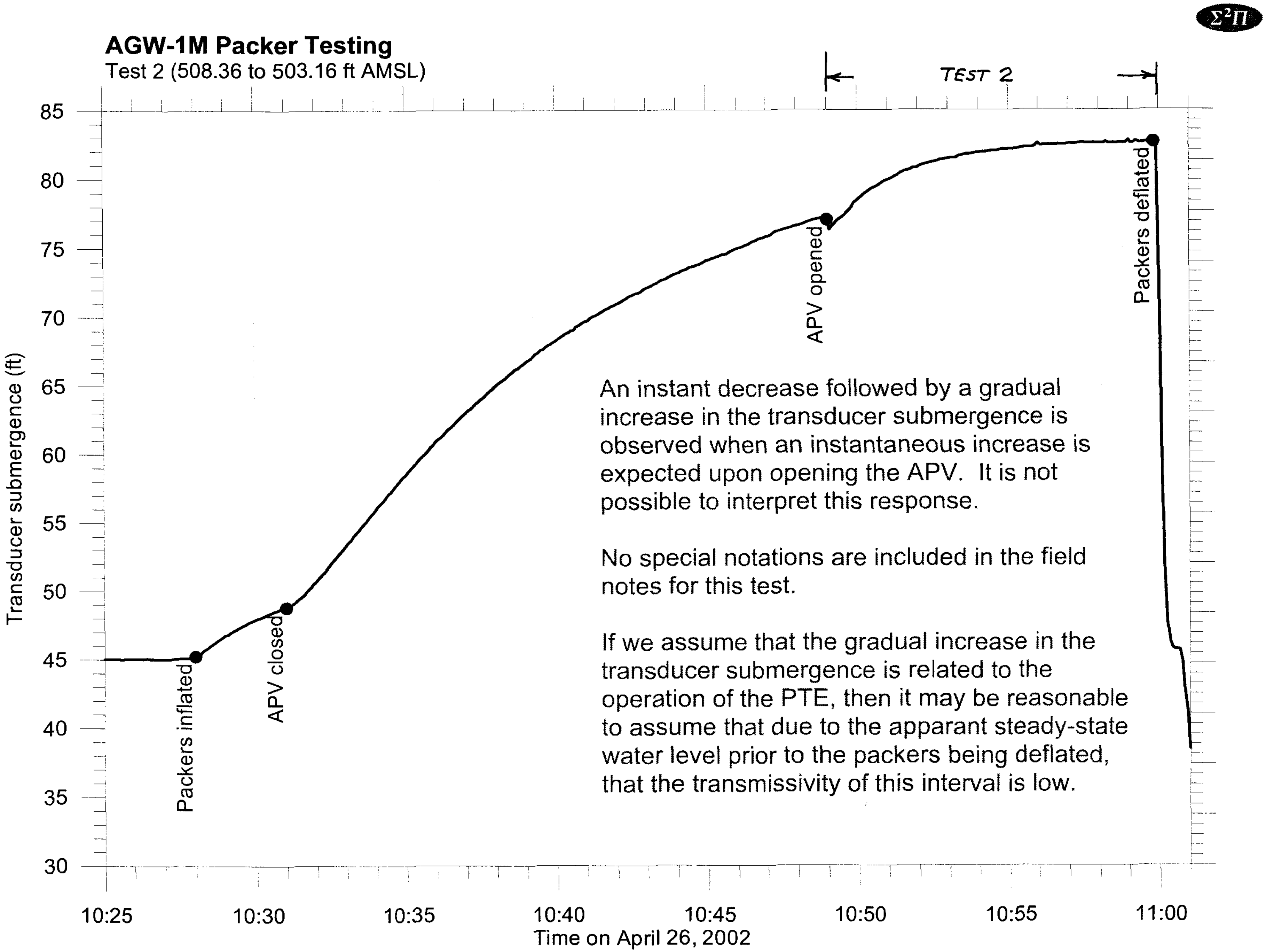
WELL DATA (AGW1M-1)

Initial Displacement: 36.05 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

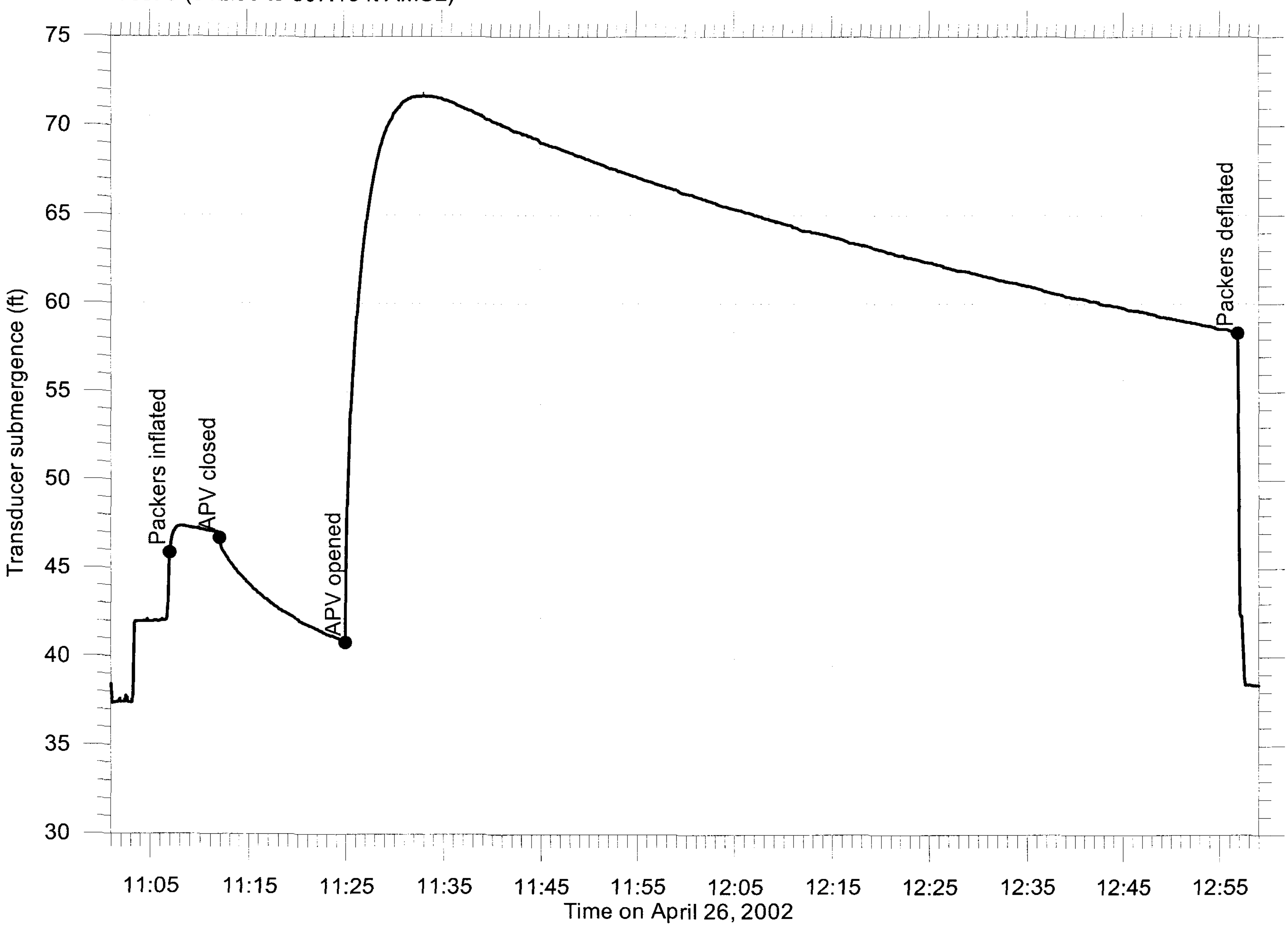
SOLUTION

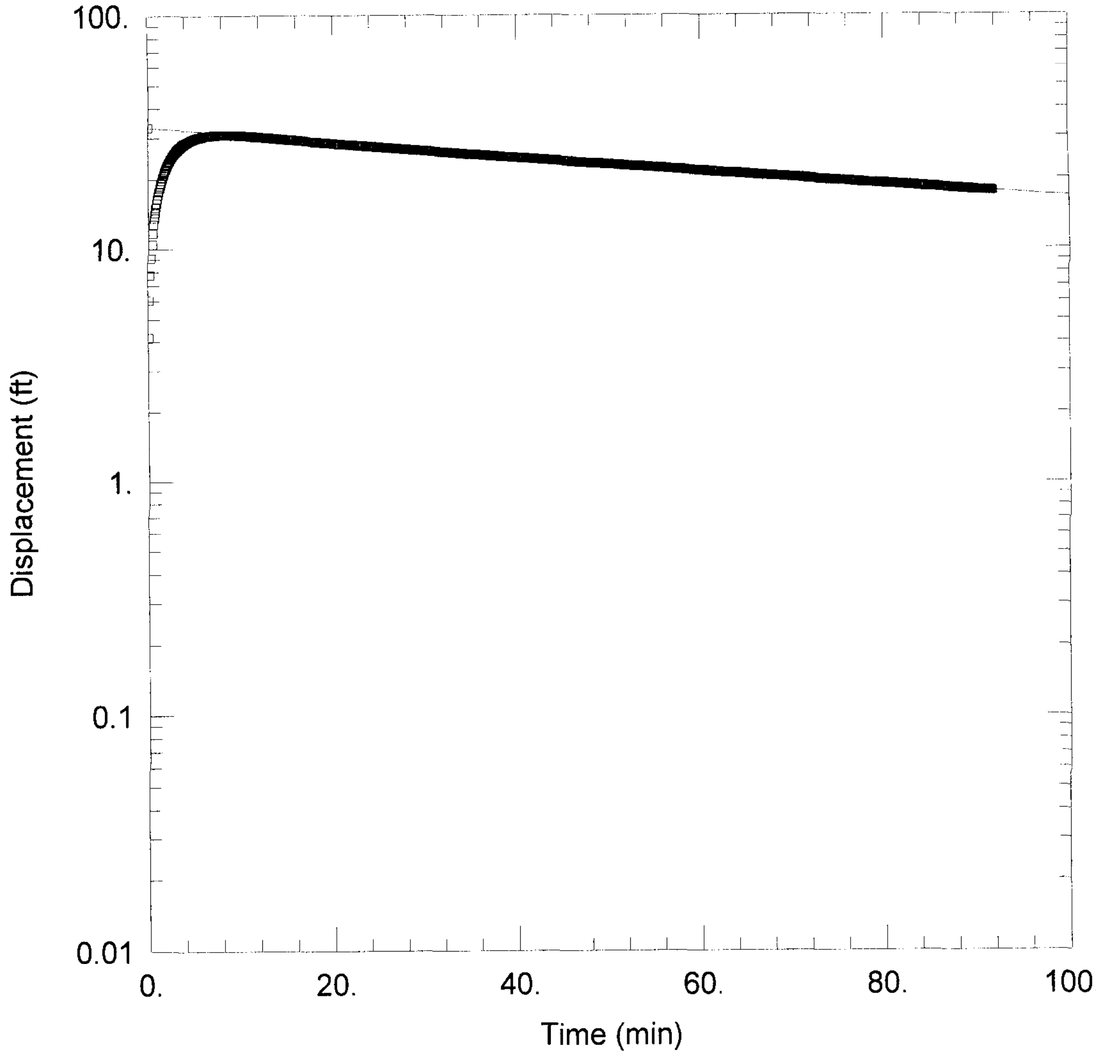
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.005277 ft^2/day
S = 1.E-06


AGW-1M Packer Testing
Test 2 (508.36 to 503.16 ft AMSL)
TEST 2
Transducer submergence (ft)
85
80
75
70
65
60
55
50
45
40
35
30
10:25
10:30
10:35
10:40
10:45
10:50
10:55
11:00
Time on April 26, 2002
Packers inflated
APV closed
APV opened
Packers deflated
An instant decrease followed by a gradual increase in the transducer submergence is observed when an instantaneous increase is expected upon opening the APV. It is not possible to interpret this response.
No special notations are included in the field notes for this test.
If we assume that the gradual increase in the transducer submergence is related to the operation of the PTE, then it may be reasonable to assume that due to the apparant steady-state water level prior to the packers being deflated, that the transmissivity of this interval is low.
Σ²Π

AGW-1M Packer Testing
Test 3 (512.36 to 507.16 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1M\AGW1M-3a.aqt
Date: 11/25/02 Time: 11:53:24

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

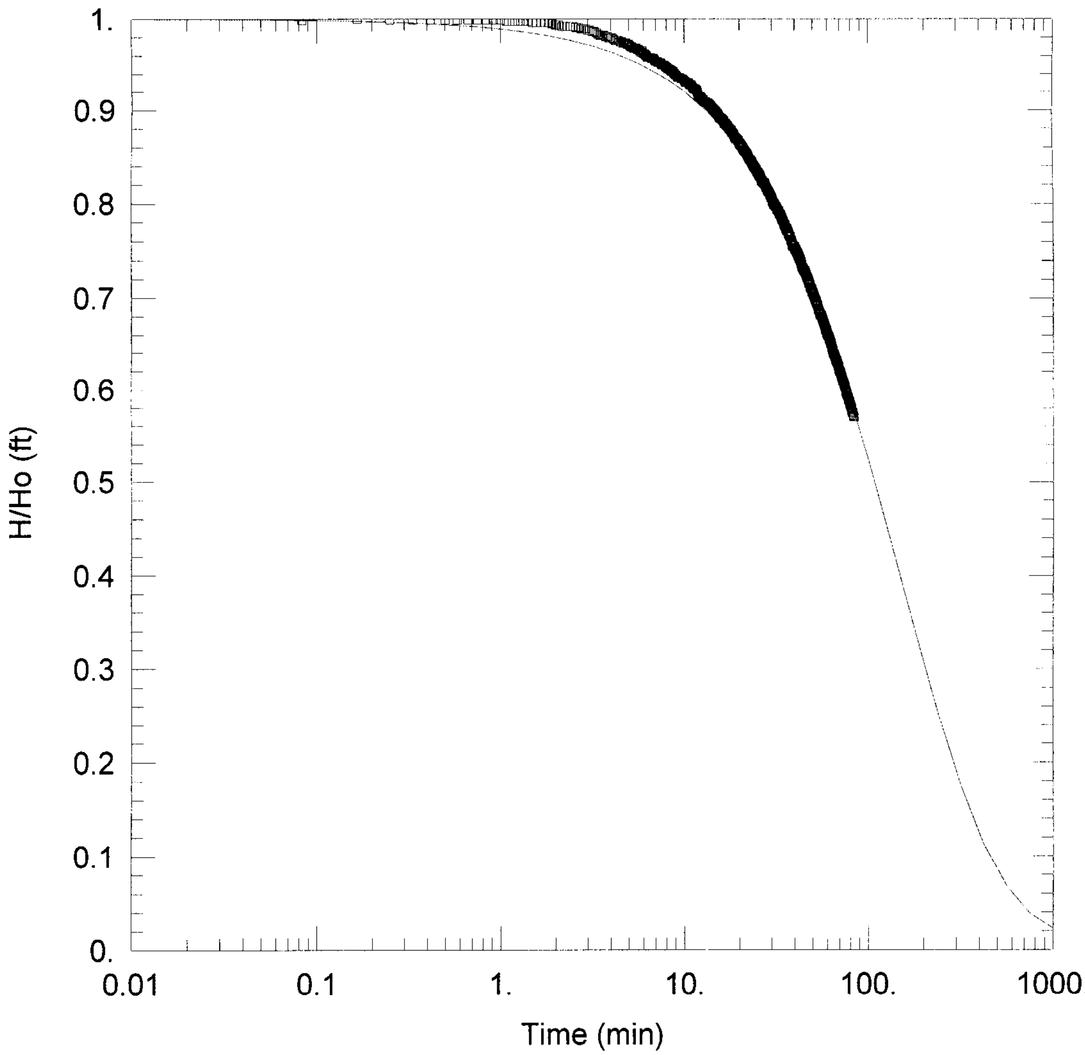
WELL DATA (AGW1M-3)

Initial Displacement: 33.27 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.09124 ft/day
y0 = 33.27 ft



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1M\AGW1M-3.aqt
Date: 11/25/02 Time: 12:16:30

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1M-3)

Initial Displacement: 30.88 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

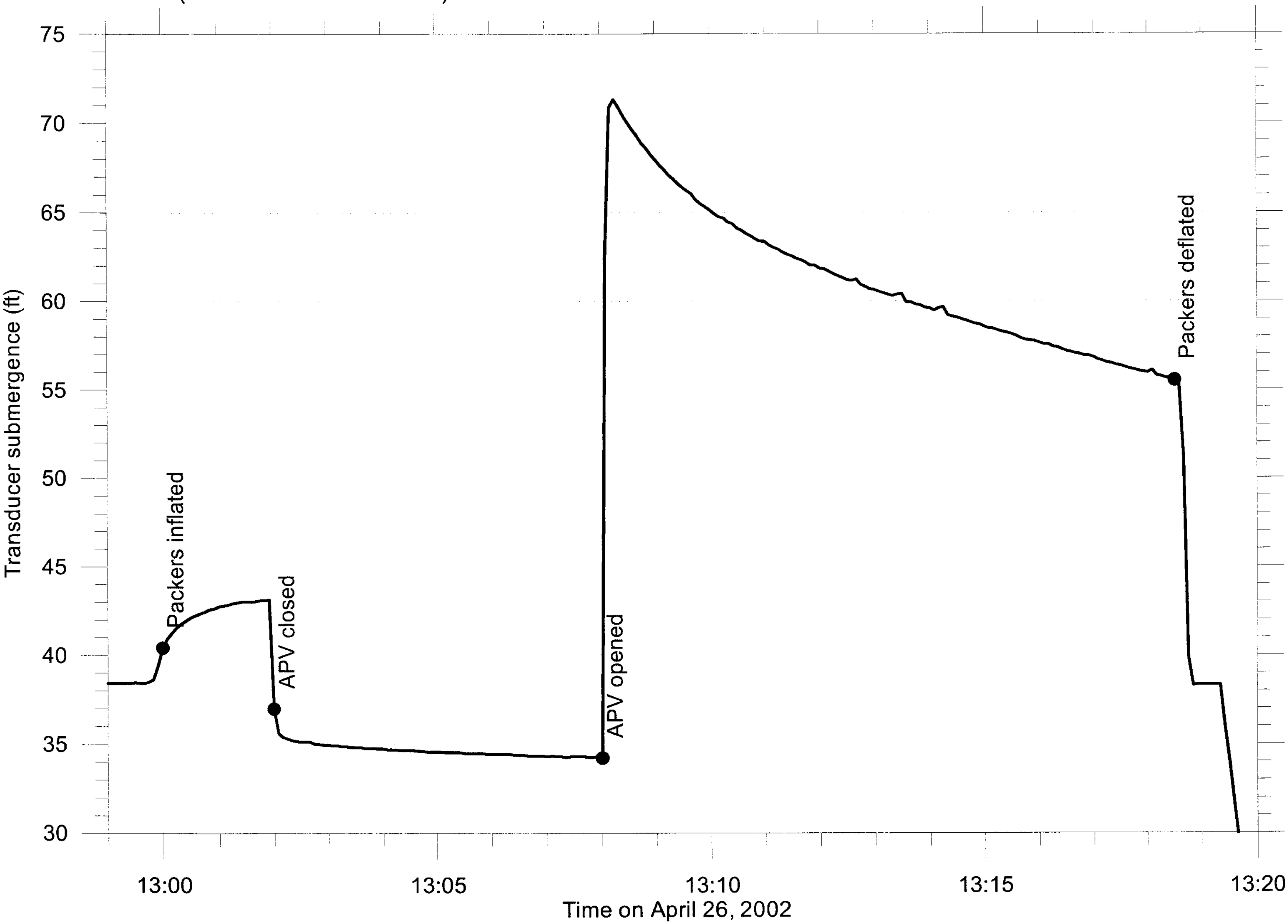
SOLUTION

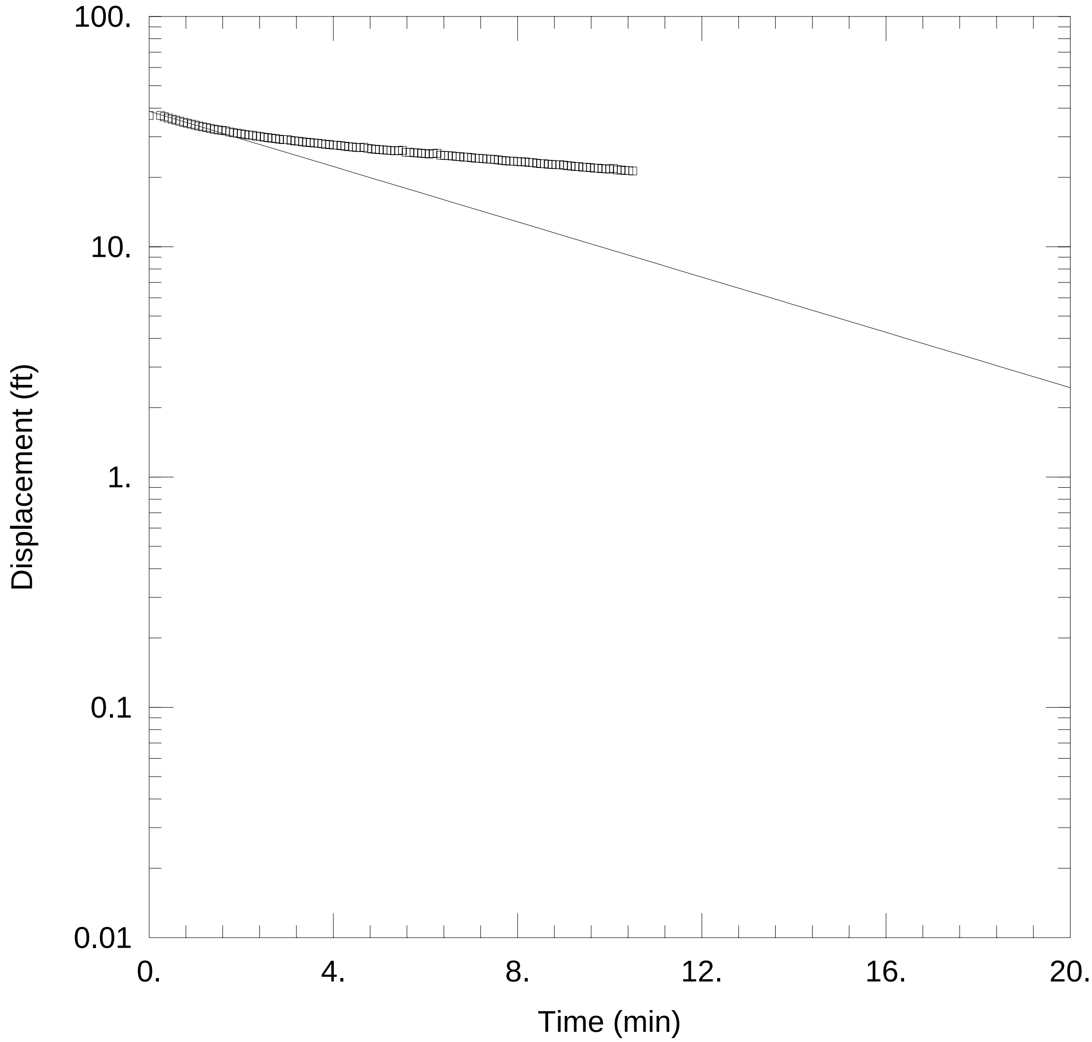
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.0487 ft^2/day
S = 1.E-06

AGW-1M Packer Testing

Test 4 (516.36 to 511.16 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-4a.aqt
Date: 01/22/03 Time: 10:00:16

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

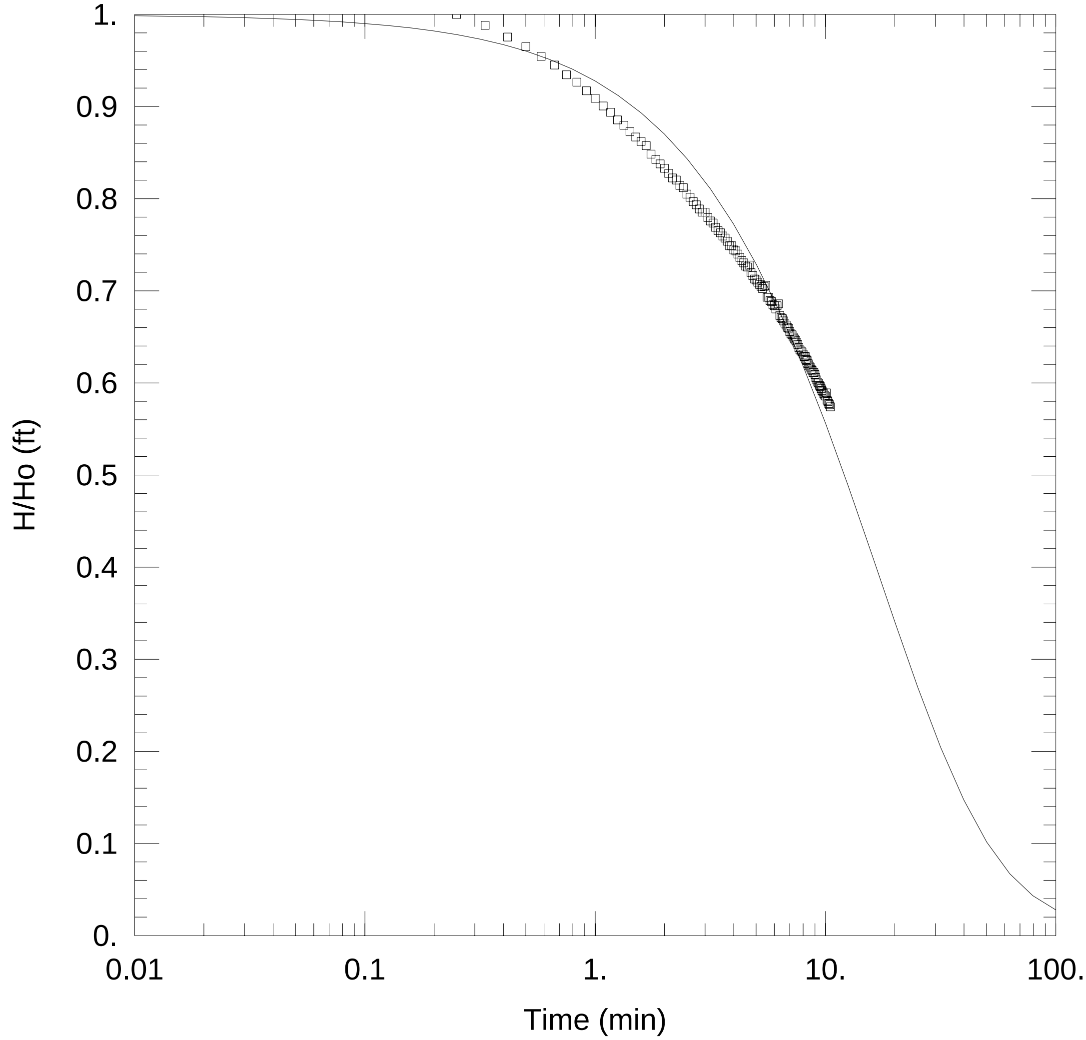
WELL DATA (AGW1M-4)

Initial Displacement: 37.12 ft Casing Radius: 0.1667 ft
Wellbore Radius: 0.1667 ft Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 1.83 ft/day y0 = 38.72 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-4b.aqt
Date: 01/22/03 Time: 10:00:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1M-4)

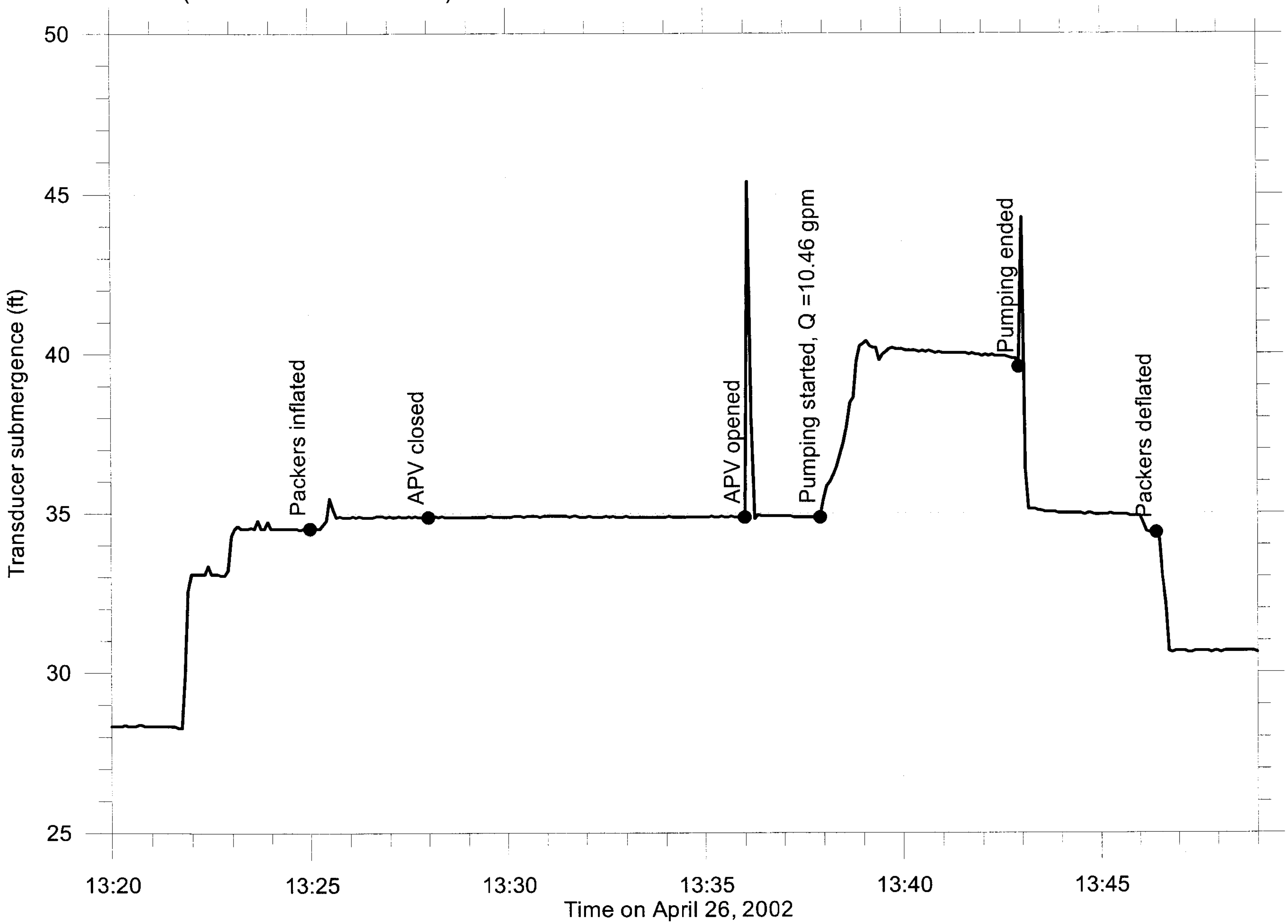
Initial Displacement: 37.12 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

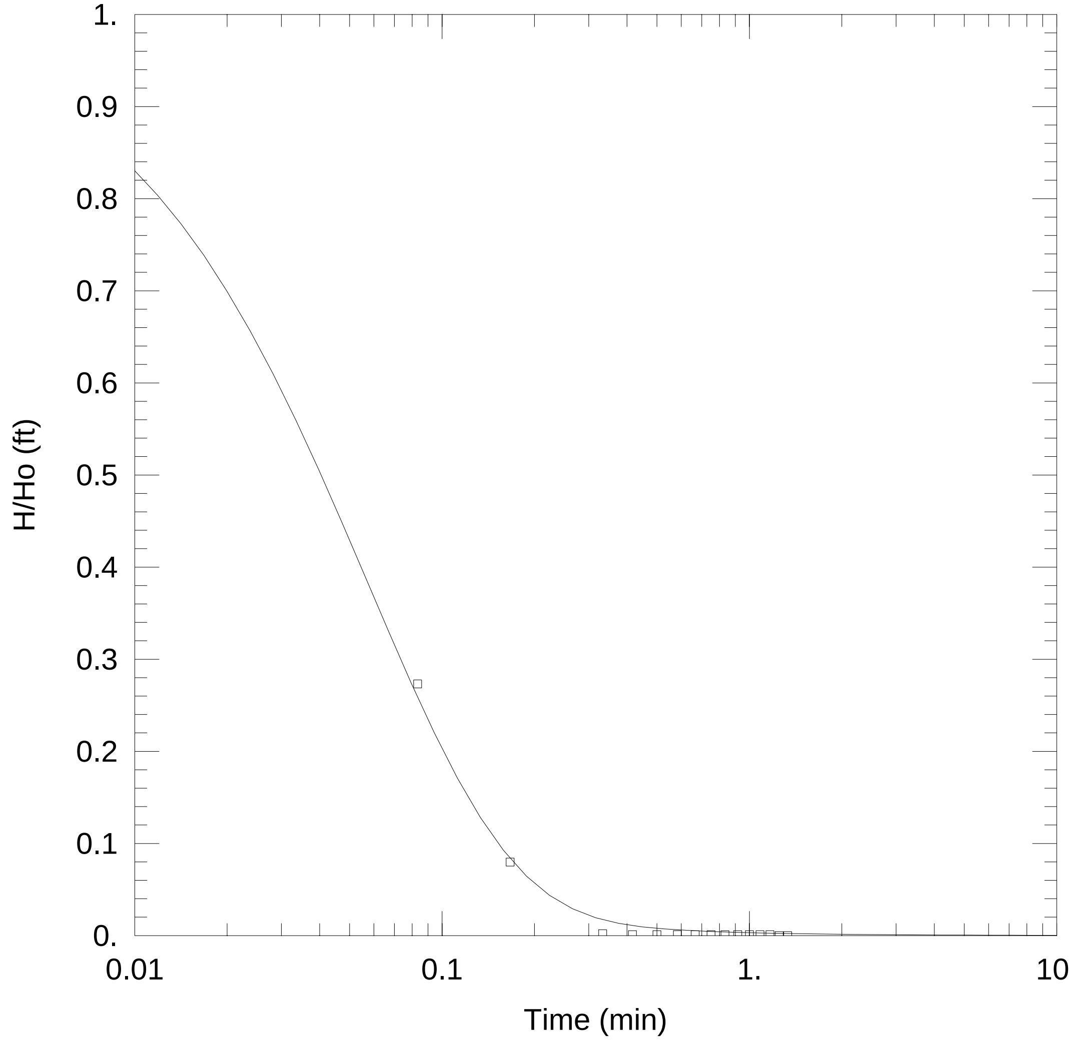
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.4366 ft^2/day S = 1.E-06

AGW-1M Packer Testing

Test 5 (520.36 to 515.16 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-5Sb.aqt
Date: 01/22/03 Time: 10:02:18

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

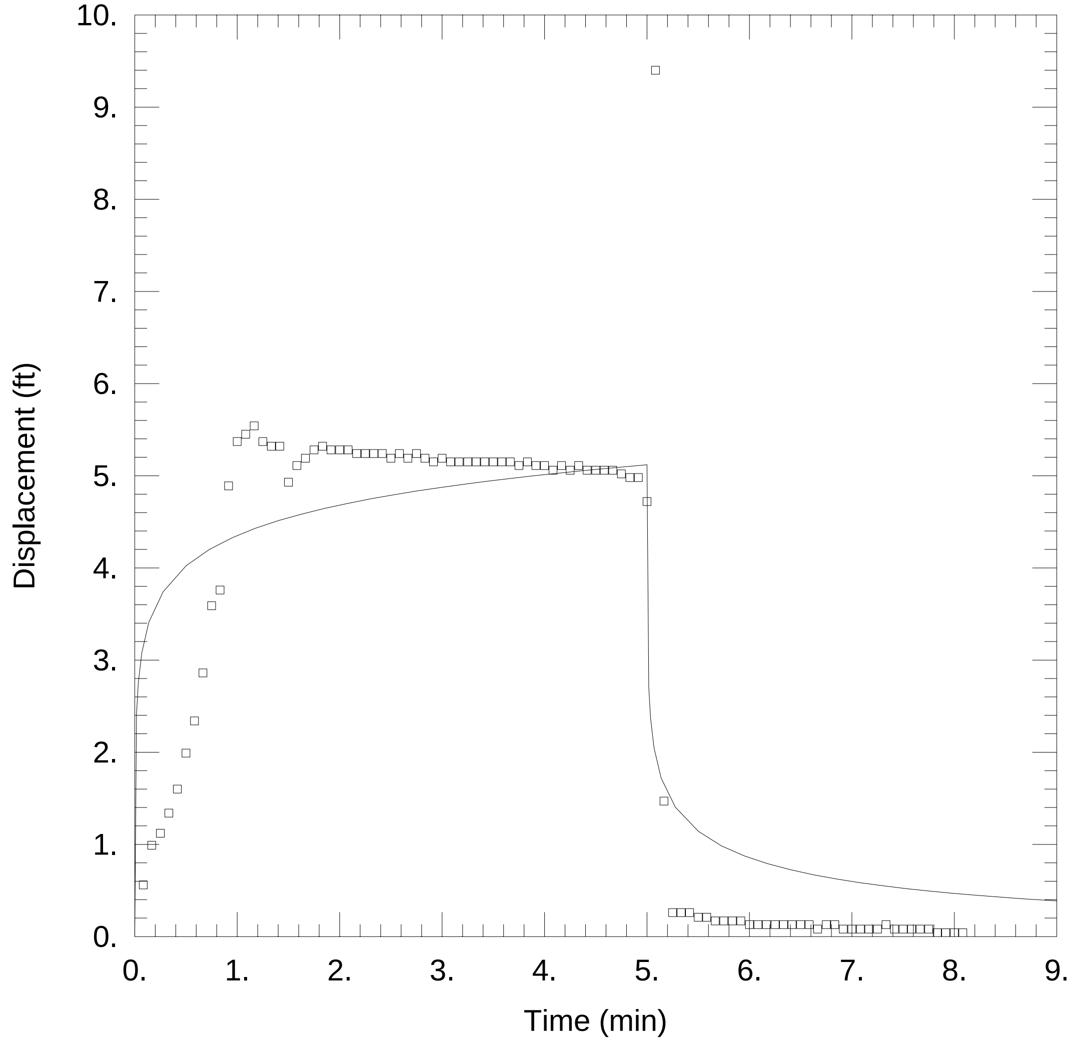
WELL DATA (AGW1M-5S)

Initial Displacement: 38.5 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 235. ft^2/day S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-5P.aqt
Date: 01/22/03 Time: 10:02:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW1M-5	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ AGW1M-5	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 337.3 ft^2/day S = 1.E-06
Sw = -3.816 C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh s(t) = 3.1Q + 0.$Q^{2.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 183.7%

AGW-1M, Test 5P

Alternative analyses

Average Q: 10.5 gpm

"Drawdown" (s or ΔH): 5.15 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

T = 510 ft²/d

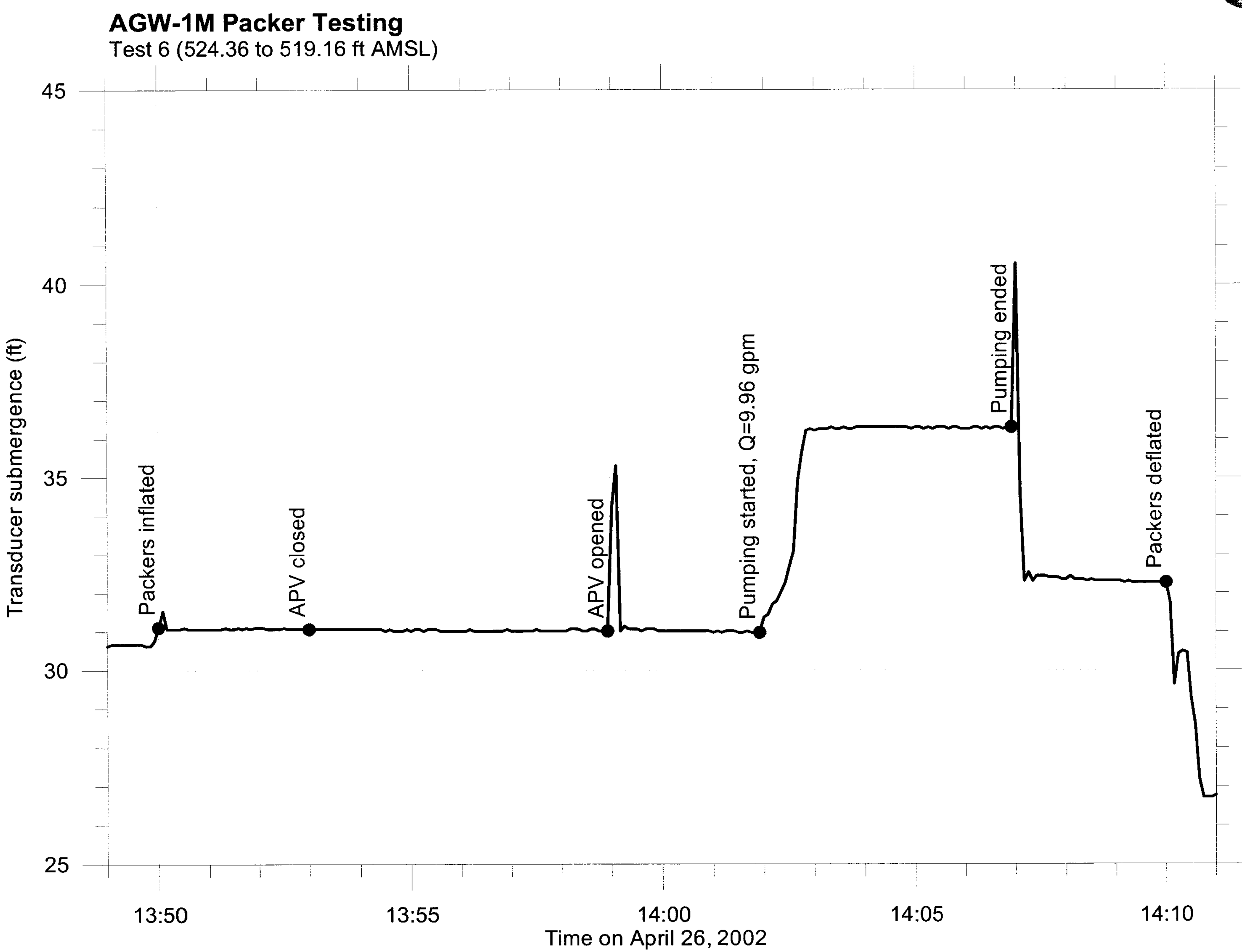
<u>T by Thiem solution:</u>

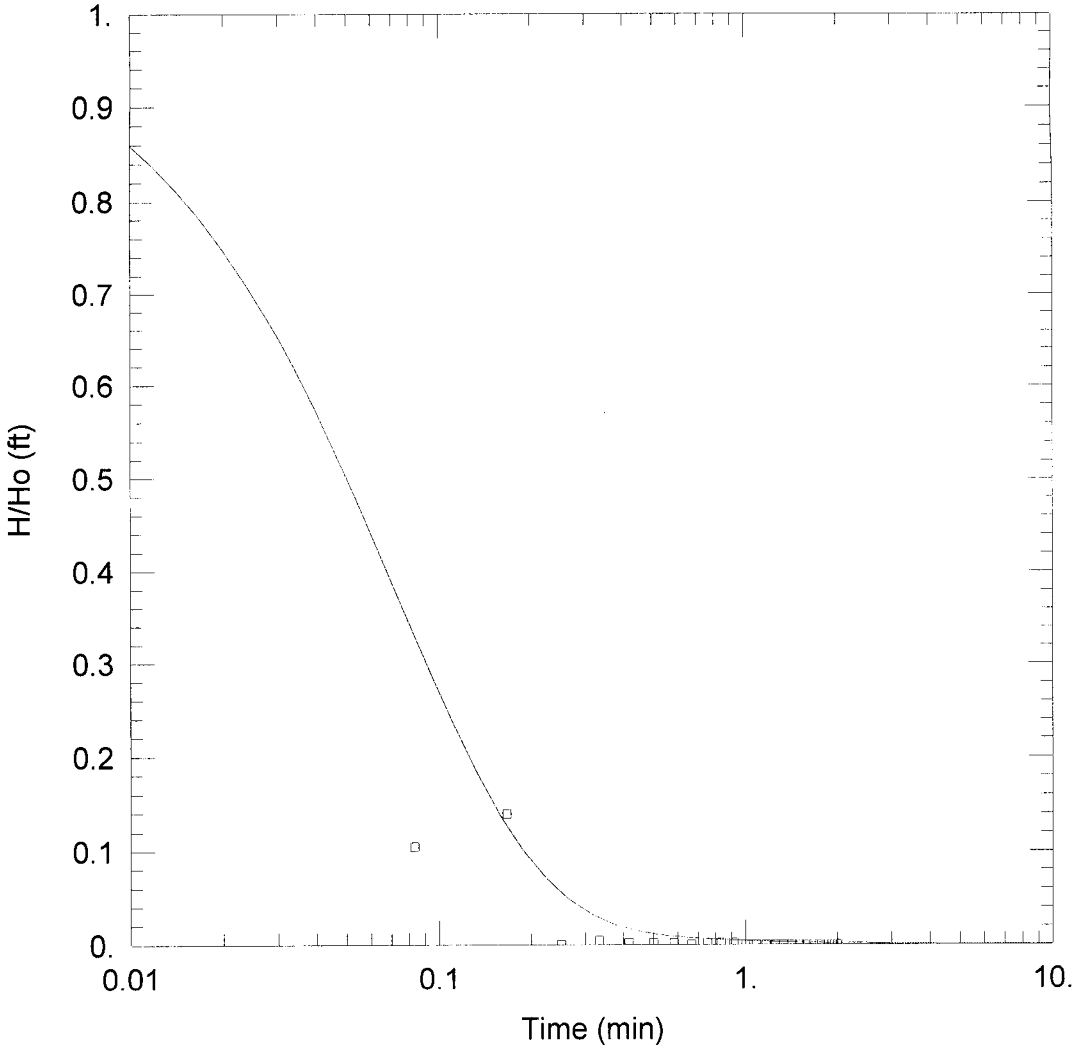
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)

$r_w = 3^7/_8" = 0.1615$ ft

T = 332 ft²/d


AGW-1M Packer Testing
Test 6 (524.36 to 519.16 ft AMSL)
45
40
35
30
25
Transducer submergence (ft)
Packers inflated
APV closed
APV opened
Pumping started, Q=9.96 gpm
Pumping ended
Packers deflated
13:50
13:55
14:00
14:05
14:10
Time on April 26, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-6S.aqt
Date: 01/13/03 Time: 10:25:04

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

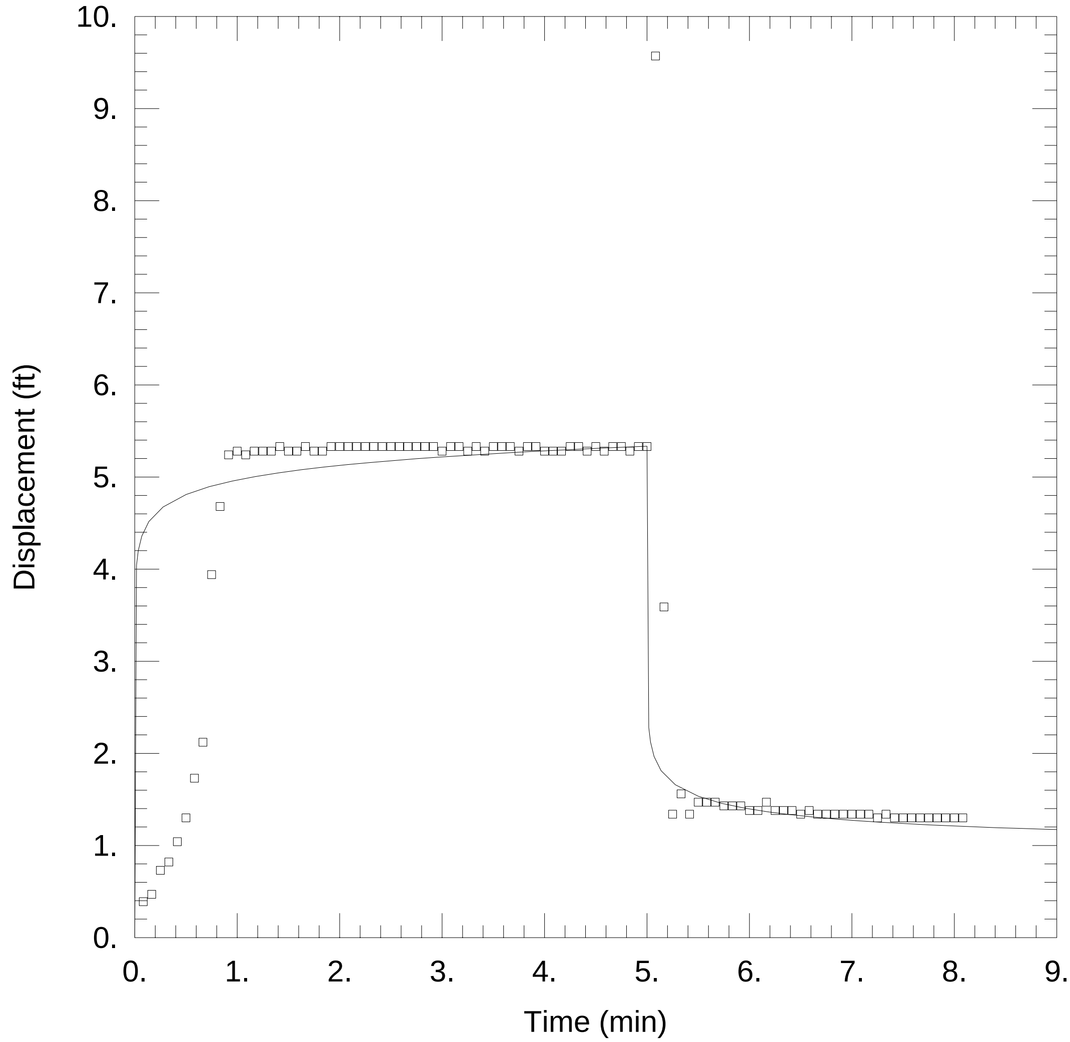
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1M-6S)

Initial Displacement: 30.67 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 189. ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-6P.aqt
Date: 01/22/03 Time: 10:03:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW1M-6	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ AGW1M-6	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 671.5 ft^2/day S = 1.E-06
Sw = 0. C = 0.4134 min^2/ft^5
P = 3.

Step Test Model: Jacob-Rorabaugh s(t) = 2.977Q + 0.4134$Q^{3.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 80.12%

AGW-1M, Test 6P

Alternative analyses

Average Q: 10 gpm
"Drawdown" (s or ΔH): 5.33 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

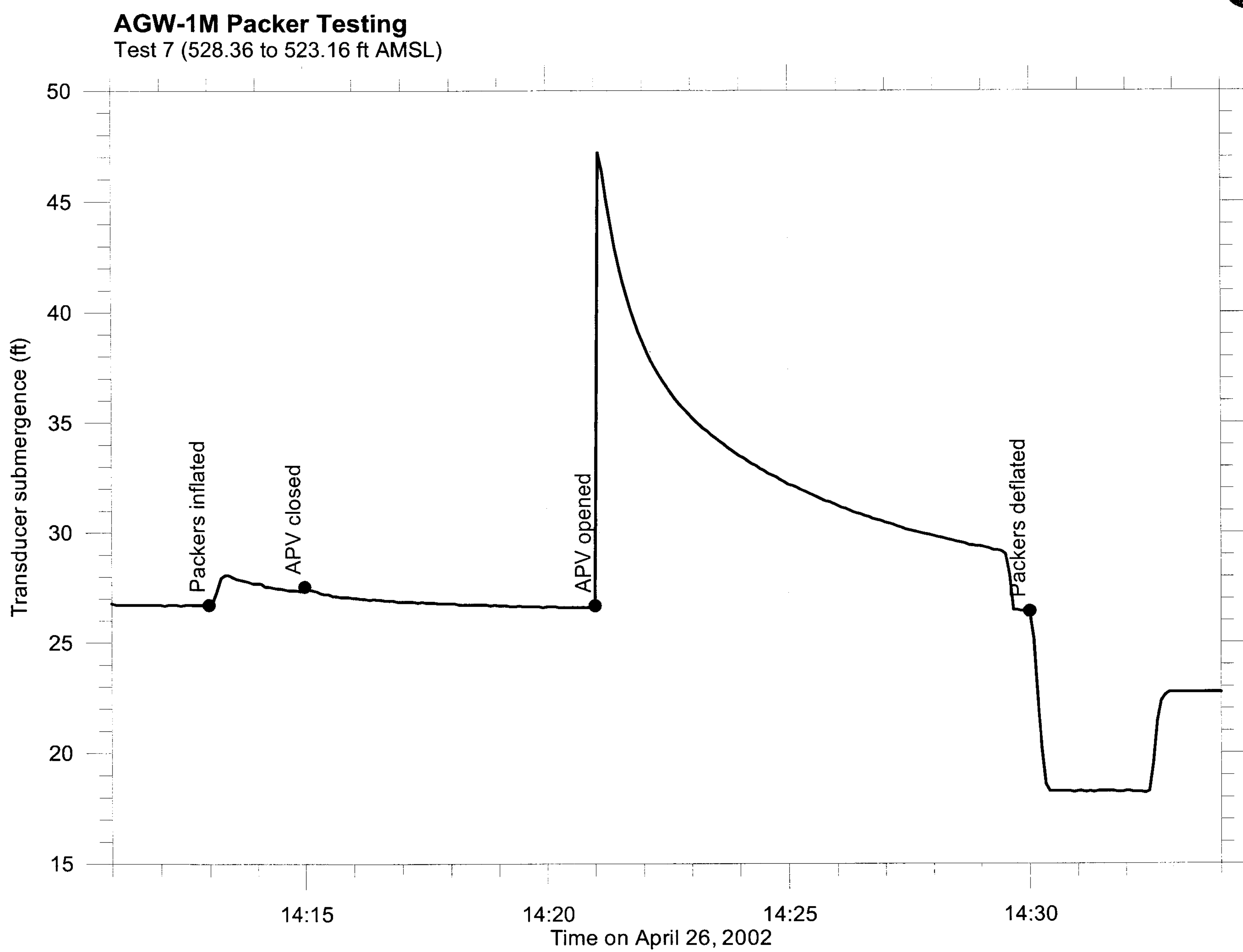
$T = 469\ ft^2/d$

T by Thiem solution:

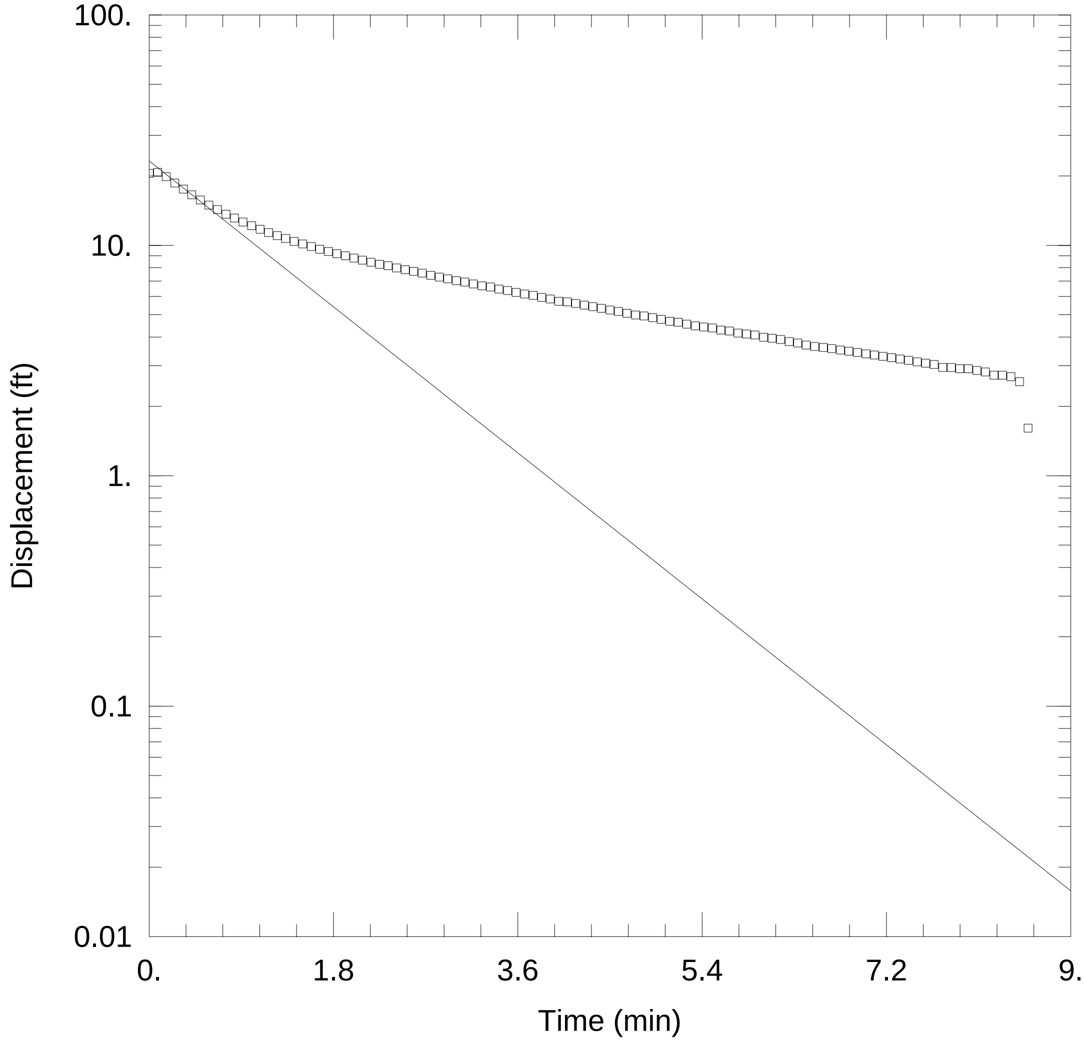
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

$T = 305\ ft^2/d$



AGW-1M Packer Testing
Test 7 (528.36 to 523.16 ft AMSL)
Transducer submergence (ft)
50
45
40
35
30
25
20
15
Packers inflated
APV closed
APV opened
Packers deflated
14:15
14:20
14:25
14:30
Time on April 26, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-7a.aqt
Date: 01/22/03 Time: 10:05:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

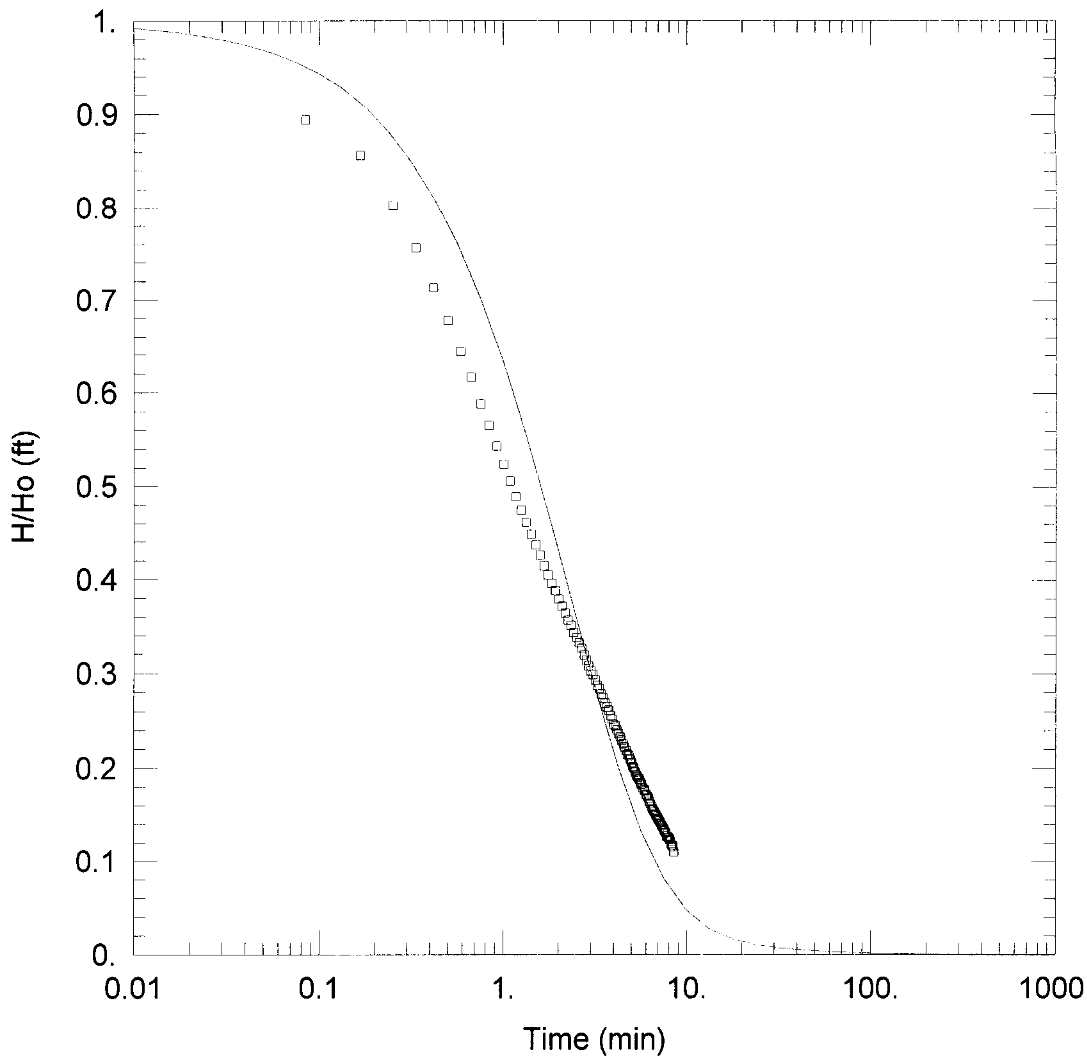
WELL DATA (AGW1M-7)

Initial Displacement: 20.53 ft Casing Radius: 0.1667 ft
Wellbore Radius: 0.1667 ft Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 10.73 ft/day y0 = 23.24 ft



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1M\AGW1M-7b.aqt
Date: 11/25/02 Time: 11:52:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1M-7)

Initial Displacement: 23.2 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

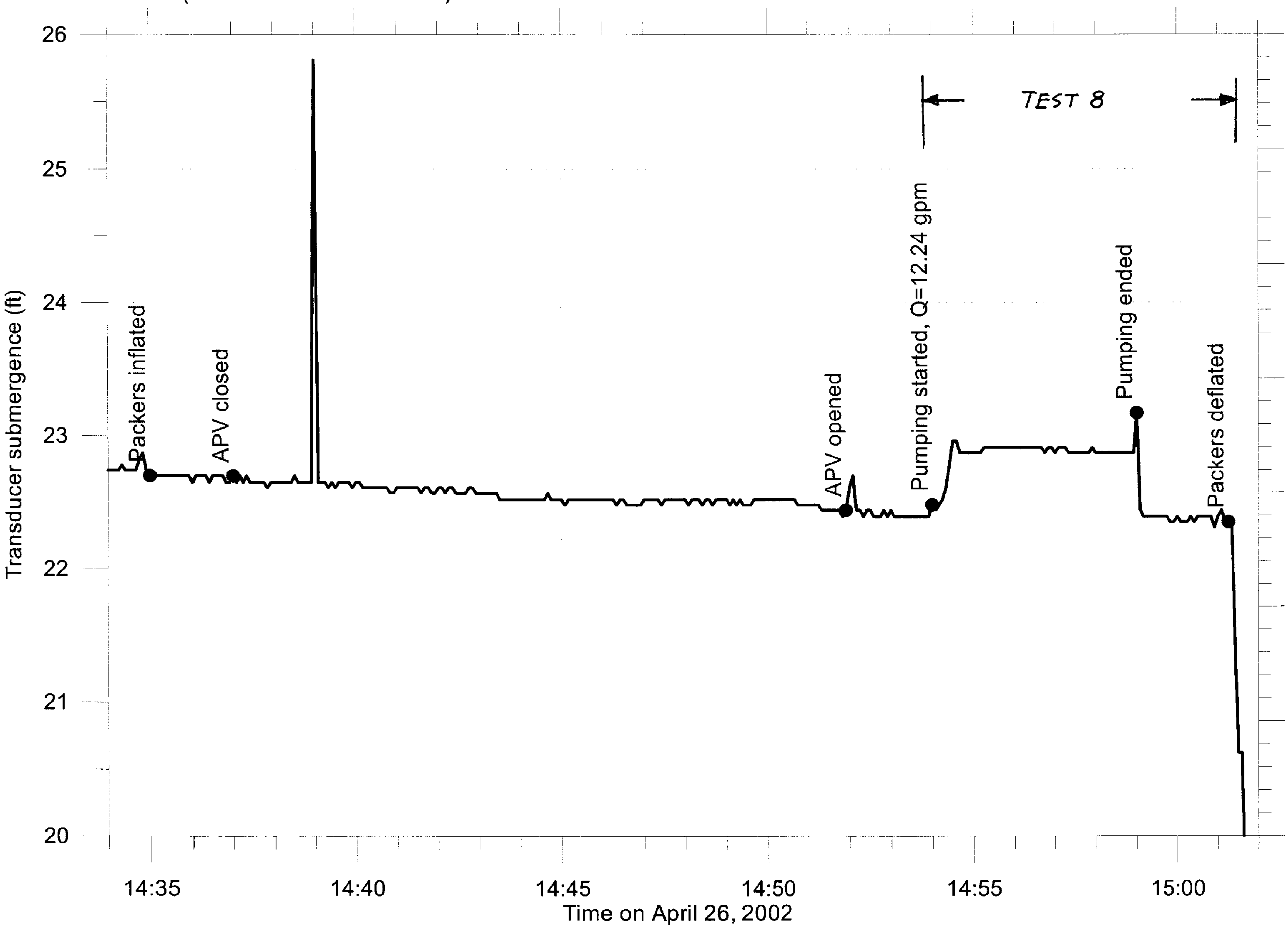
SOLUTION

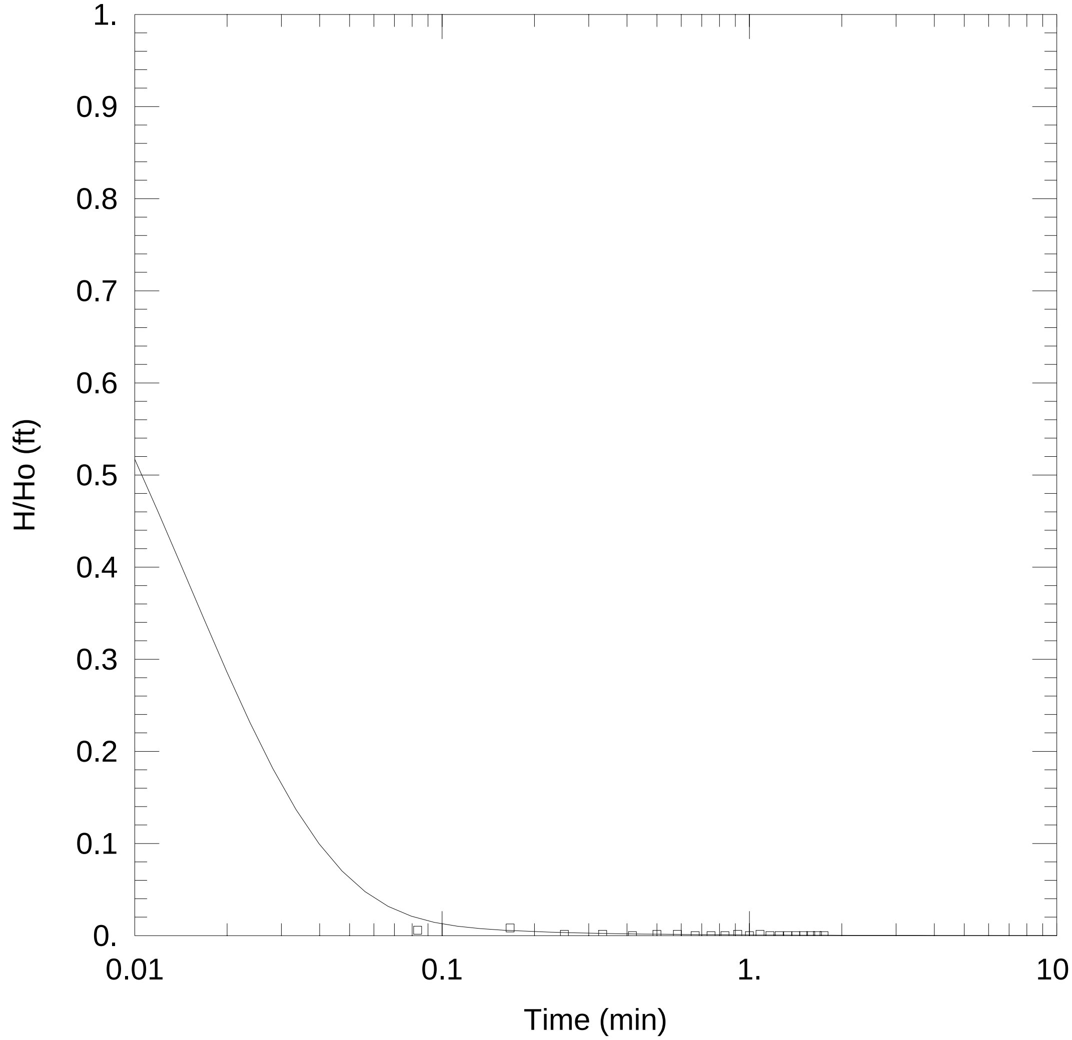
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

˜ = 3.304 ft^2/day
S = 1.E-06

AGW-1M Packer Testing

Test 8 (532.36 to 527.16 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-8Sb.aqt
Date: 01/22/03 Time: 10:06:54

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

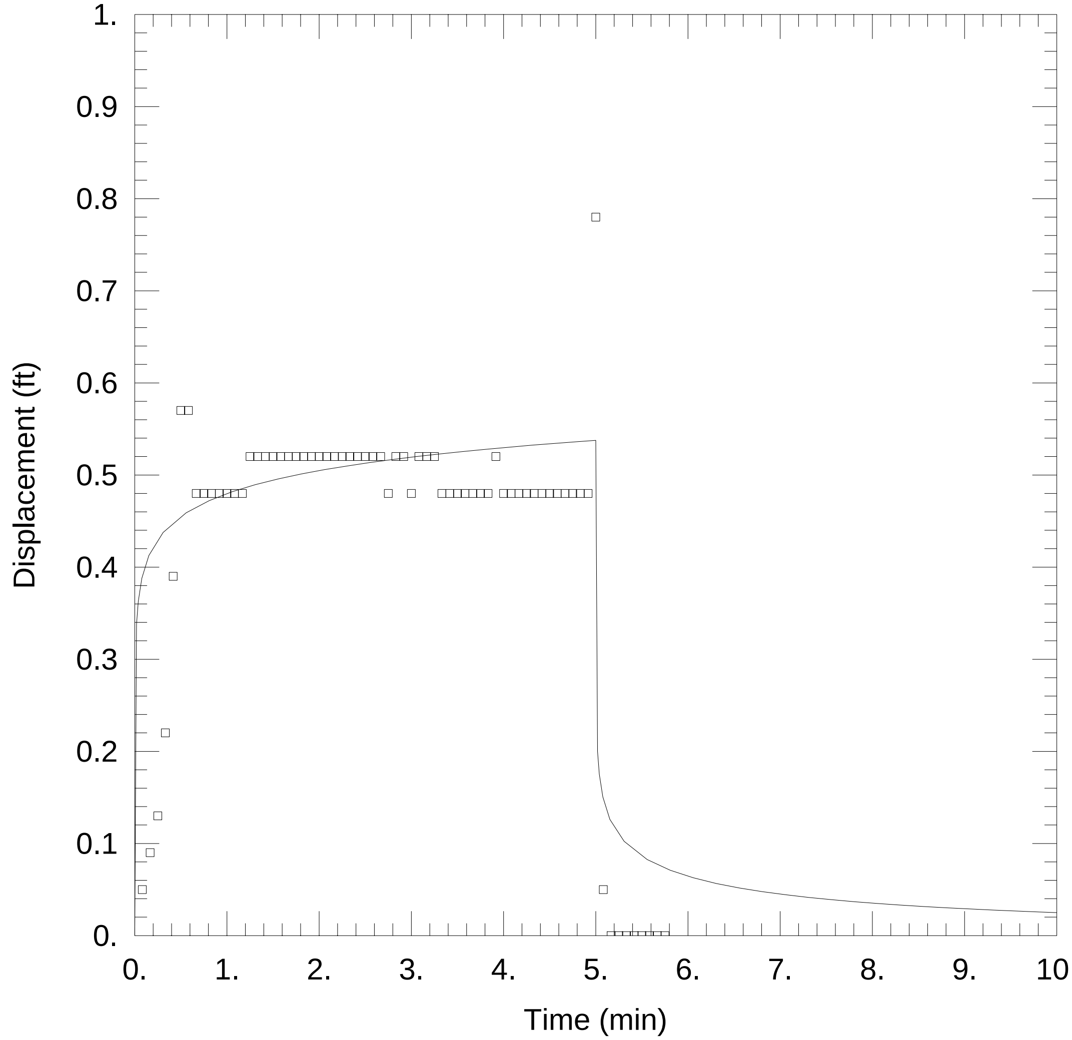
WELL DATA (AGW1M-8S)

Initial Displacement: 37.87 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 901.1 ft^2/day S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-8P.aqt
Date: 01/22/03 Time: 10:05:24

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW1M-8	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ AGW1M-8	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 5213.4 ft^2/day S = 1.E-06
Sw = -3.077 C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh s(t) = 0.2932Q + $0.Q^{2.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 146.1%

AGW-1M, Test 8P

Alternative analyses

Average Q: 12.24 gpm
"Drawdown" (s or ΔH): 0.5 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 6120\ ft^2/d}}$

T by Thiem solution:

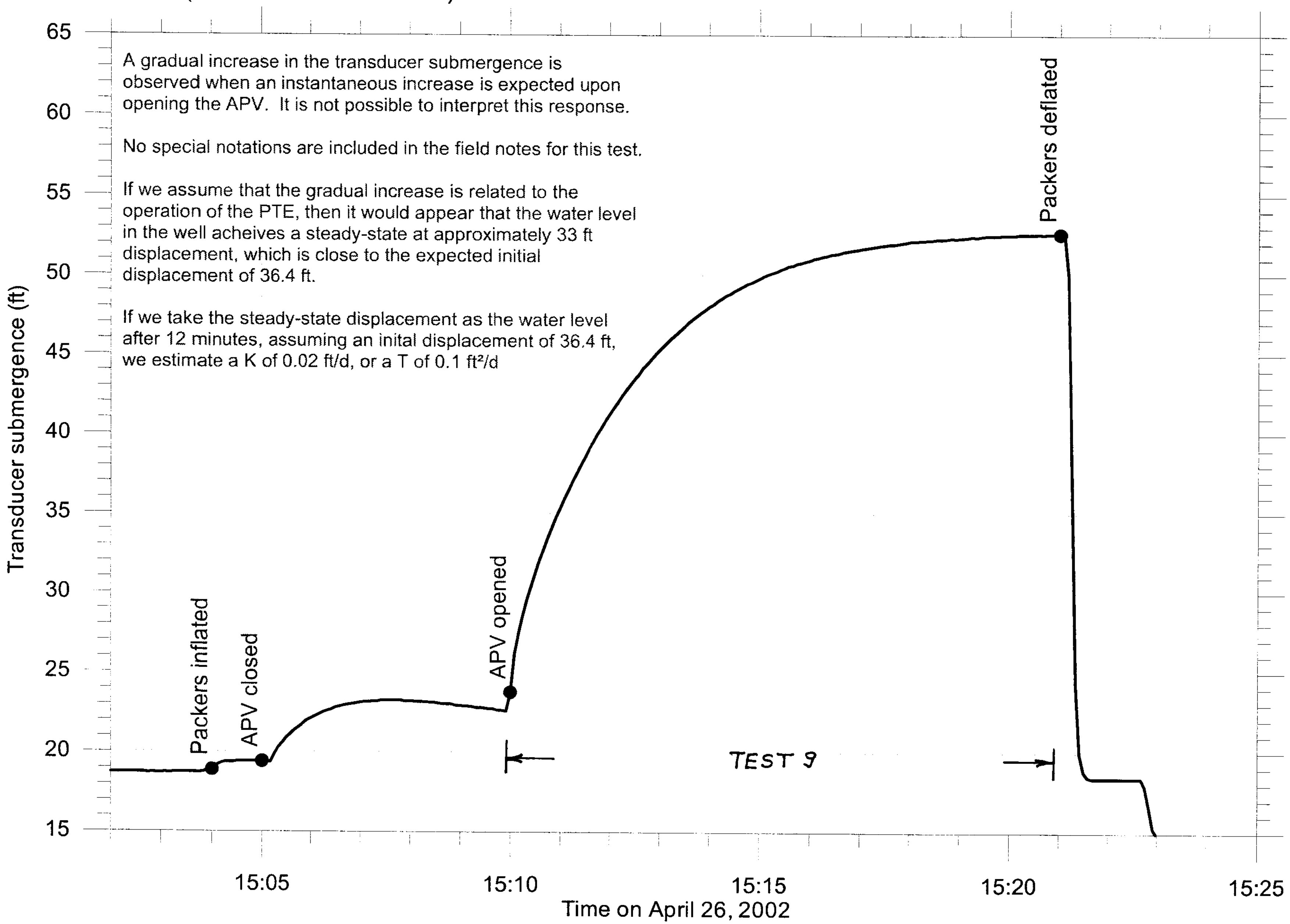
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

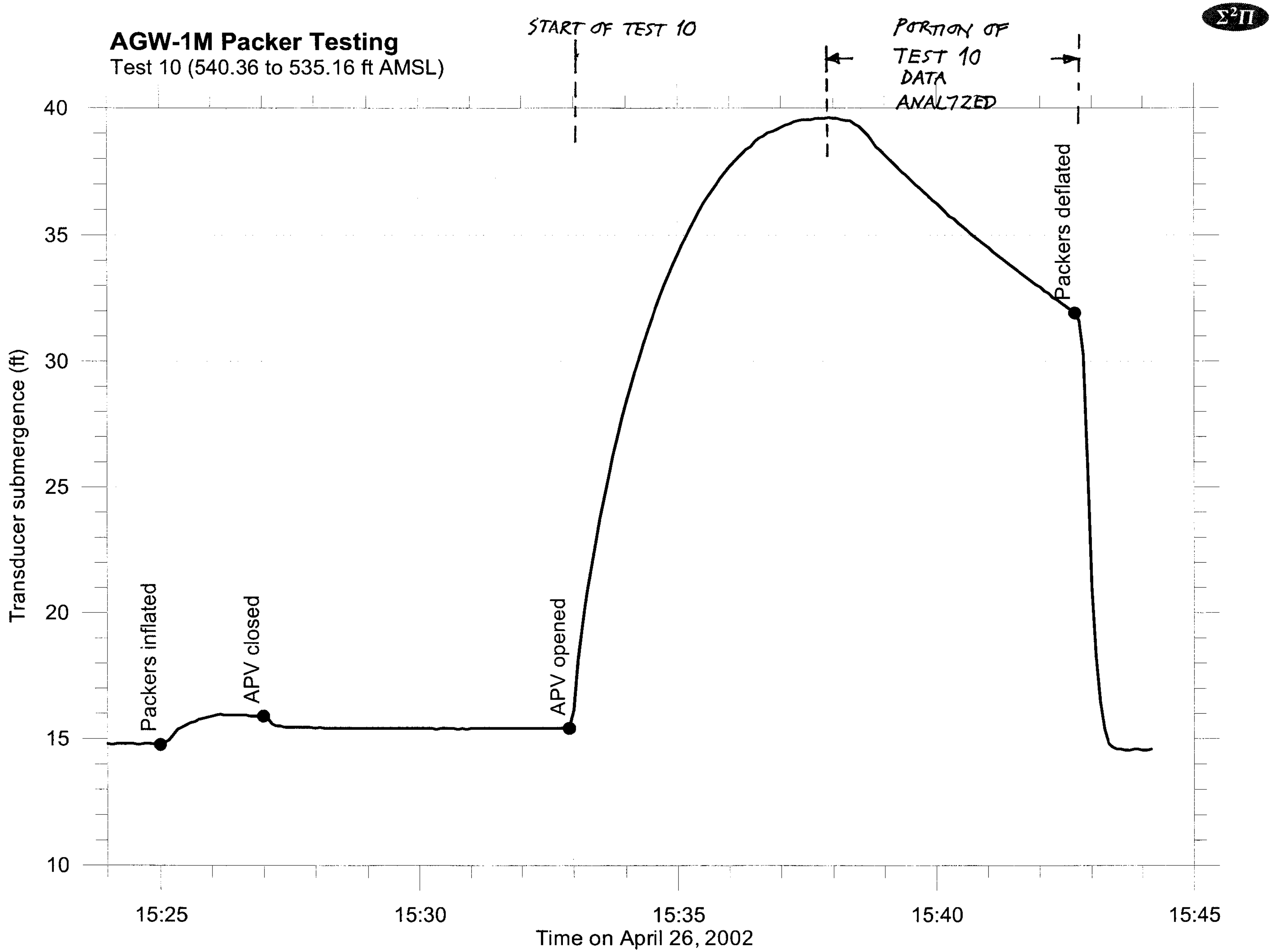
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

$\underline{\underline{T = 3985\ ft^2/d}}$

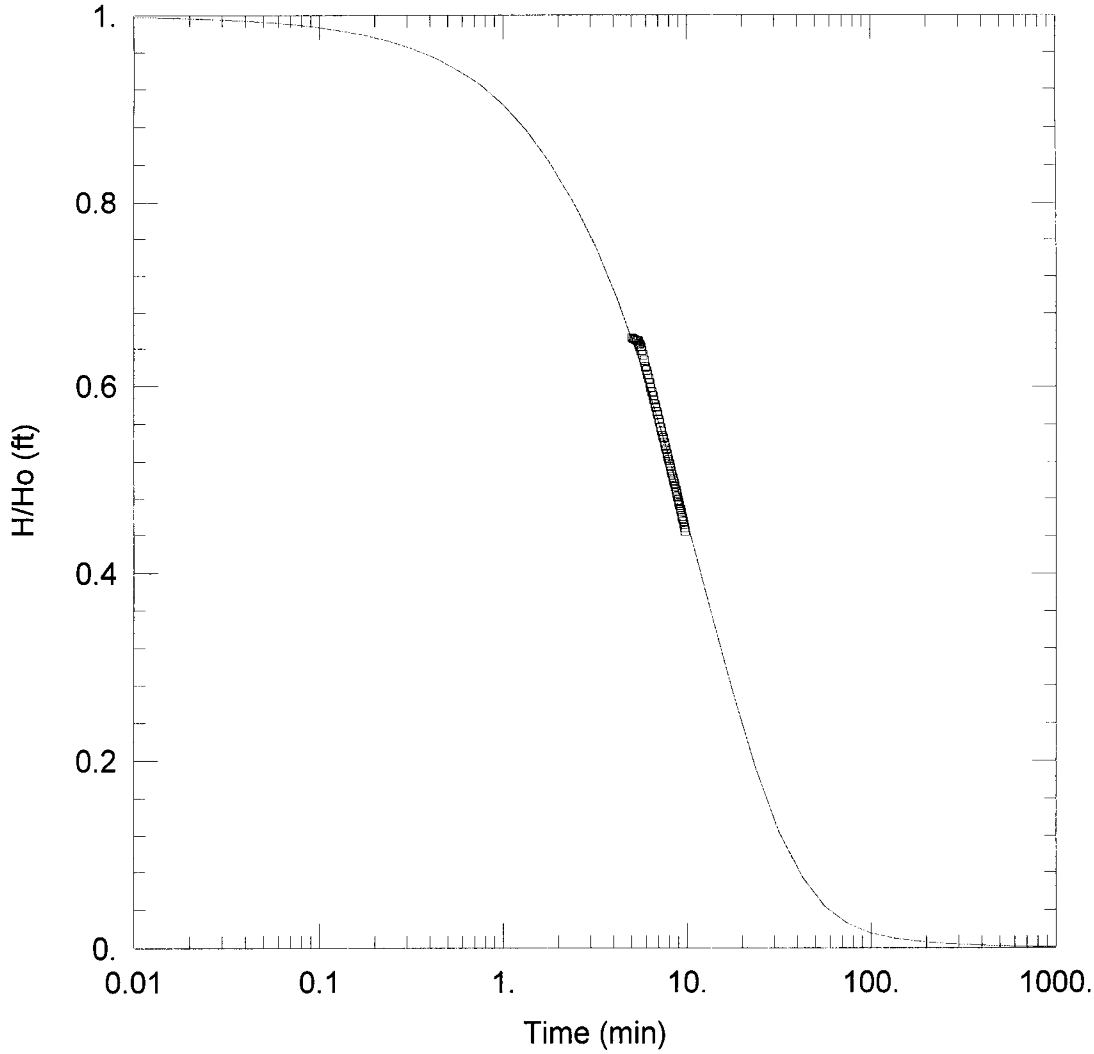
AGW-1M Packer Testing

Test 9 (536.36 to 531.16 ft AMSL)





AGW-1M Packer Testing
Test 10 (540.36 to 535.16 ft AMSL)
START OF TEST 10
PORTION OF TEST 10 DATA ANALYZED
Packers inflated
APV closed
APV opened
Packers deflated
Transducer submergence (ft)
40
35
30
25
20
15
10
15:25
15:30
15:35
15:40
15:45
Time on April 26, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1M\AGW1M-10a.aqt
Date: 11/26/02 Time: 09:59:30

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1M-10)

Initial Displacement: 37.12 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.613 ft^2/day
S = 1.E-06

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

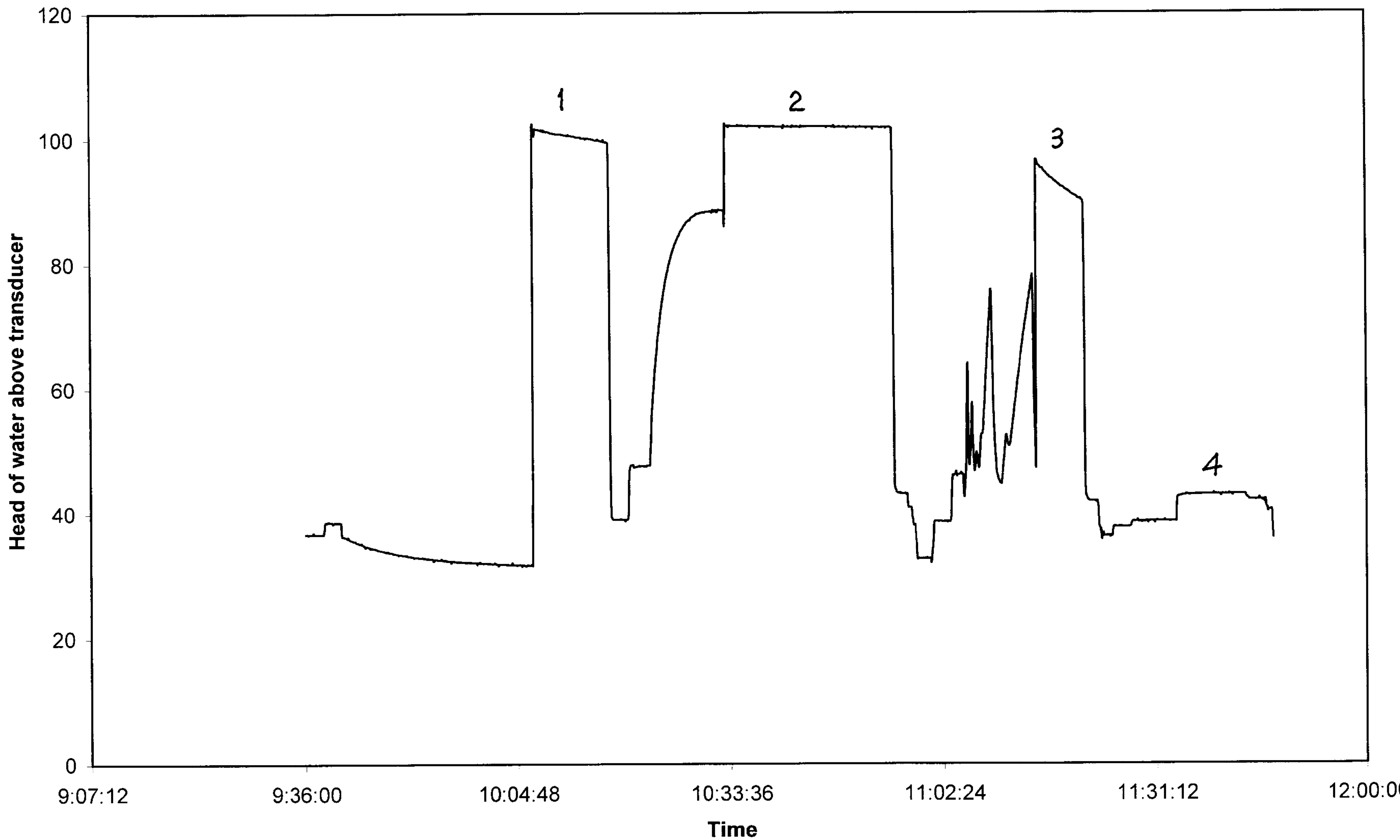
AGW-1L

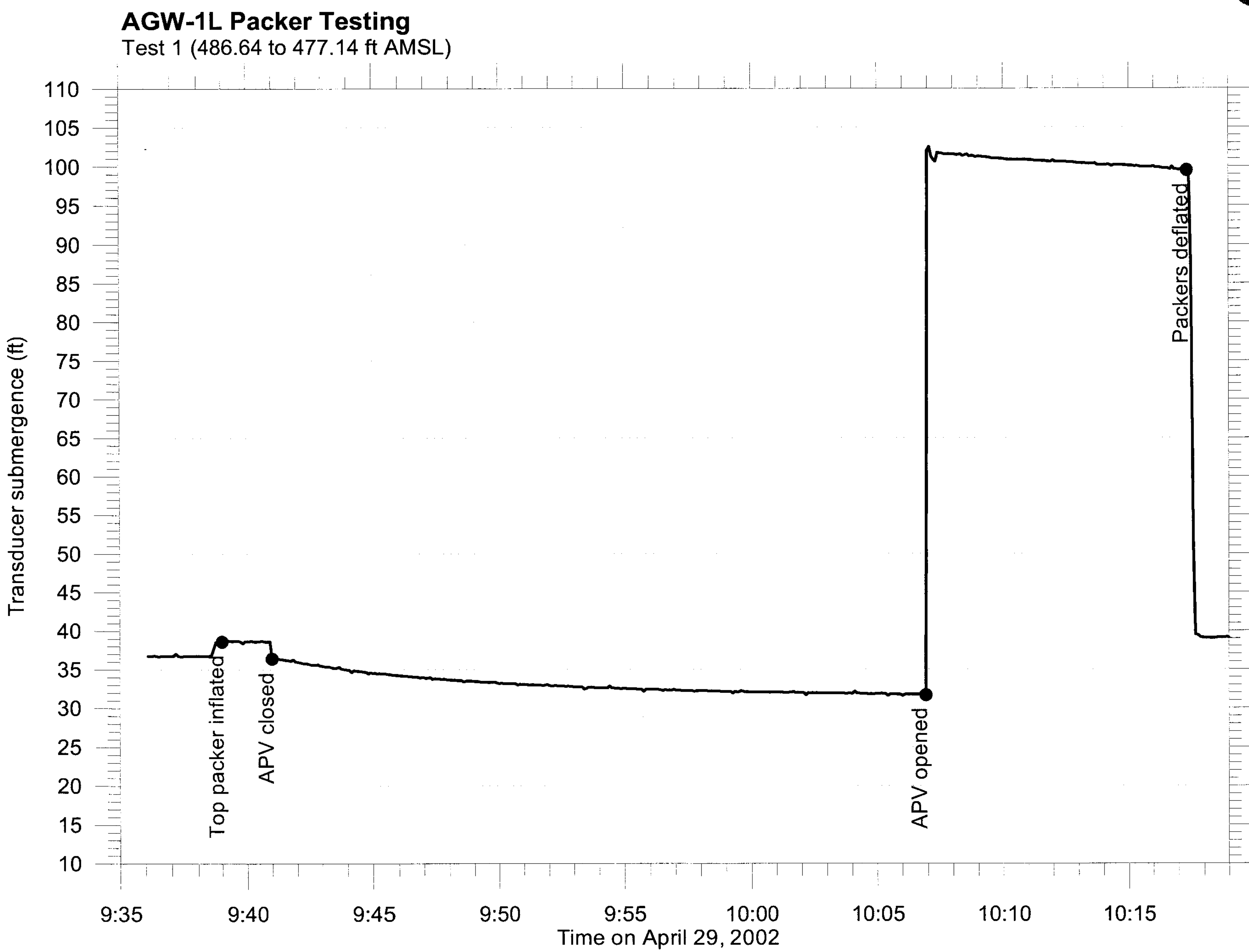
Testing Dates: April 29, 2002

Summary of Tests:

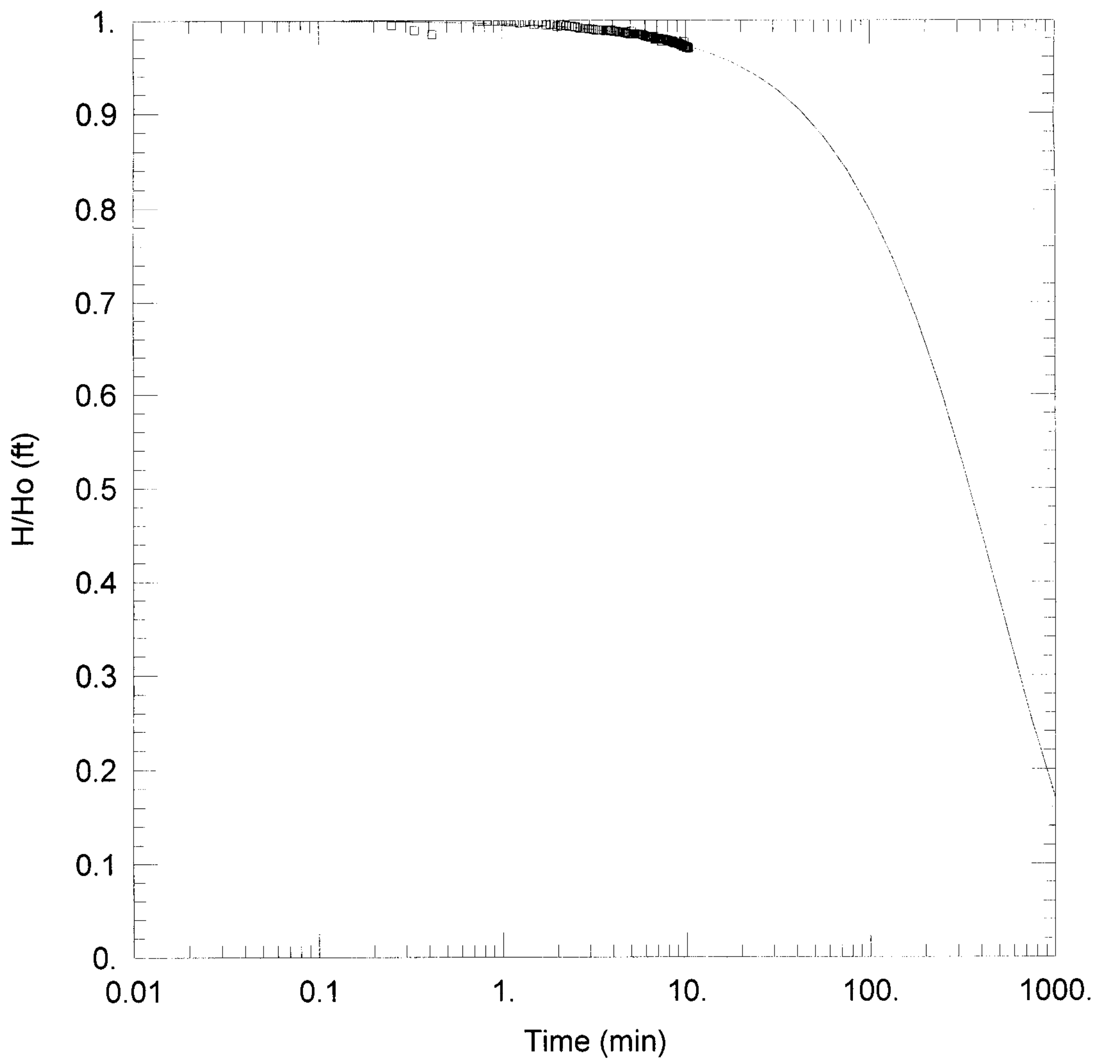
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
AGW-1L	1	486.64	477.14	0.018	
AGW-1L	2	486.64	481.44	0.005	
AGW-1L	3	490.64	485.44	0.17	
AGW-1L	4	494.64	489.44	<<1	

Monitoring Well AGW-1L





AGW-1L Packer Testing
Test 1 (486.64 to 477.14 ft AMSL)
Transducer submergence (ft)
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
Top packer inflated
APV closed
APV opened
Packers deflated
9:35
9:40
9:45
9:50
9:55
10:00
10:05
10:10
10:15
Time on April 29, 2002



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1L\AGW1L-1.aqt
Date: 11/25/02 Time: 12:47:15

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1L-1)

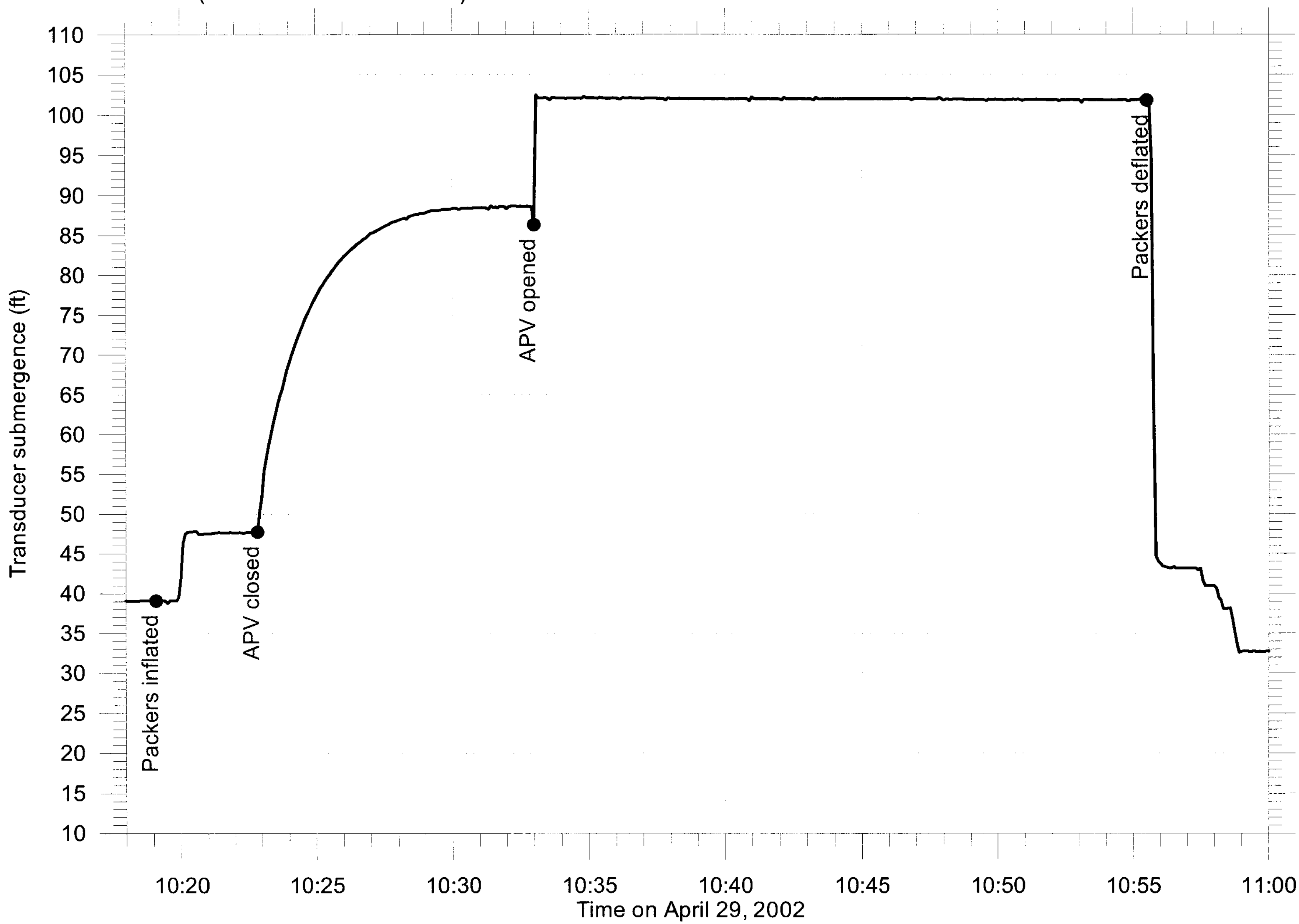
Initial Displacement: 69.96 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

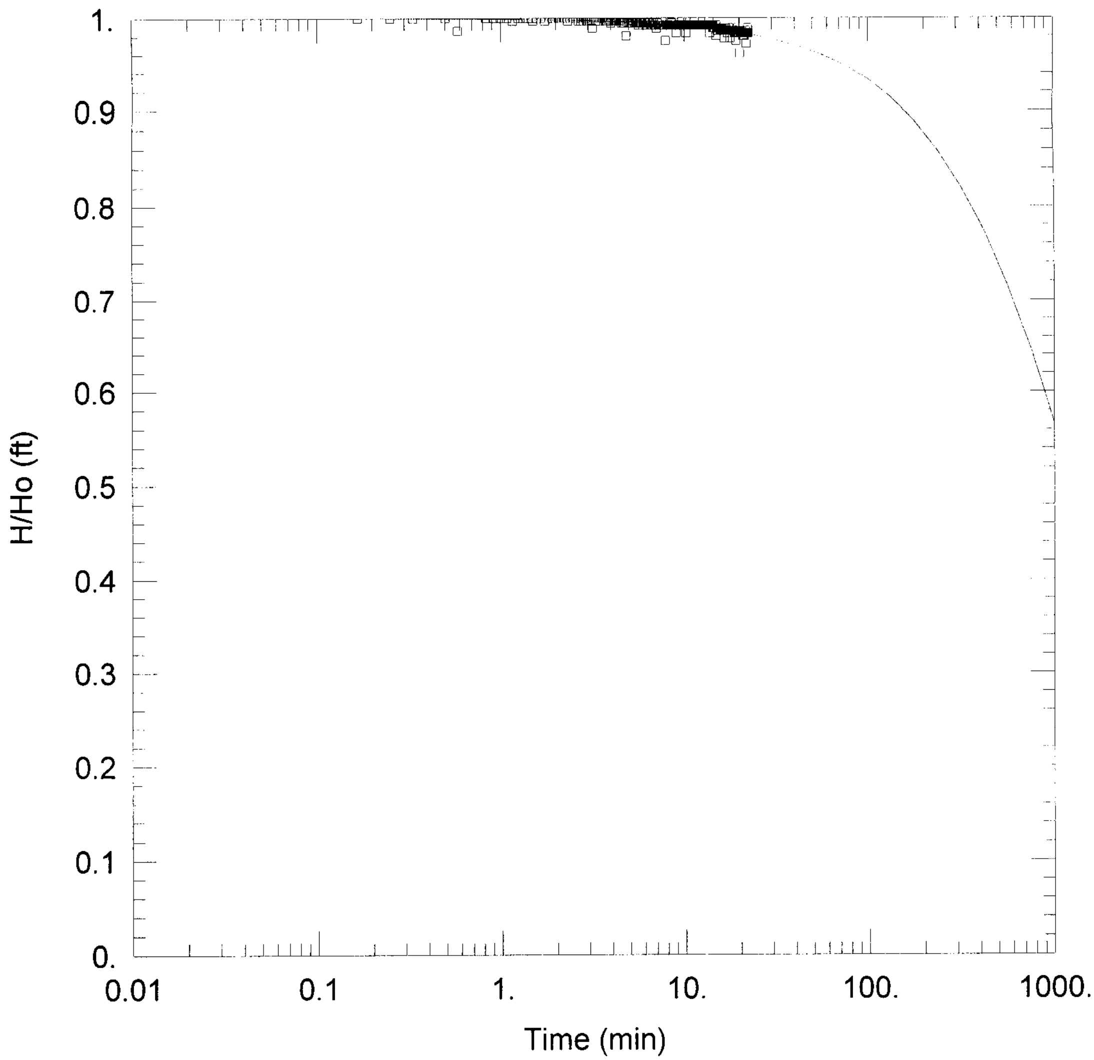
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.01845 ft^2/day
S = 1.E-07

AGW-1L Packer Testing

Test 2 (486.64 to 481.44 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1L\AGW1L-2.aqt
Date: 11/25/02 Time: 12:47:20

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1L-2)

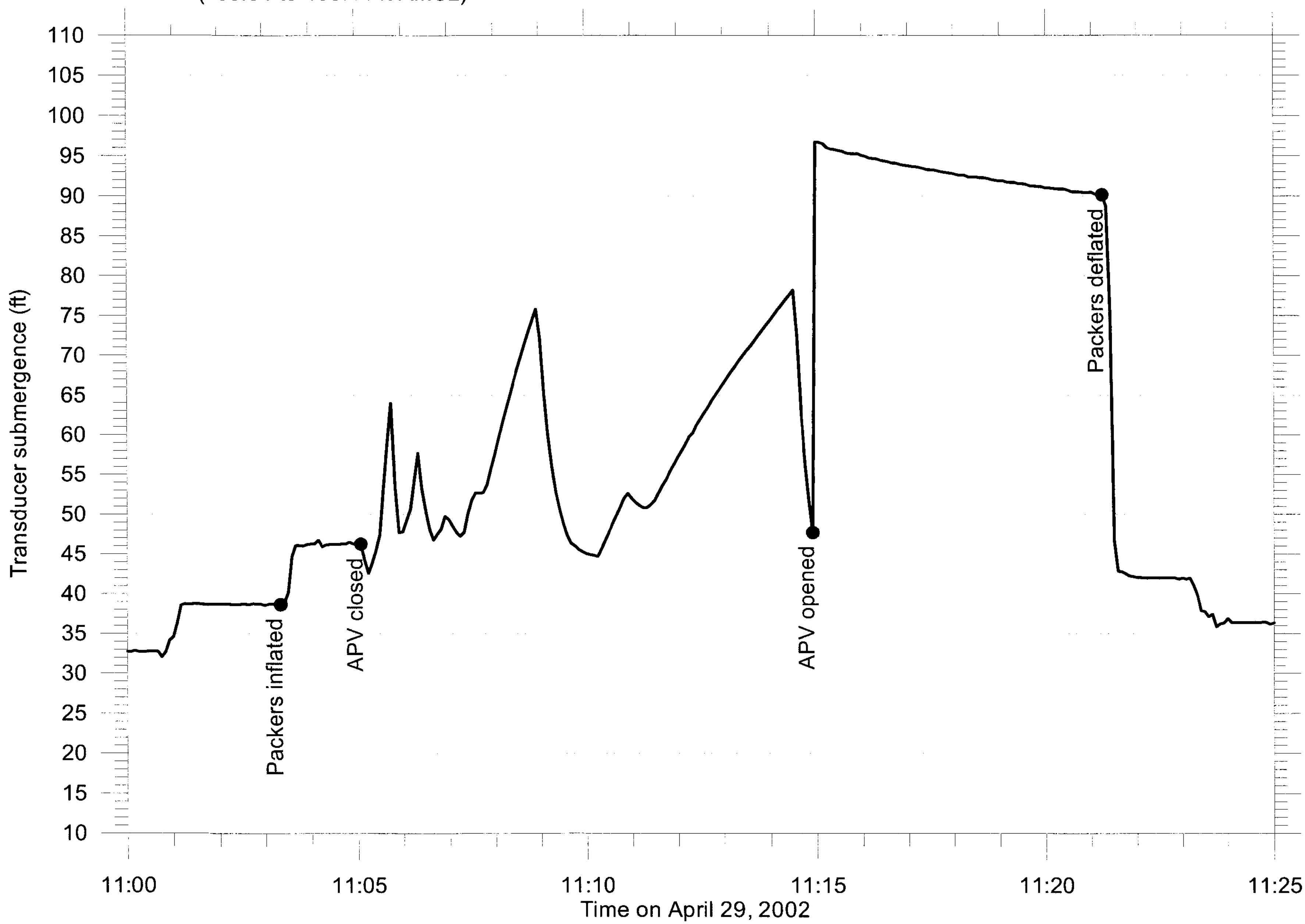
Initial Displacement: 15.77 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

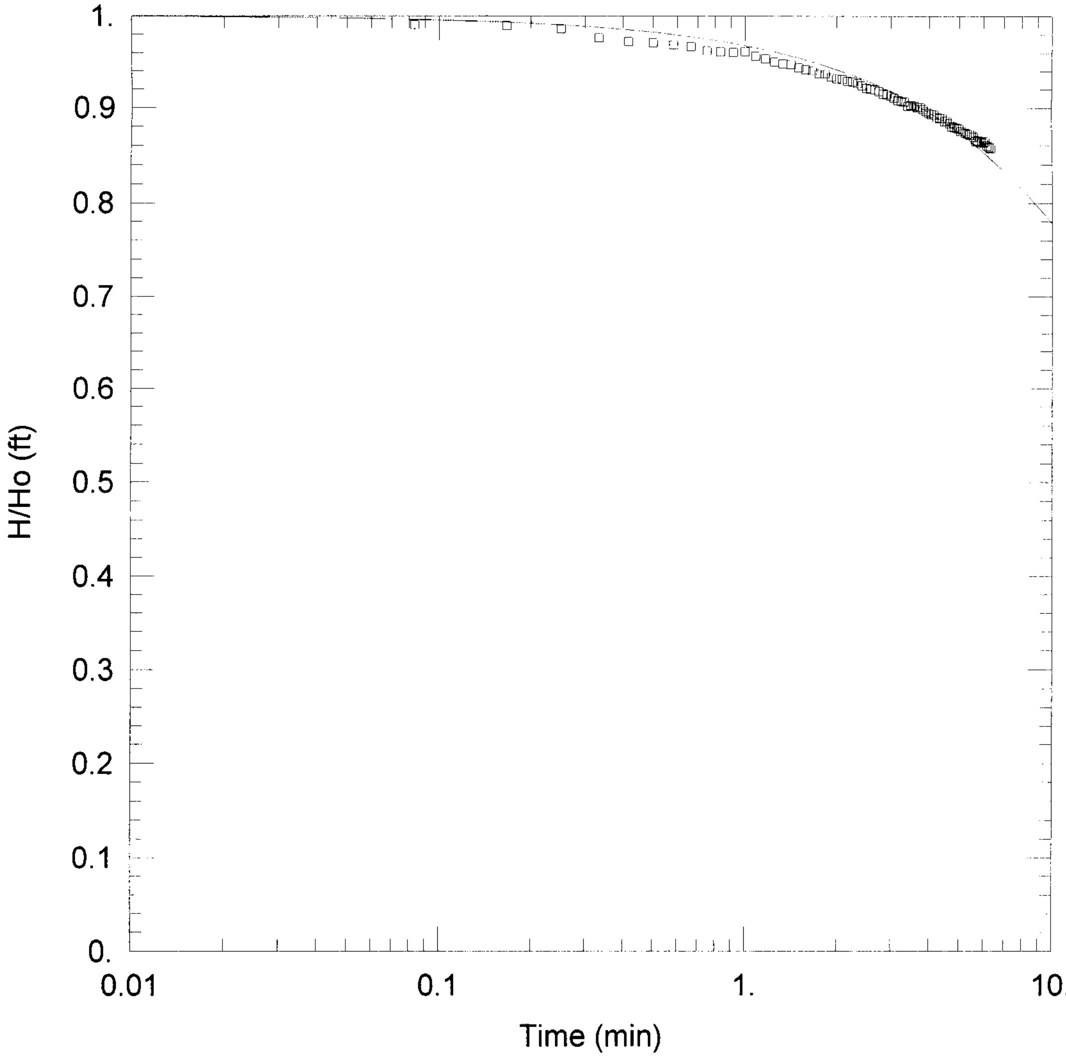
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.005086 ft^2/day
S = 1.E-07

AGW-1L Packer Testing

Test 3 (490.64 to 485.44 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\AGW-1\AGW-1L\AGW1L-3b.aqt
Date: 11/25/02 Time: 12:47:05

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1L-3)

Initial Displacement: 49.5 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

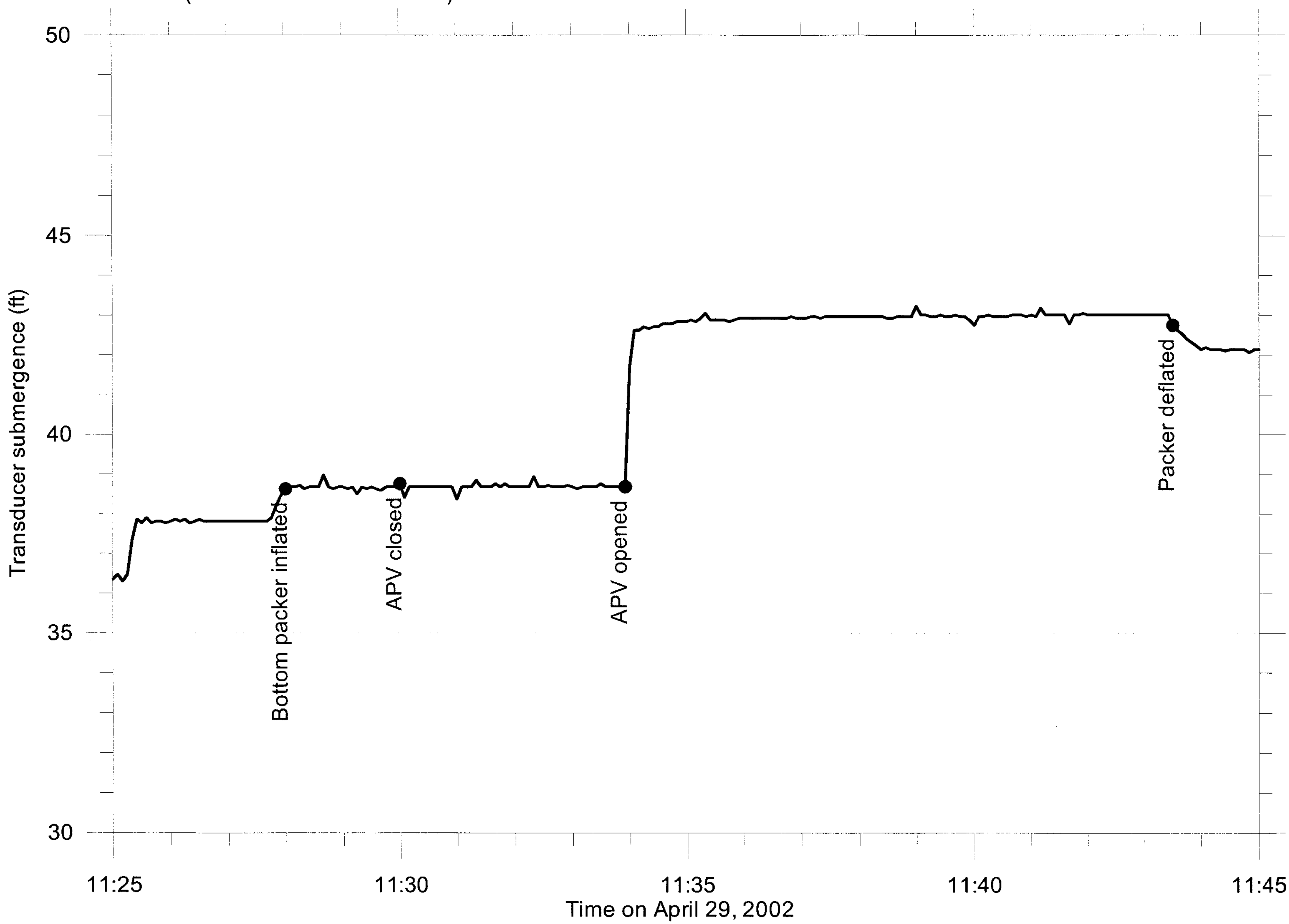
SOLUTION

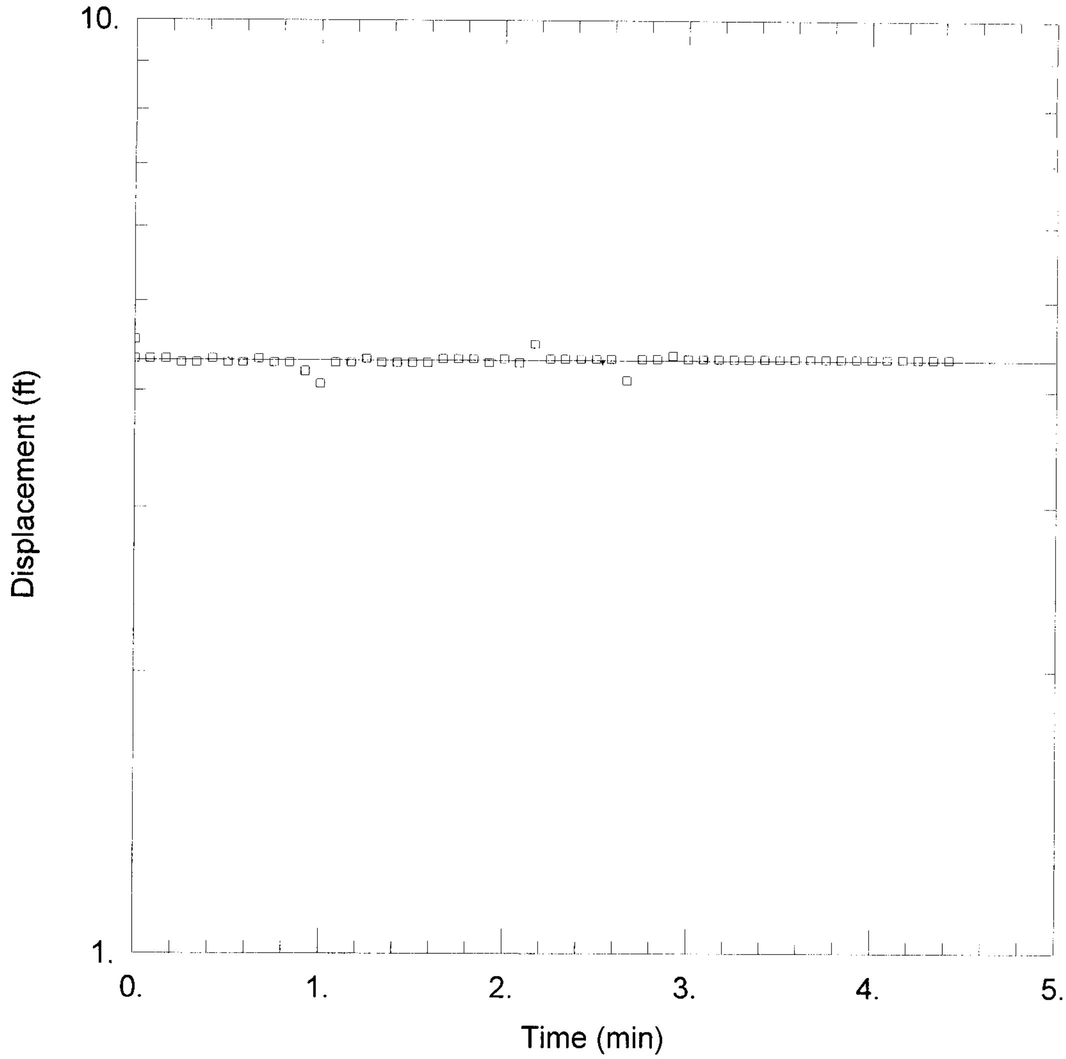
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.168 ft^2/day
S = 1.E-06

AGW-1L Packer Testing

Test 4 (495.84 to 489.44 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-1L\AGW1L-4.aqt
Date: 01/20/03 Time: 12:02:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW1L-1)

Initial Displacement: 4.33 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
K = 1.923E-11 ft/day y0 = 4.314 ft

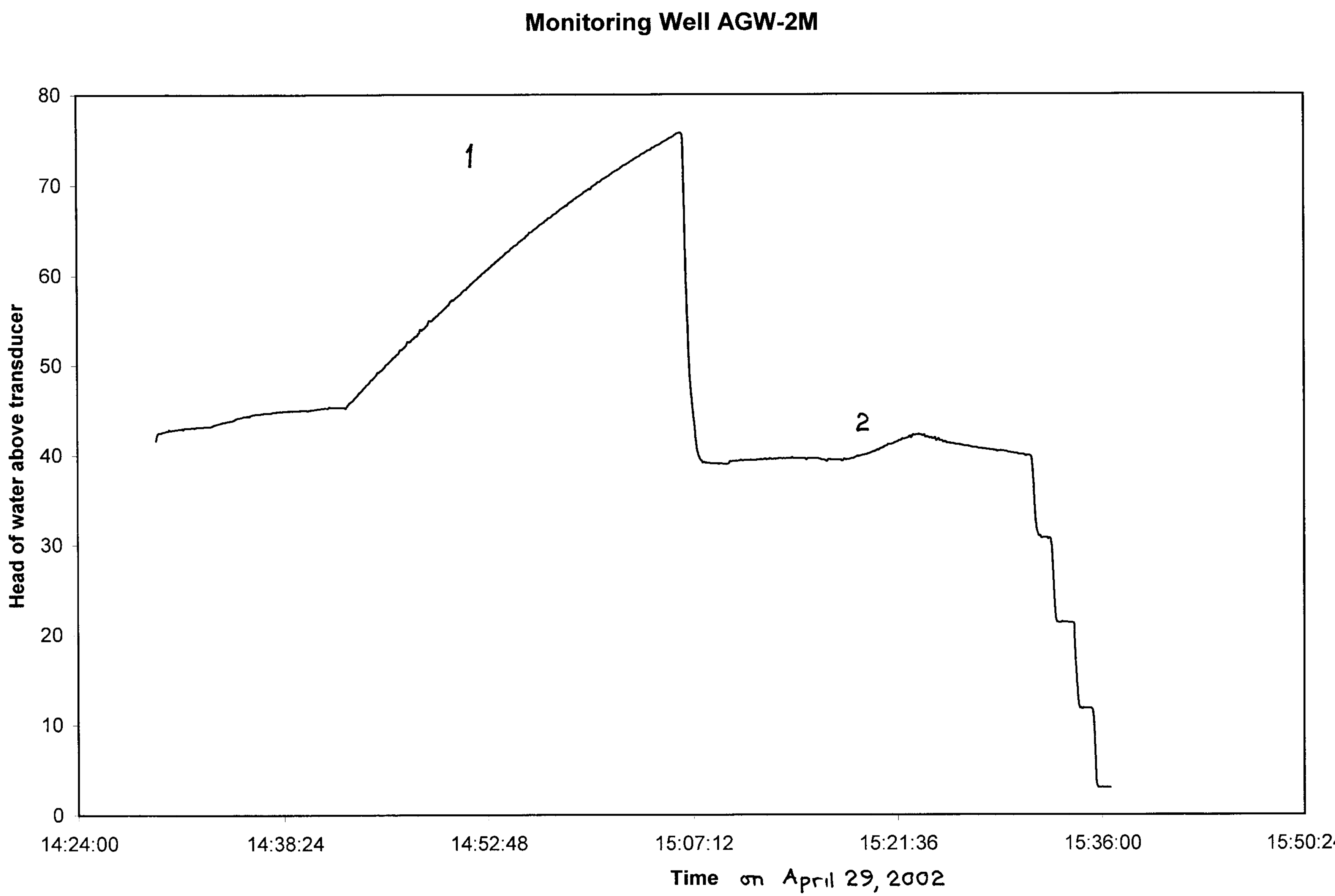
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

AGW-2M

Testing Dates: April 29 & 30, 2002

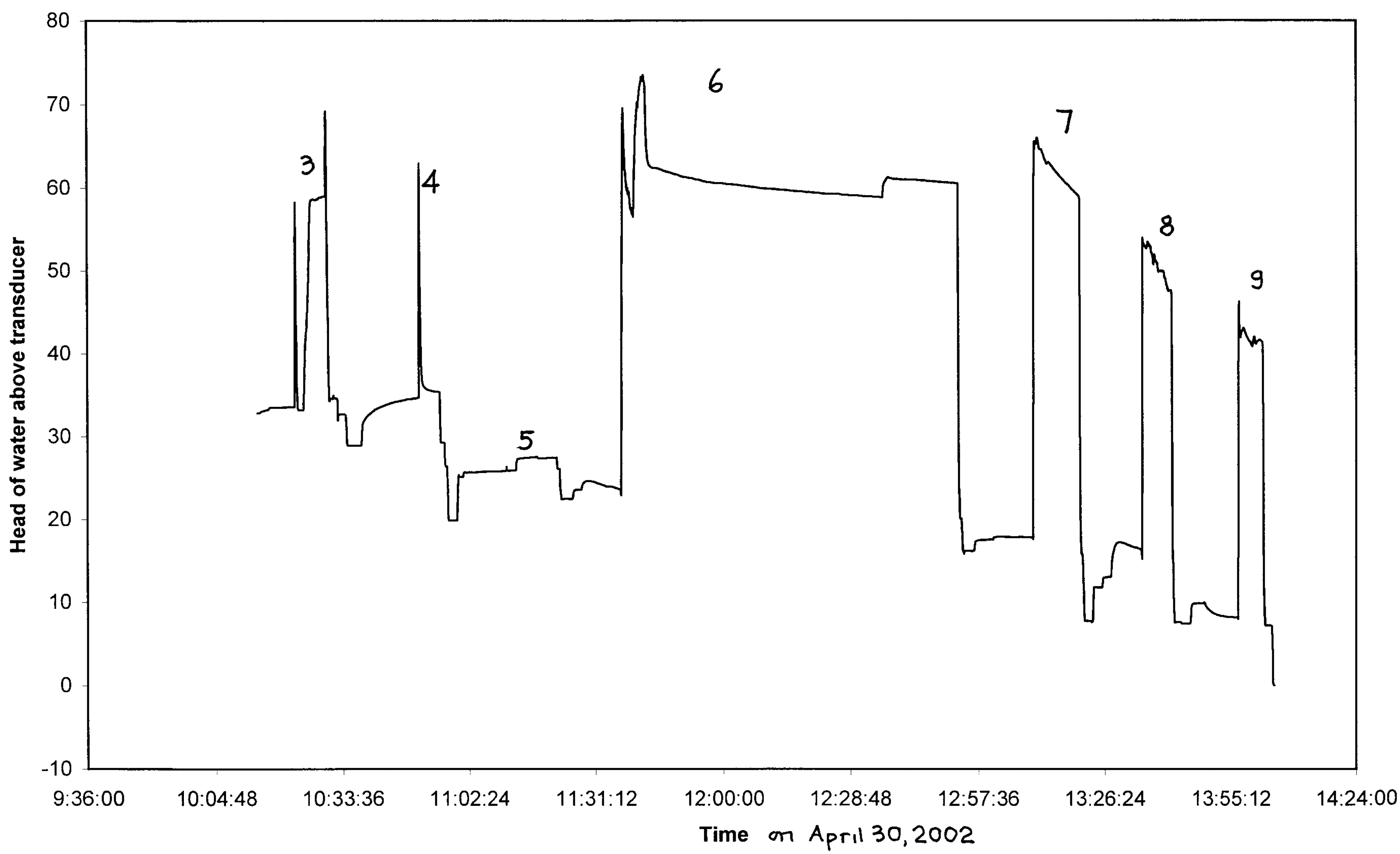
Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
AGW-2M	1	511.49	501.99	0.03	see PT Memo
AGW-2M	2S	515.49	510.29	100	see PT Memo
AGW-2M	3P	519.49	514.29	61	
AGW-2M	4	523.49	518.29	37	
AGW-2M	5P	527.49	522.29	1900	see UR Memo
AGW-2M	6	531.49	526.29	0.01	see PT Memo
AGW-2M	7	535.49	530.29	0.092	
AGW-2M	8	539.49	534.29	0.18	
AGW-2M	9	543.49	538.29	0.056	



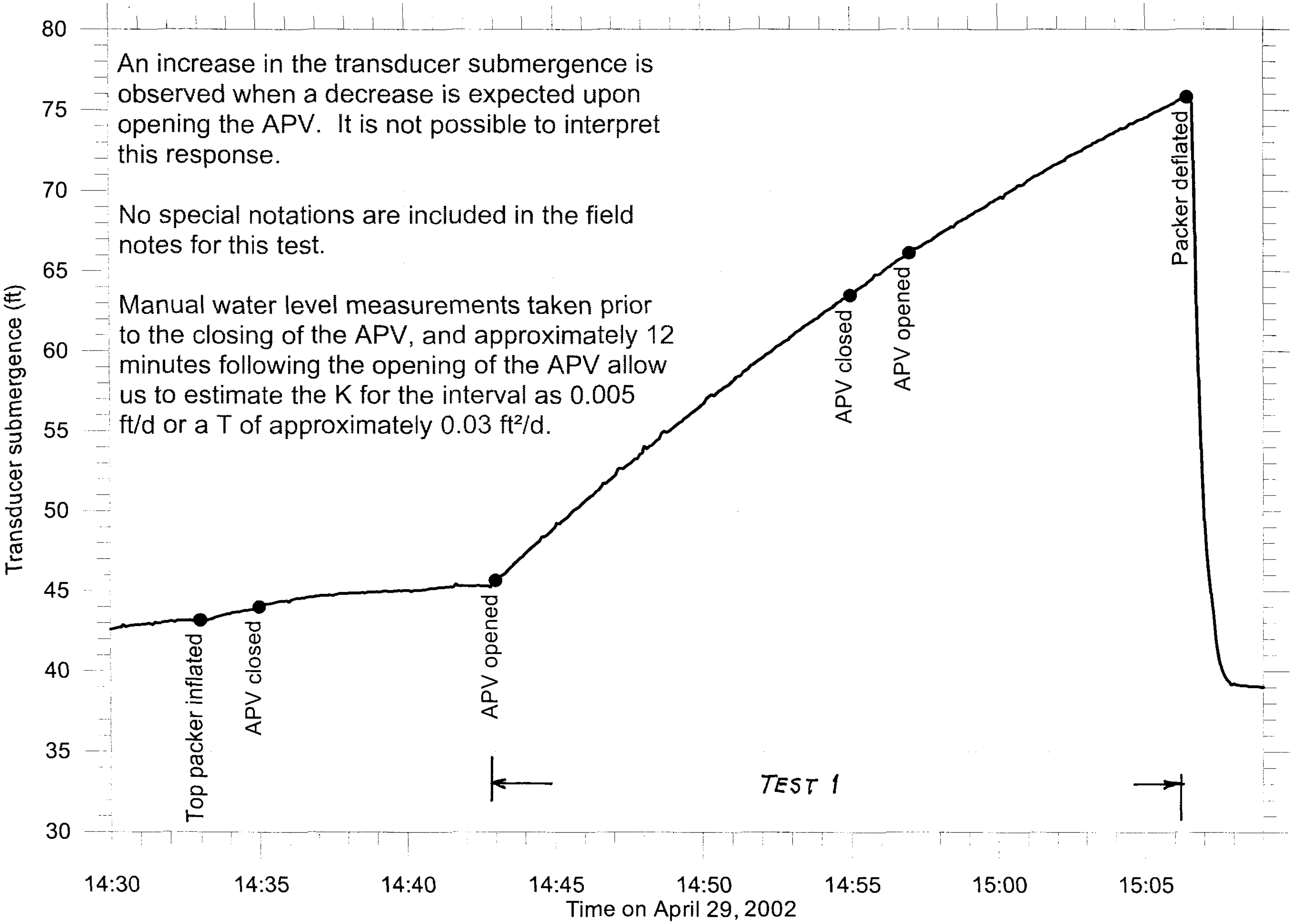
Monitoring Well AGW-2M
Head of water above transducer
80
70
60
50
40
30
20
10
0
1
2
14:24:00
14:38:24
14:52:48
15:07:12
15:21:36
15:36:00
15:50:24
Time on April 29, 2002

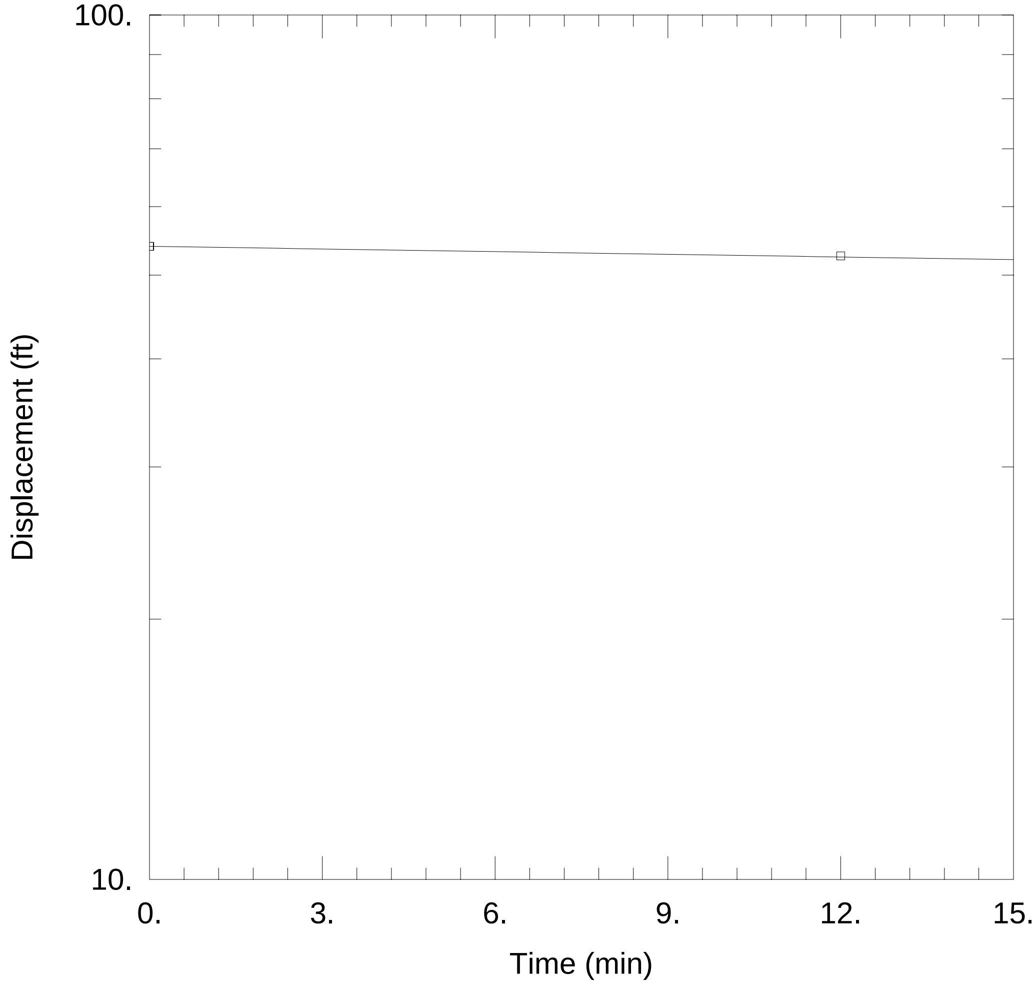
Monitoring Well AGW-2M



AGW-2M Packer Testing

Test 1 (511.49 to 501.99 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-1.aqt
Date: 01/22/03 Time: 10:07:55

AQUIFER DATA

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

WELL DATA (OW 1)

Initial Displacement: 53.99 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

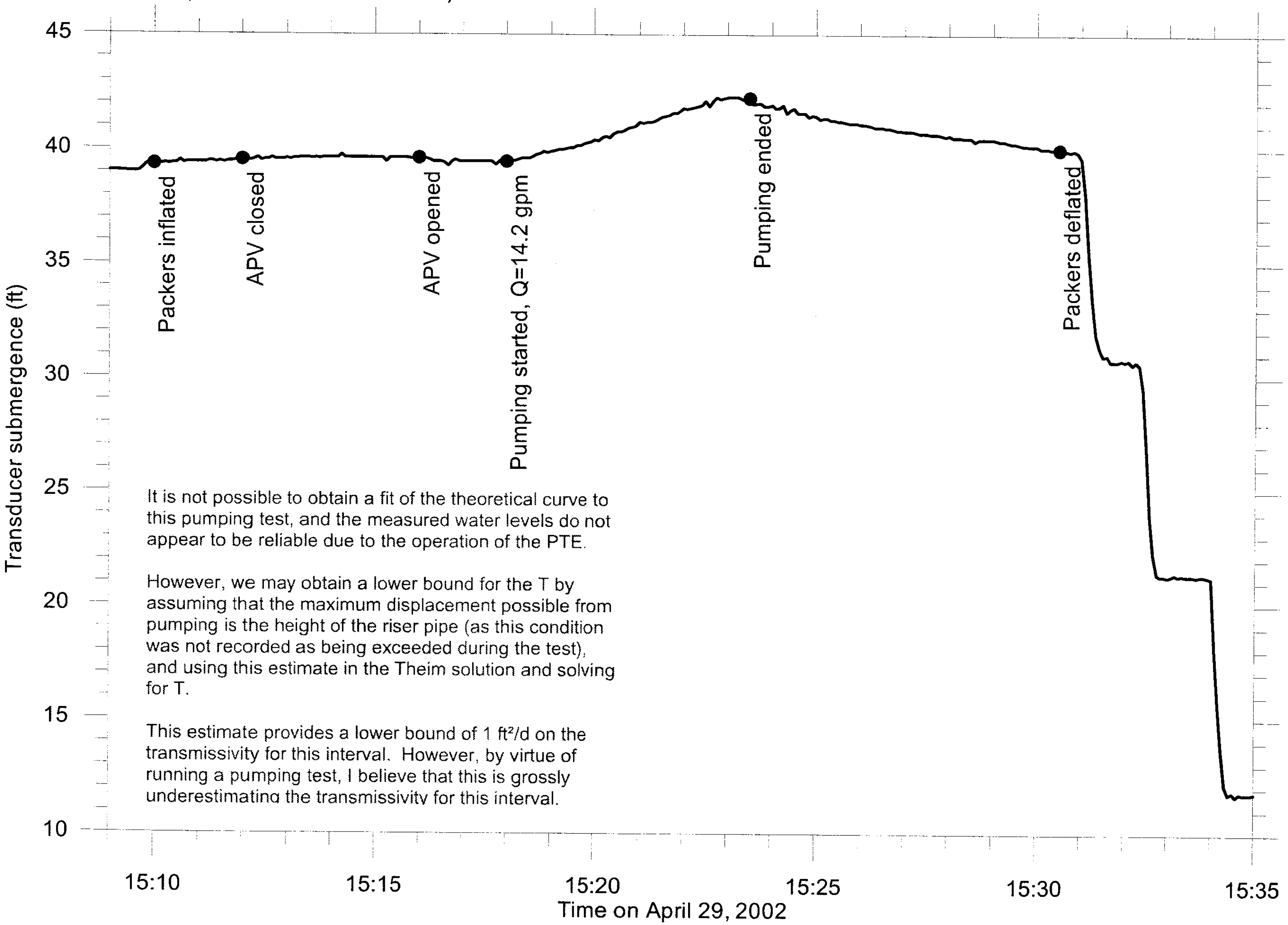
SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.005478 ft/day y0 = 53.99 ft

AGW-2M Packer Testing

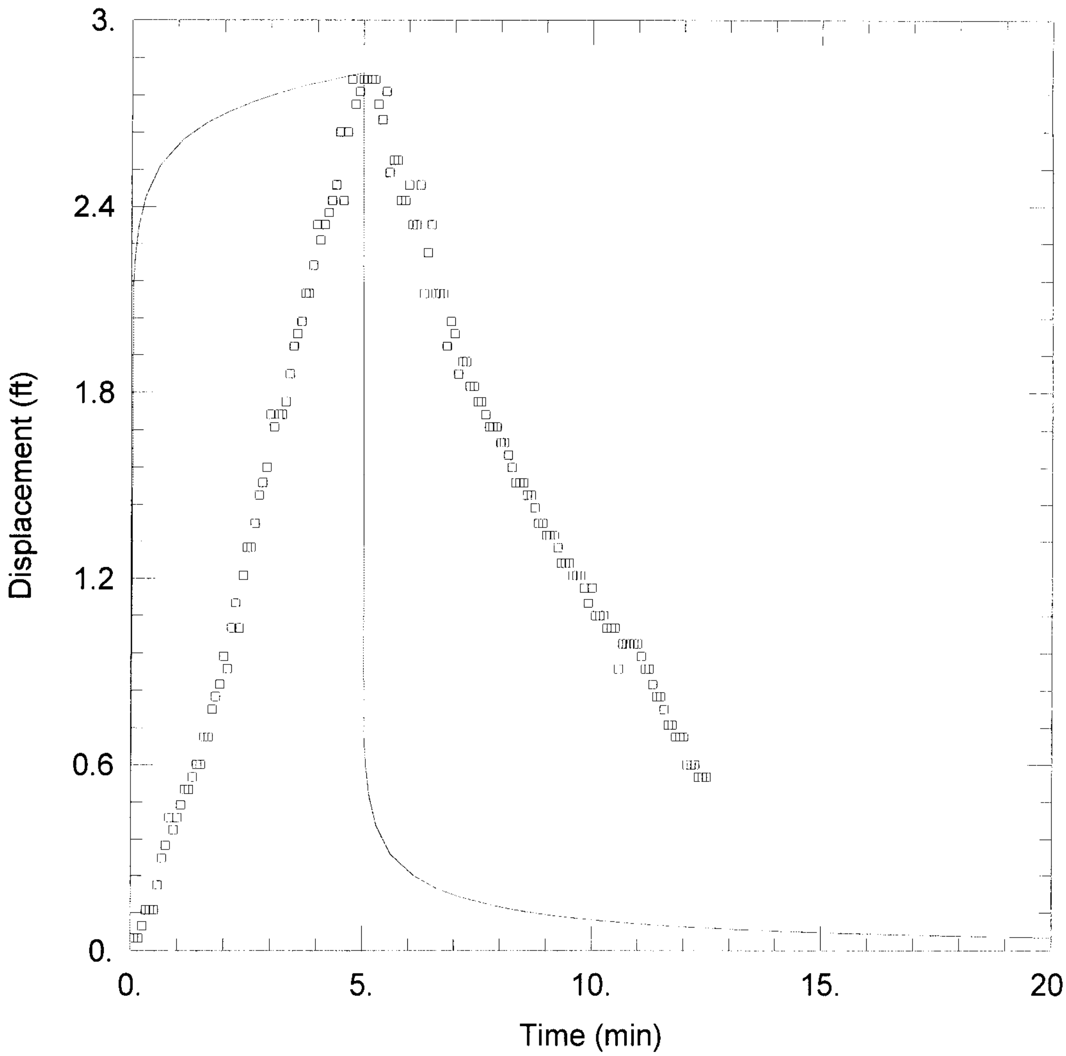
Test 2 (515.49 to 510.29 ft AMSL)



It is not possible to obtain a fit of the theoretical curve to this pumping test, and the measured water levels do not appear to be reliable due to the operation of the PTE.

However, we may obtain a lower bound for the T by assuming that the maximum displacement possible from pumping is the height of the riser pipe (as this condition was not recorded as being exceeded during the test), and using this estimate in the Theim solution and solving for T.

This estimate provides a lower bound of 1 ft^2/d on the transmissivity for this interval. However, by virtue of running a pumping test, I believe that this is grossly underestimating the transmissivity for this interval.



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-2.aqt
Date: 11/25/02 Time: 15:30:06

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW2M-2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
AGW2M-2	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 1526.8 ft^2/day

Kz/Kr = 1.

S = 1.E-06

b = 5.2 ft

AGW-2M, Test 2P

Alternative analyses

Average Q: 14.2 gpm
"Drawdown" (s or ΔH): 2.81 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 1263\ ft^2/d}}$

<u>T by Thiem solution:</u>

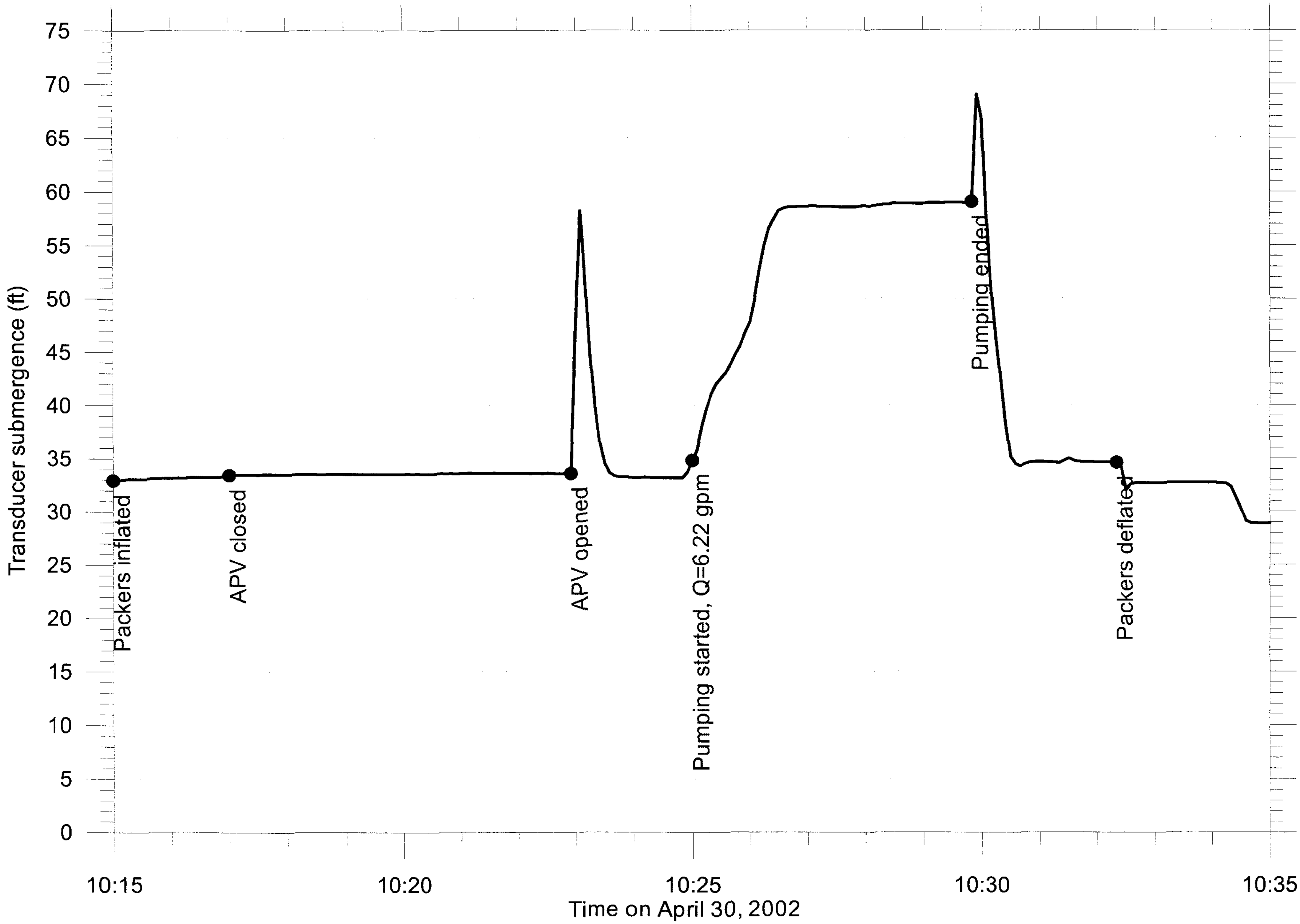
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

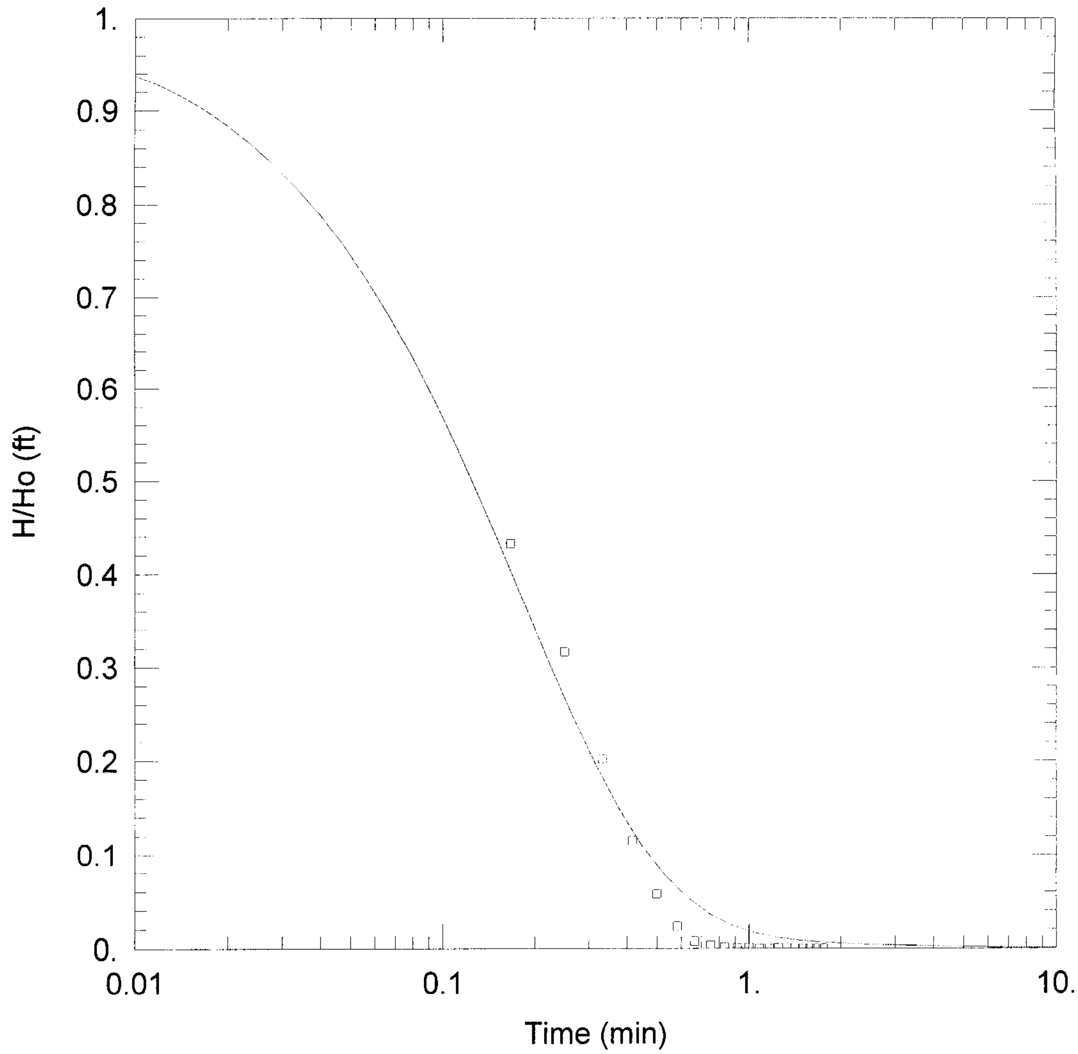
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8" = 0.1615$ ft

$\underline{\underline{T = 823\ ft^2/d}}$

AGW-2M Packer Testing

Test 3 (519.49 to 514.29 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-3S.aqt
Date: 01/13/03 Time: 10:29:10

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

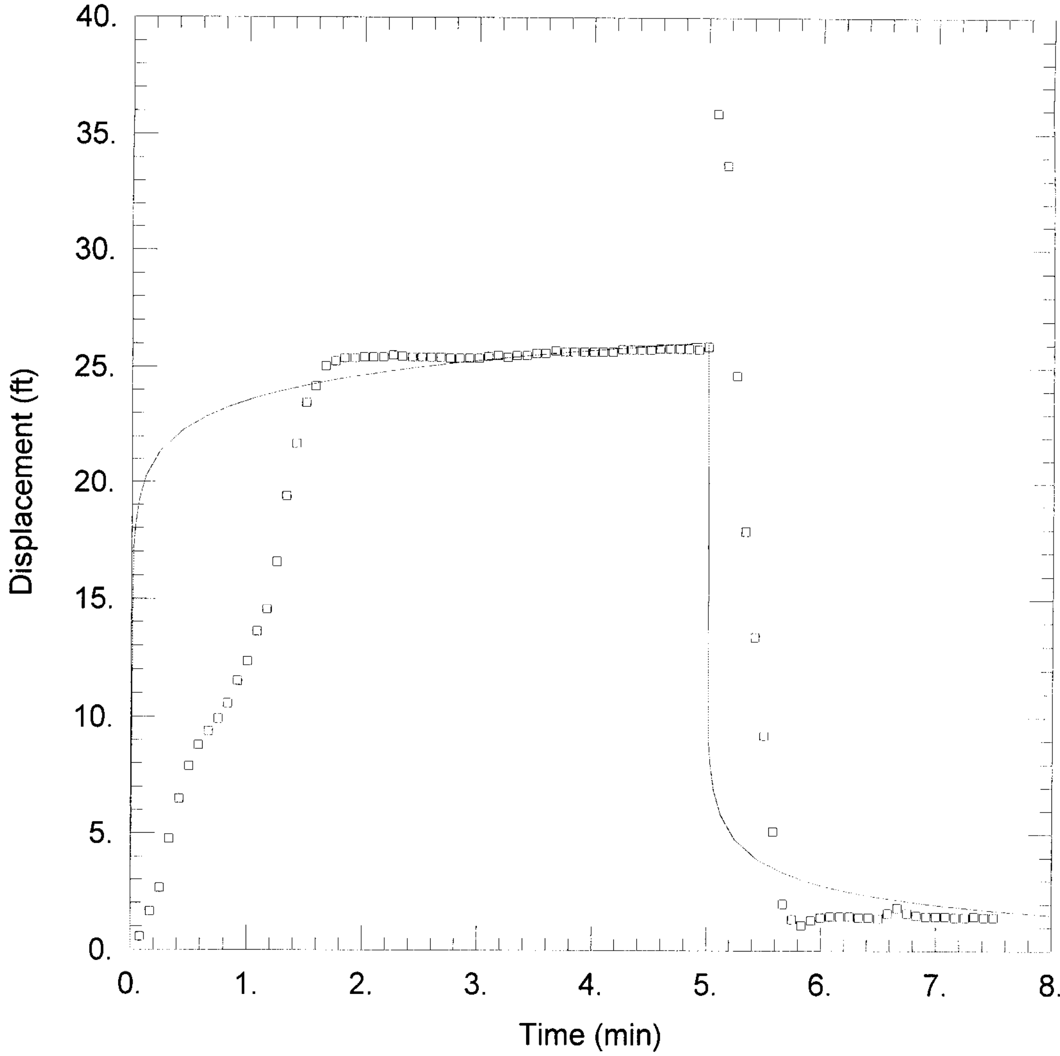
WELL DATA (AGW2M-3S)

Initial Displacement: 57.99 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 76.1 ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-3.aqt
Date: 11/25/02 Time: 15:31:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW2M-3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ AGW2M-3	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 60.81 ft^2/day
Sw = 0.
P = 2.93

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 28.35Q + 0.Q^{2.93}$
W.E. = 100.%

AGW-2M, Test 3P

Alternative analyses

Average Q: 6.2 gpm
"Drawdown" (s or ΔH): 25.81 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

$T = 60\ ft^2/d$

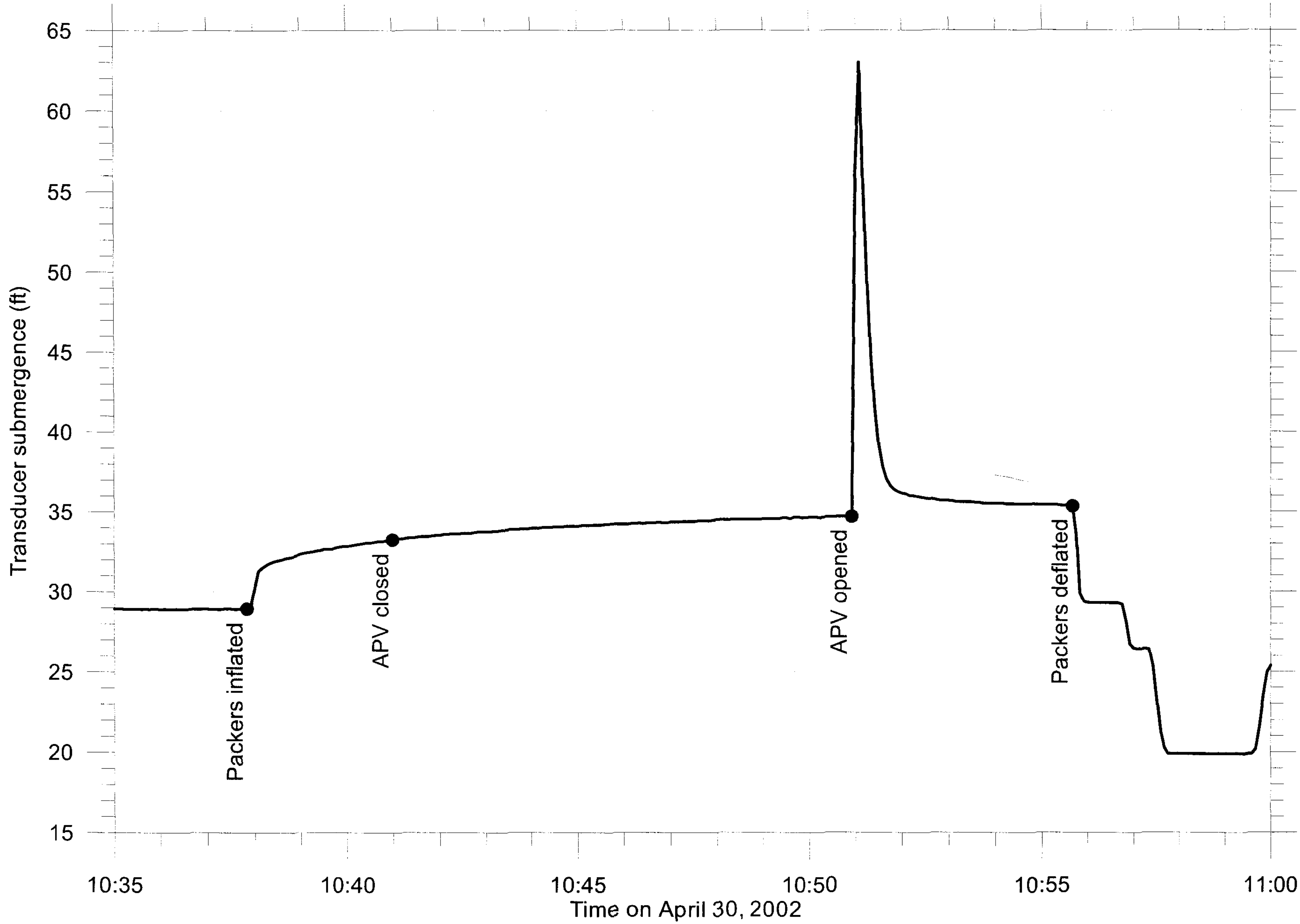
T by Thiem solution:

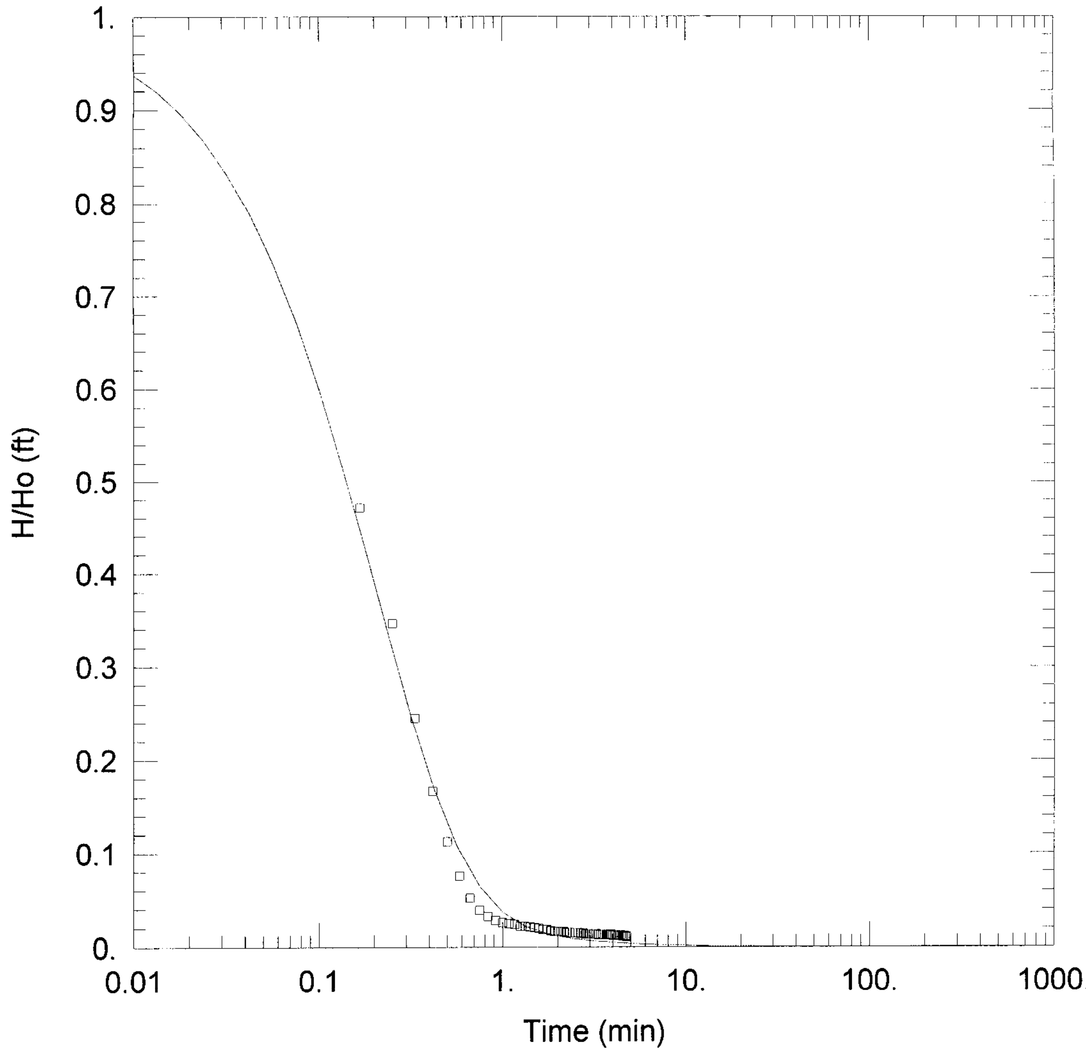
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8" = 0.1615$ ft

$T = 39\ ft^2/d$

AGW-2M Packer Testing
Test 4 (523.49 to 518.29 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-4.aqt
Date: 11/25/02 Time: 15:31:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2M-4)

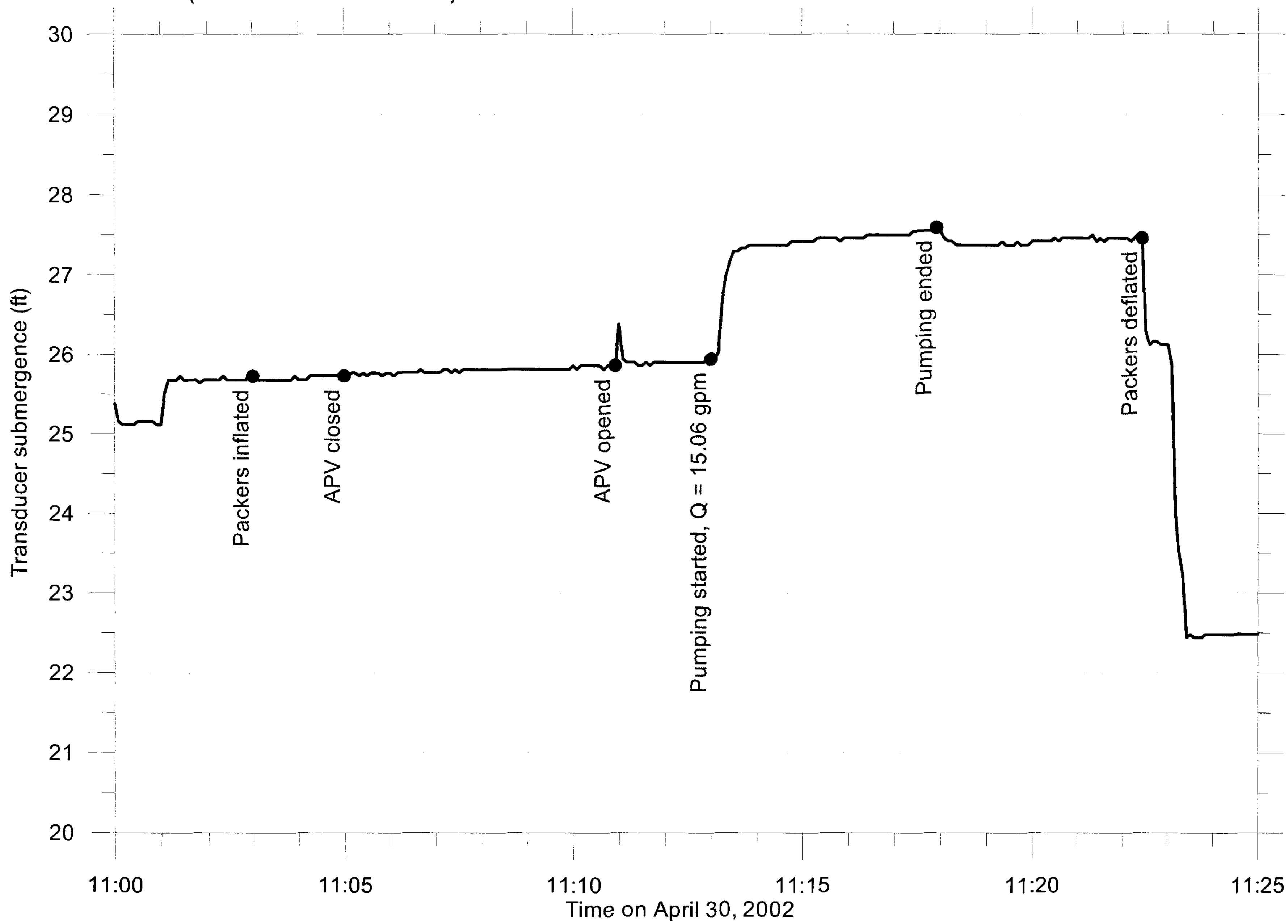
Initial Displacement: 60. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

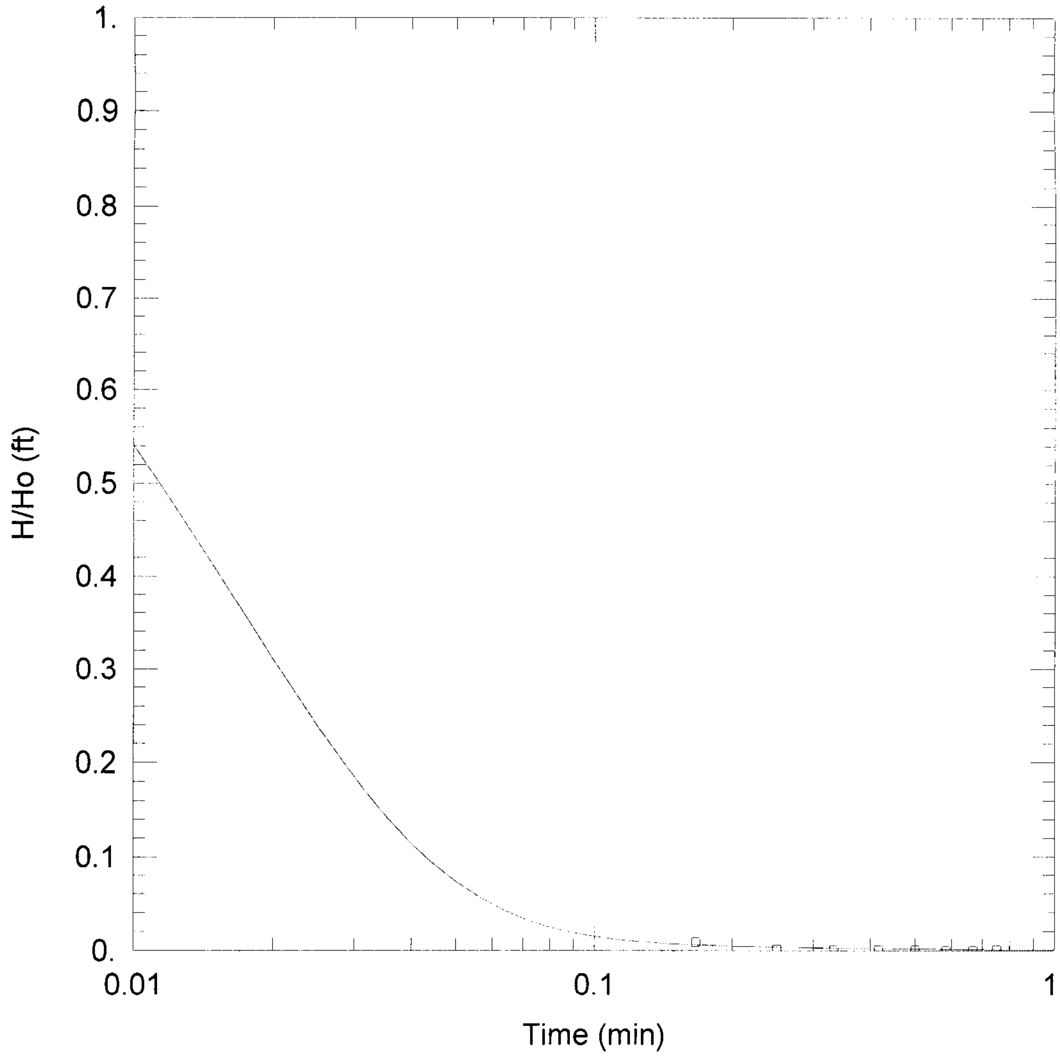
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 37.43 ft^2/day
S = 1.E-06

AGW-2M Packer Testing
Test 5 (527.49 to 522.29 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-5 slug.aqt
Date: 01/13/03 Time: 10:30:16

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

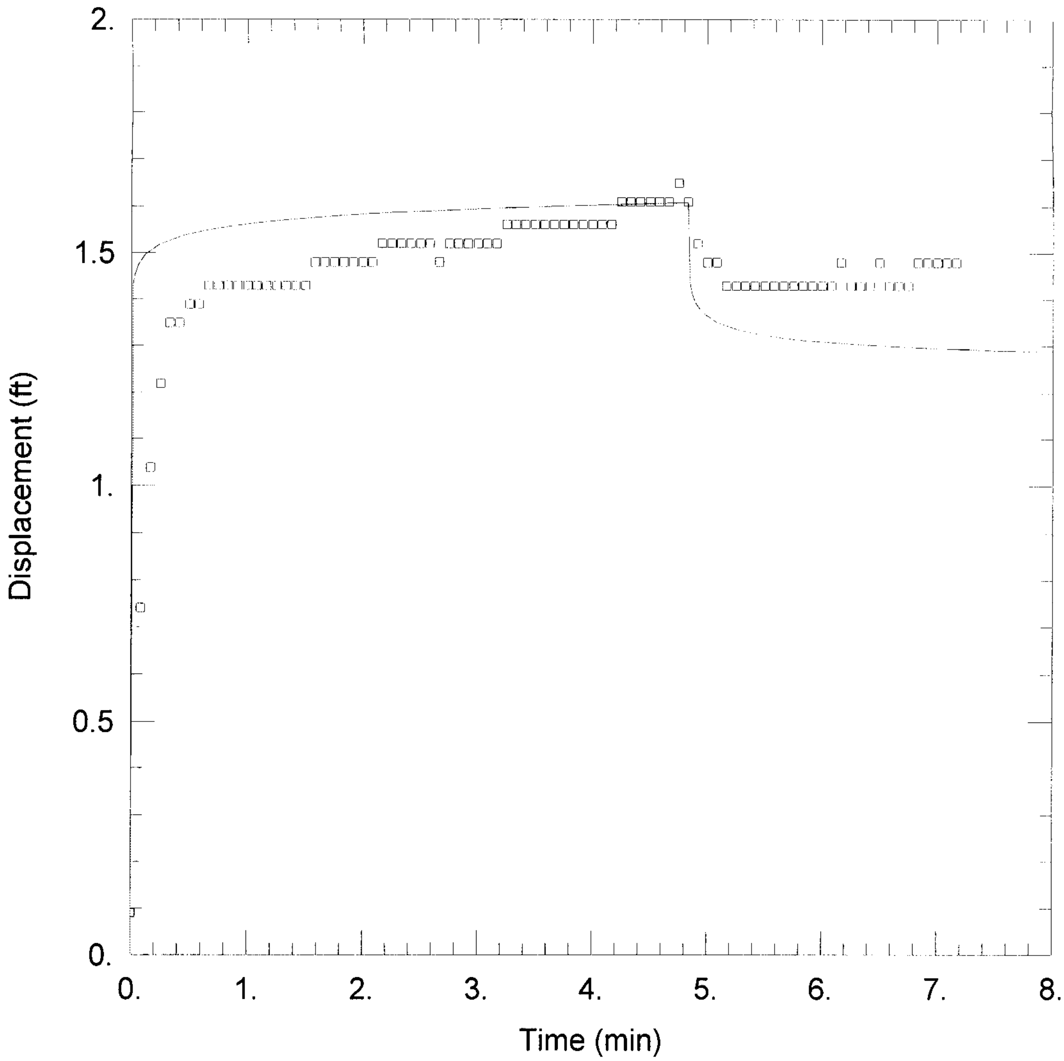
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2M-5S)

Initial Displacement: 58. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
¯ = 832.8 ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-5.aqt
Date: 11/25/02 Time: 15:30:50

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW2M-5	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ AGW2M-5	0	0

SOLUTION

Aquifer Model: Confined

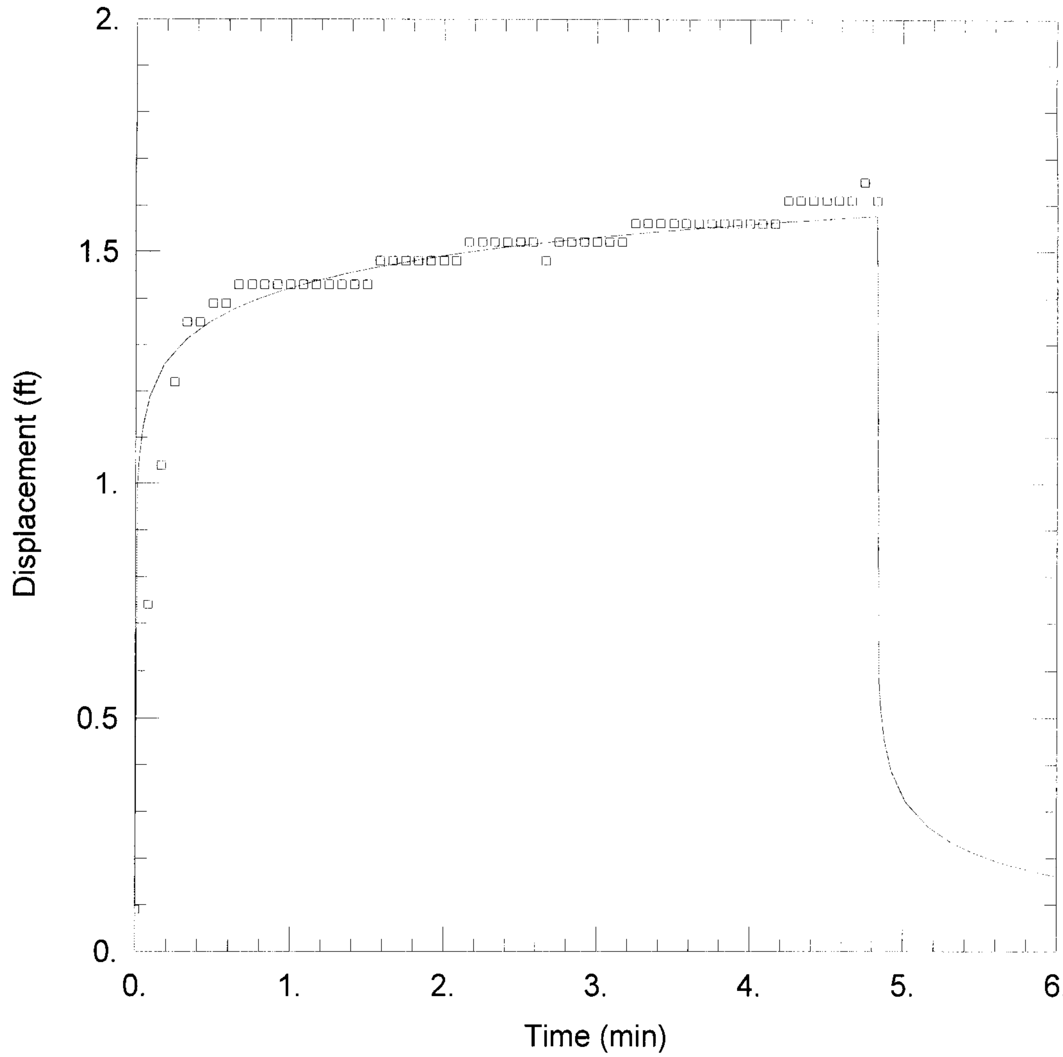
= 7585.8 ft^2/day
Sw = -5.
P = 1.638

Solution Method: Theis (Step Test)

S = 1.E-06
C = 0.4007 min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 0.1491Q + 0.4007Q^{1.638}$
W.E. = 38.71%



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-5 pumping only.aqt
Date: 01/15/03 Time: 10:58:11

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
AGW2M-5	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
AGW2M-5	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

= 2357.2 ft^2/day
Sw = -2.082
P = 1.5

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 0.7066Q + 0.Q^{1.5}$
W.E. = 128.7%

AGW-2M, Test 5P

Alternative analyses

Average Q: 15.06 gpm
"Drawdown" (s or ΔH): 1.6 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 2353\ ft^2/d}}$

<u>T by Thiem solution:</u>

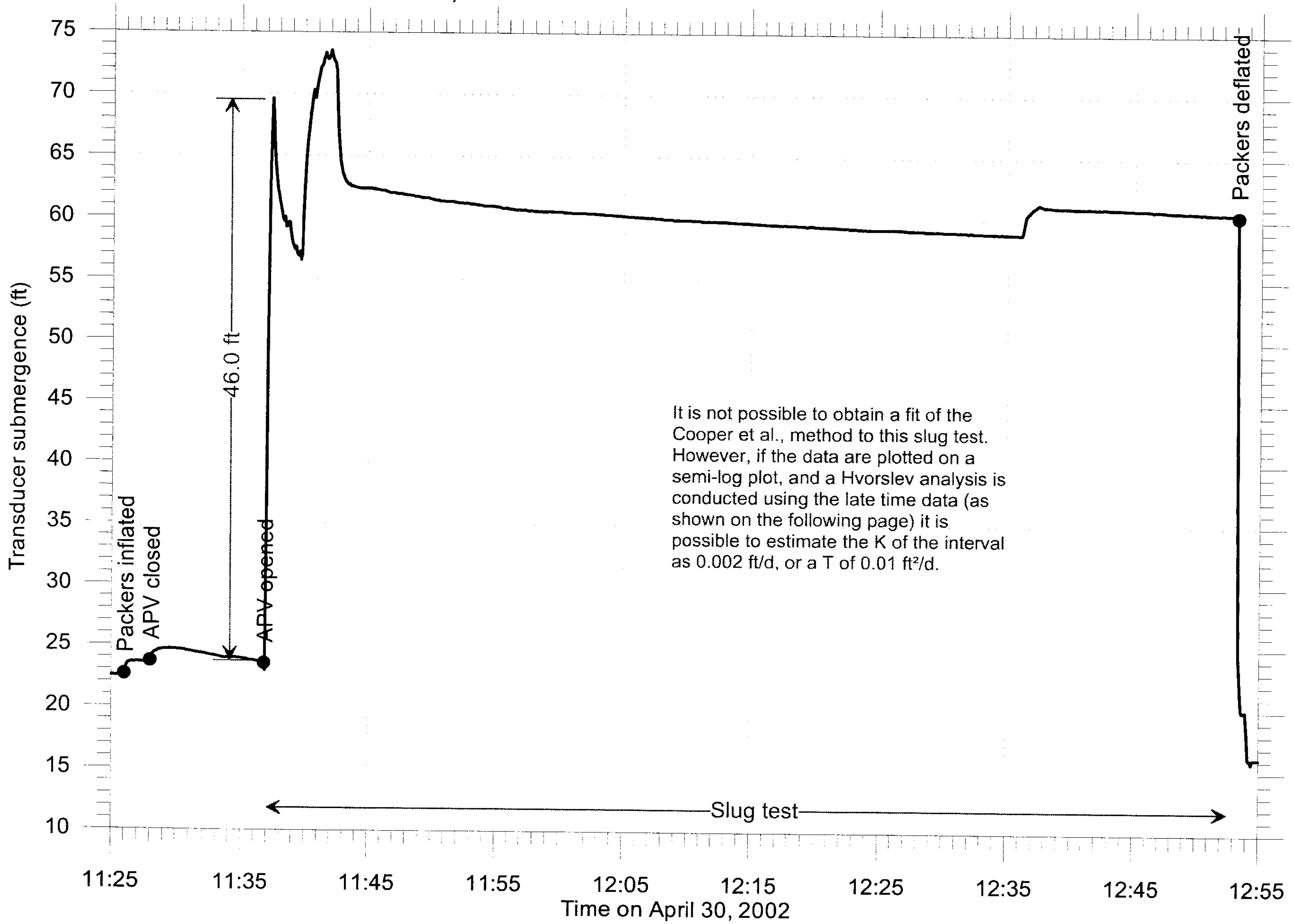
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

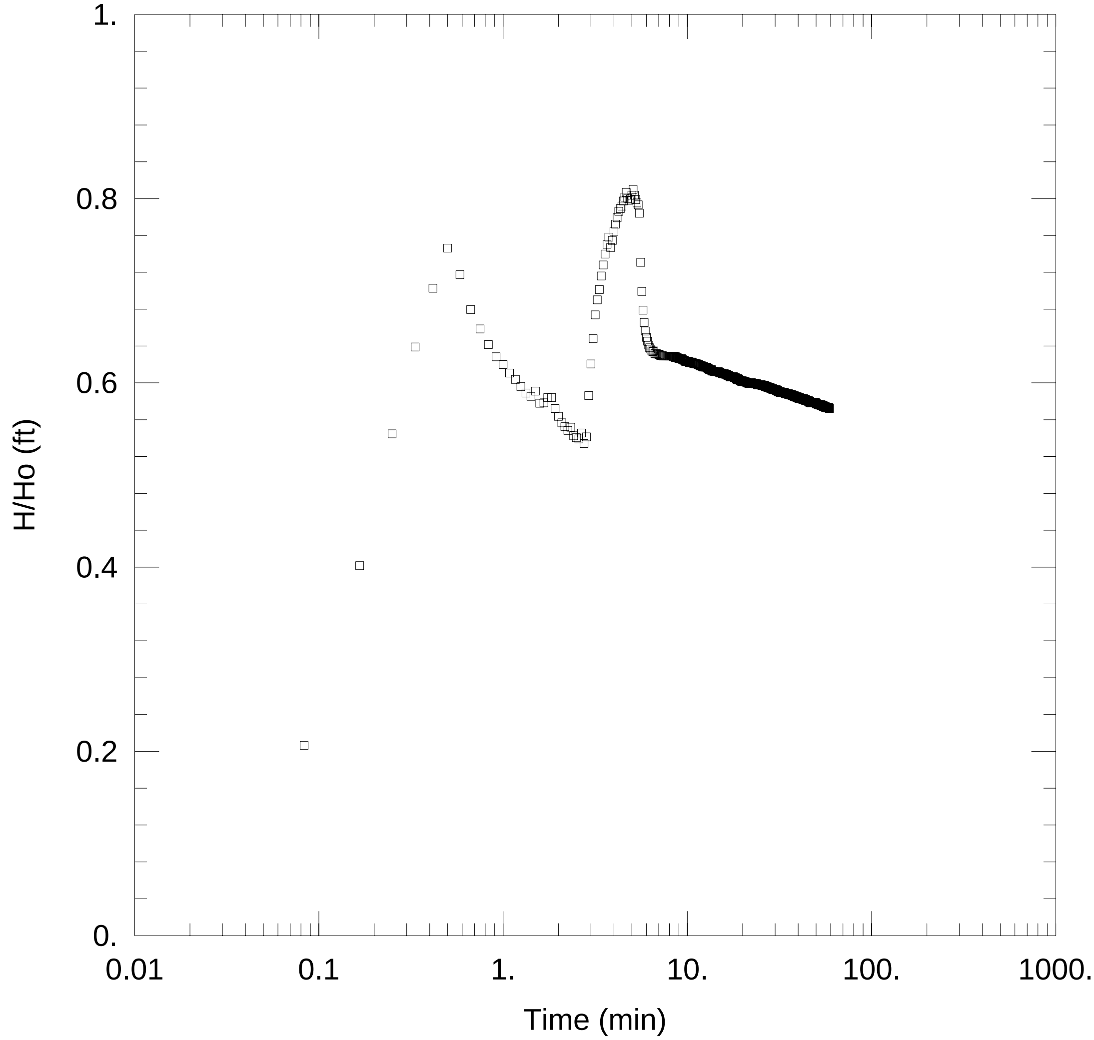
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3\,^7/_8" = 0.1615$ ft

$\underline{\underline{T = 1532\ ft^2/d}}$

AGW-2M Packer Testing

Test 6 (531.49 to 526.29 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-6.aqt
Date: 01/22/03 Time: 15:57:40

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

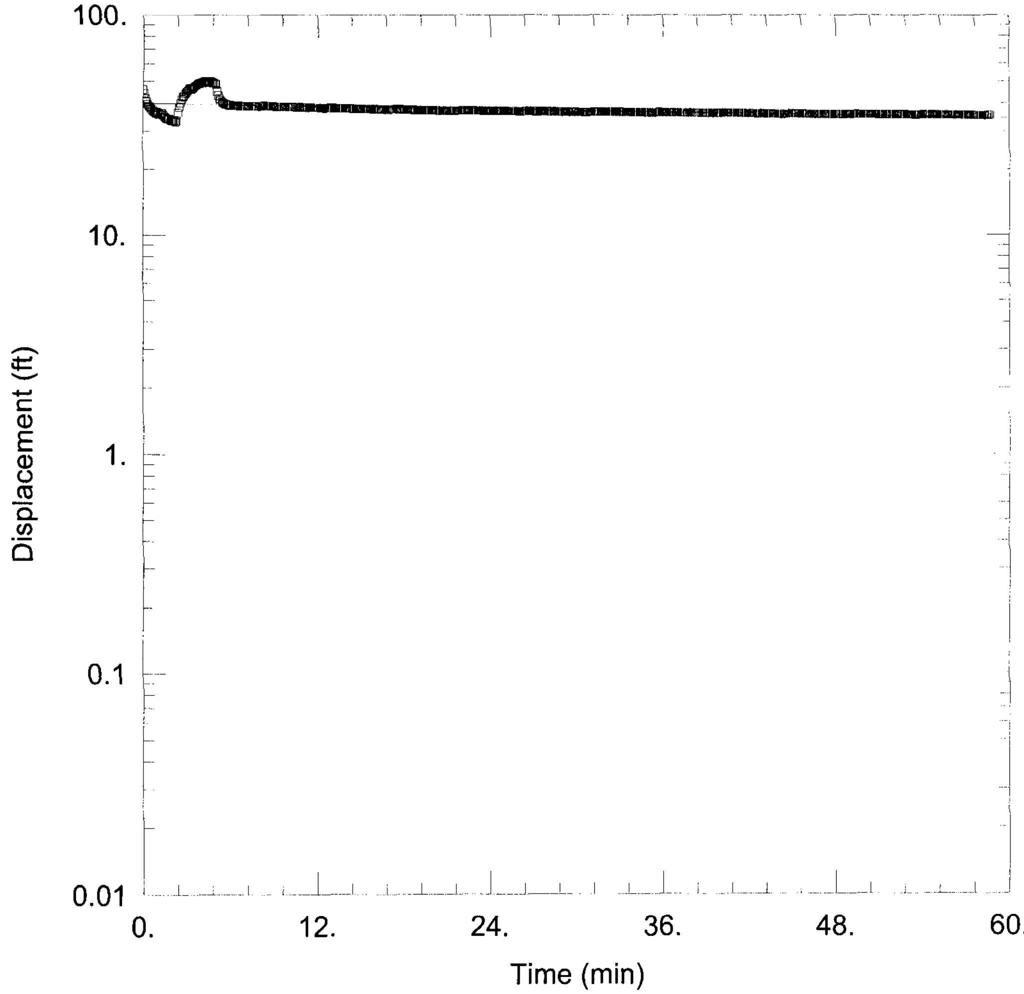
WELL DATA (AGW2M-6)

Initial Displacement: 61.7 ft Casing Radius: 0.1667 ft
Wellbore Radius: 0.1667 ft Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.274 ft^2/day S = 1.E-06



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-6(Approximate analysis - H).aqt
Date: 12/19/02 Time: 11:18:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2M-6)

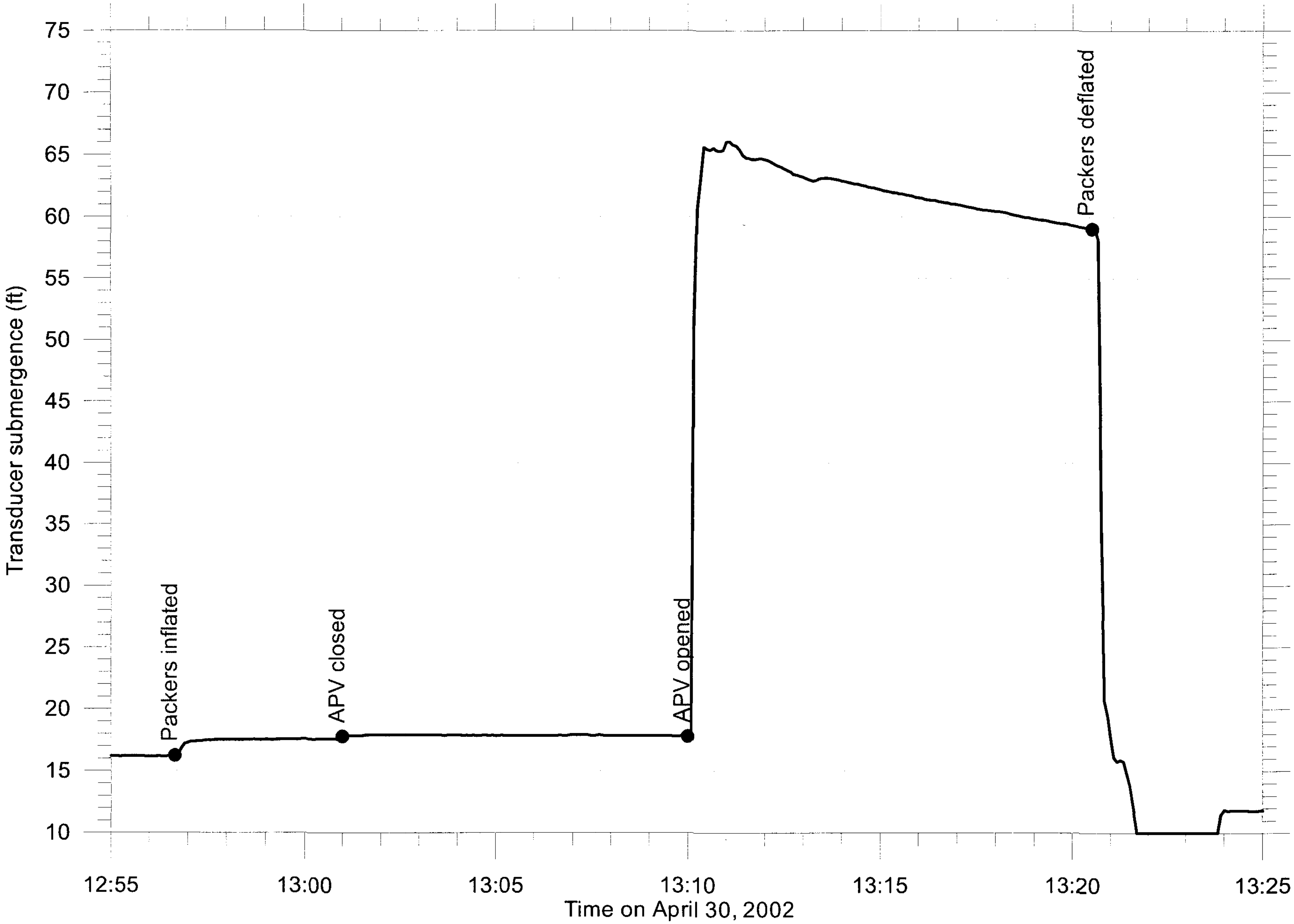
Initial Displacement: 46. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

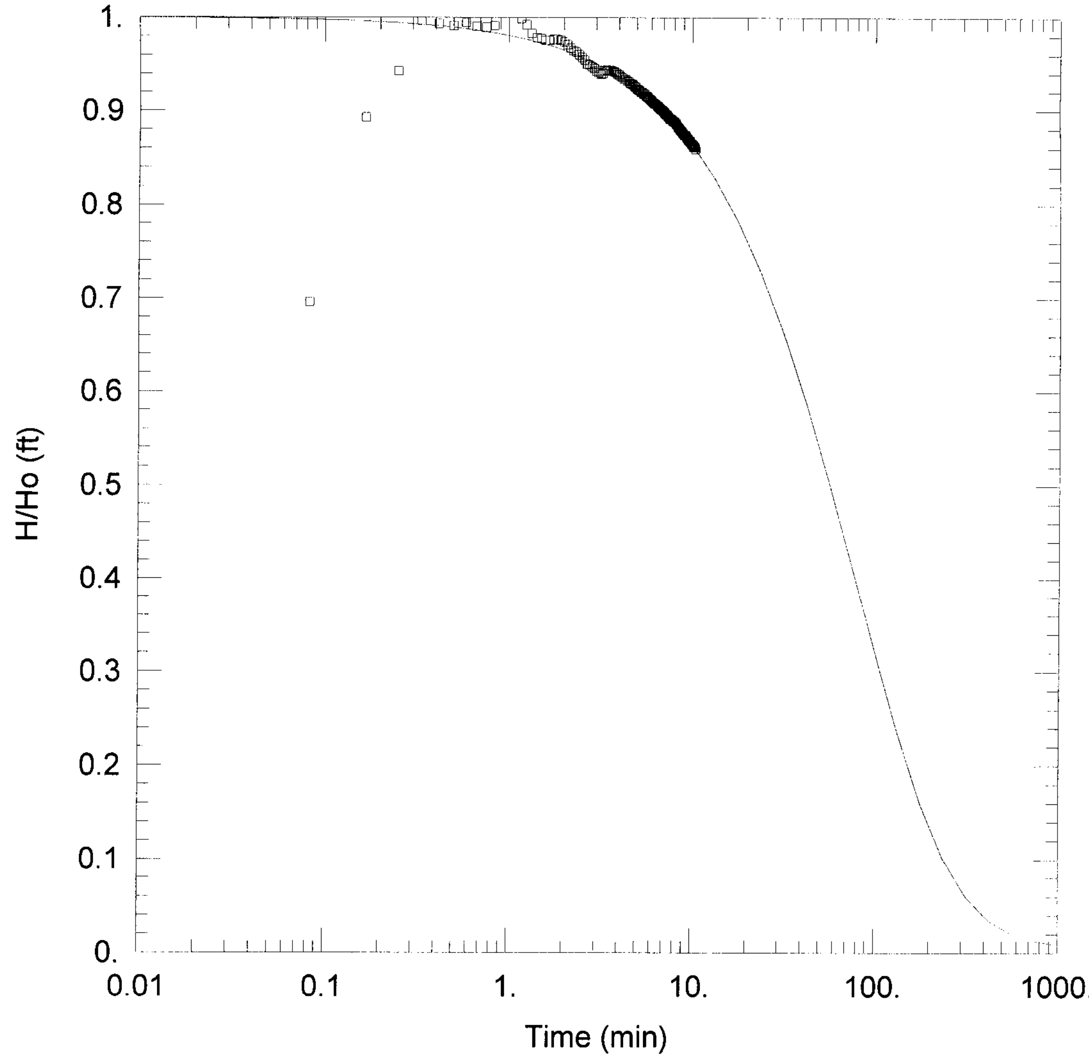
SOLUTION

Aquifer Model: Confined
Solution Method:
K = 0.00206 ft/day
y0 = 39.9 ft

AGW-2M Packer Testing

Test 7 (535.49 to 530.29 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-7.aqt
Date: 11/25/02 Time: 15:30:26

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

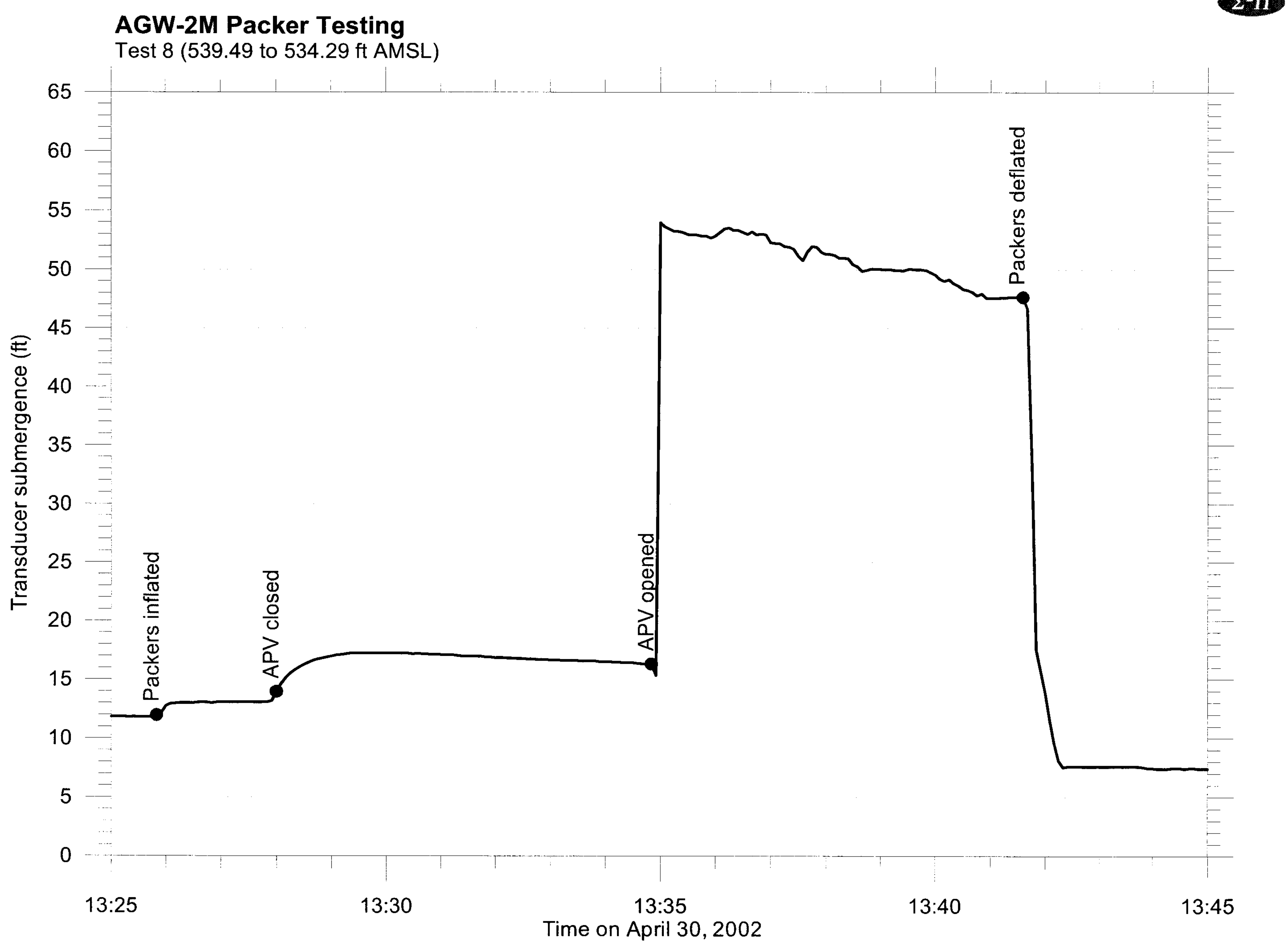
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2M-7)

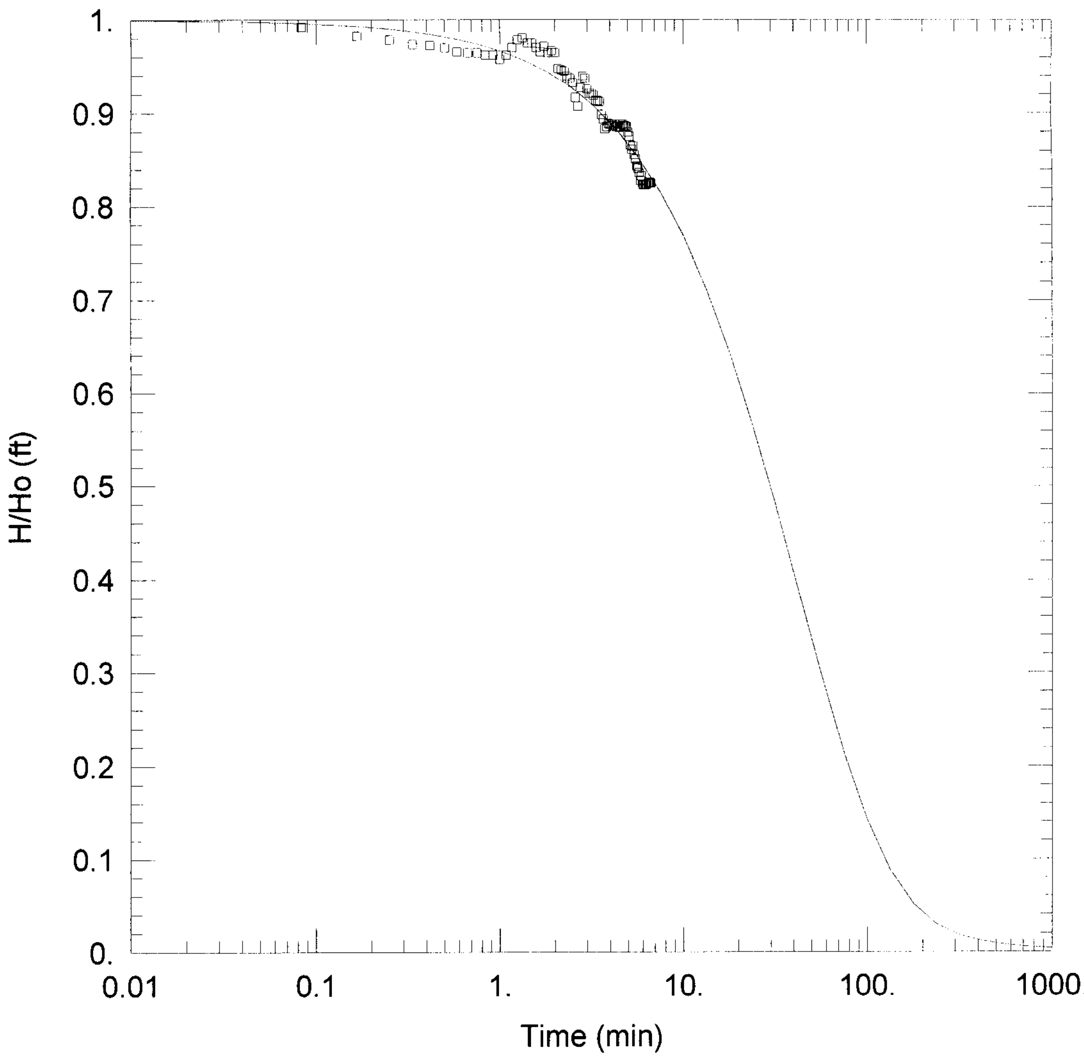
Initial Displacement: 47.98 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
‾ = 0.09206 ft^2/day S = 1.E-06



AGW-2M Packer Testing
Test 8 (539.49 to 534.29 ft AMSL)
Transducer submergence (ft)
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Packers inflated
APV closed
APV opened
Packers deflated
13:25
13:30
13:35
13:40
13:45
Time on April 30, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-8.aqt
Date: 11/25/02 Time: 15:30:18

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2M-8)

Initial Displacement: 37.95 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

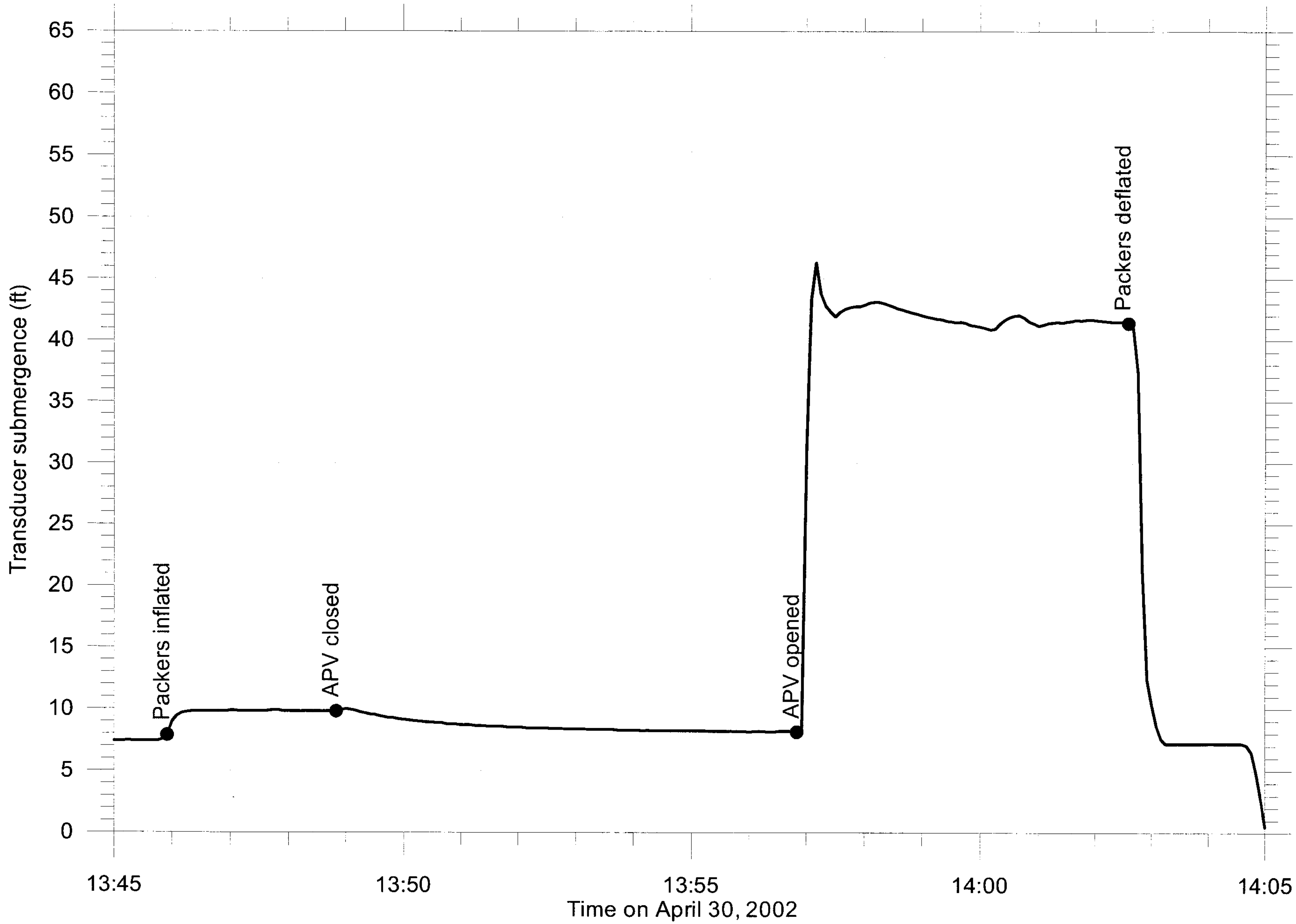
SOLUTION

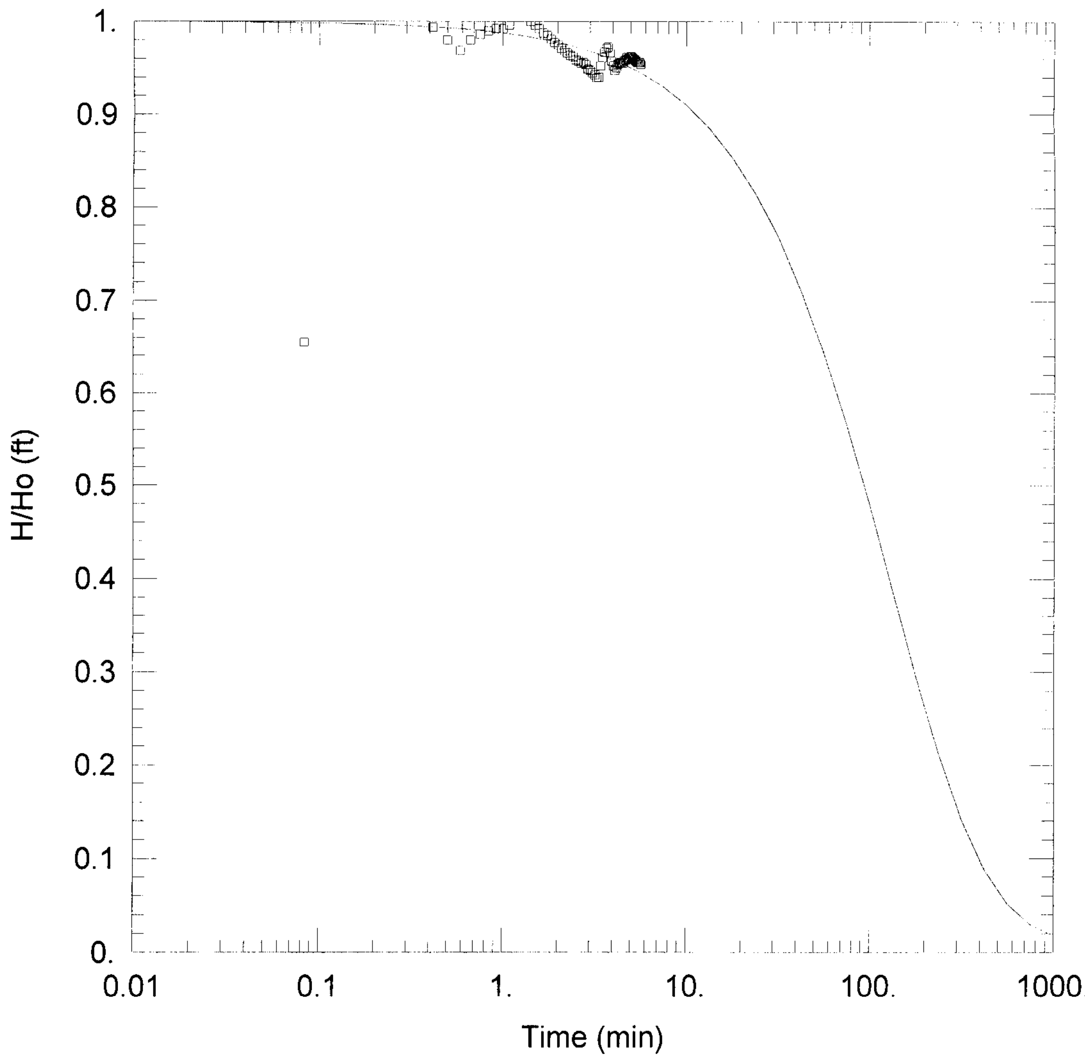
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

¯ = 0.1782 ft^2/day
S = 1.E-06

AGW-2M Packer Testing

Test 9 (543.49 to 538.29 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2M\AGW2M-9.aqt
Date: 11/25/02 Time: 15:31:45

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2M-9)

Initial Displacement: 34.88 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.05626 ft^2/day S = 1.E-06

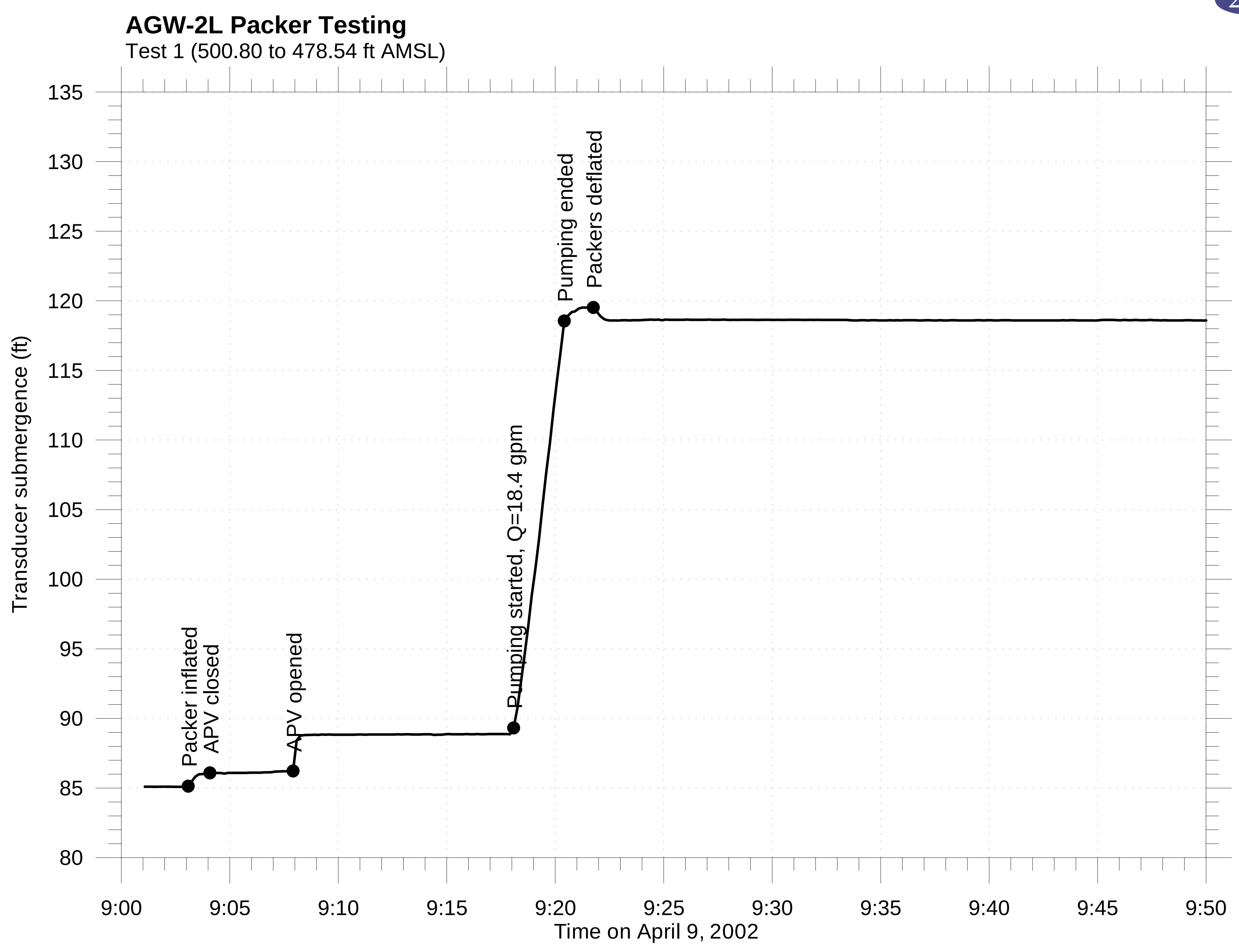
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

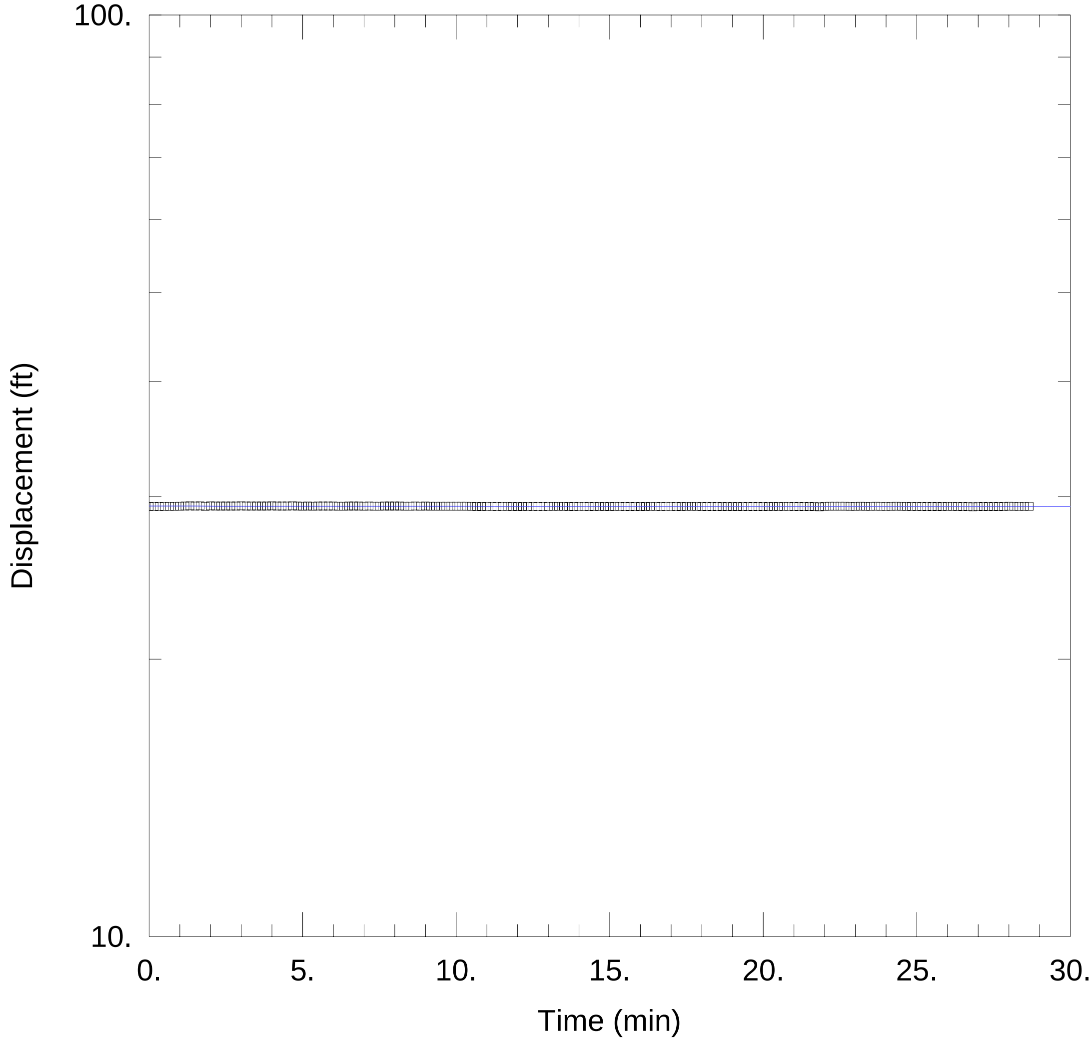
AGW-2L

Testing Dates: April 9, 2002

Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
AGW-2L	1P	500.8	482.84	<<1	


AGW-2L Packer Testing
Test 1 (500.80 to 478.54 ft AMSL)
Transducer submergence (ft)
Time on April 9, 2002
Packer inflated
APV closed
APV opened
Pumping started, Q=18.4 gpm
Pumping ended
Packers deflated
80
85
90
95
100
105
110
115
120
125
130
135
9:00
9:05
9:10
9:15
9:20
9:25
9:30
9:35
9:40
9:45
9:50



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\AGW-2L\AGW-2L(1).aqt
Date: 01/20/03 Time: 12:33:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (AGW2L-1)

Initial Displacement: 29.29 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 3.922E-05 ft/day y0 = 29.31 ft

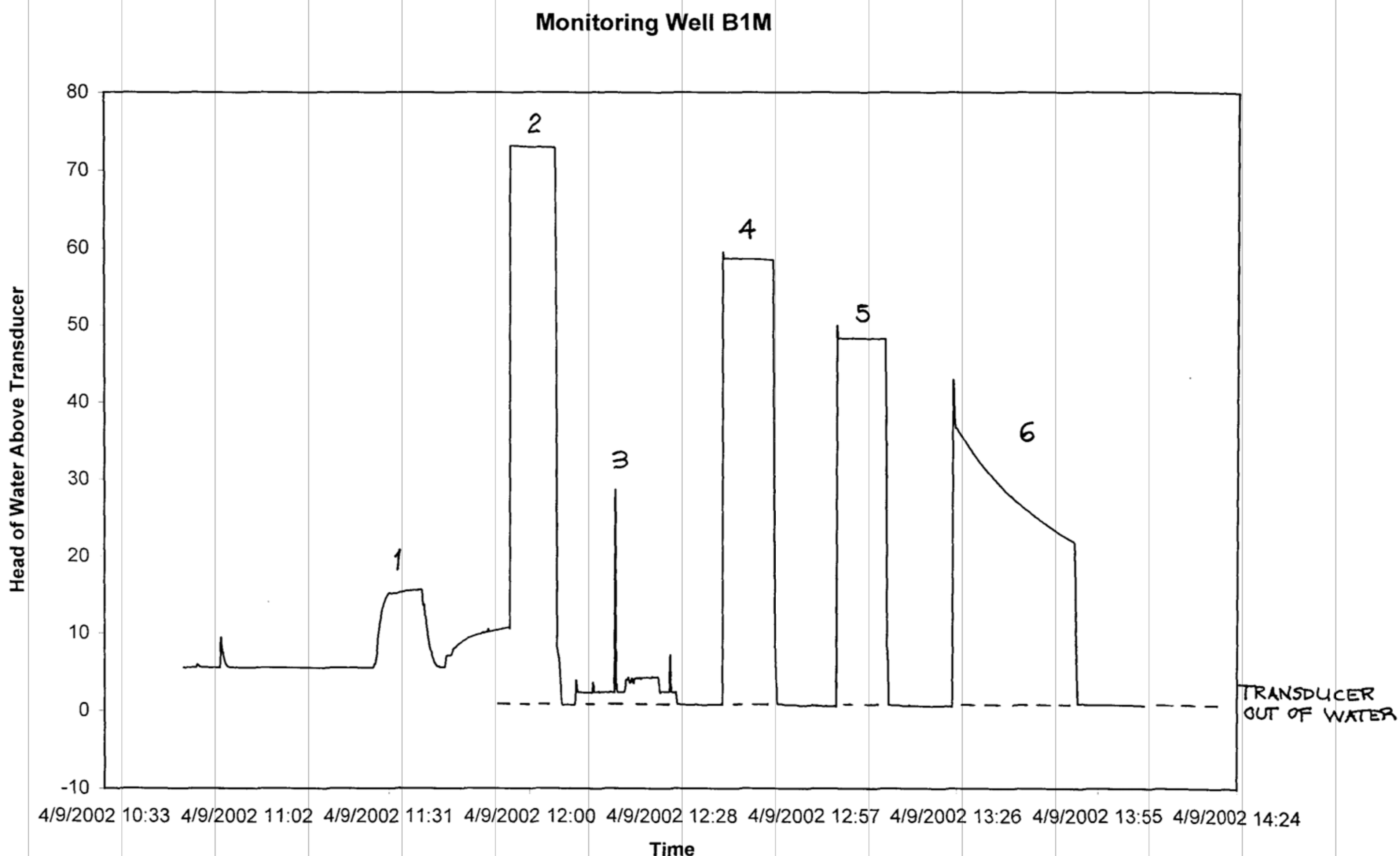
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

B1M

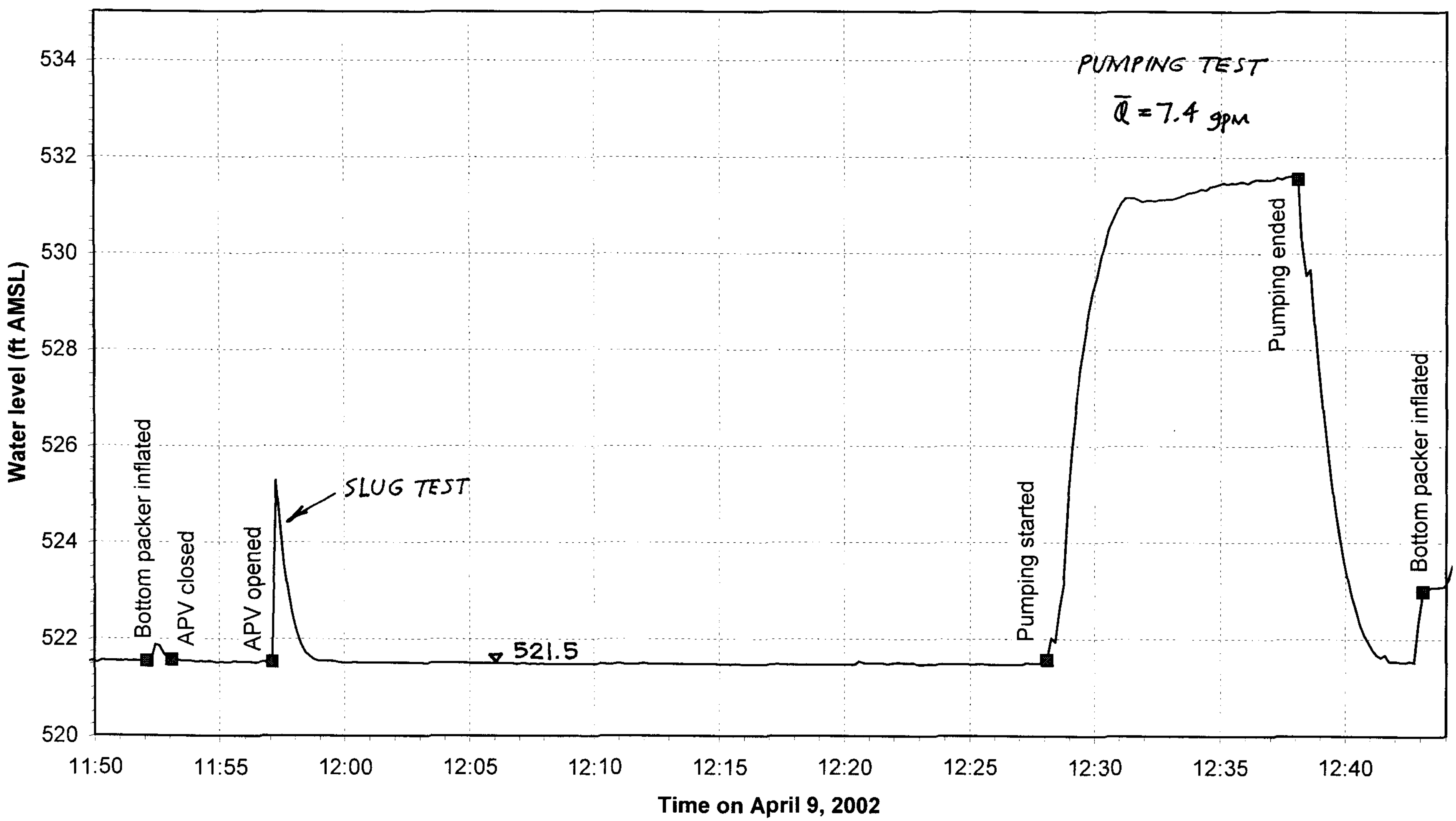
Testing Dates: April 9, 2002
April 15, 2002 (Retest of interval 517.01 to 507.51 ft MSL)

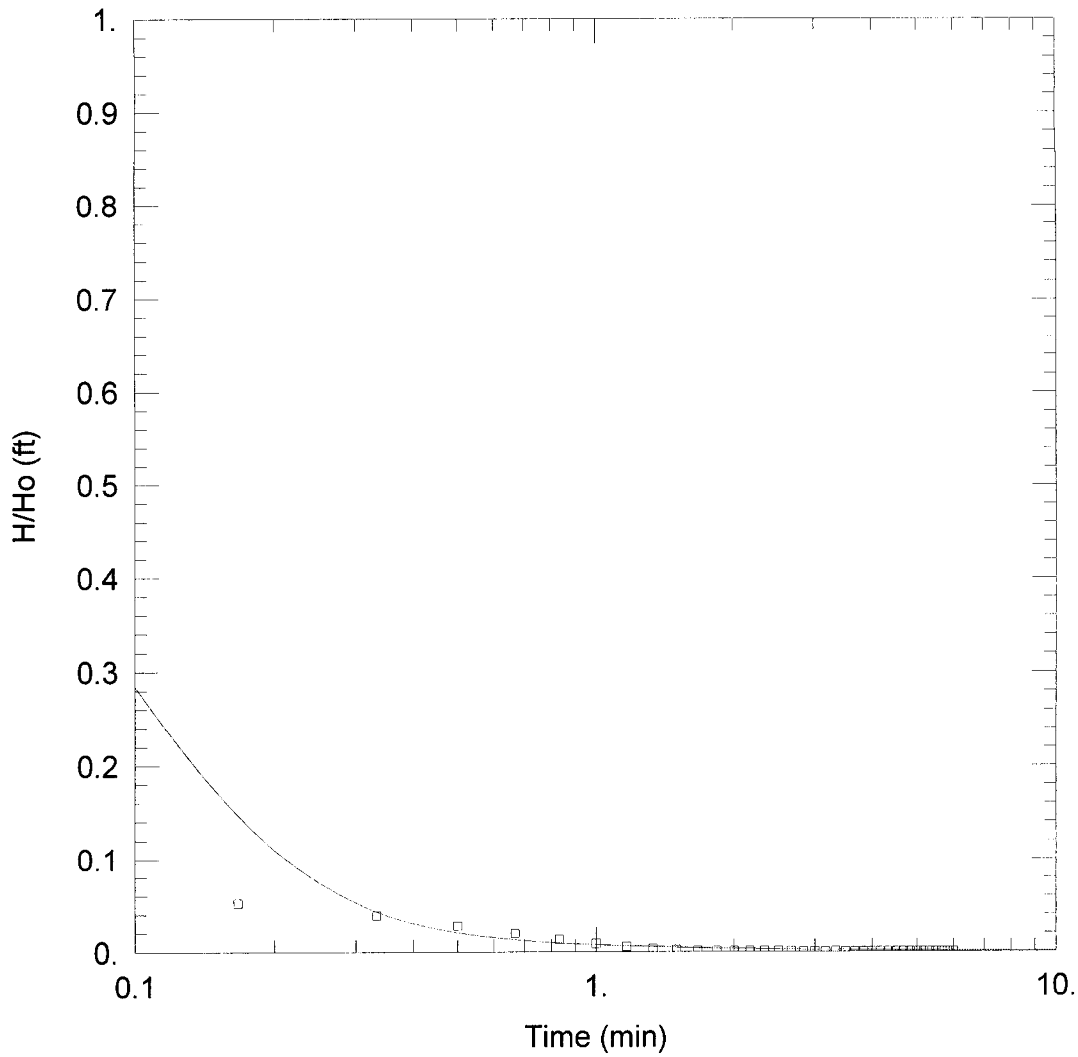
Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
B1M	1	517.01	507.51	0.32	
B1M	2	517.01	511.81	<<1	
B1M	3P	521.01	515.81	520	
B1M	4	525.01	519.81	0.0025	
B1M	5	529.01	523.81	<<1	
B1M	6	533.01	527.81	0.21	


Monitoring Well B1M
80
70
60
50
40
30
20
10
0
-10
Head of Water Above Transducer
4/9/2002 10:33
4/9/2002 11:02
4/9/2002 11:31
4/9/2002 12:00
4/9/2002 12:28
4/9/2002 12:57
4/9/2002 13:26
4/9/2002 13:55
4/9/2002 14:24
Time
1
2
3
4
5
6
TRANSDUCER
OUT OF WATER

B1M
Water Levels for Interval 1
(507.61 to 517.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-1S.aqt
Date: 11/26/02 Time: 08:19:20

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

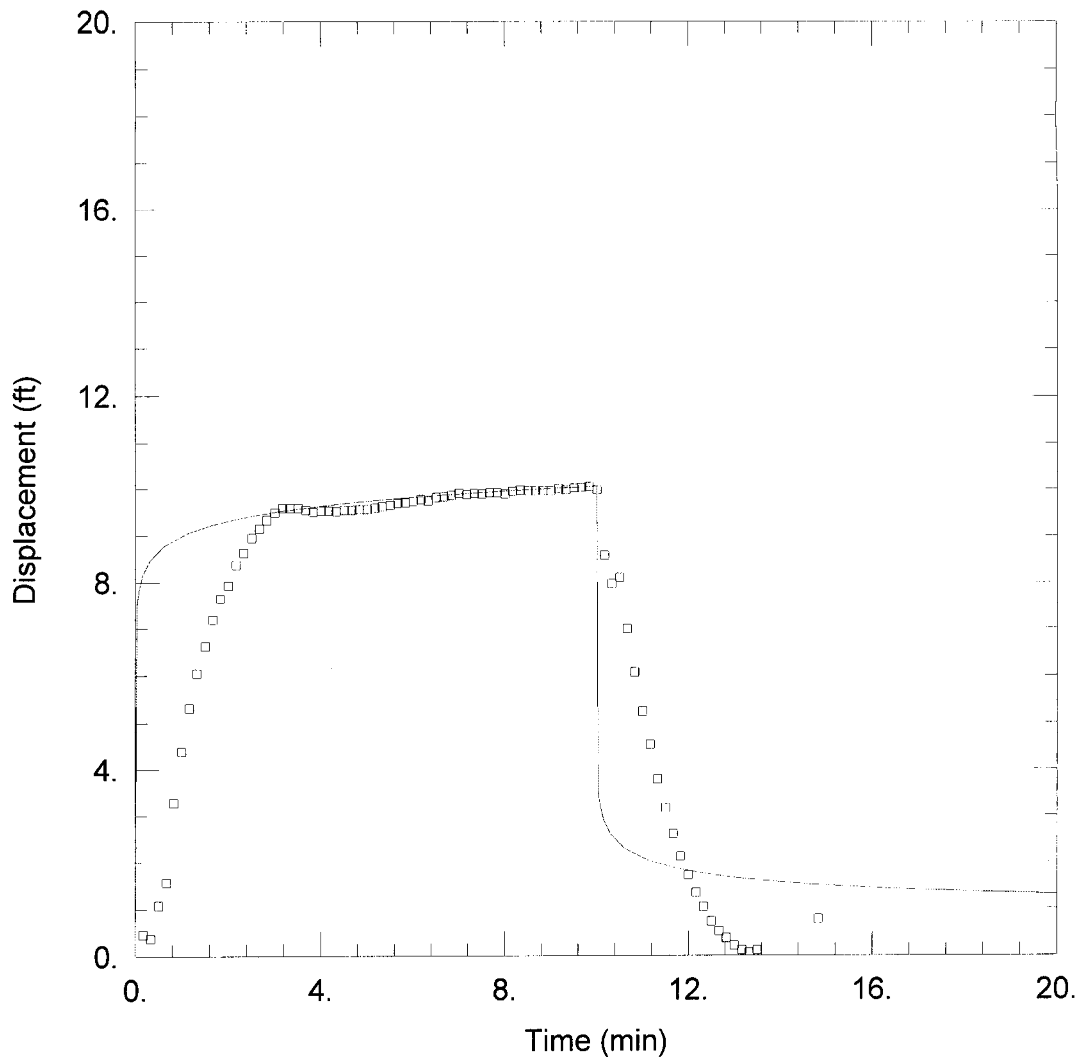
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B1M(0409)-1S)

Initial Displacement: 73. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 104.5 ft^2/day
S = 1.E-06



B1M TEST 1 (PUMPING TEST)

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-1P.aqt
Date: 11/26/02 Time: 08:19:25

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610
Test Well: B1M Test 1
Test Date: 2002 April 9

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
B1M-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
B1M-1	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

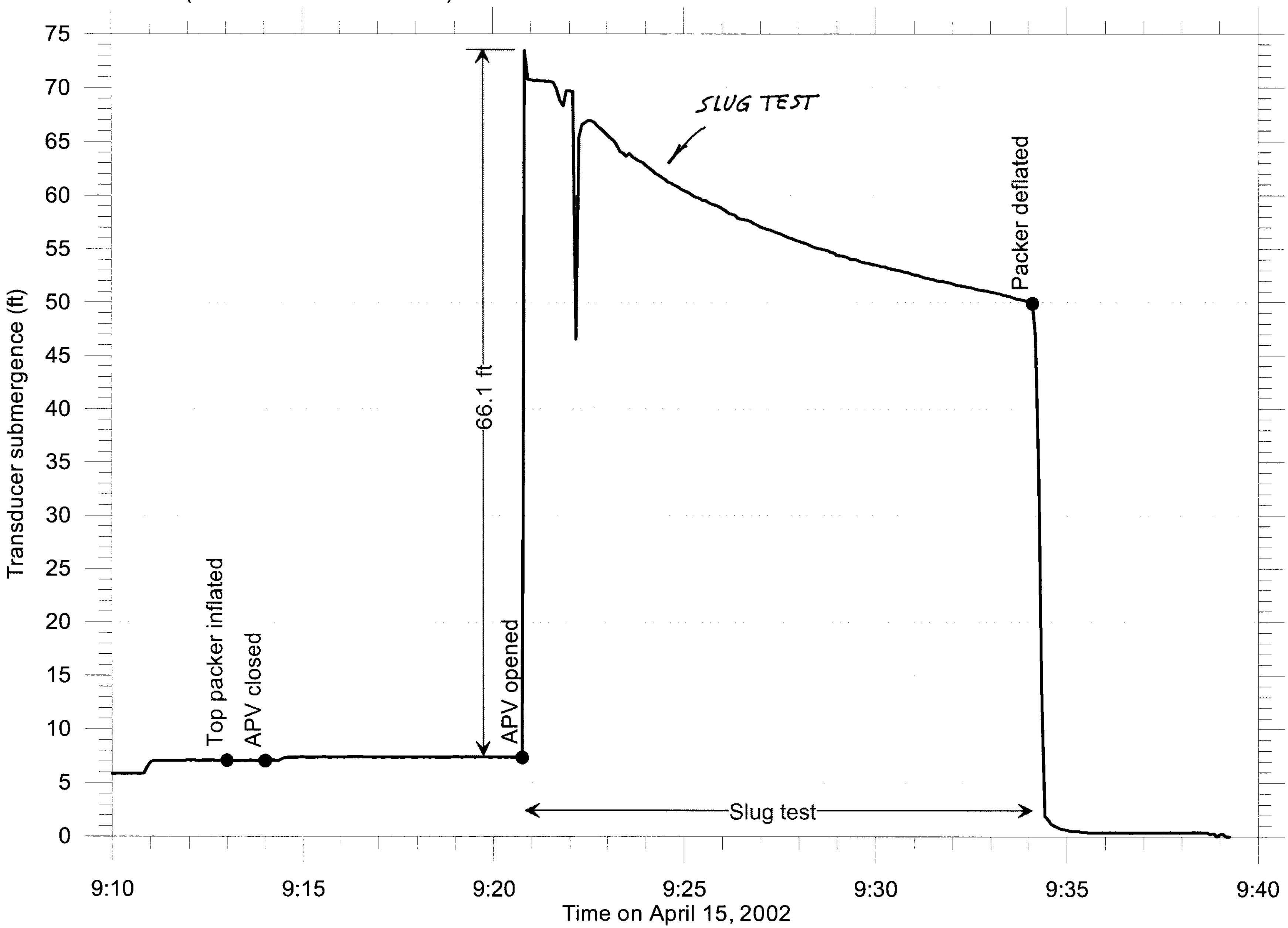
T = 247. ft^2/day
Sw = 0.
P = 1.5

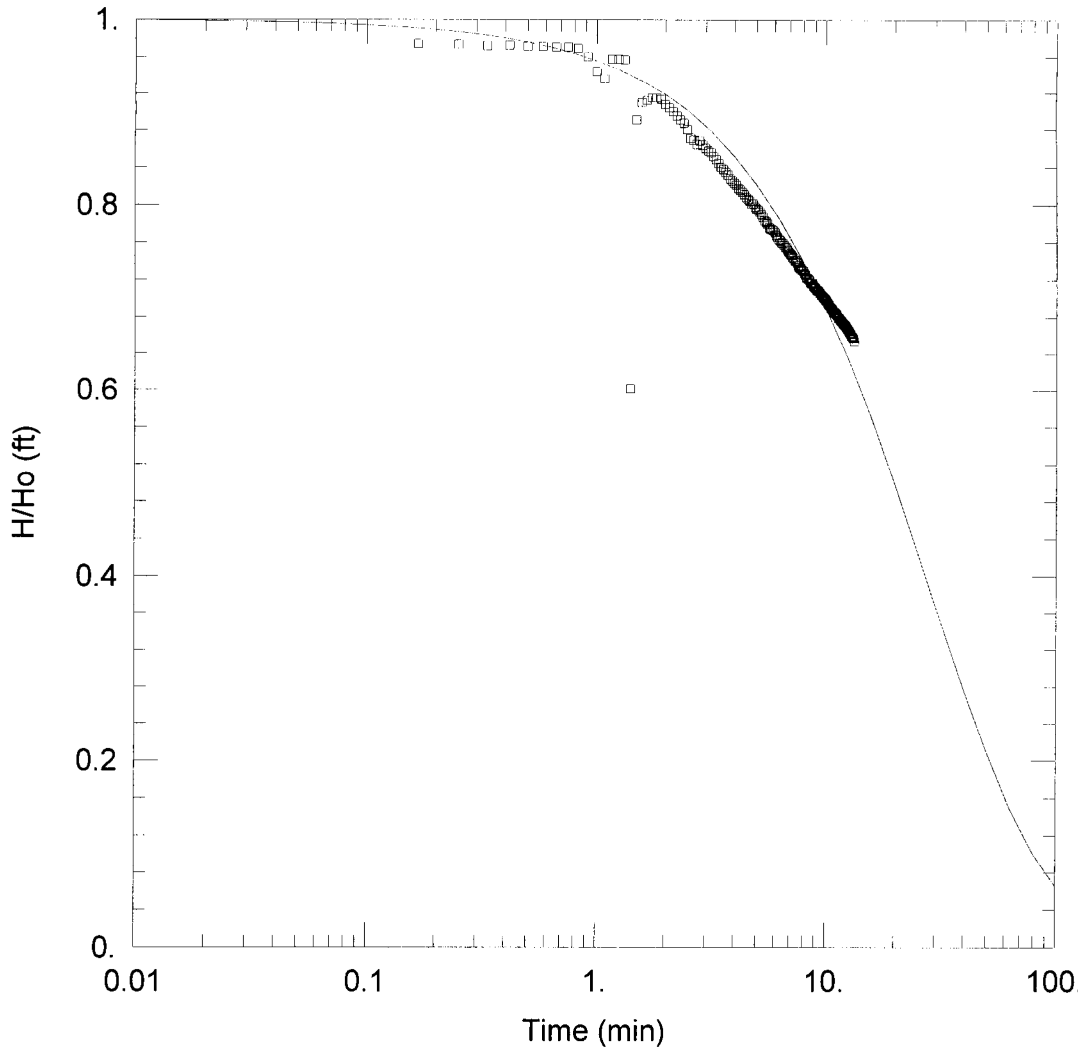
S = 1.E-06
C = 1. min^2/ft^5

Step Test Model: Jacob-Rorabaugh

$s(t) = 8.103Q + 1.Q^{1.5}$

B1M Packer Testing -- Retest of interval 1
Test 1 (517.01 to 507.61 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M(0415)-1.aqt
Date: 11/26/02 Time: 08:19:31

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B1M(0415)-1)

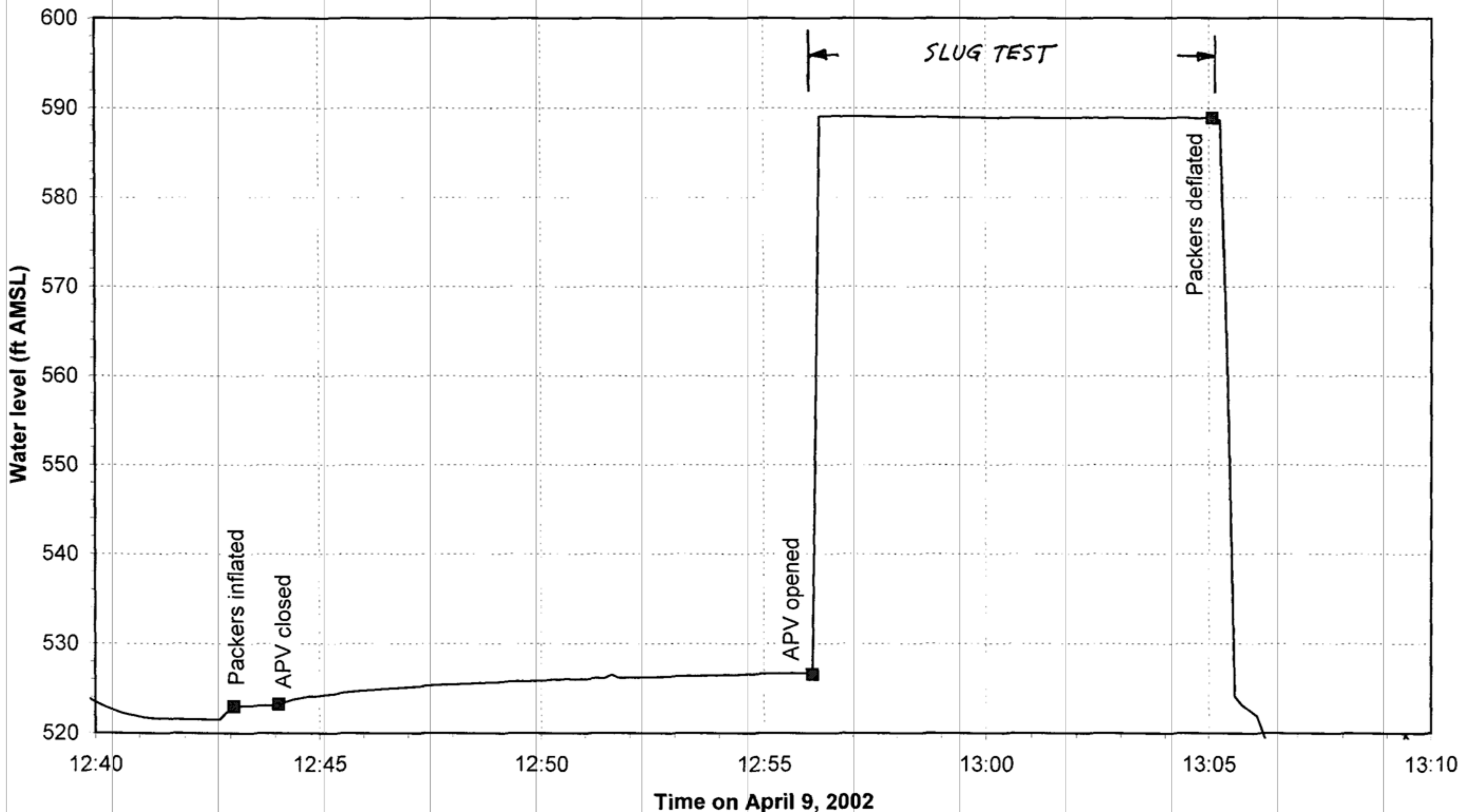
Initial Displacement: 65.1 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

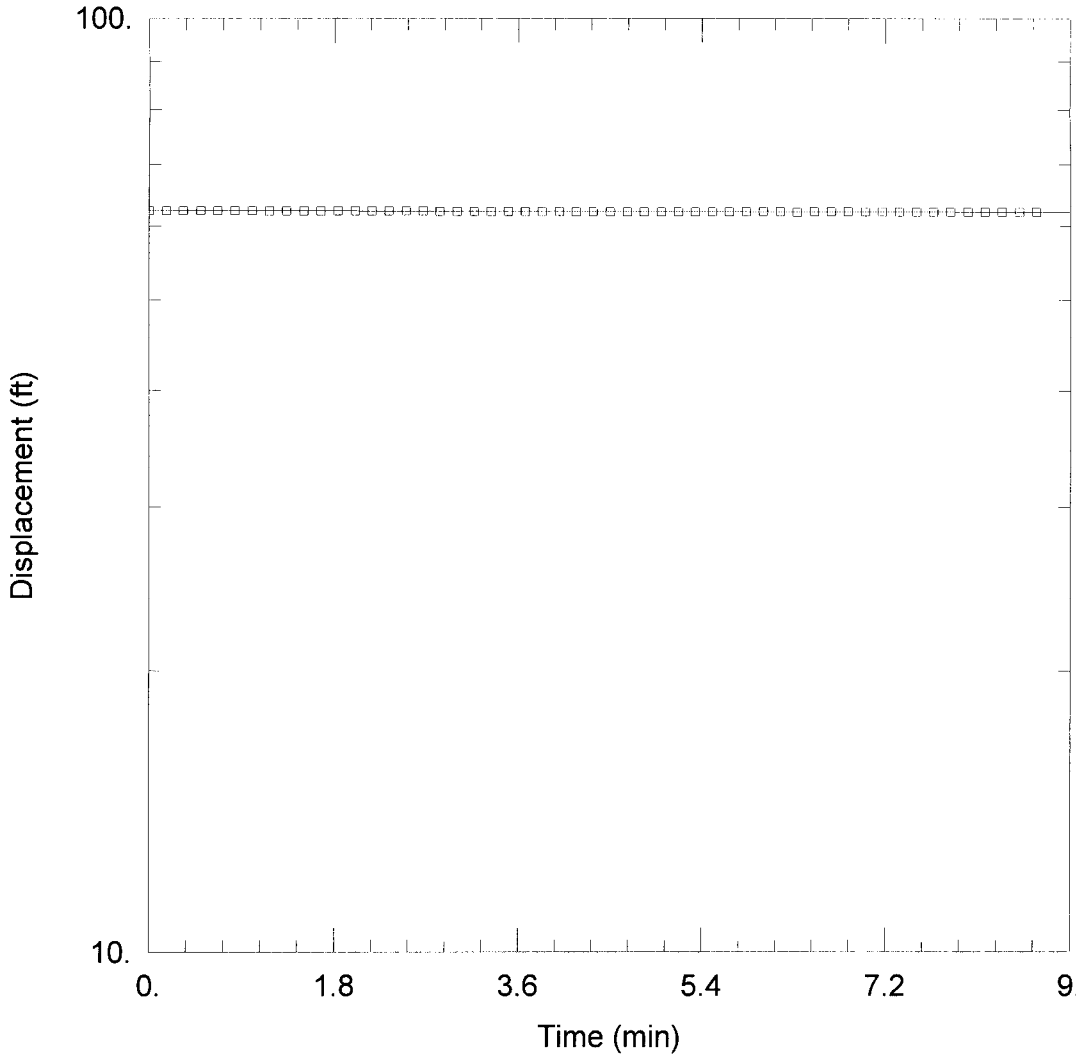
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.3176 ft^2/day S = 1.E-07

B1M
Water Levels for Interval 2
(511.81 to 517.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-2.aqt
Date: 11/26/02 Time: 08:19:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B1M-2)

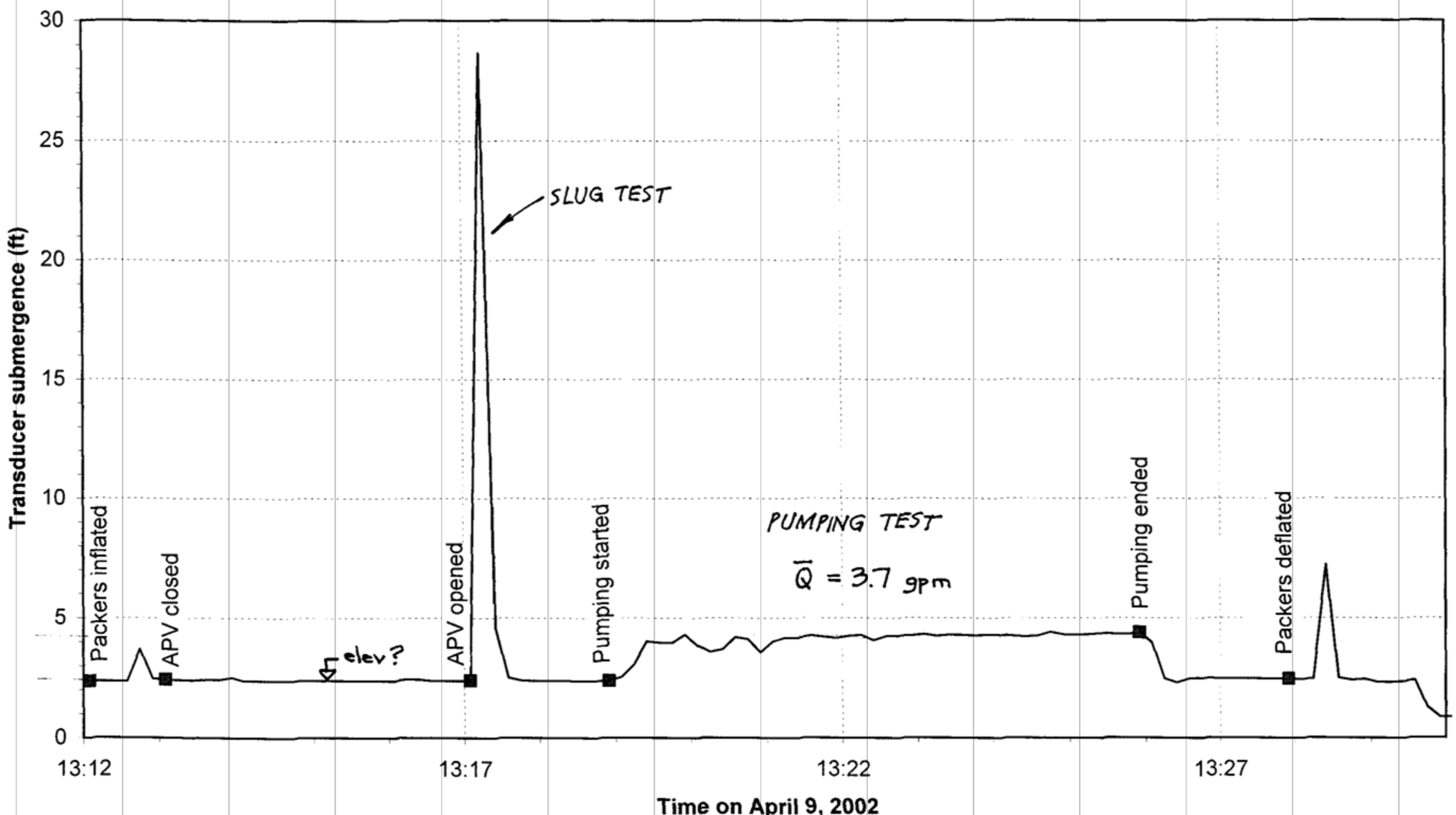
Initial Displacement: 62.38 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

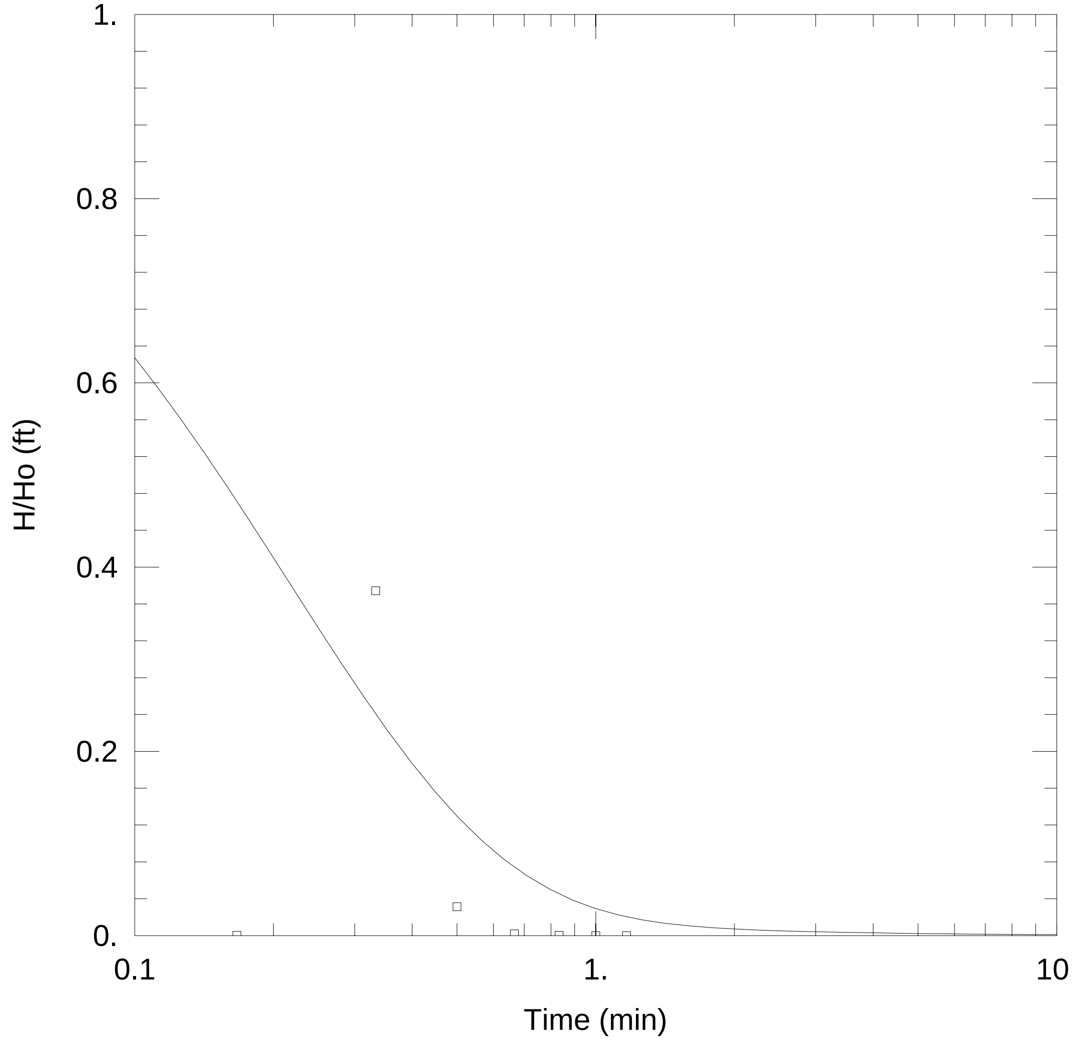
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0003537 ft/day
y0 = 62.35 ft

B1M
Water Levels for Interval 3
(515.81 to 521.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-3Sa.aqt
Date: 01/22/03 Time: 10:13:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

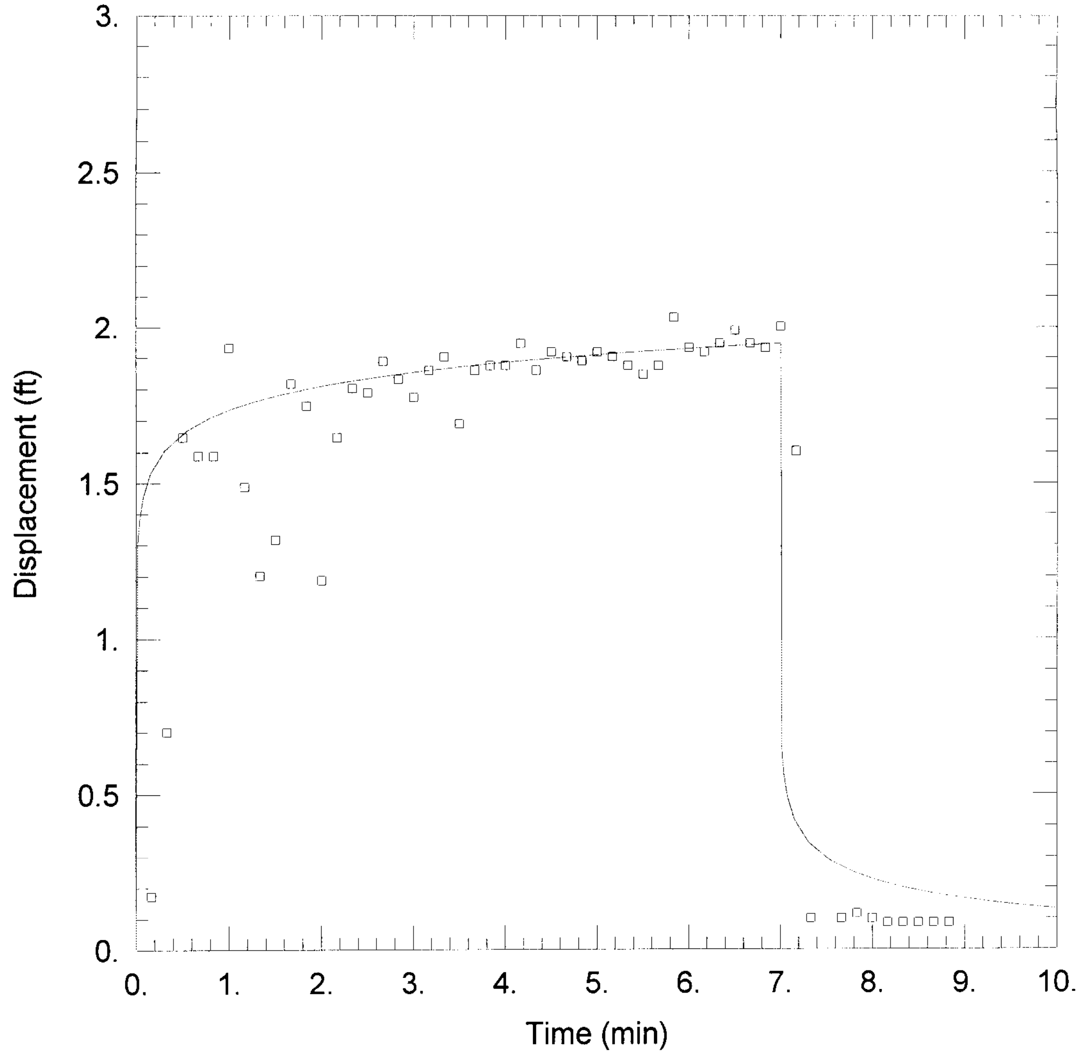
WELL DATA (B1M-3S)

Initial Displacement: 70.2 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 62.28 ft^2/day S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-3.aqt
Date: 11/26/02 Time: 08:19:10

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
B1M-3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ B1M-3	0	0

SOLUTION

Aquifer Model: Confined

T = 520. ft^2/day
Sw = 0.
P = 2.

Solution Method: Theis (Step Test)

S = 1.E-05
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 3.506Q + 0.Q^2$.
W.E. = 100.%

B1M, Test 3P

Alternative analyses

Average Q: 3.7 gpm
"Drawdown" (s or ΔH): 2 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 463\ ft^2/d}}$

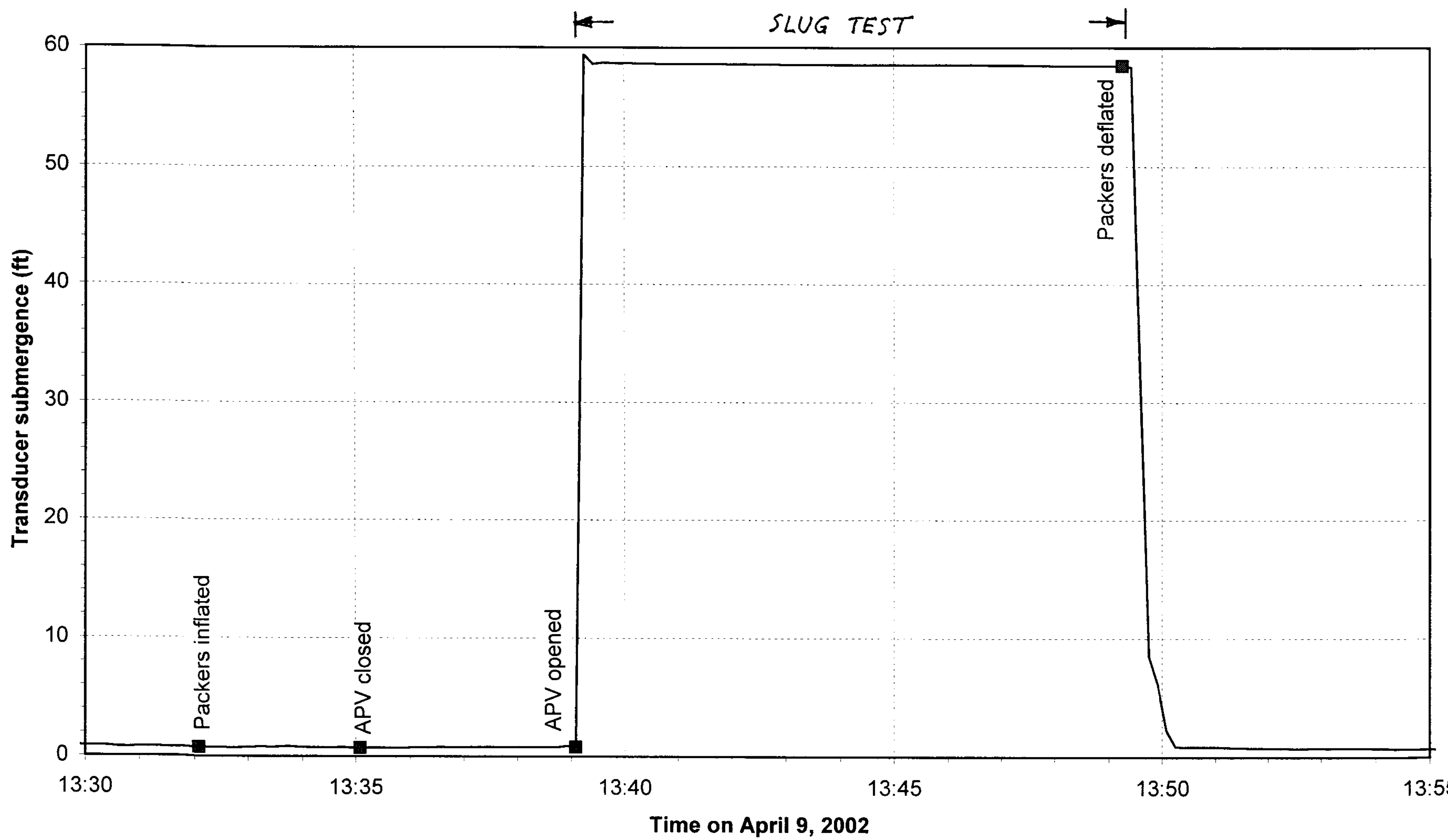
<u>T by Thiem solution:</u>

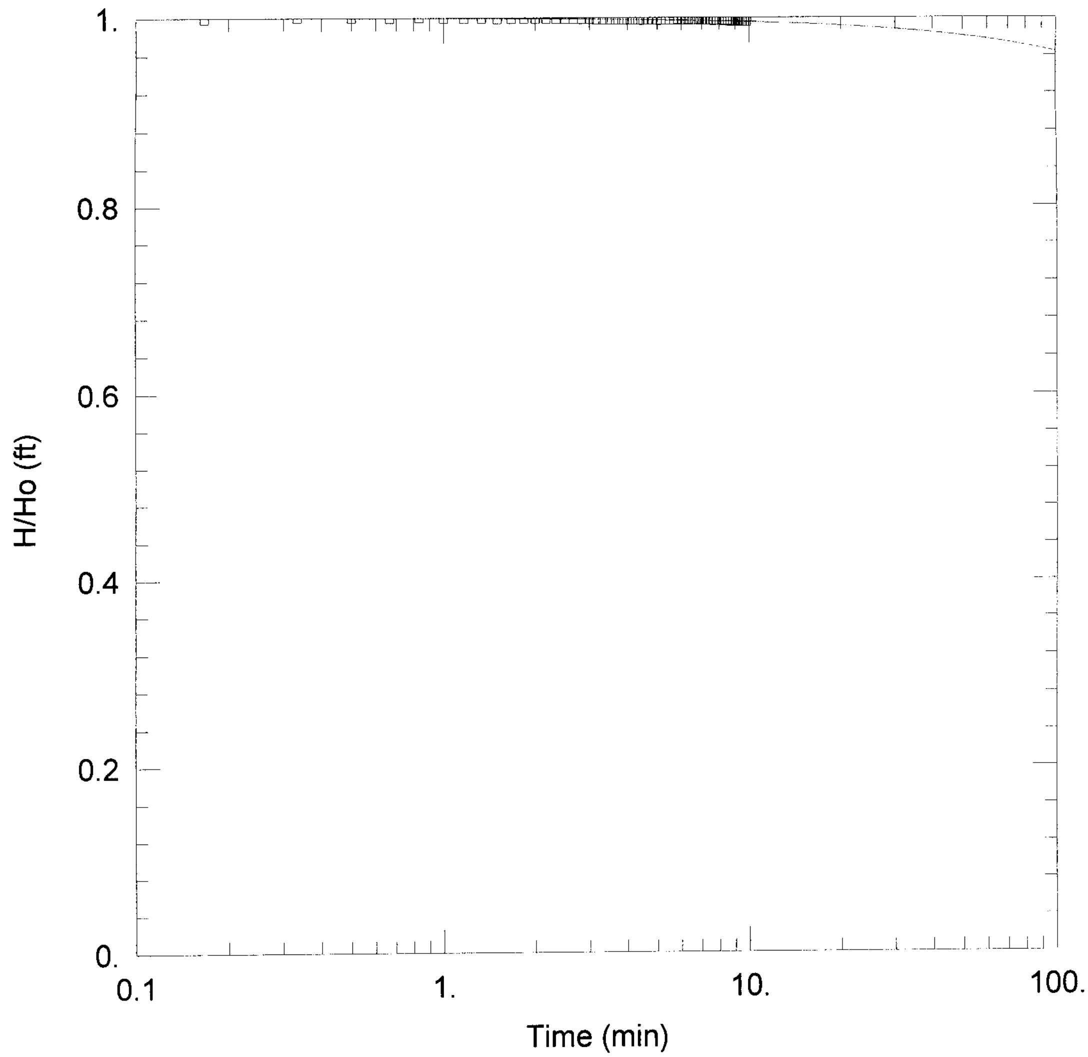
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8" = 0.1615$ ft

$\underline{\underline{T = 301\ ft^2/d}}$

B1M
Water Levels for Interval 4
(519.81 to 525.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-4.aqt
Date: 11/26/02 Time: 08:18:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

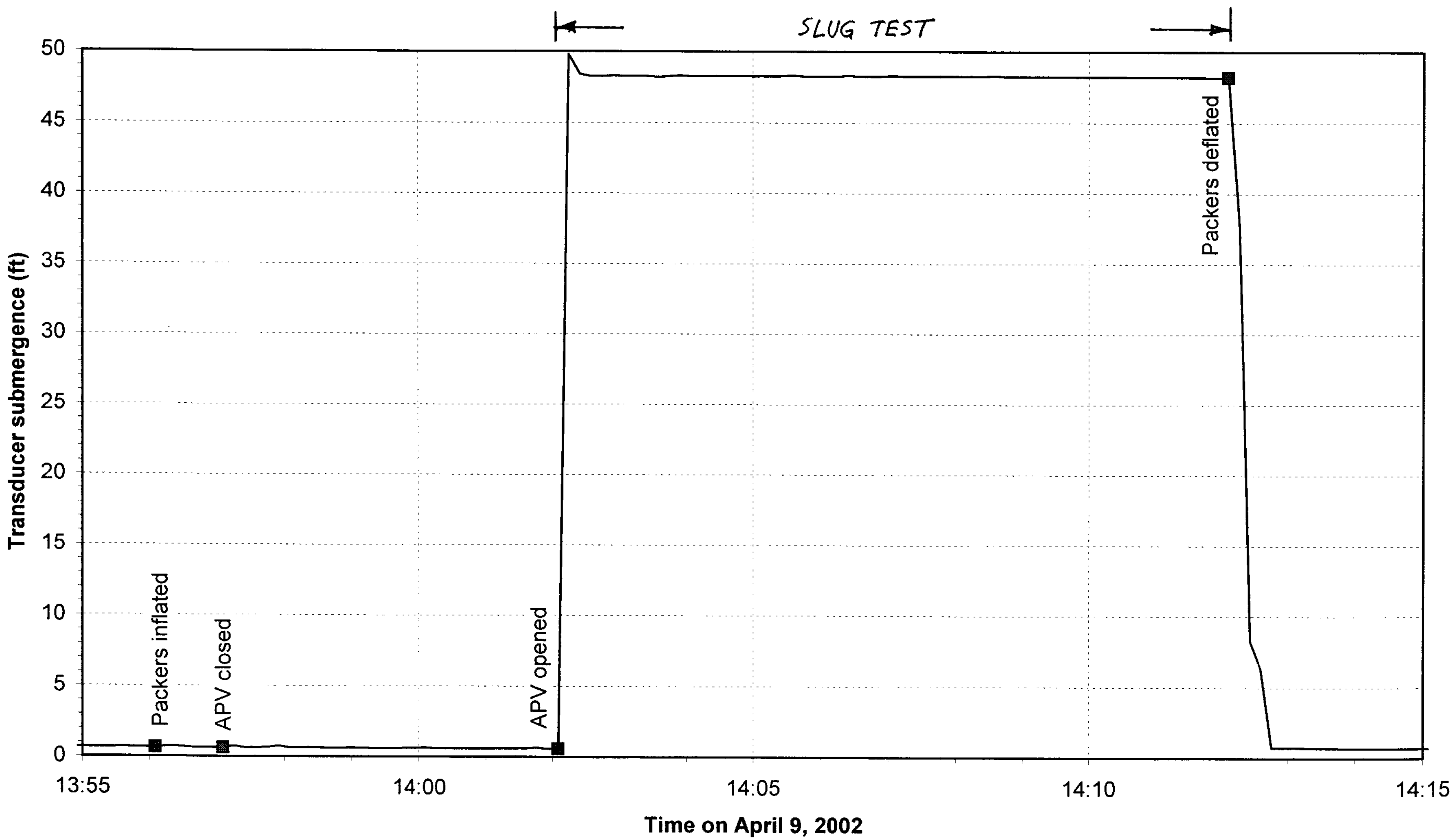
WELL DATA (B1M-4)

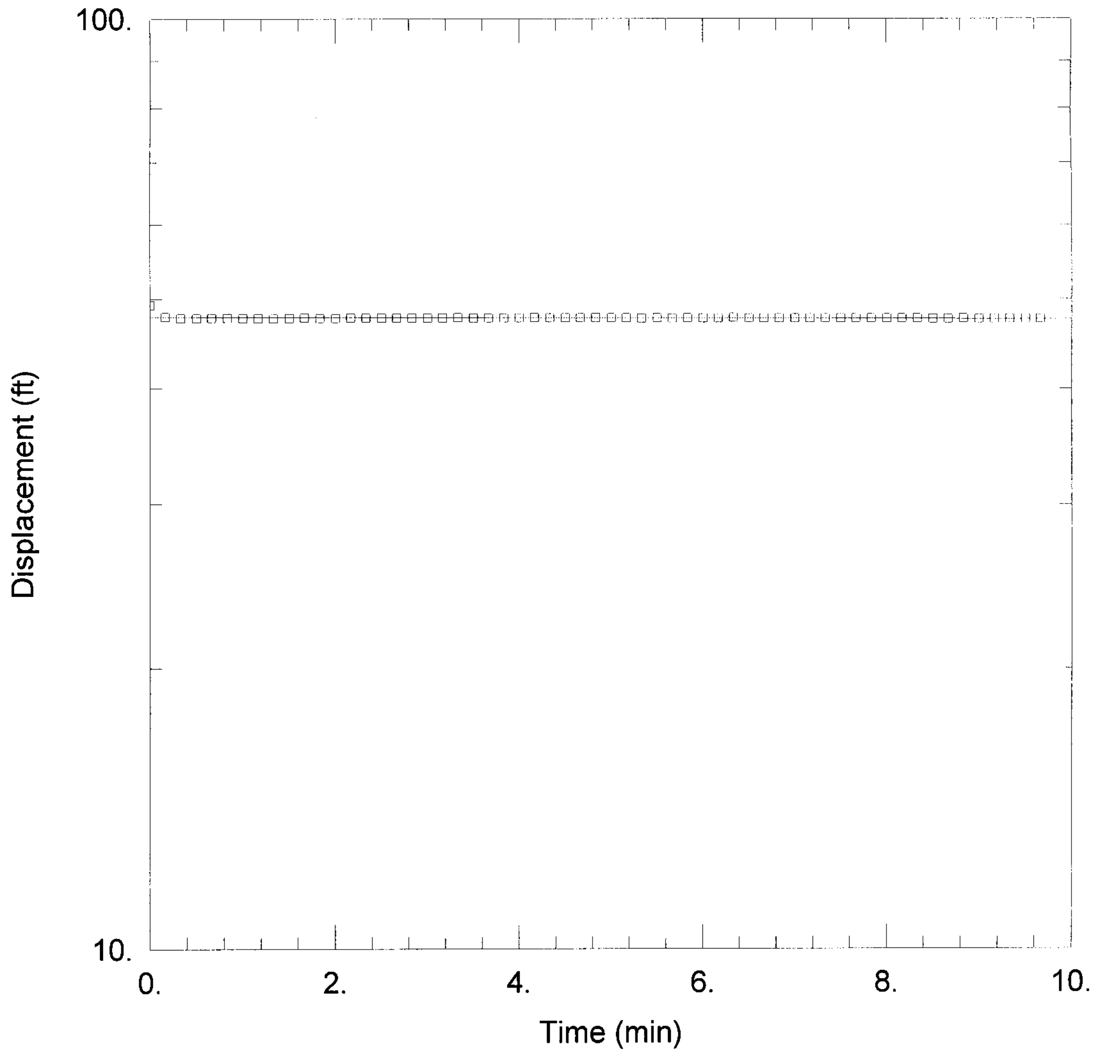
Initial Displacement: 57.92 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.04167 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.002496 ft^2/day
S = 1.E-07

B1M
Water Levels for Interval 5
(523.81 to 529.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-5.aqt
Date: 11/26/02 Time: 08:19:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (B1M-5)

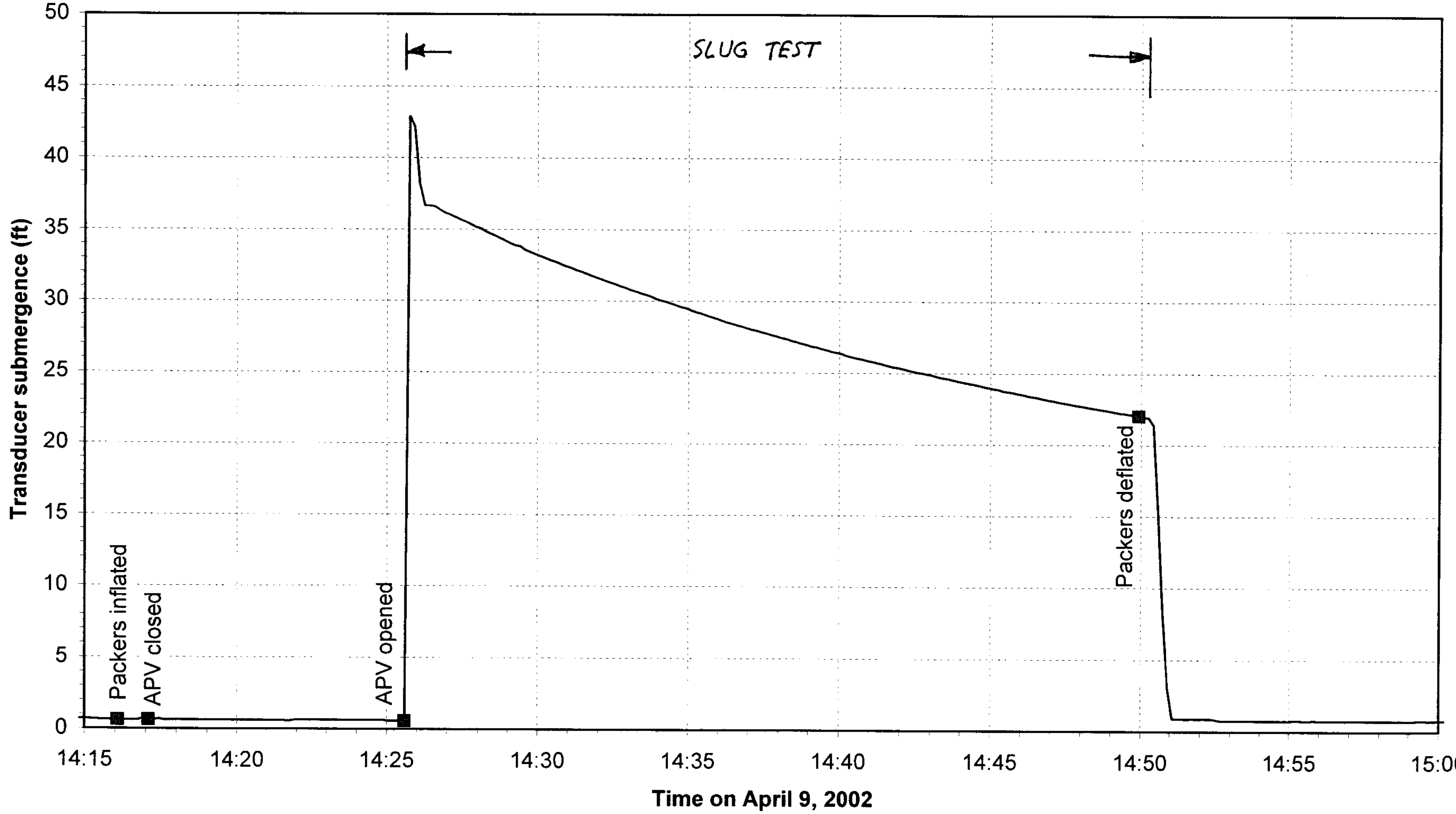
Initial Displacement: 1. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

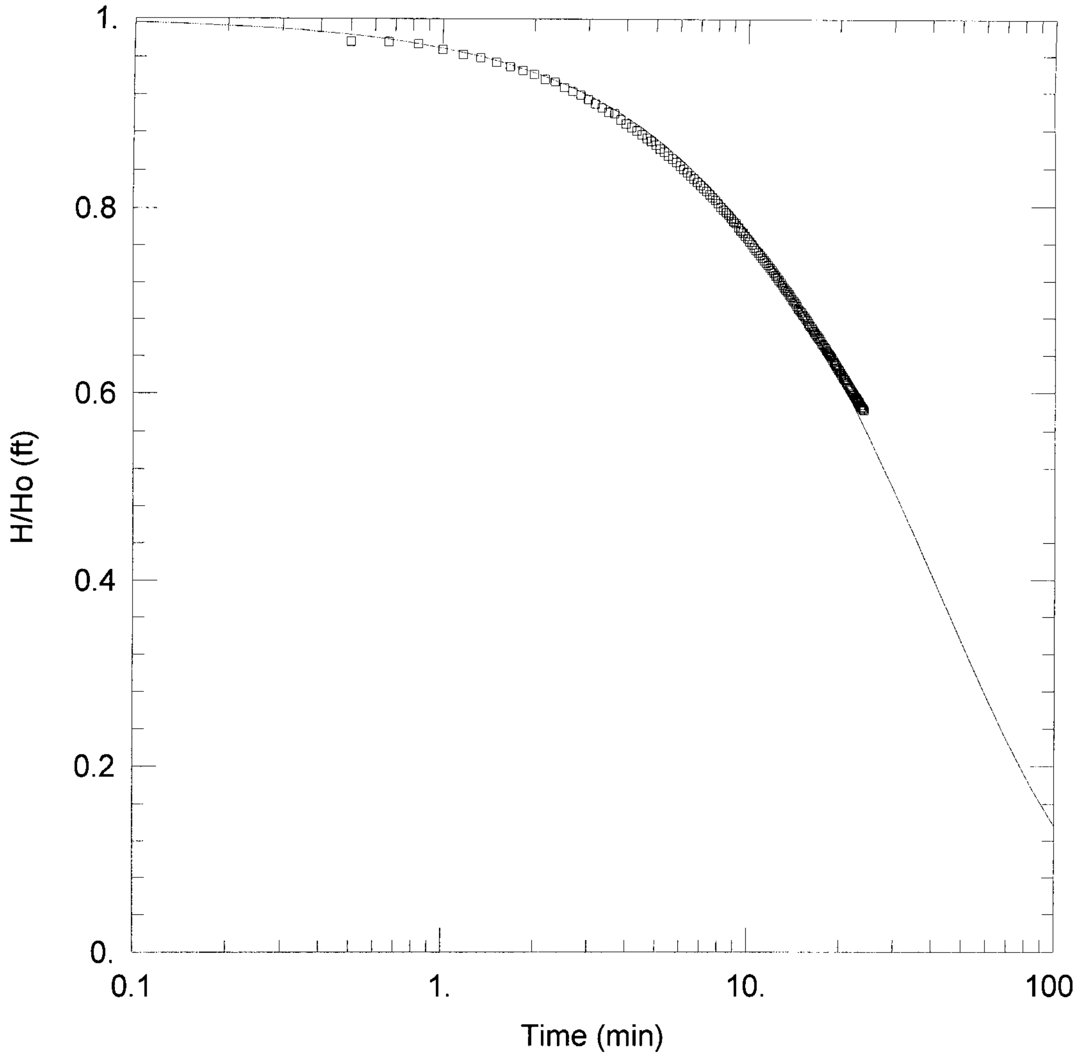
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0004056 ft/day
y0 = 47.83 ft

B1M
Water Levels for Interval 6
(527.81 to 533.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\B1M\B1M-6.aqt
Date: 11/26/02 Time: 08:18:45

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA (B1M-6)

Initial Displacement: 37. ft
Wellbore Radius: 0.1615 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.2125 ft^2/day
S = 1.E-07

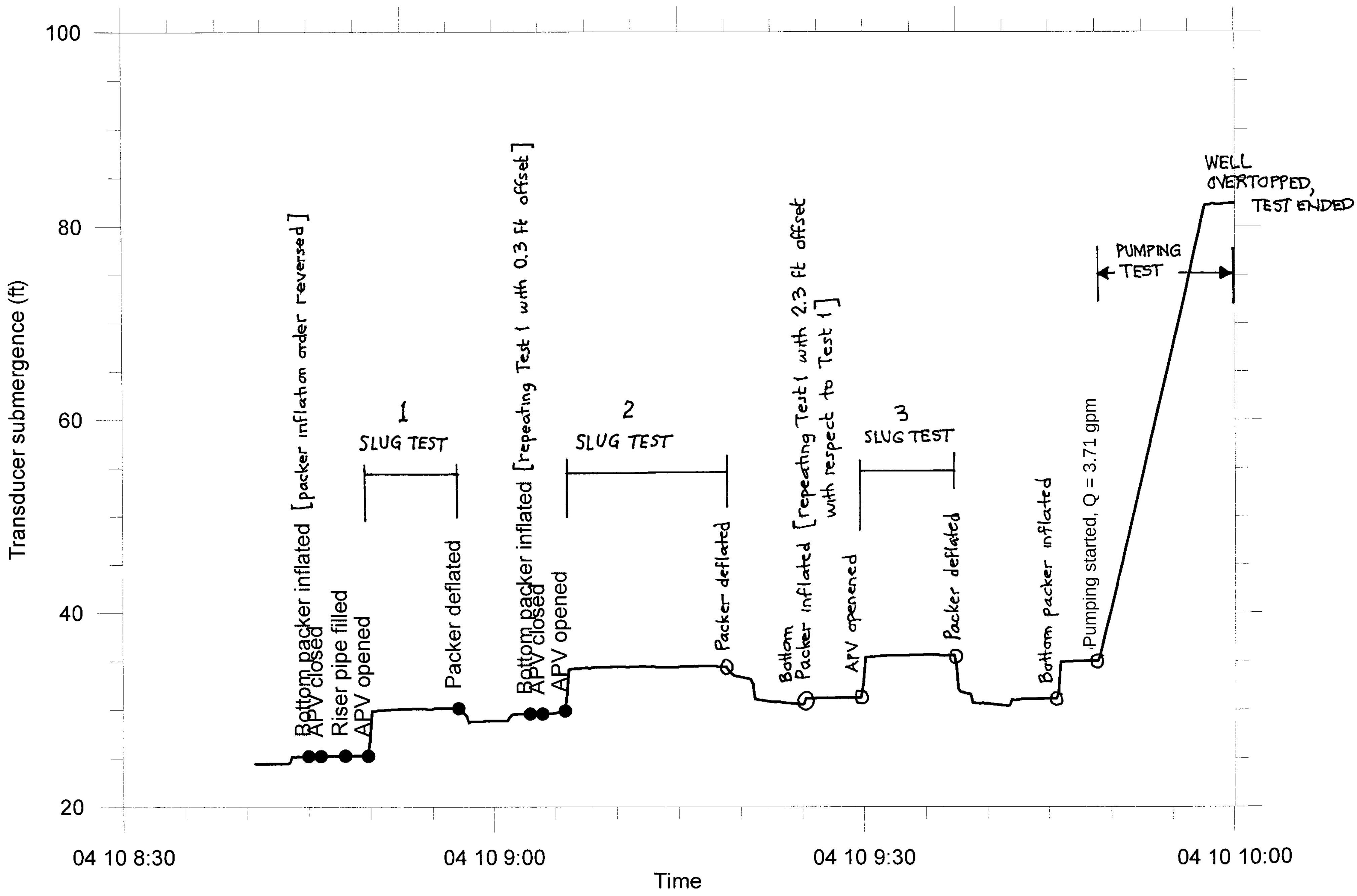
B1L

Testing Dates: April 10, 2002

Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
B1L	1	505.7	494.94	<<1	No recovery observed
B1L	2	505.7	495.24	<<1	No recovery observed
B1L	3	505.7	497.24	<<1	No recovery observed
B1L	4P	505.7	501.04	<<1	No water entered formation

B1L Packer Testing



Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

BC3U

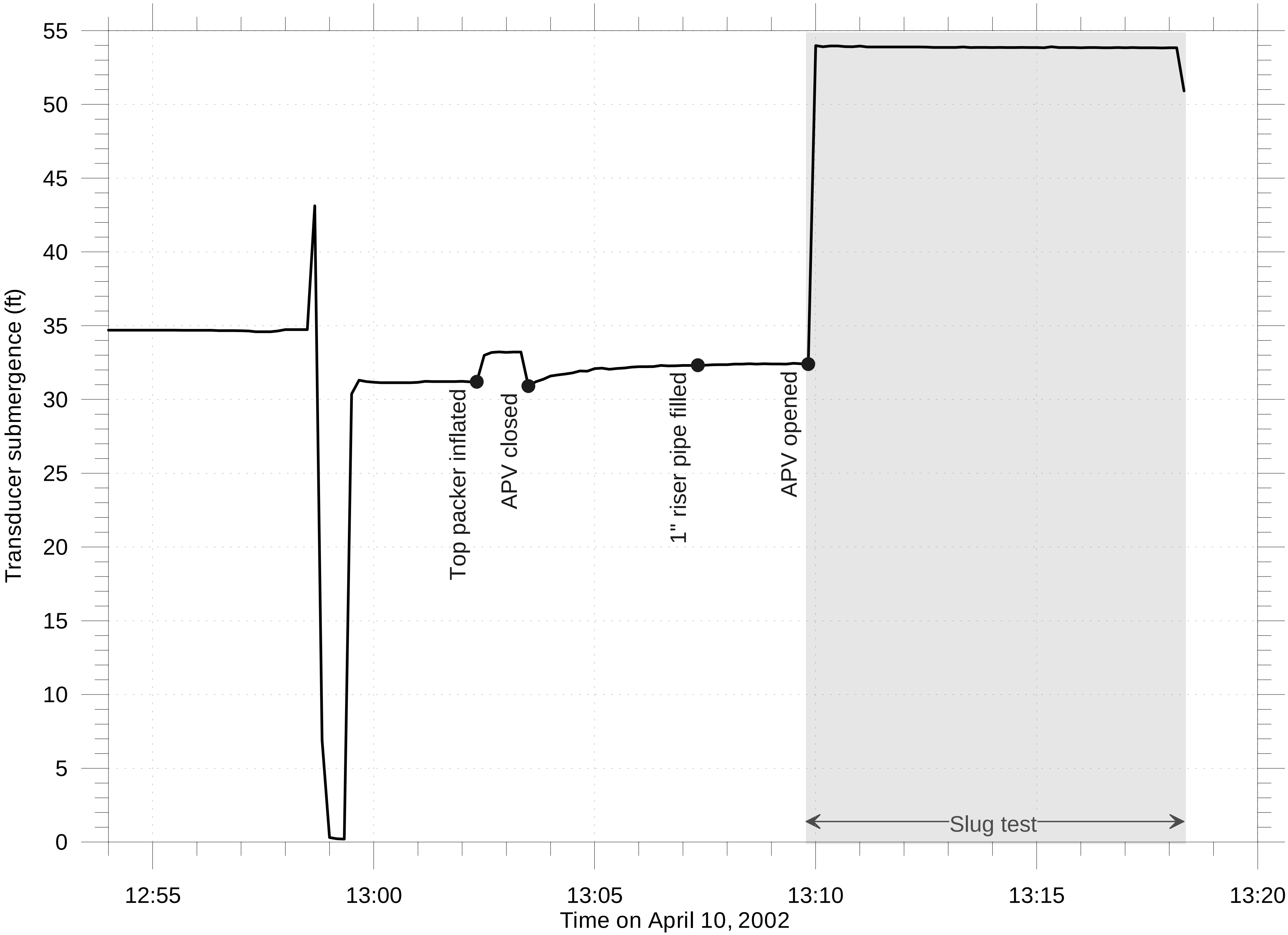
Testing Dates: April 10, 2002

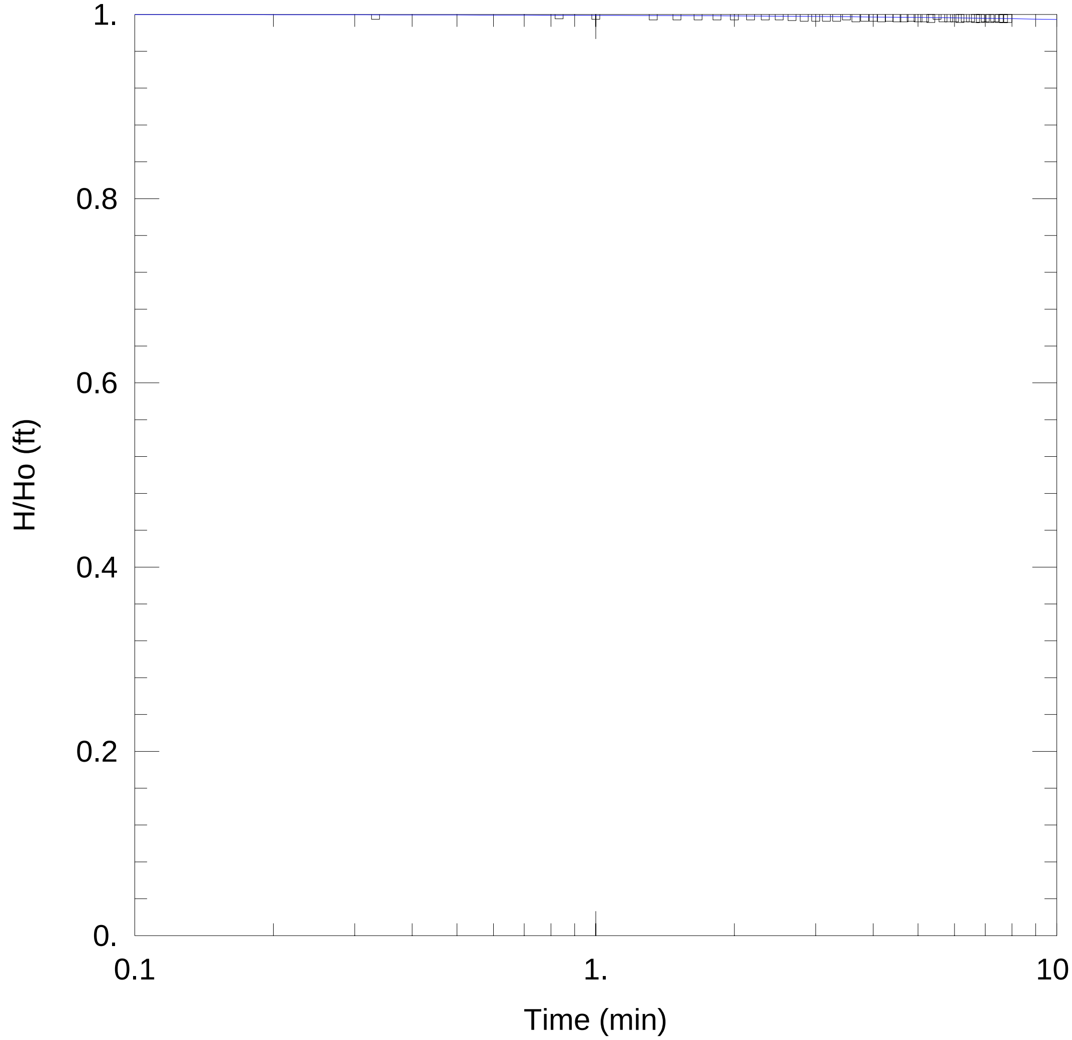
Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
BC3U	1	540.83	530.83	0.0013	

BC3U Packer Testing

Test 1 (540.83 to 530.83 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\BC3U\BC3U-1.aqt
Date: 01/20/03 Time: 13:49:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BC3U-1)

Initial Displacement: 21.54 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.001288 ft^2/day S = 1.E-05

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

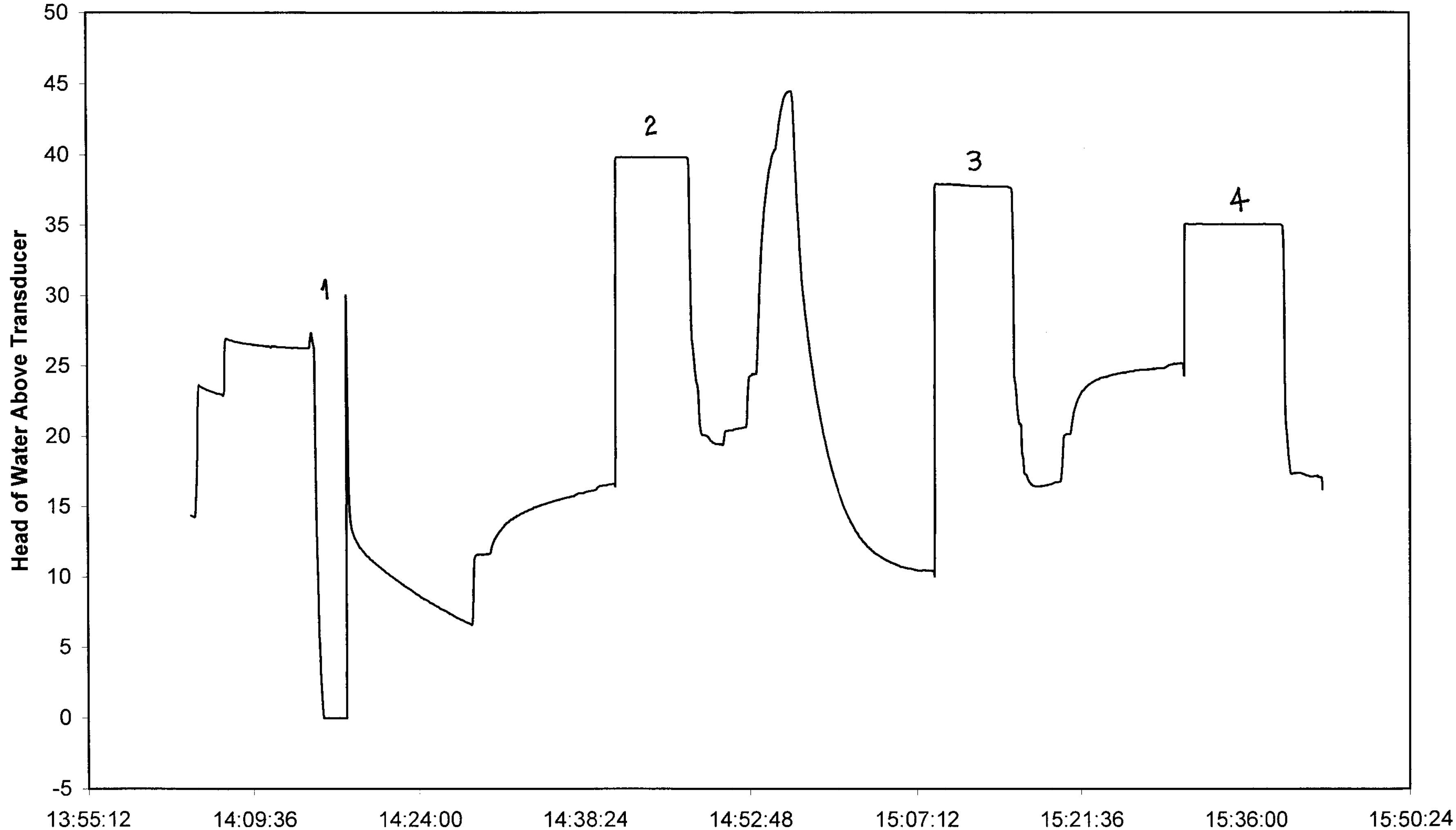
D2U

Testing Dates: April 11 & 12, 2002

Summary of Tests:

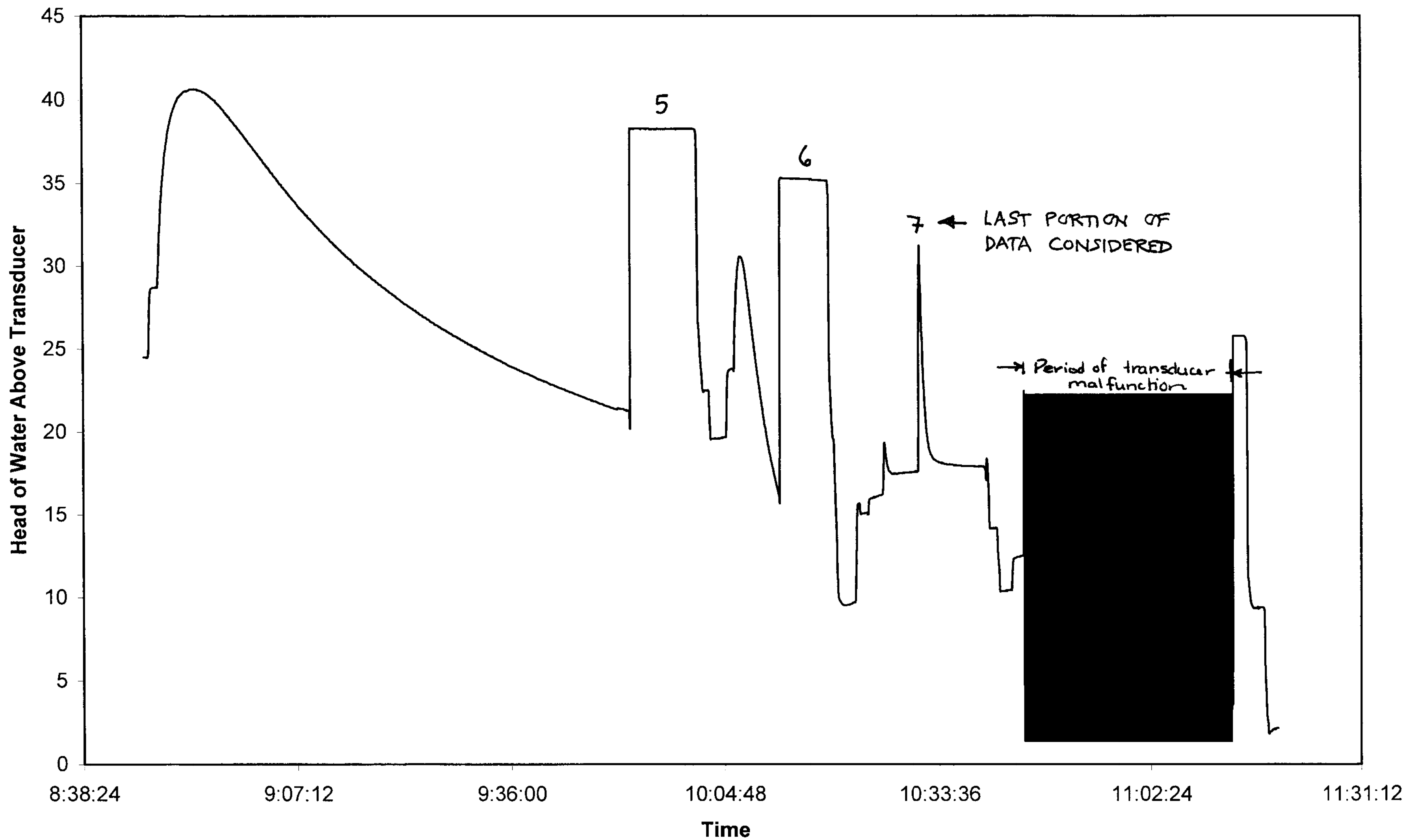
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
D2U	1	551.41	541.91	0.51	
D2U	2	551.41	546.21	<<1	
D2U	3	555.41	550.21	0.0058	
D2U	4	559.41	554.21	<<1	
D2U	5	563.41	558.21	<<1	
D2U	6	567.41	562.21	0.000002	
D2U	7	571.41	566.21	14.45	
D2U	8	575.41	570.21	NIR (TE)	see PT Memo
D2U	9	579.41	574.21	NIR (TE)	see PT Memo

Monitoring Well D2U



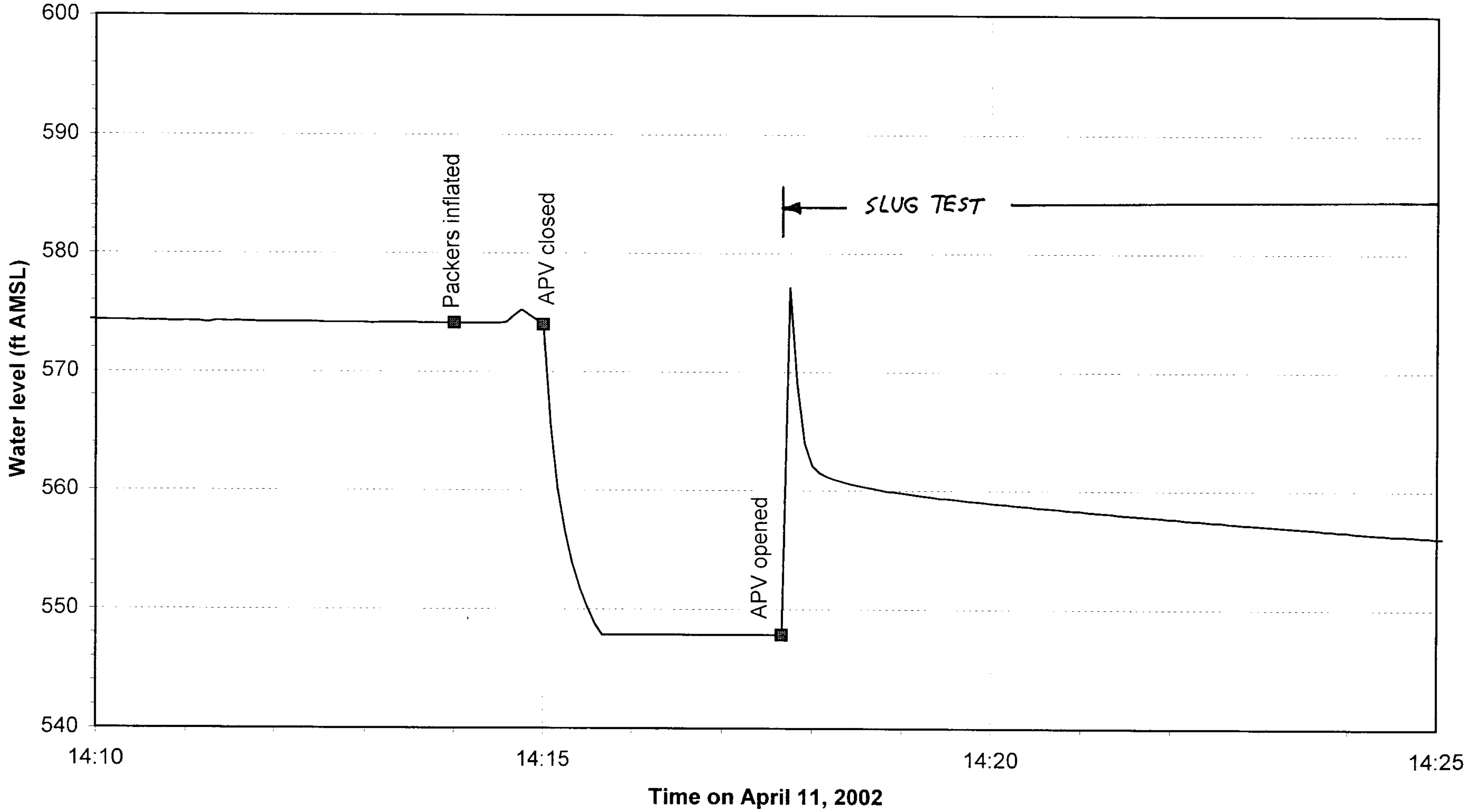
April 11, 2002

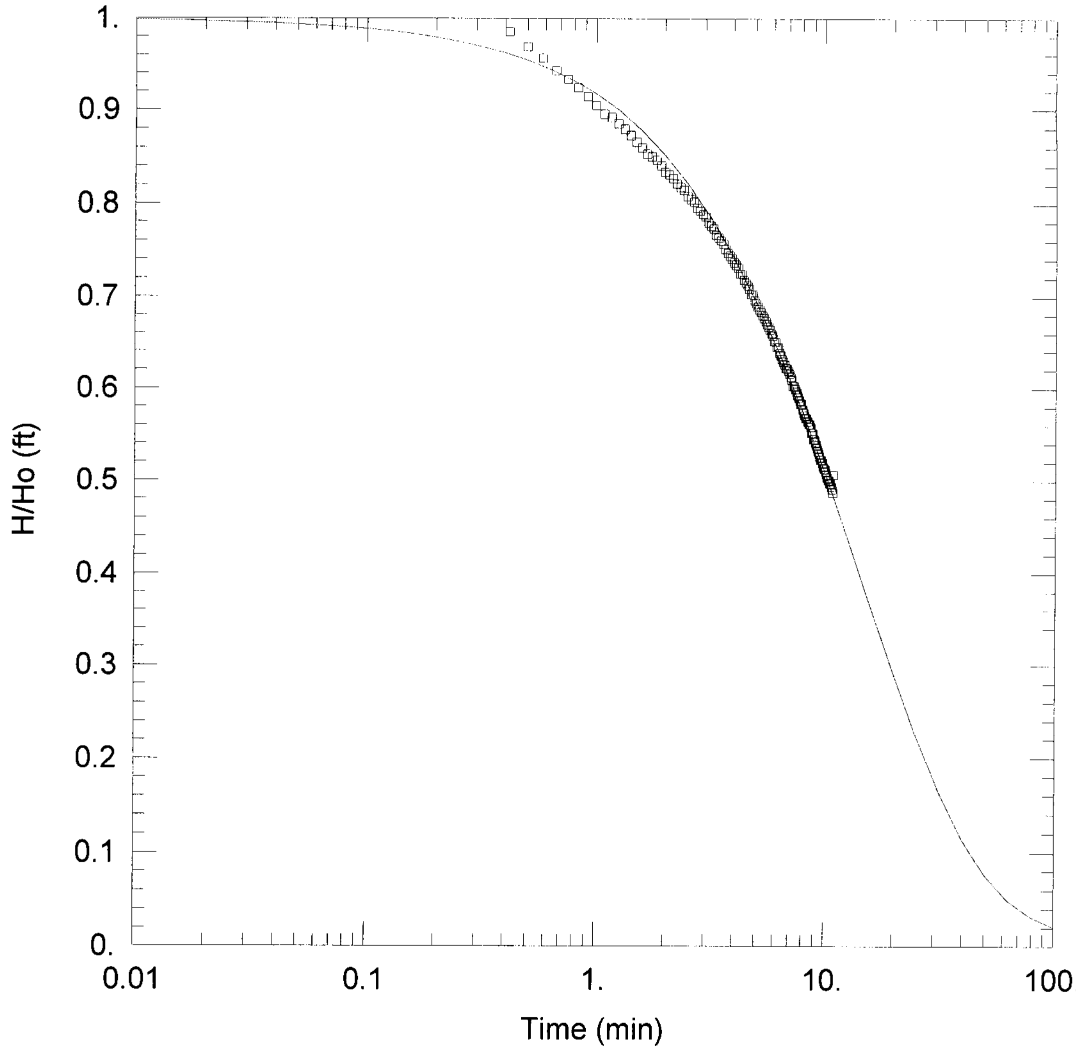
Monitoring Well D2U



April 12, 2002

D2U
Water Levels for Interval 1
(541.91 to 551.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-1.aqt
Date: 11/26/02 Time: 08:22:13

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA (D2U-1)

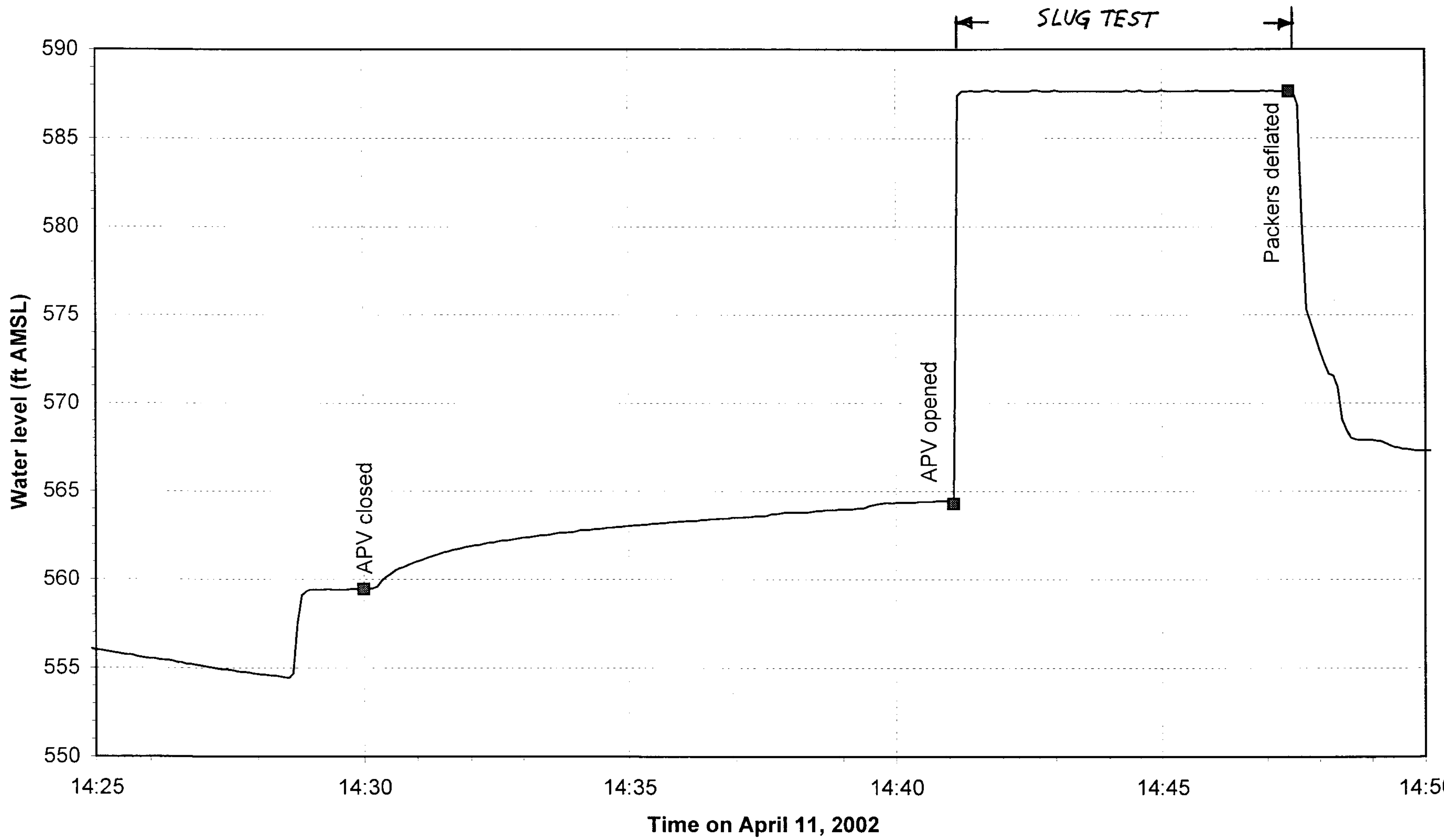
Initial Displacement: 13.5 ft
Wellbore Radius: 0.1615 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 1. ft

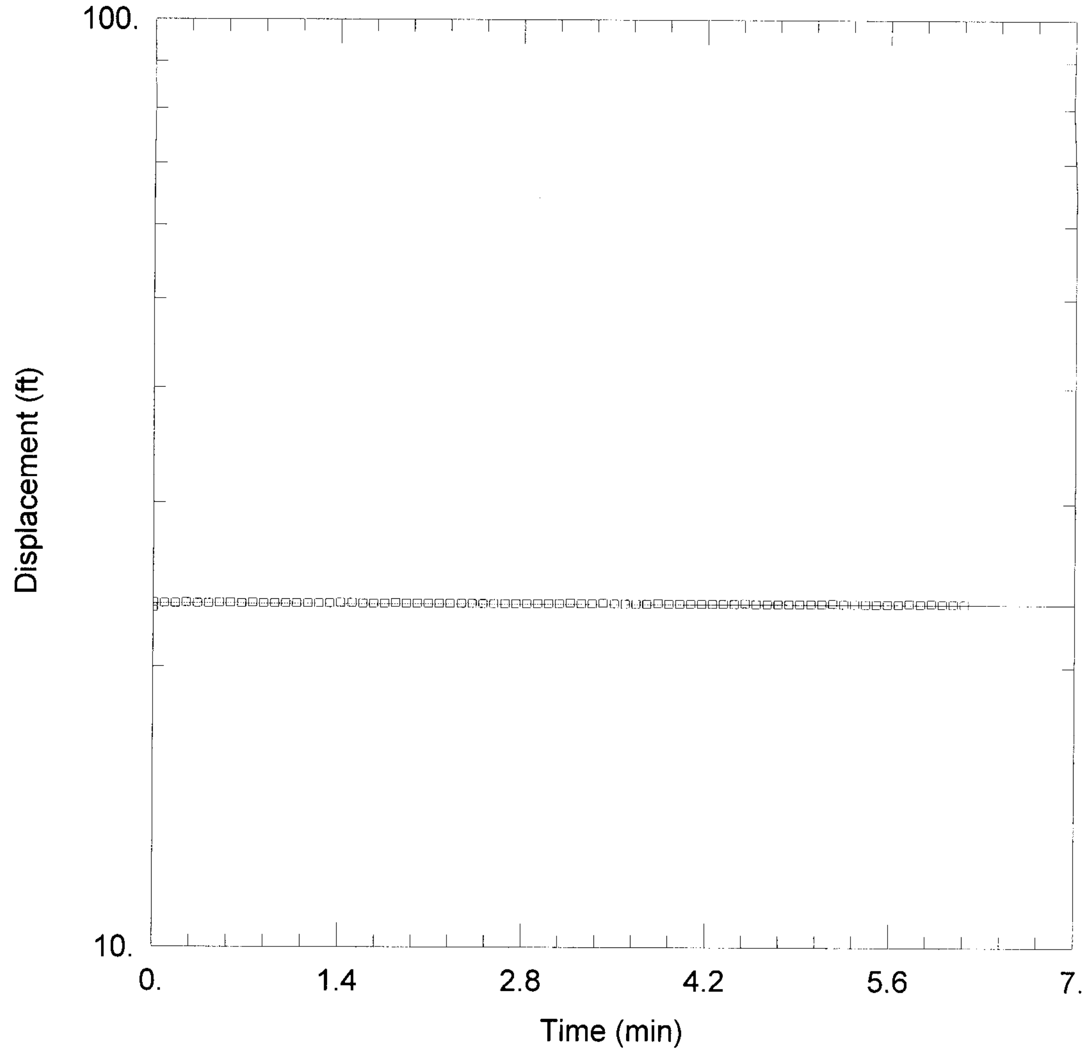
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.5103 ft^2/day
S = 1.E-06

D2U
Water Levels for Interval 2
(546.21 to 551.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-2.aqt
Date: 11/26/02 Time: 08:22:16

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2U-2)

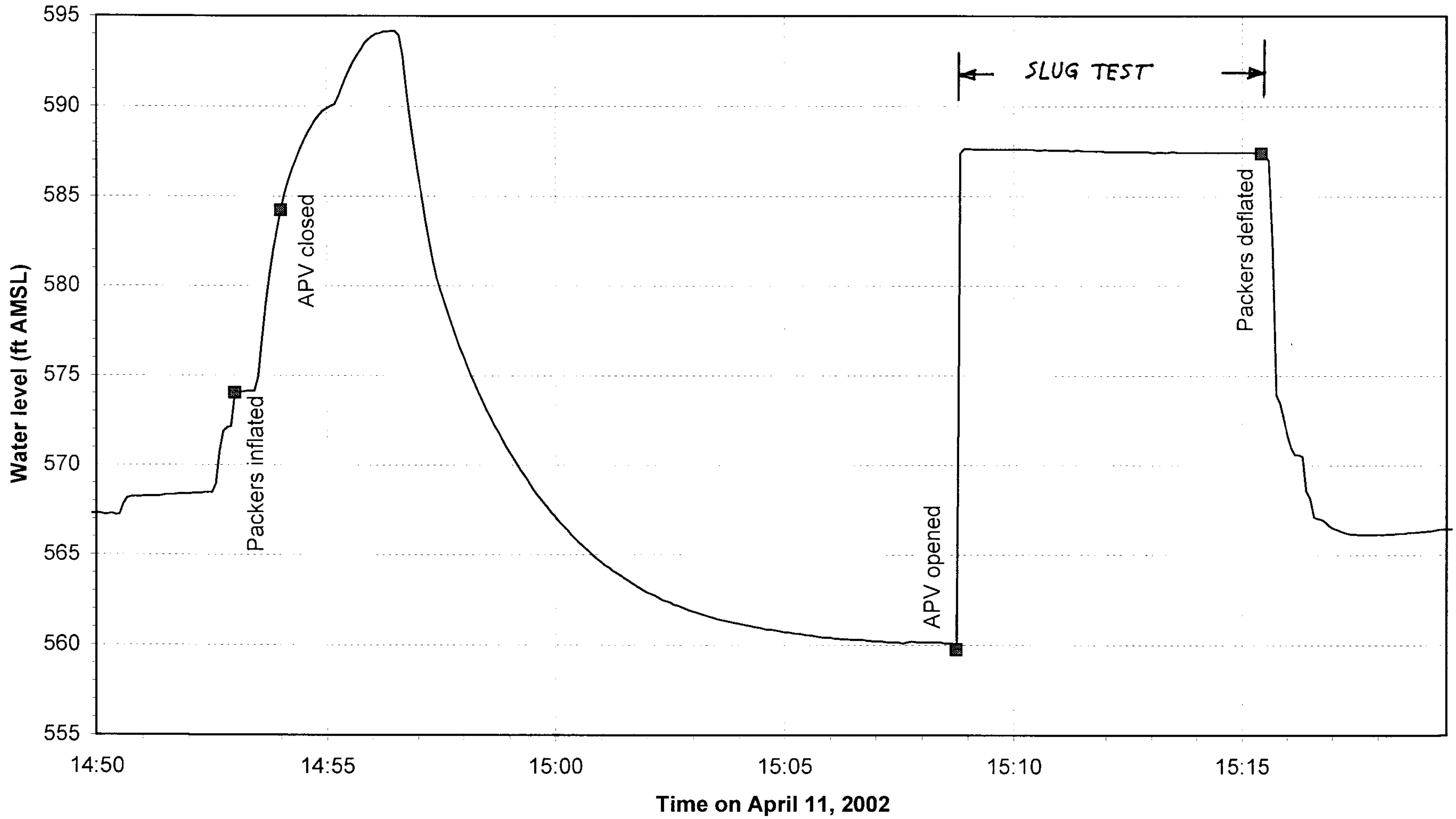
Initial Displacement: 23.43 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

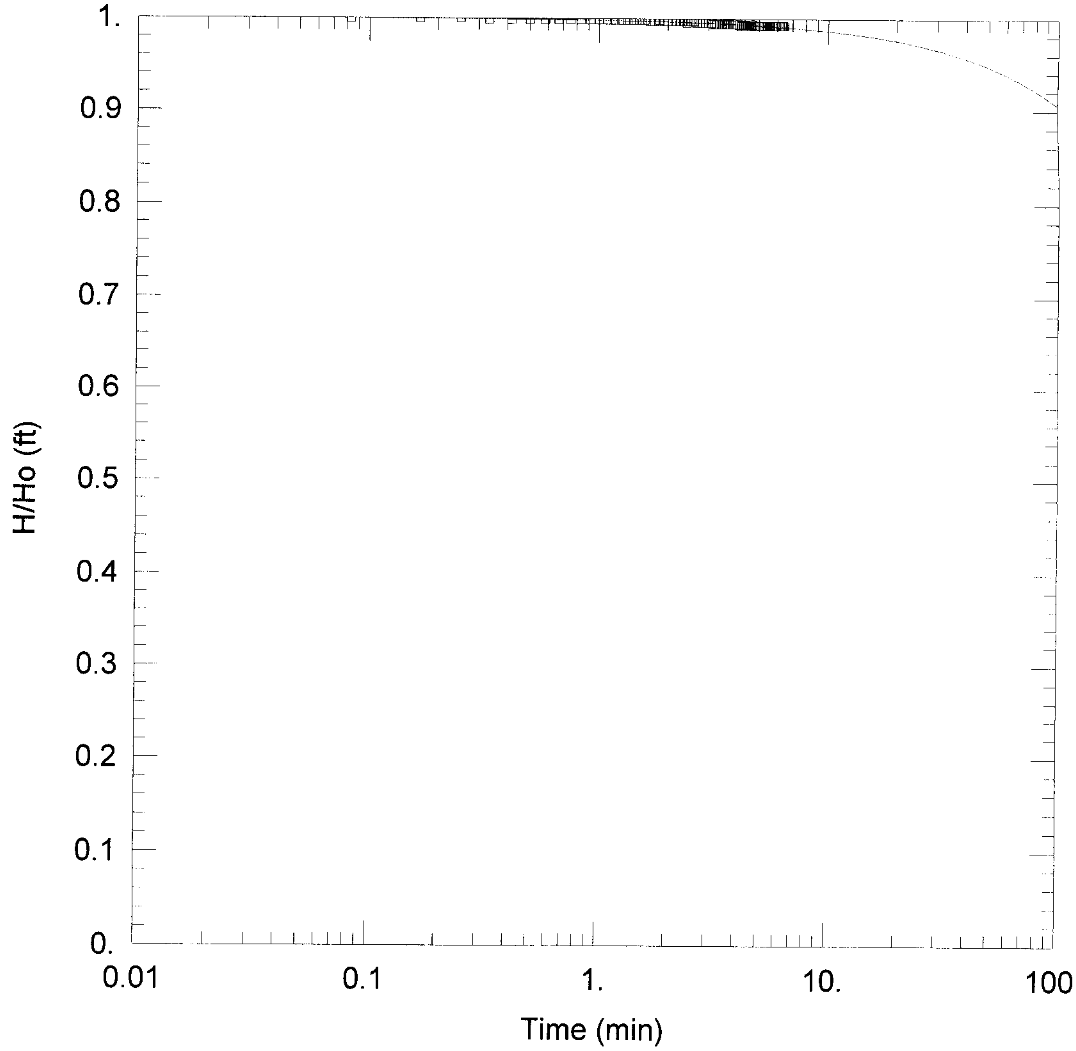
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0001923 ft/day
y0 = 23.38 ft

D2U
Water Levels for Interval 3
(550.21 to 555.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-3.aqt
Date: 11/26/02 Time: 08:22:20

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

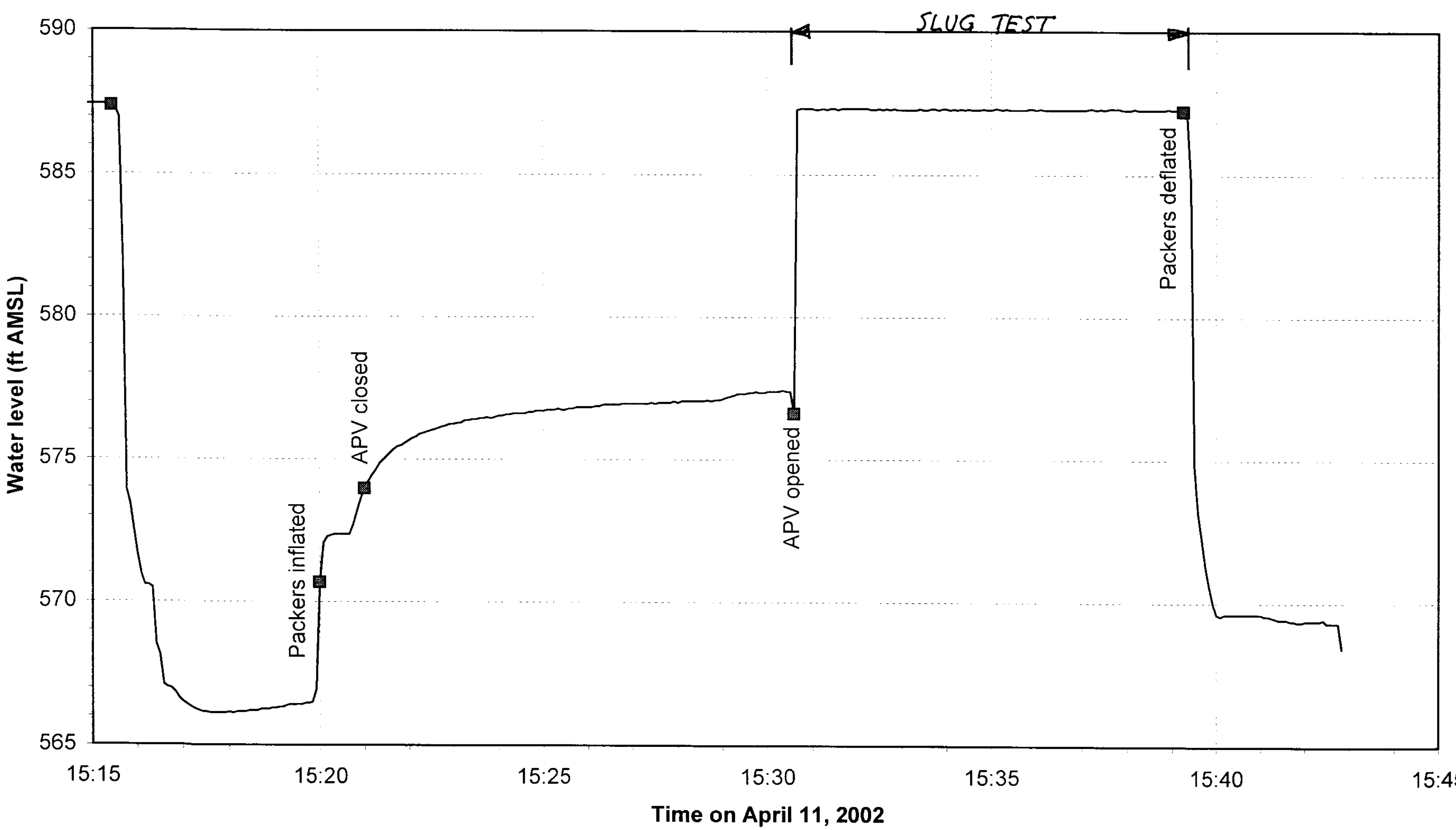
WELL DATA (D2U-3)

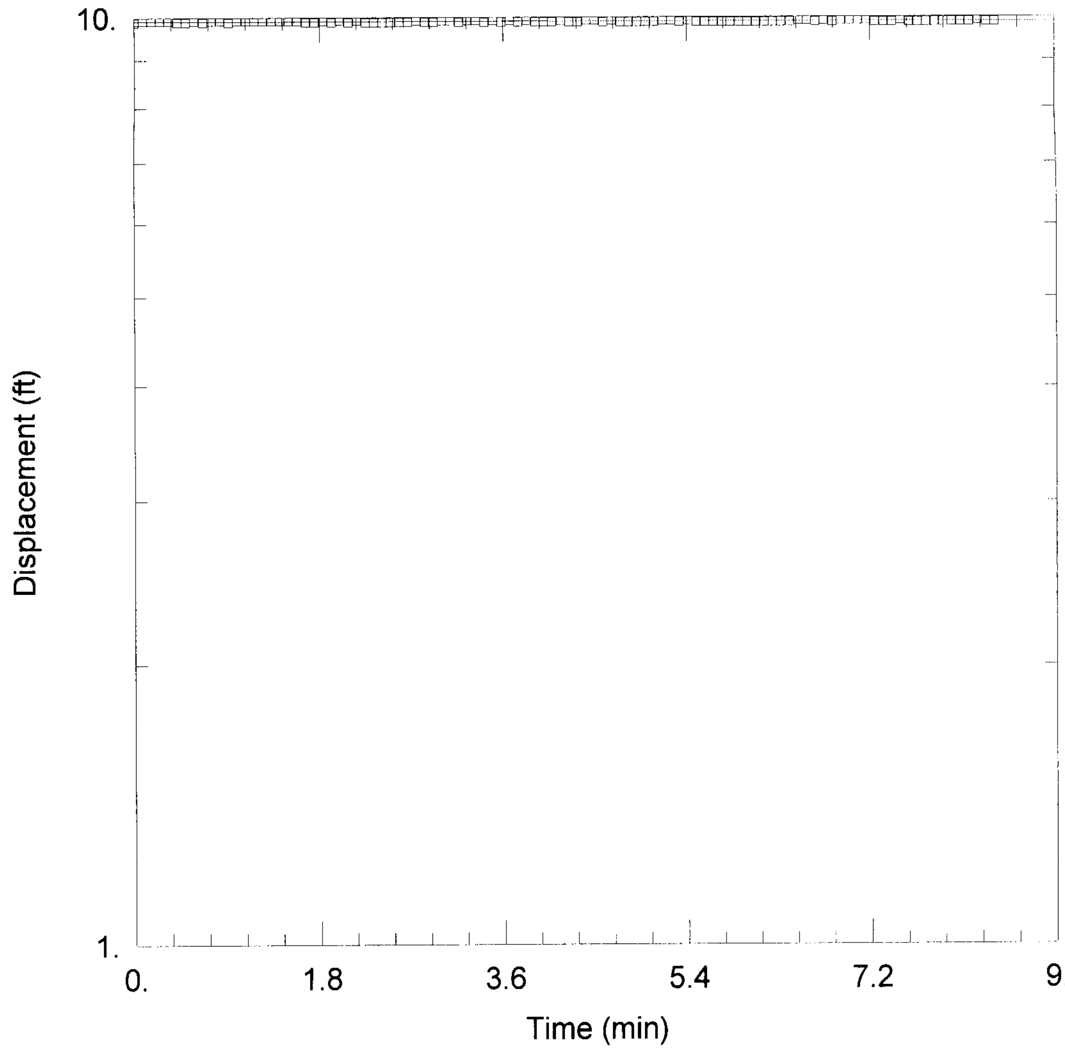
Initial Displacement: 27.55 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.005851 ft^2/day
S = 1.E-06

D2U
Water Levels for Interval 4
(554.21 to 559.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-4.aqt
Date: 11/26/02 Time: 08:22:09

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2U-4)

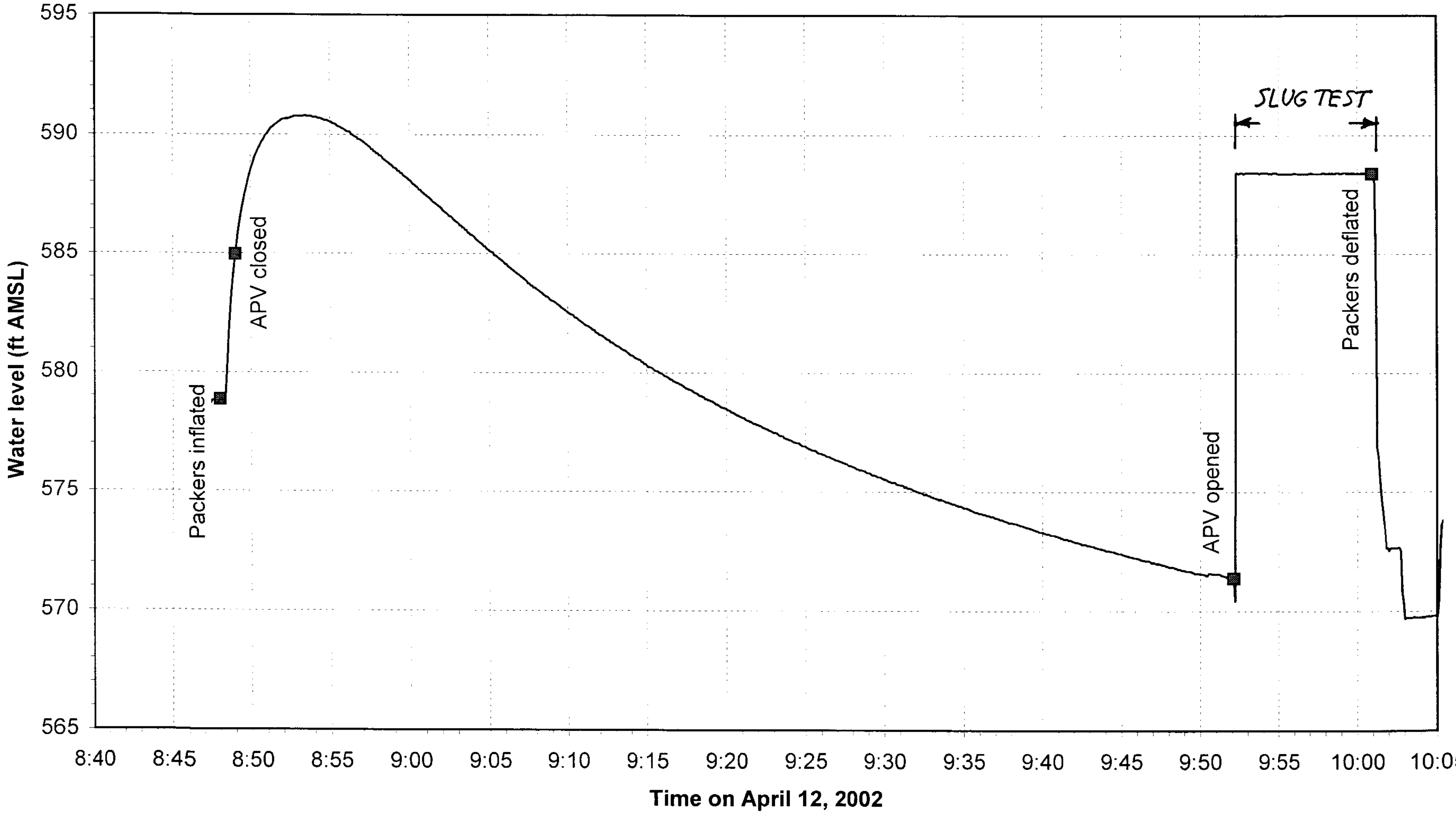
Initial Displacement: 9.92 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

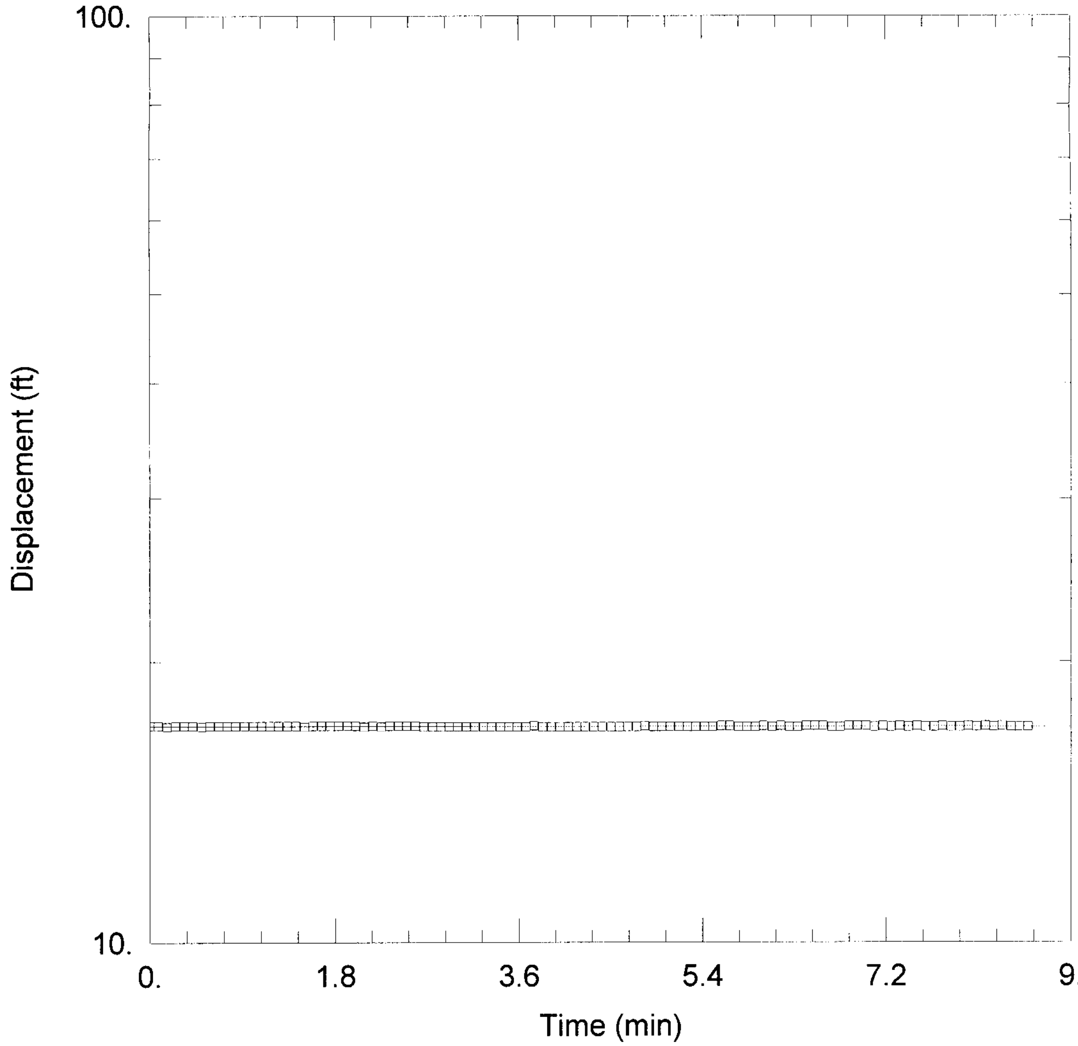
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0001853 ft/day
y0 = 9.906 ft

D2U
Water Levels for Interval 5
(558.21 to 563.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-5.aqt
Date: 11/26/02 Time: 08:22:07

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2U-5)

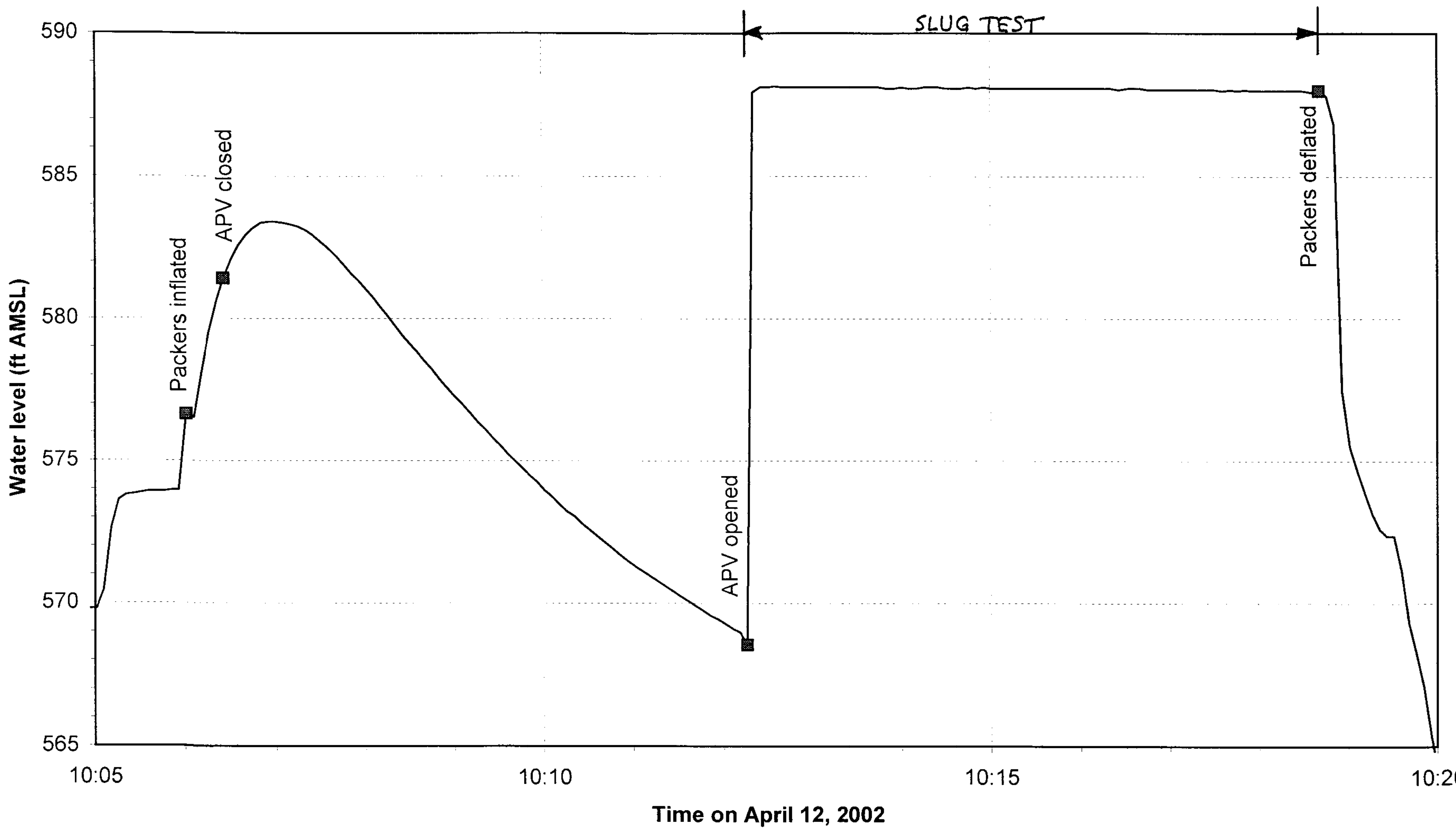
Initial Displacement: 17.07 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

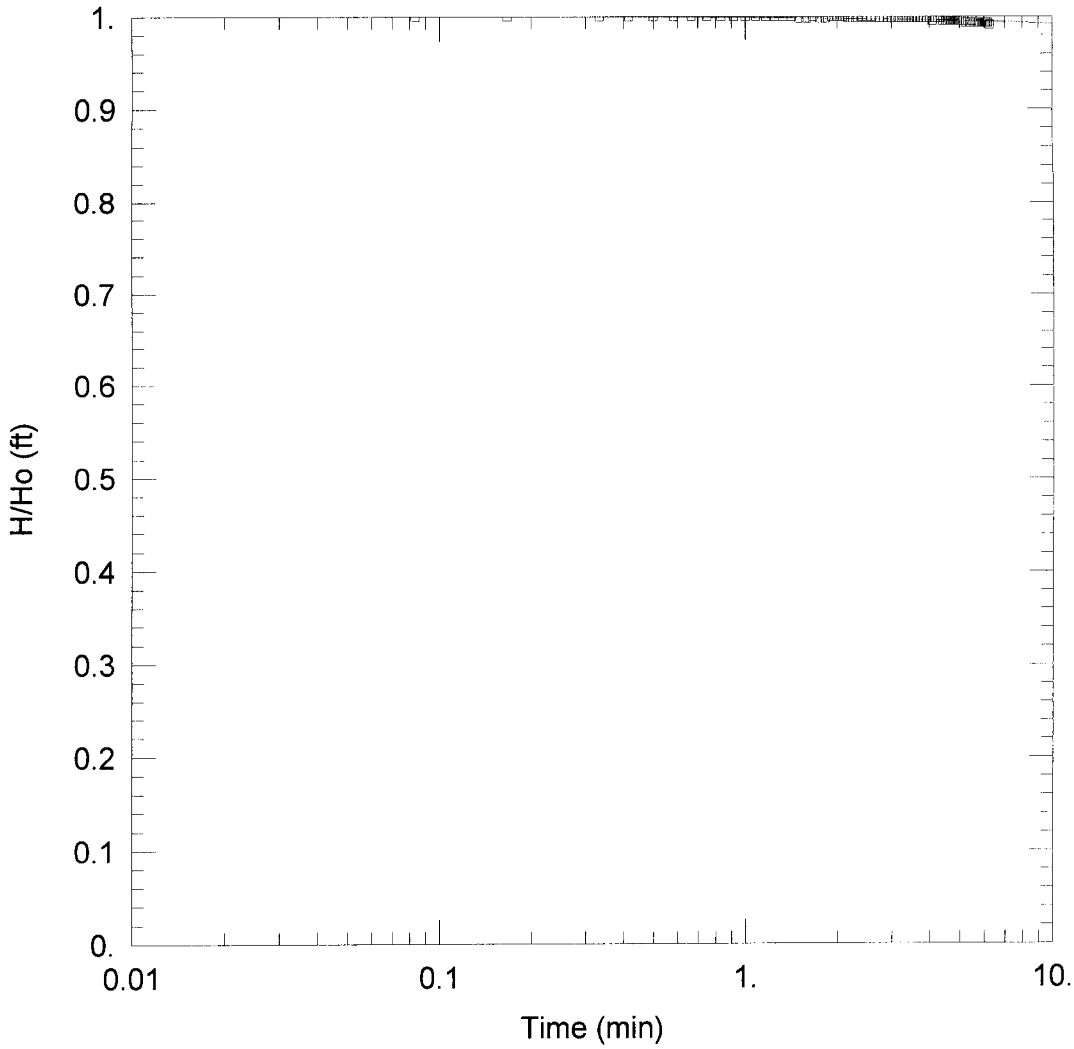
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0001361 ft/day
y0 = 17.05 ft

D2U
Water Levels for Interval 6
(462.21 to 567.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-6.aqt
Date: 11/26/02 Time: 08:22:03

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2U-5)

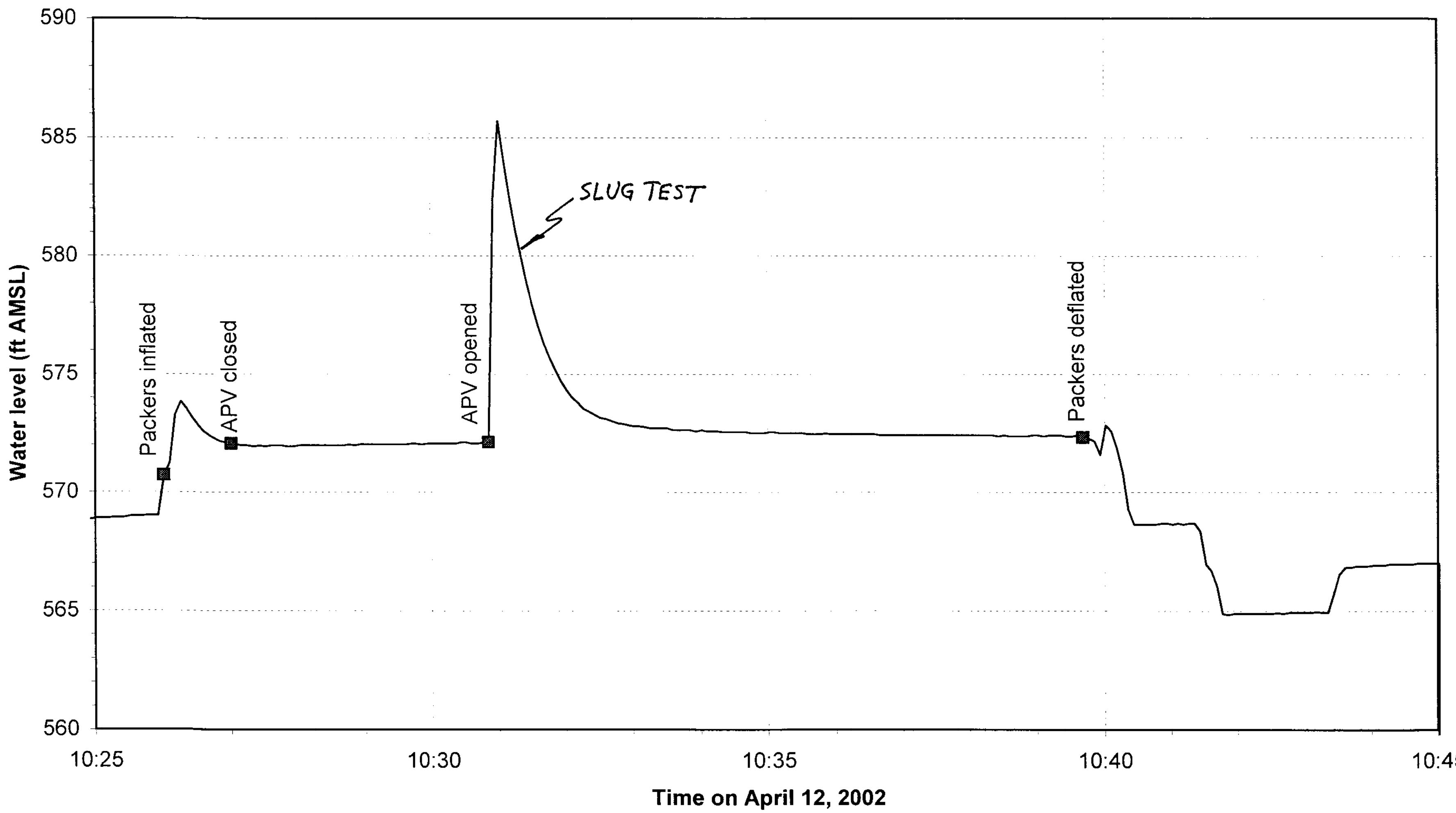
Initial Displacement: 19.58 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

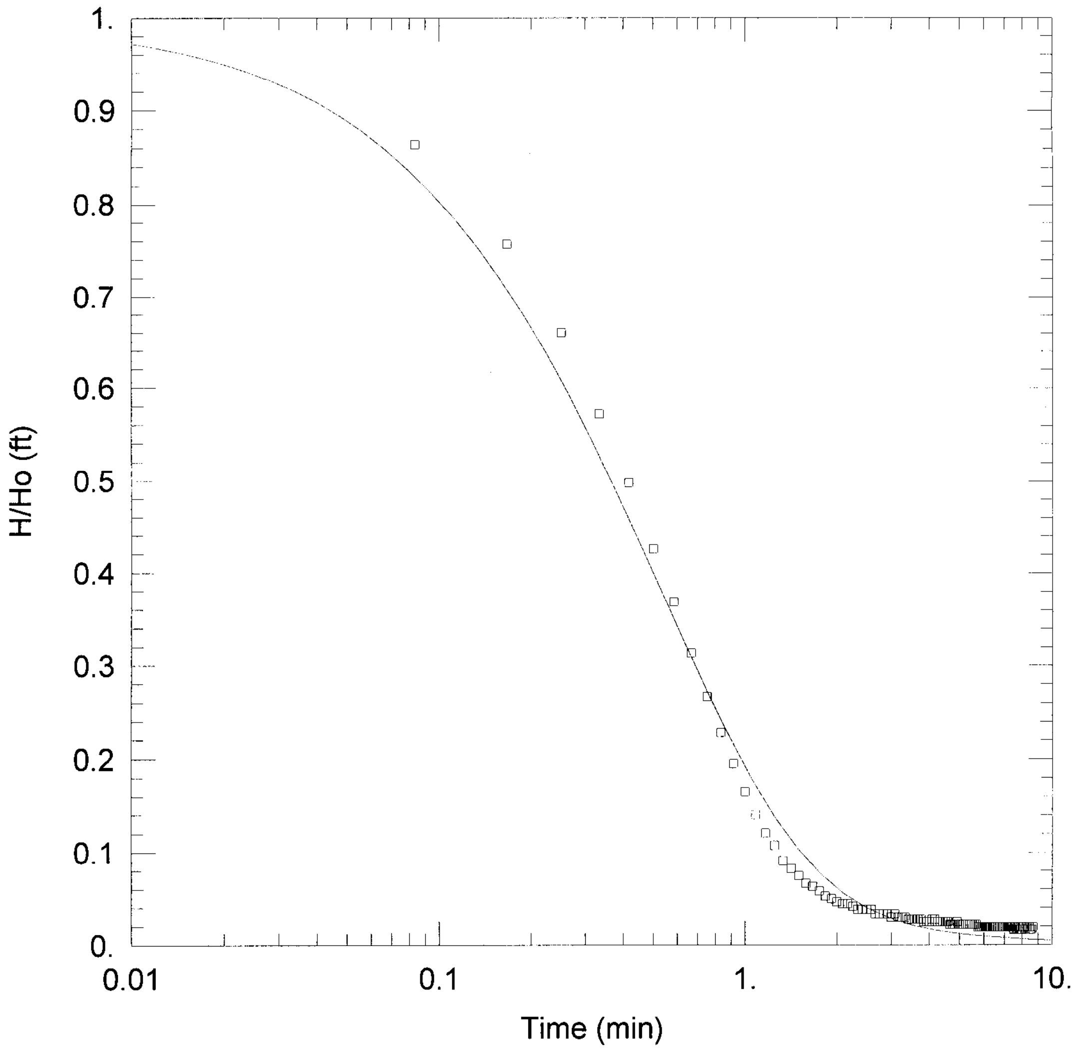
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.297E-06 ft^2/min
S = 1.E-06

D2U
Water Levels for Interval 7
(566.21 to 571.41 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2U\D2U-7.aqt
Date: 11/26/02 Time: 08:22:00

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2U-7)

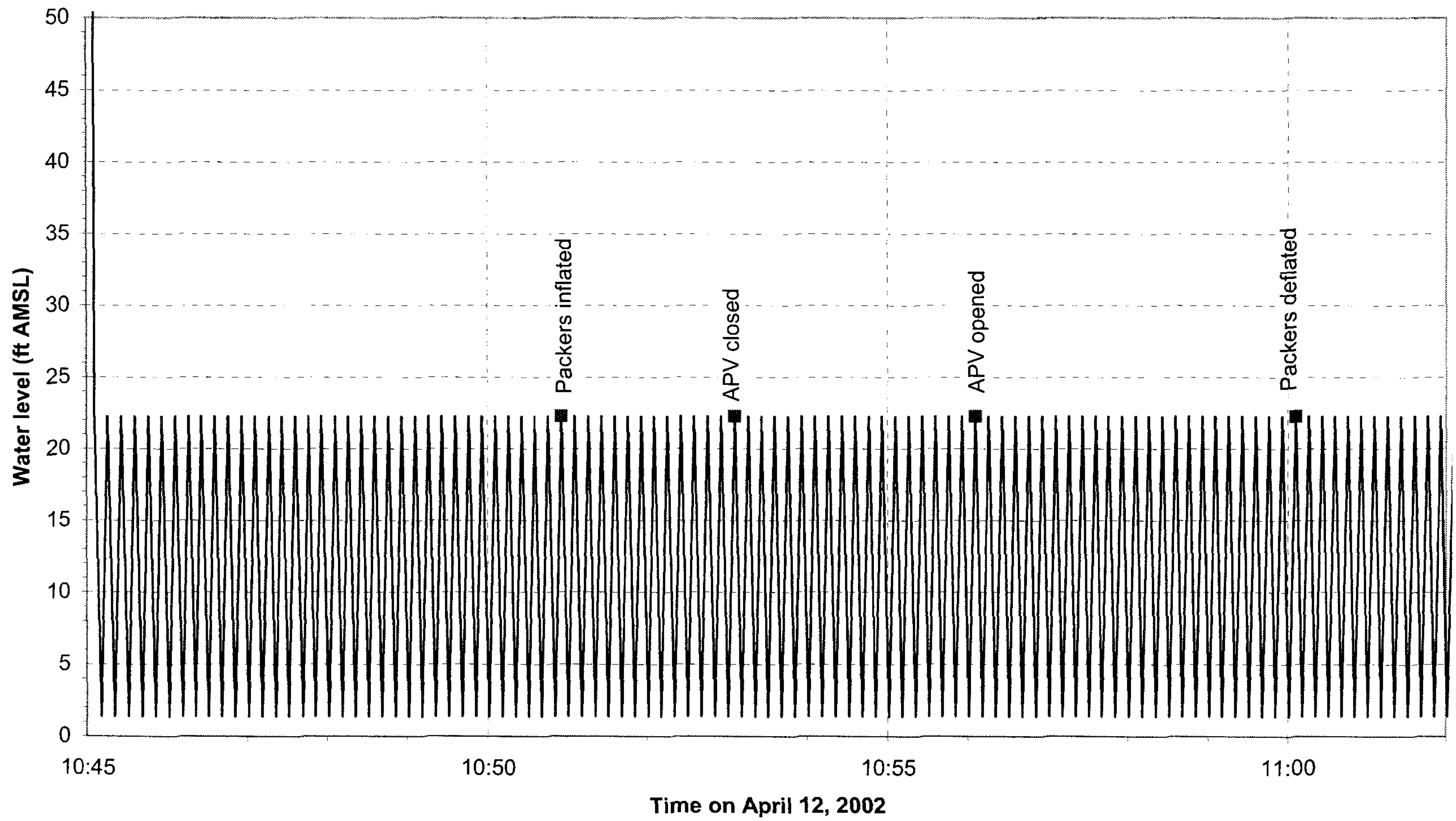
Initial Displacement: 15.74 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 1. ft

SOLUTION

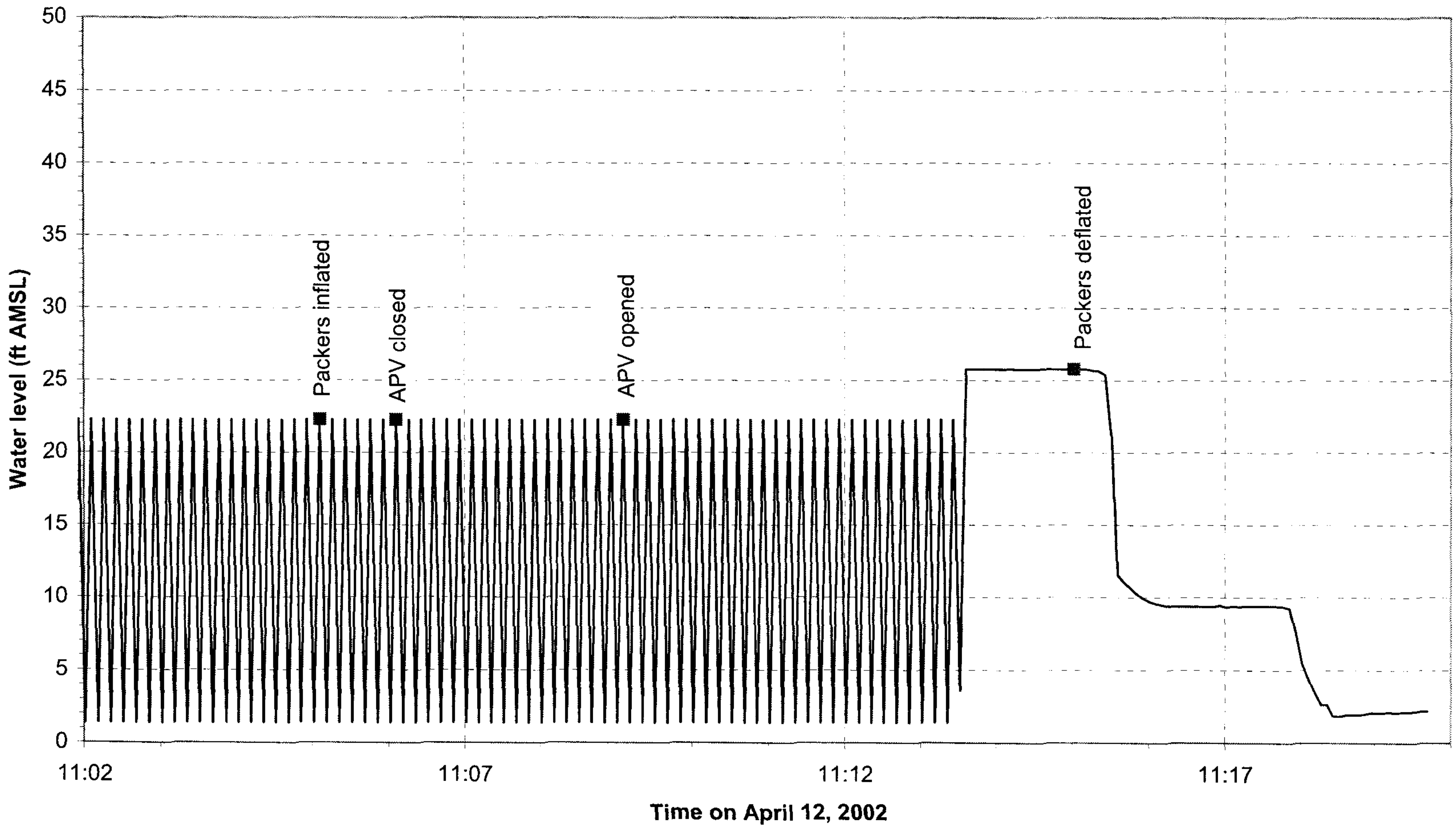
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 14.45 ft^2/day
S = 1.E-06

D2U
Water Levels for Interval 8
(575.41 to 570.21 ft AMSL)



D2U
Water Levels for Interval 9
(579.41 to 574.21 ft AMSL)



Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

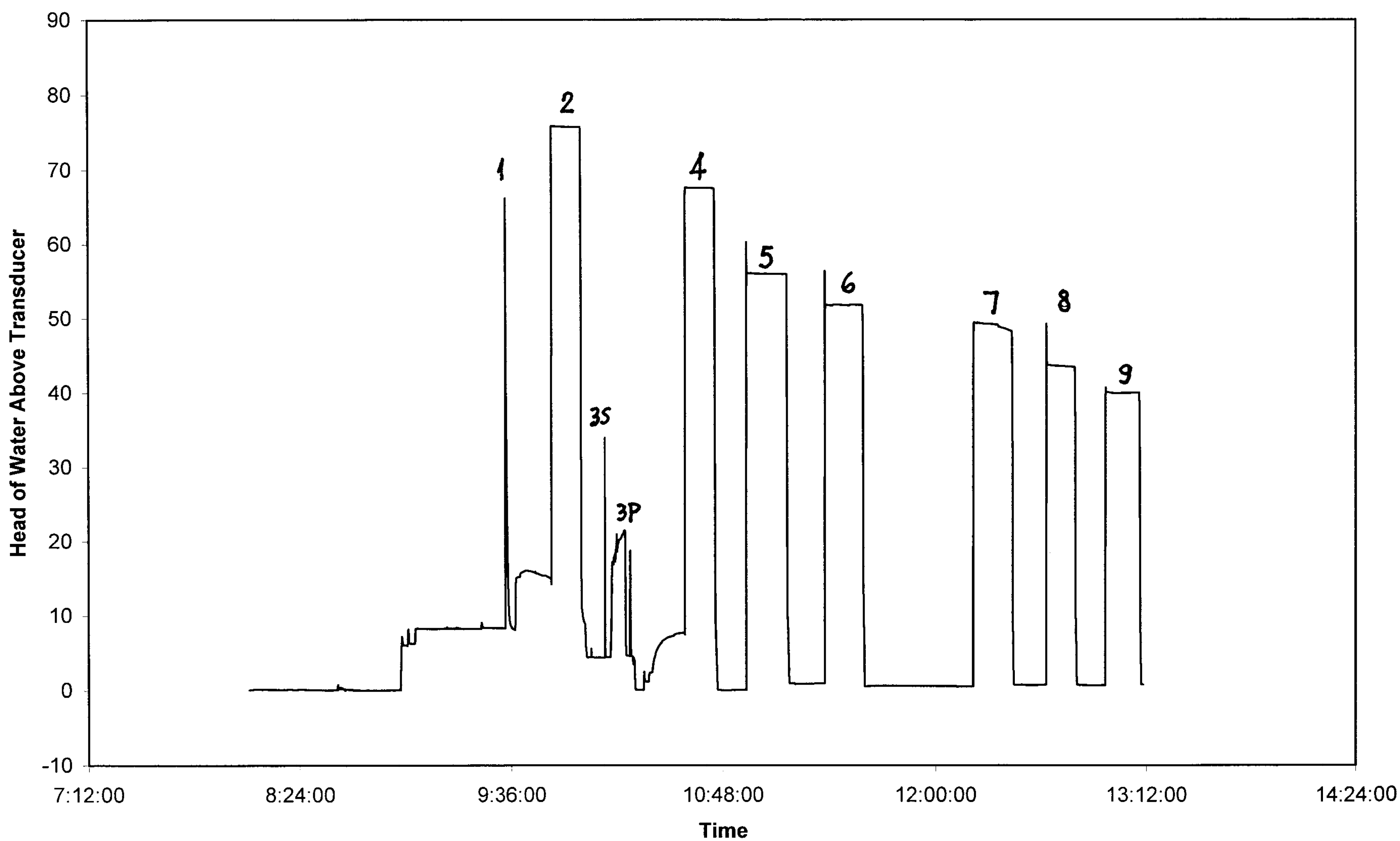
D2M

Testing Dates: April 11, 2002 (Non-vented system)
April 19, 2002 (Vented system)
April 22, 2002 (Alternate vented system)

Summary of Tests:

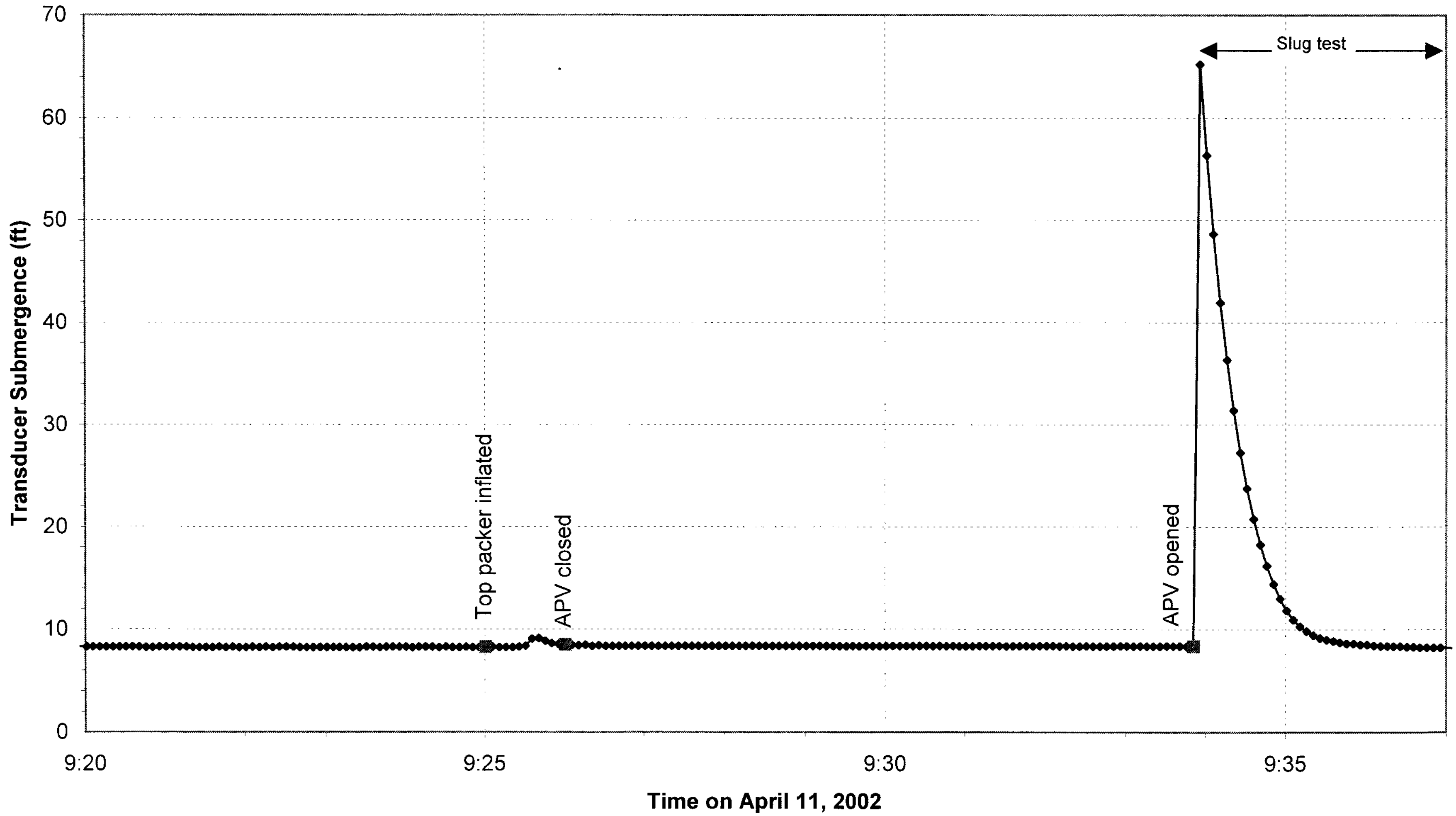
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
D2M	1	513.2	503.7	20	
D2M	2	513.2	508	<0.001	
D2M	1	517.2	512	59	
D2M	2	521.2	516	<0.001	
D2M	3	525.2	520	0.003	
D2M	4	529.2	524	<0.001	
D2M	5	533.2	528	<0.001	
D2M	6	537.2	532	<0.001	
D2M	7	541.2	536	<0.001	

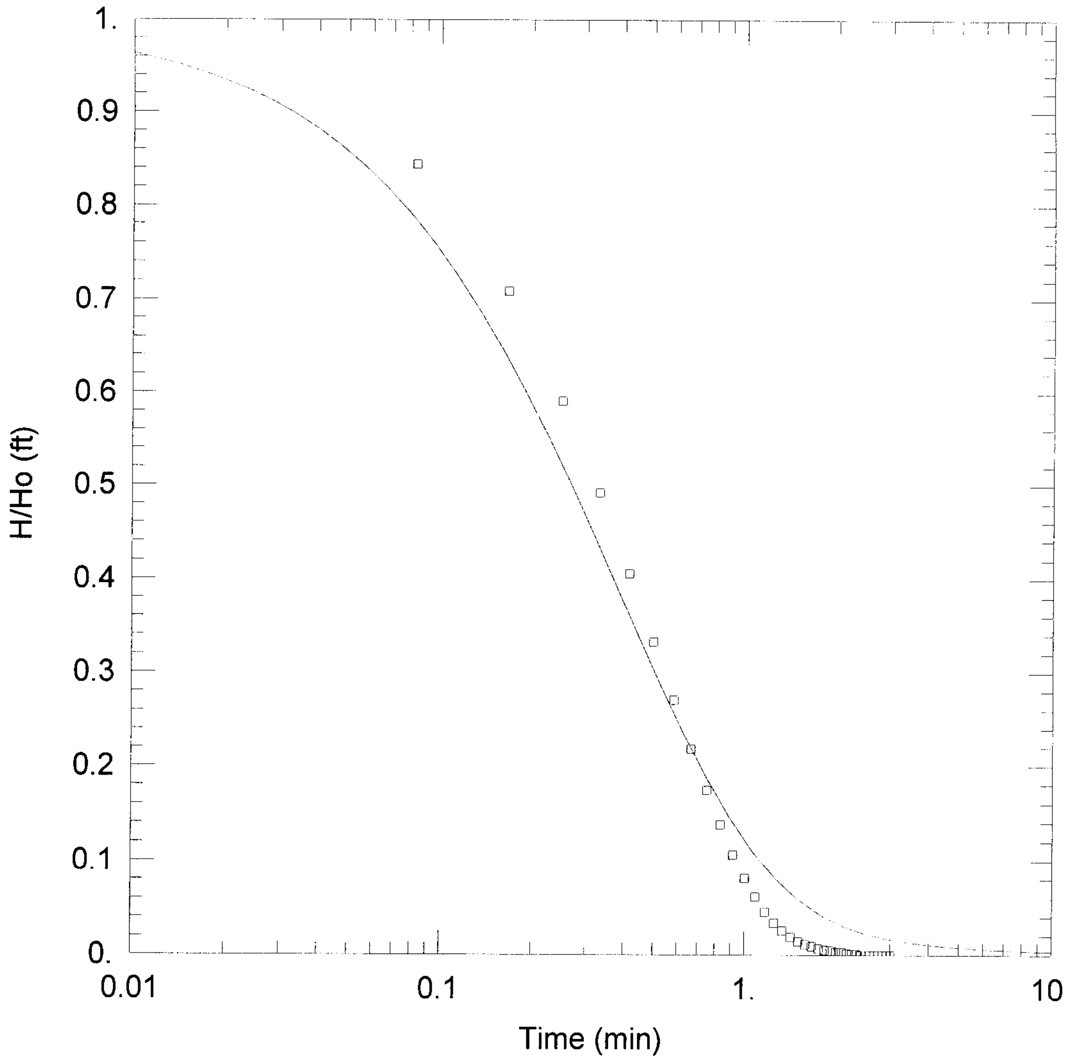
Monitoring Well D2M



D2M0411. xls
NON-VENTED SYSTEM

D2M
Transducer Submergence for Interval 1
(503.7 to 513.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-1.aqt
Date: 11/26/02 Time: 12:50:31

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M 0411-1)

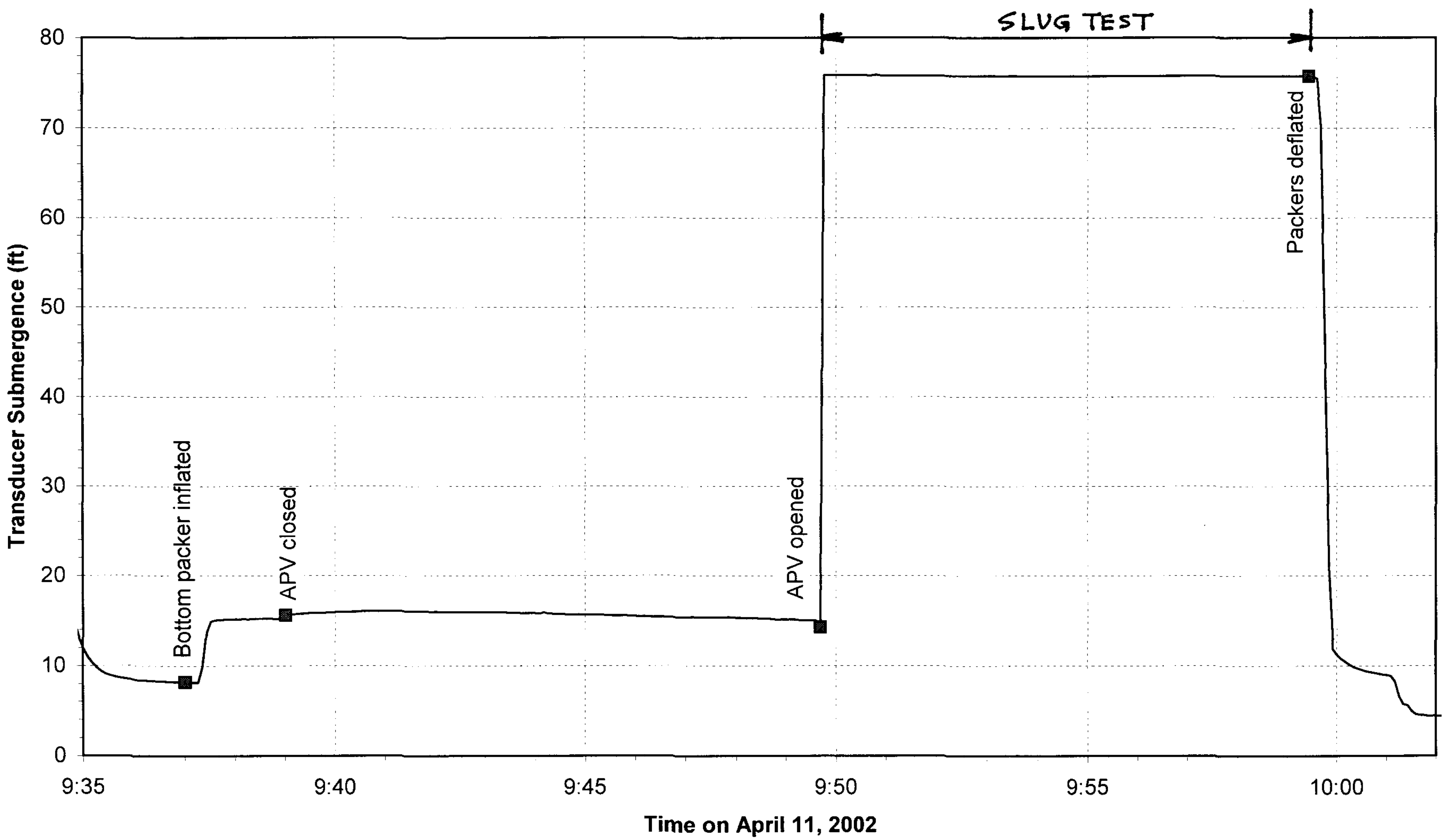
Initial Displacement: 56.87 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

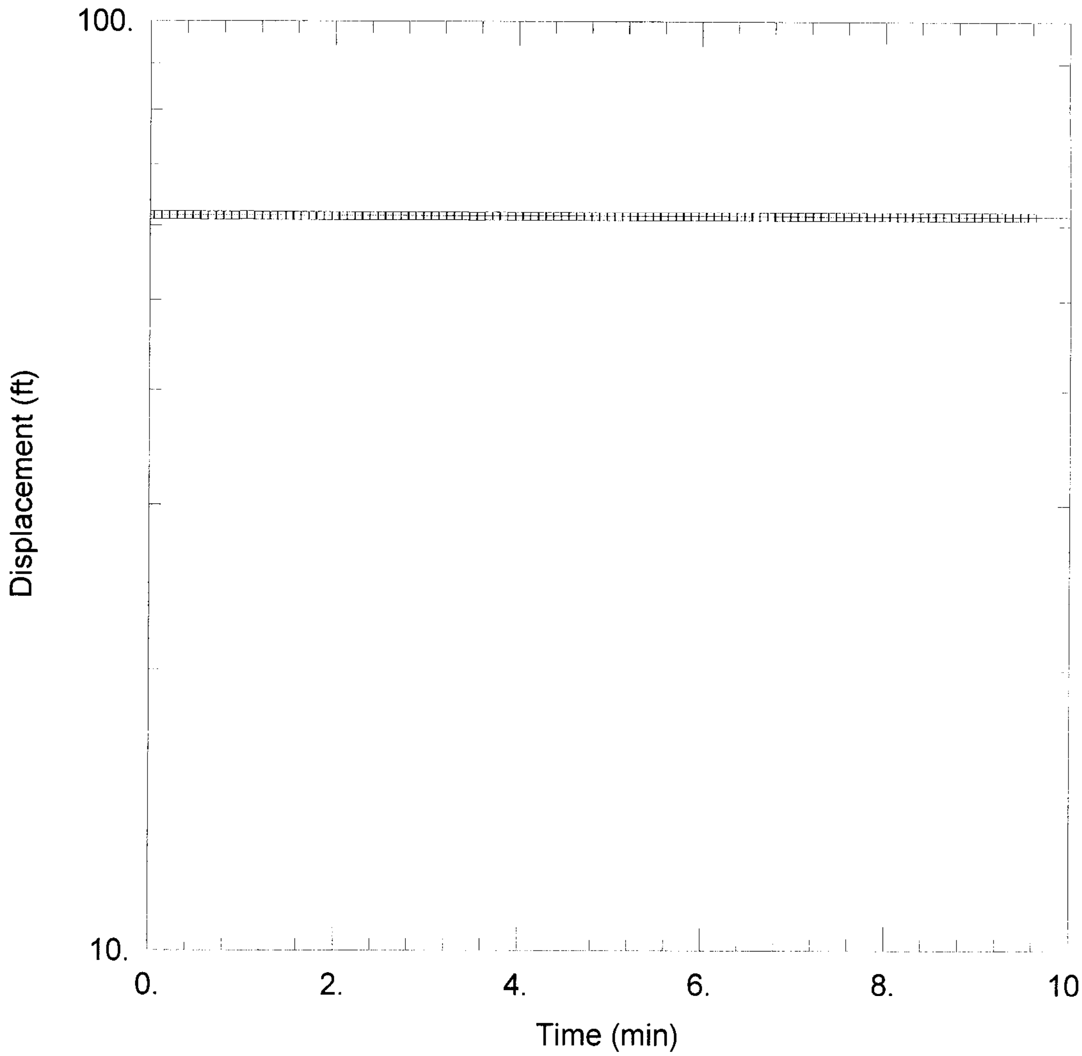
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 19.58 ft^2/day
S = 1.E-06

D2M
Transducer Submergence for Interval 2
(508 to 513.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-2.aqt
Date: 11/26/02 Time: 12:37:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M 0411-2)

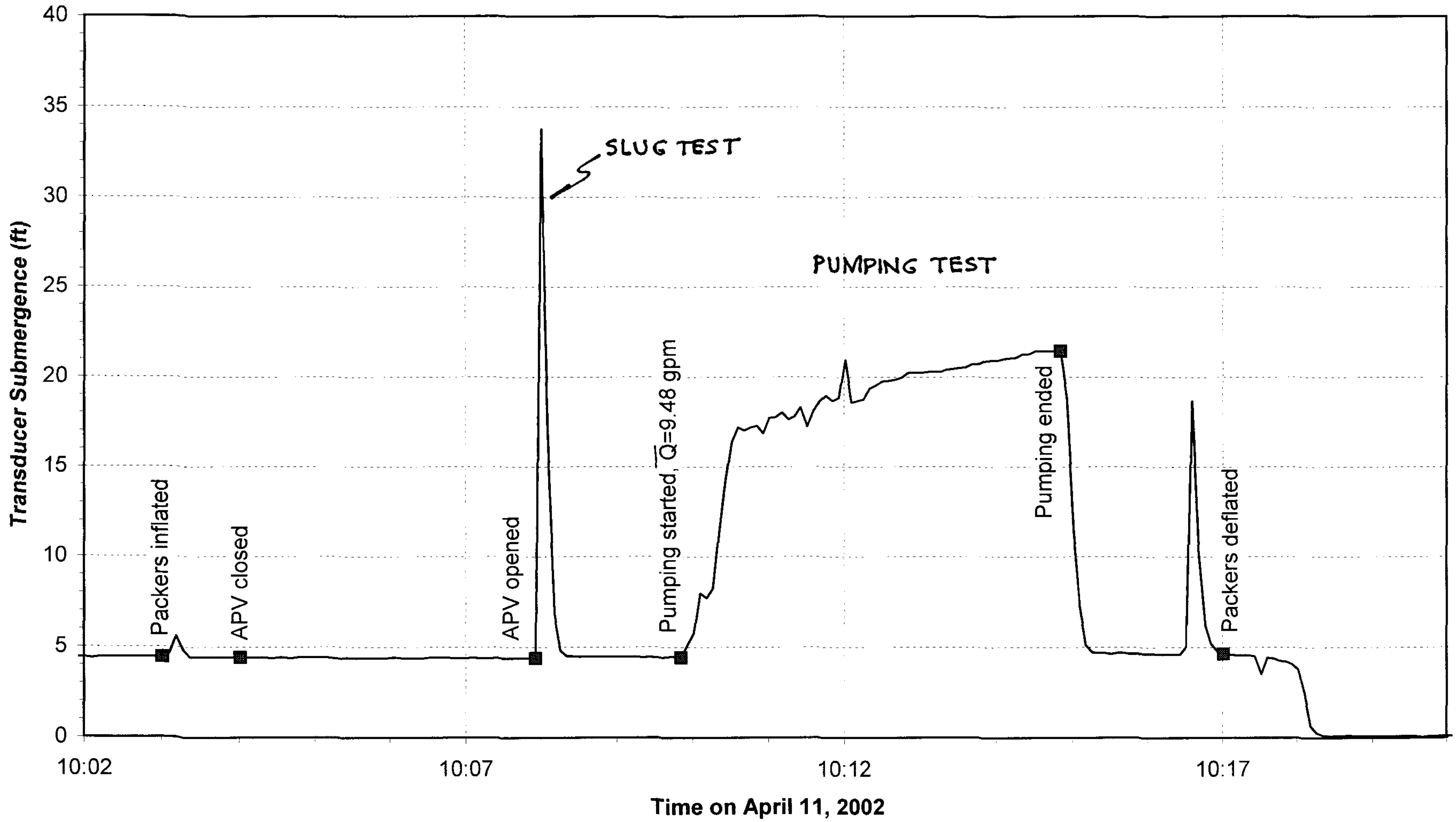
Initial Displacement: 61.63 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

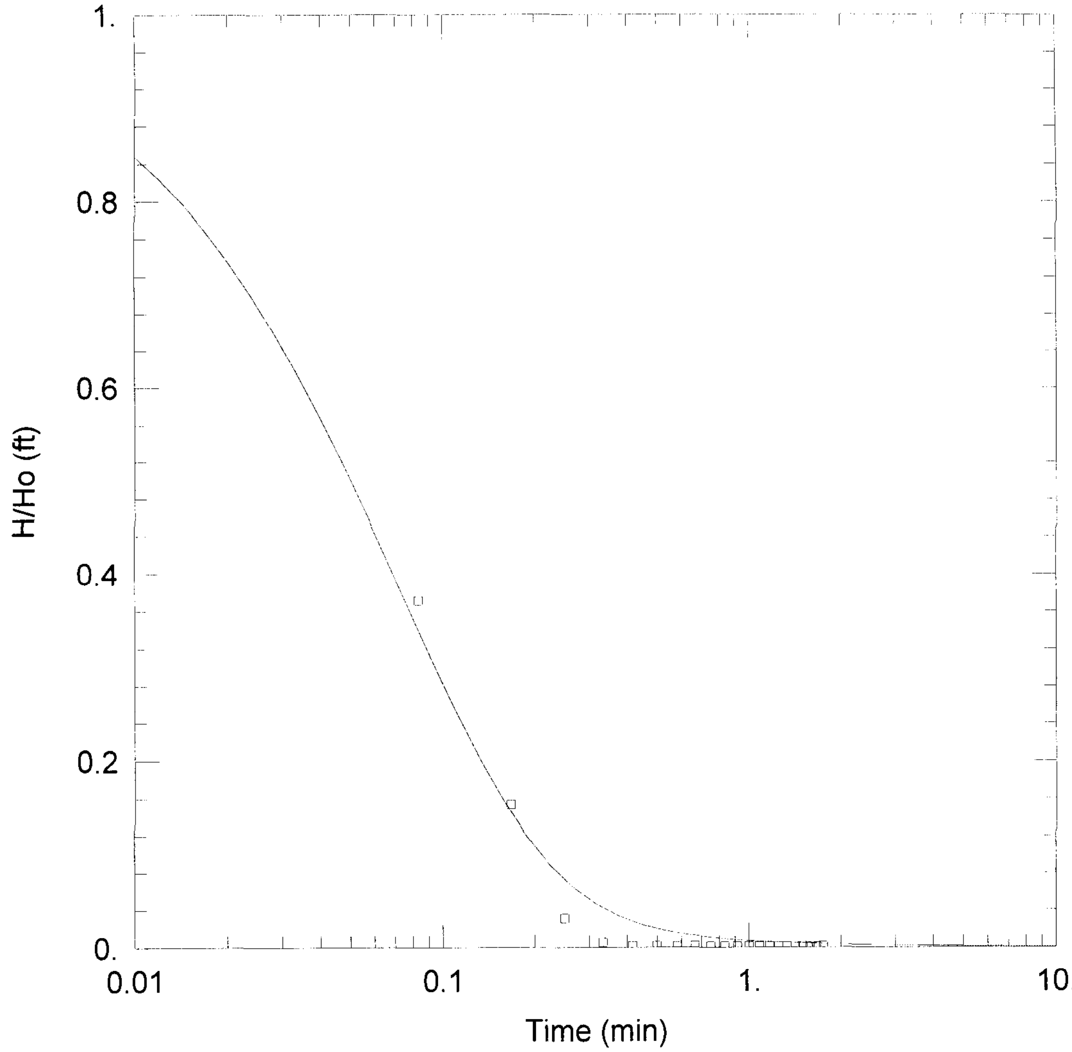
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0001573 ft/day
y0 = 61.58 ft

D2M
Transducer Submergence for Interval 3
(512 to 517.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\D2M\2002-April-11\D2M 0411-3S.aqt
Date: 01/14/03 Time: 12:08:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

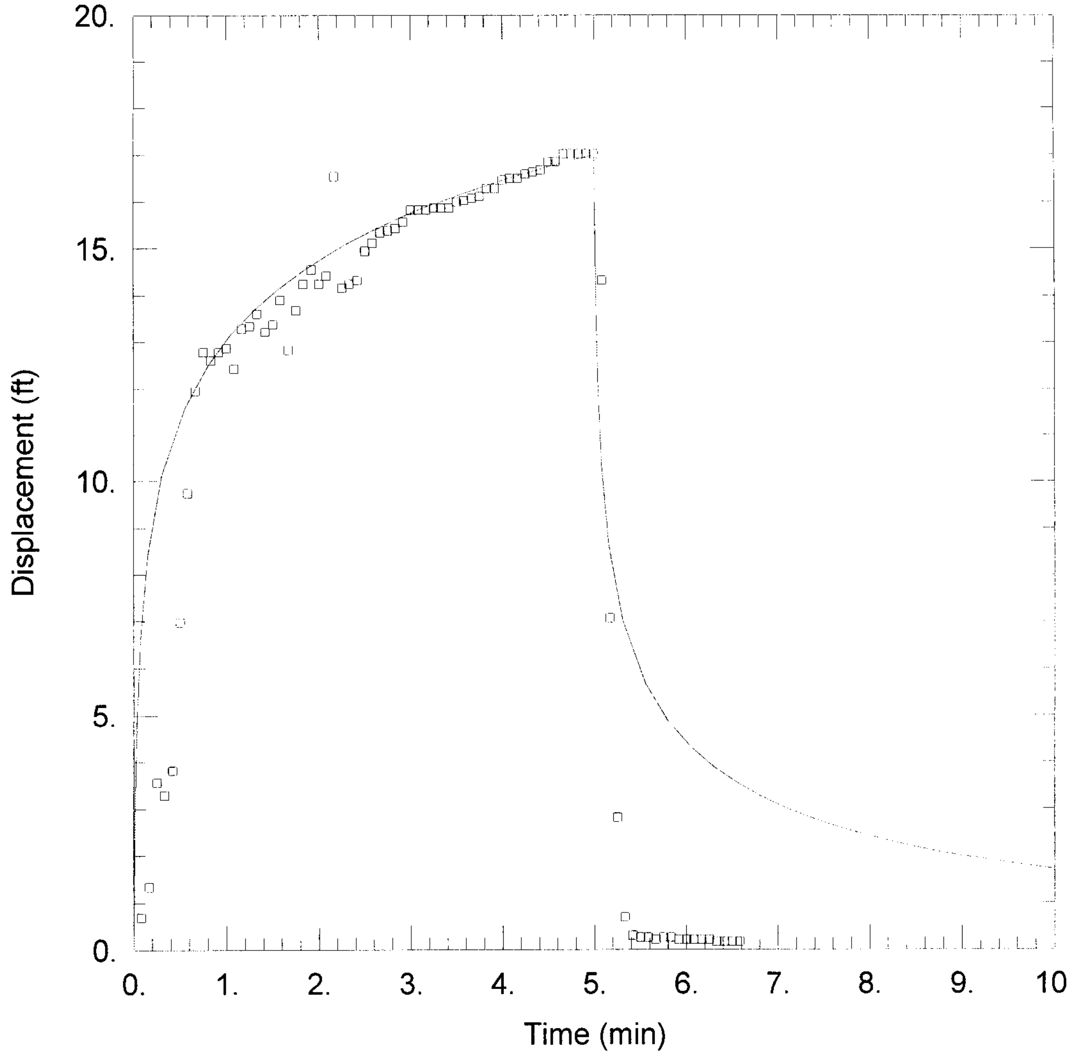
WELL DATA (D2M 0411-3S)

Initial Displacement: 79.3 ft
Wellbore Radius: 0.1615 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

` = 105.1 ft^2/day
S = 1.E-06



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-3P.aqt
Date: 11/26/02 Time: 12:37:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Test Well: D2M 0411-3

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
D2M 0411-3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
D2M 0411-3P	0	0

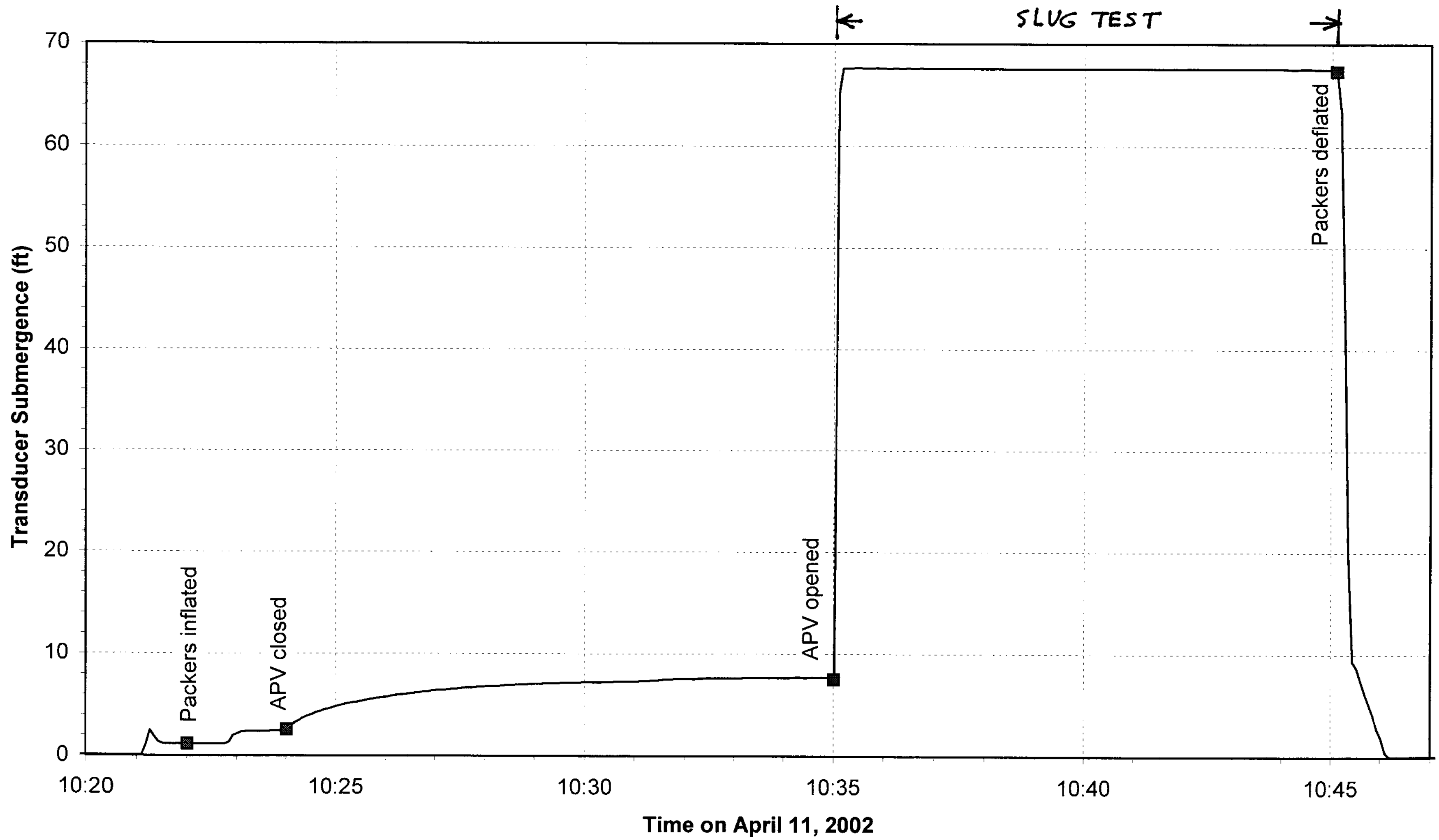
SOLUTION

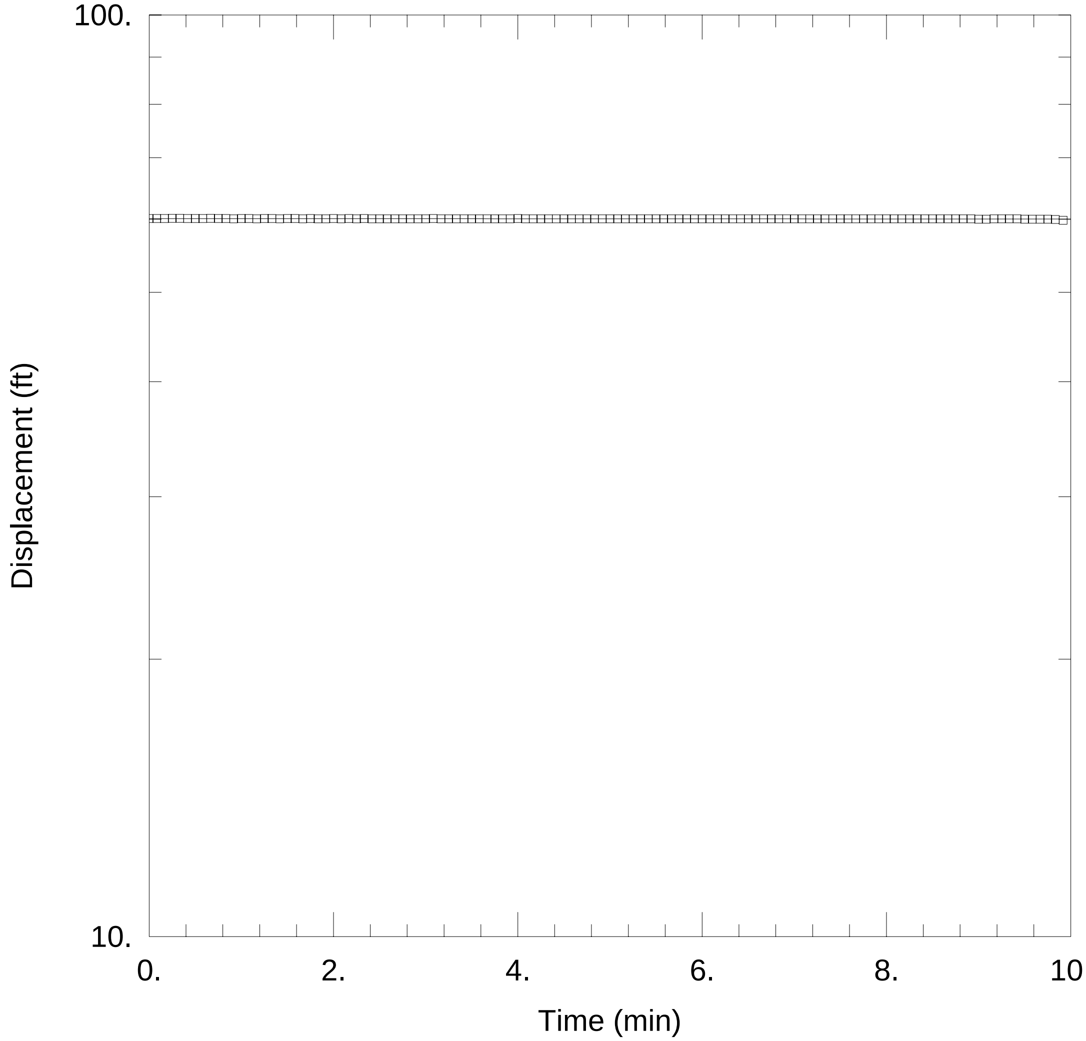
Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 58.84 ft^2/day
S = 1.E-06
Sw = -4.896
C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min
s(t) = $10.28Q + 0.Q^{2.}$
W.E. = 285.4%

D2M
Transducer Submergence for Interval 4
(516 to 521.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-4.aqt
Date: 01/22/03 Time: 10:31:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M-4(0411))

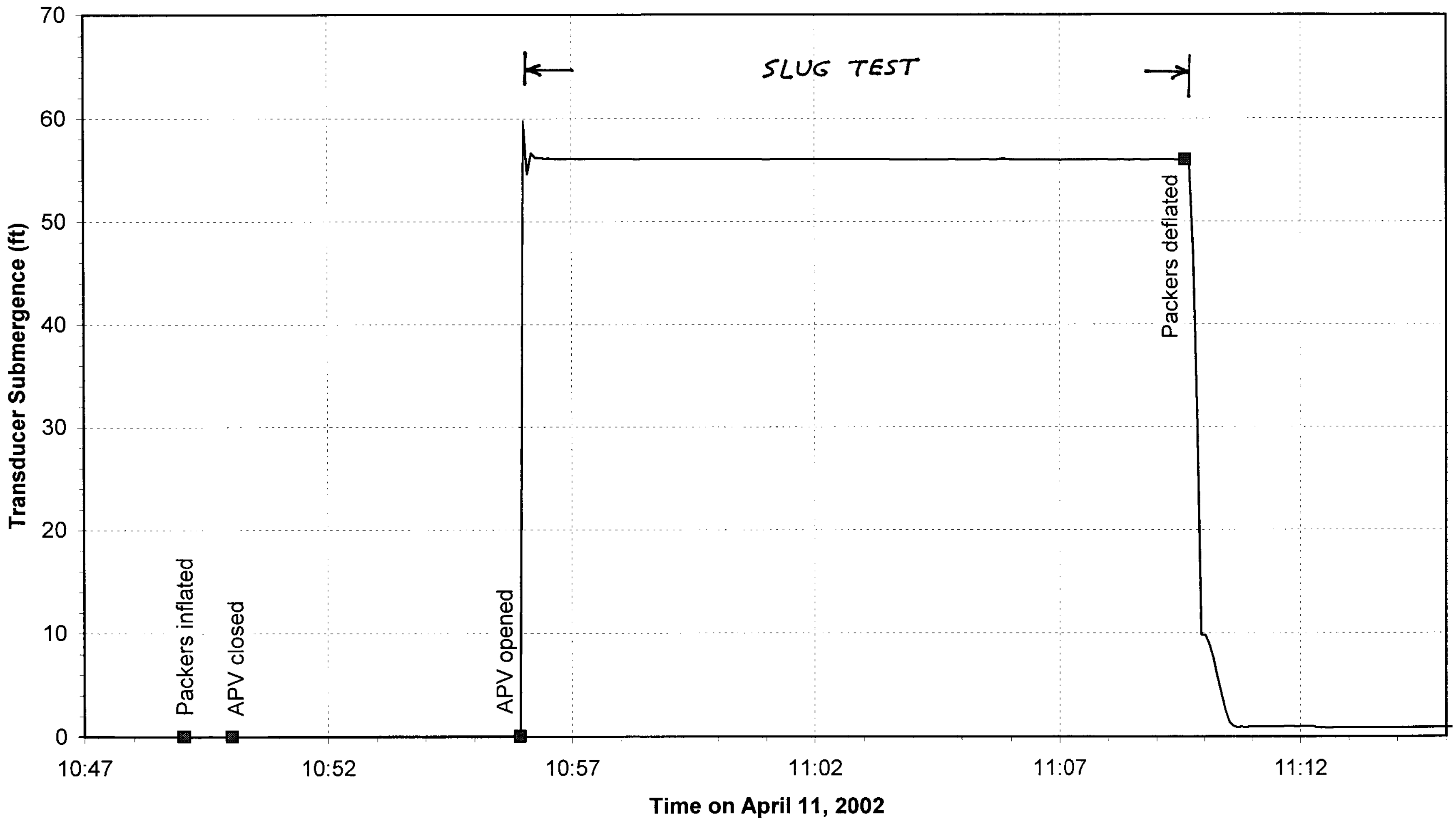
Initial Displacement: 60.12 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

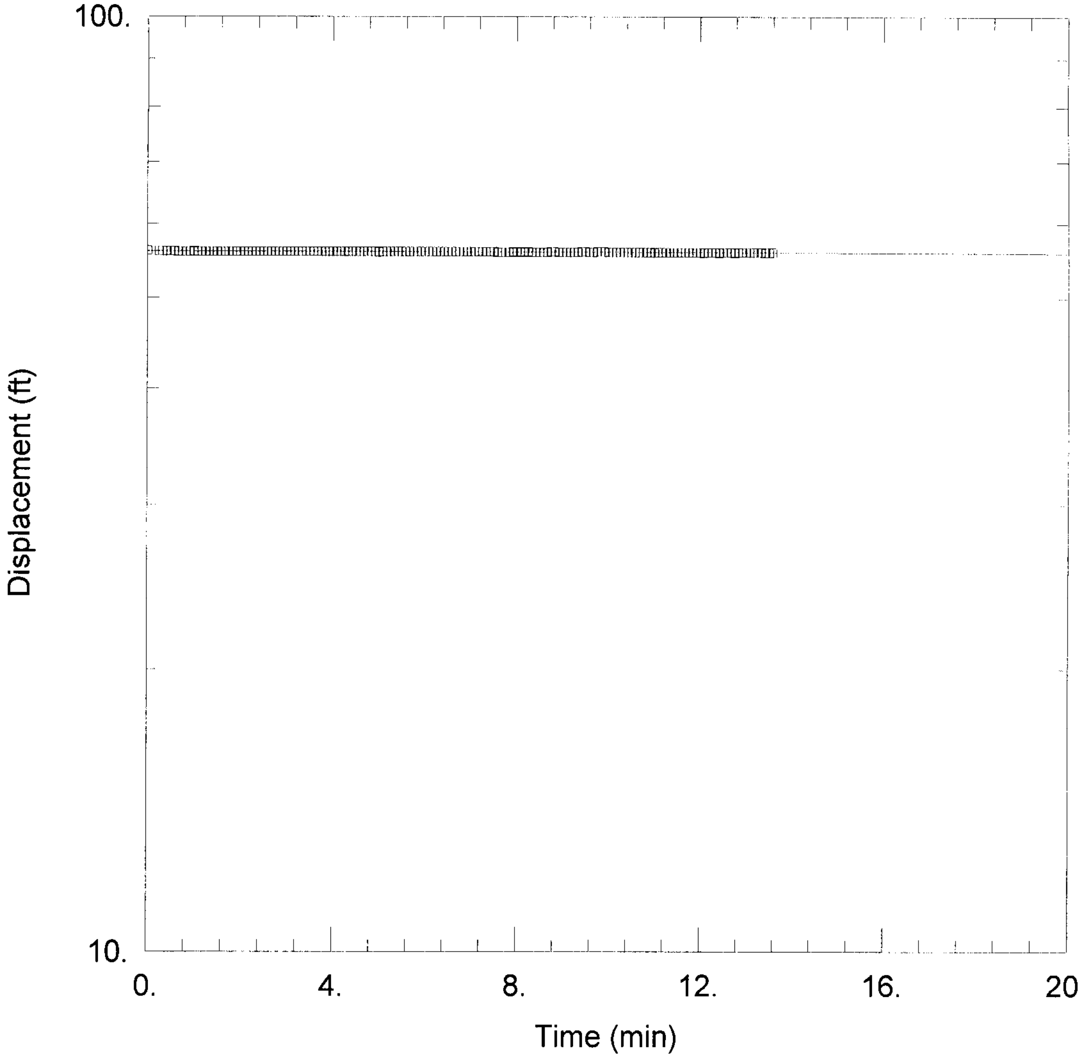
SOLUTION

Aquifer Model: Confined Solution Method:

K = 9.546E-05 ft/day y0 = 60.12 ft

D2M
Transducer Submergence for Interval 5
(520 to 525.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-5.aqt
Date: 11/26/02 Time: 12:37:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M-5(0411))

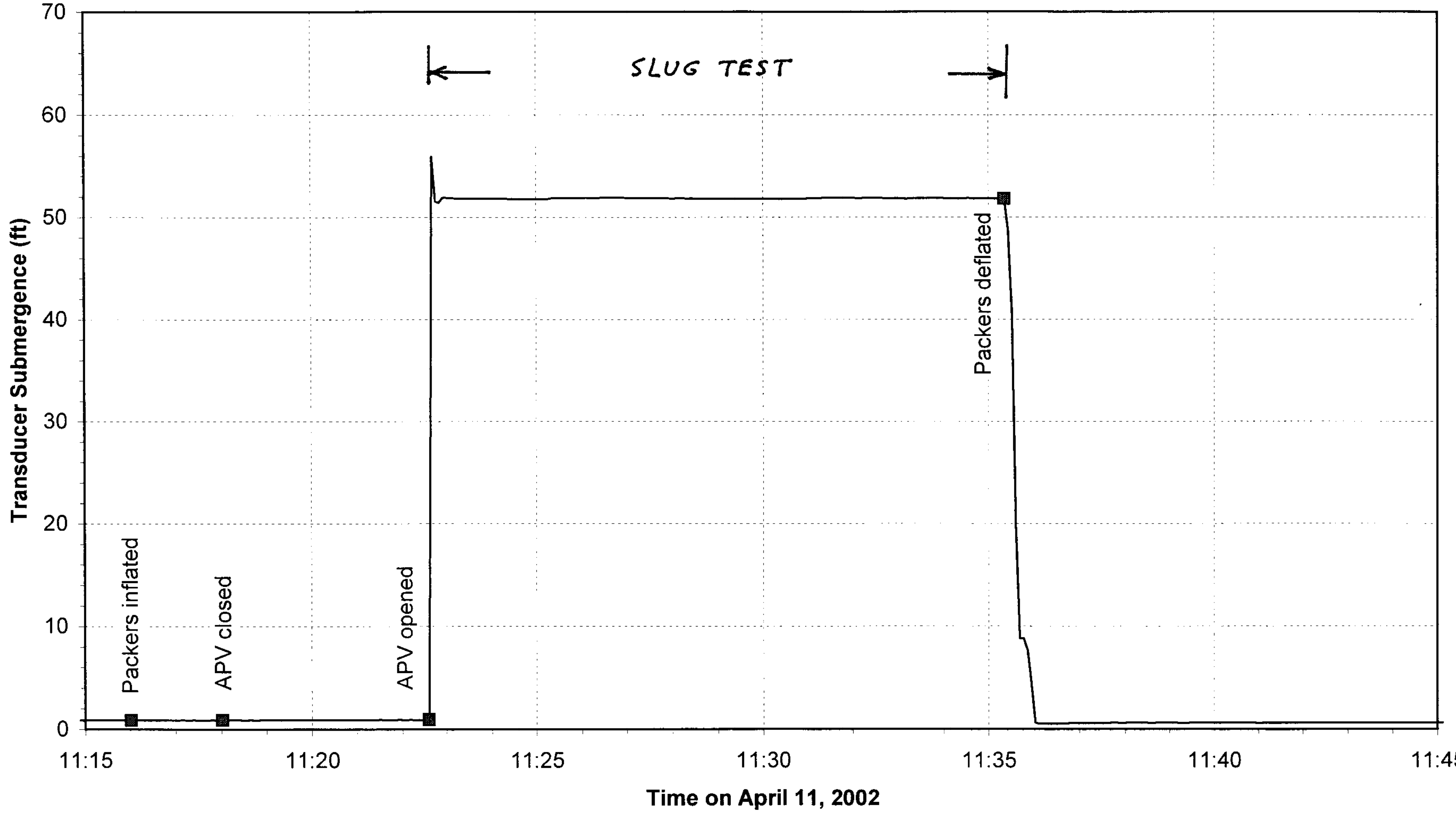
Initial Displacement: 56.18 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

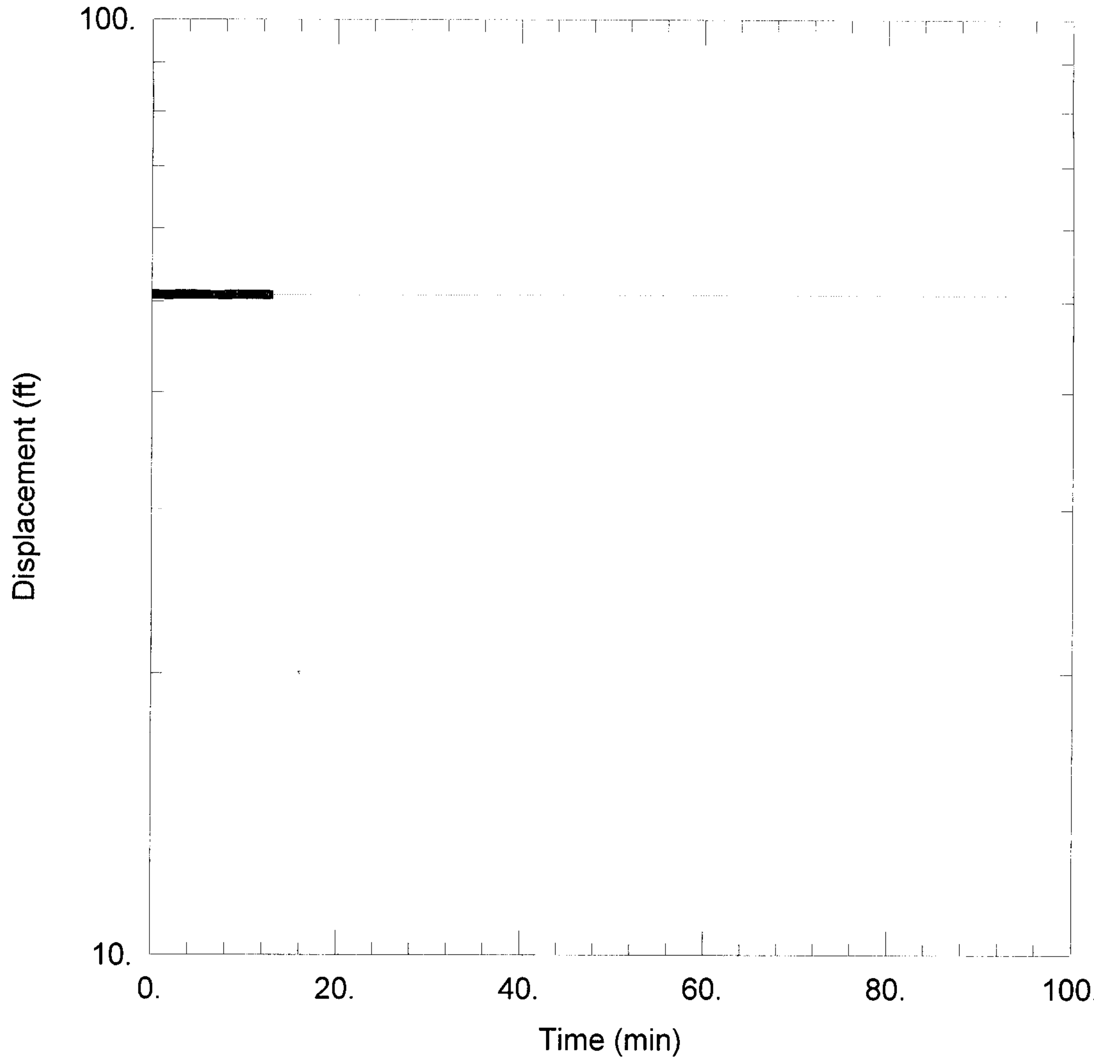
SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.0001449 ft/day
y0 = 56.07 ft

D2M
Transducer Submergence for Interval 6
(524 to 529.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-6.aqt
Date: 11/26/02 Time: 12:37:05

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M-6(0411))

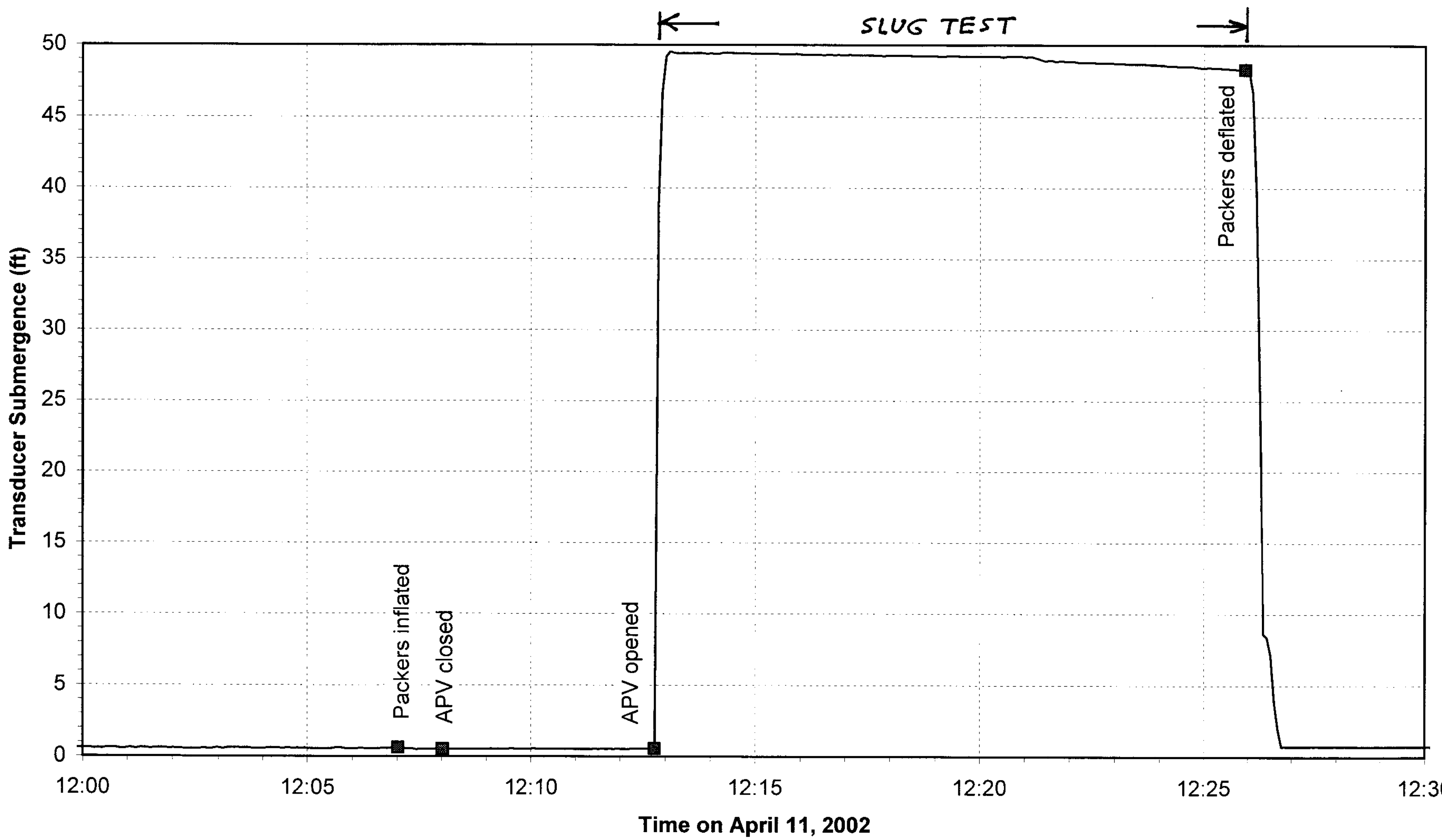
Initial Displacement: 50.94 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

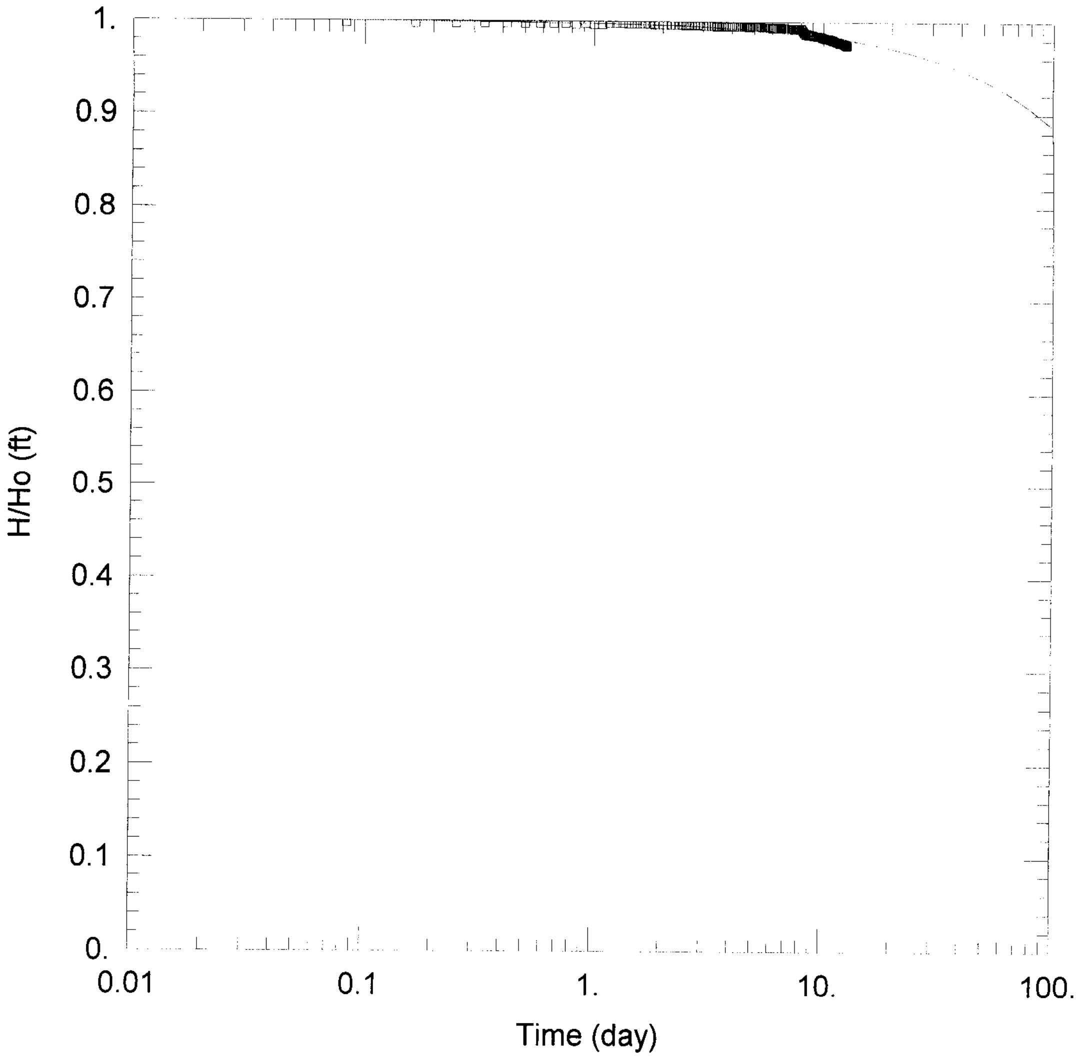
SOLUTION

Aquifer Model: Confined Solution Method:

= 1.E-10 ft/day y0 = 50.87 ft

D2M
Transducer Submergence for Interval 7
(528 to 533.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-7.aqt
Date: 11/26/02 Time: 12:37:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

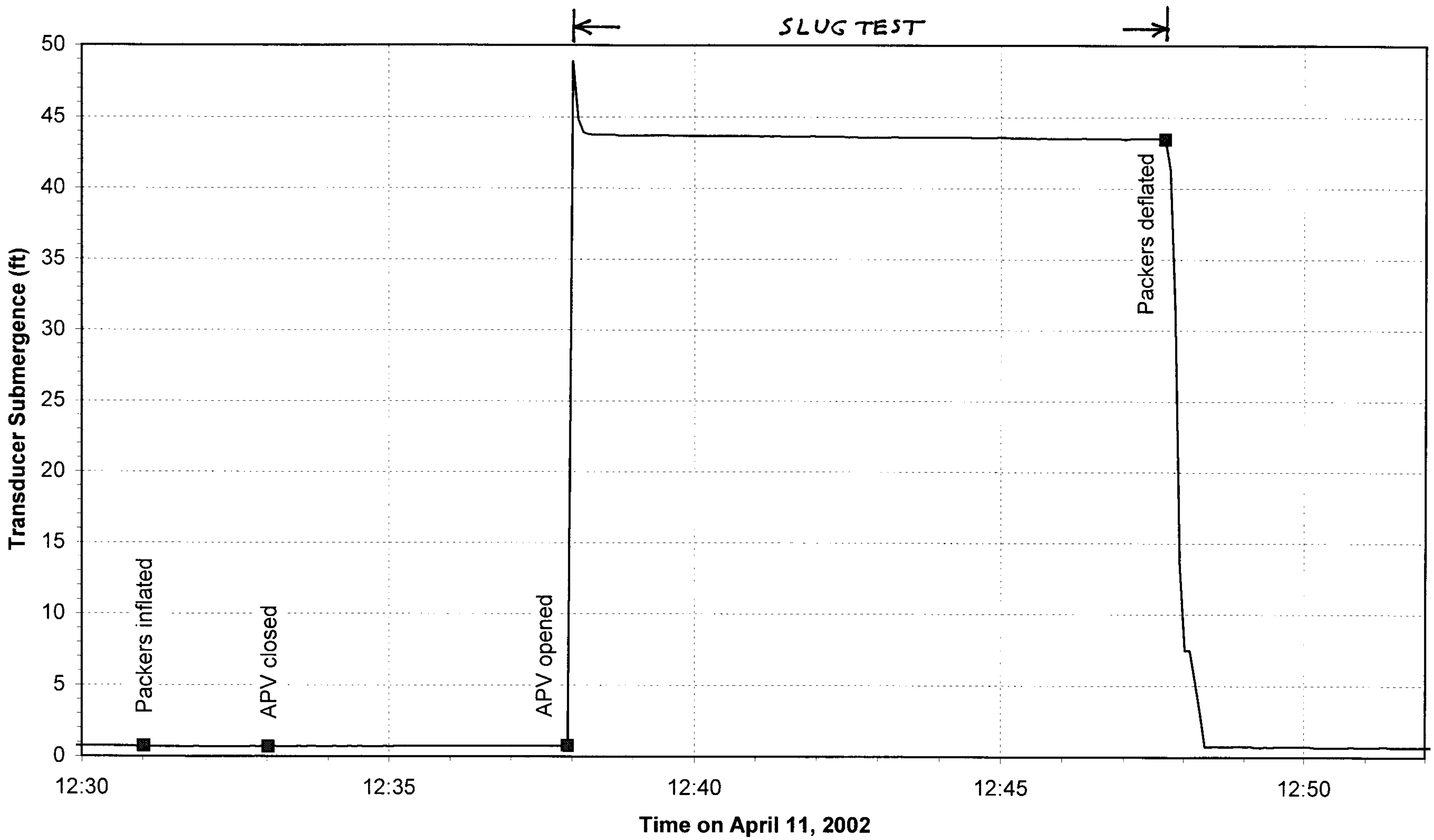
WELL DATA (D2M 0411-7)

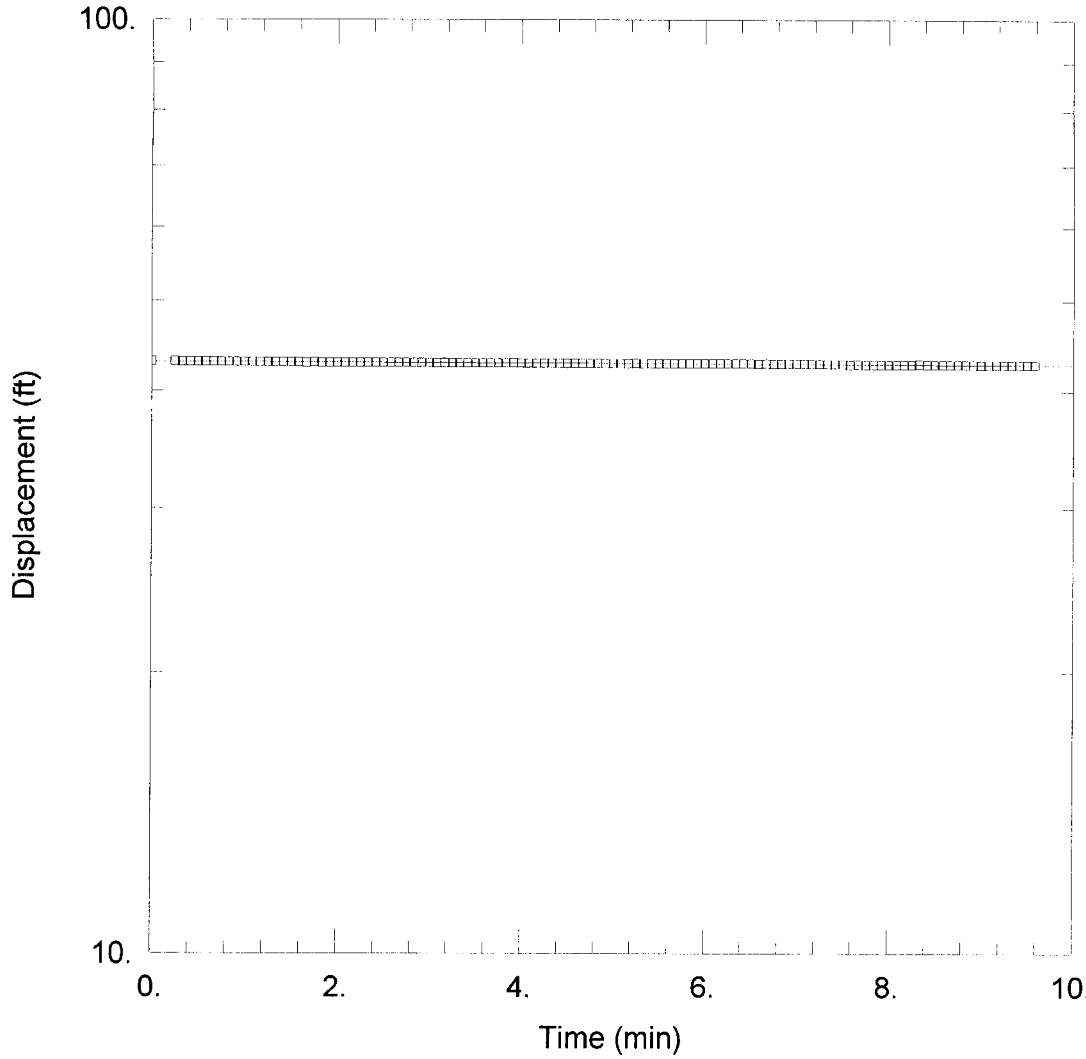
Initial Displacement: 48.99 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 5.115E-06 ft^2/day
S = 1.E-06

D2M
Transducer Submergence for Interval 8
(532 to 537.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-8.aqt
Date: 11/26/02 Time: 12:36:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M-8(0411))

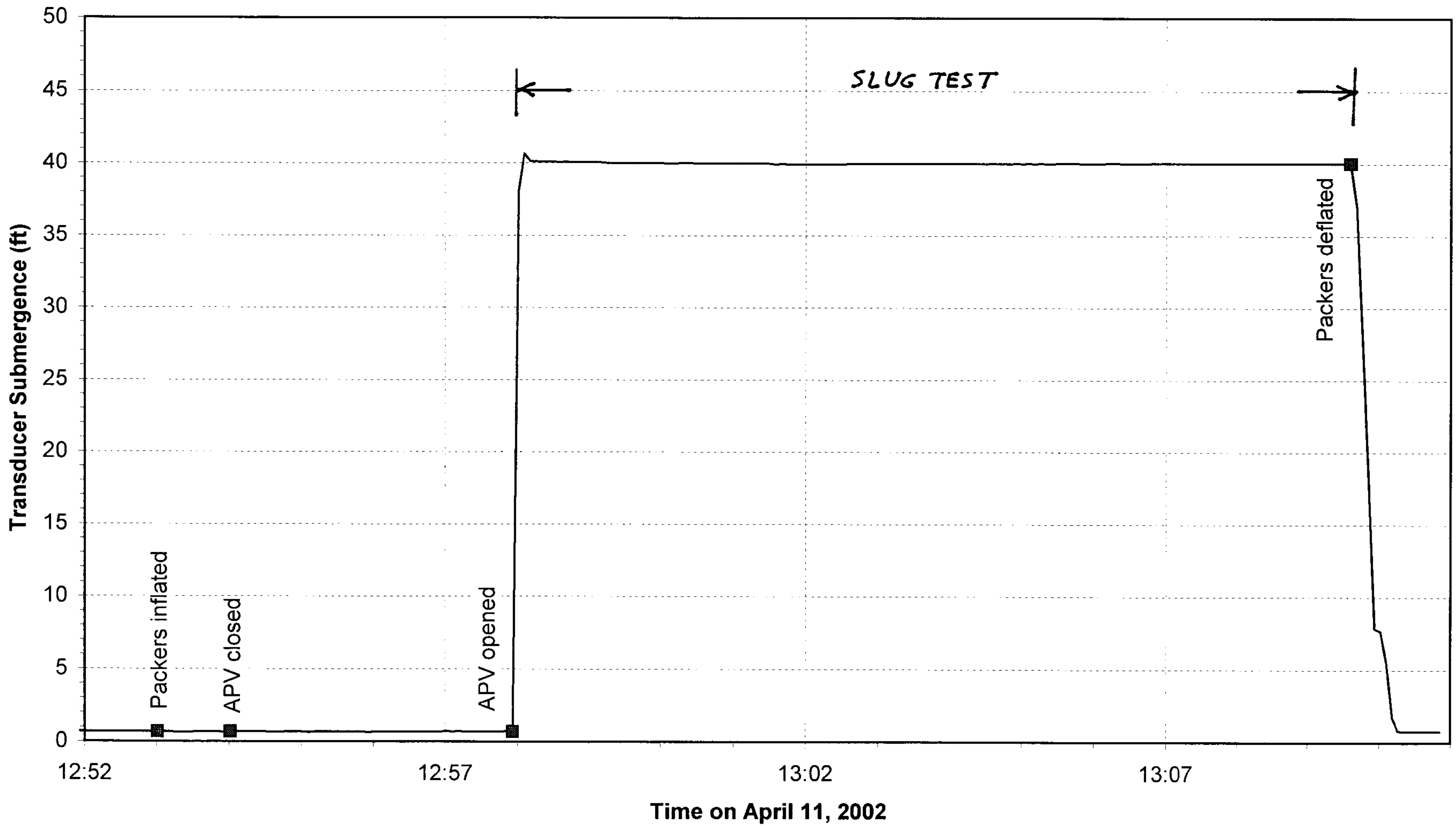
Initial Displacement: 43.01 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

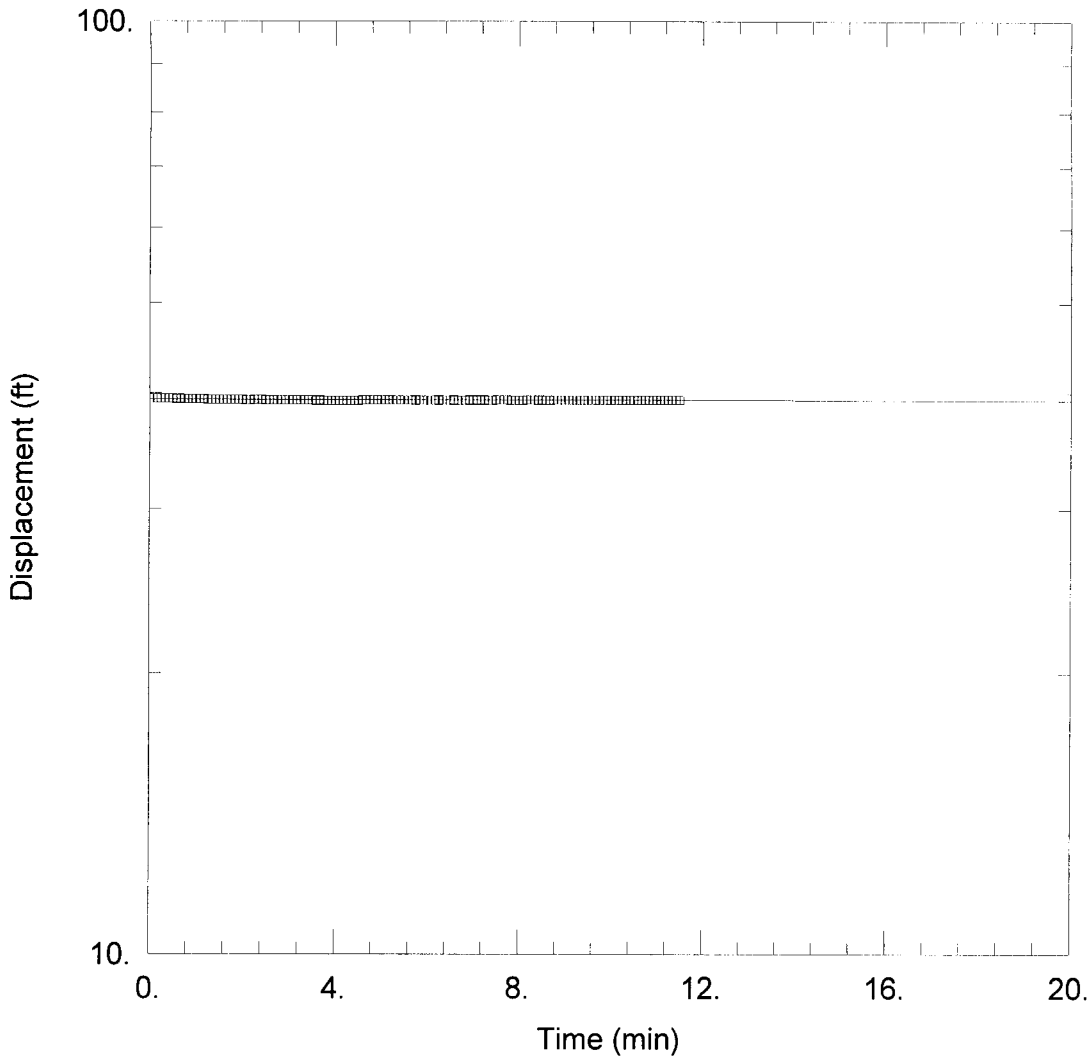
SOLUTION

Aquifer Model: Confined
Solution Method:

´ = 0.000547 ft/day
y0 = 42.95 ft

D2M
Transducer Submergence for Interval 9
(536 to 541.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-11\D2M 0411-9.aqt
Date: 11/26/02 Time: 12:36:55

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

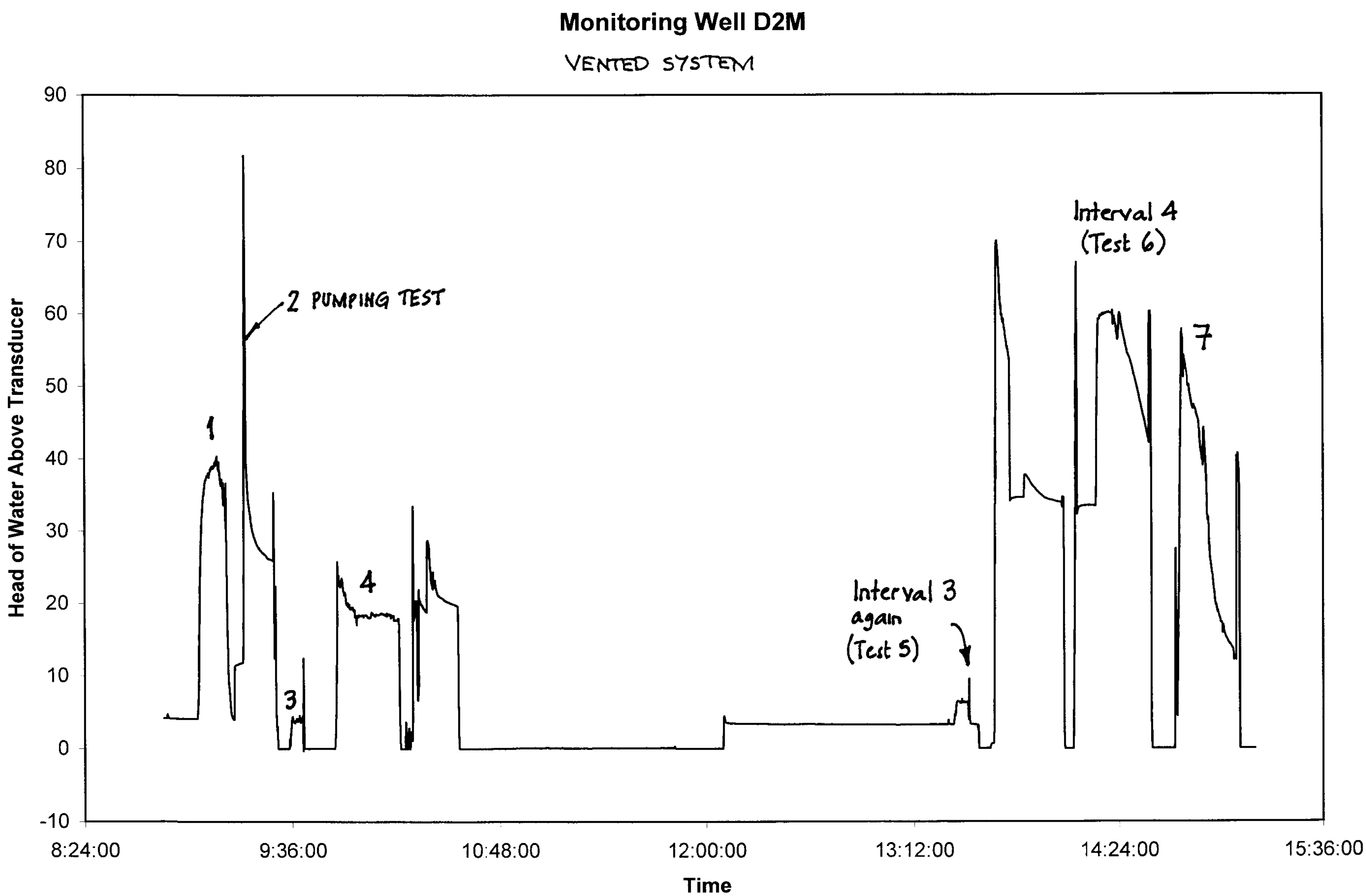
WELL DATA (D2M-9(0411))

Initial Displacement: 39.46 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

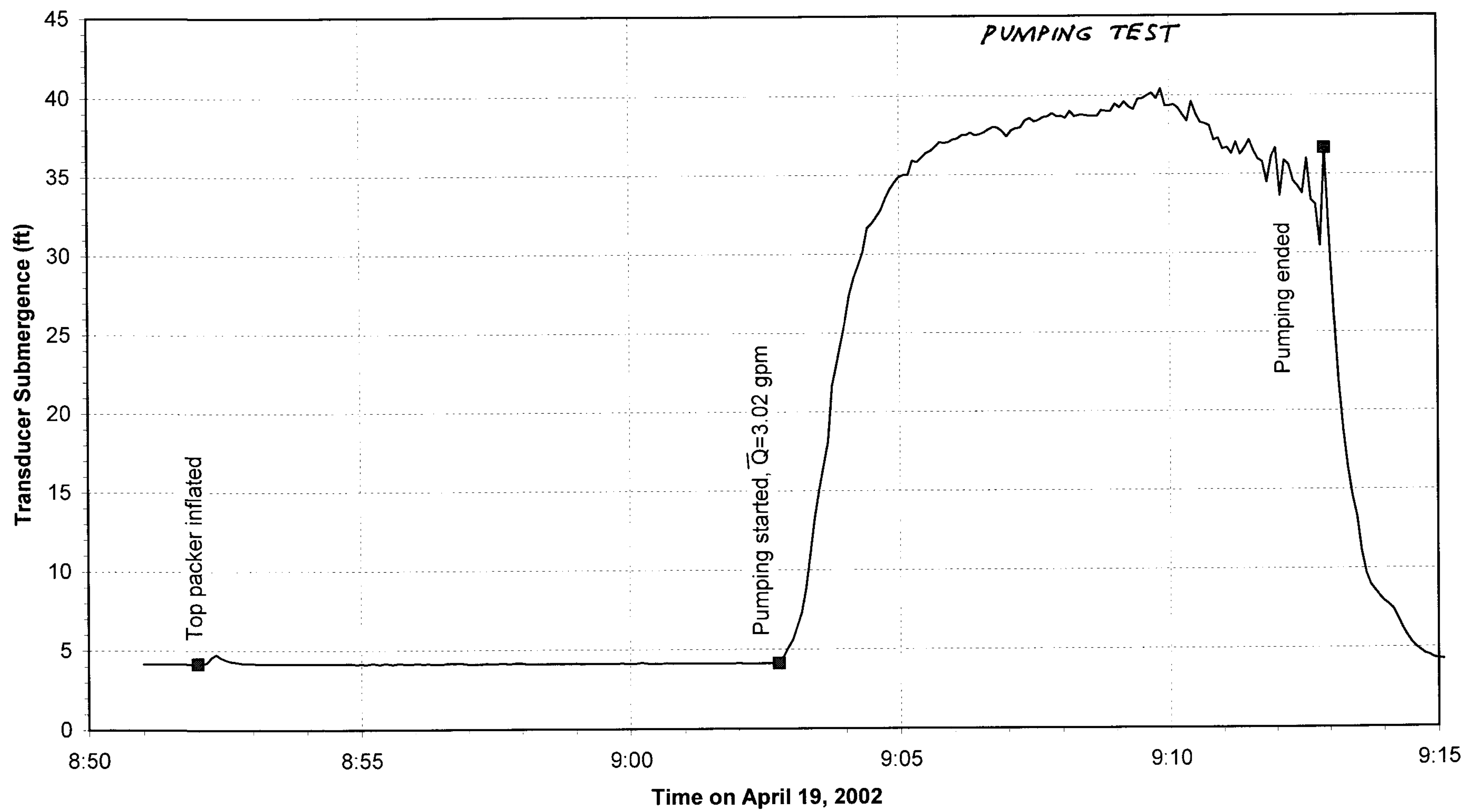
K = 2.37E-05 ft/day
y0 = 39.32 ft

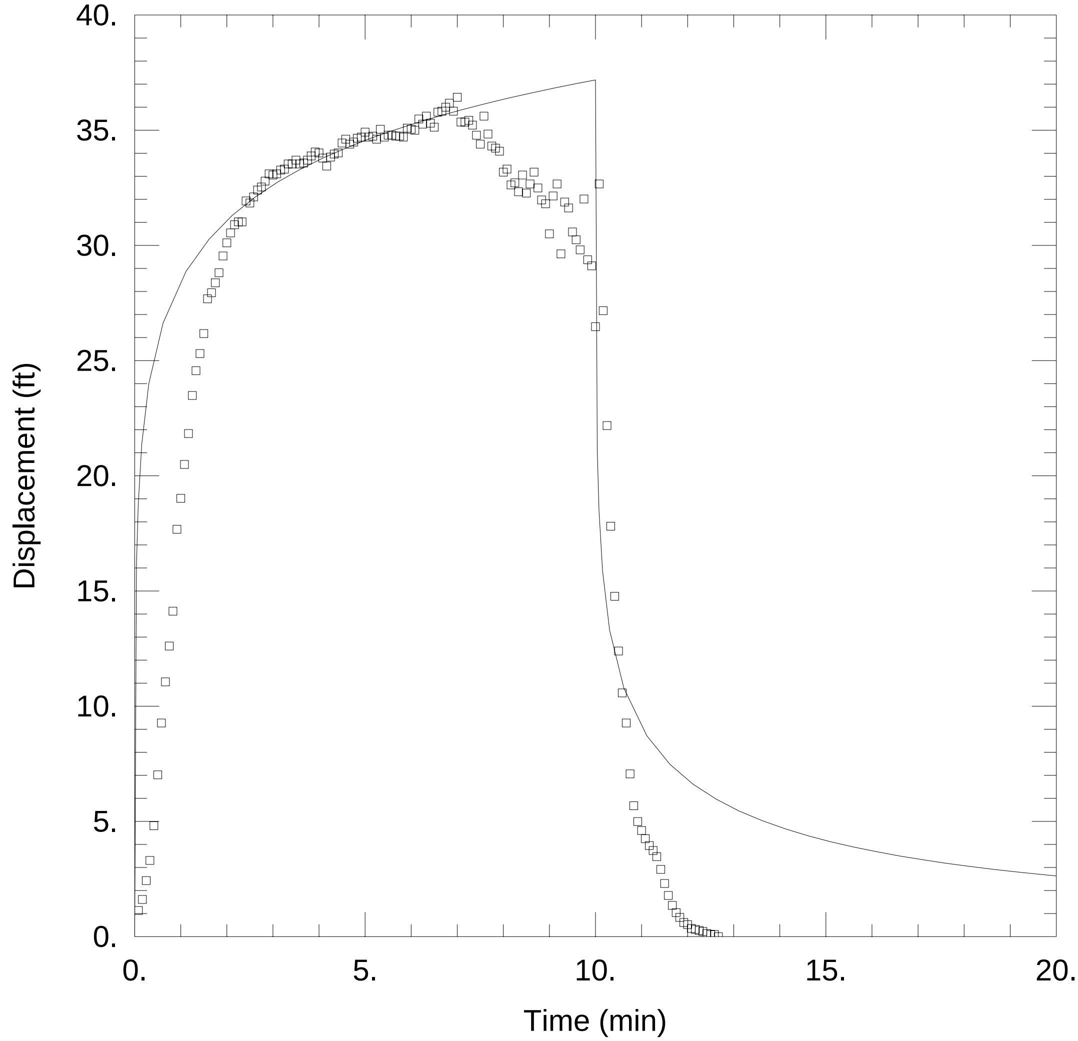


Monitoring Well D2M
VENTED SYSTEM
90
80
70
60
50
40
30
20
10
0
-10
Head of Water Above Transducer
8:24:00
9:36:00
10:48:00
12:00:00
13:12:00
14:24:00
15:36:00
Time
1
2 PUMPING TEST
3
4
Interval 3
again
(Test 5)
Interval 4
(Test 6)
7

D2M0419. xls

D2M
Transducer Submergence for Test 1
(503.7 to 513.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-19\D2M 0419-1.aqt
Date: 01/22/03 Time: 10:33:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 2511.9 ft Anisotropy Ratio (Kz/Kr): 0.001

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
D2M 0419-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ D2M 0419-1	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

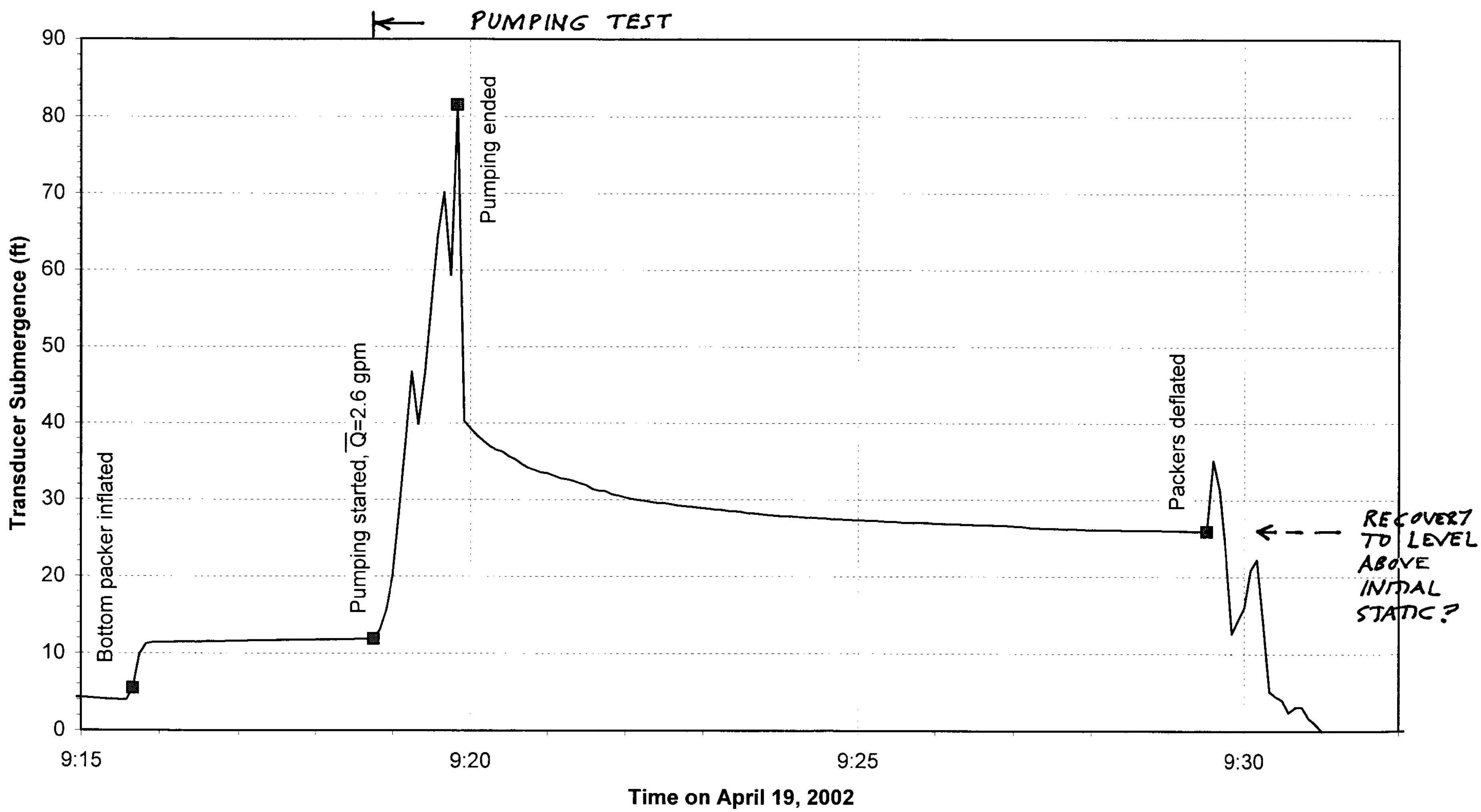
T = 12.2 ft^2/day
Sw = -1.87
P = 3.

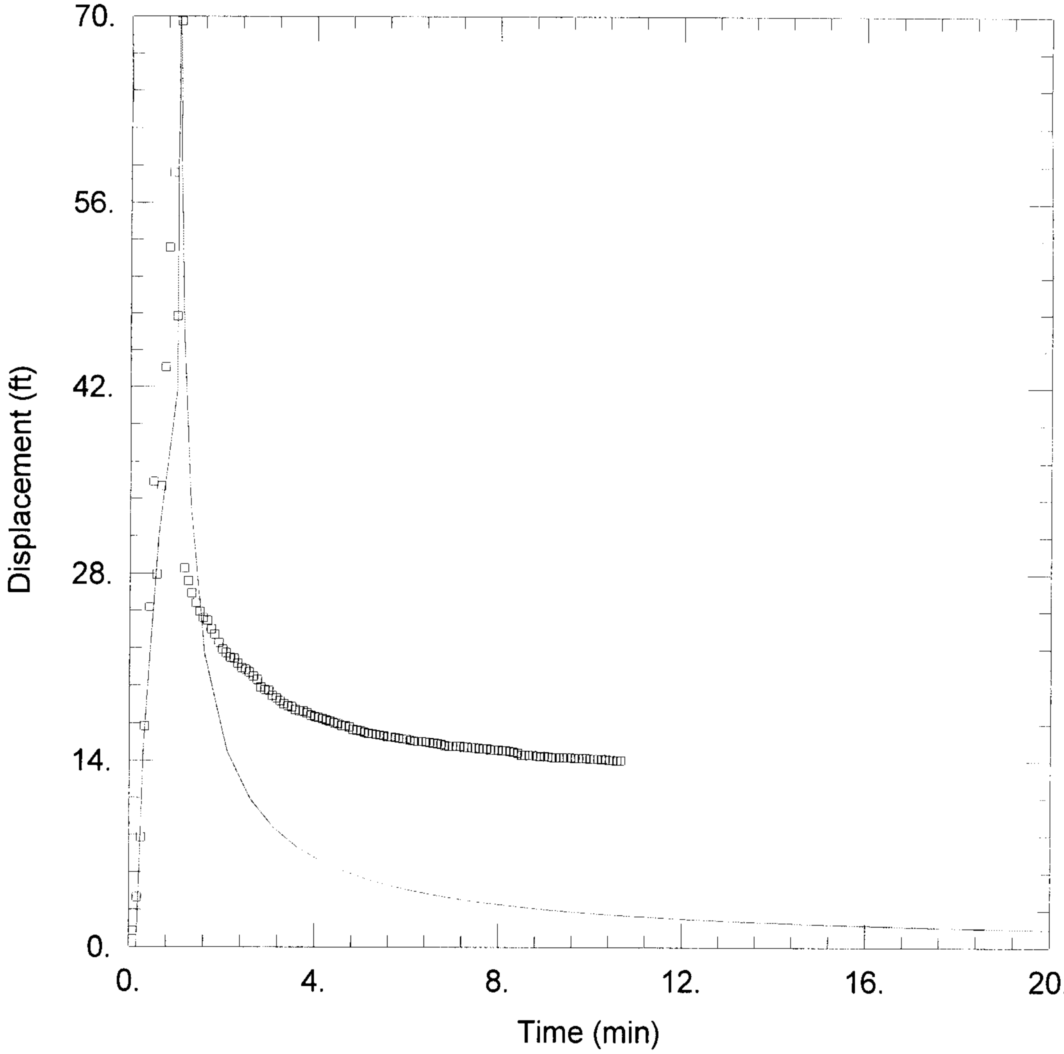
S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 70.46Q + 0.$Q^{3.}$
W.E. = 149.9%

D2M
Transducer Submergence for Test 2
(508 to 513.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-19\D2M 0419-2.aqt
Date: 11/26/02 Time: 12:54:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
D2M 0419-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ D2M 0419-1	0	0

SOLUTION

Aquifer Model: Confined

T = 0.001219 ft^2/min
Sw = -2.584
P = 1.5

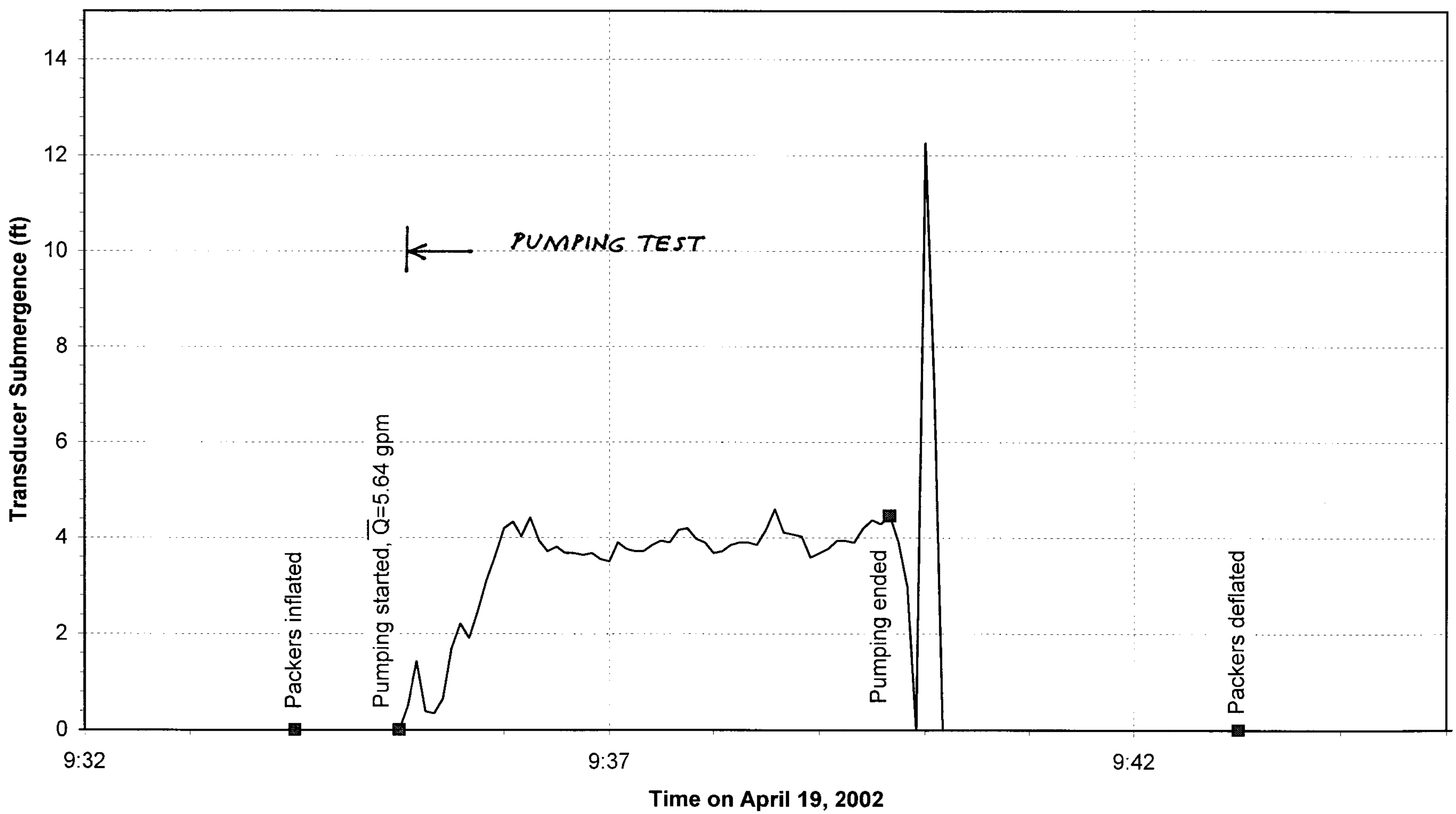
Solution Method: Theis (Step Test)

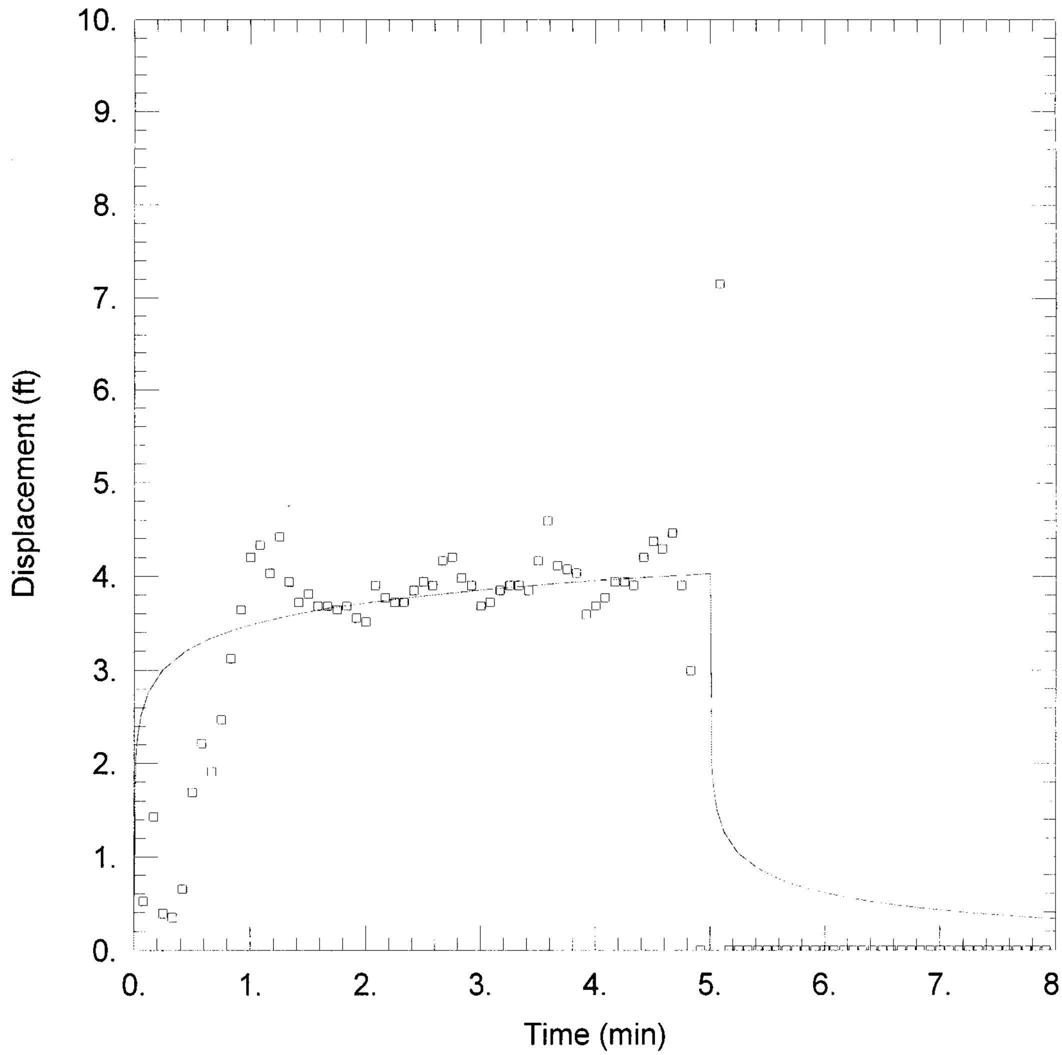
S = 1.E-05
C = 1. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 119.5Q + 1.Q^{1.5}$
W.E. = 380.3%

D2M
Transducer Submergence for Test 3
(512 to 517.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-19\D2M 0419-3.1.aqt
Date: 11/26/02 Time: 12:54:40

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
D2M 0419-3.1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ D2M 0419-3.1	0	0

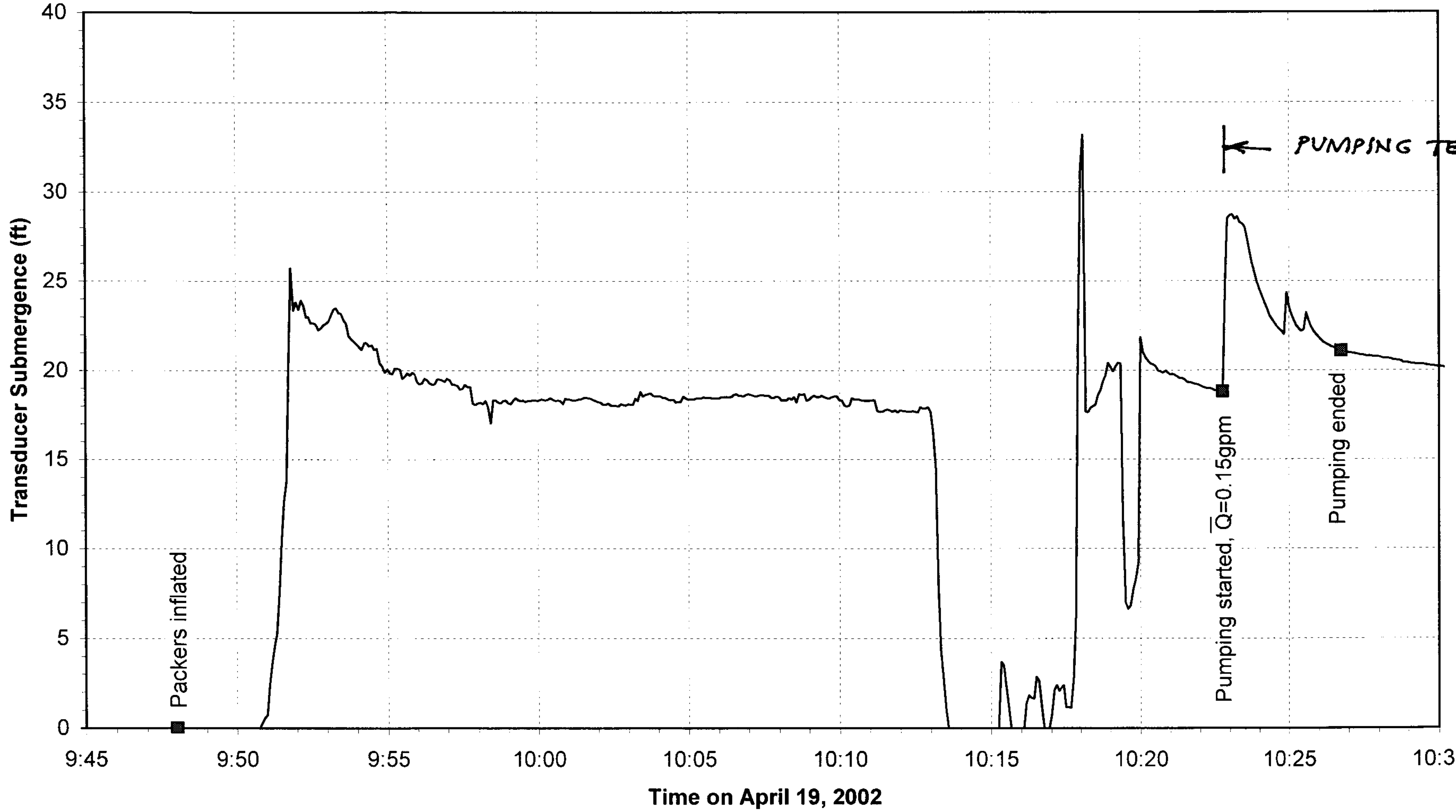
SOLUTION

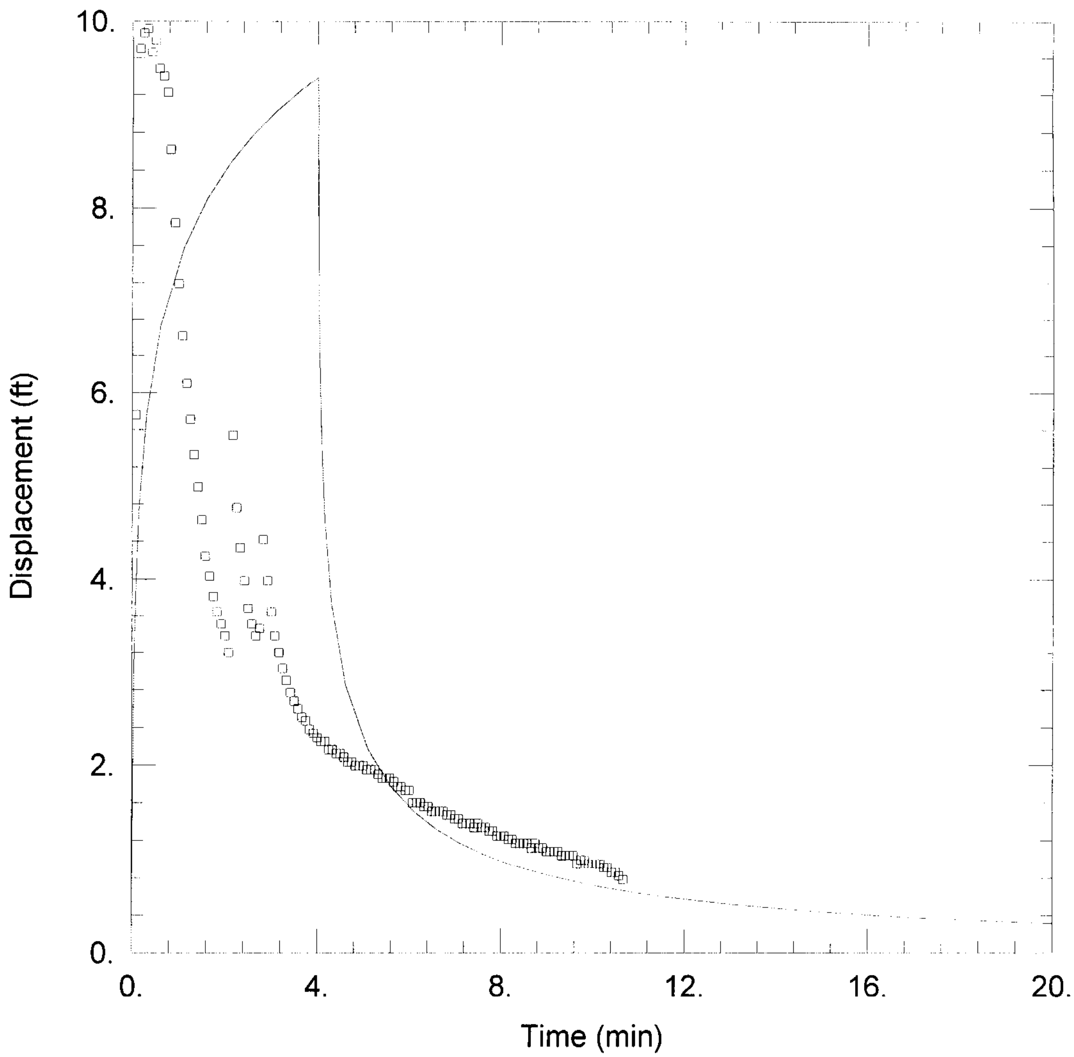
Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 0.176 ft^2/min S = 1.784E-07
Sw = -2.895 C = 0. min^2/ft^5
P = 3.

Step Test Model: Jacob-Rorabaugh s(t) = 4.615Q + 0.$Q^{3.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 156.7%

D2M
Transducer Submergence for Test 4
(516 to 521.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-19\D2M 0419-4.1.aqt
Date: 11/26/02 Time: 12:54:25

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
D2W 0419-4.1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ D2W 0419-4.1	0	0

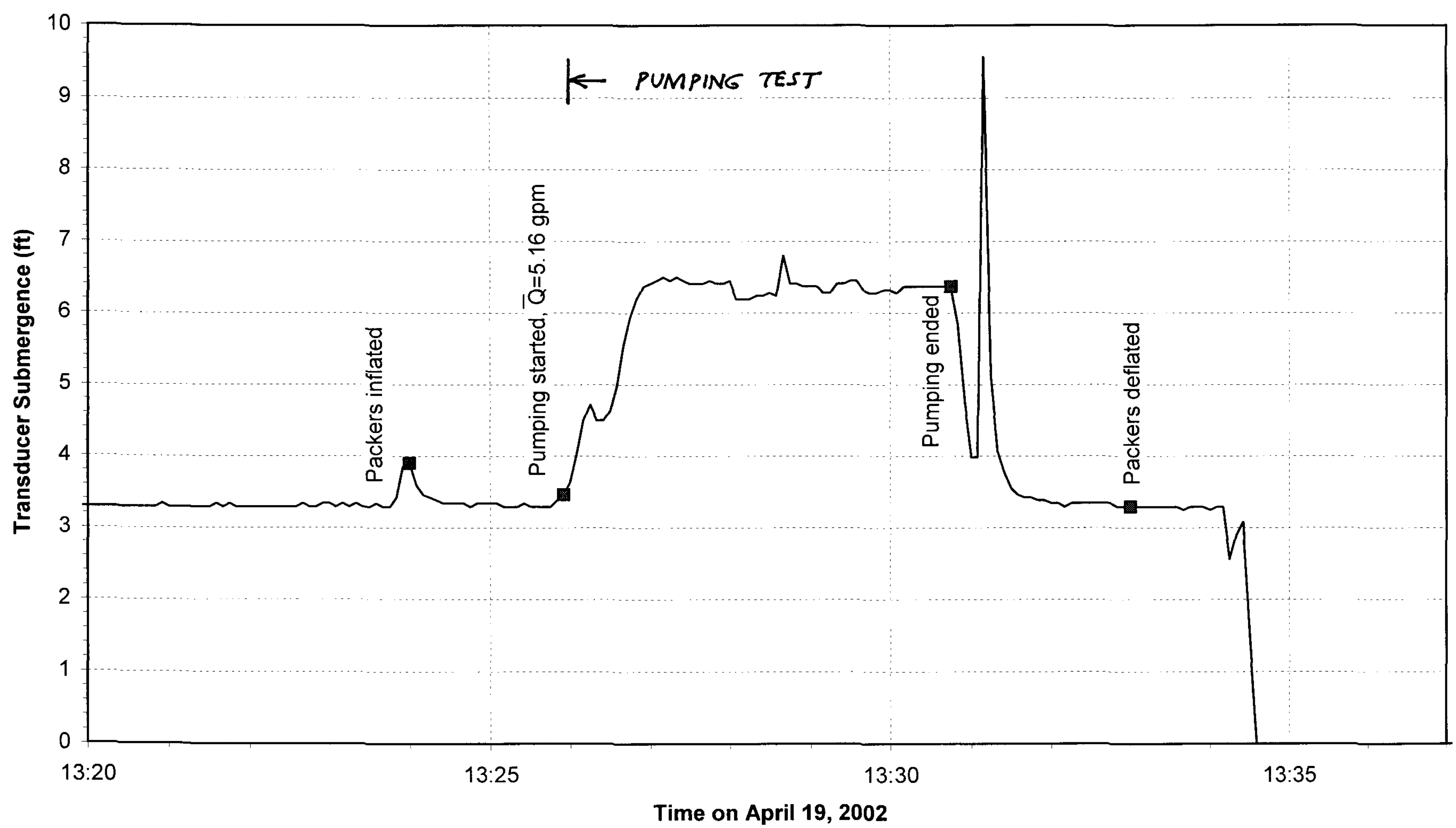
SOLUTION

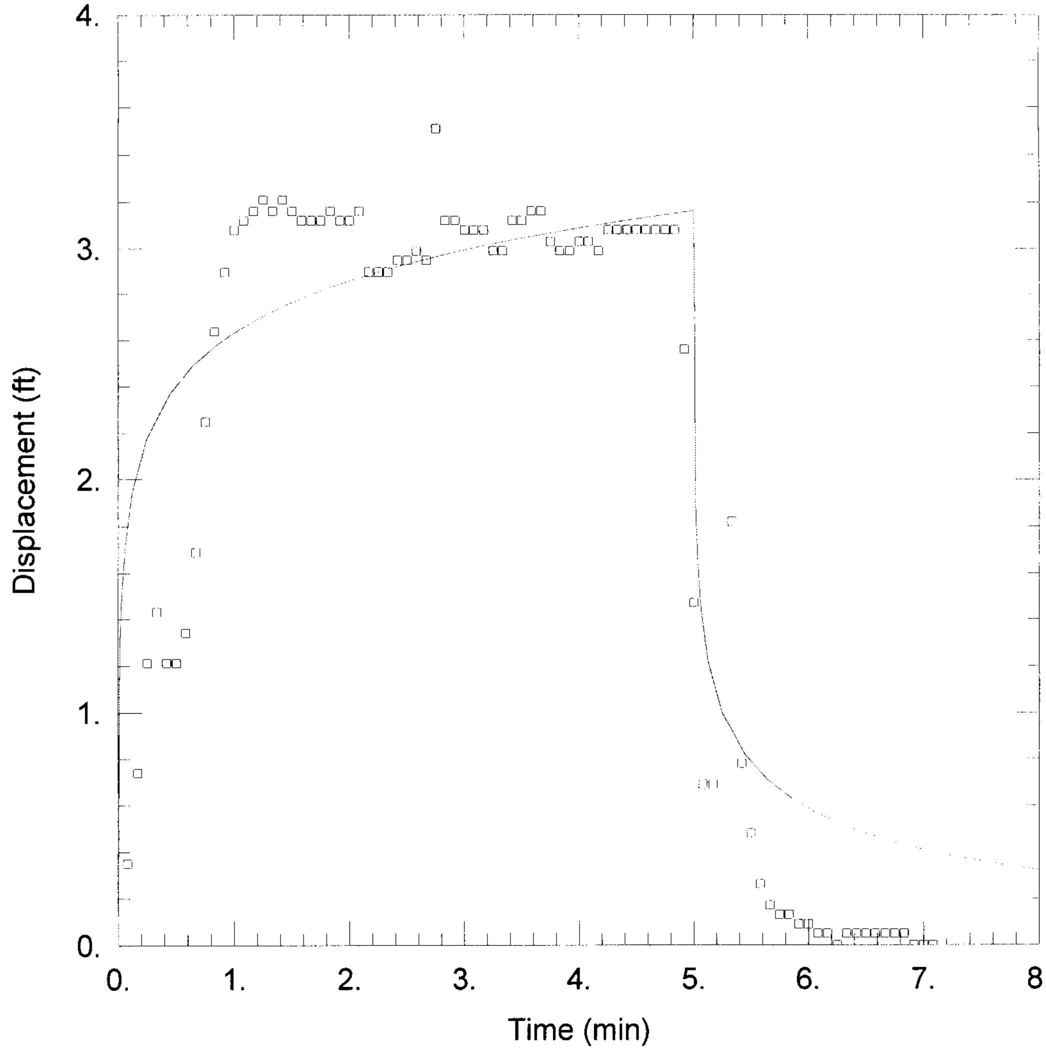
Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 0.001122 ft^2/min S = 5.495E-05
Sw = 0. C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh $s(t)$ = $369.9Q + 0.Q^{2.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 100.%

D2M
Transducer Submergence for Test 5
(512 to 517.2 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-19\D2M 0419-3.2.aqt
Date: 11/26/02 Time: 12:54:28

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
D2M 0419-3.2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ D2M 0419-3.2	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

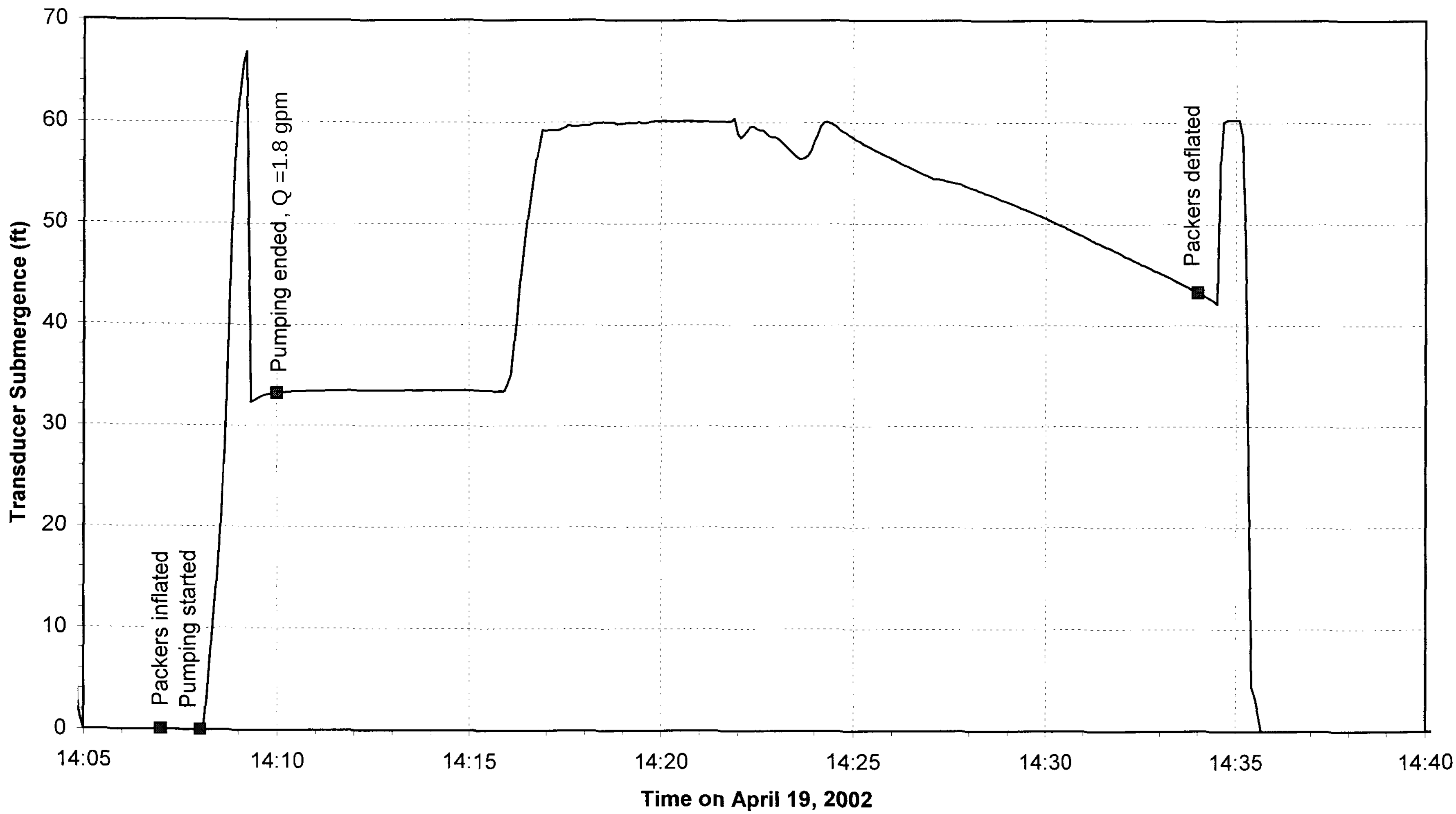
T = 241.1 ft^2/day
Sw = -3.096
P = 2.

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

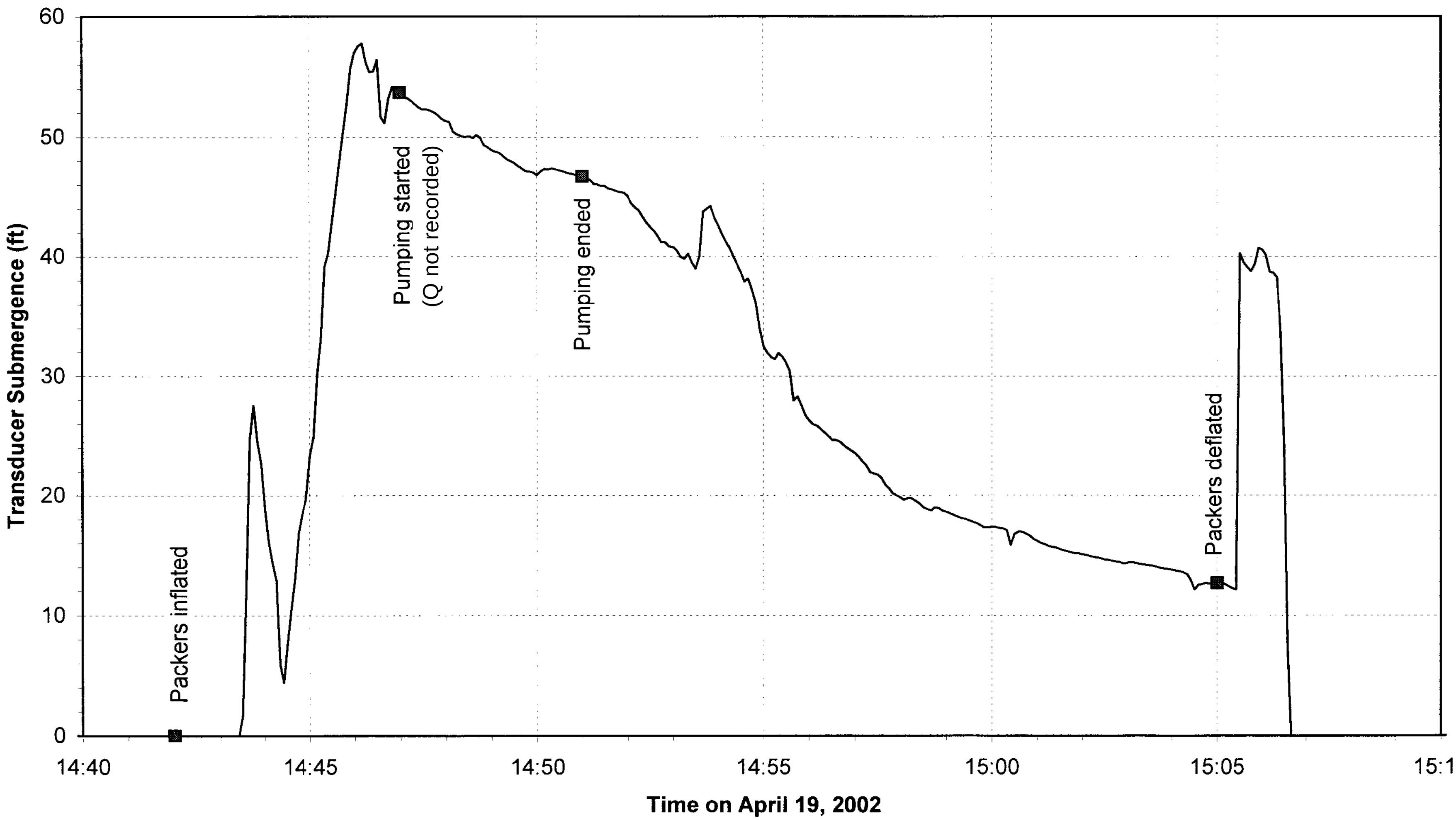
s(t) = 3.818Q + 0.$Q^{2.}$
W.E. = 177.1%

D2M
Transducer Submergence for Test 6
(516 to 521.2 ft AMSL)



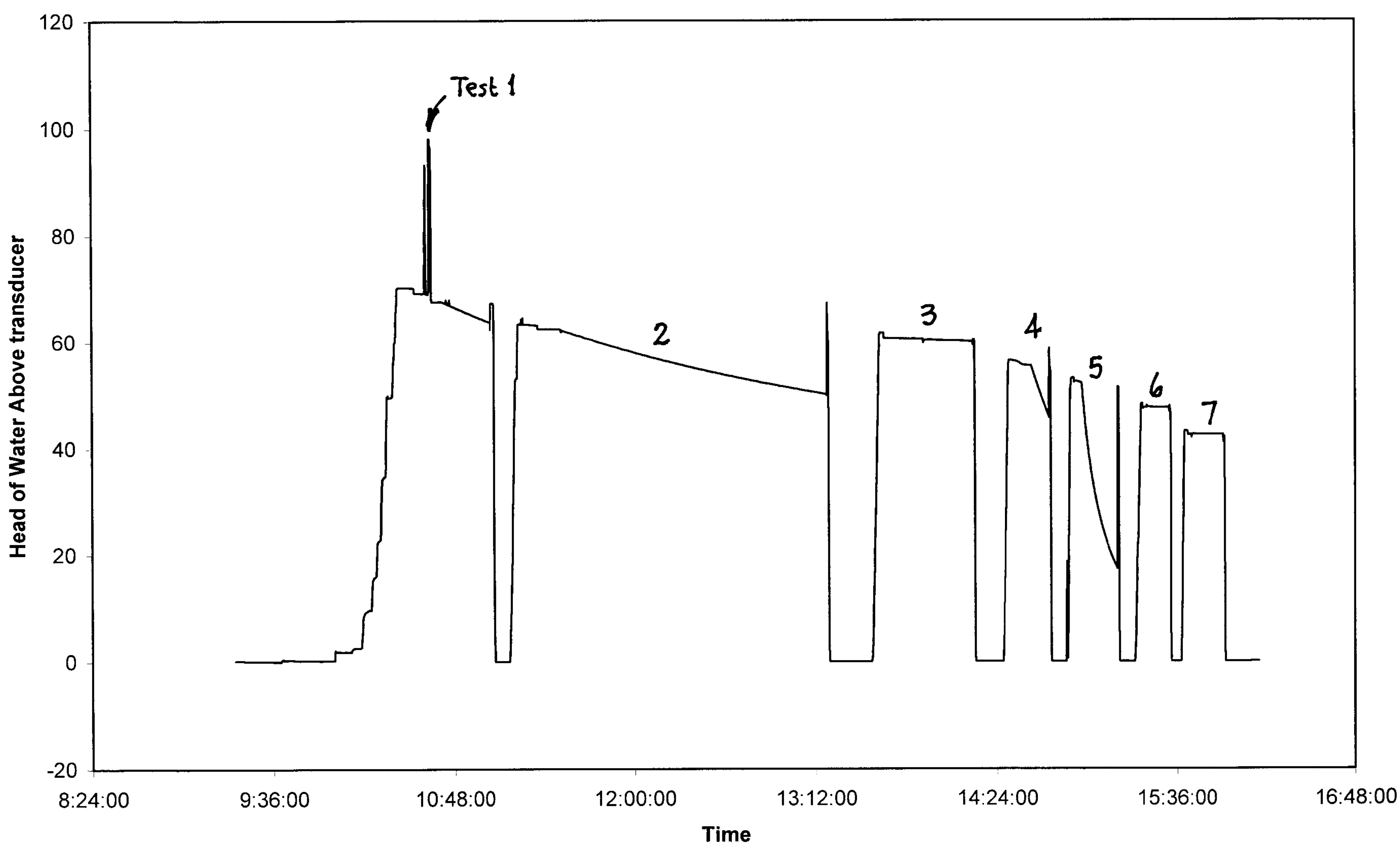
- What interval corresponds to the test?
- Are the results interpretable?

D2M
Transducer Submergence for Test 7
(524 to 529.2 ft AMSL)



Monitoring Well D2M

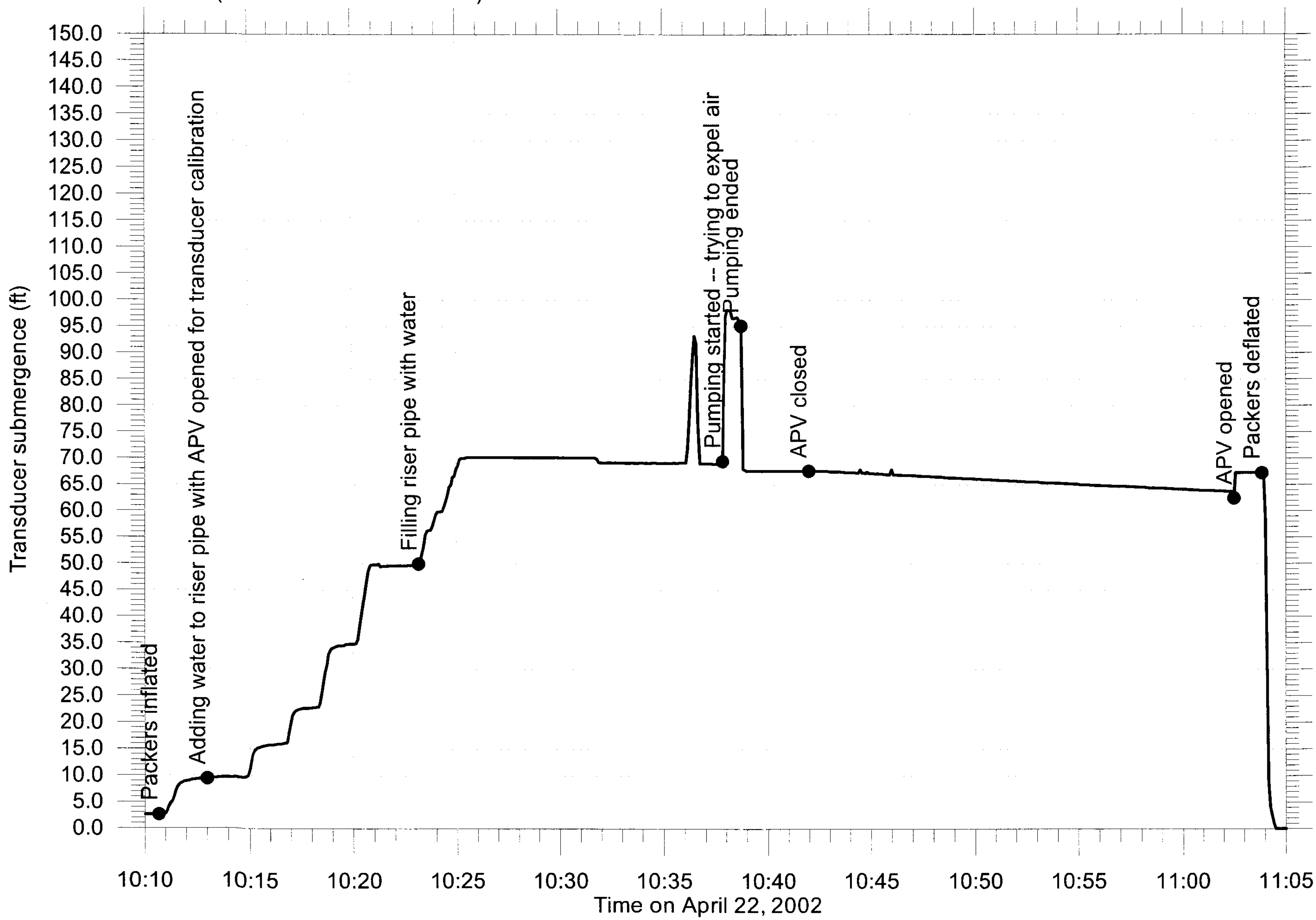
ALTERNATE VENTING SYSTEM

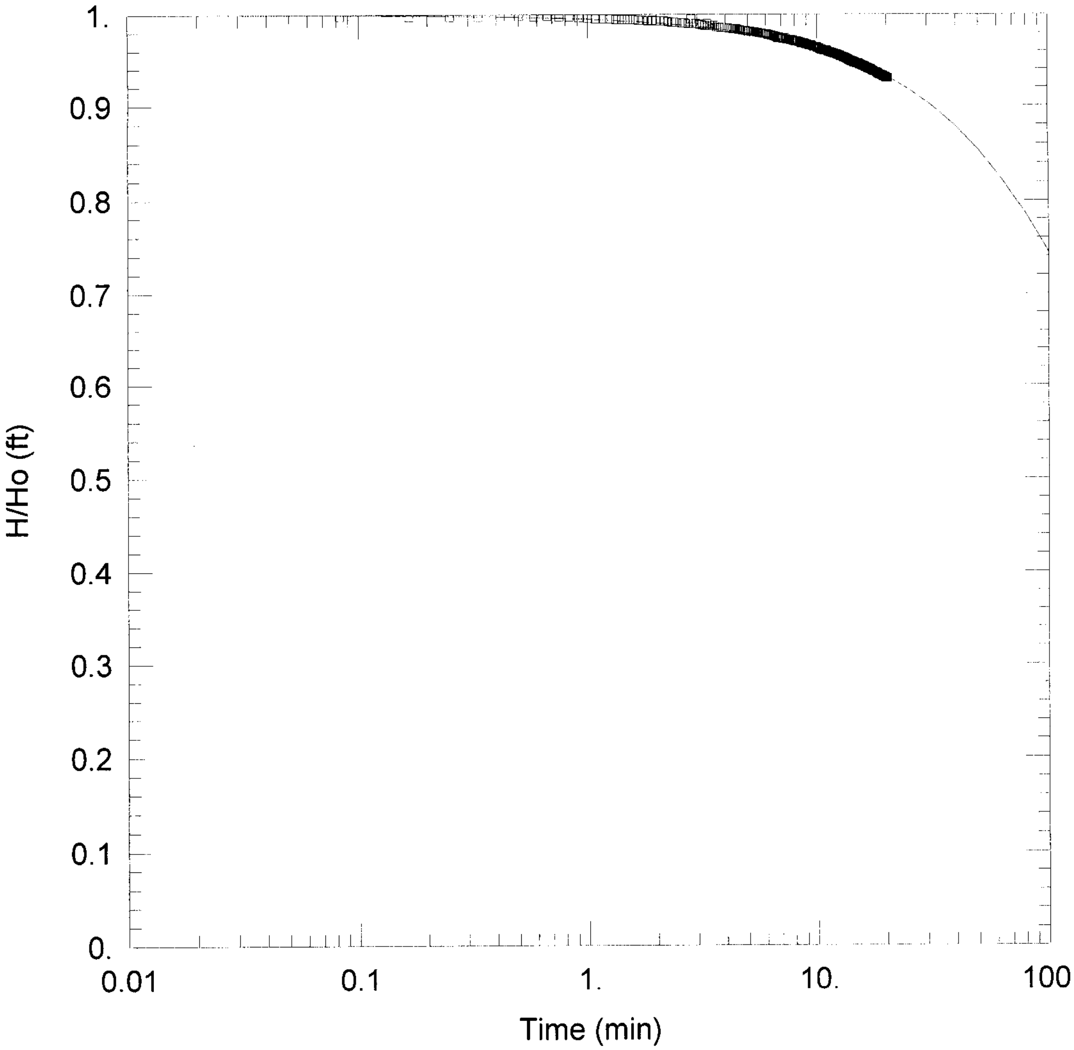


D2M0422.xls

D2M Packer Testing Retesting conducted 2002 April 22

Test 1 (517.20 to 512.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-1.aqt
Date: 11/26/02 Time: 12:54:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M.0422.1)

Initial Displacement: 57.77 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

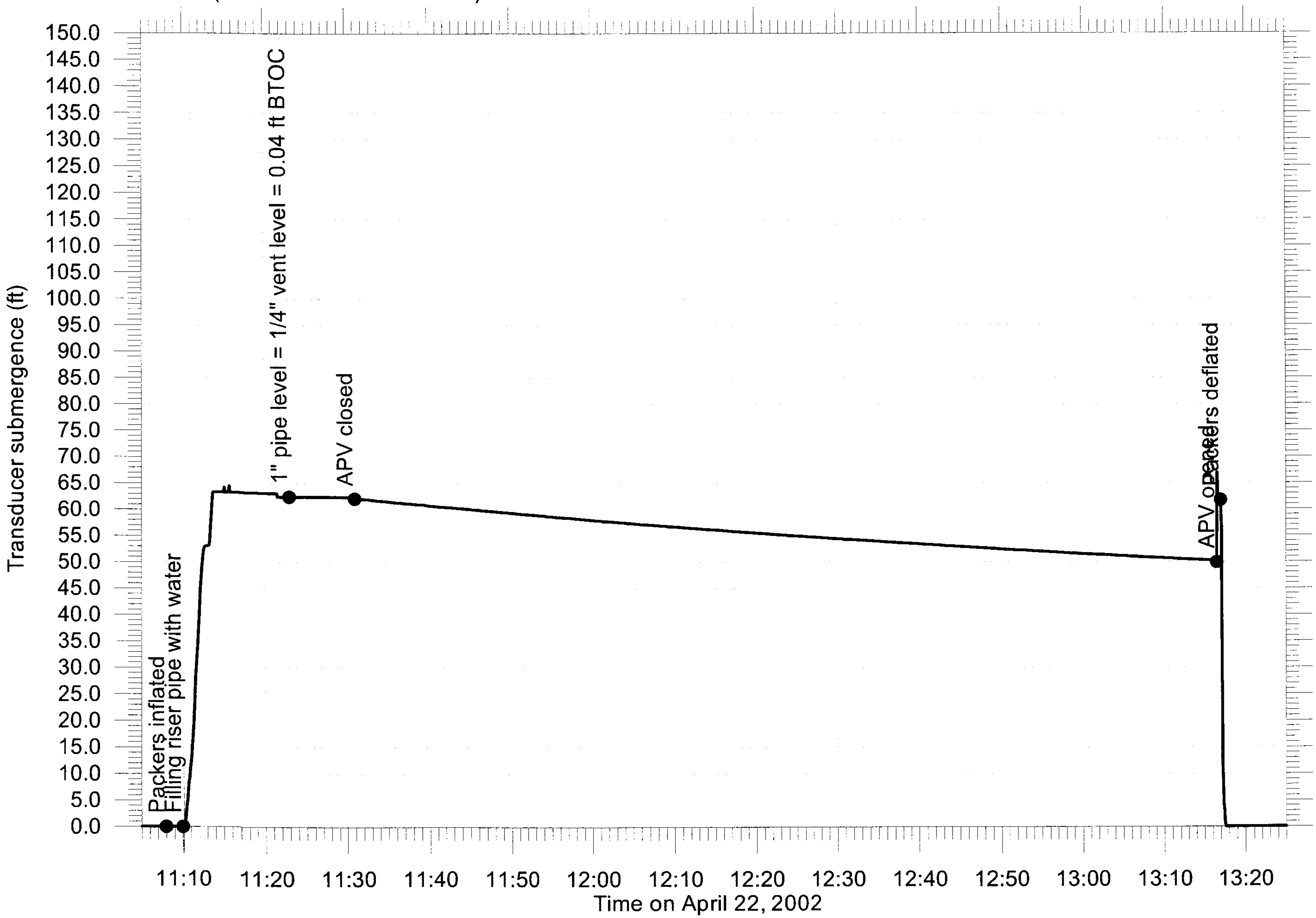
SOLUTION

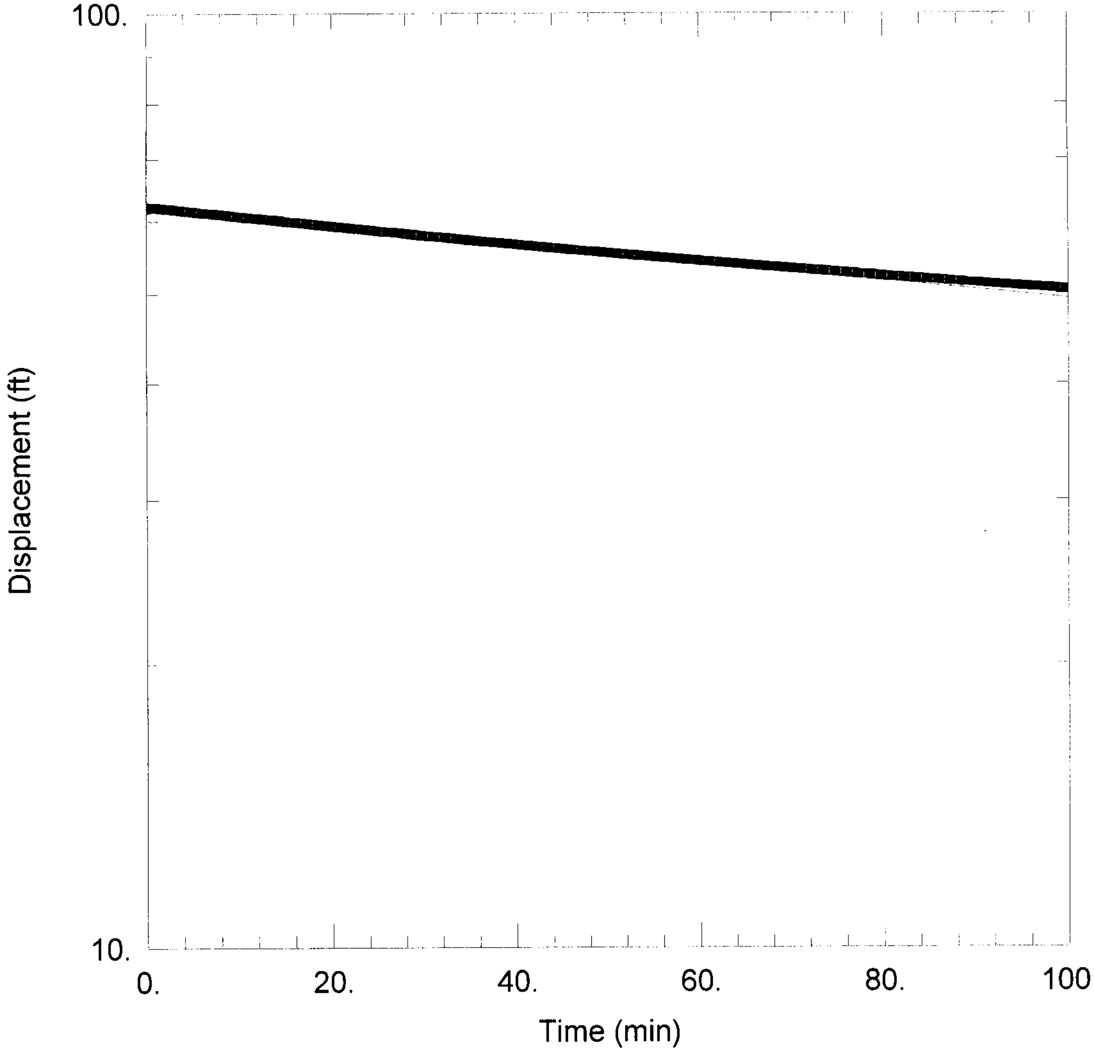
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

¯ = 0.02021 ft^2/day
S = 1.E-06

D2M Packer Testing Retesting conducted 2002 April 22

Test 2 (521.20 to 516.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-2a.aqt
Date: 11/26/02 Time: 12:55:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

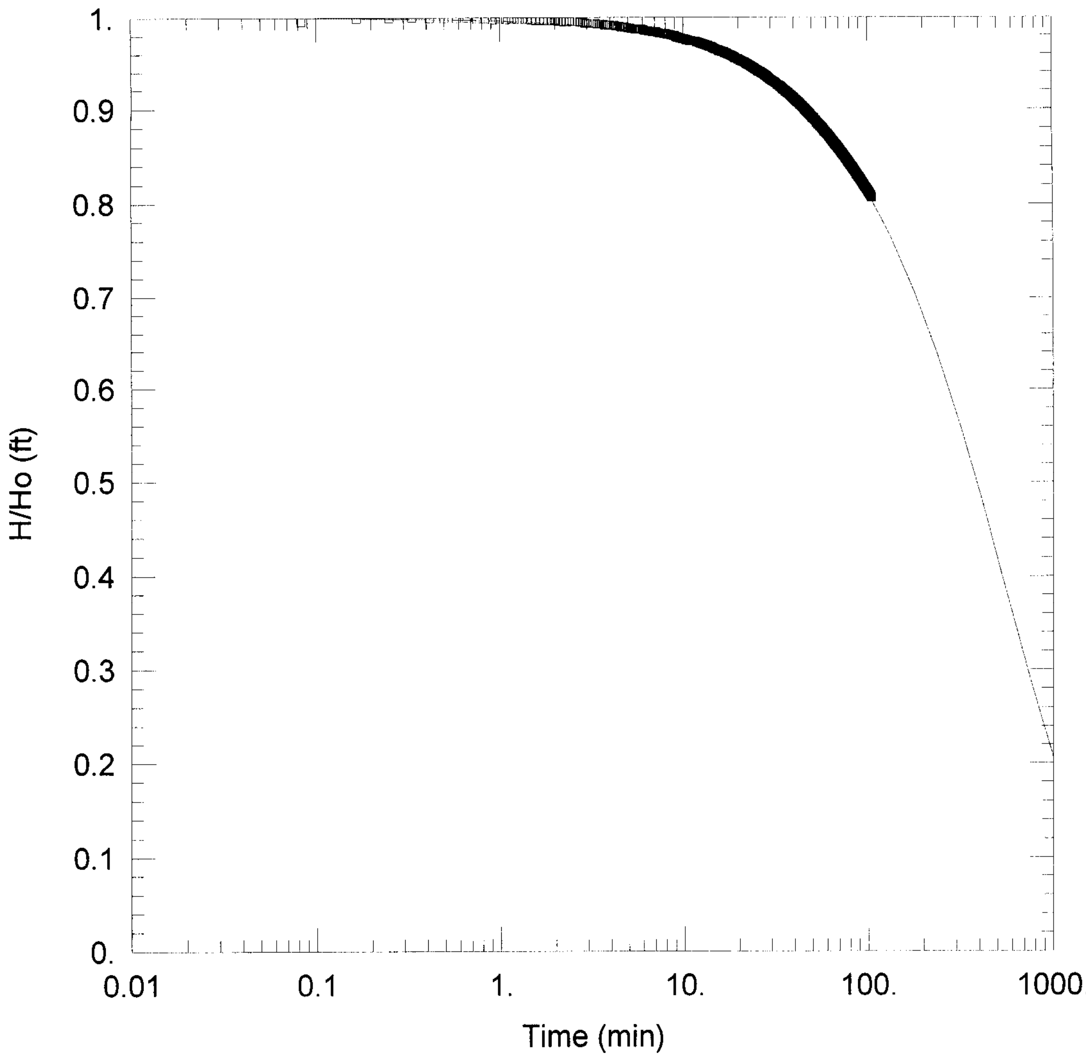
WELL DATA (D2M(0422)-2)

Initial Displacement: 1. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.02083 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.0004754 ft/day
y0 = 62.15 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-2b.aqt
Date: 11/26/02 Time: 12:55:27

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M(0422)-2)

Initial Displacement: 62.15 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

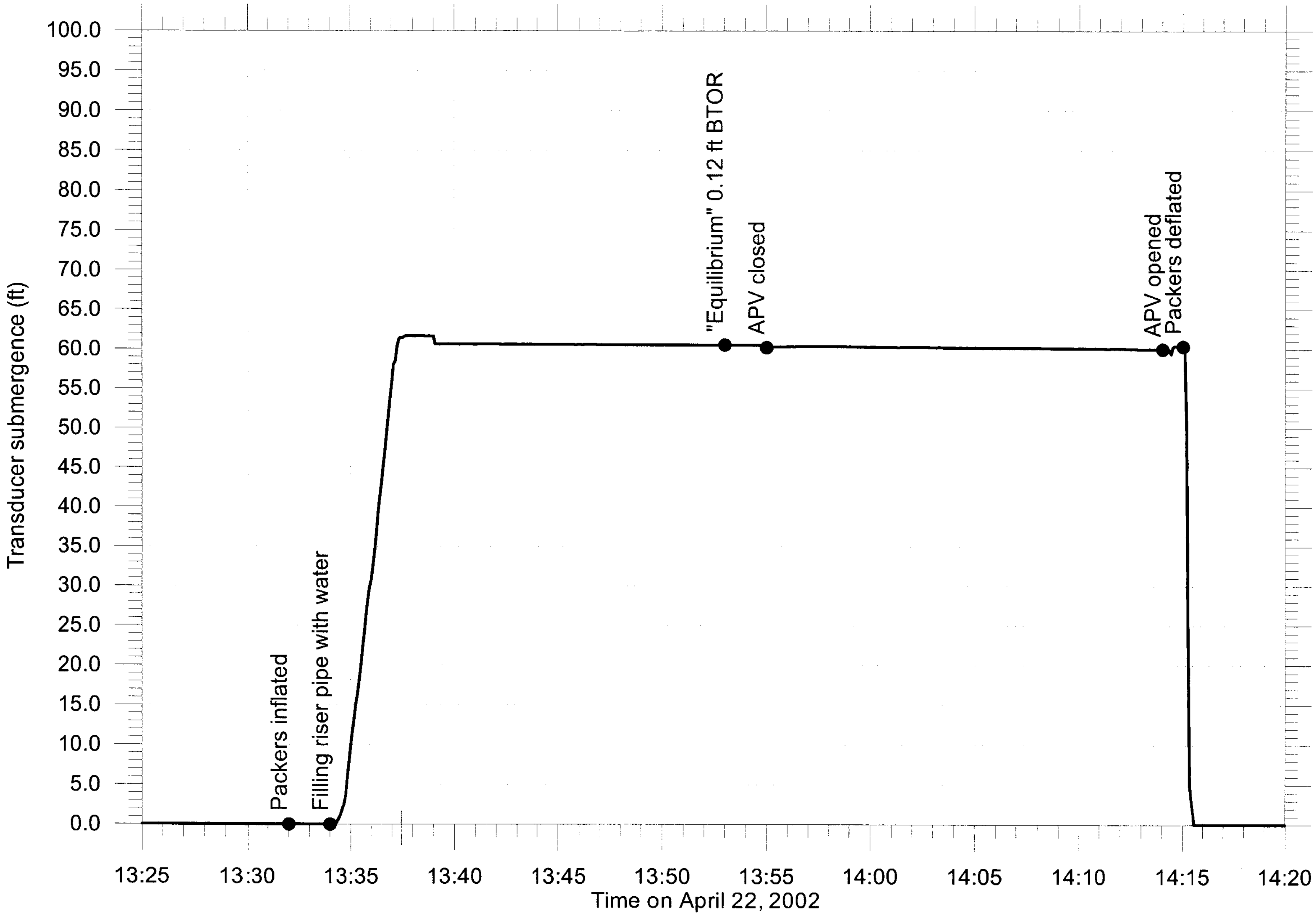
SOLUTION

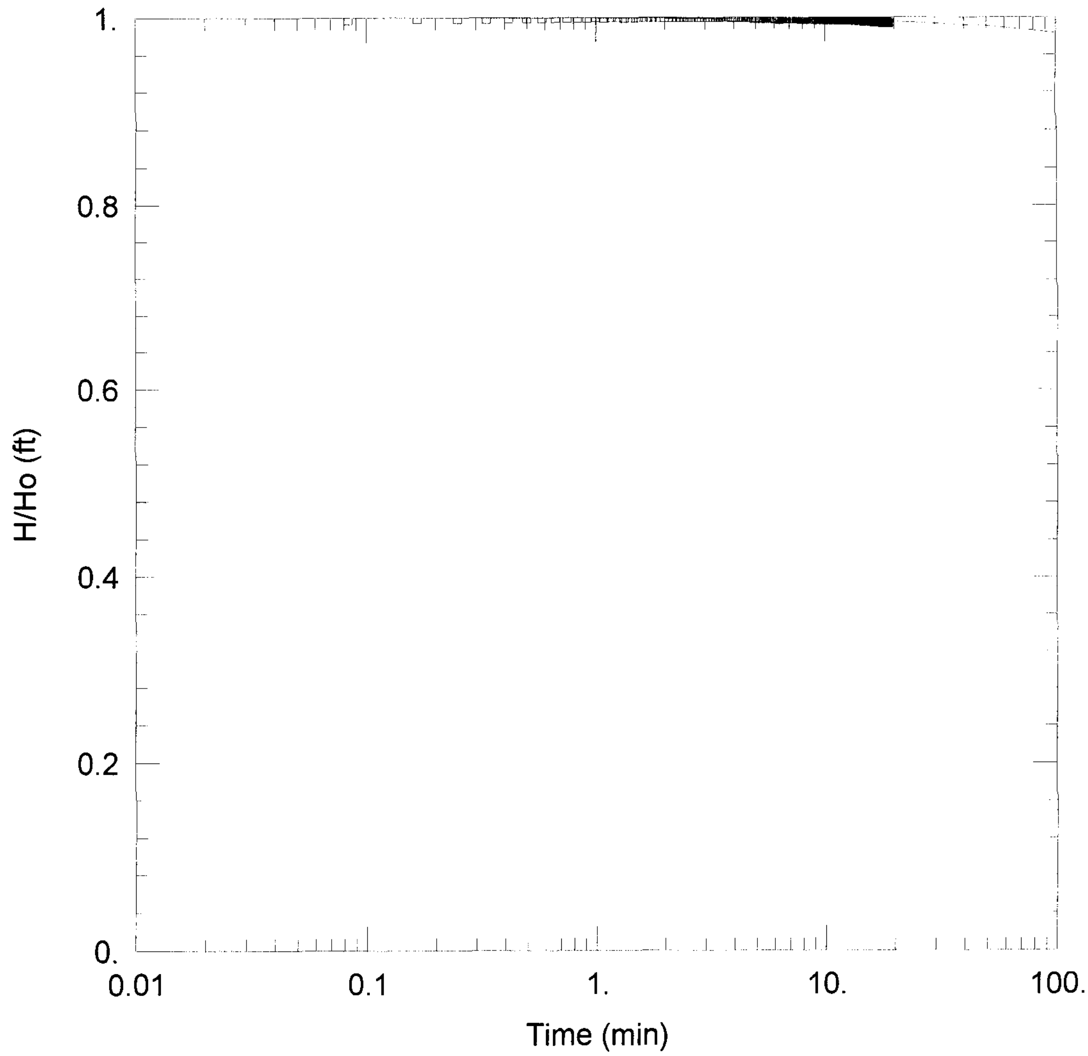
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.01367 ft^2/day
S = 1.E-06

D2M Packer Testing Retesting conducted 2002 April 22

Test 3 (525.20 to 520.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-3.aqt
Date: 11/26/02 Time: 12:55:20

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M0422-3)

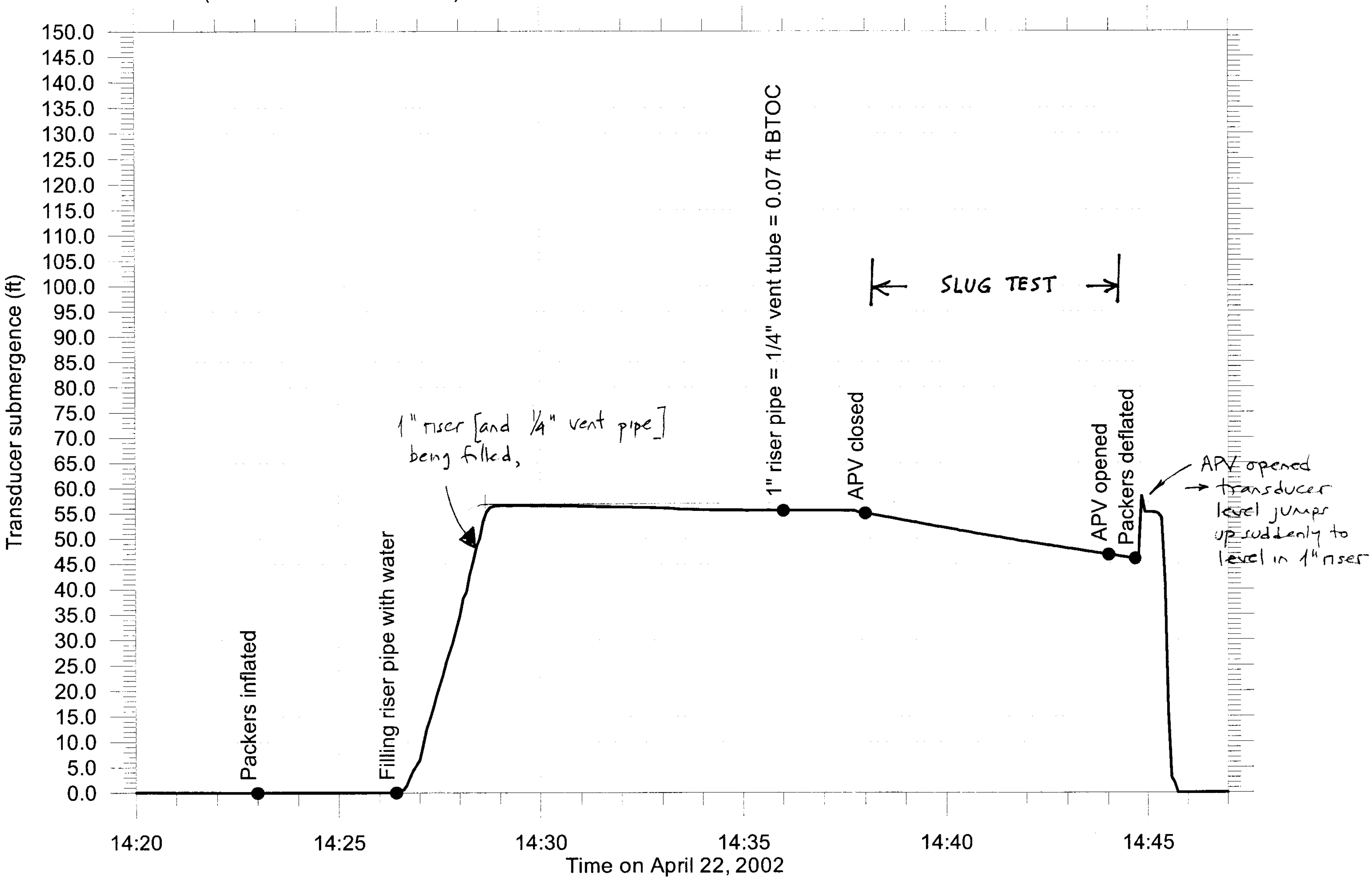
Initial Displacement: 60.35 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0104 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

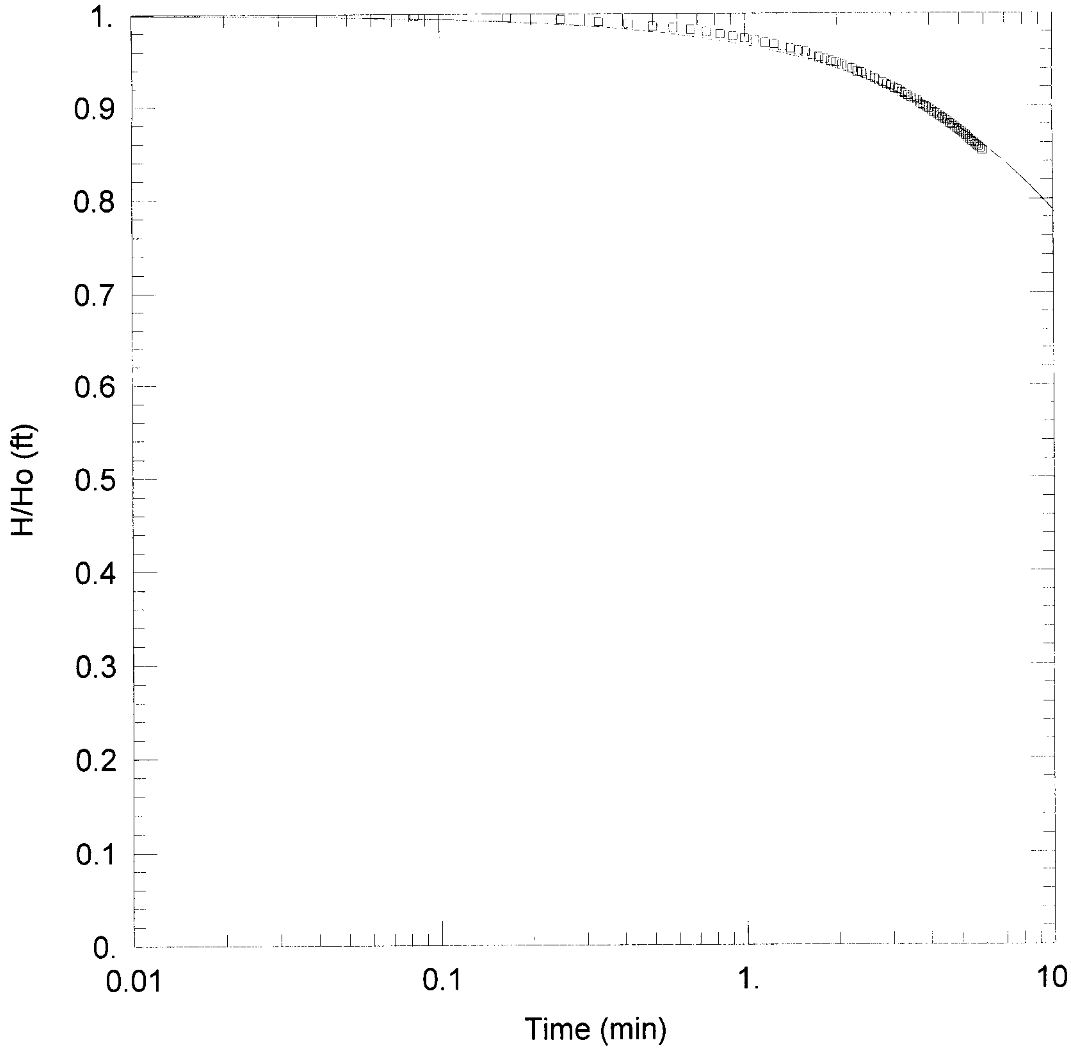
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.865E-05 ft^2/day
S = 1.E-06

D2M Packer Testing Retesting conducted 2002 April 22
Test 4 (529.20 to 524.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-4.aqt
Date: 11/26/02 Time: 12:55:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M0422-4)

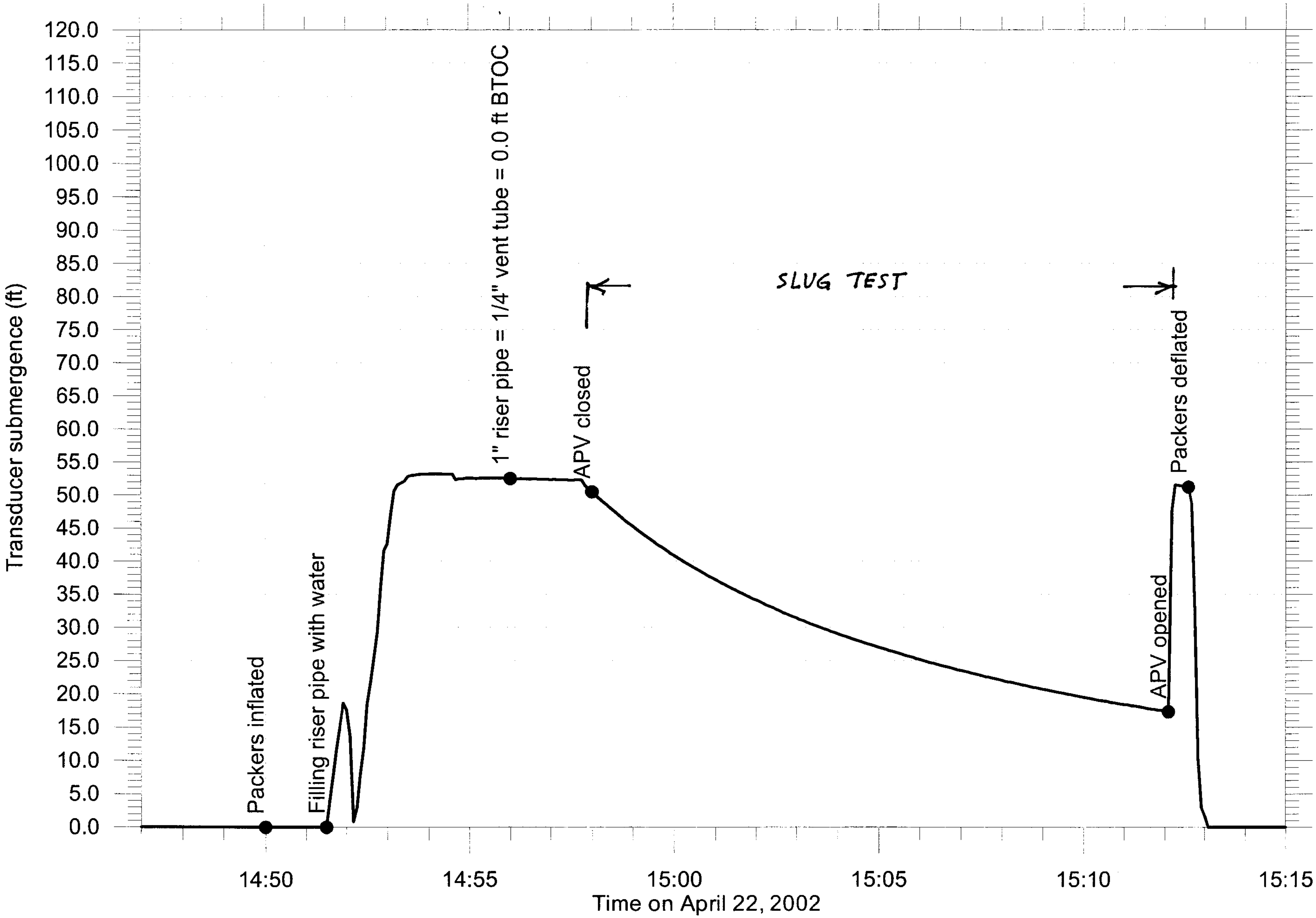
Initial Displacement: 55. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0104 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

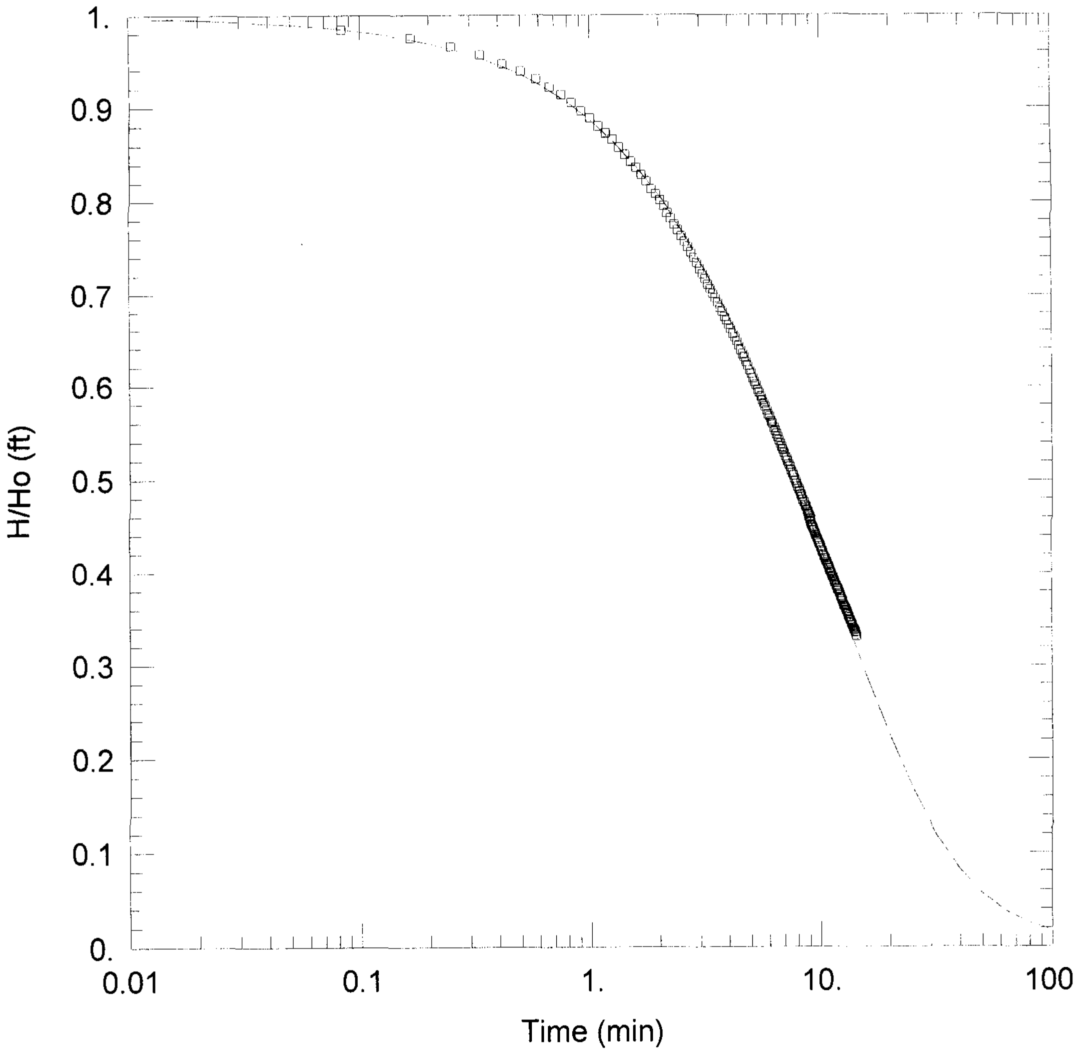
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

‾ = 0.007009 ft^2/day
S = 1.E-06

D2M Packer Testing Retesting conducted 2002 April 22
Test 5 (533.20 to 528.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-5.aqt
Date: 11/26/02 Time: 12:55:07

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft *Anisotropy Ratio (Kz/Kr):* 1.

WELL DATA (D2M0422-5)

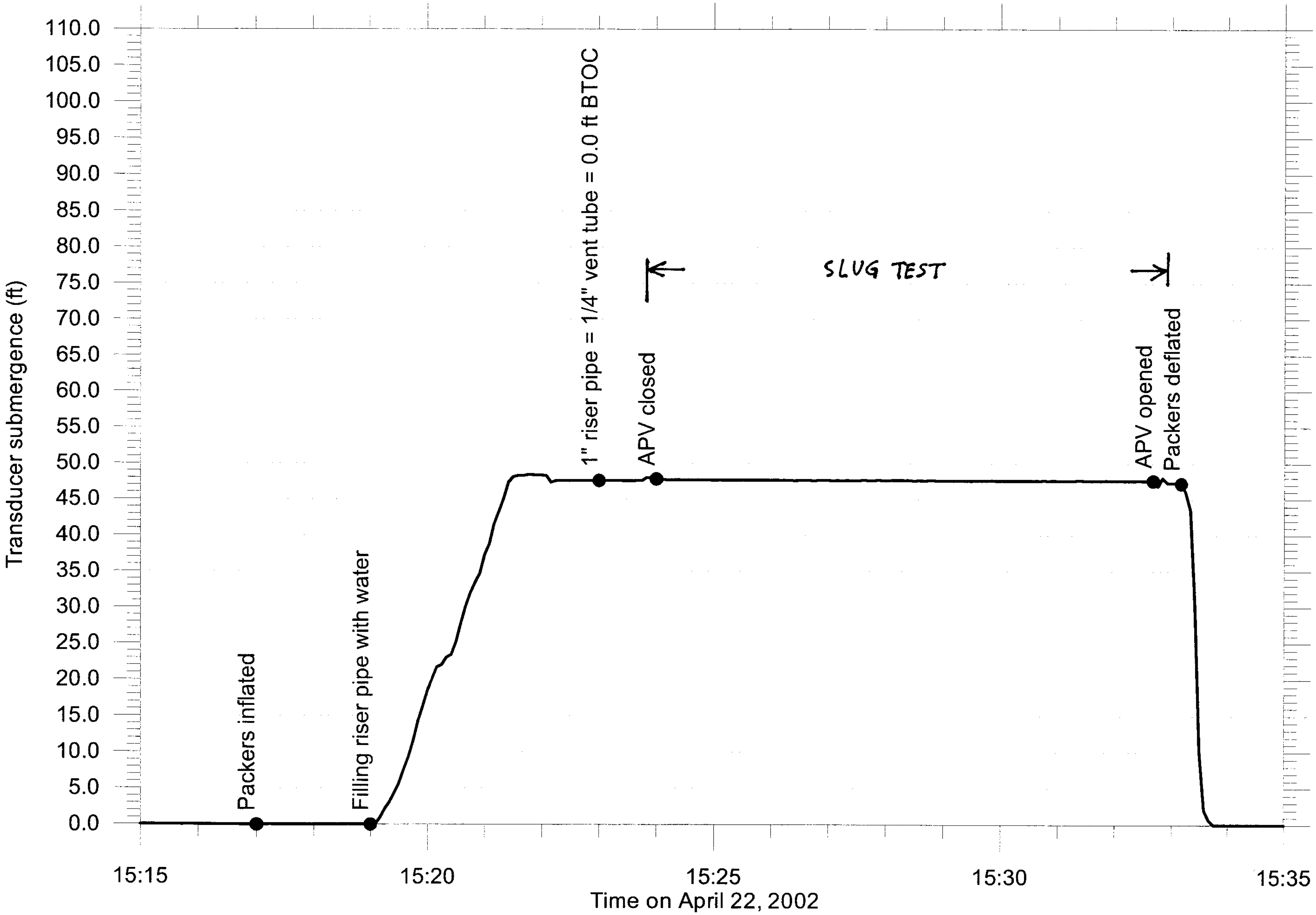
Initial Displacement: 52.24 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0104 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

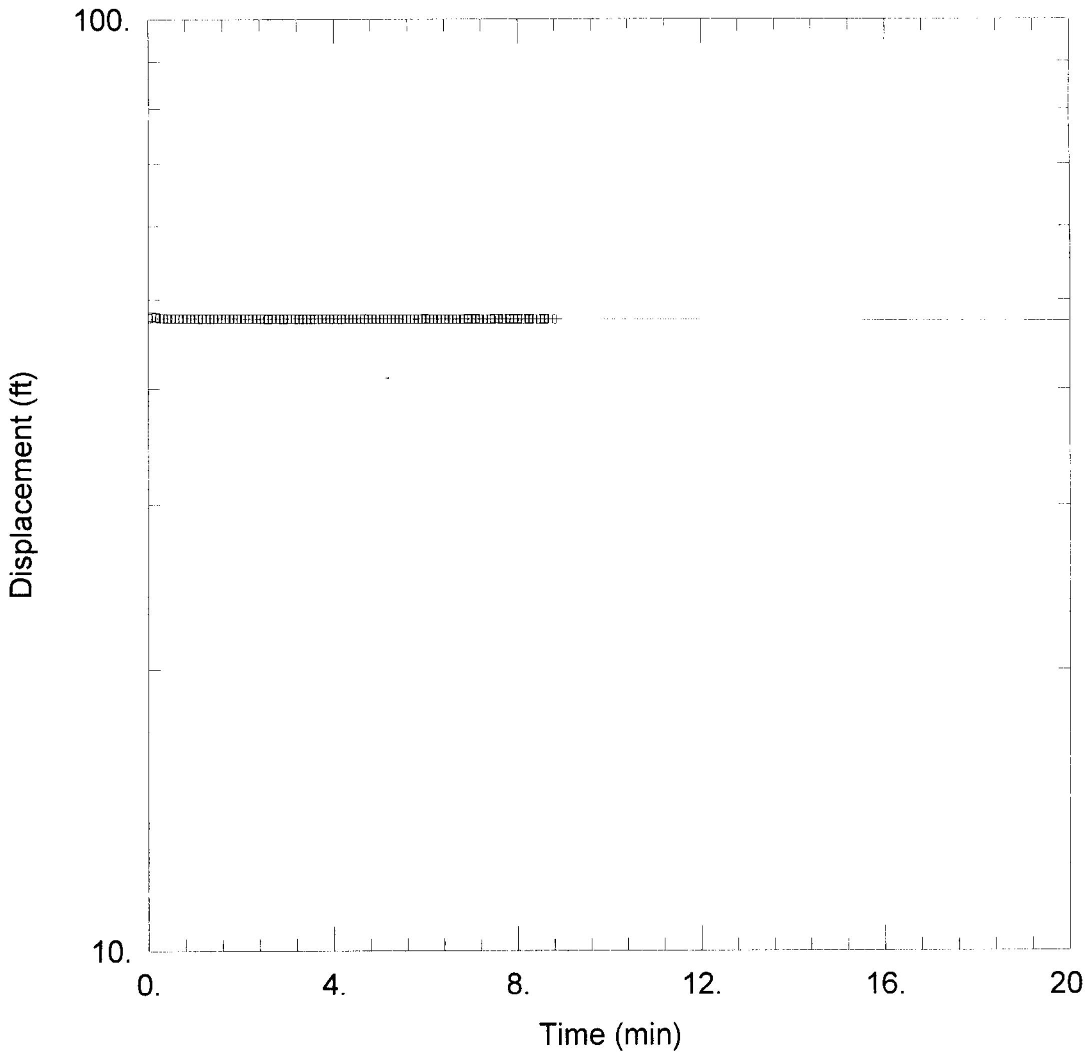
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.03146 ft^2/day
S = 1.E-06

D2M Packer Testing Retesting conducted 2002 April 22
Test 6 (537.20 to 532.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-6.aqt
Date: 11/26/02 Time: 12:55:01

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M0422-6)

Initial Displacement: 47.7 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft

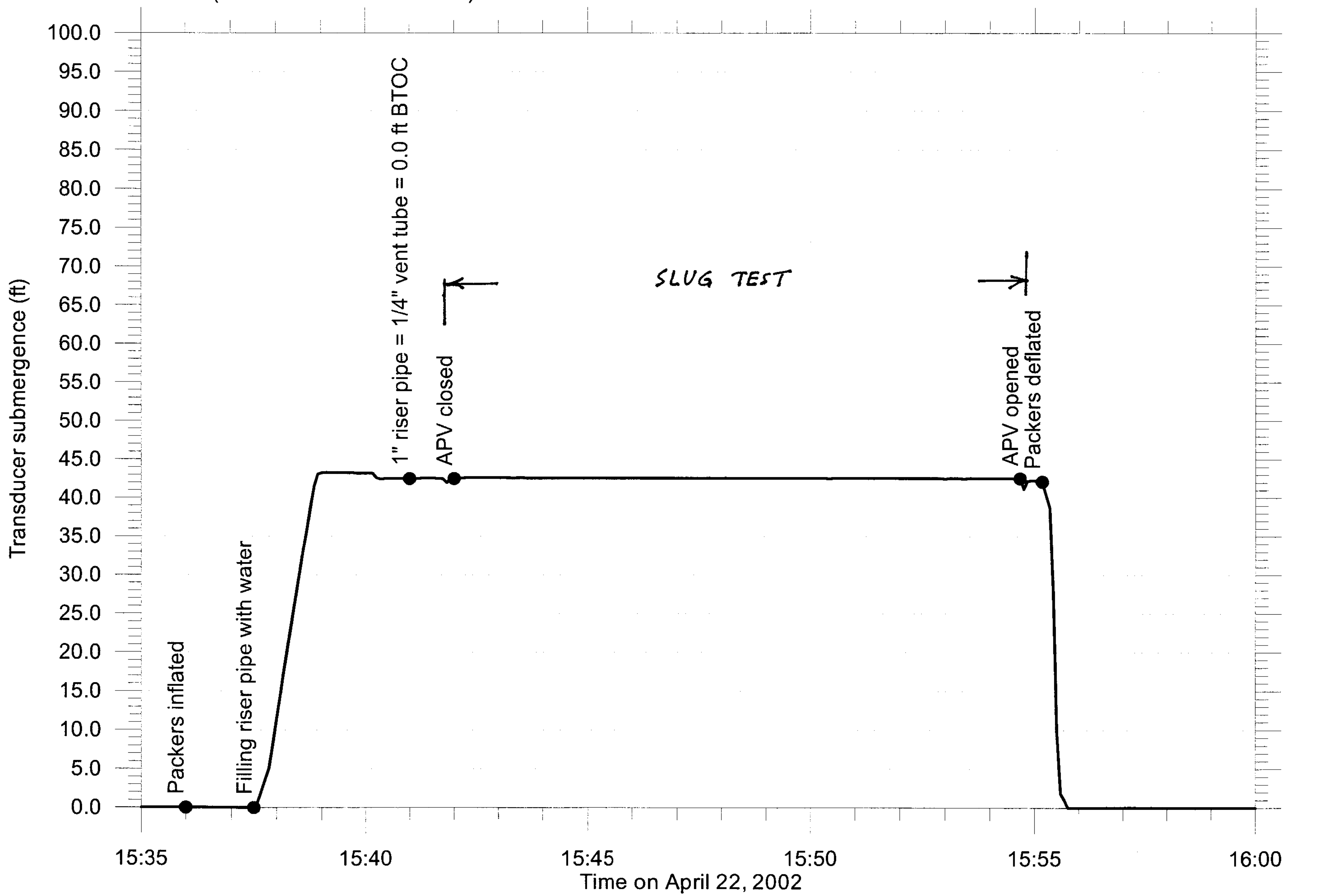
Casing Radius: 0.0104 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

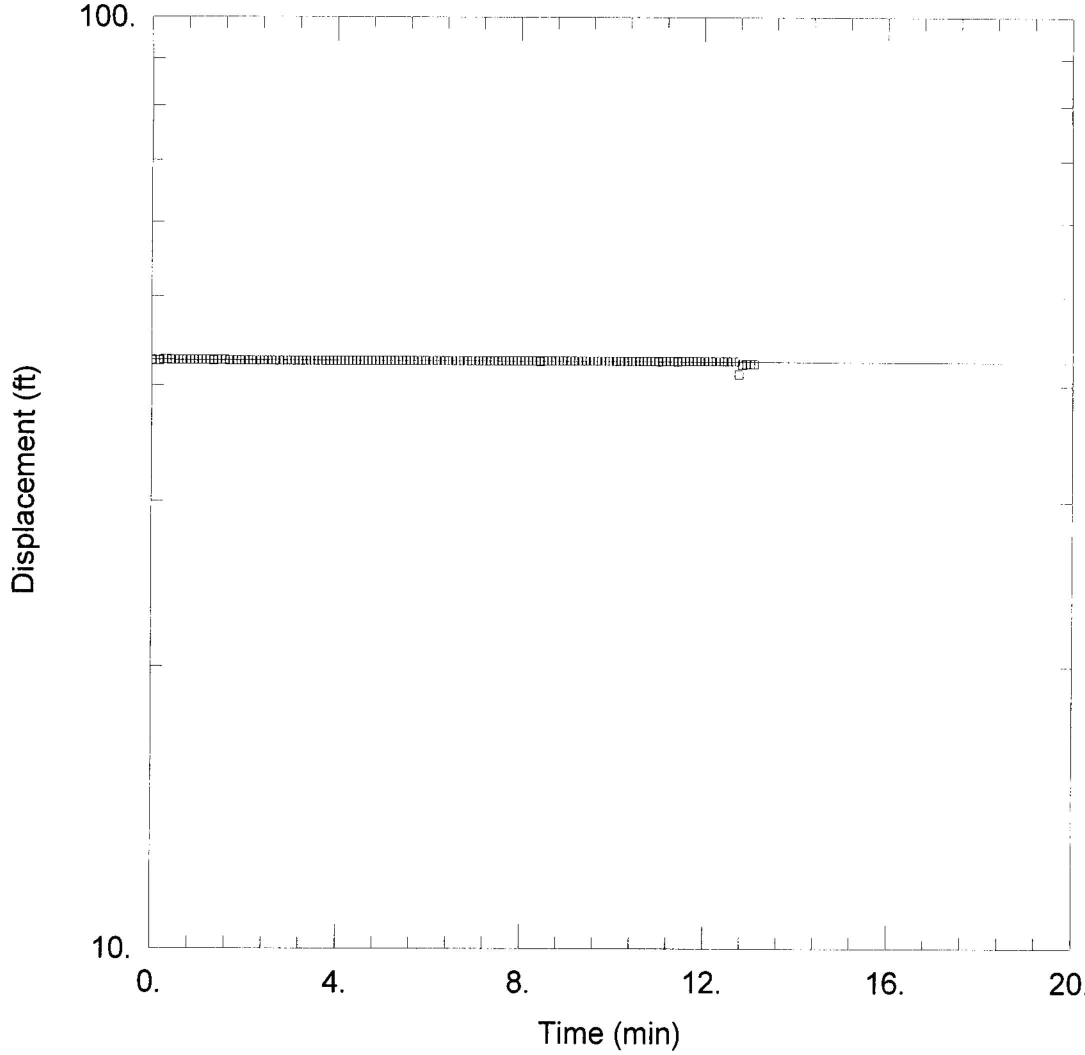
SOLUTION

Aquifer Model: Confined
Solution Method:

K = 1.228E-05 ft/day
y0 = 47.68 ft

D2M Packer Testing Retesting conducted 2002 April 22
Test 7 (541.20 to 536.00 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2M\2002-April-22\D2M0422-7.aqt
Date: 11/26/02 Time: 12:55:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2M0422-7)

Initial Displacement: 42.58 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0104 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 1.182E-05 ft/day
y0 = 42.58 ft

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

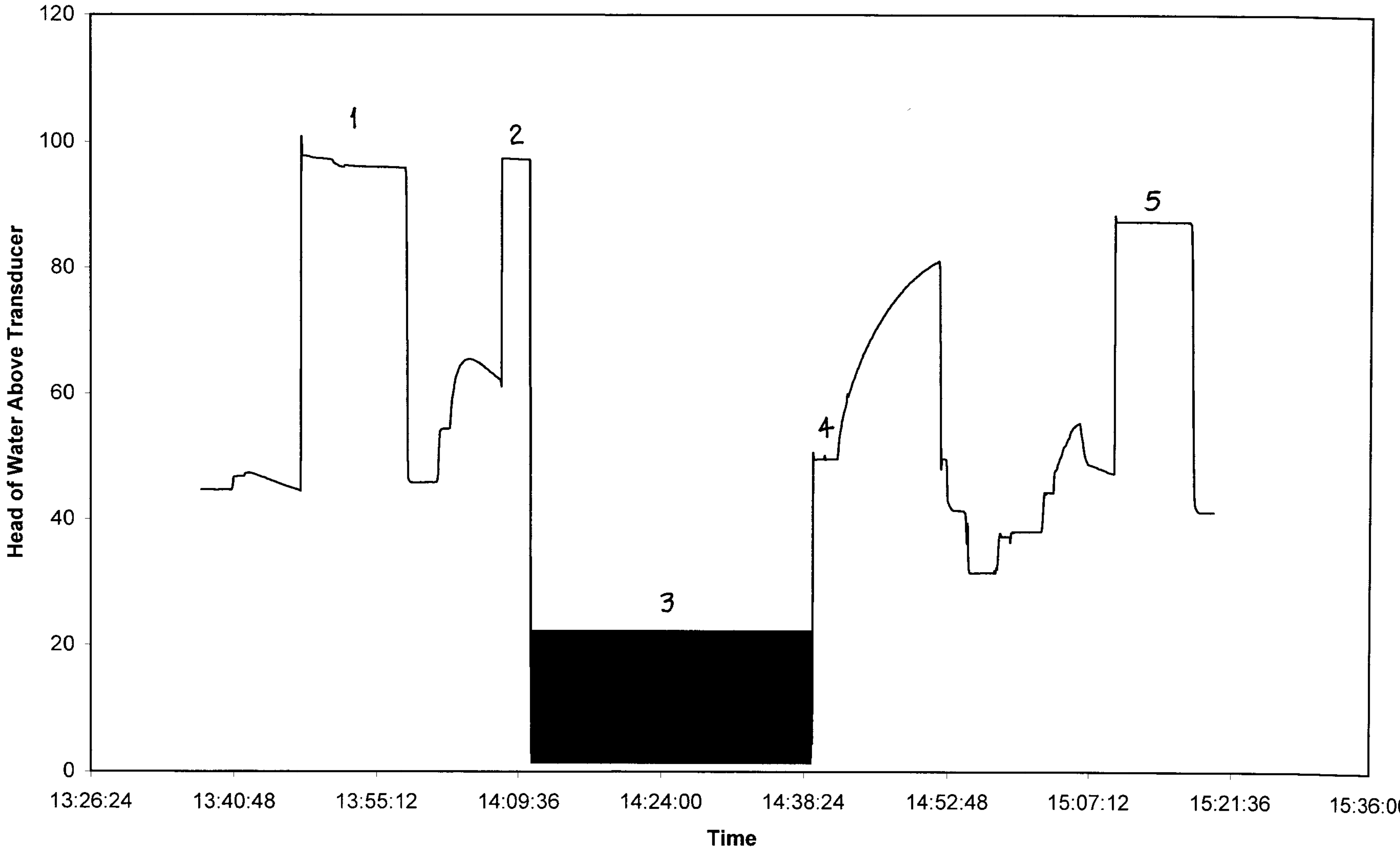
D2L

Testing Dates: April 12, 2002

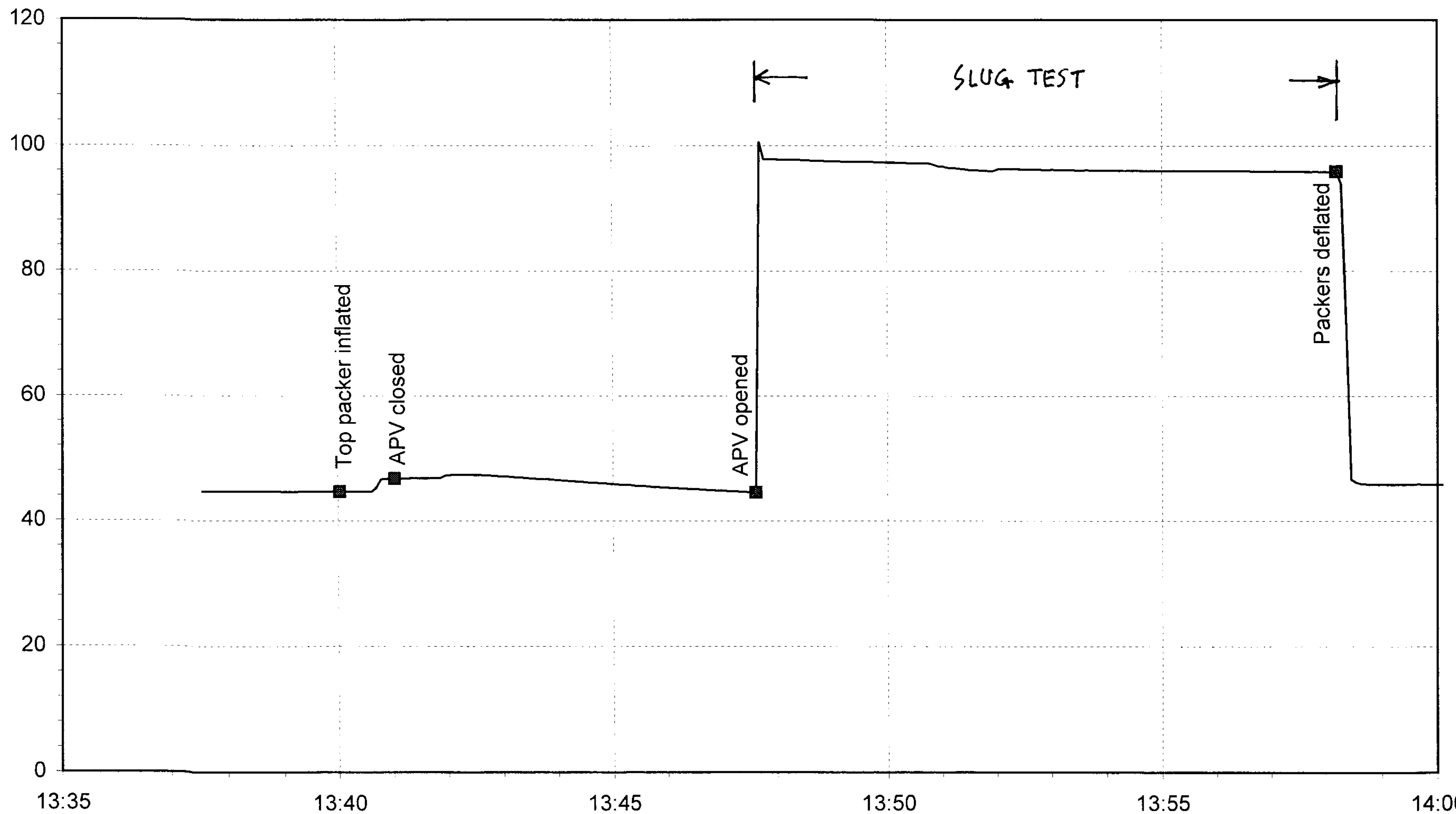
Summary of Tests:

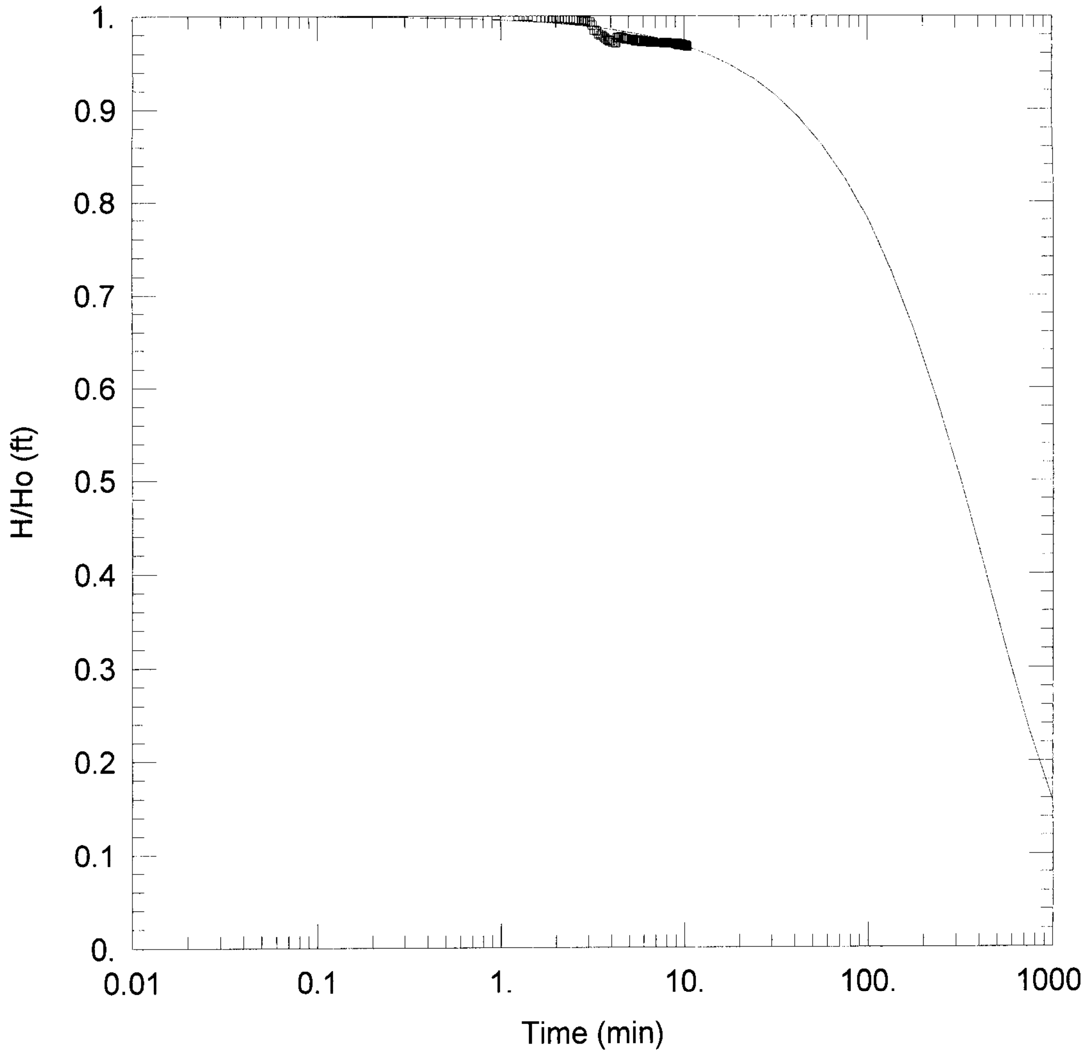
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
D2L	1	489.92	480.42	0.017	
D2L	2	489.92	484.72	<<1	
D2L	3	493.92	488.72	NIR (TE)	see PT Memo
D2L	4	497.92	492.72	NIR	see PT Memo
D2L	5	501.92	496.72	<<1	

Monitoring Well D2L



D2L
Transducer Submergence for Interval 1
(489.92 to 480.42 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2L\D2L-1.aqt
Date: 11/26/02 Time: 08:20:42

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA (D2L Test 1)

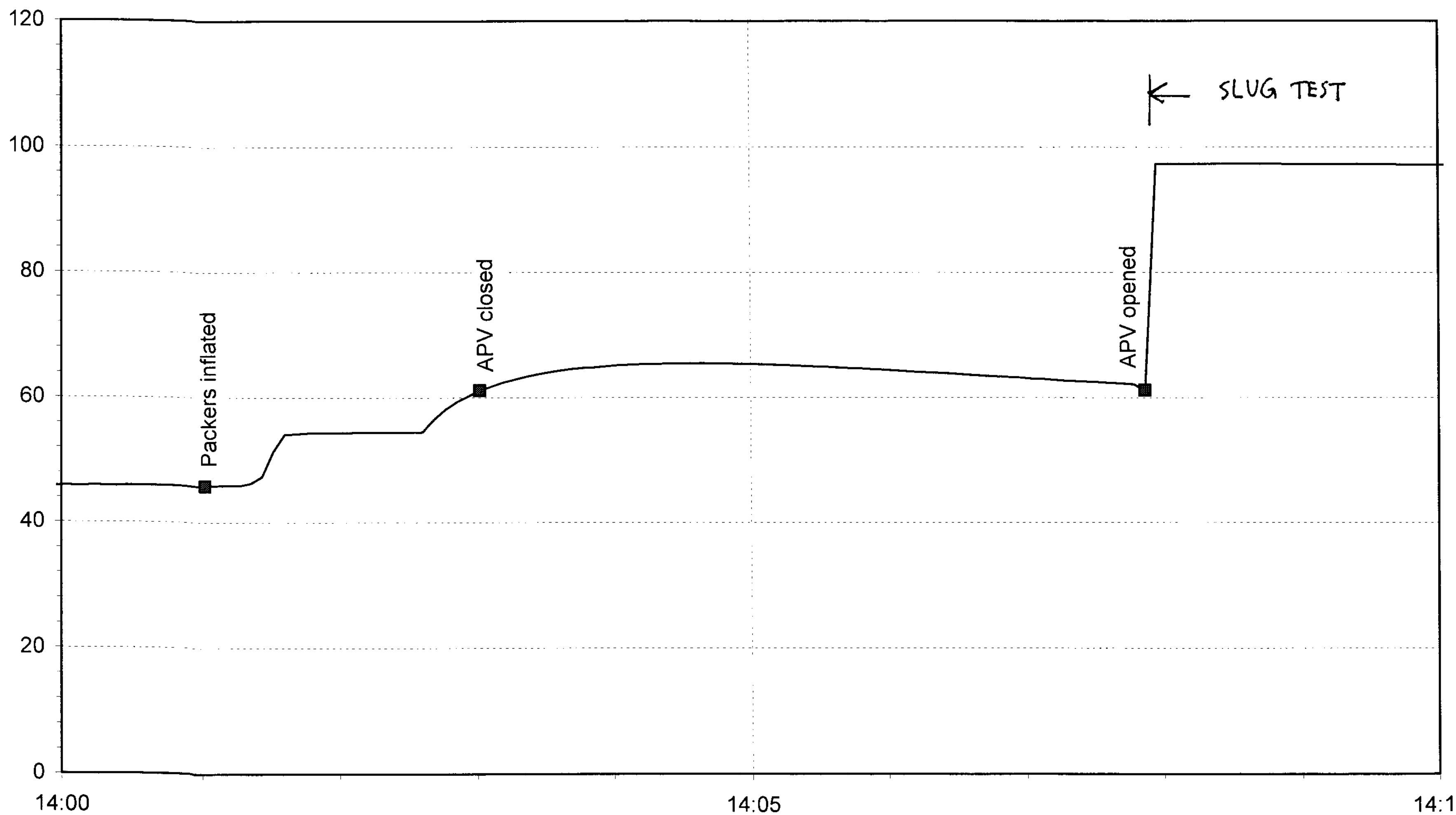
Initial Displacement: 53. ft
Wellbore Radius: 0.1615 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 1. ft

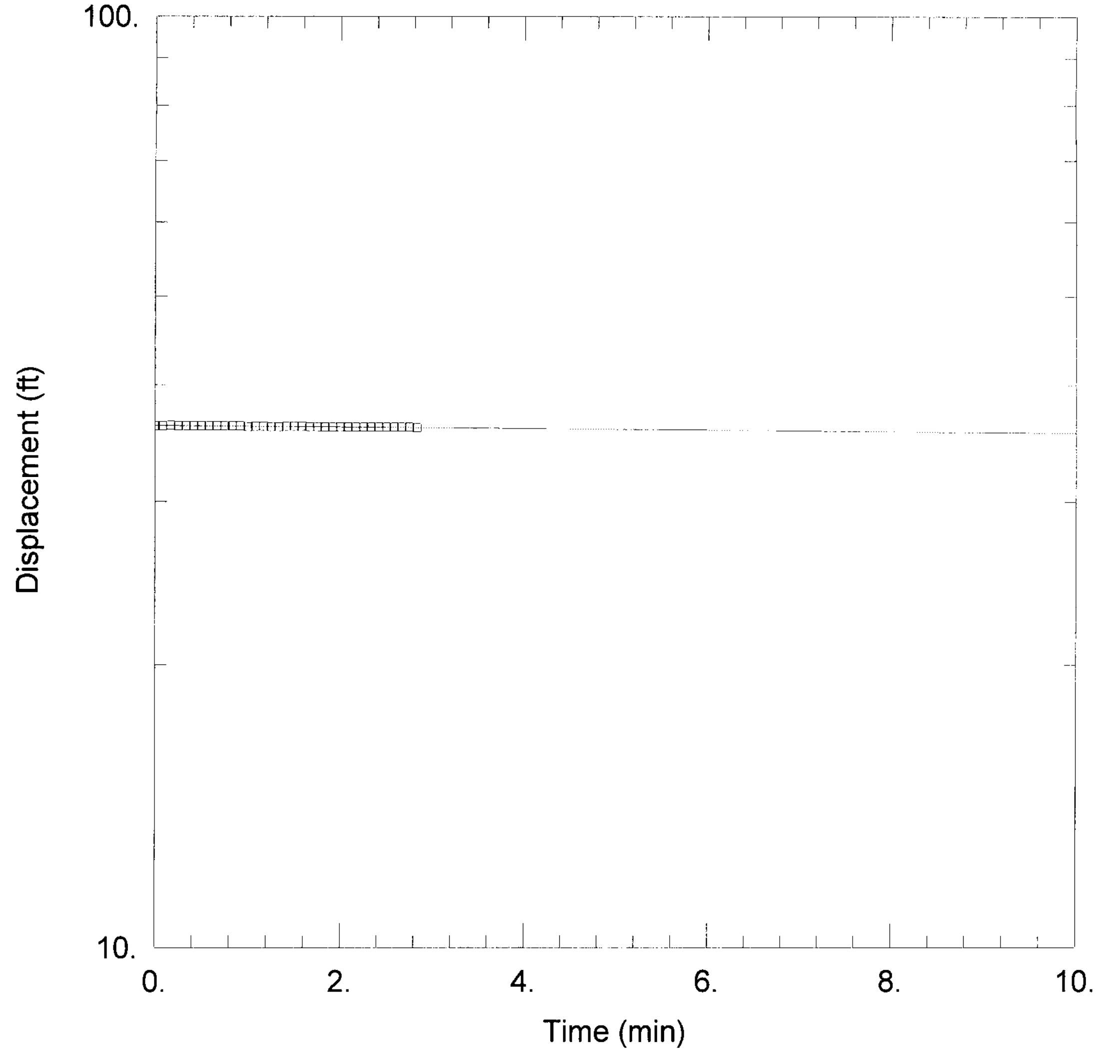
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.01669 ft^2/day
S = 1.E-06

D2L
Transducer Submergence for Interval 2
(489.92 to 484.72 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2L\D2L-2.aqt
Date: 11/26/02 Time: 08:20:45

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2L-2)

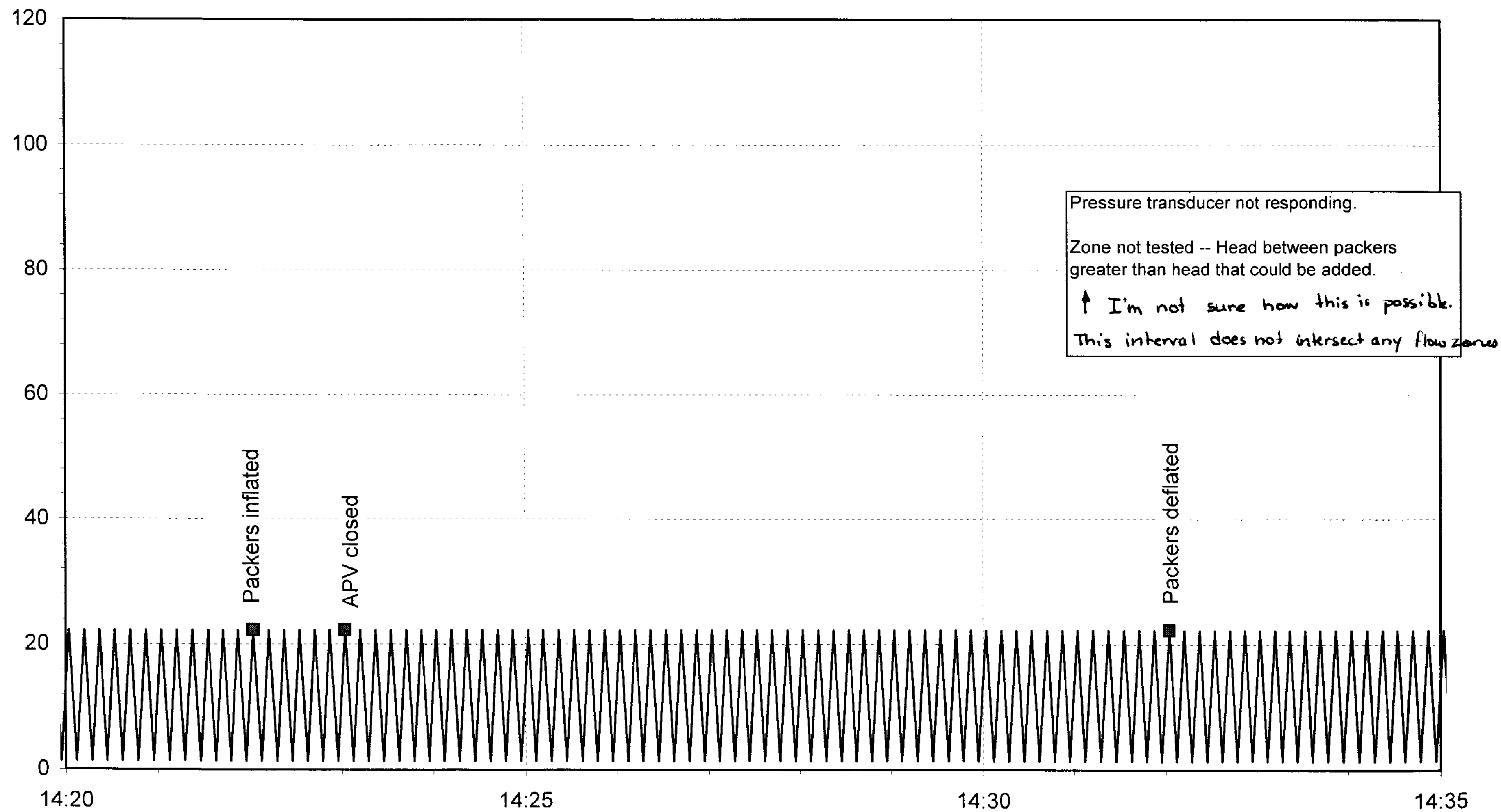
Initial Displacement: 36.16 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

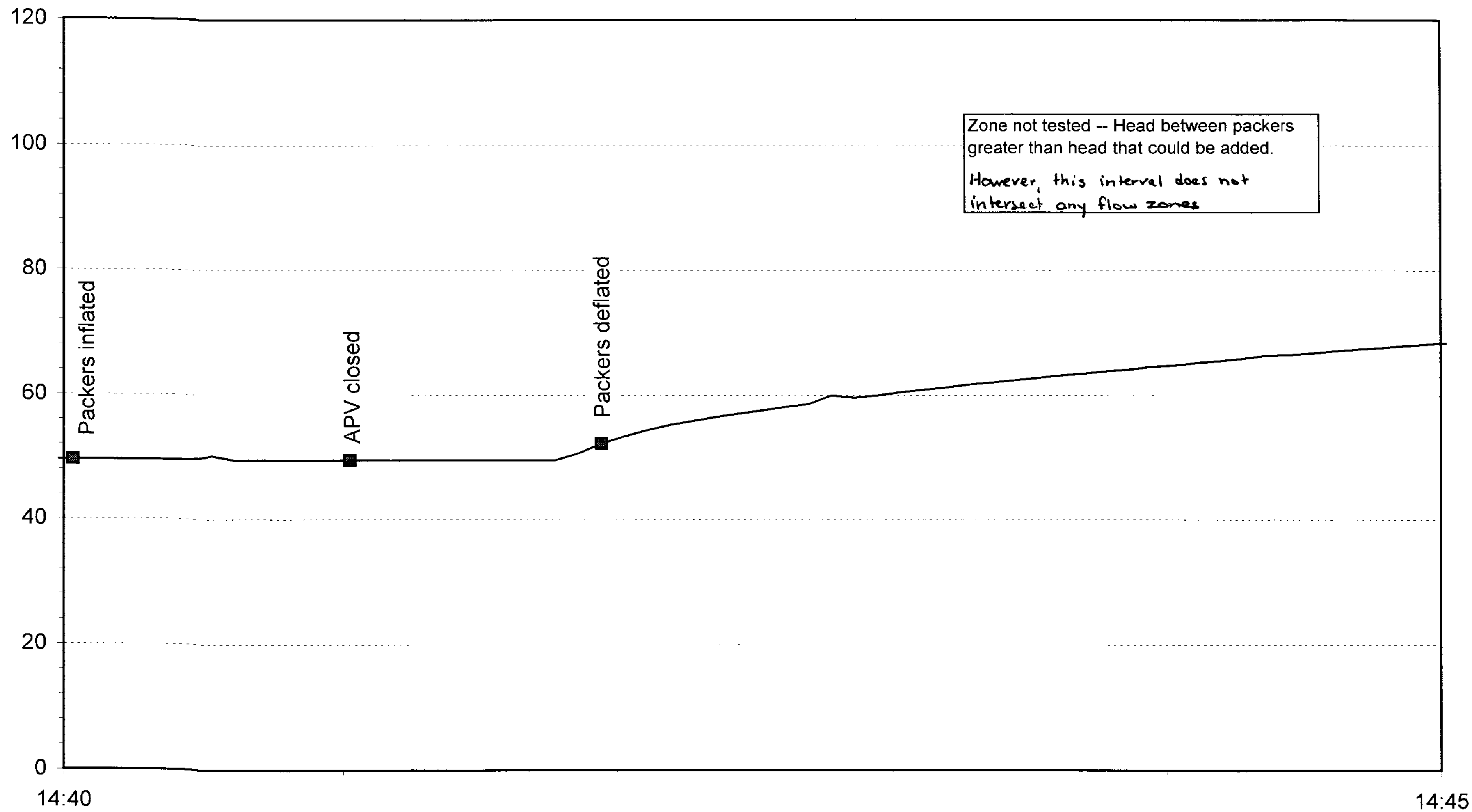
= 0.001513 ft/day y0 = 36.19 ft

D2L
Transducer Submergence for Interval 3
(493.92 to 488.72 ft AMSL)

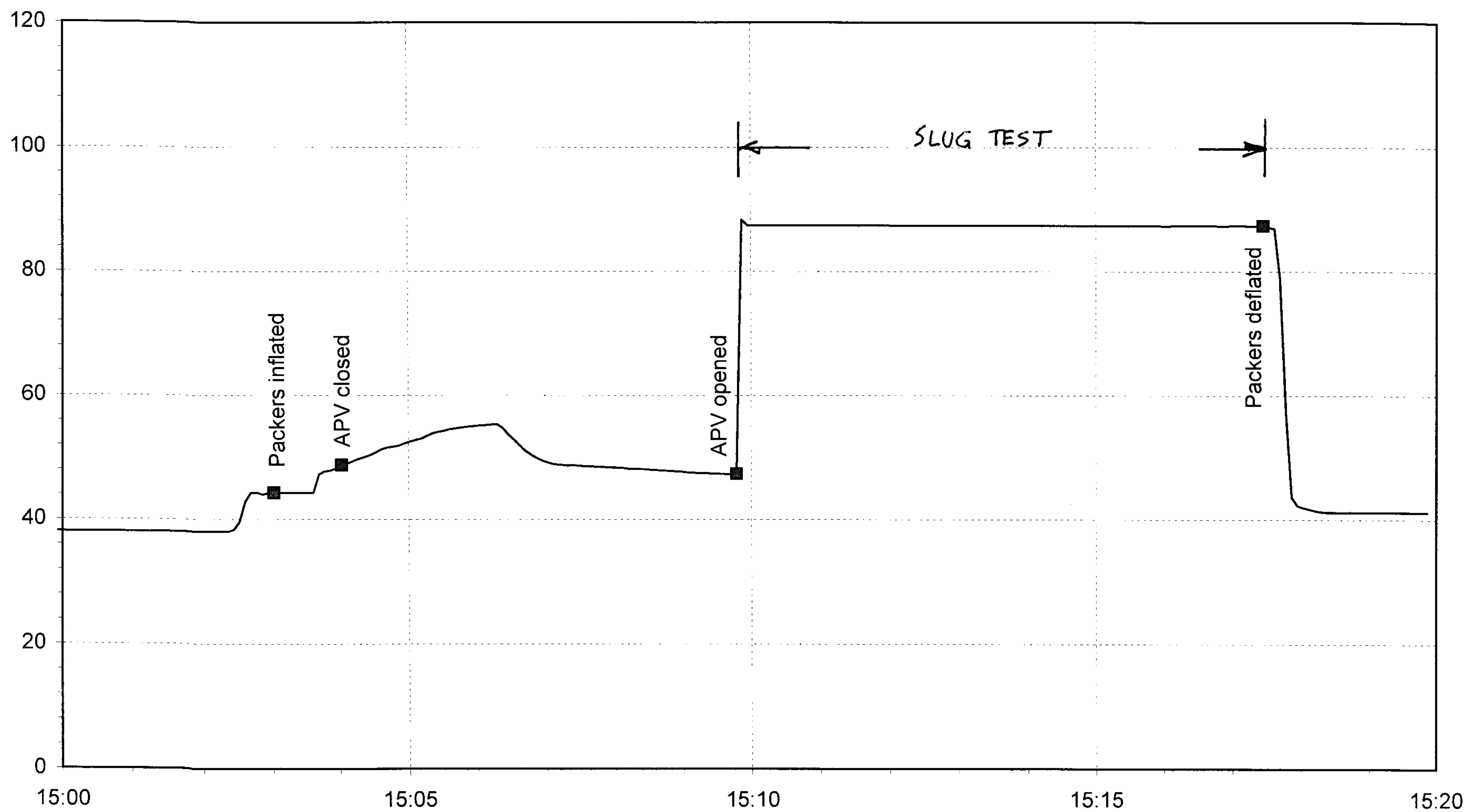


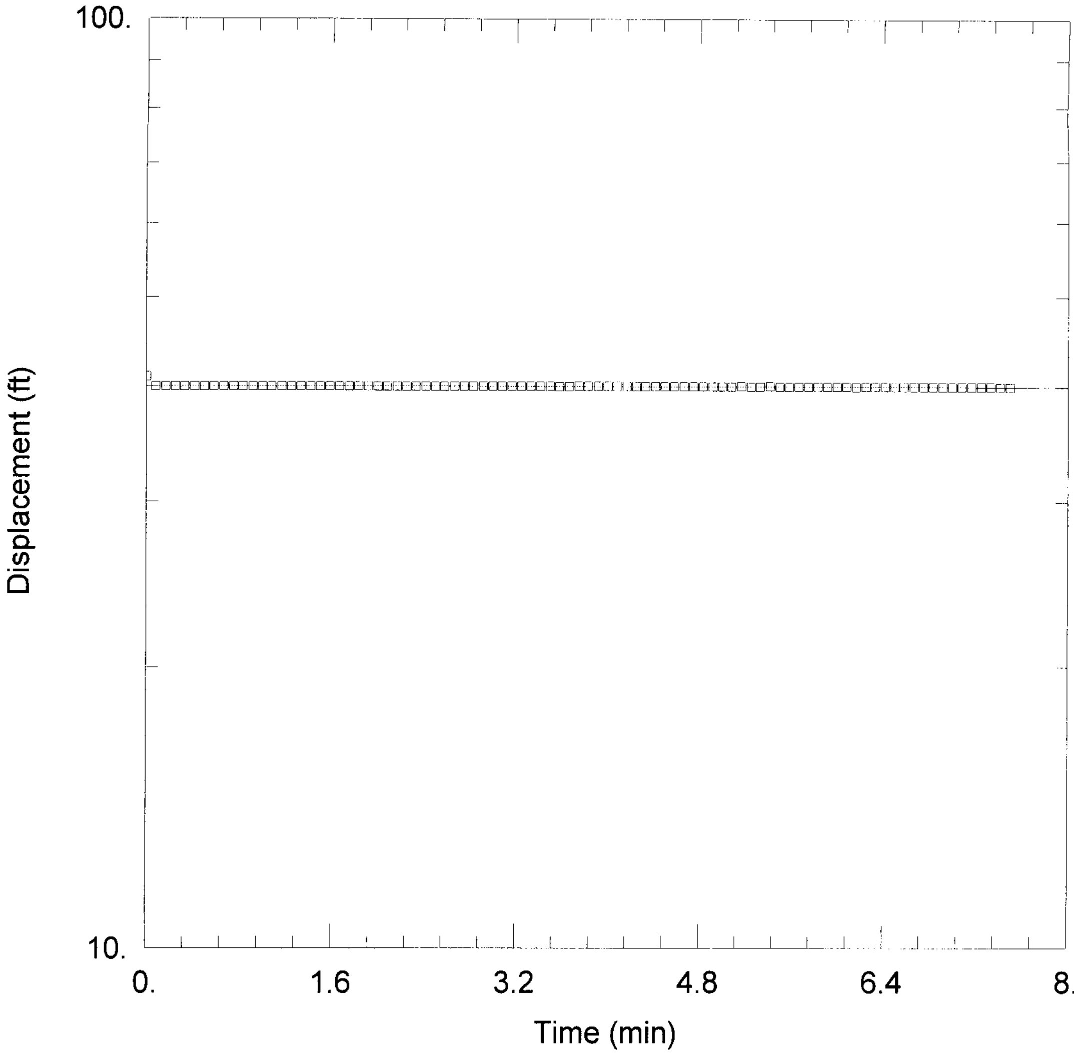
Apparently clear evidence of transducer malfunction

D2L
Transducer Submergence for Interval 4
(497.92 to 492.72 ft AMSL)



D2L
Transducer Submergence for Interval 5
(501.92 to 469.72 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\D2L\D2L-5.aqt
Date: 11/26/02 Time: 08:20:49

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (D2L-5)

Initial Displacement: 40.98 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0001735 ft/day
y0 = 40.03 ft

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

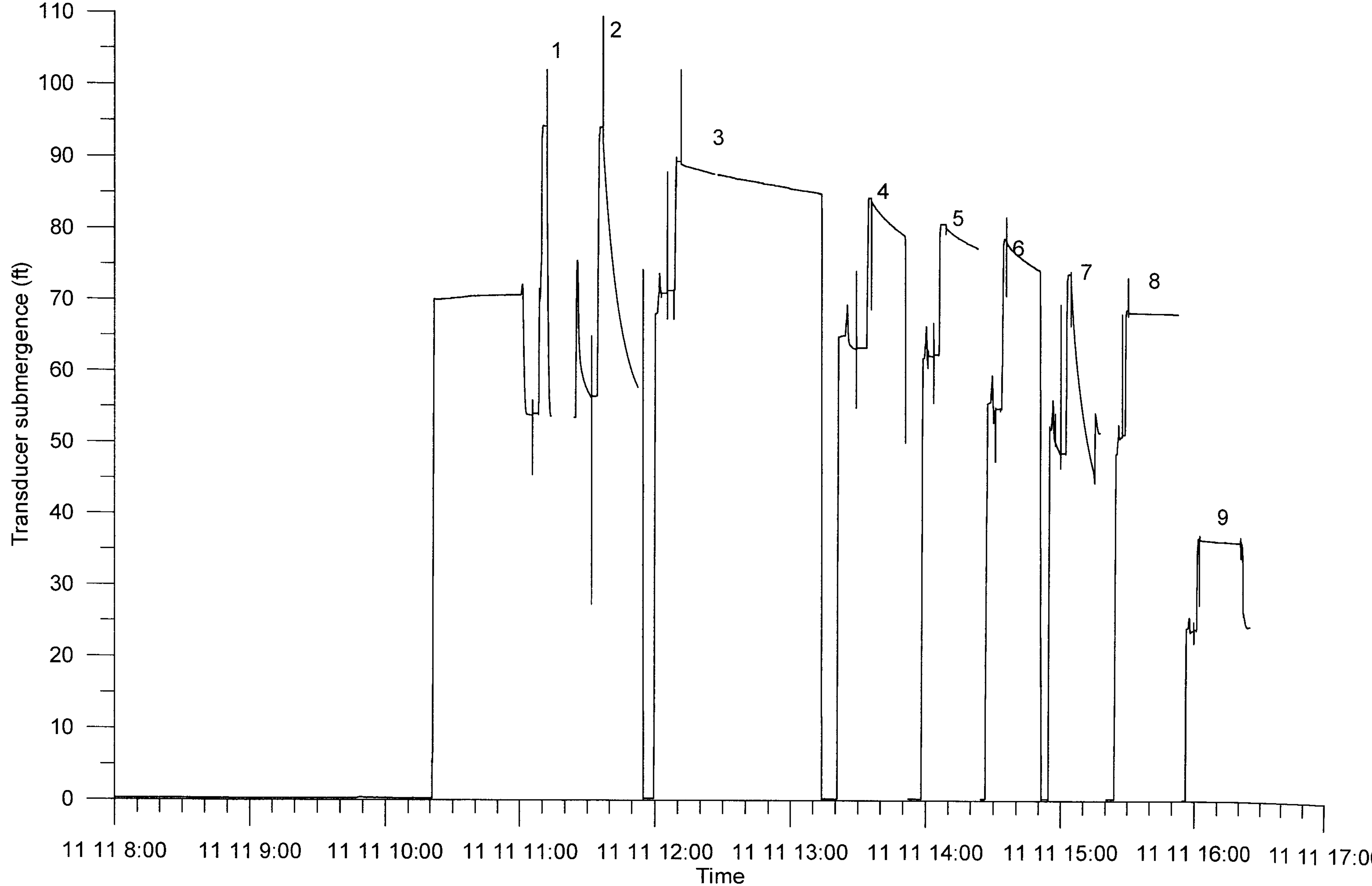
E6

Testing Dates: November 11 - 12, 2002

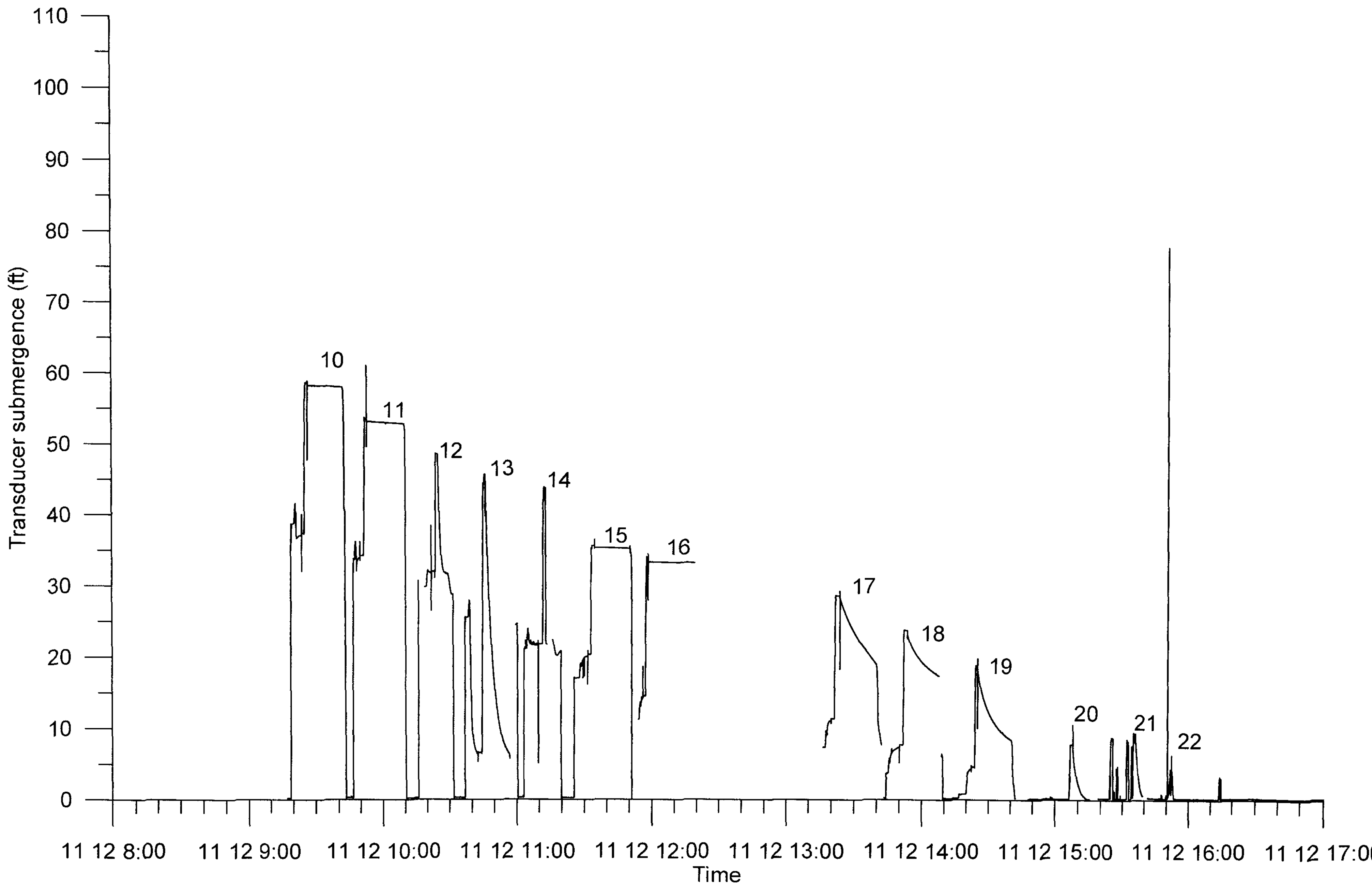
Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
E6	1	479.76	470.36	25	
E6	2	479.76	474.26	2.2	
E6	3	484.26	478.76	0.02	
E6	4	488.76	483.26	0.12	
E6	5	493.26	487.76	0.13	
E6	6	497.76	492.26	0.03	
E6	7	502.26	496.76	2.7	
E6	8	506.76	501.26	<0.001	
E6	9	511.26	505.76	0.01	
E6	10	515.76	510.26	<0.001	
E6	11	520.26	514.76	<0.001	
E6	12	524.76	519.26	16	
E6	13	529.26	523.76	4.9	
E6	14	533.76	528.26	297	
E6	15	538.26	532.76	<0.001	
E6	16	542.76	537.26	<0.001	
E6	17	547.26	541.76	0.64	
E6	18	551.76	546.26	0.07	
E6	19	556.26	550.76	0.3	
E6	20	560.76	555.26	6.7	
E6	21	565.26	559.76	8.7	
E6	22	569.76	564.26	36	

E6 Packer Testing

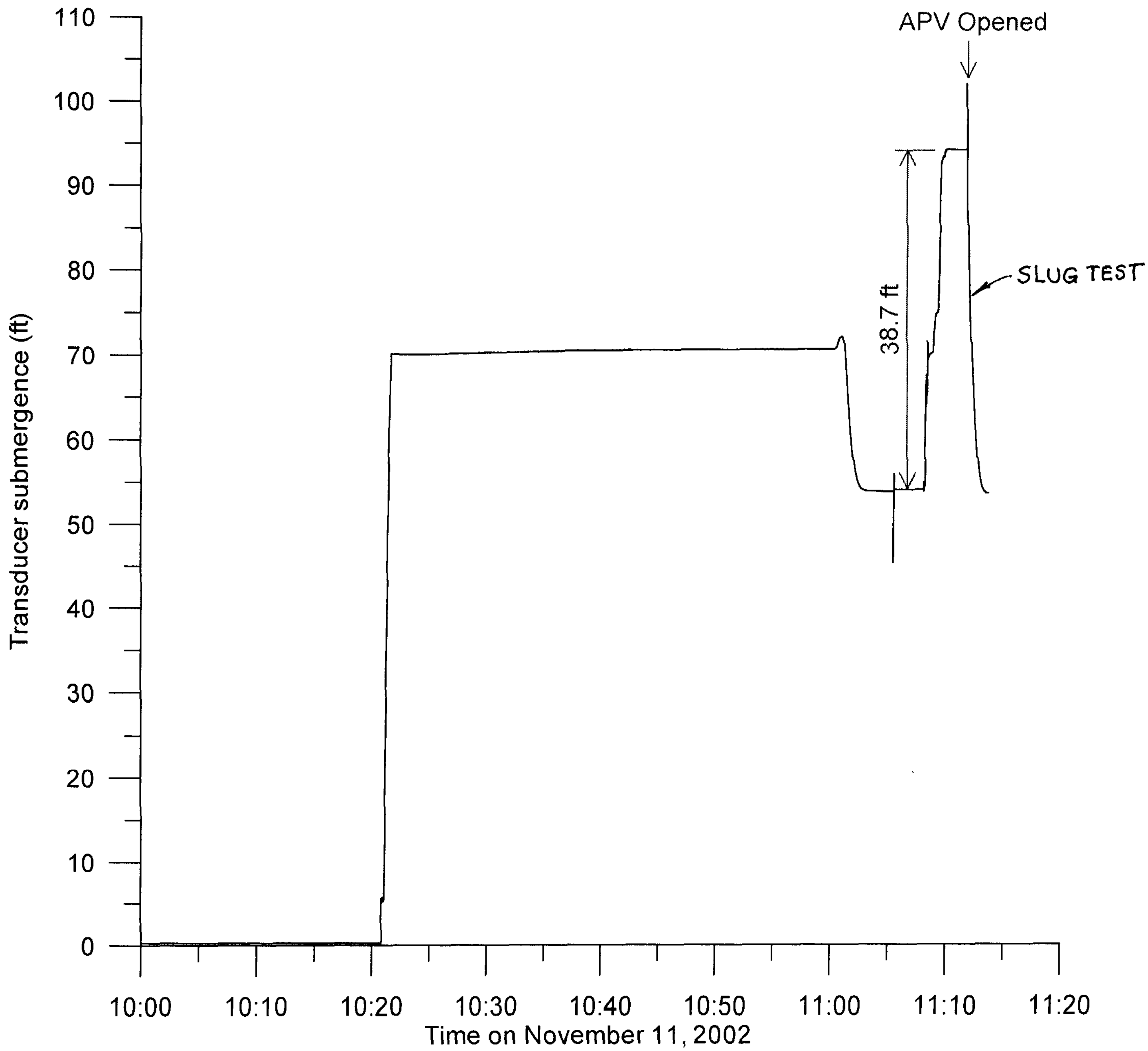


E6 Packer Testing

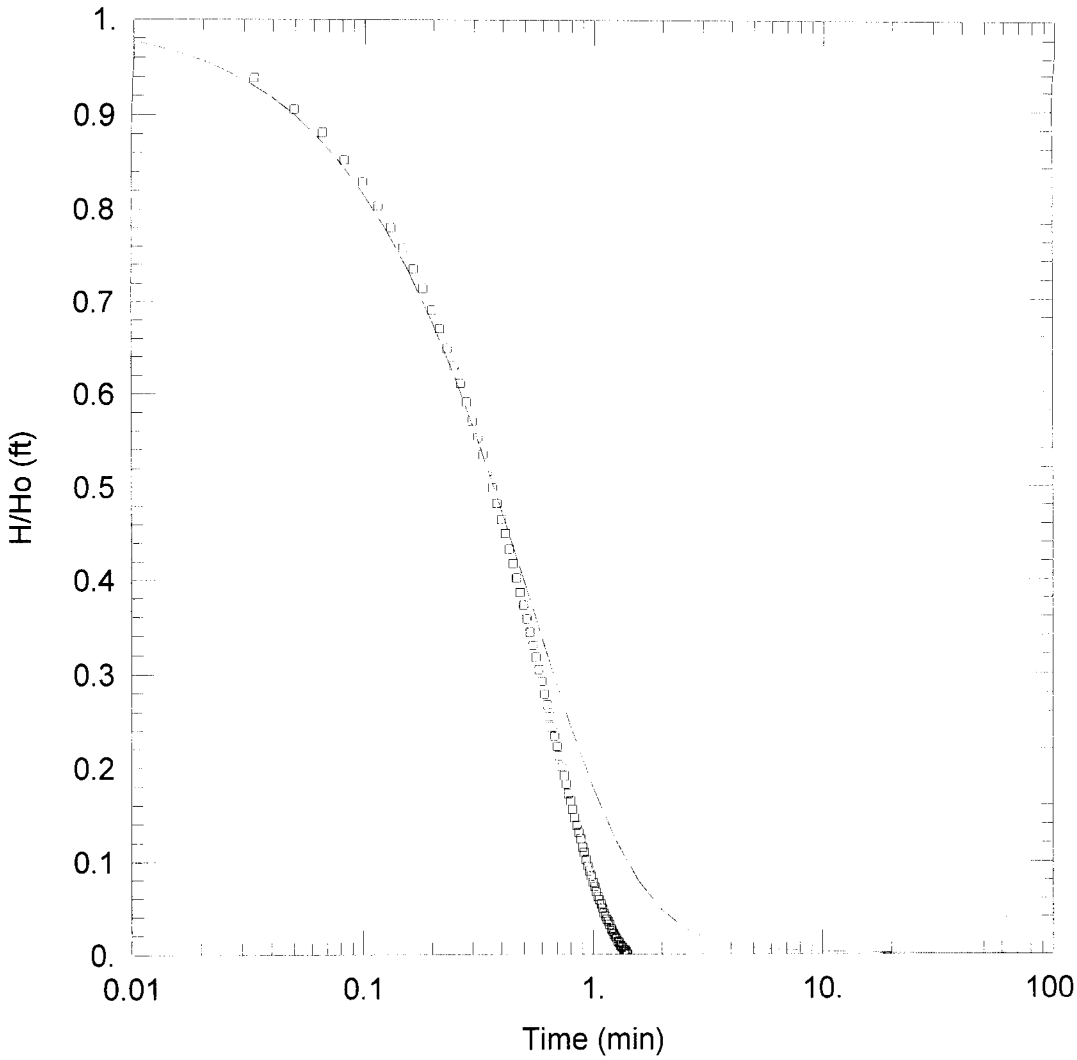


E6

Test 1



APV Opened
SLUG TEST
38.7 ft
Transducer submergence (ft)
110
100
90
80
70
60
50
40
30
20
10
0
10:00
10:10
10:20
10:30
10:40
10:50
11:00
11:10
11:20
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-1.aqt
Date: 12/06/02 Time: 15:04:37

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

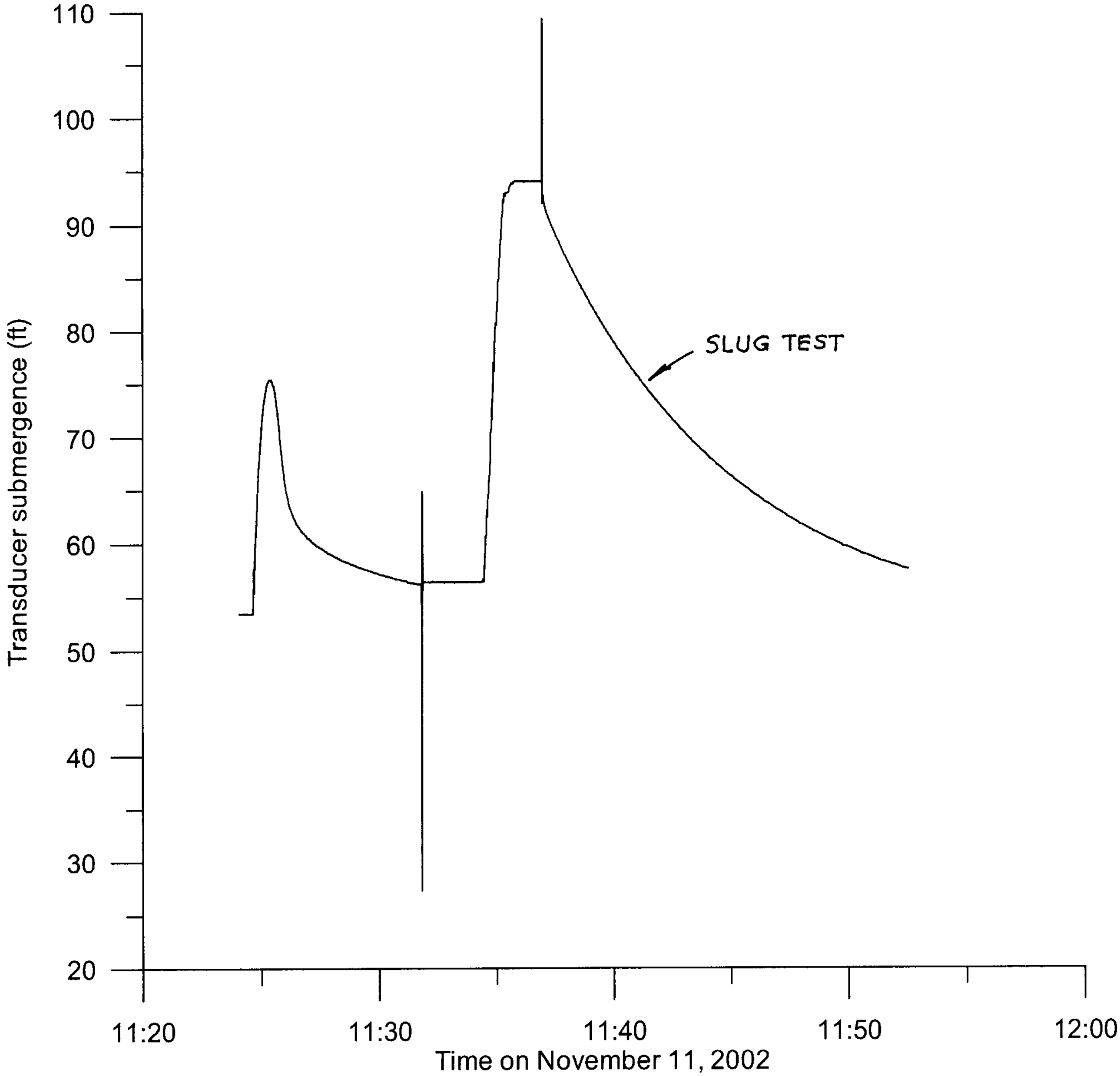
Initial Displacement: 38.7 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

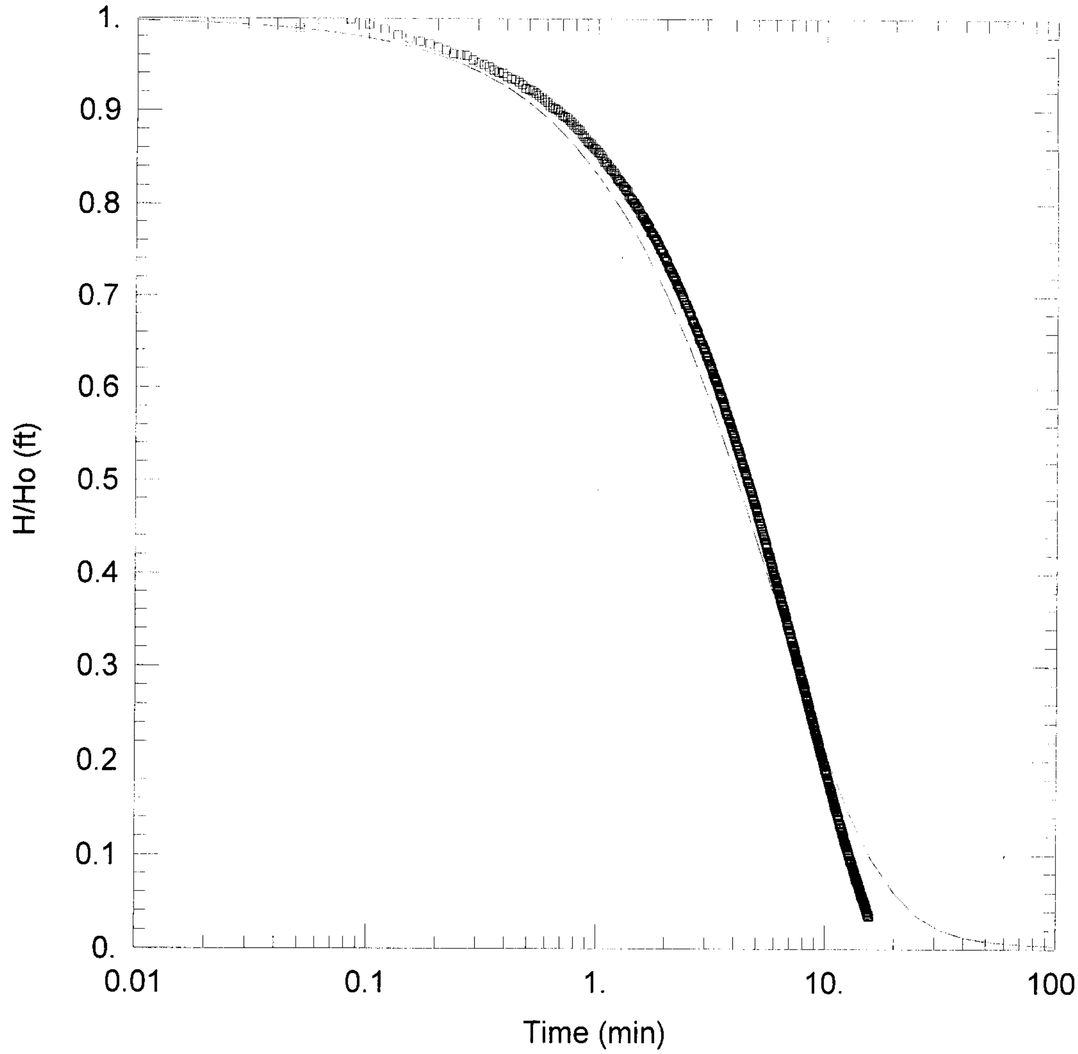
^quifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 24.64 ft^2/day S = 1.E-10

E6

Test 2



110
100
90
80
70
60
50
40
30
20
Transducer submergence (ft)
SLUG TEST
11:20
11:30
11:40
11:50
12:00
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-2.aqt
Date: 12/06/02 Time: 15:08:58

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

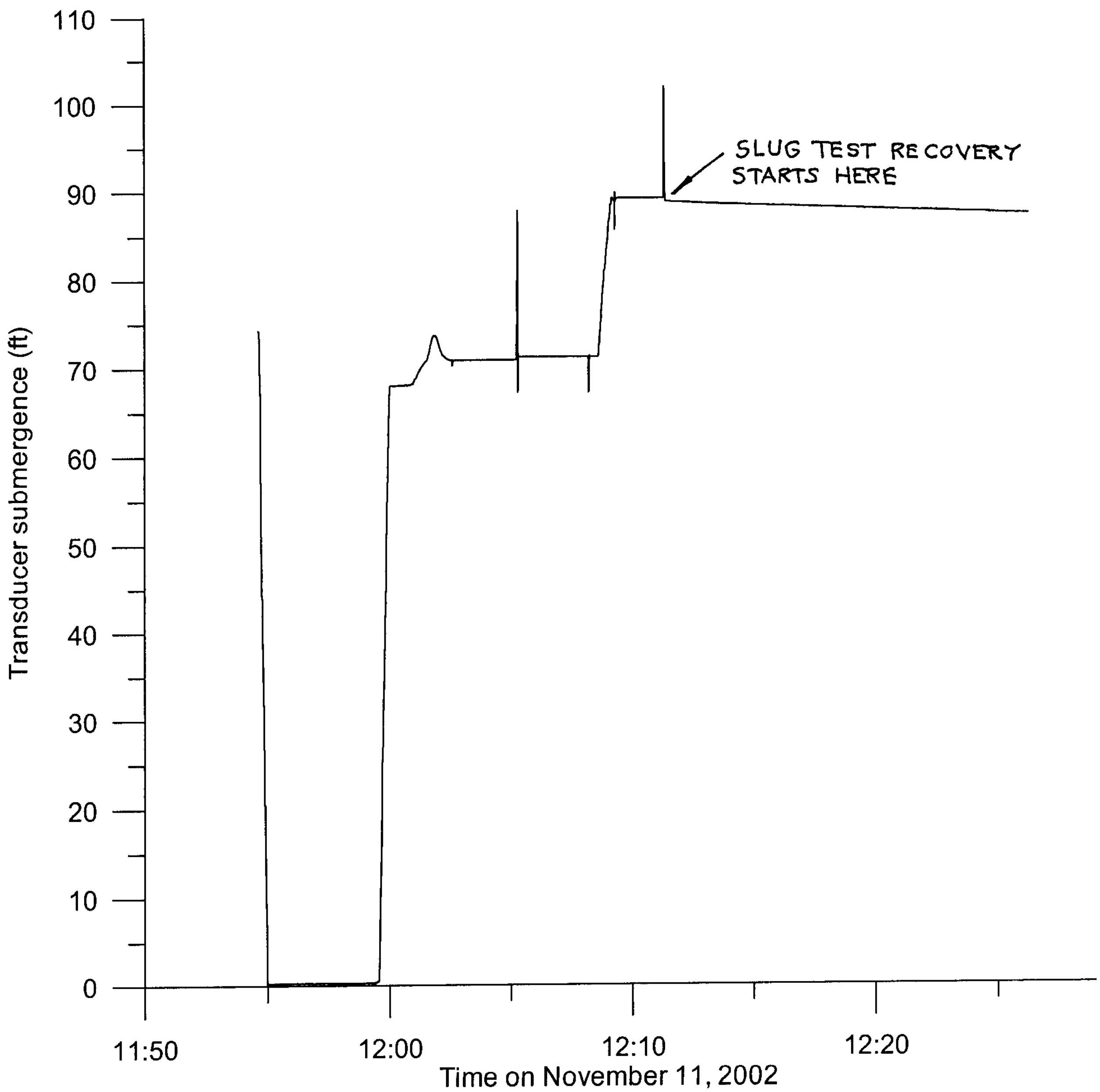
Initial Displacement: 36.02 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

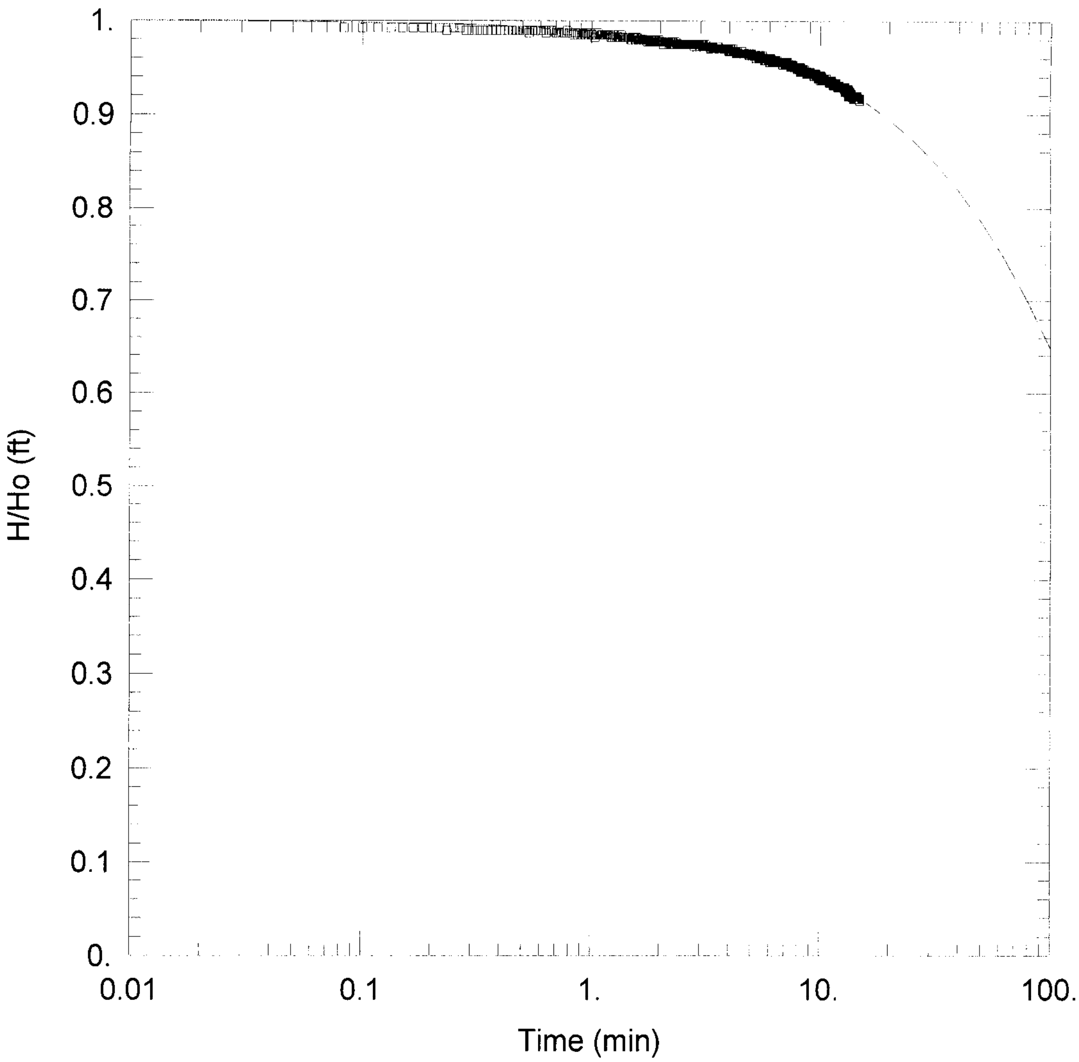
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 2.223 ft^2/day S = 1.E-10

E6

Test 3



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
SLUG TEST RECOVERY STARTS HERE
11:50
12:00
12:10
12:20
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-3.aqt
Date: 12/06/02 Time: 15:07:02

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

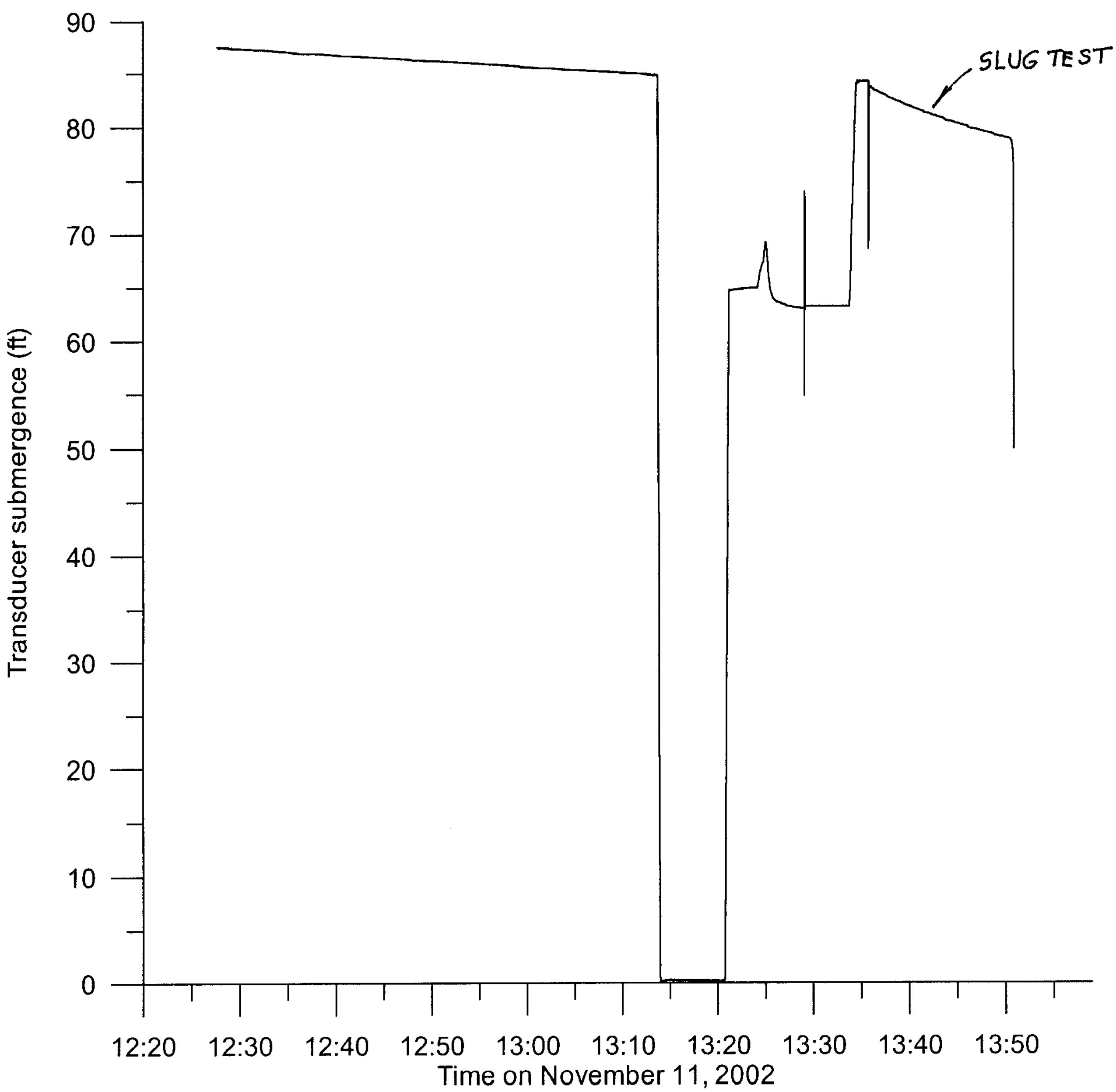
Initial Displacement: 17.79 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

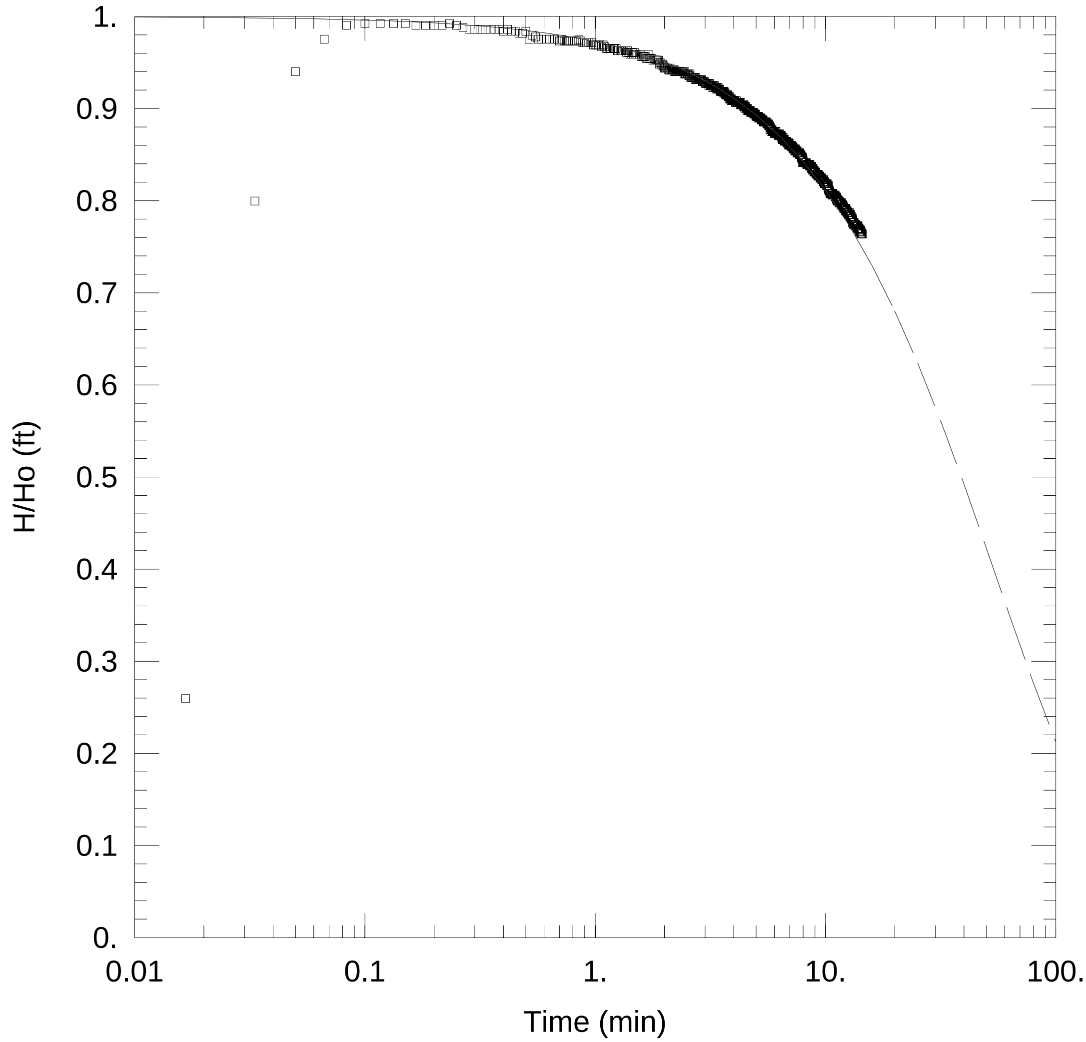
^quifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.02169 ft^2/day S = 1.E-05

E6

Test 4



SLUG TEST
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
12:20
12:30
12:40
12:50
13:00
13:10
13:20
13:30
13:40
13:50
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\E6\E6-4.aqt
Date: 01/22/03 Time: 10:39:01

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 20.66 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

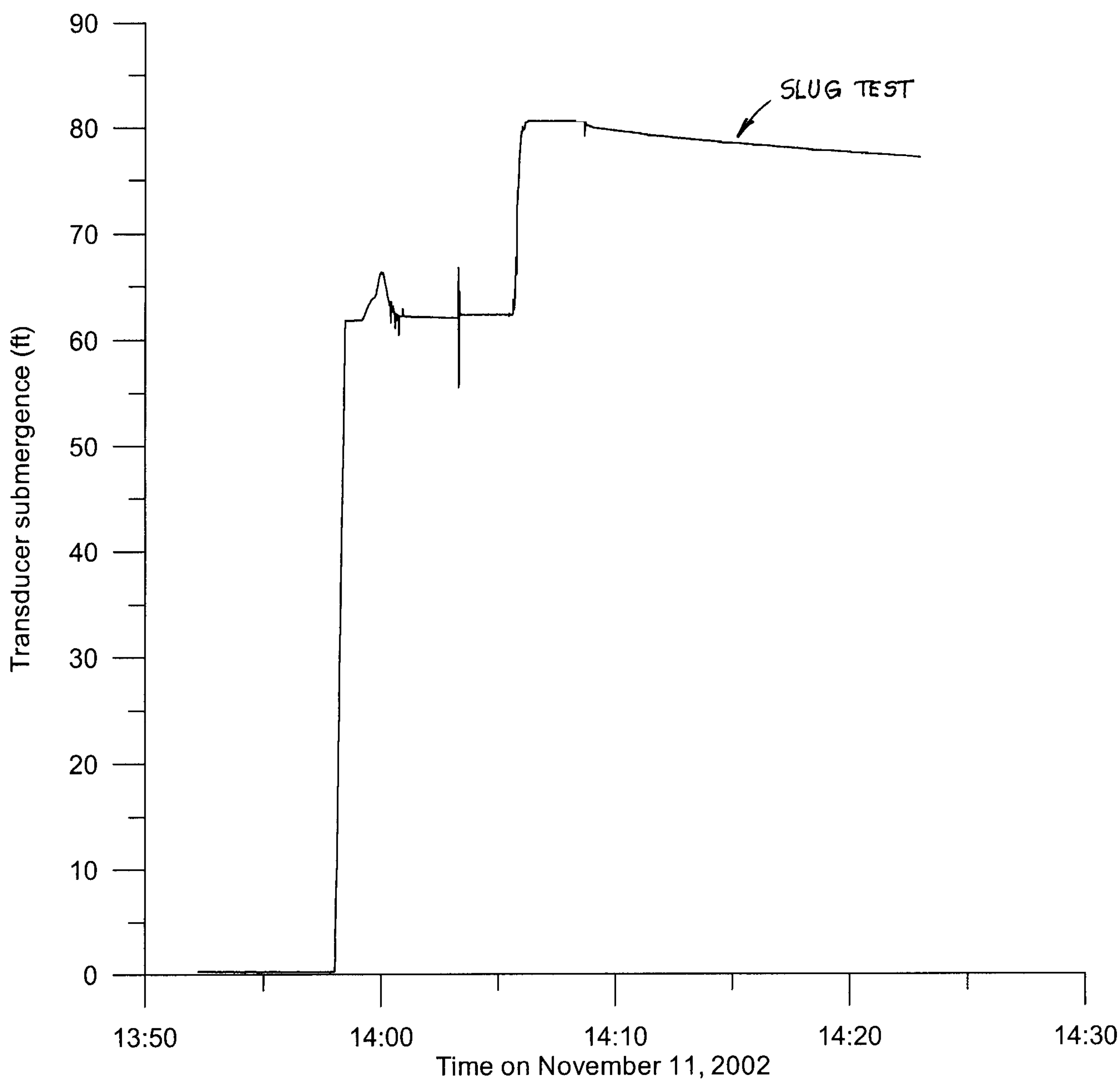
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

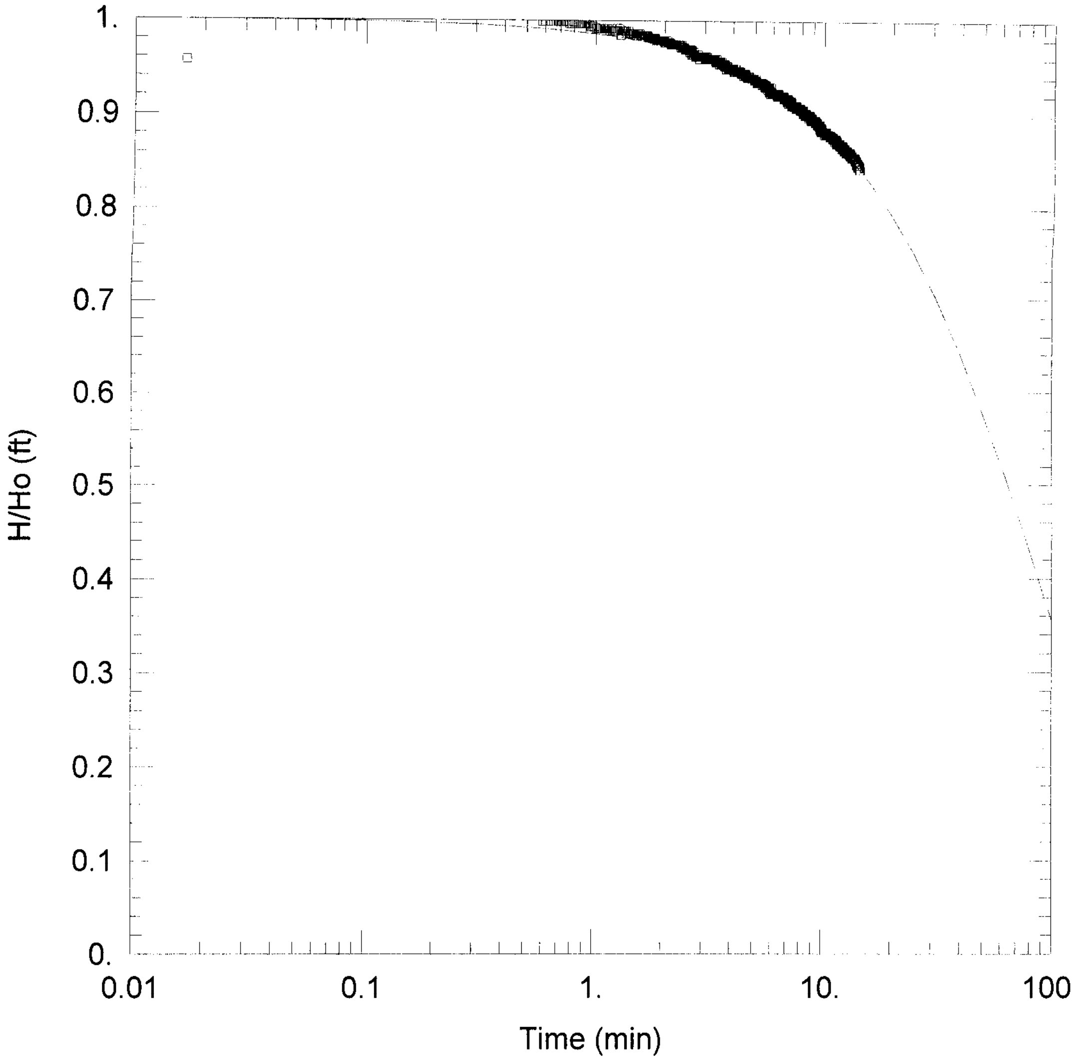
T = 0.1254 ft^2/day S = 1.E-06

E6

Test 5



SLUG TEST
Transducer submergence (ft)
90
80
70
60
50
40
30
20
10
0
13:50
14:00
14:10
14:20
14:30
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-5.aqt
Date: 12/06/02 Time: 15:06:23

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

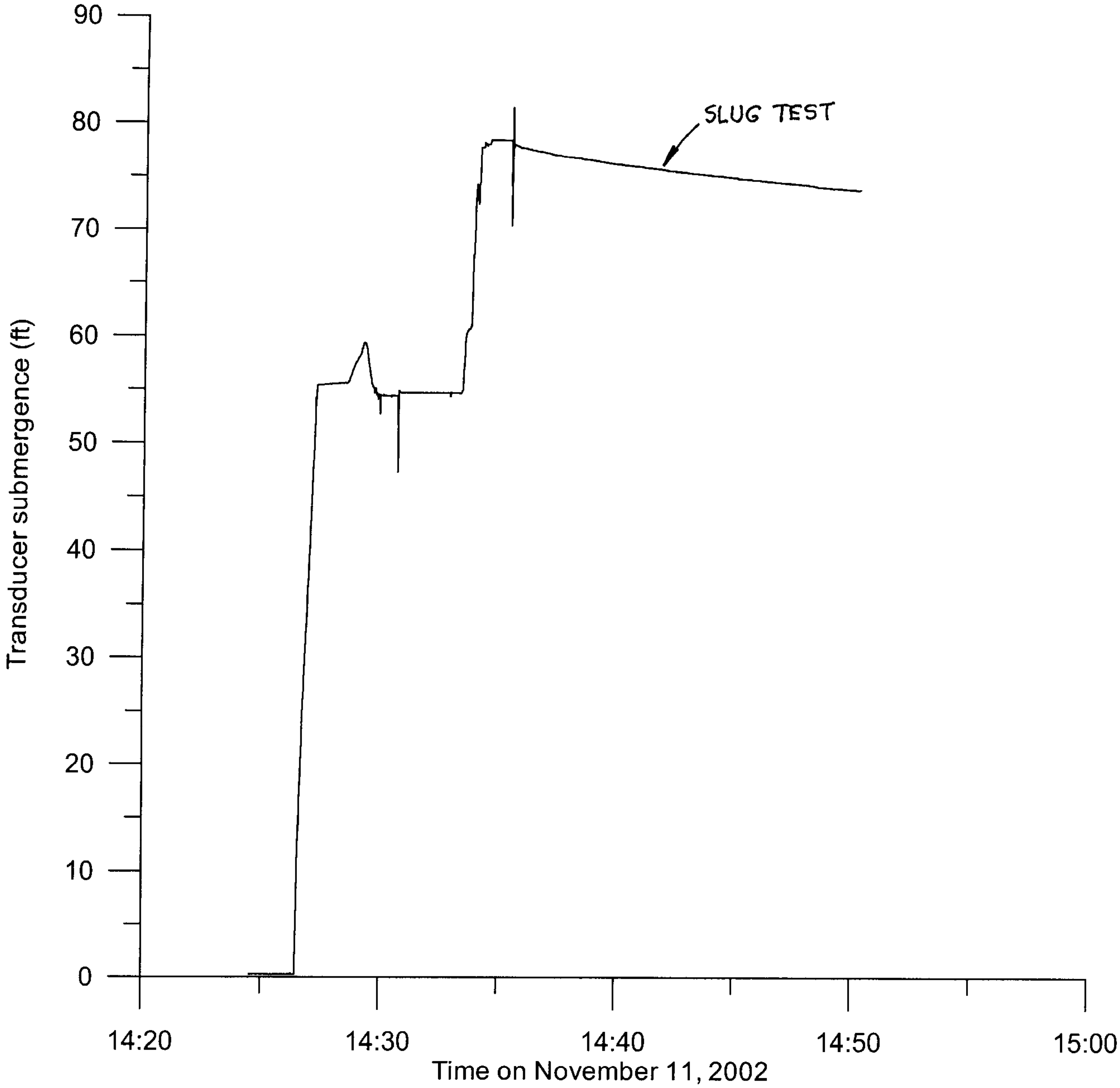
Initial Displacement: 17.58 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

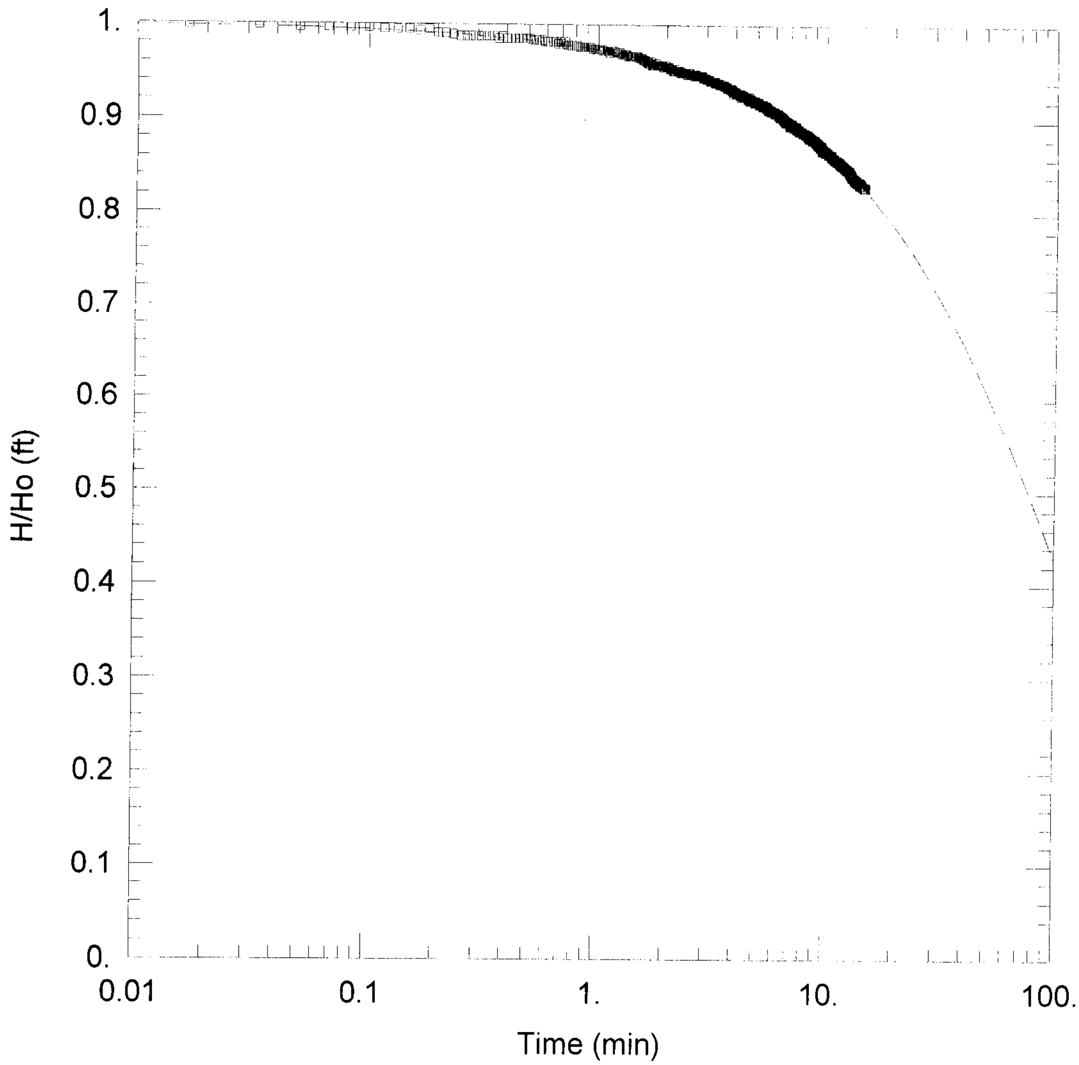
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1283 ft^2/day
S = 6.156E-10

E6

Test 6



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
SLUG TEST
14:20
14:30
14:40
14:50
15:00
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-6.aqt
Date: 12/06/02 Time: 15:05:39

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

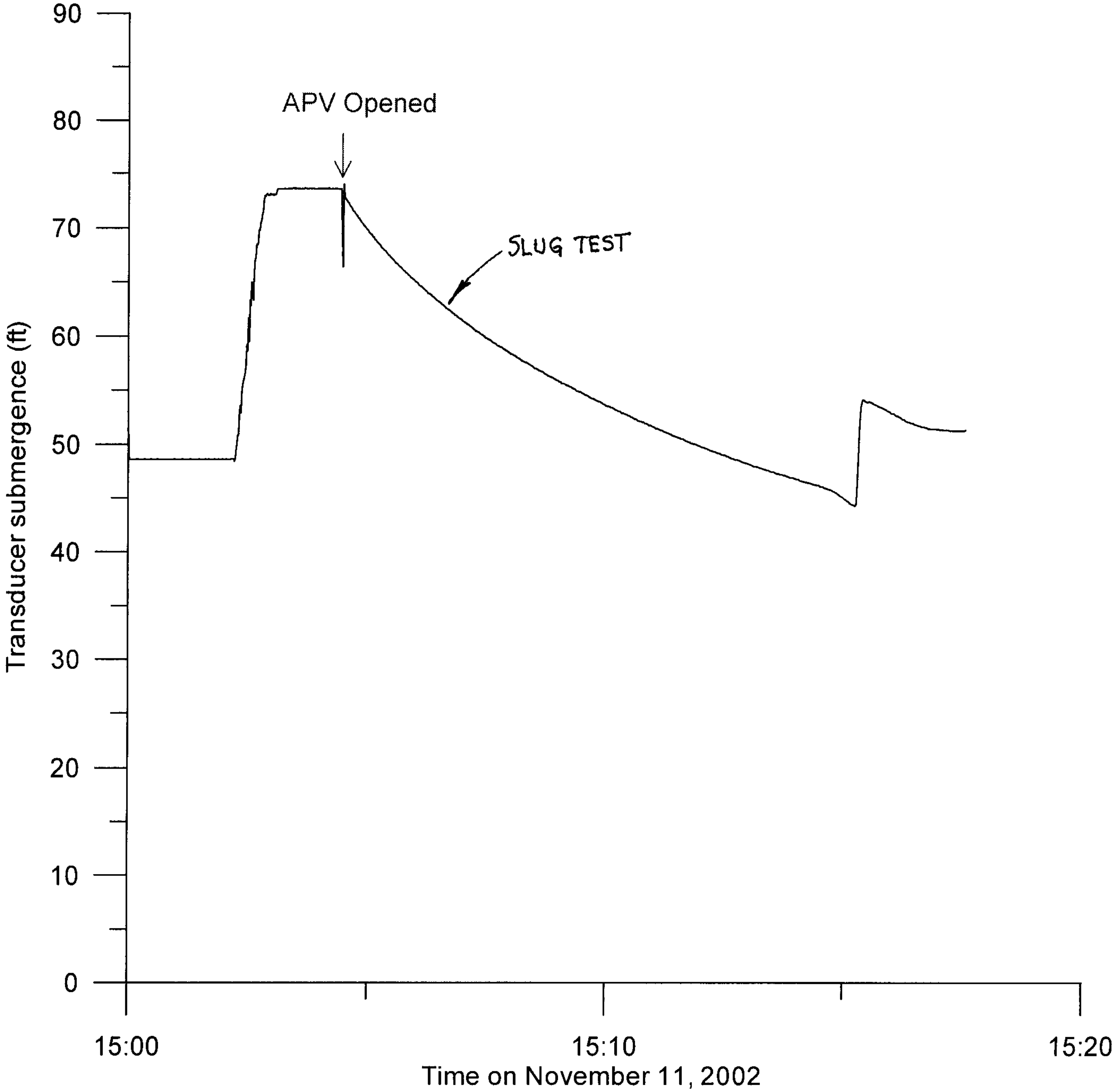
Initial Displacement: 23.44 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

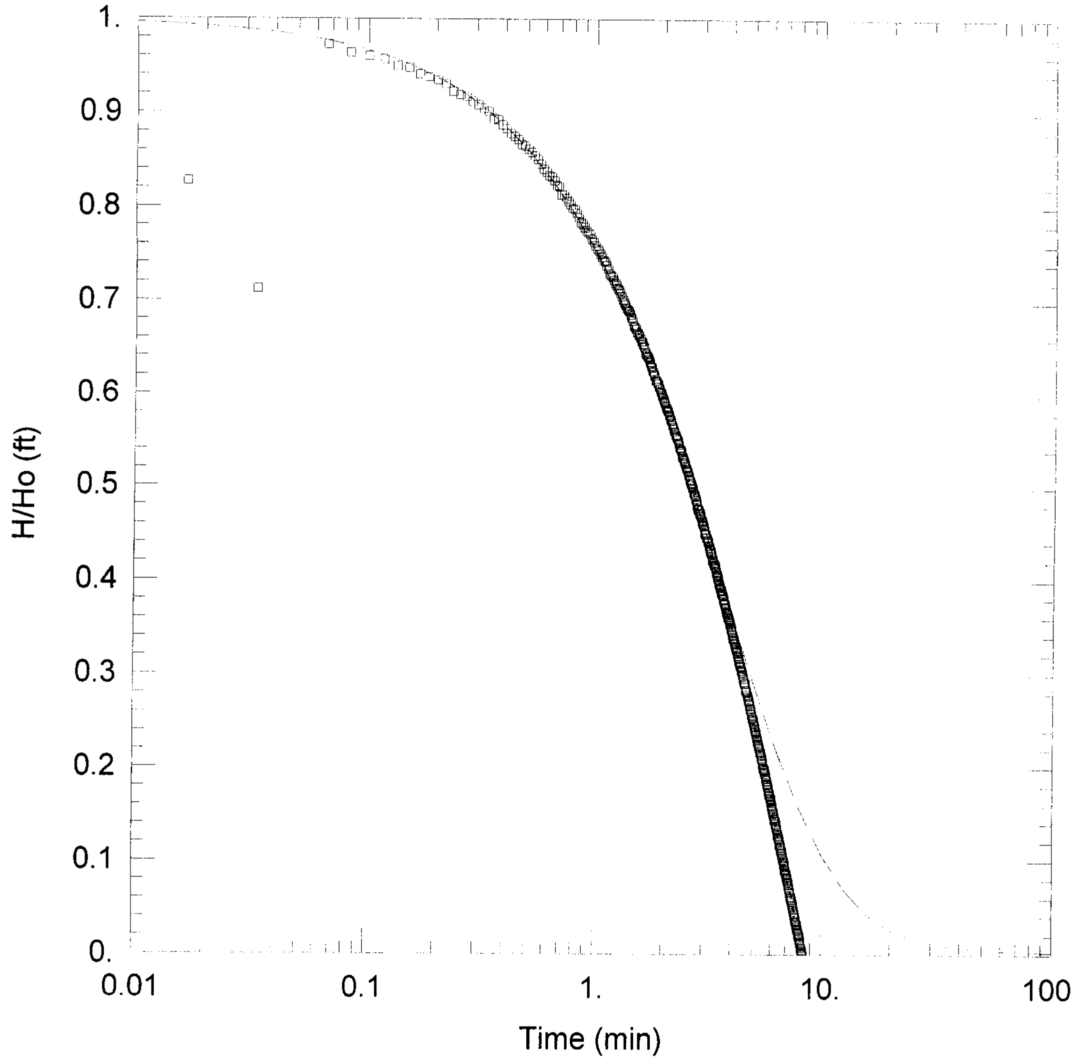
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.03443 ft^2/day S = 0.0001

E6

Test 7



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
APV Opened
SLUG TEST
15:00
15:10
15:20
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-7.aqt
Date: 12/06/02 Time: 15:05:09

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 25. ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

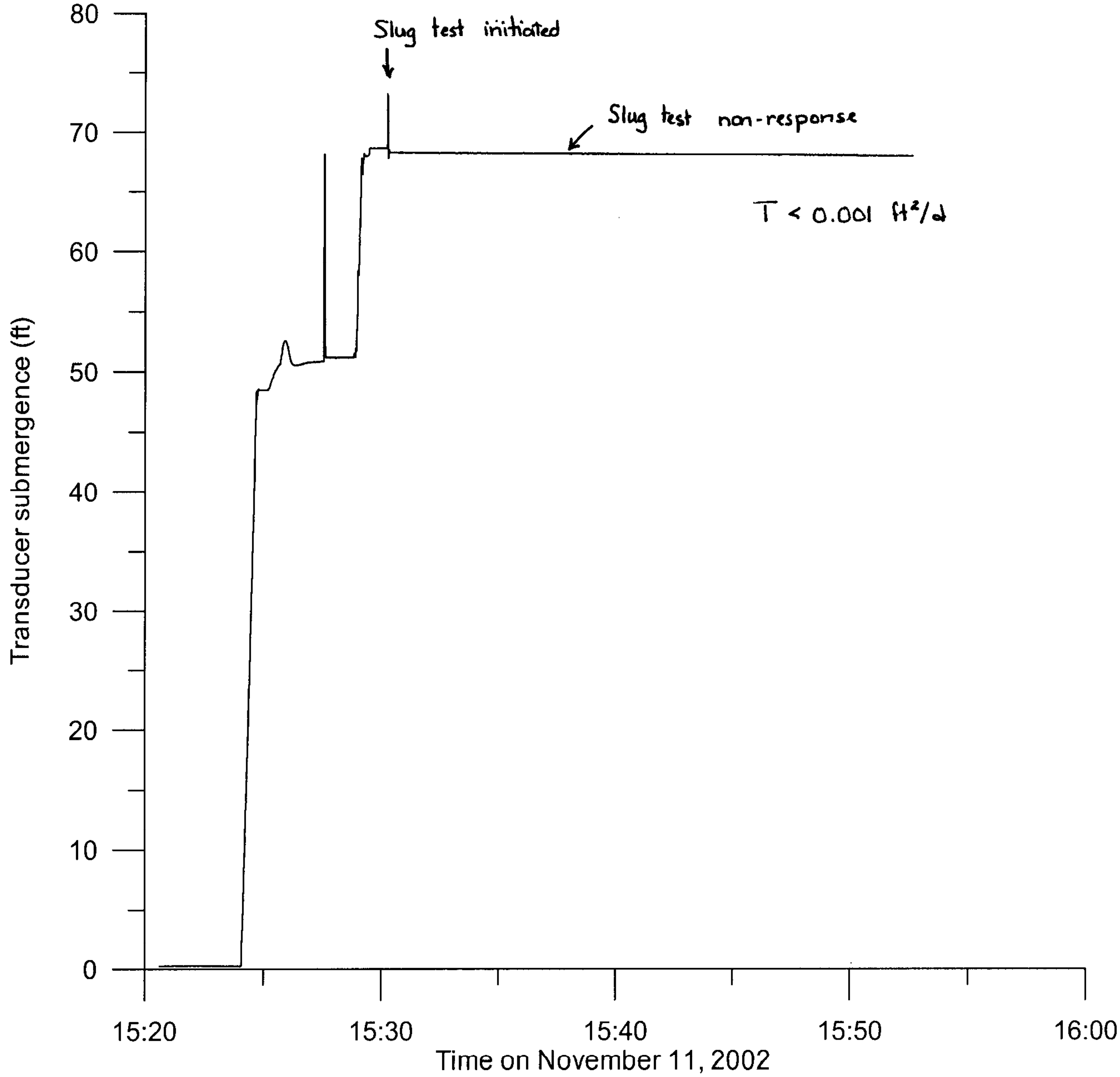
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.664 ft^2/day
S = 1.E-08

E6

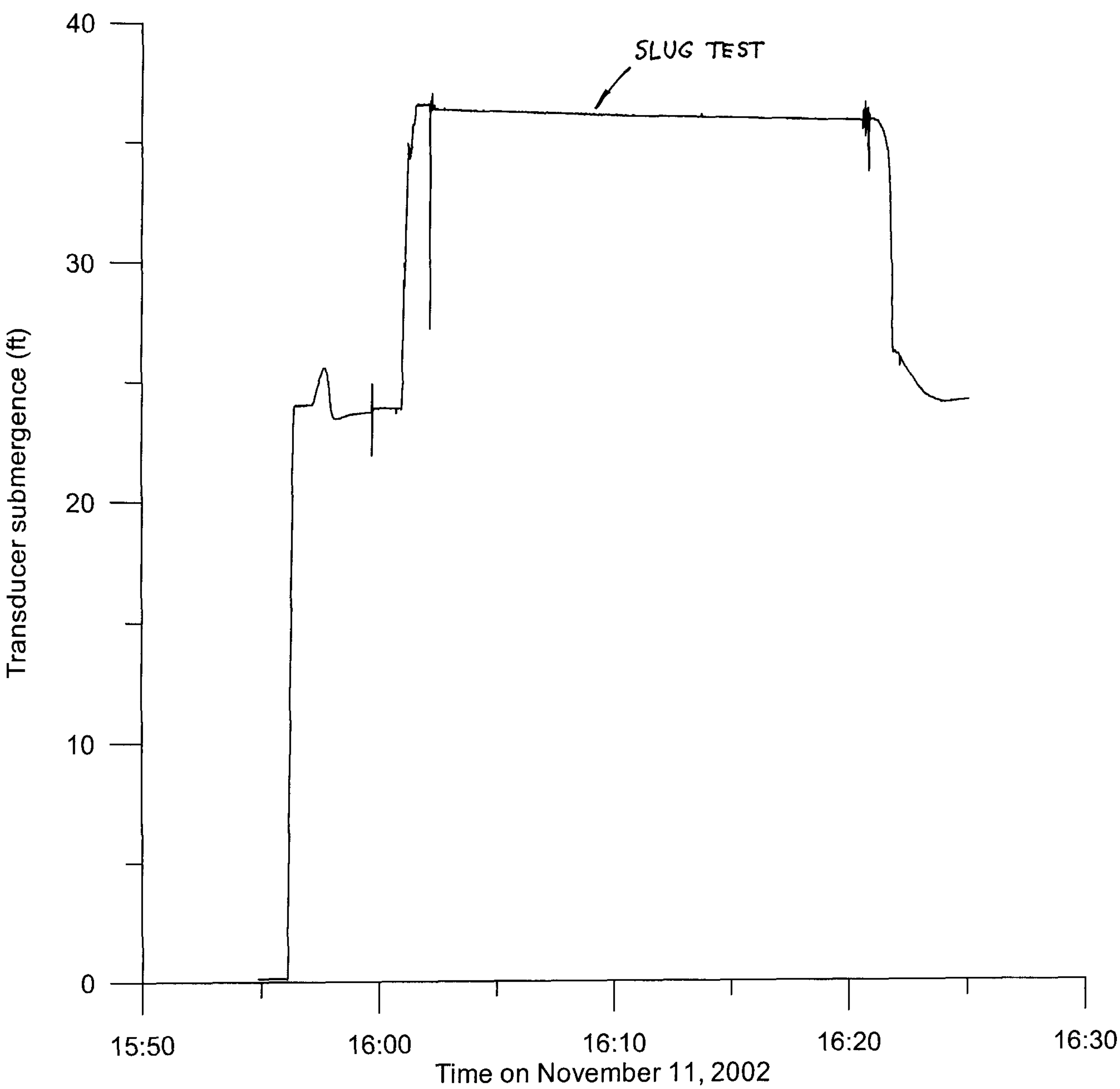
Test 8

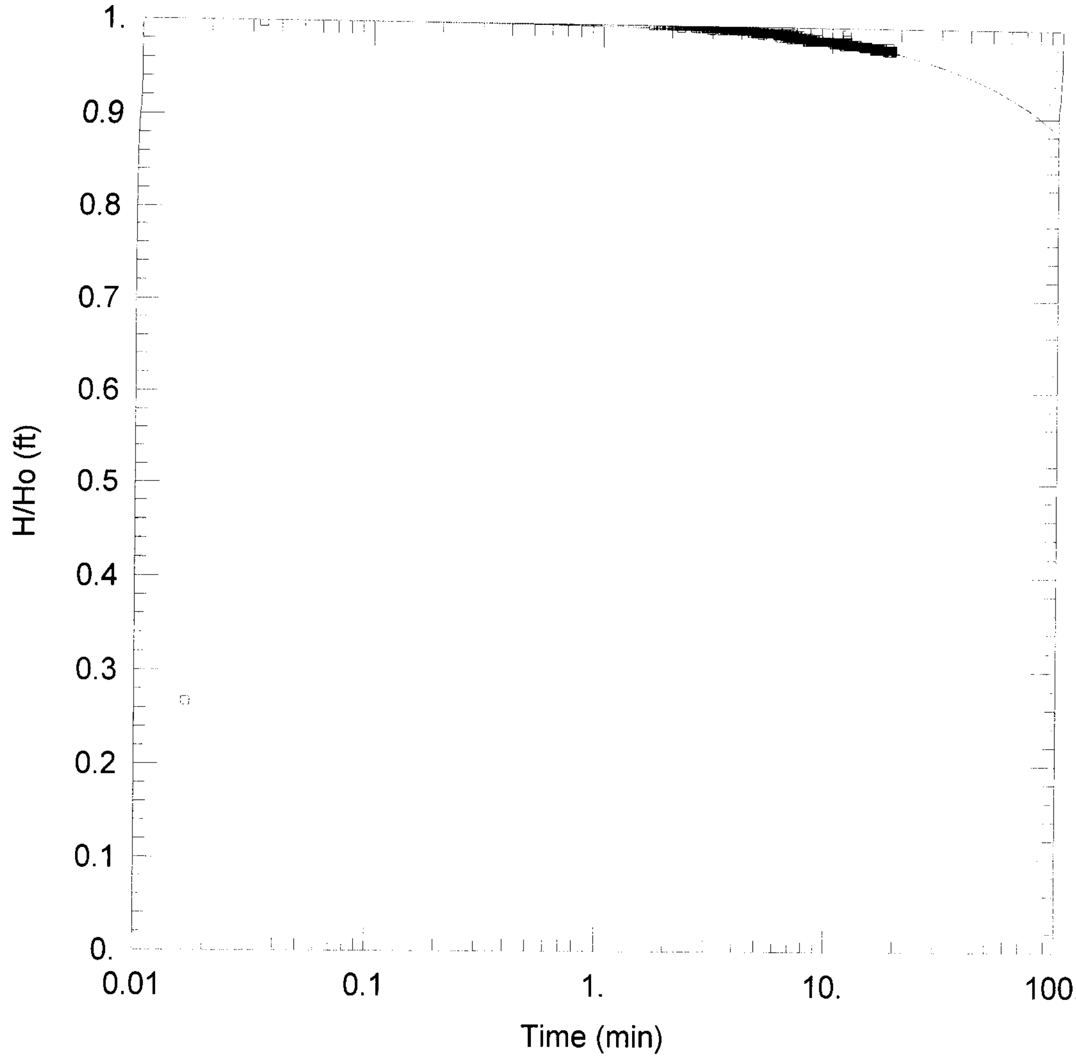


Slug test initiated
Slug test non-response
T < 0.001 ft²/d
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
15:20
15:30
15:40
15:50
16:00
Time on November 11, 2002

E6

Test 9


SLUG TEST
Transducer submergence (ft)
40
30
20
10
0
15:50
16:00
16:10
16:20
16:30
Time on November 11, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-9.aqt
Date: 12/06/02 Time: 15:11:37

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 12.43 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

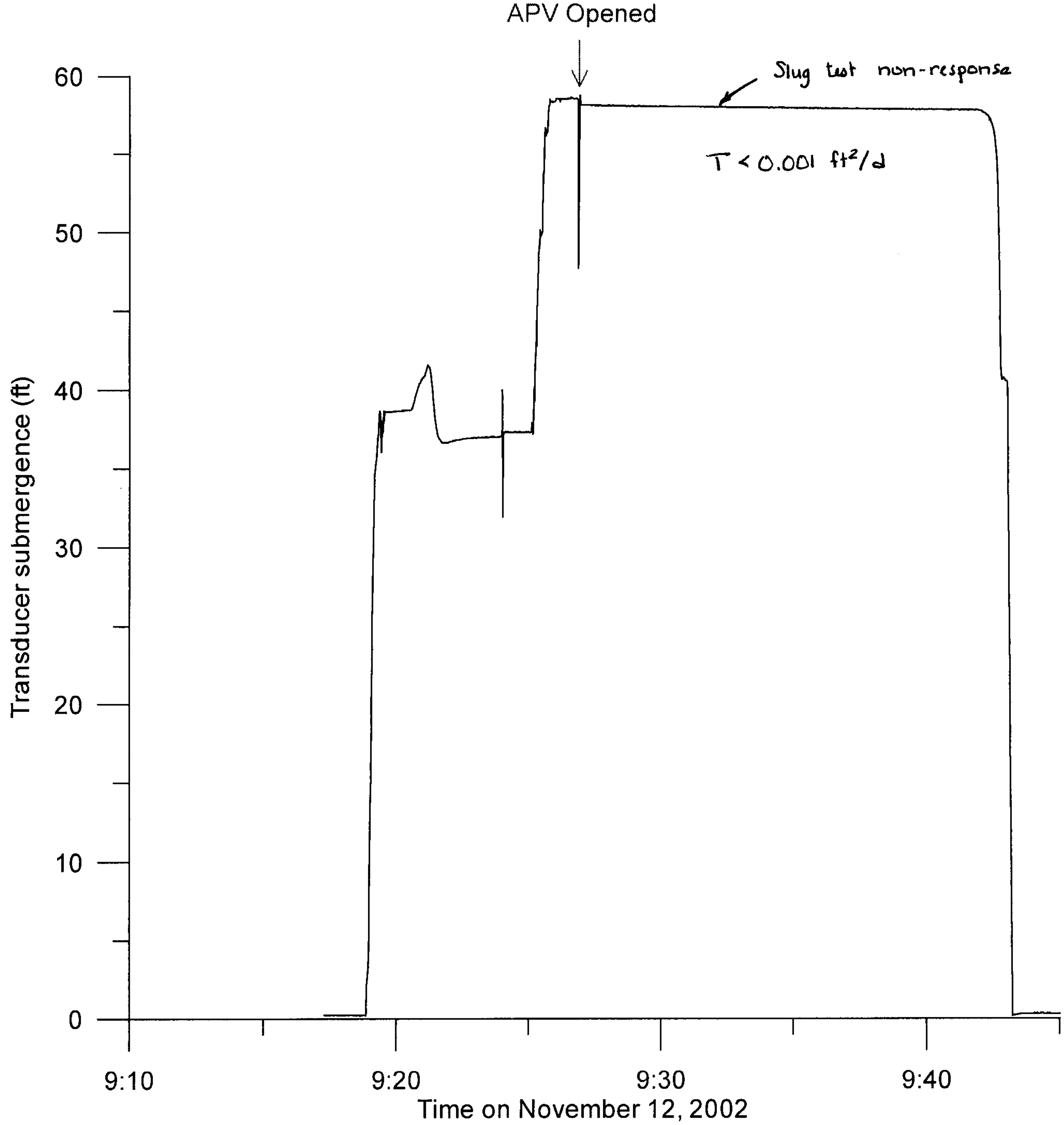
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.01469 ft^2/day S = 1.E-10

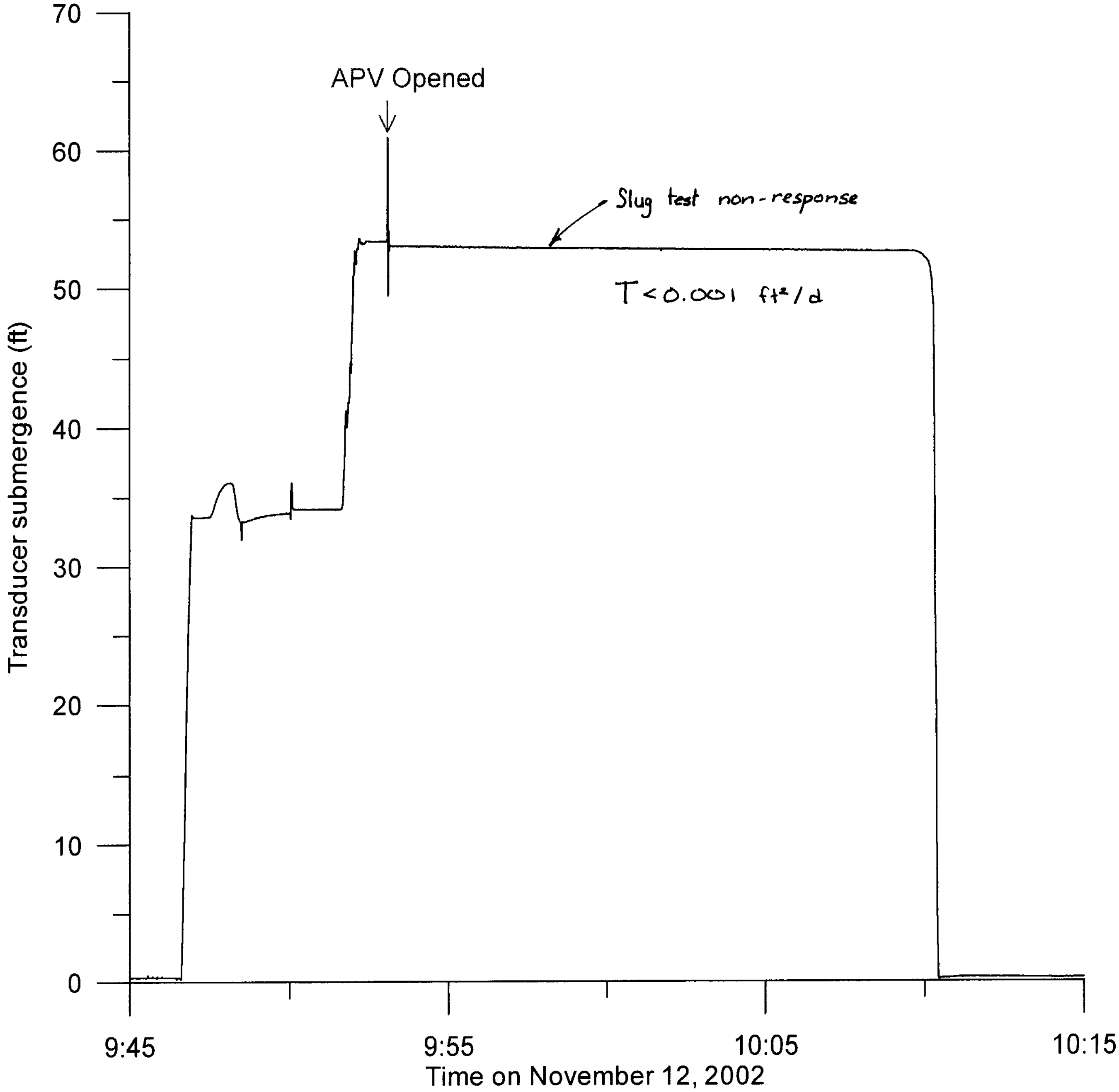
E6

Test 10


APV Opened
Slug test non-response
T < 0.001 ft²/d
60
50
40
30
20
10
0
Transducer submergence (ft)
9:10
9:20
9:30
9:40
Time on November 12, 2002

E6

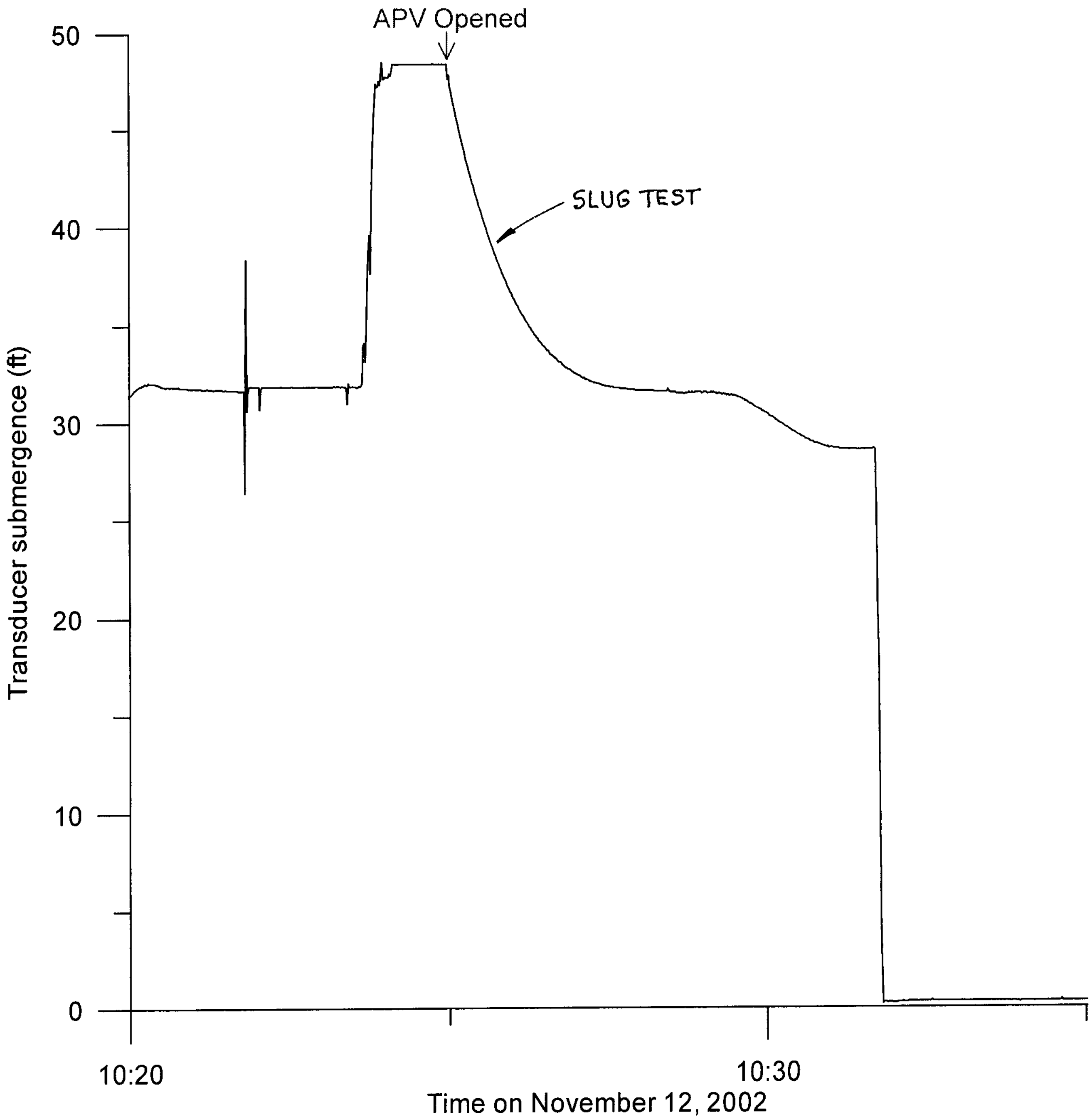
Test 11



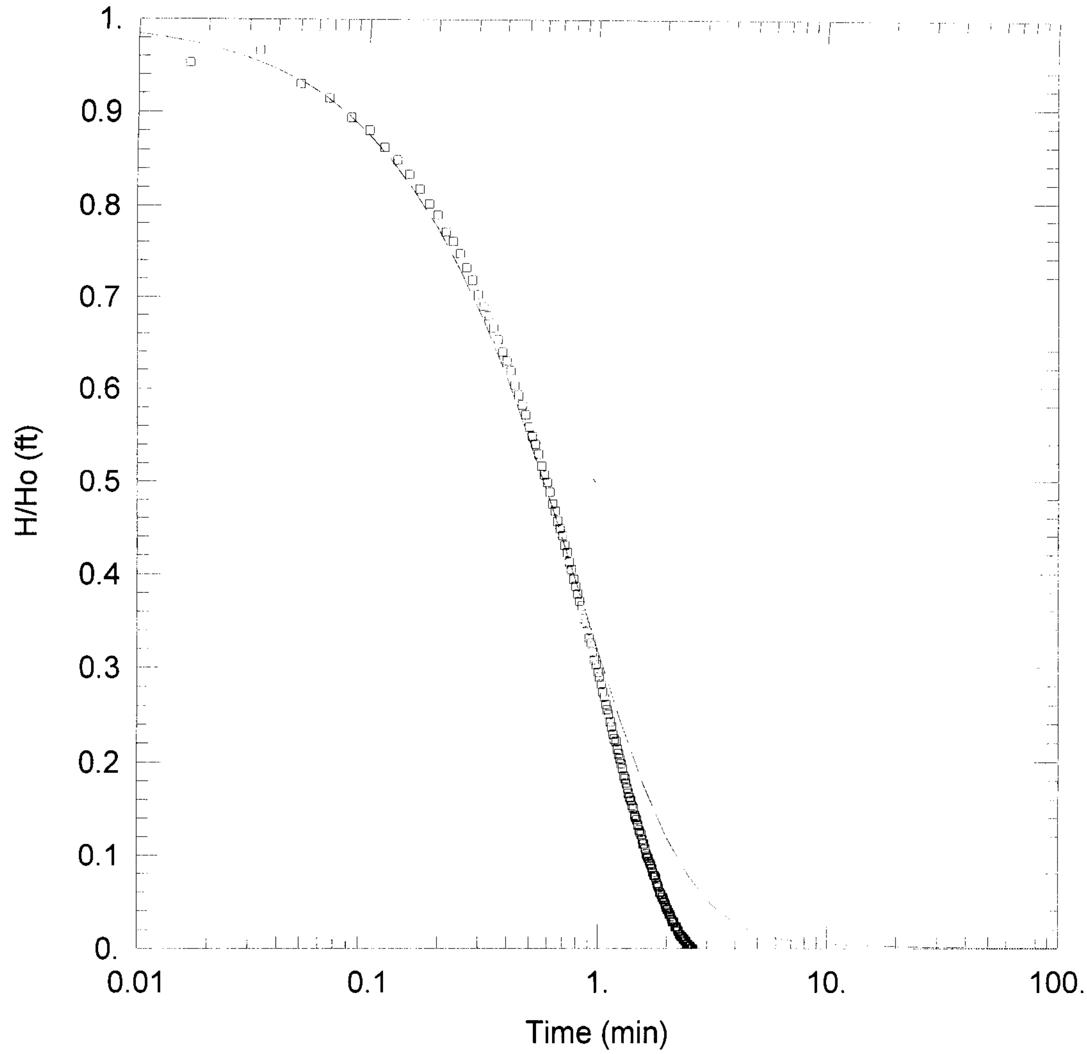
APV Opened
Slug test non-response
T<0.001 ft²/d
Transducer submergence (ft)
70
60
50
40
30
20
10
0
9:45
9:55
10:05
10:15
Time on November 12, 2002

E6

Test 12



APV Opened
SLUG TEST
50
40
30
20
10
0
Transducer submergence (ft)
10:20
10:30
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-12.aqt
Date: 12/06/02 Time: 15:11:13

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 16.56 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

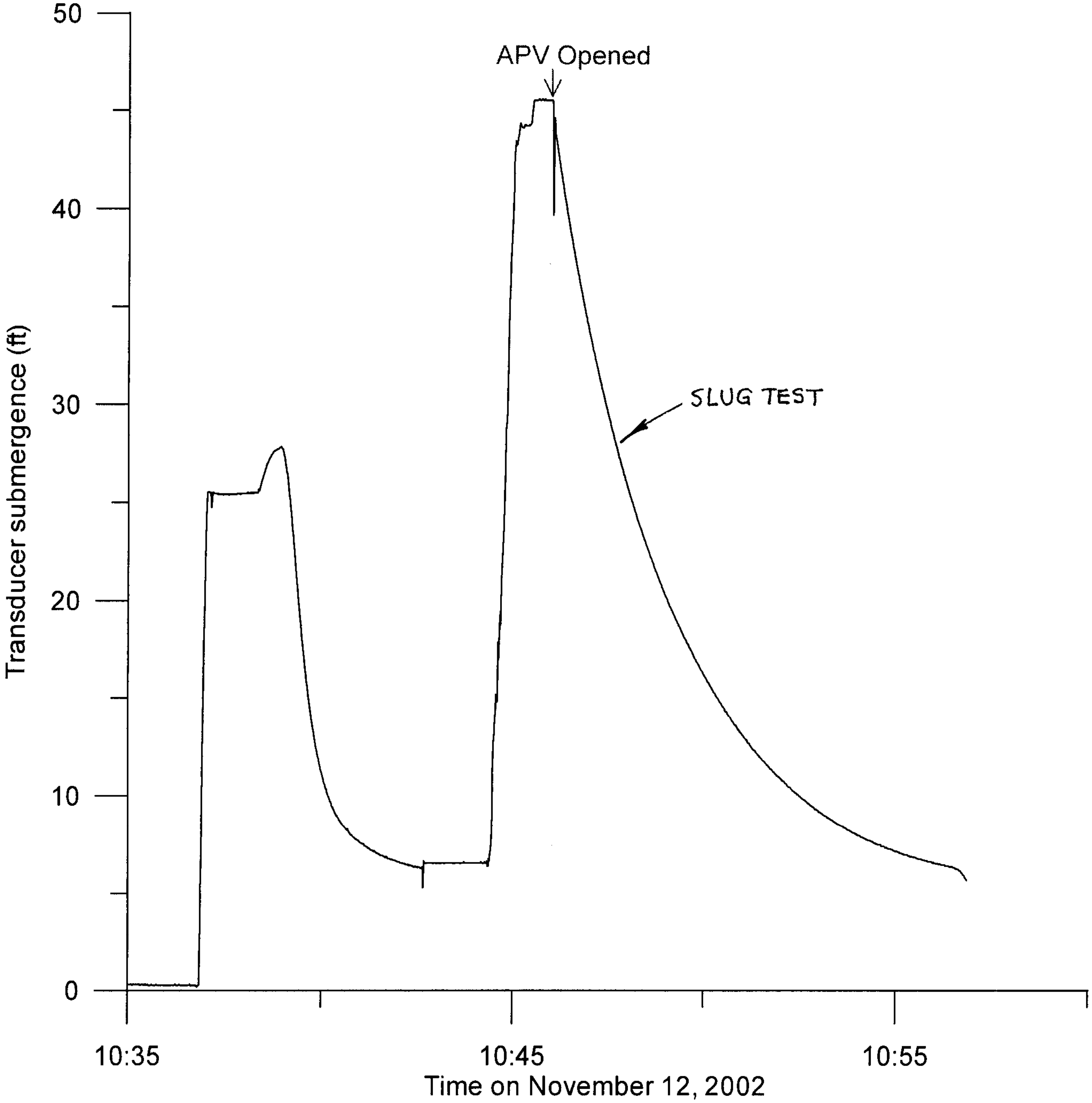
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

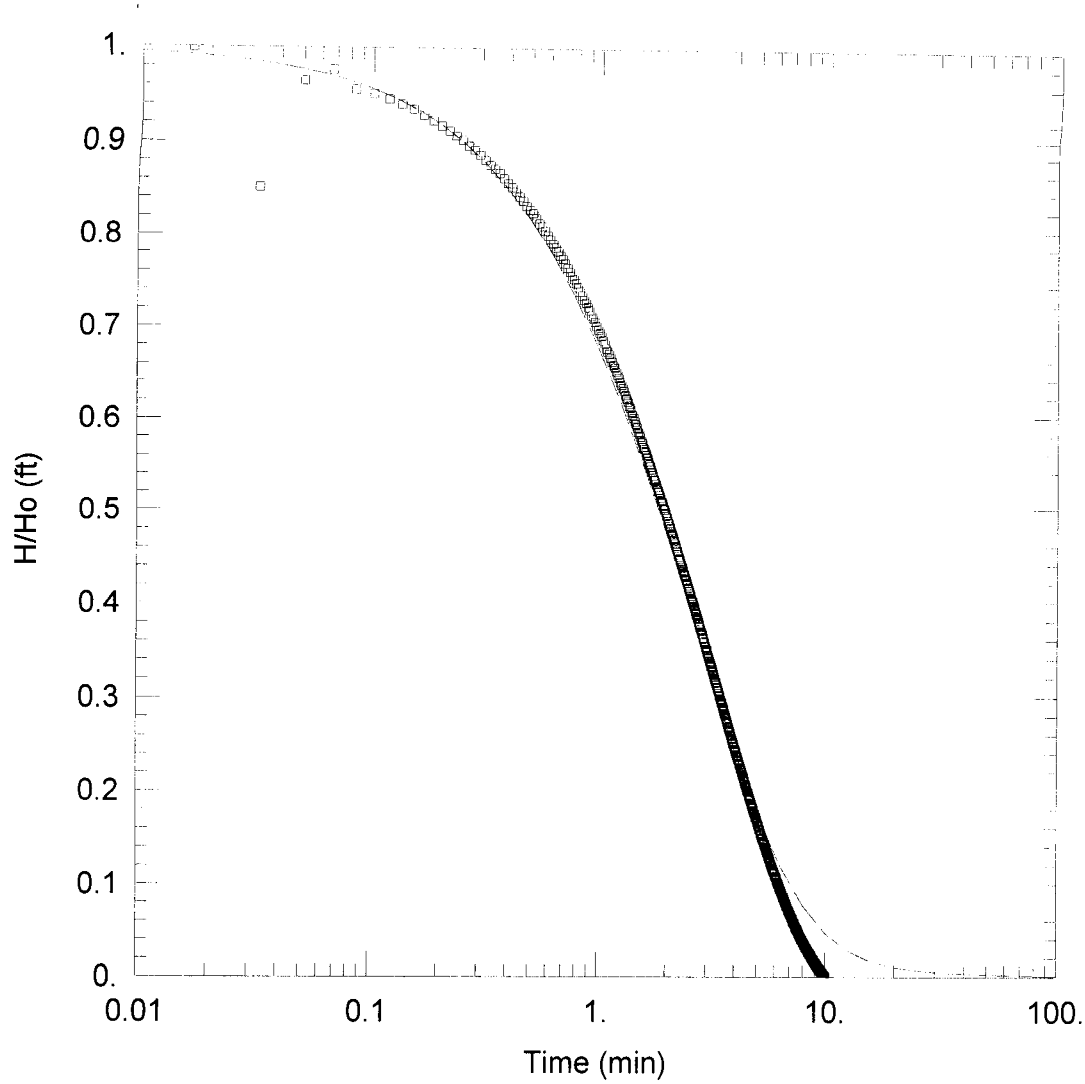
= 15.77 ft^2/day S = 1.E-10

E6

Test 13



50
40
30
20
10
0
Transducer submergence (ft)
APV Opened
SLUG TEST
10:35
10:45
10:55
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-13.aqt
Date: 12/06/02 Time: 15:10:55

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

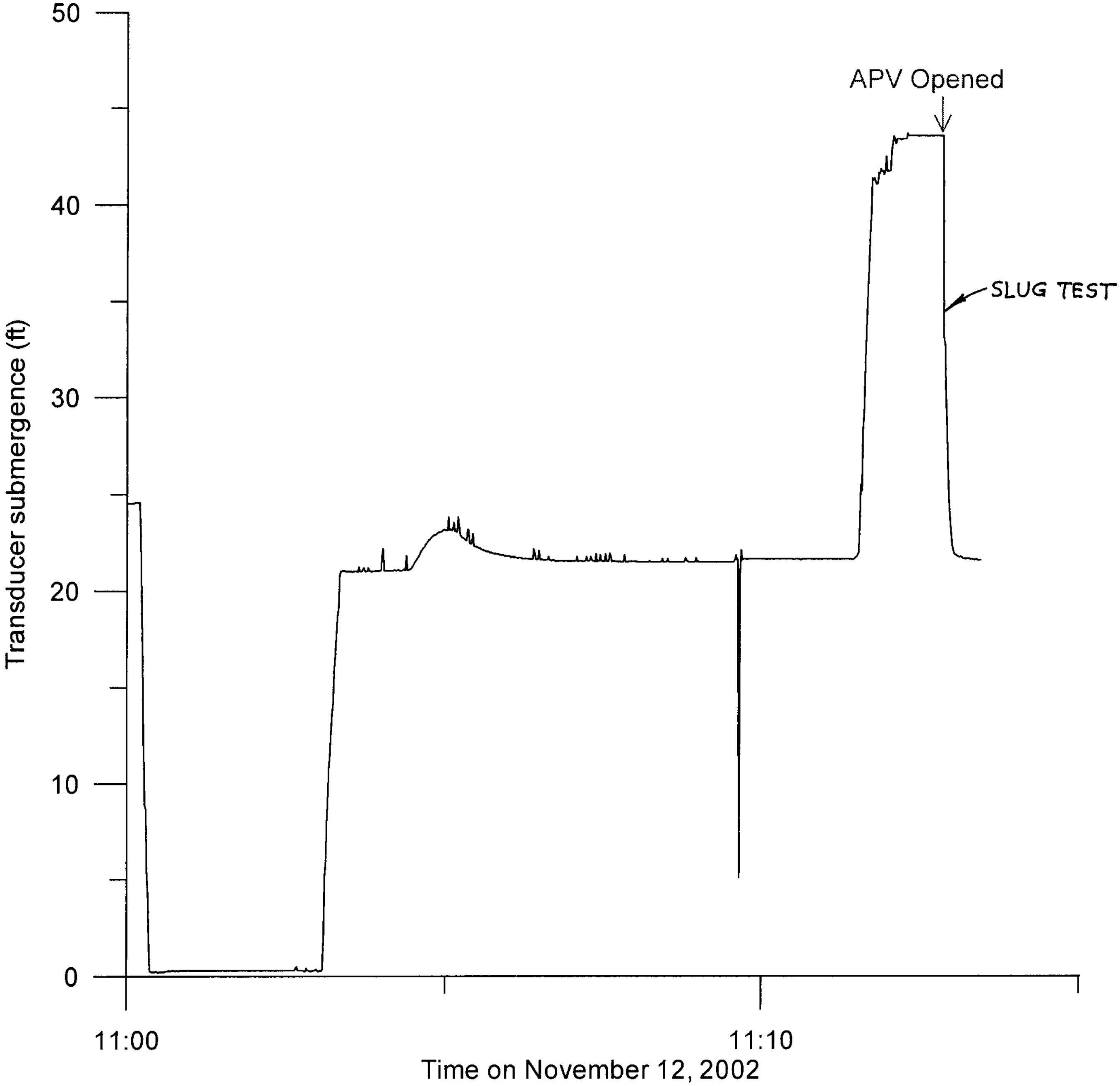
Initial Displacement: 38.97 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

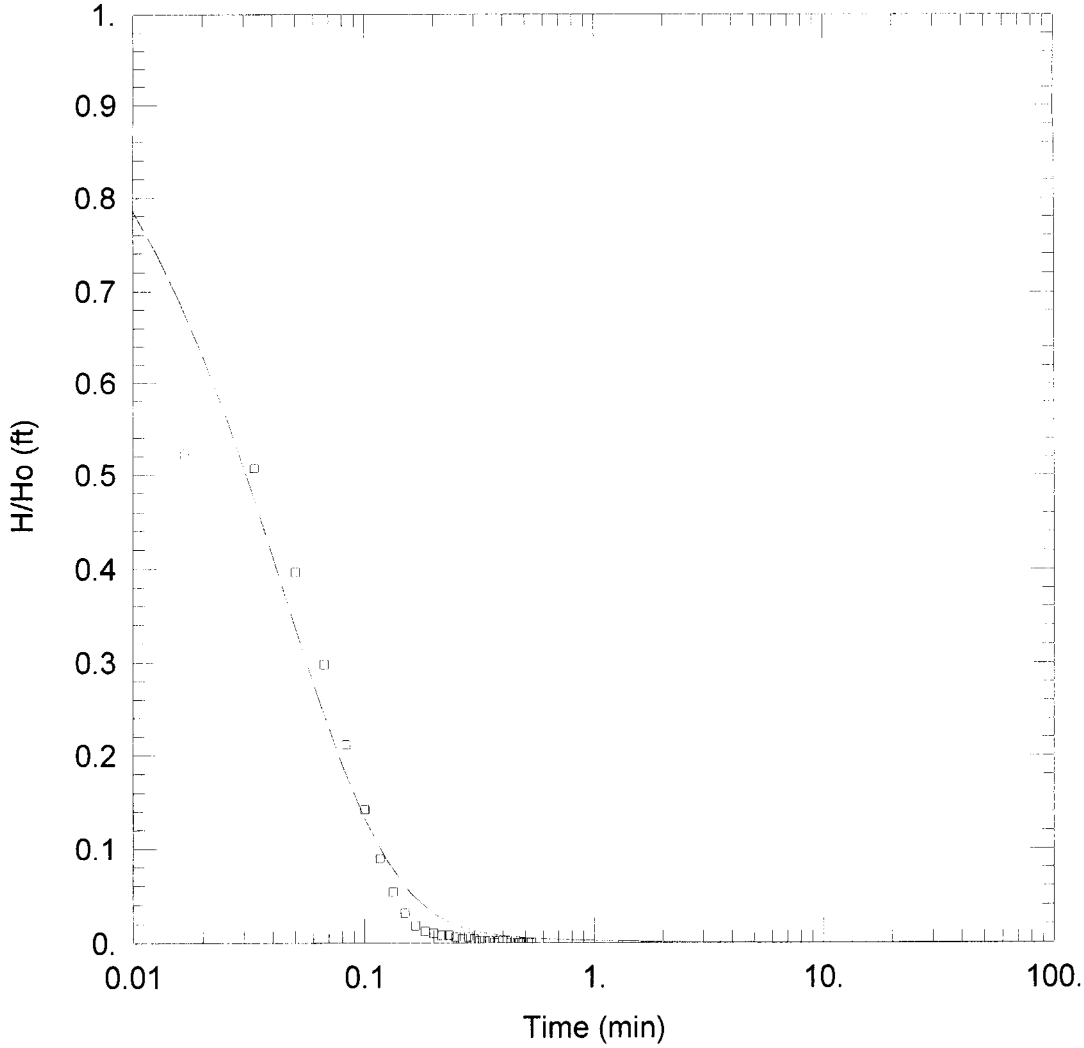
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 4.939 ft^2/day S = 1.E-10

E6

Test 14


APV Opened
SLUG TEST
50
40
30
20
10
0
Transducer submergence (ft)
11:00
11:10
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-14.aqt
Date: 12/06/02 Time: 15:10:36

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

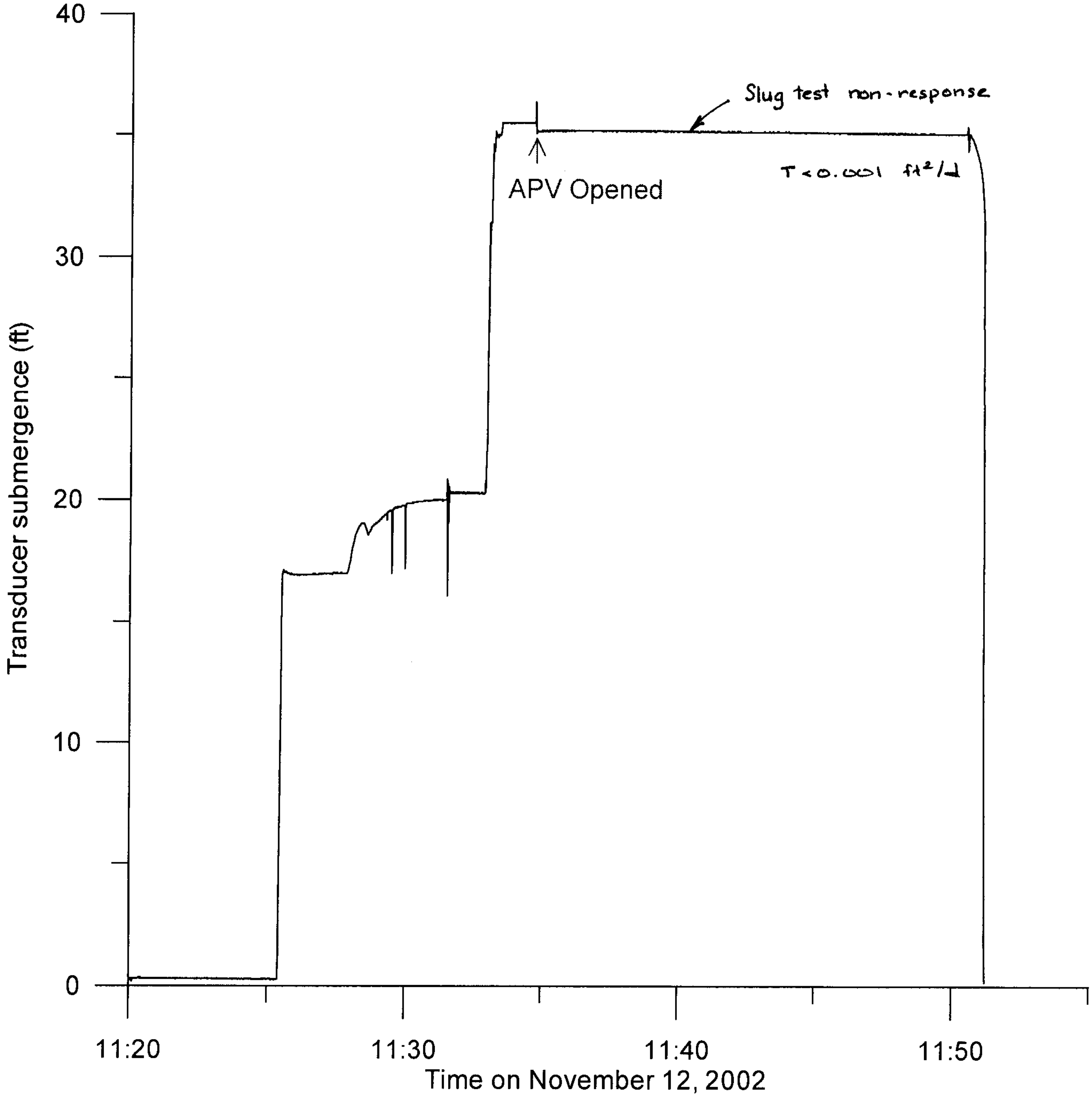
Initial Displacement: 21.93 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 296.8 ft^2/day
S = 1.E-10

E6

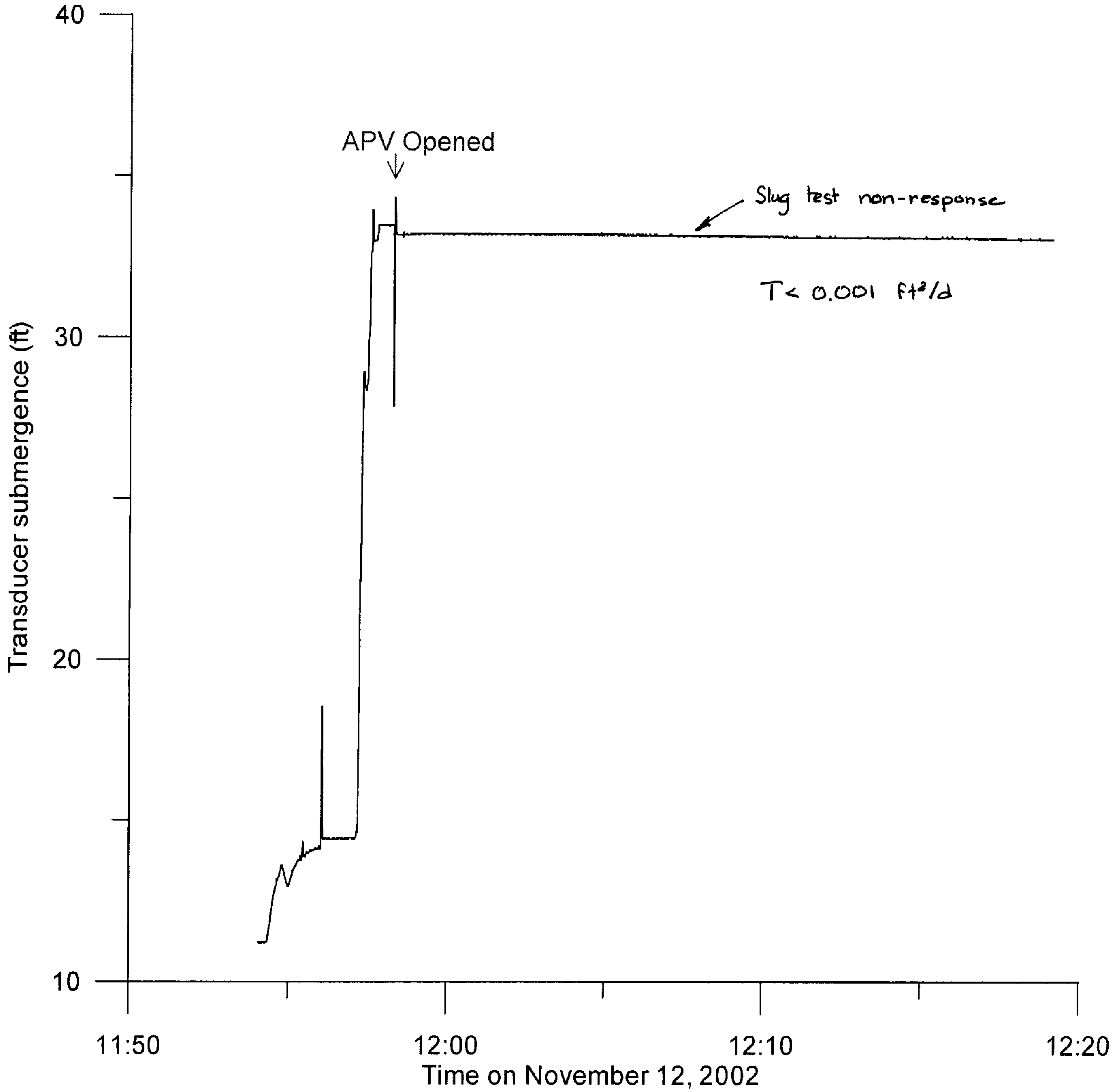
Test 15



40
30
20
10
0
Transducer submergence (ft)
Slug test non-response
APV Opened
T < 0.001 ft²/d
11:20
11:30
11:40
11:50
Time on November 12, 2002

E6

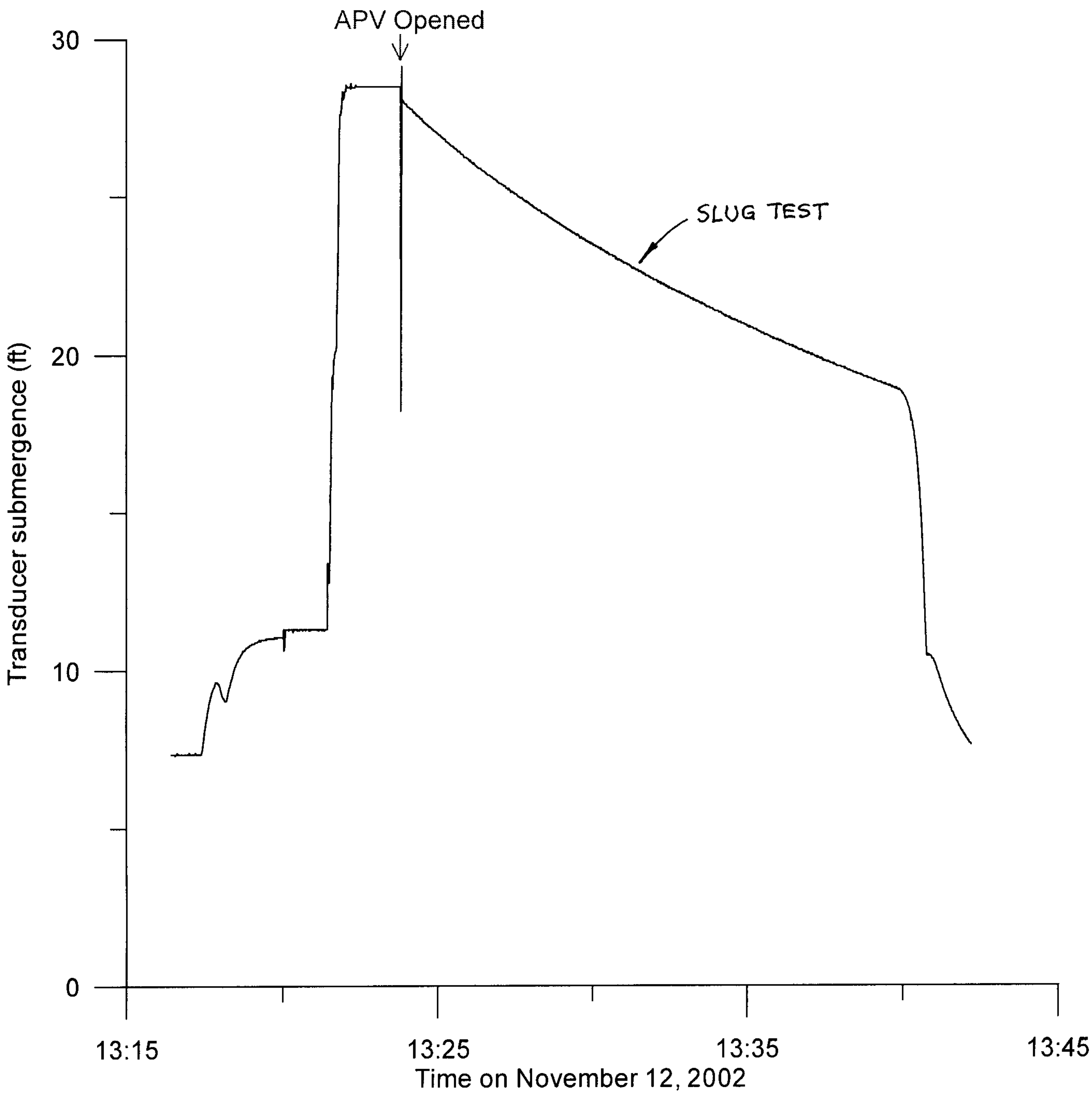
Test 16



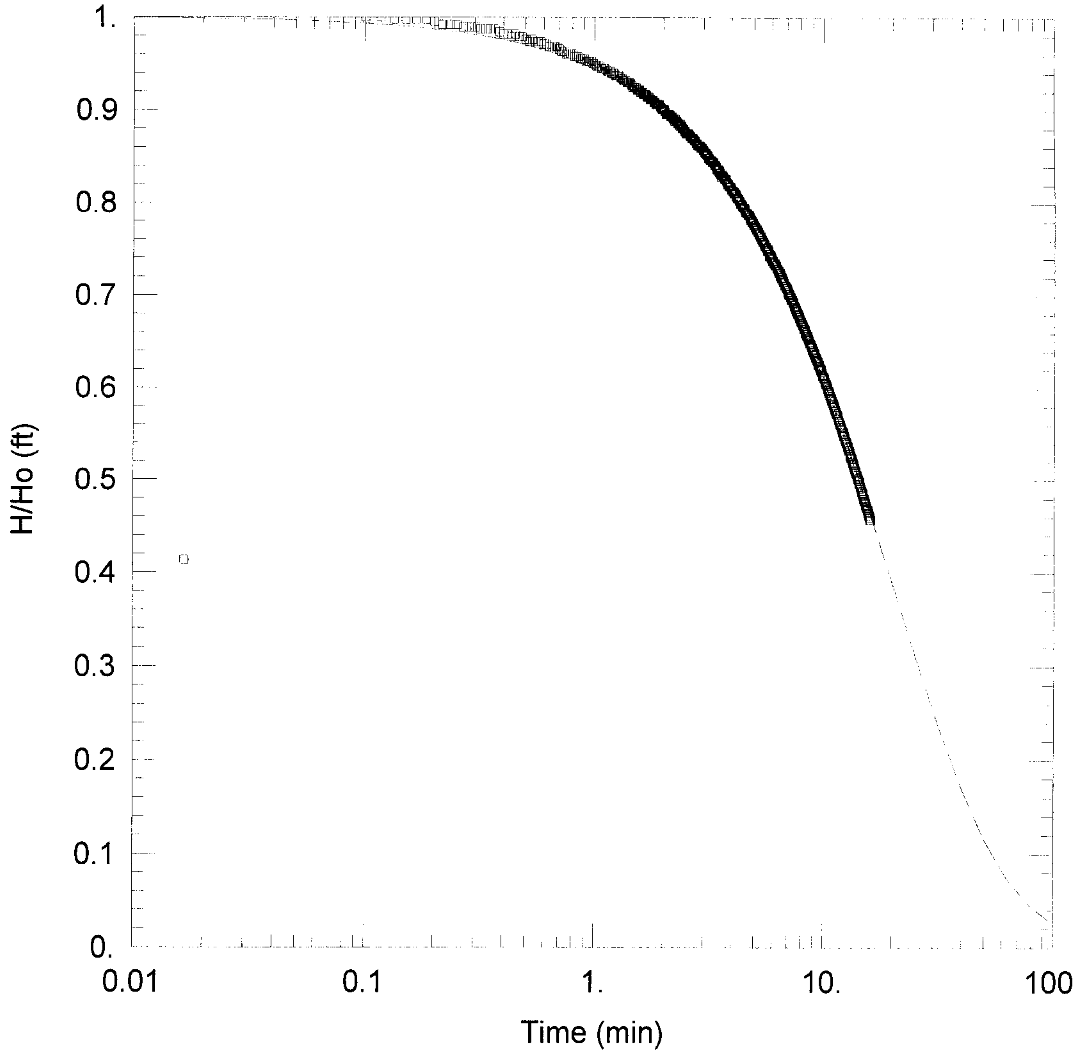
APV Opened
Slug test non-response
T< 0.001 ft²/d
40
30
20
10
Transducer submergence (ft)
11:50
12:00
12:10
12:20
Time on November 12, 2002

E6

Test 17



APV Opened
SLUG TEST
30
20
10
0
Transducer submergence (ft)
13:15
13:25
13:35
13:45
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-17.aqt
Date: 12/06/02 Time: 15:10:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 16.65 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

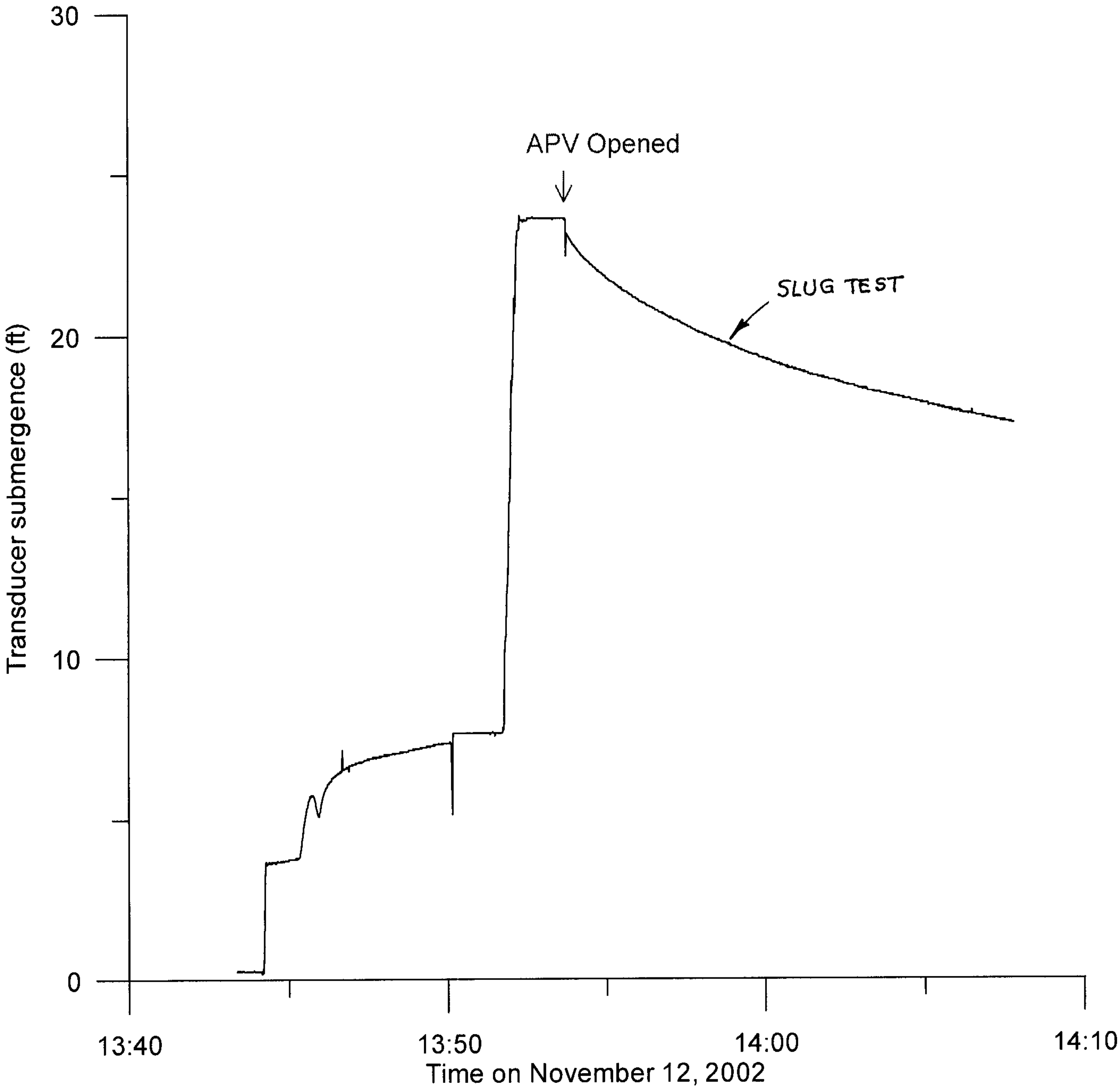
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

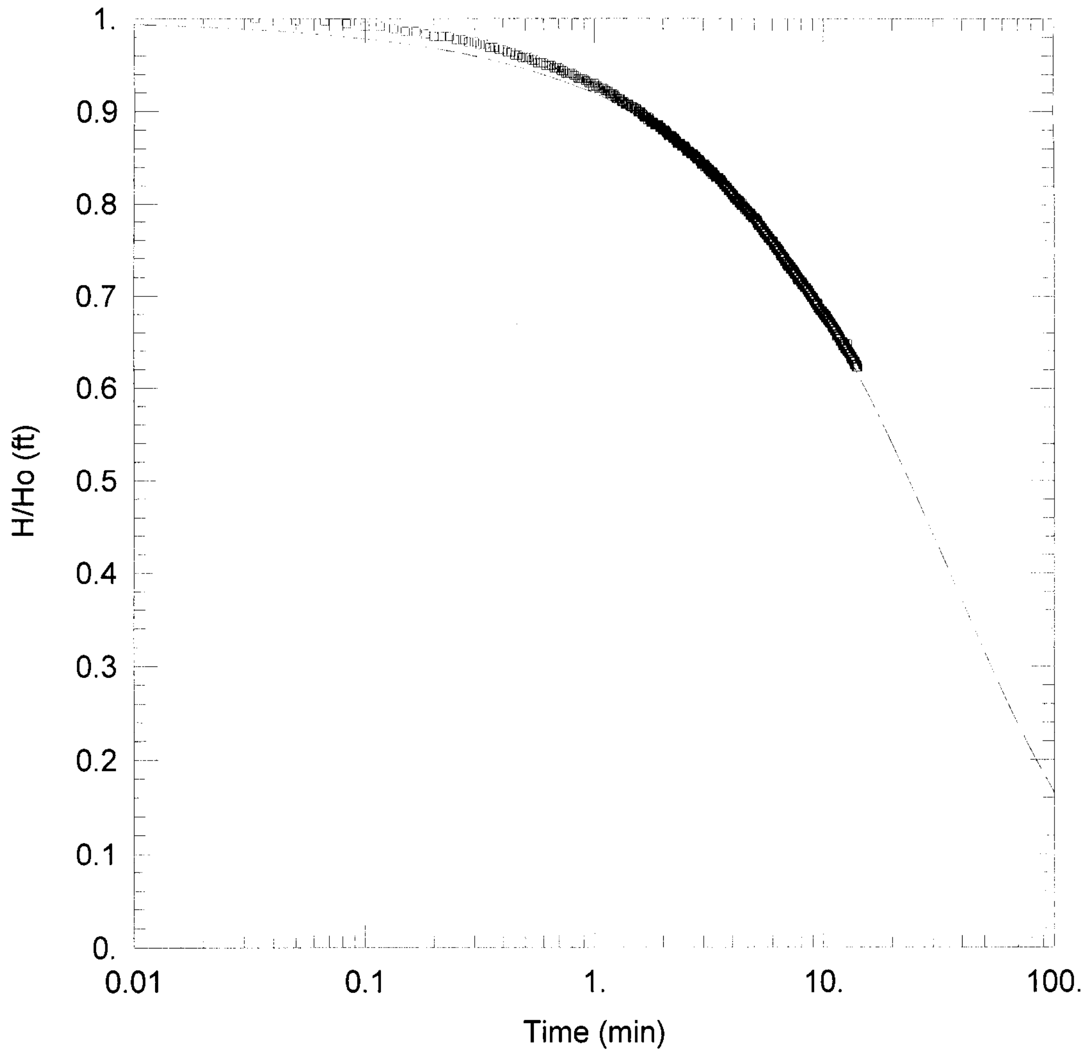
= 0.6365 ft^2/day
S = 1.E-10

E6

Test 18



APV Opened
SLUG TEST
30
20
10
0
Transducer submergence (ft)
13:40
13:50
14:00
14:10
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-18.aqt
Date: 12/06/02 Time: 15:10:00

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 15.48 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

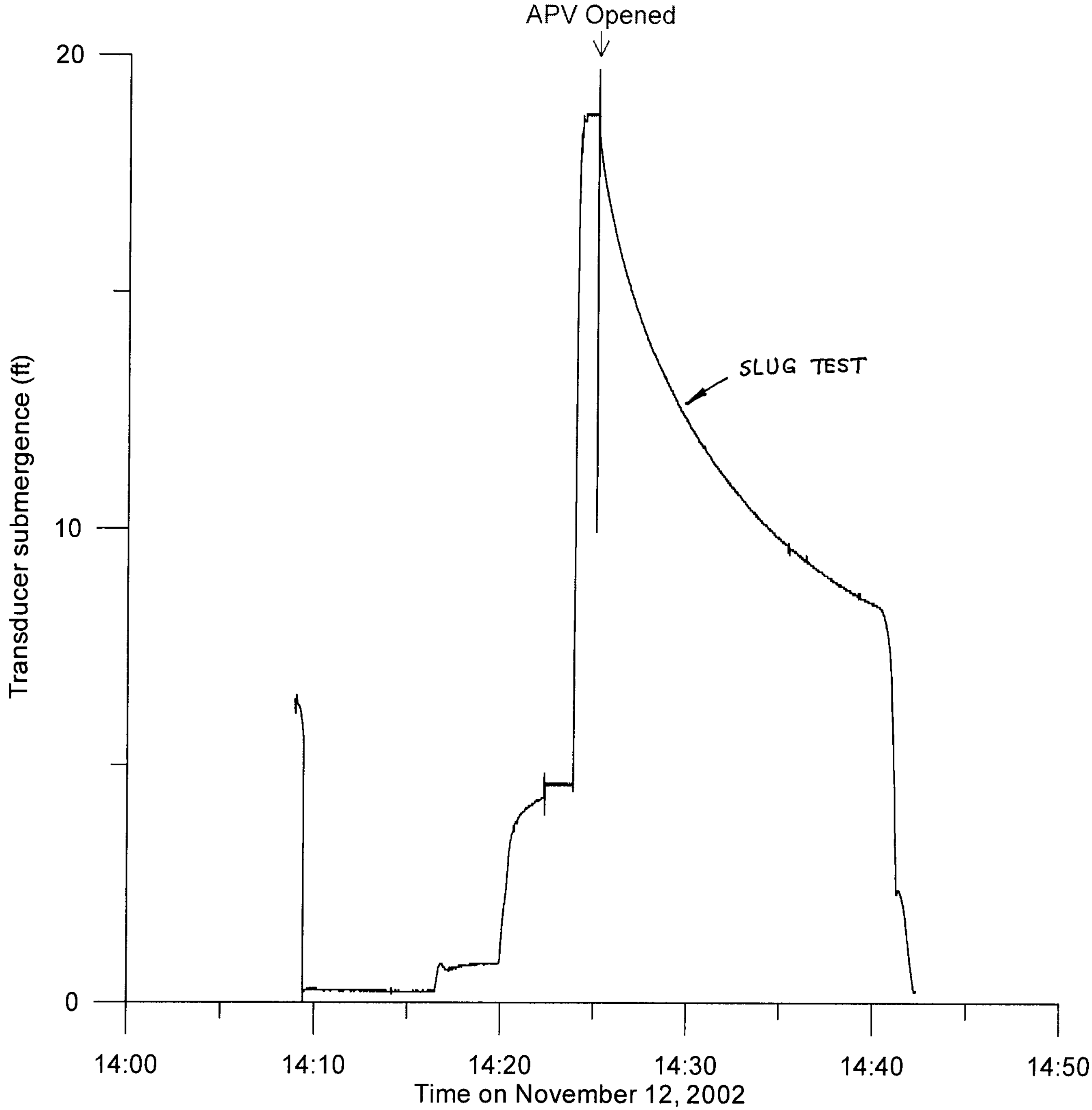
SOLUTION

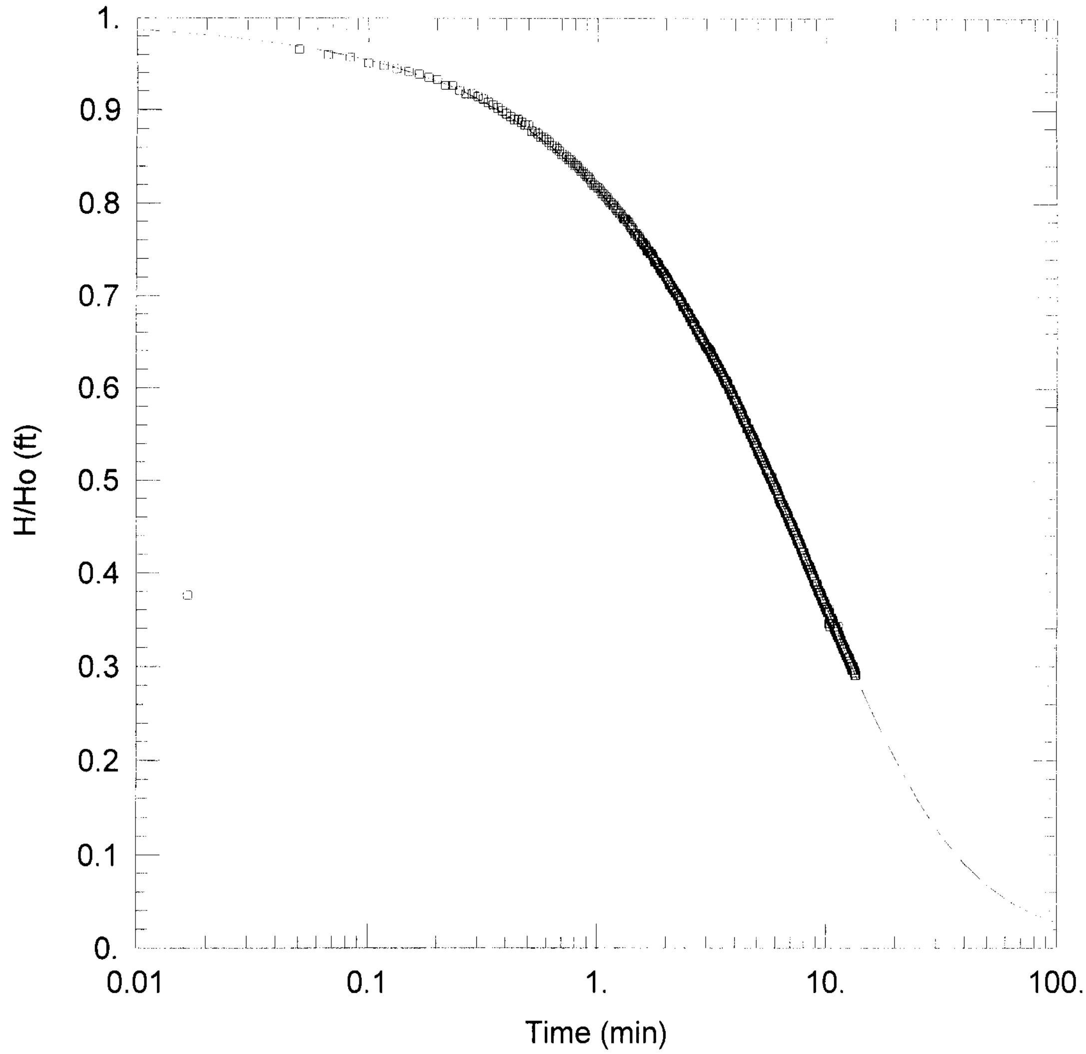
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.07111 ft^2/day
S = 0.0007533

E6

Test 19


APV Opened
20
10
0
Transducer submergence (ft)
SLUG TEST
14:00
14:10
14:20
14:30
14:40
14:50
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-19.aqt
Date: 12/06/02 Time: 15:09:31

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

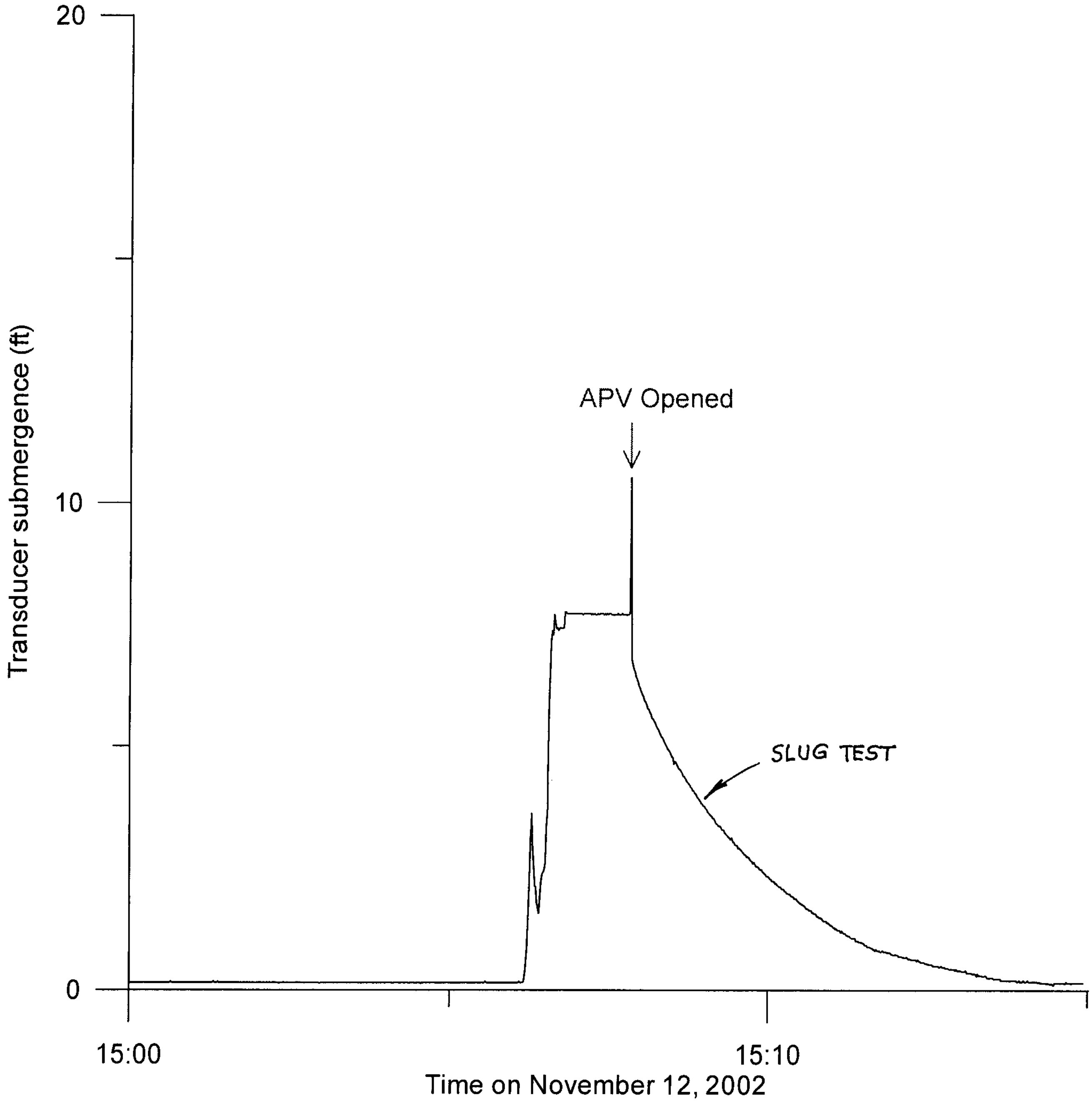
Initial Displacement: 14.14 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

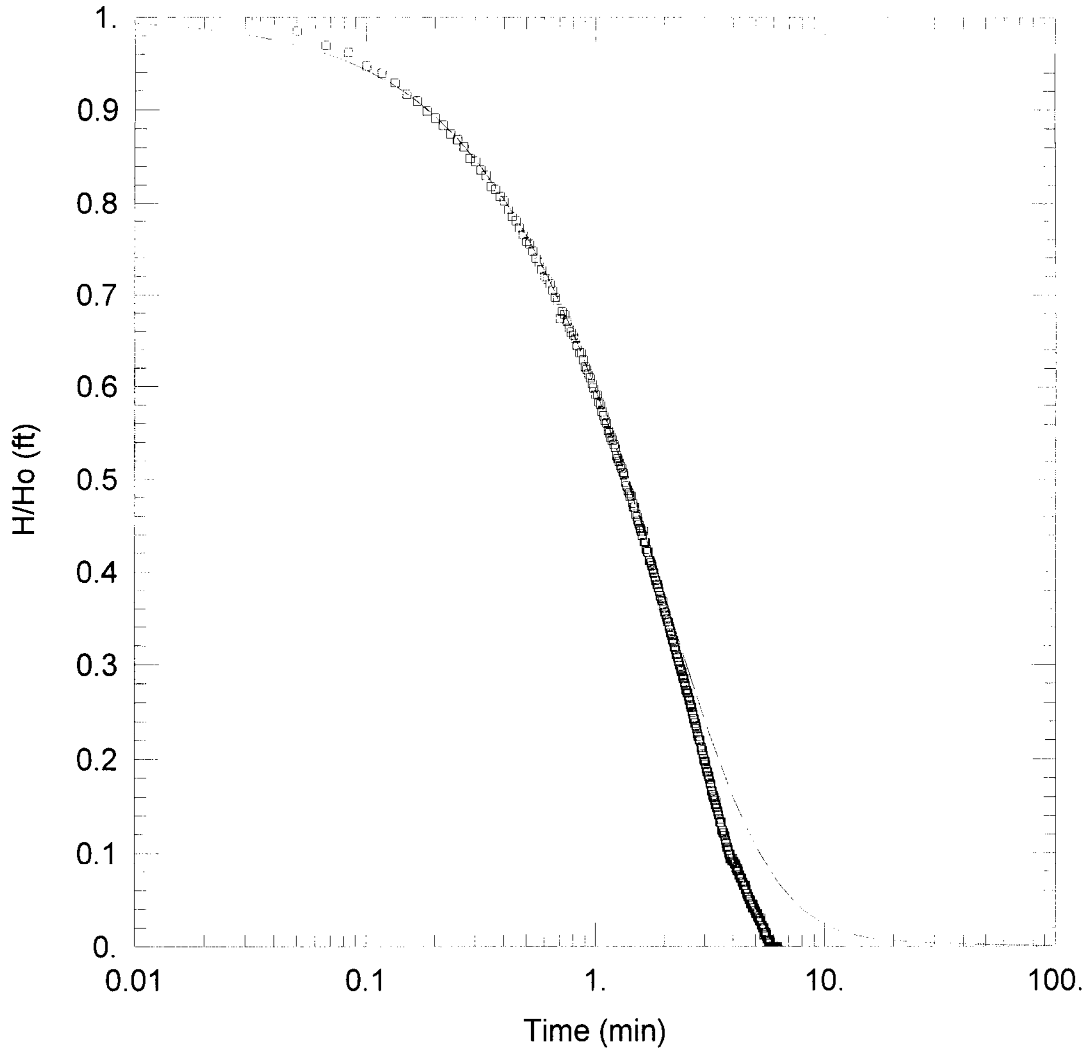
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
= 0.3053 ft^2/day S = 0.0006187

E6

Test 20



20
10
0
Transducer submergence (ft)
APV Opened
SLUG TEST
15:00
15:10
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-20.aqt
Date: 12/06/02 Time: 15:08:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

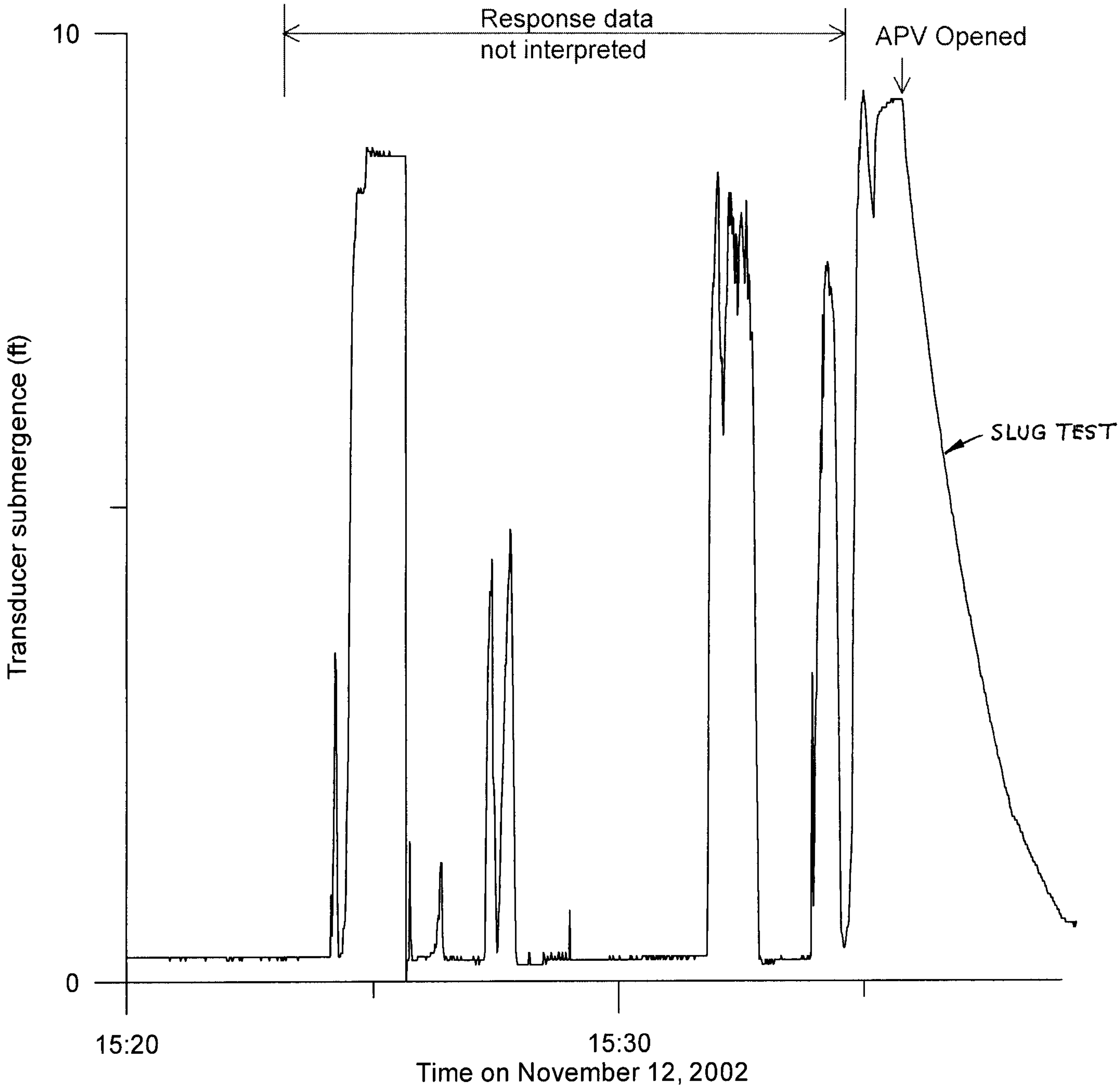
Initial Displacement: 6.6 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

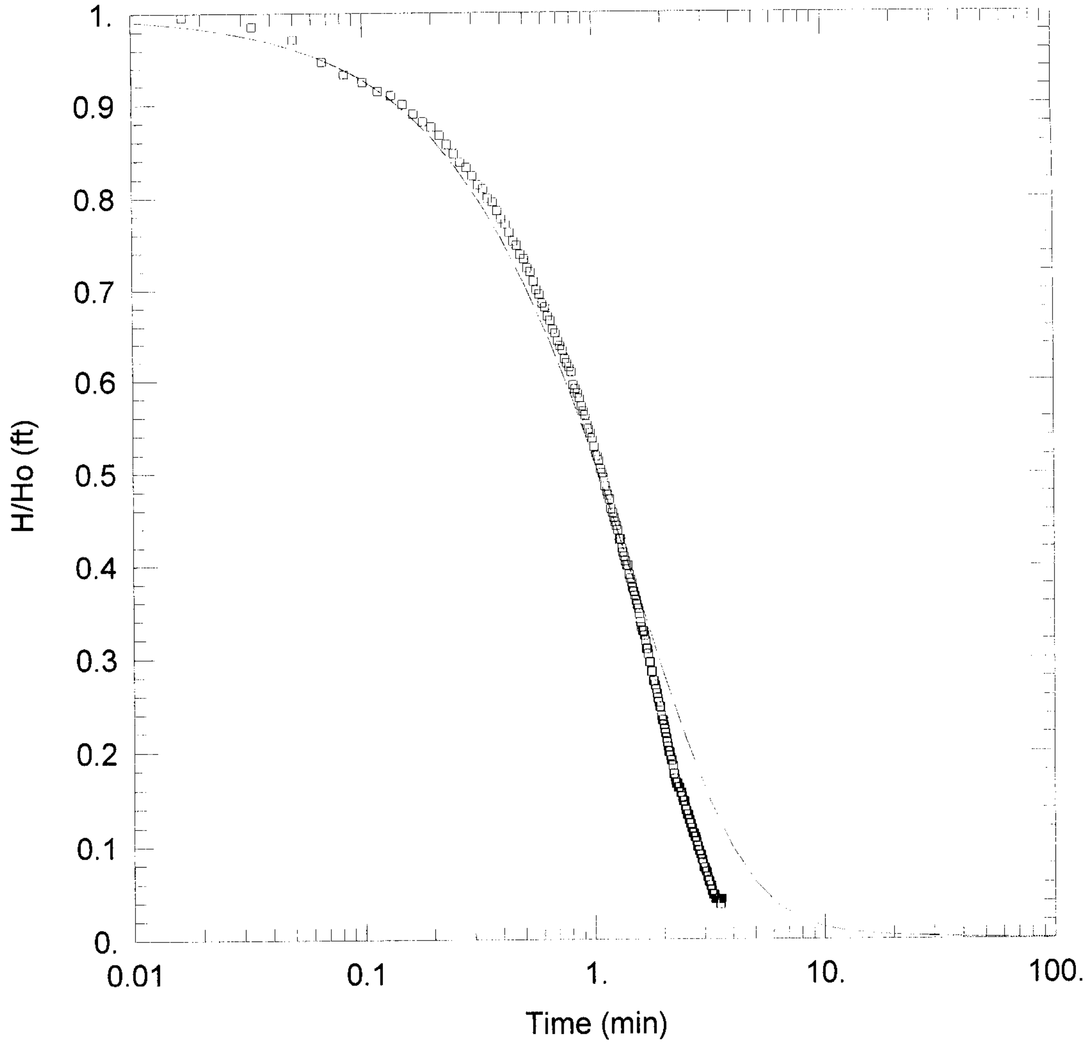
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 6.658 ft^2/day S = 1.E-10

E6

Test 21



10
0
Response data
not interpreted
APV Opened
SLUG TEST
Transducer submergence (ft)
15:20
15:30
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-21.aqt
Date: 12/06/02 Time: 15:07:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 9.08 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

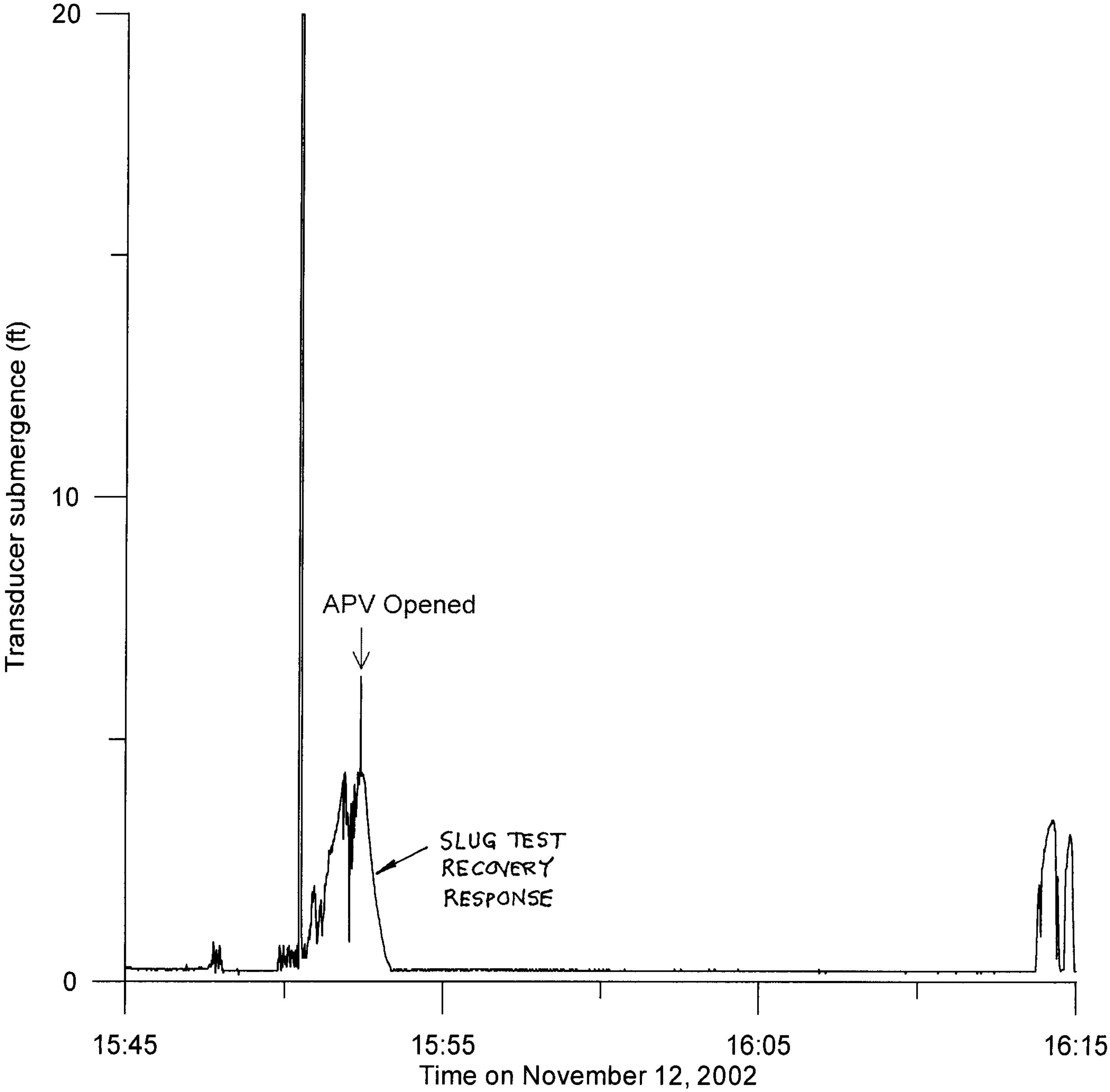
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

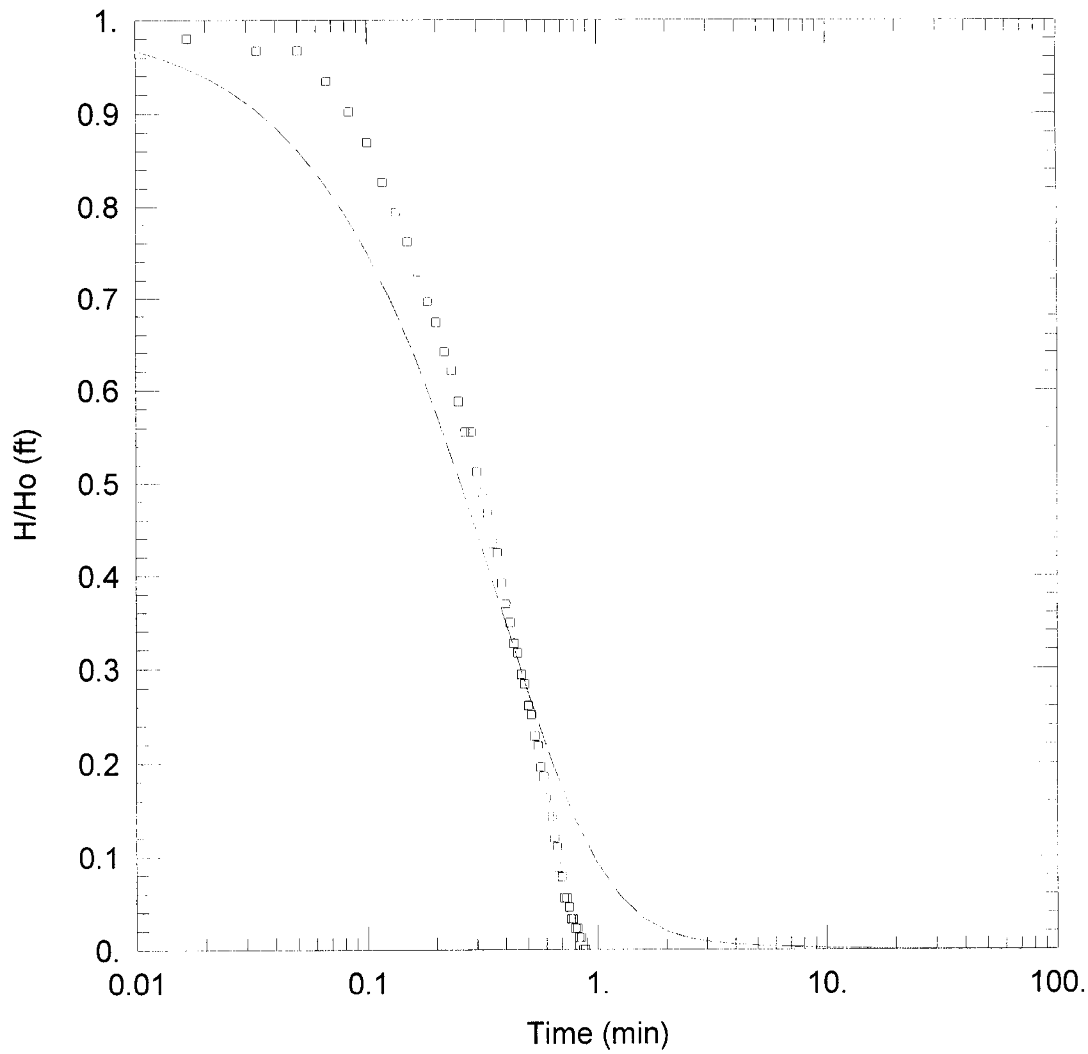
T = 8.739 ft^2/day
S = 1.E-10

E6

Test 22



20
10
0
Transducer submergence (ft)
APV Opened
SLUG TEST
RECOVERY
RESPONSE
15:45
15:55
16:05
16:15
Time on November 12, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\E6\E6-22.aqt
Date: 12/06/02 Time: 15:07:25

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 3.98 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 35.9 ft^2/day
S = 1.E-10

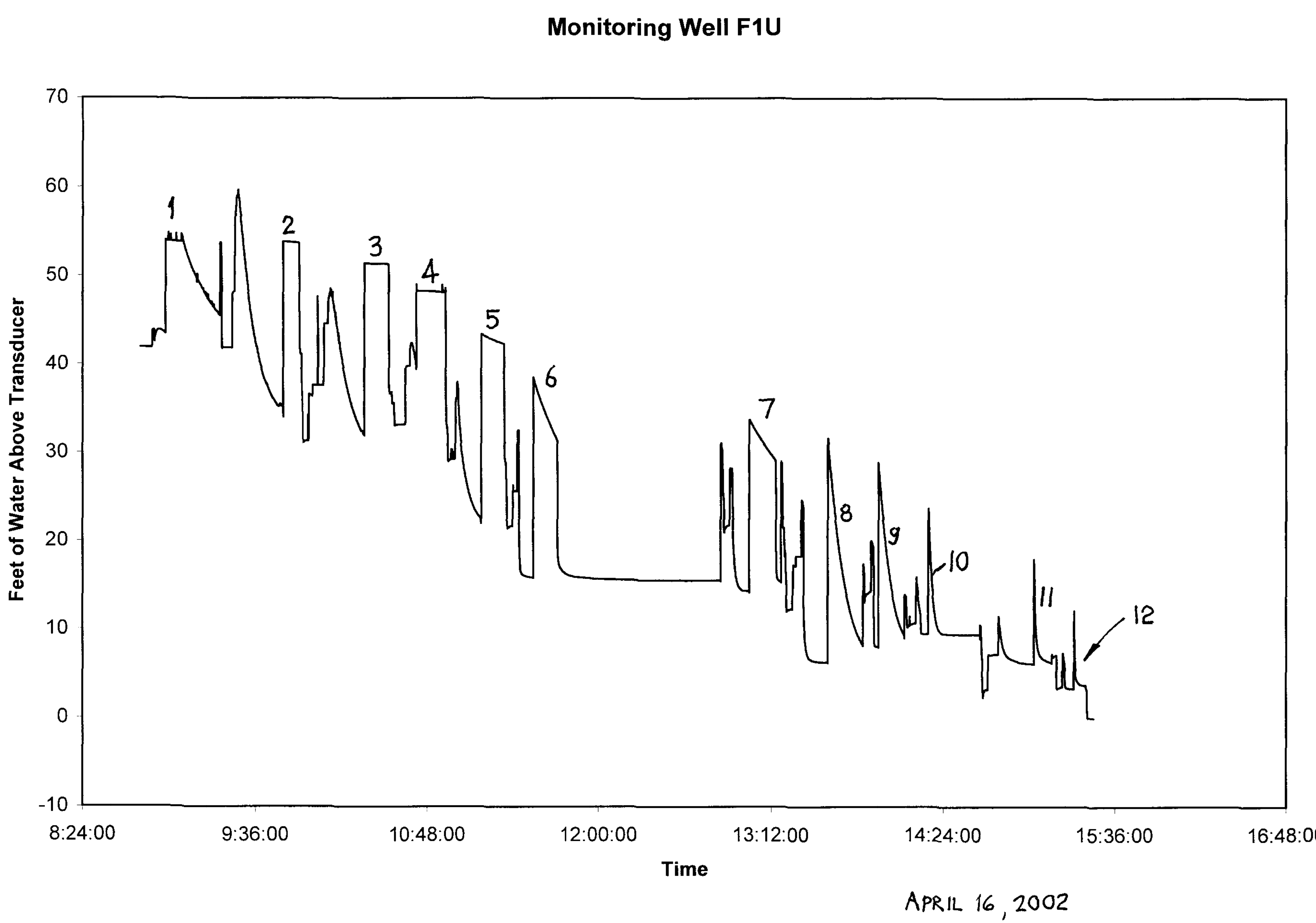
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

F1U

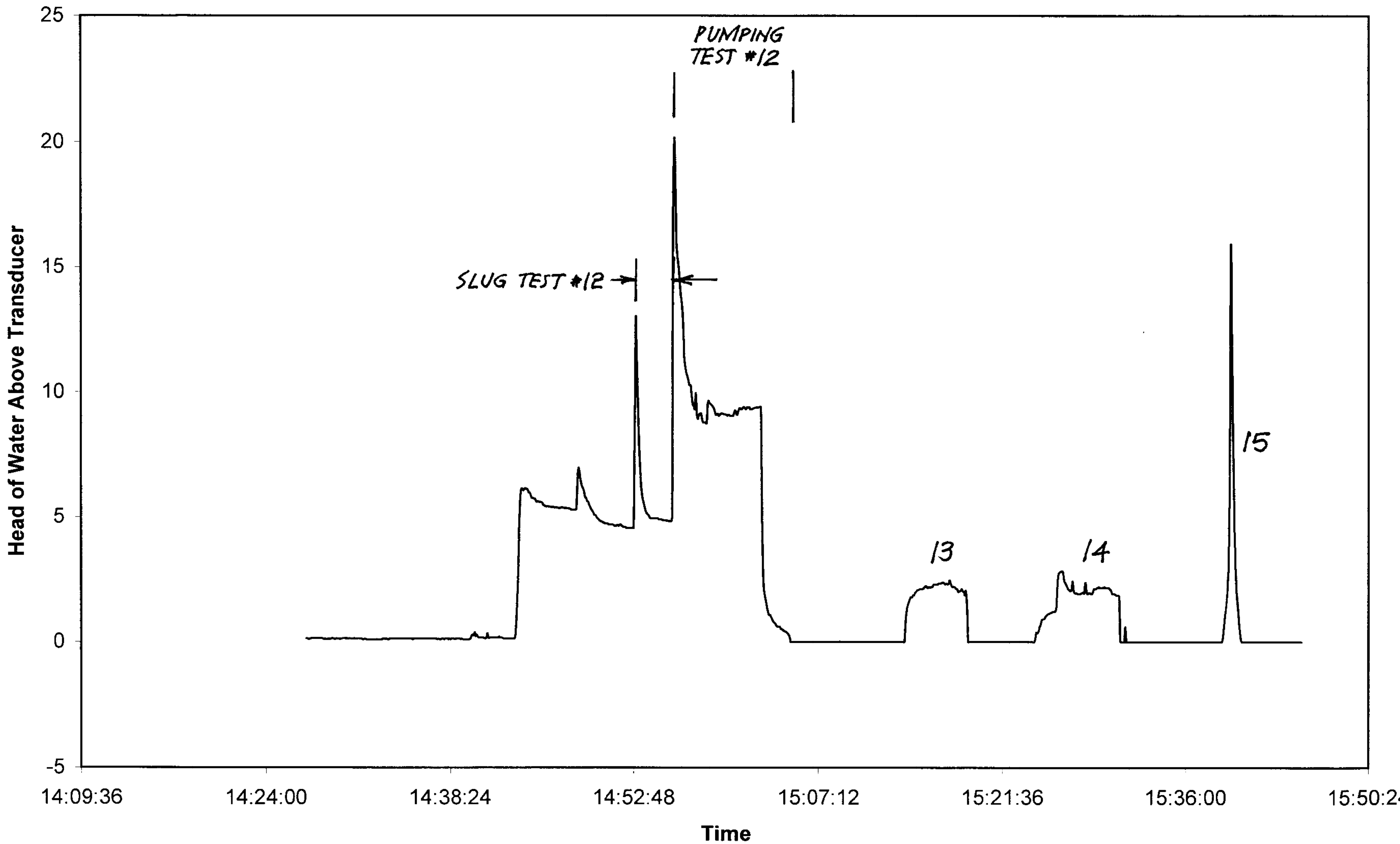
Testing Dates: April 16 & 17, 2002

Summary of Tests:

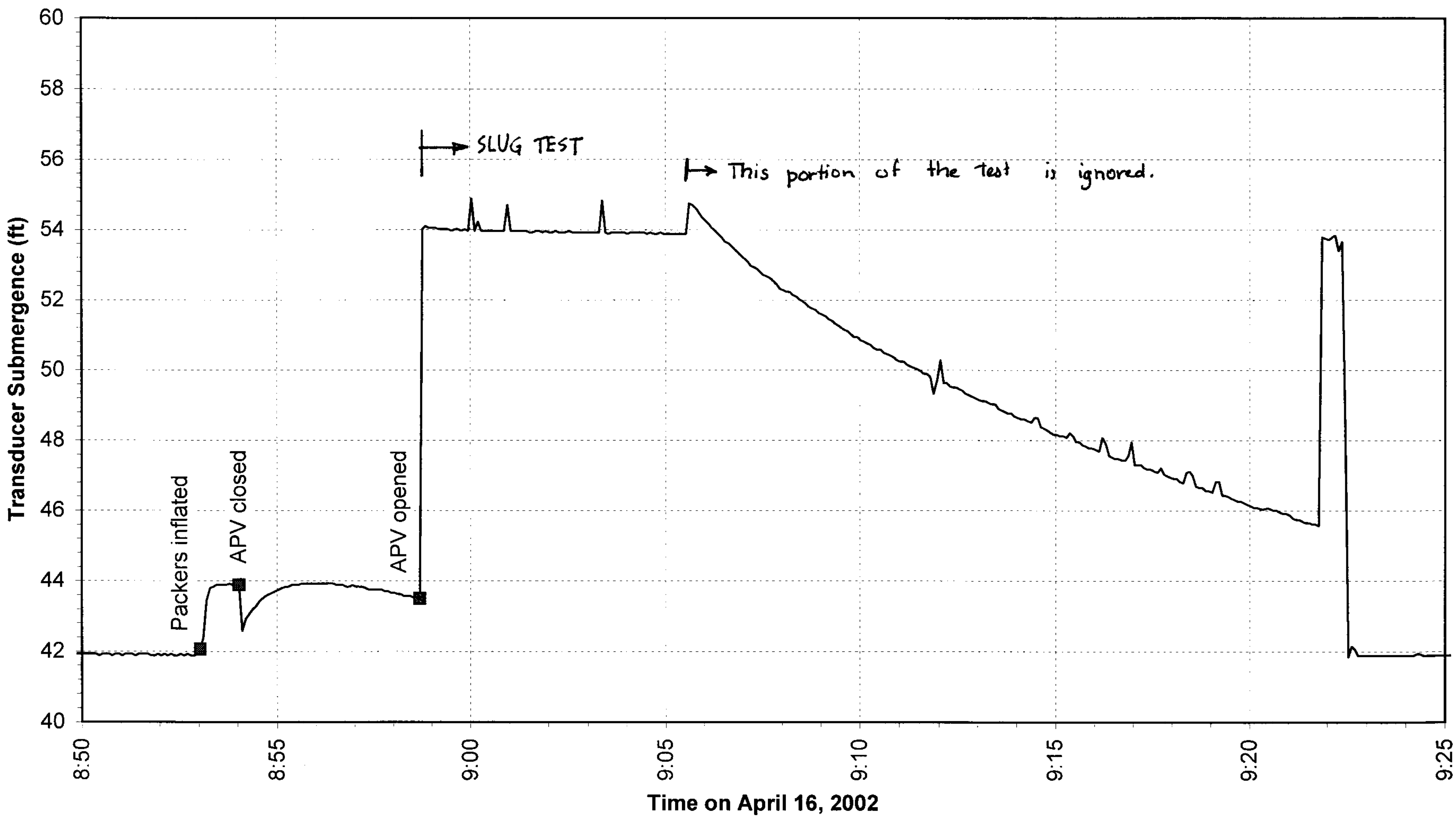
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
F1U	1	549.51	540.01	0.015	
F1U	2	549.51	544.31	<<1	
F1U	3	553.51	548.31	<<1	
F1U	4	557.51	552.31	0.008	
F1U	5	561.51	556.31	0.028	
F1U	6	565.51	560.31	0.27	
F1U	7	569.51	564.31	0.16	
F1U	8	573.51	568.31	1.3	
F1U	9	577.51	572.31	1.1	
F1U	10	581.51	576.31	5	
F1U	11	585.51	580.51	9.6	
F1U	12P	589.51	584.31	350	
F1U	13	593.51	588.31	182.5	
F1U	14	597.51	592.31	413	
F1U	15	601.51	596.31	38	See PT memo

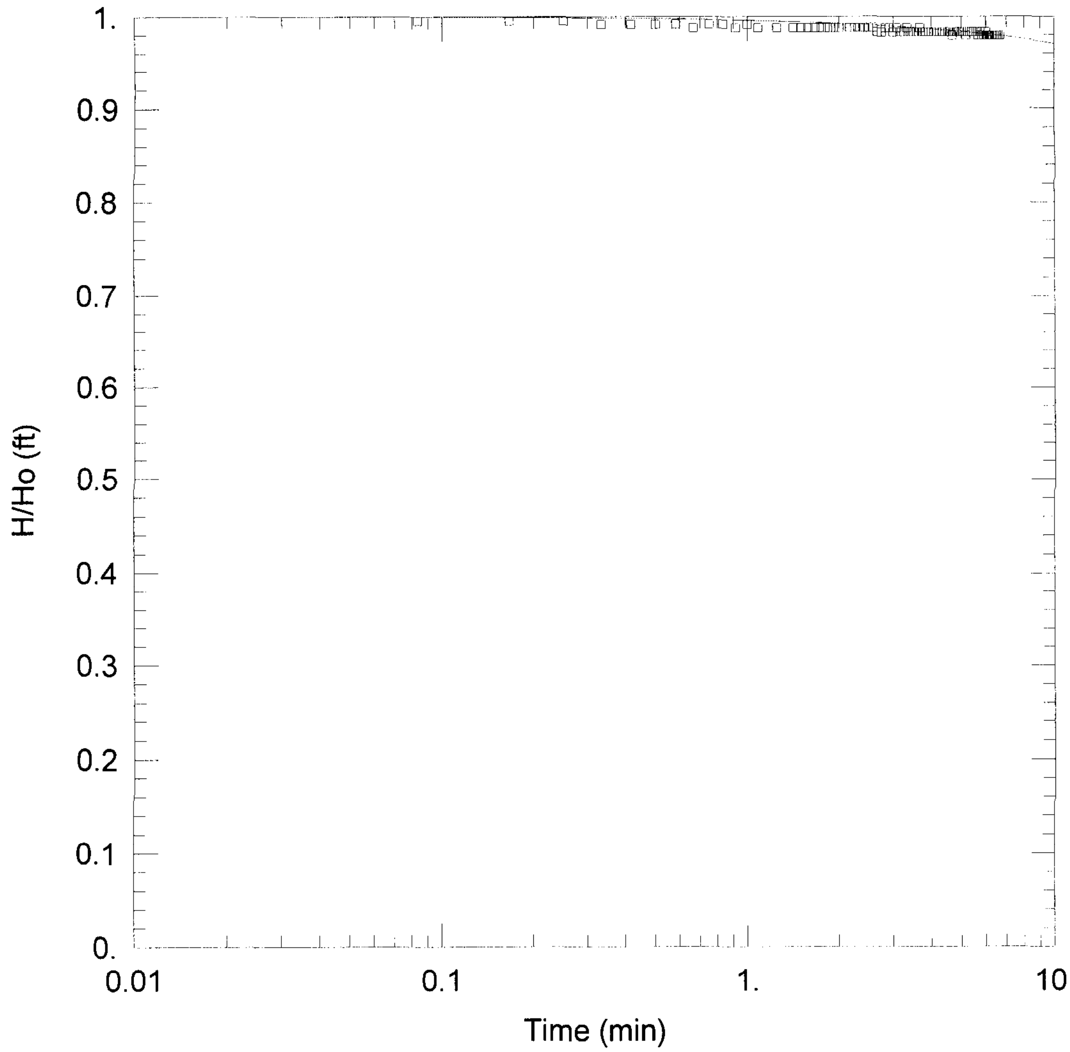

Monitoring Well F1U
Feet of Water Above Transducer
70
60
50
40
30
20
10
0
-10
8:24:00
9:36:00
10:48:00
12:00:00
13:12:00
14:24:00
15:36:00
16:48:00
Time
1
2
3
4
5
6
7
8
9
10
11
12
APRIL 16, 2002

Monitoring Well F1U



F1U
Transducer Submergence for Interval 1
(549.51 to 540.01 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-1.aqt
Date: 11/26/02 Time: 08:37:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-1)

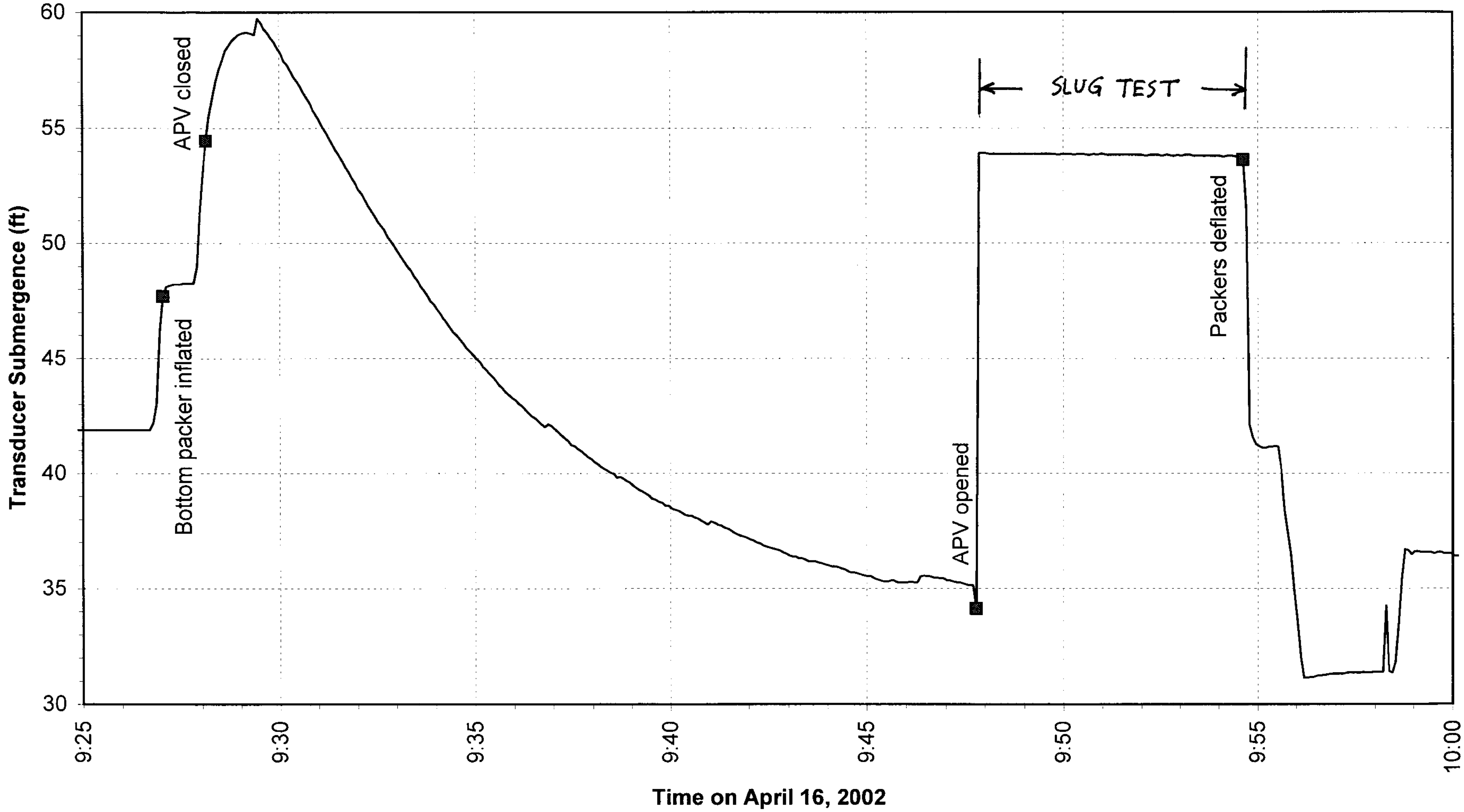
Initial Displacement: 10.61 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

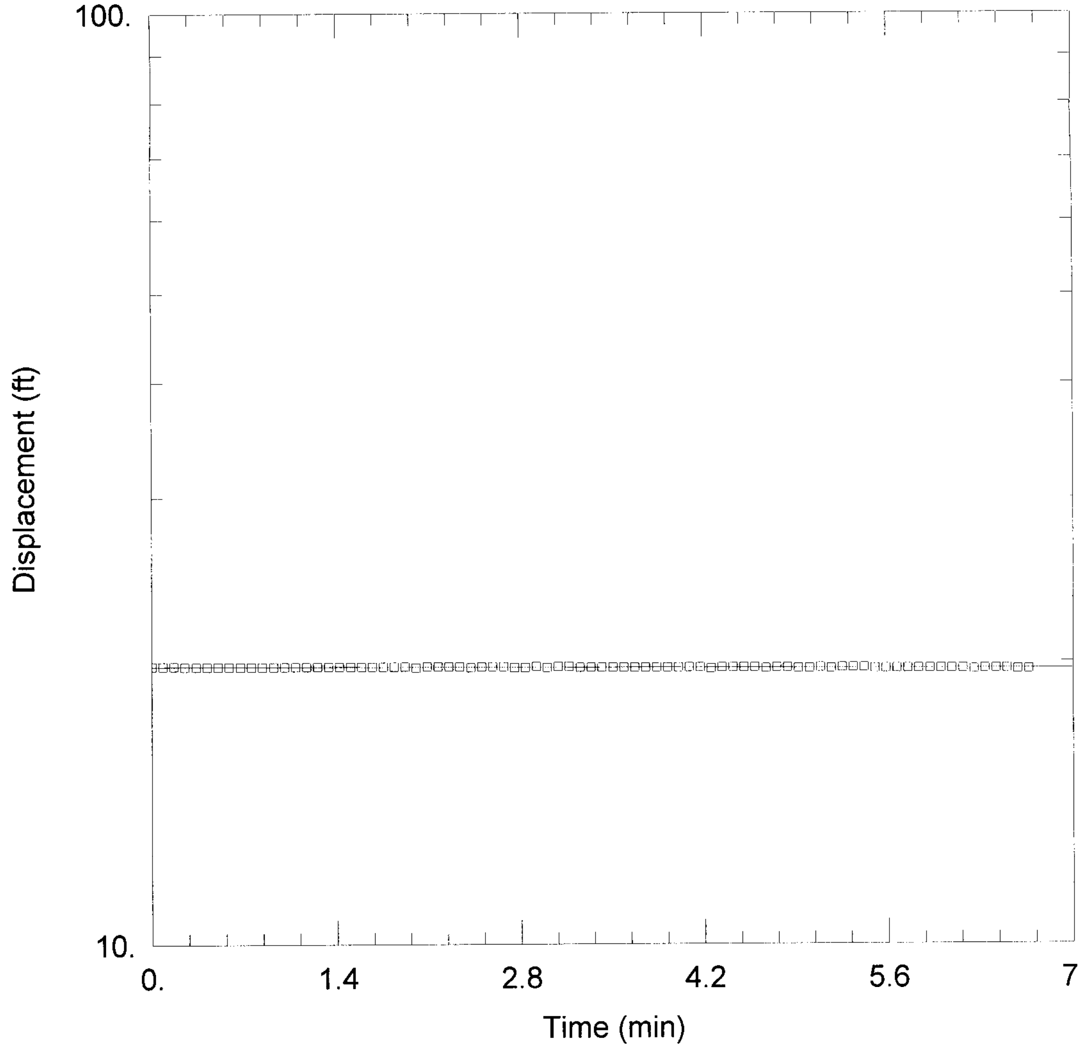
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

¯ = 0.01536 ft²/day
S = 1.E-06

F1U
Transducer Submergence for Interval 2
(549.51 to 544.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-2.aqt
Date: 11/26/02 Time: 08:37:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-2)

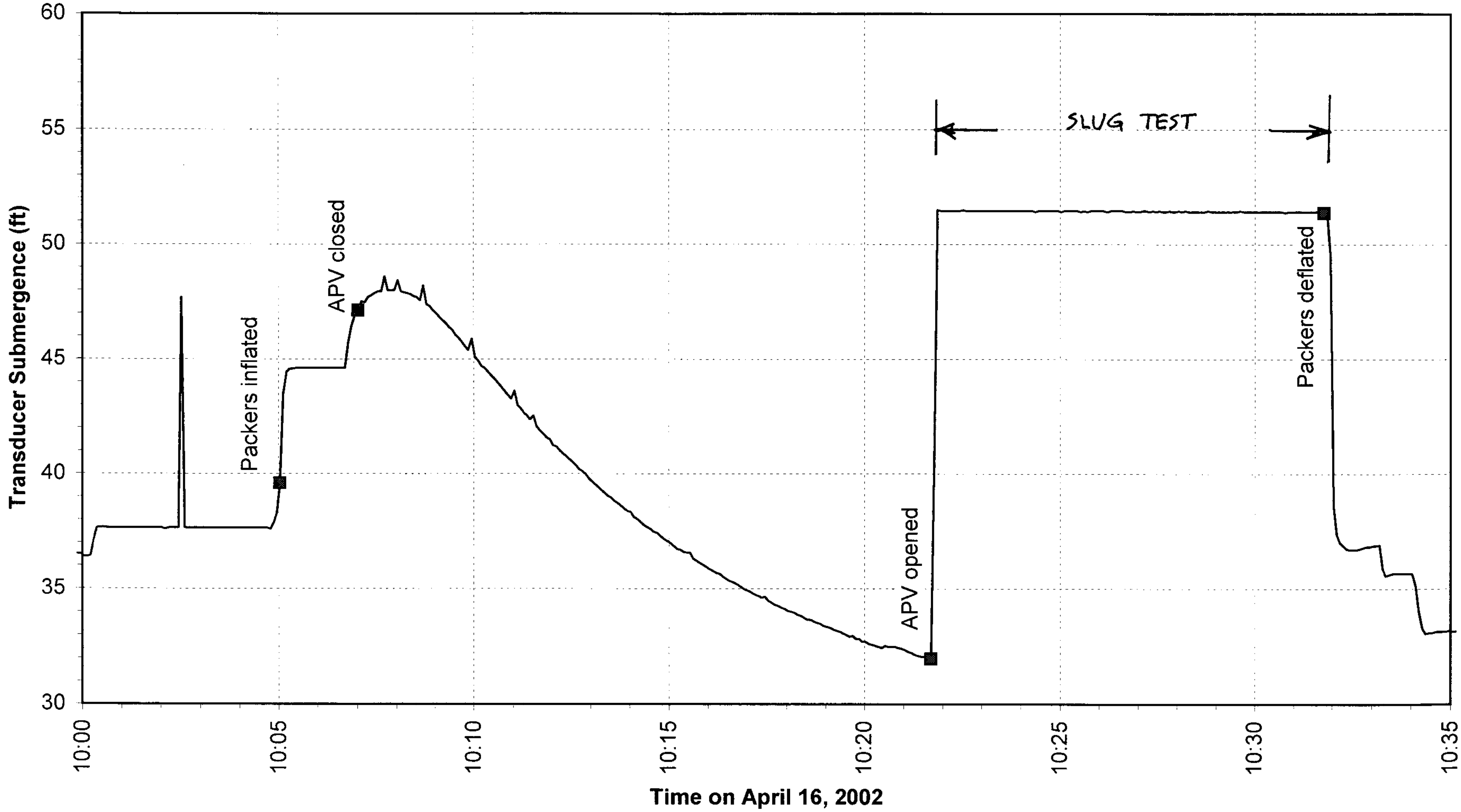
Initial Displacement: 19.79 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

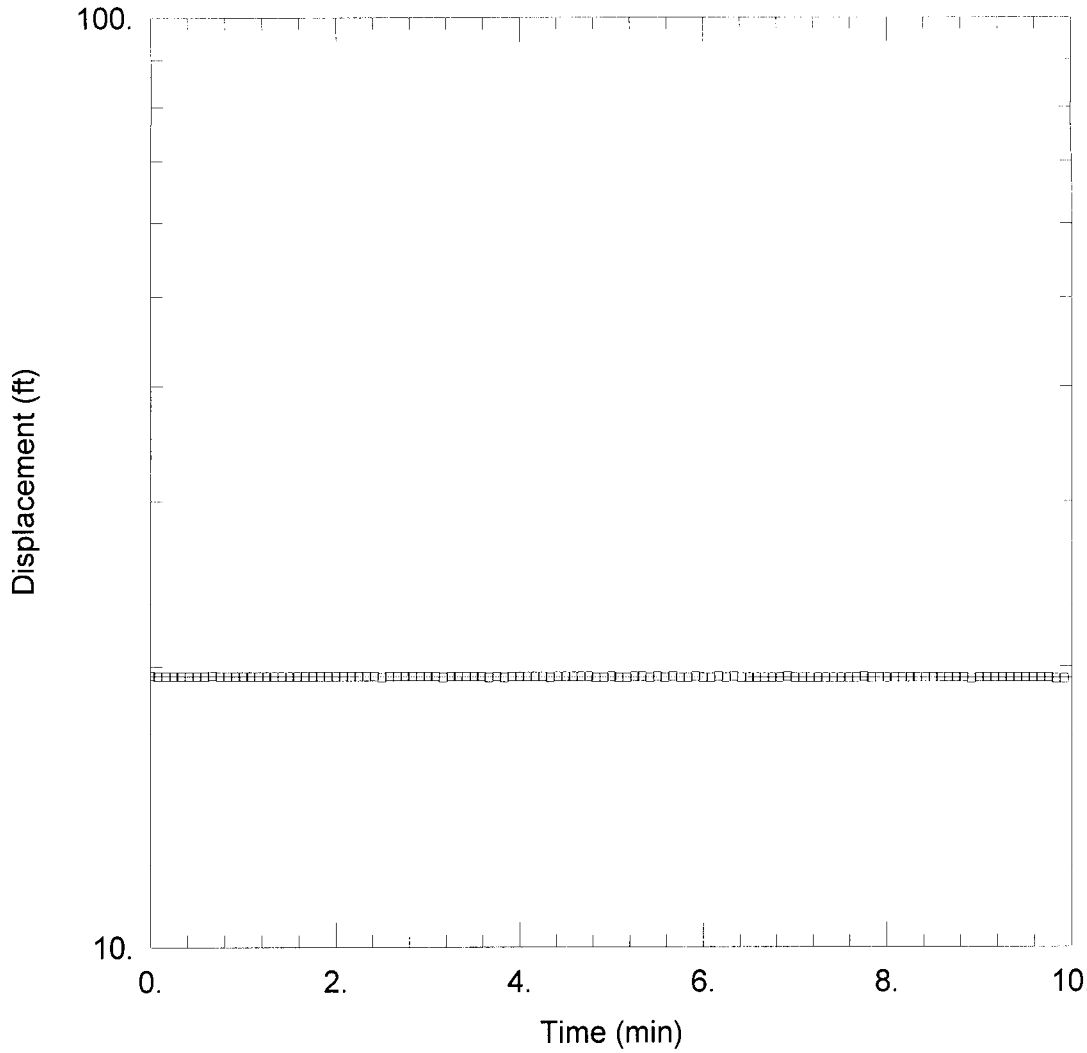
SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.0007974 ft/day
y0 = 19.78 ft

F1U
Transducer Submergence for Interval 3
(553.51 to 548.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-3.aqt
Date: 11/26/02 Time: 08:37:45

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-3)

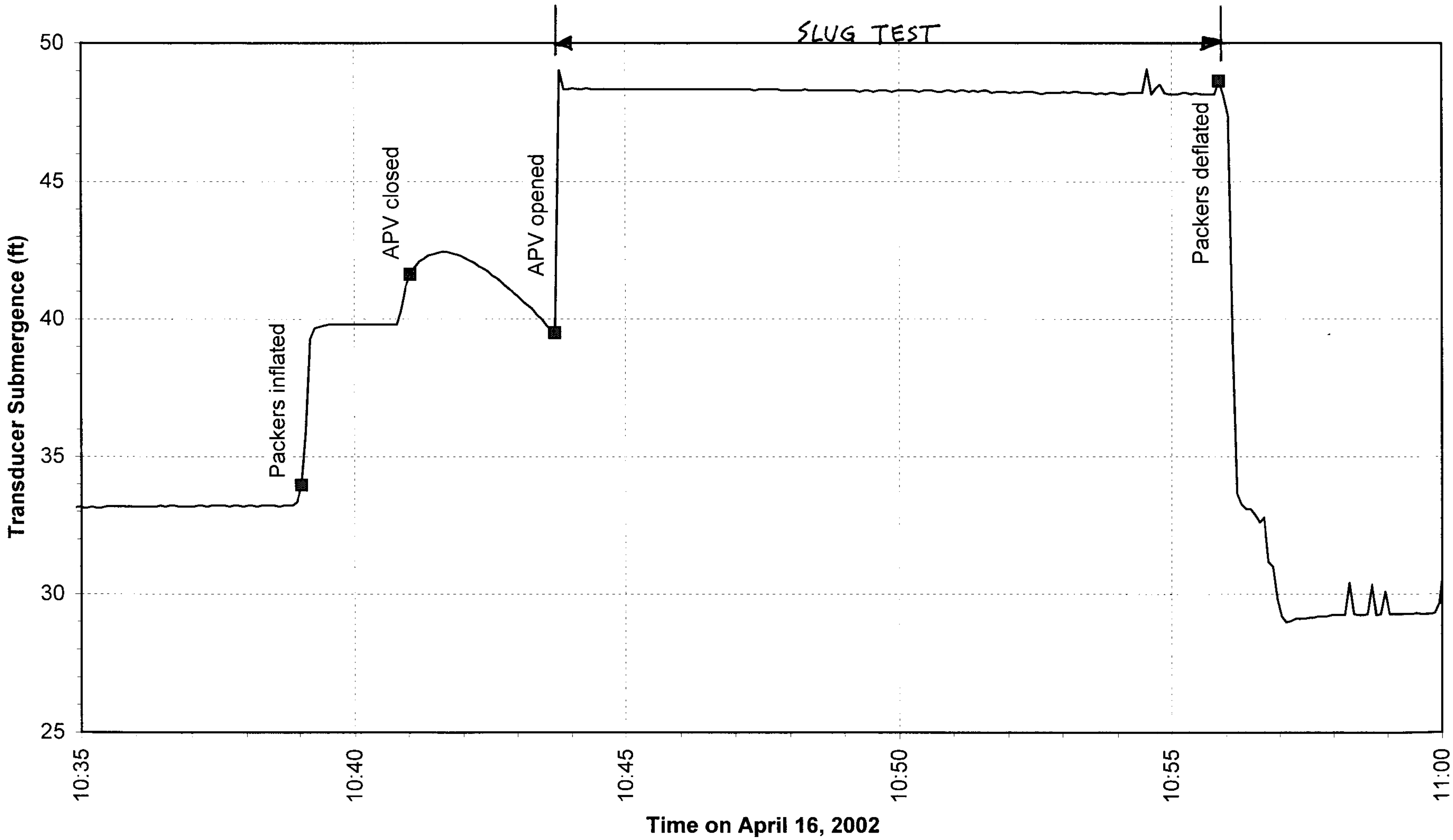
Initial Displacement: 19.54 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

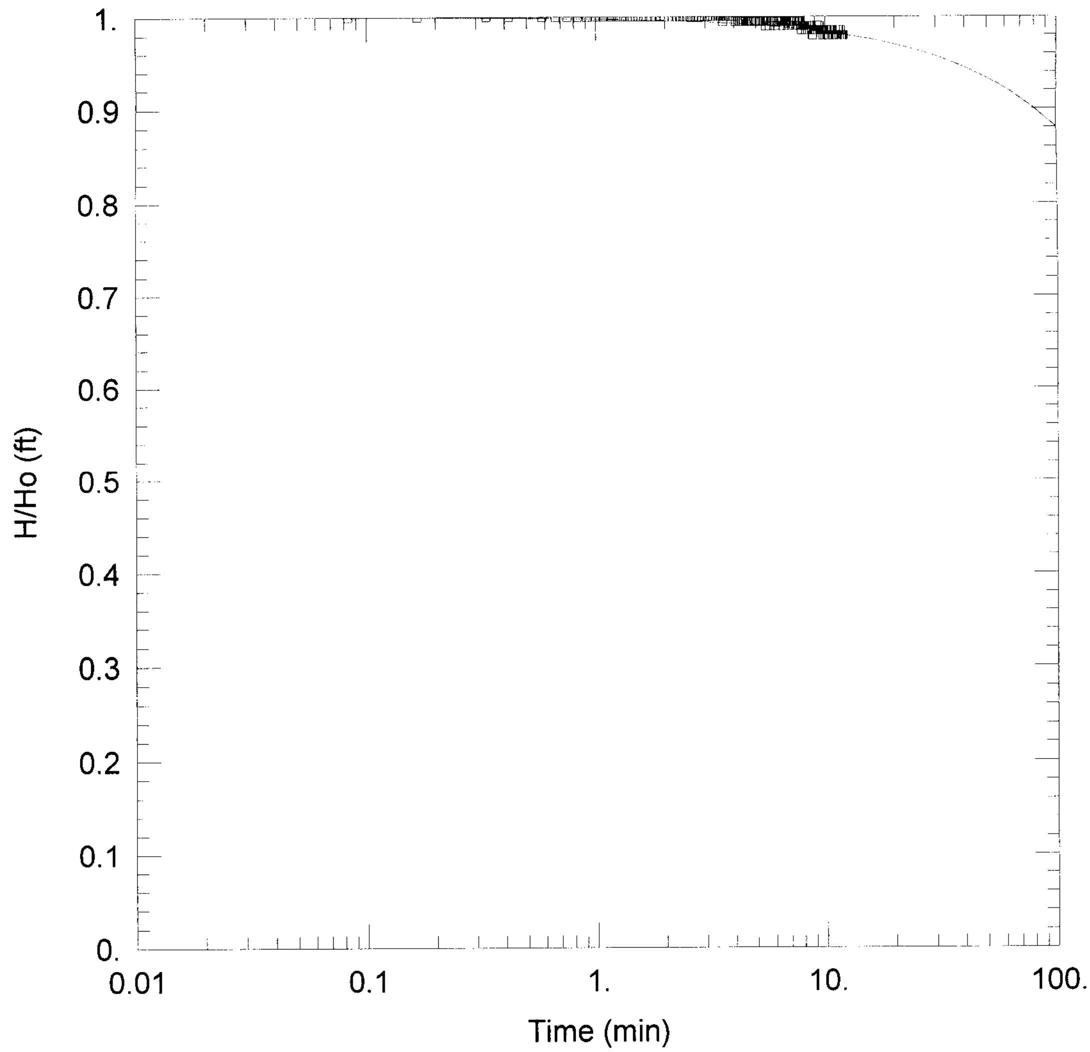
SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.0003236 ft/day
y0 = 19.51 ft

F1U
Transducer Submergence for Interval 4
(557.51 to 552.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-4.aqt
Date: 11/26/02 Time: 08:37:41

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

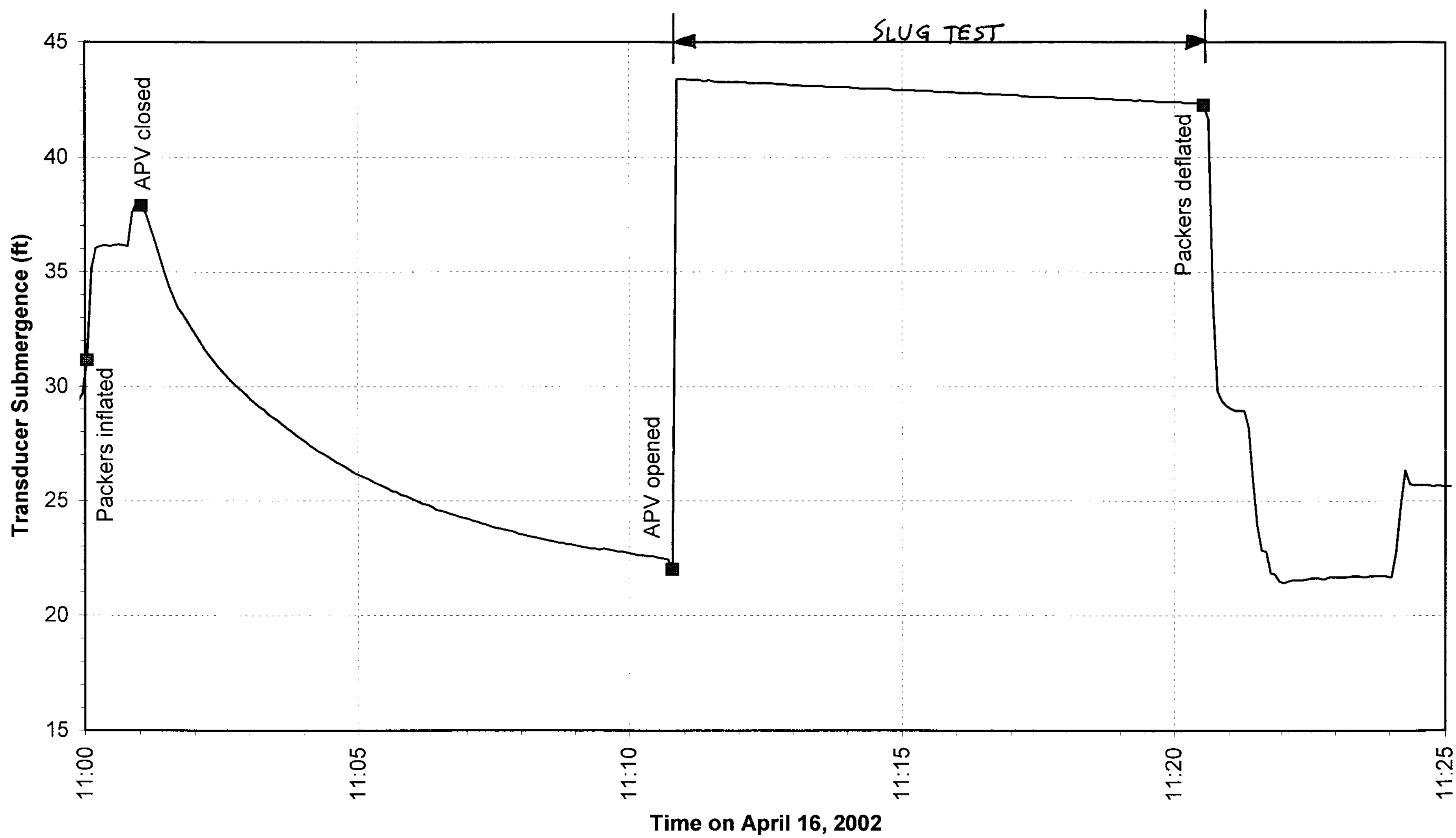
WELL DATA (F1U-4)

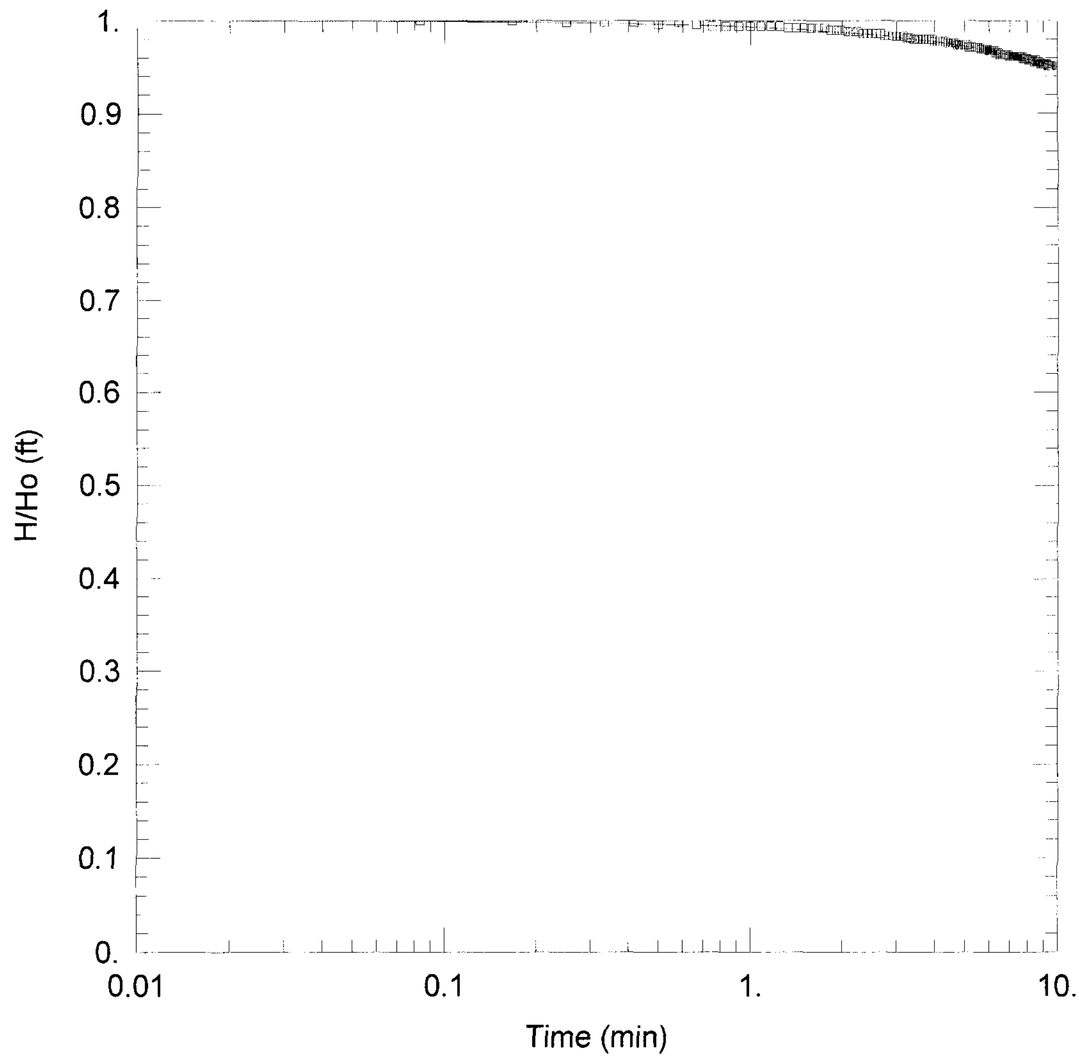
Initial Displacement: 8.84 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
‾ = 0.007897 ft^2/day
S = 1.E-06

F1U
Transducer Submergence for Interval 5
(561.51 to 556.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-5.aqt
Date: 11/26/02 Time: 08:37:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

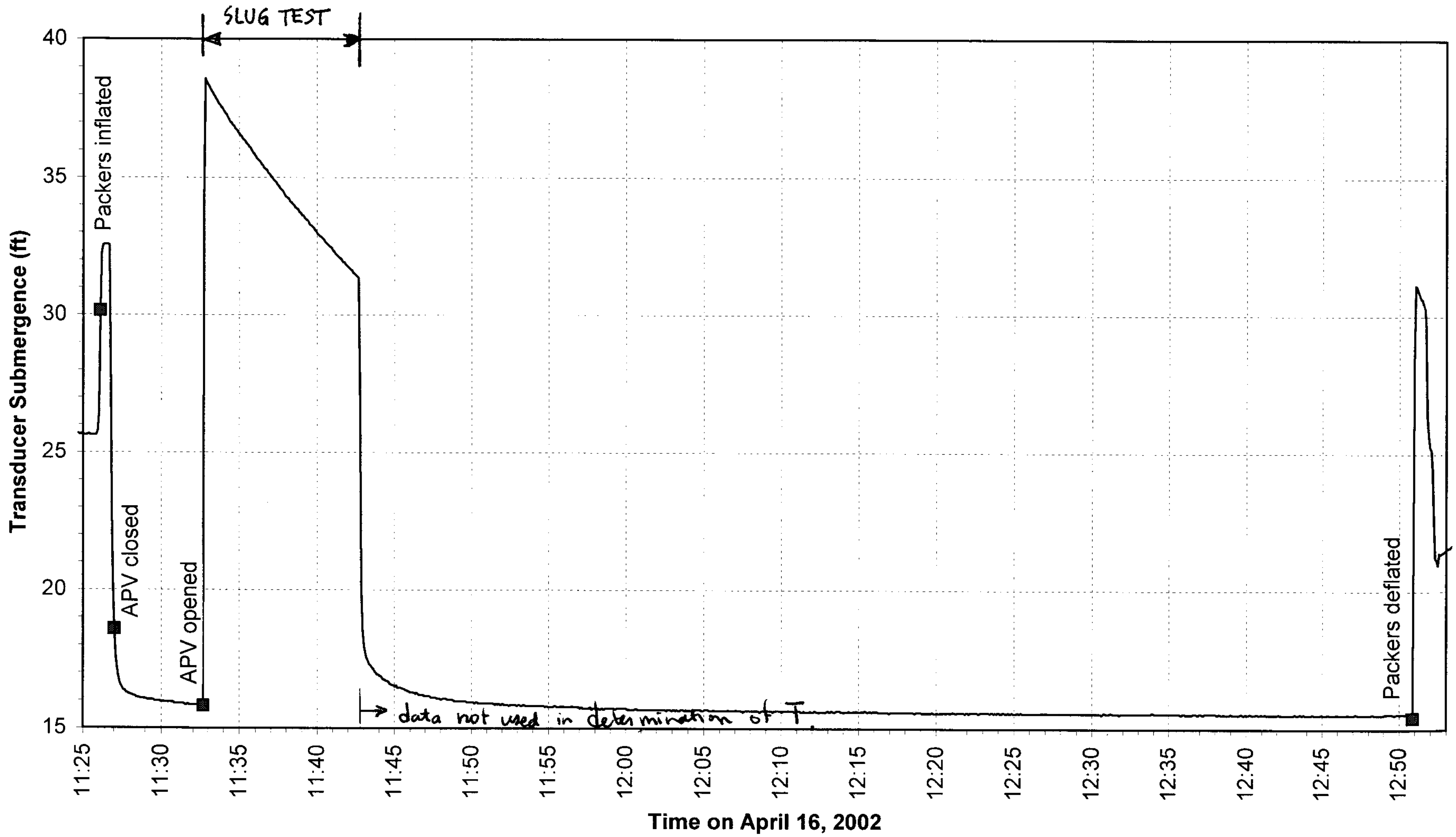
WELL DATA (F1U-5)

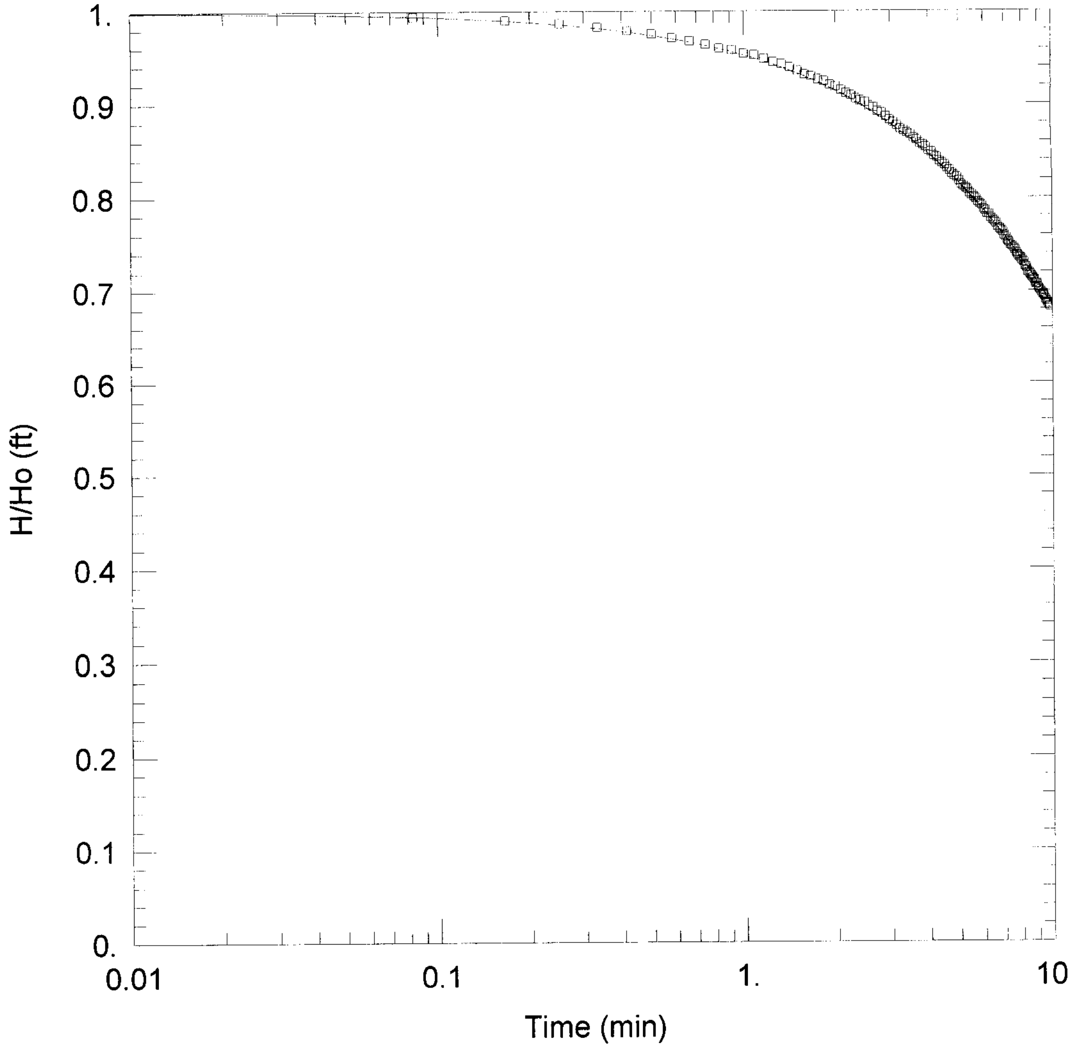
Initial Displacement: 21.4 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.02825 ft^2/day
S = 1.E-06

F1U
Transducer Submergence for Interval 6
(565.51 to 560.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-6.aqt
Date: 11/26/02 Time: 08:37:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-6)

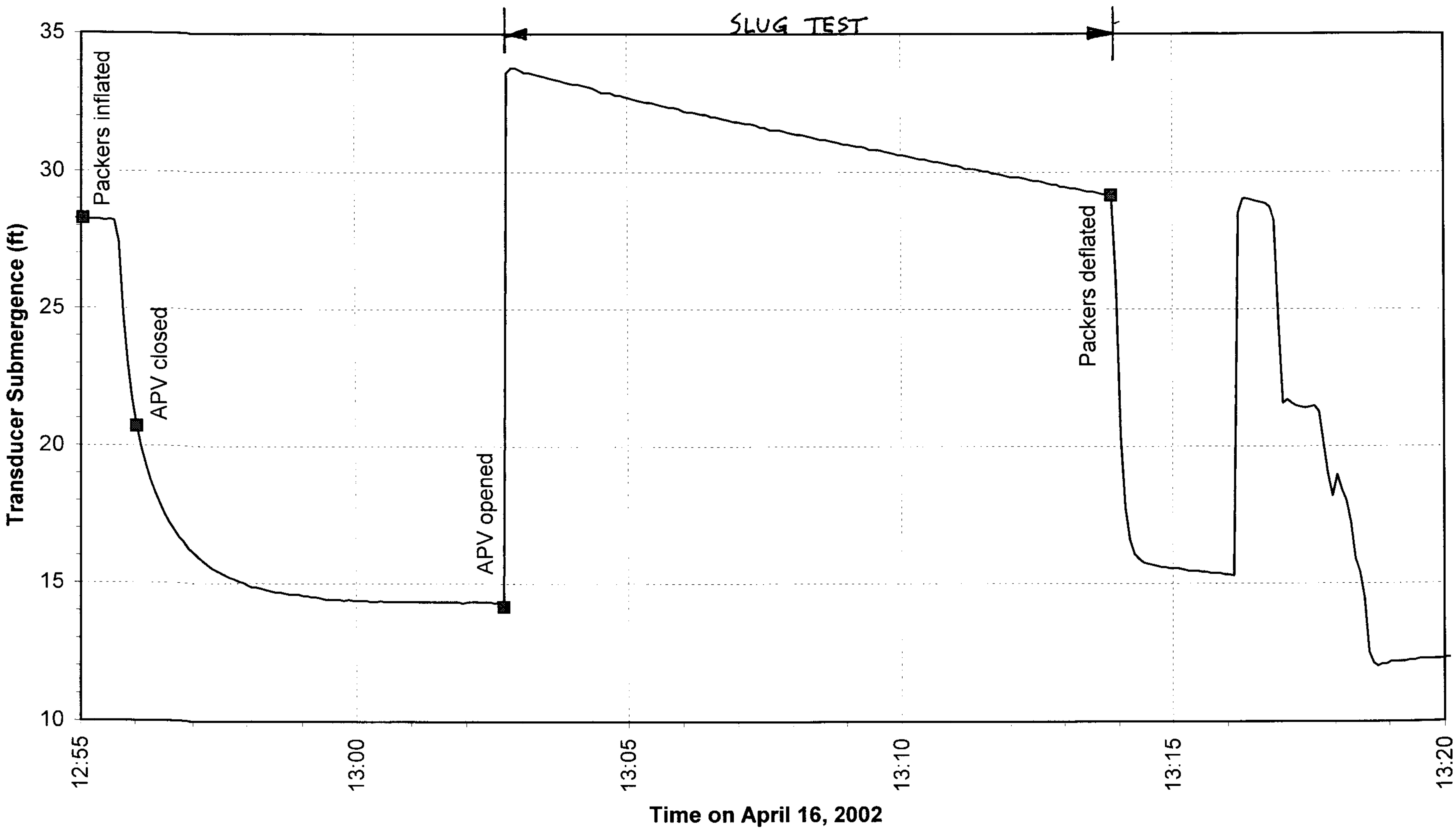
Initial Displacement: 22.78 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

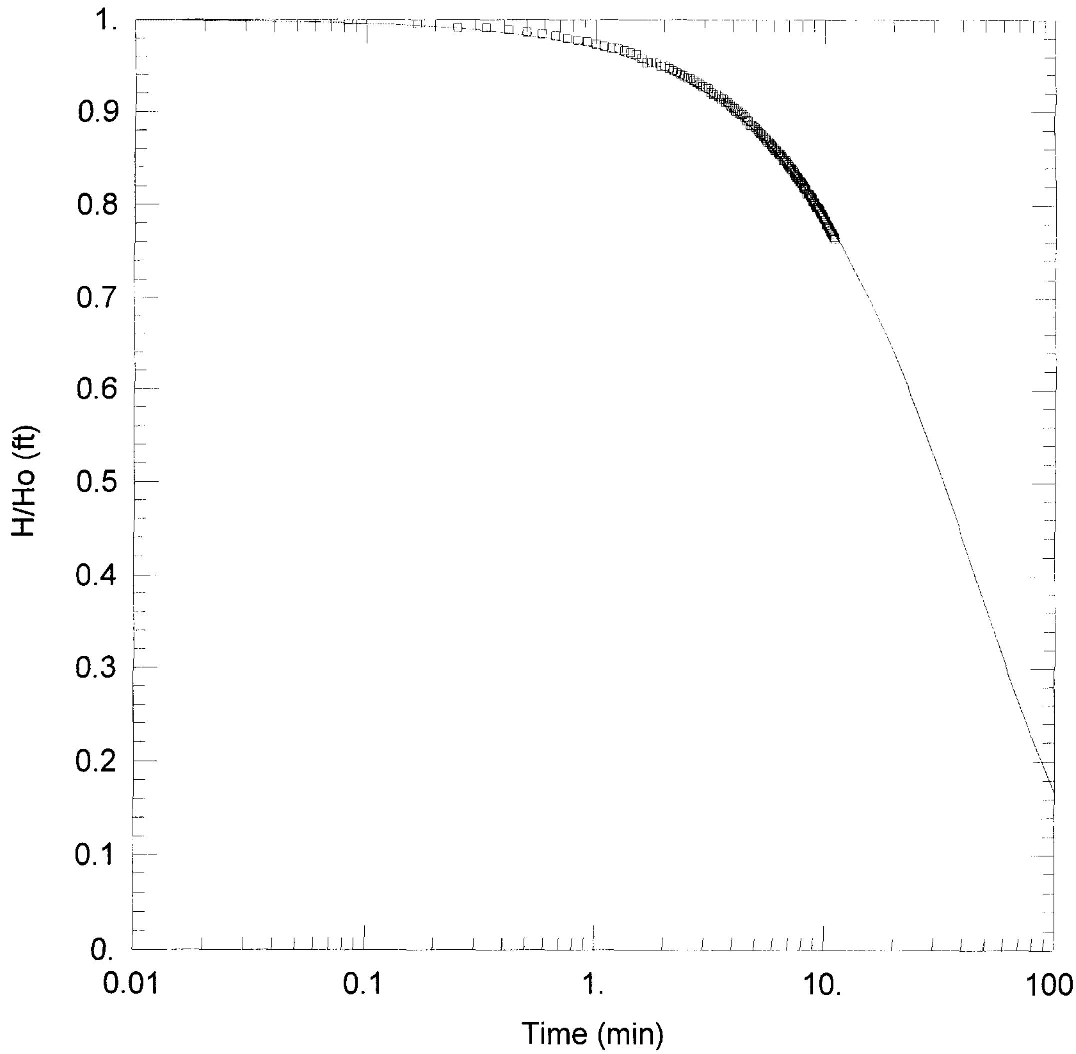
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

$^{-}$ = 0.2675 ft^2/day
S = 1.E-06

F1U
Transducer Submergence for Interval 7
(569.51 to 564.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-7.aqt
Date: 11/26/02 Time: 08:37:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

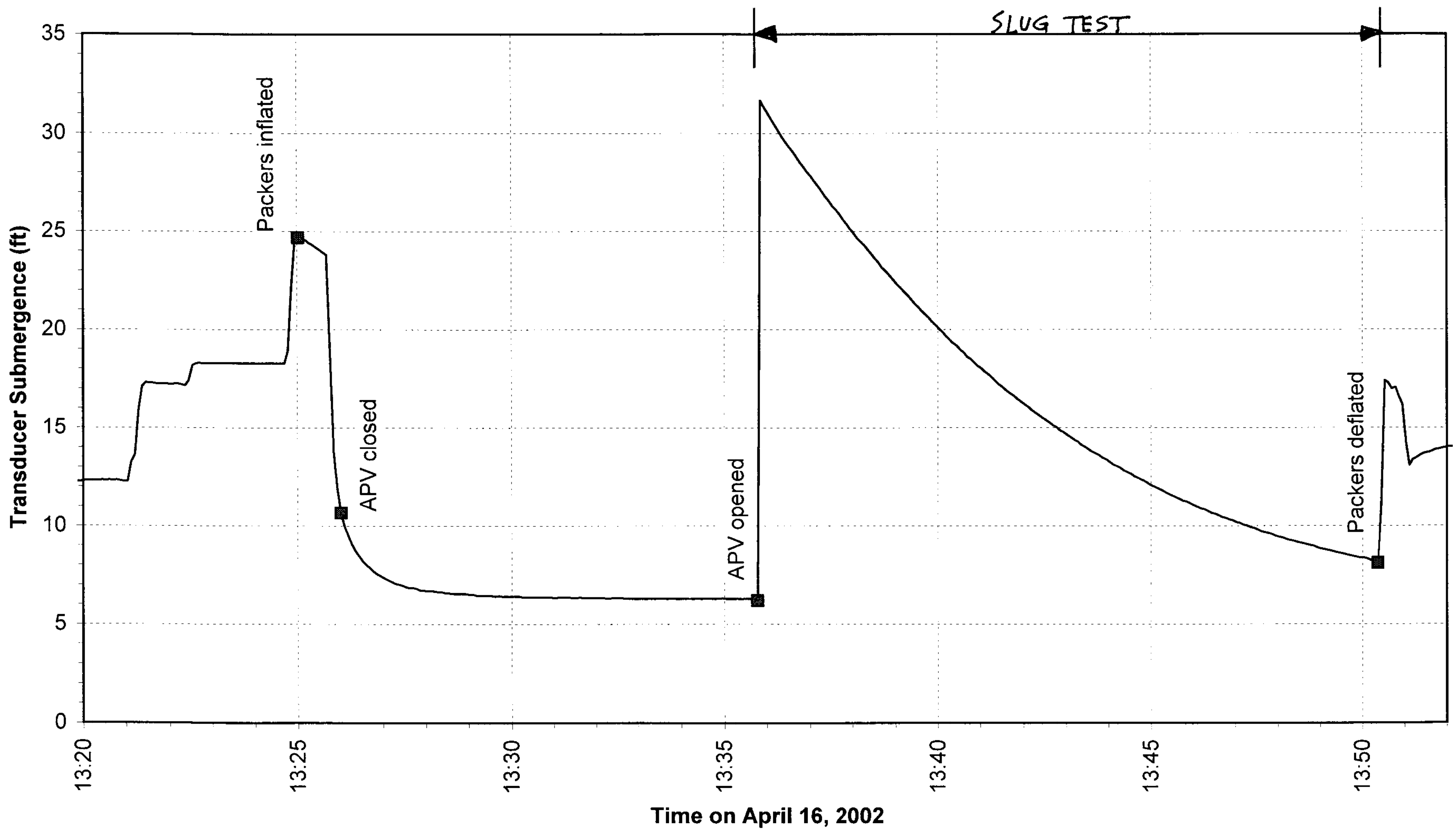
WELL DATA (F1U-7)

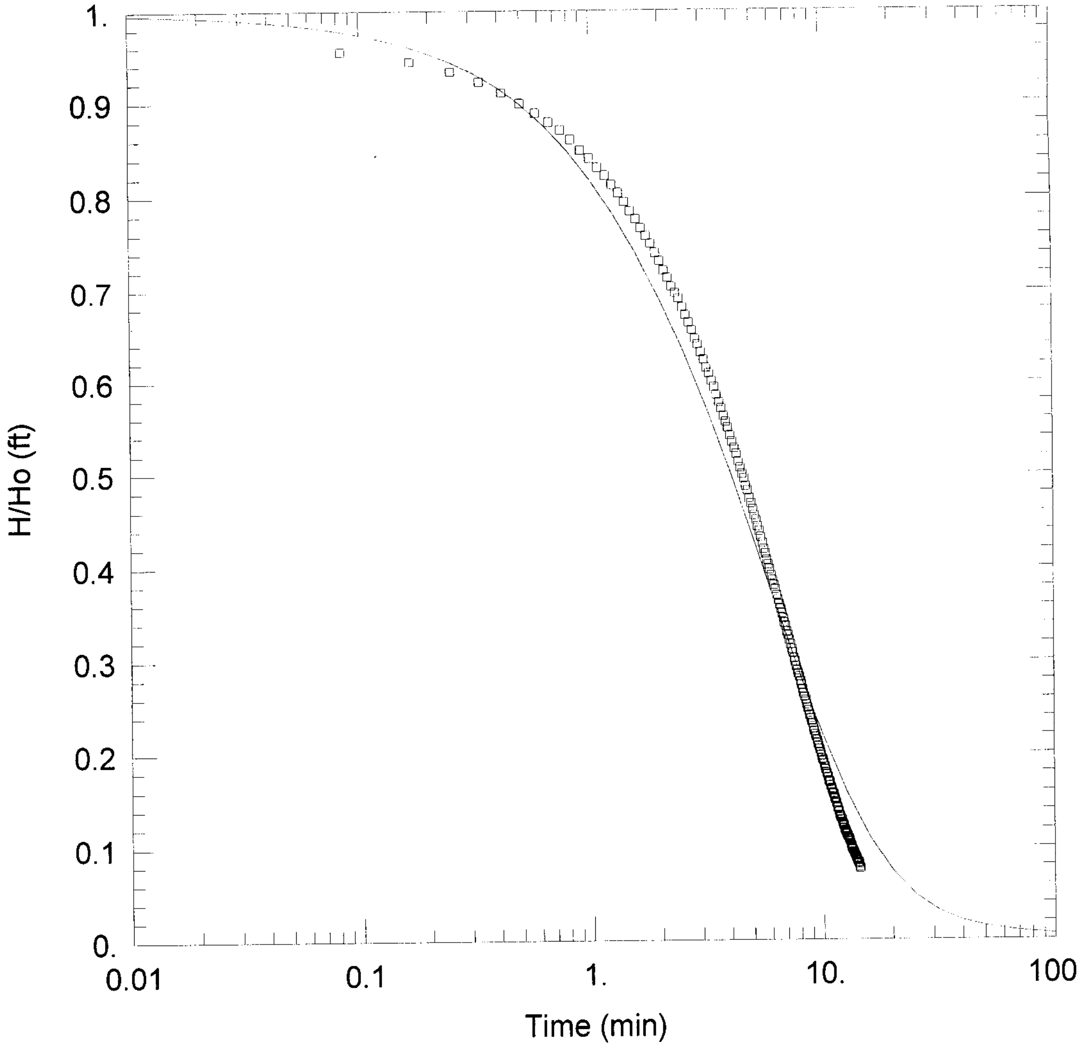
Initial Displacement: 19.62 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.16 ft^2/day S = 1.E-06

F1U
Transducer Submergence for Interval 8
(573.51 to 568.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-8.aqt
Date: 11/26/02 Time: 08:37:21

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-8)

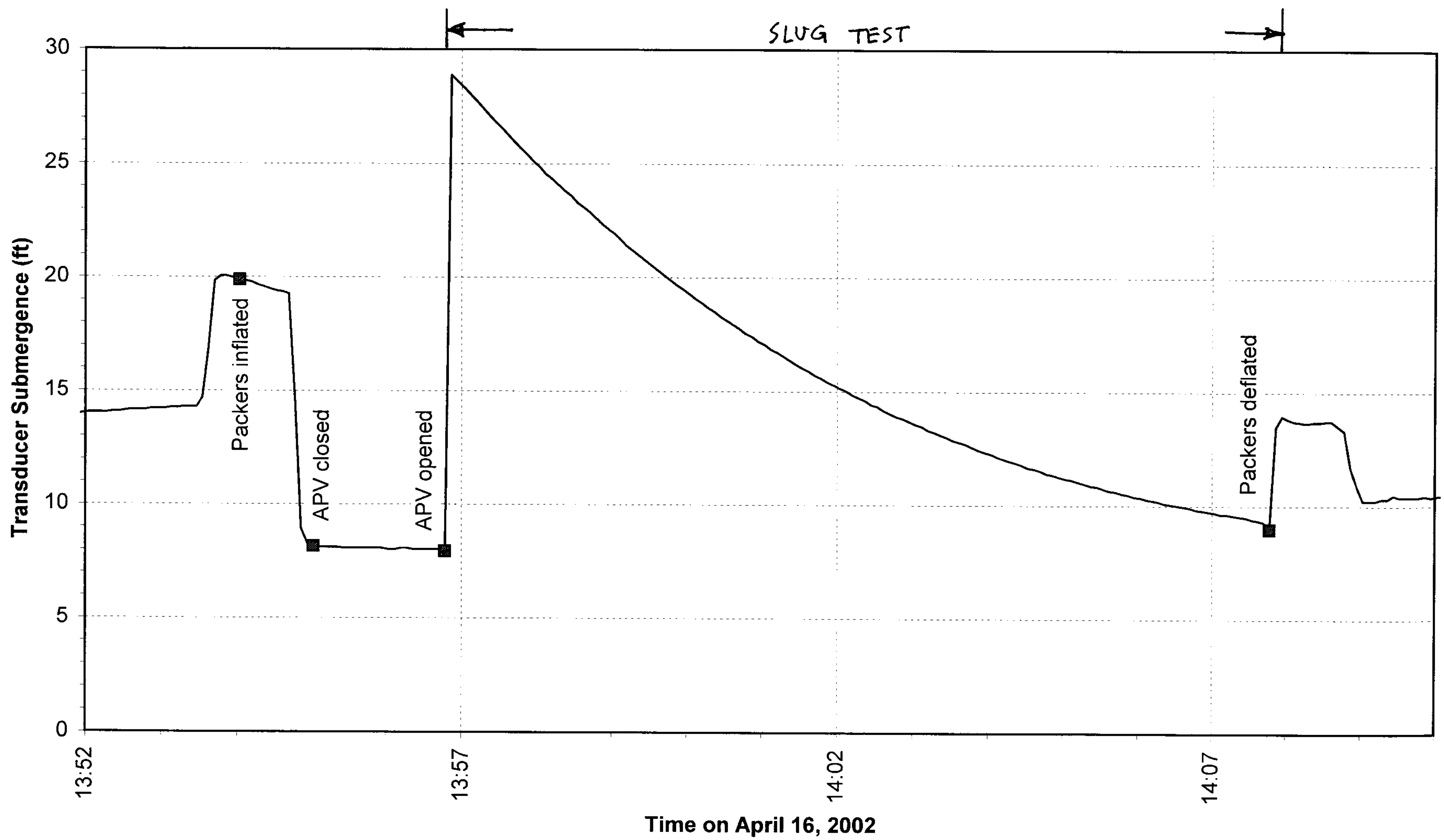
Initial Displacement: 26.28 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

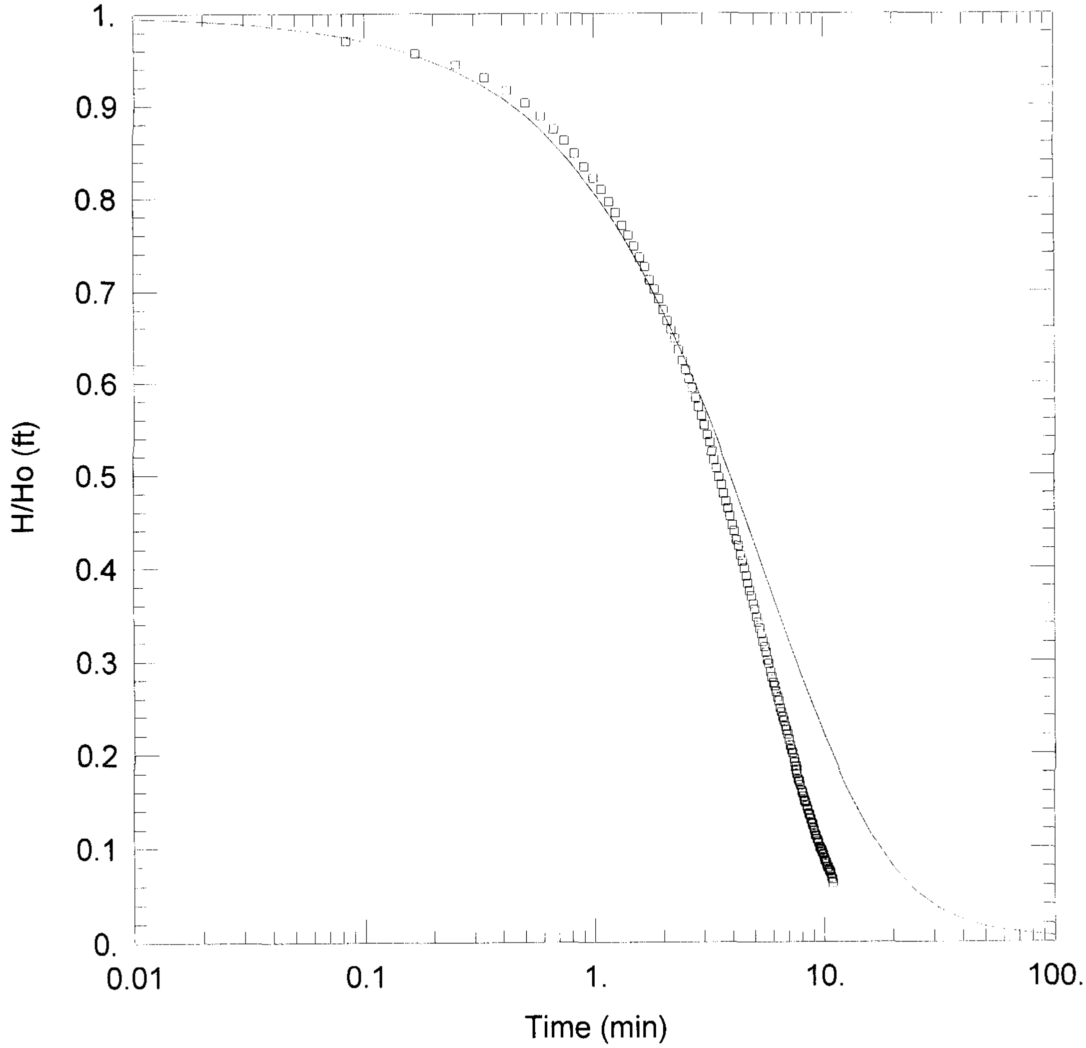
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

‾ = 1.312 ft²/day
S = 1.E-06

F1U
Transducer Submergence for Interval 9
(577.51 to 572.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-9.aqt
Date: 11/26/02 Time: 08:38:38

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

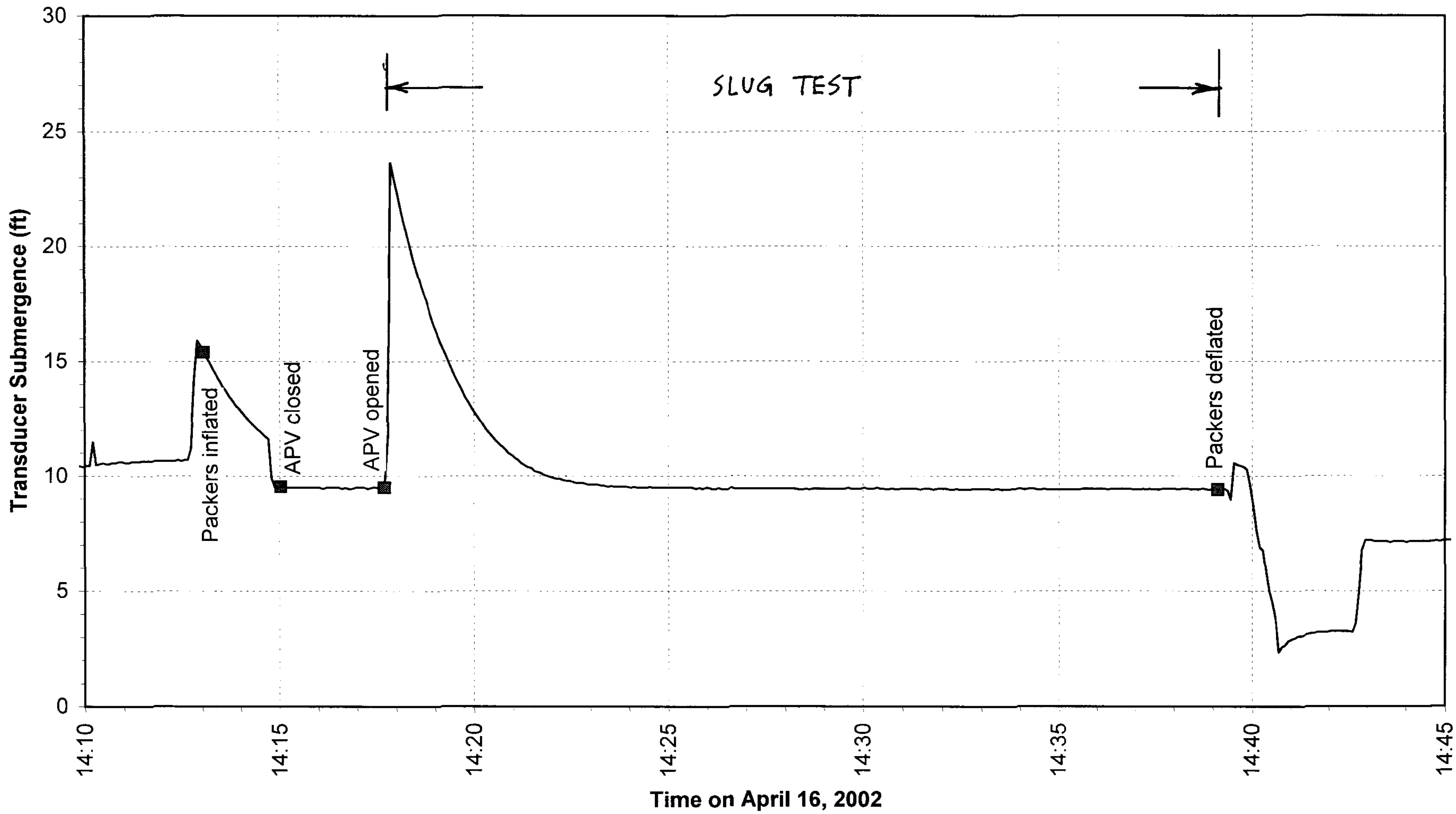
WELL DATA (F1U-9)

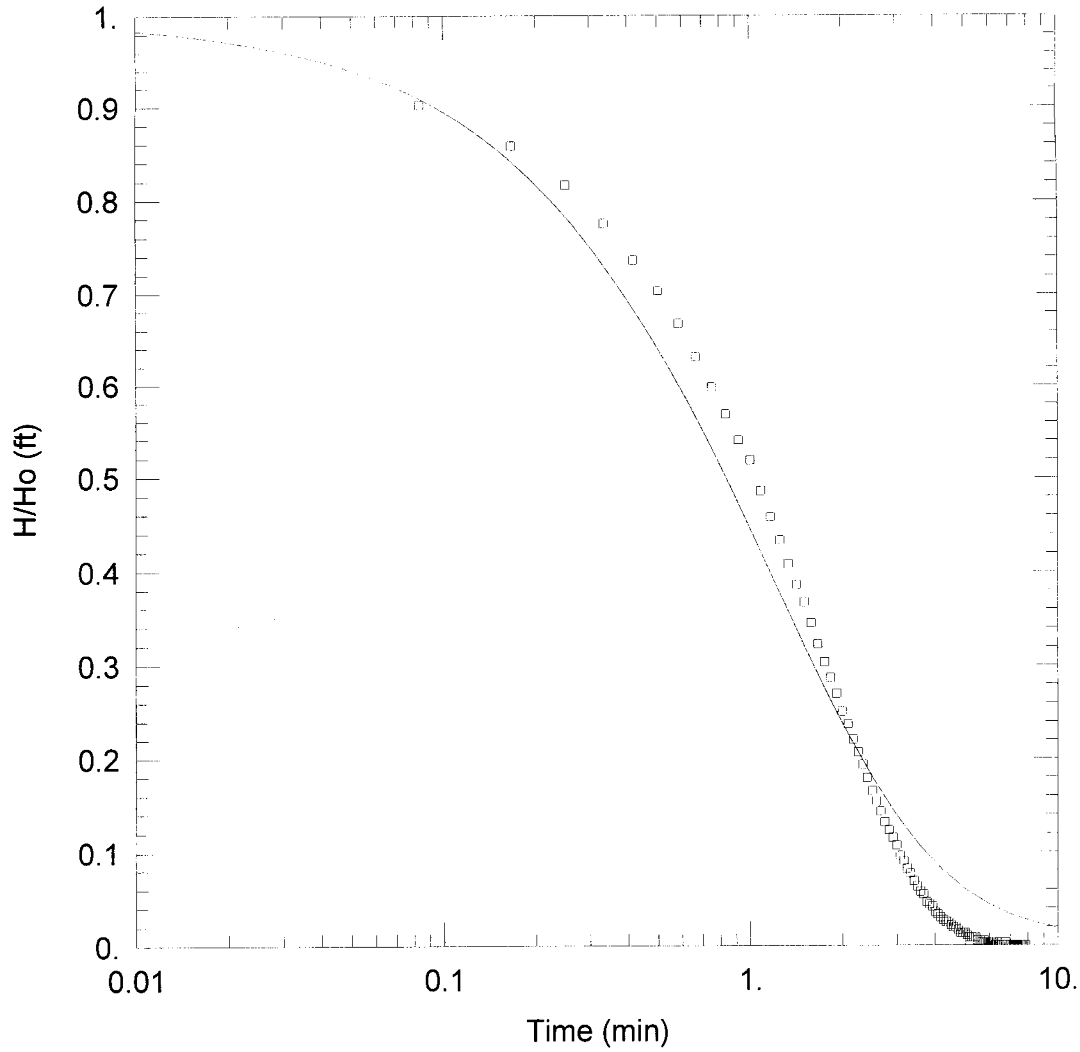
Initial Displacement: 21.6 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
$^{-}$ = 1.072 ft^2/day
S = 1.E-05

F1U
Transducer Submergence for Interval 10
(581.51 to 576.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-10.aqt
Date: 11/26/02 Time: 08:38:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-10)

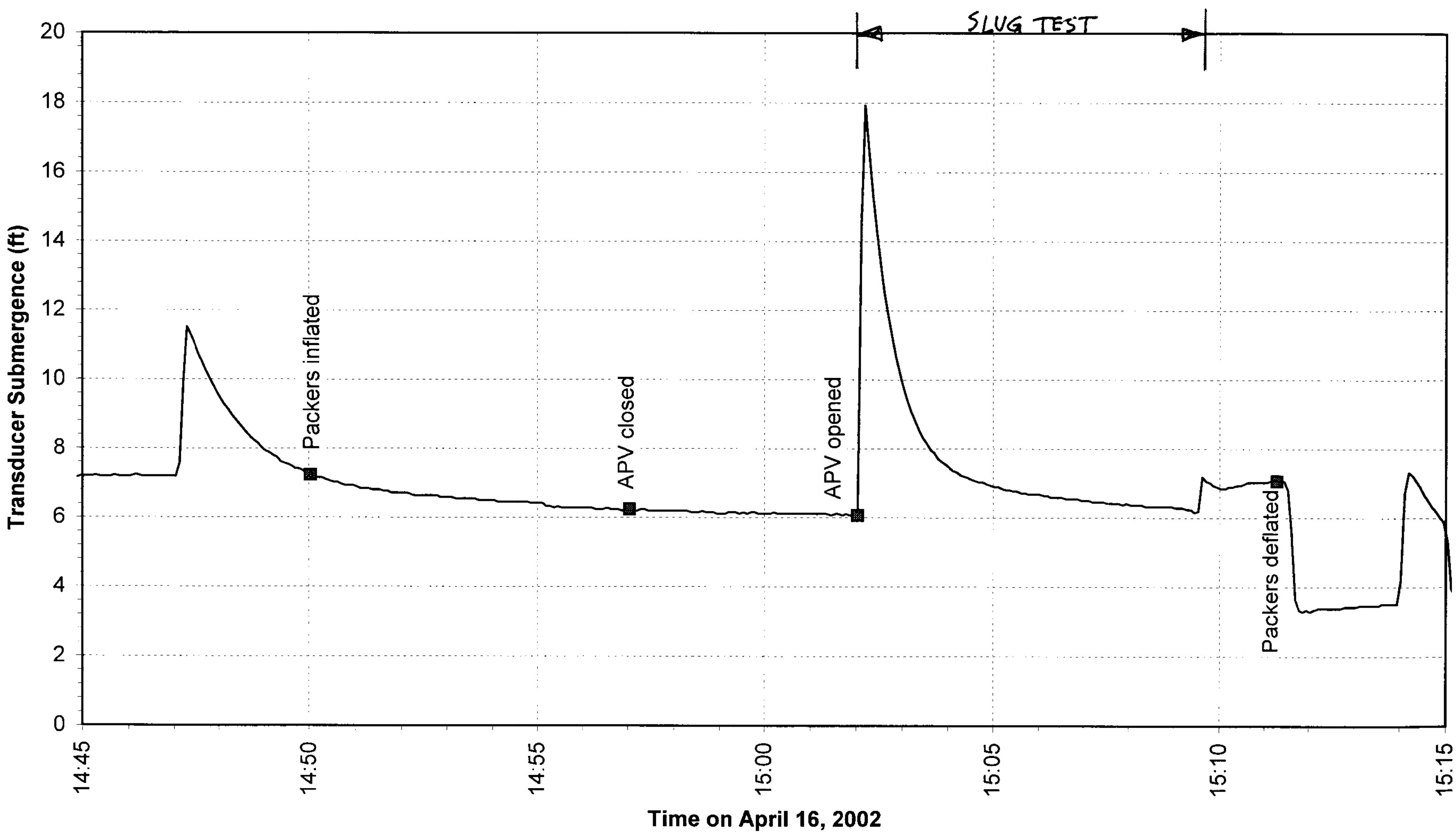
Initial Displacement: 15.7 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

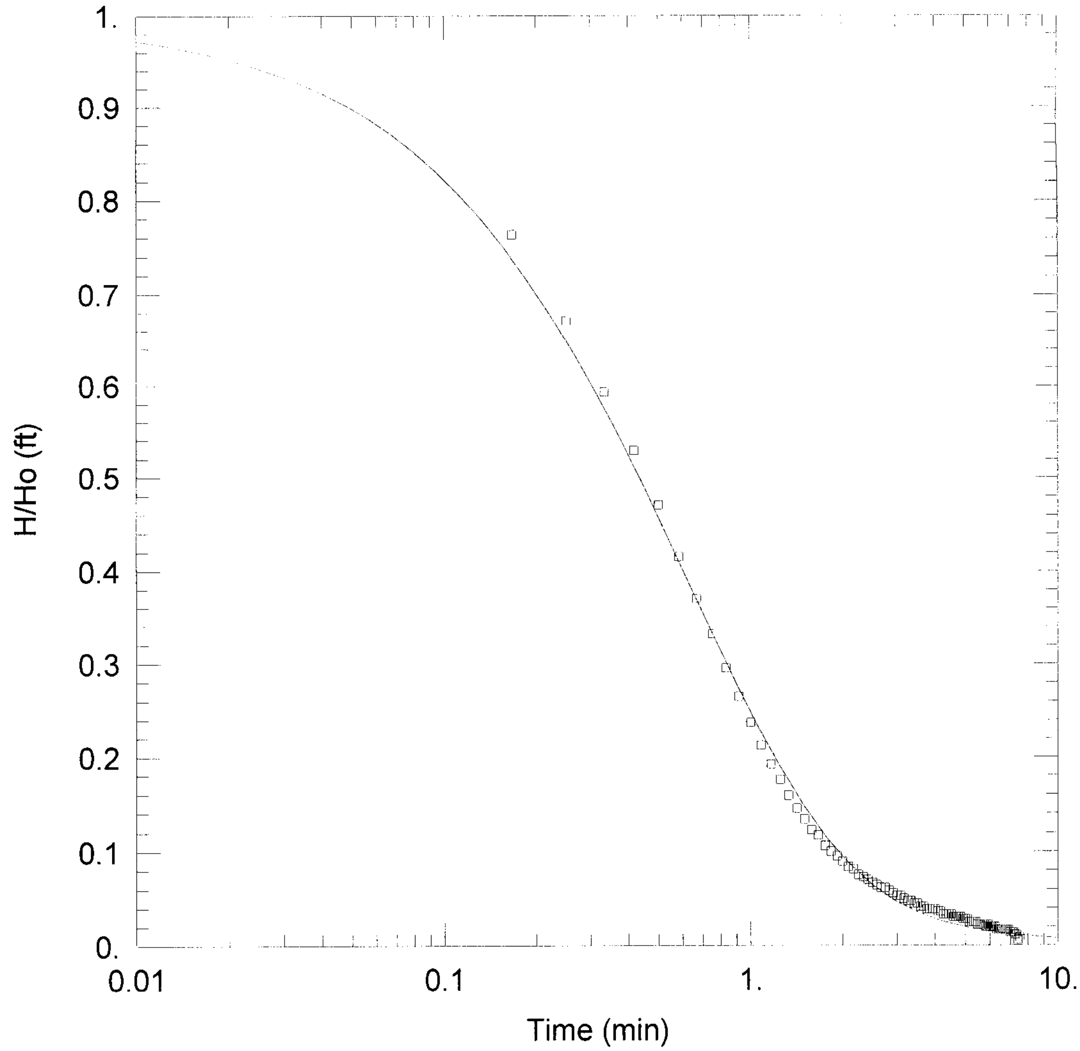
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 5. ft^2/day
S = 1.E-05

F1U
Transducer Submergence for Interval 11
(585.51 to 580.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-11.aqt
Date: 11/26/02 Time: 08:38:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-11)

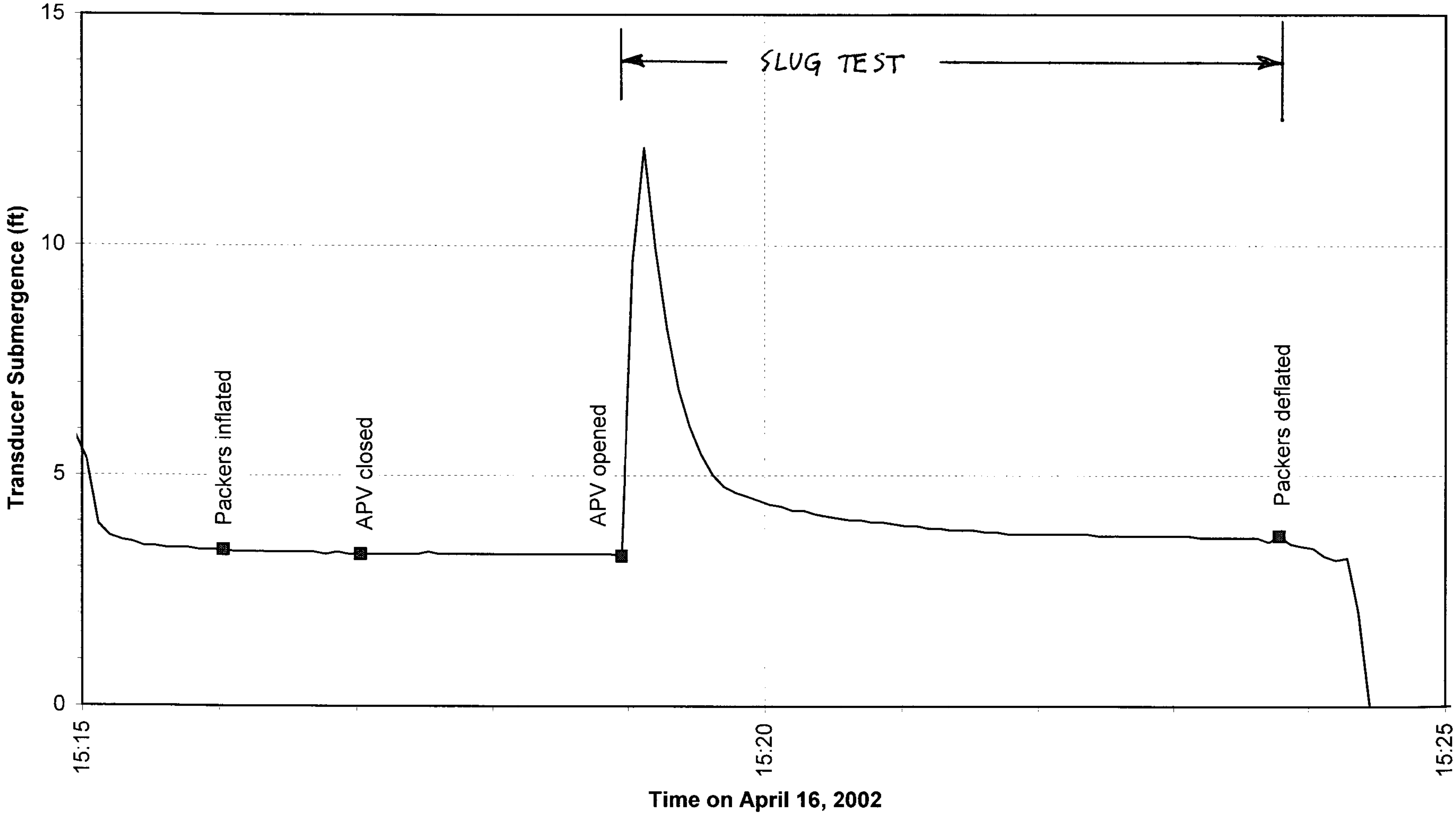
Initial Displacement: 15.55 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

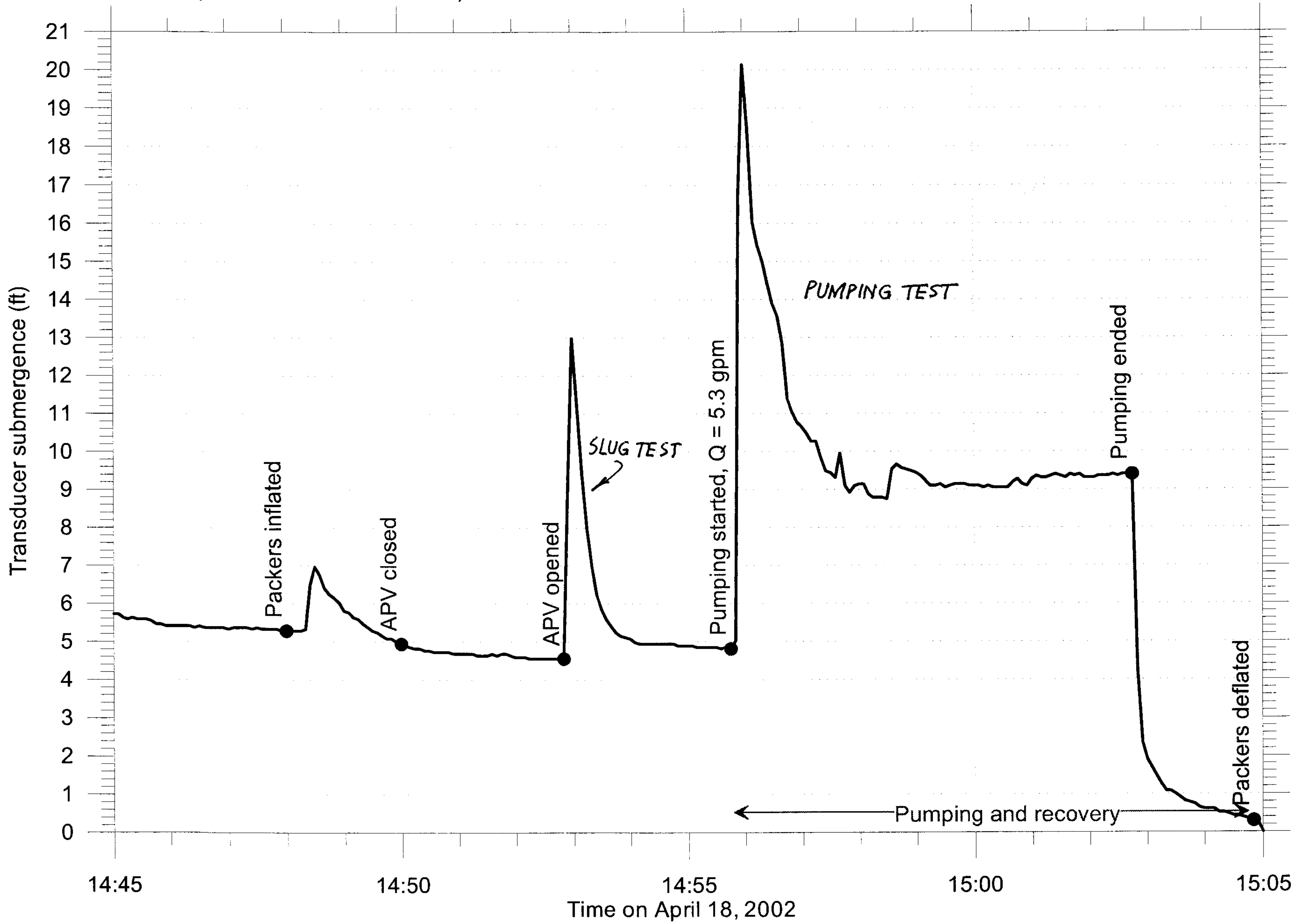
¯ = 9.623 ft^2/day
S = 1.E-05

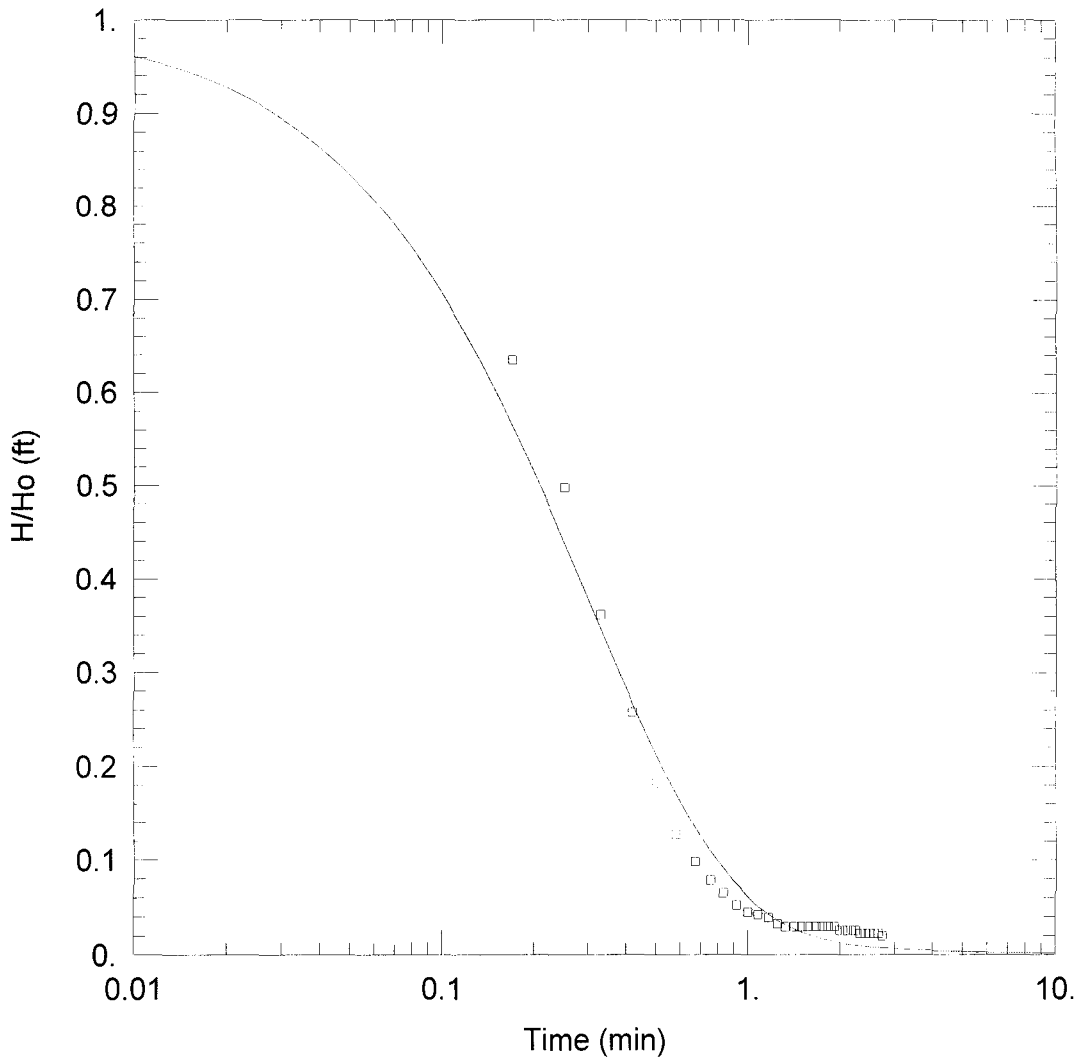
F1U
Transducer Submergence for Interval 12
(589.51 to 584.31 ft AMSL)



F1U Packer Testing

Test 12 (589.51 to 584.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-12S (0418).aqt
Date: 01/13/03 Time: 11:02:06

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U(0418)12S)

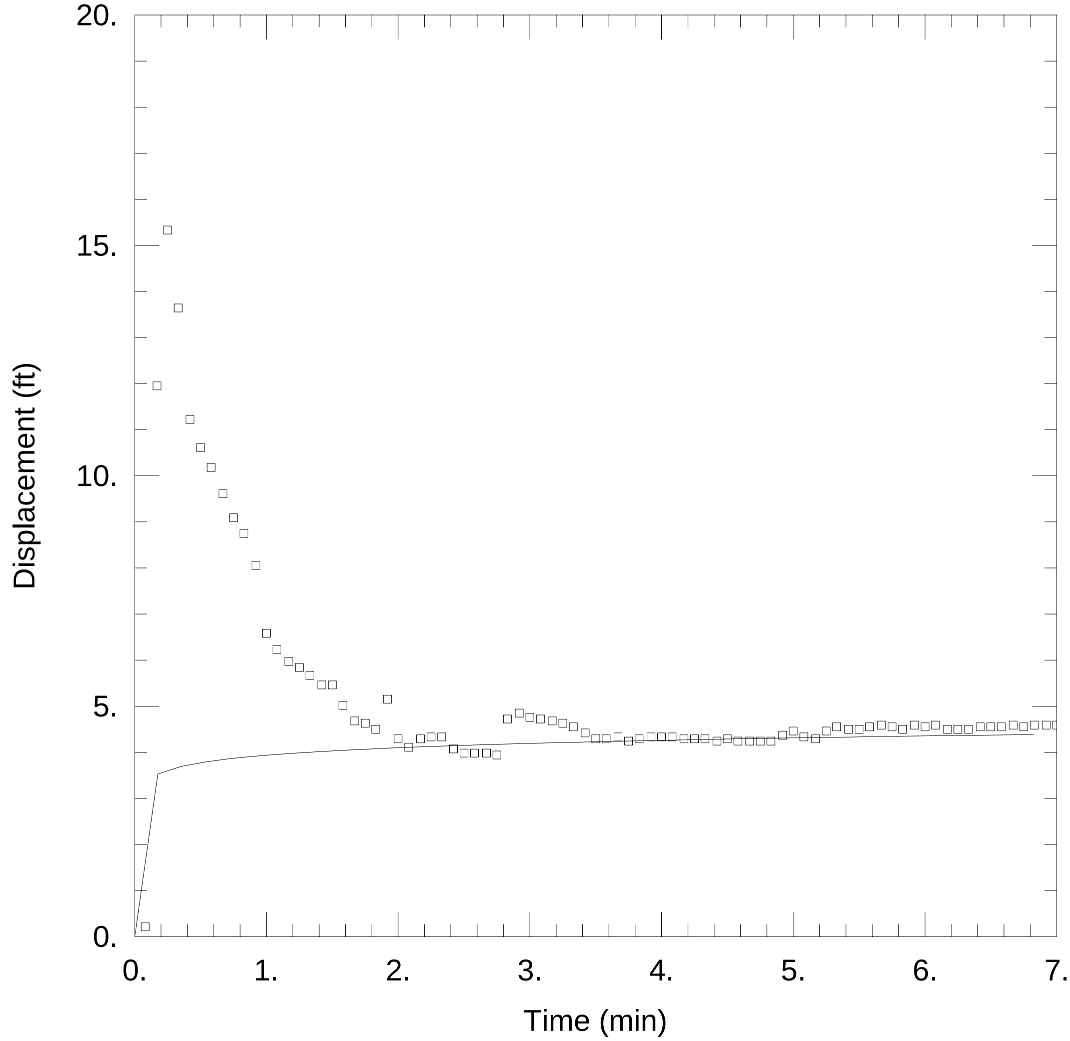
Initial Displacement: 13.3 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

¯ = 45.51 ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-12P (0418).aqt
Date: 01/22/03 Time: 10:41:15

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
F1U(0418)12P	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ F1U(0418)12P	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 347.7 ft^2/day
Sw = 0.
P = 1.5

S = 1.E-06
C = 1.E-30 min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 5.553Q + 1.E-30$Q^{1.5}$
W.E. = 100.%

F1U, Test 12P

Alternative analyses

Average Q: 5.3 gpm

"Drawdown" (s or ΔH): 4.59 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 289\ ft^2/d}}$

<u>T by Thiem solution:</u>

$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

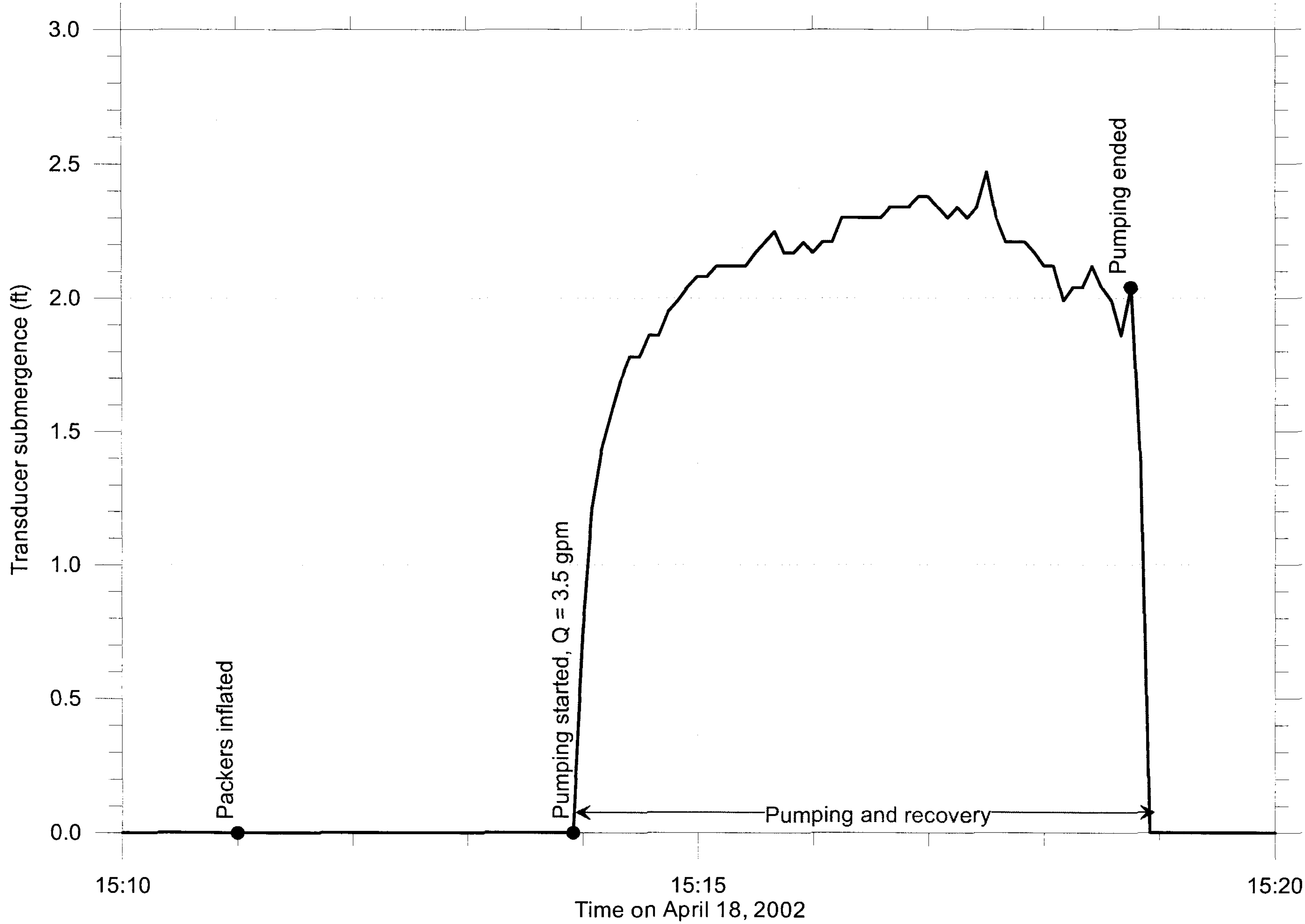
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)

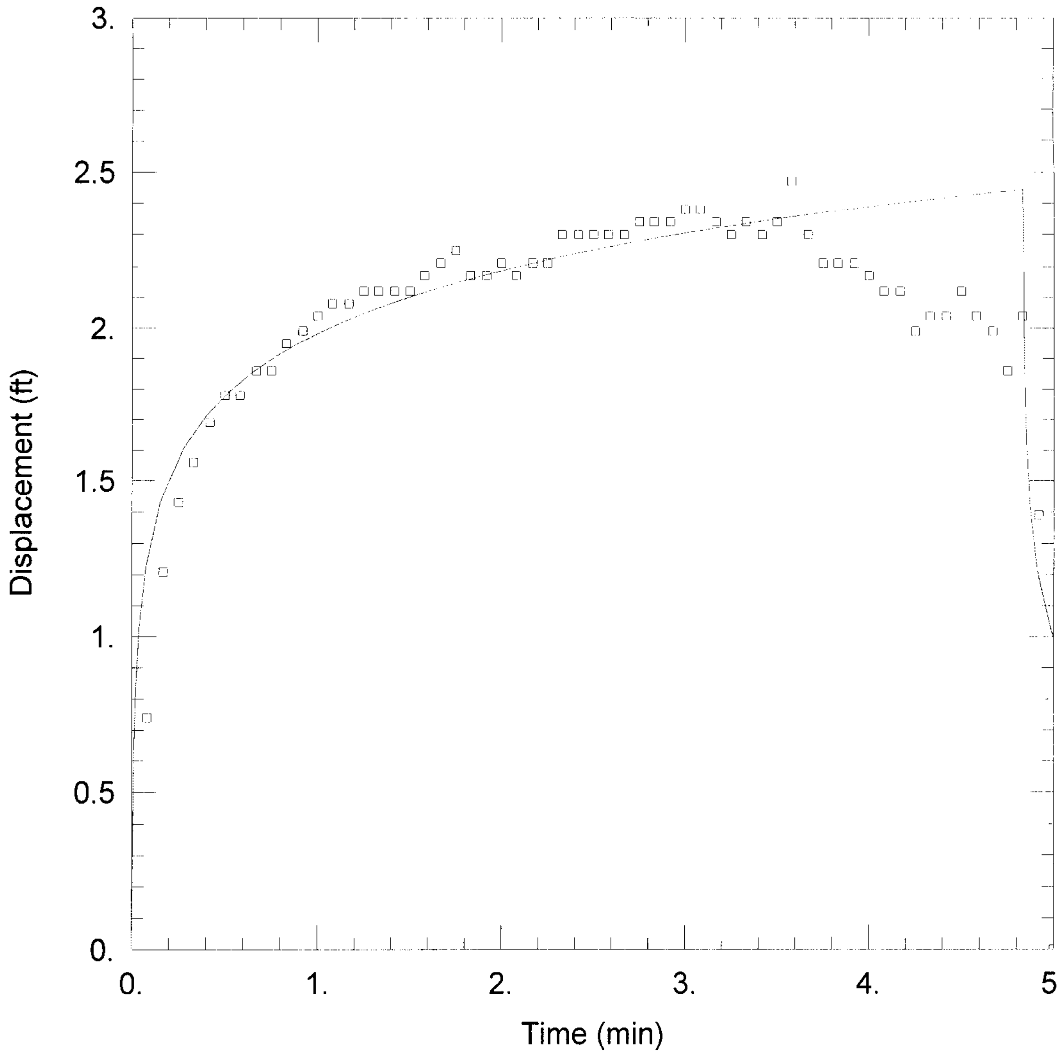
$r_w = 3^7/_8" = 0.1615$ ft

$\underline{\underline{T = 188\ ft^2/d}}$

F1U Packer Testing

Test 13 (593.51 to 588.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-13.aqt
Date: 11/26/02 Time: 08:38:11

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
F1U-13	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ F1U-13	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 182.5 ft^2/day

S = 1.E-06

Sw = -4.73

C = 0. min^2/ft^5

P = 2.

Step Test Model: Jacob-Rorabaugh

Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 4.236Q + 0.$Q^{2.}$

W.E. = 240.3%

F1U, Test 13

Alternative analyses

Average Q: 3.52 gpm
"Drawdown" (s or ΔH): 2.04 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

T = 431 ft²/d

T by Thiem solution:

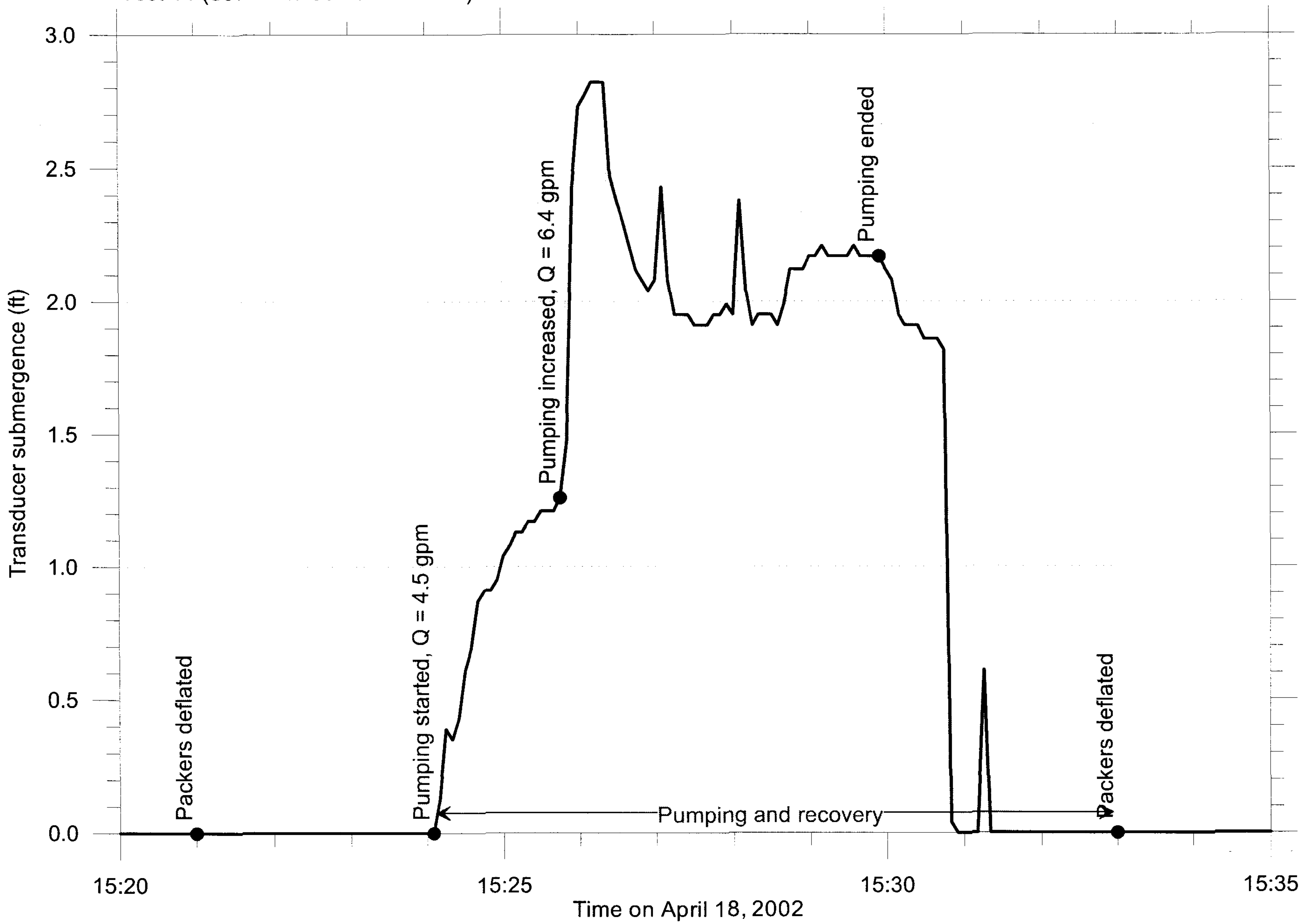
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

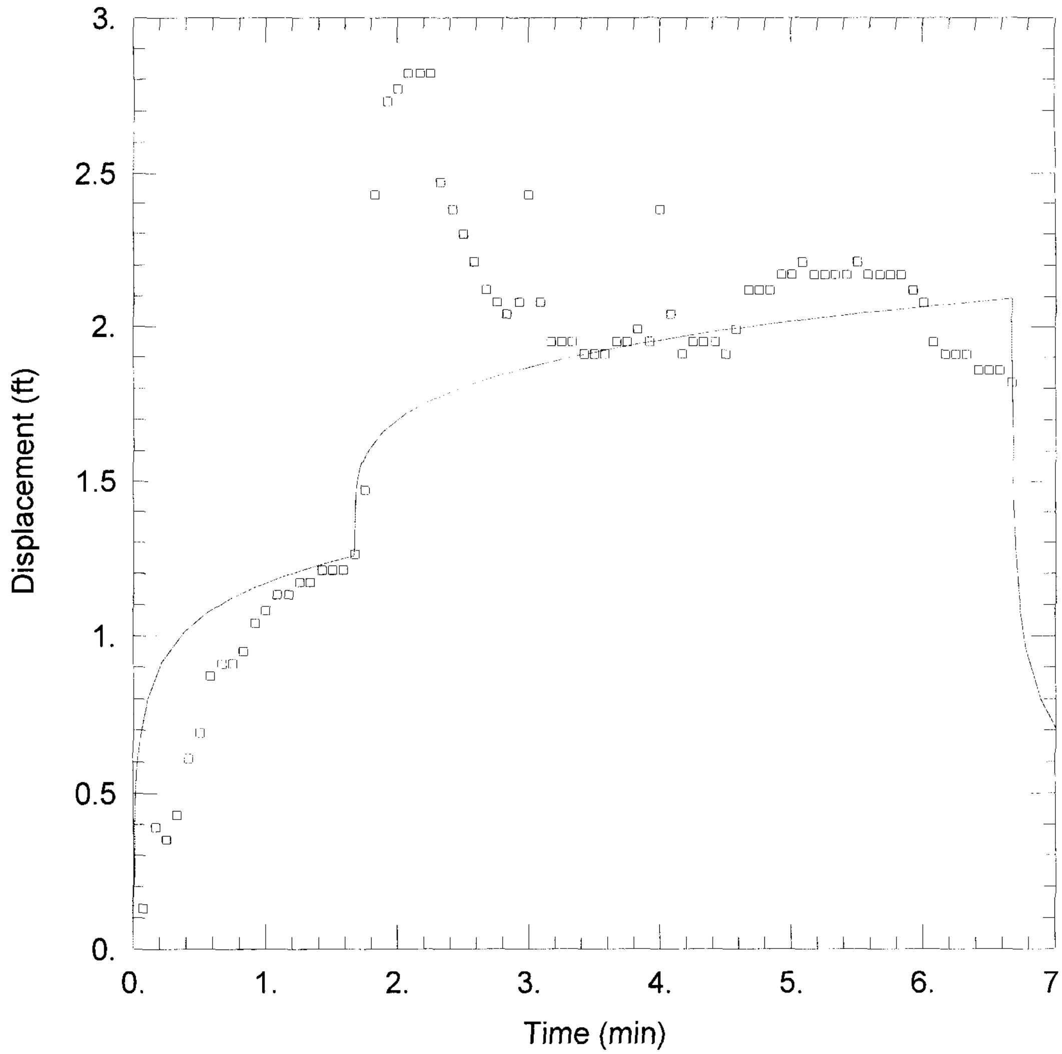
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
r_w = $3^7/_8$" = 0.1615 ft

T = 281 ft²/d

F1U Packer Testing

Test 14 (597.51 to 592.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-14.aqt
Date: 11/26/02 Time: 09:43:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
F1U-14	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
F1U-14	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Step Test)

T = 413.7 ft^2/day
Sw = -5.
P = 3.

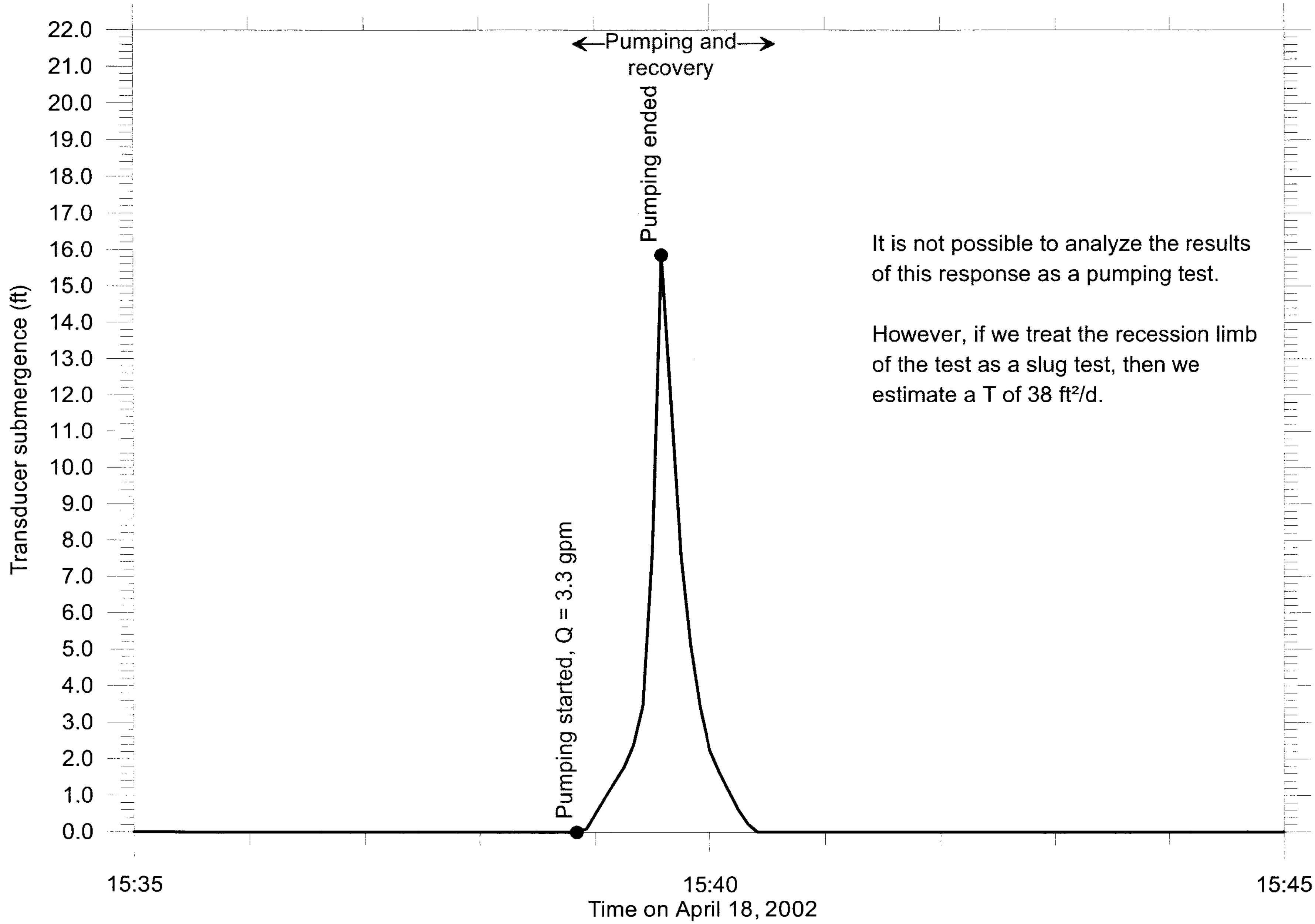
S = 1.E-06
C = 0. min^2/ft^5

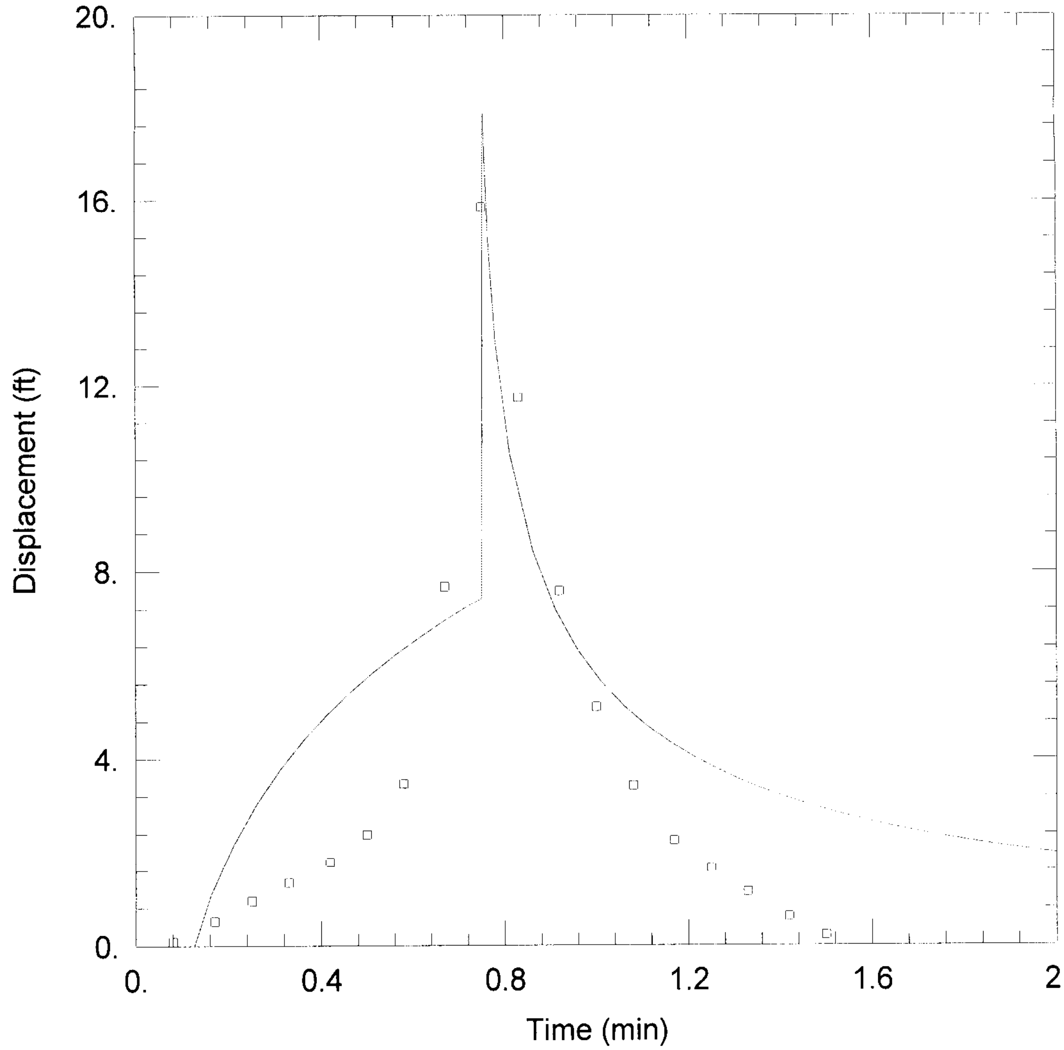
Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 1.946Q + 0.$Q^{3.}$
W.E. = 242.4%

F1U Packer Testing

Test 15 (601.51 to 596.31 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-15.aqt
Date: 11/26/02 Time: 08:37:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
F1U-15	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
F1U-15	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 11.99 ft^2/day

S = 0.006848

Sw = -1.304

C = 0. min^2/ft^5

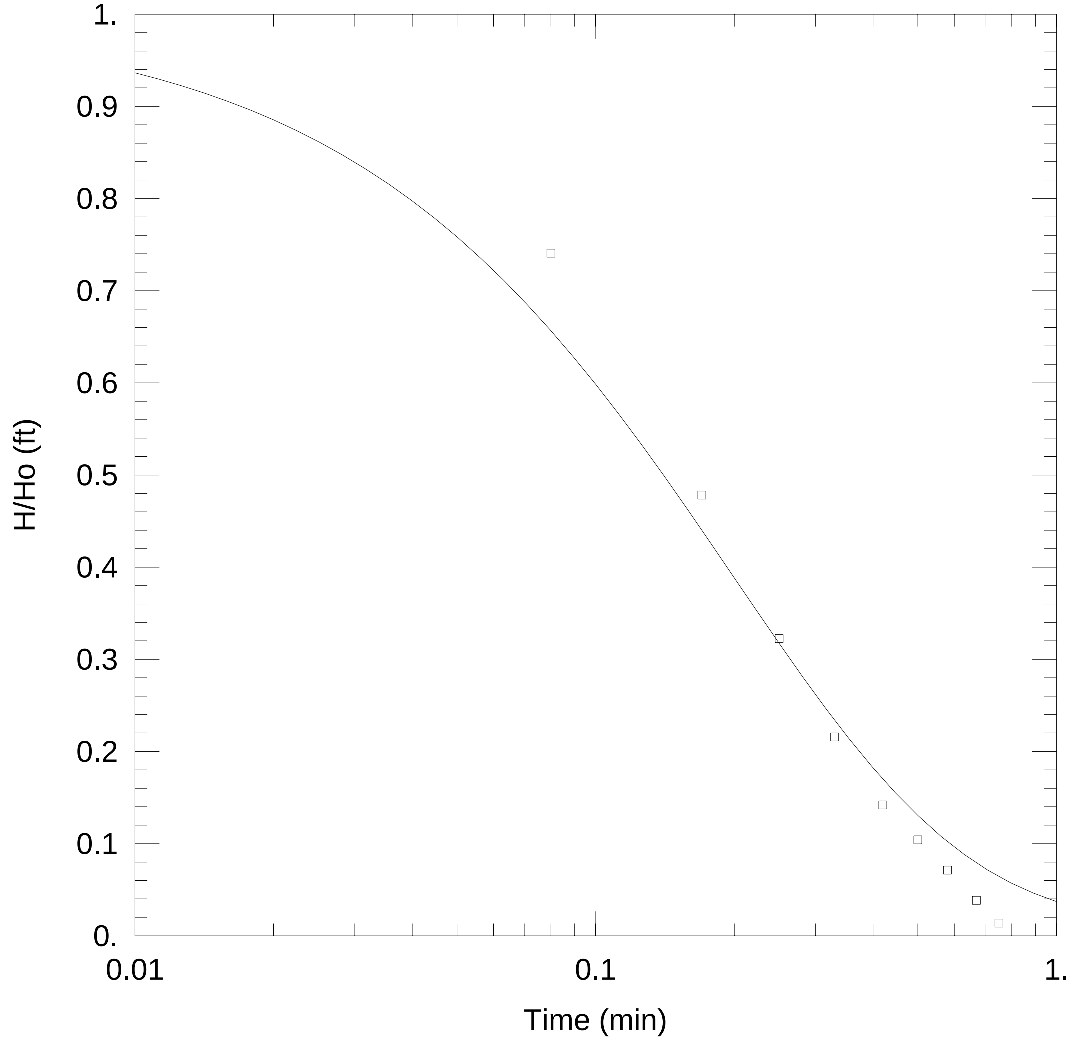
P = 2.

Step Test Model: Jacob-Rorabaugh

$s(t) = 19.57Q + 0.Q^{2.}$

Time (t) = 1. min Rate (Q) in cu. ft/min

W.E. = 227.4%



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1U\F1U-15 (recession limb as a slug test).aqt
Date: 01/23/03 Time: 08:46:16

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1U-15)

Initial Displacement: 15.85 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 37.59 ft^2/day S = 1.E-06

F1U, Test 15

Alternative analyses

Average Q: 3.33 gpm
"Drawdown" (s or ΔH): 15.85 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

T = 53 ft²/d

T by Thiem solution:

$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

T = 34 ft²/d

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

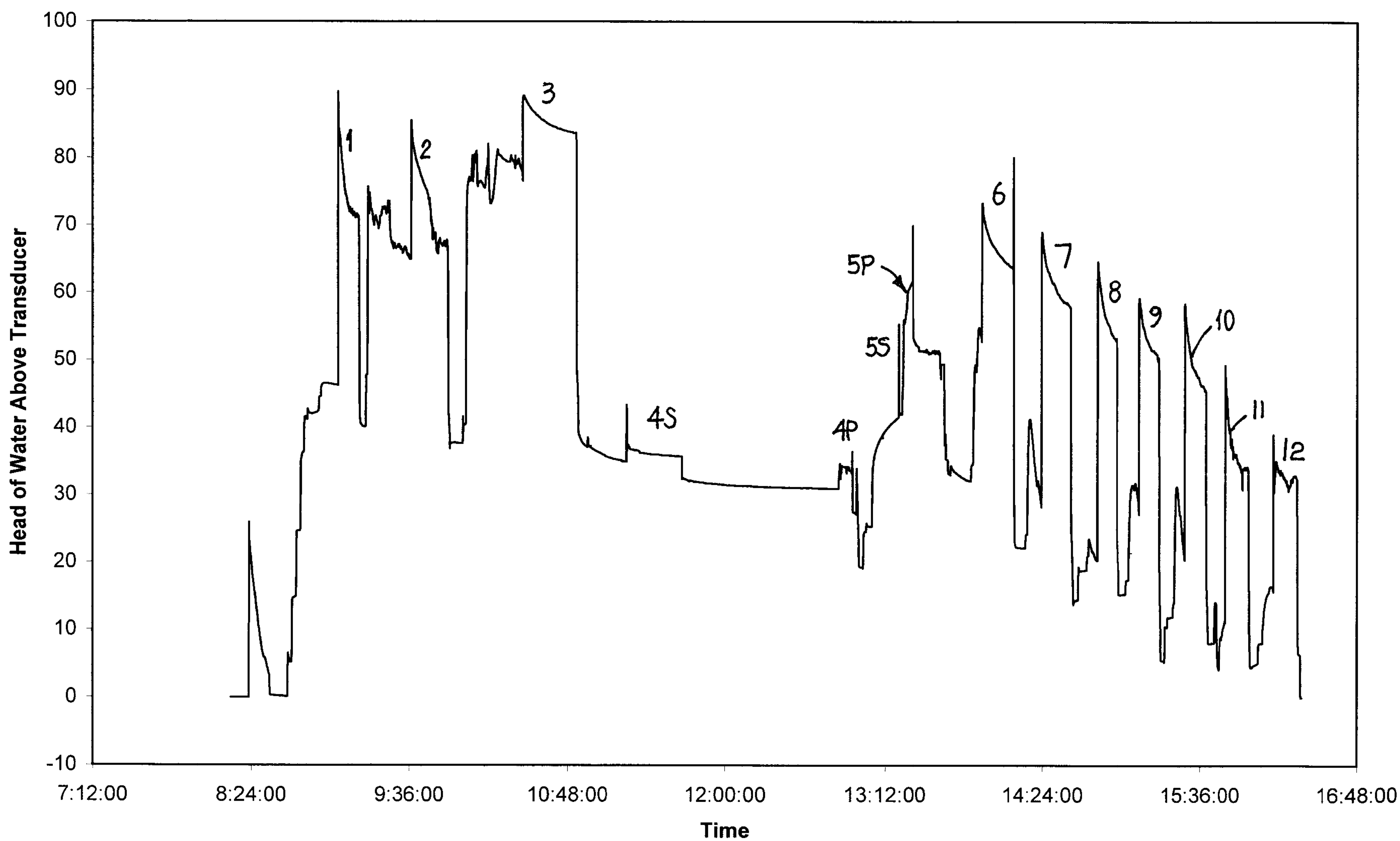
F1M

Testing Dates: April 17, 2002

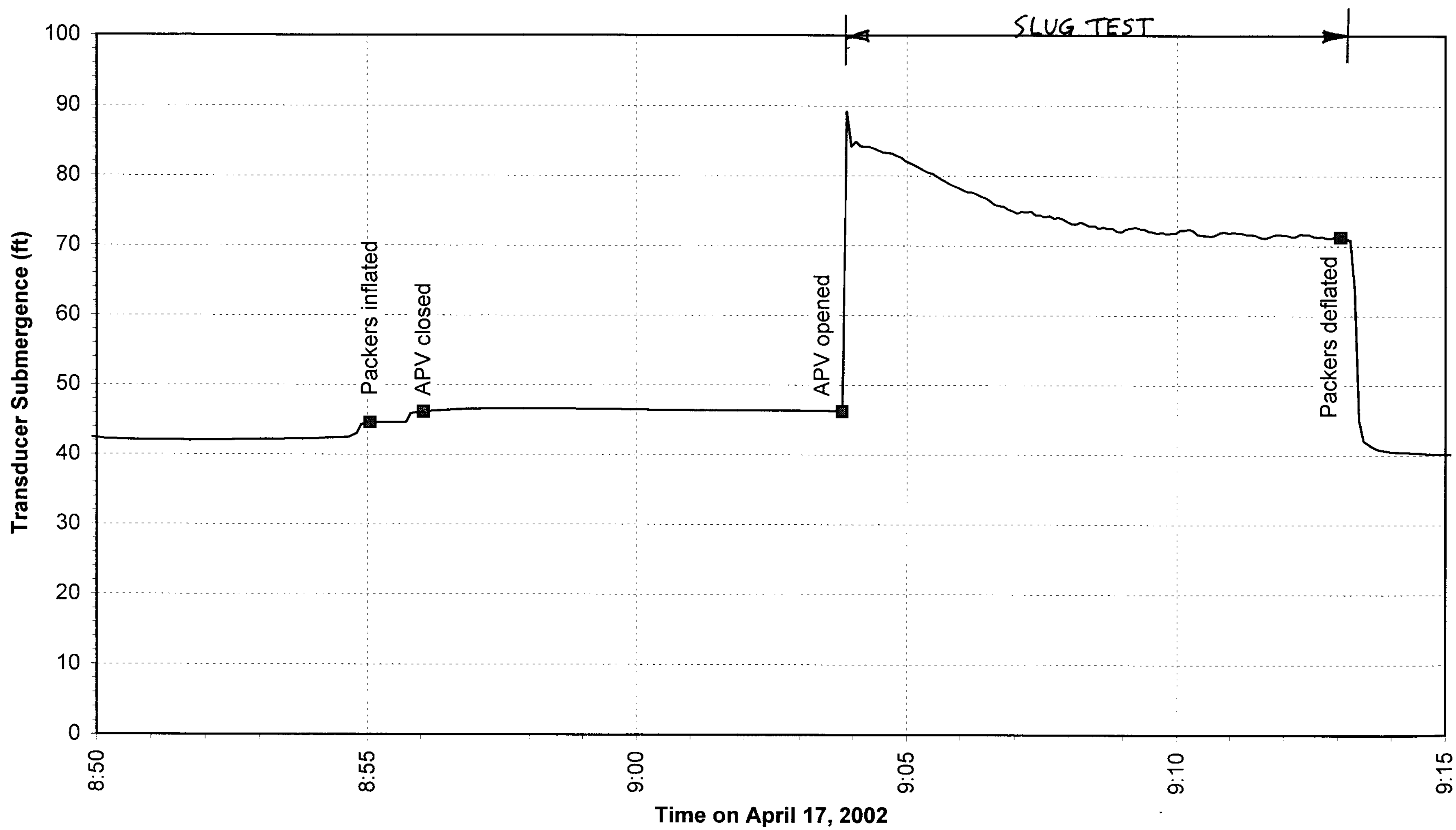
Summary of Tests:

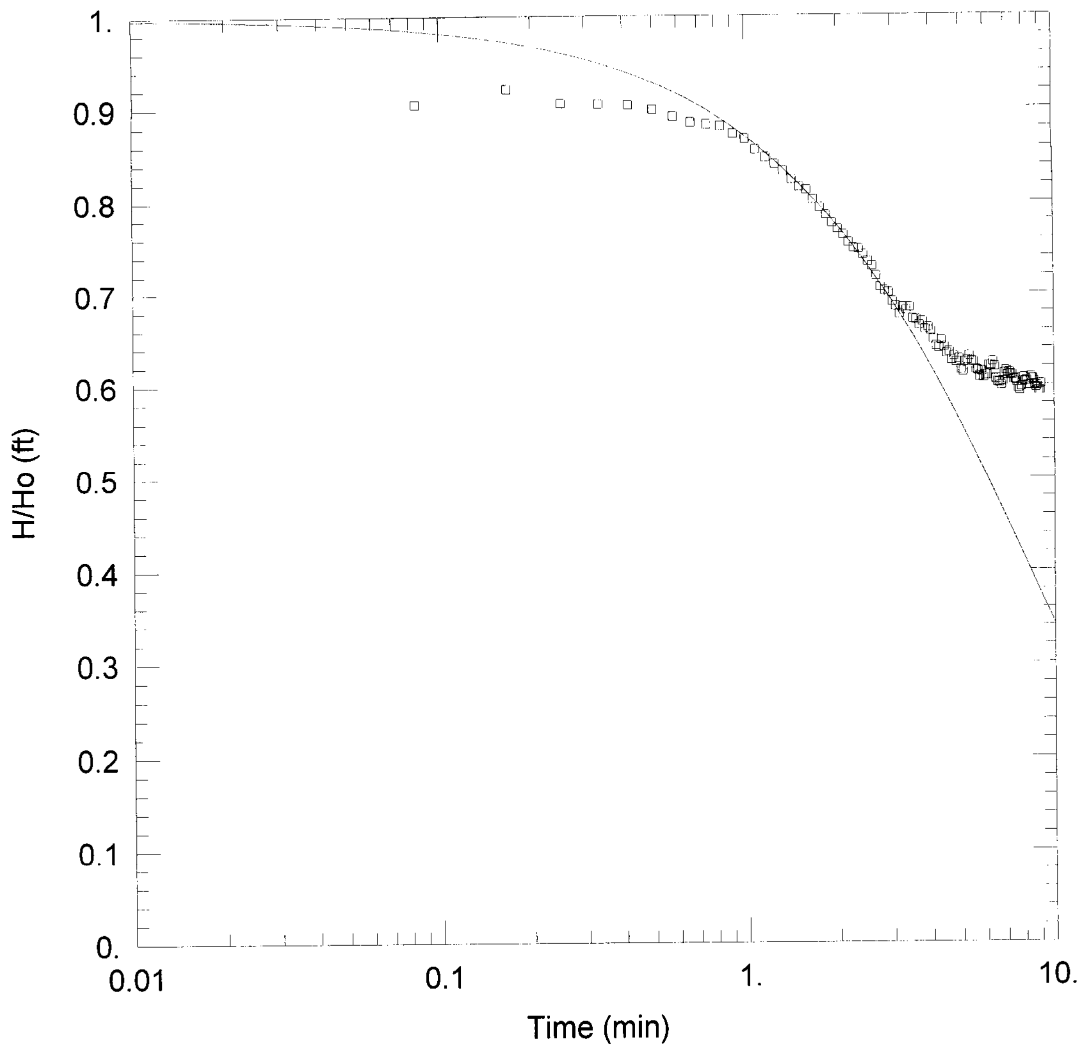
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
F1M	1	501.68	492.18	0.9	
F1M	2	501.68	496.48	0.8	
F1M	3	505.68	500.48	0.39	
F1M	4P	509.68	504.48	1000	
F1M	5P	513.68	508.48	60	see UR Memo
F1M	6	517.68	512.48	0.35	
F1M	7	521.68	516.48	0.51	
F1M	8	525.68	520.48	0.53	
F1M	9	529.68	524.48	0.51	
F1M	10	533.68	528.48	0.72	
F1M	11	537.68	532.48	0.88	
F1M	12	541.68	536.48	0.25	

Monitoring Well F1M



F1M
Transducer Submergence for Interval 1
(501.68 to 492.18 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-1.aqt
Date: 11/26/02 Time: 08:24:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-1)

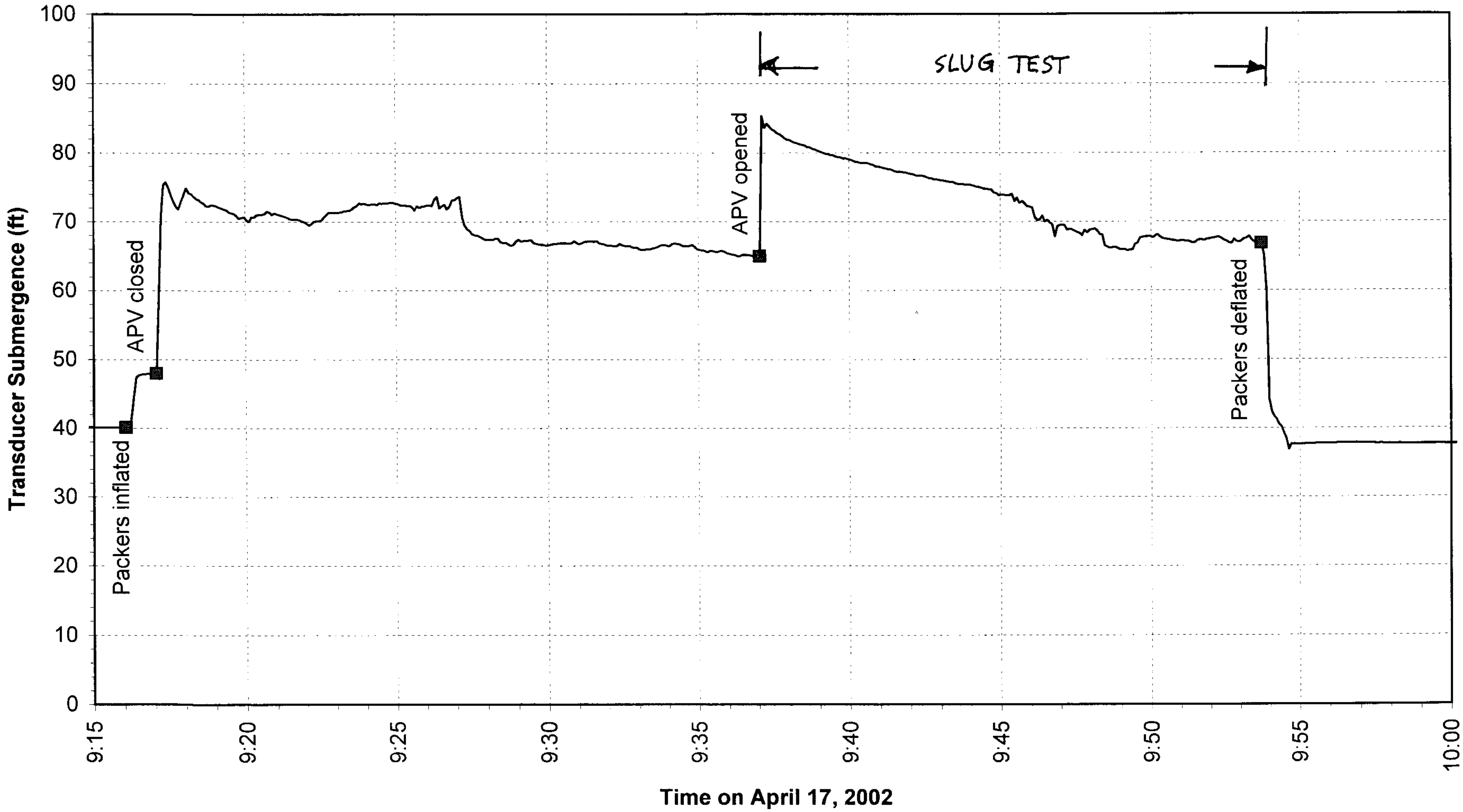
Initial Displacement: 42. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

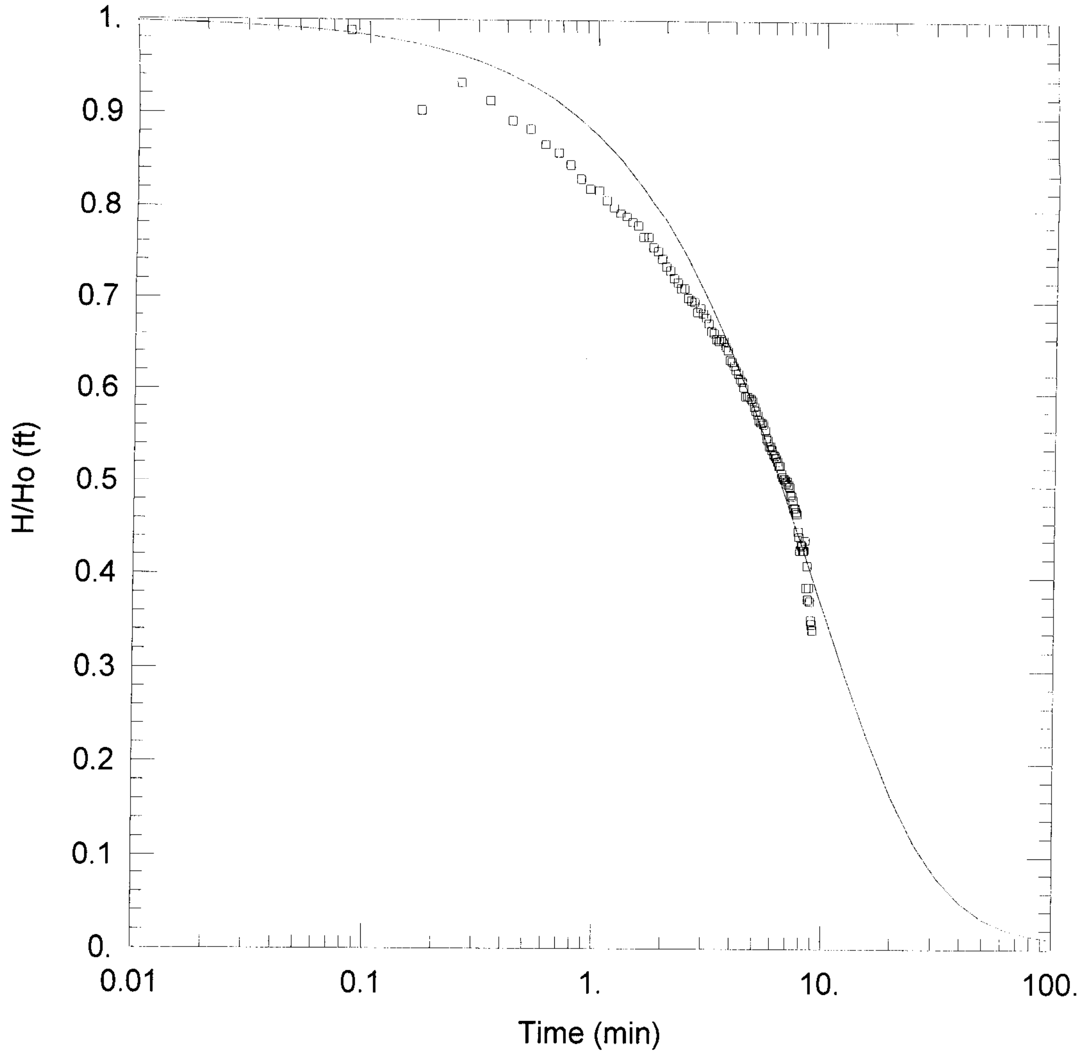
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.8679 ft^2/day
S = 1.E-06

F1M
Transducer Submergence for Interval 2
(501.68 to 496.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-2.aqt
Date: 11/26/02 Time: 08:24:05

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

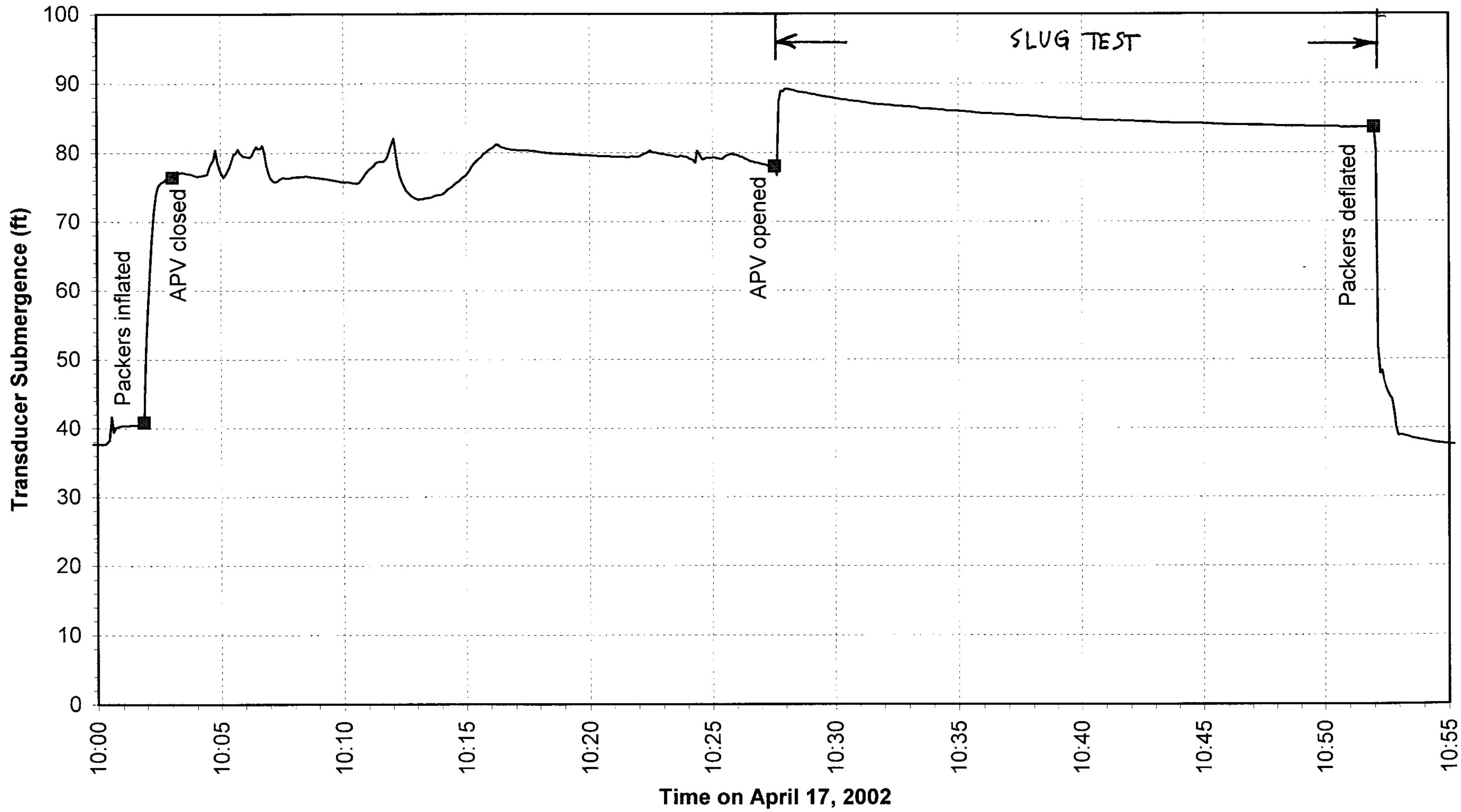
WELL DATA (F1M-2)

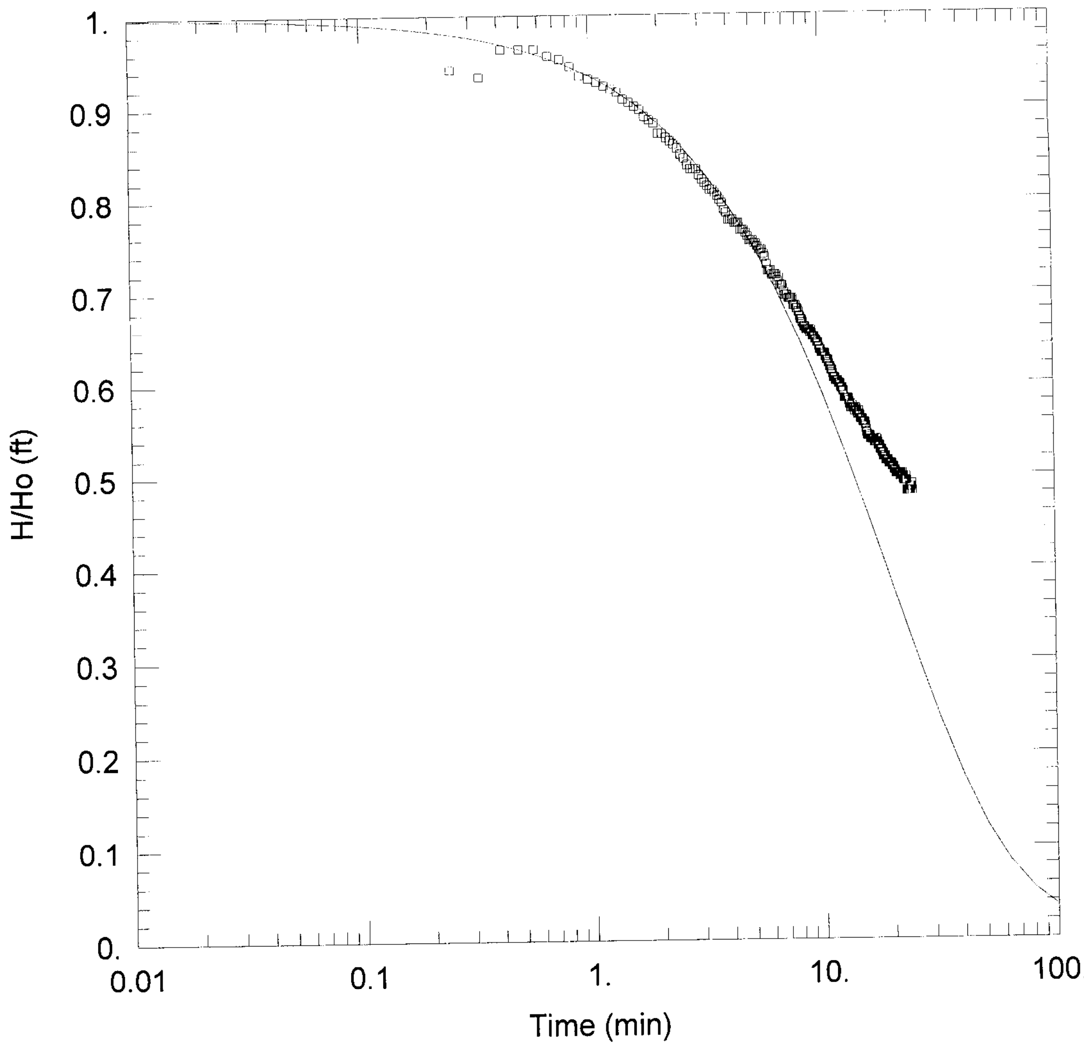
Initial Displacement: 20.6 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.8076 ft^2/day
S = 1.E-06

F1M
Transducer Submergence for Interval 3
(505.68 to 500.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-3b.aqt
Date: 11/26/02 Time: 08:23:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-3)

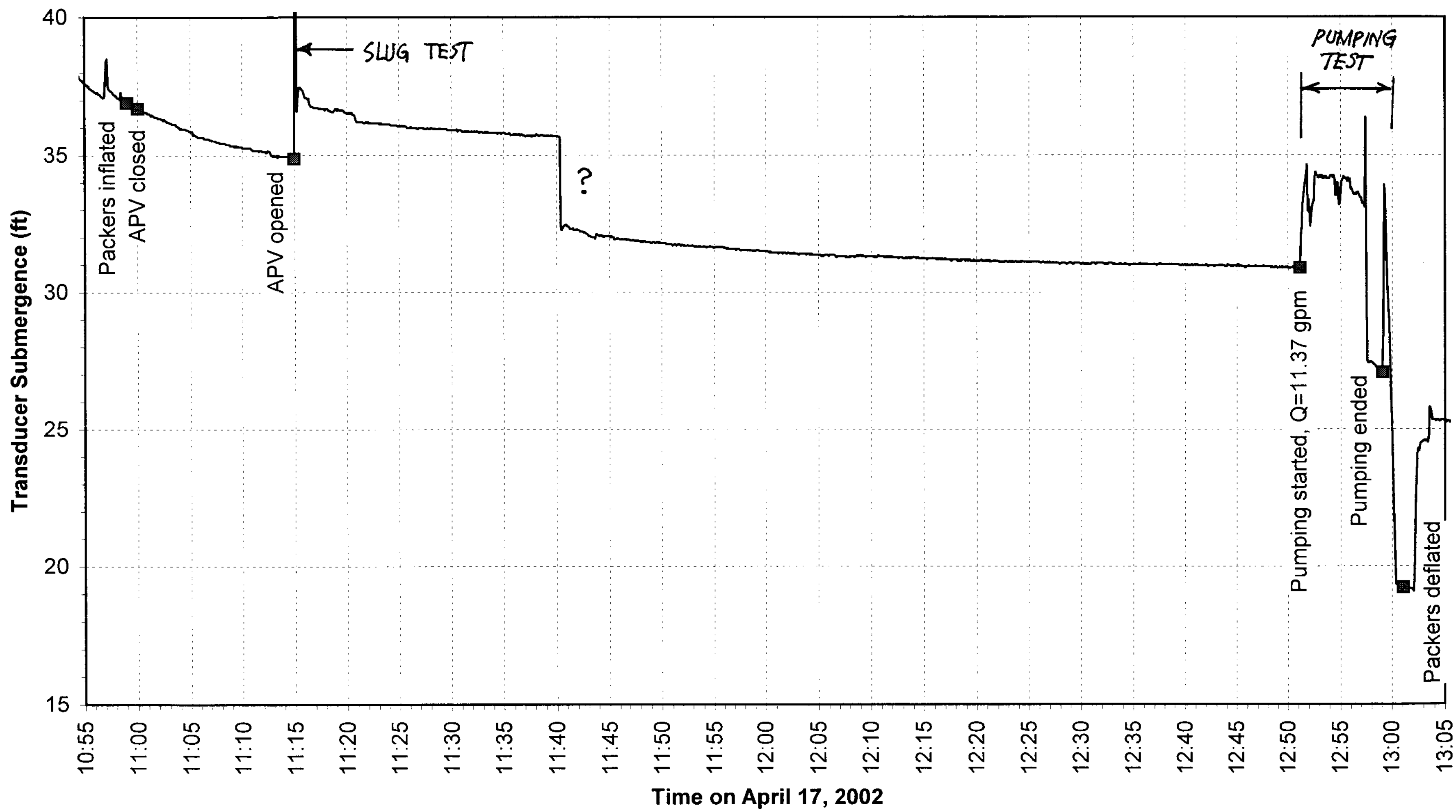
Initial Displacement: 11.59 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

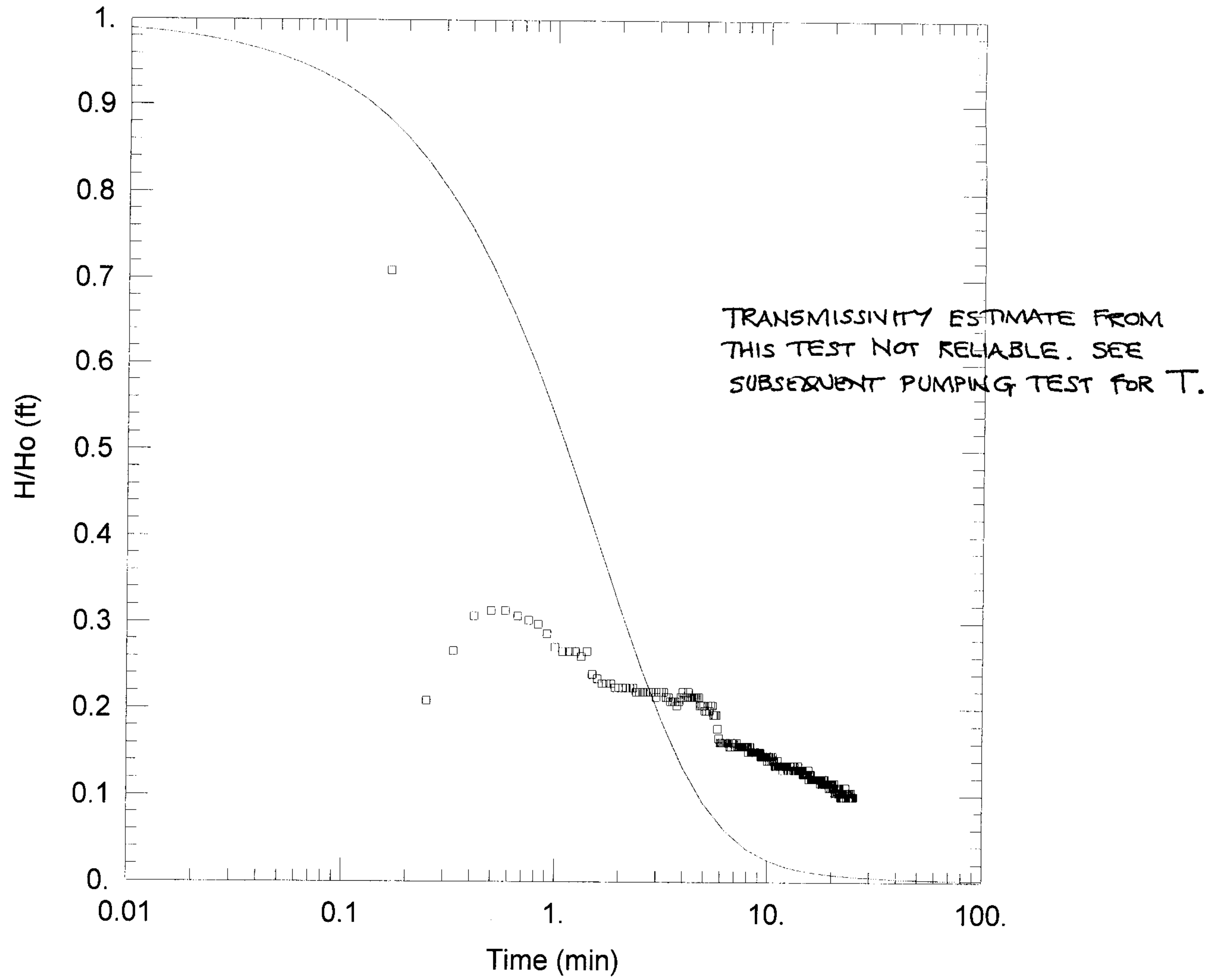
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.3901 ft^2/day
S = 1.E-06

F1M
Transducer Submergence for Interval 4
(509.68 to 504.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-4S.aqt
Date: 11/26/02 Time: 08:23:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

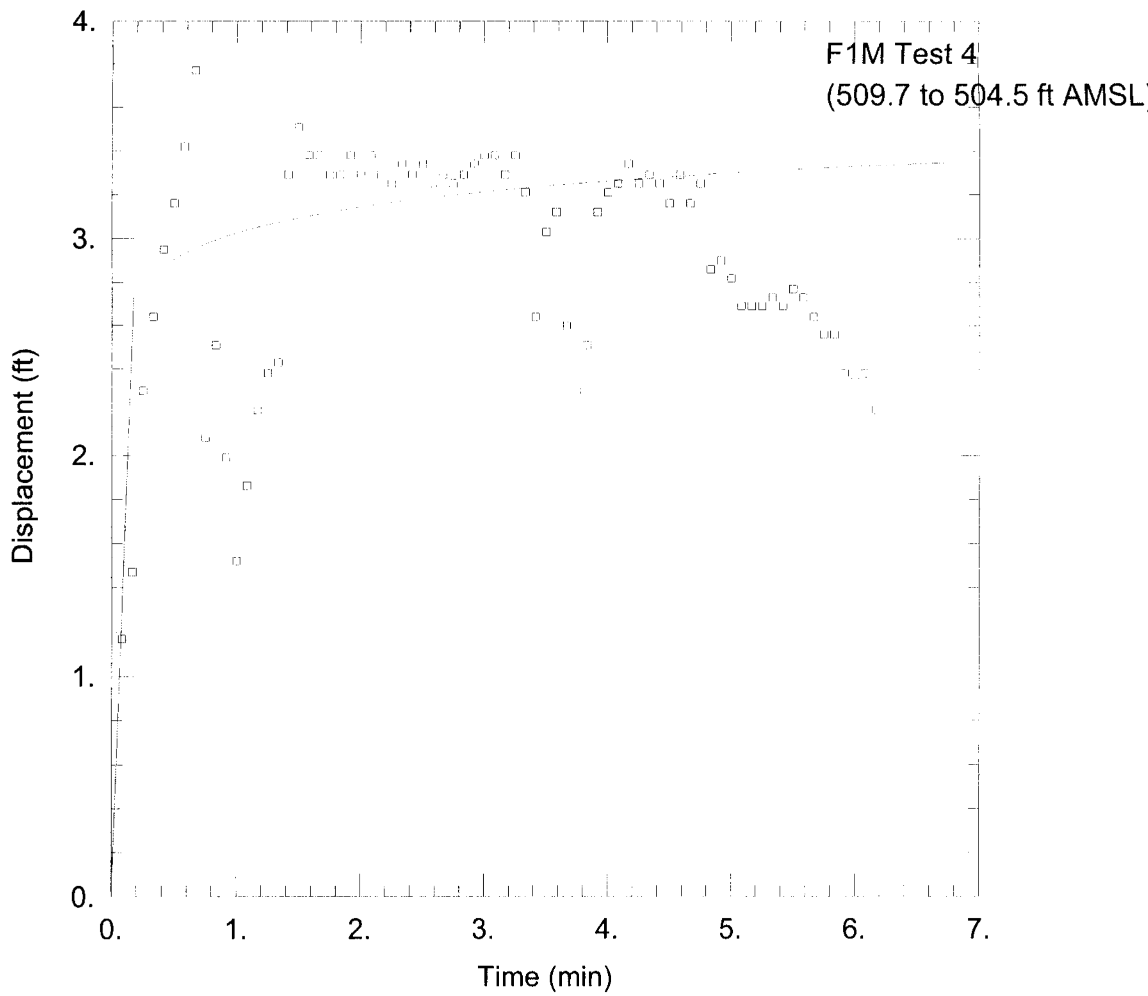
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-4S)

Initial Displacement: 8.3 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 4.668 ft^2/day
S = 1.E-06



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-4P.aqt
Date: 12/18/02 Time: 12:40:51

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
F1M-4	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
F1M-4	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 1031.6 ft^2/day
Sw = 0.
P = 2.

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 1.985Q + 0.$Q^{2.}$
W.E. = 100.%

F1M, Test 4P

Alternative analyses

Average Q: 11.37 gpm
"Drawdown" (s or ΔH): 3.2 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

<u>*T = 888 ft²/d*</u>

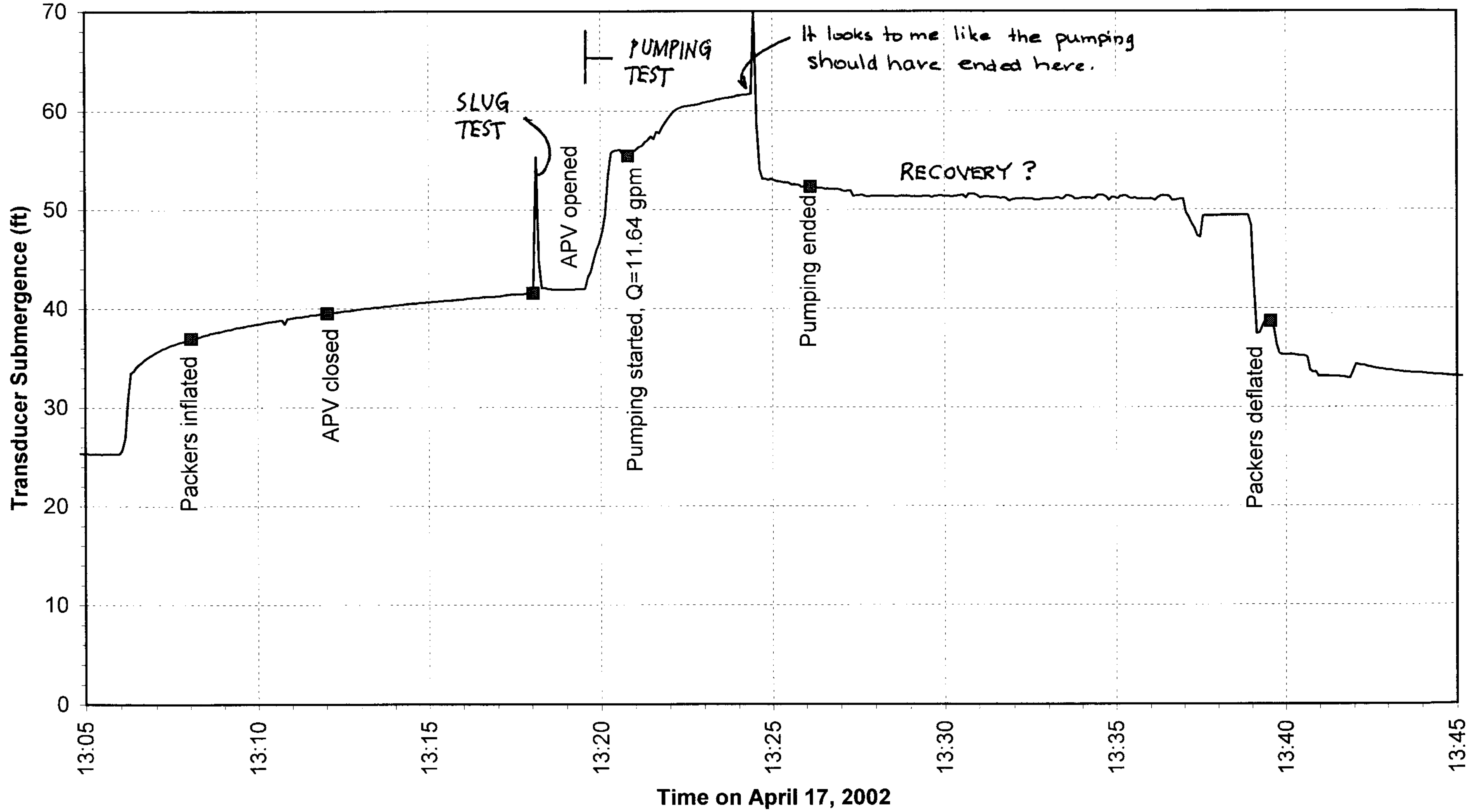
<u>T by Thiem solution:</u>

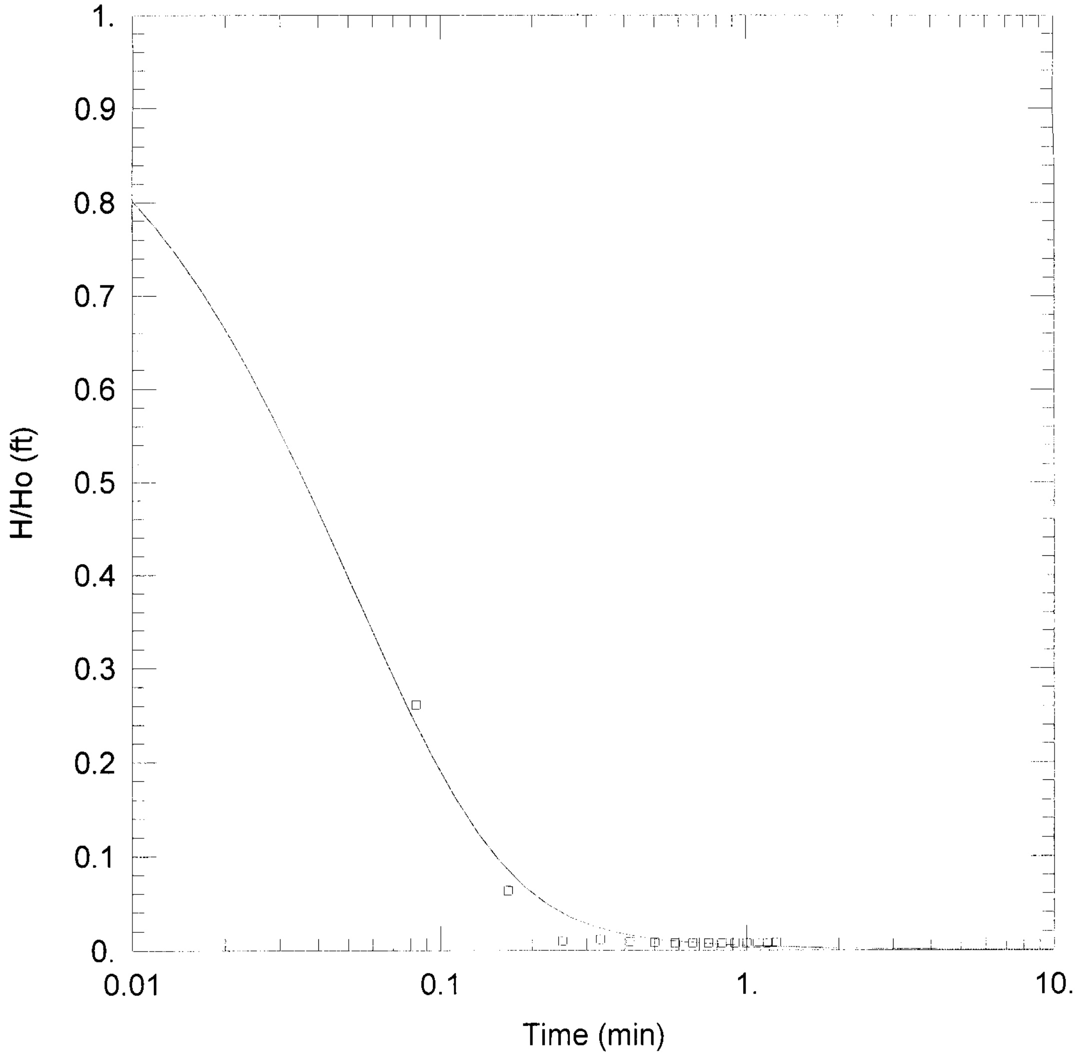
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

<u>*T = 578 ft²/d*</u>

F1M
Transducer Submergence for Interval 5
(513.68 to 508.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-5slug.aqt
Date: 01/13/03 Time: 10:57:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

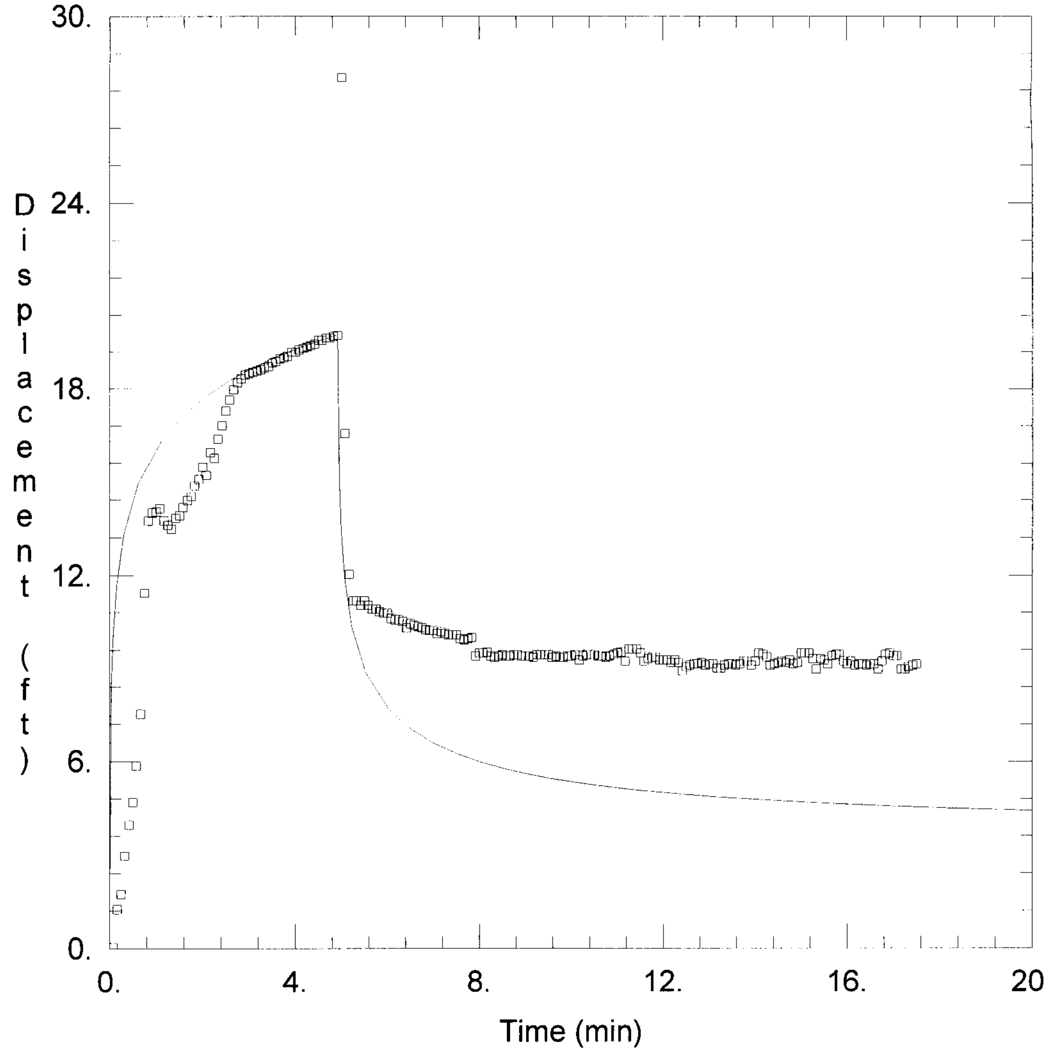
WELL DATA (F1M-5 Slug)

Initial Displacement: 52.9 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 145. ft^2/day
S = 1.E-06



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\F1M\F1M-5.aqt
Date: 05/27/02 Time: 15:39:49

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-5	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
J1M-5	0	0

SOLUTION

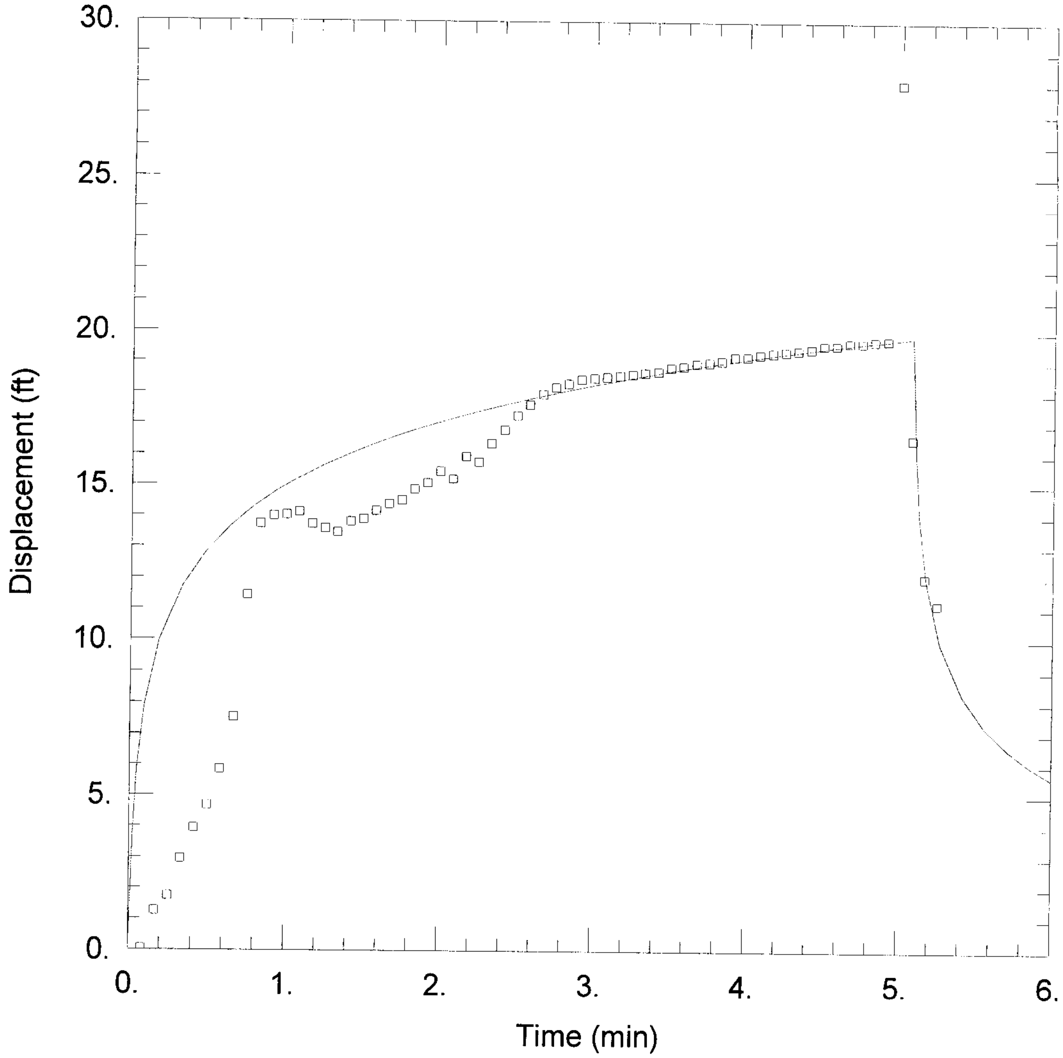
Aquifer Model: Confined
Solution Method: Theis (Step Test)

= 76.55 ft^2/day
Sw = -5.
P = 3.

S = 1.E-06
C = 1. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 7.894Q + 1.$Q^{3.}$
W.E. = 221.6%



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-5 pumping only.aqt
Date: 11/26/02 Time: 08:23:39

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-5	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-5	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 59.76 ft^2/day

S = 1.E-06

√ = -5.

C = 0. min^2/ft^5

P = 1.5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 9.637Q + 0.Q^{1.5}$
W.E. = 299.%

F1M, Test 5P

Alternative analyses

Average Q: 11.64 gpm
"Drawdown" (s or ΔH): 19.75 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

T = 147 ft²/d

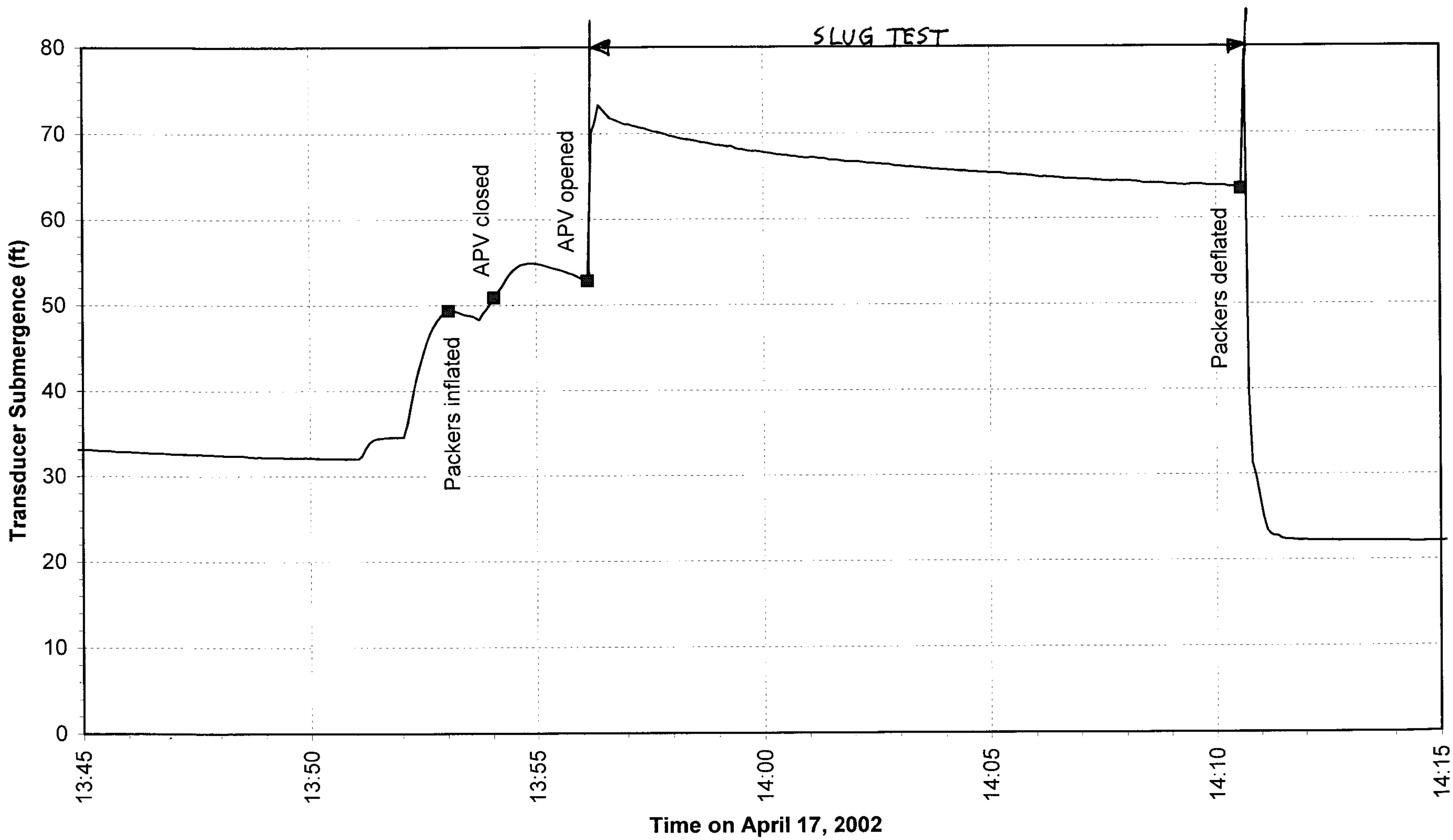
T by Thiem solution:

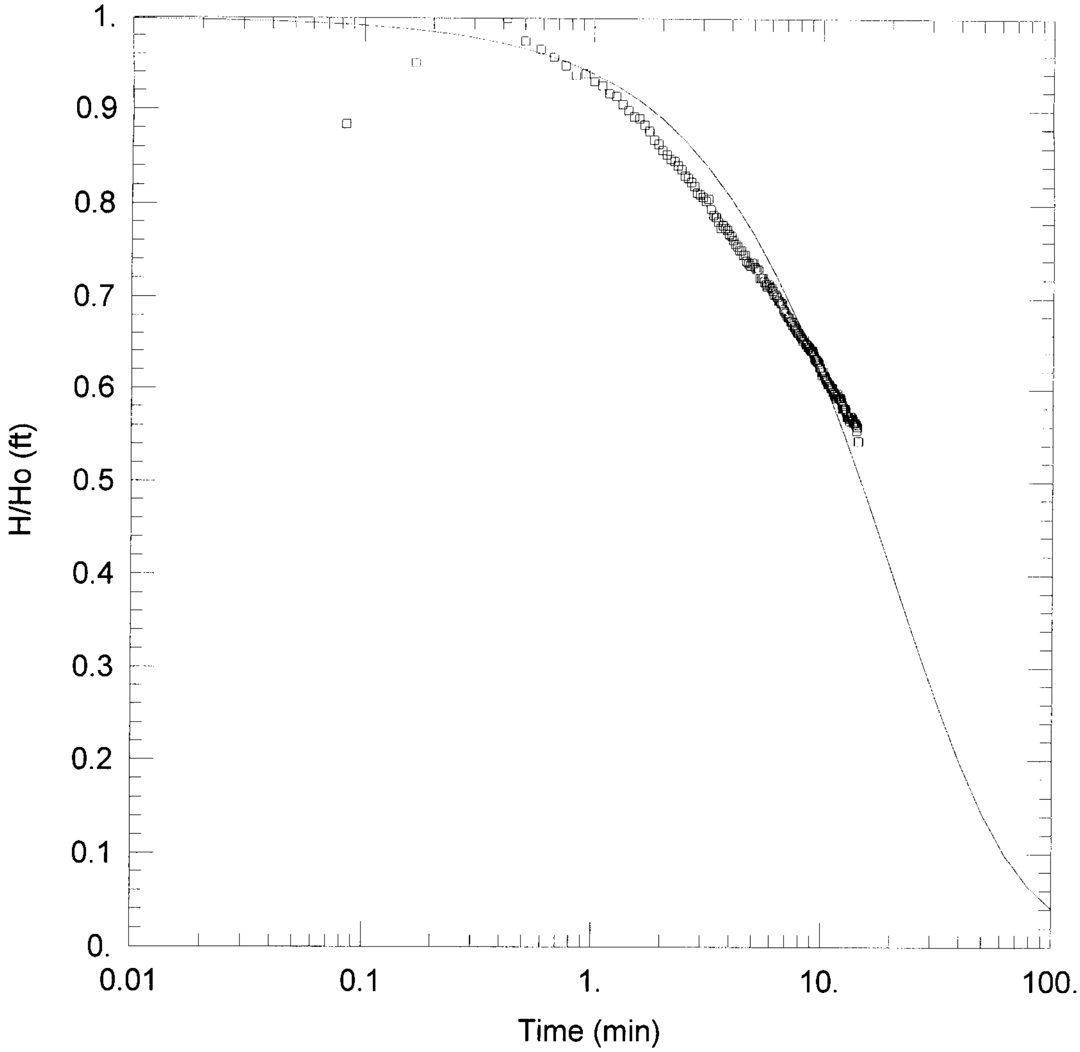
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
r_w = $3^7/_8$" = 0.1615 ft

T = 96 ft²/d

F1M
Transducer Submergence for Interval 6
(517.68 to 512.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-6baqt.aqt
Date: 11/26/02 Time: 08:23:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

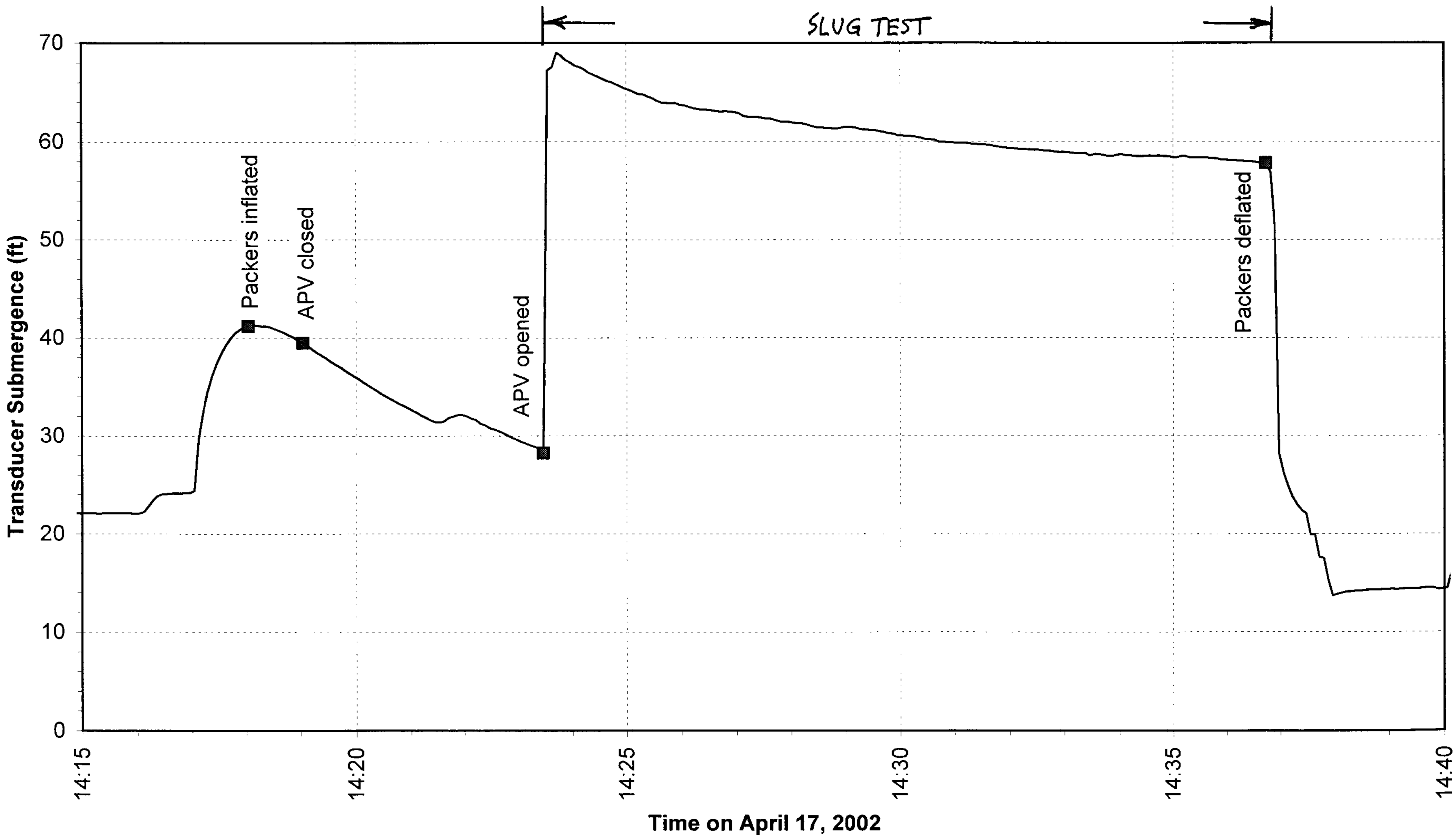
WELL DATA (J1M-6)

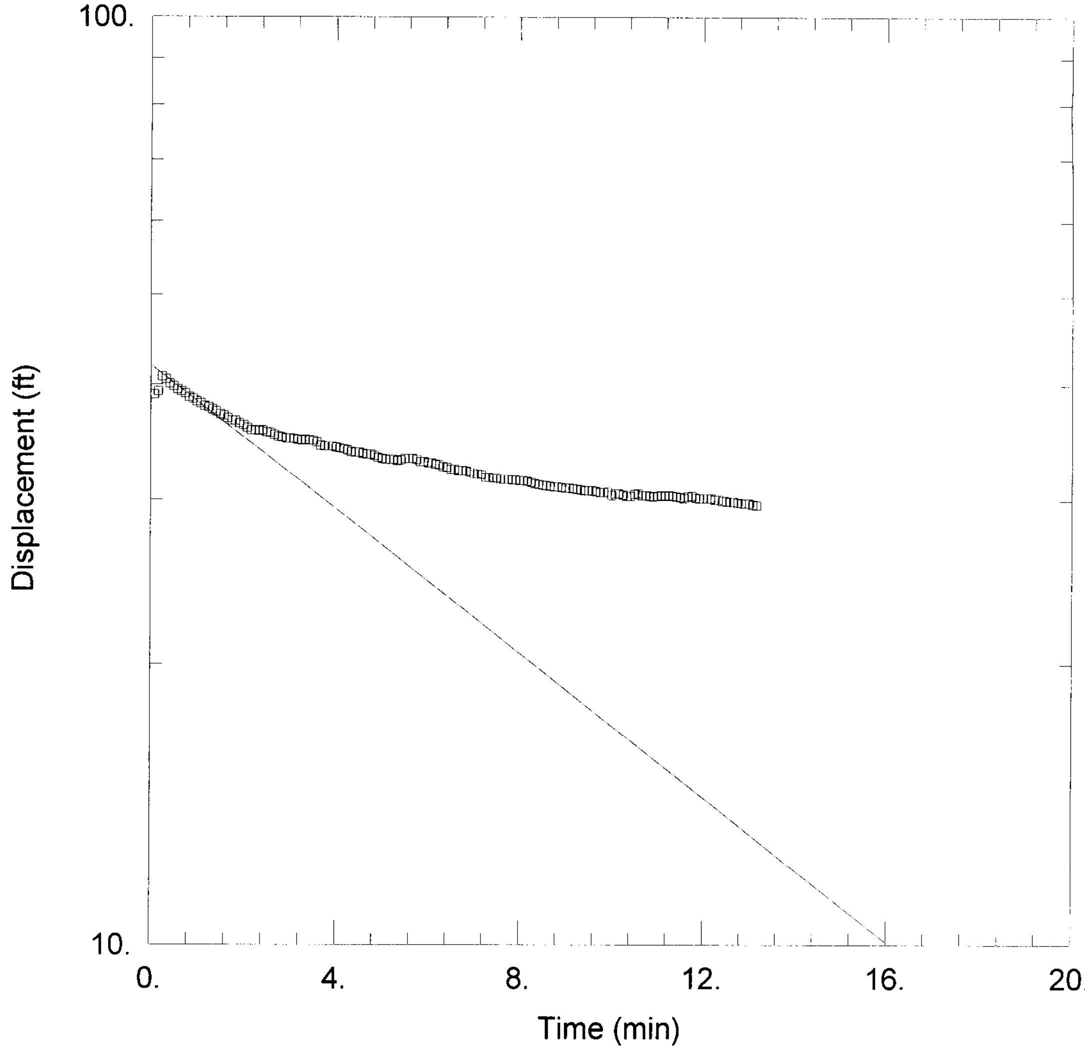
Initial Displacement: 19.5 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
$T = 0.3545\ ft^2/day$
S = 1.E-06

F1M
Transducer Submergence for Interval 7
(521.68 to 516.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-7a.aqt
Date: 11/26/02 Time: 08:23:05

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

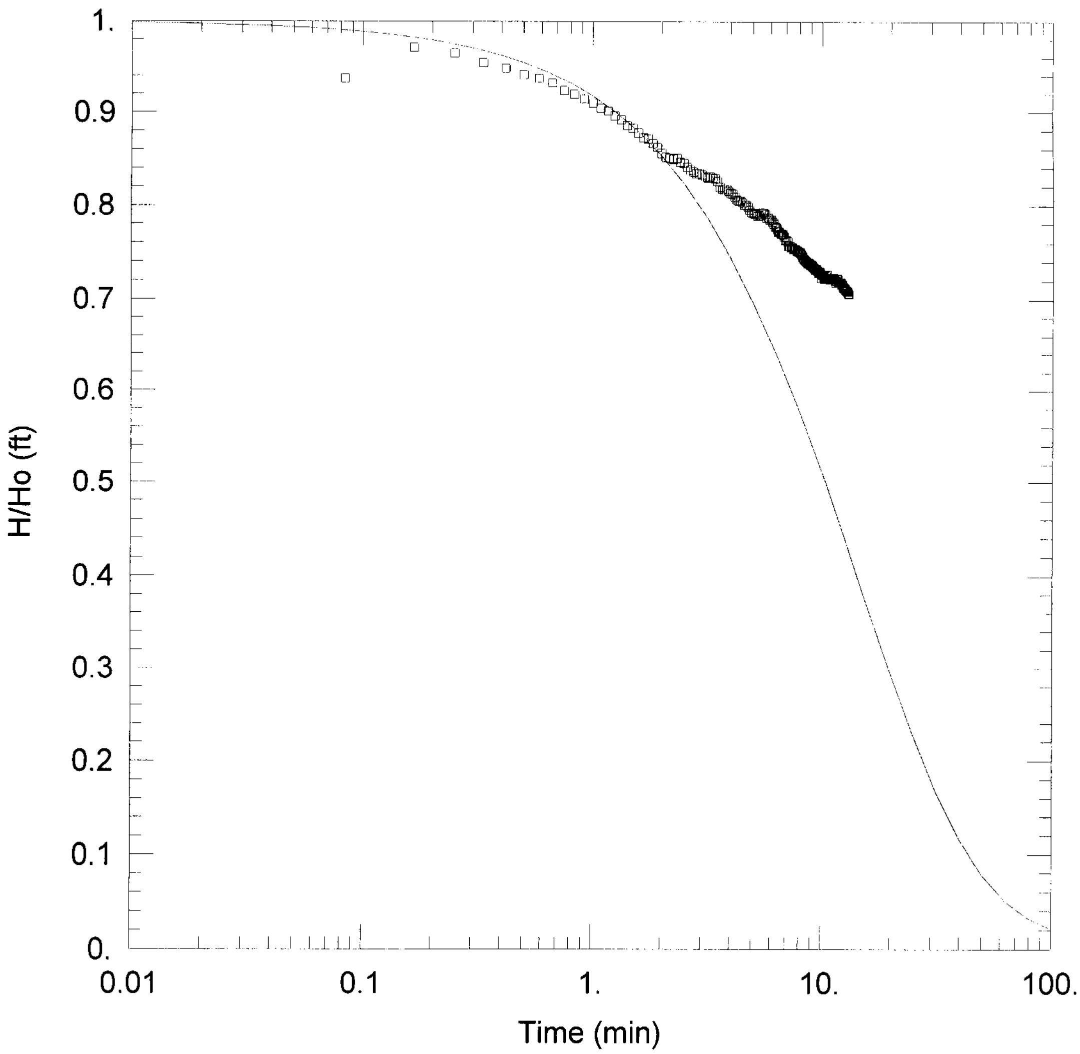
WELL DATA (F1M-7)

Initial Displacement: 1. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 1.18 ft/day
y0 = 41.96 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-7b.aqt
Date: 11/26/02 Time: 08:23:02

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

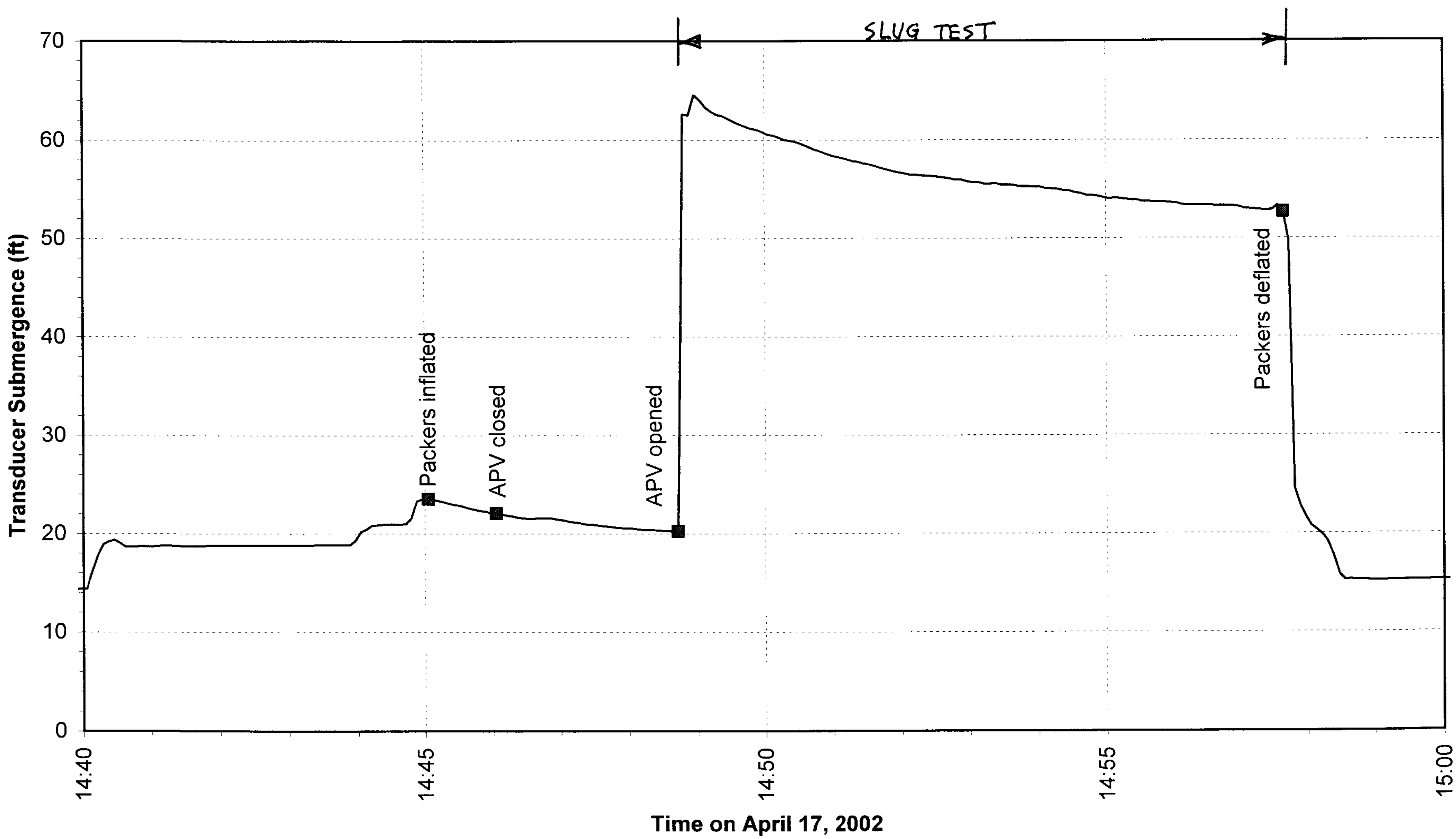
WELL DATA (F1M-7)

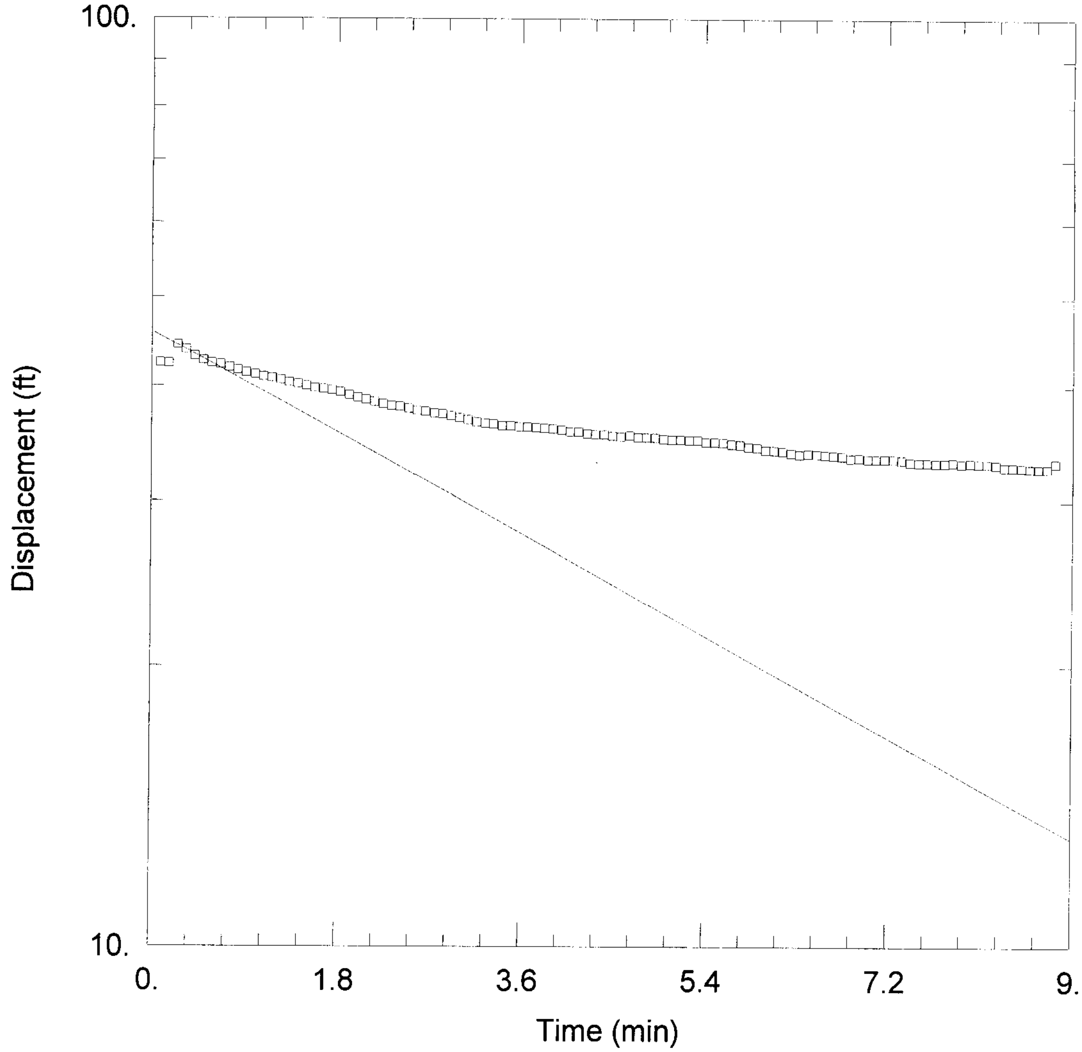
Initial Displacement: 41.96 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.5058 ft^2/day S = 1.E-06

F1M
Transducer Submergence for Interval 8
(525.68 to 520.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-8a.aqt
Date: 11/26/02 Time: 08:22:58

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

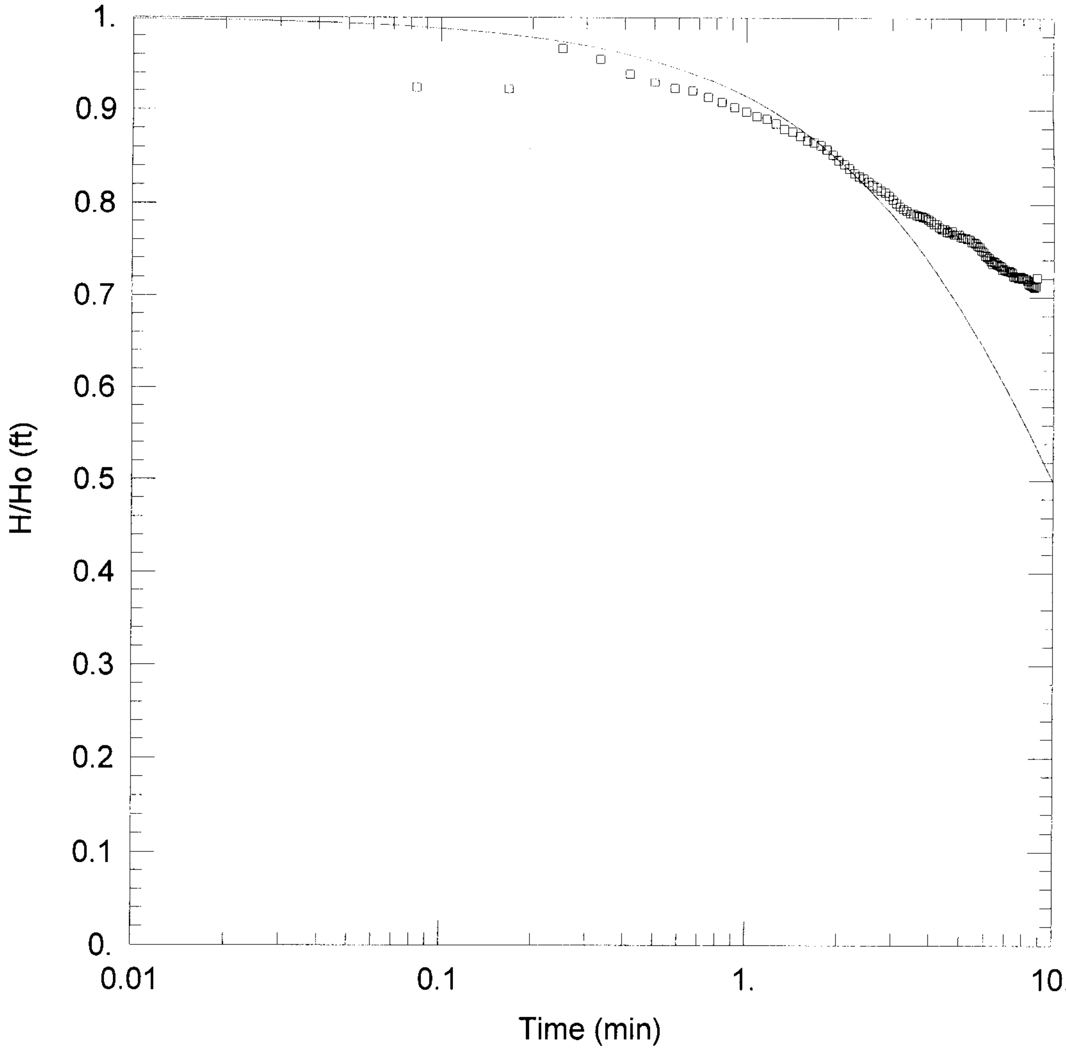
WELL DATA (F1M-8)

Initial Displacement: 1. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 1.848 ft/day
y0 = 45.89 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-8b.aqt
Date: 11/26/02 Time: 08:22:55

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-8)

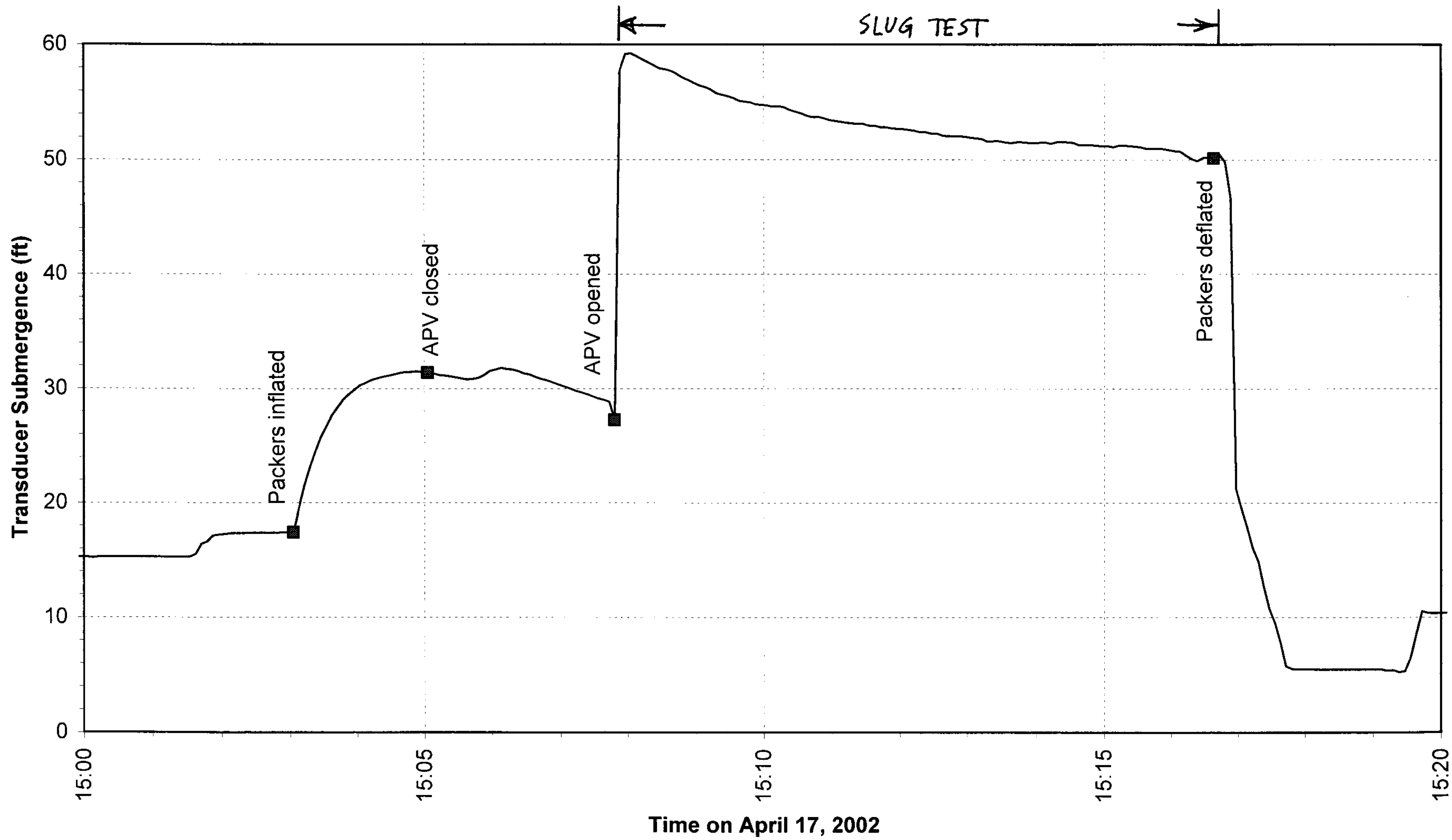
Initial Displacement: 45.89 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

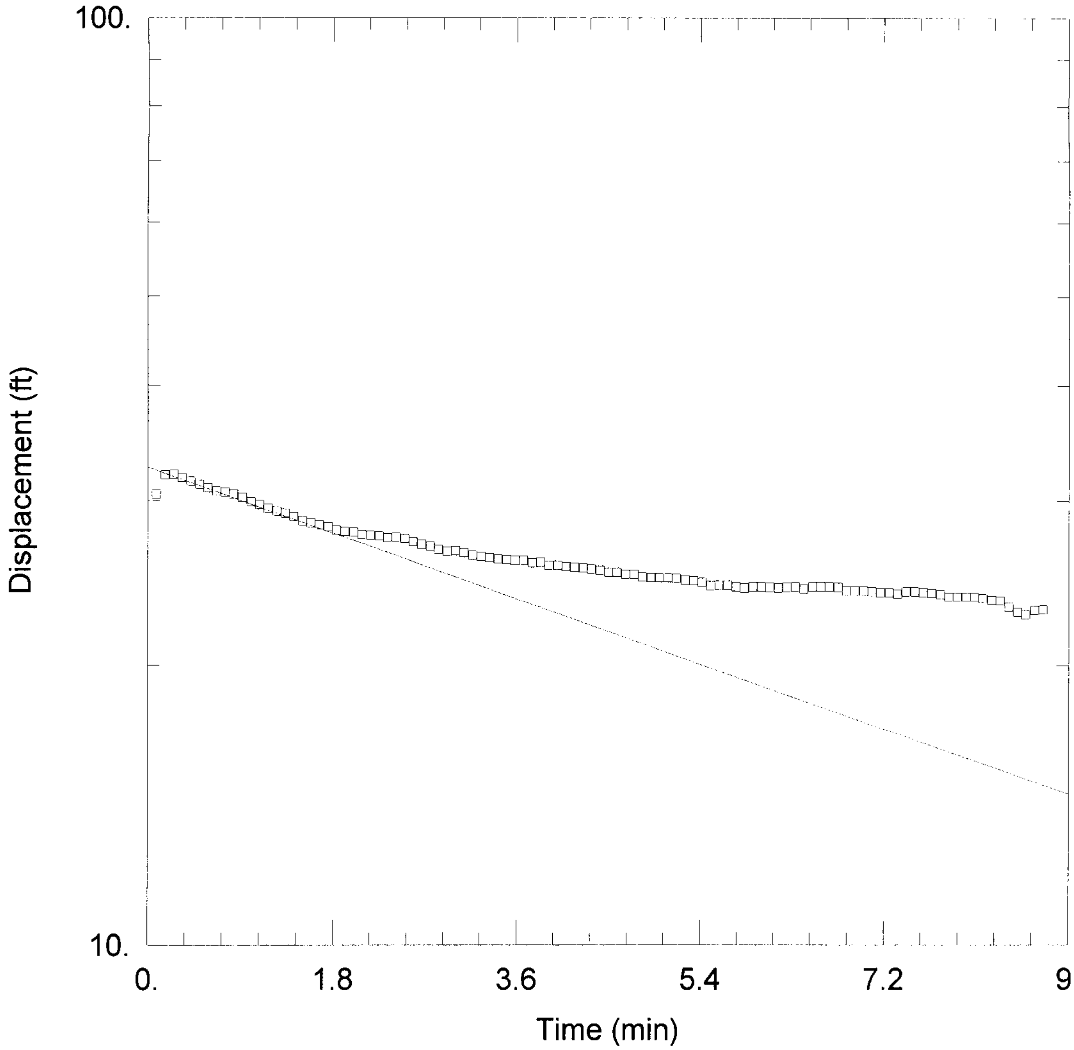
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.5285 ft^2/day S = 1.E-06

F1M
Transducer Submergence for Interval 9
(529.68 to 524.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-9a.aqt
Date: 11/26/02 Time: 08:22:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

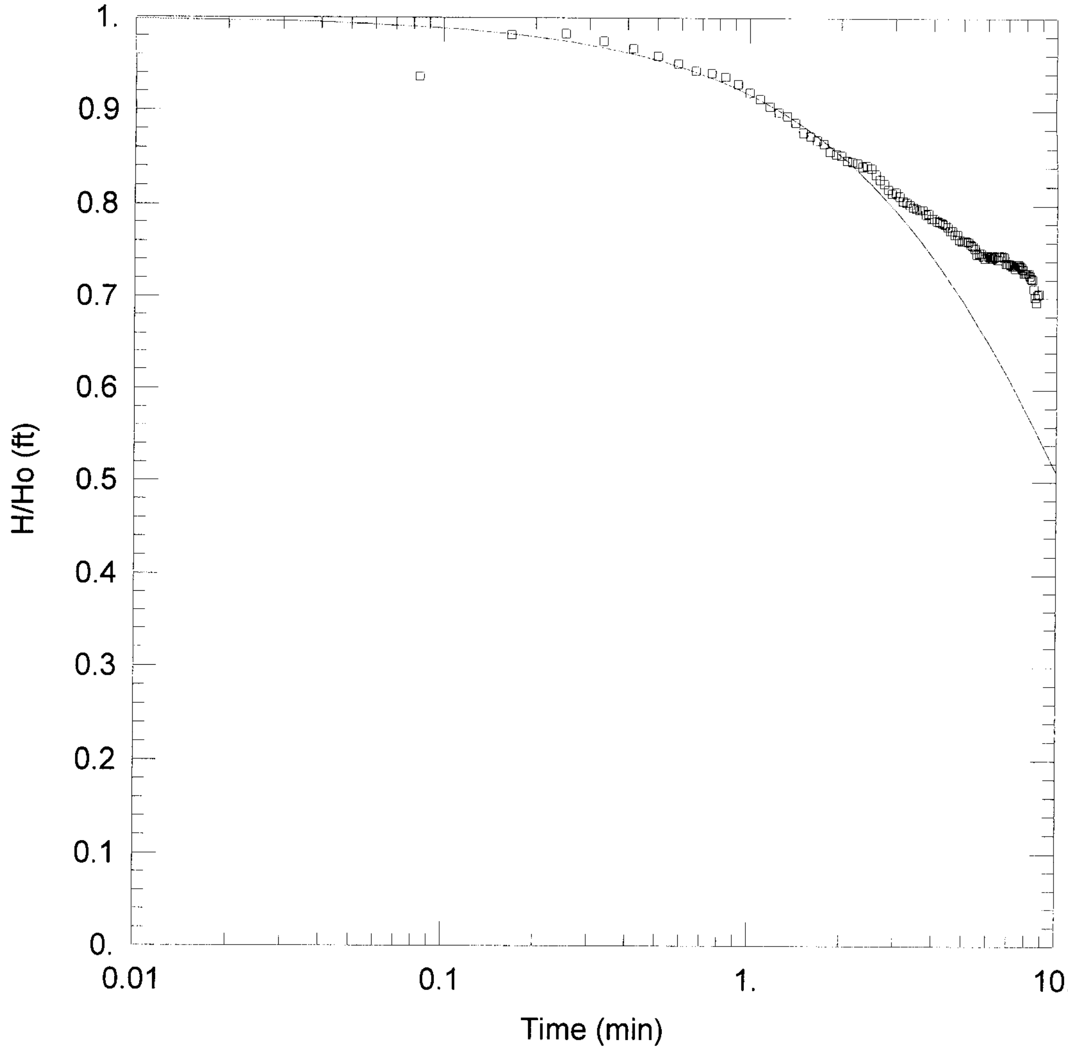
WELL DATA (J1M-9)

Initial Displacement: 1. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 1.189 ft/day
y0 = 32.57 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-9b.aqt
Date: 11/26/02 Time: 08:22:44

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-9)

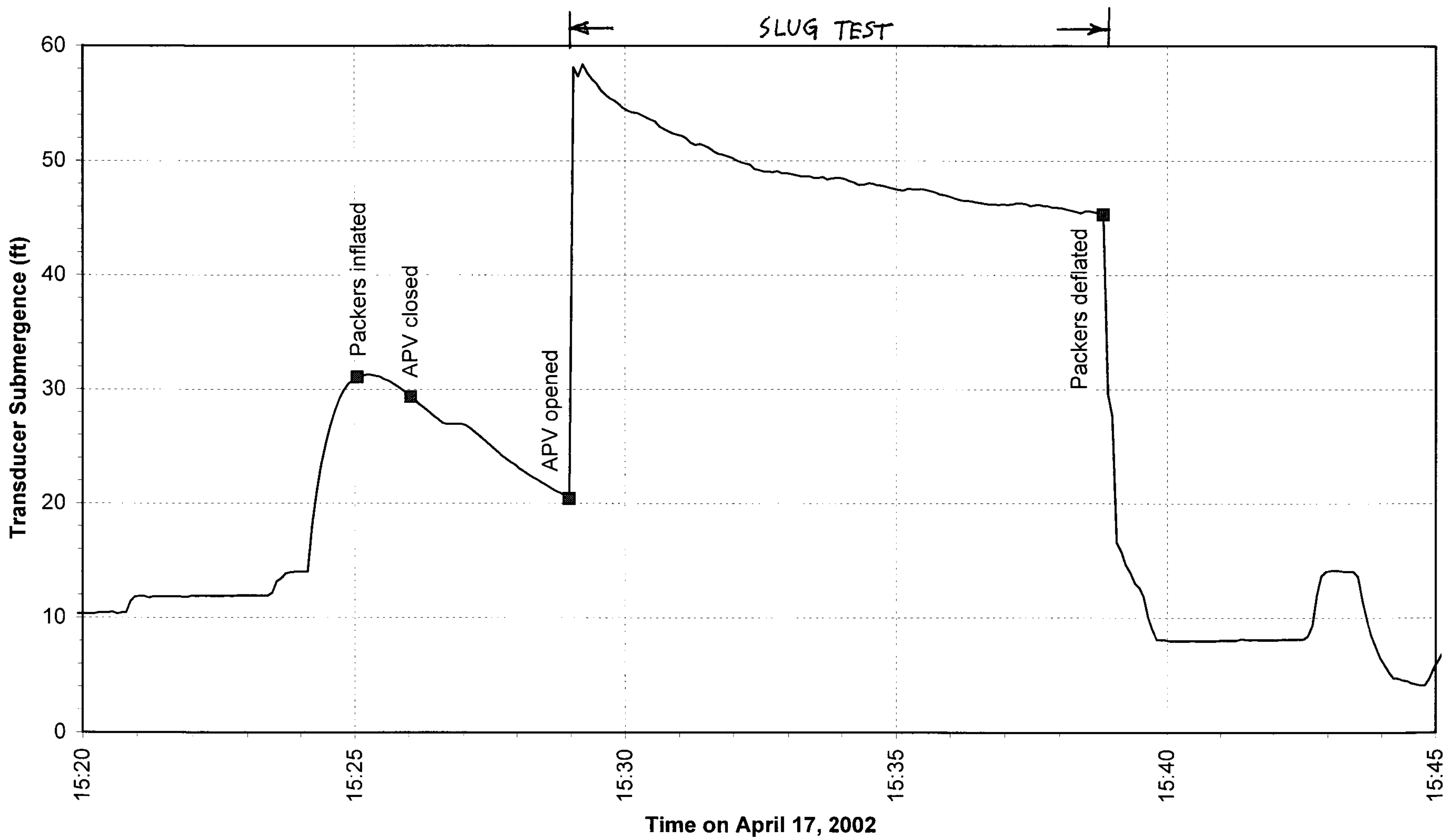
Initial Displacement: 32.57 ft
Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft
Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft
Total Well Penetration Depth: 5.2 ft

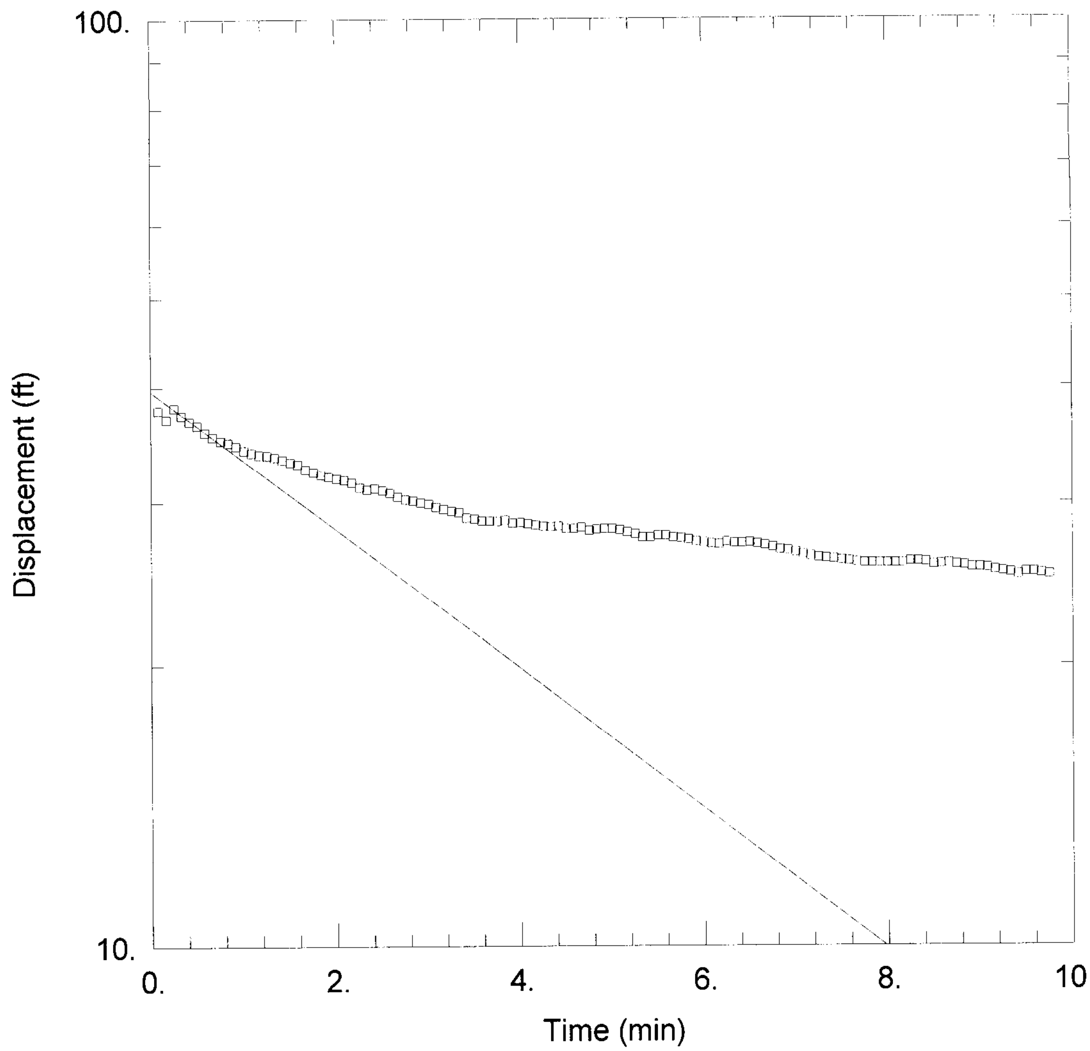
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.5086 ft^2/day
S = 1.E-06

F1M
Transducer Submergence for Interval 10
(533.68 to 528.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-10a.aqt
Date: 11/26/02 Time: 08:24:31

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

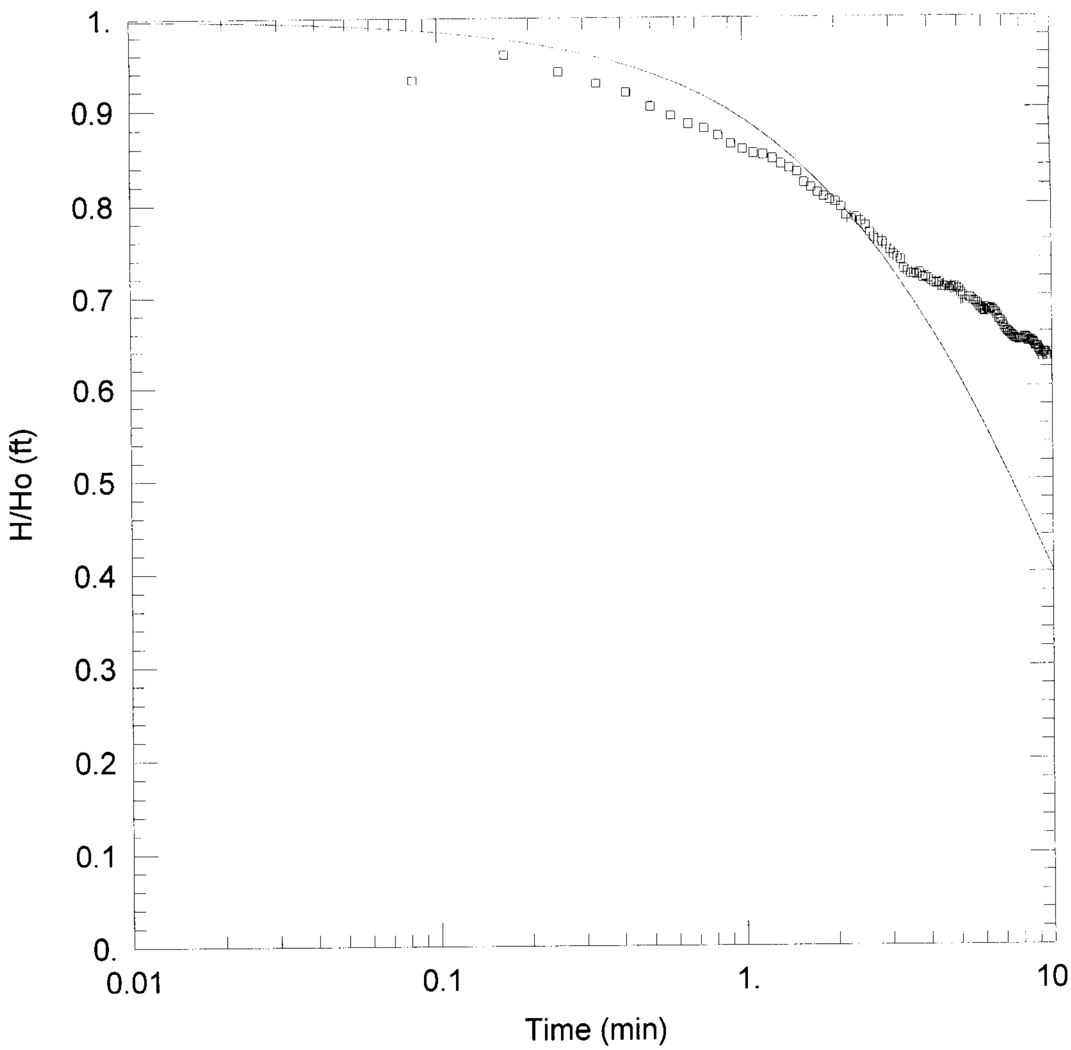
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-10)

Initial Displacement: 1. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
K = 2.287 ft/day
Solution Method:
y0 = 39.65 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-10b.aqt
Date: 11/26/02 Time: 08:24:27

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

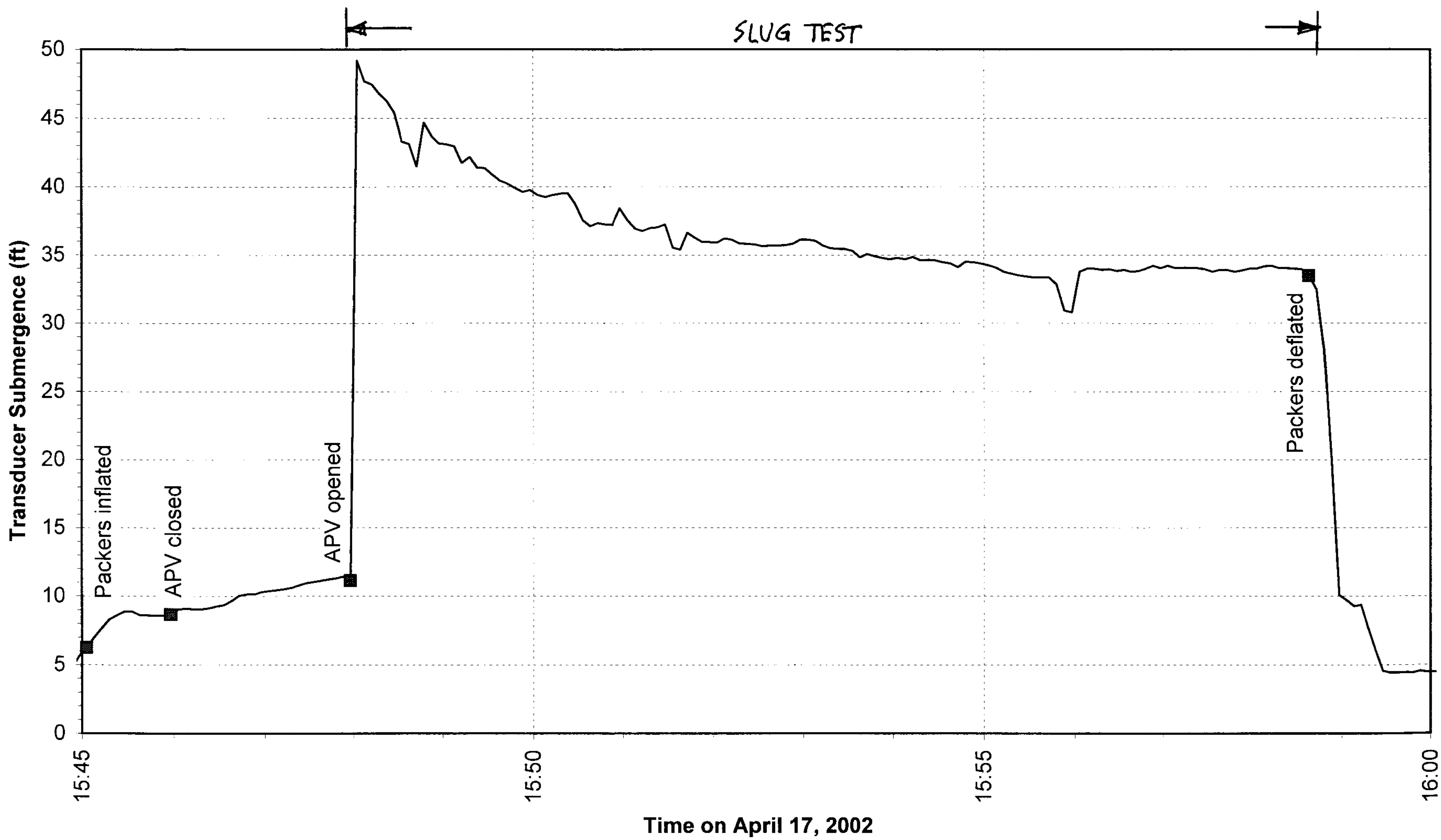
WELL DATA (F1M-10)

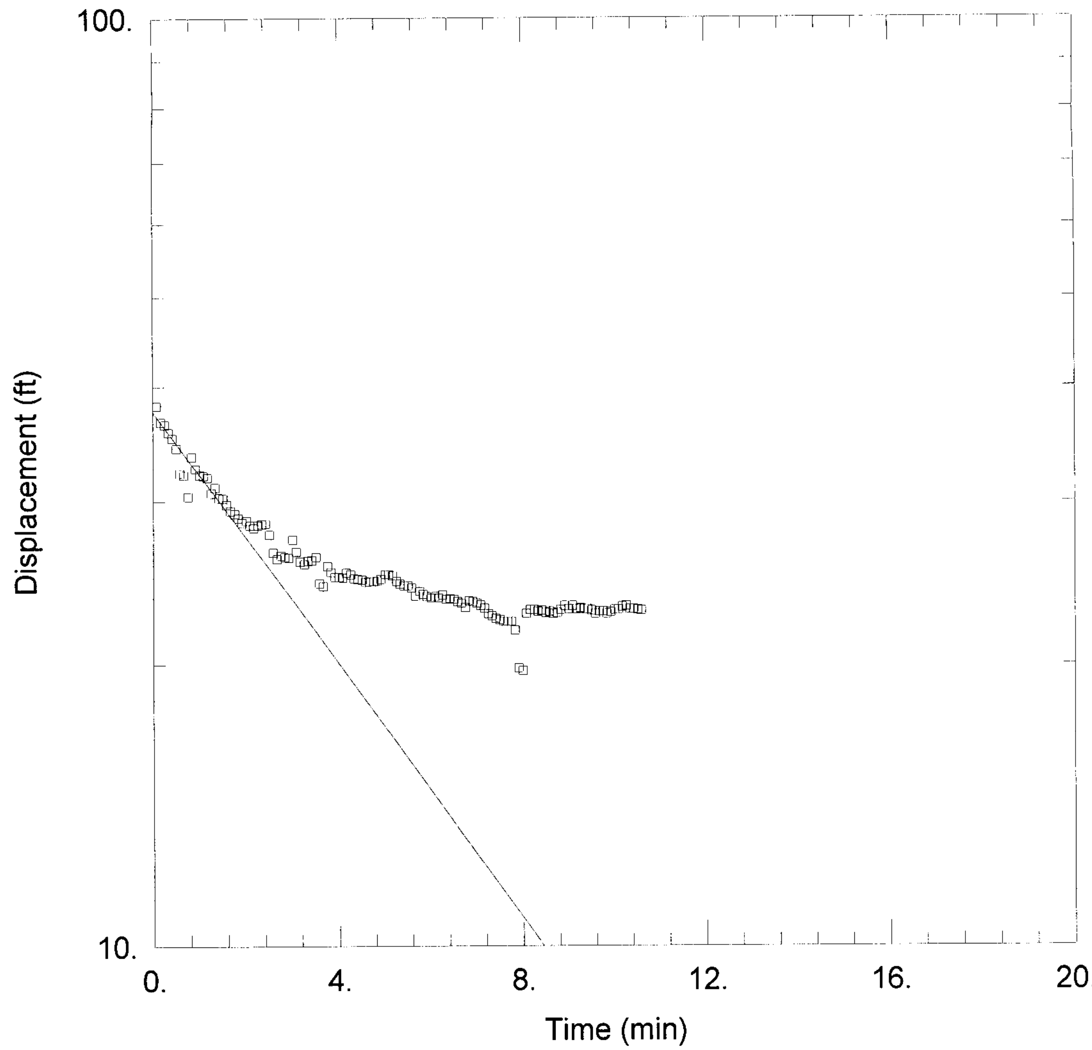
Initial Displacement: 39.65 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.7183 ft^2/day
S = 1.E-06

F1M
Transducer Submergence for Interval 11
(537.68 to 532.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-11a.aqt
Date: 11/26/02 Time: 08:24:25

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

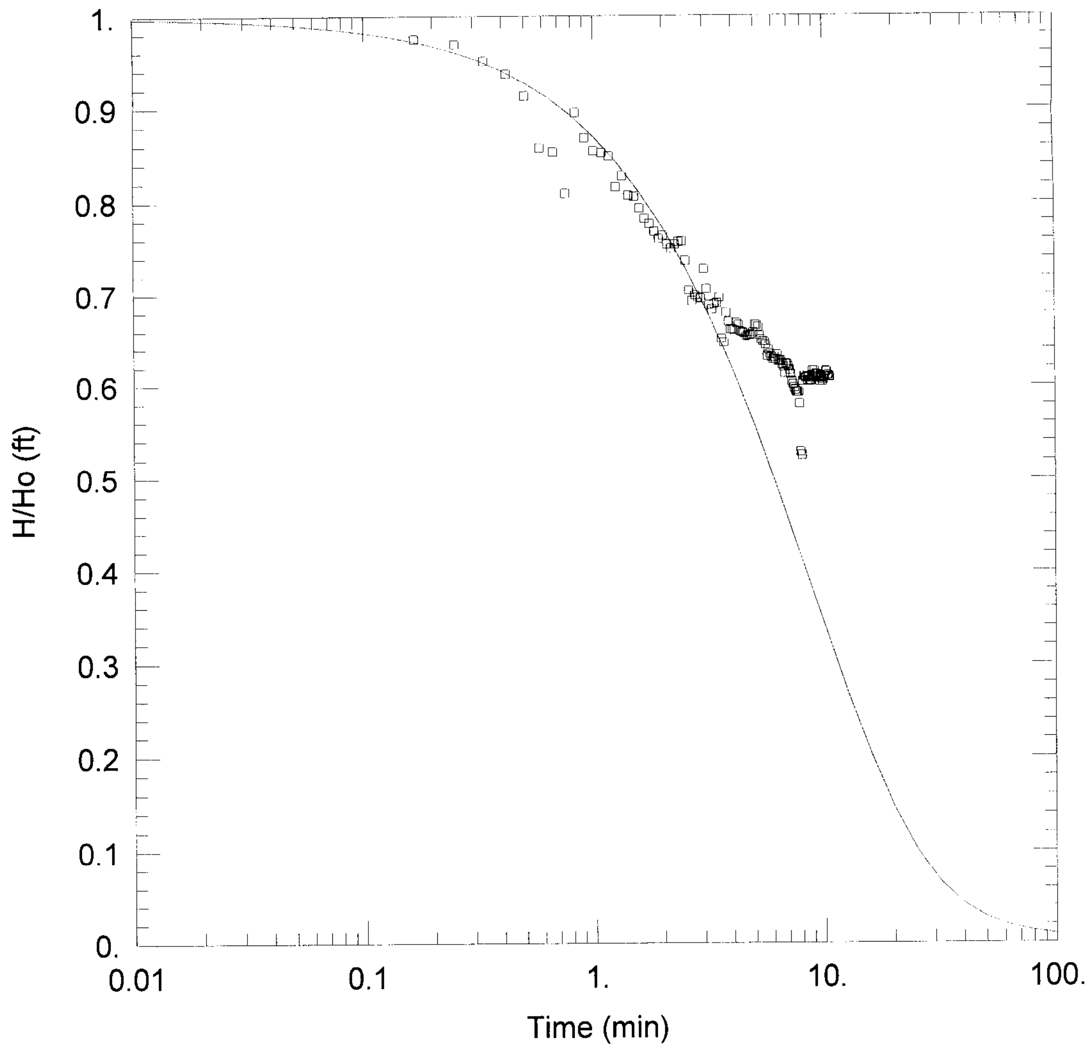
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-11)

Initial Displacement: 1. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
K = 2.072 ft/day
Solution Method:
y0 = 37.51 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-11b.aqt
Date: 11/26/02 Time: 08:24:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-11)

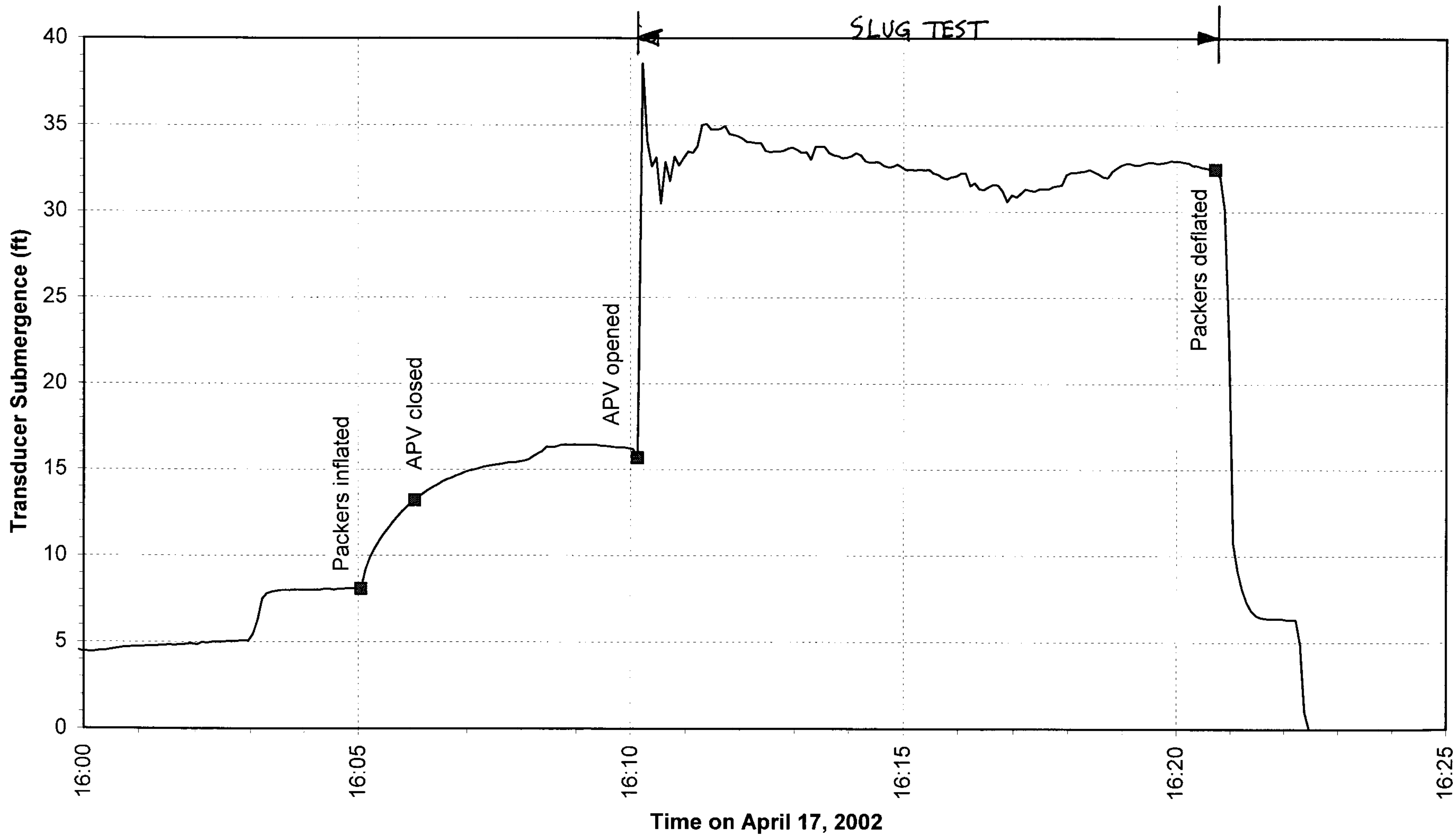
Initial Displacement: 37.51 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

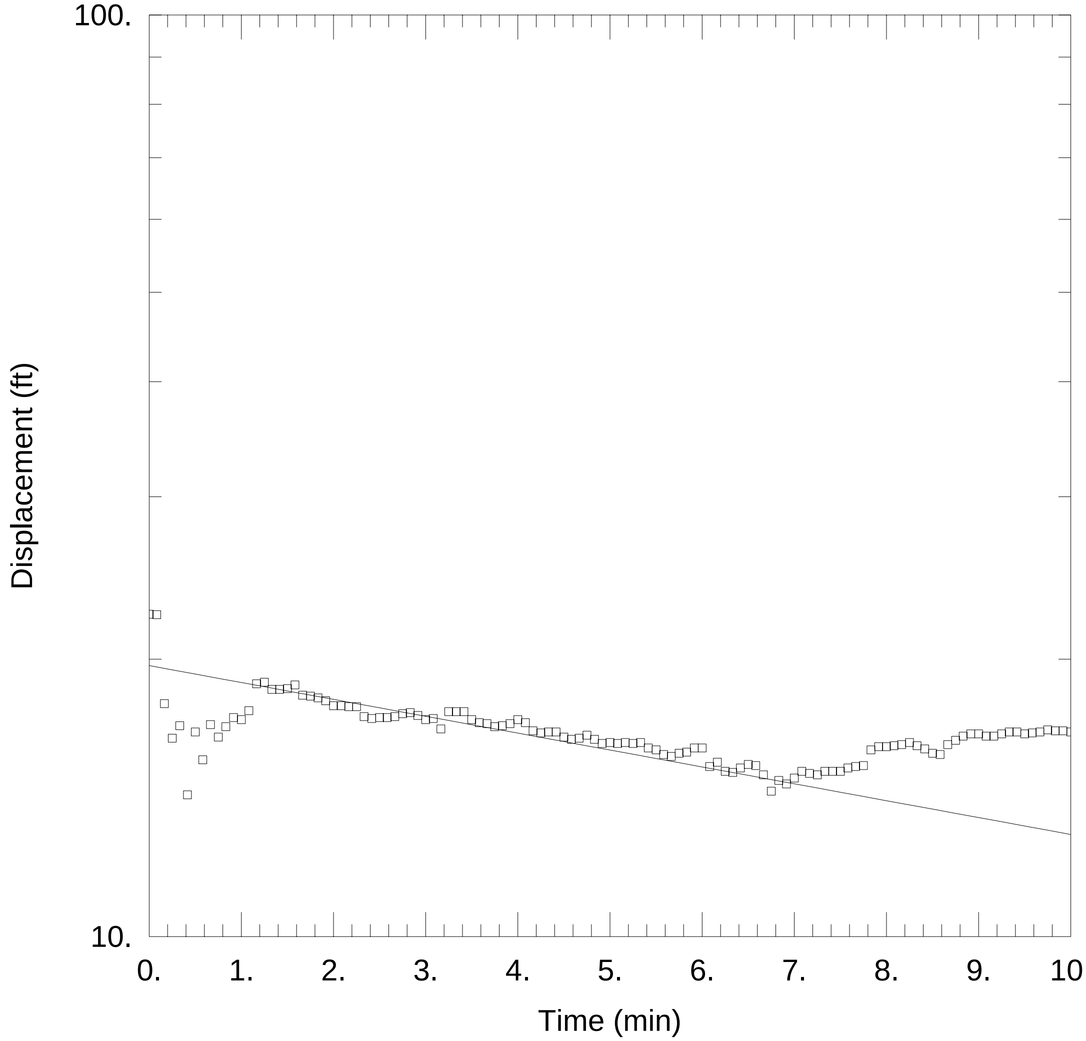
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.8763 ft^2/day
S = 1.E-06

F1M
Transducer Submergence for Interval 12
(541.68 to 536.48 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-12a.aqt
Date: 01/22/03 Time: 14:07:40

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

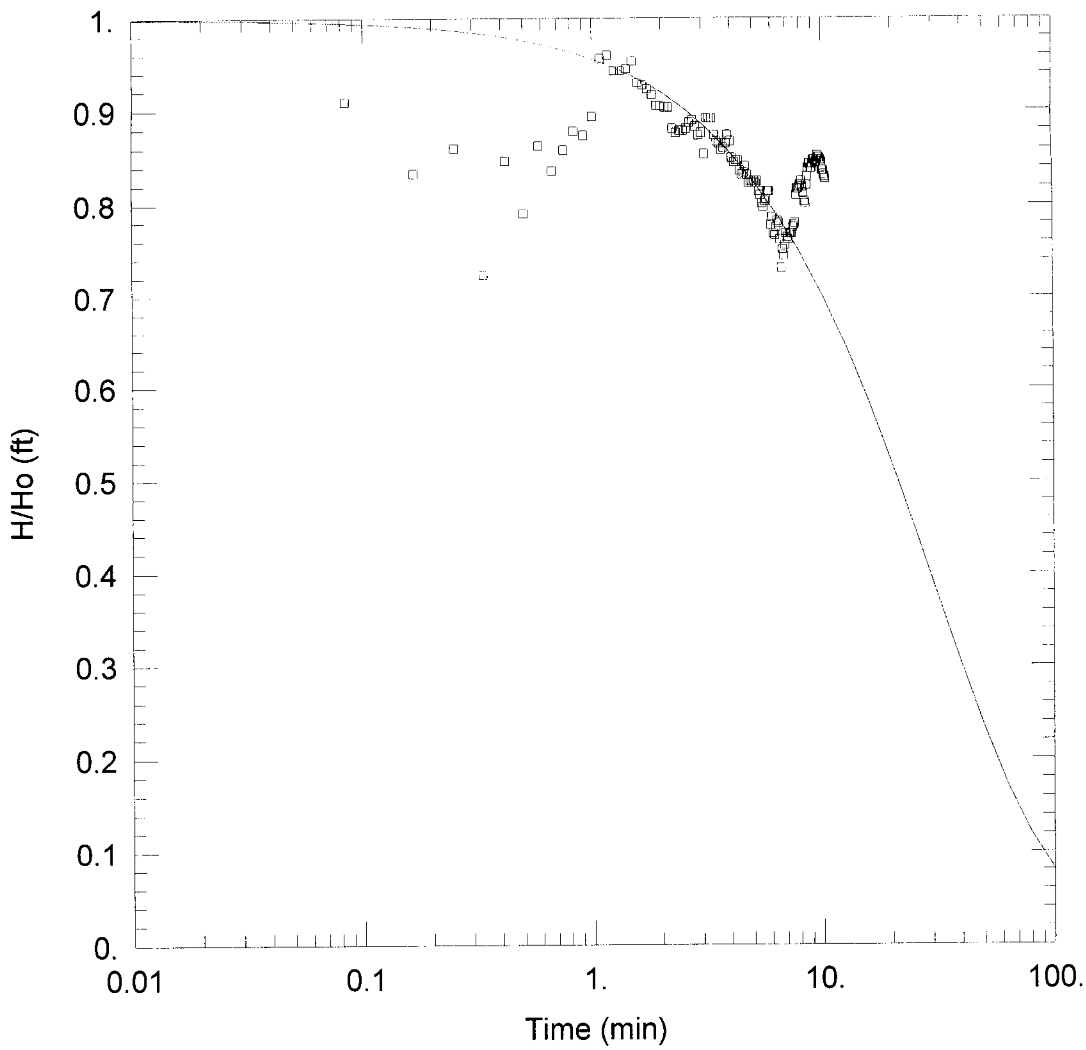
WELL DATA (F1M-12)

Initial Displacement: 22.37 ft Casing Radius: 0.1667 ft
Wellbore Radius: 0.1667 ft Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.5585 ft/day y0 = 19.68 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F1M\F1M-12b.aqt
Date: 11/26/02 Time: 08:24:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F1M-12)

Initial Displacement: 19.68 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.2489 ft^2/day
S = 1.E-06

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

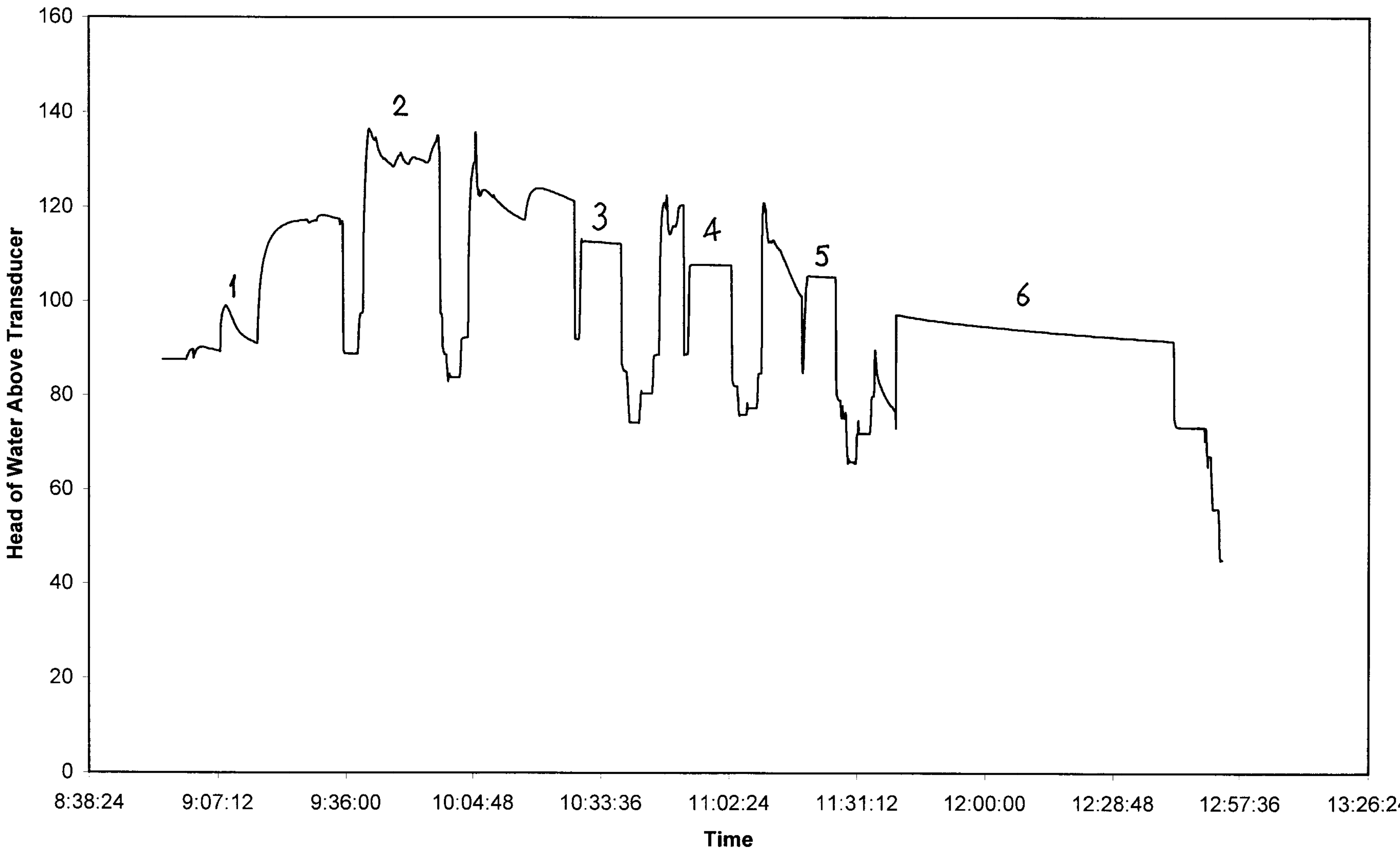
F2L

Testing Dates: April 18, 2002

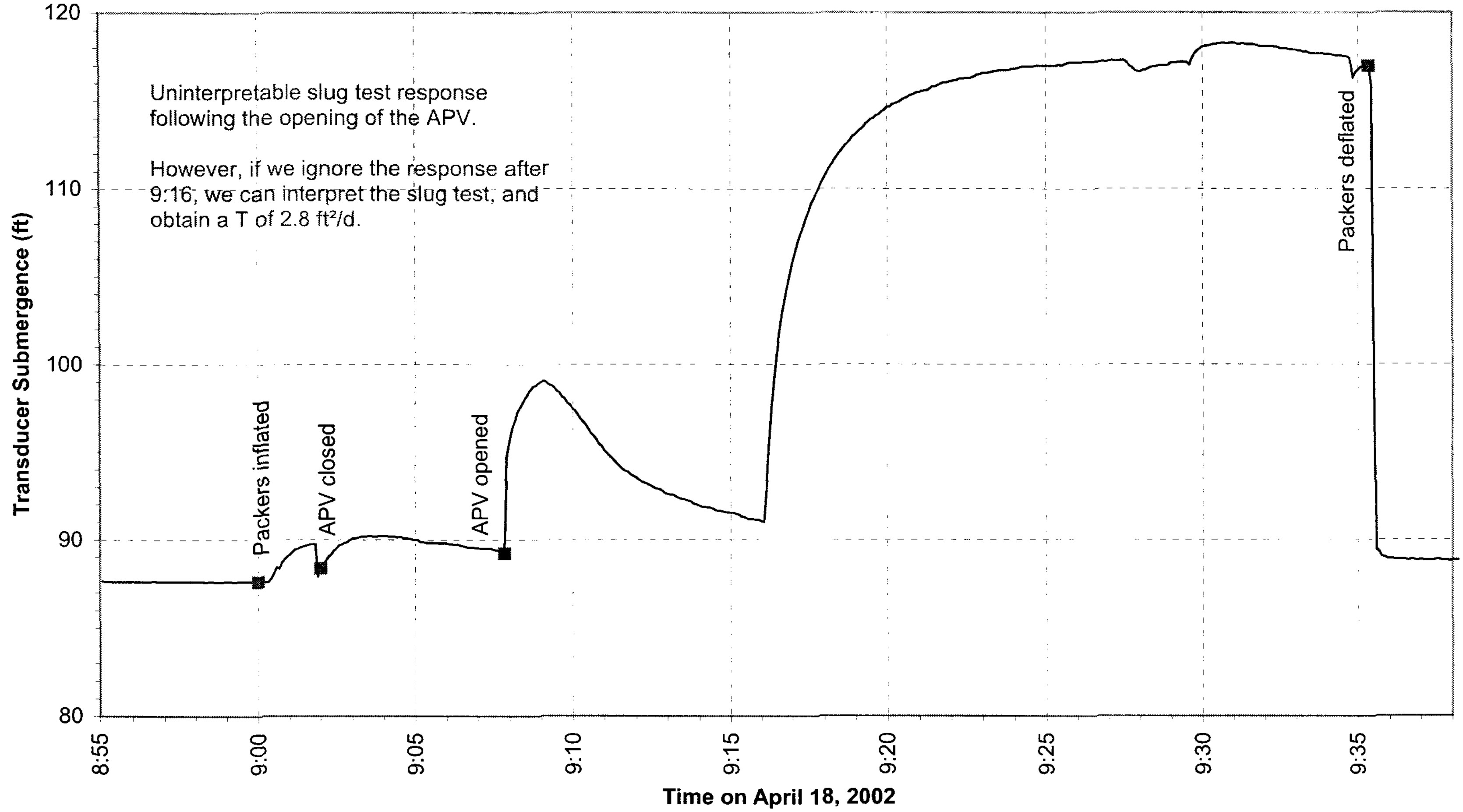
Summary of Tests:

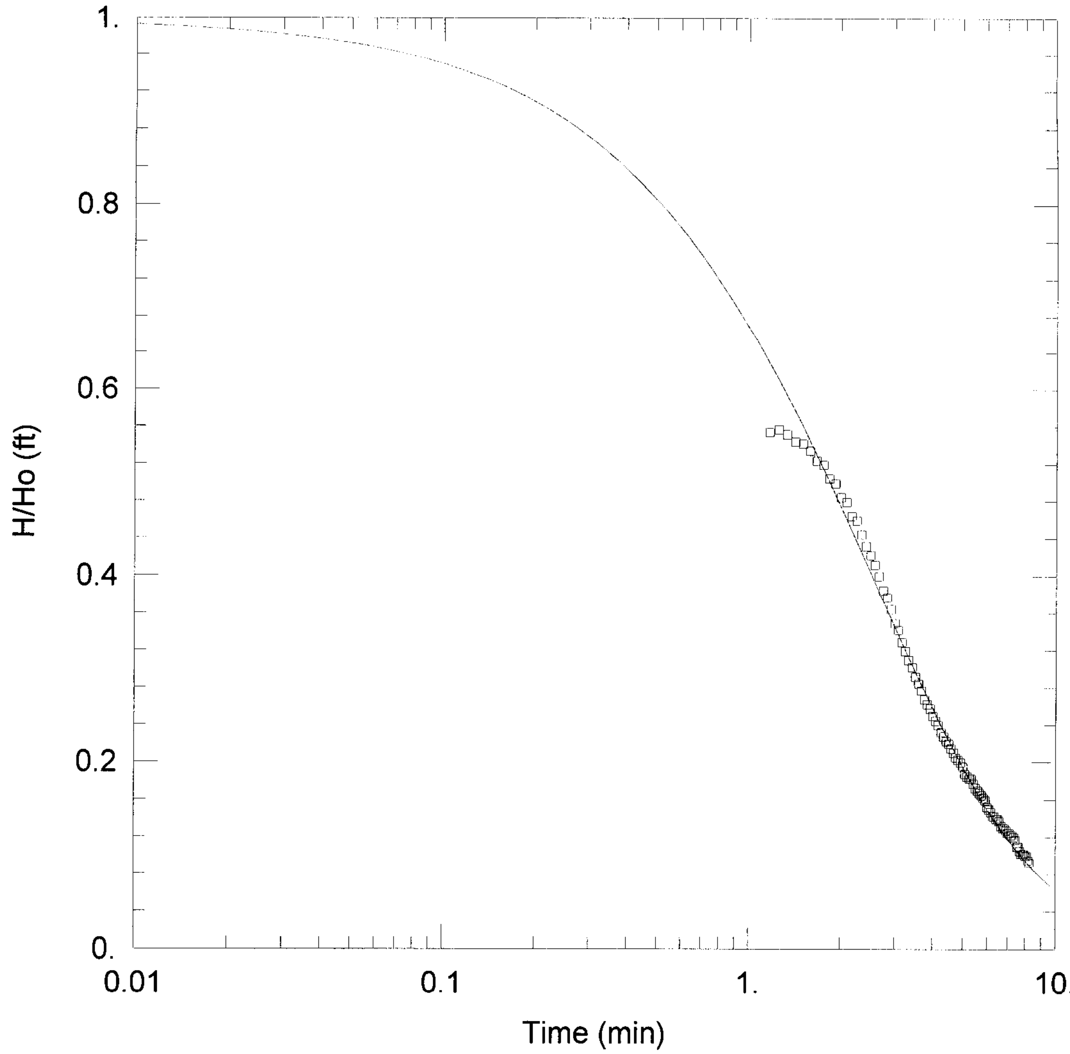
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
F2L	1	480.73	471.23	0.04	see PT Memo
F2L	2	480.73	475.53	NIR	see PT Memo
F2L	3	484.73	479.53	0.01	see PT Memo
F2L	4	488.73	483.53	<<1	
F2L	5	492.73	487.53	0.013	
F2L	6	496.73	491.53	0.032	

Monitoring Well F2L



F2L
Transducer Submergence for Interval 1
(480.73 to 471.23 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F2L\F2L-1.aqt
Date: 11/26/02 Time: 10:47:41

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

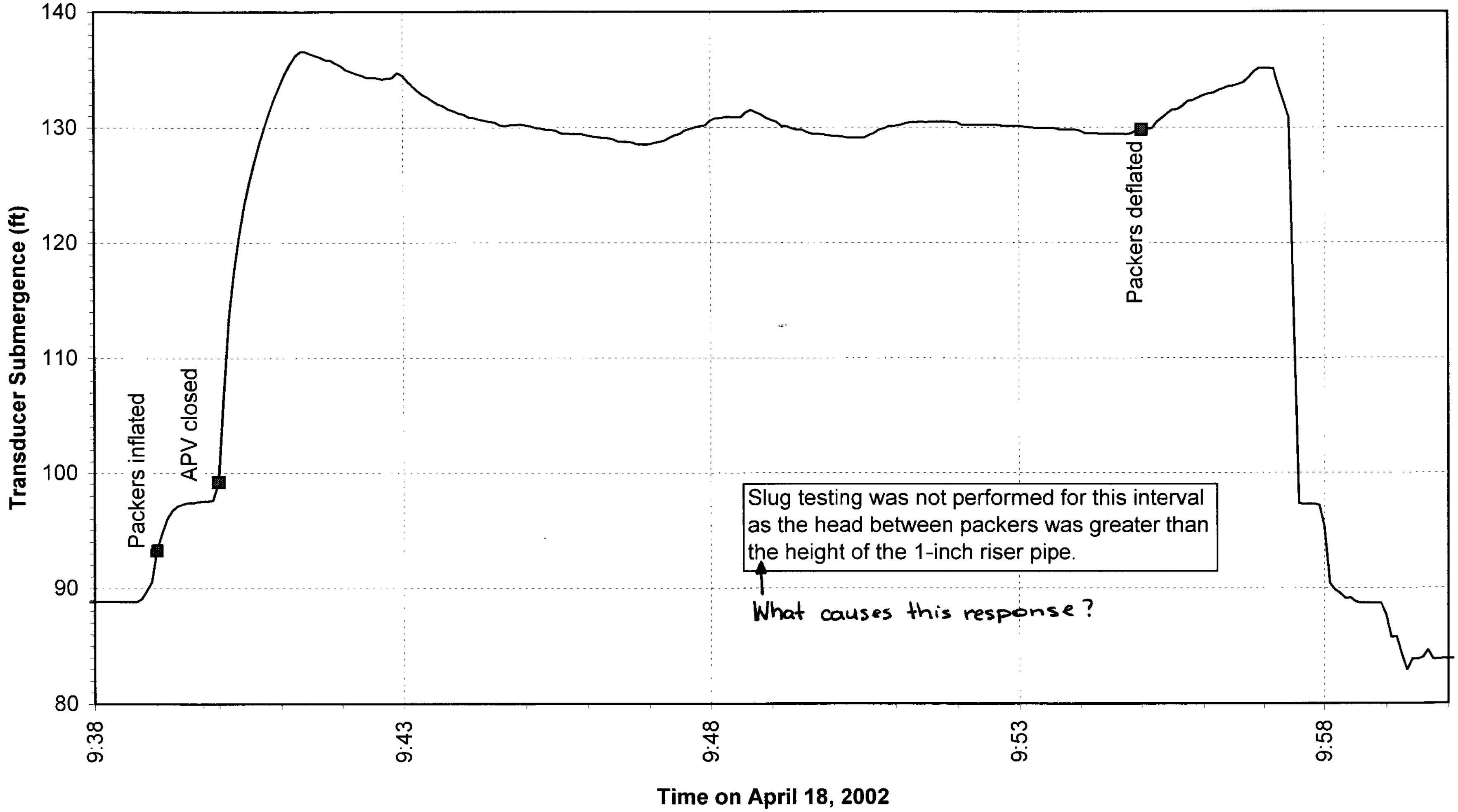
WELL DATA (F2L-1)

Initial Displacement: 17.35 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

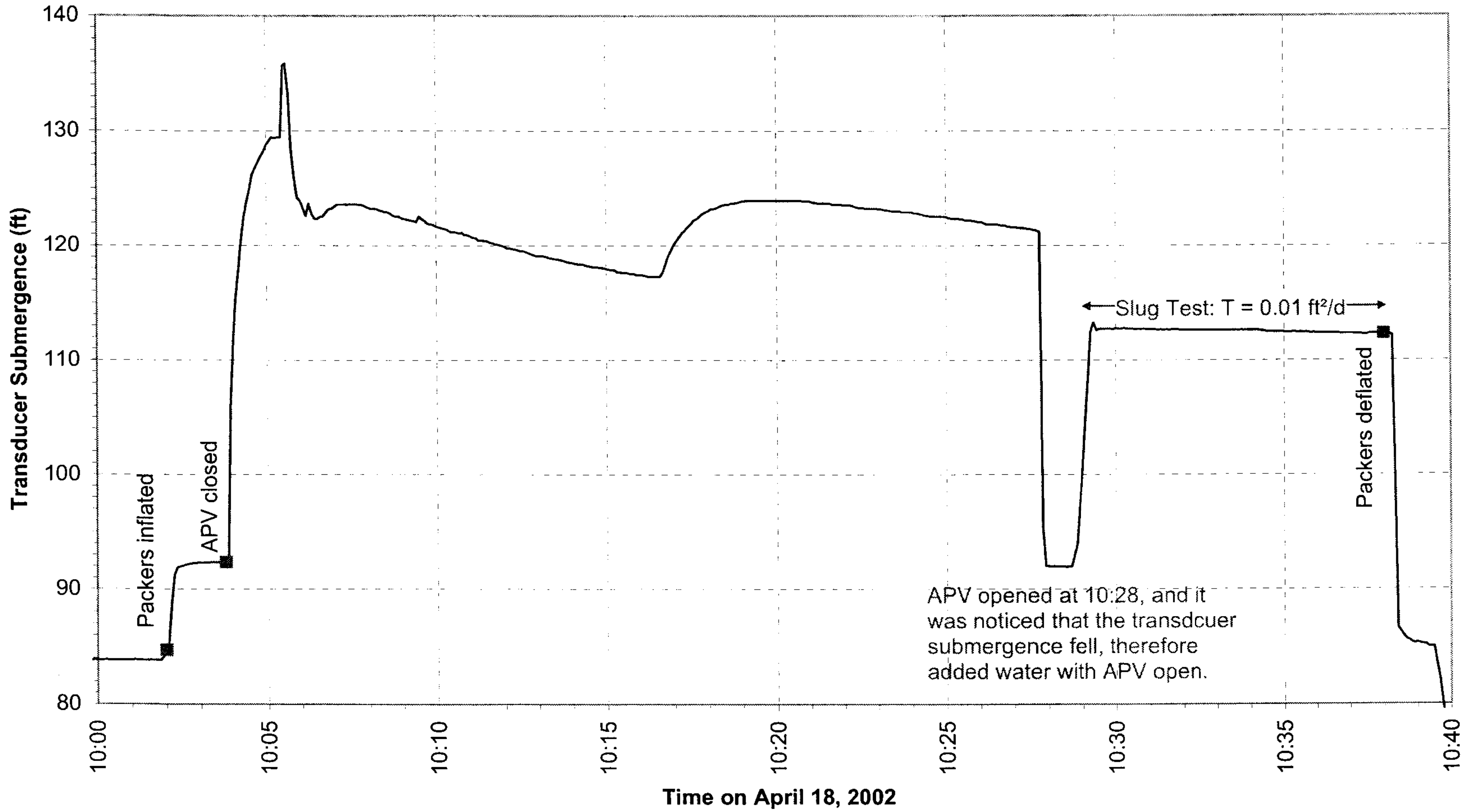
SOLUTION

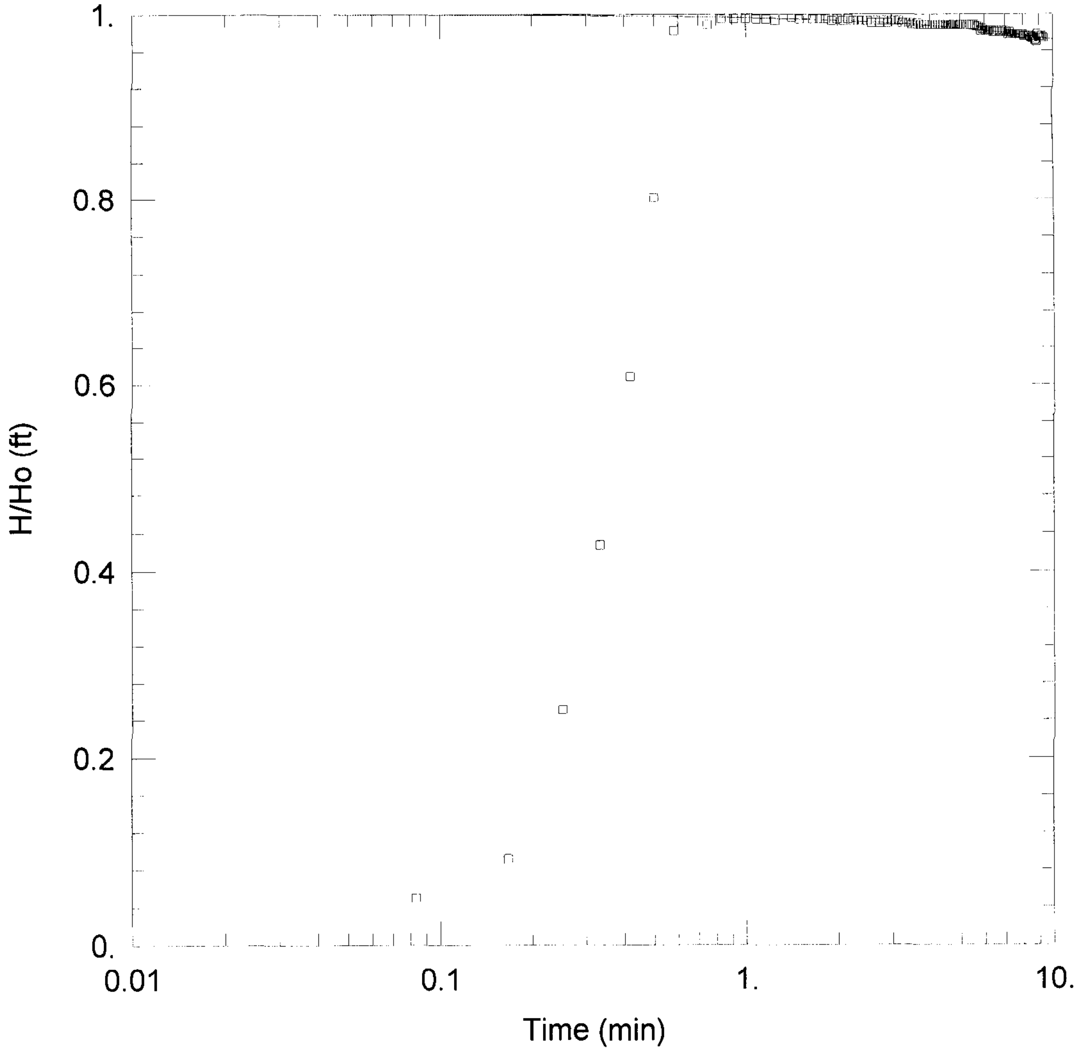
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 2.859 ft^2/day S = 1.E-06

F2L
Transducer Submergence for Interval 2
(480.73 to 475.53 ft AMSL)



F2L
Transducer Submergence for Interval 3
(484.73 to 479.53 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F2L\F2L-3.aqt
Date: 11/26/02 Time: 10:48:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F2L-3)

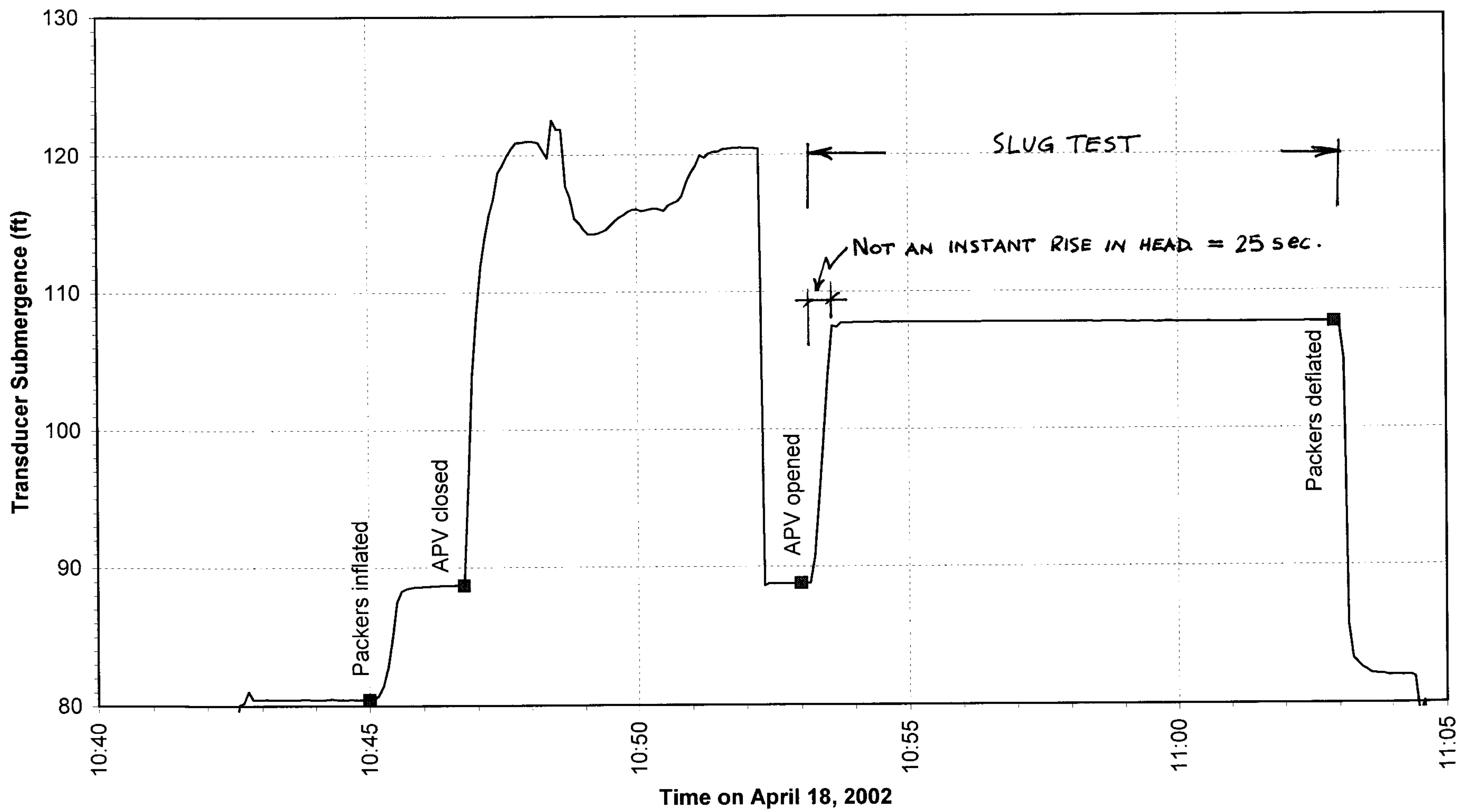
Initial Displacement: 20.86 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

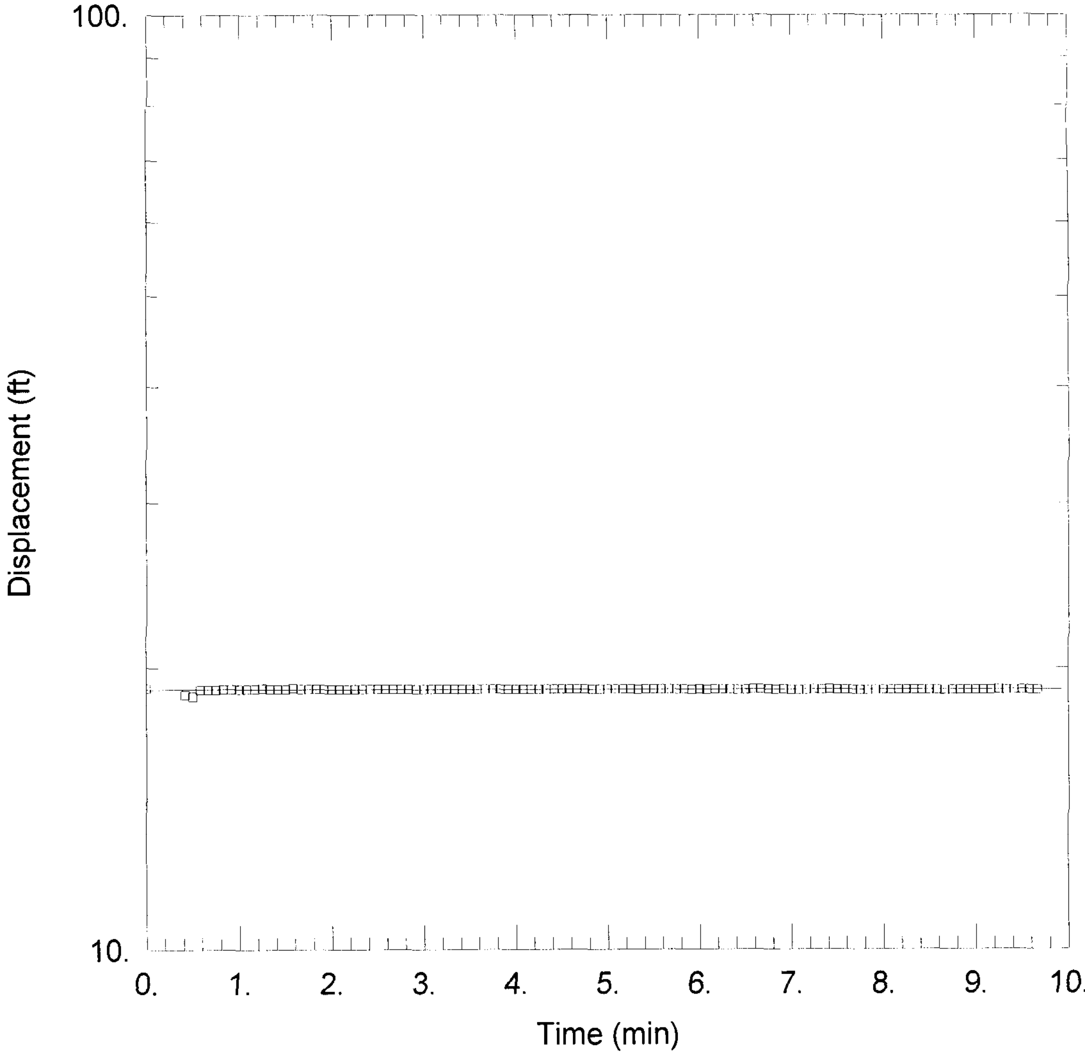
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.0144 ft^2/day
S = 1.E-06

F2L
Transducer Submergence for Interval 4
(488.73 to 483.53 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F2L\F2L-4.aqt
Date: 11/26/02 Time: 10:44:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F2L-4)

Initial Displacement: 19.01 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft

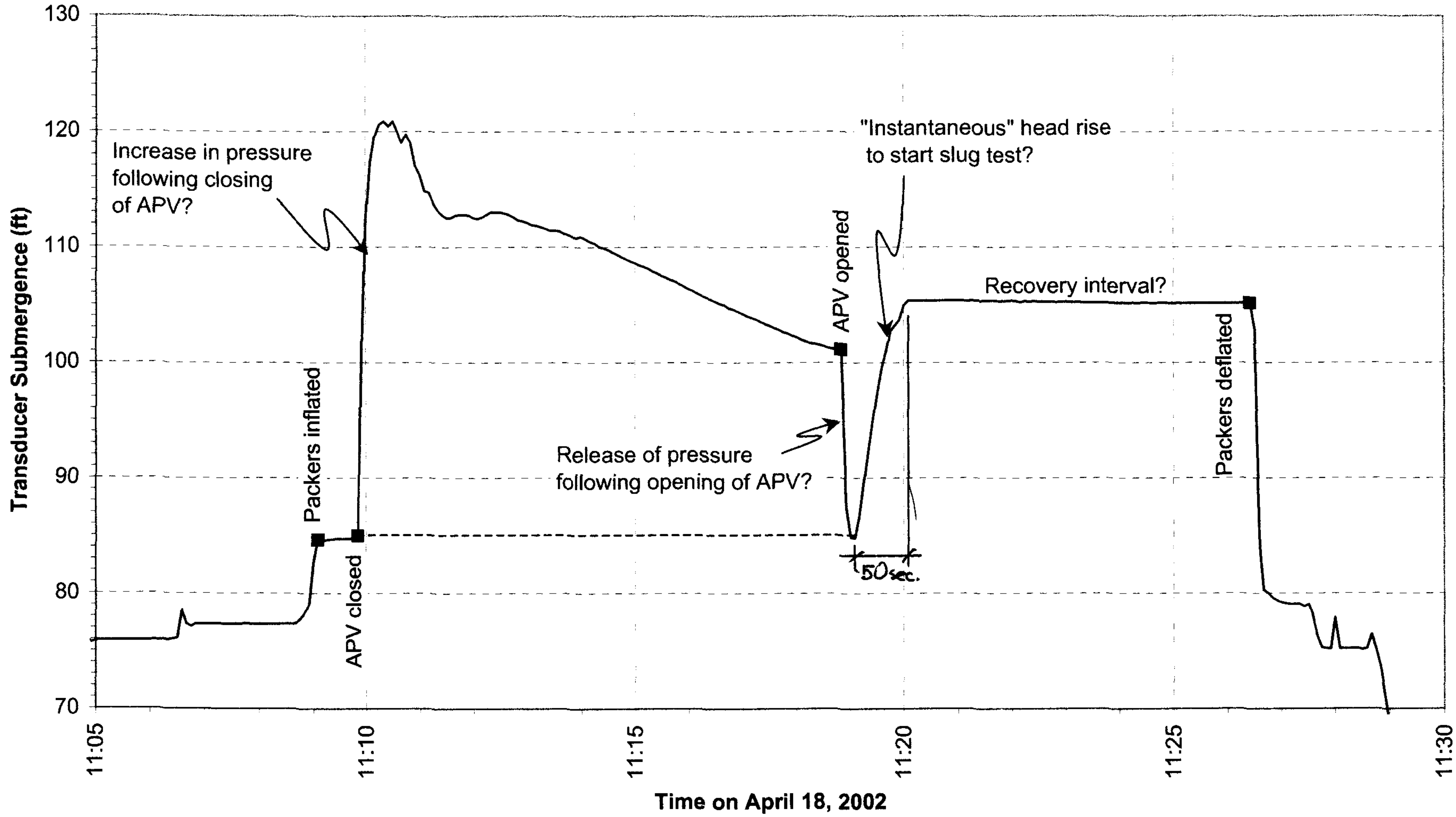
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

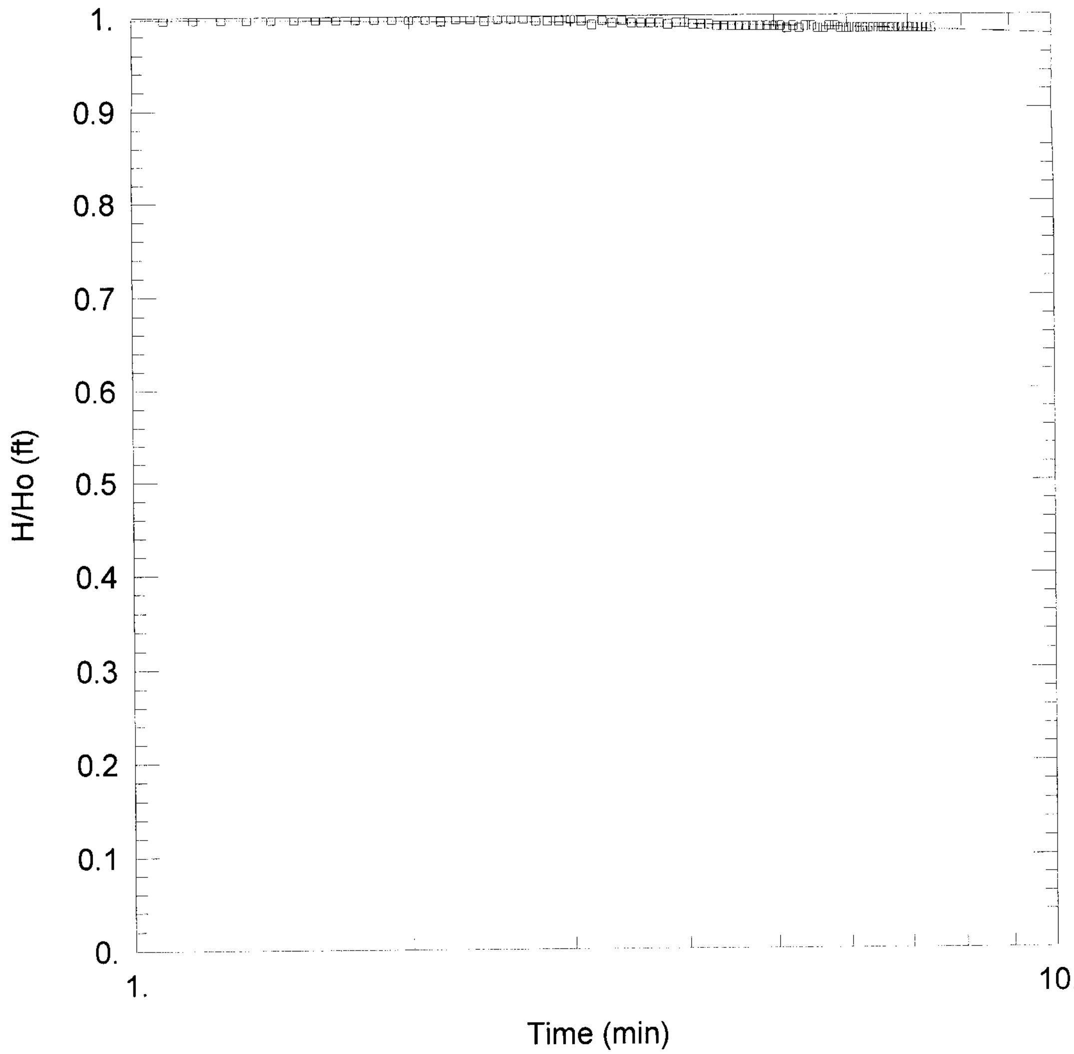
SOLUTION

Aquifer Model: Confined
= 6.968E-05 ft/day

Solution Method:
y0 = 18.96 ft

F2L
Transducer Submergence for Interval 5
(492.73 to 487.53 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F2L\F2L-5.aqt
Date: 11/26/02 Time: 10:44:40

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

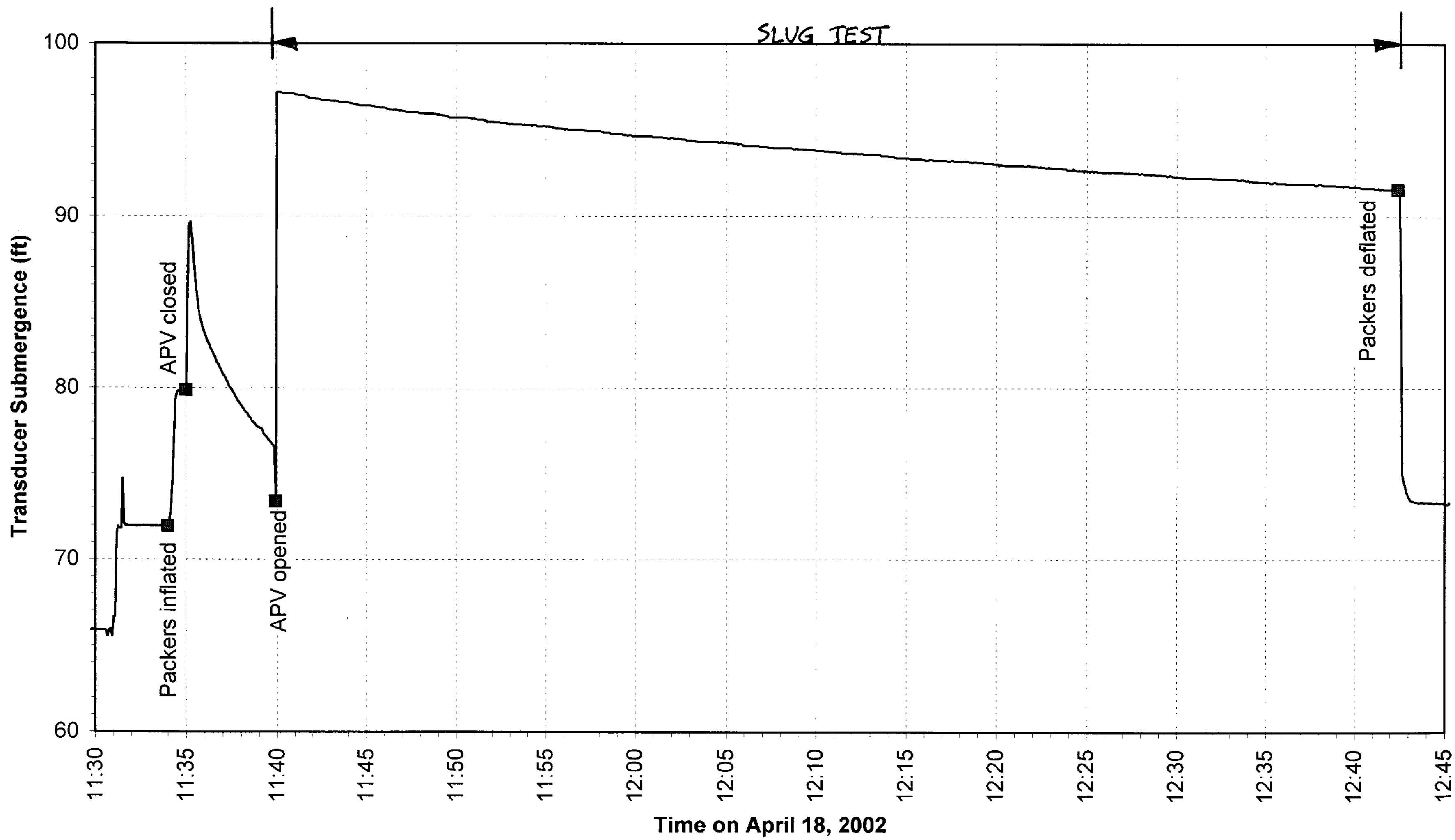
WELL DATA (F2L-5)

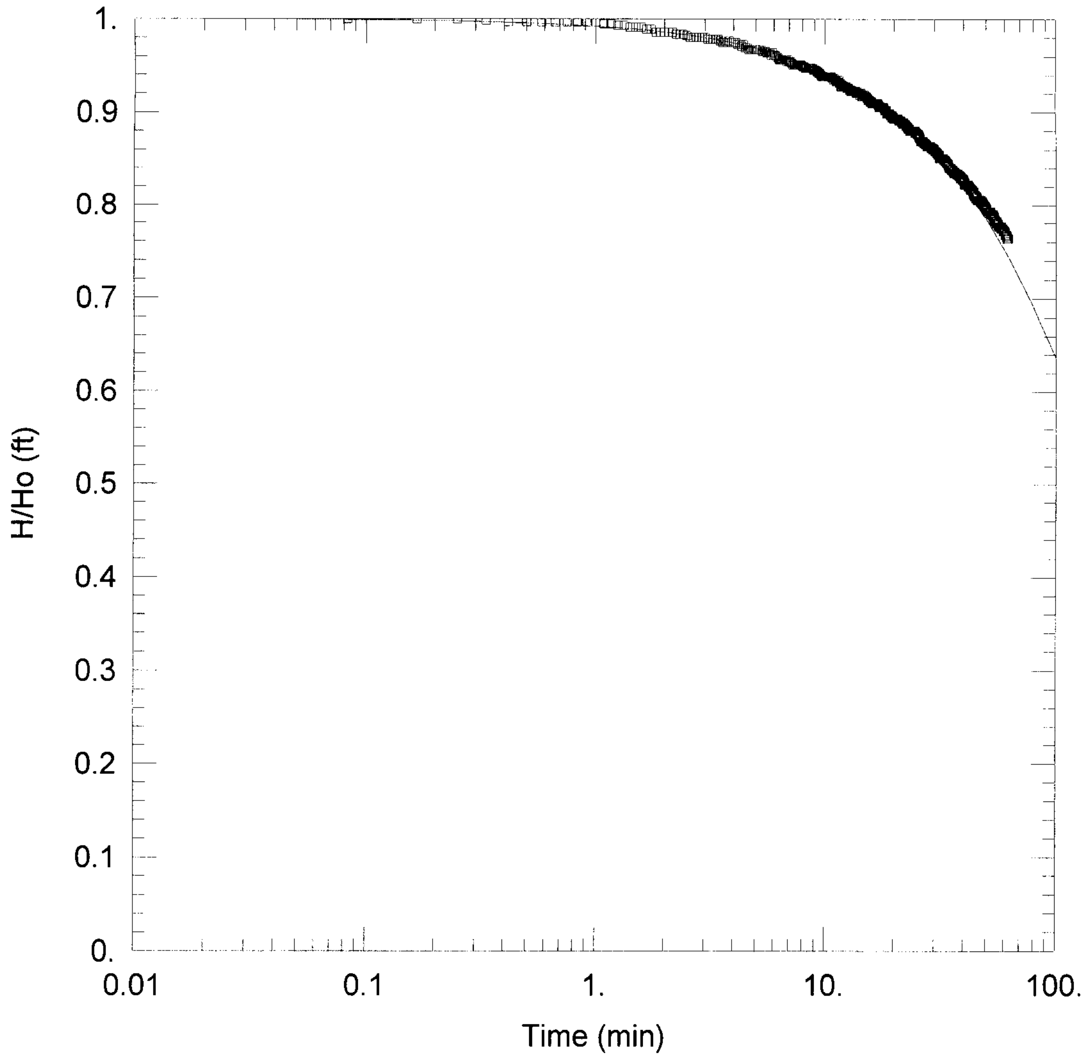
Initial Displacement: 20.6 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.01329 ft^2/day
S = 1.E-07

F2L
Transducer Submergence for Interval 6
(496.73 to 491.53 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\F2L\F2L-6.aqt
Date: 11/26/02 Time: 10:44:36

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (F2L-6)

Initial Displacement: 23.82 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.03246 ft^2/day
S = 1.E-06

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

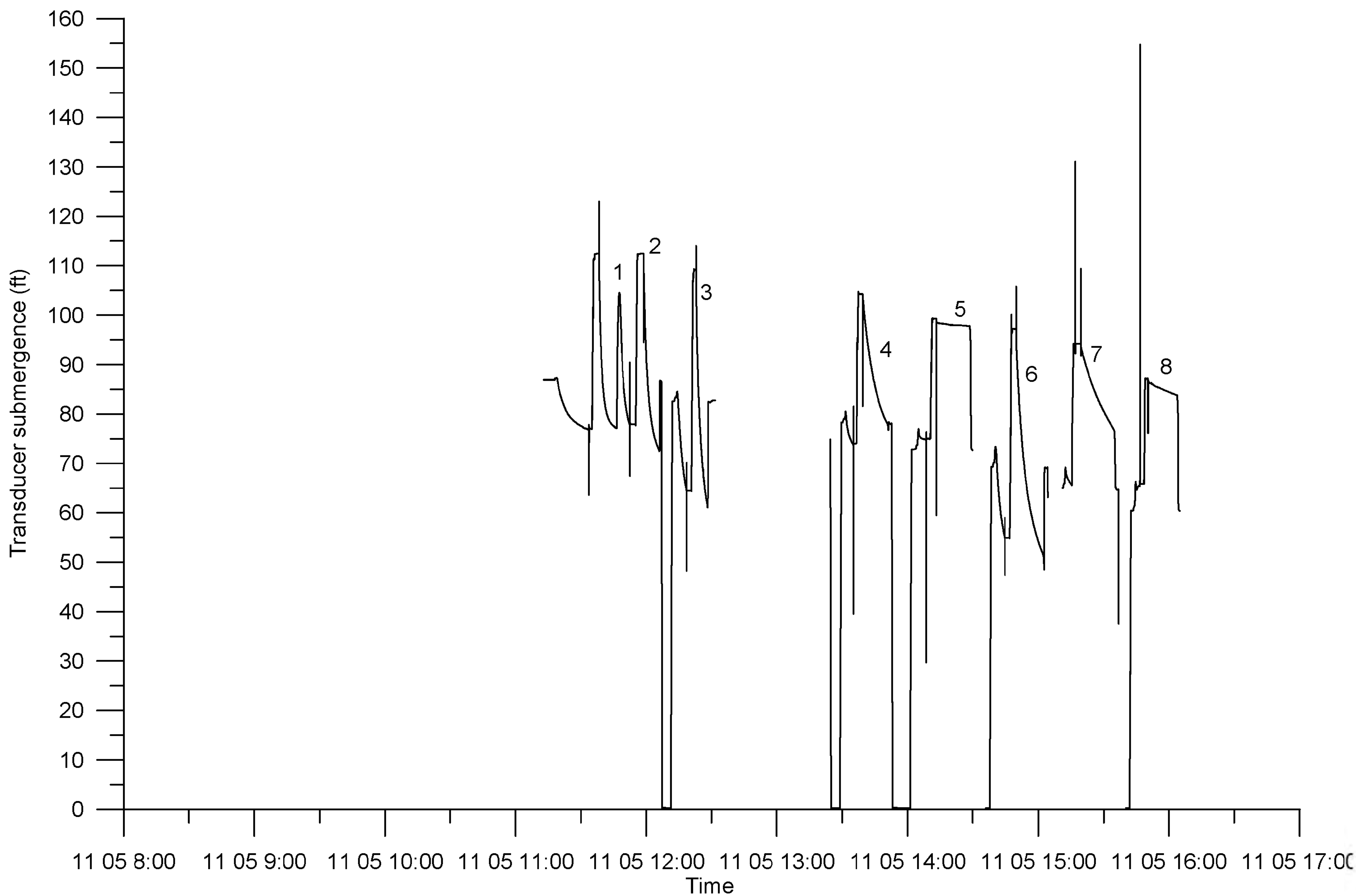
F6

Testing Dates: November 05 - 07, 2002

Summary of Tests:

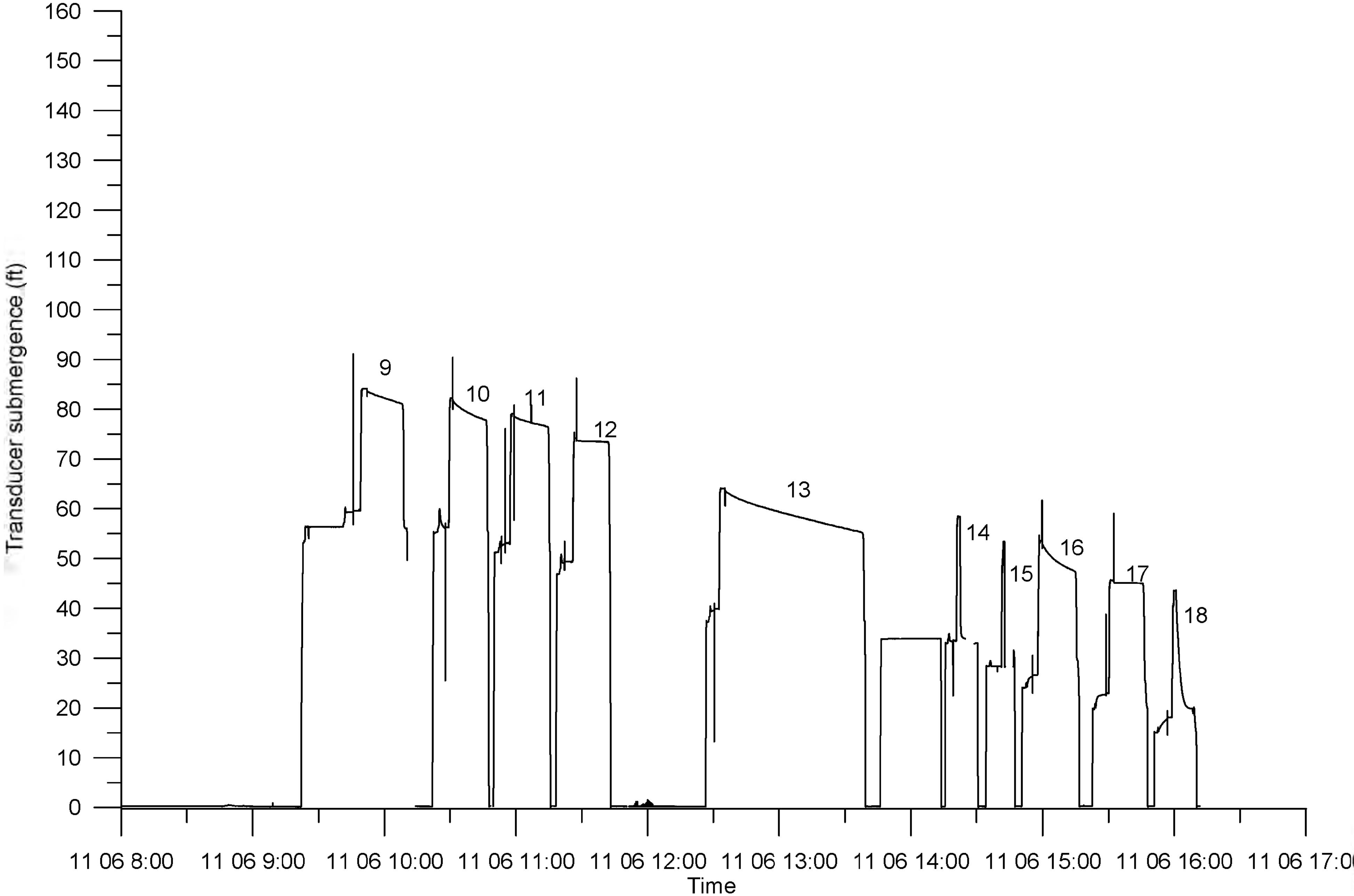
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
F6	1	470.92	461.52	8.6	
F6	2	470.92	465.42	8.1	
F6	3	475.42	469.92	18	
F6	4	479.92	474.42	2.3	
F6	5	484.42	478.92	0.002	
F6	6	488.92	483.42	3.7	
F6	7	493.42	487.92	0.74	
F6	8	497.92	492.42	0.06	
F6	9	502.42	496.92	0.03	
F6	10	506.92	501.42	0.04	
F6	11	511.42	505.92	0.01	
F6	12	515.92	510.42	0.0007	
F6	13	520.42	514.92	0.02	
F6	14	524.92	519.42	90	
F6	15	529.42	523.92	305	
F6	16	533.92	528.42	0.05	
F6	17	538.42	532.92	<0.002	
F6	18	542.92	537.42	6.4	
F6	19	547.42	541.92	0.06	
F6	20	551.92	546.42	98	
F6	21	556.42	550.92	80	

F6

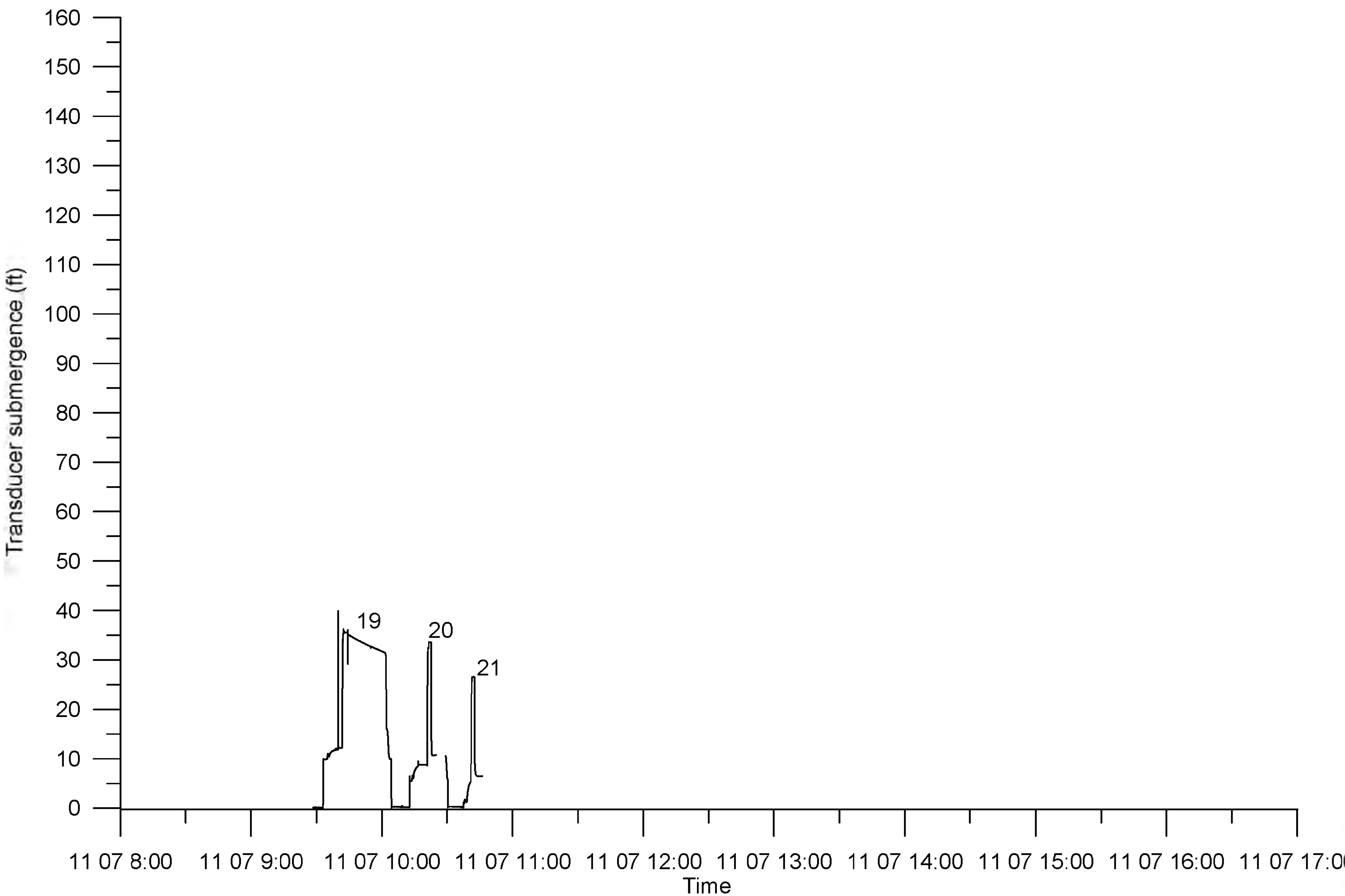


Transducer submergence (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
1
2
3
4
5
6
7
8
11 05 8:00
11 05 9:00
11 05 10:00
11 05 11:00
11 05 12:00
11 05 13:00
11 05 14:00
11 05 15:00
11 05 16:00
11 05 17:00
Time

F6

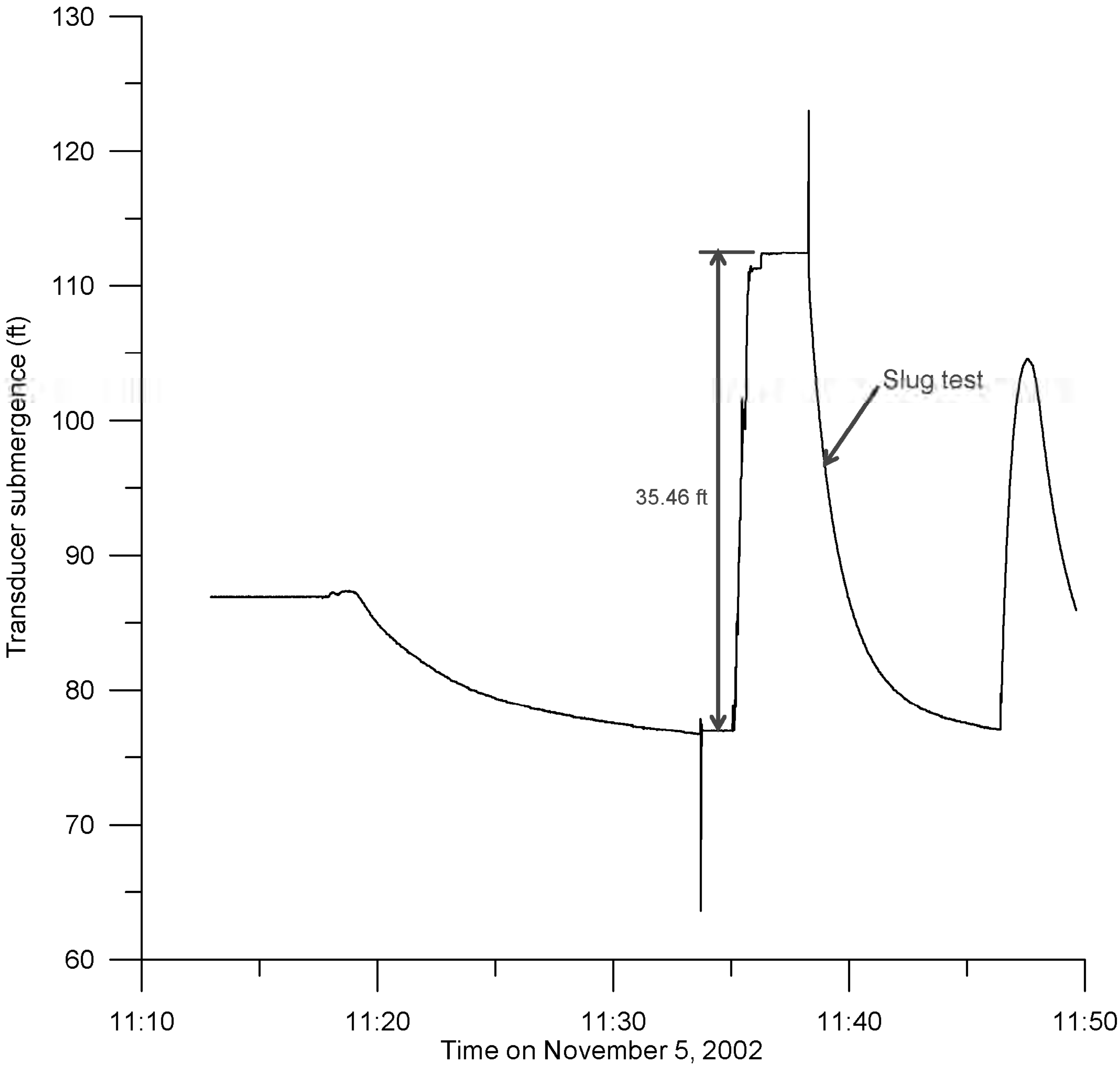

160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
9
10
11
12
13
14
15
16
17
18
11 06 8:00
11 06 9:00
11 06 10:00
11 06 11:00
11 06 12:00
11 06 13:00
11 06 14:00
11 06 15:00
11 06 16:00
11 06 17:00
Time

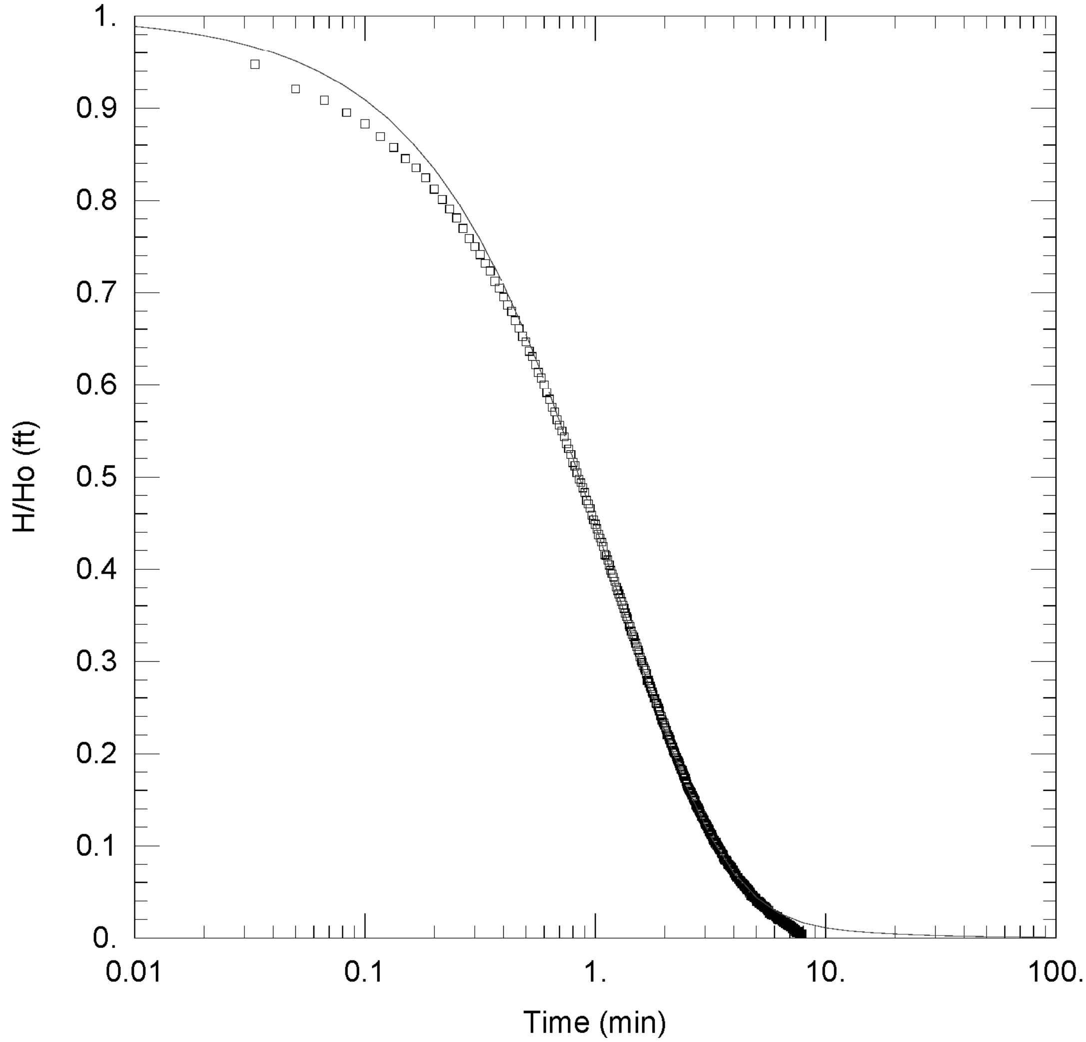
F6


Transducer submergence (ft)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
19
20
21
11 07 8:00
11 07 9:00
11 07 10:00
11 07 11:00
11 07 12:00
11 07 13:00
11 07 14:00
11 07 15:00
11 07 16:00
11 07 17:00
Time

F6

Test 1


130
120
110
100
90
80
70
60
Transducer submergence (ft)
35.46 ft
Slug test
11:10
11:20
11:30
11:40
11:50
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-1.aqt
Date: 01/20/03 Time: 16:17:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 35.46 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

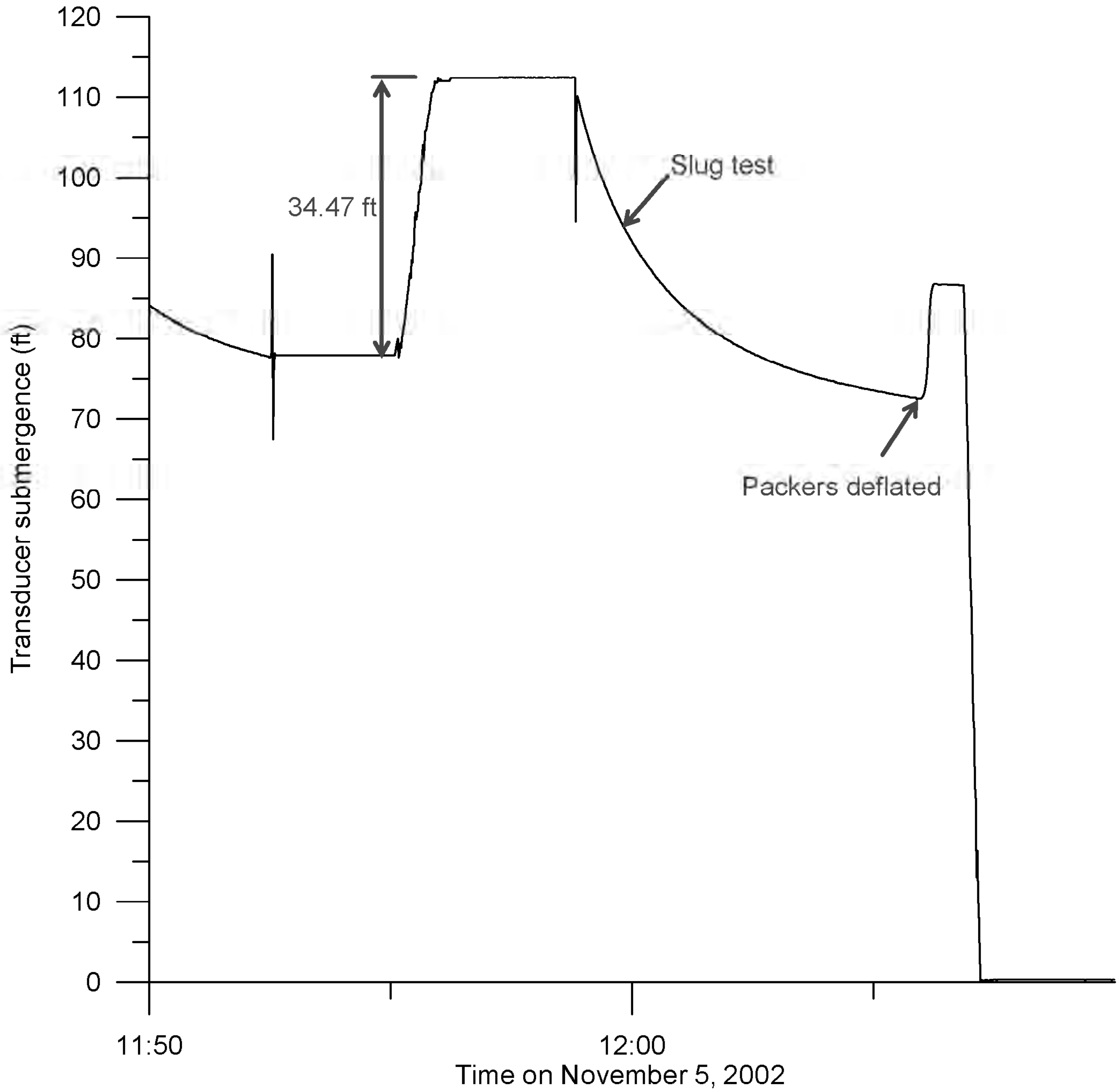
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

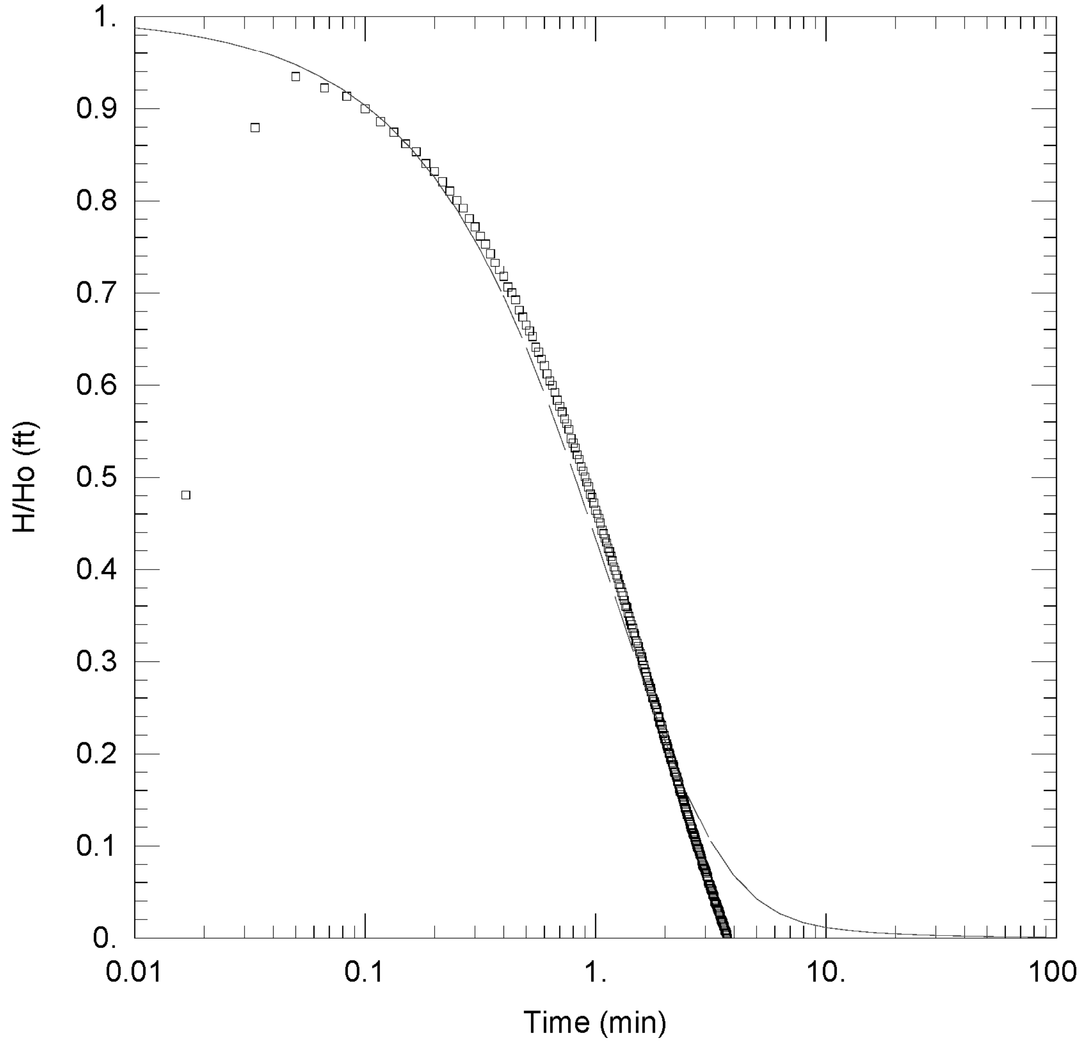
T = 8.634 ft^2/day S = 4.767E-09

F6

Test 2



Transducer submergence (ft)
120
110
100
90
80
70
60
50
40
30
20
10
0
34.47 ft
Slug test
Packers deflated
11:50
12:00
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-2.aqt
Date: 01/20/03 Time: 16:18:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 34.47 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

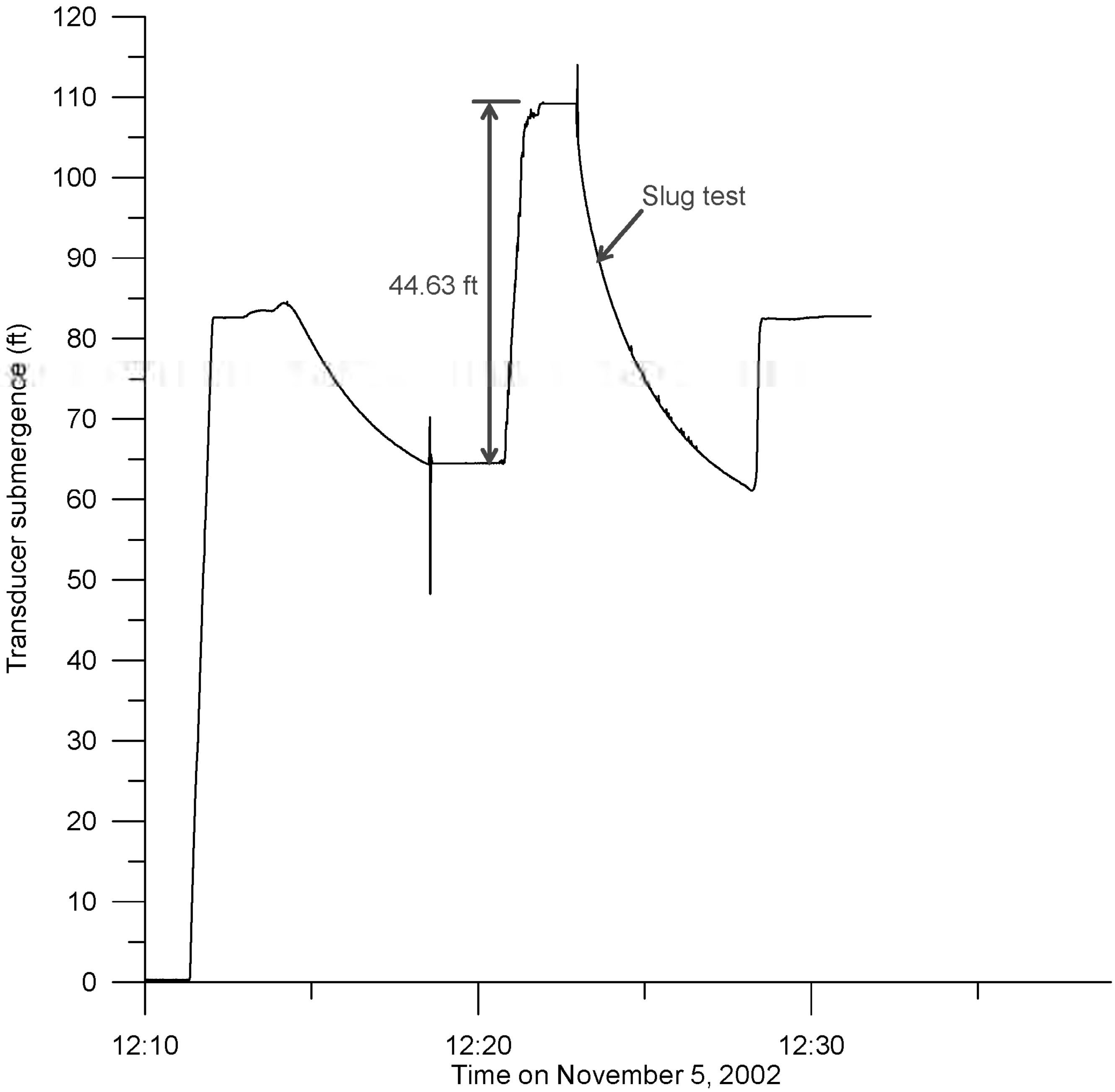
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

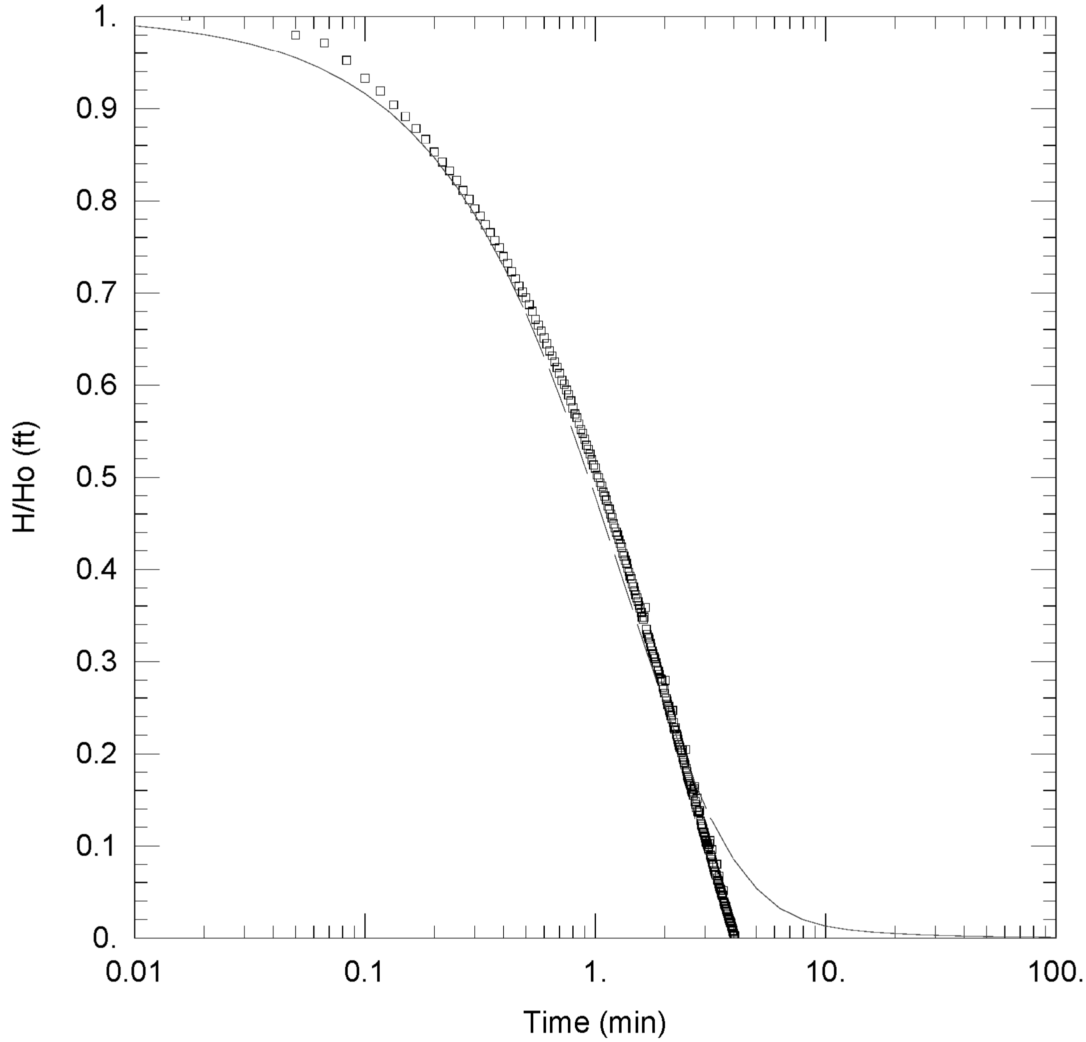
T = 8.111 ft^2/day S = 2.5E-08

F6

Test 3



Transducer submergence (ft)
120
110
100
90
80
70
60
50
40
30
20
10
0
44.63 ft
Slug test
12:10
12:20
12:30
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-3.aqt
Date: 01/20/03 Time: 16:18:45

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 40.52 ft Casing Radius: 0.0625 ft
Wellbore Radius: 0.1614 ft Well Skin Radius: 0.1614 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

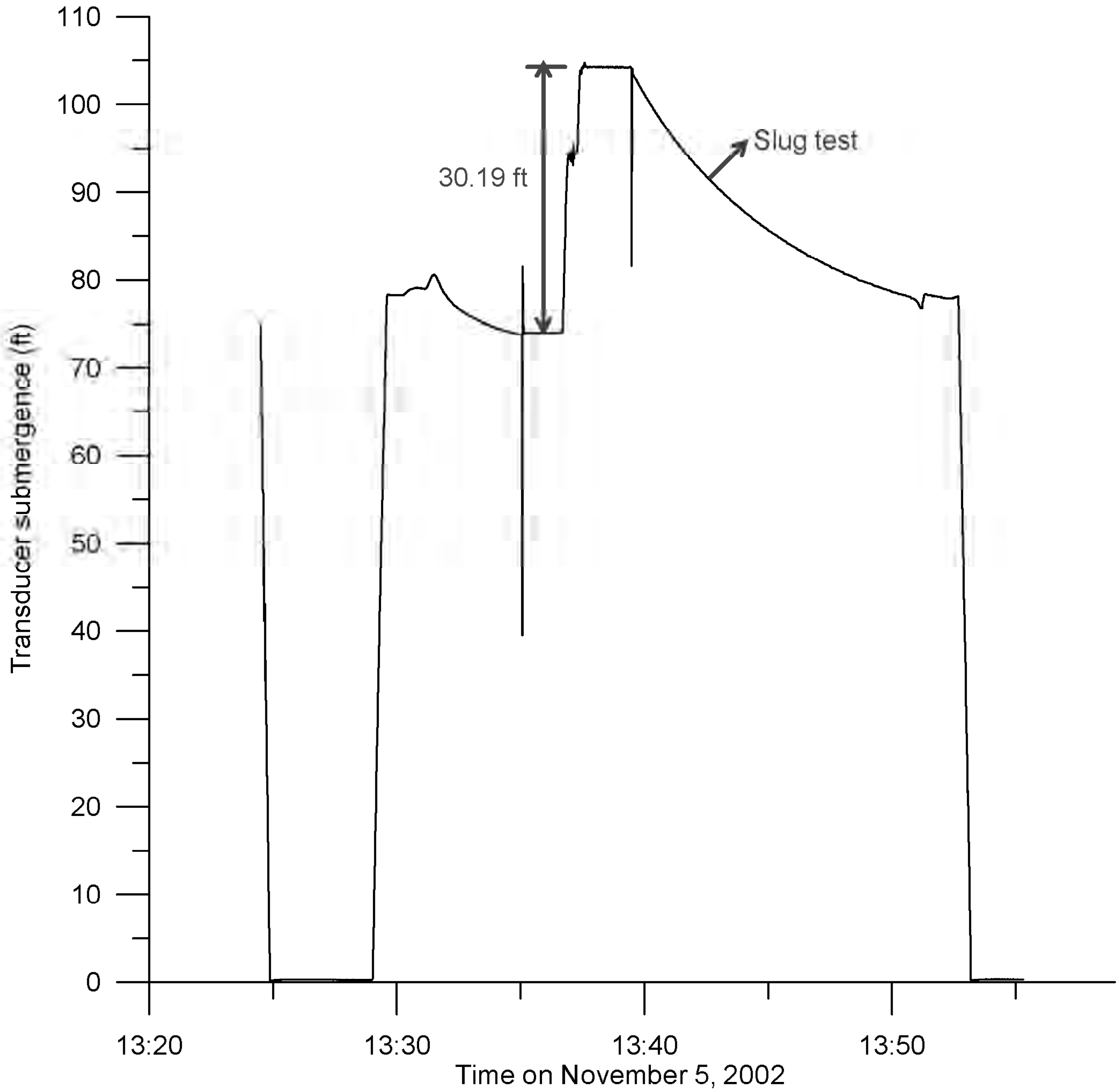
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

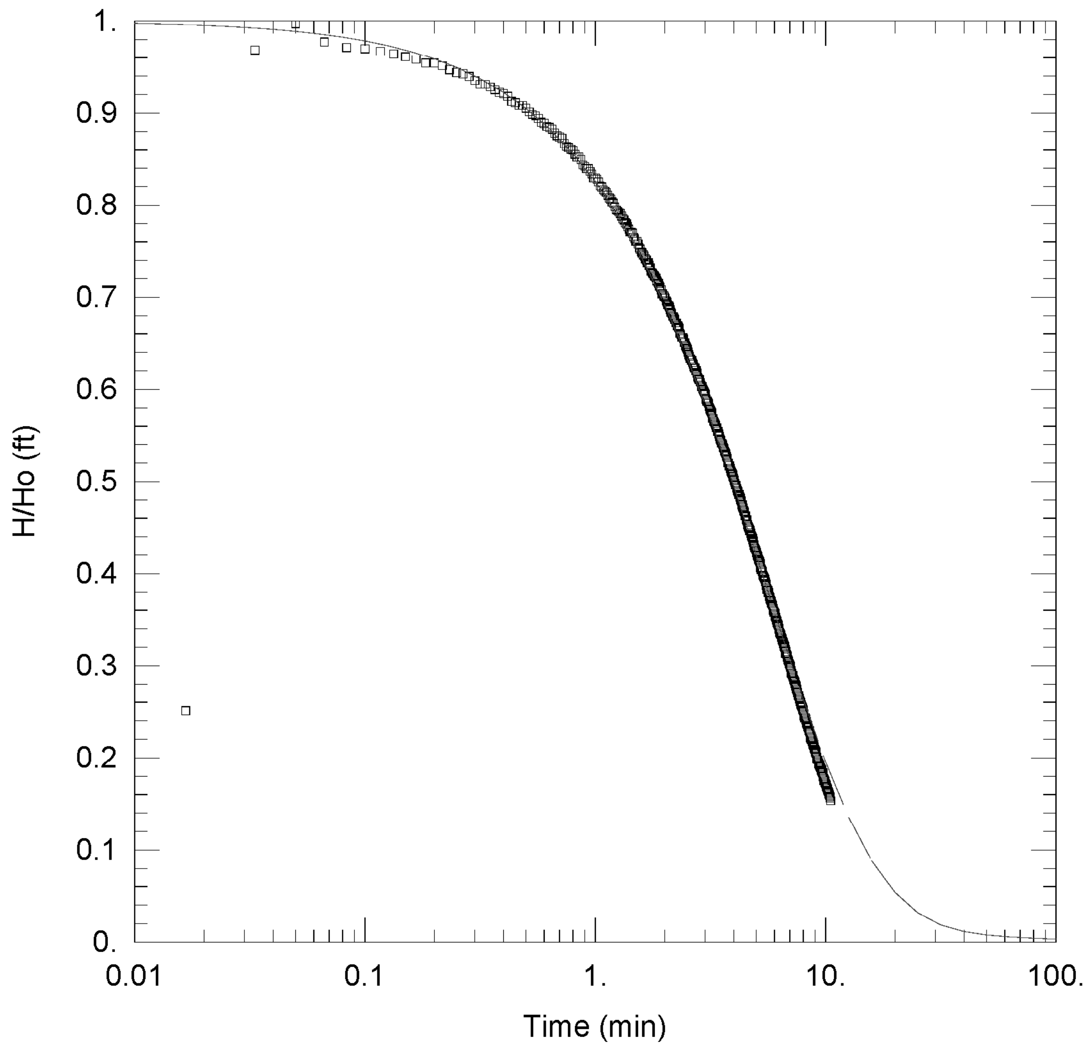
T = 17.64 ft^2/day S = 2.5E-08

F6

Test 4



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
30.19 ft
Slug test
13:20
13:30
13:40
13:50
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-4.aqt
Date: 01/20/03 Time: 16:20:11

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

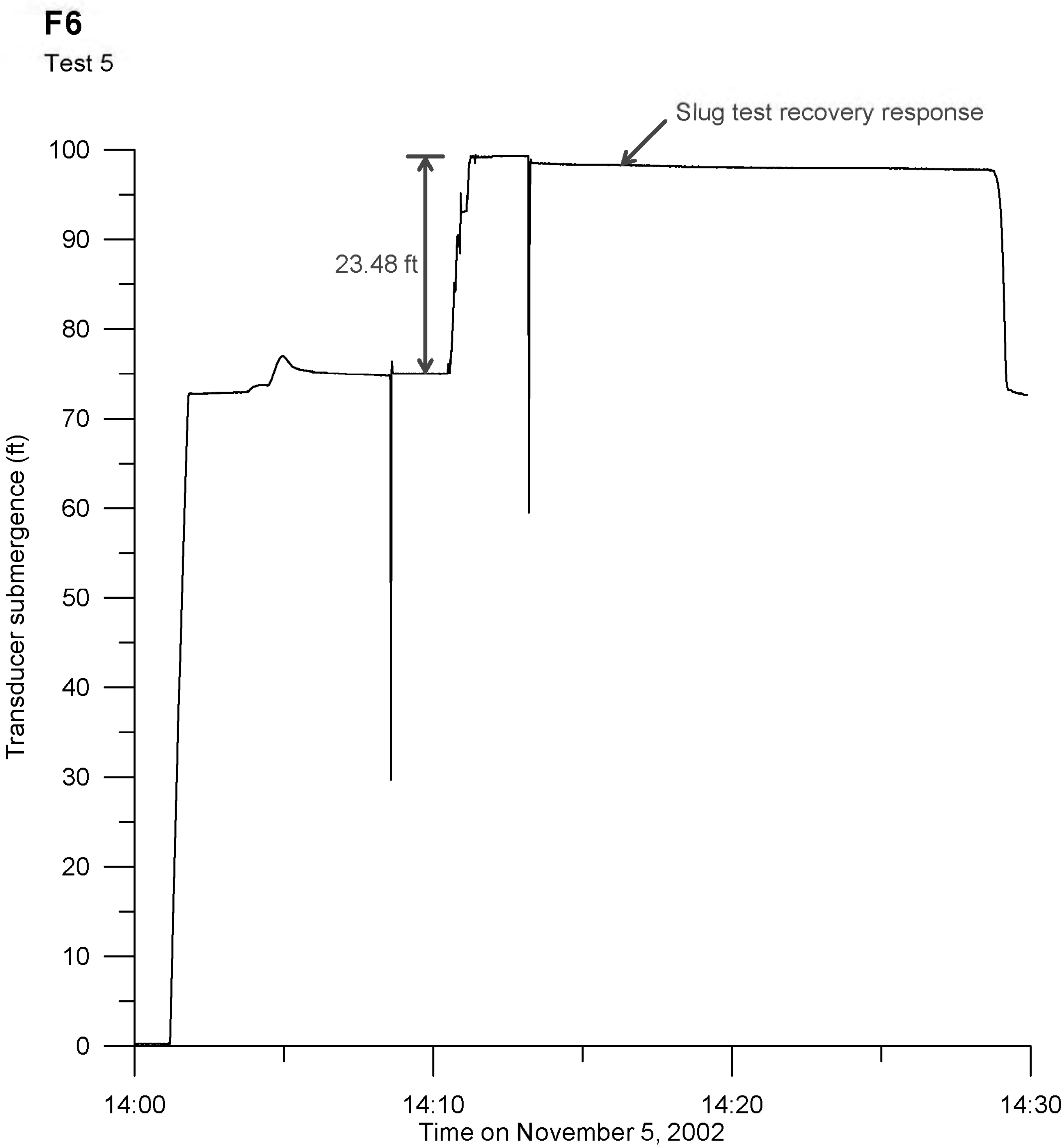
WELL DATA

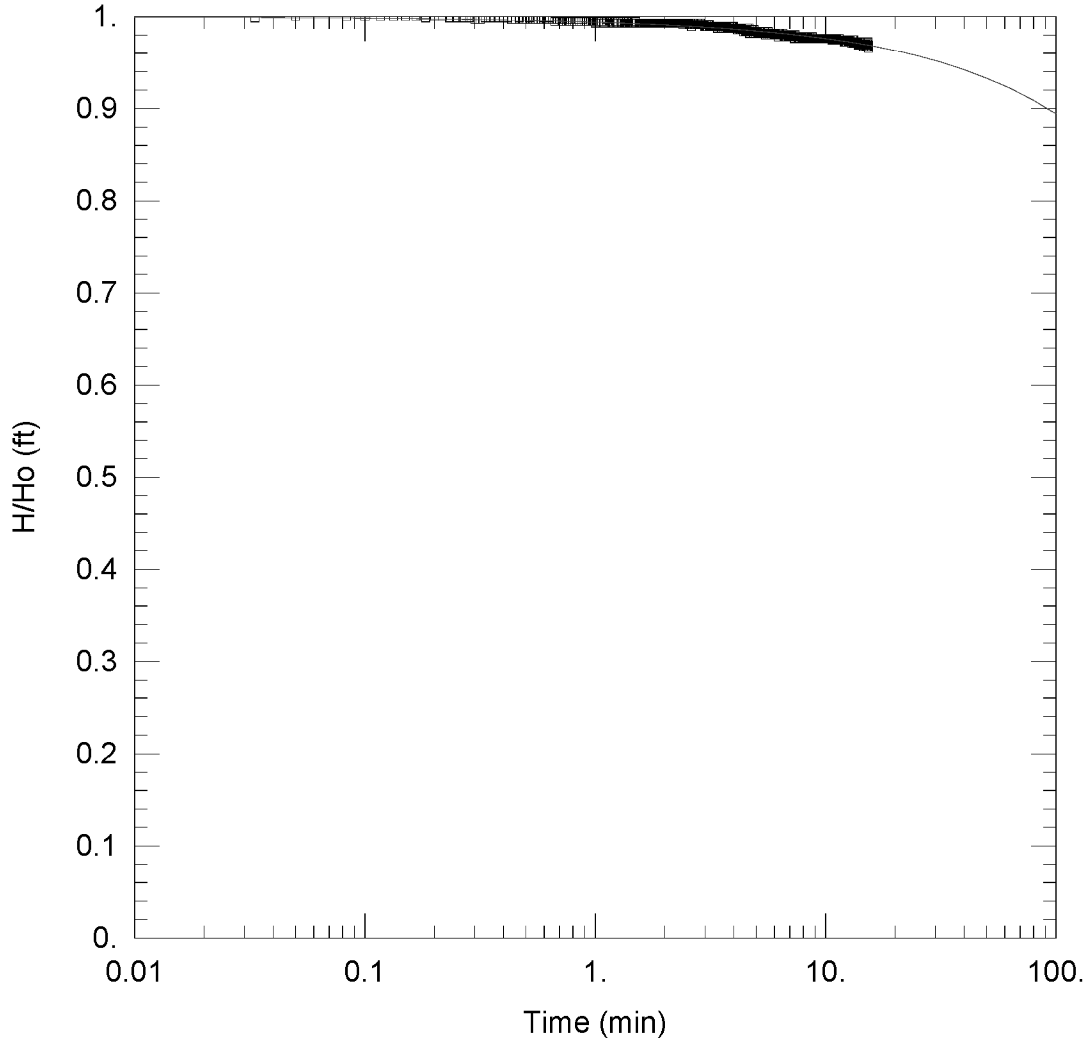
Initial Displacement: 30.19 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

$T = 2.326\ ft^2/day$ S = 1.E-10


F6
Test 5
Slug test recovery response
23.48 ft
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
14:00
14:10
14:20
14:30
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-5.aqt
Date: 01/20/03 Time: 16:20:01

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 23.52 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

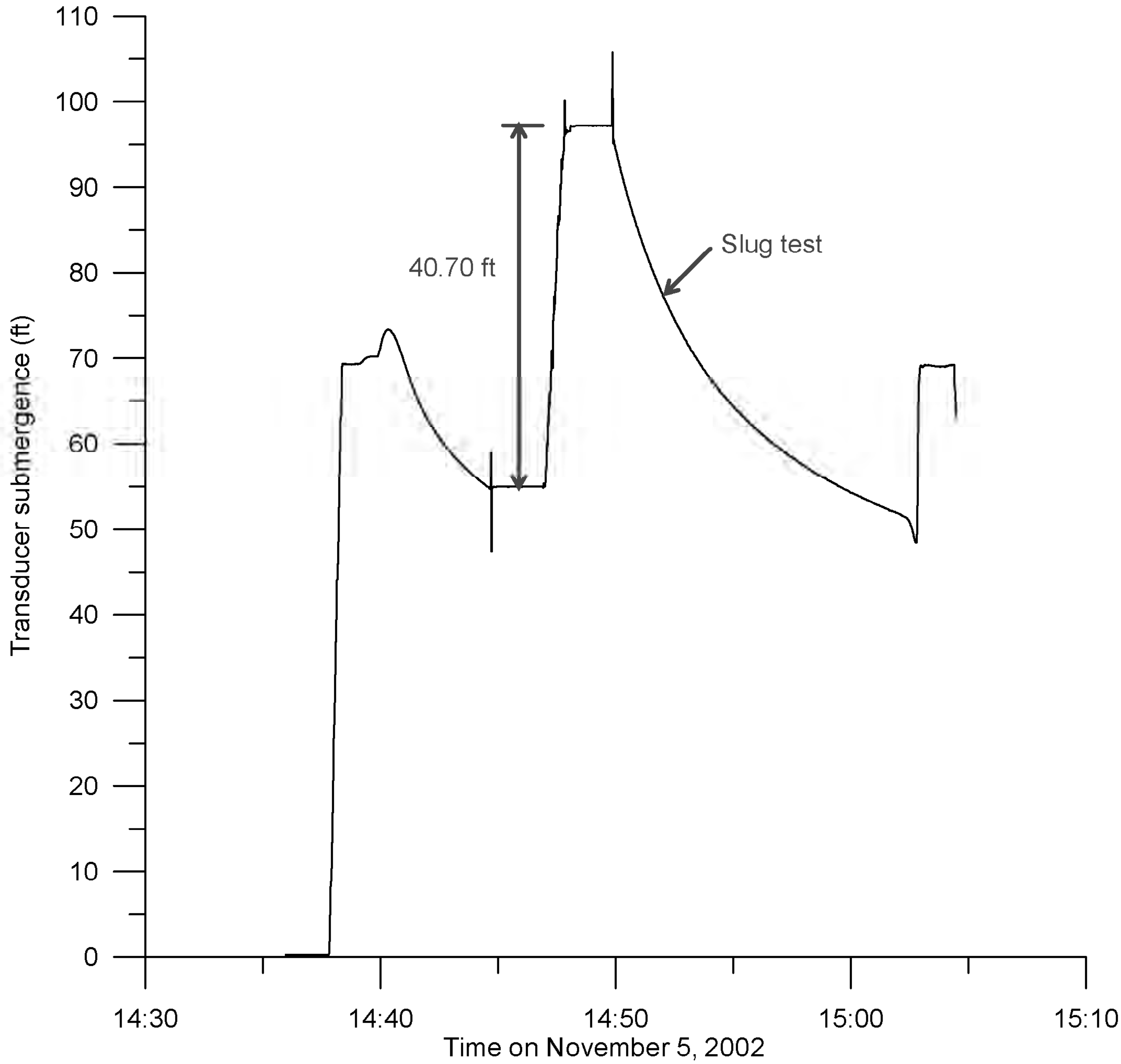
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

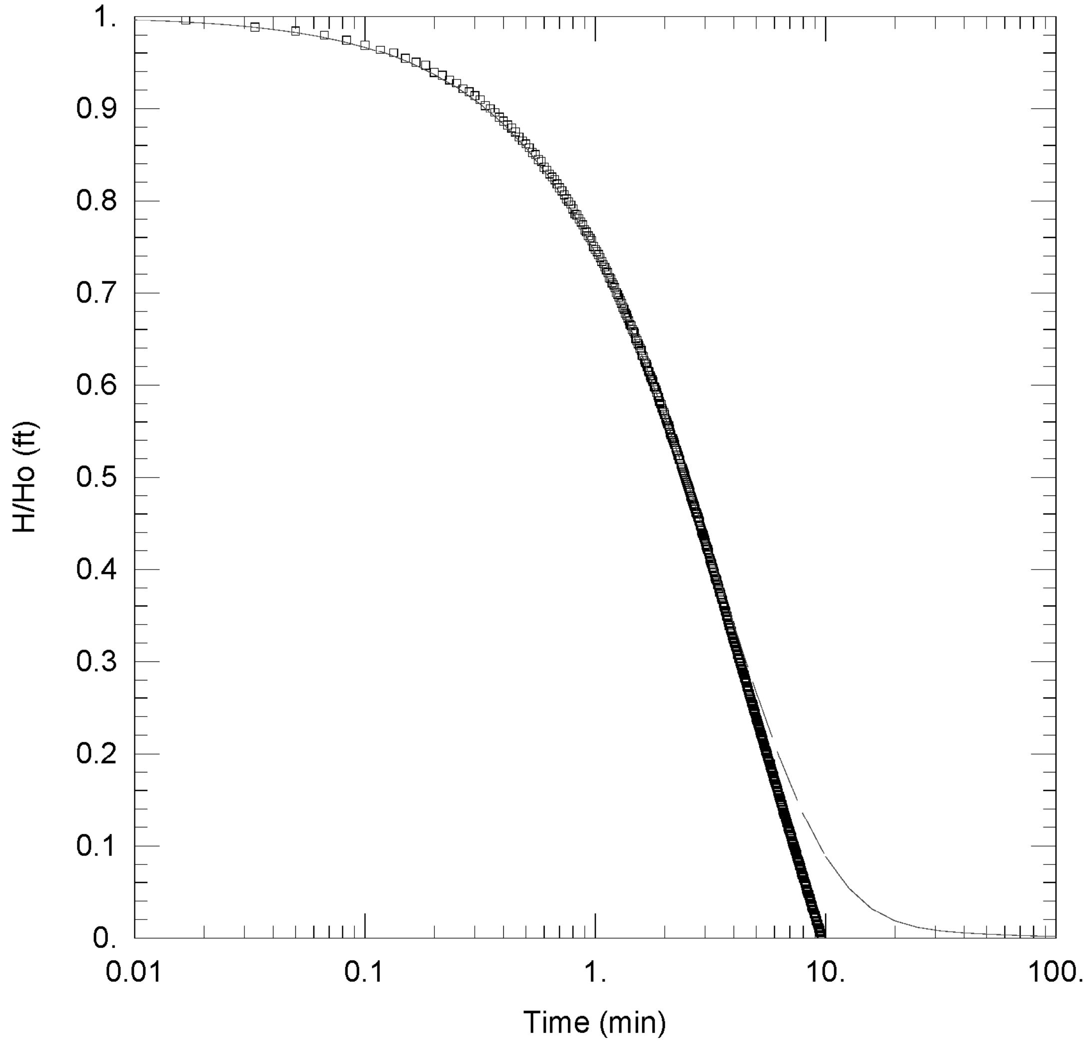
T = 0.001856 ft^2/day S = 0.000246

F6

Test 6



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
40.70 ft
Slug test
14:30
14:40
14:50
15:00
15:10
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-6.aqt
Date: 01/20/03 Time: 16:20:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 40.7 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

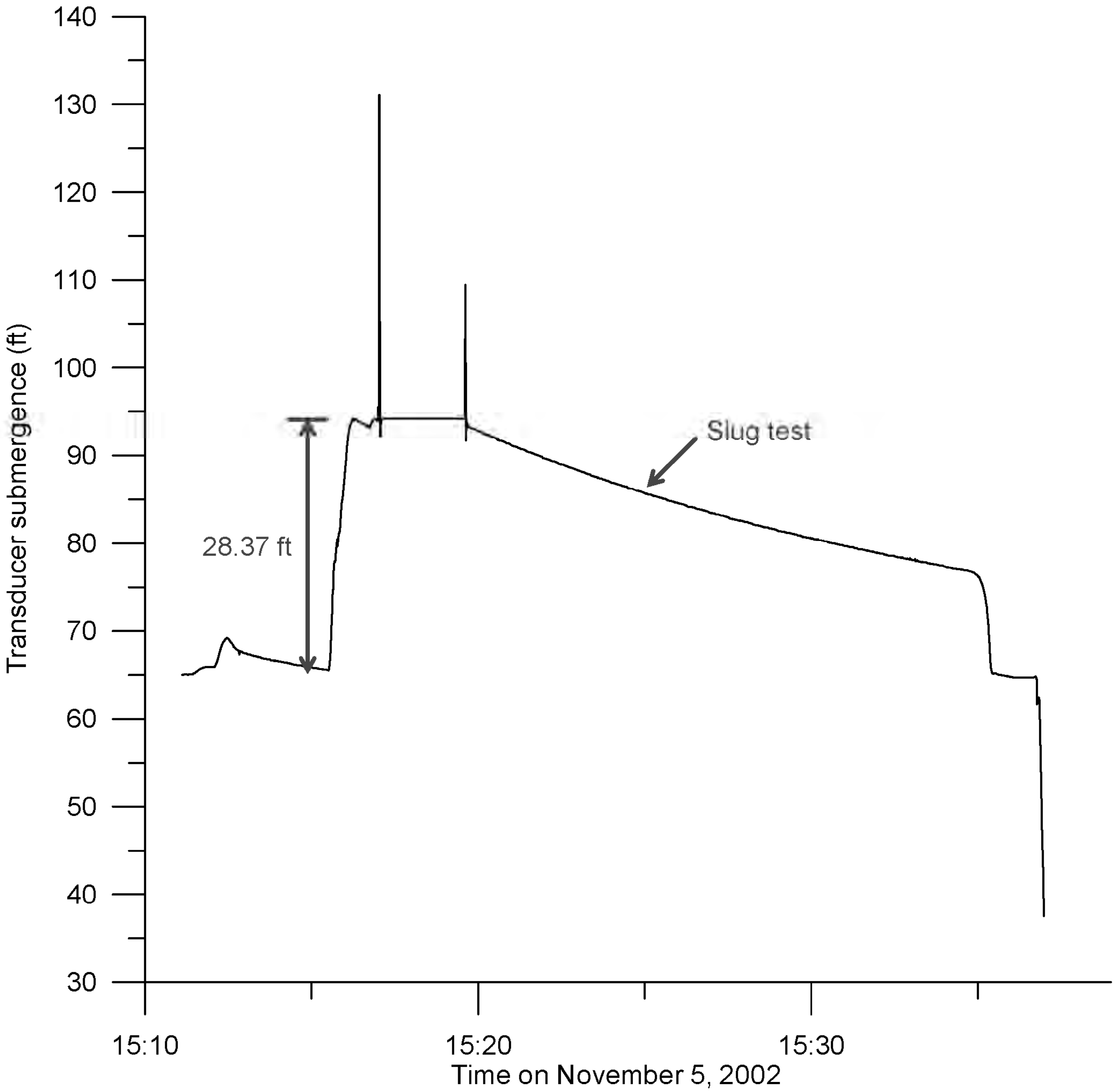
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

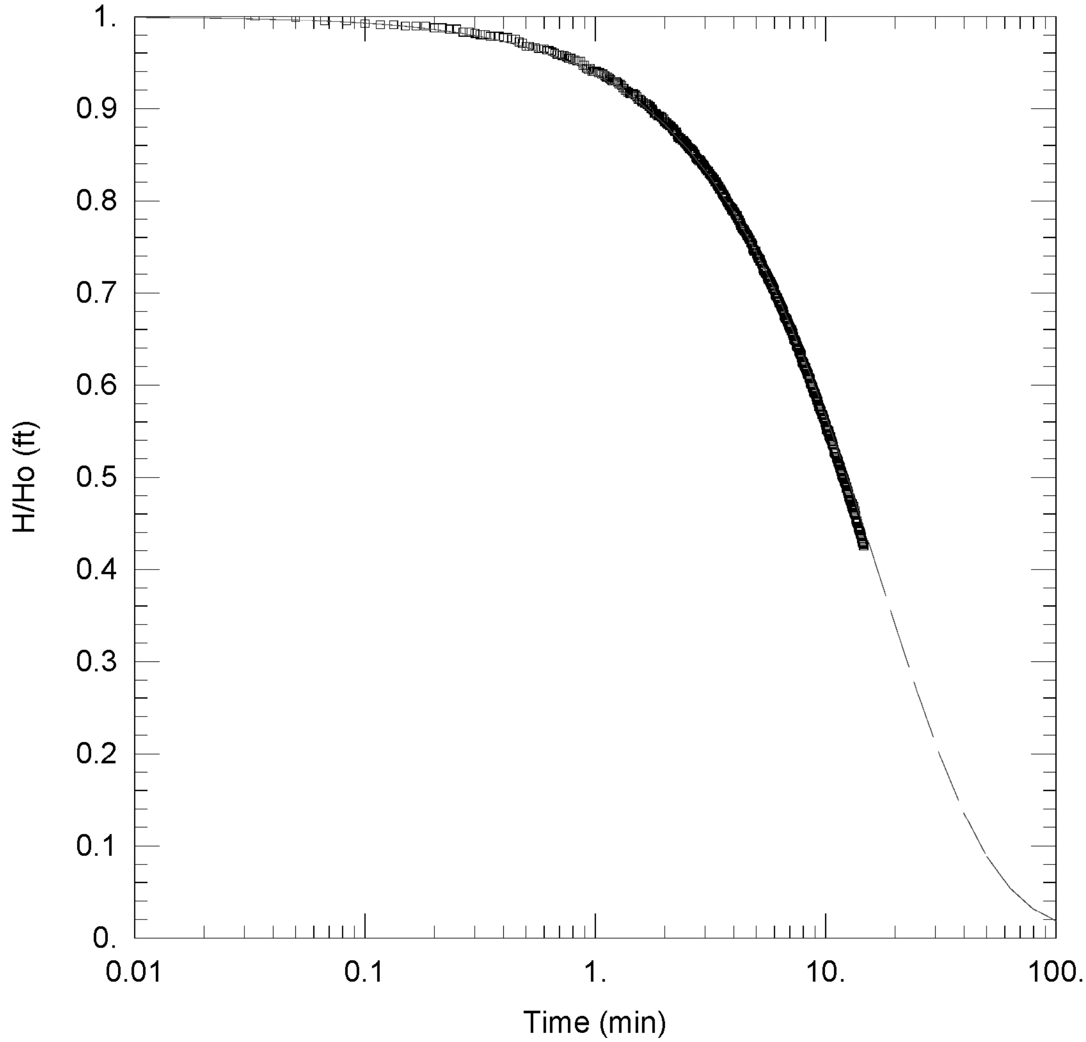
T = 3.684 ft^2/day S = 1.E-10

F6

Test 7



140
130
120
110
100
90
80
70
60
50
40
30
Transducer submergence (ft)
28.37 ft
Slug test
15:10
15:20
15:30
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-7.aqt
Date: 01/20/03 Time: 16:19:06

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 28.37 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

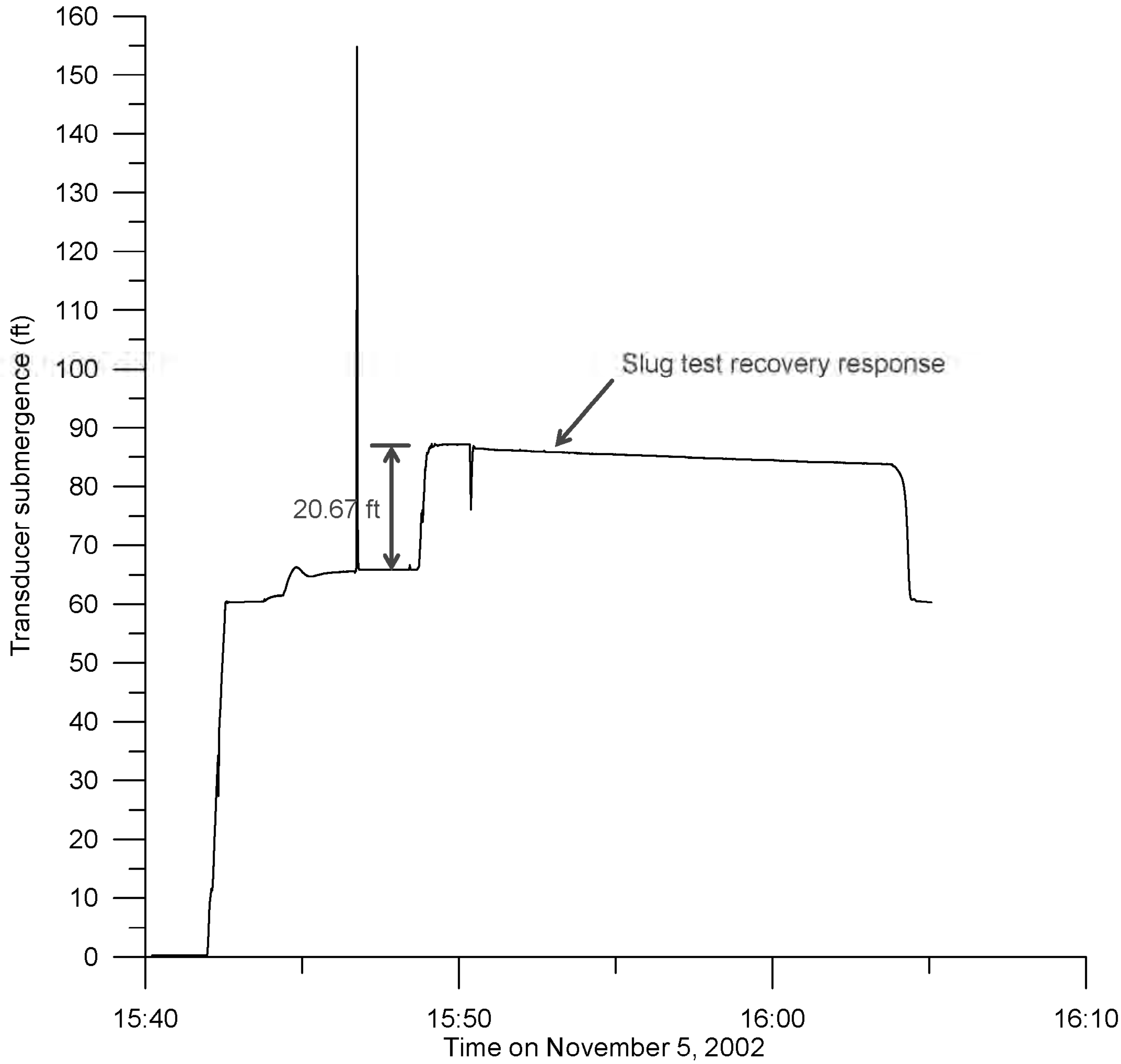
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

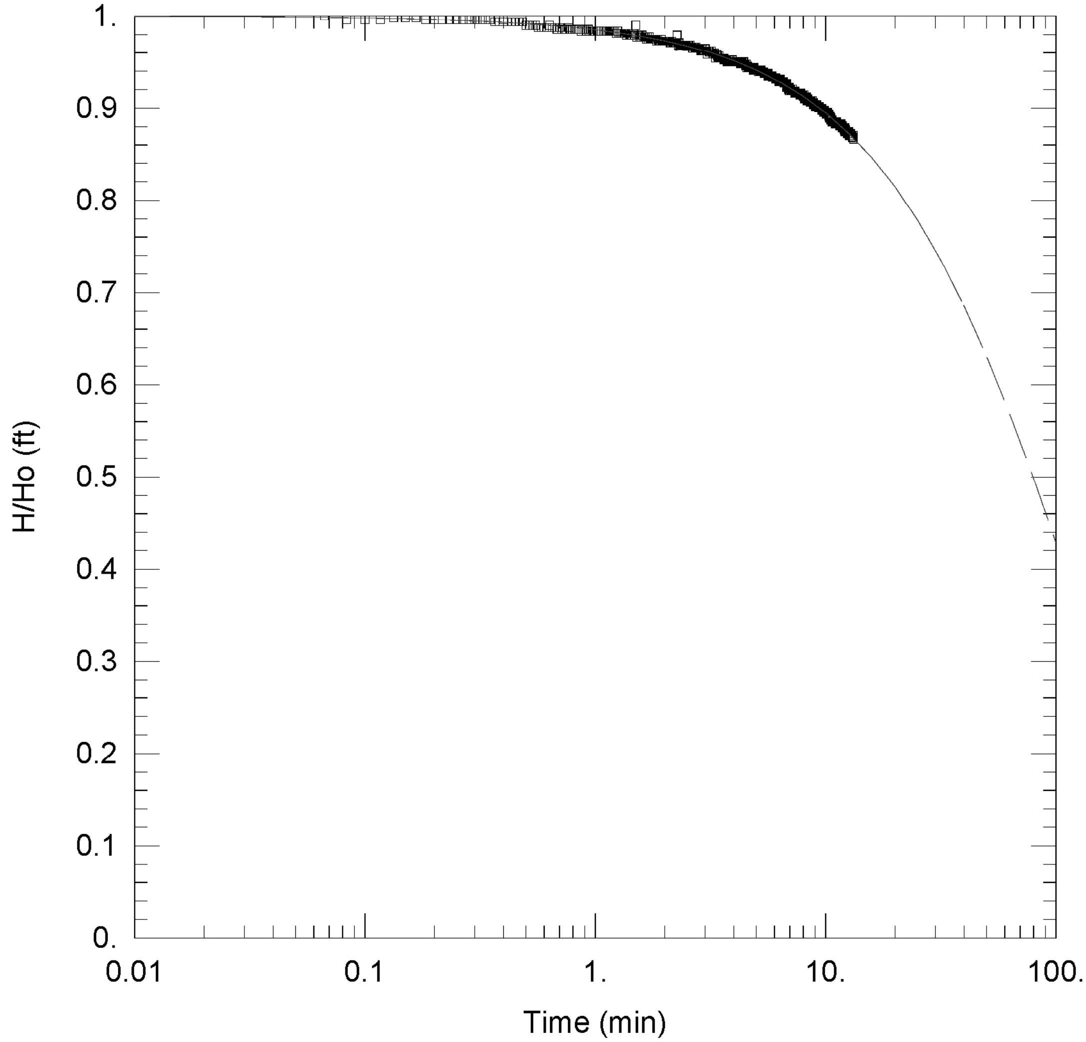
$T = 0.7353$ ft^2/day $S = 1.E-10$

F6

Test 8



Transducer submergence (ft)
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
20.67 ft
Slug test recovery response
15:40
15:50
16:00
16:10
Time on November 5, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-8.aqt
Date: 01/20/03 Time: 16:20:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 20.67 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

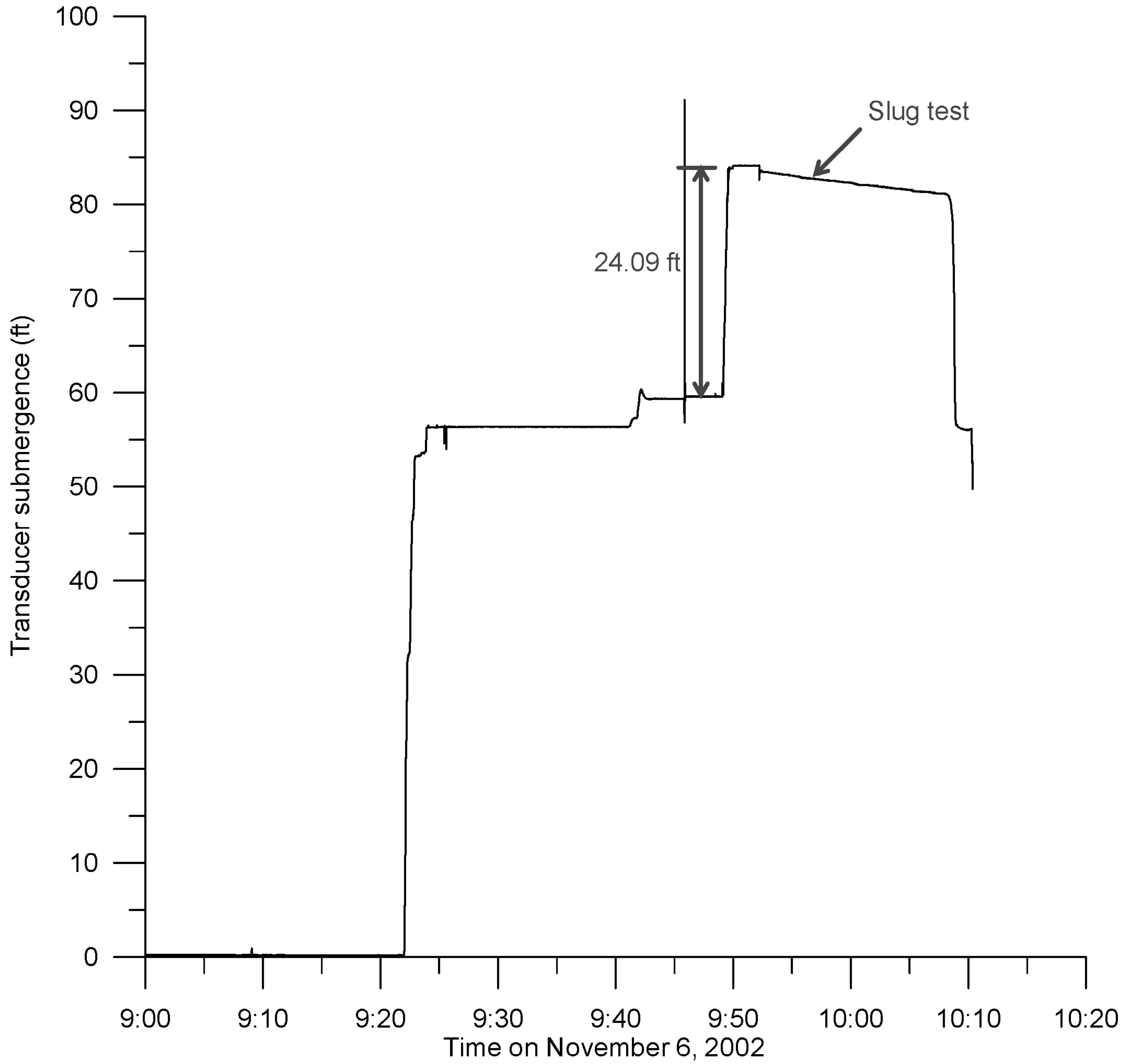
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

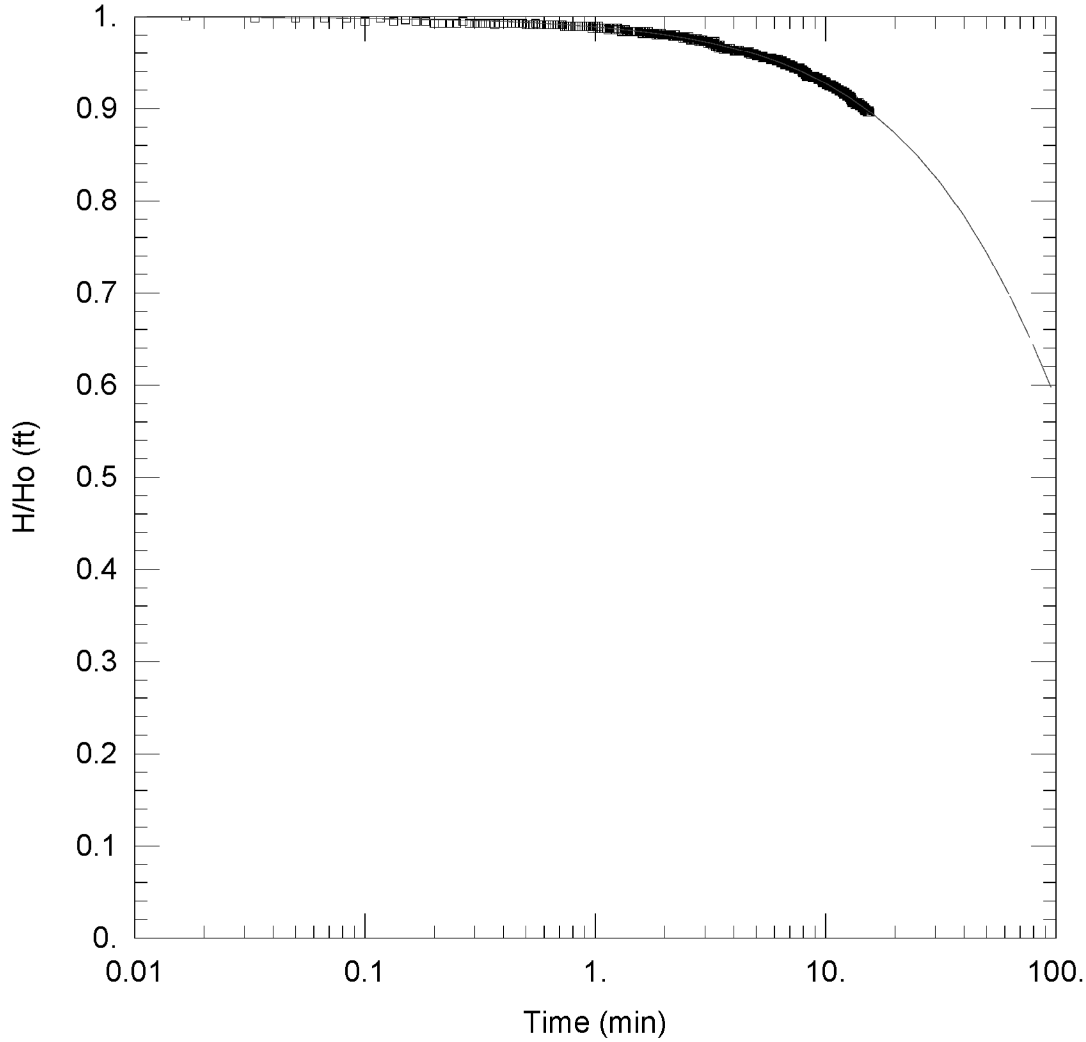
T = 0.06137 ft^2/day S = 1.002E-06

F6

Test 9



Transducer submergence (ft)
100
90
80
70
60
50
40
30
20
10
0
Slug test
24.09 ft
9:00
9:10
9:20
9:30
9:40
9:50
10:00
10:10
10:20
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-9.aqt
Date: 01/20/03 Time: 16:21:02

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 24.09 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

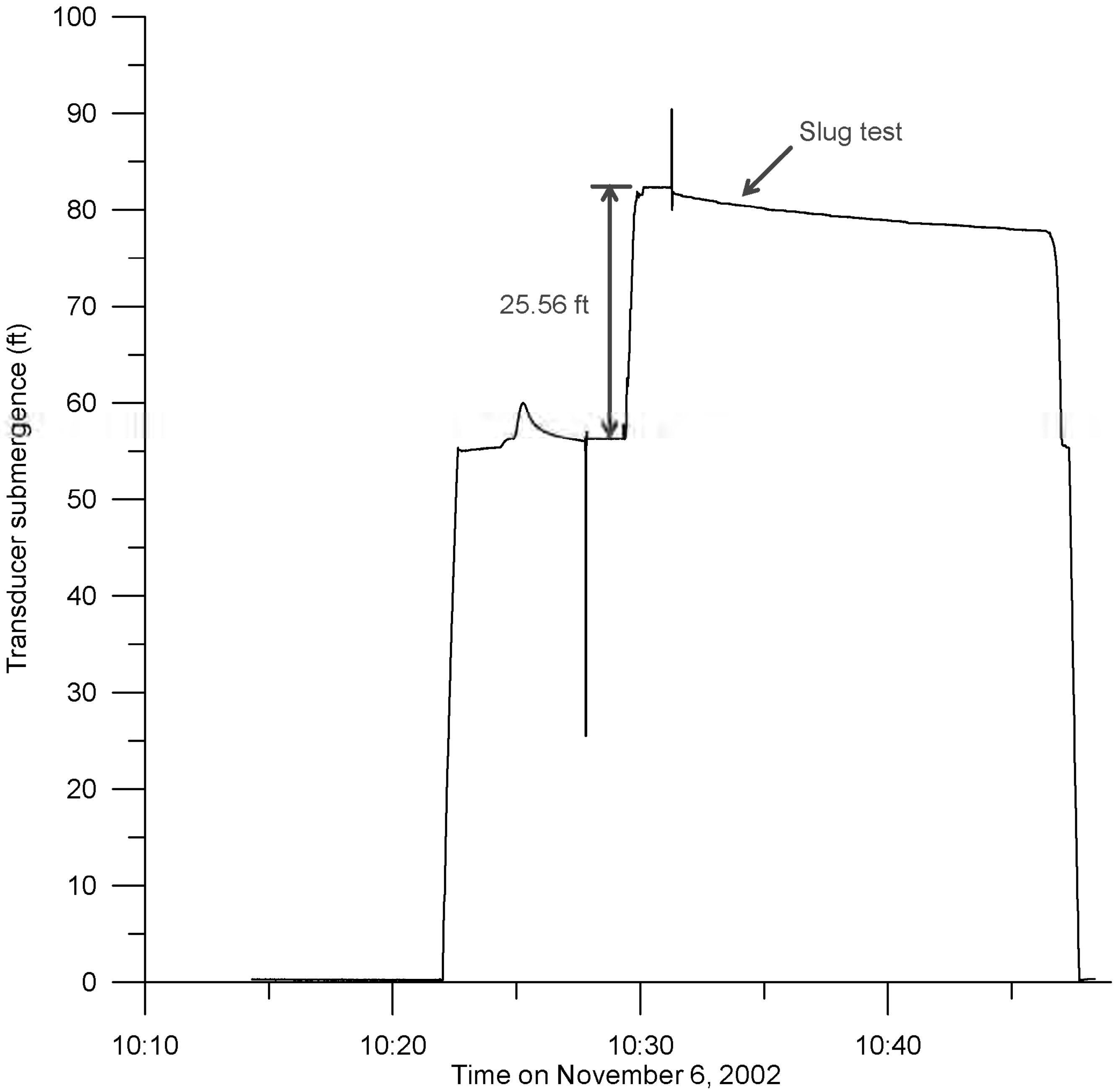
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

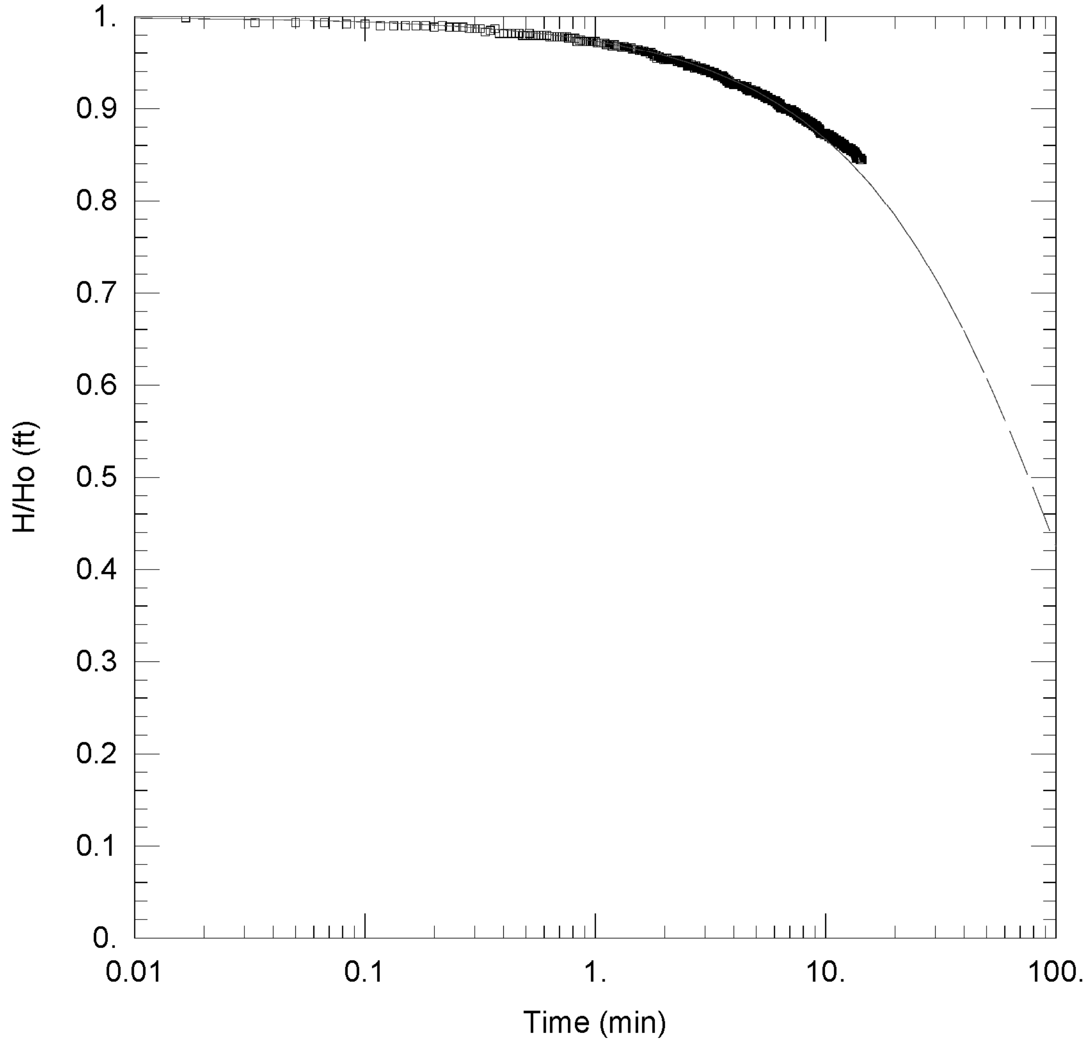
T = 0.02955 ft^2/day S = 6.422E-06

F6

Test 10



Slug test
25.56 ft
Transducer submergence (ft)
100
90
80
70
60
50
40
30
20
10
0
10:10
10:20
10:30
10:40
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-10.aqt
Date: 01/20/03 Time: 16:20:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 25.56 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

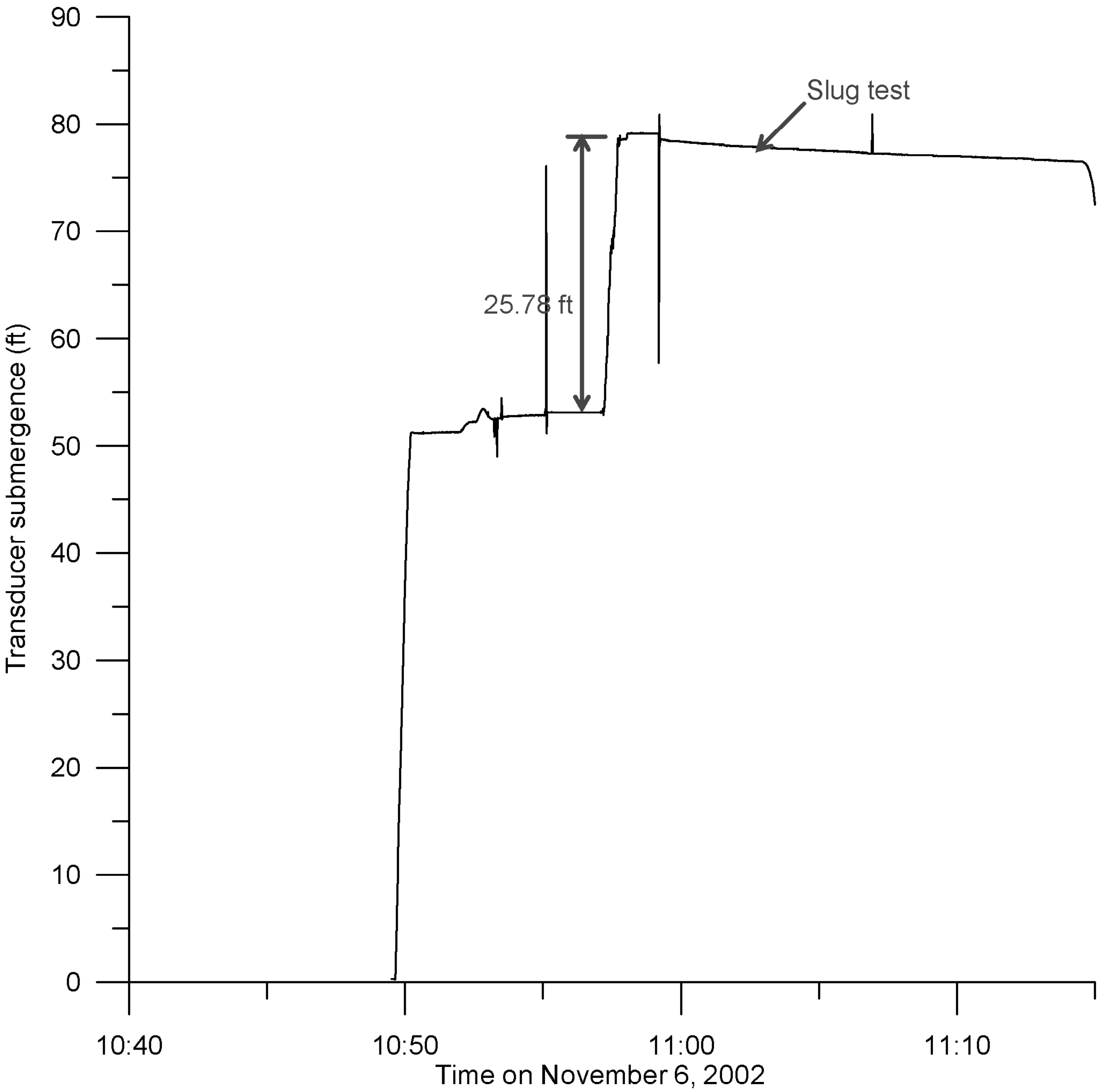
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

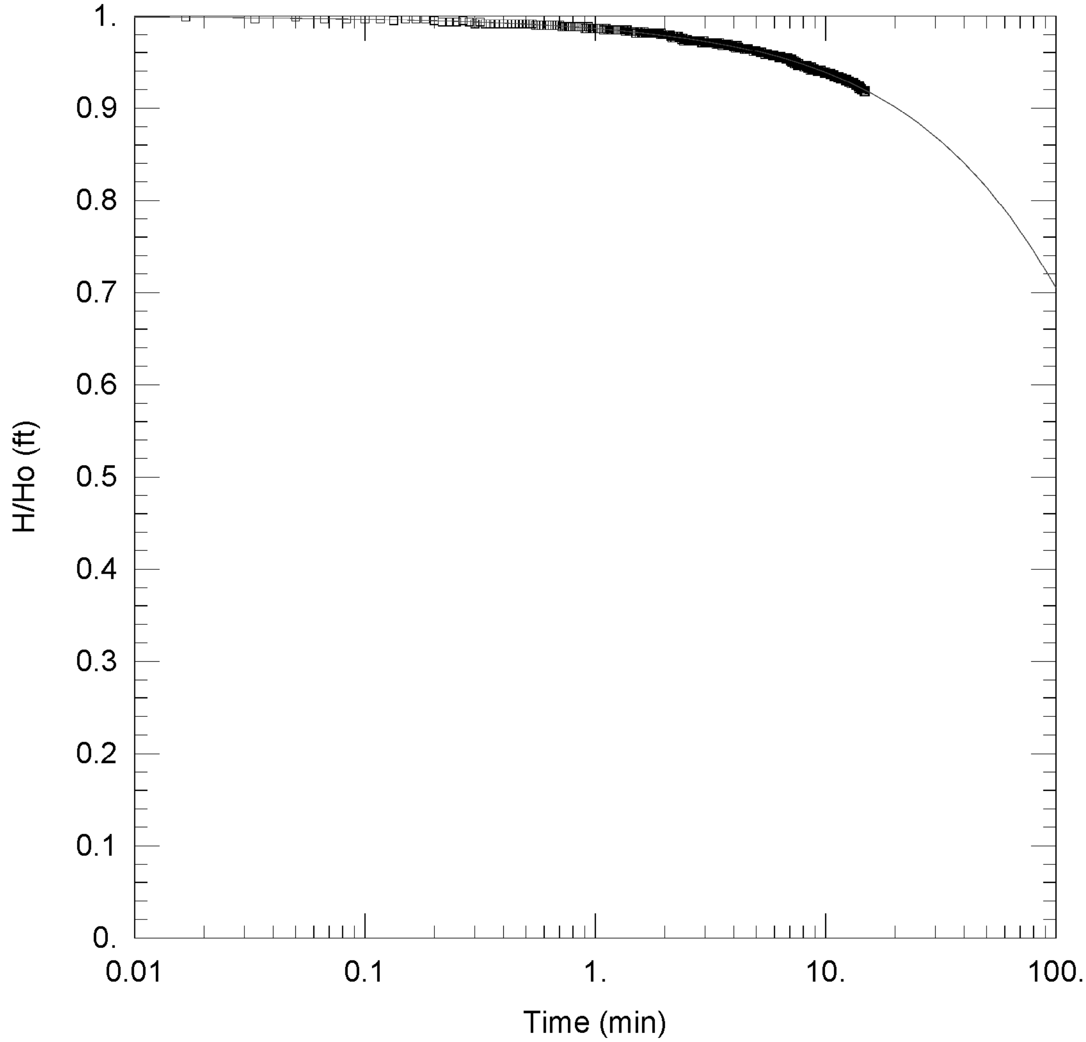
T = 0.03502 ft^2/day S = 0.0001

F6

Test 11



Slug test
25.78 ft
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
10:40
10:50
11:00
11:10
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-11.aqt
Date: 01/20/03 Time: 16:21:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 25.78 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

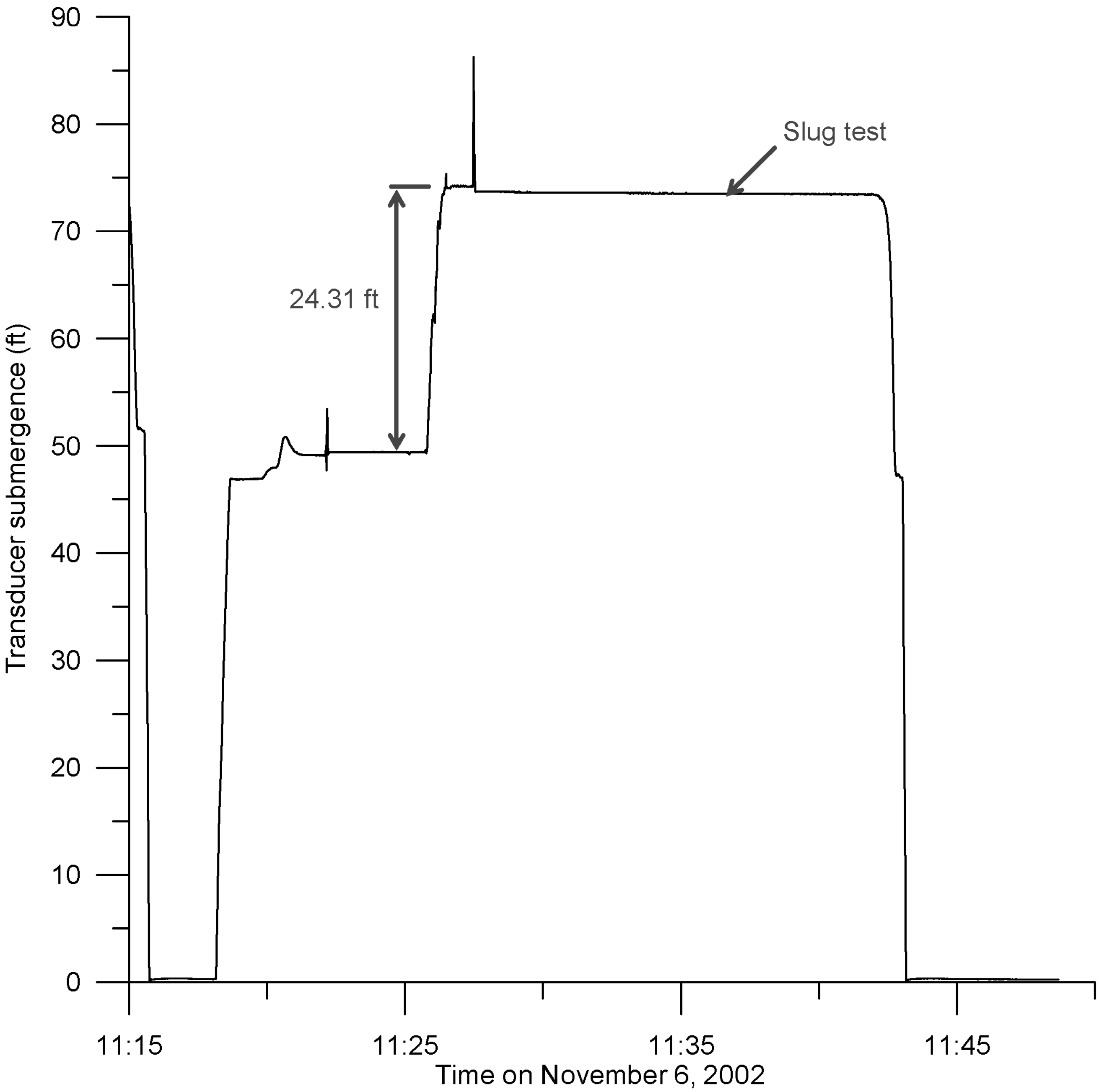
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

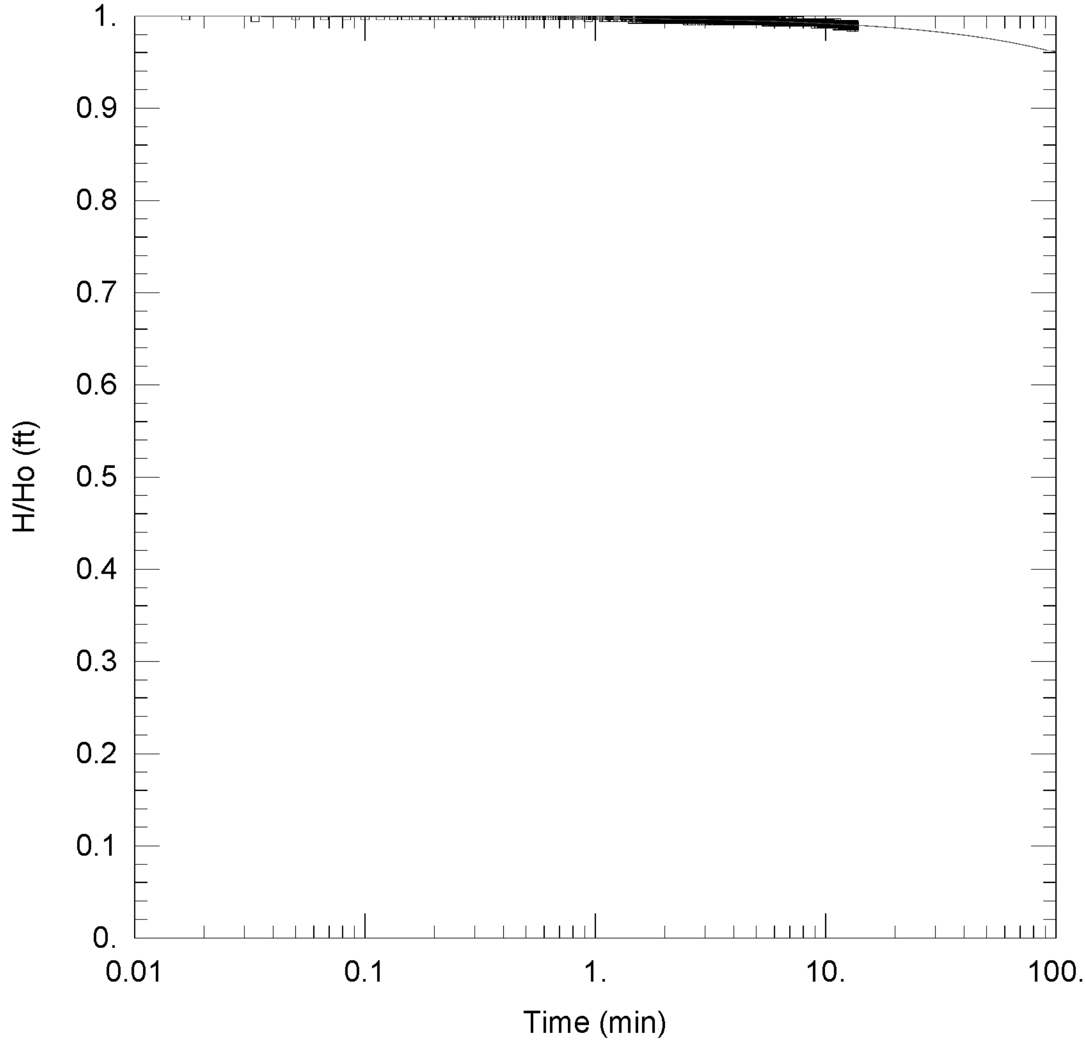
T = 0.01019 ft^2/day S = 0.0001452

F6

Test 12



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
24.31 ft
Slug test
11:15
11:25
11:35
11:45
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-12.aqt
Date: 01/20/03 Time: 16:21:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 24.31 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

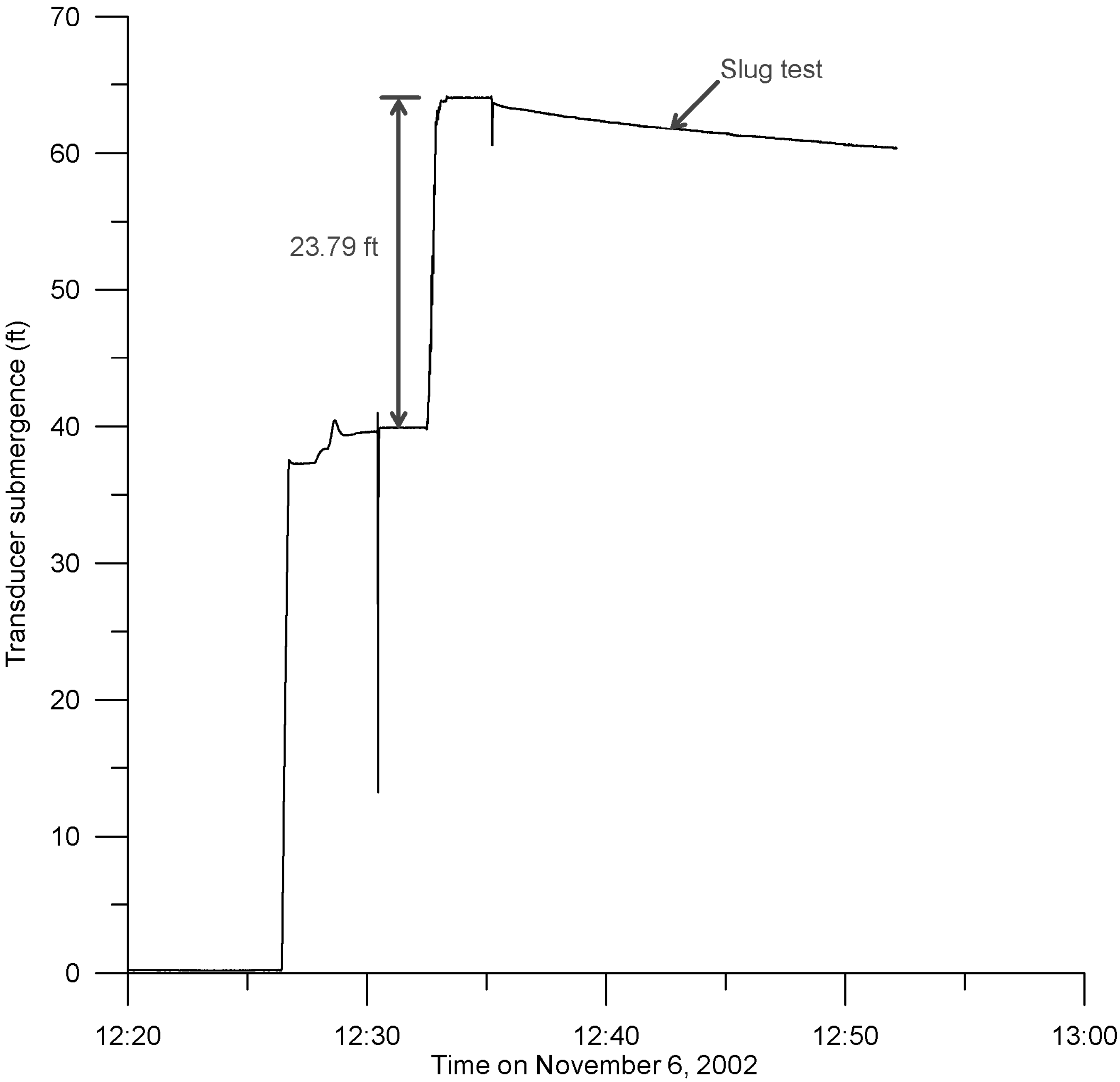
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

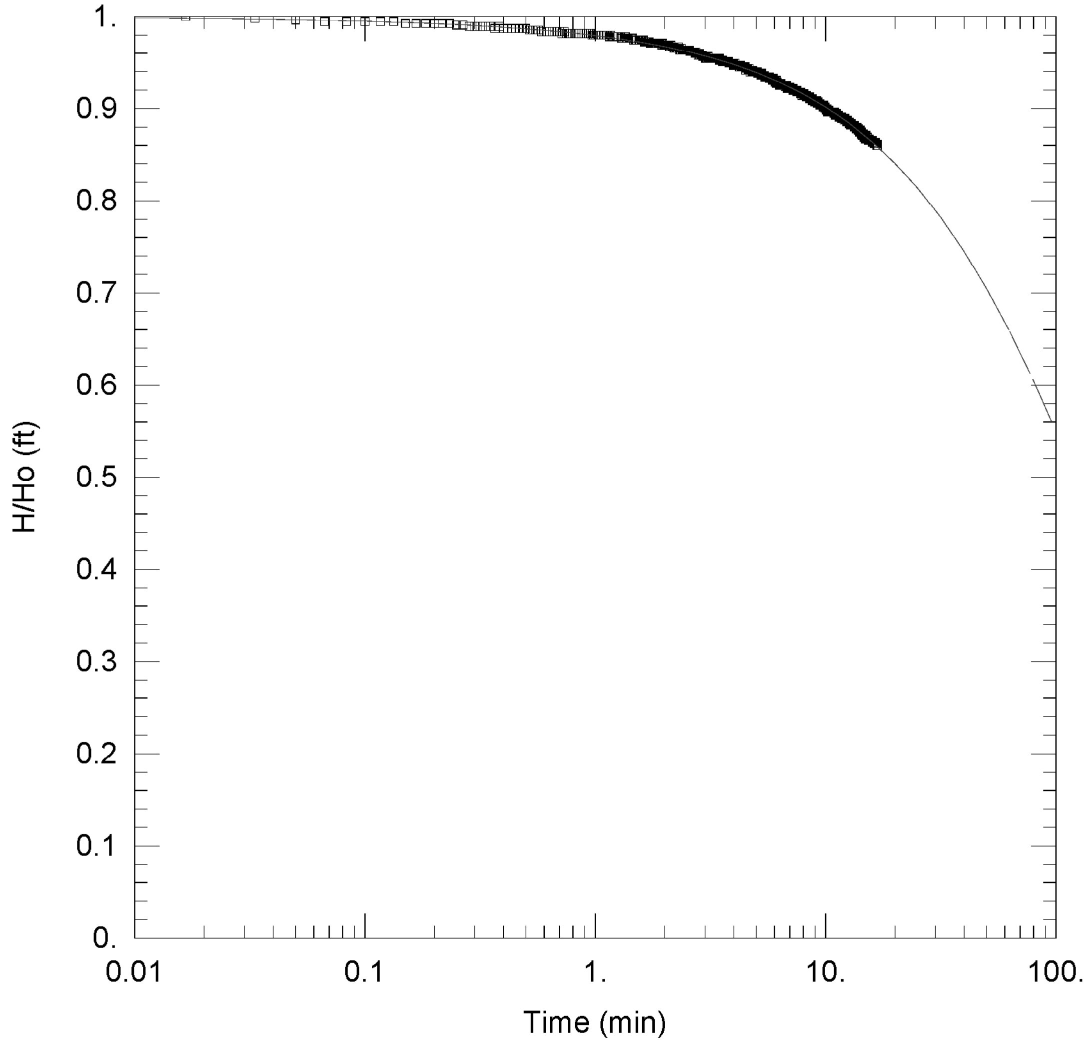
T = 0.000718 ft^2/day S = 6.793E-05

F6

Test 13



70
60
50
40
30
20
10
0
Transducer submergence (ft)
Slug test
23.79 ft
12:20
12:30
12:40
12:50
13:00
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-13.aqt
Date: 01/20/03 Time: 16:21:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 23.79 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

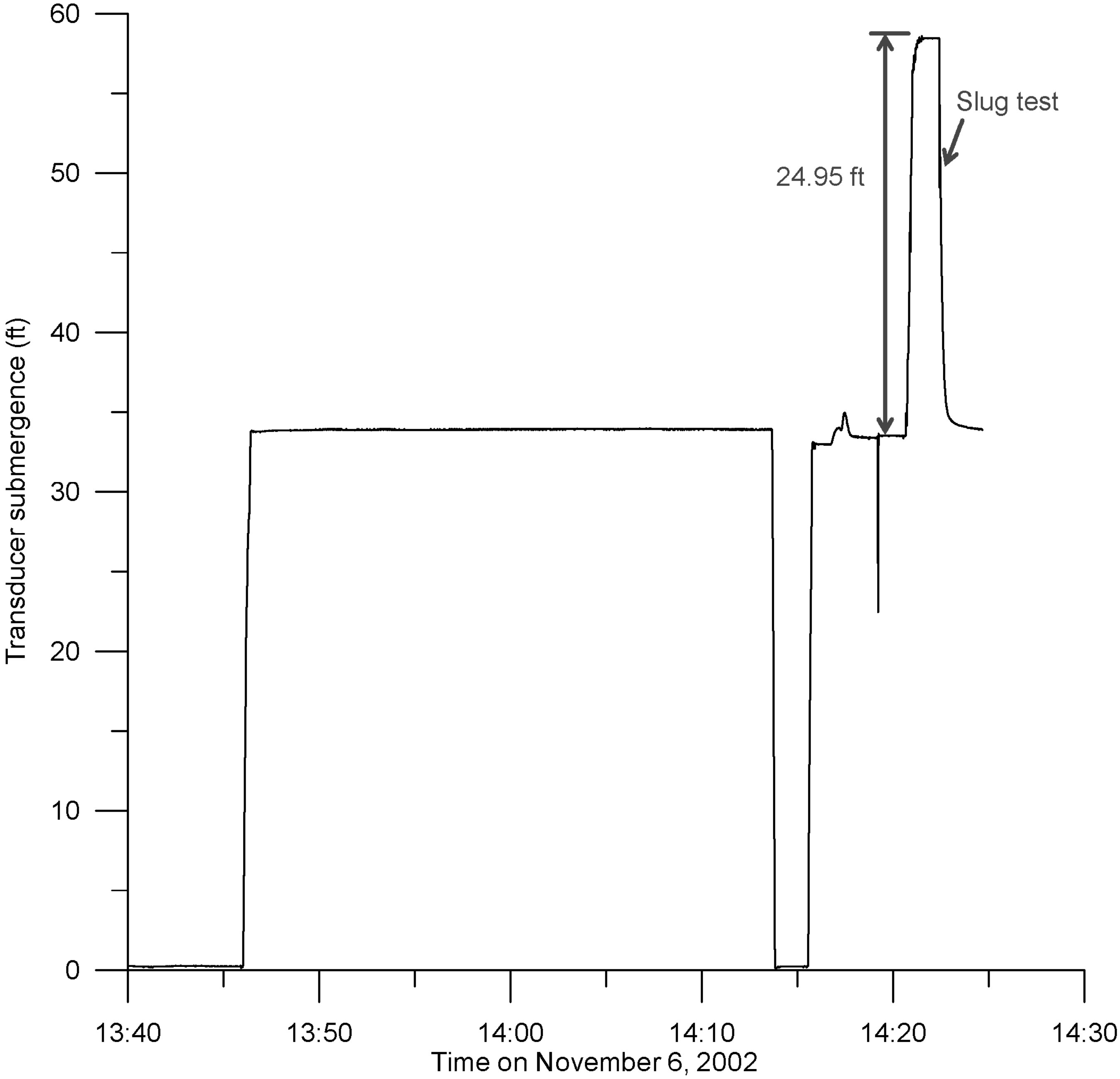
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

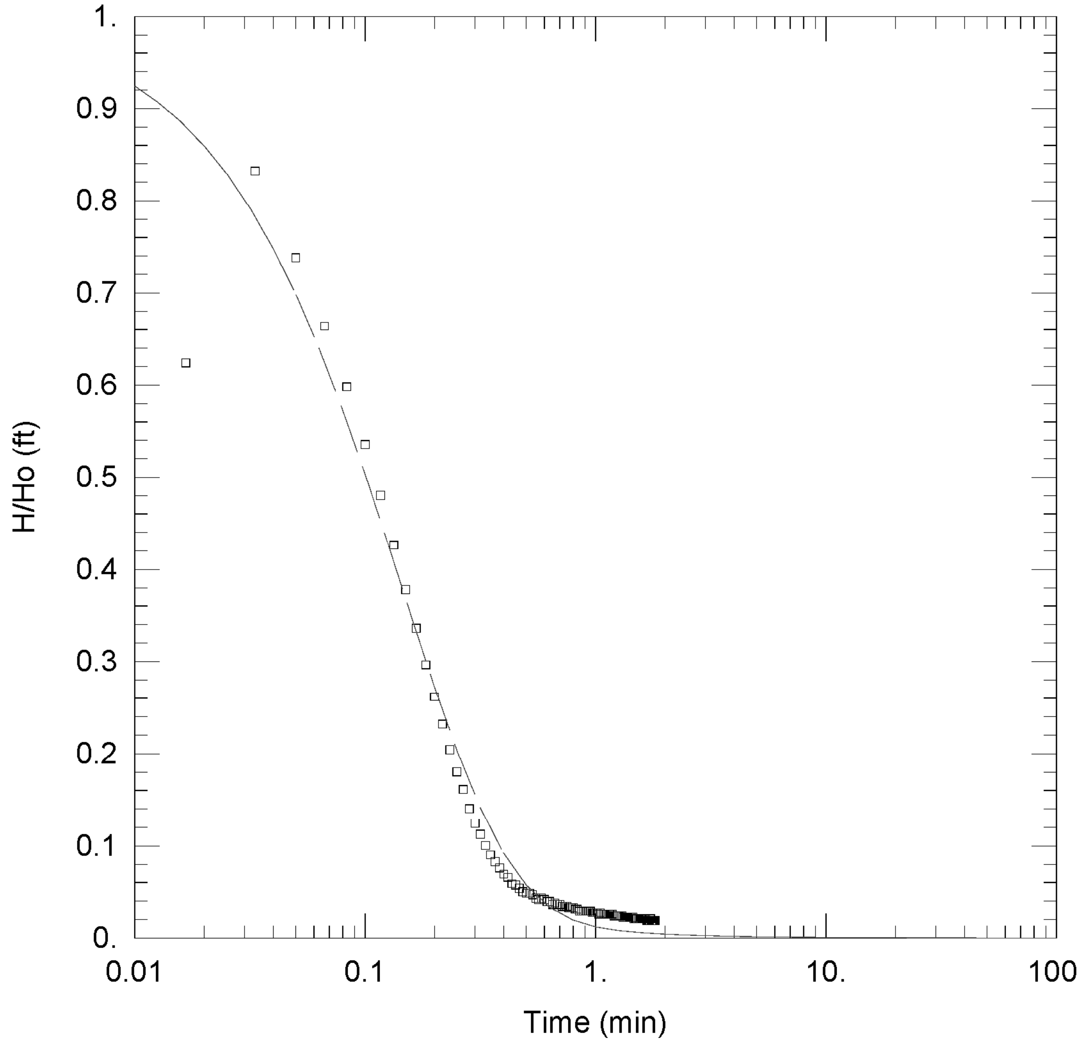
$T = 0.02086\ ft^2/day$ $S = 0.0001337$

F6

Test 14



24.95 ft
Slug test
Transducer submergence (ft)
60
50
40
30
20
10
0
13:40
13:50
14:00
14:10
14:20
14:30
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-14.aqt
Date: 01/20/03 Time: 16:21:27

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 24.95 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

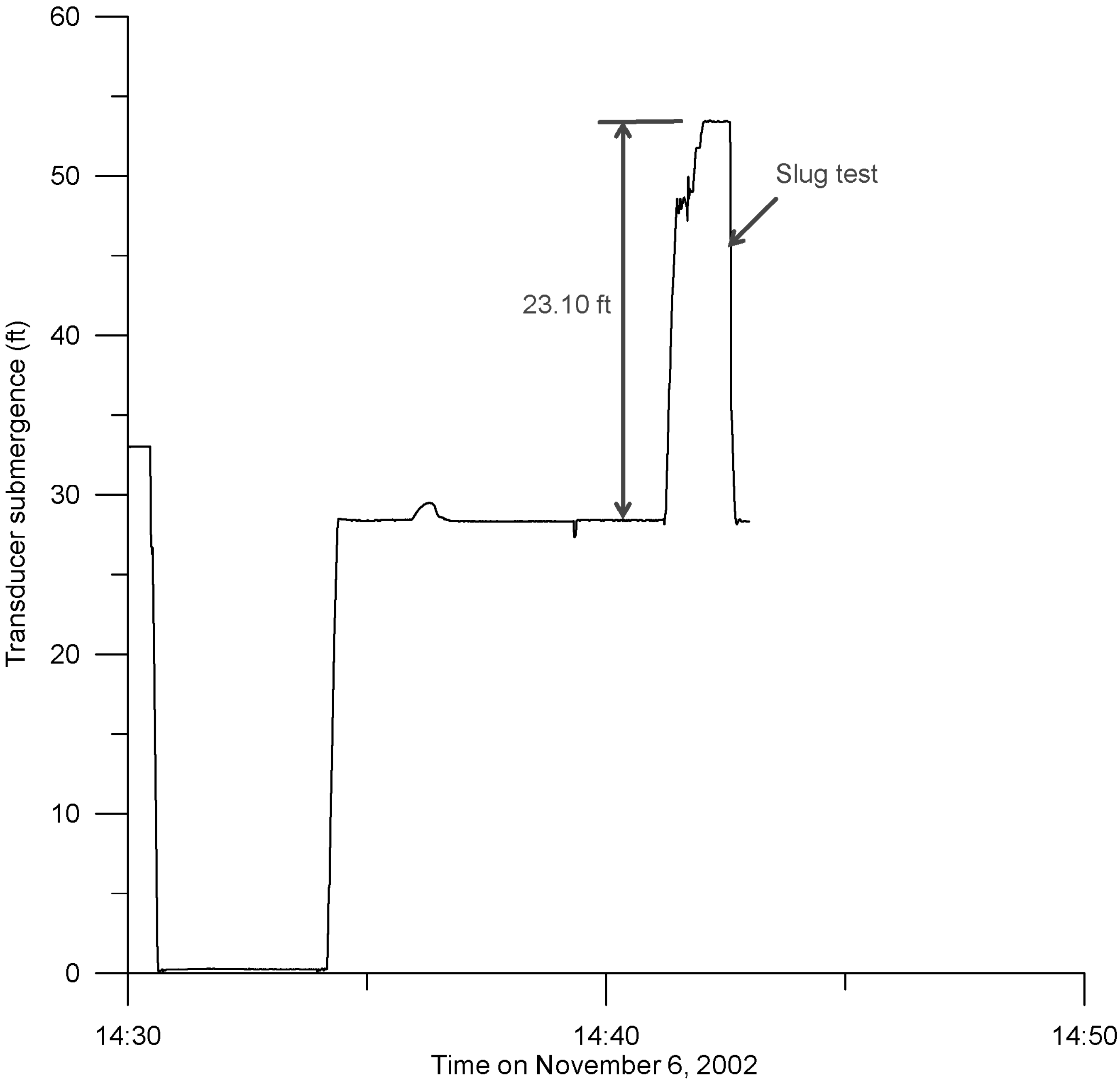
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

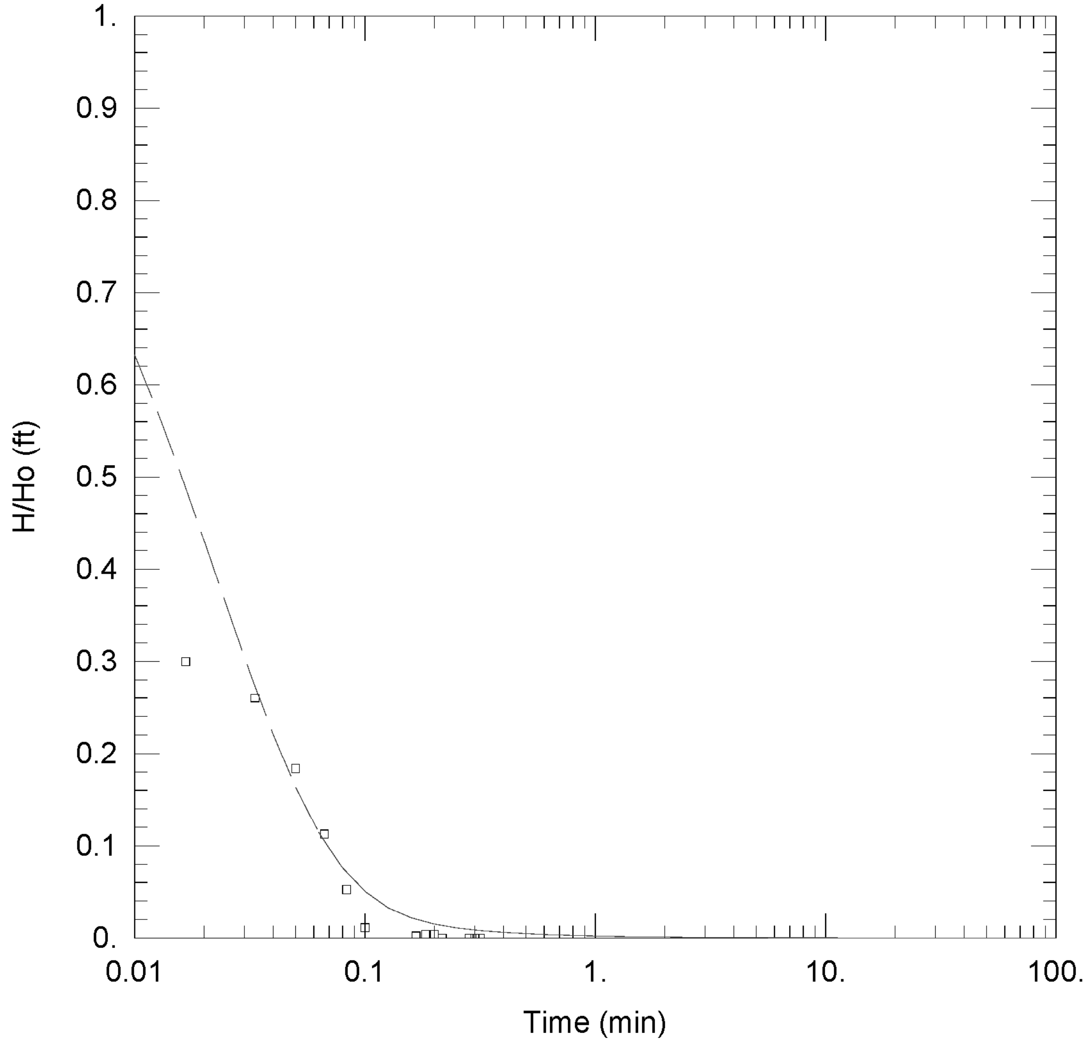
$T = 90.39\ ft^2/day$ S = 1.E-10

F6

Test 15



Transducer submergence (ft)
60
50
40
30
20
10
0
23.10 ft
Slug test
14:30
14:40
14:50
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-15.aqt
Date: 01/20/03 Time: 16:22:04

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 23.1 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

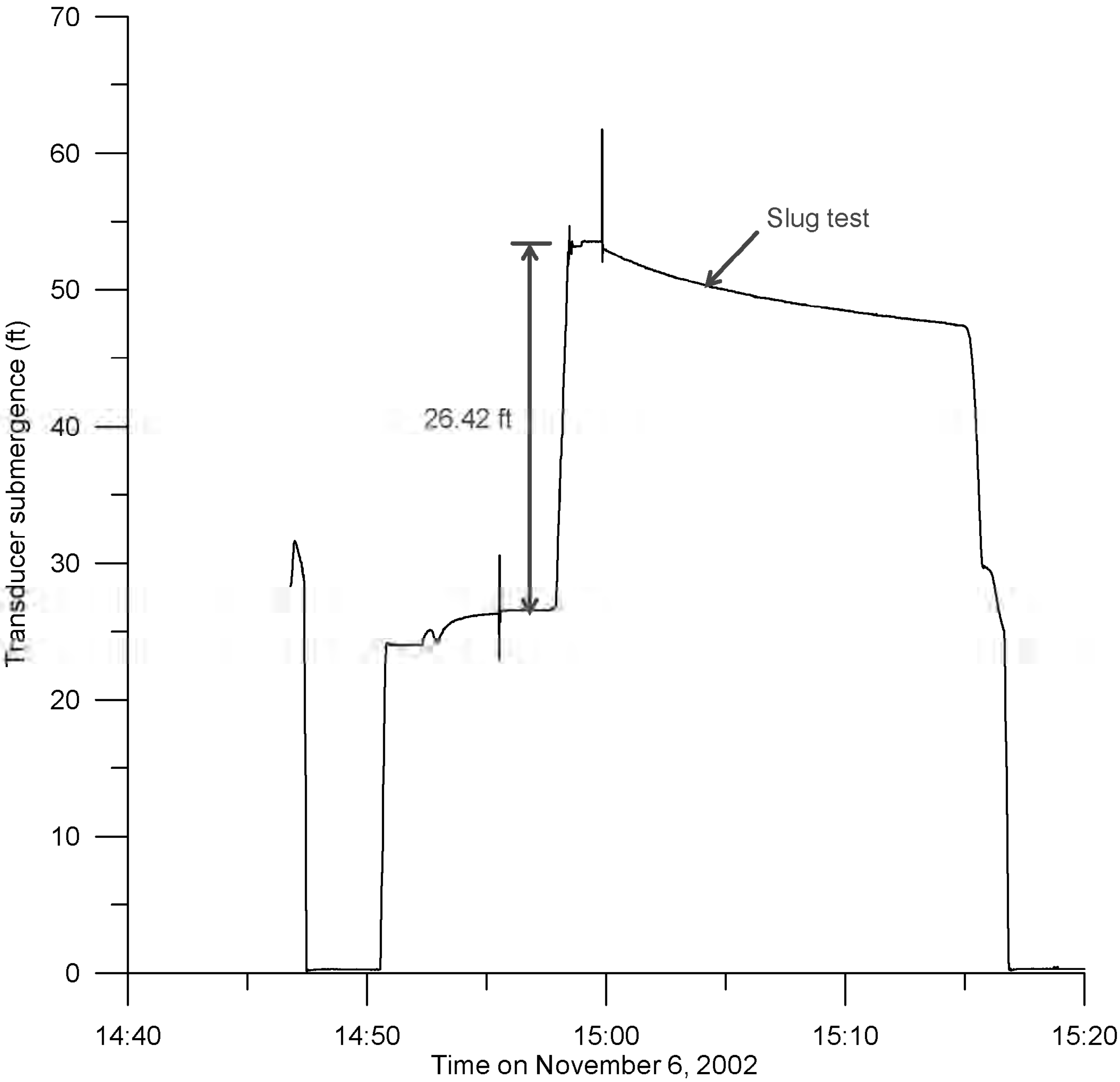
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

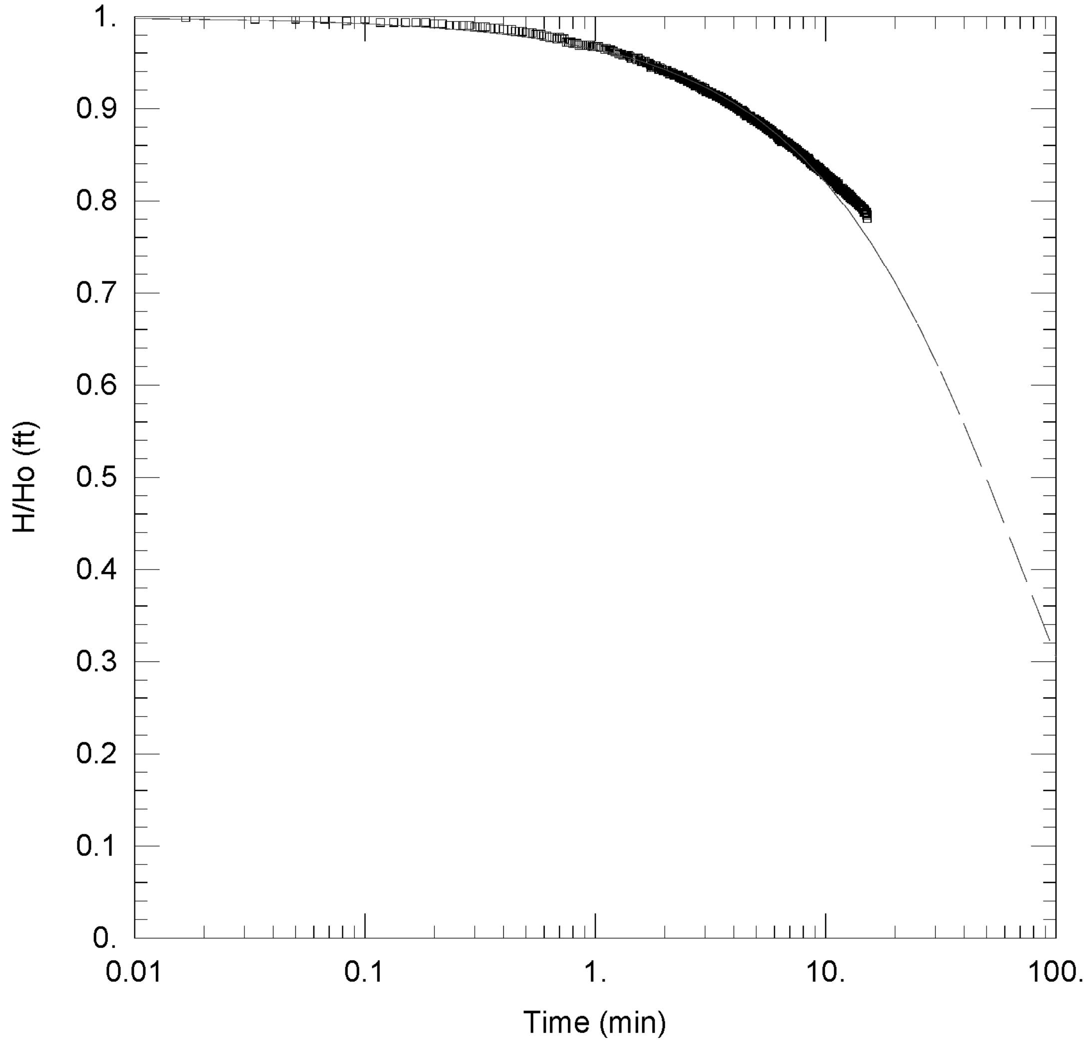
$T = 304.7\ ft^2/day$ S = 1.E-06

F6

Test 16



70
60
50
40
30
20
10
0
Transducer submergence (ft)
26.42 ft
Slug test
14:40
14:50
15:00
15:10
15:20
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-16.aqt
Date: 01/20/03 Time: 16:21:58

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

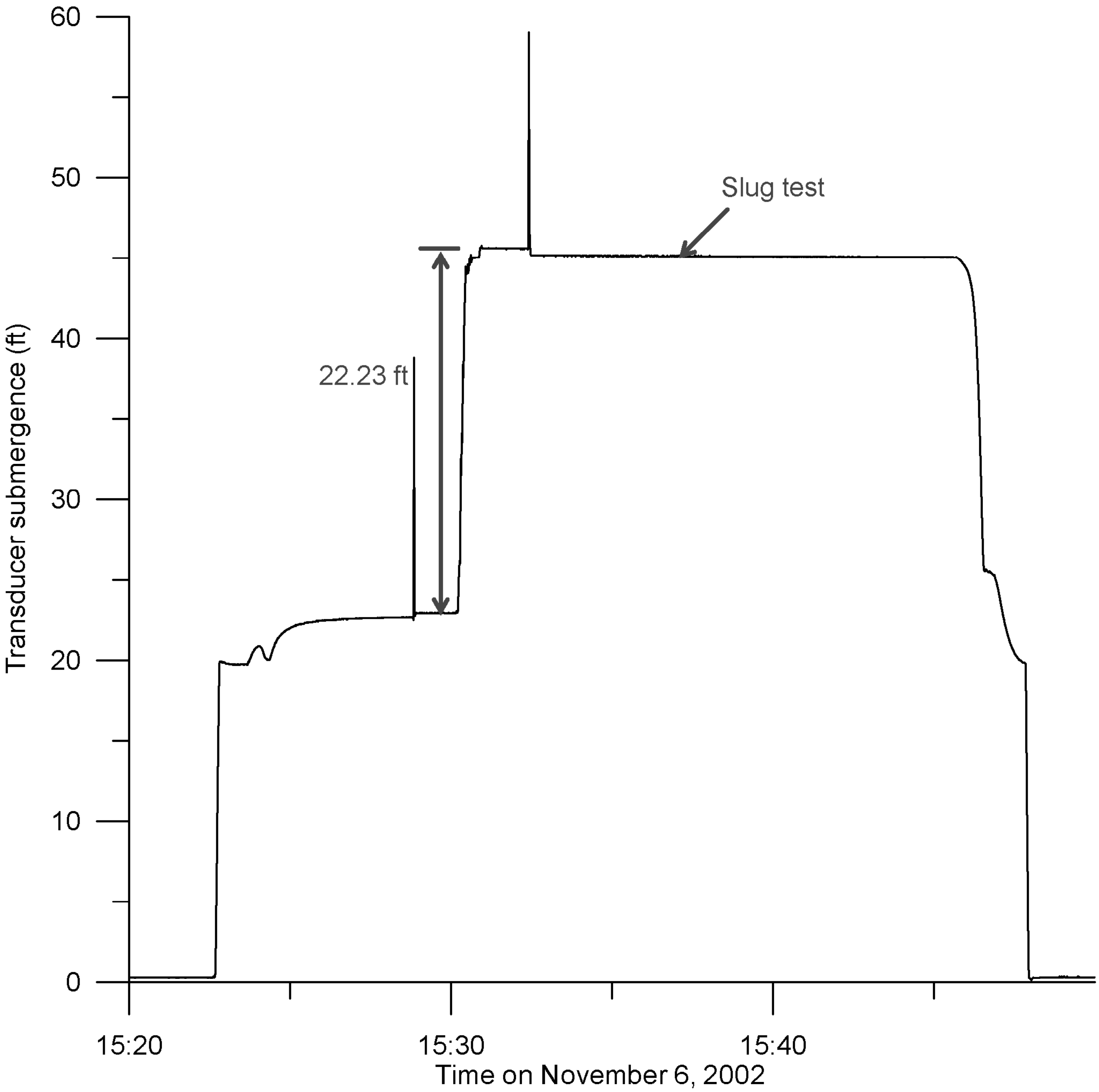
Initial Displacement: 26.42 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

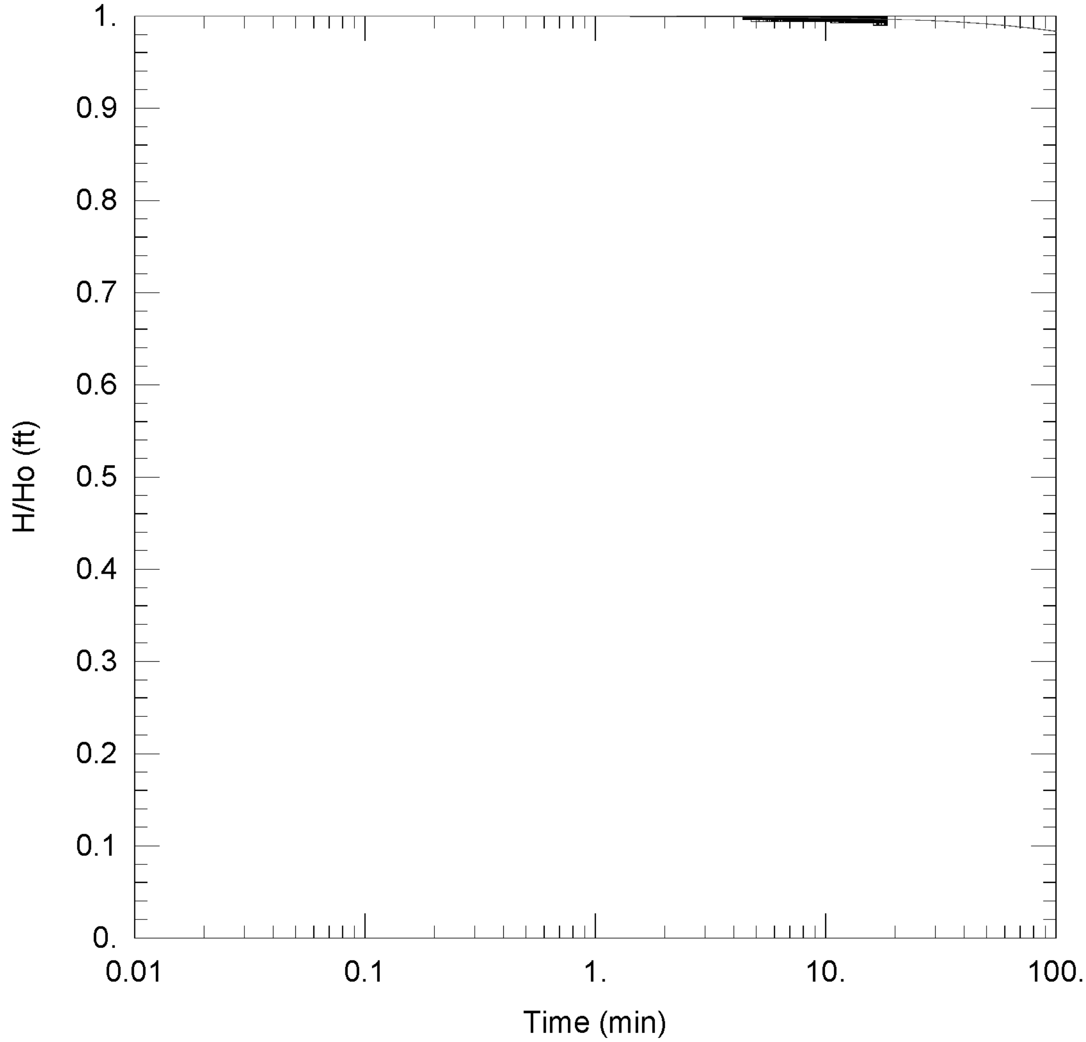
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.05376 ft^2/day S = 0.0001

F6

Test 17



60
50
40
30
20
10
0
Transducer submergence (ft)
22.23 ft
Slug test
15:20
15:30
15:40
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-17.aqt
Date: 01/20/03 Time: 16:22:10

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 22.23 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

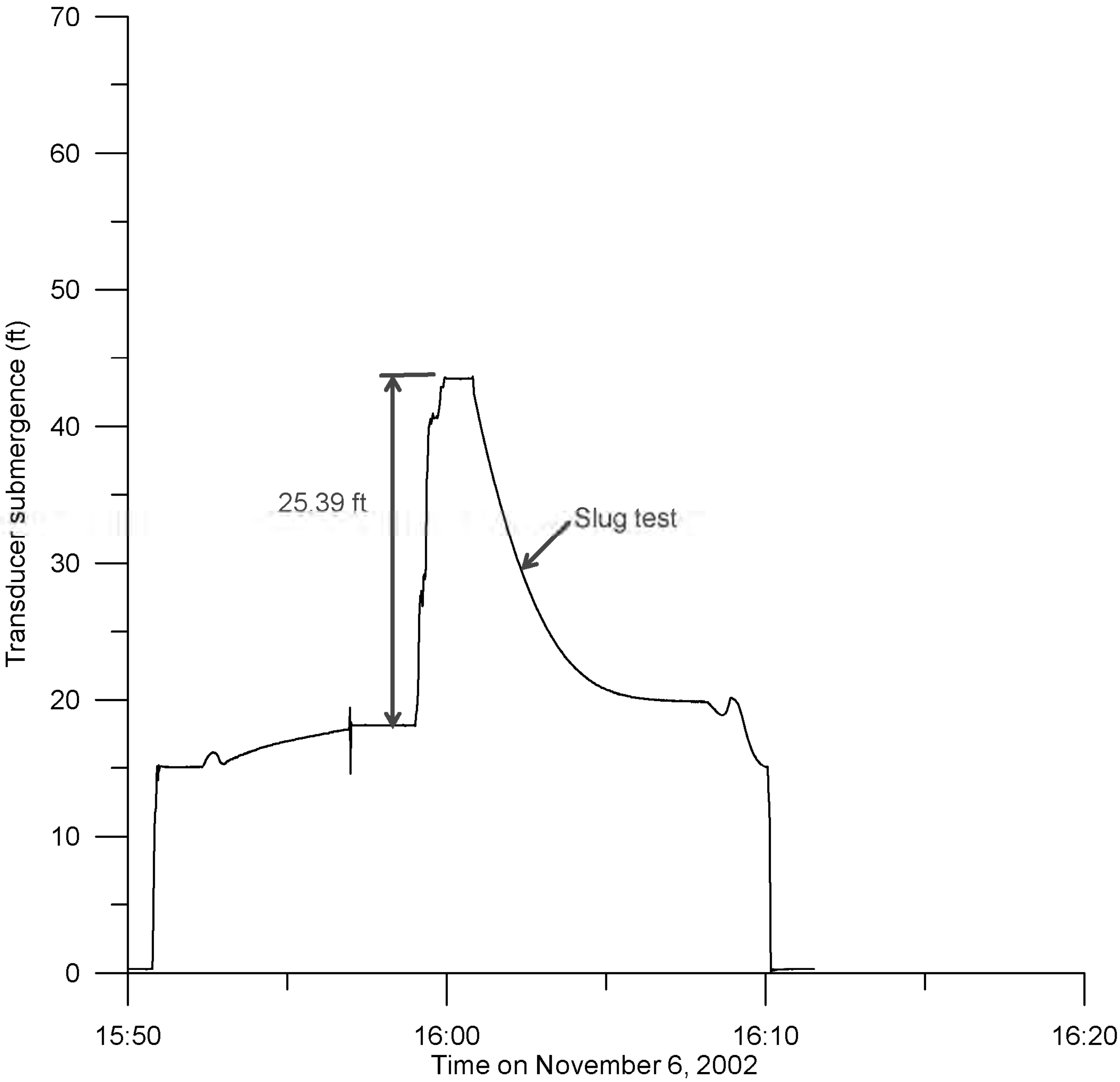
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

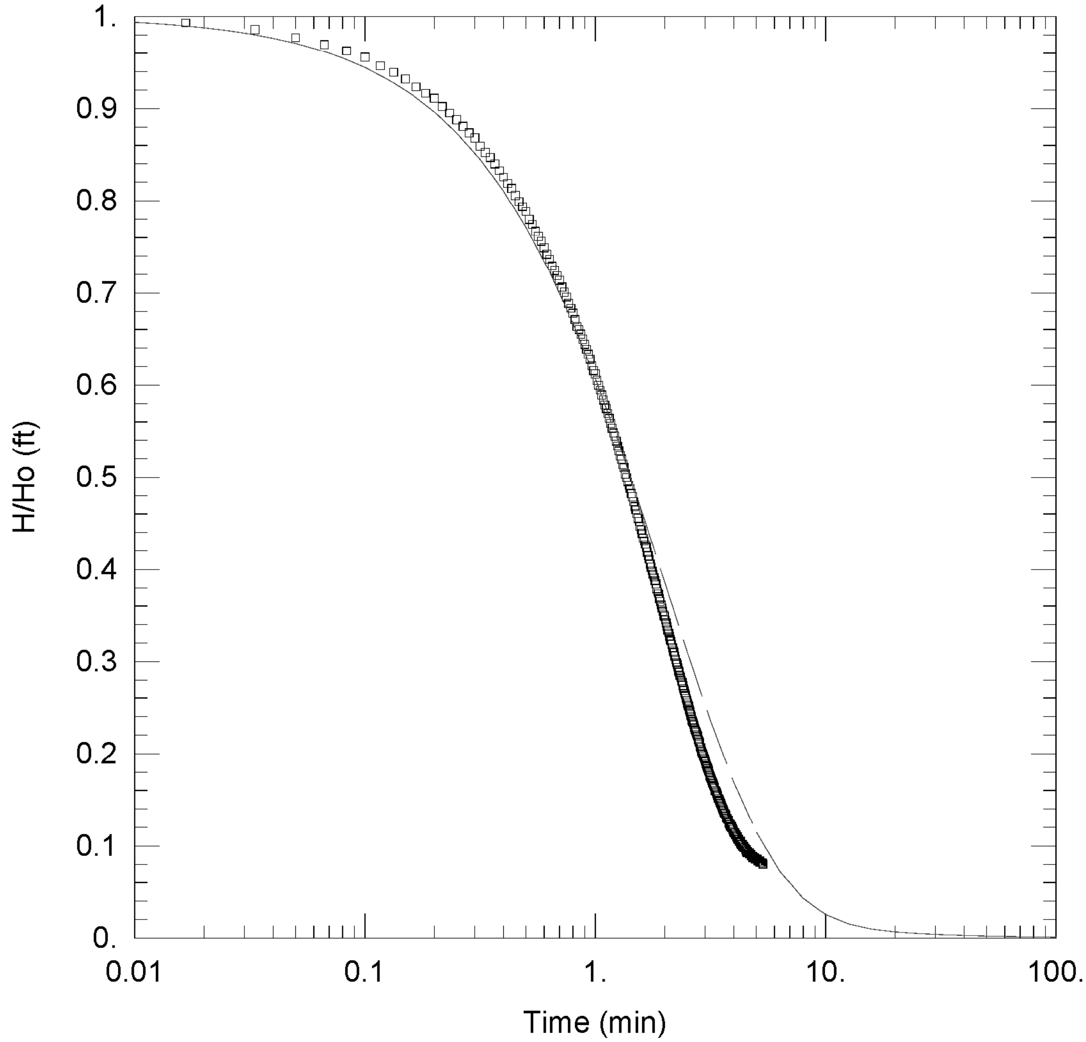
T = 0.001746 ft^2/day S = 1.E-10

F6

Test 18



70
60
50
40
30
20
10
0
Transducer submergence (ft)
25.39 ft
Slug test
15:50
16:00
16:10
16:20
Time on November 6, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-18.aqt
Date: 01/20/03 Time: 16:22:54

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 24.31 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

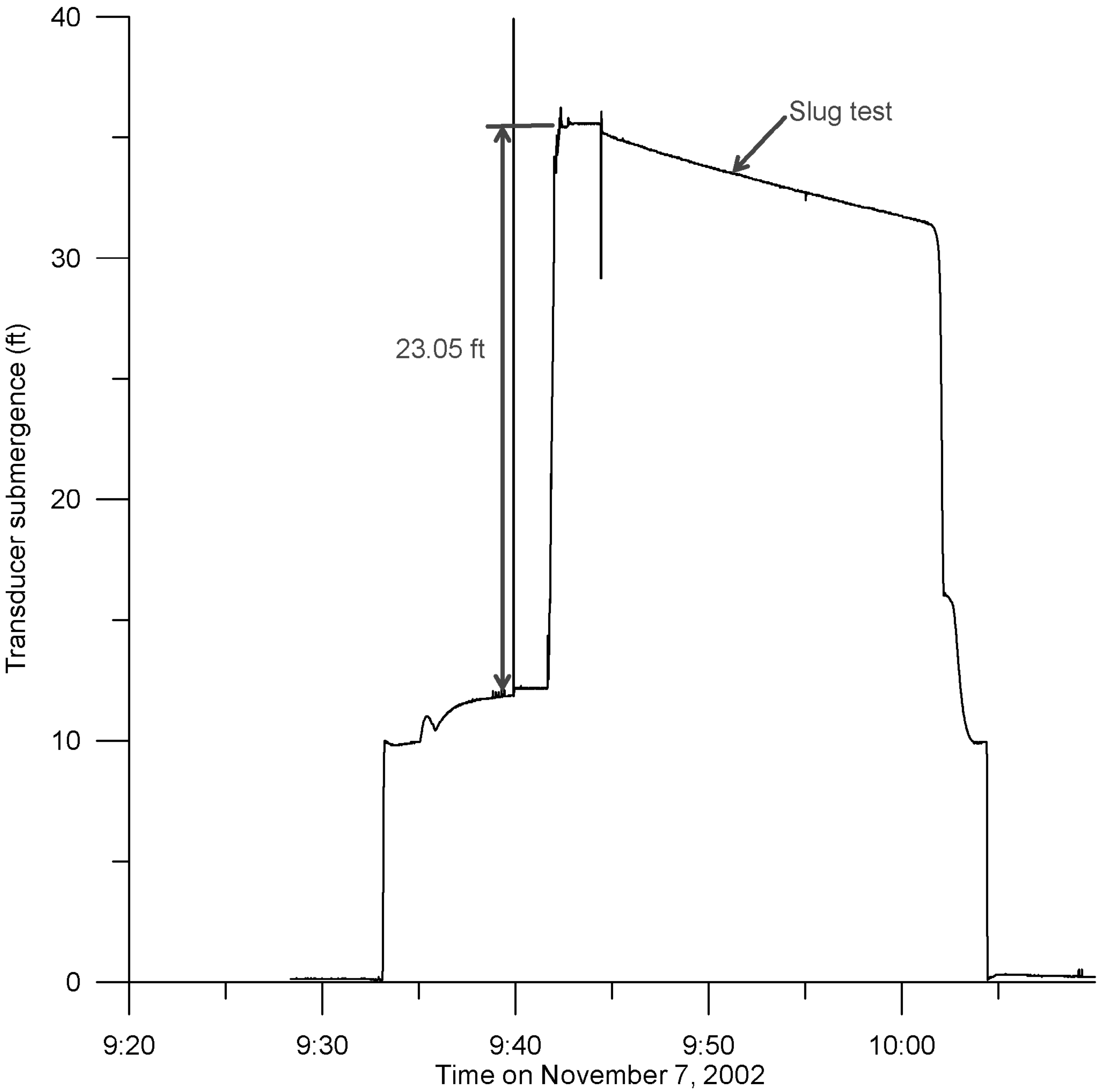
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

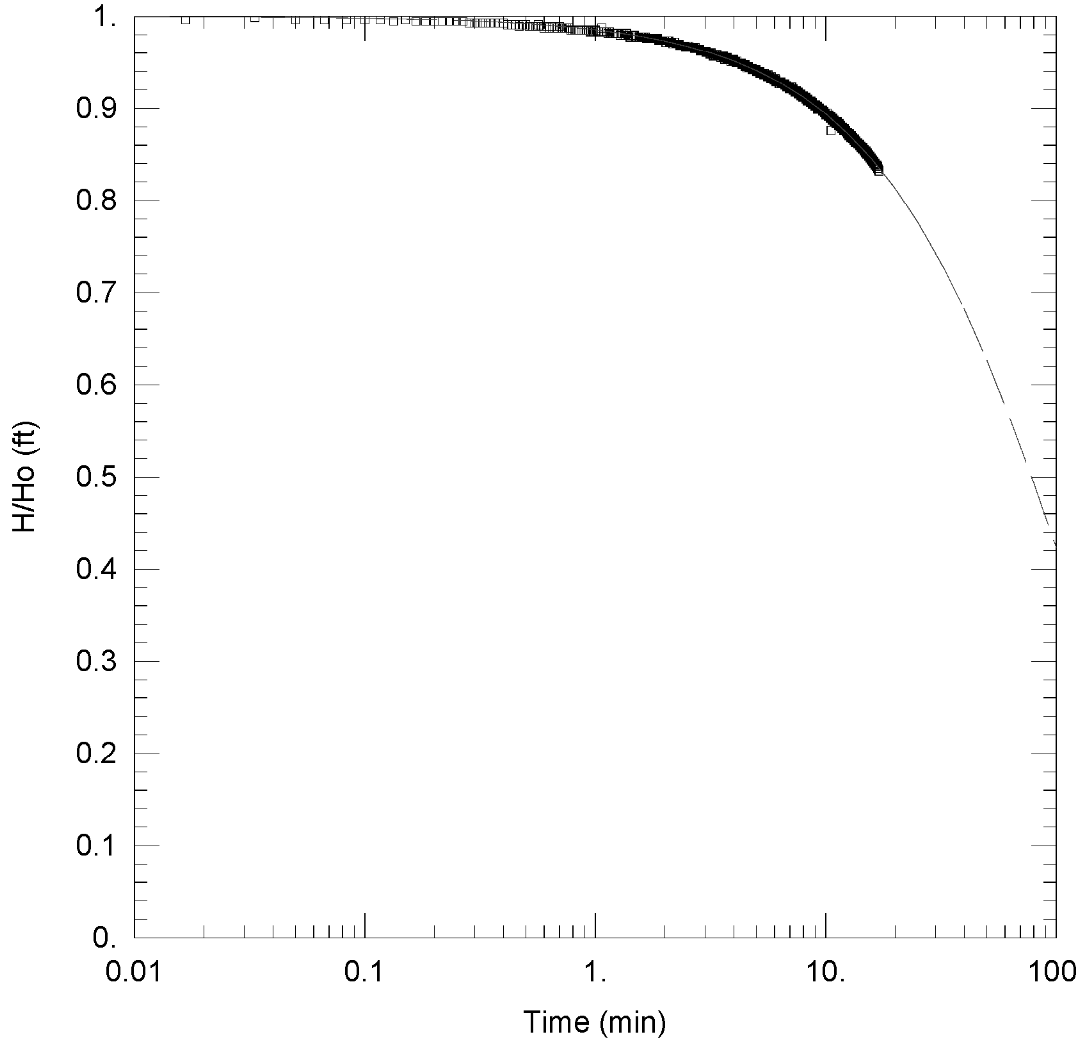
T = 6.418 ft^2/day S = 1.E-10

F6

Test 19



40
30
20
10
0
Transducer submergence (ft)
Slug test
23.05 ft
9:20
9:30
9:40
9:50
10:00
Time on November 7, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-19.aqt
Date: 01/20/03 Time: 16:22:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 23.05 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

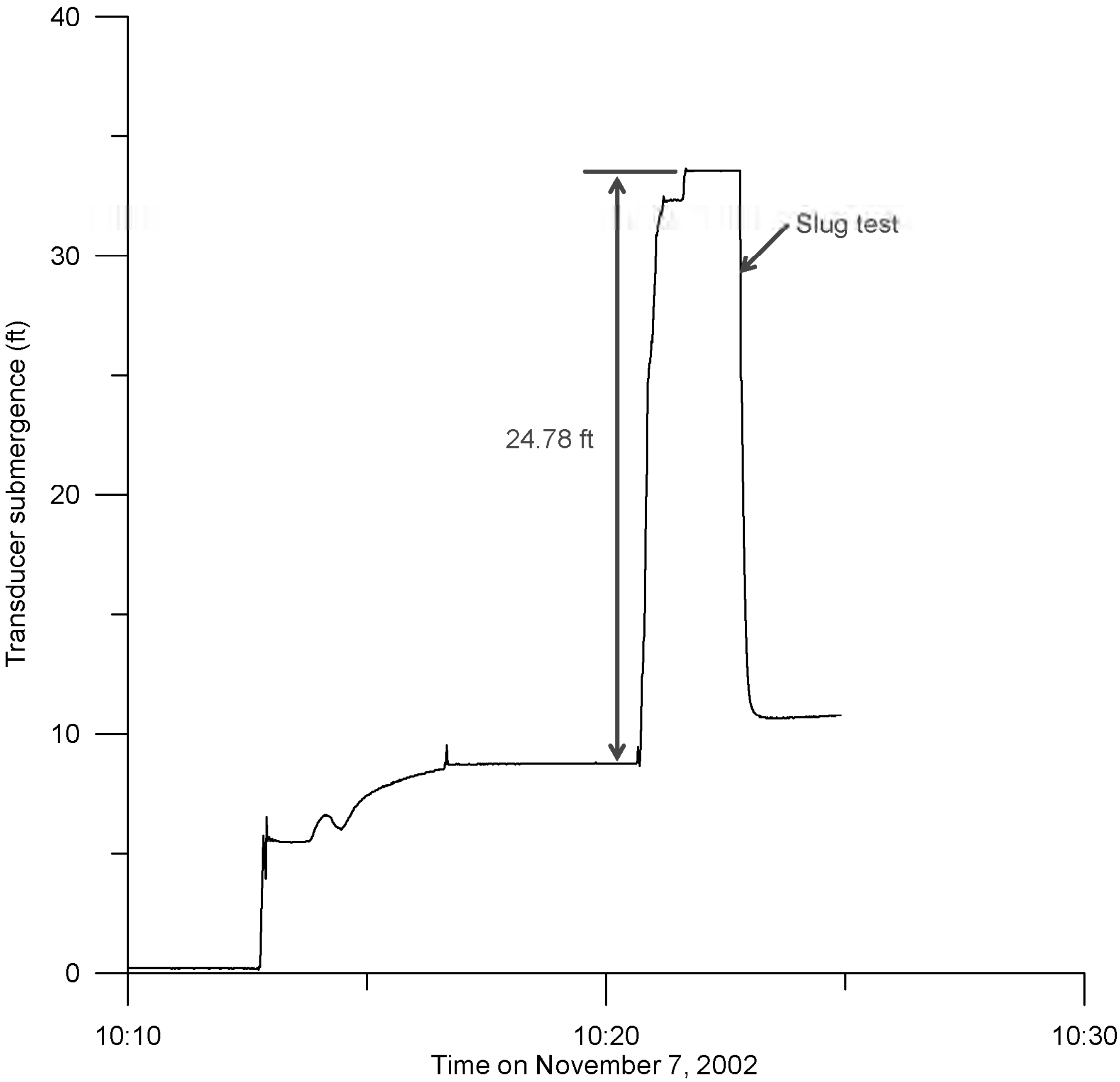
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

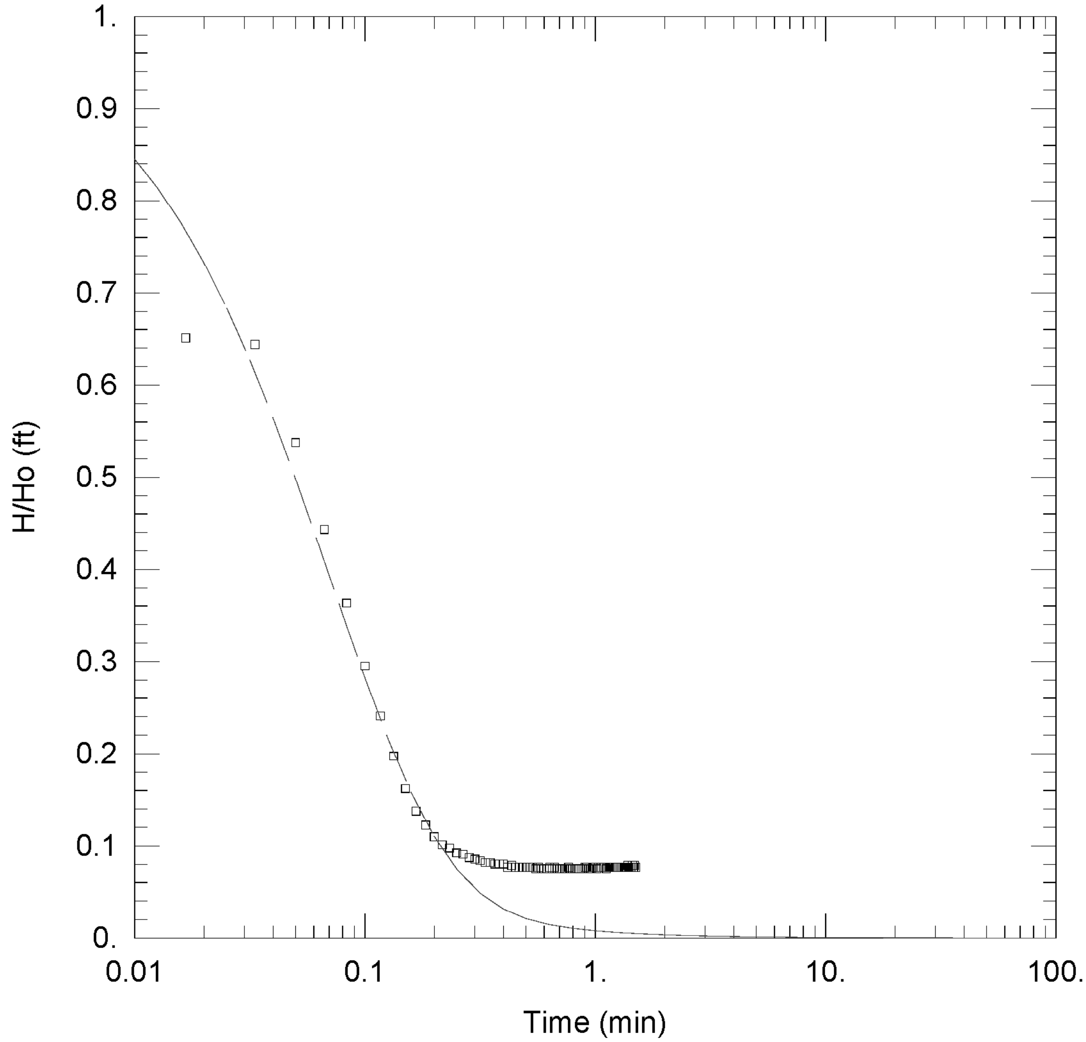
T = 0.06417 ft^2/day S = 7.488E-07

F6

Test 20



40
30
20
10
0
24.78 ft
Slug test
Transducer submergence (ft)
10:10
10:20
10:30
Time on November 7, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-20.aqt
Date: 01/20/03 Time: 16:23:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 24.78 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

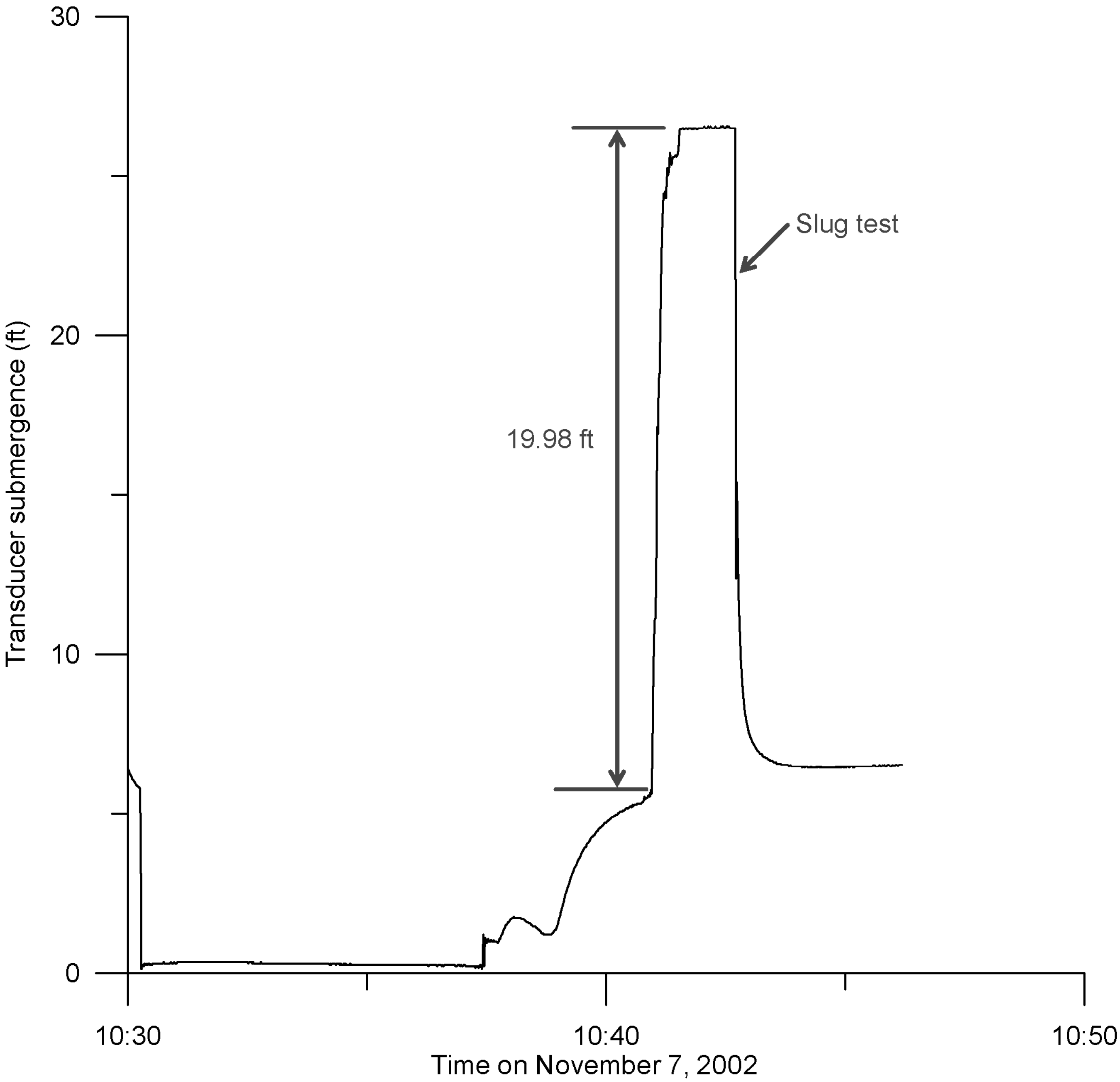
SOLUTION

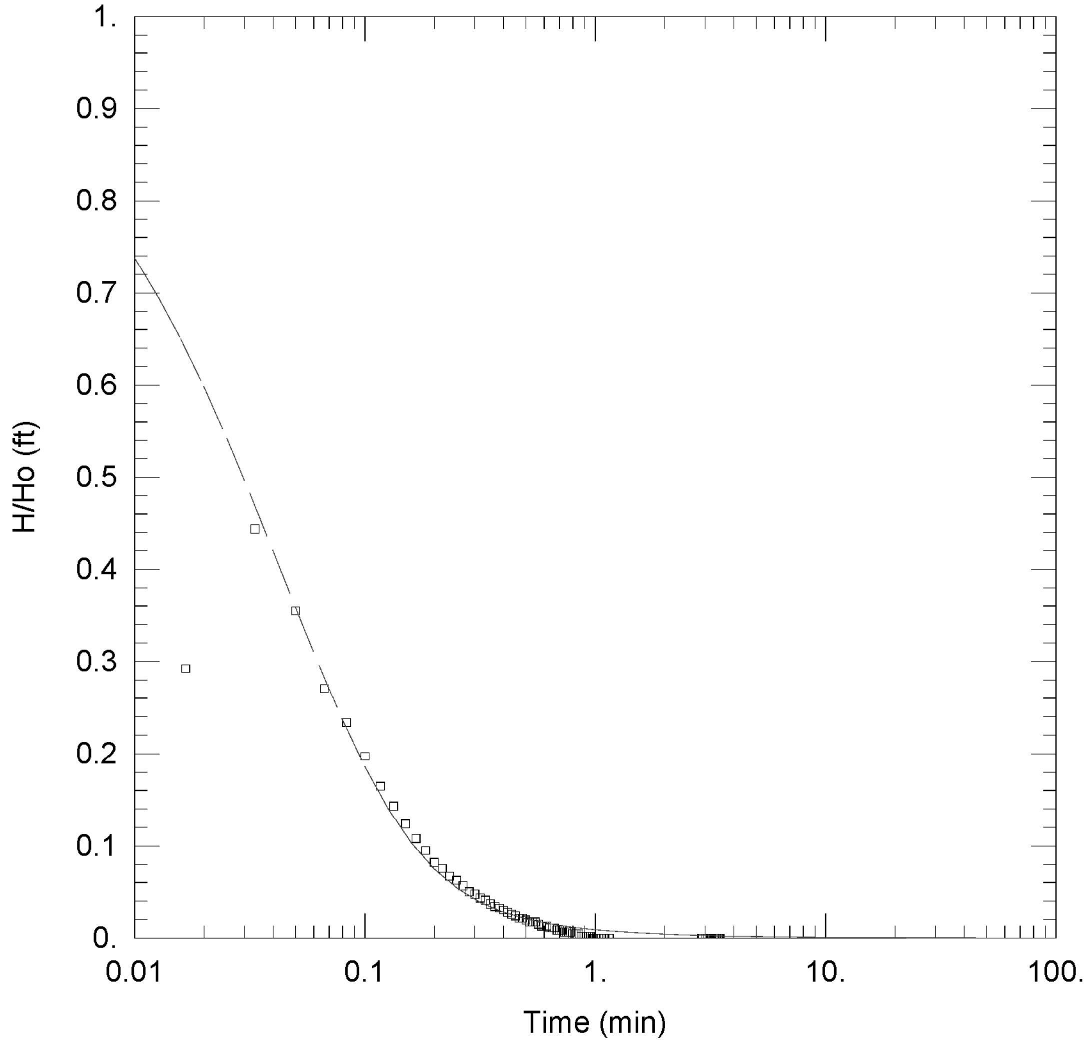
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 98.29 ft^2/day
S = 1.E-06

F6

Test 21


30
20
10
0
Transducer submergence (ft)
19.98 ft
Slug test
10:30
10:40
10:50
Time on November 7, 2002



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\All Users\Documents\F6\F6-21.aqt
Date: 01/20/03 Time: 16:23:02

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 19.98 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 80.39 ft^2/day S = 0.0001796

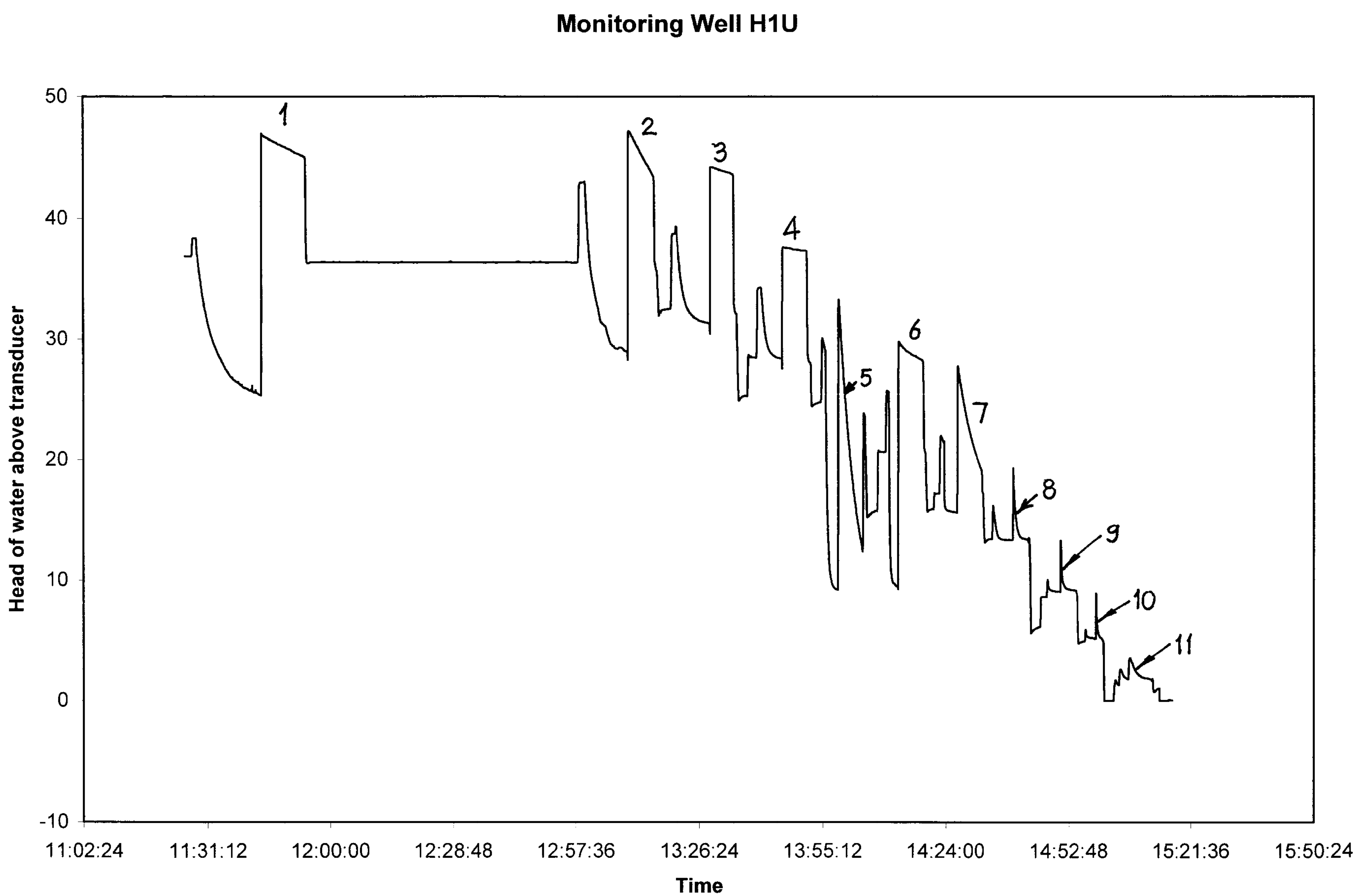
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

H1U

Testing Dates: April 23, 2002

Summary of Tests:

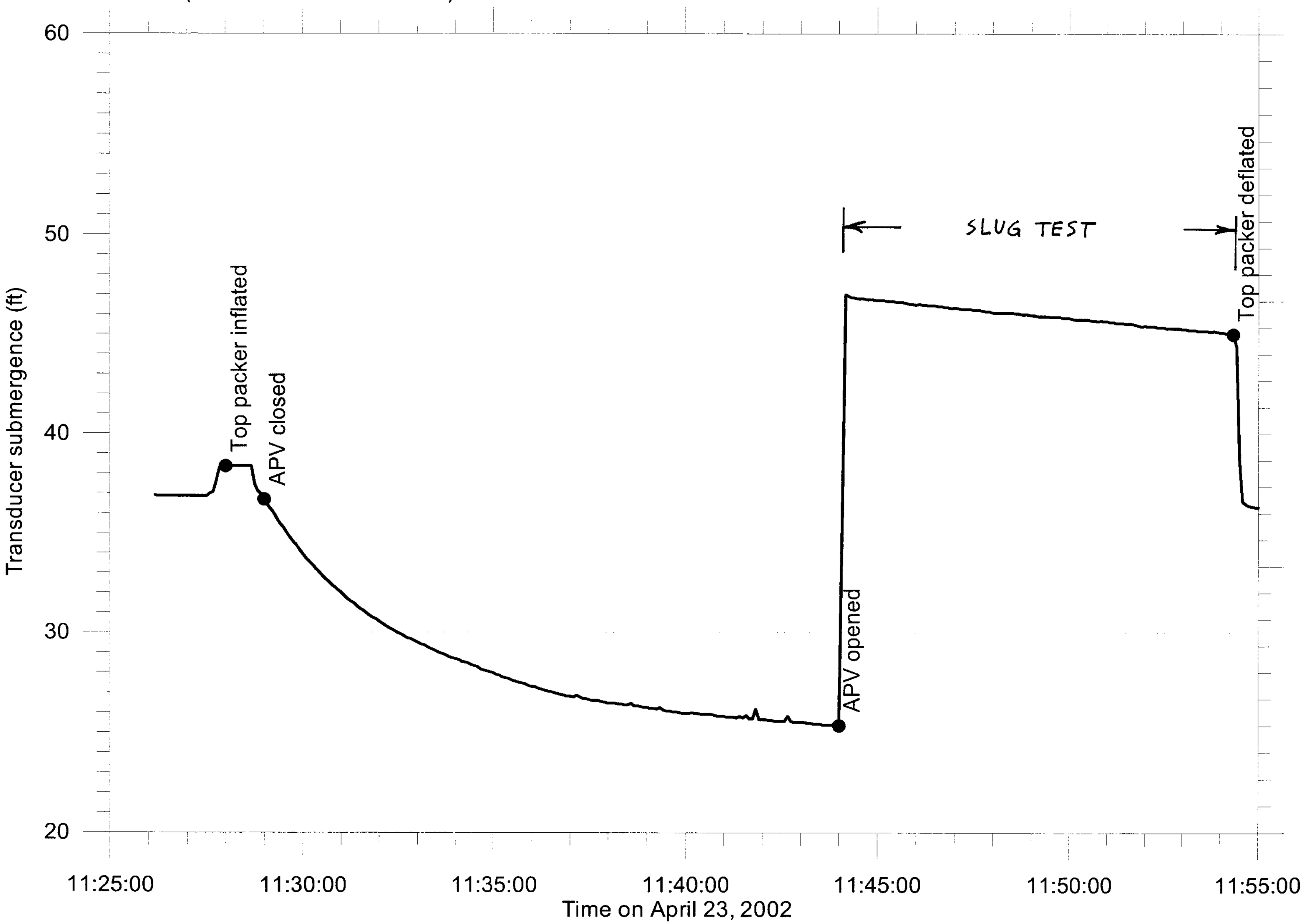
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
H1U	1	573.23	563.73	0.049	
H1U	2	573.23	568.03	0.24	
H1U	3	577.23	572.03	0.047	
H1U	4	581.23	576.03	0.029	
H1U	5	585.23	580.03	2	
H1U	6	589.23	584.03	0.1	
H1U	7	593.23	588.03	1.7	
H1U	8	597.23	592.03	16	
H1U	9	601.23	596.03	37	
H1U	10	605.23	600.03	42	
H1U	11	609.23	604.03	8.6	

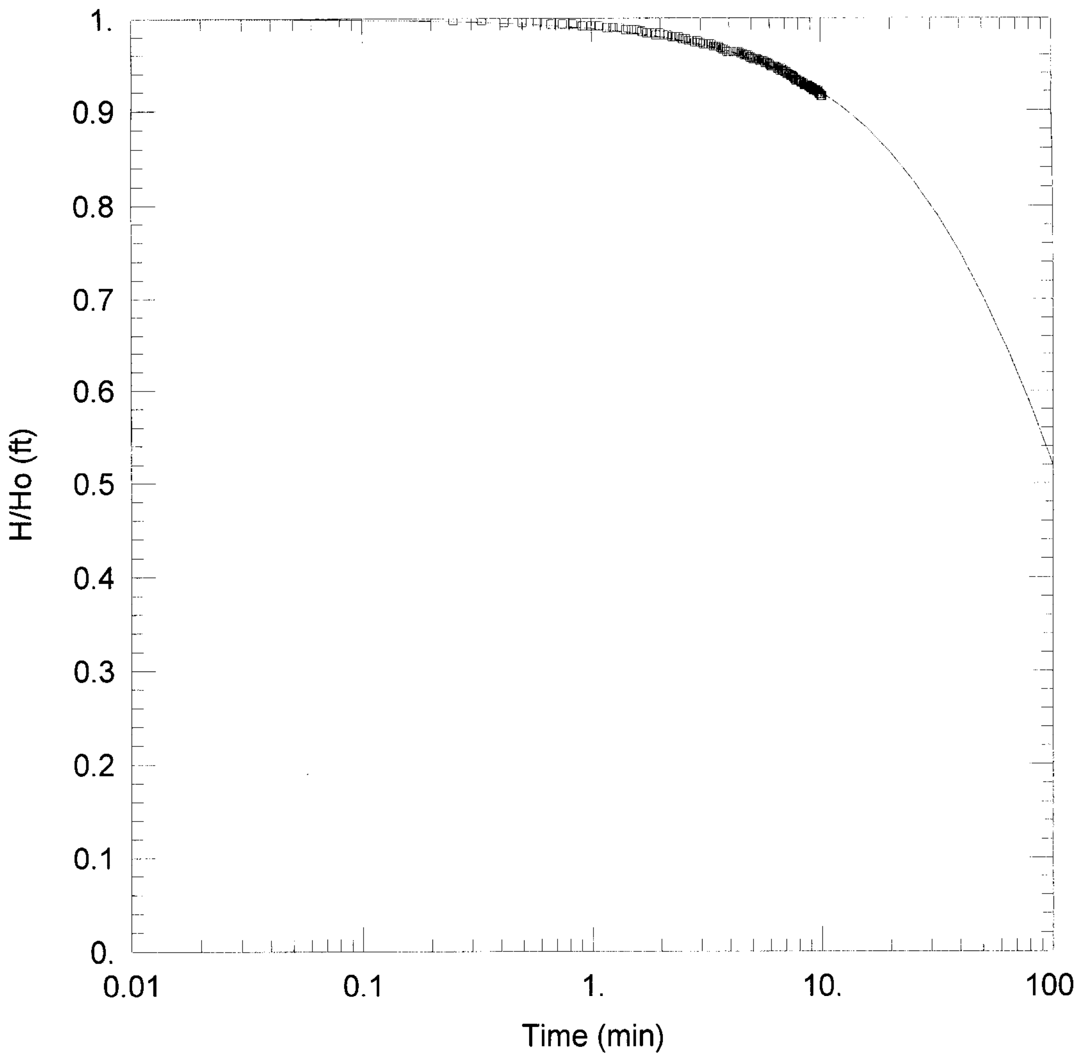


Monitoring Well H1U
Head of water above transducer
50
40
30
20
10
0
-10
11:02:24
11:31:12
12:00:00
12:28:48
12:57:36
13:26:24
13:55:12
14:24:00
14:52:48
15:21:36
15:50:24
Time
1
2
3
4
5
6
7
8
9
10
11

H1U Packer Testing

Test 1 (573.23 to 563.73 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-1.aqt
Date: 11/26/02 Time: 10:51:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-1)

Initial Displacement: 21.53 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

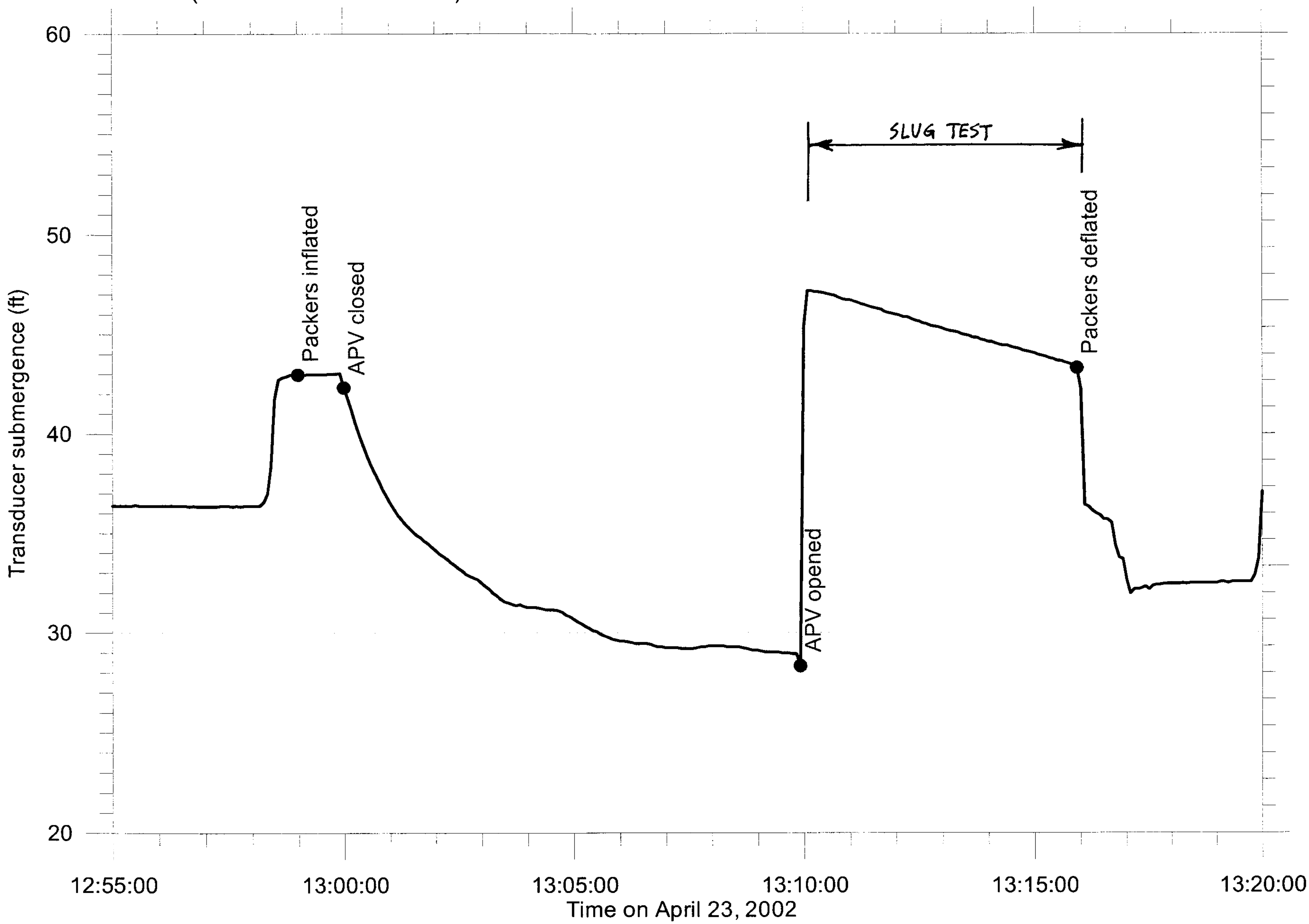
SOLUTION

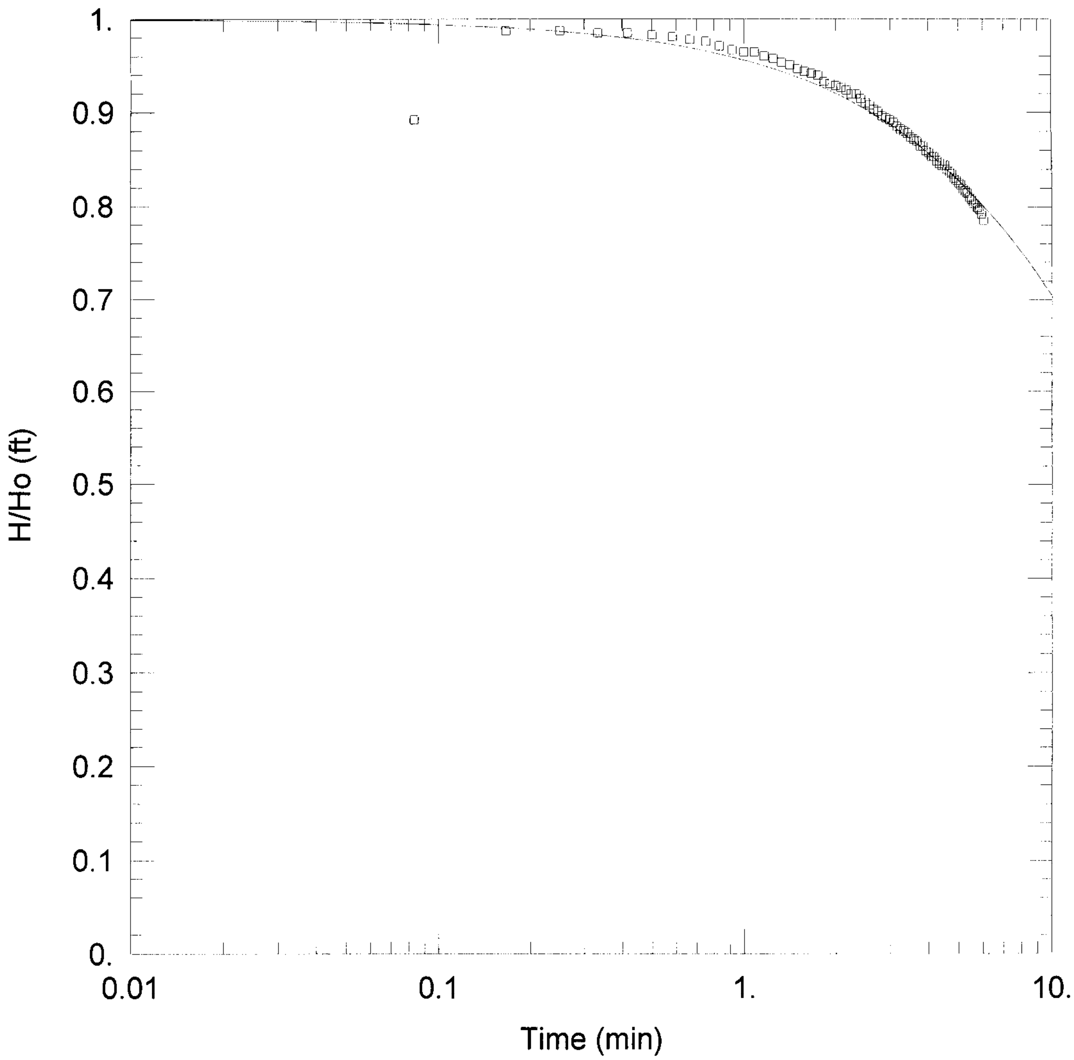
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.04939 ft^2/day
S = 1.E-06

H1U Packer Testing

Test 2 (573.23 to 568.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-2.aqt
Date: 11/26/02 Time: 10:52:50

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-2)

Initial Displacement: 19.08 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

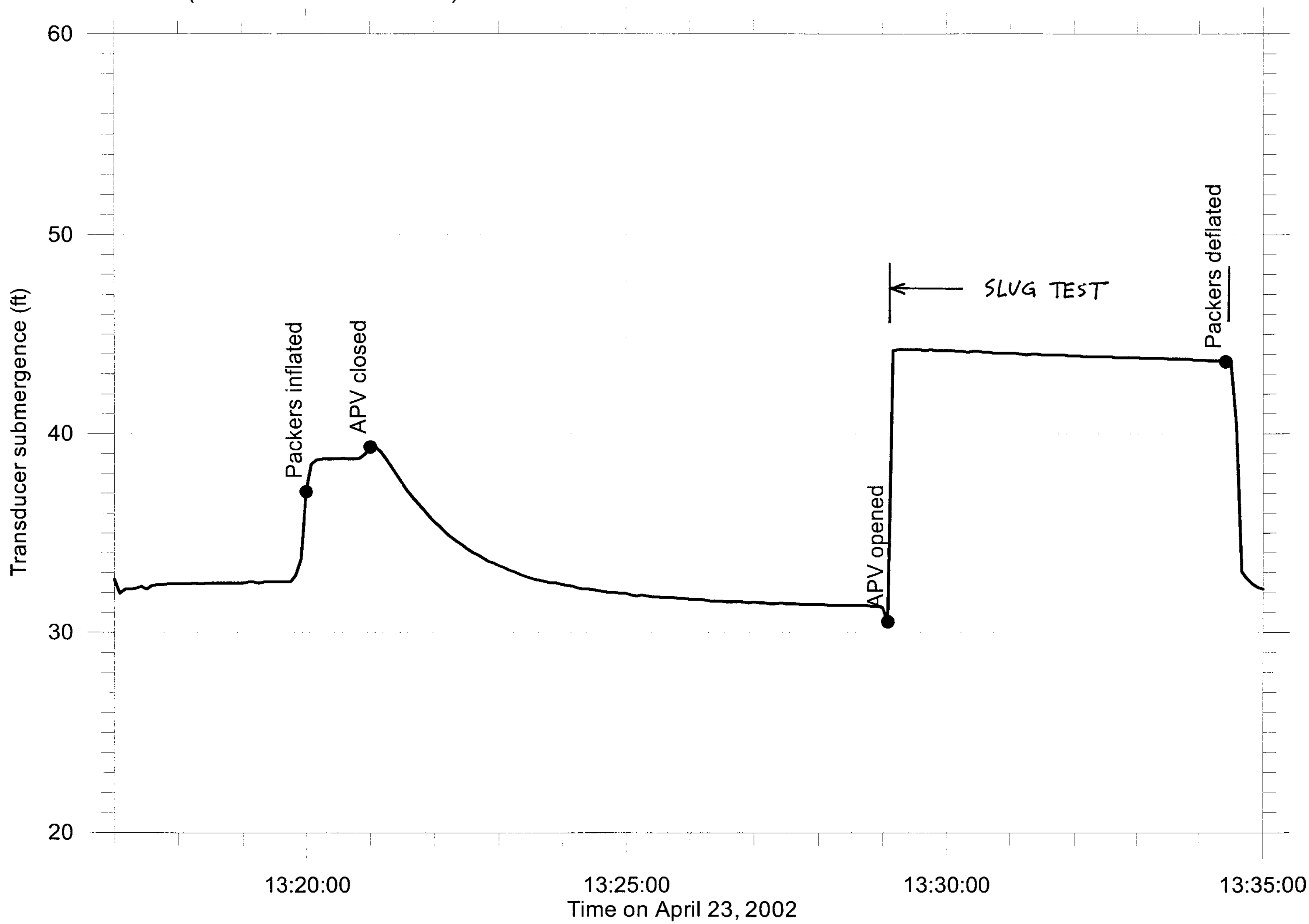
SOLUTION

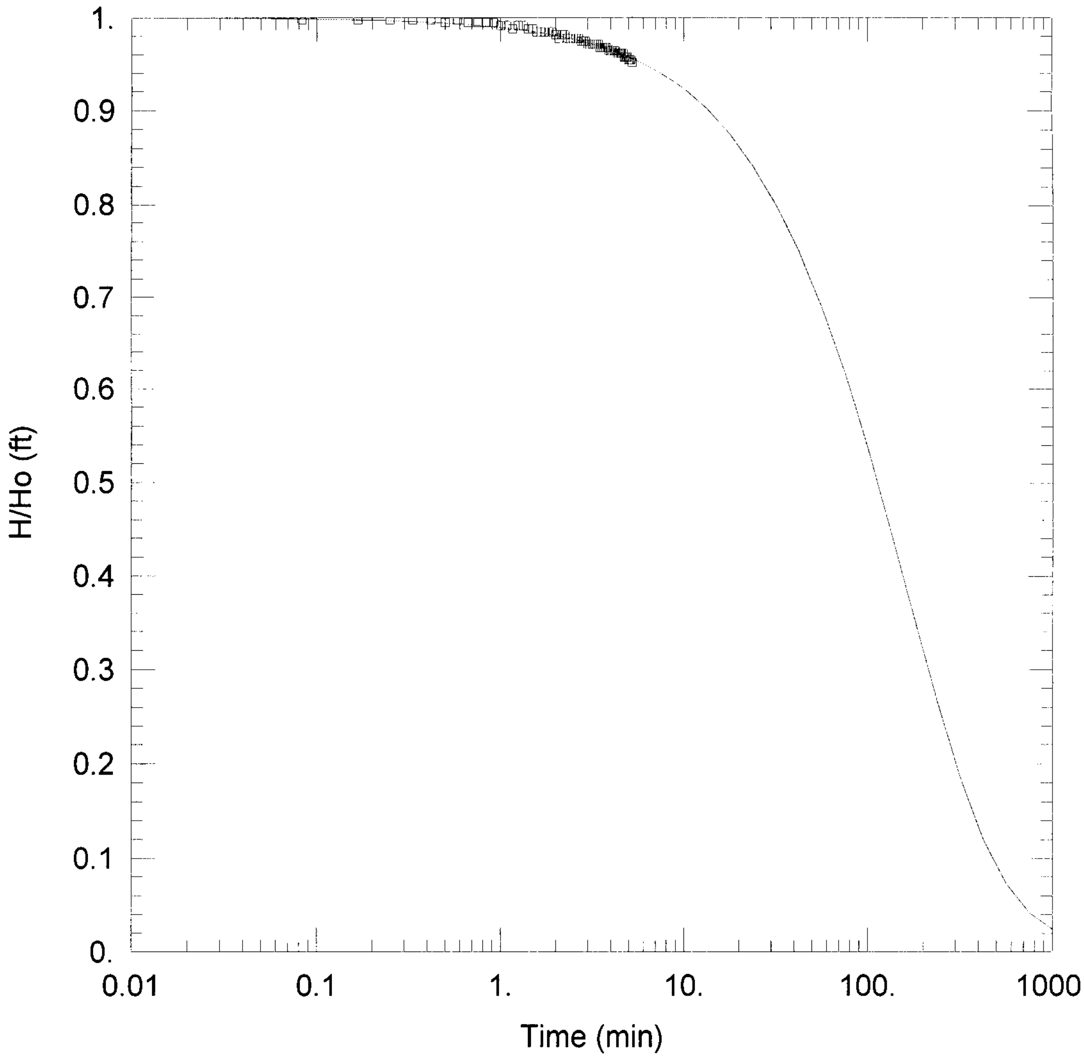
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

' = 0.2439 ft^2/day
S = 1.E-06

H1U Packer Testing

Test 3 (577.23 to 572.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-3.aqt
Date: 11/26/02 Time: 10:52:42

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-3)

Initial Displacement: 12.98 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

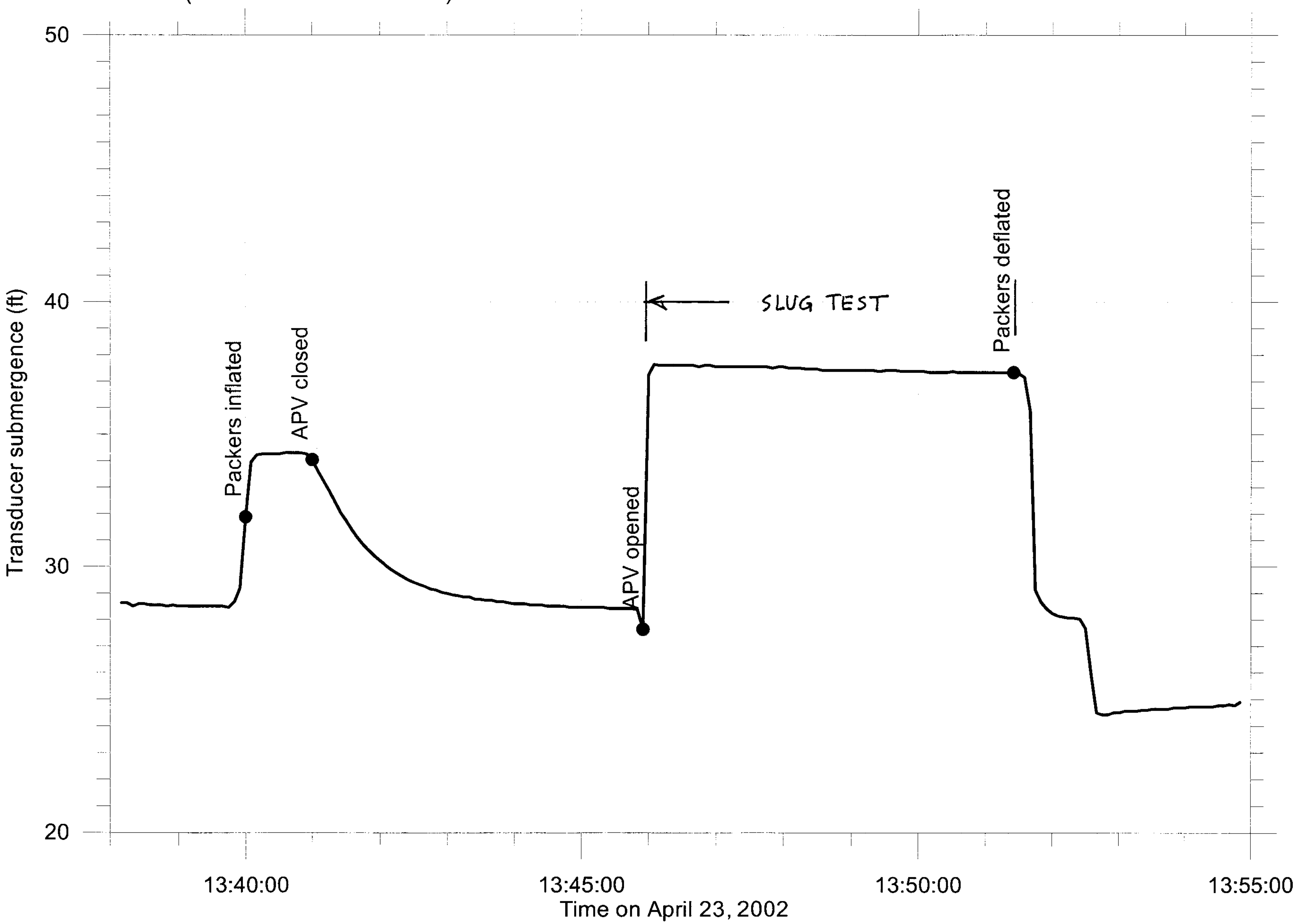
SOLUTION

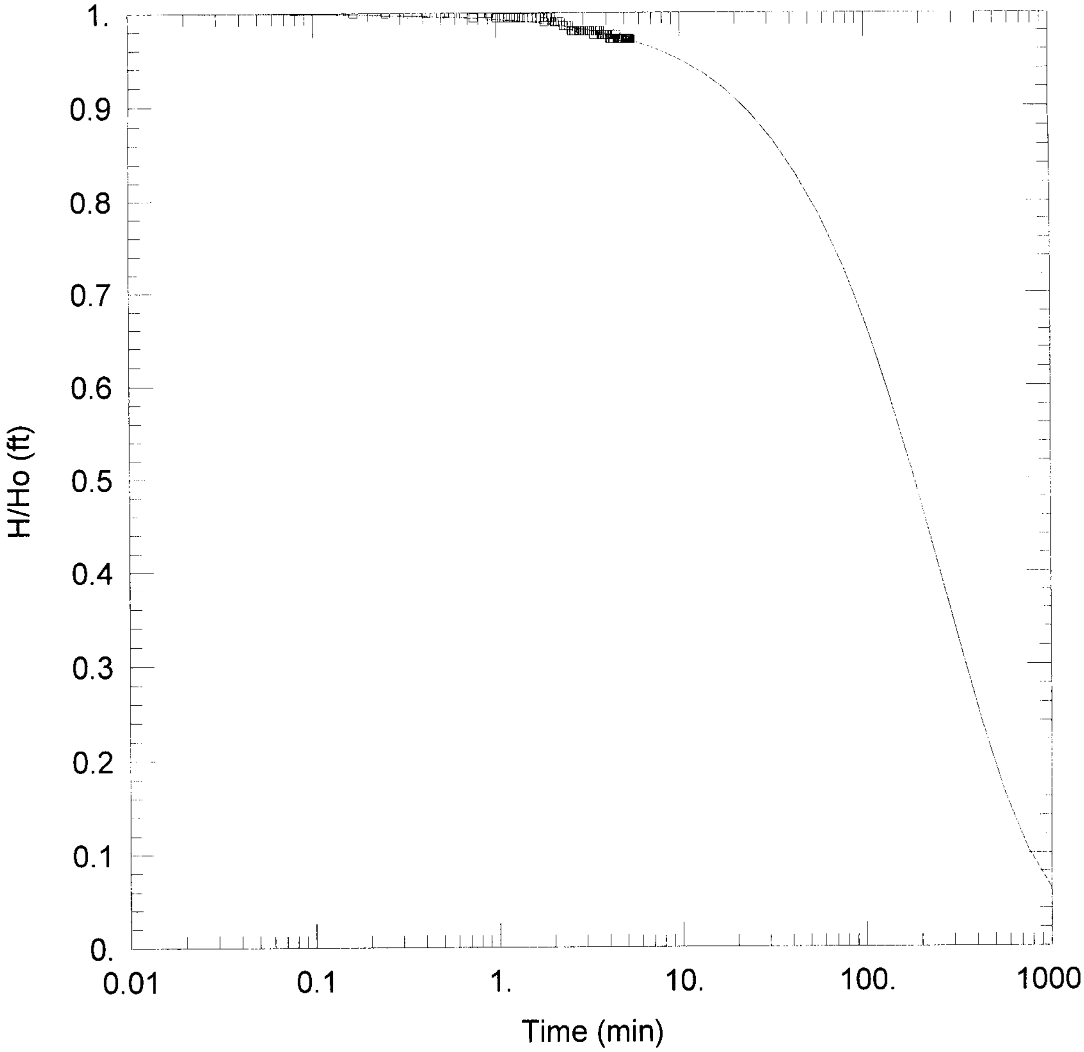
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.04663 ft^2/day S = 1.E-06

H1U Packer Testing

Test 4 (581.23 to 576.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-4.aqt
Date: 11/26/02 Time: 10:52:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-4)

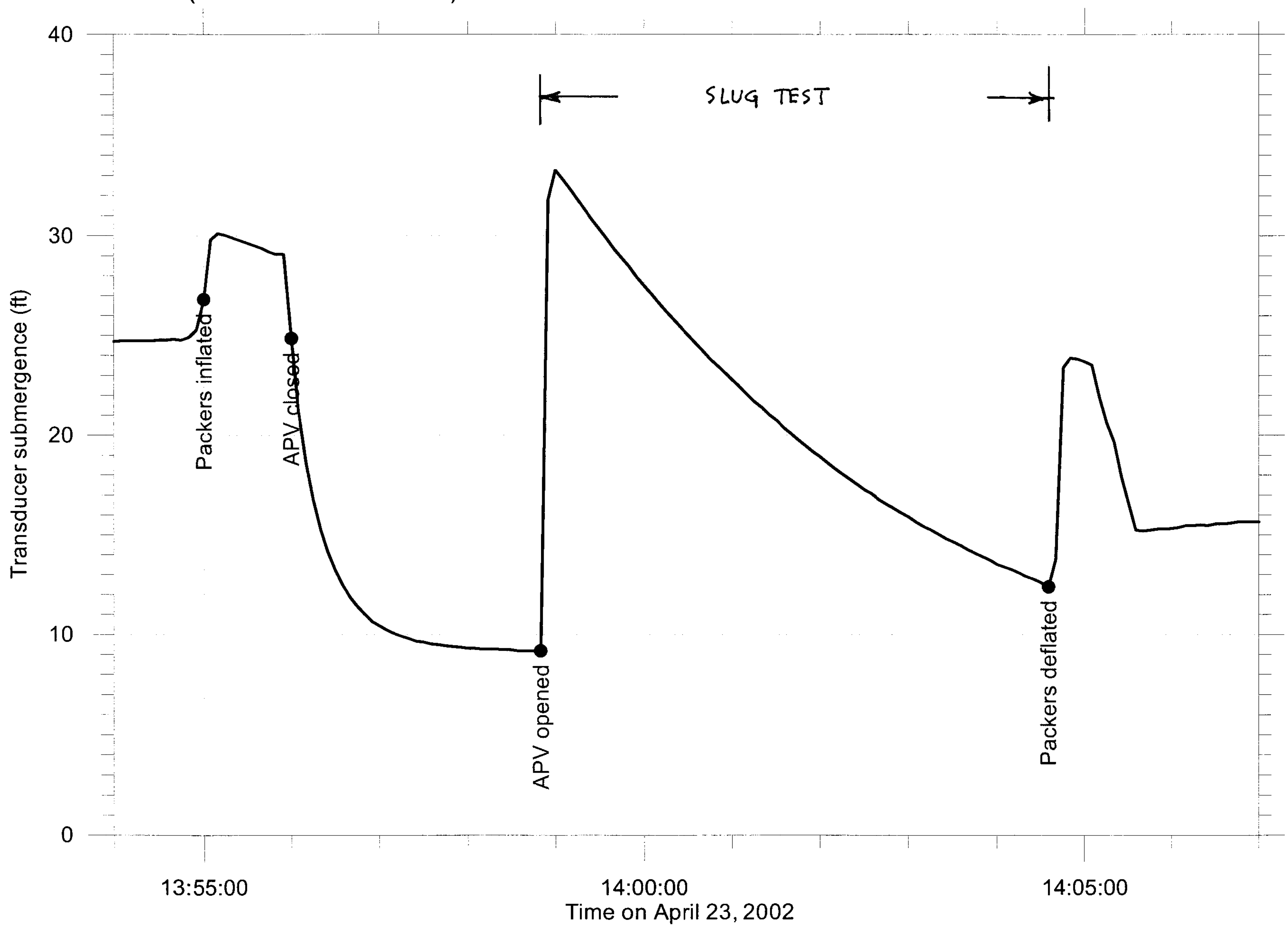
Initial Displacement: 9.23 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

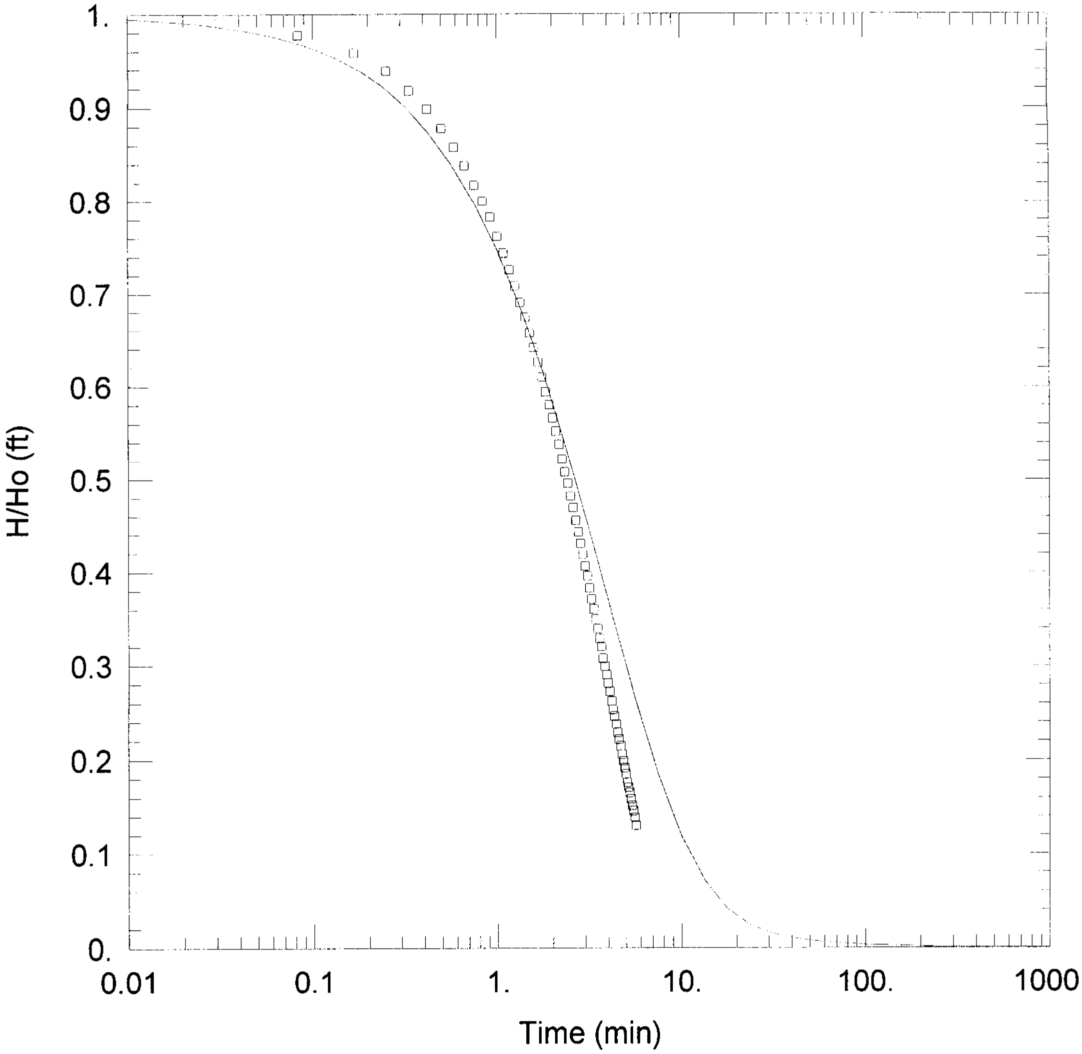
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
= 0.02881 ft^2/day
S = 1.E-06

H1U Packer Testing

Test 5 (585.23 to 580.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-5.aqt
Date: 11/26/02 Time: 10:52:17

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-5)

Initial Displacement: 24.63 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft

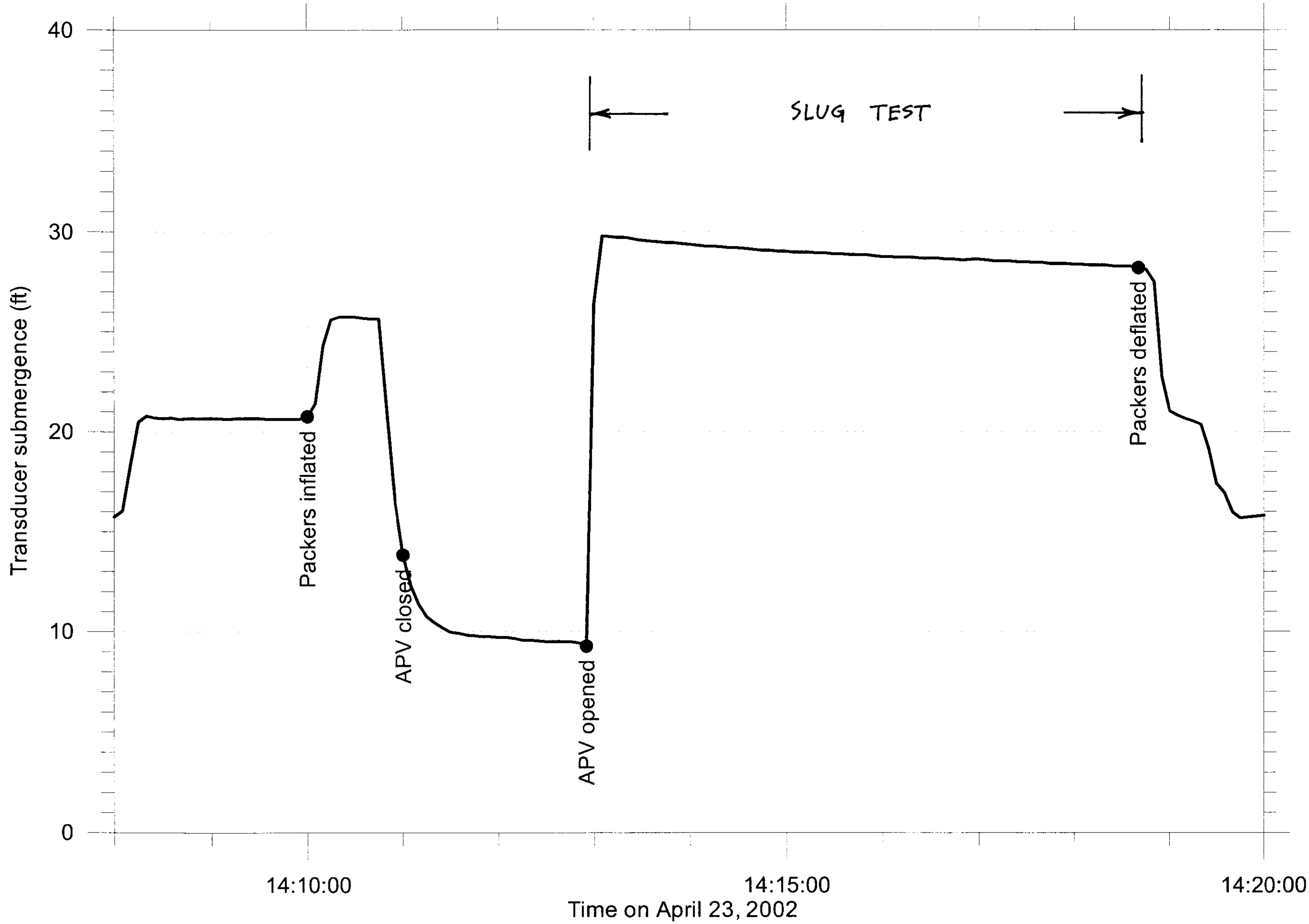
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

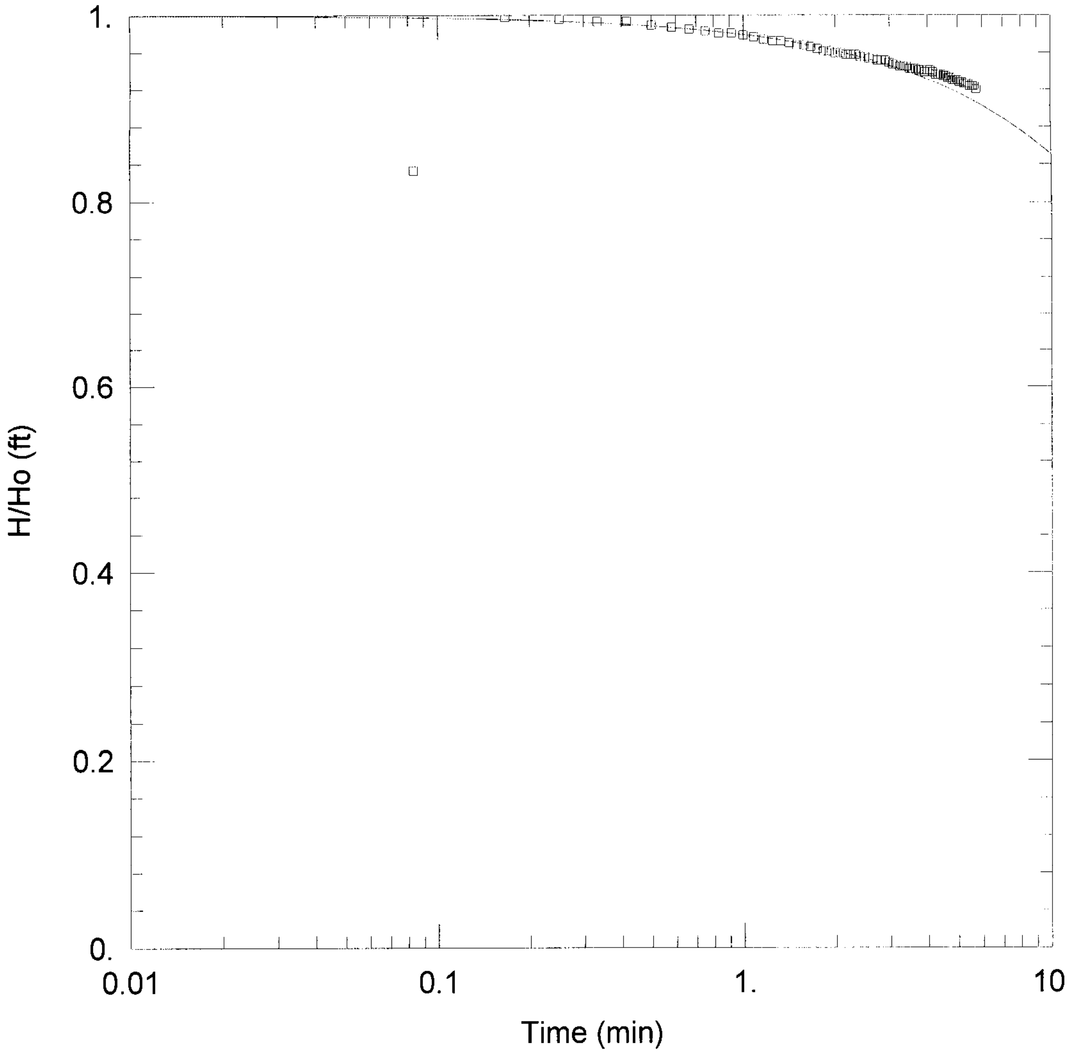
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 1.988 ft^2/day
S = 1.E-06

H1U Packer Testing
Test 6 (589.23 to 584.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-6.aqt
Date: 11/26/02 Time: 11:02:30

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-6)

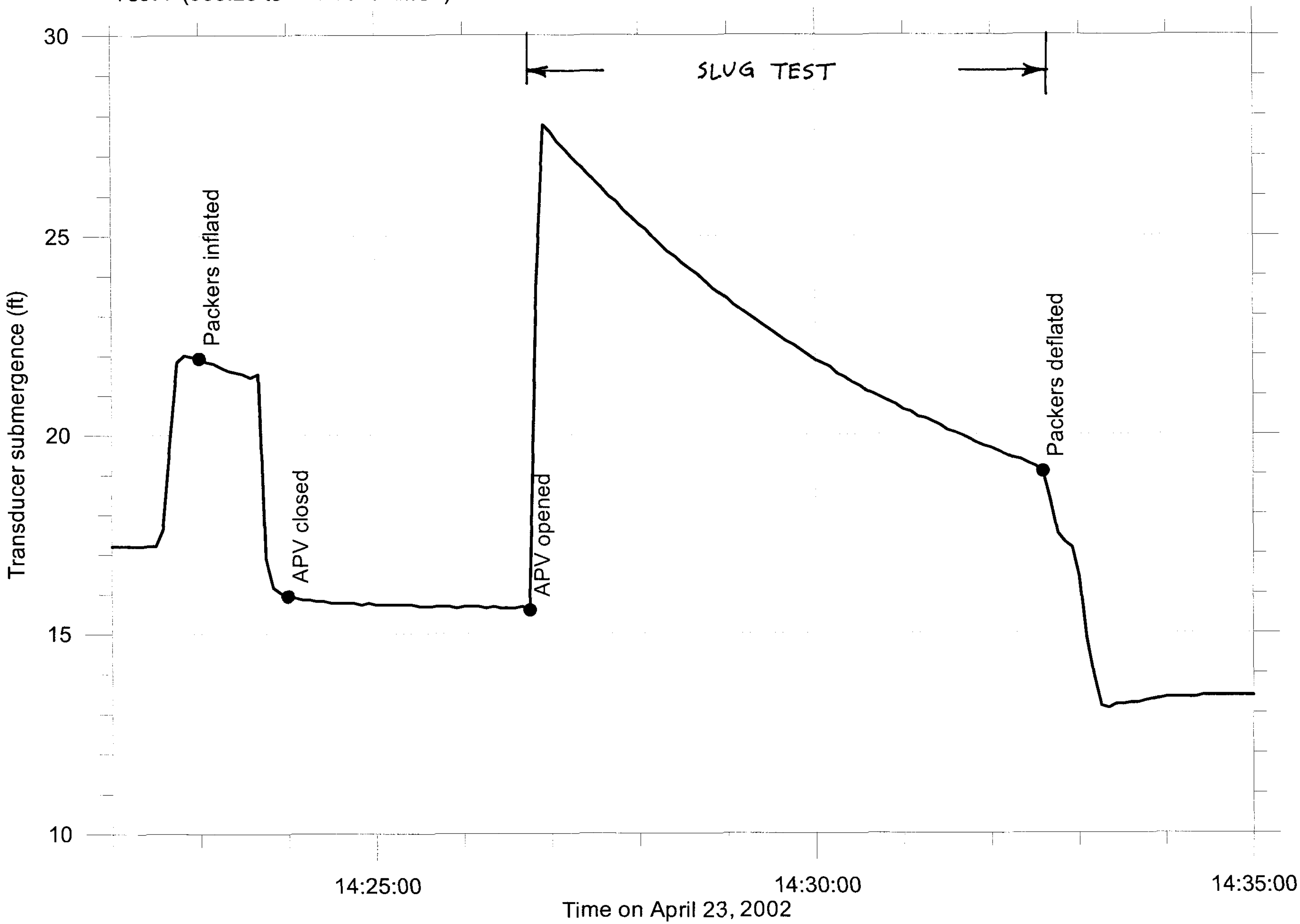
Initial Displacement: 20.58 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1616 ft
Total Well Penetration Depth: 5.2 ft

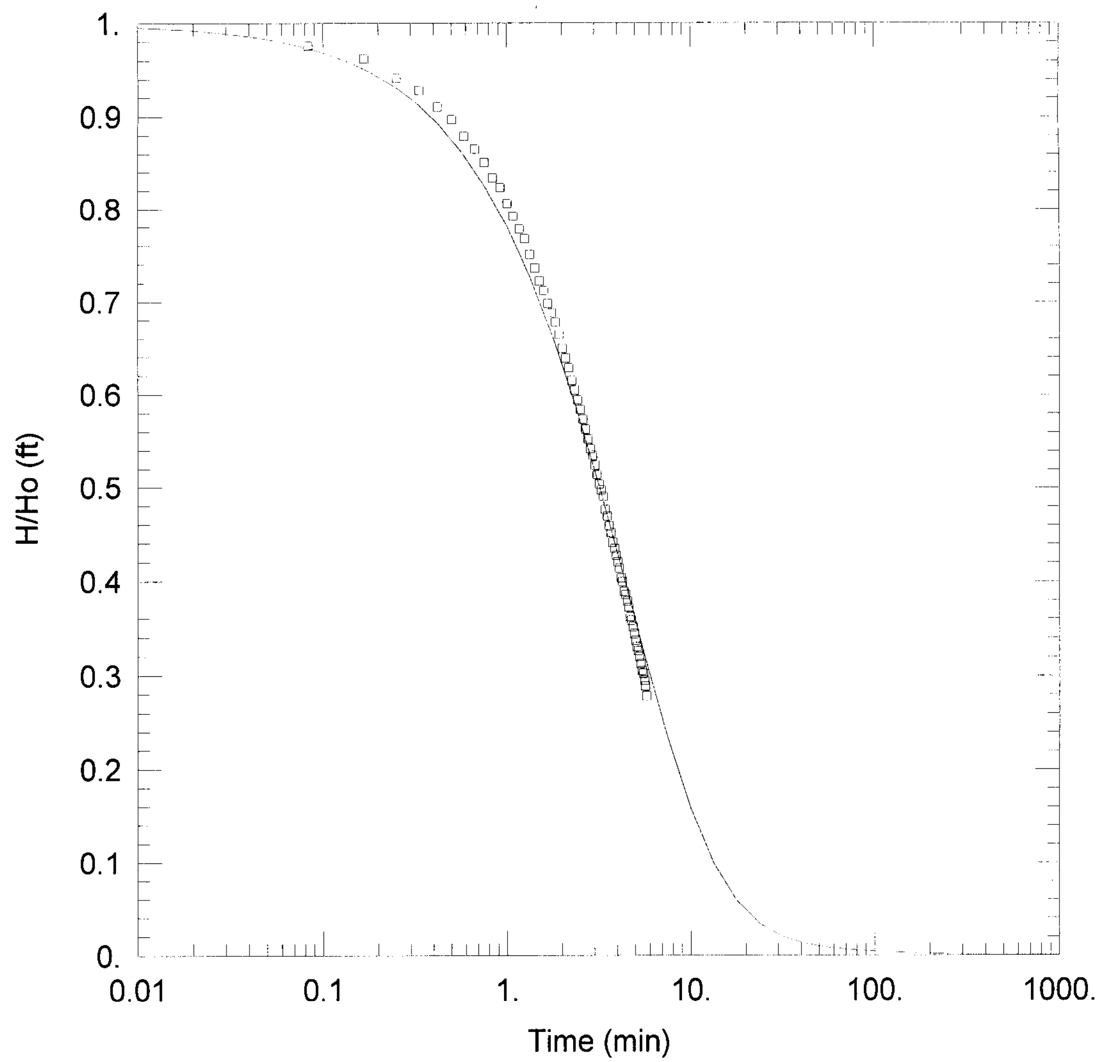
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1027 ft^2/day
S = 1.E-06

H1U Packer Testing

Test 7 (593.23 to 588.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-7.aqt
Date: 11/26/02 Time: 10:51:50

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-7)

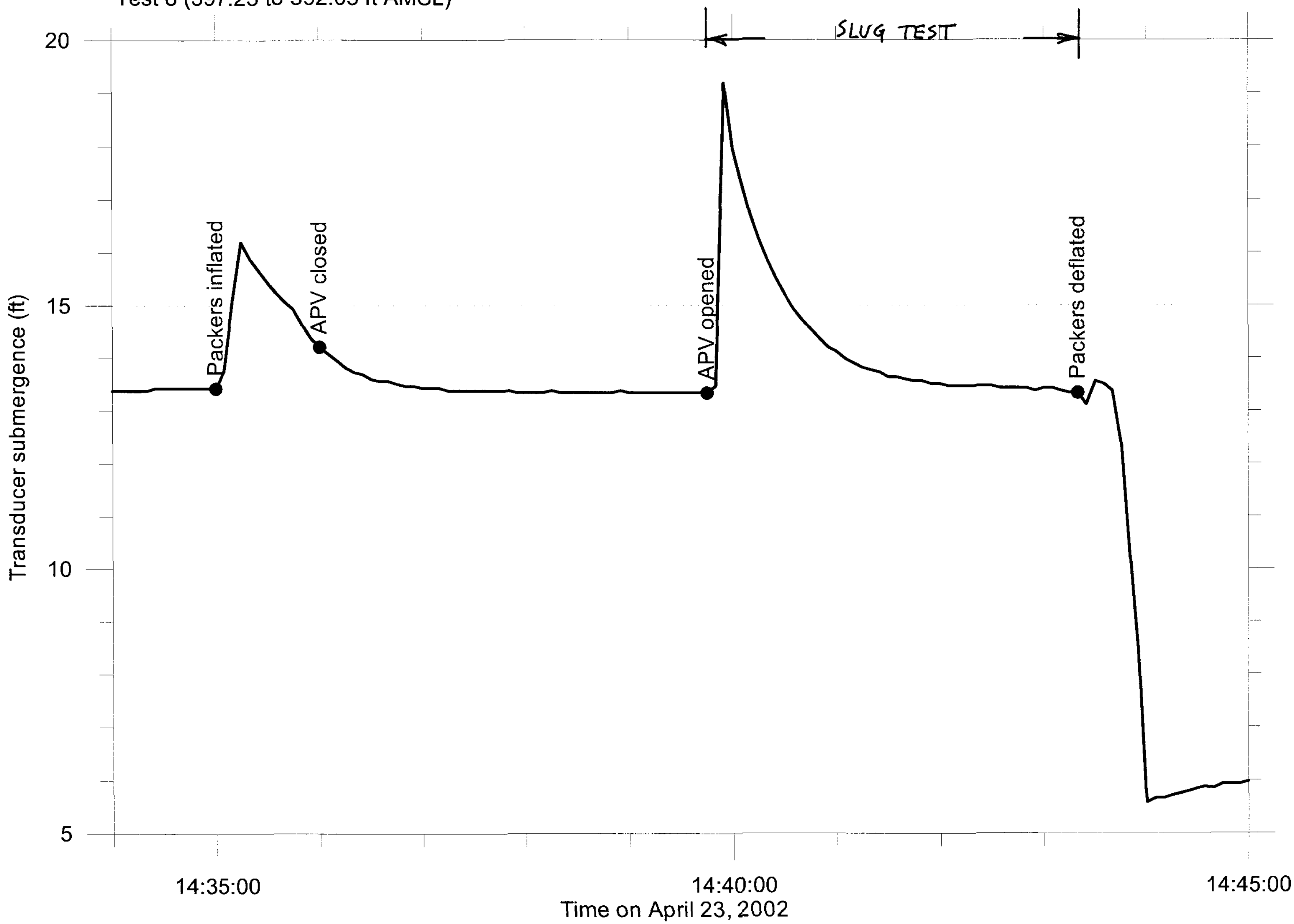
Initial Displacement: 12.47 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

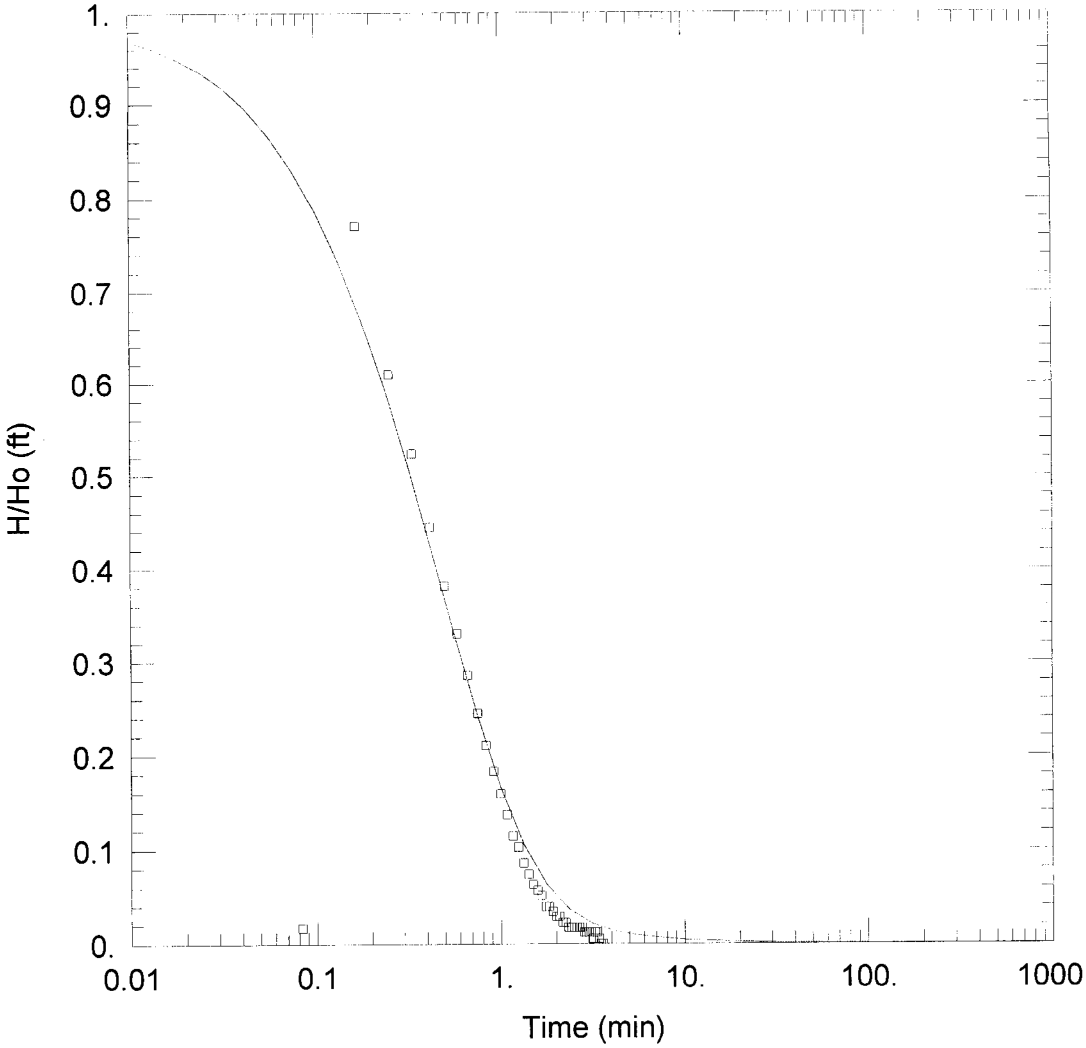
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

- = 1.658 ft^2/day
S = 1.E-06

H1U Packer Testing
Test 8 (597.23 to 592.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-8.aqt
Date: 11/26/02 Time: 10:51:39

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-8)

Initial Displacement: 7.596 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

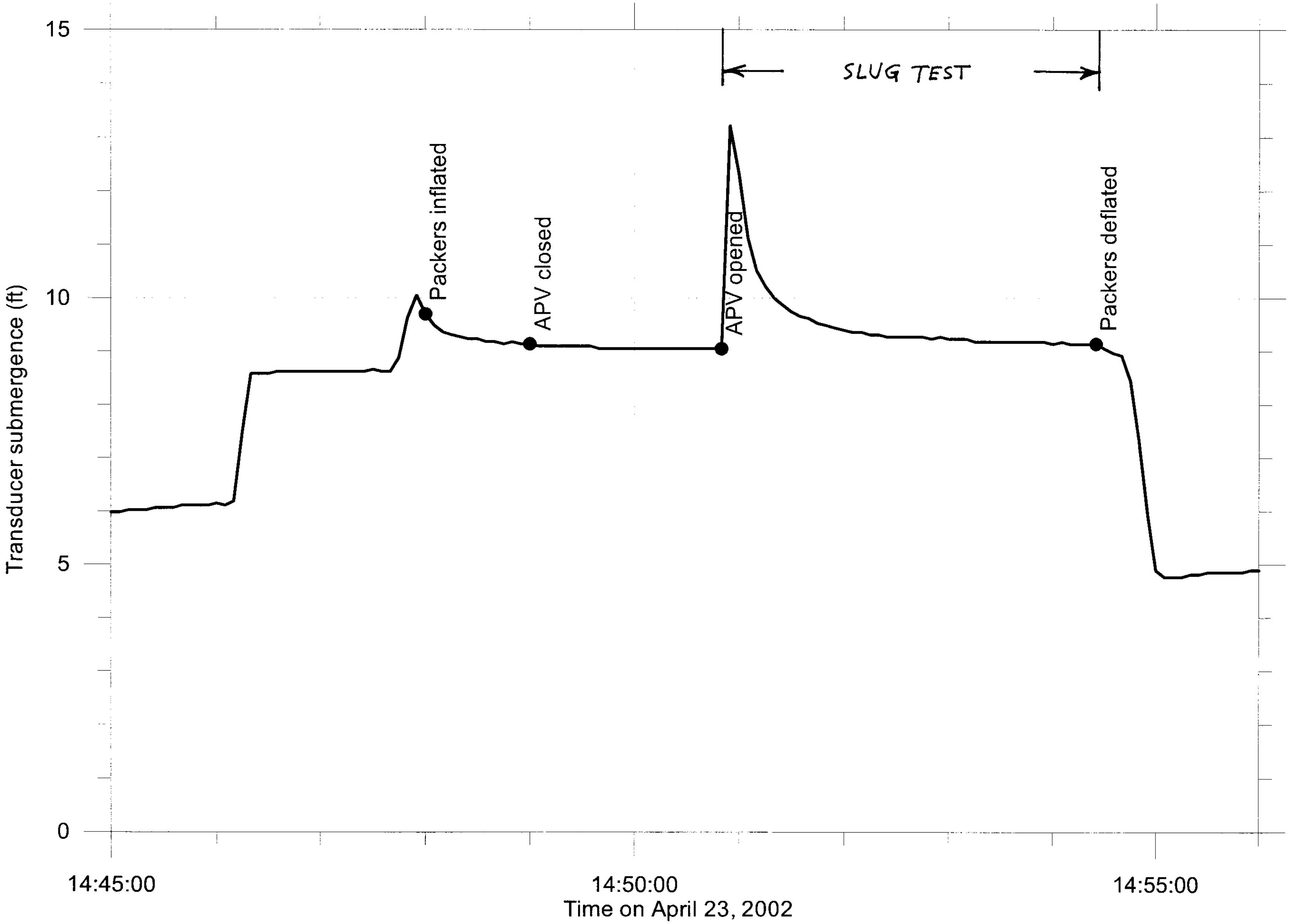
SOLUTION

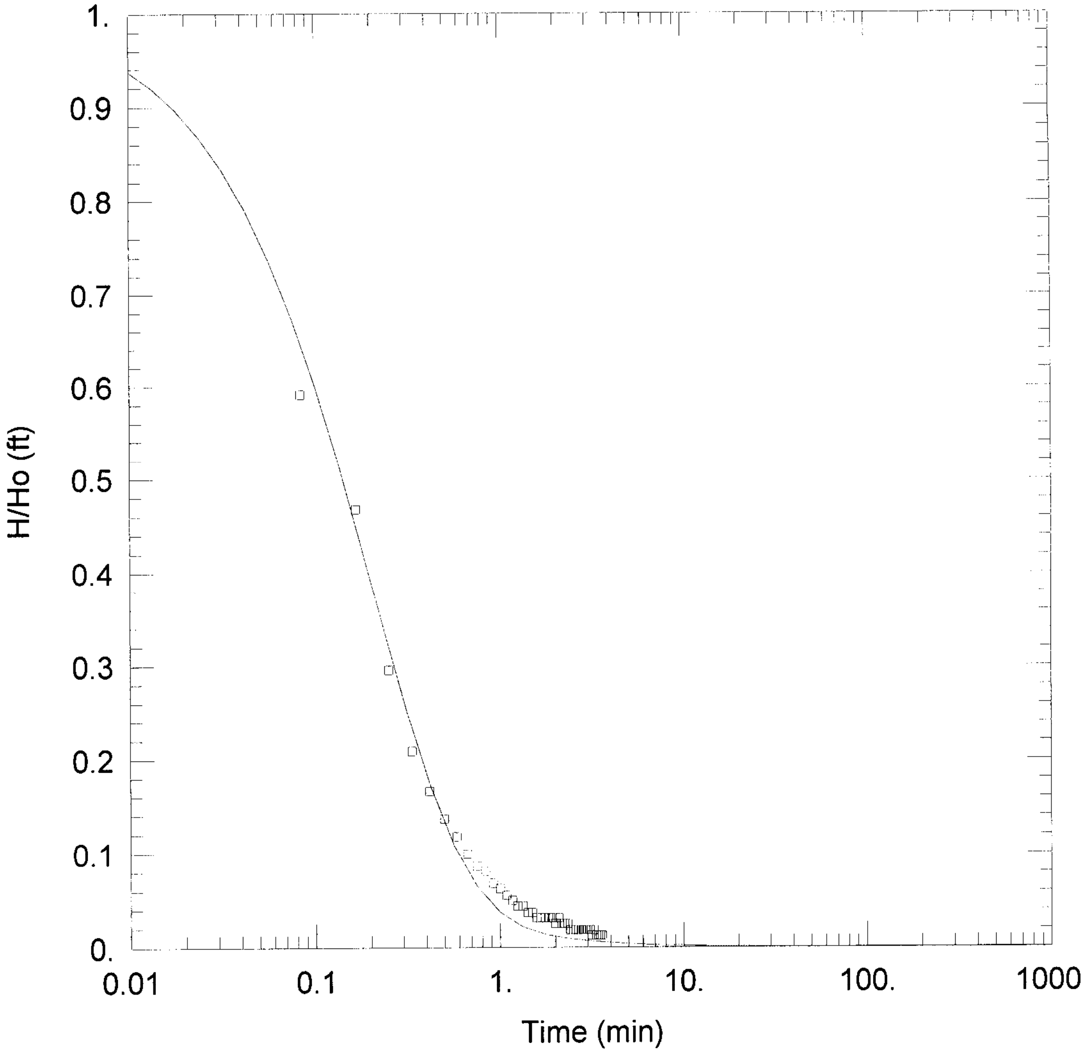
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 16.02 ft^2/day
S = 1.E-06

H1U Packer Testing

Test 9 (601.23 to 596.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-9.aqt
Date: 11/26/02 Time: 10:53:13

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

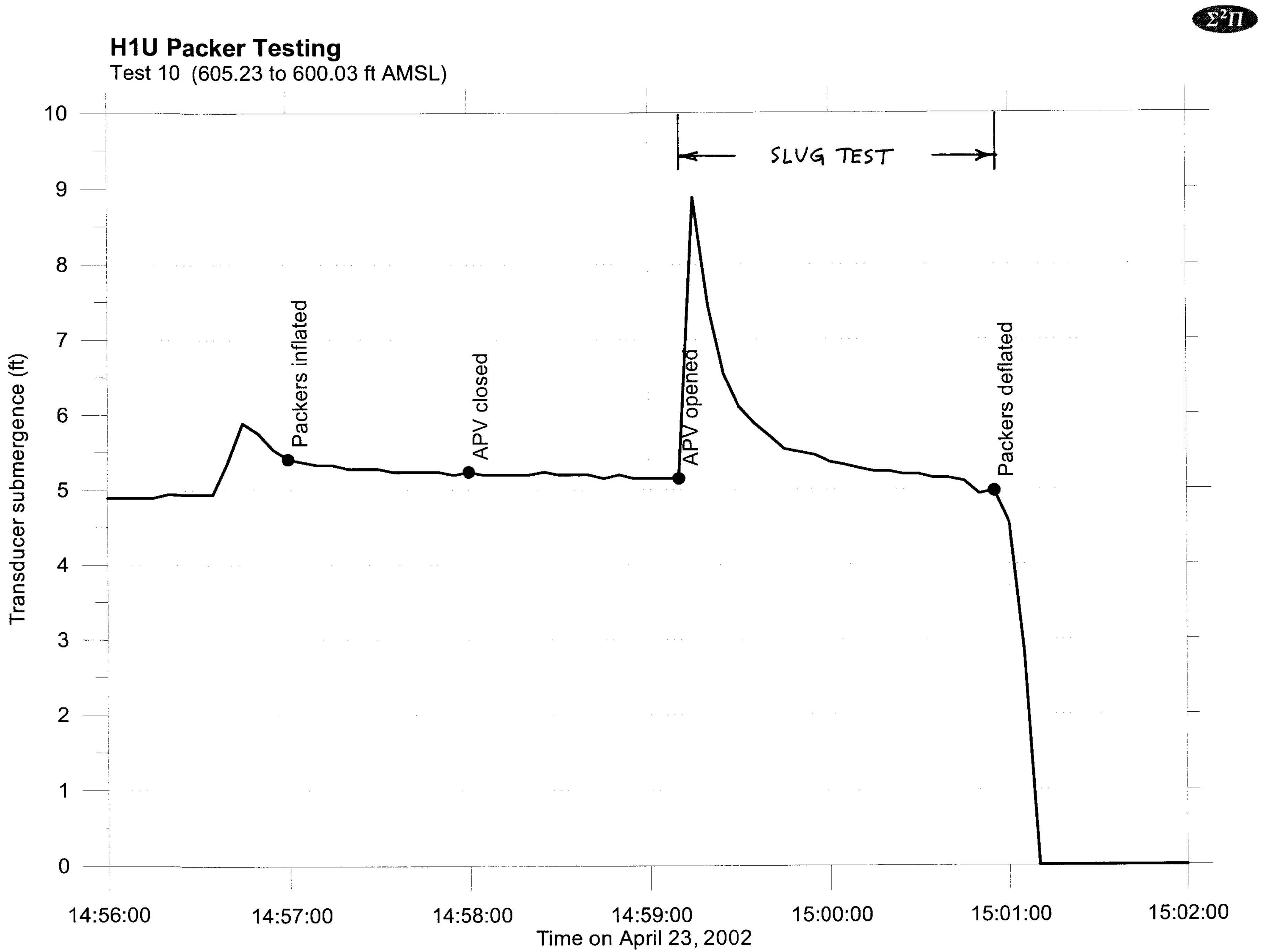
WELL DATA (H1U-9)

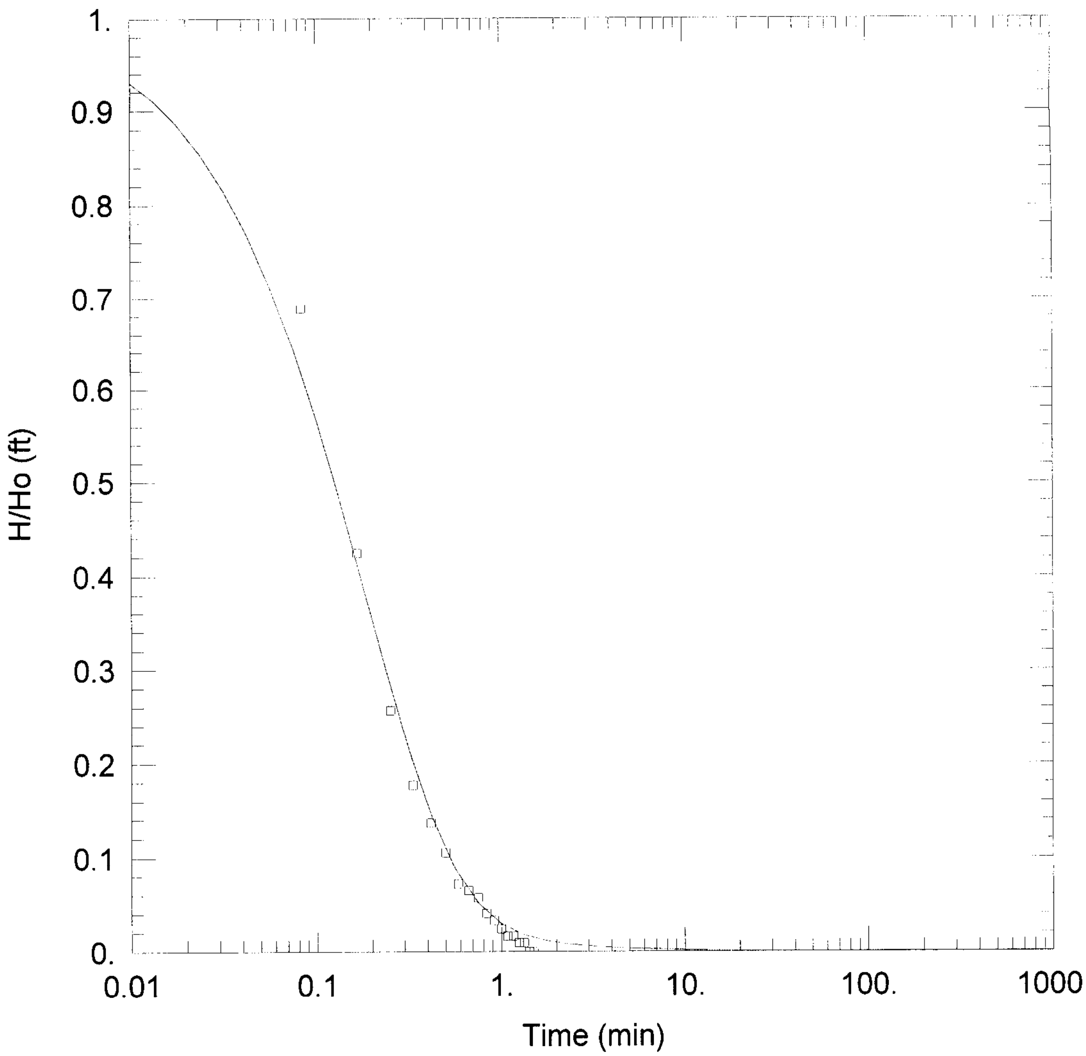
Initial Displacement: 7.035 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 37.26 ft^2/day
S = 1.E-06


H1U Packer Testing
Test 10 (605.23 to 600.03 ft AMSL)
Transducer submergence (ft)
10
9
8
7
6
5
4
3
2
1
0
Packers inflated
APV closed
APV opened
Packers deflated
SLUG TEST
14:56:00
14:57:00
14:58:00
14:59:00
15:00:00
15:01:00
15:02:00
Time on April 23, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-10.aqt
Date: 11/26/02 Time: 10:53:04

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-10)

Initial Displacement: 5.417 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

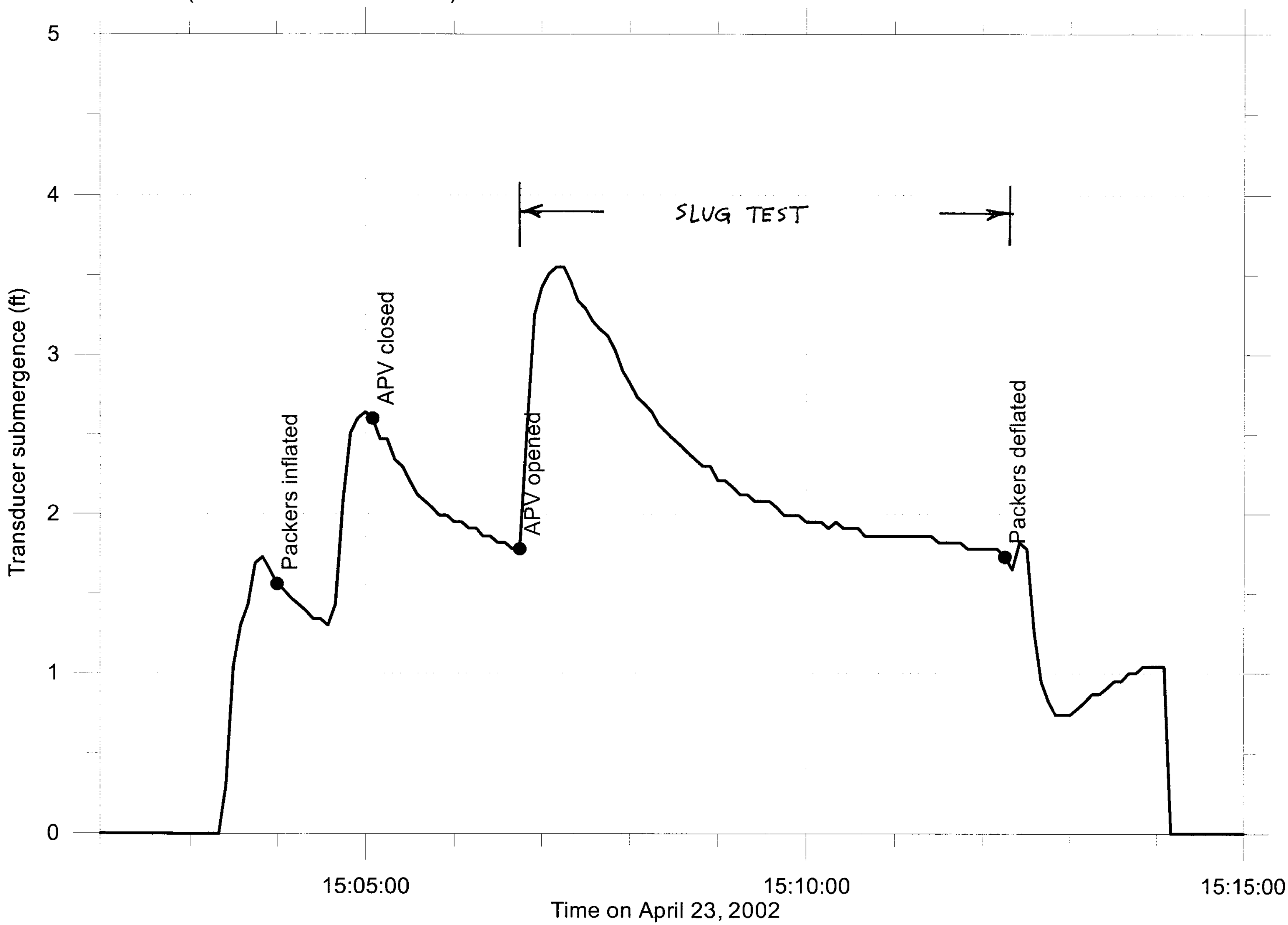
SOLUTION

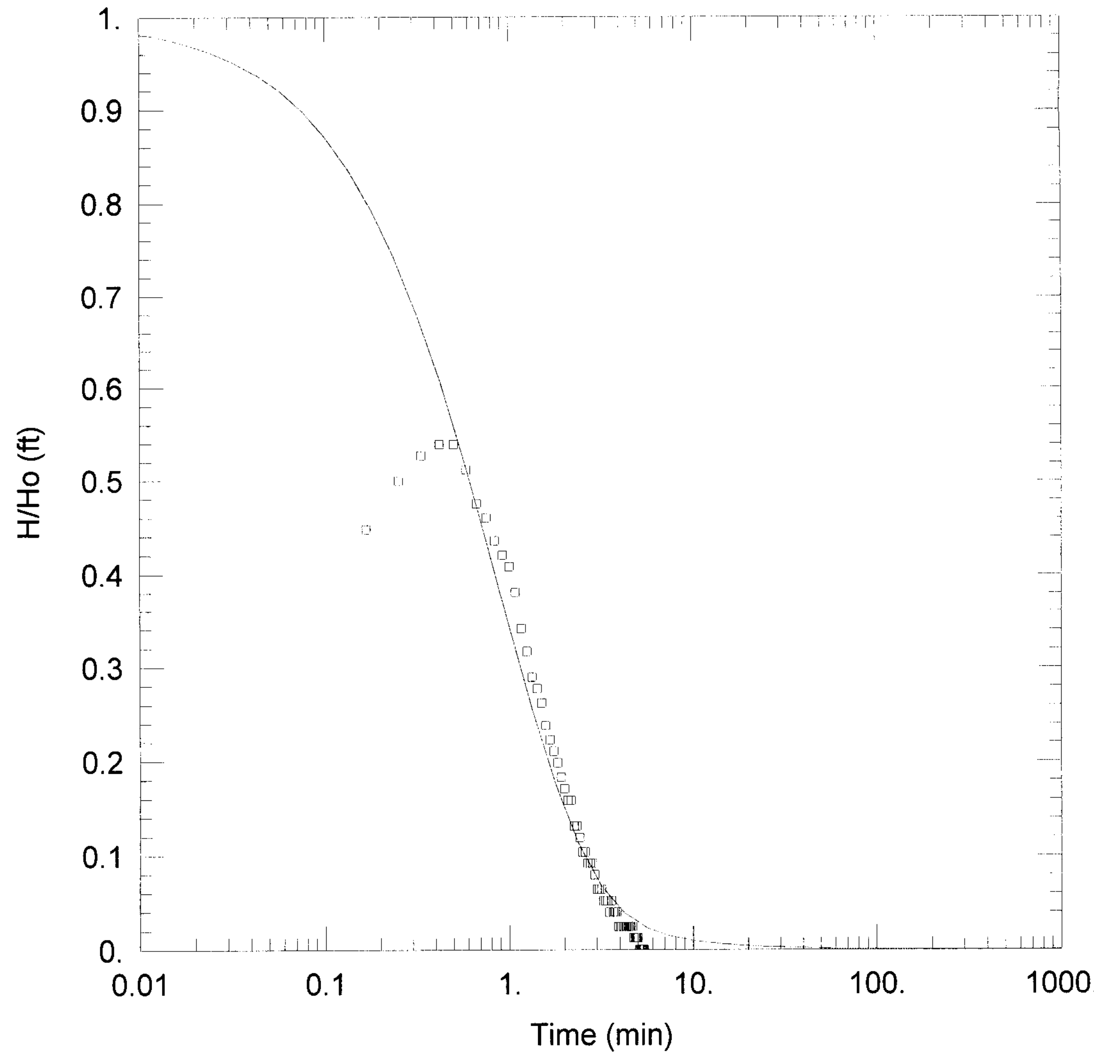
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 42.05 ft^2/day
S = 1.E-06

H1U Packer Testing

Test 11 (609.23 to 604.03 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1U\H1U-11.aqt
Date: 11/26/02 Time: 10:52:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1U-11)

Initial Displacement: 3.282 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 8.643 ft^2/day
S = 1.E-06

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

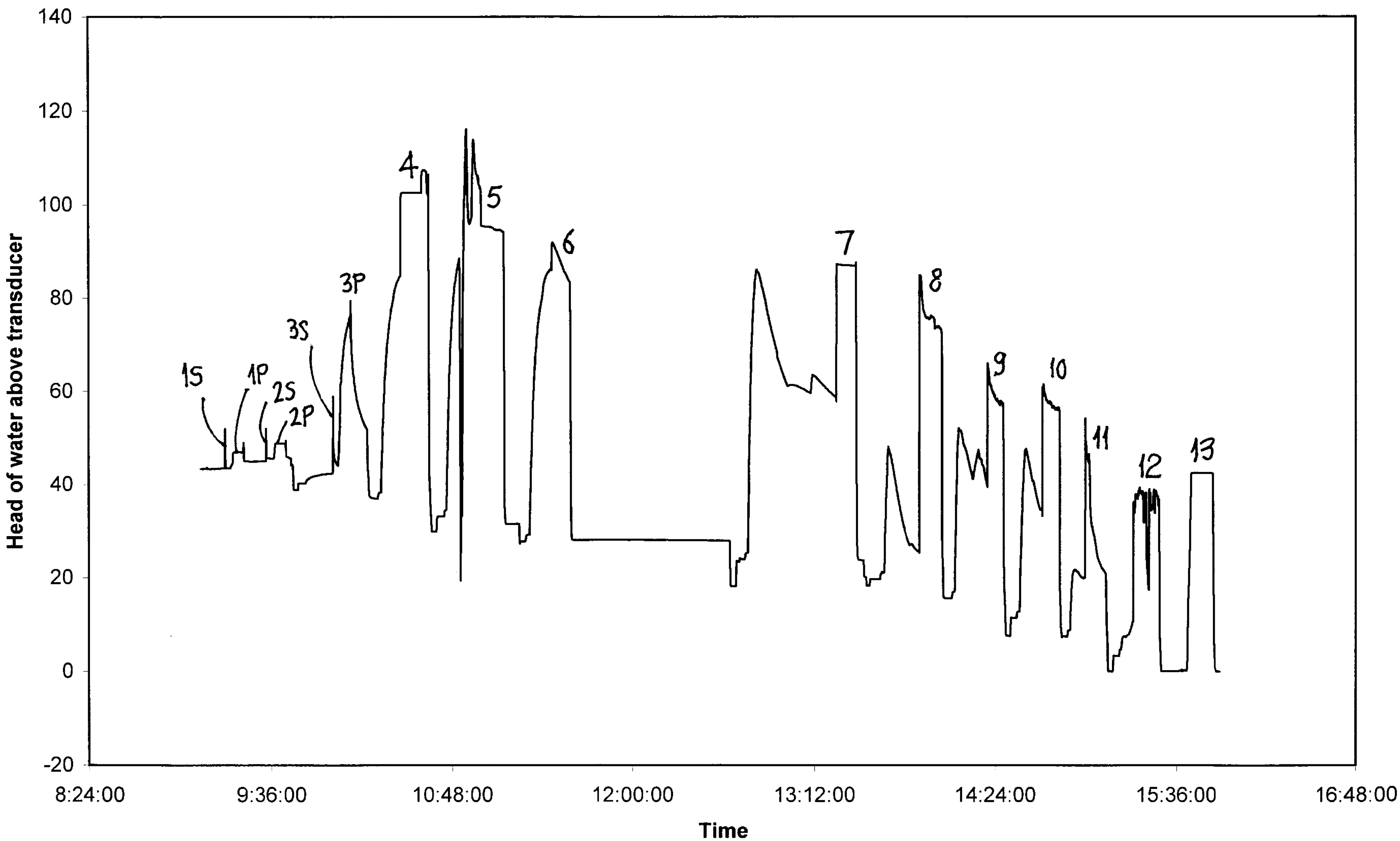
H1M

Testing Dates: April 24, 2002

Summary of Tests:

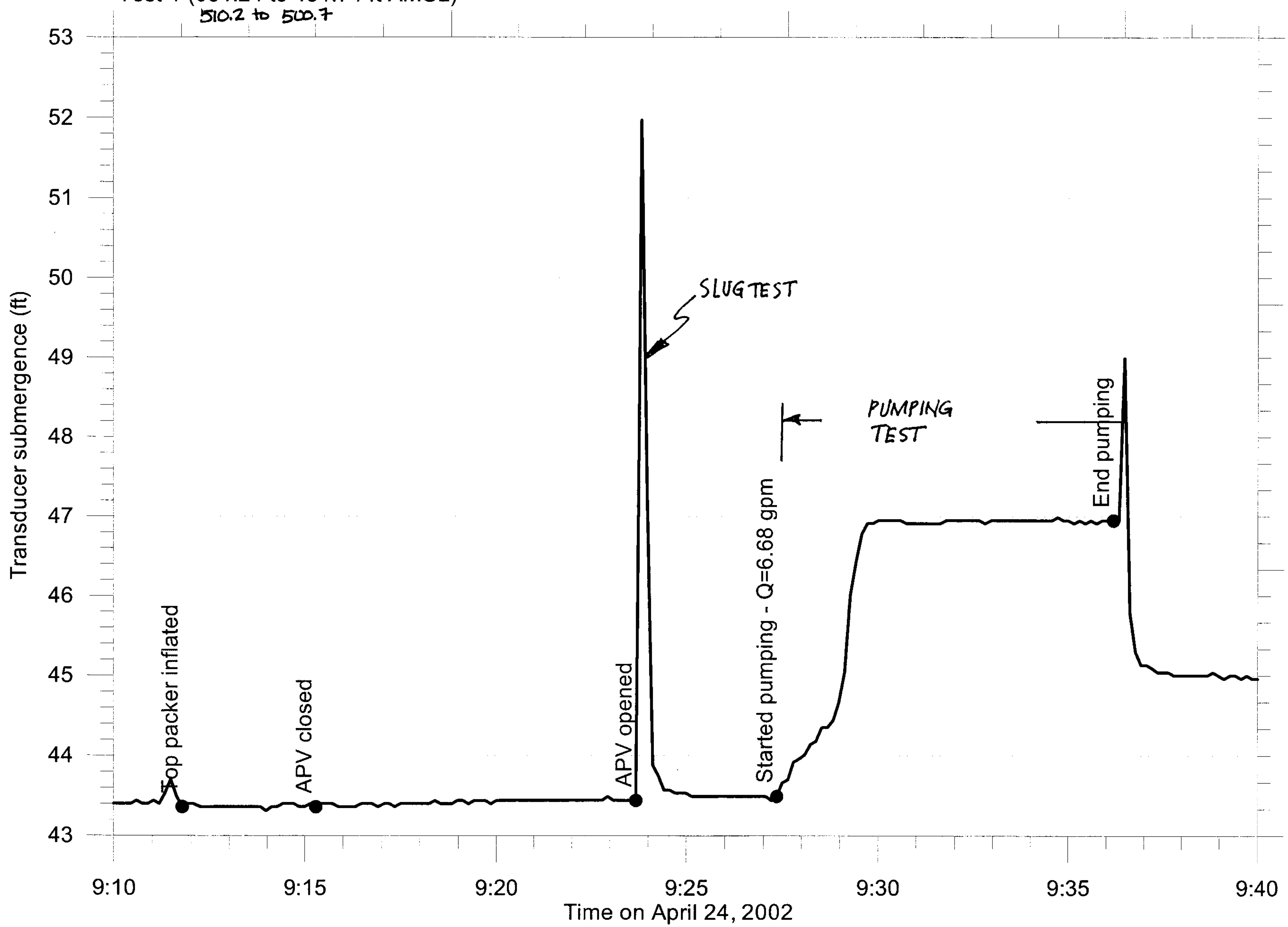
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
H1M	1P	510.24	500.74	5.5	see UR Memo
H1M	2P	510.24	505.04	1070	
H1M	3P	514.24	509.04	27	
H1M	4	518.24	513.04	<<1	
H1M	5	522.24	517.04	NIR	
H1M	6	526.24	521.04	2.5	
H1M	7	530.24	525.04	0.009	
H1M	8	534.24	529.04	1.8	
H1M	9	538.24	533.04	1.4	
H1M	10	542.24	537.04	0.81	
H1M	11	546.24	541.04	3.9	
H1M	12	550.24	545.04	<<1	
H1M	13	563.74	549.04	<<1	

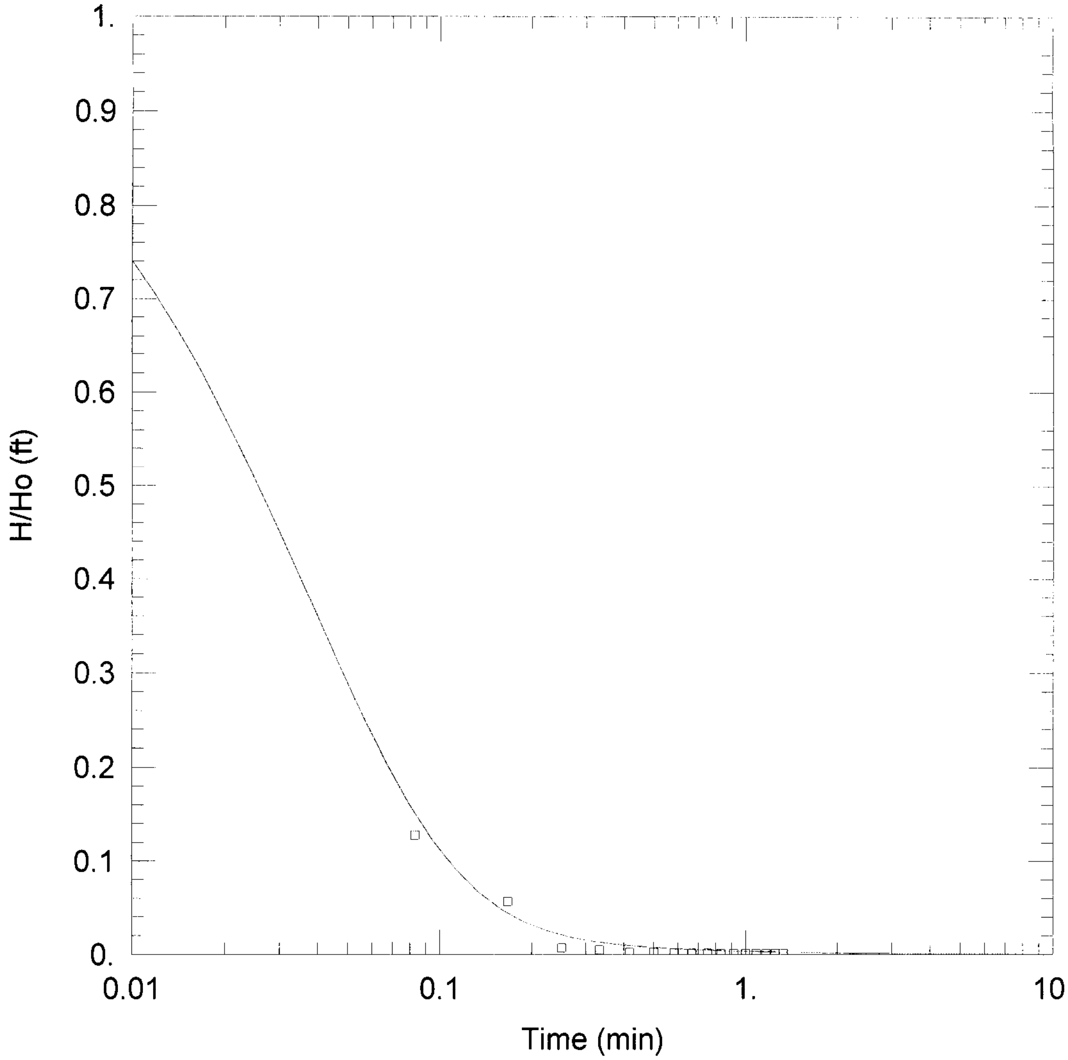
Monitoring Well H1M



H1M Packer Testing

Test 1 (~~501.24 to 491.74~~ ft AMSL)
510.2 to 500.7





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-1Slug.aqt
Date: 01/15/03 Time: 10:48:46

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

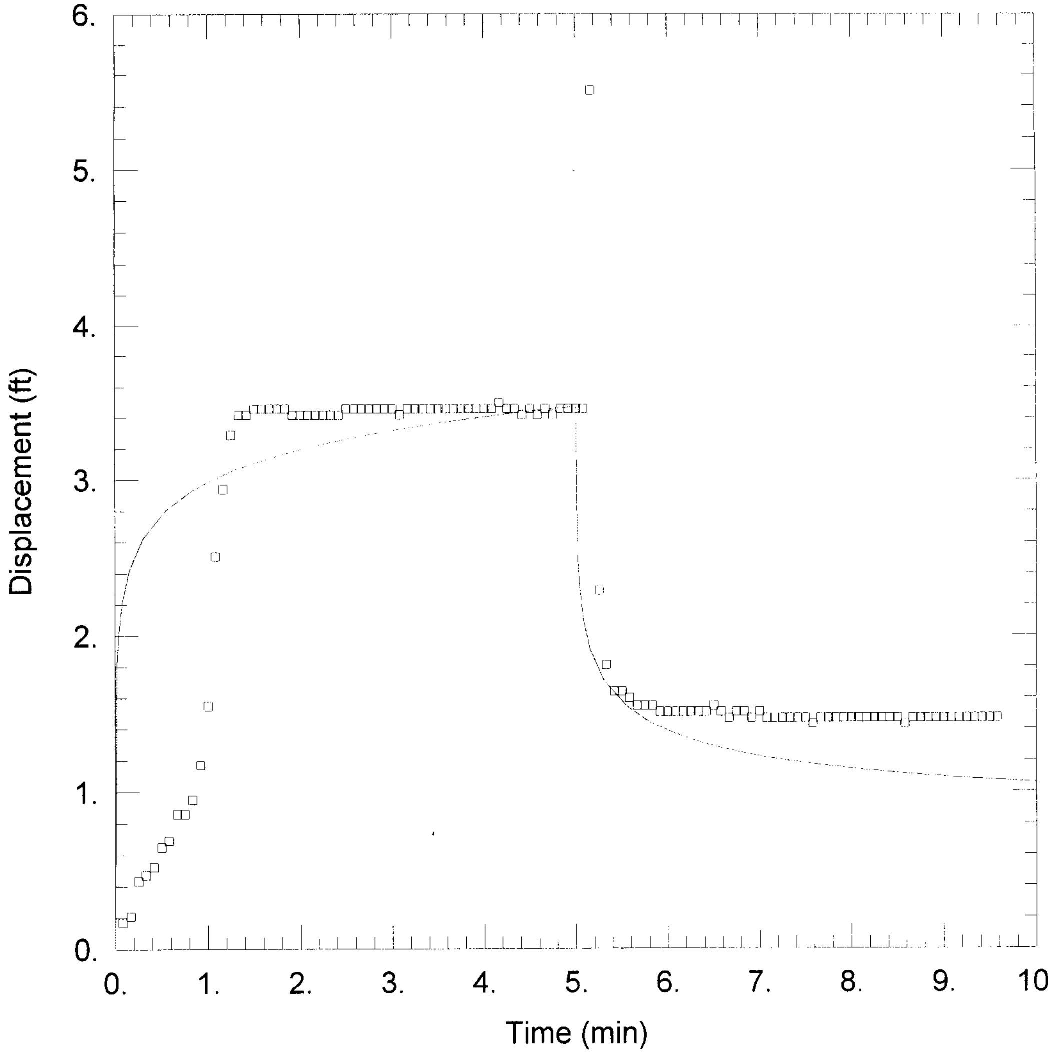
WELL DATA (H1M-1 Slug)

Initial Displacement: 66.65 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 205.6 ft^2/day
S = 1.E-06



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-1.aqt
Date: 01/13/03 Time: 10:05:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
H1M-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
H1M-1	0	0

SOLUTION

Aquifer Model: Confined

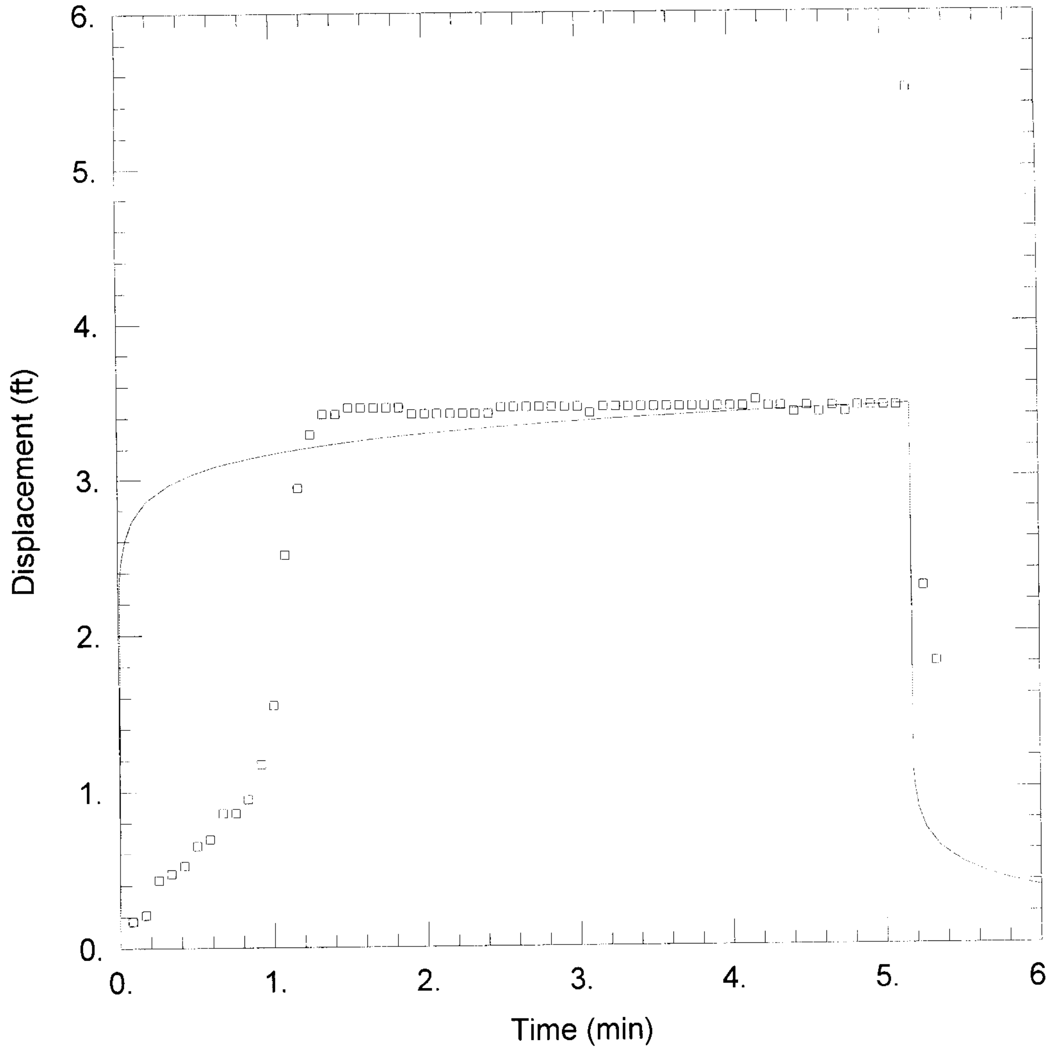
= 336.8 ft^2/day
Sw = -4.853
P = 1.5

Solution Method: Theis (Step Test)

S = 1.E-06
C = 1. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 2.399Q + 1.Q^{1.5}$
W.E. = 170.5%



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-1 pumping only.aqt
Date: 01/13/03 Time: 09:18:07

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
H1M-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
H1M-1	0	0

SOLUTION

Aquifer Model: Confined

= 557.7 ft^2/day
Sw = 0.
P = 3.

Solution Method: Theis (Step Test)

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 3.546Q + $0.Q^{3.}$
W.E. = 100.%

H1M, Test 1P

Alternative analyses

Average Q: 6.7 gpm
"Drawdown" (s or ΔH): 3.5 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$$\underline{\underline{T = 479\ ft^2/d}}$$

<u>T by Thiem solution:</u>

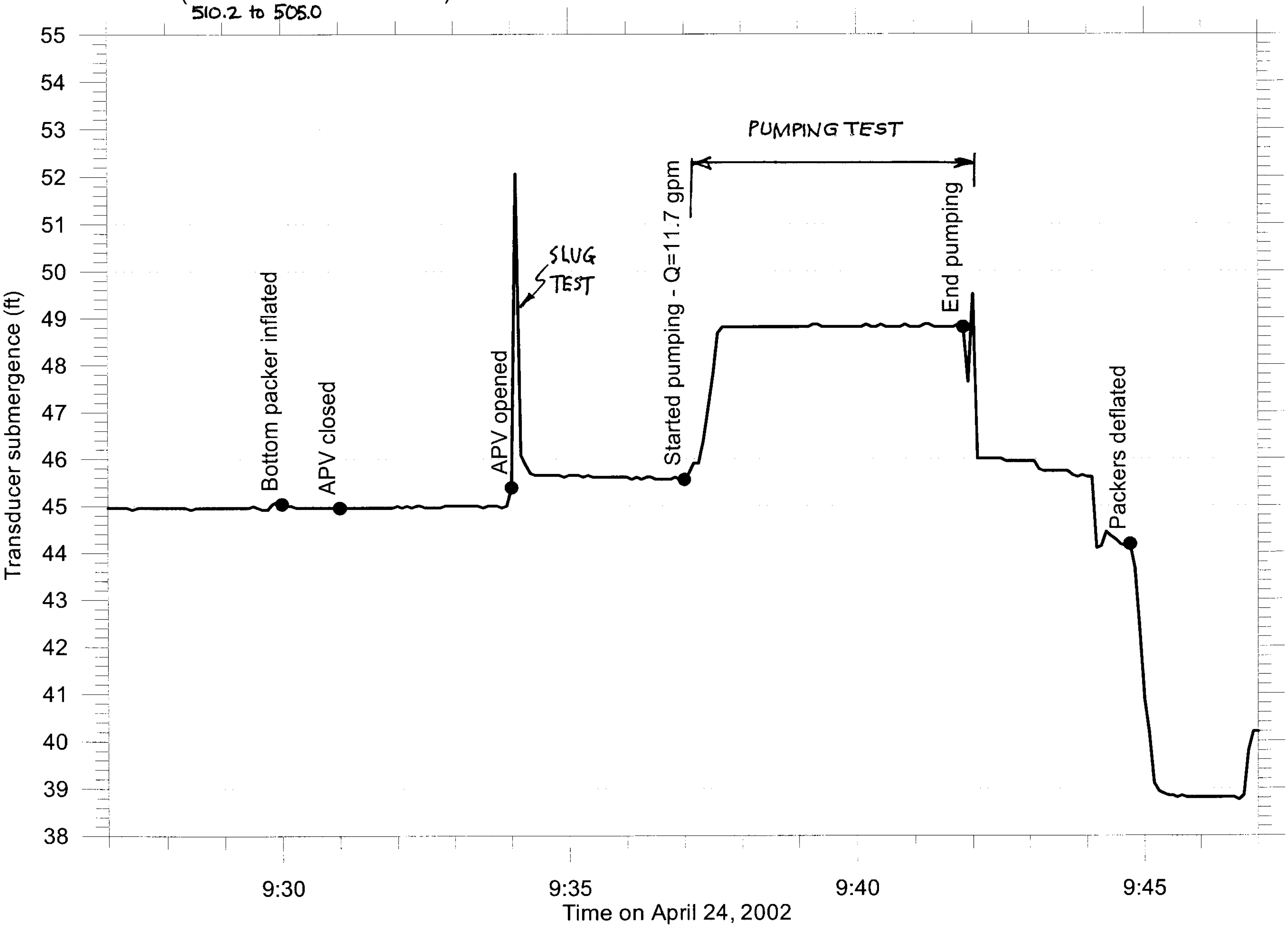
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

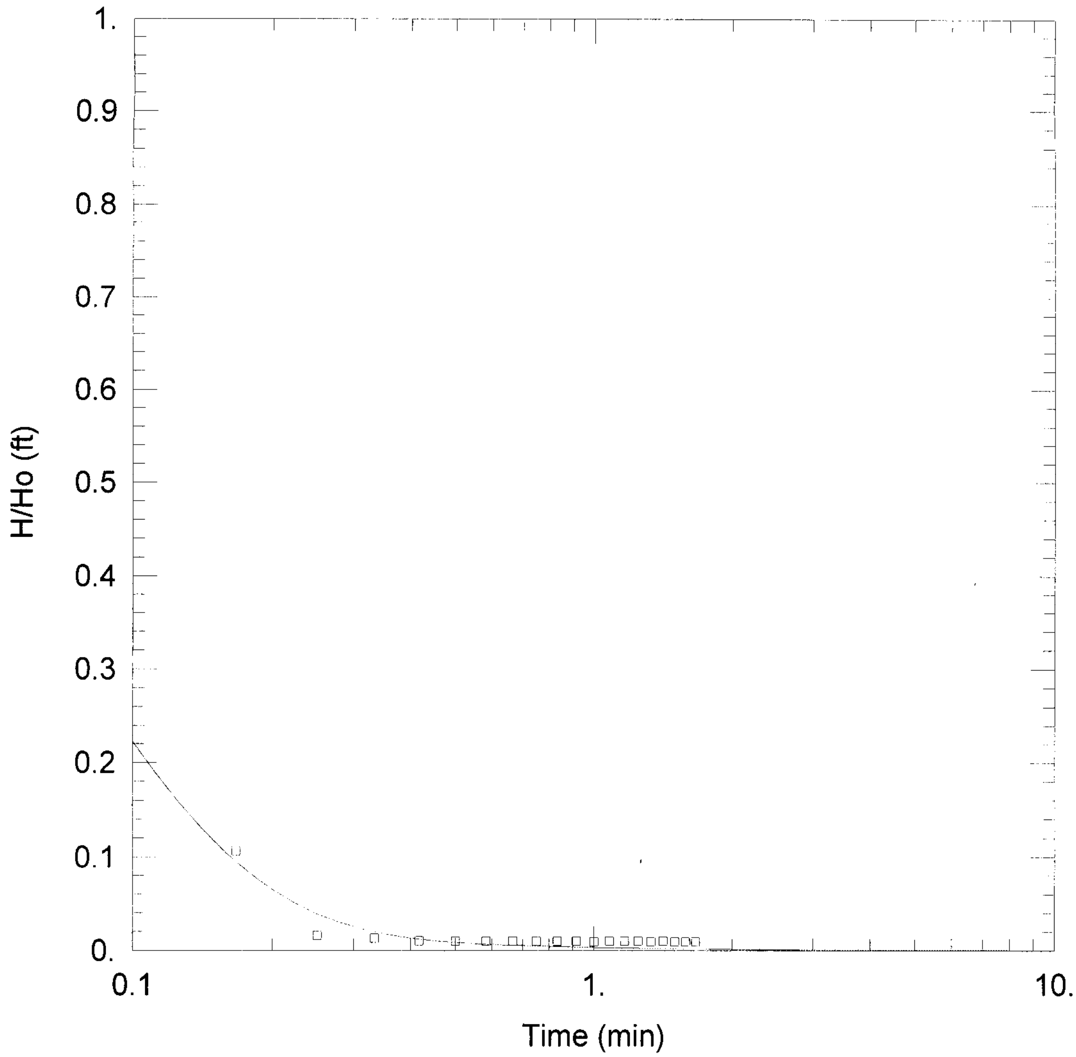
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

$$\underline{\underline{T = 312\ ft^2/d}}$$

H1M Packer Testing

Test 2 (~~501.24 to 496.04~~ ft AMSL)
510.2 to 505.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-2S.aqt
Date: 01/13/03 Time: 11:13:16

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

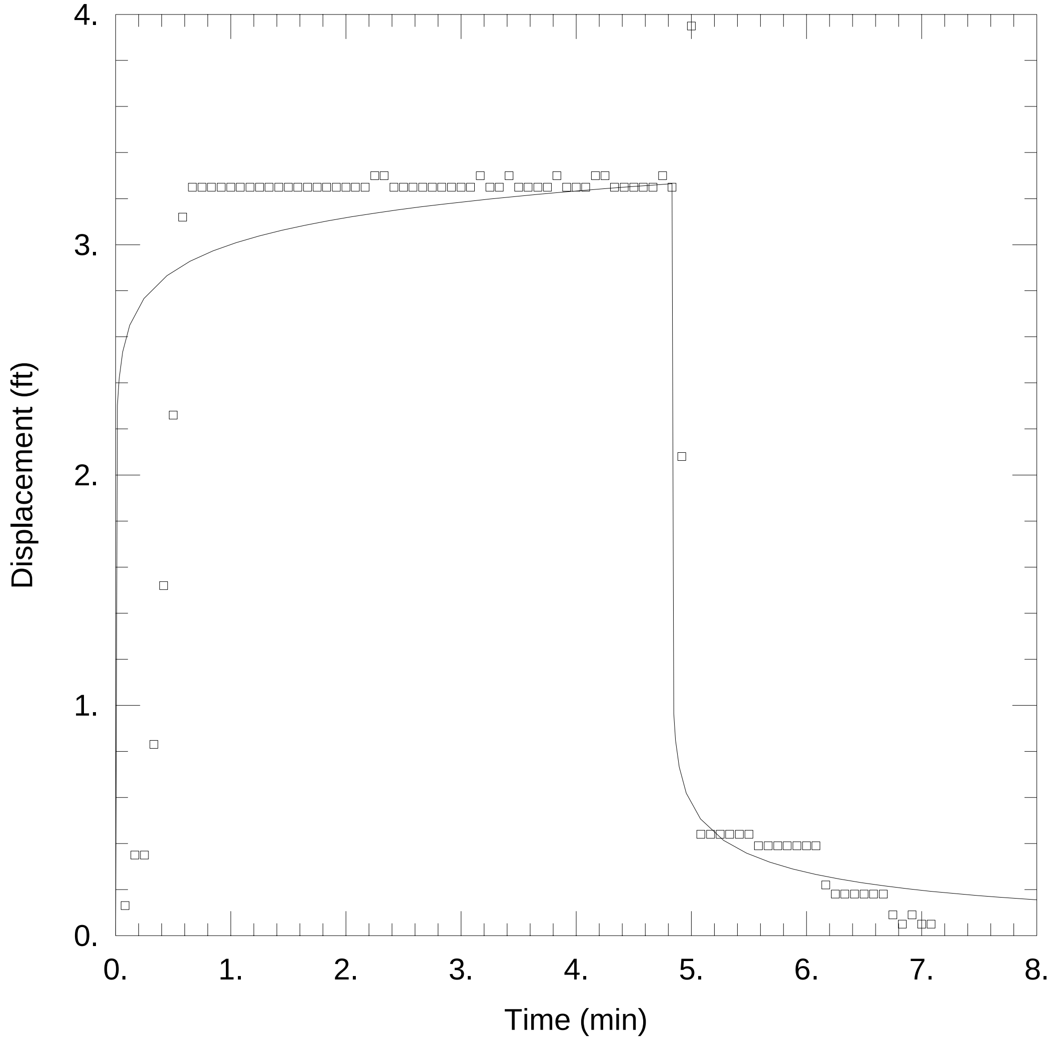
WELL DATA (H1M-2S)

Initial Displacement: 66.35 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 220.2 ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-2.aqt
Date: 01/22/03 Time: 14:40:37

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
H1M-2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ H1M-2	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 1069.7 ft^2/day
Sw = 0.
P = 2.

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 1.919Q + 0.$Q^{2.}$
W.E. = 100.%

H1M, Test 2P

Alternative analyses

Average Q: 11.7 gpm

"Drawdown" (s or ΔH): 3.25 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 900\ ft^2/d}}$

<u>T by Thiem solution:</u>

$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

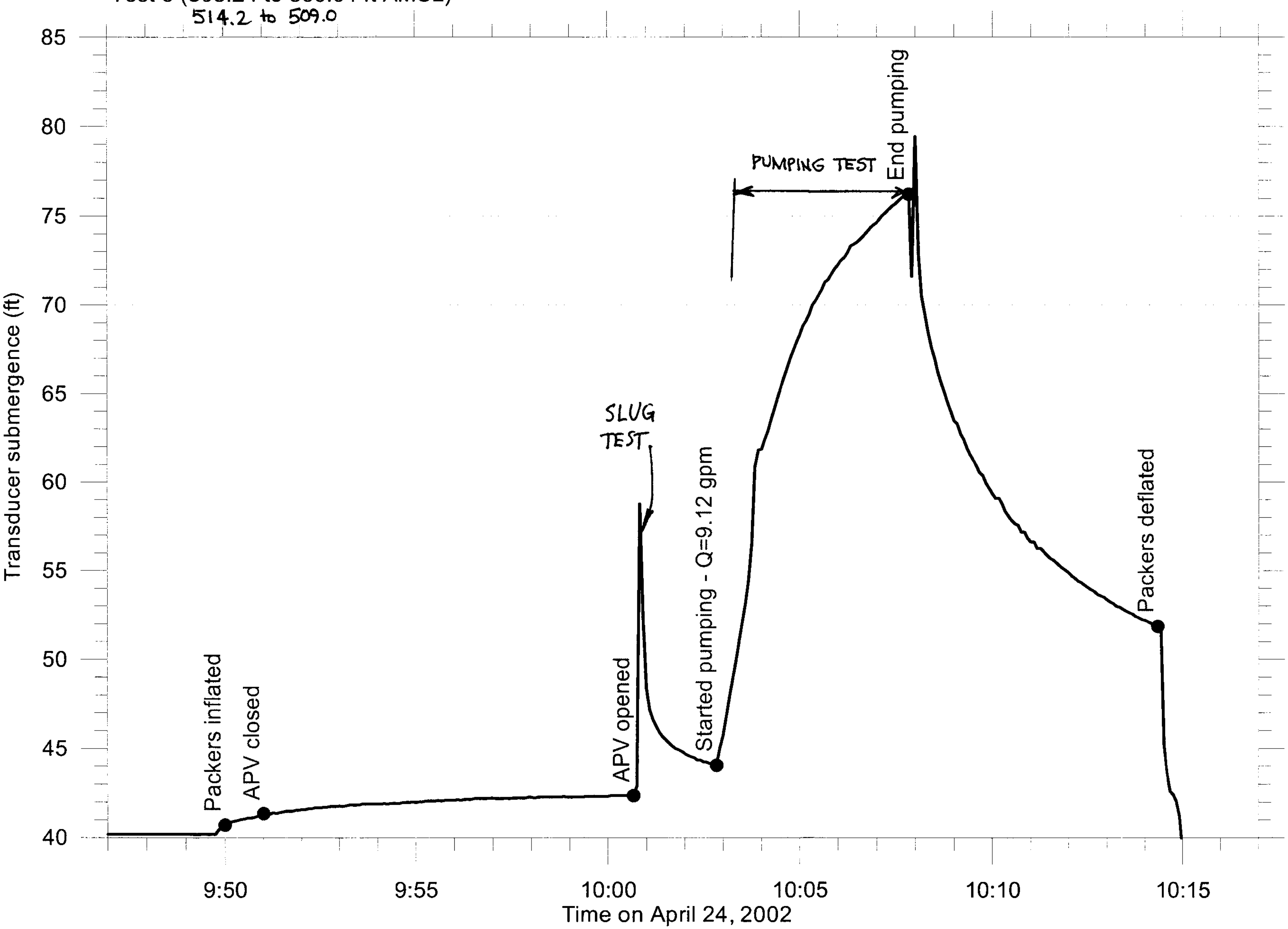
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)

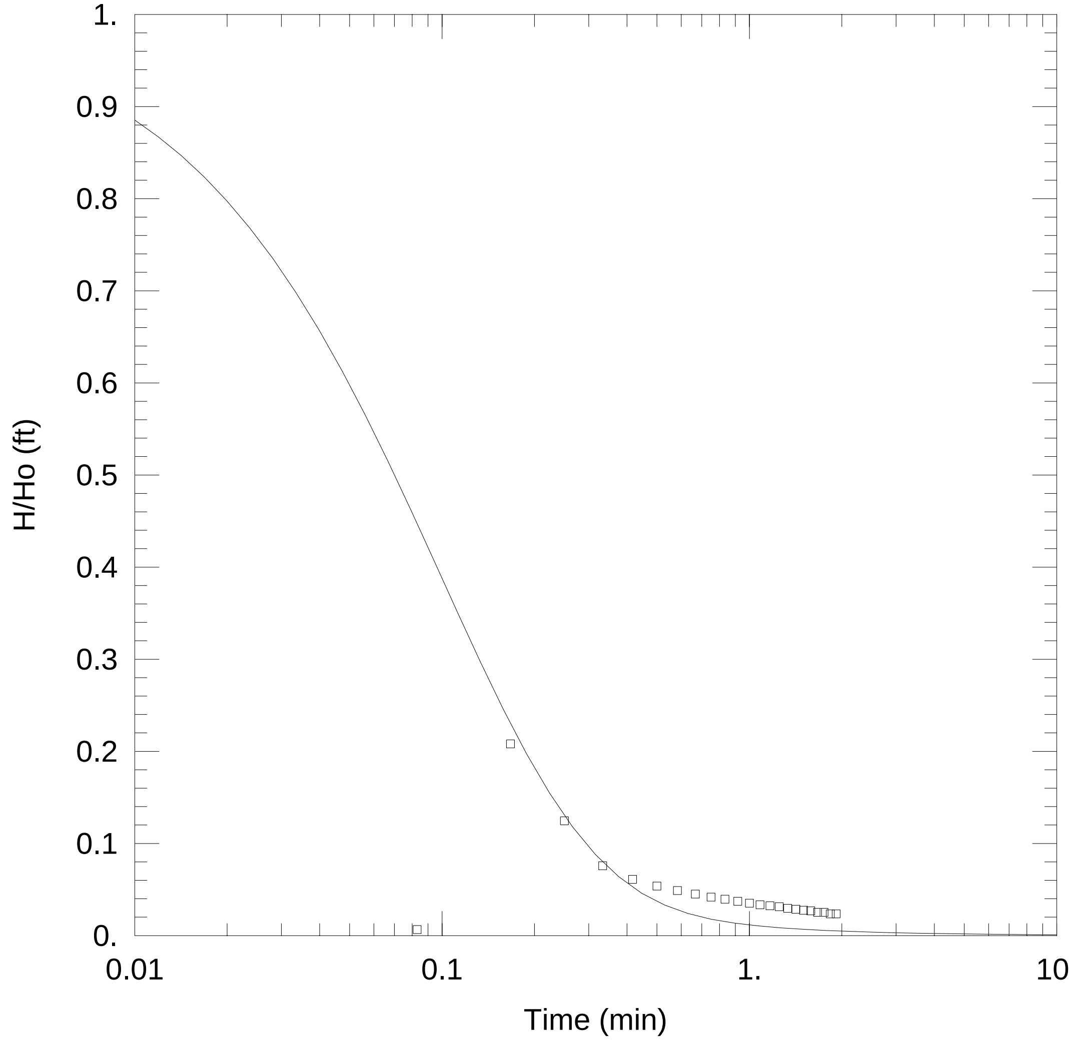
$r_w = 3^7/_8" = 0.1615$ ft

$\underline{\underline{T = 586\ ft^2/d}}$

H1M Packer Testing

Test 3 (~~505.24 to 500.04~~ ft AMSL)
514.2 to 509.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-3S.aqt
Date: 01/22/03 Time: 14:41:21

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

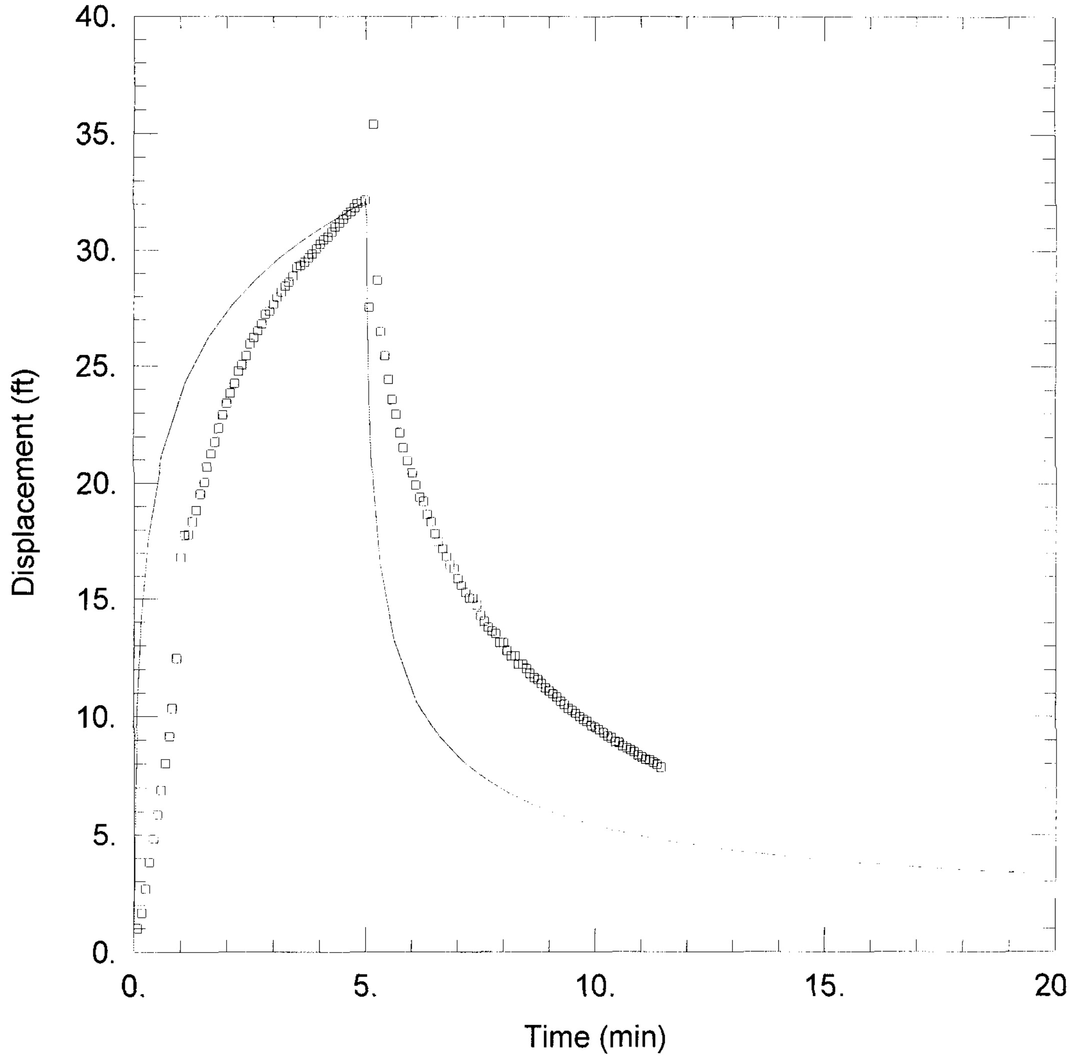
WELL DATA (H1M-3S)

Initial Displacement: 78.9 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 75.18 ft^2/day S = 1.E-06



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-3.aqt
Date: 11/26/02 Time: 11:07:00

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
H1M-3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ H1M-3	0	0

SOLUTION

Aquifer Model: Confined

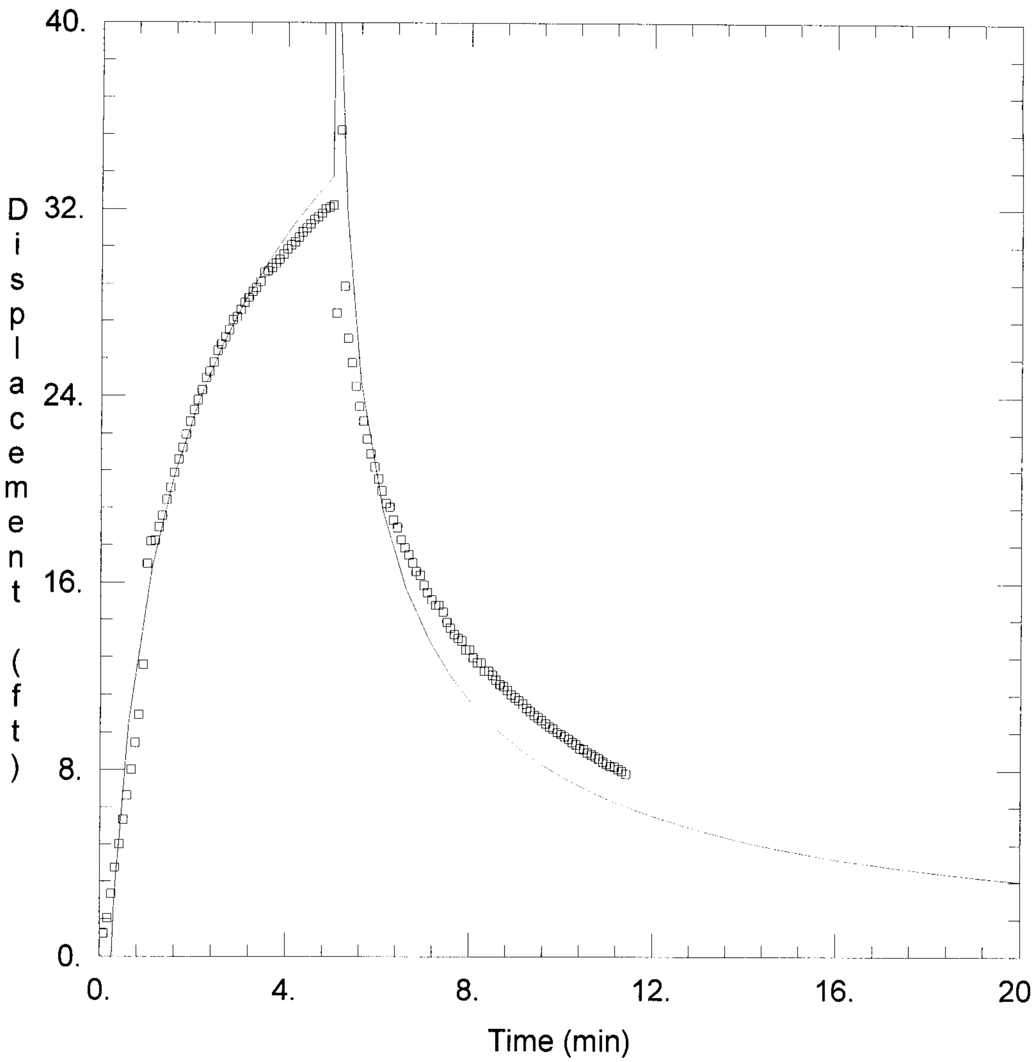
Solution Method: Theis (Step Test)

T = 26.92 ft^2/day
Sw = -5.
P = 3.

S = 1.E-06
C = 1. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 18.Q + 1.Q^{3.}$
W.E. = 310.8%



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\H1M\H1M-3.aqt
Date: 05/16/02 Time: 11:16:26

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
H1M-3	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ H1M-3	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

= 12.5 ft^2/day
Sw = -3.738
P = 3.

S = 0.0001
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 12.65Q + 0.Q^{3.}$
W.E. = 641.6%

H1M, Test 3P

Alternative analyses

Average Q: 9.12 gpm
"Drawdown" (s or ΔH): 32 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 71\ ft^2/d}}$

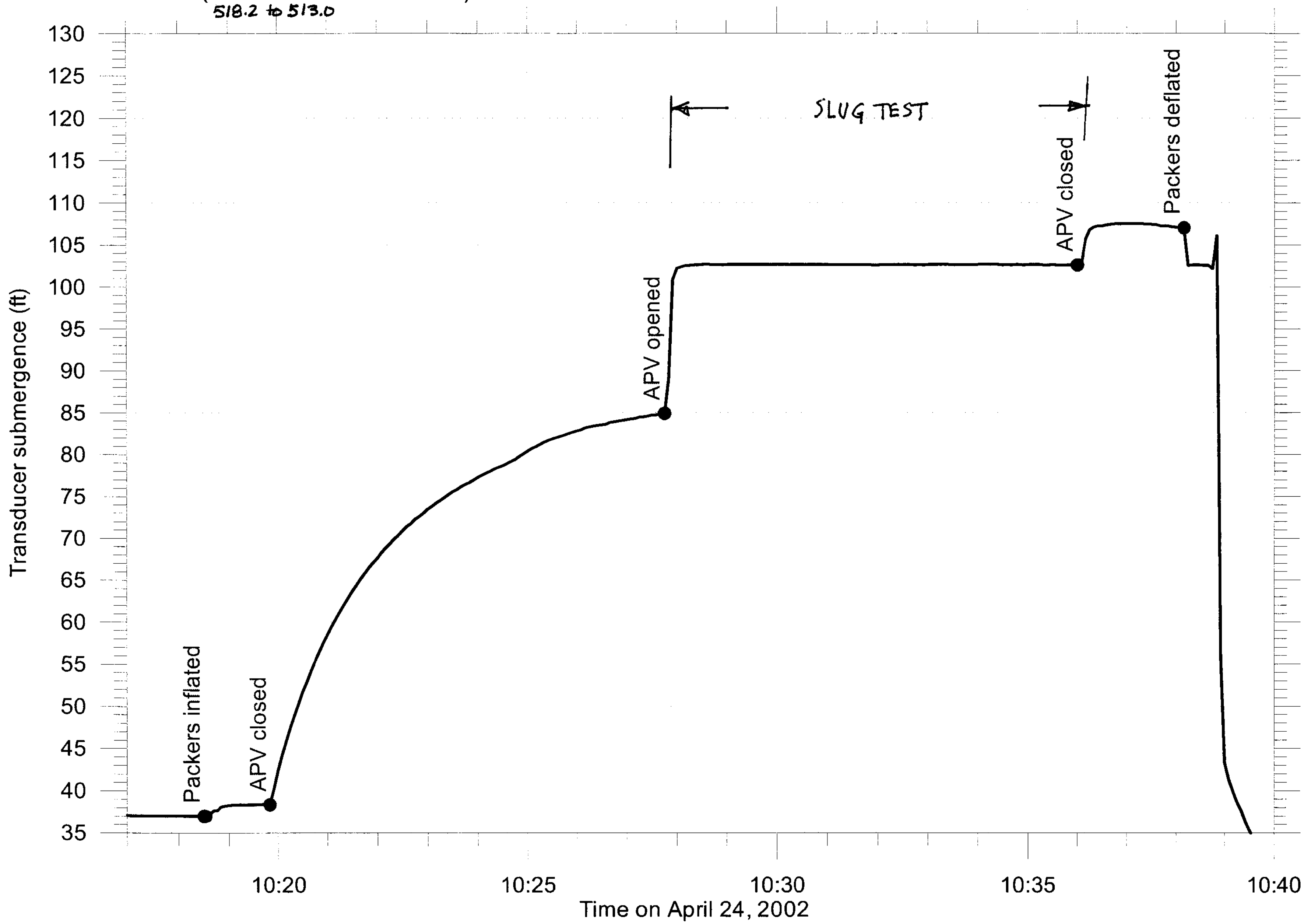
<u>T by Thiem solution:</u>

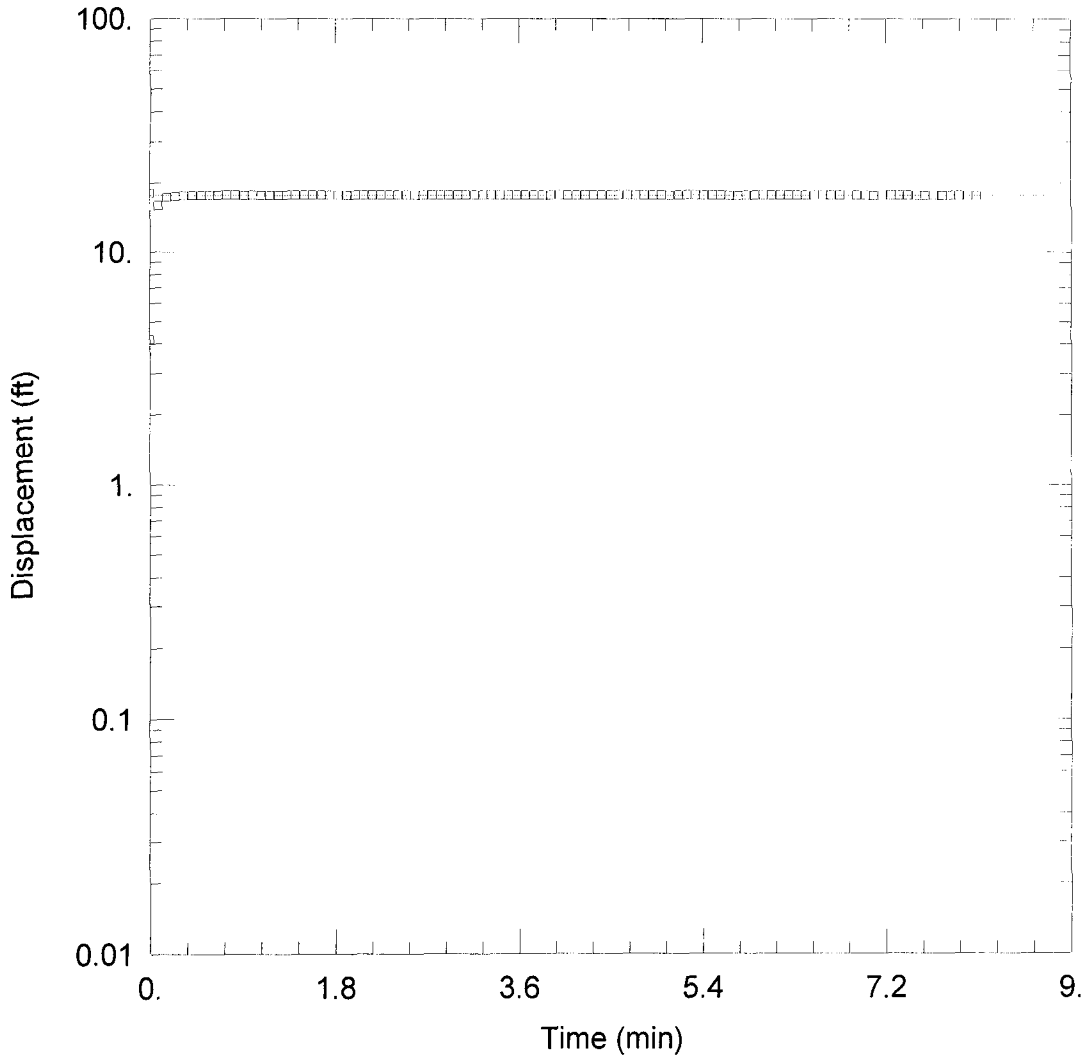
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

$\underline{\underline{T = 46\ ft^2/d}}$

H1M Packer Testing
Test 4 (~~509.24 to 504.04~~ ft AMSL)
518.2 to 513.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-4.aqt
Date: 11/26/02 Time: 11:06:50

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

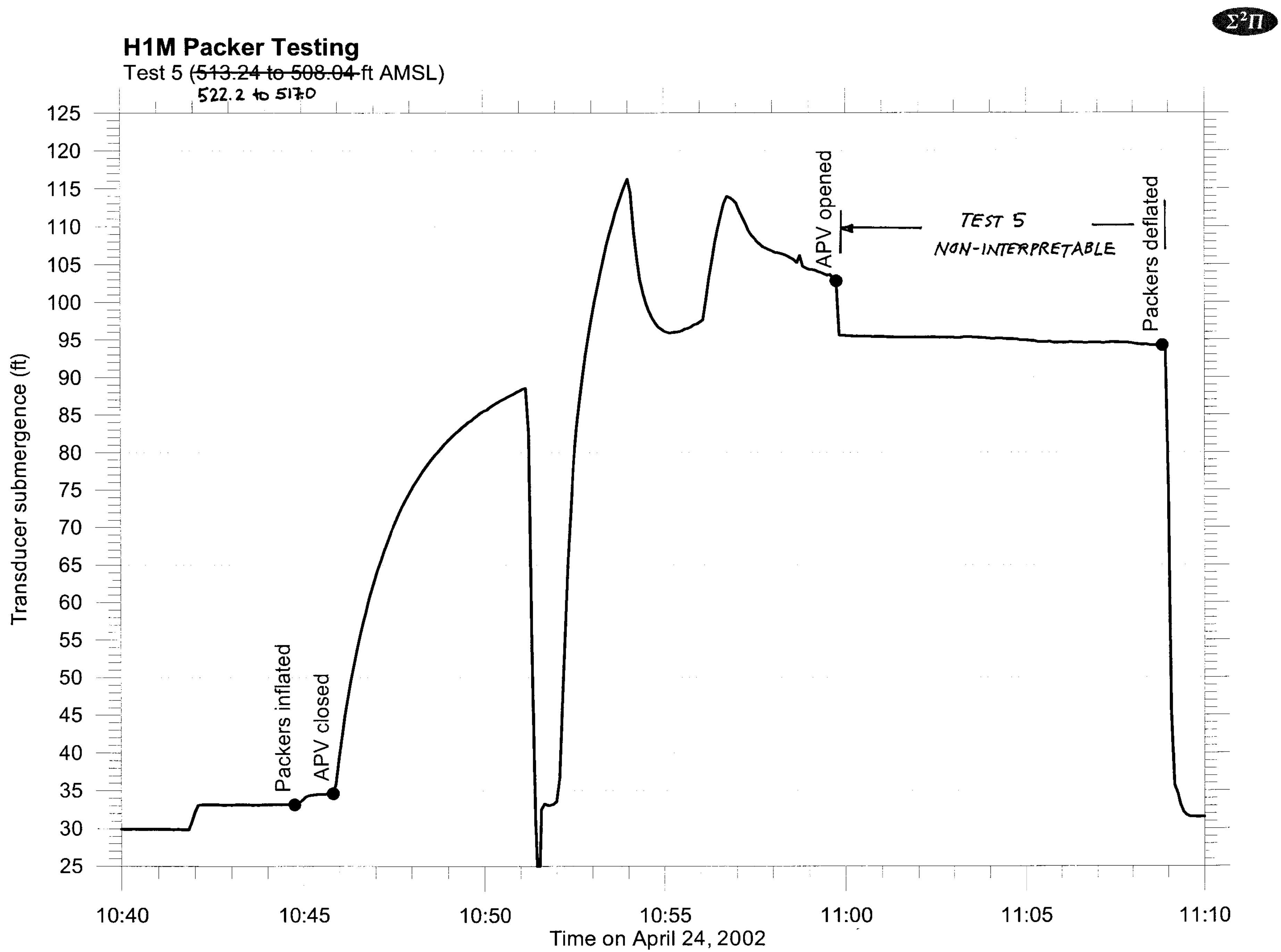
WELL DATA (H1M-4)

Initial Displacement: 18.16 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

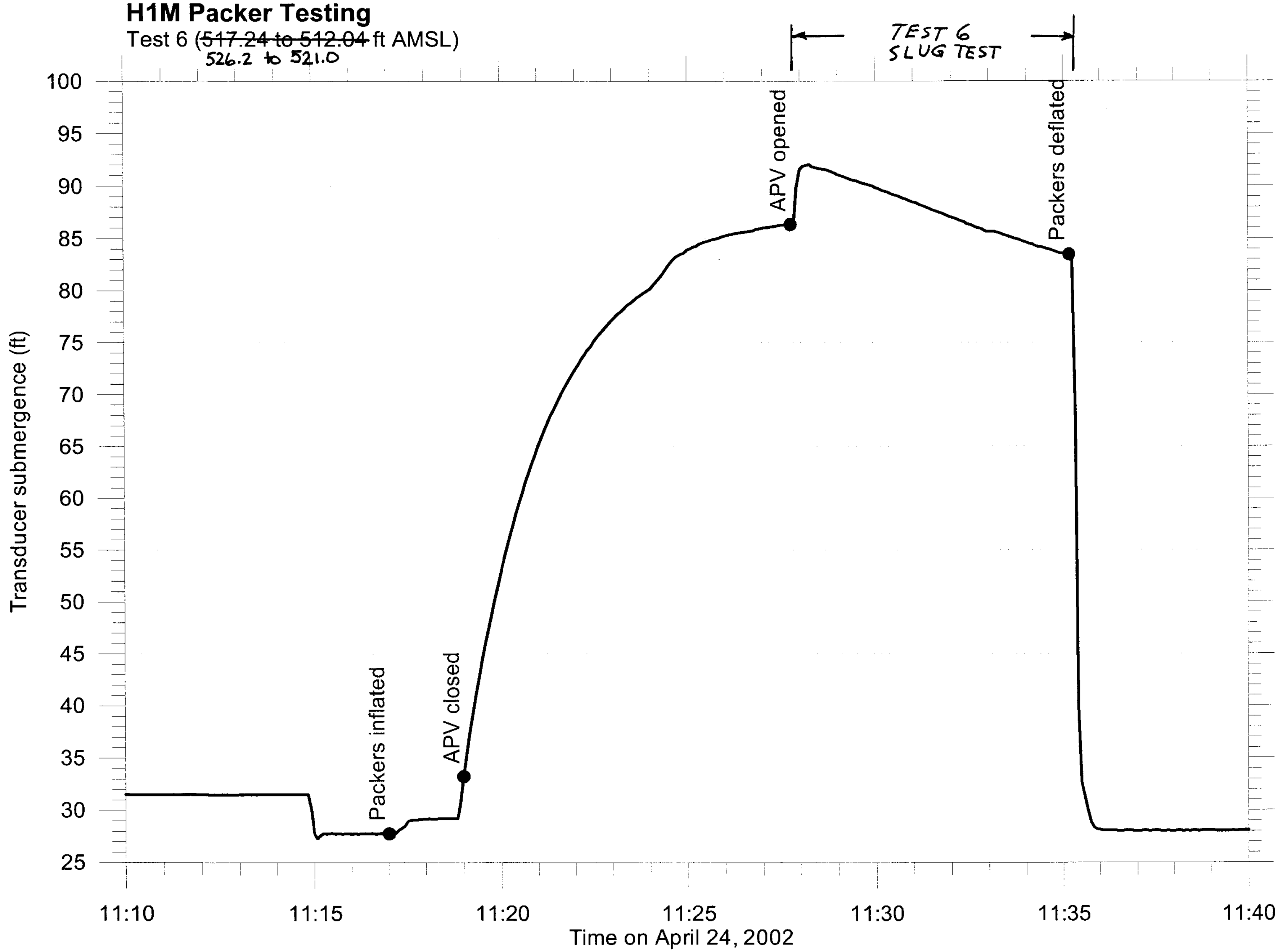
'' = 0.0001 ft/day
y0 = 17.72 ft

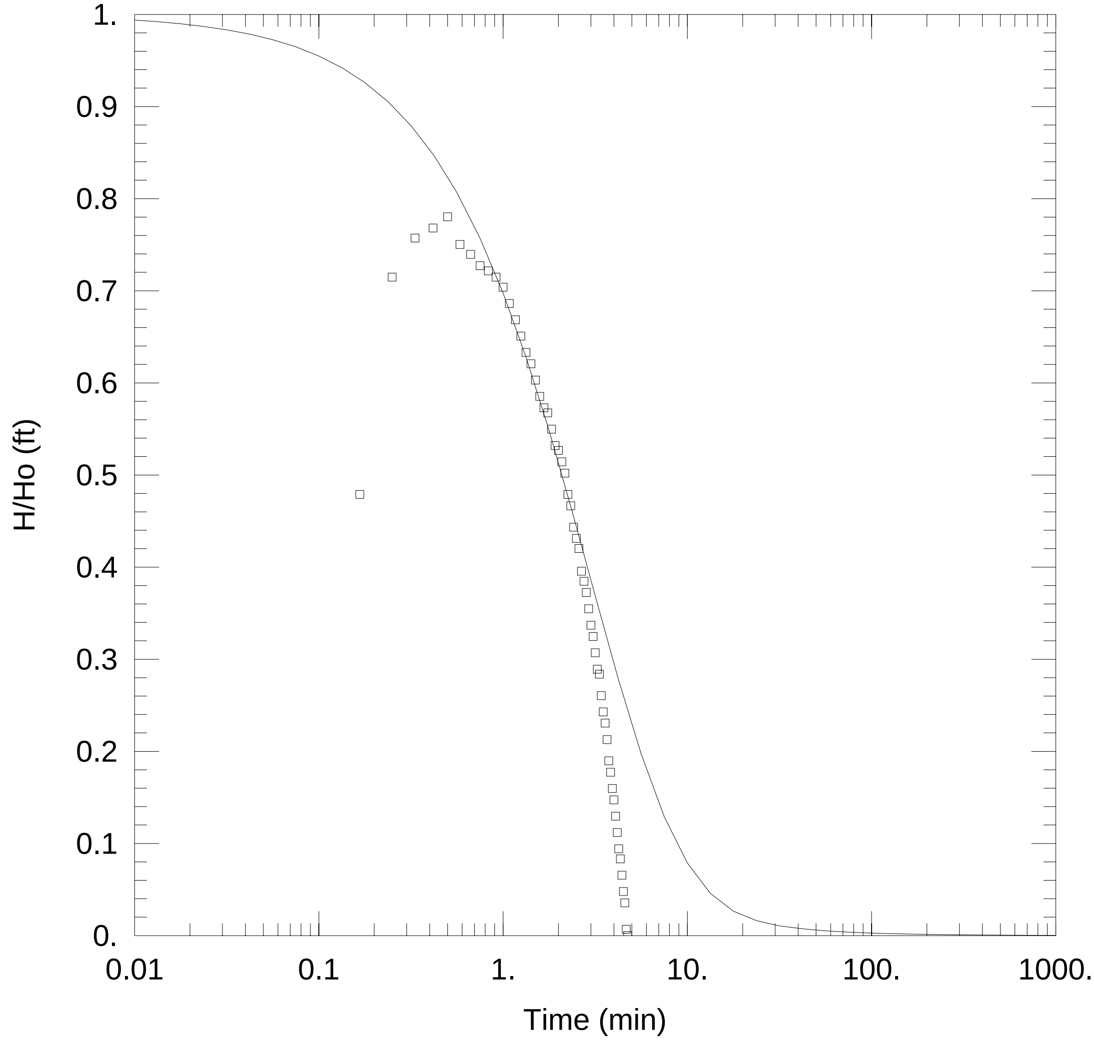


Σ²Π
H1M Packer Testing
Test 5 (~~513.24 to 508.04~~ ft AMSL)
522.2 to 517.0
Transducer submergence (ft)
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
Packers inflated
APV closed
APV opened
TEST 5
NON-INTERPRETABLE
Packers deflated
10:40
10:45
10:50
10:55
11:00
11:05
11:10
Time on April 24, 2002

H1M Packer Testing

Test 6 (~~517.24 to 512.04~~ ft AMSL)
526.2 to 521.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-6.aqt
Date: 01/22/03 Time: 14:41:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-6)

Initial Displacement: 7.33 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

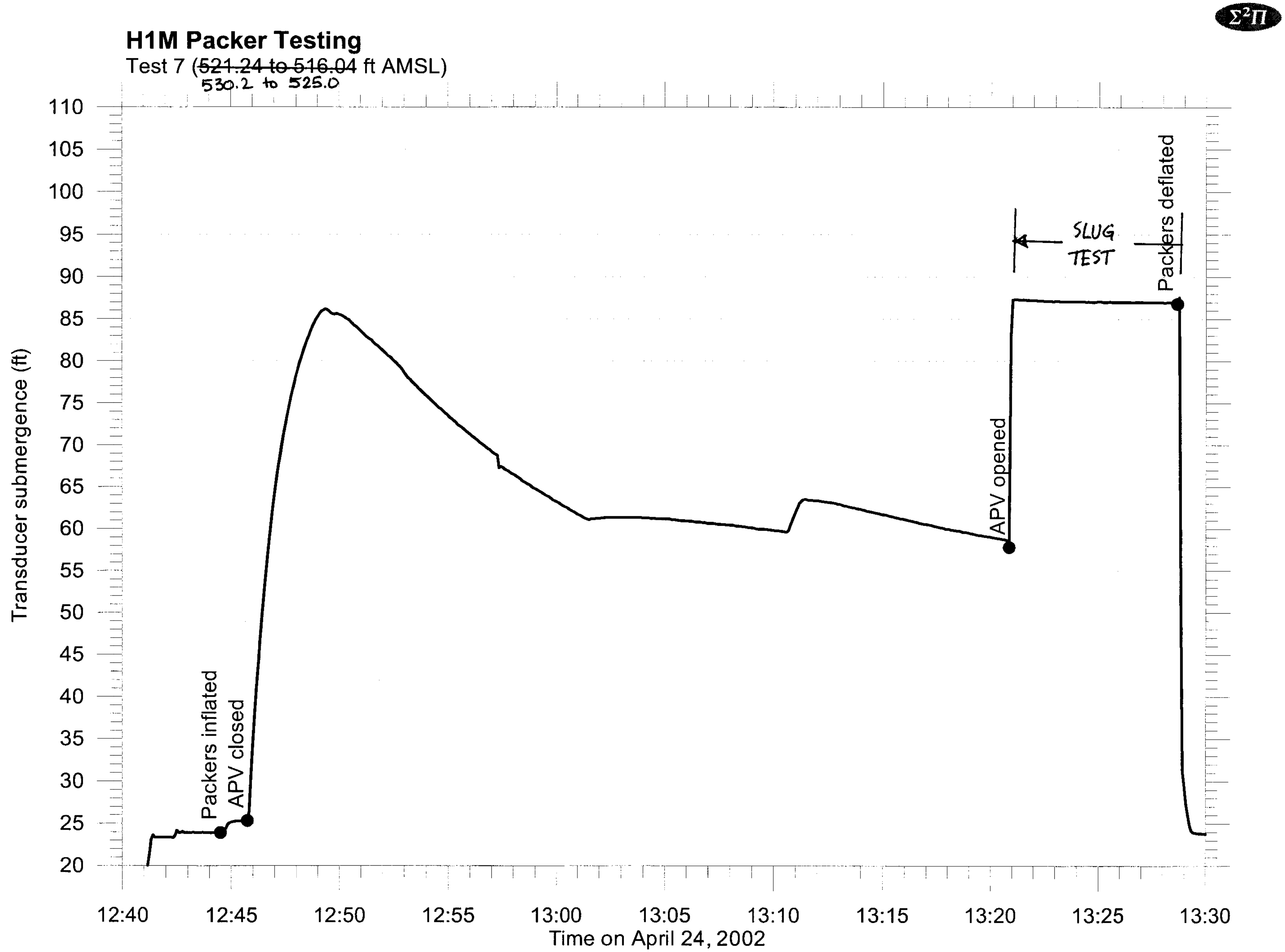
SOLUTION

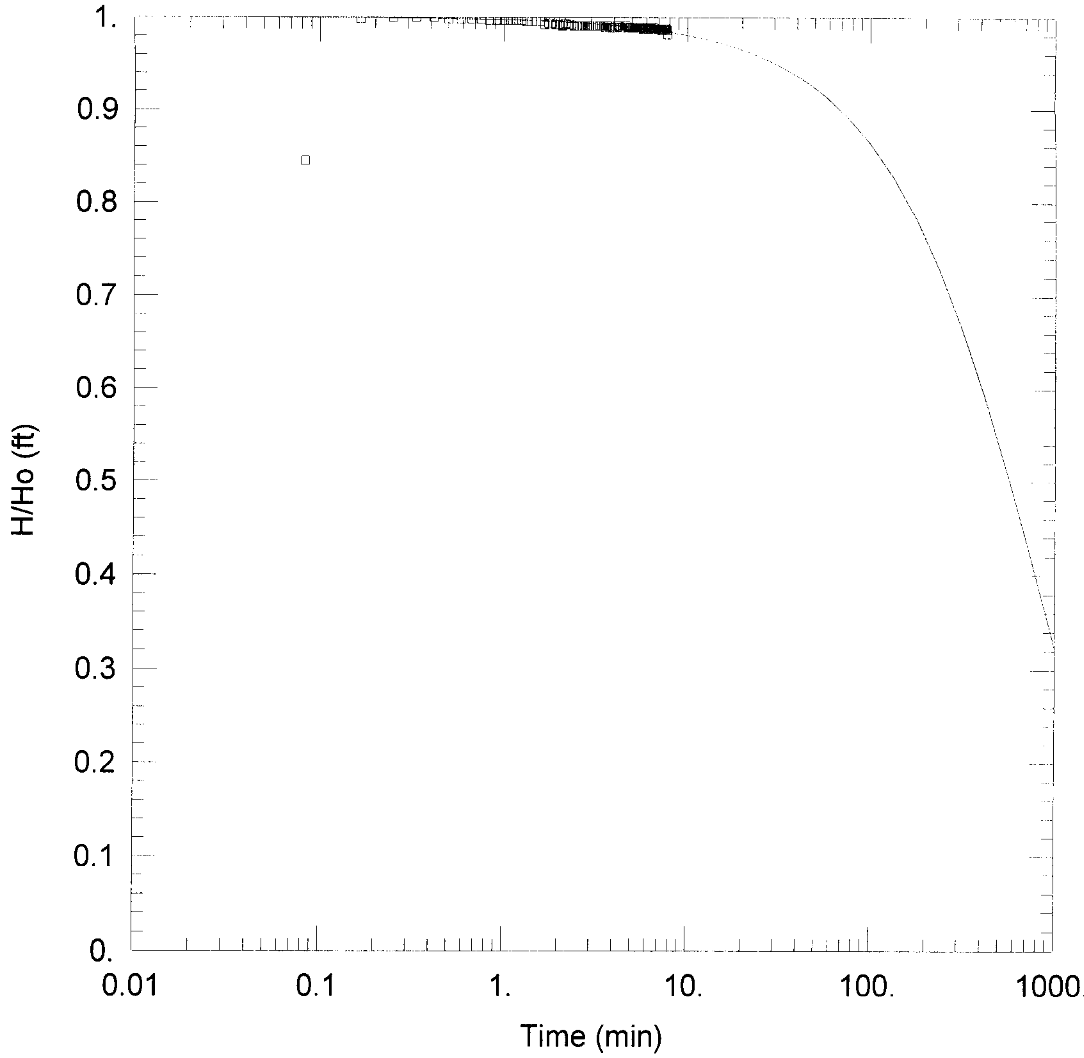
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.525 ft^2/day S = 1.E-06

H1M Packer Testing

Test 7 (~~521.24 to 516.04~~ ft AMSL)
530.2 to 525.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-7.aqt
Date: 11/26/02 Time: 11:06:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-7)

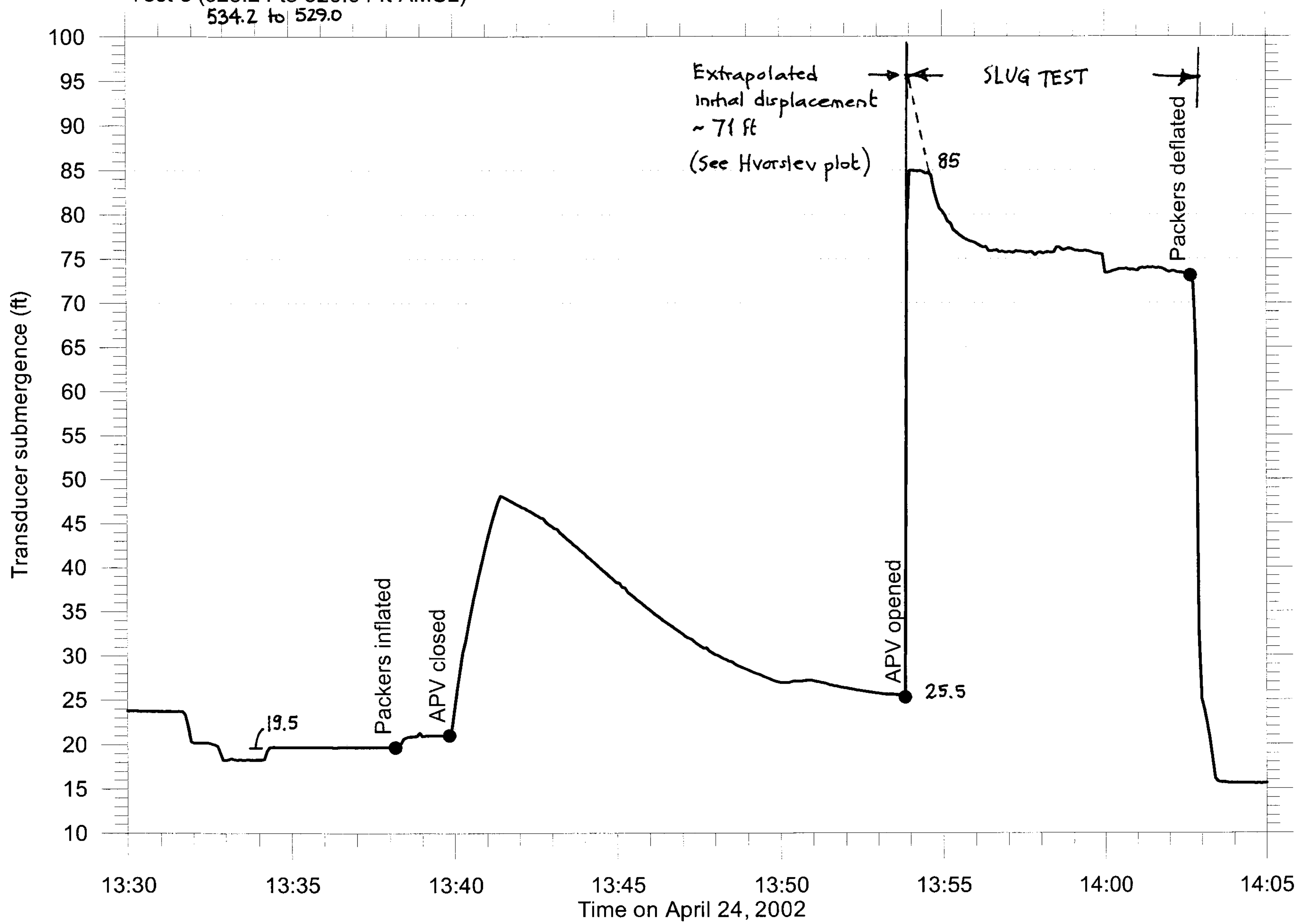
Initial Displacement: 28.72 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

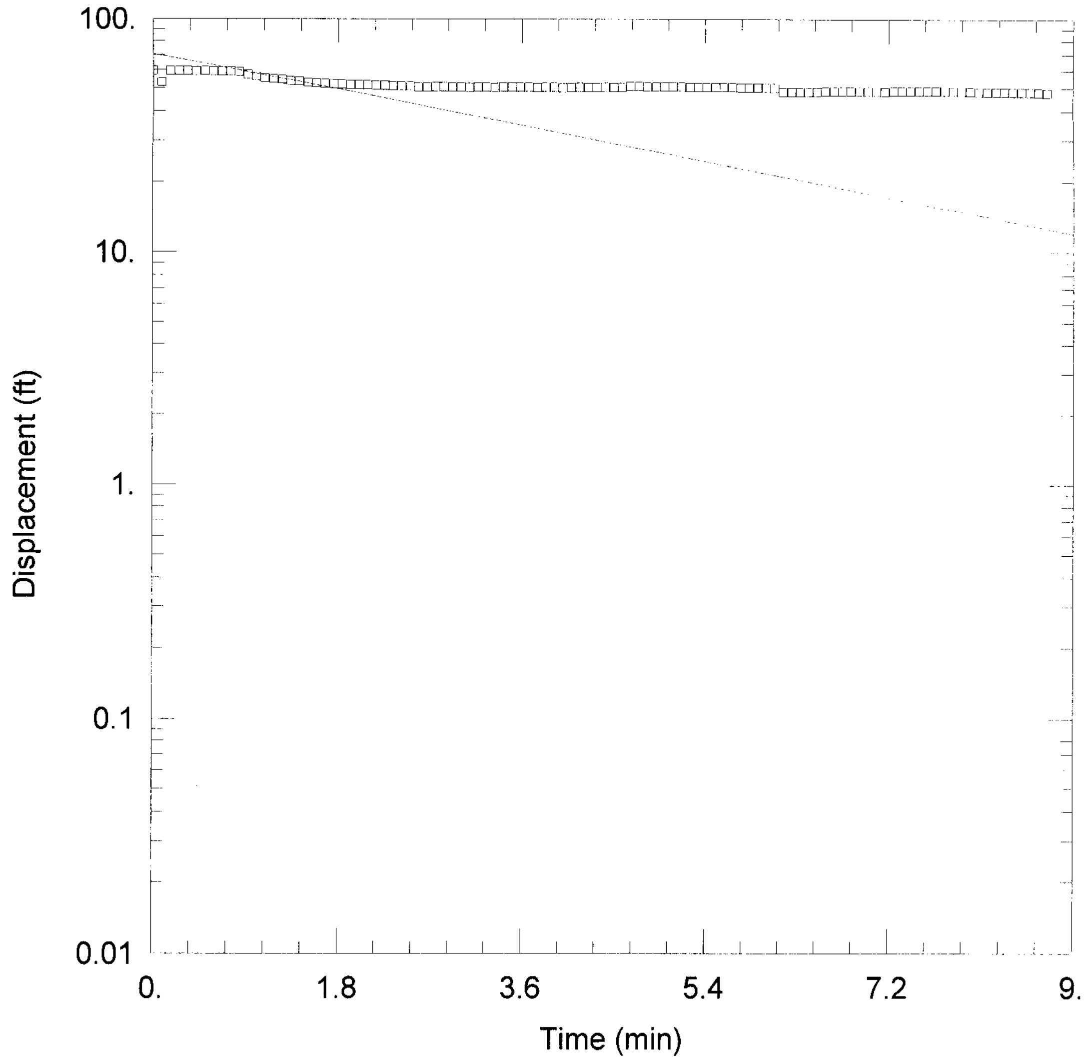
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
$^{-}$ = 0.009226 ft^2/day
S = 1.E-06

H1M Packer Testing

Test 8 (~~525.24 to 520.04~~ ft AMSL)
534.2 to 529.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-8a.aqt
Date: 11/26/02 Time: 11:06:24

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

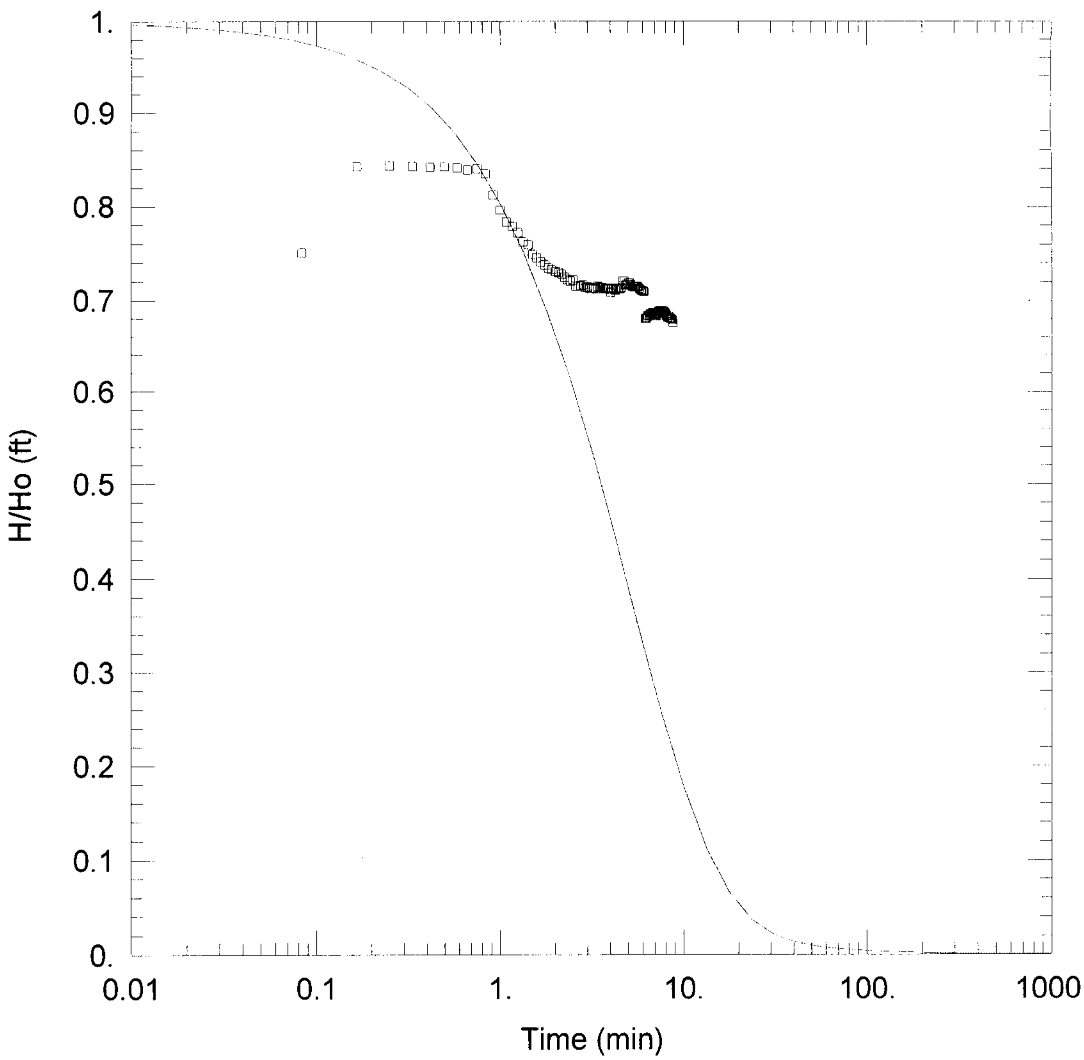
WELL DATA (H1M-8)

Initial Displacement: 59.79 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 2.606 ft/day
y0 = 70.75 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-8b.aqt
Date: 11/26/02 Time: 11:08:11

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-8)

Initial Displacement: 70.75 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

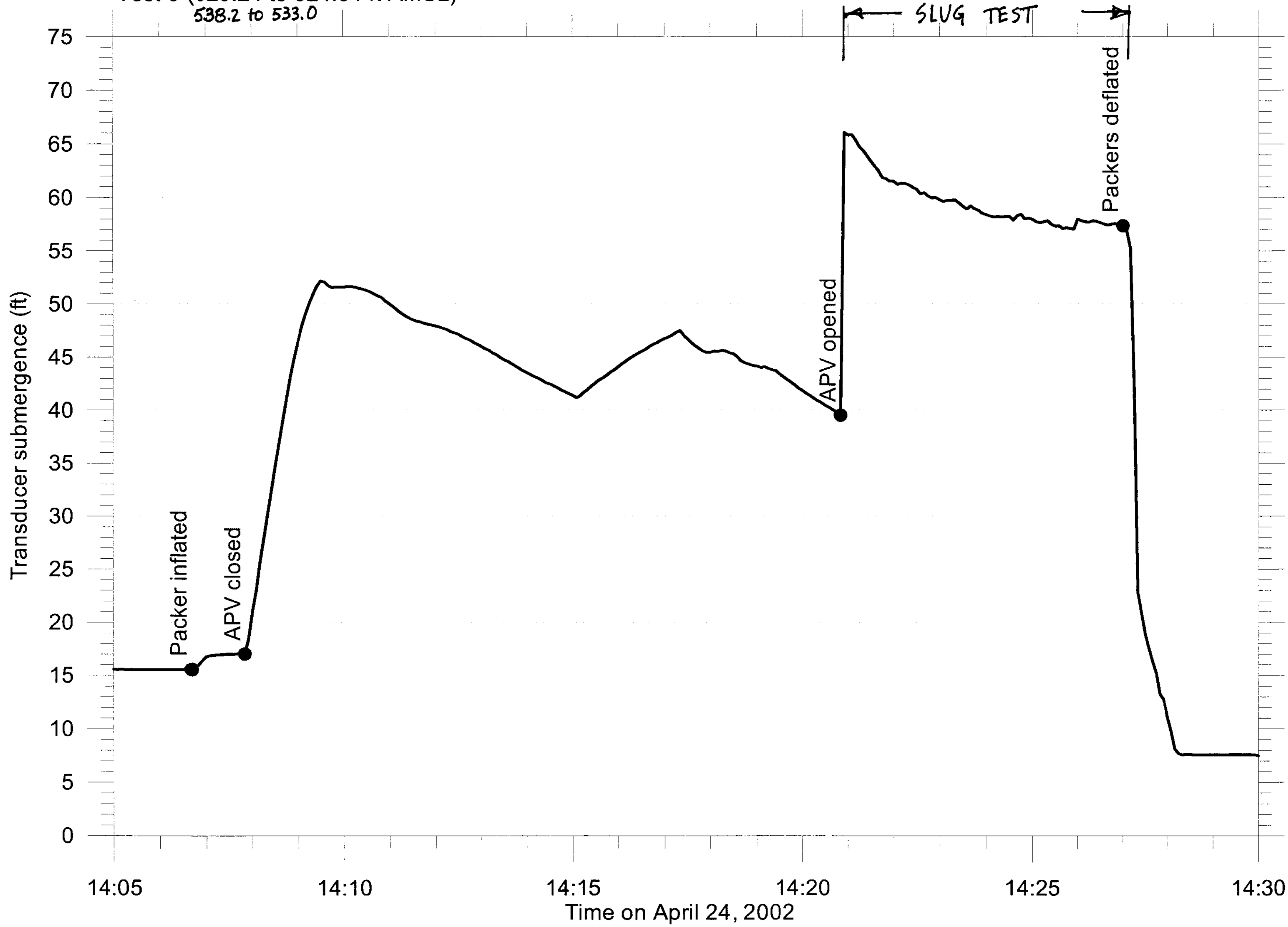
SOLUTION

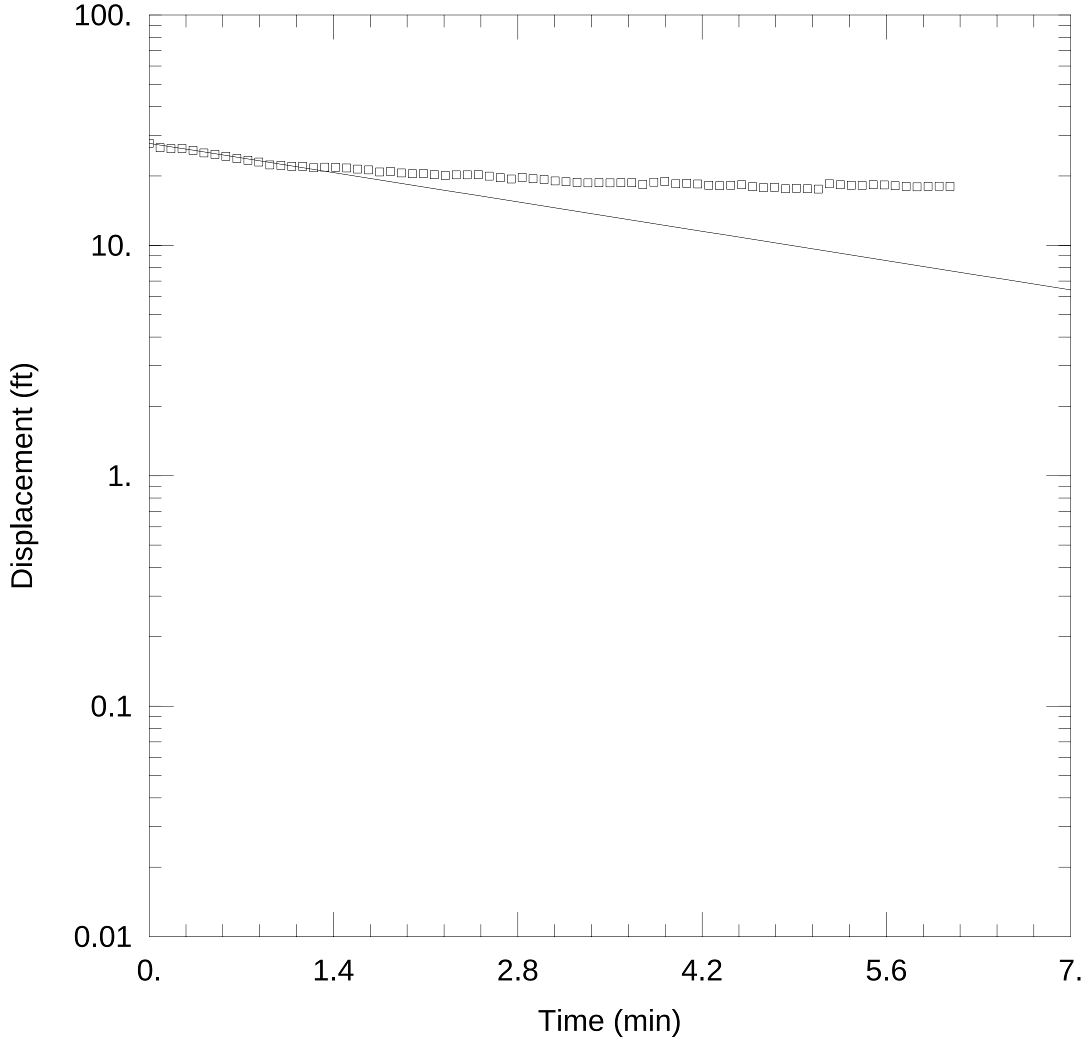
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

` = 1.788 ft^2/day
S = 1.E-07

H1M Packer Testing

Test 9 (~~529.24 to 524.04~~ ft AMSL)
538.2 to 533.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-9a.aqt
Date: 01/22/03 Time: 14:42:36

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

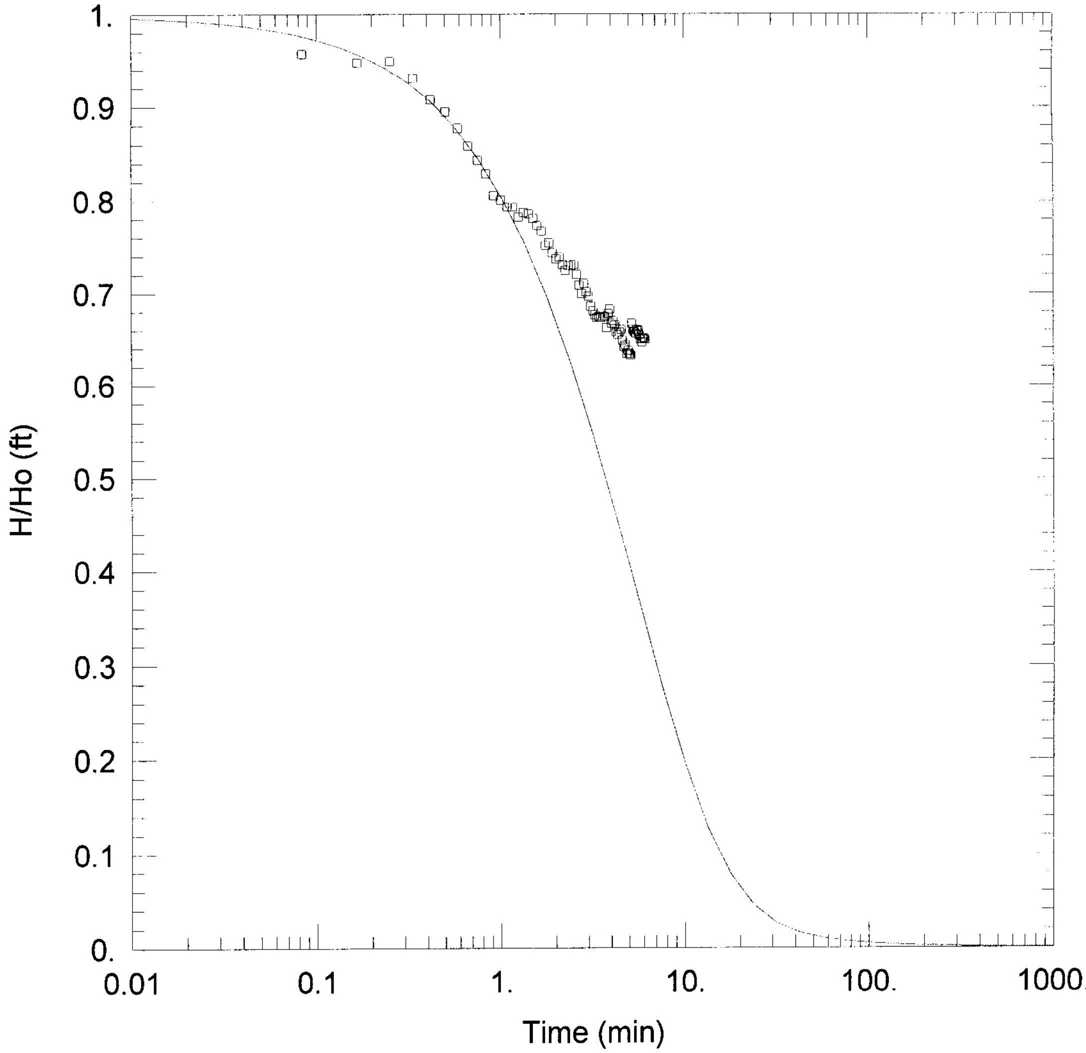
WELL DATA (H1M-9)

Initial Displacement: 27.73 ft
Casing Radius: 0.1667 ft
Wellbore Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 2.772 ft/day
y0 = 27.73 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-9b.aqt
Date: 11/26/02 Time: 11:05:54

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-9)

Initial Displacement: 27.73 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

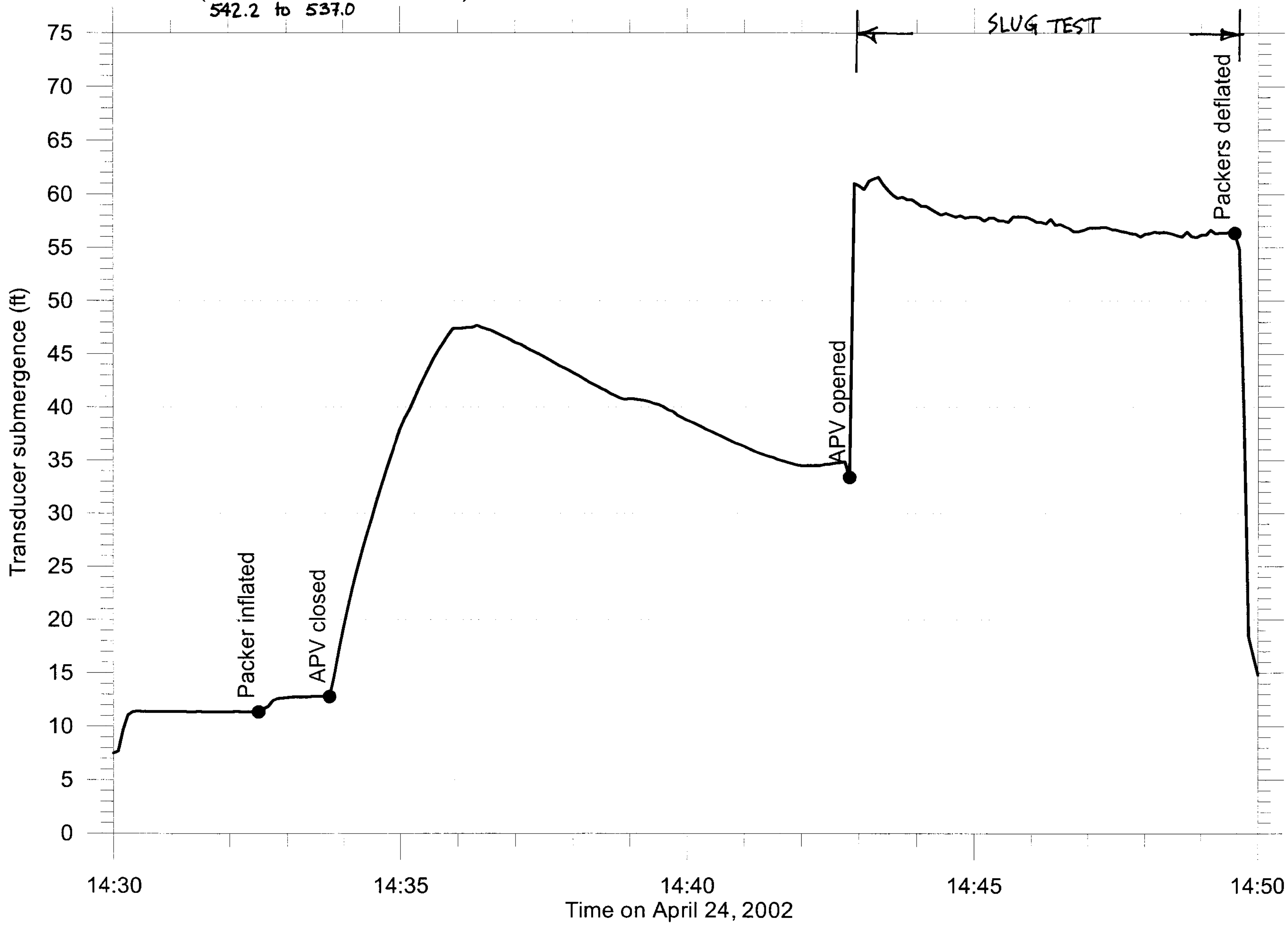
SOLUTION

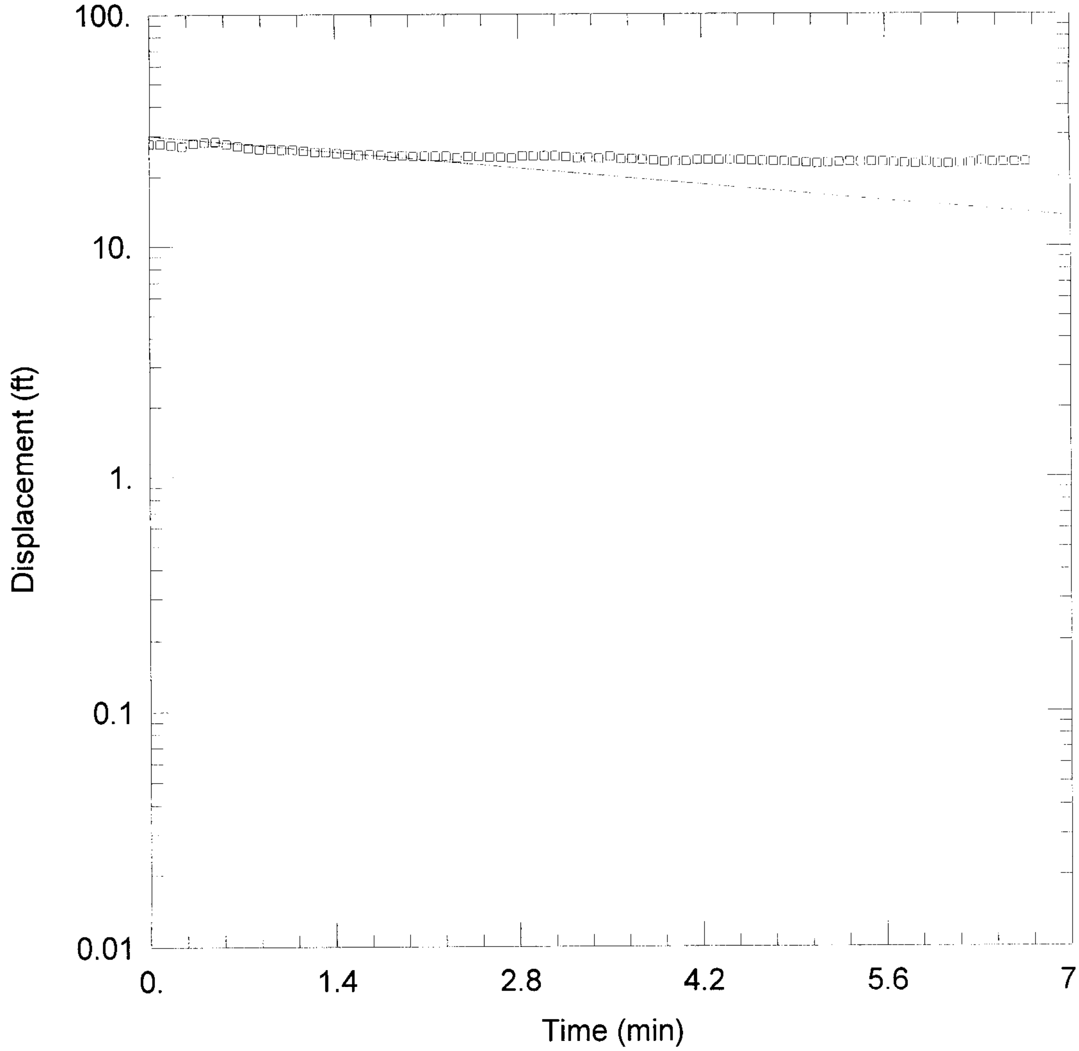
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

¯ = 1.427 ft^2/day
S = 1.E-06

H1M Packer Testing

Test 10 (~~533.24 to 528.04~~ ft AMSL)
542.2 to 537.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-10a.aqt
Date: 11/26/02 Time: 11:07:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

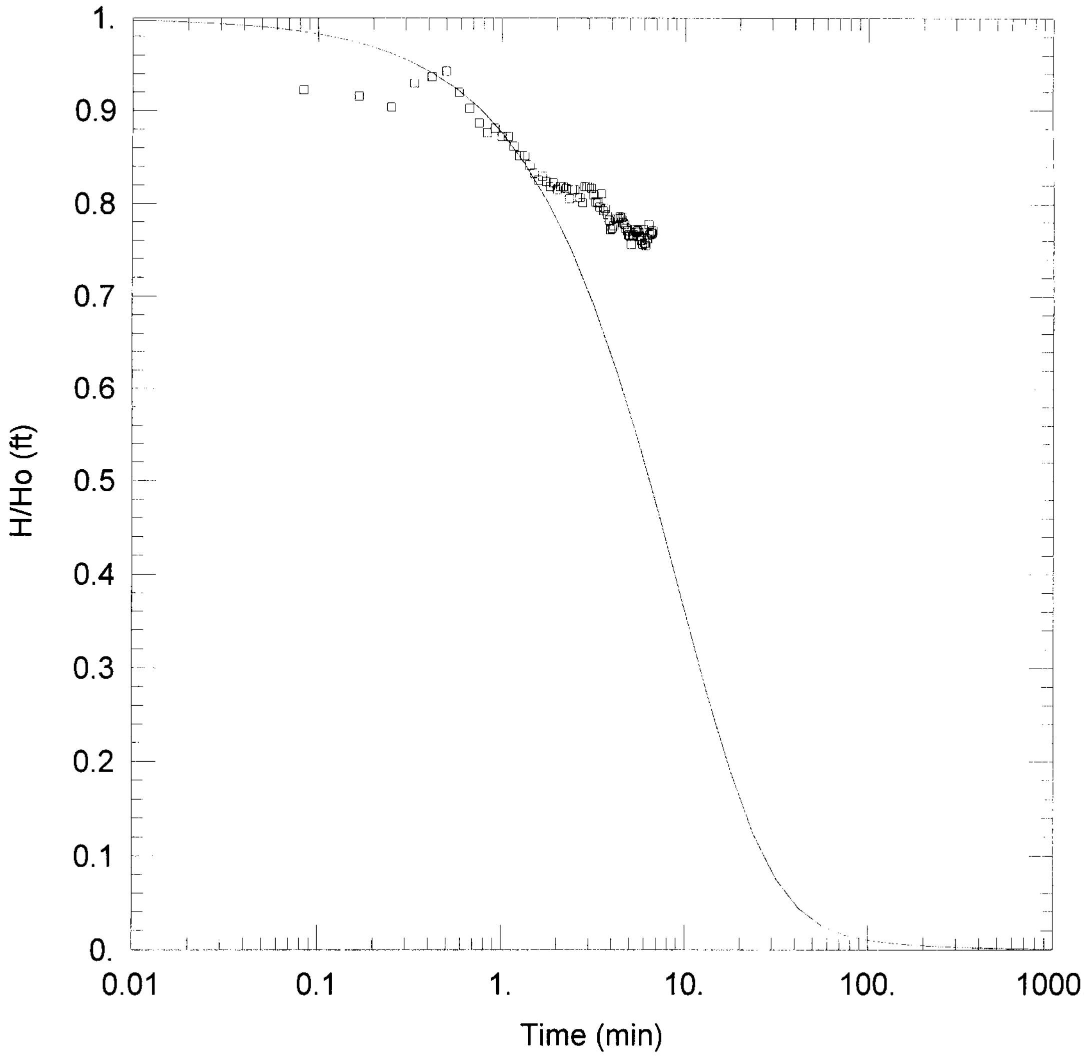
WELL DATA (H1M-10)

Initial Displacement: 27.6 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 1.506 ft/day
y0 = 29.91 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-10b.aqt
Date: 11/26/02 Time: 11:07:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-10)

Initial Displacement: 29.91 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0415 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

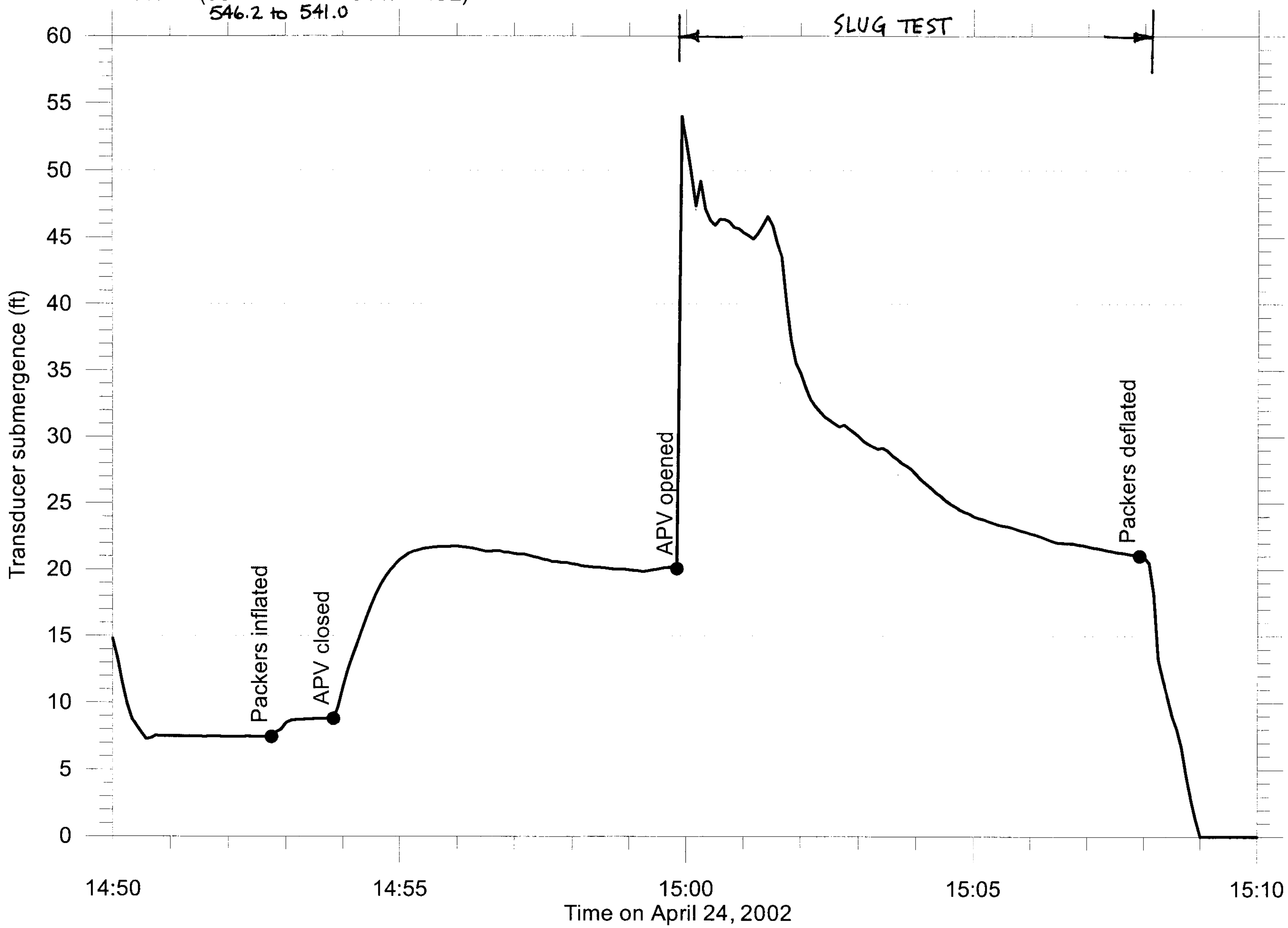
SOLUTION

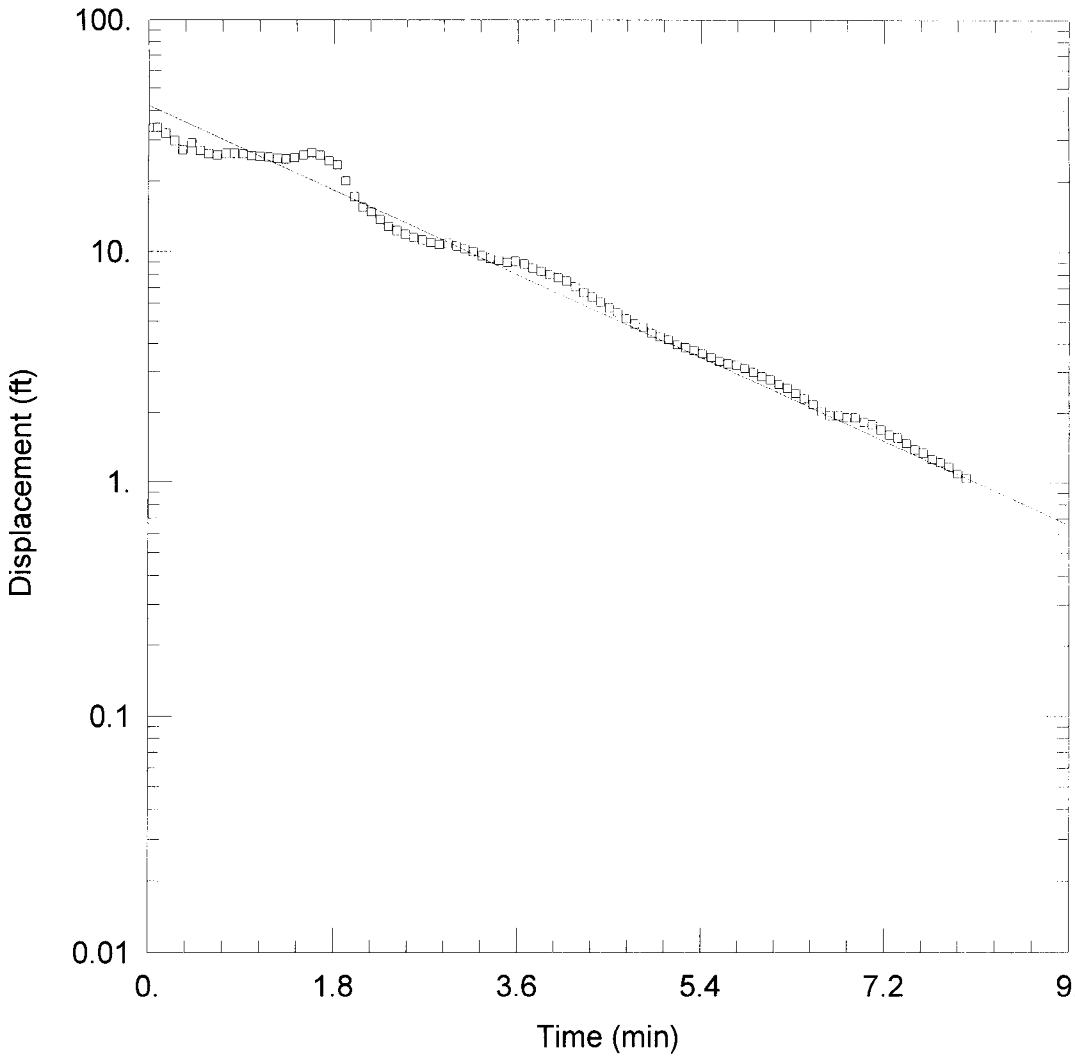
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.8114 ft^2/day
S = 1.E-06

H1M Packer Testing

Test 11 (~~537.24 to 532.04~~ ft AMSL)
546.2 to 541.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-11a.aqt
Date: 11/26/02 Time: 11:07:46

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

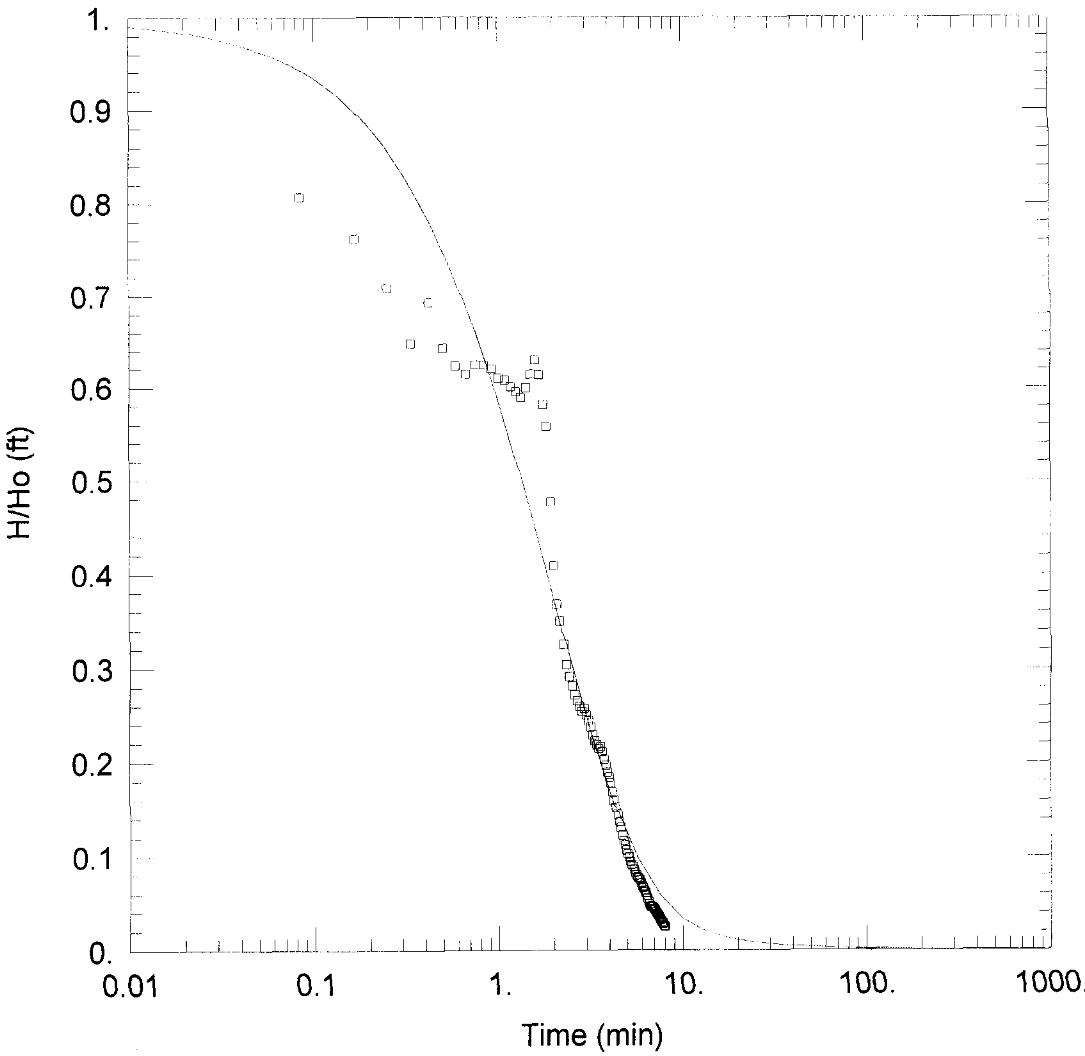
WELL DATA (H1M-11)

Initial Displacement: 33.96 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 6.115 ft/day
y0 = 42.1 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-11b.aqt
Date: 11/26/02 Time: 11:07:42

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-11)

Initial Displacement: 42.1 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

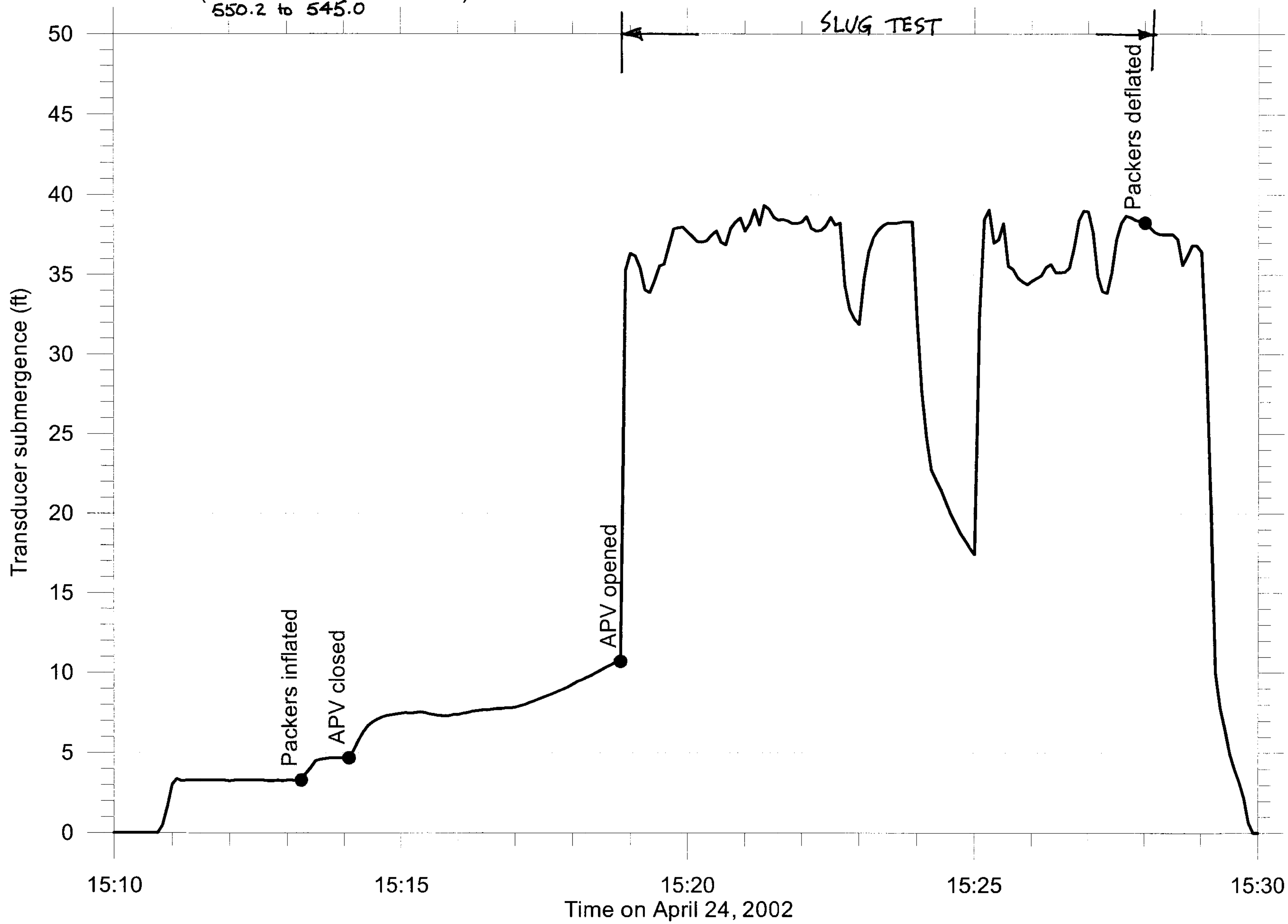
SOLUTION

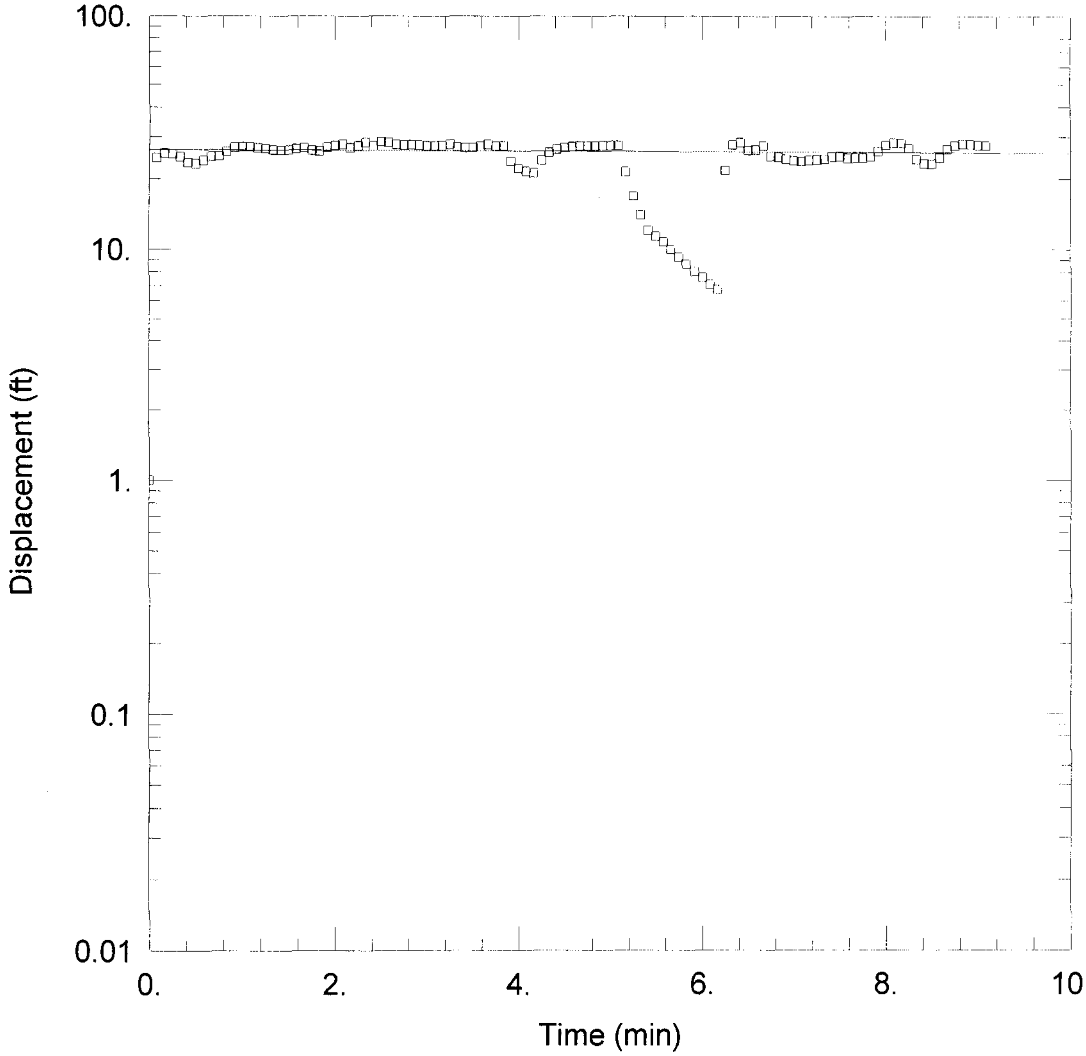
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 3.936 ft^2/day
S = 1.E-06

H1M Packer Testing

Test 12 (~~541.24 to 536.04~~ ft AMSL)
550.2 to 545.0





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-12.aqt
Date: 11/26/02 Time: 11:07:32

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-12)

Initial Displacement: 1. ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

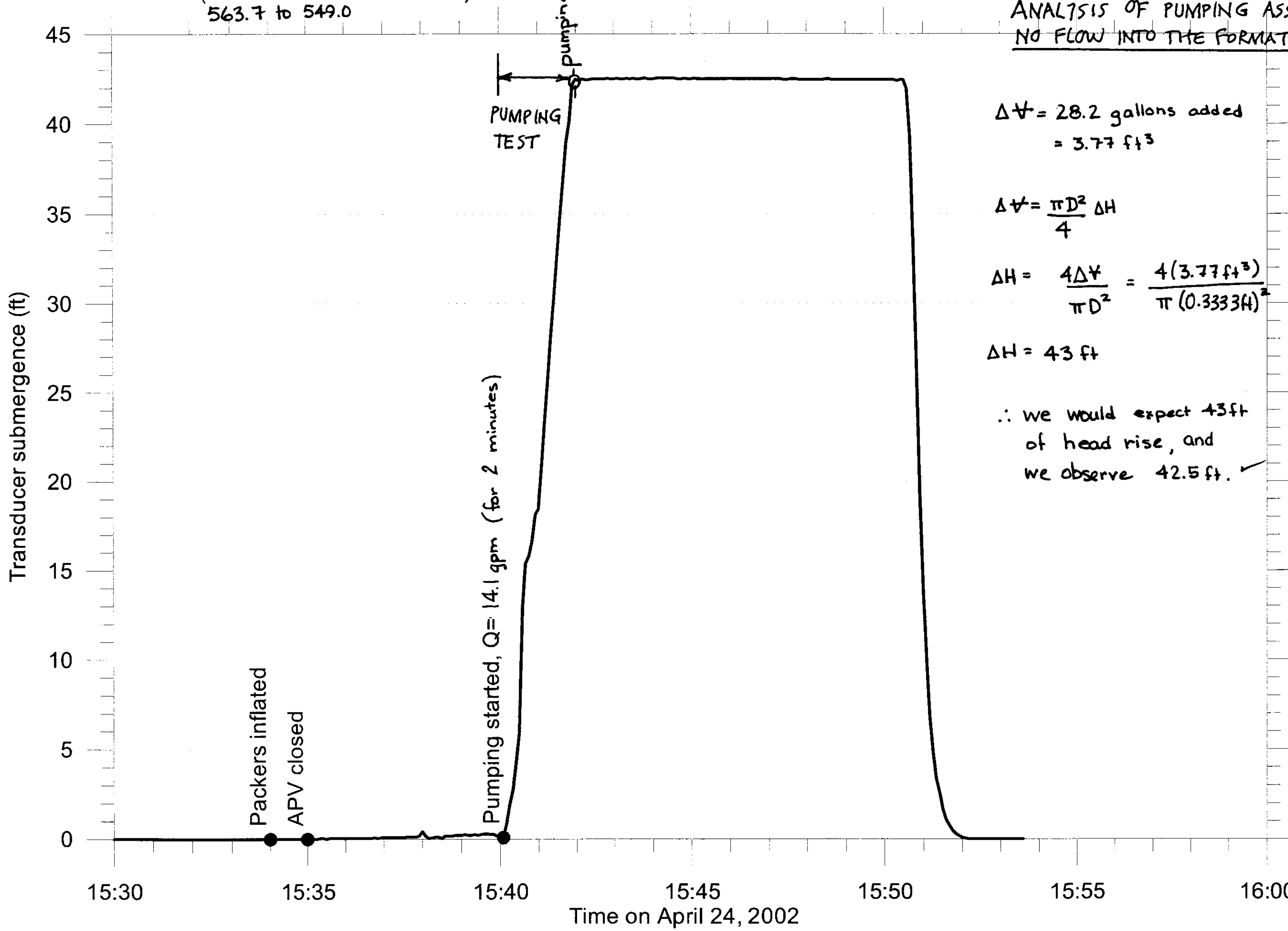
SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.002852 ft/day
y0 = 26.54 ft

H1M Packer Testing

Test 13 (~~561.40 to 540.04~~ ft AMSL)
563.7 to 549.0



<u>ANALYSIS OF PUMPING ASSUMING NO FLOW INTO THE FORMATION</u>

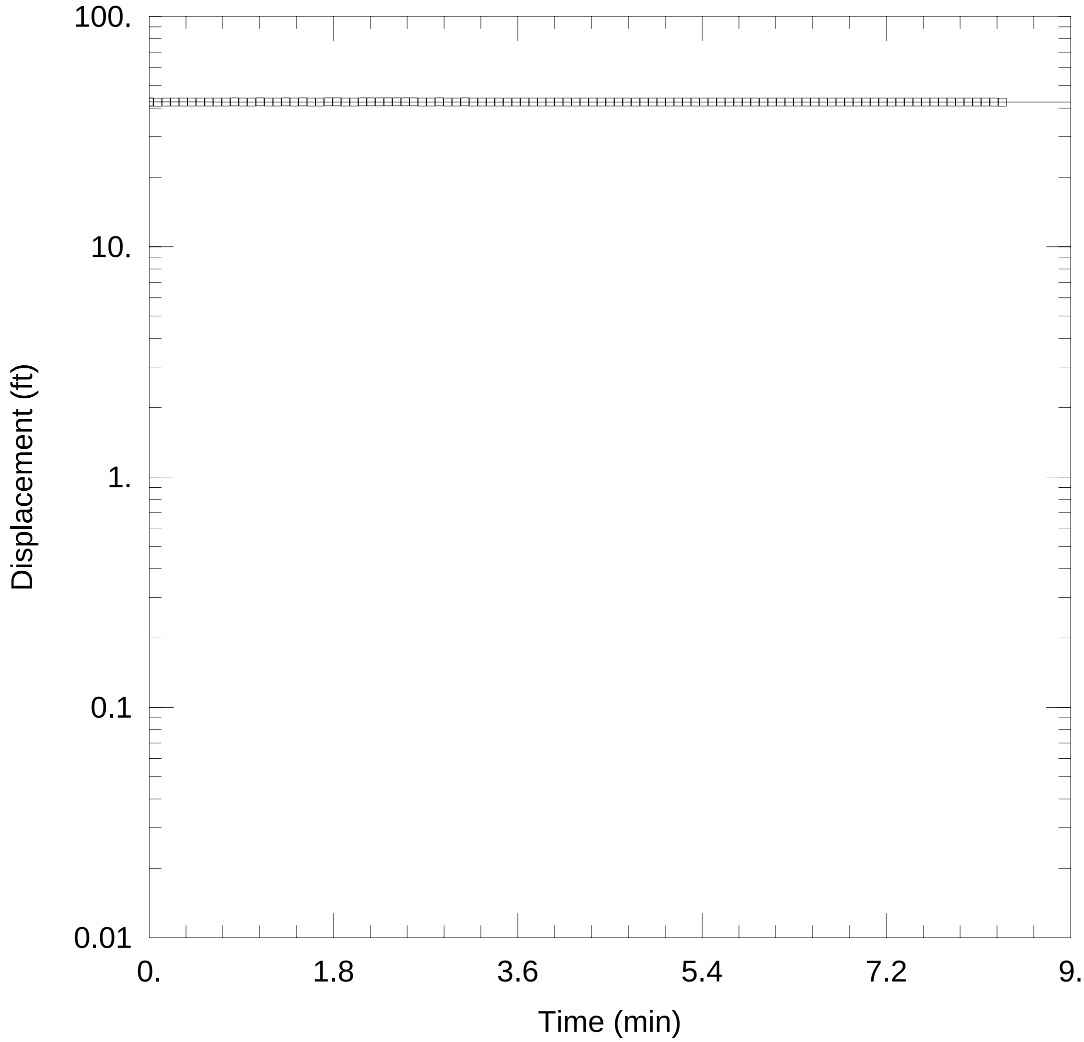
$\Delta \forall = 28.2$ gallons added $= 3.77\ ft^3$

$$\Delta \forall = \frac{\pi D^2}{4} \Delta H$$

$$\Delta H = \frac{4 \Delta \forall}{\pi D^2} = \frac{4(3.77\,ft^3)}{\pi (0.3333 ft)^2}$$

$\Delta H = 43$ ft

$\therefore$ we would expect 43 ft of head rise, and we observe 42.5 ft.



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1M\H1M-13.aqt
Date: 01/22/03 Time: 14:43:18

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1M-13)

Initial Displacement: 42.49 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1667 ft Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.0001419 ft/day y0 = 42.51 ft

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

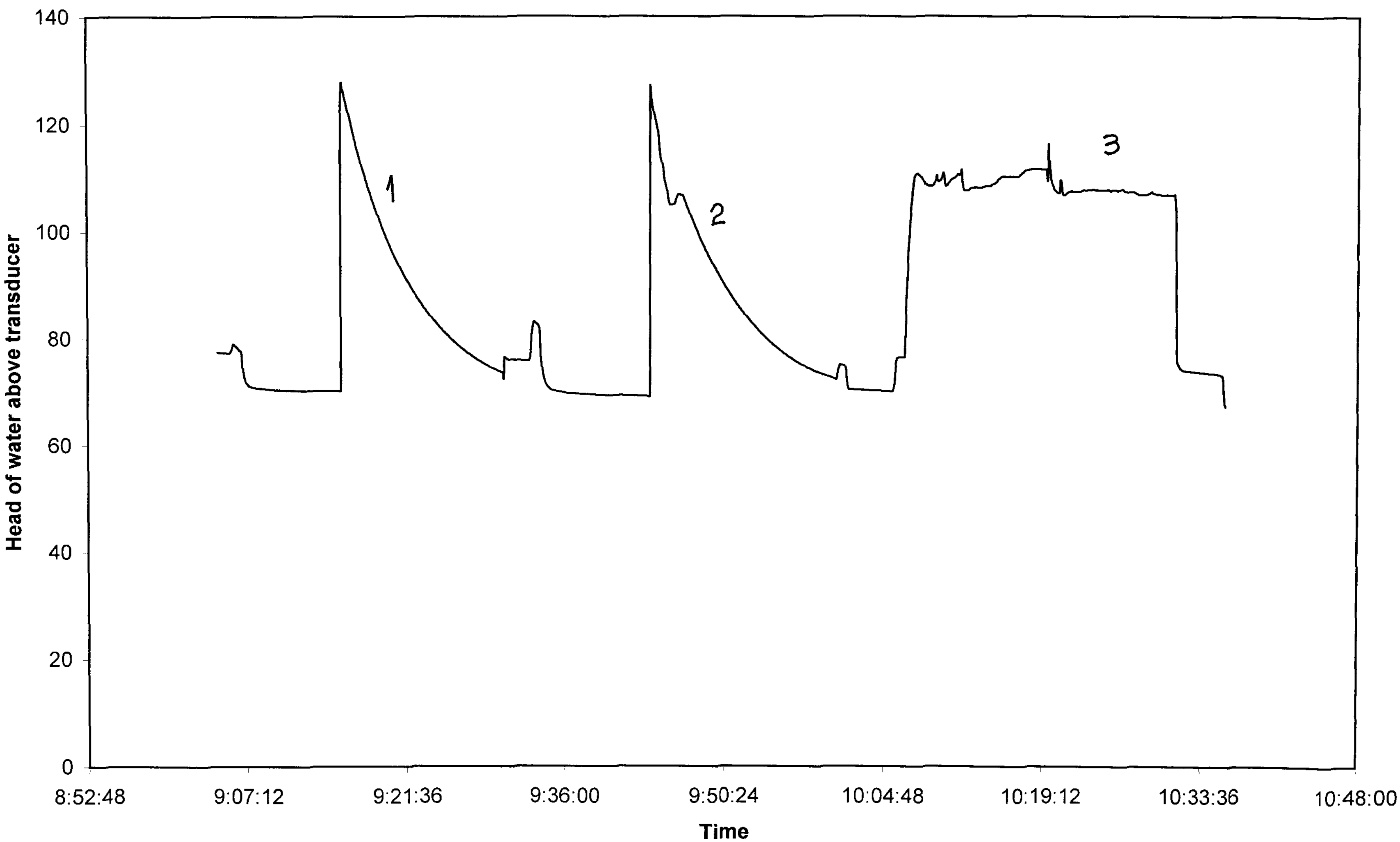
H1L

Testing Dates: April 25, 2002

Summary of Tests:

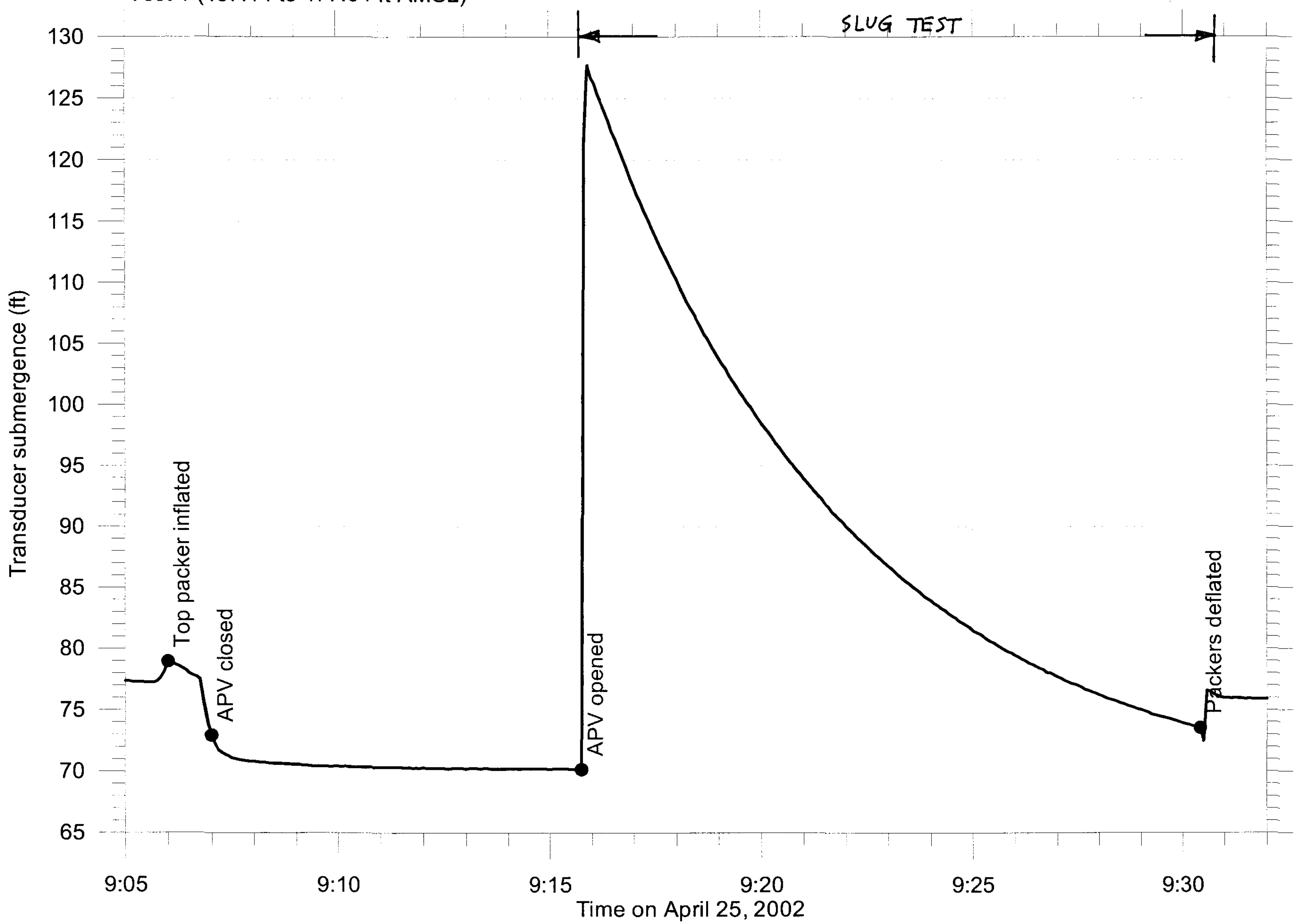
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
H1L	1	487.14	477.64	1.5	
H1L	2	487.14	481.94	1.4	
H1L	3	491.14	485.94	48	

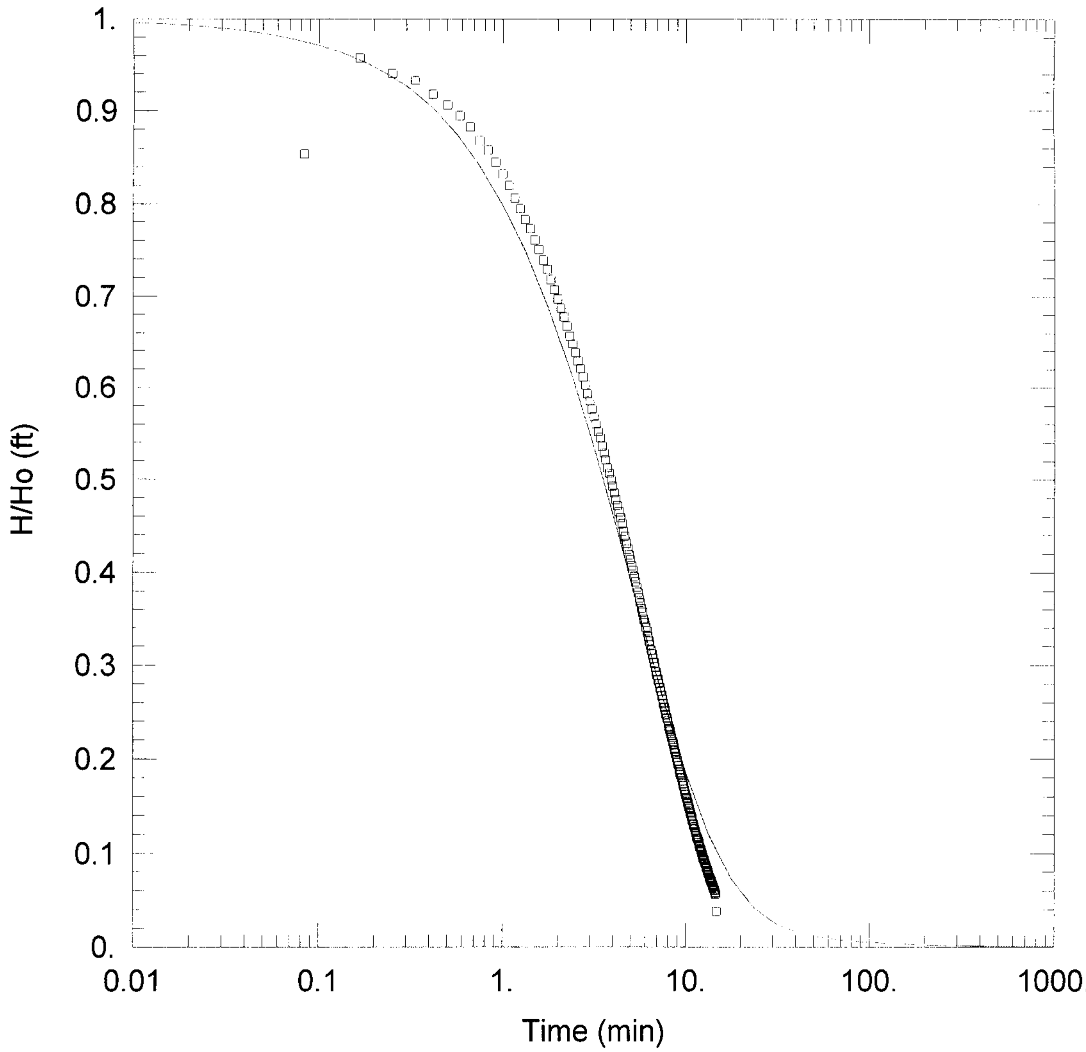
Monitoring Well H1L



H1L Packer Testing

Test 1 (487.14 to 477.64 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1L\H1L-1.aqt
Date: 11/26/02 Time: 11:08:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1L-1)

Initial Displacement: 60.08 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

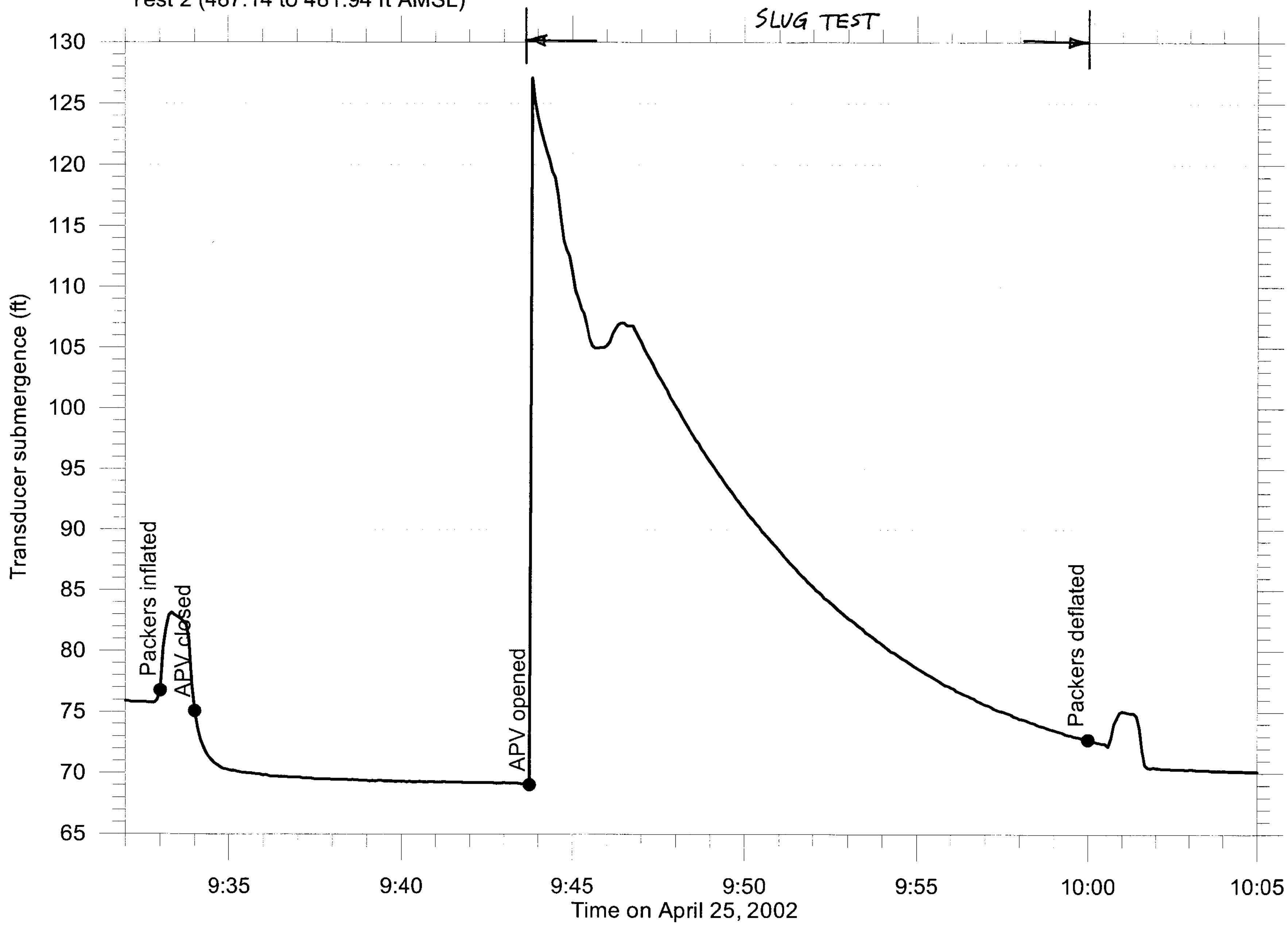
SOLUTION

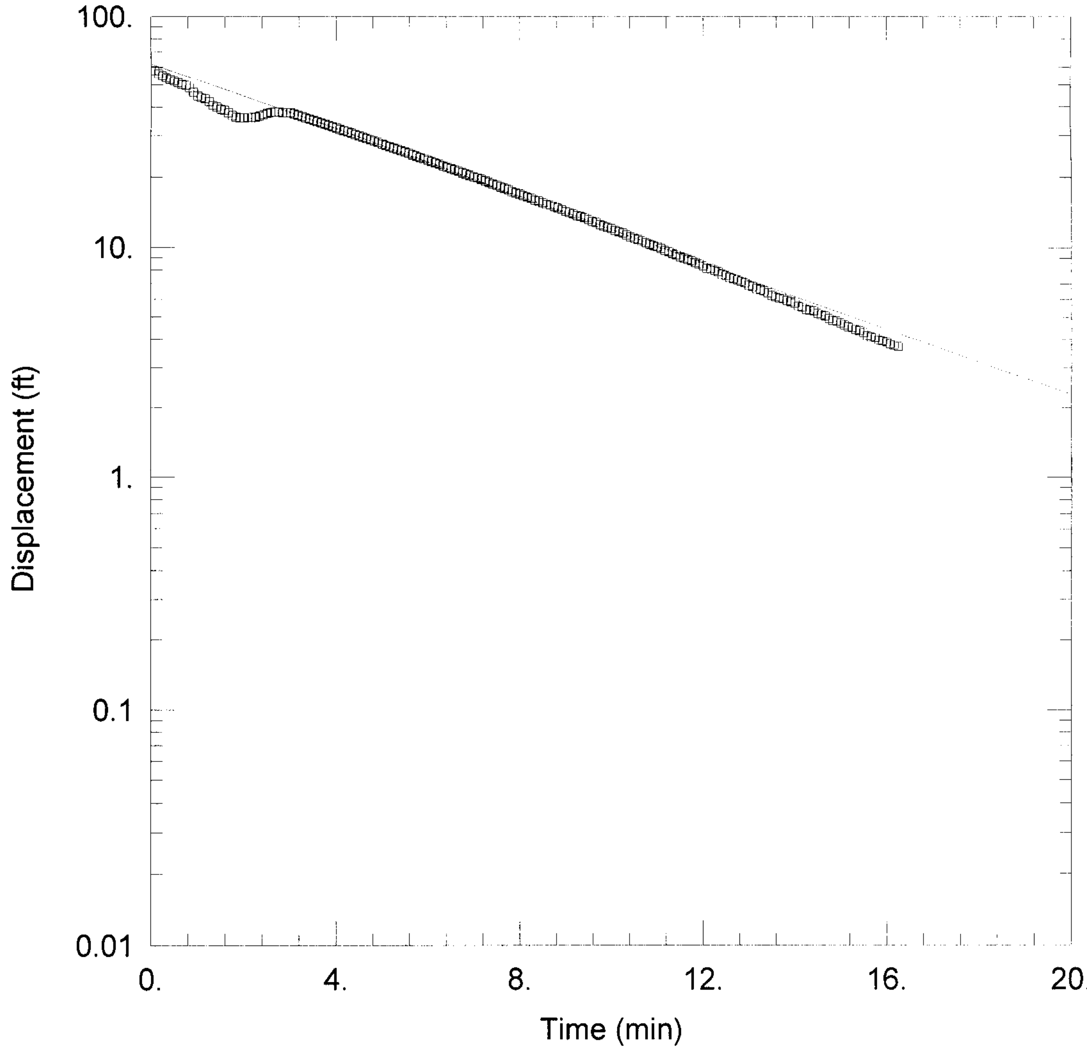
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 1.485 ft^2/day
S = 1.E-06

H1L Packer Testing

Test 2 (487.14 to 481.94 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1L\H1L-2a.aqt
Date: 11/26/02 Time: 11:08:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

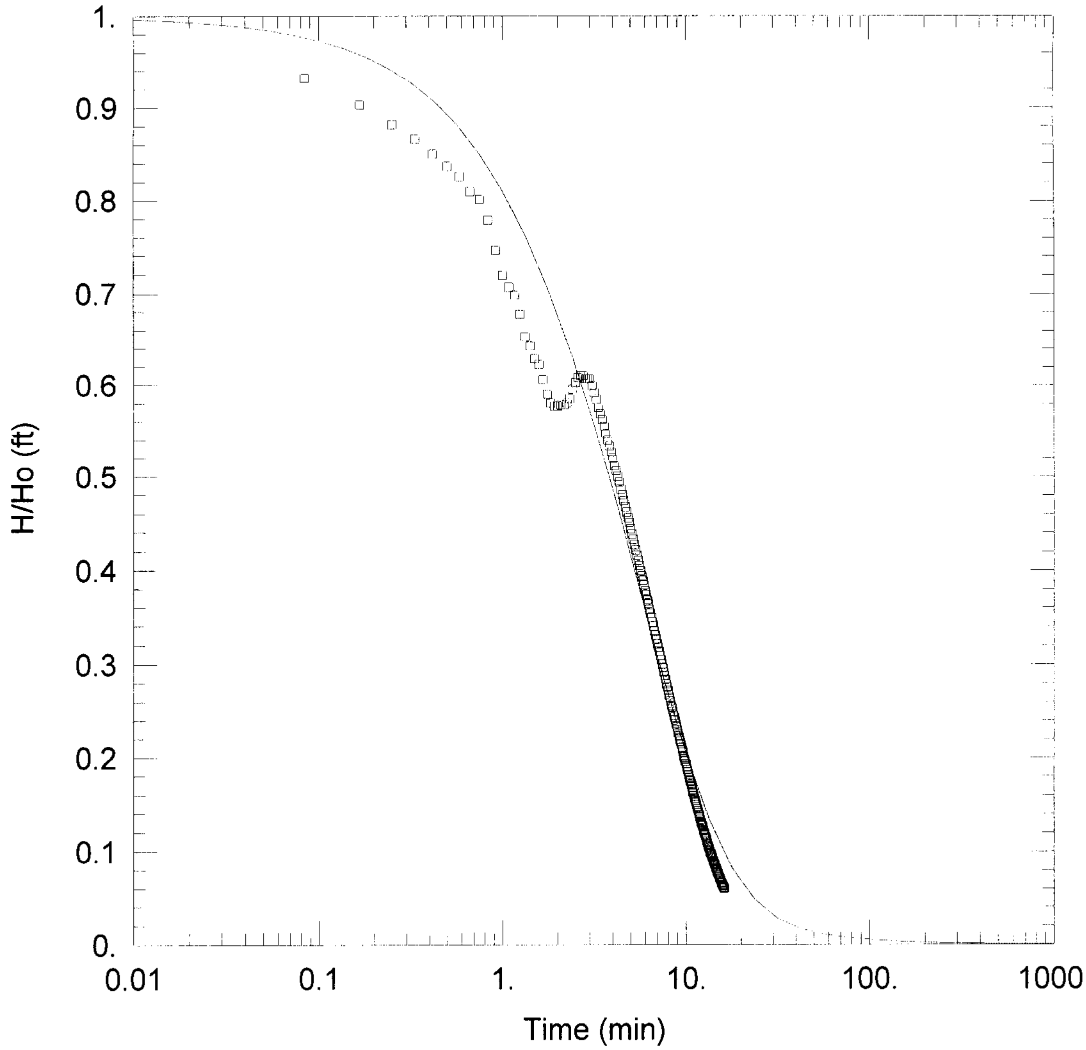
WELL DATA (H1L-2)

Initial Displacement: 58.04 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

'' = 2.185 ft/day
y0 = 62.25 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1L\H1L-2b.aqt
Date: 11/26/02 Time: 11:08:39

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1L-2)

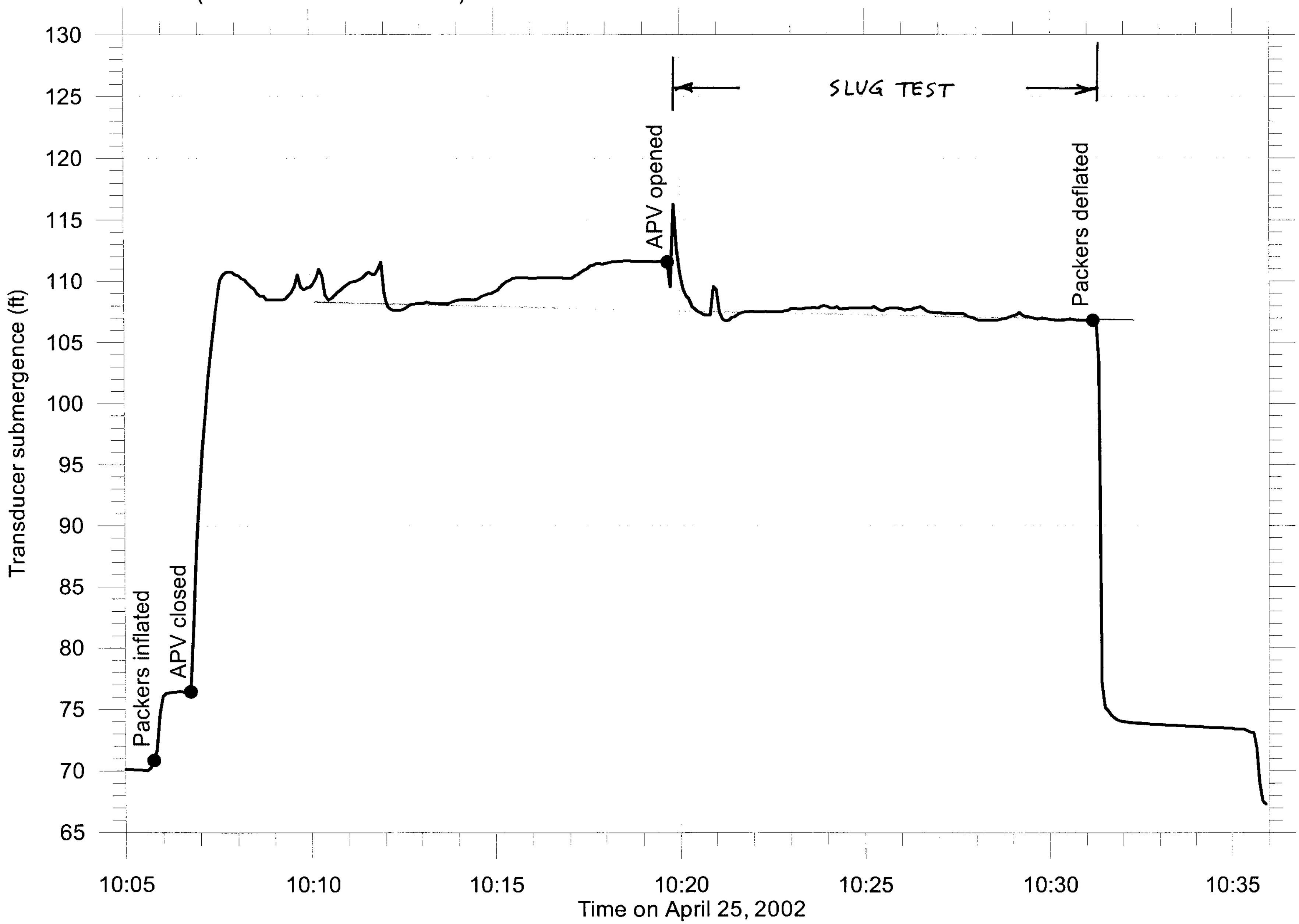
Initial Displacement: 62.25 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

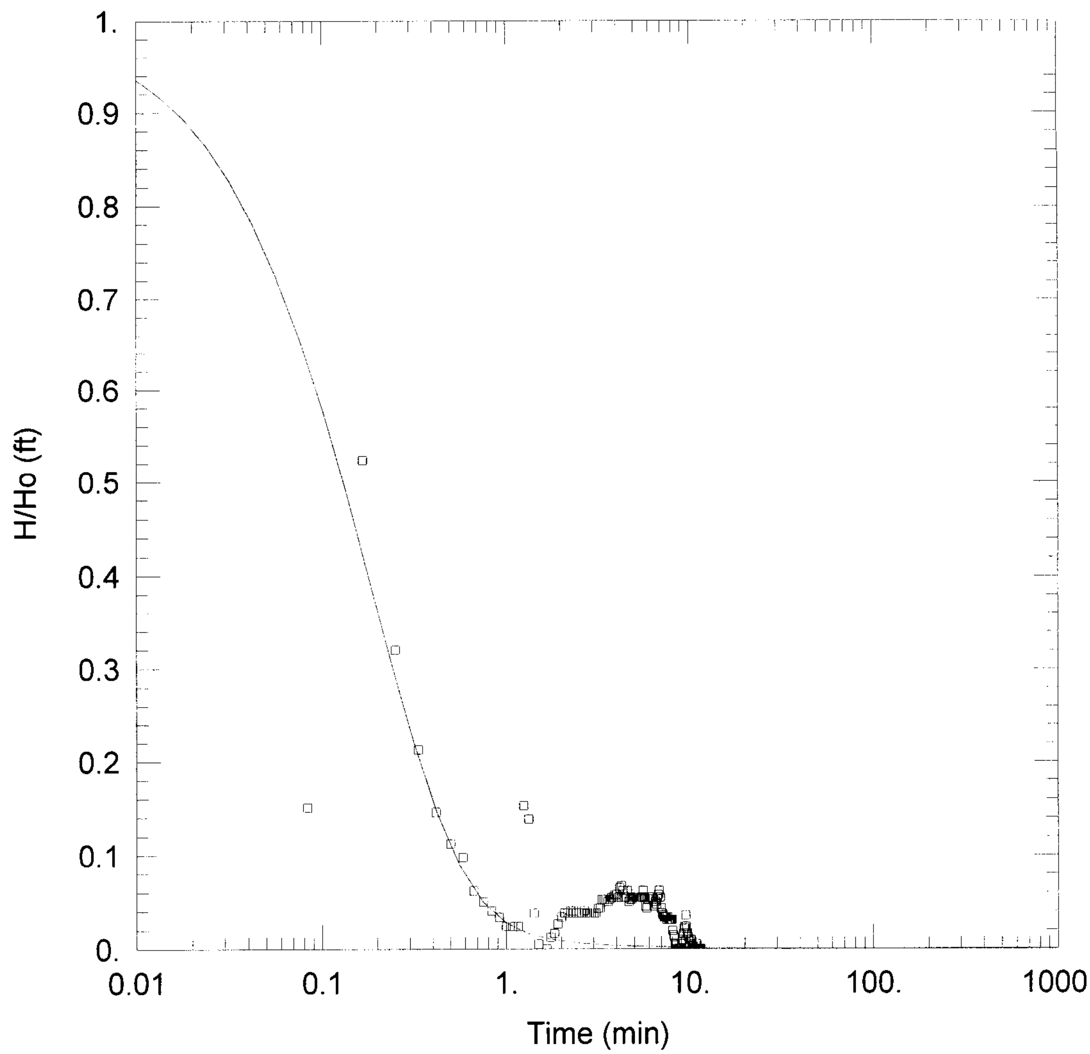
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.381 ft^2/day
S = 1.E-06

H1L Packer Testing

Test 3 (491.14 to 485.94 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H1L\H1L-3.aqt
Date: 11/26/02 Time: 11:08:51

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (H1L-3)

Initial Displacement: 18.1 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
T = 48.5 ft^2/day
Solution Method: Cooper-Bredehoeft-Papadopulos
S = 1.E-07

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

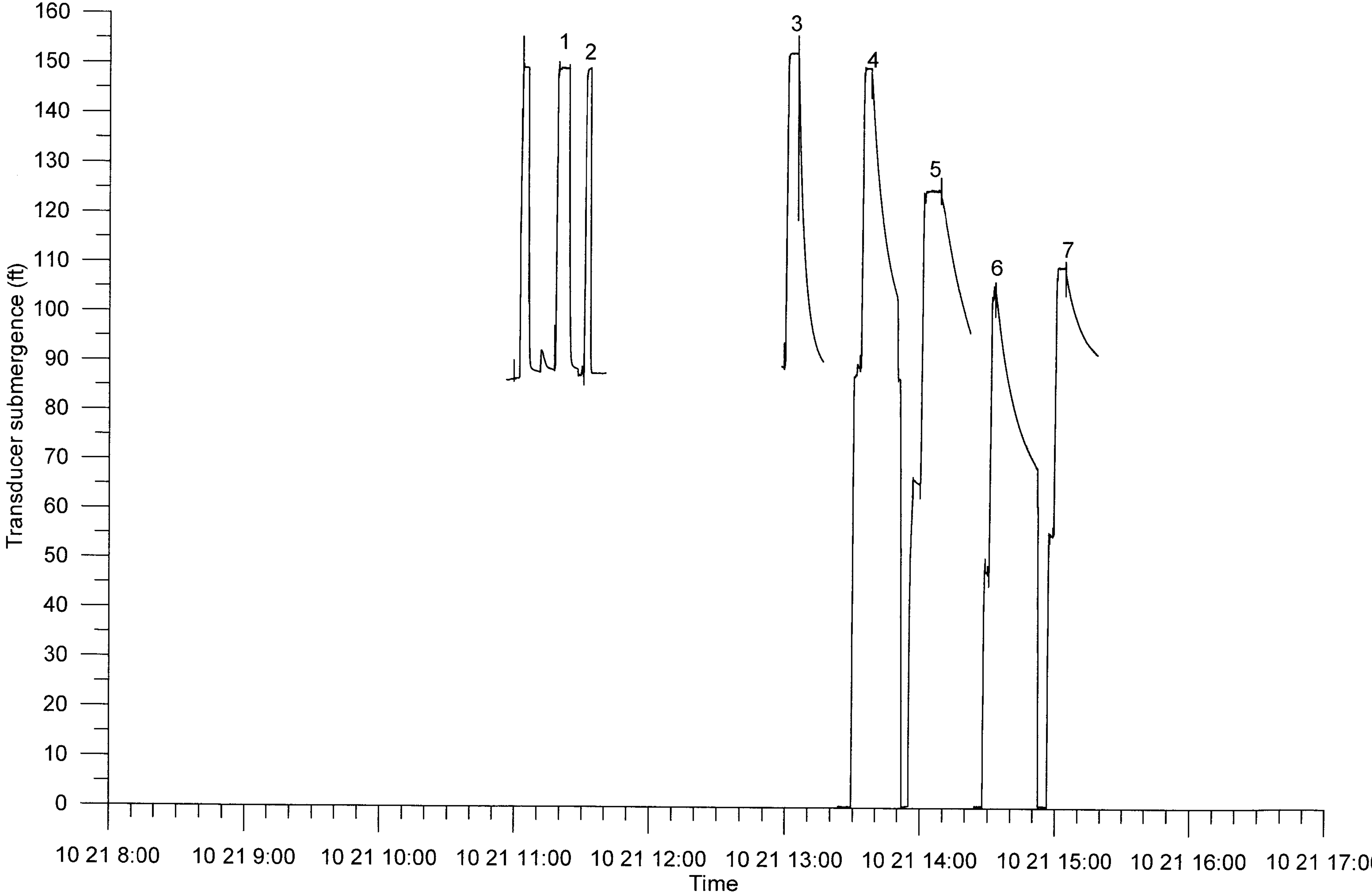
H5

Testing Dates: October 21 - 24, 2002
November 07, 2002 (Retest of intervals 560.65 to 555.15 ft MSL through 574.15 to 568.65 ft MSL; New intervals 592.15 to 586.65 ft MSL and 596.65 to 591.15 ft MSL)

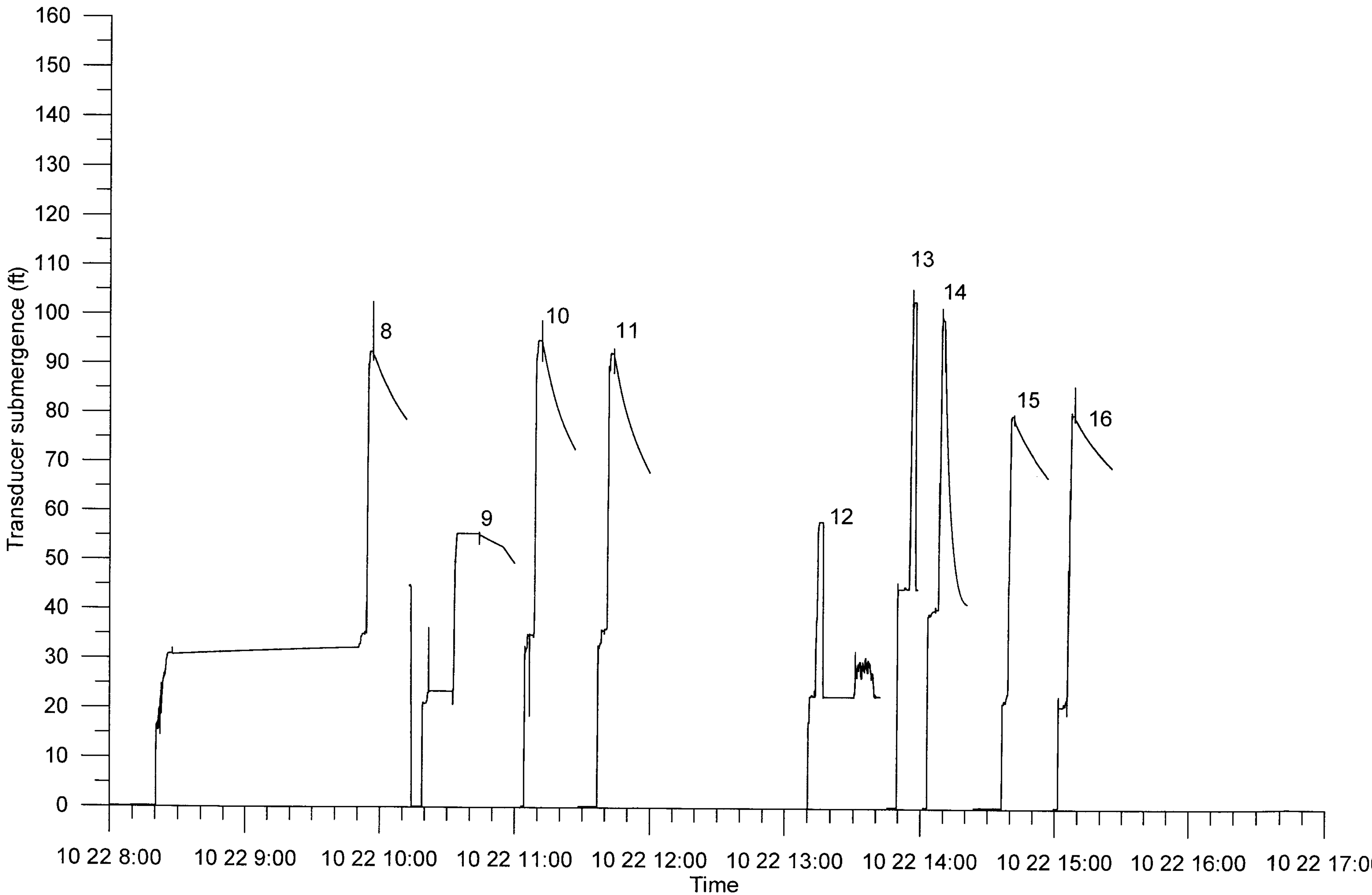
Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
H5	1	457.15	447.75	25	Packers poorly sealed
H5	2	457.15	451.65	39	Packers poorly sealed
H5	3	461.65	456.15	2.4	
H5	4	466.15	460.65	0.92	
H5	5	470.65	465.15	0.32	
H5	6	475.15	469.65	0.43	
H5	7	479.65	474.15	0.25	
H5	8	484.15	478.65	0.12	
H5	9	488.65	483.15	0.09	
H5	10	493.15	487.65	0.22	
H5	11	497.65	492.15	0.25	
H5	12	502.15	496.65	180	
H5	13	506.65	501.15	300	
H5	14	511.15	505.65	3.2	
H5	15	515.65	510.15	0.11	
H5	16	520.15	514.65	0.07	
H5	17	524.65	519.15	0.03	
H5	18	529.15	523.65	0.005	
H5	19	533.65	528.15	<0.001	
H5	20	538.15	532.65	<0.001	
H5	21	542.65	537.15	<0.001	
H5	22	529.15	541.65	3	
H5	23	551.65	546.15	1.6	
H5	24	556.15	550.65	0.04	
H5	25	560.65	555.15	0.18	
H5	26	565.15	559.65	1.2	
H5	27	569.65	564.15	0.012	
H5	28	574.15	568.65	0.009	
H5	29	578.65	573.15	0.014	
H5	30	583.15	577.65	0.11	
H5	31	587.65	582.15	0.07	
H5	32	592.15	586.65	0.02	
H5	33	596.65	591.15	2.4	

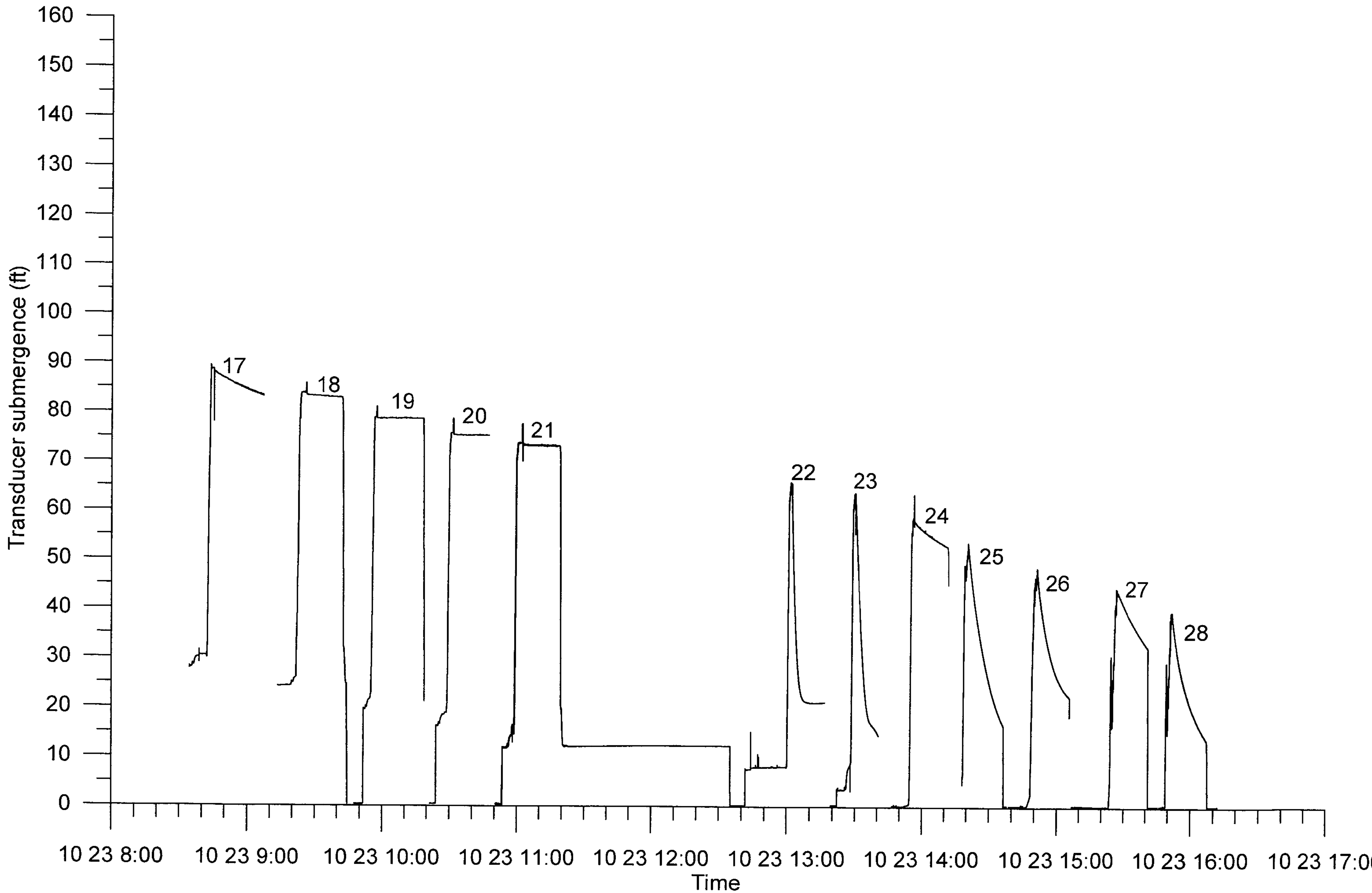
H5 Packer Testing



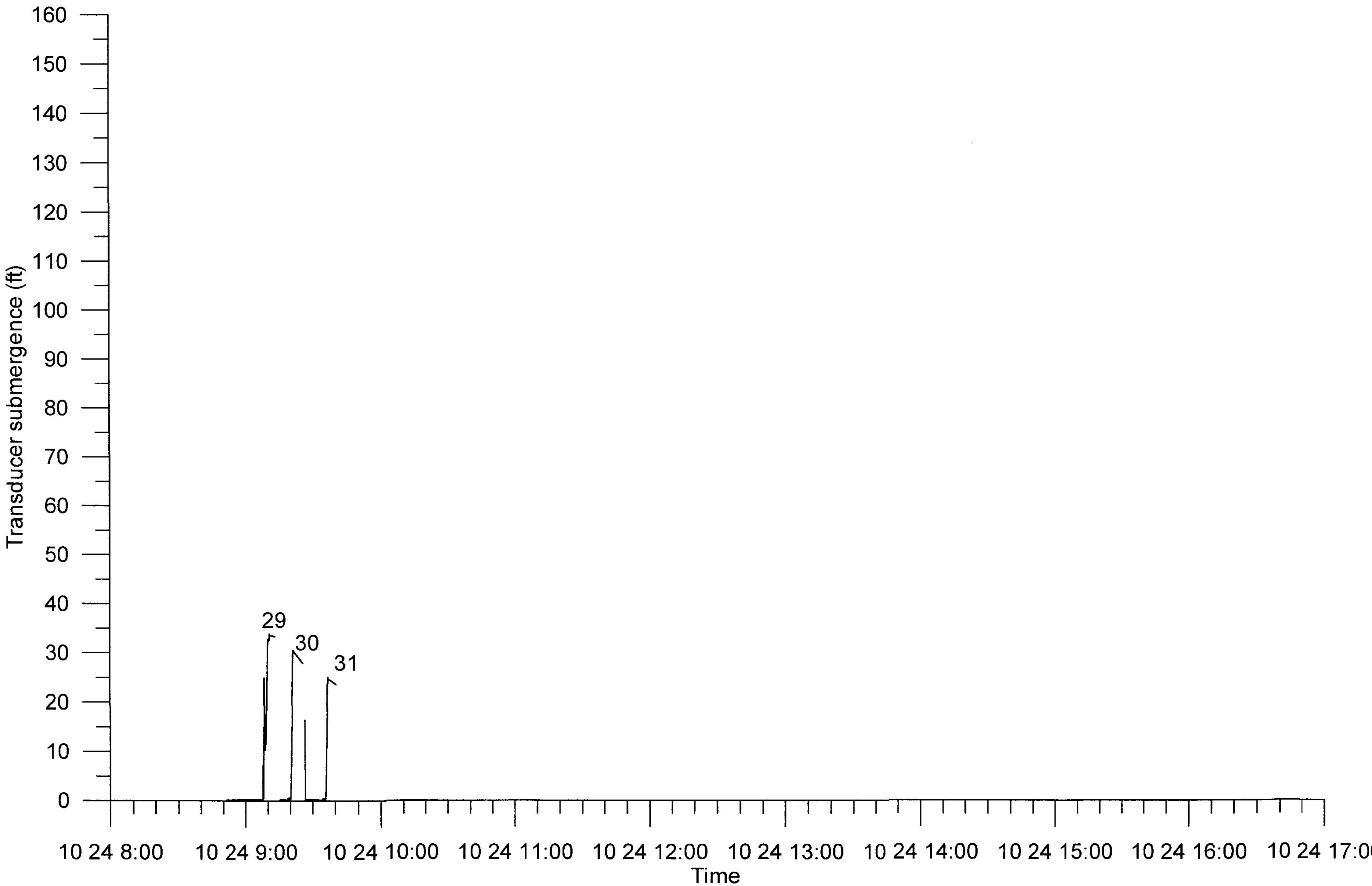
H5 Packer Testing



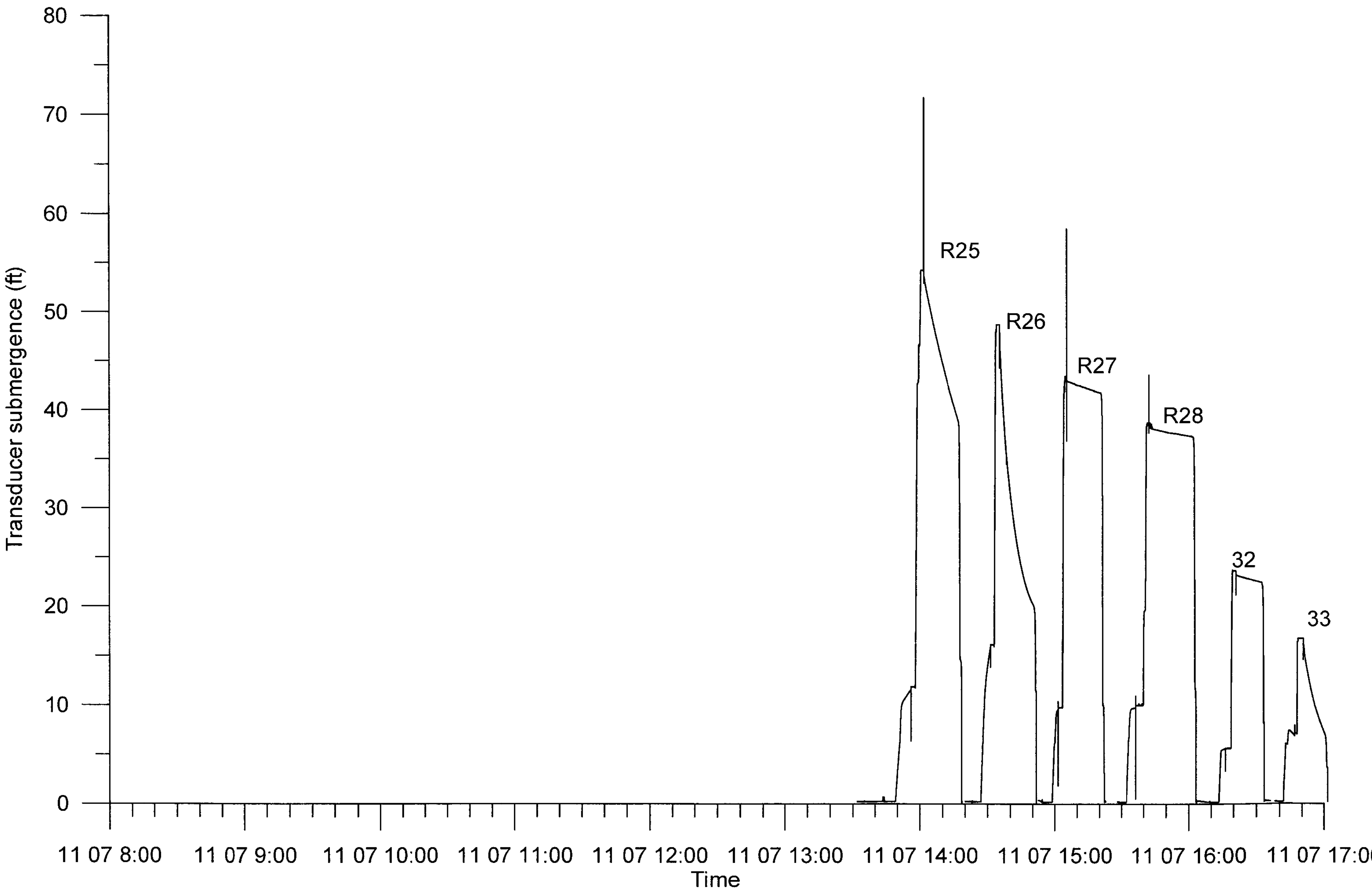
H5 Packer Testing



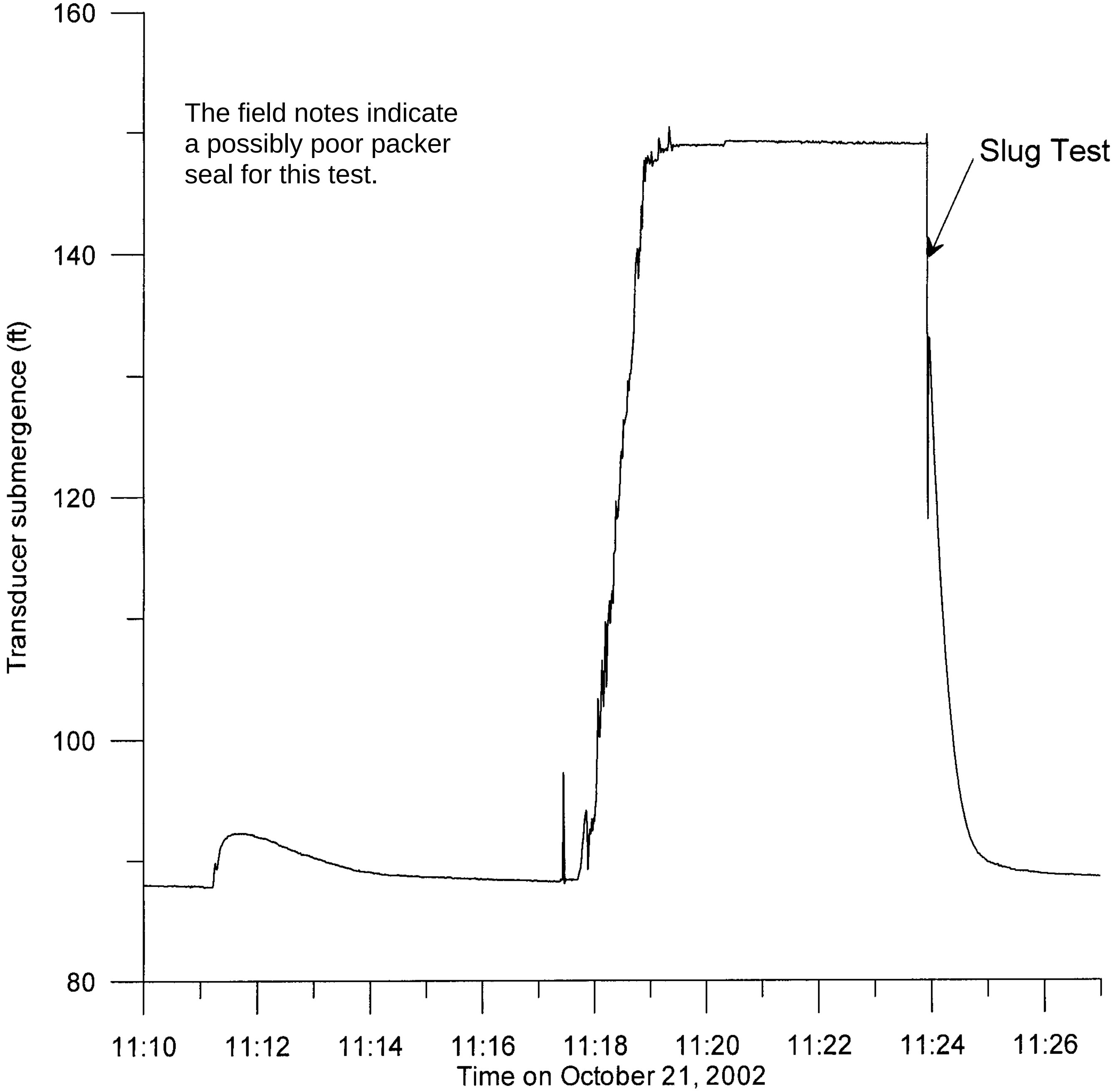
H5 Packer Testing

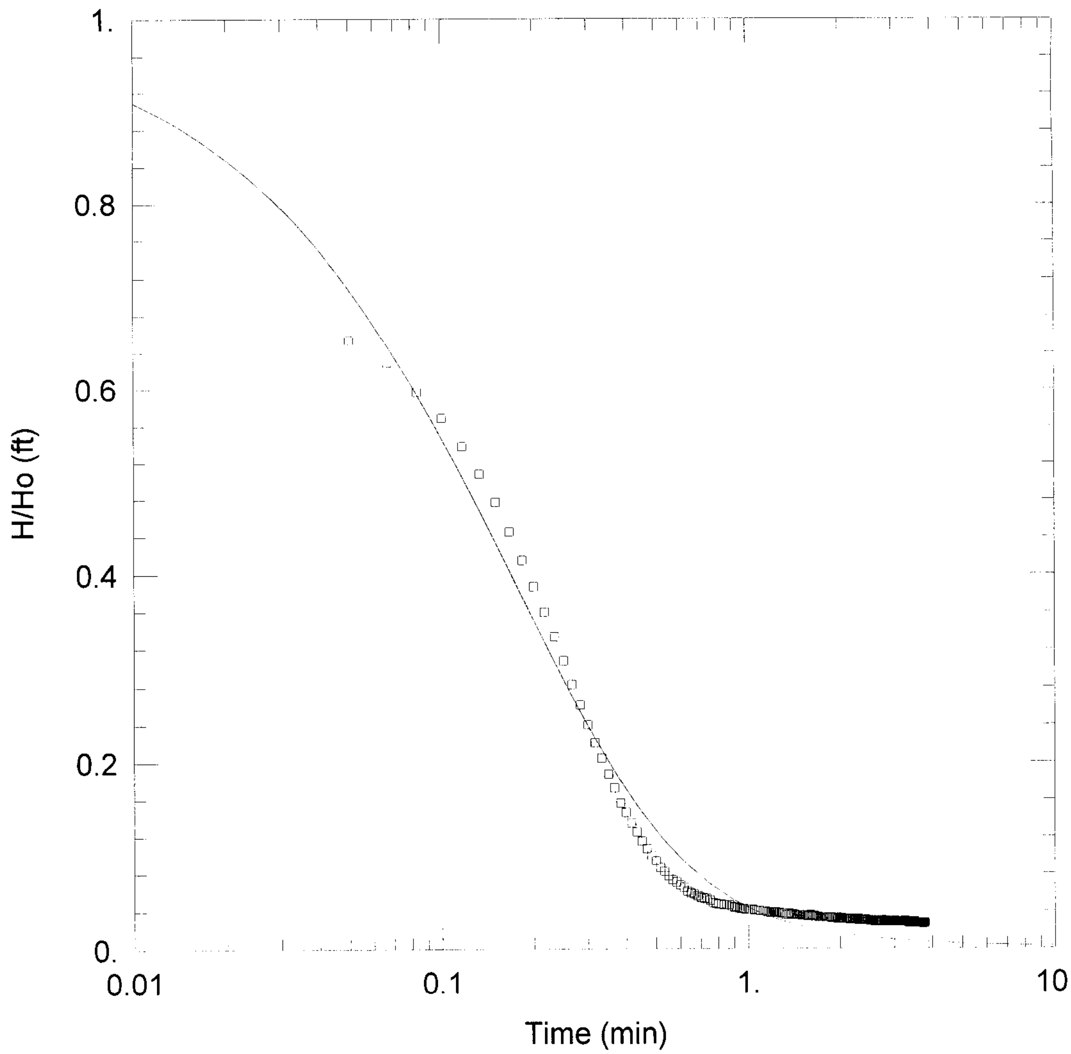


H5 Packer Testing



H5
Test 1


The field notes indicate
a possibly poor packer
seal for this test.
Slug Test
160
140
120
100
80
Transducer submergence (ft)
11:10
11:12
11:14
11:16
11:18
11:20
11:22
11:24
11:26
Time on October 21, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-1(c).aqt
Date: 01/21/03 Time: 12:53:26

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.5 ft Anisotropy Ratio (Kz/Kr): 1.

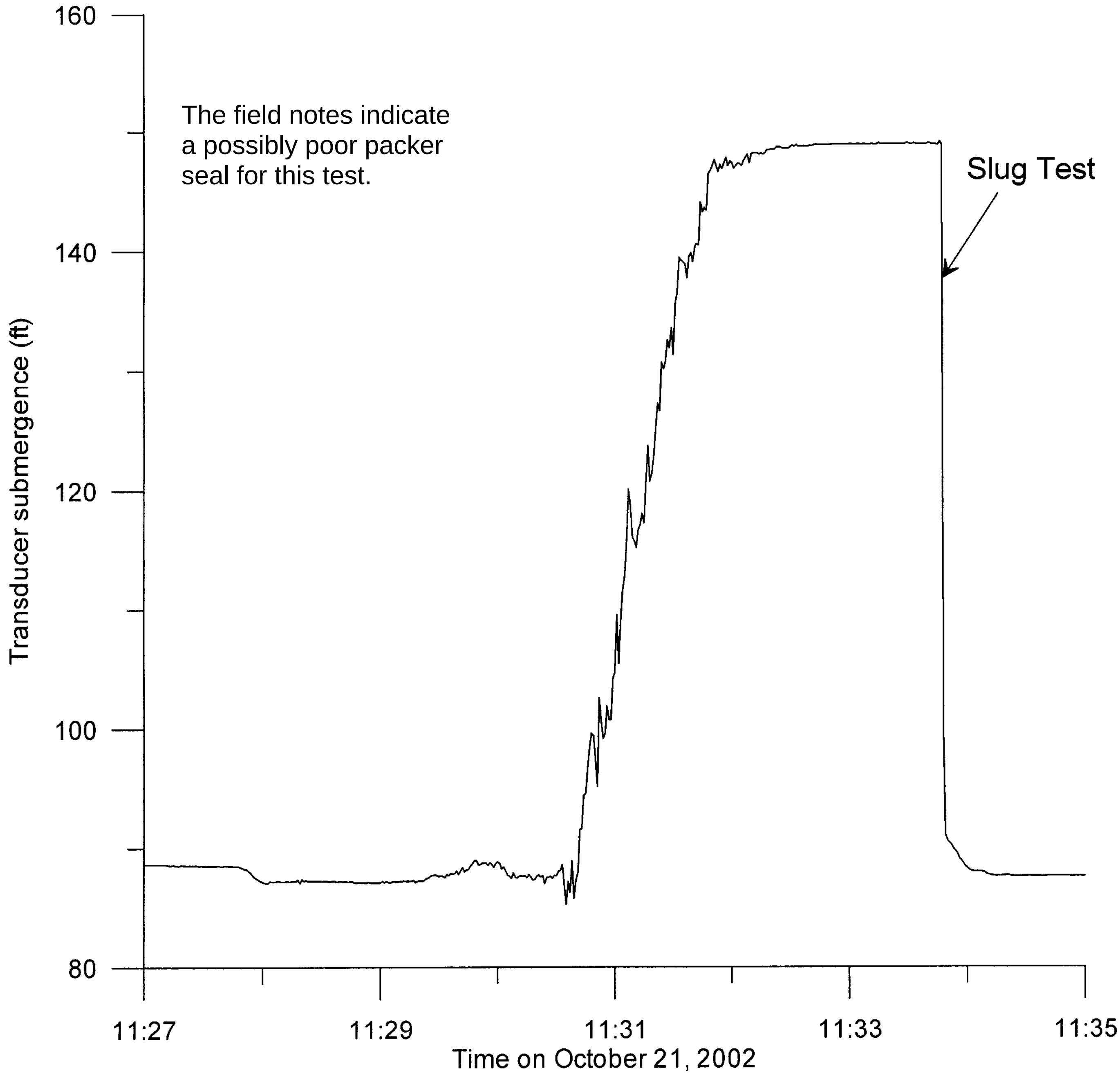
WELL DATA

Initial Displacement: 53.03 ft
Wellbore Radius: 0.3333 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.3333 ft
Total Well Penetration Depth: 1. ft

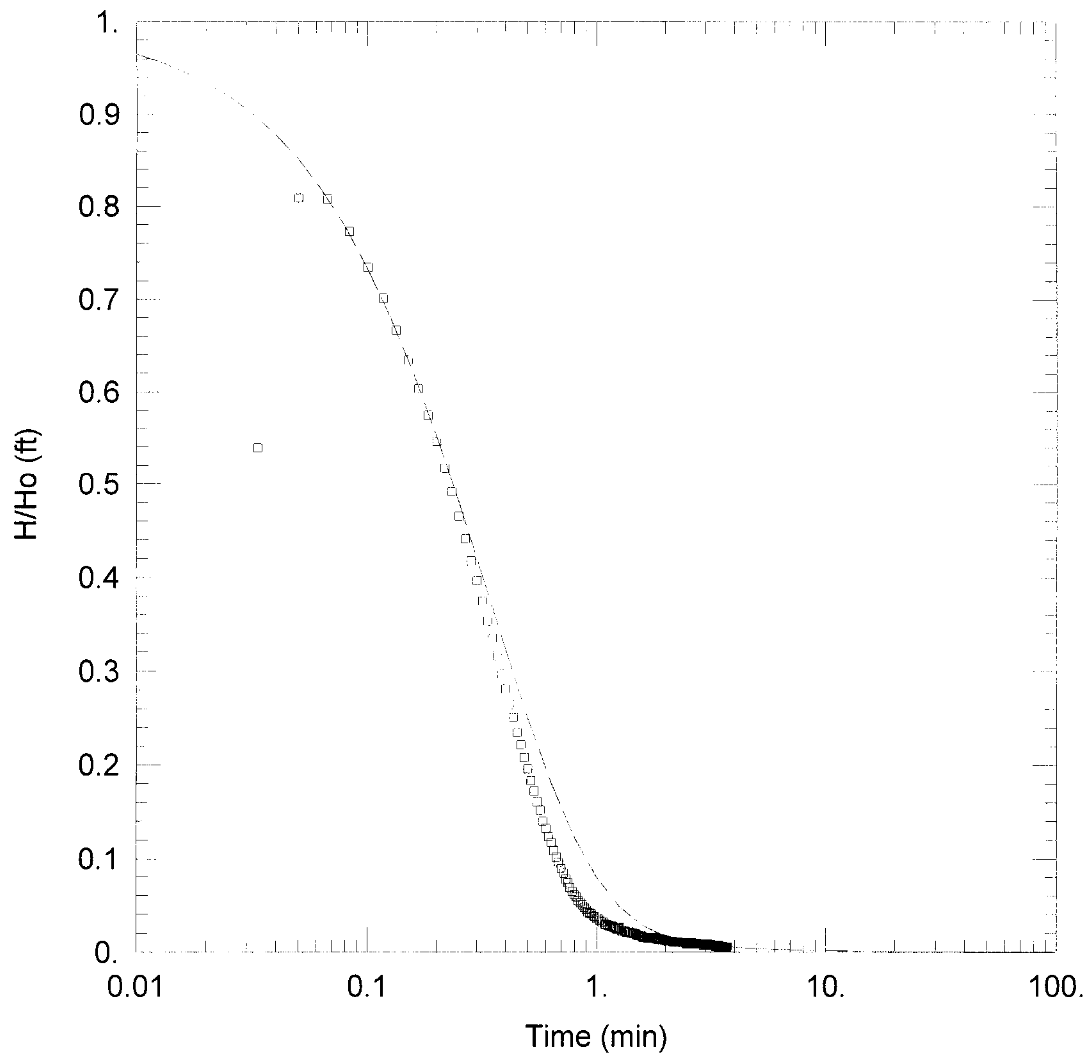
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 25.55 ft^2/day
S = 2.513E-05

H5
Test 2



160
140
120
100
80
Transducer submergence (ft)
The field notes indicate
a possibly poor packer
seal for this test.
Slug Test
11:27
11:29
11:31
11:33
11:35
Time on October 21, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-2(c).aqt
Date: 01/21/03 Time: 12:50:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

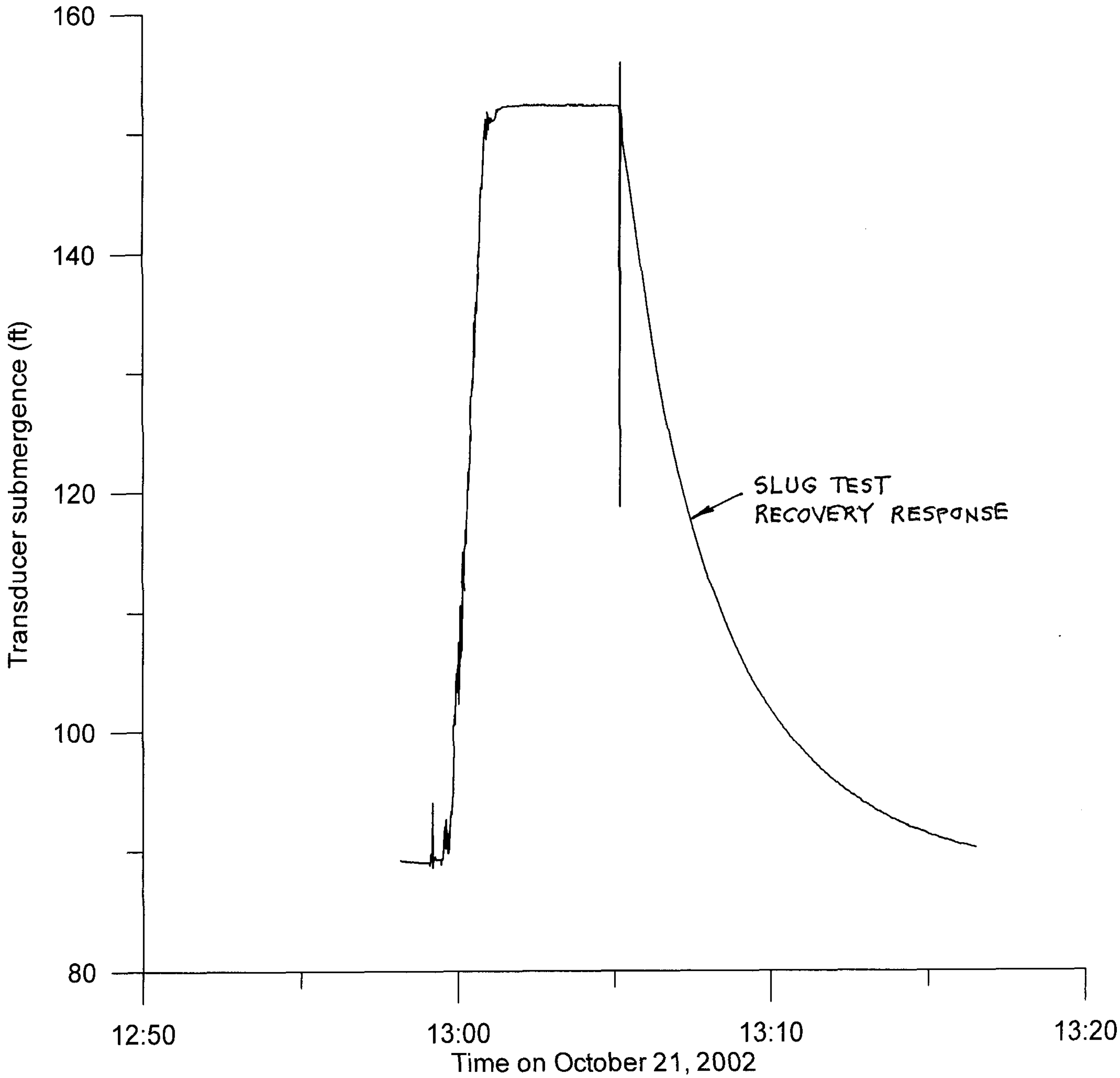
Initial Displacement: 55.59 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

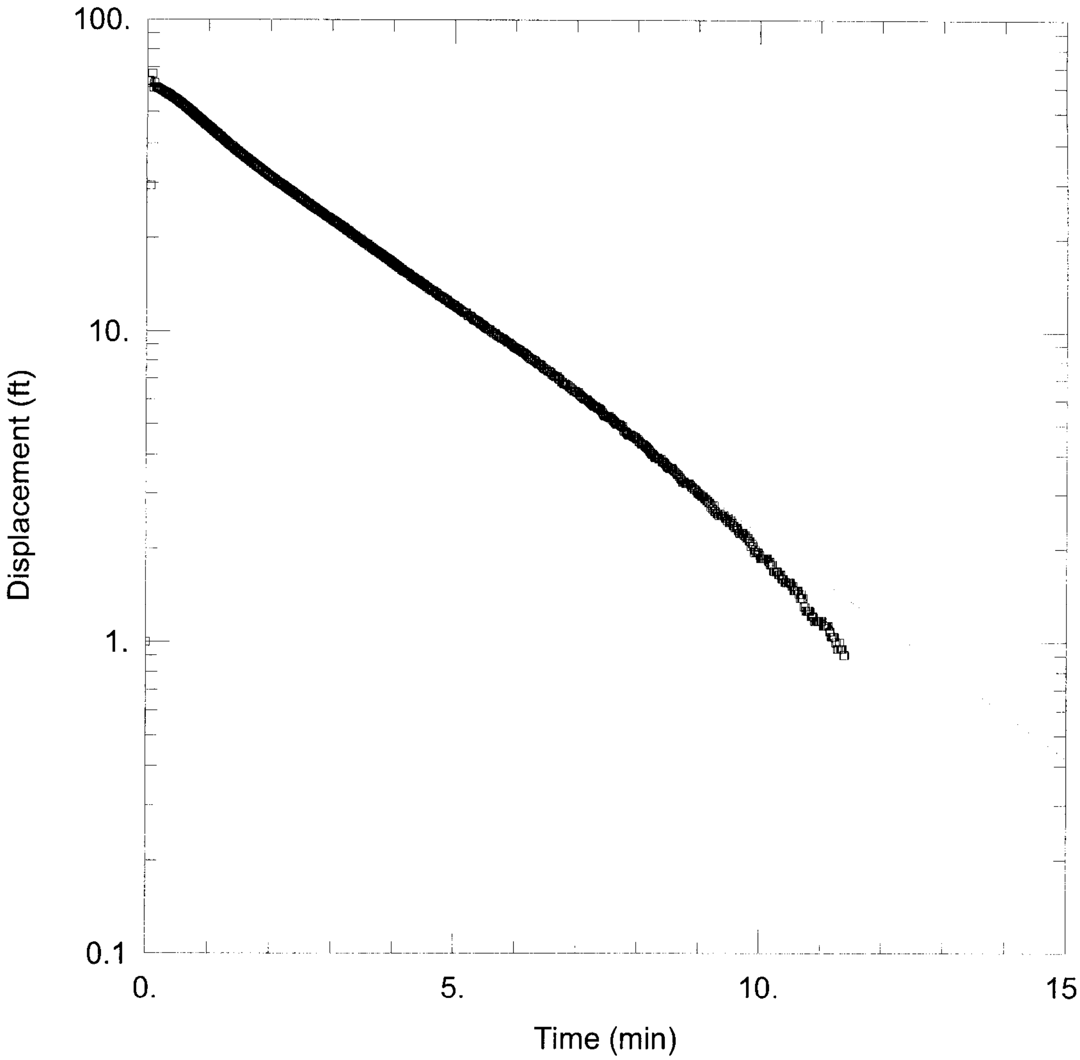
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

= 38.78 ft^2/day S = 1.E-10

H5
Test 3


160
140
120
100
80
Transducer submergence (ft)
12:50
13:00
13:10
13:20
Time on October 21, 2002
SLUG TEST
RECOVERY RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-3(h).aqt
Date: 01/21/03 Time: 12:16:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

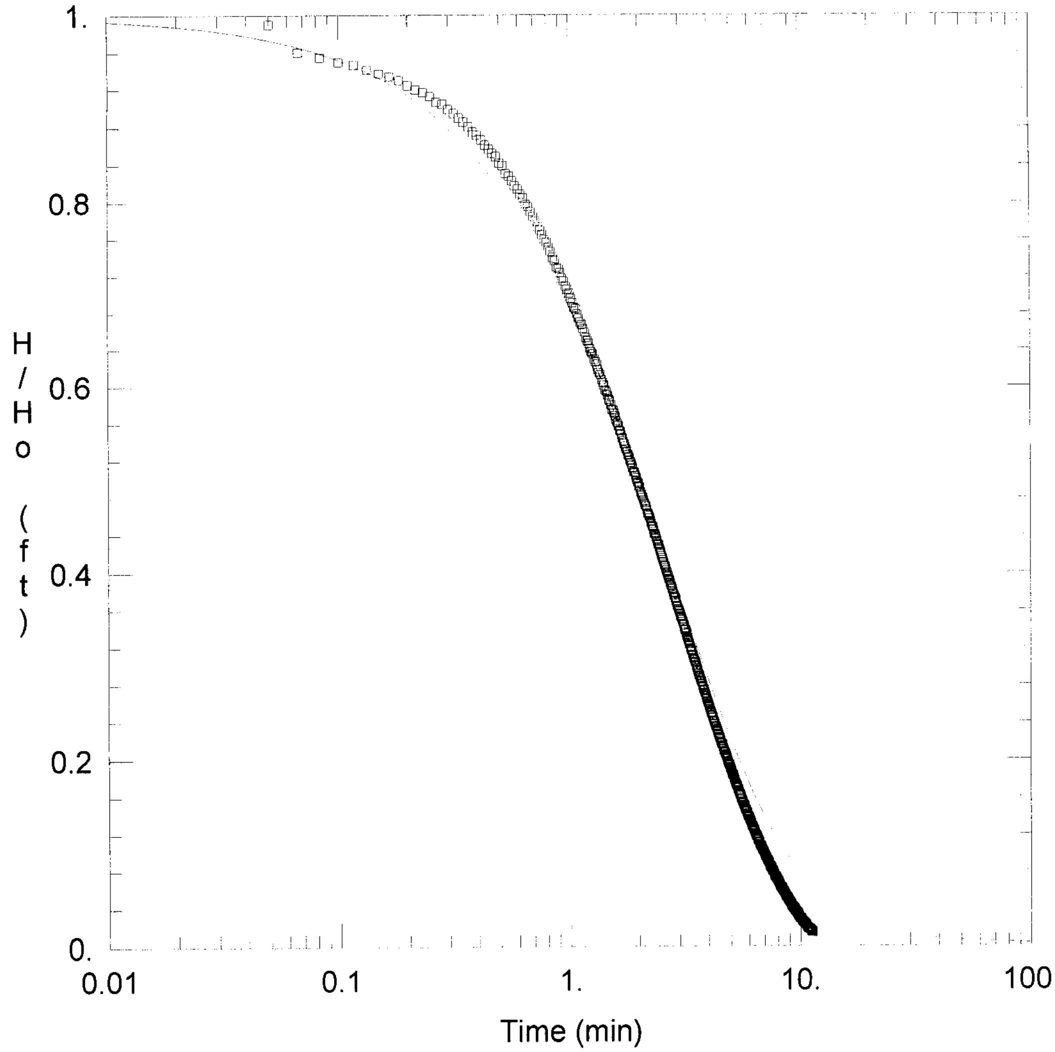
WELL DATA

Initial Displacement: 1. ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method:

= 0.6106 ft/day
y0 = 62.7 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-3(c).aqt
Date: 12/05/02 Time: 15:04:17

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

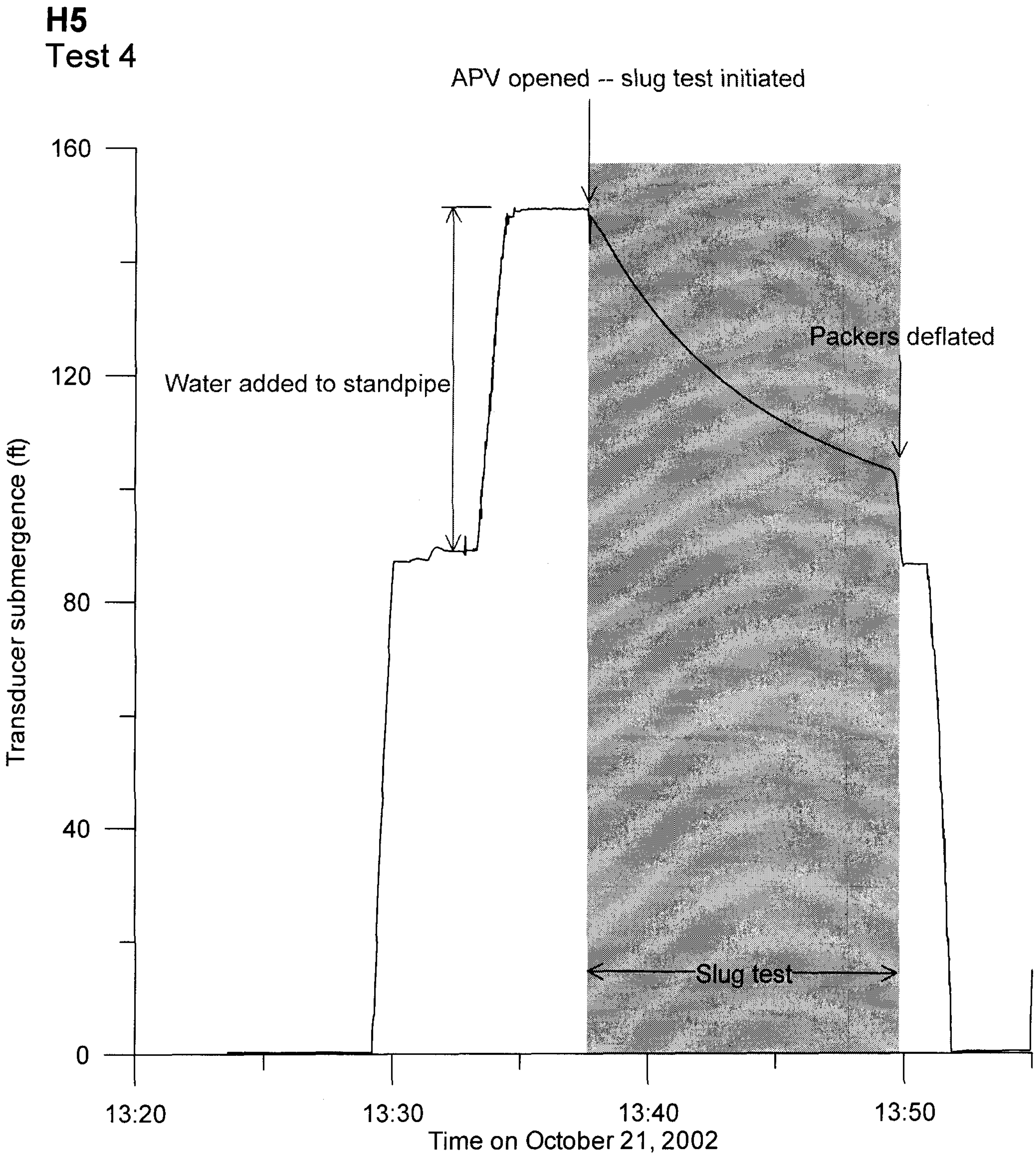
WELL DATA

Initial Displacement: 62.7 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

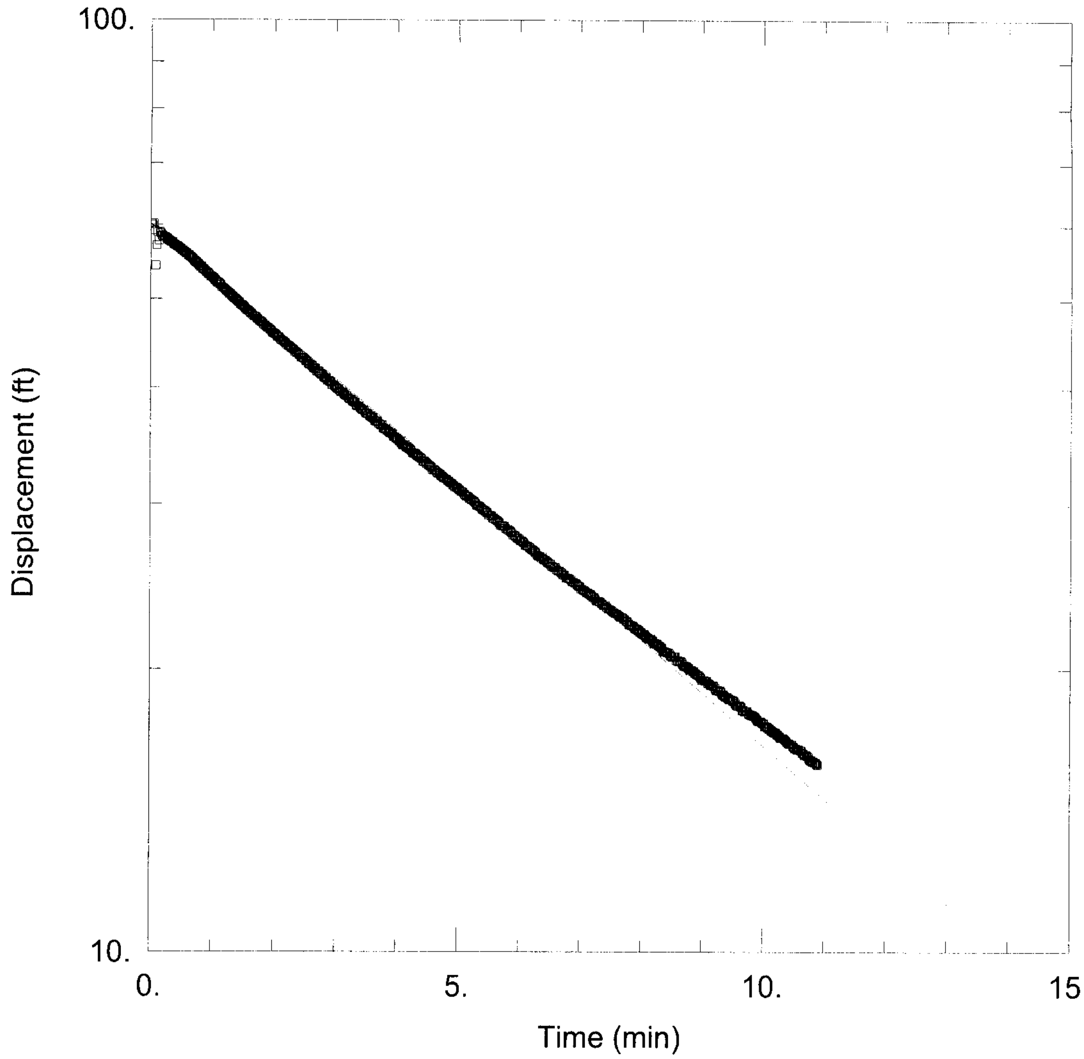
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.433 ft^2/day
S = 1.E-06



H5
Test 4
APV opened -- slug test initiated
Packers deflated
Water added to standpipe
Slug test
Transducer submergence (ft)
160
120
80
40
0
13:20
13:30
13:40
13:50
Time on October 21, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-4(h).aqt
Date: 01/21/03 Time: 12:20:02

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

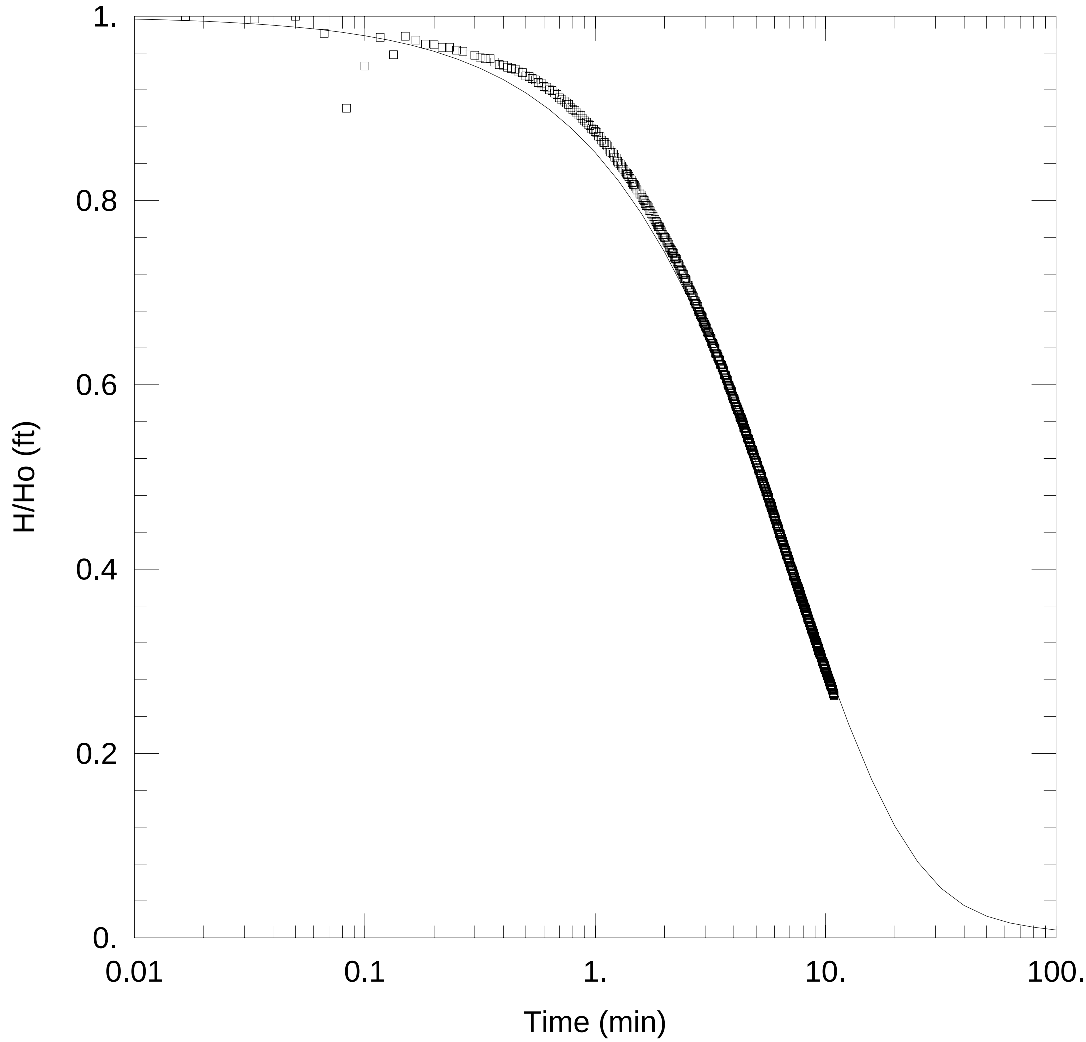
WELL DATA

Initial Displacement: 1. ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method:

= 0.2363 ft/day y0 = 60.3 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-4(c).aqt
Date: 01/22/03 Time: 15:37:17

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

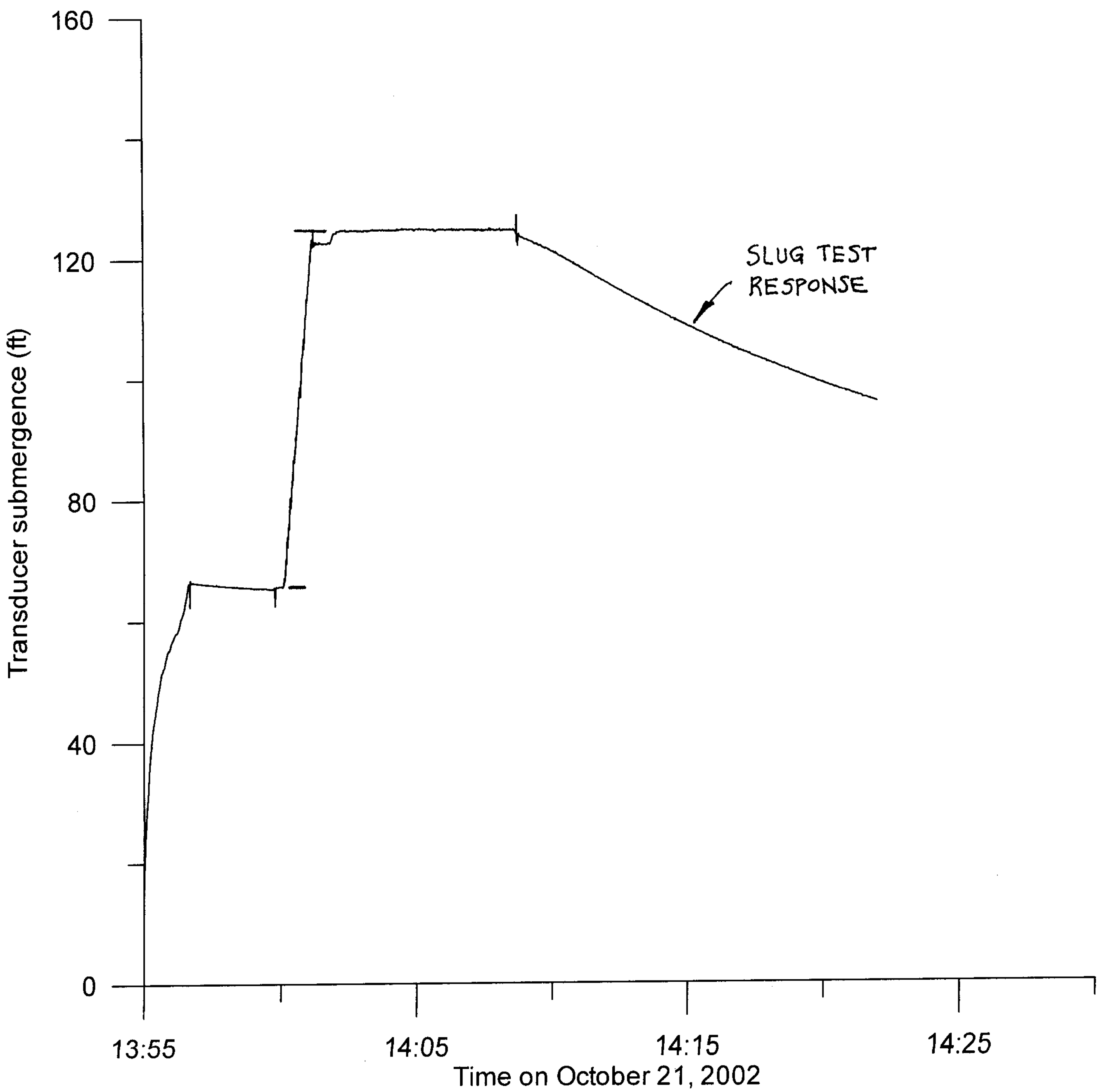
Initial Displacement: 60.3 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

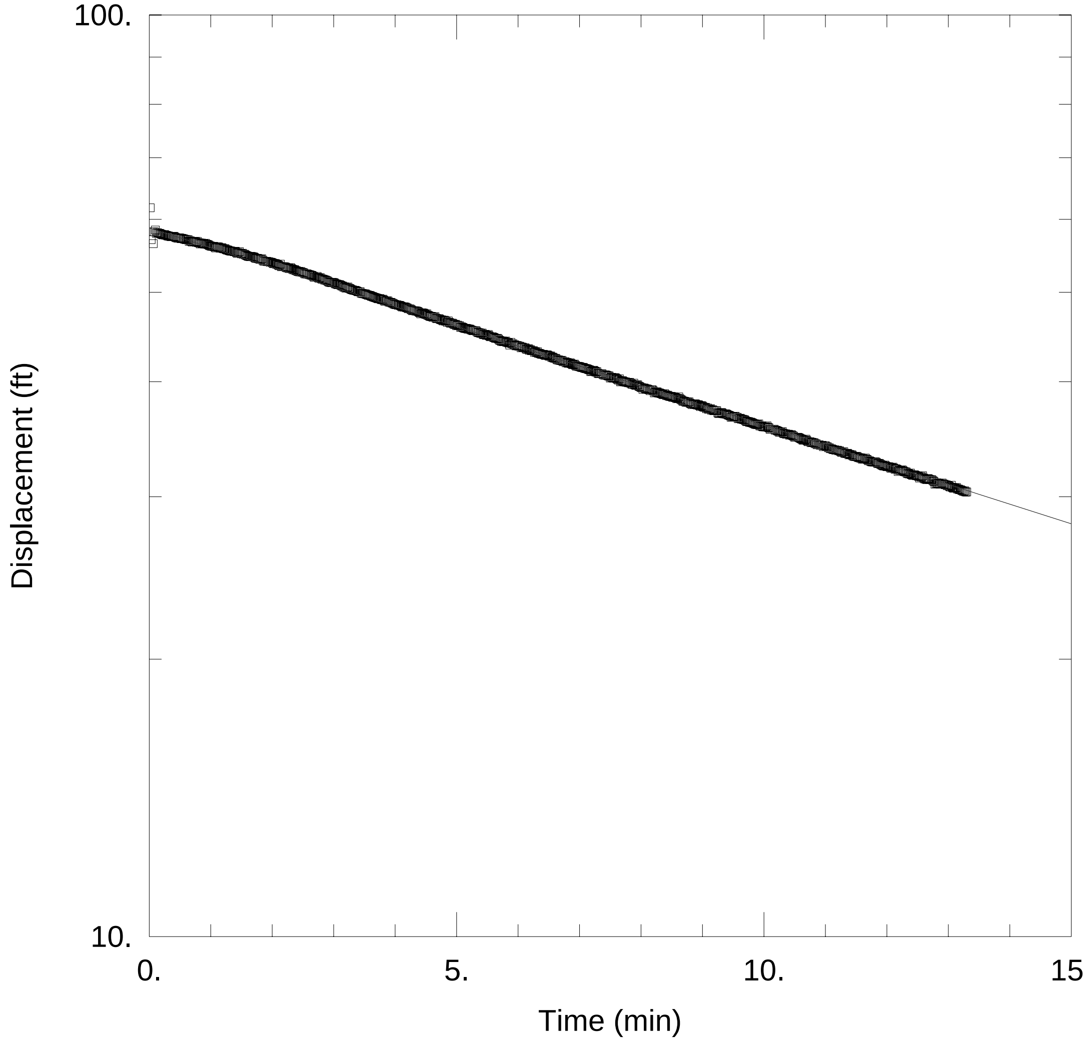
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.9287 ft^2/day S = 1.E-06

H5
Test 5


160
120
80
40
0
Transducer submergence (ft)
13:55
14:05
14:15
14:25
Time on October 21, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-5(h).aqt
Date: 01/22/03 Time: 15:38:03

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

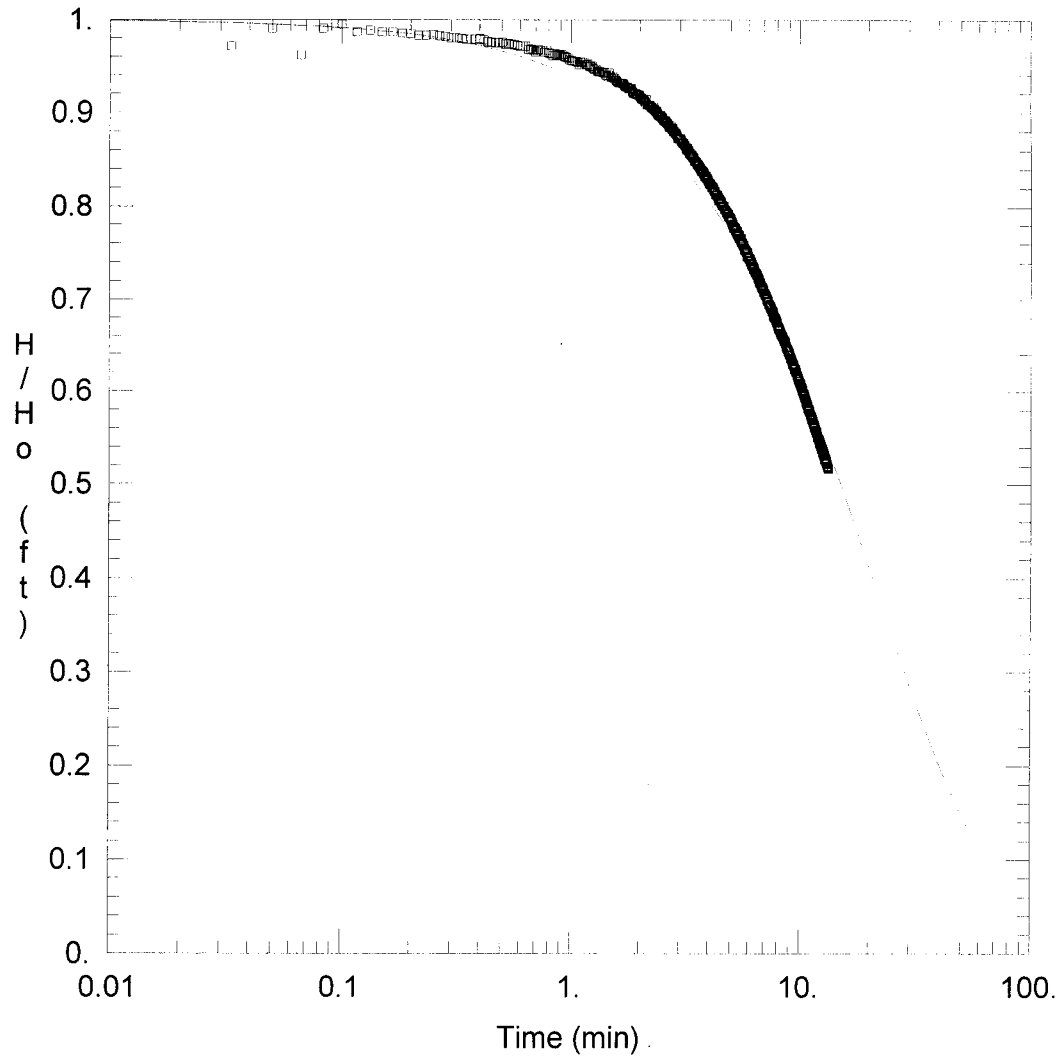
WELL DATA

Initial Displacement: 1. ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.09026 ft/day y0 = 58.73 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-5(c).aqt
Date: 12/05/02 Time: 15:06:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

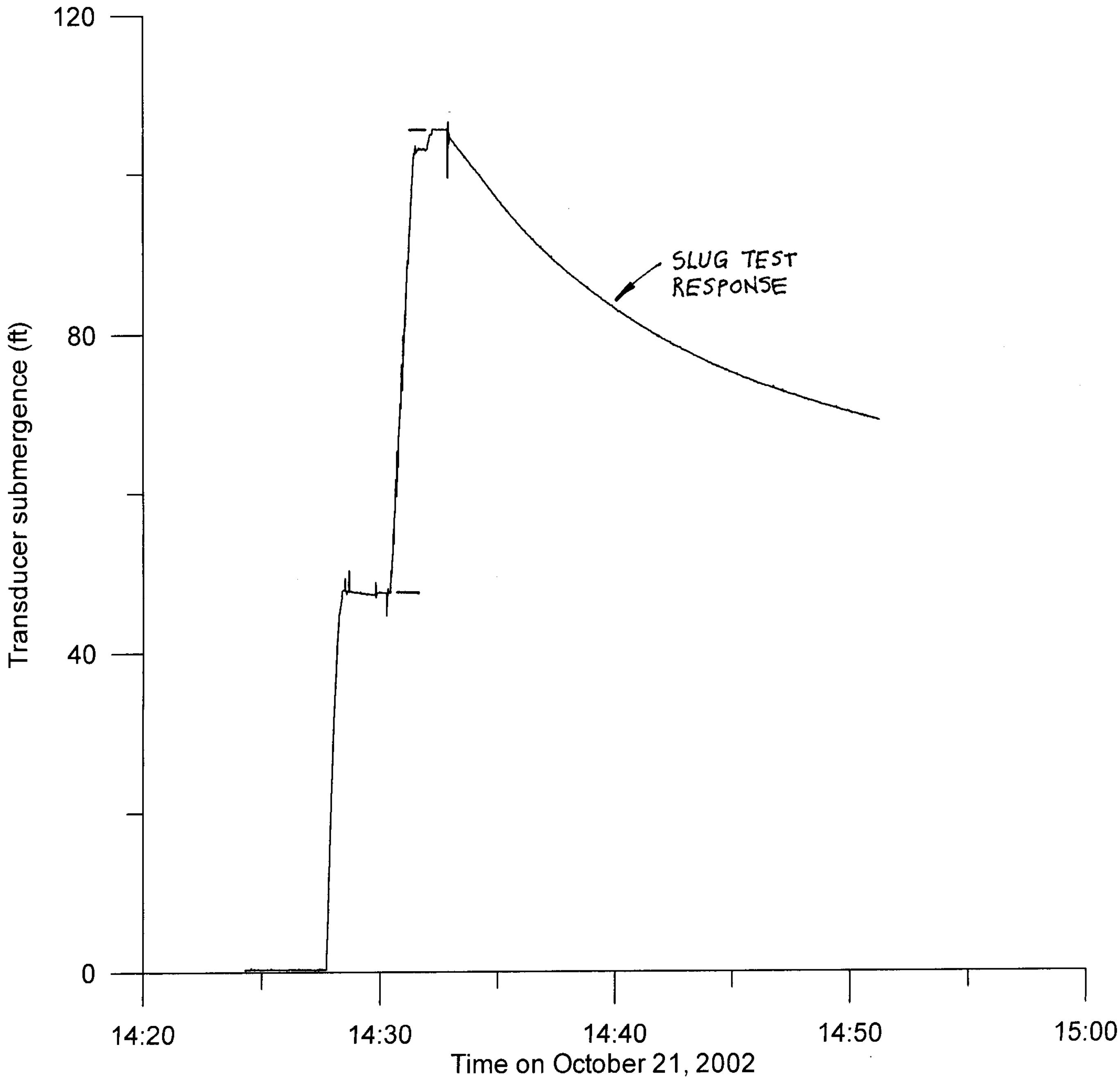
Initial Displacement: 58.73 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

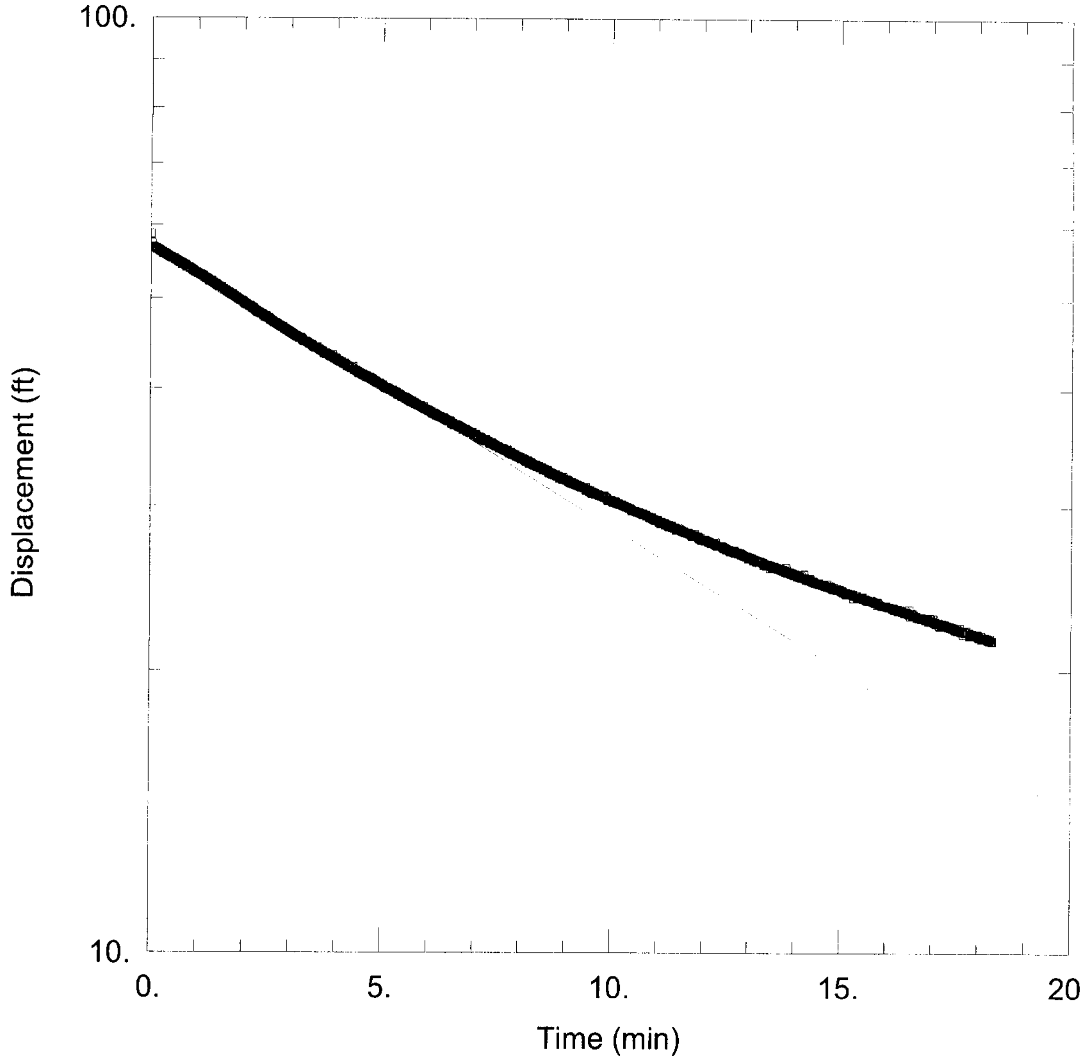
SOLUTION

quifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.3237 ft^2/day S = 1.E-06

H5
Test 6


120
80
40
0
Transducer submergence (ft)
14:20
14:30
14:40
14:50
15:00
Time on October 21, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-6(h).aqt
Date: 01/21/03 Time: 12:21:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

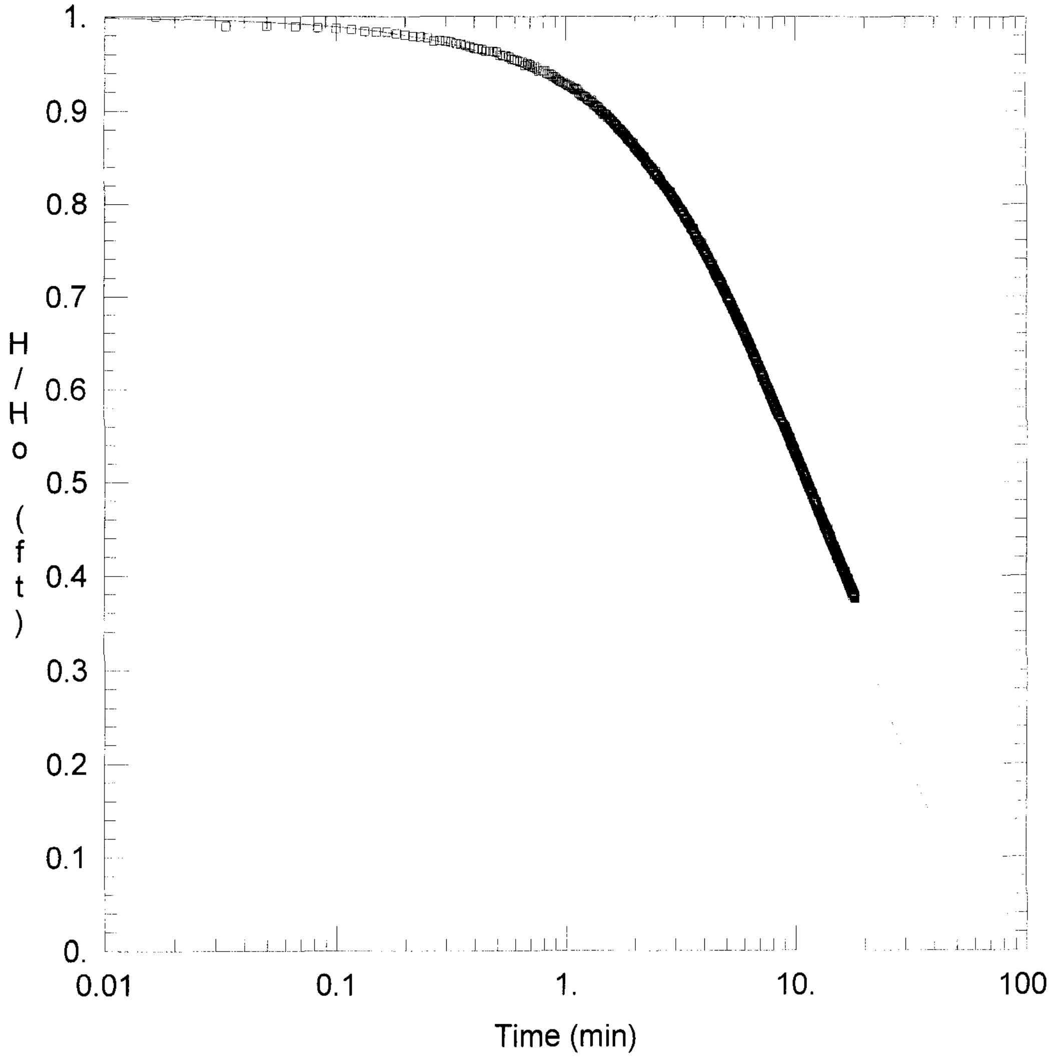
Saturated Thickness: 1. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 58.73 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
= 0.1285 ft/day
Solution Method:
y0 = 57.43 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-6(c).aqt
Date: 12/05/02 Time: 15:06:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

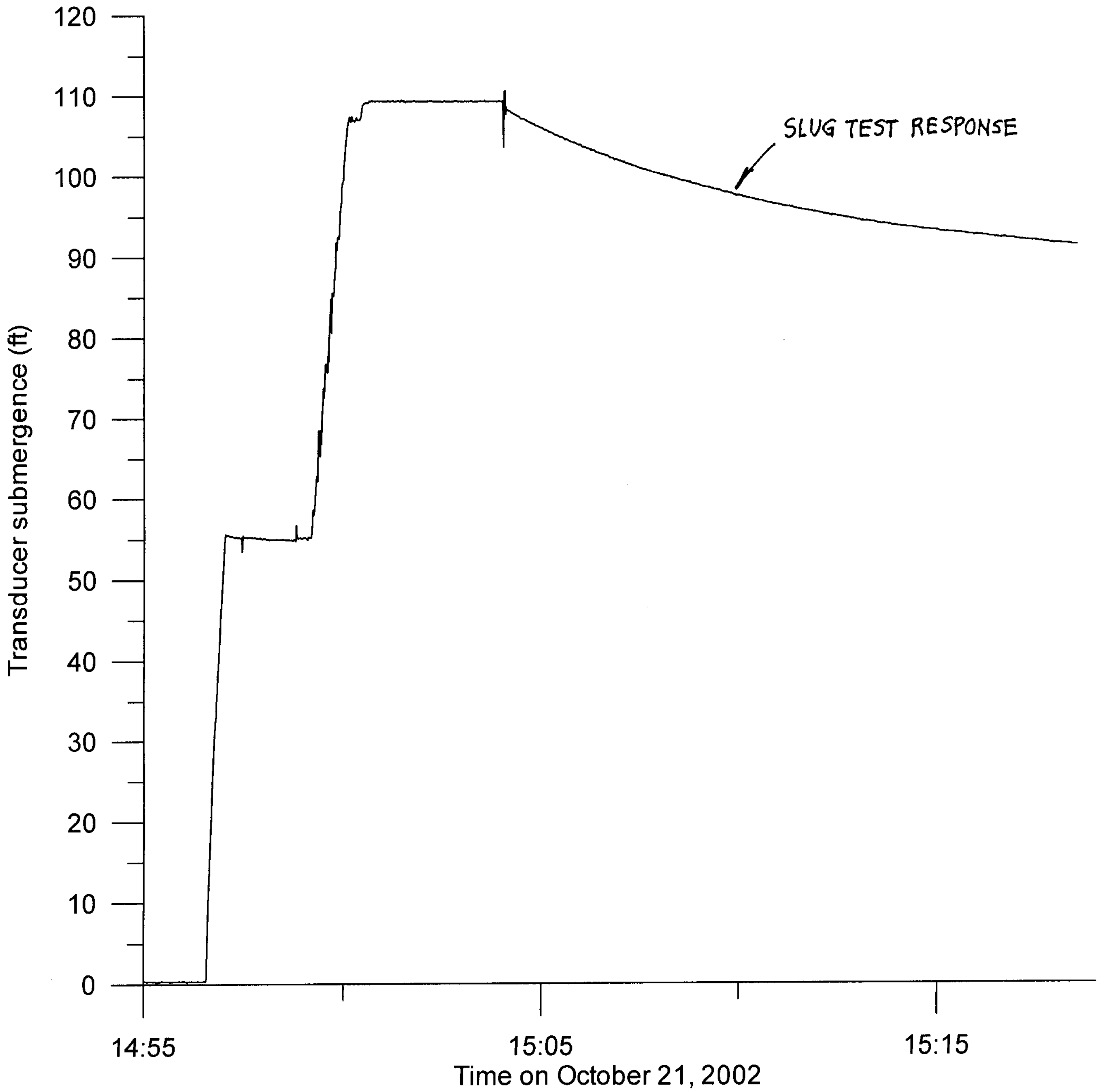
Initial Displacement: 57.43 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

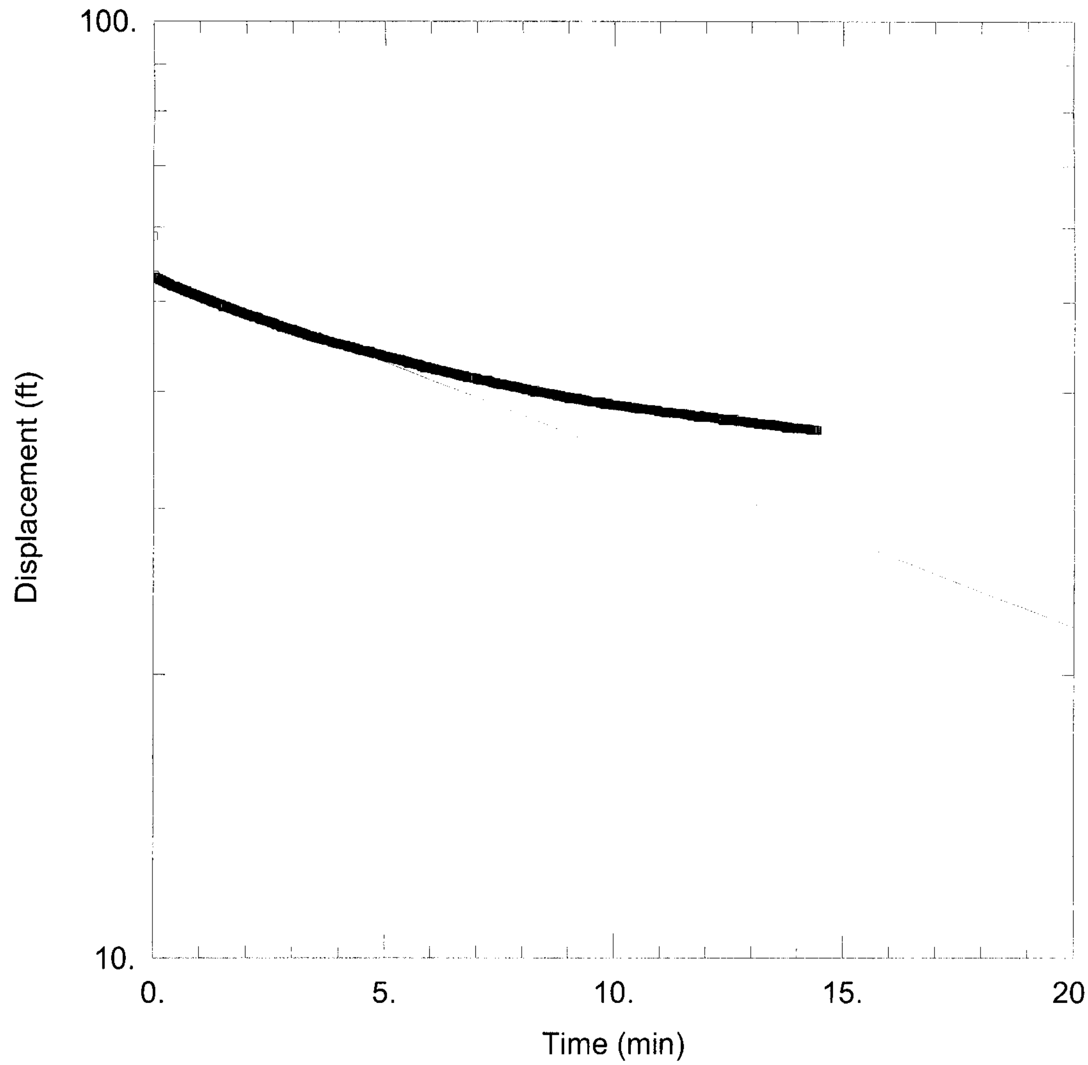
quifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.4292 ft^2/day
S = 1.E-06

H5
Test 7



Transducer submergence (ft)
120
110
100
90
80
70
60
50
40
30
20
10
0
14:55
15:05
15:15
Time on October 21, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-7(h).aqt
Date: 01/21/03
Time: 12:25:18

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

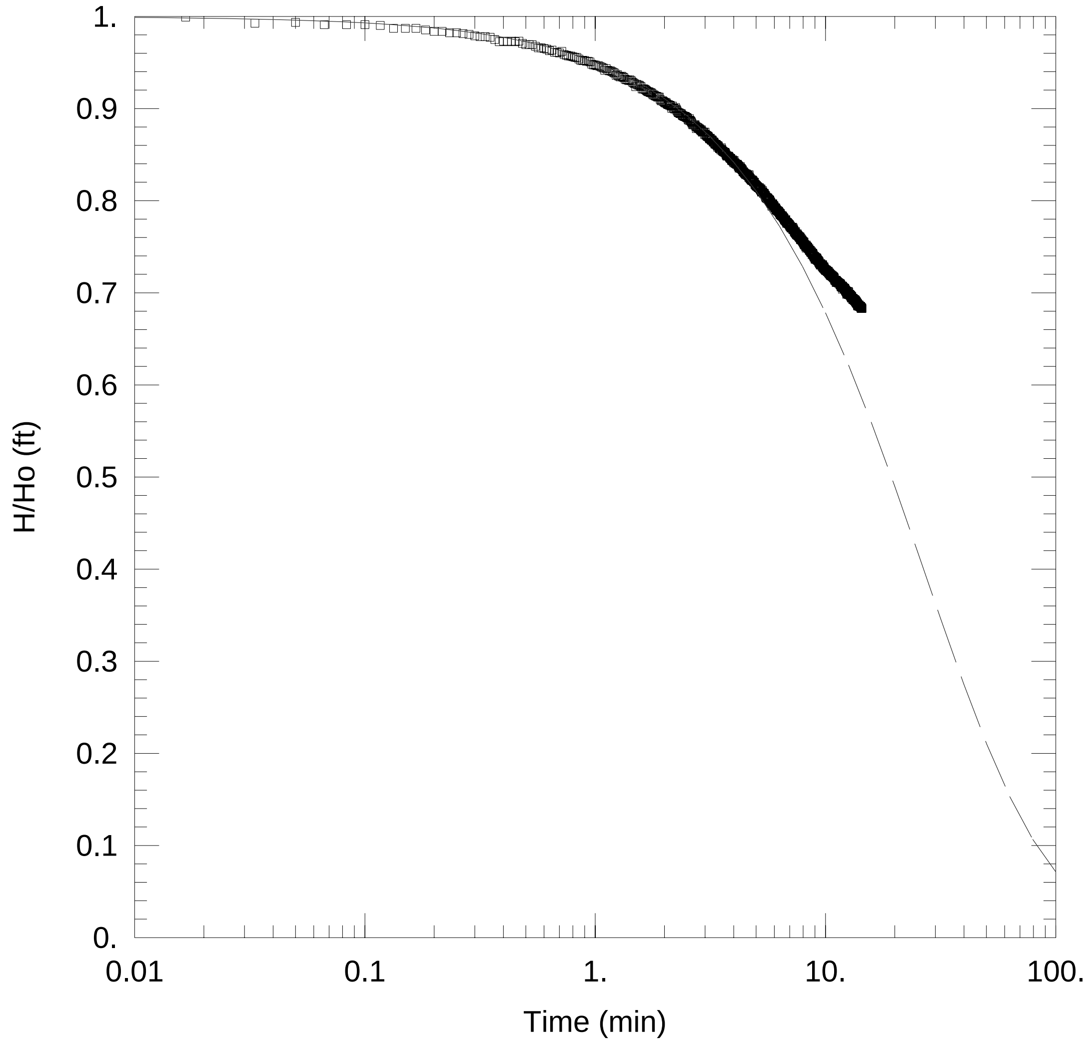
WELL DATA

Initial Displacement: 58.73 ft
Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft
Well Skin Radius: 0.2448 ft
Screen Length: 1. ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.07924 ft/day
y0 = 53.4 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-7(c).aqt
Date: 01/22/03 Time: 15:38:31

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

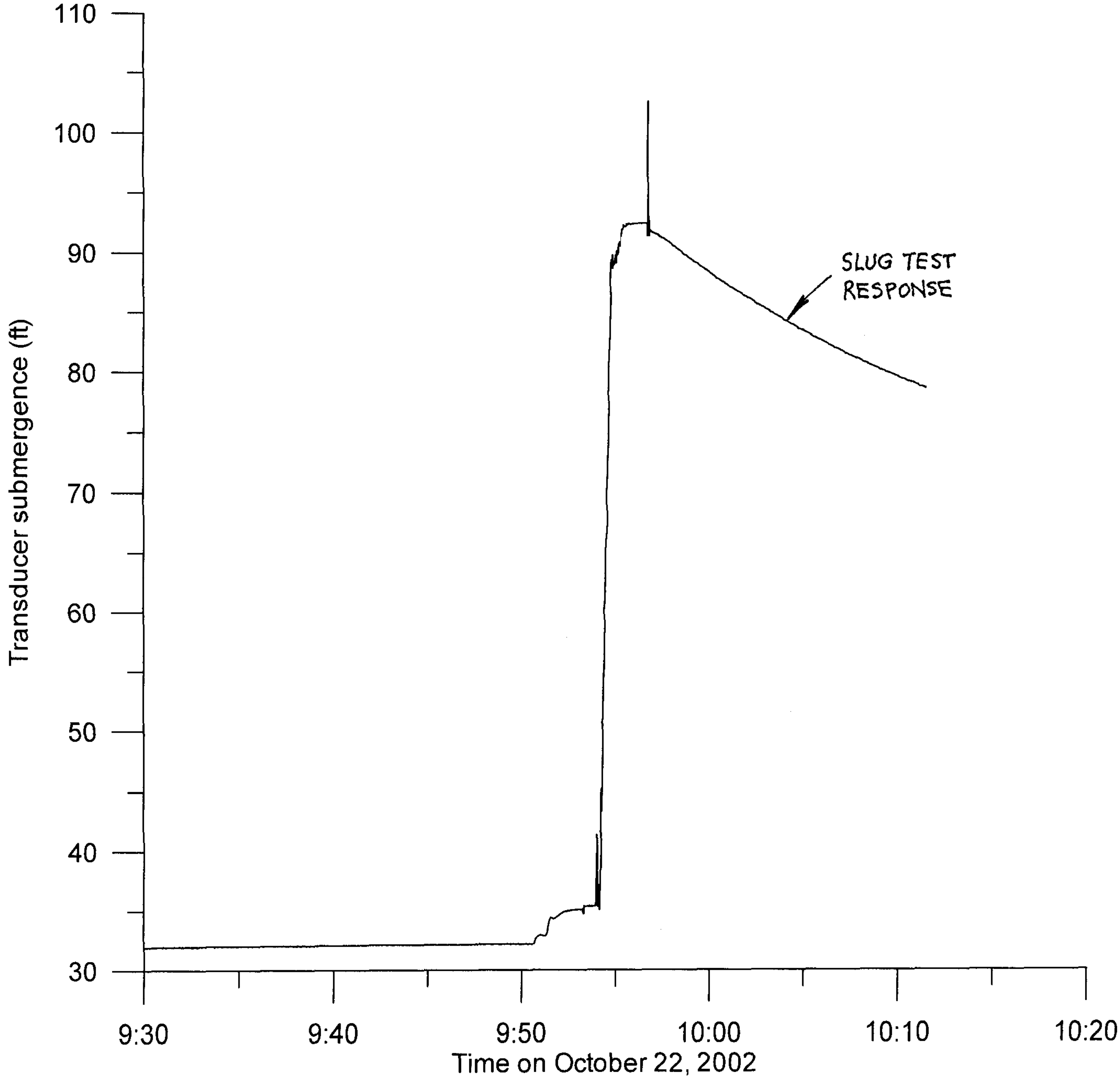
Initial Displacement: 53.4 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

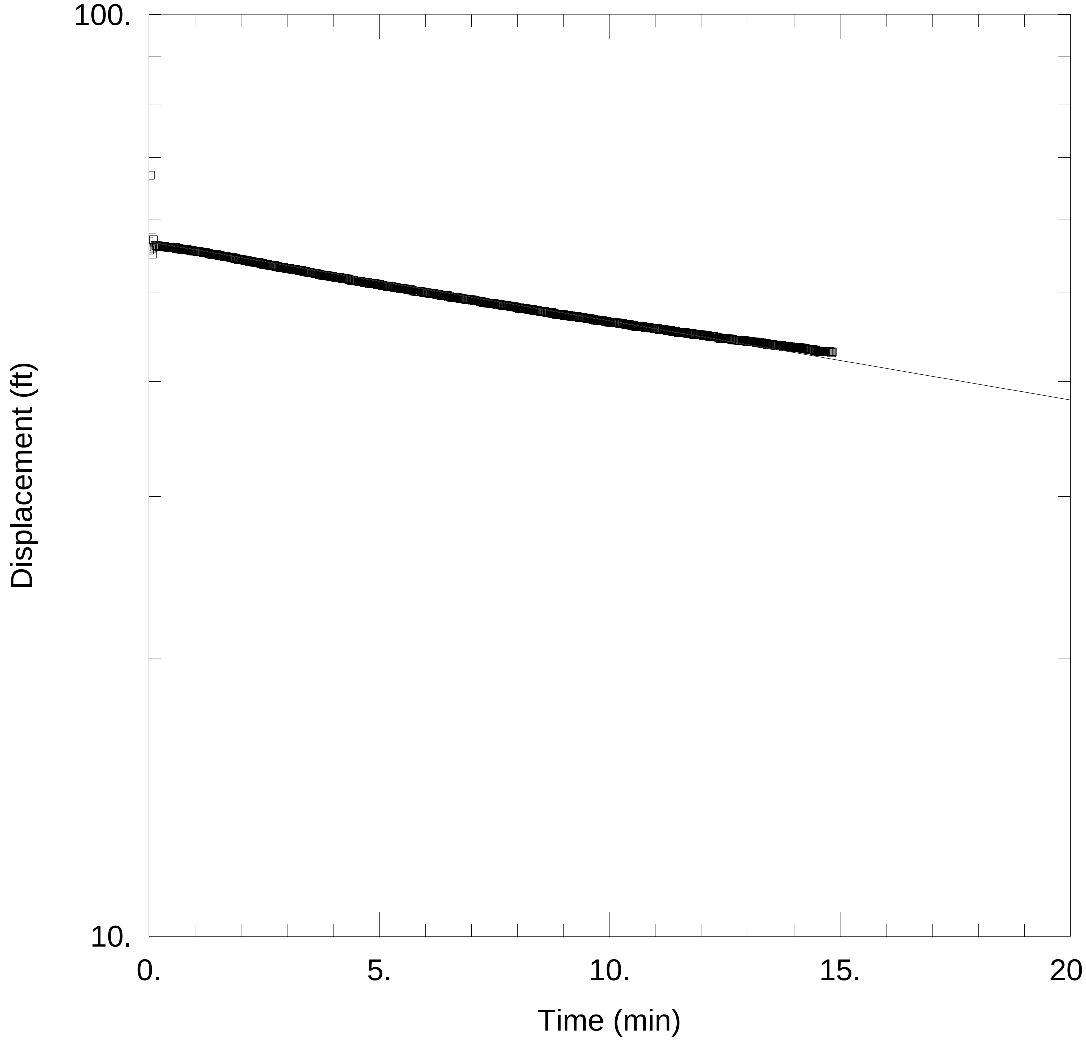
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.2525 ft^2/day S = 1.E-06

H5
Test 8


110
100
90
80
70
60
50
40
30
Transducer submergence (ft)
9:30
9:40
9:50
10:00
10:10
10:20
Time on October 22, 2002
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-8(h).aqt
Date: 01/22/03 Time: 15:39:10

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

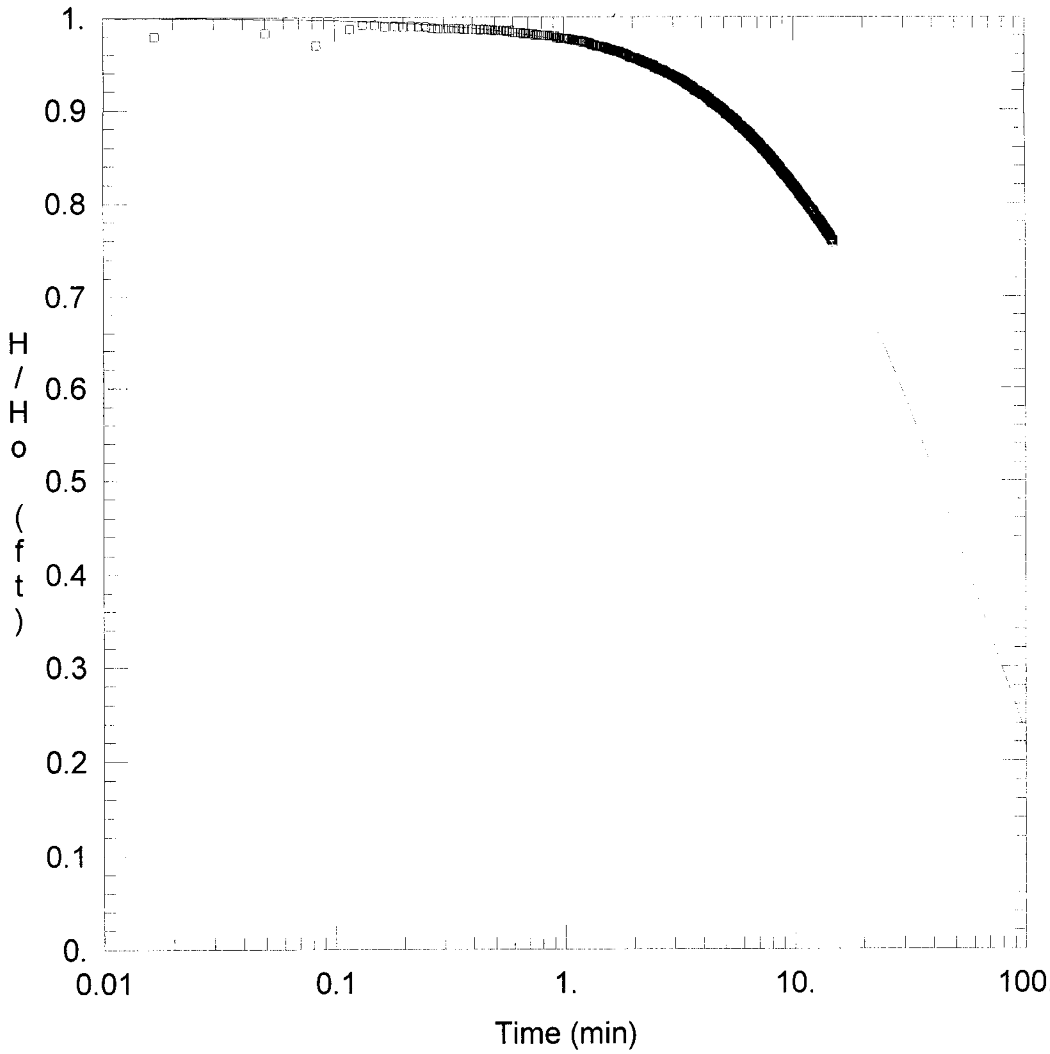
WELL DATA

Initial Displacement: 1. ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0362 ft/day
y0 = 56.7 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-8(c).aqt
Date: 12/05/02 Time: 15:11:05

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

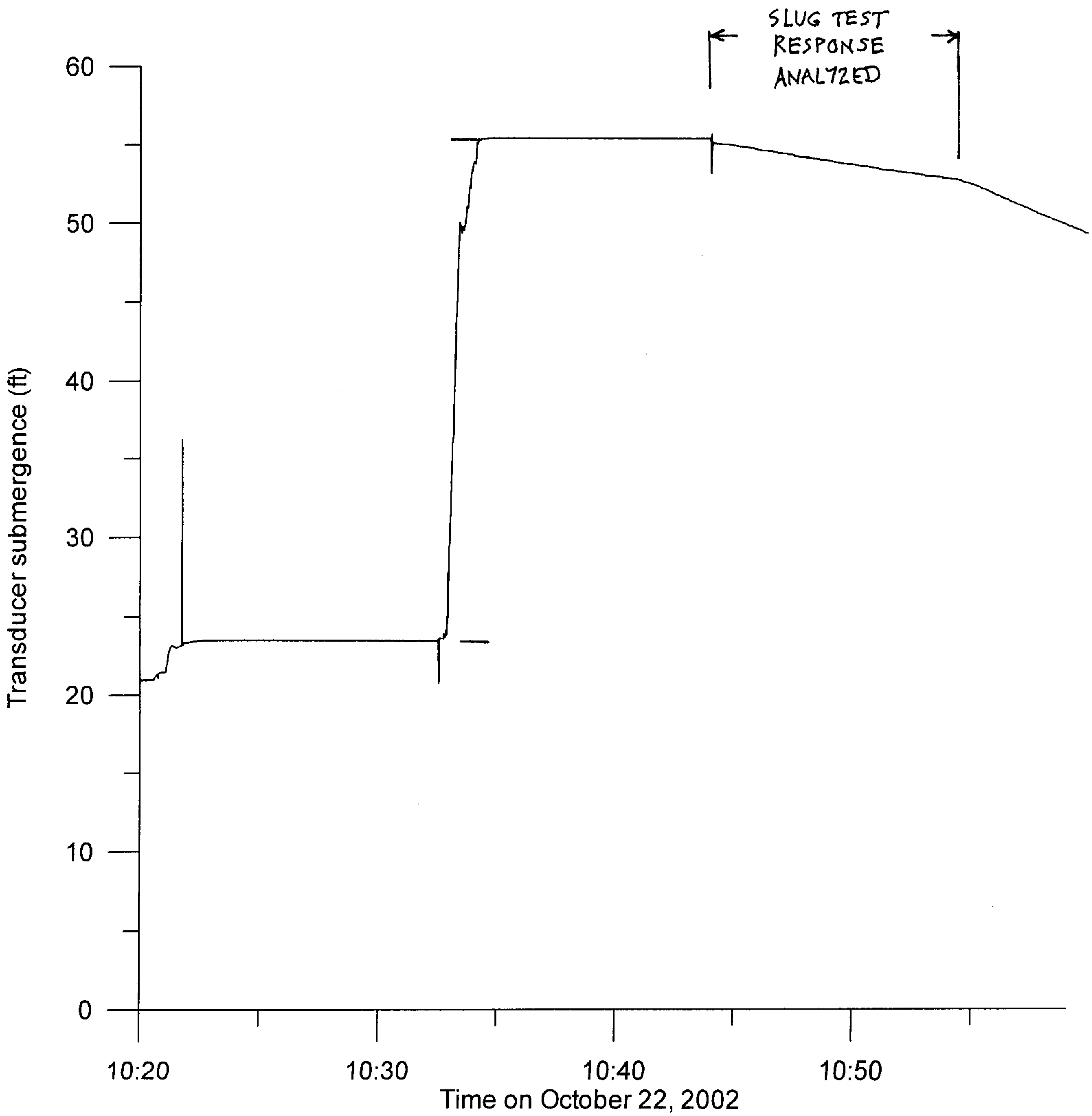
Initial Displacement: 56.7 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

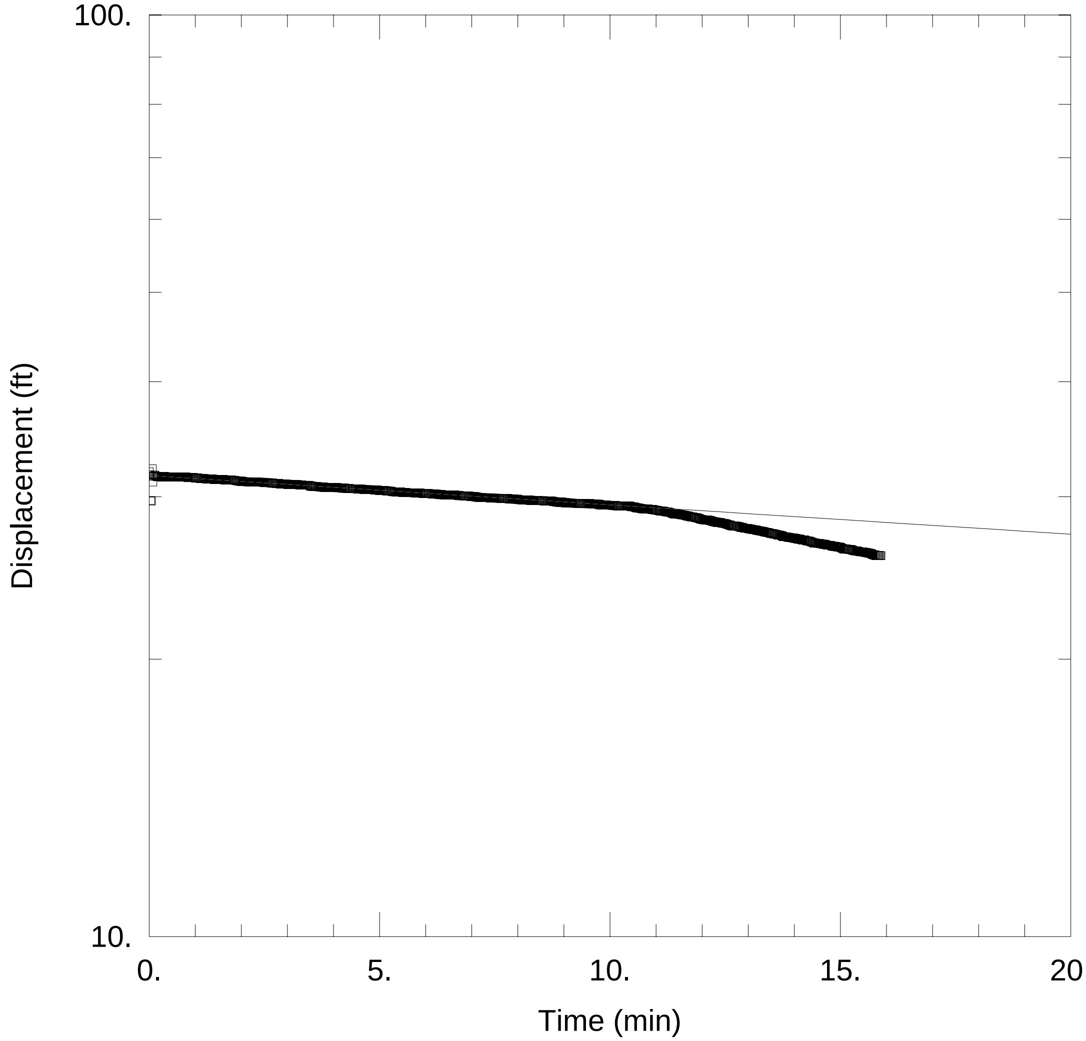
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.1181 ft^2/day
S = 1.E-06

H5
Test 9


SLUG TEST
RESPONSE
ANALYZED
60
50
40
30
20
10
0
Transducer submergence (ft)
10:20
10:30
10:40
10:50
Time on October 22, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-9(h).aqt
Date: 01/22/03 Time: 15:39:37

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

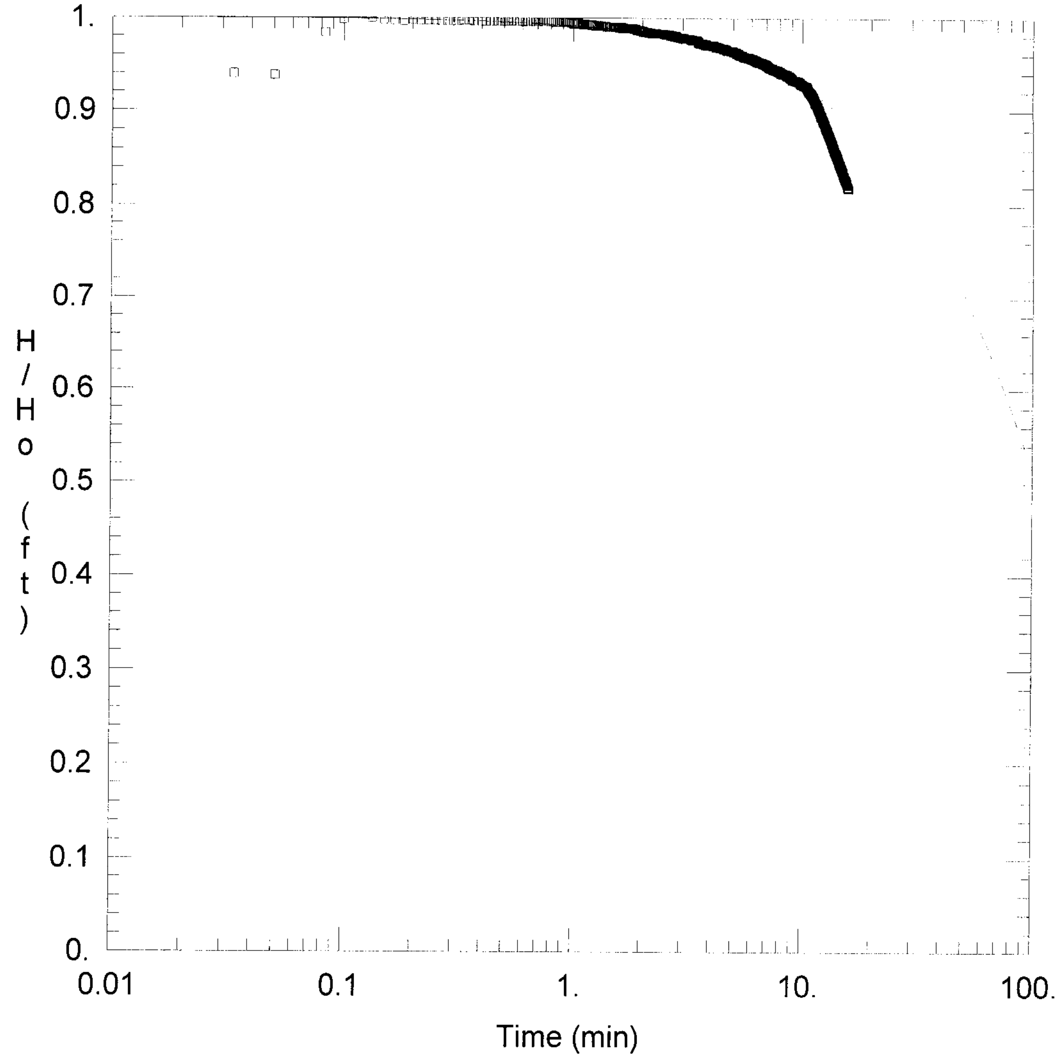
WELL DATA

Initial Displacement: 1. ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.01341 ft/day y0 = 31.64 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-9(c).aqt
Date: 12/05/02 Time: 15:11:36

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 31.64 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

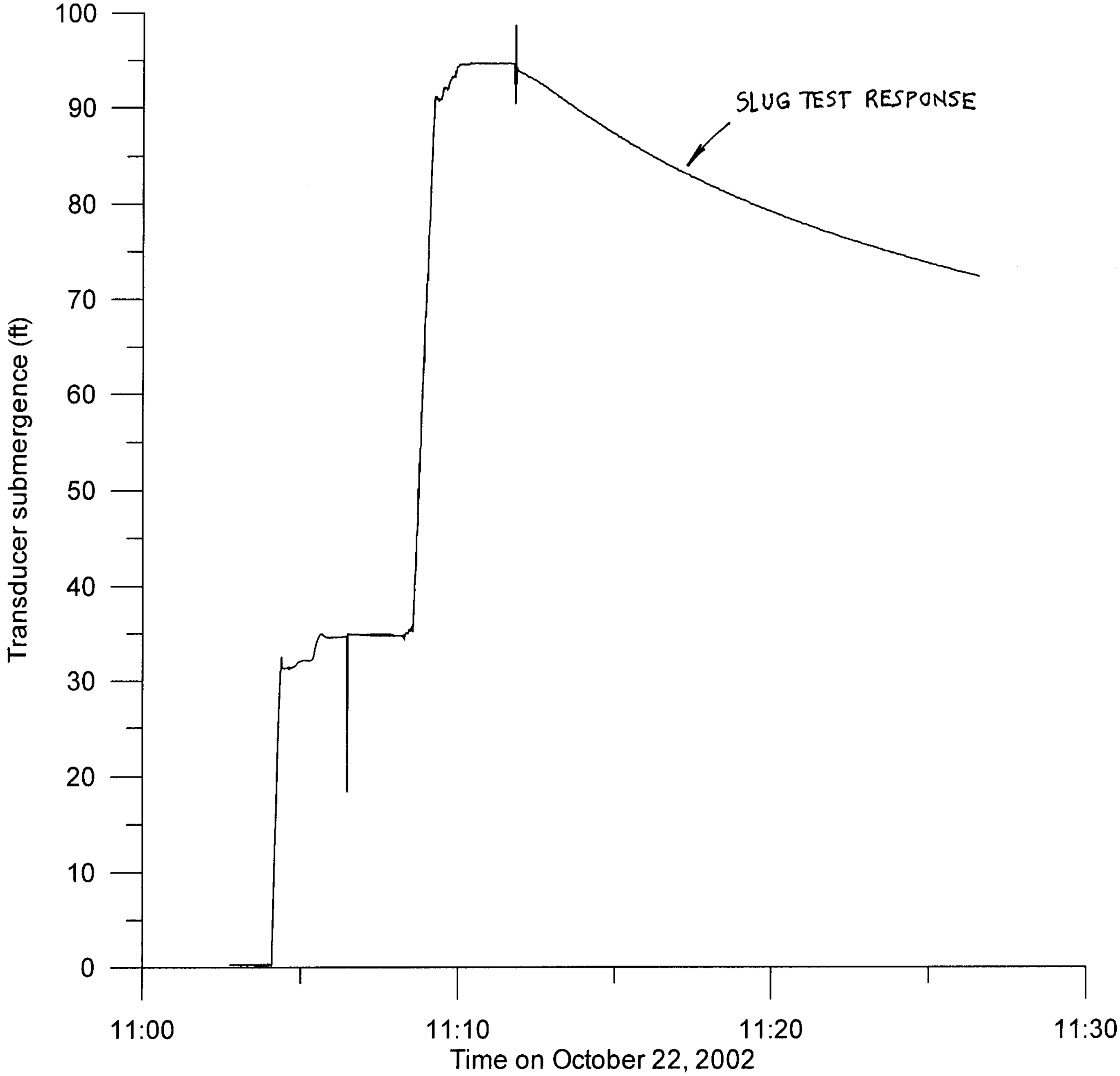
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

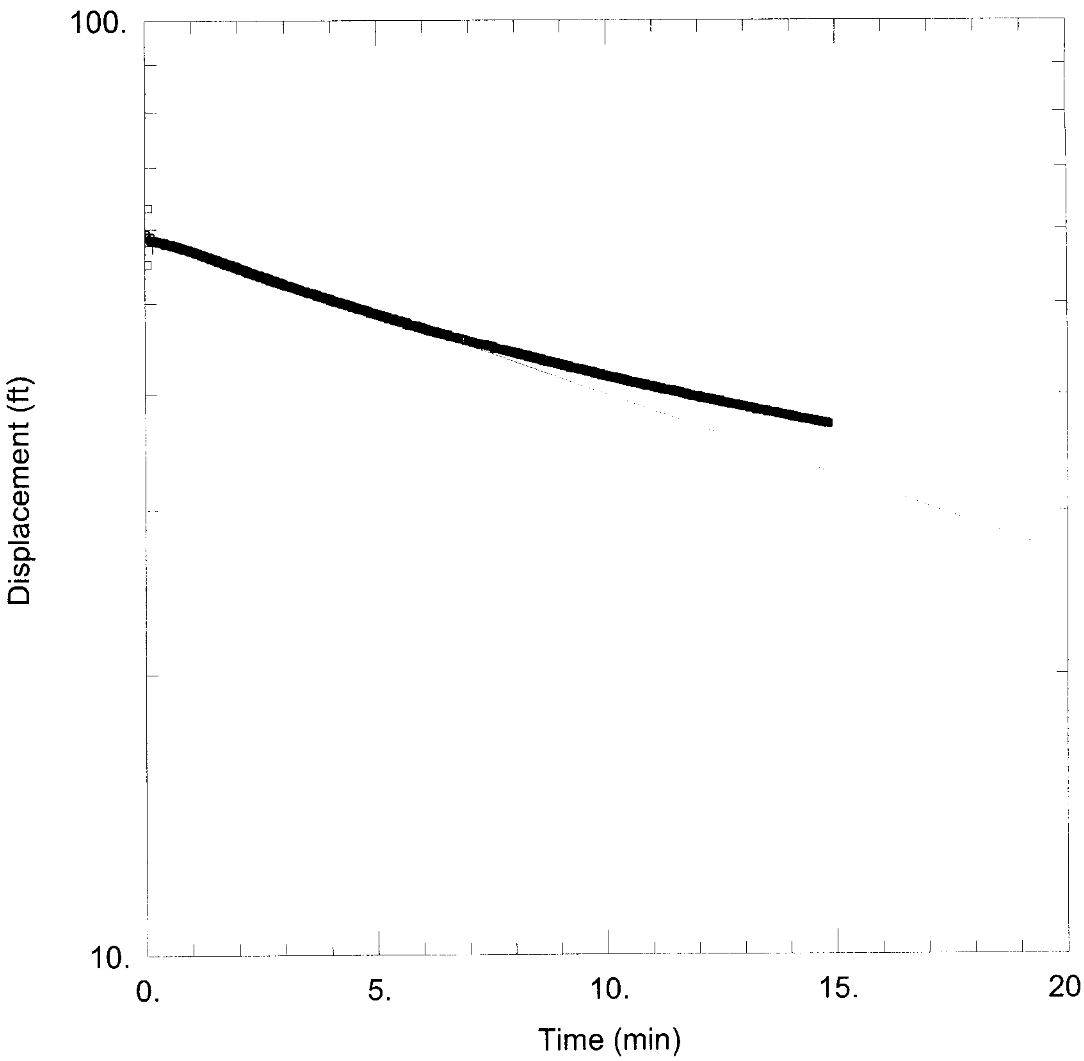
quifer Model: Confined
$T = 0.08709\ ft^2/day$

Solution Method: Cooper-Bredehoeft-Papadopulos
S = 1.E-10

H5
Test 10



100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
SLUG TEST RESPONSE
11:00
11:10
11:20
11:30
Time on October 22, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\H5-10(h).aqt
Date: 01/21/03 Time: 12:15:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

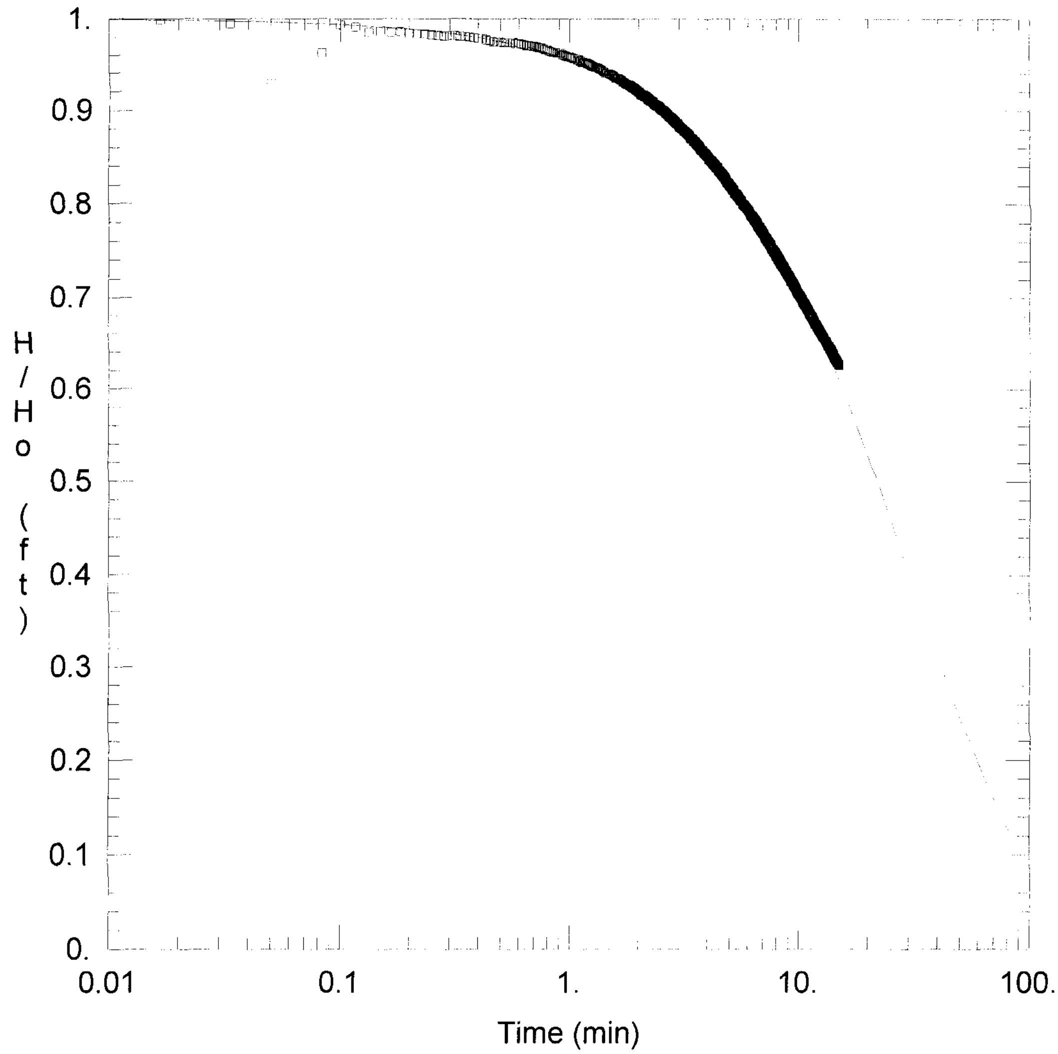
Initial Displacement: 1. ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
= 0.07233 ft/day

Solution Method:
y0 = 59.27 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-10(c).aqt
Date: 12/05/02 Time: 15:12:12

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

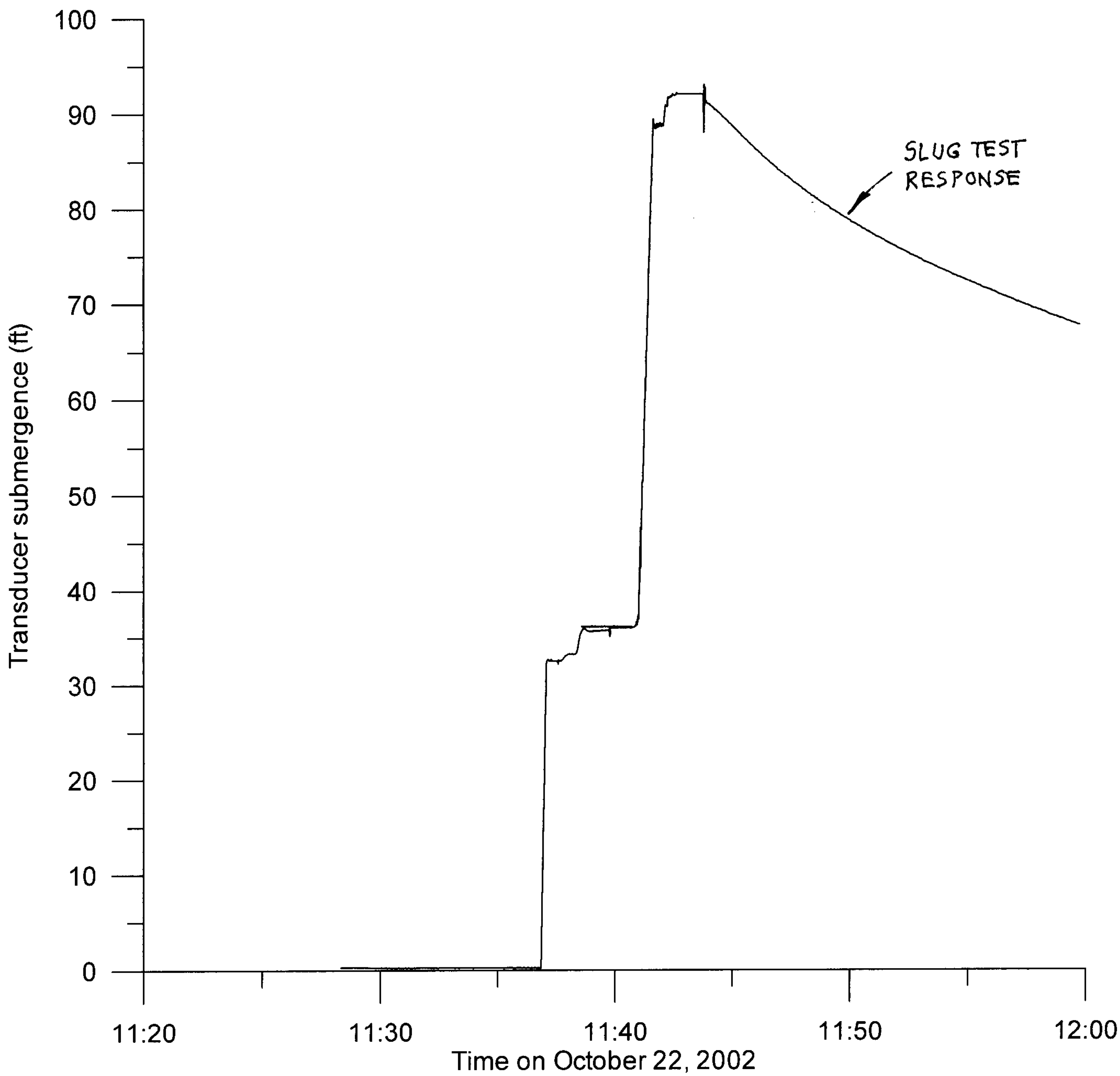
WELL DATA

Initial Displacement: 59.27 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

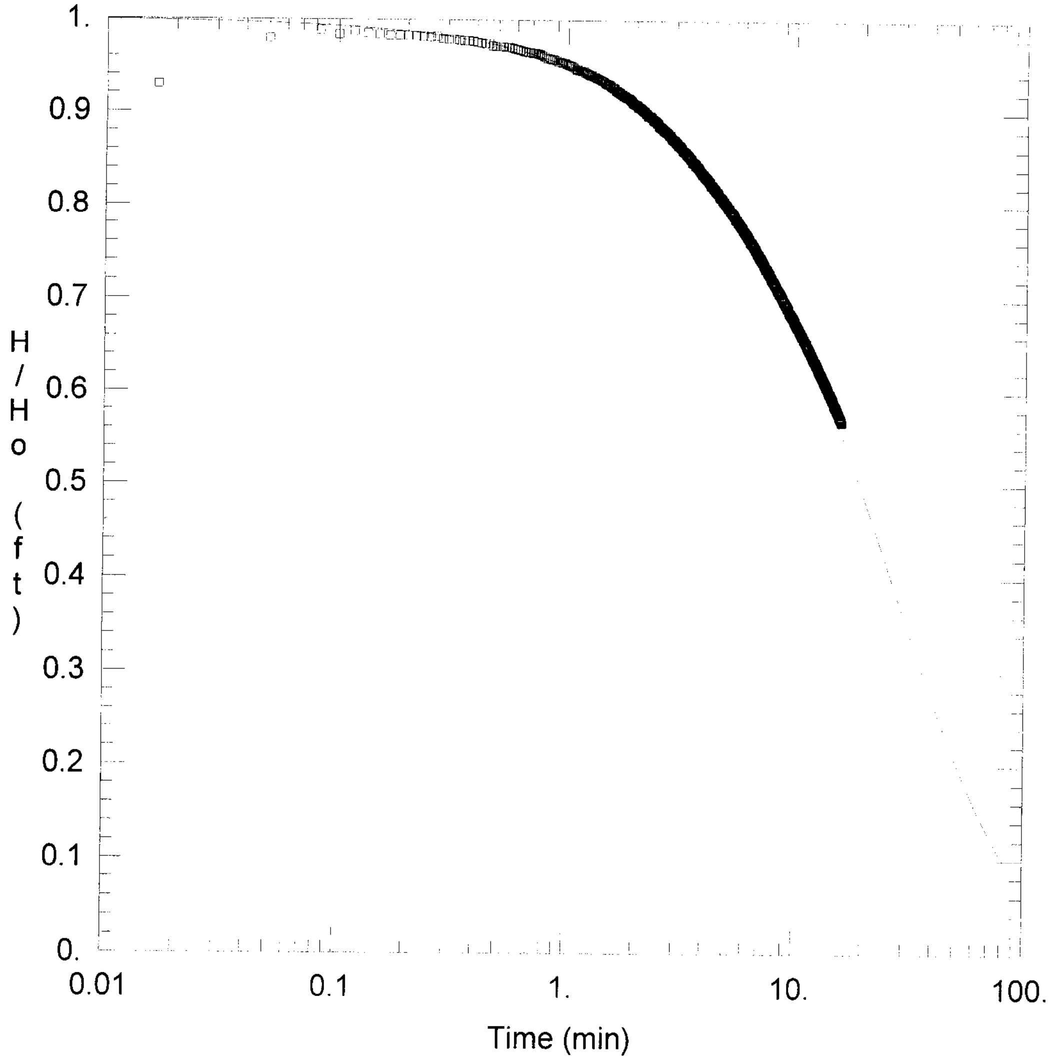
SOLUTION

^quifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
ı = 0.2227 ft^2/day S = 1.E-06

H5
Test 11



100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
11:20
11:30
11:40
11:50
12:00
Time on October 22, 2002
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-11(c).aqt
Date: 12/05/02 Time: 15:18:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

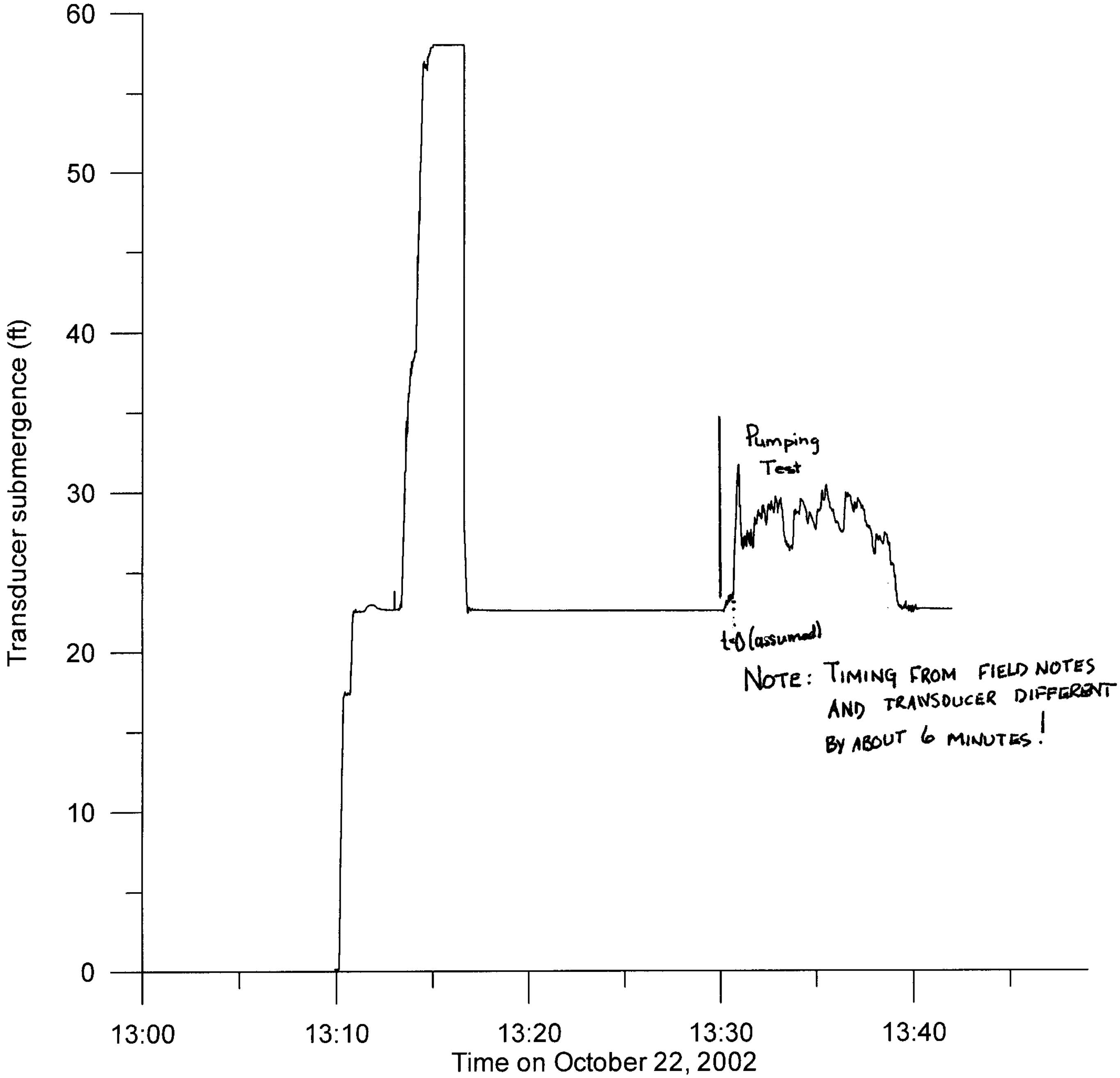
WELL DATA

Initial Displacement: 56.09 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

ɿuifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.2535 ft^2/day
S = 1.E-06

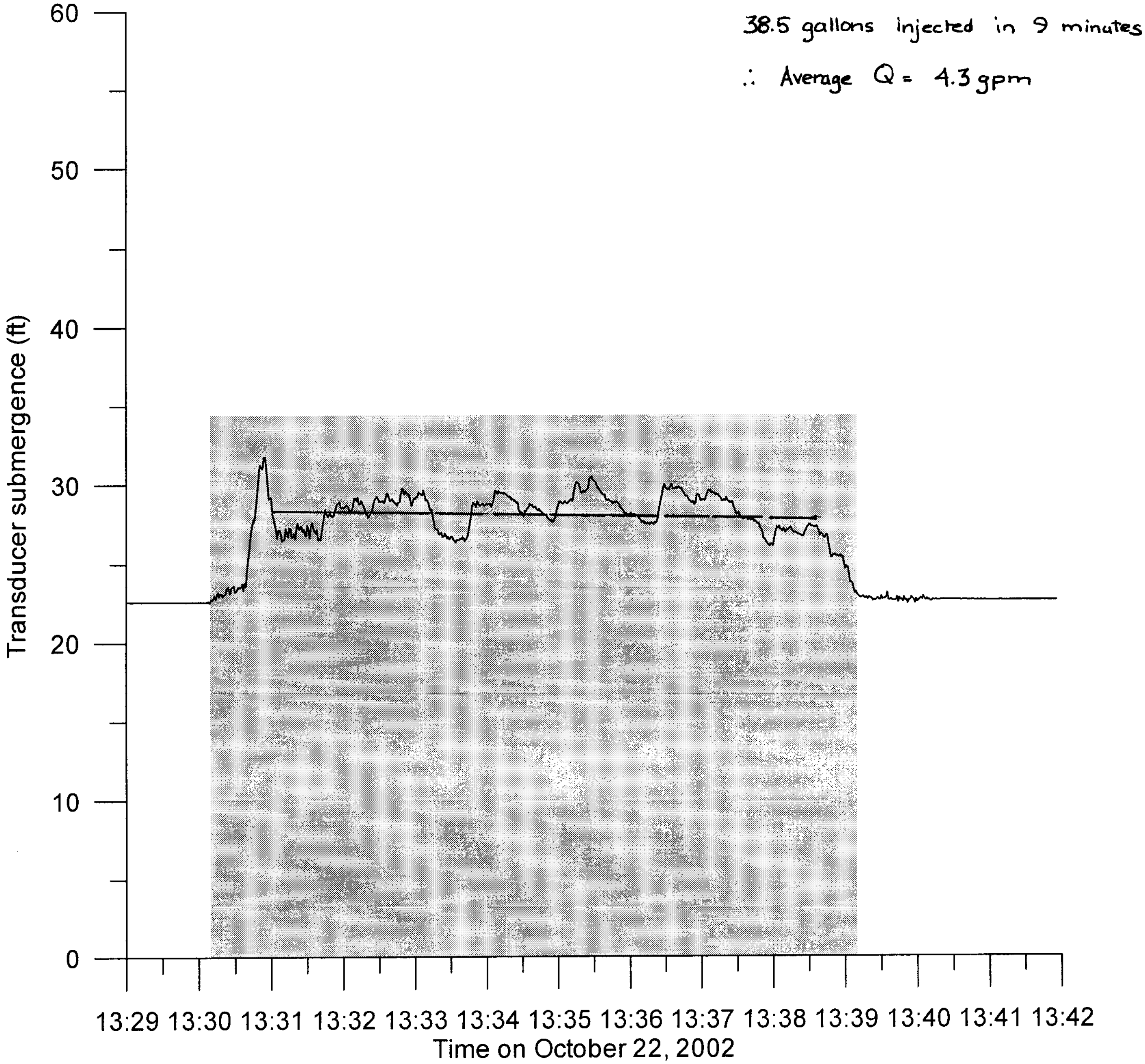
H5
Test 12

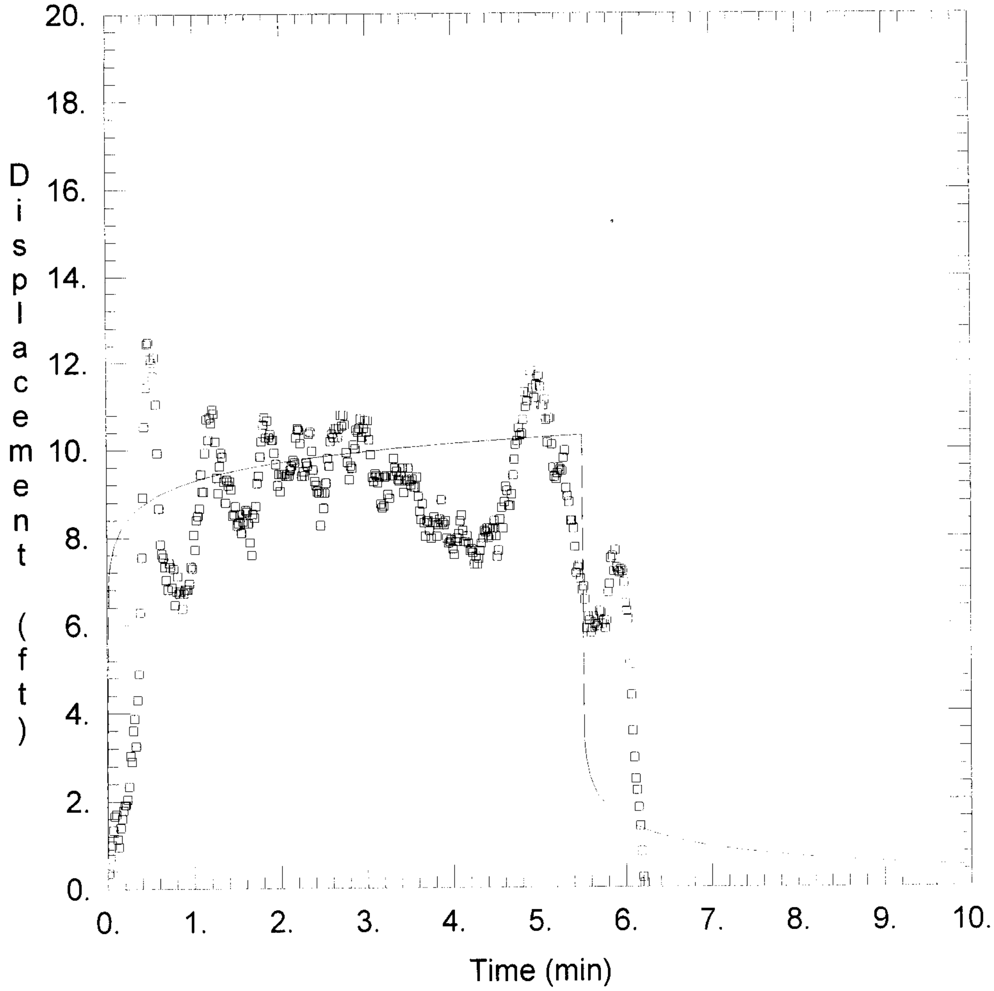


60
50
40
30
20
10
0
Transducer submergence (ft)
13:00
13:10
13:20
13:30
13:40
Time on October 22, 2002
Pumping Test
t=0 (assumed)
NOTE: TIMING FROM FIELD NOTES AND TRANSDUCER DIFFERENT BY ABOUT 6 MINUTES!

H5

Test 12 (Pumping test only)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\I1\i1-12(p).aqt
Date: 12/05/02 Time: 14:51:29

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
I1-12	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ I1-12	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

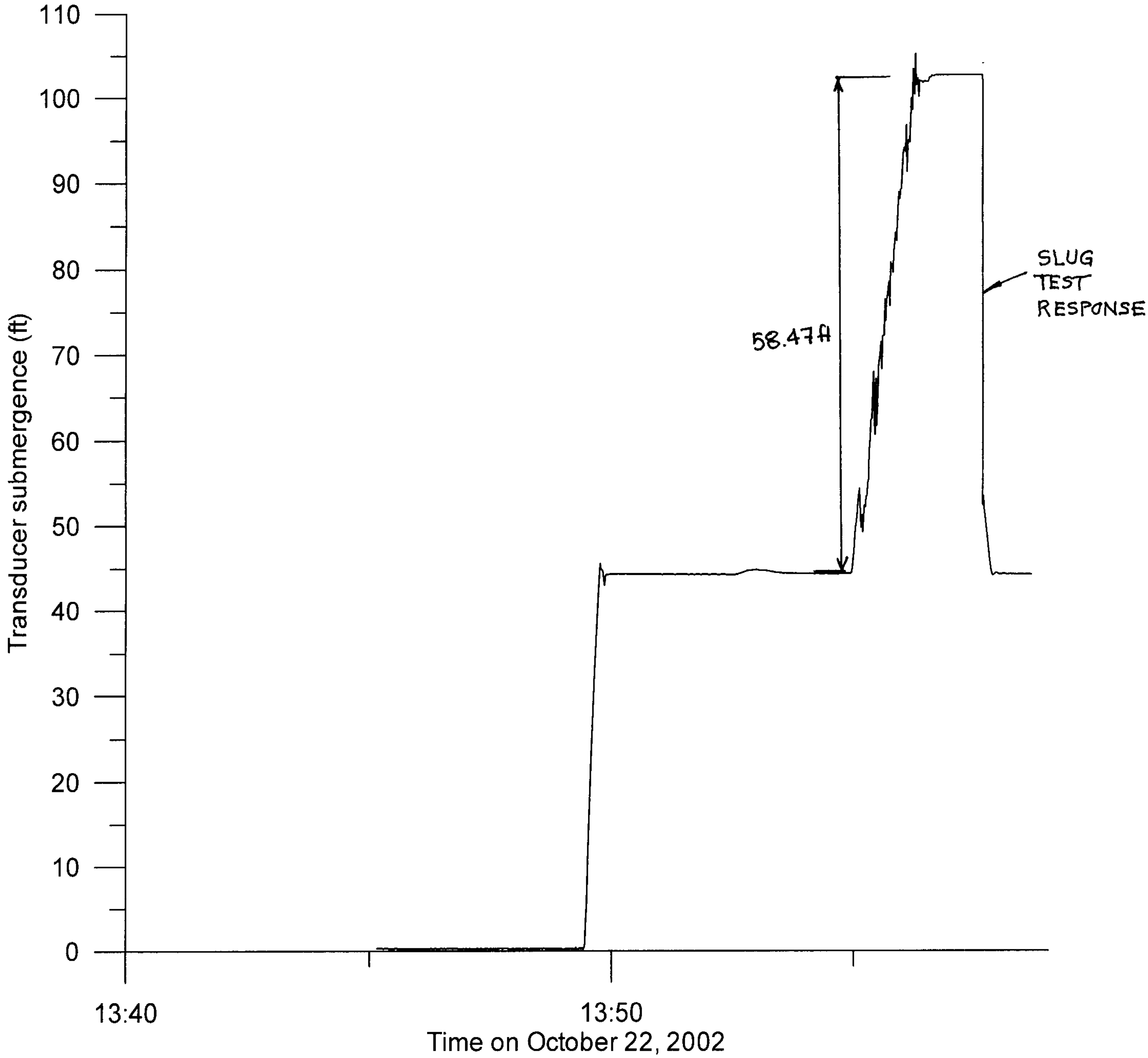
T = 179.9 ft^2/day
Sw = 0.
P = 2.

S = 1.E-06
C = 0. min^2/ft^5

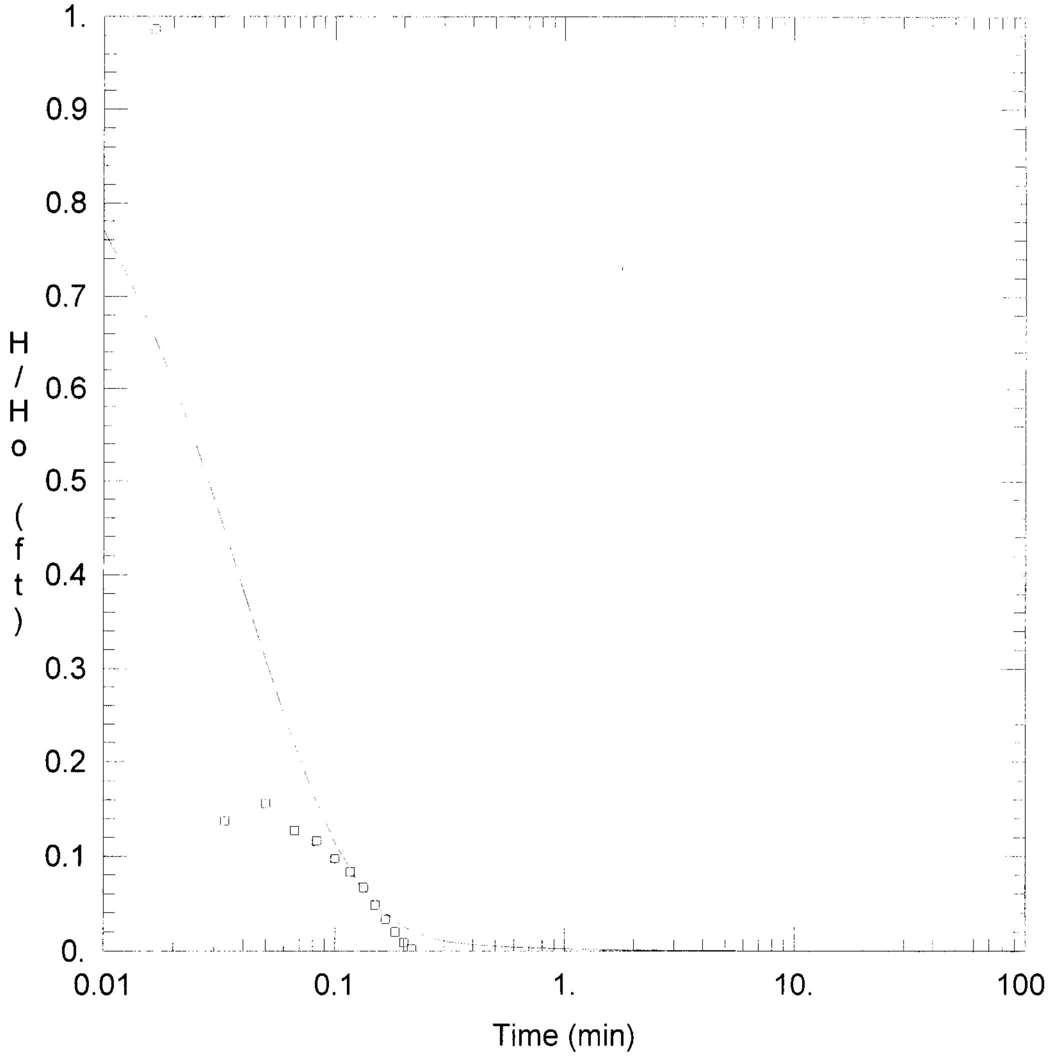
Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 9.783Q + 0.$Q^{2.}$
W.E. = 100.%

H5
Test 13



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
13:40
13:50
Time on October 22, 2002
58.47ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-13(c).aqt
Date: 12/05/02 Time: 15:19:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

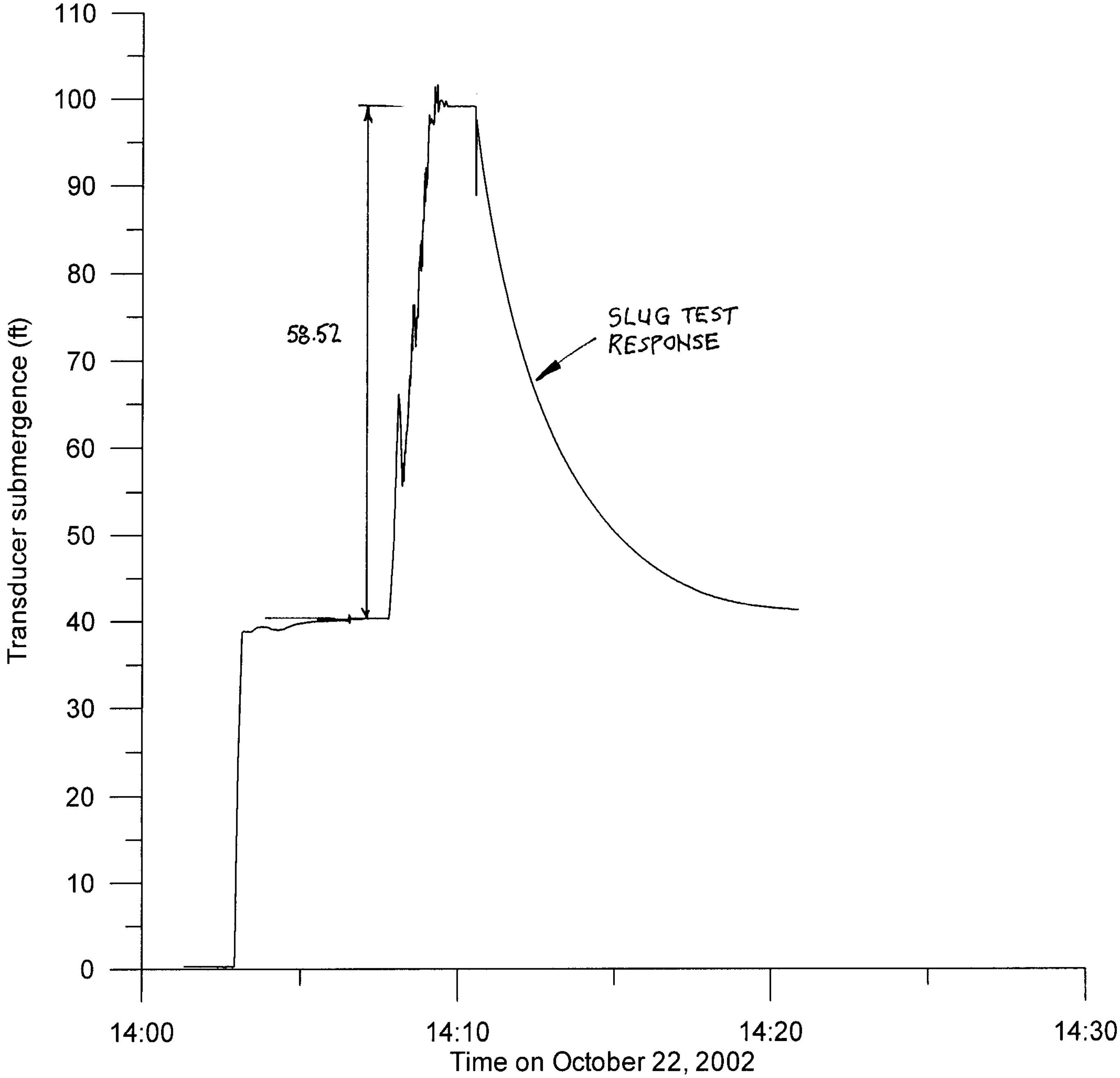
Initial Displacement: 58.51 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

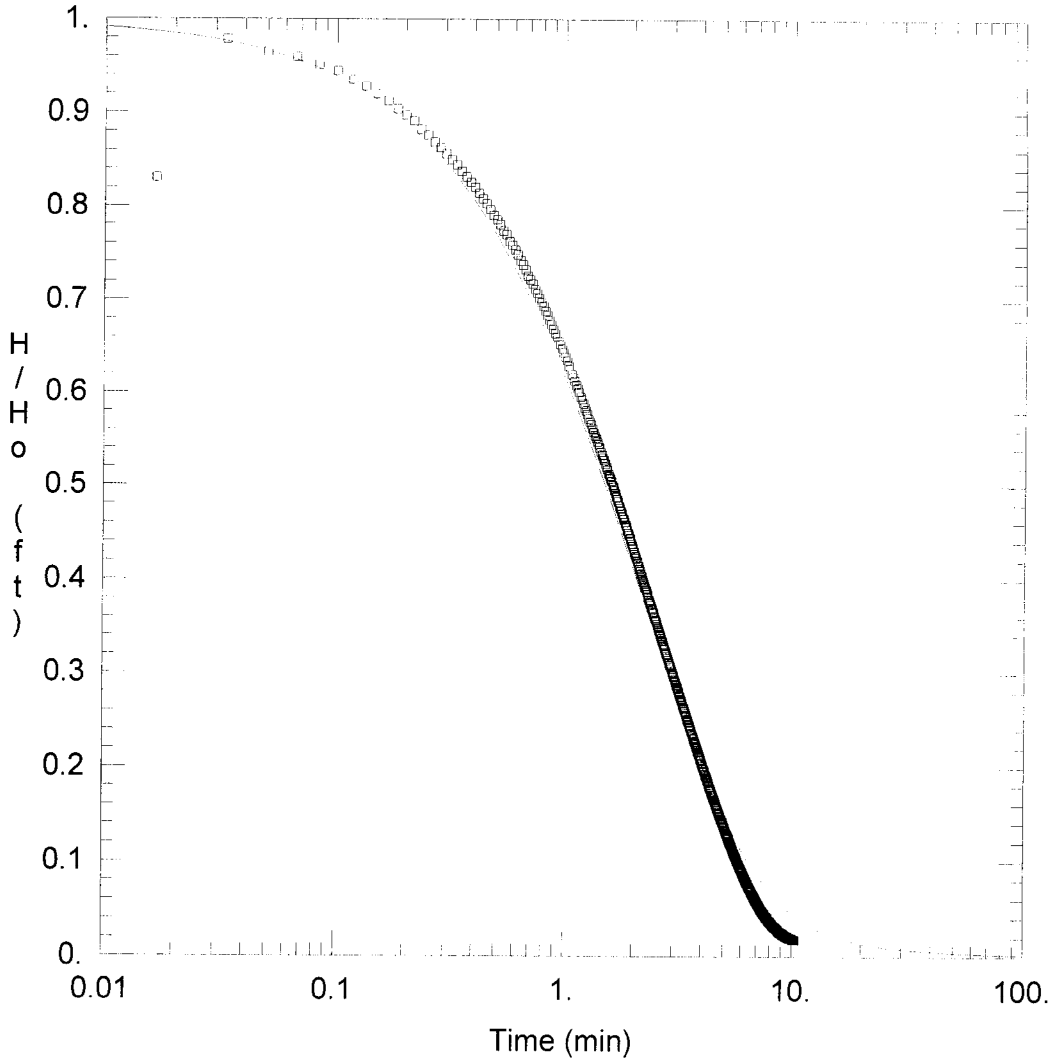
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

$T = 323.\ ft^2/day$ $S = 1.E-10$

H5
Test 14



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
58.52
SLUG TEST
RESPONSE
14:00
14:10
14:20
14:30
Time on October 22, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-14(c).aqt
Date: 12/05/02 Time: 15:20:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 58.52 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

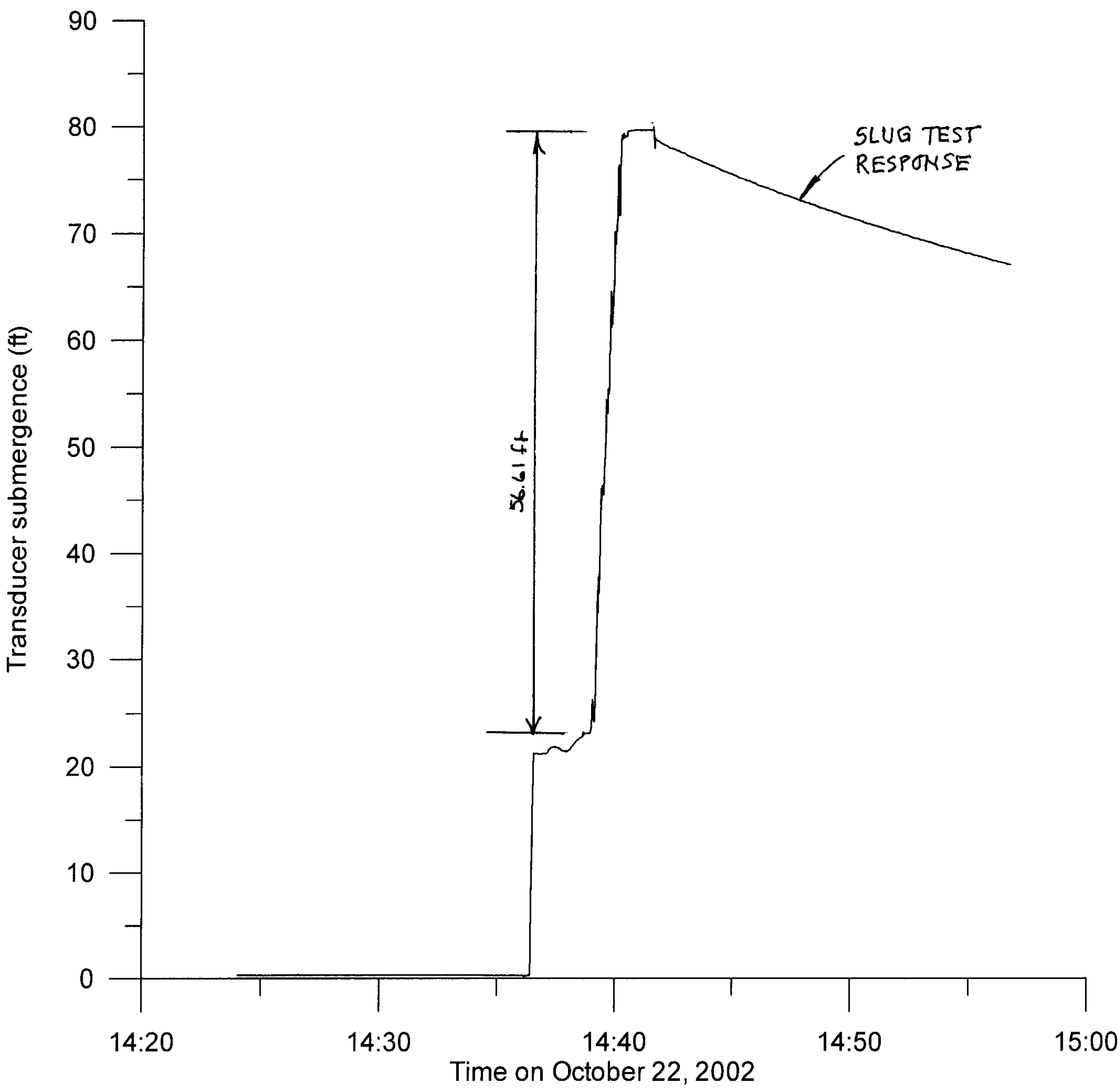
Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

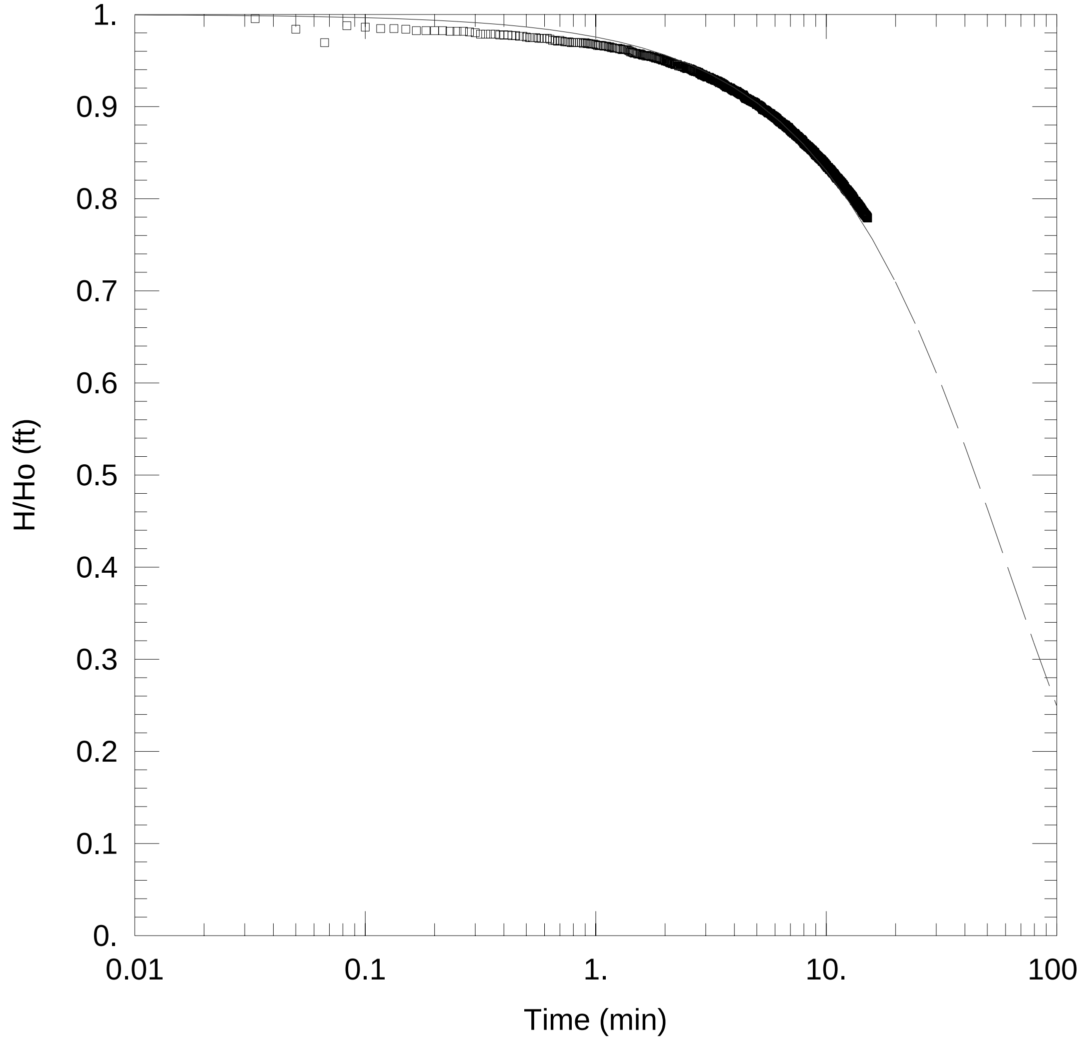
T = 3.249 ft^2/day

S = 1.E-06

H5
Test 15



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
14:20
14:30
14:40
14:50
15:00
Time on October 22, 2002
56.61 ft
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-15(c).aqt
Date: 01/22/03 Time: 15:40:13

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

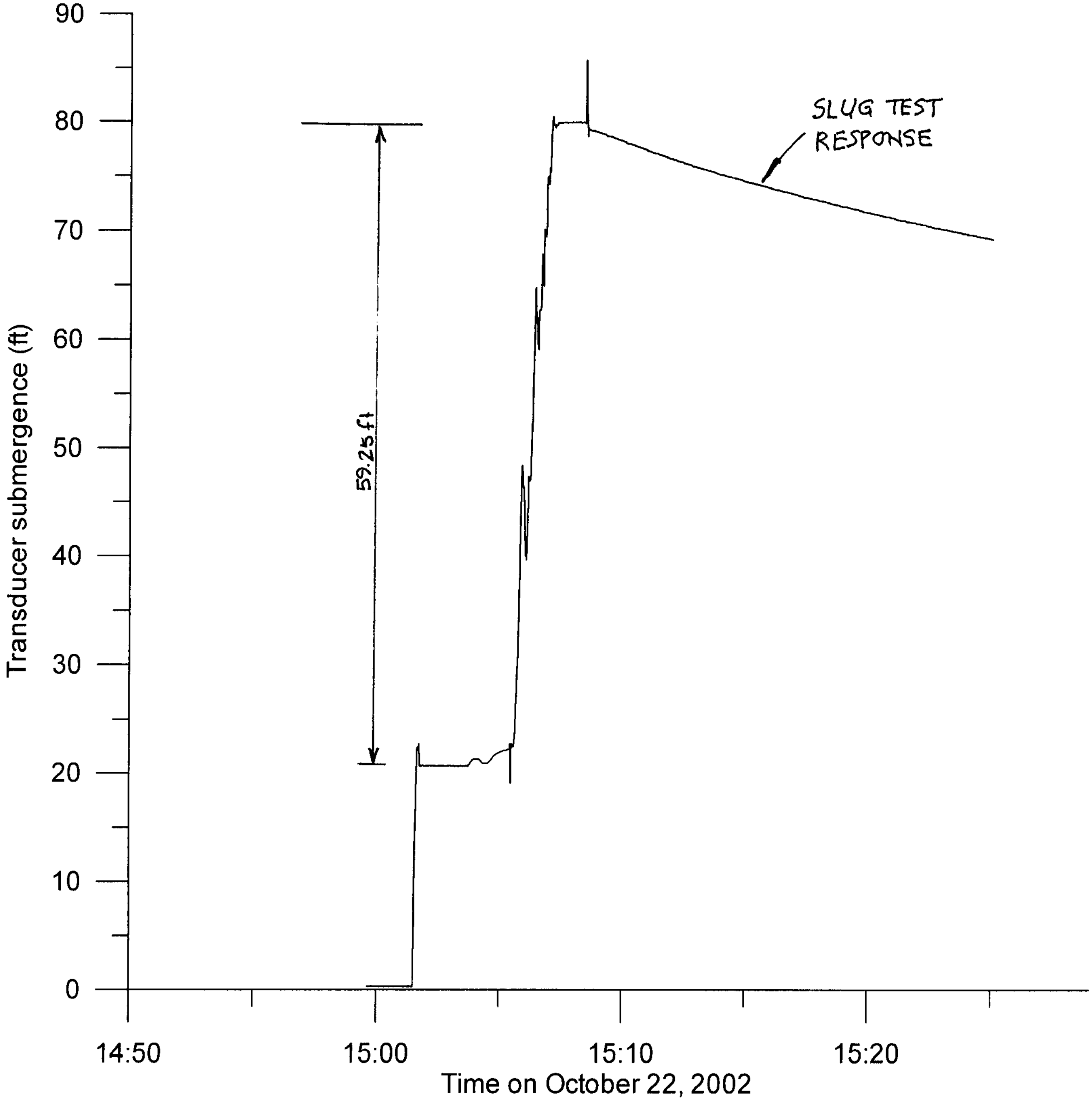
Initial Displacement: 56.61 ft
Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft
Well Skin Radius: 0.2448 ft
Screen Length: 1. ft
Total Well Penetration Depth: 1. ft

SOLUTION

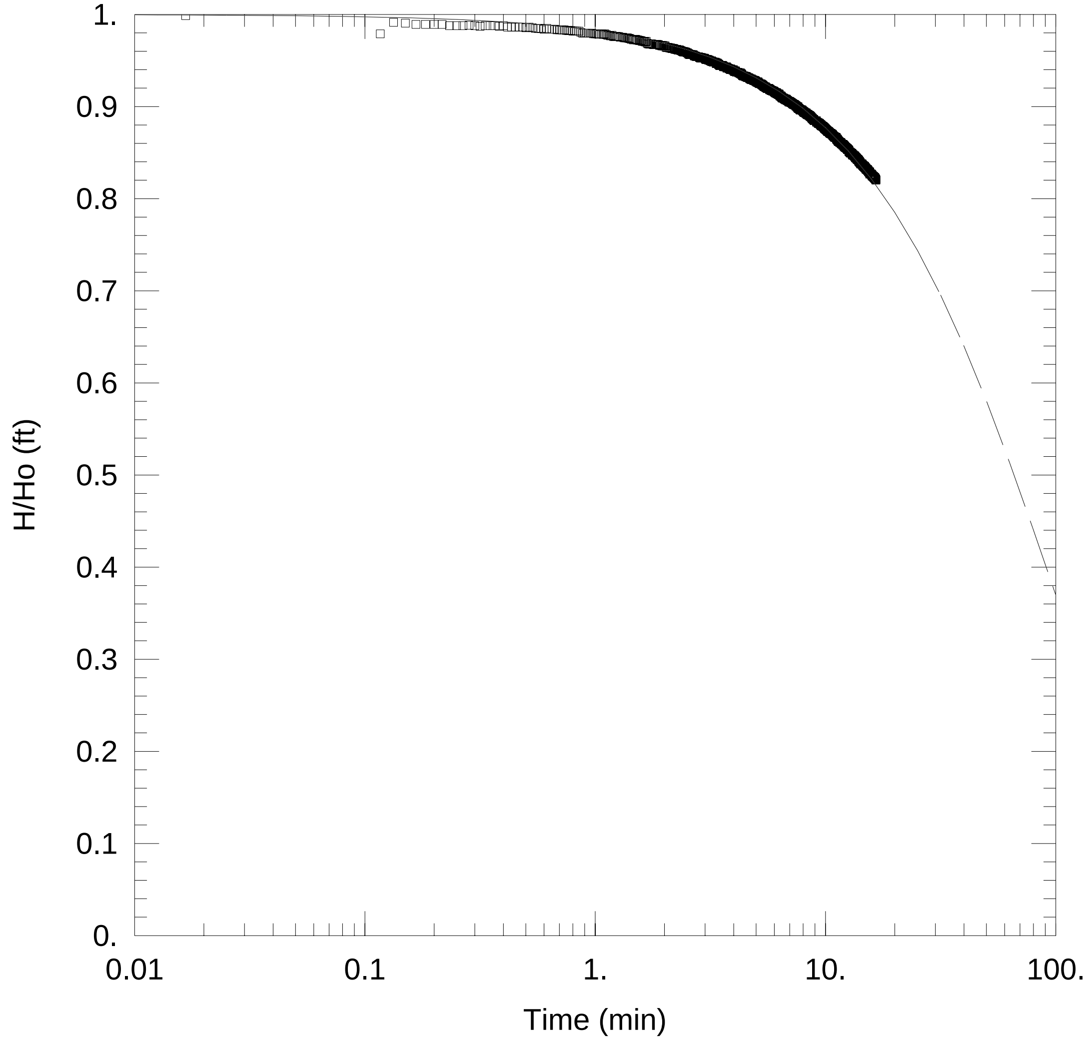
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.11 ft^2/day
S = 1.E-06

H5
Test 16



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
59.25 ft
SLUG TEST RESPONSE
14:50
15:00
15:10
15:20
Time on October 22, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-16(c).aqt
Date: 01/22/03 Time: 15:40:53

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

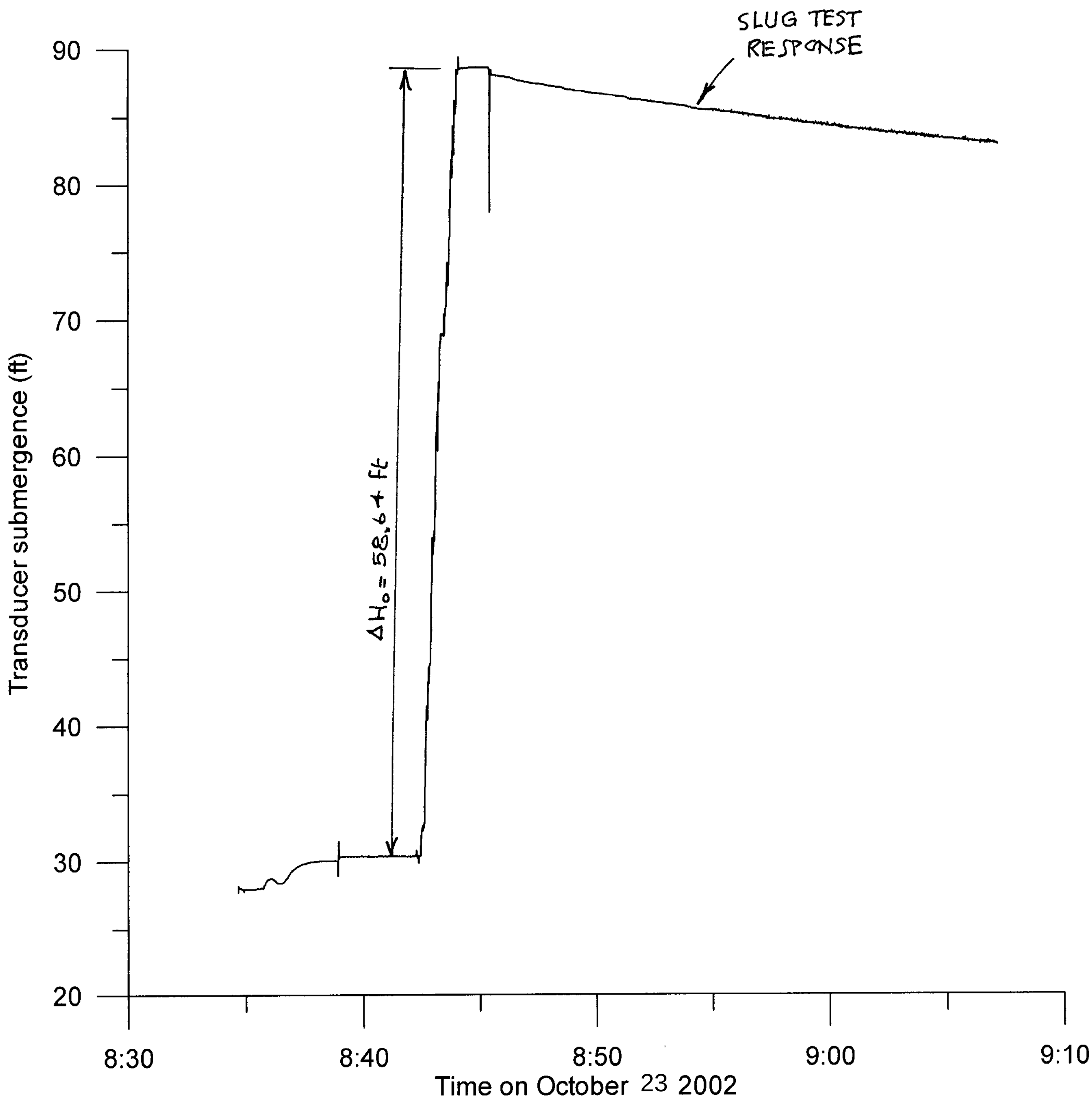
WELL DATA

Initial Displacement: 59.25 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

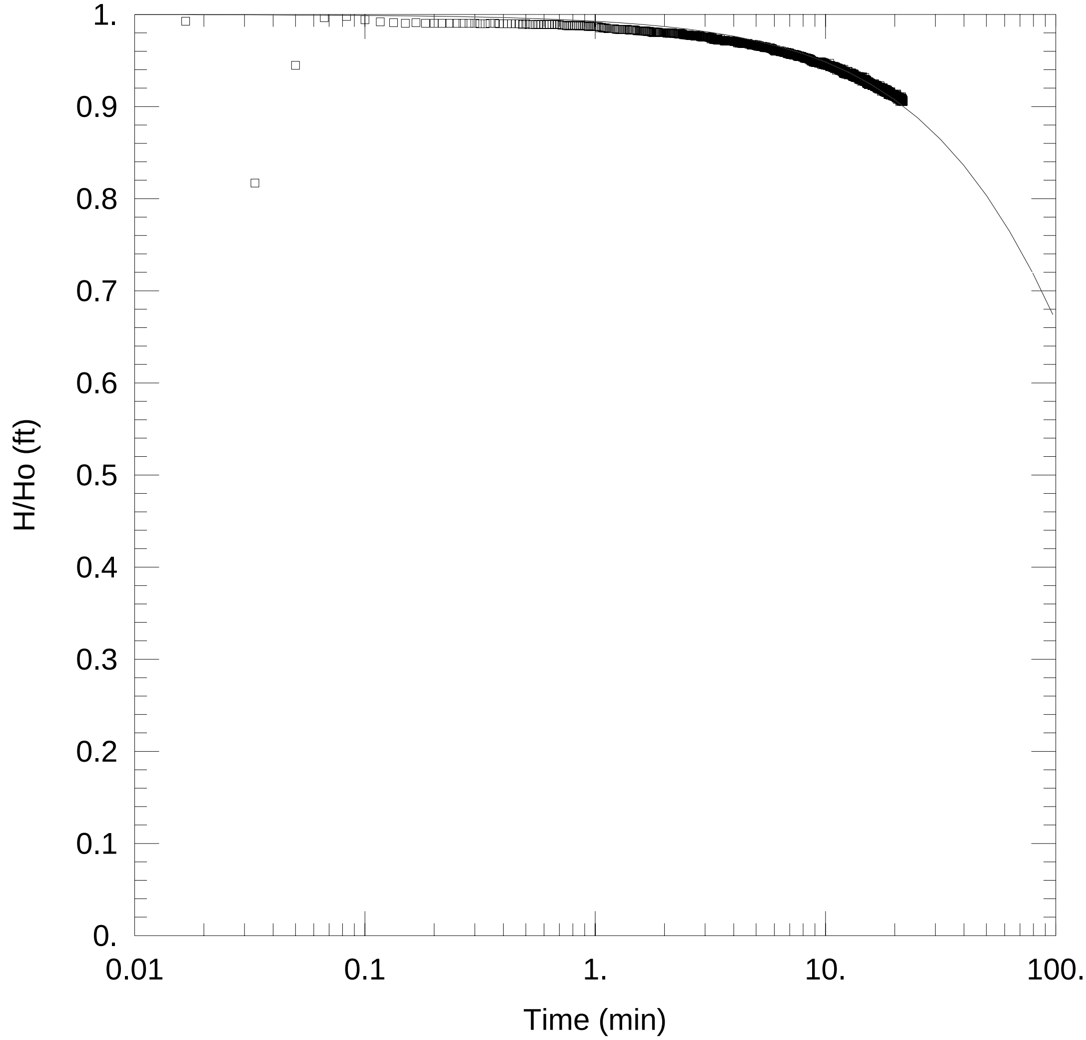
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.07409 ft^2/day S = 1.E-06

H5
Test 17



SLUG TEST RESPONSE
$\Delta H_o = 58.64$ ft
90
80
70
60
50
40
30
20
Transducer submergence (ft)
8:30
8:40
8:50
9:00
9:10
Time on October 23 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-17(c).aqt
Date: 01/22/03 Time: 15:40:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

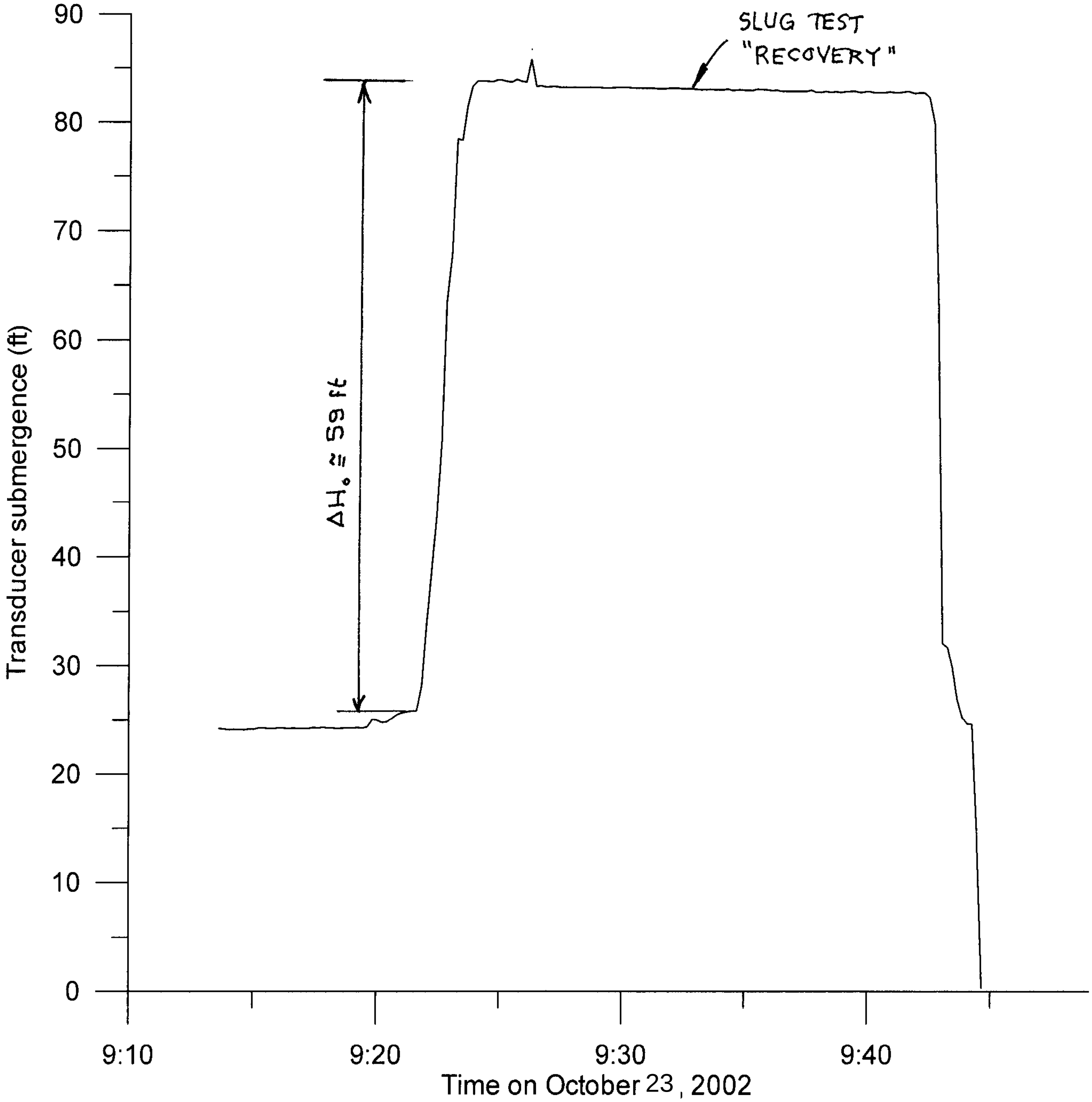
Initial Displacement: 58.64 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

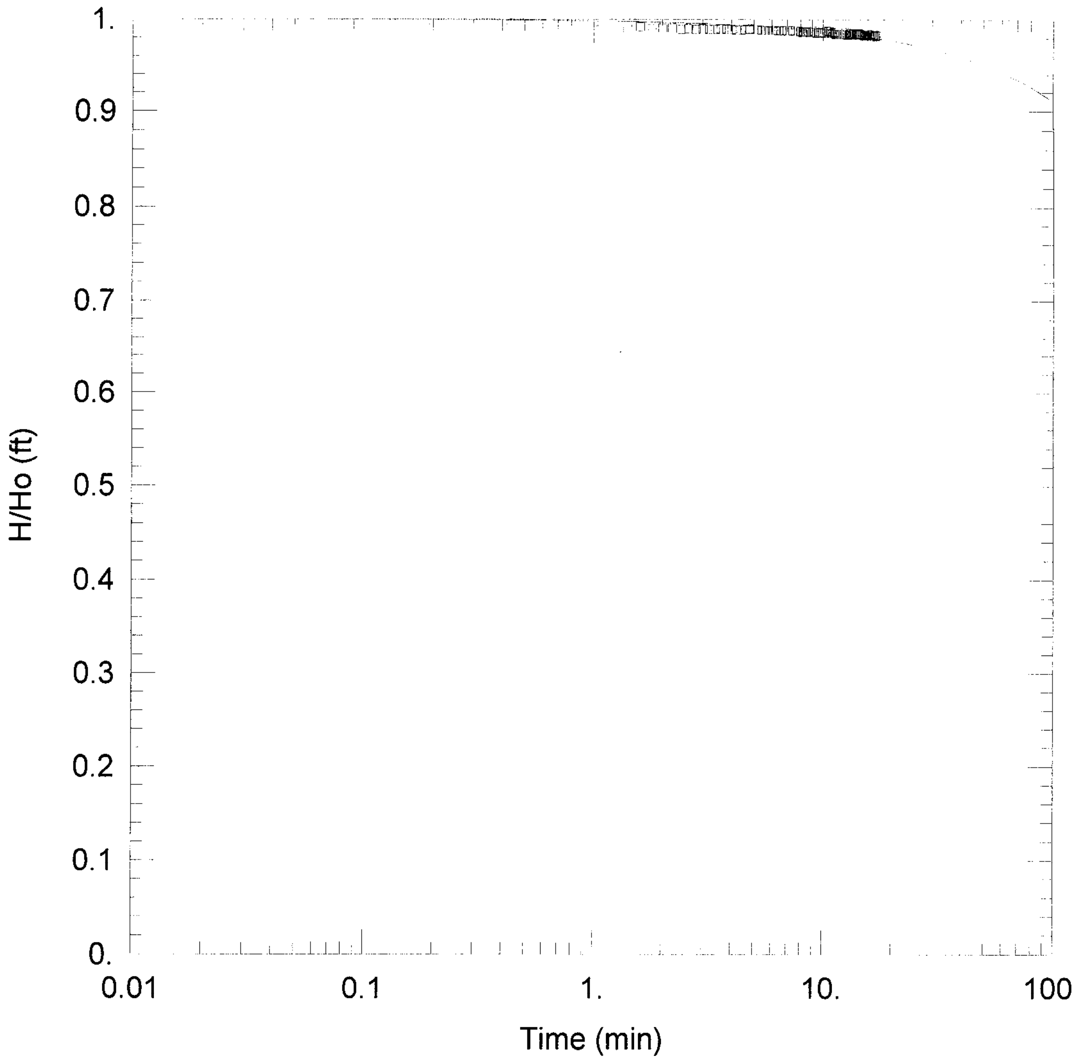
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.02642 ft^2/day S = 1.E-06

H5
Test 18



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
9:10
9:20
9:30
9:40
Time on October 23, 2002
SLUG TEST
"RECOVERY"
ΔH₀ ≈ 59 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-18(c).aqt
Date: 12/05/02 Time: 15:55:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

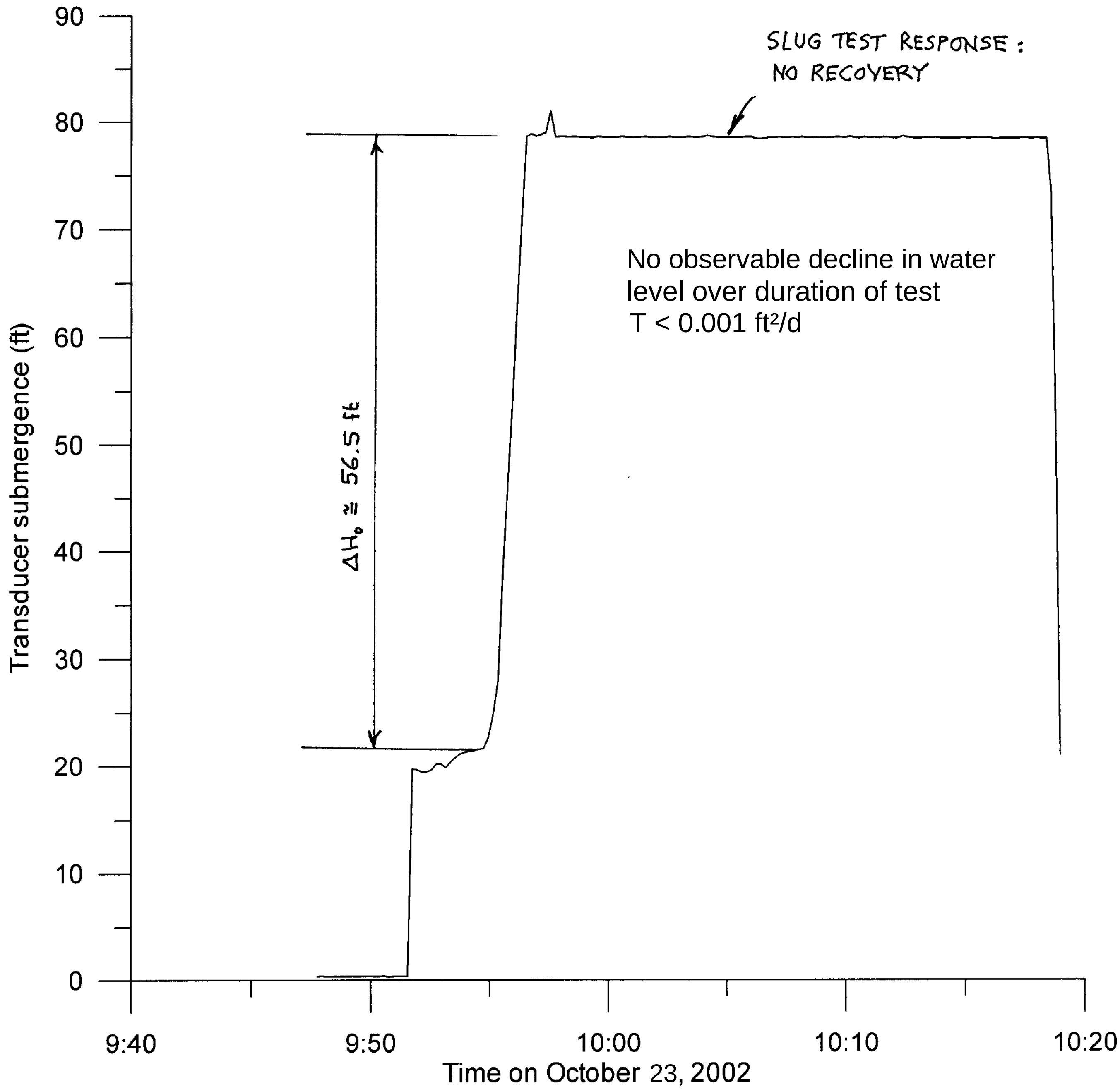
WELL DATA

Initial Displacement: 59.64 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

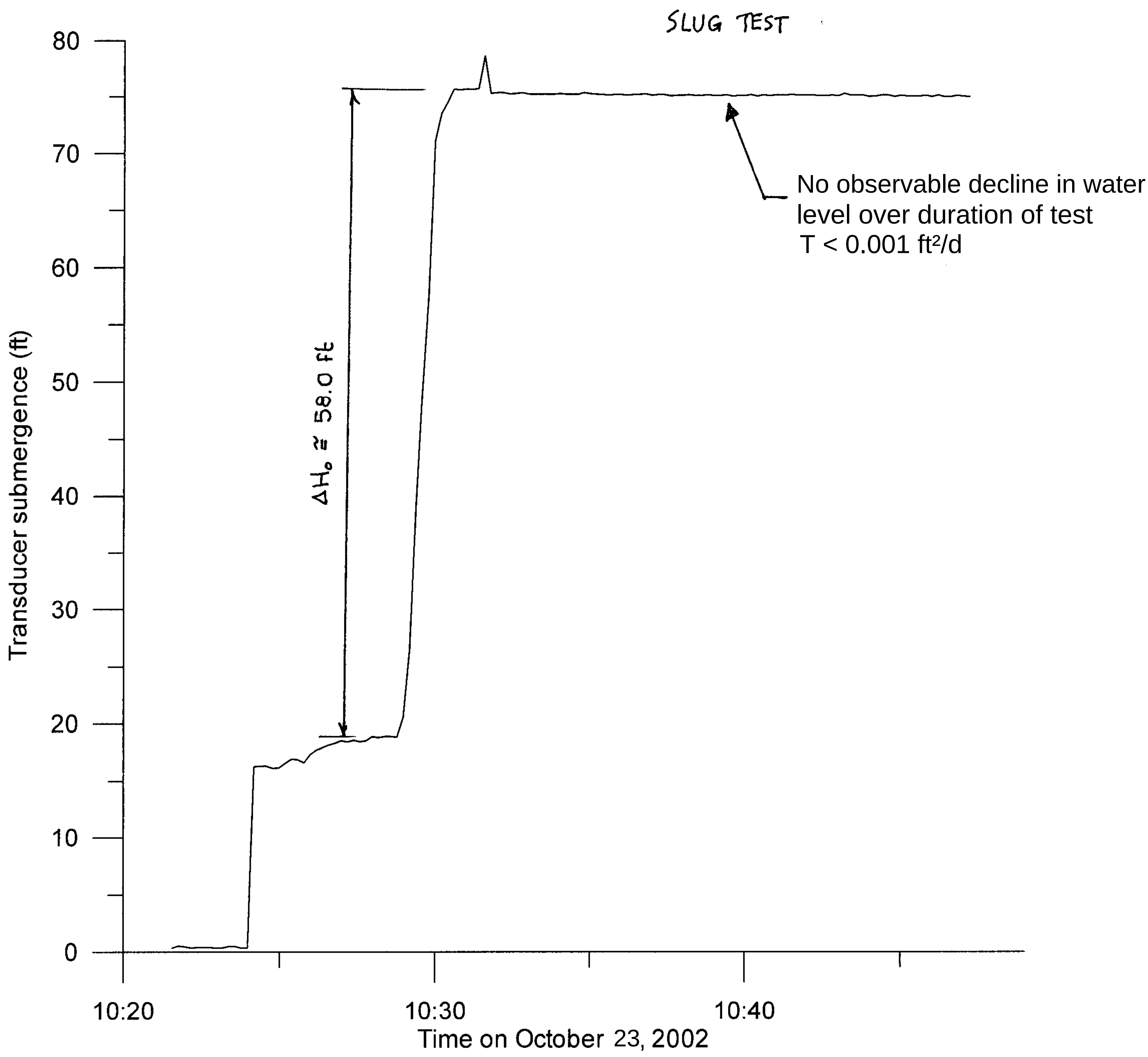
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
. = 0.005 ft^2/day
S = 1.E-06

H5
Test 19



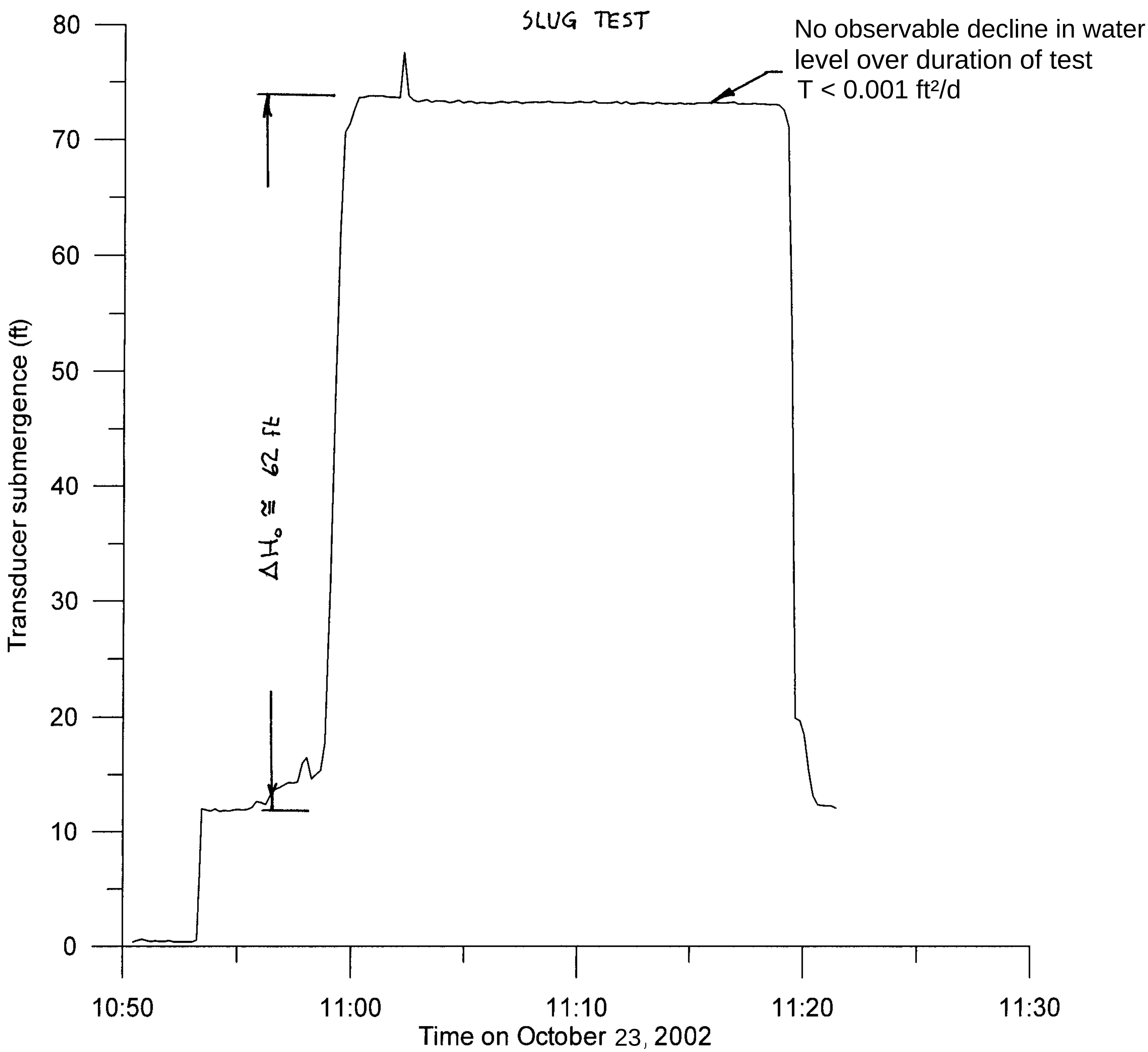
SLUG TEST RESPONSE :
NO RECOVERY
No observable decline in water level over duration of test
T < 0.001 ft²/d
$\Delta H_o \cong 56.5$ ft
Transducer submergence (ft)
90
80
70
60
50
40
30
20
10
0
9:40
9:50
10:00
10:10
10:20
Time on October 23, 2002

H5
Test 20



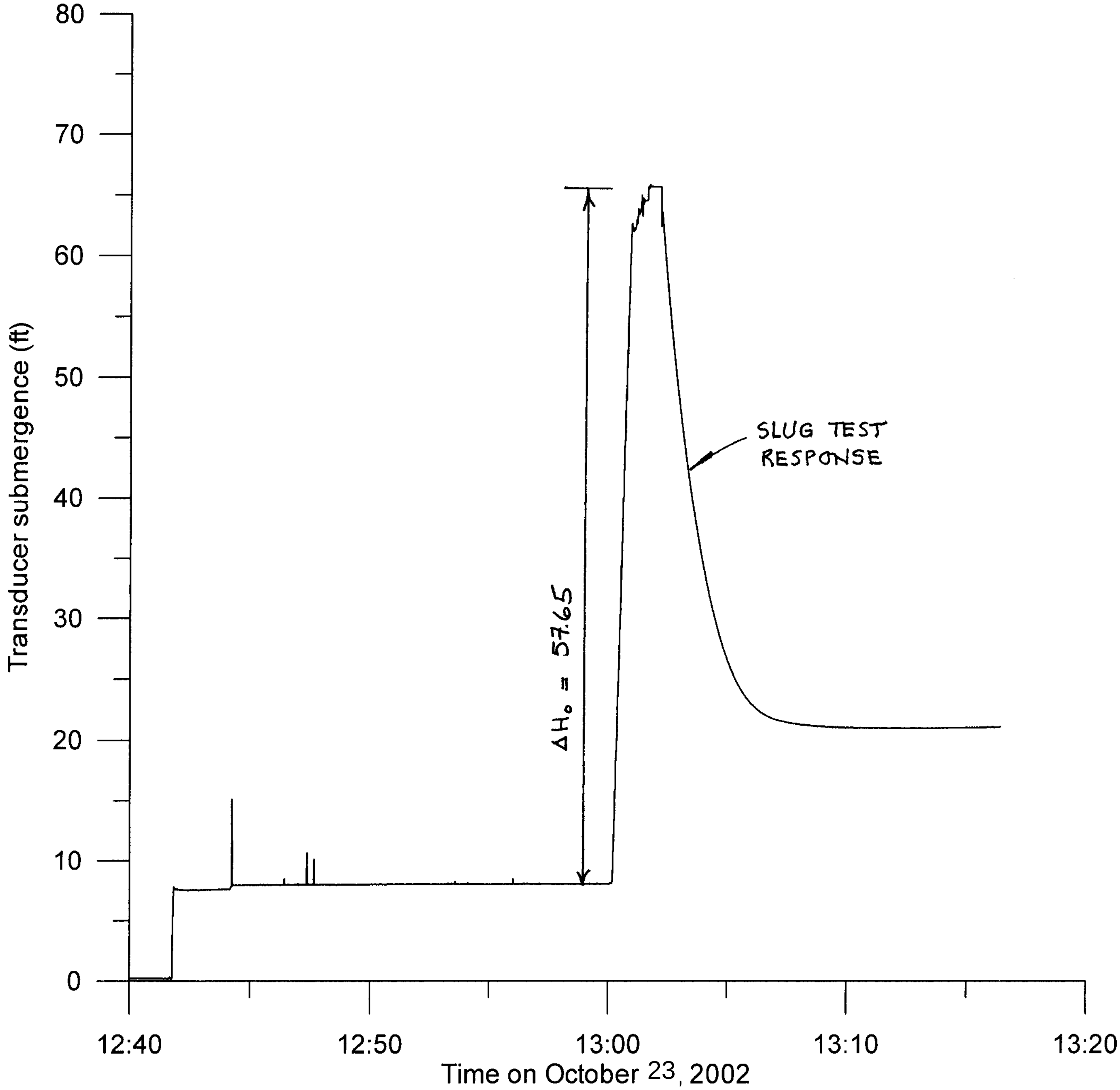
SLUG TEST
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
ΔH₀ ≅ 58.0 ft
No observable decline in water level over duration of test
T < 0.001 ft²/d
10:20
10:30
10:40
Time on October 23, 2002

H5
Test 21

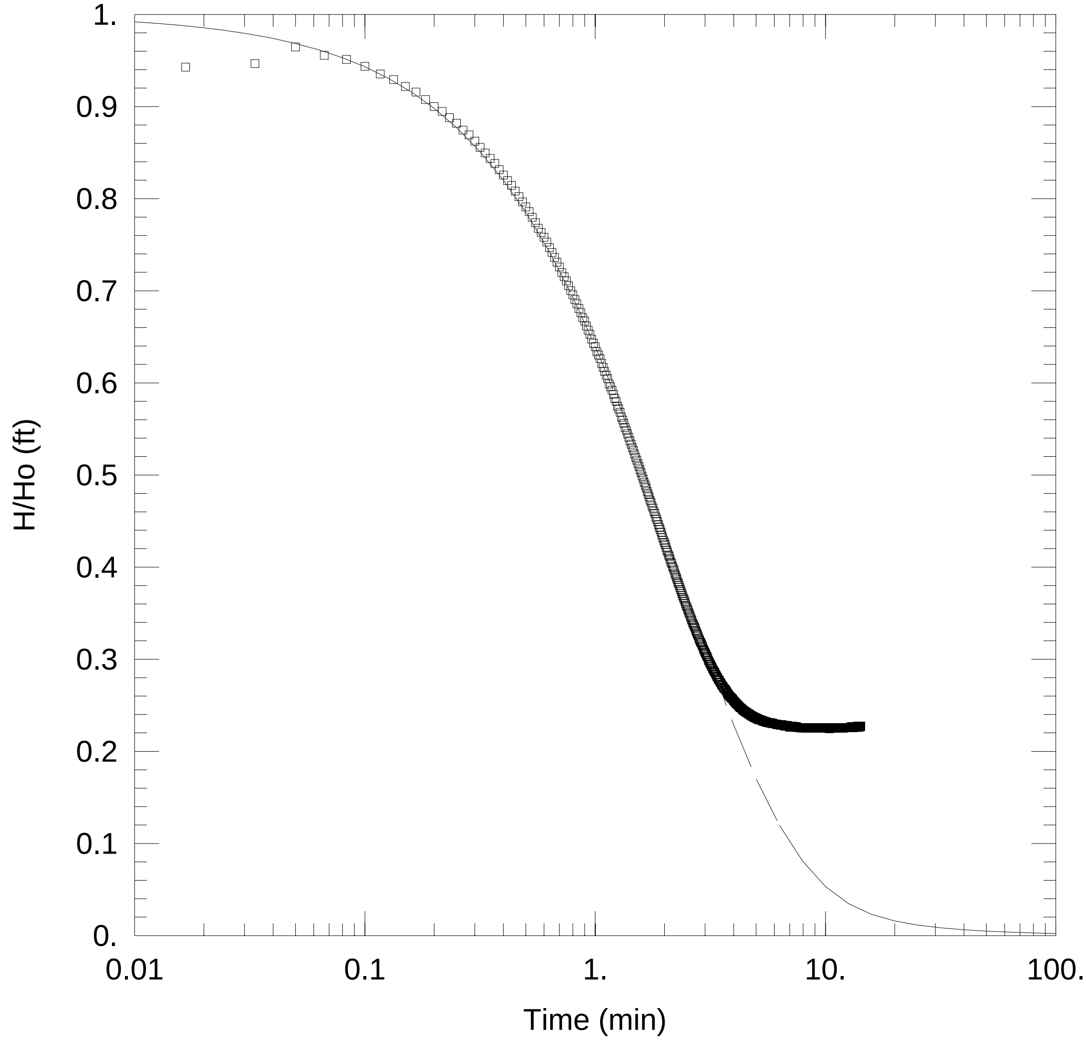


SLUG TEST
No observable decline in water level over duration of test
T < 0.001 ft²/d
ΔH₀ ≅ 62 ft
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
10:50
11:00
11:10
11:20
11:30
Time on October 23, 2002

H5
Test 22



80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
12:40
12:50
13:00
13:10
13:20
Time on October 23, 2002
ΔH₀ = 57.65
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-22(c).aqt
Date: 01/22/03 Time: 15:42:24

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

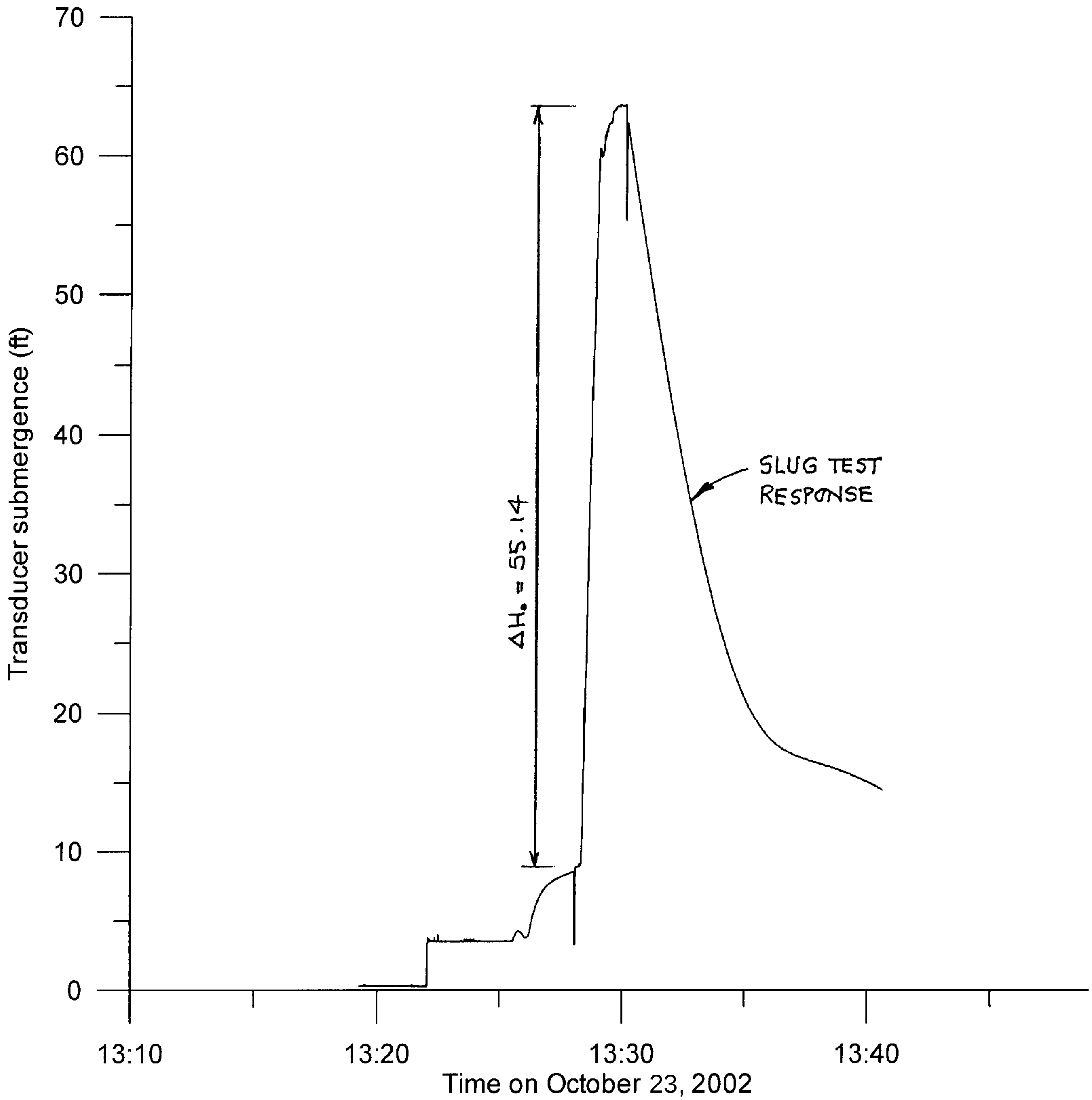
WELL DATA

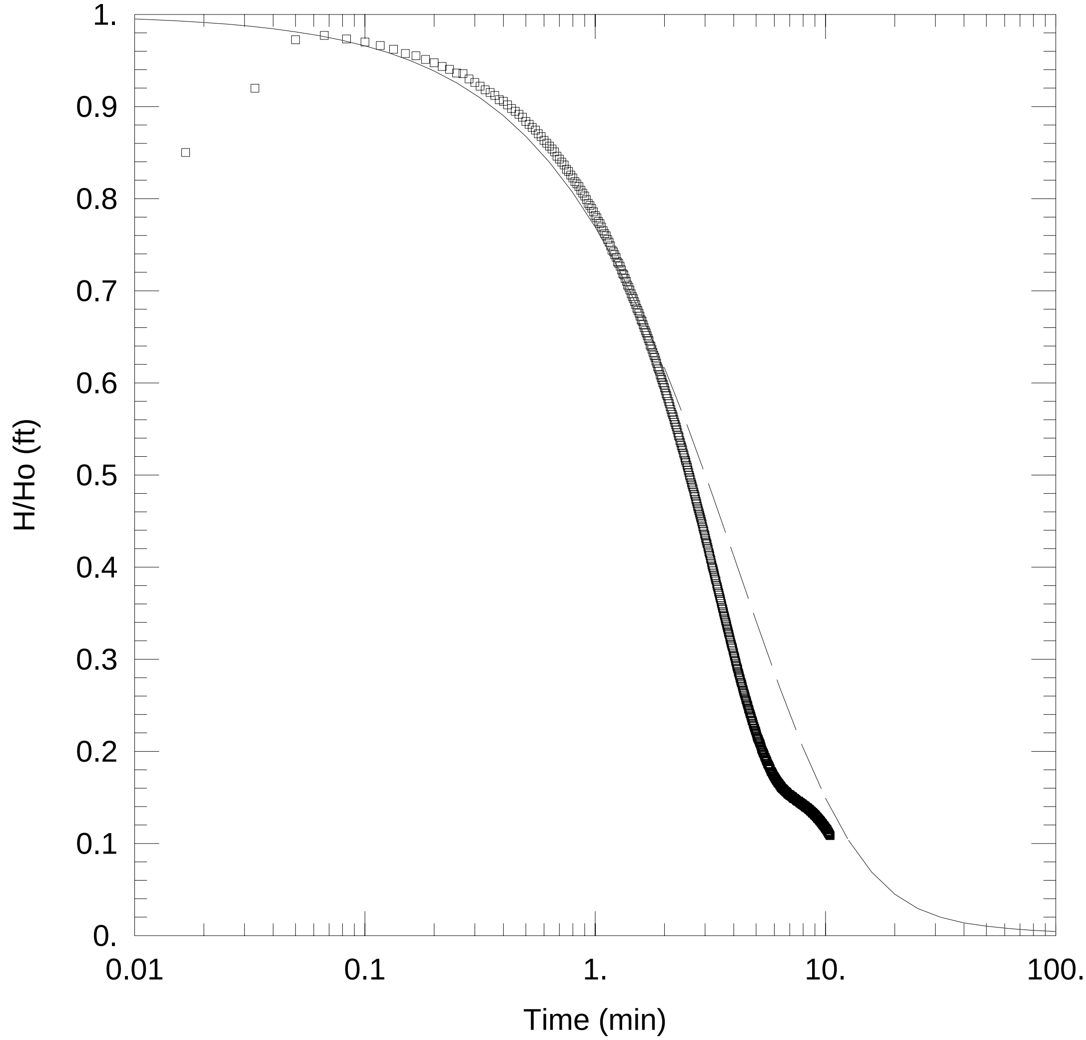
Initial Displacement: 57.65 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 2.96 ft^2/day S = 1.E-06

H5
Test 23


70
60
50
40
30
20
10
0
Transducer submergence (ft)
13:10
13:20
13:30
13:40
Time on October 23, 2002
ΔH₀ = 55.14
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-23(c).aqt
Date: 01/22/03 Time: 15:42:46

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

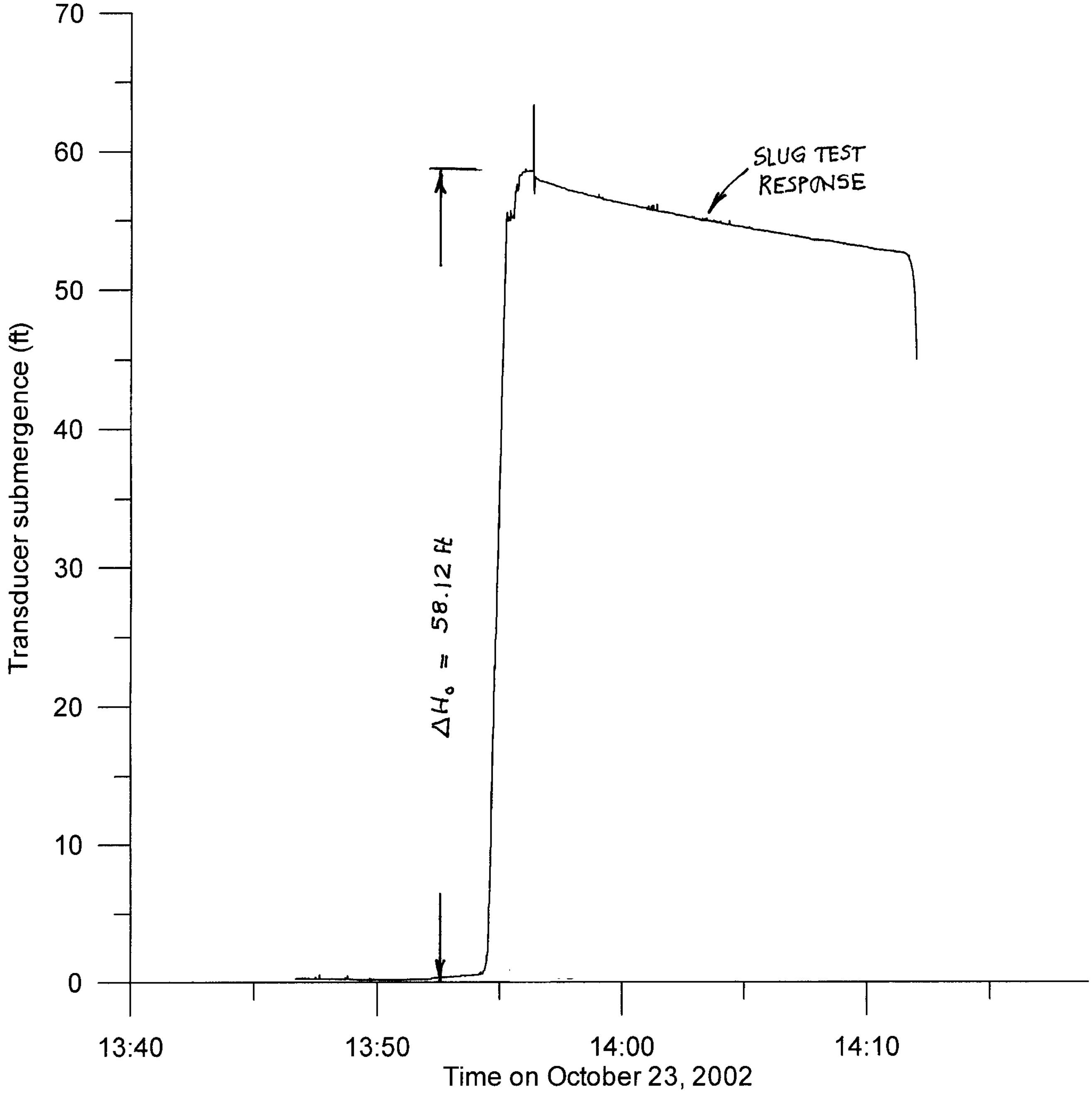
WELL DATA

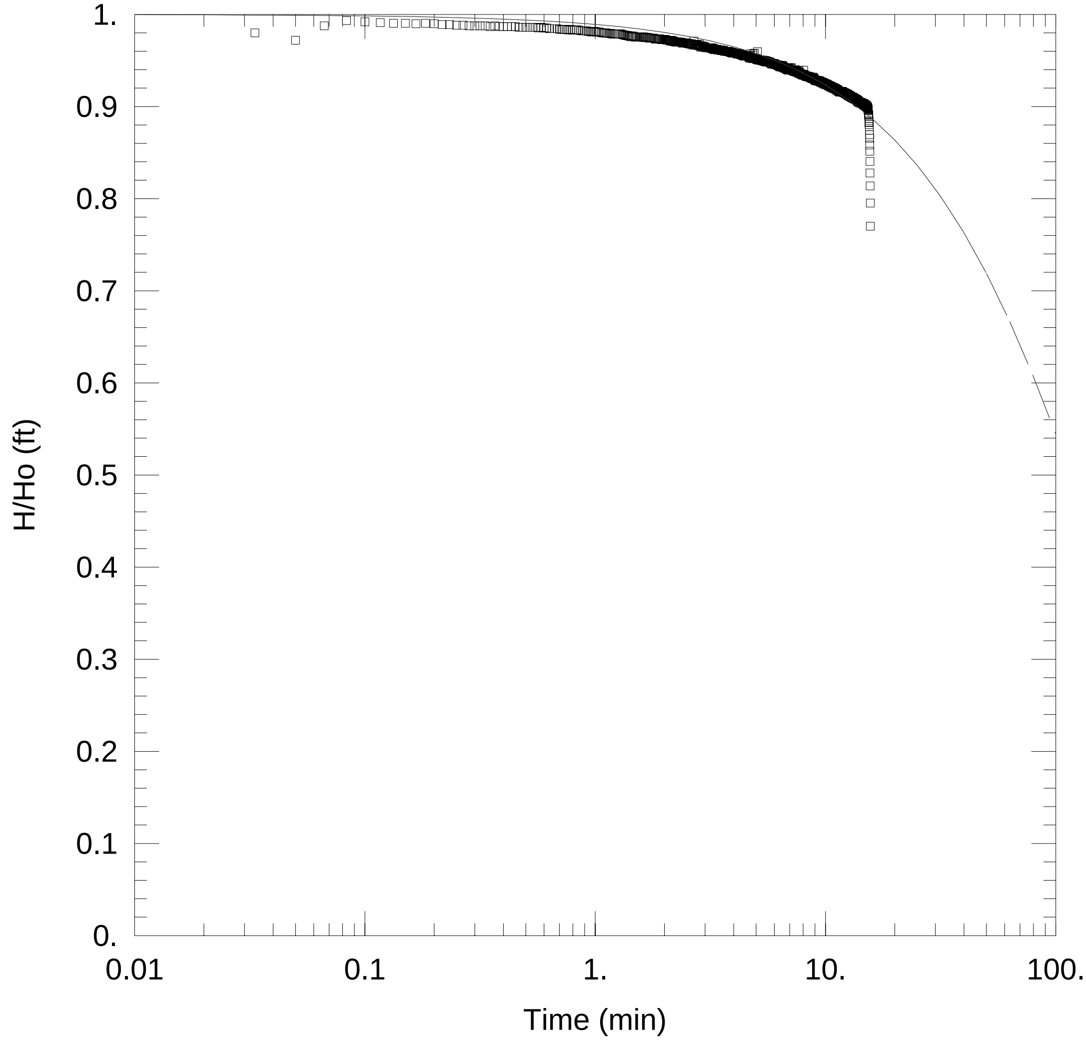
Initial Displacement: 55.14 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 1.622 ft^2/day S = 1.E-06

H5
Test 24


70
60
50
40
30
20
10
0
Transducer submergence (ft)
13:40
13:50
14:00
14:10
Time on October 23, 2002
SLUG TEST RESPONSE
ΔH₀ = 58.12 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-24(c).aqt
Date: 01/22/03 Time: 15:44:27

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

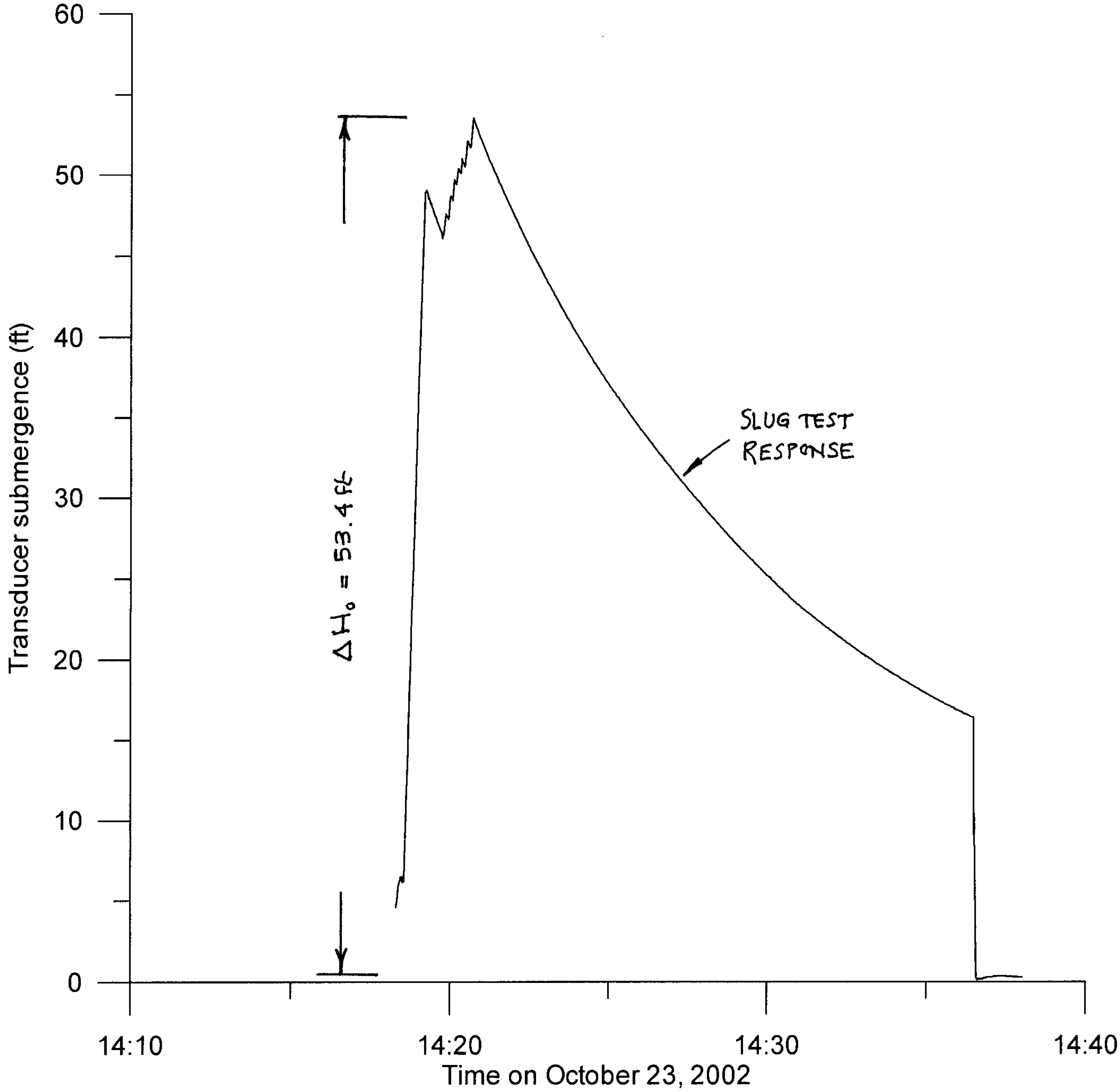
Initial Displacement: 58.6 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

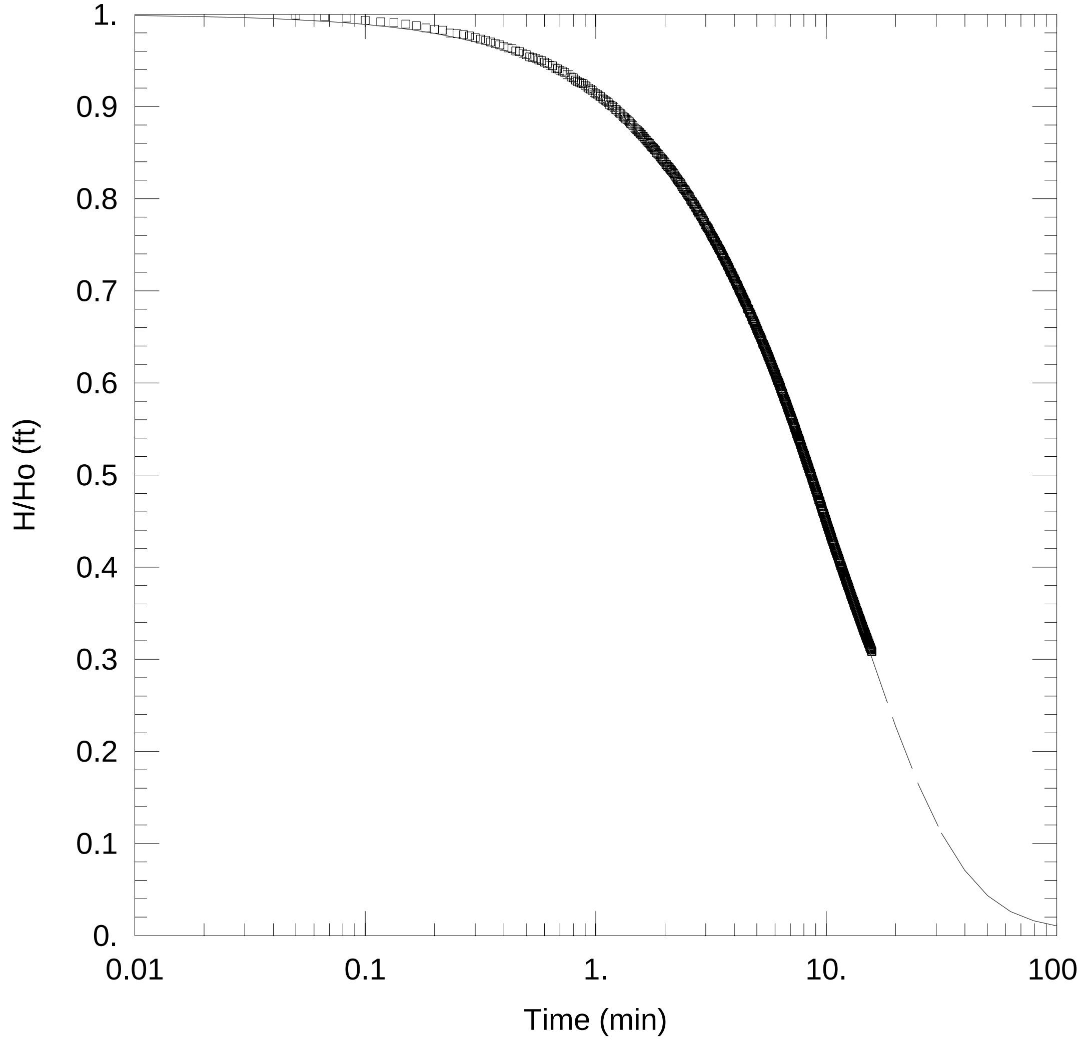
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

$T = 0.04205\ ft^2/day$ $S = 1.E-06$

H5
Test 25



60
50
40
30
20
10
0
Transducer submergence (ft)
14:10
14:20
14:30
14:40
Time on October 23, 2002
ΔH₀ = 53.4 ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-25(c).aqt
Date: 01/22/03 Time: 15:44:38

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 53.4 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

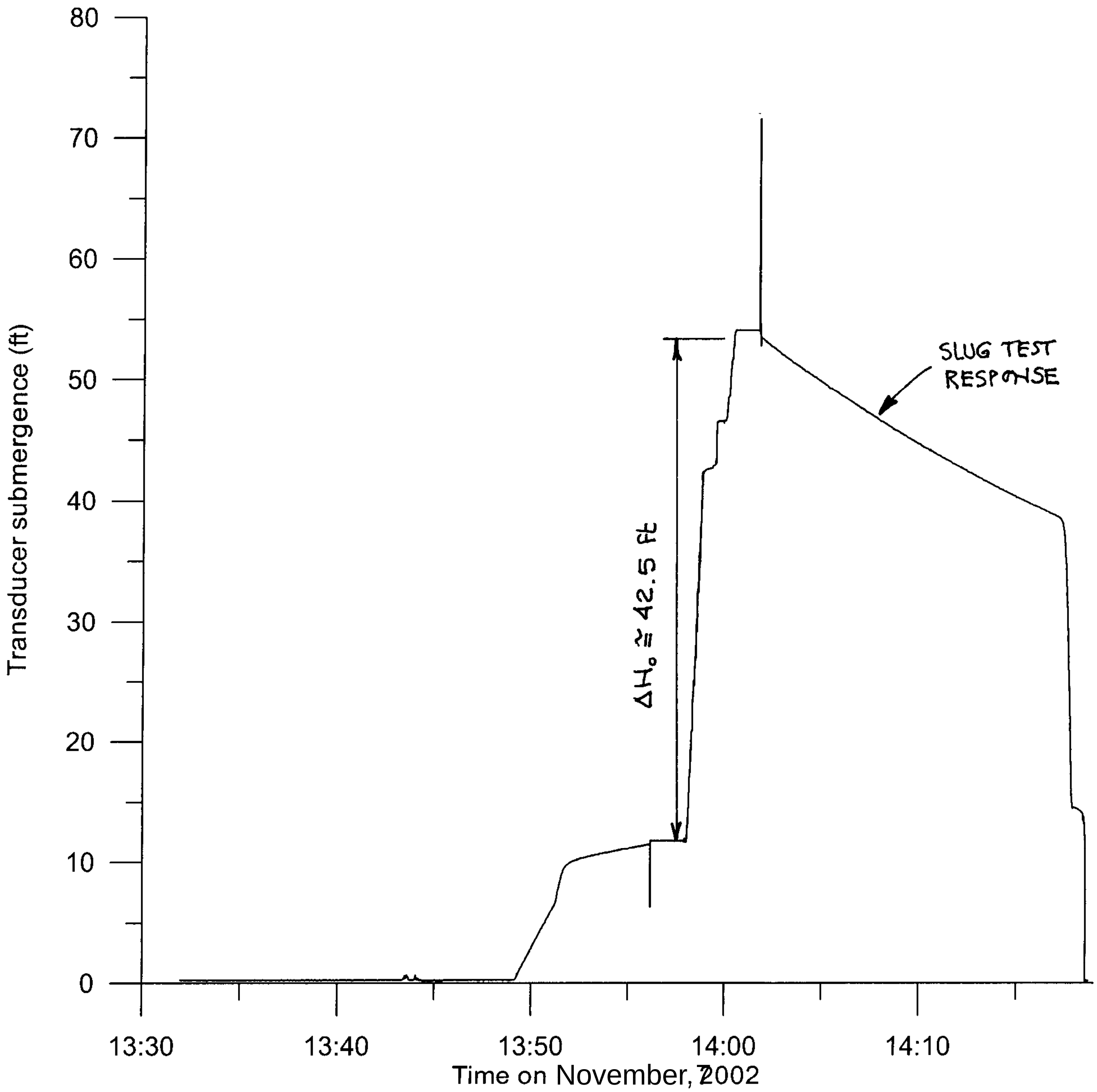
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

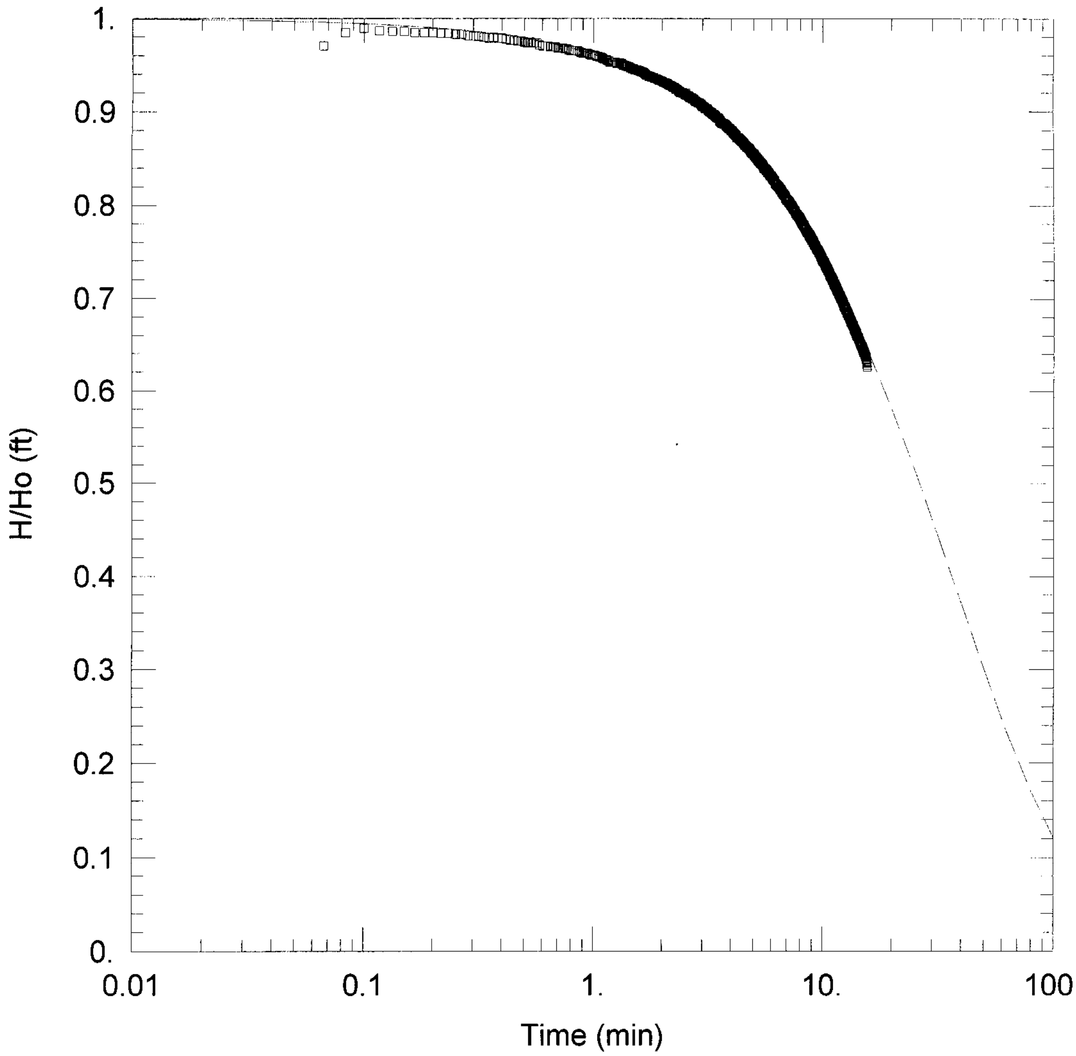
T = 0.9113 ft^2/day S = 1.548E-09

H5

Test R25



80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
$\Delta H_o \cong 42.5$ ft
SLUG TEST RESPONSE
13:30
13:40
13:50
14:00
14:10
Time on November, 7 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\RETEST\H5-R25(c).aqt
Date: 12/06/02 Time: 08:46:44

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

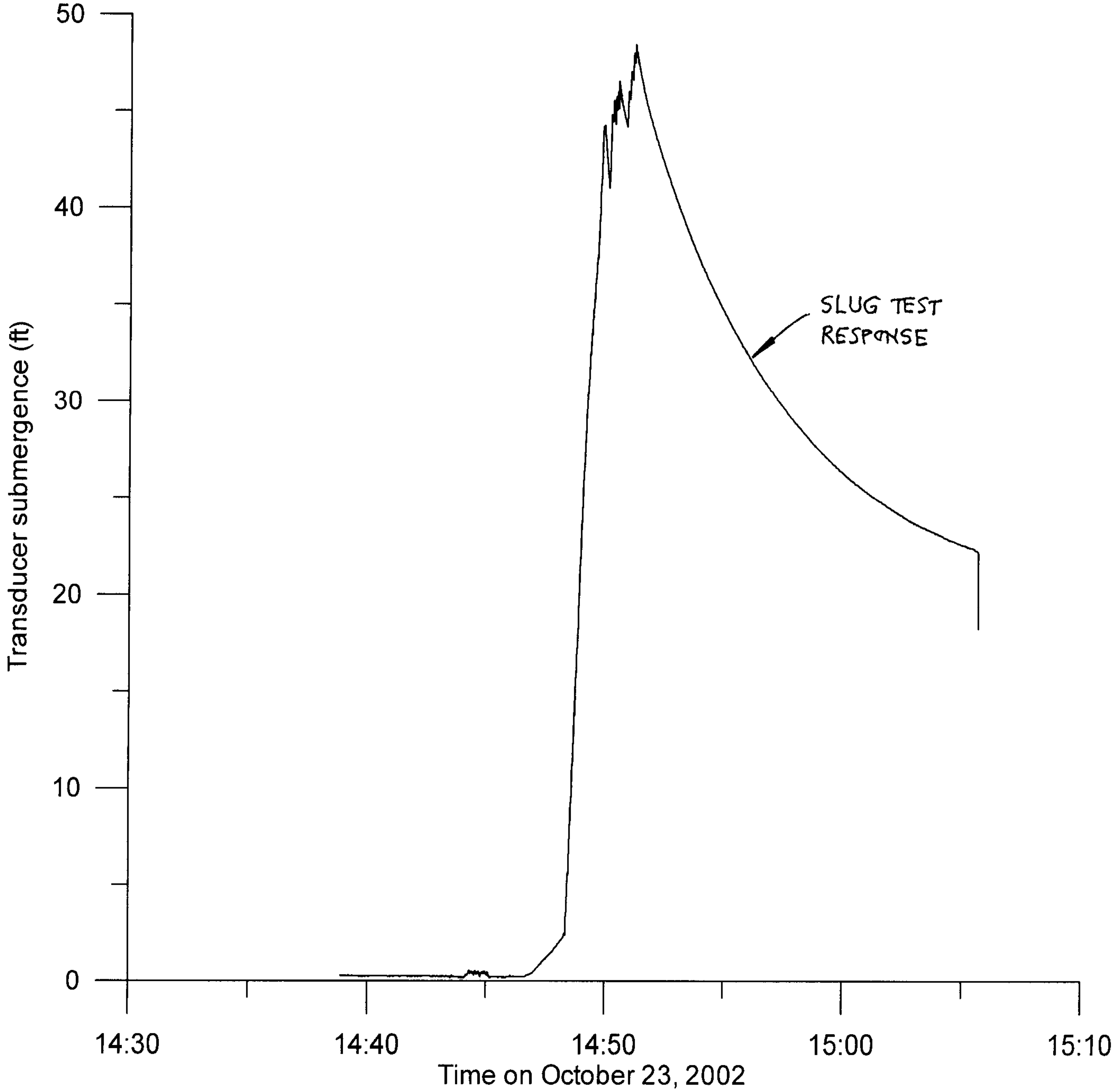
Initial Displacement: 42.34 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

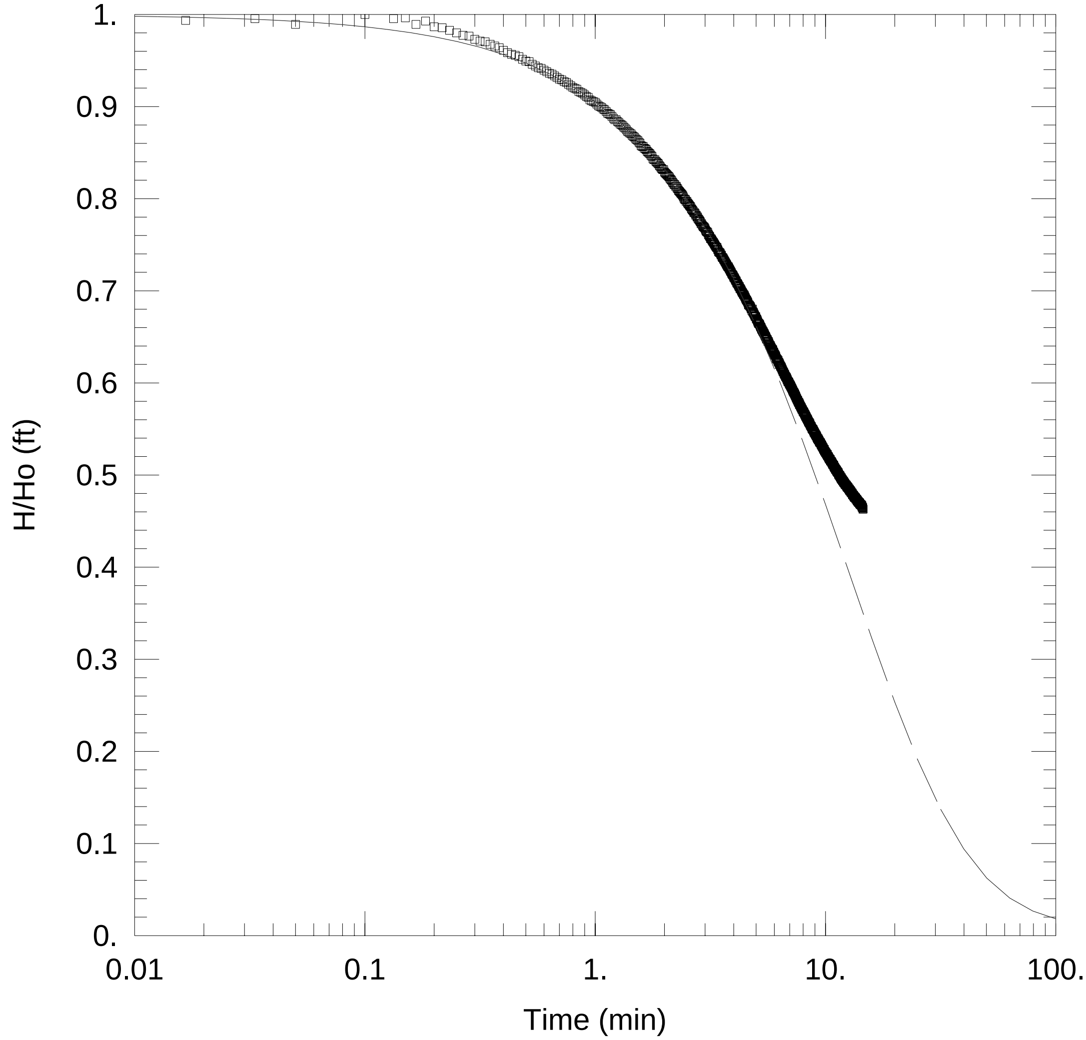
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

. = 0.1848 ft^2/day S = 1.E-06

H5
Test 26


50
40
30
20
10
0
Transducer submergence (ft)
SLUG TEST RESPONSE
14:30
14:40
14:50
15:00
15:10
Time on October 23, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-26(c).aqt
Date: 01/22/03 Time: 15:44:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

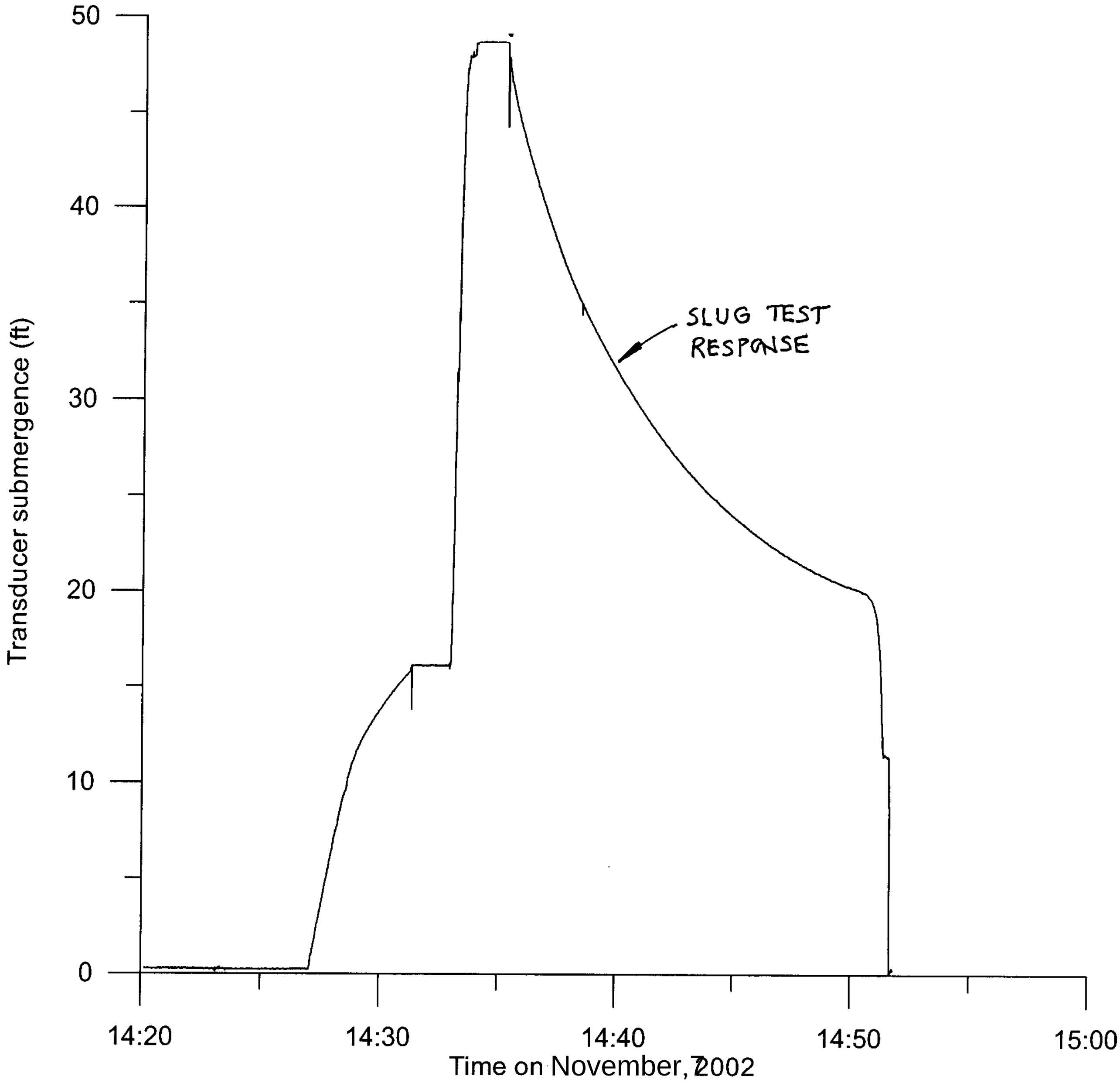
Initial Displacement: 48.08 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

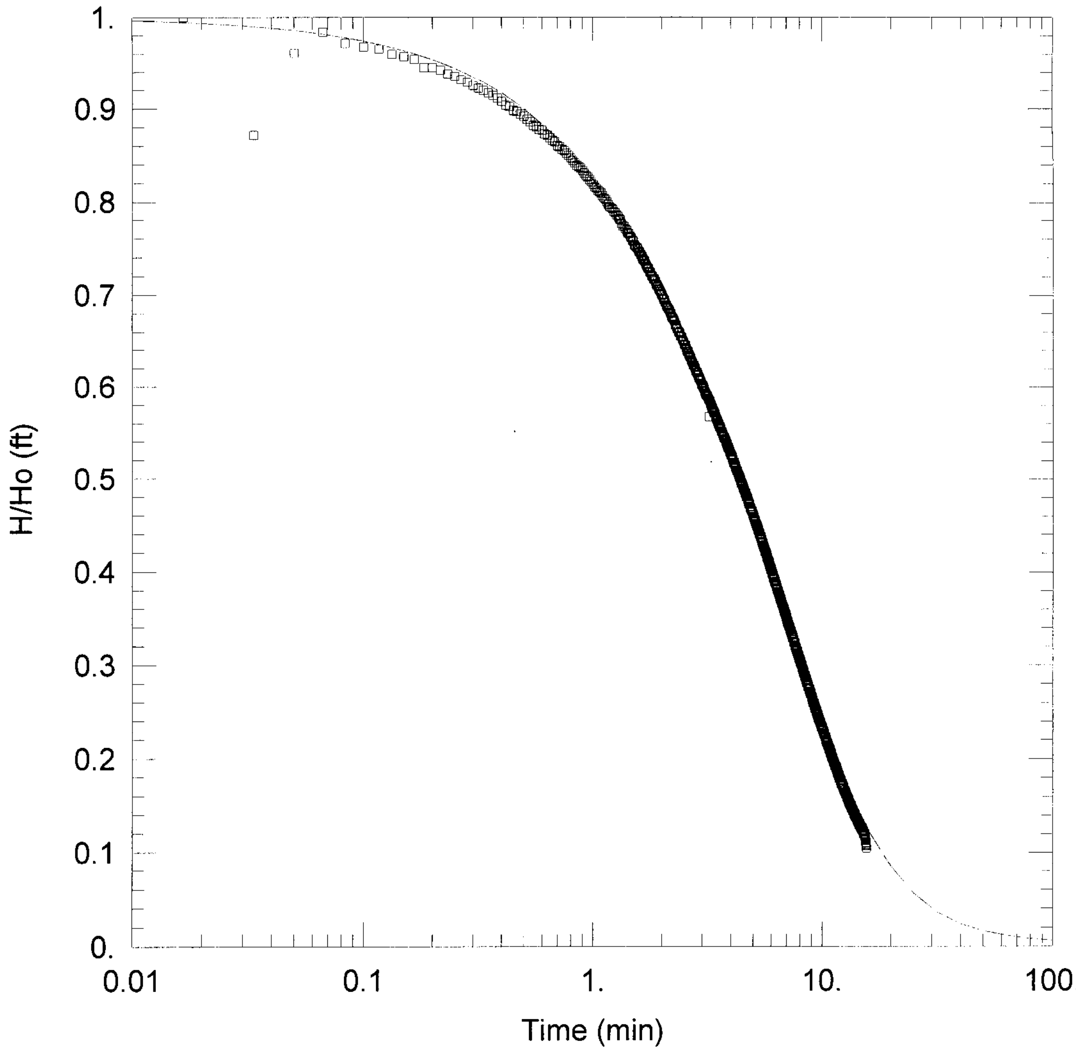
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
$T = 0.5419$ ft^2/day $S = 1.E\text{-}06$

H5

Test R26



50
40
30
20
10
0
Transducer submergence (ft)
14:20
14:30
14:40
14:50
15:00
Time on November 7, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\RETEST\H5-R26(c).aqt
Date: 12/06/02 Time: 08:46:07

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

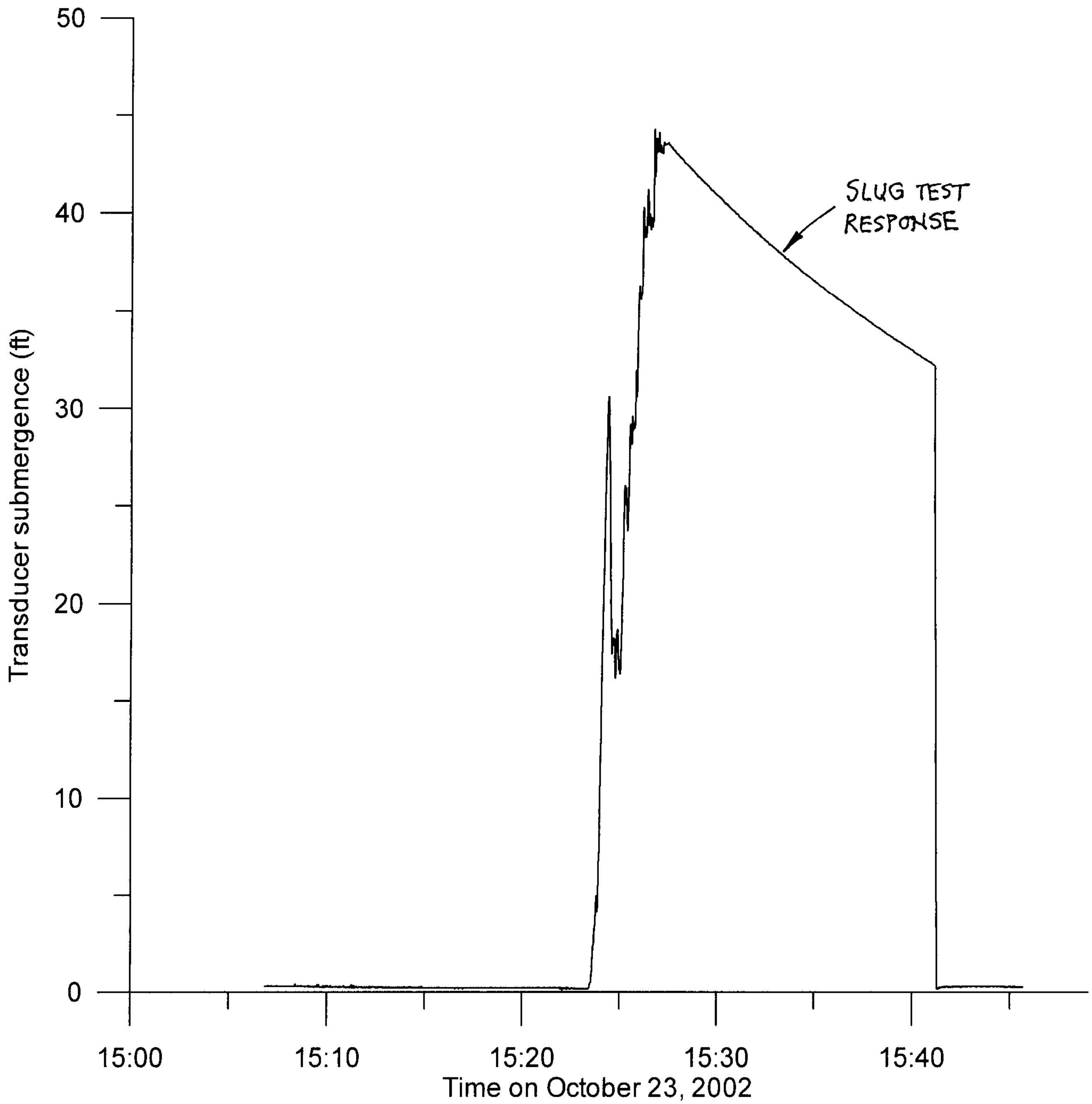
WELL DATA

Initial Displacement: 32.31 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

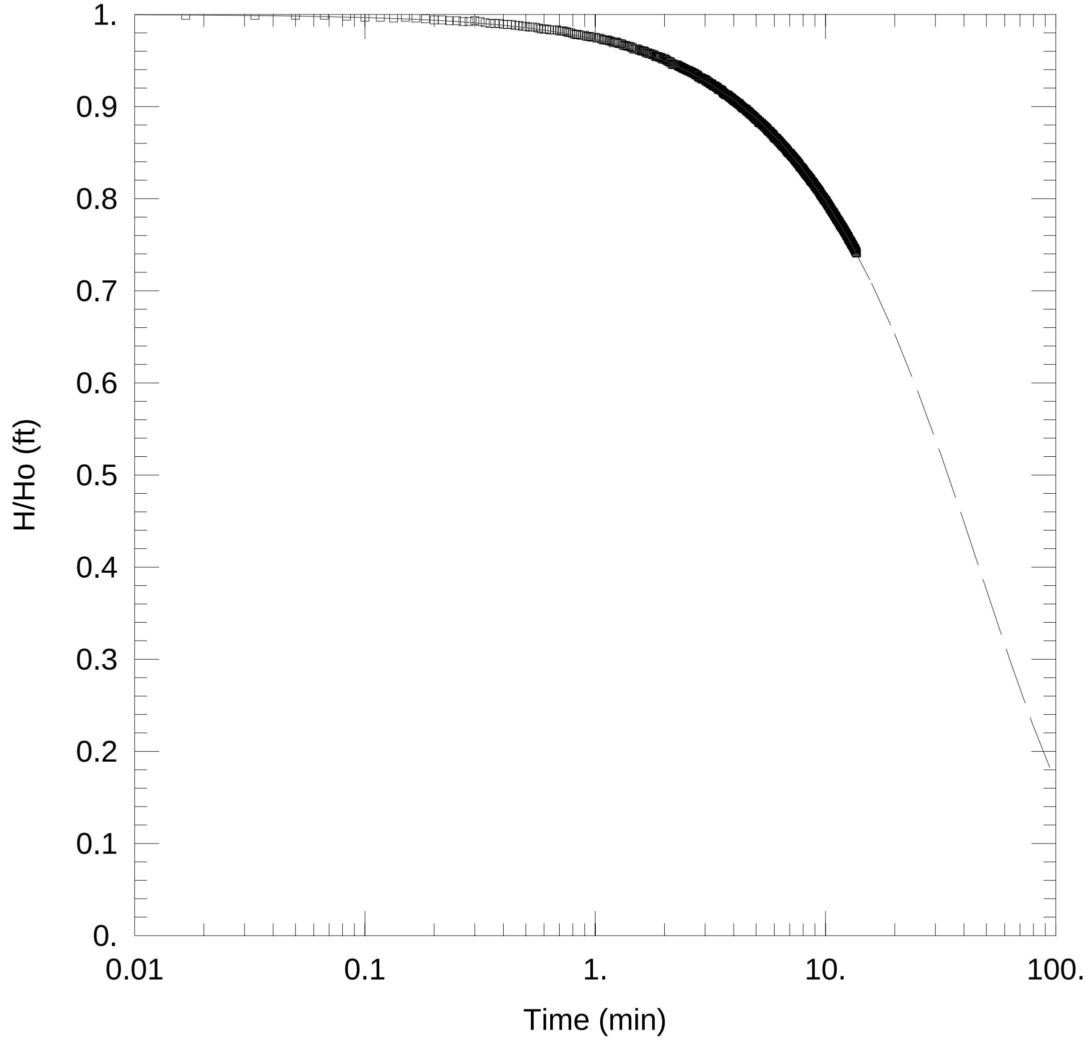
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
. = 1.15 ft^2/day S = 1.E-06

H5
Test 27



50
40
30
20
10
0
Transducer submergence (ft)
15:00
15:10
15:20
15:30
15:40
Time on October 23, 2002
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-27(c).aqt
Date: 01/22/03 Time: 15:44:42

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 43.57 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

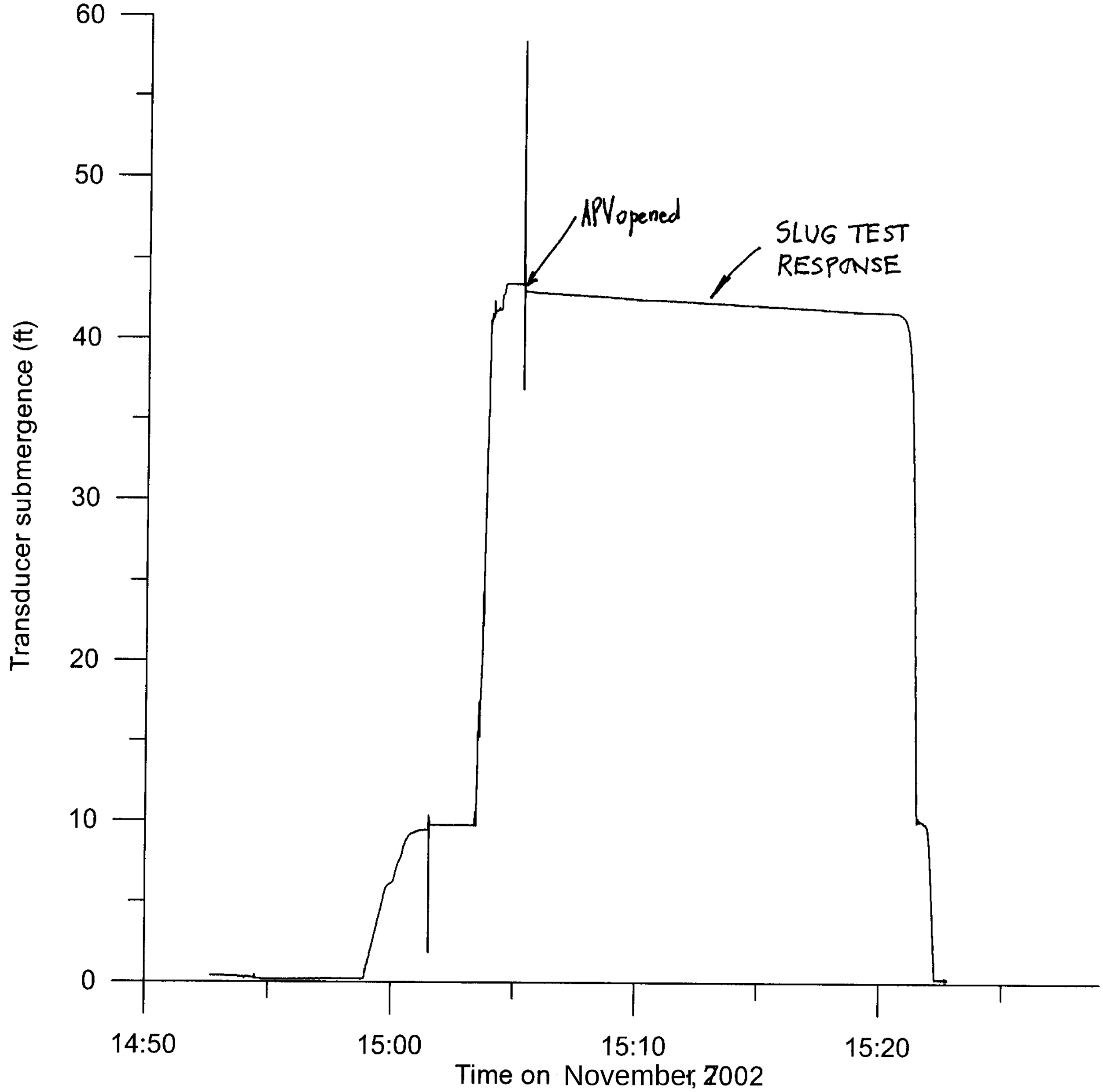
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

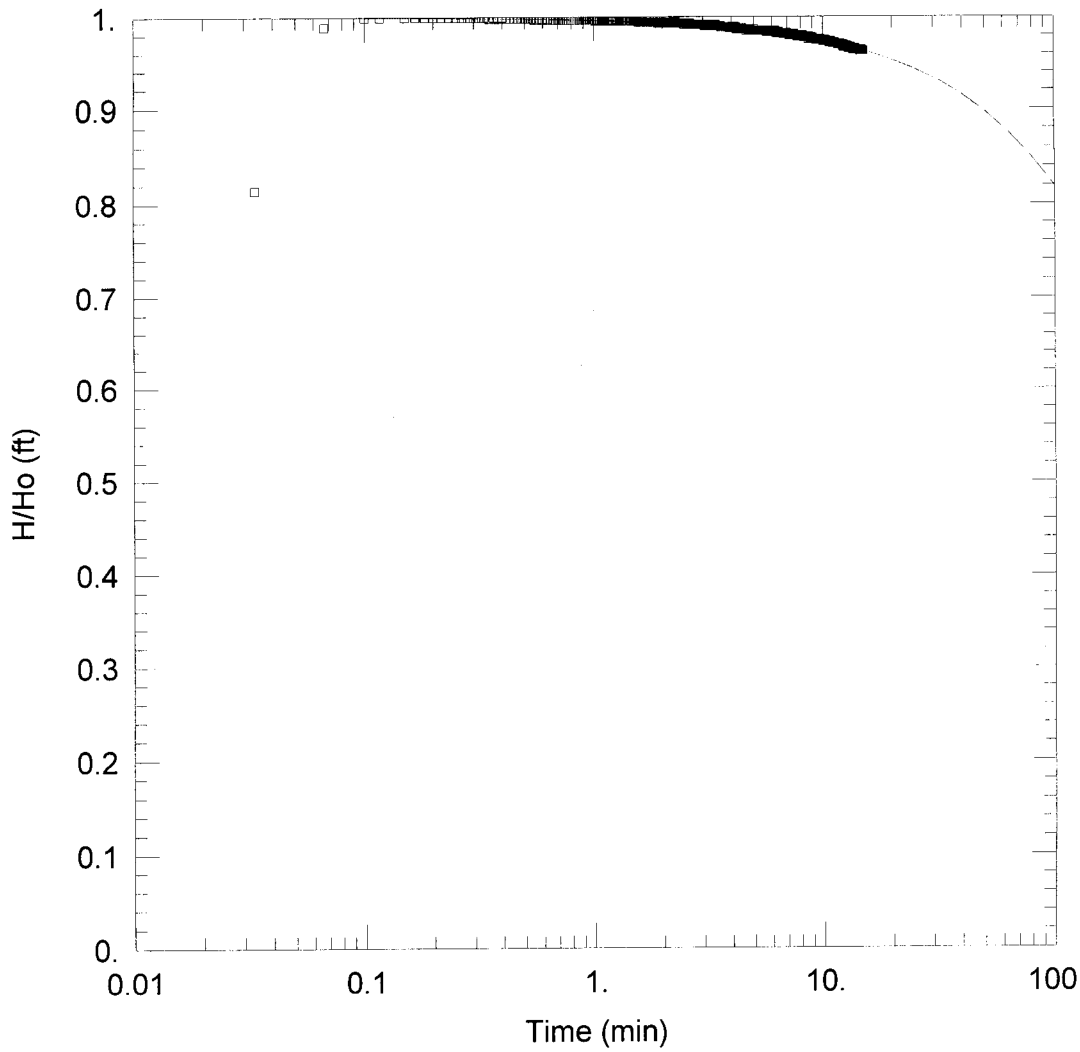
T = 0.196 ft^2/day S = 2.141E-08

H5

Test R27



60
50
40
30
20
10
0
Transducer submergence (ft)
APV opened
SLUG TEST RESPONSE
14:50
15:00
15:10
15:20
Time on November 7, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\RETEST\H5-R27(c).aqt
Date: 12/06/02 Time: 08:44:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

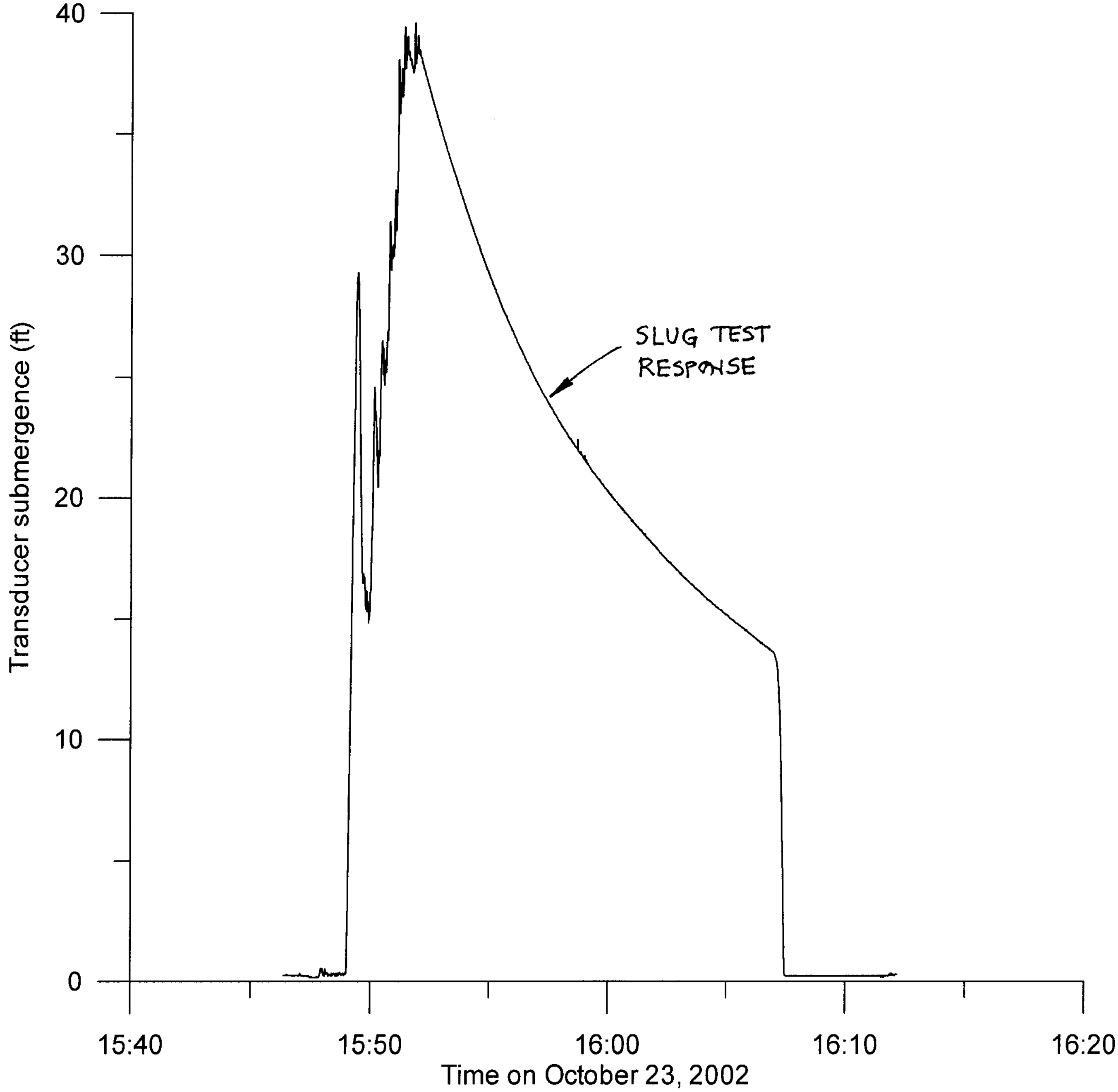
Initial Displacement: 33.25 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

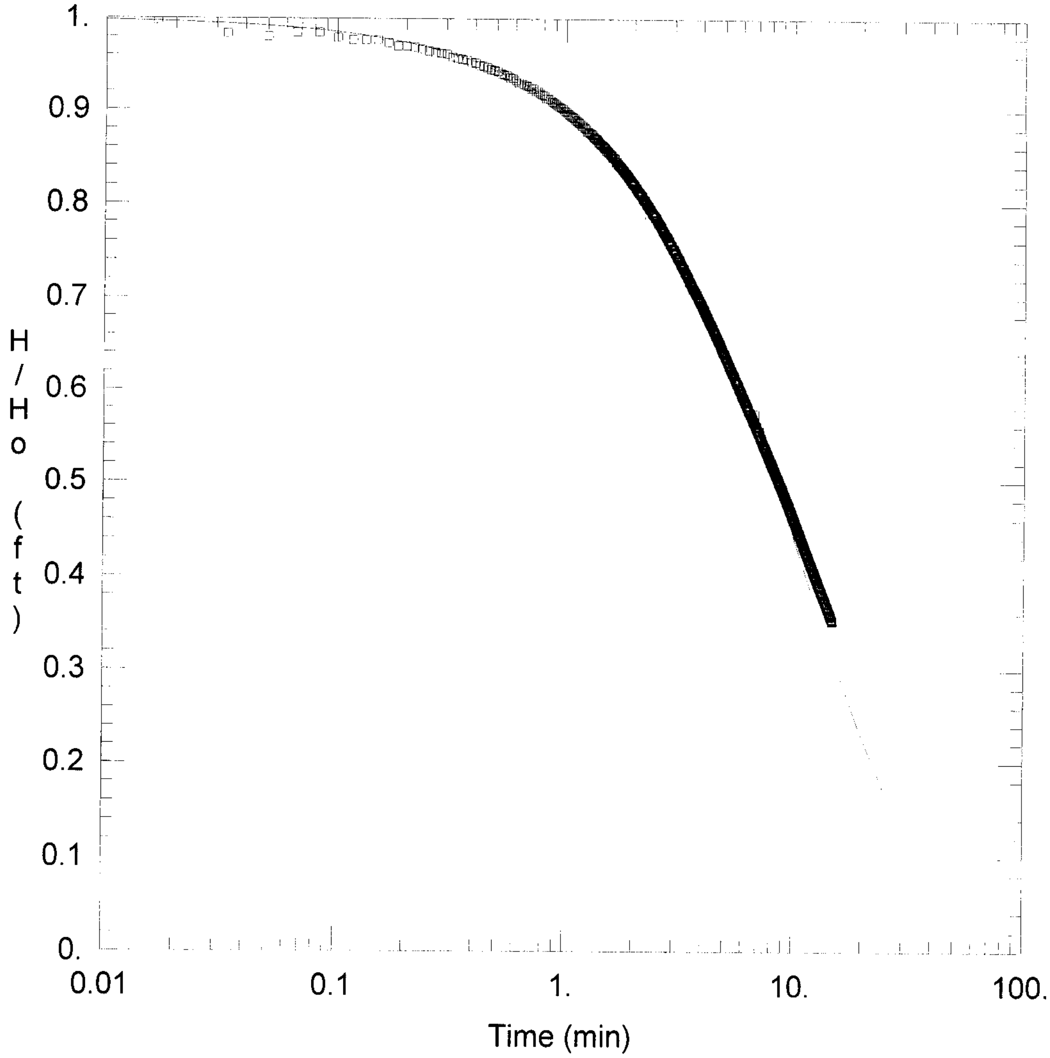
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

. = 0.01192 ft^2/day
S = 1.E-06

H5
Test 28


40
30
20
10
0
Transducer submergence (ft)
SLUG TEST RESPONSE
15:40
15:50
16:00
16:10
16:20
Time on October 23, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-28(c).aqt
Date: 12/05/02 Time: 15:28:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

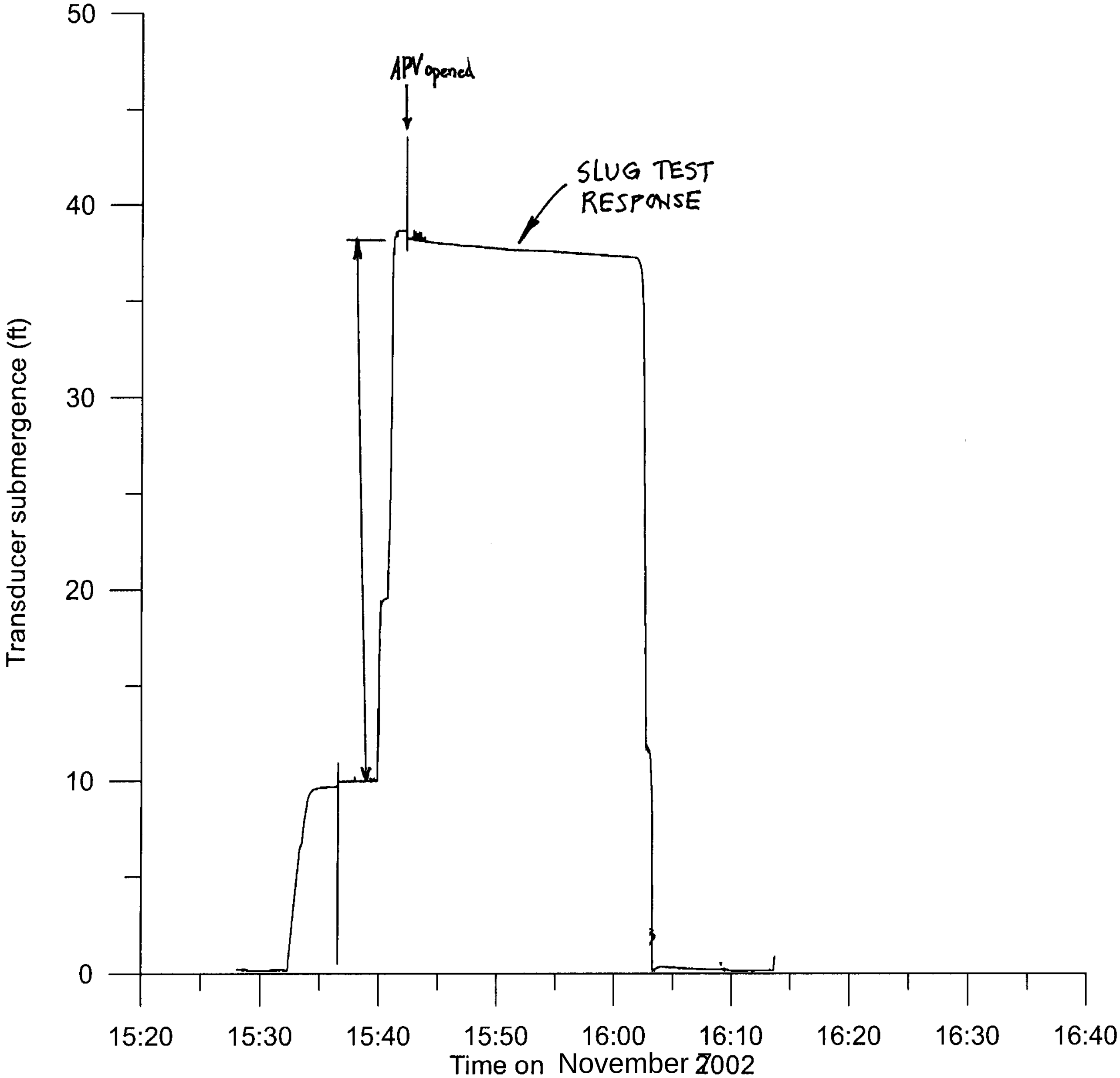
Initial Displacement: 39.11 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

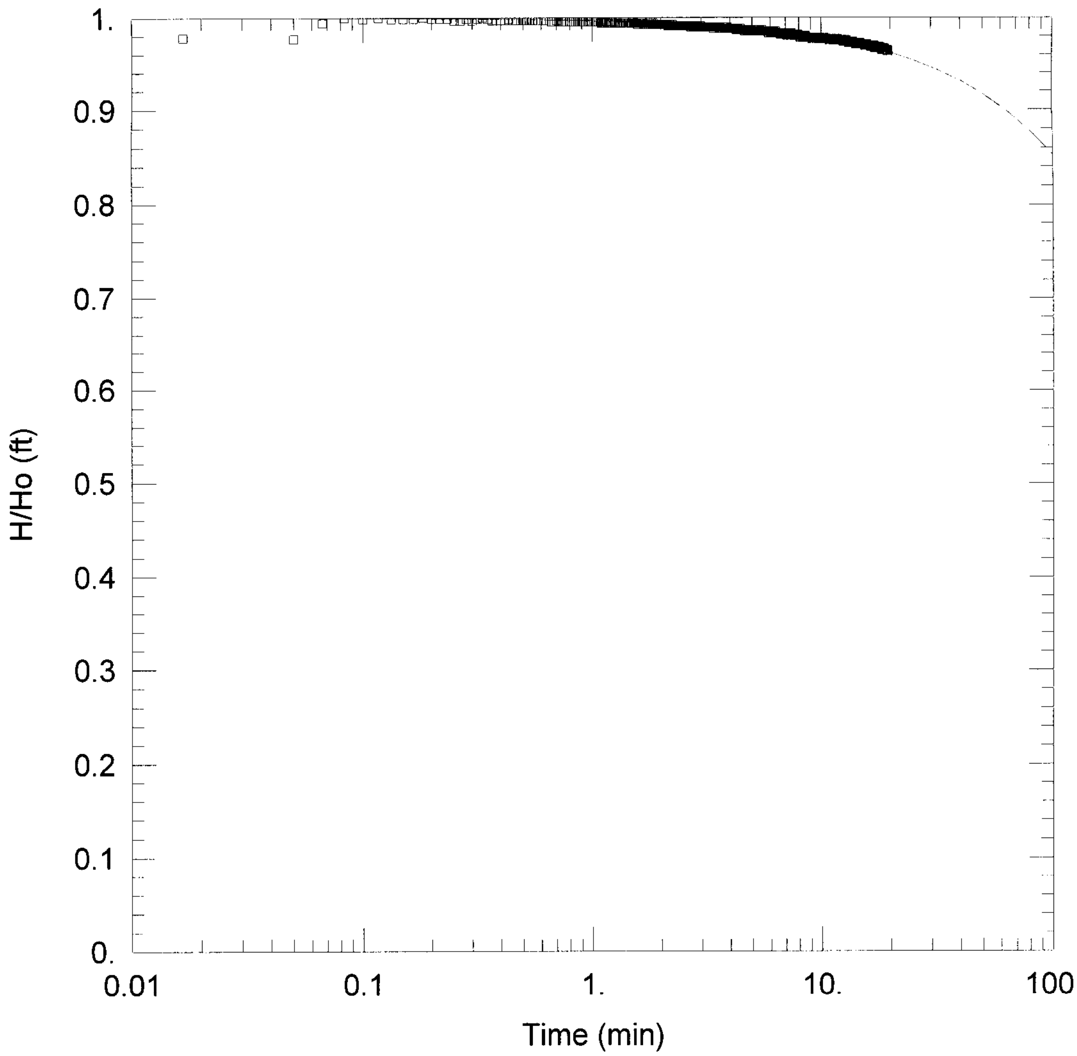
Aquifer Model: Confined
T = 0.5889 ft^2/day
Solution Method: Cooper-Bredehoeft-Papadopulos
S = 1.E-06

H5

Test R28



APV opened
SLUG TEST RESPONSE
Transducer submergence (ft)
0
10
20
30
40
50
15:20
15:30
15:40
15:50
16:00
16:10
16:20
16:30
16:40
Time on November 7 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\RETEST\H5-R28(c).aqt
Date: 12/06/02 Time: 08:44:03

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 28.33 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

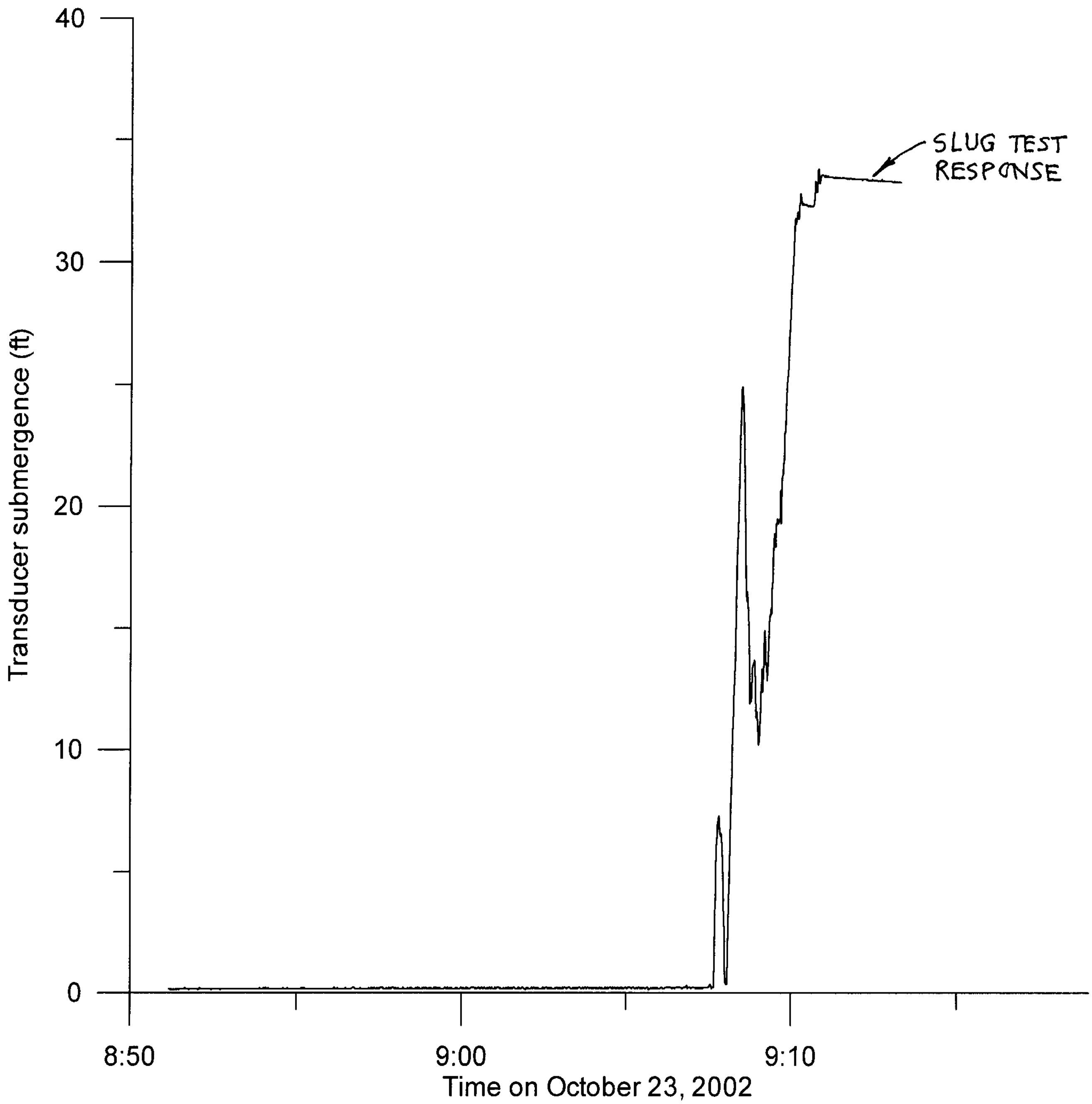
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

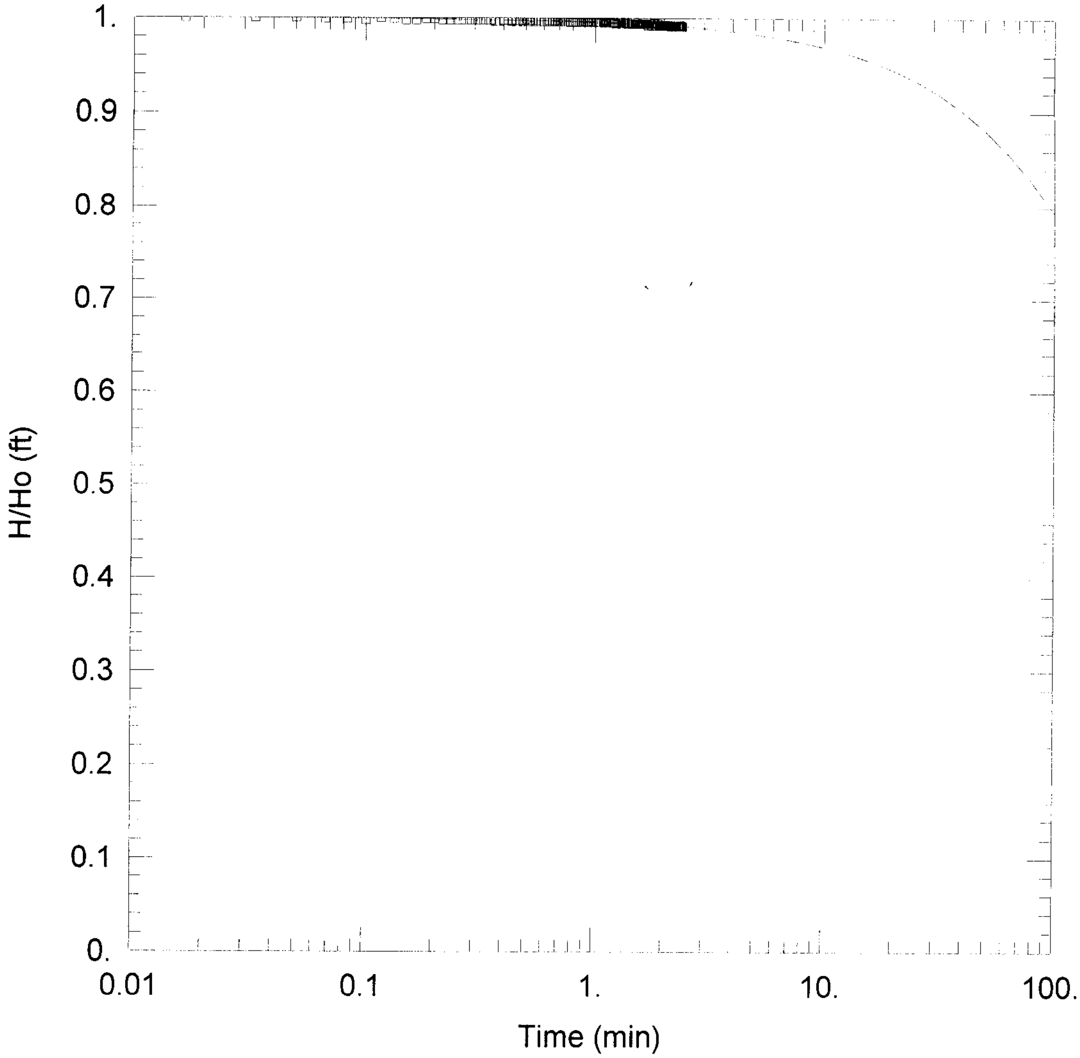
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.009233 ft^2/day
S = 1.E-06

H5
Test 29



40
30
20
10
0
Transducer submergence (ft)
8:50
9:00
9:10
Time on October 23, 2002
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-29(c).aqt
Date: 12/05/02 Time: 16:07:09

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 33.44 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

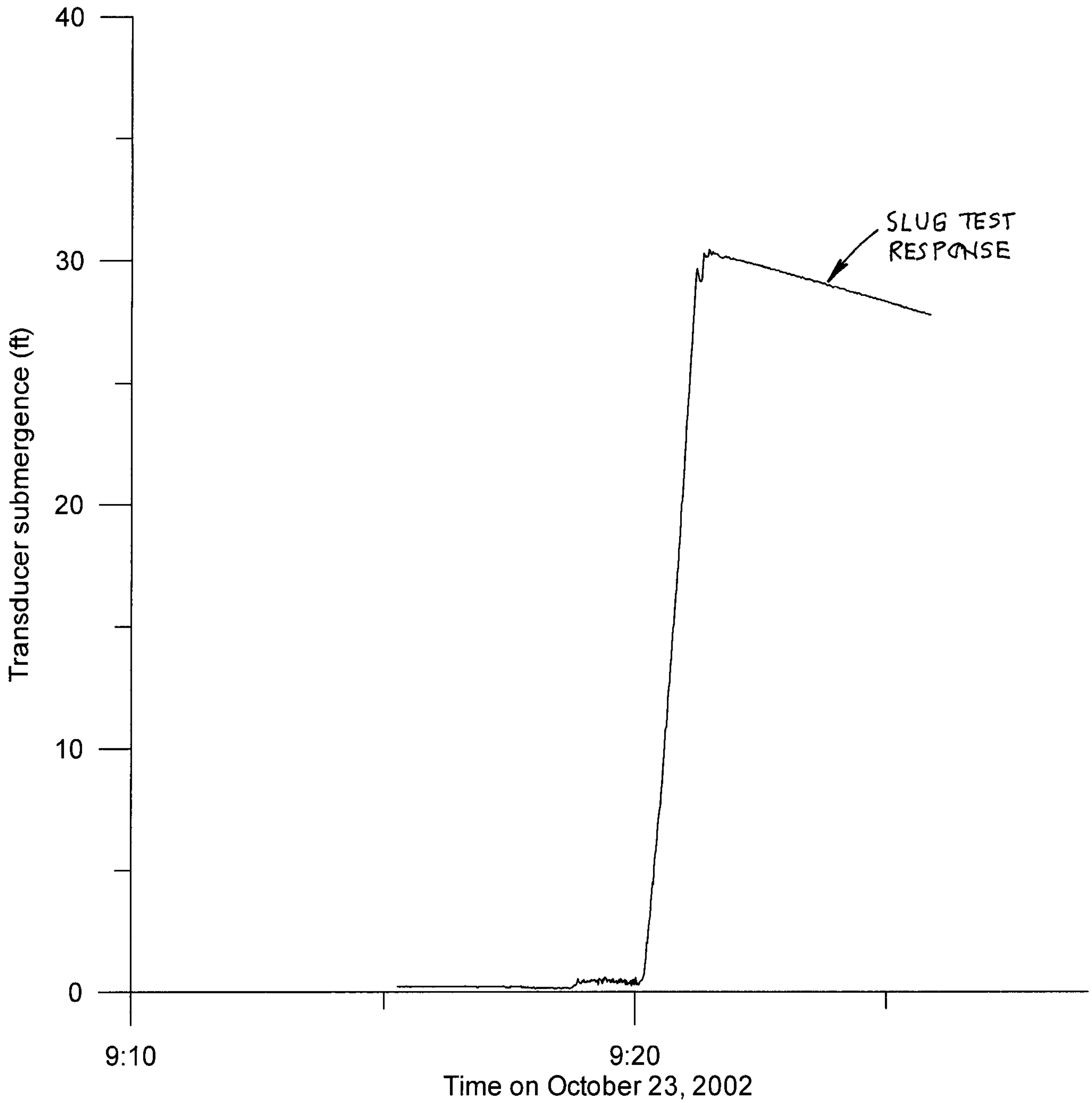
Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

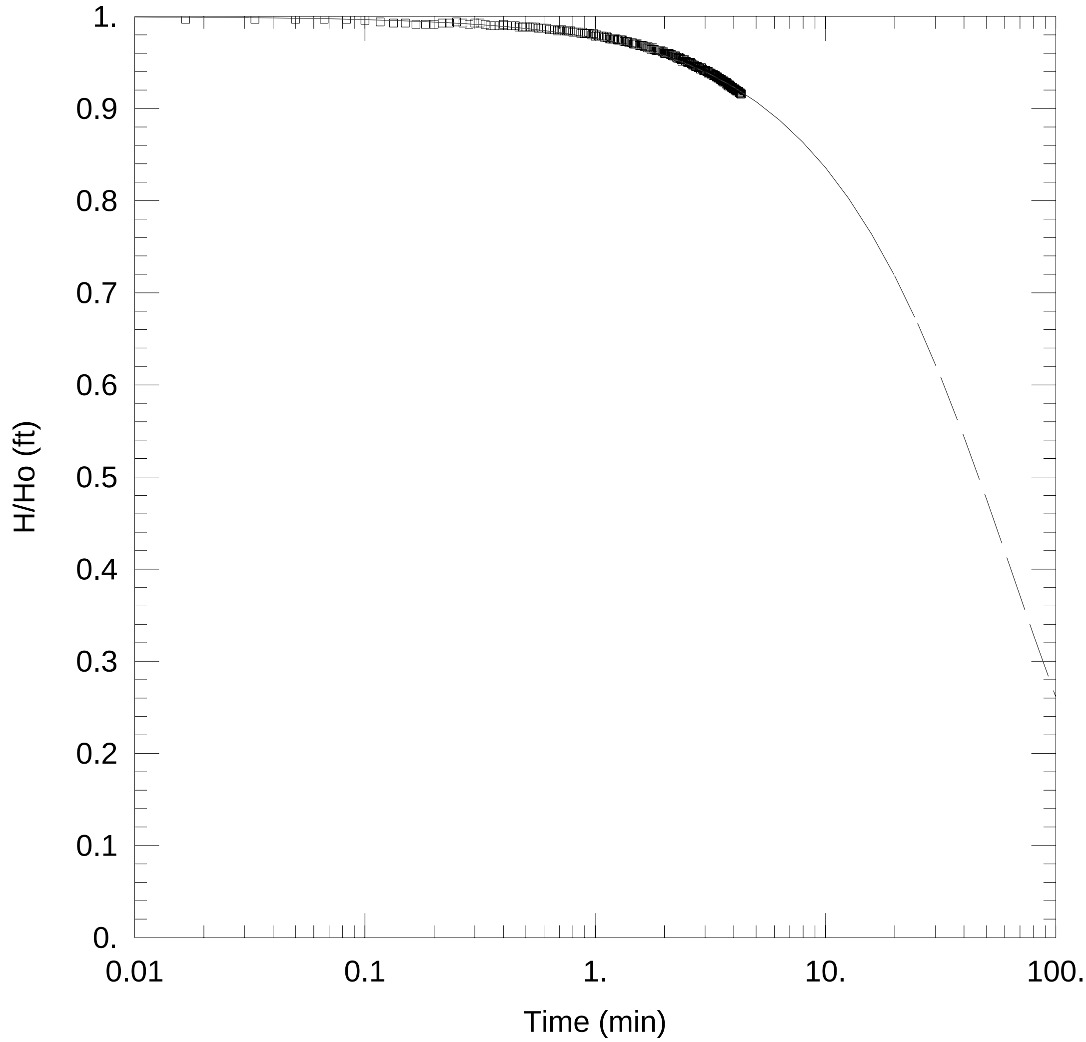
$T = 0.014$ ft^2/day

S = 1.E-06

H5
Test 30



40
30
20
10
0
Transducer submergence (ft)
9:10
9:20
Time on October 23, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-30(c).aqt
Date: 01/22/03 Time: 15:44:24

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

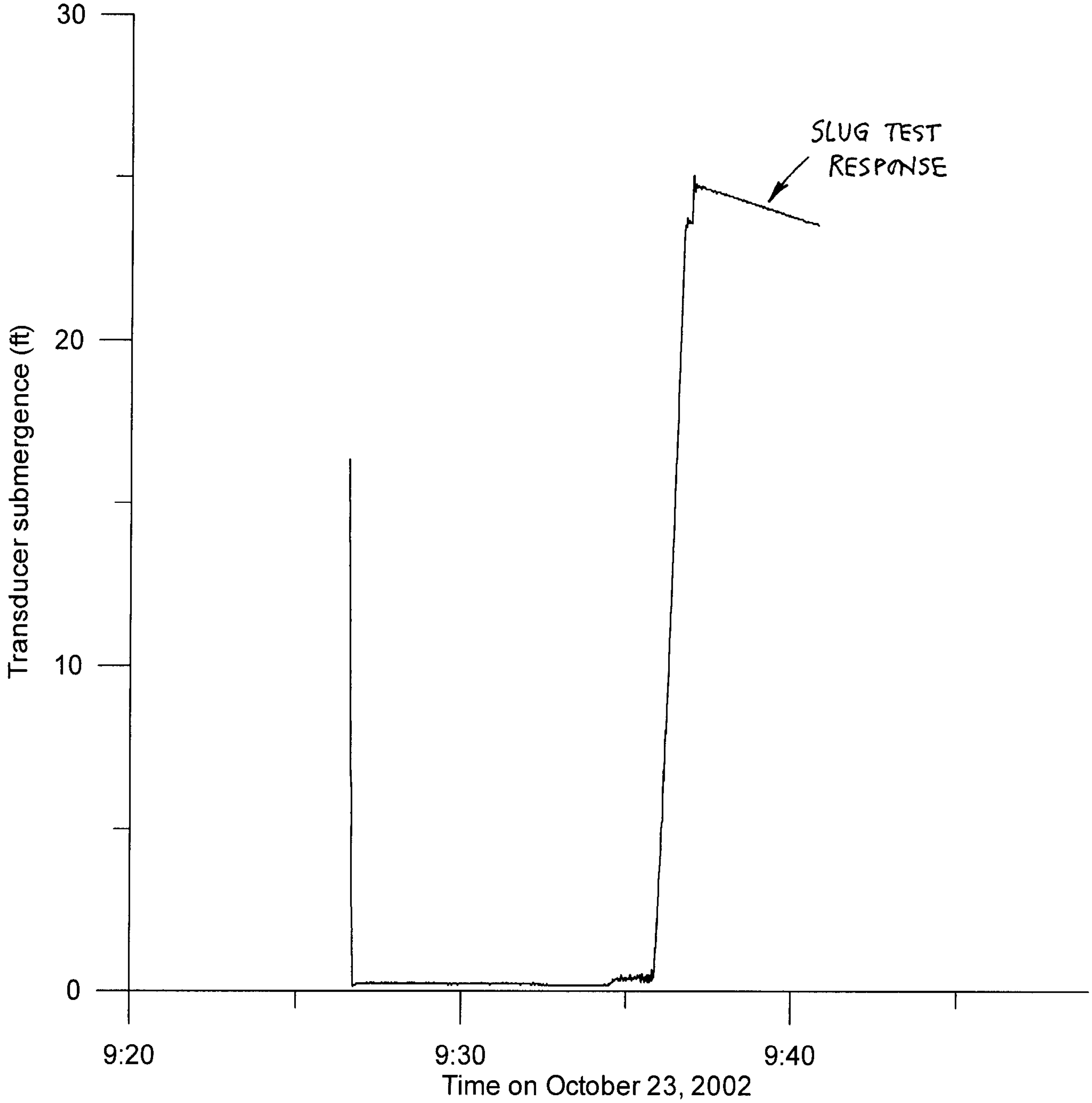
Initial Displacement: 30.41 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

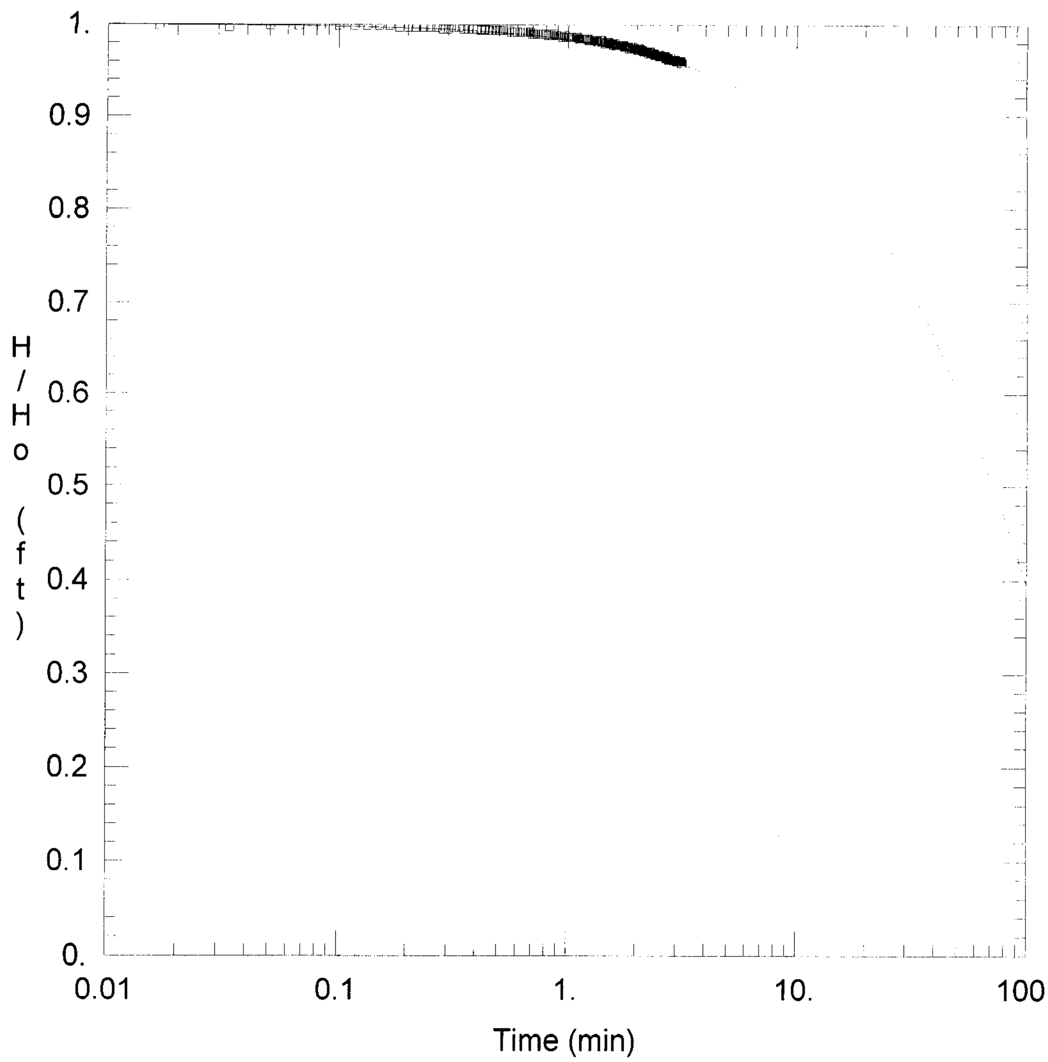
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.1055 ft^2/day S = 1.E-06

H5
Test 31


30
20
10
0
Transducer submergence (ft)
9:20
9:30
9:40
Time on October 23, 2002
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-31(c).aqt
Date: 12/05/02 Time: 15:29:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 24.6 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

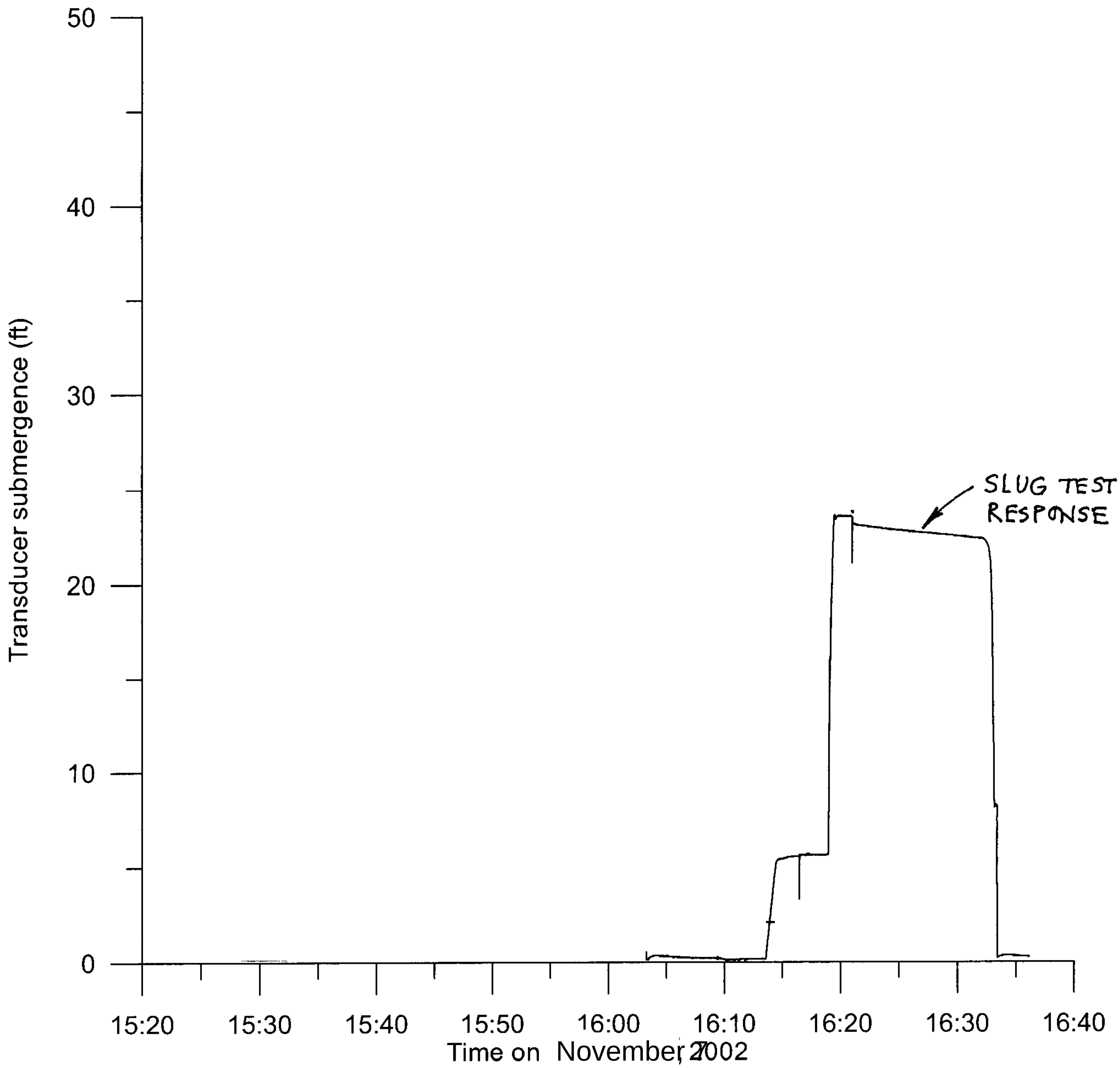
SOLUTION

`quifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

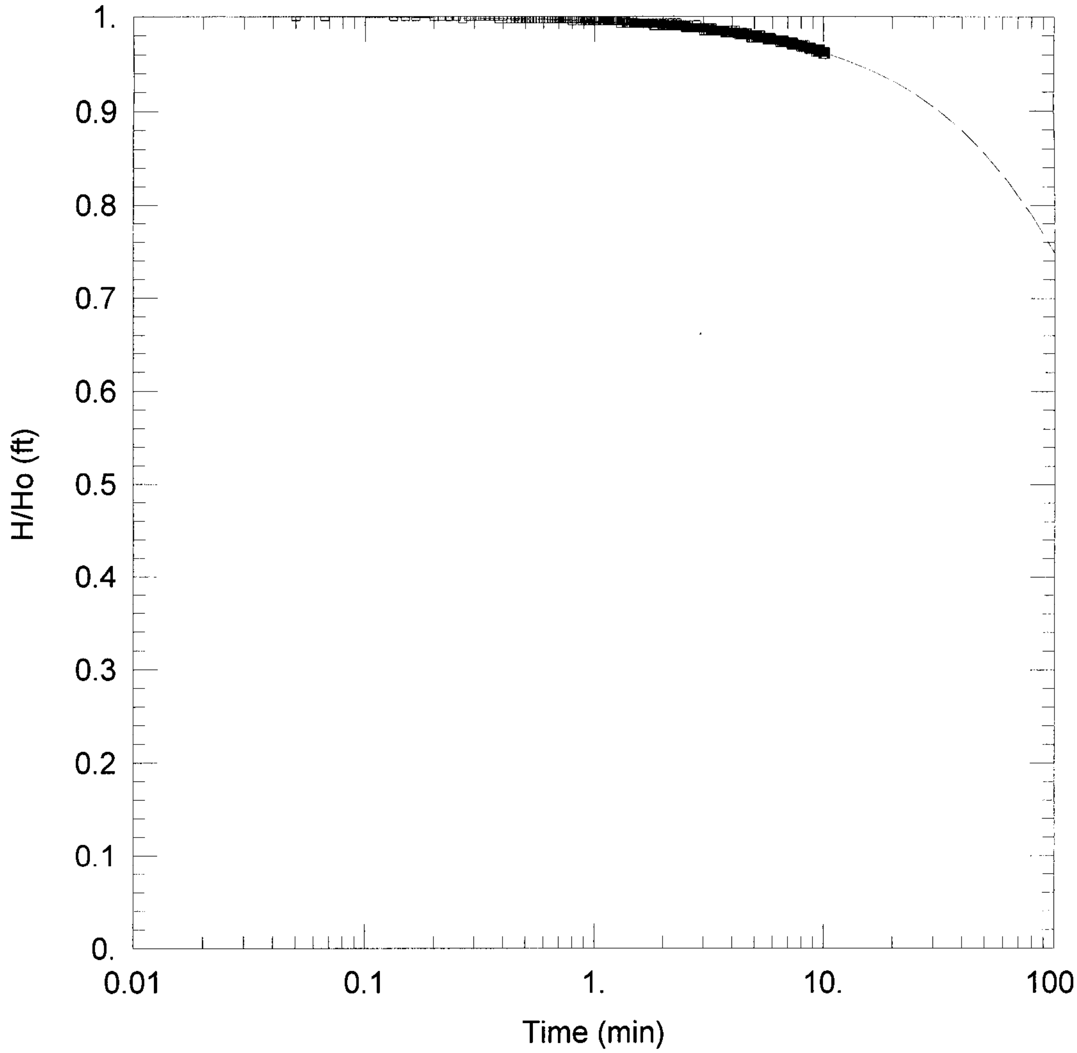
T = 0.06814 ft^2/day
S = 1.E-06

H5

Test 32



50
40
30
20
10
0
Transducer submergence (ft)
15:20
15:30
15:40
15:50
16:00
16:10
16:20
16:30
16:40
Time on November 7, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\RETEST\H5-32(c).aqt
Date: 12/06/02 Time: 08:39:21

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 17.51 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

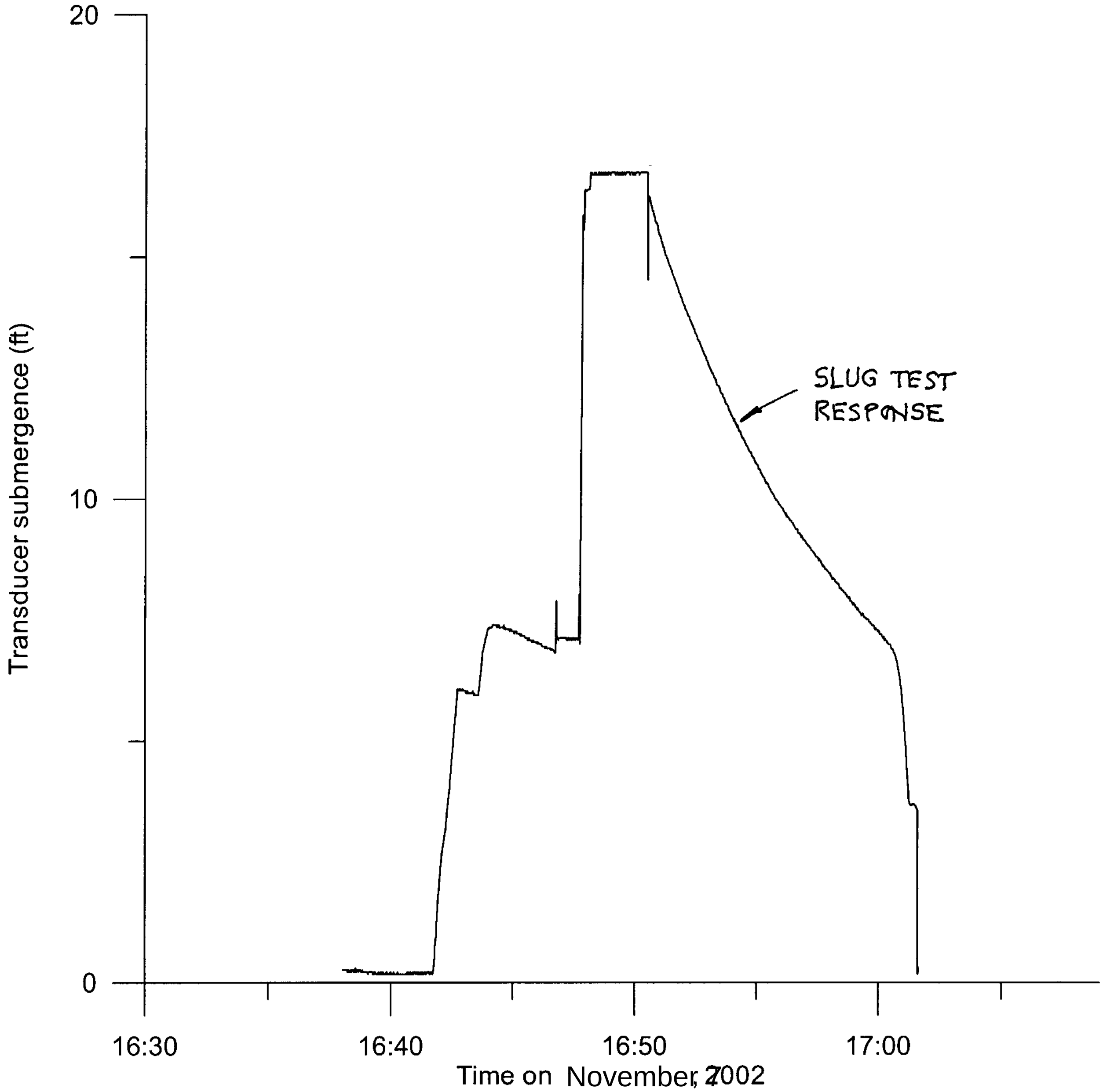
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

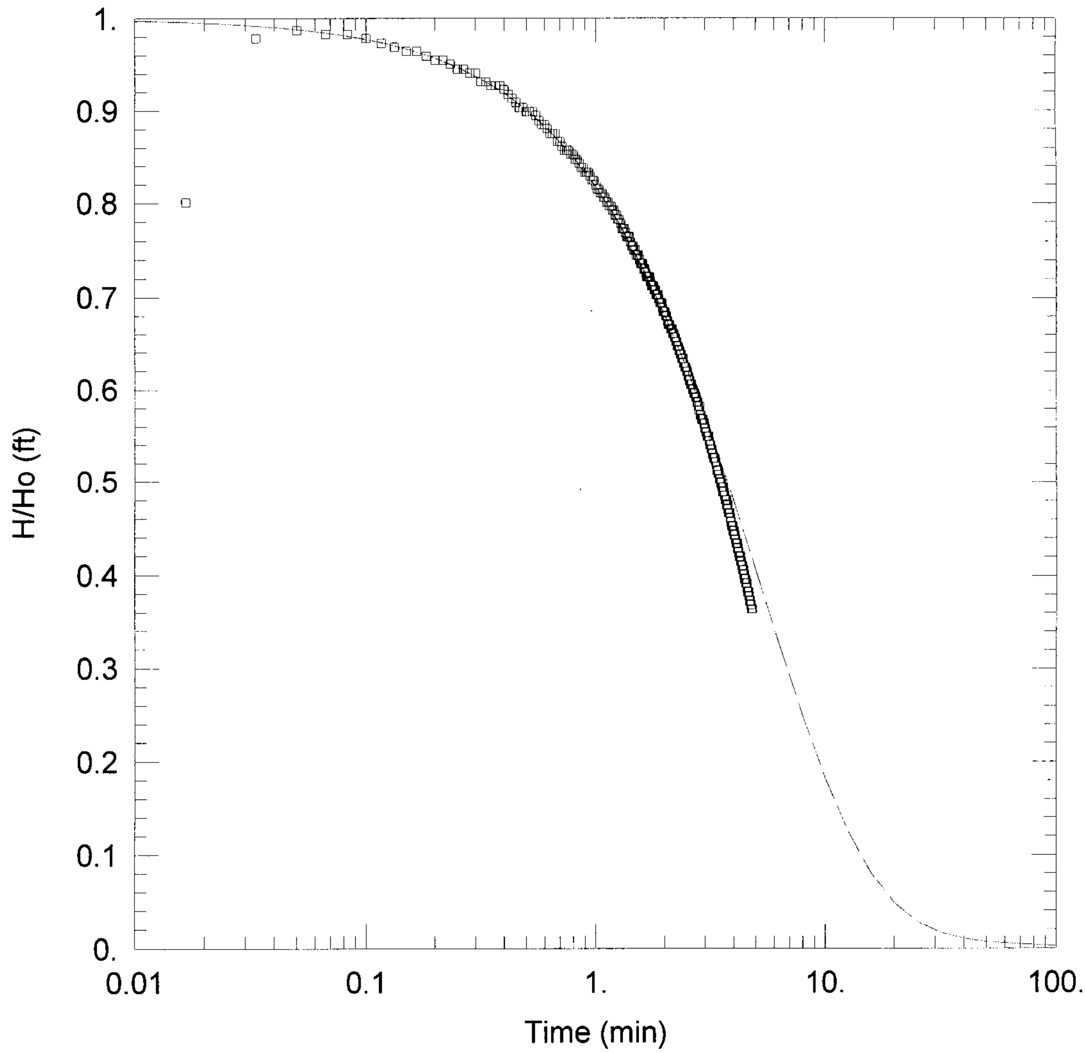
T = 0.01809 ft^2/day
S = 1.E-06

H5

Test 33



20
10
0
Transducer submergence (ft)
16:30
16:40
16:50
17:00
Time on November 7, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\H5\RETEST\H5-33(c).aqt
Date: 12/06/02 Time: 08:41:30

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 9.29 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.439 ft^2/day
S = 1.E-10

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

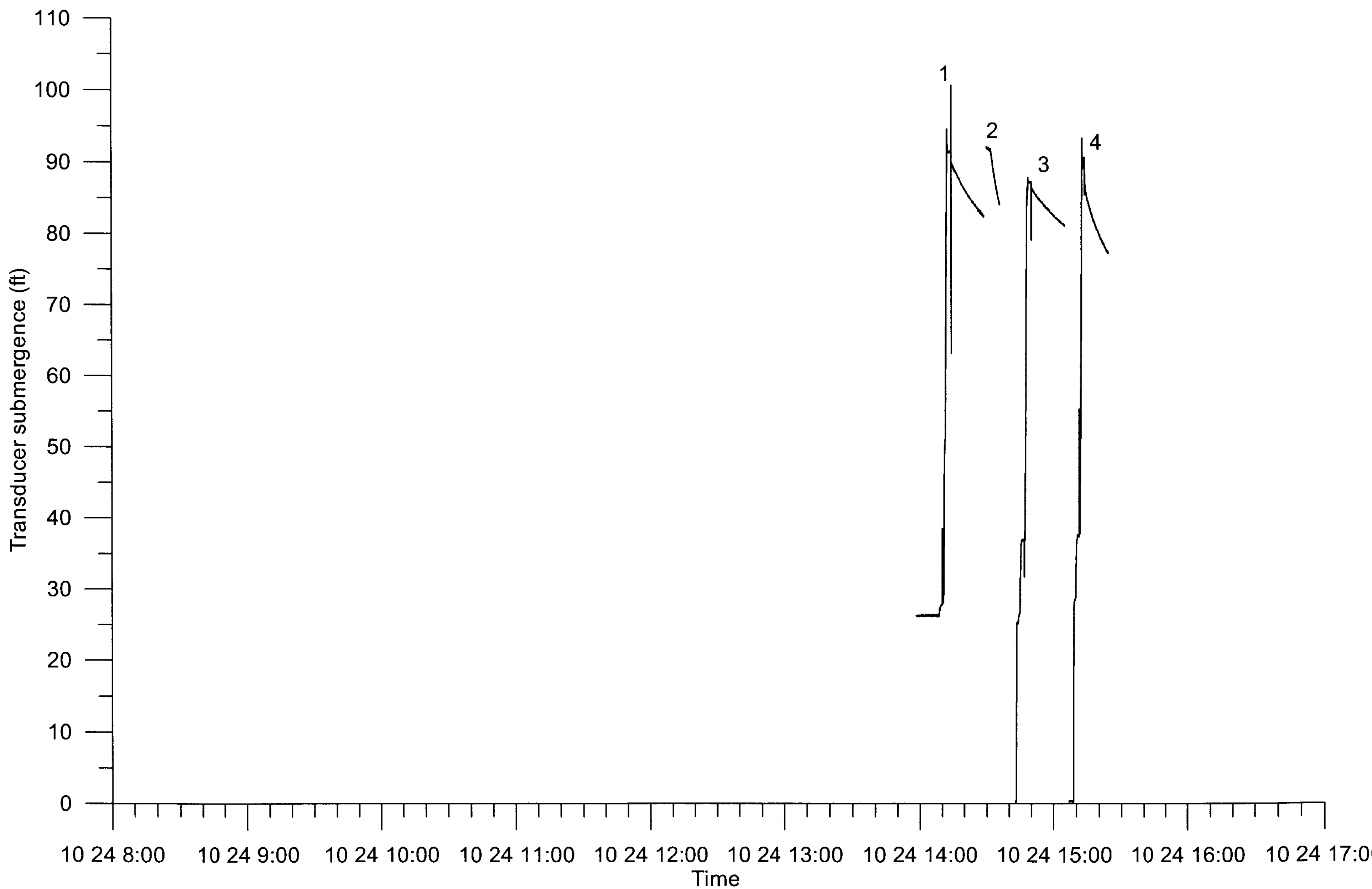
I1

Testing Dates: October 24 - 25 & 28 - 30, 2002

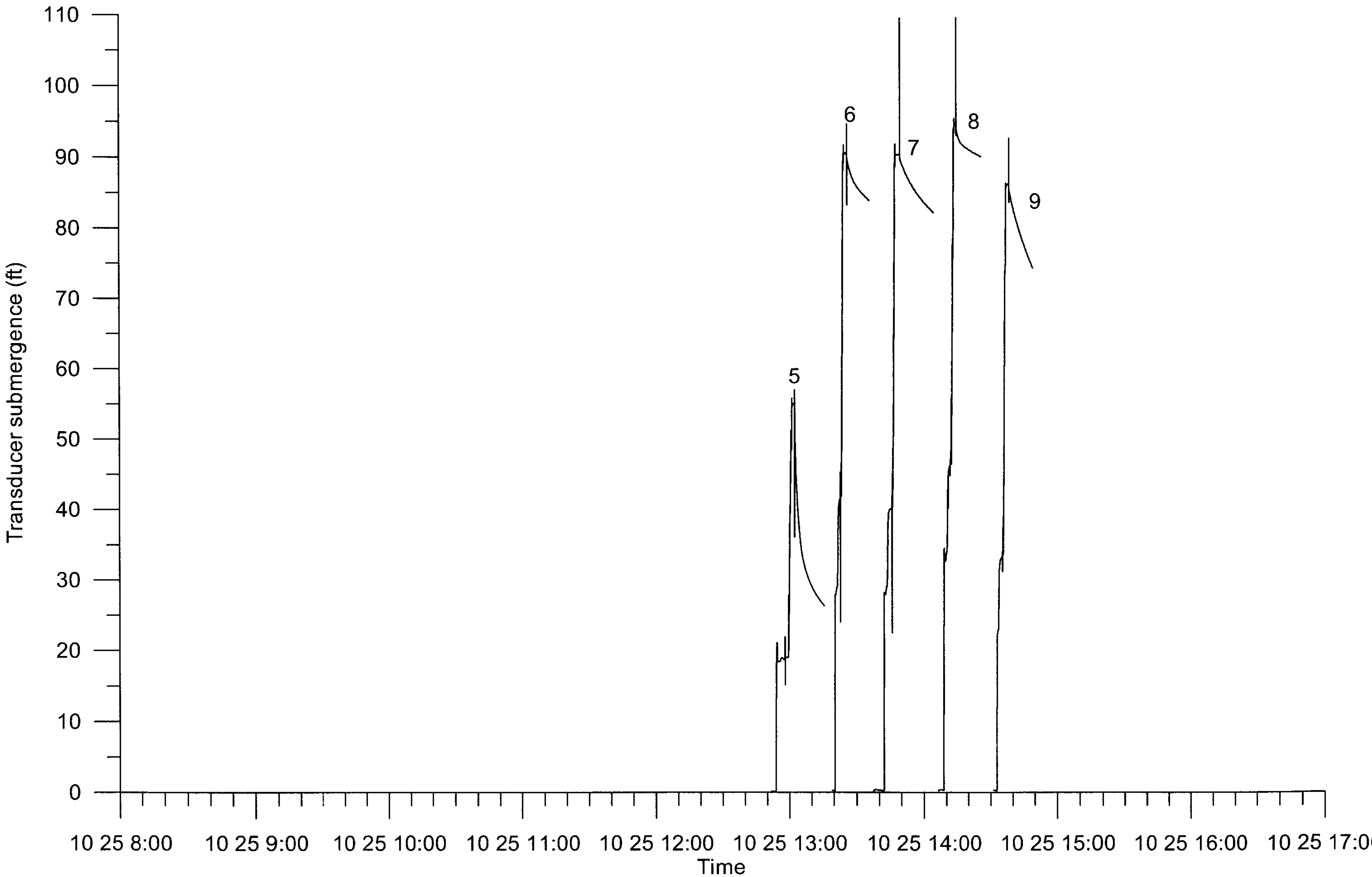
Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
I1	1	472.82	463.42	0.05	
I1	2	472.82	467.32	NIR	
I1	3	477.32	471.82	0.04	
I1	4	481.82	476.32	2.3	
I1	5	486.32	480.82	2.6	
I1	6	490.82	485.32	0.14	
I1	7	495.32	489.82	0.04	
I1	8	499.82	494.32	0.14	
I1	9	504.32	498.82	0.16	
I1	10	508.82	503.32	119	
I1	11	513.32	507.82	191	
I1	12	517.82	512.32	171	
I1	13	522.32	516.82	166	
I1	14	526.82	521.32	<0.001	
I1	15	531.32	525.82	<0.001	
I1	16	535.82	530.32	<0.001	
I1	17	540.32	534.82	0.03	
I1	18	544.82	539.32	0.01	
I1	19	549.32	543.82	0.79	
I1	20	553.82	548.32	7.8	
I1	21	558.32	552.82	0.78	
I1	22	562.82	557.32	0.08	
I1	23	567.32	561.82	5.2	
I1	24	571.82	596.32	8.5	
I1	25	576.32	570.82	3.3	
I1	26	580.82	575.32	4.8	
I1	27	585.32	579.82	0.89	
I1	28	589.82	584.32	0.28	
I1	29	594.32	588.82	2.7	
I1	30	598.82	593.32	41	

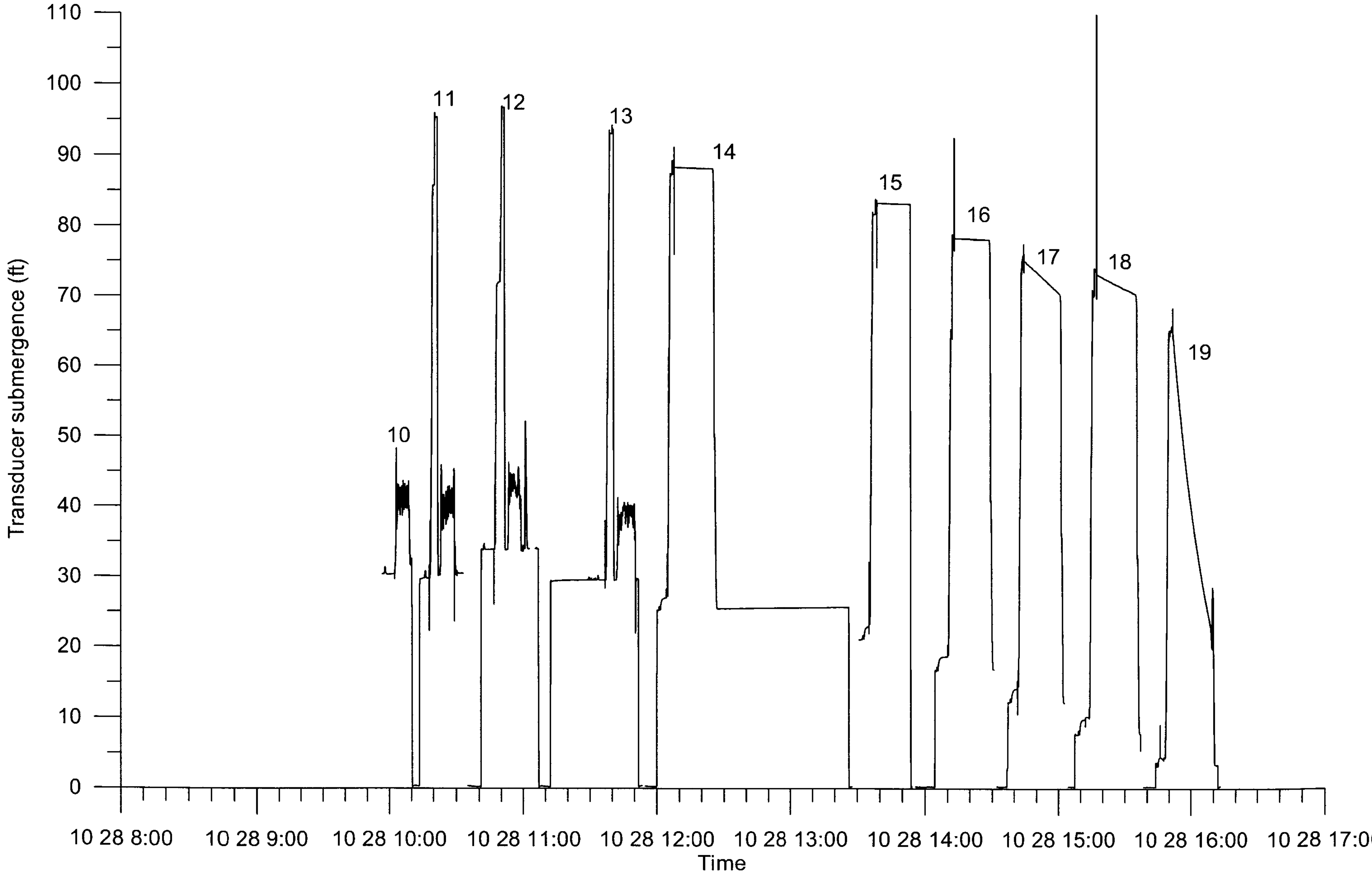
I1 Packer Testing



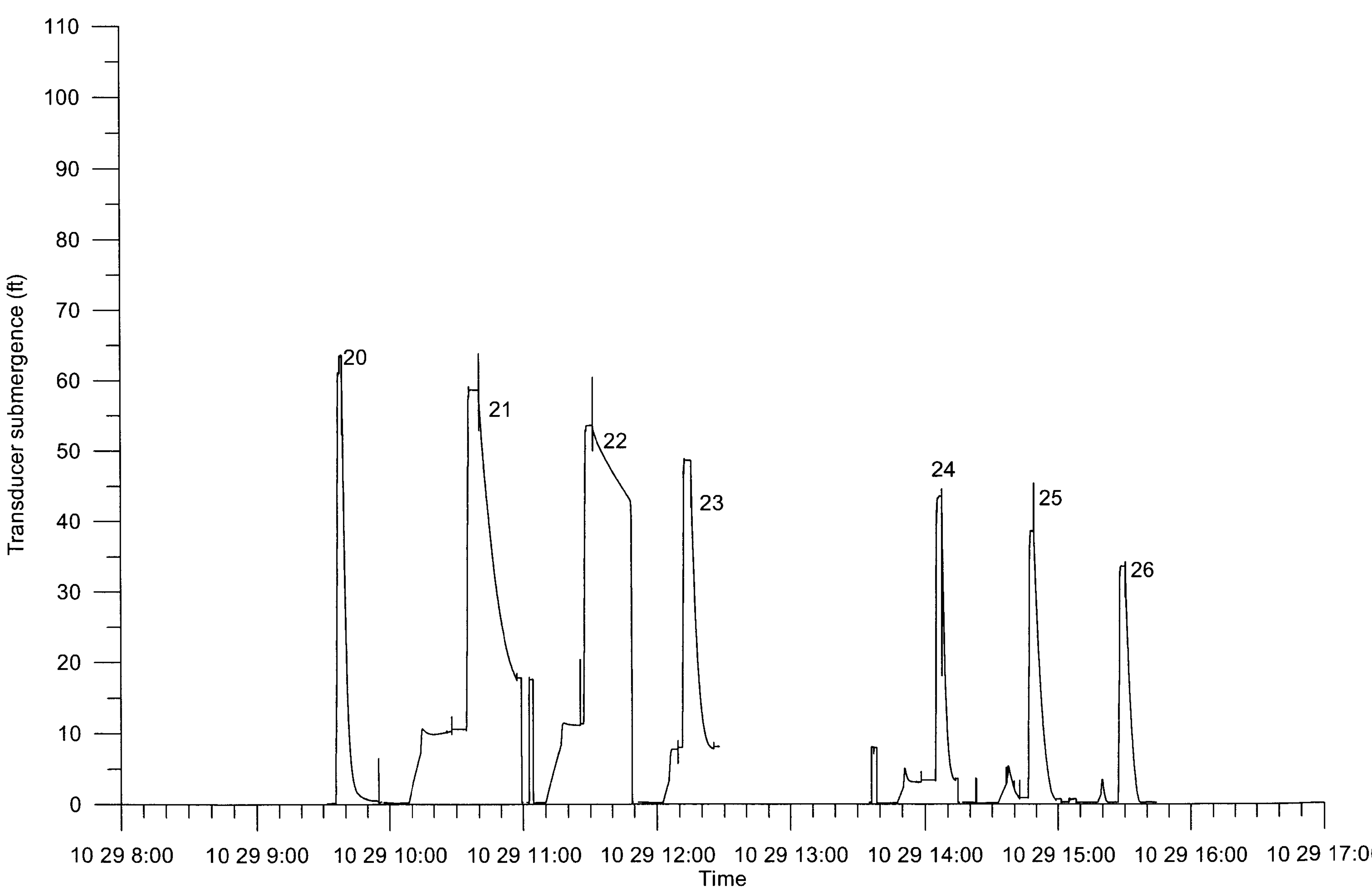
I1 Packer Testing



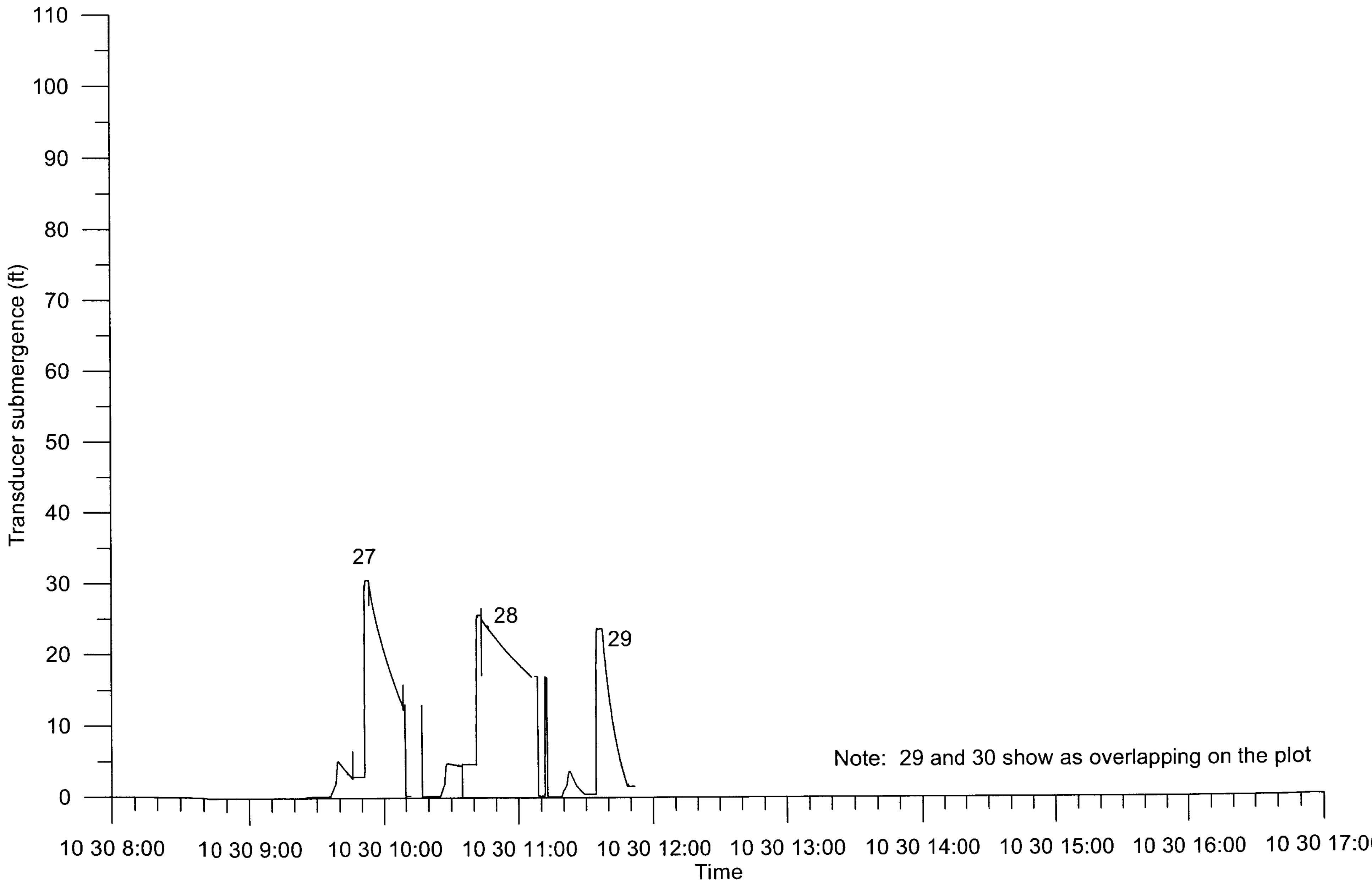
I1 Packer Testing



I1 Packer Testing

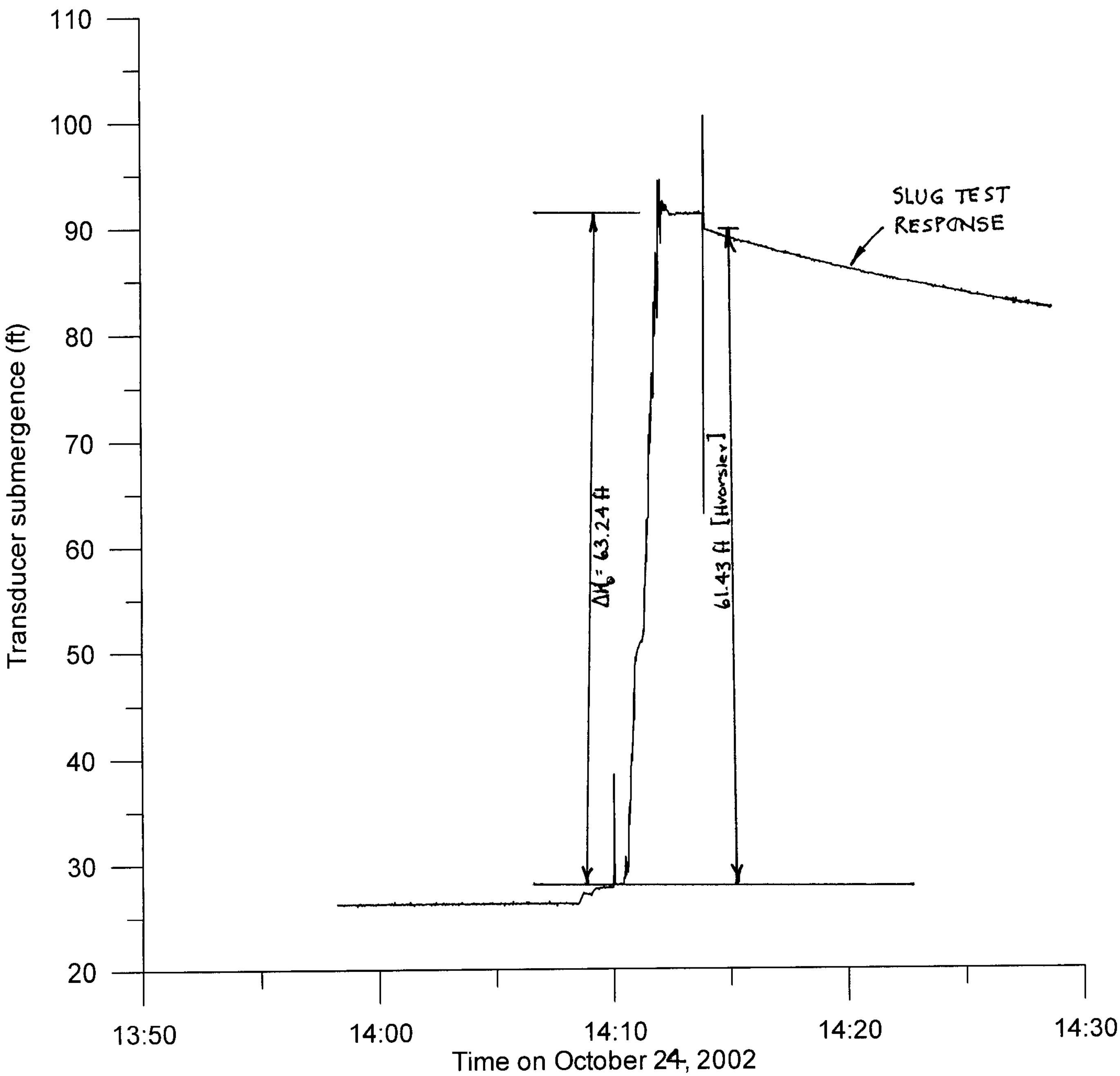


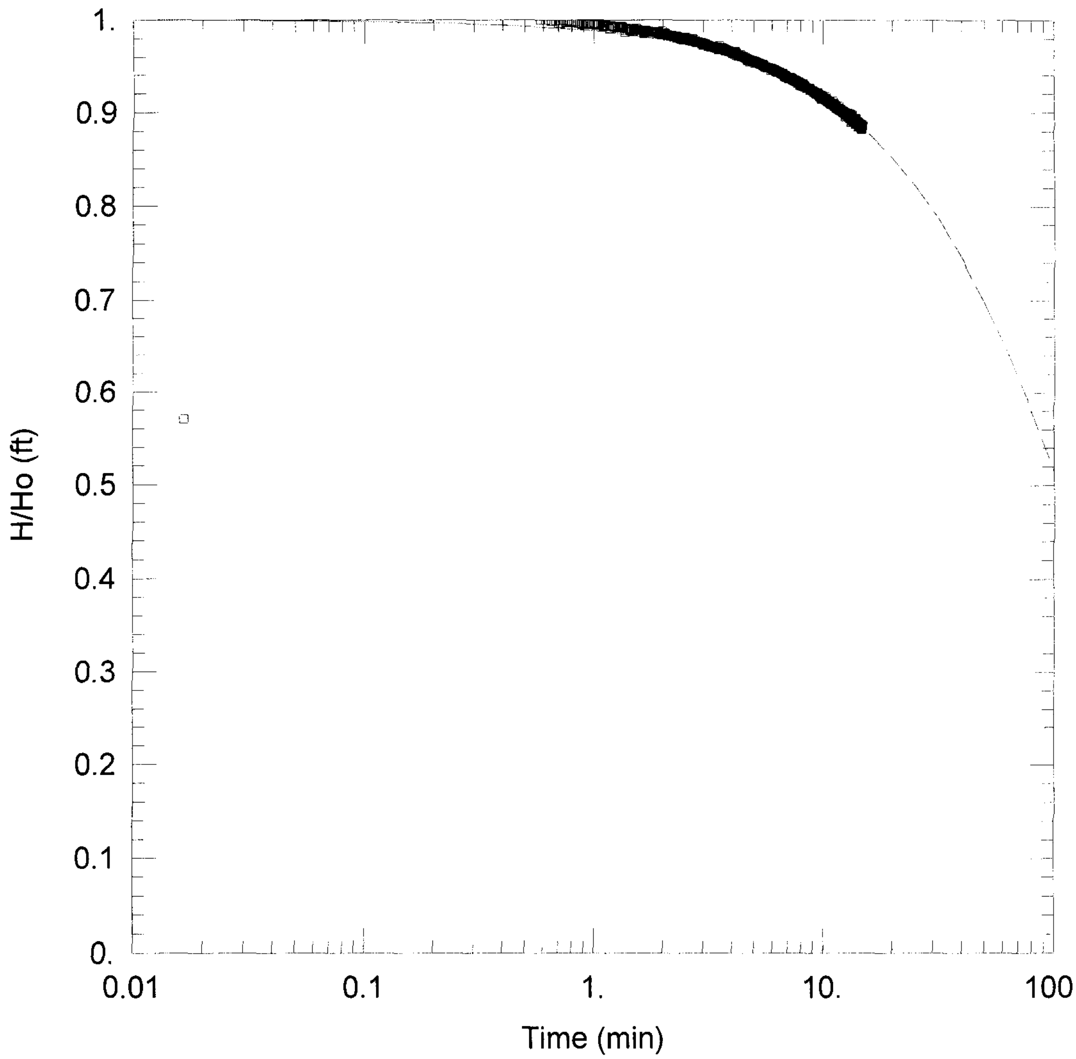
I1 Packer Testing



I1

Test 1


Transducer submergence (ft)
110
100
90
80
70
60
50
40
30
20
13:50
14:00
14:10
14:20
14:30
Time on October 24, 2002
SLUG TEST RESPONSE
ΔH_0 = 63.24 ft
61.43 ft [Hvorslev]



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-1(c).aqt
Date: 12/06/02 Time: 09:19:17

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

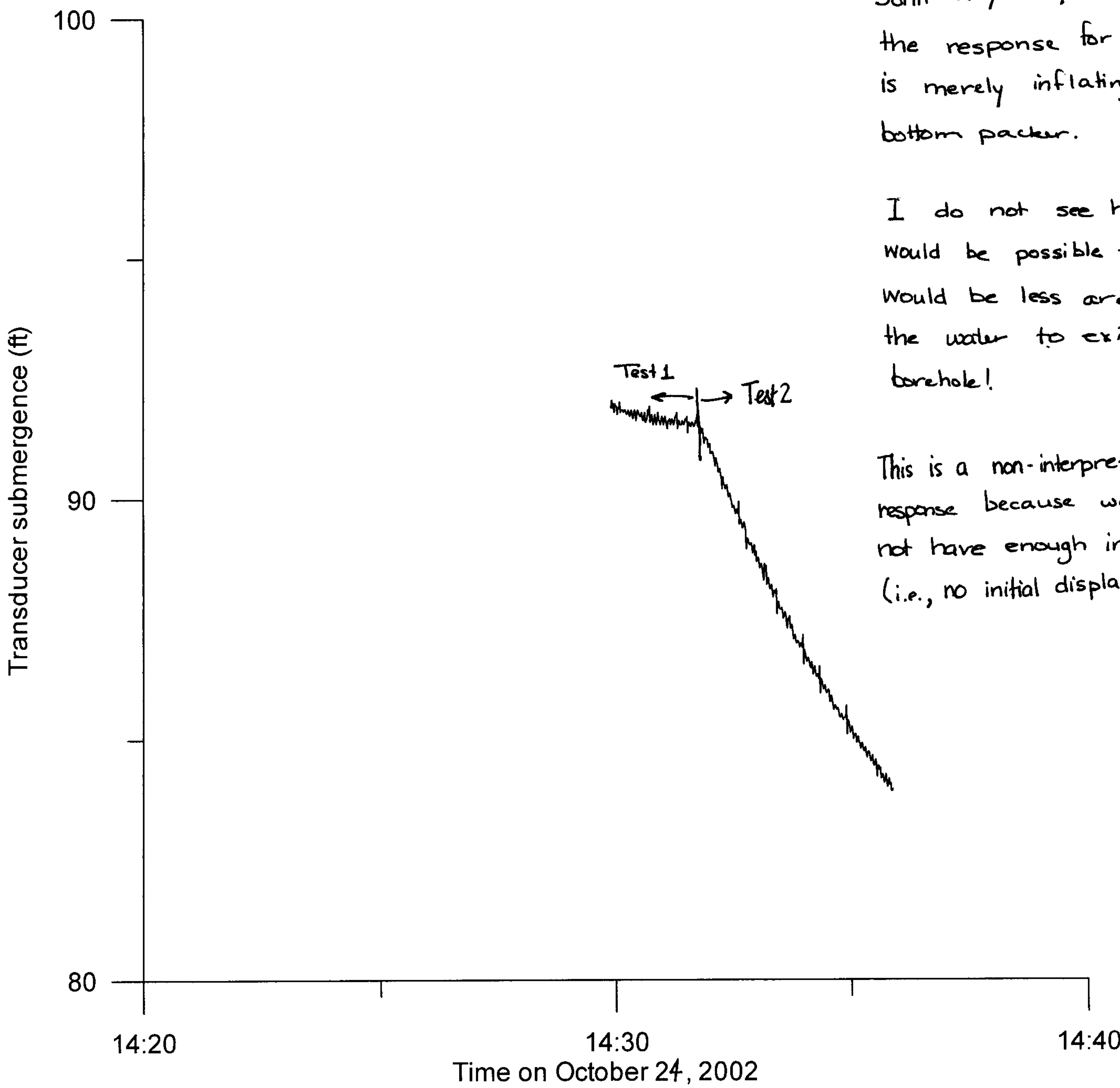
Initial Displacement: 61.43 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.04636 ft^2/day
S = 1.E-06

I1

Test 2



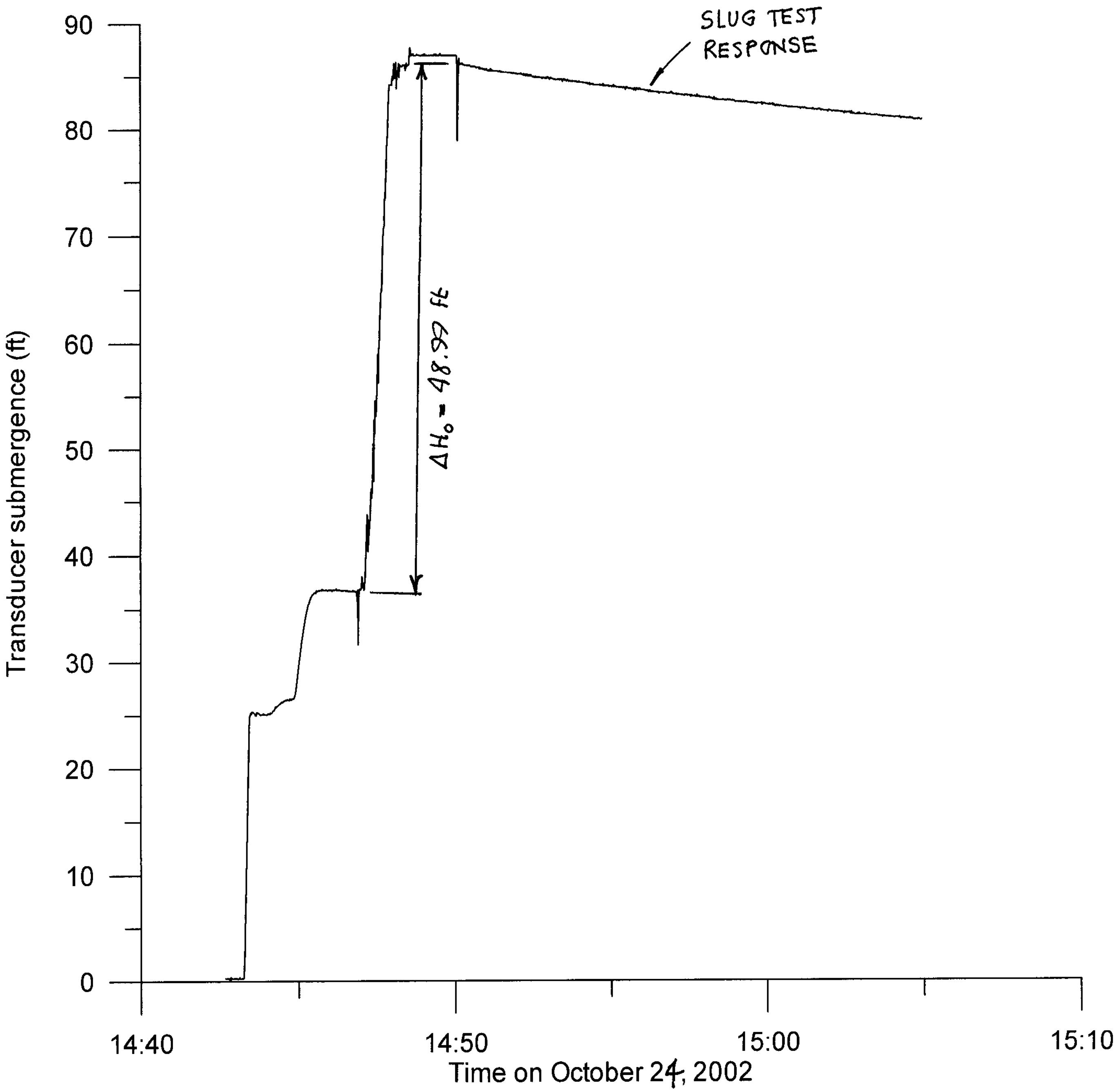
John Raby says that the response for Test 2 is merely inflating the bottom packer.

I do not see how that would be possible → there would be less area for the water to exit the borehole!

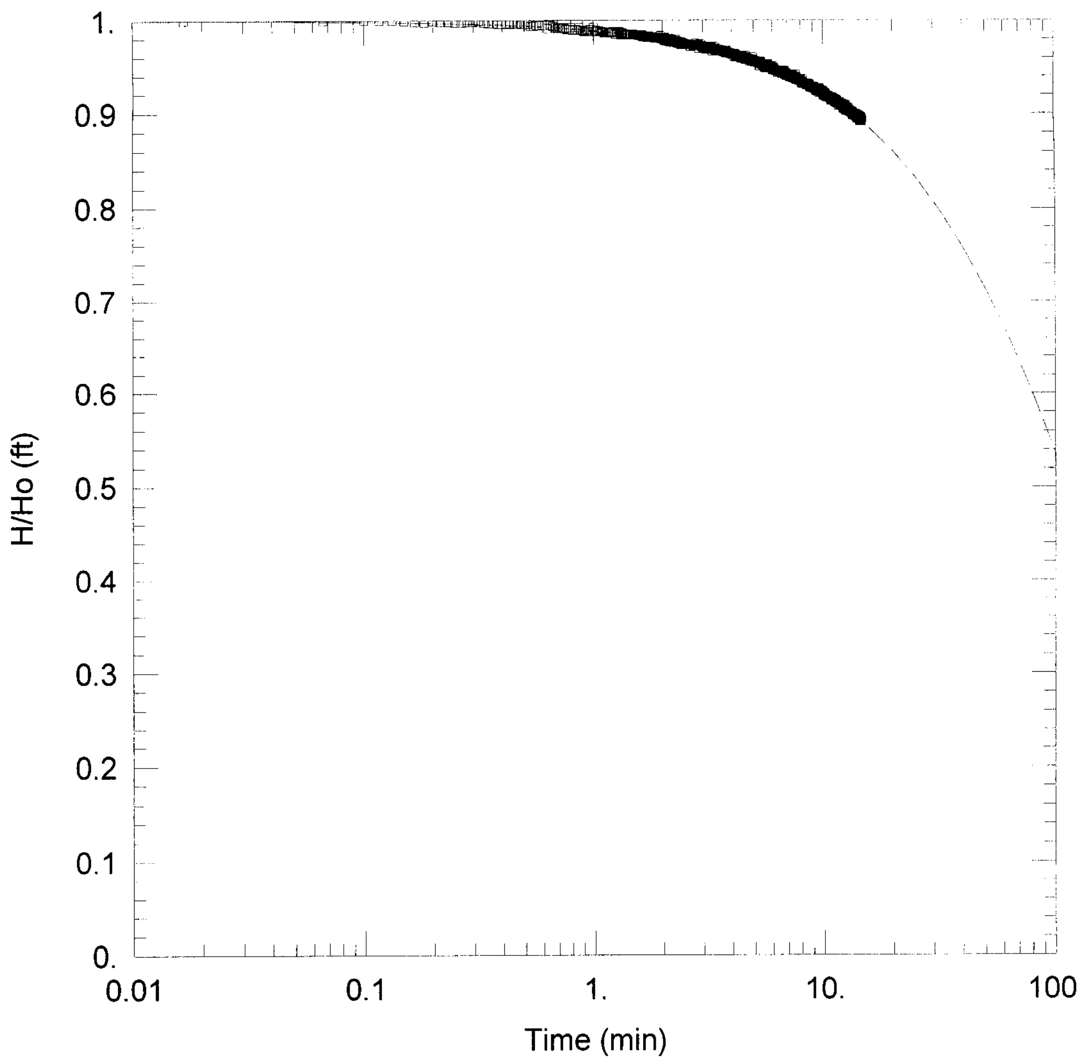
This is a non-interpretable response because we do not have enough information (i.e., no initial displacement)

I1

Test 3



SLUG TEST RESPONSE
$\Delta H_o = 48.99$ ft
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
14:40
14:50
15:00
15:10
Time on October 24, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-3(c).aqt
Date: 12/06/02 Time: 09:19:51

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

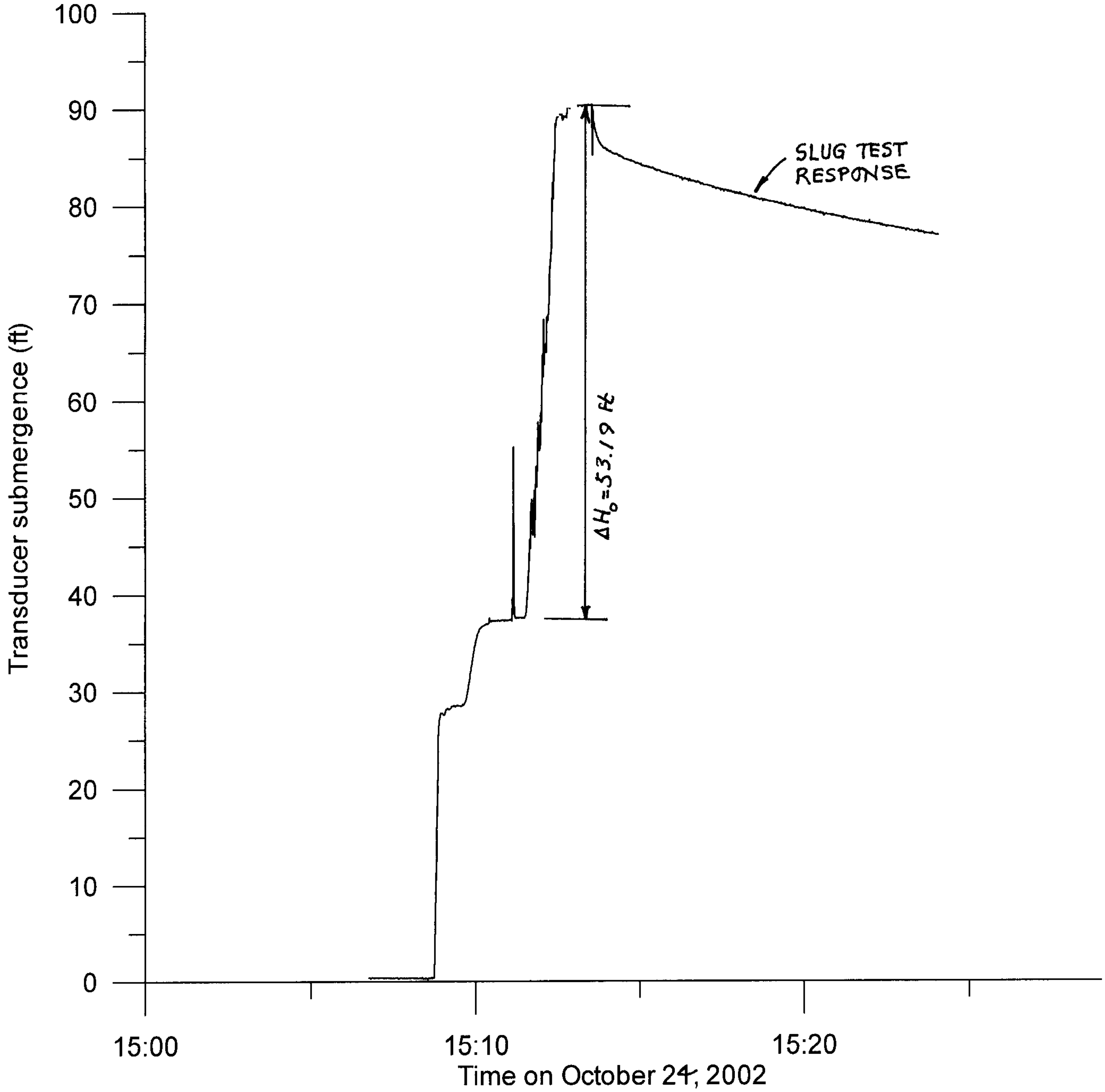
Initial Displacement: 48.99 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

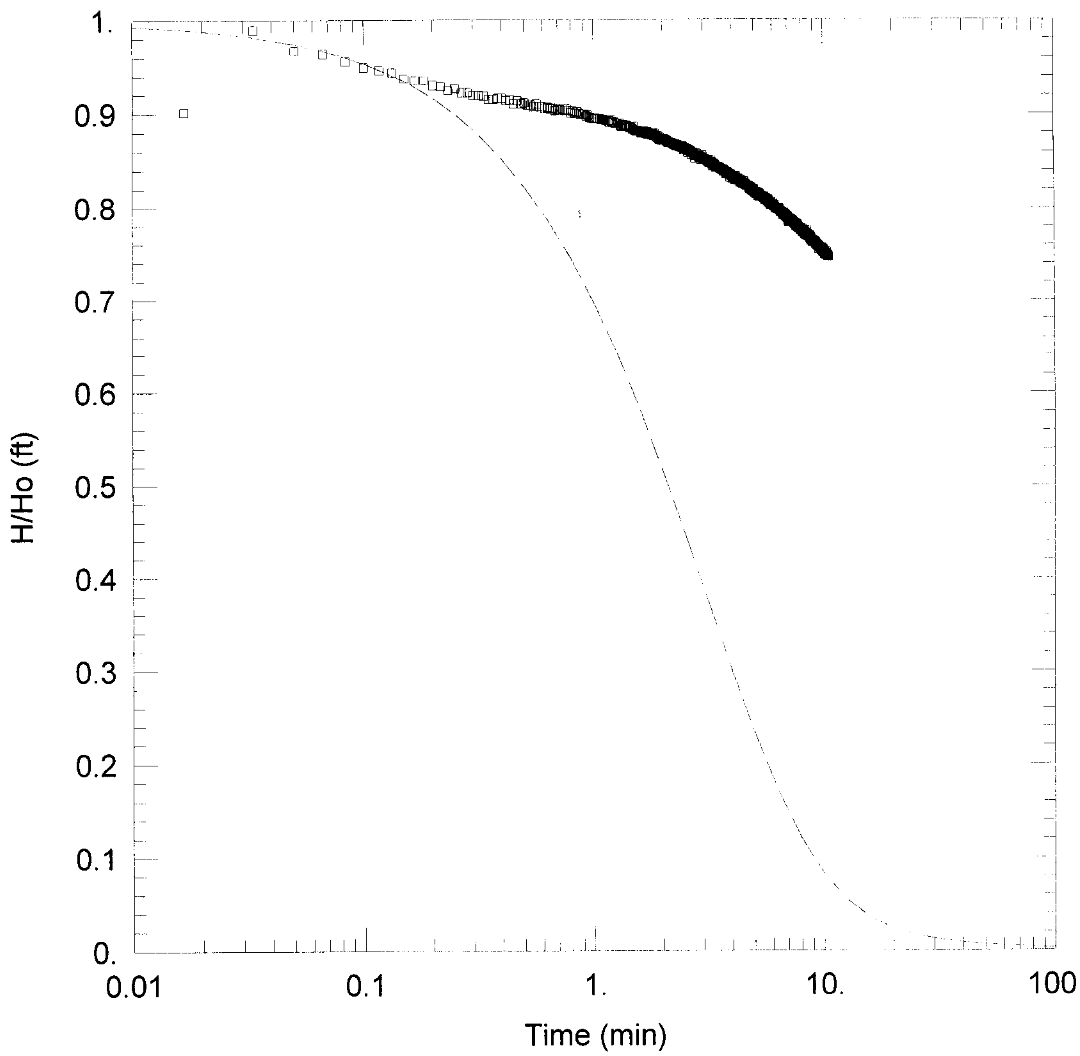
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.04312 ft^2/day
S = 1.E-06

I1

Test 4



100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
15:00
15:10
15:20
Time on October 24, 2002
SLUG TEST RESPONSE
ΔH_o=53.19 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-4(c).aqt
Date: 12/06/02 Time: 09:39:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

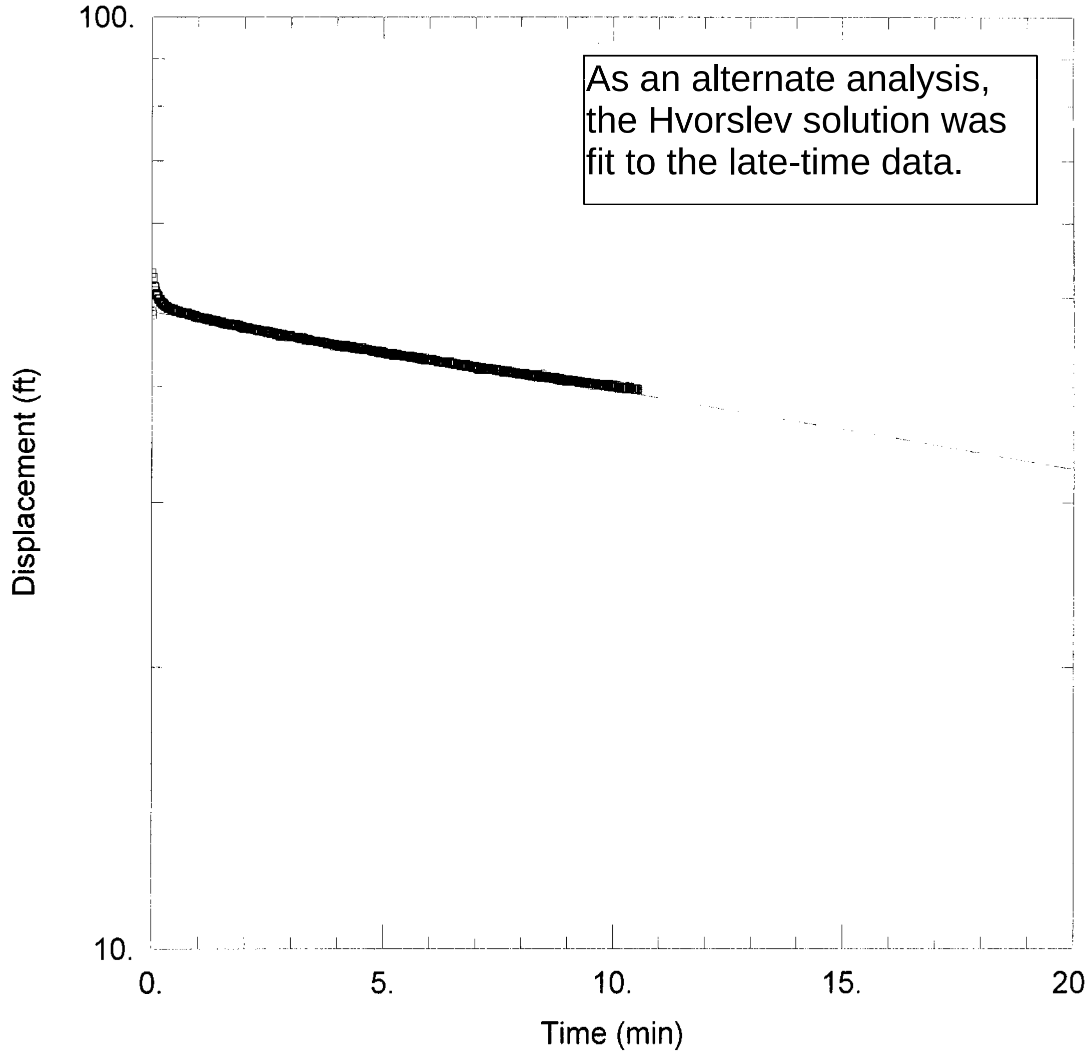
WELL DATA

Initial Displacement: 53.19 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 2.331 ft^2/day
S = 1.E-06



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-4(h) late time data fit.aqt
Date: 12/06/02 Time: 09:43:41

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

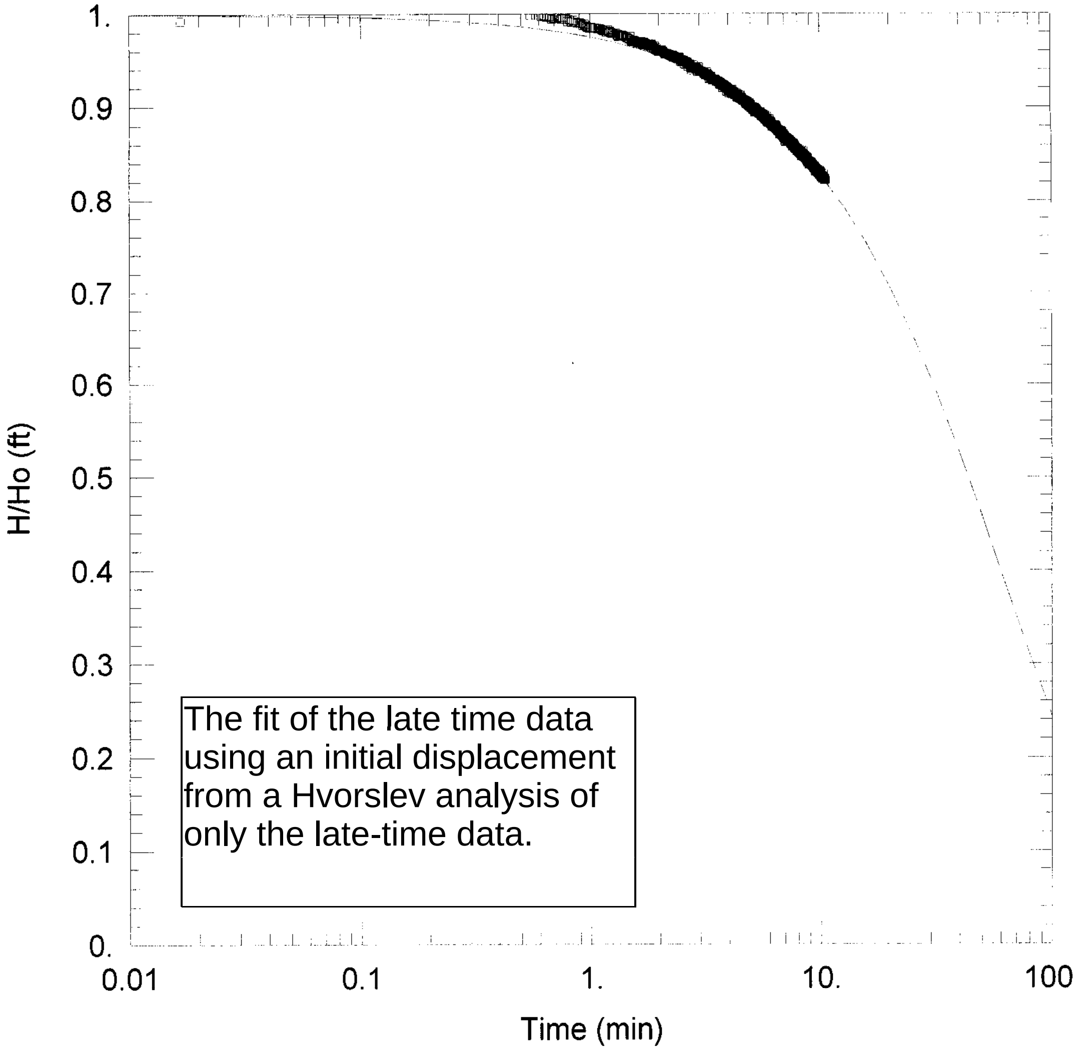
WELL DATA

Initial Displacement: 48.31 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 0.03595 ft/day
y0 = 48.31 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-4(c) late time data fit.aqt
Date: 12/06/02 Time: 09:44:25

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 48.31 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

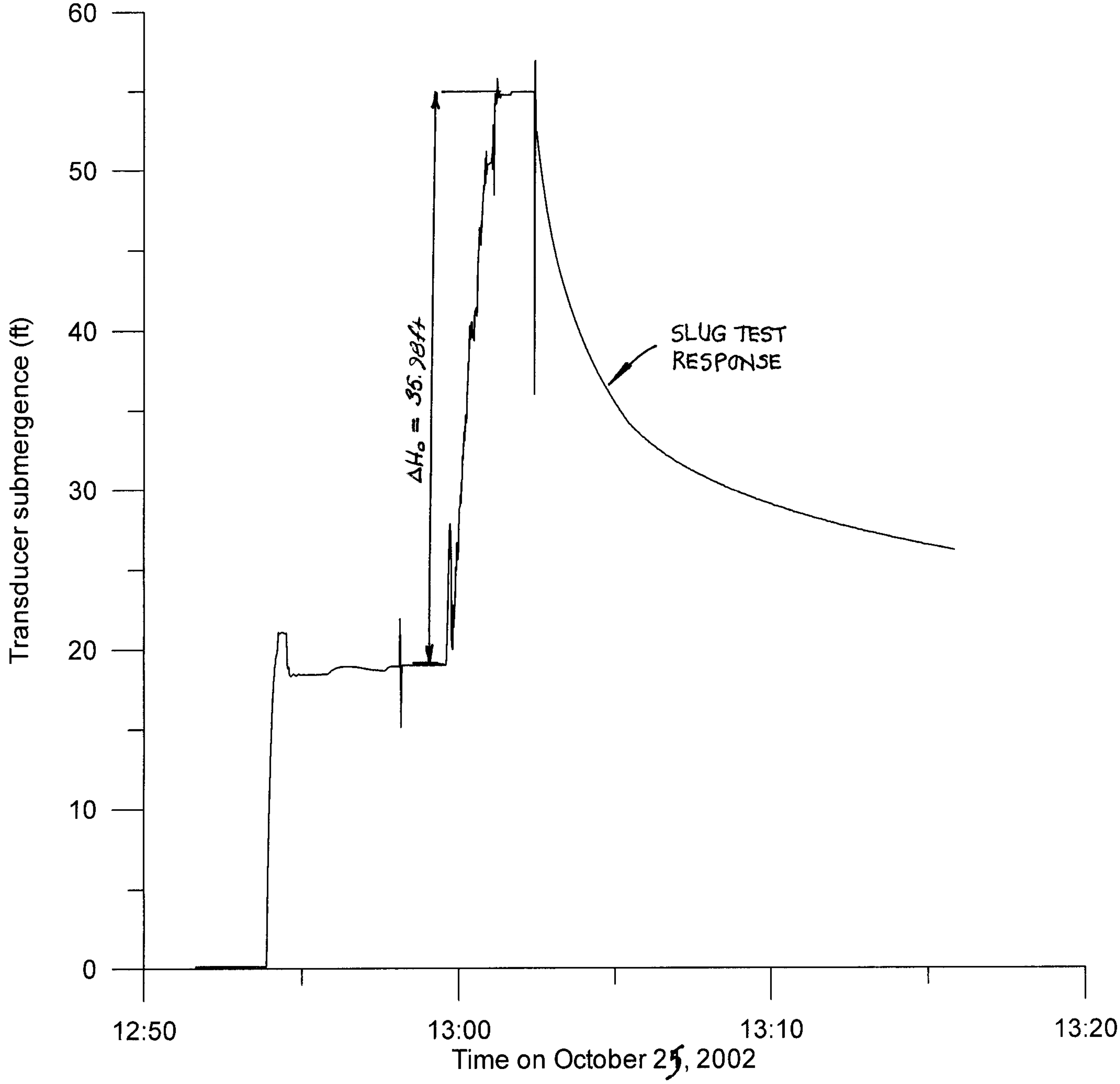
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.112 ft^2/day
S = 1.E-06

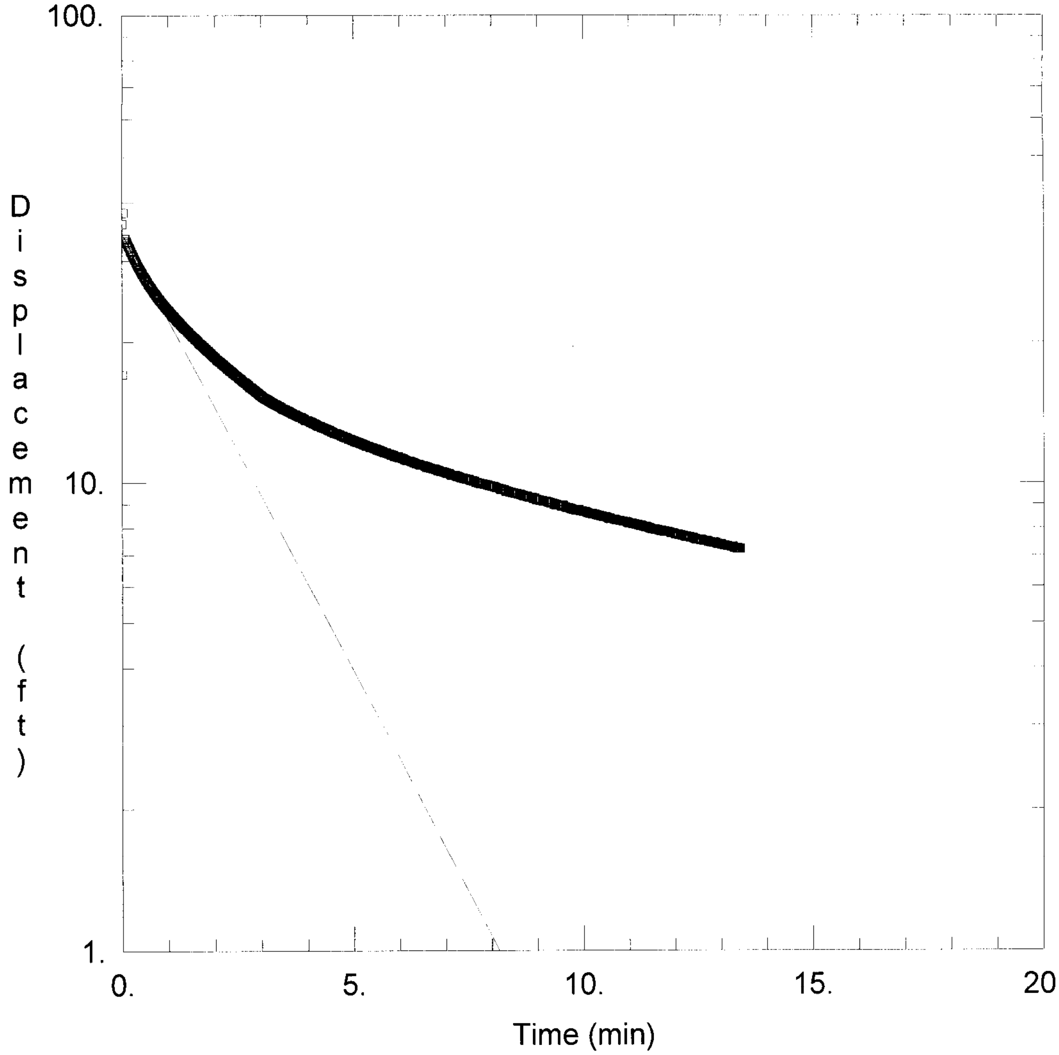
This transmissivity estimate is only 5% of that estimated using the early-time data.

I1

Test 5



Transducer submergence (ft)
60
50
40
30
20
10
0
12:50
13:00
13:10
13:20
Time on October 25, 2002
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\I1\i1-5(h).aqt
Date: 11/12/02 Time: 12:40:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

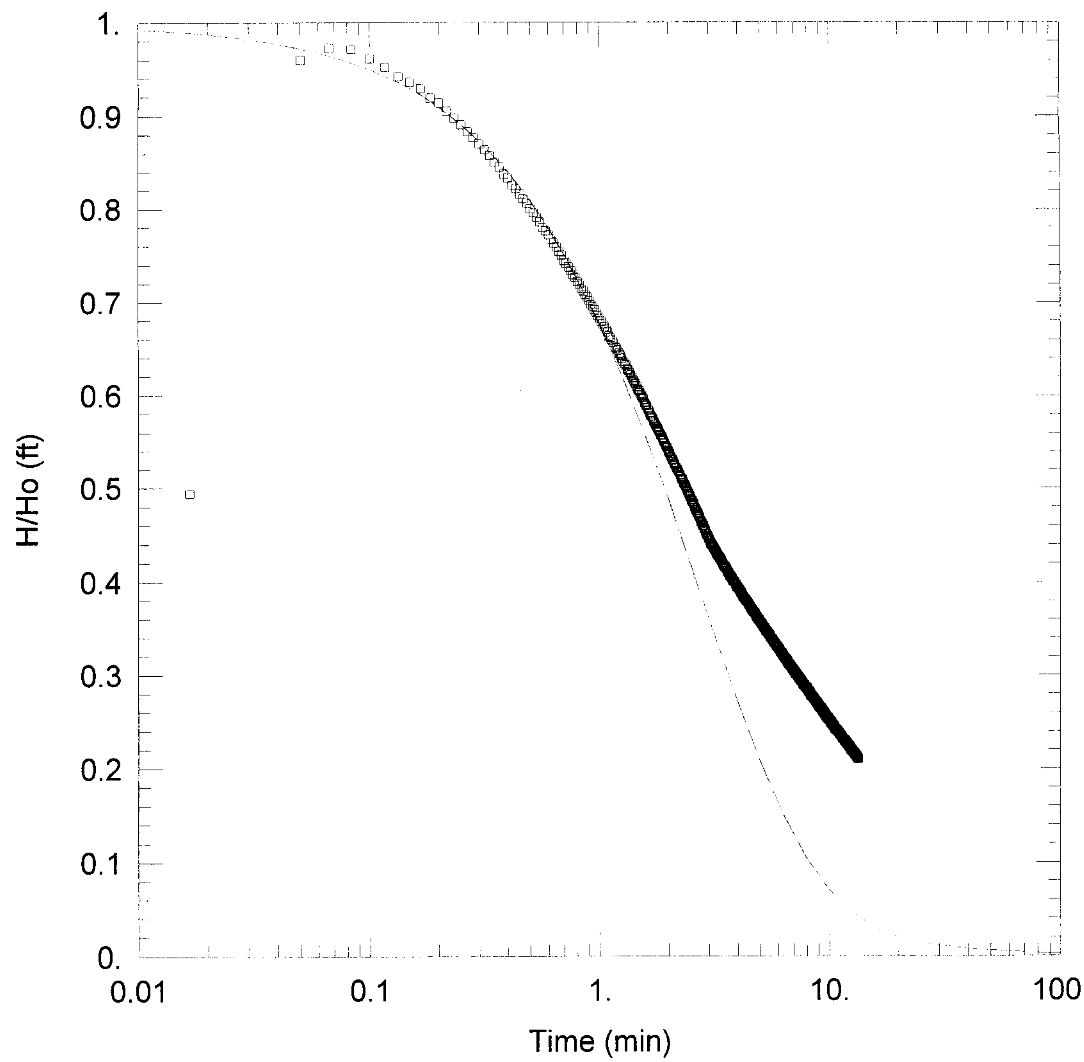
Saturated Thickness: 1. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 35.98 ft
Wellbore Radius: 0.1614 ft
Screen Length: 1. ft
Casing Radius: 0.0625 ft
Well Skin Radius: 0.1614 ft
Total Well Penetration Depth: 1. ft

SOLUTION

quifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
K = 2.254 ft/day
y0 = 34.37 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-5(c).aqt
Date: 12/06/02 Time: 10:11:56

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

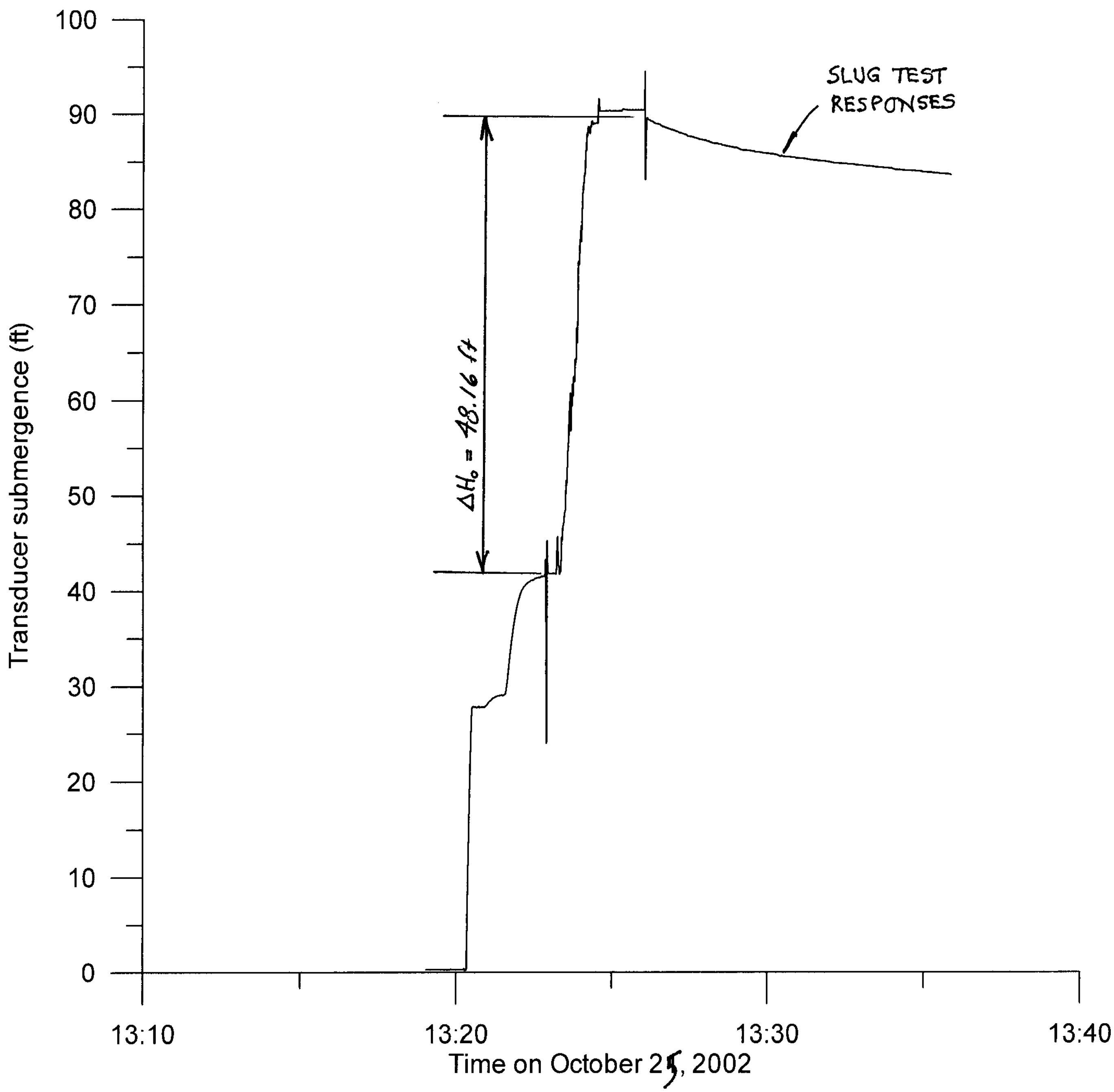
Initial Displacement: 34.37 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

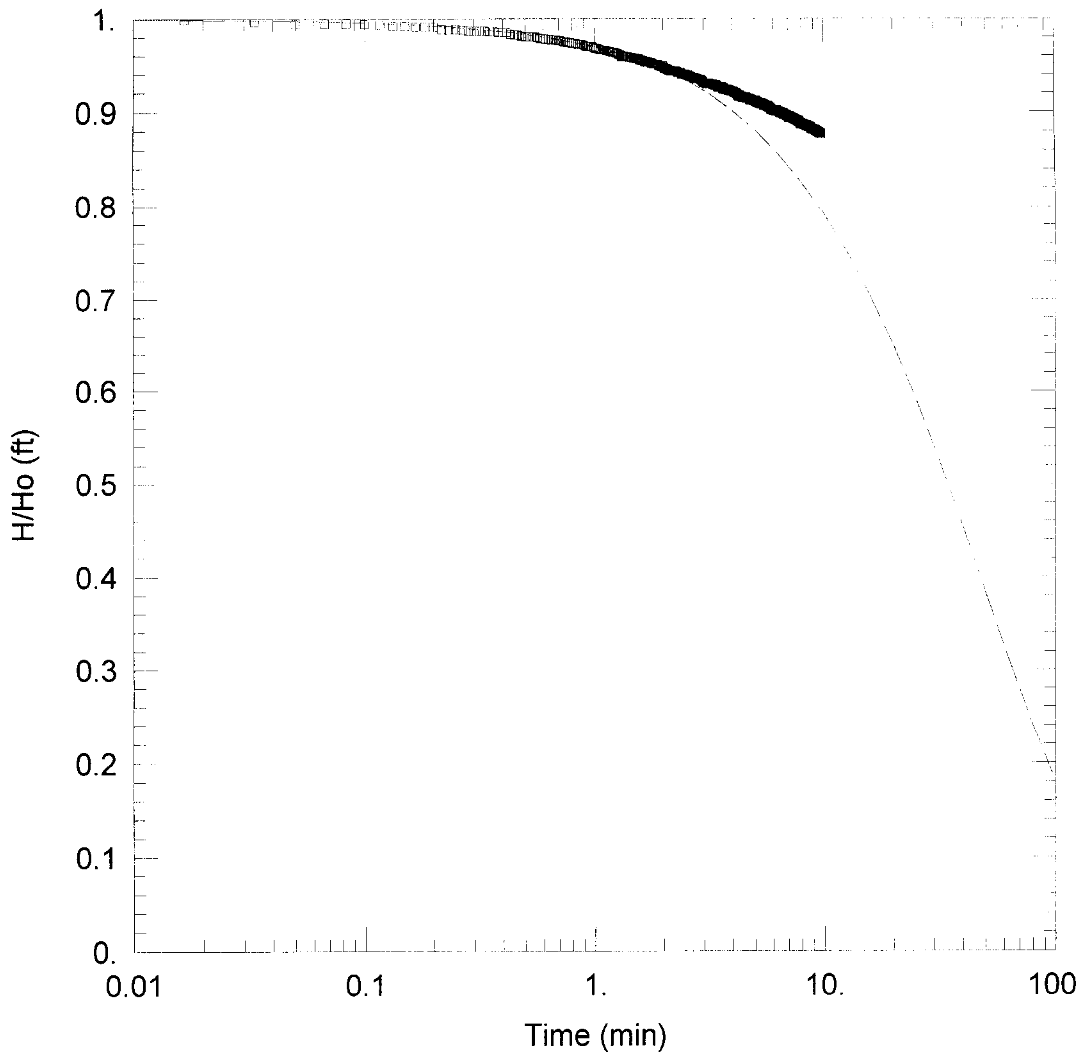
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 2.553 ft^2/day
S = 1.E-06

I1

Test 6



100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
13:10
13:20
13:30
13:40
Time on October 25, 2002
ΔH_o = 48.16 ft
SLUG TEST RESPONSES



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-6(c).aqt
Date: 12/06/02 Time: 10:14:30

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

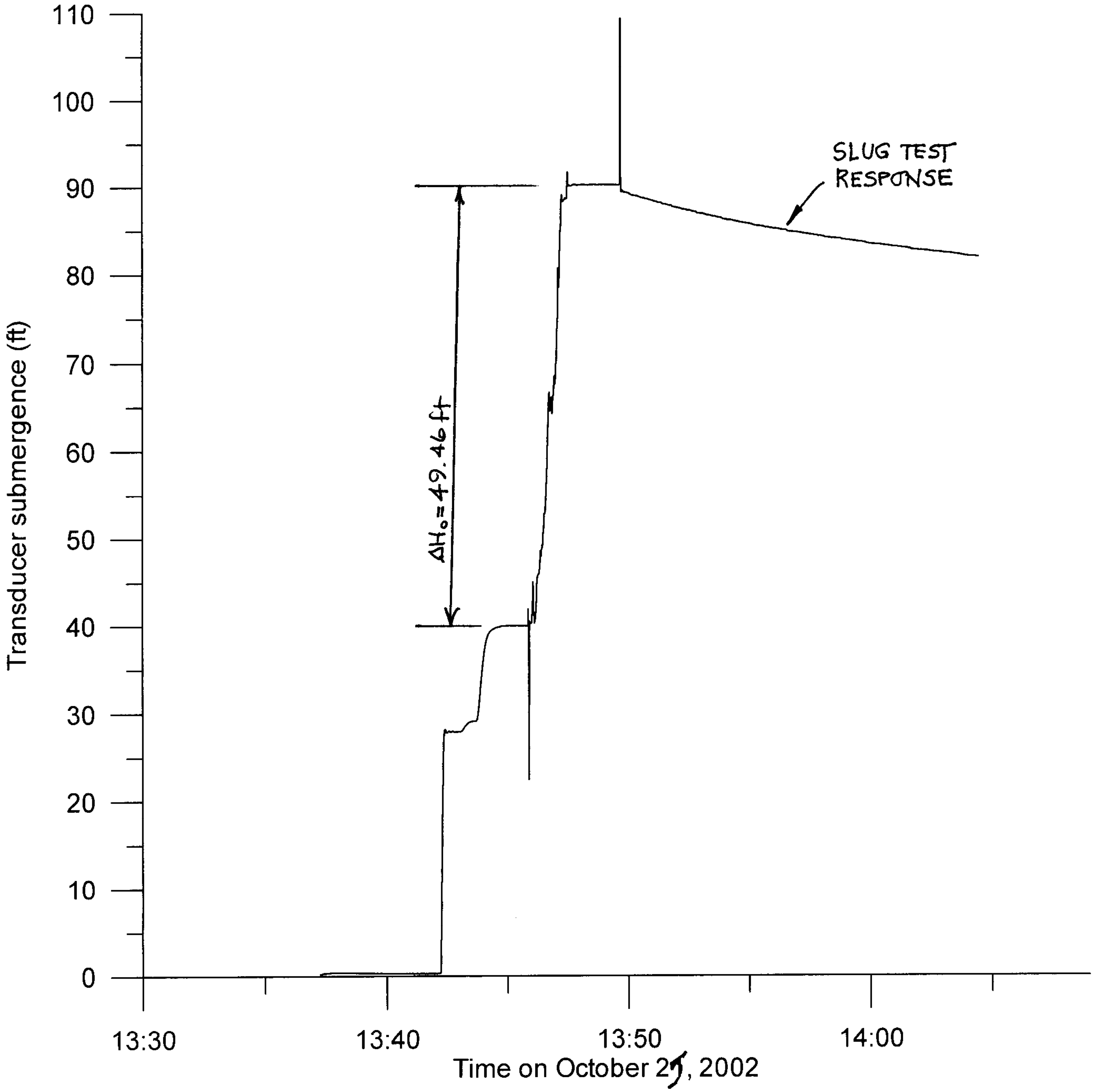
Initial Displacement: 48.16 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

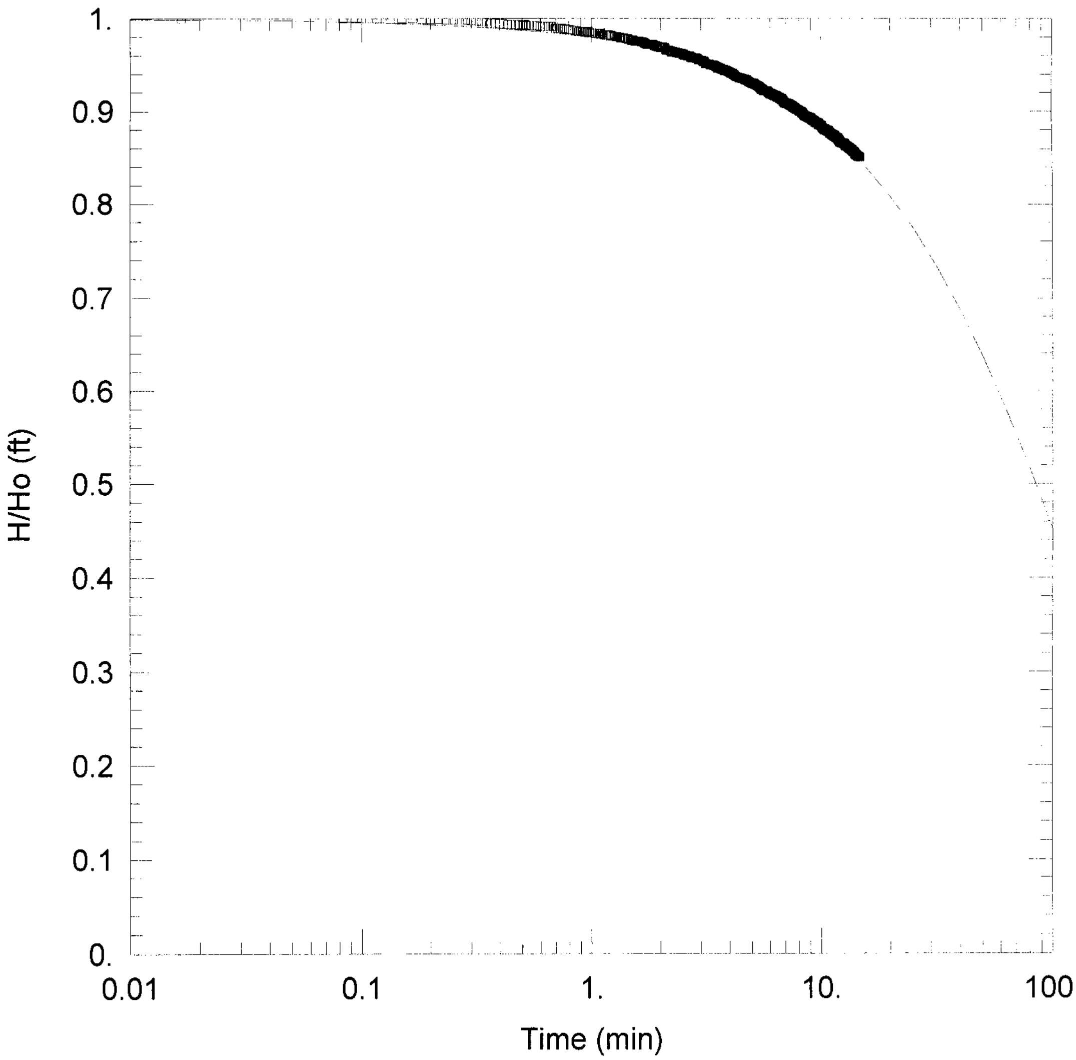
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1425 ft^2/day
S = 1.E-06

I1

Test 7



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
13:30
13:40
13:50
14:00
Time on October 2~~1~~, 2002
$\Delta H_o = 49.46$ ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-7(c).aqt
Date: 12/06/02 Time: 10:13:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

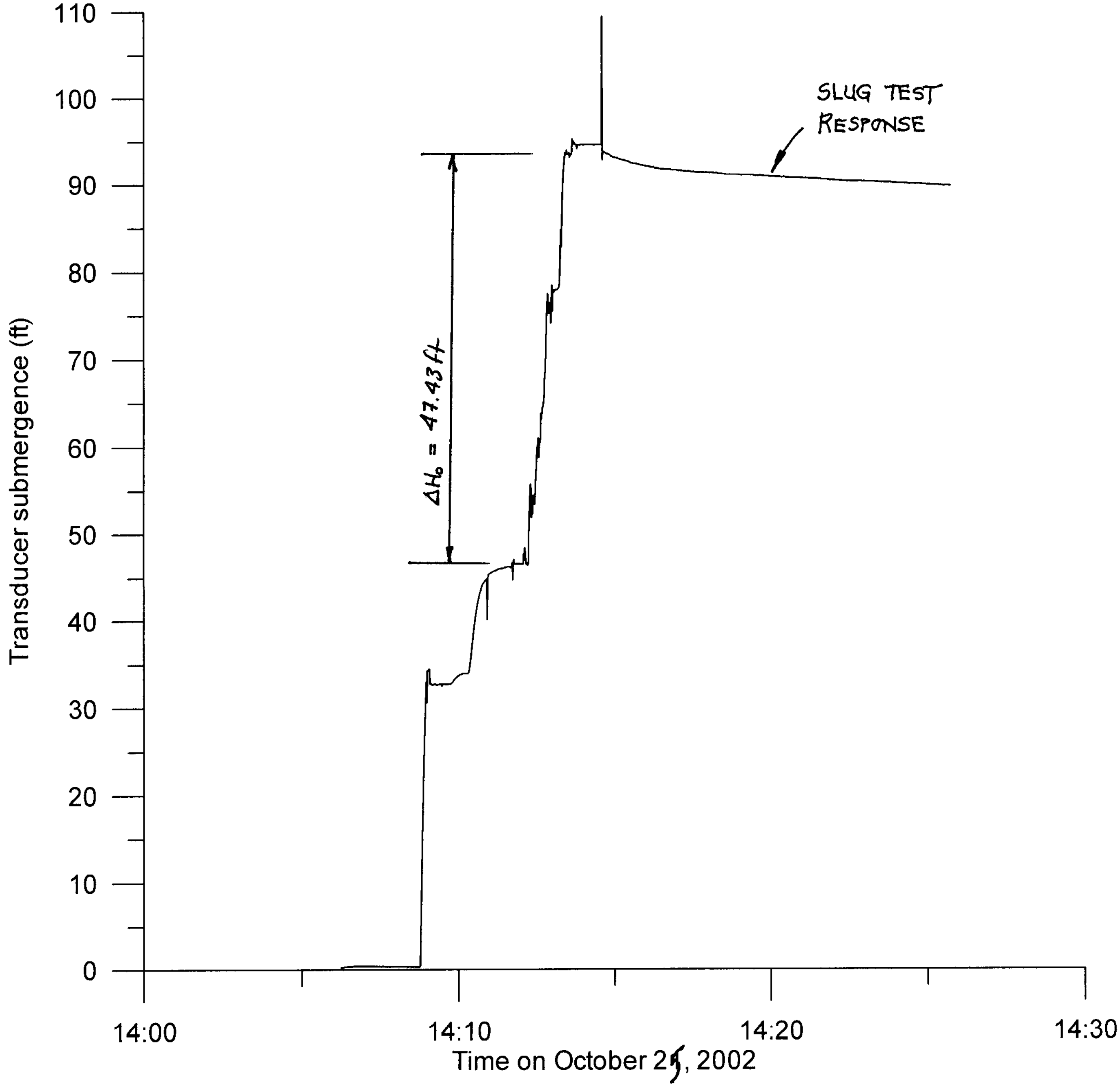
Initial Displacement: 49.46 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

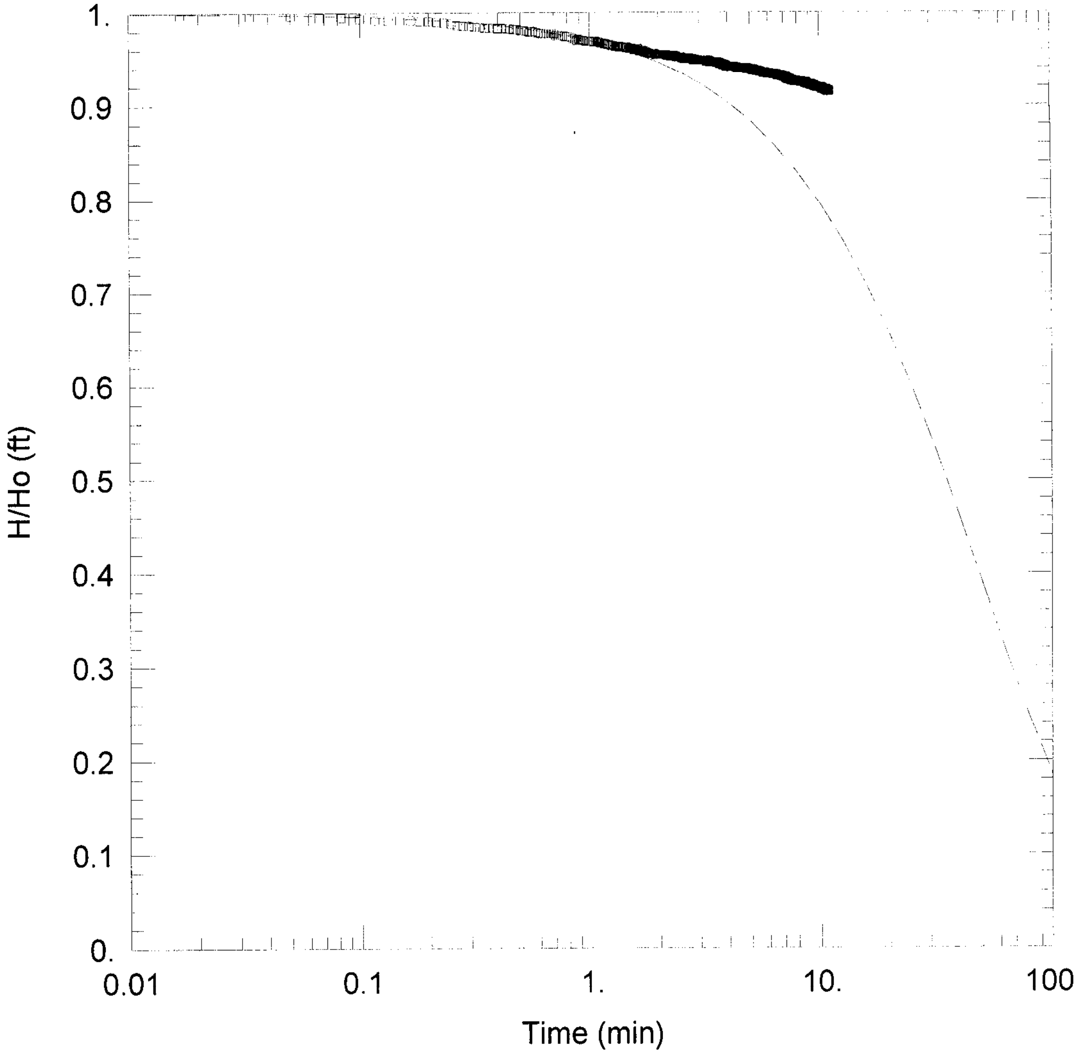
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.03775 ft^2/day
S = 3.343E-05

I1

Test 8



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
14:00
14:10
14:20
14:30
Time on October 25, 2002
SLUG TEST RESPONSE
ΔH₀ = 47.43 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-8(c).aqt
Date: 12/06/02 Time: 10:12:41

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

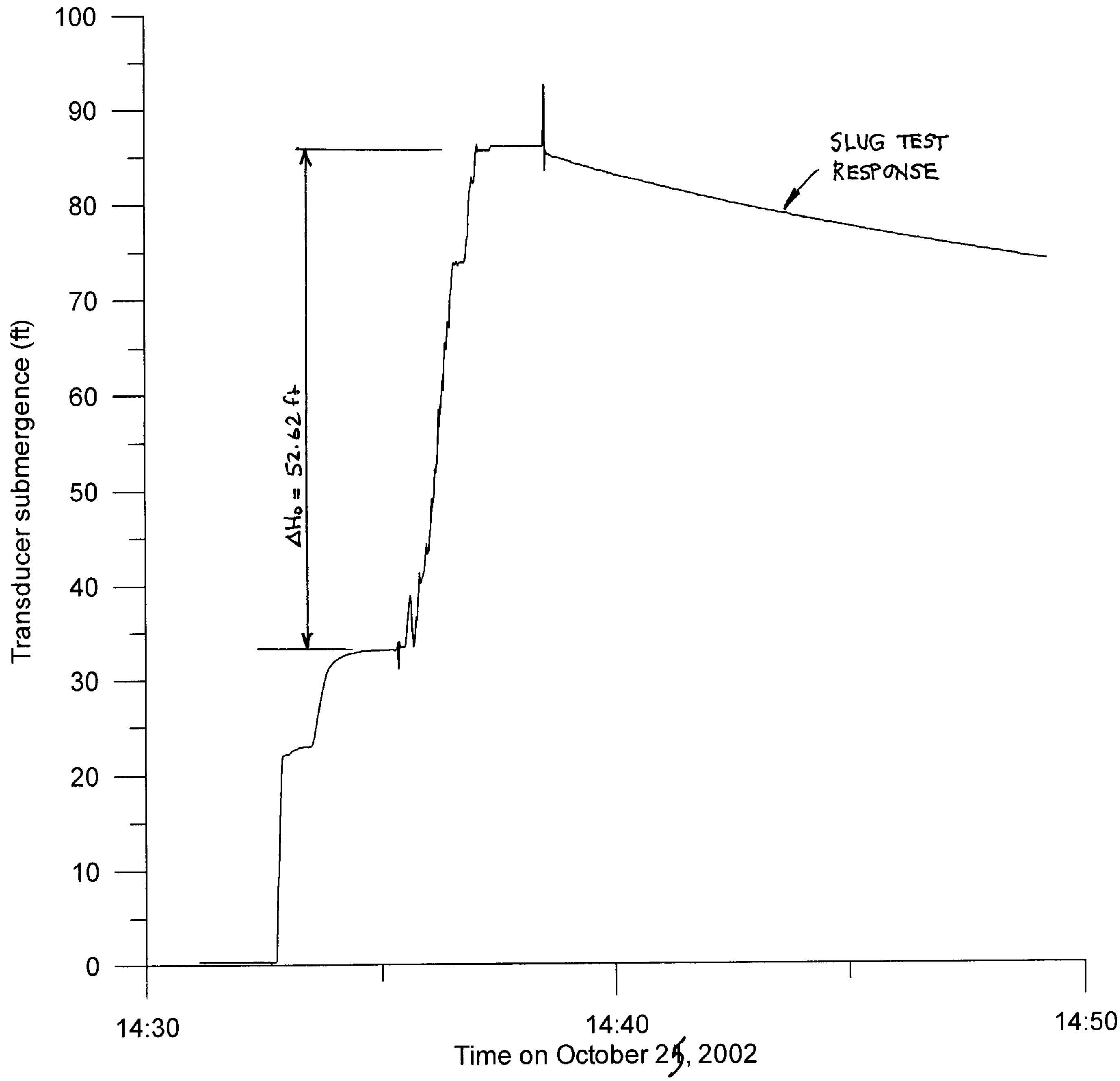
Initial Displacement: 47.43 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

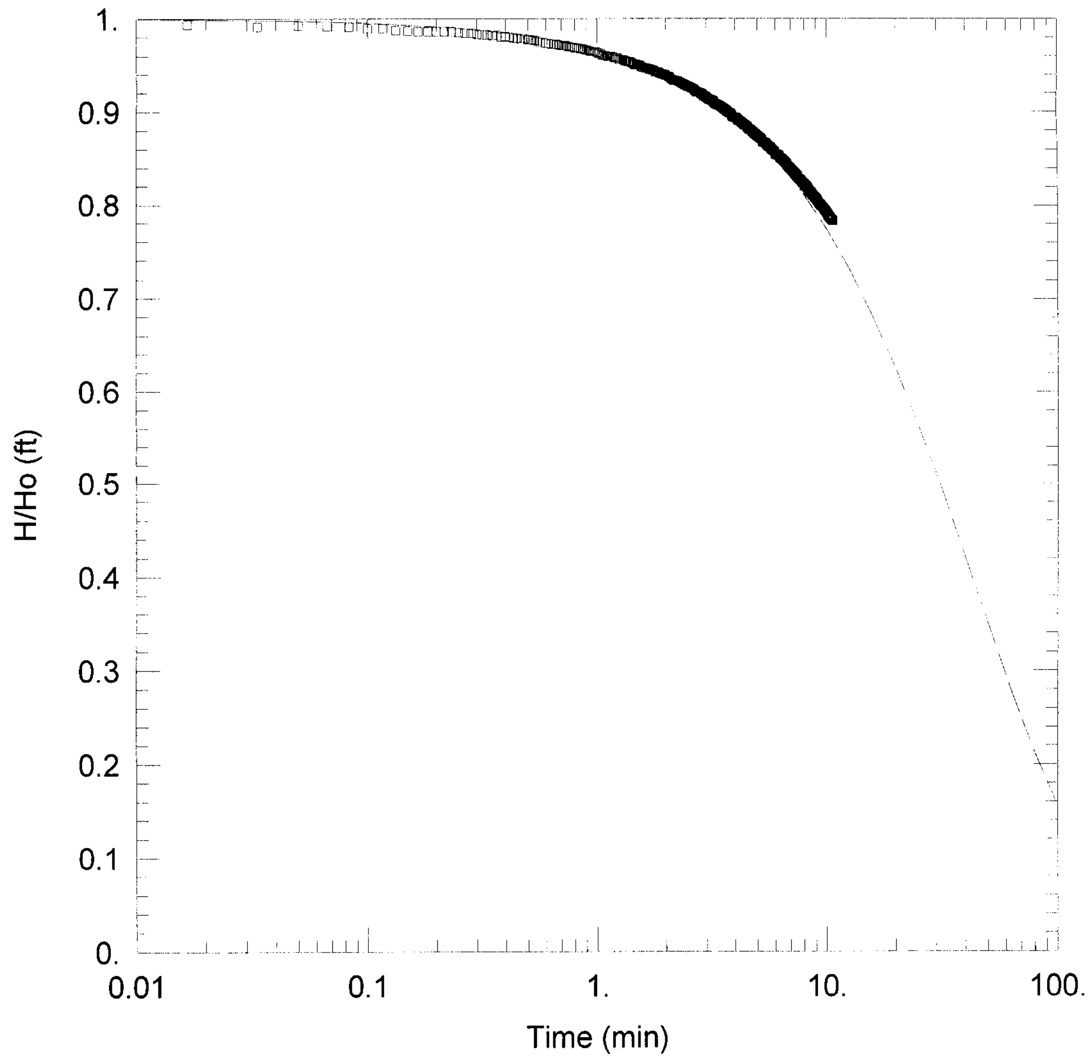
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1391 ft^2/day
S = 1.E-06

I1

Test 9



100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
ΔH₀ = 52.62 ft
SLUG TEST RESPONSE
14:30
14:40
14:50
Time on October 25, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-9(c).aqt
Date: 12/06/02 Time: 10:15:05

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 52.62 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

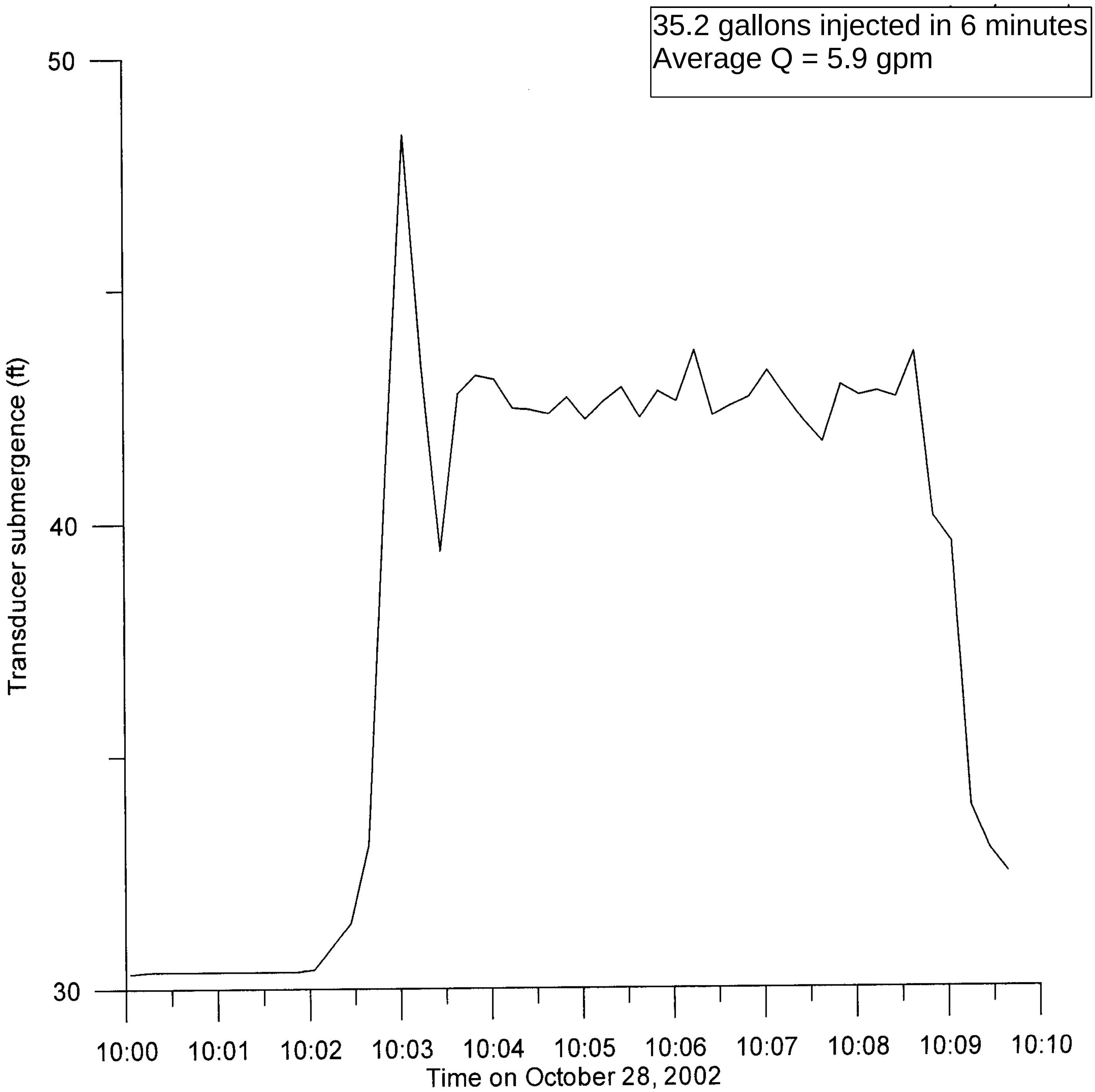
SOLUTION

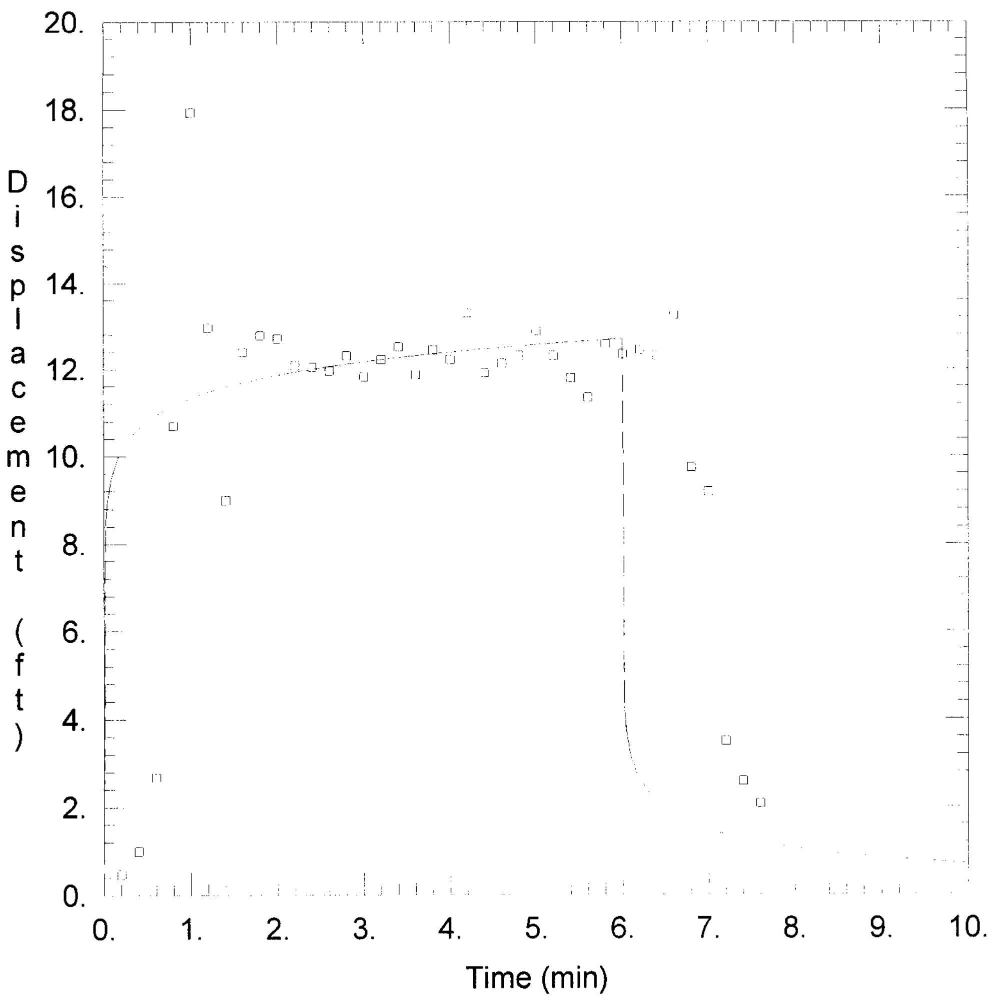
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.1577 ft^2/day
S = 1.E-06

I1

Test 10 (Pumping test)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\I1\i1-10(p).aqt
Date: 12/05/02 Time: 14:52:49

AQUIFER DATA

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

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
I1-10	0	0	I1-10	0	0

SOLUTION

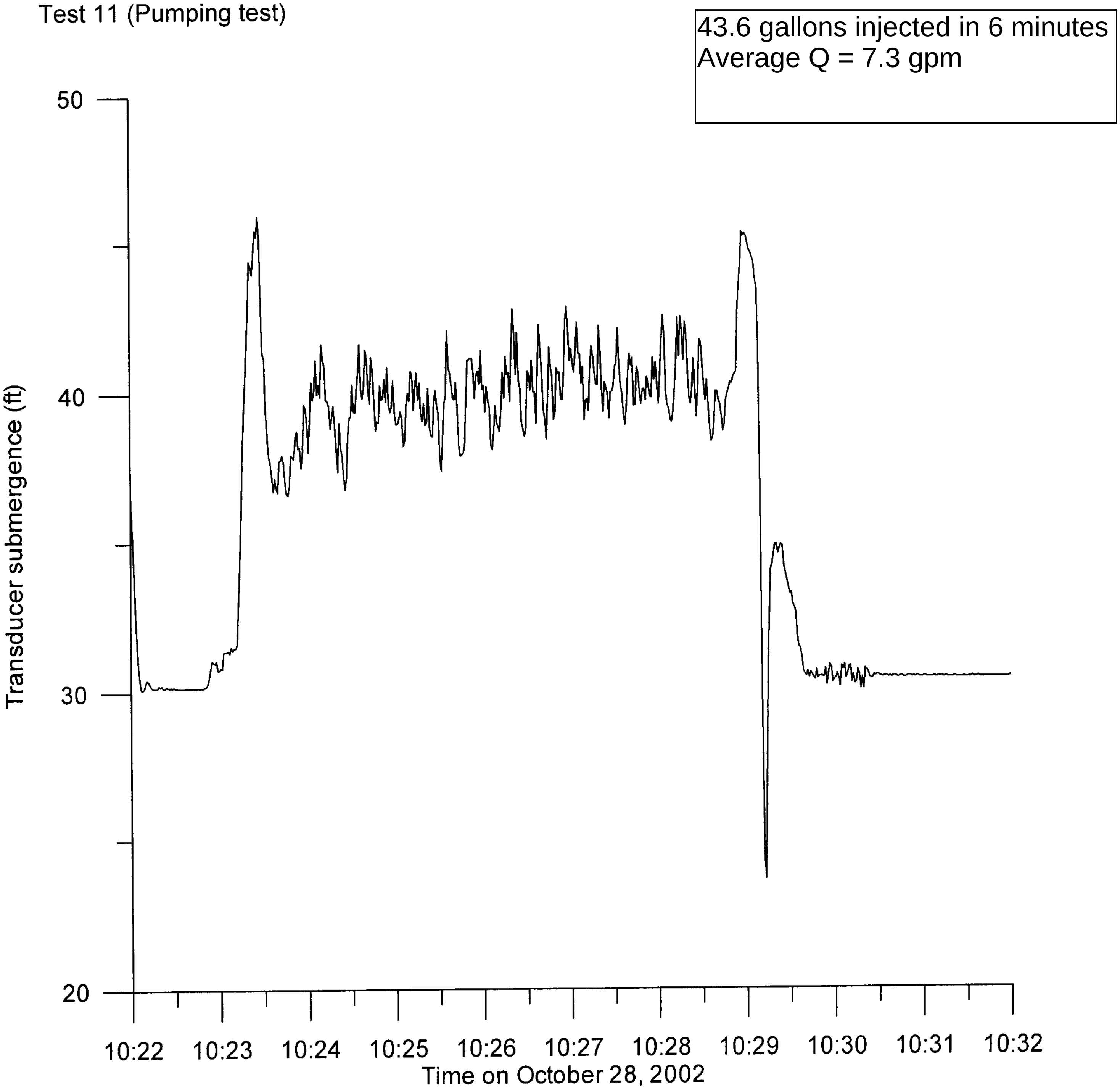
Aquifer Model: Confined Solution Method: Theis (Step Test)

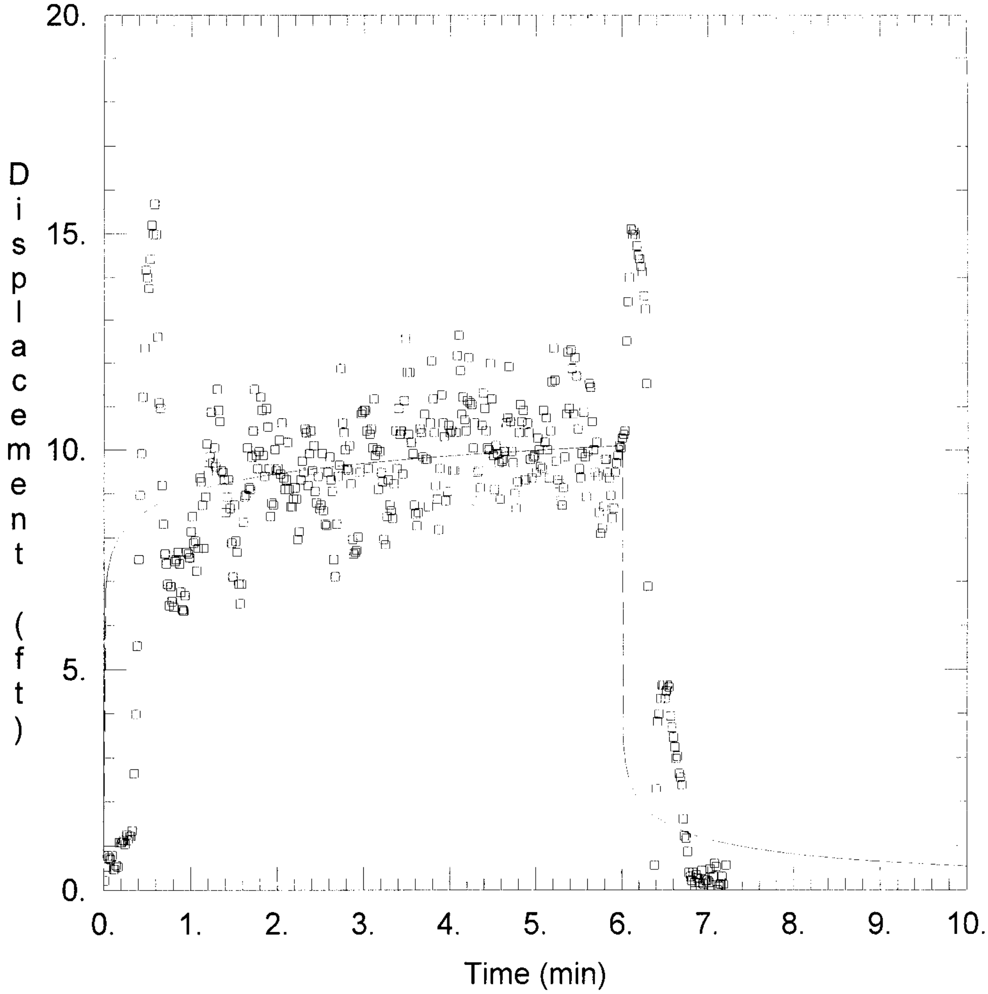
T = 119.2 ft^2/day S = 1.E-06
Sw = 0. C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh $s(t) = 14.37Q + 0.Q^{2.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 100.%

I1

Test 11 (Pumping test)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\I1\i1-11(p).aqt
Date: 12/05/02 Time: 14:53:21

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
I1-11	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
I1-11	0	0

SOLUTION

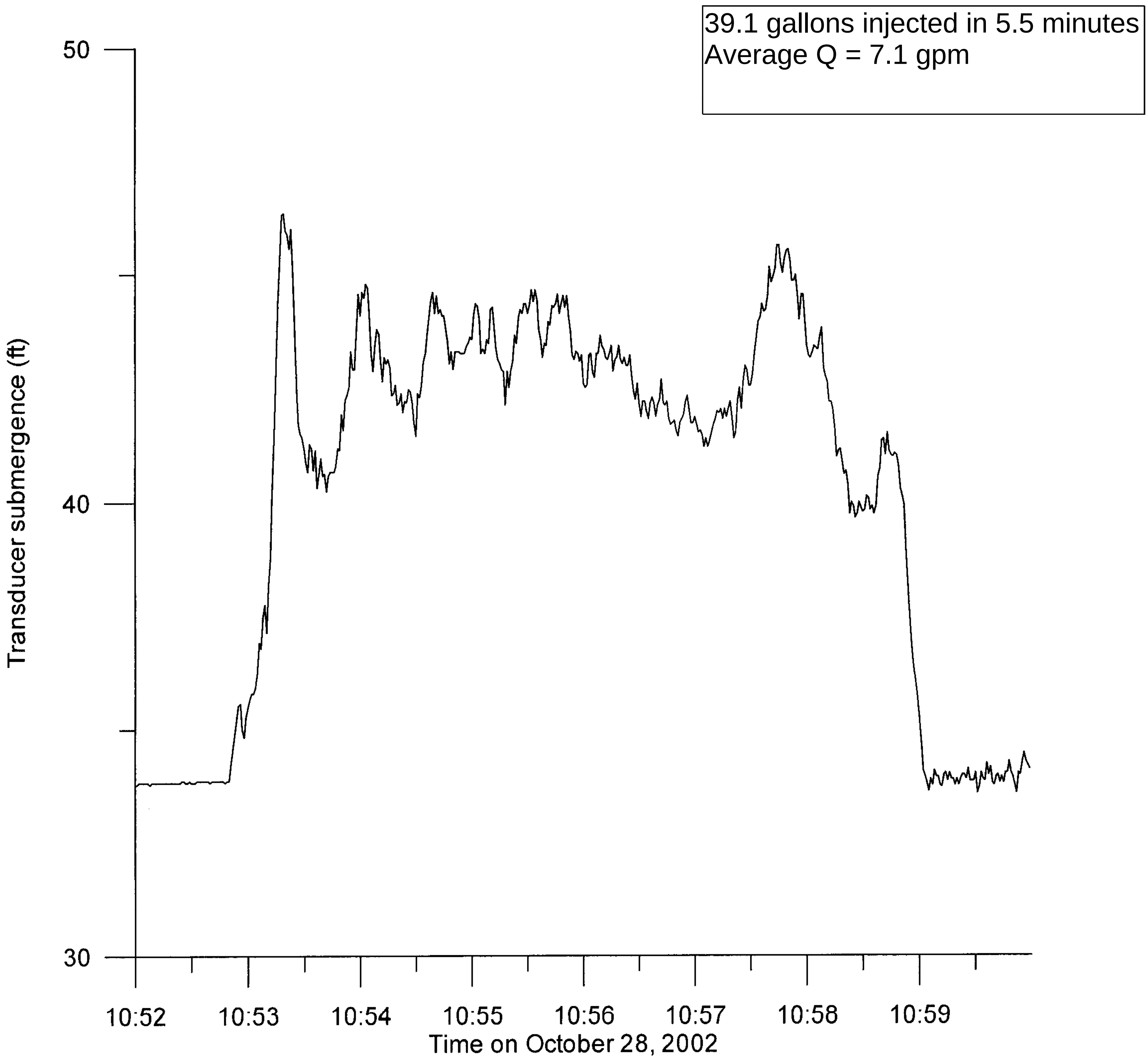
Aquifer Model: Confined
Solution Method: Theis (Step Test)

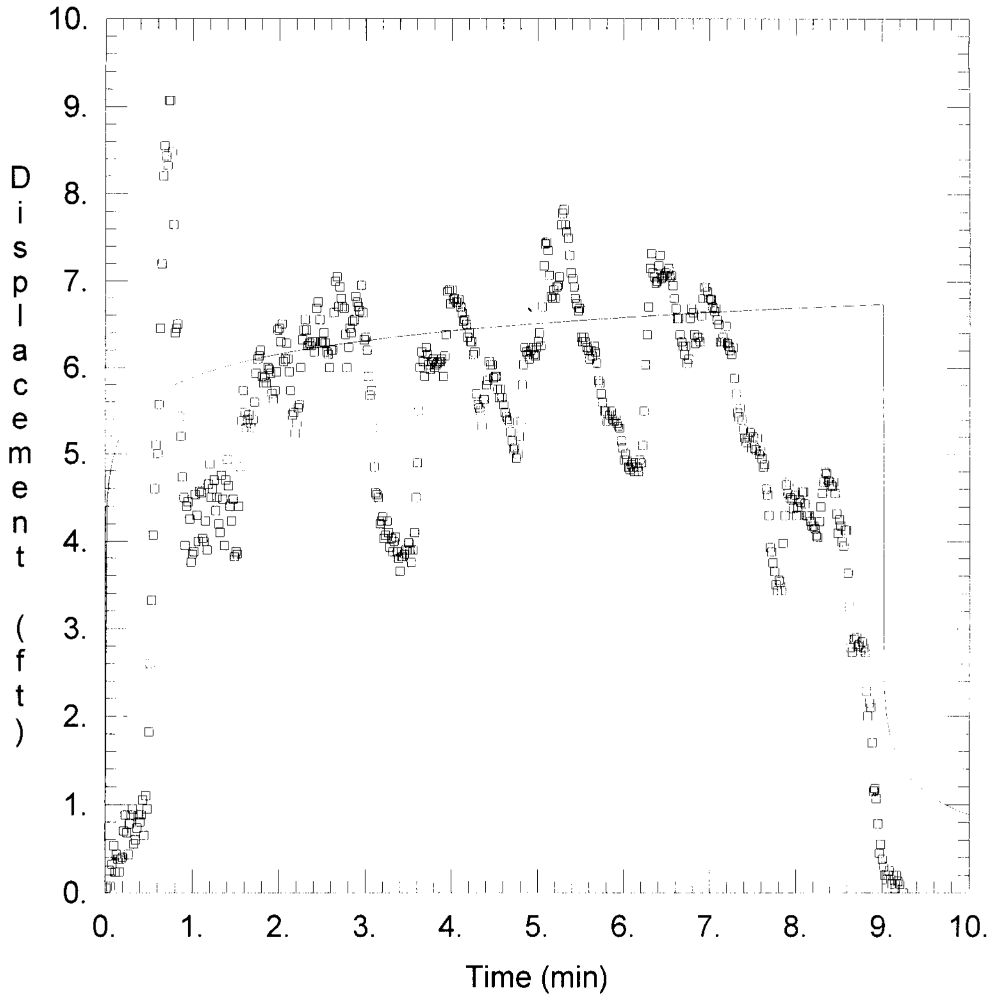
T = 190.6 ft^2/day
S = 1.E-06
Sw = 0.
C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min
s(t) = 9.267Q + 0.Q^{2}
W.E. = 100.%

I1

Test 12


39.1 gallons injected in 5.5 minutes
Average Q = 7.1 gpm
50
40
30
Transducer submergence (ft)
10:52
10:53
10:54
10:55
10:56
10:57
10:58
10:59
Time on October 28, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\H5\H5-12(p).aqt
Date: 12/05/02 Time: 14:56:56

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
H5-12	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ H5-12	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 171.3 ft^2/day
Sw = 0.
P = 1.991

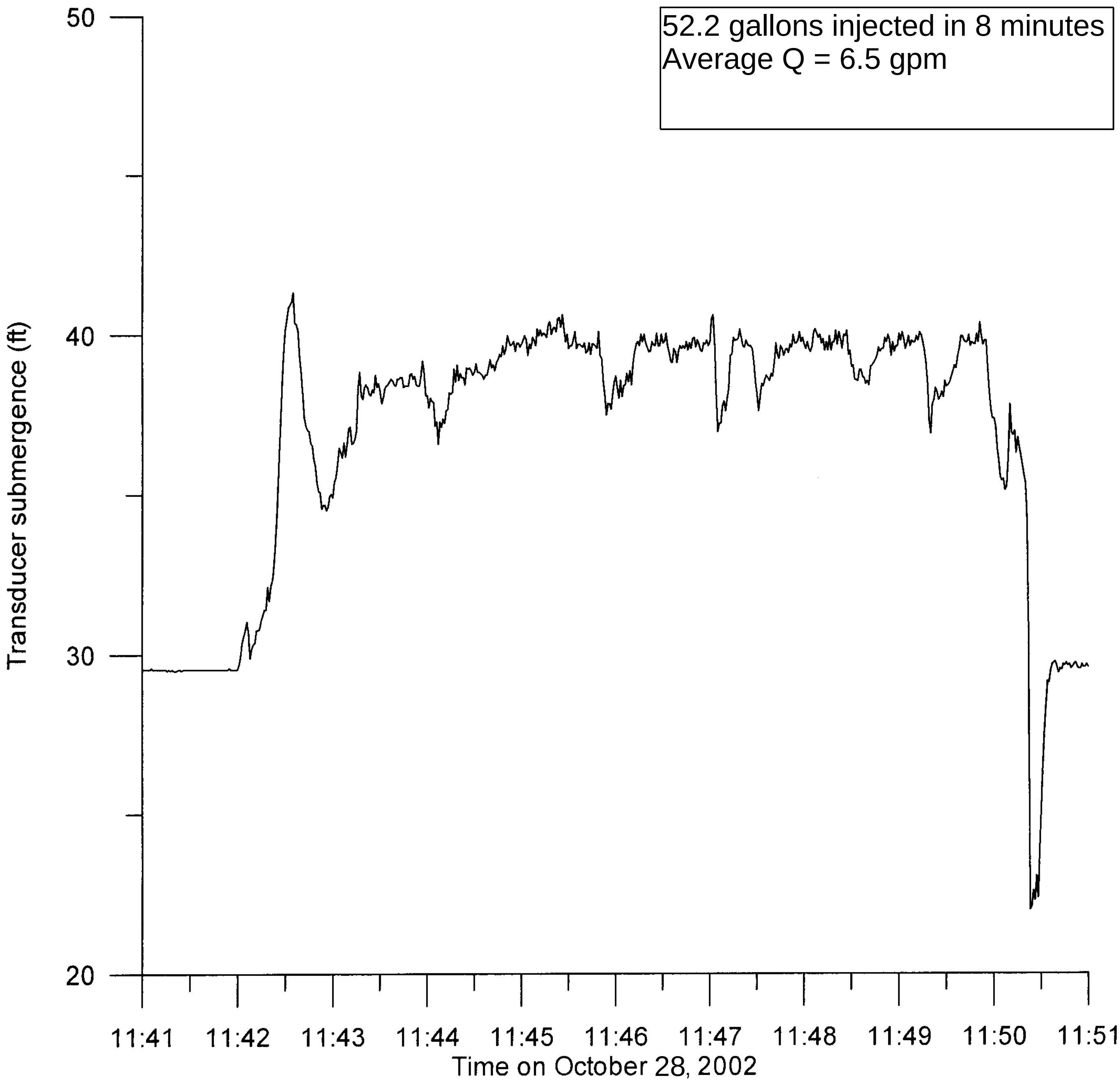
S = 1.E-06
C = 0. min^2/ft^5

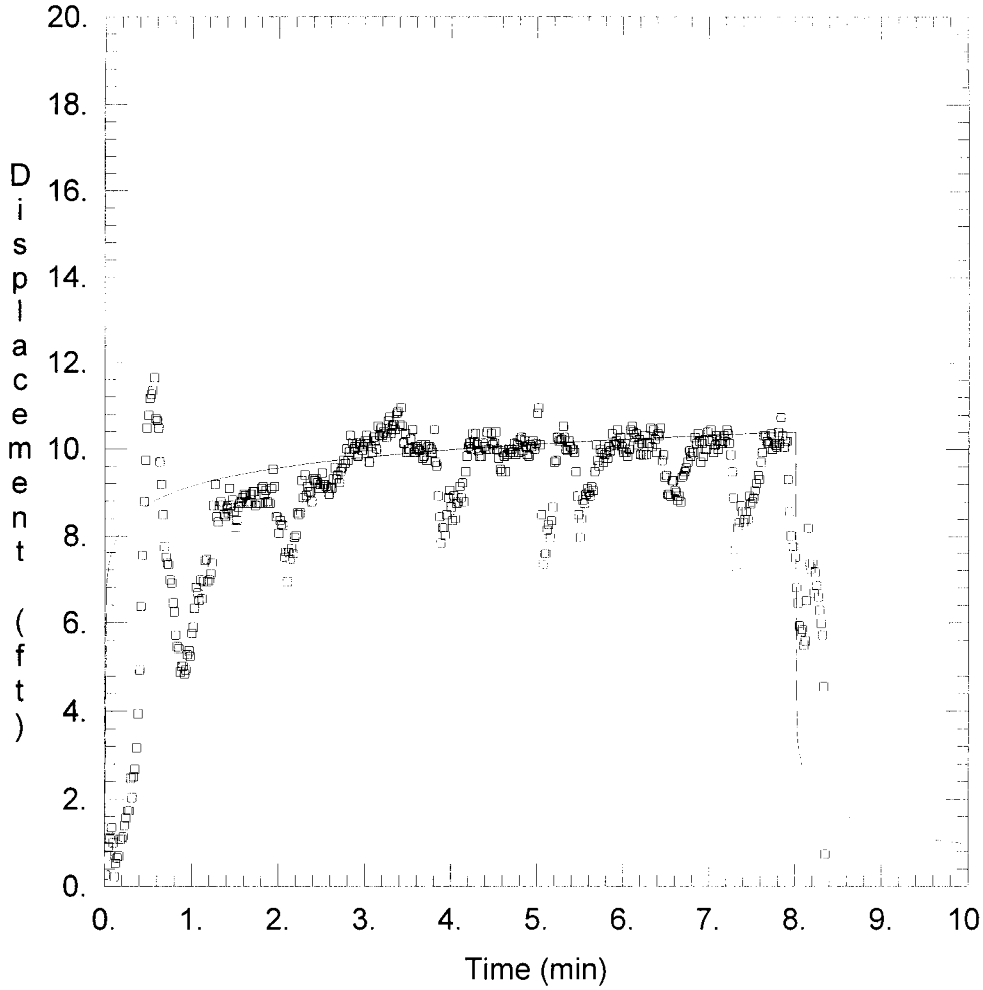
Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 10.24Q + 0.Q^{1.991}$
W.E. = 100.%

I1

Test 13 (Pumping test)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\I1\i1-13(p).aqt
Date: 12/05/02 Time: 14:53:53

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
I1-13	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ I1-13	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 166.3 ft^2/day

Sw = 0.

P = 2.

S = 1.E-06

C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh

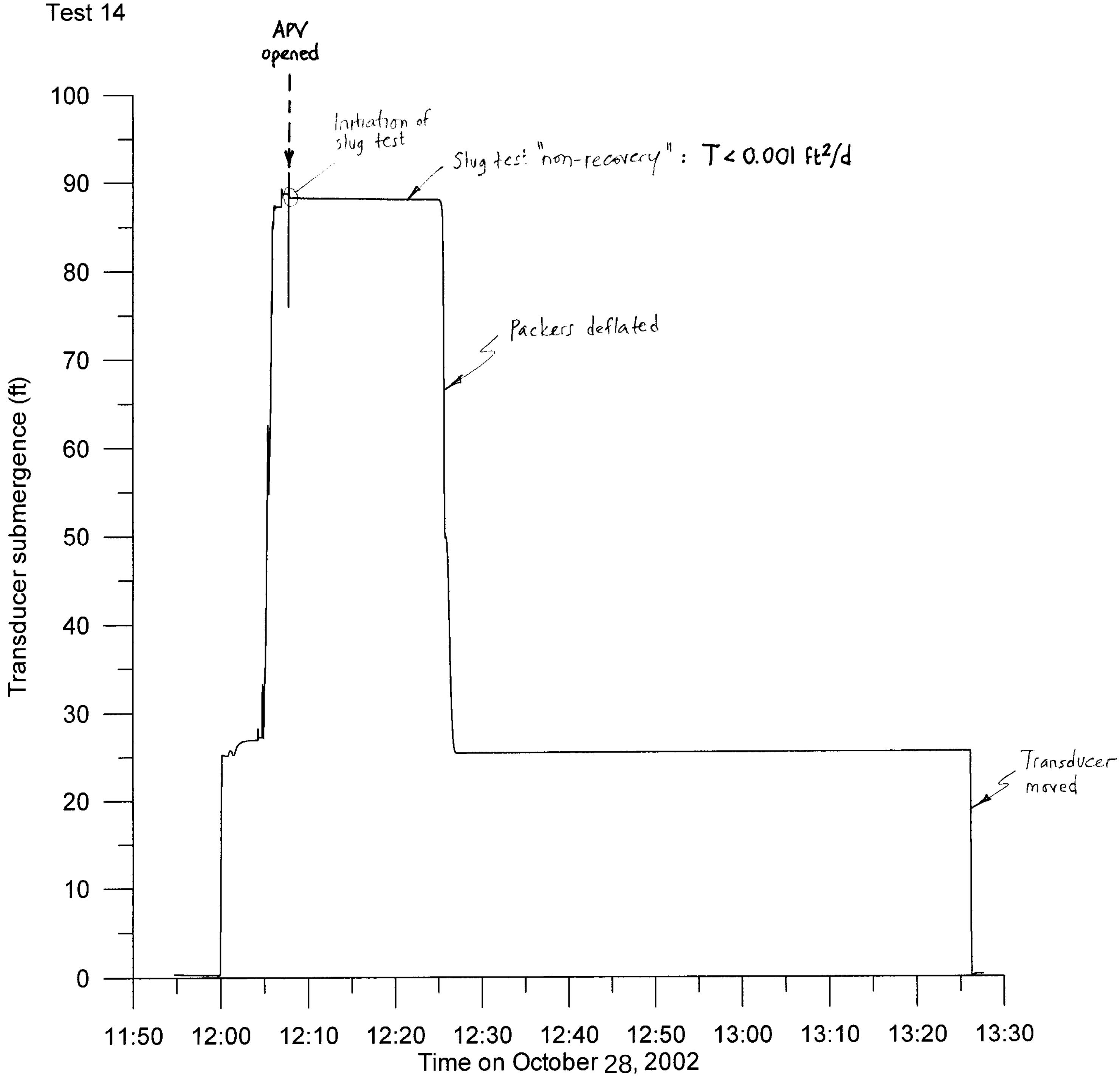
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 10.53Q + 0.$Q^{2.}$

W.E. = 100.%

I1

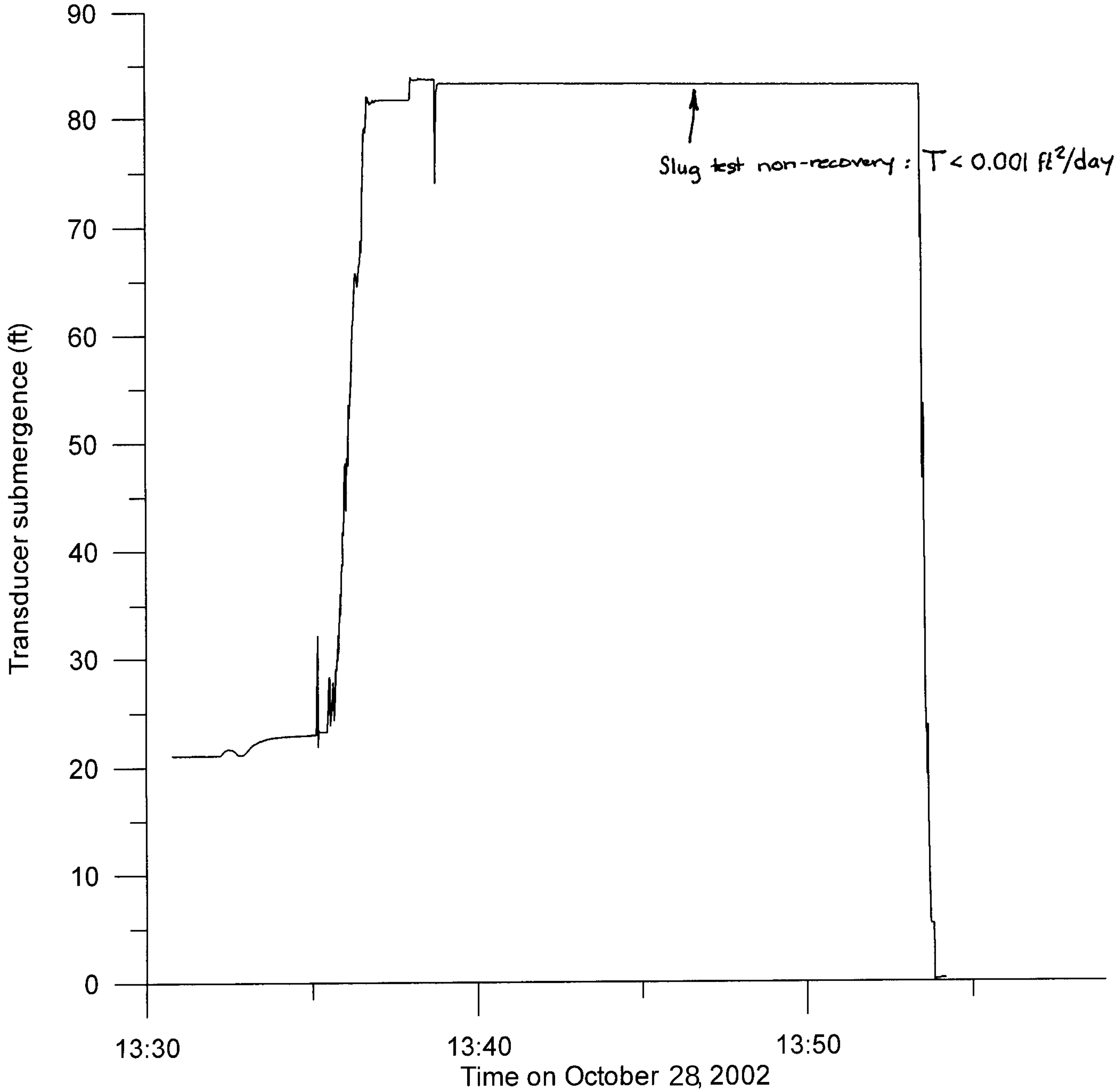
Test 14



APV opened
Initiation of slug test
Slug test "non-recovery" : T < 0.001 ft²/d
Packers deflated
Transducer moved
Transducer submergence (ft)
100
90
80
70
60
50
40
30
20
10
0
11:50
12:00
12:10
12:20
12:30
12:40
12:50
13:00
13:10
13:20
13:30
Time on October 28, 2002

I1

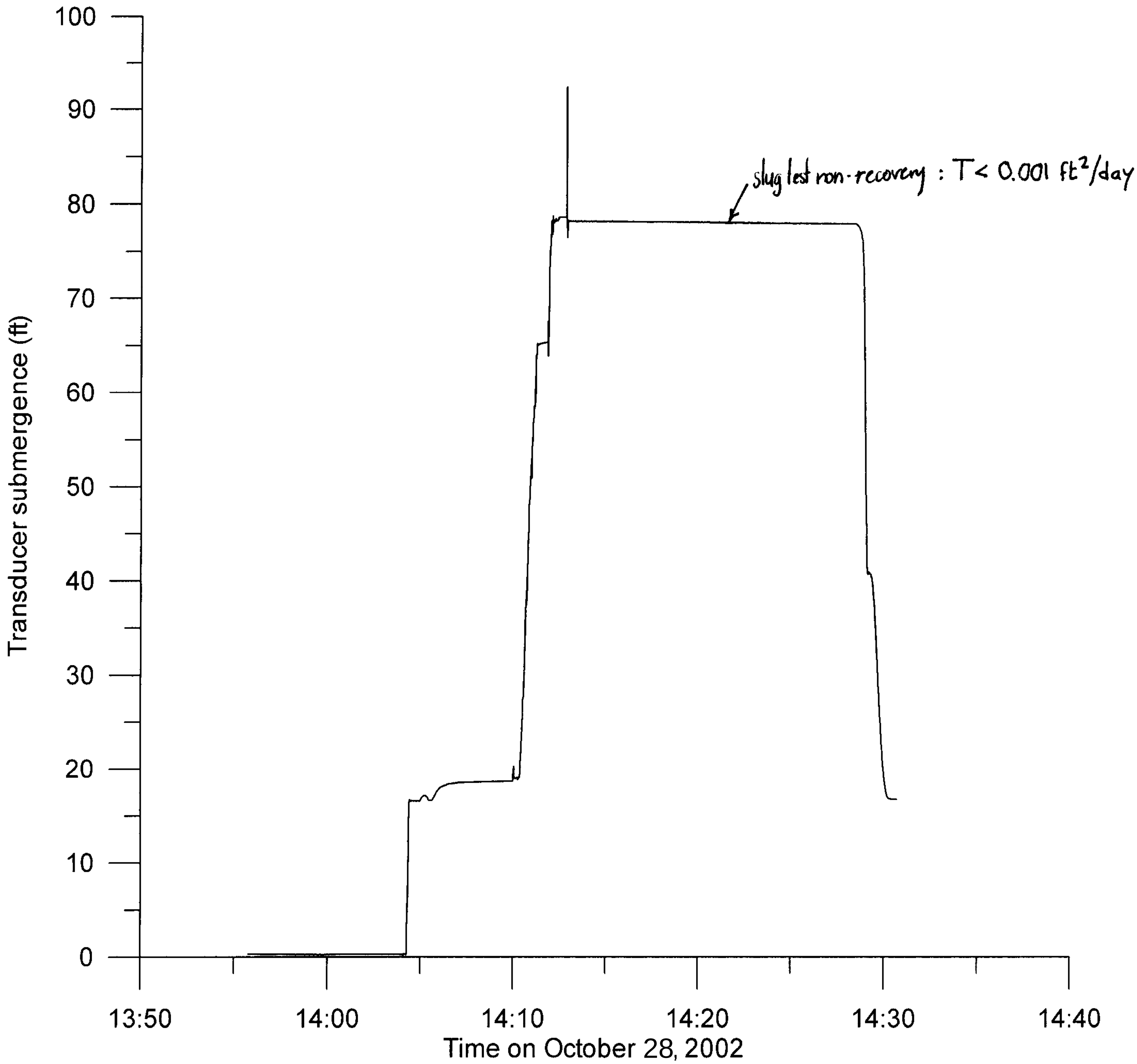
Test 15



90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
13:30
13:40
13:50
Time on October 28, 2002
Slug test non-recovery : T < 0.001 ft²/day

I1

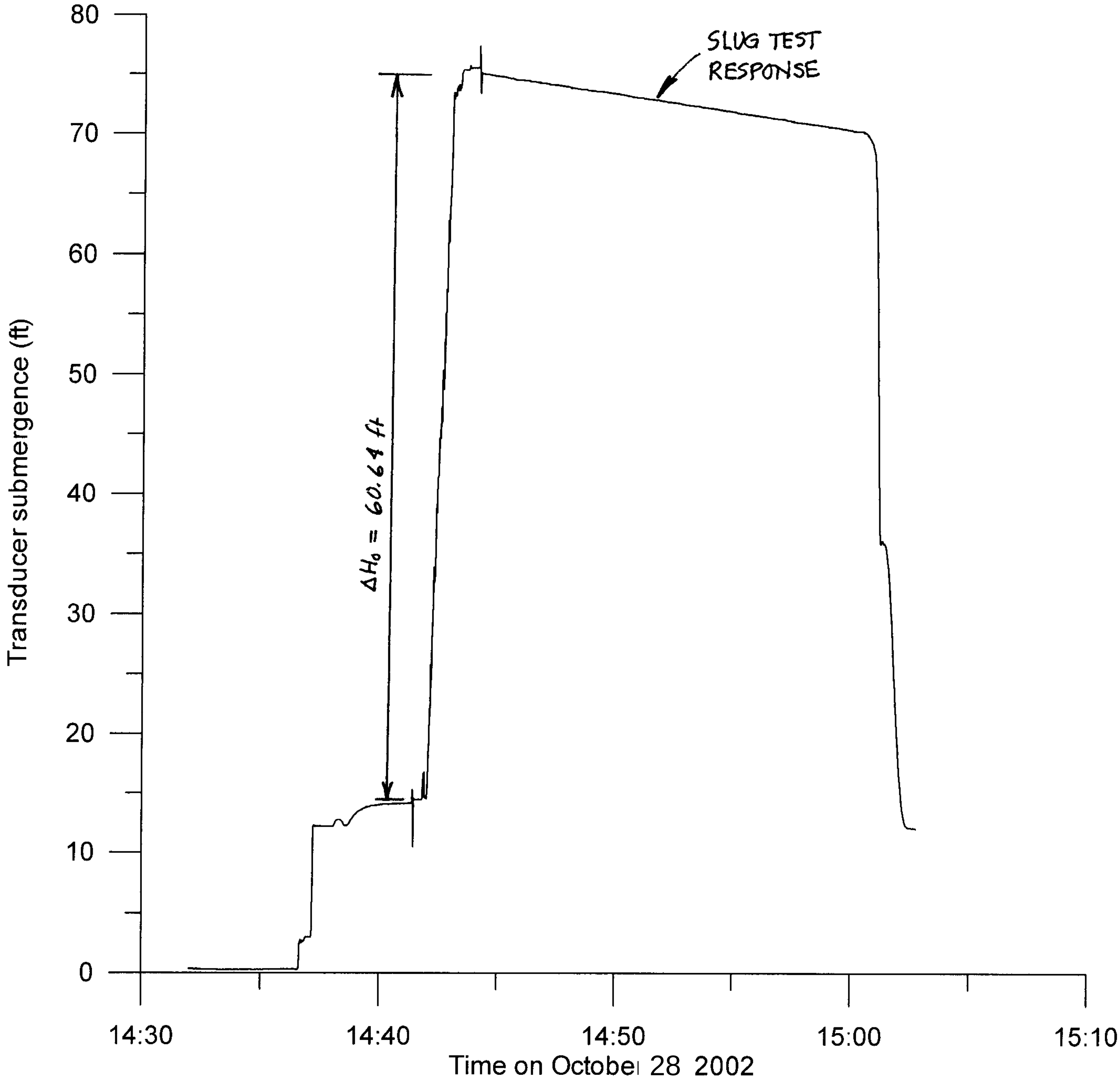
Test 16



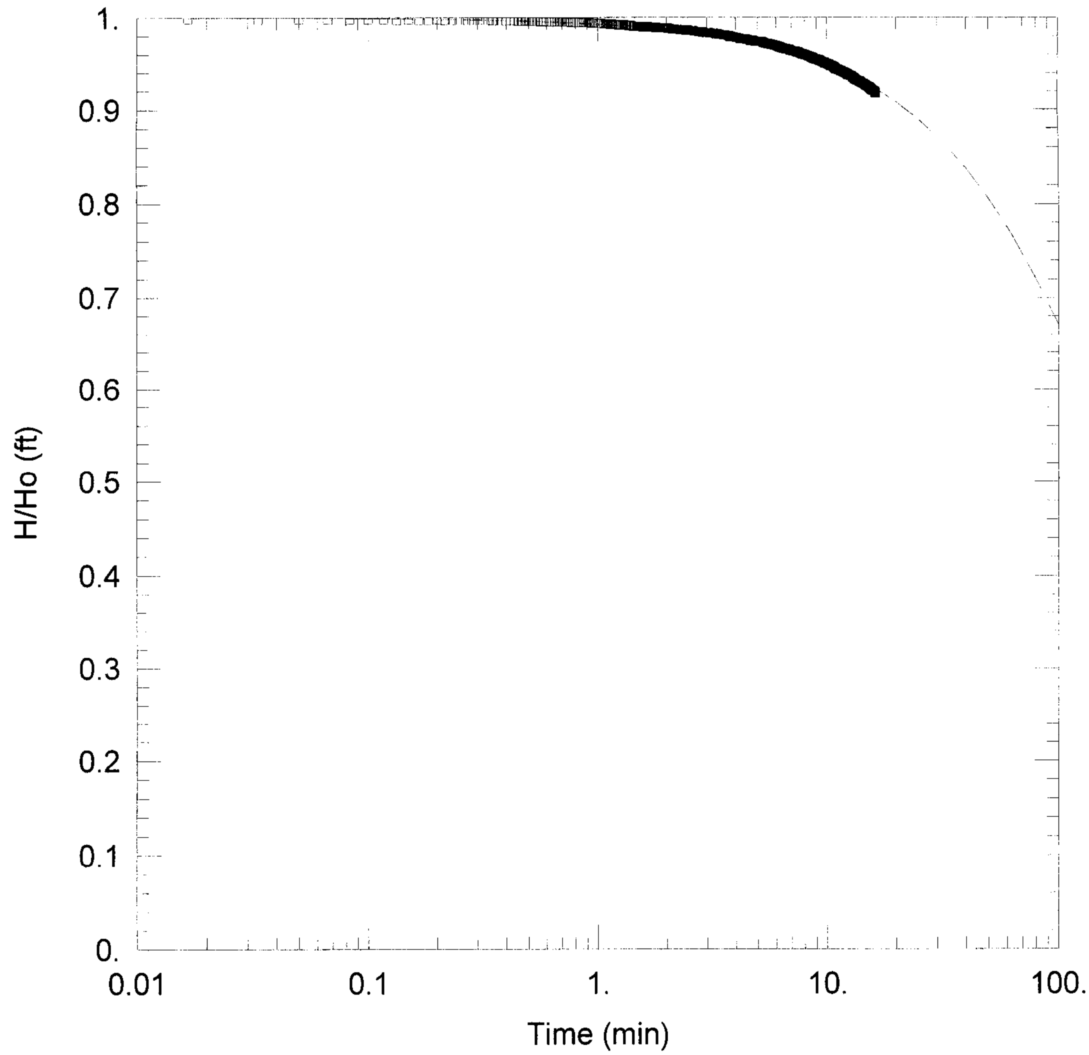
slug test non-recovery : T< 0.001 ft²/day
Transducer submergence (ft)
100
90
80
70
60
50
40
30
20
10
0
13:50
14:00
14:10
14:20
14:30
14:40
Time on October 28, 2002

I1

Test 17



80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
14:30
14:40
14:50
15:00
15:10
Time on Octobe| 28 2002
SLUG TEST
RESPONSE
ΔH₀ = 60.64 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-17(c).aqt
Date: 12/06/02 Time: 10:21:50

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 60.64 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

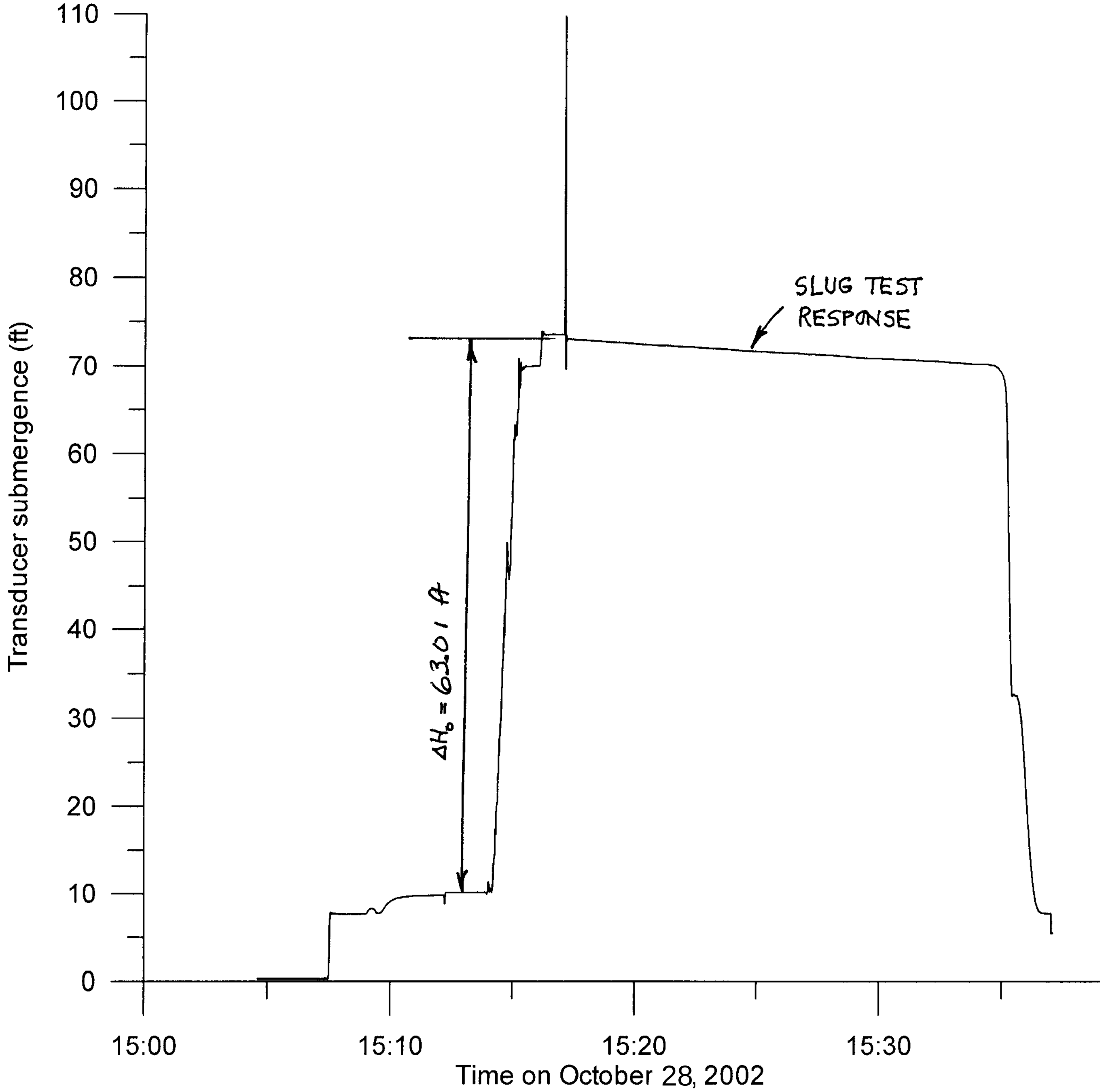
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

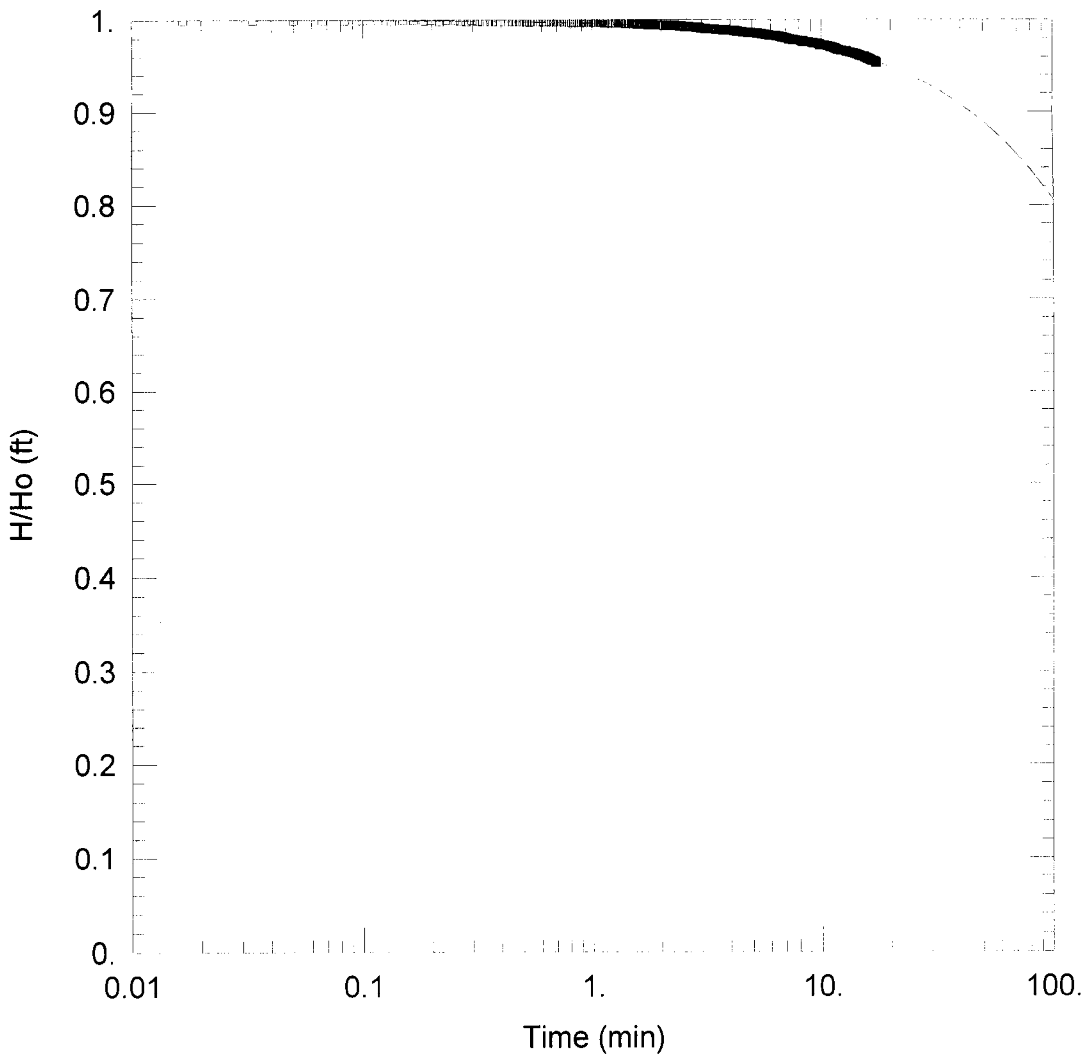
T = 0.0261 ft^2/day
S = 1.E-06

I1

Test 18



110
100
90
80
70
60
50
40
30
20
10
0
Transducer submergence (ft)
15:00
15:10
15:20
15:30
Time on October 28, 2002
SLUG TEST
RESPONSE
ΔH₀ = 63.01 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-18(c).aqt
Date: 12/06/02 Time: 10:22:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

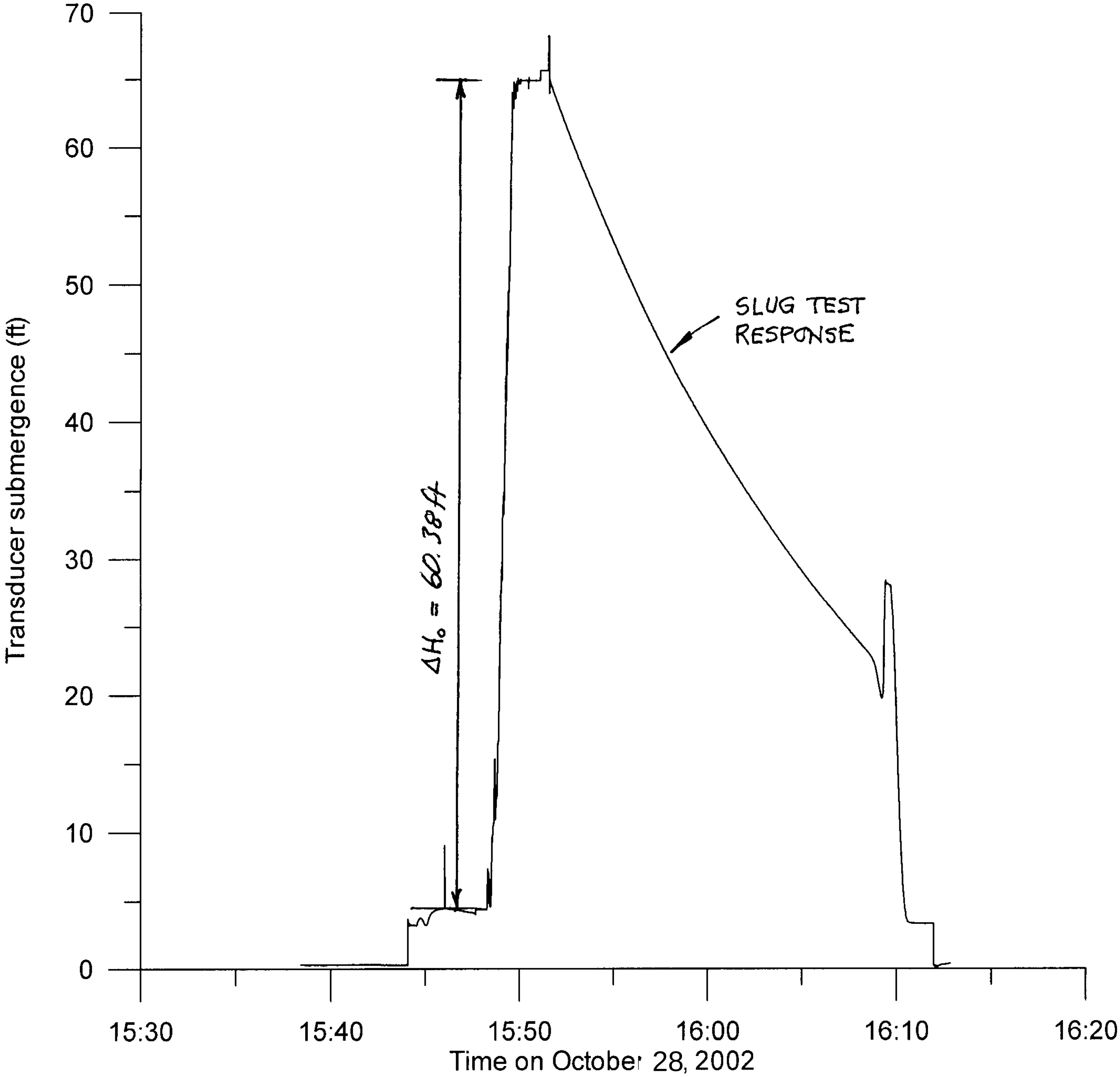
Initial Displacement: 63.01 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

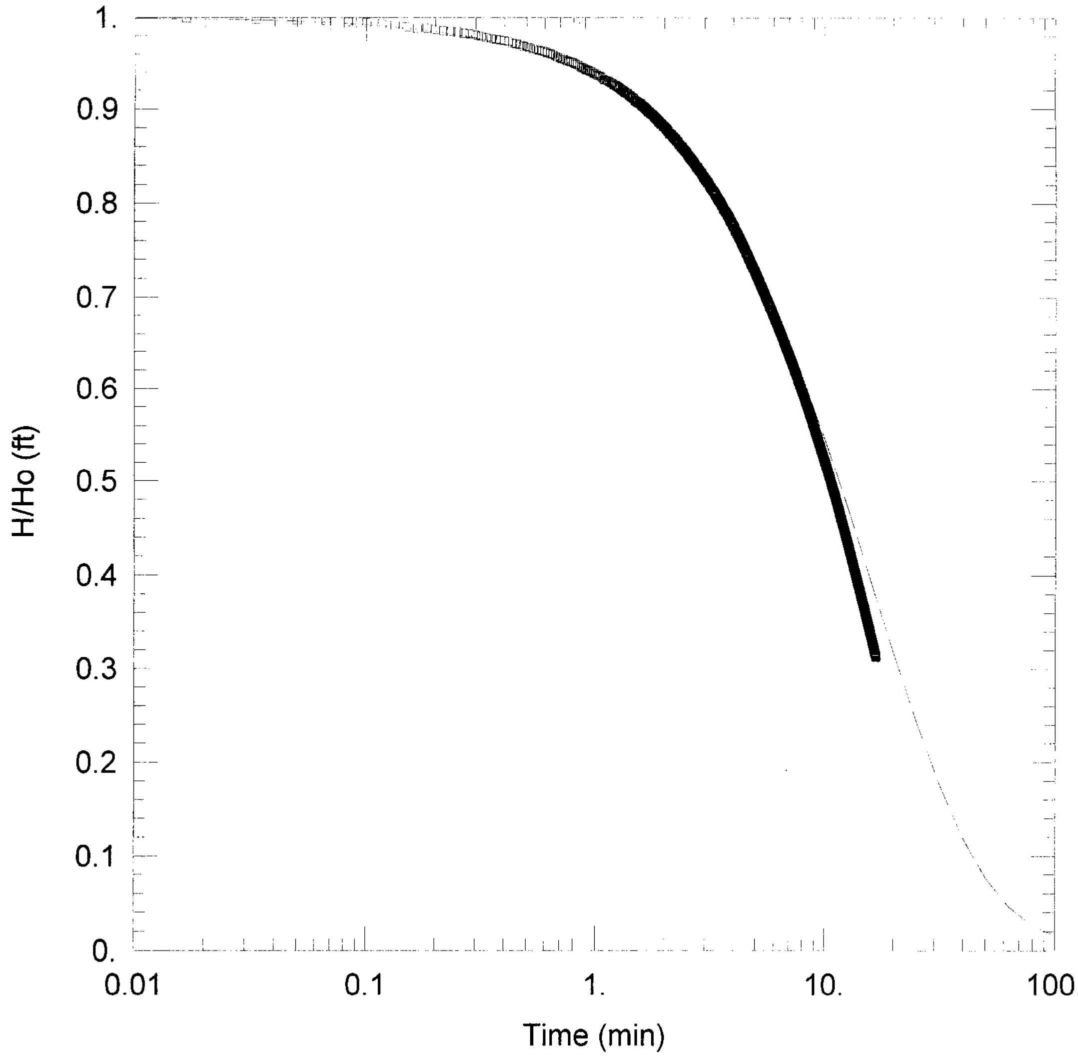
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
ı = 0.01297 ft^2/day S = 1.E-06

I1

Test 19



70
60
50
40
30
20
10
0
Transducer submergence (ft)
$\Delta H_o = 60.38 ft$
SLUG TEST RESPONSE
15:30
15:40
15:50
16:00
16:10
16:20
Time on October 28, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-19(c).aqt
Date: 12/06/02 Time: 10:23:08

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

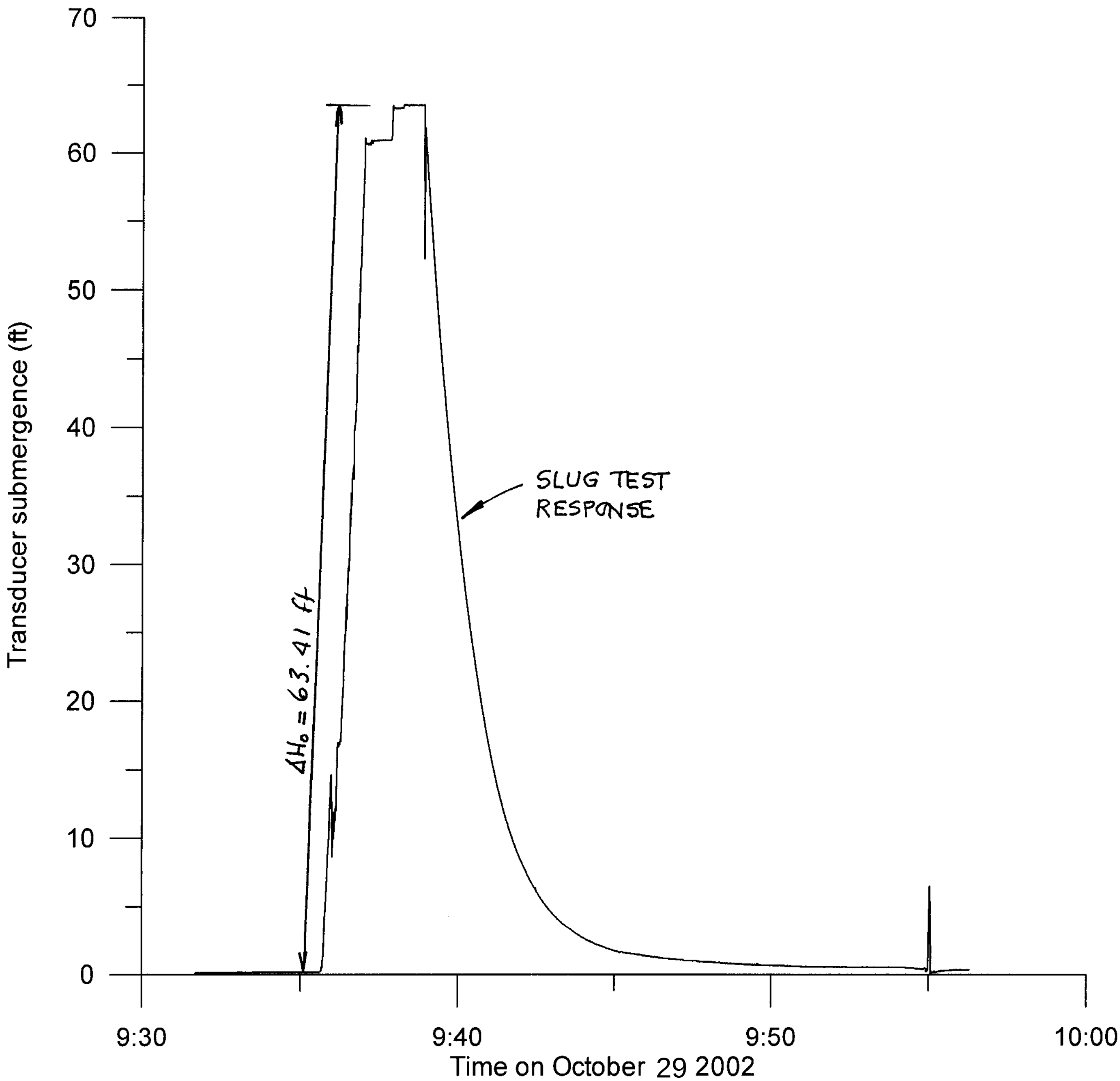
Initial Displacement: 60.38 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

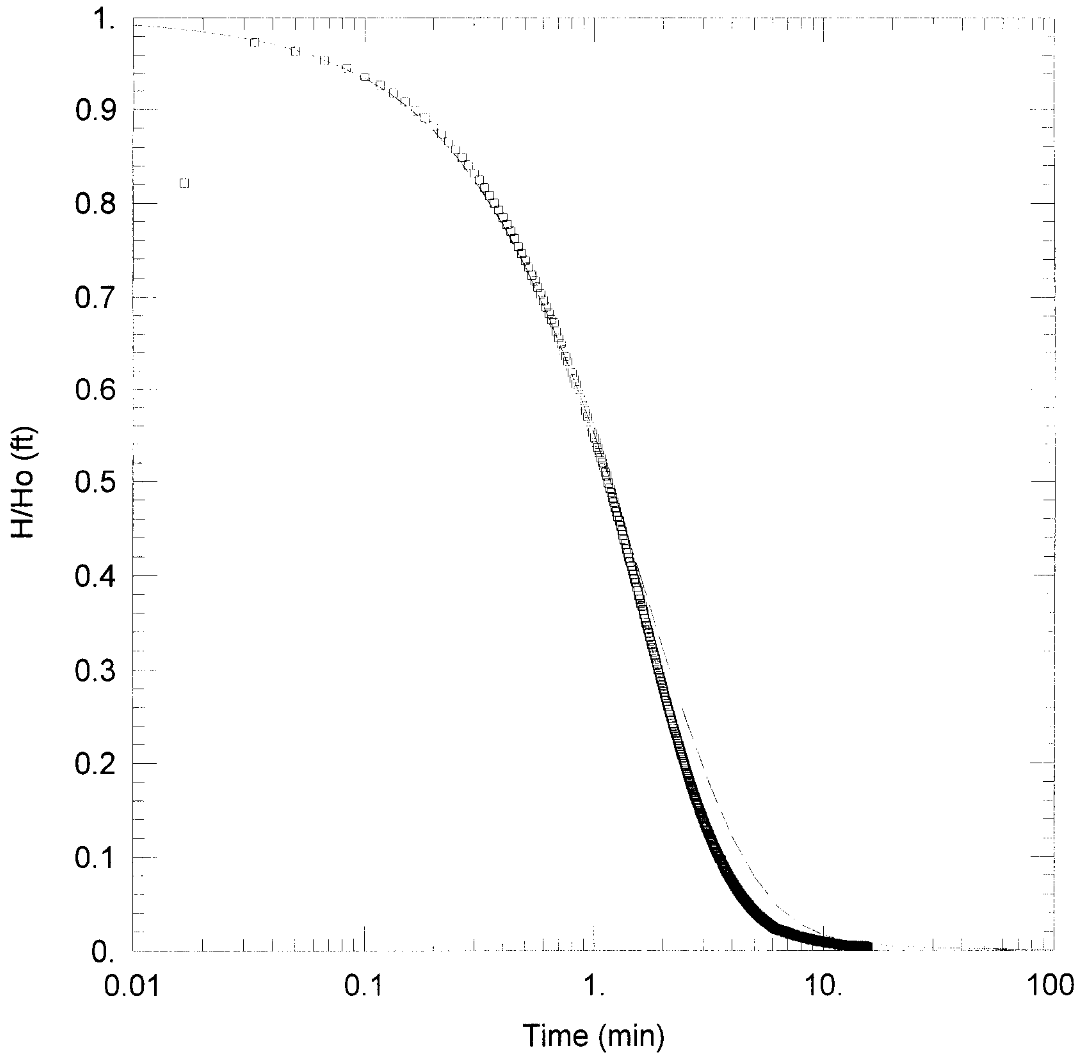
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
, = 0.7877 ft^2/day
S = 1.E-10

I1

Test 20


70
60
50
40
30
20
10
0
Transducer submergence (ft)
9:30
9:40
9:50
10:00
Time on October 29 2002
SLUG TEST
RESPONSE
ΔH₀ = 63.41 ft



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-20(c).aqt
Date: 12/06/02 Time: 10:23:55

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 63.41 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

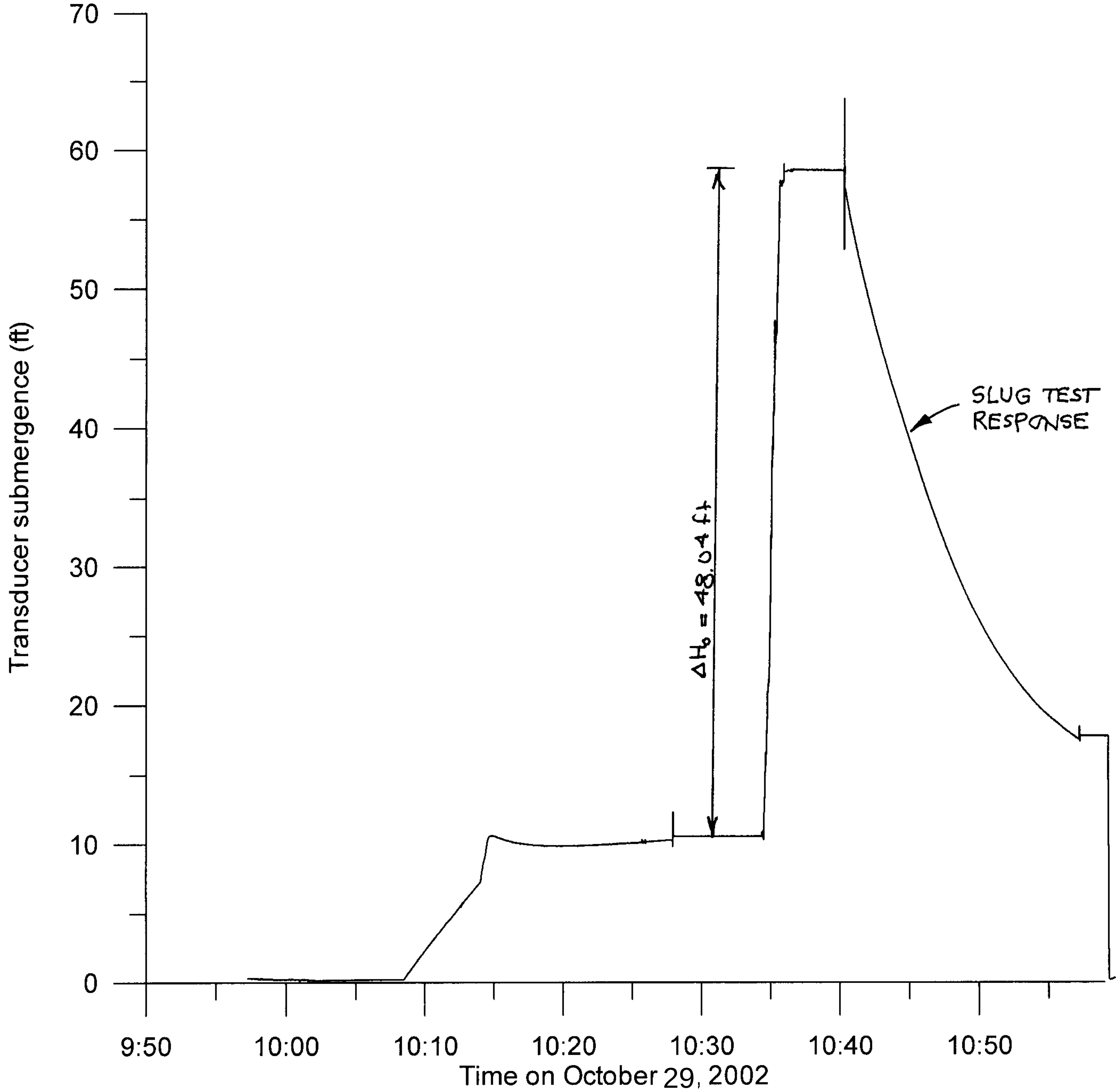
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

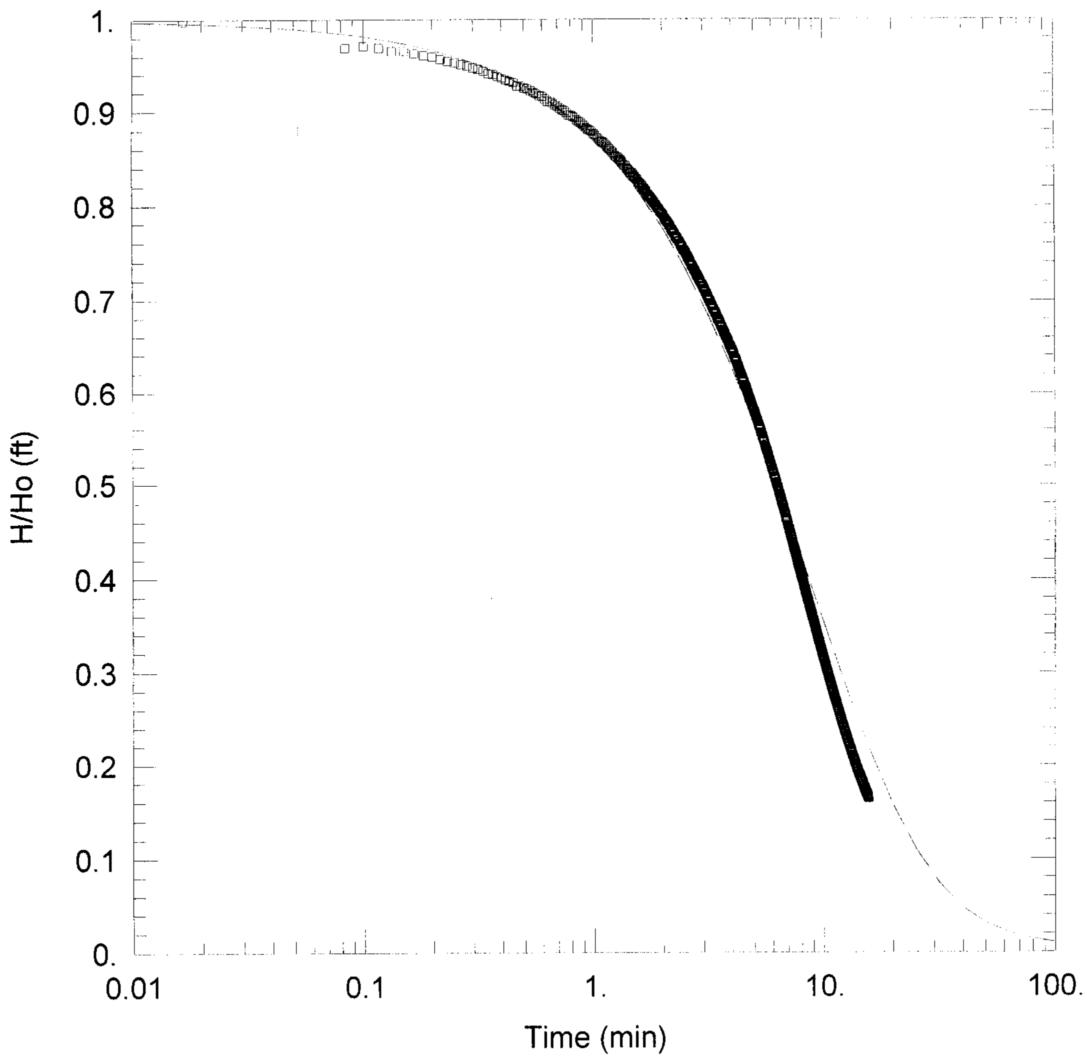
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 7.781 ft^2/day S = 1.E-10

I1

Test 21



70
60
50
40
30
20
10
0
Transducer submergence (ft)
9:50
10:00
10:10
10:20
10:30
10:40
10:50
Time on October 29, 2002
ΔH_0 = 48.04 ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-21(c).aqt
Date: 12/06/02 Time: 11:00:02

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

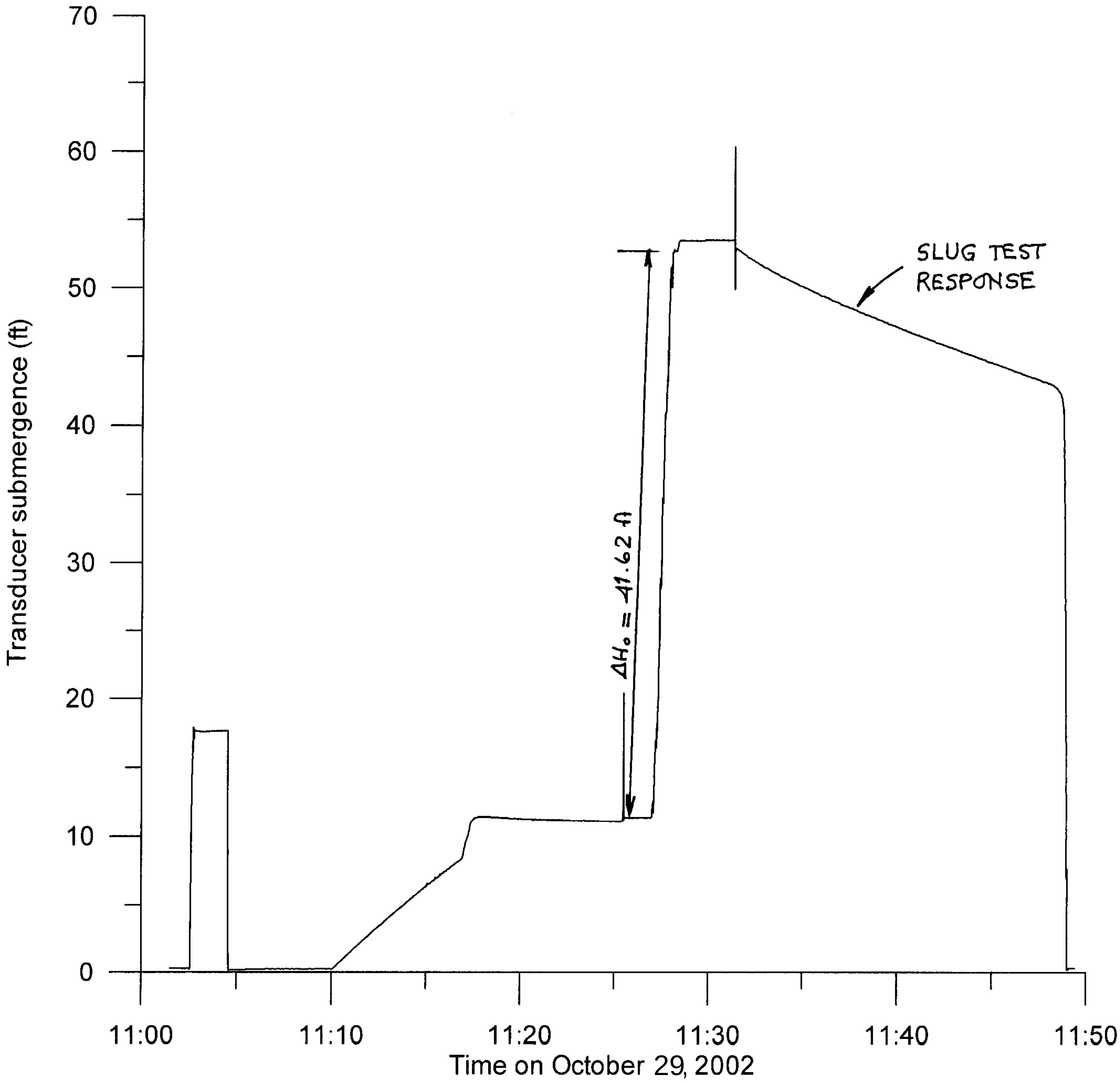
Initial Displacement: 48.04 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

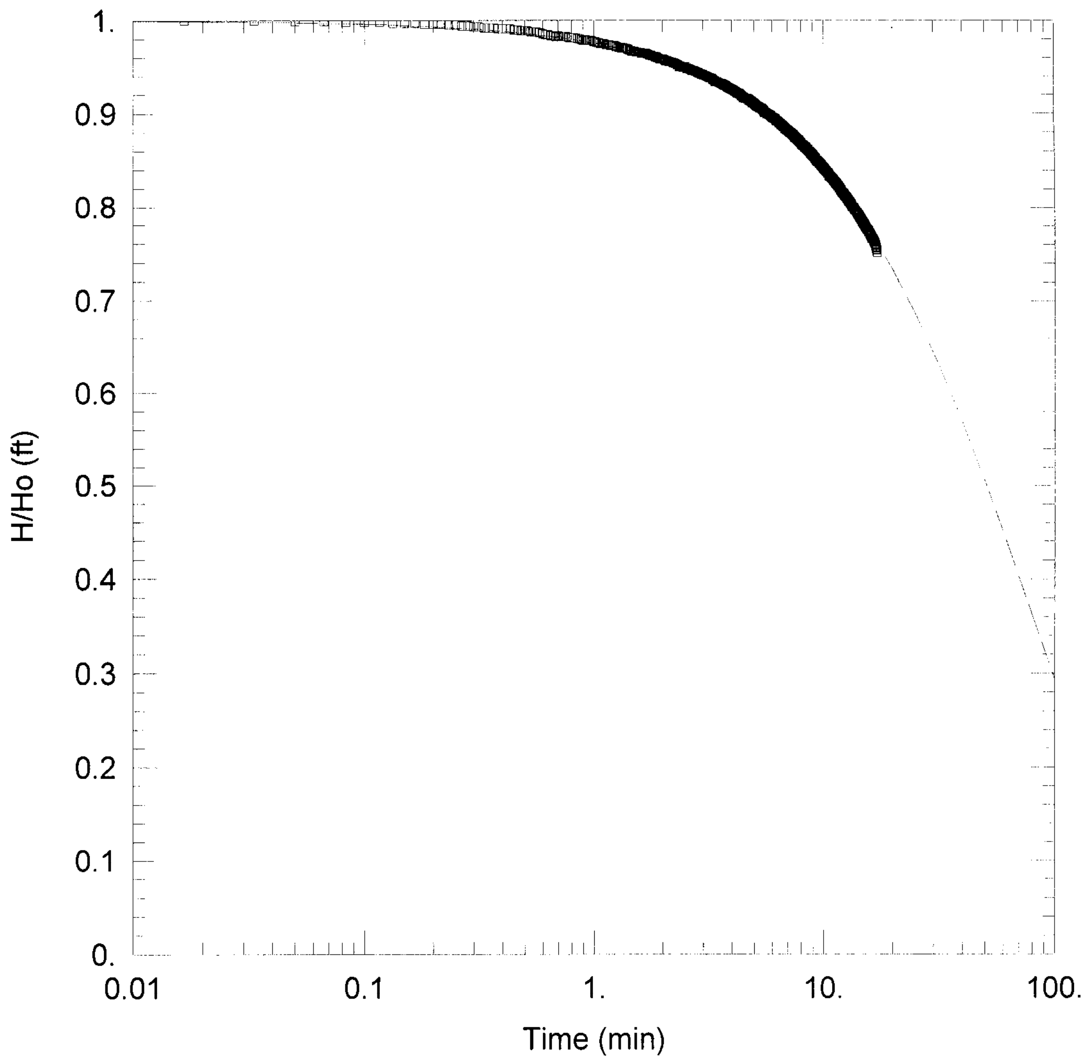
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
= 0.7835 ft^2/day
S = 1.E-06

I1

Test 22



70
60
50
40
30
20
10
0
Transducer submergence (ft)
11:00
11:10
11:20
11:30
11:40
11:50
Time on October 29, 2002
ΔH₀ = 41.62 ft
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-22(c).aqt
Date: 12/06/02 Time: 11:00:43

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

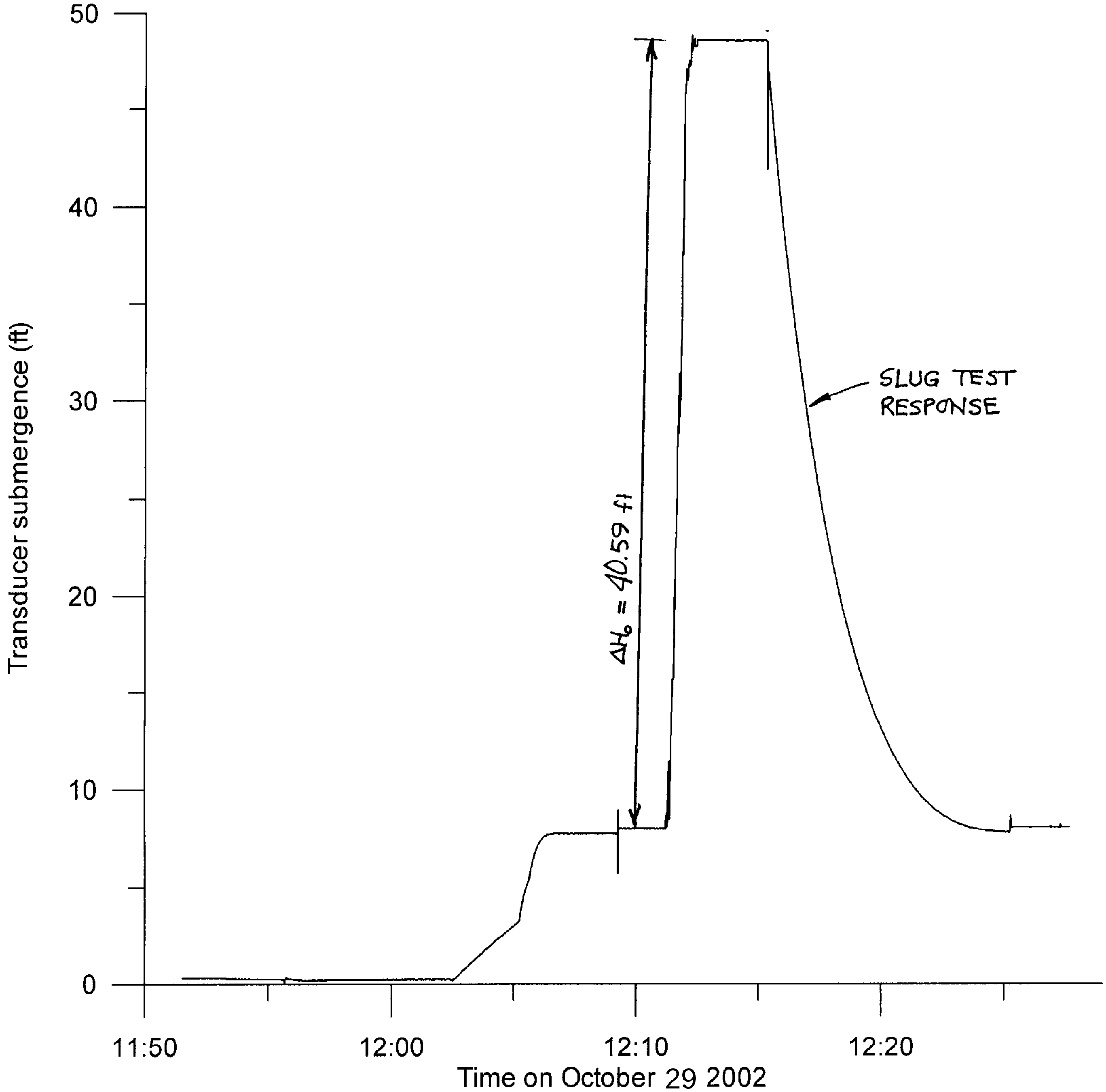
Initial Displacement: 41.62 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

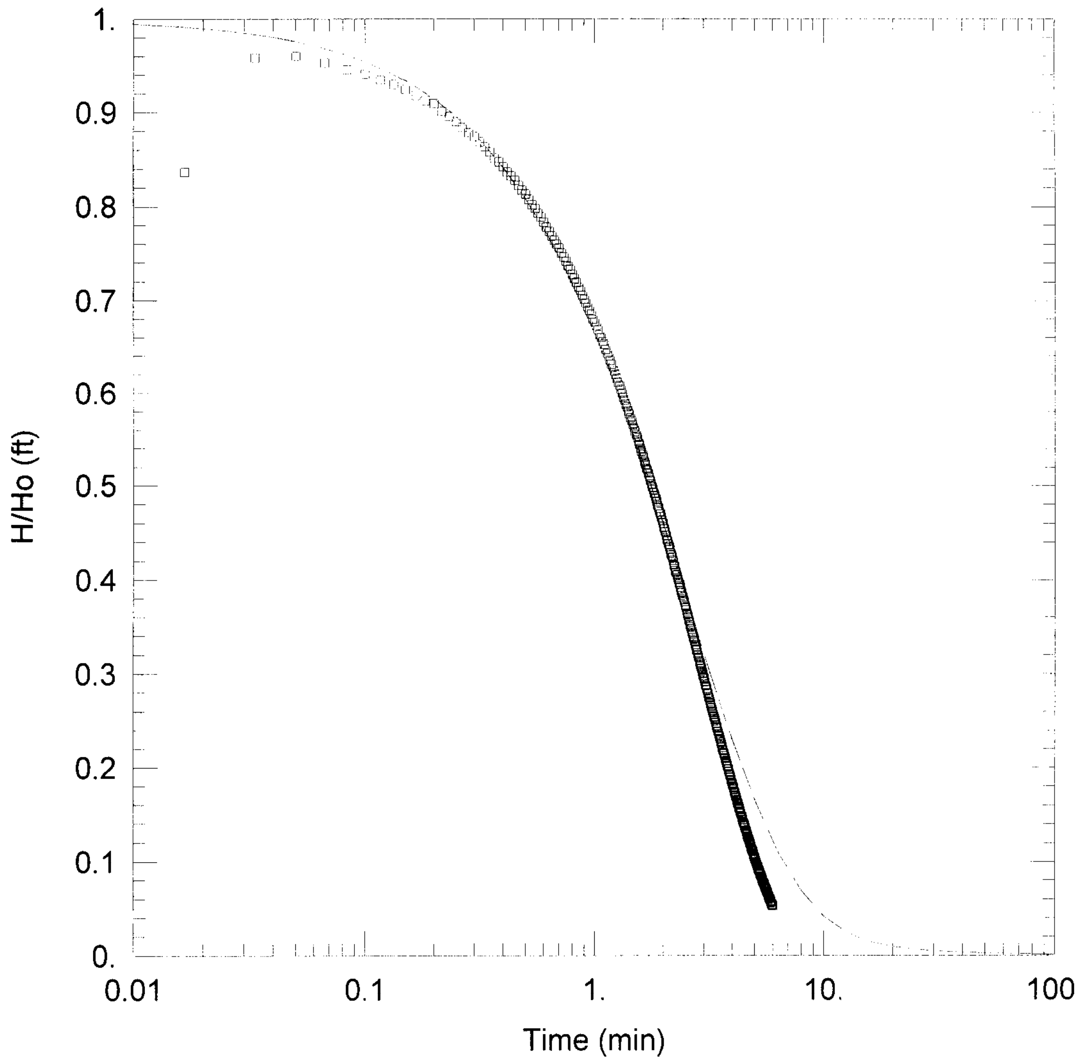
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.08181 ft^2/day
S = 4.584E-06

I1

Test 23



50
40
30
20
10
0
Transducer submergence (ft)
11:50
12:00
12:10
12:20
Time on October 29 2002
ΔH₀ = 40.59 ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-23(c).aqt
Date: 12/06/02 Time: 11:01:15

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

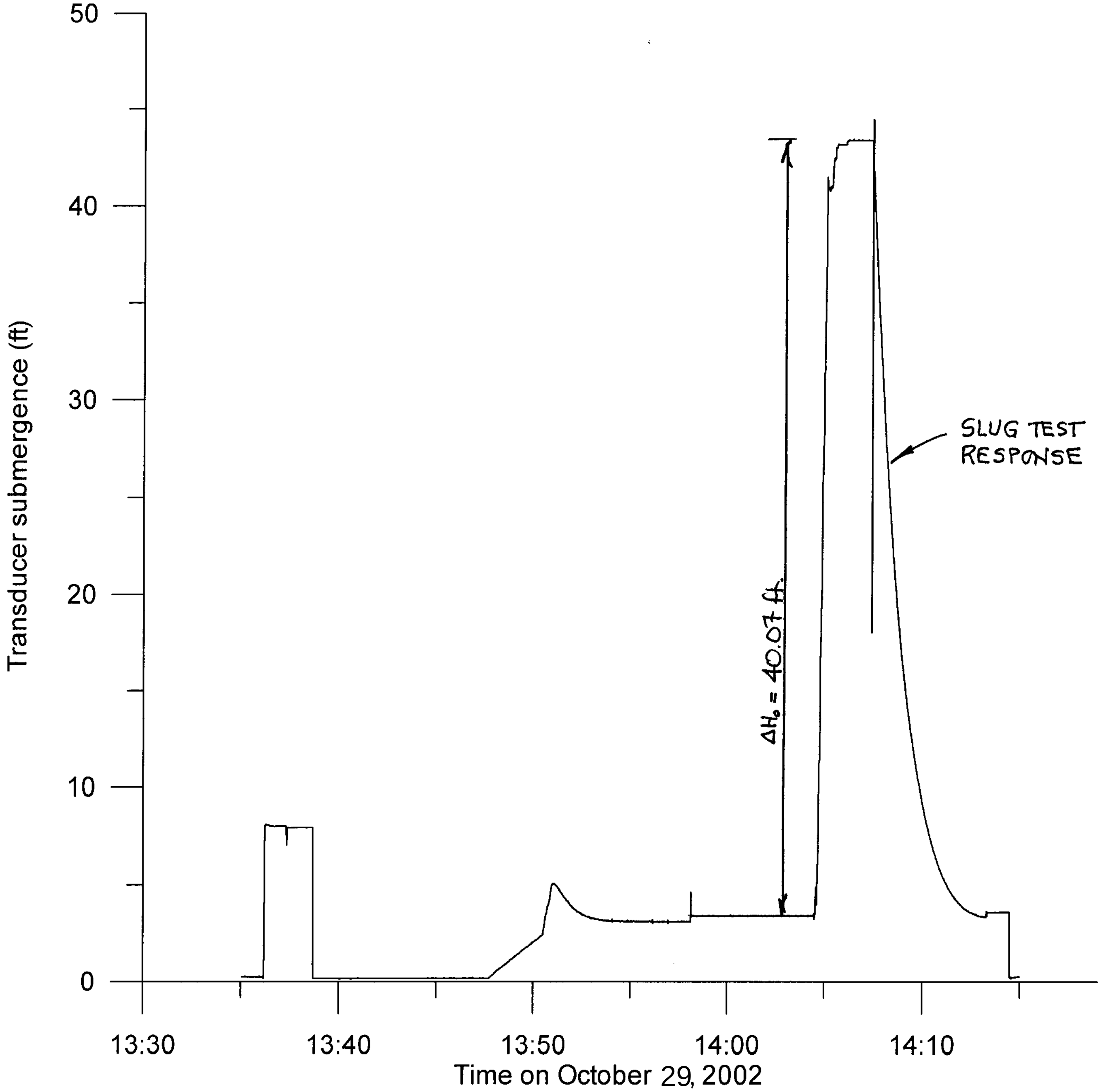
Initial Displacement: 40.59 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

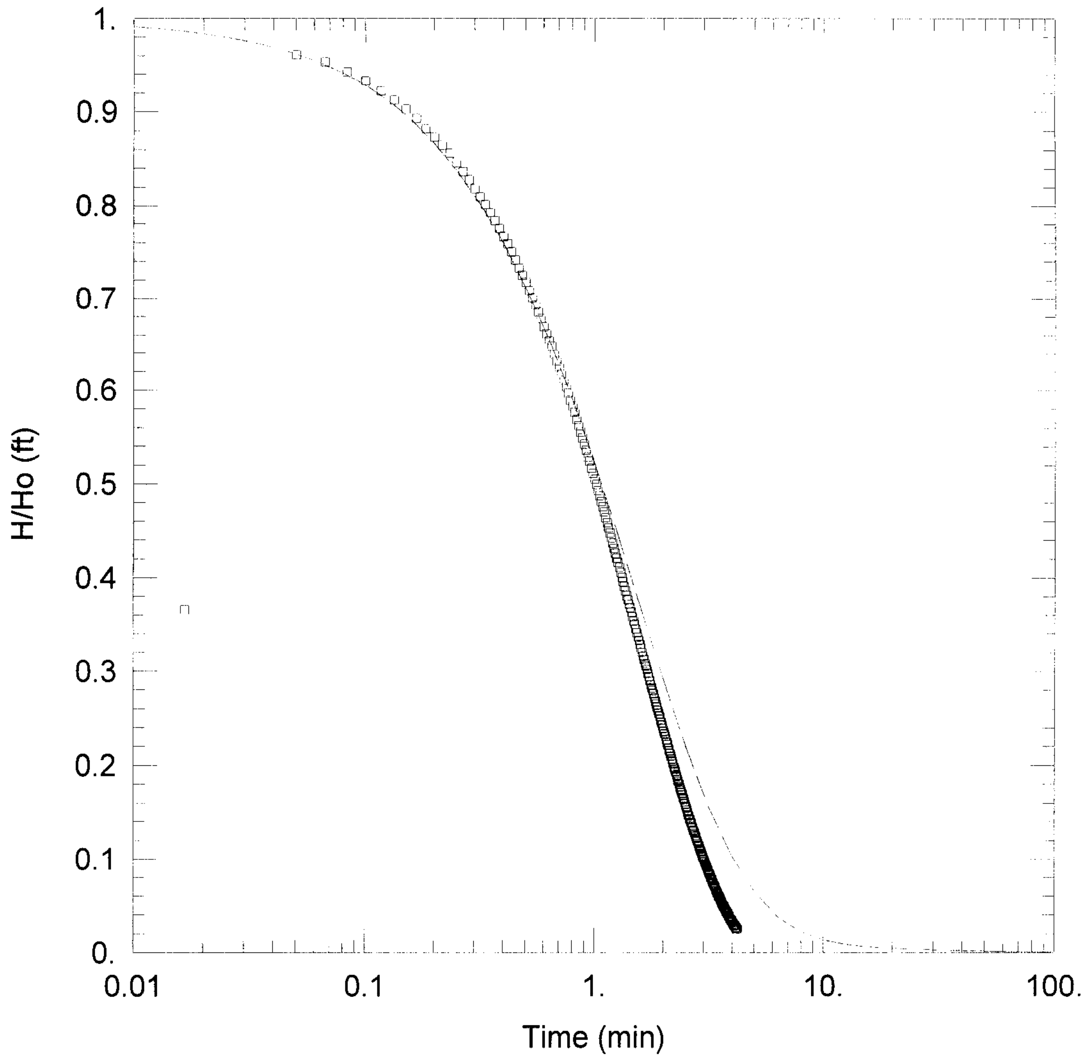
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 5.188 ft^2/day S = 1.E-10

I1

Test 24



50
40
30
20
10
0
Transducer submergence (ft)
13:30
13:40
13:50
14:00
14:10
Time on October 29, 2002
ΔH₀ = 40.07 ft.
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-24(c).aqt
Date: 12/06/02 Time: 11:02:37

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 40.07 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

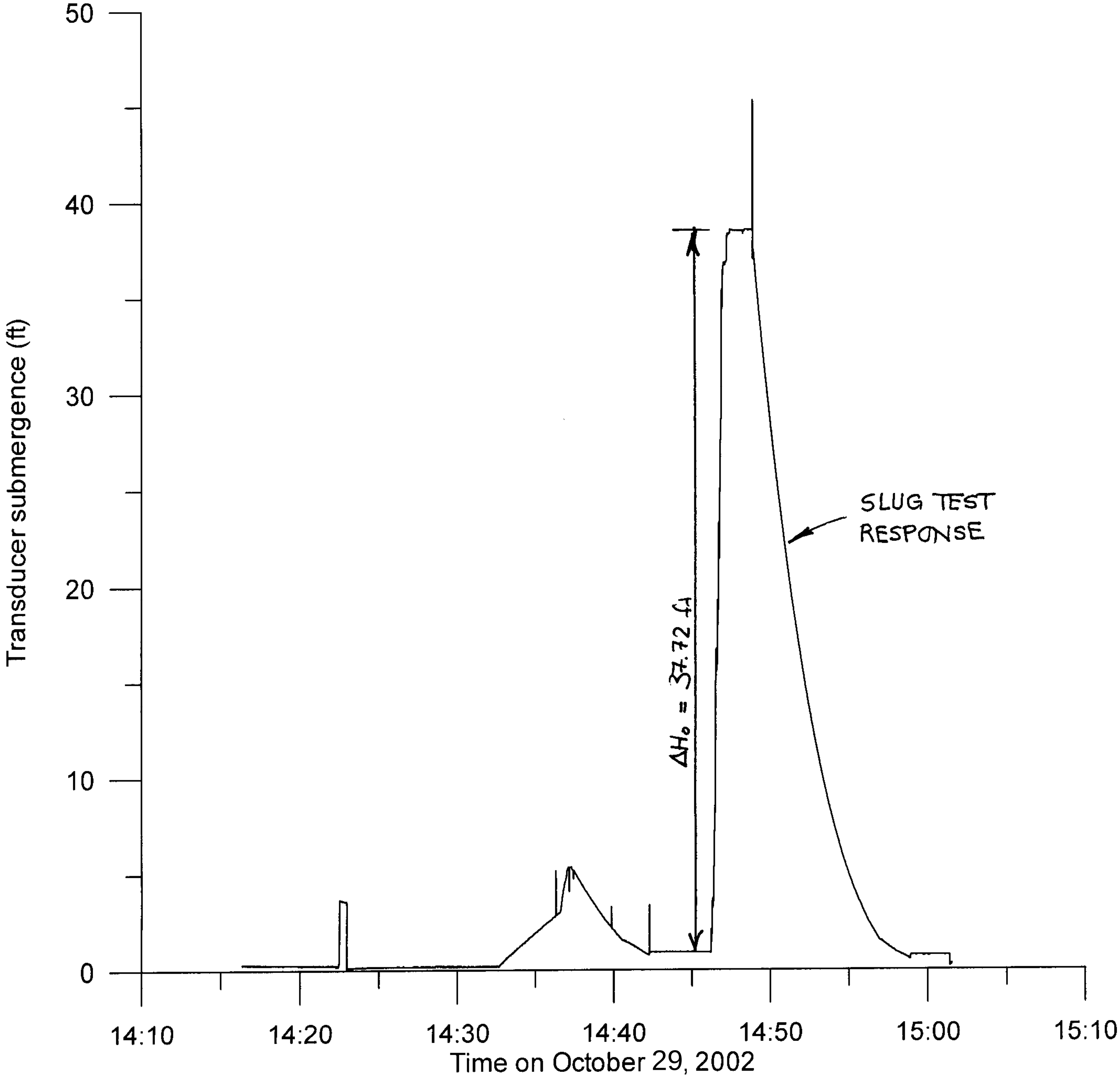
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

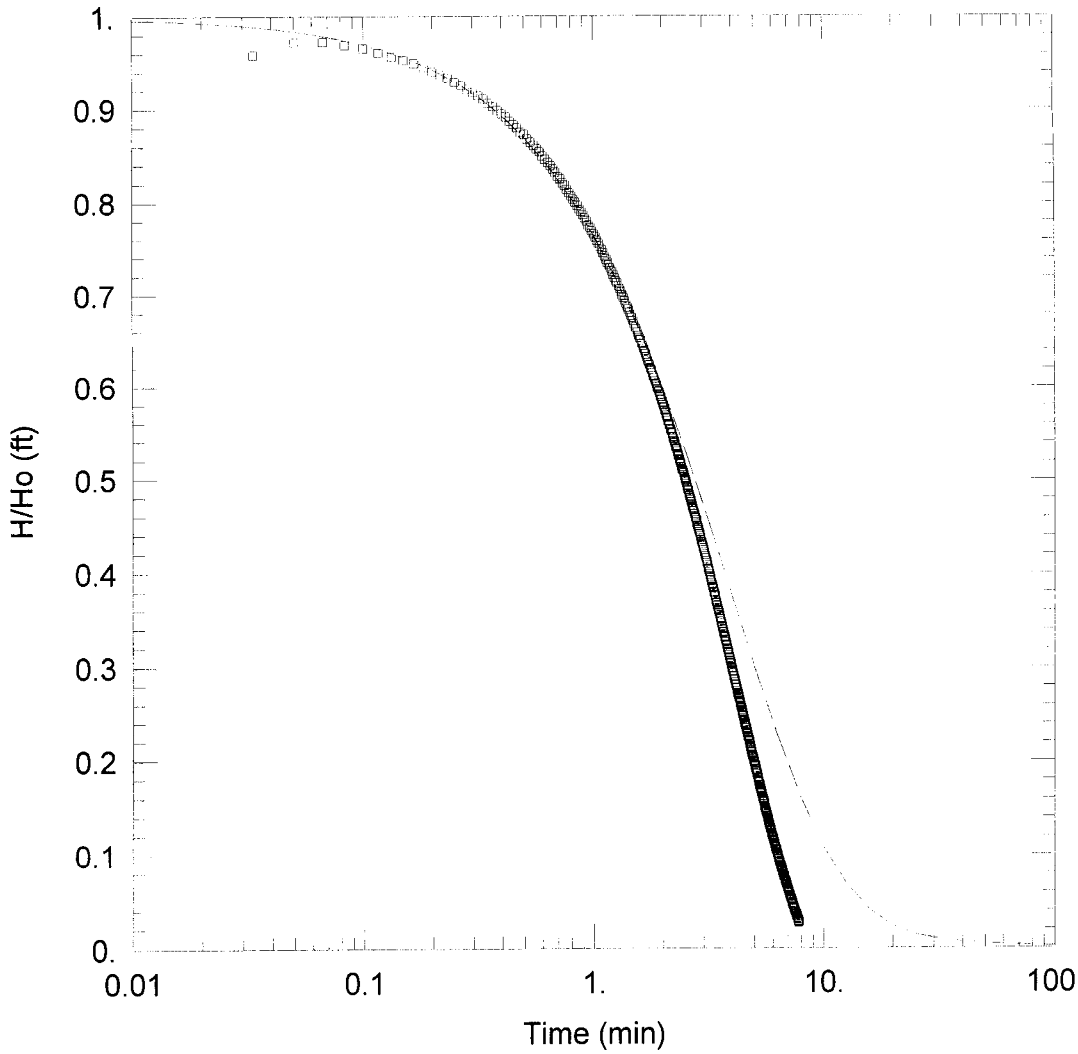
, = 8.528 ft^2/day S = 1.E-10

I1

Test 25



50
40
30
20
10
0
Transducer submergence (ft)
14:10
14:20
14:30
14:40
14:50
15:00
15:10
Time on October 29, 2002
ΔH_o = 37.72 ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-25(c).aqt
Date: 12/06/02 Time: 11:01:55

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 37.72 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

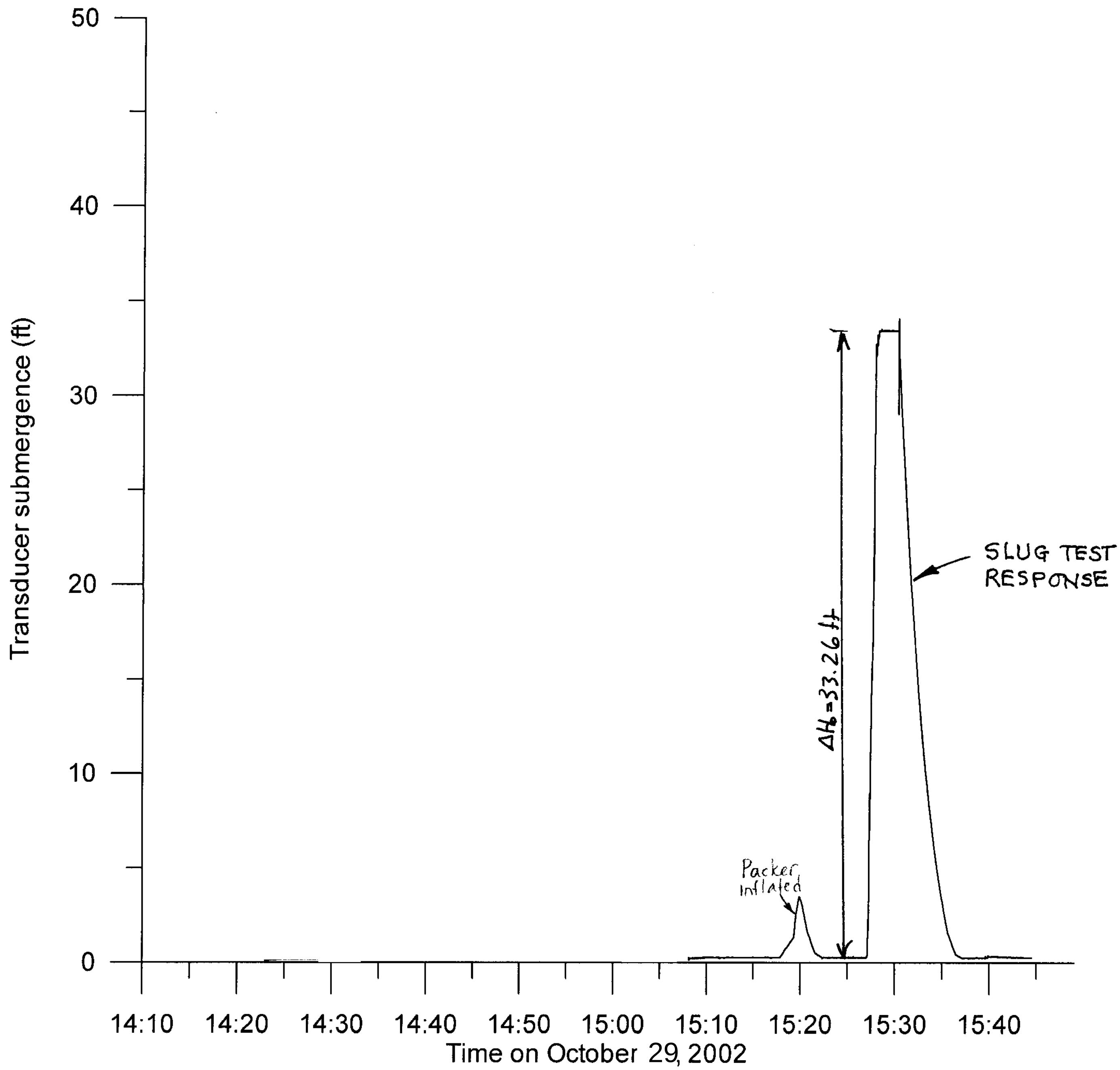
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

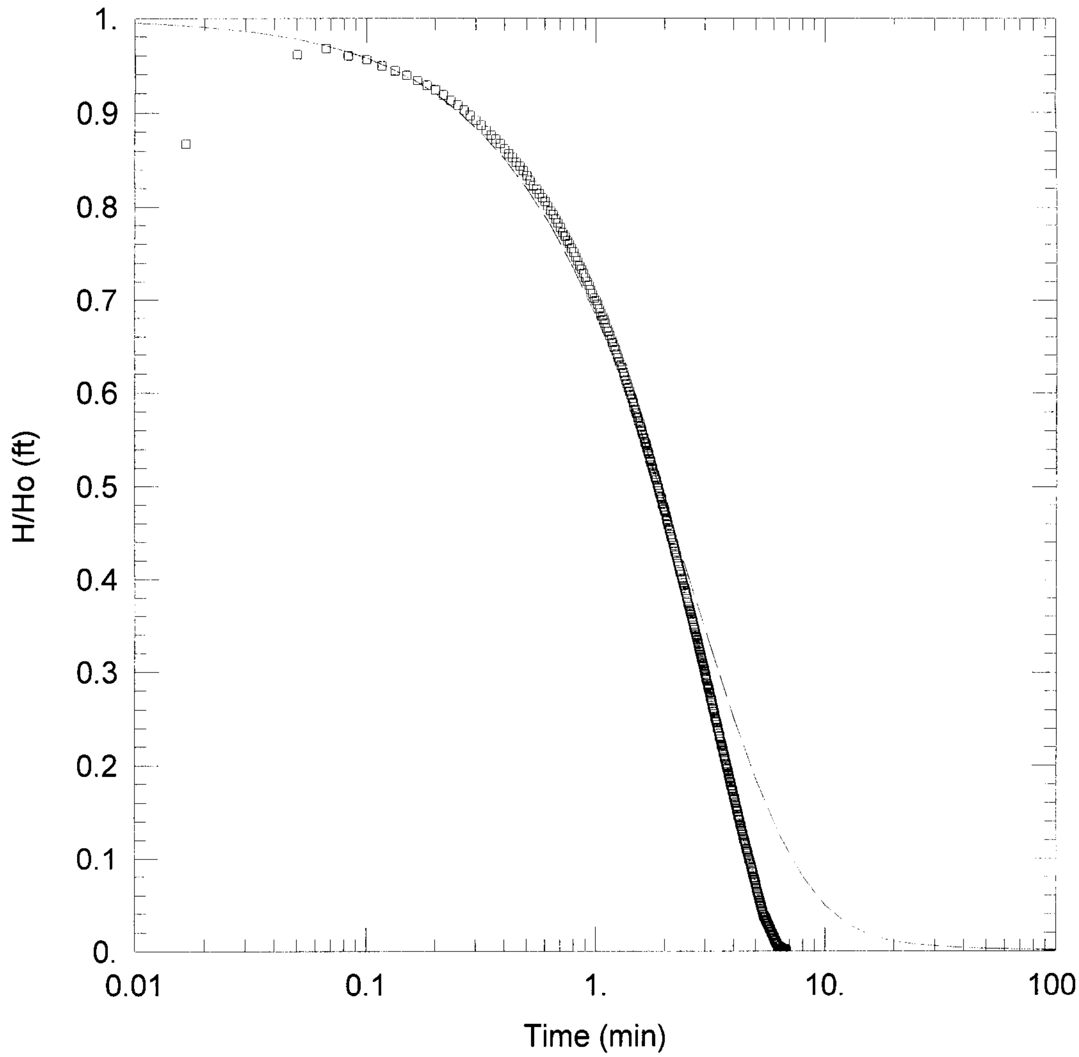
T = 3.329 ft^2/day
S = 1.E-10

I1

Test 26



50
40
30
20
10
0
Transducer submergence (ft)
14:10
14:20
14:30
14:40
14:50
15:00
15:10
15:20
15:30
15:40
Time on October 29, 2002
Packer inflated
ΔH₀=33.26 ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-26(c).aqt
Date: 12/06/02 Time: 12:48:17

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

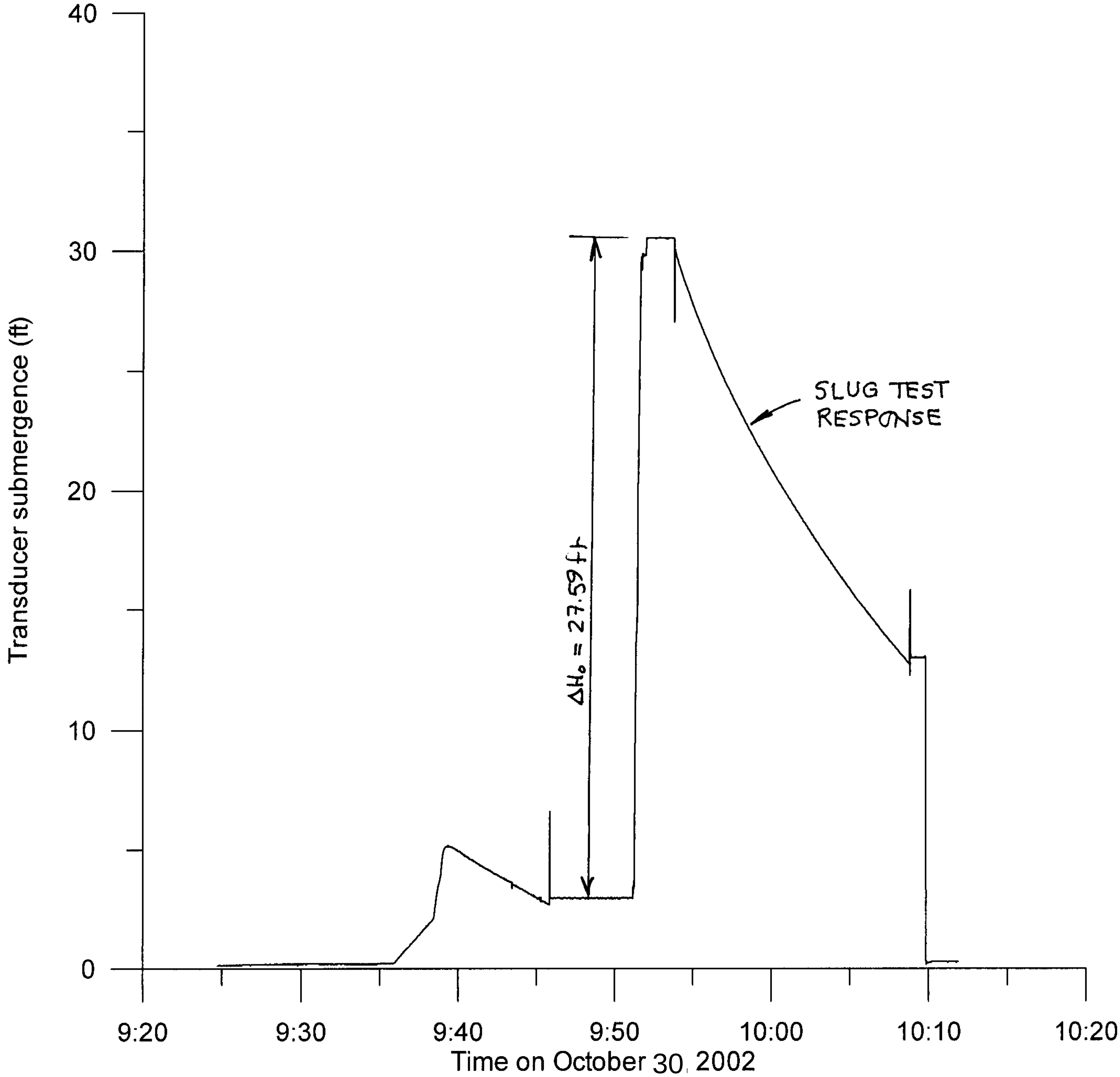
Initial Displacement: 33.26 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

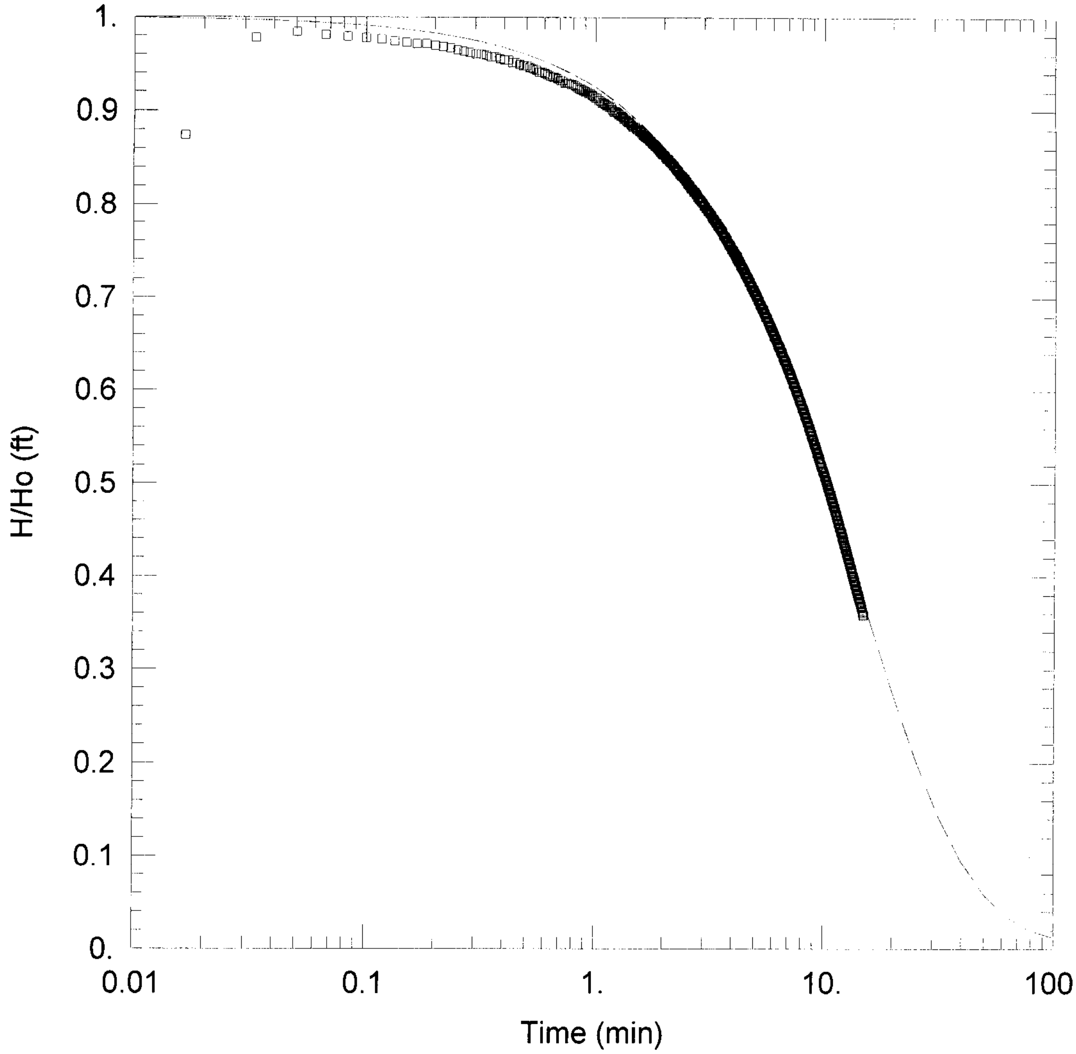
Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 4.829 ft^2/day S = 1.E-10

I1

Test 27



40
30
20
10
0
Transducer submergence (ft)
9:20
9:30
9:40
9:50
10:00
10:10
10:20
Time on October 30, 2002
ΔH₀ = 27.59 ft
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-27(c).aqt
Date: 12/06/02 Time: 12:48:23

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 27.59 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

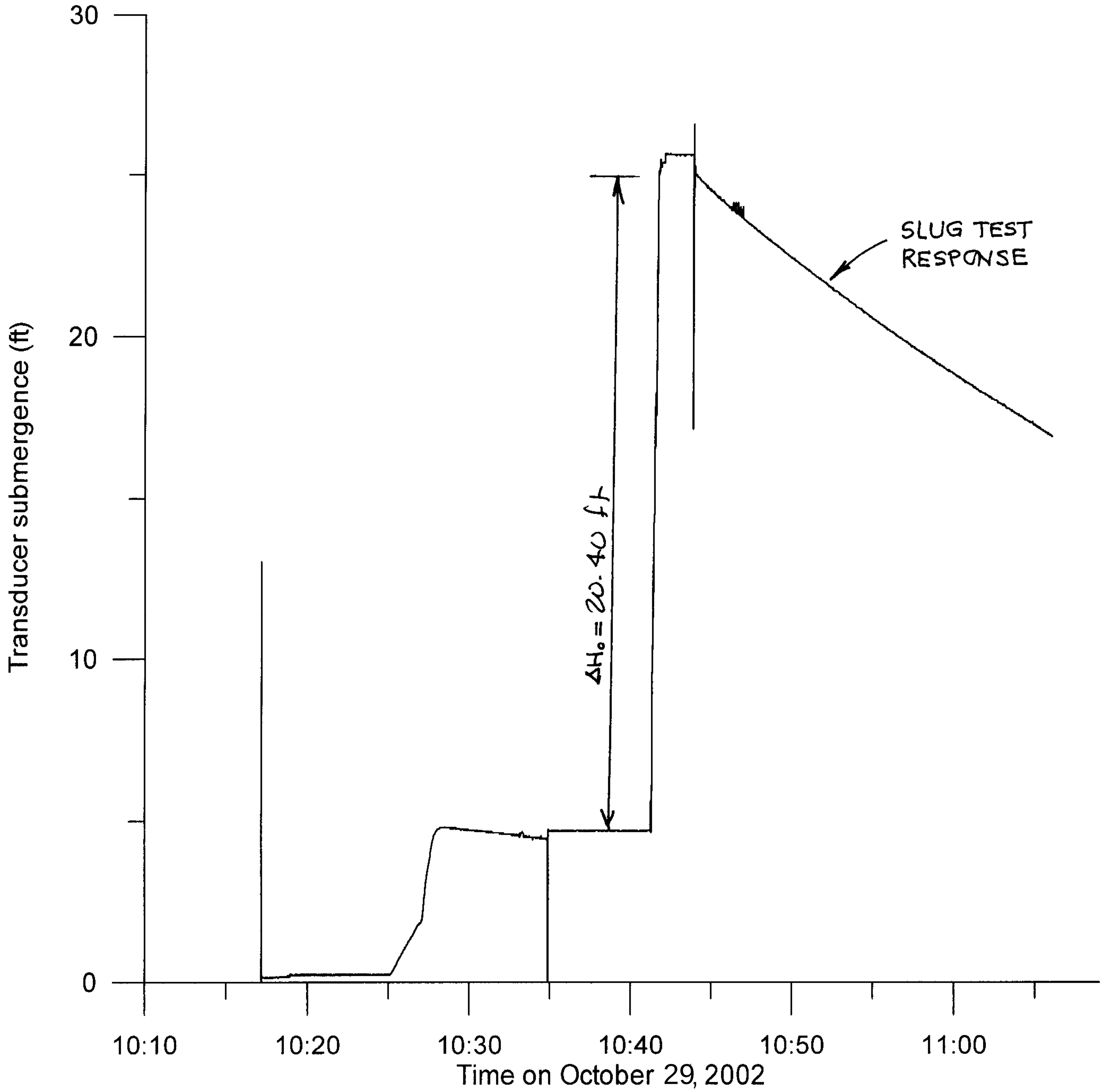
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

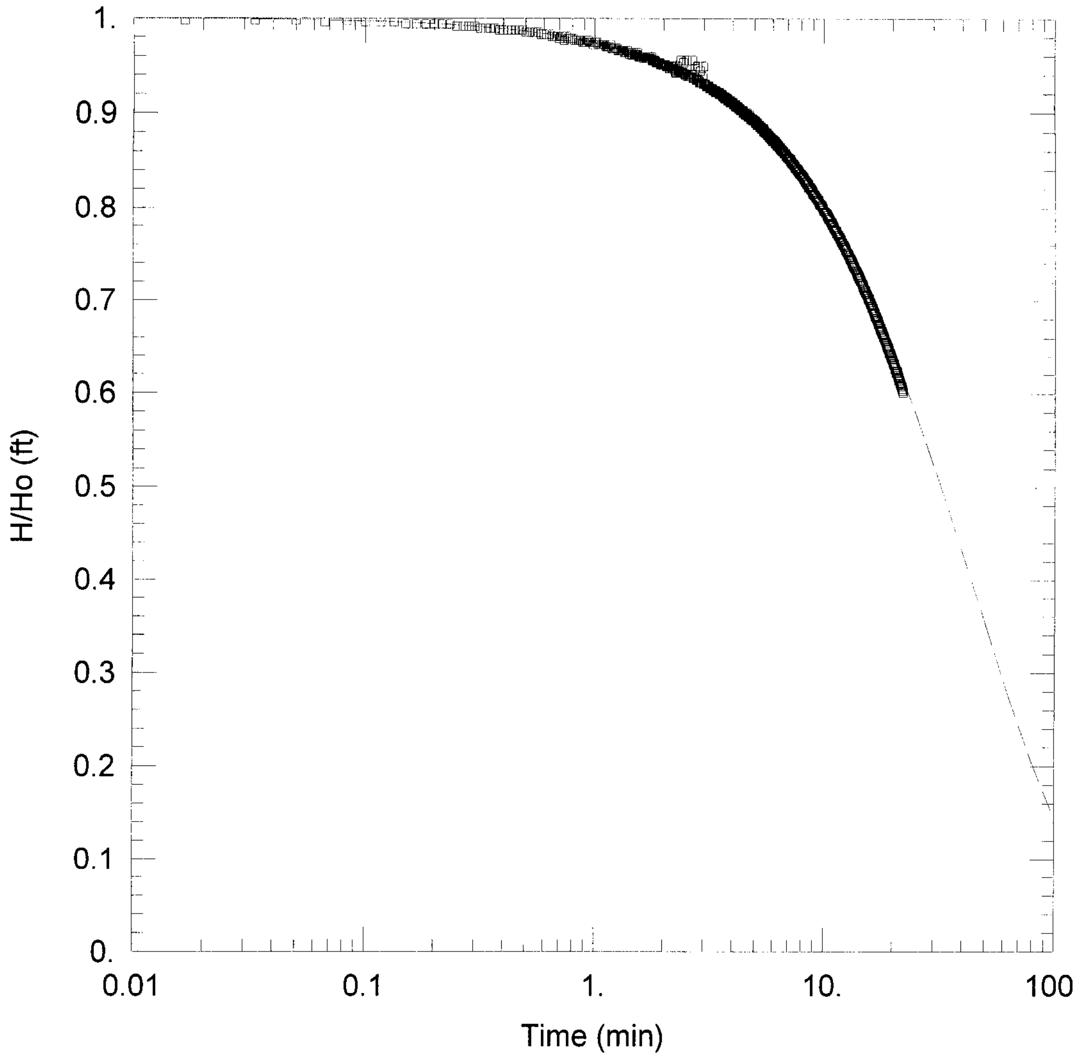
T = 0.8941 ft^2/day
S = 1.E-10

I1

Test 28



30
20
10
0
Transducer submergence (ft)
10:10
10:20
10:30
10:40
10:50
11:00
Time on October 29, 2002
ΔH₀ = 20.40 ft
SLUG TEST
RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-28(c).aqt
Date: 12/06/02 Time: 12:48:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 20.4 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

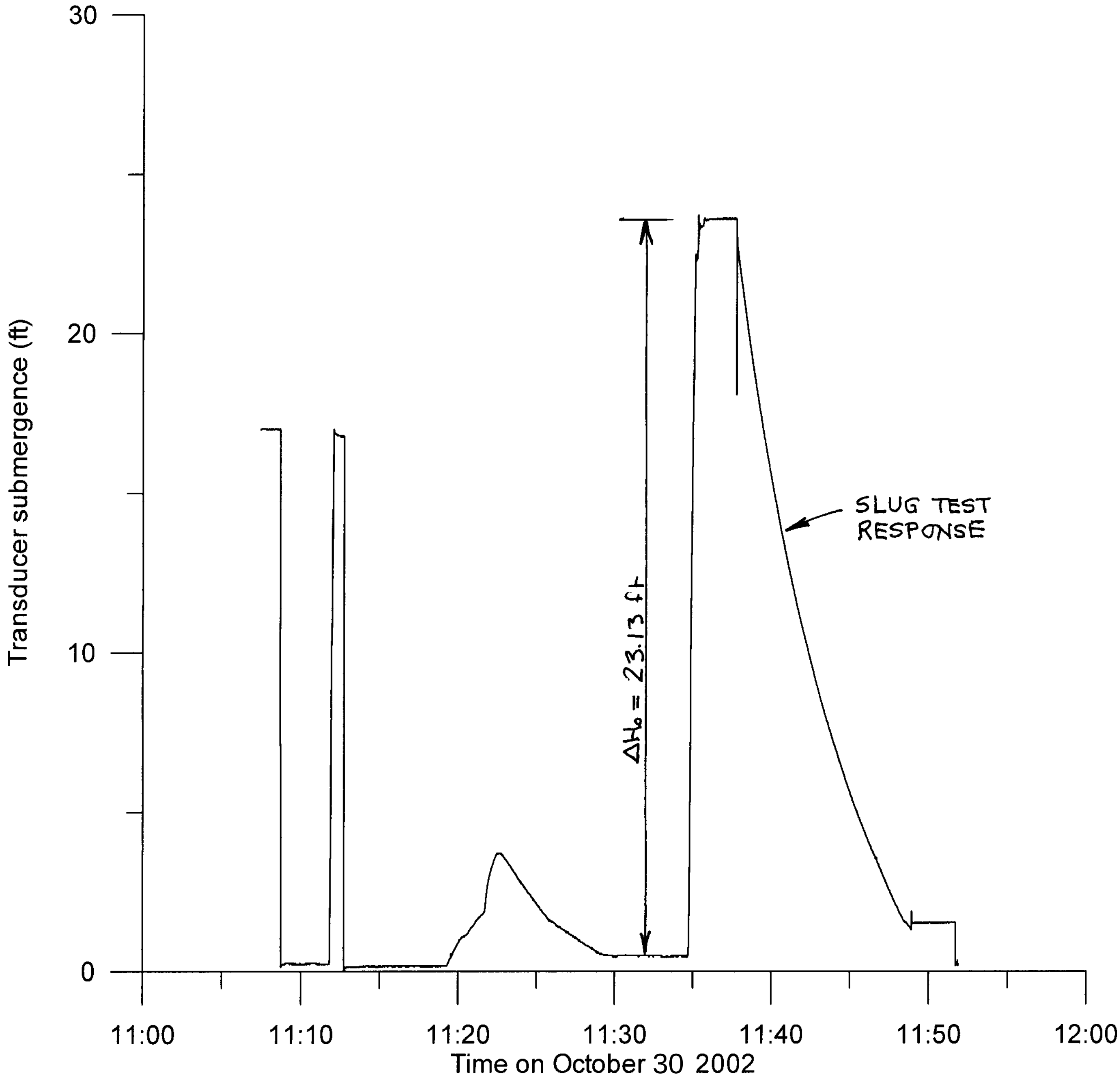
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

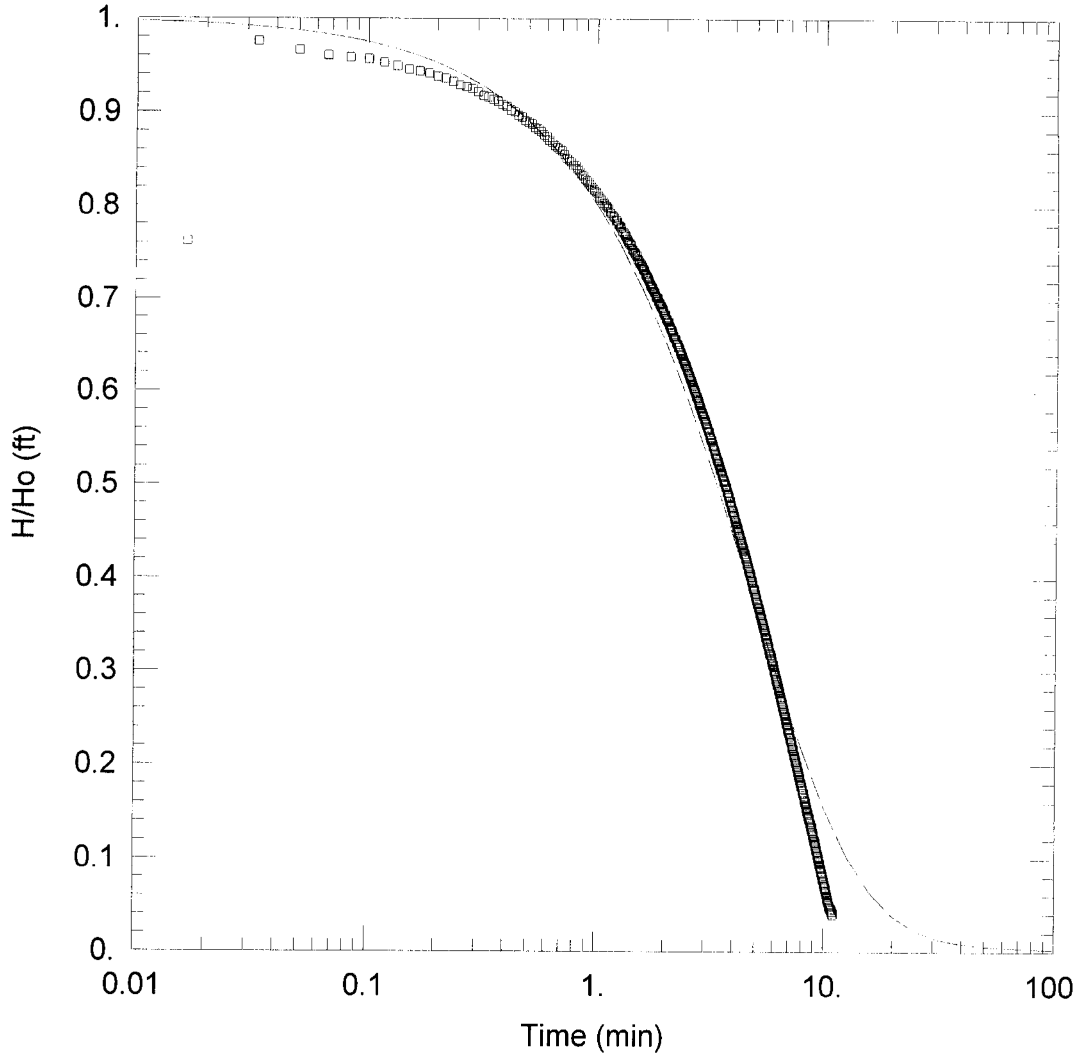
T = 0.2824 ft^2/day S = 1.E-10

I1

Test 29



30
20
10
0
Transducer submergence (ft)
11:00
11:10
11:20
11:30
11:40
11:50
12:00
Time on October 30 2002
ΔH₀ = 23.13 ft
SLUG TEST RESPONSE



WELL TEST ANALYSIS

Data Set: S:\Packer testing\I1\i1-29(c).aqt
Date: 12/06/02

Time: 12:48:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

Saturated Thickness: 1. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 23.13 ft
Wellbore Radius: 0.2448 ft
Screen Length: 1. ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.2448 ft
Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined

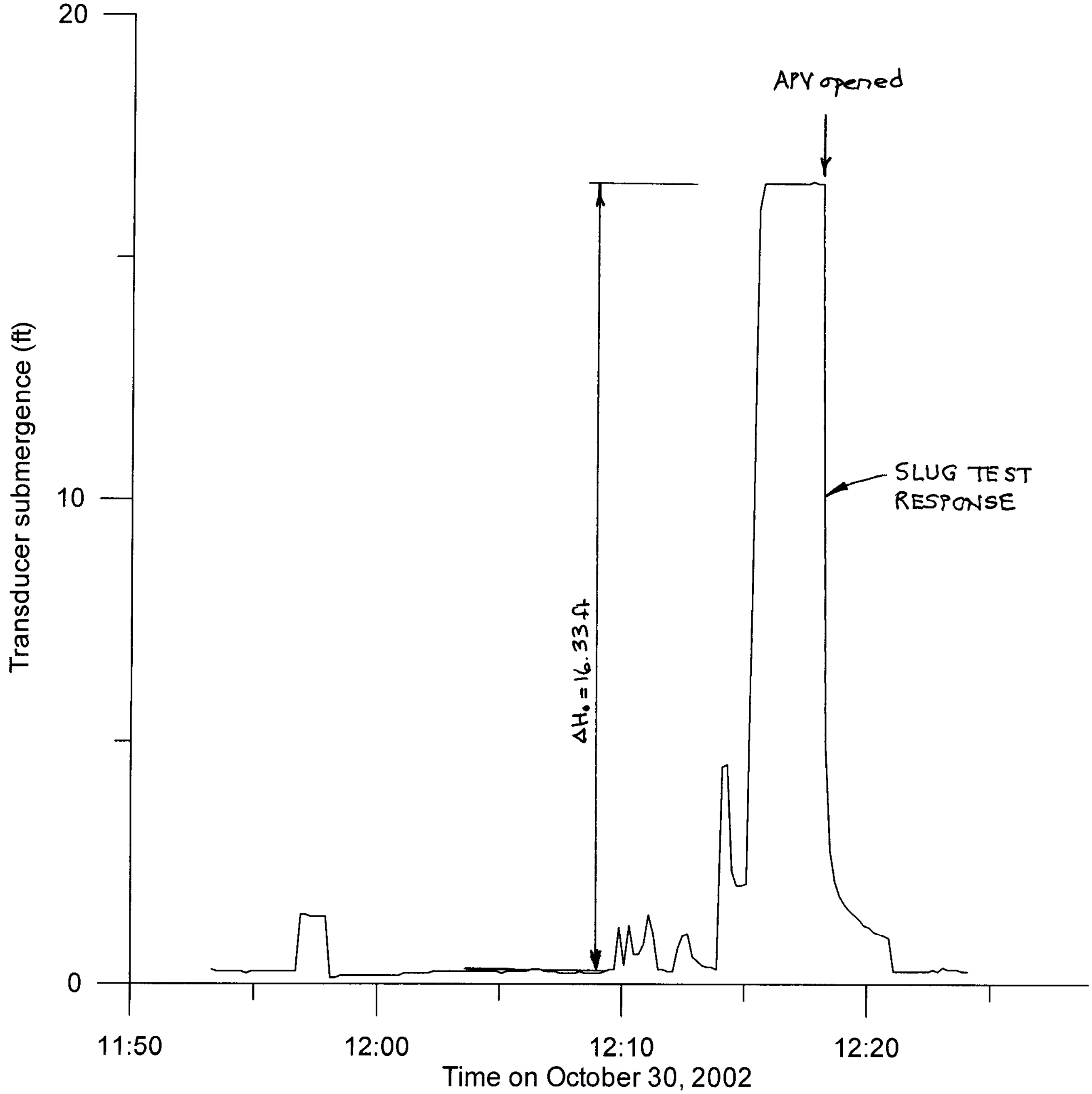
Solution Method: Cooper-Bredehoeft-Papadopulos

. = 2.704 ft^2/day

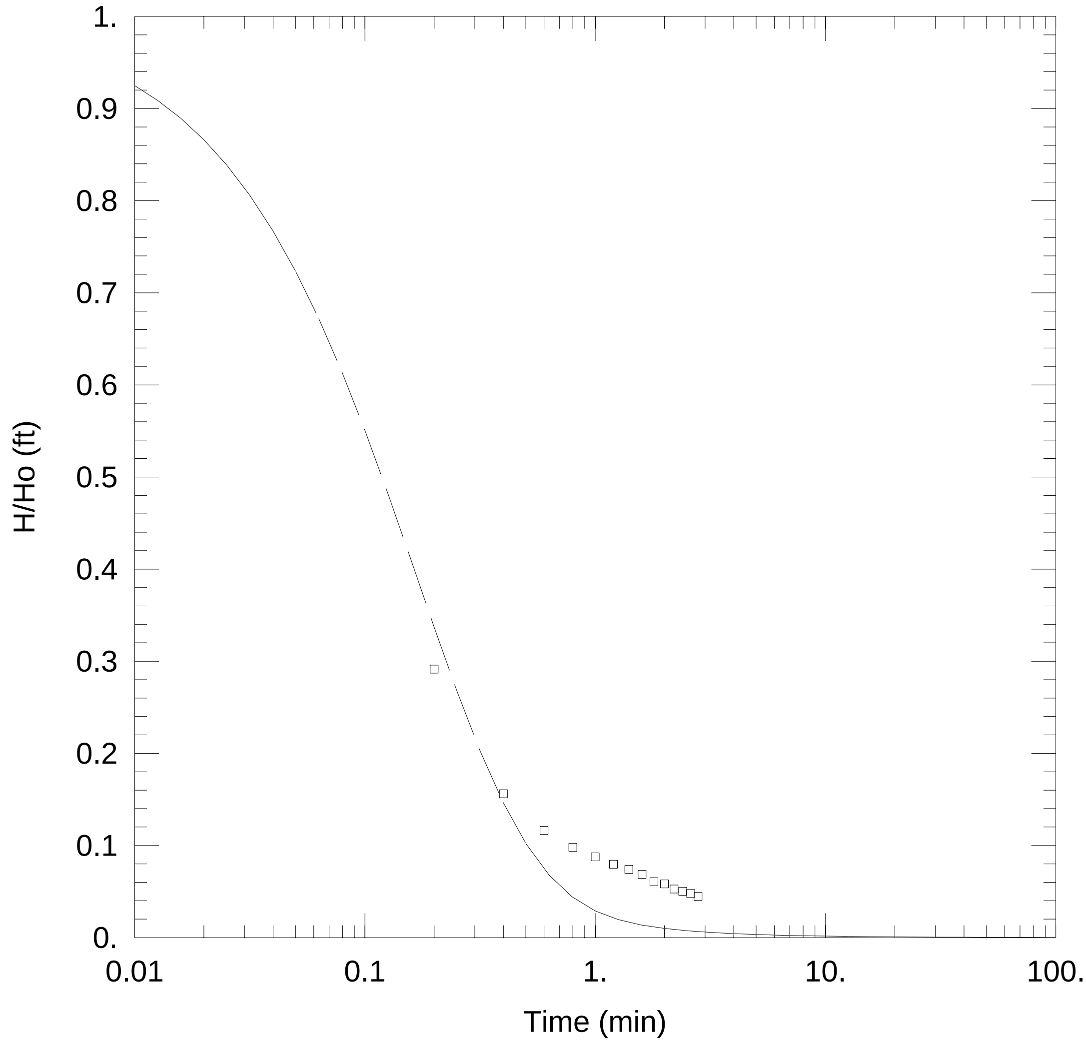
S = 1.E-10

I1

Test 30



Data available only once every 12 seconds.



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\I1\i1-30(c).aqt
Date: 01/22/03 Time: 16:03:44

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates
Project: SSP-610

AQUIFER DATA

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

WELL DATA

Initial Displacement: 16.33 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.2448 ft Well Skin Radius: 0.2448 ft
Screen Length: 1. ft Total Well Penetration Depth: 1. ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

$T = 41.13\ ft^2/day$ S = 1.E-06

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

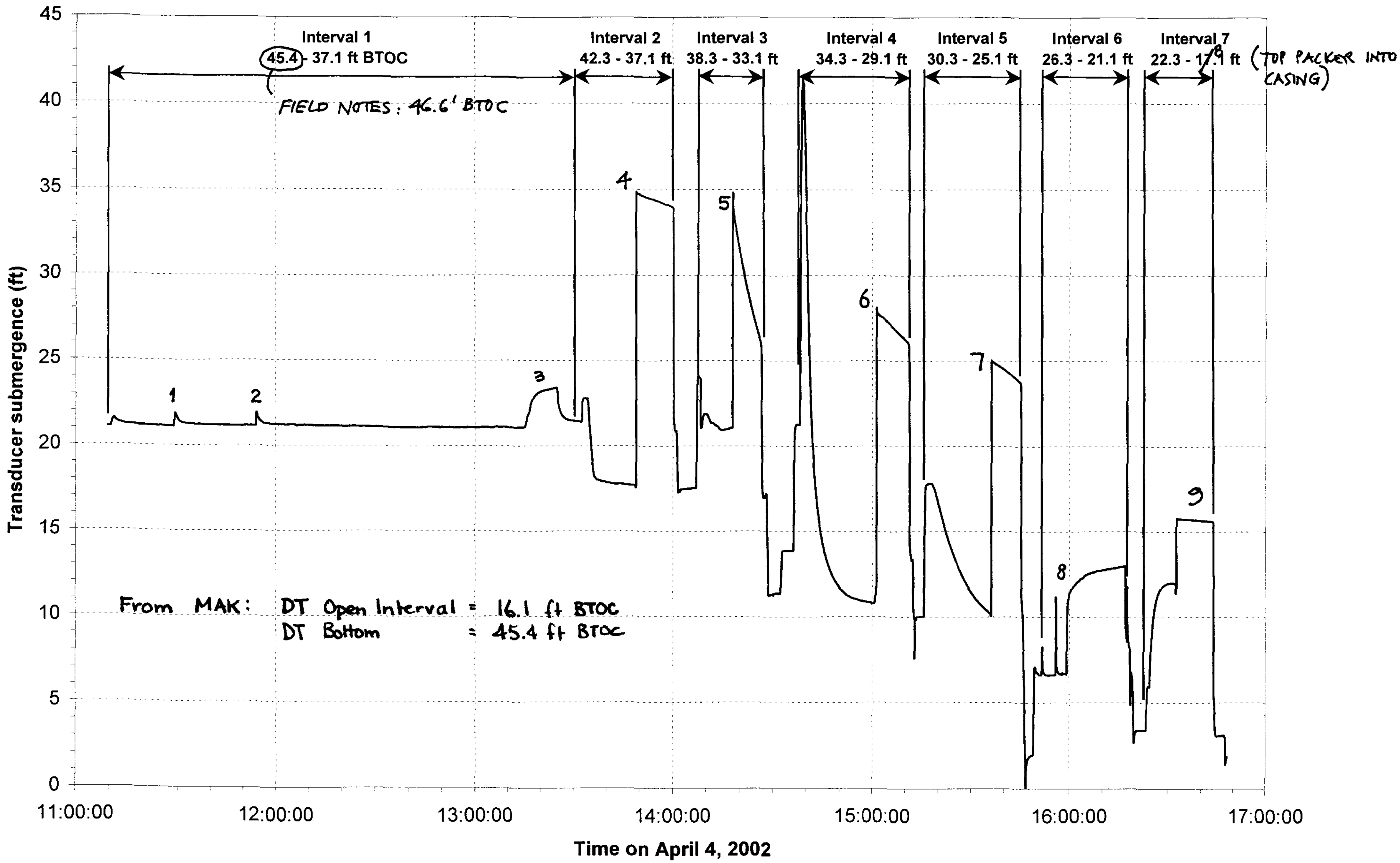
J1U

Testing Dates: April 4, 2002
April 15, 2002 (Retest of Interval 571.76 to 562.26 ft MSL)

Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
J1U	1	571.76	562.26	0.13	
J1U	2	571.76	566.56	0.022	
J1U	3	575.76	570.56	0.65	
J1U	4	579.76	574.56	0.084	
J1U	5	583.76	578.56	0.04	
J1U	6P	587.76	582.56	89	
J1U	7	591.76	586.56	0.03	

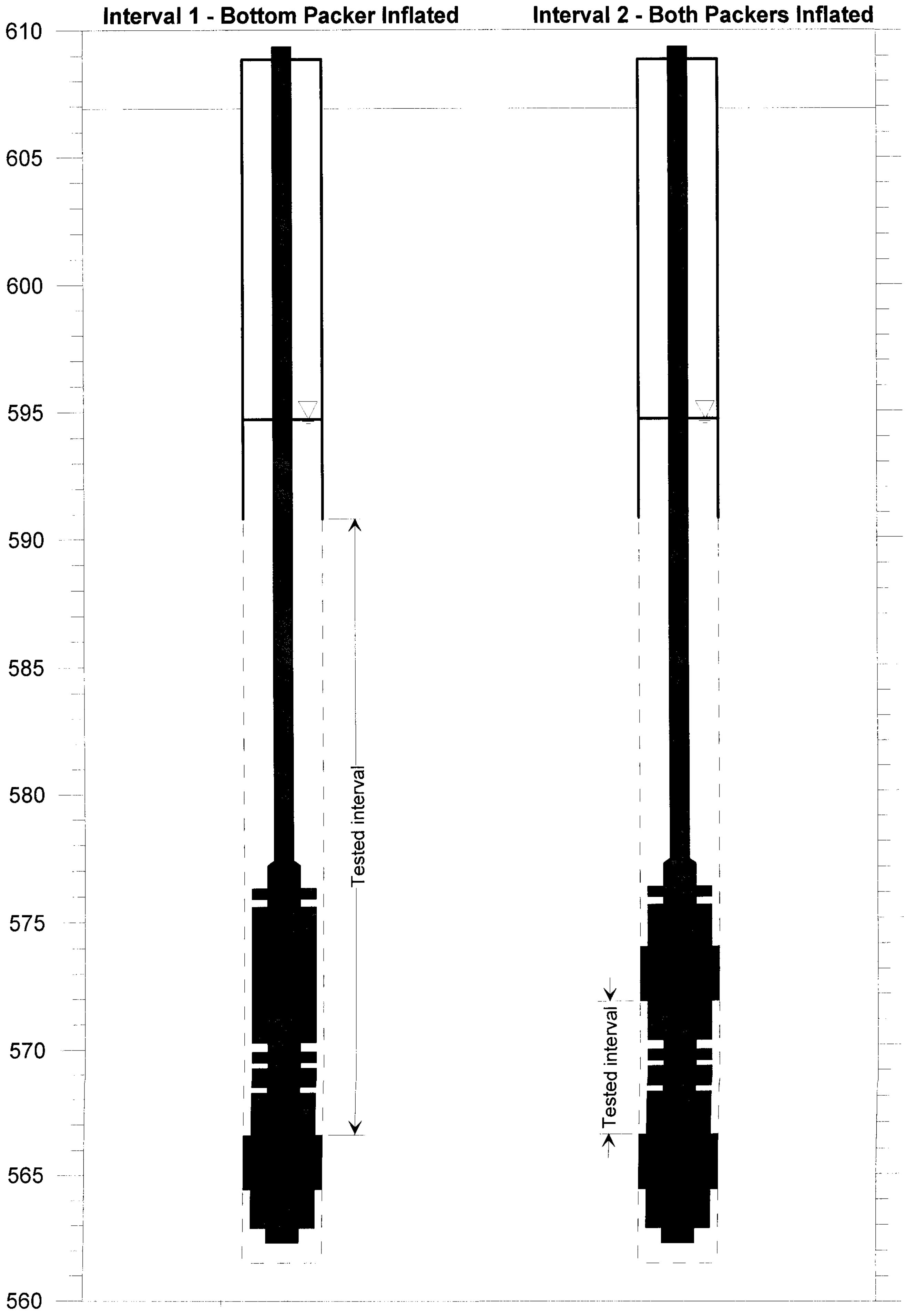
J1U

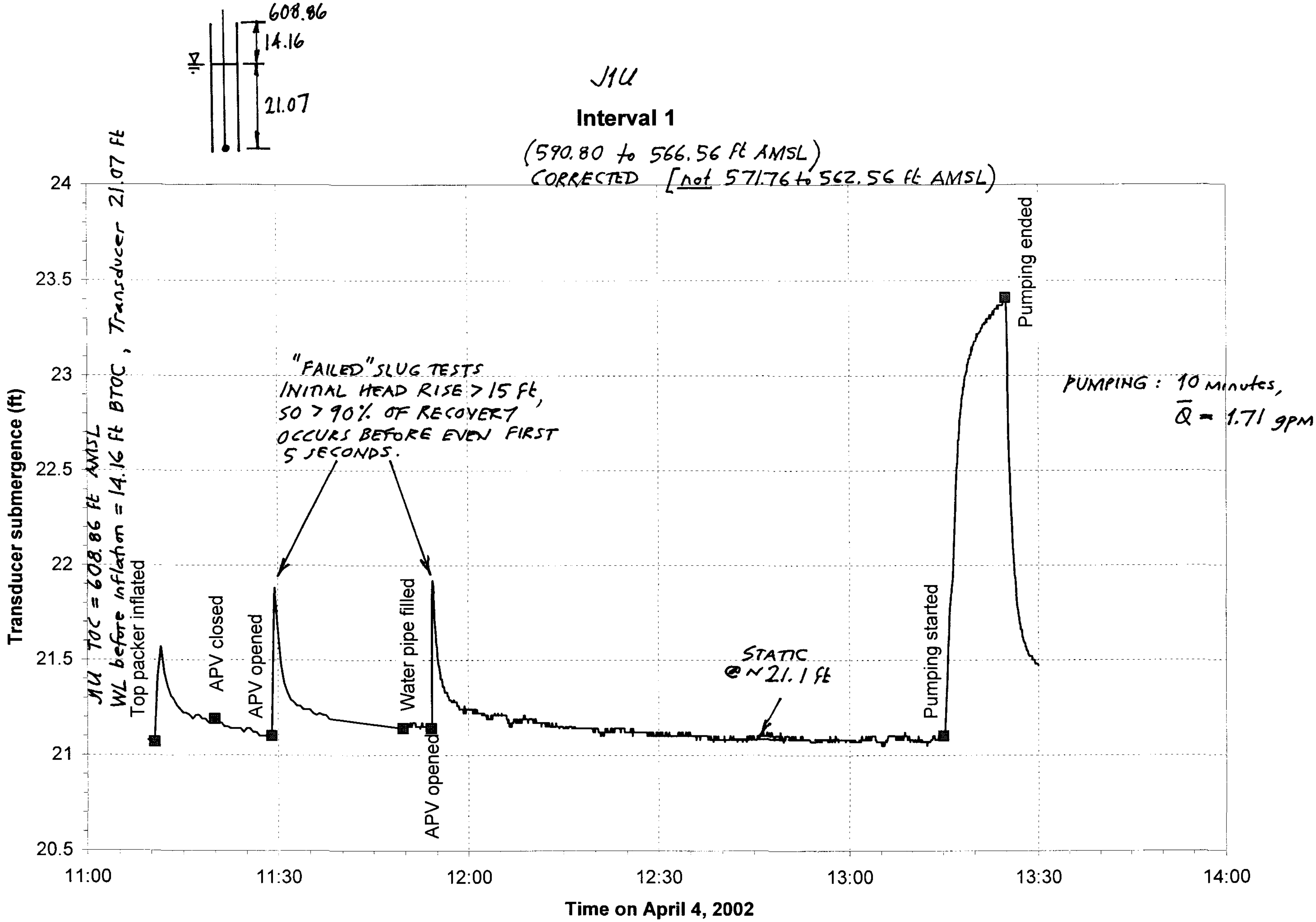


Interval 1
45.4 - 37.1 ft BTOC
FIELD NOTES: 46.6' BTOC
Interval 2
42.3 - 37.1 ft
Interval 3
38.3 - 33.1 ft
Interval 4
34.3 - 29.1 ft
Interval 5
30.3 - 25.1 ft
Interval 6
26.3 - 21.1 ft
Interval 7
22.3 - 17.9 ft
(TOP PACKER INTO CASING)
1
2
3
4
5
6
7
8
9
From MAK: DT Open Interval = 16.1 ft BTOC
DT Bottom = 45.4 ft BTOC
Transducer submergence (ft)
45
40
35
30
25
20
15
10
5
0
11:00:00
12:00:00
13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
Time on April 4, 2002

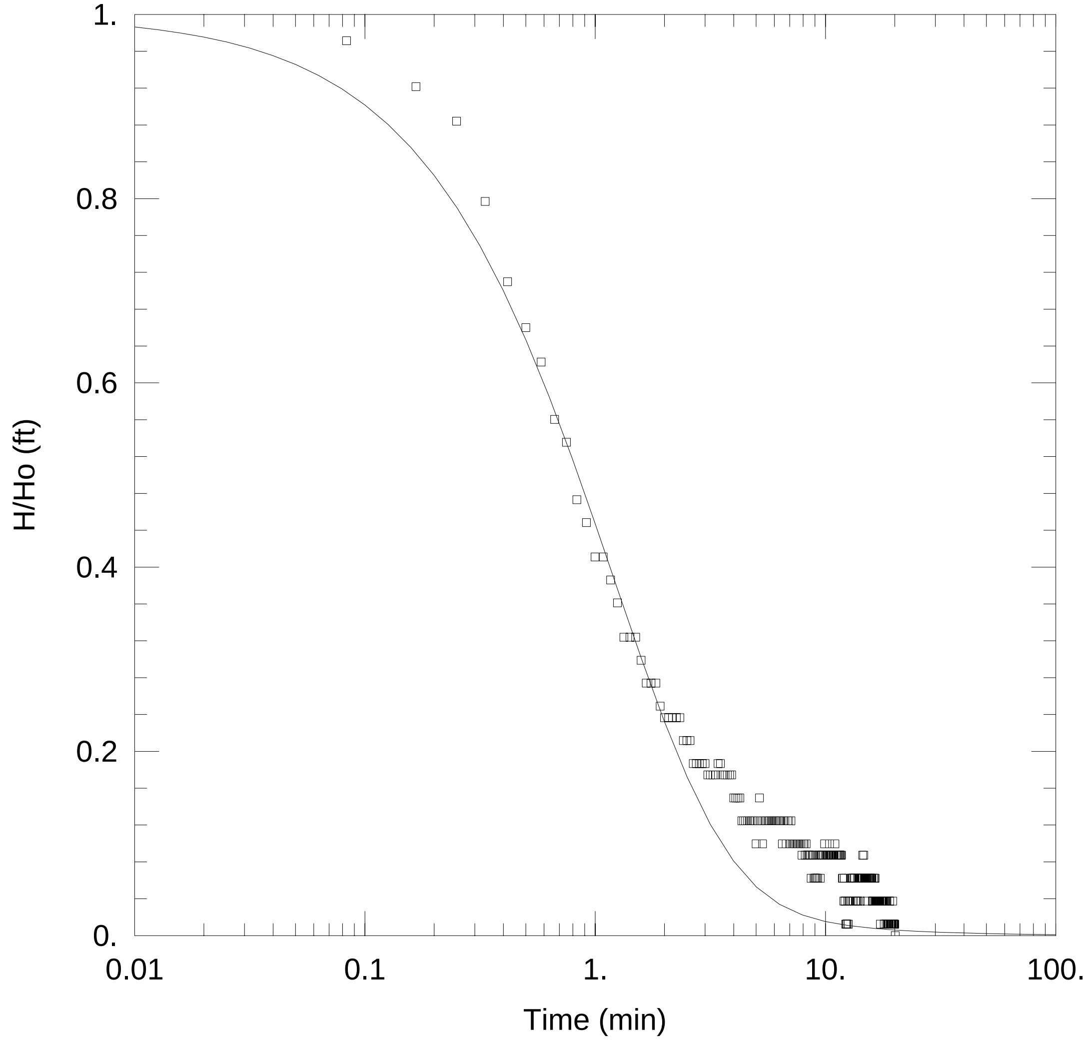
Packer Testing at J1U

Conducted April 4, 2002





J1U
Interval 1
(590.80 to 566.56 ft AMSL)
CORRECTED [not 571.76 to 562.56 ft AMSL)
608.86
14.16
21.07
J1U TOC = 608.86 ft AMSL
WL before inflation = 14.16 ft BTOC, Transducer 21.07 ft
Top packer inflated
APV closed
APV opened
"FAILED" SLUG TESTS
INITIAL HEAD RISE > 15 ft,
SO > 90% OF RECOVERY
OCCURS BEFORE EVEN FIRST
5 SECONDS.
Water pipe filled
APV opened
STATIC
@ ~21.1 ft
Pumping started
Pumping ended
PUMPING : 10 minutes,
$\bar{Q}$ = 1.71 gpm
Transducer submergence (ft)
24
23.5
23
22.5
22
21.5
21
20.5
11:00
11:30
12:00
12:30
13:00
13:30
14:00
Time on April 4, 2002



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-1b.aqt
Date: 01/22/03 Time: 16:05:01

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

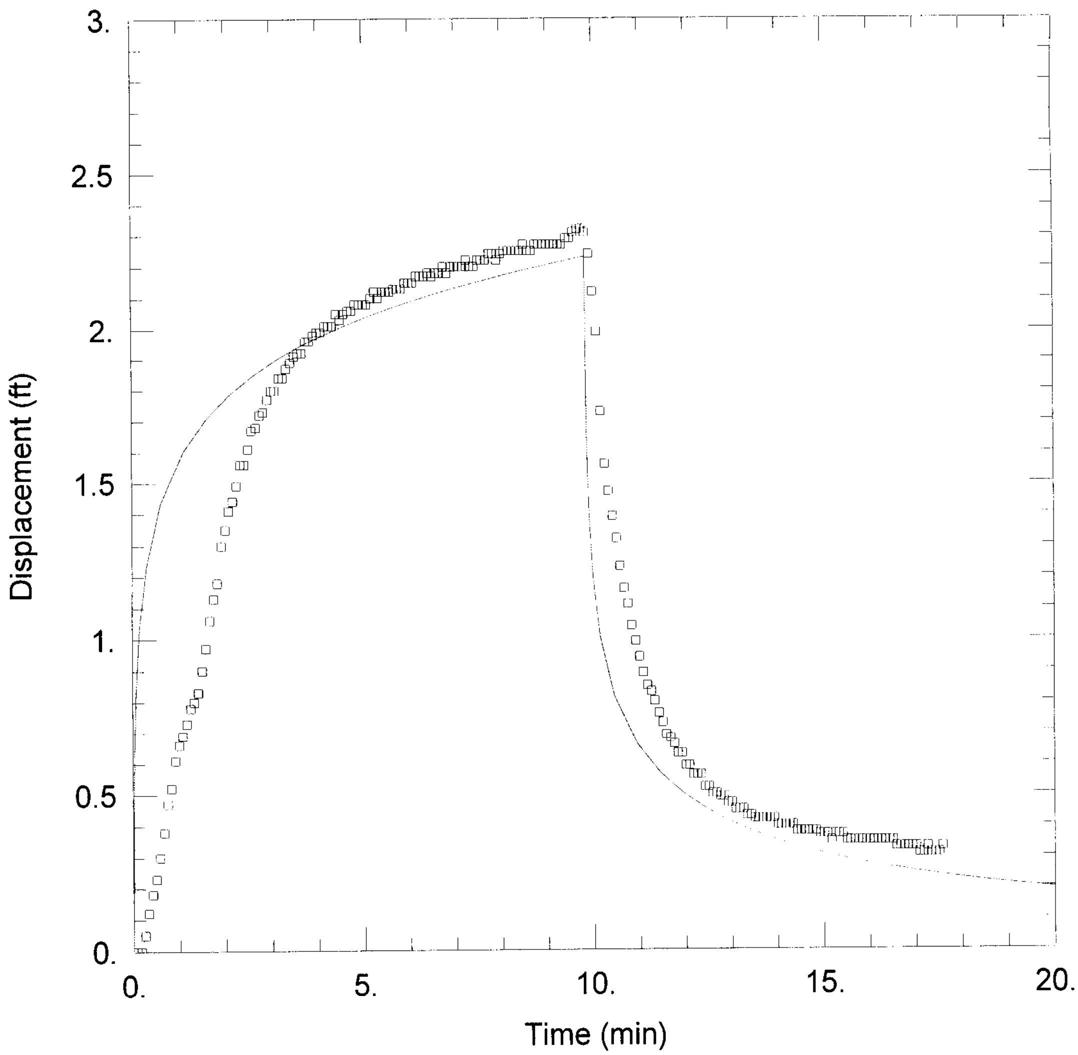
WELL DATA (J1U-1a)

Initial Displacement: 0.803 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1667 ft Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 6.215 ft^2/day S = 1.E-06



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-1.aqt
Date: 11/26/02 Time: 11:26:50

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 28.54 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1U-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
J1U-1	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 90.77 ft^2/day
Sw = -5.
P = 2.

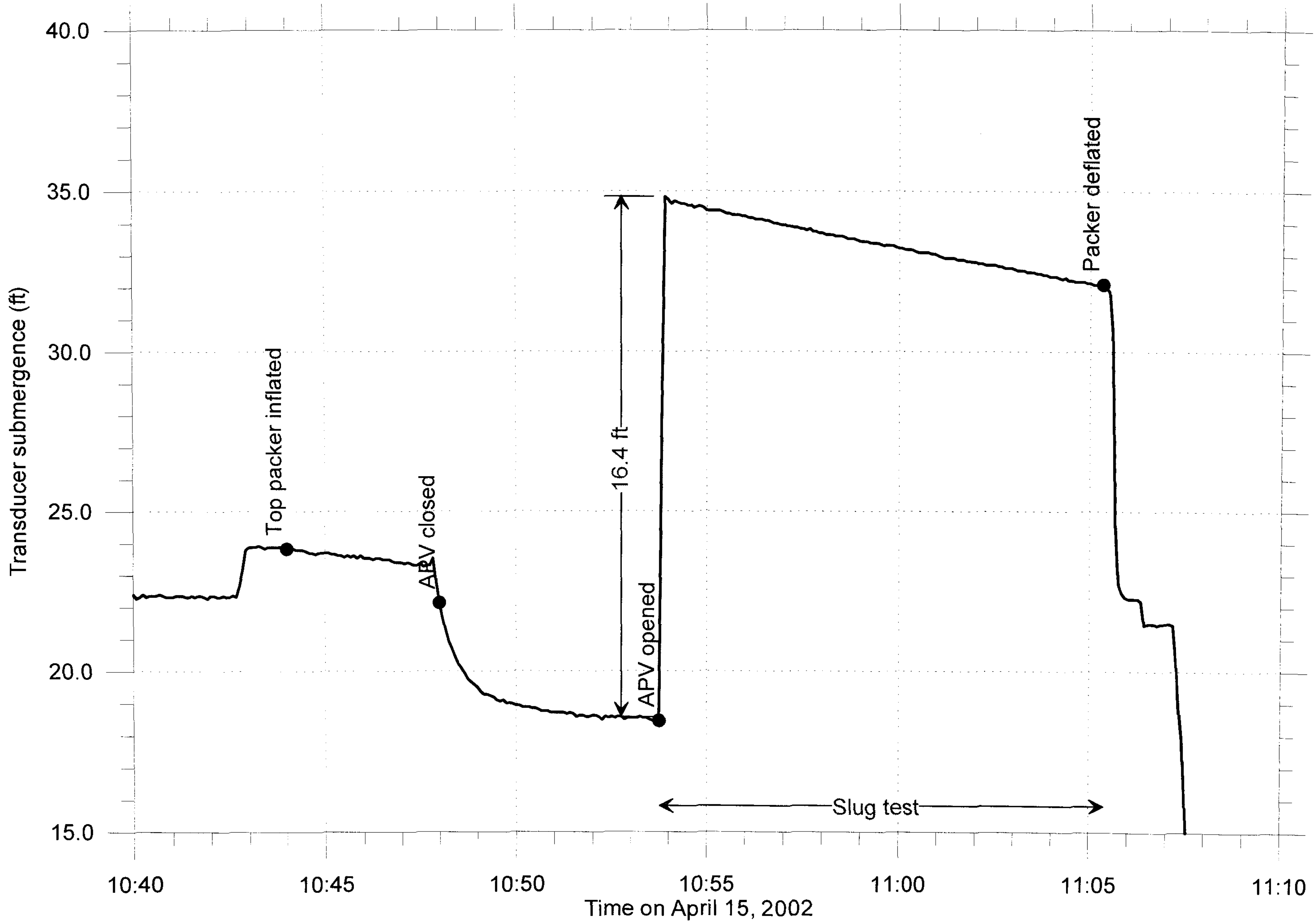
S = 1.E-06
C = 1.E-30 min^2/ft^5

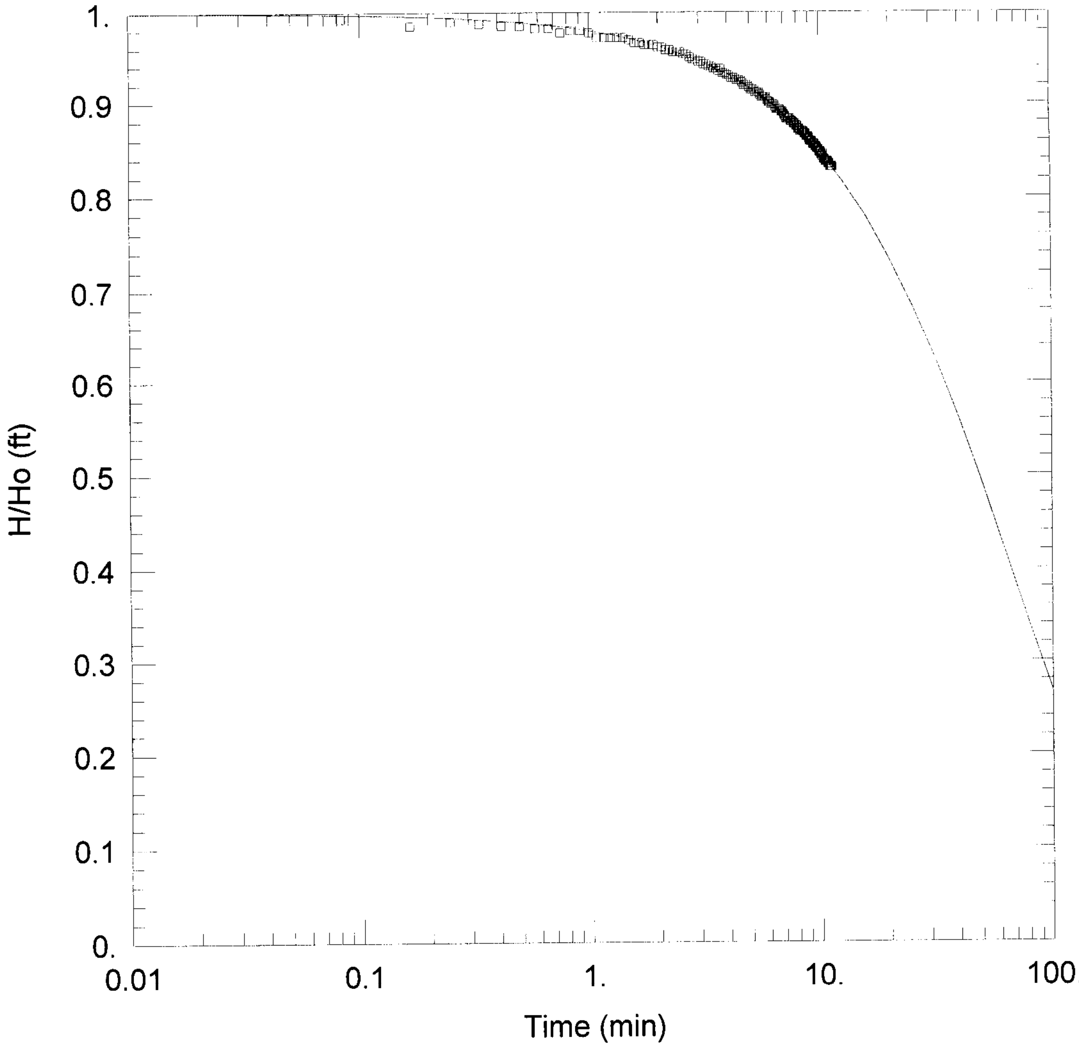
Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 6.872Q + 1.E-30Q^2.
W.E. = 283.7%

J1U Packer Testing -- Retest of interval 1

Test 1 (571.76 to 562.26 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U(0415)-1.aqt
Date: 11/26/02 Time: 11:26:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1U(0415)-1S)

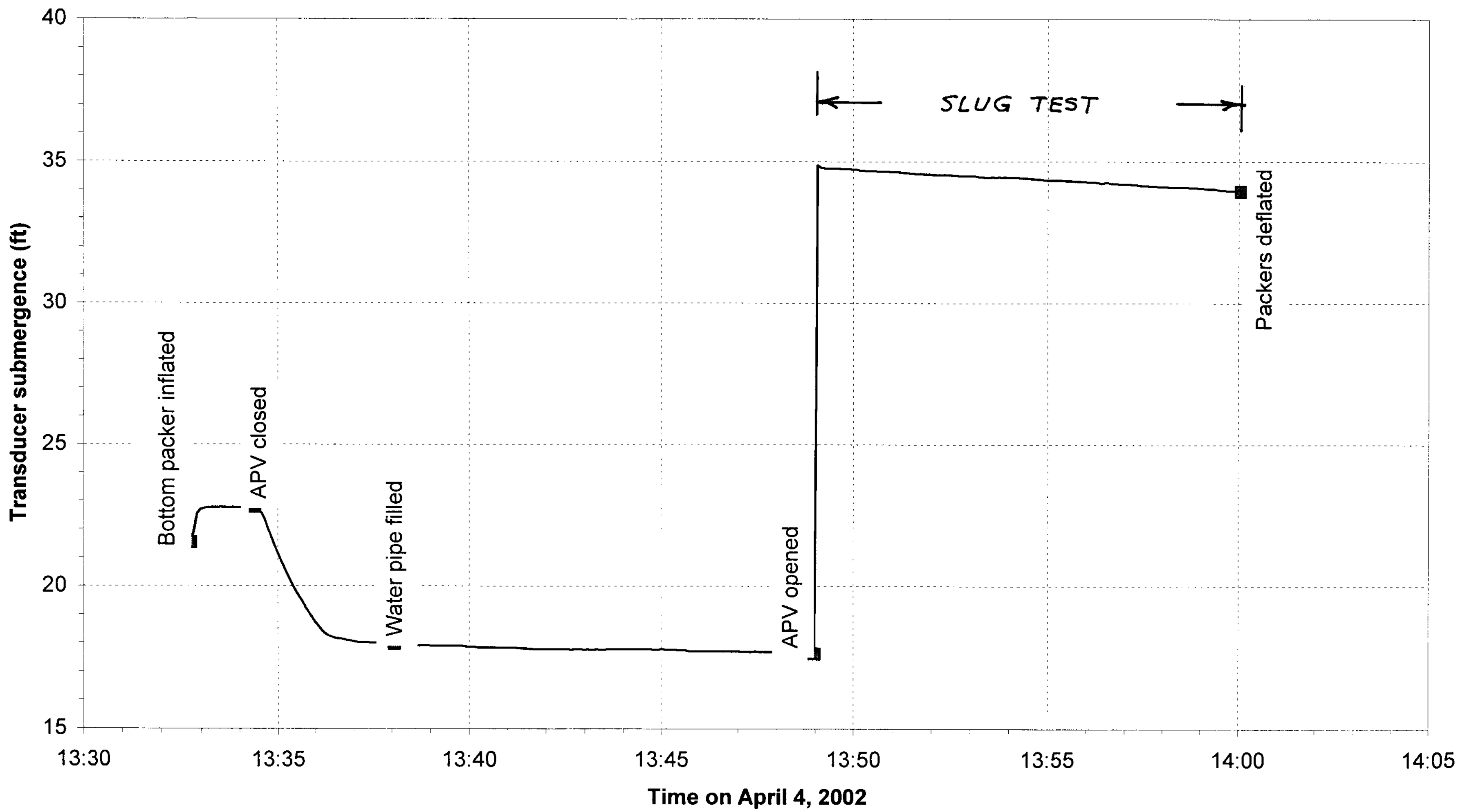
Initial Displacement: 16.4 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

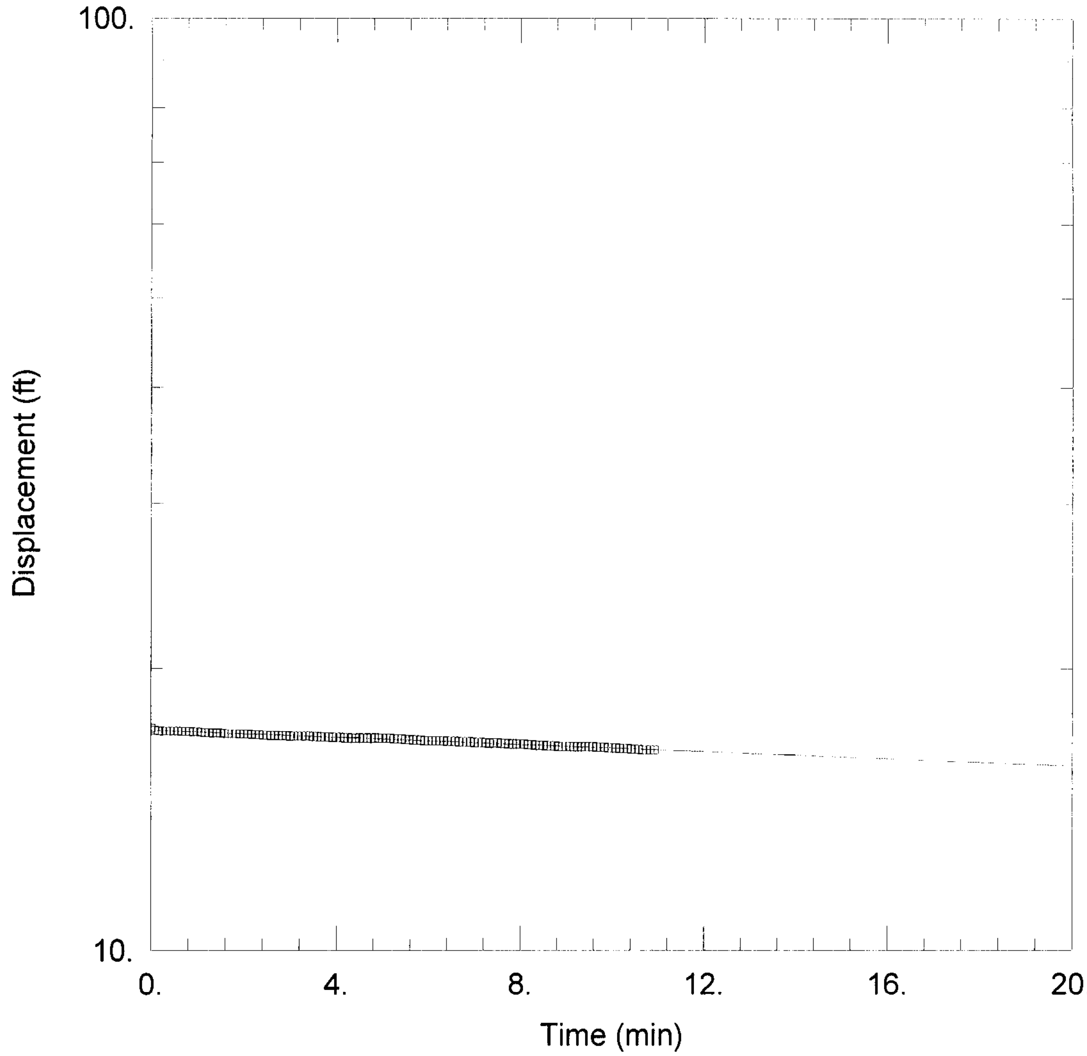
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.1309 ft^2/day
S = 1.E-07

J1U
Transducer Submergence for Interval 2
(571.76 to 566.56 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-2H.aqt
Date: 11/26/02 Time: 11:26:38

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

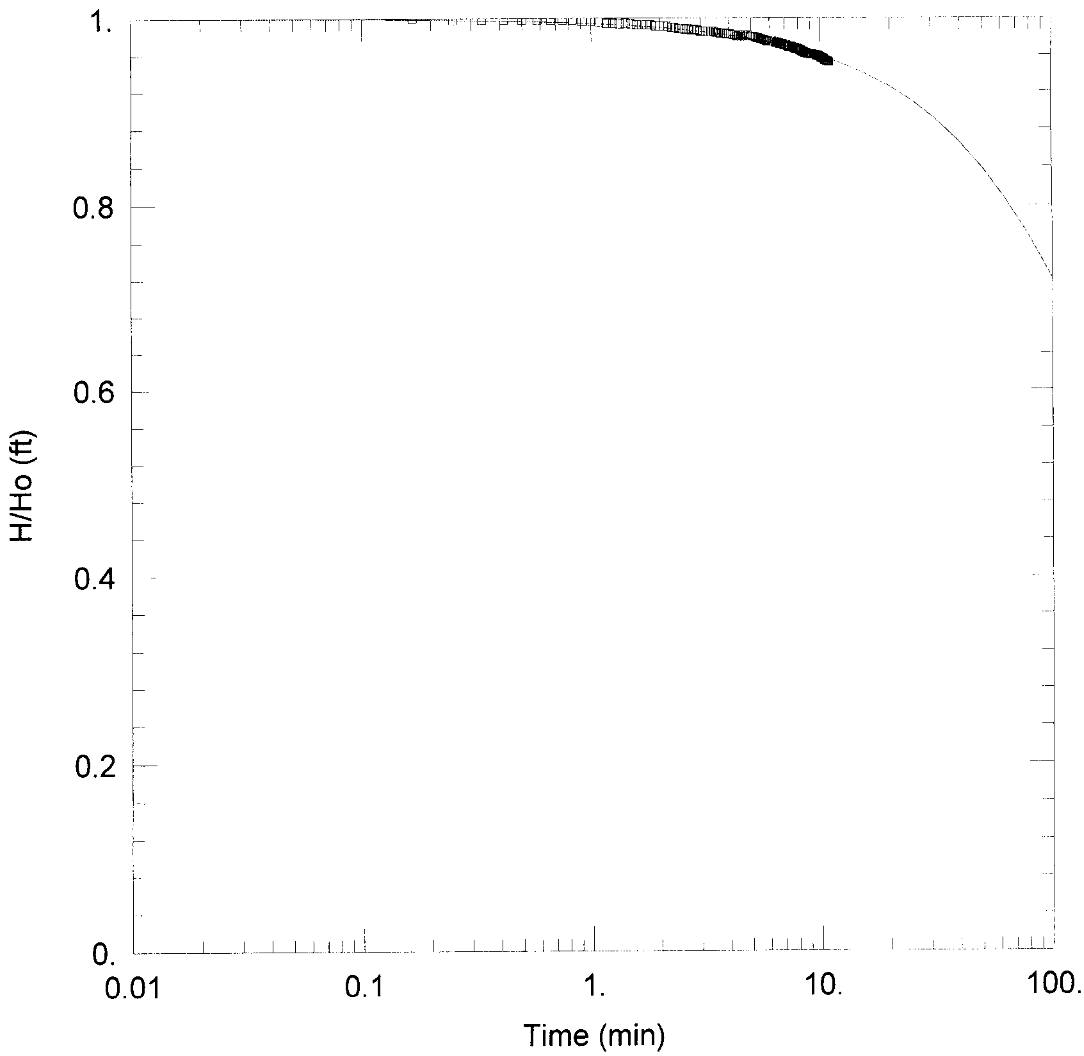
WELL DATA (J1U-2)

Initial Displacement: 17.26 ft
Casing Radius: 0.1667 ft
Wellbore Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Screen Length: 5.2 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

´ = 0.05794 ft/day
y0 = 17.16 ft



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-2CBP.aqt
Date: 11/26/02 Time: 11:26:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1U-2)

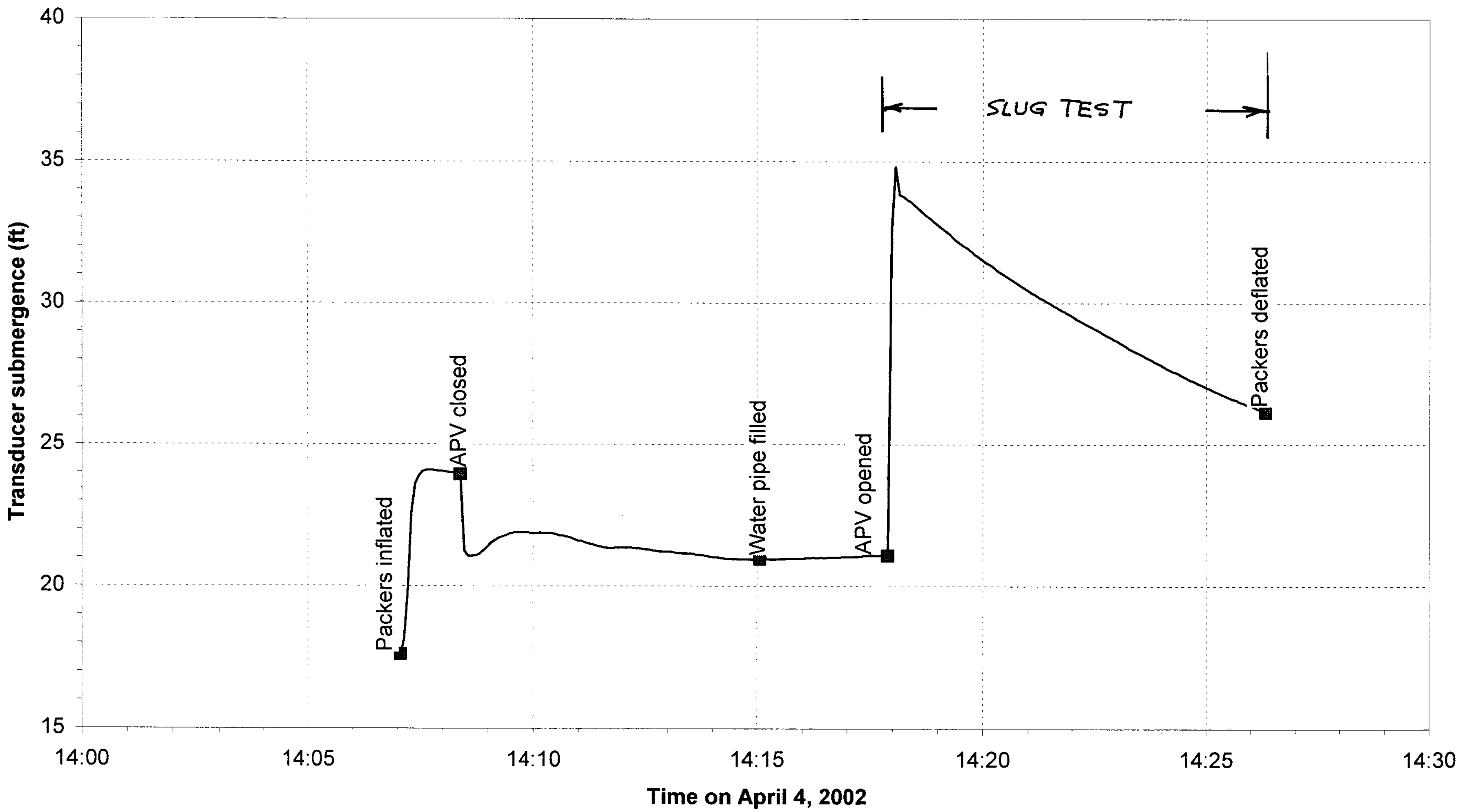
Initial Displacement: 17.16 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

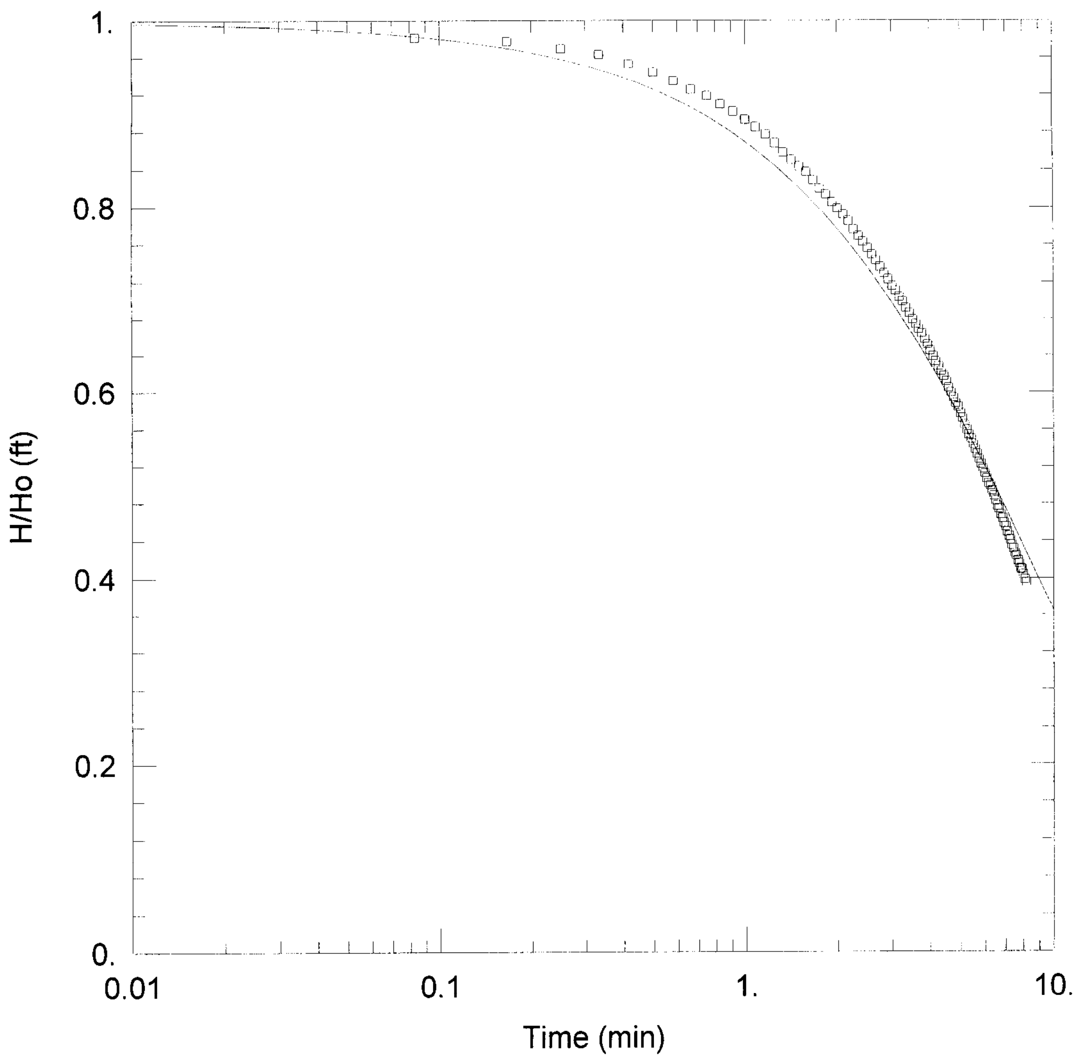
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

‾ = 0.02246 ft^2/day
S = 1.E-06

J1U
Transducer Submergence for Interval 3
(575.76 to 570.56 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-3.aqt
Date: 11/26/02 Time: 11:26:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA (J1U-3)

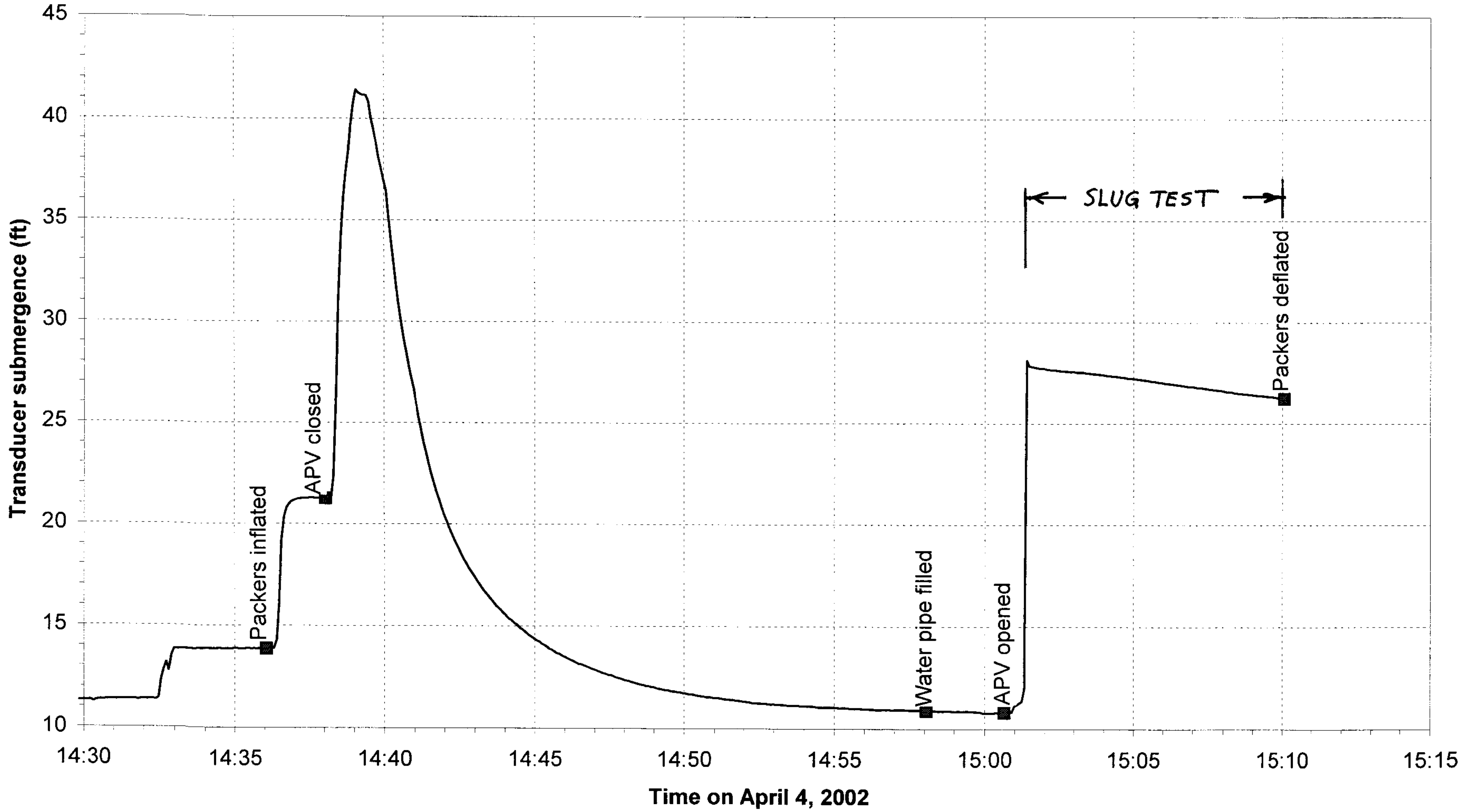
Initial Displacement: 12.99 ft
Wellbore Radius: 0.1615 ft
Screen Length: 1. ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 1. ft

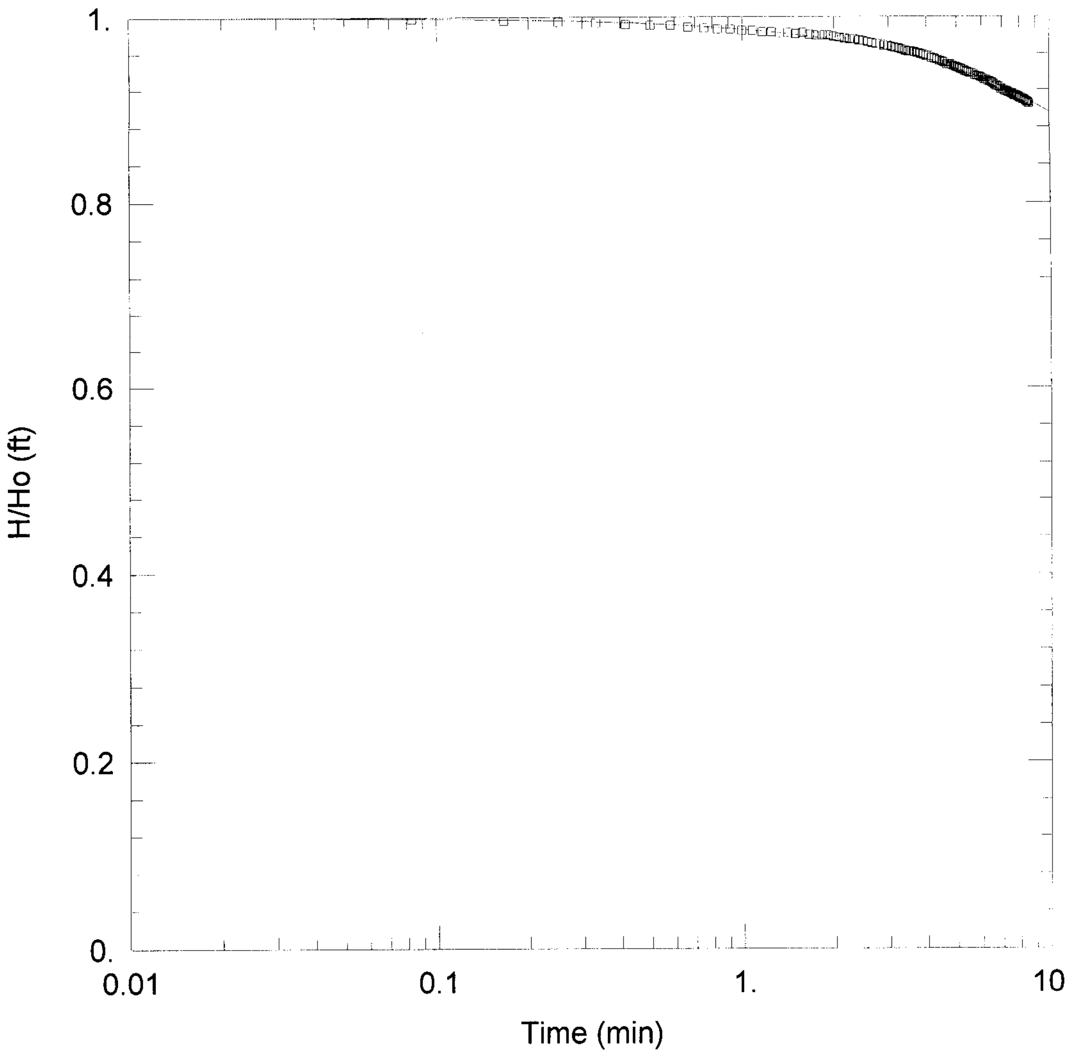
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.6495 ft^2/day
S = 1.E-05

J1U
Transducer Submergence for Interval 4
(579.76 to 574.56 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-4.aqt
Date: 11/26/02 Time: 11:26:26

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1U-4)

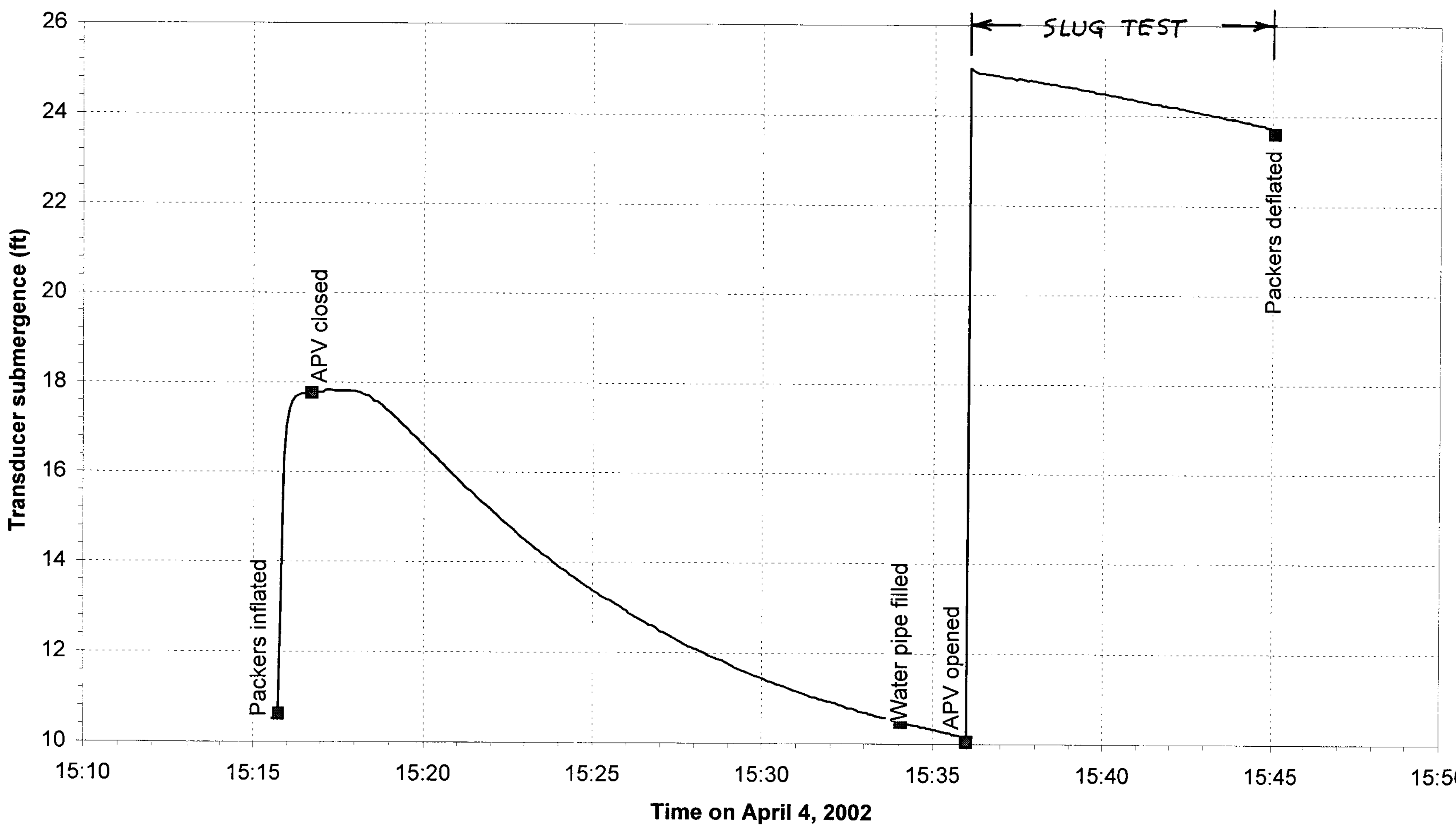
Initial Displacement: 17.09 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

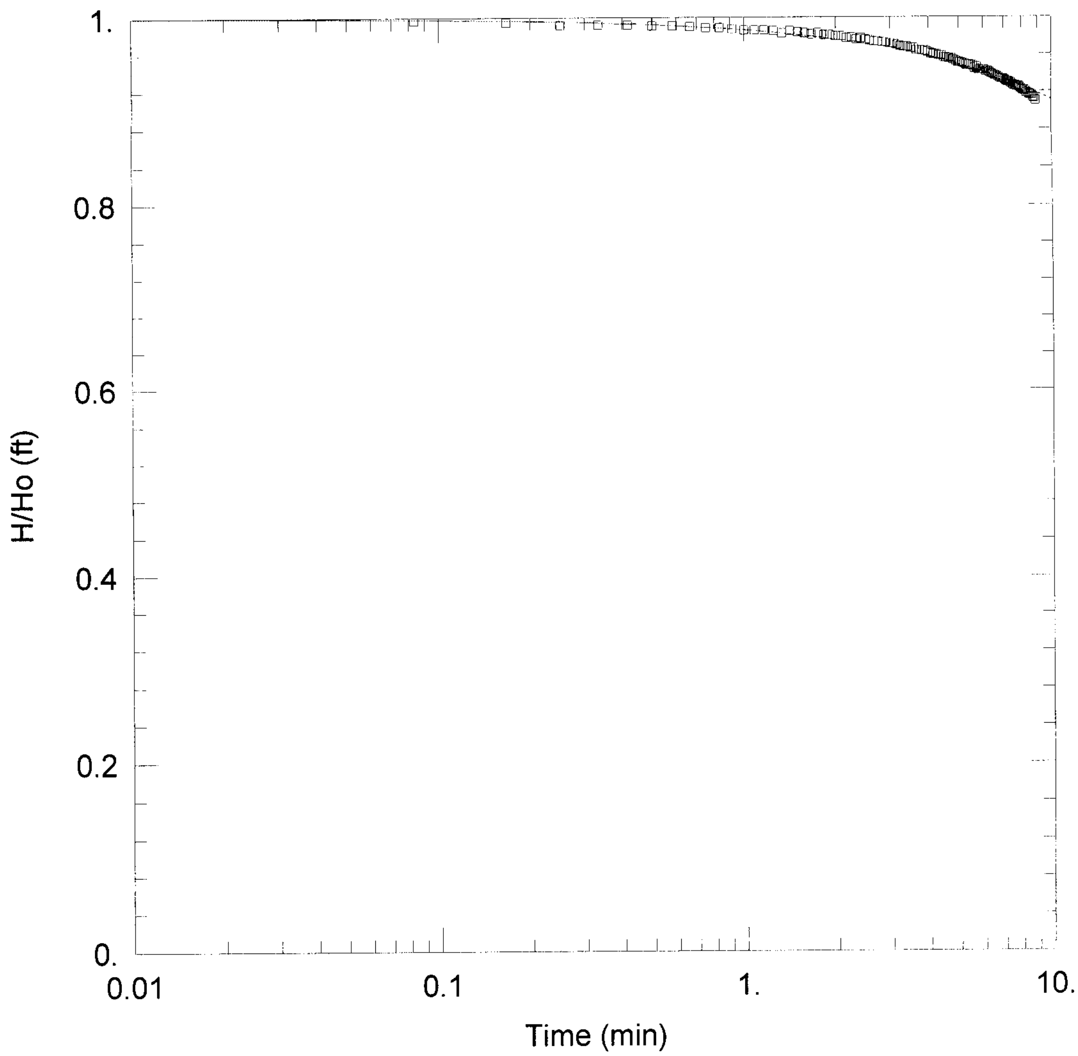
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.0841 ft^2/day
S = 1.E-07

J1U
Transducer Submergence for Interval 5
(583.76 to 578.56 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-5.aqt
Date: 11/26/02 Time: 11:26:55

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1U-5)

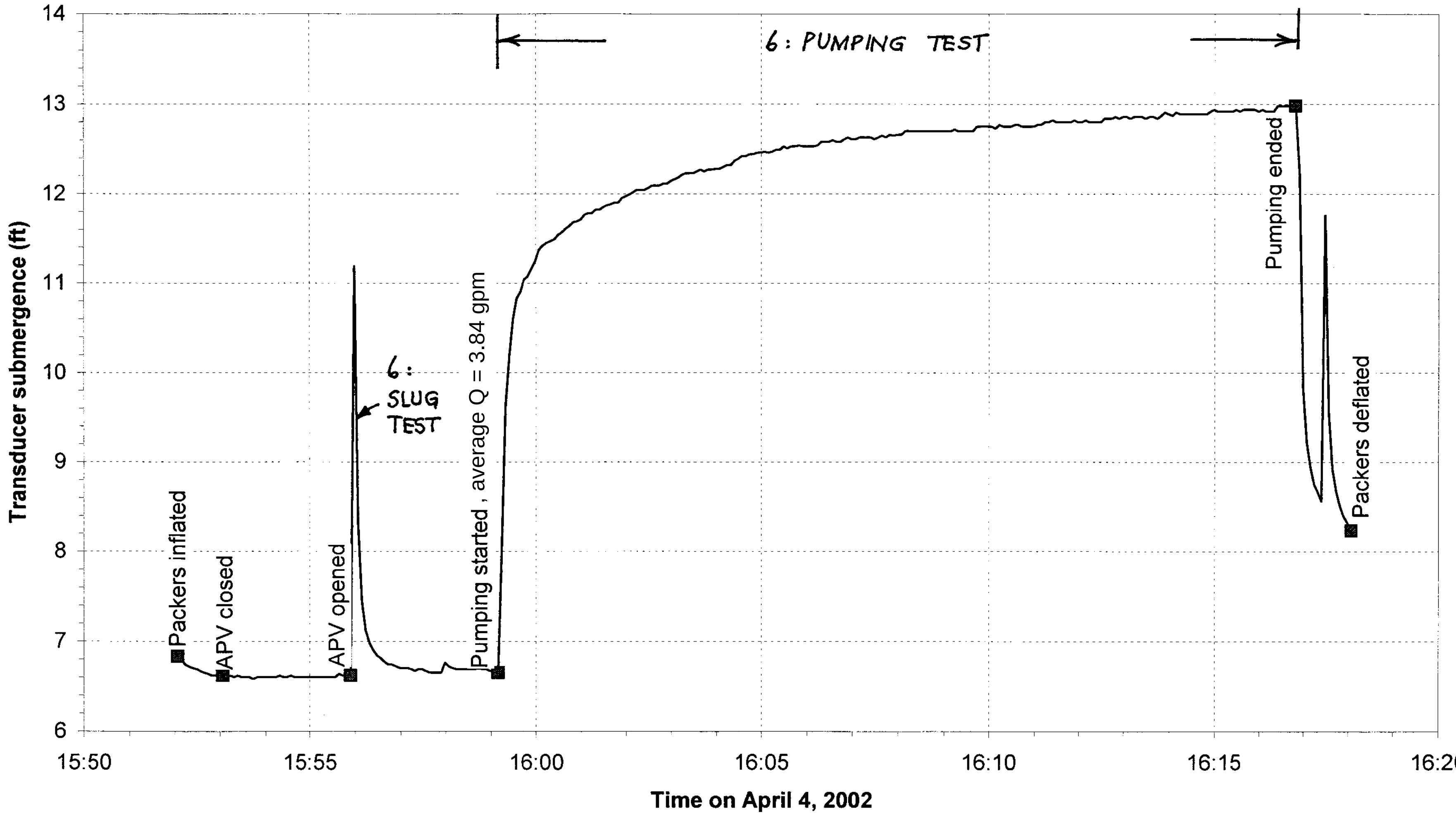
Initial Displacement: 15. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

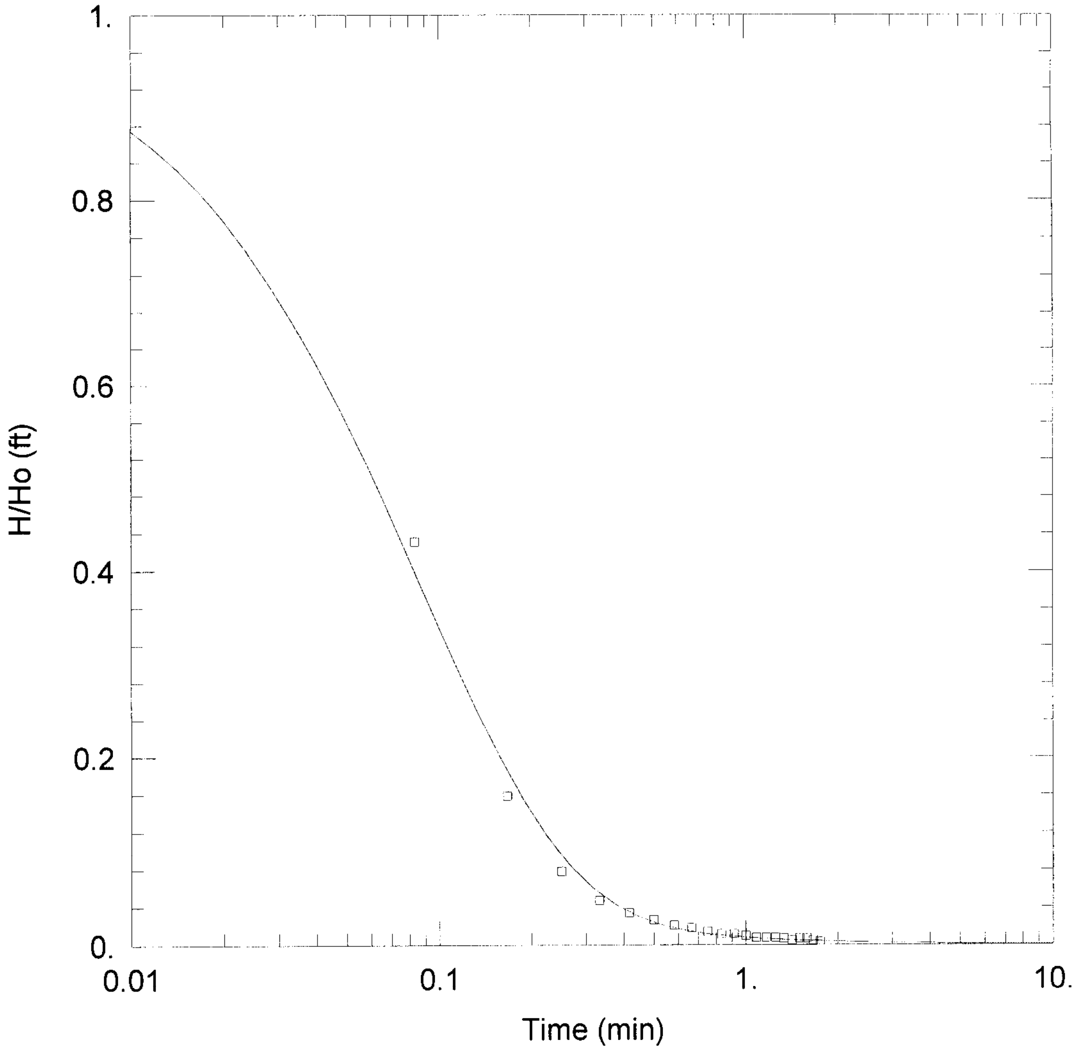
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.04046 ft^2/day
S = 1.E-05

J1U
Transducer Submergence for Interval 6
(587.76 to 582.56 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-6a.aqt
Date: 11/26/02 Time: 11:26:15

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

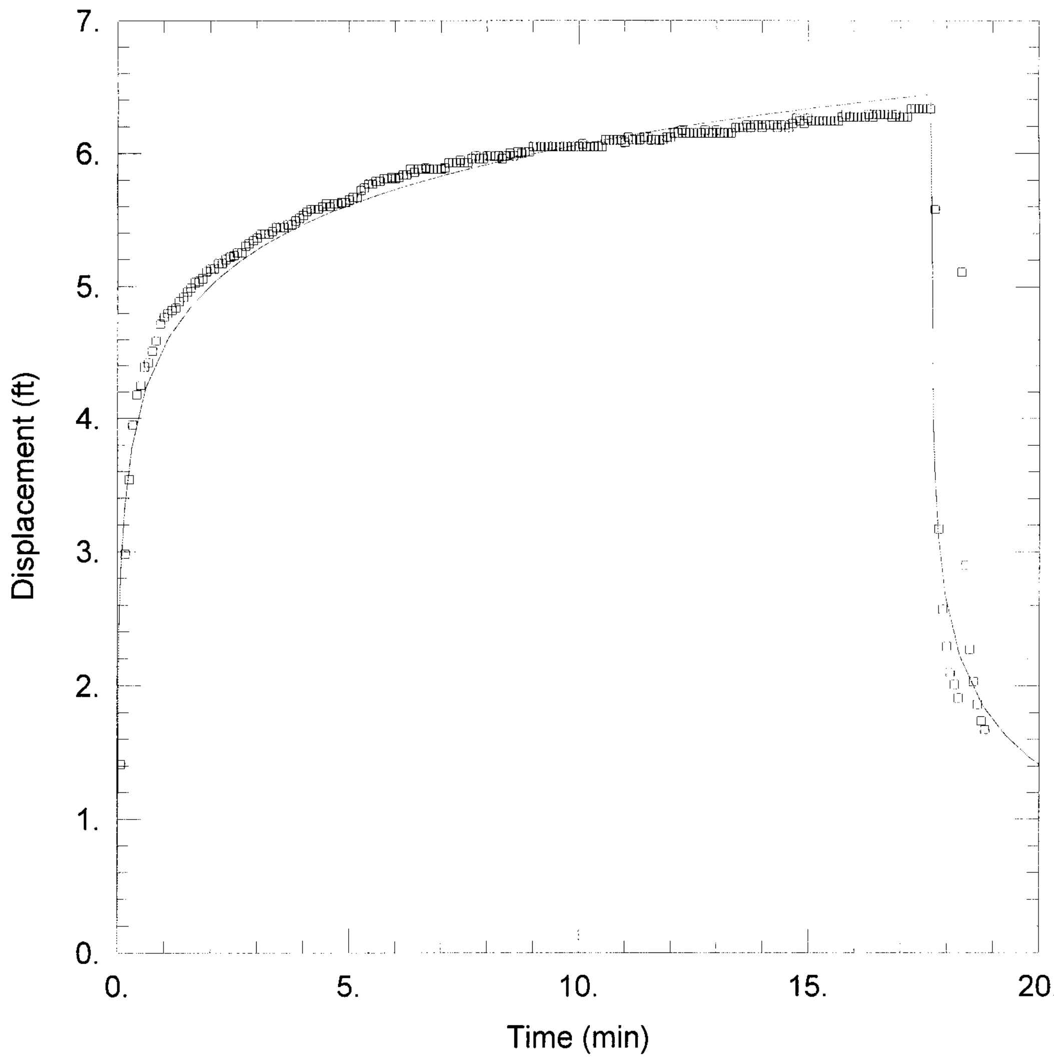
WELL DATA (J1U-6a)

Initial Displacement: 10.6 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

¯ = 104.4 ft^2/day
S = 1.E-07



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-6.aqt
Date: 11/26/02 Time: 11:26:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1U-6	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ J1U-6	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 89.48 ft^2/day
Sw = -4.253
P = 2.407

S = 1.E-06
C = 1.E-30 min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 8.866Q + 1.E\text{-}30Q^{2.407}$
W.E. = 222.9%

J1U, Test 6P

Alternative analyses

Average Q: 3.84 gpm
"Drawdown" (s or ΔH): 6.33 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

<u>*T = 152 ft²/d*</u>

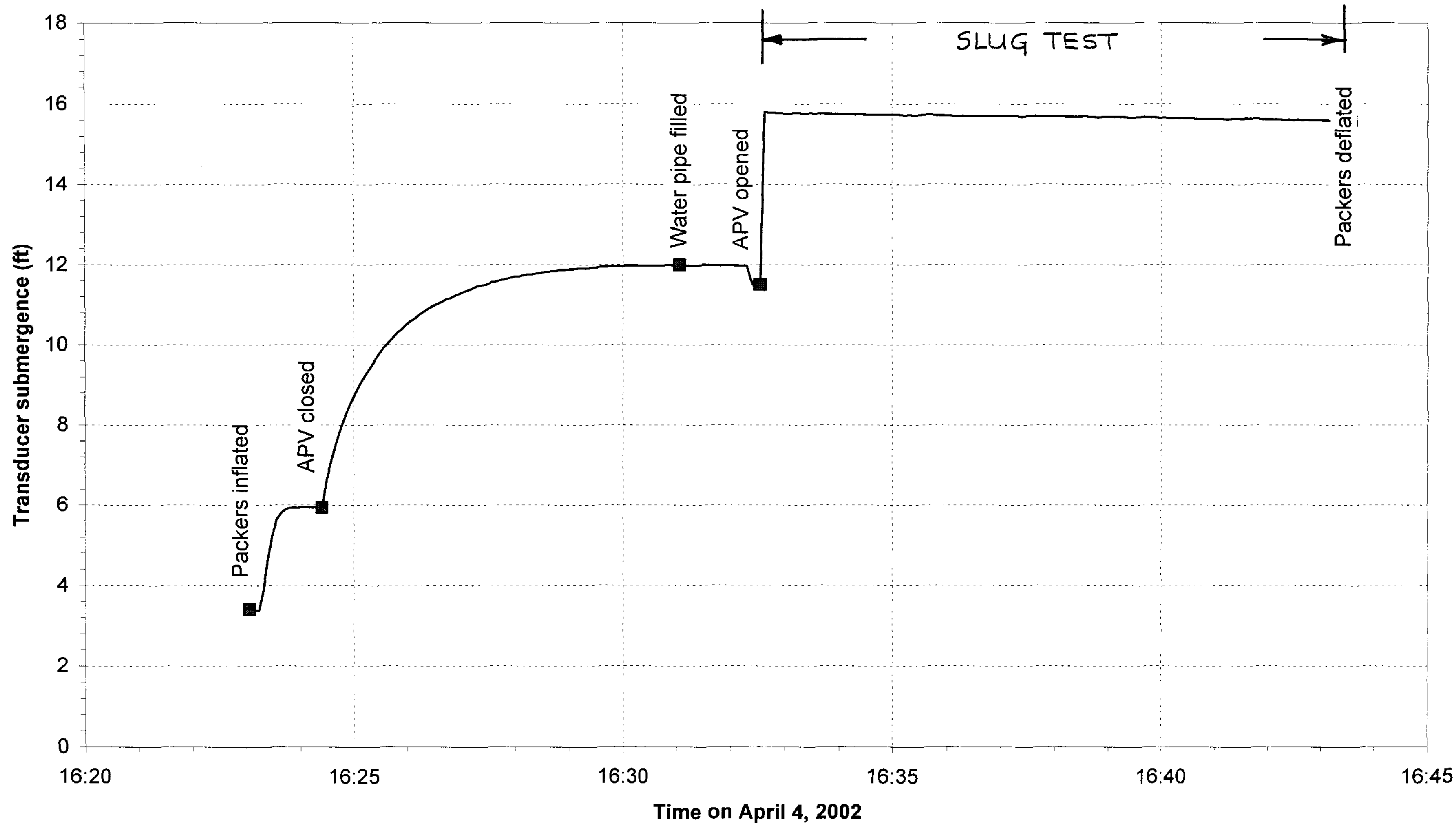
<u>T by Thiem solution:</u>

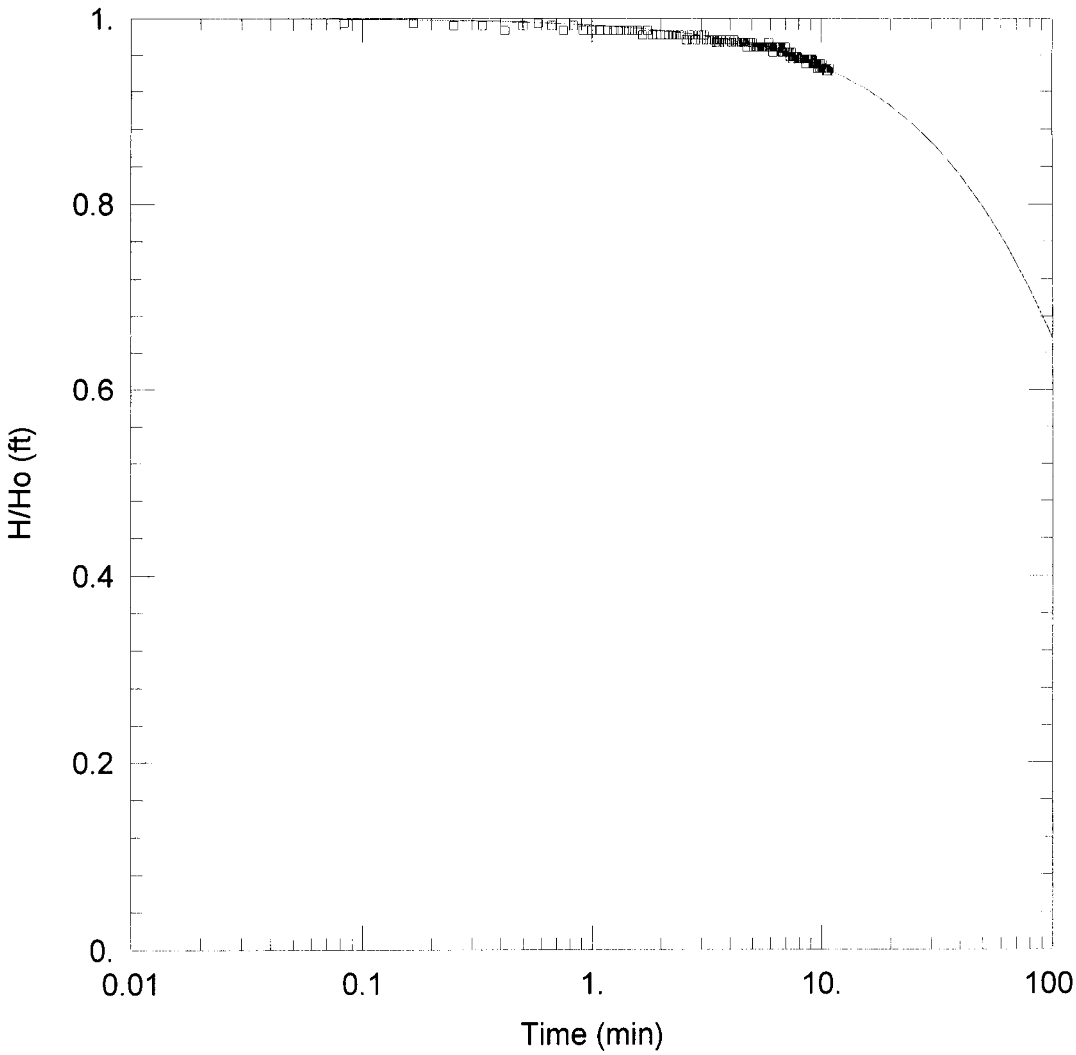
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8$" = 0.1615 ft

<u>*T = 99 ft²/d*</u>

J1U
Transducer Submergence for Interval 7
(591.76 to 586.56 ft AMSL)





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J1U\J1U-7.aqt
Date: 11/26/02 Time: 11:26:11

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1U-7)

Initial Displacement: 3.83 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.02995 ft^2/day
S = 1.E-06

Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

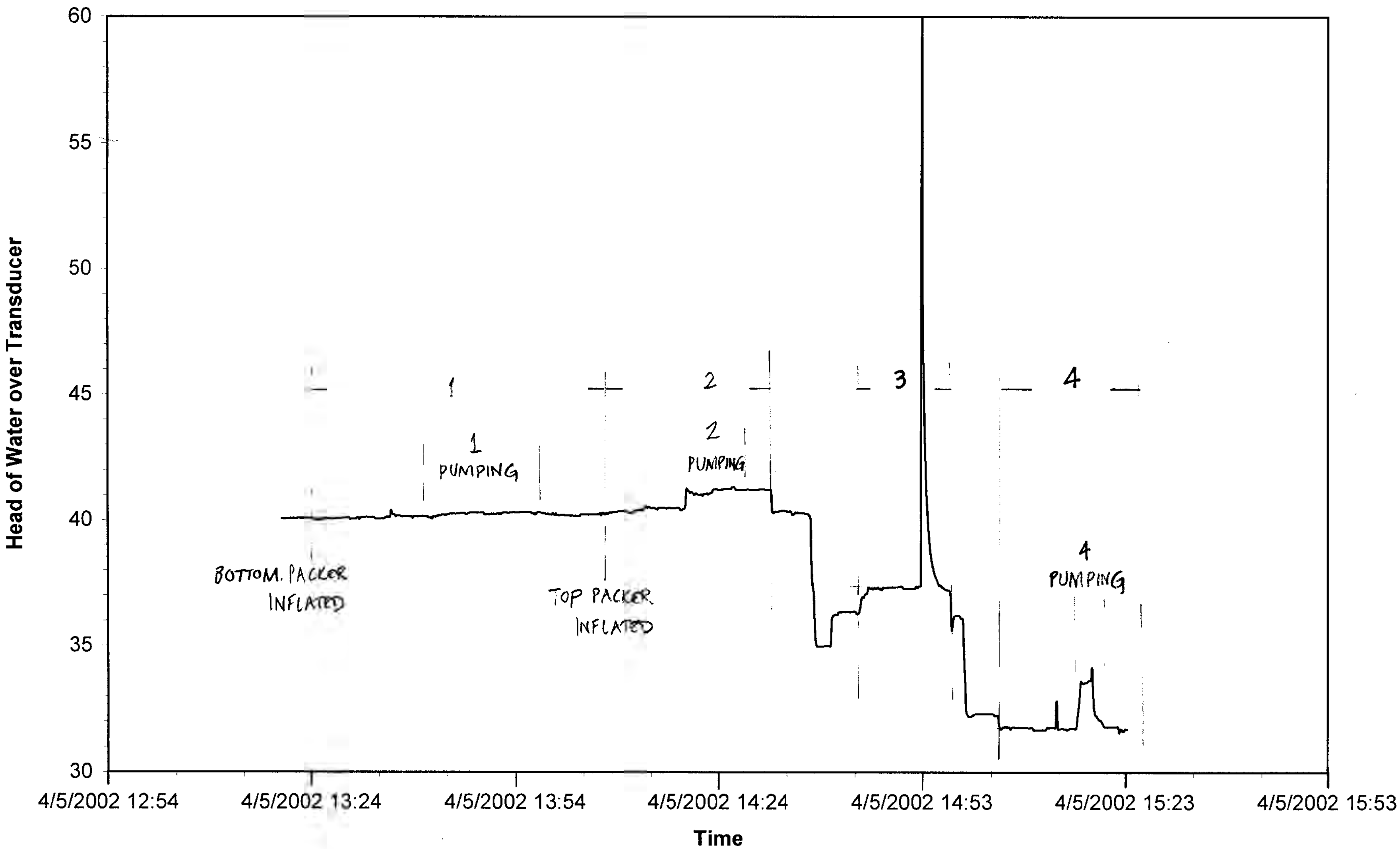
J1M

Testing Dates: April 5 & 8, 2002
April 15, 2002 (Retest of interval 515.59 to 506.09 ft MSL)

Summary of Tests:

Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
J1M	1P	515.59	506.09	4040	Retest April 15, 2002
J1M	2P	514.39	509.19	2300	see UR Memo
J1M	3	518.39	513.19	20.1	
J1M	5	522.39	517.19	32	
J1M	6P	526.59	521.39	2600	
J1M	7	530.59	525.39	<<1	
J1M	8	534.59	529.39	<<1	
J1M	9	538.59	533.39	4.4	
J1M	10	542.69	537.49	<<1	
J1M	11	546.69	541.49	21	
J1M	12	550.69	545.49	<<1	
J1M	13	554.69	549.49	<<1	
J1M	14	558.69	553.49	<<1	
J1M	15	562.69	557.49	0.0062	

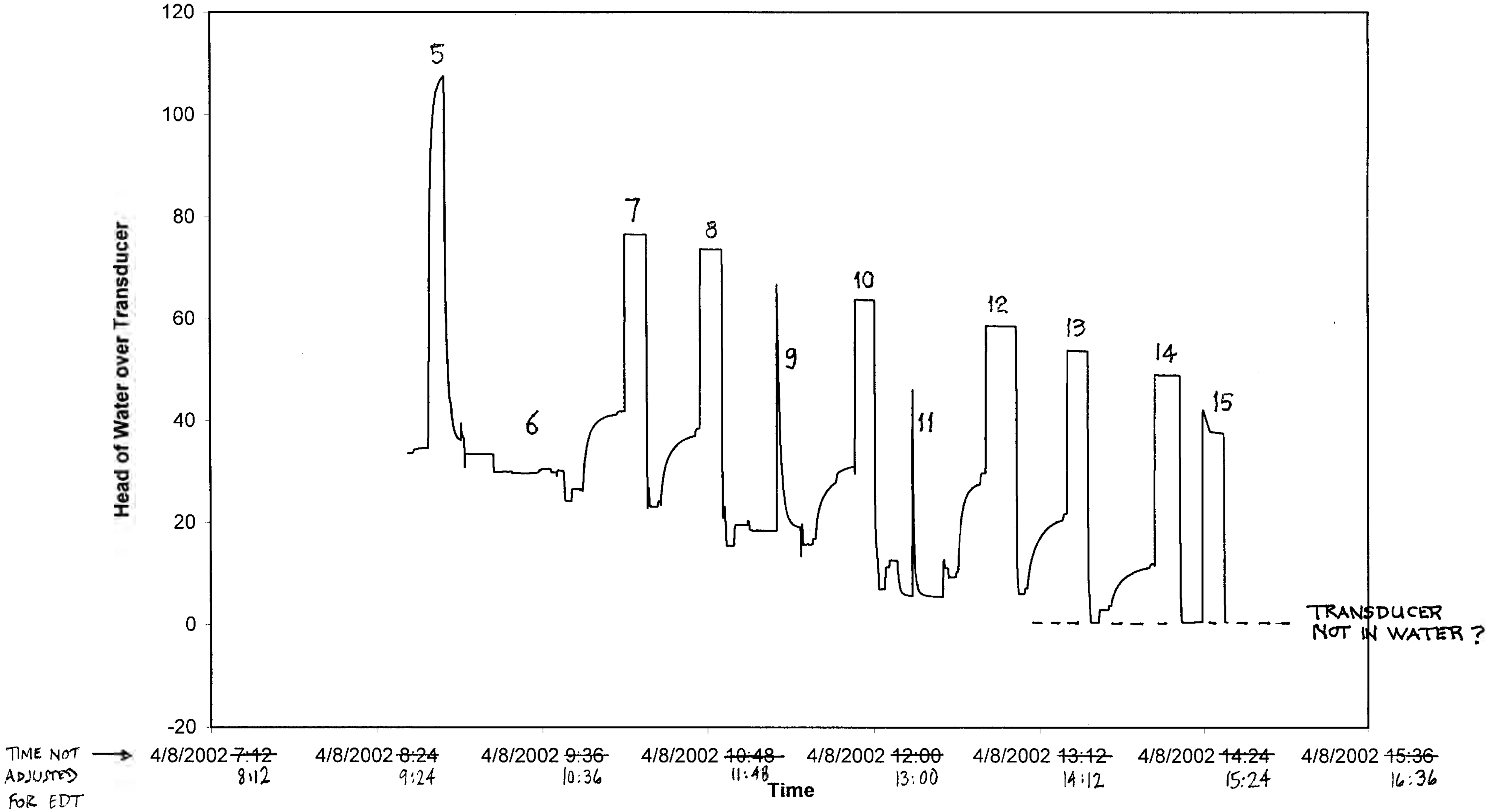
Monitoring Well J1M (Day 1 of testing)



In Situ transducer (vented or not?)

J1M0405A.xls

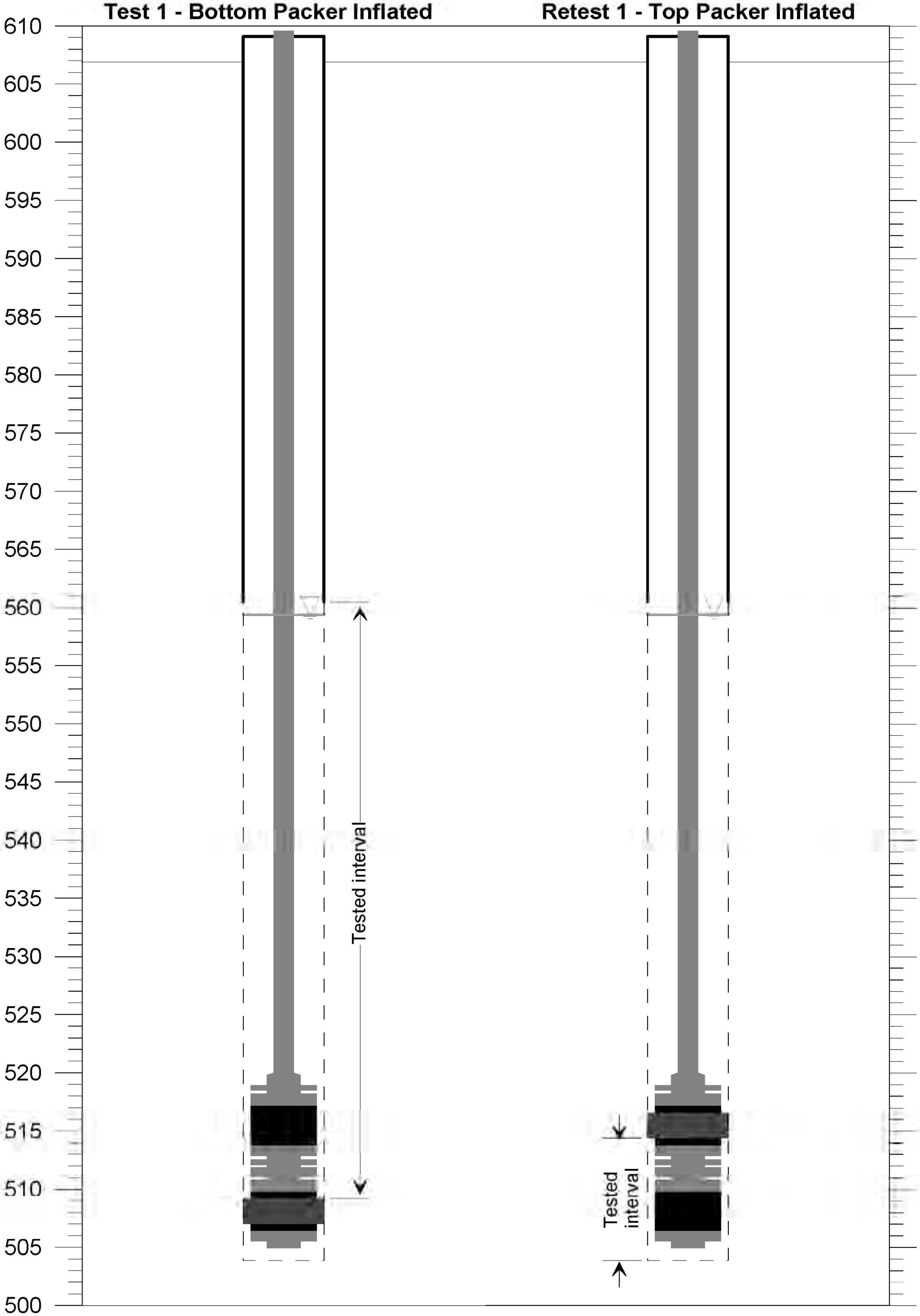
Monitoring Well J1M (Day 2 of testing)

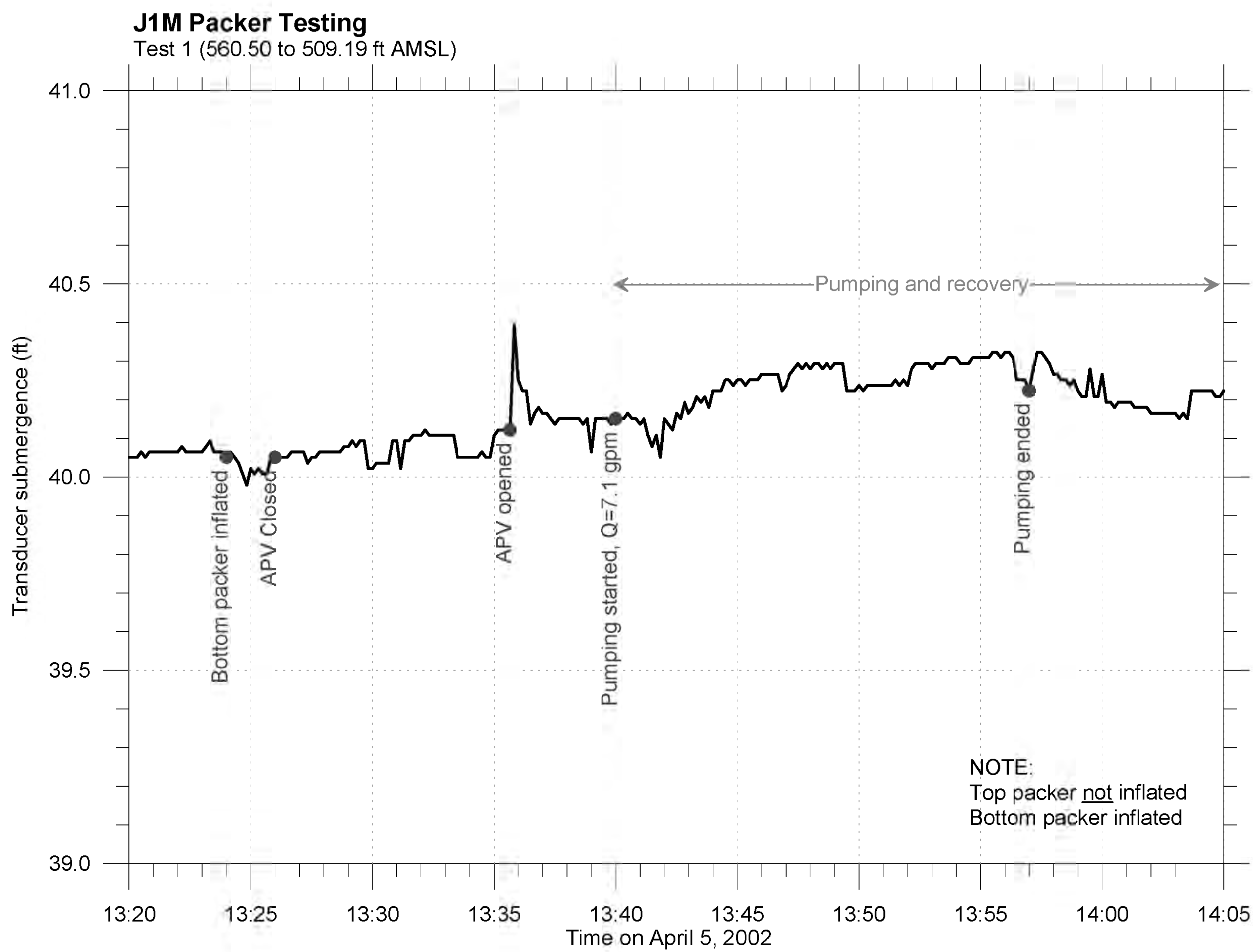


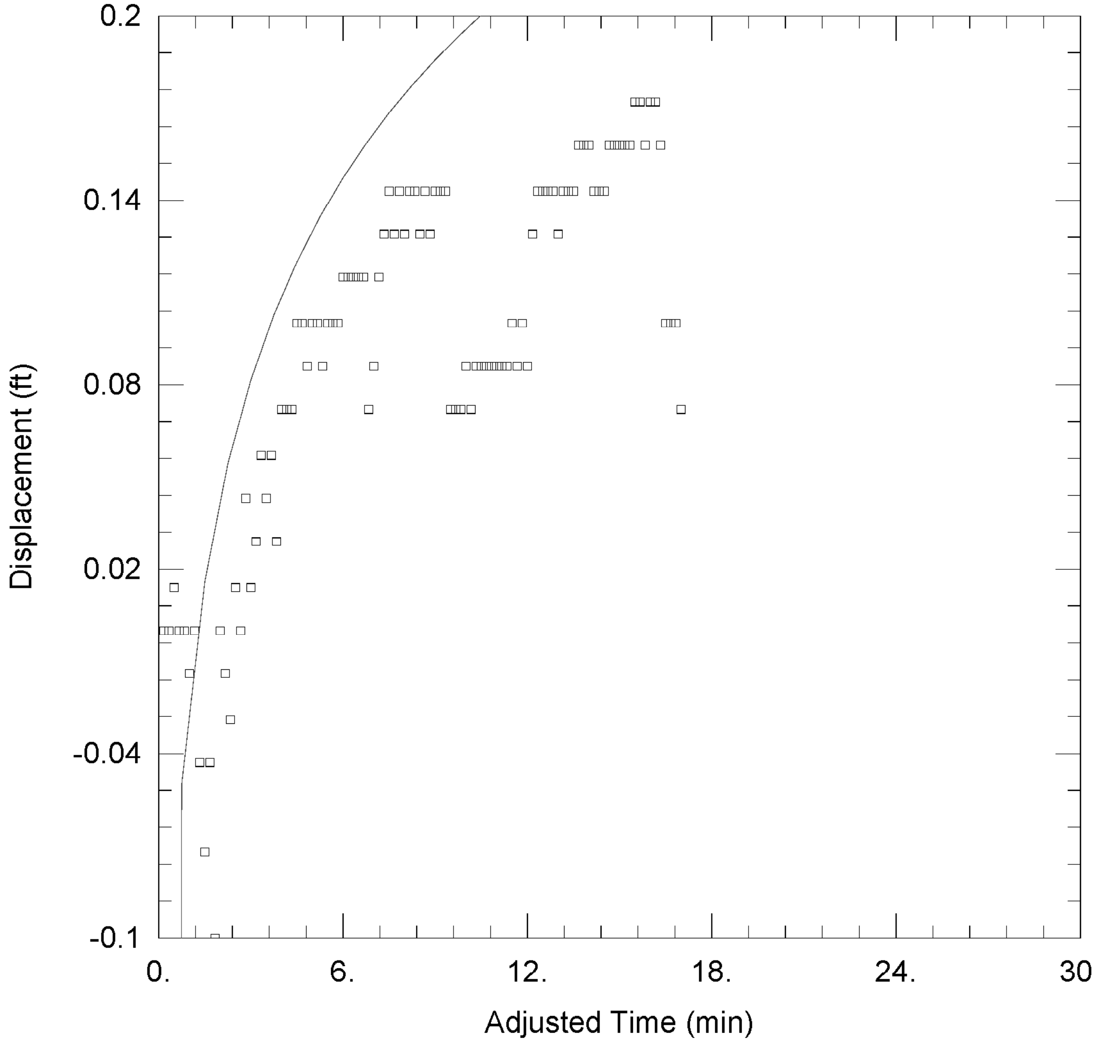
J1M0408.xls

Packer Testing at J1M, Elevation 515.59 to 503.89 ft MSL

Conducted April 5, 2002 and April 15, 2002




J1M Packer Testing
Test 1 (560.50 to 509.19 ft AMSL)
Transducer submergence (ft)
41.0
40.5
40.0
39.5
39.0
Pumping and recovery
Bottom packer inflated
APV Closed
APV opened
Pumping started, Q=7.1 gpm
Pumping ended
NOTE:
Top packer not inflated
Bottom packer inflated
13:20
13:25
13:30
13:35
13:40
13:45
13:50
13:55
14:00
14:05
Time on April 5, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-1P.aqt
Date: 01/21/03 Time: 14:29:57

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-1	0	0

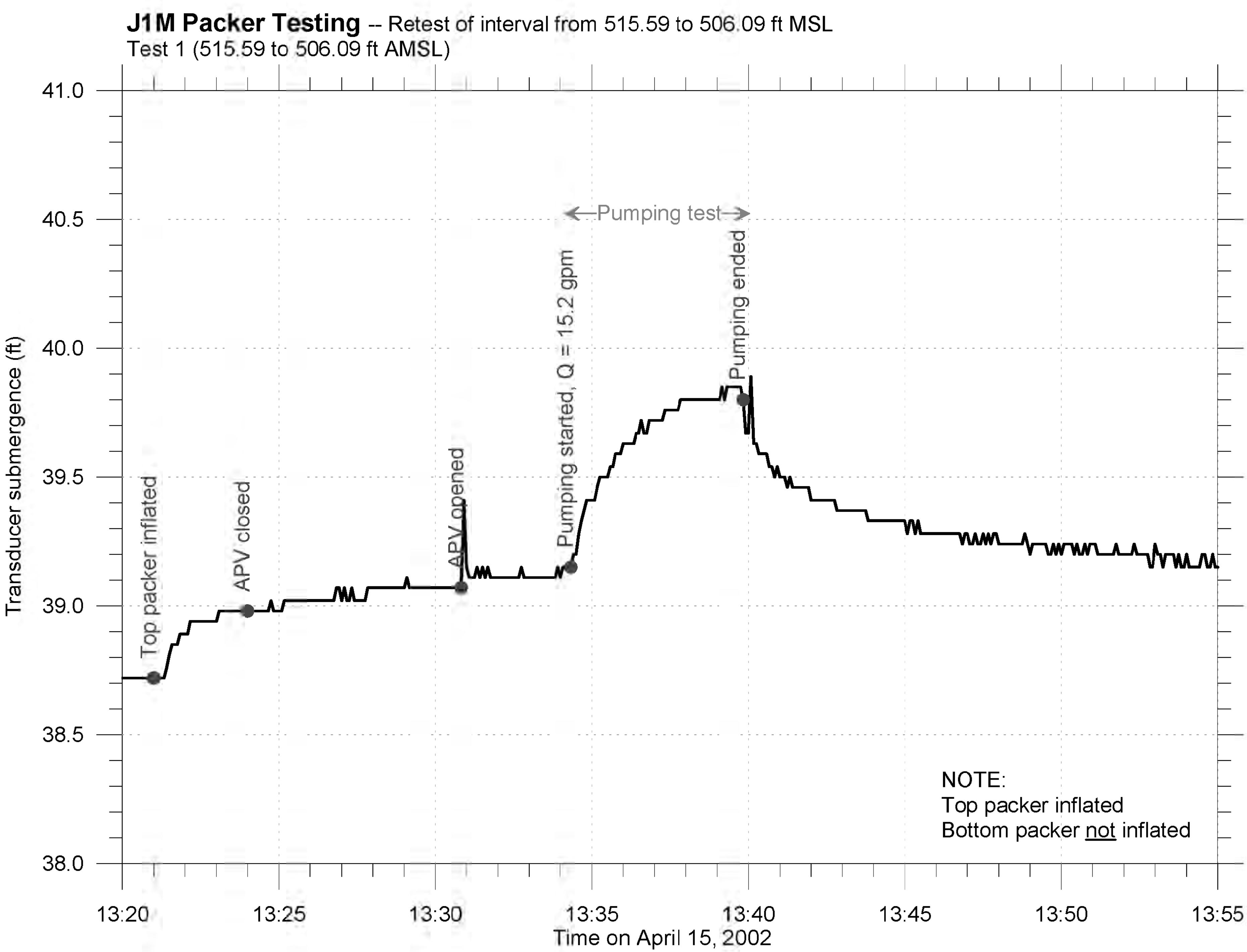
Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-1	0	0

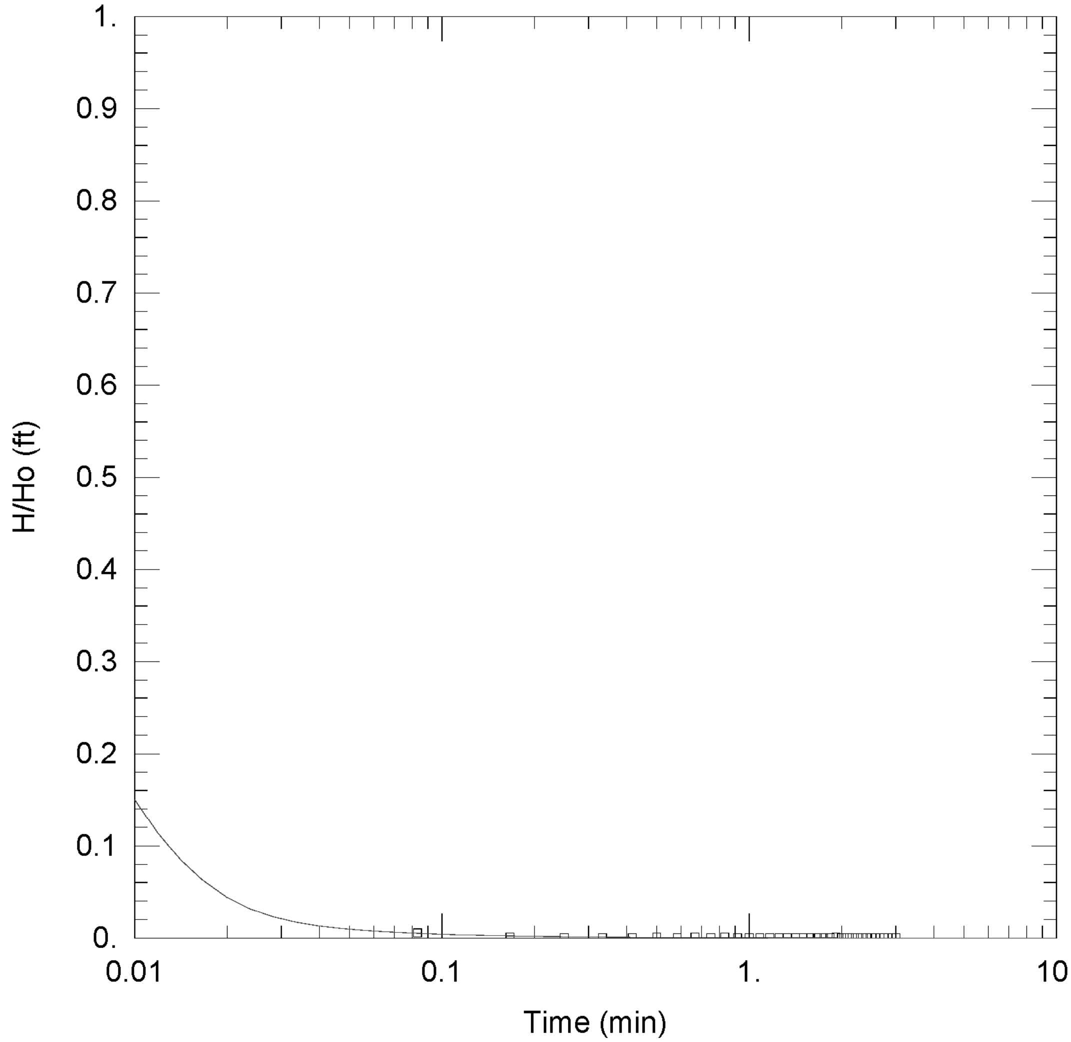
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Jacob

T = 1147.4 ft^2/day S = 81.69



J1M Packer Testing -- Retest of interval from 515.59 to 506.09 ft MSL
Test 1 (515.59 to 506.09 ft AMSL)
Transducer submergence (ft)
41.0
40.5
40.0
39.5
39.0
38.5
38.0
Top packer inflated
APV closed
APV opened
Pumping started, Q = 15.2 gpm
Pumping ended
Pumping test
NOTE:
Top packer inflated
Bottom packer not inflated
13:20
13:25
13:30
13:35
13:40
13:45
13:50
13:55
Time on April 15, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M(0415)-1S.aqt
Date: 01/21/03 Time: 14:30:04

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

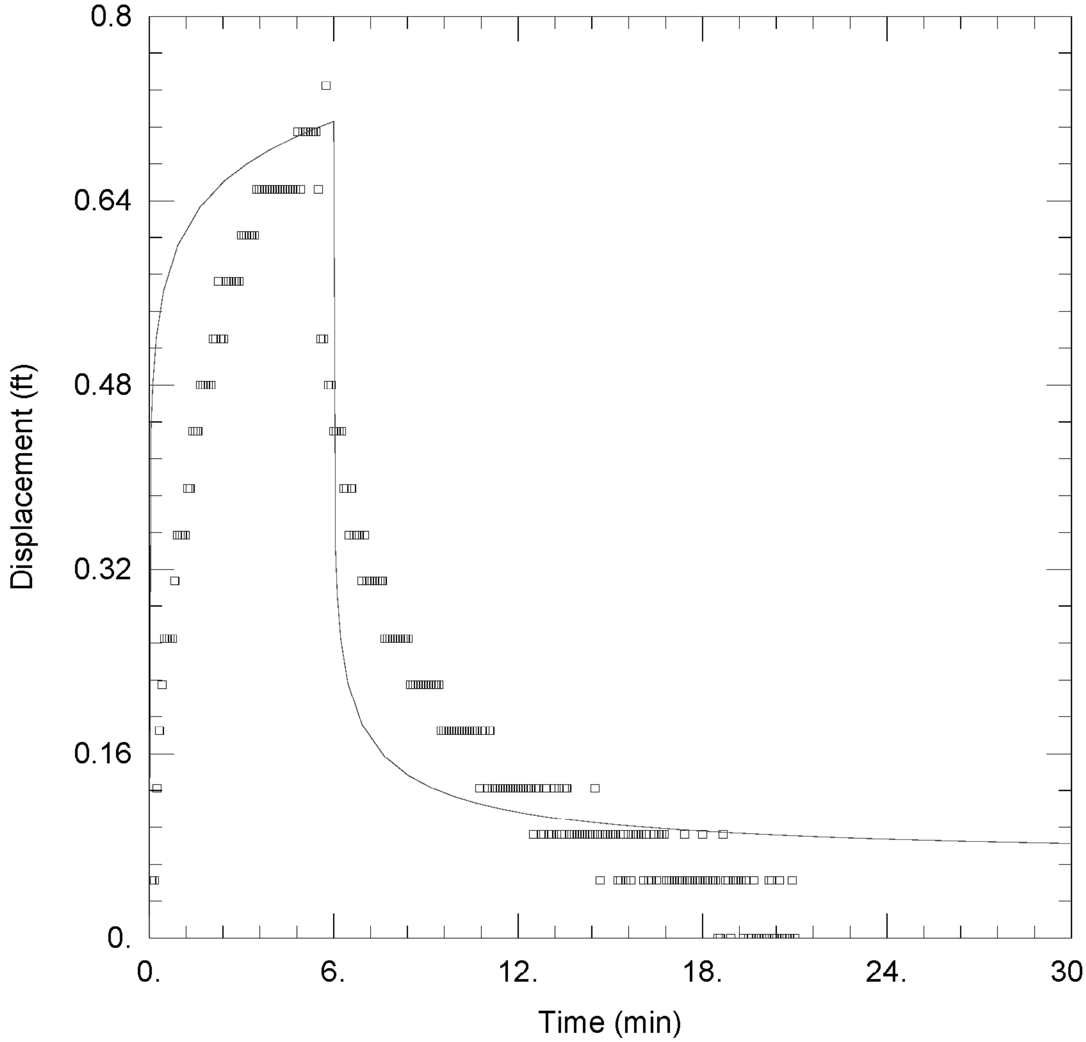
WELL DATA (J1M(0415)-1S)

Initial Displacement: 61. ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 1718.2 ft^2/day S = 1.E-06



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M(0415)-1P.aqt
Date: 01/21/03 Time: 14:24:52

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M(0415)-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M(0415)-1	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 4040.2 ft^2/day

S = 1.E-06

Sw = -5.

C = 0.008263 min^2/ft^5

P = 3.

Step Test Model: Jacob-Rorabaugh

Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 0.2639Q + 0.008263Q^3$

W.E. = 183.7%

J1M, Test 1P (April 15, 2002)

Alternative analyses

Average Q: 15.15 gpm

"Drawdown" (s or ΔH): 0.7 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 5411\ ft^2/d}}$

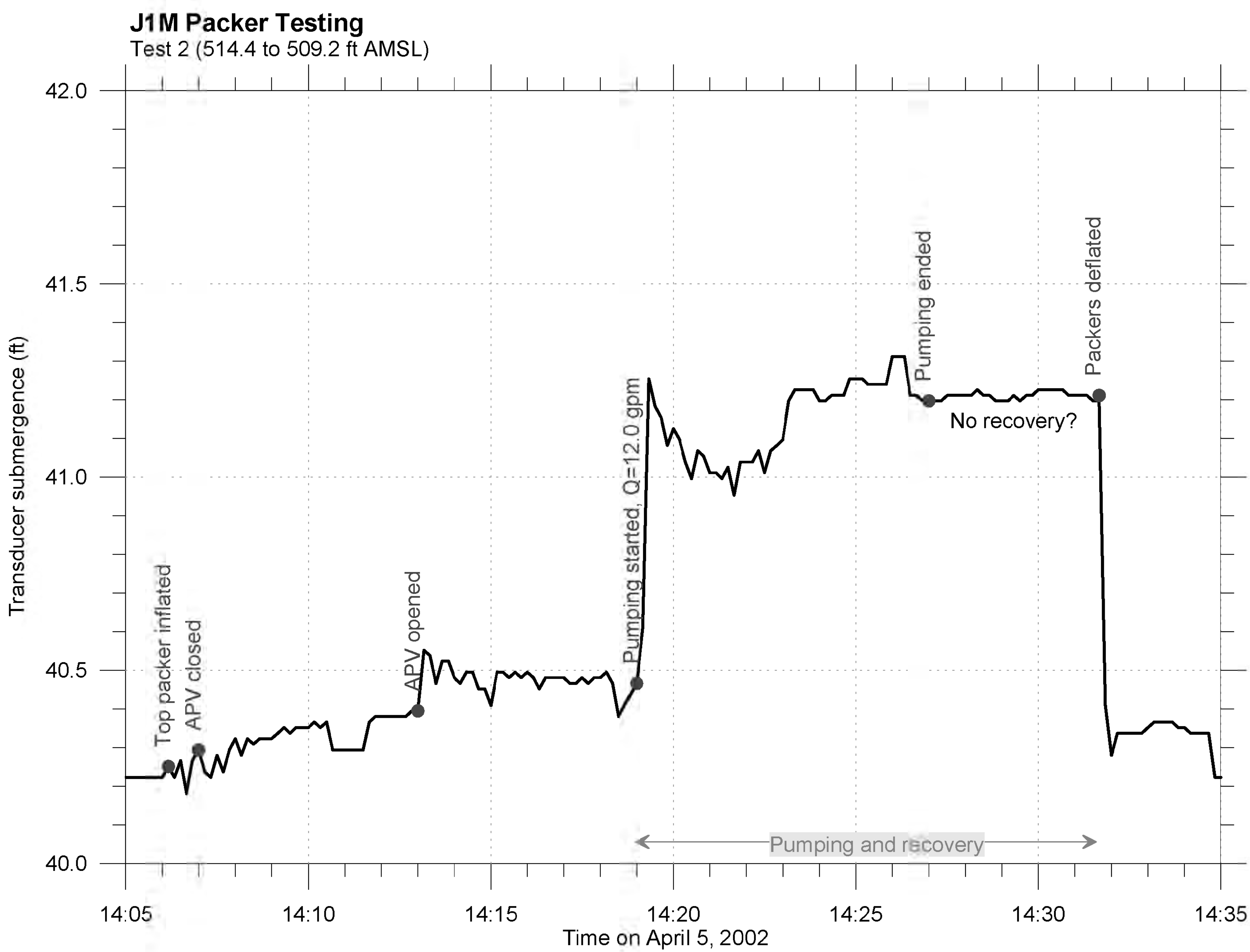
T by Thiem solution:

$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

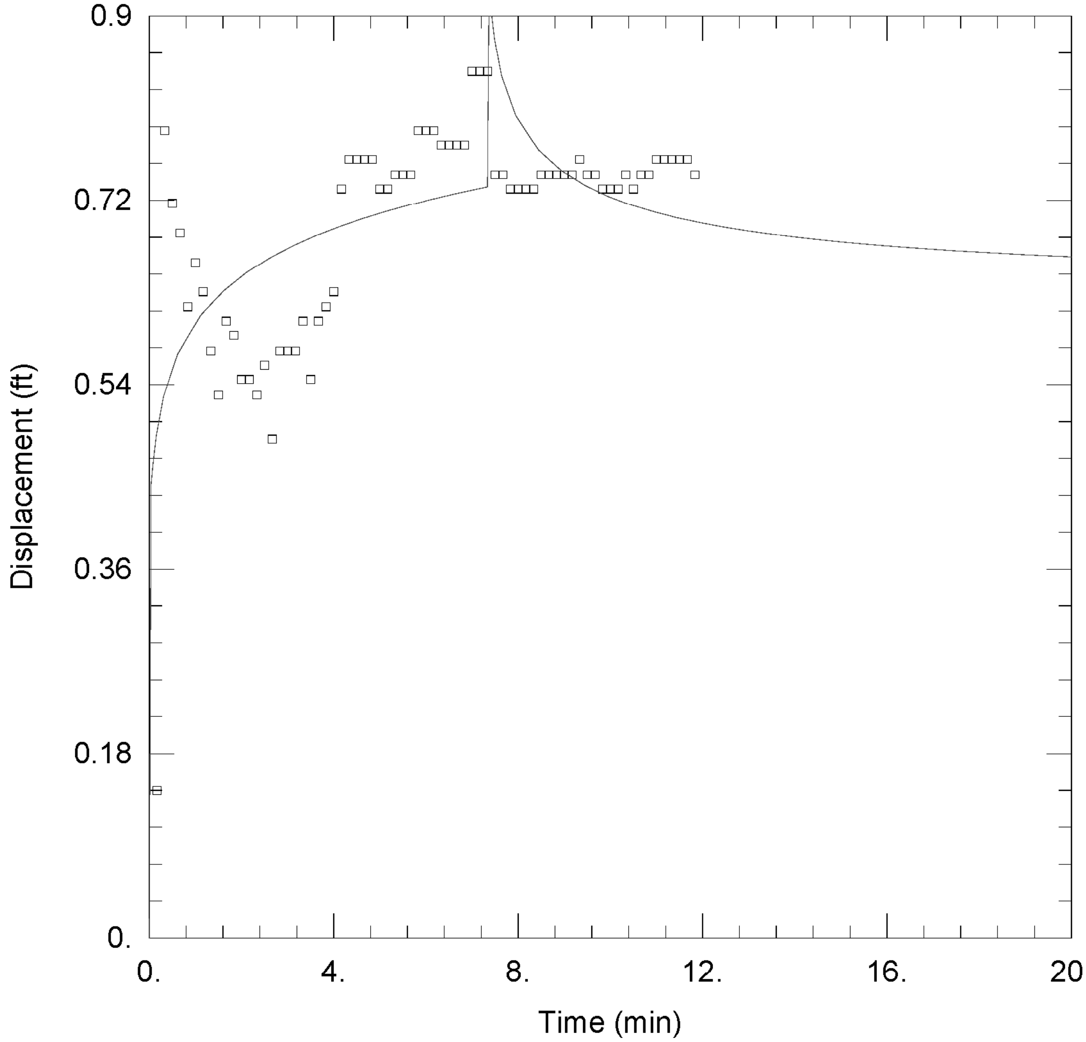
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)

$r_w = 3^7/_8" = 0.1615$ ft

$\underline{\underline{T = 3523\ ft^2/d}}$



J1M Packer Testing
Test 2 (514.4 to 509.2 ft AMSL)
Transducer submergence (ft)
42.0
41.5
41.0
40.5
40.0
14:05
14:10
14:15
14:20
14:25
14:30
14:35
Time on April 5, 2002
Top packer inflated
APV closed
APV opened
Pumping started, Q=12.0 gpm
Pumping ended
No recovery?
Packers deflated
Pumping and recovery



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-2P.aqt
Date: 01/21/03 Time: 14:26:44

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-2	0	0

SOLUTION

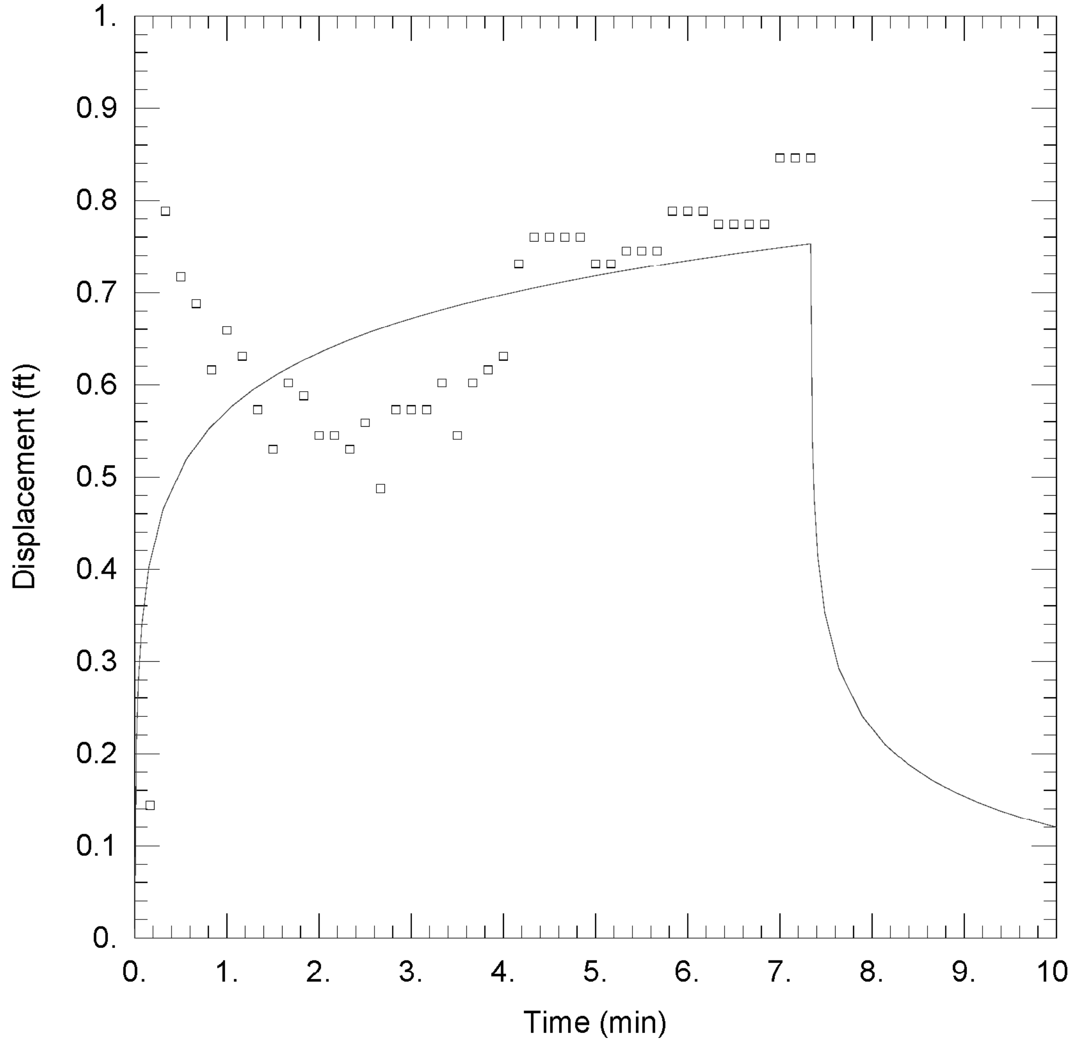
Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 3055.3 ft^2/day
Sw = -1.479
P = 1.995

S = 42.54
C = 0.1939 min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = -0.01844Q + 0.1939Q^{1.995}$
W.E. = 27.89%



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-2(pumping only).aqt
Date: 01/21/03 Time: 14:28:16

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-2	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 2283.8 ft^2/day

S = 2.996E-05

Sw = -5.

C = 0. min^2/ft^5

P = 1.5

Step Test Model: Jacob-Rorabaugh

Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 0.3157Q + 0.$Q^{1.5}$

W.E. = 259.%

J1M, Test 2P

Alternative analyses

Average Q: 12 gpm

"Drawdown" (s or ΔH): 0.85 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 3529\ ft^2/d}}$

<u>T by Thiem solution:</u>

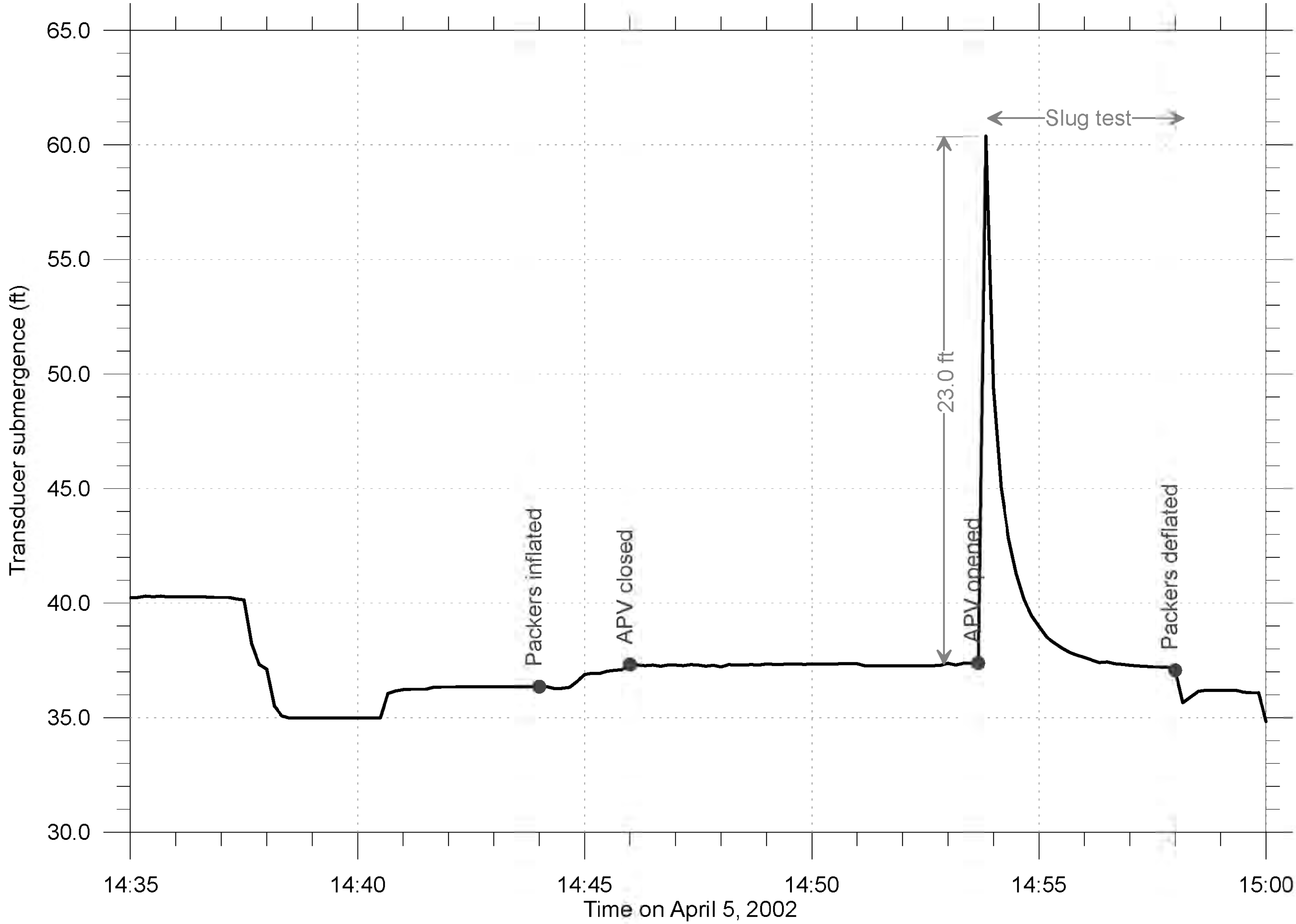
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

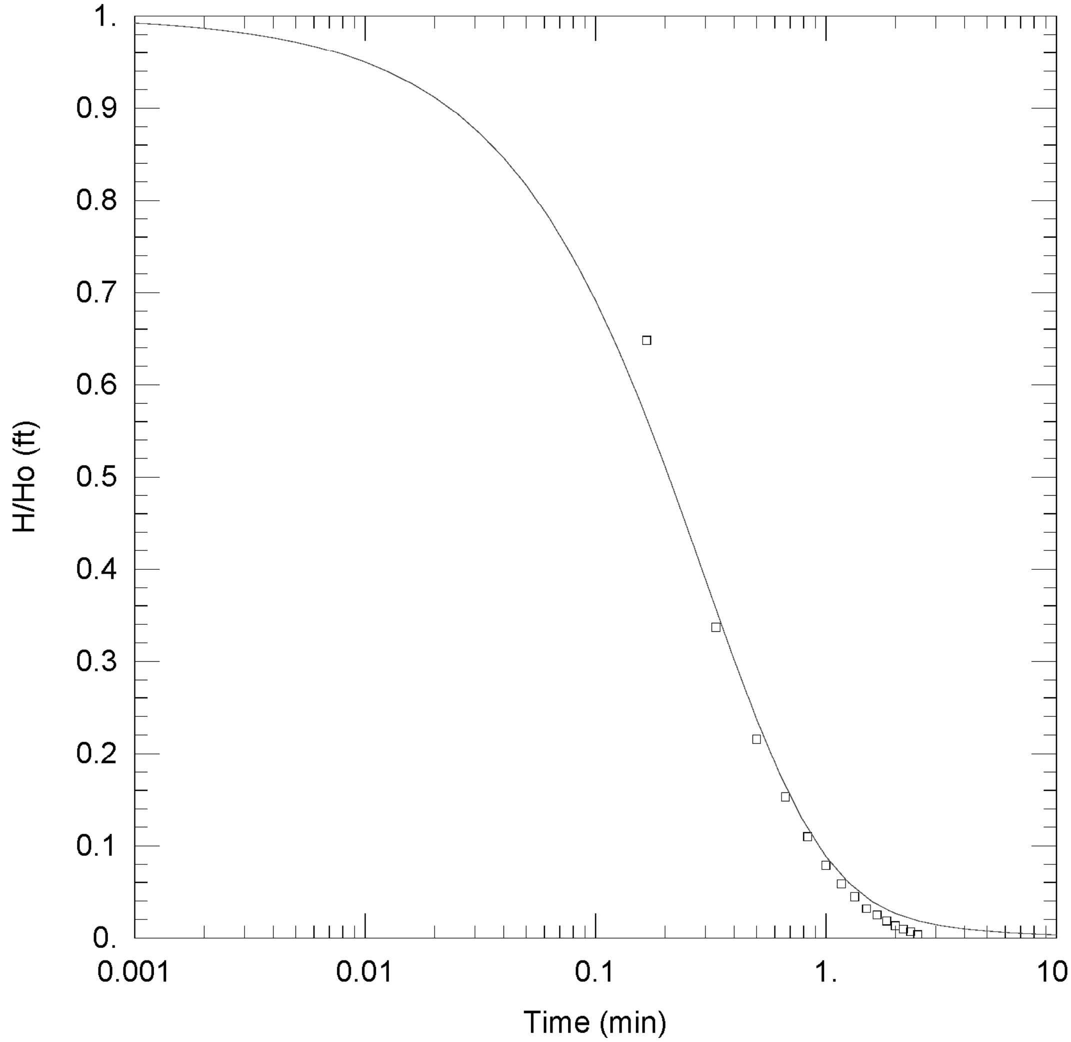
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)

$r_w = 3^7/_8" = 0.1615$ ft

$\underline{\underline{T = 2298\ ft^2/d}}$

J1M Packer Testing
Test 3 (518.39 to 513.19 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-3S.aqt
Date: 01/21/03 Time: 14:26:14

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

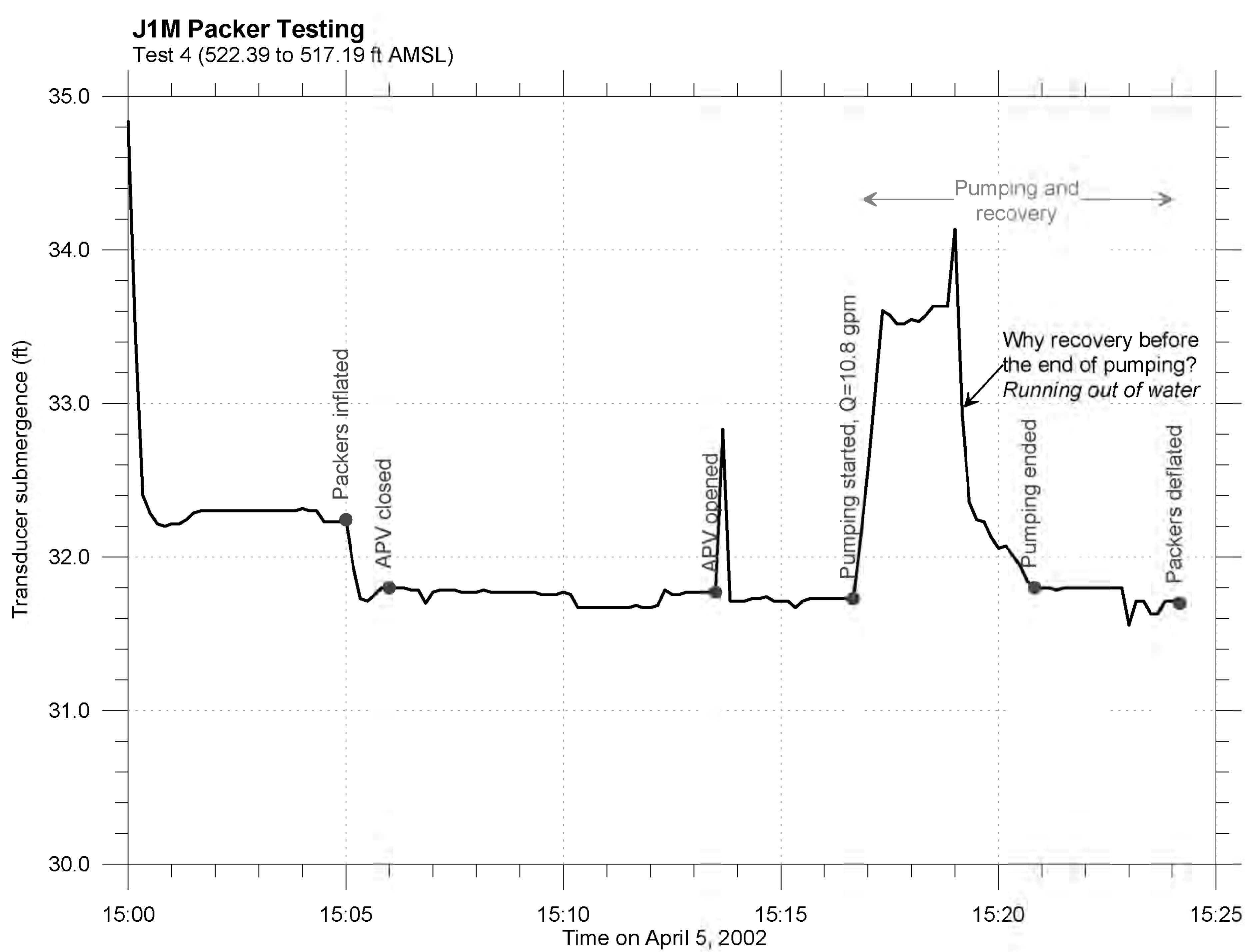
WELL DATA (J1M-3)

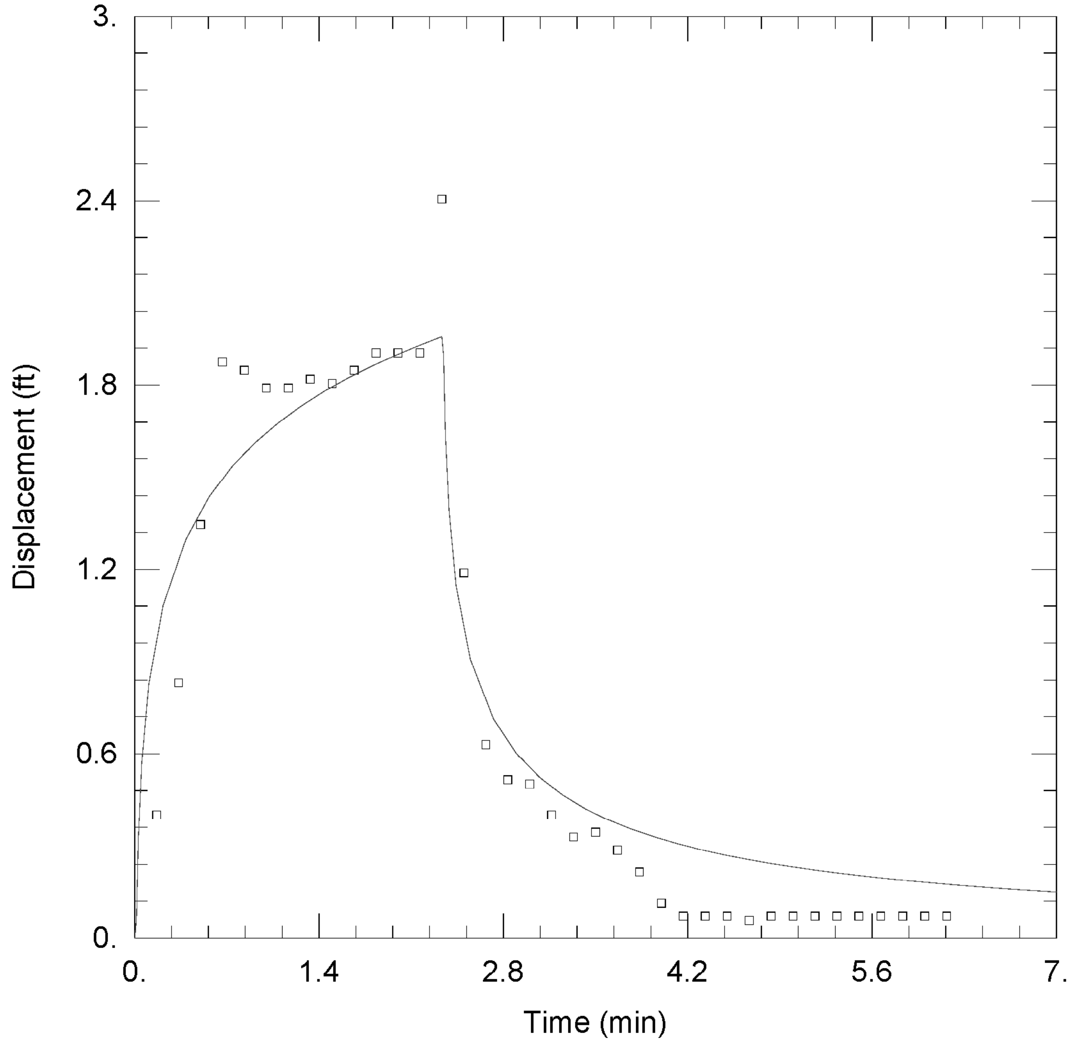
Initial Displacement: 35.5 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 20.1 ft^2/day S = 1.E-05


J1M Packer Testing
Test 4 (522.39 to 517.19 ft AMSL)
Transducer submergence (ft)
35.0
34.0
33.0
32.0
31.0
30.0
15:00
15:05
15:10
15:15
15:20
15:25
Time on April 5, 2002
Packers inflated
APV closed
APV opened
Pumping started, Q=10.8 gpm
Pumping and recovery
Why recovery before the end of pumping?
Running out of water
Pumping ended
Packers deflated



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-4P.aqt
Date: 01/21/03 Time: 14:26:01

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-4	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-4	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 447.6 ft^2/day

S = 2.472E-05

Sw = -4.68

C = 0. min^2/ft^5

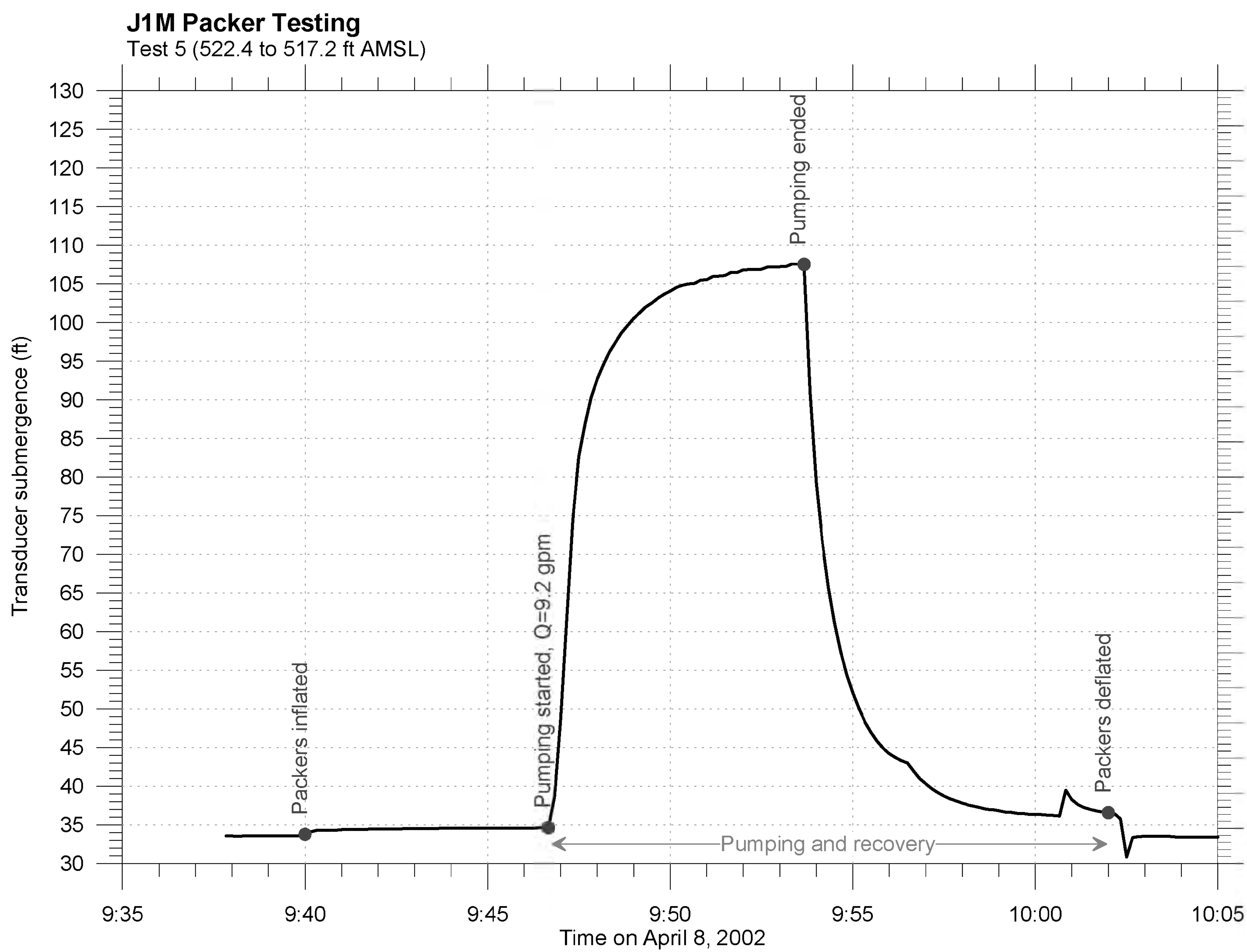
P = 1.5

Step Test Model: Jacob-Rorabaugh

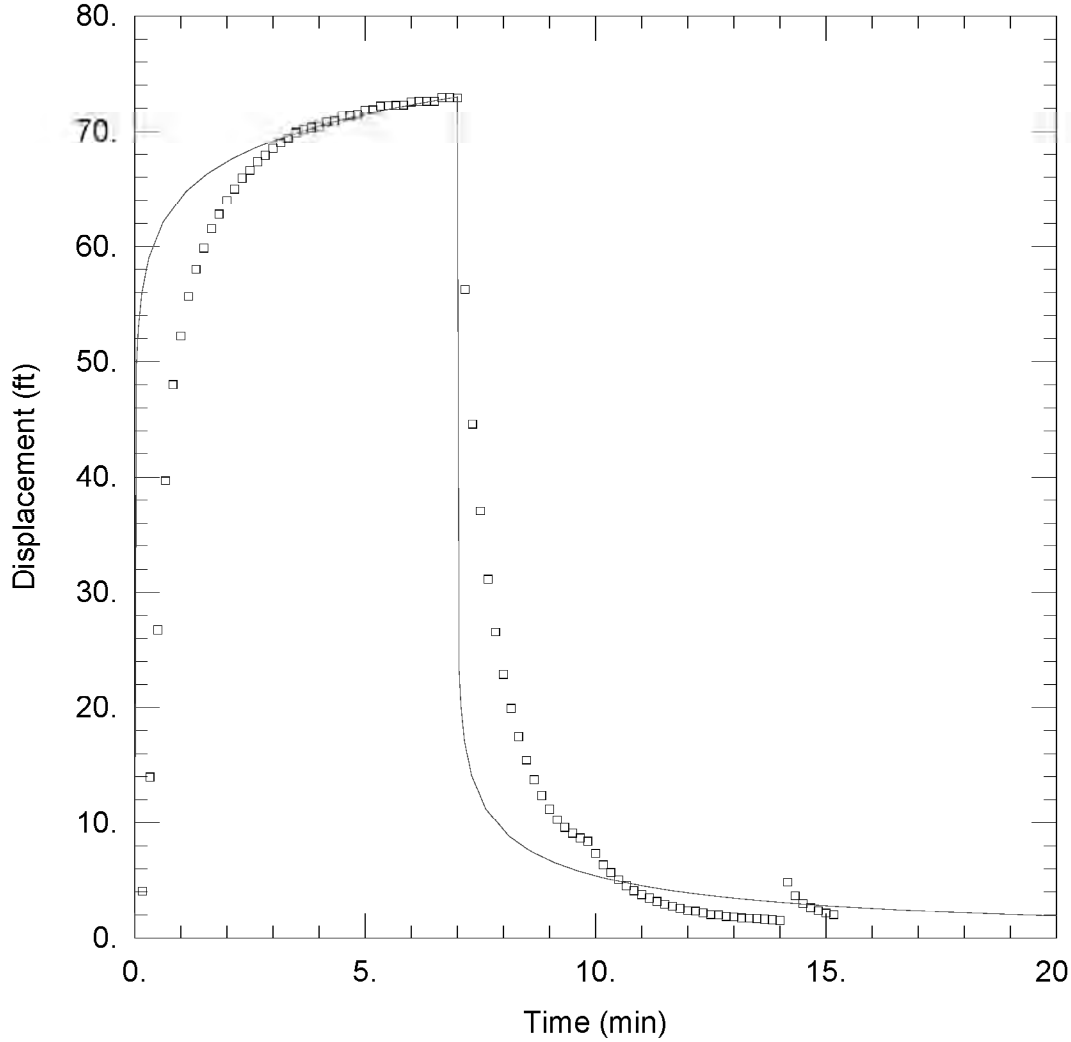
$s(t) = 1.145Q + 0.Q^{1.5}$

Time (t) = 1. min Rate (Q) in cu. ft/min

W.E. = 309.3%



J1M Packer Testing
Test 5 (522.4 to 517.2 ft AMSL)
Transducer submergence (ft)
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
Packers inflated
Pumping started, Q=9.2 gpm
Pumping ended
Packers deflated
Pumping and recovery
9:35
9:40
9:45
9:50
9:55
10:00
10:05
Time on April 8, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-5P.aqt
Date: 01/21/03 Time: 14:25:49

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-5	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-5	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 31.6 ft^2/day
Sw = 0.
P = 3.

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 52.18Q + 0.Q^{3.}$
W.E. = 100.%

J1M, Test 5

Alternative analyses

Average Q: 9.2 gpm
"Drawdown" (s or ΔH): 72.915 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

T = 32 ft²/d

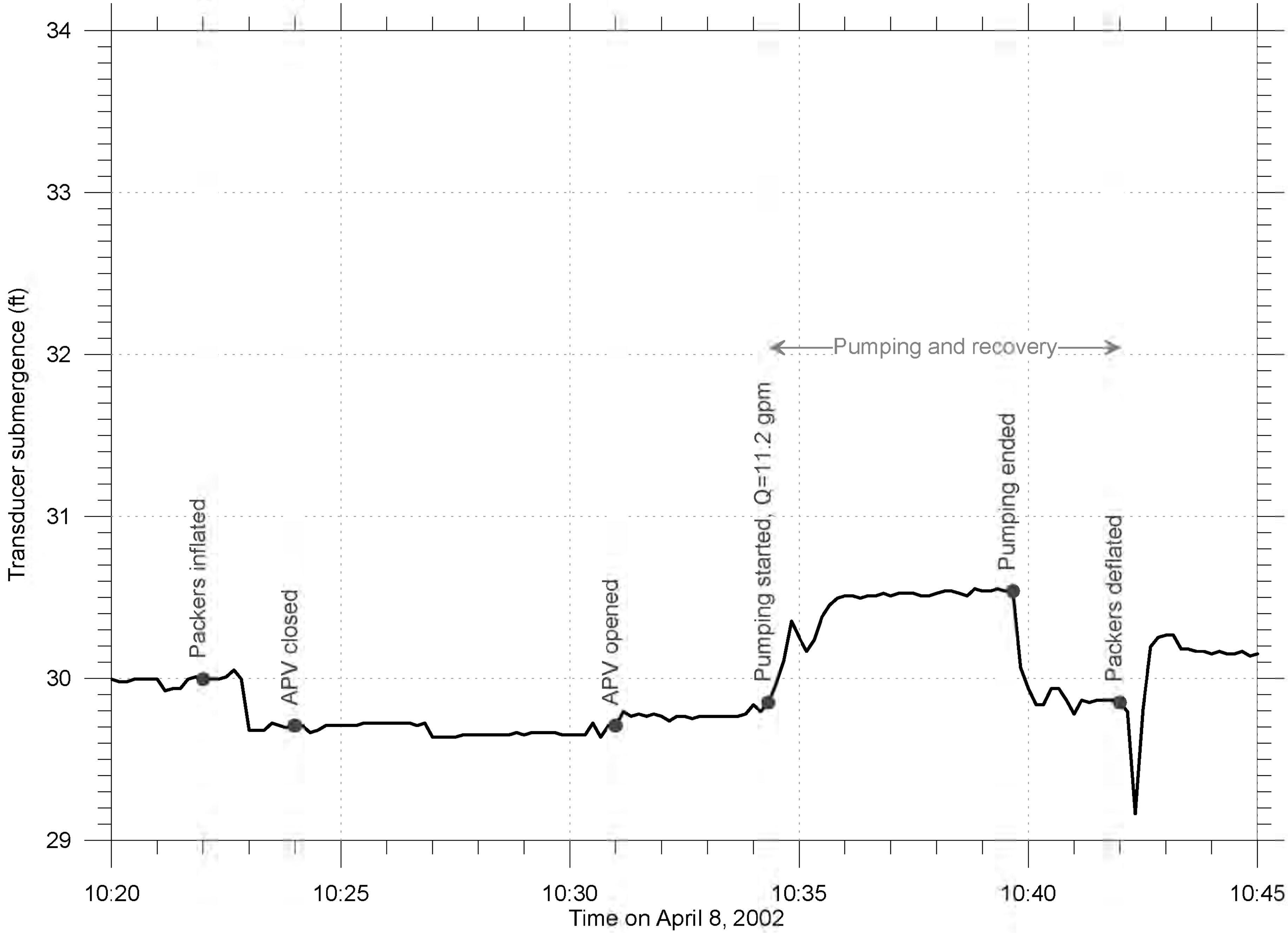
T by Thiem solution:

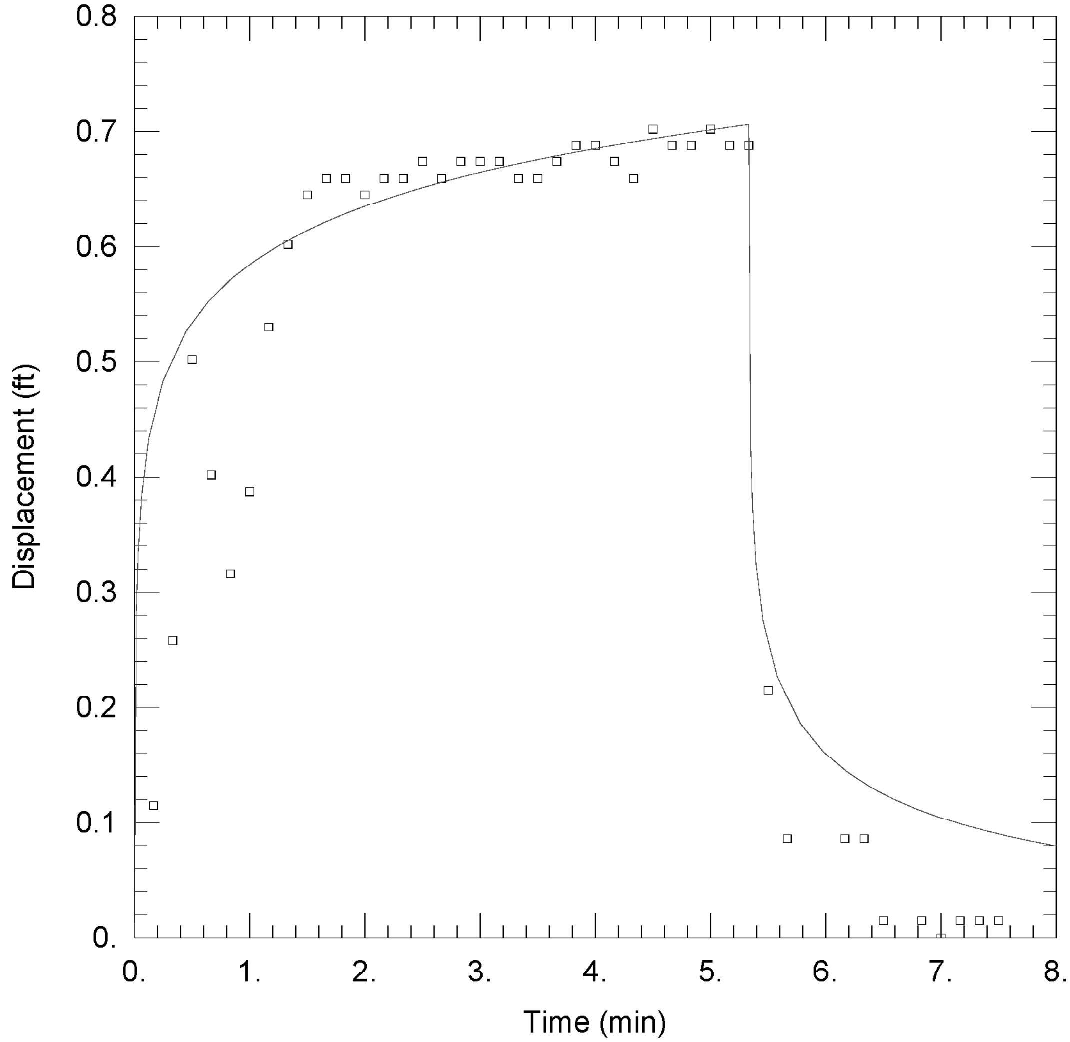
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w \right)}{\Delta H}$$

where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
r_w = $3^7/_8$" = 0.1615 ft

T = 21 ft²/d

J1M Packer Testing
Test 6 (526.59 to 521.39 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-6P.aqt
Date: 01/21/03 Time: 14:25:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

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

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J1M-6	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J1M-6	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 2662.3 ft^2/day
Sw = -4.248
P = 2.

S = 9.736E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 0.3465Q + 0.Q^{2.}$
W.E. = 205.6%

J1M, Test 6P

Alternative analyses

Average Q: 11.2 gpm

"Drawdown" (s or ΔH): 0.7 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 4000\ ft^2/d}}$

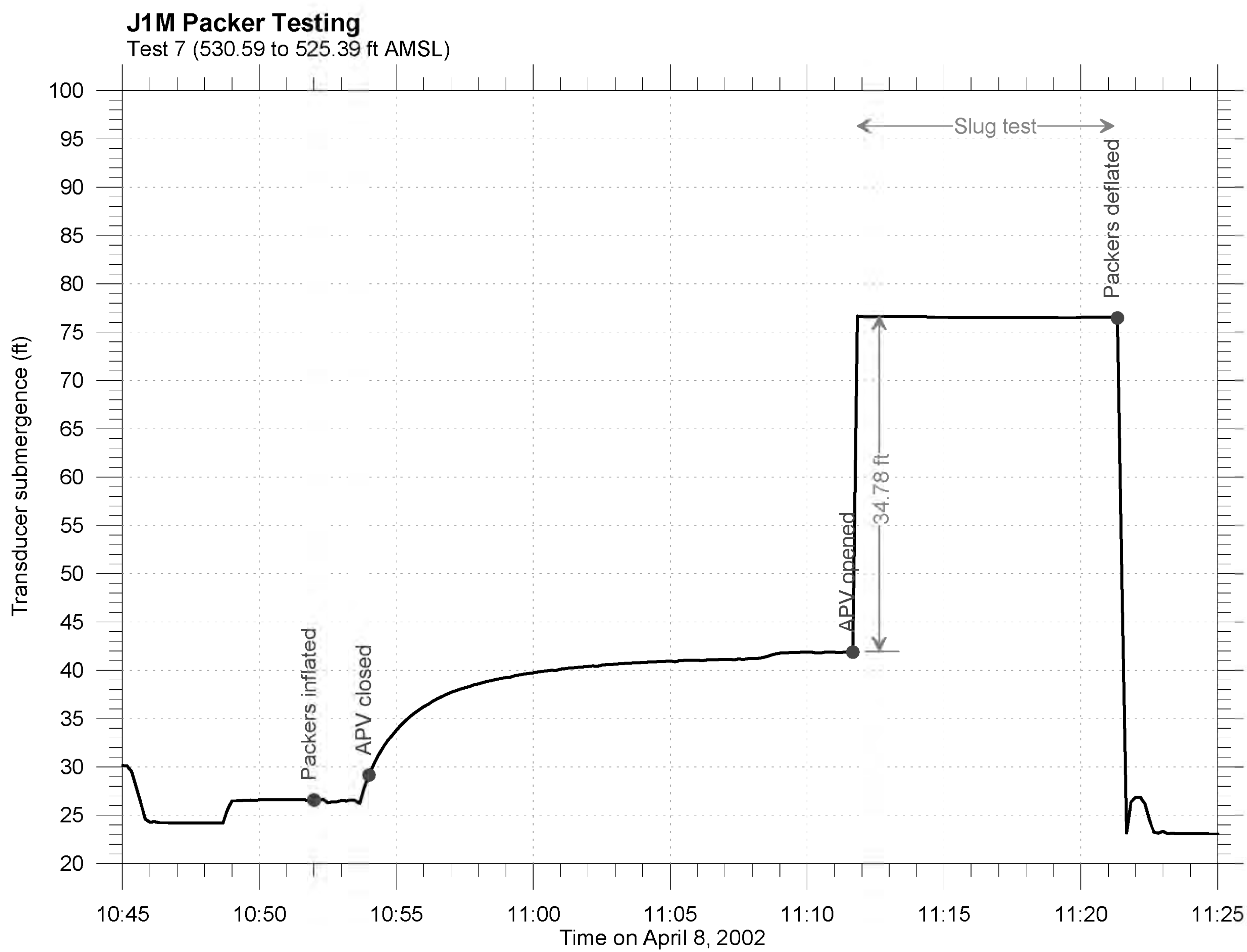
<u>T by Thiem solution:</u>

$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

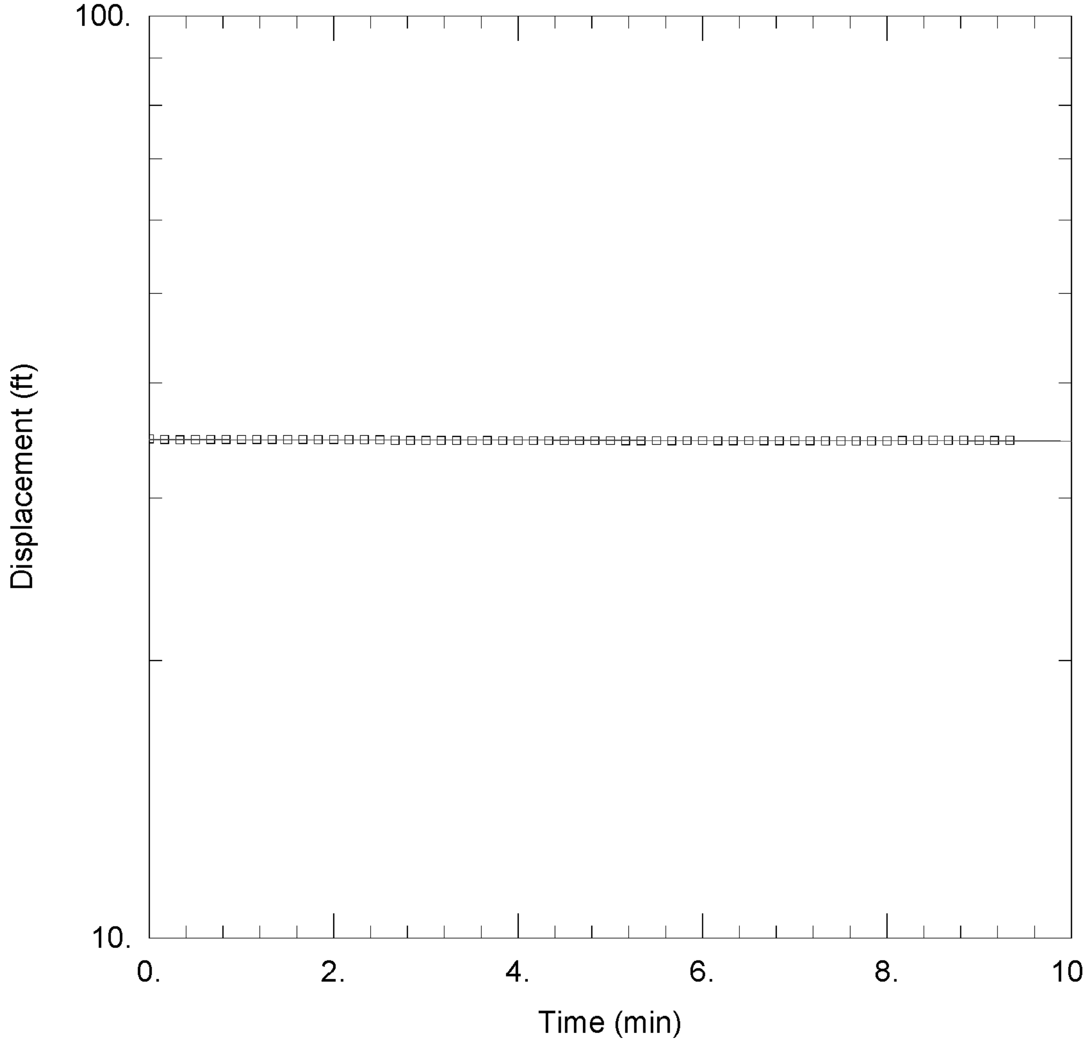
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)

$r_w = 3^7/_8$" = 0.1615 ft

$\underline{\underline{T = 2605\ ft^2/d}}$



J1M Packer Testing
Test 7 (530.59 to 525.39 ft AMSL)
Transducer submergence (ft)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
Slug test
Packers deflated
34.78 ft
APV opened
Packers inflated
APV closed
10:45
10:50
10:55
11:00
11:05
11:10
11:15
11:20
11:25
Time on April 8, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-7S.aqt
Date: 01/21/03 Time: 14:25:13

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

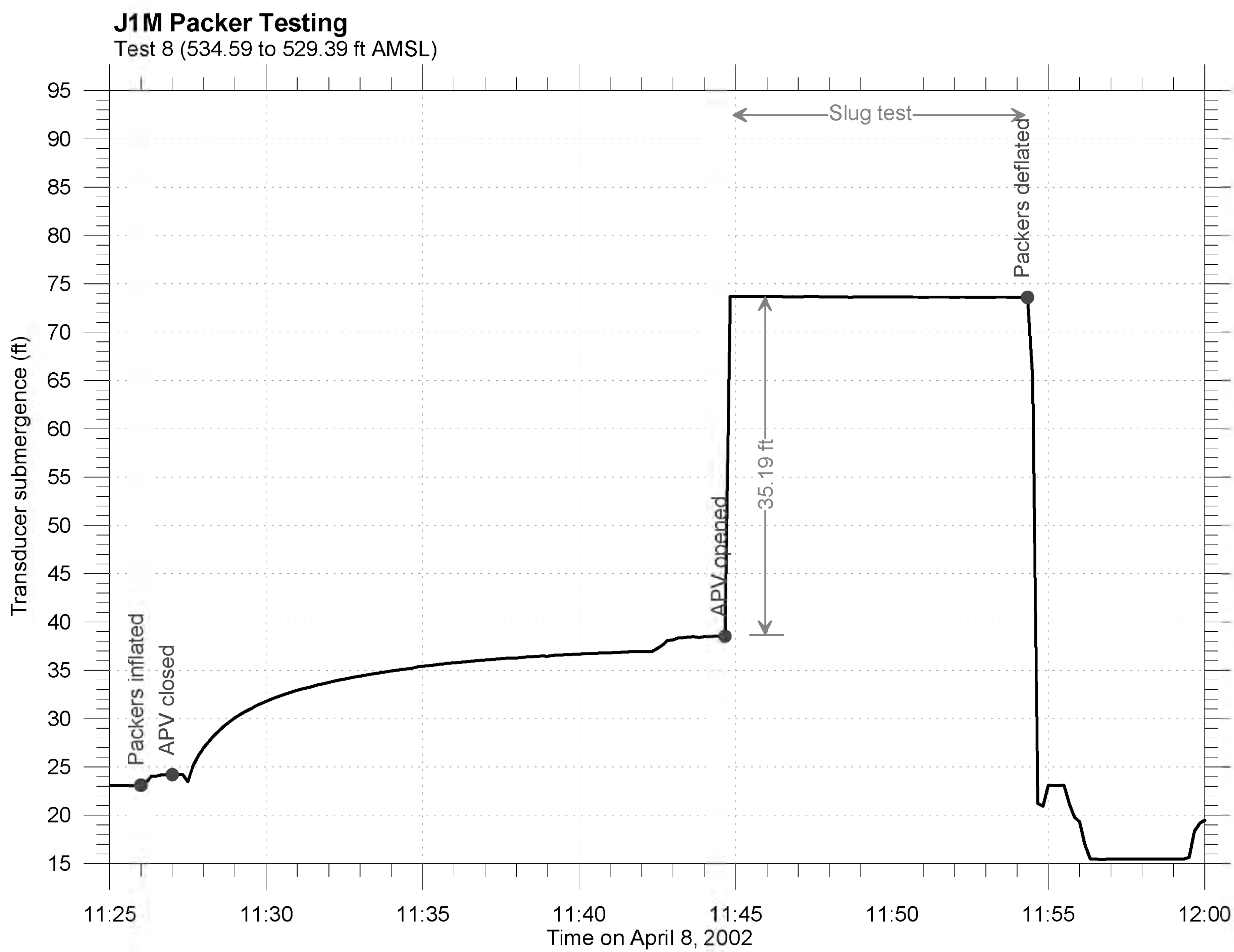
WELL DATA (J1M-7)

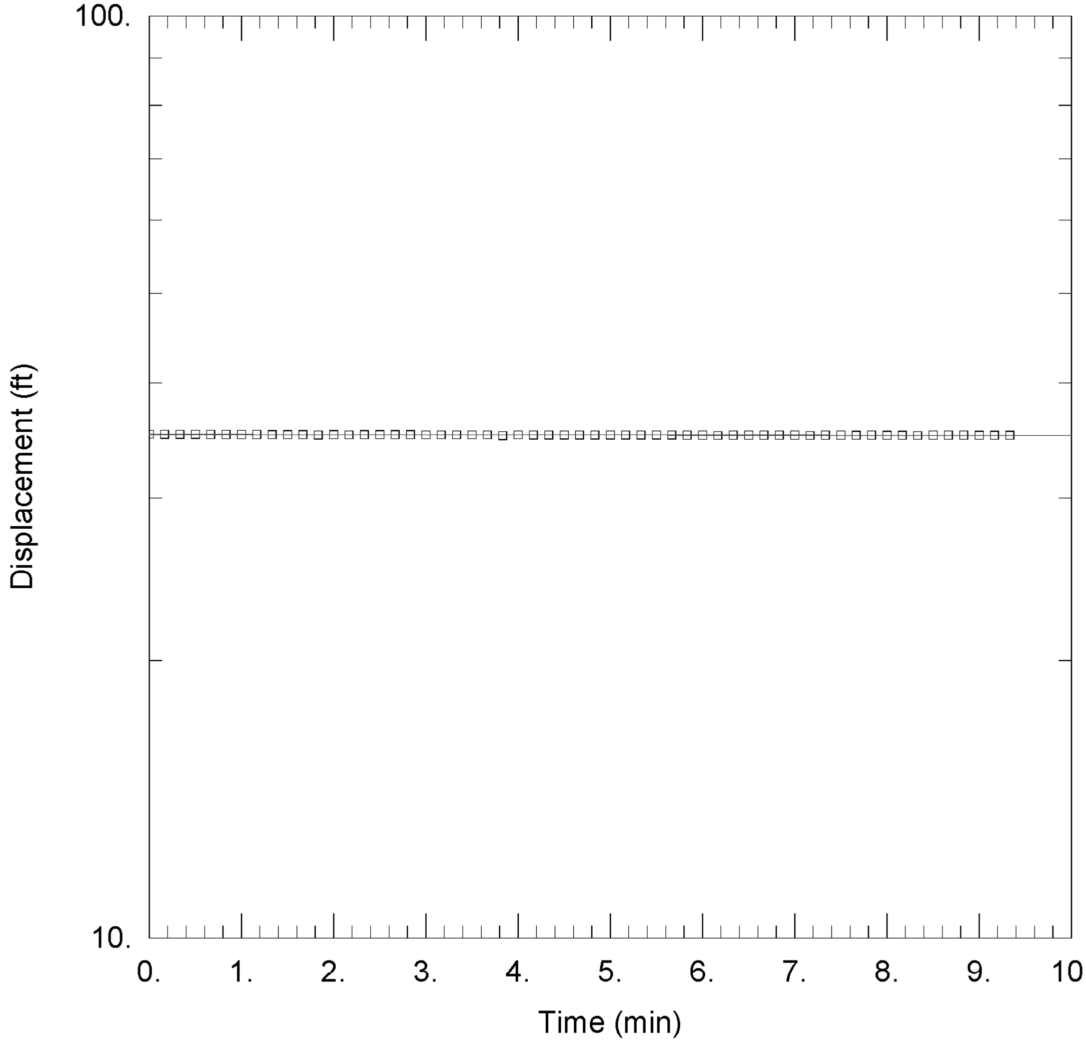
Initial Displacement: 34.78 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.0002971 ft/day y0 = 34.72 ft


J1M Packer Testing
Test 8 (534.59 to 529.39 ft AMSL)
Transducer submergence (ft)
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
Packers inflated
APV closed
APV opened
35.19 ft
Slug test
Packers deflated
11:25
11:30
11:35
11:40
11:45
11:50
11:55
12:00
Time on April 8, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-8S.aqt
Date: 01/21/03 Time: 14:25:04

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1M-8)

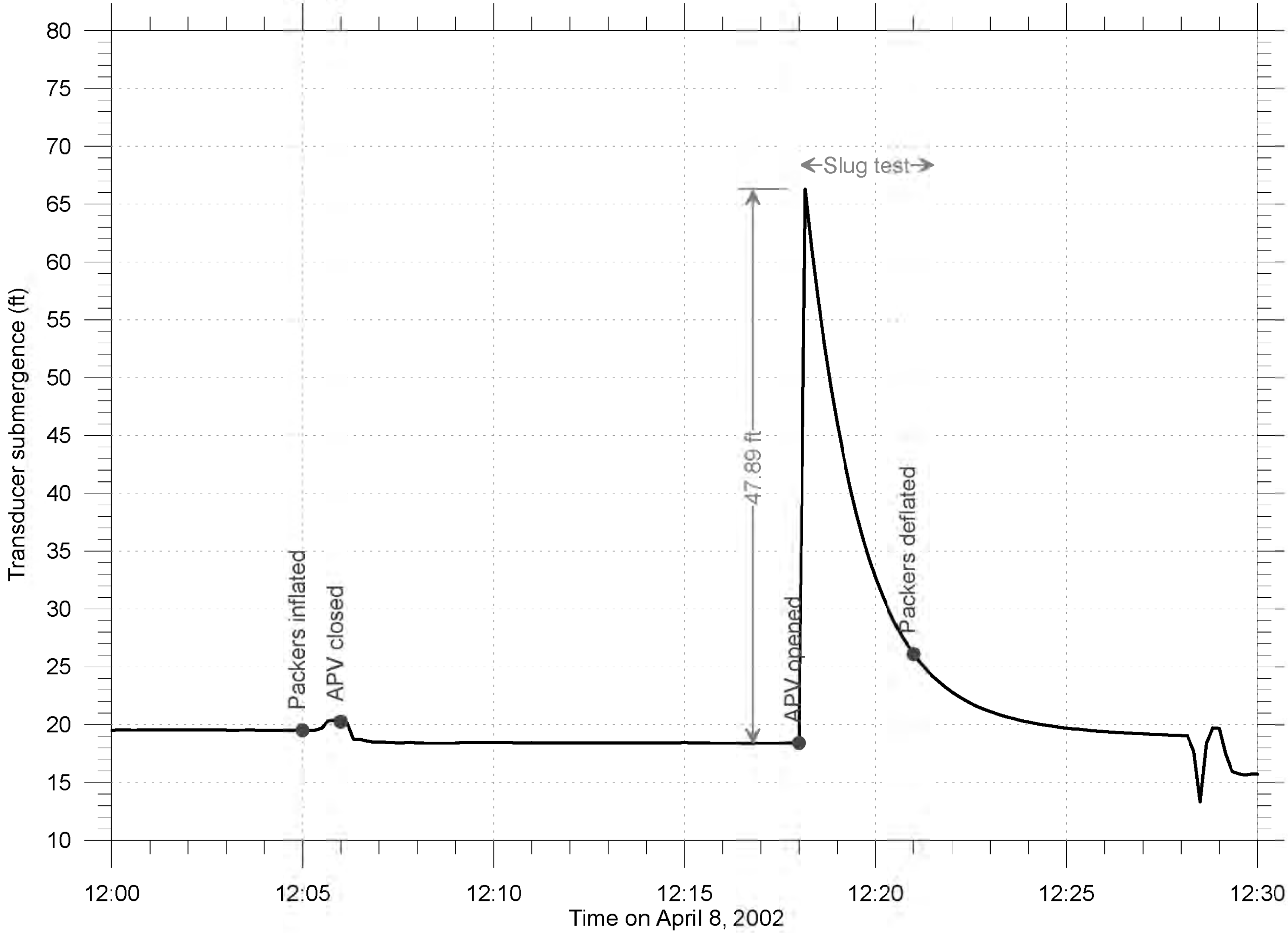
Initial Displacement: 35.19 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

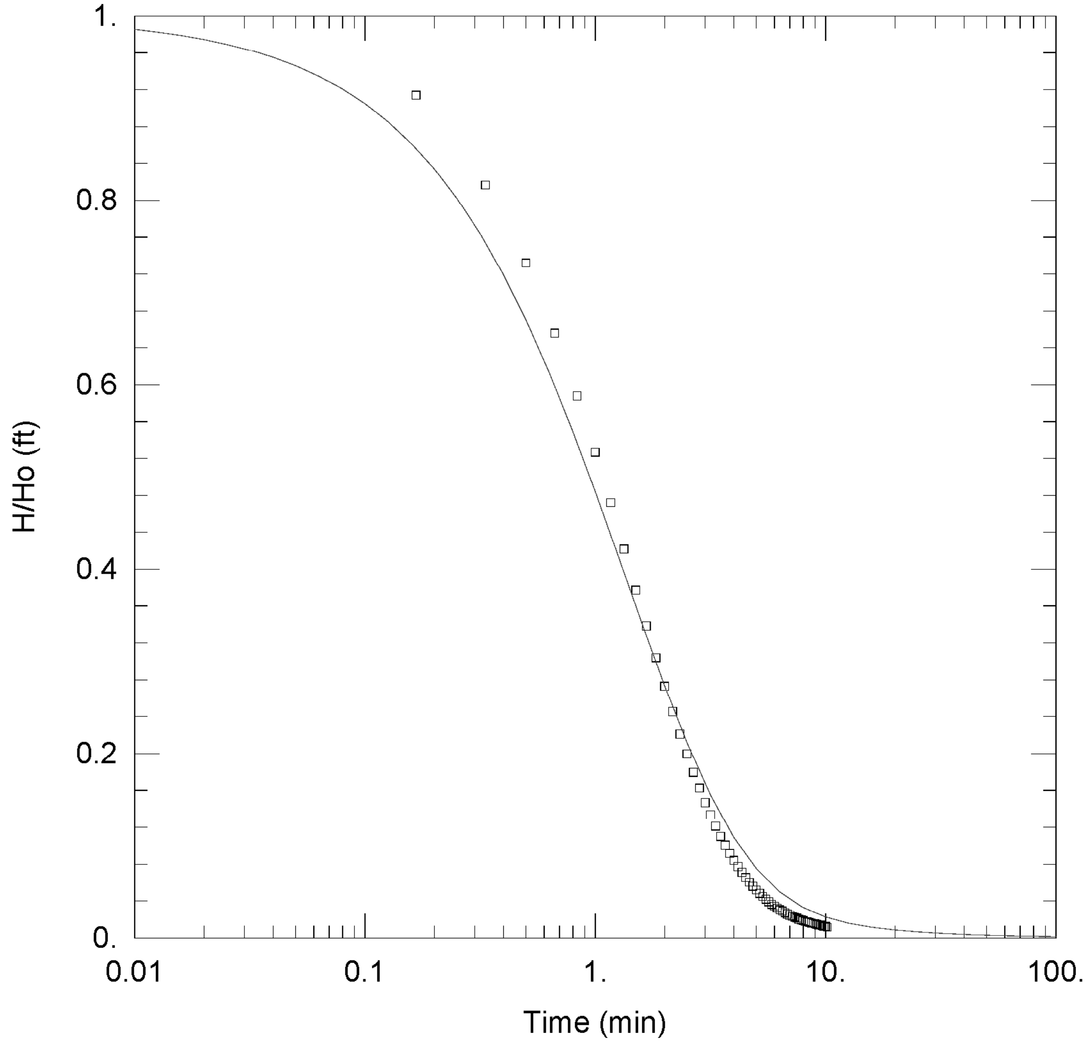
SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.0002154 ft/day y0 = 35.17 ft

J1M Packer Testing
Test 9 (538.59 to 533.39 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-9S.aqt
Date: 01/21/03 Time: 14:30:09

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1M-9)

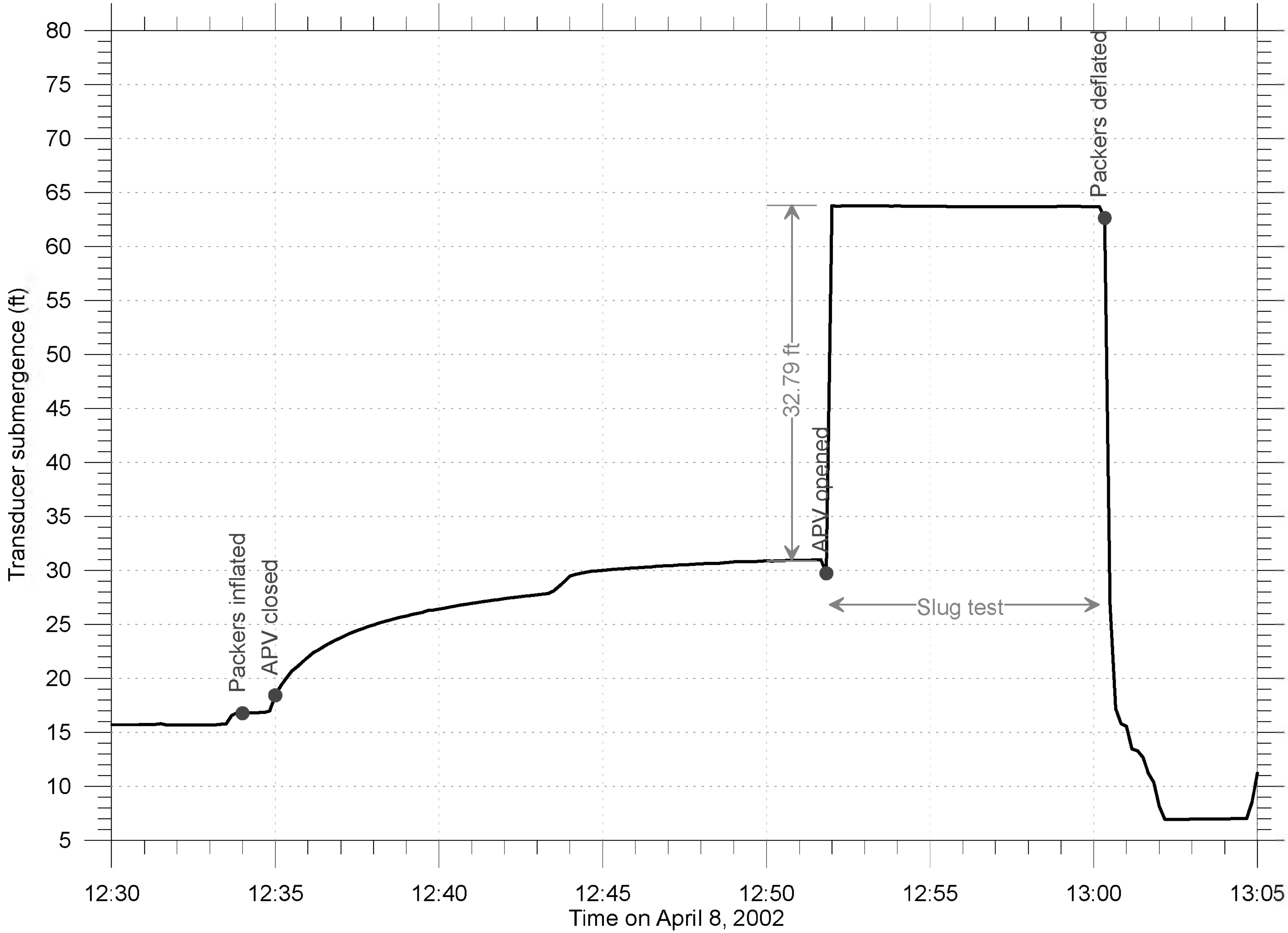
Initial Displacement: 52.39 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

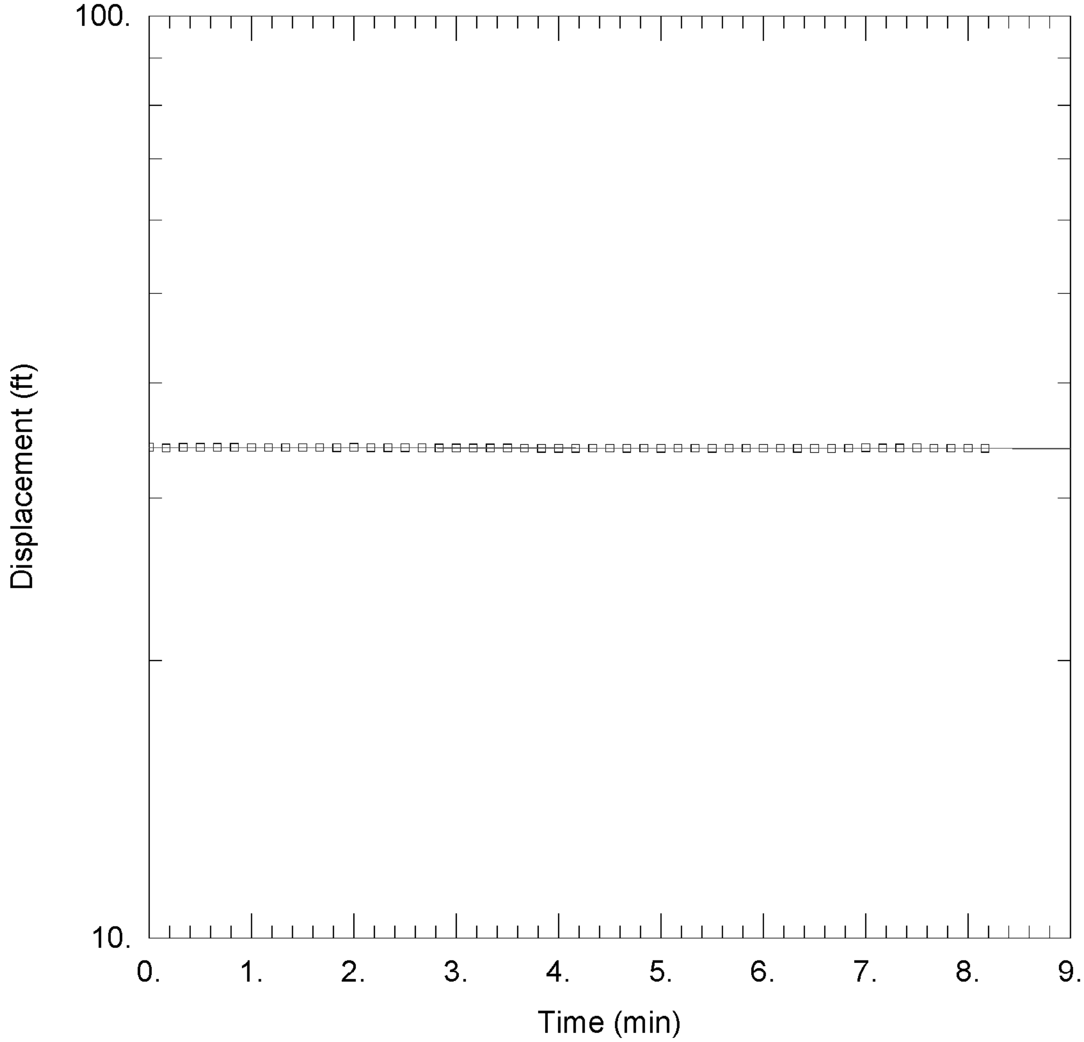
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 4.417 ft^2/day S = 1.E-05

J1M Packer Testing
Test 10 (542.69 to 537.49 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-10S.aqt
Date: 01/21/03 Time: 14:29:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

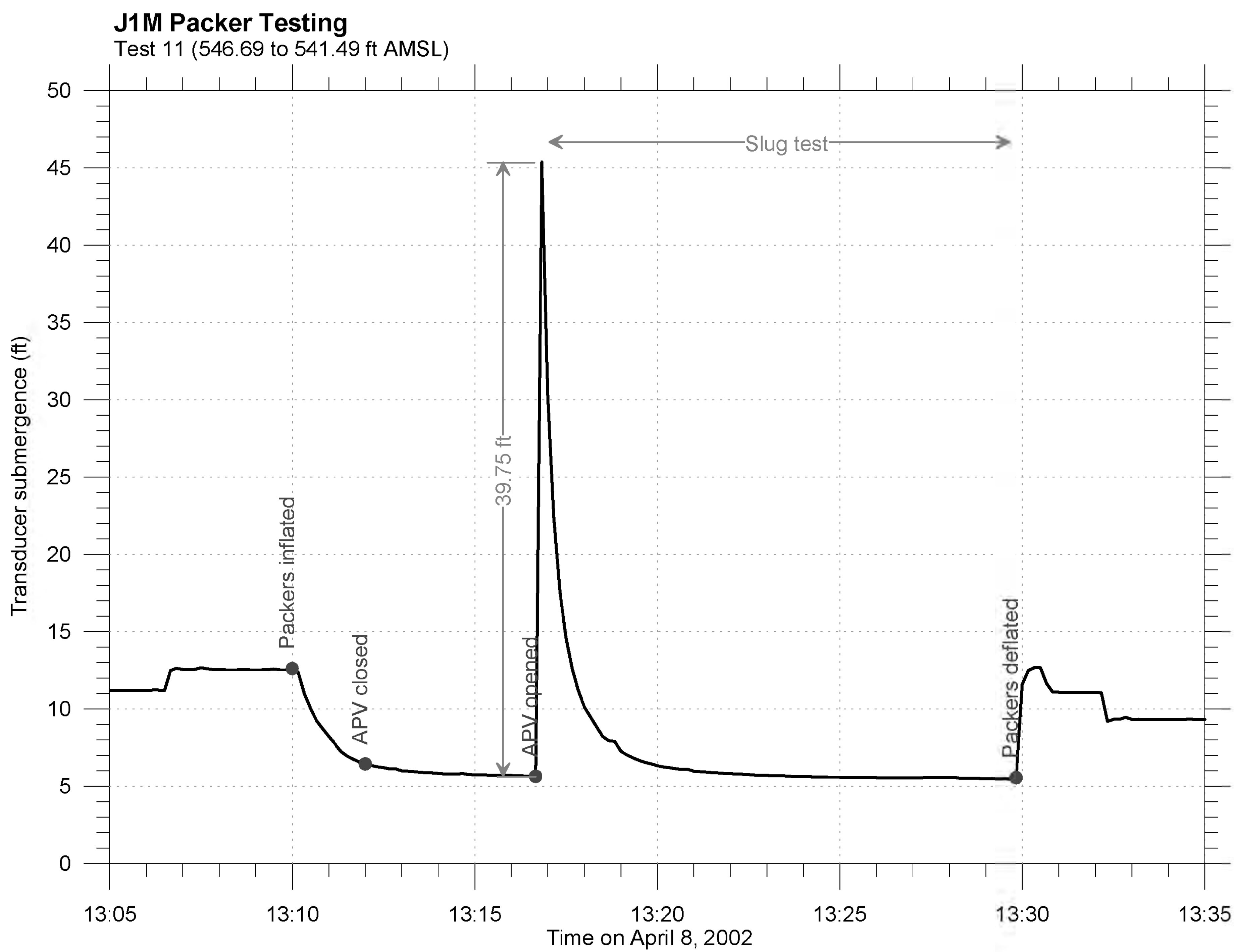
WELL DATA (J1M-10)

Initial Displacement: 34.06 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

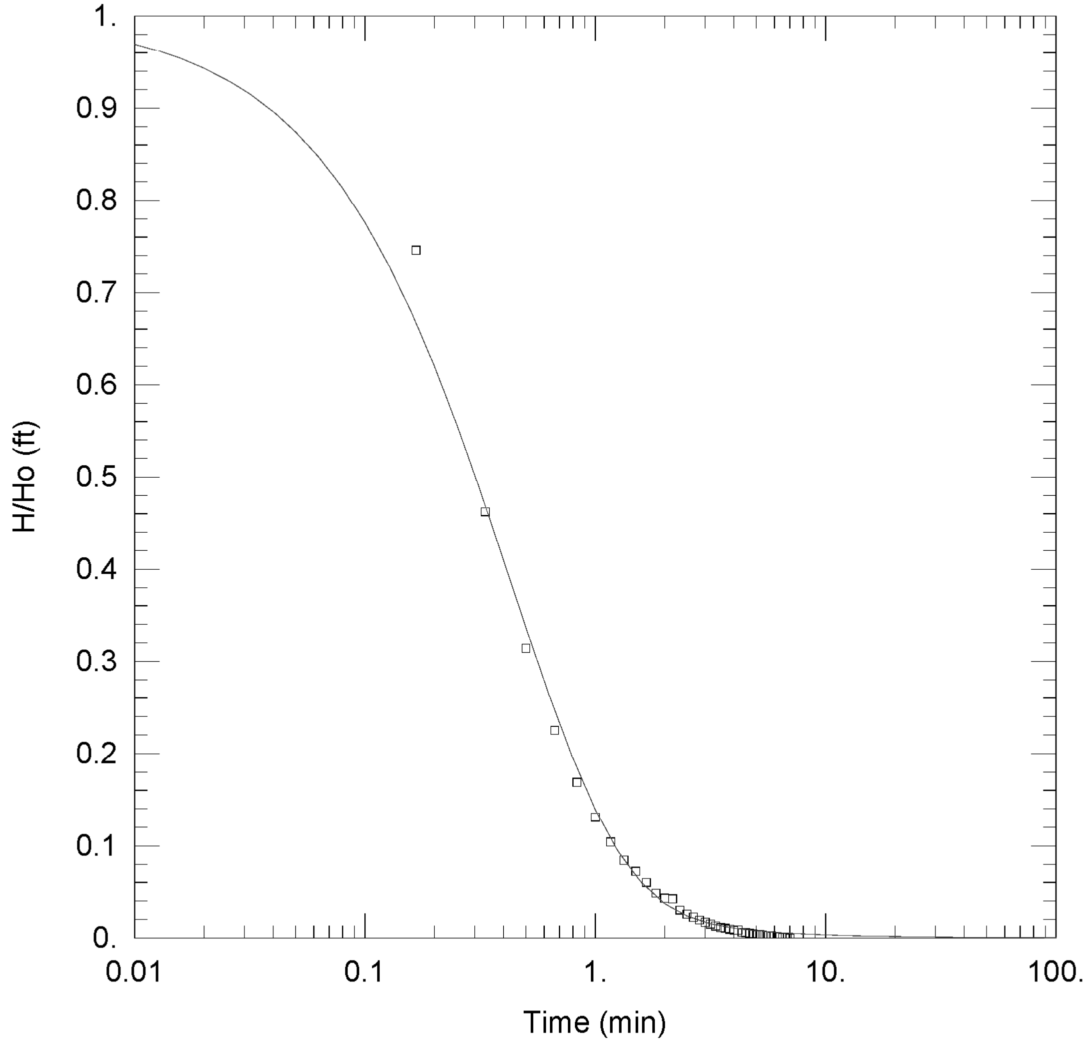
SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.0002339 ft/day y0 = 34.03 ft



J1M Packer Testing
Test 11 (546.69 to 541.49 ft AMSL)
Transducer submergence (ft)
0
5
10
15
20
25
30
35
40
45
50
Packers inflated
APV closed
APV opened
39.75 ft
Slug test
Packers deflated
13:05
13:10
13:15
13:20
13:25
13:30
13:35
Time on April 8, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-11S.aqt
Date: 01/21/03 Time: 14:29:27

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1M-11)

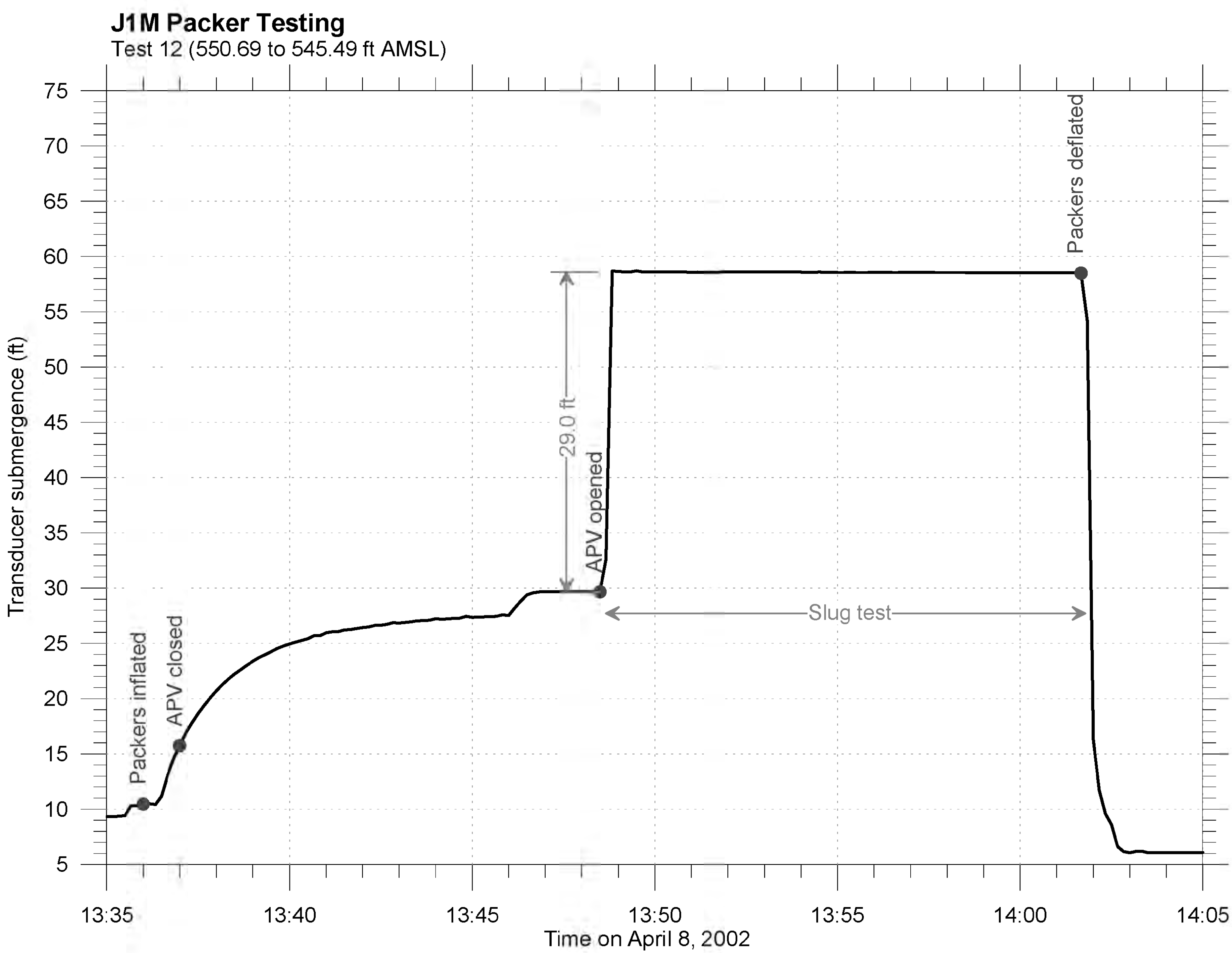
Initial Displacement: 53.3 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft

Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

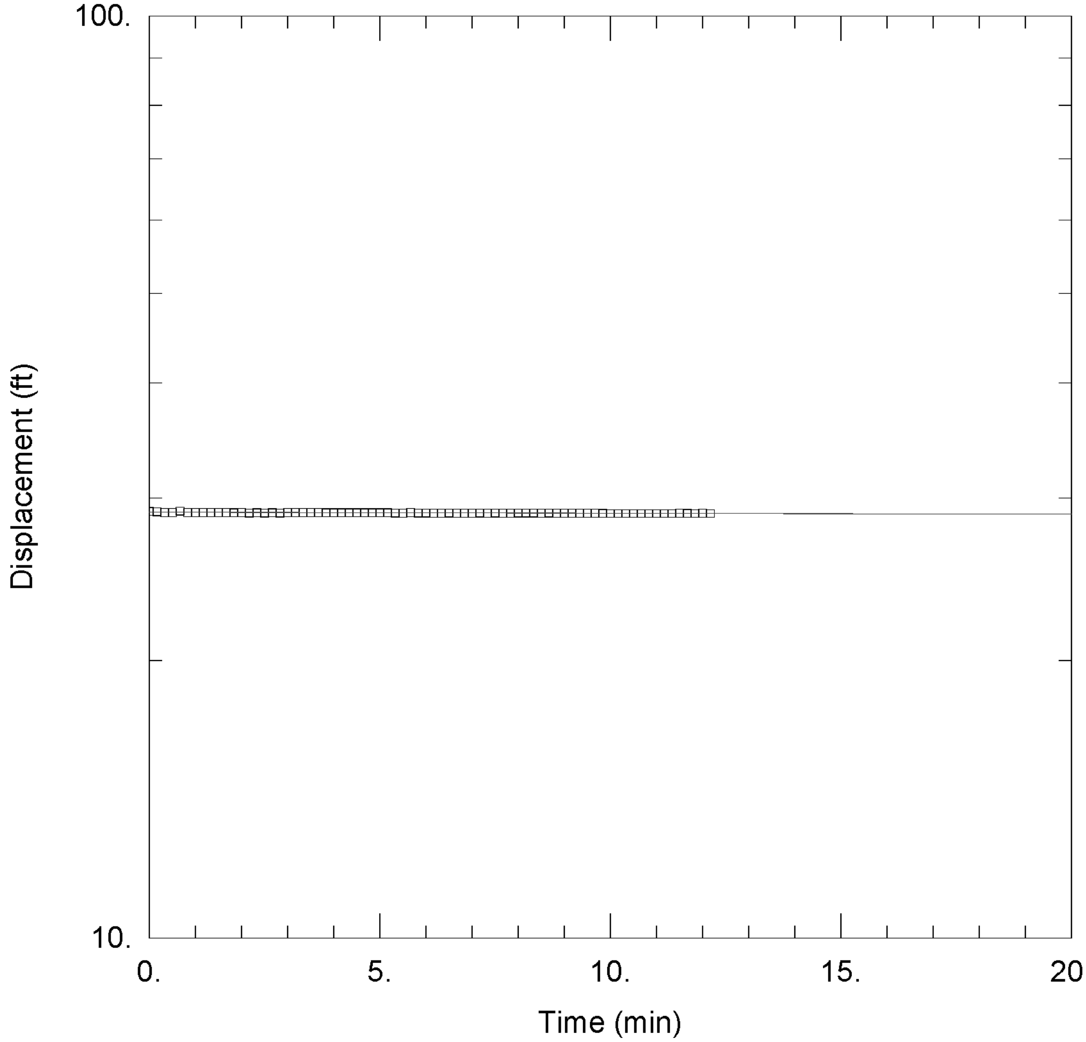
SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

$T = 21.03\ ft^2/day$ $S = 1.E-07$



J1M Packer Testing
Test 12 (550.69 to 545.49 ft AMSL)
Transducer submergence (ft)
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
Packers inflated
APV closed
29.0 ft
APV opened
Slug test
Packers deflated
13:35
13:40
13:45
13:50
13:55
14:00
14:05
Time on April 8, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-12S.aqt
Date: 01/21/03
Time: 14:29:20

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

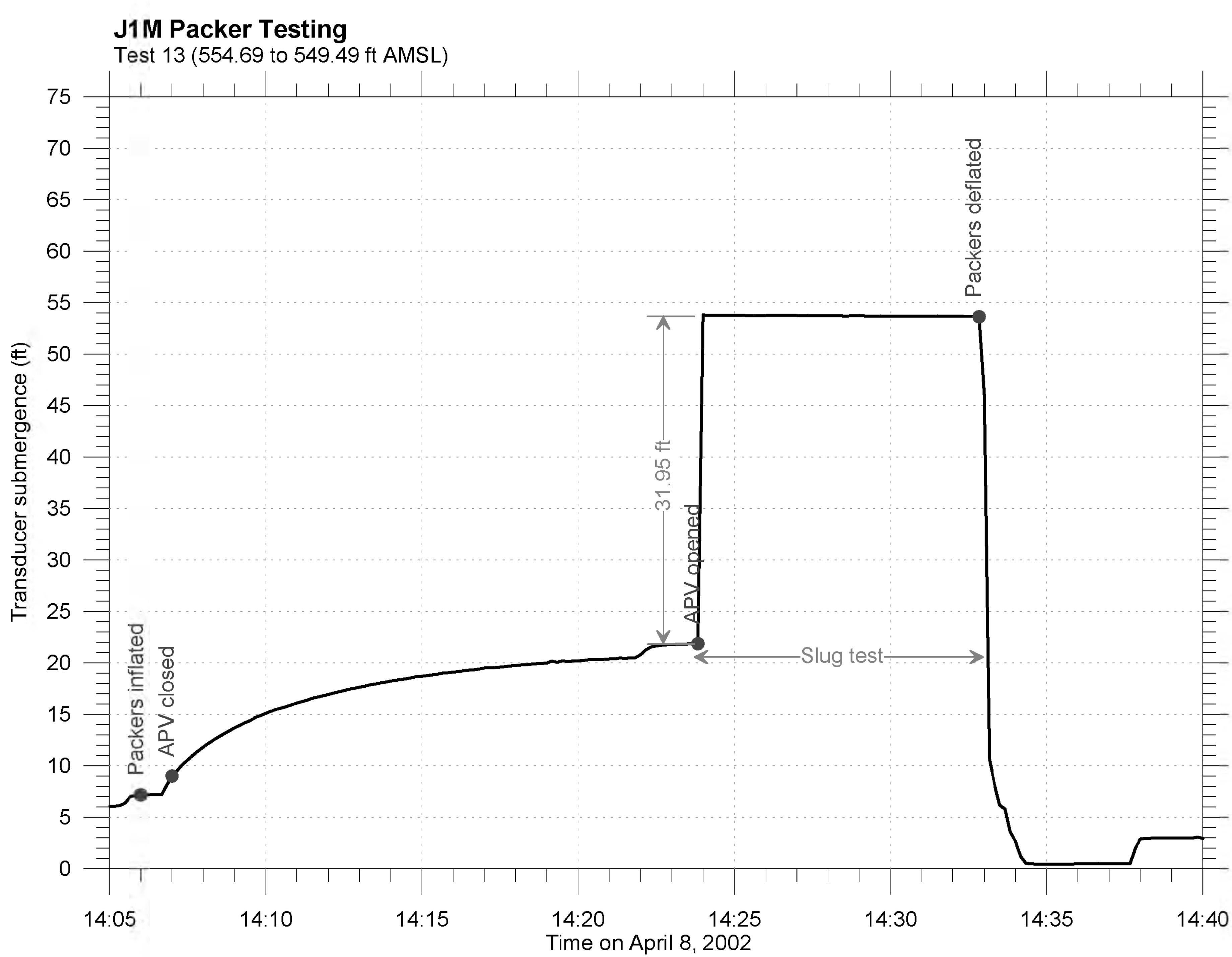
WELL DATA (J1M-12)

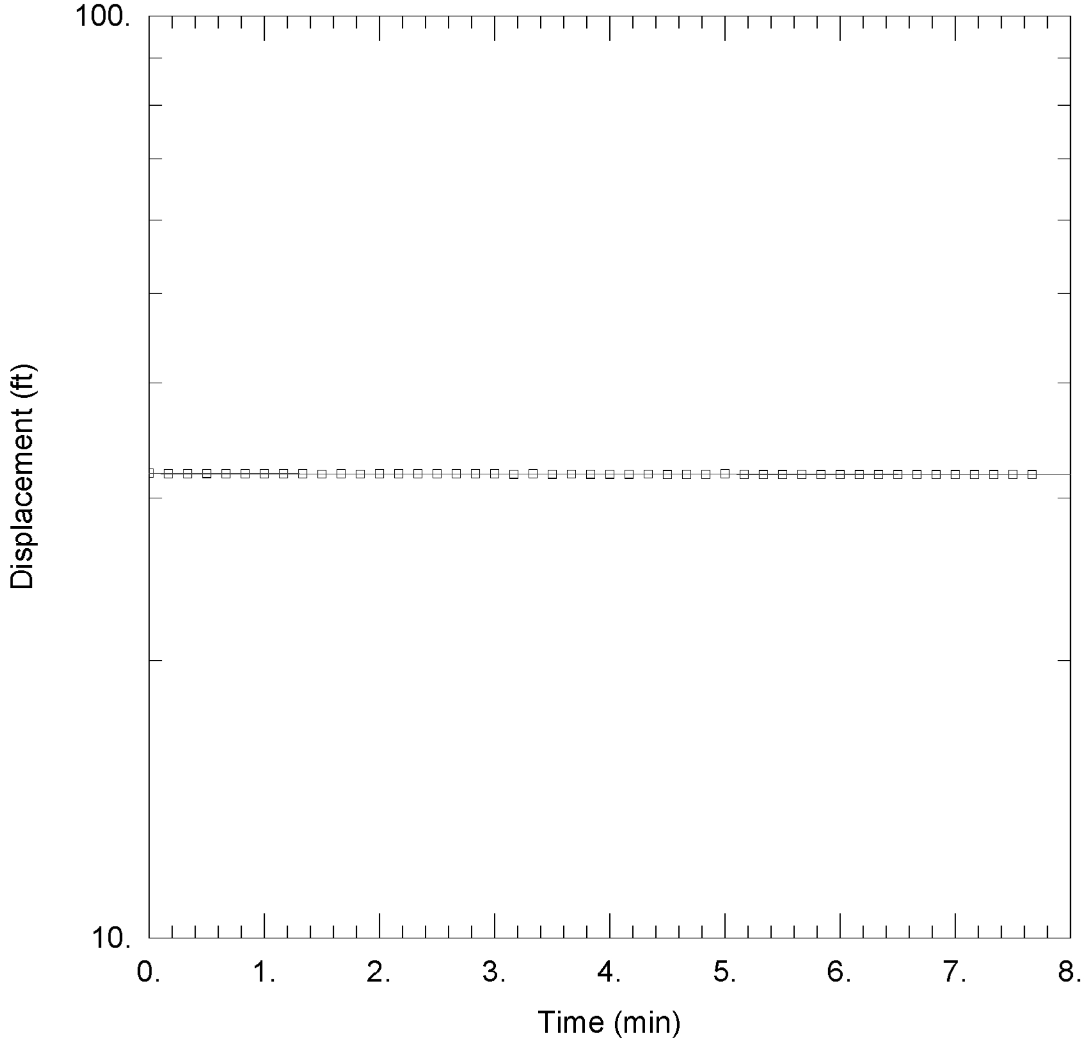
Initial Displacement: 29.02 ft
Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft
Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

K = 0.0002186 ft/day
y0 = 28.95 ft


J1M Packer Testing
Test 13 (554.69 to 549.49 ft AMSL)
Transducer submergence (ft)
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Packers inflated
APV closed
APV opened
31.95 ft
Slug test
Packers deflated
14:05
14:10
14:15
14:20
14:25
14:30
14:35
14:40
Time on April 8, 2002



WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-13S.aqt
Date: 01/21/03 Time: 14:29:09

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1M-13)

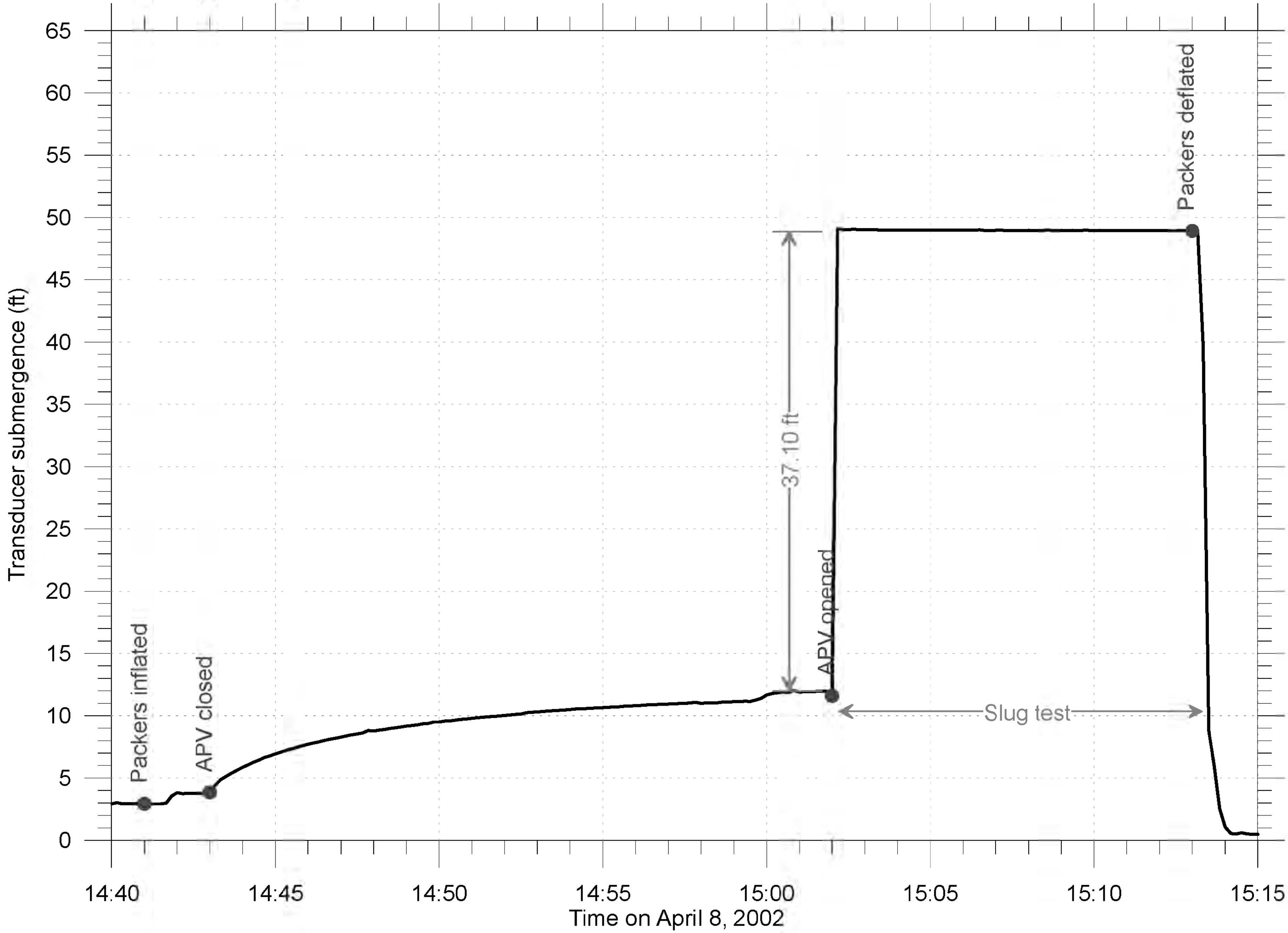
Initial Displacement: 31.95 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

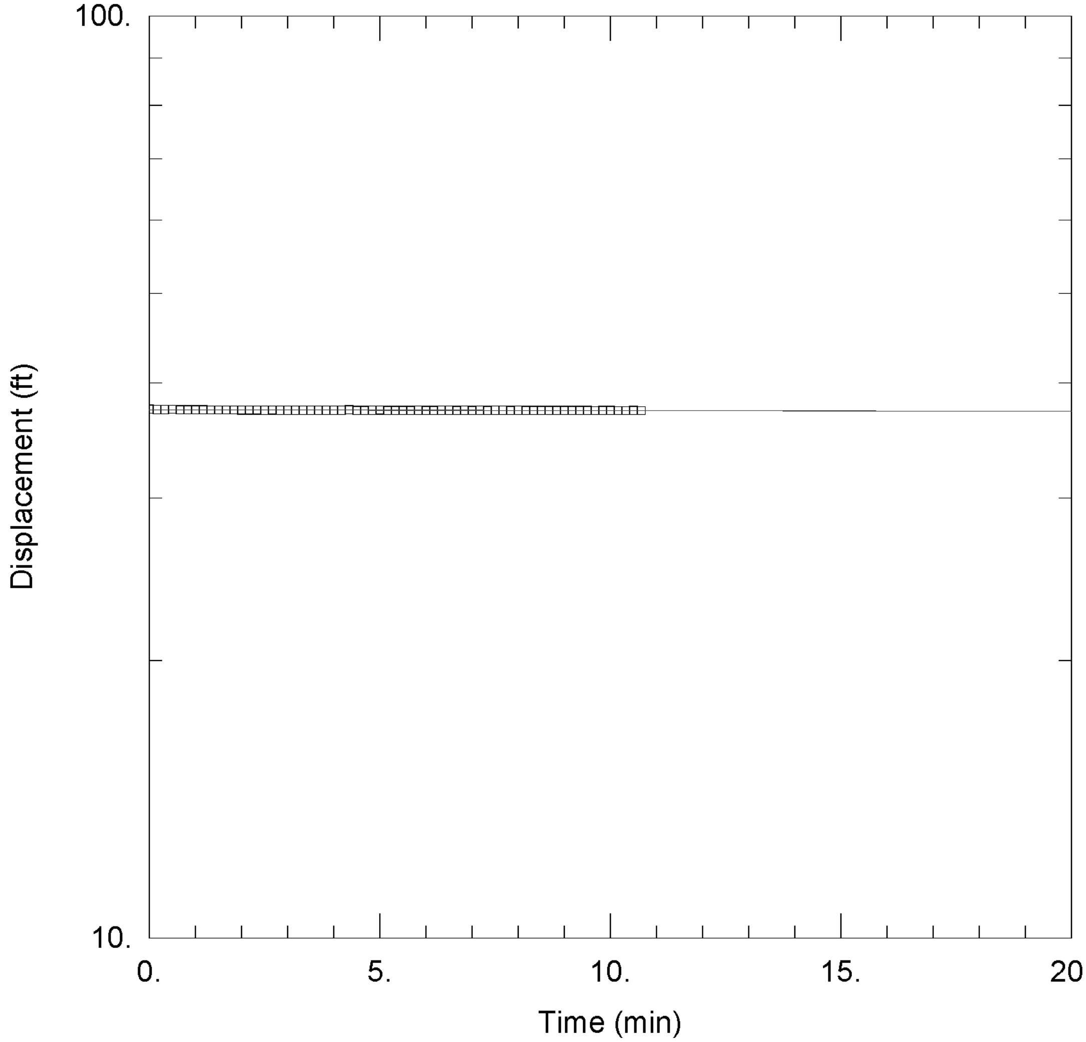
SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.0002626 ft/day y0 = 31.9 ft

J1M Packer Testing
Test 14 (558.69 to 553.49 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-14S.aqt
Date: 01/21/03 Time: 14:28:59

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1M-14)

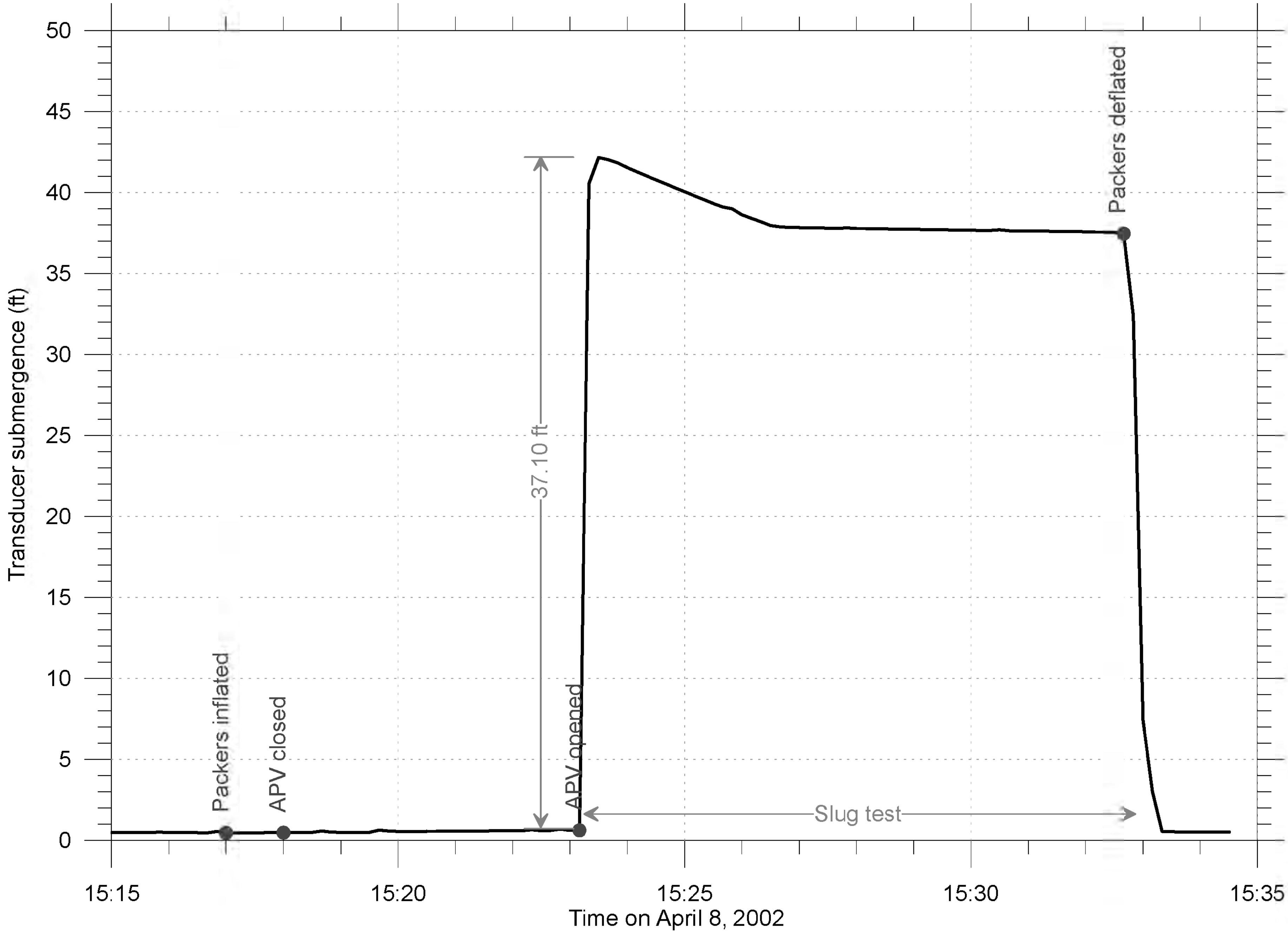
Initial Displacement: 37.47 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

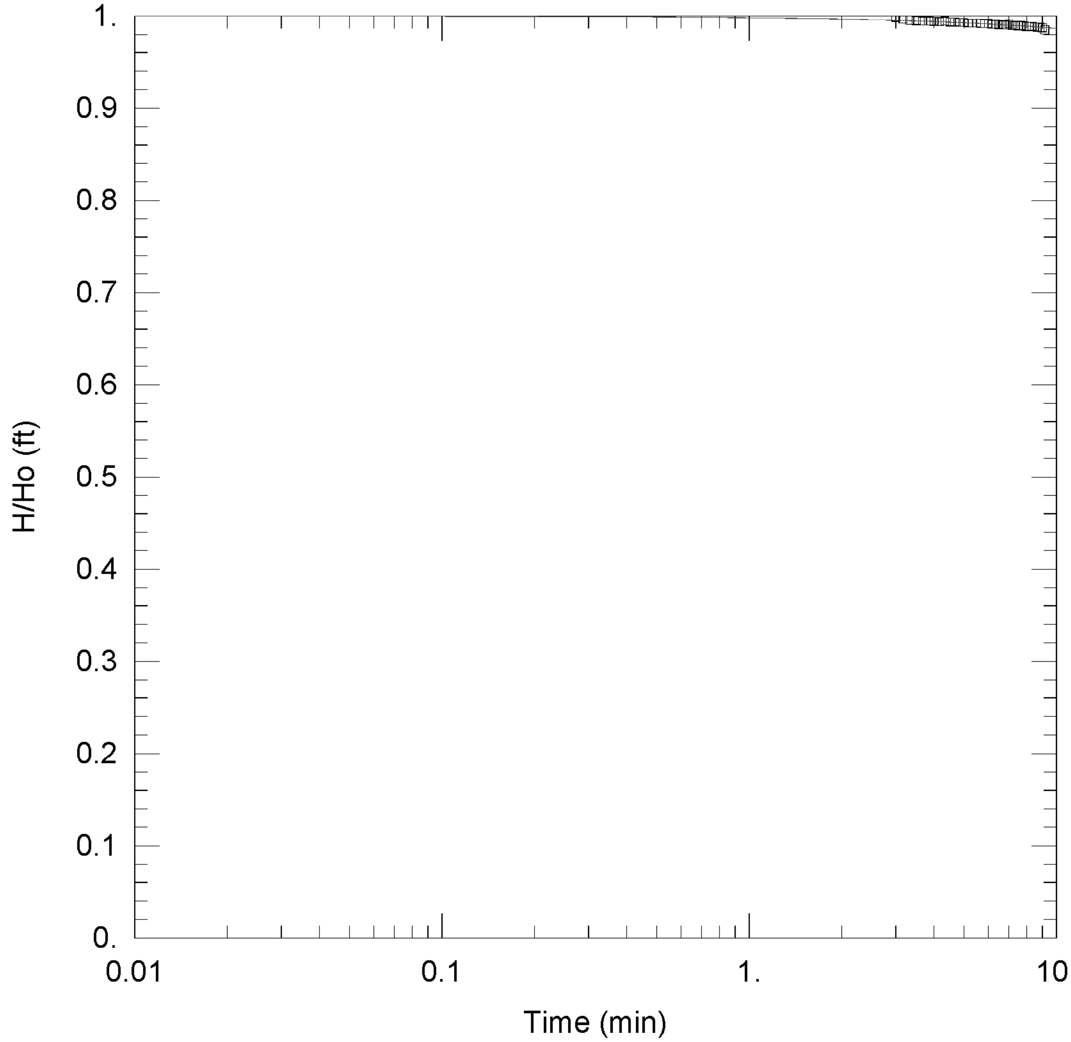
SOLUTION

Aquifer Model: Confined Solution Method:

K = 0.0001513 ft/day y0 = 37.41 ft

J1M Packer Testing
Test 15 (562.69 to 557.49 ft AMSL)





WELL TEST ANALYSIS

Data Set: S:\Packer testing\J1M\J1M-15S.aqt
Date: 01/21/03 Time: 14:28:48

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J1M-15)

Initial Displacement: 37.4 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.006178 ft^2/day S = 1.E-06

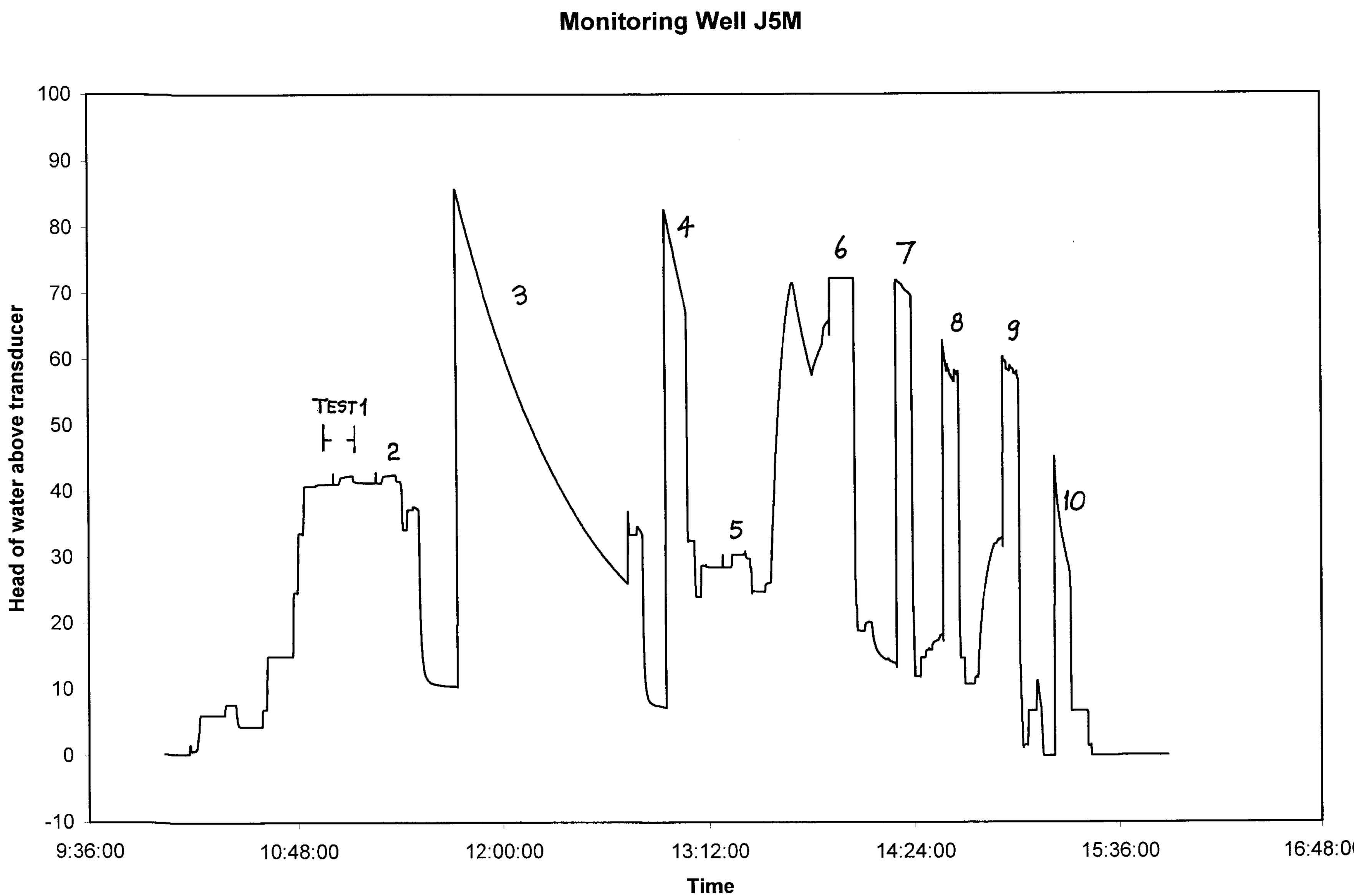
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

J5M

Testing Dates: May 01, 2002

Summary of Tests:

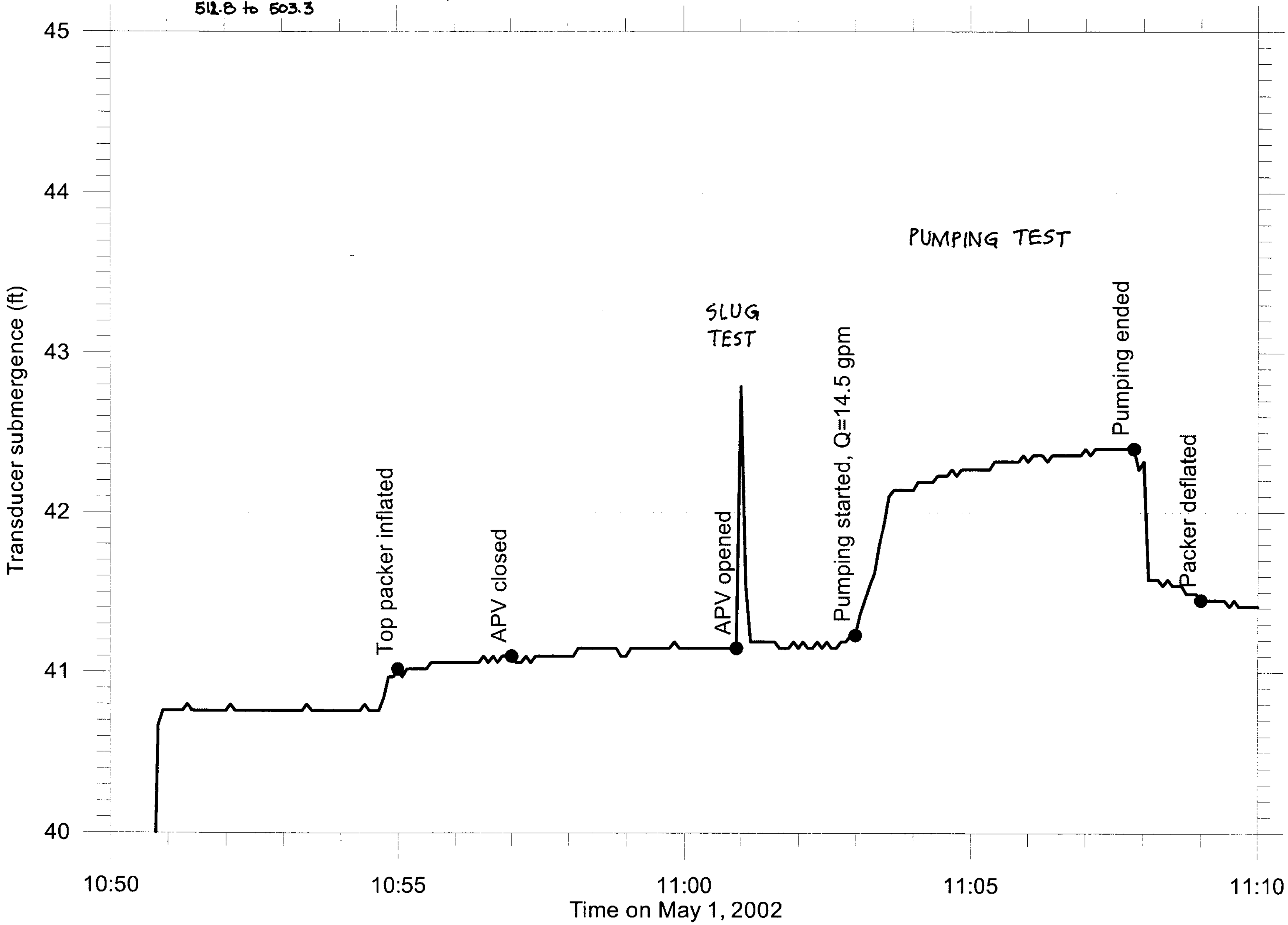
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
J5M	1P	512.77	503.27	2200	
J5M	2P	512.77	507.57	2300	
J5M	3	516.77	511.57	0.2	
J5M	4	520.77	515.57	0.2	
J5M	5P	524.77	519.57	2700	see UR Memo
J5M	6	528.77	523.57	<<1	
J5M	7	532.77	527.57	0.041	
J5M	8	536.77	531.57	0.62	
J5M	9	540.77	535.57	<<1	
J5M	10	544.77	539.57	0.78	

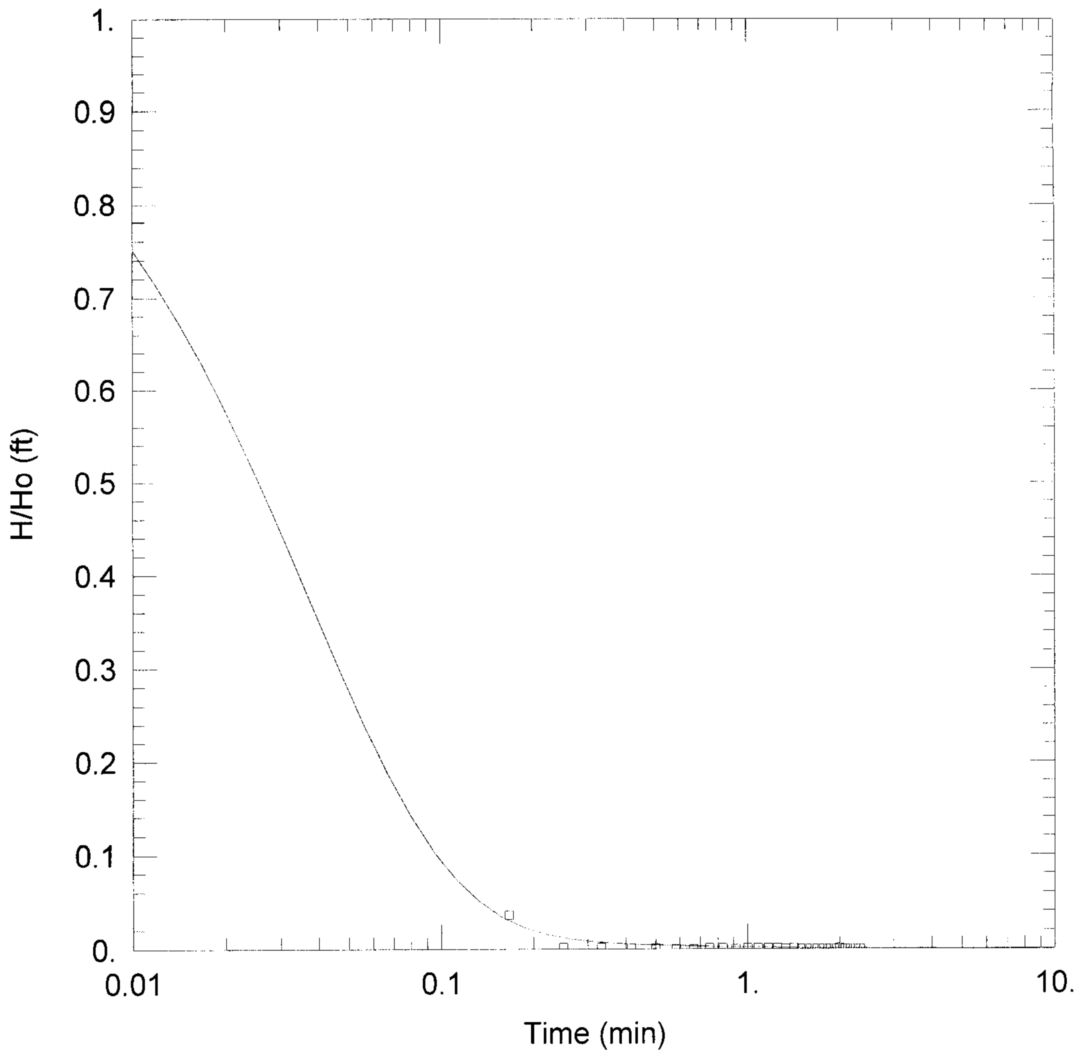


Monitoring Well J5M
100
90
80
70
60
50
40
30
20
10
0
-10
Head of water above transducer
TEST1
2
3
4
5
6
7
8
9
10
9:36:00
10:48:00
12:00:00
13:12:00
14:24:00
15:36:00
16:48:00
Time

J5M Packer Testing

Test 1 (~~507.09 to 497.59~~ ft AMSL)
512.8 to 503.3





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-1Slug.aqt
Date: 01/13/03 Time: 11:06:28

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

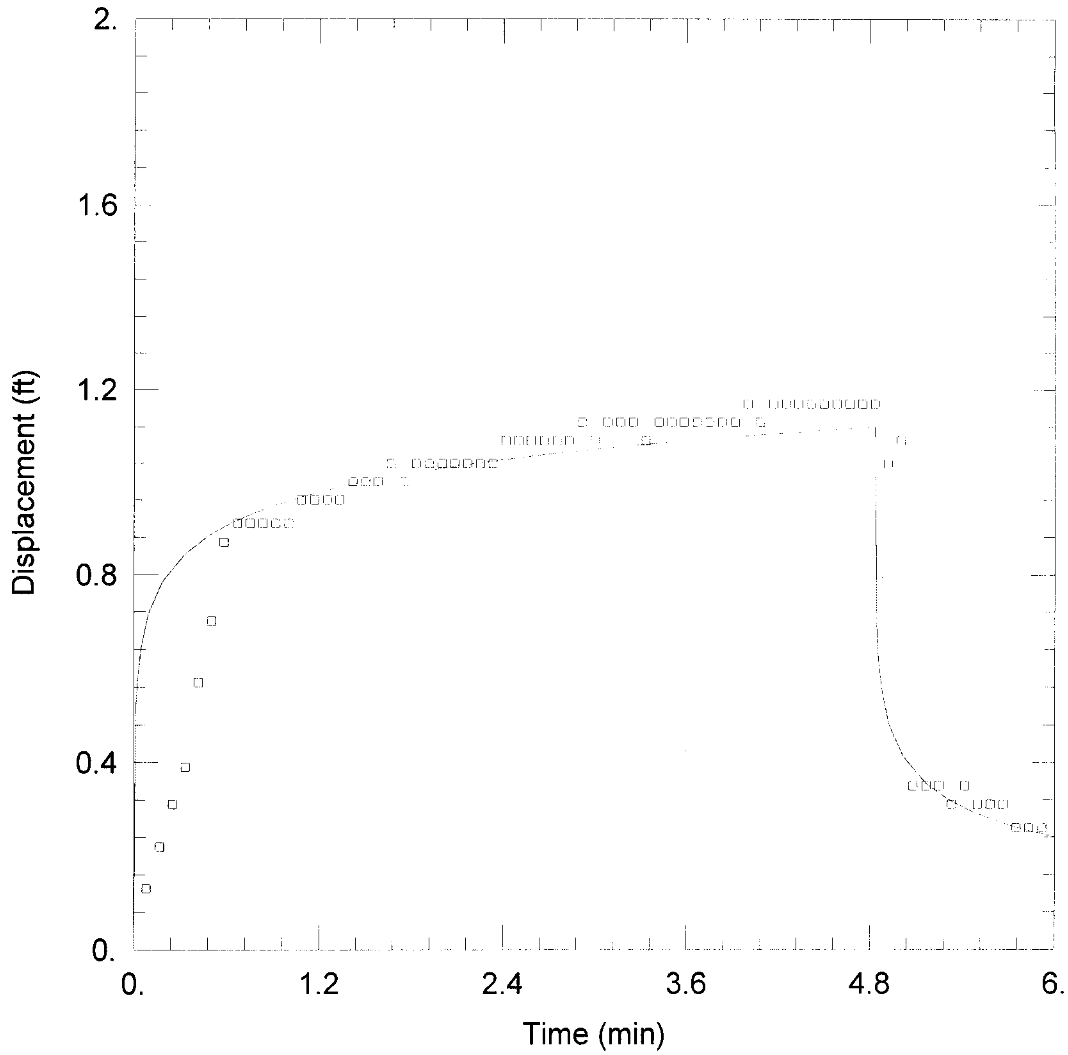
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-5 Slug)

Initial Displacement: 54.4 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 370. ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-1.aqt
Date: 12/19/02 Time: 13:01:21

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J5M-1	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
J5M-1	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

= 2162.4 ft^2/day
Sw = -5.
P = 1.5

S = 1.E-06
C = 0.0273 min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 0.4565Q + 0.0273Q^{1.5}$
W.E. = 199.5%

J5M, Test 1P

Alternative analyses

Average Q: 14.5 gpm
"Drawdown" (s or ΔH): 1.17 ft

T by Specific capacity:

$$T = 250\frac{Q}{s}$$

T = 3098 ft²/d

T by Thiem solution:

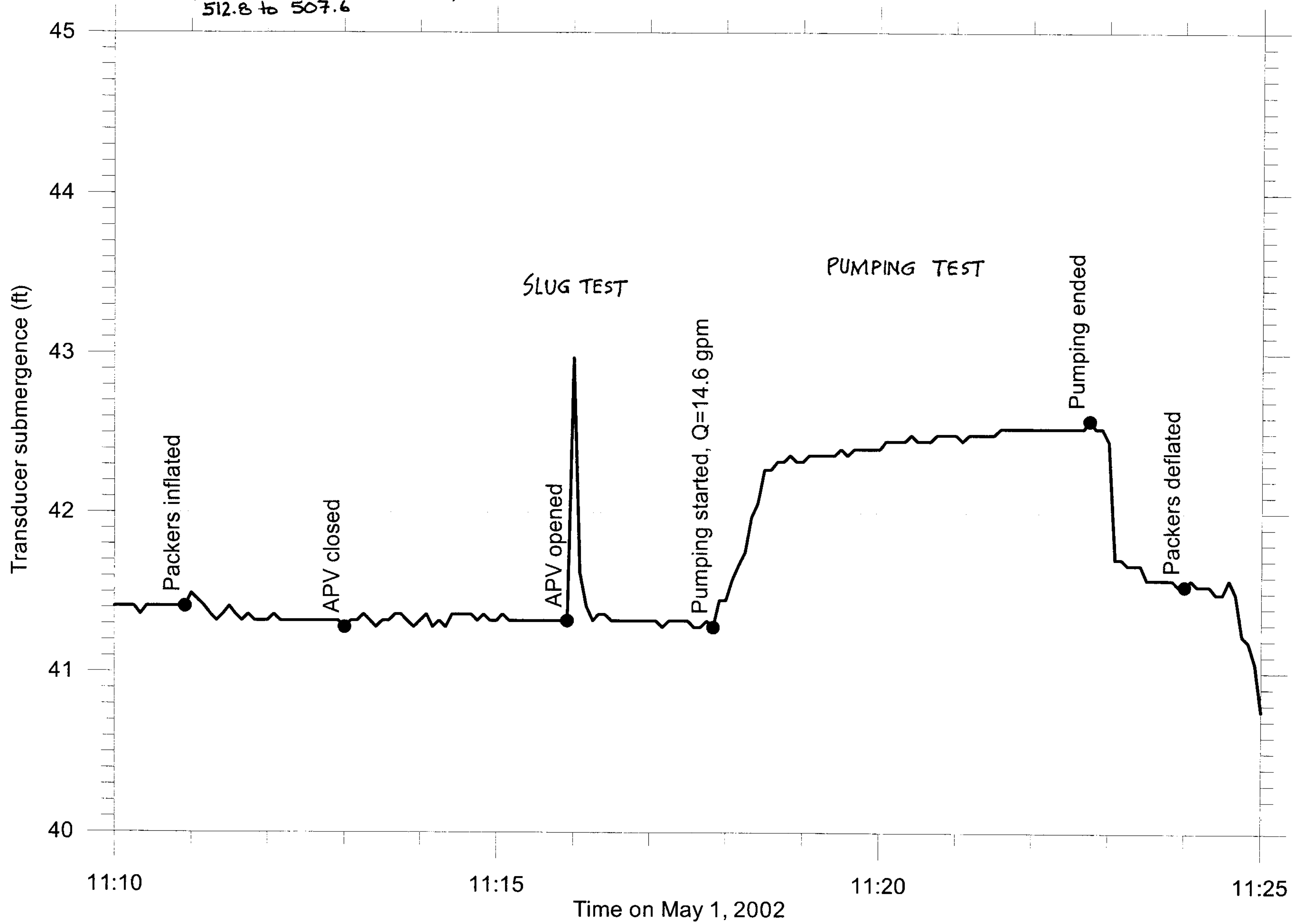
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

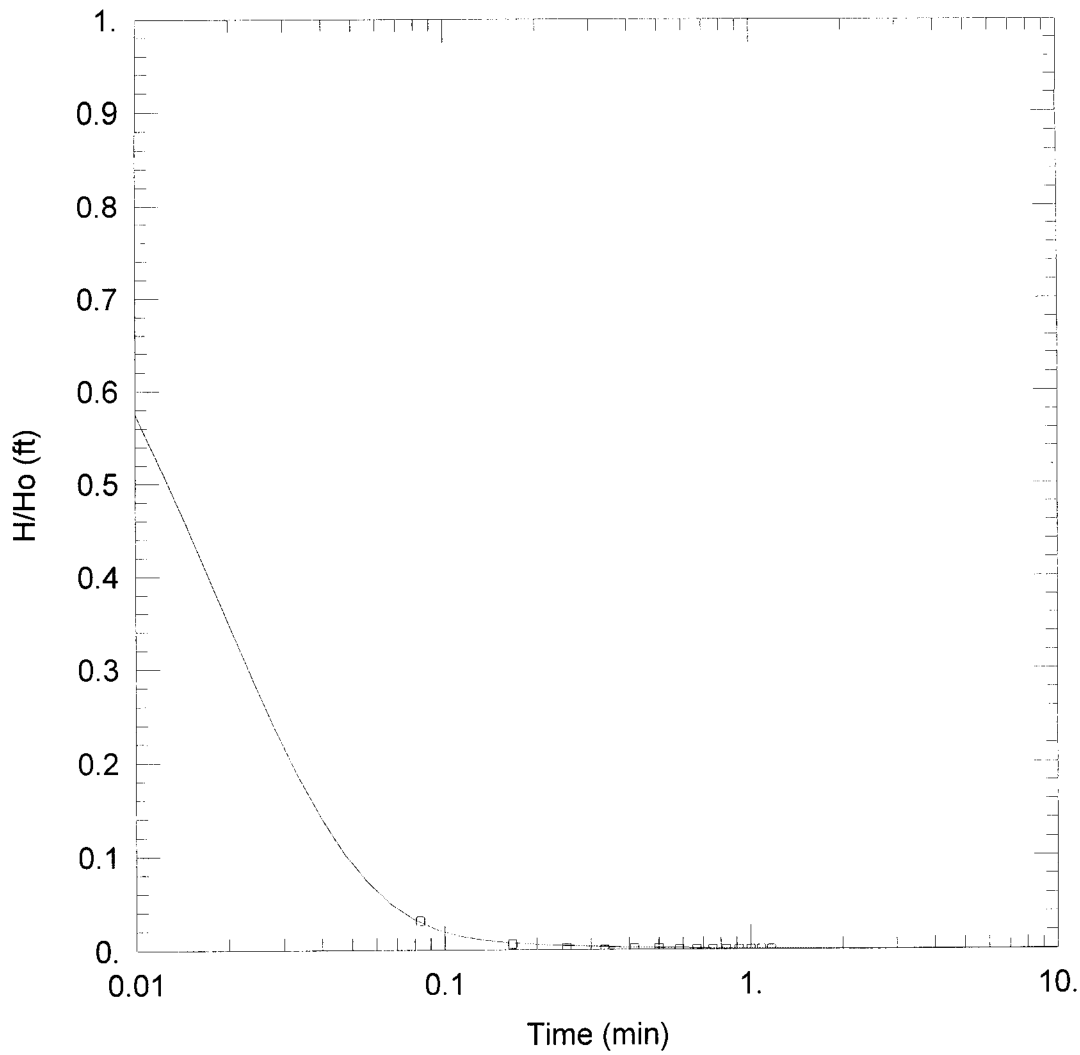
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3\,{}^7/_8$" = 0.1615 ft

T = 2018 ft²/d

J5M Packer Testing

Test 2 (~~507.09 to 501.89~~ ft AMSL)
512.8 to 507.6





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-2S.aqt
Date: 01/13/03 Time: 11:07:41

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

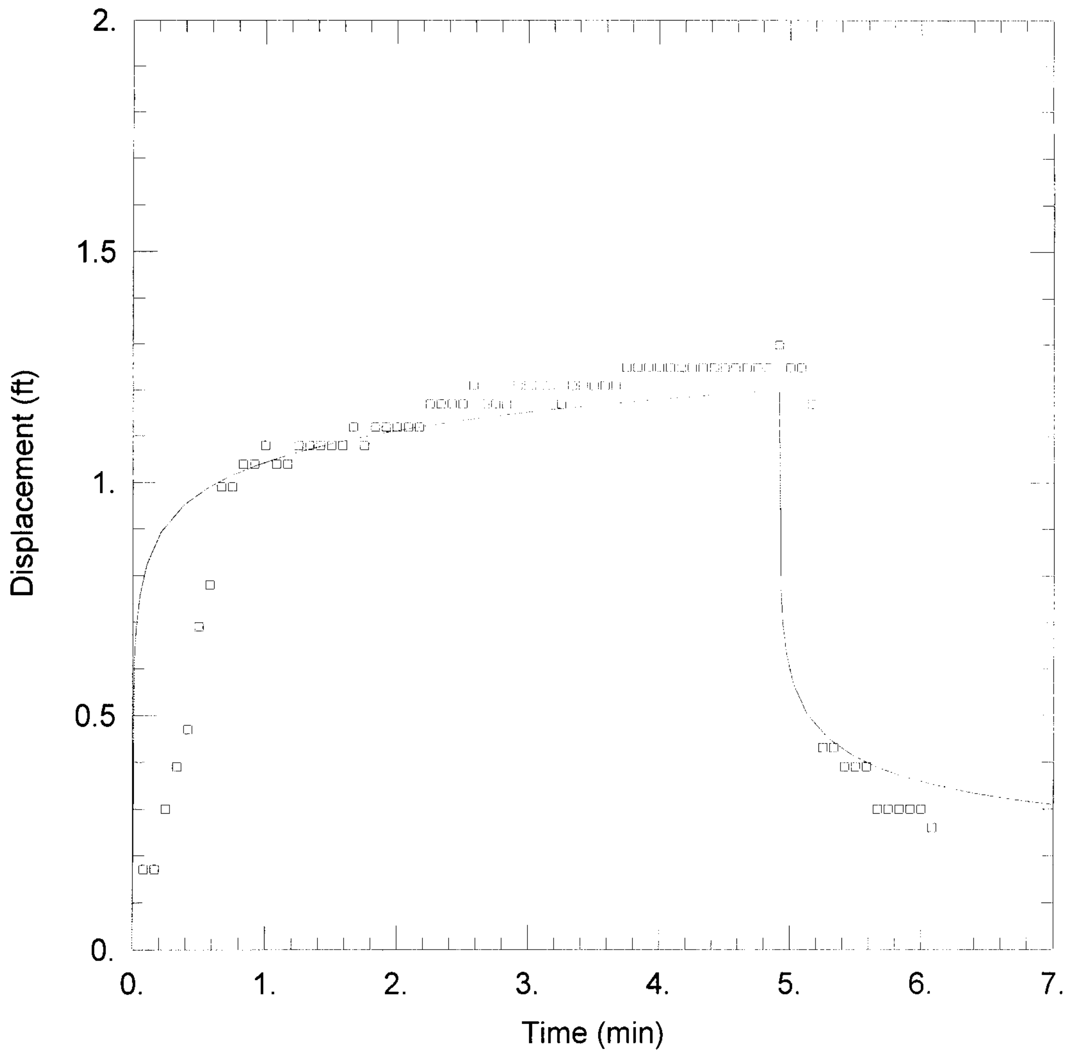
WELL DATA (J5M-2S)

Initial Displacement: 53.66 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 747. ft^2/day
S = 1.E-10



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-2.aqt
Date: 12/19/02 | Time: 13:00:27

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft | Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
J5M-2	0	0	J5M-2	0	0

SOLUTION

Aquifer Model: Confined | Solution Method: Theis (Step Test)

T = 2269.5 ft^2/day | S = 1.E-06
Sw = -5. | C = 0.06986 min^2/ft^5
P = 1.5

Step Test Model: Jacob-Rorabaugh | $s(t) = 0.4374Q + 0.06986Q^{1.5}$
Time (t) = 1. min Rate (Q) in cu. ft/min | W.E. = 176.1%

J5M, Test 2P

Alternative analyses

Average Q: 14.6 gpm
"Drawdown" (s or ΔH): 1.25 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$\underline{\underline{T = 2920\ ft^2/d}}$

<u>T by Thiem solution:</u>

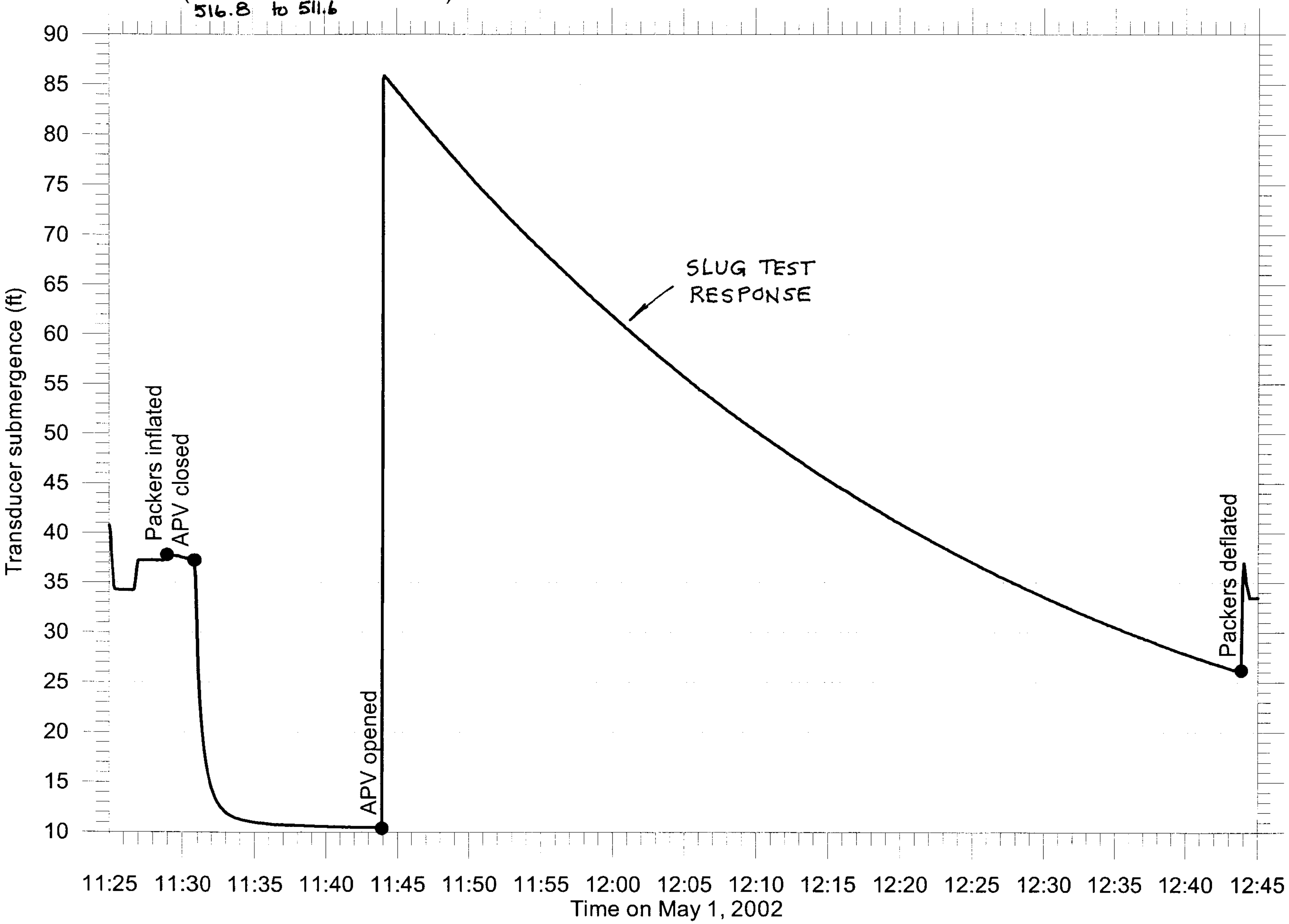
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

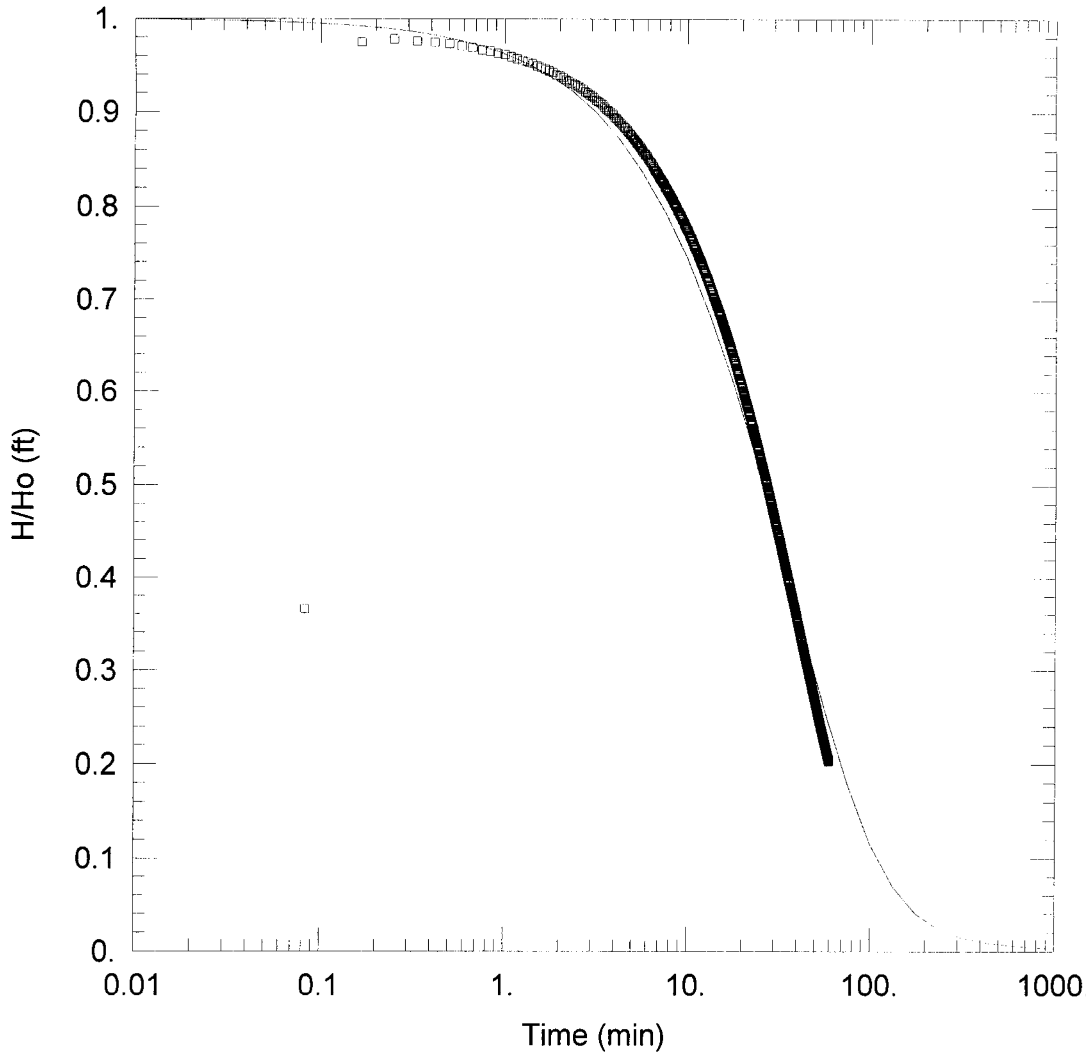
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3\,{}^7/_8" = 0.1615$ ft

$\underline{\underline{T = 1901\ ft^2/d}}$

J5M Packer Testing

Test 3 (~~511.09 to 505.89~~ ft AMSL)
516.8 to 511.6





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5M\J5M-3.aqt
Date: 11/25/02 Time: 11:30:23

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

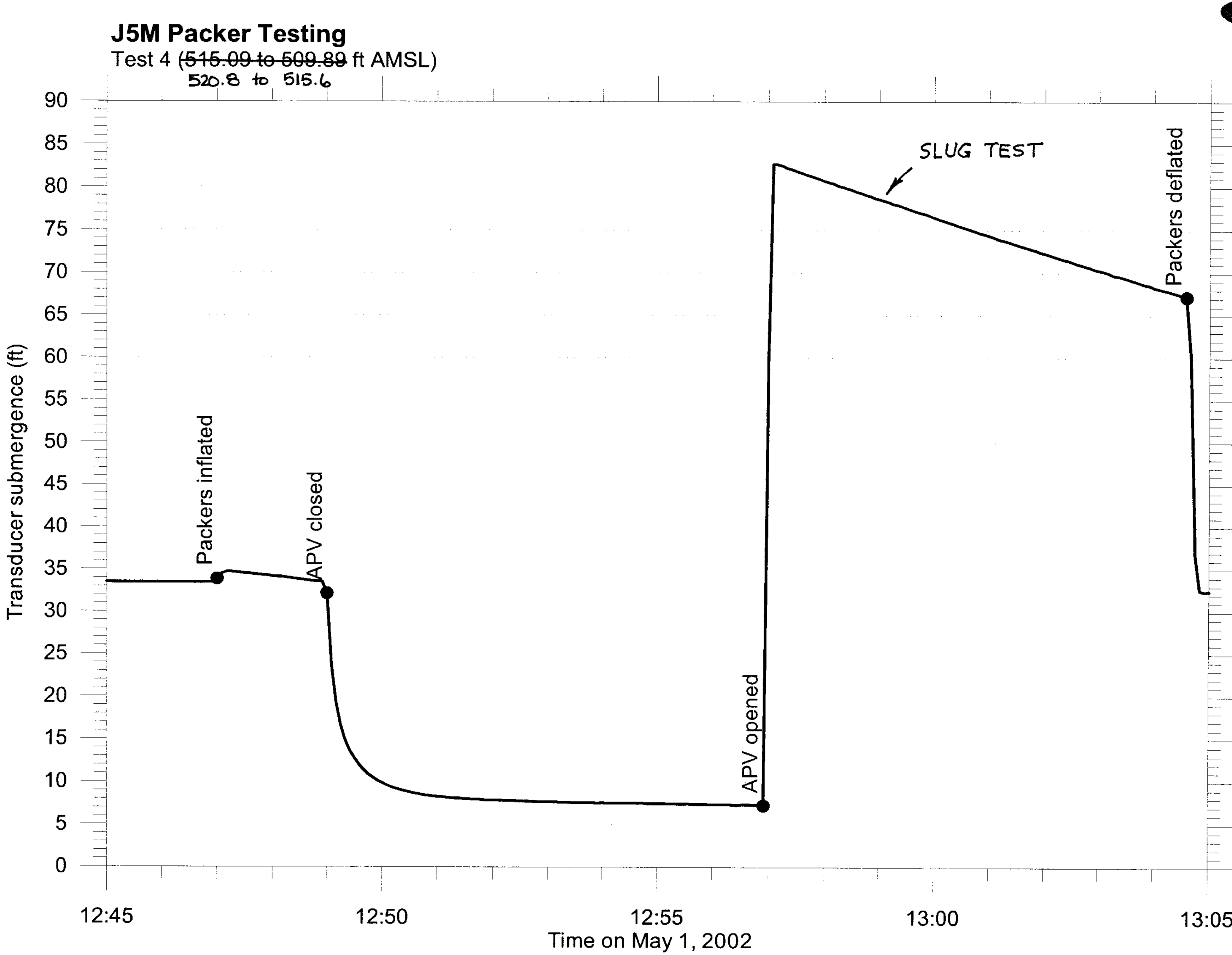
WELL DATA (J5M-3)

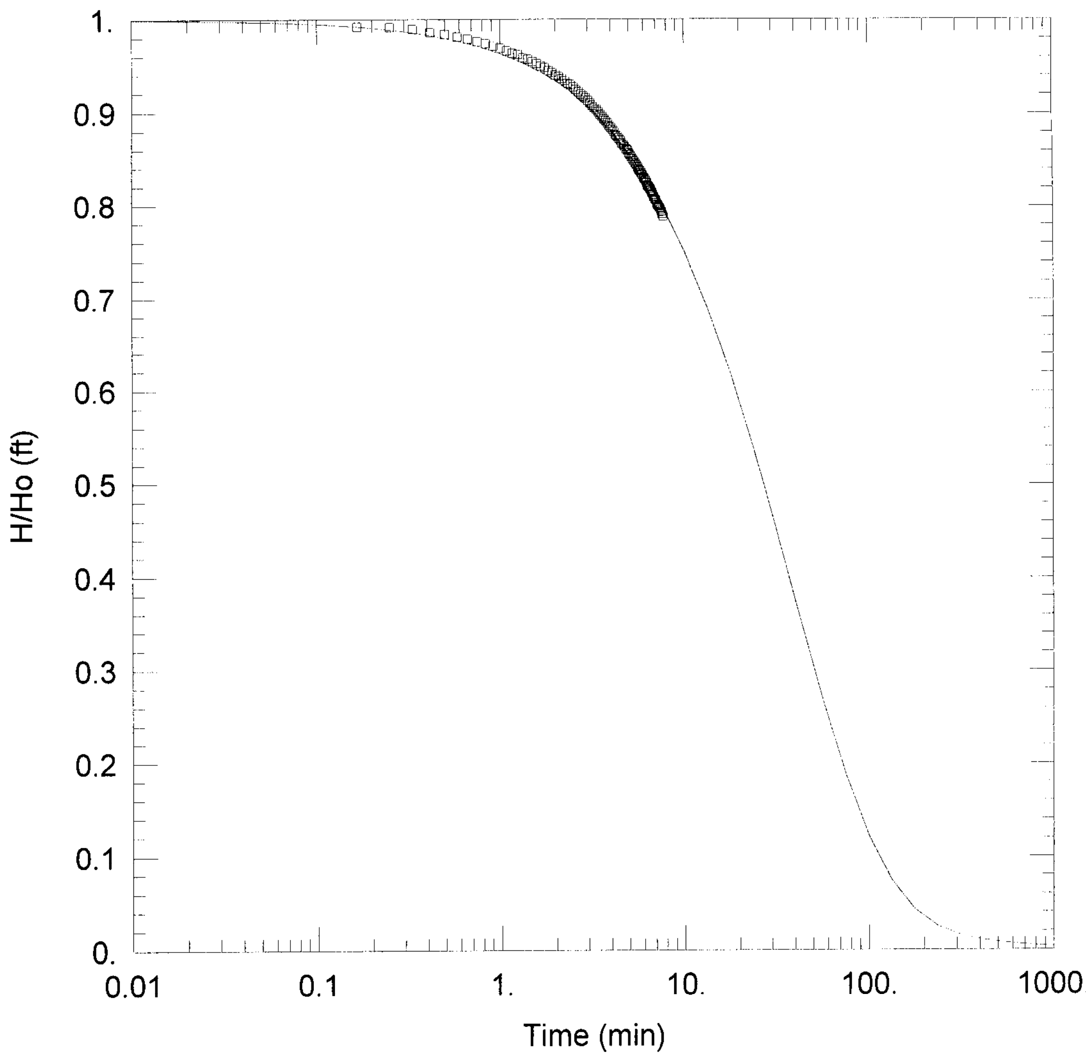
Initial Displacement: 77.13 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.2019 ft^2/day
S = 1.E-06


J5M Packer Testing
Test 4 (~~515.09 to 509.89~~ ft AMSL)
520.8 to 515.6
Transducer submergence (ft)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
Packers inflated
APV closed
APV opened
SLUG TEST
Packers deflated
12:45
12:50
12:55
13:00
13:05
Time on May 1, 2002



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5M\J5M-4.aqt
Date: 11/25/02 Time: 11:30:19

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-4)

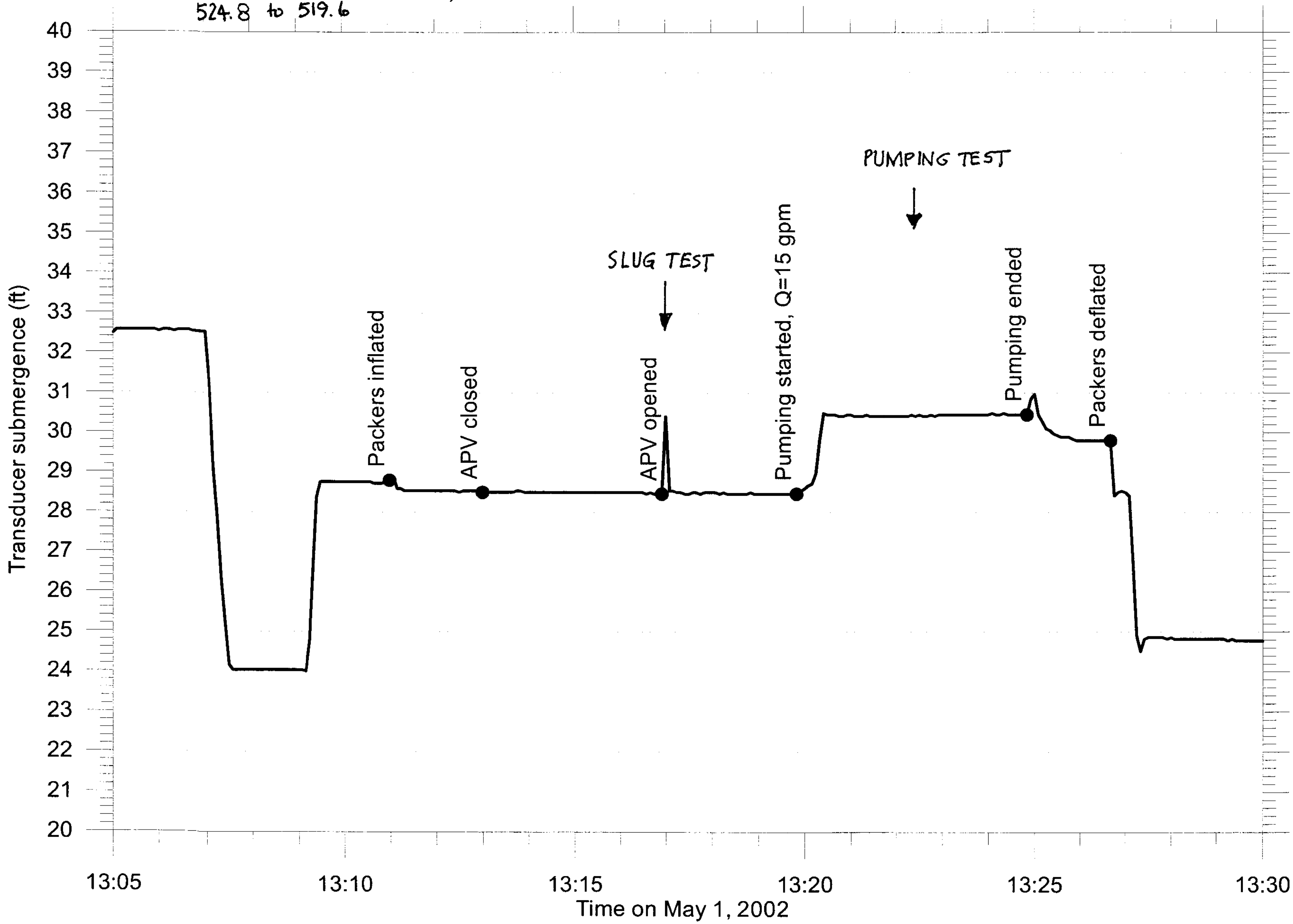
Initial Displacement: 76.05 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

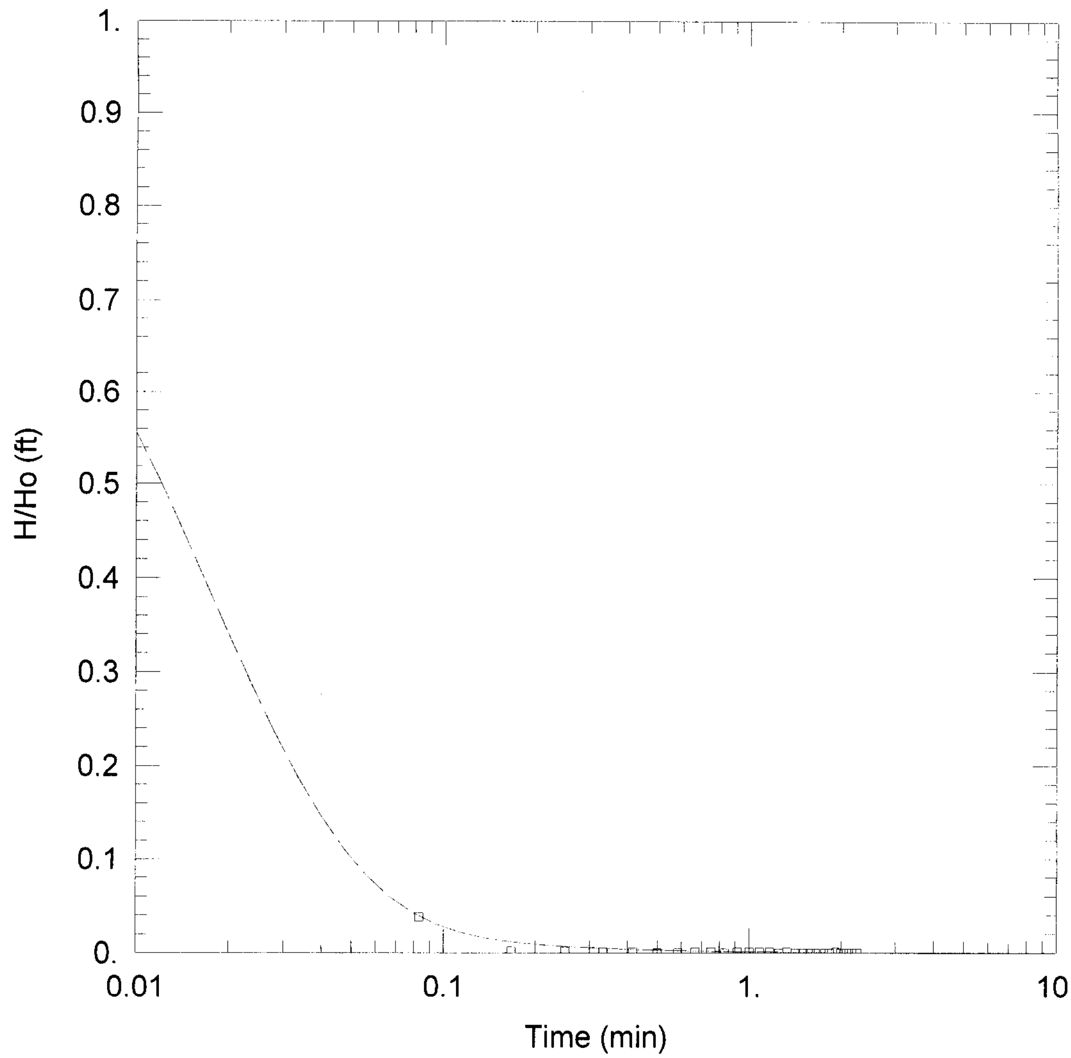
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.1962 ft^2/day
S = 1.E-06

J5M Packer Testing

Test 5 (~~519.09 to 513.89~~ ft AMSL)
524.8 to 519.6





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-5S.aqt
Date: 01/15/03 Time: 11:04:24

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

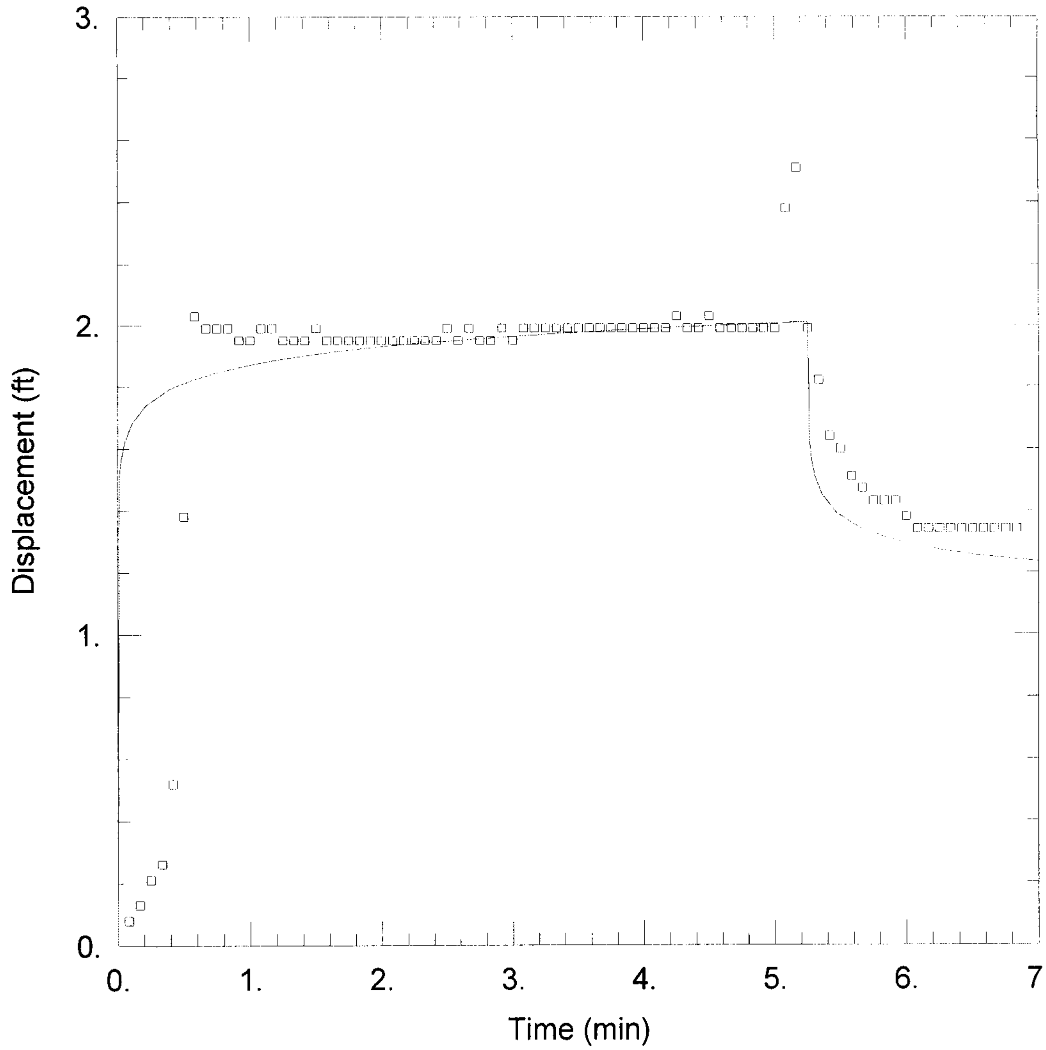
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-5S)

Initial Displacement: 51.28 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
= 445.4 ft^2/day S = 7.777E-07



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5M\J5M-5.aqt
Date: 11/25/02 Time: 11:32:54

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J5M-2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
J5M-5	0	0

SOLUTION

Aquifer Model: Confined

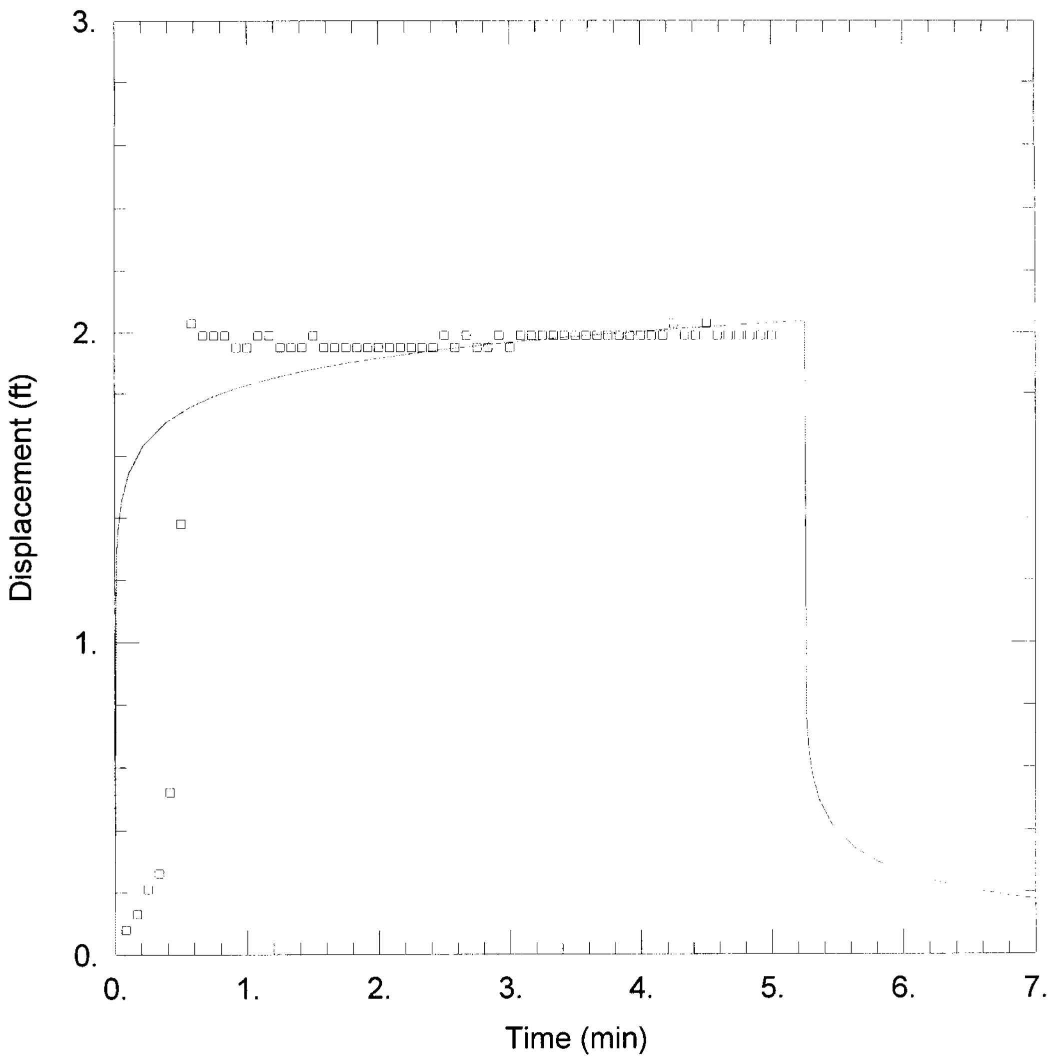
Solution Method: Theis (Step Test)

T = 2694.2 ft^2/day
Sw = -5.
P = 2.698

S = 1.E-06
C = 0.1709 min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

$s(t) = 0.3757Q + 0.1709Q^{2.698}$
W.E. = 85.91%



WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-5 (pumping only).aqt
Date: 01/15/03 Time: 11:11:22

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
J5M-2	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ J5M-5	0	0

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Step Test)

T = 1807.3 ft^2/day
Sw = -2.032
P = 2.

S = 1.E-06
C = 0. min^2/ft^5

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. min Rate (Q) in cu. ft/min

s(t) = 0.9111Q + 0.Q^2
W.E. = 128.3%

J5M, Test 5P

Alternative analyses

Average Q: 15 gpm
"Drawdown" (s or ΔH): 2.1 ft

<u>T by Specific capacity:</u>

$$T = 250\frac{Q}{s}$$

$$\underline{\underline{T = 1786\ ft^2/d}}$$

<u>T by Thiem solution:</u>

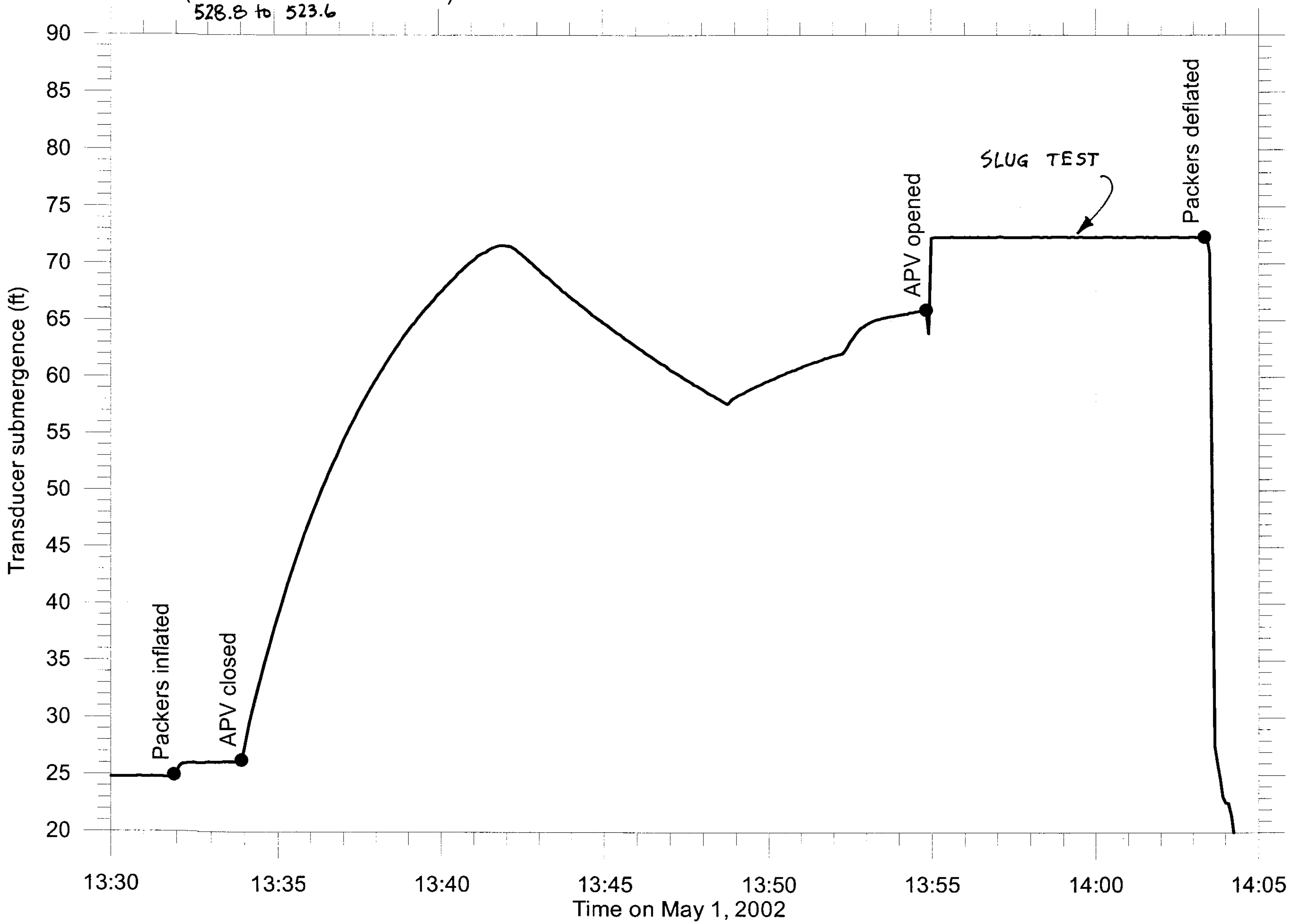
$$T = \frac{Q}{2\pi}\frac{\ln\left(R/r_w\right)}{\Delta H}$$

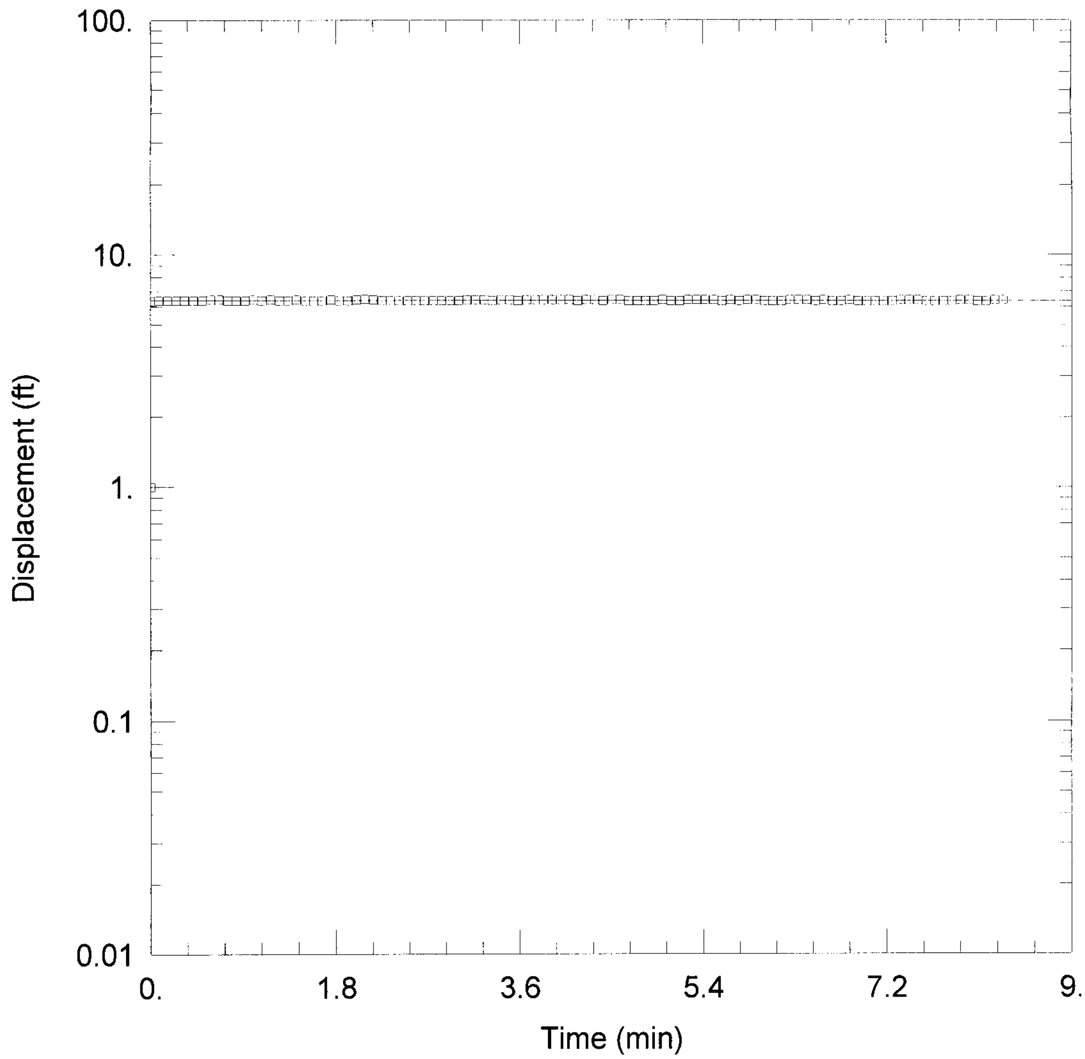
where: R = 32.81 ft (assumed to be 10 m after Novakowski et al., 1999)
$r_w = 3^7/_8" = 0.1615$ ft

$$\underline{\underline{T = 1163\ ft^2/d}}$$

J5M Packer Testing

Test 6 (~~523.09 to 517.89~~ ft AMSL)
528.8 to 523.6





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-6.aqt
Date: 11/25/02 Time: 11:25:42

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-6)

Initial Displacement: 1. ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

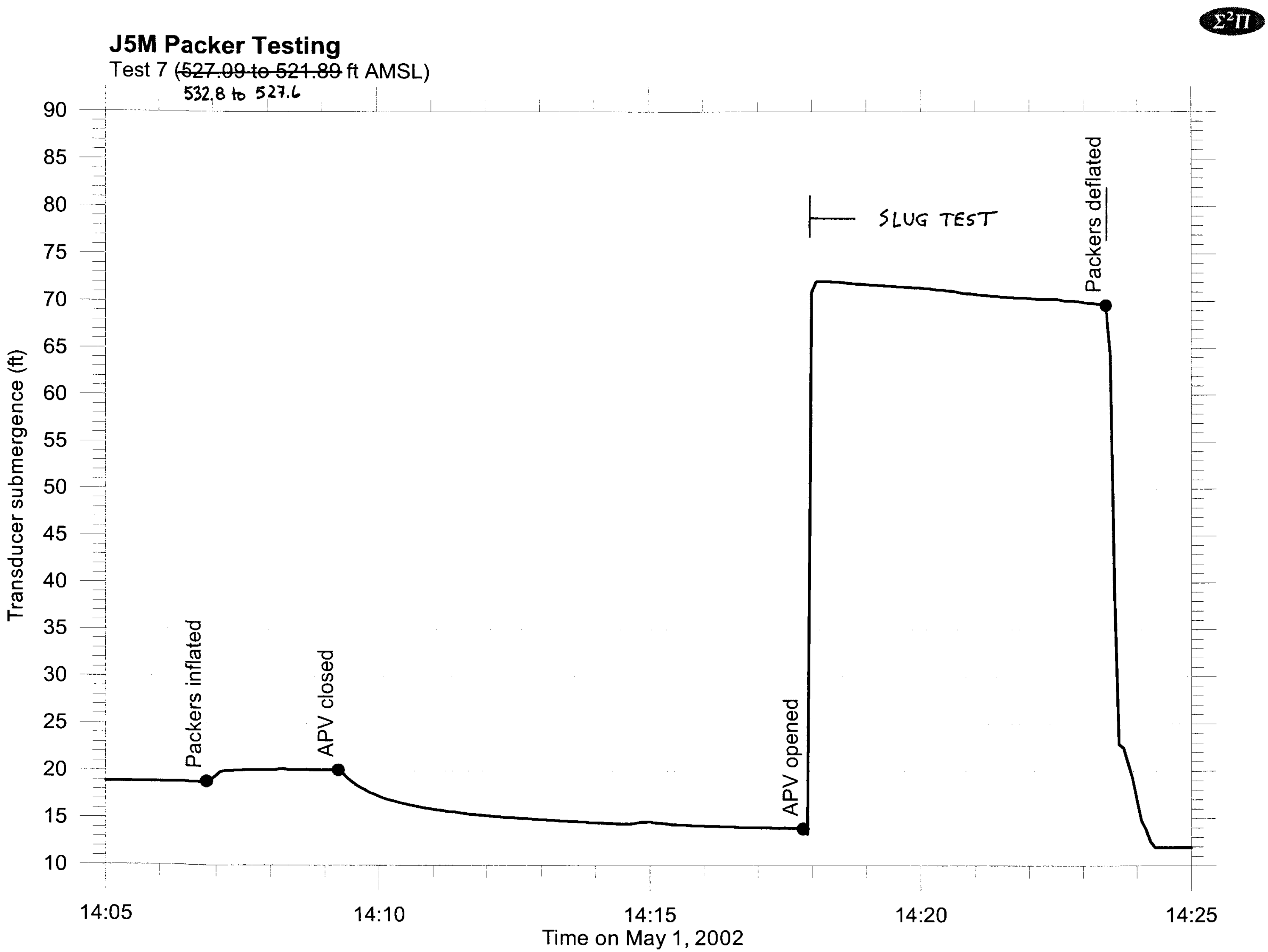
Aquifer Model: Confined
Solution Method:

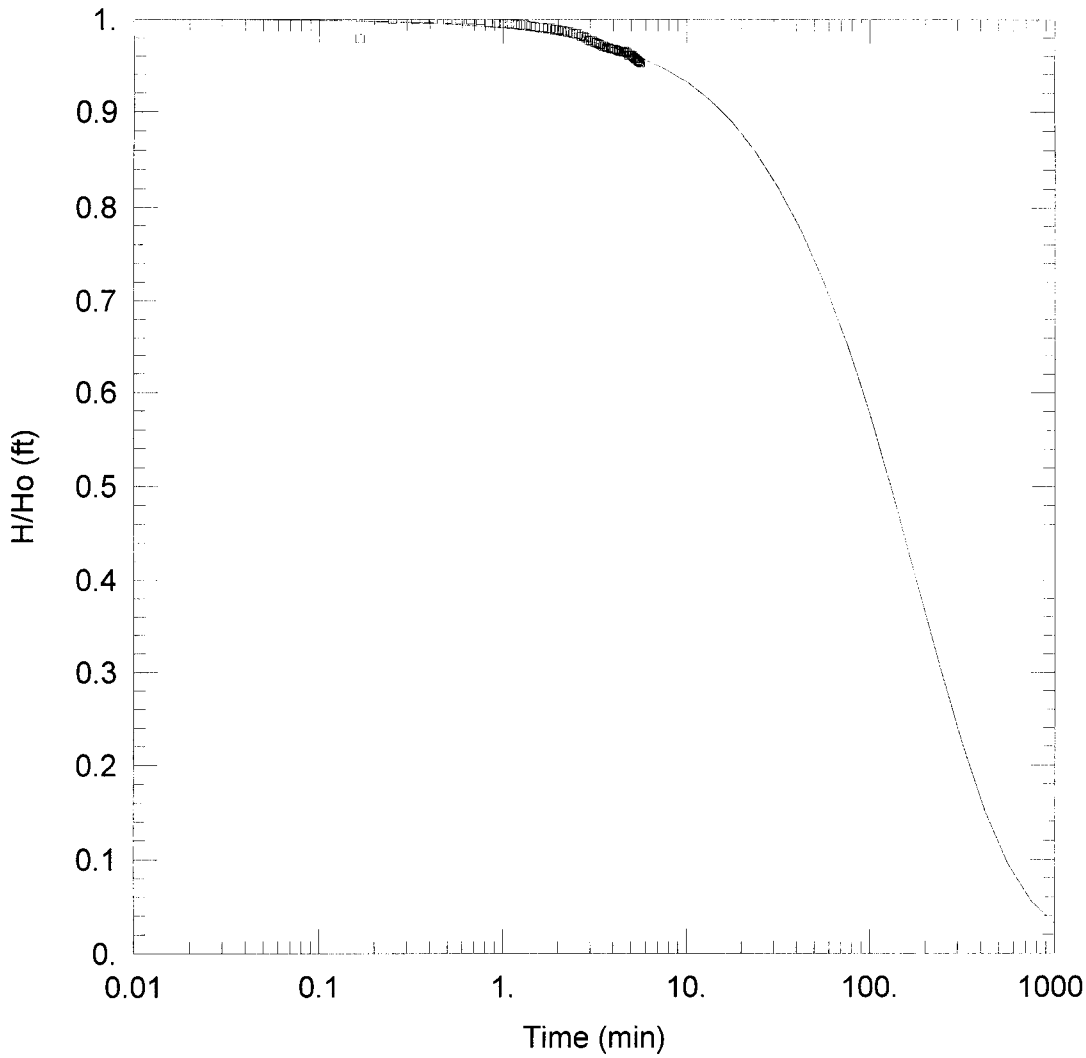
´ = 0.0001 ft/day
y0 = 6.387 ft

J5M Packer Testing

Test 7 (~~527.09 to 521.89~~ ft AMSL)

532.8 to 527.6





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-7.aqt
Date: 11/25/02 Time: 11:25:34

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-7)

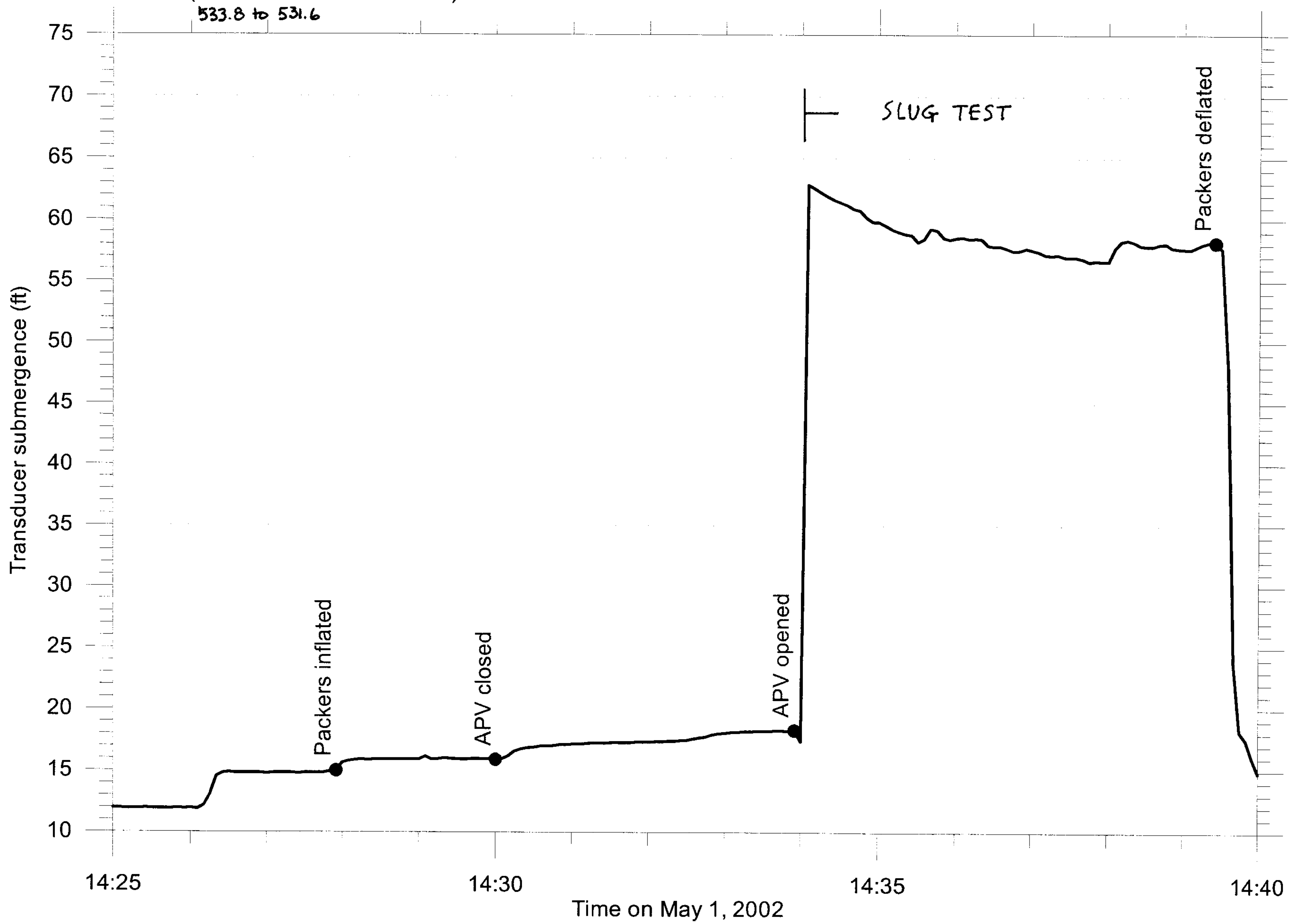
Initial Displacement: 53.19 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

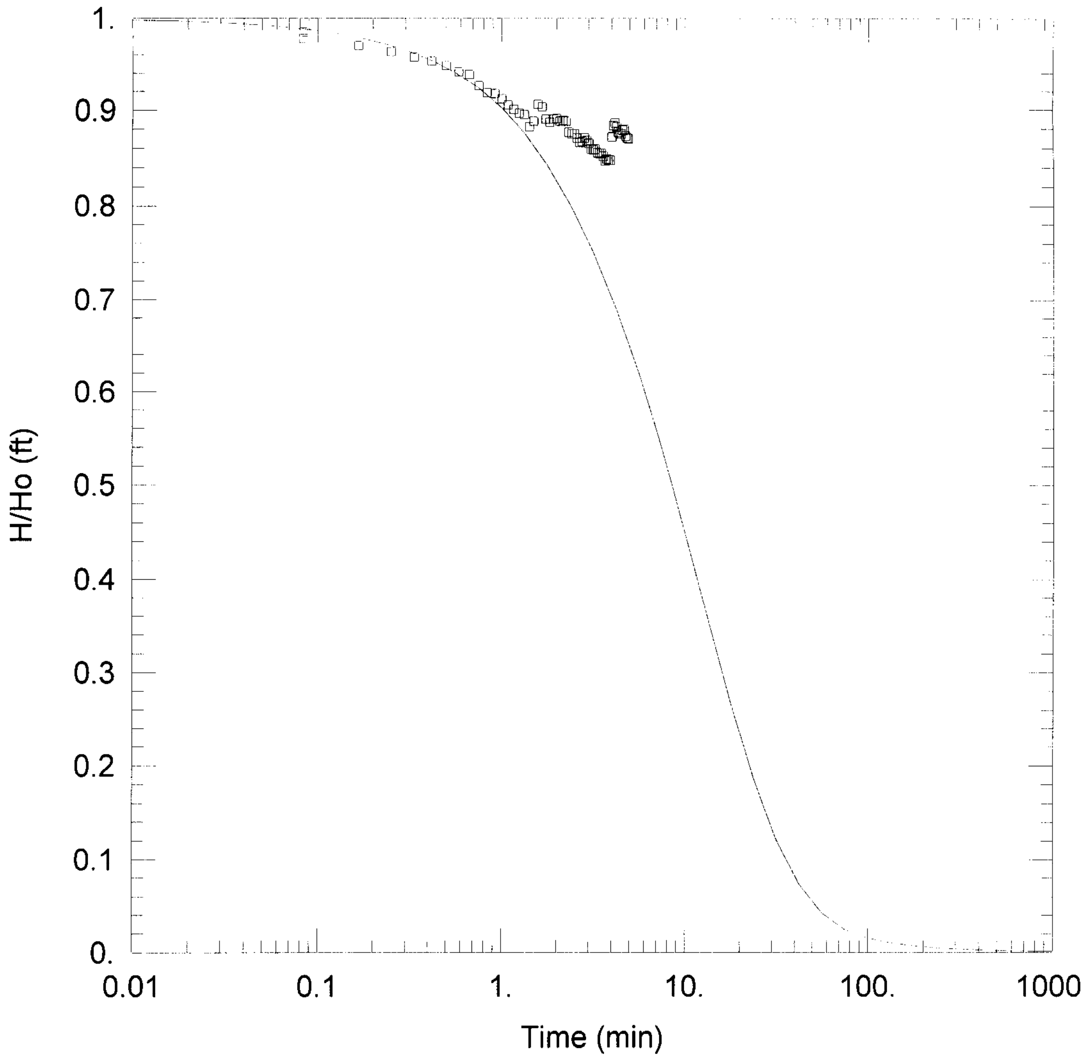
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.04064 ft^2/day
S = 1.E-06

J5M Packer Testing

Test 8 (~~531.09 to 525.89~~ ft AMSL)
533.8 to 531.6





WELL TEST ANALYSIS

Data Set: R:\ssp610\SCR_Hydrology\Packer testing\J5M\J5M-8.aqt
Date: 11/25/02 Time: 11:25:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-8)

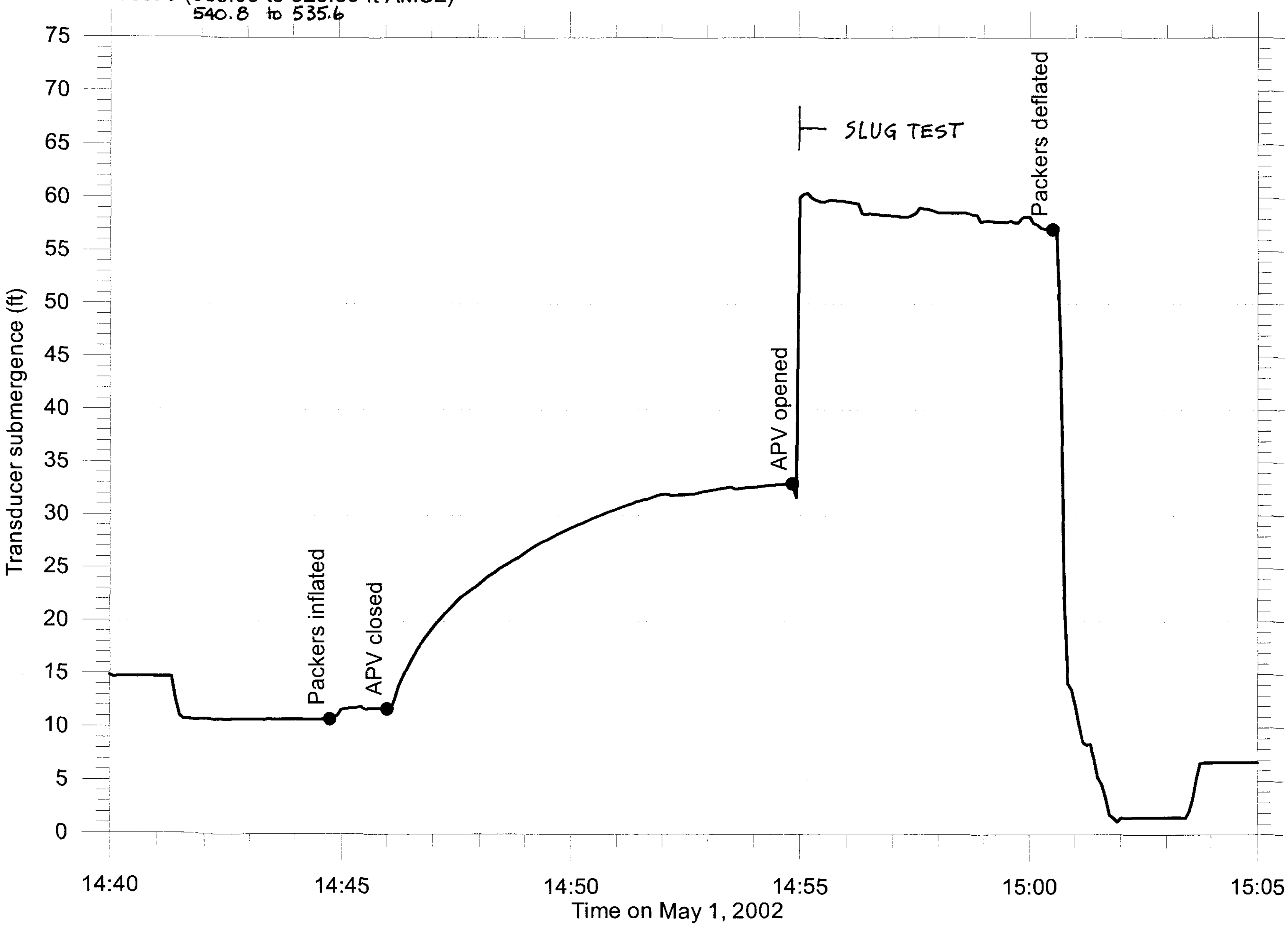
Initial Displacement: 45.26 ft
Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft
Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft
Total Well Penetration Depth: 5.2 ft

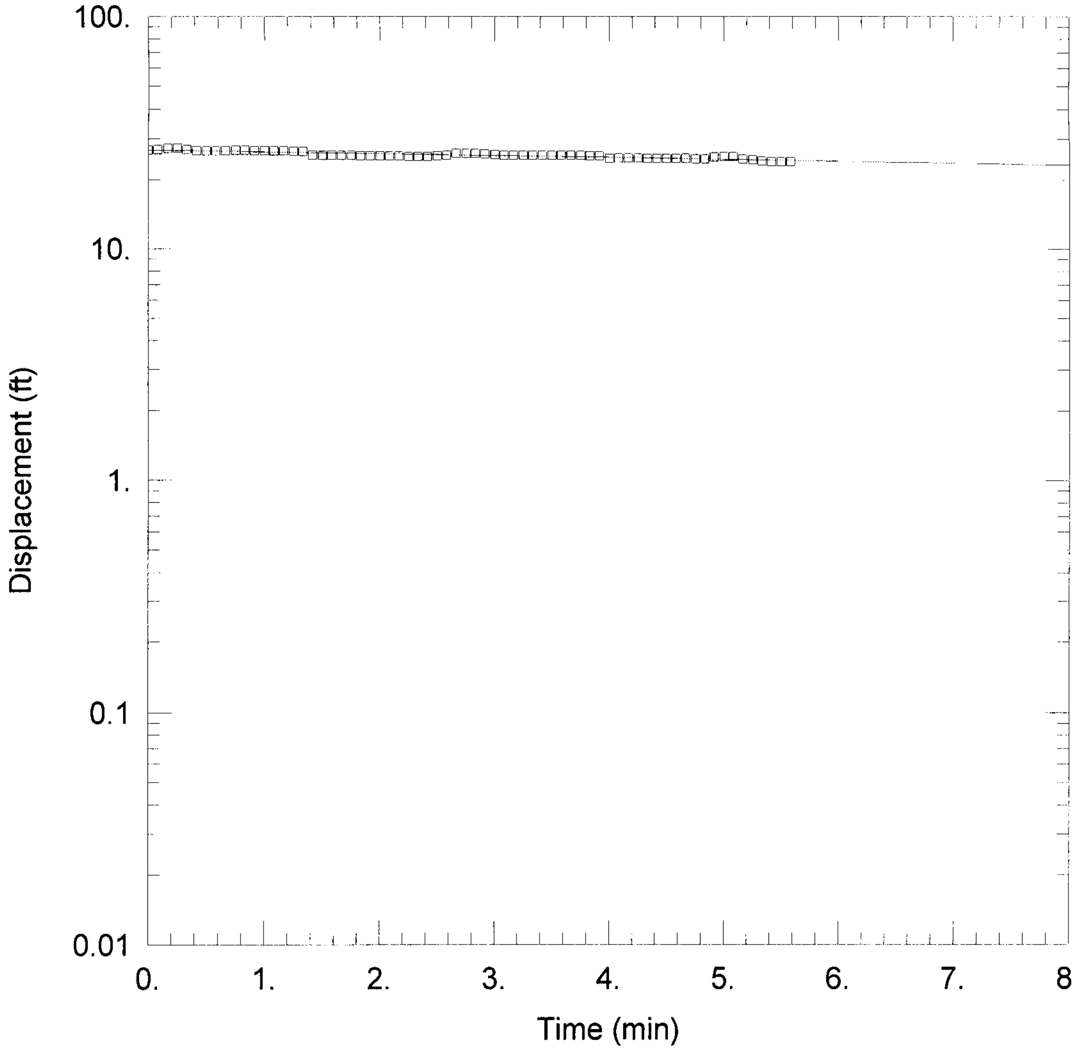
SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.6192 ft^2/day
S = 1.E-06

J5M Packer Testing

Test 9 (~~535.09 to 529.89~~ ft AMSL)
540.8 to 535.6





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5M\J5M-9.aqt
Date: 11/25/02 Time: 11:32:30

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-9)

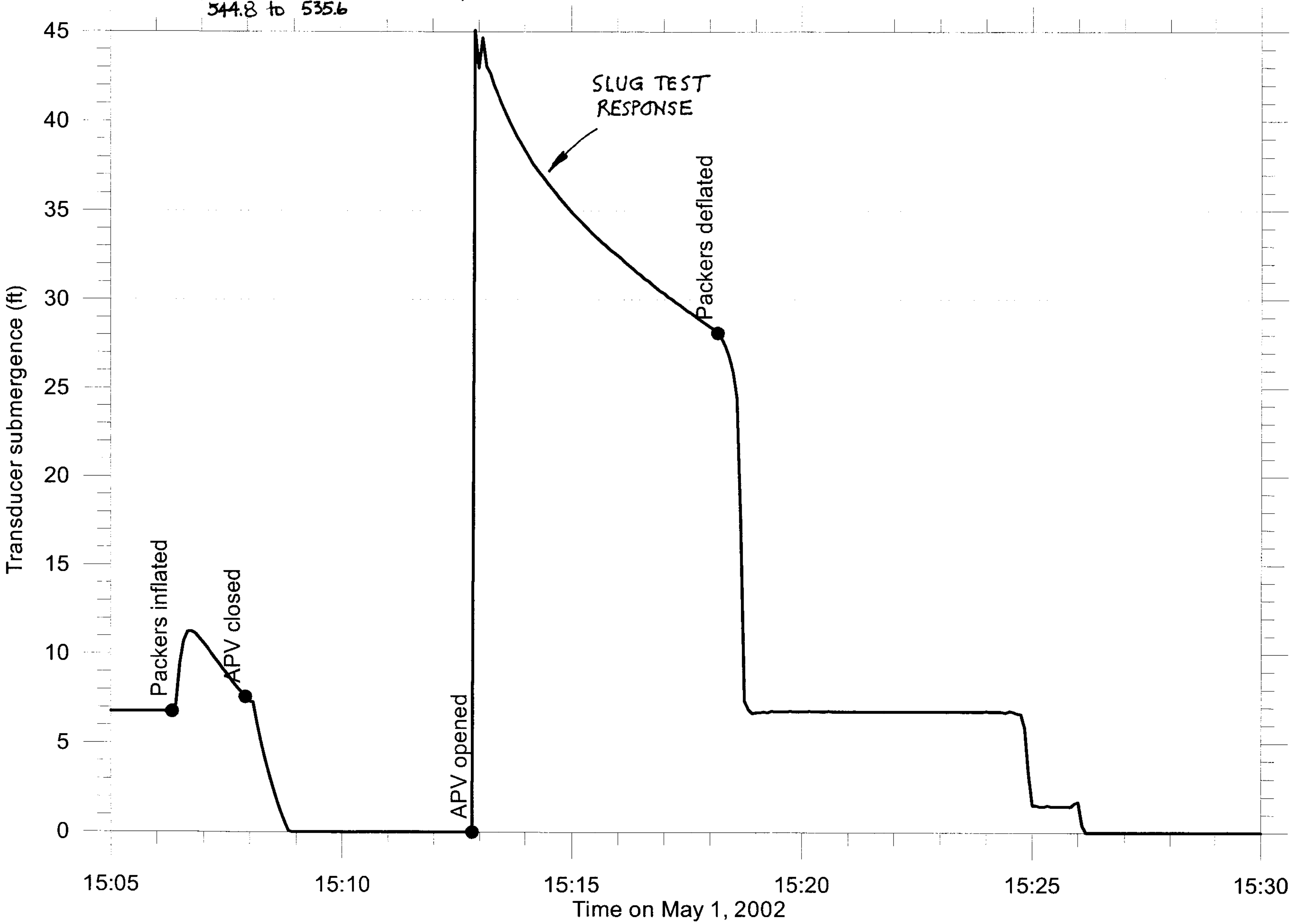
Initial Displacement: 26.91 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

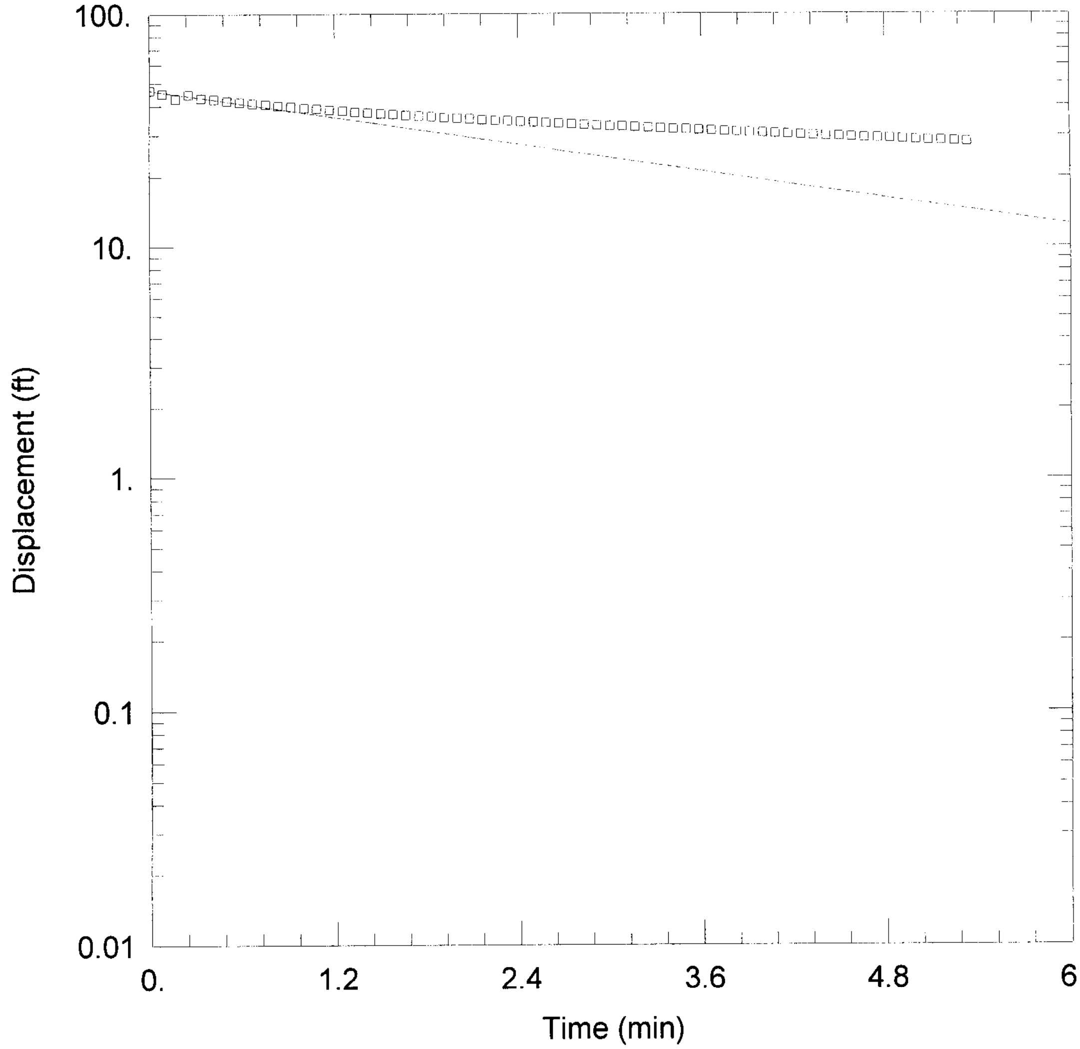
SOLUTION

Aquifer Model: Confined
Solution Method:
K = 0.01497 ft/day
y0 = 26.91 ft

J5M Packer Testing

Test 10 (~~539.09 to 533.89~~ ft AMSL)
544.8 to 535.6





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5M\J5M-10a.aqt
Date: 11/25/02 Time: 11:30:40

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

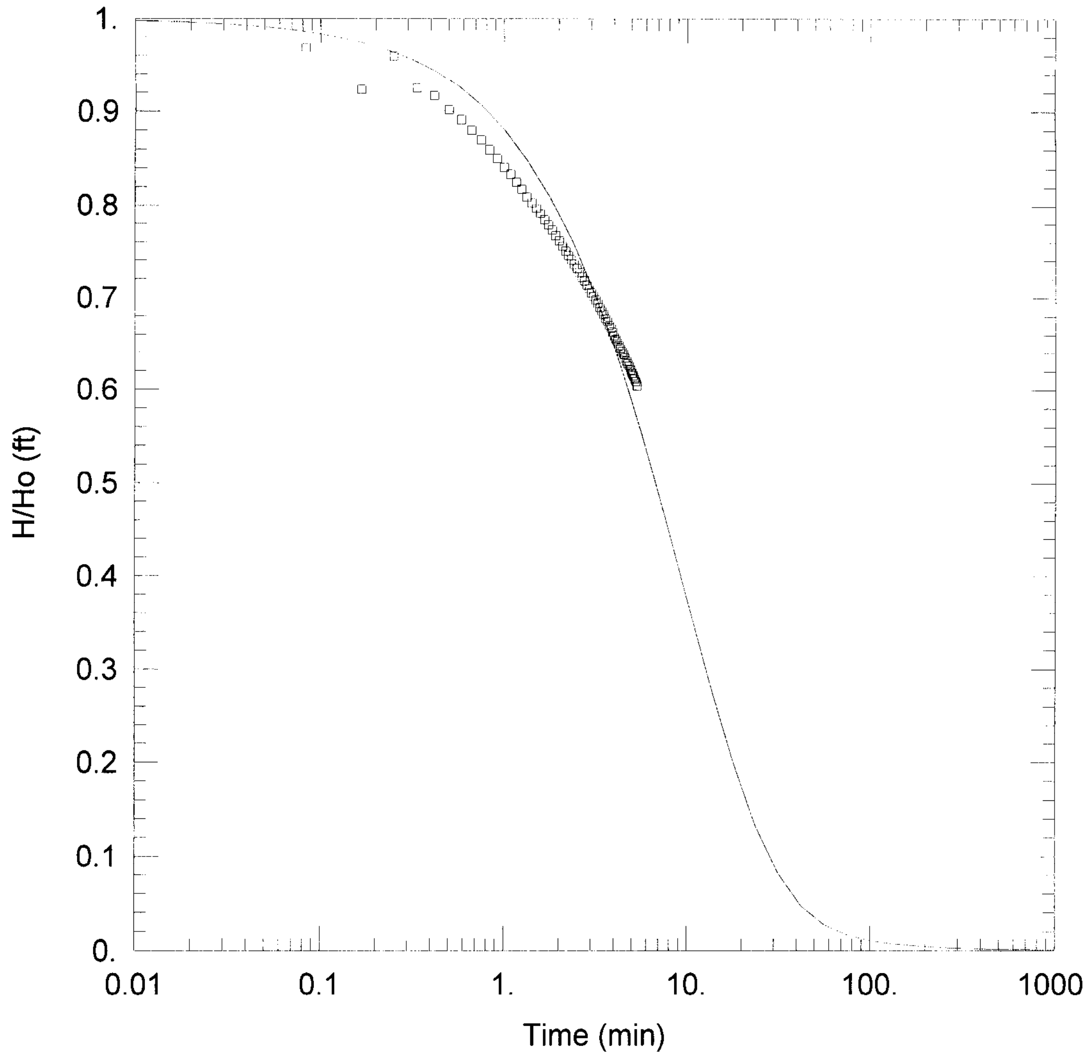
Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-10)

Initial Displacement: 46.55 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.1667 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
K = 2.904 ft/day
Solution Method:
y0 = 46.55 ft



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5M\J5M-10b.aqt
Date: 11/25/02 Time: 11:30:35

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5M-10)

Initial Displacement: 46.55 ft Casing Radius: 0.0417 ft
Wellbore Radius: 0.1615 ft Well Skin Radius: 0.1615 ft
Screen Length: 5.2 ft Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined Solution Method: Cooper-Bredehoeft-Papadopulos
T = 0.7827 ft^2/day S = 1.E-06

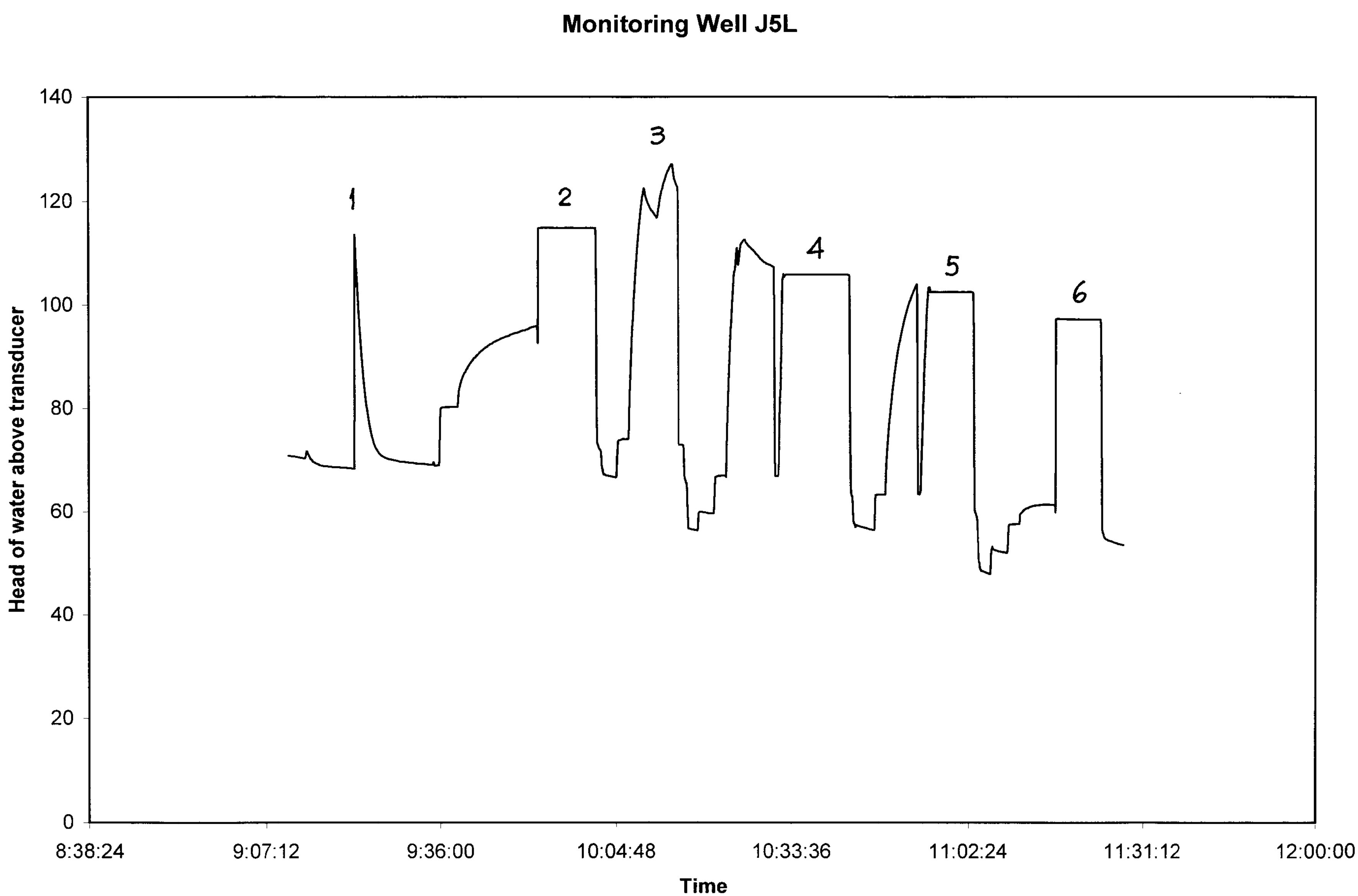
Hyde Park Landfill
Site Characterization Report – Hydrologic Characterization
Packer Testing Results

J5L

Testing Dates: May 02, 2002

Summary of Tests:

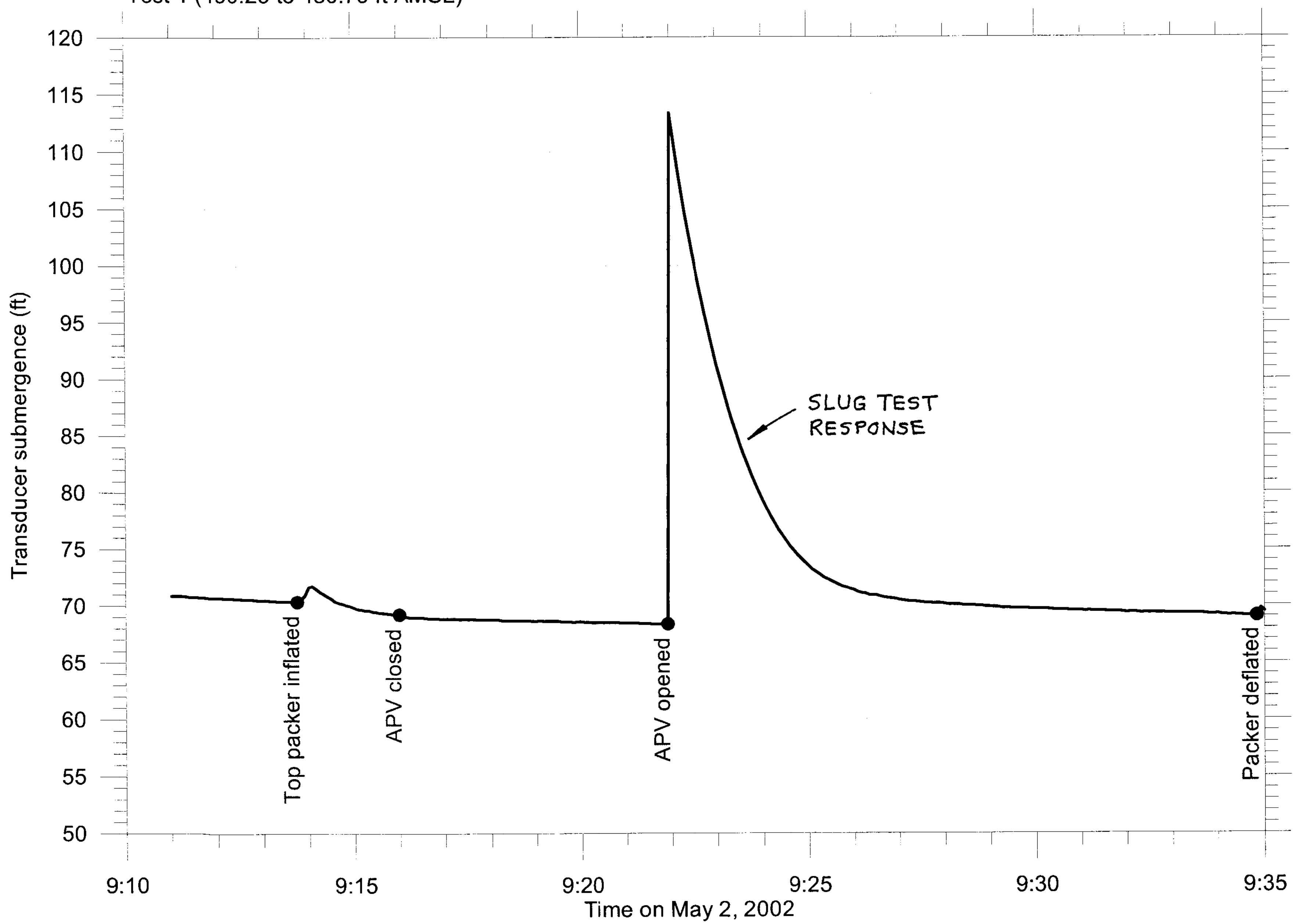
Well	Test #	Top of interval (ft MSL)	Bottom of interval (ft MSL)	Transmissivity (ft^2/d)	Notes
J5L	1	490.29	480.79	6.1	
J5L	2	490.29	485.09	<0.01	
J5L	3	494.29	489.09	NIR	see PT Memo
J5L	4	498.29	493.09	<0.01	see PT Memo
J5L	5	502.29	497.09	<0.01	see PT Memo
J5L	6	506.29	501.09	<0.01	

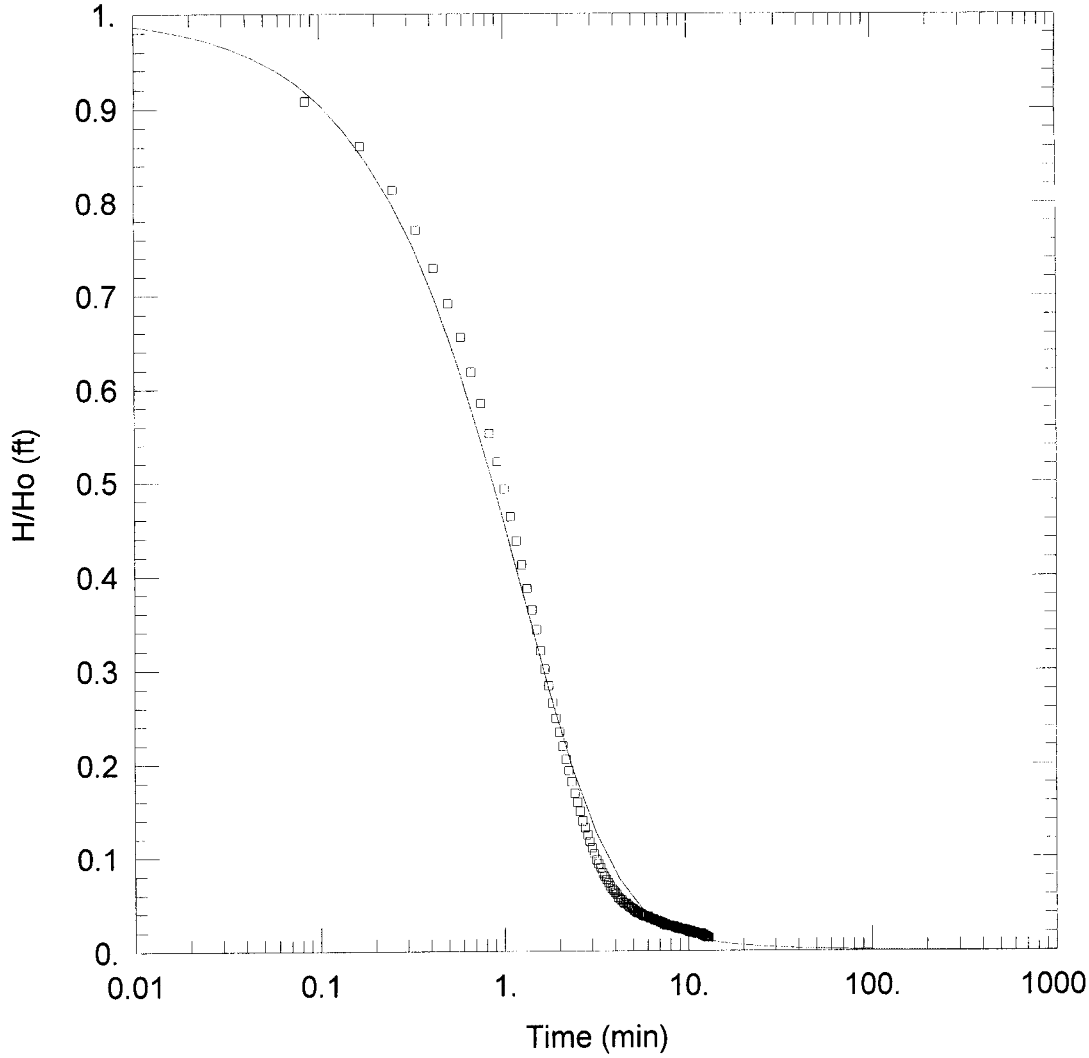


Monitoring Well J5L
Head of water above transducer
140
120
100
80
60
40
20
0
8:38:24
9:07:12
9:36:00
10:04:48
10:33:36
11:02:24
11:31:12
12:00:00
Time
1
2
3
4
5
6

J5L Packer Testing

Test 1 (490.29 to 480.79 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5L\J5L-1.aqt
Date: 11/25/02 Time: 11:47:25

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5L-1)

Initial Displacement: 49.61 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

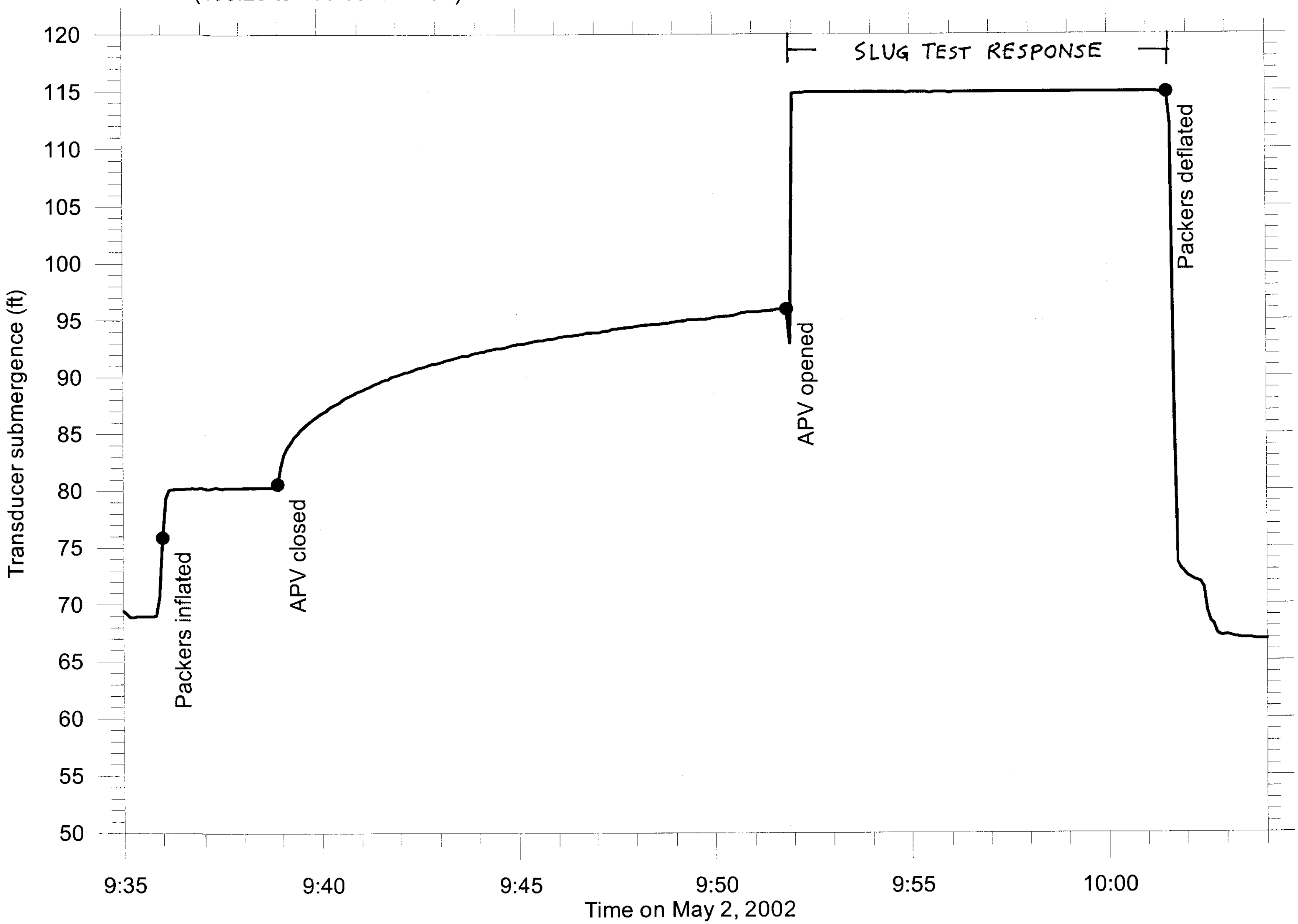
SOLUTION

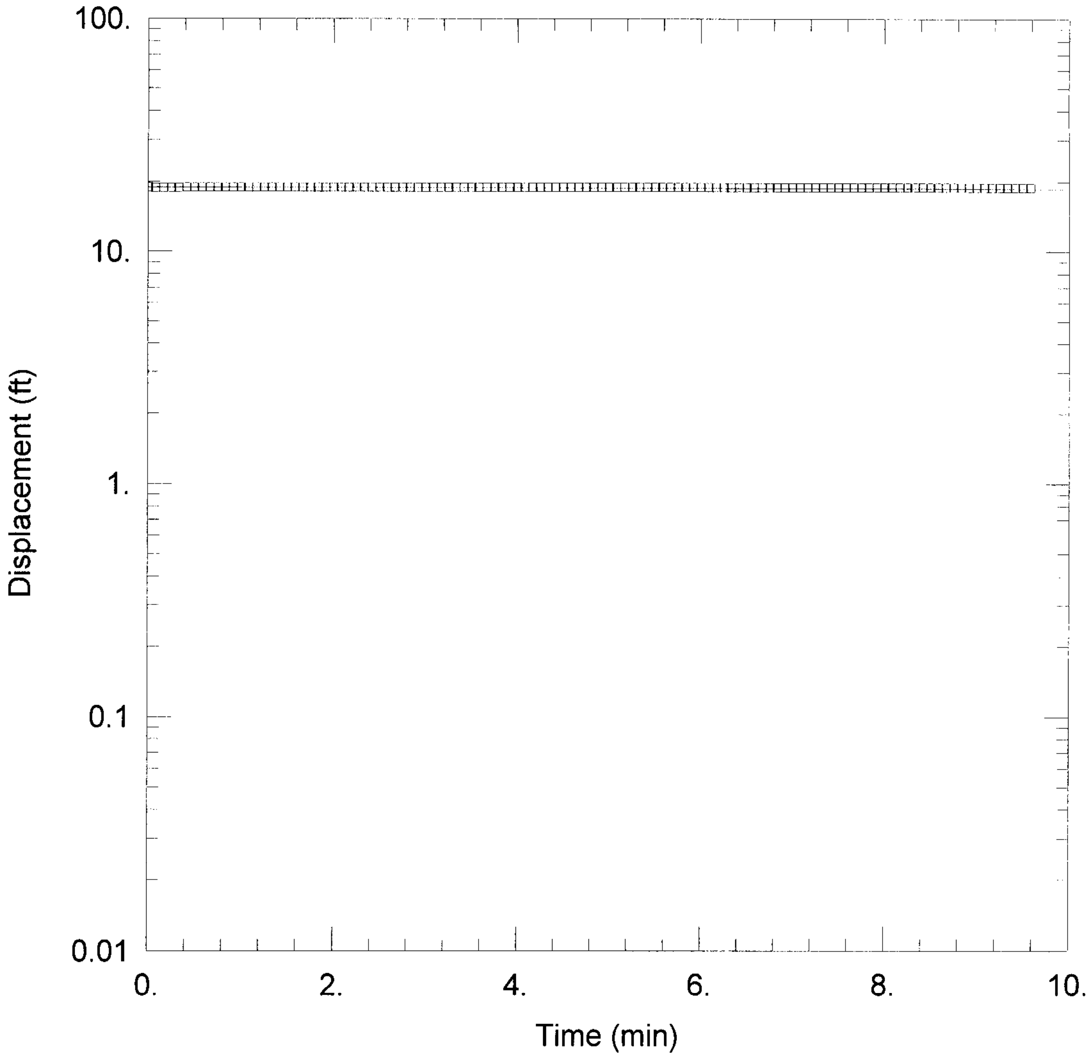
Aquifer Model: Confined
Solution Method: Cooper-Bredehoeft-Papadopulos

= 6.068 ft^2/day
S = 1.E-06

J5L Packer Testing

Test 2 (490.29 to 485.09 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5L\J5L-2.aqt
Date: 11/25/02 Time: 11:47:37

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5L-2)

Initial Displacement: 18.92 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

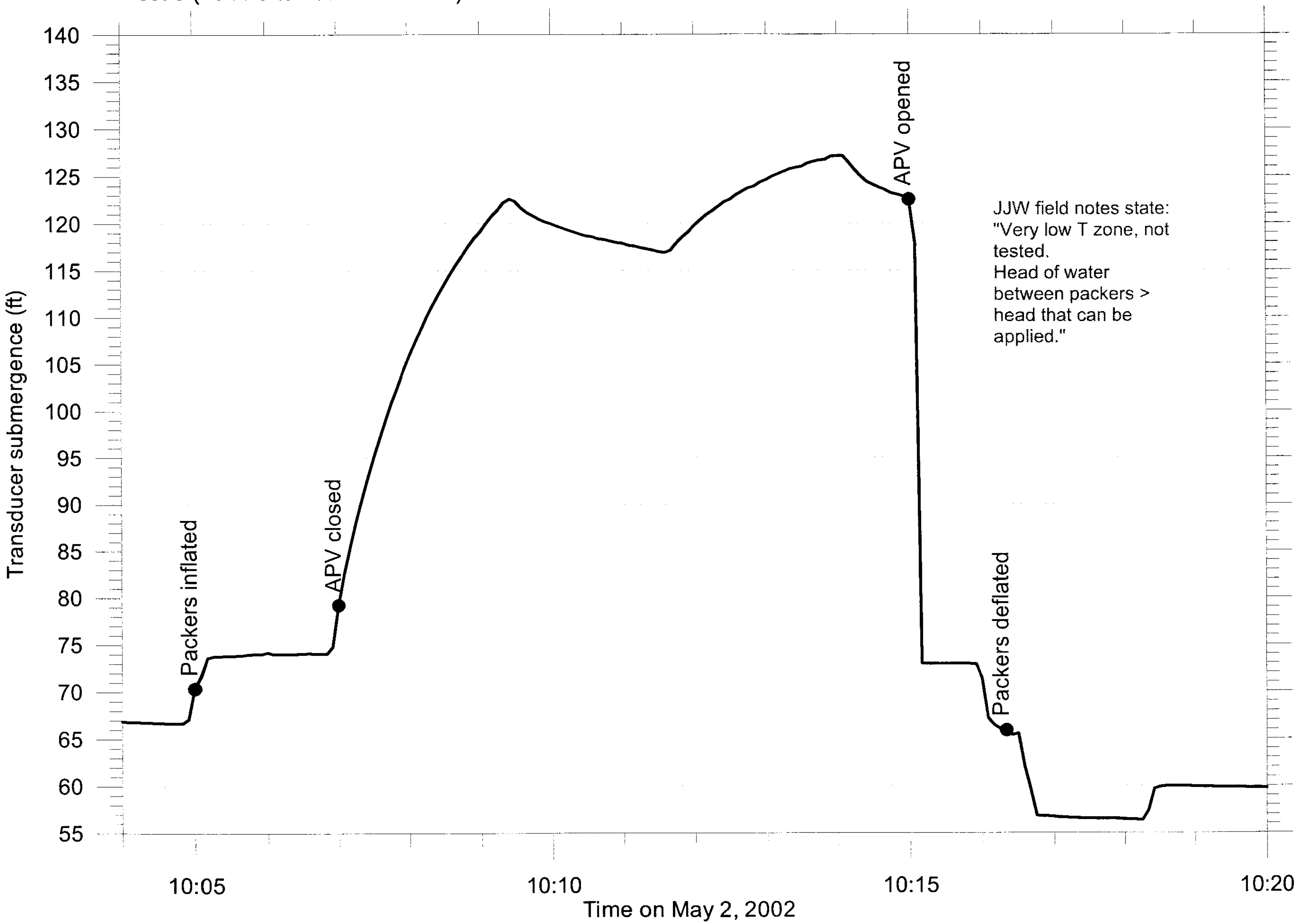
SOLUTION

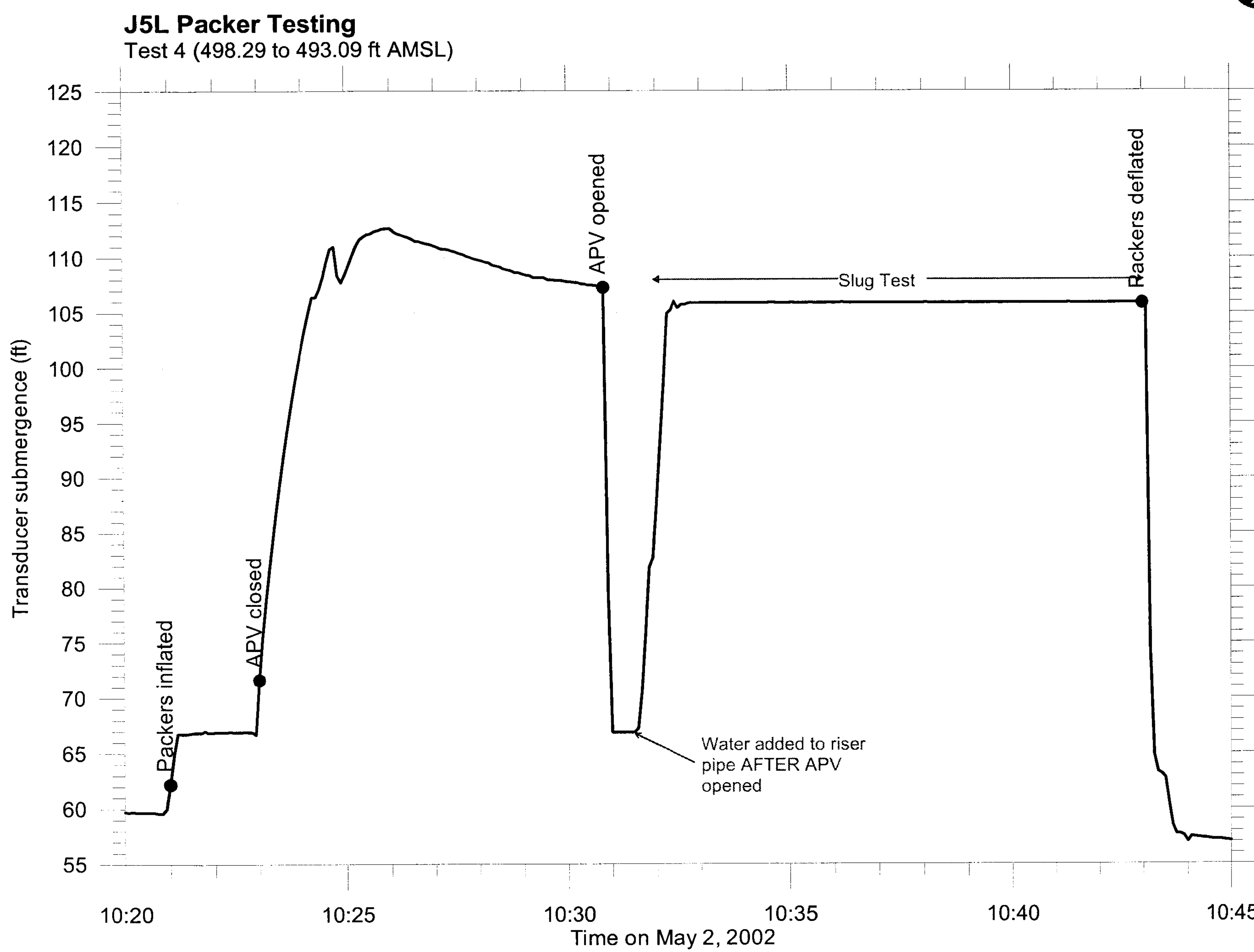
Aquifer Model: Confined
Solution Method:

' = 0.001 ft/day
y0 = 18.92 ft

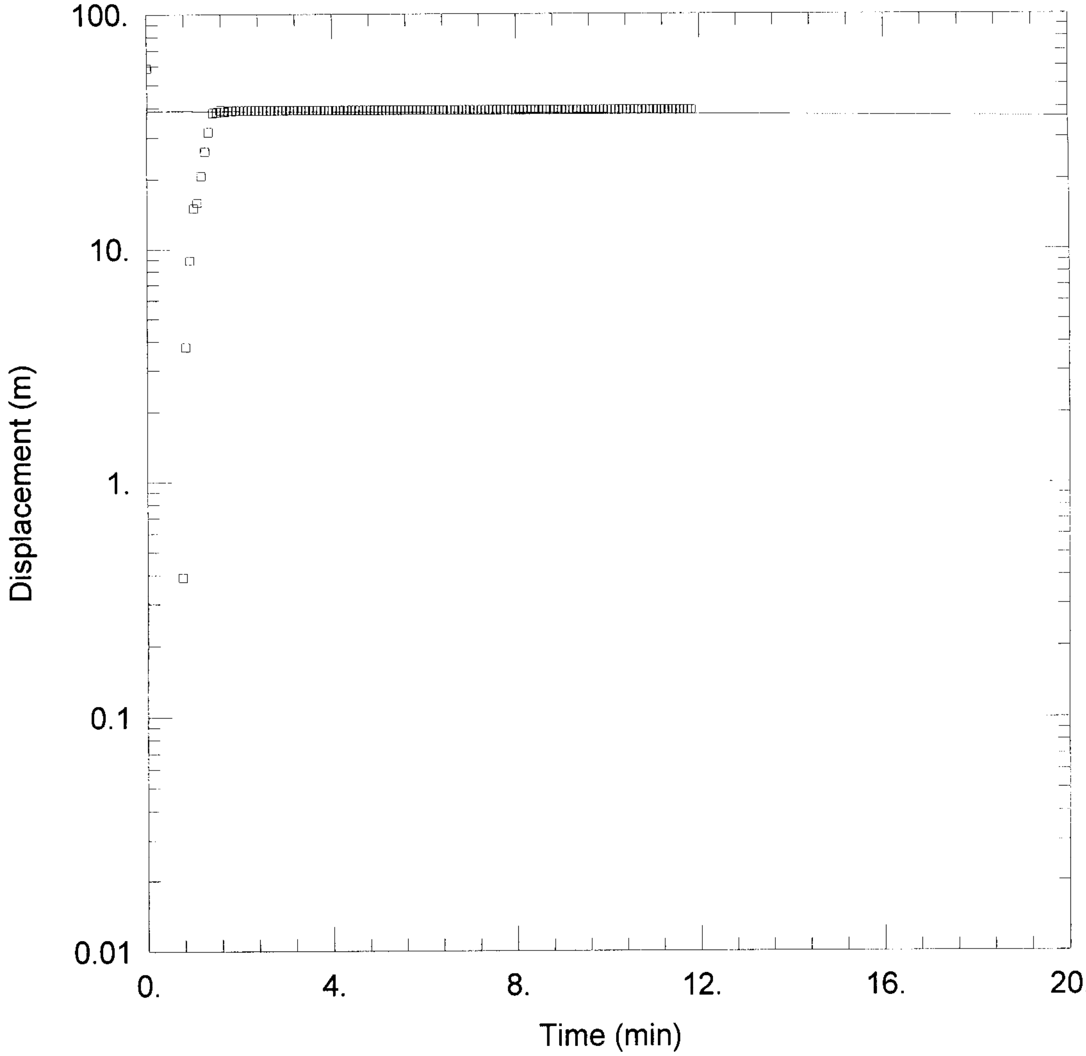
J5L Packer Testing

Test 3 (494.29 to 489.09 ft AMSL)





J5L Packer Testing
Test 4 (498.29 to 493.09 ft AMSL)
Transducer submergence (ft)
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
Packers inflated
APV closed
APV opened
Slug Test
Packers deflated
Water added to riser pipe AFTER APV opened
10:20
10:25
10:30
10:35
10:40
10:45
Time on May 2, 2002



WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5L\J5L-4.aqt
Date: 11/25/02 Time: 11:47:33

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5L-4)

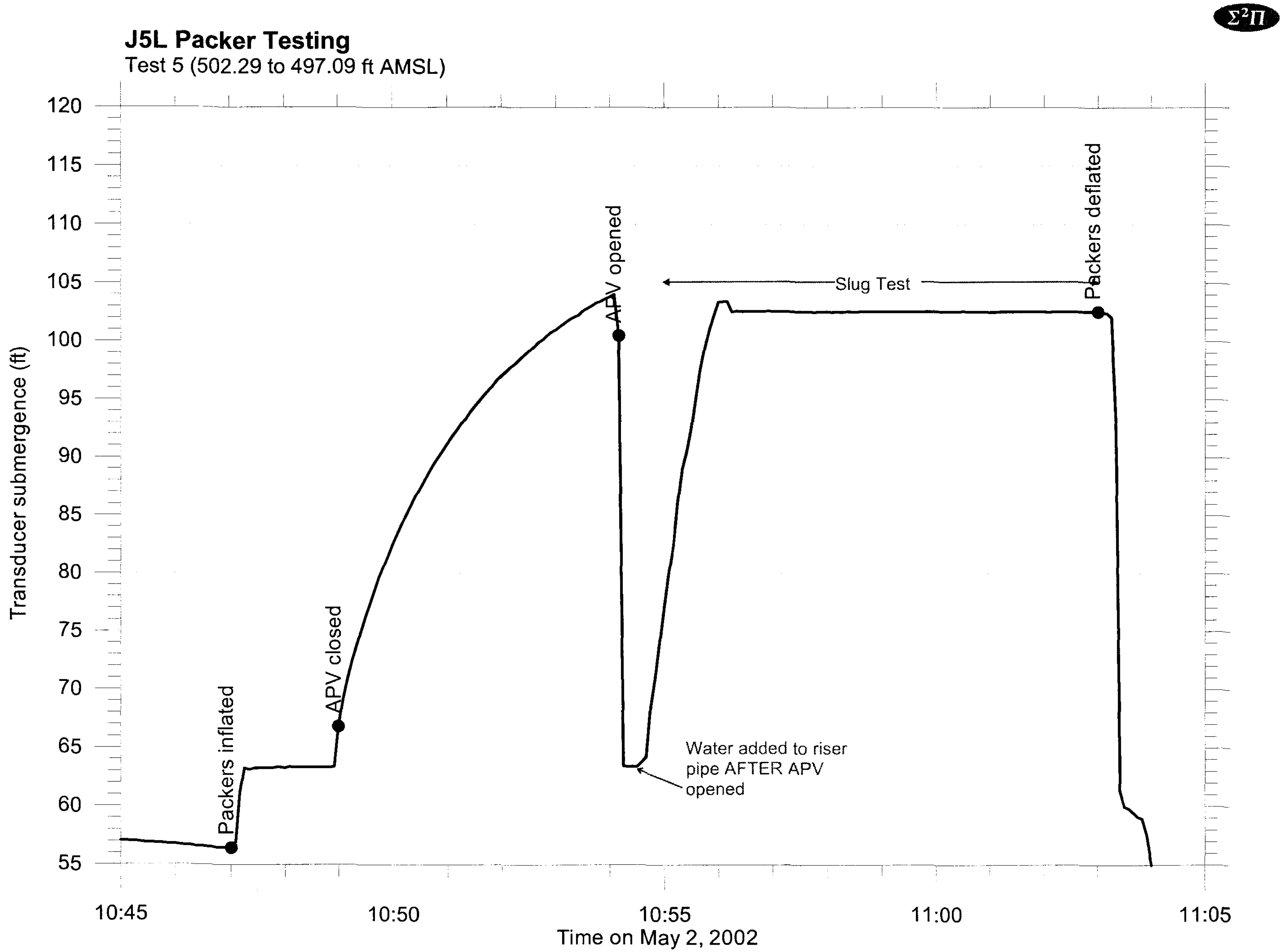
Initial Displacement: 58.99 m
Wellbore Radius: 0.1615 m
Screen Length: 5.2 m
Casing Radius: 0.0417 m
Well Skin Radius: 0.1615 m
Total Well Penetration Depth: 5.2 m

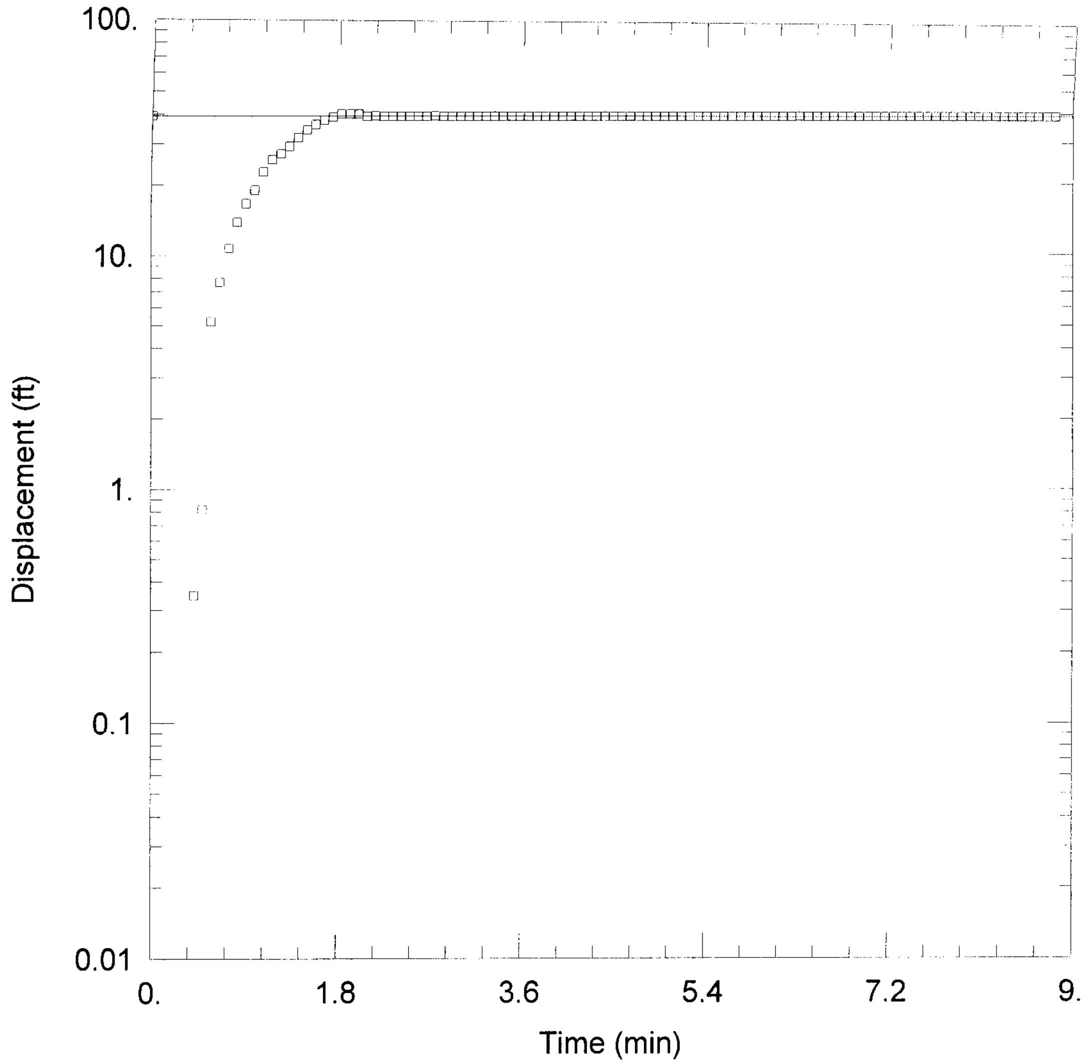
SOLUTION

Aquifer Model: Confined
Solution Method:

K= 0.009085 ft/day T= K× 5.2 = 0.05 ft²/d
y0 = 38.99 m

J5L Packer Testing
Test 5 (502.29 to 497.09 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5L\J5L-5.aqt
Date: 11/25/02 Time: 11:47:29

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5L-5)

Initial Displacement: 39.36 ft
Wellbore Radius: 0.1615 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1615 ft
Total Well Penetration Depth: 5.2 ft

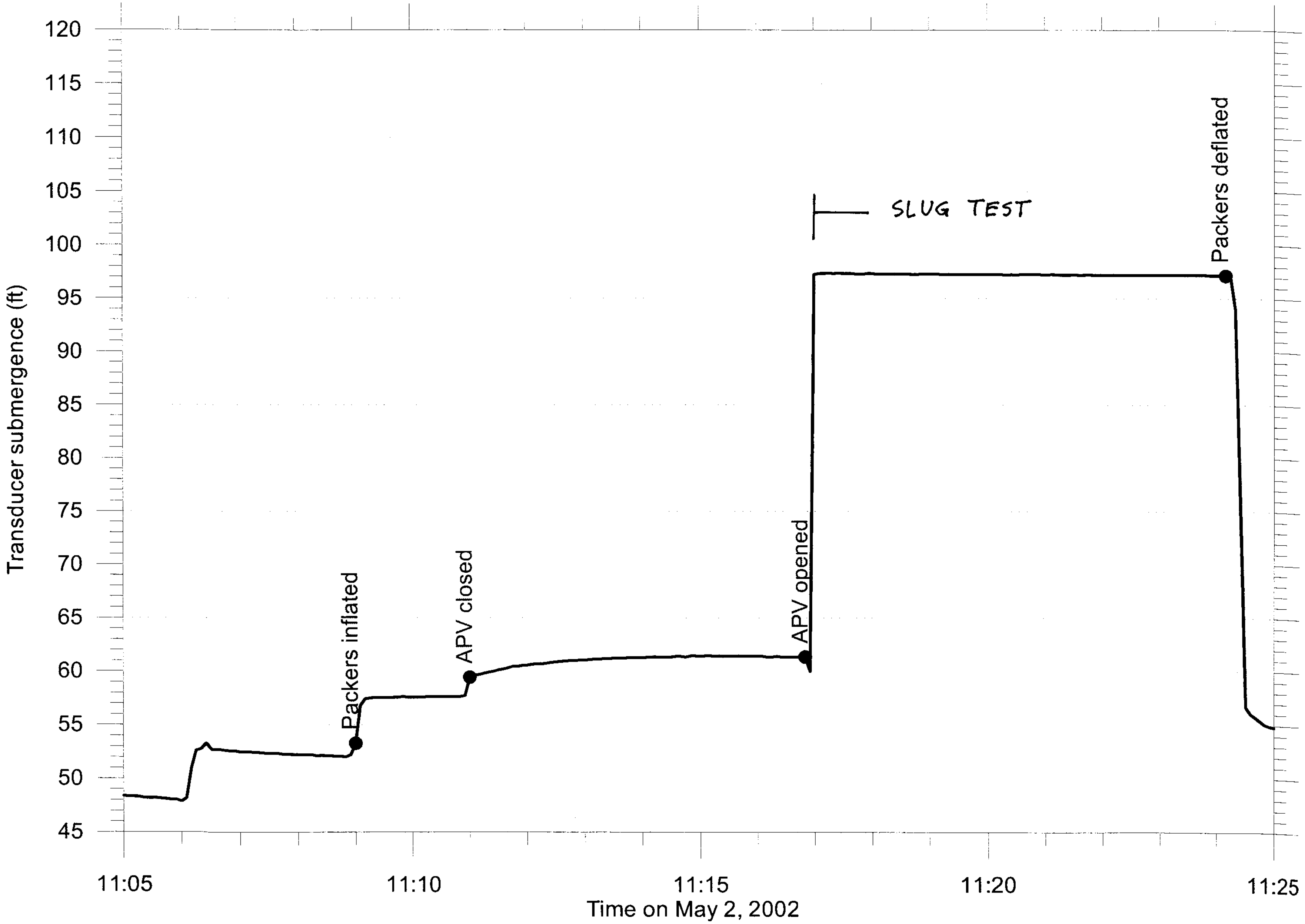
SOLUTION

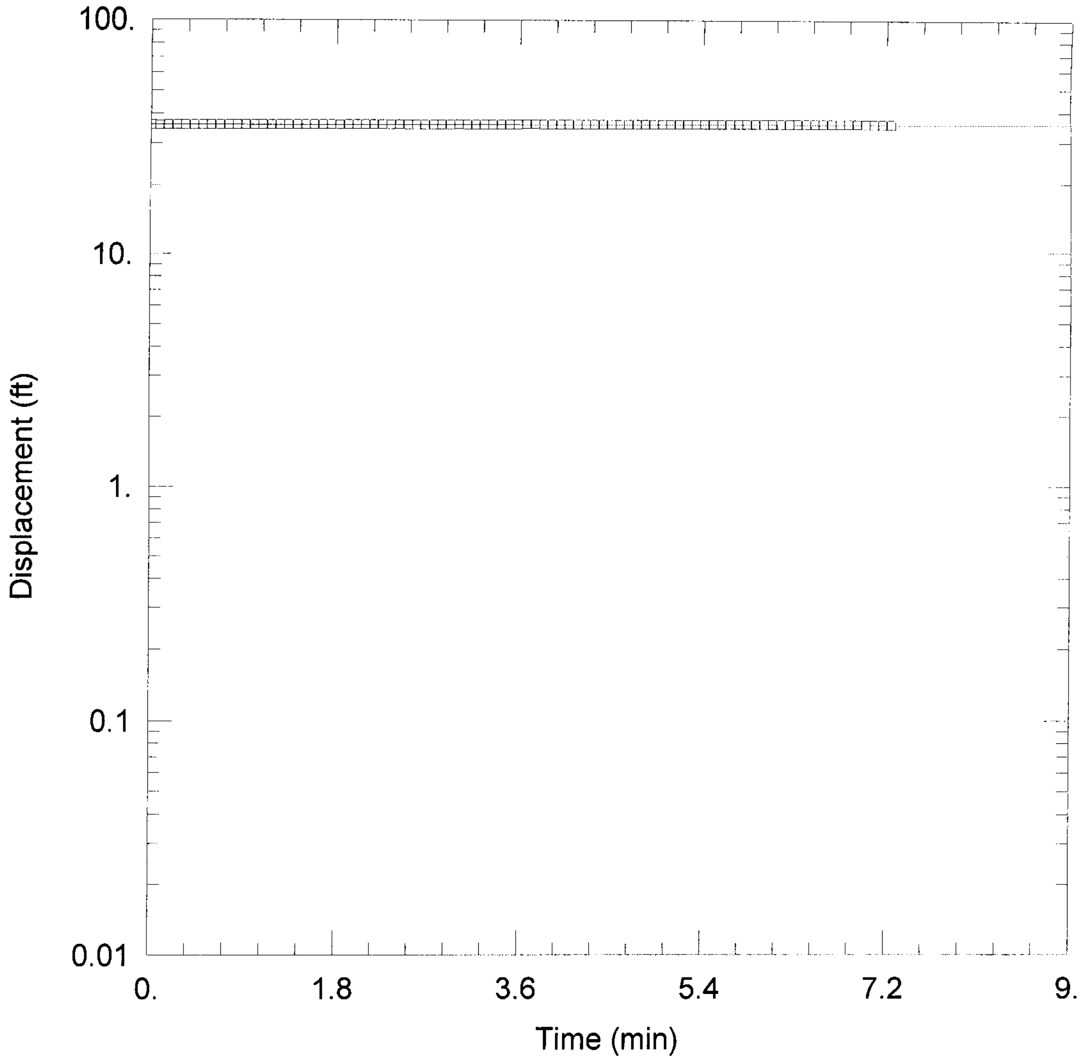
Aquifer Model: Confined
Solution Method:

K = 0.000535 ft/day T = 5.2 × K = 0.003 ft²/d
y0 = 39.31 ft

J5L Packer Testing

Test 6 (506.29 to 501.09 ft AMSL)





WELL TEST ANALYSIS

Data Set: D:\sspa\SSP-610\Packer testing\J5\J5L\J5L-6.aqt
Date: 11/25/02 Time: 11:47:40

PROJECT INFORMATION

Company: S.S. Papadopulos & Associates

AQUIFER DATA

Saturated Thickness: 5.2 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (J5L-6)

Initial Displacement: 35.99 ft
Wellbore Radius: 0.1667 ft
Screen Length: 5.2 ft
Casing Radius: 0.0417 ft
Well Skin Radius: 0.1667 ft
Total Well Penetration Depth: 5.2 ft

SOLUTION

Aquifer Model: Confined
Solution Method:

'´ = 0.001 ft/day
y0 = 35.99 ft

A5. PW-1L Packer Installation

Memorandum

Date: February 20, 2003

From: Hyde Park Technical Team

To: George Luxbacher and Rick Passmore, Glenn Springs Holdings, Inc.

SSPA Project: 610

Re: Responses to Installation of a Packer in PW 1L

R:\ssp610\SCR_Hydrology\Report\SSPA summaries\PW-1L packer installation\Memo_PW-1L packer installation.doc

1. Overview

During the shutdown monitoring we observed that the water levels in B2M-09 and B2L-11 tracked each other closely. Their response suggested that an external mechanism linked the two wells. In particular, a vertical conduit appeared to connect the FZ-09 and FZ-11 at the B2. Pumping well PW-1L is located about 500 ft from B2, and is open across both FZ-09 and FZ-11. To test the possibility that PW-1L is acting as a conduit, we isolated the two flow zones in the well. This was accomplished on January 21, 2003 by removing the pump from the well and inflating a packer just above FZ-11, cutting off the possibility of vertical flow down the wellbore.

The continuous water levels recorded in B2M-09 and B2L-11 after the shutdown of the bedrock pumping system, but before the installation of the packer in PW-1L, are plotted in Figure 1. At the start of the shutdown, B2M-09 was dry (the elevation of FZ-09 at this location is at about 522 ft MSL), and the water level in B2L-11 was at 507 ft MSL, about 14 ft lower. Following the shutdown of the bedrock purge wells on January 7, the water levels in the two wells began tracking each other closely after the water levels had recovered sufficiently to re-saturate FZ-09. The final recovered water levels on January 20 were 552 ft and 545 ft MSL for B2M-09 and B2L-11, respectively.

The packer was installed in PW-1L on January 21. The continuous water levels in B2M-09 and B2L-11 recorded beyond the installation of the packer are plotted in Figure 2. As shown in the figure, the water levels at B2M-09 and B2L-11 began to diverge immediately following the isolation of FZ-09 and FZ-11 in PW-1L. The water levels in B2M-09 and B2L-11 equilibrated at new levels of 554 ft and 531 ft MSL, respectively. The difference in water levels between the two flow zones under recovered conditions was 23 feet.

2. Analysis

Within one day of the installation of the packer in PW-1L, the water level in B2M-09 equilibrated to a new water level of 554 ft, an increase of 2 ft. The water level in B2L-11 equilibrated to a level of 536 ft, representing a decline of 14 ft. To test our understanding of the influence of PW-1L, we have applied the Sokol (1963) analysis to try and match the observed composite water level in FZ-09/11 prior to installation of the packer.

According to the Sokol (1963) analysis, the composite water level between FZ-09 and FZ-11 is given by the transmissivity-weighted average of the true water levels in the individual flow zones:

$$\bar{h} = \frac{h_{09}T_{09} + h_{11}T_{11}}{T_{09} + T_{11}} \qquad (1)$$

where *h* and *T* designate the water level and transmissivities in the flow zones.

Dividing through by the transmissivity of FZ-11, T_{11}, yields:

$$\bar{h} = \frac{h_{09}\left(T_{09}/T_{11}\right) + h_{11}}{\left(T_{09}/T_{11}\right) + 1} \qquad (2)$$

The predictions of the Sokol analysis are plotted in Figure 3. The composite water level is plotted as a function of the transmissivity contrast T_{09}/T_{11}. Slug tests conducted at PW-1L after installation of the packer yielded transmissivities of 2300 ft^2/day and 520 ft^2/day, above and below the packer, respectively. The interval above the packer is open across FZ-08 and FZ-09. The interval below the packer is open across FZ-10 and FZ-11. If we assume that the transmissivities are dominated by FZ-09 and FZ-11, then the transmissivities of FZ-09 and FZ-11 differ by a factor of about 4.4 at PW-1L. Substituting this value into Equation (2) yields a composite water level of 551 ft. This matches the observed water level very closely.

3. Conclusions

The data collected following the installation of a packer at PW-1L demonstrated clearly that PW-1L acts as a conduit between FZ-09 and FZ-11, and causes water levels in the B2 cluster to equilibrate. The results of the PW-1L packer testing showed the profound effect on water levels in the discrete flow zones caused by existing wells at the Site that are open across multiple flow zones.

To test our understanding of the influence of PW-1L, we applied the Sokol (1963) analysis to try and match the observed composite water level in FZ-09/11 prior to installation of the packer. The results of the Sokol (1963) analysis showed that we able to match closely the observed composite FZ-09/FZ-11 water level at B2.

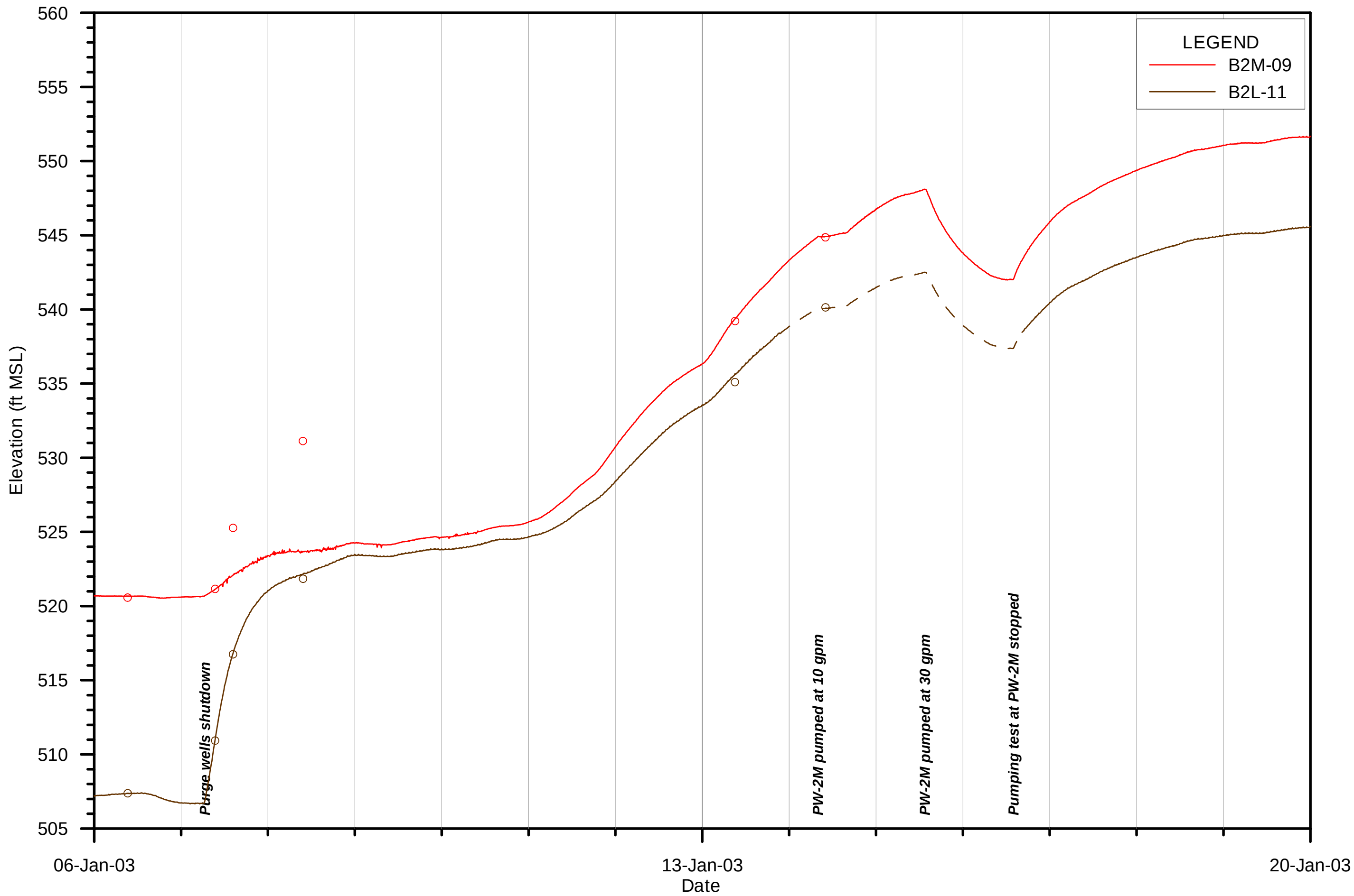


Figure 1 Water levels in B2M-09 and B2L-11 prior to the installation of a packer in PW-1L

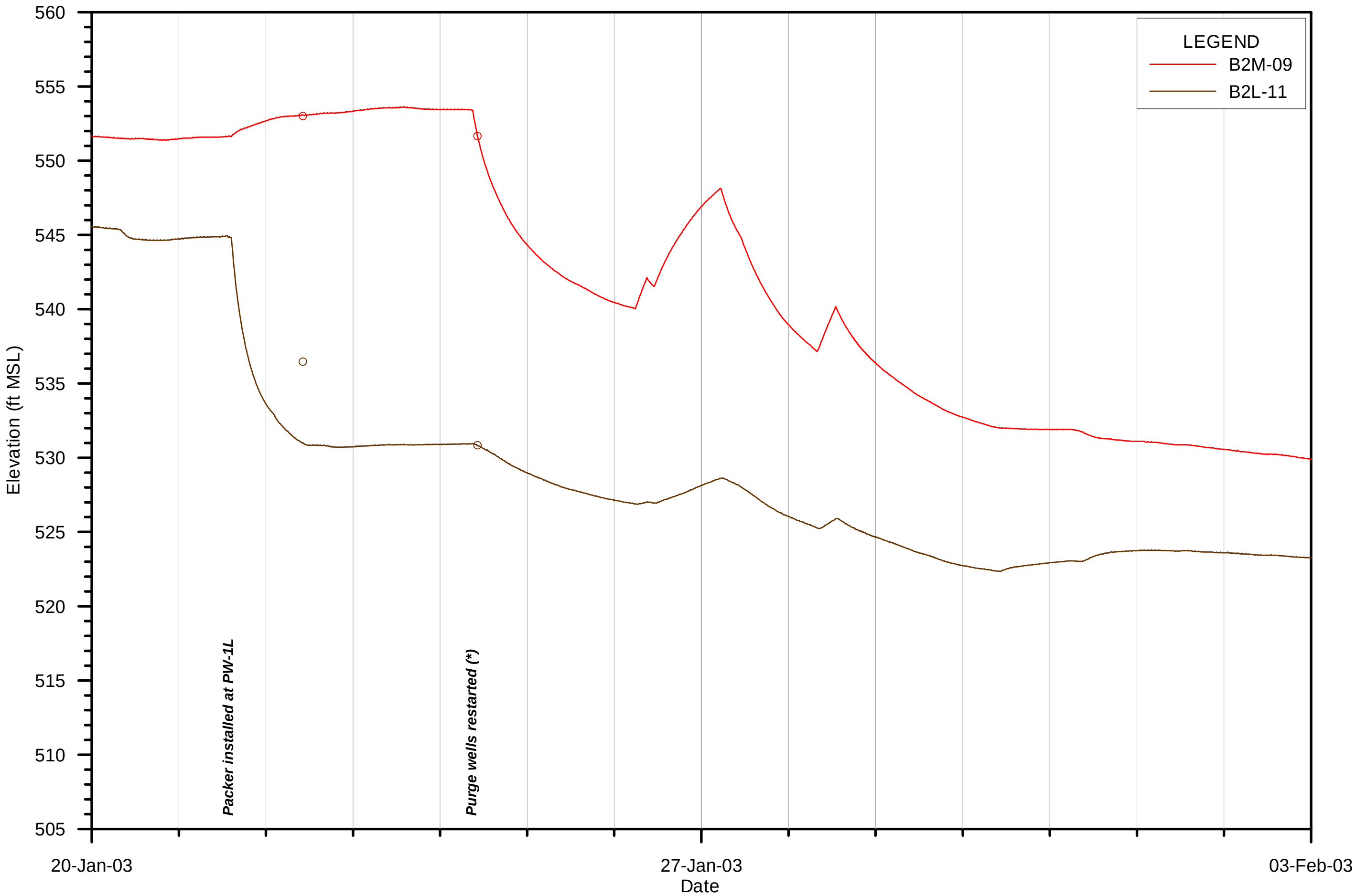


Figure 2 Water levels in B2M-09 and B2L-11 after the installation of a packer in PW-1L

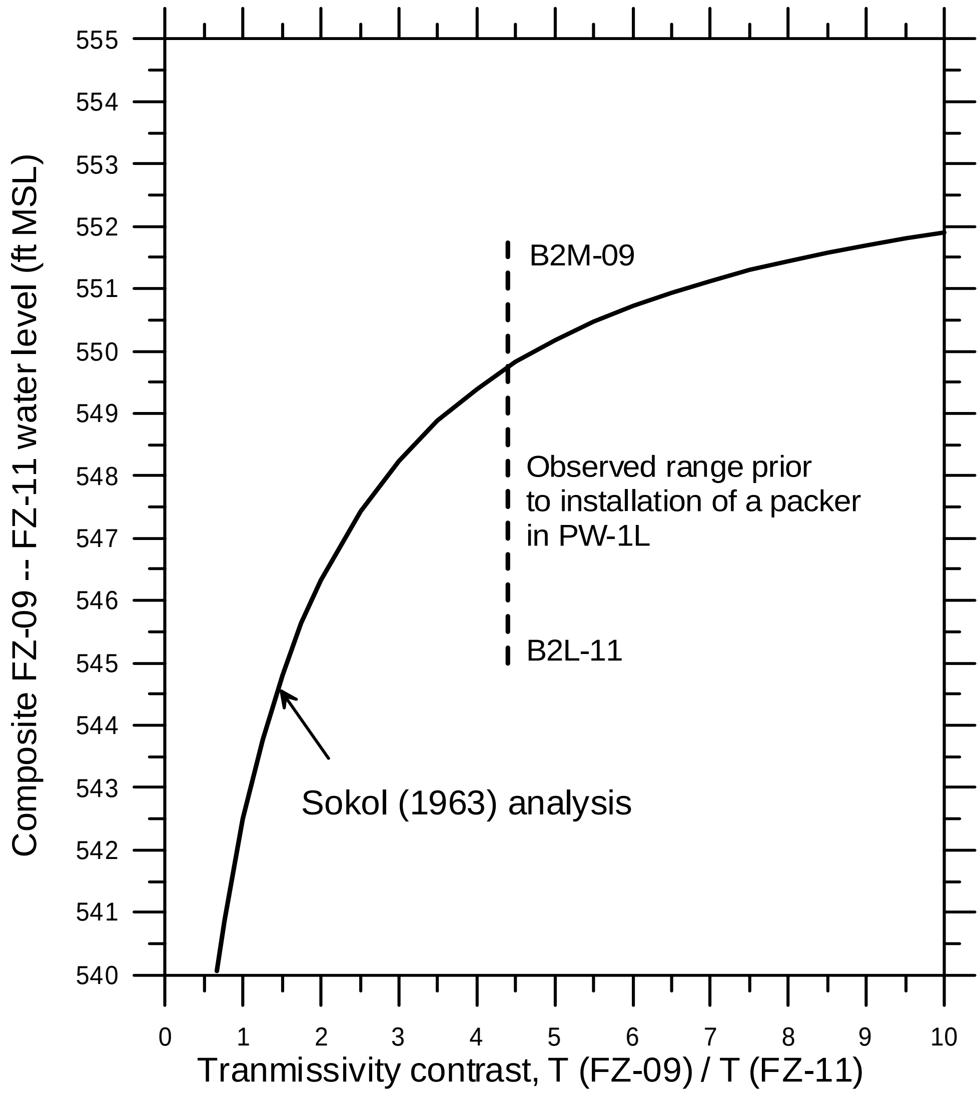


Figure 3 Sokol (1963) analysis of composite water levels at B2M-09 and B2L-11