

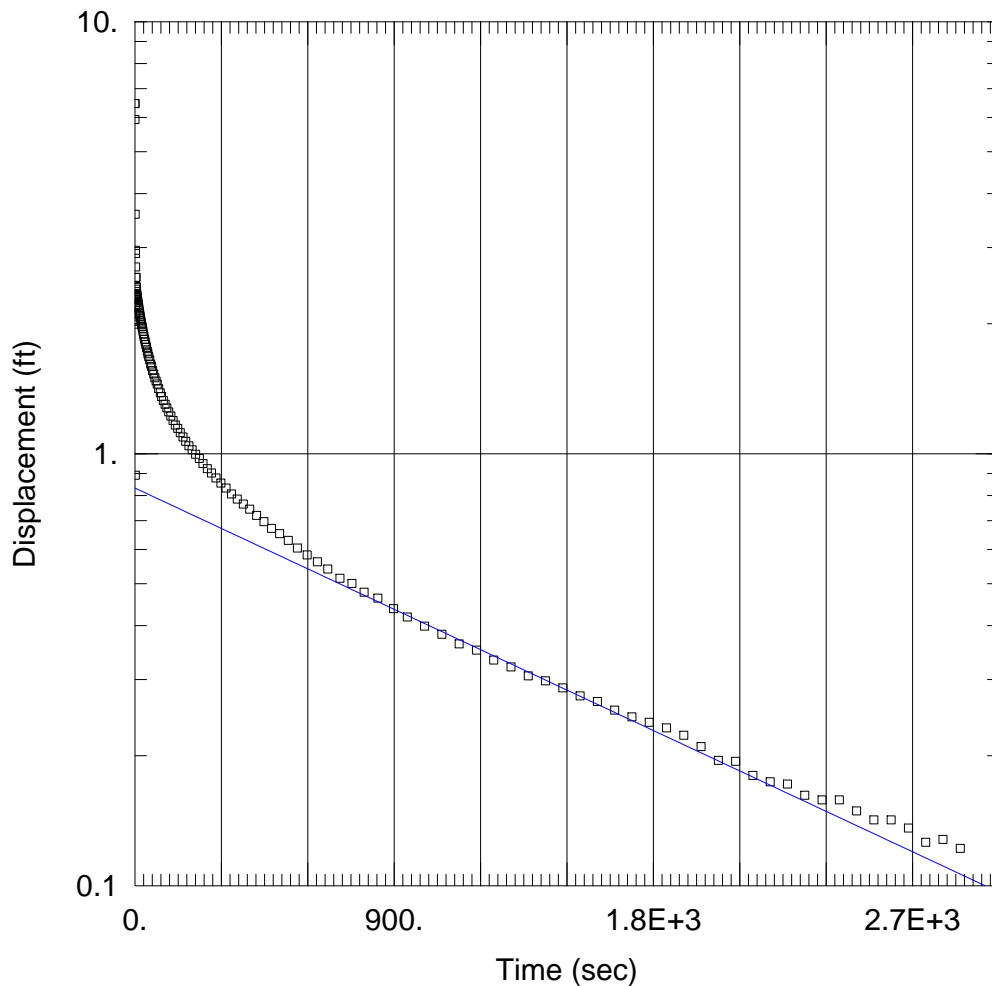
# U-1 Falling Head\_Bouwer-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Bouwer-Rice  
K = 0.1476 ft/day      y0 = 0.8328 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft  
Static Water Column Height: 17.5 ft  
Total Well Penetration Depth: 27. ft  
Screen Length: 19.5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

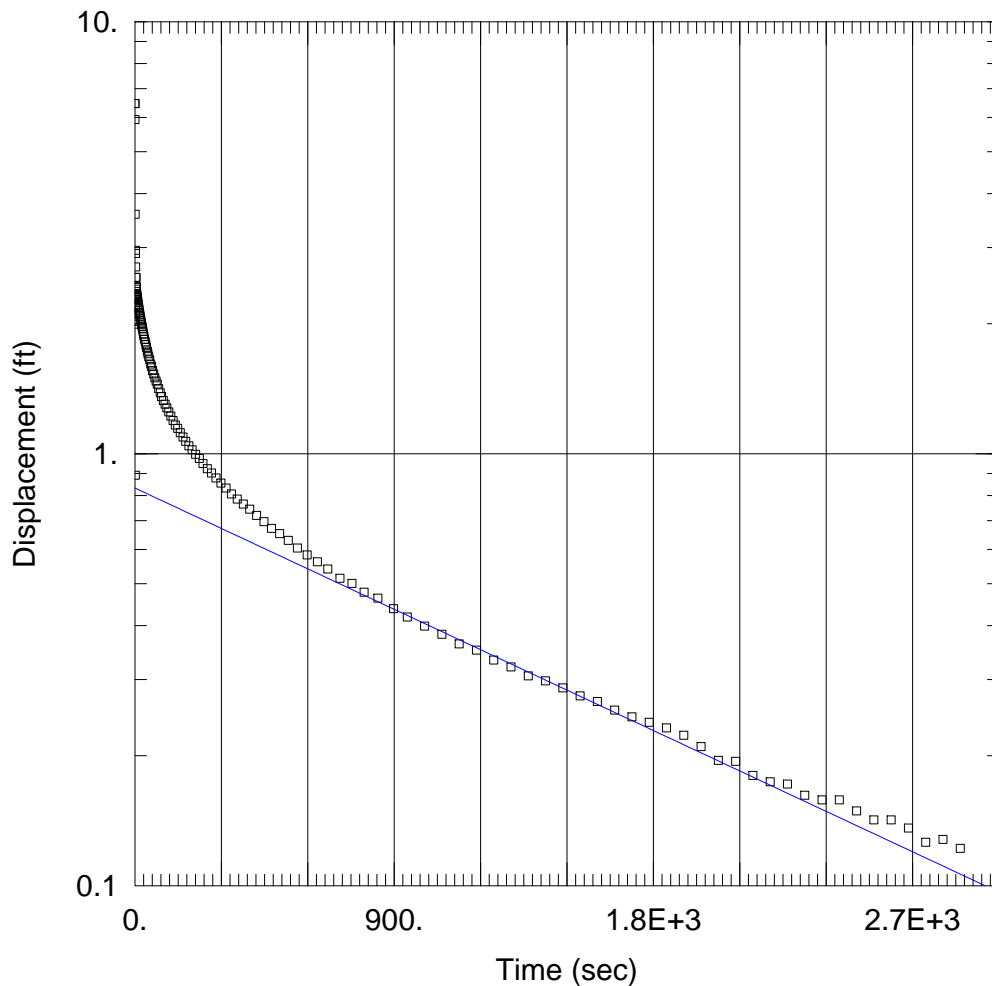
# U-1 Falling Head\_Bouwer-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Bouwer-Rice  
 K = 0.1476 ft/day      y0 = 0.8328 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft  
 Static Water Column Height: 17.5 ft  
 Total Well Penetration Depth: 27. ft  
 Screen Length: 19.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

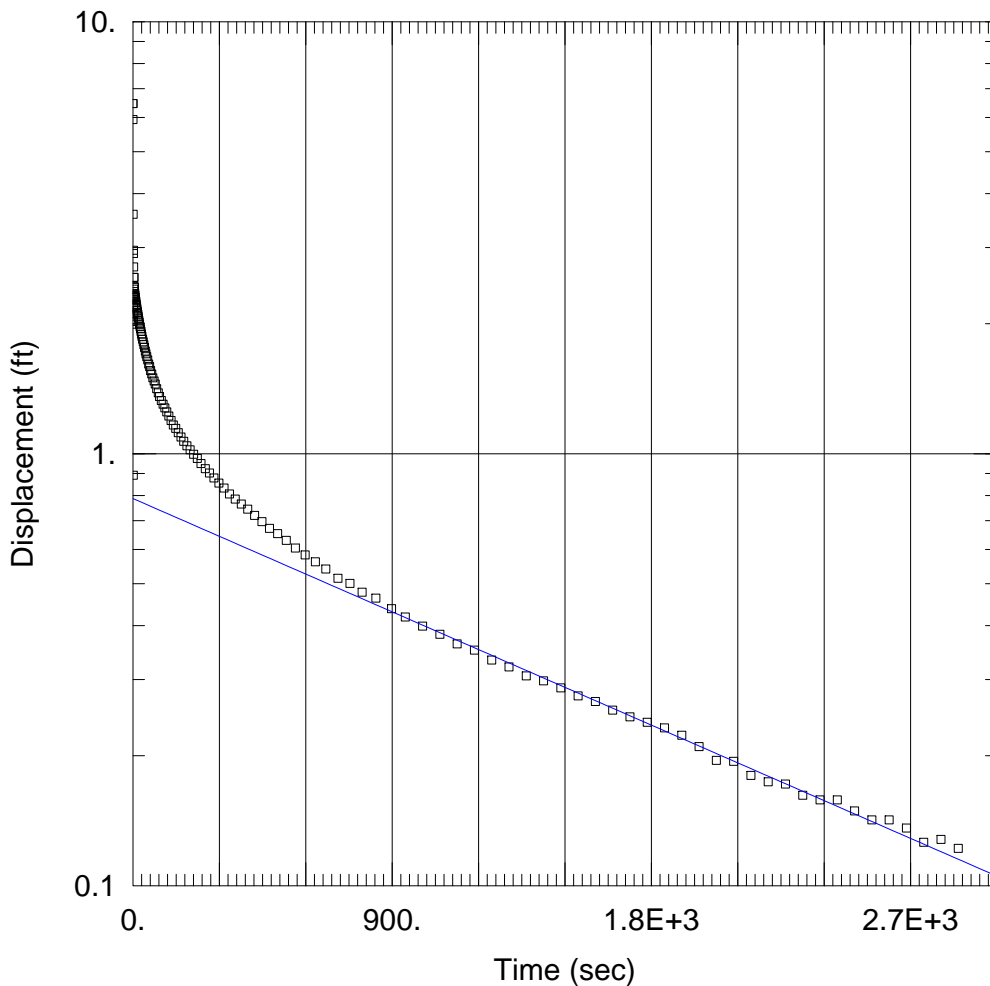
# U-1 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Hvorslev  
K = 0.2466 ft/day      y0 = 0.7873 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft  
Static Water Column Height: 17.5 ft  
Total Well Penetration Depth: 27. ft  
Screen Length: 19.5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

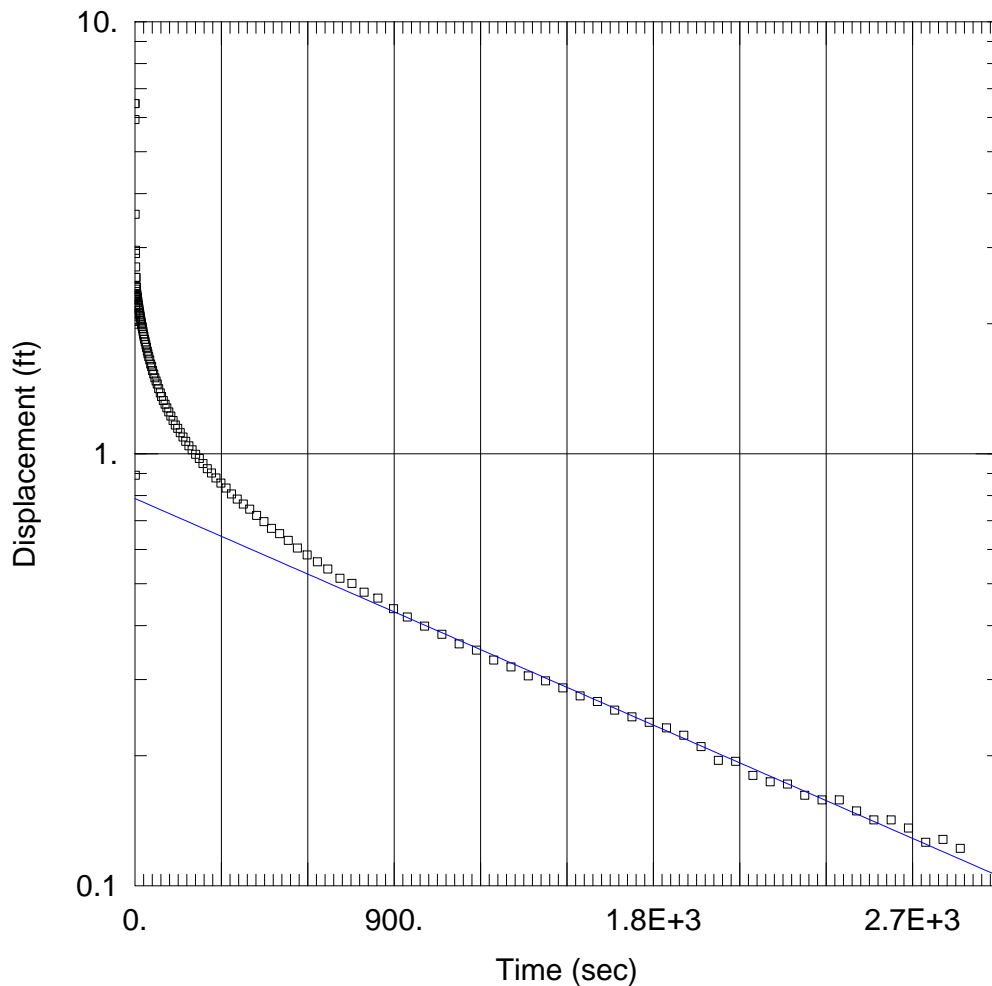
# U-1 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.2466 ft/day      y0 = 0.7873 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft  
Static Water Column Height: 17.5 ft  
Total Well Penetration Depth: 27. ft  
Screen Length: 19.5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\U-1 RH\U-1 RH BR-Unc.aqt  
 Title: U-1 Rising Head\_Bouwer-Rice  
 Date: 12/11/12  
 Time: 18:31:25

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/31/2012  
 Test Well: U-1

---

AQUIFER DATA

Saturated Thickness: 17. ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: U-1

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

Initial Displacement: 6.466 ft  
 Static Water Column Height: 17.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 19.5 ft  
 Total Well Penetration Depth: 27. ft

No. of Observations: 136

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	3.295	147.6	1.151
0.22	3.166	156.6	1.123
0.475	2.216	166.2	1.101
0.725	2.247	175.8	1.079
0.975	2.822	186.6	1.049
1.225	2.762	198.	1.036
1.475	2.379	210.	1.01
1.993	2.639	222.6	0.984
2.215	2.598	235.8	0.965
2.435	2.441	250.2	0.94
2.655	2.414	265.2	0.921
2.877	2.511	280.8	0.898
3.097	2.528	297.6	0.88
3.334	2.457	315.6	0.861
3.695	2.427	334.2	0.837
4.114	2.461	354.6	0.815
4.534	2.39	375.6	0.792
4.954	2.415	397.8	0.773
5.459	2.366	421.8	0.748
5.974	2.36	447.	0.733
6.454	2.35	473.4	0.713
7.054	2.338	501.6	0.69
7.655	2.316	531.6	0.671
8.254	2.3	563.4	0.649
8.914	2.283	597.	0.633
9.634	2.267	633.	0.615
10.41	2.246	669.	0.597
11.19	2.228	711.	0.574
12.04	2.208	753.	0.558

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
12.94	2.188	795.	0.544
13.9	2.17	843.	0.527
14.85	2.148	897.	0.506
15.94	2.125	945.	0.491
17.07	2.101	1005.	0.474
18.27	2.079	1065.	0.459
19.54	2.058	1125.	0.441
20.85	2.033	1185.	0.43
22.29	2.01	1245.	0.42
23.8	1.983	1305.	0.408
25.35	1.956	1365.	0.398
27.04	1.926	1425.	0.382
28.83	1.903	1485.	0.373
30.7	1.878	1545.	0.367
32.73	1.851	1605.	0.356
34.83	1.821	1665.	0.351
37.05	1.79	1725.	0.343
39.45	1.764	1785.	0.335
41.97	1.732	1845.	0.33
44.61	1.707	1905.	0.325
47.43	1.677	1965.	0.315
50.44	1.647	2025.	0.307
53.61	1.617	2085.	0.308
56.97	1.59	2145.	0.3
60.57	1.559	2205.	0.291
64.17	1.529	2265.	0.29
68.37	1.5	2325.	0.286
72.57	1.474	2385.	0.282
76.77	1.441	2445.	0.28
81.57	1.415	2505.	0.275
86.97	1.389	2565.	0.27
91.77	1.357	2625.	0.264
97.77	1.327	2685.	0.263
103.8	1.301	2745.	0.255
109.8	1.282	2805.	0.255
116.4	1.252	2865.	0.253
123.6	1.226	2925.	0.253
131.4	1.203	2985.	0.248
139.2	1.174	3045.	0.243

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 2.963

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.07162	ft/day
y0	0.6237	ft

K = 2.526E-5 cm/sec  
 T = K\*b = 1.217 ft<sup>2</sup>/day (0.01309 sq. cm/sec)

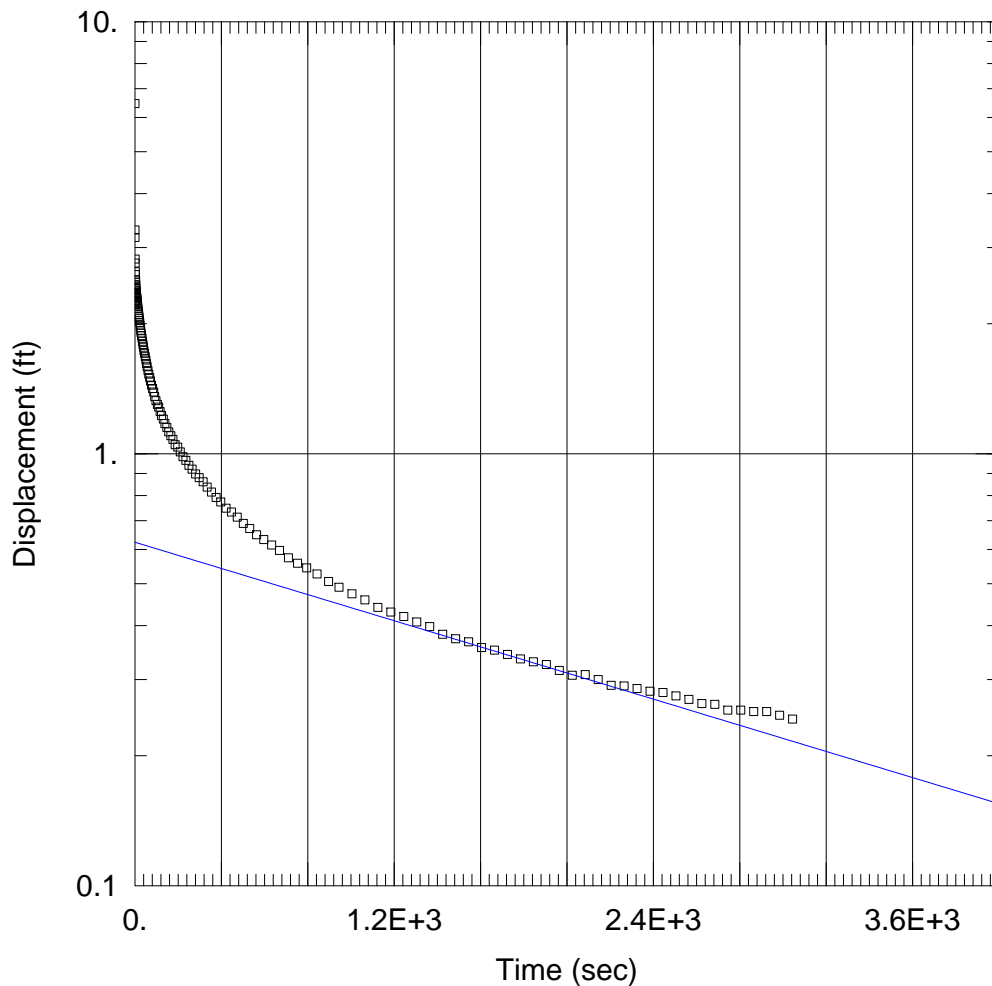
# U-1 Rising Head\_Bouwer-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 K = 0.07162 ft/day      y0 = 0.6237 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft  
 Static Water Column Height: 17.5 ft  
 Total Well Penetration Depth: 27. ft  
 Screen Length: 19.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

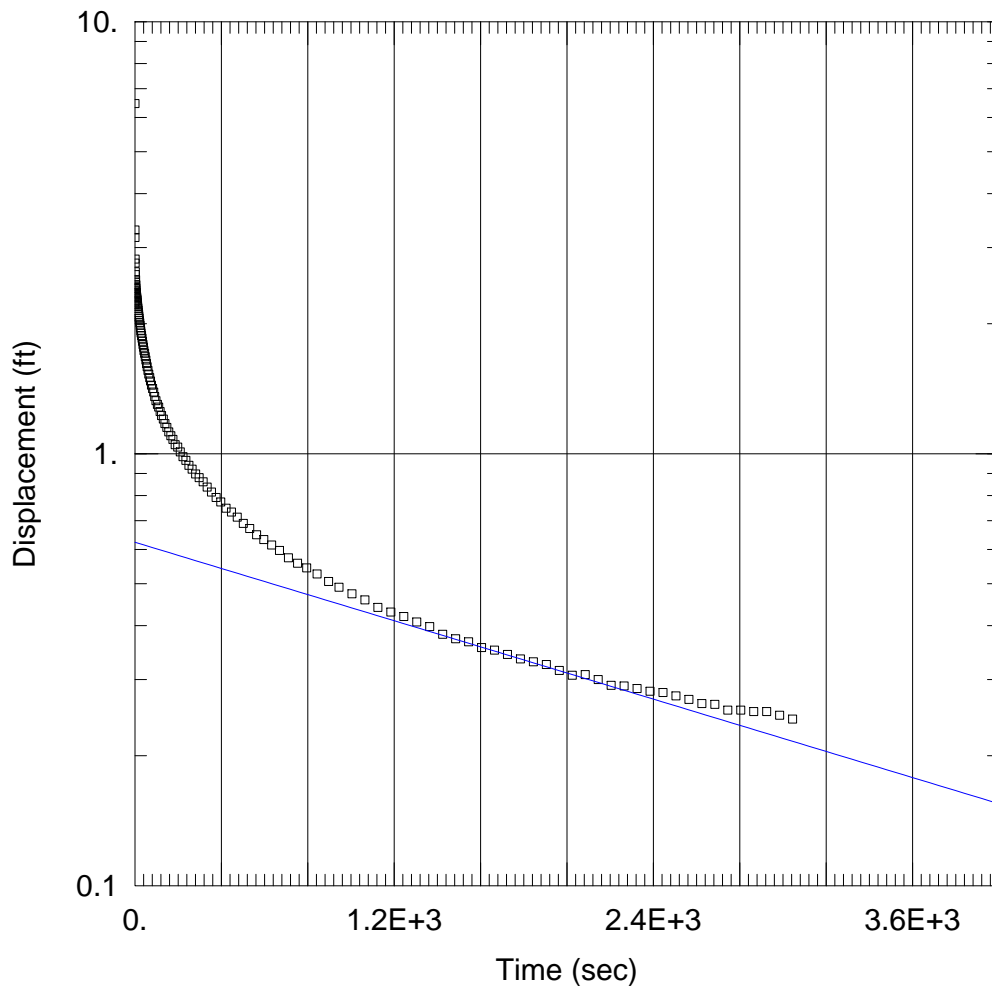
# U-1 Rising Head\_Bouwer-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Bouwer-Rice  
K = 0.07162 ft/day      y0 = 0.6237 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft  
Static Water Column Height: 17.5 ft  
Total Well Penetration Depth: 27. ft  
Screen Length: 19.5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft



# U-1 Rising Head\_Hvorslev

Prepared By:

**JBR Env. Consultants**

Prepared For:

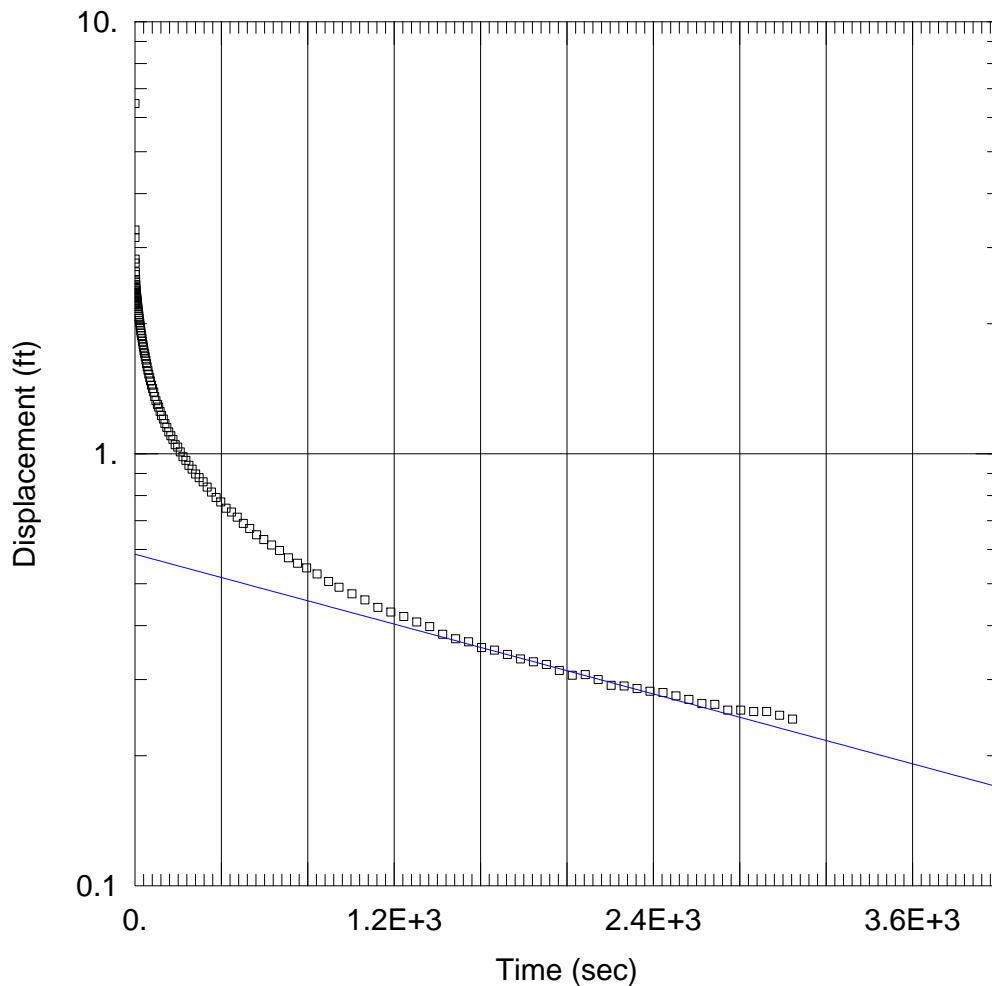
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

K = 0.1141 ft/day      y0 = 0.5852 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft

Static Water Column Height: 17.5 ft

Total Well Penetration Depth: 27. ft

Screen Length: 19.5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# U-1 Rising Head\_Hvorslev

Prepared By:

**JBR Env. Consultants**

Prepared For:

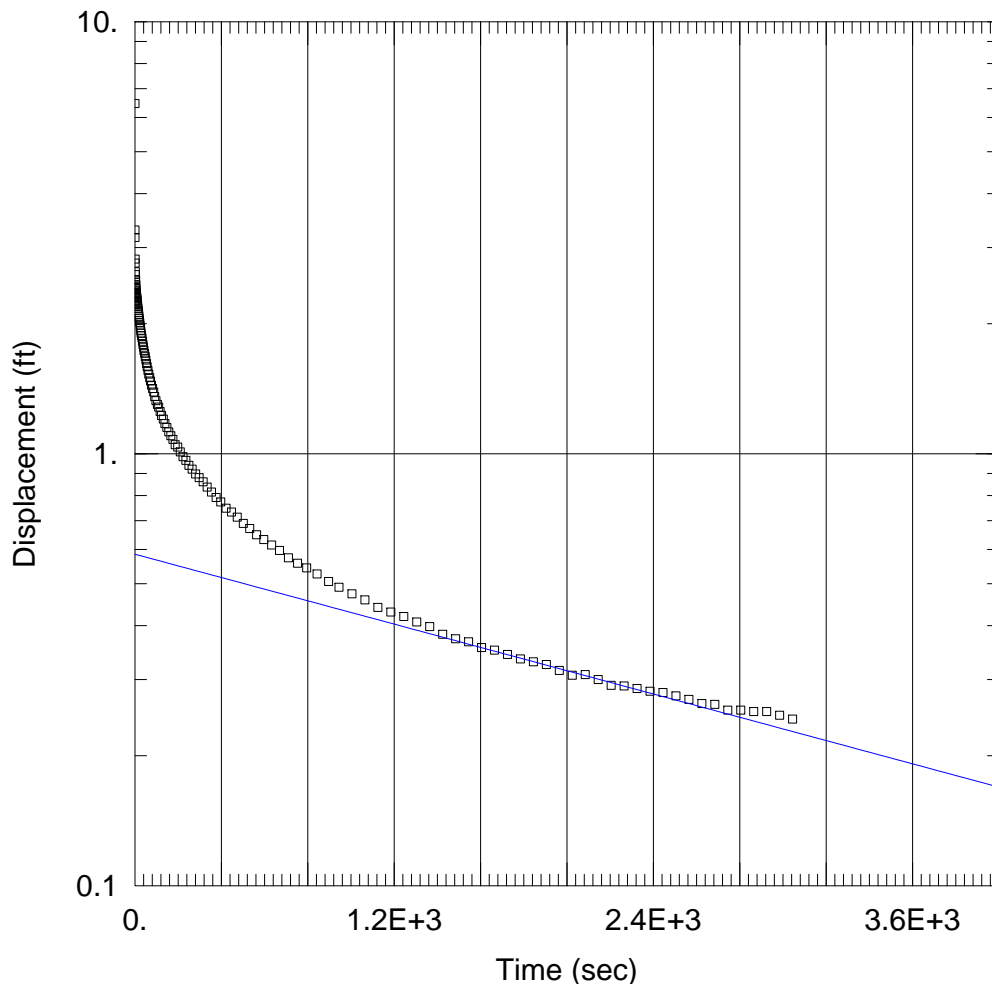
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.1141 ft/day      y0 = 0.5852 ft

## WELL DATA (U-1)

Initial Displacement: 6.466 ft

Static Water Column Height: 17.5 ft

Total Well Penetration Depth: 27. ft

Screen Length: 19.5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\C-1 FH\C-1 FH BR-U.aqt  
 Title: C-1 Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:08:21

---

**PROJECT INFORMATION**

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: C-1

---

**AQUIFER DATA**

Saturated Thickness: 15.5 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

**SLUG TEST WELL DATA**

Test Well: C-1

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

Initial Displacement: 9.309 ft  
 Static Water Column Height: 15.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 9.5 ft  
 Total Well Penetration Depth: 12. ft

No. of Observations: 117

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	9.309	77.25	1.859
0.22	6.917	82.05	1.84
0.446	2.829	87.45	1.815
0.696	2.893	92.25	1.799
0.946	4.632	98.25	1.772
1.196	2.594	104.2	1.745
1.446	0.185	110.2	1.727
1.696	1.69	116.8	1.7
2.17	2.946	124.	1.678
2.391	1.755	131.8	1.65
2.611	1.589	139.6	1.623
2.833	2.38	148.	1.593
3.063	2.67	157.	1.563
3.283	2.26	166.6	1.528
3.502	1.968	176.2	1.492
3.806	2.224	187.	1.466
4.166	2.346	198.4	1.434
4.587	2.117	210.4	1.394
5.006	2.285	223.	1.36
5.426	2.194	236.2	1.325
5.906	2.227	250.6	1.284
6.446	2.202	265.6	1.245
6.926	2.213	281.2	1.205
7.526	2.199	298.	1.165
8.127	2.206	316.	1.123
8.726	2.194	334.6	1.083
9.386	2.197	355.4	1.038
10.11	2.19	376.	0.995
10.89	2.186	398.2	0.947

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
11.67	2.177	422.2	0.905
12.51	2.173	447.4	0.864
13.41	2.165	473.8	0.818
14.37	2.159	502.	0.776
15.33	2.155	532.	0.729
16.41	2.15	563.8	0.682
17.75	2.144	597.4	0.64
18.75	2.138	633.4	0.595
20.01	2.129	669.4	0.552
21.33	2.122	711.4	0.509
22.77	2.115	753.4	0.469
24.27	2.107	795.4	0.433
25.83	2.091	843.4	0.389
27.51	2.082	897.4	0.355
29.31	2.076	945.4	0.322
31.17	2.064	1005.4	0.286
33.21	2.06	1065.4	0.25
35.31	2.048	1125.4	0.22
37.53	2.032	1185.4	0.197
39.93	2.022	1245.4	0.171
42.45	2.013	1305.4	0.15
45.09	1.998	1365.4	0.133
47.91	1.983	1425.4	0.117
50.91	1.973	1485.4	0.101
54.09	1.961	1545.4	0.089
57.45	1.945	1605.4	0.076
61.05	1.929	1665.4	0.067
64.65	1.912	1725.4	0.057
68.85	1.896	1785.4	0.043
73.05	1.878		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 2.034

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.5052	ft/day
y0	2.052	ft

K = 0.0001782 cm/sec  
 T = K\*b = 7.83 ft<sup>2</sup>/day (0.08419 sq. cm/sec)

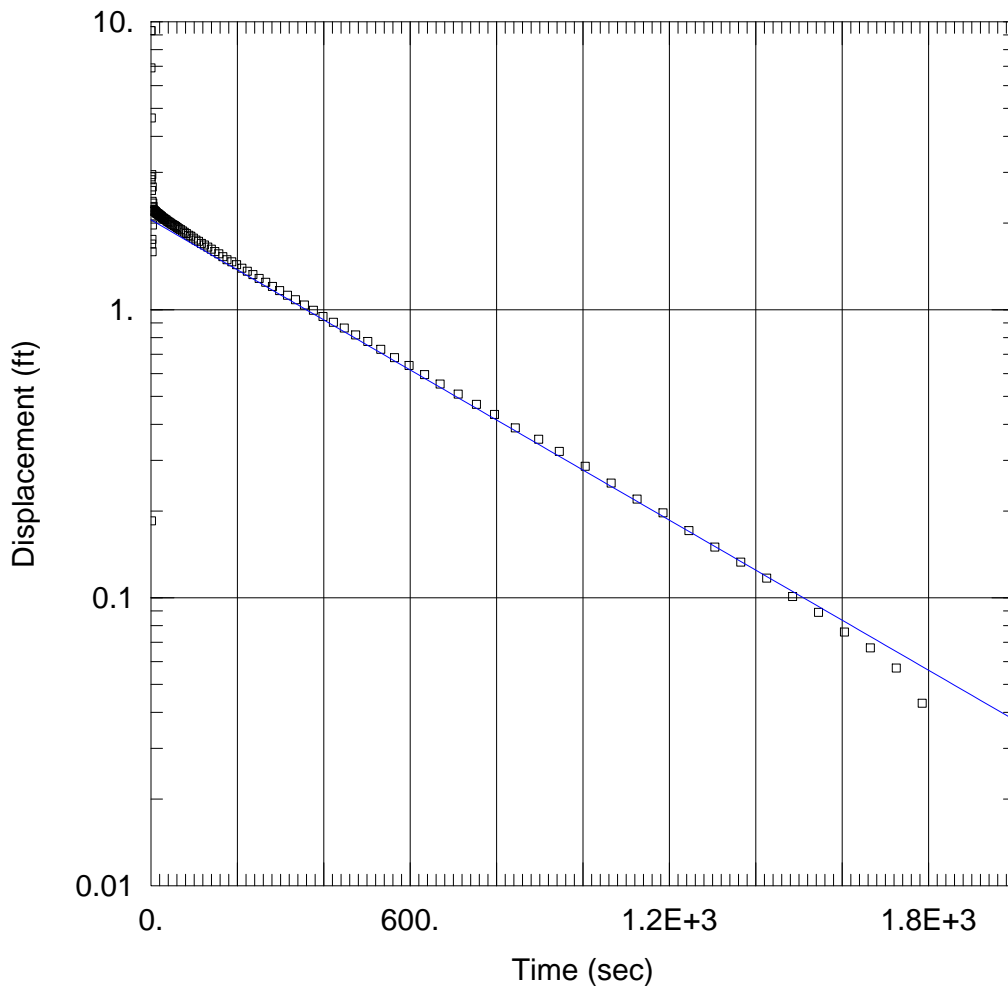
# C-1 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bower-Rice  
 K = 0.5052 ft/day      y0 = 2.052 ft

## WELL DATA (C-1)

Initial Displacement: 9.309 ft  
 Static Water Column Height: 15.5 ft  
 Total Well Penetration Depth: 12. ft  
 Screen Length: 9.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

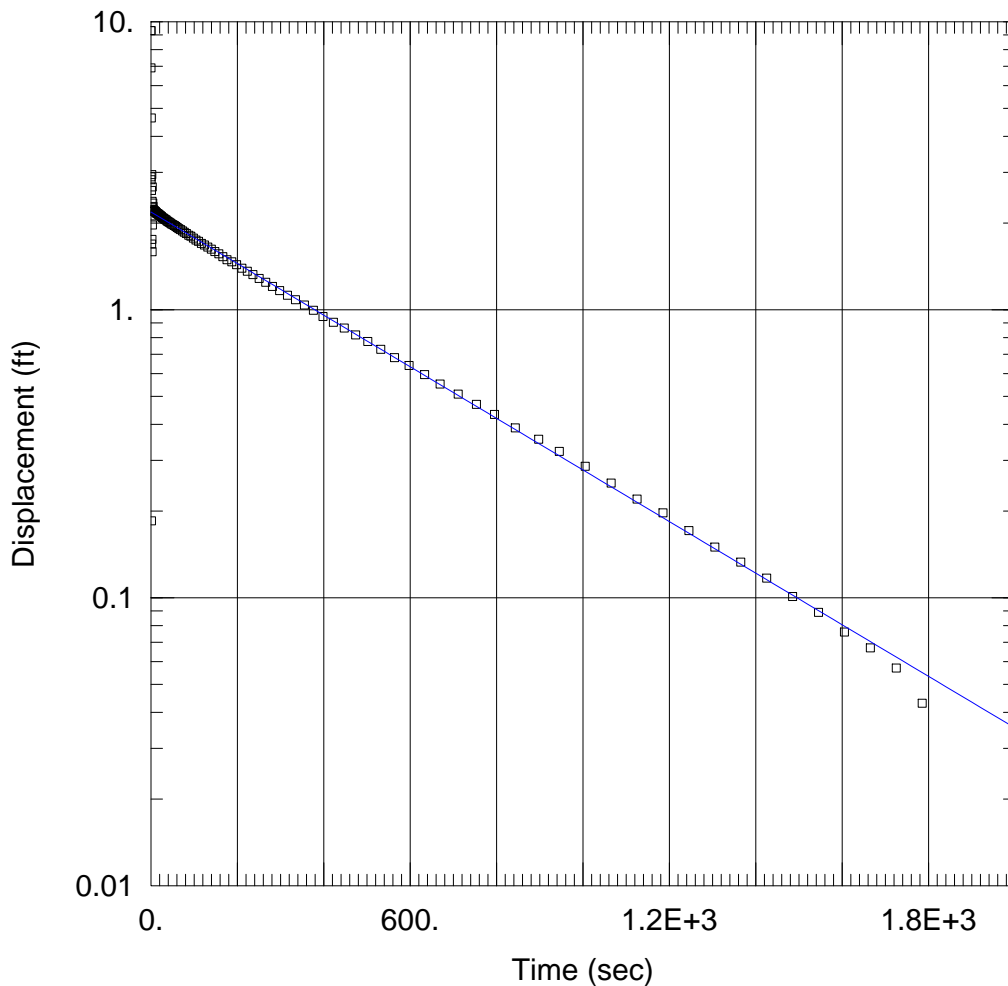
# C-1 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Bower-Rice  
 K = 0.5208 ft/day      y0 = 2.185 ft

## WELL DATA (C-1)

Initial Displacement: 9.309 ft  
 Static Water Column Height: 15.5 ft  
 Total Well Penetration Depth: 12. ft  
 Screen Length: 9.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

# C-1 Falling Head\_Hvorslev

Prepared By:

JBR Env. Consultants

Prepared For:

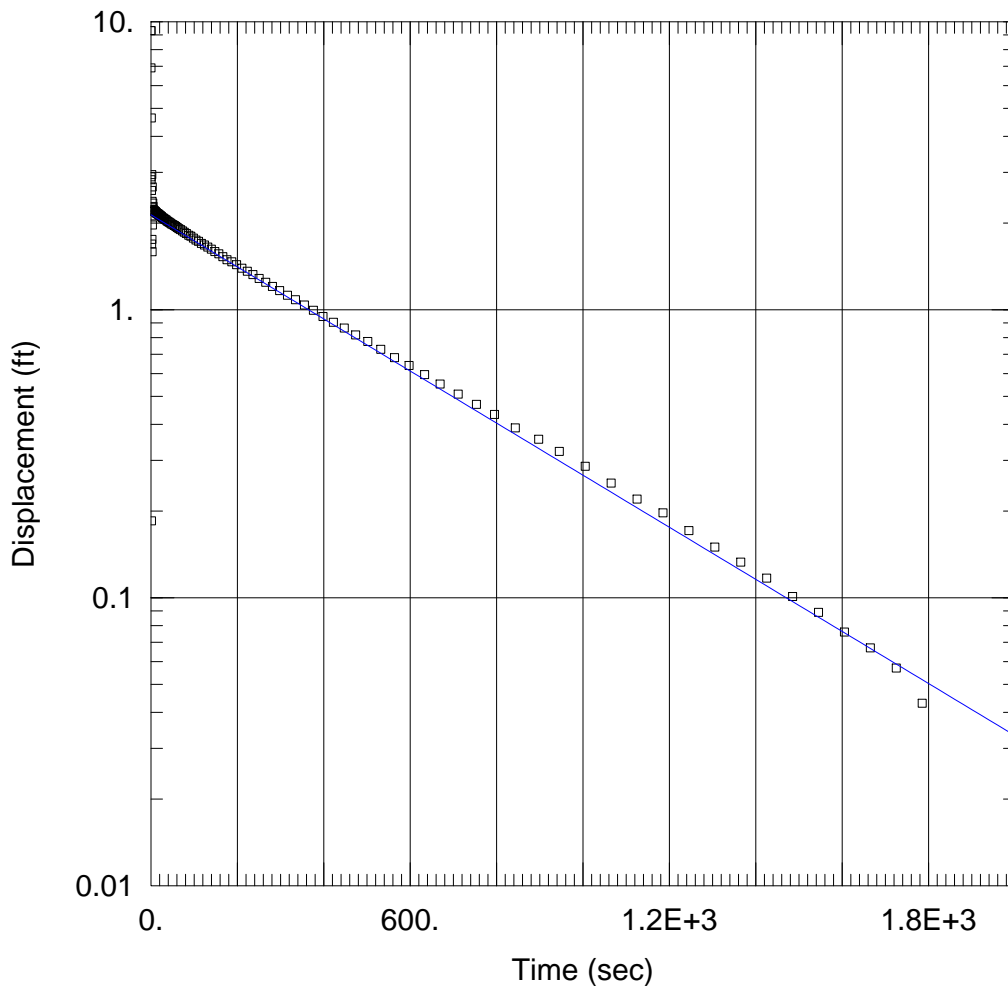
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

K = 0.7618 ft/day      y0 = 2.136 ft

## WELL DATA (C-1)

Initial Displacement: 9.309 ft

Static Water Column Height: 15.5 ft

Total Well Penetration Depth: 12. ft

Screen Length: 9.5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# C-1 Falling Head\_Hvorslev

Prepared By:

JBR Env. Consultants

Prepared For:

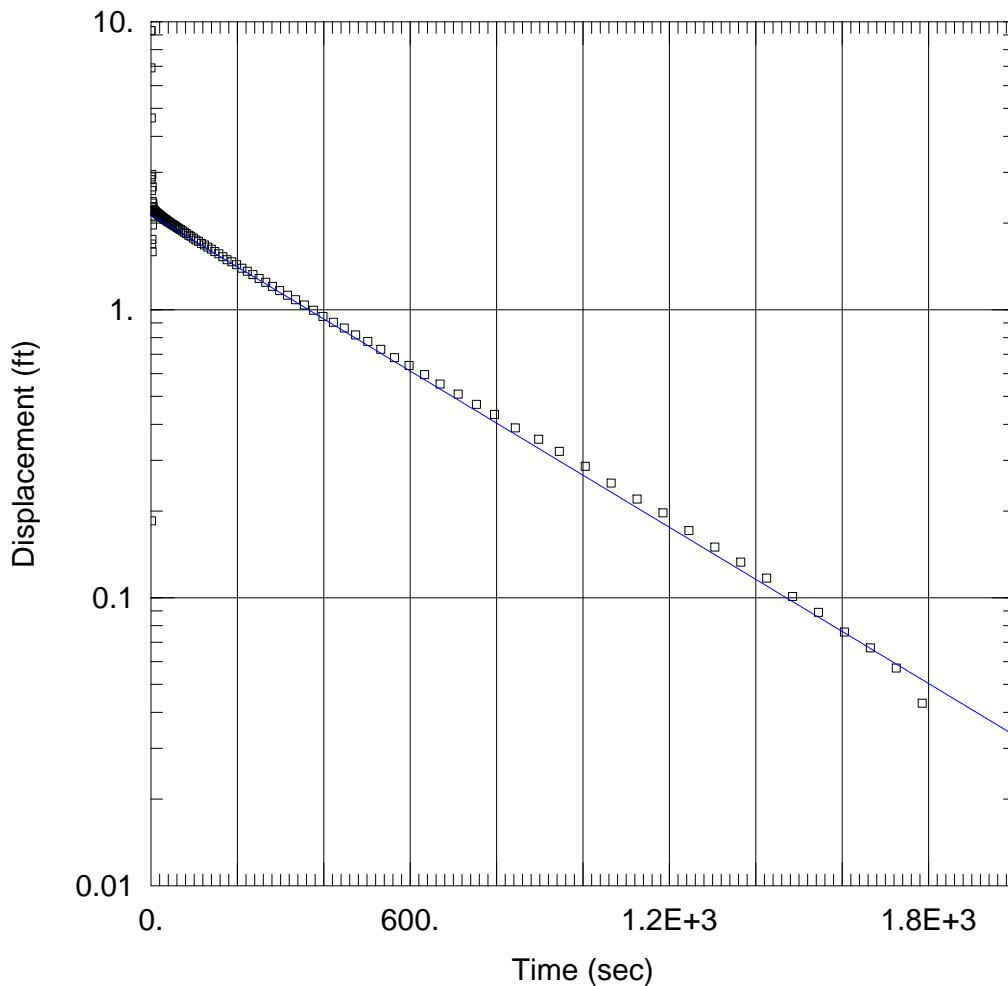
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.7618 ft/day       $y_0 =$  2.136 ft

## WELL DATA (C-1)

Initial Displacement: 9.309 ft

Static Water Column Height: 15.5 ft

Total Well Penetration Depth: 12. ft

Screen Length: 9.5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft



Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\C-1 RH\C-1 RH BR-Unc.aqt  
 Title: C-1 Rising Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:10:51

---

PROJECT INFORMATION

Company: JBR Env. Consultants.  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: C-1

---

AQUIFER DATA

Saturated Thickness: 15.5 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: C-1

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

Initial Displacement: 3.77 ft  
 Static Water Column Height: 15.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 9.5 ft  
 Total Well Penetration Depth: 12. ft

No. of Observations: 137

Observation Data			
Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	3.77	84.35	2.004
0.25	4.072	89.75	1.978
0.5	3.866	94.55	1.959
0.983	3.683	100.6	1.935
1.204	2.498	106.6	1.915
1.424	2.753	112.6	1.891
1.645	2.855	119.2	1.865
1.867	2.6	126.3	1.838
2.086	2.801	134.2	1.812
2.306	2.626	141.9	1.783
2.526	2.713	150.3	1.753
2.746	2.649	159.3	1.724
3.	2.666	168.9	1.697
3.25	2.634	178.6	1.666
3.5	2.633	189.3	1.629
3.75	2.619	200.8	1.595
4.	2.613	212.8	1.562
4.514	2.587	225.3	1.528
4.736	2.578	238.6	1.491
4.956	2.569	252.9	1.453
5.177	2.564	267.9	1.412
5.399	2.562	283.5	1.374
5.619	2.557	300.4	1.332
5.863	2.548	318.4	1.285
6.144	2.532	336.9	1.238
6.47	2.529	357.4	1.193
6.89	2.519	378.4	1.145
7.31	2.517	400.5	1.1
7.73	2.501	424.5	1.05

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
8.21	2.483	449.8	1.004
8.75	2.473	476.1	0.956
9.23	2.461	504.4	0.906
9.83	2.455	534.4	0.858
10.43	2.443	566.1	0.812
11.03	2.44	599.7	0.767
11.69	2.429	635.8	0.719
12.41	2.398	671.8	0.675
13.19	2.405	713.8	0.628
13.97	2.392	755.8	0.585
14.81	2.385	797.8	0.549
15.71	2.383	845.8	0.507
16.67	2.363	899.8	0.468
17.63	2.356	947.8	0.436
18.71	2.345	1007.8	0.396
19.85	2.333	1067.8	0.364
21.05	2.323	1127.8	0.335
22.31	2.318	1187.8	0.312
23.63	2.304	1247.8	0.288
25.07	2.296	1307.8	0.269
26.57	2.284	1367.8	0.248
28.13	2.275	1427.8	0.232
29.81	2.262	1487.8	0.217
31.61	2.251	1547.8	0.201
33.47	2.24	1607.8	0.192
35.51	2.229	1667.8	0.179
37.61	2.22	1727.8	0.168
39.83	2.205	1787.8	0.163
42.23	2.192	1847.8	0.221
44.75	2.182	1907.8	0.205
47.39	2.164	1967.8	0.192
50.21	2.152	2027.8	0.181
53.21	2.138	2087.8	0.168
56.39	2.126	2147.8	0.155
59.75	2.107	2207.8	0.153
63.35	2.09	2267.8	0.144
66.95	2.074	2327.8	0.134
71.15	2.056	2387.8	0.131
75.35	2.036	2447.8	0.125
79.55	2.02		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 2.034

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.4442	ft/day
y0	2.185	ft

K = 0.0001567 cm/sec  
 T = K\*b = 6.885 ft<sup>2</sup>/day (0.07403 sq. cm/sec)

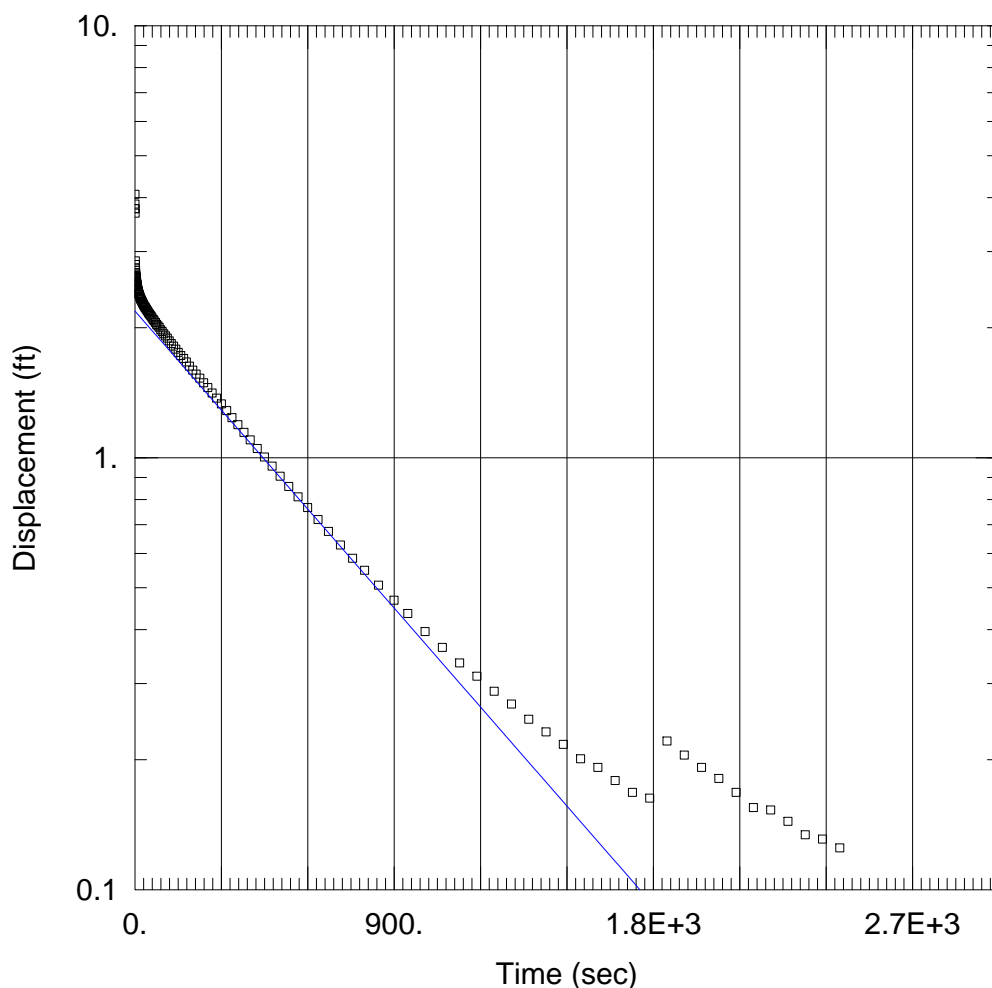
# C-1 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants.**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 $K = 0.4442$  ft/day       $y_0 = 2.185$  ft

## WELL DATA (C-1)

Initial Displacement: 3.77 ft  
 Static Water Column Height: 15.5 ft  
 Total Well Penetration Depth: 12. ft  
 Screen Length: 9.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

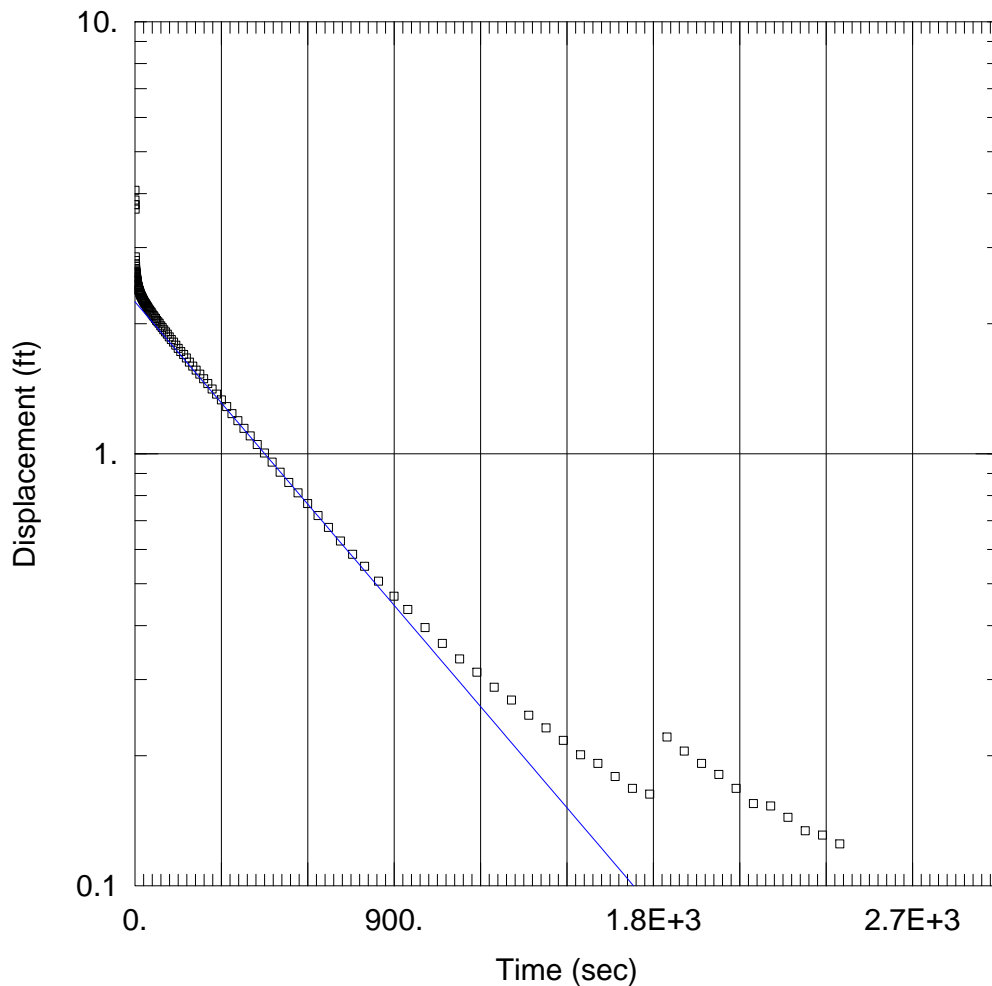
# C-1 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants.**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Bouwer-Rice  
 K = 0.454 ft/day      y0 = 2.247 ft

## WELL DATA (C-1)

Initial Displacement: 3.77 ft  
 Static Water Column Height: 15.5 ft  
 Total Well Penetration Depth: 12. ft  
 Screen Length: 9.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

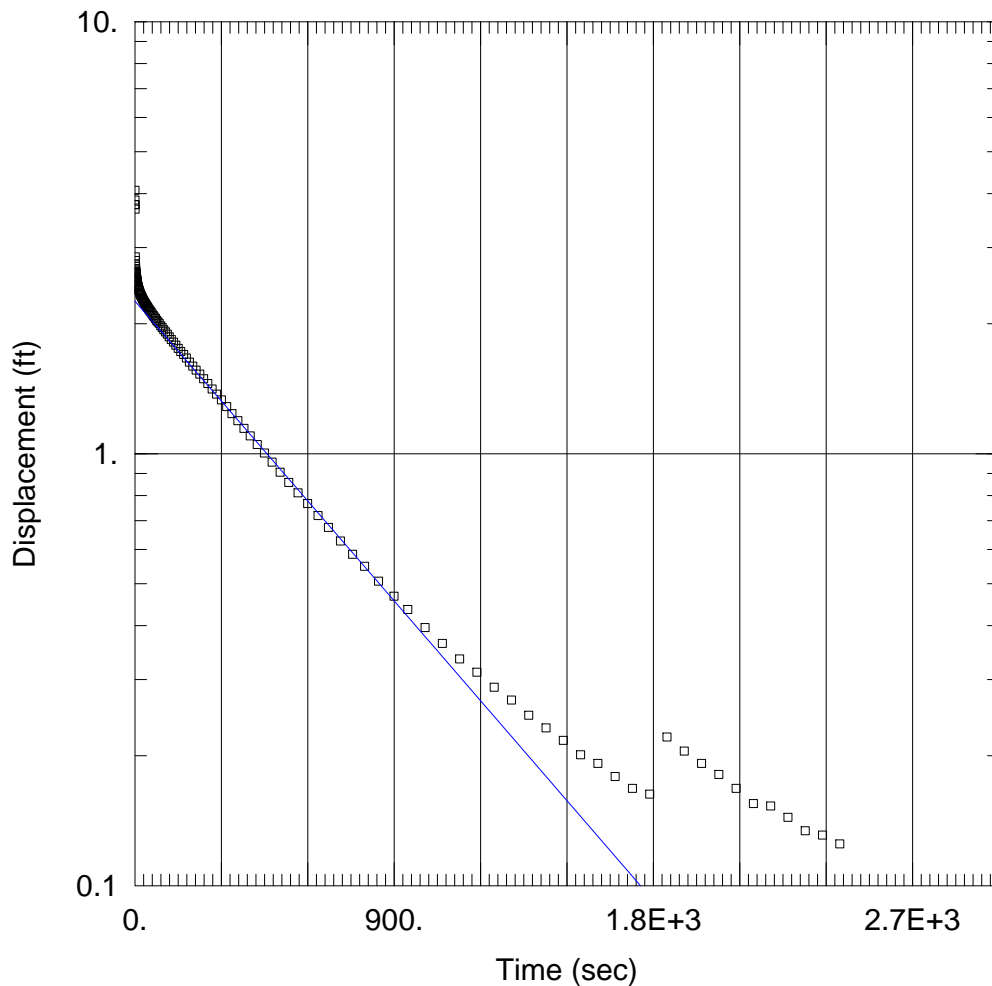
# C-1 Rising Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants.**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Hvorslev  
 K = 0.6494 ft/day      y0 = 2.255 ft

## WELL DATA (C-1)

Initial Displacement: 3.77 ft  
 Static Water Column Height: 15.5 ft  
 Total Well Penetration Depth: 12. ft  
 Screen Length: 9.5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

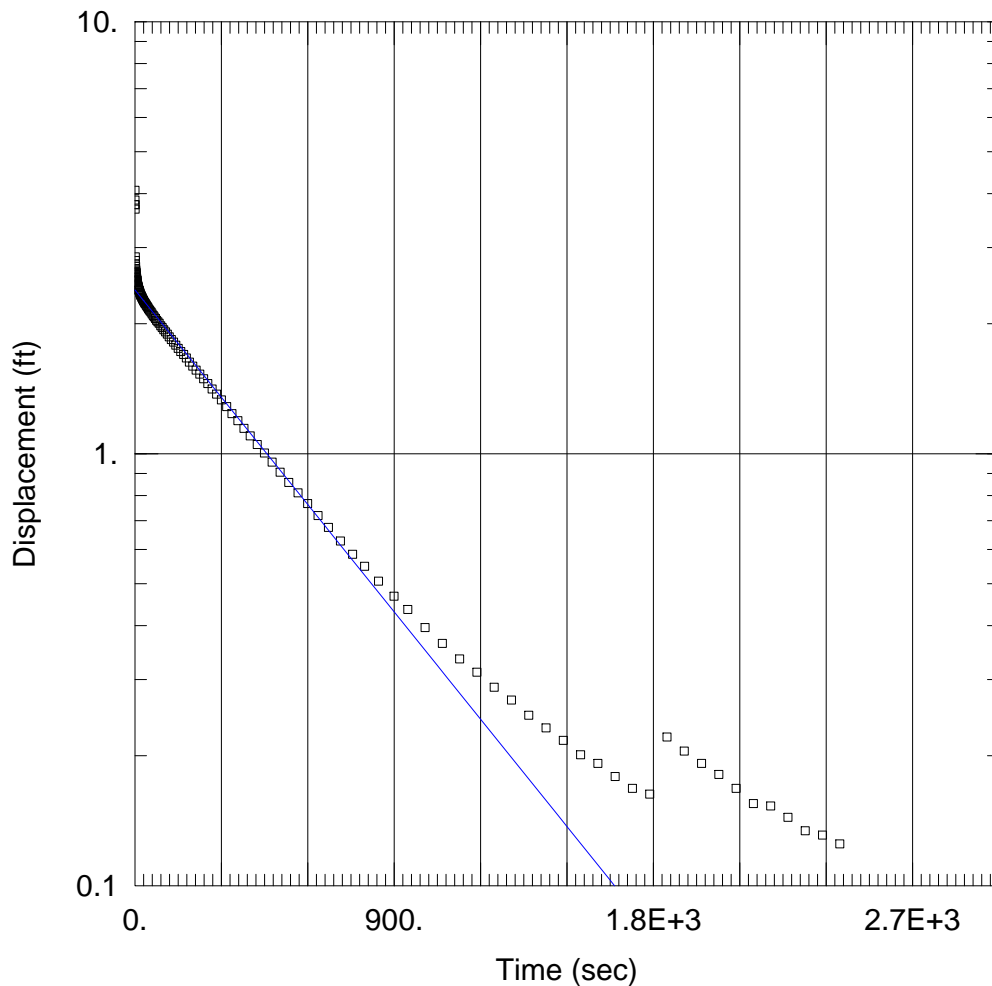
# C-1 Rising Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants.**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.6976 ft/day      y0 = 2.394 ft

## WELL DATA (C-1)

Initial Displacement: 3.77 ft  
Static Water Column Height: 15.5 ft  
Total Well Penetration Depth: 12. ft  
Screen Length: 9.5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\C2 -FH\C-2 FH BR-Unc.aqt  
 Title: C-2 Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:12:42

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PROJECT INFORMATION

Company: JBR Env. Consultants,  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: C-2

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AQUIFER DATA

Saturated Thickness: 18. ft  
 Anisotropy Ratio (Kz/Kr): 1.

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SLUG TEST WELL DATA

Test Well: C-2

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

Initial Displacement: 5.507 ft  
 Static Water Column Height: 19.3 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 15. ft  
 Total Well Penetration Depth: 18.3 ft

No. of Observations: 143

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	5.507	234.7	1.256
0.22	1.33	249.1	1.224
0.44	-0.605	264.1	1.197
0.676	0.867	279.7	1.165
0.926	2.916	296.5	1.141
1.259	2.848	314.5	1.112
1.481	2.786	333.1	1.083
1.702	2.295	353.5	1.053
1.922	1.554	374.6	1.023
2.286	1.725	396.9	0.991
2.646	2.497	420.7	0.966
3.066	2.316	445.9	0.933
3.486	1.876	472.3	0.9
3.905	2.101	500.6	0.872
4.386	2.257	530.5	0.848
4.925	2.009	562.3	0.82
5.405	2.114	595.9	0.796
6.006	2.132	631.9	0.769
6.606	2.062	667.9	0.748
7.206	2.125	709.9	0.72
7.865	2.07	751.9	0.696
8.585	2.096	793.9	0.67
9.365	2.06	841.9	0.648
10.15	2.073	895.9	0.621
10.99	2.063	943.9	0.598
11.89	2.053	1003.9	0.571
12.85	2.049	1063.9	0.55
13.81	2.041	1123.9	0.522
14.89	2.033	1183.9	0.502

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
16.03	2.031	1243.9	0.48
17.23	2.018	1303.9	0.456
18.49	2.01	1363.9	0.445
19.81	2.004	1423.9	0.425
21.25	1.995	1483.9	0.409
22.75	1.986	1543.9	0.394
24.31	1.978	1603.9	0.381
25.99	1.964	1663.9	0.366
27.79	1.957	1723.9	0.352
29.65	1.94	1783.9	0.342
31.68	1.929	1843.9	0.323
33.79	1.918	1903.9	0.314
36.01	1.904	1963.9	0.302
38.41	1.895	2023.9	0.292
41.08	1.877	2083.9	0.278
43.56	1.868	2143.9	0.269
46.39	1.852	2203.9	0.262
49.43	1.836	2263.9	0.255
52.75	1.822	2323.9	0.244
55.92	1.802	2383.9	0.234
59.57	1.787	2443.9	0.22
63.13	1.768	2503.9	0.219
67.4	1.752	2563.9	0.214
71.53	1.732	2623.9	0.203
75.79	1.716	2683.9	0.2
80.59	1.696	2743.9	0.191
85.93	1.677	2803.9	0.185
90.72	1.657	2863.9	0.182
96.81	1.633	2923.9	0.174
102.7	1.612	2983.9	0.173
108.8	1.584	3043.9	0.163
115.4	1.563	3103.9	0.158
122.5	1.54	3163.9	0.155
130.3	1.515	3223.9	0.147
138.2	1.493	3283.9	0.142
146.5	1.47	3343.9	0.136
155.7	1.439	3403.9	0.135
165.1	1.417	3463.9	0.131
174.7	1.389	3523.9	0.128
185.5	1.361	3583.9	0.122
197.	1.331	3643.9	0.119
208.9	1.311	3703.9	0.114
221.5	1.277		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 2.694

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.1511	ft/day
y0	1.191	ft

K = 5.331E-5 cm/sec  
 T = K\*b = 2.72 ft<sup>2</sup>/day (0.02925 sq. cm/sec)



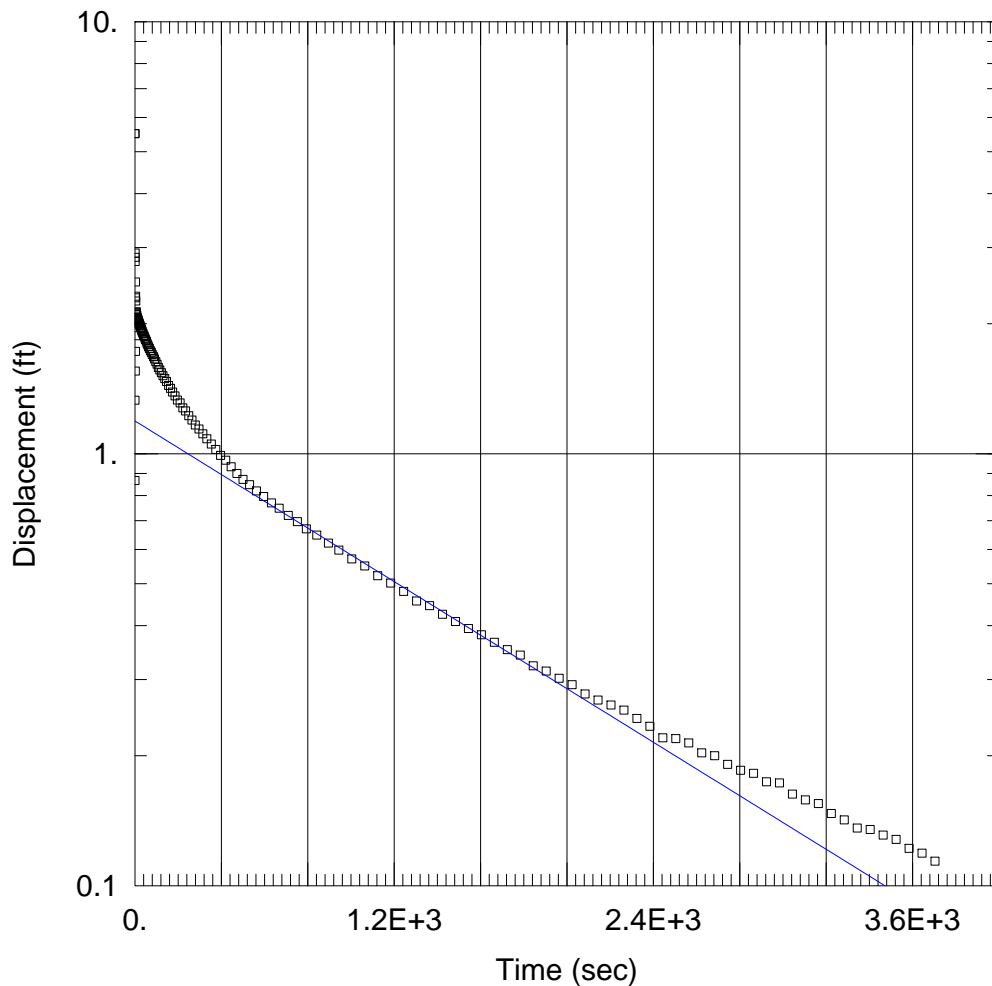
# C-2 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants,**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 K = 0.1511 ft/day      y0 = 1.191 ft

## WELL DATA (C-2)

Initial Displacement: 5.507 ft  
 Static Water Column Height: 19.3 ft  
 Total Well Penetration Depth: 18.3 ft  
 Screen Length: 15. ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

# C-2 Falling Head\_Bower-Rice

Prepared By:

JBR Env. Consultants,

Prepared For:

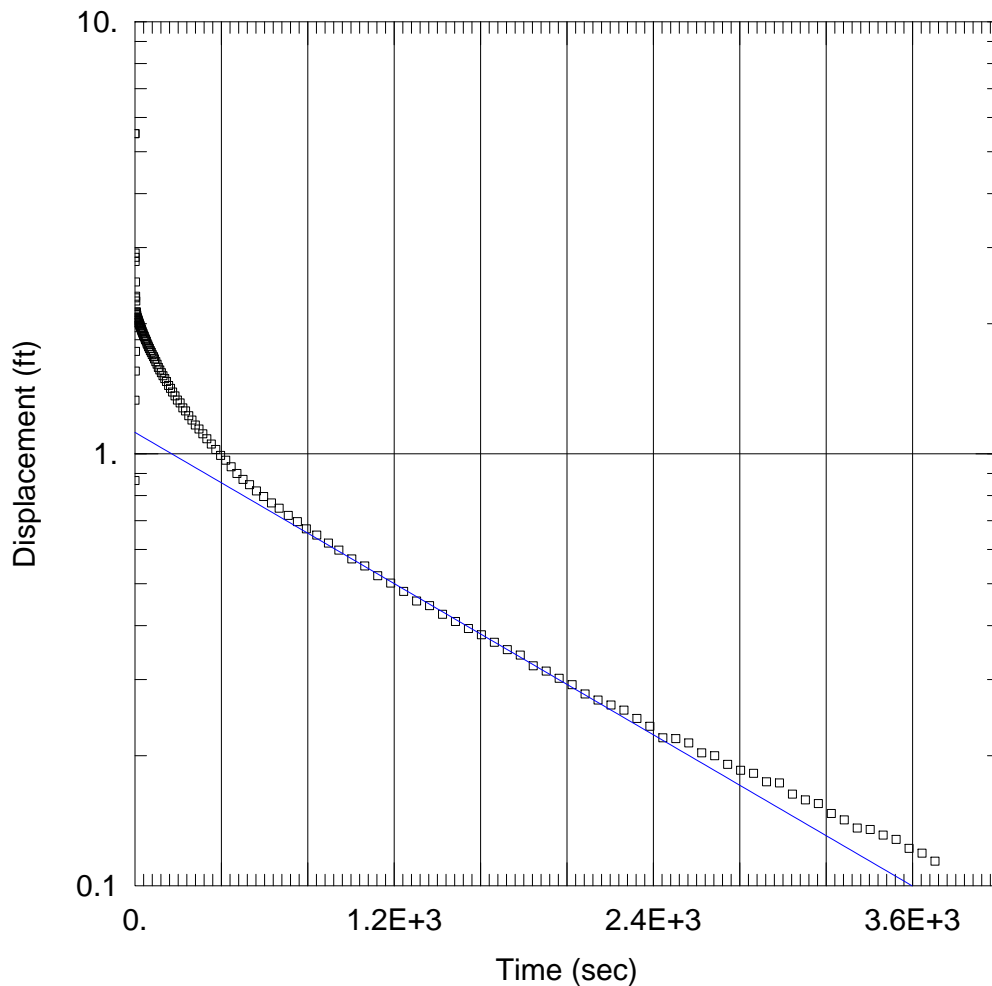
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Bower-Rice

K = 0.1423 ft/day      y0 = 1.12 ft

## WELL DATA (C-2)

Initial Displacement: 5.507 ft

Static Water Column Height: 19.3 ft

Total Well Penetration Depth: 18.3 ft

Screen Length: 15. ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# C-2 Falling Head\_Hvorslev

Prepared By:

**JBR Env. Consultants,**

Prepared For:

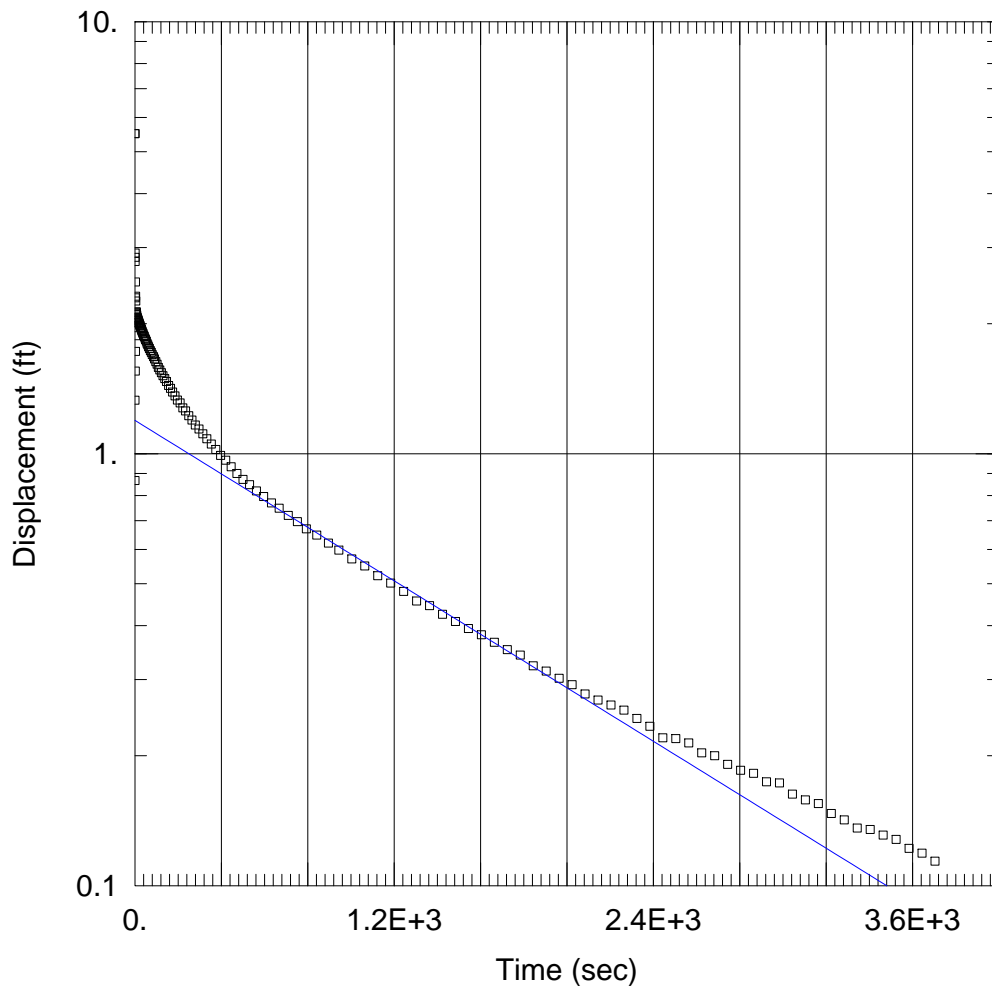
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

$K = 0.2294$  ft/day       $y_0 = 1.194$  ft

## WELL DATA (C-2)

Initial Displacement: 5.507 ft

Static Water Column Height: 19.3 ft

Total Well Penetration Depth: 18.3 ft

Screen Length: 15. ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# C-2 Falling Head\_Hvorslev

Prepared By:

JBR Env. Consultants,

Prepared For:

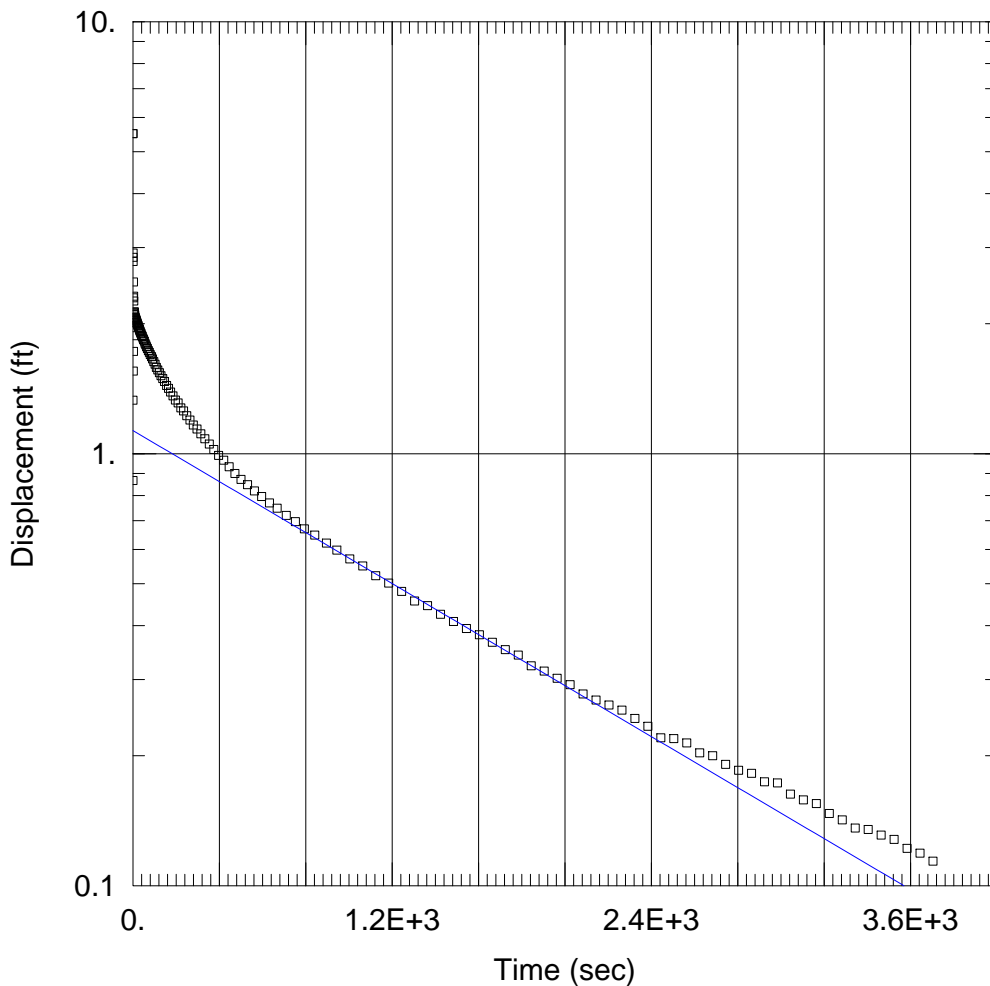
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.2188 ft/day       $y_0 =$ 1.131 ft

## WELL DATA (C-2)

Initial Displacement: 5.507 ft

Static Water Column Height: 19.3 ft

Total Well Penetration Depth: 18.3 ft

Screen Length: 15. ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\C-2 RH\C-2 RH BR-Unc.aqt  
 Title: C-2 Rising Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:13:27

---

**PROJECT INFORMATION**

Company: JBR Env. Consultants,  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: C-2

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**AQUIFER DATA**

Saturated Thickness: 18. ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

**SLUG TEST WELL DATA**

Test Well: C-2

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

Initial Displacement: 5.575 ft  
 Static Water Column Height: 19.4 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 15. ft  
 Total Well Penetration Depth: 18.4 ft

No. of Observations: 996

Observation Data			
Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	5.575	2.447E+4	0.18
0.479	4.17	2.453E+4	0.174
0.699	1.946	2.459E+4	0.176
0.923	1.349	2.465E+4	0.178
1.144	2.96	2.471E+4	0.178
1.364	3.584	2.477E+4	0.176
1.584	2.583	2.483E+4	0.177
1.804	1.743	2.489E+4	0.179
2.023	2.227	2.495E+4	0.175
2.243	2.968	2.501E+4	0.175
2.463	2.826	2.507E+4	0.18
2.683	2.183	2.513E+4	0.174
2.902	2.054	2.519E+4	0.183
3.139	2.502	2.525E+4	0.174
3.389	2.671	2.531E+4	0.178
3.774	2.155	2.537E+4	0.176
3.994	2.235	2.543E+4	0.175
4.219	2.461	2.549E+4	0.178
4.439	2.465	2.555E+4	0.178
4.749	2.215	2.561E+4	0.179
5.109	2.307	2.567E+4	0.18
5.529	2.324	2.573E+4	0.176
5.949	2.245	2.579E+4	0.178
6.368	2.301	2.585E+4	0.175
6.849	2.234	2.591E+4	0.175
7.389	2.261	2.597E+4	0.174
7.868	2.231	2.603E+4	0.173
8.469	2.224	2.609E+4	0.175
9.069	2.213	2.615E+4	0.177

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
9.669	2.199	2.621E+4	0.175
10.33	2.196	2.627E+4	0.171
11.05	2.188	2.633E+4	0.176
11.83	2.178	2.639E+4	0.175
12.61	2.167	2.645E+4	0.178
13.45	2.161	2.651E+4	0.178
14.35	2.154	2.657E+4	0.175
15.31	2.143	2.663E+4	0.175
16.27	2.135	2.669E+4	0.176
17.35	2.125	2.675E+4	0.176
18.49	2.114	2.681E+4	0.178
19.69	2.098	2.687E+4	0.177
20.95	2.098	2.693E+4	0.173
22.27	2.09	2.699E+4	0.178
23.71	2.074	2.705E+4	0.173
25.21	2.064	2.711E+4	0.176
26.77	2.053	2.717E+4	0.173
28.45	2.049	2.723E+4	0.175
30.25	2.032	2.729E+4	0.174
32.11	2.023	2.735E+4	0.177
34.15	2.013	2.741E+4	0.173
36.25	2.002	2.747E+4	0.173
38.47	1.987	2.753E+4	0.176
40.87	1.976	2.759E+4	0.171
43.39	1.967	2.765E+4	0.174
46.03	1.95	2.771E+4	0.176
48.85	1.938	2.777E+4	0.174
51.85	1.921	2.783E+4	0.177
55.03	1.909	2.789E+4	0.176
58.39	1.894	2.795E+4	0.175
61.99	1.877	2.801E+4	0.175
65.59	1.866	2.807E+4	0.172
69.79	1.845	2.813E+4	0.174
73.99	1.833	2.819E+4	0.177
78.19	1.816	2.825E+4	0.175
82.99	1.795	2.831E+4	0.175
88.39	1.779	2.837E+4	0.174
93.19	1.76	2.843E+4	0.174
99.19	1.738	2.849E+4	0.174
105.2	1.723	2.855E+4	0.172
111.2	1.702	2.861E+4	0.176
117.8	1.683	2.867E+4	0.174
125.	1.66	2.873E+4	0.174
132.8	1.642	2.879E+4	0.171
140.6	1.621	2.885E+4	0.173
149.	1.6	2.891E+4	0.171
158.	1.578	2.897E+4	0.172
167.6	1.557	2.903E+4	0.173
177.2	1.533	2.909E+4	0.172
188.	1.51	2.915E+4	0.174
199.4	1.488	2.921E+4	0.17
211.4	1.459	2.927E+4	0.17
224.	1.437	2.933E+4	0.17
237.2	1.412	2.939E+4	0.172
251.6	1.393	2.945E+4	0.175
266.6	1.364	2.951E+4	0.171
282.2	1.343	2.957E+4	0.171
299.	1.313	2.963E+4	0.175
317.	1.287	2.969E+4	0.171
335.6	1.26	2.975E+4	0.172
356.	1.235	2.981E+4	0.171
377.	1.207	2.987E+4	0.169
399.2	1.182	2.993E+4	0.169
423.2	1.158	2.999E+4	0.167
448.4	1.135	3.005E+4	0.172
474.8	1.104	3.011E+4	0.17

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
503.	1.08	3.017E+4	0.168
533.	1.05	3.023E+4	0.165
564.8	1.023	3.029E+4	0.169
598.4	0.995	3.035E+4	0.166
634.4	0.969	3.041E+4	0.166
670.4	0.945	3.047E+4	0.168
712.4	0.915	3.053E+4	0.171
754.4	0.887	3.059E+4	0.163
796.4	0.863	3.065E+4	0.167
844.4	0.836	3.071E+4	0.164
898.4	0.807	3.077E+4	0.167
946.4	0.782	3.083E+4	0.164
1006.4	0.757	3.089E+4	0.167
1066.4	0.729	3.095E+4	0.163
1126.4	0.706	3.101E+4	0.166
1186.4	0.684	3.107E+4	0.165
1246.4	0.666	3.113E+4	0.165
1306.4	0.64	3.119E+4	0.164
1366.4	0.623	3.125E+4	0.166
1426.4	0.606	3.131E+4	0.167
1486.4	0.592	3.137E+4	0.168
1546.4	0.574	3.143E+4	0.166
1606.4	0.555	3.149E+4	0.165
1666.4	0.544	3.155E+4	0.165
1726.4	0.53	3.161E+4	0.164
1786.4	0.515	3.167E+4	0.168
1846.4	0.501	3.173E+4	0.166
1906.4	0.499	3.179E+4	0.163
1966.4	0.48	3.185E+4	0.162
2026.4	0.471	3.191E+4	0.167
2086.4	0.459	3.197E+4	0.165
2146.4	0.449	3.203E+4	0.163
2206.4	0.443	3.209E+4	0.159
2266.4	0.435	3.215E+4	0.163
2326.4	0.427	3.221E+4	0.162
2386.4	0.418	3.227E+4	0.164
2446.4	0.413	3.233E+4	0.162
2506.4	0.401	3.239E+4	0.158
2566.4	0.397	3.245E+4	0.16
2626.4	0.393	3.251E+4	0.161
2686.4	0.381	3.257E+4	0.161
2746.4	0.376	3.263E+4	0.165
2806.4	0.369	3.269E+4	0.162
2866.4	0.364	3.275E+4	0.161
2926.4	0.356	3.281E+4	0.159
2986.4	0.352	3.287E+4	0.163
3046.4	0.346	3.293E+4	0.16
3106.4	0.343	3.299E+4	0.159
3166.4	0.339	3.305E+4	0.158
3226.4	0.333	3.311E+4	0.157
3286.4	0.329	3.317E+4	0.156
3346.4	0.325	3.323E+4	0.162
3406.4	0.318	3.329E+4	0.161
3466.4	0.315	3.335E+4	0.158
3526.4	0.313	3.341E+4	0.159
3586.4	0.308	3.347E+4	0.157
3646.4	0.306	3.353E+4	0.16
3706.4	0.301	3.359E+4	0.157
3766.4	0.297	3.365E+4	0.159
3826.4	0.293	3.371E+4	0.159
3886.4	0.288	3.377E+4	0.157
3946.4	0.287	3.383E+4	0.155
4006.4	0.281	3.389E+4	0.157
4066.4	0.281	3.395E+4	0.157
4126.4	0.277	3.401E+4	0.159
4186.4	0.275	3.407E+4	0.156

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
4246.4	0.275	3.413E+4	0.156
4306.4	0.269	3.419E+4	0.156
4366.4	0.265	3.425E+4	0.156
4426.4	0.265	3.431E+4	0.156
4486.4	0.264	3.437E+4	0.152
4546.4	0.26	3.443E+4	0.155
4606.4	0.256	3.449E+4	0.154
4666.4	0.254	3.455E+4	0.159
4726.4	0.254	3.461E+4	0.157
4786.4	0.252	3.467E+4	0.159
4846.4	0.245	3.473E+4	0.157
4906.4	0.244	3.479E+4	0.156
4966.4	0.243	3.485E+4	0.155
5026.4	0.242	3.491E+4	0.16
5086.4	0.241	3.497E+4	0.157
5146.4	0.237	3.503E+4	0.153
5206.4	0.238	3.509E+4	0.156
5266.4	0.233	3.515E+4	0.156
5326.4	0.231	3.521E+4	0.156
5386.4	0.23	3.527E+4	0.154
5446.4	0.23	3.533E+4	0.155
5506.4	0.229	3.539E+4	0.153
5566.4	0.224	3.545E+4	0.154
5626.4	0.224	3.551E+4	0.156
5686.4	0.227	3.557E+4	0.157
5746.4	0.22	3.563E+4	0.152
5806.4	0.22	3.569E+4	0.156
5866.4	0.218	3.575E+4	0.154
5926.4	0.219	3.581E+4	0.154
5986.4	0.217	3.587E+4	0.155
6046.4	0.213	3.593E+4	0.154
6106.4	0.214	3.599E+4	0.156
6166.4	0.212	3.605E+4	0.154
6226.4	0.217	3.611E+4	0.155
6286.4	0.209	3.617E+4	0.153
6346.4	0.209	3.623E+4	0.155
6406.4	0.205	3.629E+4	0.154
6466.4	0.208	3.635E+4	0.154
6526.4	0.208	3.641E+4	0.155
6586.4	0.206	3.647E+4	0.153
6646.4	0.203	3.653E+4	0.155
6706.4	0.205	3.659E+4	0.154
6766.4	0.203	3.665E+4	0.156
6826.4	0.203	3.671E+4	0.155
6886.4	0.204	3.677E+4	0.157
6946.4	0.201	3.683E+4	0.156
7006.4	0.203	3.689E+4	0.154
7066.4	0.204	3.695E+4	0.155
7126.4	0.202	3.701E+4	0.154
7186.4	0.198	3.707E+4	0.156
7246.4	0.201	3.713E+4	0.157
7306.4	0.199	3.719E+4	0.157
7366.4	0.197	3.725E+4	0.157
7426.4	0.196	3.731E+4	0.155
7486.4	0.197	3.737E+4	0.157
7546.4	0.194	3.743E+4	0.157
7606.4	0.196	3.749E+4	0.158
7666.4	0.195	3.755E+4	0.154
7726.4	0.195	3.761E+4	0.156
7786.4	0.194	3.767E+4	0.156
7846.4	0.195	3.773E+4	0.158
7906.4	0.192	3.779E+4	0.155
7966.4	0.191	3.785E+4	0.156
8026.4	0.195	3.791E+4	0.158
8086.4	0.19	3.797E+4	0.157
8146.4	0.191	3.803E+4	0.157



Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
8206.4	0.191	3.809E+4	0.154
8266.4	0.19	3.815E+4	0.155
8326.4	0.191	3.821E+4	0.153
8386.4	0.191	3.827E+4	0.153
8446.4	0.192	3.833E+4	0.156
8506.4	0.187	3.839E+4	0.156
8566.4	0.191	3.845E+4	0.152
8626.4	0.189	3.851E+4	0.149
8686.4	0.184	3.857E+4	0.154
8746.4	0.185	3.863E+4	0.153
8806.4	0.185	3.869E+4	0.154
8866.4	0.187	3.875E+4	0.149
8926.4	0.186	3.881E+4	0.155
8986.4	0.186	3.887E+4	0.153
9046.4	0.188	3.893E+4	0.155
9106.4	0.186	3.899E+4	0.153
9166.4	0.184	3.905E+4	0.154
9226.4	0.185	3.911E+4	0.152
9286.4	0.184	3.917E+4	0.152
9346.4	0.181	3.923E+4	0.153
9406.4	0.187	3.929E+4	0.149
9466.4	0.183	3.935E+4	0.151
9526.4	0.186	3.941E+4	0.151
9586.4	0.184	3.947E+4	0.152
9646.4	0.18	3.953E+4	0.152
9706.4	0.182	3.959E+4	0.15
9766.4	0.182	3.965E+4	0.148
9826.4	0.182	3.971E+4	0.152
9886.4	0.183	3.977E+4	0.152
9946.4	0.185	3.983E+4	0.151
1.001E+4	0.182	3.989E+4	0.15
1.007E+4	0.181	3.995E+4	0.151
1.013E+4	0.181	4.001E+4	0.15
1.019E+4	0.182	4.007E+4	0.15
1.025E+4	0.18	4.013E+4	0.154
1.031E+4	0.18	4.019E+4	0.15
1.037E+4	0.181	4.025E+4	0.149
1.043E+4	0.179	4.031E+4	0.149
1.049E+4	0.18	4.037E+4	0.15
1.055E+4	0.178	4.043E+4	0.15
1.061E+4	0.183	4.049E+4	0.149
1.067E+4	0.181	4.055E+4	0.146
1.073E+4	0.178	4.061E+4	0.147
1.079E+4	0.176	4.067E+4	0.149
1.085E+4	0.179	4.073E+4	0.149
1.091E+4	0.176	4.079E+4	0.152
1.097E+4	0.178	4.085E+4	0.151
1.103E+4	0.178	4.091E+4	0.149
1.109E+4	0.176	4.097E+4	0.15
1.115E+4	0.175	4.103E+4	0.148
1.121E+4	0.183	4.109E+4	0.148
1.127E+4	0.176	4.115E+4	0.148
1.133E+4	0.172	4.121E+4	0.149
1.139E+4	0.176	4.127E+4	0.151
1.145E+4	0.173	4.133E+4	0.148
1.151E+4	0.175	4.139E+4	0.148
1.157E+4	0.174	4.145E+4	0.151
1.163E+4	0.174	4.151E+4	0.151
1.169E+4	0.173	4.157E+4	0.147
1.175E+4	0.174	4.163E+4	0.149
1.181E+4	0.171	4.169E+4	0.151
1.187E+4	0.174	4.175E+4	0.152
1.193E+4	0.172	4.181E+4	0.149
1.199E+4	0.171	4.187E+4	0.149
1.205E+4	0.173	4.193E+4	0.147
1.211E+4	0.171	4.199E+4	0.148

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.217E+4	0.173	4.205E+4	0.149
1.223E+4	0.172	4.211E+4	0.149
1.229E+4	0.174	4.217E+4	0.156
1.235E+4	0.172	4.223E+4	0.148
1.241E+4	0.169	4.229E+4	0.152
1.247E+4	0.172	4.235E+4	0.148
1.253E+4	0.17	4.241E+4	0.149
1.259E+4	0.169	4.247E+4	0.15
1.265E+4	0.169	4.253E+4	0.147
1.271E+4	0.175	4.259E+4	0.152
1.277E+4	0.171	4.265E+4	0.148
1.283E+4	0.172	4.271E+4	0.148
1.289E+4	0.17	4.277E+4	0.153
1.295E+4	0.168	4.283E+4	0.152
1.301E+4	0.171	4.289E+4	0.149
1.307E+4	0.169	4.295E+4	0.152
1.313E+4	0.17	4.301E+4	0.146
1.319E+4	0.17	4.307E+4	0.148
1.325E+4	0.169	4.313E+4	0.15
1.331E+4	0.169	4.319E+4	0.149
1.337E+4	0.17	4.325E+4	0.15
1.343E+4	0.171	4.331E+4	0.148
1.349E+4	0.169	4.337E+4	0.15
1.355E+4	0.175	4.343E+4	0.149
1.361E+4	0.174	4.349E+4	0.15
1.367E+4	0.17	4.355E+4	0.151
1.373E+4	0.174	4.361E+4	0.15
1.379E+4	0.17	4.367E+4	0.149
1.385E+4	0.17	4.373E+4	0.15
1.391E+4	0.172	4.379E+4	0.148
1.397E+4	0.17	4.385E+4	0.15
1.403E+4	0.17	4.391E+4	0.15
1.409E+4	0.174	4.397E+4	0.149
1.415E+4	0.171	4.403E+4	0.148
1.421E+4	0.17	4.409E+4	0.15
1.427E+4	0.168	4.415E+4	0.152
1.433E+4	0.17	4.421E+4	0.157
1.439E+4	0.174	4.427E+4	0.15
1.445E+4	0.17	4.433E+4	0.149
1.451E+4	0.17	4.439E+4	0.151
1.457E+4	0.171	4.445E+4	0.149
1.463E+4	0.172	4.451E+4	0.151
1.469E+4	0.173	4.457E+4	0.149
1.475E+4	0.17	4.463E+4	0.152
1.481E+4	0.173	4.469E+4	0.148
1.487E+4	0.168	4.475E+4	0.15
1.493E+4	0.172	4.481E+4	0.149
1.499E+4	0.171	4.487E+4	0.15
1.505E+4	0.171	4.493E+4	0.149
1.511E+4	0.172	4.499E+4	0.149
1.517E+4	0.169	4.505E+4	0.15
1.523E+4	0.172	4.511E+4	0.146
1.529E+4	0.171	4.517E+4	0.15
1.535E+4	0.171	4.523E+4	0.149
1.541E+4	0.171	4.529E+4	0.148
1.547E+4	0.17	4.535E+4	0.151
1.553E+4	0.17	4.541E+4	0.15
1.559E+4	0.168	4.547E+4	0.15
1.565E+4	0.171	4.553E+4	0.149
1.571E+4	0.172	4.559E+4	0.15
1.577E+4	0.17	4.565E+4	0.153
1.583E+4	0.17	4.571E+4	0.149
1.589E+4	0.168	4.577E+4	0.151
1.595E+4	0.17	4.583E+4	0.15
1.601E+4	0.169	4.589E+4	0.155
1.607E+4	0.171	4.595E+4	0.153

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
1.613E+4	0.168	4.601E+4	0.151
1.619E+4	0.17	4.607E+4	0.153
1.625E+4	0.175	4.613E+4	0.151
1.631E+4	0.173	4.619E+4	0.15
1.637E+4	0.172	4.625E+4	0.151
1.643E+4	0.171	4.631E+4	0.151
1.649E+4	0.171	4.637E+4	0.152
1.655E+4	0.173	4.643E+4	0.153
1.661E+4	0.17	4.649E+4	0.154
1.667E+4	0.172	4.655E+4	0.153
1.673E+4	0.171	4.661E+4	0.152
1.679E+4	0.172	4.667E+4	0.153
1.685E+4	0.169	4.673E+4	0.153
1.691E+4	0.171	4.679E+4	0.151
1.697E+4	0.17	4.685E+4	0.151
1.703E+4	0.175	4.691E+4	0.149
1.709E+4	0.173	4.697E+4	0.153
1.715E+4	0.173	4.703E+4	0.152
1.721E+4	0.174	4.709E+4	0.152
1.727E+4	0.174	4.715E+4	0.153
1.733E+4	0.177	4.721E+4	0.153
1.739E+4	0.176	4.727E+4	0.155
1.745E+4	0.175	4.733E+4	0.153
1.751E+4	0.174	4.739E+4	0.149
1.757E+4	0.18	4.745E+4	0.15
1.763E+4	0.178	4.751E+4	0.152
1.769E+4	0.174	4.757E+4	0.153
1.775E+4	0.175	4.763E+4	0.151
1.781E+4	0.18	4.769E+4	0.153
1.787E+4	0.178	4.775E+4	0.153
1.793E+4	0.176	4.781E+4	0.155
1.799E+4	0.179	4.787E+4	0.148
1.805E+4	0.178	4.793E+4	0.15
1.811E+4	0.177	4.799E+4	0.147
1.817E+4	0.178	4.805E+4	0.149
1.823E+4	0.175	4.811E+4	0.151
1.829E+4	0.182	4.817E+4	0.152
1.835E+4	0.175	4.823E+4	0.152
1.841E+4	0.174	4.829E+4	0.154
1.847E+4	0.178	4.835E+4	0.151
1.853E+4	0.177	4.841E+4	0.152
1.859E+4	0.178	4.847E+4	0.153
1.865E+4	0.177	4.853E+4	0.152
1.871E+4	0.179	4.859E+4	0.154
1.877E+4	0.177	4.865E+4	0.152
1.883E+4	0.179	4.871E+4	0.155
1.889E+4	0.178	4.877E+4	0.154
1.895E+4	0.178	4.883E+4	0.15
1.901E+4	0.183	4.889E+4	0.151
1.907E+4	0.177	4.895E+4	0.151
1.913E+4	0.181	4.901E+4	0.152
1.919E+4	0.173	4.907E+4	0.15
1.925E+4	0.177	4.913E+4	0.15
1.931E+4	0.179	4.919E+4	0.151
1.937E+4	0.177	4.925E+4	0.158
1.943E+4	0.176	4.931E+4	0.154
1.949E+4	0.178	4.937E+4	0.151
1.955E+4	0.178	4.943E+4	0.152
1.961E+4	0.177	4.949E+4	0.151
1.967E+4	0.177	4.955E+4	0.151
1.973E+4	0.177	4.961E+4	0.15
1.979E+4	0.178	4.967E+4	0.15
1.985E+4	0.176	4.973E+4	0.153
1.991E+4	0.186	4.979E+4	0.149
1.997E+4	0.176	4.985E+4	0.151
2.003E+4	0.178	4.991E+4	0.152

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
2.009E+4	0.176	4.997E+4	0.15
2.015E+4	0.177	5.003E+4	0.151
2.021E+4	0.178	5.009E+4	0.148
2.027E+4	0.178	5.015E+4	0.153
2.033E+4	0.18	5.021E+4	0.155
2.039E+4	0.179	5.027E+4	0.152
2.045E+4	0.178	5.033E+4	0.152
2.051E+4	0.182	5.039E+4	0.154
2.057E+4	0.178	5.045E+4	0.152
2.063E+4	0.182	5.051E+4	0.152
2.069E+4	0.182	5.057E+4	0.154
2.075E+4	0.182	5.063E+4	0.149
2.081E+4	0.179	5.069E+4	0.15
2.087E+4	0.18	5.075E+4	0.154
2.093E+4	0.179	5.081E+4	0.15
2.099E+4	0.181	5.087E+4	0.15
2.105E+4	0.181	5.093E+4	0.15
2.111E+4	0.183	5.099E+4	0.149
2.117E+4	0.181	5.105E+4	0.148
2.123E+4	0.177	5.111E+4	0.15
2.129E+4	0.177	5.117E+4	0.149
2.135E+4	0.176	5.123E+4	0.149
2.141E+4	0.179	5.129E+4	0.15
2.147E+4	0.178	5.135E+4	0.148
2.153E+4	0.179	5.141E+4	0.151
2.159E+4	0.183	5.147E+4	0.149
2.165E+4	0.178	5.153E+4	0.149
2.171E+4	0.182	5.159E+4	0.15
2.177E+4	0.183	5.165E+4	0.149
2.183E+4	0.181	5.171E+4	0.148
2.189E+4	0.181	5.177E+4	0.148
2.195E+4	0.178	5.183E+4	0.144
2.201E+4	0.18	5.189E+4	0.147
2.207E+4	0.179	5.195E+4	0.142
2.213E+4	0.181	5.201E+4	0.147
2.219E+4	0.182	5.207E+4	0.148
2.225E+4	0.179	5.213E+4	0.147
2.231E+4	0.18	5.219E+4	0.147
2.237E+4	0.178	5.225E+4	0.151
2.243E+4	0.181	5.231E+4	0.148
2.249E+4	0.177	5.237E+4	0.147
2.255E+4	0.179	5.243E+4	0.149
2.261E+4	0.178	5.249E+4	0.147
2.267E+4	0.178	5.255E+4	0.148
2.273E+4	0.179	5.261E+4	0.147
2.279E+4	0.18	5.267E+4	0.149
2.285E+4	0.178	5.273E+4	0.15
2.291E+4	0.177	5.279E+4	0.15
2.297E+4	0.177	5.285E+4	0.148
2.303E+4	0.181	5.291E+4	0.144
2.309E+4	0.177	5.297E+4	0.147
2.315E+4	0.178	5.303E+4	0.147
2.321E+4	0.178	5.309E+4	0.145
2.327E+4	0.178	5.315E+4	0.146
2.333E+4	0.178	5.321E+4	0.149
2.339E+4	0.178	5.327E+4	0.151
2.345E+4	0.177	5.333E+4	0.152
2.351E+4	0.176	5.339E+4	0.151
2.357E+4	0.18	5.345E+4	0.152
2.363E+4	0.179	5.351E+4	0.148
2.369E+4	0.178	5.357E+4	0.149
2.375E+4	0.178	5.363E+4	0.15
2.381E+4	0.176	5.369E+4	0.15
2.387E+4	0.175	5.375E+4	0.148
2.393E+4	0.177	5.381E+4	0.15
2.399E+4	0.177	5.387E+4	0.149

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
2.405E+4	0.177	5.393E+4	0.15
2.411E+4	0.178	5.399E+4	0.145
2.417E+4	0.181	5.405E+4	0.148
2.423E+4	0.183	5.411E+4	0.142
2.429E+4	0.177	5.417E+4	0.145
2.435E+4	0.175	5.423E+4	0.151
2.441E+4	0.174	5.429E+4	0.145

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 In(Re/rw): 2.697

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.06573	ft/day
y0	0.9009	ft

K = 2.319E-5 cm/sec  
 T = K\*b = 1.183 ft<sup>2</sup>/day (0.01272 sq. cm/sec)

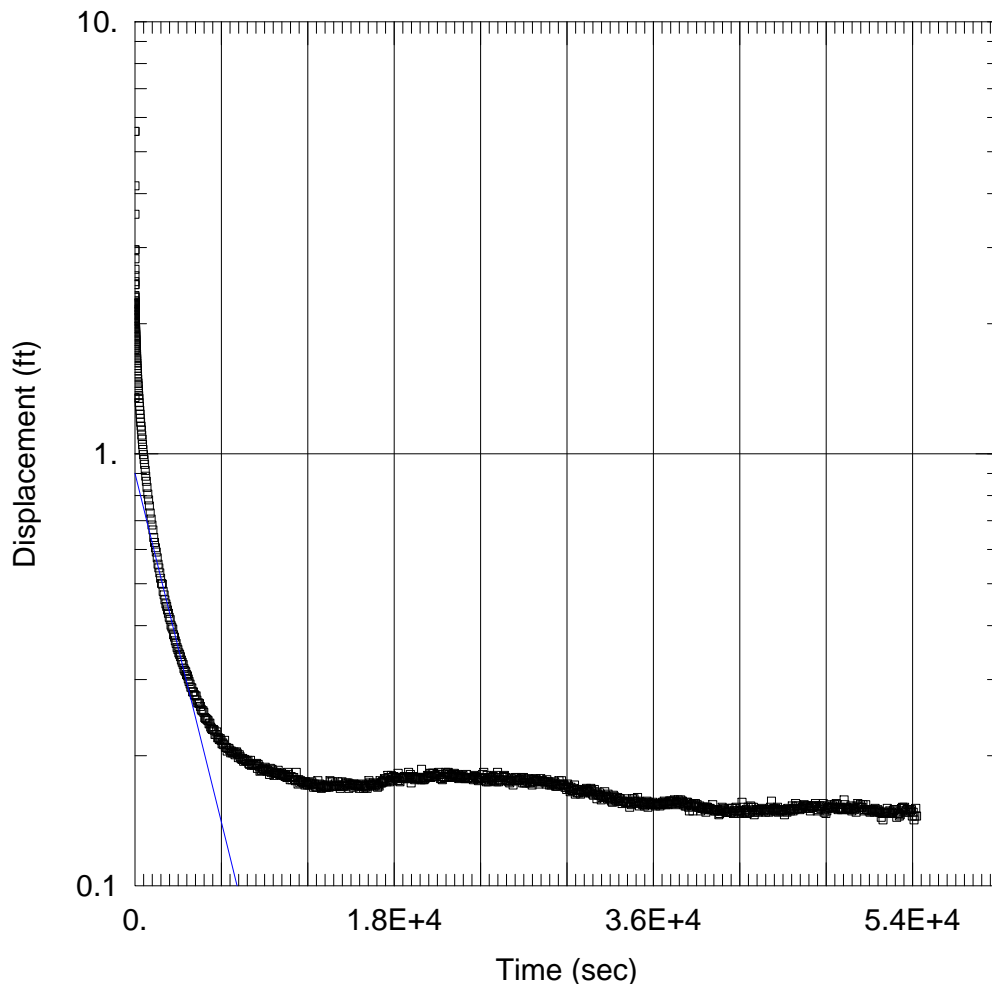
# C-2 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants,**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Bower-Rice  
K = 0.06573 ft/day      y0 = 0.9009 ft

## WELL DATA (C-2)

Initial Displacement: 5.575 ft  
Static Water Column Height: 19.4 ft  
Total Well Penetration Depth: 18.4 ft  
Screen Length: 15 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

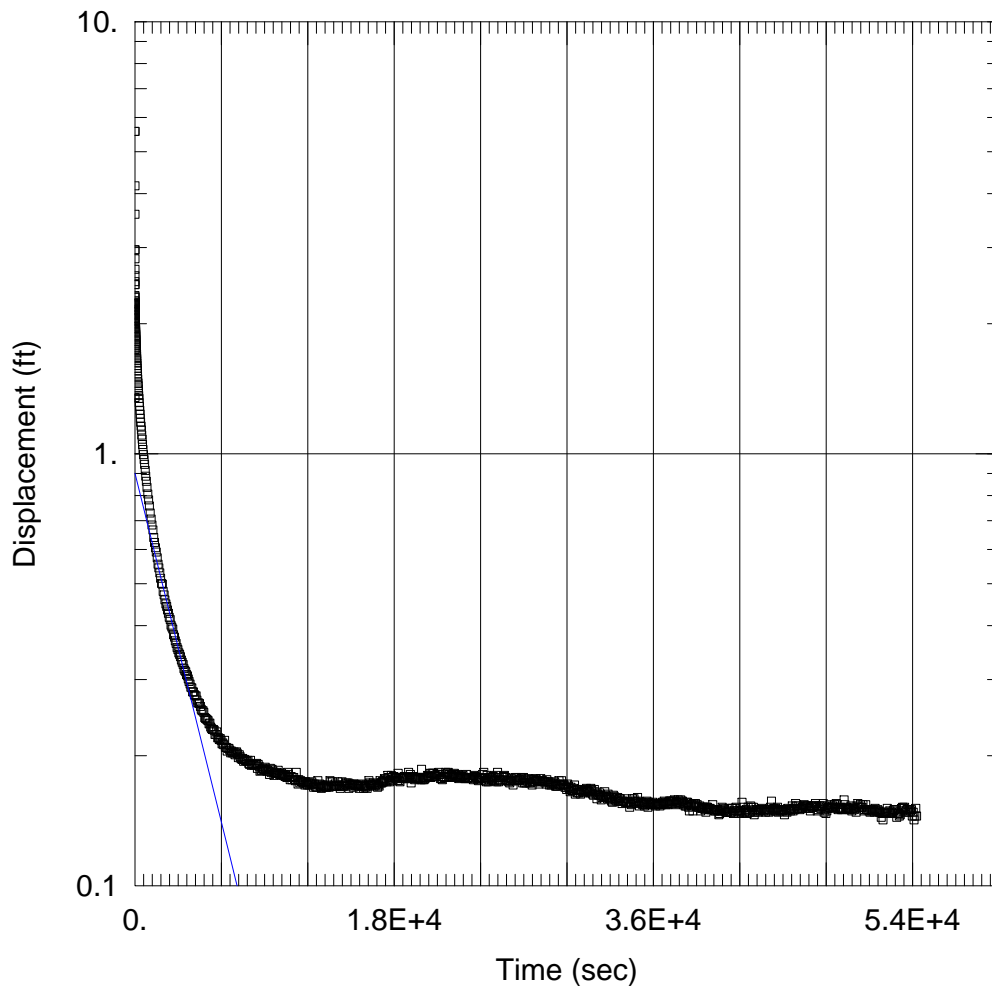
# C-2 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants,**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Bower-Rice  
K = 0.06573 ft/day      y0 = 0.9009 ft

## WELL DATA (C-2)

Initial Displacement: 5.575 ft  
Static Water Column Height: 19.4 ft  
Total Well Penetration Depth: 18.4 ft  
Screen Length: 15 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

# C-2 Rising Head\_Hvorslev

Prepared By:

JBR Env. Consultants,

Prepared For:

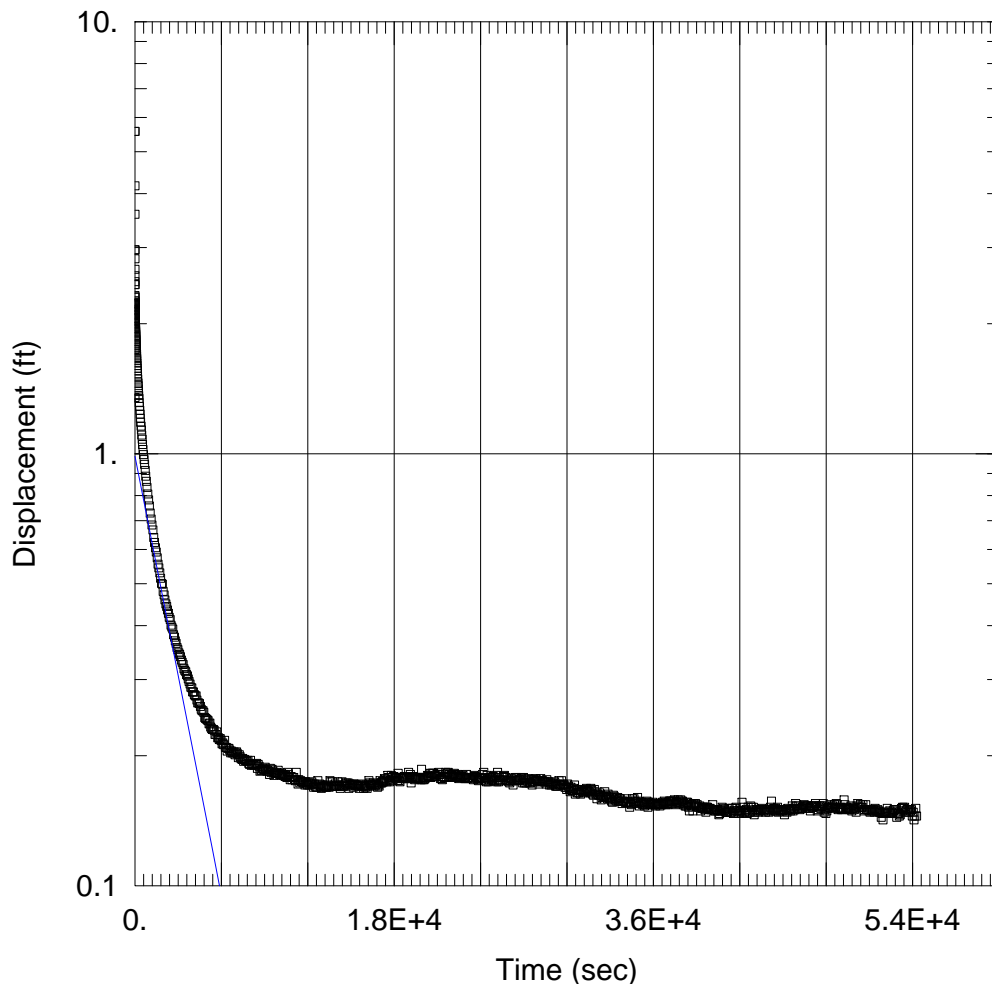
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

K = 0.1254 ft/day      y0 = 0.9862 ft

## WELL DATA (C-2)

Initial Displacement: 5.575 ft

Static Water Column Height: 19.4 ft

Total Well Penetration Depth: 18.4 ft

Screen Length: 15 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft



# C-2 Rising Head\_Hvorslev

Prepared By:

JBR Env. Consultants,

Prepared For:

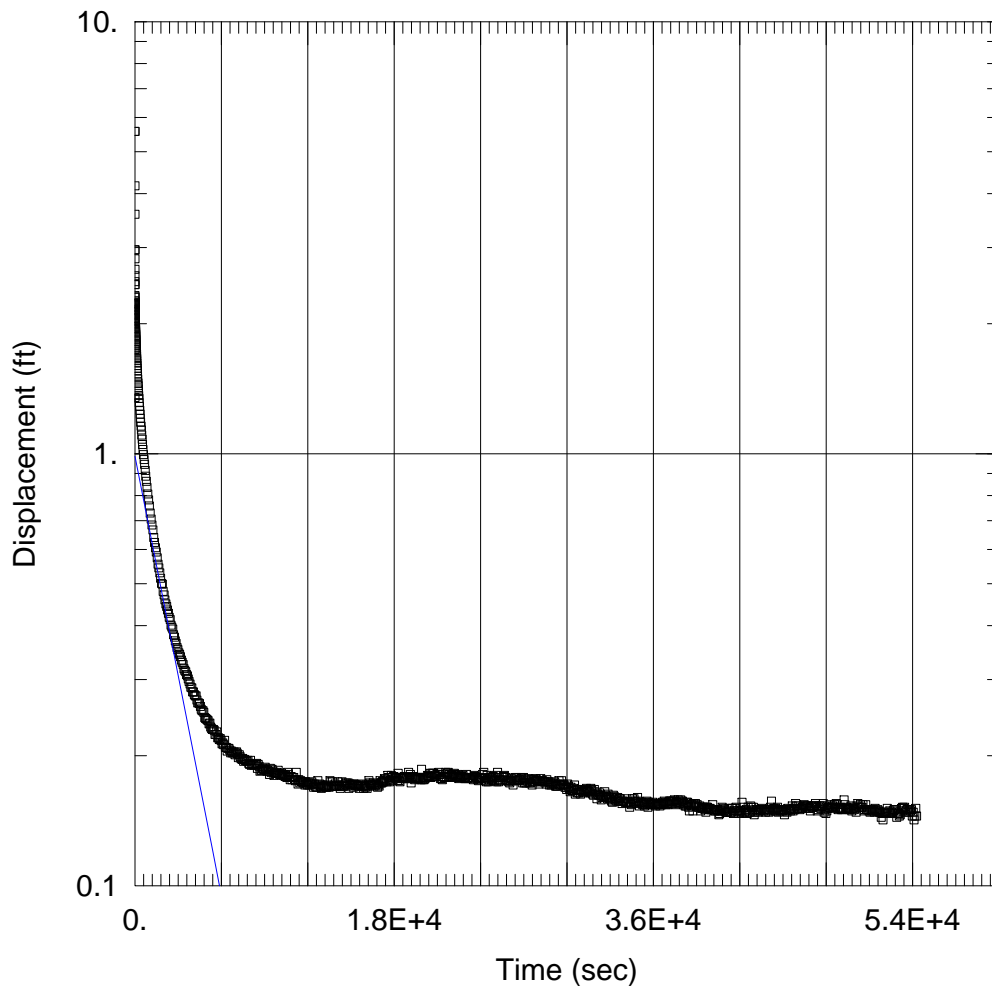
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 0.1254 ft/day      y0 = 0.9862 ft

## WELL DATA (C-2)

Initial Displacement: 5.575 ft

Static Water Column Height: 19.4 ft

Total Well Penetration Depth: 18.4 ft

Screen Length: 15 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-9 FH\P-9 FH BR-Unc.aqt  
 Title: P-9 Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:14:29

---

PROJECT INFORMATION

Company: JBR Env. Consultants,  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: P-9

---

AQUIFER DATA

Saturated Thickness: 27.7 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: P-9

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

Initial Displacement: 5.274 ft  
 Static Water Column Height: 27.7 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 5. ft  
 Total Well Penetration Depth: 16.7 ft

No. of Observations: 74

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	5.274	39.58	0.051
0.25	4.832	42.14	0.049
0.5	3.259	44.96	0.049
0.86	2.961	47.96	0.049
1.22	-0.335	51.26	0.048
1.64	1.255	54.59	0.048
2.06	0.876	58.1	0.048
2.48	0.869	61.7	0.045
2.961	0.714	65.9	0.043
3.5	0.605	70.1	0.042
3.98	0.528	74.3	0.041
4.58	0.445	79.1	0.045
5.18	0.358	84.5	0.042
5.78	0.294	89.45	0.041
6.44	0.258	95.3	0.043
7.16	0.215	101.3	0.044
7.94	0.182	107.4	0.041
8.72	0.151	113.9	0.04
9.56	0.14	121.1	0.037
10.46	0.122	129.	0.037
11.42	0.113	136.8	0.042
12.38	0.103	145.2	0.03
13.46	0.094	154.1	0.04
14.6	0.084	163.7	0.036
15.8	0.078	173.3	0.04
17.2	0.073	184.2	0.039
18.38	0.075	195.6	0.031
19.82	0.073	207.5	0.038
21.32	0.071	220.2	0.036

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
22.88	0.064	233.4	0.037
24.56	0.065	247.7	0.037
26.36	0.06	262.8	0.035
28.22	0.06	278.3	0.034
30.26	0.059	295.3	0.04
32.36	0.056	313.3	0.038
34.58	0.055	331.7	0.041
37.01	0.053	352.1	0.035

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 In(Re/rw): 1.71

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	6.868	ft/day
y0	0.1014	ft

K = 0.002423 cm/sec

T = K\*b = 190.2 ft<sup>2</sup>/day (2.045 sq. cm/sec)

# P-9 Falling Head\_Bower-Rice

Prepared By:

JBR Env. Consultants,

Prepared For:

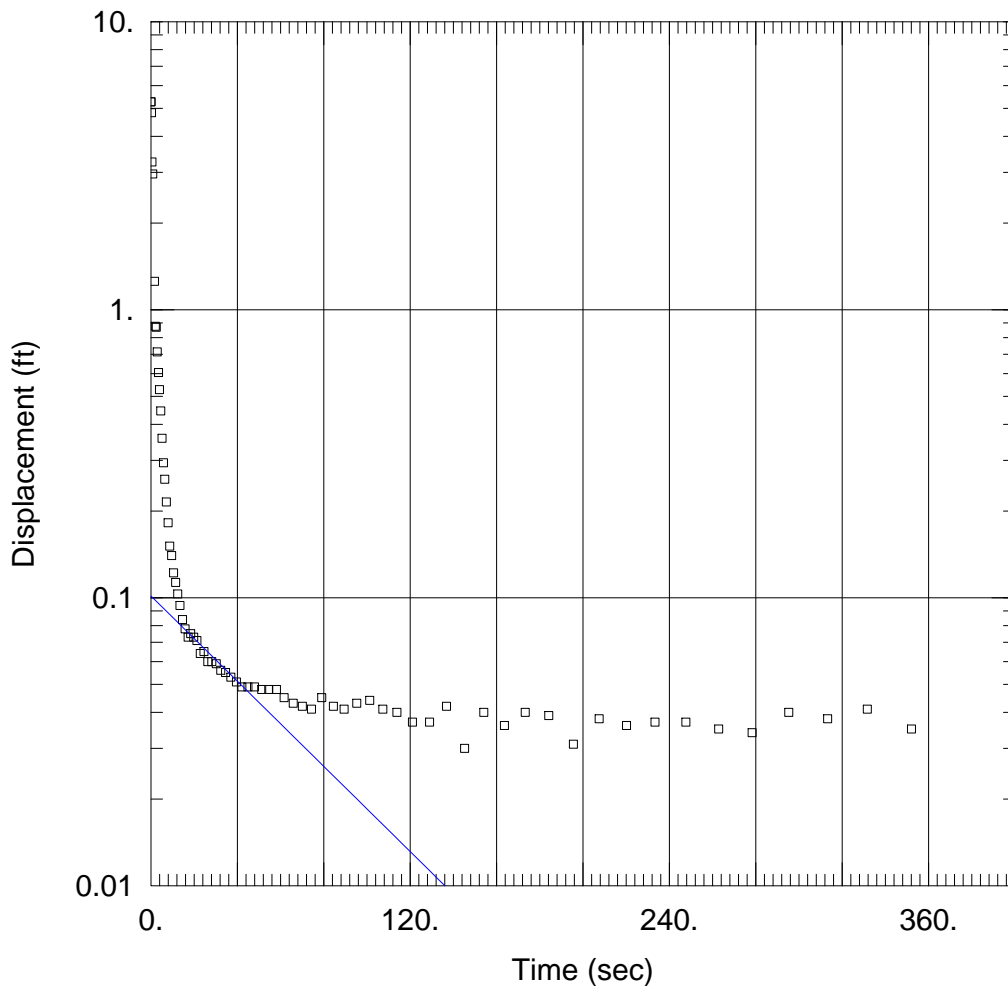
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 6.868 ft/day      y0 = 0.1014 ft

## WELL DATA (P-9)

Initial Displacement: 5.274 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# P-9 Falling Head\_Bower-Rice

Prepared By:

JBR Env. Consultants,

Prepared For:

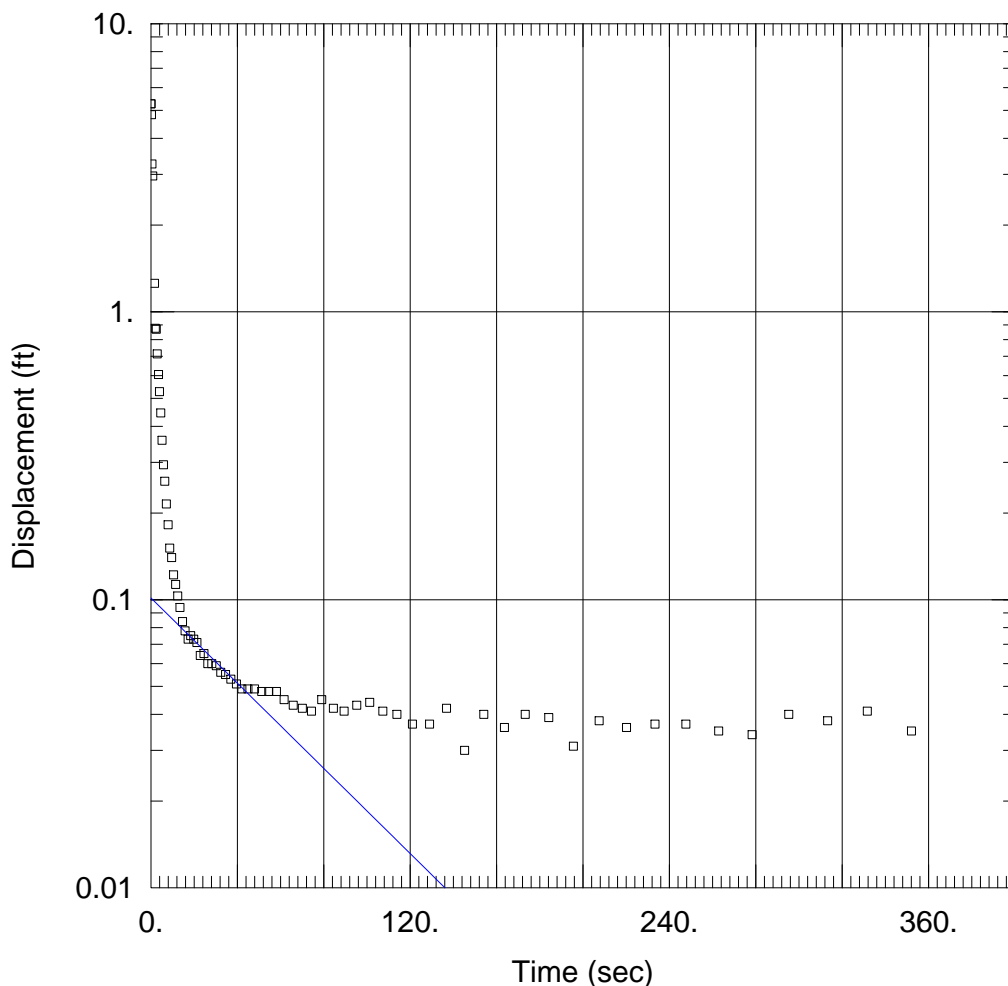
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Bower-Rice

K = 6.868 ft/day      y0 = 0.1014 ft

## WELL DATA (P-9)

Initial Displacement: 5.274 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# P-9 Falling Head\_Hvorslev

Prepared By:

JBR Env. Consultants,

Prepared For:

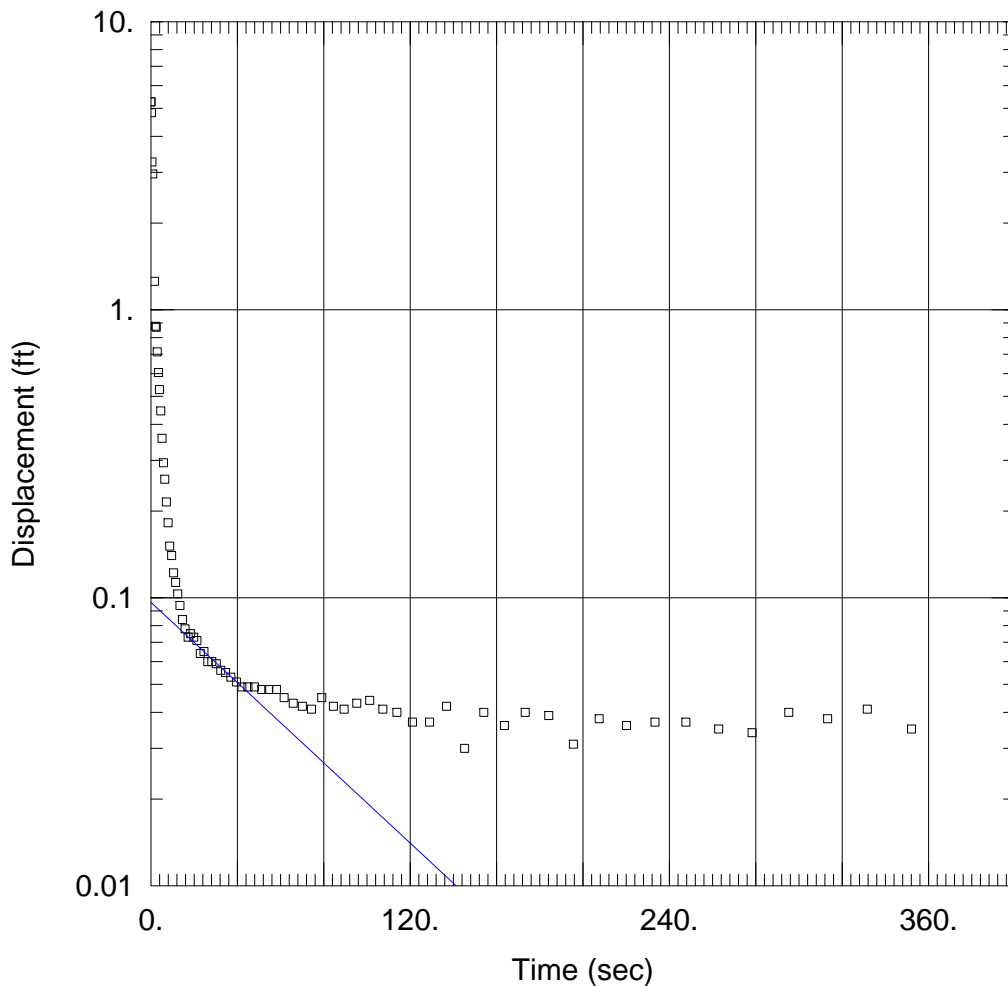
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

K = 8.748 ft/day

y0 = 0.09635 ft

## WELL DATA (P-9)

Initial Displacement: 5.274 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# P-9 Falling Head\_Hvorslev

Prepared By:

JBR Env. Consultants,

Prepared For:

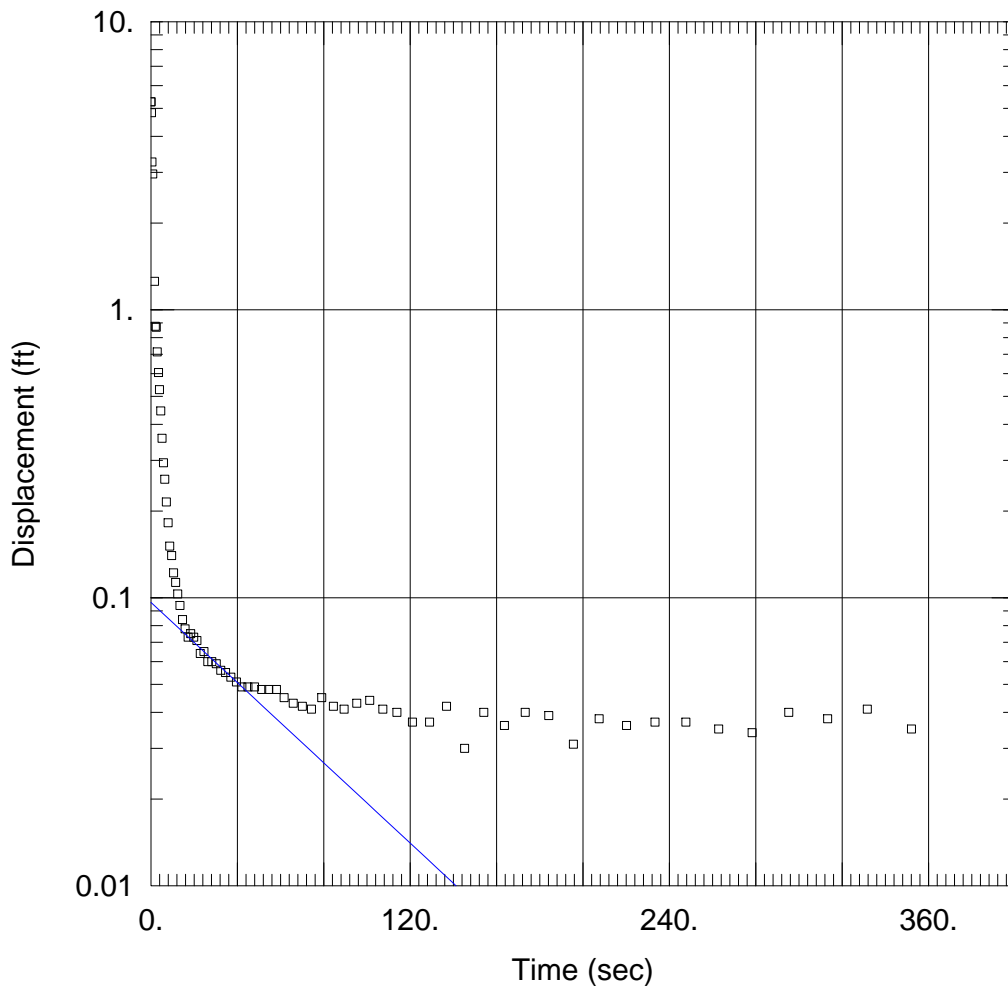
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 8.748 ft/day       $y_0 =$ 0.09635 ft

## WELL DATA (P-9)

Initial Displacement: 5.274 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-9 RH\P-9 RH BR-Unc.aqt  
 Title: P-9 Rising Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:15:36

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: P-9

---

AQUIFER DATA

Saturated Thickness: 27.7 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: P-9

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

Initial Displacement: 4.08 ft  
 Static Water Column Height: 27.7 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 5. ft  
 Total Well Penetration Depth: 16.7 ft

No. of Observations: 81

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	4.08	40.25	0.04
0.223	2.087	42.88	0.039
0.443	1.49	45.87	0.037
0.751	2.331	48.7	0.042
0.975	2.123	51.94	0.036
1.328	1.77	55.24	0.04
1.75	1.638	58.84	0.035
1.972	1.507	62.55	0.033
2.193	1.393	66.64	0.03
2.414	1.282	70.95	0.029
2.899	1.058	75.04	0.035
3.218	0.947	79.85	0.032
3.698	0.782	85.24	0.031
4.363	0.605	90.04	0.03
4.792	0.512	96.08	0.032
5.425	0.399	102.2	0.027
5.918	0.331	108.2	0.032
6.548	0.263	114.6	0.025
7.177	0.21	121.8	0.032
7.897	0.166	129.8	0.027
8.677	0.132	137.6	0.025
9.51	0.113	146.	0.028
10.3	0.094	154.9	0.026
11.4	0.083	164.4	0.025
12.16	0.08	174.2	0.027
13.15	0.076	184.8	0.025
14.2	0.073	196.2	0.022
15.52	0.071	208.4	0.026
16.54	0.065	220.9	0.021



<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
17.8	0.061	234.	0.021
19.17	0.057	248.4	0.021
20.74	0.054	263.5	0.019
22.06	0.05	279.1	0.019
23.79	0.052	295.9	0.023
25.3	0.05	313.9	0.019
27.1	0.047	332.4	0.019
28.96	0.048	352.8	0.02
31.12	0.045	374.	0.014
33.15	0.042	396.	0.016
35.45	0.042	420.1	0.021
37.78	0.046		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 $\ln(Re/rw)$ : 1.71

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	5.32	ft/day
y0	0.06661	ft

$K = 0.001877$  cm/sec

$T = K \cdot b = 147.4$  ft<sup>2</sup>/day (1.585 sq. cm/sec)

# P-9 Rising Head\_Bower-Rice

Prepared By:

**JBR Env. Consultants**

Prepared For:

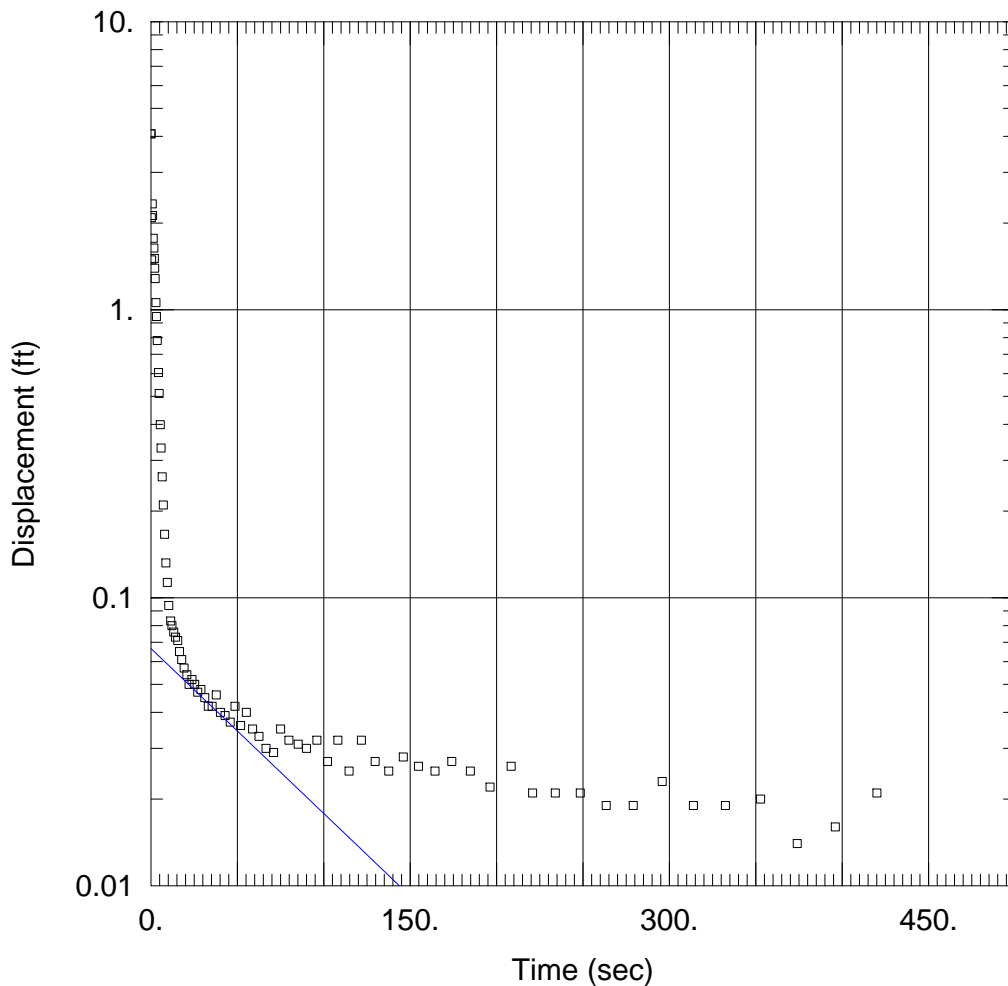
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

$K = \underline{5.32}$  ft/day

$y_0 = \underline{0.06661}$  ft

## WELL DATA (P-9)

Initial Displacement: 4.08 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# P-9 Rising Head\_Bower-Rice

Prepared By:

JBR Env. Consultants

Prepared For:

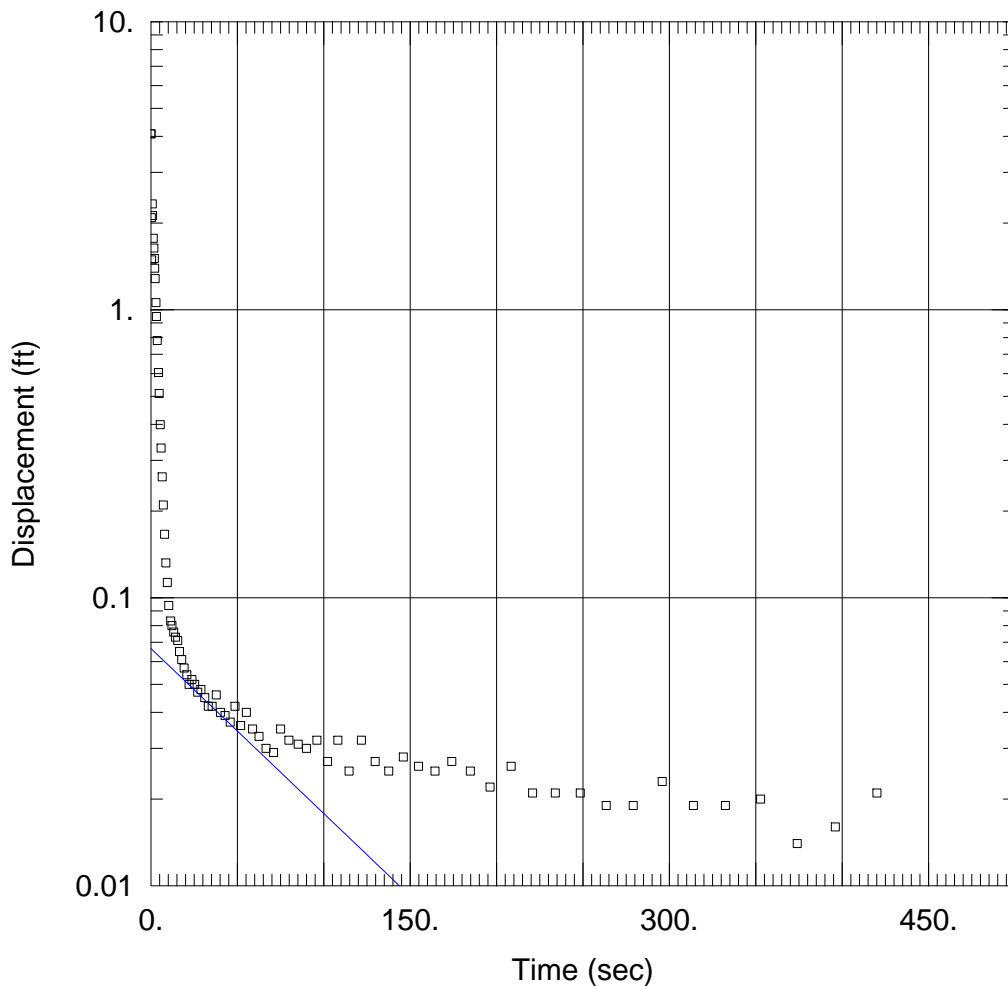
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Bower-Rice

K = 5.32 ft/day

y0 = 0.06661 ft

## WELL DATA (P-9)

Initial Displacement: 4.08 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

# P-9 Rising Head\_Hvorslev

Prepared By:

**JBR Env. Consultants**

Prepared For:

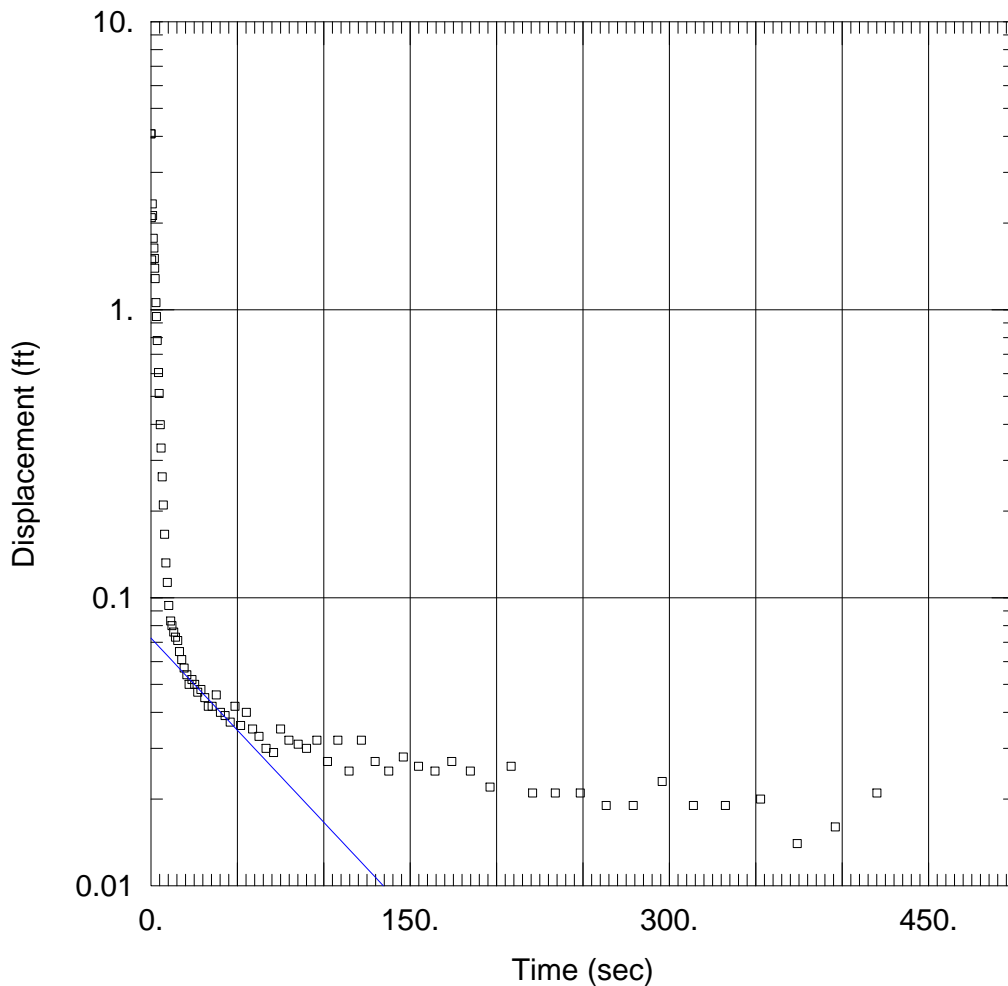
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Hvorslev

K = 8.028 ft/day      y0 = 0.07236 ft

## WELL DATA (P-9)

Initial Displacement: 4.08 ft

Static Water Column Height: 27.7 ft

Total Well Penetration Depth: 16.7 ft

Screen Length: 5 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

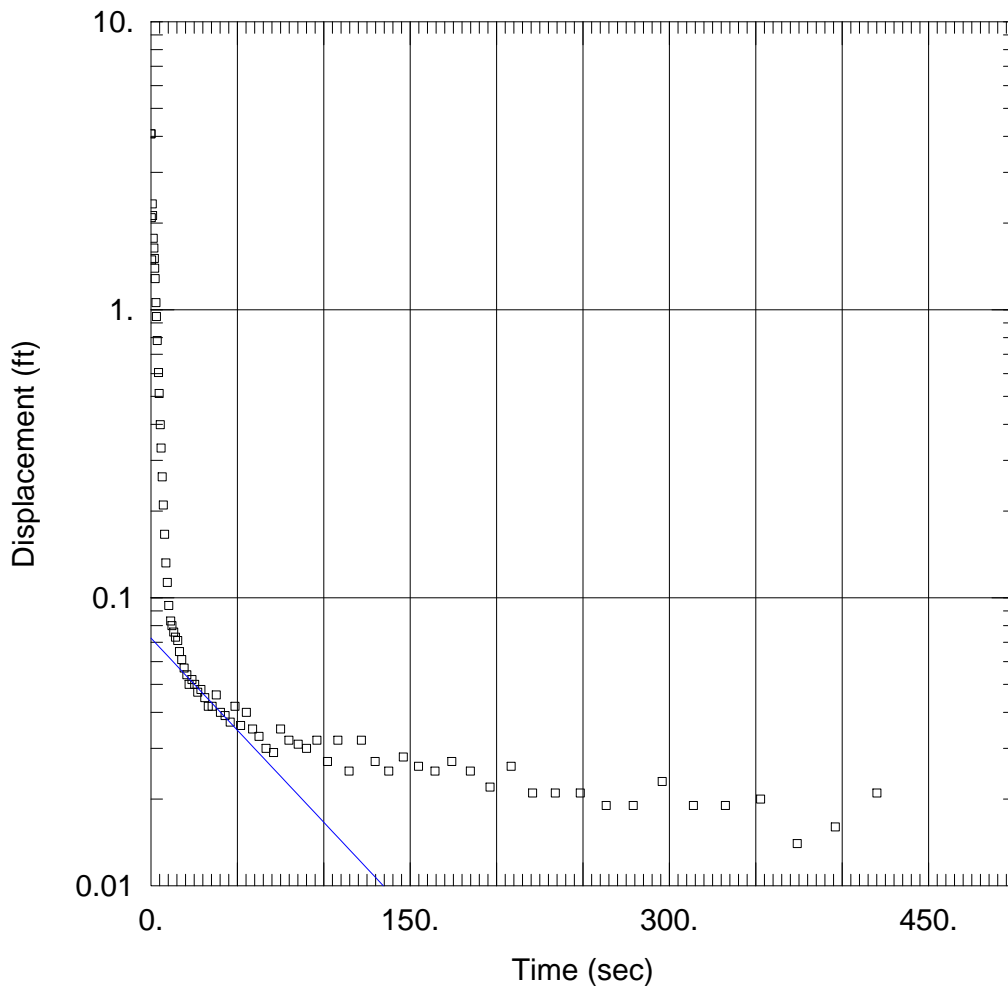
# P-9 Rising Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 8.028 ft/day      y0 = 0.07236 ft

## WELL DATA (P-9)

Initial Displacement: 4.08 ft  
Static Water Column Height: 27.7 ft  
Total Well Penetration Depth: 16.7 ft  
Screen Length: 5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-10 FH\P-10 FH BR-Unc.aqt  
 Title: P-10 Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:16:42

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: P-10

---

AQUIFER DATA

Saturated Thickness: 5.7 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: P-10

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

Initial Displacement: 4.033 ft  
 Static Water Column Height: 5.7 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 5. ft  
 Total Well Penetration Depth: 5.5 ft

No. of Observations: 145

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	4.033	263.9	1.509
0.25	0.717	279.6	1.512
0.5	0.051	296.4	1.511
0.75	1.92	314.4	1.511
1.	2.42	332.9	1.511
1.25	1.376	353.4	1.507
1.5	1.168	374.4	1.507
1.75	1.78	396.6	1.505
2.11	1.441	420.6	1.509
2.47	1.547	445.8	1.505
2.89	1.48	472.1	1.505
3.31	1.501	500.4	1.505
3.73	1.5	530.4	1.508
4.21	1.502	562.1	1.505
4.75	1.499	595.8	1.506
5.23	1.506	631.8	1.504
5.83	1.506	667.8	1.505
6.43	1.51	709.8	1.503
7.03	1.512	751.8	1.505
7.69	1.518	793.8	1.507
8.41	1.509	841.8	1.504
9.19	1.515	895.8	1.505
9.97	1.514	943.8	1.503
10.81	1.517	1003.8	1.502
11.71	1.514	1063.8	1.501
12.67	1.517	1123.8	1.502
13.63	1.518	1183.8	1.504
14.71	1.515	1243.8	1.499
15.85	1.512	1303.8	1.501

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
17.05	1.517	1363.8	1.501
18.39	1.519	1423.8	1.5
19.69	1.514	1483.8	1.499
21.07	1.516	1543.8	1.494
22.74	1.514	1603.8	1.499
24.13	1.515	1663.8	1.499
25.81	1.515	1723.8	1.5
27.61	1.516	1783.8	1.497
29.62	1.517	1843.8	1.495
31.64	1.513	1903.8	1.493
33.66	1.515	1963.8	1.494
35.97	1.515	2023.8	1.496
38.23	1.512	2083.8	1.491
40.75	1.515	2143.8	1.492
43.52	1.511	2203.8	1.493
46.21	1.514	2263.8	1.492
49.21	1.513	2323.8	1.492
52.39	1.515	2383.8	1.493
55.75	1.514	2443.8	1.493
59.35	1.512	2503.8	1.491
63.08	1.517	2563.8	1.493
67.15	1.512	2623.8	1.492
71.48	1.514	2683.8	1.494
75.55	1.512	2743.8	1.49
80.35	1.519	2803.8	1.491
85.75	1.515	2863.8	1.491
90.55	1.512	2923.8	1.491
96.61	1.512	2983.8	1.489
102.7	1.513	3043.8	1.491
108.6	1.514	3103.8	1.492
115.2	1.513	3163.8	1.491
122.4	1.515	3223.8	1.492
130.2	1.517	3283.8	1.49
137.9	1.519	3343.8	1.491
146.3	1.513	3403.8	1.491
155.4	1.512	3463.8	1.49
165.1	1.51	3523.8	1.488
174.6	1.509	3583.8	1.489
185.4	1.506	3643.8	1.49
196.8	1.511	3703.8	1.485
208.8	1.51	3763.8	1.493
221.3	1.507	3823.8	1.49
234.6	1.509	3883.8	0.802
249.	1.509		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 1.601

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.001161	ft/day
y0	1.528	ft

K = 4.094E-7 cm/sec  
 T = K\*b = 0.006615 ft<sup>2</sup>/day (7.113E-5 sq. cm/sec)

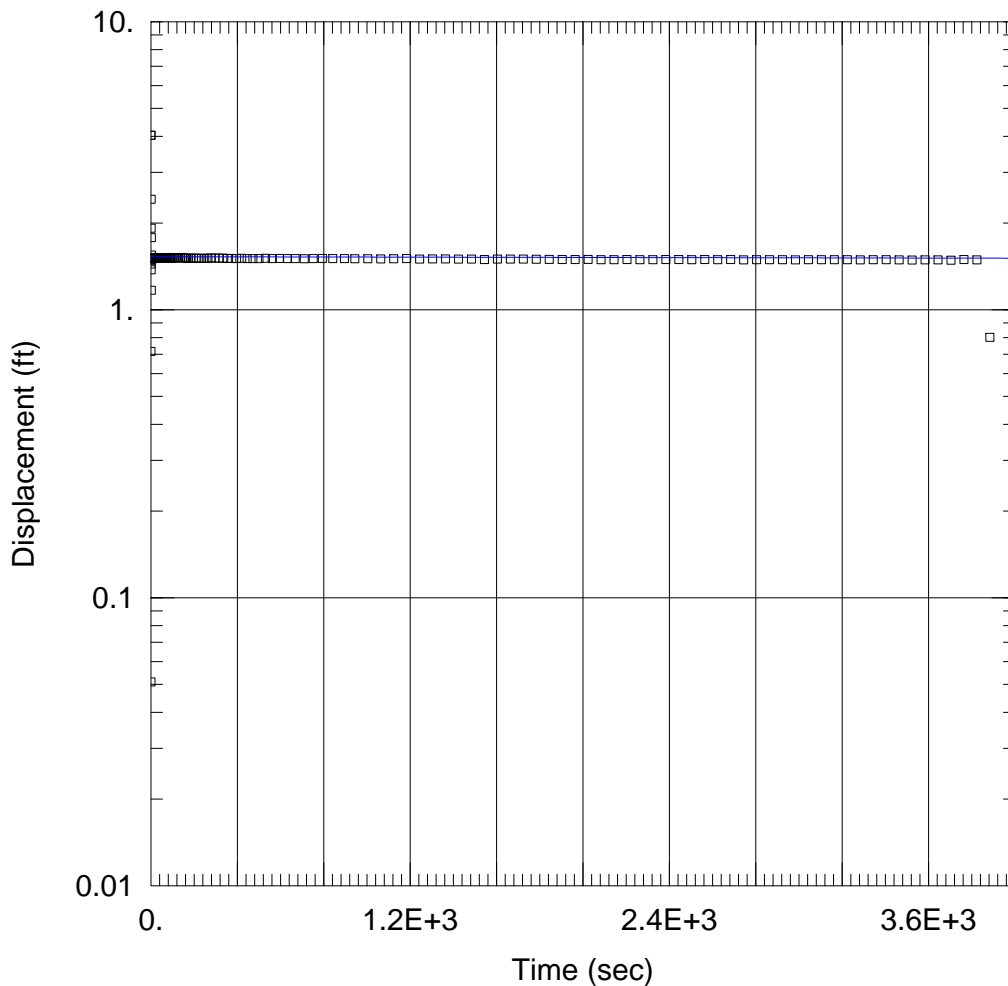
# P-10 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bower-Rice  
 K = 0.001161 ft/day      y0 = 1.528 ft

## WELL DATA (P-10)

Initial Displacement: 4.033 ft  
 Static Water Column Height: 5.7 ft  
 Total Well Penetration Depth: 5.5 ft  
 Screen Length: 5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft



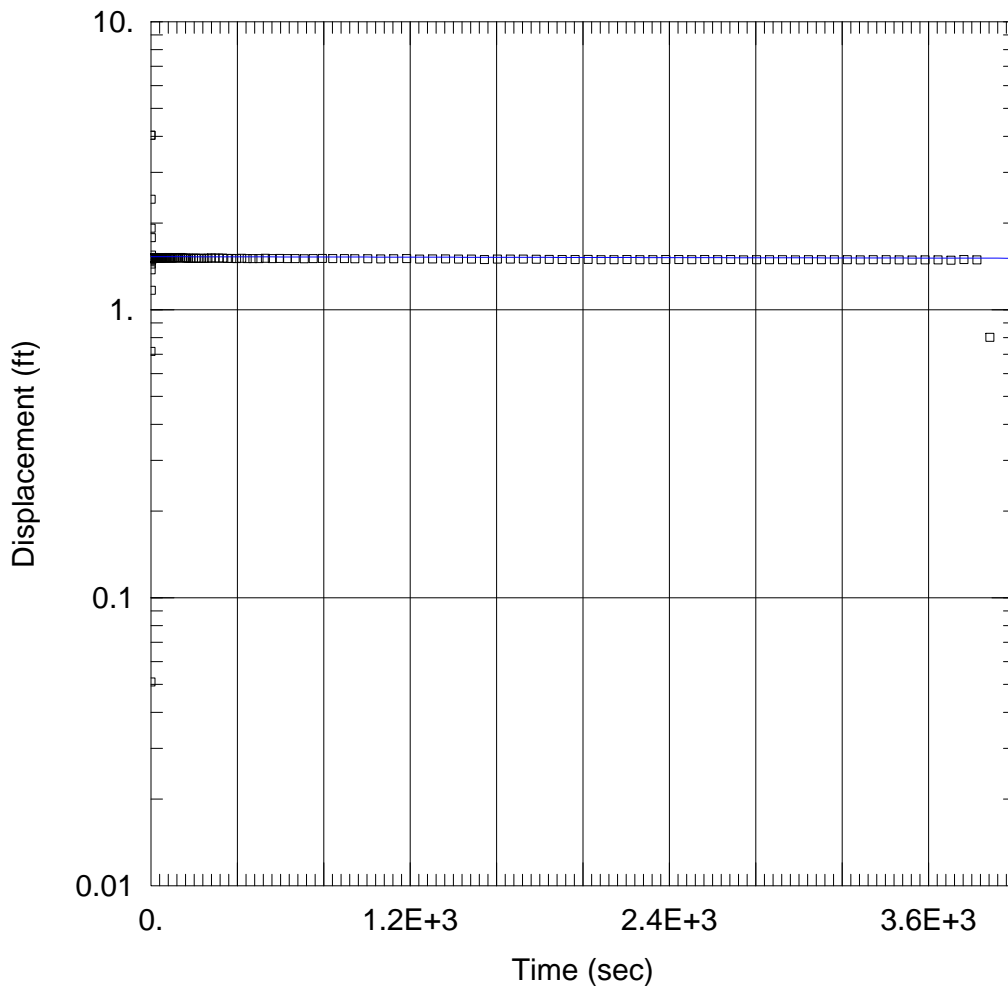
# P-10 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Bouwer-Rice  
 K = 0.001161 ft/day      y0 = 1.528 ft

## WELL DATA (P-10)

Initial Displacement: 4.033 ft  
 Static Water Column Height: 5.7 ft  
 Total Well Penetration Depth: 5.5 ft  
 Screen Length: 5 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

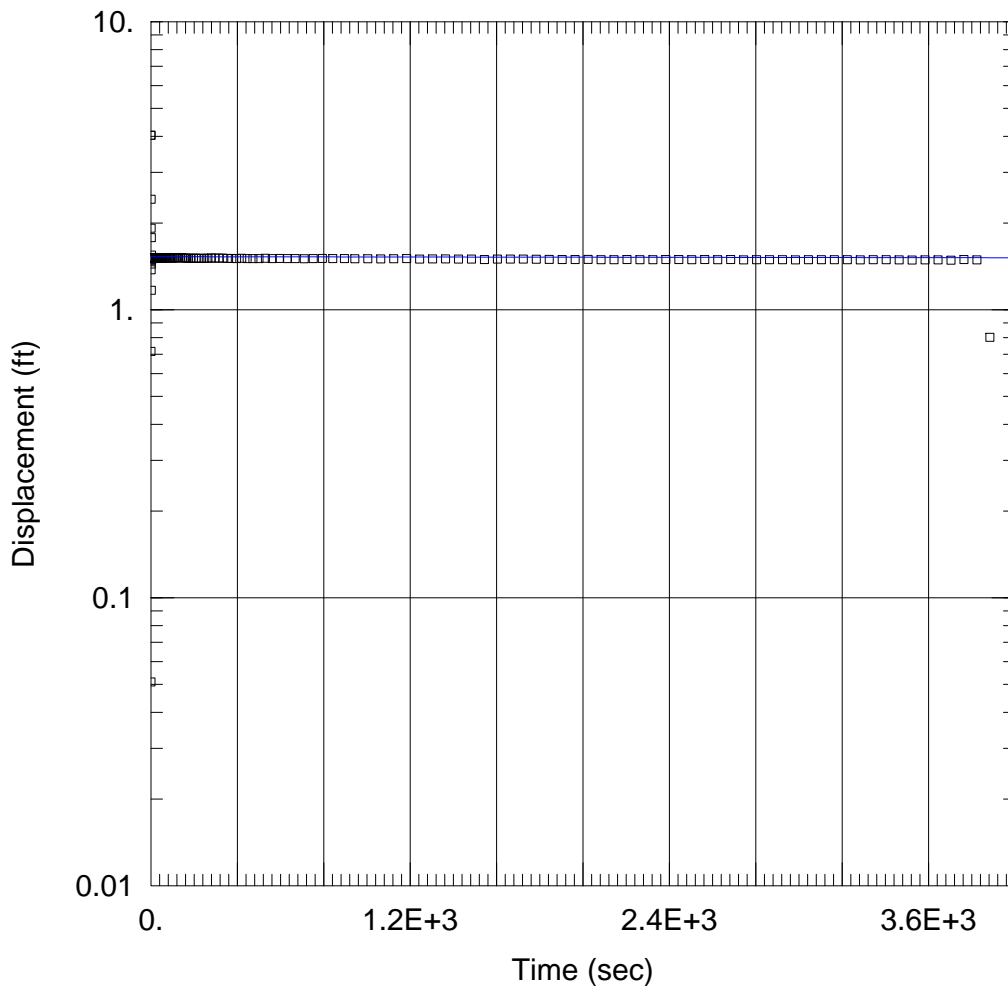
# P-10 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Hvorslev  
K = 0.001161 ft/day      y0 = 1.528 ft

## WELL DATA (P-10)

Initial Displacement: 4.033 ft  
Static Water Column Height: 5.7 ft  
Total Well Penetration Depth: 5.5 ft  
Screen Length: 5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

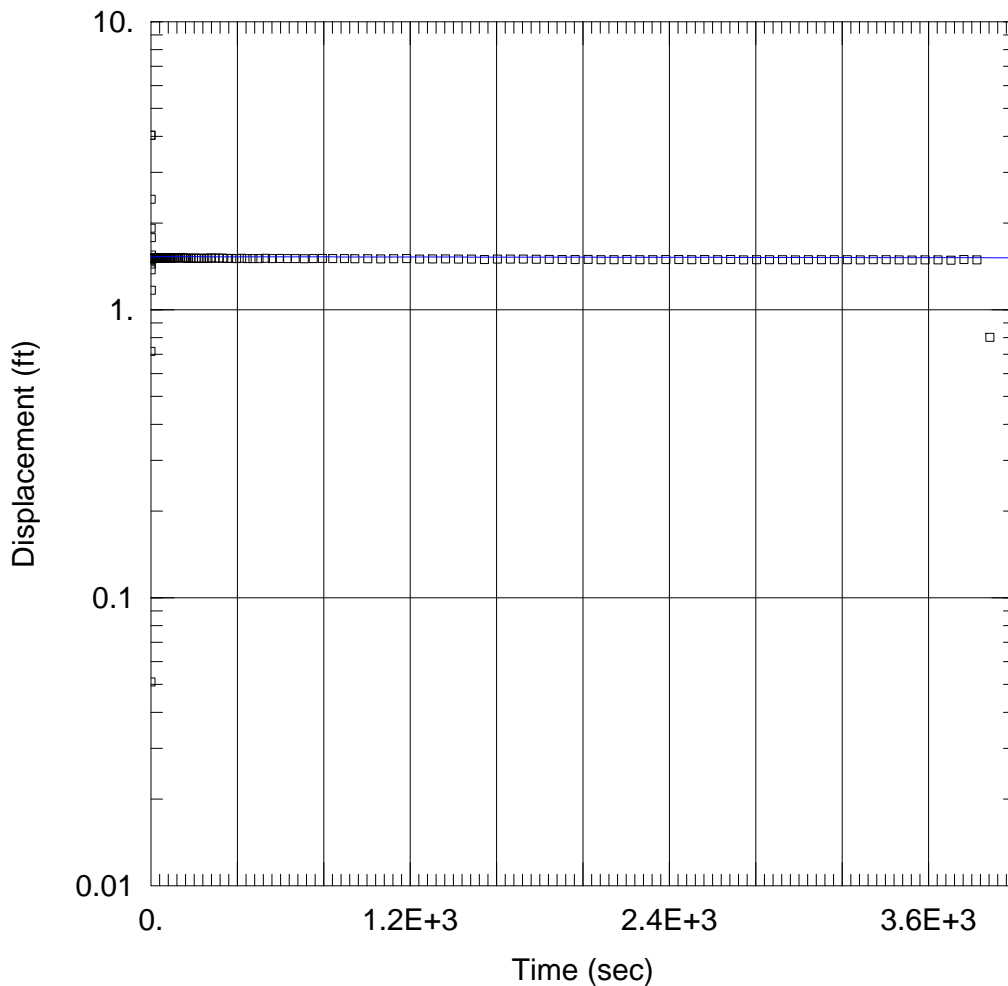
# P-10 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.001161 ft/day      y0 = 1.528 ft

## WELL DATA (P-10)

Initial Displacement: 4.033 ft  
Static Water Column Height: 5.7 ft  
Total Well Penetration Depth: 5.5 ft  
Screen Length: 5 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-13 FH\P-13R FH BR-Unc.aq  
 Title: P-13R Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:23:47

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/29/2012  
 Test Well: P-13R

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AQUIFER DATA

Saturated Thickness: 6. ft  
 Anisotropy Ratio (Kz/Kr): 1.

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SLUG TEST WELL DATA

Test Well: P-13R

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

Initial Displacement: 6.82 ft  
 Static Water Column Height: 10.9 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.67 ft  
 Well Skin Radius: 0.67 ft  
 Screen Length: 3.9 ft  
 Total Well Penetration Depth: 10.7 ft

No. of Observations: 254

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	6.282	2684.5	1.55
0.25	6.61	2744.5	1.527
0.5	3.256	2804.5	1.504
0.75	5.111	2864.5	1.487
1.	4.676	2924.5	1.467
1.25	-1.029	2984.5	1.448
1.5	2.918	3044.5	1.426
1.75	4.087	3104.5	1.405
2.	2.396	3164.5	1.388
2.25	2.836	3224.5	1.366
2.5	2.816	3284.5	1.351
2.86	2.791	3344.5	1.332
3.22	2.863	3404.5	1.311
3.64	2.87	3464.5	1.295
4.06	2.868	3524.5	1.276
4.48	2.873	3584.5	1.26
4.96	2.875	3644.5	1.244
5.5	2.877	3704.5	1.224
5.98	2.871	3764.5	1.203
6.58	2.869	3824.5	1.192
7.18	2.885	3884.5	1.176
7.78	2.879	3944.5	1.161
8.44	2.871	4004.5	1.14
9.16	2.878	4064.5	1.127
9.94	2.875	4124.5	1.114
10.72	2.875	4184.5	1.099
11.56	2.876	4244.5	1.083
12.46	2.874	4304.5	1.066
13.6	2.868	4364.5	1.049

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
14.38	2.873	4424.5	1.034
15.46	2.871	4484.5	1.018
16.6	2.873	4544.5	1.009
17.8	2.866	4604.5	0.992
19.06	2.867	4664.5	0.982
20.38	2.865	4724.5	0.962
21.82	2.862	4784.5	0.949
23.32	2.864	4844.5	0.935
24.88	2.864	4904.5	0.923
26.56	2.861	4964.5	0.906
28.36	2.857	5024.5	0.896
30.22	2.859	5084.5	0.882
32.26	2.852	5144.5	0.868
34.36	2.857	5204.5	0.856
36.58	2.855	5264.5	0.844
38.98	2.85	5324.5	0.83
41.5	2.851	5384.5	0.823
44.14	2.848	5444.5	0.812
46.96	2.846	5504.5	0.795
49.96	2.84	5564.5	0.788
53.14	2.84	5624.5	0.774
56.5	2.836	5684.5	0.765
60.1	2.831	5744.5	0.751
63.7	2.83	5804.5	0.734
67.9	2.828	5864.5	0.729
72.1	2.826	5924.5	0.719
76.3	2.82	5984.5	0.709
81.1	2.816	6044.5	0.692
86.5	2.815	6104.5	0.685
91.3	2.807	6164.5	0.673
97.3	2.803	6224.5	0.66
103.3	2.798	6284.5	0.654
109.5	2.791	6344.5	0.643
115.9	2.792	6404.5	0.629
123.1	2.782	6464.5	0.621
130.9	2.778	6524.5	0.61
138.7	2.775	6584.5	0.602
147.1	2.772	6644.5	0.592
156.1	2.759	6704.5	0.581
165.7	2.753	6764.5	0.572
175.3	2.747	6824.5	0.564
186.1	2.739	6884.5	0.553
197.5	2.732	6944.5	0.546
209.5	2.724	7004.5	0.535
222.1	2.715	7064.5	0.527
235.3	2.702	7124.5	0.516
249.7	2.699	7184.5	0.512
264.7	2.687	7244.5	0.499
280.3	2.676	7304.5	0.491
297.1	2.662	7364.5	0.482
315.2	2.656	7424.5	0.475
333.8	2.644	7484.5	0.463
354.1	2.629	7544.5	0.46
375.1	2.608	7604.5	0.447
397.5	2.603	7664.5	0.441
421.3	2.585	7724.5	0.436
446.5	2.571	7784.5	0.428
472.9	2.555	7844.5	0.418
501.1	2.571	7904.5	0.411
531.1	2.521	7964.5	0.403
562.9	2.495	8024.5	0.397
596.5	2.48	8084.5	0.389
632.5	2.464	8144.5	0.38
668.5	2.441	8204.5	0.37
710.5	2.418	8264.5	0.368
752.5	2.395	8324.5	0.359

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
794.5	2.367	8384.5	0.349
842.5	2.348	8444.5	0.344
896.5	2.32	8504.5	0.338
944.5	2.293	8564.5	0.335
1004.5	2.258	8624.5	0.324
1064.5	2.234	8684.5	0.318
1124.5	2.201	8744.5	0.312
1184.5	2.178	8804.5	0.306
1244.5	2.147	8864.5	0.293
1304.5	2.114	8924.5	0.291
1364.5	2.085	8984.5	0.289
1424.5	2.057	9044.5	0.281
1484.5	2.029	9104.5	0.275
1544.5	2.003	9164.5	0.271
1604.5	1.975	9224.5	0.262
1664.5	1.949	9284.5	0.257
1724.5	1.924	9344.5	0.253
1784.5	1.899	9404.5	0.244
1844.5	1.871	9464.5	0.242
1904.5	1.85	9524.5	0.235
1964.5	1.825	9584.5	0.227
2024.5	1.797	9644.5	0.224
2084.5	1.772	9704.5	0.219
2144.5	1.747	9764.5	0.208
2204.5	1.723	9824.5	0.207
2264.5	1.7	9884.5	0.202
2324.5	1.678	9944.5	0.196
2384.5	1.657	1.0E+4	0.191
2444.5	1.636	1.006E+4	0.184
2504.5	1.616	1.012E+4	0.176
2564.5	1.593	1.018E+4	0.172
2624.5	1.569	1.024E+4	0.167

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 1.777

VISUAL ESTIMATION RESULTSEstimated Parameters

Parameter	Estimate	
K	0.1253	ft/day
y0	2.818	ft

K = 4.42E-5 cm/sec  
 T = K\*b = 0.7518 ft<sup>2</sup>/day (0.008083 sq. cm/sec)

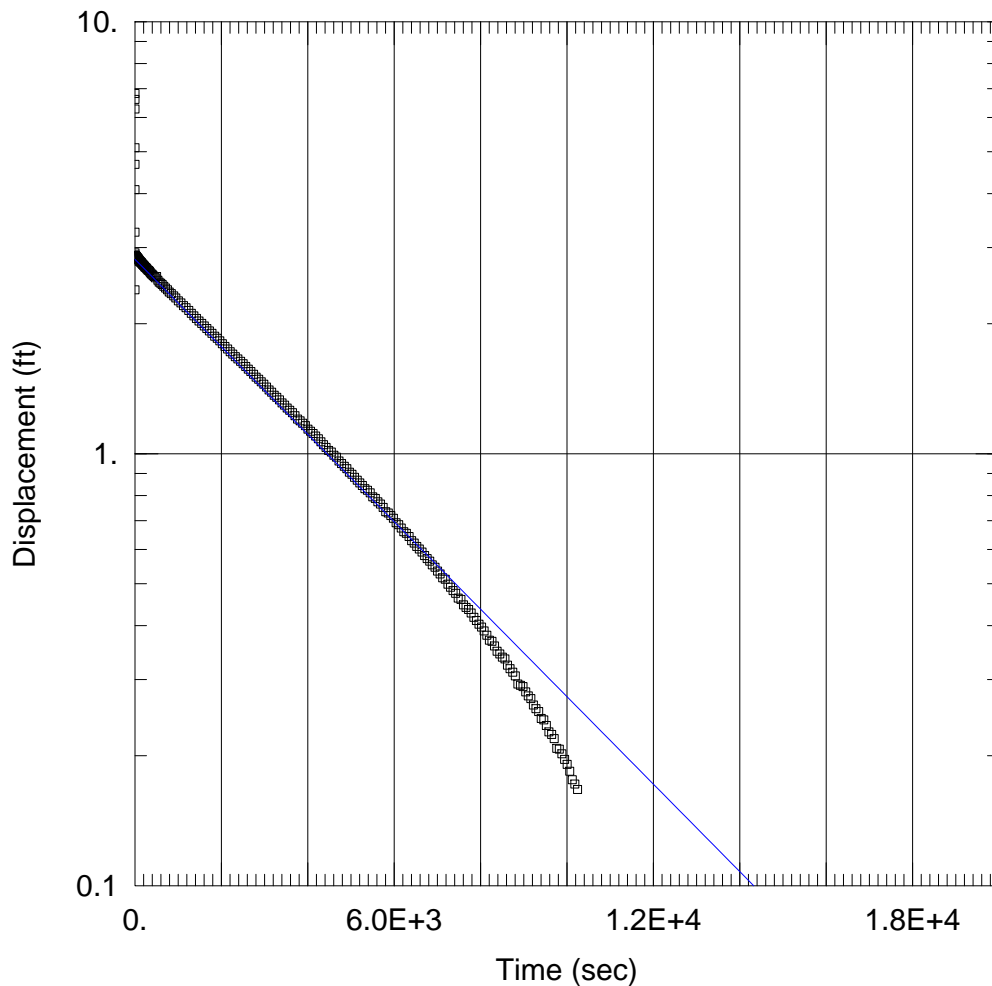
# P-13R Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Bouwer-Rice  
K = 0.1253 ft/day      y0 = 2.818 ft

## WELL DATA (P-13R)

Initial Displacement: 6.82 ft  
Static Water Column Height: 10.9 ft  
Total Well Penetration Depth: 10.7 ft  
Screen Length: 3.9 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.67 ft

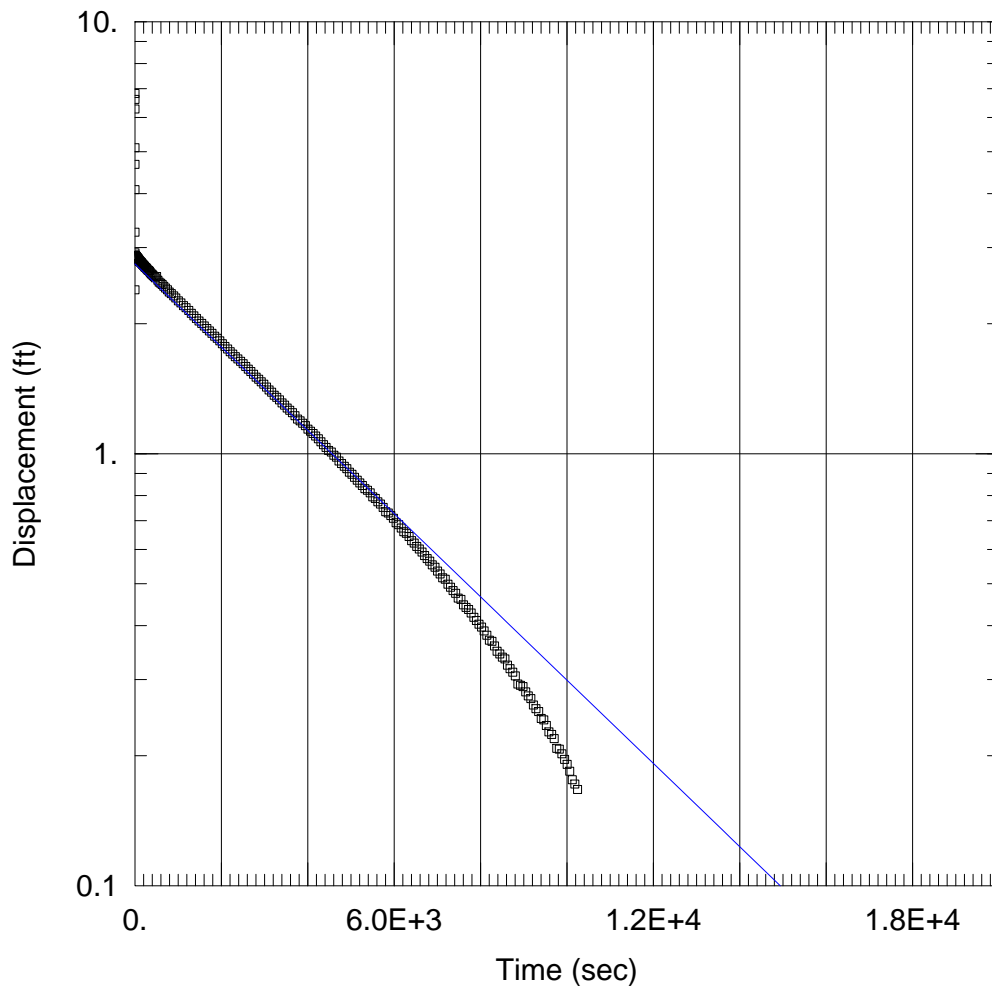
# P-13R Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Bouwer-Rice  
K = 0.1193 ft/day      y0 = 2.751 ft

## WELL DATA (P-13R)

Initial Displacement: 6.82 ft  
Static Water Column Height: 10.9 ft  
Total Well Penetration Depth: 10.7 ft  
Screen Length: 3.9 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.67 ft



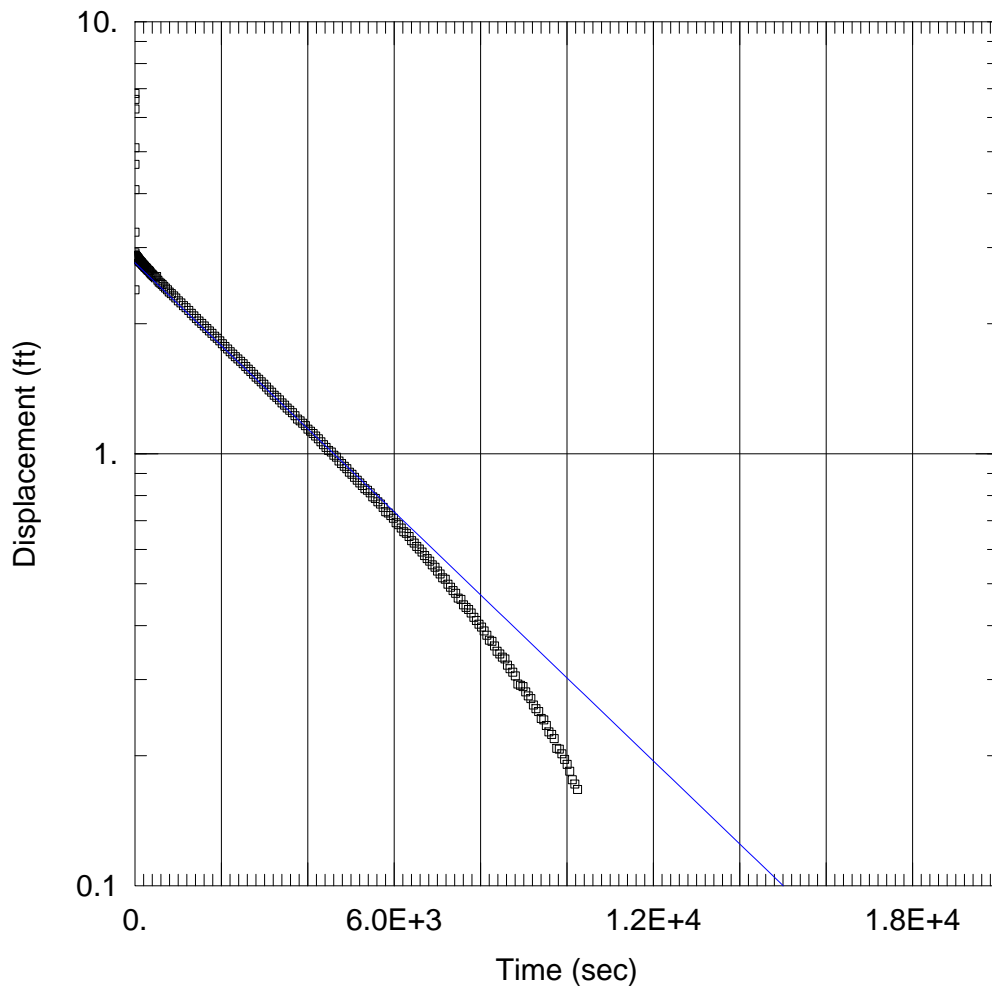
# P-13R Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Hvorslev  
K = 0.1647 ft/day       $y_0 = \underline{2.768}$  ft

## WELL DATA (P-13R)

Initial Displacement: 6.82 ft  
Static Water Column Height: 10.9 ft  
Total Well Penetration Depth: 10.7 ft  
Screen Length: 3.9 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.67 ft

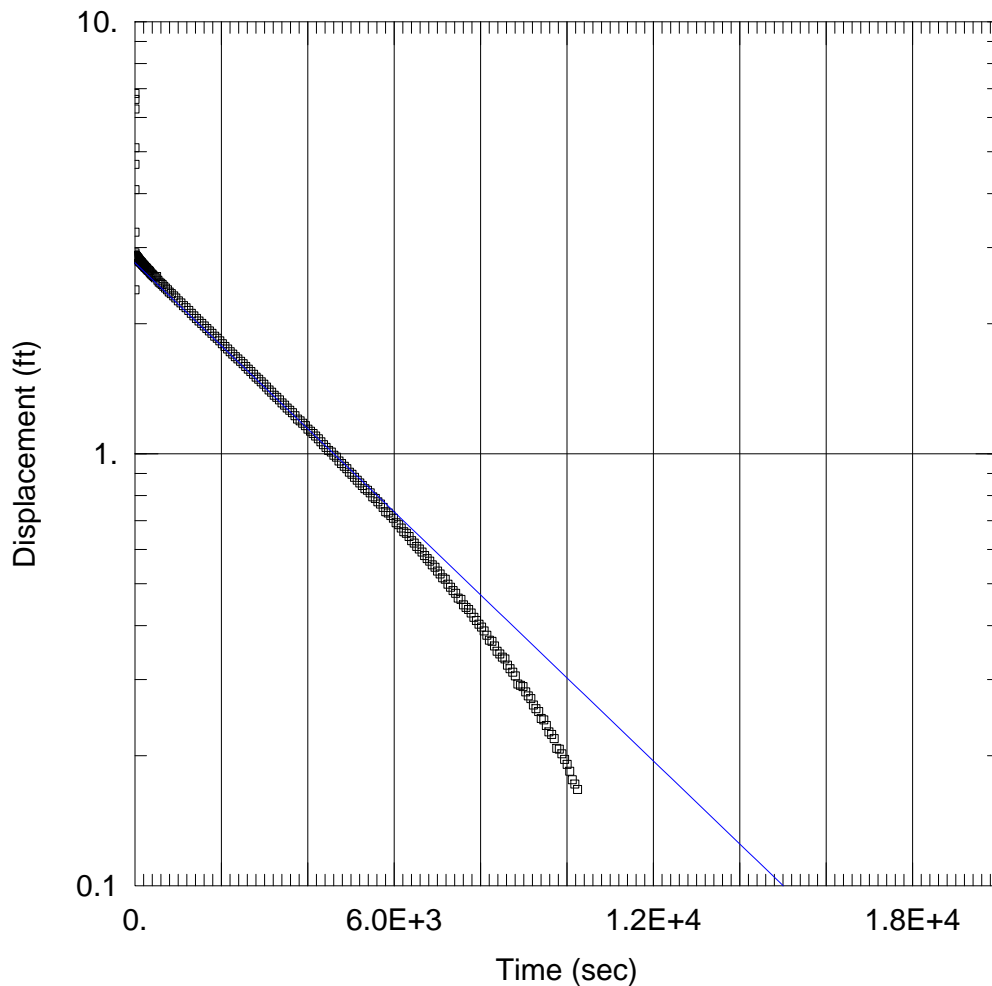
# P-13R Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.1647 ft/day       $y_0 =$  2.768 ft

## WELL DATA (P-13R)

Initial Displacement: 6.82 ft  
Static Water Column Height: 10.9 ft  
Total Well Penetration Depth: 10.7 ft  
Screen Length: 3.9 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.67 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-13 RH\P-13R RH BR-Unc.ac  
 Title: P-13R Risisng Head\_Bouwer-Rice  
 Date: 12/11/12  
 Time: 18:25:50

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PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/29/2012  
 Test Well: P-13R

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AQUIFER DATA

Saturated Thickness: 6. ft  
 Anisotropy Ratio (Kz/Kr): 1.

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SLUG TEST WELL DATA

Test Well: P-13R

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

Initial Displacement: 4.169 ft  
 Static Water Column Height: 11.3 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.67 ft  
 Well Skin Radius: 0.67 ft  
 Screen Length: 3.9 ft  
 Total Well Penetration Depth: 11.1 ft

No. of Observations: 261

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	4.169	2924.5	1.201
0.25	2.876	2984.5	1.184
0.5	2.59	3044.5	1.171
0.75	2.879	3104.5	1.156
1.	3.075	3164.5	1.143
1.25	3.069	3224.5	1.129
1.5	3.063	3284.5	1.116
1.75	3.044	3344.5	1.103
2.	3.043	3404.5	1.09
2.25	3.037	3464.5	1.078
2.5	3.03	3524.5	1.063
2.86	3.018	3584.5	1.053
3.22	3.014	3644.5	1.039
3.64	2.998	3704.5	1.027
4.06	3.017	3764.5	1.018
4.48	2.989	3824.5	1.006
4.96	2.972	3884.5	0.996
5.5	2.99	3944.5	0.988
5.98	2.989	4004.5	0.977
6.58	2.987	4064.5	0.967
7.18	2.983	4124.5	0.954
7.78	2.984	4184.5	0.946
8.44	2.98	4244.5	0.934
9.16	2.975	4304.5	0.926
9.94	2.972	4364.5	0.913
10.72	2.963	4424.5	0.908
11.56	2.964	4484.5	0.897
12.46	2.961	4544.5	0.889
13.42	2.958	4604.5	0.882

<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
14.38	2.955	4664.5	0.873
15.46	2.949	4724.5	0.86
16.6	2.947	4784.5	0.853
17.8	2.943	4844.5	0.849
19.06	2.938	4904.5	0.841
20.38	2.937	4964.5	0.832
21.82	2.93	5024.5	0.825
23.32	2.929	5084.5	0.821
24.88	2.924	5144.5	0.811
26.56	2.919	5204.5	0.802
28.36	2.913	5264.5	0.793
30.22	2.909	5324.5	0.788
32.26	2.906	5384.5	0.781
34.36	2.898	5444.5	0.777
36.58	2.894	5504.5	0.769
38.98	2.886	5564.5	0.765
41.5	2.882	5624.5	0.757
44.14	2.874	5684.5	0.752
46.96	2.872	5744.5	0.742
49.96	2.861	5804.5	0.739
53.14	2.856	5864.5	0.736
56.5	2.849	5924.5	0.728
60.1	2.841	5984.5	0.72
63.7	2.84	6044.5	0.716
67.9	2.83	6104.5	0.712
72.1	2.824	6164.5	0.707
76.3	2.823	6224.5	0.702
81.1	2.808	6284.5	0.701
86.5	2.802	6344.5	0.691
91.3	2.795	6404.5	0.687
97.3	2.786	6464.5	0.676
103.3	2.777	6524.5	0.675
109.3	2.768	6584.5	0.672
115.9	2.759	6644.5	0.667
123.1	2.747	6704.5	0.662
130.9	2.738	6764.5	0.661
138.7	2.727	6824.5	0.651
147.1	2.719	6884.5	0.65
156.1	2.707	6944.5	0.645
165.7	2.693	7004.5	0.642
175.3	2.68	7064.5	0.638
186.1	2.665	7124.5	0.633
197.5	2.648	7184.5	0.631
209.5	2.632	7244.5	0.626
222.1	2.621	7304.5	0.622
235.3	2.608	7364.5	0.618
249.7	2.589	7424.5	0.614
264.7	2.581	7484.5	0.614
280.3	2.565	7544.5	0.611
297.1	2.542	7604.5	0.606
315.1	2.524	7664.5	0.603
333.7	2.505	7724.5	0.596
354.1	2.47	7784.5	0.596
375.1	2.457	7844.5	0.592
397.3	2.438	7904.5	0.59
421.3	2.421	7964.5	0.59
446.5	2.397	8024.5	0.581
472.9	2.369	8084.5	0.58
501.1	2.348	8144.5	0.575
531.1	2.323	8204.5	0.578
562.9	2.286	8264.5	0.573
596.5	2.248	8324.5	0.569
632.5	2.212	8384.5	0.567
668.5	2.19	8444.5	0.562
710.5	2.156	8504.5	0.561
752.5	2.13	8564.5	0.559

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
794.5	2.107	8624.5	0.558
842.5	2.075	8684.5	0.553
896.5	2.041	8744.5	0.551
944.5	2.005	8804.5	0.552
1004.5	1.968	8864.5	0.55
1064.5	1.898	8924.5	0.546
1124.5	1.909	8984.5	0.542
1184.5	1.881	9044.5	0.541
1244.5	1.852	9104.5	0.539
1304.5	1.816	9164.5	0.538
1364.5	1.784	9224.6	0.533
1424.5	1.751	9284.5	0.531
1484.5	1.719	9344.5	0.528
1544.5	1.689	9404.5	0.527
1604.5	1.661	9464.5	0.529
1664.5	1.636	9524.5	0.528
1724.5	1.609	9584.5	0.52
1784.5	1.578	9644.5	0.52
1844.5	1.555	9704.5	0.517
1904.5	1.529	9764.5	0.517
1964.5	1.496	9824.5	0.516
2024.5	1.469	9884.5	0.51
2084.5	1.436	9944.5	0.51
2144.5	1.41	1.0E+4	0.508
2204.5	1.42	1.006E+4	0.512
2264.5	1.399	1.012E+4	0.503
2324.5	1.378	1.018E+4	0.504
2384.5	1.357	1.024E+4	0.505
2444.5	1.331	1.03E+4	0.503
2504.5	1.311	1.036E+4	0.499
2564.5	1.294	1.042E+4	0.498
2624.5	1.279	1.048E+4	0.495
2684.5	1.263	1.054E+4	0.495
2744.5	1.247	1.06E+4	0.491
2804.5	1.229	1.066E+4	0.491
2864.5	1.215		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 1.794

VISUAL ESTIMATION RESULTSEstimated Parameters

Parameter	Estimate	
K	0.1439	ft/day
y0	2.524	ft

K = 5.078E-5 cm/sec  
 T = K\*b = 0.8636 ft<sup>2</sup>/day (0.009286 sq. cm/sec)

# P-13R Risisng Head\_Bouwer-Rice

Prepared By:

**JBR Env. Consultants**

Prepared For:

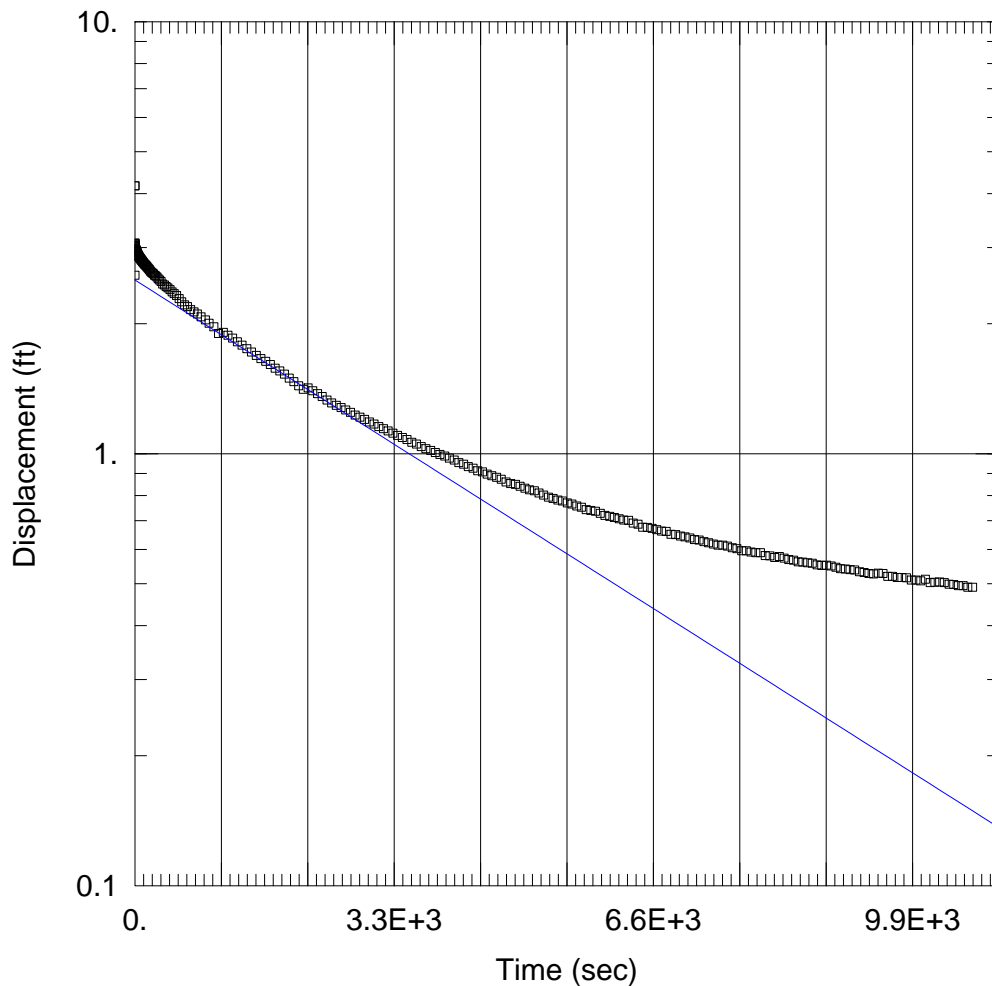
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.1439 ft/day      y0 = 2.524 ft

## WELL DATA (P-13R)

Initial Displacement: 4.169 ft

Static Water Column Height: 11.3 ft

Total Well Penetration Depth: 11.1 ft

Screen Length: 3.9 ft

Casing Radius: 0.17 ft

Well Radius: 0.67 ft

# P-13R Rising Head\_Bouwer-Rice

Prepared By:

JBR Env. Consultants

Prepared For:

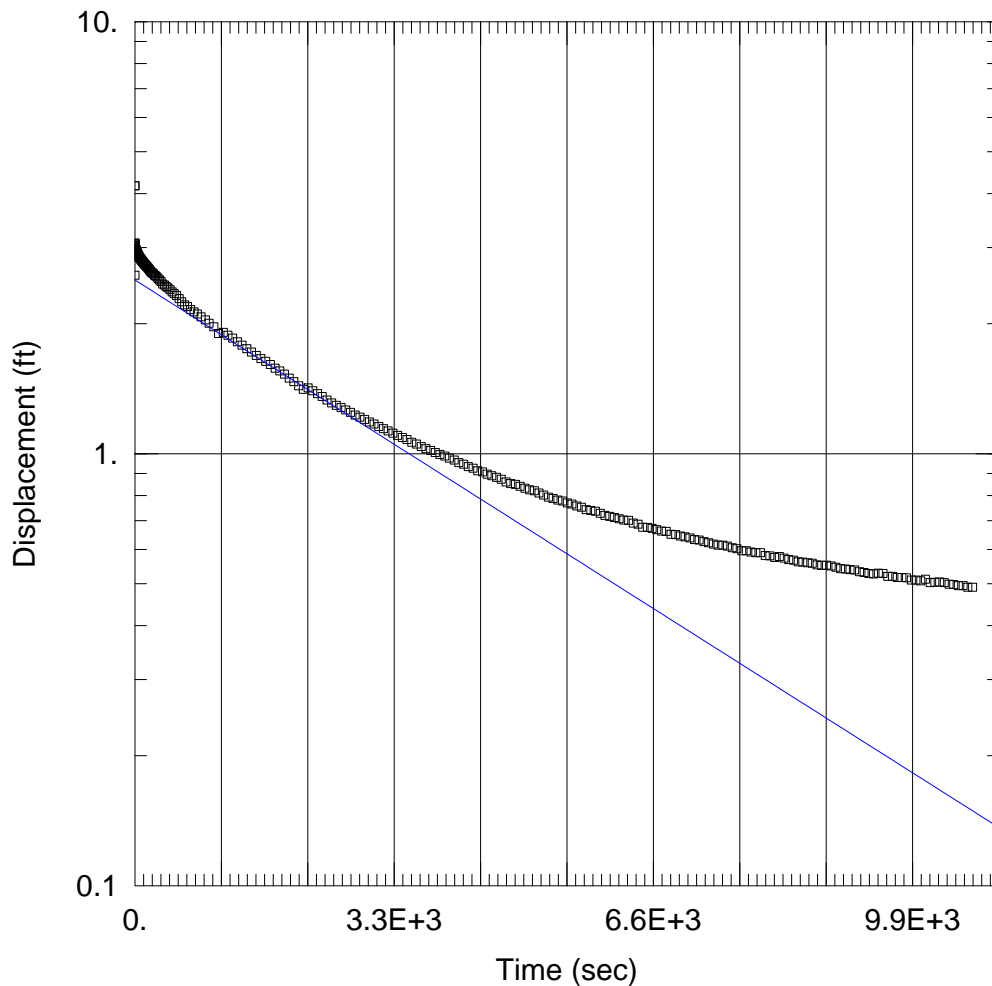
Tuppan Consultants

Project:

B.A12414.00

Location:

Cowlitz County, WA



## SOLUTION

Aquifer Model: Confined

Solution Method: Bouwer-Rice

K = 0.1439 ft/day      y0 = 2.524 ft

## WELL DATA (P-13R)

Initial Displacement: 4.169 ft

Static Water Column Height: 11.3 ft

Total Well Penetration Depth: 11.1 ft

Screen Length: 3.9 ft

Casing Radius: 0.17 ft

Well Radius: 0.67 ft

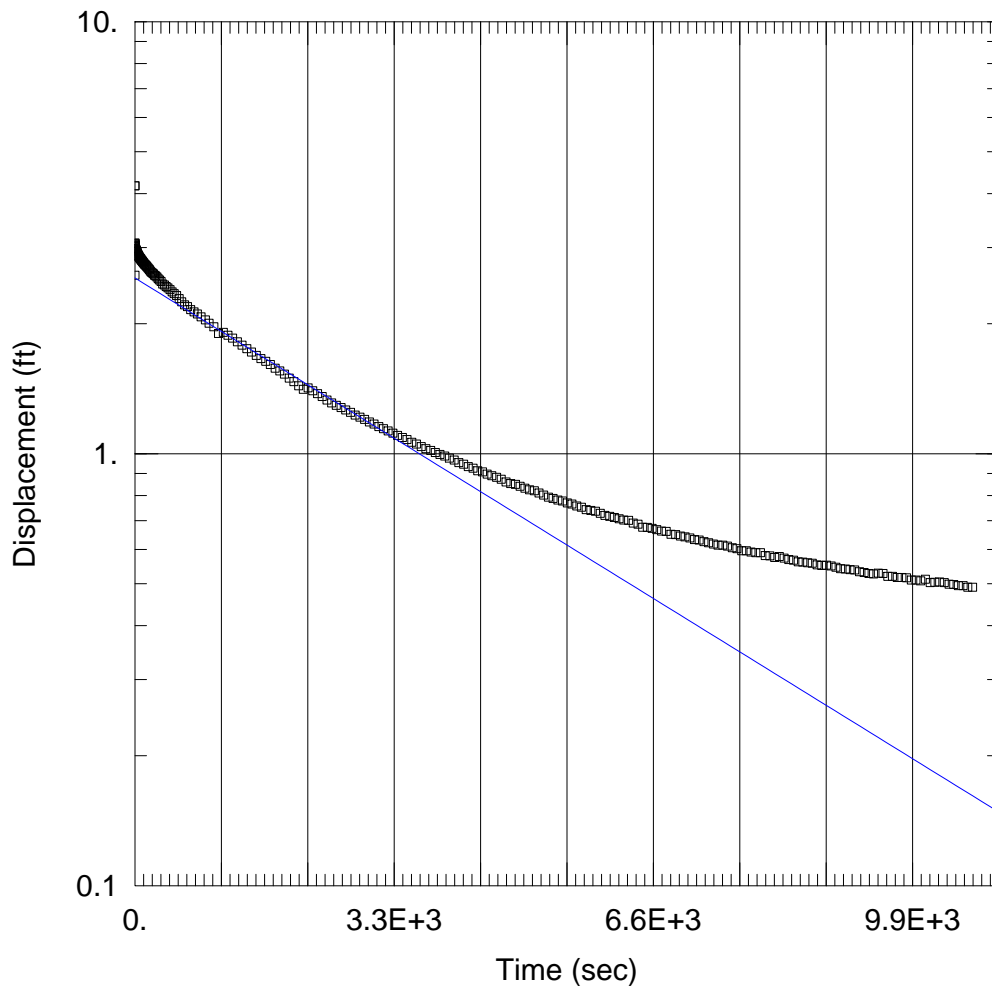
# P-13R Risisng Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Hvorslev  
 $K = 0.1927$  ft/day       $y_0 = 2.552$  ft

## WELL DATA (P-13R)

Initial Displacement: 4.169 ft  
 Static Water Column Height: 11.3 ft  
 Total Well Penetration Depth: 11.1 ft  
 Screen Length: 3.9 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.67 ft



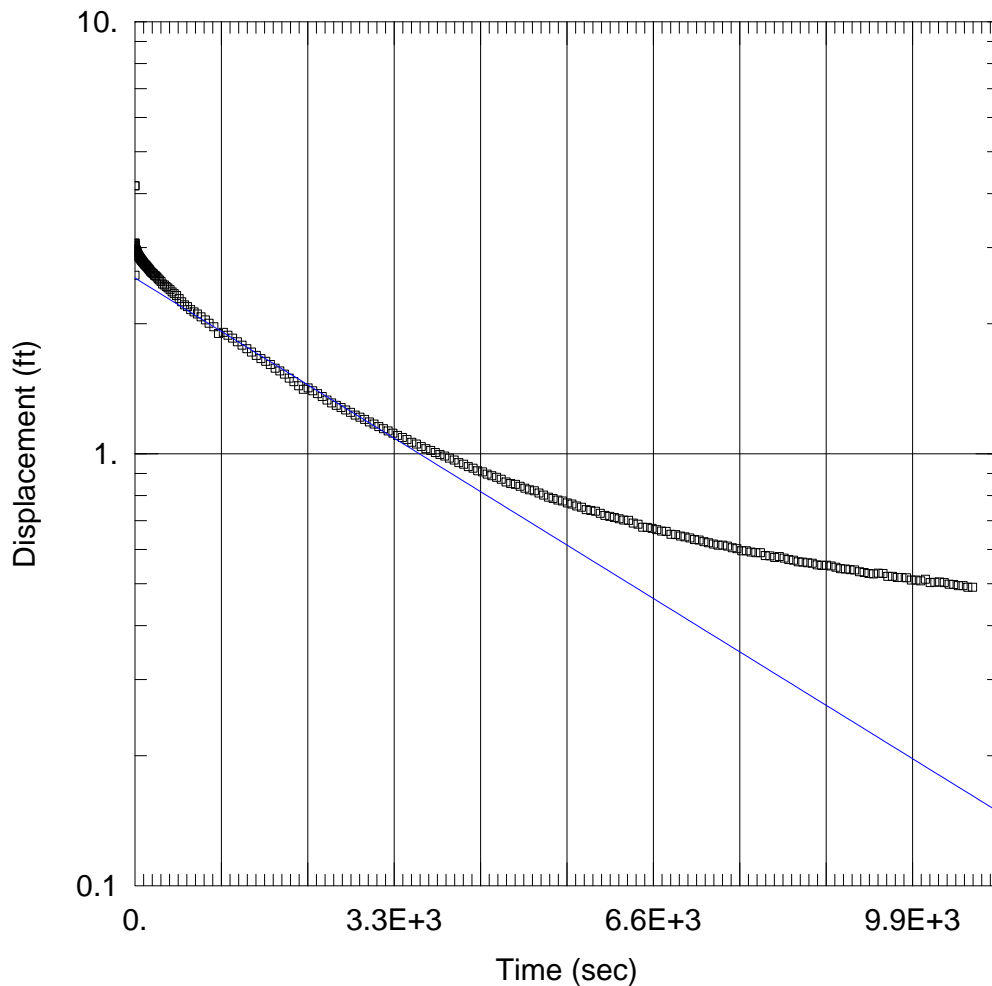
# P-13R Risisng Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.1927 ft/day      y0 = 2.552 ft

## WELL DATA (P-13R)

Initial Displacement: 4.169 ft  
Static Water Column Height: 11.3 ft  
Total Well Penetration Depth: 11.1 ft  
Screen Length: 3.9 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.67 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-19 FH\P-19 FH BR-Unc.aqt  
 Title: P-19 Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:26:49

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/31/2012  
 Test Well: P-19

---

AQUIFER DATA

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

---

SLUG TEST WELL DATA

Test Well: P-19

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

Initial Displacement: 5.431 ft  
 Static Water Column Height: 18.24 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 4.8 ft  
 Total Well Penetration Depth: 12.54 ft

No. of Observations: 129

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	5.431	439.3	1.496
0.6	2.159	465.7	1.469
1.26	2.423	493.9	1.437
1.98	2.147	523.9	1.406
2.76	2.099	555.7	1.377
3.54	2.105	589.3	1.342
4.38	2.109	625.3	1.309
5.28	2.105	661.3	1.276
6.24	2.105	703.3	1.236
7.2	2.102	745.3	1.198
8.28	2.101	787.3	1.167
9.42	2.091	835.3	1.119
10.62	2.094	889.3	1.075
11.88	2.091	937.3	1.042
13.2	2.088	997.3	0.996
14.64	2.083	1057.3	0.956
16.14	2.078	1117.3	0.909
17.7	2.08	1177.3	0.869
19.38	2.076	1237.3	0.83
21.18	2.072	1297.3	0.8
23.04	2.074	1357.3	0.76
25.08	2.064	1417.3	0.721
27.18	2.053	1477.3	0.686
29.4	2.056	1537.3	0.659
31.8	2.051	1597.3	0.629
34.32	2.045	1657.3	0.598
36.96	2.039	1717.3	0.568
39.78	2.033	1777.3	0.542
42.78	2.022	1837.3	0.516

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
45.96	2.022	1897.3	0.487
49.32	2.008	1957.3	0.469
52.92	2.002	2017.3	0.442
56.52	1.997	2077.3	0.419
60.72	1.989	2137.3	0.398
64.92	1.975	2197.3	0.367
69.12	1.977	2257.3	0.358
73.92	1.972	2317.3	0.333
79.32	1.96	2377.3	0.315
84.12	1.947	2437.3	0.298
90.12	1.94	2497.3	0.281
96.12	1.929	2557.3	0.259
102.1	1.921	2617.3	0.248
108.7	1.905	2677.3	0.226
115.9	1.898	2737.3	0.216
123.7	1.884	2797.3	0.196
131.7	1.872	2857.3	0.184
139.9	1.859	2917.3	0.172
148.9	1.856	2977.3	0.155
158.5	1.836	3037.3	0.14
168.2	1.82	3097.3	0.129
179.1	1.807	3157.3	0.116
190.5	1.793	3217.3	0.11
202.4	1.778	3277.3	0.096
214.9	1.762	3337.3	0.084
228.1	1.747	3397.3	0.076
242.5	1.729	3457.3	0.068
257.5	1.713	3517.3	0.054
273.2	1.688	3577.3	0.049
289.9	1.669	3637.3	0.043
307.9	1.644	3697.3	0.031
326.6	1.622	3757.3	0.022
347.	1.602	3817.3	0.016
368.	1.576	3877.3	0.005
390.1	1.552	3937.3	-0.001
414.1	1.528		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 1.866

VISUAL ESTIMATION RESULTSEstimated Parameters

Parameter	Estimate	
K	0.3326	ft/day
y0	2.08	ft

K = 0.0001173 cm/sec  
 T = K\*b = 4.323 ft<sup>2</sup>/day (0.04649 sq. cm/sec)

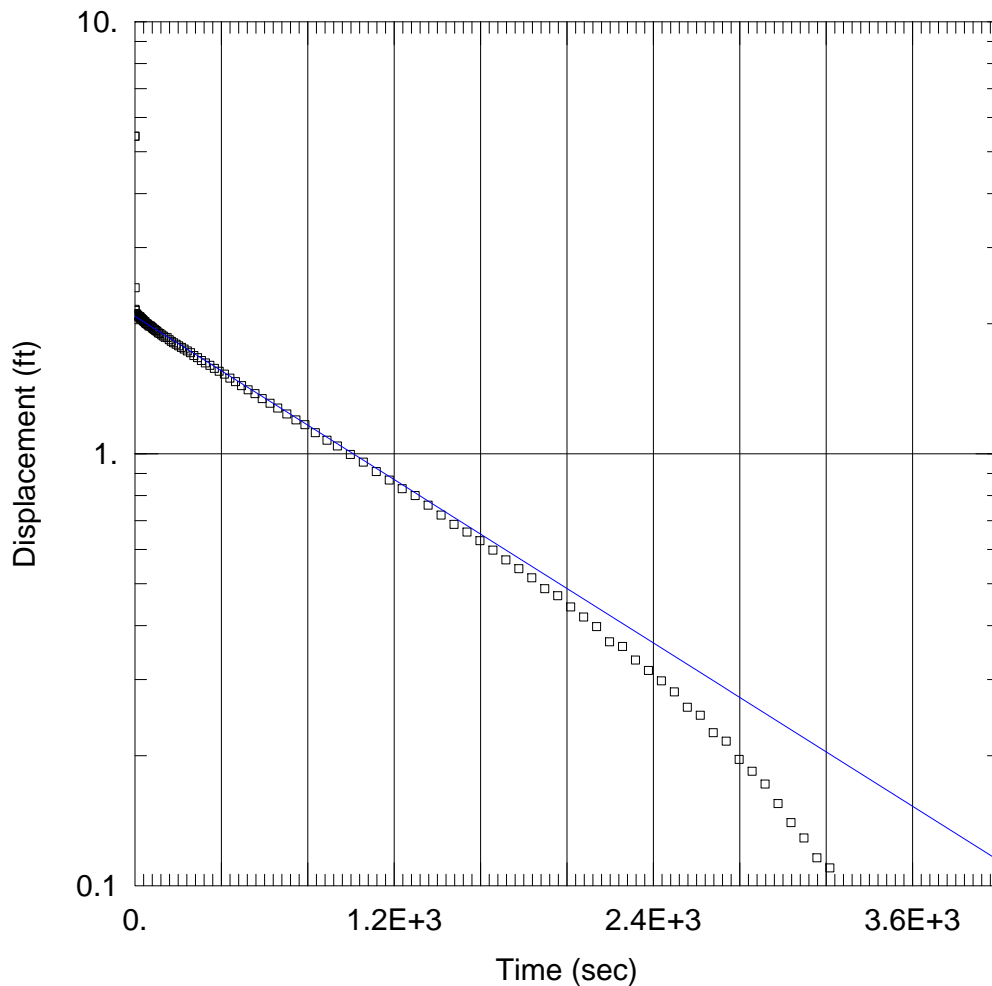
# P-19 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 K = 0.3326 ft/day      y0 = 2.08 ft

## WELL DATA (P-19)

Initial Displacement: 5.431 ft  
 Static Water Column Height: 18.24 ft  
 Total Well Penetration Depth: 12.54 ft  
 Screen Length: 4.8 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

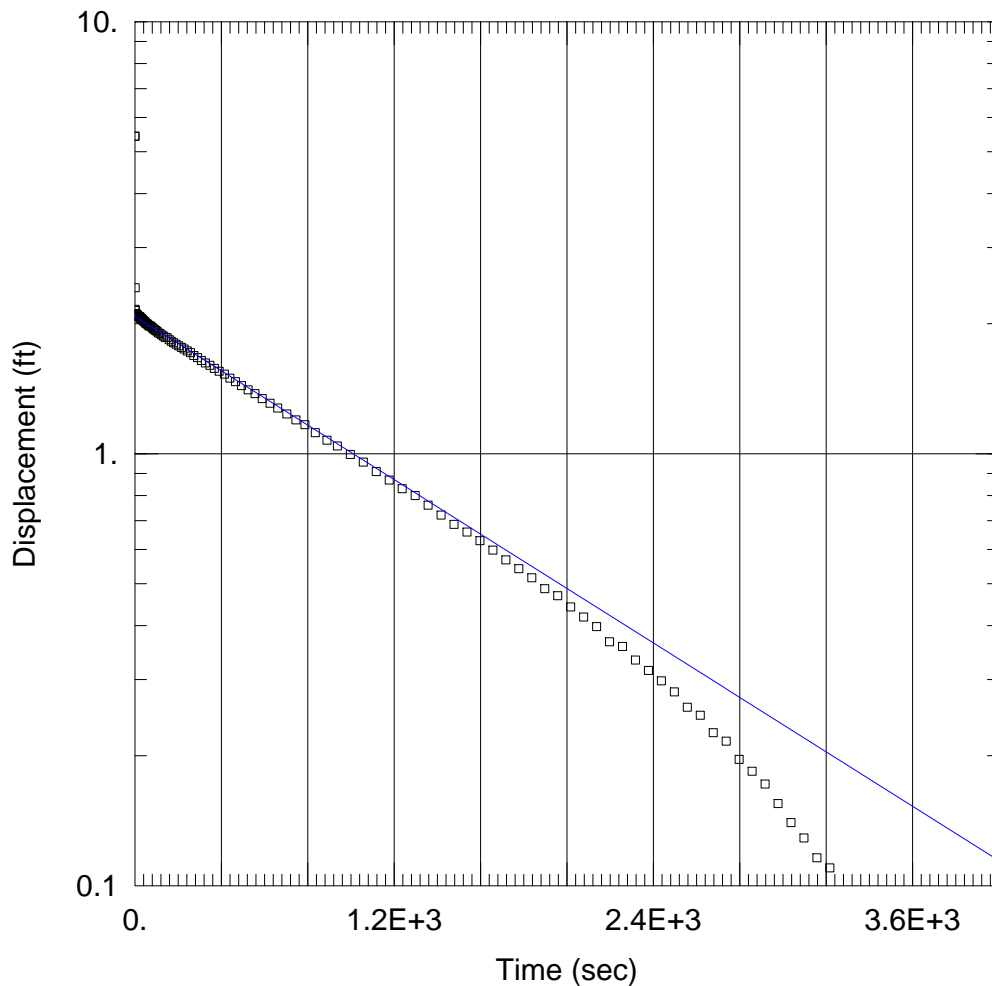
# P-19 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Bouwer-Rice  
 K = 0.3326 ft/day      y0 = 2.08 ft

## WELL DATA (P-19)

Initial Displacement: 5.431 ft  
 Static Water Column Height: 18.24 ft  
 Total Well Penetration Depth: 12.54 ft  
 Screen Length: 4.8 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

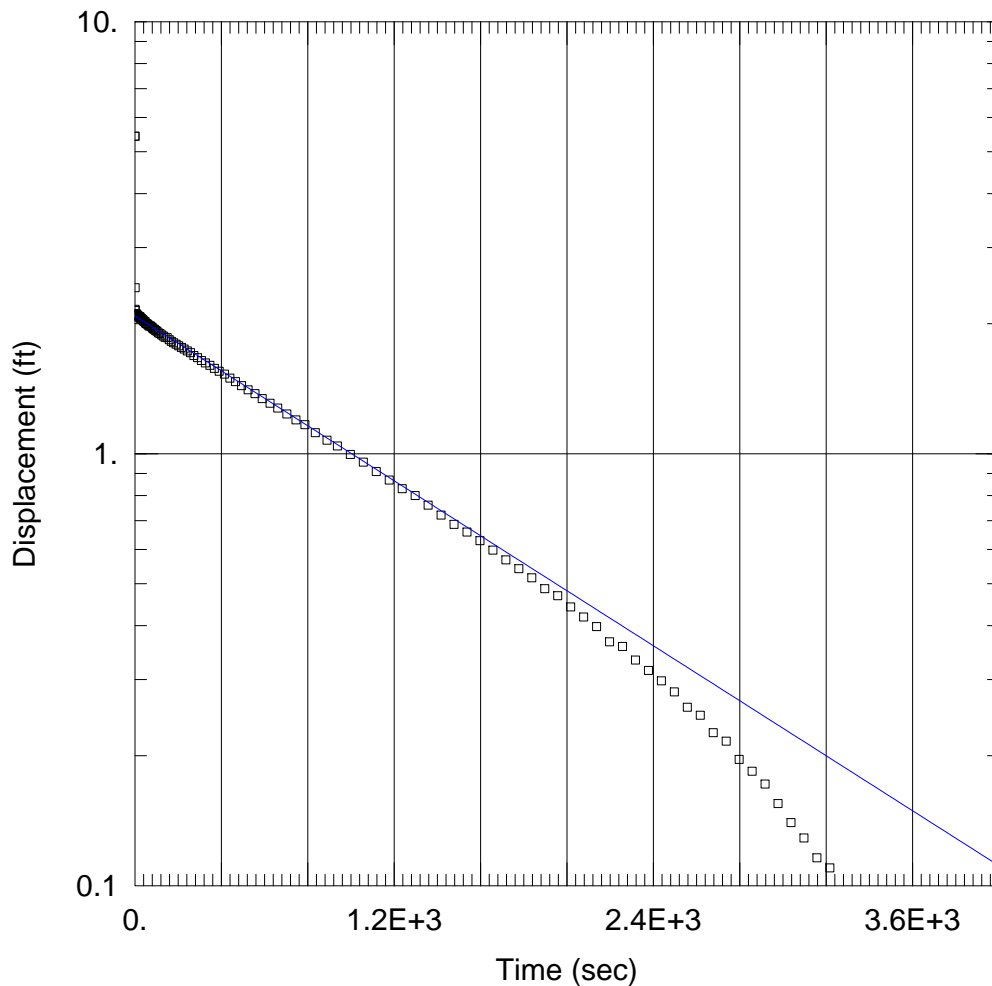
# P-19 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Hvorslev  
K = 0.4091 ft/day      y0 = 2.086 ft

## WELL DATA (P-19)

Initial Displacement: 5.431 ft  
Static Water Column Height: 18.24 ft  
Total Well Penetration Depth: 12.54 ft  
Screen Length: 4.8 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

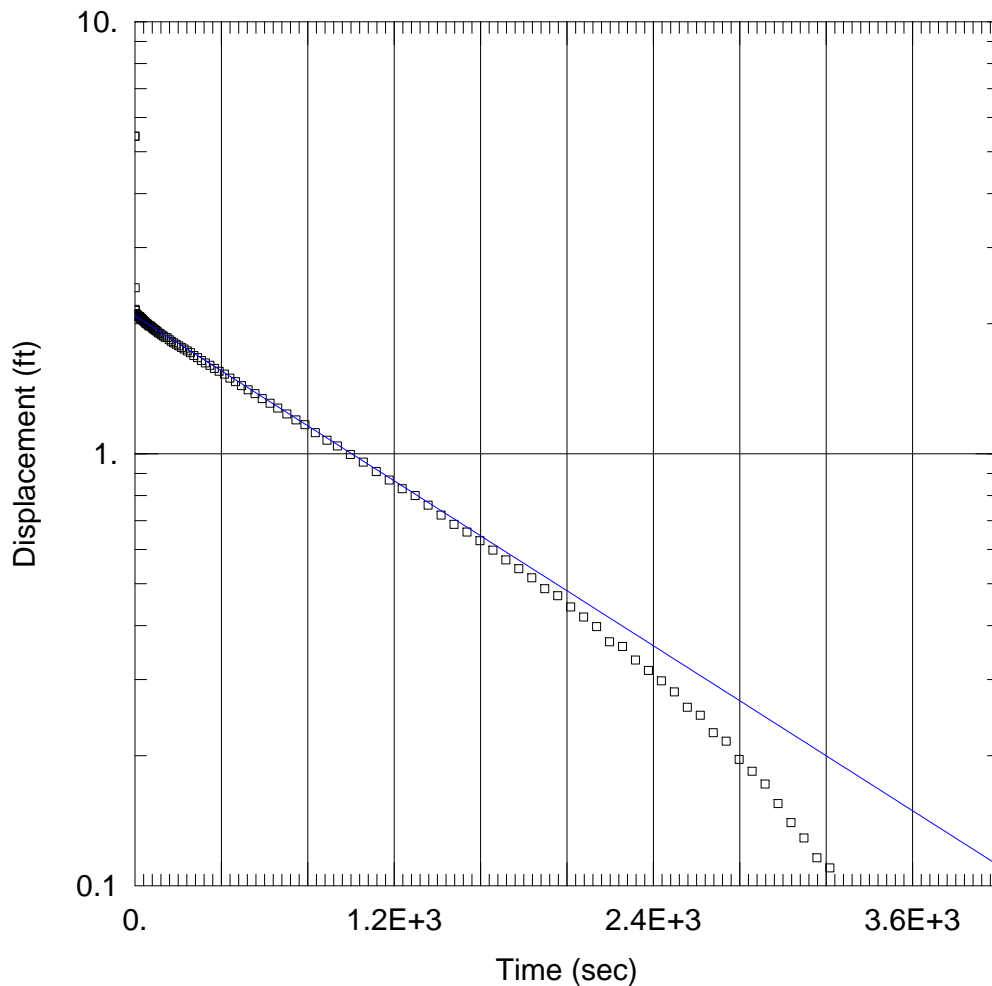
# P-19 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.4091 ft/day      y0 = 2.086 ft

## WELL DATA (P-19)

Initial Displacement: 5.431 ft  
Static Water Column Height: 18.24 ft  
Total Well Penetration Depth: 12.54 ft  
Screen Length: 4.8 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-19 RH\P-19 RH BR-Unc.aqt  
 Title: P-19 Rising Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:27:52

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/31/2012  
 Test Well: P-19

---

AQUIFER DATA

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

---

SLUG TEST WELL DATA

Test Well: P-19

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

Initial Displacement: 4.266 ft  
 Static Water Column Height: 18.24 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 4.8 ft  
 Total Well Penetration Depth: 12.54 ft

No. of Observations: 175

Observation Data			
Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	4.266	708.7	1.441
0.221	0.701	750.7	1.405
0.443	4.112	792.7	1.377
0.663	0.651	840.7	1.342
1.007	1.271	894.7	1.303
1.23	2.971	942.7	1.27
1.454	2.027	1002.7	1.231
1.675	2.106	1062.7	1.194
1.896	2.493	1122.7	1.156
2.3	2.36	1182.7	1.12
2.72	2.22	1242.7	1.091
3.201	2.186	1302.7	1.052
3.74	2.217	1362.7	1.024
4.22	2.198	1422.7	0.991
4.82	2.207	1482.7	0.963
5.421	2.2	1542.7	0.935
6.02	2.195	1602.7	0.907
6.68	2.19	1662.7	0.878
7.4	2.188	1722.7	0.853
8.18	2.183	1782.7	0.827
8.96	2.185	1842.7	0.805
9.8	2.179	1902.7	0.782
10.7	2.179	1962.7	0.76
11.66	2.175	2022.7	0.739
12.62	2.173	2082.7	0.714
13.7	2.169	2142.7	0.692
14.84	2.168	2202.7	0.676
16.04	2.166	2262.7	0.656
17.3	2.158	2322.7	0.641



<u>Time (sec)</u>	<u>Displacement (ft)</u>	<u>Time (sec)</u>	<u>Displacement (ft)</u>
18.62	2.157	2382.7	0.623
20.06	2.154	2442.7	0.604
21.56	2.147	2502.7	0.587
23.12	2.146	2562.7	0.572
24.8	2.143	2622.7	0.557
26.6	2.139	2682.7	0.542
28.46	2.139	2742.7	0.528
30.5	2.133	2802.7	0.513
32.6	2.131	2862.7	0.501
34.82	2.125	2922.7	0.487
37.22	2.121	2982.7	0.476
39.74	2.115	3042.7	0.465
42.38	2.118	3102.7	0.451
45.2	2.117	3162.7	0.44
48.2	2.106	3222.7	0.428
51.38	2.104	3282.7	0.42
54.74	2.096	3342.7	0.409
58.34	2.088	3402.7	0.406
61.94	2.087	3462.7	0.387
66.14	2.079	3522.7	0.377
70.34	2.075	3582.7	0.37
74.54	2.072	3642.7	0.363
79.34	2.062	3702.7	0.362
84.74	2.056	3762.7	0.346
89.54	2.047	3822.7	0.336
95.54	2.042	3882.7	0.329
101.5	2.034	3942.7	0.32
107.5	2.024	4002.7	0.316
114.1	2.021	4062.7	0.308
121.3	2.012	4122.7	0.304
129.1	1.999	4182.7	0.294
136.9	1.992	4242.7	0.289
145.3	1.984	4302.7	0.288
154.3	1.968	4362.7	0.281
163.9	1.961	4422.7	0.276
173.5	1.946	4482.7	0.269
184.3	1.93	4542.7	0.262
195.7	1.92	4602.7	0.256
207.7	1.909	4662.7	0.294
220.3	1.895	4722.7	0.249
233.5	1.876	4782.9	0.242
247.9	1.864	4842.8	0.241
262.9	1.851	4902.7	0.236
278.5	1.831	4962.7	0.232
295.3	1.813	5022.7	0.233
313.3	1.798	5082.7	0.226
331.9	1.776	5142.7	0.22
352.3	1.753	5202.7	0.219
373.3	1.731	5262.7	0.213
395.5	1.715	5322.7	0.211
419.5	1.689	5382.7	0.206
444.7	1.665	5442.7	0.203
471.1	1.646	5502.8	0.201
499.3	1.617	5562.7	0.196
529.3	1.588	5622.7	0.195
561.1	1.557	5682.7	0.194
594.7	1.533	5742.8	0.185
630.7	1.504	5802.7	0.184
666.7	1.473		

SOLUTION

Slug Test  
 Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 ln(Re/rw): 1.866

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	0.2334	ft/day
y0	2.065	ft

K = 8.235E-5 cm/sec

T = K\*b = 3.035 ft<sup>2</sup>/day (0.03263 sq. cm/sec)

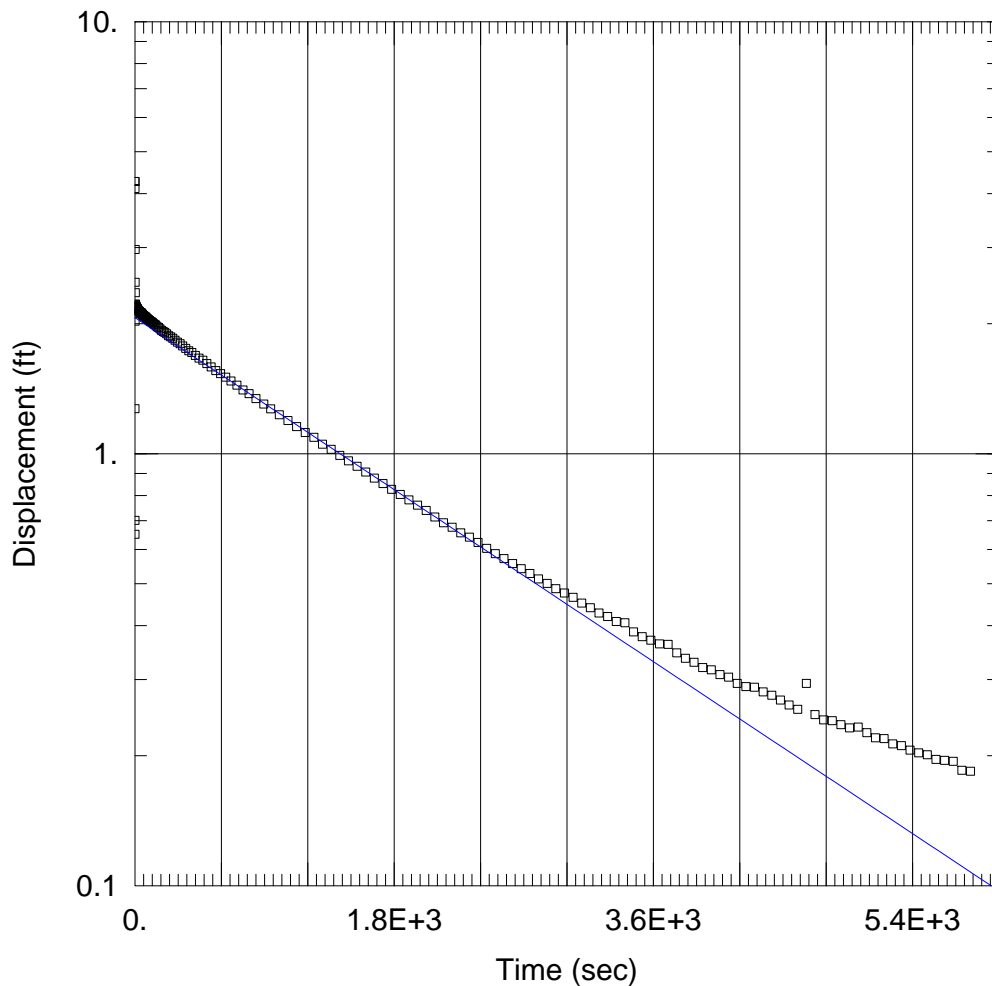
# P-19 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bower-Rice  
 K = 0.2334 ft/day      y0 = 2.065 ft

## WELL DATA (P-19)

Initial Displacement: 4.266 ft  
 Static Water Column Height: 18.24 ft  
 Total Well Penetration Depth: 12.54 ft  
 Screen Length: 4.8 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

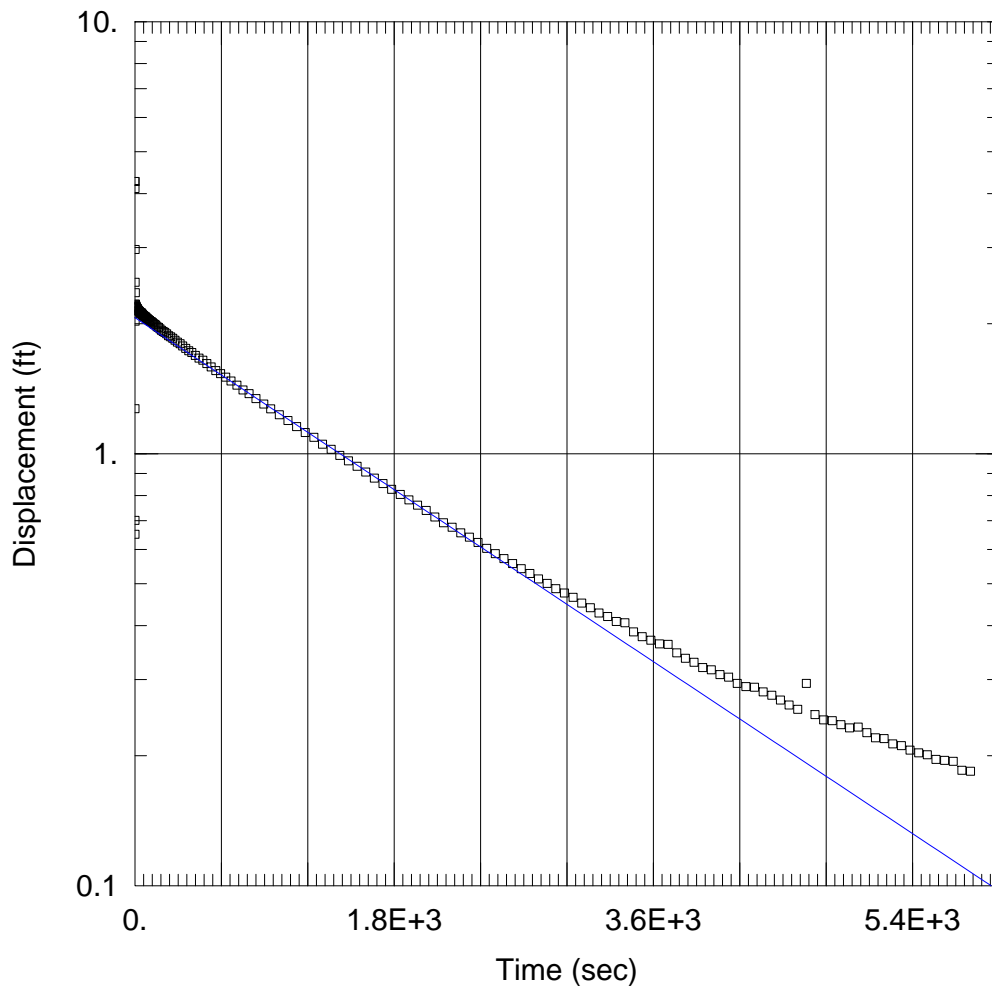
# P-19 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Bouwer-Rice  
K = 0.2334 ft/day      y0 = 2.065 ft

## WELL DATA (P-19)

Initial Displacement: 4.266 ft  
Static Water Column Height: 18.24 ft  
Total Well Penetration Depth: 12.54 ft  
Screen Length: 4.8 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

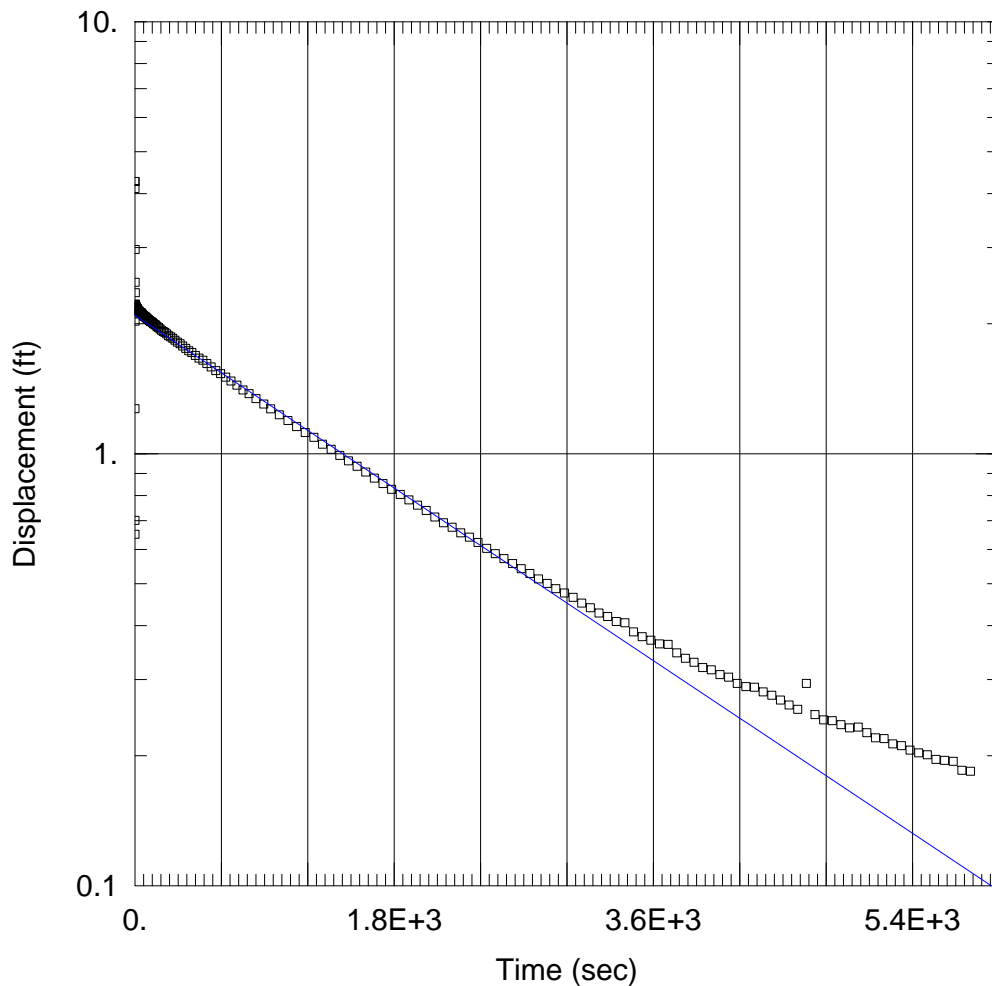
# P-19 Rising Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Hvorslev  
K = 0.2854 ft/day       $y_0 = \underline{2.091}$  ft

## WELL DATA (P-19)

Initial Displacement: 4.266 ft  
Static Water Column Height: 18.24 ft  
Total Well Penetration Depth: 12.54 ft  
Screen Length: 4.8 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

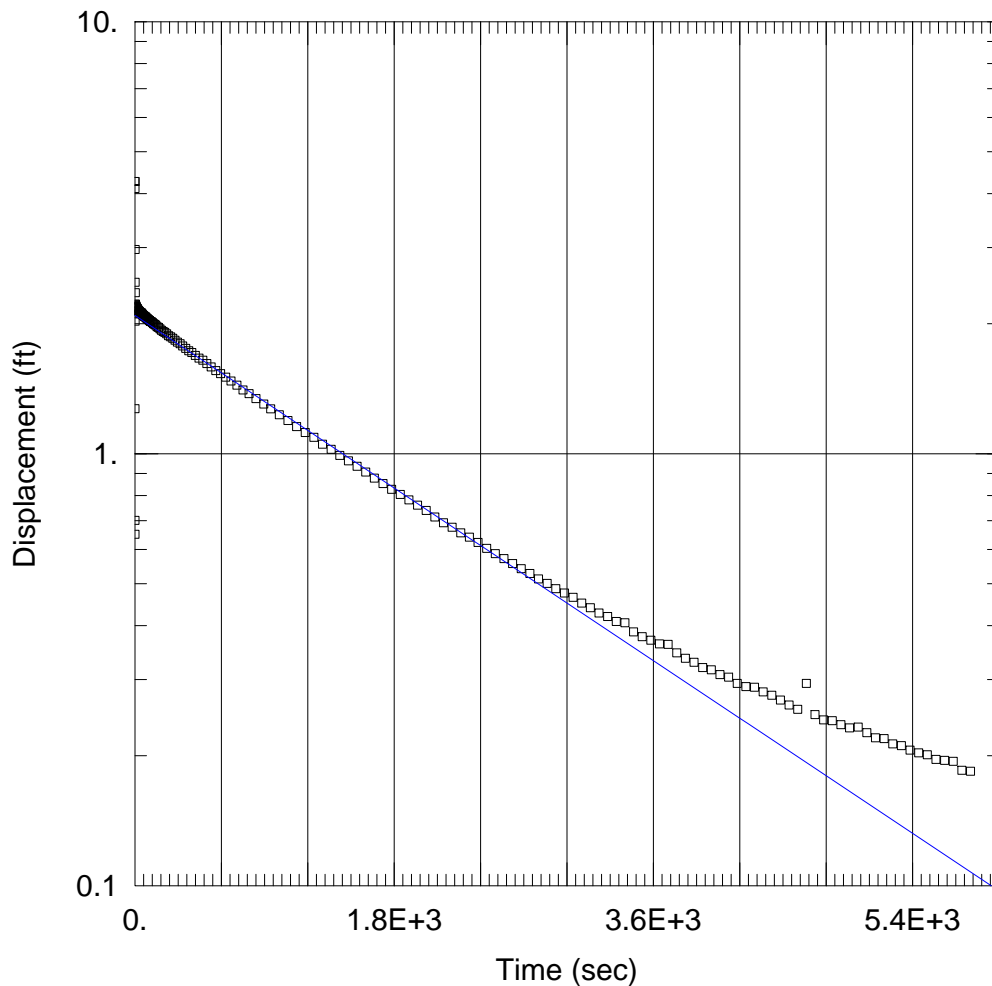
# P-19 Rising Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Hvorslev  
K = 0.2854 ft/day      y0 = 2.091 ft

## WELL DATA (P-19)

Initial Displacement: 4.266 ft  
Static Water Column Height: 18.24 ft  
Total Well Penetration Depth: 12.54 ft  
Screen Length: 4.8 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-20 FH\P-20 FH BR-c.aqt  
 Title: P-20 Falling Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:29:15

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: P-20

---

AQUIFER DATA

Saturated Thickness: 5.3 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: P-20

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

Initial Displacement: 3.871 ft  
 Static Water Column Height: 14.1 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 2.2 ft  
 Total Well Penetration Depth: 13.9 ft

No. of Observations: 57

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	3.871	8.846	0.11
0.221	2.261	9.446	0.09
0.442	2.217	10.05	0.076
0.662	2.242	10.71	0.063
0.884	1.89	11.43	0.055
1.104	0.424	12.21	0.046
1.324	0.462	12.99	0.042
1.543	0.521	13.83	0.033
1.763	0.825	14.73	0.034
2.016	0.784	15.69	0.028
2.266	0.72	16.65	0.028
2.516	0.672	17.73	0.021
2.766	0.625	18.87	0.024
3.016	0.573	20.07	0.018
3.37	0.533	21.33	0.015
3.618	0.498	22.65	0.016
3.838	0.47	24.09	0.014
4.057	0.441	25.59	0.01
4.276	0.421	27.15	0.008
4.516	0.387	28.83	0.007
4.766	0.362	30.63	0.006
5.126	0.32	32.48	0.011
5.486	0.293	34.53	0.006
5.906	0.26	36.63	0.005
6.326	0.229	38.85	0.001
6.745	0.2	41.24	0.
7.226	0.172	43.77	0.002
7.766	0.148	46.41	0.
8.245	0.132		

---

SOLUTION

Slug Test  
Aquifer Model: Confined  
Solution Method: Bouwer-Rice  
ln(Re/rw): 1.947

---

VISUAL ESTIMATION RESULTSEstimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	292.6	ft/day
y0	1.366	ft

$K = 0.1032$  cm/sec

$T = K*b = 1550.6$  ft<sup>2</sup>/day (16.67 sq. cm/sec)



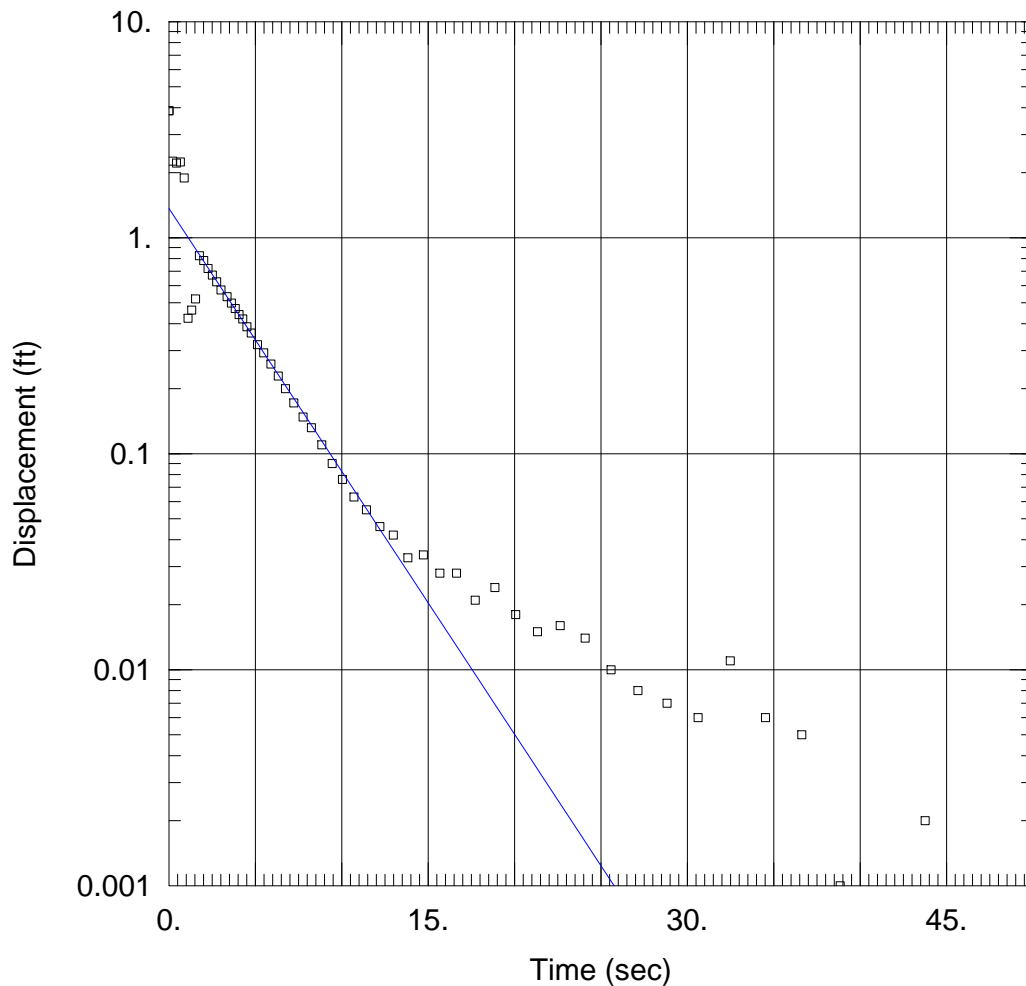
# P-20 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 K = 292.6 ft/day      y0 = 1.366 ft

## WELL DATA (P-20)

Initial Displacement: 3.871 ft  
 Static Water Column Height: 14.1 ft  
 Total Well Penetration Depth: 13.9 ft  
 Screen Length: 2.2 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

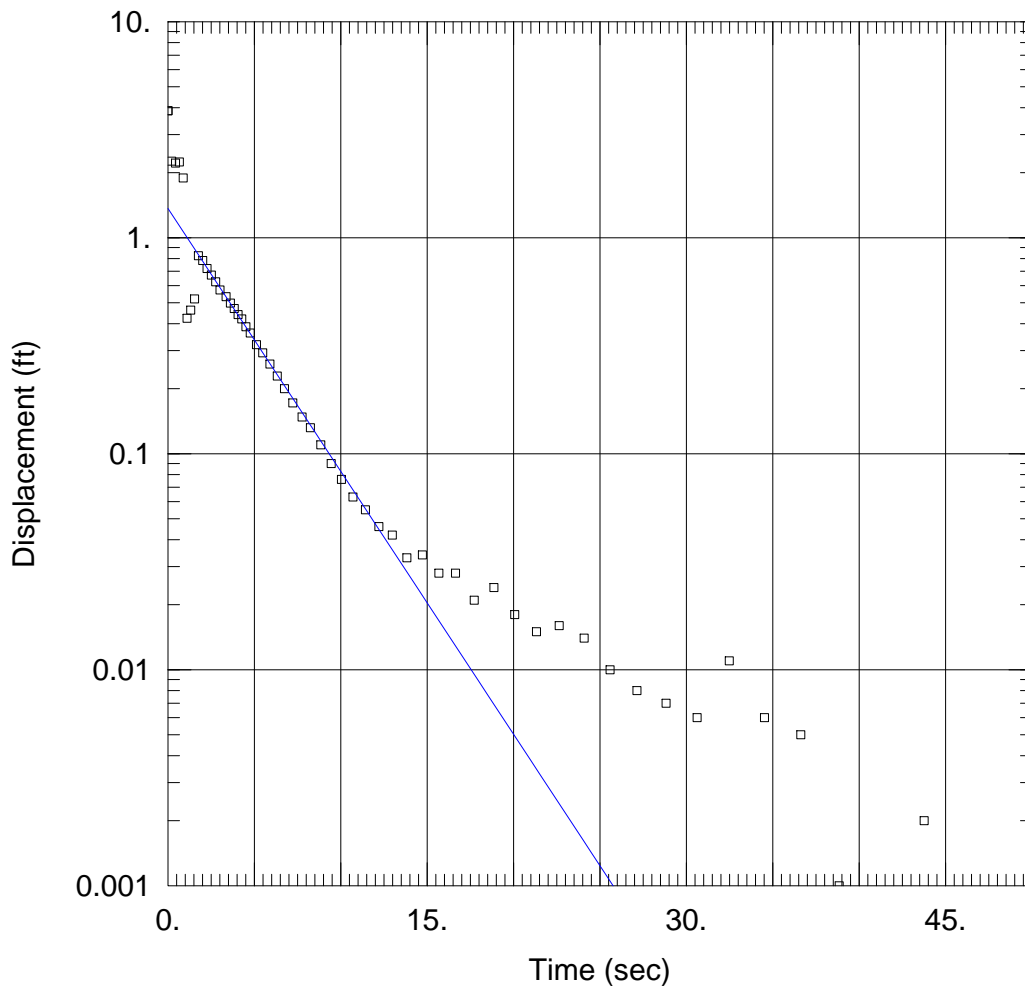
# P-20 Falling Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Bower-Rice  
 $K = 292.6$  ft/day       $y_0 = 1.366$  ft

## WELL DATA (P-20)

Initial Displacement: 3.871 ft  
 Static Water Column Height: 14.1 ft  
 Total Well Penetration Depth: 13.9 ft  
 Screen Length: 2.2 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

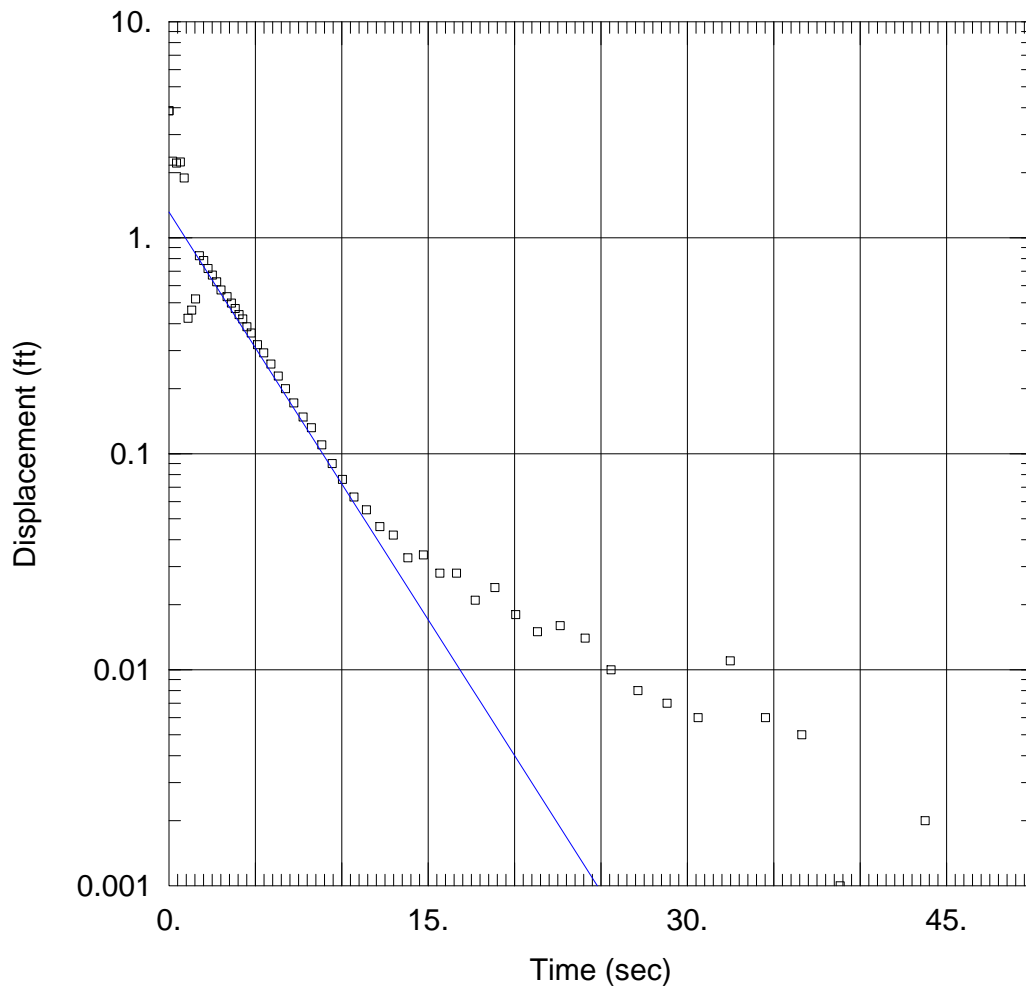
# P-20 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Hvorslev  
 $K = 339.7$  ft/day       $y_0 = 1.315$  ft

## WELL DATA (P-20)

Initial Displacement: 3.871 ft  
 Static Water Column Height: 14.1 ft  
 Total Well Penetration Depth: 13.9 ft  
 Screen Length: 2.2 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

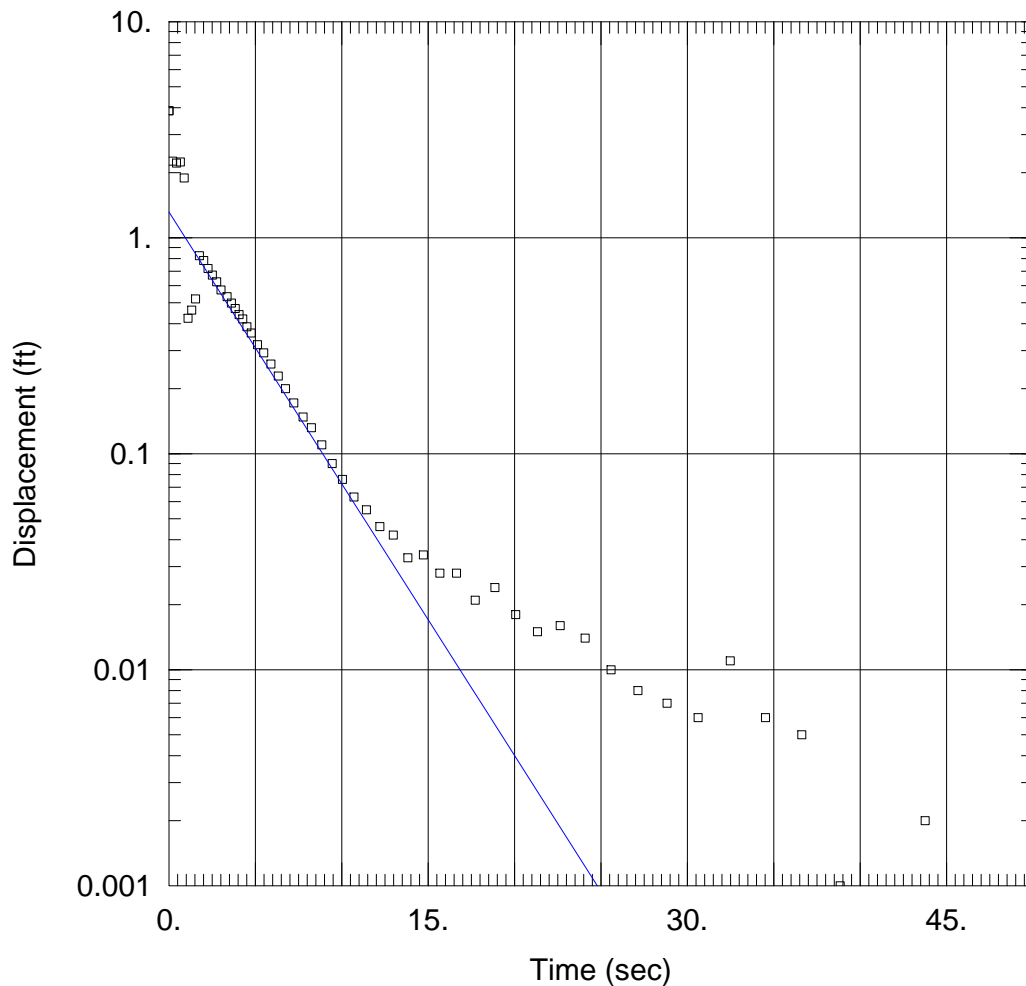
# P-20 Falling Head\_Hvorslev

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
 Solution Method: Hvorslev  
 K = 339.7 ft/day       $y_0 =$ 1.315 ft

## WELL DATA (P-20)

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 Total Well Penetration Depth: 13.9 ft  
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 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

Data Set: M:\Tuppan Consultants\B.A12414.00 - Cowlitz County Landfill\Slug Tests\P-20 RH\P-20 FH BR-Unc.aqt  
 Title: P-20 Rising Head\_Bower-Rice  
 Date: 12/11/12  
 Time: 18:47:15

---

PROJECT INFORMATION

Company: JBR Env. Consultants  
 Client: Tuppan Consultants  
 Project: B.A12414.00  
 Location: Cowlitz County, WA  
 Test Date: 10/30/2012  
 Test Well: P-20

---

AQUIFER DATA

Saturated Thickness: 3.4 ft  
 Anisotropy Ratio (Kz/Kr): 1.

---

SLUG TEST WELL DATA

Test Well: P-20

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

Initial Displacement: 2.778 ft  
 Static Water Column Height: 14.1 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft  
 Well Skin Radius: 0.5 ft  
 Screen Length: 2.2 ft  
 Total Well Penetration Depth: 13.9 ft

No. of Observations: 54

Time (sec)	Observation Data		Displacement (ft)
	Displacement (ft)	Time (sec)	
0.	2.778	9.959	0.202
0.221	1.739	10.74	0.165
0.441	2.173	11.52	0.134
0.66	1.894	12.36	0.113
0.881	2.105	13.26	0.094
1.102	1.707	14.22	0.079
1.322	1.603	15.18	0.073
1.549	1.511	16.26	0.058
1.799	1.426	17.4	0.051
2.049	1.348	18.6	0.047
2.295	1.278	19.86	0.043
2.549	1.199	21.18	0.036
2.799	1.137	22.62	0.038
3.049	1.073	24.12	0.035
3.299	1.017	25.68	0.033
3.659	0.939	27.36	0.02
4.019	0.858	29.16	0.031
4.439	0.776	31.02	0.029
4.859	0.71	33.06	0.029
5.279	0.639	35.16	0.024
5.759	0.571	37.38	0.024
6.299	0.504	39.78	0.023
6.779	0.445	42.3	0.024
7.379	0.381	44.94	0.023
7.979	0.328	47.93	0.013
8.579	0.28	50.76	0.017
9.239	0.237	53.94	0.019

---

SOLUTION

Slug Test  
Aquifer Model: Unconfined  
Solution Method: Bouwer-Rice  
ln(Re/rw): 1.947

---

### VISUAL ESTIMATION RESULTS

#### Estimated Parameters

<u>Parameter</u>	<u>Estimate</u>	
K	266.4	ft/day
y0	2.227	ft

K = 0.09397 cm/sec

T = K\*b = 905.7 ft<sup>2</sup>/day (9.738 sq. cm/sec)

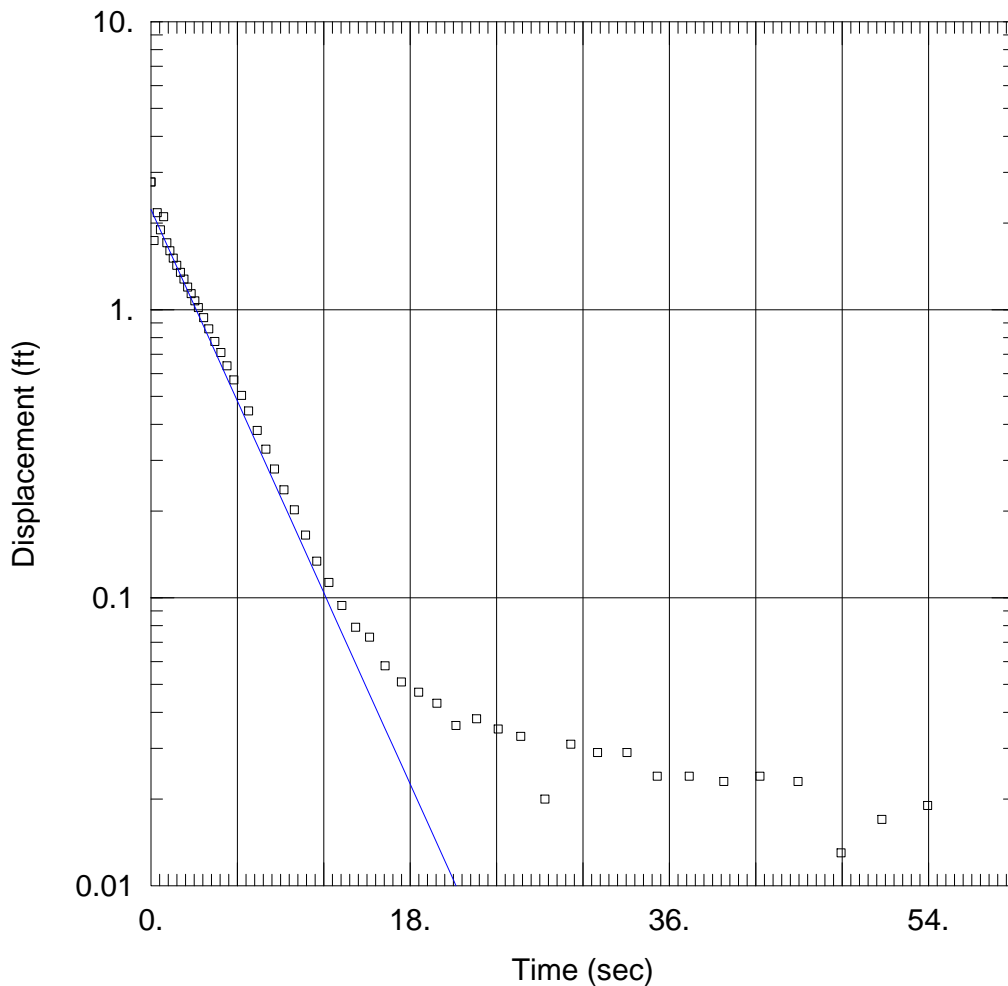
# P-20 Rising Head\_Bower-Rice

Prepared By:  
**JBR Env. Consultants**

Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
 Solution Method: Bouwer-Rice  
 K = 266.4 ft/day      y0 = 2.227 ft

## WELL DATA (P-20)

Initial Displacement: 2.778 ft  
 Static Water Column Height: 14.1 ft  
 Total Well Penetration Depth: 13.9 ft  
 Screen Length: 2.2 ft  
 Casing Radius: 0.17 ft  
 Well Radius: 0.5 ft

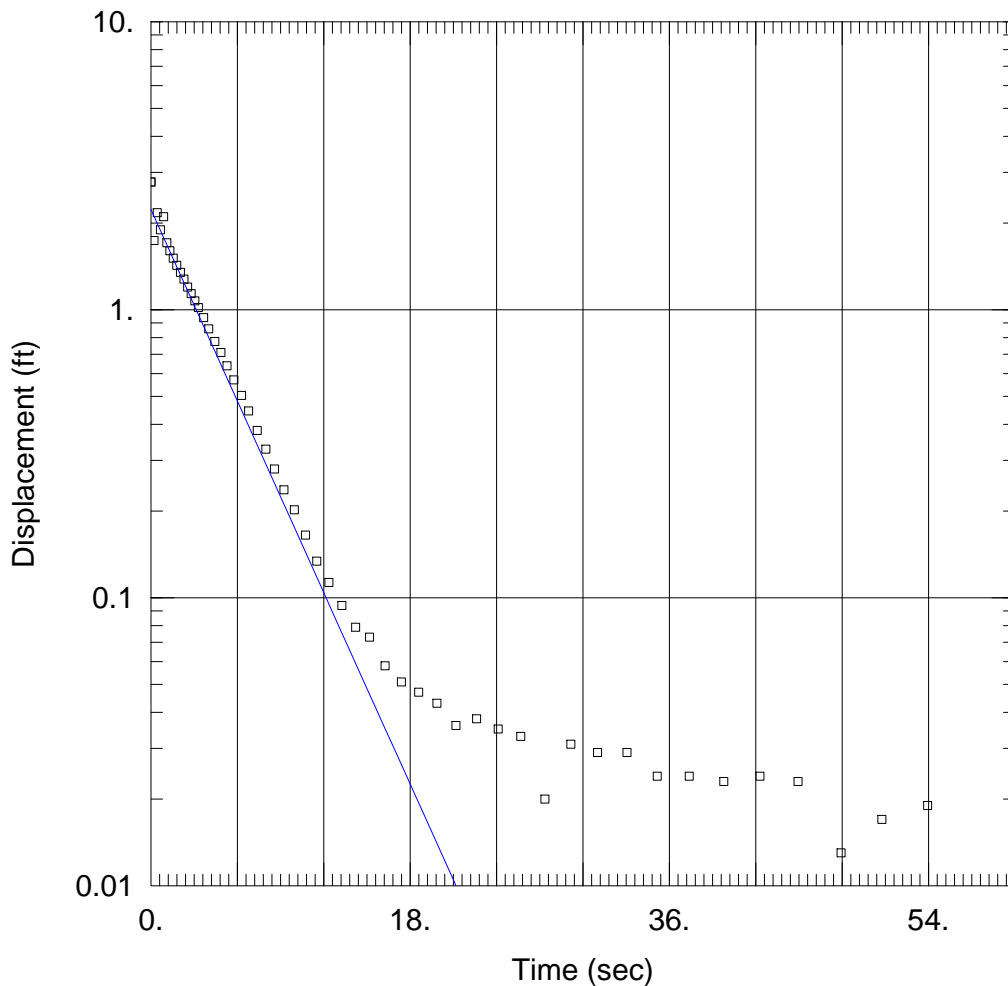
# P-20 Rising Head\_Bower-Rice

Prepared By:  
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Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined  
Solution Method: Bower-Rice  
K = 266.4 ft/day       $y_0 =$  2.227 ft

## WELL DATA (P-20)

Initial Displacement: 2.778 ft  
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Total Well Penetration Depth: 13.9 ft  
Screen Length: 2.2 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft



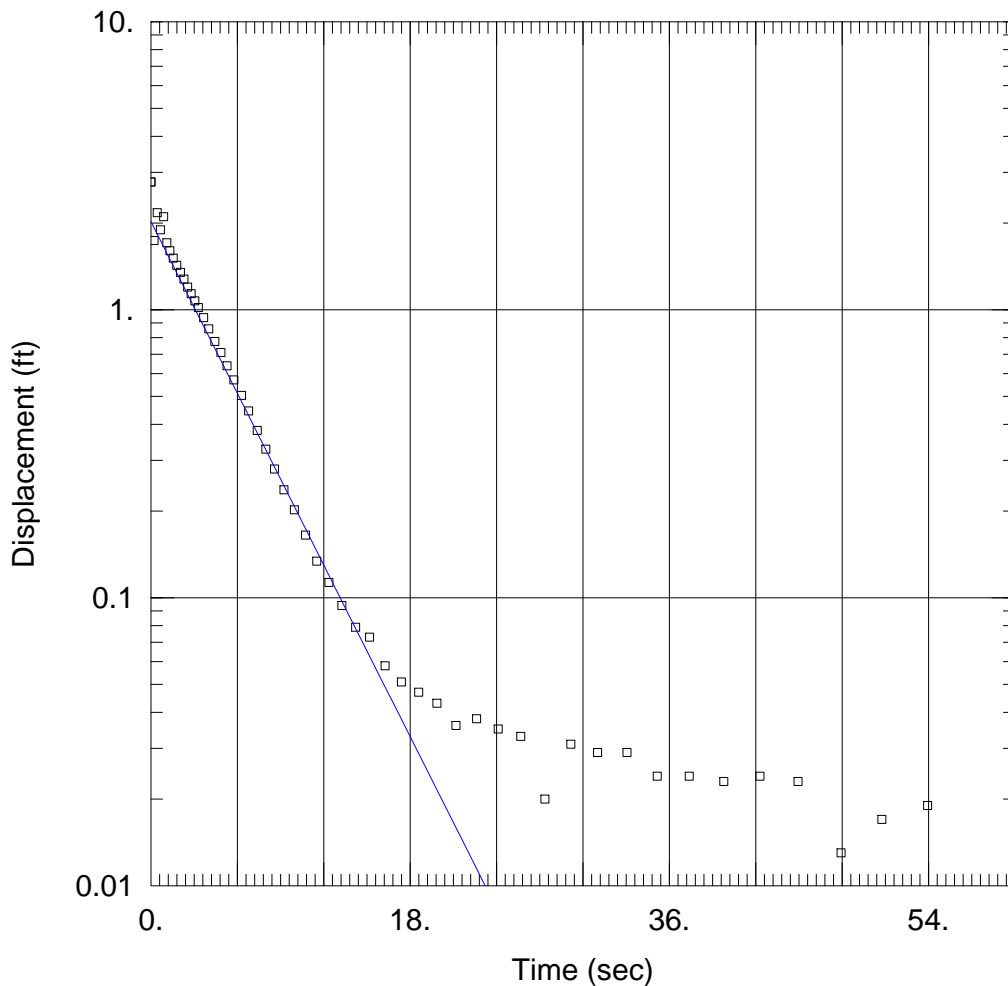
# P-20 Rising Head\_Hvorslev

Prepared By:  
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Prepared For:  
**Tuppan Consultants**

Project:  
**B.A12414.00**

Location:  
**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Unconfined  
Solution Method: Hvorslev  
K = 268.2 ft/day       $y_0 = \underline{2.022}$  ft

## WELL DATA (P-20)

Initial Displacement: 2.778 ft  
Static Water Column Height: 14.1 ft  
Total Well Penetration Depth: 13.9 ft  
Screen Length: 2.2 ft  
Casing Radius: 0.17 ft  
Well Radius: 0.5 ft

# P-20 Rising Head\_Hvorslev

Prepared By:

**JBR Env. Consultants**

Prepared For:

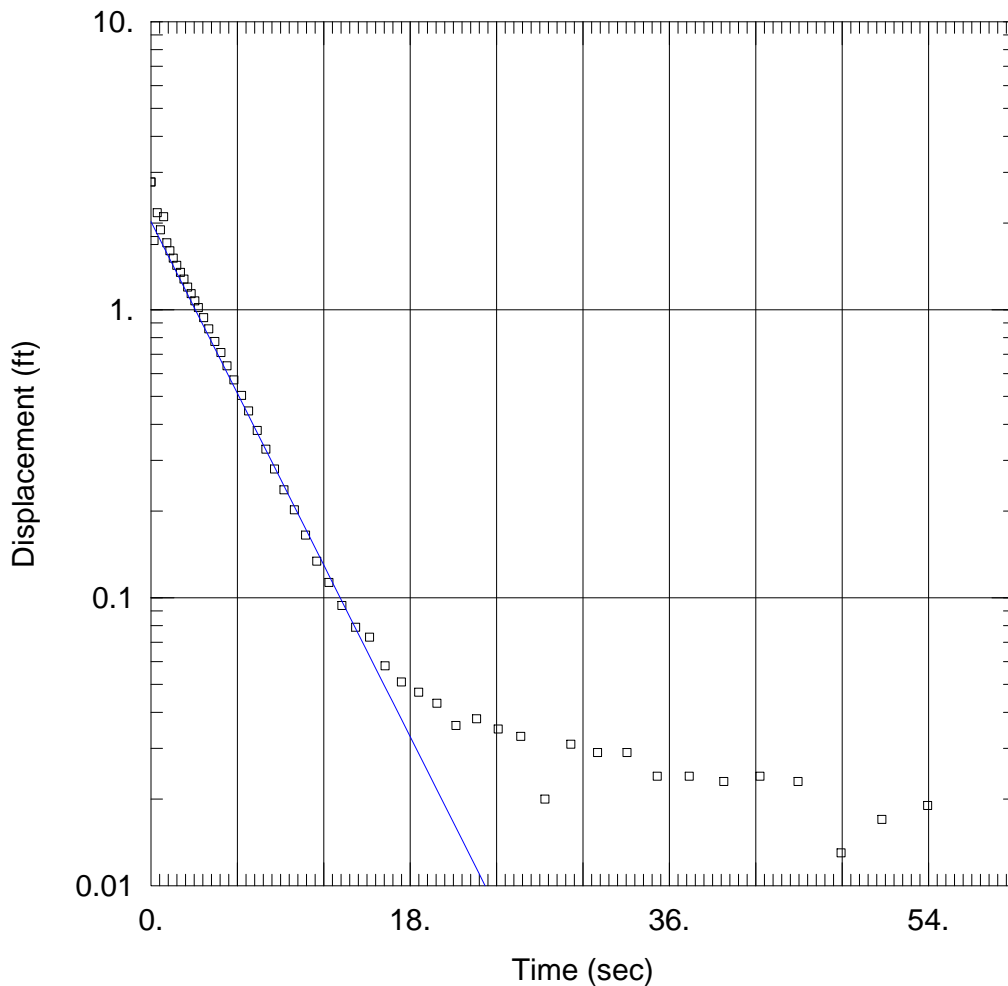
**Tuppan Consultants**

Project:

**B.A12414.00**

Location:

**Cowlitz County, WA**



## SOLUTION

Aquifer Model: Confined

Solution Method: Hvorslev

K = 268.2 ft/day       $y_0 =$ 2.022 ft

## WELL DATA (P-20)

Initial Displacement: 2.778 ft

Static Water Column Height: 14.1 ft

Total Well Penetration Depth: 13.9 ft

Screen Length: 2.2 ft

Casing Radius: 0.17 ft

Well Radius: 0.5 ft

**ATTACHMENT B**  
**PHOTOGRAPHS**

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