APPENDIX H – In-Situ Hydraulic Conductivity Data

H.1 – Slug Test Summary (Most Recent Investigation)
H.2 – Slug Test Data (Most Recent Investigation)
H.3 – Slug Test Summary (Previous Investigation)

APTIM

H.1 – Slug Test Summary (Most Recent Investigation)

Zion Landfill Site 2 North Expansion
2019 Slug Test Summary Table
Shallow Drift Wells

Well ID	Type	Analysis Method	Analysis Type	Initial Displacement H(0)	Static Water Column Height (H)	Saturated Thickness of Aquifer (b)	Depth to Top of Well Screen from Upper Confining Unit (d)	Length of Well Screen (perforated interval) (L)	Inside Radius of Casing r(c)	Radius of Well (open or perforated Interval) r(w)	Outer Radius of Well Skin (disturbed zone enveloping filter pack) r(sk)	Depth to Water (Feet Below TOC)	K_h (cm/sec)	Geometric Mean K_h (cm/sec)
P-01-18SD	FH	Bouwer-Rice	Confined	1.724	26.20	13.00	2.78	9.66	0.0833	0.208	0.208	68.40	3.24E-04	2.99E-04
	RH			1.456									2.75E-04	
P-03-18SD	FH	Bouwer-Rice	Confined	1.621	24.42	15.36	5.22	9.66	0.0833	0.208	0.208	82.37	1.34E-03	1.46E-03
	RH			1.310									1.58E-03	
P-04-18USD	FH	Bouwer-Rice	Confined	1.680	29.34	9.92	0.00	9.62	0.0833	0.208	0.208	67.43	2.83E-04	2.87E-04
	RH			1.447									2.90E-04	
P-04-18LSD	FH	Bouwer-Rice	Confined	1.943	43.70	5.87	0.71	4.68	0.0833	0.208	0.208	70.90	4.06E-04	3.77E-04
	RH			1.364									3.51E-04	
P-05-18SD	FH	Bouwer-Rice	Confined	1.163	37.03	4.53	0.00	4.69	0.0833	0.208	0.208	85.56	8.38E-04	7.71E-04
	RH			1.502									7.09E-04	
P-06-18USD	FH(1)	Bouwer-Rice	Confined	1.133	30.56	10.50	0.09	9.62	0.0833	0.208	0.208	82.30	8.50E-03	6.51E-03
	RH(1)			1.001									3.73E-03	
P-06-18USD	FH(2)	Bouwer-Rice	Confined	1.342	30.56	10.50	0.09	9.62	0.0833	0.208	0.208	82.30	9.94E-03	
	RH(2)			1.190									5.71E-03	
P-06-18LSD	FH(1)	Bouwer-Rice	Confined	1.802	46.43	32.64	22.50	9.62	0.0833	0.208	0.208	88.17	2.52E-03	2.63E-03
	RH(1)			1.375									2.38E-03	
P-06-18LSD	FH(2)	Bouwer-Rice	Confined	1.662	46.43	32.64	22.50	9.62	0.0833	0.208	0.208	88.17	3.35E-03	
	RH(2)			1.359									2.38E-03	
P-07-18USD	FH	Bouwer-Rice	Confined	2.052	21.48	12.20	2.00	9.54	0.0833	0.208	0.208	68.98	8.35E-05	7.11E-05
	RH			2.323									6.06E-05	
P-07-18LSD	FH	Bouwer-Rice	Confined	1.894	47.22	11.43	1.29	9.53	0.0833	0.208	0.208	71.33	1.58E-04	2.34E-04
	RH			1.350									3.46E-04	
P-08-18SD	FH	Bouwer-Rice	Confined	1.740	38.62	6.32	1.16	4.68	0.0833	0.208	0.208	85.84	1.70E-03	1.79E-03
	RH			1.413									1.89E-03	
P-09-18SD	FH	Bouwer-Rice	Confined	1.987	31.01	13.22	3.07	9.65	0.0833	0.208	0.208	75.74	3.36E-05	1.91E-05
	RH			1.805									1.09E-05	
P-10-18SD	FH(1)	Bouwer-Rice	Confined	1.666	31.36	12.63	2.49	9.65	0.0833	0.208	0.208	71.16	2.27E-03	2.12E-03
	RH(1)			1.522									2.03E-03	
P-10-18SD	FH(2)	Bouwer-Rice	Confined	1.890	31.36	12.63	2.49	9.65	0.0833	0.208	0.208	71.16	2.24E-03	
	RH(2)			1.420									1.97E-03	
P-11-18SD	FH	Bouwer-Rice	Confined	1.889	45.99	8.71	0.00	9.56	0.0833	0.208	0.208	76.25	1.80E-04	1.75E-04
	RH			1.482									1.70E-04	
P-12-18SD	FH	Bouwer-Rice	Confined	2.046	29.41	11.78	1.59	9.61	0.0833	0.208	0.208	79.31	7.05E-05	6.20E-05
	RH			1.482									5.45E-05	
P-13-18SD	FH(1)	Butler(1998) Inertial	Confined	0.377	28.47	12.02	1.87	9.67	0.0833	0.208	0.208	70.06	7.83E-02	9.72E-02
	RH(1)			0.338									9.99E-02	
P-13-18SD	FH(2)	Butler(1998) Inertial	Confined	0.240	28.47	12.02	1.87	9.67	0.0833	0.208	0.208	70.06	1.08E-01	
	RH(2)			0.298									1.06E-01	
P-14-18SD	FH	Bouwer-Rice	Confined	2.440	45.45	6.04	0.88	4.68	0.0833	0.208	0.208	79.11	2.02E-05	1.65E-05
	RH			1.491									1.36E-05	
P-15-18SD	FH	Bouwer-Rice	Confined	1.952	28.72	13.36	3.22	9.65	0.0833	0.208	0.208	73.78	1.86E-06	1.87E-06
	RH			1.160									1.87E-06	
Minimum				0.24	21.48	4.53	0.00	4.68	0.0833	0.208	0.208	67.43	1.859E-06	1.866E-06
Maximum				2.44	47.22	32.64	22.5	9.67	0.0833	0.208	0.208	88.17	1.079E-01	9.716E-02
Geometric Mean				1.484	34.39	12.73	3.61	8.68	0.0833	0.208	0.208	76.59	6.403E-04	3.57E-04

Note: All units in **feet** unless otherwise noted.

FH or FH(1)=Falling Head Test #1

FH(2)=Falling Head Test #2

RH or RH(1)=Rising Head Test #1

RH(2)=Rising Head Test #2

TOC=Top of PVC Well Casing

APTIM

Zion Landfill Site 2 North Expansion
2019 Slug Test Summary Table
Basal Drift Well

Well ID	Type	Analysis Method	Analysis Type	Initial Displacement H(0)	Static Water Column Height (H)	Saturated Thickness of Aquifer (b)	Depth to Top of Well Screen from Upper Confining Unit (d)	Length of Well Screen (perforated interval) (L)	Inside Radius of Casing r(c)	Radius of Well (open or perforated Interval) r(w)	Outer Radius of Well Skin (disturbed zone enveloping filter pack) r(sk)	Depth to Water (Feet Below TOC)	K_h (cm/sec)	Geometric Mean K_h (cm/sec)
P-08-18D	FH	Bouwer-Rice	Confined	1.862	124.60	11.08	0.94	9.55	0.0833	0.208	0.208	83.94	2.58E-04	2.51E-04
	RH			1.537									2.43E-04	
Minimum				1.537	124.60	11.08	0.94	9.55	0.0833	0.208	0.208	83.94	2.432E-04	2.506E-04
Maximum				1.862	124.60	11.08	0.94	9.55	0.0833	0.208	0.208	83.94	2.582E-04	2.506E-04
Geometric Mean				1.700	124.60	11.08	0.94	9.55	0.0833	0.208	0.208	83.94	2.506E-04	2.51E-04

Note: All units in **feet** unless otherwise noted.

FH or FH(1)=Falling Head Test #1

FH(2)=Falling Head Test #2

RH or RH(1)=Rising Head Test #1

RH(2)=Rising Head Test #2

TOC=Top of PVC Well Casing

APTIM

Zion Landfill Site 2 North Expansion
2019 Slug Test Summary Table
Intra-Till Wells

Well ID	Type	Analysis Method	Analysis Type	Initial Displacement H(0)	Static Water Column Height (H)	Saturated Thickness of Aquifer (b)	Depth to Top of Well Screen from Upper Confining Unit (d)	Length of Well Screen (perforated interval) (L)	Inside Radius of Casing r(c)	Radius of Well (open or perforated Interval) r(w)	Outer Radius of Well Skin (disturbed zone enveloping filter pack) r(sk)	Depth to Water (Feet Below TOC)	K_h (cm/sec)	Geometric Mean K_h (cm/sec)
P-01-18IT	FH	Bouwer-Rice	Confined	1.639	13.69	4.30	0.00	4.67	0.0833	0.208	0.208	30.78	1.76E-04	1.74E-04
	RH			1.556									1.72E-04	
P-08-18IT	FH	Bouwer-Rice	Confined	1.595	18.09	5.99	0.83	4.68	0.0833	0.208	0.208	42.47	3.68E-04	3.29E-04
	RH			1.419									2.94E-04	
P-12-18IT	FH	Bouwer-Rice	Confined	1.160	18.77	12.29	2.15	9.57	0.0833	0.208	0.208	43.11	7.61E-05	5.96E-05
	RH			1.042									4.67E-05	
P-13-18IT	FH	Bouwer-Rice	Confined	1.391	17.29	7.54	2.40	4.68	0.0833	0.208	0.208	35.38	3.63E-03	3.46E-03
	RH			1.309									3.30E-03	
P-14-18IT	FH	Bouwer-Rice	Confined	1.222	20.74	6.57	1.41	4.68	0.0833	0.208	0.208	65.86	3.02E-06	2.66E-06
	RH			1.271									2.34E-06	
Minimum				1.042	13.69	4.30	0.00	4.67	0.0833	0.208	0.208	30.78	2.337E-06	2.655E-06
Maximum				1.639	20.74	12.29	2.4	9.57	0.0833	0.208	0.208	65.86	3.631E-03	3.462E-03
Geometric Mean				1.360	17.72	7.34	1.36	5.66	0.0833	0.208	0.208	43.52	1.257E-04	1.26E-04

Note: All units in **feet** unless otherwise noted.

FH or FH(1)=Falling Head Test #1

FH(2)=Falling Head Test #2

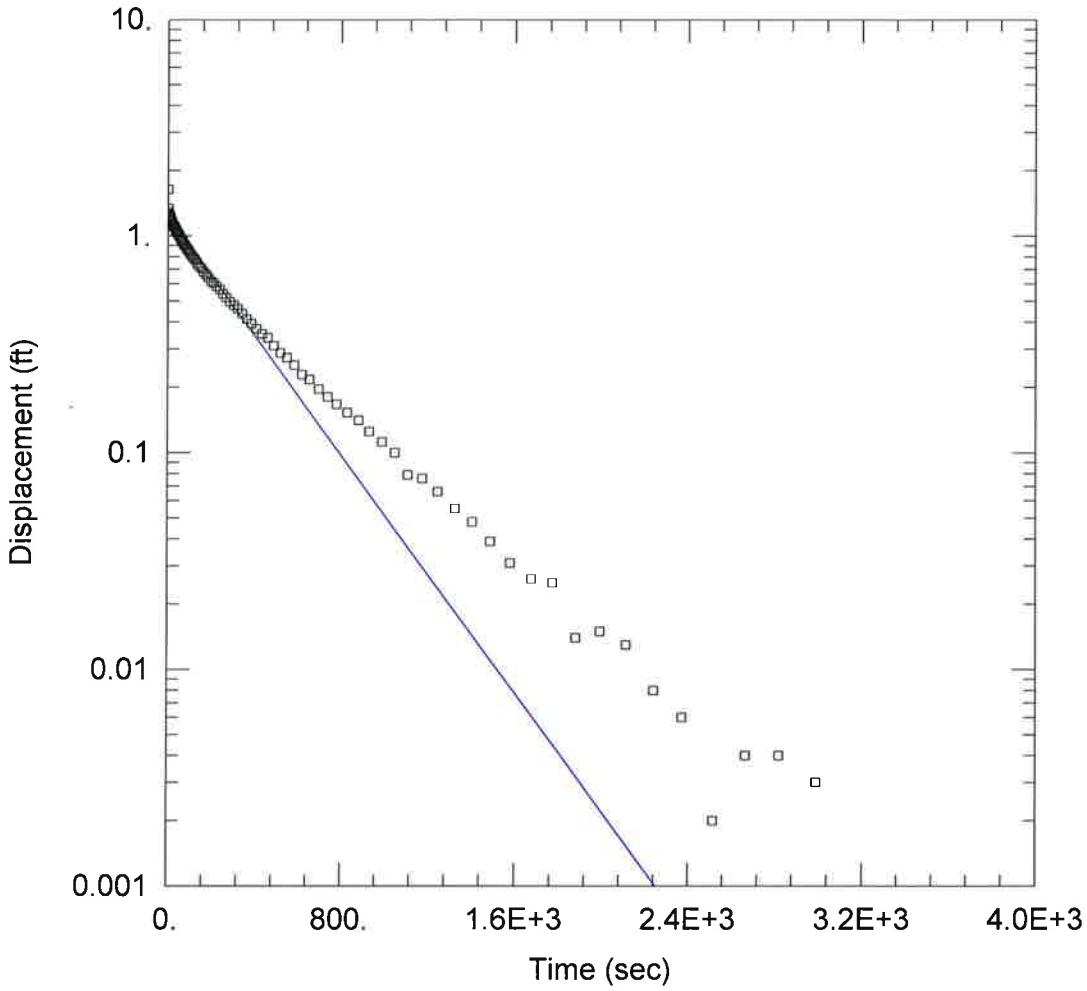
RH or RH(1)=Rising Head Test #1

RH(2)=Rising Head Test #2

TOC=Top of PVC Well Casing

APTIM

H.2 – Slug Test Data (Most Recent Investigation)



P-01-18IT FH1

Data Set: T:\...\P-01-18IT FH1.aqt
Date: 04/03/19 Time: 12:59:21

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-01-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 4.3 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01-18IT)

Initial Displacement: 1.639 ft
Total Well Penetration Depth: 4.67 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 13.69 ft
Screen Length: 4.67 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001762 cm/sec
y0 = 1.223 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-01-18
Title: P-01-18IT FH1
Date: 04/03/19
Time: 12:59:31

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-01-18IT

AQUIFER DATA

Saturated Thickness: 4.3 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-01-18IT

X Location: 11523. ft
Y Location: 13134. ft

Initial Displacement: 1.639 ft
Static Water Column Height: 13.69 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.67 ft
Total Well Penetration Depth: 4.67 ft

No. of Observations: 93

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.639	222.8	0.584
0.96	1.111	237.2	0.564
1.92	1.333	252.2	0.539
3.	1.281	267.8	0.518
4.14	1.276	284.6	0.496
5.34	1.256	302.6	0.478
6.6	1.247	321.2	0.46
7.919	1.232	341.6	0.438
9.36	1.221	362.6	0.413
10.86	1.212	384.8	0.393
12.42	1.205	408.8	0.372
14.1	1.19	434.	0.353
15.9	1.176	460.4	0.339
17.76	1.166	488.6	0.311
19.8	1.148	518.6	0.288
21.9	1.133	550.4	0.274
24.12	1.119	584.	0.253
26.52	1.114	620.	0.229
29.04	1.1	656.	0.217
31.68	1.09	698.	0.196
34.5	1.067	740.	0.181
37.5	1.056	782.	0.167
40.68	1.042	830.	0.153
44.04	1.03	884.	0.141
47.64	1.018	932.	0.125
51.24	0.999	992.	0.112

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
55.44	0.984	1052.	0.1
59.64	0.964	1112.	0.079
63.84	0.949	1178.	0.076
68.64	0.936	1250.	0.066
74.04	0.912	1328.	0.055
78.84	0.9	1406.	0.048
84.84	0.877	1490.	0.039
90.84	0.861	1580.	0.031
96.91	0.846	1676.	0.026
103.4	0.823	1772.	0.025
110.6	0.803	1880.	0.014
118.4	0.785	1994.	0.015
126.2	0.769	2114.	0.013
134.6	0.745	2240.	0.008
143.6	0.721	2372.	0.006
153.2	0.707	2516.	0.002
162.9	0.682	2666.	0.004
173.6	0.663	2822.	0.004
185.	0.642	2990.	0.003
197.	0.618	3170.	0.
209.6	0.604		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.3

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001762	cm/sec
y0	1.223	ft

T = K*b = 0.02309 cm²/sec

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-01-18
Title: P-01-18IT RH1
Date: 04/03/19
Time: 13:00:25

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-01-18IT

AQUIFER DATA

Saturated Thickness: 4.3 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-01-18IT

X Location: 11523. ft
Y Location: 13134. ft

Initial Displacement: 1.556 ft
Static Water Column Height: 13.69 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.67 ft
Total Well Penetration Depth: 4.67 ft

No. of Observations: 102

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.548	119.9	0.817
0.42	1.434	127.7	0.808
0.839	1.382	135.5	0.791
1.259	1.373	143.9	0.768
1.74	1.357	152.9	0.744
2.279	1.342	162.5	0.731
2.759	1.342	172.1	0.71
3.359	1.332	182.9	0.689
3.96	1.327	194.3	0.673
4.559	1.31	206.3	0.648
5.219	1.313	218.9	0.627
5.939	1.299	232.1	0.604
6.719	1.294	246.5	0.587
7.499	1.291	261.5	0.558
8.339	1.284	277.1	0.541
9.239	1.276	293.9	0.514
10.2	1.274	311.9	0.501
11.16	1.253	330.5	0.484
12.24	1.282	350.9	0.456
13.38	1.278	371.9	0.438
14.58	1.241	394.1	0.417
15.84	1.22	418.1	0.401
17.16	1.213	443.3	0.383
18.6	1.206	469.7	0.36
20.1	1.201	497.9	0.343
21.66	1.185	527.9	0.319

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
23.34	1.181	559.7	0.305
25.14	1.17	593.3	0.284
27.	1.155	629.3	0.263
29.04	1.137	665.3	0.249
31.14	1.129	707.3	0.232
33.36	1.122	749.3	0.217
35.76	1.111	791.3	0.203
38.28	1.096	839.3	0.189
40.92	1.078	893.3	0.166
43.74	1.069	941.3	0.156
46.74	1.059	1001.3	0.135
49.92	1.046	1061.3	0.127
53.28	1.03	1121.3	0.111
56.88	1.022	1187.3	0.104
60.48	1.011	1259.3	0.091
64.68	0.985	1337.3	0.075
68.88	0.976	1415.3	0.071
73.08	0.958	1499.3	0.057
77.88	0.942	1589.3	0.048
83.28	0.926	1685.3	0.036
88.08	0.911	1781.3	0.029
94.08	0.898	1889.3	0.022
100.1	0.874	2003.3	0.013
106.1	0.858	2123.3	0.008
112.7	0.845	2249.3	0.

SOLUTION

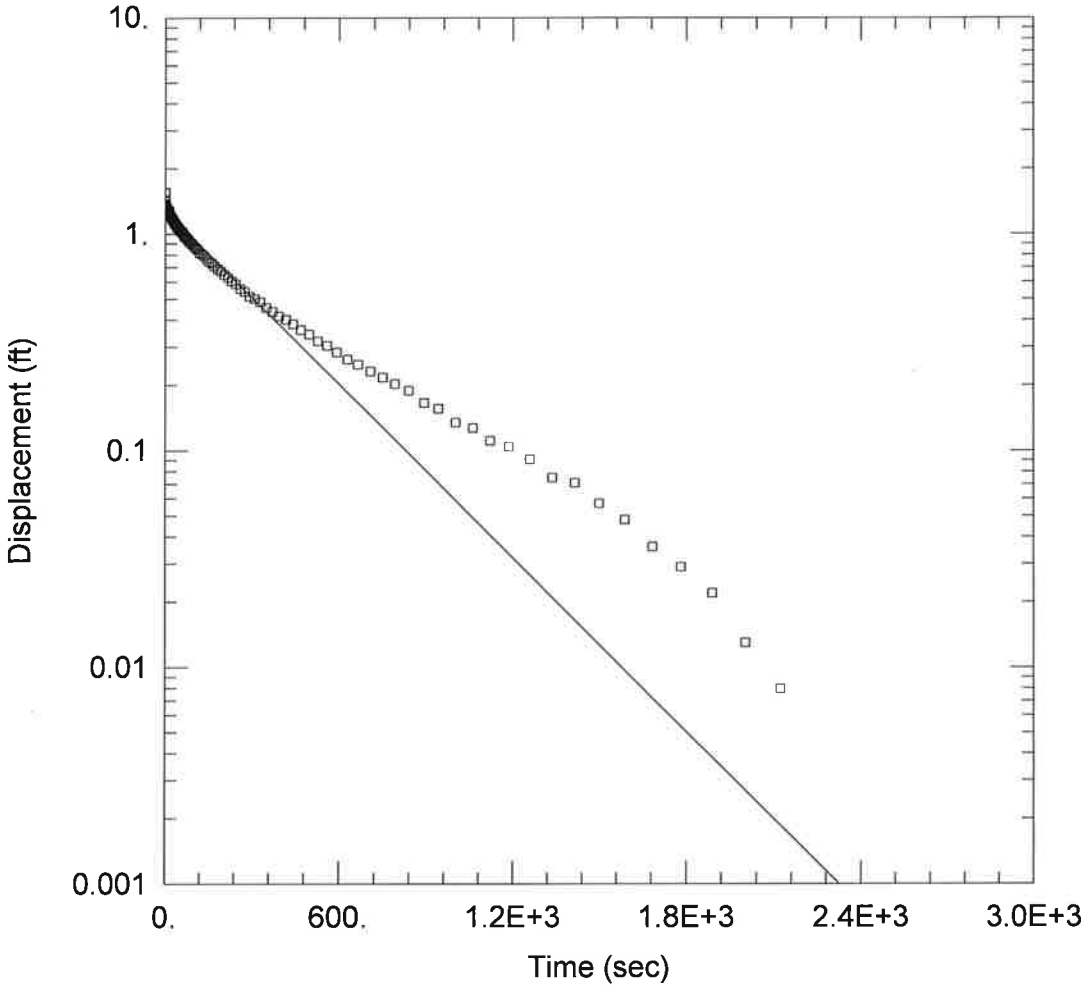
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 0.

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001717	cm/sec
y0	1.286	ft

$T = K*b = 0.0225$ cm²/sec



P-01-18IT RH1

Data Set: T:\...\P-01-18IT RH1.aqt
Date: 04/03/19 Time: 13:00:34

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-01-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 4.3 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01-18IT)

Initial Displacement: 1.556 ft
Total Well Penetration Depth: 4.67 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 13.69 ft
Screen Length: 4.67 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.0001717 cm/sec y0 = 1.286 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-01-18
Title: P-01-18IT RH1
Date: 04/03/19
Time: 13:08:15

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-01-18IT

AQUIFER DATA

Saturated Thickness: 4.3 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-01-18IT

X Location: 11523. ft
Y Location: 13134. ft

Initial Displacement: 1.556 ft
Static Water Column Height: 13.69 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.67 ft
Total Well Penetration Depth: 4.67 ft

No. of Observations: 102

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.548	119.9	0.817
0.42	1.434	127.7	0.808
0.839	1.382	135.5	0.791
1.259	1.373	143.9	0.768
1.74	1.357	152.9	0.744
2.279	1.342	162.5	0.731
2.759	1.342	172.1	0.71
3.359	1.332	182.9	0.689
3.96	1.327	194.3	0.673
4.559	1.31	206.3	0.648
5.219	1.313	218.9	0.627
5.939	1.299	232.1	0.604
6.719	1.294	246.5	0.587
7.499	1.291	261.5	0.558
8.339	1.284	277.1	0.541
9.239	1.276	293.9	0.514
10.2	1.274	311.9	0.501
11.16	1.253	330.5	0.484
12.24	1.282	350.9	0.456
13.38	1.278	371.9	0.438
14.58	1.241	394.1	0.417
15.84	1.22	418.1	0.401
17.16	1.213	443.3	0.383
18.6	1.206	469.7	0.36
20.1	1.201	497.9	0.343
21.66	1.185	527.9	0.319

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
23.34	1.181	559.7	0.305
25.14	1.17	593.3	0.284
27.	1.155	629.3	0.263
29.04	1.137	665.3	0.249
31.14	1.129	707.3	0.232
33.36	1.122	749.3	0.217
35.76	1.111	791.3	0.203
38.28	1.096	839.3	0.189
40.92	1.078	893.3	0.166
43.74	1.069	941.3	0.156
46.74	1.059	1001.3	0.135
49.92	1.046	1061.3	0.127
53.28	1.03	1121.3	0.111
56.88	1.022	1187.3	0.104
60.48	1.011	1259.3	0.091
64.68	0.985	1337.3	0.075
68.88	0.976	1415.3	0.071
73.08	0.958	1499.3	0.057
77.88	0.942	1589.3	0.048
83.28	0.926	1685.3	0.036
88.08	0.911	1781.3	0.029
94.08	0.898	1889.3	0.022
100.1	0.874	2003.3	0.013
106.1	0.858	2123.3	0.008
112.7	0.845	2249.3	0.

SOLUTION

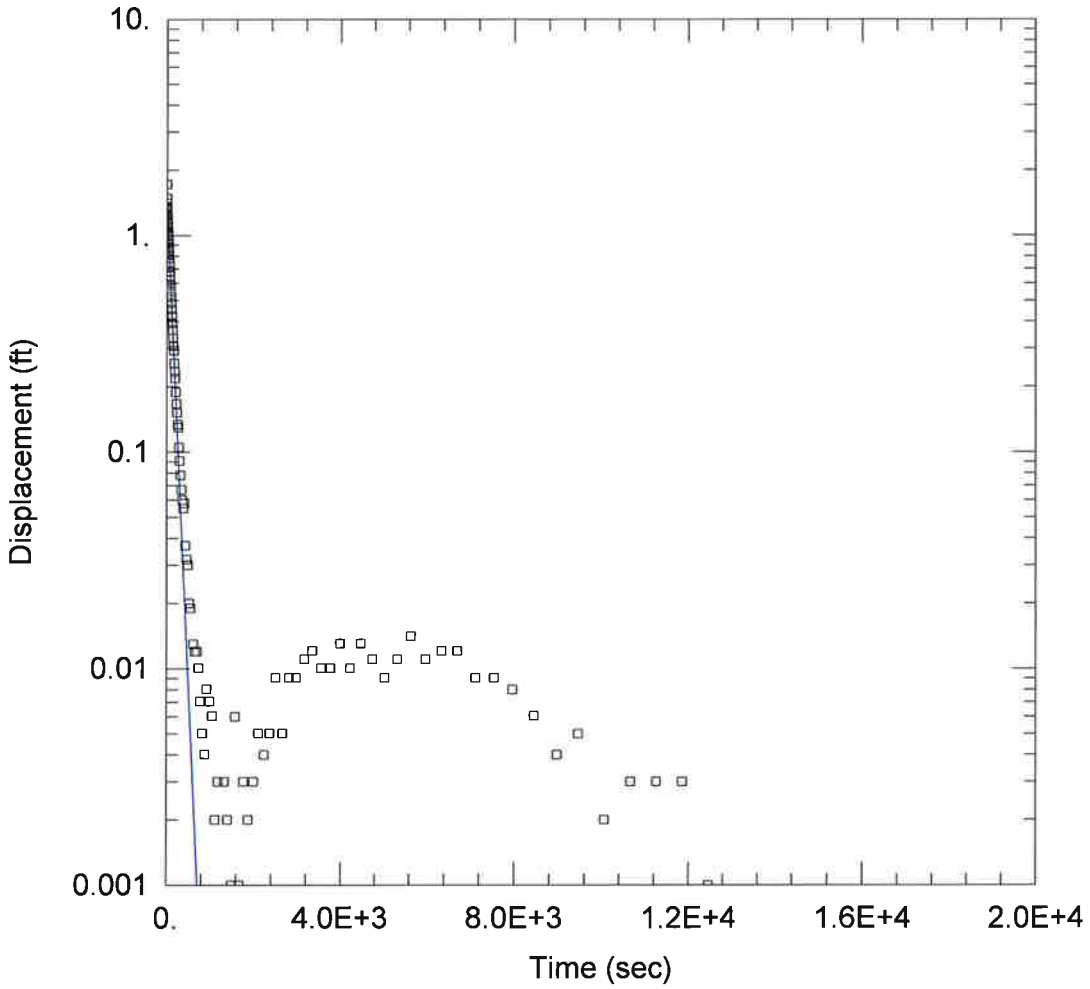
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.3

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001717	cm/sec
y0	1.286	ft

$T = K*b = 0.0225$ cm²/sec



P-01-18SD FH1

Data Set: T:\...\P-01-18SD FH1.aqt
Date: 04/09/19 Time: 09:48:47

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-01-18SD
Test Date: 2-27-2019

AQUIFER DATA

Saturated Thickness: 13. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01-18SD)

Initial Displacement: 1.724 ft
Total Well Penetration Depth: 12.44 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 26.2 ft
Screen Length: 9.66 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0003243 cm/sec
y0 = 1.424 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-01-18
Title: P-01-18SD FH1
Date: 04/09/19
Time: 09:49:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-27-2019
Test Well: P-01-18SD

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-01-18SD

X Location: 11523. ft
Y Location: 13130. ft

Initial Displacement: 1.724 ft
Static Water Column Height: 26.2 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.66 ft
Total Well Penetration Depth: 12.44 ft

No. of Observations: 119

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.724	461.3	0.032
0.9	1.482	489.5	0.03
1.86	1.312	519.5	0.02
2.82	1.408	551.3	0.019
3.9	1.358	584.9	-0.023
5.04	1.345	620.9	0.013
6.24	1.325	656.9	0.012
7.5	1.31	698.9	0.012
8.82	1.291	740.9	0.01
10.26	1.265	782.9	0.007
11.76	1.245	830.9	0.005
13.32	1.229	884.9	0.004
15.	1.199	932.9	0.008
16.8	1.177	992.9	0.007
18.66	1.151	1052.9	0.006
20.7	1.128	1112.9	0.002
22.8	1.102	1178.9	0.003
25.02	1.079	1250.9	-0.001
27.42	1.048	1328.9	0.003
29.94	1.02	1406.9	0.002
32.58	0.999	1490.9	0.001
35.4	0.964	1580.9	0.006
38.4	0.935	1676.9	0.001
41.58	0.905	1772.9	0.003
44.94	0.873	1880.9	0.002
48.54	0.845	1994.9	0.003

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
52.14	0.812	2114.9	0.005
56.34	0.78	2240.9	0.004
60.54	0.749	2372.9	0.005
64.74	0.716	2516.9	0.009
69.54	0.682	2666.9	0.005
74.94	0.649	2822.9	0.009
79.74	0.619	2990.9	0.009
85.74	0.586	3170.9	0.011
91.74	0.552	3356.9	0.012
97.74	0.52	3560.9	0.01
104.3	0.488	3770.9	0.01
111.5	0.456	3992.9	0.013
119.3	0.424	4232.9	0.01
127.1	0.393	4484.9	0.013
135.5	0.366	4748.9	0.011
144.5	0.335	5030.9	0.009
154.1	0.309	5330.9	0.011
163.7	0.294	5648.9	0.014
174.5	0.257	5984.9	0.011
185.9	0.234	6344.9	0.012
197.9	0.219	6704.9	0.012
210.5	0.189	7124.9	0.009
223.7	0.167	7544.9	0.009
238.1	0.152	7964.9	0.008
253.1	0.134	8444.9	0.006
268.7	0.13	8984.9	0.004
285.5	0.105	9464.9	0.005
303.5	0.091	1.006E+4	0.002
322.1	0.078	1.066E+4	0.003
342.5	0.067	1.126E+4	0.003
363.5	0.06	1.186E+4	0.003
385.7	0.055	1.246E+4	0.001
409.7	0.058	1.306E+4	0.
434.9	0.037		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.917

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0003243	cm/sec
y0	1.424	ft

T = K*b = 0.1285 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0003243	5.322E-6	+/- 1.054E-5	60.93	cm/sec
y0	1.424	0.009406	+/- 0.01862	151.4	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1285 cm²/sec

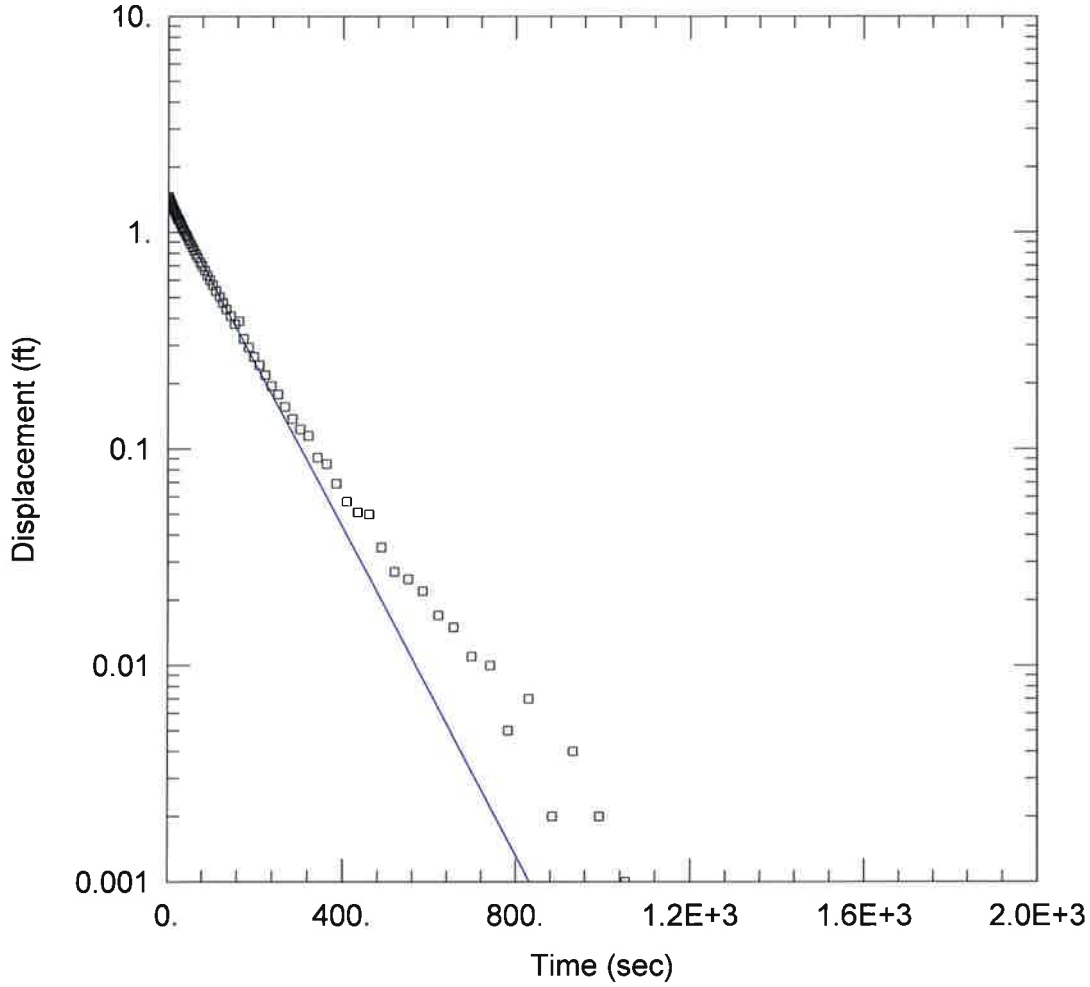
Parameter Correlations

	K	y0
K	1.00	0.63
y0	0.63	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.1328 ft^2
Variance . . . . . 0.001135 ft^2
Std. Deviation . . . . . 0.03369 ft
Mean . . . . . 0.00642 ft
No. of Residuals 119
No. of Estimates 2



P-01-18SD RH1

Data Set: T:\...\P-01-18SD RH1.aqt
Date: 04/09/19 Time: 09:54:11

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-01-18SD
Test Date: 2-27-2019

AQUIFER DATA

Saturated Thickness: 13. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-01-18SD)

Initial Displacement: 1.456 ft
Total Well Penetration Depth: 12.44 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 26.2 ft
Screen Length: 9.66 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002749 cm/sec
y0 = 1.427 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-01-18
Title: P-01-18SD RH1
Date: 04/09/19
Time: 09:54:21

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-27-2019
Test Well: P-01-18SD

AQUIFER DATA

Saturated Thickness: 13. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-01-18SD

X Location: 11523. ft
Y Location: 13130. ft

Initial Displacement: 1.456 ft
Static Water Column Height: 26.2 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.66 ft
Total Well Penetration Depth: 12.44 ft

No. of Observations: 76

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.456	119.3	0.503
0.899	1.454	127.1	0.471
1.859	1.428	135.5	0.44
2.82	1.418	144.5	0.41
3.9	1.399	154.1	0.376
5.04	1.379	163.7	0.388
6.24	1.364	174.5	0.322
7.5	1.342	185.9	0.293
8.82	1.328	197.9	0.266
10.26	1.313	210.5	0.243
11.76	1.285	223.7	0.219
13.32	1.27	238.1	0.195
15.	1.247	253.1	0.178
16.8	1.223	268.7	0.156
18.66	1.203	285.5	0.137
20.7	1.181	303.5	0.123
22.8	1.144	322.1	0.115
25.02	1.147	342.5	0.091
27.42	1.111	363.5	0.085
29.94	1.086	385.7	0.069
32.58	1.058	409.7	0.057
35.4	1.031	434.9	0.051
38.4	1.005	461.3	0.05
41.58	0.973	489.5	0.035
44.94	0.947	519.5	0.027
48.54	0.913	551.3	0.025

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
52.14	0.882	584.9	0.022
56.34	0.853	620.9	0.017
60.54	0.823	656.9	0.015
64.74	0.792	698.9	0.011
69.54	0.762	740.9	0.01
74.94	0.725	782.9	0.005
79.74	0.697	830.9	0.007
85.74	0.665	884.9	0.002
91.74	0.629	932.9	0.004
97.74	0.6	992.9	0.002
104.3	0.569	1052.9	0.001
111.5	0.534	1112.9	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.917

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.000276	cm/sec
y0	1.427	ft

T = K*b = 0.1093 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0002749	2.154E-6	+/- 4.291E-6	127.6	cm/sec
y0	1.427	0.004376	+/- 0.008717	326.	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1089 cm²/sec

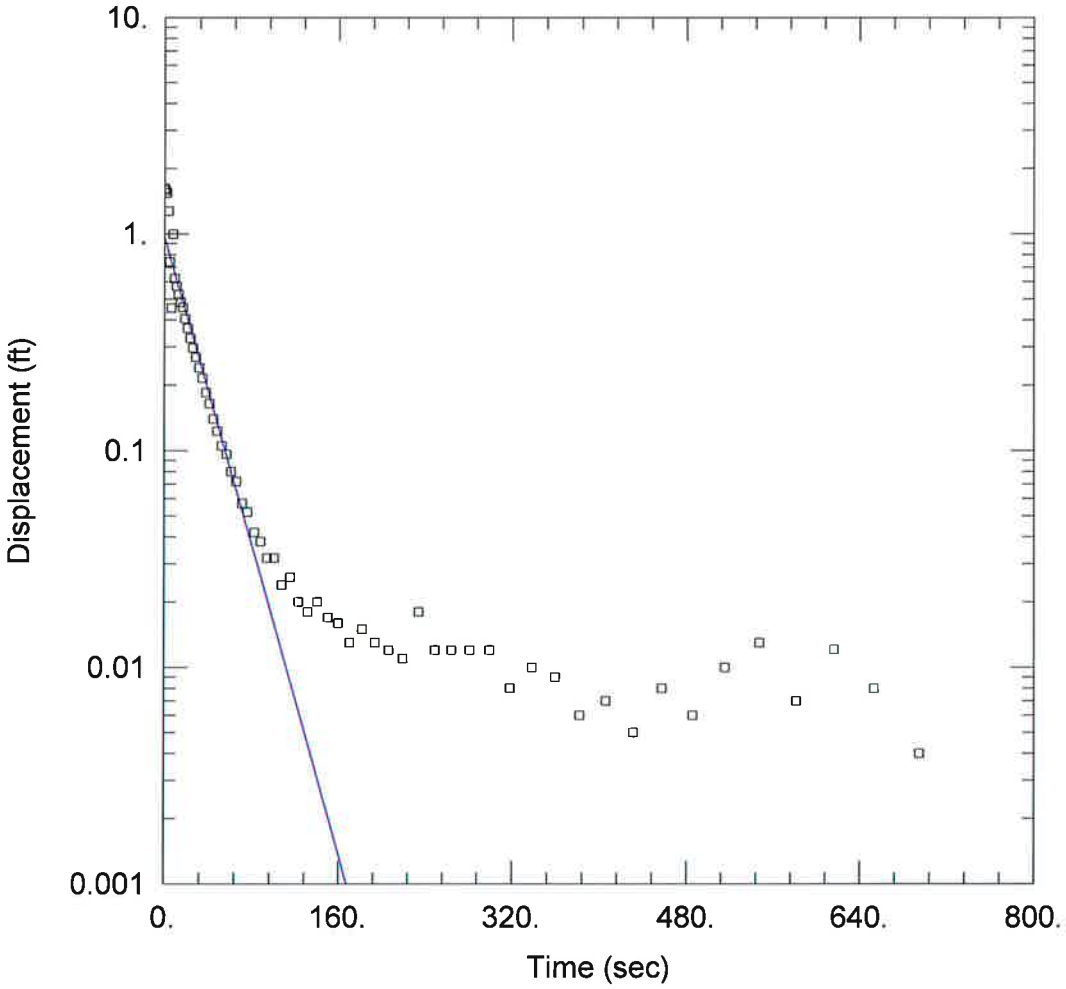
Parameter Correlations

	K	y0
K	1.00	0.63
y0	0.63	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.02001 ft^2
Variance . . . . . 0.0002704 ft^2
Std. Deviation . . . . . 0.01644 ft
Mean . . . . . 0.004442 ft
No. of Residuals 76
No. of Estimates 2



P-03-18SD FH1

Data Set: T:\...\P-03-18SD FH1.aqt
Date: 04/15/19 Time: 15:12:07

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-03-18SD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 15.36 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-03-18SD)

Initial Displacement: 1.621 ft
Total Well Penetration Depth: 14.88 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 24.42 ft
Screen Length: 9.66 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001341 cm/sec
y0 = 0.9506 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-03-18
Title: P-03-18SD FH1
Date: 04/15/19
Time: 15:12:12

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-03-18SD

AQUIFER DATA

Saturated Thickness: 15.36 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-03-18SD

X Location: 13039. ft
Y Location: 13130. ft

Initial Displacement: 1.621 ft
Static Water Column Height: 24.42 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.66 ft
Total Well Penetration Depth: 14.88 ft

No. of Observations: 65

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.621	107.6	0.024
1.14	1.587	115.4	0.026
2.34	1.545	123.2	0.02
3.6	1.272	131.6	0.018
4.92	0.741	140.6	0.02
6.36	0.454	150.2	0.017
7.86	0.995	159.8	0.016
9.42	0.622	170.6	0.013
11.1	0.572	182.	0.015
12.9	0.524	194.	0.013
14.76	0.483	206.6	0.012
16.8	0.457	219.8	0.011
18.9	0.406	234.2	0.018
21.12	0.366	249.2	0.012
23.52	0.329	264.8	0.012
26.04	0.297	281.6	0.012
28.68	0.269	299.6	0.012
31.5	0.241	318.2	0.008
34.5	0.216	338.6	0.01
37.68	0.185	359.6	0.009
41.04	0.165	381.8	0.006
44.64	0.14	405.8	0.007
48.24	0.123	431.	0.005
52.44	0.105	457.4	0.008
56.64	0.096	485.6	0.006
60.84	0.08	515.6	0.01

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
65.64	0.072	547.4	0.013
71.04	0.057	581.	0.007
75.84	0.052	617.	0.012
81.84	0.042	653.	0.008
87.84	0.038	695.	0.004
93.84	0.032	737.	0.
100.4	0.032		

SOLUTION

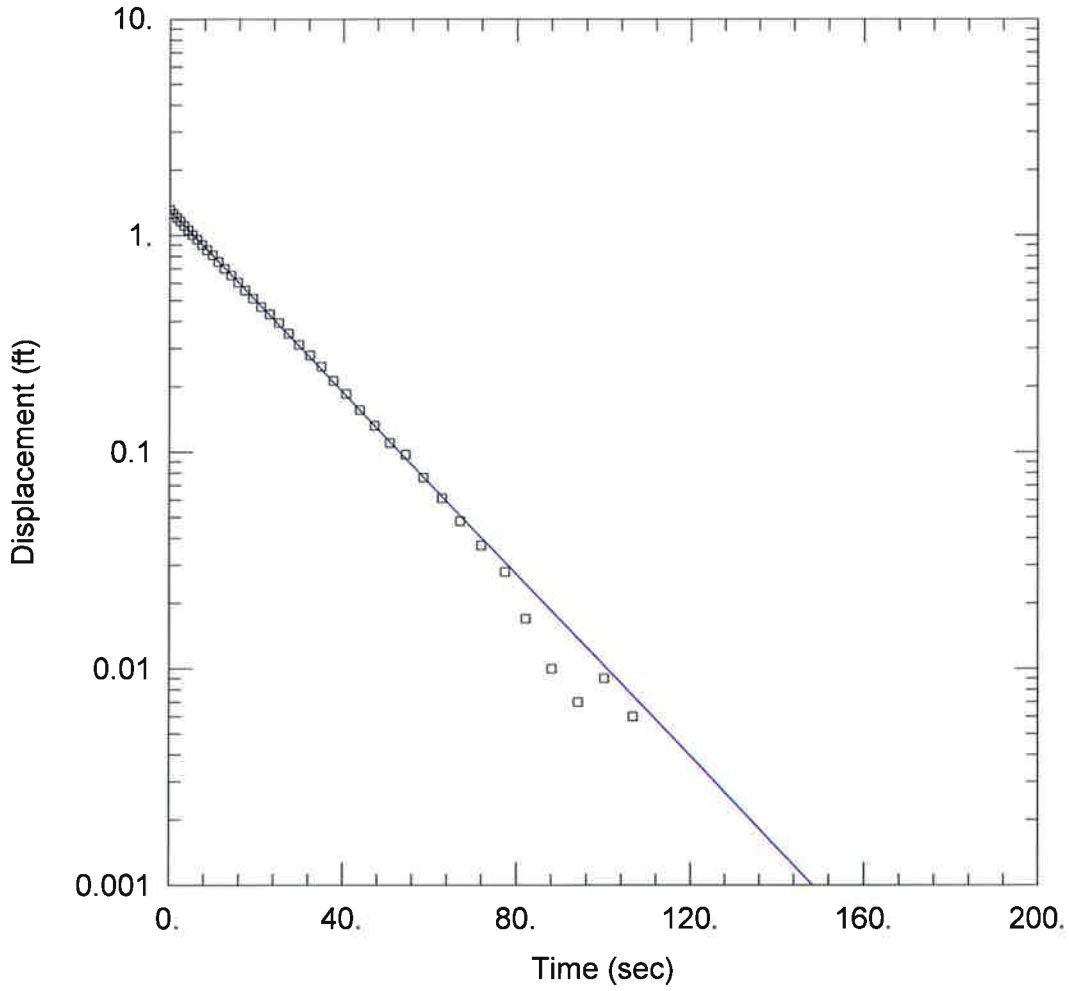
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.03

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.001341	cm/sec
y0	0.9506	ft

$T = K*b = 0.6276$ cm²/sec



P-03-18SD RH1

Data Set: T:\...\P-03-18SD RH1.aqt
Date: 04/03/19 Time: 13:16:28

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-03-18SD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 15.36 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-03-18SD)

Initial Displacement: 1.31 ft
Total Well Penetration Depth: 14.88 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 24.42 ft
Screen Length: 9.66 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001581 cm/sec
y0 = 1.3 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-03-18
Title: P-03-18SD RH1
Date: 04/03/19
Time: 13:16:21

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-03-18SD

AQUIFER DATA

Saturated Thickness: 15.36 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-03-18SD

X Location: 13039. ft
Y Location: 13130. ft

Initial Displacement: 1.31 ft
Static Water Column Height: 24.42 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.66 ft
Total Well Penetration Depth: 14.88 ft

No. of Observations: 41

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.31	29.82	0.312
0.78	1.261	32.34	0.279
1.56	1.21	34.98	0.247
2.4	1.159	37.8	0.213
3.3	1.104	40.8	0.185
4.259	1.055	43.98	0.156
5.219	1.001	47.34	0.132
6.3	0.955	50.94	0.11
7.44	0.902	54.54	0.097
8.64	0.854	58.74	0.076
9.9	0.808	62.94	0.061
11.22	0.751	67.14	0.048
12.66	0.701	71.94	0.037
14.16	0.651	77.34	0.028
15.72	0.605	82.14	0.017
17.4	0.556	88.14	0.01
19.2	0.51	94.14	0.007
21.06	0.467	100.1	0.009
23.1	0.432	106.7	0.006
25.2	0.394	113.9	0.
27.42	0.352		

SOLUTION

Slug Test
Aquifer Model: Confined

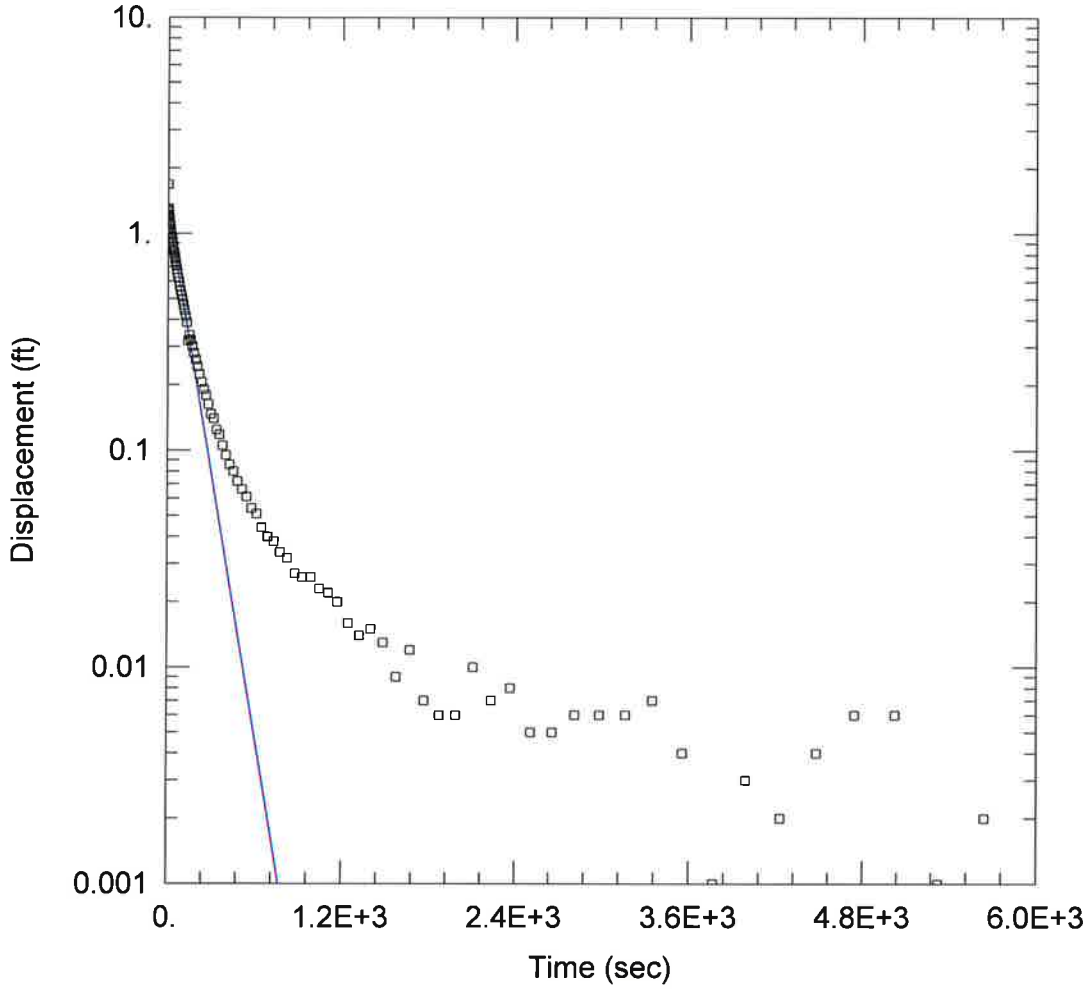
Solution Method: Bouwer-Rice
ln(Re/rw): 0.

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.001581	cm/sec
y0	1.3	ft

$T = K*b = 0.74$ cm²/sec



P-04-18USD FH1

Data Set: T:\...\P-04-18USD FH1.aqt
Date: 04/23/19 Time: 16:45:30

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-04-18USD
Test Date: 2-28-2019

AQUIFER DATA

Saturated Thickness: 9.92 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-04-18USD)

Initial Displacement: 1.68 ft
Total Well Penetration Depth: 9.62 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 29.34 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002833 cm/sec
y0 = 1.272 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-04-18
Title: P-04-18USD FH1
Date: 04/23/19
Time: 16:45:35

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-28-2019
Test Well: P-04-18USD

AQUIFER DATA

Saturated Thickness: 9.92 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-04-18USD

X Location: 11615. ft
Y Location: 13621. ft

Initial Displacement: 1.68 ft
Static Water Column Height: 29.34 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 9.62 ft

No. of Observations: 101

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.68	338.6	0.124
1.155	1.303	359.6	0.118
2.34	1.282	381.8	0.105
3.6	1.257	405.8	0.095
4.92	1.226	431.	0.086
6.361	1.208	457.4	0.08
7.861	1.181	485.6	0.072
9.42	1.151	515.6	0.066
11.1	1.131	547.4	0.061
12.9	1.106	581.	0.054
14.76	1.087	617.	0.051
16.8	1.055	653.	0.044
18.9	1.03	695.	0.04
21.12	1.004	737.	0.038
23.52	0.976	779.	0.034
26.04	0.953	827.	0.032
28.68	0.945	881.	0.027
31.5	0.906	929.	0.026
34.5	0.87	989.	0.026
37.68	0.845	1049.	0.023
41.04	0.816	1109.	0.022
44.64	0.787	1175.	0.02
48.24	0.763	1247.	0.016
52.44	0.736	1325.	0.014
56.64	0.708	1403.	0.015
60.84	0.679	1487.	0.013

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
65.64	0.654	1577.	0.009
71.04	0.624	1673.	0.012
75.84	0.598	1769.	0.007
81.84	0.569	1877.	0.006
87.84	0.542	1991.	0.006
93.84	0.517	2111.	0.01
100.4	0.493	2237.	0.007
107.6	0.467	2369.	0.008
115.4	0.442	2513.	0.005
123.2	0.416	2663.	0.005
131.6	0.388	2819.	0.006
140.6	0.32	2987.	0.006
150.2	0.34	3167.	0.006
159.8	0.323	3353.	0.007
170.6	0.301	3557.	0.004
182.	0.281	3767.	0.001
194.	0.261	3989.	0.003
206.6	0.243	4229.	0.002
219.8	0.224	4481.	0.004
234.2	0.206	4745.	0.006
249.2	0.191	5027.	0.006
264.8	0.179	5327.	0.001
281.6	0.163	5645.	0.002
299.6	0.147	5981.	0.
318.2	0.14		

SOLUTION

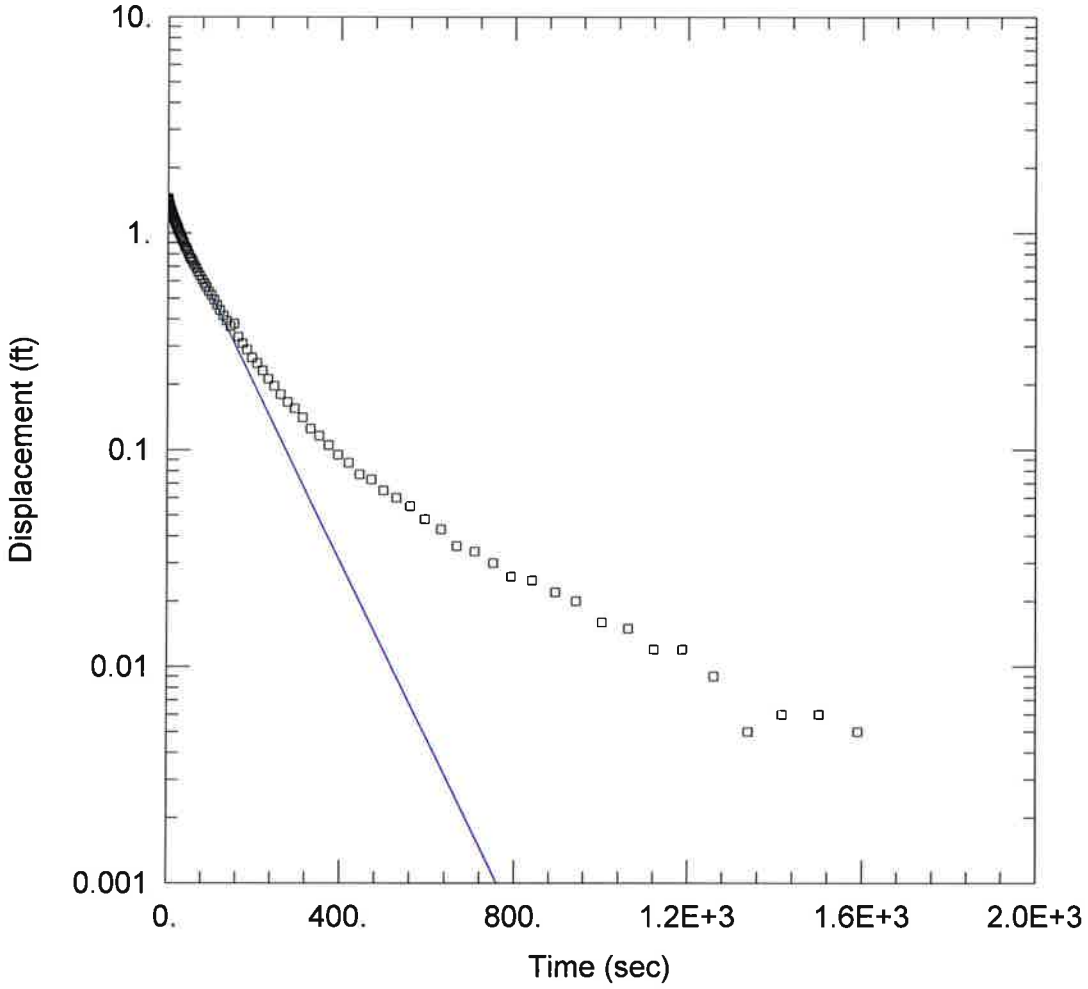
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.82

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0002833	cm/sec
y0	1.272	ft

T = K*b = 0.08565 cm²/sec



P-04-18USD RH1

Data Set: T:\...\P-04-18USD RH1.aqt
Date: 04/23/19 Time: 16:47:47

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-04-18USD
Test Date: 2-28-2019

AQUIFER DATA

Saturated Thickness: 9.92 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-04-18USD)

Initial Displacement: 1.447 ft
Total Well Penetration Depth: 9.62 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 29.34 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002898 cm/sec
y0 = 1.349 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-04-18
Title: P-04-18USD RH1
Date: 04/23/19
Time: 16:47:52

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-28-2019
Test Well: P-04-18USD

AQUIFER DATA

Saturated Thickness: 9.92 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-04-18USD

X Location: 11615. ft
Y Location: 13621. ft

Initial Displacement: 1.447 ft
Static Water Column Height: 29.34 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 9.62 ft

No. of Observations: 102

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.447	89.55	0.564
0.25	1.433	95.55	0.538
0.5	1.415	101.6	0.516
0.75	1.417	107.5	0.491
1.11	1.401	114.1	0.465
1.47	1.393	121.3	0.441
1.89	1.377	129.1	0.416
2.31	1.367	136.9	0.394
2.73	1.359	145.3	0.371
3.21	1.346	154.3	0.381
3.749	1.338	163.9	0.332
4.23	1.321	173.6	0.31
4.83	1.312	184.3	0.289
5.43	1.299	195.7	0.266
6.029	1.285	207.7	0.251
6.689	1.274	220.3	0.232
7.409	1.259	233.6	0.212
8.189	1.247	247.9	0.197
8.97	1.233	262.9	0.18
9.81	1.222	278.5	0.166
10.71	1.202	295.3	0.155
11.67	1.19	313.3	0.141
12.63	1.177	331.9	0.125
13.71	1.161	352.3	0.116
14.85	1.142	373.3	0.105
16.05	1.123	395.5	0.095

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
17.31	1.11	419.5	0.087
18.63	1.094	444.7	0.077
20.07	1.077	471.1	0.073
21.57	1.06	499.3	0.065
23.13	1.039	529.3	0.06
24.81	1.018	561.1	0.055
26.61	1.002	594.7	0.048
28.47	0.981	630.7	0.043
30.51	0.958	666.7	0.036
32.61	0.936	708.7	0.034
34.83	0.916	750.7	0.03
37.23	0.895	792.7	0.026
39.75	0.865	840.7	0.025
42.39	0.849	894.7	0.022
45.21	0.825	942.7	0.02
48.21	0.799	1002.7	0.016
51.39	0.77	1062.7	0.015
54.75	0.758	1122.7	0.012
58.35	0.736	1188.7	0.012
61.95	0.71	1260.7	0.009
66.15	0.685	1338.7	0.005
70.35	0.66	1416.7	0.006
74.55	0.636	1500.7	0.006
79.35	0.611	1590.7	0.005
84.75	0.587	1686.7	0.

SOLUTION

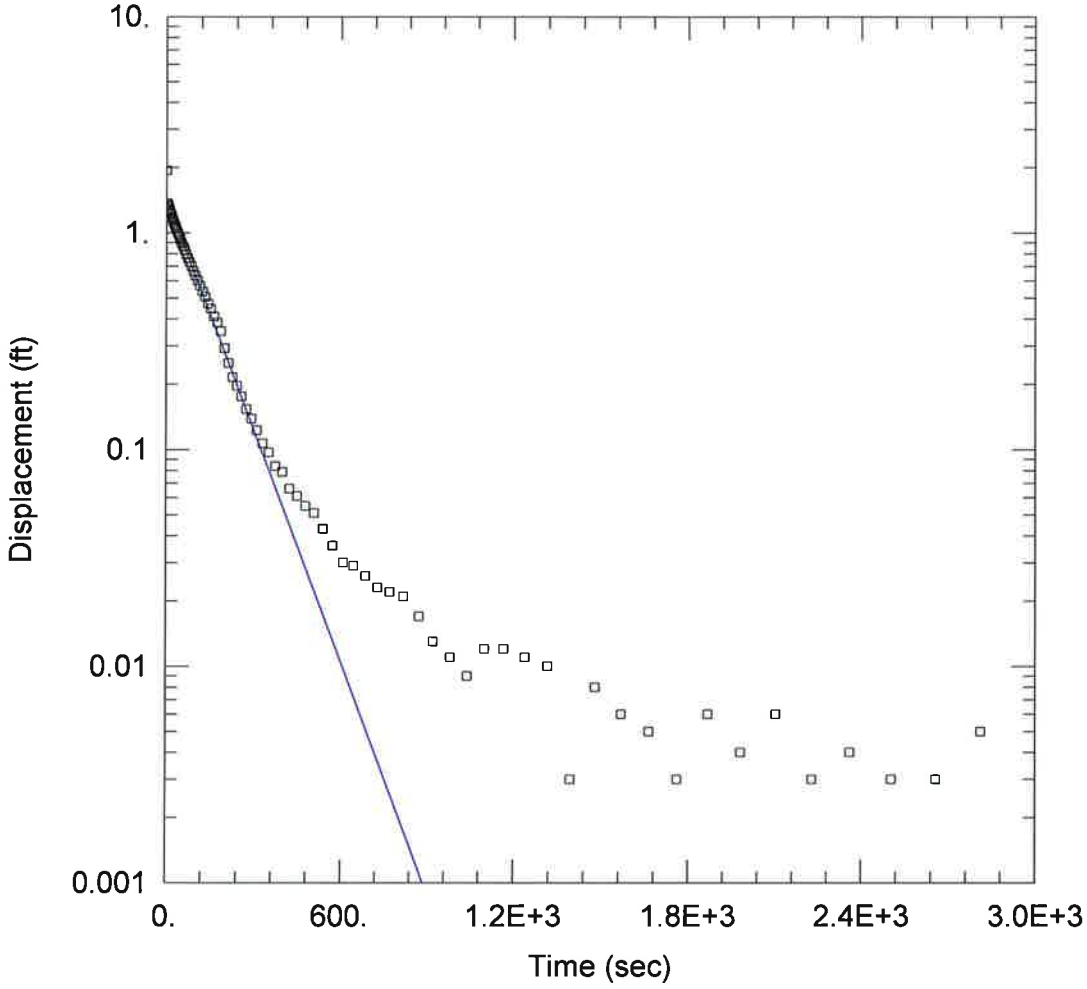
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.82

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0002898	cm/sec
y0	1.349	ft

T = K*b = 0.08763 cm²/sec



P-04-18LSD FH1

Data Set: T:\...\P-04-18LSD FH1.aqt
Date: 04/23/19 Time: 16:40:32

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-04-18LSD
Test Date: 2-27-2019

AQUIFER DATA

Saturated Thickness: 5.87 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-04-18LSD)

Initial Displacement: 1.943 ft
Total Well Penetration Depth: 5.39 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 43.7 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0004057 cm/sec
y0 = 1.424 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-04-18
Title: P-04-18LSD FH1
Date: 04/23/19
Time: 16:40:37

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-27-2019
Test Well: P-04-18LSD

AQUIFER DATA

Saturated Thickness: 5.87 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-04-18LSD

X Location: 11615. ft
Y Location: 13616. ft

Initial Displacement: 1.943 ft
Static Water Column Height: 43.7 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.39 ft

No. of Observations: 83

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.943	273.8	0.154
1.559	1.325	291.8	0.139
3.24	1.371	310.4	0.123
5.04	1.344	330.8	0.107
6.9	1.329	351.8	0.097
8.94	1.293	374.	0.084
11.04	1.275	398.	0.079
13.26	1.249	423.2	0.066
15.66	1.216	449.6	0.061
18.18	1.185	477.8	0.055
20.82	1.158	507.8	0.051
23.64	1.134	539.6	0.043
26.64	1.104	573.2	0.036
29.82	1.075	609.2	0.03
33.18	1.053	645.2	0.029
36.78	1.012	687.2	0.026
40.38	0.987	729.2	0.023
44.58	0.955	771.2	0.022
48.78	0.926	819.2	0.021
52.98	0.892	873.2	0.017
57.78	0.863	921.2	0.013
63.18	0.829	981.2	0.011
67.98	0.795	1041.2	0.009
73.98	0.762	1101.2	0.012
79.98	0.733	1167.2	0.012
85.98	0.701	1239.2	0.011

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
92.58	0.666	1317.2	0.01
99.78	0.634	1395.2	0.003
107.6	0.602	1479.2	0.008
115.4	0.568	1569.2	0.006
123.8	0.536	1665.2	0.005
132.8	0.506	1761.2	0.003
142.4	0.472	1869.2	0.006
152.	0.446	1983.2	0.004
162.8	0.411	2103.2	0.006
174.2	0.386	2229.2	0.003
186.2	0.351	2361.2	0.004
198.8	0.293	2505.2	0.003
212.	0.251	2655.2	0.003
226.4	0.216	2811.2	0.005
241.4	0.197	2979.2	0.
257.	0.176		

SOLUTION

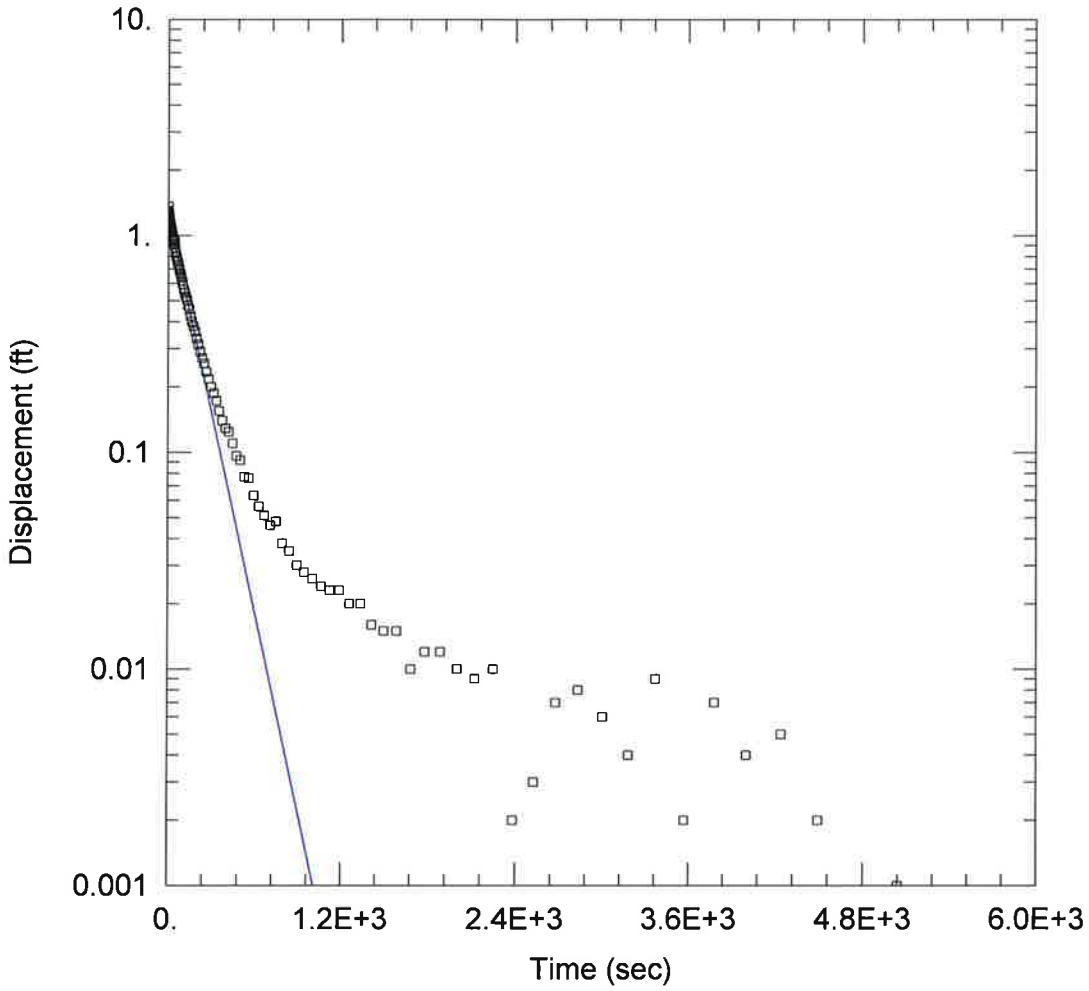
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.223

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0004057	cm/sec
y0	1.424	ft

$T = K*b = 0.07258$ cm²/sec



P-04-18LSD RH1

Data Set: T:\...\P-04-18LSD RH1.aqt
Date: 04/23/19 Time: 16:42:53

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-04-18LSD
Test Date: 2-27-2019

AQUIFER DATA

Saturated Thickness: 5.87 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-04-18LSD)

Initial Displacement: 1.364 ft
Total Well Penetration Depth: 5.39 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 43.7 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0003506 cm/sec
y0 = 1.256 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-04-18
Title: P-04-18LSD RH1
Date: 04/23/19
Time: 16:42:59

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-27-2019
Test Well: P-04-18LSD

AQUIFER DATA

Saturated Thickness: 5.87 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-04-18LSD

X Location: 11615. ft
Y Location: 13616. ft

Initial Displacement: 1.364 ft
Static Water Column Height: 43.7 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.39 ft

No. of Observations: 122

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.364	154.6	0.426
0.25	1.229	164.2	0.401
0.5	1.291	173.8	0.381
0.75	1.296	184.6	0.361
1.	1.292	196.	0.335
1.36	1.29	208.	0.314
1.72	1.285	220.6	0.291
2.14	1.275	233.8	0.272
2.56	1.254	248.2	0.256
2.98	1.26	263.2	0.235
3.46	1.271	278.8	0.218
4.	1.244	295.6	0.2
4.48	1.246	313.6	0.187
5.08	1.229	332.2	0.173
5.68	1.223	352.6	0.155
6.28	1.213	373.6	0.14
6.94	1.207	395.8	0.129
7.66	1.196	419.8	0.124
8.44	1.214	445.	0.11
9.22	1.172	471.4	0.096
10.06	1.169	499.6	0.092
10.96	1.158	529.6	0.077
11.92	1.144	561.4	0.076
12.88	1.136	595.	0.063
13.96	1.123	631.	0.056
15.1	1.11	667.	0.051

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
16.3	1.099	709.	0.046
17.56	1.087	751.	0.048
18.88	1.082	793.	0.038
20.32	1.064	841.	0.035
21.82	1.052	895.	0.03
23.38	1.04	943.	0.028
25.06	1.03	1003.	0.026
26.86	0.997	1063.	0.024
28.72	0.998	1123.	0.023
30.76	0.985	1189.	0.023
32.86	0.968	1261.	0.02
35.08	0.95	1339.	0.02
37.48	0.935	1417.	0.016
40.	0.915	1501.	0.015
42.64	0.939	1591.	0.015
45.46	0.878	1687.	0.01
48.46	0.84	1783.	0.012
51.64	0.826	1891.	0.012
55.01	0.799	2005.	0.01
58.6	0.794	2125.	0.009
62.2	0.771	2251.	0.01
66.4	0.754	2383.	0.002
70.6	0.732	2527.	0.003
74.8	0.709	2677.	0.007
79.6	0.689	2833.	0.008
85.	0.663	3001.	0.006
89.8	0.639	3181.	0.004
95.8	0.614	3367.	0.009
101.8	0.594	3571.	0.002
107.8	0.562	3781.	0.007
114.4	0.543	4003.	0.004
121.6	0.522	4243.	0.005
129.4	0.506	4495.	0.002
137.2	0.474	5041.	0.001
145.6	0.456	5341.	0.

SOLUTION

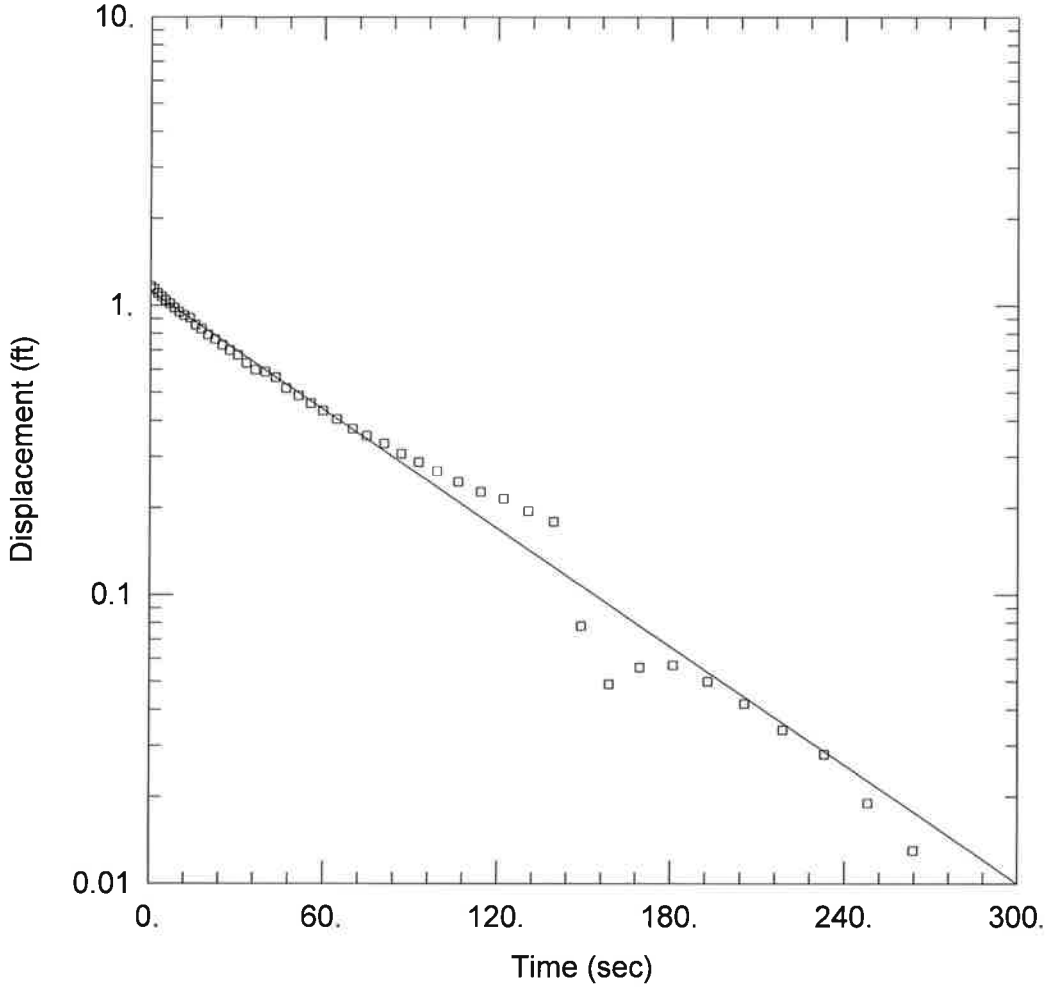
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.223

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0003506	cm/sec
y0	1.256	ft

T = K*b = 0.06272 cm²/sec



P-05-18SD FH1

Data Set: T:\...\P-05-18SD FH1.aqt
Date: 04/03/19 Time: 13:47:49

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-05-18SD
Test Date: 2-28-2019

AQUIFER DATA

Saturated Thickness: 4.53 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-05-18SD)

Initial Displacement: 1.163 ft
Total Well Penetration Depth: 4.69 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 37.03 ft
Screen Length: 4.69 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.0008382 cm/sec y0 = 1.12 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-05-18
Title: P-05-18SD FH1
Date: 04/03/19
Time: 13:48:06

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-28-2019
Test Well: P-05-18SD

AQUIFER DATA

Saturated Thickness: 4.53 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-05-18SD

X Location: 12392. ft
Y Location: 13629. ft

Initial Displacement: 1.163 ft
Static Water Column Height: 37.03 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.69 ft
Total Well Penetration Depth: 4.69 ft

No. of Observations: 48

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.163	59.7	0.433
1.2	1.14	64.5	0.405
2.459	1.102	69.9	0.375
3.779	1.074	74.7	0.354
5.219	1.043	80.7	0.333
6.719	1.014	86.7	0.307
8.279	0.982	92.7	0.287
9.96	0.95	99.3	0.267
11.76	0.922	106.5	0.246
13.68	0.903	114.3	0.227
15.66	0.857	122.1	0.215
17.76	0.828	130.5	0.195
19.98	0.791	139.5	0.179
22.38	0.764	149.1	0.078
24.9	0.73	158.7	0.049
27.54	0.699	169.5	0.056
30.36	0.673	180.9	0.057
33.36	0.632	192.9	0.05
36.54	0.599	205.5	0.042
39.93	0.589	218.7	0.034
43.5	0.564	233.1	0.028
47.1	0.518	248.1	0.019
51.3	0.488	263.7	0.013
55.5	0.459	280.5	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.316

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0008382	cm/sec
y0	1.12	ft

T = K*b = 0.1157 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0008382	1.432E-5	+/- 2.882E-5	58.54	cm/sec
y0	1.12	0.008654	+/- 0.01742	129.4	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1157 cm²/sec

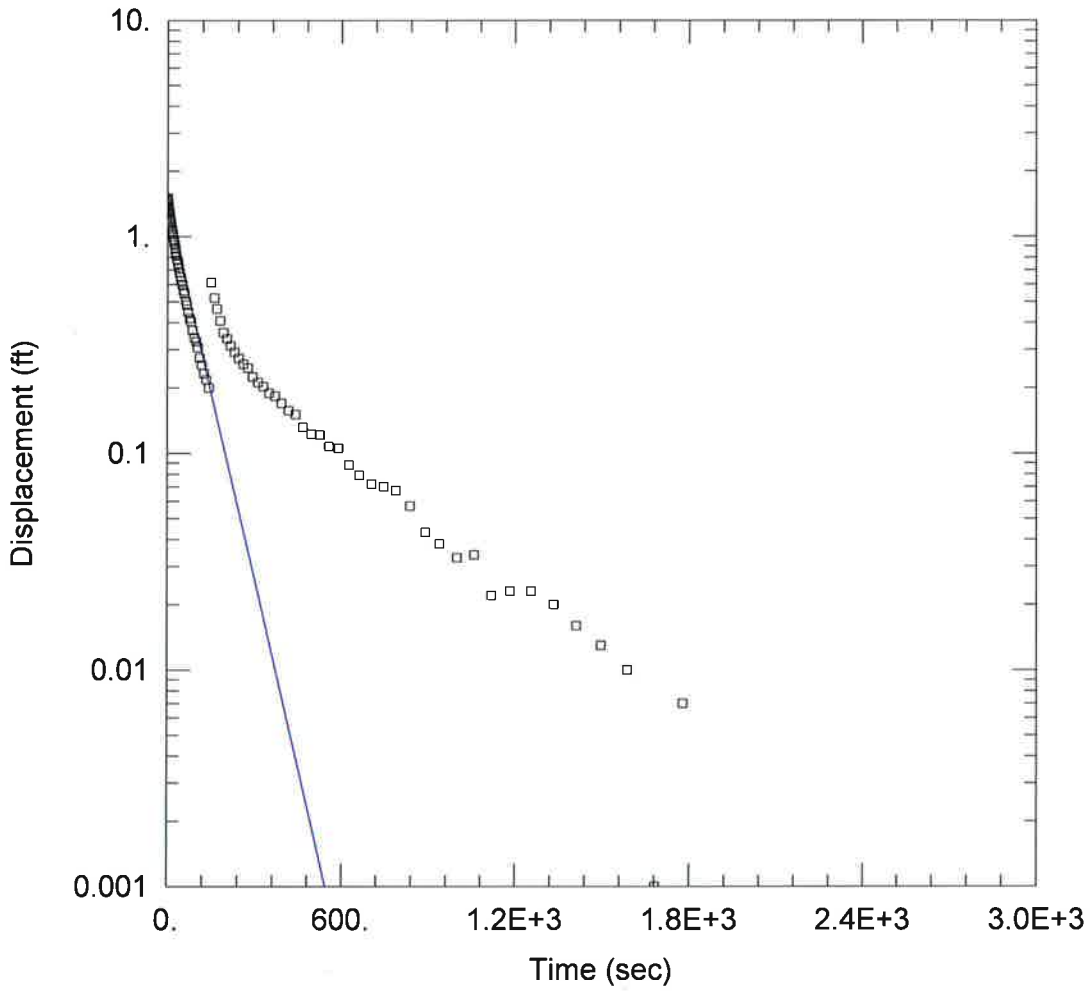
Parameter Correlations

	K	y0
K	1.00	0.65
y0	0.65	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.02847 ft^2
Variance . . . . . 0.000619 ft^2
Std. Deviation . . . . . 0.02488 ft
Mean . . . . . 0.001129 ft
No. of Residuals 48
No. of Estimates 2



P-05-18SD RH1

Data Set: T:\...\P-05-18SD RH1.aqt
Date: 04/03/19 Time: 14:20:03

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-05-18SD
Test Date: 2-28-2019

AQUIFER DATA

Saturated Thickness: 4.53 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-05-18SD)

Initial Displacement: 1.502 ft
Total Well Penetration Depth: 4.69 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 37.03 ft
Screen Length: 4.69 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
K = 0.0007085 cm/sec
Solution Method: Bouwer-Rice
y0 = 1.362 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-05-18
Title: P-05-18SD RH1
Date: 04/03/19
Time: 14:20:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-28-2019
Test Well: P-05-18SD

AQUIFER DATA

Saturated Thickness: 4.53 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-05-18SD

X Location: 12392. ft
Y Location: 13629. ft

Initial Displacement: 1.502 ft
Static Water Column Height: 37.03 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.69 ft
Total Well Penetration Depth: 4.69 ft

No. of Observations: 94

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.502	125.4	0.233
0.48	1.483	133.2	0.218
1.08	1.462	141.6	0.2
1.681	1.436	150.6	0.611
2.28	1.419	160.2	0.52
2.94	1.393	169.8	0.464
3.66	1.374	180.6	0.409
4.44	1.345	192.	0.36
5.22	1.325	204.	0.337
6.06	1.293	216.6	0.313
6.96	1.271	229.8	0.292
7.92	1.251	244.2	0.274
8.88	1.223	259.2	0.258
9.96	1.195	274.8	0.247
11.1	1.169	291.6	0.225
12.3	1.144	309.6	0.212
13.56	1.114	328.2	0.203
14.88	1.088	348.6	0.189
16.32	1.058	369.6	0.183
17.82	1.027	391.8	0.17
19.38	0.998	415.8	0.157
21.06	0.969	441.	0.151
22.86	0.943	467.4	0.131
24.72	0.913	495.6	0.122
26.76	0.877	525.6	0.121
28.86	0.845	557.4	0.107

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
31.08	0.813	591.	0.105
33.48	0.775	627.	0.088
36.	0.751	663.	0.079
38.64	0.719	705.	0.072
41.48	0.678	747.	0.07
44.54	0.648	789.	0.067
47.64	0.625	837.	0.057
51.	0.6	891.	0.043
54.6	0.563	939.	0.038
58.2	0.544	999.	0.033
62.4	0.504	1059.	0.034
66.6	0.483	1119.	0.022
70.8	0.448	1185.	0.023
75.6	0.419	1257.	0.023
81.	0.404	1335.	0.02
85.8	0.369	1413.	0.016
91.8	0.341	1497.	0.013
97.8	0.327	1587.	0.01
103.8	0.307	1683.	0.001
110.4	0.275	1779.	0.007
117.6	0.255	2001.	0.

SOLUTION

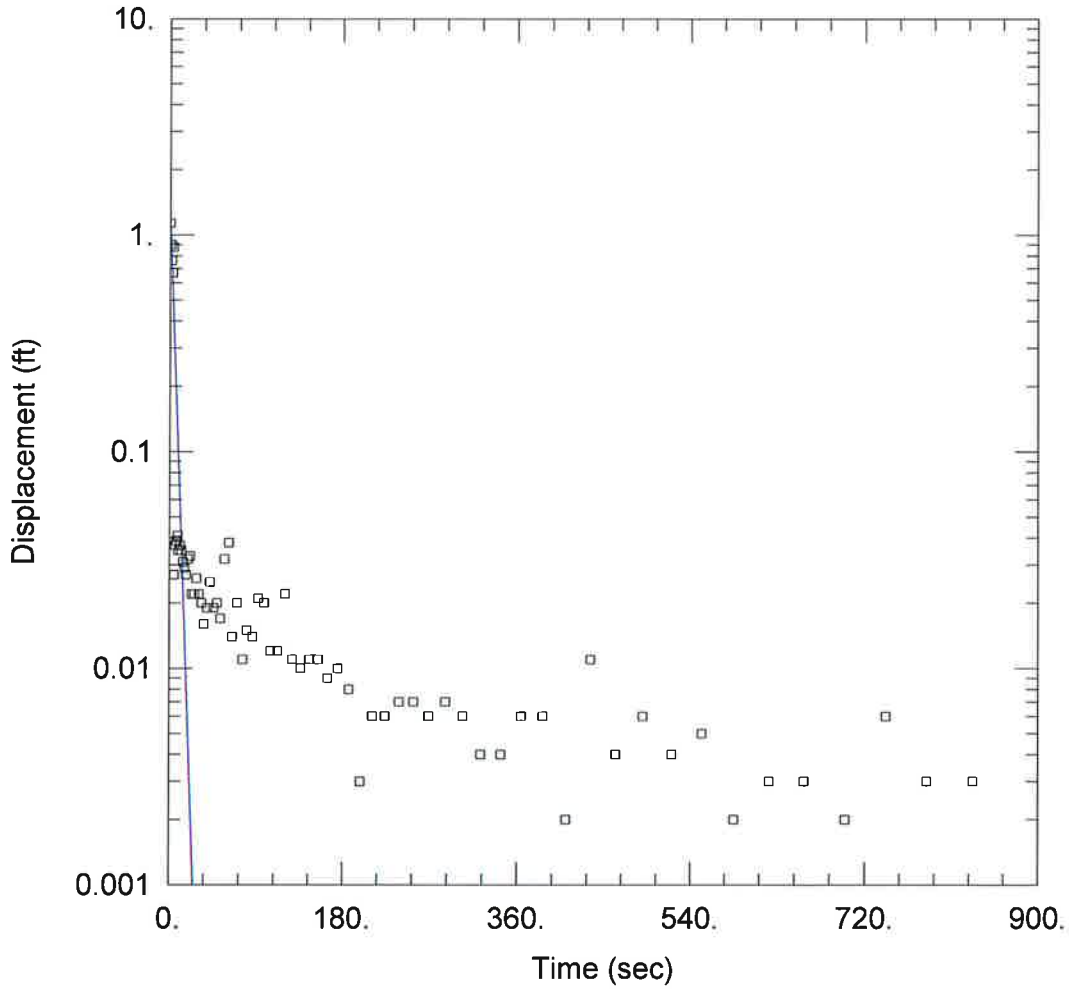
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.316

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0007085	cm/sec
y0	1.362	ft

$T = K*b = 0.09783$ cm²/sec



P-06-18USD FH1

Data Set: T:\...\P-06-18USD FH1.aqt
Date: 04/09/19 Time: 10:49:05

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18USD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18USD)

Initial Displacement: 1.133 ft
Total Well Penetration Depth: 9.71 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 30.56 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.008497 cm/sec
y0 = 1.2 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18USD FH1
Date: 04/09/19
Time: 10:49:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18USD

AQUIFER DATA

Saturated Thickness: 10.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18USD

X Location: 13043. ft
Y Location: 13638. ft

Initial Displacement: 1.133 ft
Static Water Column Height: 30.56 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 9.71 ft

No. of Observations: 73

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.133	105.2	0.012
0.84	0.904	112.4	0.012
1.739	0.762	120.2	0.022
2.699	0.667	128.	0.011
3.659	0.881	136.4	0.01
4.739	0.027	145.4	0.011
5.88	0.037	155.	0.011
7.08	0.039	164.6	0.009
8.34	0.041	175.4	0.01
9.66	0.035	186.8	0.008
11.1	0.037	198.8	0.003
12.6	0.035	211.4	0.006
14.16	0.031	224.6	0.006
15.84	0.029	239.	0.007
17.64	0.027	254.	0.007
19.5	0.032	269.6	0.006
21.54	0.033	286.4	0.007
23.64	0.022	304.4	0.006
25.86	0.022	323.	0.004
28.26	0.026	343.4	0.004
30.78	0.022	364.4	0.006
33.42	0.02	386.6	0.006
36.24	0.016	410.6	0.002
39.24	0.019	435.8	0.011
42.42	0.025	462.2	0.004
45.78	0.019	490.4	0.006

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
49.38	0.02	520.4	0.004
52.98	0.017	552.2	0.005
57.18	0.032	585.8	0.002
61.47	0.038	621.8	0.003
65.58	0.014	657.8	0.003
70.38	0.02	699.8	0.002
75.78	0.011	741.8	0.006
80.58	0.015	783.8	0.003
86.58	0.014	831.8	0.003
92.58	0.021	885.8	0.
98.58	0.02		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.008596	cm/sec
y0	1.2	ft

T = K*b = 2.751 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.008497	0.0007373	+/- 0.00147	11.52	cm/sec
y0	1.2	0.05885	+/- 0.1173	20.39	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 2.719 cm²/sec

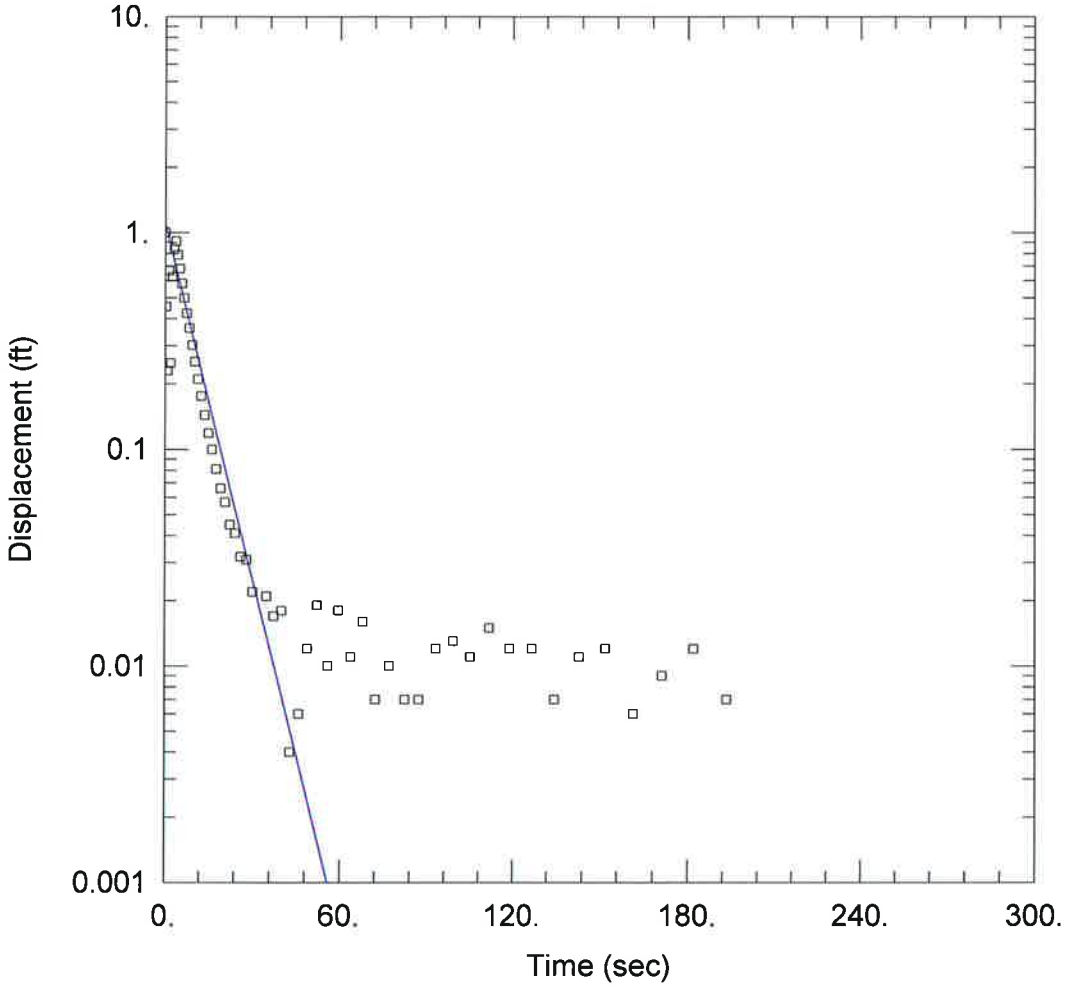
Parameter Correlations

	K	y0
K	1.00	0.61
y0	0.61	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.3801 ft^2
Variance . . . . . 0.005353 ft^2
Std. Deviation . . . . . 0.07317 ft
Mean . . . . . 0.007281 ft
No. of Residuals 73
No. of Estimates 2



P-06-18USD RH1

Data Set: T:\...\P-06-18USD RH1.aqt
Date: 04/09/19 Time: 10:56:34

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18USD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18USD)

Initial Displacement: 1.001 ft
Total Well Penetration Depth: 9.71 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 30.56 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.00373 cm/sec
y0 = 1.087 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18USD RH1
Date: 04/09/19
Time: 10:56:45

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18USD

AQUIFER DATA

Saturated Thickness: 10.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18USD

X Location: 13043. ft
Y Location: 13638. ft

Initial Displacement: 1.001 ft
Static Water Column Height: 30.56 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 9.71 ft

No. of Observations: 58

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.001	34.92	0.021
0.42	0.456	37.44	0.017
0.9	0.23	40.08	0.018
1.44	0.667	42.9	0.004
1.92	0.25	45.9	0.006
2.52	0.625	49.08	0.012
3.12	0.839	52.44	0.019
3.72	0.914	56.04	0.01
4.38	0.79	59.64	0.018
5.1	0.681	63.84	0.011
5.88	0.583	68.04	0.016
6.66	0.5	72.24	0.007
7.5	0.424	77.04	0.01
8.4	0.363	82.44	0.007
9.36	0.302	87.24	0.007
10.32	0.254	93.24	0.012
11.4	0.211	99.24	0.013
12.54	0.176	105.2	0.011
13.74	0.144	111.8	0.015
15.	0.119	119.	0.012
16.32	0.1	126.8	0.012
17.76	0.081	134.6	0.007
19.26	0.066	143.	0.011
20.82	0.057	152.	0.012
22.5	0.045	161.6	0.006
24.3	0.041	171.2	0.009

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
26.16	0.032	182.	0.012
28.2	0.031	193.4	0.007
30.3	0.022	205.4	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00373	cm/sec
y0	1.087	ft

T = K*b = 1.194 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.002653	0.000401	+/- 0.0008031	6.618	cm/sec
y0	0.7534	0.05719	+/- 0.1145	13.17	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.8492 cm²/sec

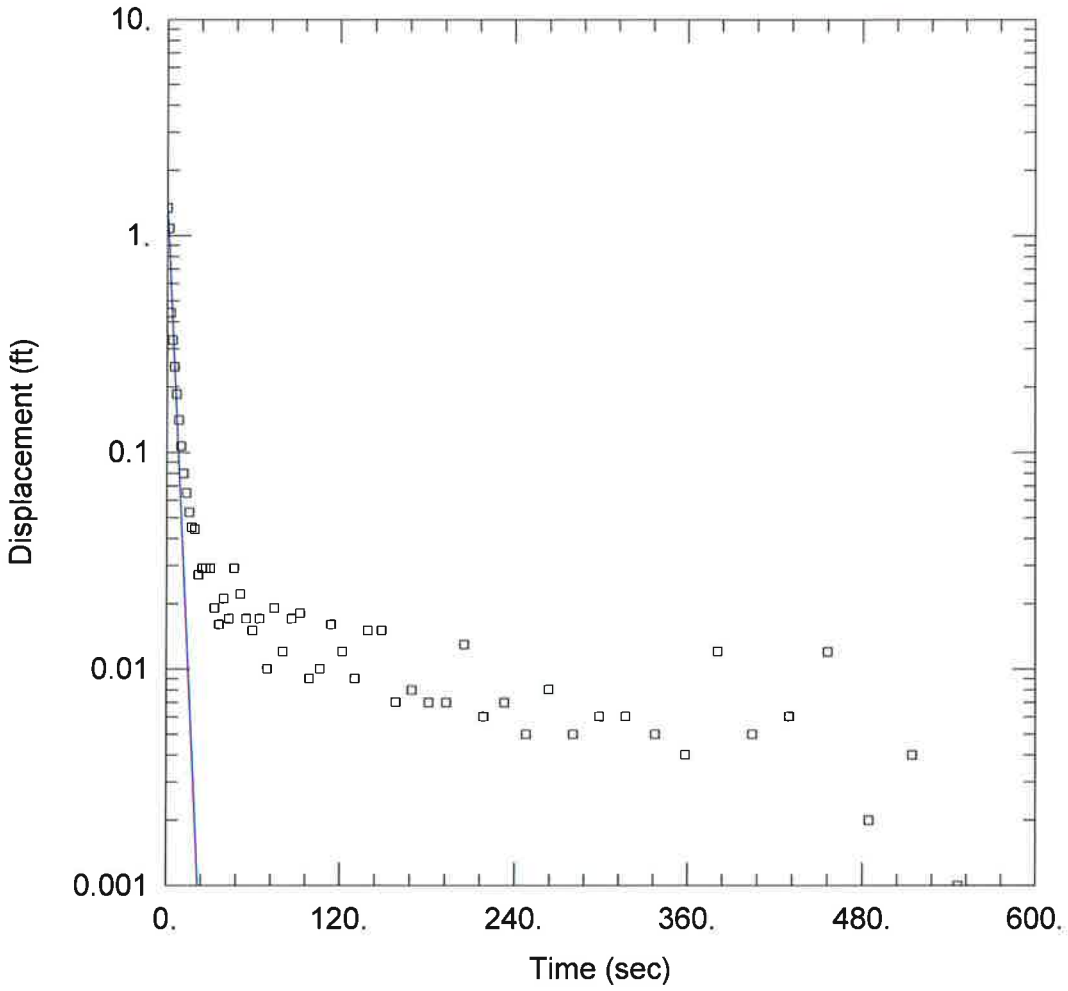
Parameter Correlations

	K	y0
K	1.00	0.67
y0	0.67	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.9125 ft^2
Variance . . . . . 0.01629 ft^2
Std. Deviation . . . . . 0.1277 ft
Mean . . . . . -0.002042 ft
No. of Residuals 58
No. of Estimates 2



P-06-18USD FH2

Data Set: T:\...\P-06-18USD FH2.aqt
Date: 04/09/19 Time: 11:01:09

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18USD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18USD)

Initial Displacement: 1.342 ft
Total Well Penetration Depth: 9.71 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 30.56 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.009937 cm/sec
y0 = 1.374 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18USD FH2
Date: 04/09/19
Time: 11:01:20

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18USD

AQUIFER DATA

Saturated Thickness: 10.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18USD

X Location: 13043. ft
Y Location: 13638. ft

Initial Displacement: 1.342 ft
Static Water Column Height: 30.56 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 9.71 ft

No. of Observations: 60

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.342	92.7	0.018
1.2	1.08	99.3	0.009
2.46	0.441	106.5	0.01
3.78	0.33	114.3	0.016
5.22	0.248	122.1	0.012
6.72	0.186	130.5	0.009
8.279	0.141	139.5	0.015
9.96	0.107	149.1	0.015
11.76	0.08	158.7	0.007
13.62	0.065	169.5	0.008
15.66	0.053	180.9	0.007
17.76	0.045	192.9	0.007
19.98	0.044	205.5	0.013
22.38	0.027	218.7	0.006
24.9	0.029	233.1	0.007
27.54	0.029	248.1	0.005
30.36	0.029	263.7	0.008
33.36	0.019	280.5	0.005
36.54	0.016	298.5	0.006
39.9	0.021	317.1	0.006
43.5	0.017	337.5	0.005
47.1	0.029	358.5	0.004
51.3	0.022	380.7	0.012
55.5	0.017	404.7	0.005
59.7	0.015	429.9	0.006
64.5	0.017	456.3	0.012

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
69.9	0.01	484.5	0.002
74.7	0.019	514.5	0.004
80.7	0.012	546.3	0.001
86.7	0.017	579.9	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.008776	cm/sec
y0	1.814	ft

T = K*b = 2.809 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.009937	0.0004594	+/- 0.0009197	21.63	cm/sec
y0	1.374	0.03463	+/- 0.06934	39.66	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 3.18 cm²/sec

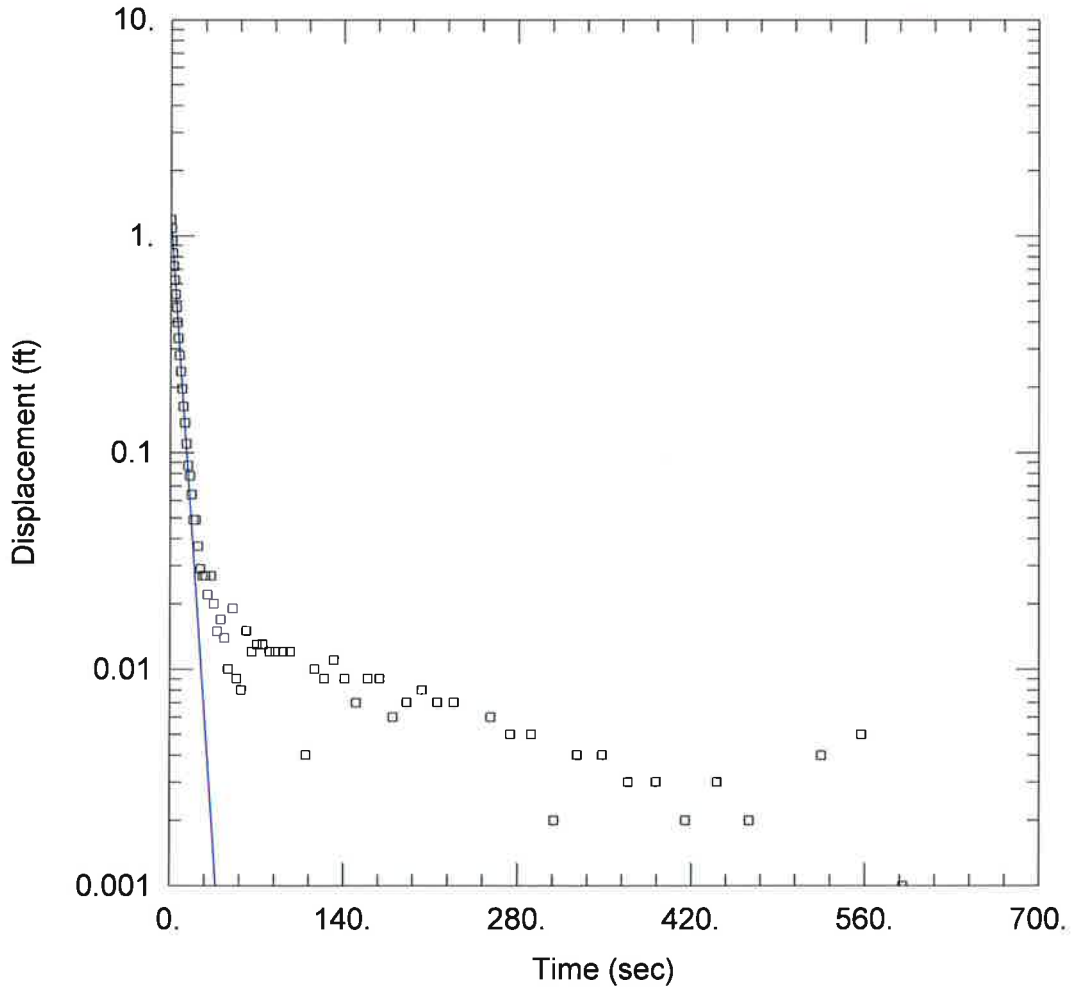
Parameter Correlations

	K	y0
K	1.00	0.55
y0	0.55	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.08557 ft^2
Variance . . . . . 0.001475 ft^2
Std. Deviation . . . . . 0.03841 ft
Mean . . . . . 0.01469 ft
No. of Residuals 60
No. of Estimates 2



P-06-18USD RH2

Data Set: T:\...\P-06-18USD RH2.aqt
Date: 04/09/19 Time: 11:02:09

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18USD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 10.5 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18USD)

Initial Displacement: 1.19 ft
Total Well Penetration Depth: 9.71 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 30.56 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.005713 cm/sec
y0 = 1.185 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18USD RH2
Date: 04/09/19
Time: 11:02:17

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18USD

AQUIFER DATA

Saturated Thickness: 10.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18USD

X Location: 13043. ft
Y Location: 13638. ft

Initial Displacement: 1.19 ft
Static Water Column Height: 30.56 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 9.71 ft

No. of Observations: 71

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.19	66.12	0.012
0.6	1.084	70.32	0.013
1.2	0.947	75.12	0.013
1.8	0.832	80.52	0.012
2.46	0.725	85.32	0.012
3.18	0.623	91.32	0.012
3.96	0.537	97.32	0.012
4.74	0.467	109.9	0.004
5.58	0.398	117.1	0.01
6.48	0.336	124.9	0.009
7.439	0.281	132.7	0.011
8.399	0.237	141.1	0.009
9.479	0.197	150.1	0.007
10.62	0.163	159.7	0.009
11.82	0.137	169.3	0.009
13.08	0.11	180.1	0.006
14.4	0.087	191.5	0.007
15.84	0.078	203.5	0.008
17.34	0.064	216.1	0.007
18.9	0.049	229.3	0.007
20.58	0.049	258.7	0.006
22.38	0.037	274.3	0.005
24.24	0.029	291.1	0.005
26.28	0.027	309.1	0.002
28.38	0.027	327.7	0.004
30.6	0.022	348.1	0.004

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
33.	0.027	369.1	0.003
35.52	0.02	391.3	0.003
38.16	0.015	415.3	0.002
40.98	0.017	440.5	0.003
43.98	0.014	466.9	0.002
47.16	0.01	525.1	0.004
50.52	0.019	556.9	0.005
54.12	0.009	590.5	0.001
57.72	0.008	662.5	0.
61.92	0.015		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.748

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.005777	cm/sec
y0	1.185	ft

T = K*b = 1.849 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.005713	6.931E-5	+/- 0.0001383	82.42	cm/sec
y0	1.185	0.008061	+/- 0.01608	147.	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 1.828 cm²/sec

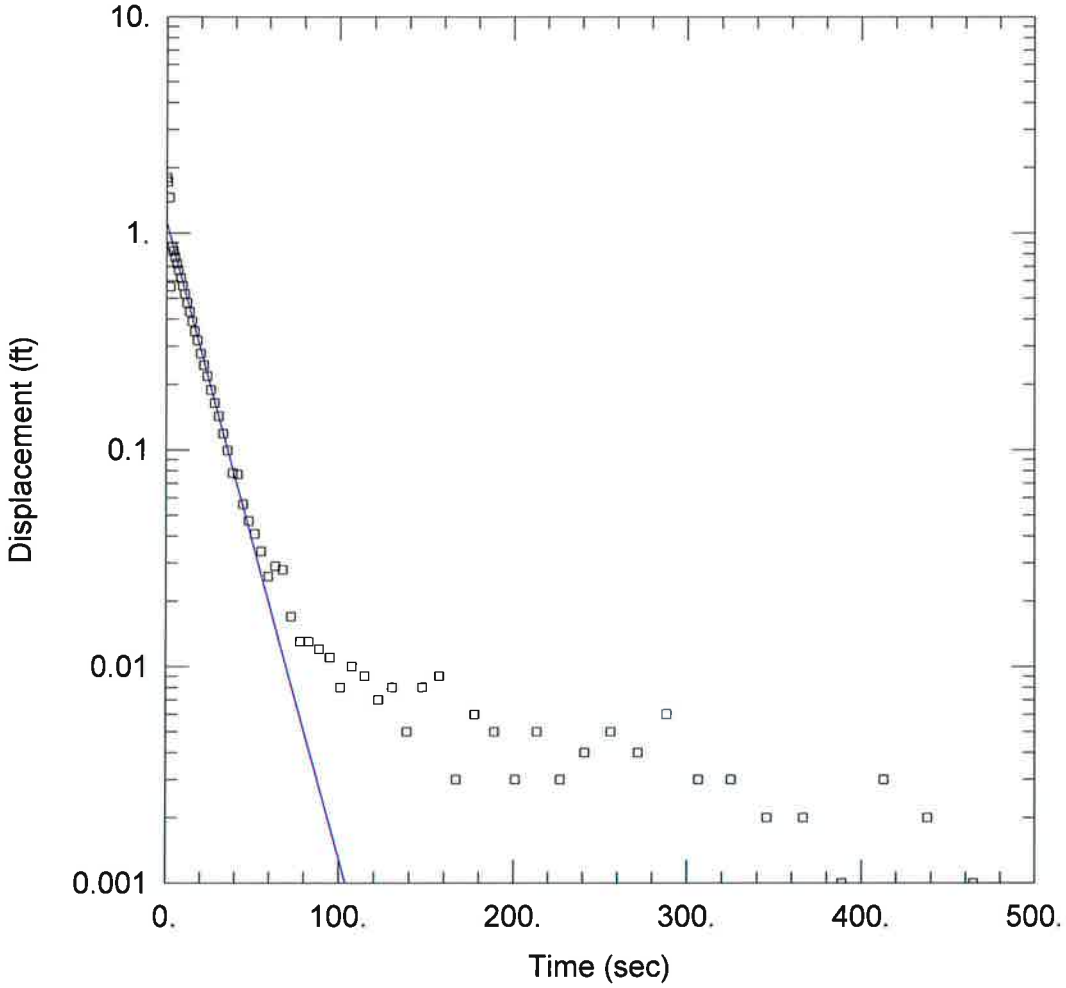
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.01109 ft^2
Variance . . . . . 0.0001607 ft^2
Std. Deviation . . . . . 0.01268 ft
Mean . . . . . 0.008117 ft
No. of Residuals 71
No. of Estimates 2



P-06-18LSD FH1

Data Set: T:\...\P-06-18LSD FH1.aqt
Date: 04/15/19 Time: 15:19:17

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18LSD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 32.64 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18LSD)

Initial Displacement: 1.802 ft
Total Well Penetration Depth: 32.12 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 46.43 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.002515 cm/sec
y0 = 1.108 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18LSD FH1
Date: 04/15/19
Time: 15:19:24

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18LSD

AQUIFER DATA

Saturated Thickness: 32.64 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18LSD

X Location: 13043. ft
Y Location: 13633. ft

Initial Displacement: 1.802 ft
Static Water Column Height: 46.43 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 32.12 ft

No. of Observations: 66

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.802	67.86	0.028
0.72	1.729	72.66	0.017
1.5	1.46	78.06	0.013
2.28	0.564	82.86	0.013
3.12	0.866	88.86	0.012
4.02	0.825	94.86	0.011
4.98	0.772	100.9	0.008
5.94	0.721	107.5	0.01
7.02	0.673	114.7	0.009
8.16	0.619	122.5	0.007
9.36	0.571	130.3	0.008
10.62	0.523	138.7	0.005
11.94	0.476	147.7	0.008
13.38	0.433	157.3	0.009
14.88	0.391	166.9	0.003
16.44	0.351	177.7	0.006
18.12	0.319	189.1	0.005
19.92	0.278	201.1	0.003
21.78	0.246	213.7	0.005
23.82	0.219	226.9	0.003
25.92	0.189	241.3	0.004
28.14	0.164	256.3	0.005
30.54	0.143	271.9	0.004
33.06	0.119	288.7	0.006
35.7	0.099	306.7	0.003
38.52	0.078	325.3	0.003

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
41.52	0.077	345.7	0.002
44.7	0.056	366.7	0.002
48.06	0.047	388.9	0.001
51.66	0.041	412.9	0.003
55.26	0.034	438.1	0.002
59.46	0.026	464.5	0.001
63.66	0.029	492.7	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.429

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002515	cm/sec
y0	1.108	ft

T = K*b = 2.502 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.003873	0.0002961	+/- 0.0005915	13.08	cm/sec
y0	1.499	0.06273	+/- 0.1253	23.9	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 3.853 cm²/sec

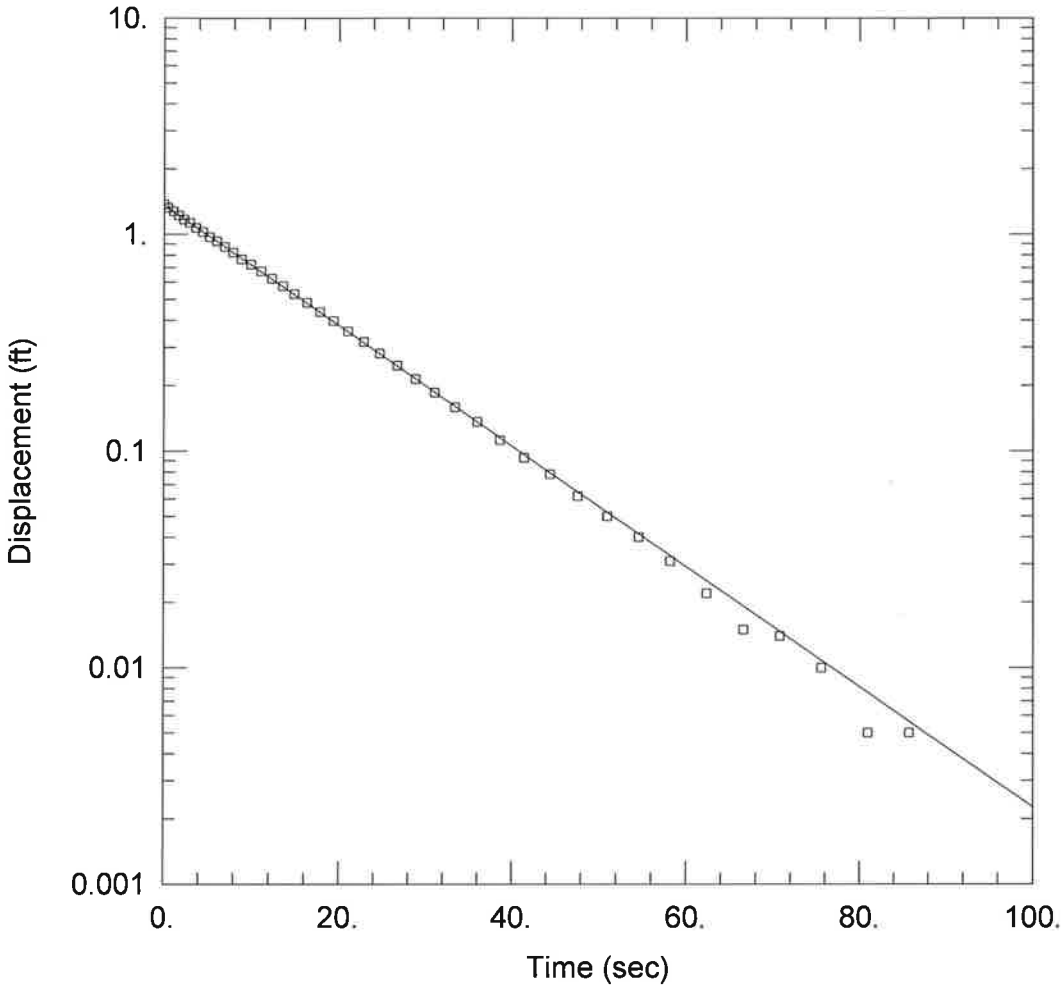
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.8145 ft^2
Variance . . . . . 0.01273 ft^2
Std. Deviation . . . . . 0.1128 ft
Mean . . . . . 0.01683 ft
No. of Residuals 66
No. of Estimates 2



P-06-18LSD RH1

Data Set: T:\...\P-06-18LSD RH1.aqt
Date: 04/04/19 Time: 07:35:45

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18LSD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 32.64 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18LSD)

Initial Displacement: 1.375 ft
Total Well Penetration Depth: 32.12 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 46.43 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.002376 cm/sec
y0 = 1.363 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18LSD RH1
Date: 04/04/19
Time: 07:35:53

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18LSD

AQUIFER DATA

Saturated Thickness: 32.64 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18LSD

X Location: 13043. ft
Y Location: 13633. ft

Initial Displacement: 1.375 ft
Static Water Column Height: 46.43 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 32.12 ft

No. of Observations: 43

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.375	22.86	0.318
0.48	1.324	24.72	0.282
1.08	1.277	26.76	0.247
1.68	1.22	28.86	0.214
2.28	1.169	31.08	0.186
2.94	1.129	33.48	0.159
3.66	1.07	36.	0.136
4.44	1.022	38.64	0.112
5.22	0.967	41.46	0.093
6.06	0.926	44.46	0.078
6.96	0.874	47.64	0.062
7.92	0.821	51.	0.05
8.88	0.765	54.6	0.04
9.96	0.724	58.2	0.031
11.1	0.674	62.4	0.022
12.3	0.624	66.6	0.015
13.56	0.577	70.8	0.014
14.88	0.53	75.6	0.01
16.32	0.482	81.	0.005
17.82	0.438	85.8	0.005
19.38	0.398	91.8	0.
21.06	0.356		

SOLUTION

Slug Test

Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.429

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002458	cm/sec
y0	1.405	ft

T = K*b = 2.445 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.002376	6.143E-6	+/- 1.241E-5	386.8	cm/sec
y0	1.363	0.00174	+/- 0.003514	783.3	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 2.364 cm²/sec

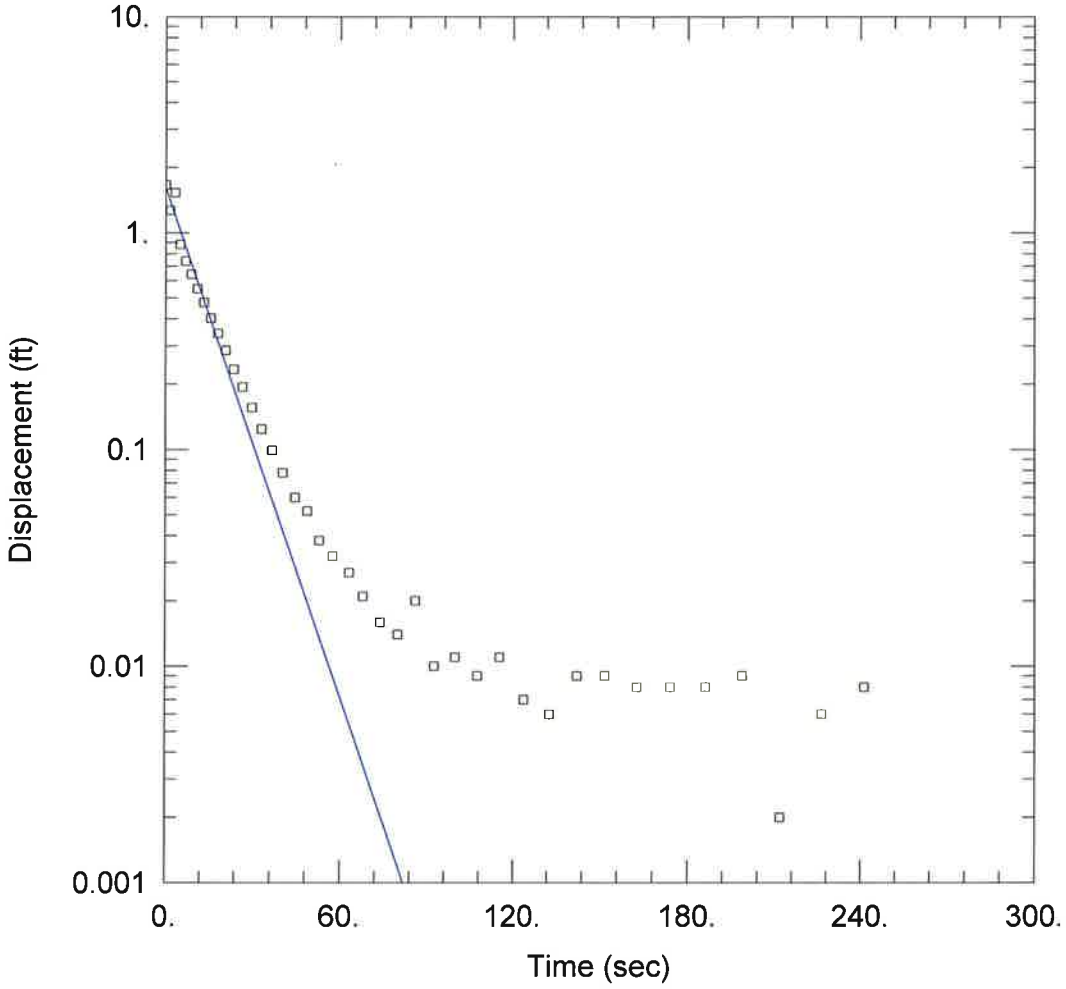
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.0006952 ft^2
Variance . . . . . 1.696E-5 ft^2
Std. Deviation . . . . . 0.004118 ft
Mean . . . . . -0.0005265 ft
No. of Residuals 43
No. of Estimates 2



P-06-18LSD FH2

Data Set: T:\...\P-06-18LSD FH2.aqt
Date: 04/04/19 Time: 07:50:41

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18LSD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 32.64 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18LSD)

Initial Displacement: 1.662 ft
Total Well Penetration Depth: 32.12 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 46.43 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.003352 cm/sec
y0 = 1.612 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18LSD FH2
Date: 04/04/19
Time: 07:50:49

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18LSD

AQUIFER DATA

Saturated Thickness: 32.64 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18LSD

X Location: 13043. ft
Y Location: 13633. ft

Initial Displacement: 1.662 ft
Static Water Column Height: 46.43 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 32.12 ft

No. of Observations: 42

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.662	63.18	0.027
1.559	1.267	67.98	0.021
3.24	1.529	73.98	0.016
5.039	0.884	79.98	0.014
6.9	0.74	86.02	0.02
8.94	0.642	92.58	0.01
11.04	0.552	99.78	0.011
13.26	0.476	107.6	0.009
15.66	0.403	115.4	0.011
18.18	0.343	123.8	0.007
20.82	0.286	132.8	0.006
23.64	0.234	142.4	0.009
26.64	0.194	152.	0.009
29.82	0.156	162.8	0.008
33.18	0.124	174.2	0.008
36.78	0.099	186.2	0.008
40.38	0.078	198.8	0.009
44.58	0.06	212.	0.002
48.78	0.052	226.4	0.006
52.98	0.038	241.4	0.008
57.78	0.032	257.	0.

SOLUTION

Slug Test
Aquifer Model: Confined

Solution Method: Bouwer-Rice
ln(Re/rw): 3.429

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0008869	cm/sec
y0	0.3393	ft

T = K*b = 0.8823 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.003352	0.0001745	+/- 0.0003527	19.21	cm/sec
y0	1.612	0.04739	+/- 0.09577	34.03	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 3.335 cm²/sec

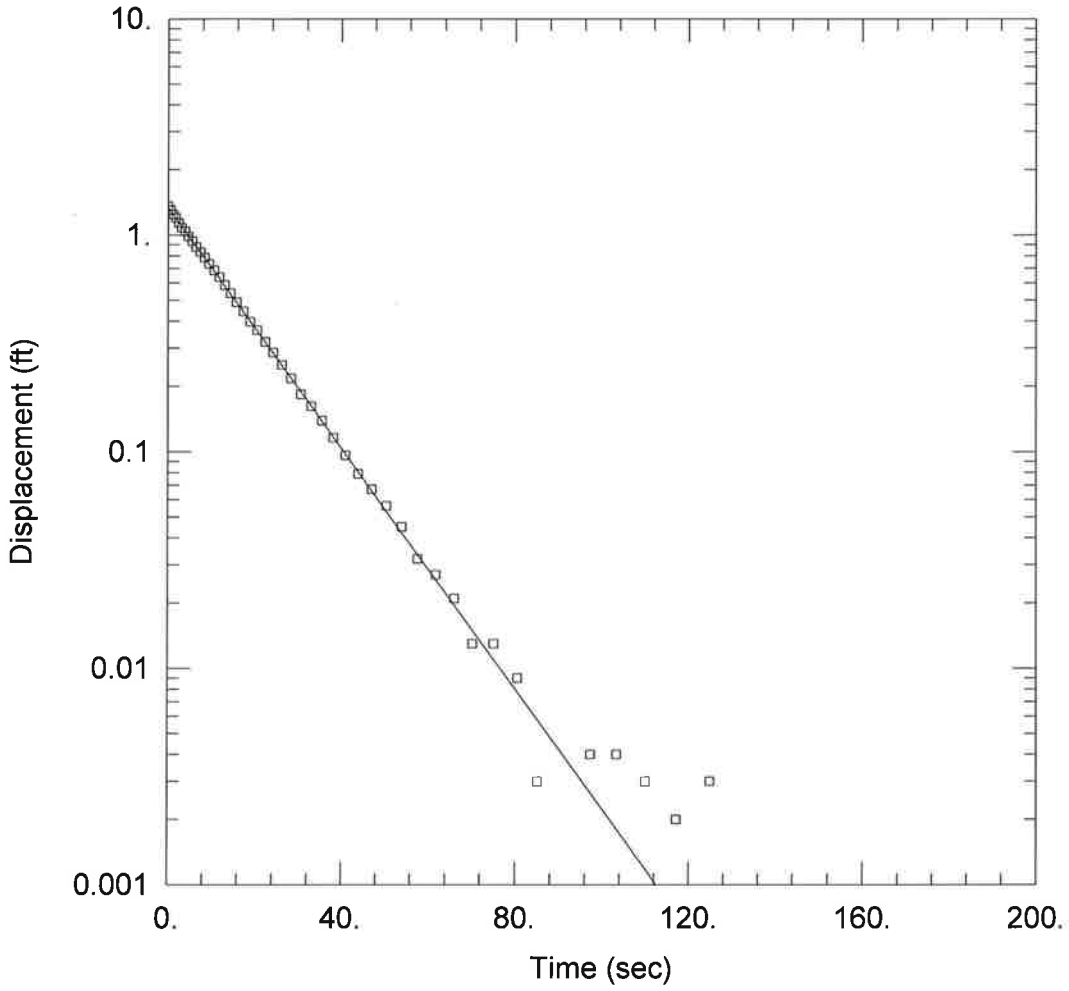
Parameter Correlations

	K	y0
K	1.00	0.64
y0	0.64	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.1888 ft^2
Variance . . . . . 0.004719 ft^2
Std. Deviation . . . . . 0.0687 ft
Mean . . . . . 0.01189 ft
No. of Residuals 42
No. of Estimates 2



P-06-18LSD RH2

Data Set: T:\...\P-06-18LSD RH2.aqt
Date: 04/04/19 Time: 07:56:27

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-06-18LSD
Test Date: 3-1-2019

AQUIFER DATA

Saturated Thickness: 32.64 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-06-18LSD)

Initial Displacement: 1.359 ft
Total Well Penetration Depth: 32.12 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 46.43 ft
Screen Length: 9.62 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.002377 cm/sec
y0 = 1.343 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-06-18
Title: P-06-18LSD RH2
Date: 04/04/19
Time: 07:56:35

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-1-2019
Test Well: P-06-18LSD

AQUIFER DATA

Saturated Thickness: 32.64 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-06-18LSD

X Location: 13043. ft
Y Location: 13633. ft

Initial Displacement: 1.359 ft
Static Water Column Height: 46.43 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.62 ft
Total Well Penetration Depth: 32.12 ft

No. of Observations: 47

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.359	28.38	0.218
0.6	1.301	30.6	0.184
1.2	1.241	33.	0.162
1.8	1.201	35.52	0.139
2.46	1.138	38.16	0.116
3.18	1.081	40.98	0.096
3.96	1.039	43.98	0.079
4.74	0.985	47.16	0.067
5.58	0.936	50.52	0.056
6.48	0.879	54.12	0.045
7.44	0.833	57.72	0.032
8.4	0.785	61.92	0.027
9.48	0.735	66.12	0.021
10.62	0.685	70.32	0.013
11.82	0.638	75.12	0.013
13.08	0.586	80.52	0.009
14.4	0.538	85.32	0.003
15.84	0.489	97.32	0.004
17.34	0.444	103.3	0.004
18.9	0.398	109.9	0.003
20.58	0.364	117.1	0.002
22.38	0.321	124.9	0.003
24.24	0.286	132.7	0.
26.28	0.252		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.429

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002377	cm/sec
y0	1.343	ft

T = K*b = 2.365 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.002377	7.408E-6	+/- 1.492E-5	320.8	cm/sec
y0	1.343	0.002092	+/- 0.004214	641.9	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 2.365 cm²/sec

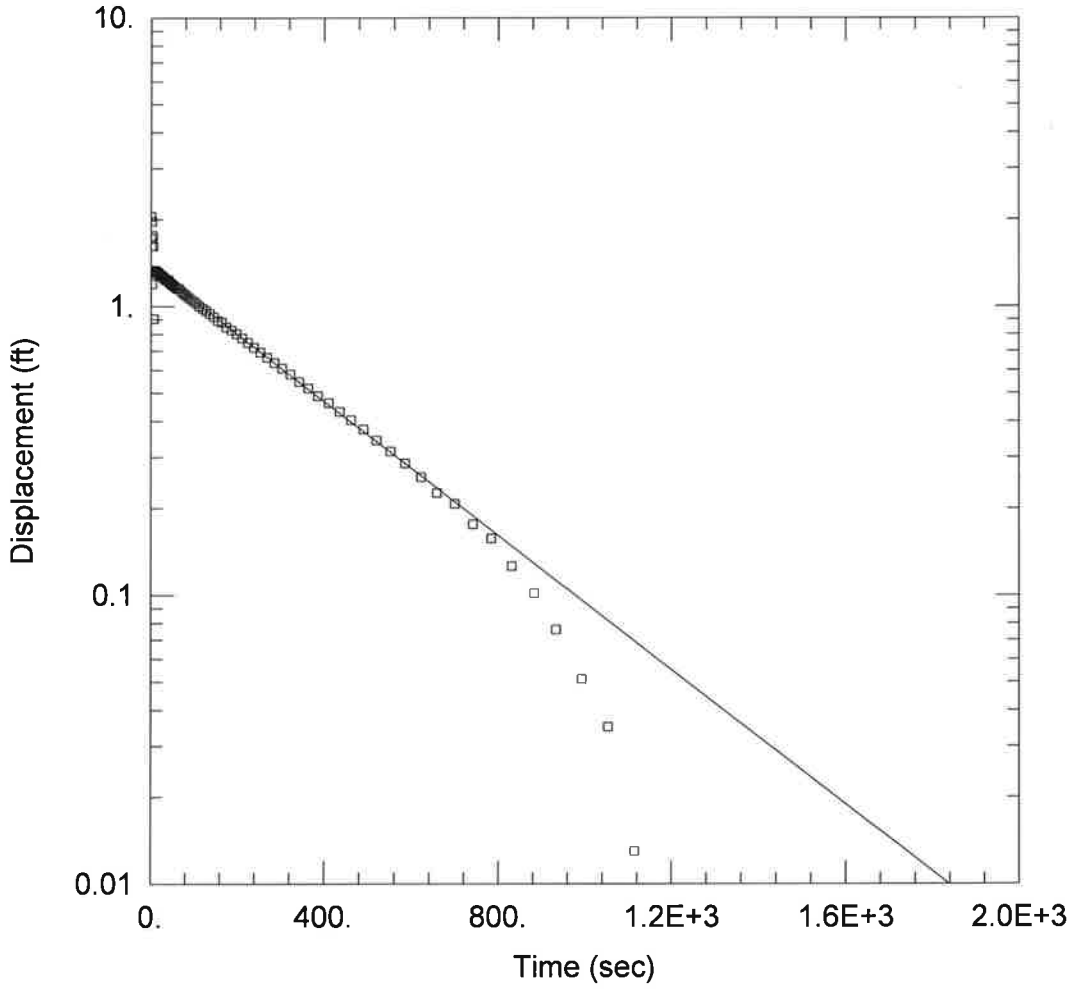
Parameter Correlations

	K	y0
K	1.00	0.67
y0	0.67	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.001046 ft^2
Variance . . . . . 2.325E-5 ft^2
Std. Deviation . . . . . 0.004821 ft
Mean . . . . . 0.0002961 ft
No. of Residuals 47
No. of Estimates 2



P-07-18USD FH1

Data Set: T:\...\P-07-18USD FH1.aqt
Date: 04/24/19 Time: 09:04:59

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-07-18USD
Test Date: 3-5-2019

AQUIFER DATA

Saturated Thickness: 12.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-18USD)

Initial Displacement: 2.052 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 21.48 ft
Screen Length: 9.54 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 8.35E-5 cm/sec
y0 = 1.367 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-07-18
Title: P-07-18USD FH1
Date: 04/24/19
Time: 09:05:07

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-5-2019
Test Well: P-07-18USD

AQUIFER DATA

Saturated Thickness: 12.2 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-07-18USD

X Location: 11602. ft
Y Location: 14158. ft

Initial Displacement: 2.052 ft
Static Water Column Height: 21.48 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.54 ft
Total Well Penetration Depth: 11.54 ft

No. of Observations: 78

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	2.052	120.2	0.981
0.839	1.72	128.	0.963
1.739	1.615	136.4	0.941
2.699	1.965	145.4	0.918
3.659	1.196	155.	0.891
4.739	1.754	164.6	0.879
5.879	1.614	175.4	0.846
7.08	0.903	186.8	0.825
8.34	1.308	198.8	0.801
9.66	1.326	211.4	0.776
11.1	1.329	224.6	0.748
12.6	1.317	239.	0.72
14.16	1.313	254.	0.692
15.84	1.313	269.6	0.665
17.64	1.302	286.4	0.636
19.5	1.292	304.4	0.609
21.54	1.282	323.	0.58
23.64	1.277	343.4	0.547
25.86	1.27	364.4	0.52
28.26	1.267	386.6	0.489
30.78	1.25	410.6	0.462
33.42	1.239	435.8	0.432
36.24	1.231	462.2	0.404
39.26	1.234	490.4	0.375
42.42	1.217	520.4	0.343
45.78	1.199	552.2	0.314

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
49.38	1.187	585.8	0.286
52.98	1.176	621.8	0.256
57.18	1.162	657.8	0.226
61.38	1.15	699.8	0.207
65.58	1.149	741.8	0.176
70.38	1.123	783.8	0.157
75.78	1.105	831.8	0.126
80.58	1.092	885.8	0.101
86.58	1.072	933.8	0.076
92.58	1.056	993.8	0.051
98.58	1.04	1053.8	0.035
105.2	1.022	1113.8	0.013
112.4	1.	1179.8	0.

SOLUTION

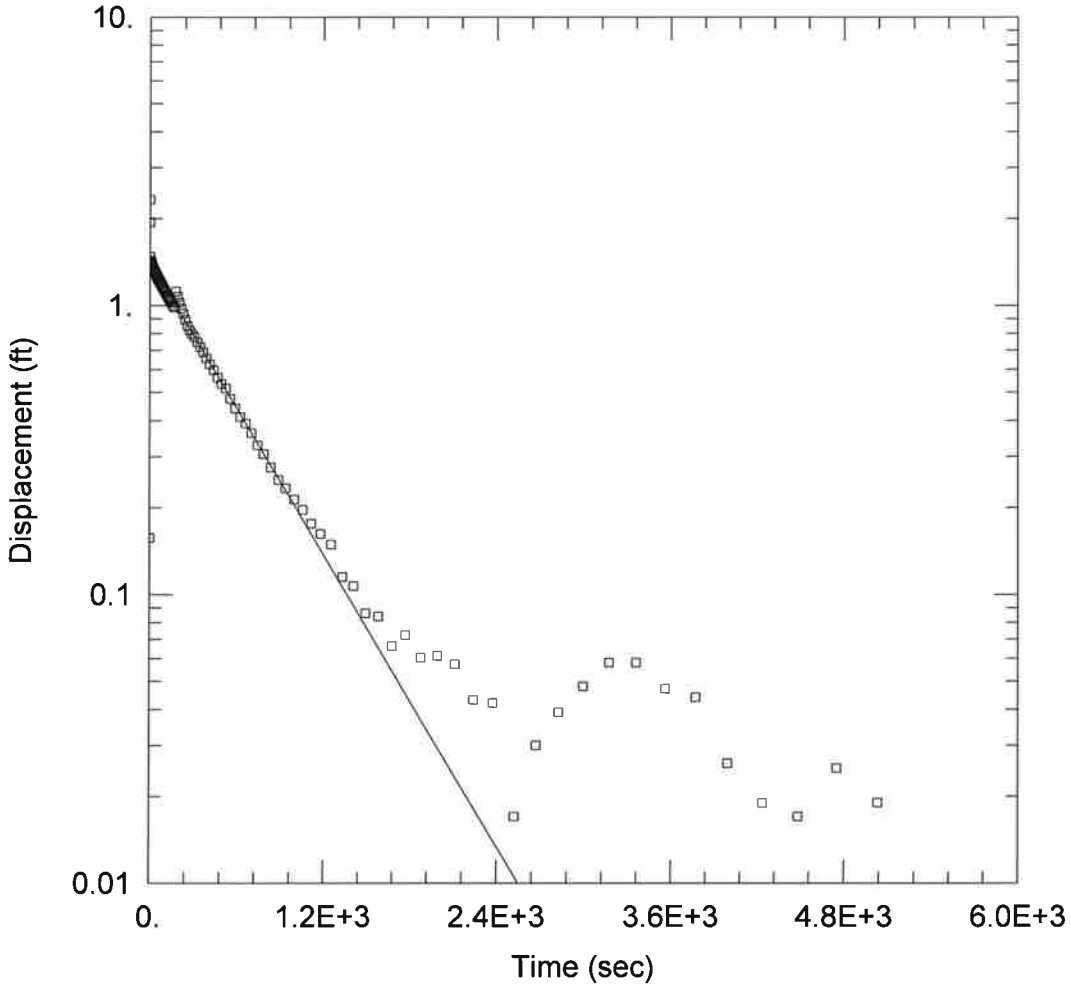
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.856

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	8.35E-5	cm/sec
y0	1.367	ft

$T = K*b = 0.03105$ cm²/sec



P-07-18USD RH1

Data Set: T:\...\P-07-18USD RH1.aqt
Date: 04/24/19 Time: 09:09:15

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-07-18USD
Test Date: 3-5-2019

AQUIFER DATA

Saturated Thickness: 12.2 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-18USD)

Initial Displacement: 2.323 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 21.48 ft
Screen Length: 9.54 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 6.059E-5 cm/sec
y0 = 1.41 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-07-18
Title: P-07-18USD RH1
Date: 04/24/19
Time: 09:09:20

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-5-2019
Test Well: P-07-18USD

AQUIFER DATA

Saturated Thickness: 12.2 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-07-18USD

X Location: 11602. ft
Y Location: 14158. ft

Initial Displacement: 2.323 ft
Static Water Column Height: 21.48 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.54 ft
Total Well Penetration Depth: 11.54 ft

No. of Observations: 107

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	2.323	256.3	0.851
0.719	0.157	271.9	0.821
1.5	1.942	288.7	0.798
2.28	1.36	306.7	0.777
3.12	1.474	325.3	0.747
4.02	1.424	345.7	0.718
4.98	1.428	366.7	0.689
5.94	1.421	388.9	0.657
7.02	1.416	412.9	0.625
8.16	1.414	438.1	0.597
9.36	1.407	464.5	0.563
10.62	1.396	492.7	0.535
11.94	1.386	522.7	0.516
13.38	1.386	554.5	0.475
14.88	1.385	588.1	0.44
16.44	1.372	624.1	0.411
18.12	1.362	660.1	0.391
19.92	1.359	702.1	0.362
21.78	1.349	744.1	0.328
23.82	1.34	786.1	0.306
25.92	1.331	834.1	0.275
28.14	1.327	888.1	0.249
30.54	1.314	936.1	0.233
33.06	1.307	996.1	0.213
35.7	1.298	1056.1	0.196
38.52	1.294	1116.1	0.176

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
41.52	1.269	1182.1	0.162
44.7	1.275	1254.1	0.149
48.06	1.263	1332.1	0.115
51.66	1.25	1410.1	0.107
55.26	1.239	1494.1	0.086
59.46	1.227	1584.1	0.084
63.66	1.218	1680.1	0.066
67.86	1.206	1776.1	0.072
72.66	1.195	1884.1	0.06
78.06	1.184	1998.1	0.061
82.86	1.167	2118.1	0.057
88.86	1.156	2244.1	0.043
94.86	1.14	2376.1	0.042
100.9	1.127	2520.1	0.017
107.5	1.109	2670.1	0.03
114.7	1.093	2826.1	0.039
122.5	1.074	2994.1	0.048
130.3	1.057	3174.1	0.058
138.7	1.042	3360.1	0.058
147.7	1.021	3564.1	0.047
157.3	1.	3774.1	0.044
166.9	0.983	3996.1	0.026
177.7	1.118	4236.1	0.019
189.1	1.074	4488.1	0.017
201.1	1.024	4752.1	0.025
213.7	0.976	5034.1	0.019
226.9	0.936	5334.1	0.
241.3	0.892		

SOLUTION

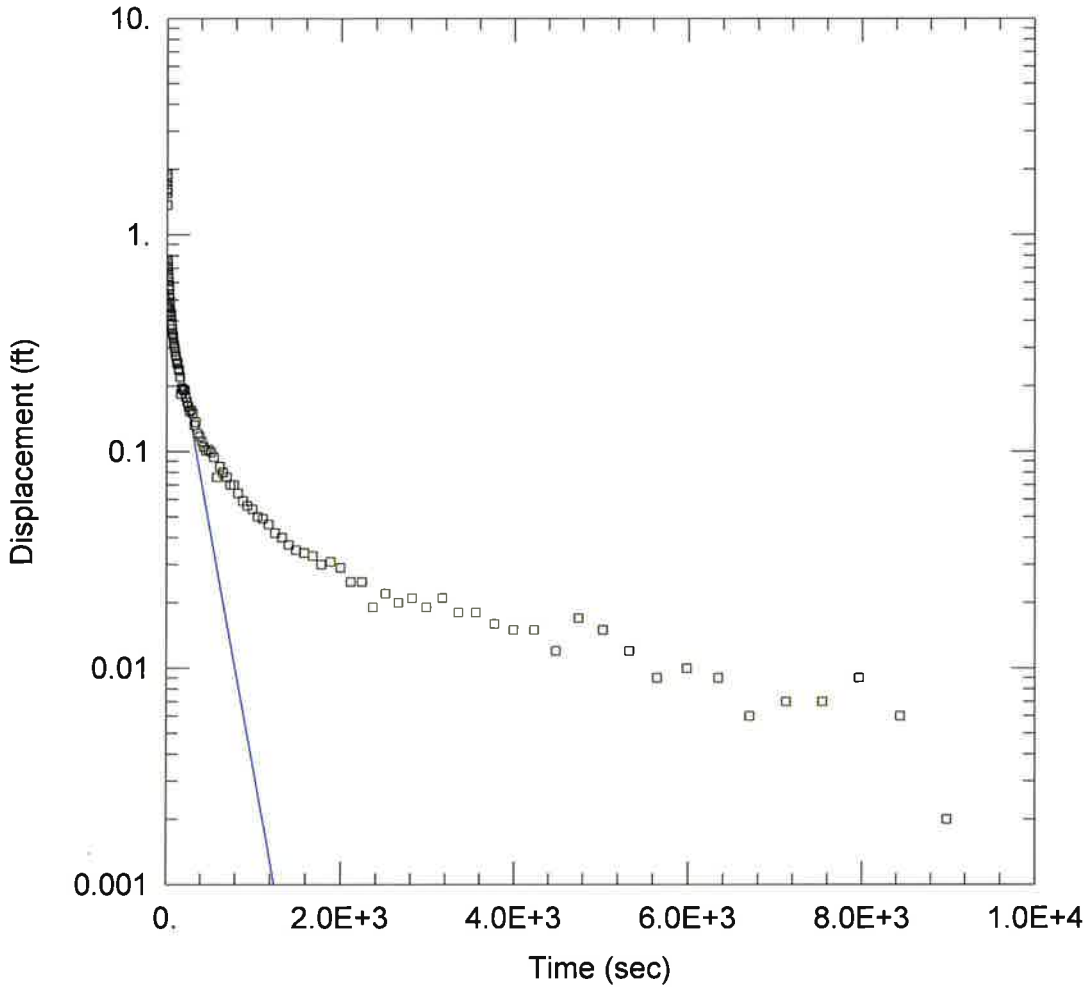
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.856

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.059E-5	cm/sec
y0	1.41	ft

T = K*b = 0.02253 cm²/sec



P-07-18LSD FH1

Data Set: T:\...\P-07-18LSD FH1.aqt
Date: 04/24/19 Time: 09:12:47

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-07-18LSD
Test Date: 3-5-2019

AQUIFER DATA

Saturated Thickness: 11.43 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-18LSD)

Initial Displacement: 1.894 ft
Total Well Penetration Depth: 10.82 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 47.22 ft
Screen Length: 9.53 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001577 cm/sec
y0 = 0.5751 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-07-18
Title: P-07-18LSD FH1
Date: 04/24/19
Time: 09:12:56

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-5-2019
Test Well: P-07-18LSD

AQUIFER DATA

Saturated Thickness: 11.43 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-07-18LSD

X Location: 11601. ft
Y Location: 14163. ft

Initial Displacement: 1.894 ft
Static Water Column Height: 47.22 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.53 ft
Total Well Penetration Depth: 10.82 ft

No. of Observations: 115

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.894	365.2	0.121
0.78	1.825	387.4	0.117
1.62	1.697	411.4	0.111
2.52	1.604	436.6	0.105
3.48	1.628	463.	0.101
4.44	1.557	491.2	0.102
5.52	1.371	521.2	0.099
6.66	0.466	553.	0.094
7.86	0.768	586.6	0.076
9.12	0.753	622.6	0.085
10.44	0.734	658.6	0.08
11.88	0.714	700.6	0.076
13.38	0.69	742.6	0.07
14.94	0.666	784.6	0.07
16.62	0.646	832.6	0.064
18.42	0.626	886.6	0.059
20.28	0.607	934.6	0.056
22.32	0.583	994.6	0.054
24.59	0.578	1054.6	0.05
26.85	0.56	1114.6	0.049
29.04	0.527	1180.6	0.046
31.56	0.506	1252.6	0.042
34.2	0.489	1330.6	0.04
37.02	0.474	1408.6	0.037
40.02	0.455	1492.6	0.035
43.2	0.444	1582.6	0.034

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
46.56	0.423	1678.6	0.033
50.16	0.429	1774.6	0.03
53.76	0.402	1882.6	0.031
57.96	0.382	1996.6	0.029
62.16	0.367	2116.6	0.025
66.36	0.351	2242.6	0.025
71.16	0.342	2374.6	0.019
76.56	0.332	2518.6	0.022
81.36	0.316	2668.6	0.02
87.36	0.307	2824.6	0.021
93.36	0.297	2992.6	0.019
99.36	0.288	3172.6	0.021
106.	0.275	3358.6	0.018
113.2	0.265	3562.6	0.018
121.	0.253	3772.6	0.016
128.8	0.256	3994.6	0.015
137.2	0.238	4234.6	0.015
146.2	0.236	4486.6	0.012
155.8	0.22	4750.6	0.017
165.4	0.184	5032.6	0.015
176.2	0.196	5332.6	0.012
187.6	0.194	5650.6	0.009
199.6	0.191	5986.6	0.01
212.2	0.192	6346.6	0.009
225.4	0.178	6706.6	0.006
239.8	0.169	7126.6	0.007
254.8	0.161	7546.6	0.007
270.4	0.153	7966.6	0.009
287.2	0.155	8446.6	0.006
305.2	0.15	8986.6	0.002
323.8	0.132	9466.6	0.
344.2	0.136		

SOLUTION

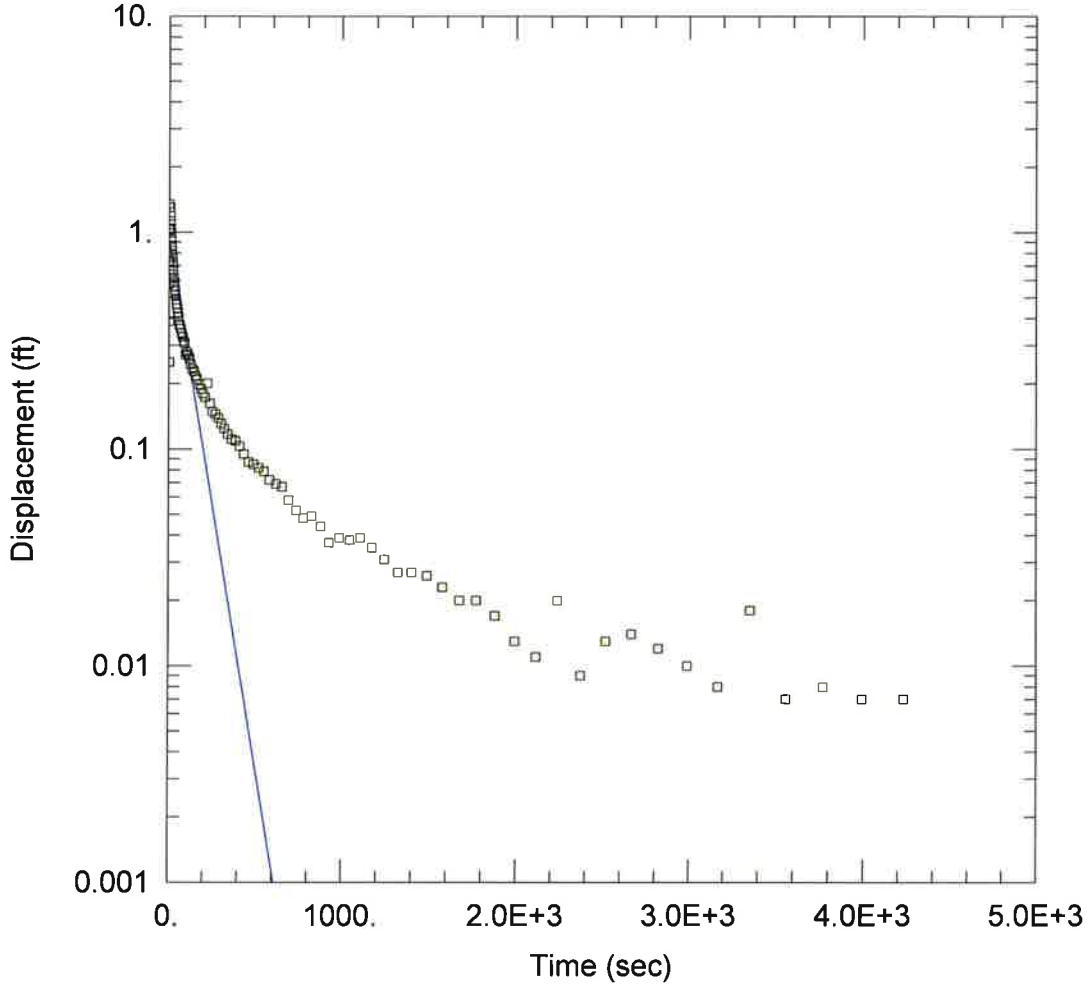
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.827

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001577	cm/sec
y0	0.5751	ft

T = K*b = 0.05495 cm²/sec



P-07-18LSD RH1

Data Set: T:\...\P-07-18LSD RH1.aqt
Date: 04/24/19 Time: 09:15:03

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-07-18LSD
Test Date: 3-5-2019

AQUIFER DATA

Saturated Thickness: 11.43 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-07-18LSD)

Initial Displacement: 1.35 ft
Total Well Penetration Depth: 10.82 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 47.22 ft
Screen Length: 9.53 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0003462 cm/sec
y0 = 0.9209 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-07-18
Title: P-07-18LSD RH1
Date: 04/24/19
Time: 09:15:09

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-5-2019
Test Well: P-07-18LSD

AQUIFER DATA

Saturated Thickness: 11.43 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-07-18LSD

X Location: 11601. ft
Y Location: 14163. ft

Initial Displacement: 1.35 ft
Static Water Column Height: 47.22 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.53 ft
Total Well Penetration Depth: 10.82 ft

No. of Observations: 100

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.35	253.1	0.149
0.9	1.026	268.7	0.145
1.86	0.734	285.5	0.139
2.82	0.577	303.5	0.131
3.9	0.252	322.1	0.124
5.04	0.388	342.5	0.117
6.24	1.302	363.5	0.111
7.5	1.186	385.7	0.109
8.82	1.124	409.7	0.103
10.26	1.039	434.9	0.095
11.76	0.991	461.3	0.087
13.32	0.925	489.5	0.085
15.	0.868	519.5	0.082
16.8	0.82	551.3	0.079
18.66	0.78	584.9	0.072
20.7	0.729	620.9	0.069
22.8	0.697	656.9	0.067
25.02	0.661	698.9	0.058
27.42	0.618	740.9	0.052
29.94	0.591	782.9	0.048
32.58	0.56	830.9	0.049
35.4	0.538	884.9	0.044
38.4	0.512	932.9	0.037
41.58	0.488	992.9	0.039
44.94	0.463	1052.9	0.038
48.54	0.446	1112.9	0.039

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
52.14	0.425	1178.9	0.035
56.34	0.406	1250.9	0.031
60.62	0.374	1328.9	0.027
64.74	0.372	1406.9	0.027
69.54	0.359	1490.9	0.026
74.94	0.341	1580.9	0.023
79.74	0.329	1676.9	0.02
85.74	0.314	1772.9	0.02
91.74	0.308	1880.9	0.017
97.74	0.273	1994.9	0.013
104.3	0.28	2114.9	0.011
111.5	0.27	2240.9	0.02
119.3	0.261	2372.9	0.009
127.1	0.246	2516.9	0.013
135.5	0.234	2666.9	0.014
144.5	0.228	2822.9	0.012
154.1	0.217	2990.9	0.01
163.7	0.209	3170.9	0.008
174.5	0.198	3356.9	0.018
185.9	0.189	3560.9	0.007
197.9	0.18	3770.9	0.008
210.5	0.173	3992.9	0.007
223.7	0.201	4232.9	0.007
238.1	0.162	4484.9	0.

SOLUTION

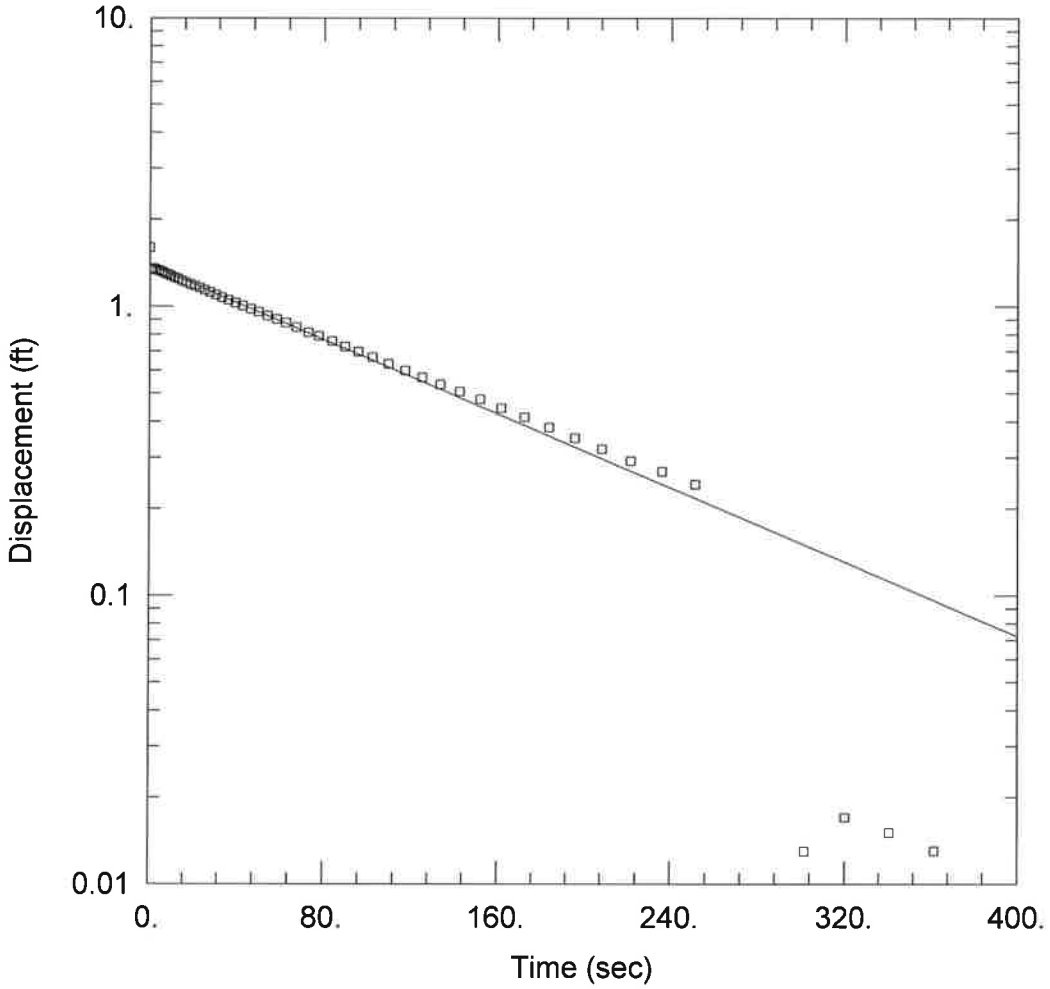
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.827

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0003462	cm/sec
y0	0.9209	ft

$T = K*b = 0.1206$ cm²/sec



P-08-18IT FH1

Data Set: T:\...\P-08-18IT FH1.aqt
Date: 04/04/19 Time: 10:00:17

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-08-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 5.99 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-08-18IT)

Initial Displacement: 1.595 ft
Total Well Penetration Depth: 5.51 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 18.09 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0003678 cm/sec
y0 = 1.387 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-08-18
Title: P-08-18IT FH1
Date: 04/04/19
Time: 10:00:26

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-08-18IT

AQUIFER DATA

Saturated Thickness: 5.99 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-08-18IT

X Location: 12384. ft
Y Location: 14143. ft

Initial Displacement: 1.595 ft
Static Water Column Height: 18.09 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.51 ft

No. of Observations: 54

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.595	62.88	0.876
0.959	1.333	67.68	0.846
2.04	1.352	73.08	0.812
3.18	1.337	77.88	0.789
4.38	1.326	83.88	0.757
5.639	1.315	89.88	0.725
6.959	1.3	95.88	0.697
8.399	1.29	102.5	0.666
9.899	1.274	109.7	0.632
11.46	1.258	117.5	0.599
13.14	1.244	125.3	0.567
14.94	1.226	133.7	0.537
16.8	1.211	142.7	0.507
18.84	1.193	152.3	0.477
20.94	1.175	161.9	0.444
23.16	1.157	172.7	0.413
25.56	1.137	184.1	0.381
28.08	1.117	196.1	0.35
30.72	1.095	208.7	0.321
33.54	1.074	221.9	0.292
36.54	1.051	236.3	0.268
39.72	1.028	251.3	0.242
43.08	1.004	301.7	0.013
46.68	0.978	320.3	0.017
50.28	0.956	340.7	0.015
54.48	0.928	361.7	0.013

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
58.68	0.902	383.9	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.235

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0005619	cm/sec
y0	1.735	ft

T = K*b = 0.1026 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0003678	8.596E-6	+/- 1.725E-5	42.79	cm/sec
y0	1.387	0.01226	+/- 0.0246	113.2	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.06715 cm²/sec

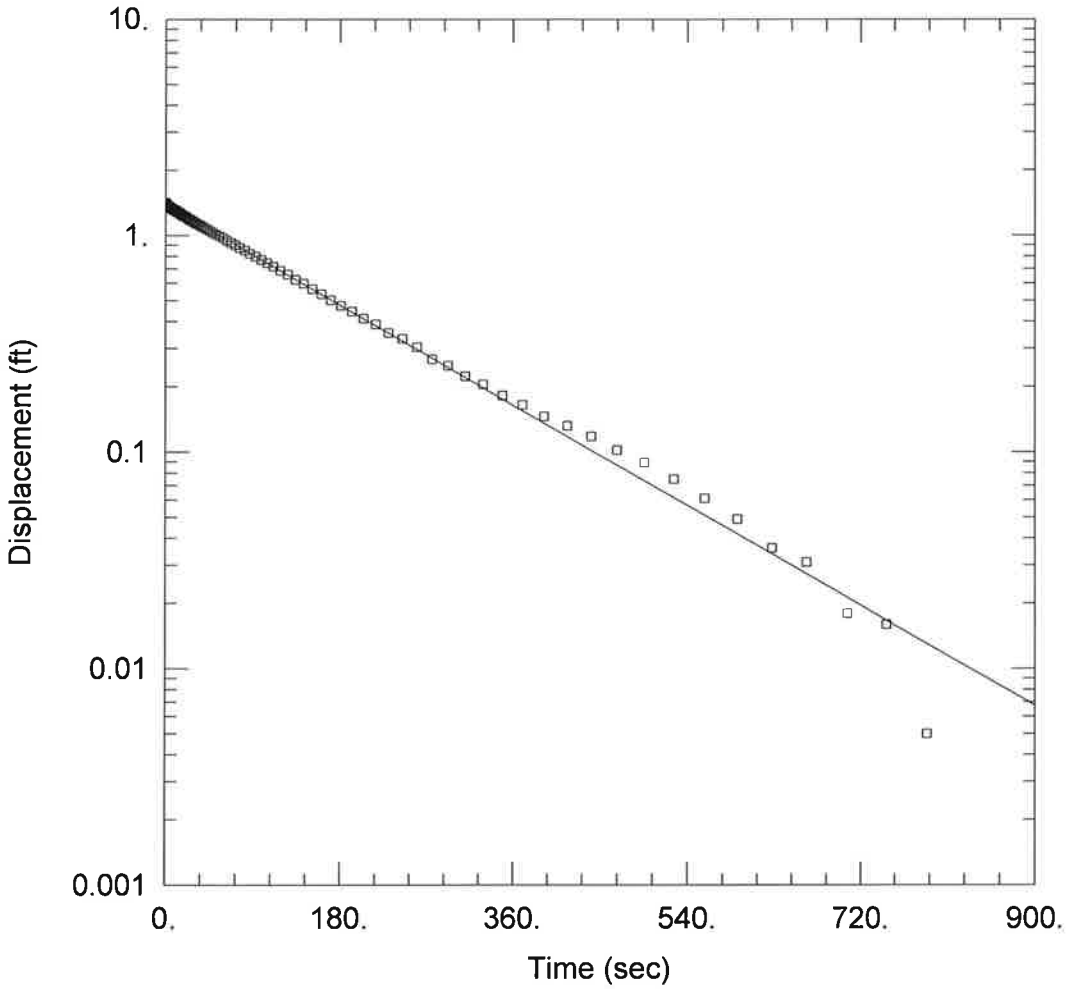
Parameter Correlations

	K	y0
K	1.00	0.63
y0	0.63	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.1114 ft^2
Variance . . . . . 0.002143 ft^2
Std. Deviation . . . . . 0.04629 ft
Mean . . . . . -0.004335 ft
No. of Residuals 54
No. of Estimates 2



P-08-18IT RH1

Data Set: T:\...\P-08-18IT RH1.aqt
Date: 04/04/19 Time: 10:13:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-08-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 5.99 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-08-18IT)

Initial Displacement: 1.419 ft
Total Well Penetration Depth: 5.51 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 18.09 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.000294 cm/sec
y0 = 1.379 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-08-18
Title: P-08-18IT RH1
Date: 04/04/19
Time: 10:13:23

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-08-18IT

AQUIFER DATA

Saturated Thickness: 5.99 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-08-18IT

X Location: 12384. ft
Y Location: 14143. ft

Initial Displacement: 1.419 ft
Static Water Column Height: 18.09 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.51 ft

No. of Observations: 81

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.419	81.54	0.849
0.54	1.398	86.34	0.823
1.02	1.391	92.34	0.797
1.62	1.381	98.34	0.769
2.22	1.366	104.3	0.745
2.82	1.362	110.9	0.717
3.48	1.361	118.1	0.685
4.2	1.35	125.9	0.658
4.98	1.343	133.7	0.624
5.76	1.336	142.1	0.598
6.6	1.331	151.1	0.564
7.5	1.316	160.7	0.534
8.46	1.312	170.3	0.502
9.42	1.305	181.1	0.473
10.5	1.301	192.5	0.445
11.64	1.283	204.5	0.413
12.84	1.277	217.1	0.388
14.1	1.27	230.3	0.354
15.42	1.256	244.7	0.333
16.86	1.243	259.7	0.305
18.36	1.227	275.3	0.268
19.92	1.223	292.1	0.25
21.6	1.207	310.1	0.223
23.4	1.193	328.7	0.205
25.26	1.179	349.1	0.182
27.3	1.163	370.1	0.165

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
29.4	1.15	392.3	0.146
31.62	1.132	416.3	0.132
34.02	1.119	441.5	0.118
36.54	1.102	467.9	0.102
39.18	1.086	496.1	0.089
42.	1.067	526.1	0.075
45.	1.051	557.9	0.061
48.18	1.029	591.5	0.049
51.54	1.01	627.5	0.036
55.14	0.99	663.5	0.031
58.74	0.972	705.5	0.018
62.94	0.945	747.5	0.016
67.14	0.922	789.5	0.005
71.34	0.9	837.5	0.
76.14	0.874		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.235

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.000294	cm/sec
y0	1.379	ft

T = K*b = 0.05368 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.000294	1.189E-6	+/- 2.366E-6	247.3	cm/sec
y0	1.379	0.001862	+/- 0.003705	740.8	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.05368 cm²/sec

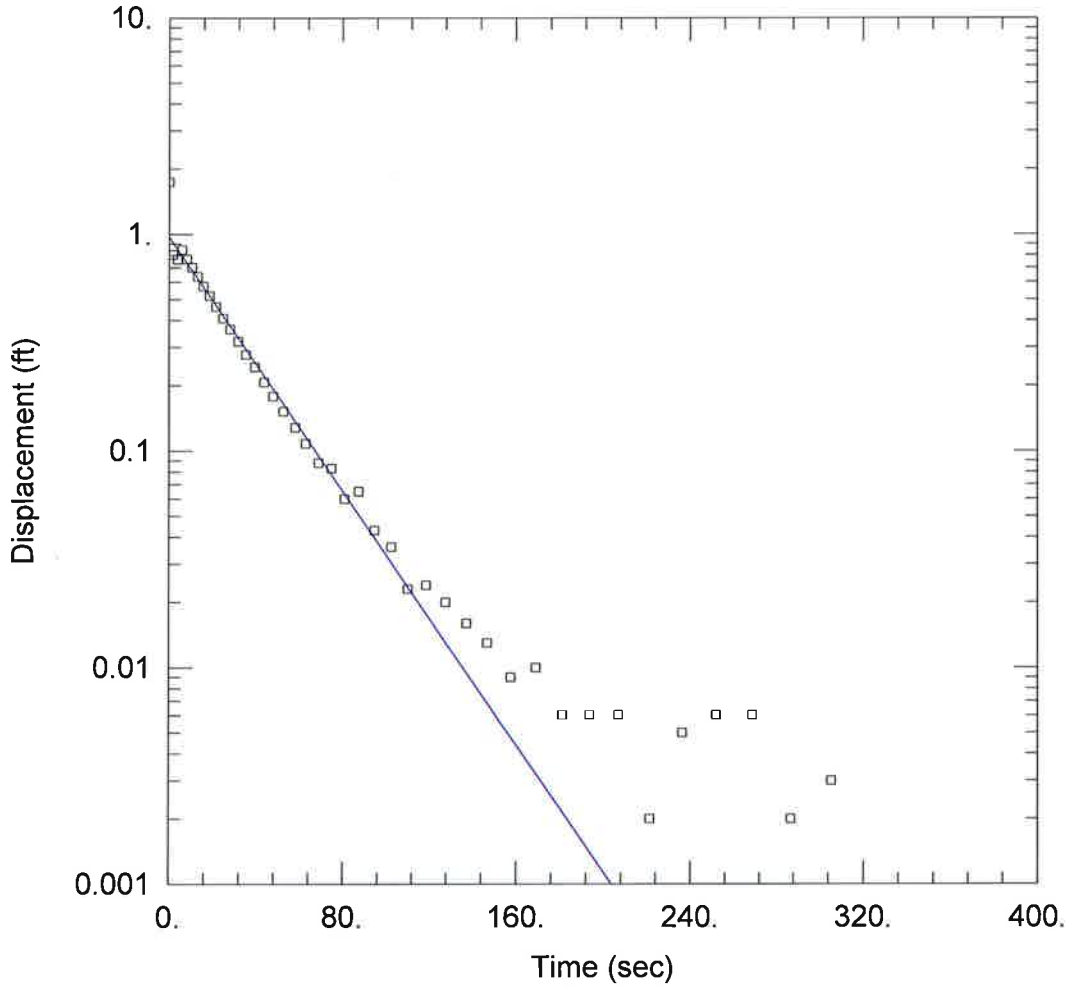
Parameter Correlations

	K	y0
K	1.00	0.58
y0	0.58	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.006403 ft^2
Variance . . . . . 8.105E-5 ft^2
Std. Deviation . . . . . 0.009003 ft
Mean . . . . . 0.001039 ft
No. of Residuals 81
No. of Estimates 2



P-08-18SD FH1

Data Set: T:\...\P-08-18SD FH1.aqt
Date: 04/09/19 Time: 15:52:14

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-08-18SD
Test Date: 3-7-2019

AQUIFER DATA

Saturated Thickness: 6.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-08-18SD)

Initial Displacement: 1.74 ft
Total Well Penetration Depth: 5.84 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 38.62 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001703 cm/sec
y0 = 0.97 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-08-18
Title: P-08-18SD FH1
Date: 04/09/19
Time: 15:52:19

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-7-2019
Test Well: P-08-18SD

AQUIFER DATA

Saturated Thickness: 6.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-08-18SD

X Location: 12384. ft
Y Location: 14139. ft

Initial Displacement: 1.74 ft
Static Water Column Height: 38.62 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.84 ft

No. of Observations: 43

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.74	80.94	0.06
1.86	0.804	87.54	0.065
3.9	0.763	94.74	0.043
6.001	0.848	102.5	0.036
8.22	0.765	110.3	0.023
10.62	0.703	118.7	0.024
13.14	0.636	127.7	0.02
15.78	0.574	137.3	0.016
18.6	0.518	146.9	0.013
21.6	0.462	157.7	0.009
24.78	0.409	169.1	0.01
28.14	0.364	181.1	0.006
31.74	0.32	193.7	0.006
35.34	0.278	206.9	0.006
39.54	0.243	221.3	0.002
43.74	0.207	236.3	0.005
47.94	0.178	251.9	0.006
52.74	0.152	268.7	0.006
58.14	0.128	286.7	0.002
62.94	0.108	305.3	0.003
68.94	0.088	325.7	0.
74.94	0.083		

SOLUTION

Slug Test

Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.264

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.001703	cm/sec
y0	0.97	ft

T = K*b = 0.328 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.00225	0.0002144	+/- 0.0004331	10.49	cm/sec
y0	1.192	0.06227	+/- 0.1258	19.14	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.4335 cm²/sec

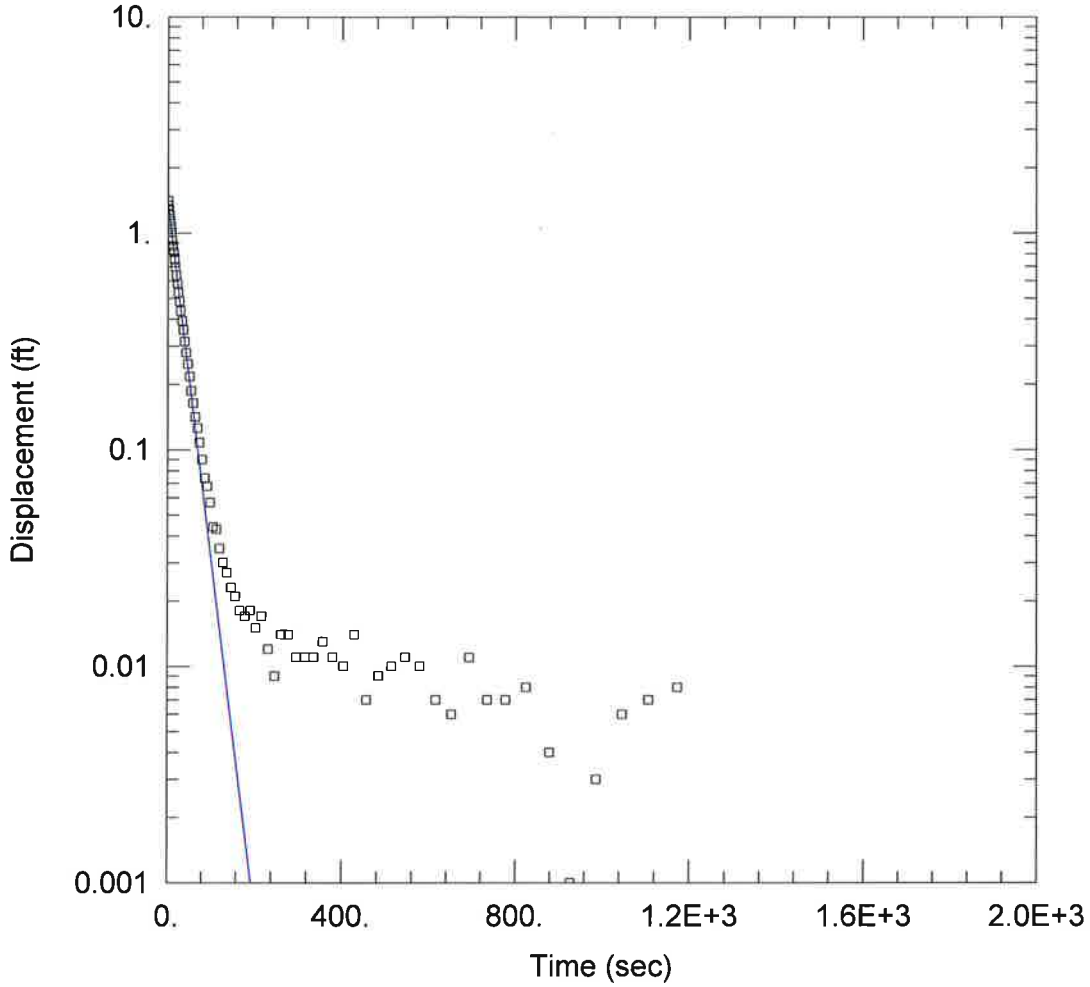
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.4728 ft^2
Variance . . . . . 0.01153 ft^2
Std. Deviation . . . . . 0.1074 ft
Mean . . . . . 0.01098 ft
No. of Residuals 43
No. of Estimates 2



P-08-18SD RH1

Data Set: T:\...\P-08-18SD RH1.aqt
Date: 04/04/19 Time: 10:41:06

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-08-18SD
Test Date: 3-7-2019

AQUIFER DATA

Saturated Thickness: 6.32 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-08-18SD)

Initial Displacement: 1.413 ft
Total Well Penetration Depth: 5.84 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 38.62 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.001886 cm/sec
y0 = 1.384 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-08-18
Title: P-08-18SD RH1
Date: 04/04/19
Time: 10:41:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-7-2019
Test Well: P-08-18SD

AQUIFER DATA

Saturated Thickness: 6.32 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-08-18SD

X Location: 12384. ft
Y Location: 14139. ft

Initial Displacement: 1.413 ft
Static Water Column Height: 38.62 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.84 ft

No. of Observations: 73

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.413	149.1	0.023
1.2	1.345	158.7	0.021
2.46	1.277	169.5	0.018
3.78	1.208	180.9	0.017
5.22	1.136	192.9	0.018
6.72	1.073	205.5	0.015
8.28	1.009	218.7	0.017
9.96	0.925	233.1	0.012
11.76	0.875	248.1	0.009
13.62	0.816	263.7	0.014
15.66	0.754	280.5	0.014
17.76	0.698	298.5	0.011
19.98	0.638	317.1	0.011
22.38	0.585	337.5	0.011
24.9	0.532	358.5	0.013
27.54	0.484	380.7	0.011
30.36	0.438	404.7	0.01
33.36	0.393	429.9	0.014
36.54	0.357	456.3	0.007
39.9	0.316	484.5	0.009
43.5	0.281	514.5	0.01
47.1	0.249	546.3	0.011
51.3	0.218	579.9	0.01
55.5	0.187	615.9	0.007
59.7	0.164	651.9	0.006
64.5	0.142	693.9	0.011

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
69.9	0.126	735.9	0.007
74.7	0.108	777.9	0.007
80.7	0.09	825.9	0.008
86.7	0.074	879.9	0.004
92.7	0.068	927.9	0.001
99.3	0.057	987.9	0.003
106.5	0.044	1047.9	0.006
114.3	0.043	1107.9	0.007
122.1	0.035	1173.9	0.008
130.5	0.03	1245.9	0.
139.5	0.027		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.264

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0002475	cm/sec
y0	0.2056	ft

T = K*b = 0.04767 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.001886	1.81E-5	+/- 3.609E-5	104.2	cm/sec
y0	1.384	0.006814	+/- 0.01359	203.	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.3633 cm²/sec

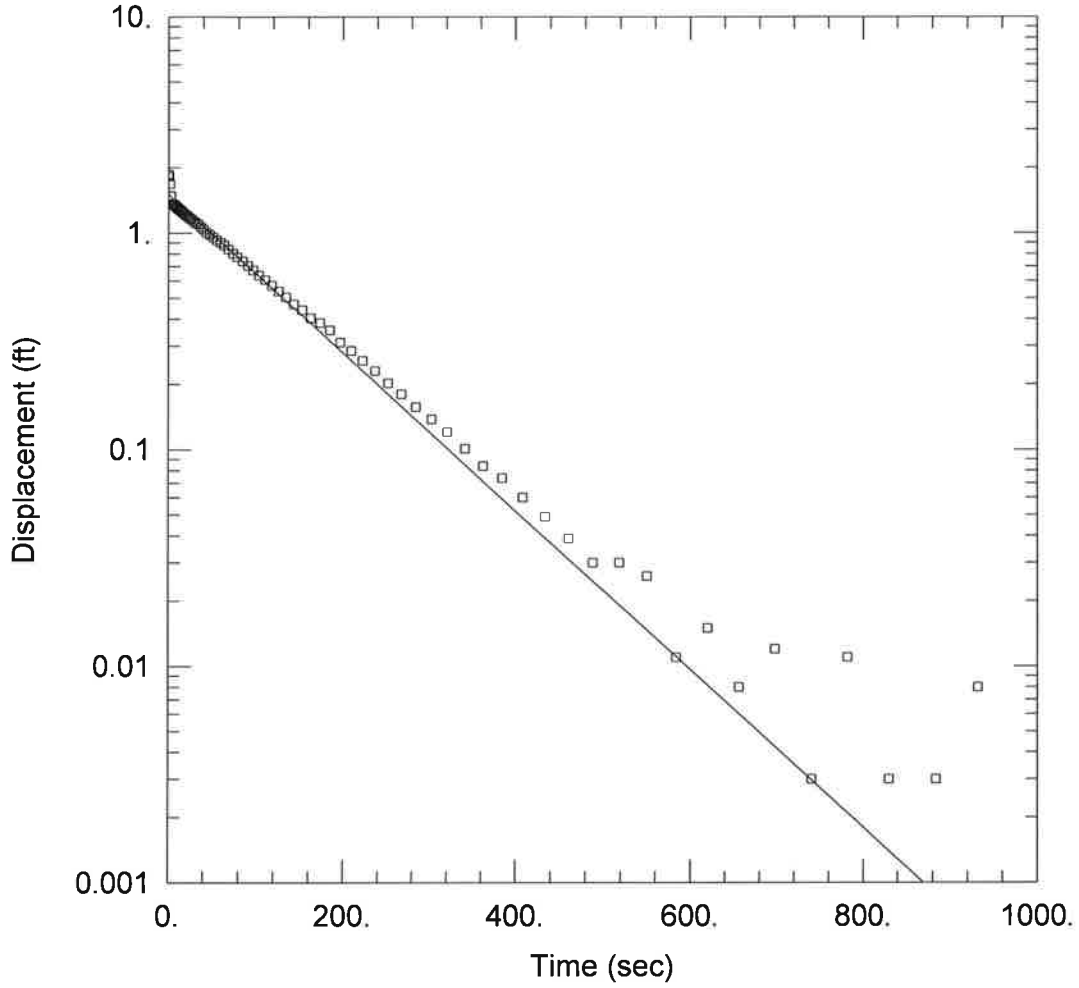
Parameter Correlations

	K	y0
K	1.00	0.67
y0	0.67	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.01521 ft^2
Variance . . . . . 0.0002142 ft^2
Std. Deviation . . . . . 0.01463 ft
Mean . . . . . 0.008253 ft
No. of Residuals 73
No. of Estimates 2



P-08-18D FH1

Data Set: T:\...\P-08-18D FH1.aqt
Date: 04/04/19 Time: 13:16:34

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-08-18D
Test Date: 3-8-2019

AQUIFER DATA

Saturated Thickness: 11.08 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-08-18D)

Initial Displacement: 1.862 ft
Total Well Penetration Depth: 10.49 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 124.6 ft
Screen Length: 9.55 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002582 cm/sec
y0 = 1.502 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-08-18
Title: P-08-18D FH1
Date: 04/04/19
Time: 13:16:44

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-8-2019
Test Well: P-08-18D

AQUIFER DATA

Saturated Thickness: 11.08 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-08-18D

X Location: 12384. ft
Y Location: 14135. ft

Initial Displacement: 1.862 ft
Static Water Column Height: 124.6 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.55 ft
Total Well Penetration Depth: 10.49 ft

No. of Observations: 73

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.862	118.4	0.57
0.96	1.828	126.2	0.537
1.92	1.682	134.6	0.505
3.	1.485	143.6	0.468
4.14	1.364	153.2	0.44
5.341	1.361	162.8	0.404
6.601	1.346	173.6	0.384
7.92	1.333	185.2	0.355
9.361	1.318	197.	0.312
10.86	1.302	209.6	0.285
12.42	1.287	222.8	0.257
14.1	1.271	237.2	0.23
15.9	1.253	252.2	0.202
17.76	1.233	267.8	0.18
19.8	1.21	284.6	0.157
21.9	1.197	302.6	0.138
24.12	1.17	321.2	0.12
26.52	1.155	341.6	0.101
29.04	1.133	362.6	0.084
31.68	1.111	384.8	0.074
34.5	1.098	408.8	0.06
37.5	1.062	434.	0.049
40.68	1.037	460.4	0.039
44.04	1.002	488.6	0.03
47.64	0.983	518.6	0.03
51.24	0.956	550.4	0.026

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
55.44	0.927	584.	0.011
59.64	0.901	620.	0.015
63.84	0.877	656.	0.008
68.64	0.839	698.	0.012
74.04	0.803	740.	0.003
78.84	0.772	782.	0.011
84.84	0.739	830.	0.003
90.84	0.706	884.	0.003
96.84	0.672	932.	0.008
103.4	0.637	992.	0.
110.6	0.607		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.813

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0002189	cm/sec
y0	1.343	ft

T = K*b = 0.07392 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0002582	8.434E-6	+/- 1.682E-5	30.61	cm/sec
y0	1.502	0.01926	+/- 0.03841	77.96	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.0872 cm²/sec

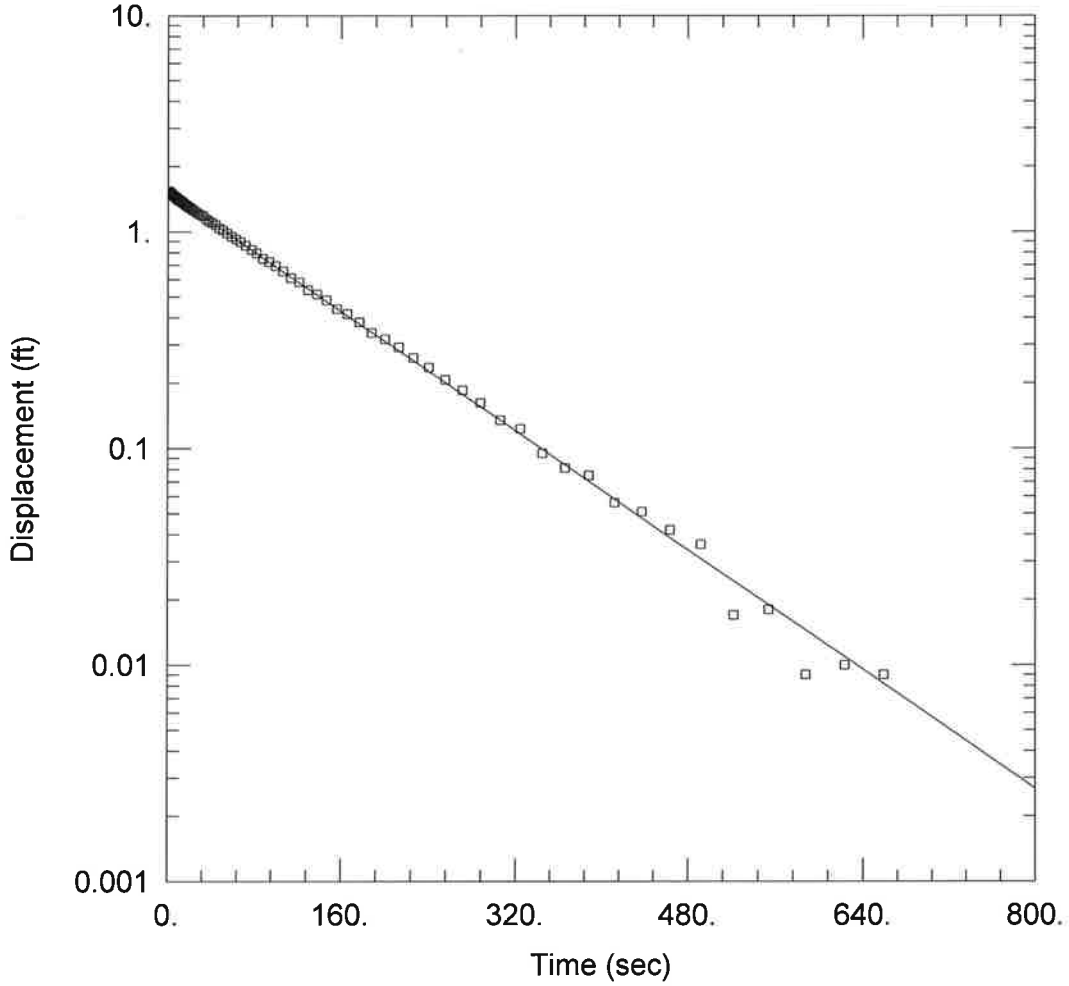
Parameter Correlations

	K	y0
K	1.00	0.63
y0	0.63	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.3679 ft^2
Variance . . . . . 0.005181 ft^2
Std. Deviation . . . . . 0.07198 ft
Mean . . . . . 0.004307 ft
No. of Residuals 73
No. of Estimates 2



P-08-18D RH1

Data Set:
Date: 04/04/19 Time: 13:26:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-08-18D
Test Date: 3-8-2019

AQUIFER DATA

Saturated Thickness: 11.08 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-08-18D)

Initial Displacement: 1.537 ft
Total Well Penetration Depth: 10.49 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 124.6 ft
Screen Length: 9.55 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002432 cm/sec
y0 = 1.522 ft

Data Set:
Title: P-08-18D RH1
Date: 04/04/19
Time: 13:26:21

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-8-2019
Test Well: P-08-18D

AQUIFER DATA

Saturated Thickness: 11.08 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-08-18D

X Location: 12384. ft
Y Location: 14135. ft

Initial Displacement: 1.537 ft
Static Water Column Height: 124.6 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.55 ft
Total Well Penetration Depth: 10.49 ft

No. of Observations: 71

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.537	88.14	0.75
0.78	1.527	94.14	0.724
1.56	1.529	100.1	0.692
2.4	1.509	106.7	0.657
3.3	1.495	113.9	0.611
4.26	1.479	121.7	0.584
5.22	1.461	129.5	0.536
6.301	1.45	137.9	0.513
7.441	1.437	146.9	0.482
8.641	1.409	156.5	0.439
9.901	1.404	166.1	0.417
11.22	1.389	176.9	0.381
12.66	1.375	188.3	0.341
14.16	1.355	200.3	0.318
15.72	1.336	212.9	0.292
17.4	1.318	226.1	0.261
19.2	1.298	240.5	0.236
21.06	1.281	255.5	0.207
23.1	1.261	271.1	0.185
25.2	1.24	287.9	0.162
27.42	1.217	305.9	0.135
29.82	1.195	324.5	0.123
32.34	1.179	344.9	0.095
34.98	1.146	365.9	0.081
37.8	1.119	388.1	0.075
40.8	1.1	412.1	0.056

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
43.98	1.072	437.3	0.051
47.34	1.037	463.7	0.042
50.94	1.014	491.9	0.036
54.54	0.98	521.9	0.017
58.74	0.949	553.7	0.018
62.94	0.924	587.3	0.009
67.14	0.894	623.3	0.01
71.94	0.861	659.3	0.009
77.34	0.824	785.3	0.
82.14	0.794		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.813

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0002464	cm/sec
y0	1.54	ft

T = K*b = 0.08322 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0002432	7.648E-7	+/- 1.526E-6	318.	cm/sec
y0	1.522	0.00179	+/- 0.003572	850.1	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.08213 cm²/sec

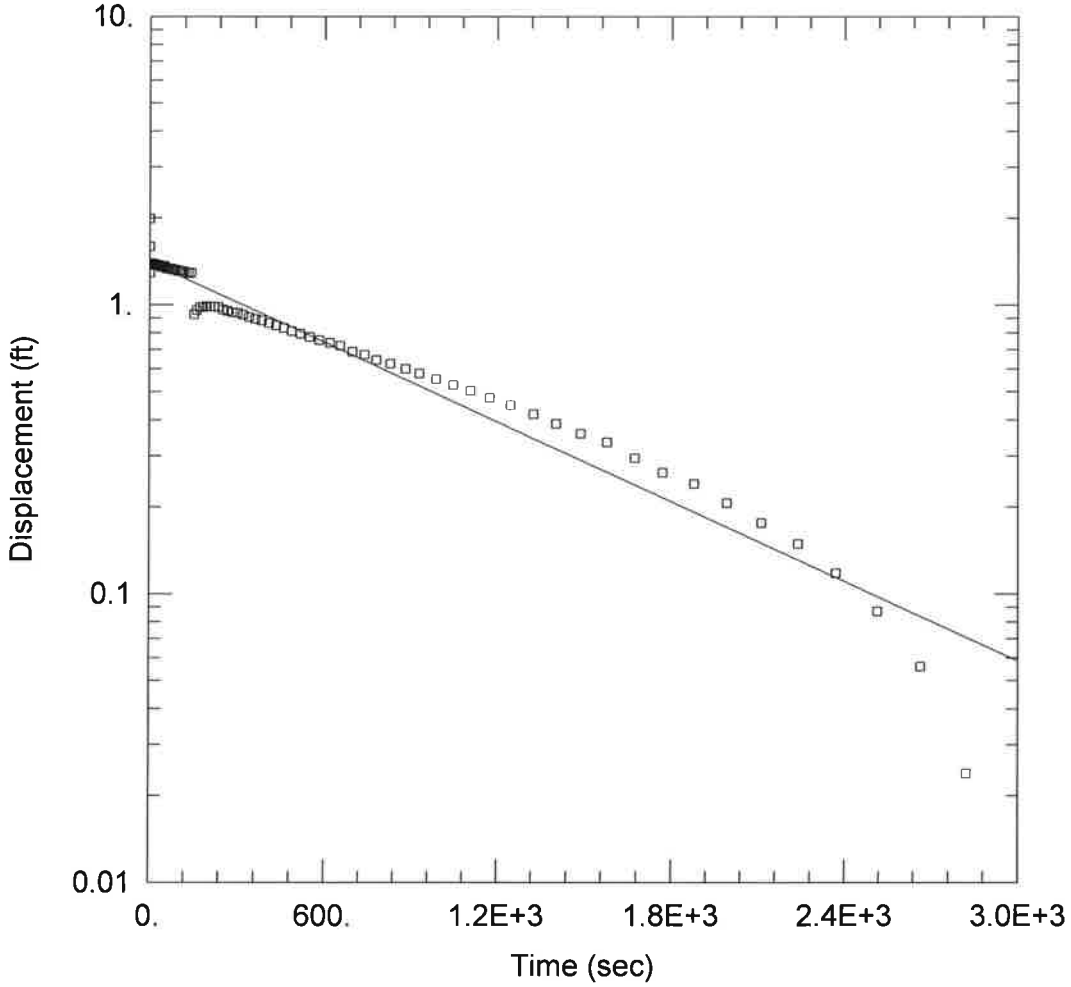
Parameter Correlations

	K	y0
K	1.00	0.61
y0	0.61	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.003628 ft^2
Variance . . . . . 5.258E-5 ft^2
Std. Deviation . . . . . 0.007251 ft
Mean . . . . . 0.0004165 ft
No. of Residuals 71
No. of Estimates 2



P-09-18SD FH1

Data Set: T:\...\P-09-18SD FH1.aqt
Date: 04/04/19 Time: 13:56:24

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-09-18SD
Test Date: 3-7-2019

AQUIFER DATA

Saturated Thickness: 13.22 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-09-18SD)

Initial Displacement: 1.987 ft
Total Well Penetration Depth: 12.72 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 31.01 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 3.358E-5 cm/sec
y0 = 1.4 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-09-18
Title: P-09-18SD FH1
Date: 04/04/19
Time: 13:56:31

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-7-2019
Test Well: P-09-18SD

AQUIFER DATA

Saturated Thickness: 13.22 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-09-18SD

X Location: 13179. ft
Y Location: 14126. ft

Initial Displacement: 1.987 ft
Static Water Column Height: 31.01 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.72 ft

No. of Observations: 91

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.987	221.9	0.984
0.96	1.592	236.3	0.98
2.04	1.289	251.3	0.962
3.18	1.392	266.9	0.952
4.38	1.39	283.7	0.939
5.64	1.39	301.7	0.936
6.96	1.388	320.3	0.922
8.399	1.388	340.7	0.907
9.899	1.389	361.7	0.893
11.46	1.386	383.9	0.88
13.14	1.383	407.9	0.864
14.94	1.381	433.1	0.848
16.8	1.381	459.5	0.83
18.84	1.372	487.7	0.81
20.94	1.369	517.7	0.794
23.16	1.375	549.5	0.774
25.56	1.371	583.1	0.753
28.08	1.364	619.1	0.739
30.72	1.369	655.1	0.721
33.54	1.365	697.1	0.688
36.54	1.365	739.1	0.672
39.72	1.352	781.1	0.644
43.08	1.36	829.1	0.626
46.68	1.349	883.1	0.6
50.28	1.361	931.1	0.577
54.48	1.344	991.1	0.55

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
58.68	1.334	1051.1	0.524
62.88	1.332	1111.1	0.501
67.68	1.329	1177.1	0.473
73.08	1.333	1249.1	0.447
77.88	1.322	1327.1	0.419
83.88	1.319	1405.1	0.388
89.88	1.319	1489.1	0.358
95.88	1.311	1579.1	0.334
102.5	1.305	1675.1	0.295
109.7	1.307	1771.1	0.263
117.5	1.302	1879.1	0.24
125.3	1.286	1993.1	0.206
133.7	1.283	2113.1	0.176
142.7	1.289	2239.1	0.149
152.3	0.925	2371.1	0.118
161.9	0.955	2515.1	0.087
172.7	0.978	2665.1	0.056
184.1	0.982	2821.1	0.024
196.1	0.986	2989.1	0.
208.7	0.984		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.939

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.391E-5	cm/sec
y0	1.415	ft

T = K*b = 0.01366 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	3.358E-5	1.345E-6	+/- 2.672E-6	24.97	cm/sec
y0	1.4	0.01598	+/- 0.03174	87.66	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.01353 cm²/sec

Parameter Correlations

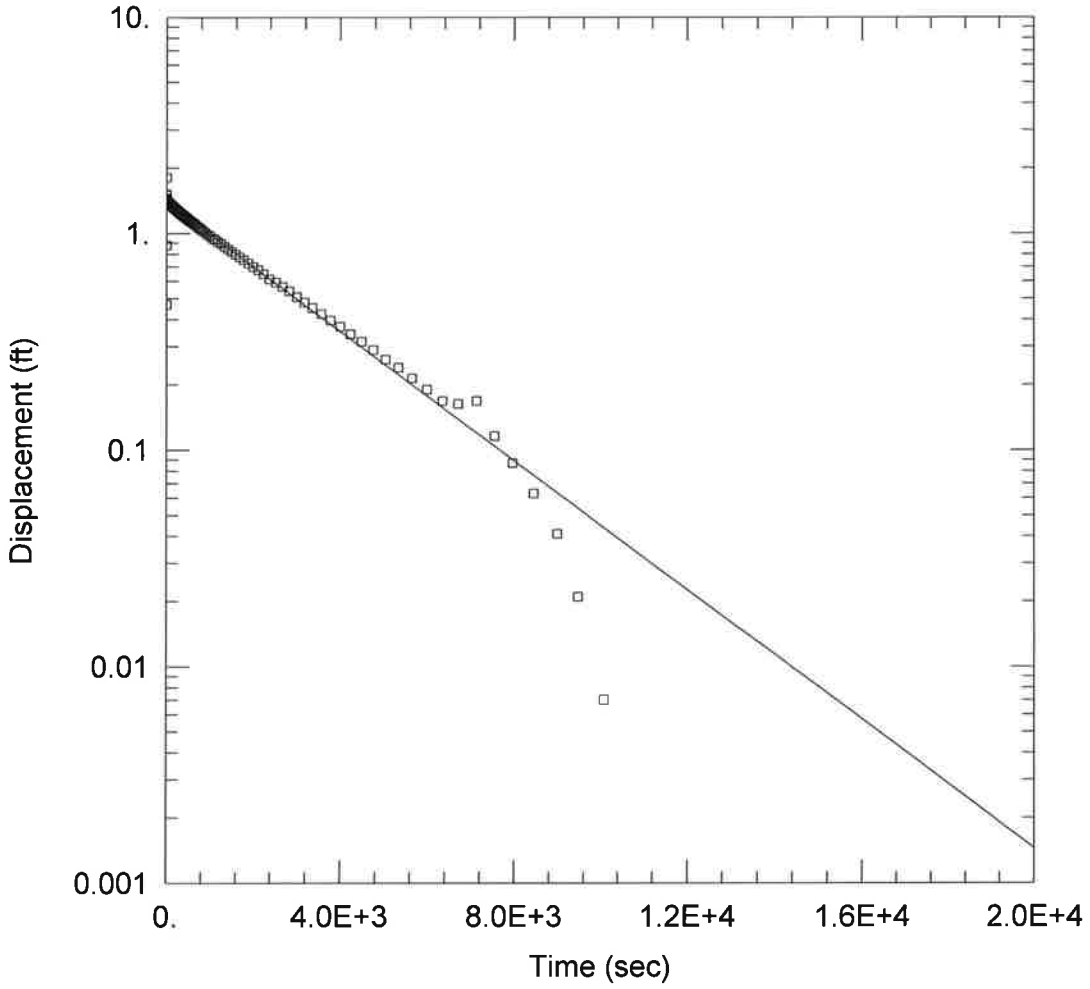
	K	y0
K	1.00	0.54
y0	0.54	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.8199 ft^2

Variance	0.009213 ft^2
Std. Deviation	0.09598 ft
Mean	0.002862 ft
No. of Residuals	91
No. of Estimates	2



P-09-18SD RH1

Data Set: T:\...\P-09-18SD RH1.aqt
Date: 04/04/19 Time: 14:02:33

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-09-18SD
Test Date: 3/7/2019-3/8/2019

AQUIFER DATA

Saturated Thickness: 13.22 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-09-18SD)

Initial Displacement: 1.805 ft
Total Well Penetration Depth: 12.72 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 31.01 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 1.089E-5 cm/sec
y0 = 1.392 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-09-18
Title: P-09-18SD RH1
Date: 04/04/19
Time: 14:02:42

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3/7/2019-3/8/2019
Test Well: P-09-18SD

AQUIFER DATA

Saturated Thickness: 13.22 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-09-18SD

X Location: 13179. ft
Y Location: 14126. ft

Initial Displacement: 1.805 ft
Static Water Column Height: 31.01 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.72 ft

No. of Observations: 133

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.805	247.7	1.271
0.25	0.468	262.7	1.264
0.5	0.881	278.3	1.255
0.86	1.368	295.1	1.249
1.22	1.512	313.1	1.239
1.64	1.503	331.7	1.223
2.06	1.452	352.1	1.222
2.48	1.443	373.1	1.211
2.96	1.452	395.3	1.201
3.5	1.443	419.3	1.191
3.98	1.444	444.5	1.181
4.58	1.441	470.9	1.168
5.18	1.433	499.1	1.157
5.78	1.433	529.1	1.146
6.44	1.428	560.9	1.132
7.16	1.431	594.5	1.12
7.94	1.421	630.5	1.105
8.72	1.419	666.5	1.094
9.56	1.421	708.5	1.074
10.46	1.418	750.5	1.059
11.42	1.413	792.5	1.042
12.38	1.413	840.5	1.025
13.46	1.418	894.5	1.006
14.6	1.411	942.5	0.985
15.8	1.412	1002.5	0.973
17.06	1.407	1062.5	0.946

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
18.38	1.404	1122.5	0.935
19.82	1.405	1188.5	0.912
21.32	1.402	1260.5	0.895
22.88	1.402	1338.5	0.869
24.56	1.397	1416.5	0.846
26.36	1.396	1500.5	0.822
28.22	1.397	1590.5	0.8
30.26	1.395	1686.5	0.775
32.36	1.392	1782.5	0.751
34.58	1.382	1890.5	0.726
36.98	1.387	2004.5	0.699
39.5	1.383	2124.5	0.677
42.14	1.389	2250.5	0.647
44.96	1.388	2382.5	0.612
47.96	1.385	2526.5	0.593
51.14	1.375	2676.5	0.566
54.5	1.383	2832.5	0.54
58.1	1.377	3000.5	0.508
61.74	1.356	3180.5	0.479
65.9	1.364	3366.5	0.452
70.1	1.37	3570.5	0.424
74.3	1.368	3780.5	0.396
79.1	1.363	4002.5	0.371
84.5	1.364	4242.5	0.342
89.3	1.351	4494.5	0.316
95.3	1.355	4758.5	0.289
101.3	1.351	5040.5	0.261
107.3	1.347	5340.5	0.24
113.9	1.341	5658.5	0.214
121.1	1.341	5994.5	0.19
128.9	1.336	6354.5	0.168
136.7	1.329	6714.5	0.163
145.1	1.327	7134.5	0.168
154.1	1.322	7554.5	0.116
163.7	1.316	7974.5	0.087
173.3	1.311	8454.5	0.063
184.1	1.307	8994.5	0.041
195.5	1.3	9474.5	0.021
207.5	1.293	1.007E+4	0.007
220.1	1.286	1.067E+4	0.
233.3	1.281		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.939

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.19E-5	cm/sec
y0	1.423	ft

T = K*b = 0.004797 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	1.089E-5	4.311E-7	+/- 8.527E-7	25.27	cm/sec
y0	1.392	0.01211	+/- 0.02395	115.	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.00439 cm²/sec

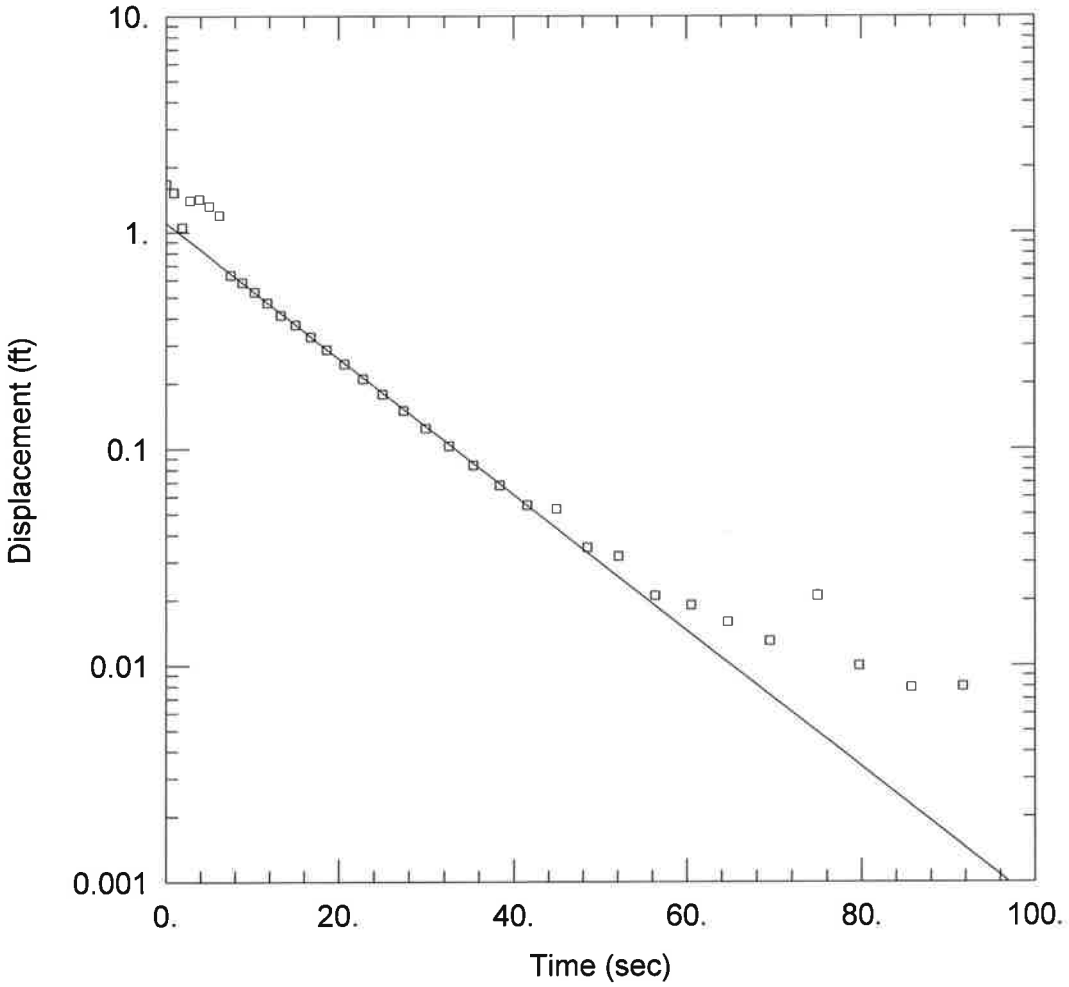
Parameter Correlations

	K	y0
K	1.00	0.44
y0	0.44	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 1.37 ft^2
Variance . . . . . 0.01046 ft^2
Std. Deviation . . . . . 0.1023 ft
Mean . . . . . 0.000179 ft
No. of Residuals 133
No. of Estimates 2



P-10-18SD FH1

Data Set: T:\...\P-10-18SD FH1.aqt
Date: 04/15/19 Time: 15:39:35

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-10-18SD
Test Date: 3-4-2019

AQUIFER DATA

Saturated Thickness: 12.63 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-10-18SD)

Initial Displacement: 1.666 ft
Total Well Penetration Depth: 12.14 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 31.36 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.002273 cm/sec
y0 = 1.104 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-10-18
Title: P-10-18SD FH1
Date: 04/15/19
Time: 15:39:42

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-4-2019
Test Well: P-10-18SD

AQUIFER DATA

Saturated Thickness: 12.63 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-10-18SD

X Location: 11603. ft
Y Location: 14653. ft

Initial Displacement: 1.666 ft
Static Water Column Height: 31.36 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.14 ft

No. of Observations: 36

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.666	27.42	0.15
0.9	1.525	29.94	0.124
1.86	1.049	32.58	0.103
2.82	1.39	35.4	0.084
3.9	1.407	38.4	0.068
5.041	1.31	41.58	0.055
6.24	1.187	44.94	0.053
7.5	0.631	48.54	0.035
8.82	0.585	52.14	0.032
10.26	0.527	56.34	0.021
11.76	0.472	60.54	0.019
13.32	0.413	64.74	0.016
15.	0.372	69.54	0.013
16.8	0.328	74.94	0.021
18.66	0.286	79.74	0.01
20.7	0.246	85.74	0.008
22.8	0.21	91.74	0.008
25.02	0.178	97.74	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.914

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002273	cm/sec
y0	1.104	ft

T = K*b = 0.8752 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.00297	0.0002104	+/- 0.0004276	14.11	cm/sec
y0	1.675	0.06515	+/- 0.1324	25.7	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 1.143 cm²/sec

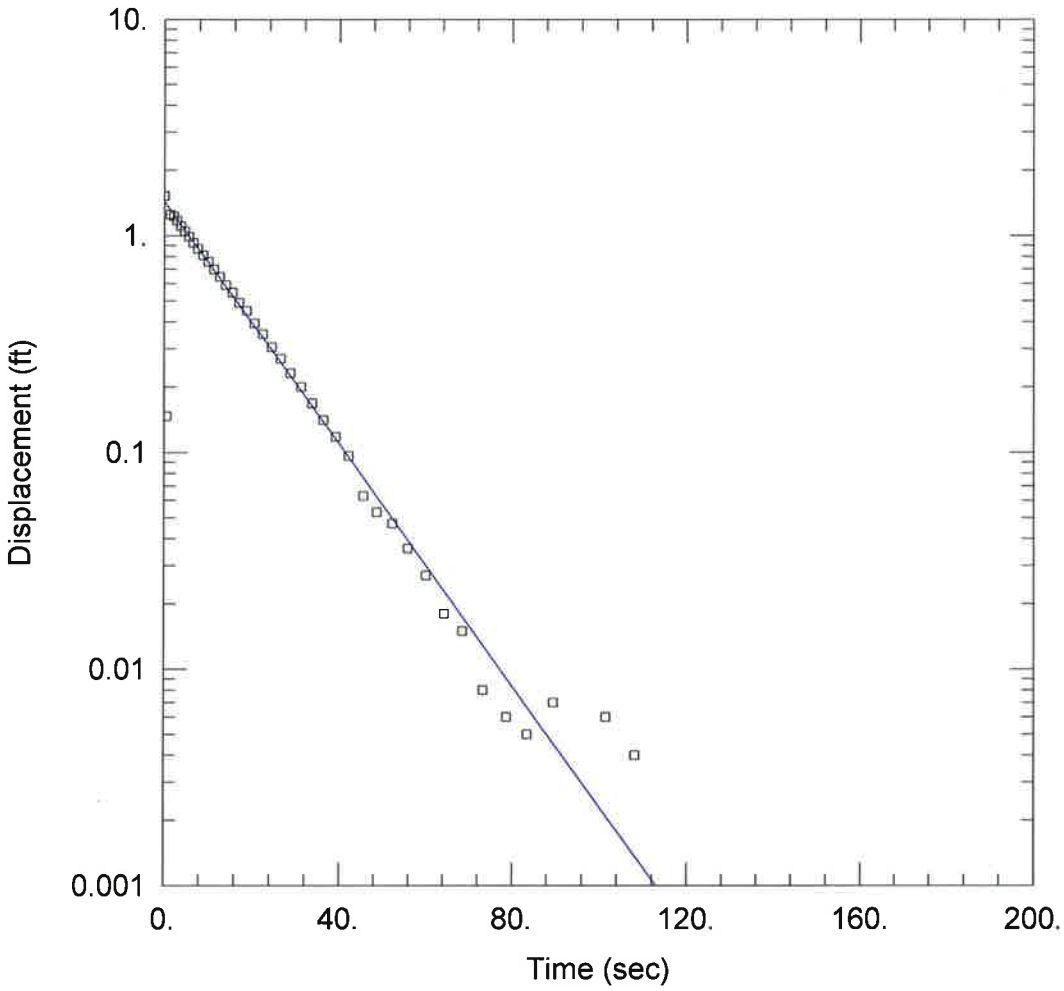
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.4278 ft^2
Variance . . . . . 0.01258 ft^2
Std. Deviation . . . . . 0.1122 ft
Mean . . . . . 0.005764 ft
No. of Residuals 36
No. of Estimates 2



P-10-18SD RH1

Data Set: T:\...\P-10-18SD RH1.aqt
Date: 04/09/19 Time: 15:56:22

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-10-18SD
Test Date: 3-4-2019

AQUIFER DATA

Saturated Thickness: 12.63 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-10-18SD)

Initial Displacement: 1.522 ft
Total Well Penetration Depth: 12.14 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 31.36 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.002025 cm/sec
y0 = 1.431 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-10-18
Title: P-10-18SD RH1
Date: 04/09/19
Time: 15:56:29

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-4-2019
Test Well: P-10-18SD

AQUIFER DATA

Saturated Thickness: 12.63 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-10-18SD

X Location: 11603. ft
Y Location: 14653. ft

Initial Displacement: 1.522 ft
Static Water Column Height: 31.36 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.14 ft

No. of Observations: 42

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.522	26.58	0.27
0.66	0.147	28.8	0.232
1.38	1.25	31.2	0.2
2.16	1.228	33.72	0.168
2.94	1.17	36.36	0.141
3.78	1.106	39.18	0.118
4.68	1.047	42.18	0.096
5.64	0.987	45.58	0.063
6.6	0.927	48.72	0.053
7.68	0.867	52.32	0.047
8.82	0.812	55.92	0.036
10.02	0.756	60.12	0.027
11.28	0.697	64.32	0.018
12.6	0.646	68.52	0.015
14.04	0.59	73.32	0.008
15.54	0.546	78.72	0.006
17.1	0.49	83.52	0.005
18.78	0.449	89.52	0.007
20.58	0.393	101.5	0.006
22.44	0.352	108.1	0.004
24.48	0.306	139.3	0.

SOLUTION

Slug Test
Aquifer Model: Confined

Solution Method: Bouwer-Rice
ln(Re/rw): 2.914

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002025	cm/sec
y0	1.431	ft

T = K*b = 0.7797 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.001651	0.0002085	+/- 0.0004215	7.916	cm/sec
y0	1.212	0.0762	+/- 0.154	15.91	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.6355 cm²/sec

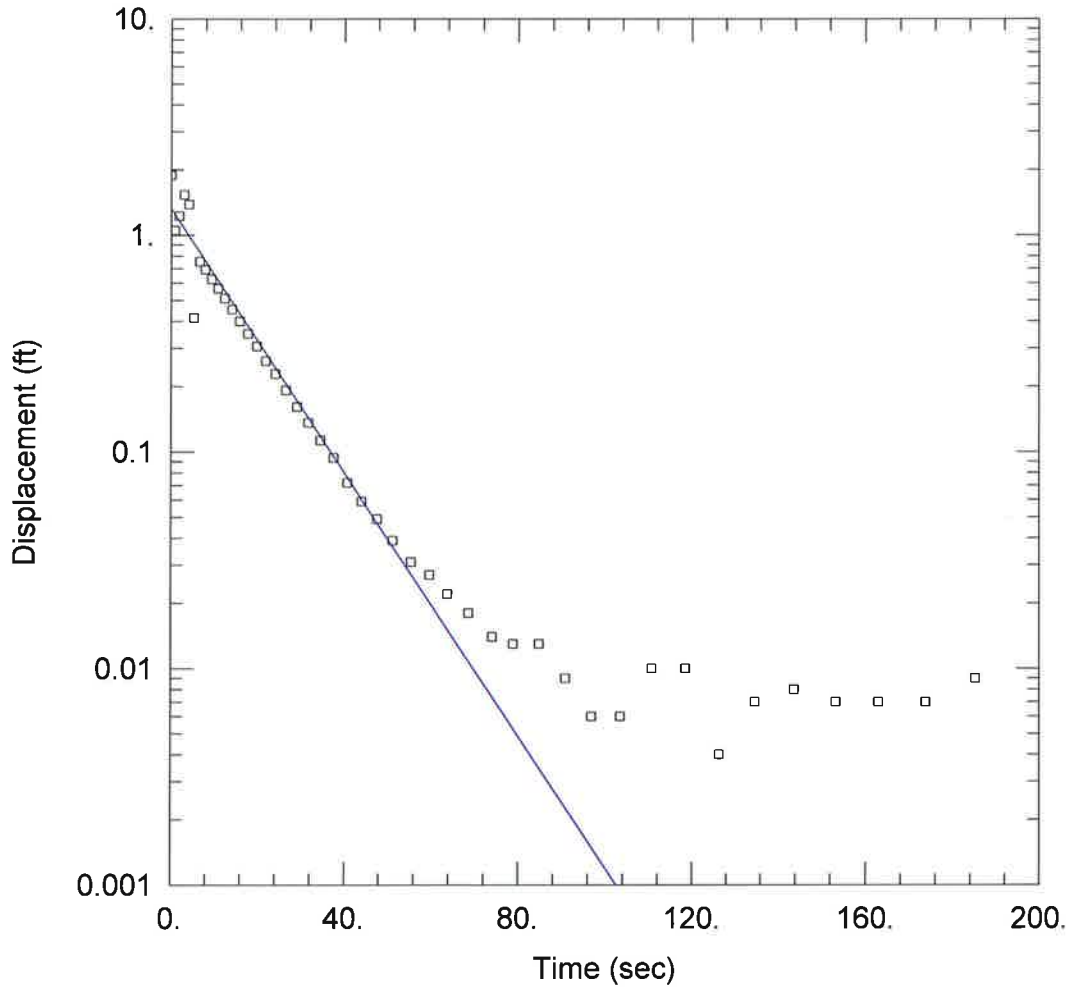
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 1.259 ft^2
Variance . . . . . 0.03149 ft^2
Std. Deviation . . . . . 0.1774 ft
Mean . . . . . -0.008012 ft
No. of Residuals 42
No. of Estimates 2



P-10-18SD FH2

Data Set: T:\...\P-10-18SD FH2.aqt
Date: 04/09/19 Time: 15:58:06

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-10-18SD
Test Date: 3-4-2019

AQUIFER DATA

Saturated Thickness: 12.63 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-10-18SD)

Initial Displacement: 1.89 ft
Total Well Penetration Depth: 12.14 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 31.36 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.002239 cm/sec
y0 = 1.32 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-10-18
Title: P-10-18SD FH2
Date: 04/09/19
Time: 15:58:12

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-4-2019
Test Well: P-10-18SD

AQUIFER DATA

Saturated Thickness: 12.63 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-10-18SD

X Location: 11603. ft
Y Location: 14653. ft

Initial Displacement: 1.89 ft
Static Water Column Height: 31.36 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.14 ft

No. of Observations: 46

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.89	44.04	0.059
0.961	1.052	47.64	0.049
1.921	1.224	51.24	0.039
3.001	1.536	55.44	0.031
4.141	1.383	59.64	0.027
5.341	0.415	63.84	0.022
6.601	0.755	68.64	0.018
7.92	0.693	74.04	0.014
9.36	0.625	78.84	0.013
10.86	0.566	84.84	0.013
12.42	0.51	90.84	0.009
14.1	0.454	96.84	0.006
15.9	0.4	103.4	0.006
17.76	0.35	110.6	0.01
19.8	0.307	118.4	0.01
21.9	0.262	126.2	0.004
24.12	0.229	134.6	0.007
26.52	0.192	143.6	0.008
29.04	0.161	153.2	0.007
31.68	0.136	162.8	0.007
34.5	0.113	173.6	0.007
37.5	0.094	185.	0.009
40.68	0.072	197.	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.914

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002239	cm/sec
y0	1.32	ft

T = K*b = 0.862 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.002923	0.0002715	+/- 0.000547	10.77	cm/sec
y0	1.565	0.07994	+/- 0.1611	19.58	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 1.125 cm²/sec

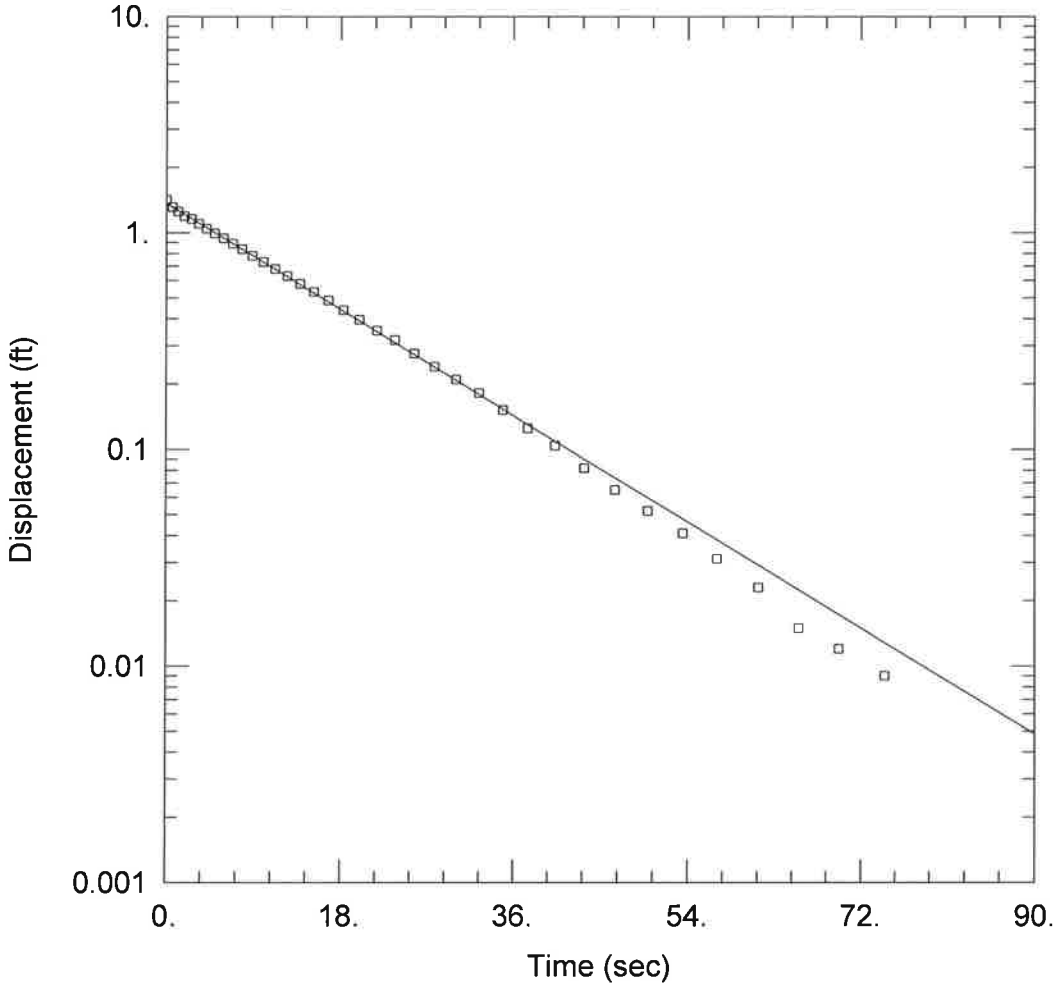
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.8195 ft^2
Variance . . . . . 0.01862 ft^2
Std. Deviation . . . . . 0.1365 ft
Mean . . . . . 0.01267 ft
No. of Residuals 46
No. of Estimates 2



P-10-18SD RH2

Data Set: T:\...\P-10-18SD RH2.aqt
Date: 04/04/19 Time: 15:07:05

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-10-18SD
Test Date: 3-4-2019

AQUIFER DATA

Saturated Thickness: 12.63 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-10-18SD)

Initial Displacement: 1.42 ft
Total Well Penetration Depth: 12.14 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 31.36 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.001972 cm/sec
y0 = 1.366 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-10-18
Title: P-10-18SD RH2
Date: 04/04/19
Time: 15:07:13

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-4-2019
Test Well: P-10-18SD

AQUIFER DATA

Saturated Thickness: 12.63 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-10-18SD

X Location: 11603. ft
Y Location: 14653. ft

Initial Displacement: 1.42 ft
Static Water Column Height: 31.36 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.14 ft

No. of Observations: 39

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.42	21.78	0.353
0.6	1.311	23.64	0.319
1.2	1.251	25.68	0.277
1.86	1.193	27.78	0.241
2.58	1.156	30.	0.21
3.36	1.097	32.4	0.182
4.14	1.043	34.92	0.152
4.98	0.993	37.56	0.125
5.88	0.941	40.38	0.104
6.84	0.889	43.38	0.082
7.8	0.839	46.56	0.065
8.88	0.782	49.92	0.052
10.02	0.731	53.52	0.041
11.22	0.678	57.12	0.031
12.48	0.63	61.32	0.023
13.8	0.58	65.52	0.015
15.24	0.533	69.72	0.012
16.74	0.486	74.52	0.009
18.3	0.439	84.72	0.
19.98	0.396		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice

ln(Re/rw): 2.914

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002113	cm/sec
y0	1.449	ft

T = K*b = 0.8134 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.001972	1.45E-5	+/- 2.938E-5	136.	cm/sec
y0	1.366	0.00503	+/- 0.01019	271.6	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.7592 cm²/sec

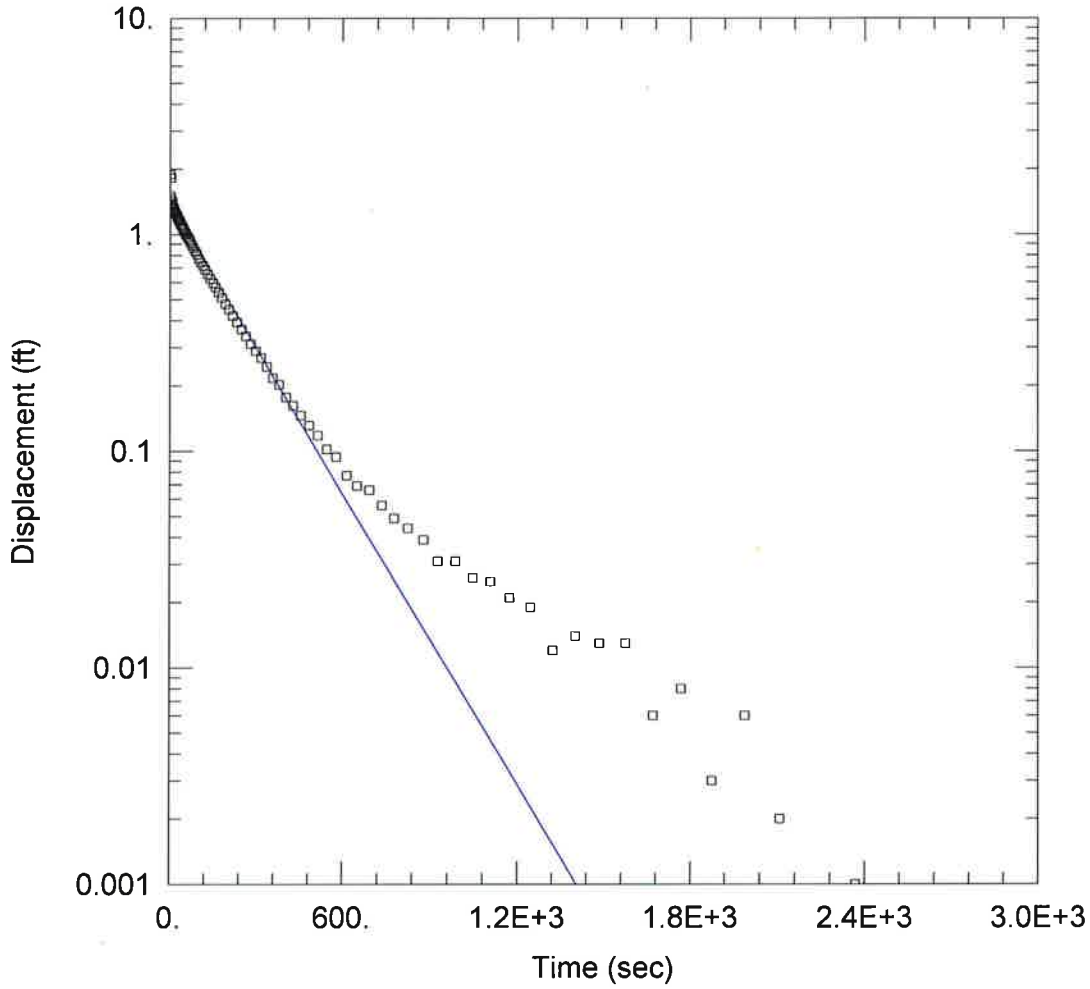
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.004891 ft^2
Variance . . . . . 0.0001322 ft^2
Std. Deviation . . . . . 0.0115 ft
Mean . . . . . -0.001237 ft
No. of Residuals 39
No. of Estimates 2



P-11-18SD FH1

Data Set: T:\...\P-11-18SD FH1.aqt
Date: 04/09/19 Time: 16:01:00

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-11-18SD
Test Date: 3-7-2019

AQUIFER DATA

Saturated Thickness: 8.71 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-11-18SD)

Initial Displacement: 1.889 ft
Total Well Penetration Depth: 9.56 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 45.99 ft
Screen Length: 9.56 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001795 cm/sec
y0 = 1.401 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-11-18
Title: P-11-18SD FH1
Date: 04/09/19
Time: 16:01:07

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-7-2019
Test Well: P-11-18SD

AQUIFER DATA

Saturated Thickness: 8.71 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-11-18SD

X Location: 12392. ft
Y Location: 14546. ft

Initial Displacement: 1.889 ft
Static Water Column Height: 45.99 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.56 ft
Total Well Penetration Depth: 9.56 ft

No. of Observations: 84

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.889	205.5	0.449
1.2	1.505	218.7	0.42
2.46	1.456	233.1	0.392
3.78	1.828	248.1	0.364
5.22	1.389	263.7	0.338
6.72	1.423	280.5	0.312
8.28	1.358	298.5	0.289
9.96	1.337	317.1	0.269
11.76	1.321	337.5	0.245
13.62	1.302	358.5	0.217
15.66	1.282	380.7	0.202
17.76	1.262	404.7	0.177
19.98	1.245	429.9	0.162
22.38	1.223	456.3	0.146
24.9	1.207	484.5	0.131
27.54	1.185	514.5	0.118
30.36	1.158	546.3	0.102
33.36	1.148	579.9	0.094
36.54	1.118	615.9	0.077
39.9	1.097	651.9	0.069
43.5	1.071	693.9	0.066
47.1	1.051	735.9	0.056
51.3	1.024	777.9	0.049
55.5	1.	825.9	0.044
59.7	0.972	879.9	0.039
64.5	0.947	927.9	0.031

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
69.9	0.923	987.9	0.031
74.7	0.891	1047.9	0.026
80.7	0.865	1107.9	0.025
86.7	0.833	1173.9	0.021
92.7	0.808	1245.9	0.019
99.3	0.771	1323.9	0.012
106.5	0.741	1401.9	0.014
114.3	0.716	1485.9	0.013
122.1	0.688	1575.9	0.013
130.5	0.653	1671.9	0.006
139.5	0.624	1767.9	0.008
149.1	0.594	1875.9	0.003
158.7	0.569	1989.9	0.006
169.5	0.538	2109.9	0.002
180.9	0.508	2367.9	0.001
192.9	0.477	2511.9	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.909

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001795	cm/sec
y0	1.401	ft

T = K*b = 0.04766 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0002103	7.215E-6	+/- 1.435E-5	29.14	cm/sec
y0	1.464	0.01939	+/- 0.03857	75.49	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.05582 cm²/sec

Parameter Correlations

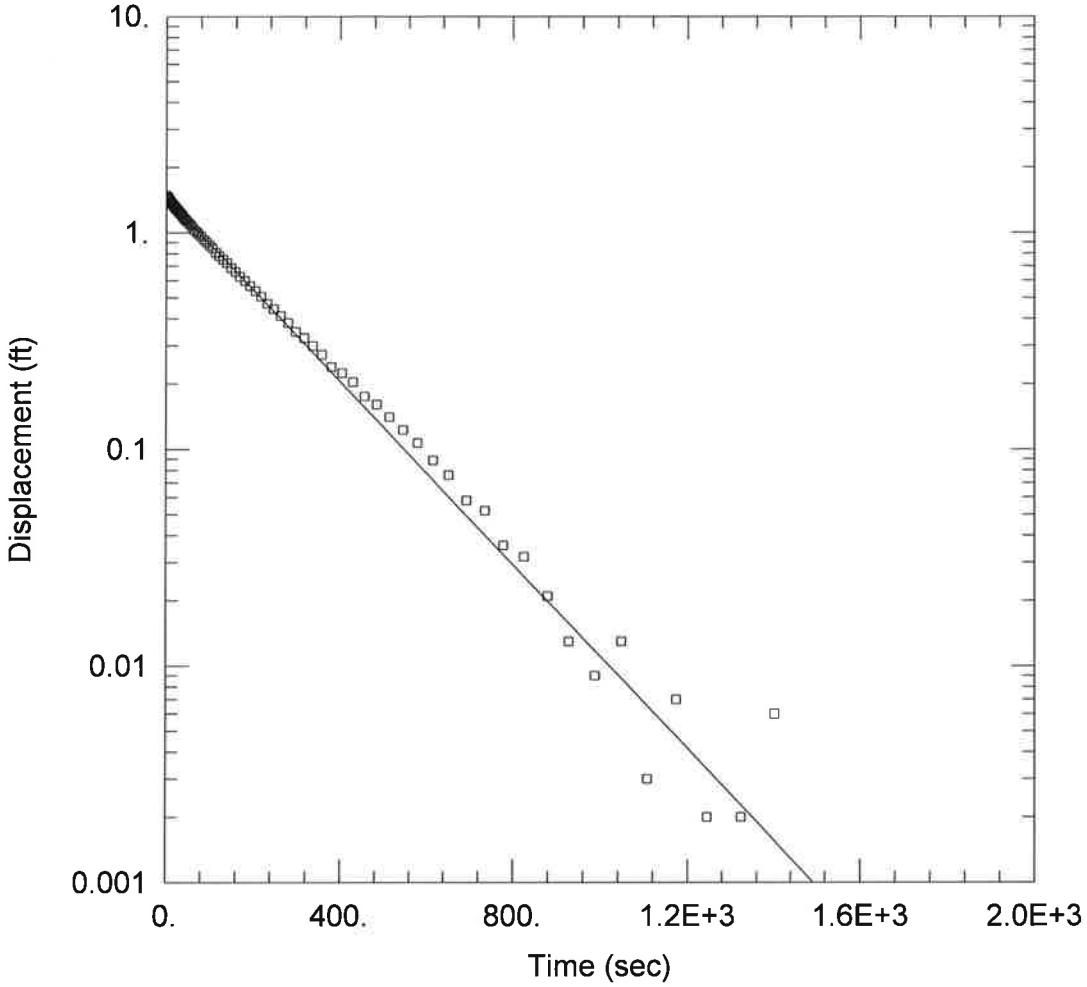
	K	y0
K	1.00	0.62
y0	0.62	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.4562 ft^2
Variance . . . . . 0.005563 ft^2
Std. Deviation . . . . . 0.07459 ft
Mean . . . . . 0.01138 ft
No. of Residuals 84

No. of Estimates 2



P-11-18SD RH1

Data Set: T:\...\P-11-18SD RH1.aqt
Date: 04/04/19 Time: 15:32:32

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-11-18SD
Test Date: 3-7-2019

AQUIFER DATA

Saturated Thickness: 8.71 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-11-18SD)

Initial Displacement: 1.482 ft
Total Well Penetration Depth: 9.56 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 45.99 ft
Screen Length: 9.56 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001698 cm/sec
y0 = 1.444 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-11-18
Title: P-11-18SD RH1
Date: 04/04/19
Time: 15:32:39

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-7-2019
Test Well: P-11-18SD

AQUIFER DATA

Saturated Thickness: 8.71 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-11-18SD

X Location: 12392. ft
Y Location: 14546. ft

Initial Displacement: 1.482 ft
Static Water Column Height: 45.99 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.56 ft
Total Well Penetration Depth: 9.56 ft

No. of Observations: 76

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.482	158.7	0.659
1.2	1.473	169.5	0.625
2.46	1.463	180.9	0.599
3.78	1.445	192.9	0.566
5.22	1.431	205.5	0.536
6.72	1.419	218.7	0.506
8.28	1.405	233.1	0.47
9.96	1.386	248.1	0.443
11.76	1.371	263.7	0.412
13.62	1.358	280.5	0.383
15.66	1.342	298.5	0.348
17.76	1.324	317.1	0.326
19.98	1.311	337.5	0.299
22.38	1.29	358.5	0.273
24.9	1.275	380.7	0.24
27.54	1.258	404.7	0.225
30.36	1.234	429.9	0.204
33.36	1.221	456.3	0.175
36.54	1.196	484.5	0.161
39.9	1.172	514.5	0.141
43.5	1.15	546.3	0.123
47.1	1.132	579.9	0.107
51.3	1.101	615.9	0.089
55.5	1.087	651.9	0.076
59.7	1.061	693.9	0.058
64.5	1.027	735.9	0.052

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
69.9	1.004	777.9	0.036
74.7	0.98	825.9	0.032
80.7	0.959	879.9	0.021
86.7	0.926	927.9	0.013
92.7	0.9	987.9	0.009
99.3	0.873	1047.9	0.013
106.5	0.847	1107.9	0.003
114.3	0.808	1173.9	0.007
122.1	0.777	1245.9	0.002
130.5	0.749	1323.9	0.002
139.5	0.724	1401.9	0.006
149.1	0.686	1485.9	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.909

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001513	cm/sec
y0	1.439	ft

T = K*b = 0.04016 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0001698	1.279E-6	+/- 2.548E-6	132.7	cm/sec
y0	1.444	0.004054	+/- 0.008076	356.3	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.04507 cm²/sec

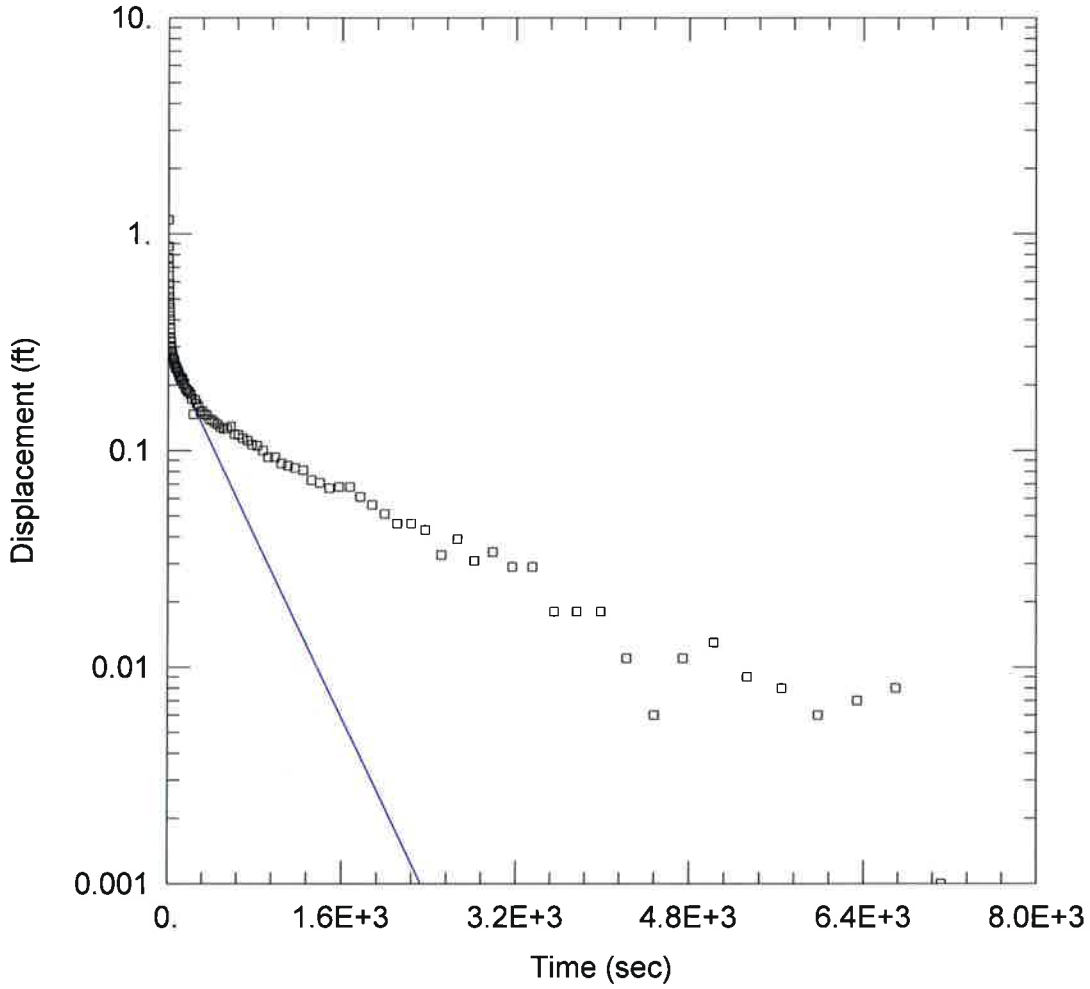
Parameter Correlations

	K	y0
K	1.00	0.61
y0	0.61	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.02025 ft^2
Variance . . . . . 0.0002736 ft^2
Std. Deviation . . . . . 0.01654 ft
Mean . . . . . 0.002689 ft
No. of Residuals 76
No. of Estimates 2



P-12-18IT FH1

Data Set: T:\...\P-12-18IT FH1.aqt
Date: 04/15/19 Time: 15:43:47

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-12-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 12.29 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-12-18IT)

Initial Displacement: 1.16 ft
Total Well Penetration Depth: 11.72 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 18.77 ft
Screen Length: 9.57 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 7.612E-5 cm/sec
y0 = 0.282 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-12-18
Title: P-12-18IT FH1
Date: 04/15/19
Time: 15:43:54

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-12-18IT

AQUIFER DATA

Saturated Thickness: 12.29 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-12-18IT

X Location: 13210. ft
Y Location: 14641. ft

Initial Displacement: 1.16 ft
Static Water Column Height: 18.77 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.57 ft
Total Well Penetration Depth: 11.72 ft

No. of Observations: 106

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.16	360.7	0.146
1.08	0.875	382.9	0.139
2.22	0.776	406.9	0.138
3.42	0.7	432.1	0.135
4.68	0.64	458.5	0.132
6.	0.586	486.7	0.128
7.44	0.546	516.7	0.126
8.94	0.511	548.5	0.126
10.5	0.482	582.1	0.129
12.18	0.456	618.1	0.119
13.98	0.431	654.1	0.118
15.84	0.404	696.1	0.114
17.88	0.365	738.1	0.111
19.98	0.349	780.1	0.106
22.2	0.329	828.1	0.105
24.6	0.316	882.1	0.1
27.12	0.305	930.1	0.093
29.76	0.297	990.1	0.093
32.58	0.288	1050.1	0.087
35.58	0.284	1110.1	0.085
38.76	0.278	1176.1	0.083
42.12	0.269	1248.1	0.081
45.72	0.266	1326.1	0.073
49.32	0.264	1404.1	0.071
53.52	0.253	1488.1	0.067
57.72	0.26	1578.1	0.068

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
61.92	0.251	1674.1	0.068
66.72	0.244	1770.1	0.061
72.12	0.239	1878.1	0.056
76.92	0.242	1992.1	0.051
82.92	0.239	2112.1	0.046
88.92	0.233	2238.1	0.046
94.92	0.229	2370.1	0.043
101.5	0.22	2514.1	0.033
108.7	0.22	2664.1	0.039
116.5	0.211	2820.1	0.031
124.3	0.216	2988.1	0.034
132.7	0.215	3168.1	0.029
141.7	0.202	3354.1	0.029
151.3	0.204	3558.1	0.018
160.9	0.192	3768.1	0.018
171.7	0.192	3990.1	0.018
183.1	0.187	4230.1	0.011
195.1	0.187	4482.1	0.006
207.7	0.182	4746.1	0.011
220.9	0.173	5028.1	0.013
235.3	0.147	5328.1	0.009
250.3	0.171	5646.1	0.008
265.9	0.164	5982.1	0.006
282.7	0.16	6342.1	0.007
300.7	0.151	6702.1	0.008
319.3	0.152	7122.1	0.001
339.7	0.147	7542.1	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.879

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	7.612E-5	cm/sec
y0	0.282	ft

T = K*b = 0.02852 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0003144	4.118E-5	+/- 8.166E-5	7.634	cm/sec
y0	0.584	0.03156	+/- 0.06258	18.5	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1178 cm²/sec

Parameter Correlations

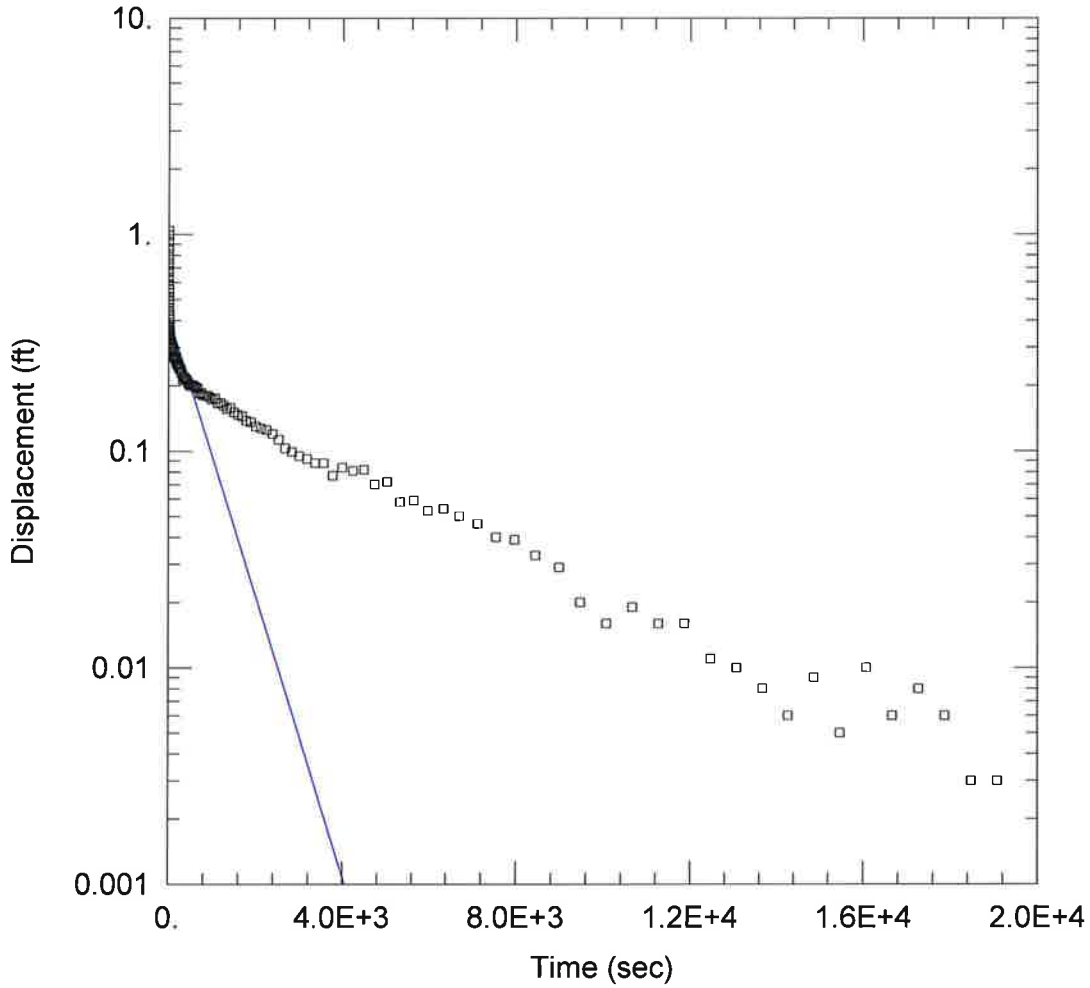
	K	y0
K	1.00	0.64

y0 0.64 1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 1.218 ft^2
Variance . . . . . 0.01171 ft^2
Std. Deviation . . . . . 0.1082 ft
Mean . . . . . 0.04075 ft
No. of Residuals 106
No. of Estimates 2



P-12-18IT RH1

Data Set: T:\...\P-12-18IT RH1.aqt
Date: 04/09/19 Time: 16:06:53

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-12-18IT
Test Date: 2/20/2019-2/21/2019

AQUIFER DATA

Saturated Thickness: 12.29 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-12-18IT)

Initial Displacement: 1.042 ft
Total Well Penetration Depth: 11.72 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 18.77 ft
Screen Length: 9.57 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 4.67E-5 cm/sec
y0 = 0.4158 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-12-18
Title: P-12-18IT RH1
Date: 04/09/19
Time: 16:06:58

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2/20/2019-2/21/2019
Test Well: P-12-18IT

AQUIFER DATA

Saturated Thickness: 12.29 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-12-18IT

X Location: 13210. ft
Y Location: 14641. ft

Initial Displacement: 1.042 ft
Static Water Column Height: 18.77 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.57 ft
Total Well Penetration Depth: 11.72 ft

No. of Observations: 140

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.042	467.9	0.203
0.54	0.991	496.1	0.2
1.02	0.922	526.1	0.202
1.62	0.86	557.9	0.201
2.22	0.807	591.5	0.199
2.82	0.765	627.5	0.196
3.48	0.719	663.5	0.195
4.2	0.68	705.5	0.184
4.98	0.635	747.5	0.186
5.76	0.613	789.5	0.181
6.6	0.588	837.5	0.18
7.5	0.558	891.5	0.18
8.46	0.537	939.5	0.177
9.42	0.517	999.5	0.173
10.5	0.497	1059.5	0.175
11.64	0.478	1119.5	0.166
12.84	0.459	1185.5	0.167
14.1	0.445	1257.5	0.162
15.42	0.428	1335.5	0.156
16.86	0.418	1413.5	0.159
18.36	0.404	1497.5	0.151
19.92	0.392	1587.5	0.147
21.6	0.381	1683.5	0.145
23.4	0.375	1779.5	0.138
25.26	0.363	1887.5	0.136
27.3	0.355	2001.5	0.13

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
29.4	0.348	2121.5	0.127
31.62	0.344	2247.5	0.125
34.02	0.339	2379.5	0.12
36.54	0.334	2523.5	0.113
39.18	0.329	2673.5	0.103
42.	0.326	2829.5	0.099
45.	0.323	2997.5	0.095
48.18	0.315	3177.5	0.092
51.54	0.315	3363.5	0.088
55.14	0.312	3567.5	0.088
58.74	0.309	3777.5	0.077
62.94	0.309	3999.5	0.084
67.14	0.301	4239.5	0.081
71.34	0.298	4491.5	0.082
76.14	0.296	4755.5	0.07
81.54	0.288	5037.5	0.072
86.34	0.297	5337.5	0.058
92.34	0.286	5655.5	0.059
98.34	0.293	5991.5	0.053
104.3	0.284	6351.5	0.054
110.9	0.278	6711.5	0.05
118.1	0.274	7131.5	0.046
125.9	0.273	7551.5	0.04
133.7	0.27	7971.5	0.039
142.1	0.267	8451.5	0.033
151.1	0.27	8991.5	0.029
160.7	0.269	9471.5	0.02
170.3	0.262	1.007E+4	0.016
181.1	0.255	1.067E+4	0.019
192.5	0.253	1.127E+4	0.016
204.5	0.251	1.187E+4	0.016
217.1	0.25	1.247E+4	0.011
230.3	0.242	1.307E+4	0.01
244.7	0.243	1.367E+4	0.008
259.7	0.238	1.427E+4	0.006
275.3	0.238	1.487E+4	0.009
292.1	0.231	1.547E+4	0.005
310.1	0.227	1.607E+4	0.01
328.7	0.213	1.667E+4	0.006
349.1	0.22	1.727E+4	0.008
370.1	0.218	1.787E+4	0.006
392.3	0.214	1.847E+4	0.003
416.3	0.213	1.907E+4	0.003
441.5	0.207	1.967E+4	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.879

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.67E-5	cm/sec
y0	0.4158	ft

T = K*b = 0.01749 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	7.771E-5	1.114E-5	+/- 2.203E-5	6.975	cm/sec
y0	0.5037	0.02116	+/- 0.04183	23.8	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02911 cm²/sec

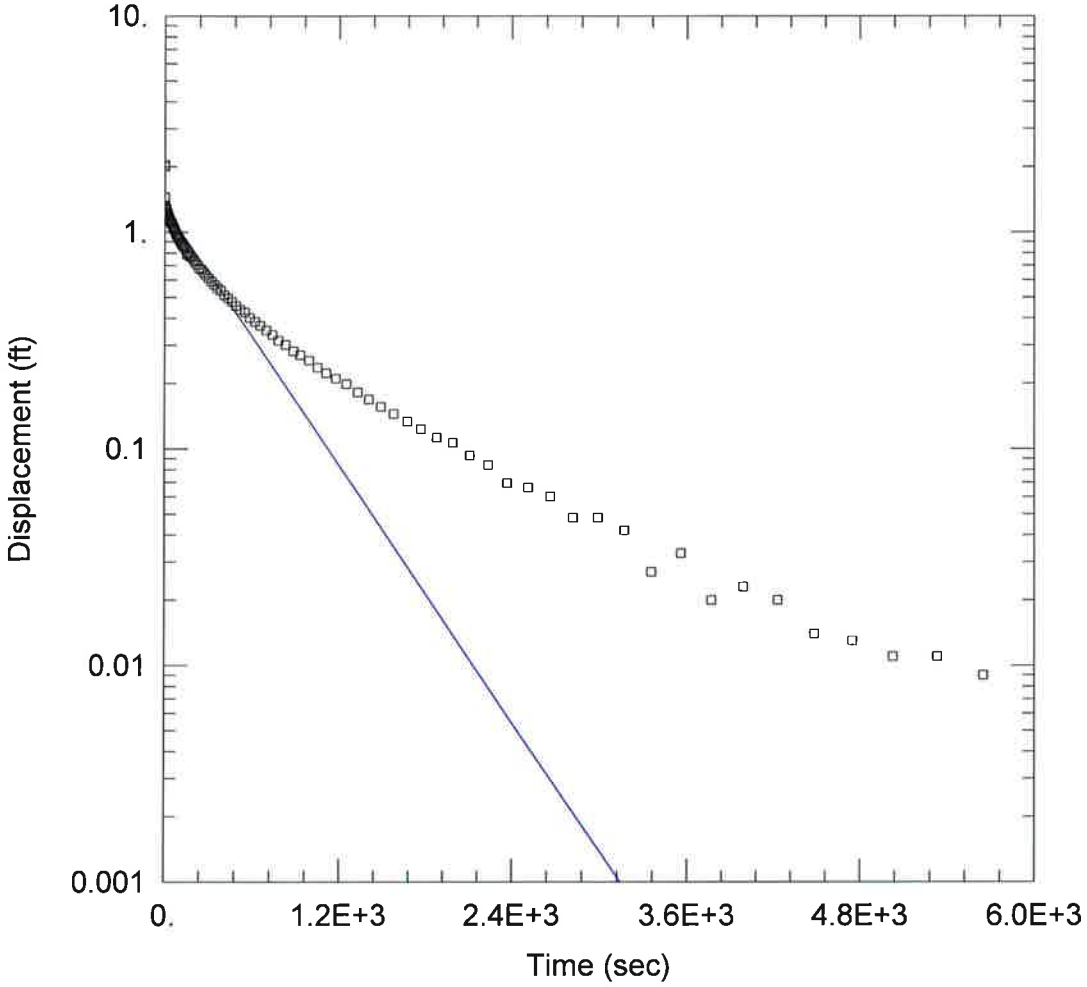
Parameter Correlations

	K	y0
K	1.00	0.54
y0	0.54	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 2.103 ft^2
Variance . . . . . 0.01524 ft^2
Std. Deviation . . . . . 0.1234 ft
Mean . . . . . 0.02993 ft
No. of Residuals 140
No. of Estimates 2



P-12-18SD FH1

Data Set: T:\...\P-12-18SD FH1.aqt
Date: 04/09/19 Time: 13:15:54

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-12-18SD
Test Date: 3-6-2019

AQUIFER DATA

Saturated Thickness: 11.78 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-12-18SD)

Initial Displacement: 2.046 ft
Total Well Penetration Depth: 11.2 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 29.41 ft
Screen Length: 9.61 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
K = 7.051E-5 cm/sec
Solution Method: Bouwer-Rice
y0 = 1.284 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-12-18
Title: P-12-18SD FH1
Date: 04/09/19
Time: 13:16:01

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-6-2019
Test Well: P-12-18SD

AQUIFER DATA

Saturated Thickness: 11.78 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-12-18SD

X Location: 13210. ft
Y Location: 14646. ft

Initial Displacement: 2.046 ft
Static Water Column Height: 29.41 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.61 ft
Total Well Penetration Depth: 11.2 ft

No. of Observations: 103

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	2.046	320.3	0.591
0.96	2.001	340.7	0.571
2.04	1.447	361.7	0.552
3.18	1.315	383.9	0.536
4.38	1.306	407.9	0.512
5.64	1.291	433.1	0.495
6.96	1.291	459.5	0.476
8.4	1.281	487.7	0.456
9.9	1.267	517.7	0.437
11.46	1.262	549.5	0.425
13.14	1.242	583.1	0.402
14.94	1.24	619.1	0.385
16.8	1.228	655.1	0.37
18.84	1.212	697.1	0.351
20.94	1.209	739.1	0.335
23.16	1.191	781.1	0.315
25.56	1.185	829.1	0.301
28.08	1.165	883.1	0.282
30.72	1.16	931.1	0.27
33.54	1.146	991.1	0.255
36.54	1.129	1051.1	0.237
39.72	1.115	1111.1	0.223
43.08	1.103	1177.1	0.211
46.68	1.093	1249.1	0.199
50.36	1.091	1327.1	0.182
54.48	1.067	1405.1	0.169

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
58.68	1.051	1489.1	0.156
62.88	1.038	1579.1	0.145
67.68	1.022	1675.1	0.133
73.08	1.007	1771.1	0.123
77.88	0.983	1879.1	0.112
83.88	0.971	1993.1	0.106
89.88	0.949	2113.1	0.093
95.88	0.939	2239.1	0.084
102.5	0.917	2371.1	0.069
109.7	0.899	2515.1	0.066
117.5	0.881	2665.1	0.06
125.3	0.865	2821.1	0.048
133.7	0.853	2989.1	0.048
142.7	0.836	3169.1	0.042
152.3	0.785	3355.1	0.027
161.9	0.802	3559.1	0.033
172.7	0.774	3769.1	0.02
184.1	0.764	3991.1	0.023
196.1	0.748	4231.1	0.02
208.7	0.727	4483.1	0.014
221.9	0.705	4747.1	0.013
236.3	0.68	5029.1	0.011
251.3	0.669	5329.1	0.011
266.9	0.65	5647.1	0.009
283.7	0.63	5983.1	0.
301.7	0.611		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.853

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0001307	cm/sec
y0	1.375	ft

T = K*b = 0.04693 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	7.051E-5	4.235E-6	+/- 8.403E-6	16.65	cm/sec
y0	1.284	0.02472	+/- 0.04903	51.95	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02532 cm²/sec

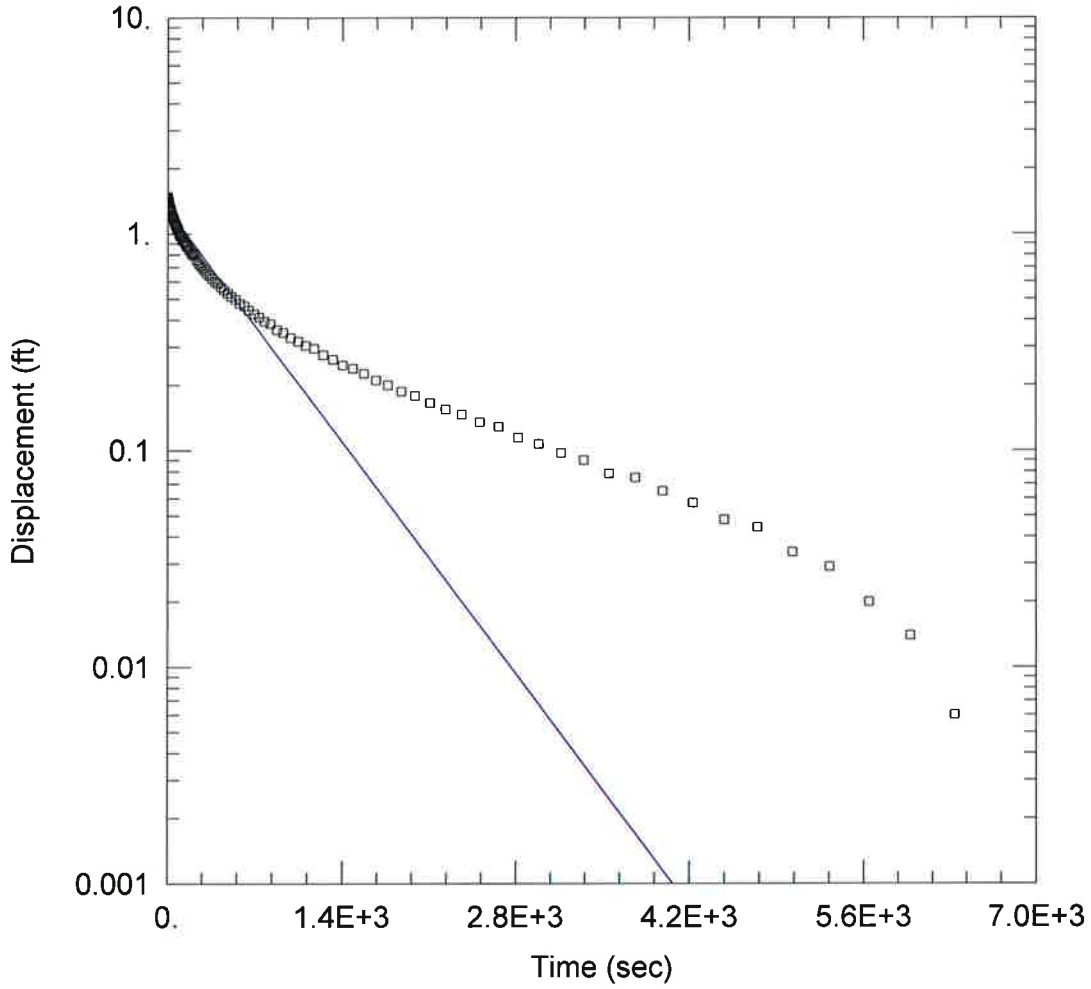
Parameter Correlations

	K	y0
K	1.00	0.57
y0	0.57	1.00

Residual Statistics

for weighted residuals

Sum of Squares	1.628 ft^2
Variance	0.01612 ft^2
Std. Deviation	0.127 ft
Mean	0.02143 ft
No. of Residuals	103
No. of Estimates	2



P-12-18SD RH1

Data Set: T:\...\P-12-18SD RH1.aqt
Date: 04/04/19 Time: 16:40:24

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-12-18SD
Test Date: 3/6/2019-3/7/2019

AQUIFER DATA

Saturated Thickness: 11.78 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-12-18SD)

Initial Displacement: 1.482 ft
Total Well Penetration Depth: 11.2 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 29.41 ft
Screen Length: 9.61 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 5.452E-5 cm/sec
y0 = 1.291 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-12-18
Title: P-12-18SD RH1
Date: 04/04/19
Time: 16:40:32

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3/6/2019-3/7/2019
Test Well: P-12-18SD

AQUIFER DATA

Saturated Thickness: 11.78 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-12-18SD

X Location: 13210. ft
Y Location: 14646. ft

Initial Displacement: 1.482 ft
Static Water Column Height: 29.41 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.61 ft
Total Well Penetration Depth: 11.2 ft

No. of Observations: 103

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.482	359.6	0.622
1.141	1.47	381.8	0.602
2.341	1.456	405.8	0.588
3.601	1.441	431.	0.566
4.921	1.421	457.4	0.549
6.361	1.409	485.6	0.531
7.861	1.394	515.6	0.514
9.421	1.38	547.4	0.496
11.1	1.365	581.	0.477
12.9	1.344	617.	0.464
14.76	1.338	653.	0.443
16.8	1.324	695.	0.426
18.9	1.31	737.	0.411
21.12	1.29	779.	0.393
23.52	1.279	827.	0.384
26.04	1.266	881.	0.36
28.68	1.25	929.	0.349
31.5	1.231	989.	0.331
34.5	1.22	1049.	0.318
37.68	1.204	1109.	0.305
41.04	1.192	1175.	0.295
44.64	1.179	1247.	0.276
48.24	1.164	1325.	0.263
52.44	1.142	1403.	0.247
56.64	1.126	1487.	0.239
60.84	1.11	1577.	0.226

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
65.64	1.094	1673.	0.211
71.04	1.076	1769.	0.2
75.84	1.061	1877.	0.187
81.84	1.043	1991.	0.178
87.84	1.027	2111.	0.165
93.84	0.986	2237.	0.154
100.4	0.993	2369.	0.146
107.6	0.978	2513.	0.135
115.4	0.958	2663.	0.128
123.2	0.928	2819.	0.114
131.6	0.924	2987.	0.107
140.6	0.905	3167.	0.097
150.2	0.884	3353.	0.09
159.8	0.873	3557.	0.078
170.6	0.85	3767.	0.075
182.	0.831	3989.	0.065
194.	0.811	4229.	0.057
206.6	0.793	4481.	0.048
219.8	0.805	4745.	0.044
234.2	0.755	5027.	0.034
249.2	0.73	5327.	0.029
264.8	0.713	5645.	0.02
281.6	0.696	5981.	0.014
299.6	0.677	6341.	0.006
318.2	0.656	6701.	0.
338.6	0.641		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.853

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.291E-5	cm/sec
y0	0.9854	ft

T = K*b = 0.008226 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	5.452E-5	2.364E-6	+/- 4.69E-6	23.06	cm/sec
y0	1.291	0.01755	+/- 0.03482	73.53	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.01957 cm²/sec

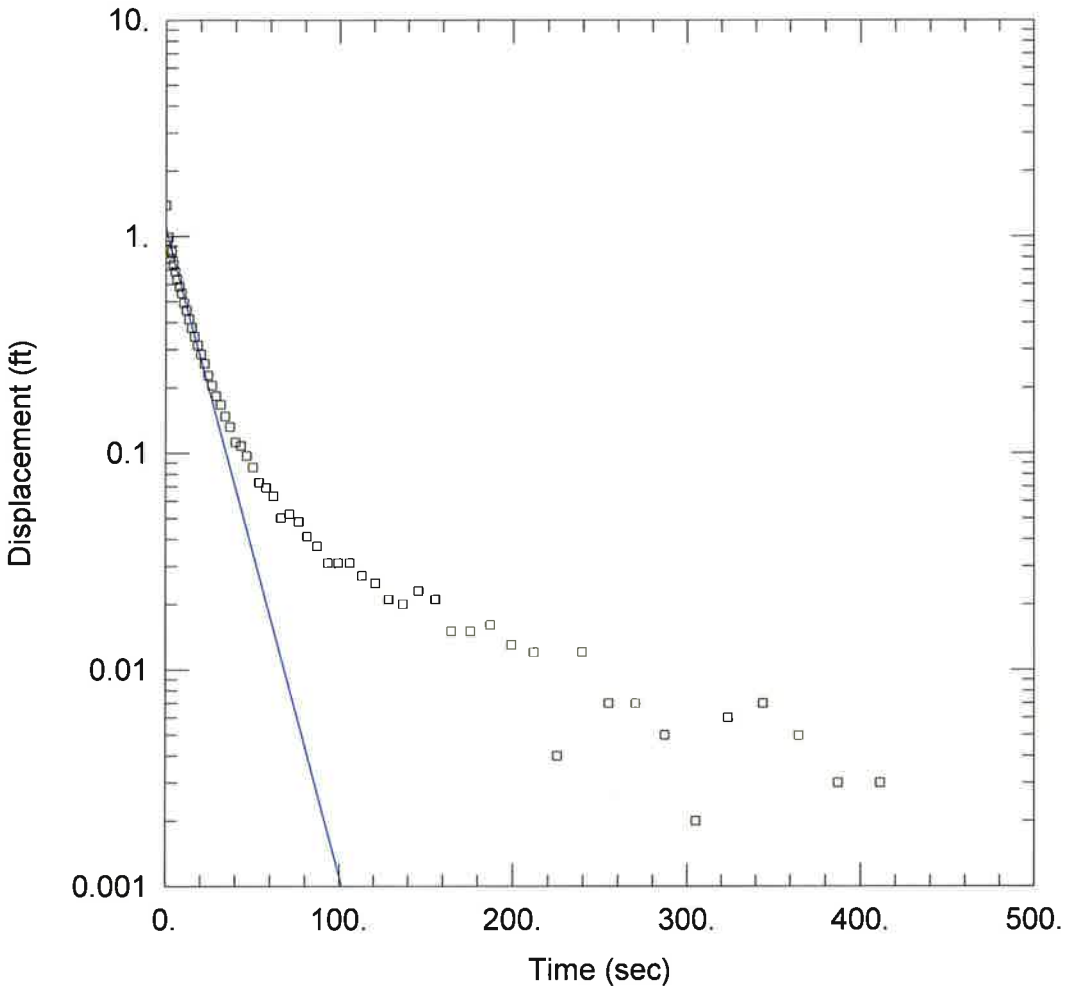
Parameter Correlations

	K	y0
K	1.00	0.56
y0	0.56	1.00

Residual Statistics

for weighted residuals

Sum of Squares	0.8743 ft^2
Variance	0.008657 ft^2
Std. Deviation	0.09304 ft
Mean	0.02632 ft
No. of Residuals	103
No. of Estimates	2



P-13-18IT FH1

Data Set: T:\...\P-13-18IT FH1.aqt
Date: 04/05/19 Time: 05:22:36

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-13-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 7.54 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-18IT)

Initial Displacement: 1.391 ft
Total Well Penetration Depth: 7.08 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 17.29 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.003631 cm/sec
y0 = 1.086 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-13-18
Title: P-13-18IT FH1
Date: 04/05/19
Time: 05:22:44

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-13-18IT

AQUIFER DATA

Saturated Thickness: 7.54 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-13-18IT

X Location: 11532. ft
Y Location: 15107. ft

Initial Displacement: 1.391 ft
Static Water Column Height: 17.29 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 7.08 ft

No. of Observations: 62

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.391	66.36	0.05
0.781	0.954	71.16	0.052
1.621	0.989	76.56	0.048
2.521	0.791	81.36	0.041
3.481	0.848	87.36	0.037
4.441	0.741	93.36	0.031
5.521	0.685	99.36	0.031
6.661	0.631	106.	0.031
7.861	0.586	113.2	0.027
9.121	0.545	121.	0.025
10.44	0.493	128.8	0.021
11.88	0.455	137.2	0.02
13.38	0.414	146.2	0.023
14.94	0.379	155.8	0.021
16.62	0.344	165.4	0.015
18.42	0.314	176.2	0.015
20.28	0.285	187.6	0.016
22.32	0.259	199.6	0.013
24.42	0.228	212.2	0.012
26.64	0.205	225.4	0.004
29.04	0.183	239.8	0.012
31.56	0.167	254.8	0.007
34.2	0.148	270.4	0.007
37.02	0.132	287.2	0.005
40.02	0.112	305.2	0.002
43.2	0.108	323.8	0.006

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
46.56	0.097	344.2	0.007
50.16	0.086	365.2	0.005
53.76	0.073	387.4	0.003
57.96	0.069	411.4	0.003
62.16	0.063	436.6	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.364

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0007565	cm/sec
y0	0.3043	ft

T = K*b = 0.1739 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.003631	0.00017	+/- 0.0003399	21.37	cm/sec
y0	1.086	0.0267	+/- 0.05341	40.65	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.8345 cm²/sec

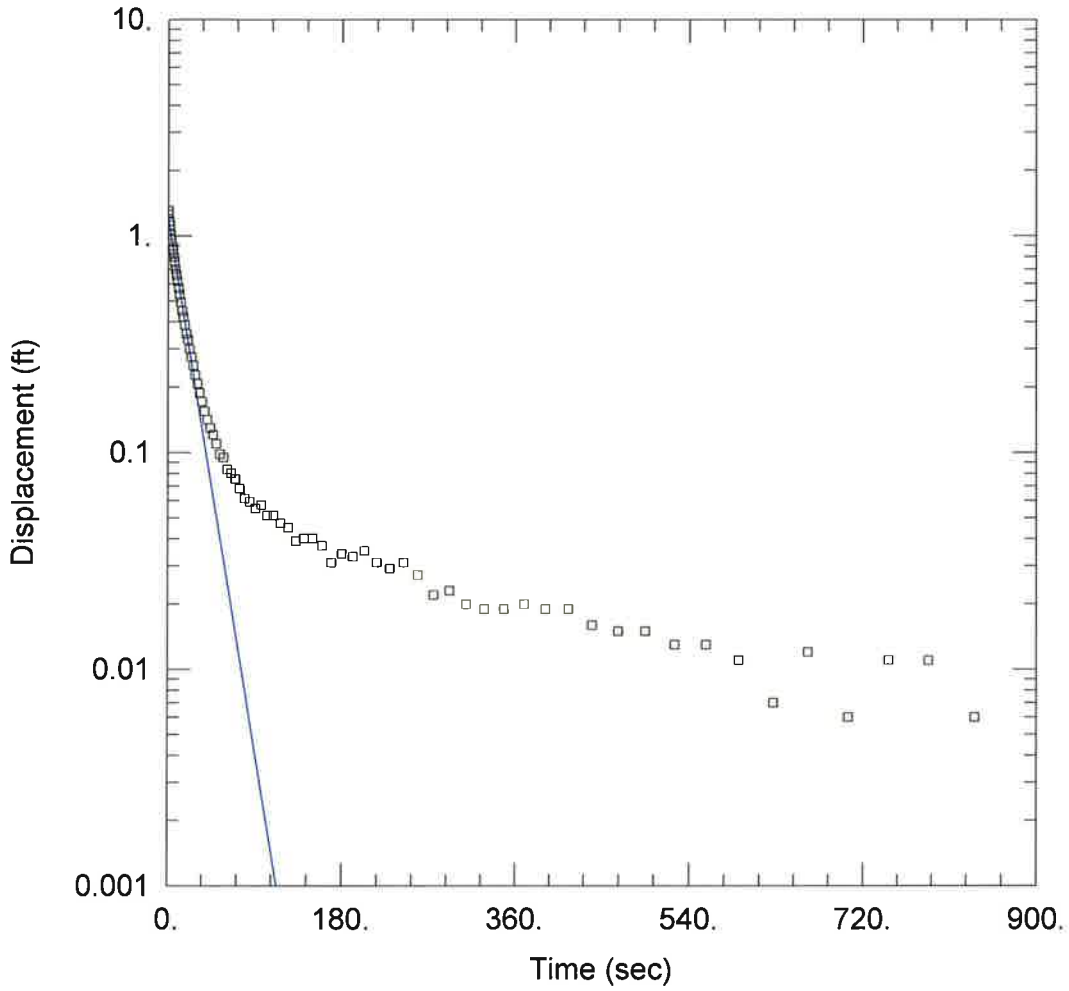
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.1713 ft^2
Variance . . . . . 0.002856 ft^2
Std. Deviation . . . . . 0.05344 ft
Mean . . . . . 0.01566 ft
No. of Residuals 62
No. of Estimates 2



P-13-18IT RH1

Data Set: T:\...\P-13-18IT RH1.aqt
Date: 04/05/19 Time: 05:28:09

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-13-18IT
Test Date: 2-20-2019

AQUIFER DATA

Saturated Thickness: 7.54 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-18IT)

Initial Displacement: 1.309 ft
Total Well Penetration Depth: 7.08 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 17.29 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.003301 cm/sec
y0 = 1.223 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-13-18
Title: P-13-18IT RH1
Date: 04/05/19
Time: 05:28:17

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-20-2019
Test Well: P-13-18IT

AQUIFER DATA

Saturated Thickness: 7.54 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-13-18IT

X Location: 11532. ft
Y Location: 15107. ft

Initial Displacement: 1.309 ft
Static Water Column Height: 17.29 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 7.08 ft

No. of Observations: 81

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.309	85.8	0.059
0.48	1.26	91.8	0.055
1.08	1.166	97.8	0.057
1.68	1.12	103.8	0.051
2.279	1.065	110.4	0.051
2.939	1.01	117.6	0.047
3.659	0.958	125.4	0.045
4.439	0.898	133.2	0.039
5.219	0.857	141.6	0.04
6.06	0.799	150.6	0.04
6.959	0.752	160.2	0.037
7.92	0.7	169.8	0.031
8.88	0.659	180.6	0.034
9.96	0.618	192.	0.033
11.1	0.571	204.	0.035
12.3	0.535	216.6	0.031
13.56	0.493	229.8	0.029
14.88	0.449	244.2	0.031
16.32	0.421	259.2	0.027
17.82	0.387	274.8	0.022
19.38	0.353	291.6	0.023
21.06	0.332	309.6	0.02
22.86	0.299	328.2	0.019
24.72	0.276	348.6	0.019
26.76	0.252	369.6	0.02
28.86	0.228	391.8	0.019

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
31.08	0.208	415.8	0.019
33.48	0.188	441.	0.016
36.	0.172	467.4	0.015
38.64	0.155	495.6	0.015
41.46	0.142	525.6	0.013
44.46	0.13	557.4	0.013
47.64	0.121	591.	0.011
51.	0.11	627.	0.007
54.6	0.098	663.	0.012
58.2	0.095	705.	0.006
62.4	0.083	747.	0.011
66.6	0.08	789.	0.011
70.8	0.075	837.	0.006
75.6	0.068	891.	0.
81.	0.061		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.364

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0003109	cm/sec
y0	0.2562	ft

T = K*b = 0.07144 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.003301	8.582E-5	+/- 0.0001708	38.47	cm/sec
y0	1.223	0.01566	+/- 0.03117	78.12	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.7587 cm²/sec

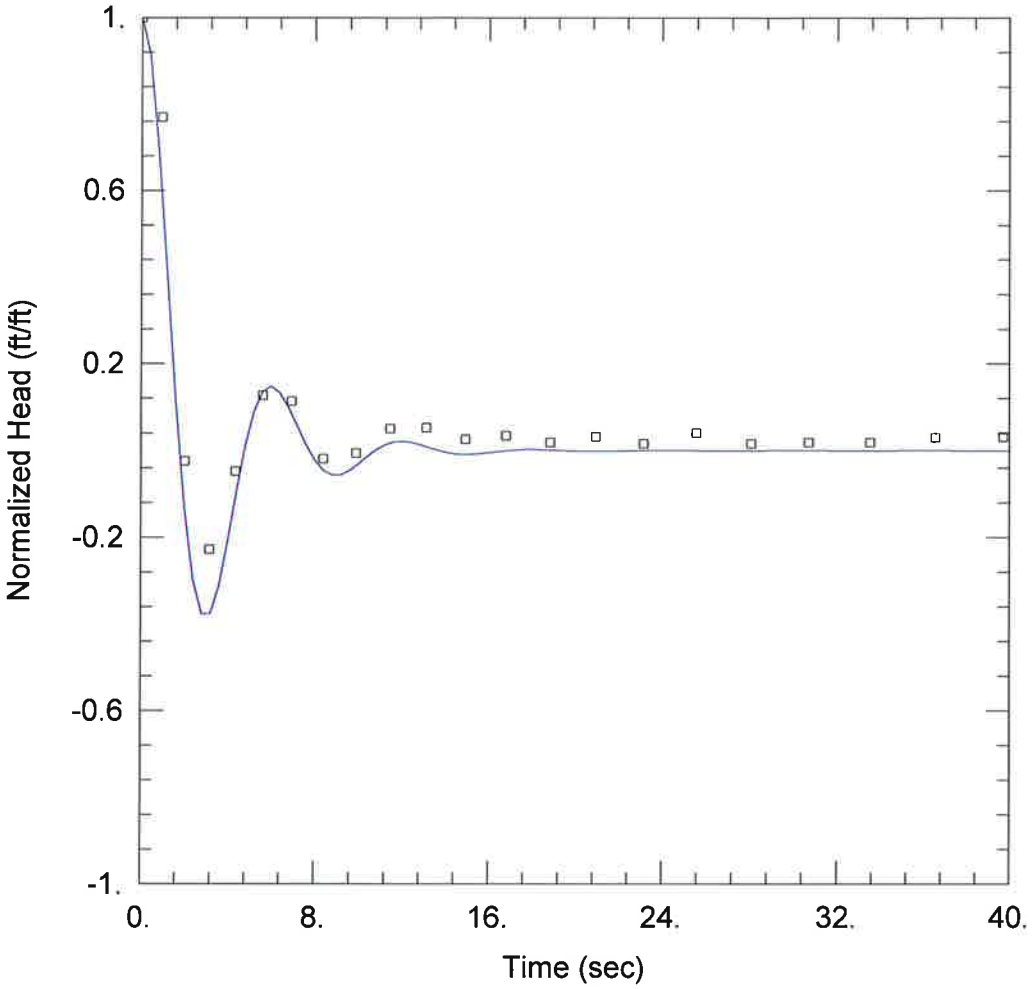
Parameter Correlations

	K	y0
K	1.00	0.66
y0	0.66	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.11 ft^2
Variance . . . . . 0.001393 ft^2
Std. Deviation . . . . . 0.03732 ft
Mean . . . . . 0.02082 ft
No. of Residuals 81
No. of Estimates 2



P-13-18SD FH1

Data Set: T:\...\P-13-18SD FH1;Butler(1998)Inertial.aqt
Date: 04/09/19 Time: 14:51:41

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-13-18SD
Test Date: 2-25-2019

AQUIFER DATA

Saturated Thickness: 12.02 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-18SD)

Initial Displacement: 0.377 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 28.47 ft
Screen Length: 9.67 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.07832 cm/sec
Le = 26.6 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-13-18
Title: P-13-18SD FH1
Date: 04/09/19
Time: 14:51:47

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-25-2019
Test Well: P-13-18SD

AQUIFER DATA

Saturated Thickness: 12.02 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-13-18SD

X Location: 11532. ft
Y Location: 15112. ft

Initial Displacement: 0.377 ft
Static Water Column Height: 28.47 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.67 ft
Total Well Penetration Depth: 11.54 ft

No. of Observations: 22

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.377	14.94	0.01
0.96	0.29	16.8	0.013
2.04	-0.009	18.84	0.007
3.18	-0.086	20.94	0.012
4.38	-0.018	23.16	0.006
5.64	0.048	25.56	0.015
6.96	0.043	28.08	0.006
8.4	-0.007	30.72	0.007
9.9	-0.002	33.54	0.007
11.46	0.019	36.54	0.011
13.14	0.02	39.72	0.012

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Butler
Log Factor: 0.2604

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.07832	cm/sec
Le	26.6	ft

T = K*b = 28.69 cm²/sec
Le = 26.6 ft
Solution is critically damped when C(D) = 1.

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.004058	0.03496	+/- 0.07292	0.1161	cm/sec
Le	26.25	17.85	+/- 37.24	1.47	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 1.487 cm²/sec
Le = 26.25 ft
Solution is critically damped when C(D) = 1.

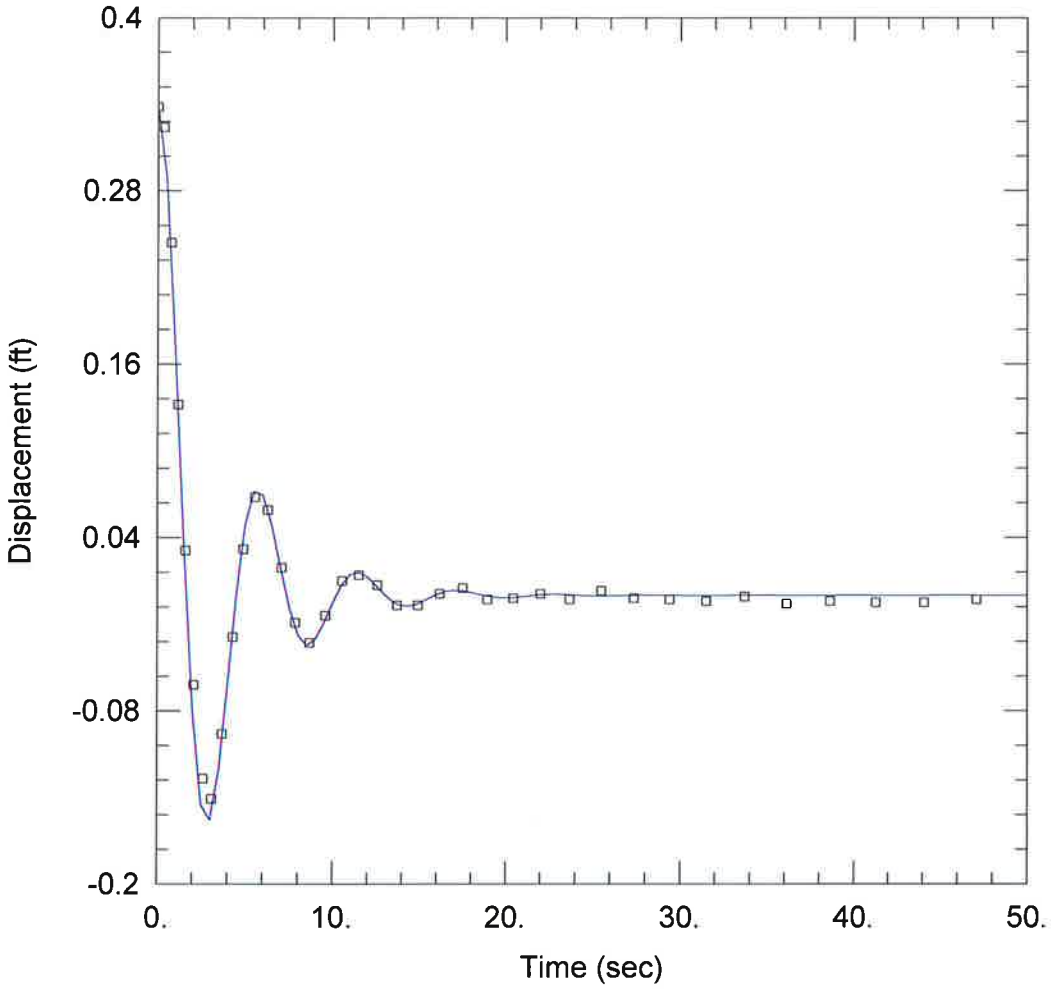
Parameter Correlations

	K	Le
K	1.00	0.03
Le	0.03	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.4417 ft^2
Variance . . . . . 0.02209 ft^2
Std. Deviation . . . . . 0.1486 ft
Mean . . . . . -0.09673 ft
No. of Residuals 22
No. of Estimates 2



P-13-18SD RH1

Data Set: T:\...\P-13-18SD RH1;Butler(1998)Inertial.aqt
Date: 04/09/19 Time: 15:07:21

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-13-18SD
Test Date: 2-25-2019

AQUIFER DATA

Saturated Thickness: 12.02 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-18SD)

Initial Displacement: 0.338 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 28.47 ft
Screen Length: 9.67 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.09985 cm/sec
Le = 24.95 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-13-18
Title: P-13-18SD RH1
Date: 04/09/19
Time: 15:07:29

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-25-2019
Test Well: P-13-18SD

AQUIFER DATA

Saturated Thickness: 12.02 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-13-18SD

X Location: 11532. ft
Y Location: 15112. ft

Initial Displacement: 0.338 ft
Static Water Column Height: 28.47 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.67 ft
Total Well Penetration Depth: 11.54 ft

No. of Observations: 38

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.338	12.6	0.007
0.36	0.324	13.74	-0.007
0.78	0.244	14.94	-0.007
1.2	0.132	16.2	0.001
1.62	0.031	17.52	0.005
2.1	-0.062	18.96	-0.003
2.64	-0.127	20.46	-0.002
3.12	-0.141	22.02	0.001
3.72	-0.096	23.7	-0.003
4.32	-0.029	25.5	0.003
4.92	0.032	27.36	-0.002
5.58	0.068	29.4	-0.003
6.3	0.059	31.5	-0.004
7.08	0.019	33.72	-0.001
7.86	-0.019	36.12	-0.006
8.7	-0.033	38.64	-0.004
9.6	-0.014	41.28	-0.005
10.56	0.01	44.1	-0.005
11.52	0.014	47.1	-0.003

SOLUTION

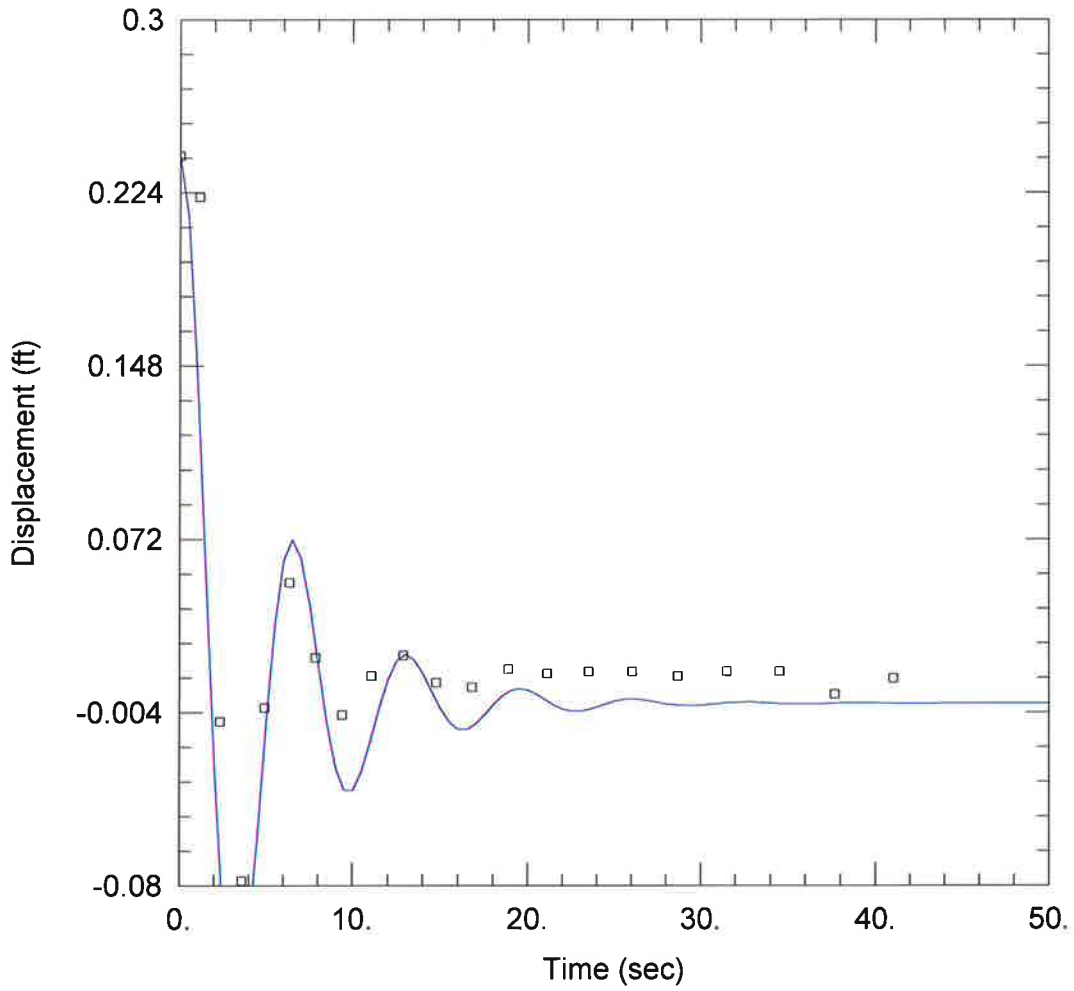
Slug Test
Aquifer Model: Confined
Solution Method: Butler
Log Factor: 0.2604

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.09985	cm/sec
Le	24.95	ft

T = K*b = 36.58 cm²/sec
Le = 24.95 ft
Solution is critically damped when C(D) = 1.



P-13-18SD FH2

Data Set: T:\...\P-13-18SD FH2;Butler(1998)Inertial.aqt
Date: 04/09/19 Time: 15:01:09

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-13-18SD
Test Date: 2-25-2019

AQUIFER DATA

Saturated Thickness: 12.02 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-18SD)

Initial Displacement: 0.24 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 28.47 ft
Screen Length: 9.67 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.1079 cm/sec
Le = 33.23 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-13-18
Title: P-13-18SD FH2
Date: 04/09/19
Time: 15:01:17

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-25-2019
Test Well: P-13-18SD

AQUIFER DATA

Saturated Thickness: 12.02 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-13-18SD

X Location: 11532. ft
Y Location: 15112. ft

Initial Displacement: 0.24 ft
Static Water Column Height: 28.47 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.67 ft
Total Well Penetration Depth: 11.54 ft

No. of Observations: 21

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.24	16.8	0.007
1.14	0.222	18.9	0.015
2.34	-0.008	21.12	0.013
3.6	-0.078	23.52	0.014
4.92	-0.002	26.04	0.014
6.36	0.053	28.68	0.012
7.86	0.02	31.5	0.014
9.42	-0.005	34.5	0.014
11.1	0.012	37.68	0.004
12.9	0.021	41.04	0.011
14.76	0.009		

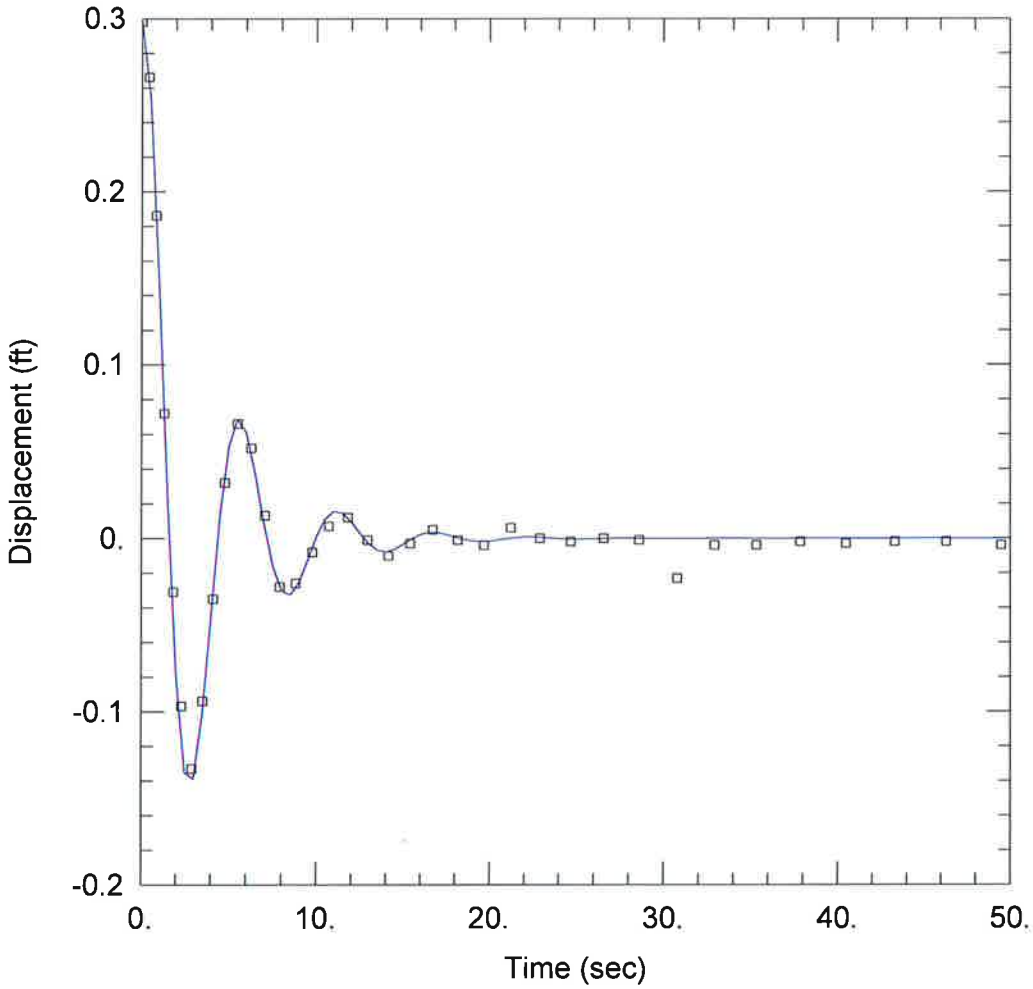
SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Butler
Log Factor: 0.2604

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.1079	cm/sec
Le	33.23	ft



P-13-18SD RH2

Data Set: T:\...\P-13-18SD RH2;Butler(1998)Inertial.aqt
Date: 04/09/19 Time: 15:10:17

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-13-18SD
Test Date: 2-25-2019

AQUIFER DATA

Saturated Thickness: 12.02 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-18SD)

Initial Displacement: 0.298 ft
Total Well Penetration Depth: 11.54 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 28.47 ft
Screen Length: 9.67 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Butler
K = 0.1056 cm/sec
Le = 23.96 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-13-18
Title: P-13-18SD RH2
Date: 04/09/19
Time: 15:10:24

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-25-2019
Test Well: P-13-18SD

AQUIFER DATA

Saturated Thickness: 12.02 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-13-18SD

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.298 ft
Static Water Column Height: 28.47 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.67 ft
Total Well Penetration Depth: 11.54 ft

No. of Observations: 37

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	0.298	14.16	-0.01
0.419	0.266	15.42	-0.003
0.839	0.186	16.74	0.005
1.32	0.072	18.18	-0.001
1.859	-0.031	19.68	-0.004
2.339	-0.097	21.24	0.006
2.939	-0.133	22.92	0.
3.54	-0.094	24.72	-0.002
4.139	-0.035	26.58	0.
4.799	0.032	28.62	-0.001
5.519	0.066	30.78	-0.023
6.299	0.052	32.94	-0.004
7.079	0.013	35.34	-0.004
7.919	-0.028	37.86	-0.002
8.819	-0.026	40.5	-0.003
9.779	-0.008	43.32	-0.002
10.74	0.007	46.32	-0.002
11.82	0.012	49.5	-0.004
12.96	-0.001		

SOLUTION

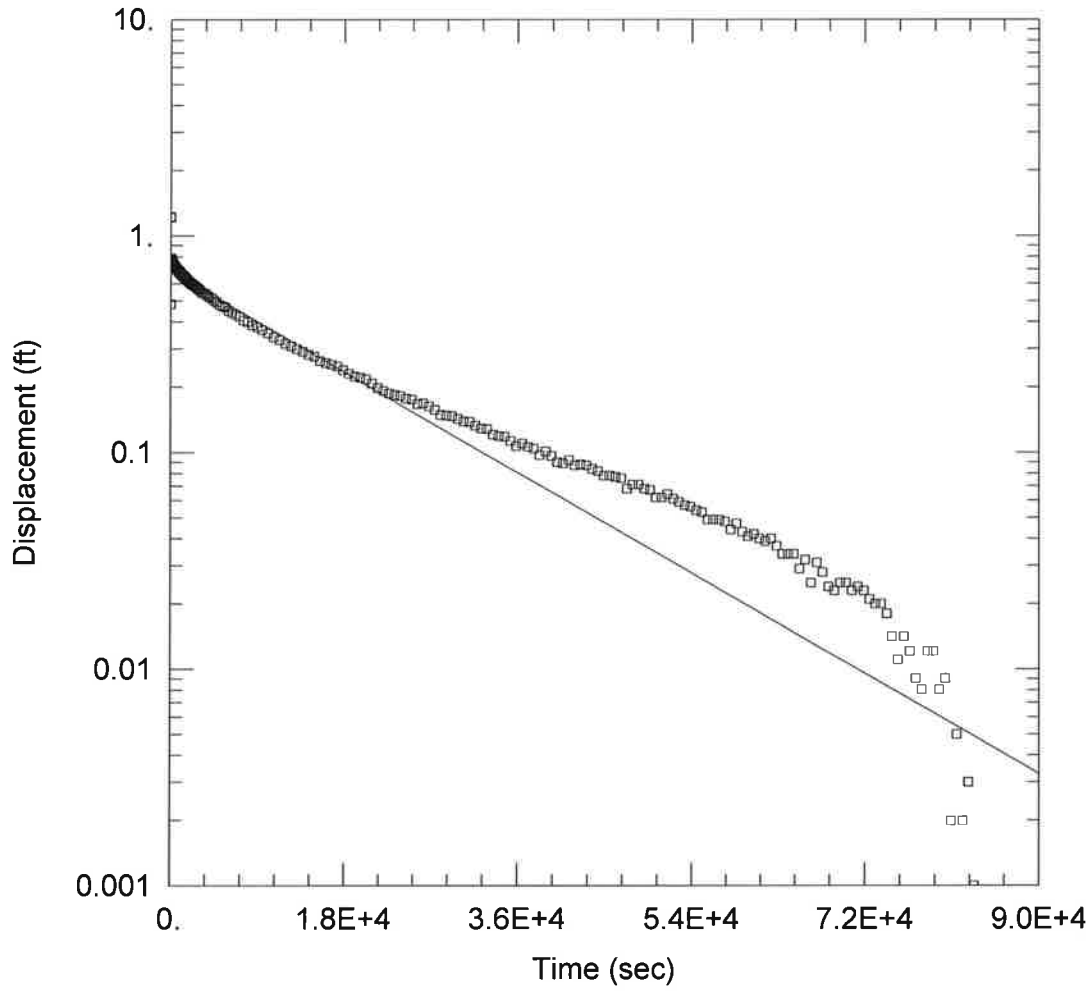
Slug Test
Aquifer Model: Confined
Solution Method: Butler
Log Factor: 0.2604

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.1056	cm/sec
Le	23.96	ft

T = K*b = 38.67 cm²/sec
Le = 23.96 ft
Solution is critically damped when C(D) = 1.



P-14-18IT FH1

Data Set: T:\...\P-14-18IT FH1.aqt
Date: 04/09/19 Time: 16:16:54

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-14-18IT
Test Date: 2/25/2019-2/26/2019

AQUIFER DATA

Saturated Thickness: 6.57 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-14-18IT)

Initial Displacement: 1.222 ft
Total Well Penetration Depth: 6.09 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 20.74 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 3.017E-6 cm/sec
y0 = 0.6821 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-14-18
Title: P-14-18IT FH1
Date: 04/09/19
Time: 16:16:59

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2/25/2019-2/26/2019
Test Well: P-14-18IT

AQUIFER DATA

Saturated Thickness: 6.57 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-14-18IT

X Location: 12400. ft
Y Location: 15154. ft

Initial Displacement: 1.222 ft
Static Water Column Height: 20.74 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 6.09 ft

No. of Observations: 246

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.222	1.067E+4	0.34
0.48	1.214	1.127E+4	0.33
1.08	0.482	1.187E+4	0.316
1.68	0.787	1.247E+4	0.309
2.28	0.783	1.307E+4	0.299
2.94	0.778	1.367E+4	0.291
3.66	0.779	1.427E+4	0.283
4.44	0.781	1.487E+4	0.277
5.22	0.785	1.547E+4	0.264
6.06	0.781	1.607E+4	0.259
6.96	0.777	1.667E+4	0.254
7.92	0.776	1.727E+4	0.249
8.88	0.777	1.787E+4	0.24
9.96	0.776	1.847E+4	0.231
11.1	0.777	1.907E+4	0.224
12.3	0.78	1.967E+4	0.221
13.56	0.778	2.027E+4	0.217
14.88	0.772	2.087E+4	0.208
16.32	0.777	2.147E+4	0.198
17.82	0.775	2.207E+4	0.192
19.38	0.775	2.267E+4	0.187
21.06	0.774	2.327E+4	0.184
22.86	0.774	2.387E+4	0.182
24.72	0.776	2.447E+4	0.177
26.76	0.775	2.507E+4	0.175
28.86	0.776	2.567E+4	0.167

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
31.08	0.775	2.627E+4	0.168
33.48	0.772	2.687E+4	0.163
36.	0.772	2.747E+4	0.157
38.64	0.773	2.807E+4	0.149
41.46	0.775	2.867E+4	0.148
44.46	0.773	2.927E+4	0.147
47.64	0.771	2.987E+4	0.143
51.	0.769	3.047E+4	0.139
54.6	0.773	3.107E+4	0.138
58.2	0.773	3.167E+4	0.133
62.4	0.768	3.227E+4	0.129
66.6	0.772	3.287E+4	0.128
70.83	0.785	3.347E+4	0.121
75.6	0.768	3.407E+4	0.119
81.	0.762	3.467E+4	0.118
85.8	0.761	3.527E+4	0.113
91.8	0.763	3.587E+4	0.107
97.8	0.763	3.647E+4	0.11
103.8	0.757	3.707E+4	0.106
110.4	0.764	3.767E+4	0.104
117.6	0.758	3.827E+4	0.097
125.4	0.761	3.887E+4	0.101
133.2	0.76	3.947E+4	0.096
141.6	0.757	4.007E+4	0.09
150.6	0.751	4.067E+4	0.089
160.2	0.756	4.127E+4	0.092
169.8	0.751	4.187E+4	0.087
180.6	0.75	4.247E+4	0.088
192.	0.749	4.307E+4	0.087
204.	0.75	4.367E+4	0.084
216.6	0.747	4.427E+4	0.082
229.8	0.74	4.487E+4	0.078
244.2	0.749	4.547E+4	0.078
259.2	0.737	4.607E+4	0.077
274.8	0.739	4.667E+4	0.076
291.6	0.74	4.727E+4	0.068
309.6	0.733	4.787E+4	0.071
328.2	0.736	4.847E+4	0.071
348.6	0.733	4.907E+4	0.068
369.6	0.725	4.967E+4	0.067
391.8	0.728	5.027E+4	0.062
415.8	0.721	5.087E+4	0.062
441.	0.718	5.147E+4	0.064
467.4	0.718	5.207E+4	0.061
495.6	0.714	5.267E+4	0.059
525.6	0.707	5.327E+4	0.057
557.4	0.711	5.387E+4	0.056
591.	0.701	5.447E+4	0.054
627.	0.699	5.507E+4	0.053
663.	0.7	5.567E+4	0.049
705.	0.69	5.627E+4	0.049
747.	0.693	5.687E+4	0.049
789.	0.681	5.747E+4	0.048
837.	0.685	5.807E+4	0.044
891.	0.684	5.867E+4	0.047
939.	0.678	5.927E+4	0.043
999.	0.676	5.987E+4	0.041
1059.	0.664	6.047E+4	0.042
1119.	0.664	6.107E+4	0.04
1185.	0.661	6.167E+4	0.039
1257.	0.652	6.227E+4	0.04
1335.	0.645	6.287E+4	0.037
1413.	0.647	6.347E+4	0.034

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1497.	0.641	6.407E+4	0.034
1587.	0.632	6.467E+4	0.034
1683.	0.627	6.527E+4	0.029
1779.	0.617	6.587E+4	0.032
1887.	0.613	6.647E+4	0.025
2001.	0.606	6.707E+4	0.031
2121.	0.6	6.767E+4	0.028
2247.	0.592	6.827E+4	0.024
2379.	0.59	6.887E+4	0.023
2523.	0.584	6.947E+4	0.025
2673.	0.574	7.007E+4	0.025
2829.	0.568	7.067E+4	0.023
2997.	0.56	7.127E+4	0.024
3177.	0.548	7.187E+4	0.023
3363.	0.543	7.247E+4	0.021
3567.	0.539	7.307E+4	0.02
3777.	0.529	7.367E+4	0.02
3999.	0.52	7.427E+4	0.018
4239.	0.514	7.487E+4	0.014
4491.	0.502	7.547E+4	0.011
4755.	0.493	7.607E+4	0.014
5037.	0.478	7.667E+4	0.012
5337.	0.471	7.727E+4	0.009
5655.	0.466	7.787E+4	0.008
5991.	0.45	7.847E+4	0.012
6351.	0.441	7.907E+4	0.012
6711.	0.431	7.967E+4	0.008
7131.	0.422	8.027E+4	0.009
7551.	0.406	8.087E+4	0.002
7971.	0.399	8.147E+4	0.005
8451.	0.386	8.207E+4	0.002
8991.	0.377	8.267E+4	0.003
9471.	0.366	8.327E+4	0.001
1.007E+4	0.354	8.387E+4	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.286

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.017E-6	cm/sec
y0	0.6821	ft

T = K*b = 0.0006042 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	3.316E-6	9.911E-8	+/- 1.952E-7	33.46	cm/sec
y0	0.7517	0.005688	+/- 0.01121	132.1	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.0006641 cm²/sec

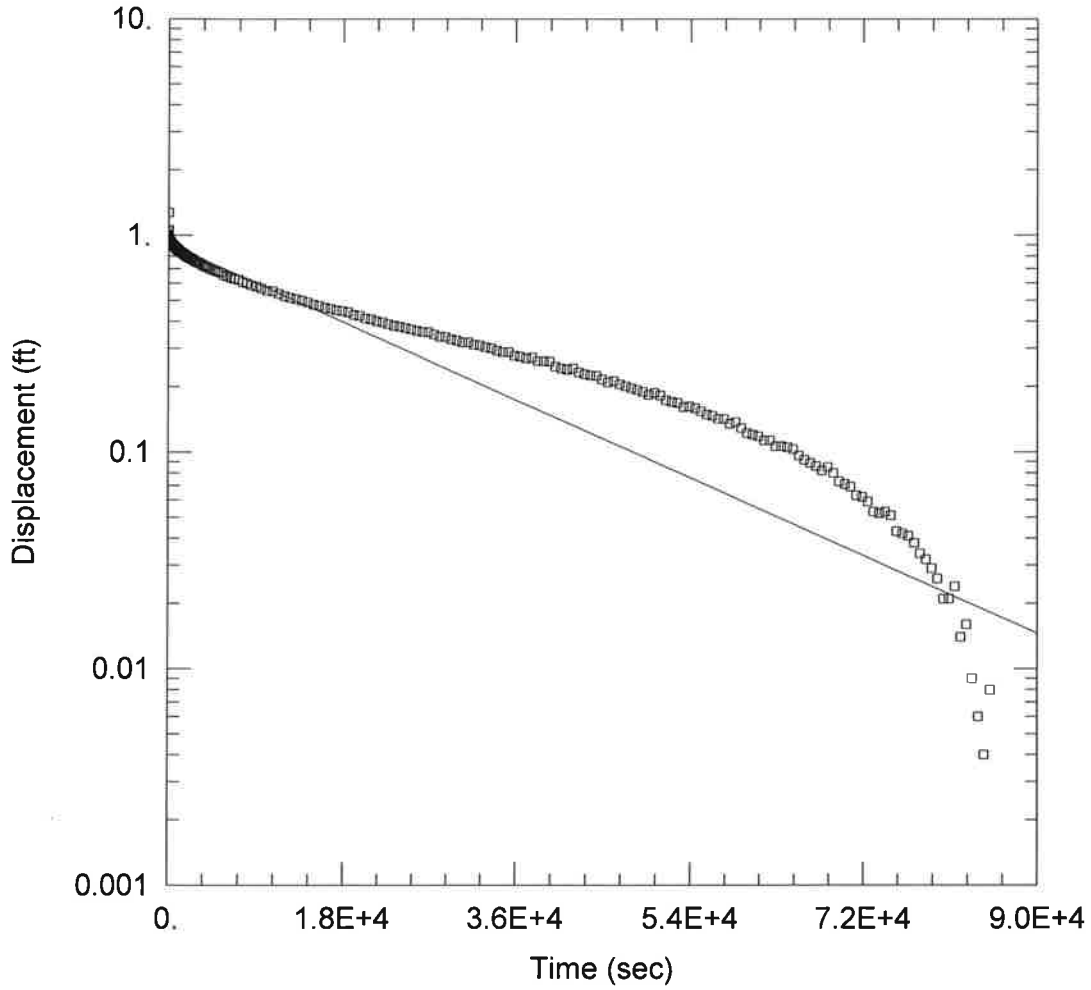
Parameter Correlations

	K	y0
K	1.00	0.37
y0	0.37	1.00

Residual Statistics

for weighted residuals

Sum of Squares	0.7426 ft^2
Variance	0.003044 ft^2
Std. Deviation	0.05517 ft
Mean	0.008039 ft
No. of Residuals	246
No. of Estimates	2



P-14-18IT RH1

Data Set: T:\...\P-14-18IT RH1.aqt
Date: 04/09/19 Time: 16:17:40

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-14-18IT
Test Date: 2/26/2019-2/27/2019

AQUIFER DATA

Saturated Thickness: 6.57 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-14-18IT)

Initial Displacement: 1.271 ft
Total Well Penetration Depth: 6.09 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 20.74 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 2.337E-6 cm/sec y0 = 0.9071 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-14-18
Title: P-14-18IT RH1
Date: 04/09/19
Time: 16:17:45

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2/26/2019-2/27/2019
Test Well: P-14-18IT

AQUIFER DATA

Saturated Thickness: 6.57 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-14-18IT

X Location: 12400. ft
Y Location: 15154. ft

Initial Displacement: 1.271 ft
Static Water Column Height: 20.74 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 6.09 ft

No. of Observations: 261

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.271	8455.2	0.586
0.25	0.905	8995.2	0.578
0.5	1.058	9475.2	0.566
0.75	1.035	1.008E+4	0.554
1.	1.002	1.068E+4	0.549
1.25	1.009	1.128E+4	0.534
1.609	1.001	1.188E+4	0.523
1.97	0.999	1.248E+4	0.514
2.39	0.989	1.308E+4	0.506
2.809	0.988	1.368E+4	0.497
3.229	0.986	1.428E+4	0.49
3.71	0.984	1.488E+4	0.478
4.249	0.979	1.548E+4	0.471
4.73	0.981	1.608E+4	0.462
5.33	0.987	1.668E+4	0.457
5.93	0.982	1.728E+4	0.45
6.53	0.983	1.788E+4	0.447
7.19	0.976	1.848E+4	0.441
7.91	0.98	1.908E+4	0.429
8.69	0.983	1.968E+4	0.424
9.47	0.978	2.028E+4	0.412
10.31	0.972	2.088E+4	0.408
11.21	0.978	2.148E+4	0.4
12.17	0.972	2.208E+4	0.396
13.13	0.974	2.268E+4	0.388
14.21	0.972	2.328E+4	0.381

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
15.35	0.973	2.388E+4	0.378
16.55	0.972	2.448E+4	0.372
17.81	0.972	2.508E+4	0.367
19.13	0.967	2.568E+4	0.361
20.57	0.966	2.628E+4	0.358
22.07	0.967	2.688E+4	0.356
23.63	0.968	2.748E+4	0.348
25.31	0.964	2.808E+4	0.34
27.11	0.964	2.868E+4	0.339
28.97	0.961	2.928E+4	0.331
31.01	0.964	2.988E+4	0.326
33.11	0.965	3.048E+4	0.32
35.33	0.961	3.108E+4	0.319
37.73	0.963	3.168E+4	0.312
40.25	0.959	3.228E+4	0.31
42.89	0.959	3.288E+4	0.304
45.71	0.958	3.348E+4	0.3
48.71	0.957	3.408E+4	0.293
51.89	0.956	3.468E+4	0.288
55.25	0.957	3.528E+4	0.288
58.85	0.956	3.588E+4	0.278
62.45	0.954	3.648E+4	0.275
66.65	0.952	3.708E+4	0.269
70.85	0.953	3.768E+4	0.272
75.05	0.948	3.828E+4	0.262
79.85	0.955	3.888E+4	0.262
85.25	0.949	3.948E+4	0.26
90.05	0.947	4.008E+4	0.247
96.05	0.945	4.068E+4	0.242
102.	0.945	4.128E+4	0.239
108.	0.934	4.188E+4	0.242
114.6	0.945	4.248E+4	0.233
121.8	0.94	4.308E+4	0.228
129.6	0.942	4.368E+4	0.225
137.4	0.939	4.428E+4	0.224
145.8	0.942	4.488E+4	0.216
154.8	0.935	4.548E+4	0.209
164.4	0.934	4.608E+4	0.212
174.	0.934	4.668E+4	0.205
184.8	0.929	4.728E+4	0.201
196.2	0.933	4.788E+4	0.197
208.2	0.931	4.848E+4	0.193
220.8	0.929	4.908E+4	0.189
234.	0.927	4.968E+4	0.183
248.4	0.919	5.028E+4	0.187
263.4	0.921	5.088E+4	0.182
279.	0.923	5.148E+4	0.173
295.8	0.919	5.208E+4	0.17
313.8	0.913	5.268E+4	0.168
332.4	0.909	5.328E+4	0.161
352.8	0.908	5.388E+4	0.162
373.8	0.906	5.448E+4	0.159
396.	0.909	5.508E+4	0.154
420.	0.907	5.568E+4	0.149
445.2	0.901	5.628E+4	0.147
471.6	0.897	5.688E+4	0.142
499.8	0.893	5.748E+4	0.142
529.8	0.892	5.808E+4	0.135
561.6	0.891	5.868E+4	0.137
595.2	0.885	5.928E+4	0.129
631.2	0.881	5.988E+4	0.122
667.2	0.881	6.048E+4	0.12
709.2	0.872	6.108E+4	0.118

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
751.2	0.877	6.168E+4	0.113
793.2	0.869	6.228E+4	0.113
841.2	0.865	6.288E+4	0.106
895.2	0.857	6.348E+4	0.106
943.2	0.859	6.408E+4	0.105
1003.2	0.85	6.468E+4	0.103
1063.2	0.847	6.528E+4	0.096
1123.2	0.843	6.588E+4	0.092
1189.2	0.838	6.648E+4	0.089
1261.2	0.833	6.708E+4	0.086
1339.2	0.827	6.768E+4	0.082
1417.2	0.827	6.828E+4	0.085
1501.2	0.819	6.888E+4	0.08
1591.2	0.813	6.948E+4	0.073
1687.2	0.81	7.008E+4	0.071
1783.2	0.805	7.068E+4	0.069
1891.2	0.794	7.128E+4	0.063
2005.2	0.791	7.188E+4	0.062
2125.2	0.784	7.248E+4	0.059
2251.2	0.78	7.308E+4	0.053
2383.2	0.776	7.368E+4	0.052
2527.2	0.771	7.428E+4	0.053
2677.2	0.759	7.488E+4	0.051
2833.2	0.752	7.548E+4	0.043
3001.2	0.748	7.608E+4	0.042
3181.2	0.741	7.668E+4	0.041
3367.2	0.731	7.728E+4	0.038
3571.2	0.721	7.788E+4	0.034
3781.2	0.714	7.848E+4	0.032
4003.2	0.709	7.908E+4	0.029
4243.2	0.697	7.968E+4	0.026
4495.2	0.692	8.028E+4	0.021
4759.2	0.683	8.088E+4	0.021
5041.2	0.676	8.148E+4	0.024
5341.2	0.669	8.208E+4	0.014
5659.2	0.652	8.268E+4	0.016
5995.2	0.645	8.328E+4	0.009
6355.2	0.635	8.388E+4	0.006
6715.2	0.627	8.448E+4	0.004
7135.2	0.621	8.508E+4	0.008
7555.2	0.607	8.568E+4	0.
7975.2	0.599		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.286

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.337E-6	cm/sec
y0	0.9071	ft

T = K*b = 0.000468 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	1.917E-6	3.409E-8	+/- 6.713E-8	56.24	cm/sec
y0	0.9271	0.004669	+/- 0.009194	198.6	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.0003839 cm²/sec

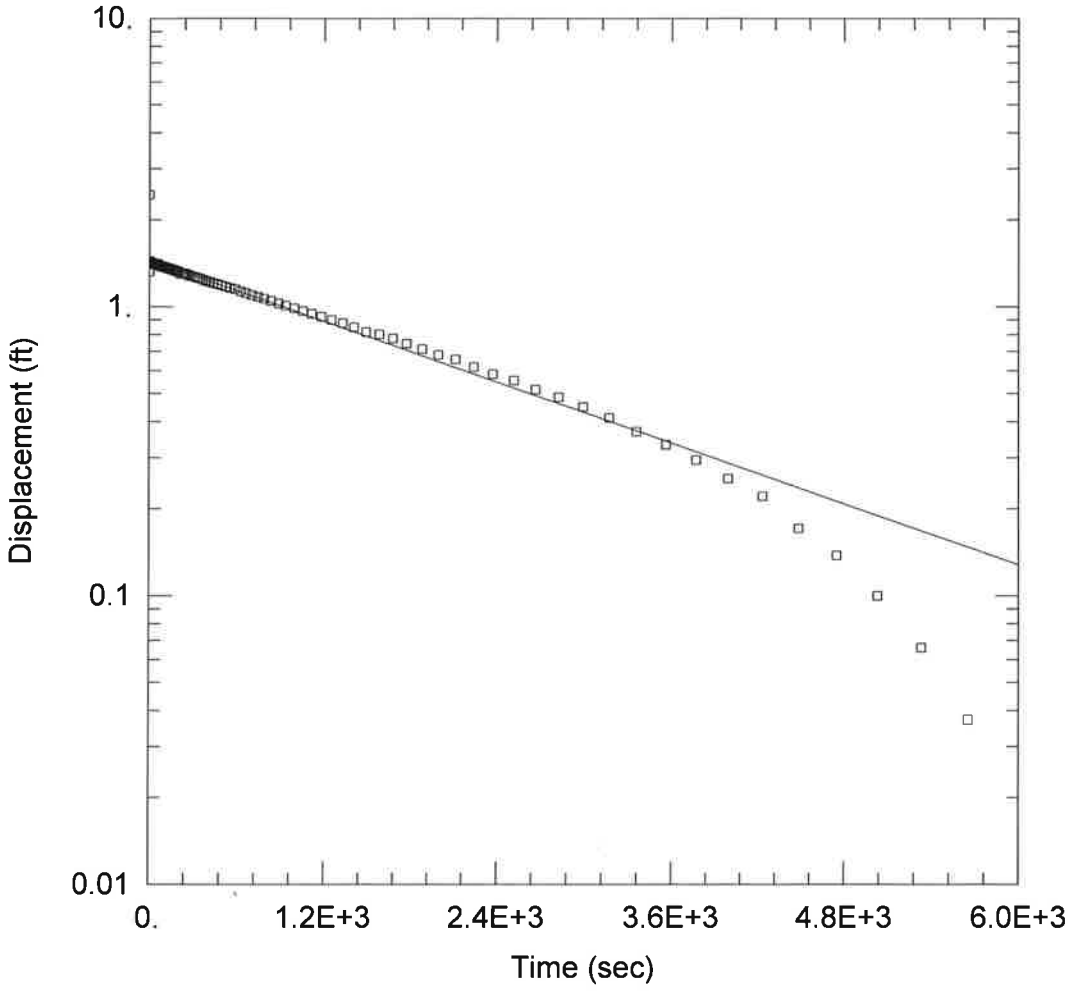
Parameter Correlations

	K	y0
K	1.00	0.36
y0	0.36	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.6595 ft^2
Variance . . . . . 0.002546 ft^2
Std. Deviation . . . . . 0.05046 ft
Mean . . . . . 0.00296 ft
No. of Residuals 261
No. of Estimates 2



P-14-18SD FH1

Data Set: T:\...\P-14-18SD FH1.aqt
Date: 04/05/19 Time: 06:37:16

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-14-18SD
Test Date: 2-25-2019

AQUIFER DATA

Saturated Thickness: 6.04 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-14-18SD)

Initial Displacement: 2.44 ft
Total Well Penetration Depth: 5.56 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 45.45 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
K = 2.015E-5 cm/sec
Solution Method: Bouwer-Rice
y0 = 1.447 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-14-18
Title: P-14-18SD FH1
Date: 04/05/19
Time: 06:37:24

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2-25-2019
Test Well: P-14-18SD

AQUIFER DATA

Saturated Thickness: 6.04 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-14-18SD

X Location: 12405. ft
Y Location: 15155. ft

Initial Displacement: 2.44 ft
Static Water Column Height: 45.45 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.56 ft

No. of Observations: 107

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	2.44	287.2	1.275
0.78	1.32	305.2	1.266
1.62	1.435	323.8	1.257
2.52	1.431	344.2	1.25
3.48	1.421	365.2	1.236
4.44	1.42	387.4	1.225
5.52	1.422	411.4	1.217
6.66	1.42	436.6	1.205
7.86	1.418	463.	1.196
9.12	1.414	491.2	1.186
10.44	1.418	521.2	1.171
11.88	1.416	553.	1.158
13.38	1.414	586.6	1.149
14.94	1.416	622.6	1.128
16.62	1.418	658.6	1.113
18.42	1.416	700.6	1.095
20.28	1.413	742.6	1.078
22.32	1.41	784.6	1.064
24.42	1.409	832.6	1.047
26.64	1.41	886.6	1.025
29.04	1.41	934.6	1.007
31.56	1.408	994.6	0.987
34.2	1.402	1054.6	0.963
37.02	1.401	1114.6	0.945
40.02	1.402	1180.6	0.923
43.2	1.401	1252.6	0.899

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
46.56	1.397	1330.6	0.876
50.16	1.404	1408.6	0.847
53.77	1.407	1492.6	0.815
57.96	1.393	1582.6	0.802
62.16	1.39	1678.6	0.776
66.36	1.39	1774.6	0.745
71.16	1.383	1882.6	0.712
76.56	1.379	1996.6	0.681
81.36	1.378	2116.6	0.657
87.36	1.375	2242.6	0.617
93.36	1.373	2374.6	0.583
99.36	1.37	2518.6	0.555
106.	1.368	2668.6	0.516
113.2	1.364	2824.6	0.485
121.	1.359	2992.6	0.449
128.8	1.356	3172.6	0.412
137.2	1.35	3358.6	0.369
146.2	1.347	3562.6	0.332
155.8	1.342	3772.6	0.295
165.4	1.336	3994.6	0.254
176.2	1.331	4234.6	0.221
187.6	1.322	4486.6	0.171
199.6	1.32	4750.6	0.138
212.2	1.295	5032.6	0.1
225.4	1.302	5332.6	0.066
239.8	1.299	5650.6	0.037
254.8	1.292	5986.6	0.
270.4	1.28		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.239

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.418E-5	cm/sec
y0	1.509	ft

T = K*b = 0.004451 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	2.015E-5	8.095E-7	+/- 1.605E-6	24.9	cm/sec
y0	1.447	0.01404	+/- 0.02784	103.1	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.00371 cm²/sec

Parameter Correlations

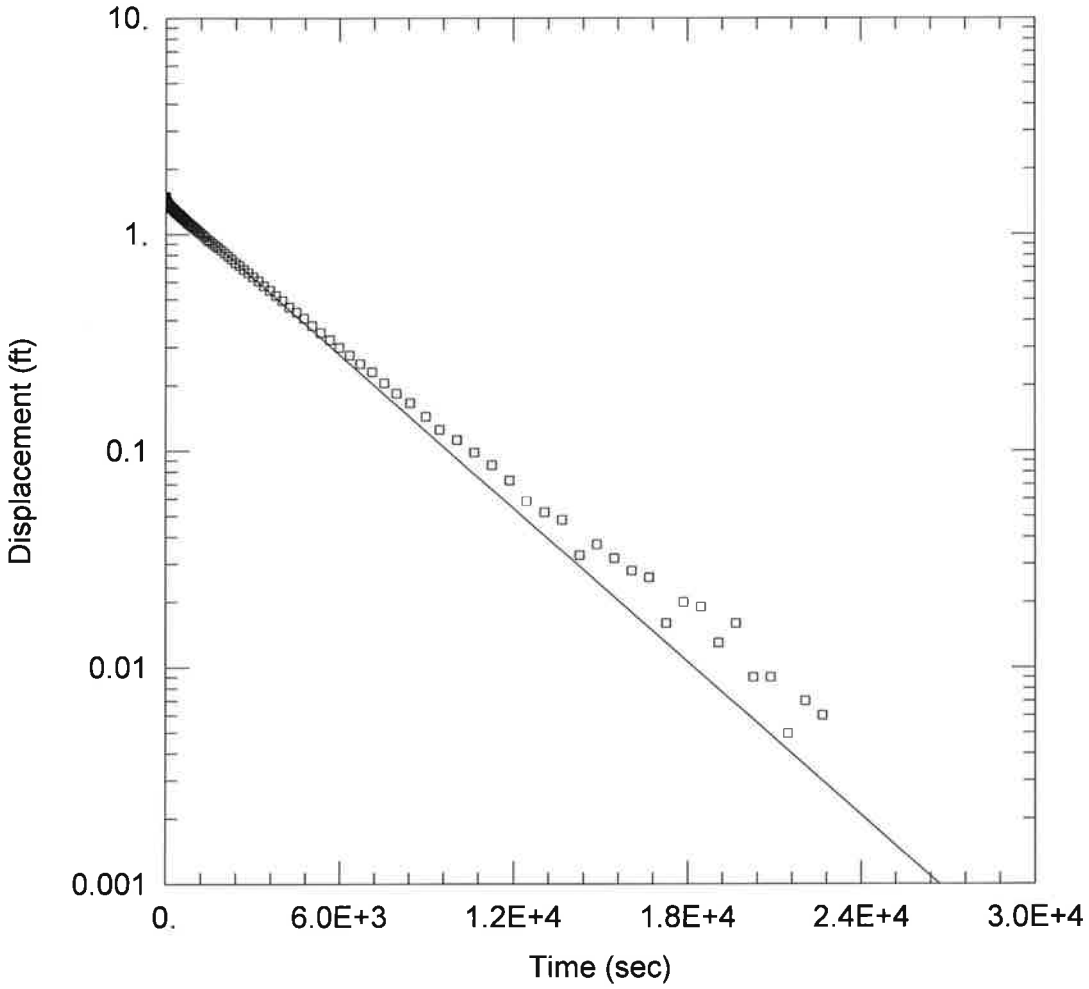
	K	y0

K	1.00	0.49
y0	0.49	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 1.105 ft^2
Variance . . . . . 0.01052 ft^2
Std. Deviation . . . . . 0.1026 ft
Mean . . . . . -0.002859 ft
No. of Residuals 107
No. of Estimates 2



P-14-18SD RH1

Data Set: T:\...\P-14-18SD RH1.aqt
Date: 04/05/19 Time: 06:42:26

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-14-18SD
Test Date: 2/25/2019-2/26/2019

AQUIFER DATA

Saturated Thickness: 6.04 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-14-18SD)

Initial Displacement: 1.491 ft
Total Well Penetration Depth: 5.56 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 45.45 ft
Screen Length: 4.68 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.355E-5 cm/sec y0 = 1.418 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-14-18
Title: P-14-18SD RH1
Date: 04/05/19
Time: 06:42:33

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 2/25/2019-2/26/2019
Test Well: P-14-18SD

AQUIFER DATA

Saturated Thickness: 6.04 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-14-18SD

X Location: 12405. ft
Y Location: 15155. ft

Initial Displacement: 1.491 ft
Static Water Column Height: 45.45 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 4.68 ft
Total Well Penetration Depth: 5.56 ft

No. of Observations: 149

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.491	527.5	1.203
0.42	1.45	559.3	1.197
0.84	1.464	592.9	1.185
1.32	1.462	628.9	1.17
1.86	1.458	664.9	1.161
2.34	1.458	706.9	1.148
2.94	1.454	748.9	1.126
3.54	1.449	790.9	1.12
4.14	1.448	838.9	1.103
4.8	1.478	892.9	1.09
5.52	1.441	940.9	1.074
6.3	1.44	1000.9	1.061
7.08	1.444	1060.9	1.041
7.92	1.435	1120.9	1.023
8.82	1.437	1186.9	1.007
9.78	1.435	1258.9	0.988
10.74	1.432	1336.9	0.968
11.82	1.43	1414.9	0.94
12.96	1.427	1498.9	0.928
14.16	1.427	1588.9	0.908
15.42	1.425	1684.9	0.884
16.74	1.419	1780.9	0.865
18.18	1.424	1888.9	0.842
19.68	1.412	2002.9	0.815
21.24	1.423	2122.9	0.792
22.92	1.407	2248.9	0.766

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
24.72	1.417	2380.9	0.735
26.58	1.414	2524.9	0.715
28.62	1.412	2674.9	0.685
30.72	1.408	2830.9	0.661
32.94	1.409	2998.9	0.635
35.34	1.418	3178.9	0.606
37.86	1.416	3364.9	0.577
40.5	1.405	3568.9	0.55
43.32	1.403	3778.9	0.52
46.32	1.403	4000.9	0.492
49.5	1.392	4240.9	0.46
52.86	1.402	4492.9	0.436
56.46	1.396	4756.9	0.408
60.06	1.396	5038.9	0.377
64.26	1.391	5338.9	0.35
68.46	1.39	5656.9	0.325
72.66	1.387	5992.9	0.299
77.46	1.388	6352.9	0.276
82.86	1.38	6712.9	0.252
87.66	1.374	7132.9	0.231
93.66	1.378	7552.9	0.205
99.66	1.375	7972.9	0.184
105.7	1.368	8452.9	0.166
112.3	1.367	8992.9	0.144
119.5	1.361	9472.9	0.125
127.3	1.356	1.007E+4	0.112
135.1	1.356	1.067E+4	0.098
143.5	1.351	1.127E+4	0.086
152.5	1.346	1.187E+4	0.073
162.1	1.338	1.247E+4	0.058
171.7	1.34	1.307E+4	0.052
182.5	1.334	1.367E+4	0.048
193.9	1.328	1.427E+4	0.033
205.9	1.327	1.487E+4	0.037
218.5	1.318	1.547E+4	0.032
231.7	1.31	1.607E+4	0.028
246.1	1.306	1.667E+4	0.026
261.1	1.306	1.727E+4	0.016
276.7	1.299	1.787E+4	0.02
293.5	1.293	1.847E+4	0.019
311.5	1.282	1.907E+4	0.013
330.1	1.266	1.967E+4	0.016
350.5	1.268	2.027E+4	0.009
371.5	1.26	2.087E+4	0.009
393.7	1.252	2.147E+4	0.005
417.7	1.244	2.207E+4	0.007
442.9	1.236	2.267E+4	0.006
469.3	1.225	2.327E+4	0.
497.5	1.216		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.239

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.355E-5	cm/sec

y0	1.418	ft

T = K*b = 0.002495 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	1.355E-5	1.001E-7	+/- 1.978E-7	135.4	cm/sec
y0	1.418	0.002324	+/- 0.004592	610.	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.002495 cm²/sec

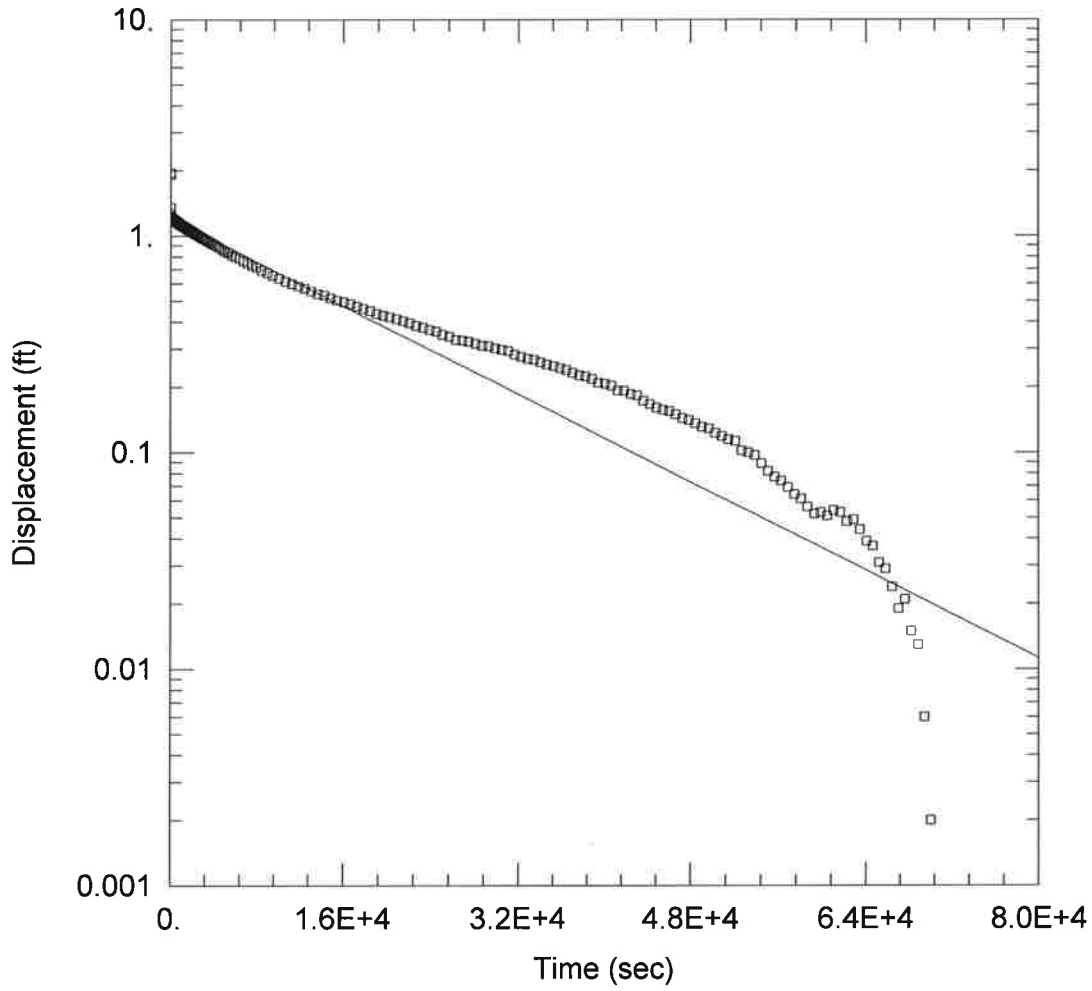
Parameter Correlations

	K	y0
K	1.00	0.44
y0	0.44	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.05602 ft^2
Variance . . . . . 0.0003811 ft^2
Std. Deviation . . . . . 0.01952 ft
Mean . . . . . 0.002287 ft
No. of Residuals 149
No. of Estimates 2



P-15-18SD FH1

Data Set: T:\...\P-15-18SD-FH1.aqt
Date: 04/09/19 Time: 15:18:27

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-15-18SD
Test Date: 3/7/2019-3/8/2019

AQUIFER DATA

Saturated Thickness: 13.36 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-15-18SD)

Initial Displacement: 1.952 ft
Total Well Penetration Depth: 12.87 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 28.72 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 1.859E-6 cm/sec
y0 = 1.206 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-15-18
Title: P-15-18SD FH1
Date: 04/09/19
Time: 15:18:33

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3/7/2019-3/8/2019
Test Well: P-15-18SD

AQUIFER DATA

Saturated Thickness: 13.36 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-15-18SD

X Location: 13214. ft
Y Location: 15144. ft

Initial Displacement: 1.952 ft
Static Water Column Height: 28.72 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.87 ft

No. of Observations: 211

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.952	8441.	0.691
1.14	1.915	8981.	0.671
2.34	1.351	9461.	0.653
3.6	1.269	1.006E+4	0.635
4.92	1.224	1.066E+4	0.614
6.36	1.216	1.126E+4	0.599
7.86	1.223	1.186E+4	0.585
9.42	1.226	1.246E+4	0.57
11.1	1.228	1.306E+4	0.554
12.9	1.223	1.366E+4	0.539
14.76	1.225	1.426E+4	0.532
16.8	1.224	1.486E+4	0.515
18.9	1.214	1.546E+4	0.503
21.12	1.222	1.606E+4	0.494
23.52	1.223	1.666E+4	0.484
26.28	1.234	1.726E+4	0.471
28.73	1.234	1.786E+4	0.461
31.5	1.222	1.846E+4	0.449
34.5	1.22	1.906E+4	0.436
37.68	1.212	1.966E+4	0.429
41.04	1.222	2.026E+4	0.421
44.64	1.22	2.086E+4	0.413
48.24	1.217	2.146E+4	0.404
52.44	1.226	2.206E+4	0.395
56.64	1.21	2.266E+4	0.384
60.84	1.209	2.326E+4	0.376

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
65.64	1.208	2.386E+4	0.367
71.04	1.216	2.446E+4	0.361
75.84	1.207	2.506E+4	0.349
81.84	1.205	2.566E+4	0.342
87.84	1.213	2.626E+4	0.331
93.84	1.215	2.686E+4	0.328
100.4	1.208	2.746E+4	0.324
107.6	1.21	2.806E+4	0.317
115.4	1.206	2.866E+4	0.311
123.2	1.205	2.926E+4	0.309
131.6	1.206	2.986E+4	0.301
140.6	1.201	3.046E+4	0.297
150.2	1.203	3.106E+4	0.293
159.8	1.198	3.166E+4	0.283
170.6	1.201	3.226E+4	0.276
182.	1.197	3.286E+4	0.27
194.	1.171	3.346E+4	0.268
206.6	1.189	3.406E+4	0.26
219.8	1.192	3.466E+4	0.254
234.2	1.19	3.526E+4	0.25
249.2	1.188	3.586E+4	0.245
264.8	1.19	3.646E+4	0.24
281.6	1.186	3.706E+4	0.233
299.6	1.186	3.766E+4	0.226
318.2	1.182	3.826E+4	0.224
338.6	1.178	3.886E+4	0.218
359.6	1.178	3.946E+4	0.209
381.8	1.173	4.006E+4	0.207
405.8	1.179	4.066E+4	0.203
431.	1.175	4.126E+4	0.193
457.4	1.167	4.186E+4	0.192
485.6	1.17	4.246E+4	0.186
515.6	1.166	4.306E+4	0.183
547.4	1.159	4.366E+4	0.173
581.	1.157	4.426E+4	0.167
617.	1.156	4.486E+4	0.161
653.	1.15	4.546E+4	0.157
695.	1.145	4.606E+4	0.155
737.	1.143	4.666E+4	0.15
779.	1.144	4.726E+4	0.144
827.	1.132	4.786E+4	0.141
881.	1.125	4.846E+4	0.136
929.	1.12	4.906E+4	0.131
989.	1.122	4.966E+4	0.129
1049.	1.118	5.026E+4	0.123
1109.	1.106	5.086E+4	0.119
1175.	1.107	5.146E+4	0.115
1247.	1.102	5.206E+4	0.113
1325.	1.093	5.266E+4	0.102
1403.	1.089	5.326E+4	0.1
1487.	1.079	5.386E+4	0.097
1577.	1.074	5.446E+4	0.089
1673.	1.067	5.506E+4	0.082
1769.	1.06	5.566E+4	0.077
1877.	1.05	5.626E+4	0.074
1991.	1.042	5.686E+4	0.069
2111.	1.032	5.746E+4	0.064
2237.	1.023	5.806E+4	0.061
2369.	1.015	5.866E+4	0.056
2513.	1.006	5.926E+4	0.052
2663.	0.991	5.986E+4	0.053
2819.	0.982	6.046E+4	0.051
2987.	0.971	6.106E+4	0.054

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
3167.	0.96	6.166E+4	0.053
3353.	0.948	6.226E+4	0.048
3557.	0.937	6.286E+4	0.049
3767.	0.921	6.346E+4	0.044
3989.	0.911	6.406E+4	0.039
4229.	0.895	6.466E+4	0.037
4481.	0.88	6.526E+4	0.031
4745.	0.863	6.586E+4	0.029
5027.	0.846	6.646E+4	0.024
5327.	0.832	6.706E+4	0.019
5645.	0.812	6.766E+4	0.021
5981.	0.797	6.826E+4	0.015
6341.	0.781	6.886E+4	0.013
6701.	0.763	6.946E+4	0.006
7121.	0.744	7.006E+4	0.002
7541.	0.728	7.066E+4	0.
7961.	0.711		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.947

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.859E-6	cm/sec
y0	1.206	ft

T = K*b = 0.0007572 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	1.671E-6	4.321E-8	+/- 8.516E-8	38.66	cm/sec
y0	1.207	0.008885	+/- 0.01751	135.8	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.0006803 cm²/sec

Parameter Correlations

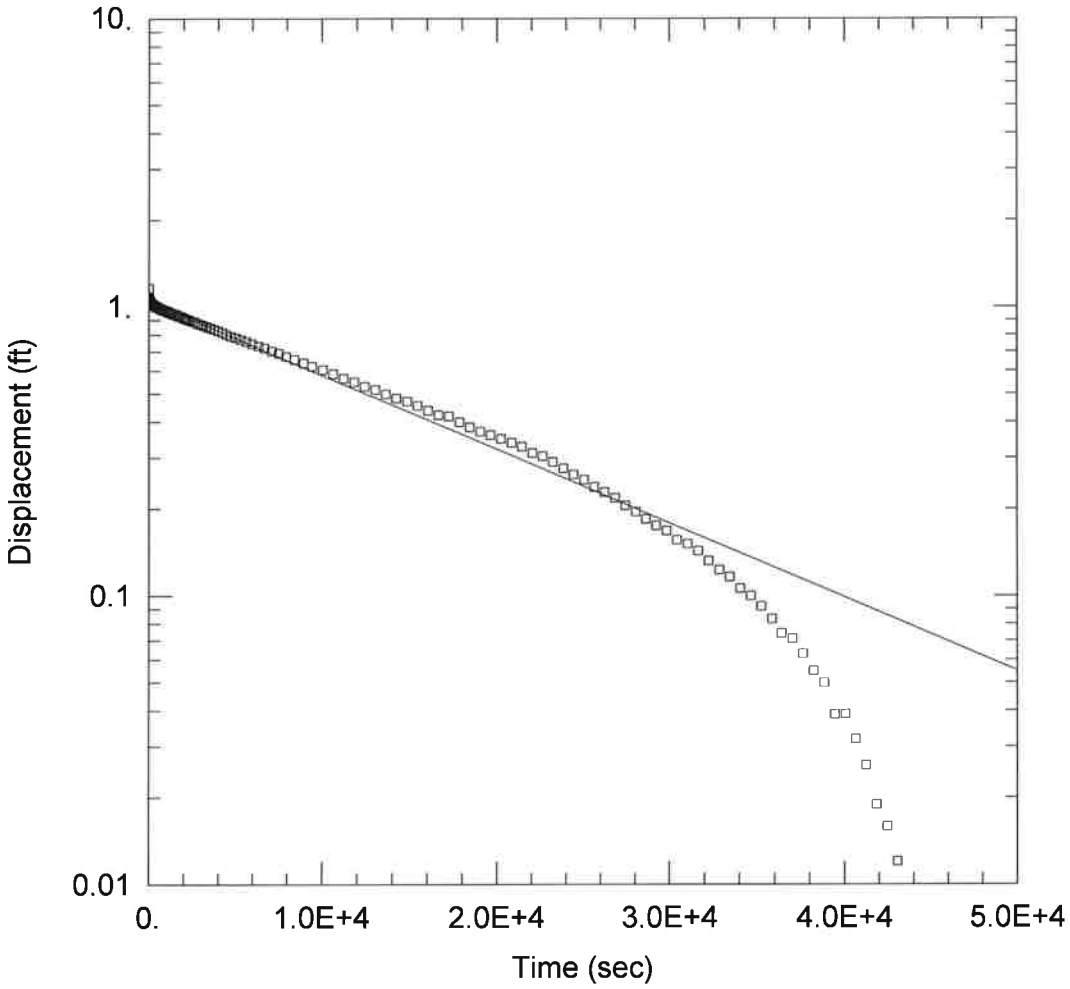
	K	y0
K	1.00	0.39
y0	0.39	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 1.411 ft^2
Variance . . . . . 0.006752 ft^2
Std. Deviation . . . . . 0.08217 ft
Mean . . . . . 0.005554 ft

No. of Residuals. 211
No. of Estimates. 2



P-15-18SD RH1

Data Set: T:\...\P-15-18SD RH1.aqt
Date: 04/05/19 Time: 07:08:38

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Well: P-15-18SD
Test Date: 3-8-2019

AQUIFER DATA

Saturated Thickness: 13.36 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-15-18SD)

Initial Displacement: 1.16 ft
Total Well Penetration Depth: 12.87 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 28.72 ft
Screen Length: 9.65 ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 1.874E-6 cm/sec
y0 = 1.046 ft

Data Set: T:\Projects\2018\Advanced Zion Landfill Expansion\Hydrogeo\Slug Tests\SLUG TESTS 2019\P-15-18
Title: P-15-18SD RH1
Date: 04/05/19
Time: 07:08:46

PROJECT INFORMATION

Company: APTIM
Client: Advanced Disposal
Project: 003211
Location: Zion, IL
Test Date: 3-8-2019
Test Well: P-15-18SD

AQUIFER DATA

Saturated Thickness: 13.36 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: P-15-18SD

X Location: 13214. ft
Y Location: 15144. ft

Initial Displacement: 1.16 ft
Static Water Column Height: 28.72 ft
Casing Radius: 0.0833 ft
Well Radius: 0.208 ft
Well Skin Radius: 0.208 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 12.87 ft

No. of Observations: 162

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.16	2508.1	0.889
1.44	1.084	2658.1	0.887
2.94	1.079	2814.1	0.875
4.5	1.069	2982.1	0.868
6.18	1.067	3162.1	0.862
7.98	1.069	3348.1	0.853
9.84	1.068	3552.1	0.843
11.88	1.071	3762.1	0.835
13.98	1.072	3984.1	0.825
16.2	1.068	4224.1	0.814
18.6	1.07	4476.1	0.802
21.12	1.065	4740.1	0.789
23.76	1.065	5022.1	0.781
26.58	1.064	5322.1	0.769
29.58	1.063	5640.1	0.757
32.76	1.063	5976.1	0.745
36.12	1.062	6336.1	0.731
39.72	1.058	6696.1	0.72
43.32	1.058	7116.1	0.701
47.52	1.056	7536.1	0.689
51.72	1.053	7956.1	0.672
55.92	1.05	8436.1	0.656
60.72	1.054	8976.1	0.638
66.12	1.043	9456.1	0.622
70.92	1.046	1.006E+4	0.605
76.92	1.039	1.066E+4	0.585

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
82.92	1.041	1.126E+4	0.565
88.92	1.04	1.186E+4	0.549
95.52	1.043	1.246E+4	0.53
102.7	1.038	1.306E+4	0.516
110.5	1.036	1.366E+4	0.498
118.3	1.036	1.426E+4	0.482
126.7	1.036	1.486E+4	0.471
135.7	1.032	1.546E+4	0.454
145.3	1.027	1.606E+4	0.437
154.9	1.028	1.666E+4	0.422
165.7	1.027	1.726E+4	0.417
177.1	1.025	1.786E+4	0.399
189.1	1.028	1.846E+4	0.383
201.7	1.021	1.906E+4	0.37
214.9	1.018	1.966E+4	0.36
229.3	1.018	2.026E+4	0.349
244.3	1.017	2.086E+4	0.338
259.9	1.015	2.146E+4	0.328
276.7	1.013	2.206E+4	0.312
294.7	1.011	2.266E+4	0.304
313.3	1.013	2.326E+4	0.29
333.7	1.008	2.386E+4	0.276
354.7	1.007	2.446E+4	0.263
376.9	1.006	2.506E+4	0.252
400.9	1.004	2.566E+4	0.238
426.1	1.001	2.626E+4	0.228
452.5	0.999	2.686E+4	0.218
480.7	0.996	2.746E+4	0.205
510.7	0.995	2.806E+4	0.195
542.5	0.994	2.866E+4	0.184
576.1	0.993	2.926E+4	0.175
612.1	0.988	2.986E+4	0.168
648.1	0.989	3.046E+4	0.156
690.1	0.983	3.106E+4	0.151
732.1	0.98	3.166E+4	0.143
774.1	0.979	3.226E+4	0.132
822.1	0.977	3.286E+4	0.123
876.1	0.971	3.346E+4	0.116
924.1	0.974	3.406E+4	0.106
984.1	0.968	3.466E+4	0.1
1044.1	0.965	3.526E+4	0.092
1104.1	0.96	3.586E+4	0.083
1170.1	0.957	3.646E+4	0.074
1242.1	0.953	3.706E+4	0.071
1320.1	0.95	3.766E+4	0.063
1398.1	0.945	3.826E+4	0.055
1482.1	0.94	3.886E+4	0.05
1572.1	0.942	3.946E+4	0.039
1668.1	0.93	4.006E+4	0.039
1764.1	0.927	4.066E+4	0.032
1872.1	0.923	4.126E+4	0.026
1986.1	0.915	4.186E+4	0.019
2106.1	0.909	4.246E+4	0.016
2232.1	0.905	4.306E+4	0.012
2364.1	0.897	4.366E+4	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 2.947

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.341E-6	cm/sec
y0	1.121	ft

T = K*b = 0.0009532 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	1.874E-6	2.077E-8	+/- 4.102E-8	90.24	cm/sec
y0	1.046	0.003117	+/- 0.006156	335.6	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.0007633 cm²/sec

Parameter Correlations

	K	y0
K	1.00	0.41
y0	0.41	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.1221 ft^2
Variance . . . . . 0.0007631 ft^2
Std. Deviation . . . . . 0.02762 ft
Mean . . . . . -0.003256 ft
No. of Residuals 162
No. of Estimates 2

H.3 – Slug Test Summary (Previous Investigation)

SUMMARY OF 2007 SLUG TEST RESULTS FOR THE SHALLOW DRIFT AQUIFER											
Well ID	**Type**	**Analysis Method**	**Analysis Type**	**Saturated Thickness**	**Total Well Penetration Depth**	**Casing Radius**	**Static Water Column Height**	**Screen Length**	**Wellbore Radius**	**K_h (cm/sec)**	**Geometric Mean K_h (cm/sec)**
G170	RH	Bouwer-Rice	Confined	11.50	13.00	0.083	19.95	10.00	0.25	6.21E-04	7.37E-04
G170	FH	Bouwer-Rice	Confined	11.50	13.00	0.083	19.95	10.00	0.25	8.75E-04	
G175	RH	Bouwer-Rice	Confined	14.67	15.00	0.083	23.68	10.00	0.25	1.21E-04	1.53E-04
G175	FH	Bouwer-Rice	Confined	14.67	15.00	0.083	23.68	10.00	0.25	1.92E-04	
MW-03-07	RH	Bouwer-Rice	Confined	10.50	9.00	0.083	47.19	10.00	0.25	1.29E-04	1.45E-04
MW-03-07	FH	Bouwer-Rice	Confined	10.50	9.00	0.083	47.19	10.00	0.25	1.63E-04	
MW-08-07	RH	Bouwer-Rice	Confined	10.00	10.00	0.083	15.22	10.00	0.25	5.50E-04	5.27E-04
MW-08-07	FH	Bouwer-Rice	Confined	10.00	10.00	0.083	15.22	10.00	0.25	5.05E-04	
MW-09-07	RH	Bouwer-Rice	Confined	10.00	10.00	0.083	20.91	10.00	0.25	2.04E-05	2.04E-05
Maximum				14.67	15.00	0.08	47.19	10.00	0.25	8.75E-04	7.37E-04
Minimum				10.00	9.00	0.08	15.22	10.00	0.25	2.04E-05	2.04E-05
Geometric Mean				11.35	11.33	0.08	23.75	10.00	0.25	2.25E-04	1.77E-04

SUMMARY OF 2007 SLUG TEST RESULTS FOR THE BASAL DRIFT AQUIFER											
Well ID	**Type**	**Analysis Method**	**Analysis Type**	**Saturated Thickness**	**Total Well Penetration Depth**	**Casing Radius**	**Static Water Column Height**	**Screen Length**	**Wellbore Radius**	**K_h (cm/sec)**	**Geomean K_h (cm/sec)**
MW-06-07	RH	Bouwer-Rice	Confined	200.00	6.33	0.083	123.60	5.00	0.25	3.56E-04	3.42E-04
MW-06-07	FH	Bouwer-Rice	Confined	200.00	6.33	0.083	123.60	5.00	0.25	3.29E-04	