

September 6, 2013

Mr. Ken Kalman
Project Manager
US Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Mr. David Cates
Project Manager
Oklahoma Department of Environmental Quality
707 North Robinson
Oklahoma City, OK 73101

Re: Cimarron Environmental Response Trust
Addendum to Hydrogeologic Pilot Test Report and Pneumatic Slug Test Memo

Dear Recipient:

Environmental Properties Management, LLC (EPM) received comments via email from DEQ and NRC in June 2013 associated with the technical reviews of the February 2013 Hydrogeologic Pilot Test Report and March 2013 Pneumatic Slug Test Memo. These comments were discussed in depth at a July 12, 2013 teleconference with DEQ, NRC, and Burns & McDonnell. The purpose of this letter is to respond to the comments and is submitted as an addendum to the February 2013 Hydrogeologic Test Report and March 2013 Pneumatic Slug Test Memo.

Pneumatic Slug Test Memo

Comment: *In the Results section Second paragraph: It is mentioned that 10 wells displayed oscillatory response curves and the other four wells (T54, T59, T62, & T89) displayed response curves similar to exponential decay. This seems to contradict observations of the AQTESOLV data and solution graphs in Attachment 4. The Springer-Gelhar (1991) solution for an unconfined aquifer was used to obtain the K values for the wells based on the presence of oscillations. However, the solution seems to fit the observed data better for the 10 non-oscillating wells. Further, the wells showing oscillating water levels (T54, T59, T62, & T89) also correspond to the wells with low K values. Could this be a natural phenomenon or simply erroneous data?*

Response: Upon further review of the AQTESOLV solutions it is clear that well T-62 displayed an oscillatory response curve. However, EPM does not concur with DEQ's assertion that wells T-54, T-59 and T-89 display oscillatory response curves and that the remaining wells display non-oscillatory response curves. Although there were data fluctuations near the static water level in the non-oscillatory response curves, these fluctuations occur after the aquifer has responded to the slug and are of a scale that are believed to be representative of natural fluctuation in the water table. The wells that displayed oscillatory response curves were found to have high K values,

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which is to be expected as oscillatory response is common in highly transmissive aquifers; caused in part by the inertial effects of their associated rapid response to a slug.

Though no solutions were altered during the review, the determination that well T-62 displayed an oscillatory response deemed the use of the Hvorslev (1951) solution as a secondary solution is inappropriate and the Hvorslev (1951) solution was chosen as the primary solution for T-59. As a result, Table 2 from the Pneumatic Slug Test Memo has been revised and is presented in Attachment 1.

Hydrogeologic Pilot Test Report (DEQ Comments)

DEQ Comment: *Section on Decommissioning status page 1-2: The DEQ will require a notice of remediation with groundwater use restrictions for all areas where COCs remain above MCLs.*

EPM Response: EPM understands that DEQ will require a notice of remediation for all areas where COCs remain above MCLs.

DEQ Comment: *Slug Test results for BA1 on page 5-4: The hydraulic conductivities (K) in the Table presented on page 5-4 do not seem to match with the AQTESOLV output (i.e., the graphs in Appendix C). Also the input data for the graphs, both well name and technical information about the well (such as saturated thickness, initial displacement, total well penetration depth, casing radius, well radius, static water column height, or screen length) do not seem to match with the respective well data in Tables C1-C14. This may be a reason for some of the unexpected results of low K where a high K was expected. Another reason may be using later times for the straight line portion of the graph instead of using early times for the straight line plot. Suggest placing the AQTESLV Output in the same order as the Tables and Figures in Appendix C.*

EMP Response: The BA1 slug test K values displayed on page 5-4 were erroneous as a result of entry error. A review of the AQTESOLV solutions showed that the project information was incorrect for all wells except TMW-5; however the solution input data were correct with the exception of the screen length. Although the screen length has little to no effect on the solutions, the screen lengths were corrected and the K values were recalculated using AQTESOLV. The K values for all seven BA1 wells are presented in Attachment 2. The AQTESOLV solutions for each well are presented in Attachment 3. With the exception of well 02W39, EPM does not concur with the use of the earlier data for straight line curve fitting. All of the wells tested except for 02W13 display the double straight line effect described by Bouwer (1989). The first straight line (earlier times) is steeper, indicating a higher K value, and is most likely caused by the draining of the filter pack into the well. Once the water level in the filter pack is equal to the water level in the well the second straight line is formed which demonstrates the K value of the

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aquifer. Although the plot of the data from 02W39 also resembles the double straight line effect the straight line fit to the early time data is shallow enough to be reflective of the aquifer.

After the review of the AQTESOLV solutions and subsequent recalculations EPM believes that the K values for the BA1 wells tested are indeed lower than expected. This is most likely a result of the evaluation of existing lithological logs and not due to errors in slug test solution calculations.

DEQ Comment: *For the evaluation of the pump test data for GE-WA-01 well on page 6-5: The results for K and S by using the Cooper-Jacob analyses applied to late times on the time drawdown graph as well as the distance drawdown graph are accepted by the DEQ.*

EPM Response: EPM notes DEQ's acceptance of the results for hydraulic conductivity (K) and Storativity (S) by using the Cooper-Jacob analyses applied to late time data on the time drawdown graph as well as the distance drawdown graph.

DEQ Comment: *For the sensitivity analysis of the storage coefficient in Appendix E: Several parameters (i.e., storage coefficient and porosity) in the existing groundwater flow models were identified as being low for the generally accepted range of values. DEQ agrees that these are low and acknowledges that the water table was shown to be insensitive to the storage coefficient. Further we suggest that EPM follow the DEQ modeling policy (see DEQ webpage - <http://www.deq.state.ok.us/factsheets/general/GroundwaterModeling.pdf>) and submit a table of input parameters and assumptions for review and approval prior to running the groundwater models.*

EPM Response: The DEQ modeling policy has been reviewed and a table of input parameters will be submitted once the model is revised.

NRC Comment: *Page 9-2 notes that additional data will be collected via pneumatic slug tests to assess the validity of the hydraulic conductivity (K) derived from the constant rate pumping test at GE-WA-01 (p. 9-2). The aquifer was not adequately stressed during the pumping test in well GE-WA-01. As a result the K values calculated based on the pumping test data is questionable. The slug tests evaluate aquifer hydraulic property of limited area adjacent to test well. The NRC staff is concerned that additional slug tests may not add more than what is already known unless an additional pumping test is conducted.*

EPM Response: If the groundwater flow model of the WAA cannot be calibrated using site-wide groundwater elevation data collected in August 2013, an additional pumping test may be

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required. This is not currently planned, since this would require installation of another larger diameter pumping well.

NRC Comment: *Confirm the sensitivity analysis of BA-1 and WAA groundwater flow models for storage coefficient was conducted under a transient condition.*

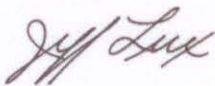
EPM Response: As originally planned, the model is run under steady state conditions to determine radius of influence and particle pathways for well field design. As a result the sensitivity analyses for storage coefficient were also run under steady state condition. As discussed in the July 12, 2013 teleconference, running sensitivity analyses for storage coefficient in a steady state condition is not valid. Converting the model to transient conditions represents a significant change in the modeling effort. The transition to a transient flow model is not currently planned unless NRC or DEQ require this change.

NRC Comment: *Given the updated groundwater flow direction (Fig. 9-1) and current distribution of uranium (Fig. 3-1), consider relocating the proposed MW 1366 approximately 50 ft. to the southeast direction of its currently proposed location. However, this also depends on whether ODEQ has any concerns with nitrates and fluorides in O2W48 or TMW-24 that would preclude moving MW1366. What are the nitrate and fluoride levels comparing to the State's standards?*

EPM Response: By the time these comments were received, EPM had already communicated with both DEQ and NRC regarding the locations of the wells and the wells had been installed. Well 1366 was not installed at the location proposed in the Hydrogeologic Pilot Test Report, but in a location selected by DEQ and NRC. Four additional wells were installed in the Western Alluvial Area at locations recommended by DEQ instead of the locations proposed in the report.

If you have questions or comments related to these responses, please feel free to call me at 405-642-5152.

Sincerely,



Jeff Lux, P.E.
Project Manager

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Attachments

Attachment 1 - Revised Pneumatic Slug Test Memo Table
Attachment 2 – Hydrogeologic Pilot Test Report Table
Attachment 3 – Revised BA#1 Slug Test Solutions

cc: David Cates, Oklahoma Department of Environmental Quality
Ken Kalman, U.S. Nuclear Regulatory Commission

ATTACHMENT 1
Revised Pneumatic Slug Test Memo Table 2

Table 2
Peumatic Slug Test Results
Cimarron Environmental Response Trust
Crescent, OK

Well	Saturated Thickness (ft)	Solution	Hydraulic Conductivity (cm/sec)
T51	10.63	Springer-Gelhar (1991)	1.5×10^{-1}
T54	6.54	Hvorslev (1951)	4.8×10^{-3}
T54	6.54	Springer-Gelhar (1991)	3.2×10^{-3}
T58	12.42	Springer-Gelhar (1991)	1.6×10^{-1}
T59	20.16	Hvorslev (1951)	3.3×10^{-3}
T59	20.16	Springer-Gelhar (1991)	2.5×10^{-3}
T62	10.49	Springer-Gelhar (1991)	4.0×10^{-3}
T74	22.75	Springer-Gelhar (1991)	5.8×10^{-2}
T81	19.8	Springer-Gelhar (1991)	2.0×10^{-1}
T82	19.83	Springer-Gelhar (1991)	2.4×10^{-1}
T84	19.8	Springer-Gelhar (1991)	1.5×10^{-1}
T86	19.93	Springer-Gelhar (1991)	1.4×10^{-1}
T88	19.99	Springer-Gelhar (1991)	1.1×10^{-1}
T89*	23.86	Hvorslev (1951)	8.6×10^{-4}
T89*	23.86	Springer-Gelhar (1991)	1.1×10^{-3}
T91	20.39	Springer-Gelhar (1991)	2.8×10^{-2}
1343	11.97	Springer-Gelhar (1991)	9.0×10^{-1}

Notes:

Shaded area indicates primary solution

* Indicates potentially erroneous data

ft = feet

cm/sec = centimeters per second

ATTACHMENT 2
Hydrogeologic Pilot Test Report Addendum Table

Table 2
Hydrogeologic Pilot Test Report Addendum
Cimarron Environmental Response Trust
Crescent, OK

Well	Saturated Thickness (ft)	Test	Solution	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)
02W10	10.05	Slug In	Dagan (1978)	0.035	1.24E-05
02W10	10.05	Slug Out	Bouwer-Rice (1976)	0.036	1.27E-05
02W10	10.05	Slug Out	Dagan (1978)	0.047	1.66E-05
02W13	14.02	Slug Out	Bouwer-Rice (1976)	6.632	2.34E-03
02W13	14.02	Slug Out	Hvorslev (1951)	7.817	2.76E-03
02W26	9.62	Slug Out	Bouwer-Rice (1976)	0.381	1.34E-04
02W26	9.62	Slug Out	Hvorslev (1951)	0.681	2.40E-04
02W28	11.12	Slug Out	Bouwer-Rice (1976)	0.476	1.68E-04
02W28	11.12	Slug Out	Hvorslev (1951)	0.594	2.10E-04
02W39	8.19	Slug Out	Bouwer-Rice (1976)	1.2	4.24E-04
02W39	8.19	Slug Out	Hvorslev (1951)	1.479	5.22E-04
GE-BA1-01	13.03	Slug In	Bouwer-Rice (1976)	0.0877	3.10E-05
GE-BA1-01	13.03	Slug In	Hvorslev (1951)	0.172	6.07E-05
GE-BA1-01	13.03	Slug Out	Bouwer-Rice (1976)	0.227	8.01E-05
TMW-5	14.18	Slug Out	Bouwer-Rice (1976)	0.092	3.25E-05
TMW-5	14.18	Slug Out	Hvorslev (1951)	0.119	4.20E-05

Notes:

Shaded rows indicates primary solution

ft = feet

ft/d = feet per day

cm/sec = centimeters per second

ATTACHMENT 3
Revised BA#1 Slug Test Solutions

WELL TEST ANALYSIS

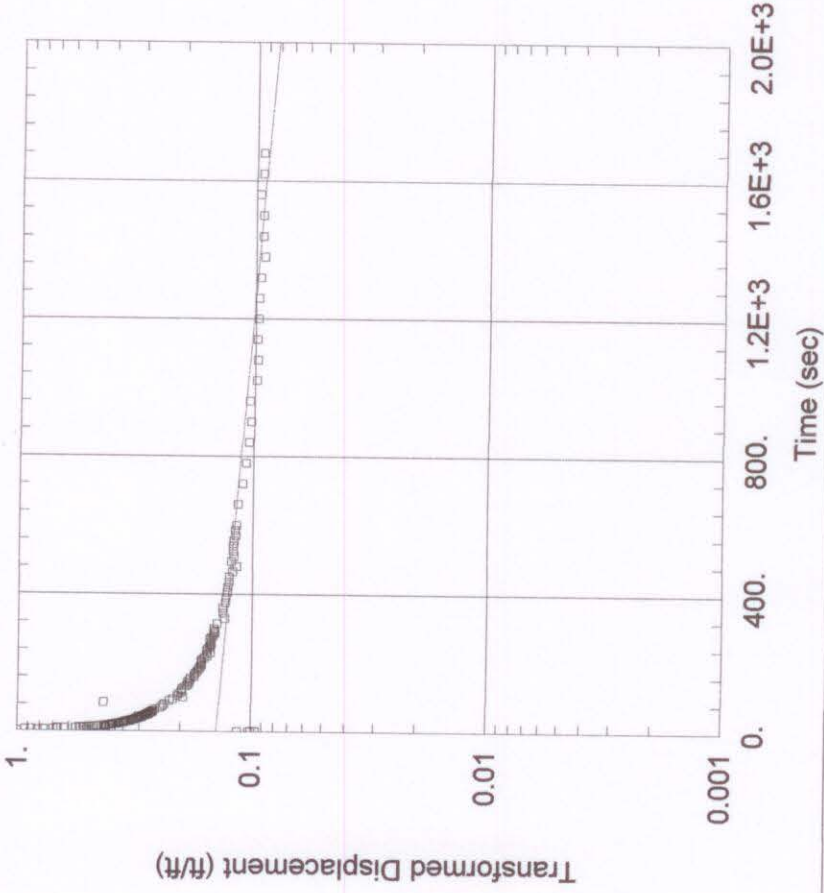
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Date: 08/29/13 Time: 15:08:43

PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W10
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Dagan
K = 0.03548 ft/day
y0 = 0.1984 ft



AQUIFER DATA

Saturated Thickness: 10.05 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W10)

Initial Displacement: 1.356 ft
Total Well Penetration Depth: 20.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 10.05 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

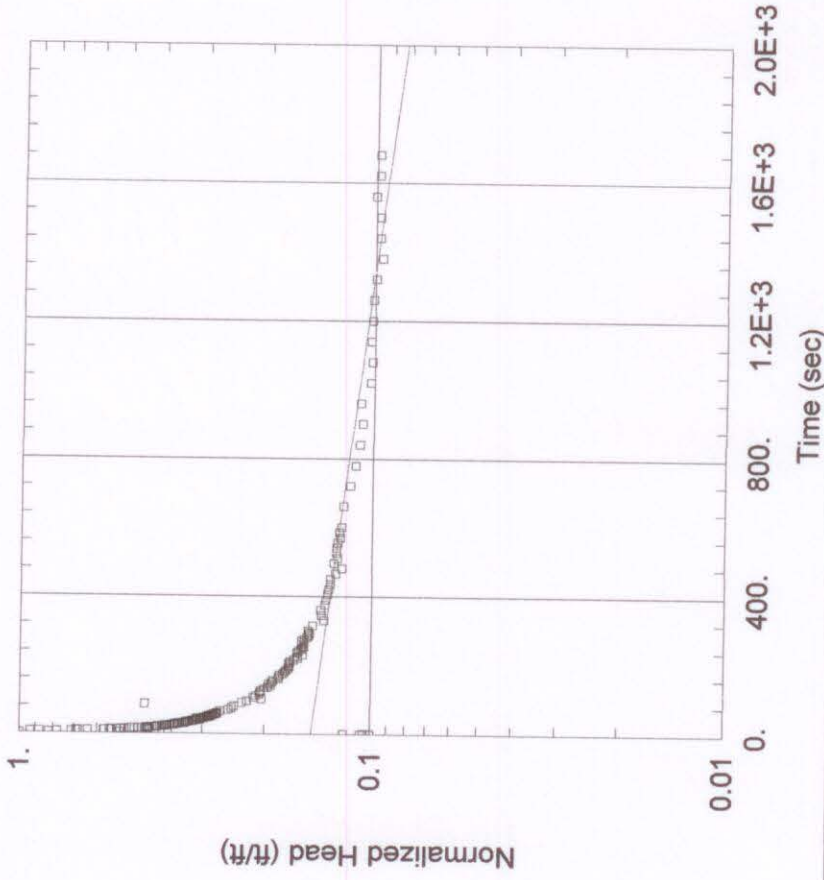
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W10
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.03572 ft/day
y0 = 0.1996 ft



AQUIFER DATA

Saturated Thickness: 10.05 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W10)

Initial Displacement: 1.356 ft
Total Well Penetration Depth: 20.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 10.05 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

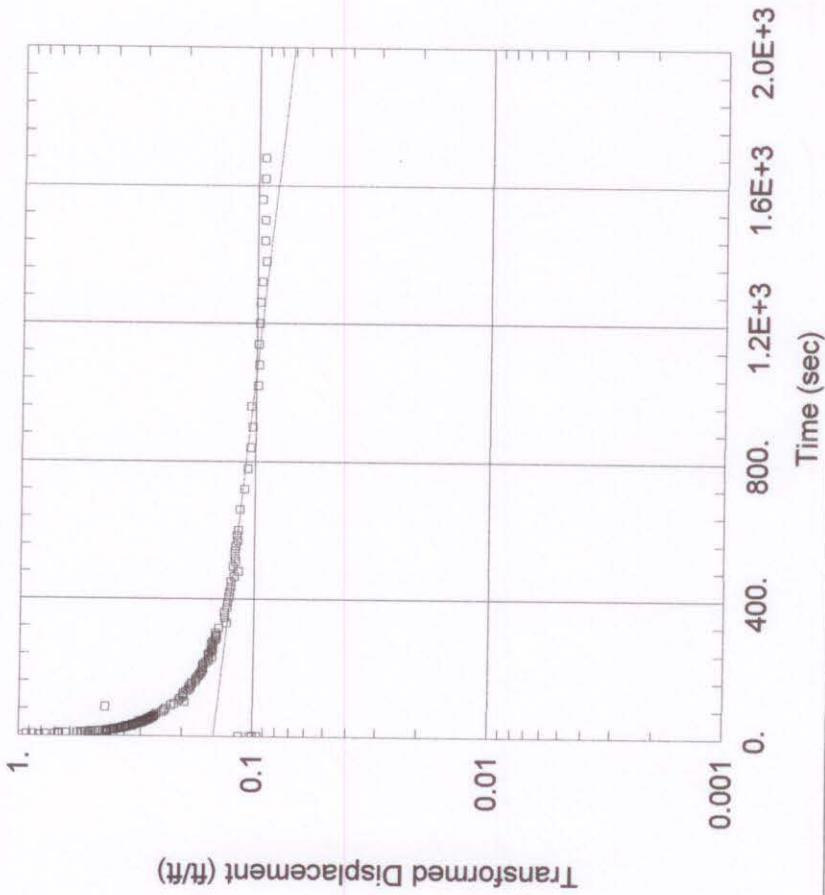
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W10
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Dagan
K = 0.04736 ft/day
y0 = 0.2063 ft



AQUIFER DATA

Saturated Thickness: 10.05 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W10)

Initial Displacement: 1.356 ft
Total Well Penetration Depth: 20.8 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 10.05 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

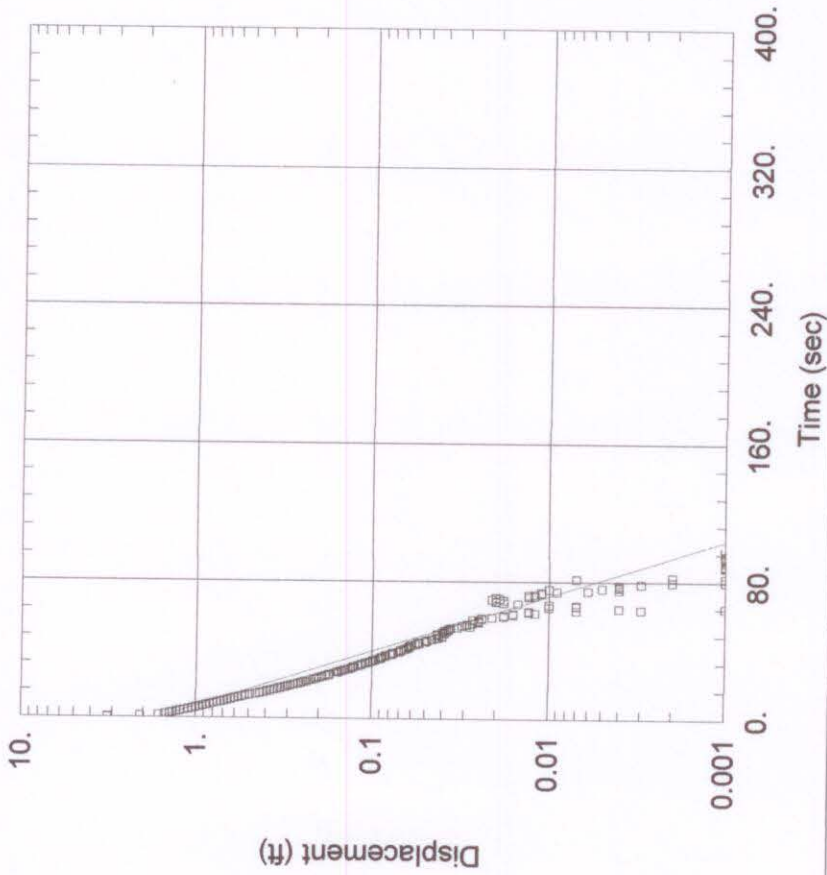
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W13
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 6.632 ft/day
y0 = 1.632 ft



AQUIFER DATA

Saturated Thickness: 14.02 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W13)

Initial Displacement: 3.2 ft
Total Well Penetration Depth: 24.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 14.02 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

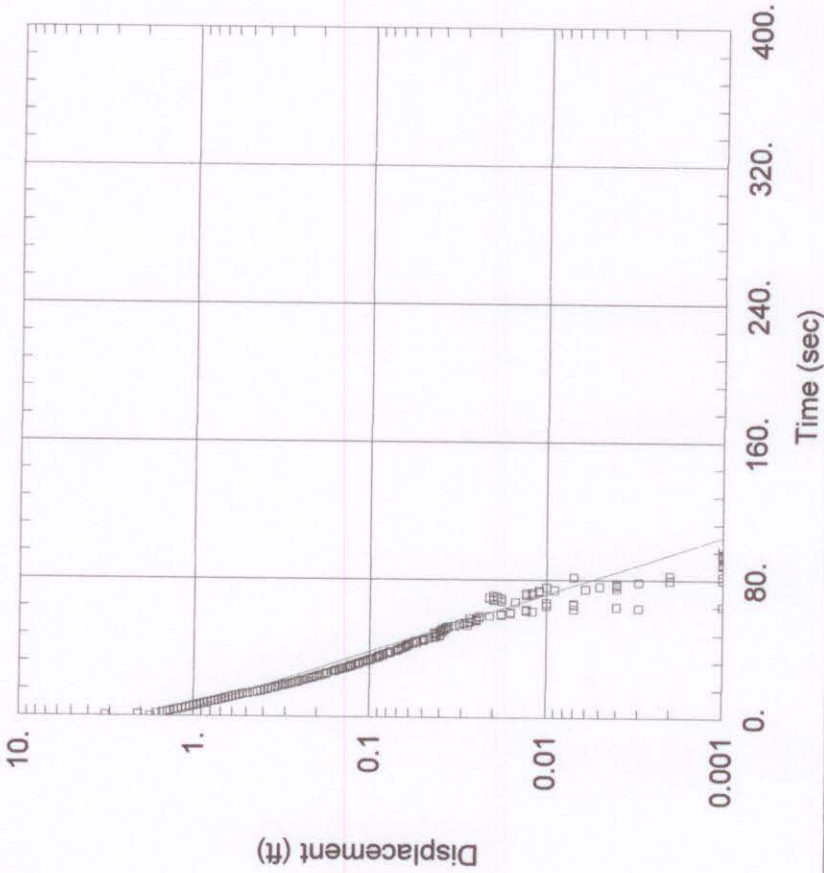
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W13
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
 $K = 7.817$ ft/day
 $y_0 = 1.369$ ft



AQUIFER DATA

Anisotropy Ratio (K_z/K_r): 1.

Saturated Thickness: 14.02 ft

WELL DATA (02W13)

Initial Displacement: 1.77 ft
Total Well Penetration Depth: 24.5 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 14.02 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

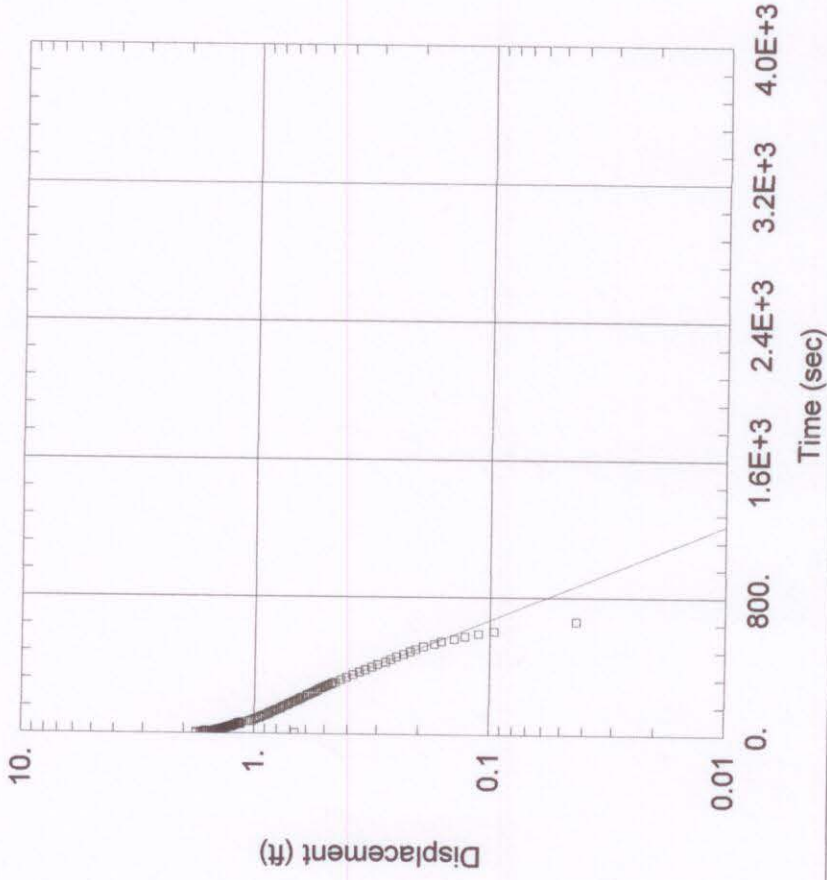
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Date: 09/03/13 Time: 11:23:56

PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W26
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.381 ft/day
y0 = 1.6 ft



AQUIFER DATA

Saturated Thickness: 9.62 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W26)

Initial Displacement: 1.77 ft
Total Well Penetration Depth: 24.68 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 9.62 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

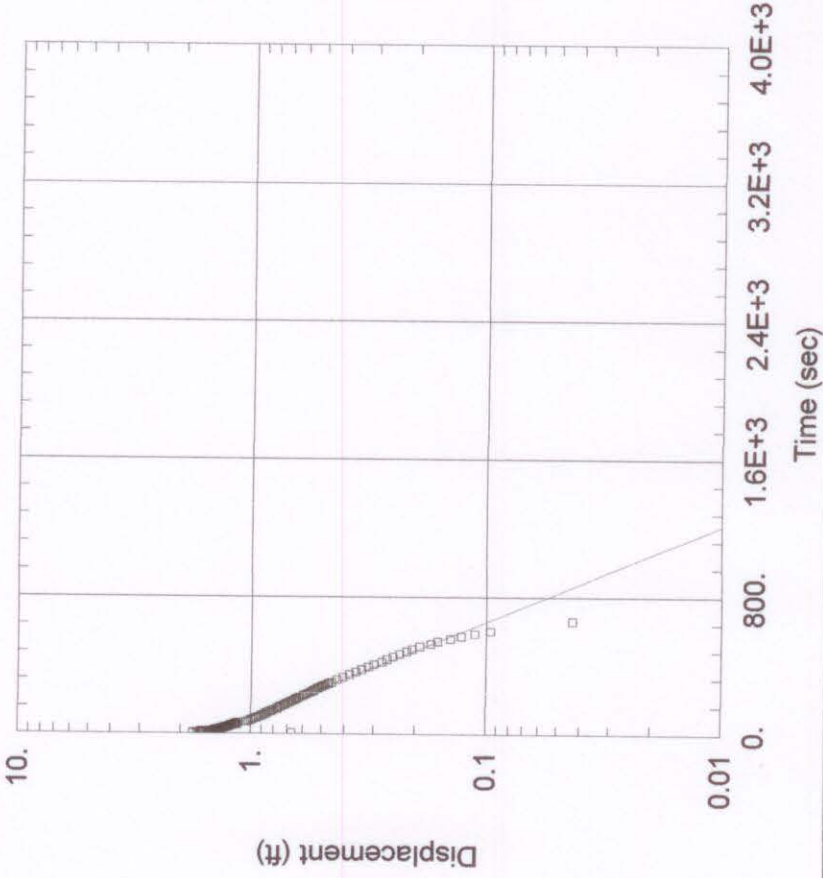
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W26
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.6814 ft/day
y0 = 1.484 ft



AQUIFER DATA

Saturated Thickness: 9.62 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W26)

Initial Displacement: 1.77 ft
Total Well Penetration Depth: 24.68 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 9.62 ft
Screen Length: 14.25 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

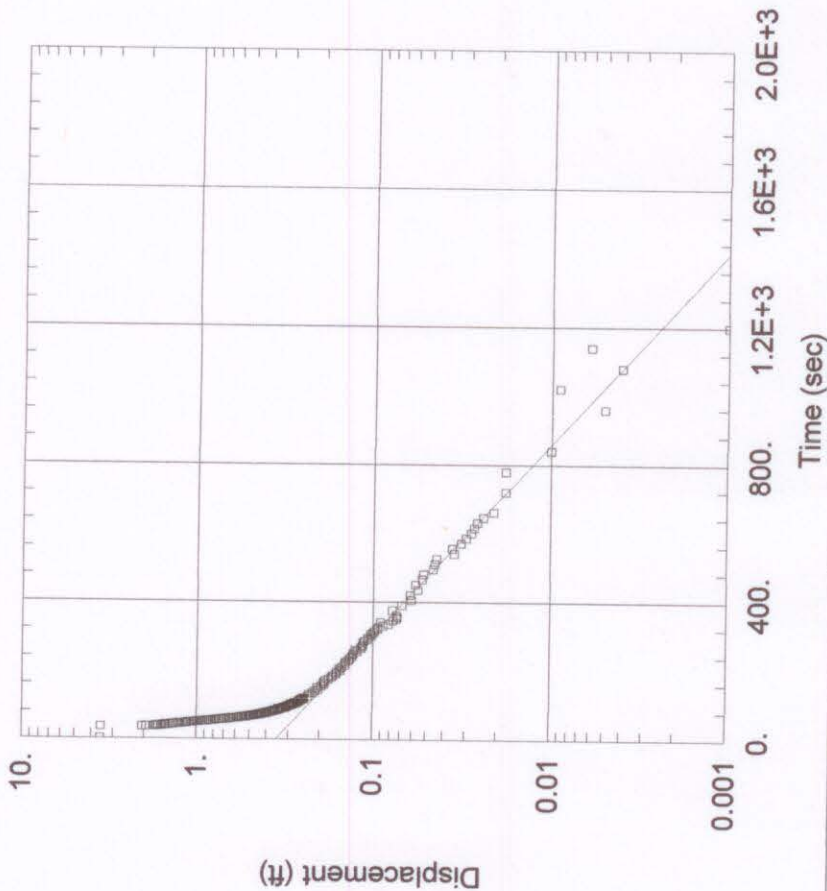
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Date: 08/29/13 Time: 15:18:00

PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W28
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.4762 ft/day
y0 = 0.3516 ft



AQUIFER DATA

Anisotropy Ratio (Kz/Kr): 1.

Saturated Thickness: 11.12 ft

WELL DATA (02W28)

Initial Displacement: 3.55 ft
Total Well Penetration Depth: 23.45 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 11.12 ft
Screen Length: 11.2 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

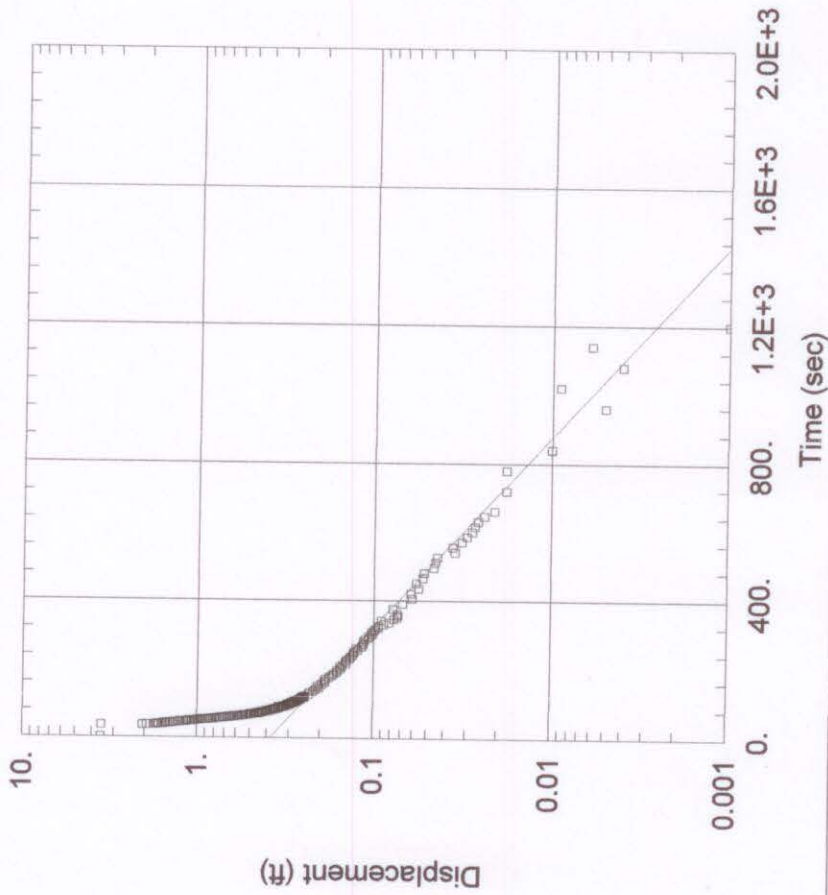
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W28
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.5937 ft/day
y0 = 0.3816 ft



AQUIFER DATA

Anisotropy Ratio (Kz/Kr): 1.

Saturated Thickness: 11.12 ft

WELL DATA (02W28)

Initial Displacement: 3.55 ft
Total Well Penetration Depth: 23.45 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 11.12 ft
Screen Length: 11.2 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

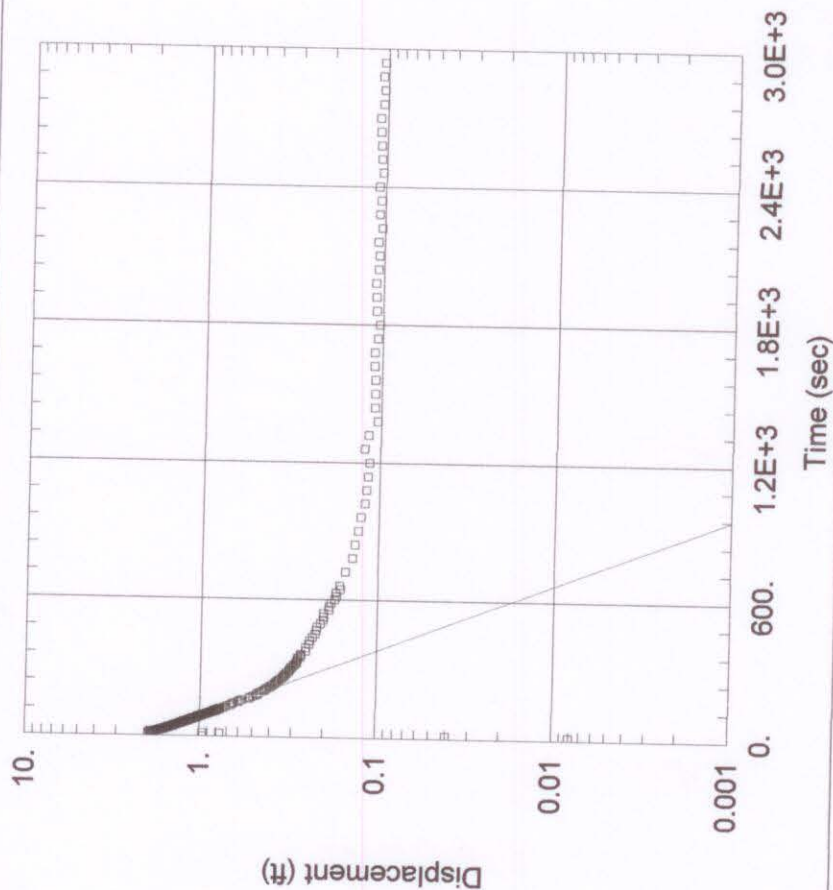
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W39
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.2 ft/day
y0 = 2.05 ft



AQUIFER DATA

Anisotropy Ratio (Kz/Kr): 1.

Saturated Thickness: 8.19 ft

WELL DATA (02W39)

Initial Displacement: 0.958 ft
Total Well Penetration Depth: 20.81 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 8.19 ft
Screen Length: 14.5 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

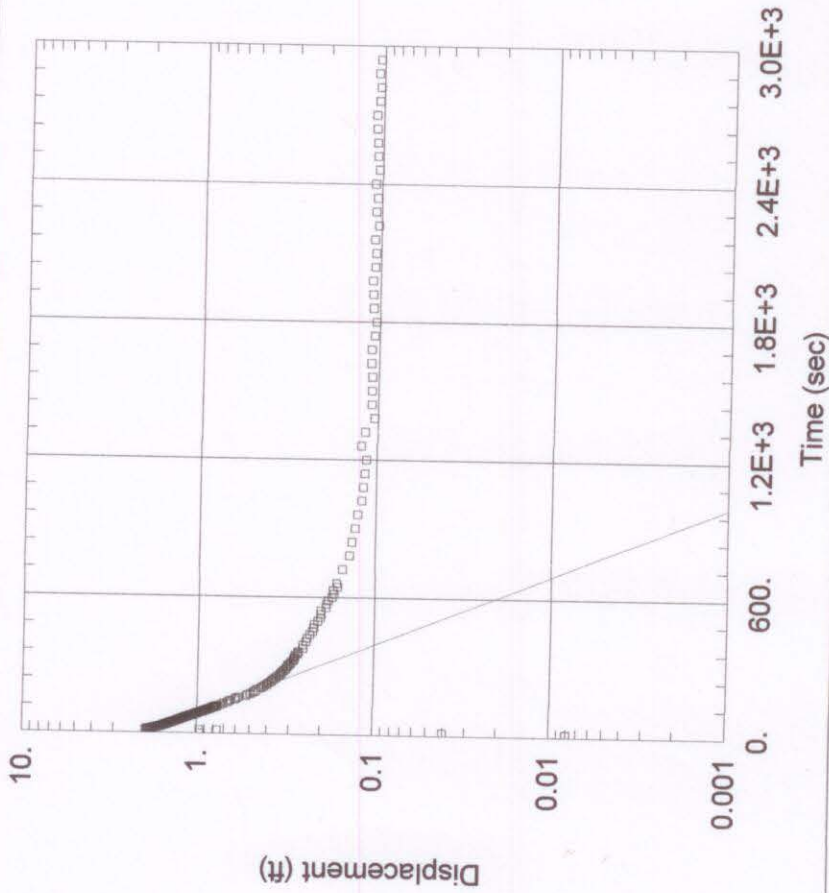
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: 02W39
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.479 ft/day
y0 = 2.001 ft



AQUIFER DATA

Saturated Thickness: 8.19 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (02W39)

Initial Displacement: 0.958 ft
Total Well Penetration Depth: 22.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 8.19 ft
Screen Length: 14.2 ft
Well Radius: 0.0833 ft

WELL TEST ANALYSIS

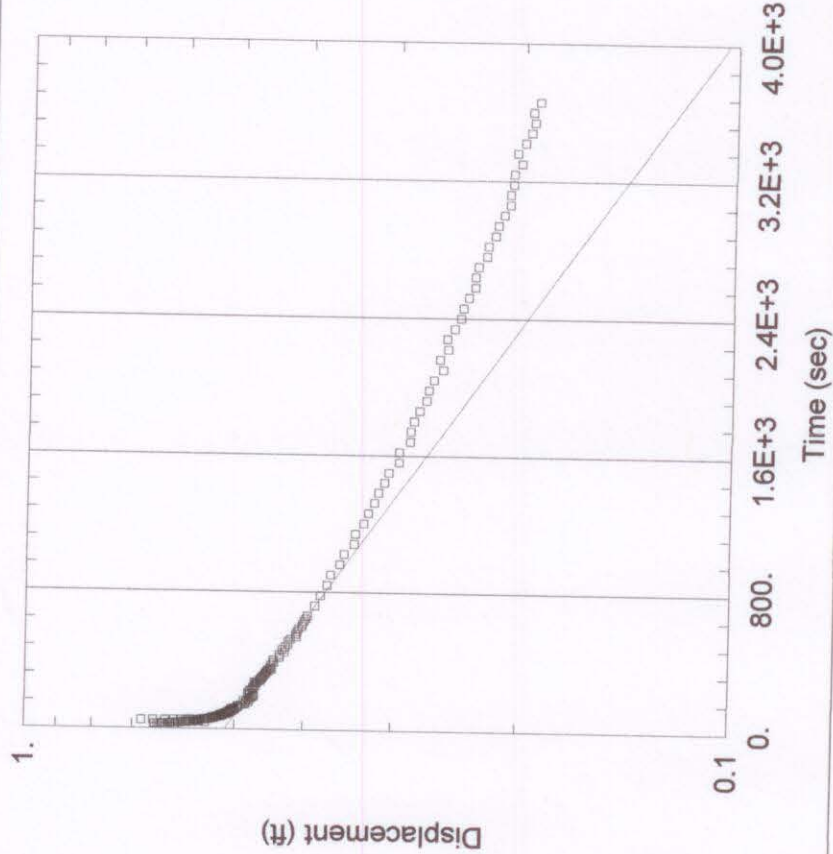
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: GE-BA1-01
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.08769 ft/day
y0 = 0.5162 ft



AQUIFER DATA

Anisotropy Ratio (Kz/Kr): 1.

Saturated Thickness: 13.03 ft

WELL DATA (GE-BA1-01)

Initial Displacement: 1.86 ft
Total Well Penetration Depth: 23.71 ft
Casing Radius: 0.167 ft

Static Water Column Height: 13.03 ft
Screen Length: 15. ft
Well Radius: 0.83 ft

WELL TEST ANALYSIS

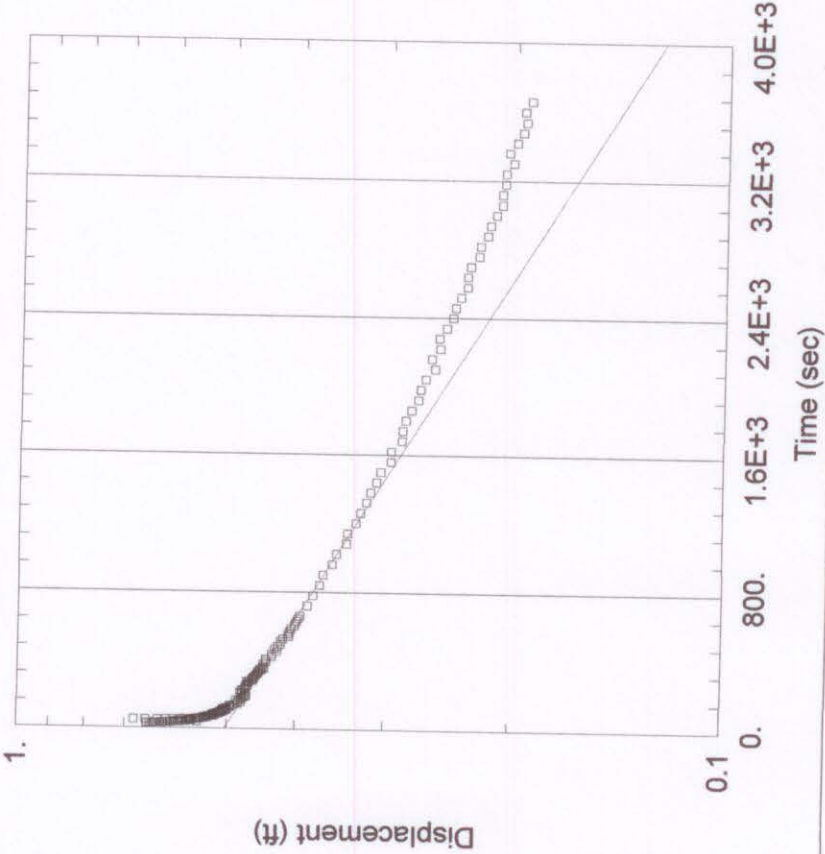
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PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: GE-BA1-01
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.1723 ft/day
y0 = 0.5036 ft



AQUIFER DATA

Anisotropy Ratio (Kz/Kr): 1.

Saturated Thickness: 13.03 ft

WELL DATA (GE-BA1-01)

Initial Displacement: 1.86 ft
Total Well Penetration Depth: 23.71 ft
Casing Radius: 0.167 ft

Static Water Column Height: 13.03 ft
Screen Length: 15. ft
Well Radius: 0.167 ft

WELL TEST ANALYSIS

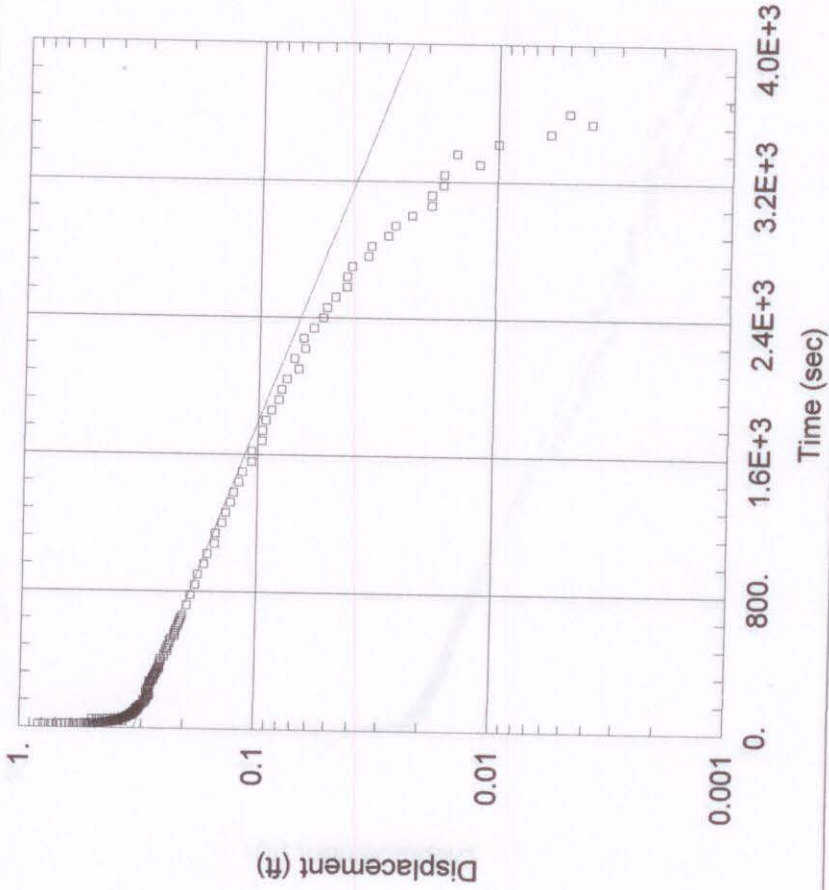
Data Set: K:\...\GEBA101slugout_bouwer_r1.aqt
Date: 08/29/13 Time: 15:27:51

PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: GE-BA1-01
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.2266 ft/day
y0 = 0.3247 ft



AQUIFER DATA

Saturated Thickness: 13.03 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (GE-BA1-01)

Initial Displacement: 1.65 ft
Total Well Penetration Depth: 23.71 ft
Casing Radius: 0.167 ft
Static Water Column Height: 13.03 ft
Screen Length: 15. ft
Well Radius: 0.167 ft

WELL TEST ANALYSIS

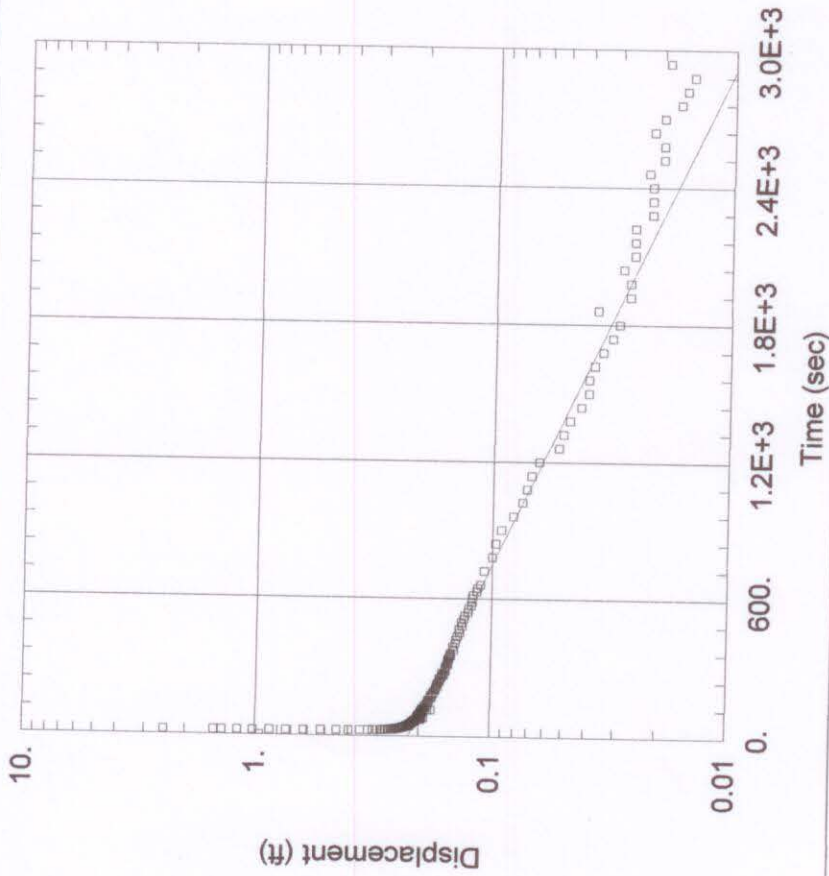
Data Set: K:\1\TMW5slugout_hvorslev.agt
Date: 08/29/13 Time: 15:38:11

PROJECT INFORMATION

Company: EPM
Client: Cimarron Environmental Trust
Project: 65943
Location: Crescent, OK
Test Well: TMW-5
Test Date: 10/18/12

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.1191 ft/day
y0 = 0.2214 ft



AQUIFER DATA

Saturated Thickness: 14.18 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (TMW-5)

Initial Displacement: 0.958 ft
Total Well Penetration Depth: 25. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 14.18 ft
Screen Length: 14.55 ft
Well Radius: 0.0833 ft