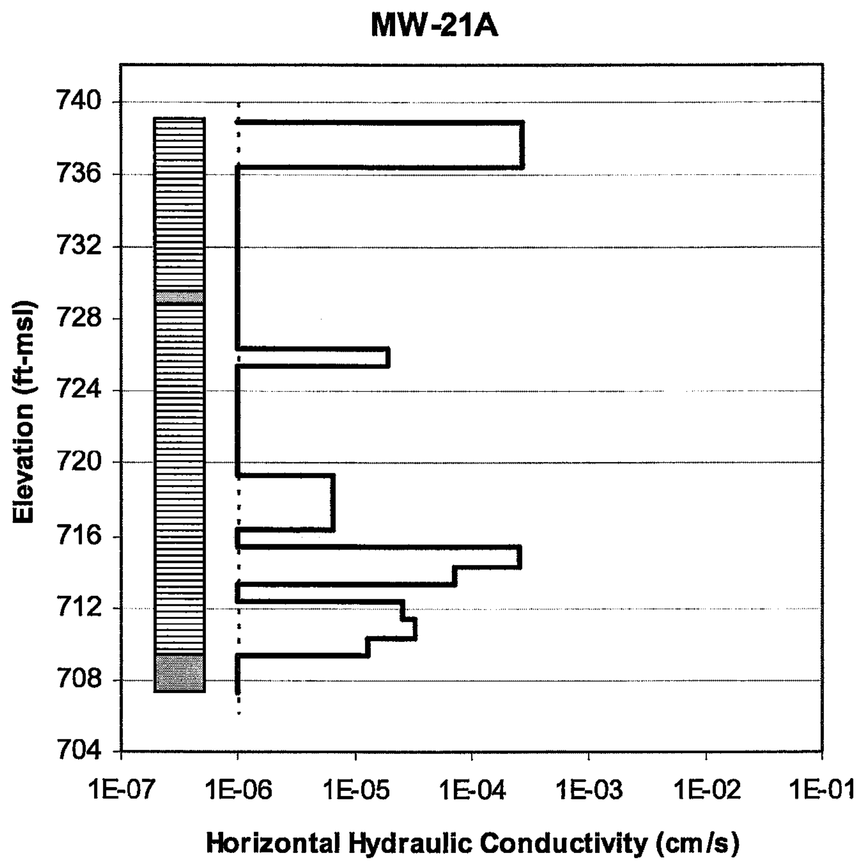
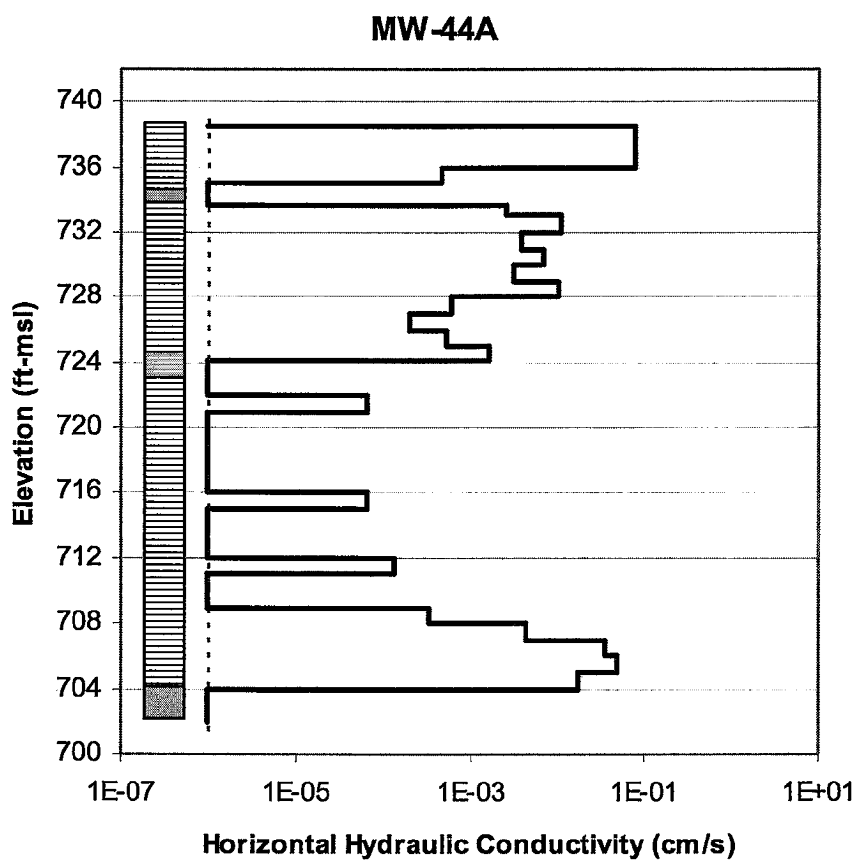
KIF Peninsula - Aquifer Testing Summary

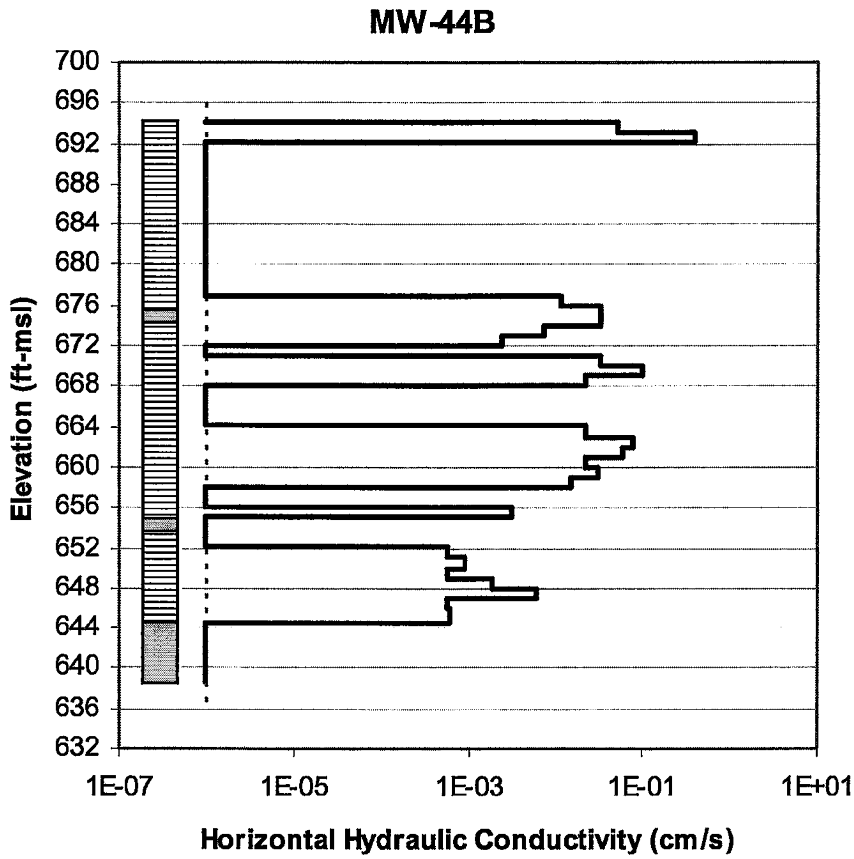
Well	test type	Q (gpm)	emfm	TOC (ft-msl)	TOG Ele (ft-msl)	initial GW Depth (ft)	initial GW Ele (ft-msl)	Analytical Results K (ft/s)	Analytical Results K (cm/s)*
MW-10A	*slug*	6 gallons		771.87	768.2	29.68	742.19	1.93E-06	**5.88E-05**
MW-10B	*slug*	3 gallons		771.61	768.2	30.35	741.26	2.34E-06	**7.13E-05**
MW-21A	*slug*	6 gallons		762.34	757.7	21.33	741.01	1.25E-06	**3.81E-05**
MW-21A	*pump*	0.18	X	762.34	757.7	21.43	740.91	1.86E-05	5.67E-04
MW-44A	*pump*	6.40 & 4.88	X	745.00	742.4	4.00 & 3.88	741.00 & 741.12	3.17E-04	**9.66E-03**
MW-44B	*pump*	18.6 & 4.90	X	744.04	742.7	3.05 & 2.85	740.99 & 741.19	6.03E-04	**1.84E-02**
MW-47A	*slug*	6 gallons		766.38	762.9	25.13	741.25	2.71E-05	8.26E-04
MW-47A	*pump*	4.17		766.38	762.9	25.55	740.83	1.25E-04	**3.81E-03**
MW-47A	*injection*	1.54		766.38	762.9	25.13	741.25	1.35E-03	4.11E-02
MW-63A	*slug*	3.5 gallons		781.96	780.2	18.58	763.38	2.64E-07	**8.05E-06**
MW-63B	*slug*	3 gallons		784.94	780.9	27.66	757.28	3.46E-07	1.05E-05
MW-63B	*injection*	0.20	X	784.94	780.9	24.99	759.95	2.10E-07	**6.40E-06**
MW-66A	*slug*	6 gallons		756.39	752.9	14.97	741.42	1.46E-05	4.45E-04
MW-66A	*pump*	0.35	X	756.39	752.9	14.81	741.58	2.13E-04	6.49E-03
MW-66A	*pump*	3.26		756.39	752.9	15.41	740.98	1.78E-05	**5.43E-04**
MW-66A	*injection*	0.76	X	756.39	752.9	14.99	741.40	8.14E-05	2.48E-03
MW-74A	*slug*	6 gallons		756.01	752.0	14.58	741.43	1.68E-06	5.12E-05
MW-74A	*pump*	0.28	X	756.01	752.0	14.42	741.59	1.02E-05	3.11E-04
MW-74A	*pump*	1.05		756.01	752.0	15.00	741.01	7.65E-06	**2.33E-04**
MW-77A	*slug*	3.5 gallons		754.37	749.9	13.08	741.29	1.14E-05	3.47E-04
MW-77A	*pump*	3.00	X	754.37	749.9	13.36	741.01	2.89E-05	8.81E-04
MW-77A	*pump*	2.50		754.37	749.9	9.98	744.39	3.89E-05	**1.19E-03**
MW-81A	*slug*	6 gallons		765.25	763.4	23.95	741.30	6.00E-06	**1.83E-04**
MW-81A	*injection*	0.65	X	765.25	763.4	23.84	741.41	2.00E-04	6.10E-03
MW-81B	*slug*	6 gallons		764.27	762.9	22.84	741.43	1.03E-04	**3.14E-03**

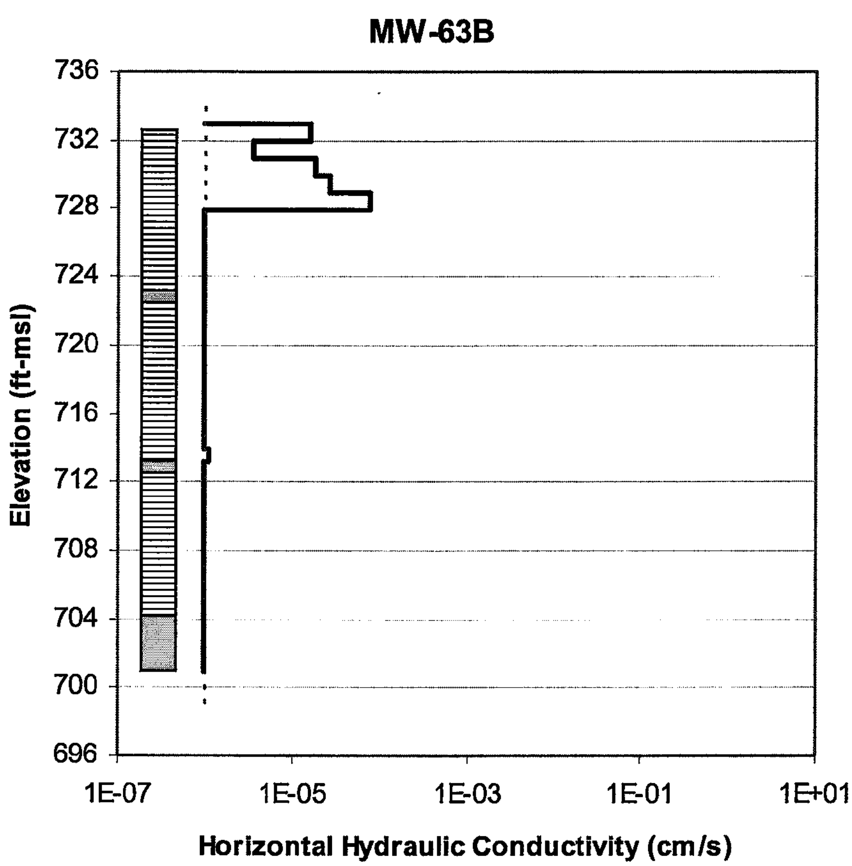
** Bold values considered most representative*

Soil wells are A wells, bedrock wells are B wells

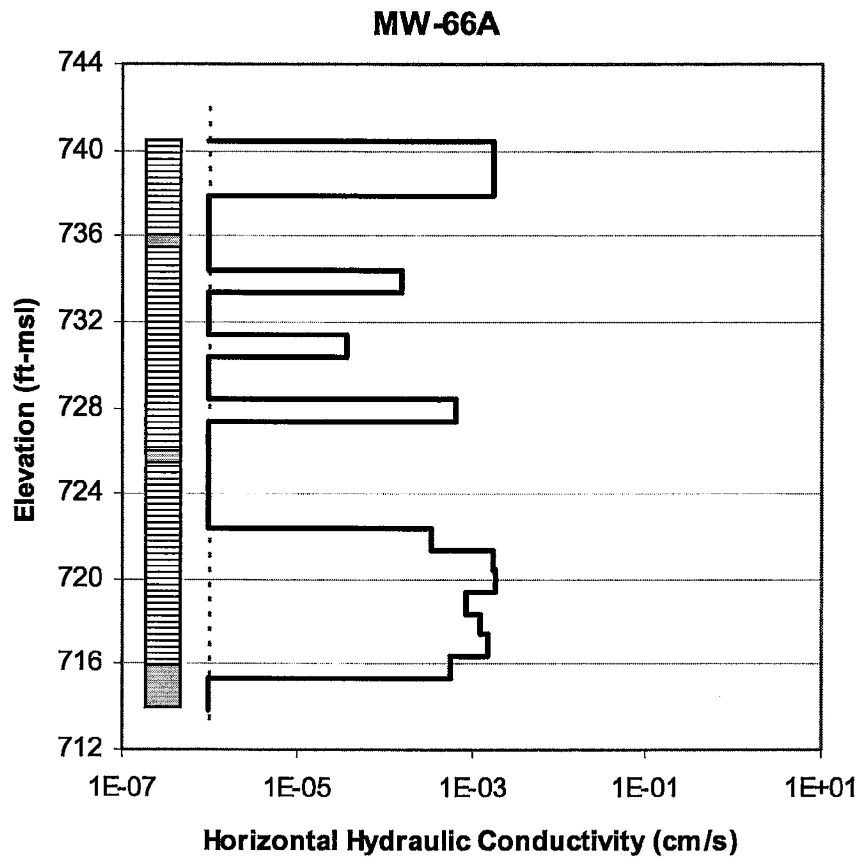

MW-21A
740
736
732
728
724
720
716
712
708
704
Elevation (ft-msl)
1E-07
1E-06
1E-05
1E-04
1E-03
1E-02
1E-01
Horizontal Hydraulic Conductivity (cm/s)


MW-44A
740
736
732
728
724
720
716
712
708
704
700
Elevation (ft-msl)
1E-07
1E-05
1E-03
1E-01
1E+01
Horizontal Hydraulic Conductivity (cm/s)

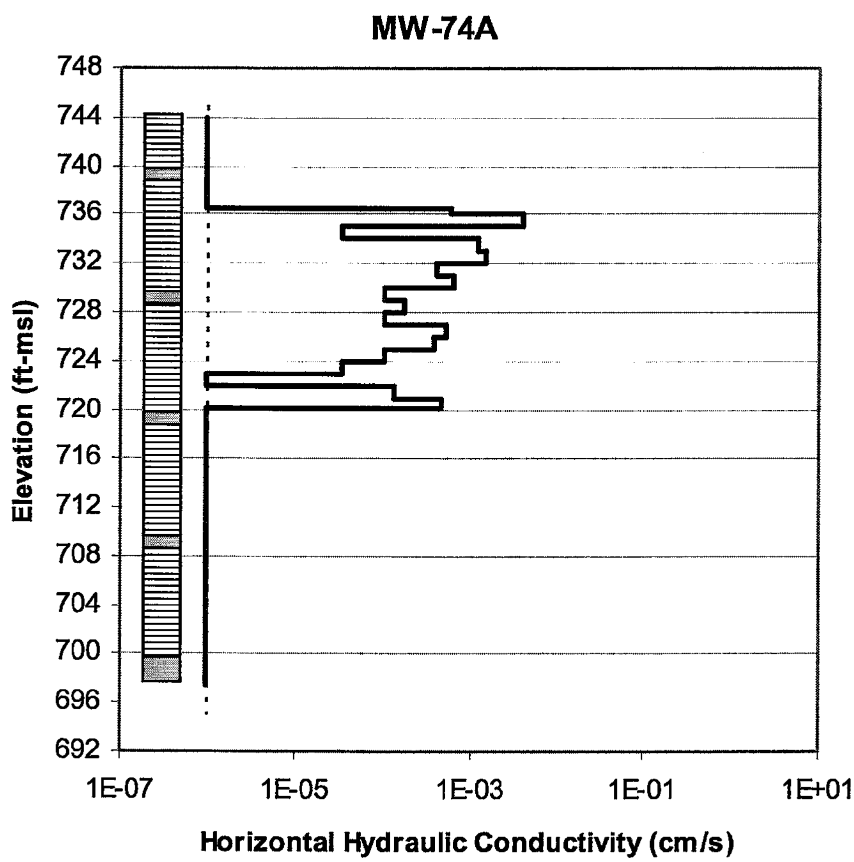

MW-44B
700
696
692
688
684
680
676
672
668
664
660
656
652
648
644
640
636
632
Elevation (ft-msl)
1E-07
1E-05
1E-03
1E-01
1E+01
Horizontal Hydraulic Conductivity (cm/s)

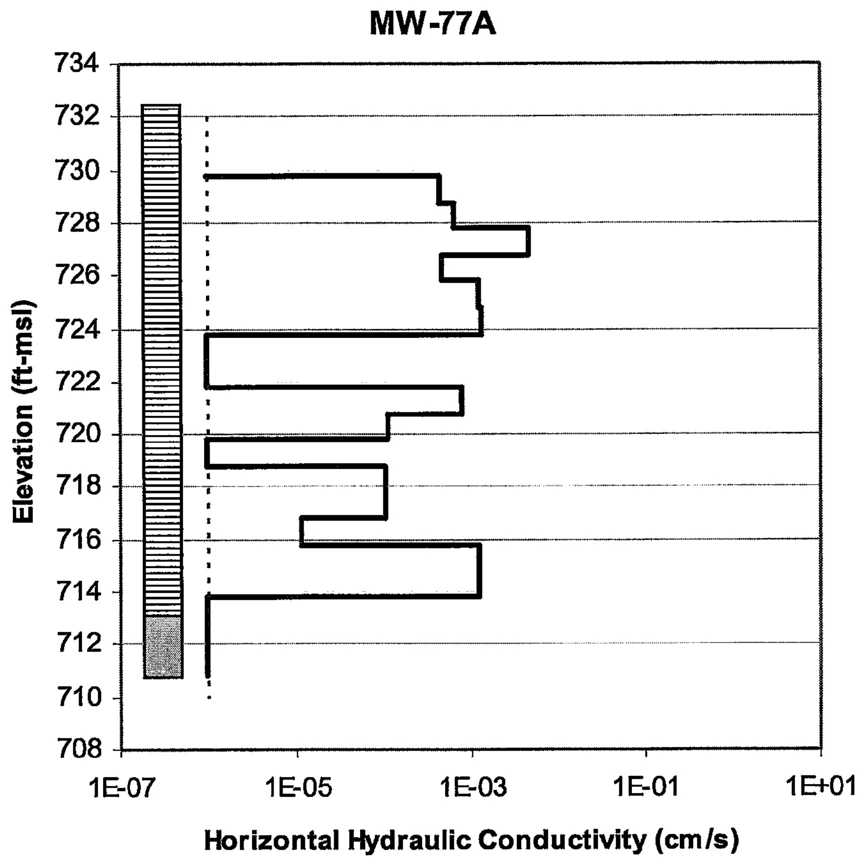

MW-63B
736
732
728
724
720
716
712
708
704
700
696
Elevation (ft-msl)
1E-07
1E-05
1E-03
1E-01
1E+01
Horizontal Hydraulic Conductivity (cm/s)

MW-66A


MW-66A
744
740
736
732
728
724
720
716
712
Elevation (ft-msl)
1E-07
1E-05
1E-03
1E-01
1E+01
Horizontal Hydraulic Conductivity (cm/s)

MW-74A


MW-74A
748
744
740
736
732
728
724
720
716
712
708
704
700
696
692
Elevation (ft-msl)
1E-07
1E-05
1E-03
1E-01
1E+01
Horizontal Hydraulic Conductivity (cm/s)



The aquifer test results above are considered final values for the KIF Peninsula. I conducted four additional pumping tests on Friday at 47A, 66A, 74A, and 77A. The most representative test results are longest tests, with highest drawdowns, and typically higher discharge rates. Likewise, pumping test results are typically preferred over injection tests. Values are higher than anticipated for many of the tests. Slug test analyses included Bouwer and Rice (1976) and Hvorslev (1951) methods. There were little differences between results of these two slug test analytical methods so Bouwer and Rice (1976) are reported in the table above. Pumping and injection test analyses included the Cooper-Jacob (1946) Time-Drawdown Method and the Theis (1935) Forward Solution. Similar results were obtained using the two analytical methods - the Cooper-Jacob (1946) Time-Drawdown Method is reported in the table above.

Bulk K values from single-well testing at soil wells were higher than anticipated at most locations. Results at soil wells range from 10^{-3} to 10^{-6} cm/s (average = 1.8E-3) – these values would suggest silty sand to loess. Results are likely to be affected skin effects to some degree – the wells were not adequately developed by MACTEC. Bulk K values for bedrock wells are simply estimates since apertures and dimensions of solutioned fractures are unknown – this was based on a porous media analyses rather than fractured bedrock.

For EMFM testing, smaller Q rates were sometimes necessary due to length of EMFM surveys and limitations of the pumping and metering equipment. Note that the lower threshold of the flowmeter is 10^{-6} cm/s as indicated on individual plots. We have yet to receive final well logs from MACTEC, hence, screen intervals are proximal. Incremental K_h values for bedrock wells are simply estimates since apertures and dimensions of solutioned fractures are unknown – this was based on a porous media analyses rather than fractured bedrock. We will probably present the final bedrock EMFM logs as normalized relative to total flow rather than discrete K values in the TDEC application.

References:

Bouwer, H. and R.C. Rice, 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

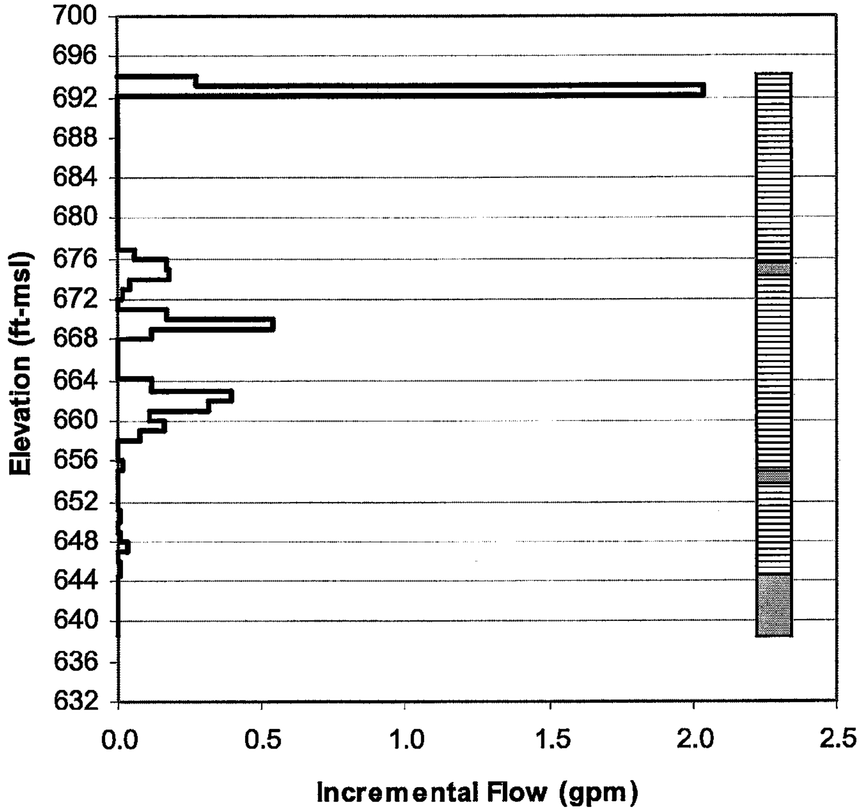
Bouwer, H. 1989. The Bouwer and Rice Slug Test - An Update, Ground Water, vol.27, No. 3, pp. 304-309.

Cooper, H.H. and C.E. Jacob, 1946. A generalized graphical method for evaluating formation constants and summarizing well field history, Am. Geophys. Union Trans., vol. 27, pp. 526-534.

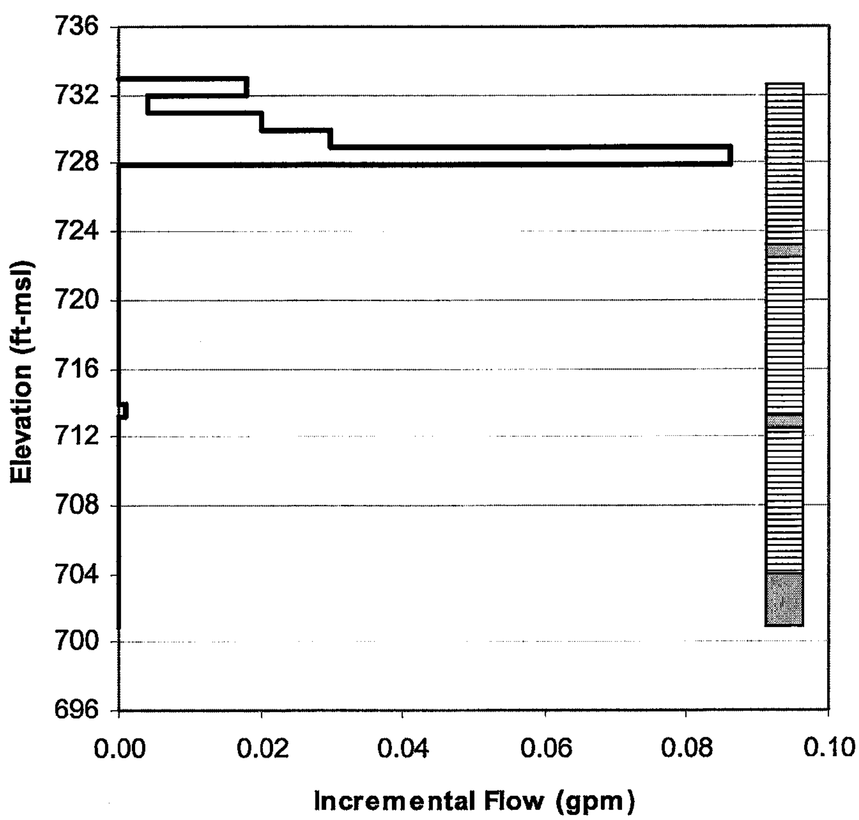
Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Ground-Water Observations, bul. no. 26, Waterways Experiment Station, Corps of Engineers, U.S. Army, Vicksburg, Mississippi.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

MW-44B


700
696
692
688
684
680
676
672
668
664
660
656
652
648
644
640
636
632
Elevation (ft-msl)
0.0
0.5
1.0
1.5
2.0
2.5
Incremental Flow (gpm)

MW-63B


736
732
728
724
720
716
712
708
704
700
696
Elevation (ft-msl)
0.00
0.02
0.04
0.06
0.08
0.10
Incremental Flow (gpm)