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Analysis Report for AP-070

Analysis of Magenta Hydraulic Tests Performed Between December 1978 and June 2009

AP-070: Analysis Plan for Non-Salado Hydraulic-Test Interpretations

Task Number 1.4.2.3

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1. Introduction

This report discusses the analyses of hydraulic tests performed in the Magenta Member of the Rustler Formation (Figure 1) at the Waste Isolation Pilot Plant (WIPP) site between December 1978 and June 2009. These analyses were performed in accordance with the Sandia National Laboratories (SNL) Analysis Plan for Non-Salado Hydraulic-Test Interpretations, AP-070, Revision 2 (Beauheim, 2009). The computer code used for analysis was nSIGHTS (n-dimensional Statistical Inverse Graphical Hydraulic Test Simulator), version 2.41. A detailed description of the approach followed in these analyses can be found in Beauheim et al. (1993, Appendix B) and Roberts et al. (1999, Chapter 6). The data analyzed for this report were collected at the following wells: DOE-2, H-2a, H-3b1, H-4a, H-5a, H-6a, H-8a, H-9a, H-10a, H-14, H-16, H-18, WIPP-18, WIPP-27, and WIPP-30.

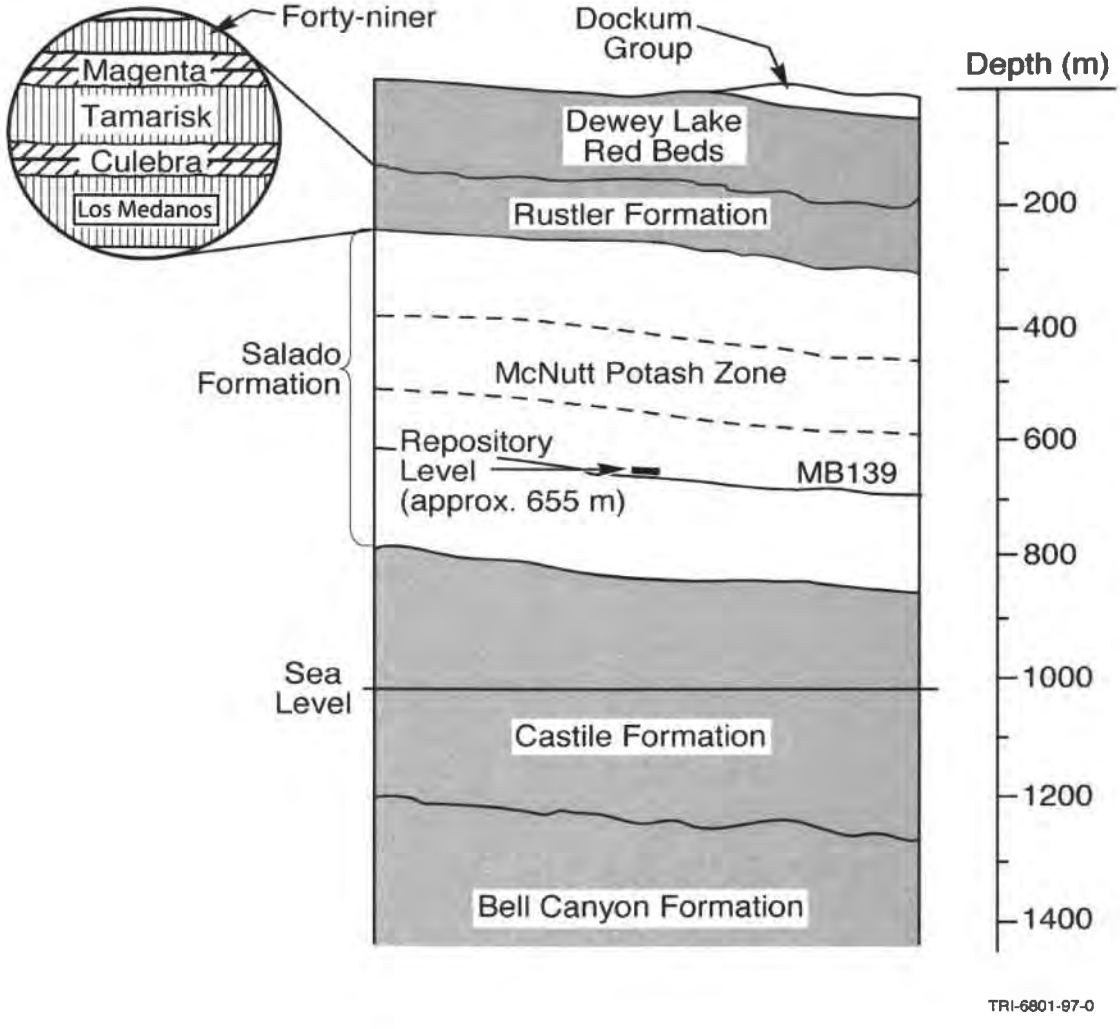

Figure 1. WIPP stratigraphy.

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2. nSIGHTS Overview

The nSIGHTS code consists of two independent applications: nPre.exe and nPost.exe. The pre-processor and simulator, nPre, is used to process the field data prior to analysis, set up the mathematical model, and then run the model in inverse mode to estimate the hydraulic parameters of interest, e.g., transmissivity (T), storage (S), etc. It also generates the data used to quantify the uncertainty associated with those hydraulic-parameter estimates. The post-processor, nPost, processes the results stored in the nPre output files, allowing graphical and statistical analysis of the simulation results.

All field data used in each analysis are entered or read into nPre and stored in a configuration file with an ***nPre*** extension. The field data include well radius, tubing-string radius, formation thickness, fluid density, and the transient pressure and flow-rate data. All input field data, including the reference ERMS numbers and field notebooks for each well, are listed in Appendix A.

The conceptual model chosen based on the characteristics of the test response determines the fitting parameters that will be estimated for each analysis. The model fitting parameters for each analysis are specified in the ***nPre*** configuration files named for each of the wells. Five hundred (500) sets of optimized fitting parameters were generated for each analysis in this report as part of the fitting-parameter uncertainty calculation. These 500 optimized parameter sets are stored in the nPre output file with an ***nOpt*** extension. The corresponding transient pressure simulations are stored in an nPre output file with an ***nXYsim*** extension. Both the ***nOpt*** and ***nXYsim*** files are read by nPost and all of the post-processing results are stored in a configuration file with an ***nPost*** extension.

The nSIGHTS input and output files for each tested well are stored in a directory structure like that shown in Figure 2.

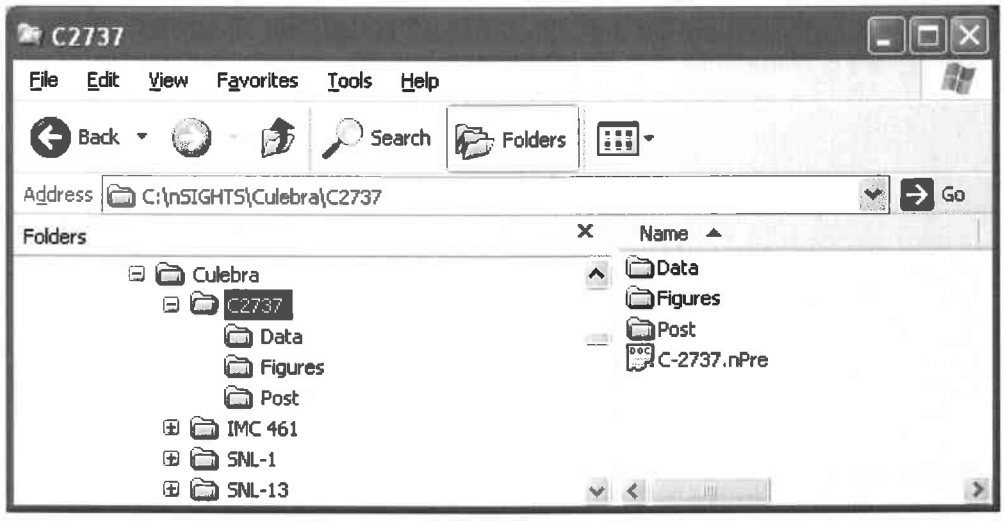

Figure 2. Directory structure for Culebra nSIGHTS analyses.

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The nPre configuration file is stored in the folder named for the tested well in a directory named for the strata tested (Figure 2). Transient pressure and flow-rate files are stored in the Data folder (Figure 3) and all nPre output files as well as the nPost configuration file are stored in the Post folder (Figure 4).

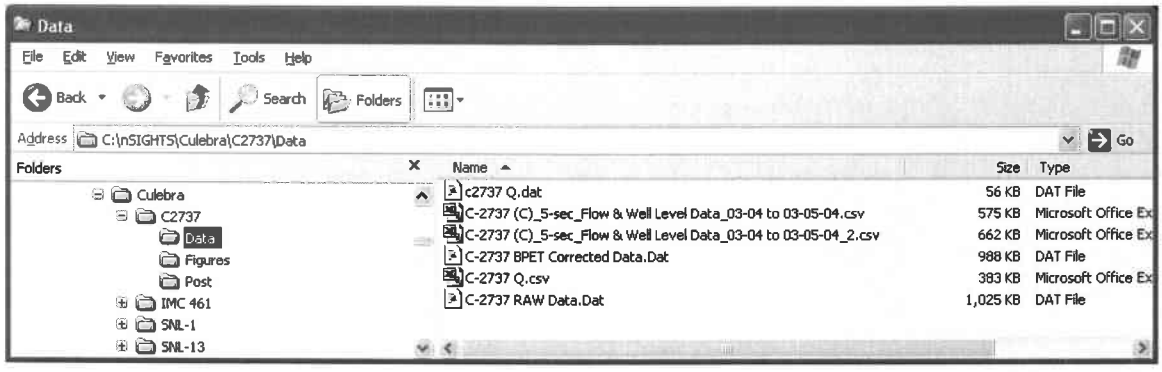

Figure 3. *Data* folder containing the pressure and flow-rate files for nPre input.

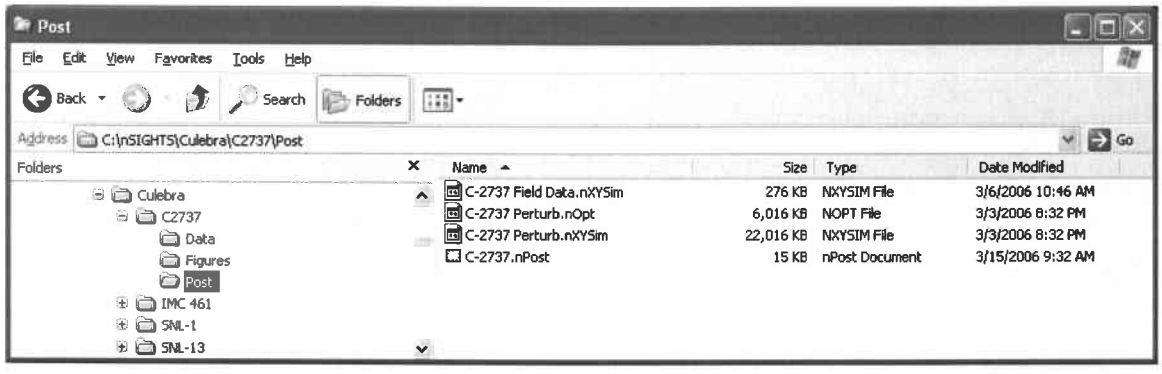

Figure 4. *Post* folder containing simulation output and post-processed data.

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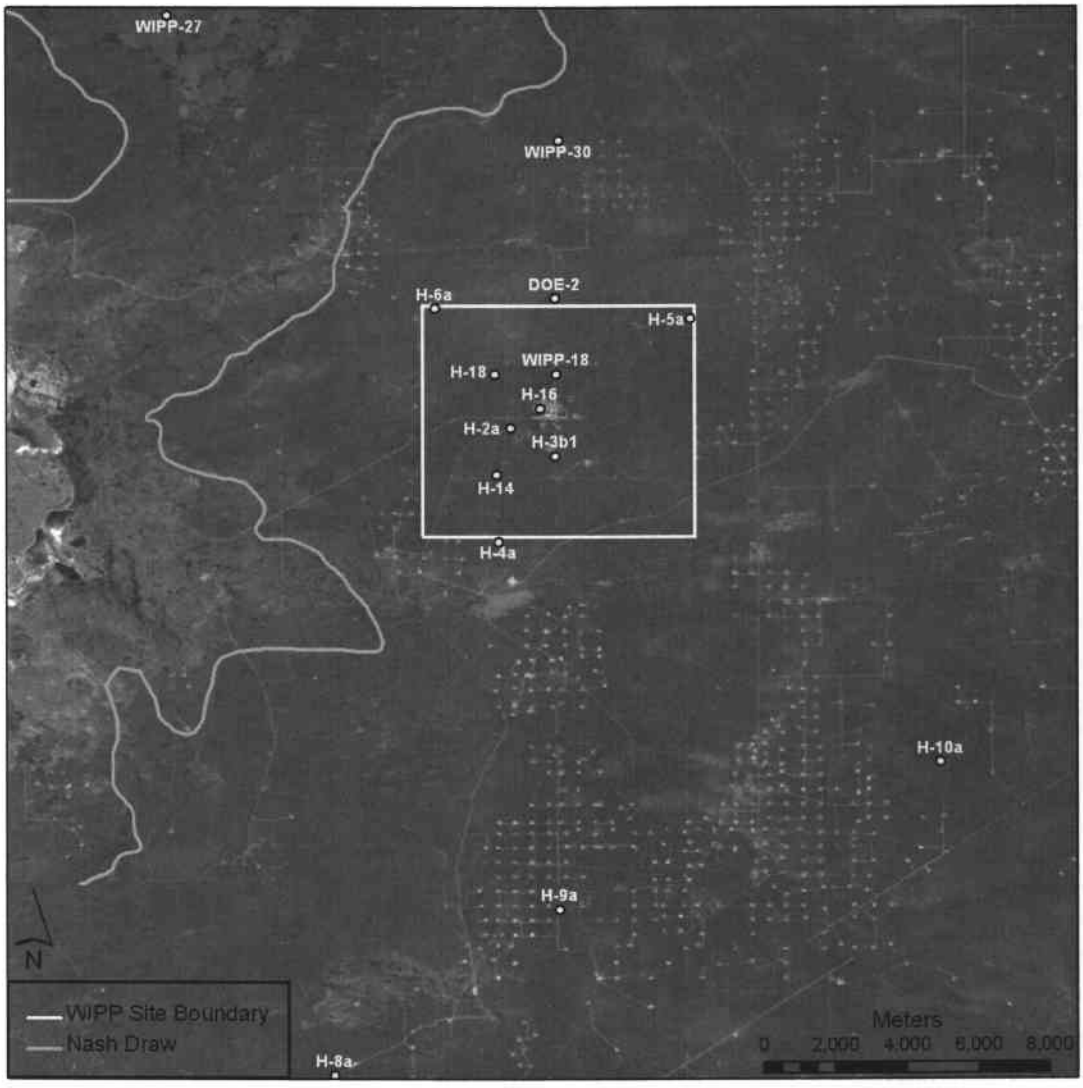
3. Test and Analysis Procedures

Single slug-injection tests were performed in wells H-2a, H-3b1, H-4a, H-5a, H-6a, H-8a, H-9a, H-10a, and WIPP-30. Two slug-injection tests were performed in WIPP-27. A single slug-withdrawal test was performed in WIPP-18 and a drill-stem test was performed in DOE-2. Three consecutive slug tests were performed in H-14 and H-16. For all slug tests, the pressure recoveries were monitored until static formation pressure was reached. A pumping test was performed in H-18 using a constant rate of 0.5 gpm. The location of each well is shown in Figure 5. Slug and pumping test analyses included the fitting of Cartesian pressure data, derivatives of normalized pulse/slug responses (Ramey A, Ramey B, Ramey C), and pressure change and pressure derivative (log-log diagnostic) as described by Bourdet (1989).



Landsat imagery obtained through EDAC Imagery OGC Web Map Services

Figure 5. Locations of tested wells.

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All the nSIGHTS test simulations incorporated pre-test pressure records of various durations as "history" periods where the associated pressures were simply specified in the simulations.

Test analysis involved finding the values of the fitting parameters that produced the best simulated matches to the pressure data collected during the slug, DST, or constant-rate test and subsequent recovery period. In addition to the formation properties of interest (principally transmissivity (T)), tubing string radius was also included as a fitting parameter in the pumping-test analyses so that nSIGHTS could exactly match the amount of wellbore storage observed during the test. The main objective of these analyses was to estimate T in the vicinity of each well for subsequent use in T-field generation and WIPP performance assessment calculations. Correlation between estimated T values and the other fitting parameters reported in Appendix B would be of interest if these correlations resulted in large uncertainty in the estimated T values. The uncertainty in the estimated T values, however, is relatively small, so any correlation between T and other fitting parameters is not of concern.

The uncertainty quantification method applied to the analyses in this report is a process referred to as *perturbation analysis*. In this process, preliminary analyses are performed in which a reasonable fit is obtained to the specified constraints defined in the nPre configuration file. The resulting values of the fitting parameters are the *baseline solution* set – a single value for each fitting parameter that provides a satisfactory fit to the data (*satisfactory* being a judgment call on the part of the analyst). Perturbation analysis begins by assigning a plus/minus range corresponding to the parameter space one wishes to investigate to each of the baseline fitting-parameter values. These plus/minus fitting-parameter ranges for each analysis are listed in Appendix B. Starting at the baseline value, the fitting parameters are randomly perturbed to fall somewhere within their assigned ranges and are then optimized from these random starting points. The objective of perturbation analysis is to sample the parameter space adequately and locate all of the minima within the parameter space. By definition, the parameter-space minimum that provides the best quantitative fit to the data, measured in terms of the smallest sum of squared errors (SSE), is the *global minimum* (assumed true solution), and the other minima are referred to as *local minima*. Local minima are effectively localized depressions in the parameter-space topography that trap the inverse regression algorithm during its attempt to find the global minimum – the smallest SSE. If multiple data types are included in the match, e.g., if pressures, pressure derivatives, etc., are matched simultaneously, then the weighted SSE values for each component are combined and the overall goodness-of-fit measure is denoted in nSIGHTS as the *fit value*.

Five hundred perturbation/optimization runs were performed for each of the analyses discussed in this report. A visual assessment of parameter-space plots for each fitting variable and a visual assessment of the fits themselves were all used to determine the value of the "fit discriminant". The fit discriminant is used to reduce the perturbations under consideration to only those within the best-fit minimum, and sufficiently close to be subjectively considered "acceptable" fits. All perturbation results for which the fit value was less than the fit discriminant were deemed acceptable solutions and are included in the final range of reported values for each fitting parameter. In some cases, the original baseline solution may not fall within the global minimum defined through perturbation analysis. The final number of satisfactory perturbation results for each test is reported in the Section 4 figure captions.

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4. Magenta Analysis Results

Discussions of the Magenta test analyses for reported wells are given below. A summary of the *T* estimates obtained from perturbation analysis of each test is shown in Table 1. The full range of *T* values from which the statistics in Table 1 are derived is presented as a scatter plot in each section below and a full listing is contained within the nPost configuration file for each analysis.

Table 1. Magenta Transmissivity Estimates.

Magenta Wells	Geometric Mean (m^2/s)	Log Geometric Mean (m^2/s)	Log Minimum (m^2/s)	Log Maximum (m^2/s)	Variance
DOE-2	1.21E-08	-8.745	-8.869	-8.648	9.93E-21
H-2a	2.72E-09	-8.566	-8.58	-8.55	4.76E-24
H-3b1	4.17E-08	-8.24	-8.94	-8.02	4.81E-18
H-4a	6.37E-08	-7.196	-7.196	-7.195	2.05E-24
H-5a	1.16E-07	-6.937	-6.97	-6.91	9.25E-20
H-6a	9.02E-07	-6.81	-6.87	-6.72	9.28E-17
H-8a	7.35E-09	-8.134	-8.18	-8.10	1.44E-21
H-9a	9.70E-07	-6.013	-6.39	-5.82	8.23E-16
H-10a	4.13E-06	-6.25	-6.45	-5.93	4.79E-15
H-14	3.23E-09	-8.491	-8.492	-8.490	2.08E-25
H-16	2.99E-08	-7.525	-7.53	-7.52	2.37E-23
H-18 (@11.10 m)*	5.28E-07	-7.12	-7.19	-7.07	8.77E-18
H-18 (@153.45 m)*	8.29E-08	-7.93	-7.94	-7.91	8.89E-21
WIPP-18	1.90E-07	-6.720	-6.82	-6.66	3.57E-18
WIPP-27(@0.06 m)*	5.76E-07	-6.98	-7.24	-6.36	3.87E-15
WIPP-27(@68.60 m)*	3.96E-02	-1.40	-2.45	-0.01	7.30E-03
WIPP-30	1.06E-08	-7.973	-8.04	-7.90	4.73E-21

*In cases where multiple transmissivities (typically called a Composite Model) were used to fit the data, each progressive *T* value was assigned a distance from the borehole.

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4.1 DOE-2

The Magenta interval of well DOE-2 was drilled and cored between August 28 and September 18, 1984 (Mercer et al., 1987). The well was deepened from May 5 to June 8, 1985, and a surface casing was set to a depth of 39 ft. At the Magenta, the outer diameter (OD) of the well was 12.25 in with a 9.625-in surface casing that contained 2.375-in OD tubing. The siting for DOE-2 was based on a depression in the Salado Formation defined by Borns et al. (1983). A physical description of the well is detailed in Figure 6.

A Drill Stem Test (DST) was initiated in the Magenta at DOE-2 on October 13, 1984, (Mercer et al., 1987). Testing concluded on October 15, 1985. The data used in this analysis are shown in Figure 7.

The DOE-2 nSIGHTS simulation consisted of four sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the DOE-2.nPre file and are listed in Appendix B.1.

The specified DOE-2 conceptual model, chosen because it was the simplest model consistent with the available information that produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values derived from perturbation analysis is shown in Figure 8. The geometric mean T estimate derived from this analysis was 1.21E-8 m^2/s. The Cartesian, Ramey A, Ramey C, and log-log pressure buildup diagnostic simulations corresponding to these T values are shown in Figures 9-12, respectively.

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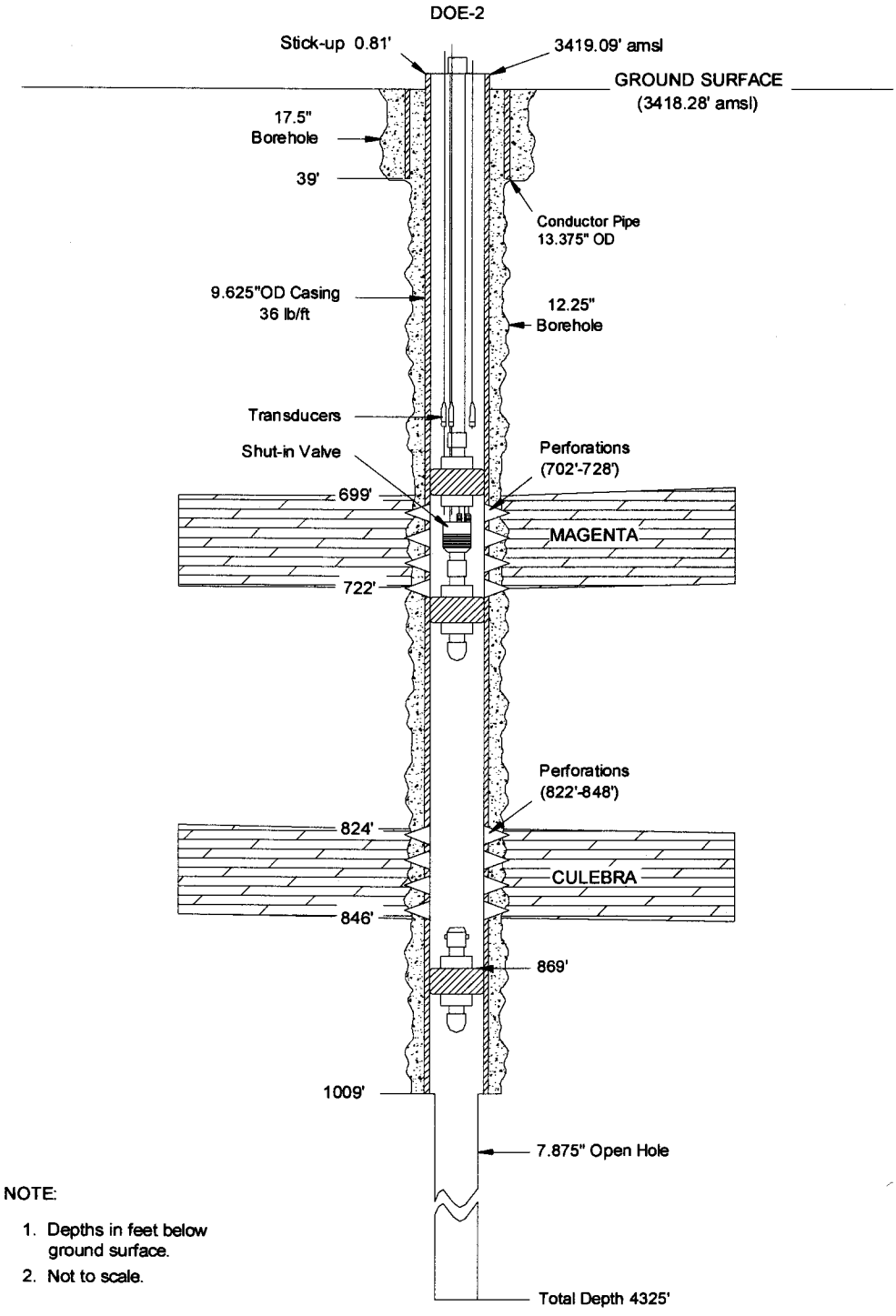

Figure 6. DOE-2 well configuration during testing.

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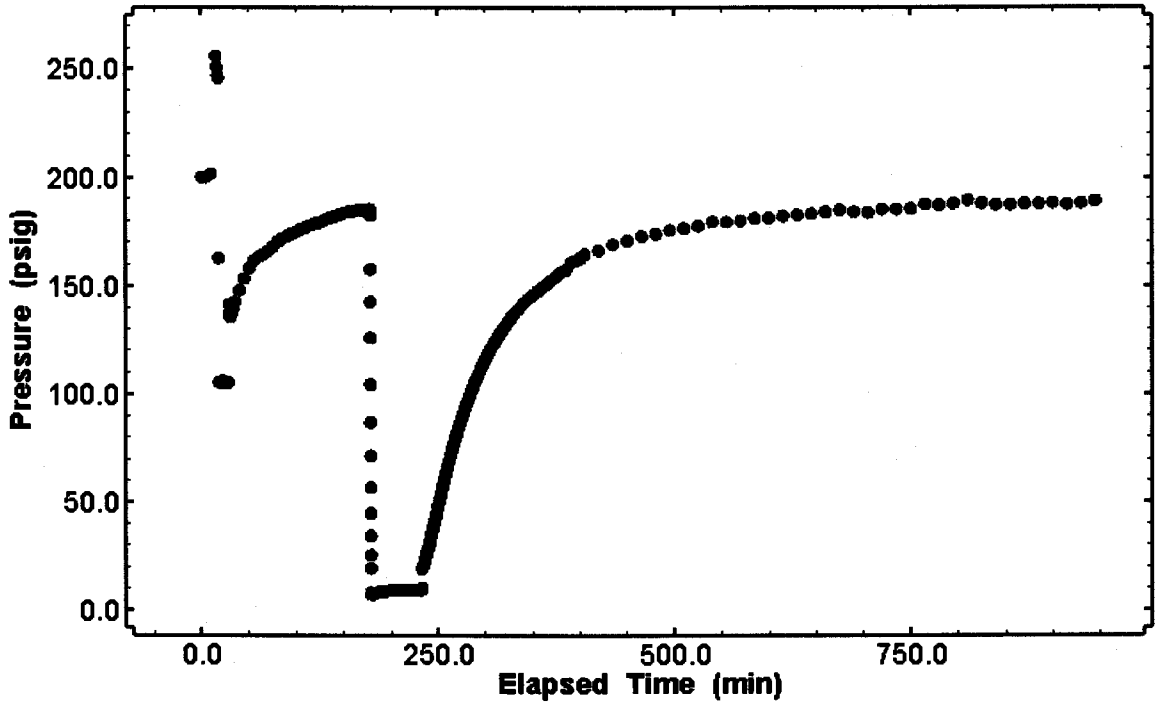

Figure 7. Pressure data from Magenta in DOE-2.

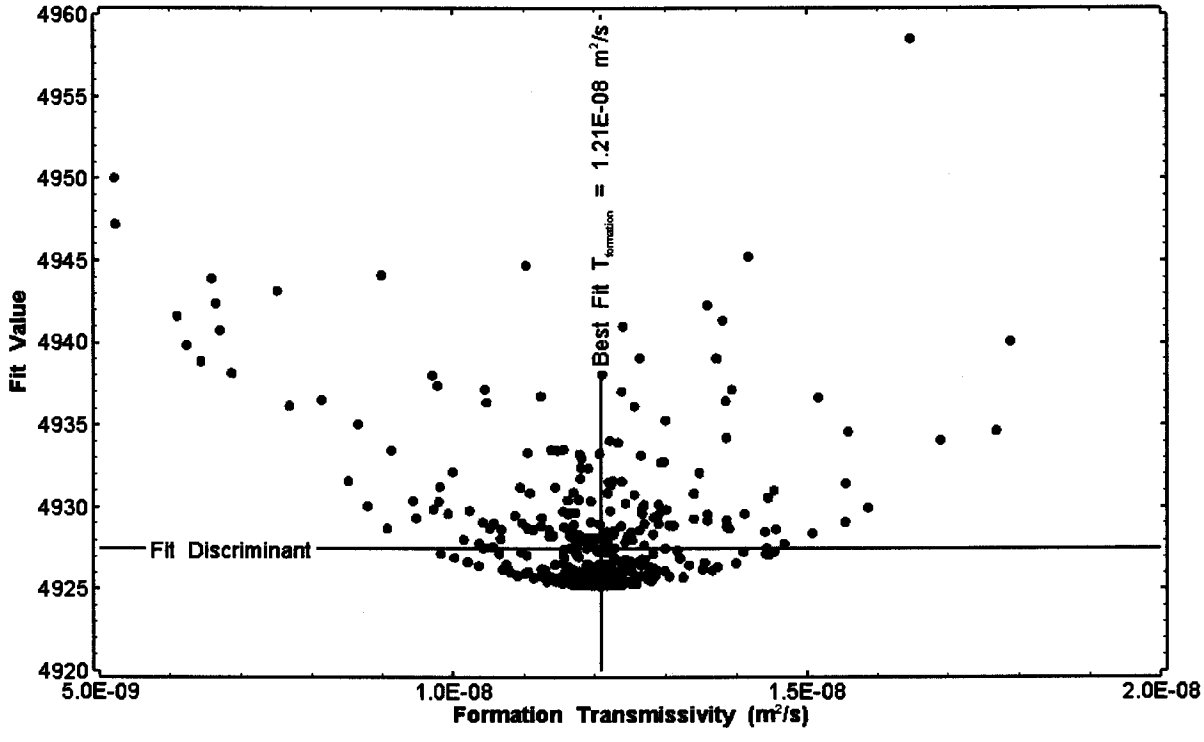

Figure 8. X-Y scatter plot showing the transmissivity parameter space derived from DOE-2 perturbation analysis along with the fit discriminant and best fit values.

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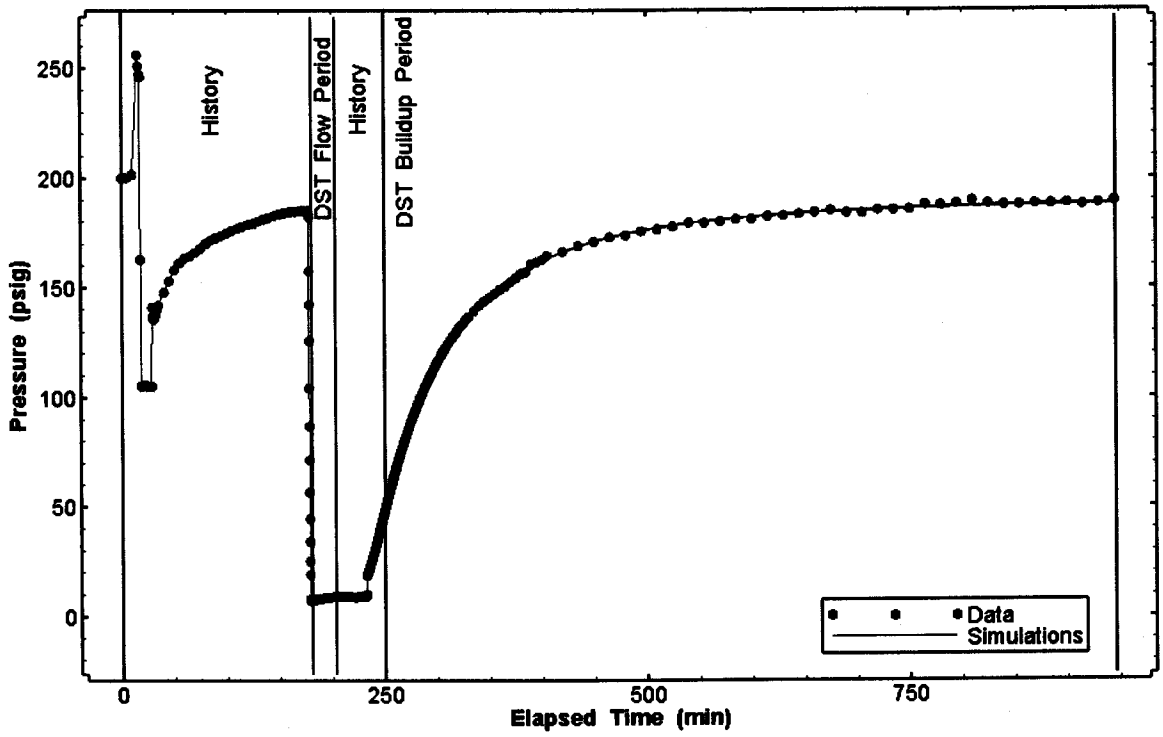

Figure 9. Linear plot showing 374 simulations of the DOE-2 pressure response.

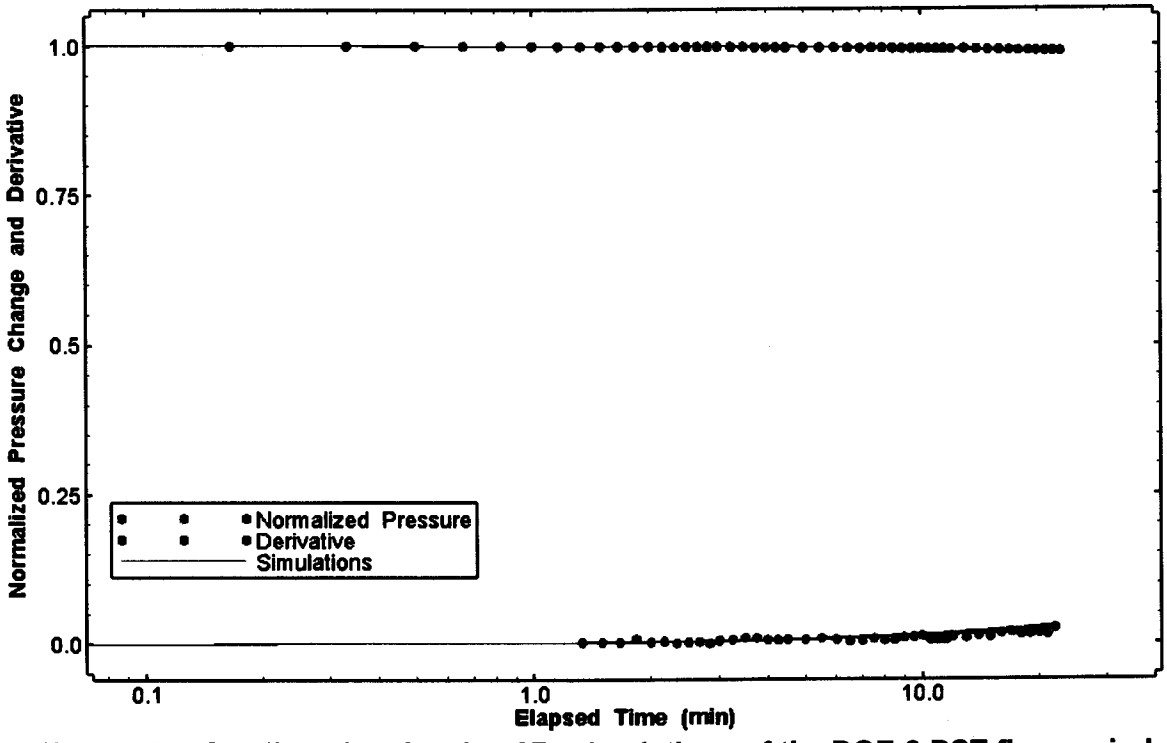

Figure 10. Semilog plot showing 374 simulations of the DOE-2 DST flow period Ramey A and derivative response.

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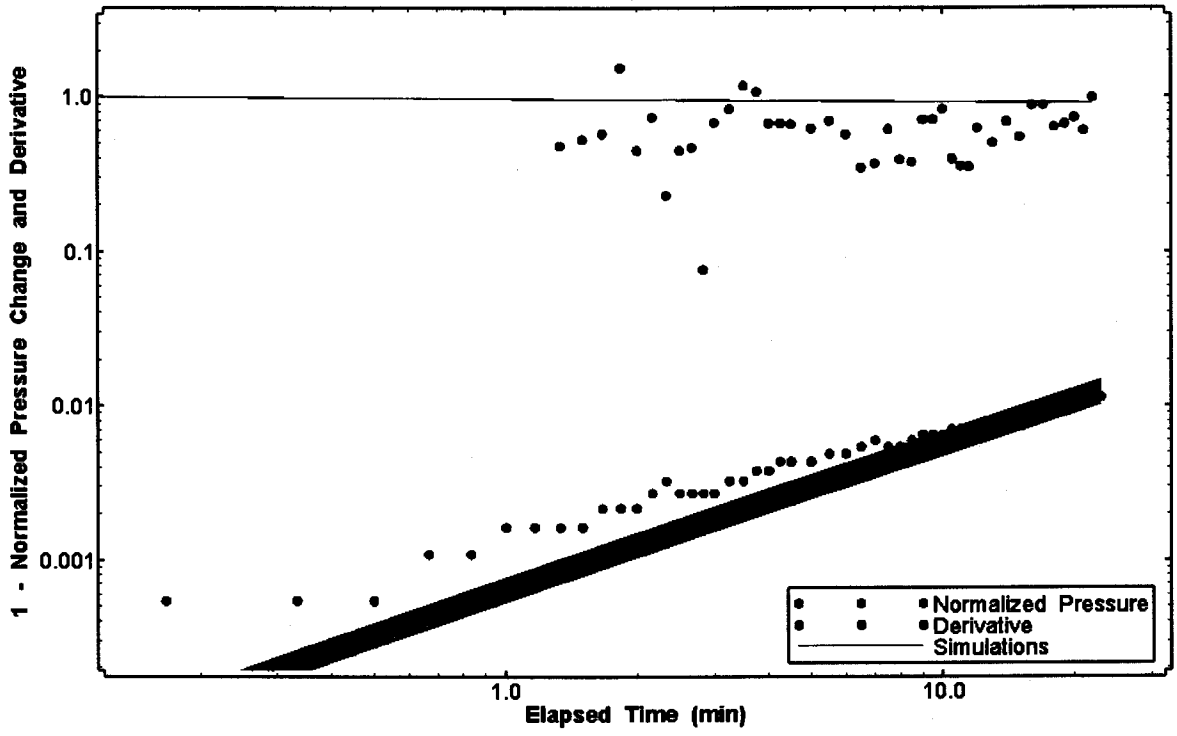

Figure 11. Log-log plot showing 374 simulations of the DOE-2 DST flow period Ramey C and derivative response.

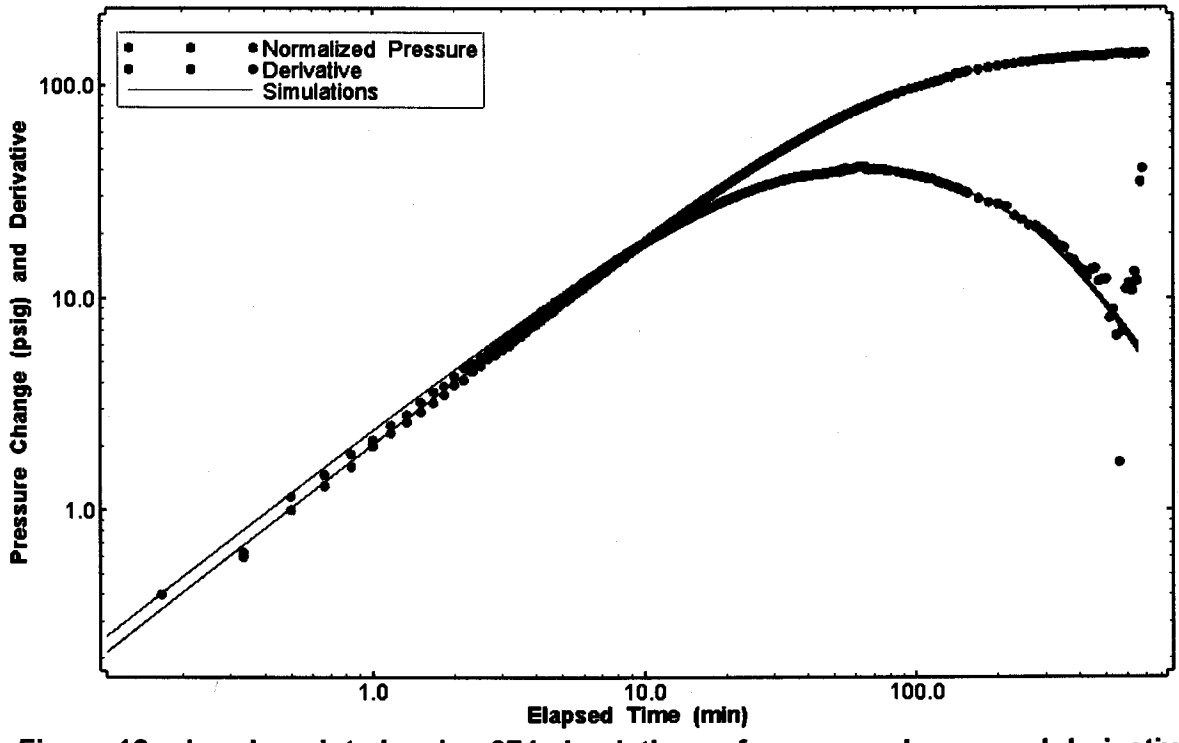

Figure 12. Log-log plot showing 374 simulations of pressure change and derivative during the DOE-2 DST buildup period.

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4.2 H-2a

Well H-2a was part of a three nested well complex (with H-2b and H-2c) intended to create an opportunity for interference testing and evaluation of the vertical conductivities between the Magenta Member of the Rustler Formation, Culebra Member of the Rustler Formation, and Salado Formation. The Magenta interval in well H-2a was drilled between February 19 and February 22, 1977 (Mercer and Orr, 1979). The inner diameter (ID) of the well was 4.75 in with a 10.75-in surface casing that contained 1.995-in ID tubing. A physical description of the well is detailed in Figure 13.

The USGS initiated a slug injection test in the H-2a Magenta interval on February 15, 1979 (Huff and Gregory, 2006). Monitoring of the slug response was concluded on February 18, 1979. The data used in this analysis are shown in Figure 14.

The nSIGHTS H-2a simulation consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-2a.nPre file and are listed in Appendix B.2.

The specified H-2a conceptual model, chosen because it was the simplest model consistent with the available information that produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values obtained from perturbation analysis is shown in Figure 15. The geometric mean T estimate derived from this analysis was 2.72E-9 m^2/s. The Cartesian, Ramey A, Ramey B, and Ramey C responses corresponding to these T values are shown in Figures 16-19, respectively.

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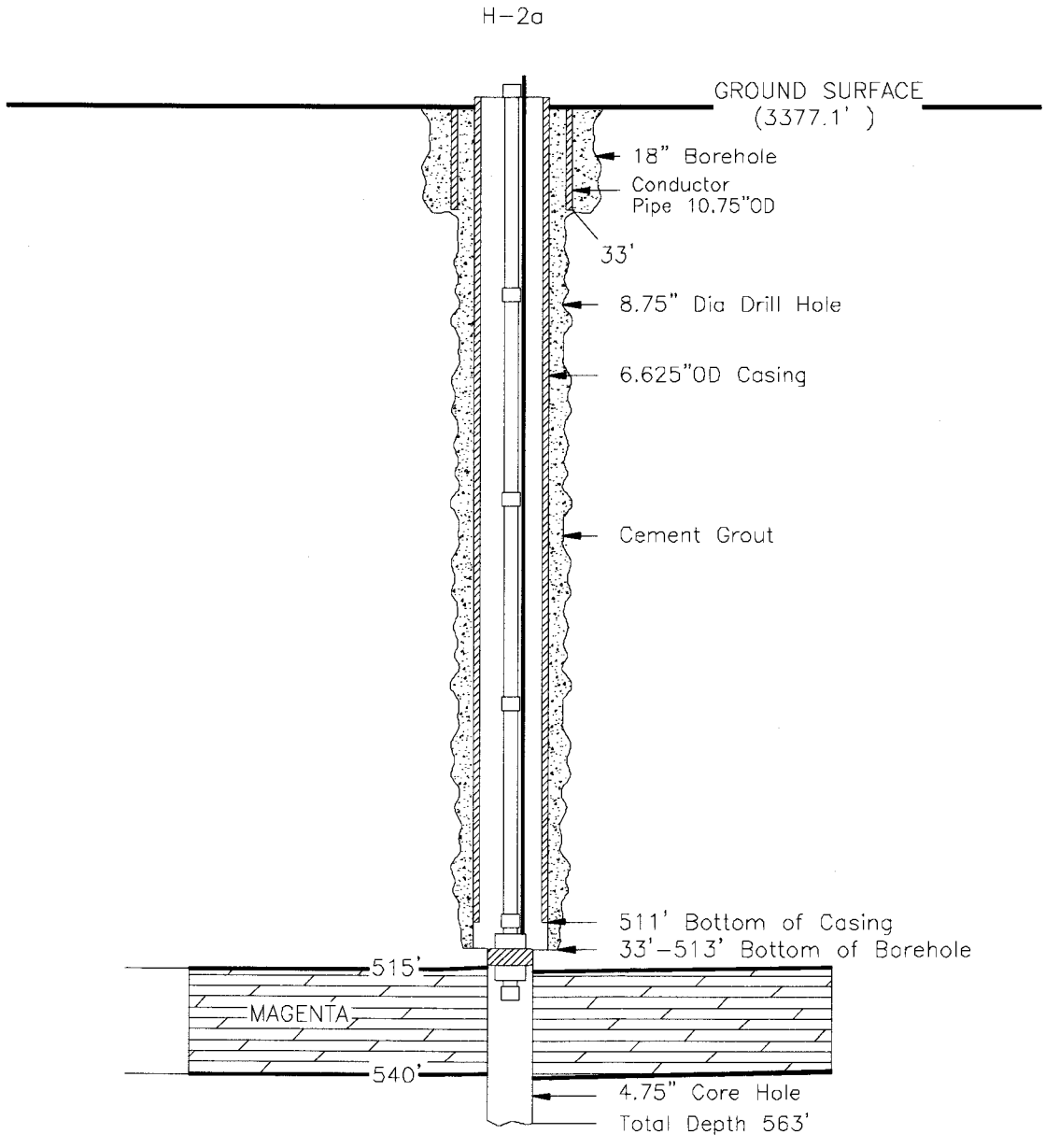

NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 13. H-2a well configuration during testing.

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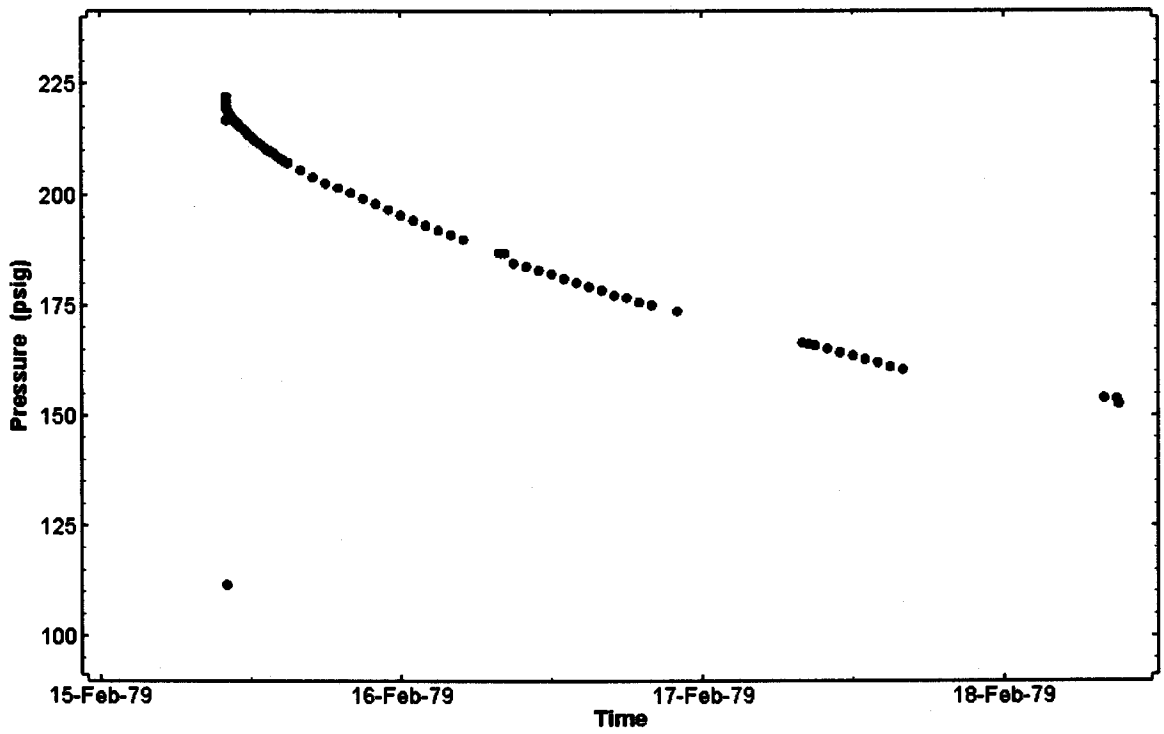

Figure 14. Pressure data from Magenta in H-2a.

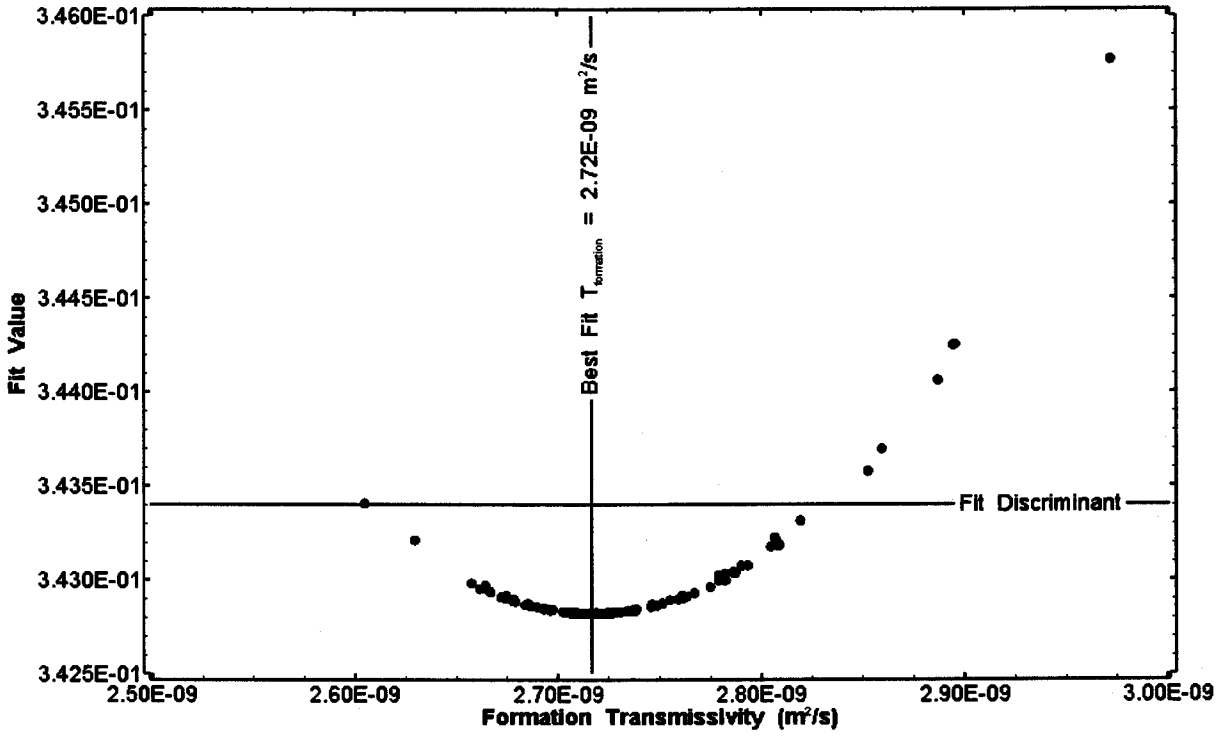

Figure 15. X-Y scatter plot showing the transmissivity parameter space derived from H-2a perturbation analysis along with the fit discriminant and best fit values.

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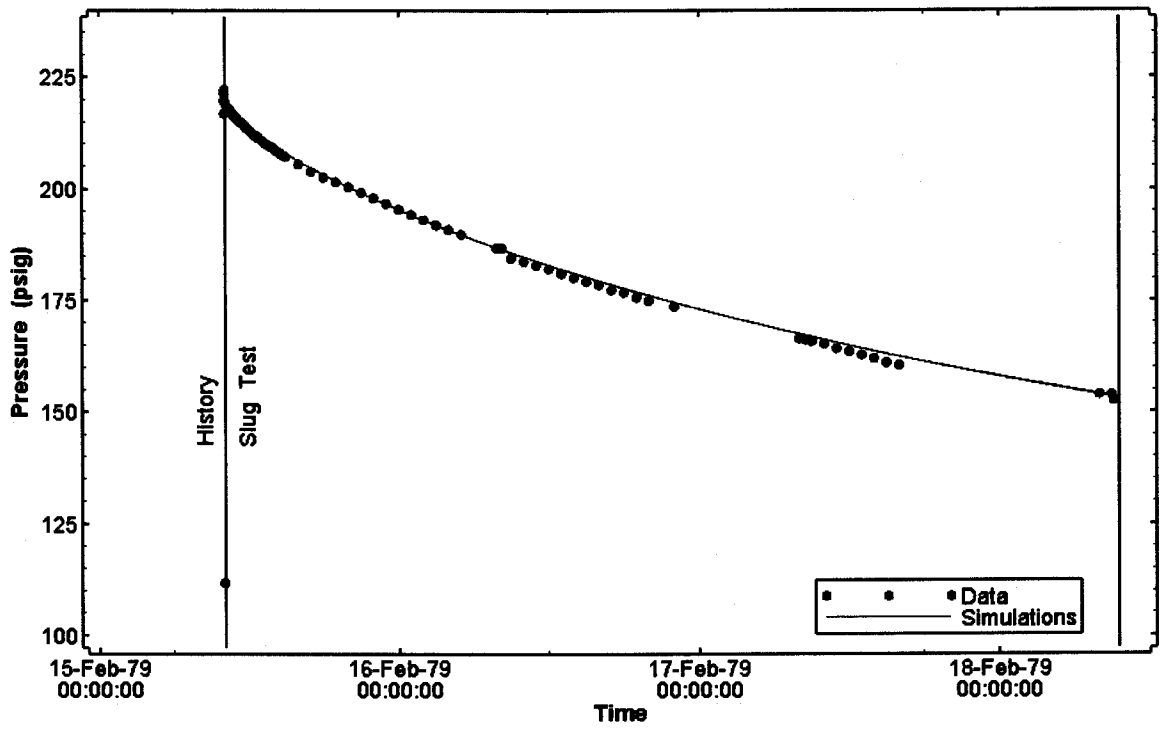

Figure 16. Linear plot showing 492 simulations of the H-2a pressure response.

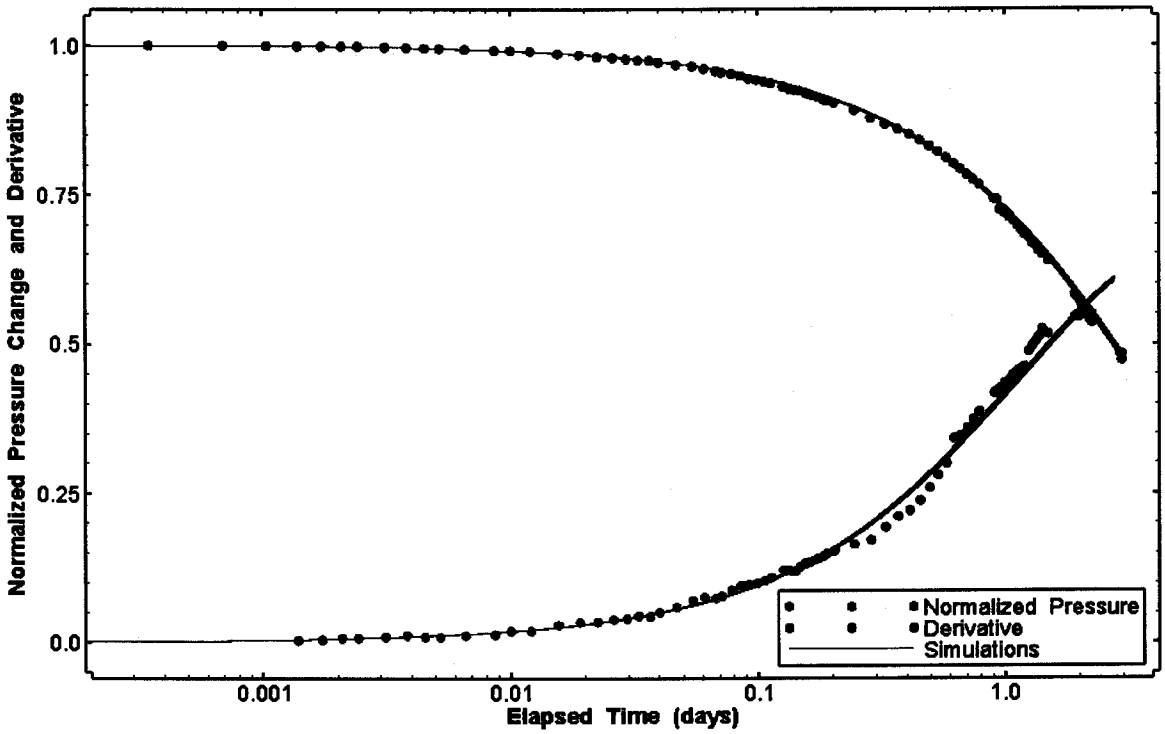

Figure 17. Semilog plot showing 492 simulations of the H-2a slug injection Ramey A and derivative response.

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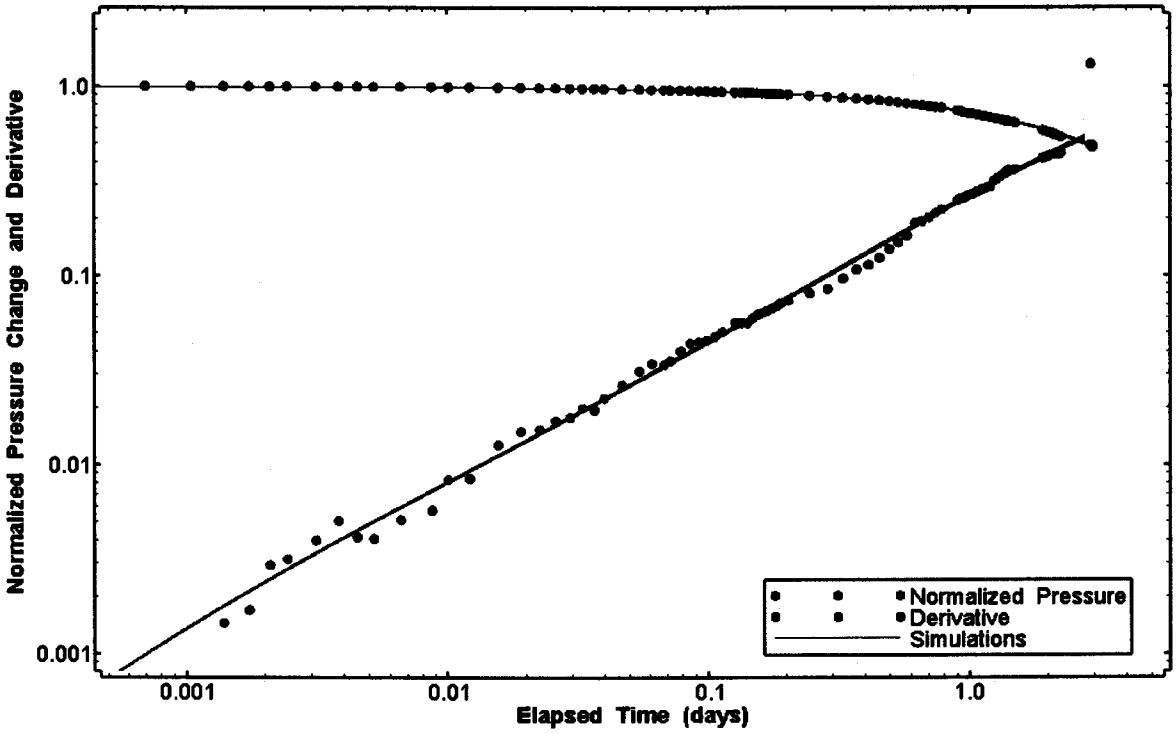

Figure 18. Log-log plot showing 492 simulations of the H-2a slug injection Ramey B and derivative response.

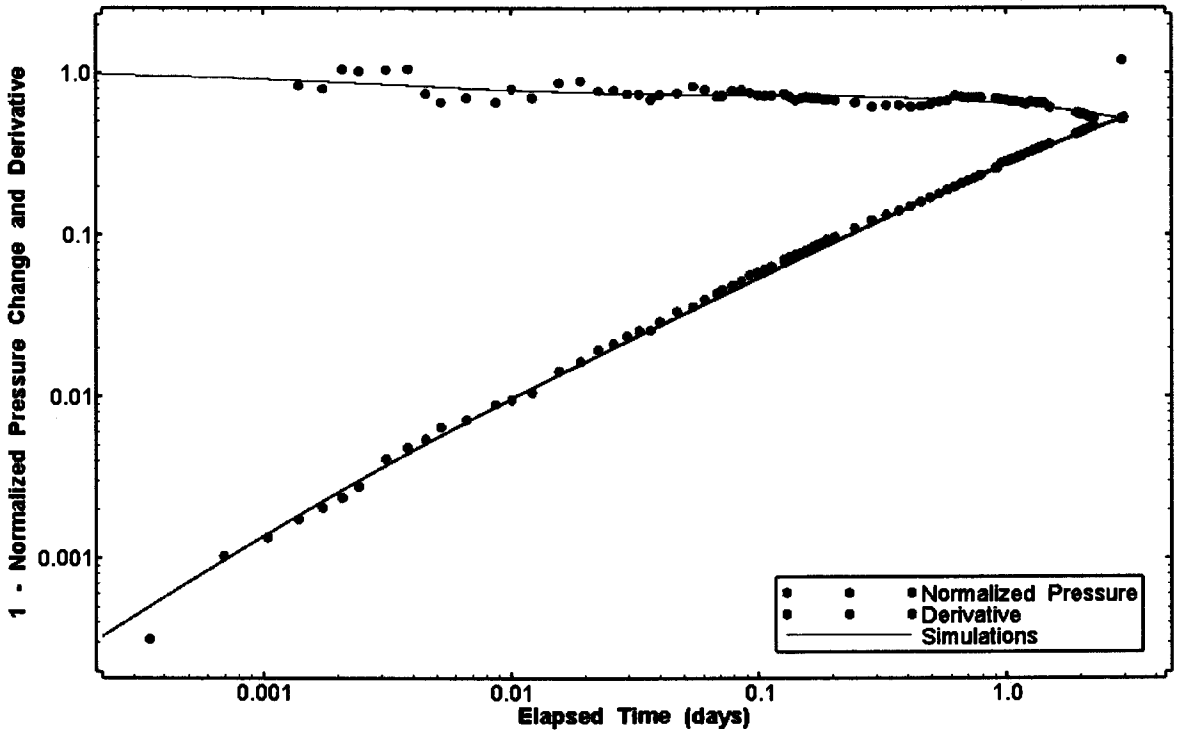

Figure 19. Log-log plot showing 492 simulations of the H-2a slug injection Ramey C and derivative response.

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4.3 H-3b1

The Magenta interval of well H-3b1 (previously designated as H-3) was rotary drilled on July 30, 1976 (Mercer and Orr, 1979). At the Magenta, the OD of the well was 8.75 in with a 6.625-in casing and a 10.75-in surface casing. A physical description of the well is detailed in Figure 20.

A slug injection test was initiated in H-3b1 (Mercer and Orr, 1979) on May 7, 1979, and concluded May 9, 1979. The data used in this analysis are shown in Figure 21.

The nSIGHTS simulation of the H-3b1 test consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-3b1.nPre file and are listed in Appendix B.3.

The specified H-3b1 conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage and skin. The range of T values obtained from perturbation analysis is shown in Figure 22. The geometric mean T estimate derived from this analysis was 4.17E-8 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these T values are shown in Figures 23-25, respectively.

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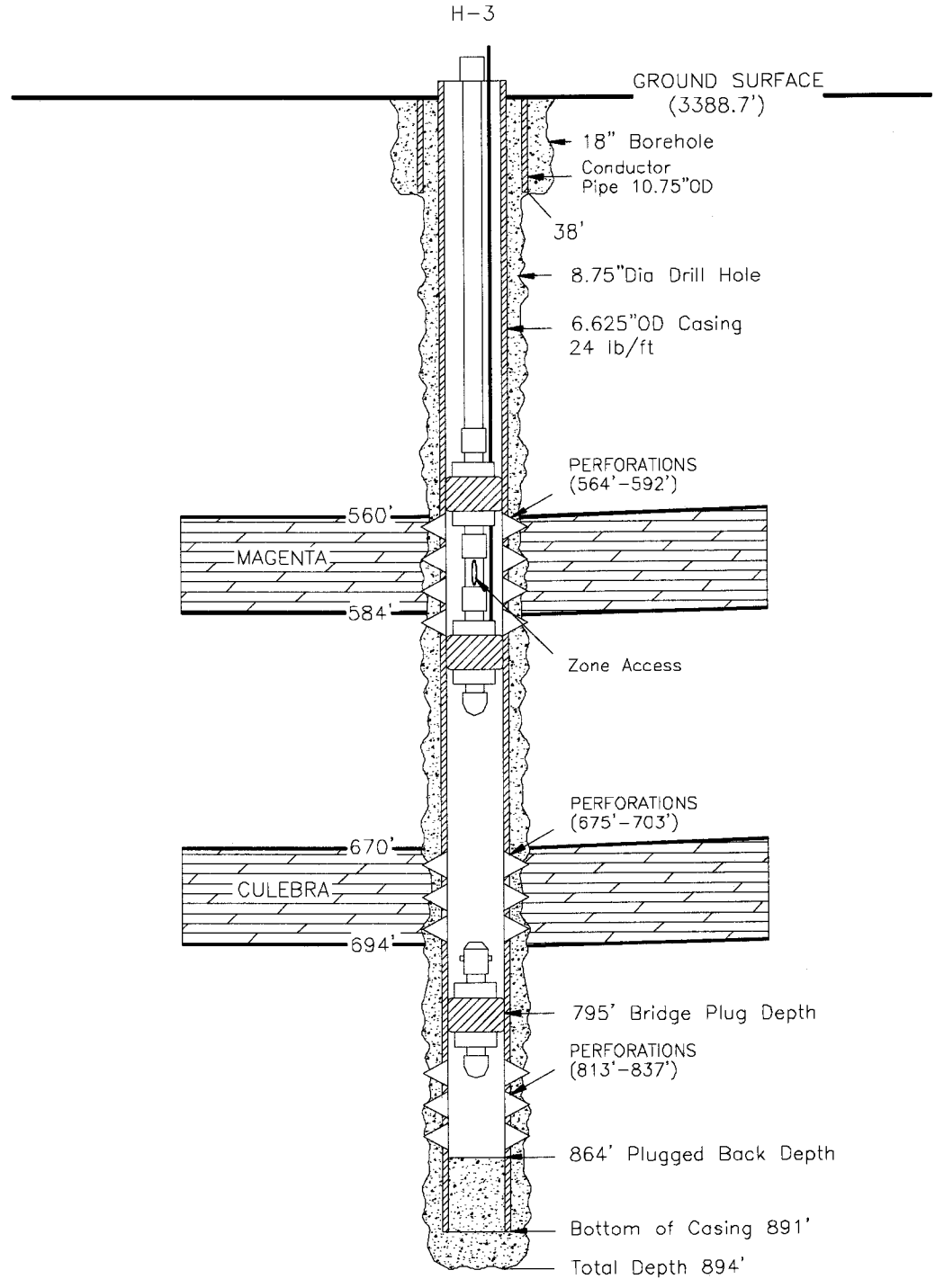

NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 20. H-3b1 well configuration during testing.

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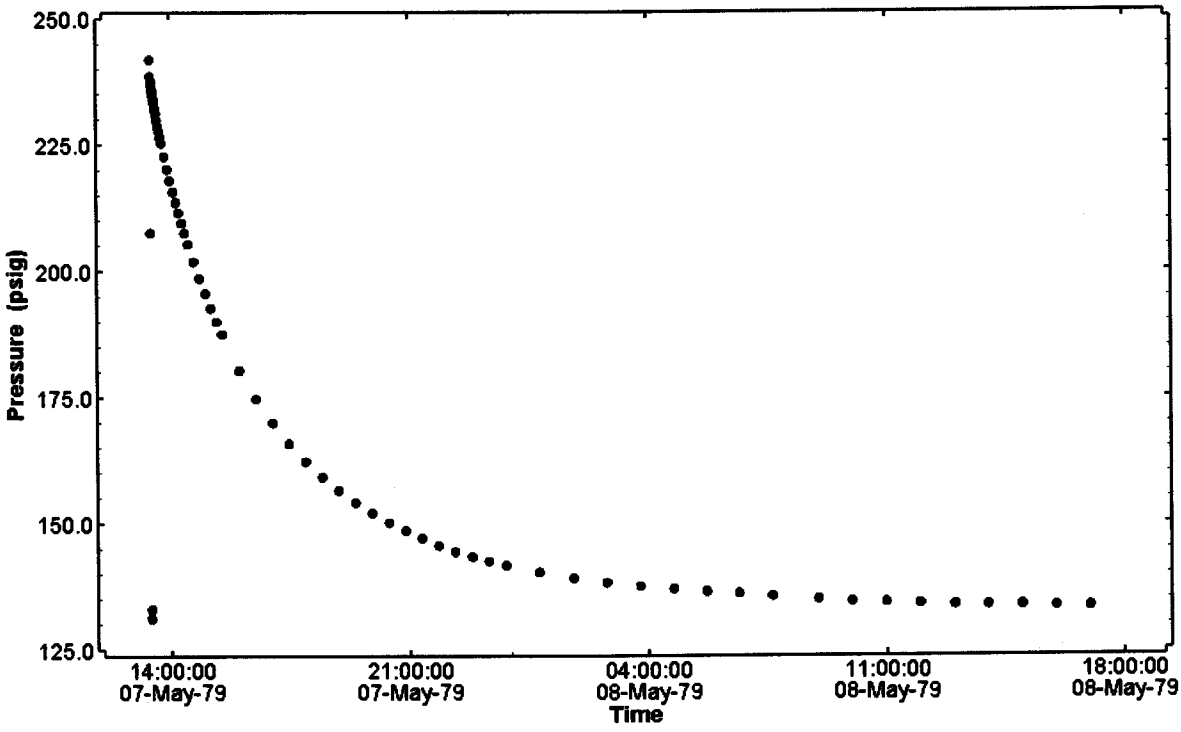

Figure 21. Pressure data from Magenta in H-3b1.

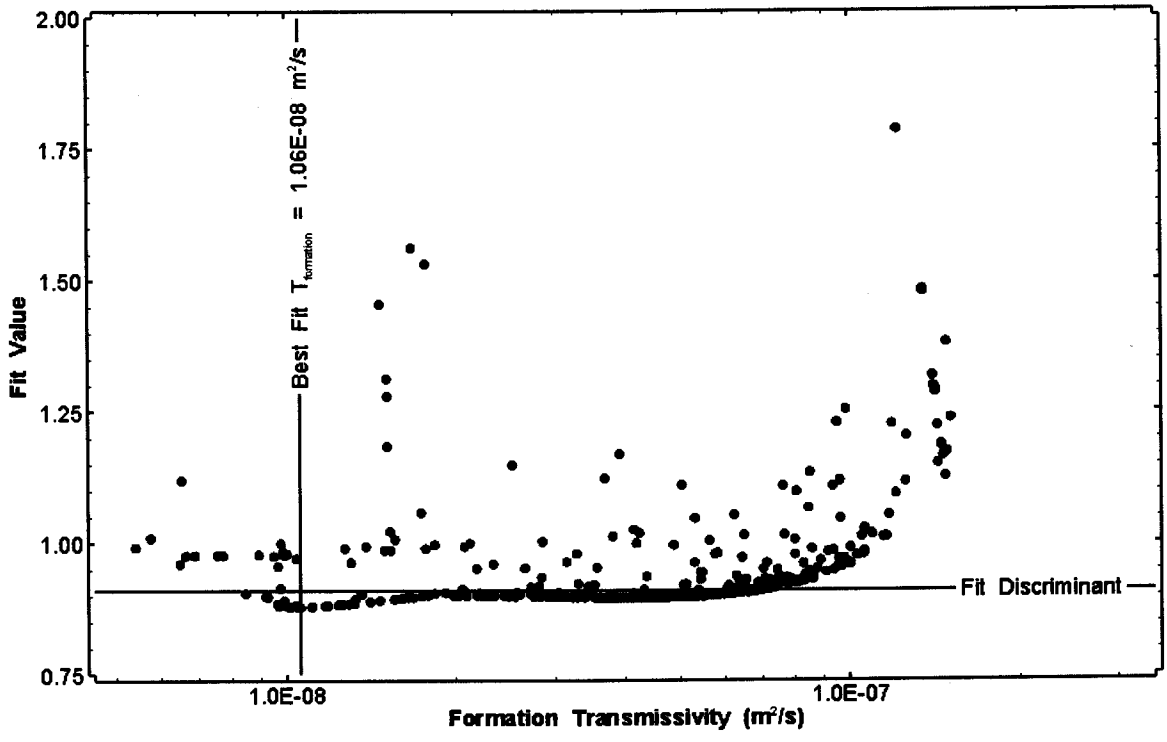

Figure 22. X-Y scatter plot showing the transmissivity parameter space derived from the H-3b1 perturbation analysis along with the fit discriminant and best fit values

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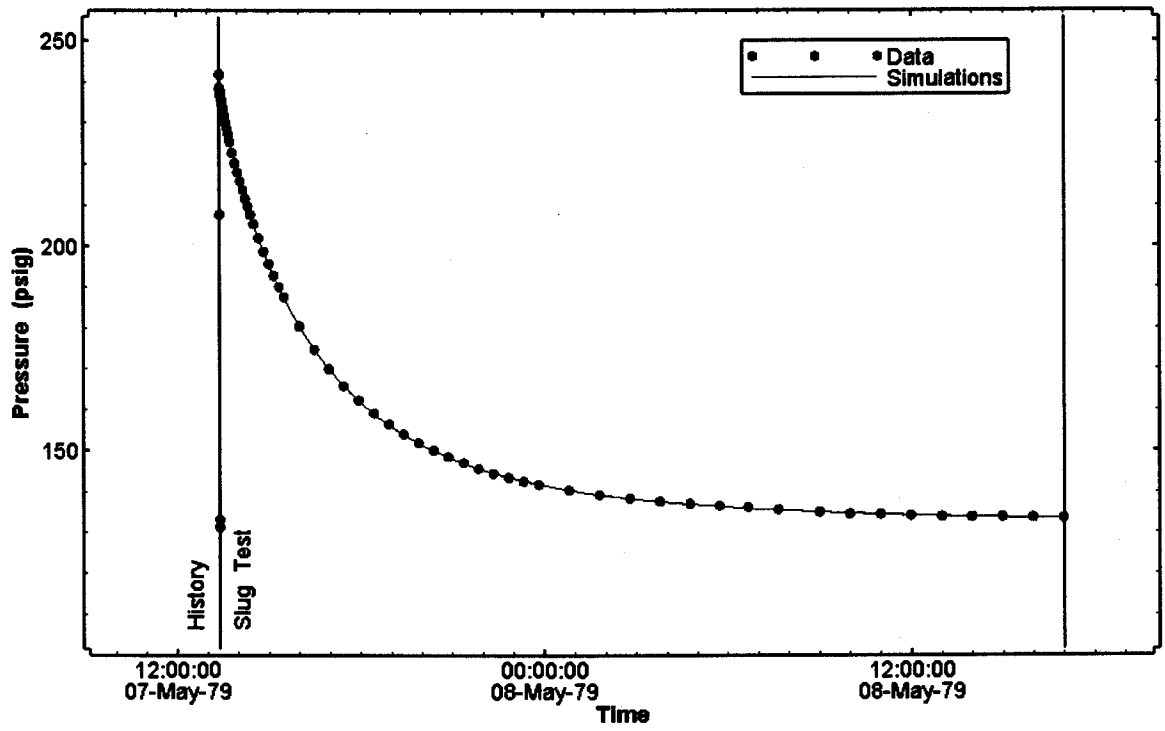

Figure 23. Linear plot showing 312 simulations of the H-3b1 pressure response.

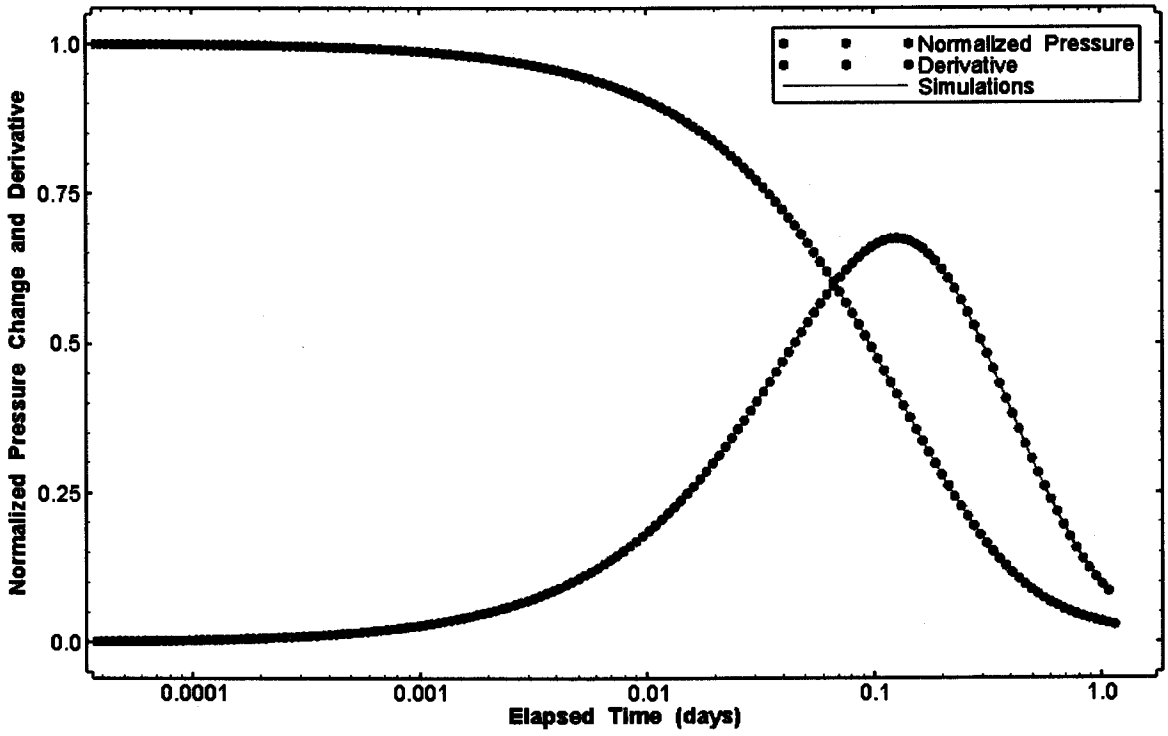

Figure 24. Semilog plot showing 312 simulations of the H-3b1 slug injection Ramey A and derivative response.

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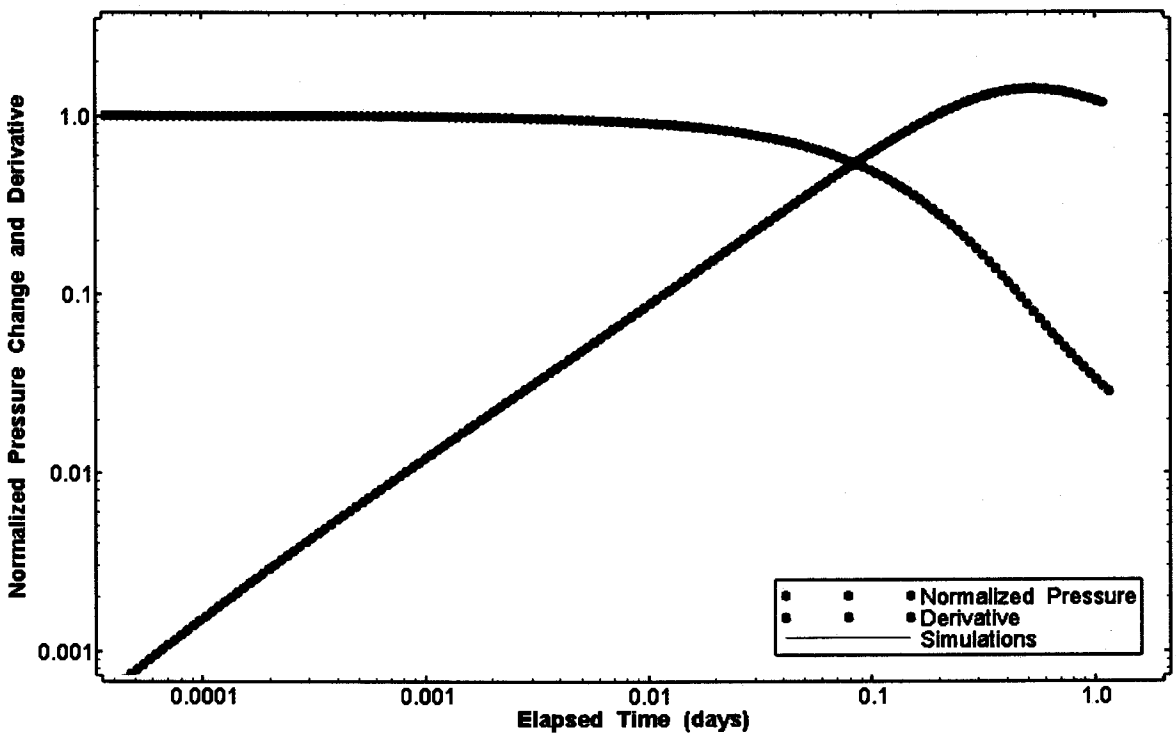

Figure 25. Log-log plot showing 312 simulations of the H-3b1 slug injection Ramey B and derivative response.

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4.4 H-4a

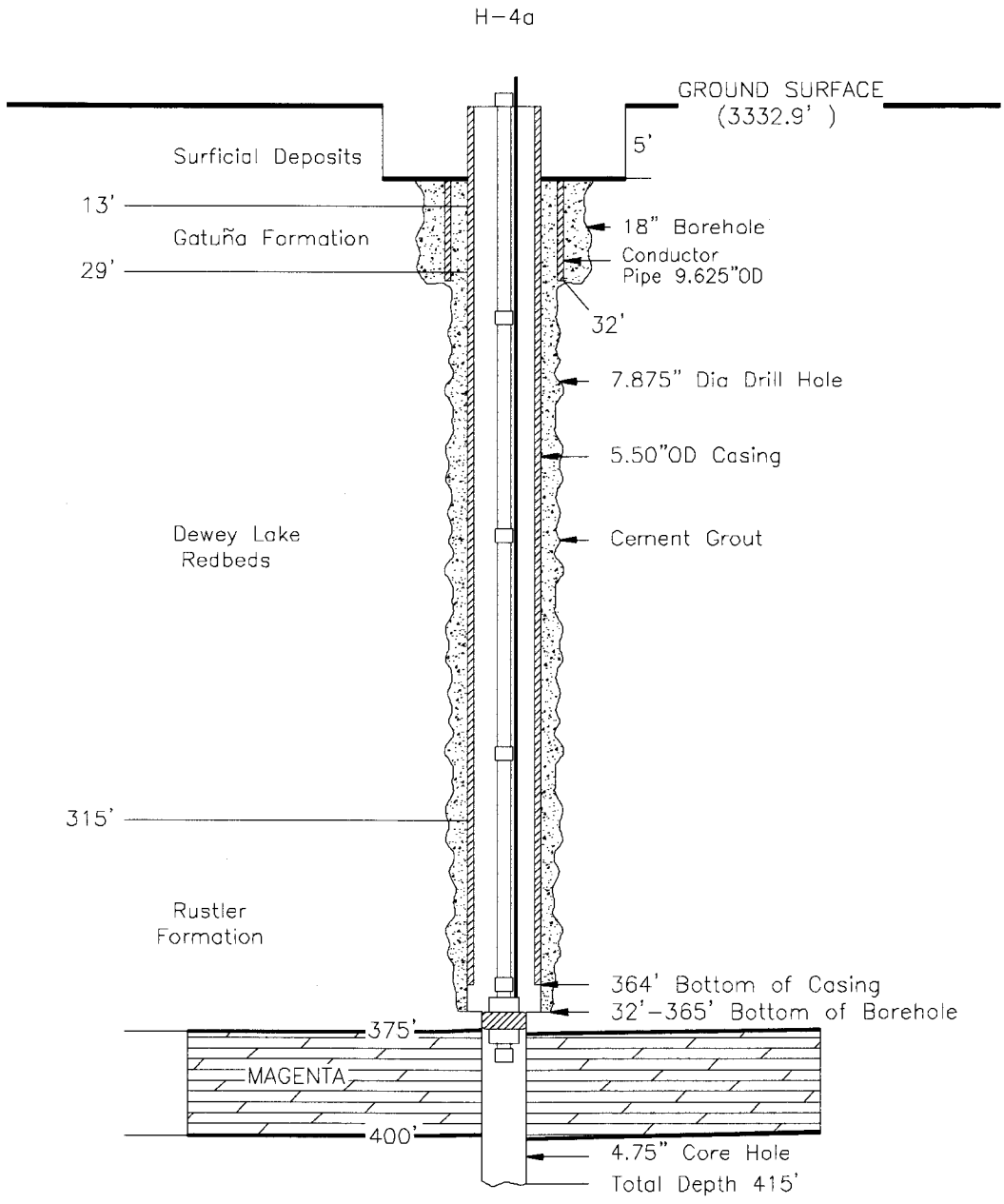
The Magenta interval of well H-4a was rotary drilled with air and air foam between May 16 and May 20, 1978 to a depth of 365 feet (Mercer et al., 1981). The well was deepened and cored on May 22 using air foam and water. The hole was then flushed with brine which was subsequently removed with air. Steel surface casing was set to a depth of 29 ft with a 9.625-in OD. At the Magenta, the OD of the well was 4.75 in. The siting for H-4a was based on the exploration of water-bearing zones above the WIPP near the southwestern boundary of the site (Mercer et al., 1981). A physical description of the well is detailed in Figure 26.

A slug-injection test was initiated in H-4a on December 2, 1978, and was monitored for 3 hours. The data used in this analysis are shown in Figure 27.

The nSIGHTS simulation of the H-4a test consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-4a.nPre file and are listed in Appendix B.4.

The specified H-4a conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values derived from perturbation analysis is shown in Figure 28. The geometric mean T estimate derived from this analysis was 6.37E-8 m^2/s. The Cartesian, Ramey A, Ramey B, and Ramey C simulations corresponding to the T values shown in Figure 28 are shown in Figures 29-32, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 26. H-4a well configuration during testing.

Information Only

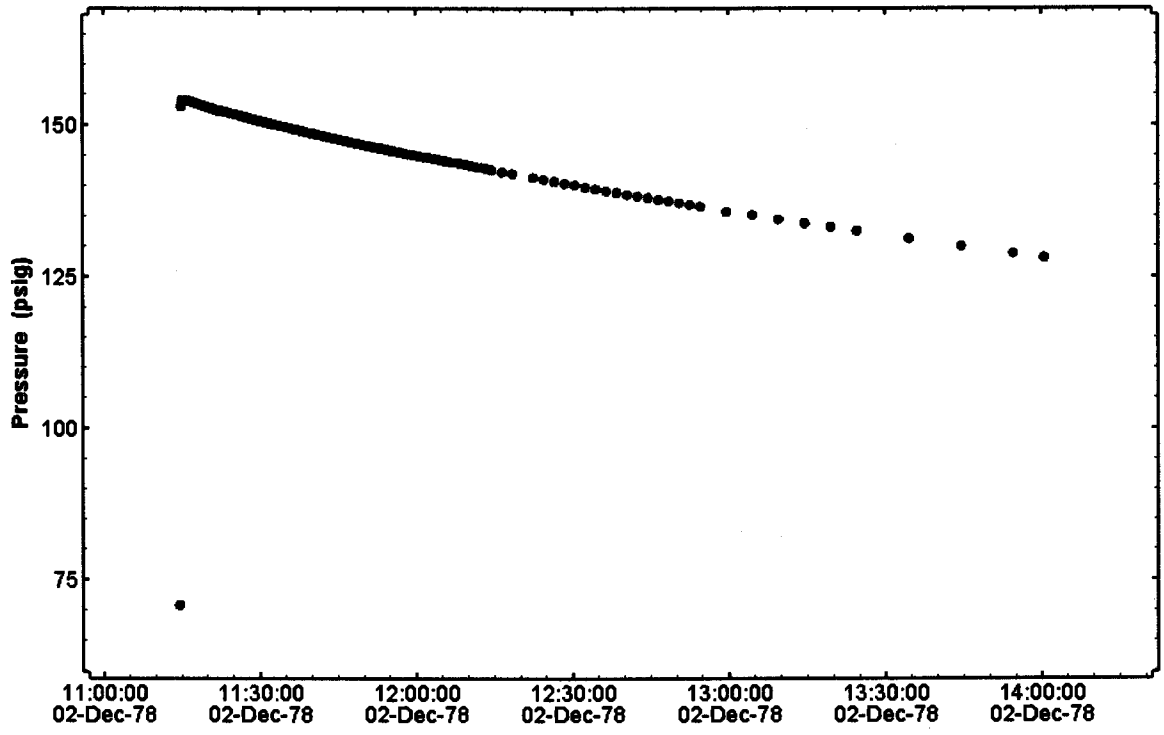


Figure 27. Pressure data from Magenta in H-4a.

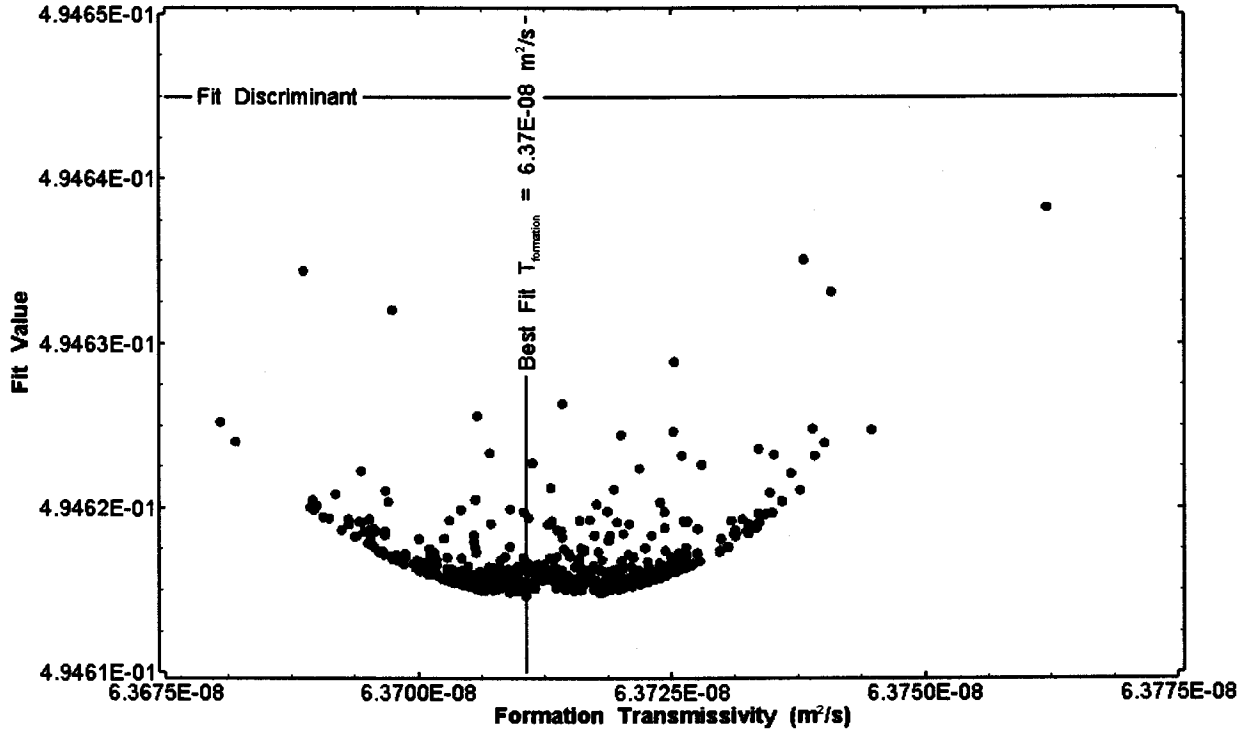


Figure 28. X-Y scatter plot showing the transmissivity parameter space derived from the H-4a perturbation analysis along with the fit discriminant and best fit values.

Information Only

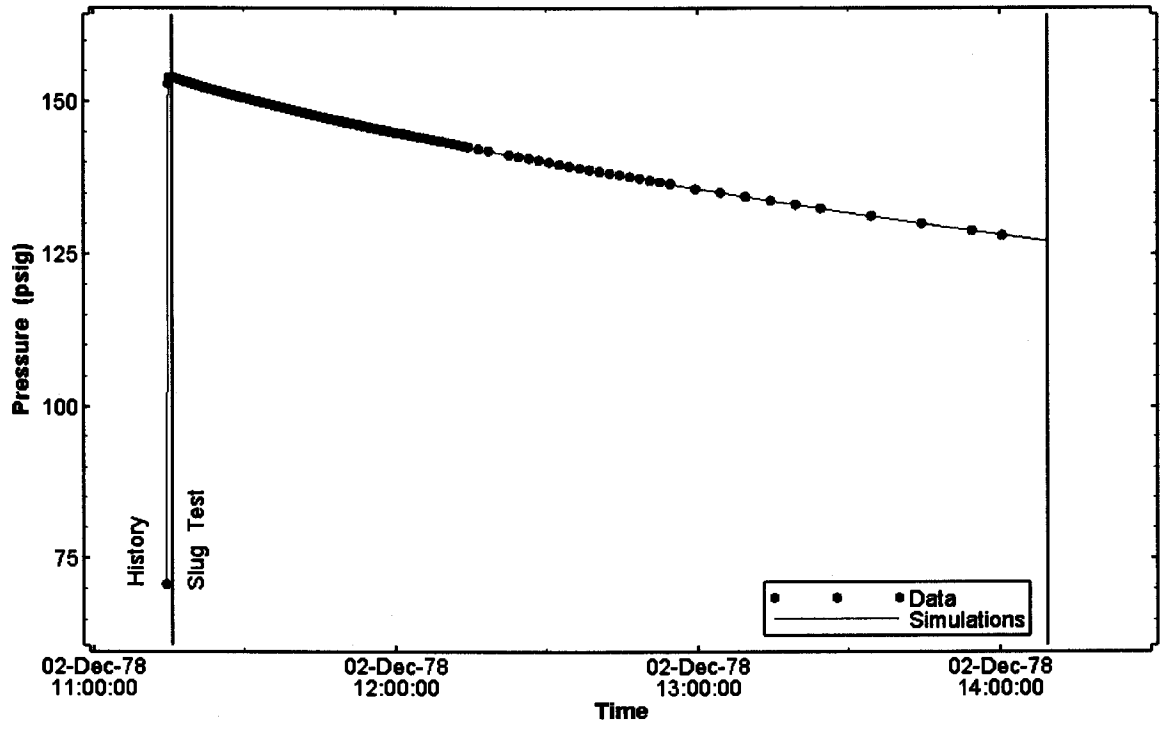


Figure 29. Linear plot showing 499 simulations of the H-4a pressure response.

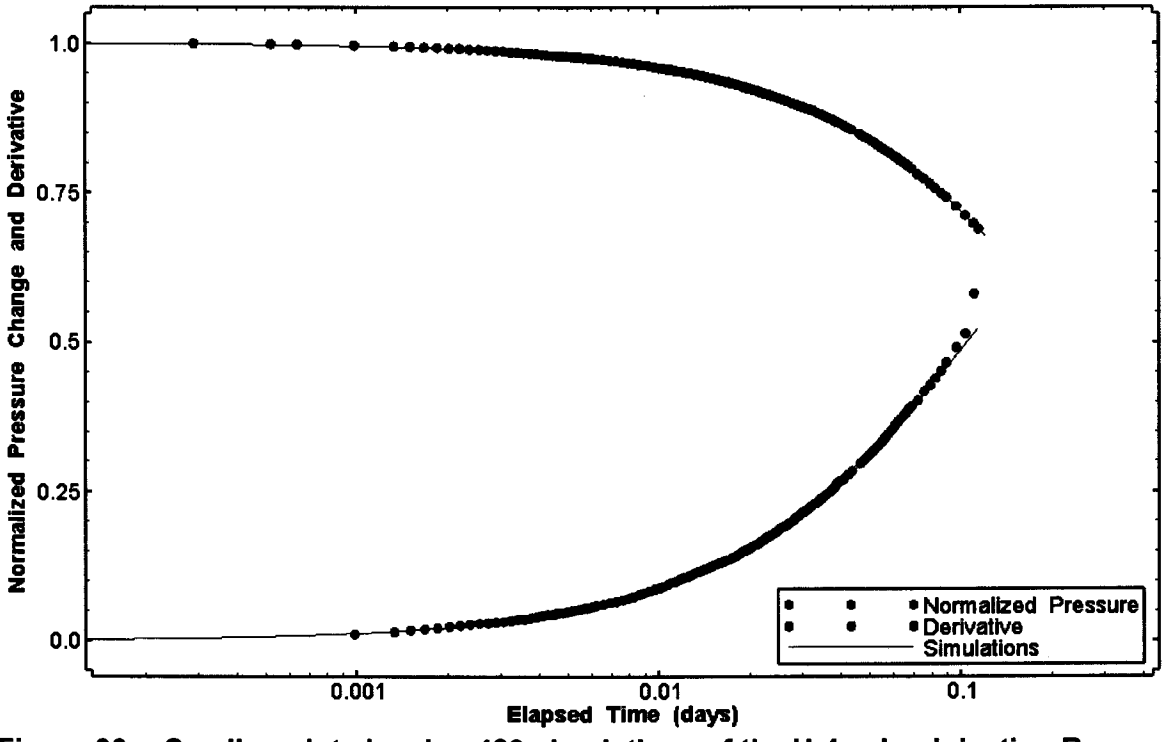


Figure 30. Semilog plot showing 499 simulations of the H-4a slug injection Ramey A and derivative response.

Information Only

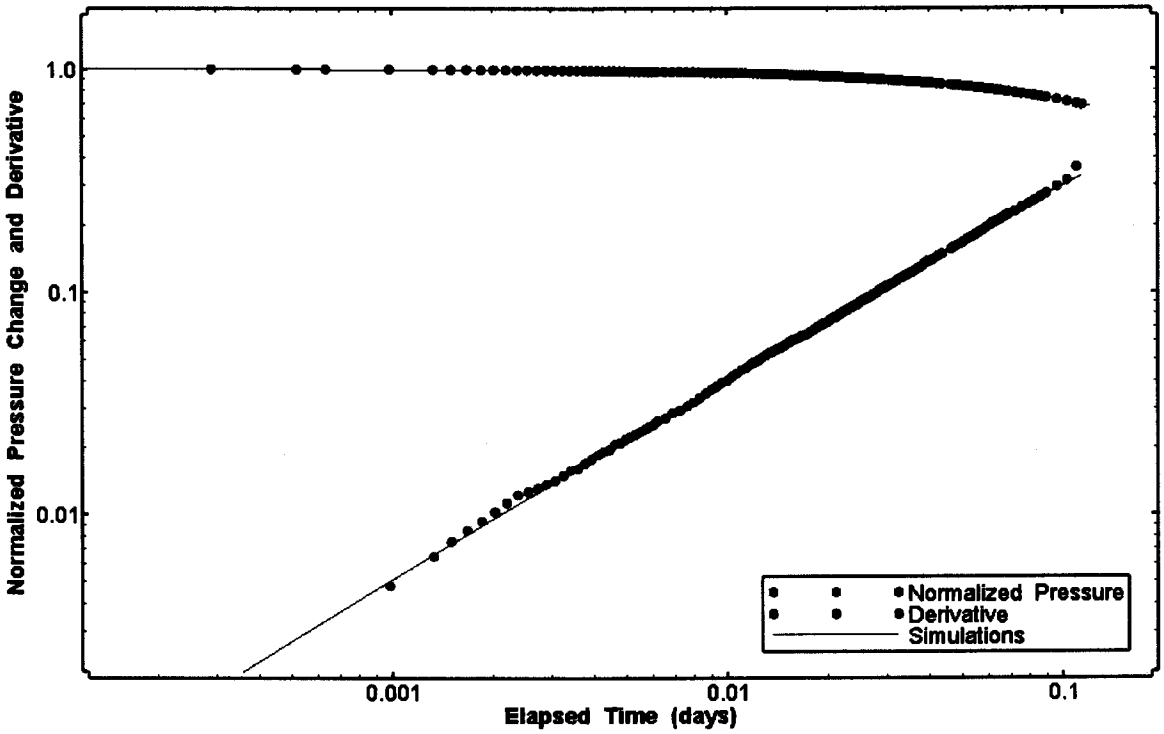


Figure 31. Log-log plot showing 499 simulations of the H-4a slug injection Ramey B and derivative response.

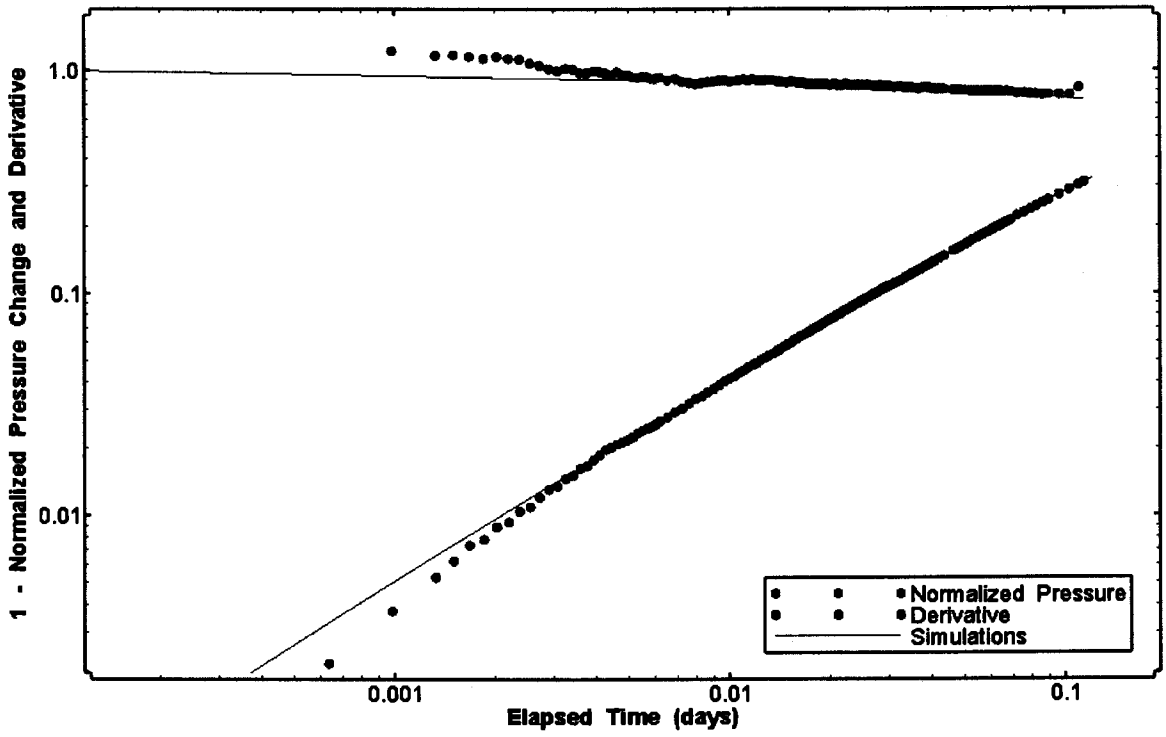


Figure 32. Log-log plot showing 499 simulations of the H-4a slug injection Ramey C and derivative response.

Information Only

4.5 H-5a

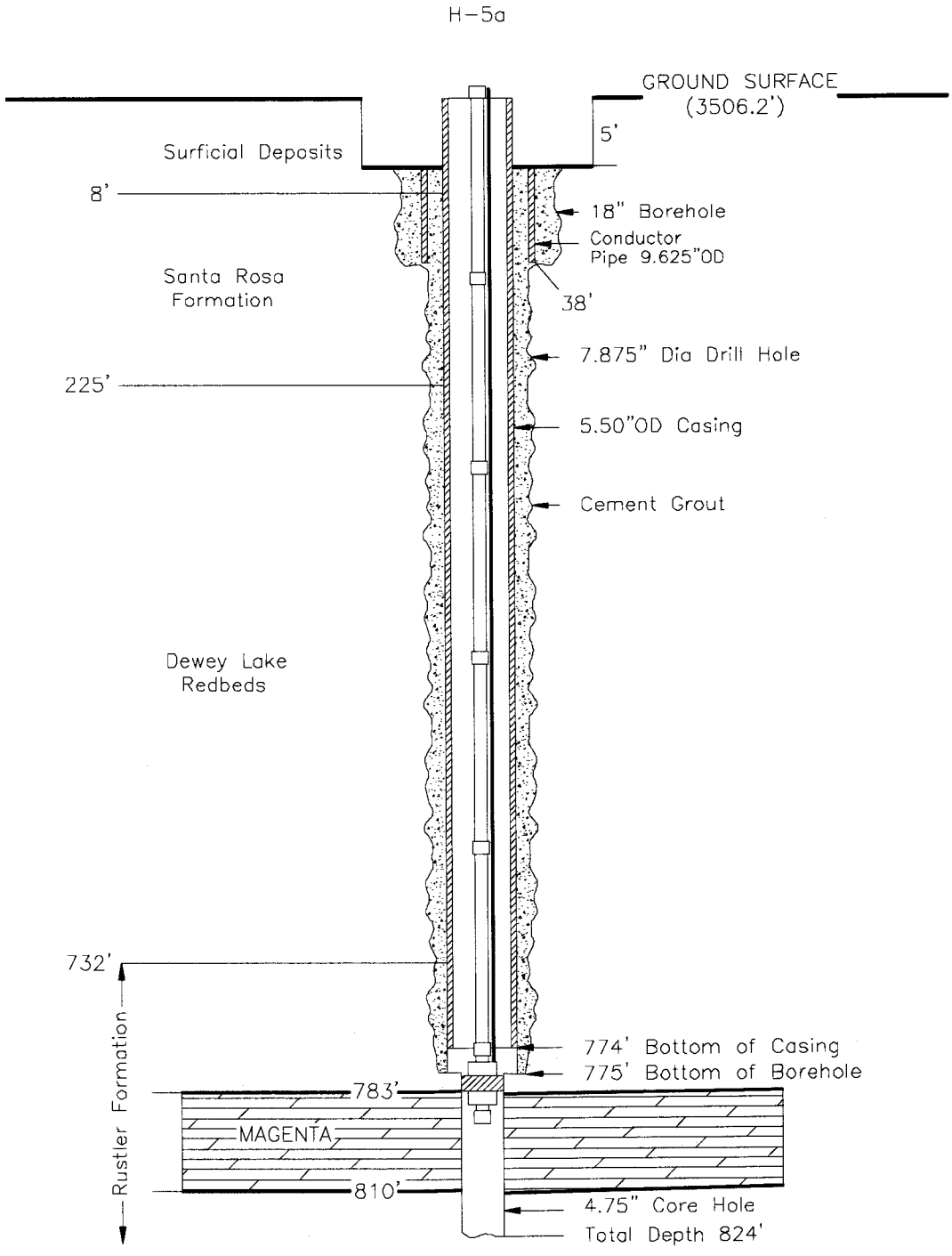
H-5a was rotary drilled with air and air foam to 775 ft between June 13 and June 17, 1978 (Dennehy and Mercer, 1982). The Magenta interval was then cored from 775 ft to 824 feet using brine between June 19 and June 20, 1978. At the Magenta, the well was 4.75-in OD core hole below an 8.92 inch (ID) surface casing that contained 4.95-in ID casing over depths of 0-774 ft. The siting for H-5a was chosen in support of determining transmissivity and storage estimates above the salt section near the northeastern boundary of the WIPP site. H-5a was one of 3 nested wells, each drilled to specific strata of interest (H-5a Magenta, H-5b Culebra, H-5c Salado). A physical description of the well is detailed in Figure 33.

A slug-injection test was initiated in H-5a (Dennehy and Mercer, 1982) on December 11, 1978. The response was monitored for approximately 10 hours. The data used for this analysis are shown in Figure 34.

The nSIGHTS simulation of the H-5a test consisted of three sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-5a.nPre file and are listed in Appendix B.5.

The specified H-5a model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values derived from perturbation analysis is shown in Figure 35. The geometric mean T estimate derived from this analysis was 1.16E-7 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these T values are shown in Figures 36-38, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 33. H-5a well configuration during testing.

Information Only

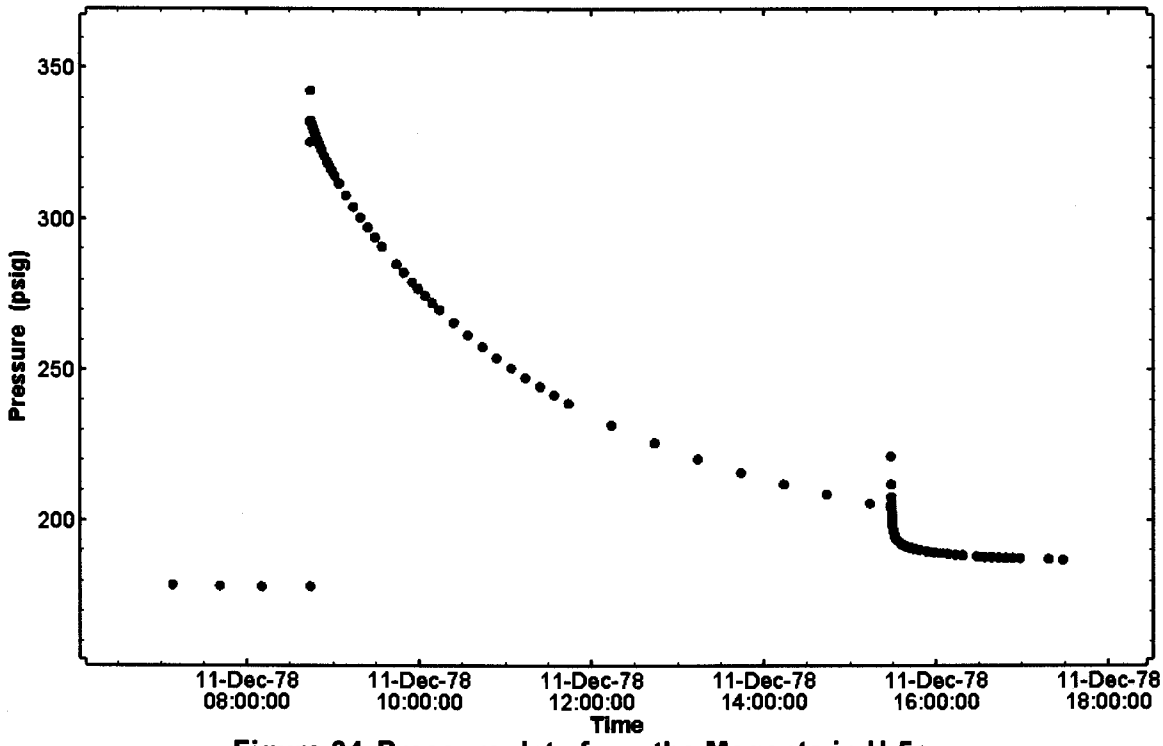


Figure 34. Pressure data from the Magenta in H-5a.

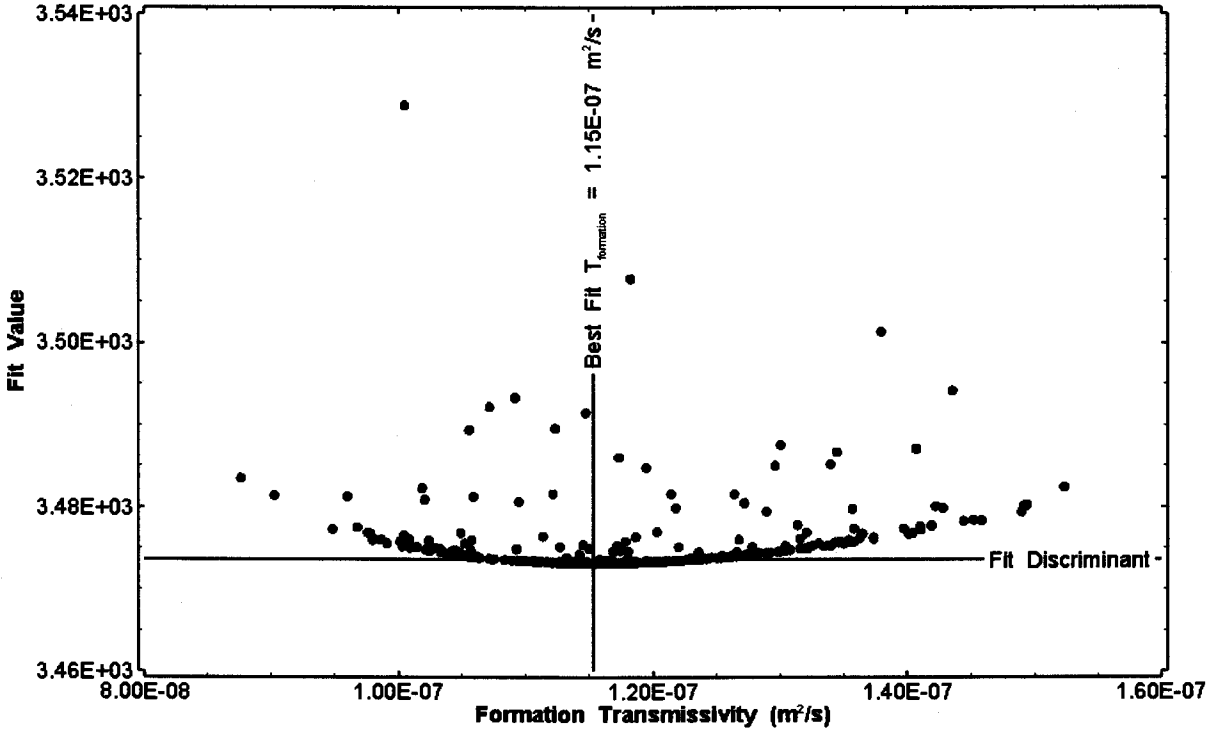


Figure 35. X-Y scatter plot showing the transmissivity parameter space derived from H-5a perturbation analysis along with the fit discriminant and best fit values.

Information Only

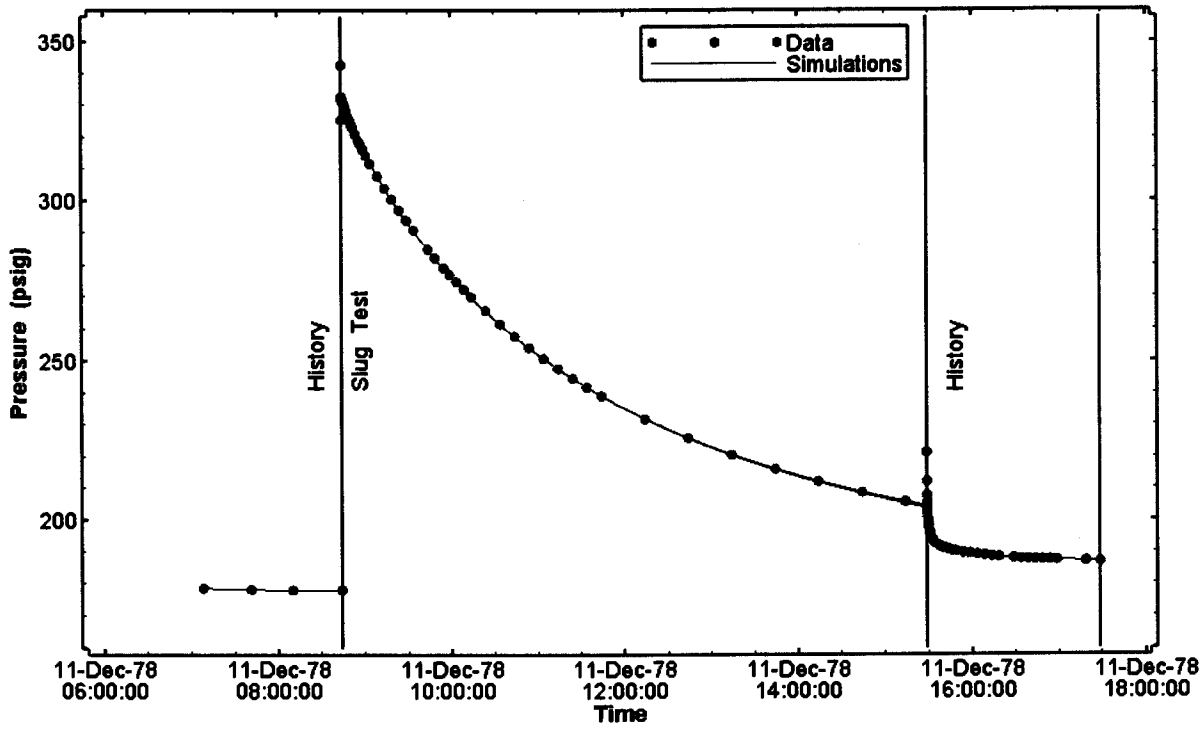


Figure 36. Linear plot showing 309 simulations of the H-5a pressure response.

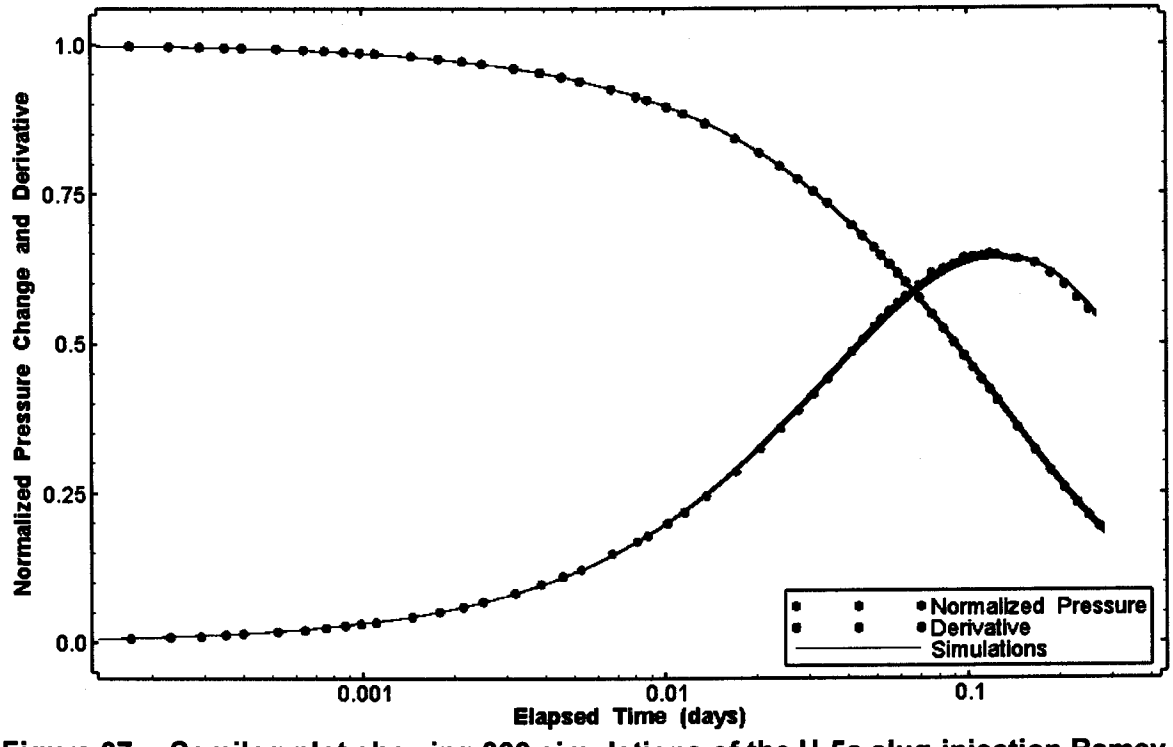


Figure 37. Semilog plot showing 309 simulations of the H-5a slug-injection Ramey A and derivative response.

Information Only

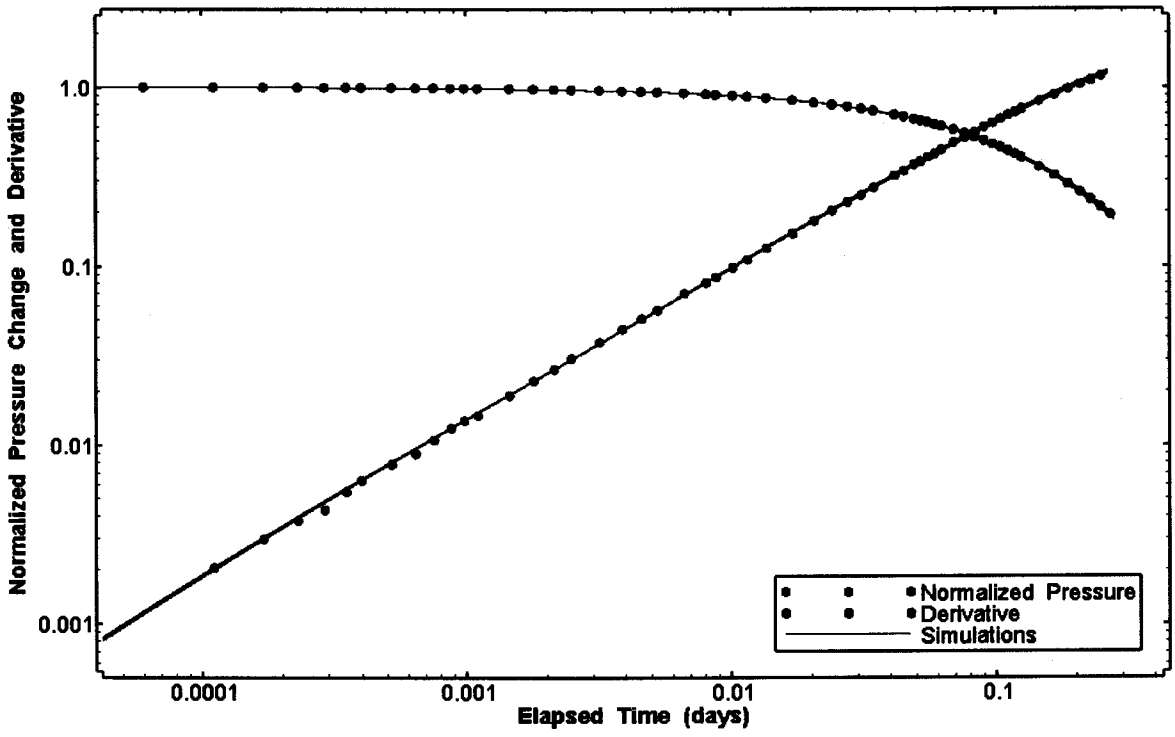


Figure 38. Log-log plot showing 309 simulations of the H-5a slug-injection Ramey B and derivative response.

Information Only

4.6 H-6a

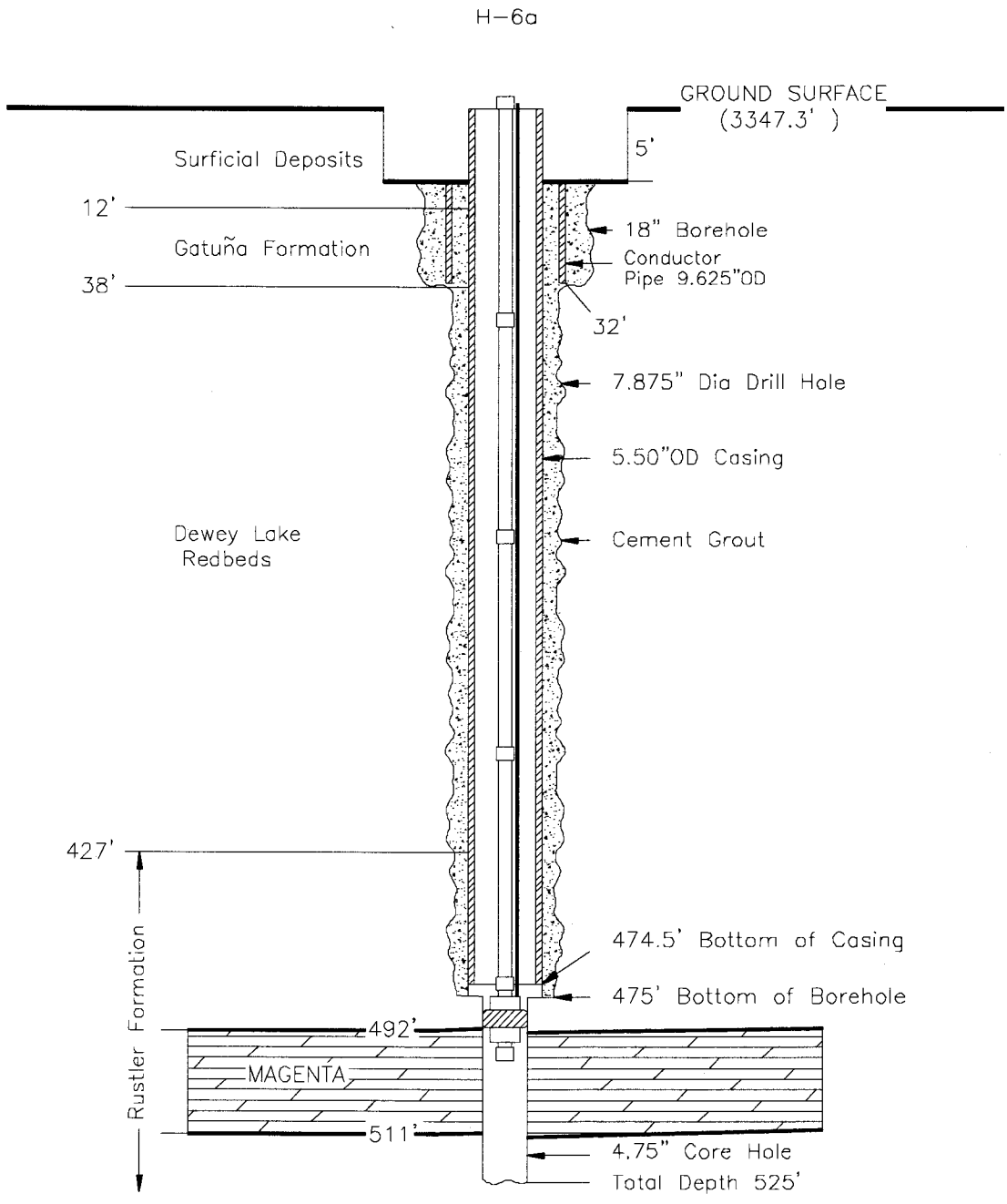
H-6a was rotary drilled to a depth of 475 ft with air between July 6 and July 7, 1978 (Dennehy, 1982). The Magenta interval of well H-6a was then cored from 475 to 525 ft using freshwater and then flushed with brine. At the Magenta, the well was 4.75-in ID core hole with 8.92-in ID surface casing to a depth of 38 feet and 4.95-in ID tubing that extends from the surface to a depth of 475 ft. The H-6a nest of wells was drilled for investigation of water chemistry and aquifer parameters above the Salado Formation. A physical description of the well is detailed in Figure 39.

A slug-injection test was initiated in H-6a (Dennehy, 1982) on December 17, 1978, and data collection ended on December 18, 1978. The data used in this analysis are shown in Figure 40.

The nSIGHTS simulation of the H-6a test consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-6a.nPre file and are listed in Appendix B.6.

The specified H-6a conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage and skin. The range of T values derived from perturbation analysis is shown in Figure 41. The geometric mean T estimate derived from this analysis was 9.02E-7 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these T values are shown in Figures 42-44, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 39. H-6a well configuration during testing.

Information Only

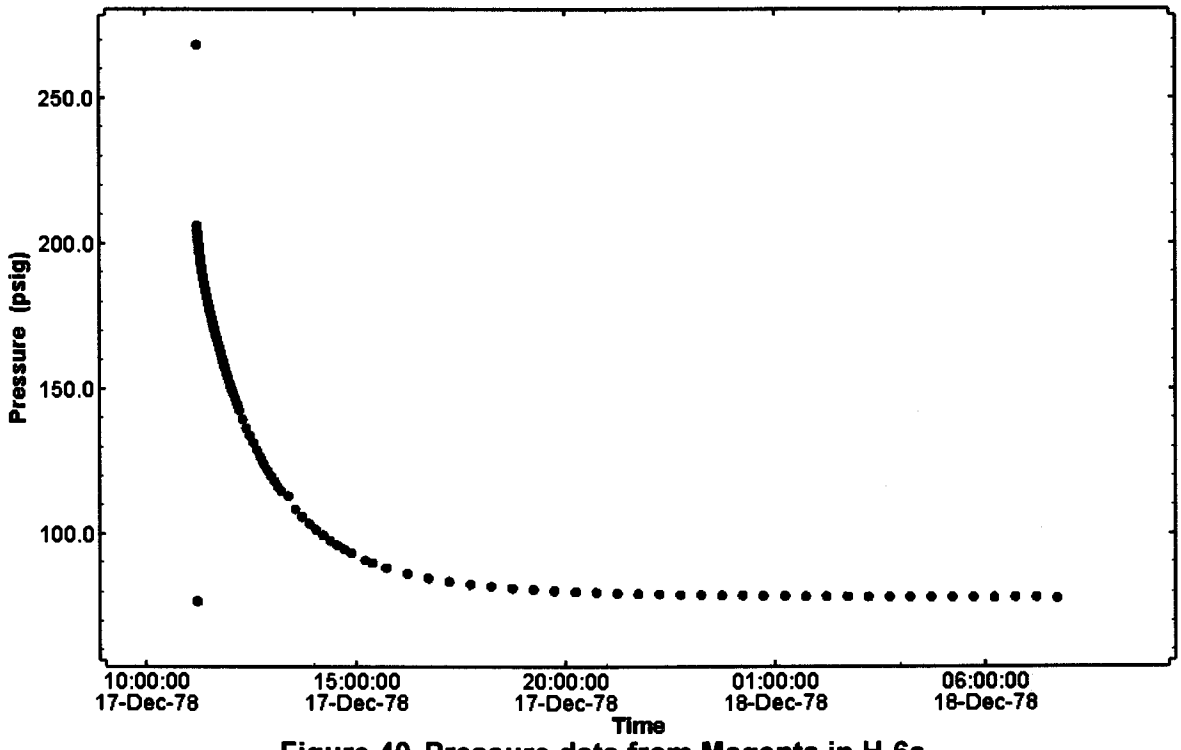


Figure 40. Pressure data from Magenta in H-6a.

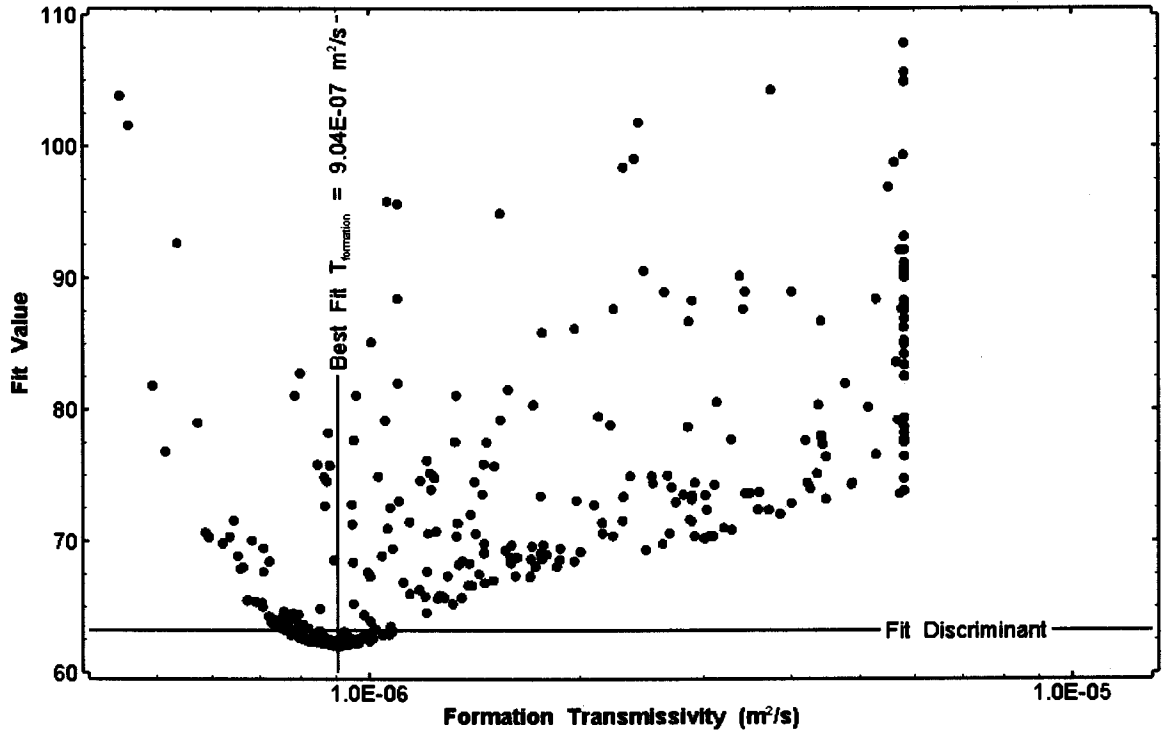


Figure 41. X-Y scatter plot showing the transmissivity parameter space derived from H-6a perturbation analysis along with the fit discriminant and best fit values.

Information Only

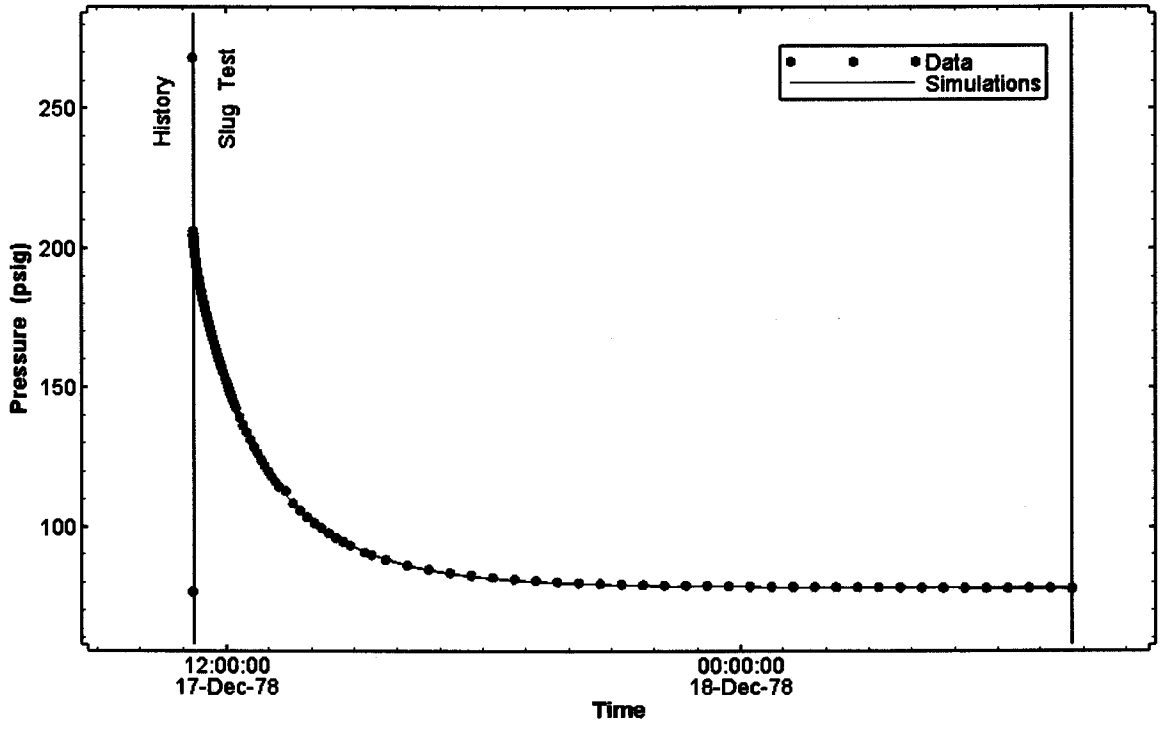


Figure 42. Linear plot showing 167 simulations of the H-6a pressure response.

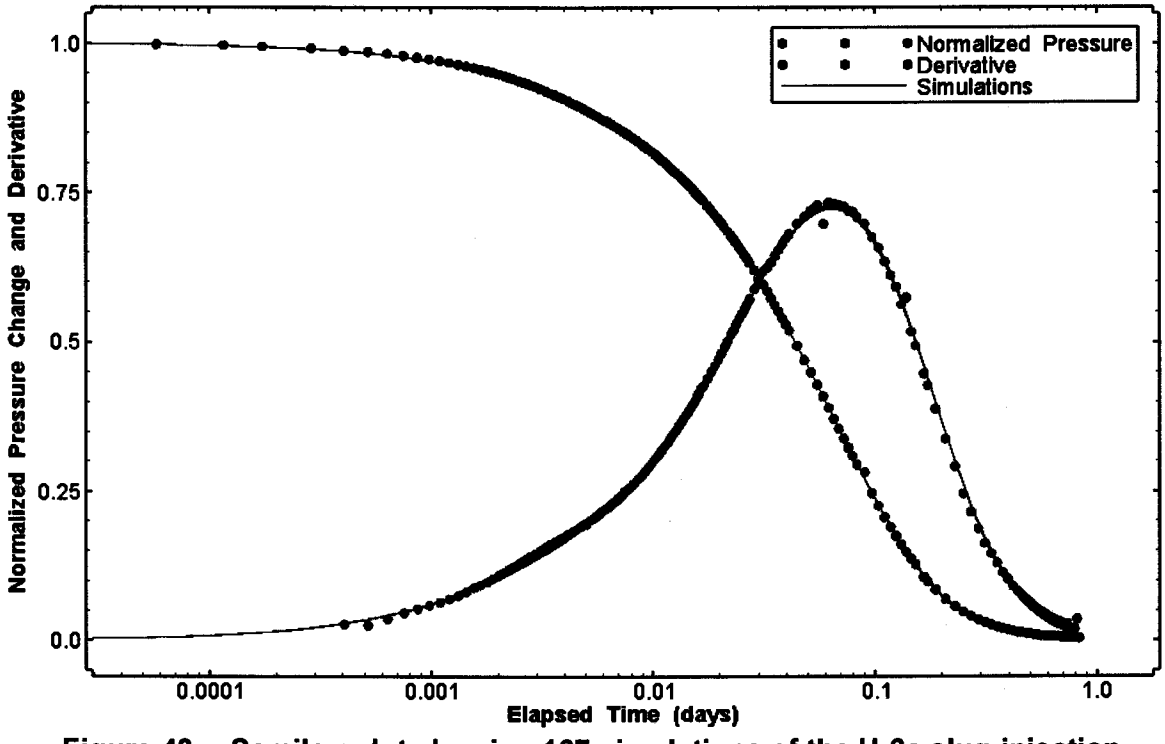


Figure 43. Semilog plot showing 167 simulations of the H-6a slug-injection Ramey A and derivative response.

Information Only

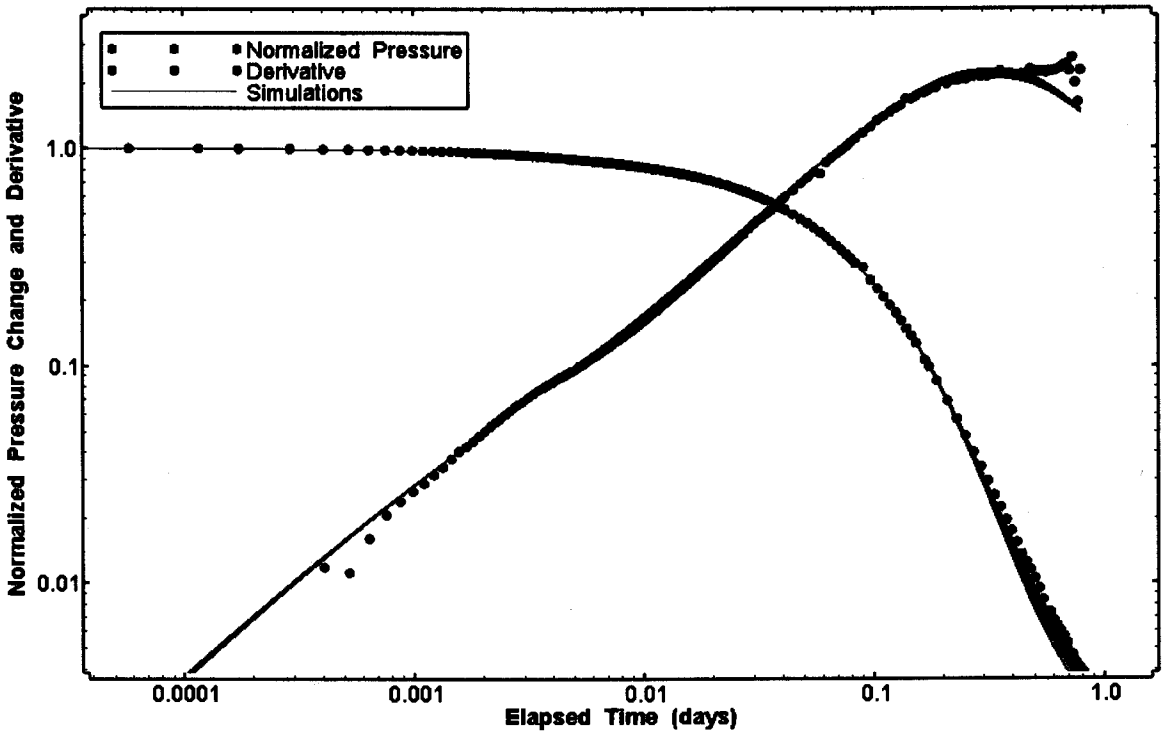


Figure 44. Log-log plot showing 167 simulations of the H-6a slug-injection Ramey B and derivative response.

Information Only

4.7 H-8a

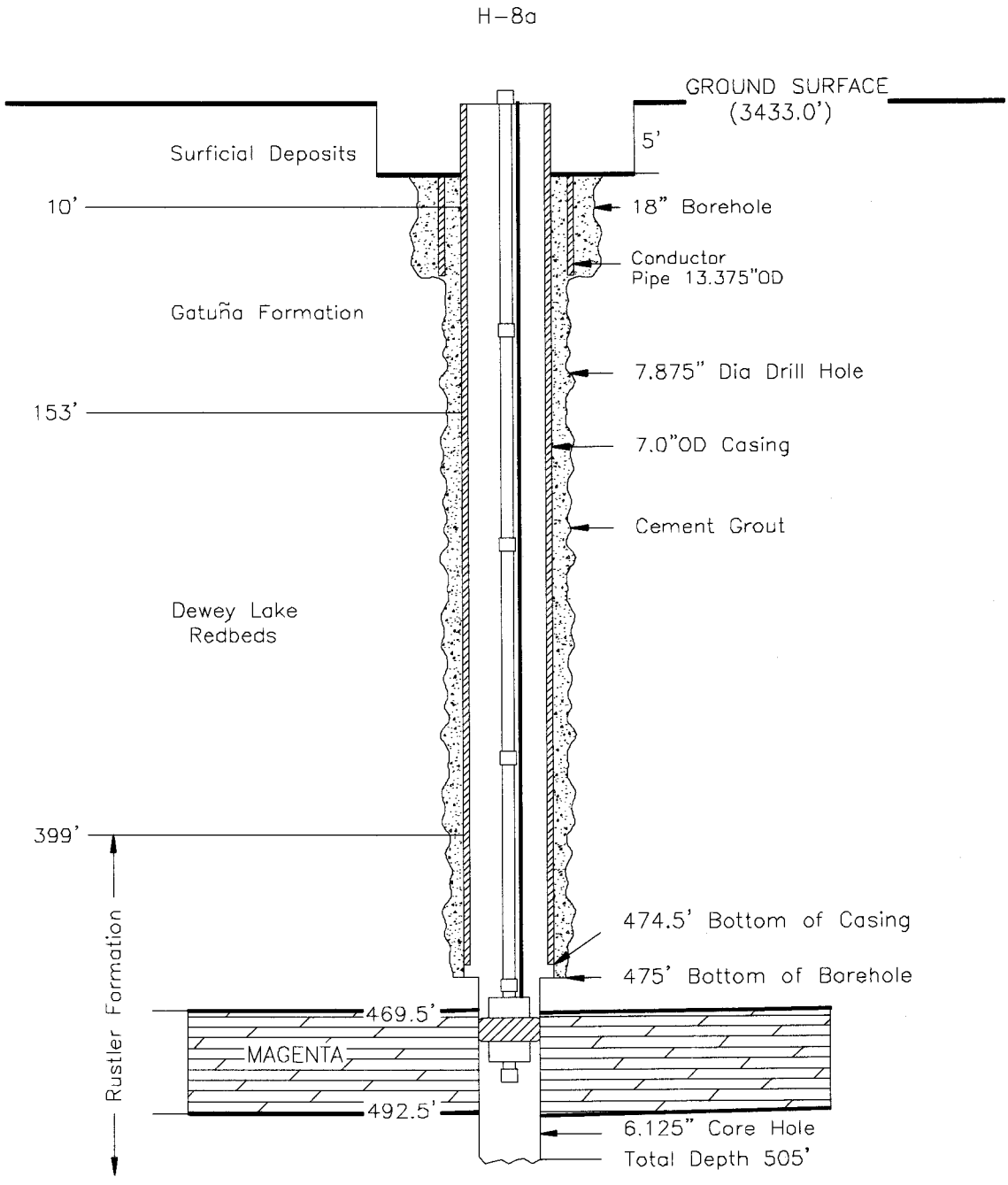
The Magenta interval of well H-8a was rotary drilled with a rock bit between September 7 and September 18, 1979 (Wells et al., 1982). The Magenta interval was an open core hole with a 6.125-in OD. Above the Magenta, the H-8a had a 7-in OD casing with a 13.375-in OD surface casing. The siting for the H-8a well complex was part of a series of four complexes near the WIPP site drilled to determine the regional geologic and hydrologic characteristics. A physical description of the well is detailed in Figure 45.

A slug-injection test was initiated on (Wells et al., 1982) January 29, 1980, and data collection ended on February 5, 1980. The data used in this analysis are shown in Figure 46.

The nSIGHTS H-8a simulation consisted of two sequences. Details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-8a.nPre file and are listed in Appendix B.7.

The specified H-8a conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values derived from perturbation analysis is shown in Figure 47. The geometric mean T estimate derived from this analysis was 7.35E-9 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these T values are shown in Figures 48-50, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 45. H-8a well configuration during testing.

Information Only

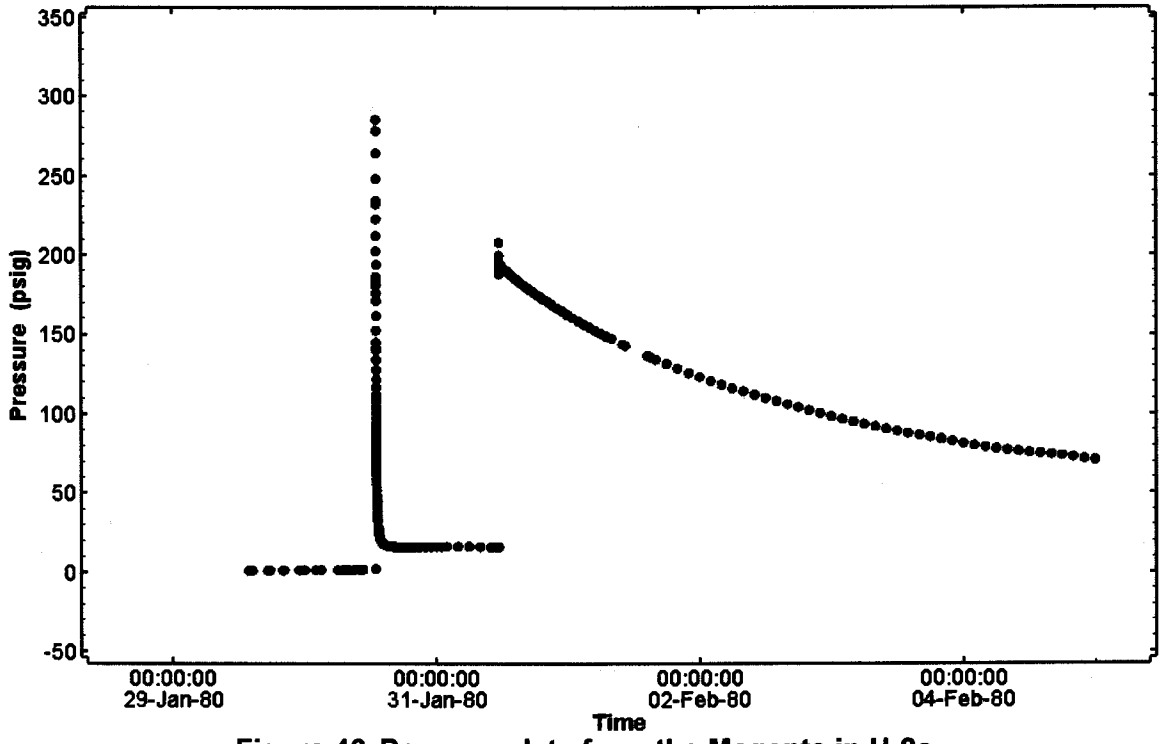


Figure 46. Pressure data from the Magenta in H-8a.

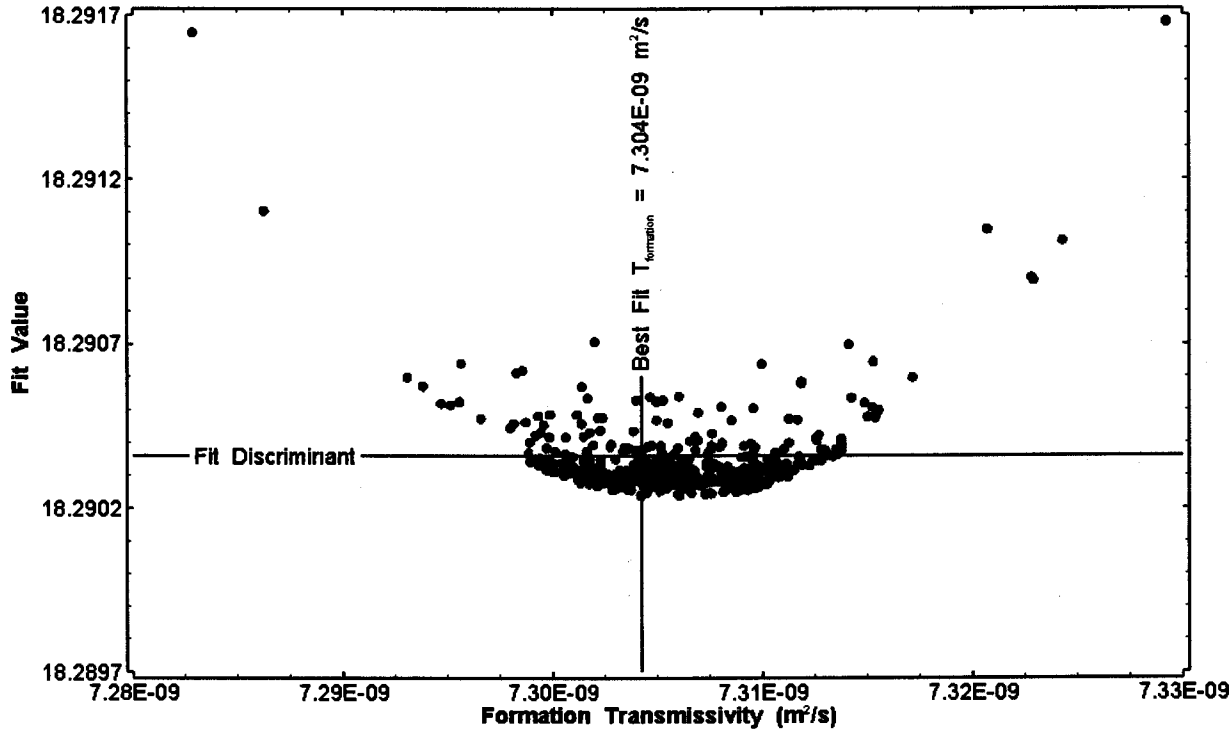


Figure 47. X-Y scatter plot showing the transmissivity parameter space derived from H-8a perturbation analysis along with the fit discriminant and best fit values.

Information Only

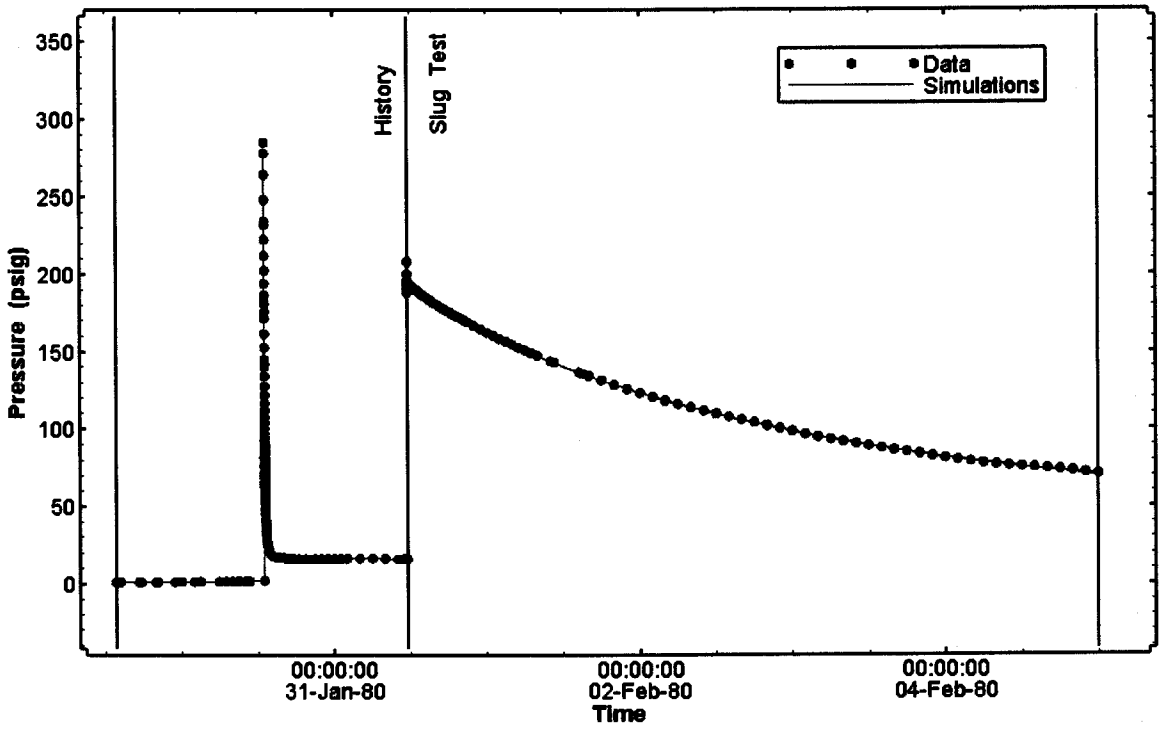


Figure 48. Linear plot showing 23 simulations of the H-8a pressure response.

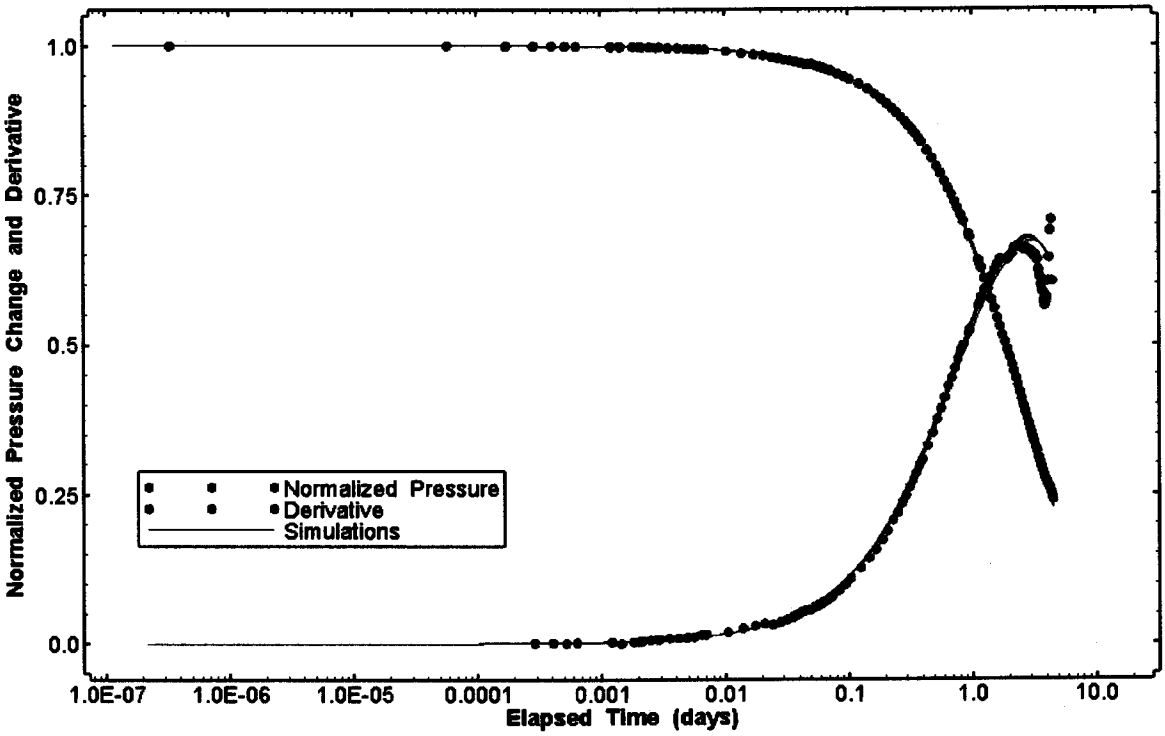


Figure 49. Semilog plot showing 23 simulations of the H-8a slug-injection Ramey A and derivative response.

Information Only

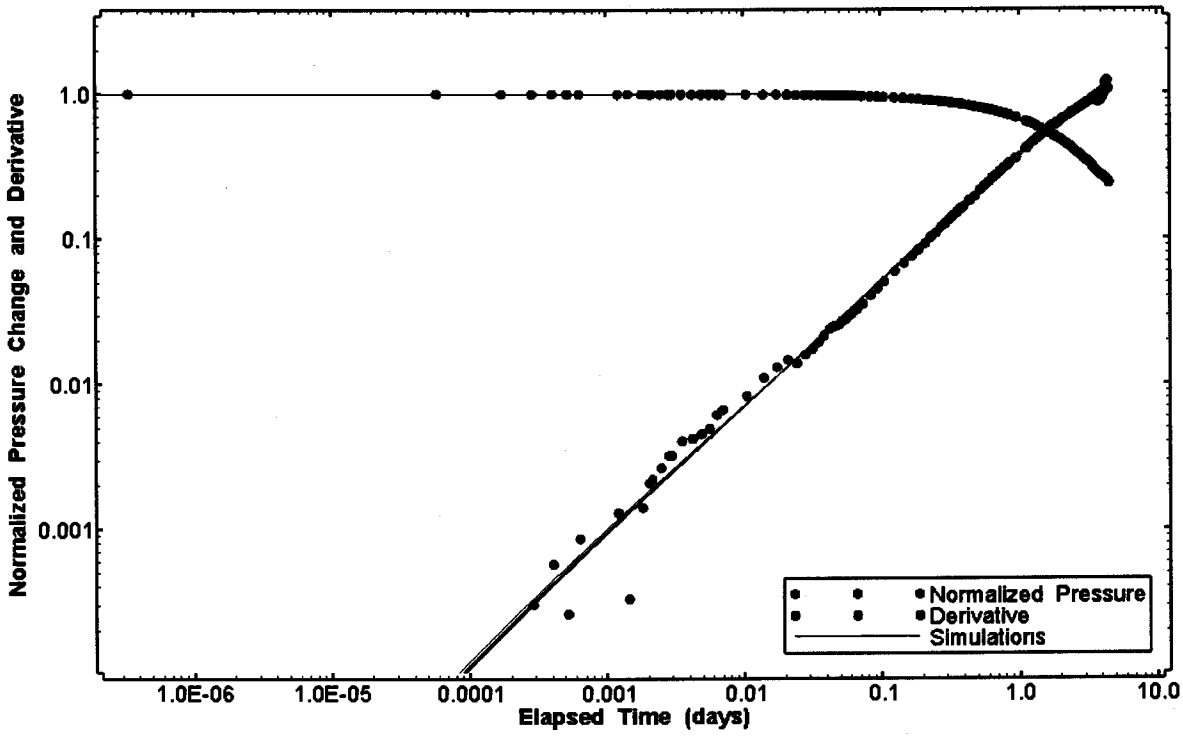


Figure 50. Log-log plot showing 23 simulations of the H-8a slug-injection Ramey B and derivative response.

Information Only

4.8 H-9a

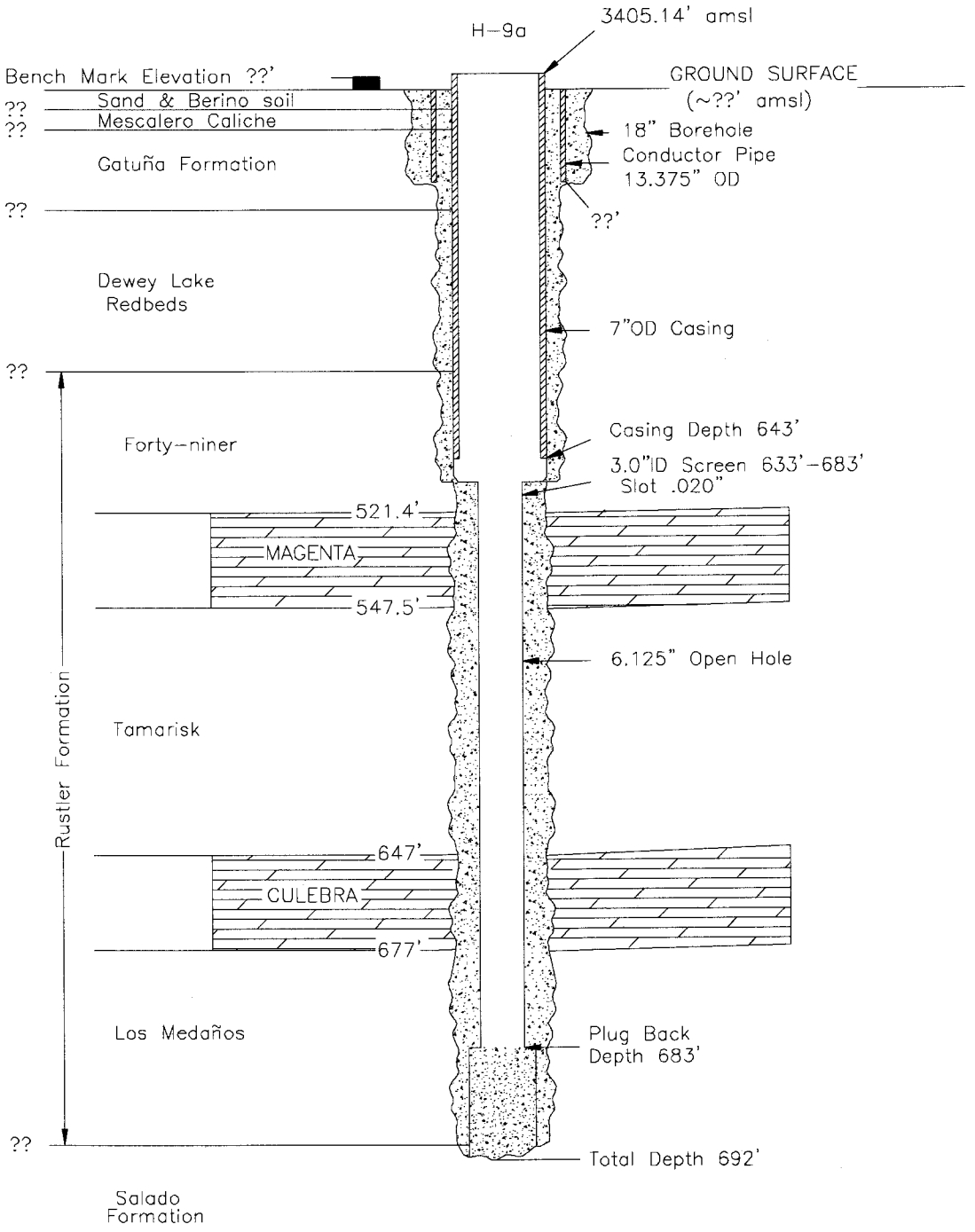
Well H-9a was part of a three well complex (with H-9b and H-9c) intended to determine the regional occurrence and movement of groundwater in the Magenta Member of the Rustler Formation, Culebra Member of the Rustler Formation, and Salado Formation. The Magenta interval in well H-9a was air-mist drilled between July 9 and September 5, 1979 (Drellack et al., 1982). The H-9a well includes a 13.375 inch OD conductor pipe with contains a 7 inch OD casing, and concludes with a 6.125 inch core hole in the Magenta. A physical description of the well is detailed in Figure 51.

A slug-injection test was initiated in the H-9a Magenta interval on February 4, 1980 and the response was monitored for 7 hours. The data used for this analysis are shown in Figure 52.

The nSIGHTS H-9a simulation consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-9a.nPre file and are listed in Appendix B.8.

The specified H-9a conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage and skin. The range of T values derived from perturbation analysis is shown in Figure 53. The geometric mean T estimate derived from this analysis was 9.70E-7 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these values are shown in Figures 54-56, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 51. H-9a well configuration during testing.

Information Only

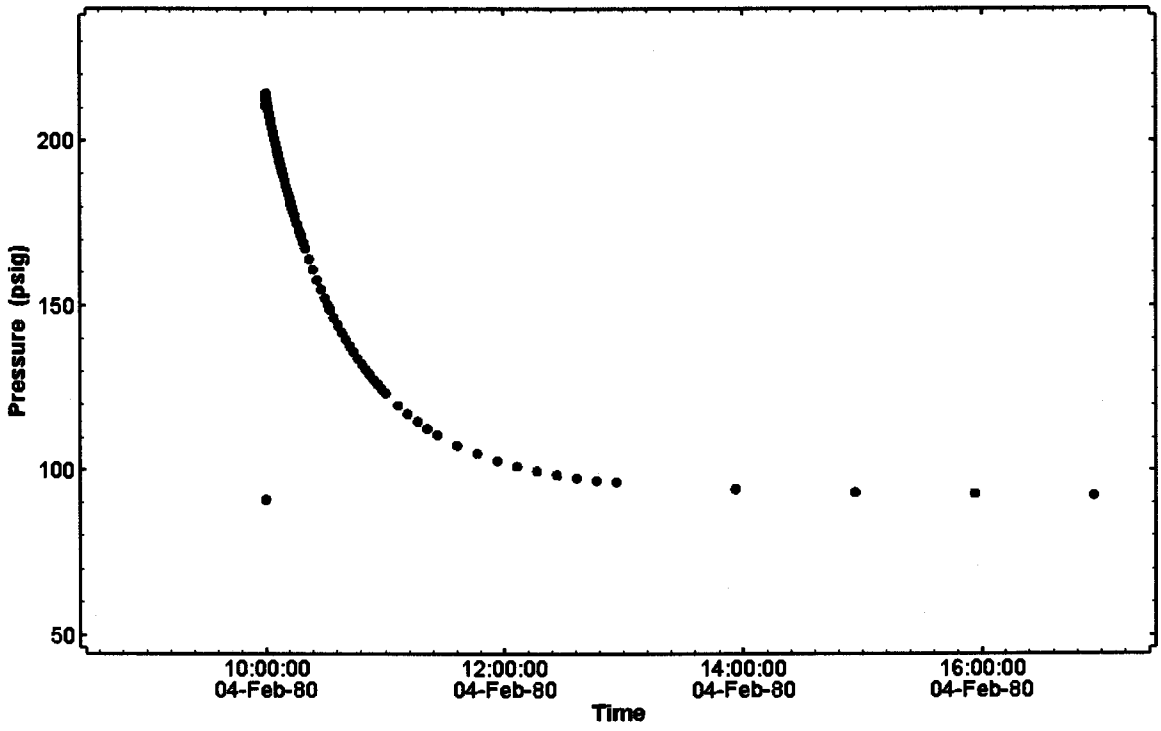


Figure 52. Pressure data from Magenta in H-9a.

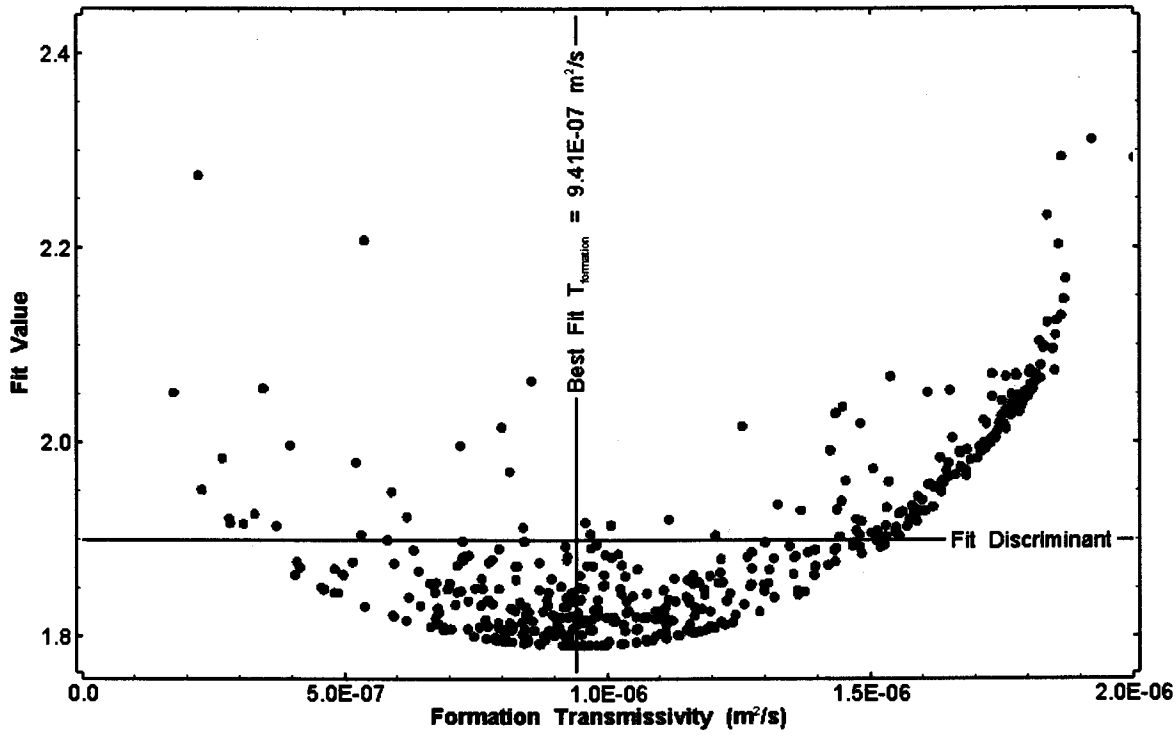


Figure 53. X-Y scatter plot showing the transmissivity parameter space derived from H-9a perturbation analysis along with the fit discriminant and best fit values.

Information Only

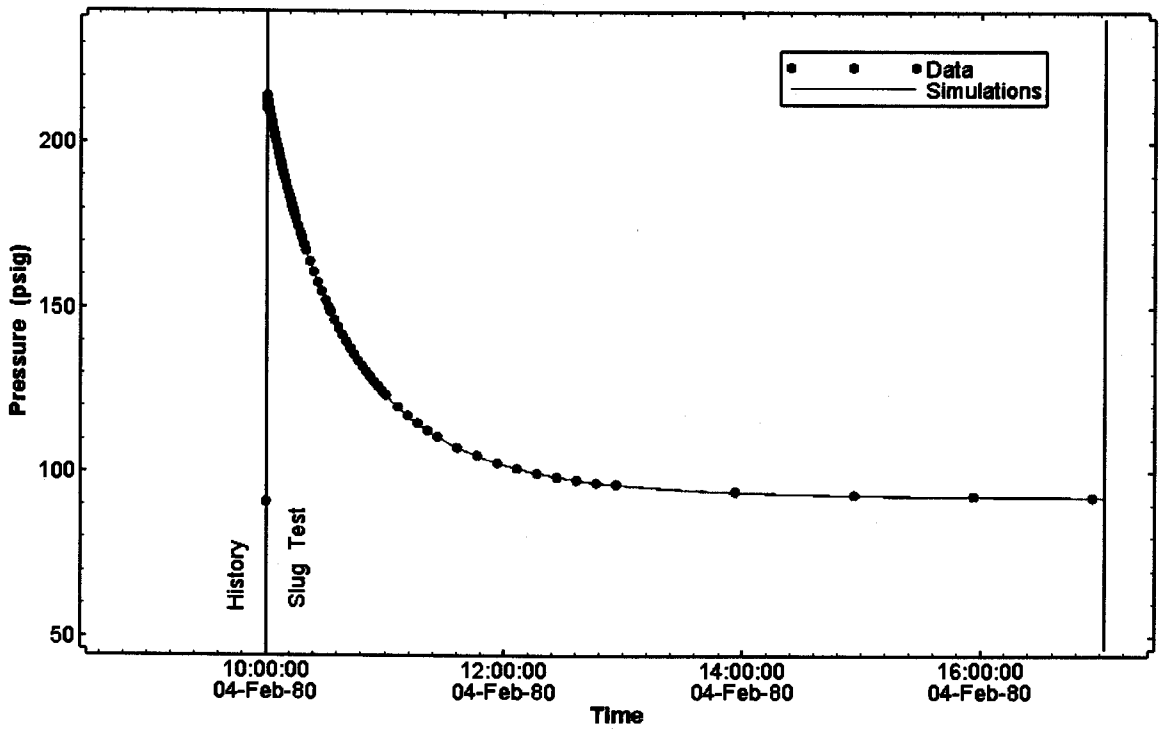


Figure 54. Linear plot showing 304 simulations of the H-9a pressure response.

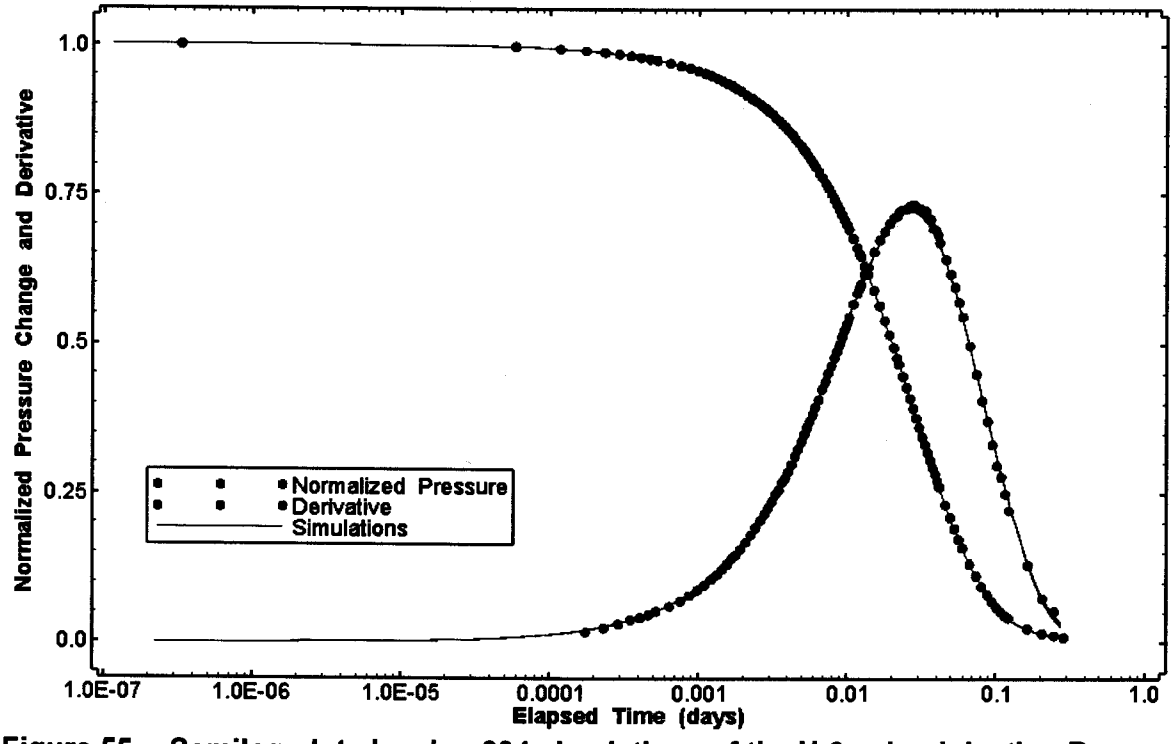


Figure 55. Semilog plot showing 304 simulations of the H-9a slug injection Ramey A and derivative response.

Information Only

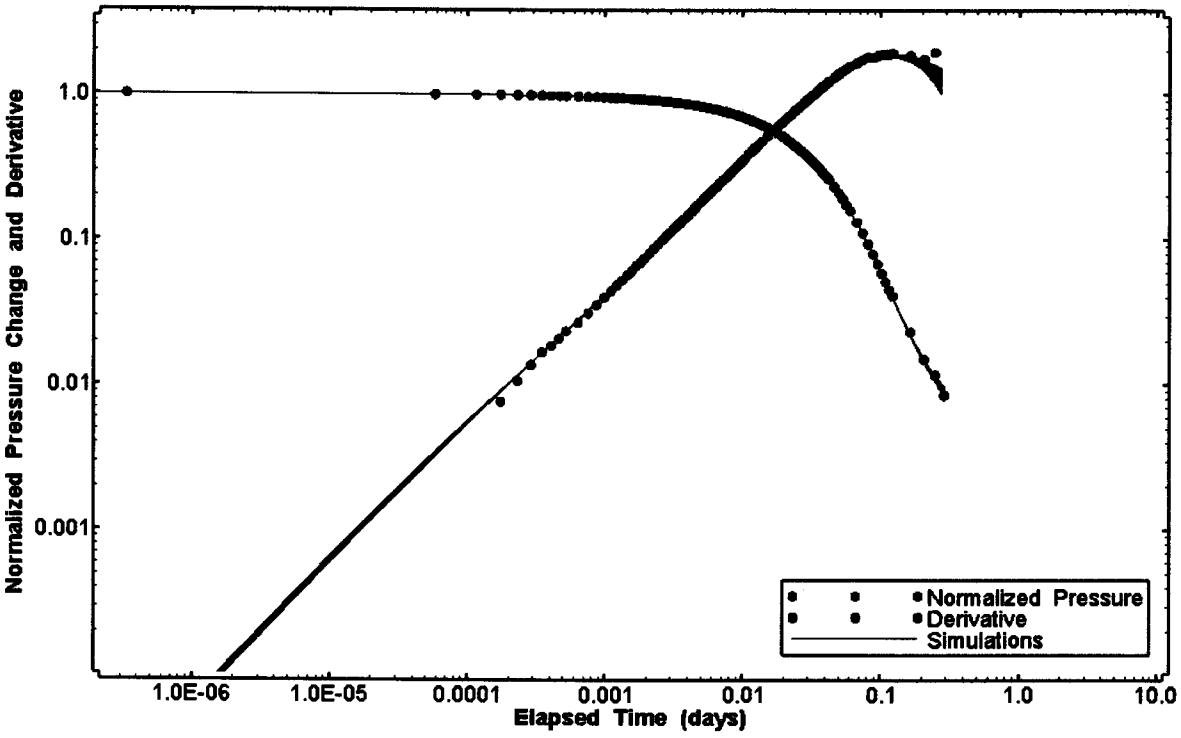


Figure 56. Log-log plot showing 304 simulations of the H-9a slug injection Ramey B and derivative response.

Information Only

4.9 H-10a

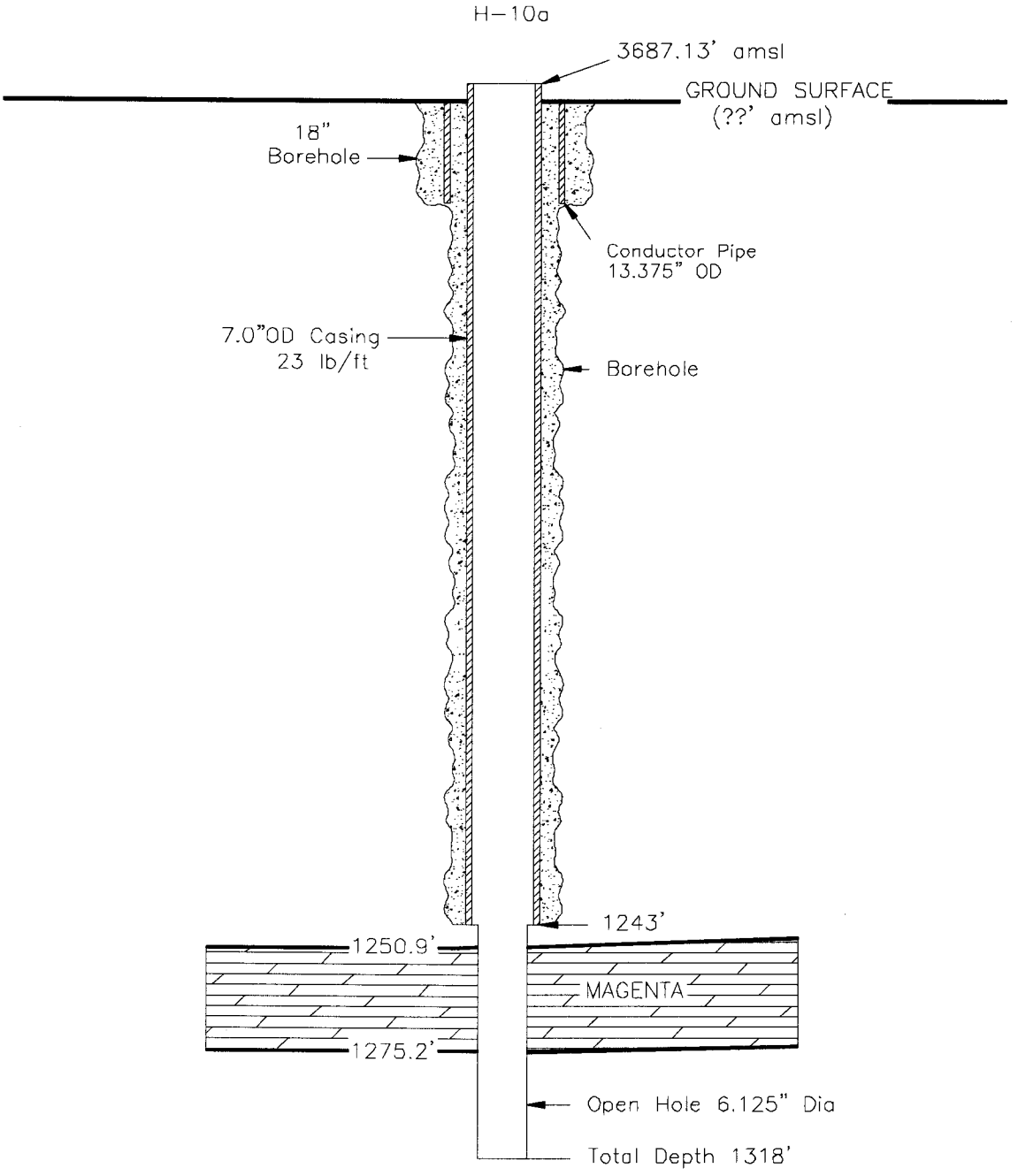
Well H-10a was part of a three nested well complex (with H-10b and H-10c) for determining regional geologic and hydrologic characteristics (Wells et al, 1983). The Magenta interval in well H-10a was air-rotary drilled between August 21 and August 26, 1979. The ID of the well was 6.125-in with a 13.375-in OD conductor pipe and a 2-in ID tubing. A physical description of the well is detailed in Figure 57.

The USGS initiated a slug test in the H-10a Magenta interval on October 2, 1980, (Wells et al, 1983). Monitoring of the slug response was concluded on February 24, 1980. The data used in this analysis are shown in Figure 58.

The nSIGHTS H-10a simulation consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-10a.nPre file and are listed in Appendix B.9.

The specified H-10a conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage and skin. The range of T values obtained from perturbation analysis is shown in Figure 59. The geometric mean T estimate derived from this analysis was 4.13E-6 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these T values are shown in Figures 60-62, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 57. H-10a well configuration during testing.

Information Only

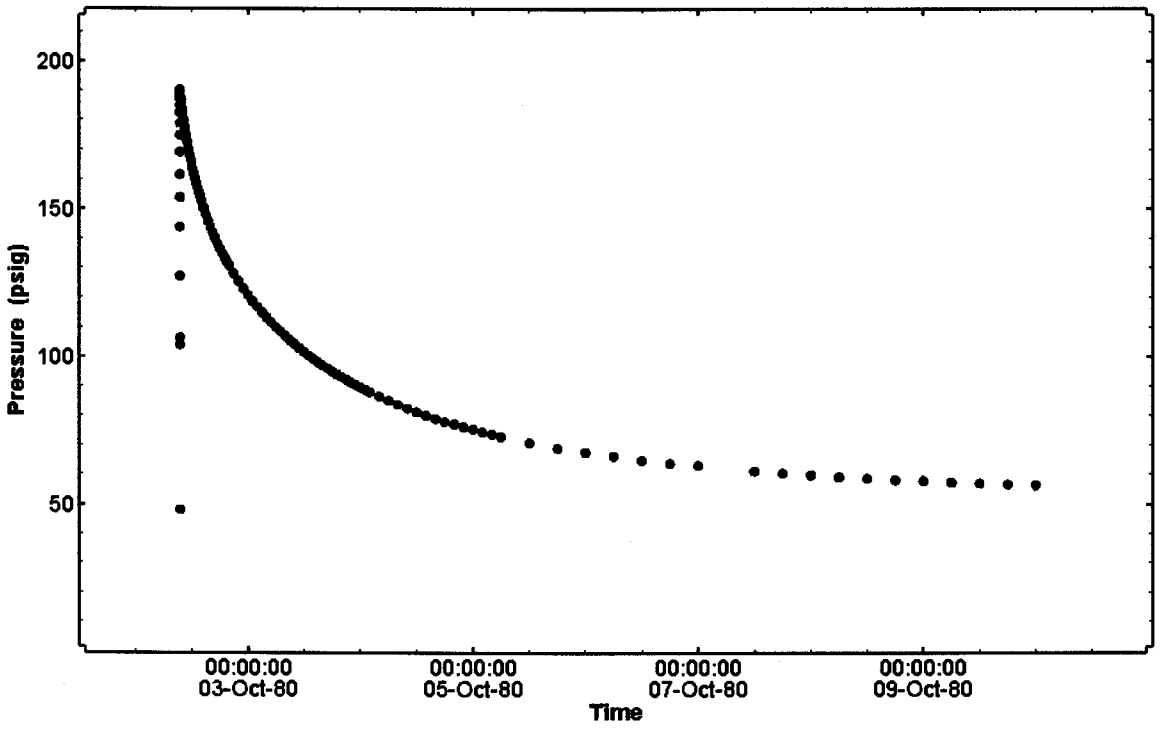


Figure 58. Pressure data from Magenta in H-10a.

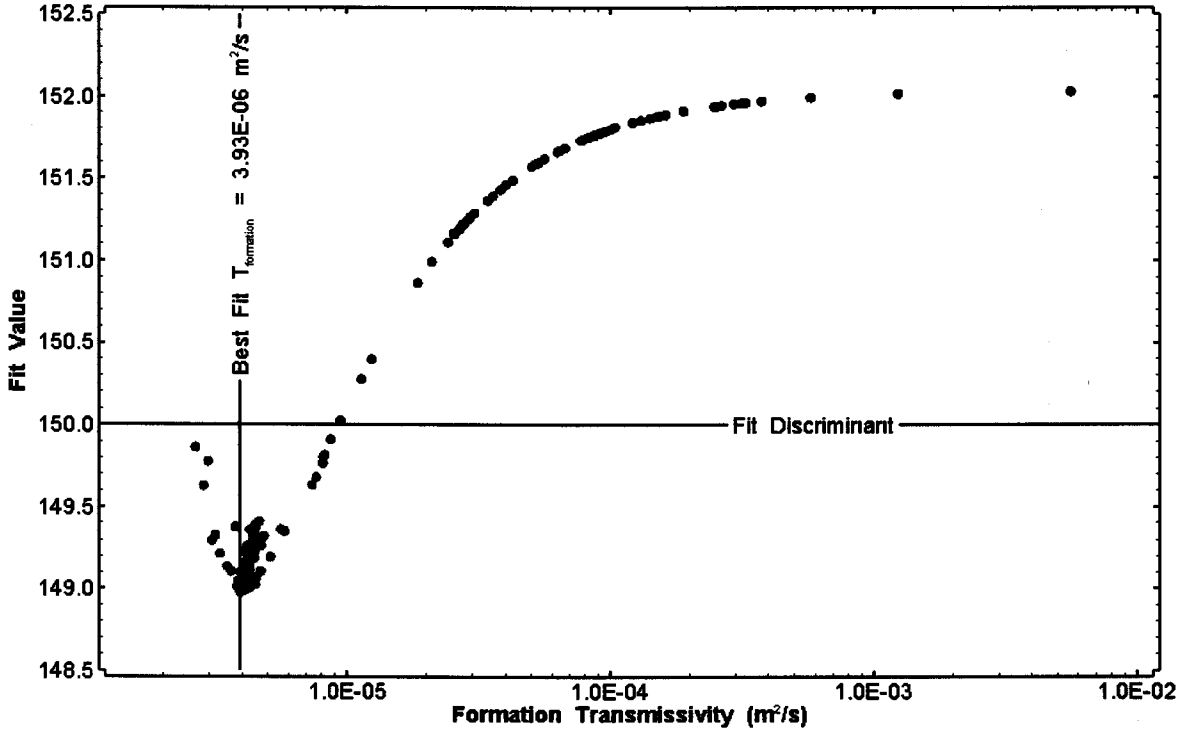


Figure 59. X-Y scatter plot showing the transmissivity parameter space derived from H-10a perturbation analysis along with the fit discriminant and best fit values.

Information Only

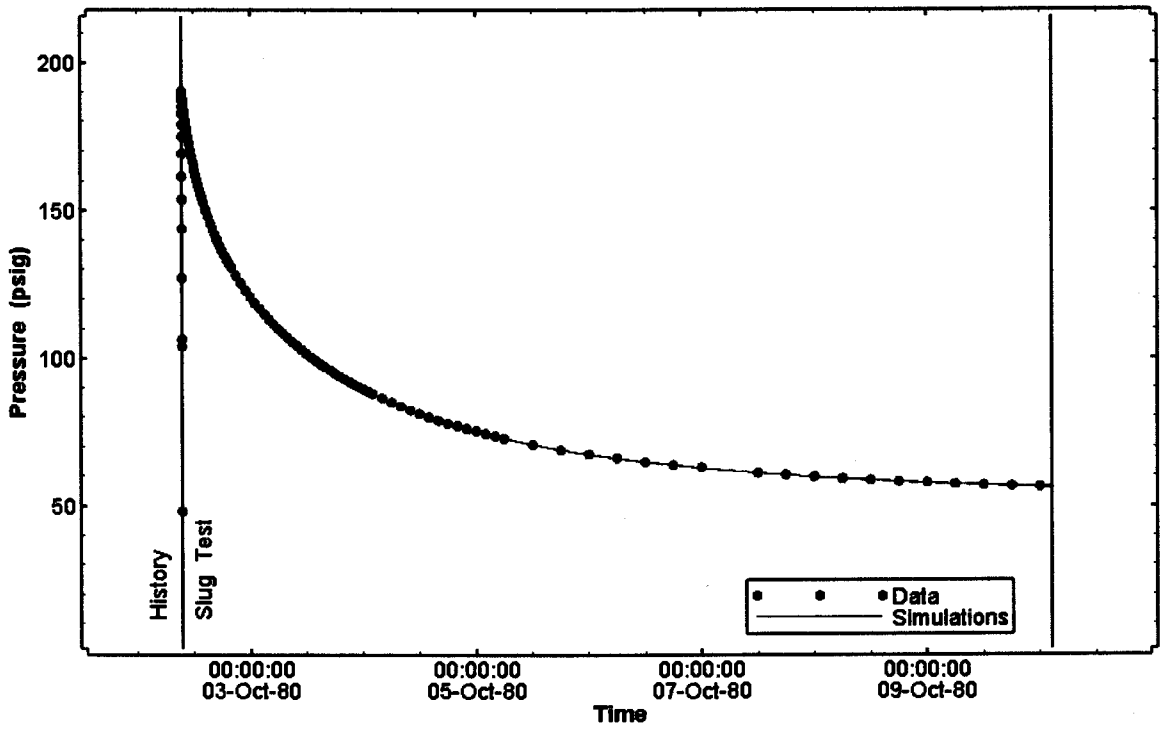


Figure 60. Linear plot showing 316 simulations of the H-10a pressure response.

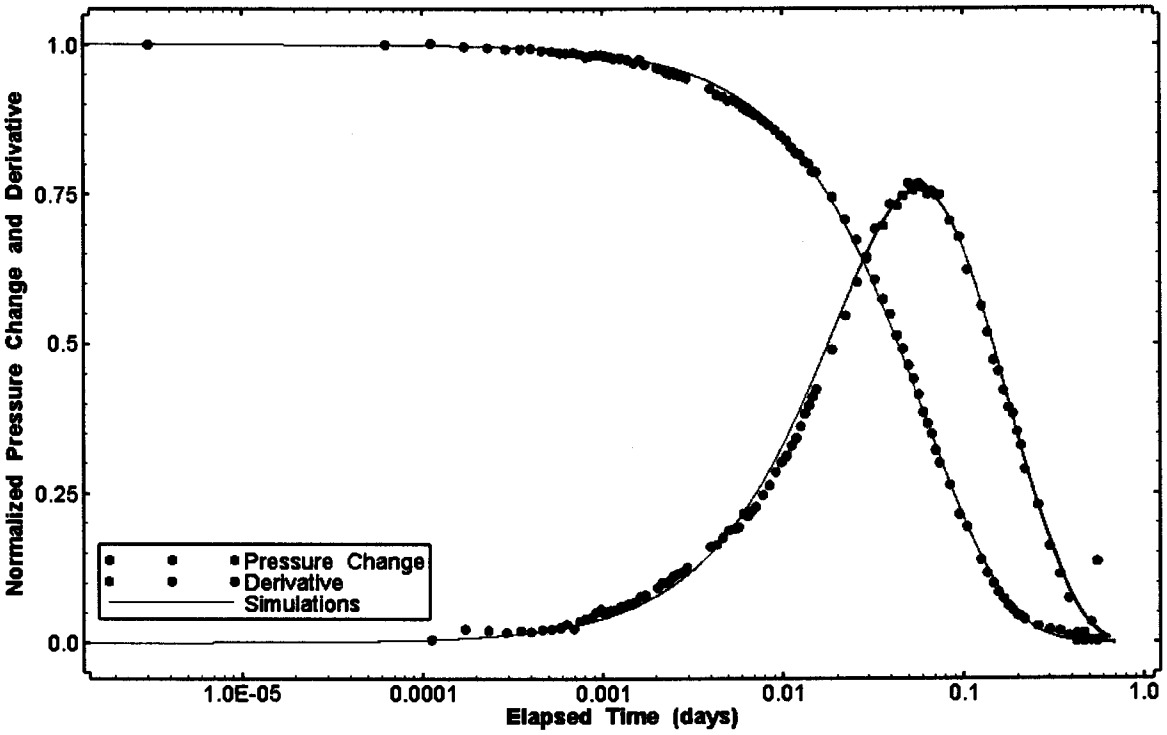


Figure 61. Semilog plot showing 316 simulations of the H-10a slug injection Ramey A and derivative response.

Information Only

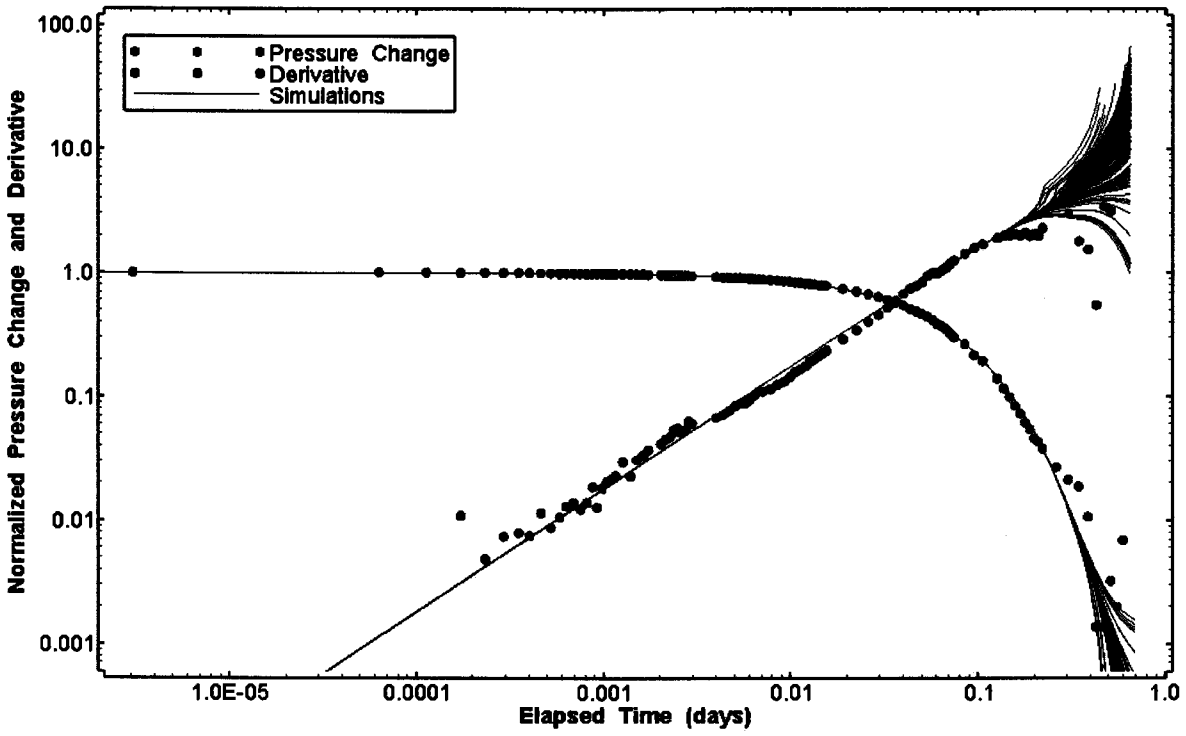


Figure 62. Log-log plot showing 316 simulations of the H-10a slug injection Ramey B and derivative response.

Information Only

4.10 H-14

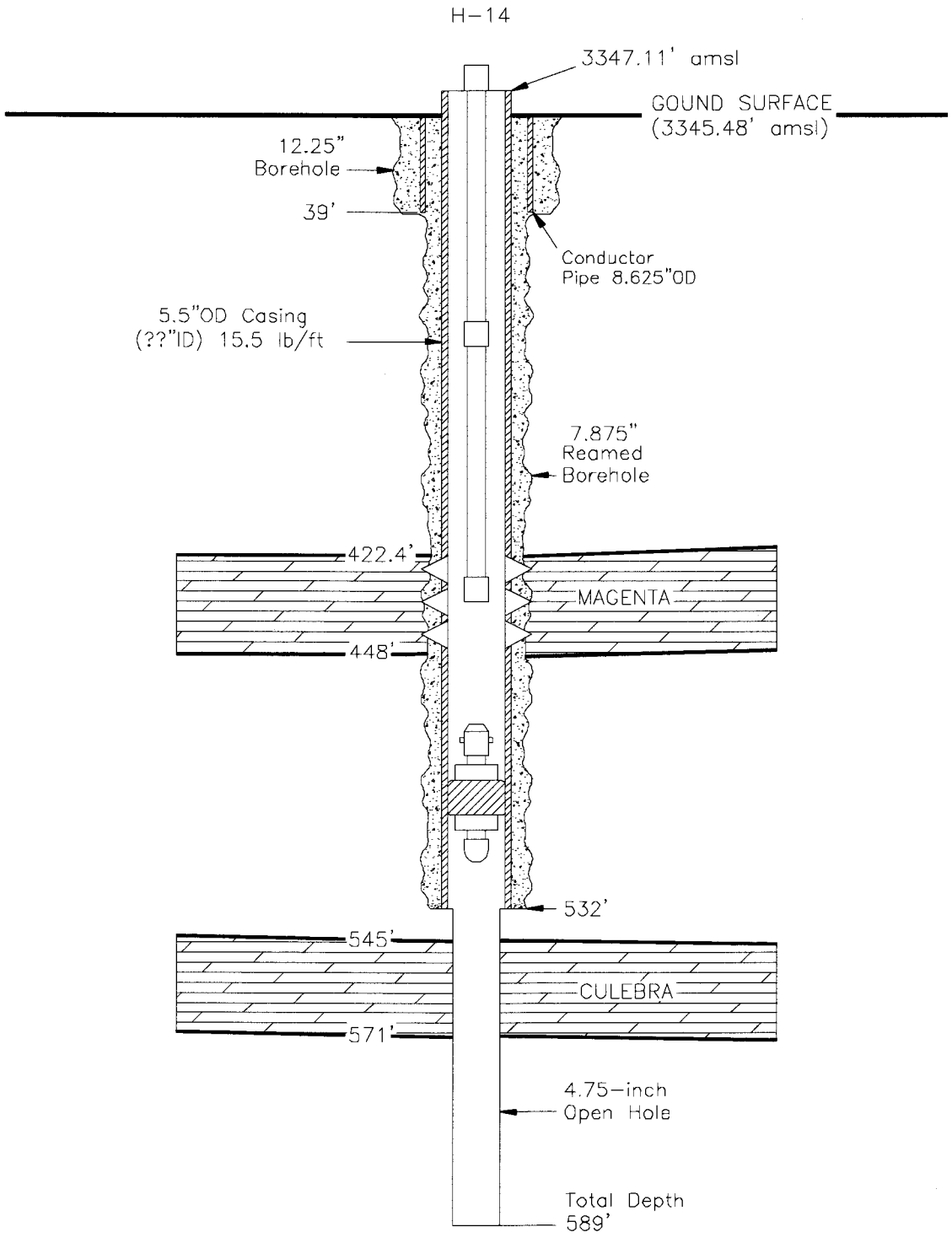
Well H-14 was drilled to compensate for a lack of data in the southwest quarter of the WIPP site for the Culebra Dolomite and to investigate a possible regional channeling of flow (Mercer and Snyder, 1990a). The Magenta interval of well H-14 was drilled between October 1 and October 2, 1986. At the Magenta, the ID of the well was 5.5 in with a 10.75-in surface casing. A physical description of the well is detailed in Figure 63.

A series of three DSTs was conducted in the H-14 Magenta between October 10 and 13, 1986. Data collection was concluded on October 13, 1986. The data used in this analysis are shown in Figure 64.

The nSIGHTS H-14 simulation consisted of twenty-three sequences. The first twelve sequences are unrecorded pre-test pressure histories described in Stensrud et al. (1987). The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-14.nPre file and are listed in Appendix B.10.

The specified H-14 conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values derived from perturbation analysis is shown in Figure 65. The geometric mean T estimate derived from this analysis was 3.23E-9 m^2/s. The Cartesian simulations corresponding to these T values are shown in Figure 66. The Ramey A, Ramey C, and log-log pressure-buildup diagnostic simulations for the first DST are shown in Figures 67, 68, and 69, respectively. The Ramey A, Ramey C, and log-log pressure-buildup diagnostic simulations for the second DST are shown in Figures 70, 71, and 72, respectively. The Ramey A, Ramey C, and log-log pressure-buildup diagnostic simulations for the third DST are shown in Figures 73, 74, and 75, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.
3. Ref.Test Plan TP 00-03, Rev.1, page 2.4-21.

Figure 63. H-14 well configuration during testing.

Information Only

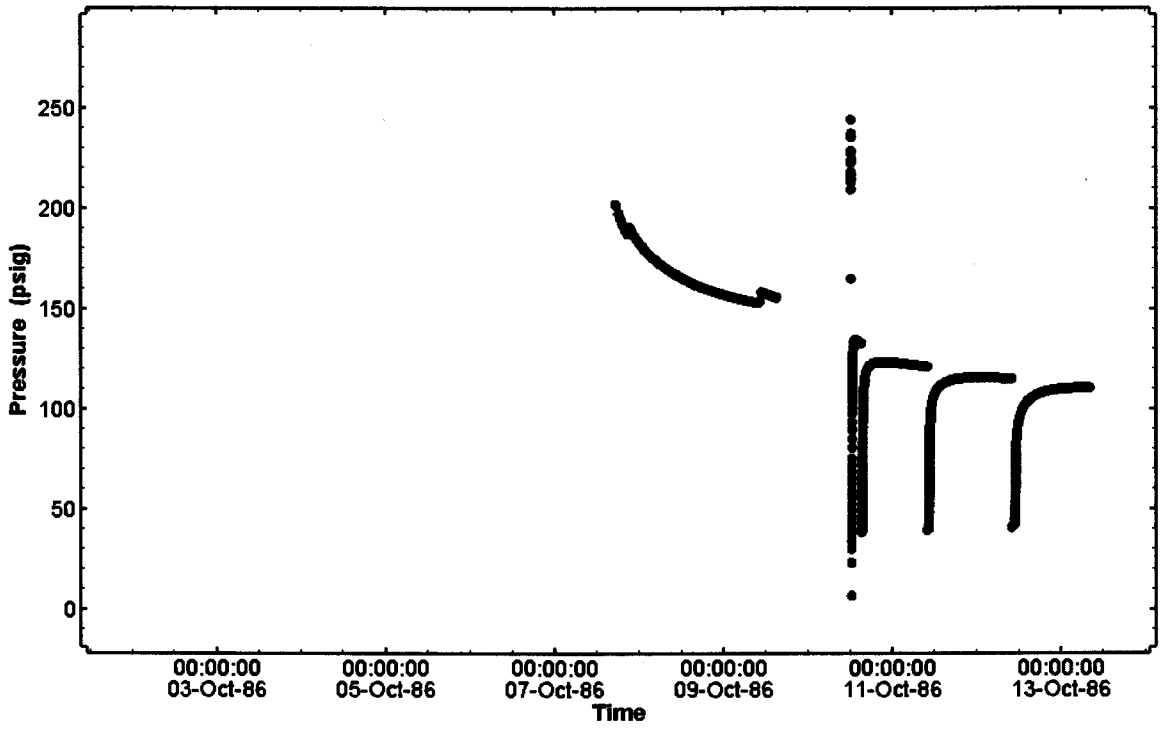


Figure 64. Pressure data from Magenta in H-14.

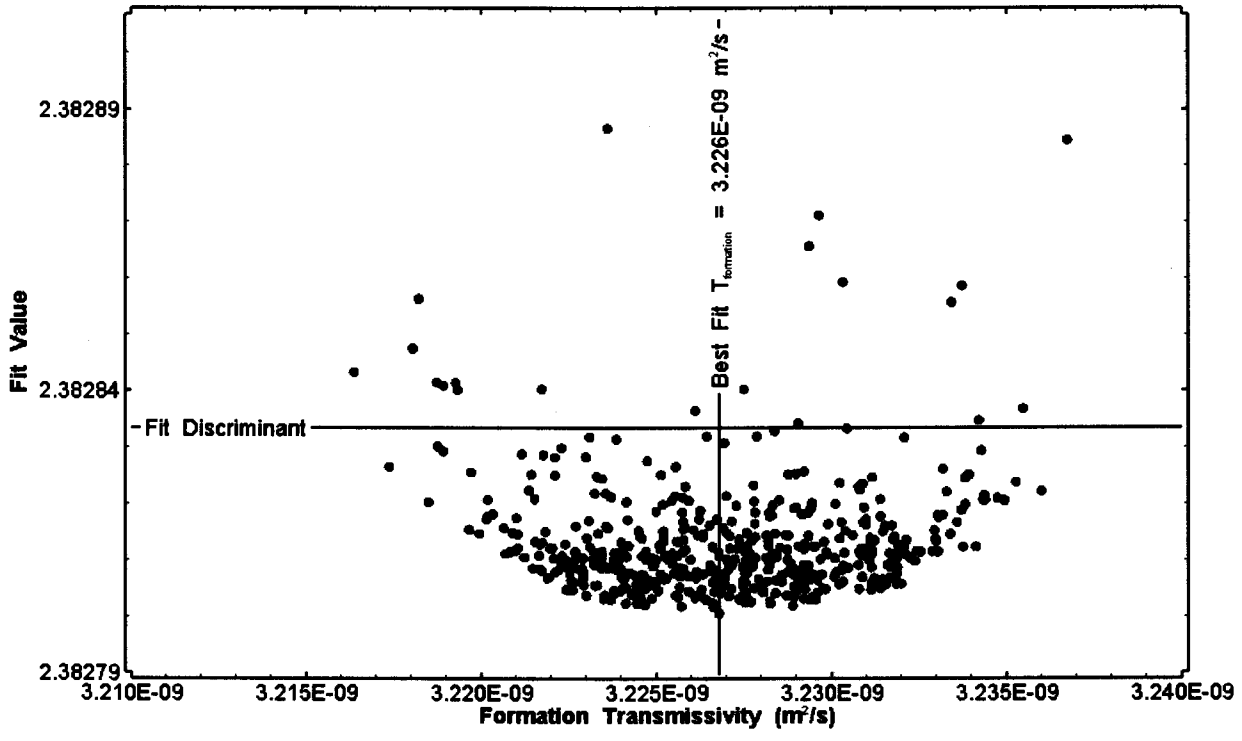


Figure 65. X-Y scatter plot showing the transmissivity parameter space derived from H-14 perturbation analysis along with the fit discriminant and best fit values.

Information Only

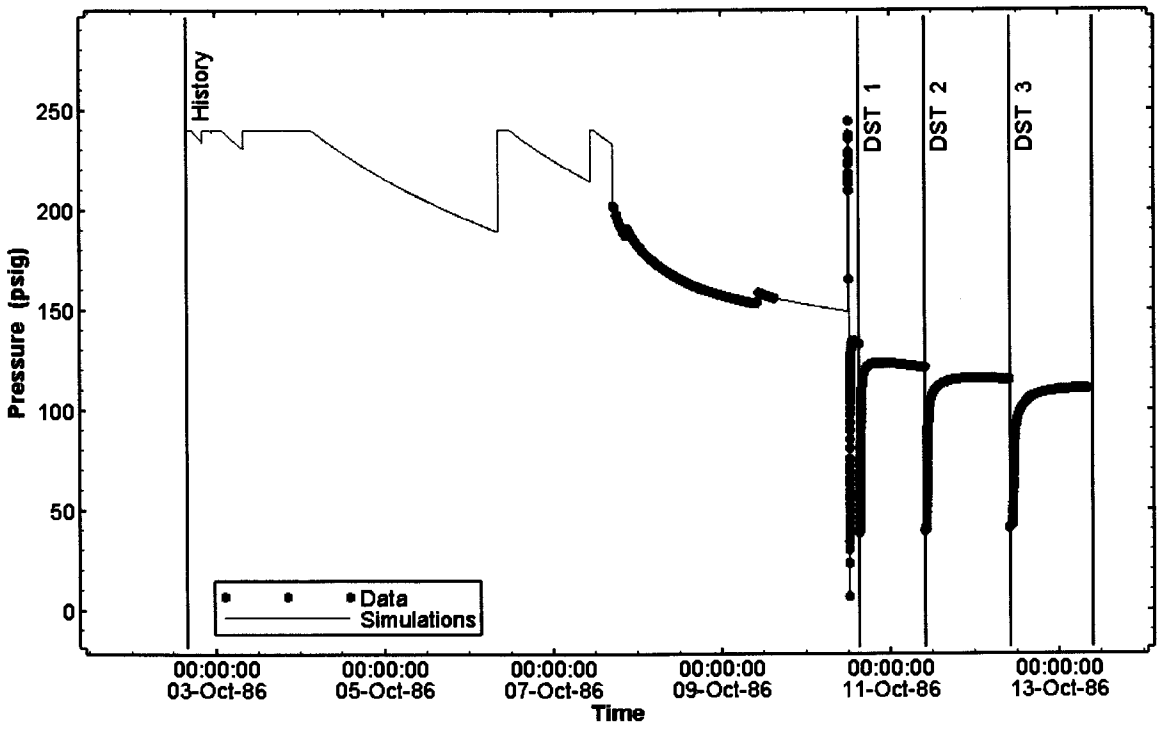


Figure 66. Linear plot showing 476 simulations of the H-14 pressure response.

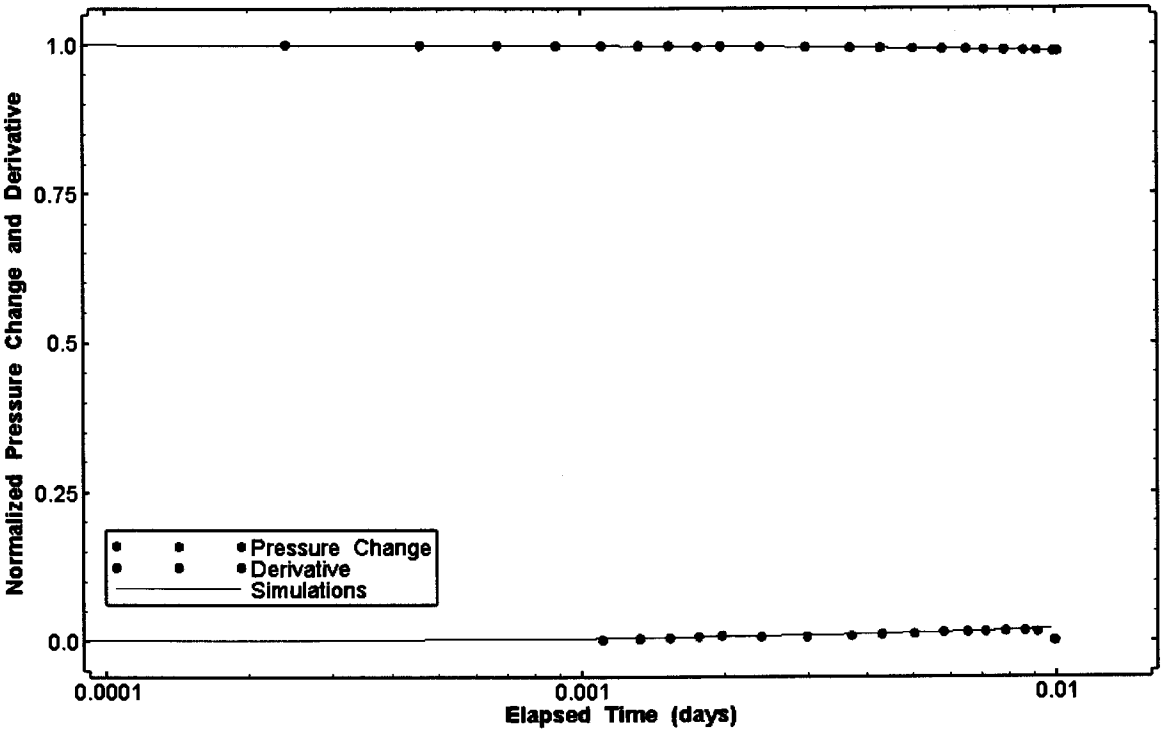


Figure 67. Semilog plot showing 476 simulations of the first H-14 DST flow period Ramey A and derivative response.

Information Only

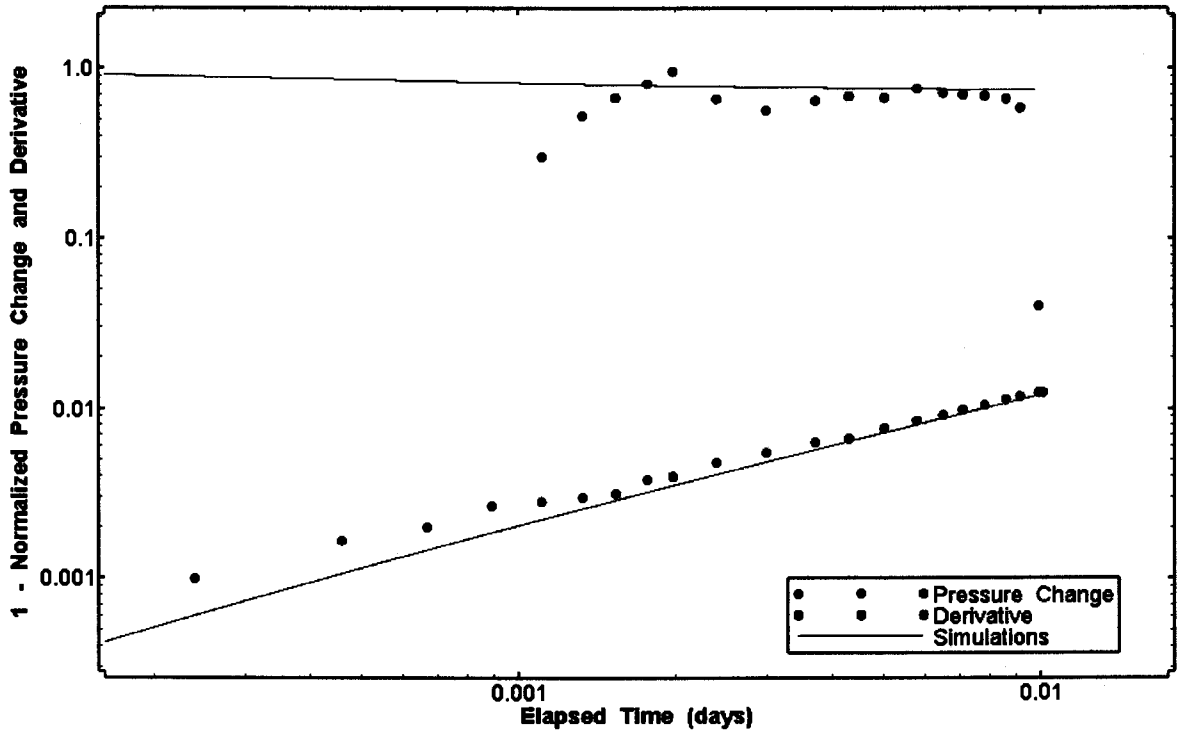


Figure 68. Log-log plot showing 476 simulations of the first H-14 DST flow period Ramey C and derivative response.

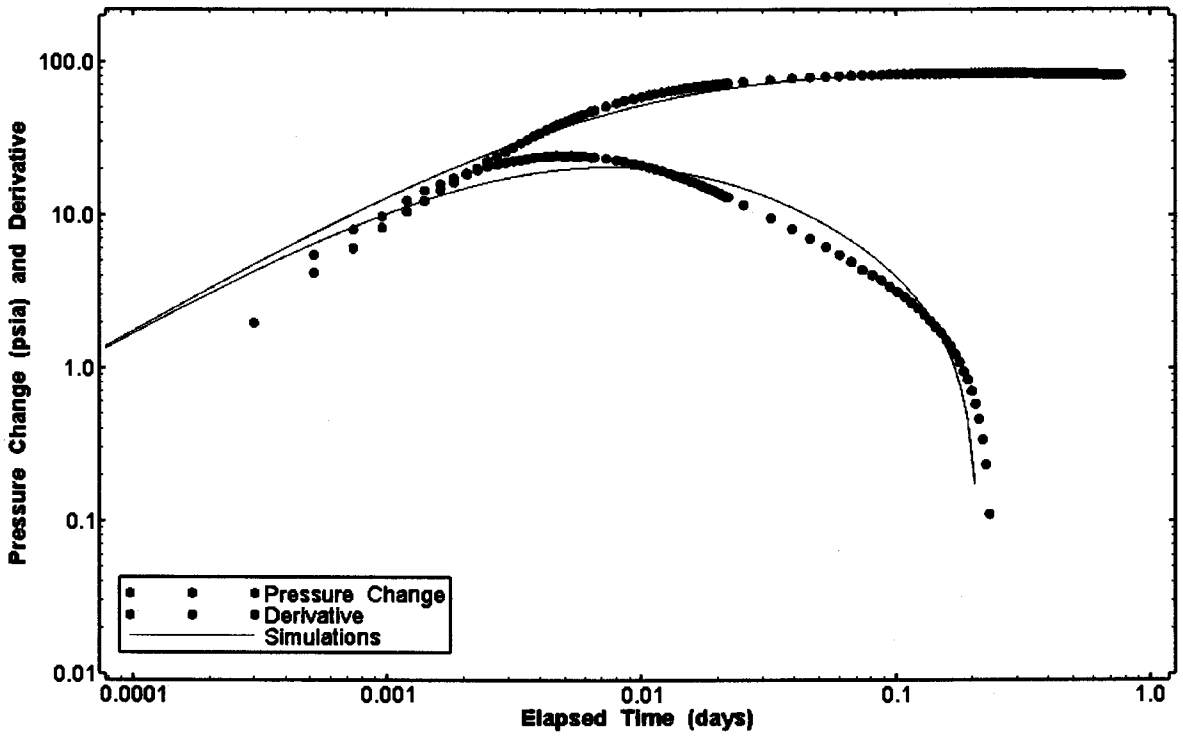


Figure 69. Log-log plot showing 476 simulations of pressure change and derivative during the first H-14 DST pressure buildup period.

Information Only

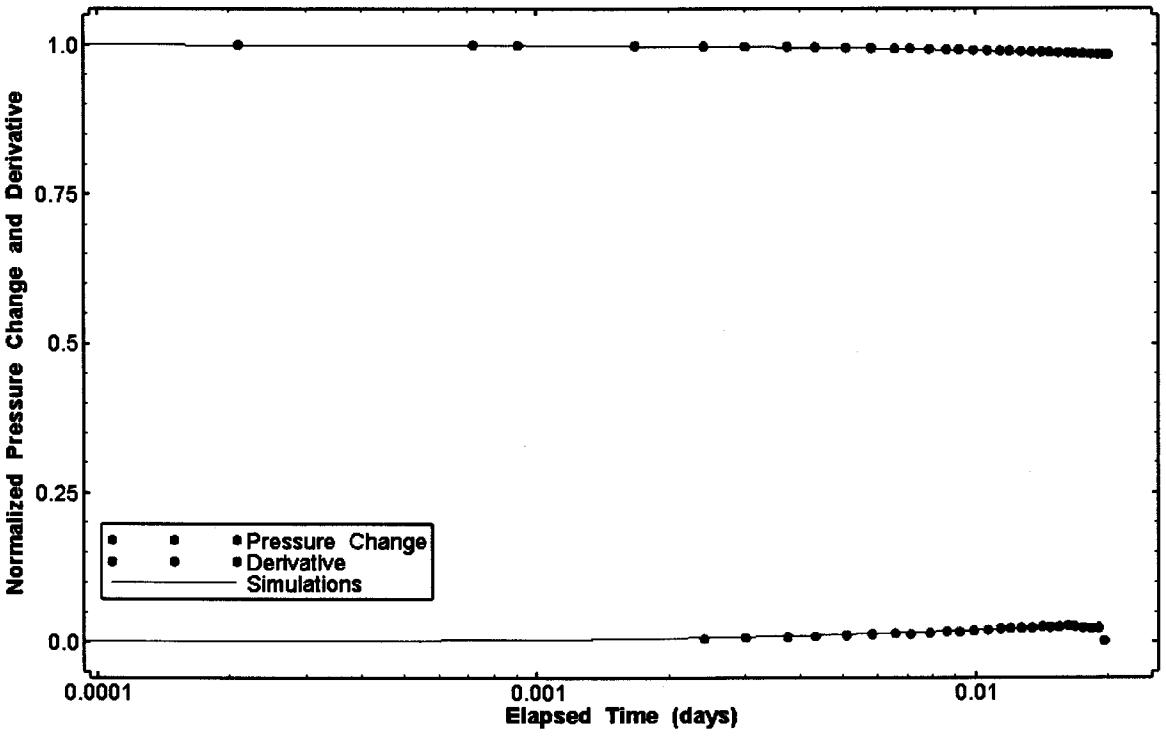


Figure 70. Semilog plot showing 476 simulations of the second H-14 DST flow period Ramey A and derivative response.

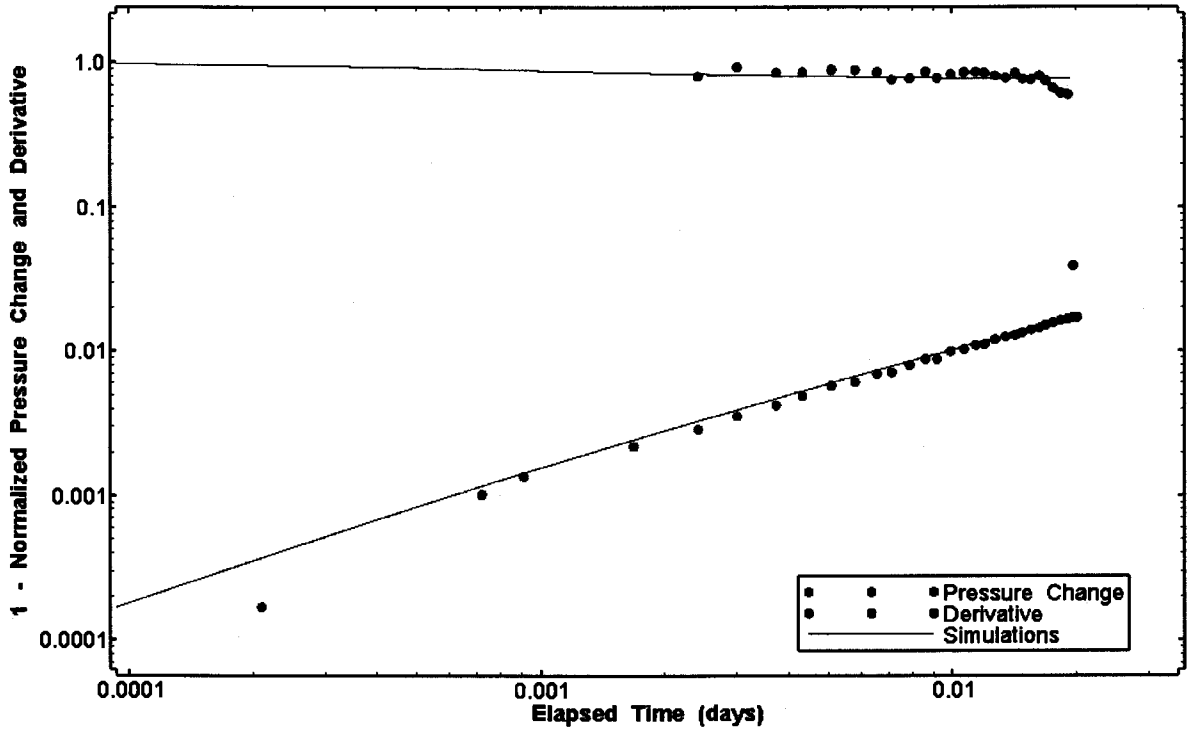


Figure 71. Log-log plot showing 476 simulations of the second H-14 DST flow period Ramey C and derivative response.

Information Only

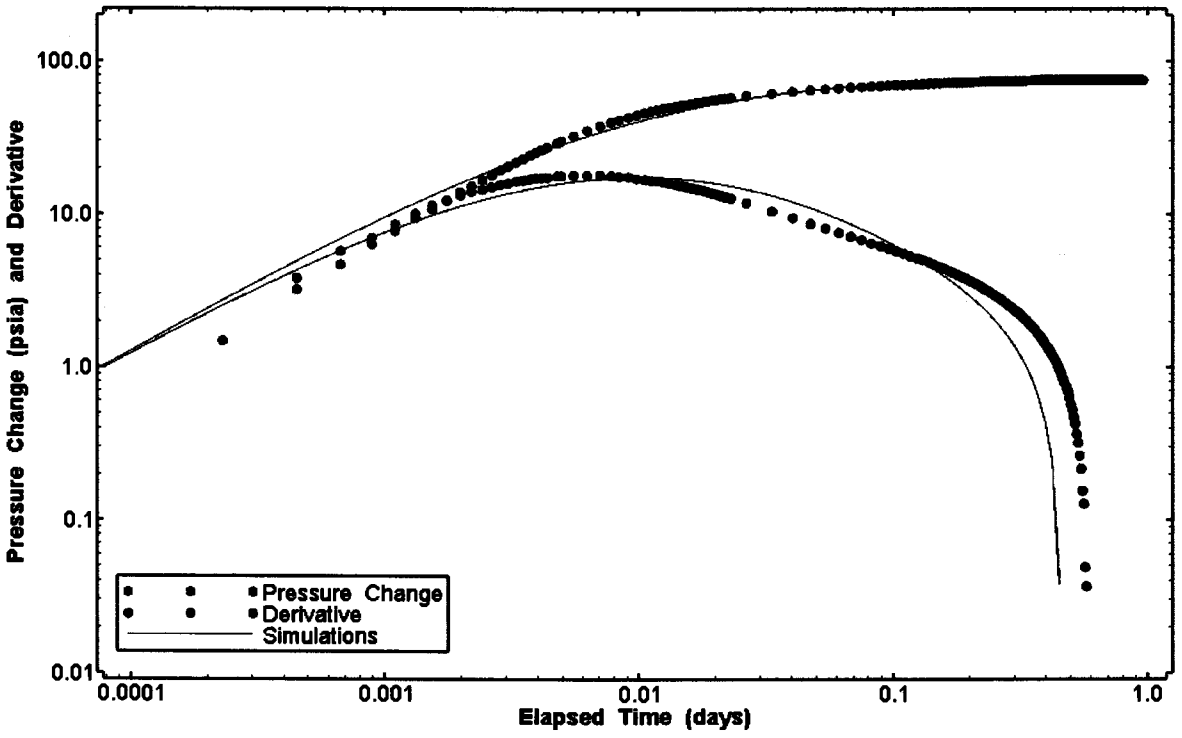


Figure 72. Log-log plot showing 476 simulations of pressure change and derivative during the second H-14 DST pressure buildup period.

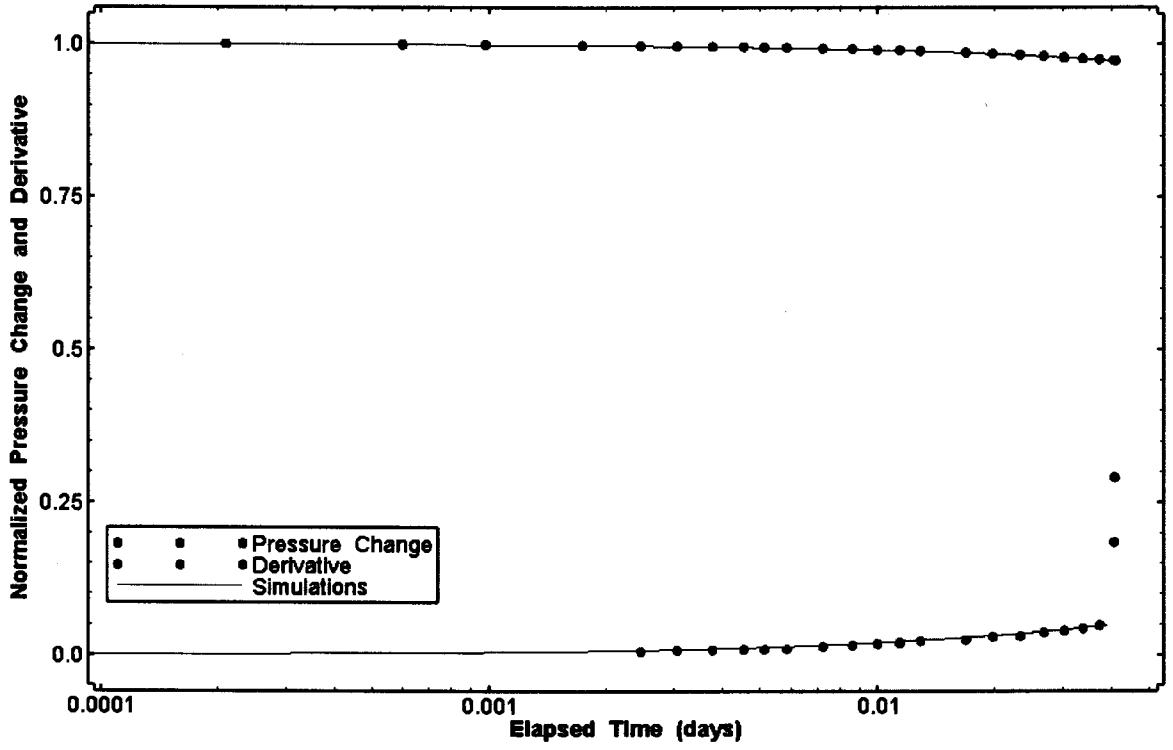


Figure 73. Semilog plot showing 476 simulations of the third H-14 DST flow period Ramey A and derivative response.

Information Only

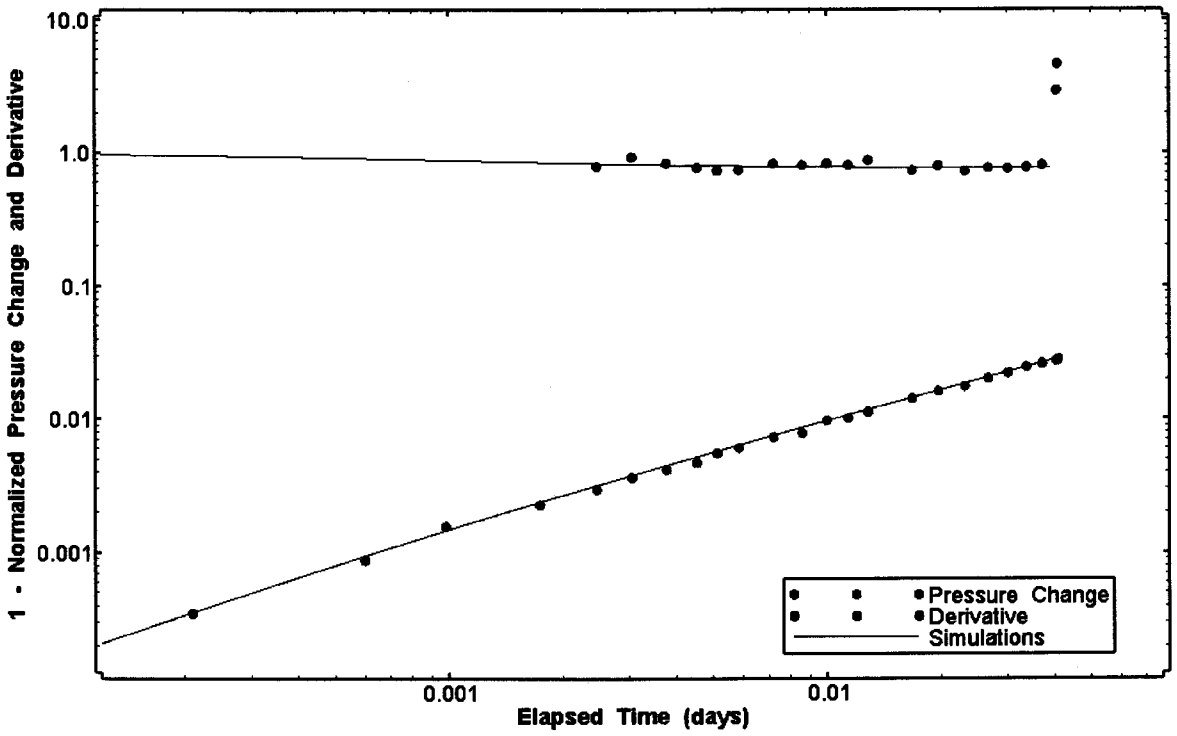


Figure 74. Log-log plot showing 476 simulations of the third H-14 DST flow period Ramey C and derivative response.

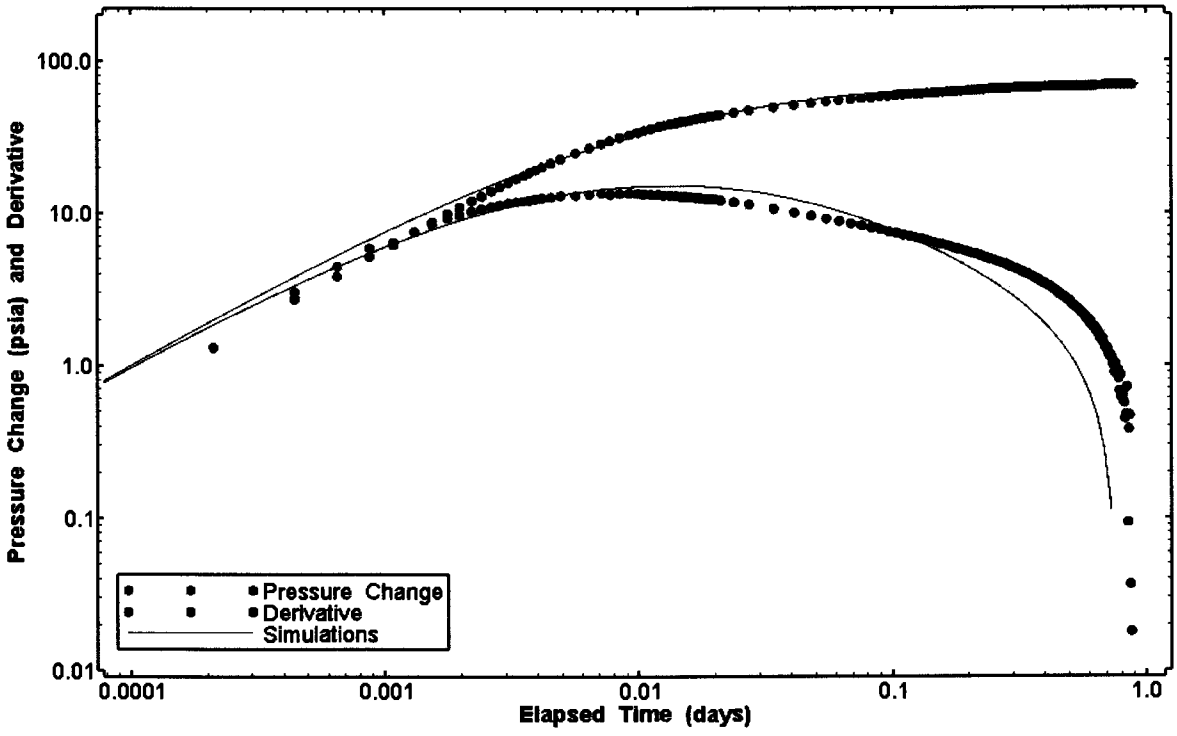


Figure 75. Log-log plot showing 476 simulations of pressure change and derivative during the third H-14 DST pressure buildup period.

Information Only

4.11 H-16

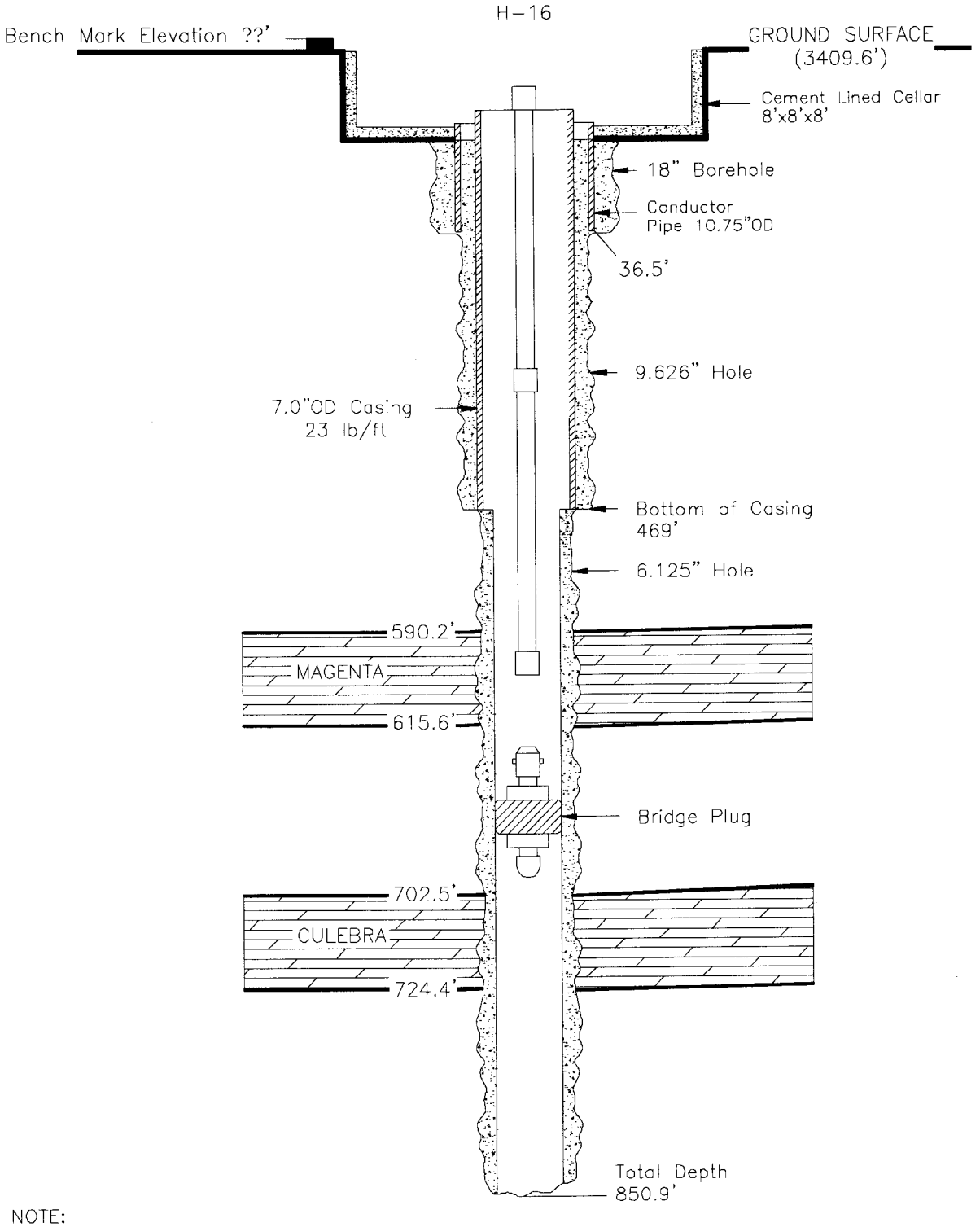
Well H-16 was drilled to assess pre- and post-mining hydraulic parameters associated with the air-intake shaft of the WIPP site (Mercer and Snyder, 1990b). The Magenta interval in well H-16 was drilled on July 29, 1987, using brine. The hole was then evacuated of drilling fluid using air. The inner diameter (ID) of the well is an uncased 4.75 inches with a 7 inch conductor casing that contains 2 inch ID tubing. A physical description of the well is detailed in Figure 76.

The USGS initiated two DSTs in the H-16 Magenta interval on July 30, 1987, and a slug test on July 31, 1987. (Mercer and Snyder, 1990b). Data monitoring was concluded on July 31, 1987. The data used in this analysis are shown in Figure 77.

The nSIGHTS H-16 simulation consisted of six sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-16.nPre file and are listed in Appendix B.11.

The specified H-16 conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage. The range of T values obtained from perturbation analysis is shown in Figure 78. The geometric mean T estimate derived from this analysis was 2.99E-8 m^2/s. The Cartesian simulations corresponding to these T values are shown in Figure 79. The Ramey A, Ramey B, and log-log pressure buildup diagnostic simulations for the first DST are shown in Figures 80, 81, and 82, respectively. The Ramey A, Ramey B, and log-log pressure buildup diagnostic simulations for the second DST are shown in Figures 83, 84, and 85, respectively. The Ramey A and Ramey B simulations for the slug withdrawal are shown in Figures 86 and 87; respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 76. H-16 well configuration during testing.

Information Only

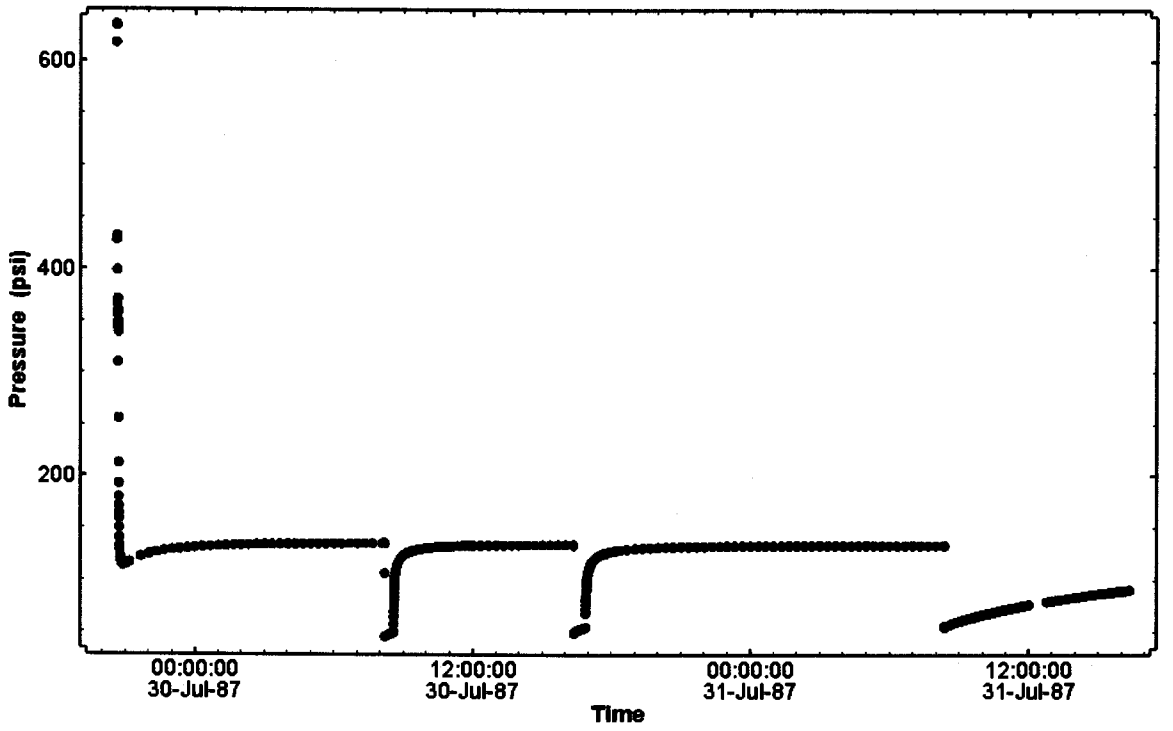


Figure 77. Pressure data from Magenta in H-16.

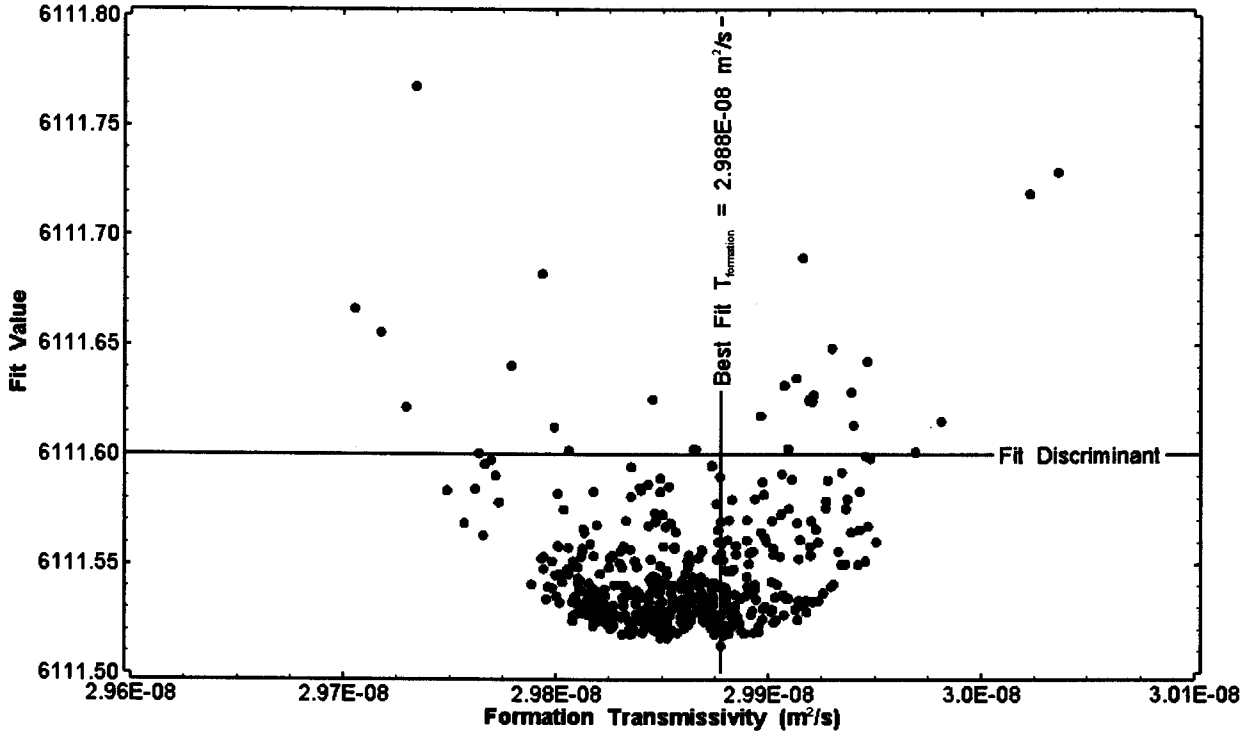


Figure 78. X-Y scatter plot showing the transmissivity parameter space derived from H-16 perturbation analysis along with the fit discriminant and fit values.

Information Only

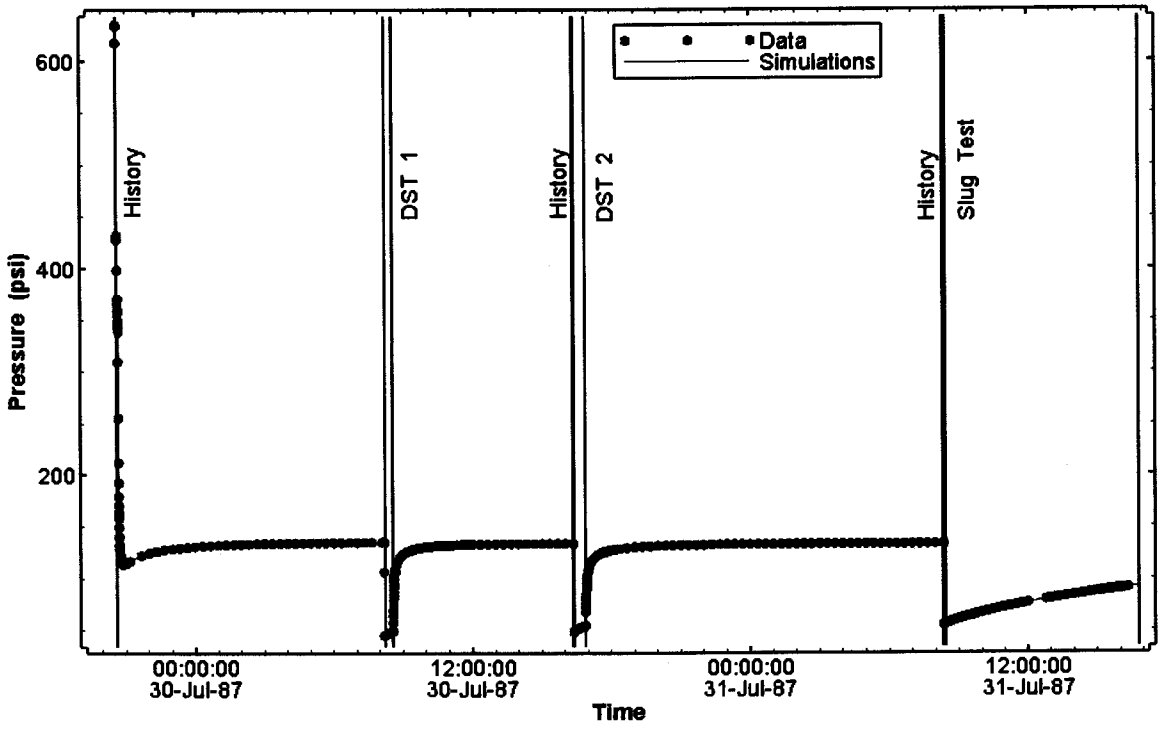


Figure 79. Linear plot showing 416 simulations of the H-16 pressure response.

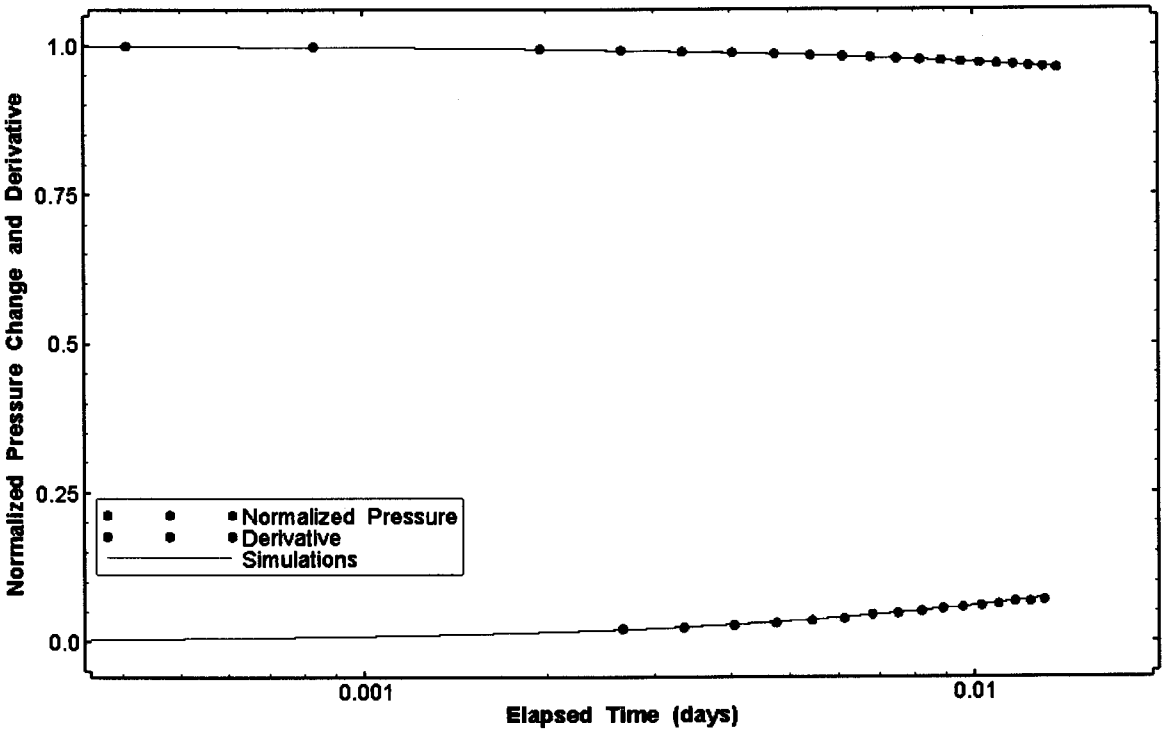


Figure 80. Semilog plot showing 416 simulations of the first H-16 DST flow period Ramey A and derivative response.

Information Only

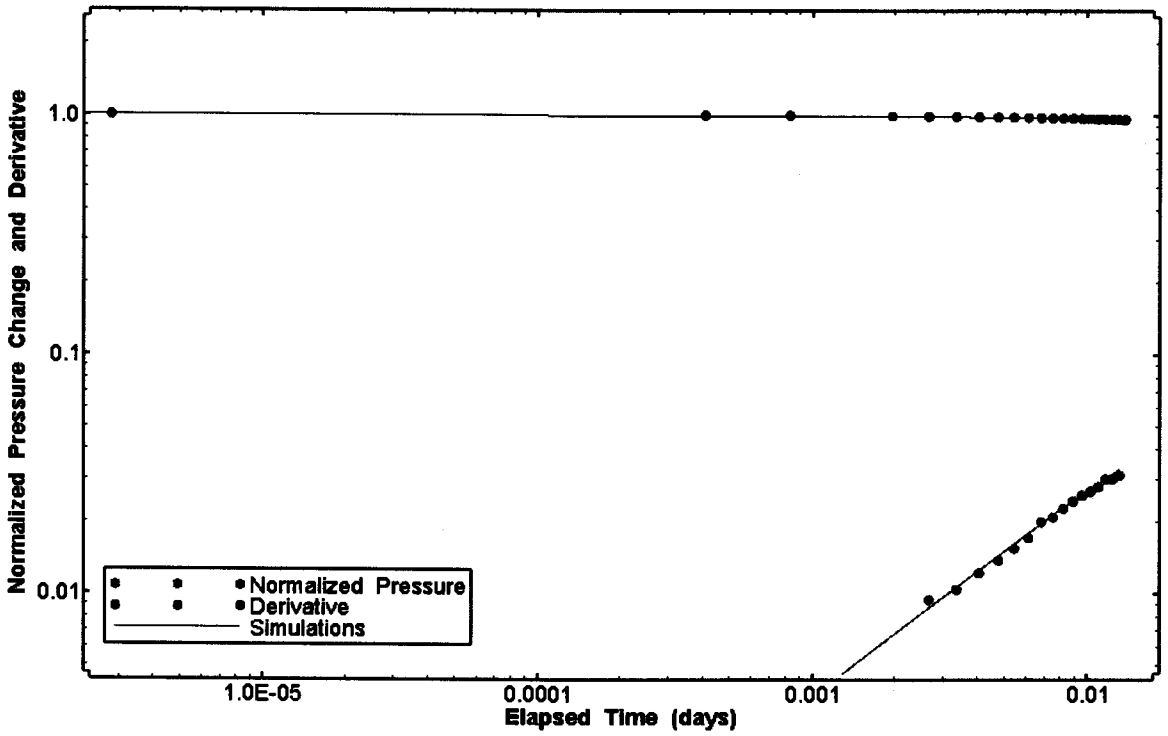


Figure 81. Log-log plot showing 416 simulations of the first H-16 DST flow period Ramey B and derivative response.

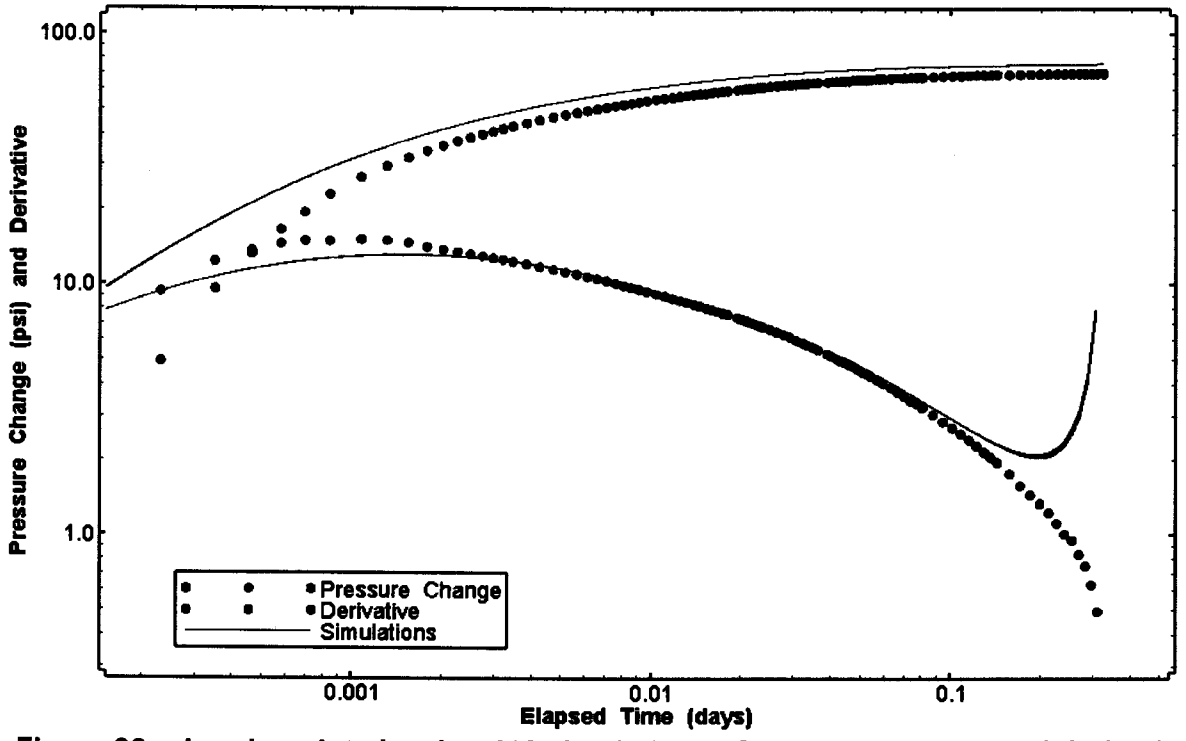


Figure 82. Log-log plot showing 416 simulations of pressure change and derivative during the first H-16 DST pressure buildup period.

Information Only

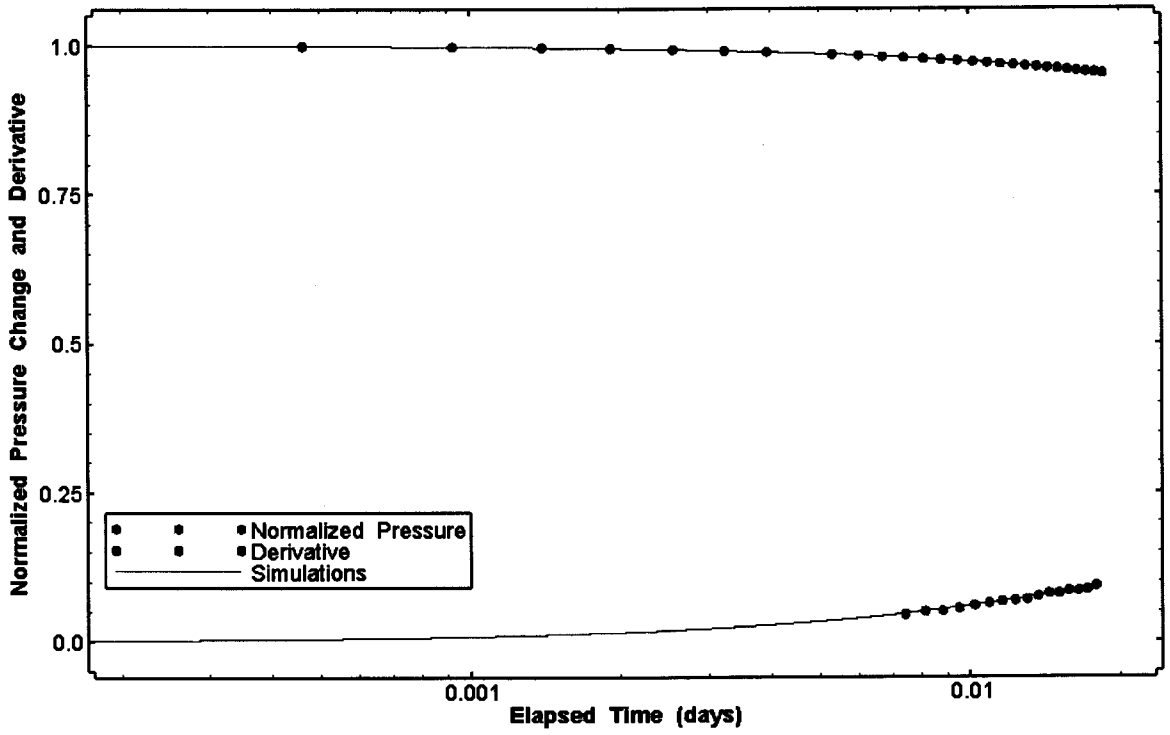


Figure 83. Semilog plot showing 416 simulations of the second H-16 DST flow period Ramey A and derivative response.

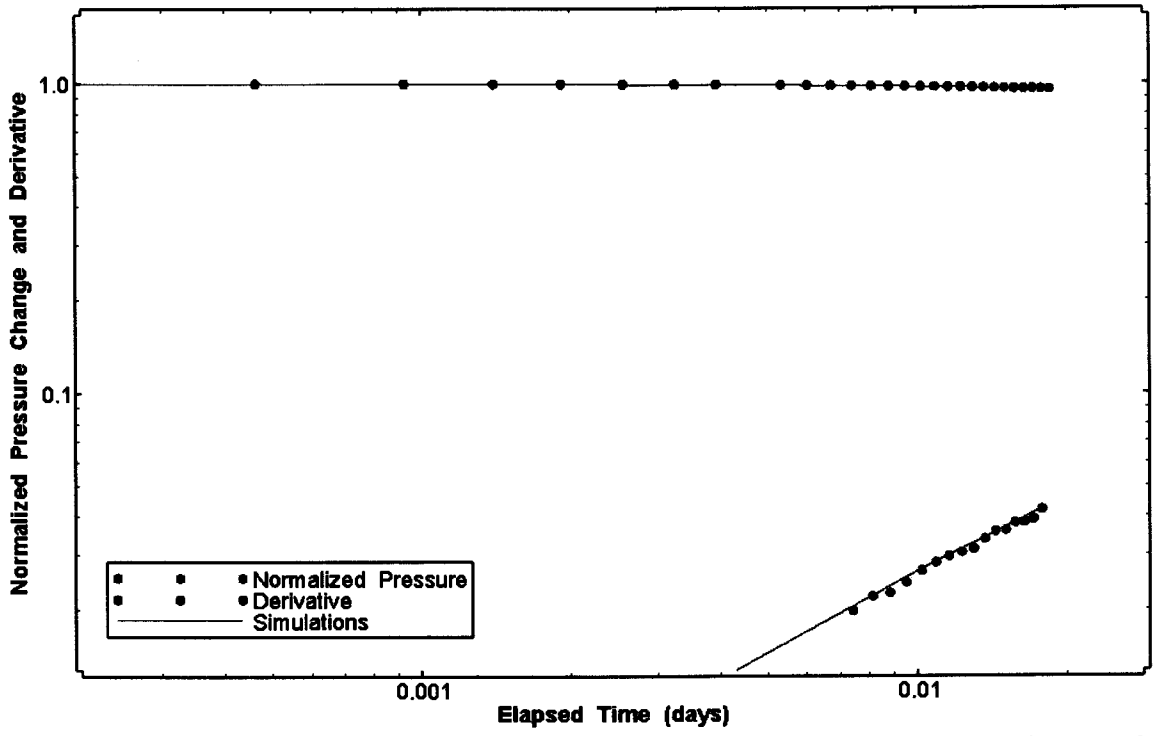


Figure 84. Log-log plot showing 416 simulations of the second H-16 DST flow period Ramey B and derivative response.

Information Only

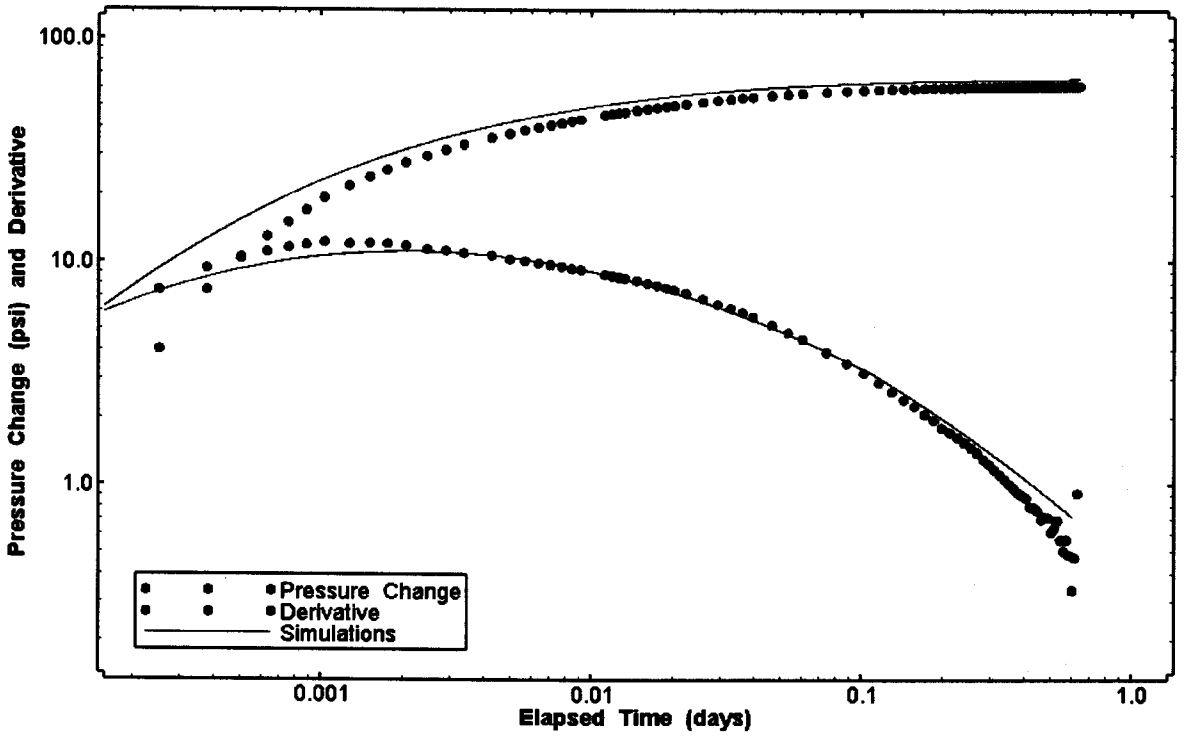


Figure 85. Log-log plot showing 416 simulations of pressure change and derivative during the second H-16 DST pressure buildup period.

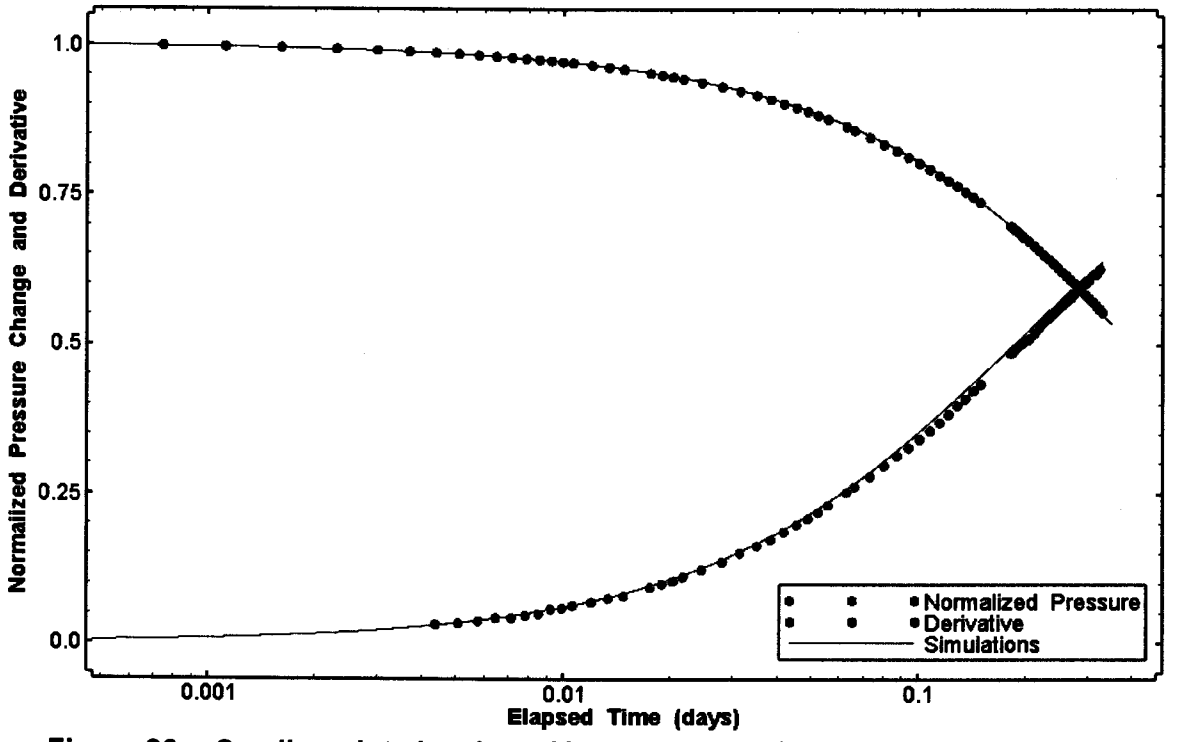


Figure 86. Semilog plot showing 416 simulations of the H-16 slug withdrawal Ramey A and derivative response.

Information Only

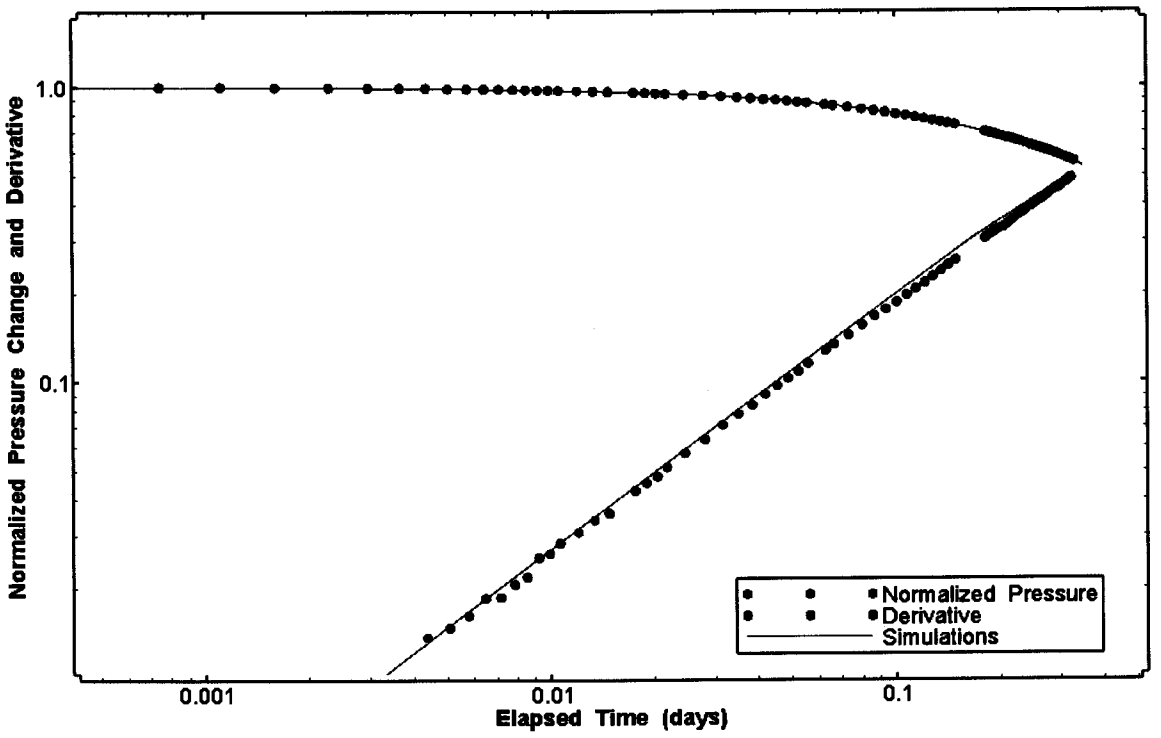


Figure 87. Log-log plot showing 416 simulations of the H-16 slug withdrawal Ramey B and derivative response.

Information Only

4.12 H-18

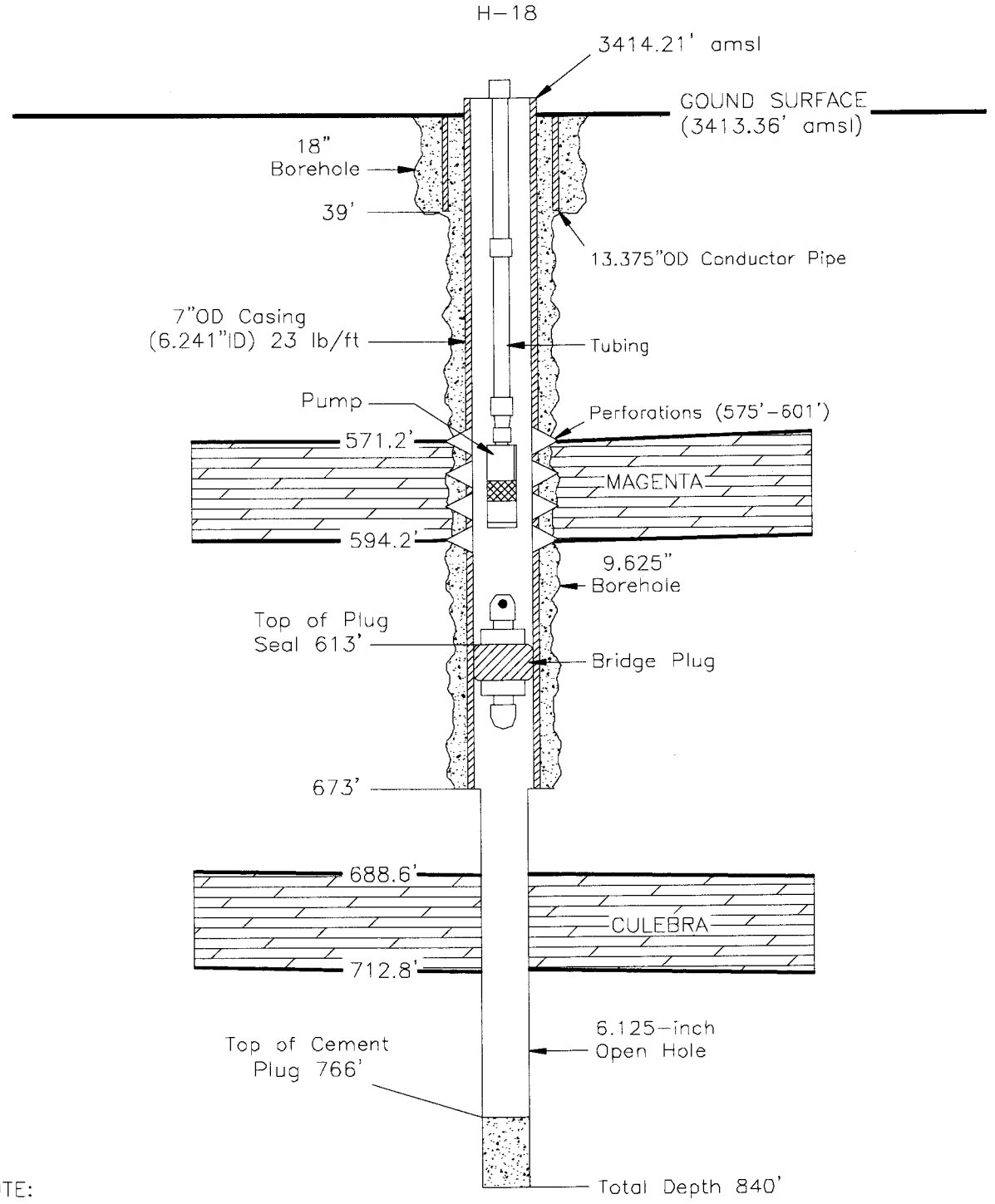
Well H-18 was drilled to assess uncertainties in WIPP site hydrologic parameters (Mercer and Snyder, 1990c). The Magenta interval in well H-18 was drilled on October 8, 1987. The ID of the well was 6.37 in with a 10.75-in conductor casing that contained 6.187-in ID tubing. A physical description of the well is detailed in Figure 88.

A constant-rate pumping test was performed in the H-18 Magenta interval from April 13, 2009 to April 17, 2009. Monitoring of the pumping test recovery was concluded on June 10, 2009. The data used in this analysis are shown in Figure 89.

The nSIGHTS H-18 simulation consisted of three sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the H-18.nPre file and are listed in Appendix B.12.

The specified H-18 conceptual model, based on the characteristics of the diagnostic derivative shown in Figure 93, was an infinite-acting composite (near-field (T_1) and far-field (T_2)) radial system with wellbore storage and skin. The ranges of T_1 and T_2 values derived from perturbation analysis are shown in Figures 90 and 91, respectively. The geometric mean T_1 estimate derived from this analysis was 5.28E-7 m^2/s and the geometric mean T_2 estimate was 8.29E-8 m^2/s. The Cartesian, log-log pressure drawdown diagnostic, and log-log pressure buildup diagnostic simulations corresponding to these T_1 and T_2 values are shown in Figures 92, 93, and 94, respectively.

Information Only



NOTE:

1. Depths in feet below ground surface.
2. Not to scale.

Figure 88. H-18 well configuration during testing.

Information Only

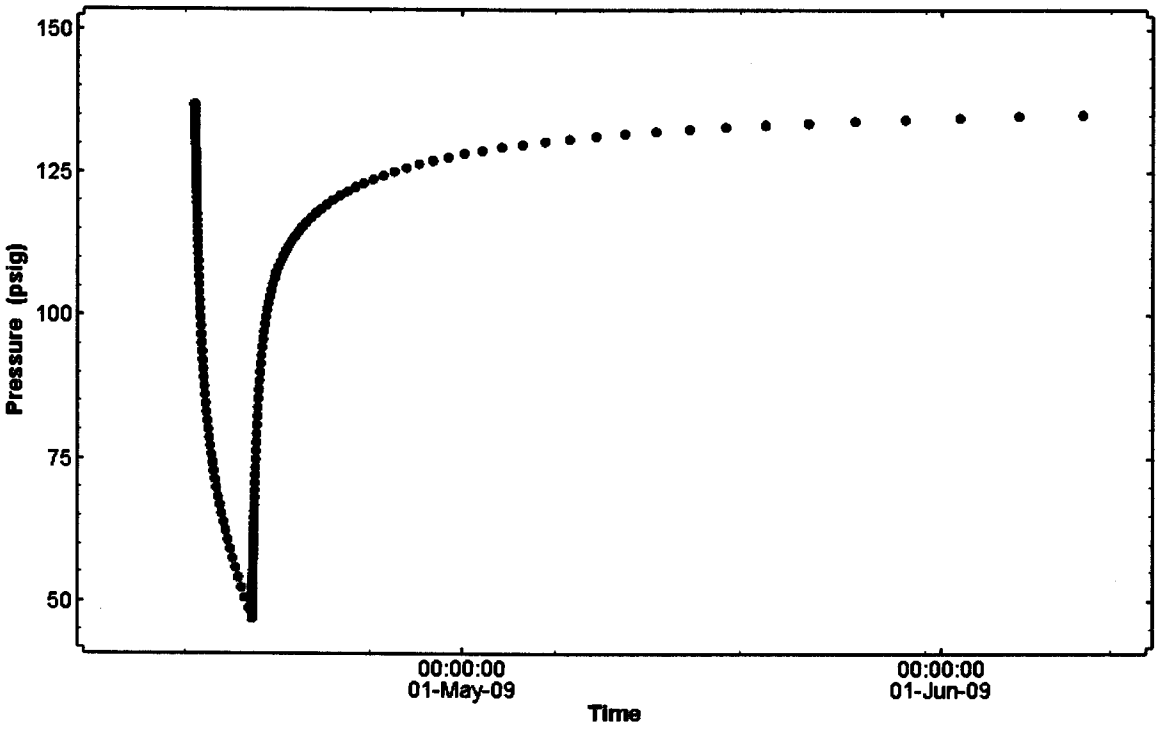


Figure 89. Pressure data from Magenta in H-18.

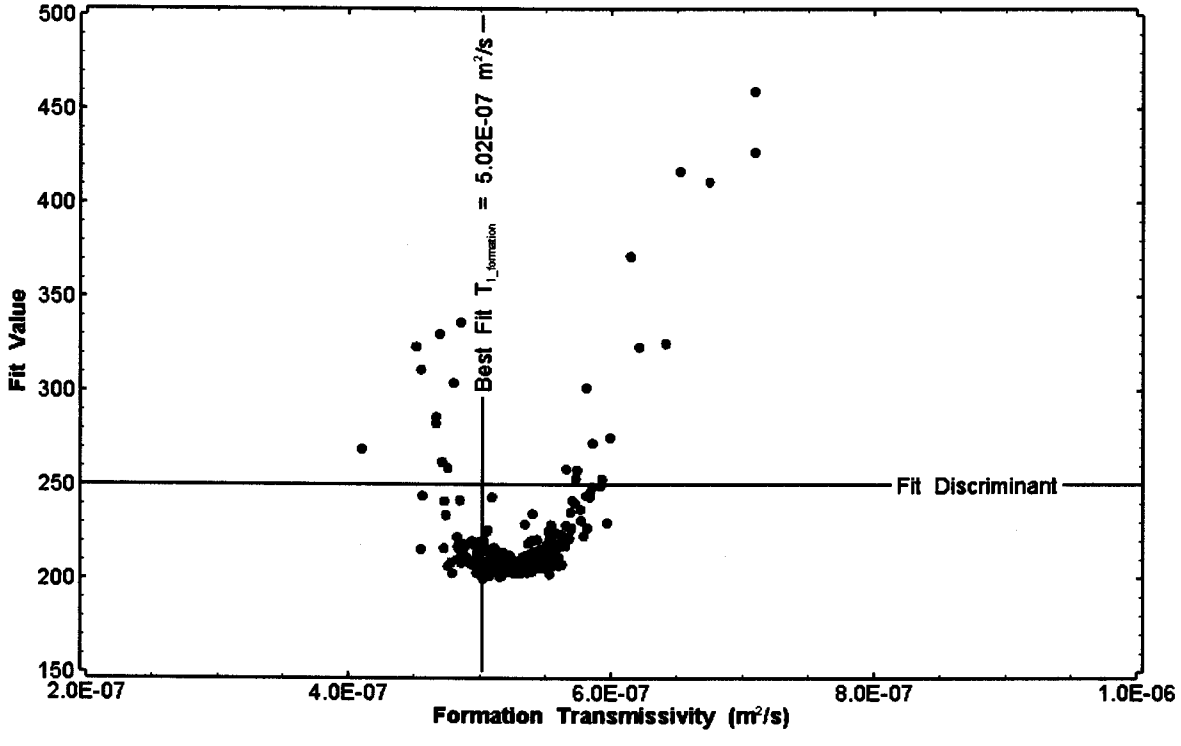


Figure 90. X-Y scatter plot showing the near-field transmissivity parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit values.

Information Only

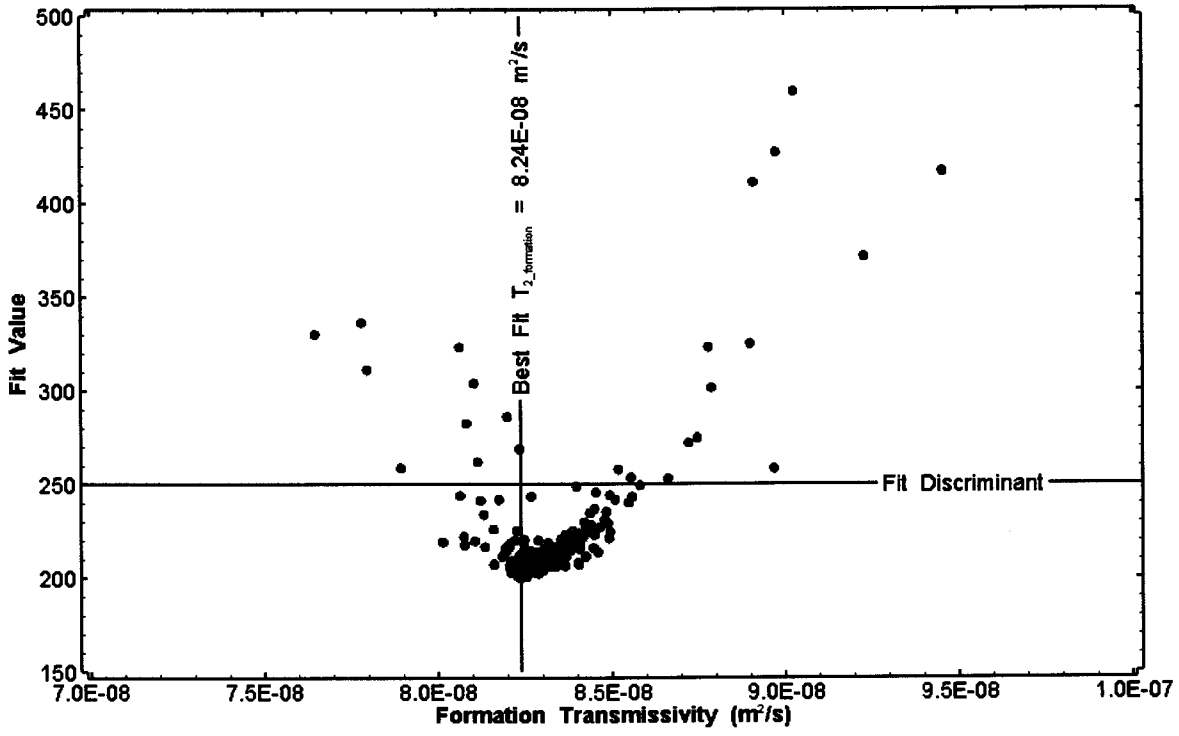


Figure 91. X-Y scatter plot showing the far-field transmissivity parameter space derived from the H-18 perturbation analysis along with the fit discriminant and best fit values.

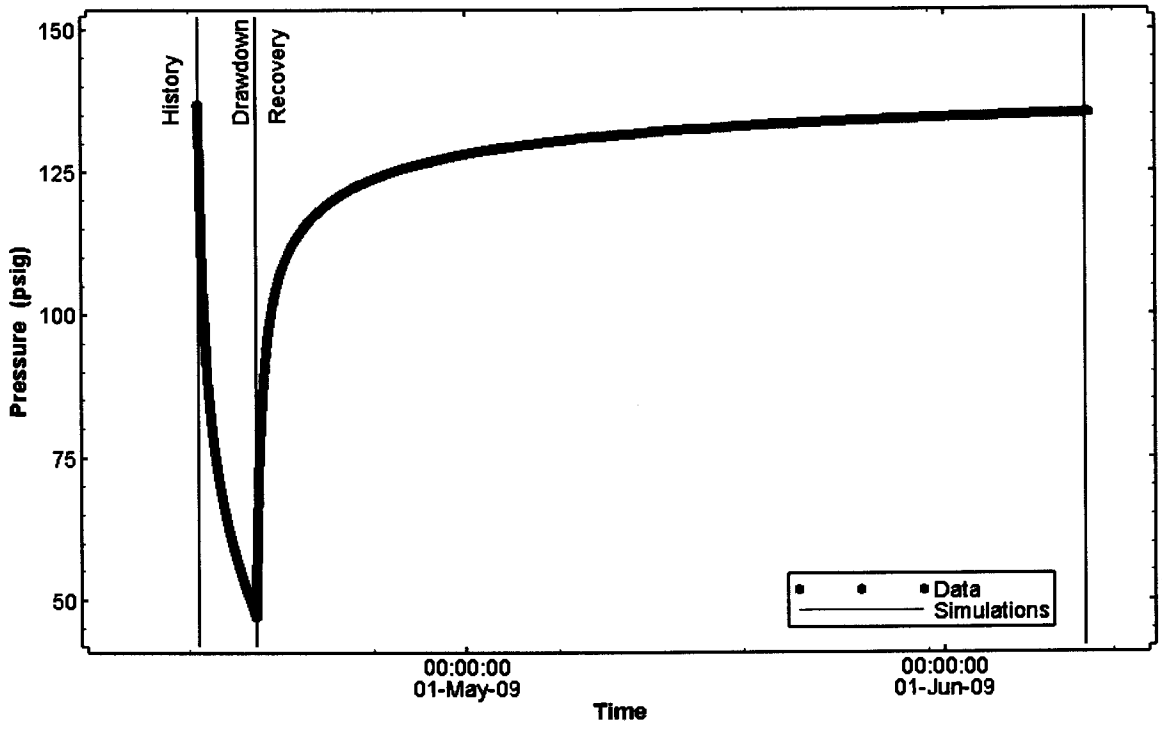


Figure 92. Linear plot showing 470 simulations of the H-18 pressure response.

Information Only

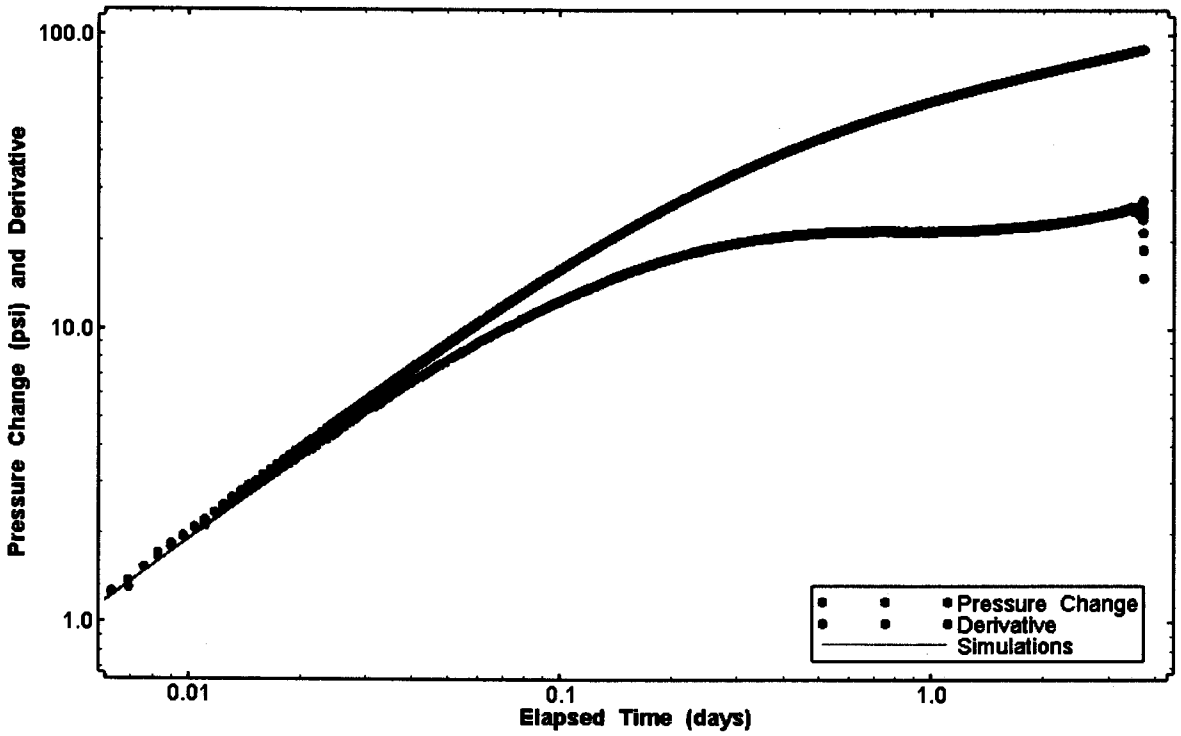


Figure 93. Log-log plot showing 470 simulations of pressure change and derivative during the H-18 constant-rate pumping test.

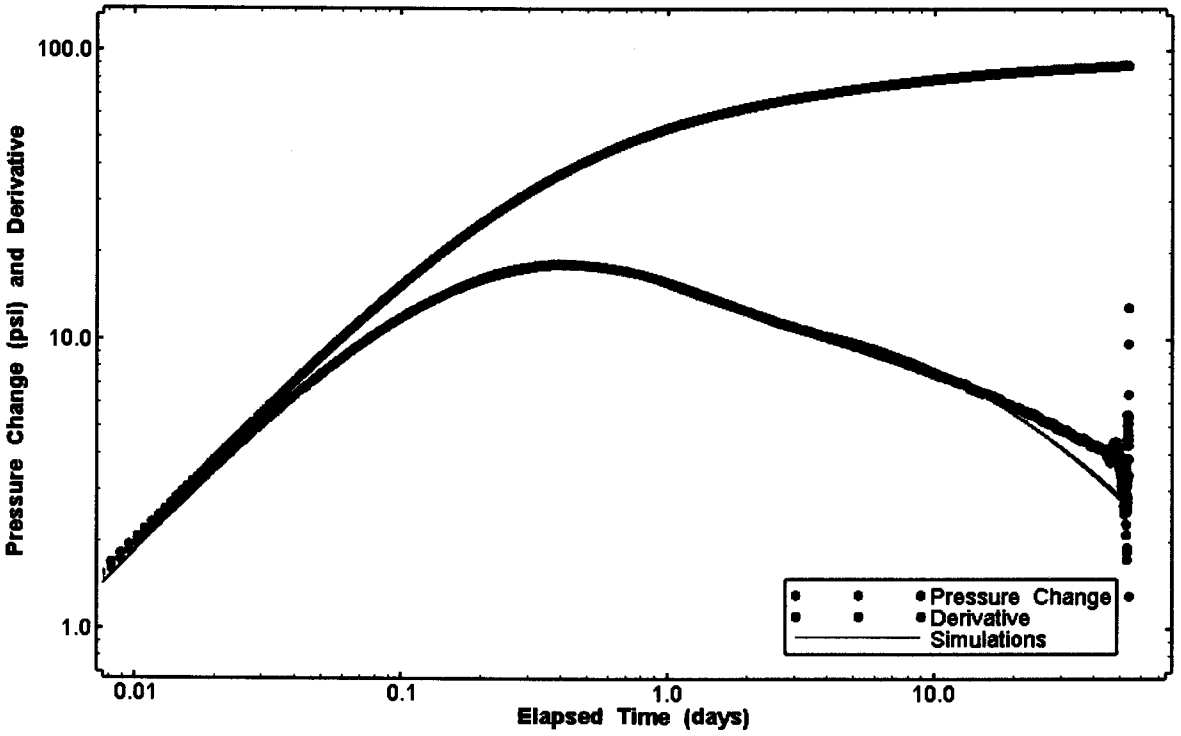


Figure 94. Log-log plot showing 470 simulations of pressure change and derivative during the H-18 pressure buildup test.

Information Only

4.13 WIPP-18

Well WIPP-18 was rotary-drilled to investigate the possibility of a local fault revealed by seismic information (Jones and Gonzales, 1979). The Magenta interval in well WIPP-18 was drilled on March 24, 1978. The ID of the well was 4.95 in with a 7-in OD surface casing that contained 2.36-in ID tubing. A physical description of the well is detailed in Figure 95.

A slug withdrawal test was initiated in the WIPP-18 Magenta interval on December 17, 2009. Monitoring of the slug response was concluded on January 5, 2010. The data used in this analysis are shown in Figure 96.

The nSIGHTS WIPP-18 simulation consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the WIPP-18.nPre file and are listed in Appendix B.13.

The specified WIPP-18 conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage and skin. The range of T values derived from perturbation analysis is shown in Figure 97. The geometric mean T estimate derived from this analysis was 1.90E-7 m^2/s. The Cartesian, Ramey A, and Ramey B simulations corresponding to these T values are shown in Figures 98, 99, and 100, respectively.

Information Only

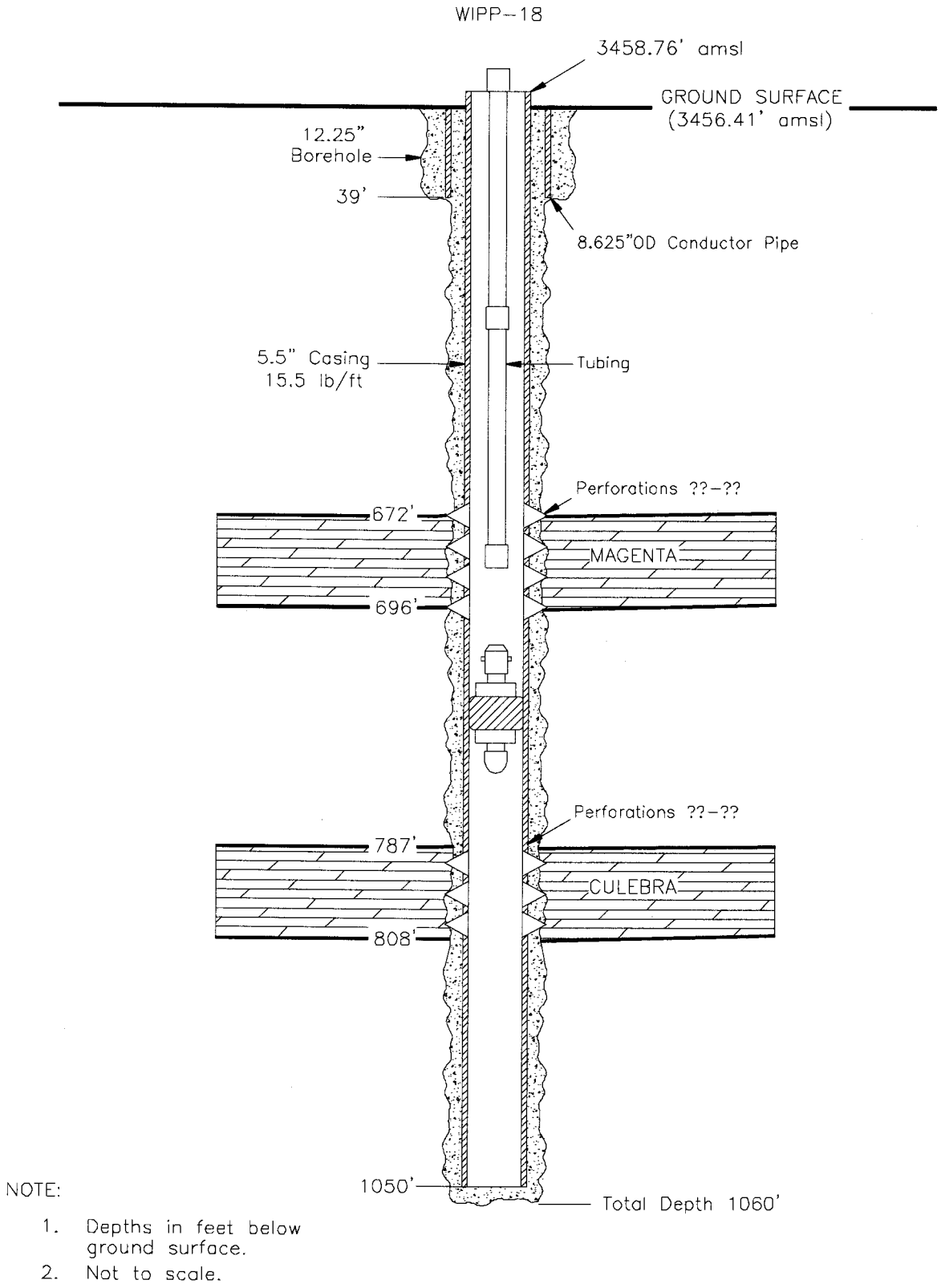


Figure 95. WIPP-18 well configuration during testing.

Information Only

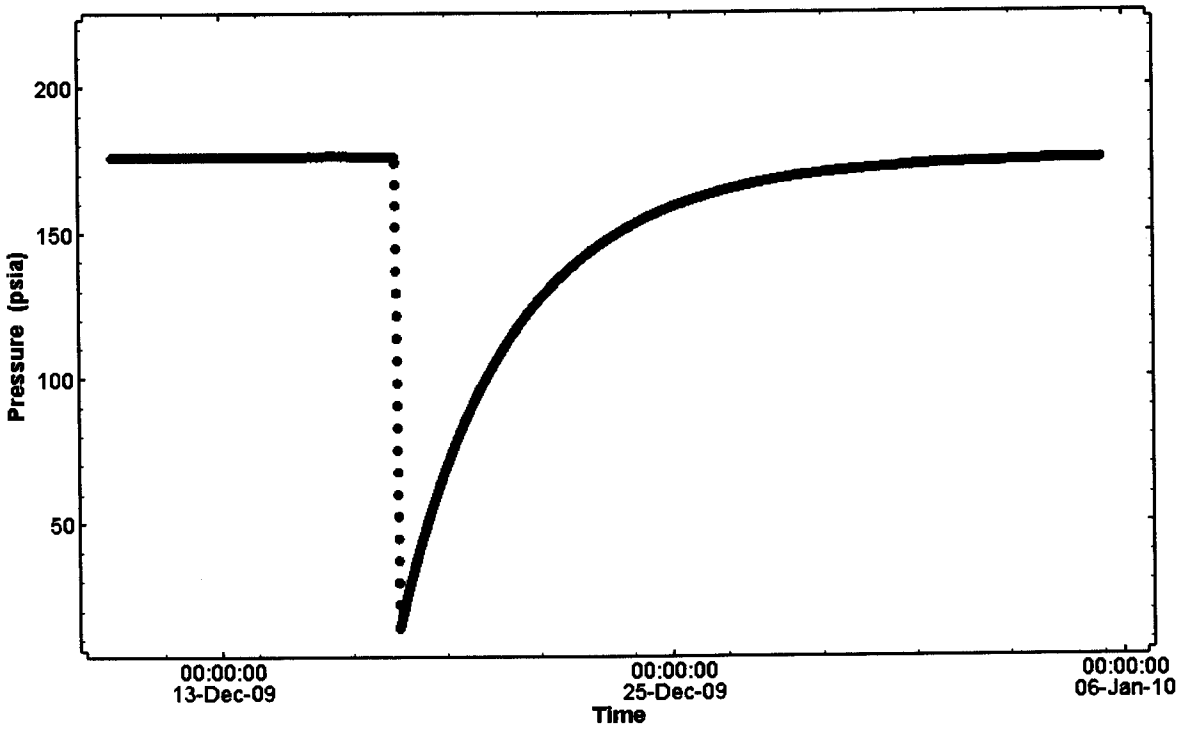


Figure 96. Pressure data from Magenta in WIPP-18.

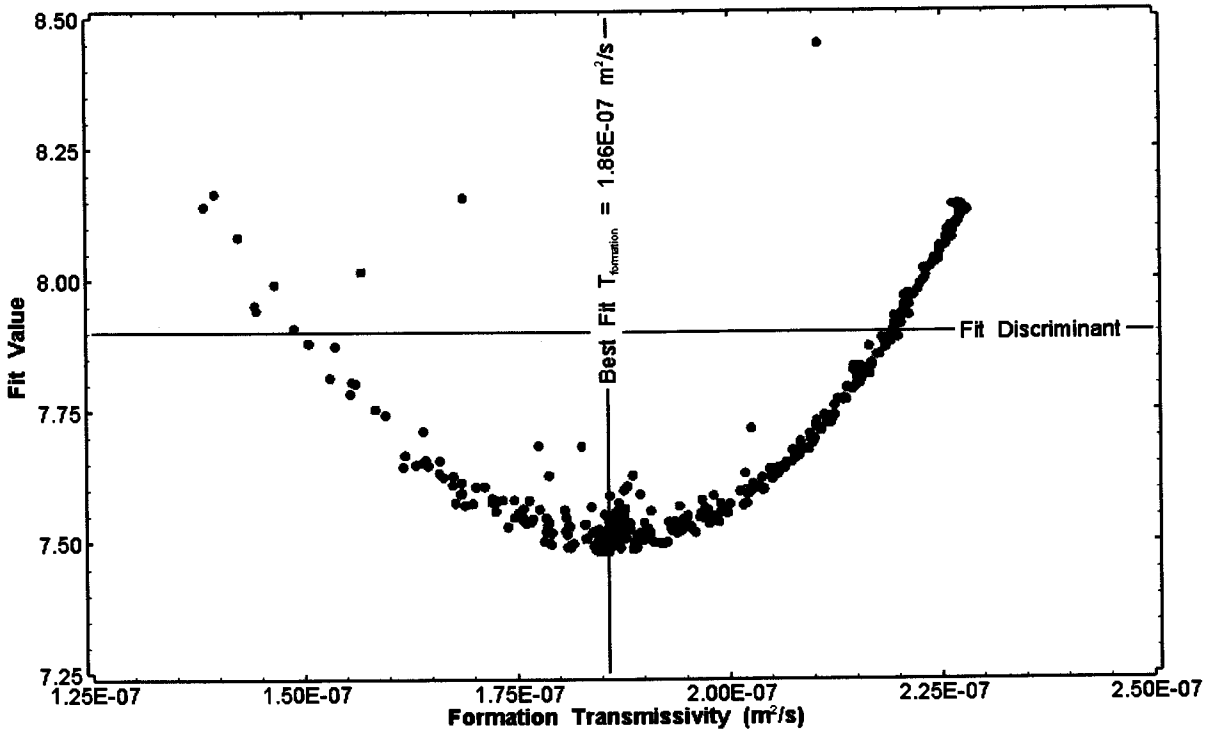


Figure 97. X-Y scatter plot showing the transmissivity parameter space derived from the WIPP-18 perturbation analysis along with the discriminant and best fit values.

Information Only

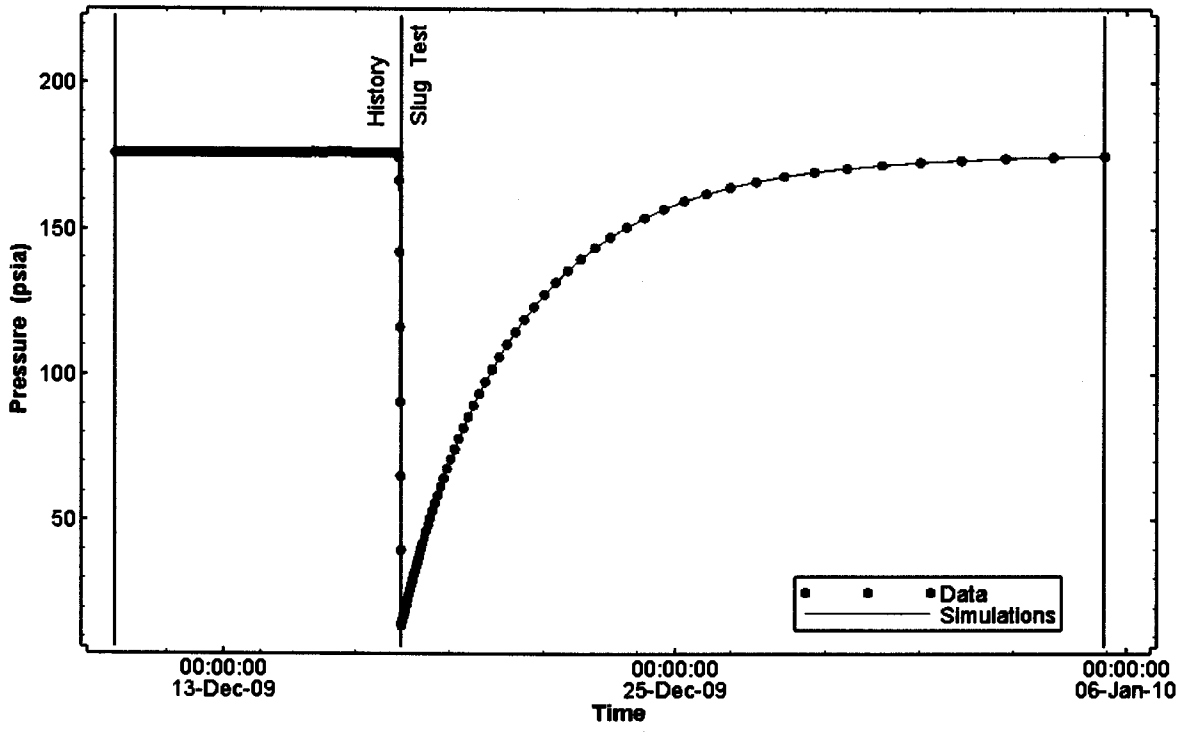


Figure 98. Linear plot showing 374 simulations of the WIPP-18 pressure response.

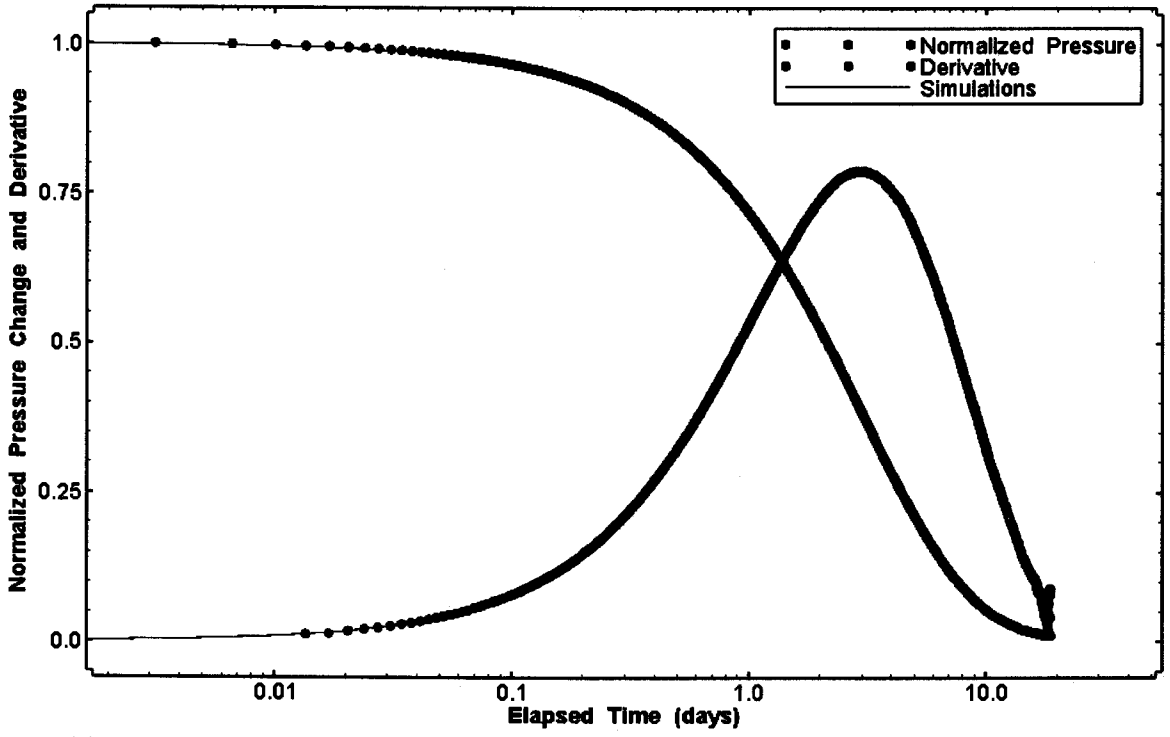


Figure 99. Semilog plot showing 374 simulations of the WIPP-18 slug withdrawal Ramey A and derivative response.

Information Only

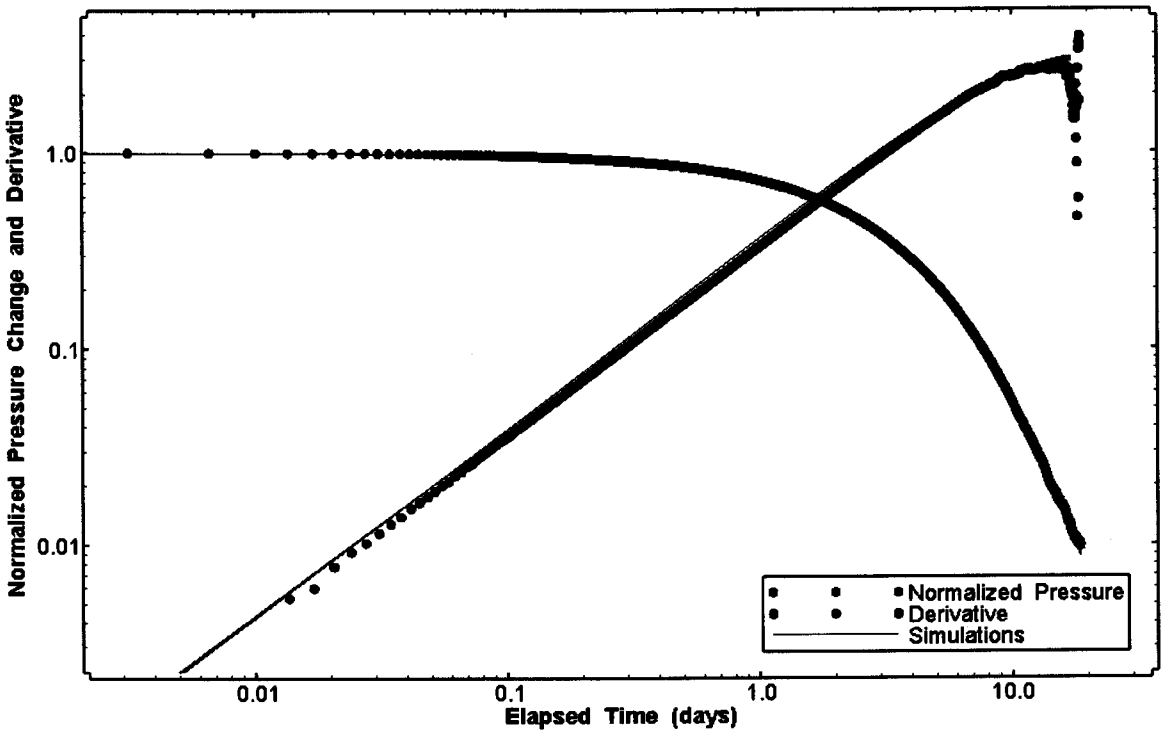


Figure 100. Log-log plot showing 374 simulations of the WIPP-18 slug withdrawal Ramey B and derivative response.

Information Only

4.14 WIPP-27

Well WIPP-27 was drilled to investigate evaporate dissolution features and to explore the stratigraphy of near-surface formations (Jones and McIntyre, 1979). The Magenta interval in well WIPP-27 was drilled on September 14, 1978. The ID of the well was 5.012 inc with a 8.75-in surface casing. A physical description of the well is detailed in Figure 101.

Two slug injection tests were performed over an hour time-span in the WIPP-27 Magenta interval on September 20, 1980 (Richey, 1987). The data used in this analysis are shown in Figure 102.

The nSIGHTS WIPP-27 simulation consisted of three sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the WIPP-27.nPre file and are listed in Appendix B.14.

The specified WIPP-27 conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting composite ((near-field (T_1) and far-field (T_2)) radial system with wellbore storage. The ranges of T_1 and T_2 values derived from perturbation analysis are shown in Figures 103 and 104, respectively. The geometric mean T_1 estimate derived from this analysis was 5.76E-7 m^2/s and the geometric mean T_2 estimate was 3.96E-2 m^2/s. The Cartesian simulations corresponding to these T values are shown in Figure 105. The Ramey A, Ramey B, and Ramey C simulations of the first slug injection corresponding to these T values are shown in Figures 106, 107, and 108, respectively. The Ramey A, Ramey B, and Ramey C simulations of the second slug injection corresponding to these T values are shown in Figures 109, 110, and 111, respectively.

Information Only

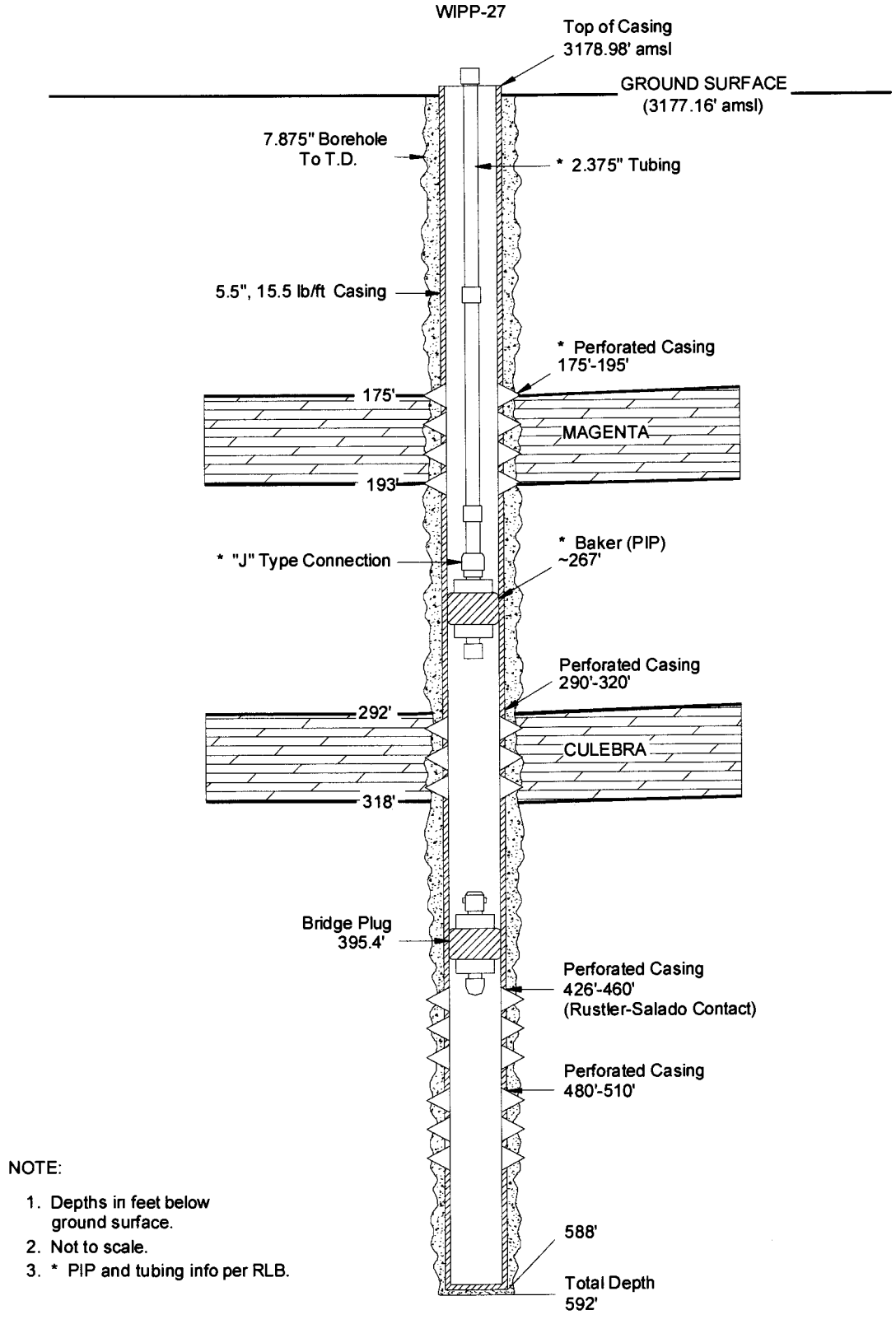


Figure 101. WIPP-27 well configuration during testing.

Information Only

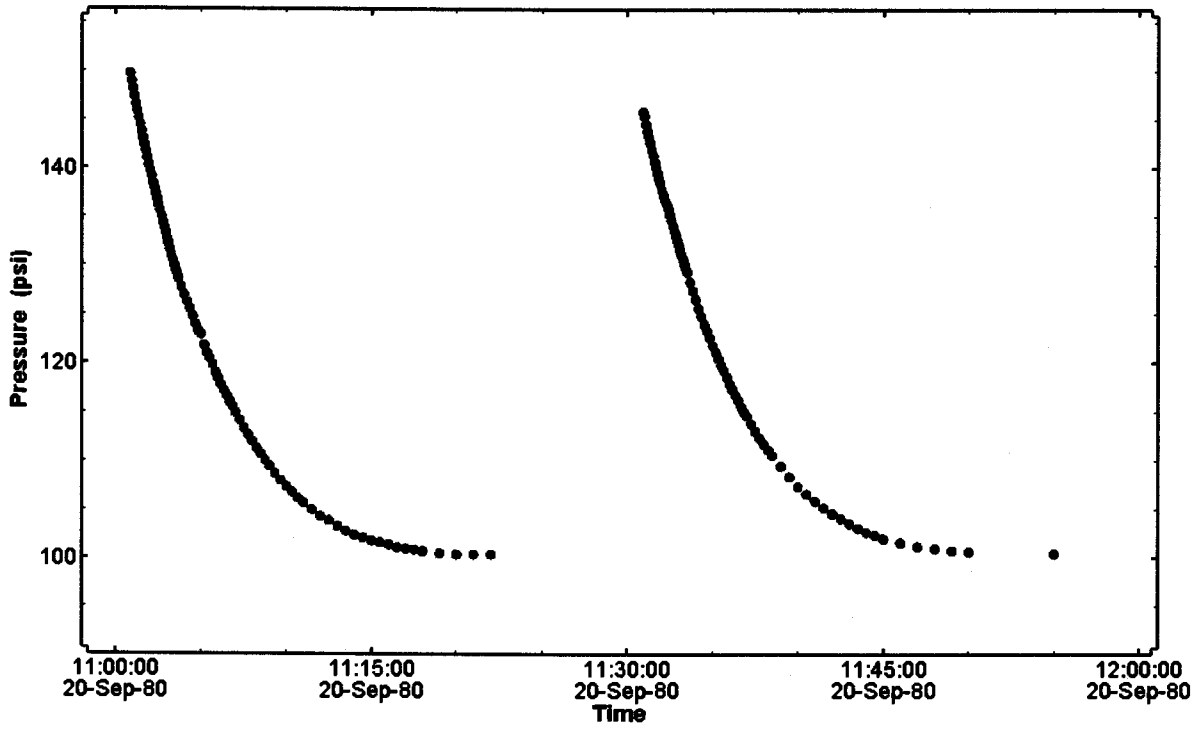


Figure 102. Pressure data from the Magenta interval in WIPP-27.

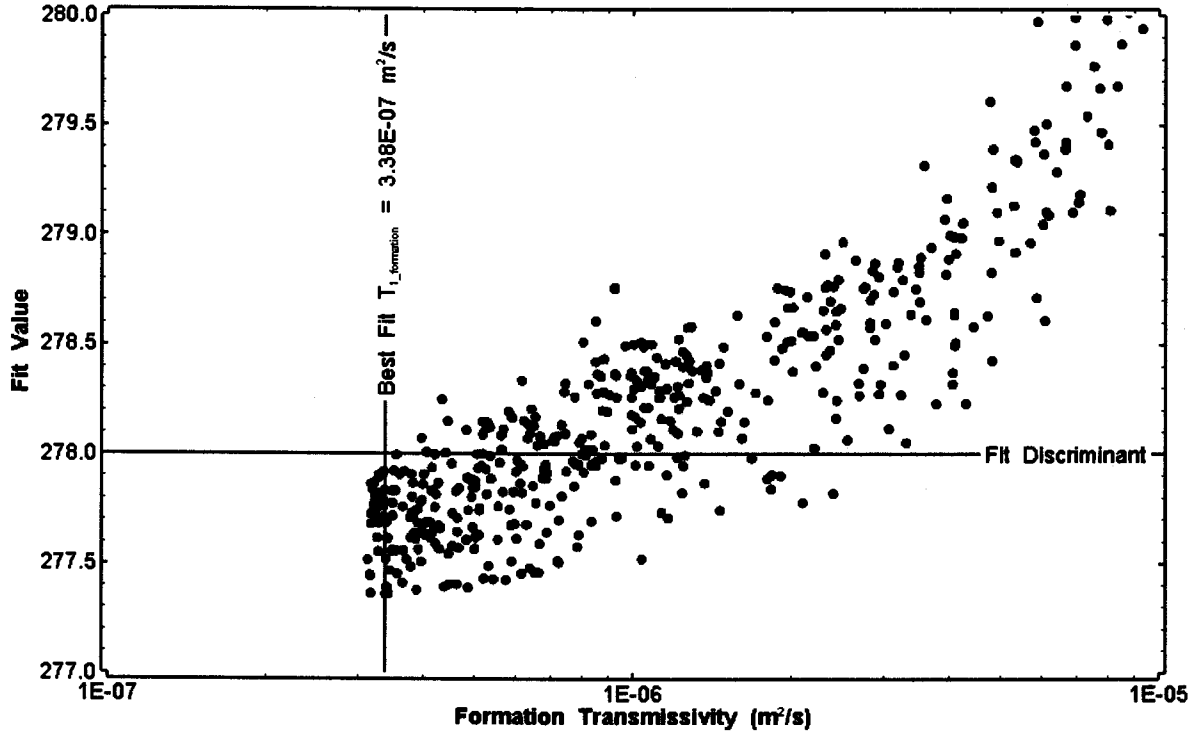


Figure 103. X-Y scatter plot showing the near-field transmissivity parameter space derived from the WIPP-27 perturbation analysis with fit discriminant and best fit values.

Information Only

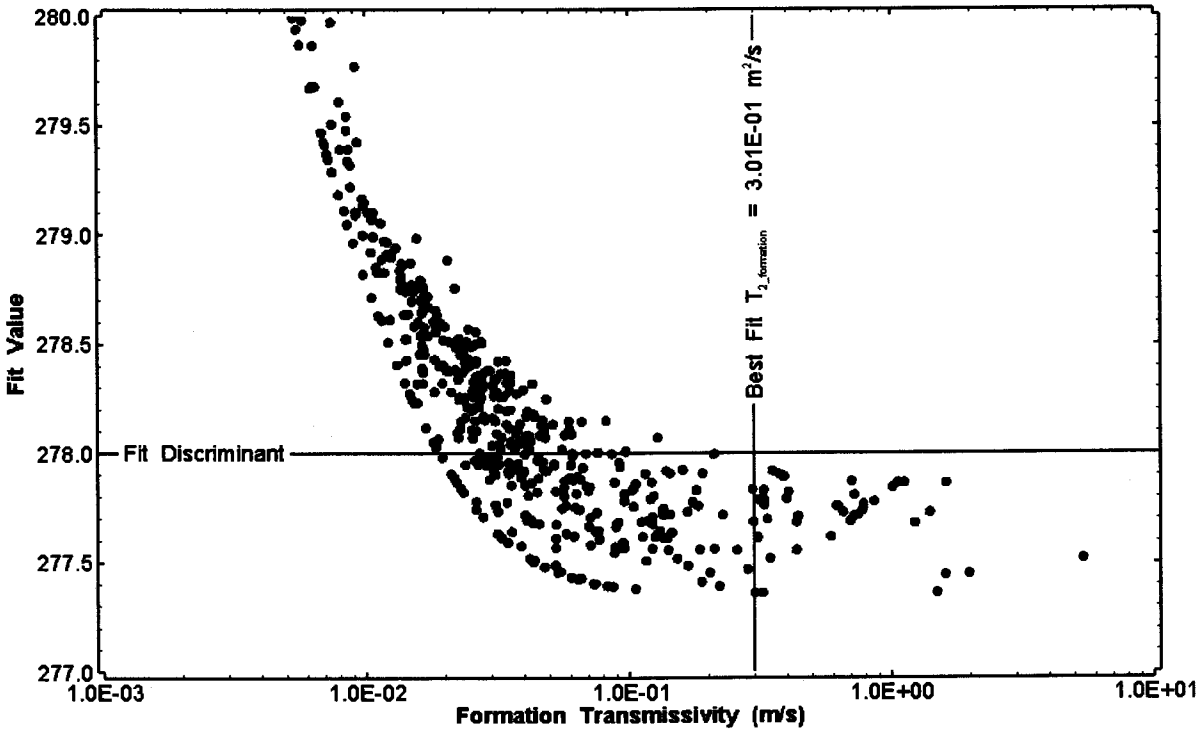


Figure 104. X-Y scatter plot showing of the far-field transmissivity parameter space derived from the WIPP-27 perturbation analysis with fit discriminant and best fit values.

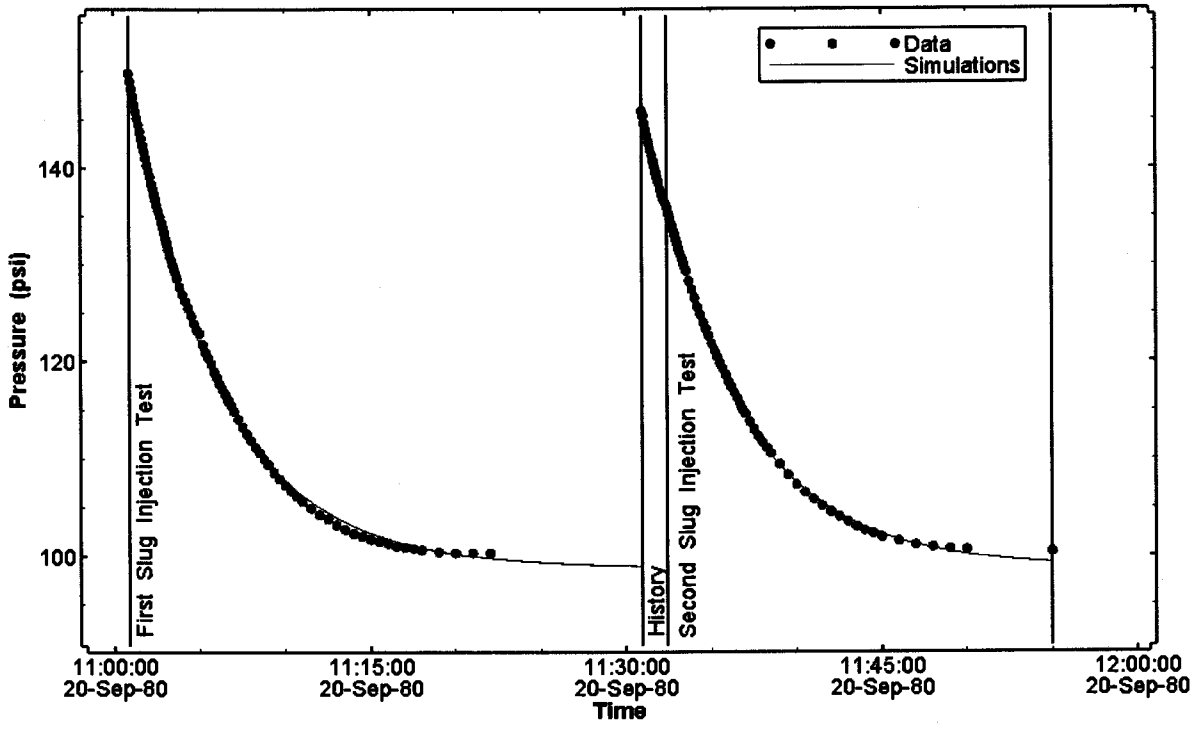


Figure 105. Linear plot showing 206 simulations of the WIPP-27 pressure response.

Information Only

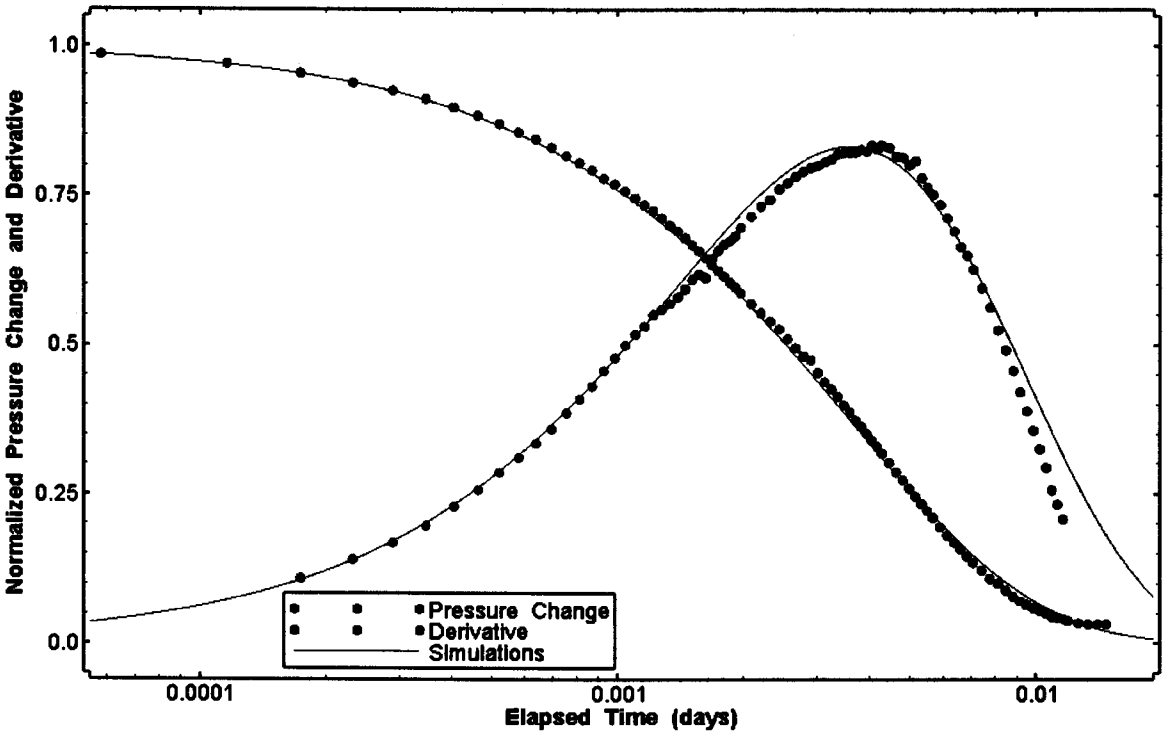


Figure 106. Semilog plot showing 214 simulations of the WIPP-27 first slug injection Ramey A and derivative response.

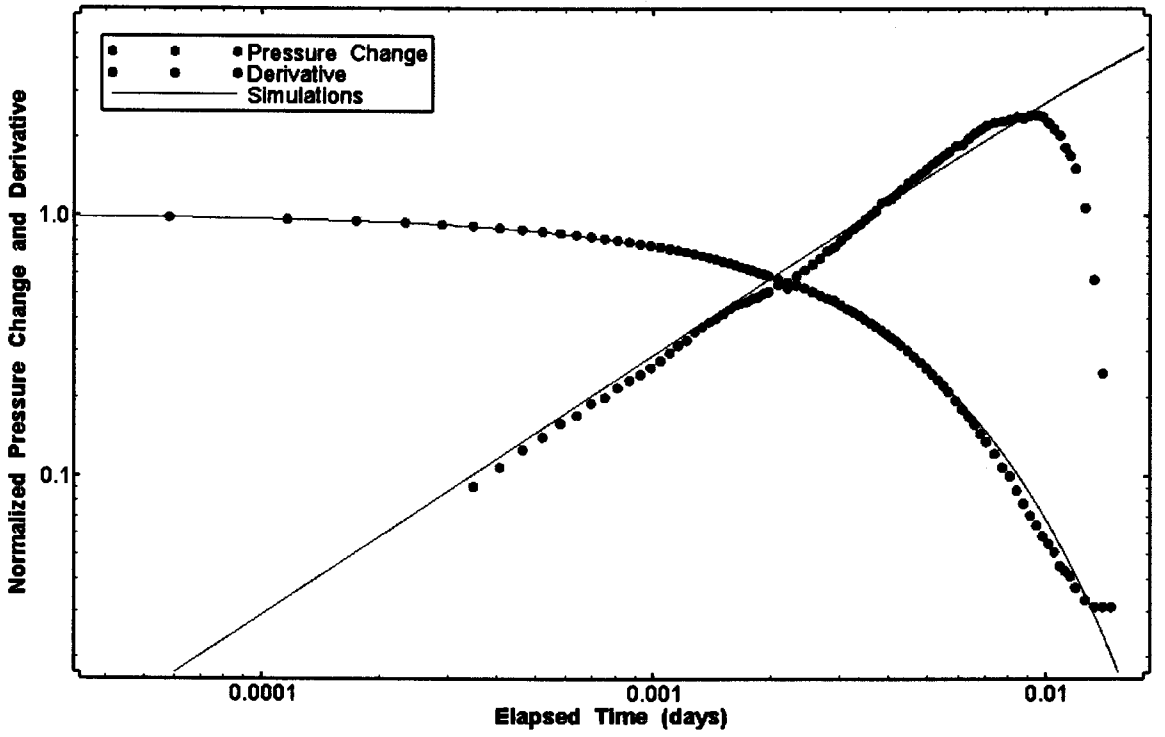


Figure 107. Log-log plot showing 214 simulations of the WIPP-27 first slug injection Ramey B and derivative response.

Information Only

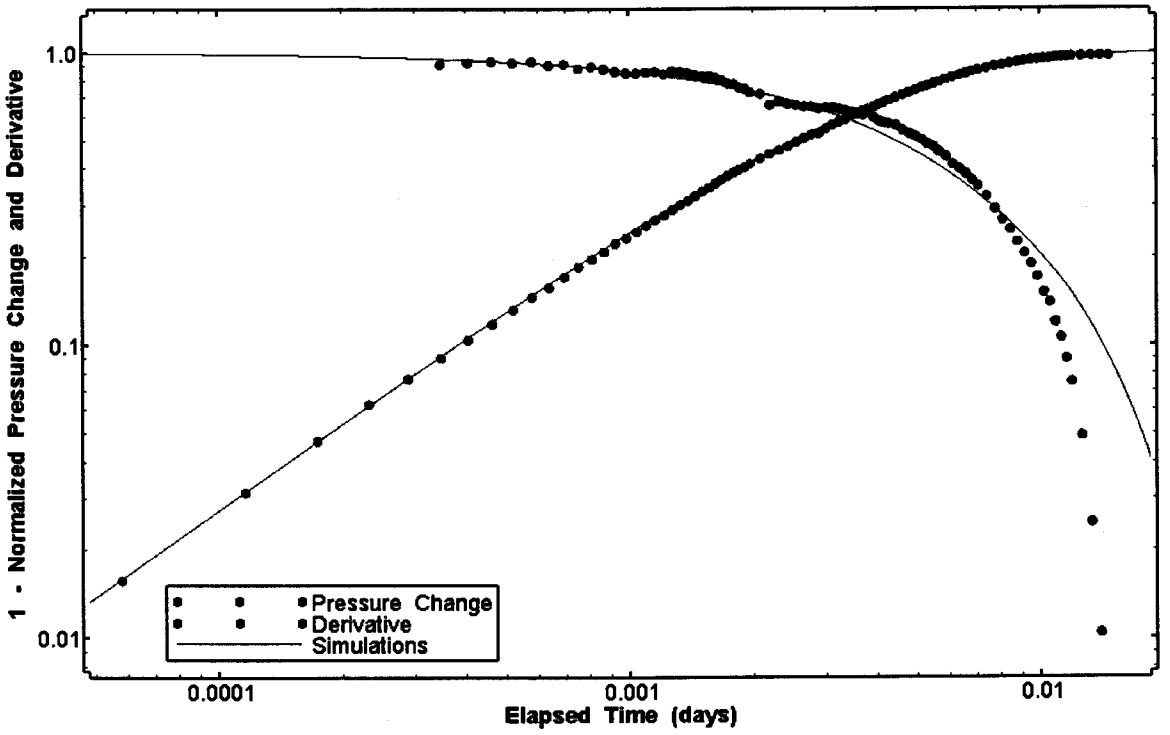


Figure 108. Log-log plot showing 214 simulations of the WIPP-27 first slug injection Ramey C and derivative response.

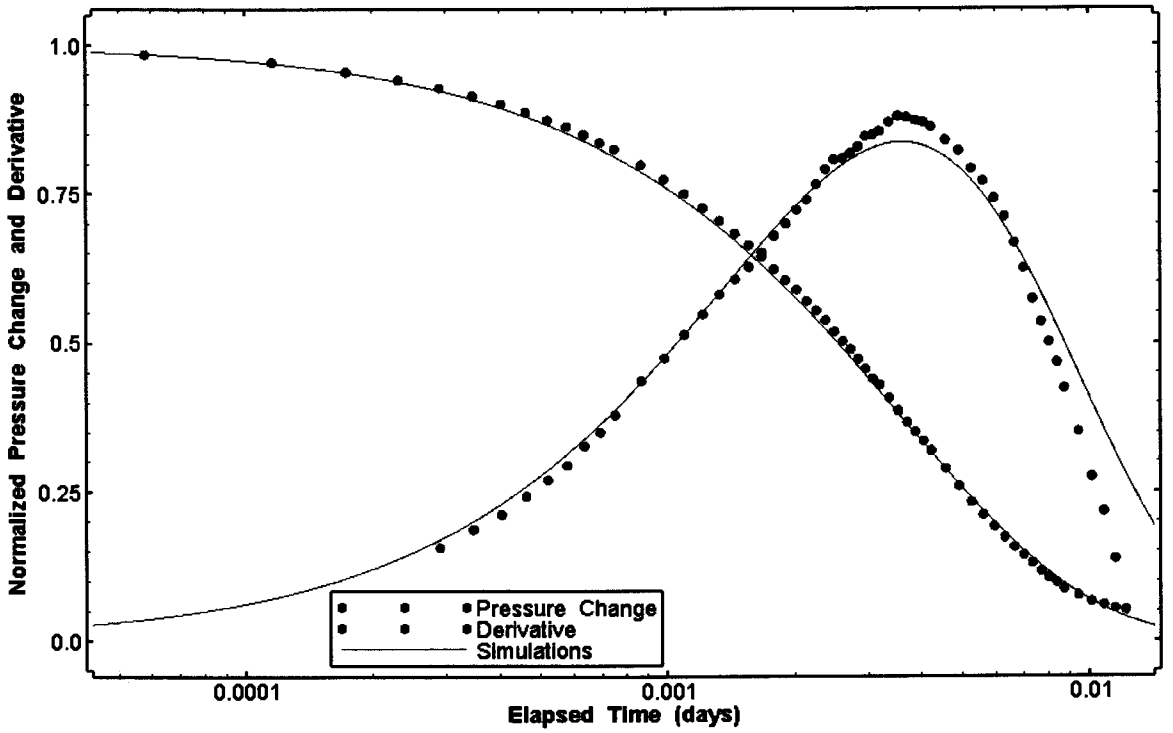


Figure 109. Semilog plot showing 214 simulations of the WIPP-27 second slug injection Ramey A and derivative response.

Information Only

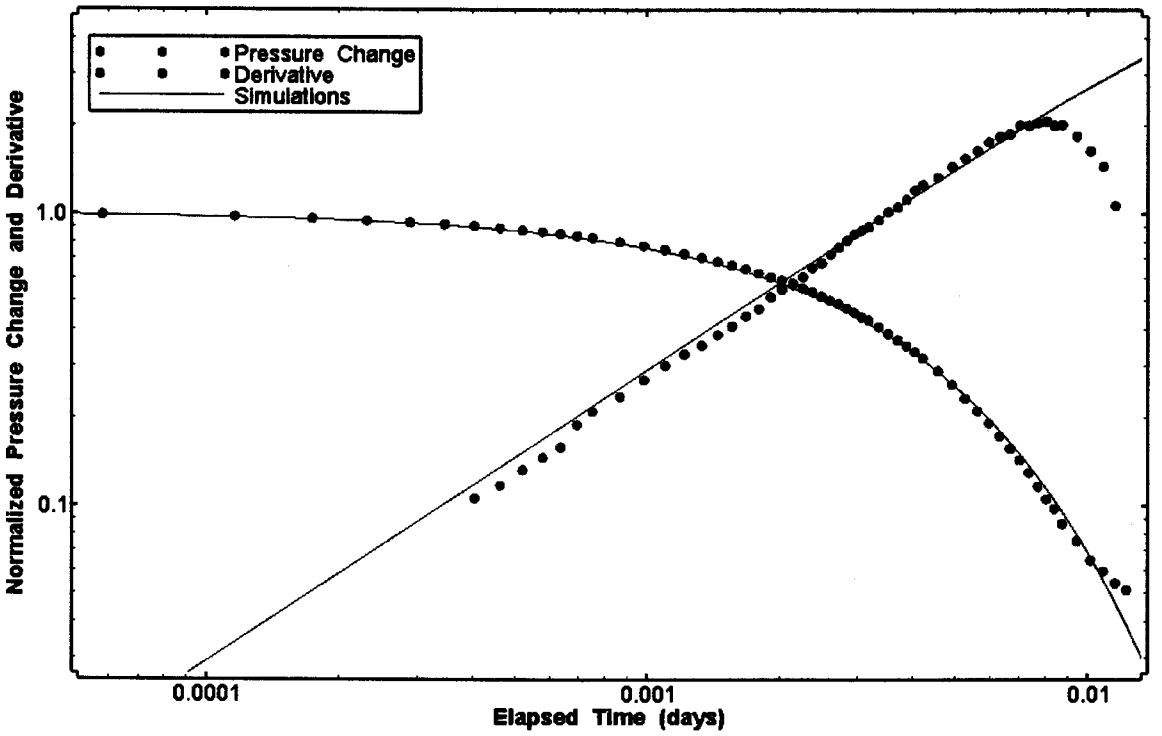


Figure 110. Log-log plot showing 214 simulations of the WIPP-27 second slug injection Ramey B and derivative response.

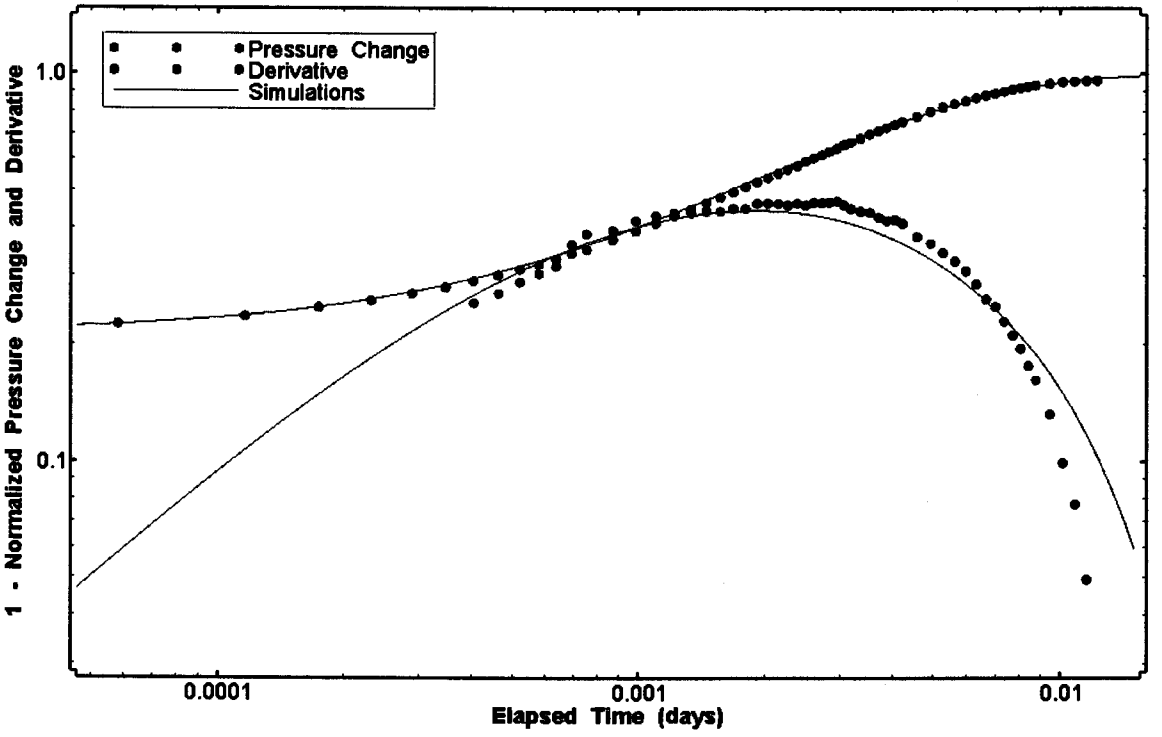


Figure 111. Log-log plot showing 214 simulations of the WIPP-27 second slug injection Ramey C and derivative response.

Information Only

4.15 WIPP-30

Well WIPP-30 was drilled to obtain core for the study of dissolution of near-surface rocks (Snyder and Drellack, 1979). The Magenta interval in well WIPP-30 was drilled on September 18, 1978. The ID of the well was 4.95 in with an 8.75-in surface casing that contained 1.995-in ID tubing. A physical description of the well is detailed in Figure 112.

The USGS initiated a slug injection test in the WIPP-30 Magenta interval on October 2, 1980 (Richey, 1987). Monitoring of the slug response was concluded on October 10, 1980. The data used in this analysis are shown in Figure 113.

The nSIGHTS WIPP-30 simulation consisted of two sequences. The details of each sequence, i.e., start/end time, pressure, etc., are specified in the WIPP-30.nPre file and are listed in Appendix B.15.

The specified WIPP-30 conceptual model, chosen because it was the simplest model that conformed to the available information and produced an acceptable fit to the data, was an infinite-acting radial system with wellbore storage and skin. The range of T values derived from perturbation analysis is shown in Figure 114. The geometric mean T estimate derived from this analysis was 1.06E-8 m^2/s. The Cartesian, Ramey A, and Ramey B simulations of the slug injection corresponding to these T values are shown in Figures 115, 116, and 117, respectively.

Information Only

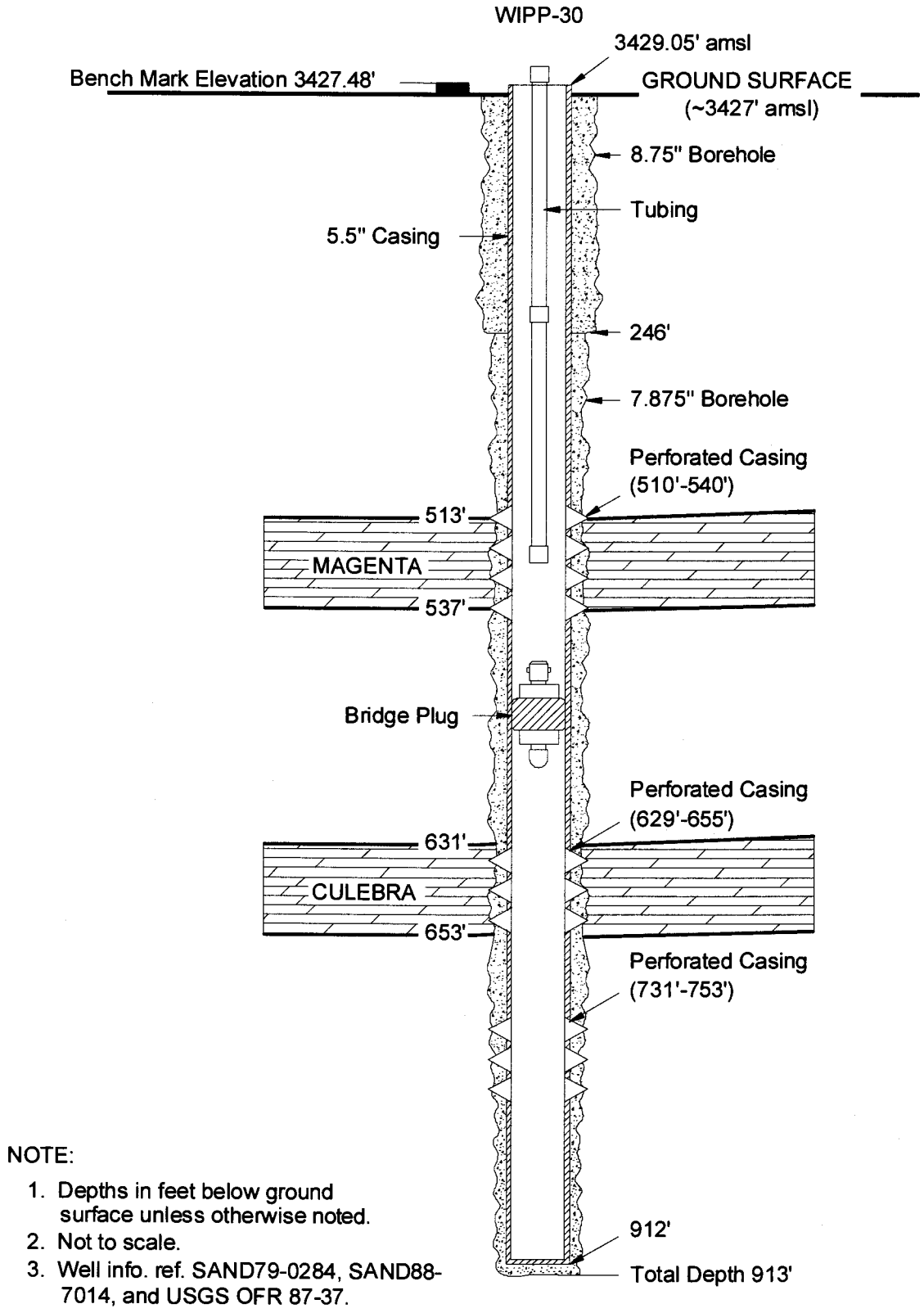


Figure 112. WIPP-30 well configuration during testing.

Information Only

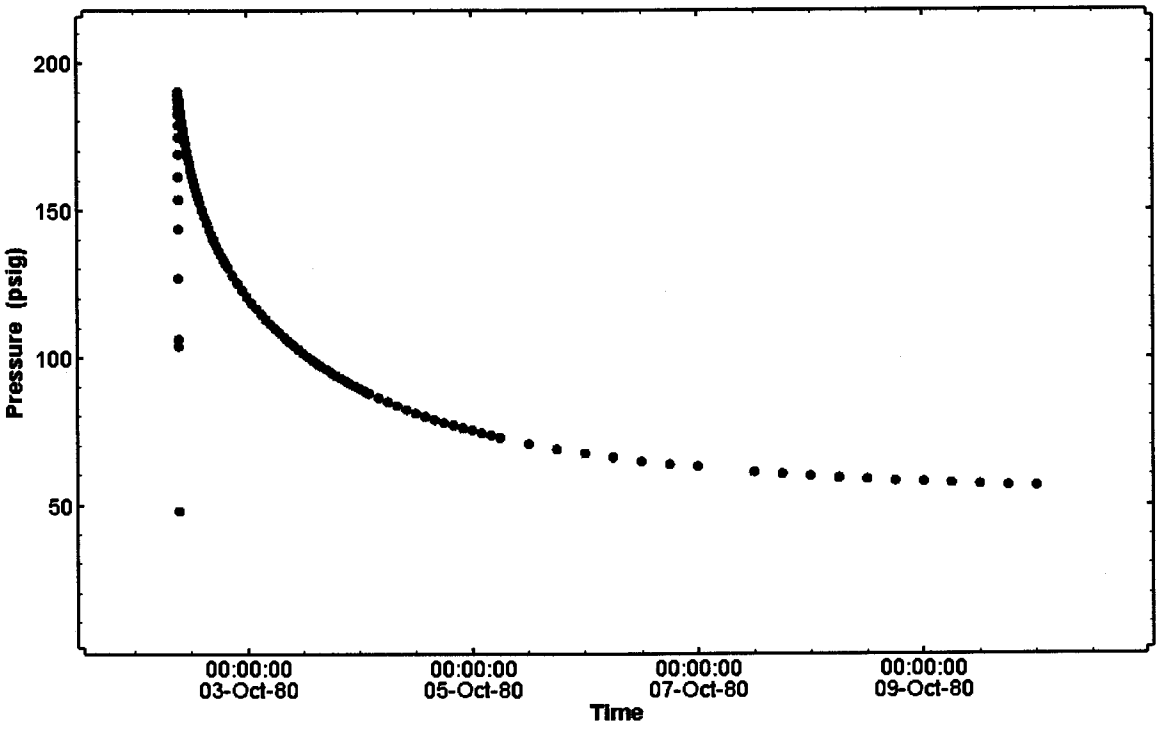


Figure 113. Pressure data from Magenta in WIPP-30.

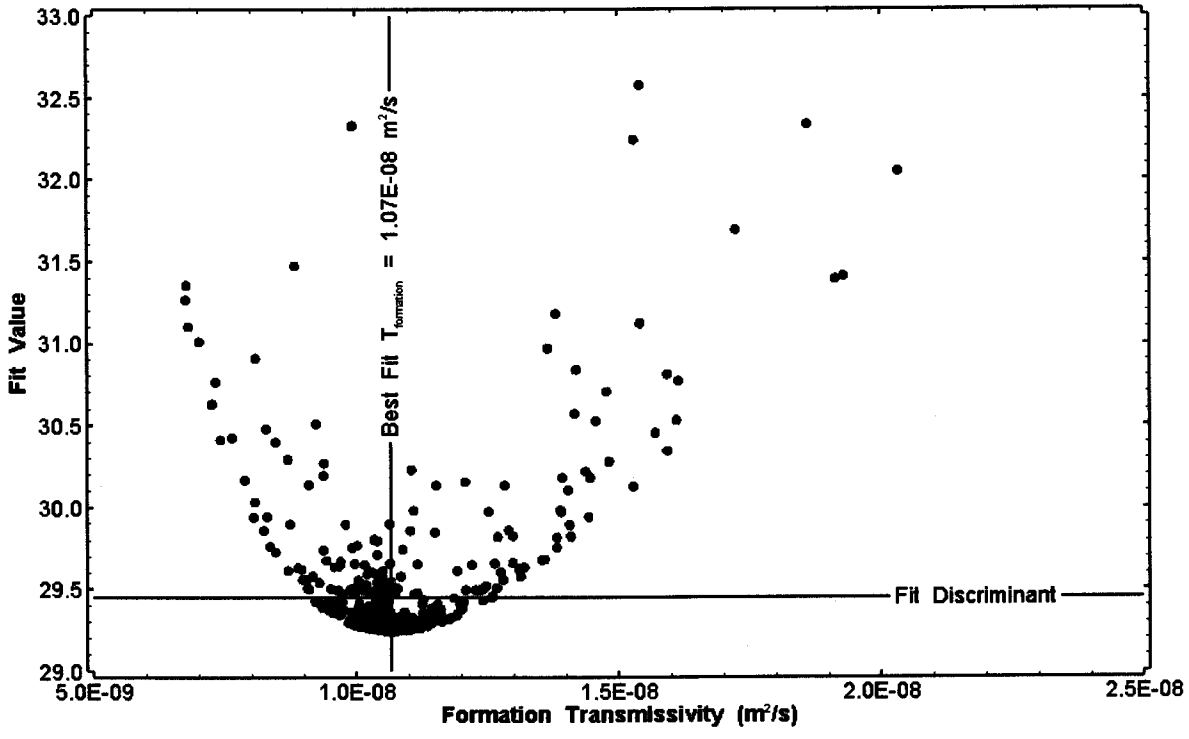


Figure 114. X-Y scatter plot showing 316 estimates of transmissivity derived from the WIPP-30 perturbation analysis.

Information Only

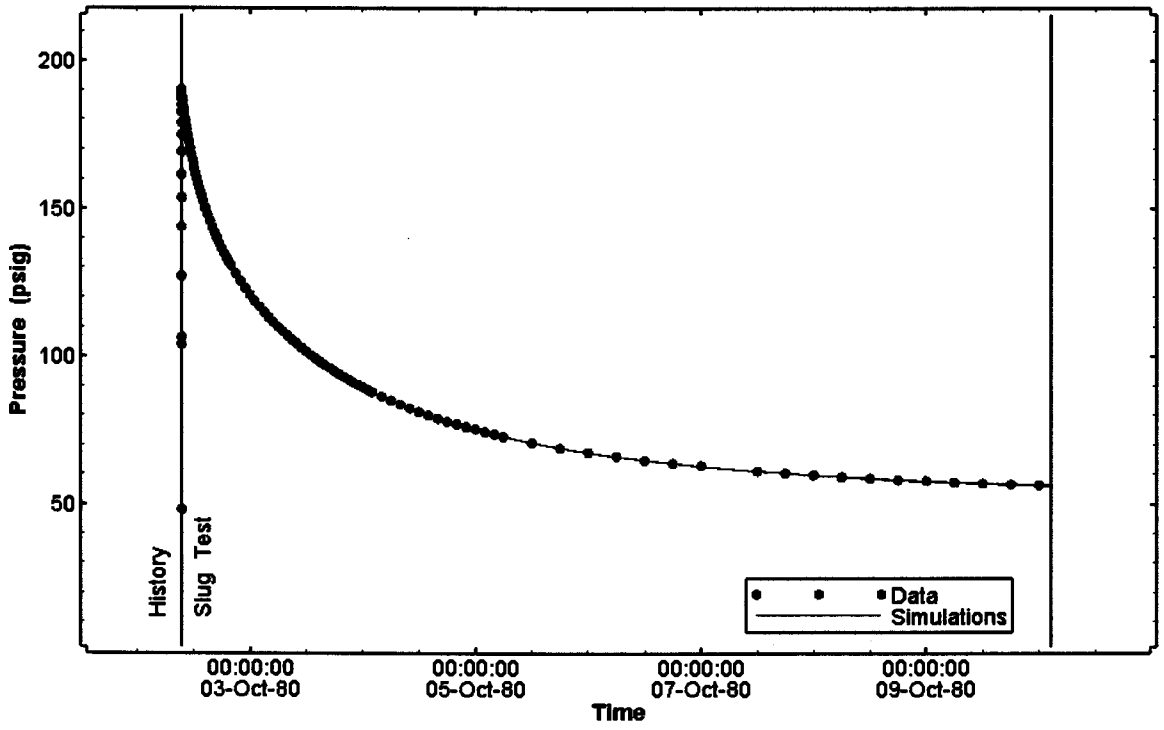


Figure 115. Linear plot showing 316 simulations of the WIPP-30 pressure response.

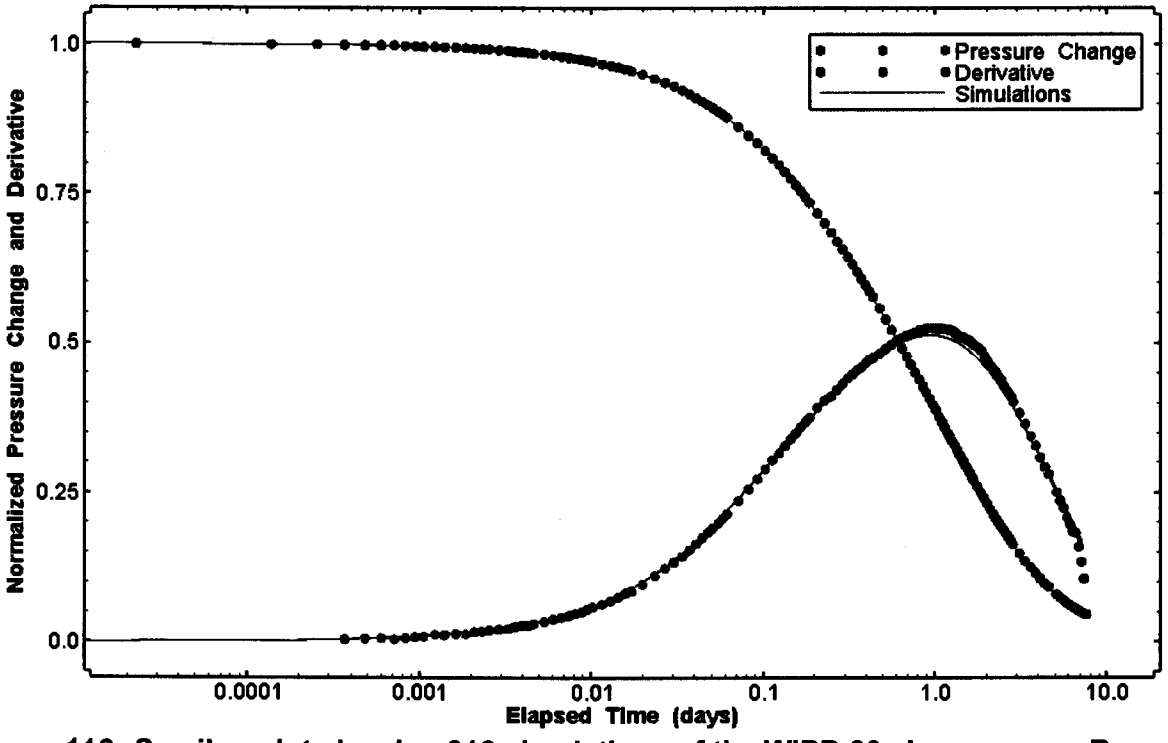


Figure 116. Semilog plot showing 316 simulations of the WIPP-30 slug recovery Ramey A and derivative response.

Information Only

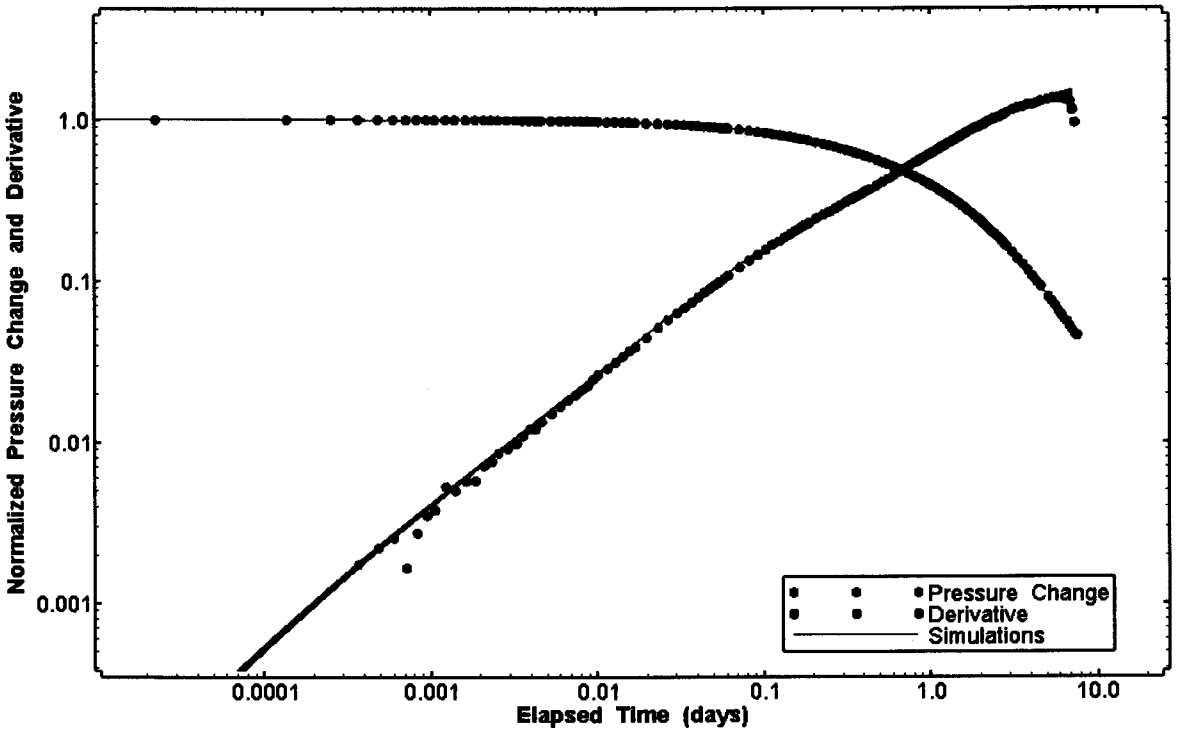


Figure 117. Log-log plot showing 316 simulations of the WIPP-30 slug recovery Ramey B and derivative response.

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Information Only

Appendix A – Magenta Hydrauli

Well	Date and Time Start DAS	Date and Time Stop DAS	book l ·0244)	Data Source Report(s)
DOE-2	9/14/1 984	7/19/1985		SAND86-0611, SAND86-7109
H-2a	2/15/79 10:02	2/18/79 9:09		WRI 79-98, OFR 2006-1129
H-3b1	5/8/79 16:59	5/8/79 16:59		WRI 79-98, OFR 2006-1129
H-4a	12/2/78 11:14	12/2/78 14:00		WRI 81-36
H-5a	12/11/78 7:08	12/11/78 17:28		WRI 82-19
H-6a	12/17/78 11:13	12/17/78 11:13		WRI 82-8
H-8a	1/29/80 13:45	2/5/80 0:00		WRI 82-4118, OFR 86-413
H-9a	2/4/80 10:00	2/4/80 16:56		WRI 82-4111, OFR 86-413
H-10a	2/23/80 9:41	2/24/80 0:00		WRI 83-4124, OFR 86-413
H-14	10/7/86 17:20	10/13/86 8:10	—	SAND89-0202, SAND87-7125
H-16	7/29/87 20:35	7/31/87 16:20	—	SAND89-0203, SAND87-7166
H-18	4/13/09 13:30	6/10/09 11:00	#9	SAND89-0204
WIPP-18	12/10/09 3:00	1/5/10 9:59	#9	SAND79-0275
WIPP-27	9/20/80 11:00	9/20/80 11:55	—	SAND79-0281, OFR 87-37
WIPP-30	10/2/80 9:30	10/10/80 2:24		SAND79-0284, OFR 87-37

Information Only

Appendix B – nSIGHTS Listings

B.1 DOE-2 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\DOE-2\DOE-
2.nPre
```

Control Settings

Main Settings

Simulation type	Forward	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	no	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	6.7056	[m]
Flow dimension	2.0	[]
Static formation pressure	192.346	[psi]
External boundary radius	1000000	[m]

Information Only

Formation conductivity	2.07413E-09	[m/sec]
Formation spec. storage	2.58689E-07	[1/m]

Fluid

Fluid density	1180.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]
Volume change from normal	0.0	[m^3]
Test-zone compressibility	7.42748E-08	[1/Pa]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.58503E-11	[USgpm]

Calculated Parameters

Formation

Transmissivity	1.39083E-08	[m^2/sec]
Storativity	1.73466E-06	[]
Diffusivity	8.01787E-03	[m^2/sec]

Test Zone

Test-zone volume	0.0766624	[m^3]
Isolated well-bore storage	5.69408E-09	[m^3/Pa]
Open hole well-bore storage	1.74285E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06676	[]
First grid increment	4.16484E-03	[m]

Sequences

Sequence: H_01

Sequence type	History	
Start time	0.000	[min]
Duration	181.000	[min]
Time step type	Static	
Static time step	1.000	[min]

Information Only

Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	181.000	[min]
Duration	23.000	[min]
Time step type	Log	
First log step	1.66667E-04	[min]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	7.000	[psi]

Sequence: H_02

Sequence type	History	
Start time	204.000	[min]
Duration	46.000	[min]
Time step type	Static	
Static time step	1.000	[min]
Type	Curve	
Wellbore storage	None	

Sequence: F_01

Sequence type	Flow	
Start time	250.000	[min]
Duration	695.000	[min]
Time step type	Log	
First log step	1.66667E-04	[min]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[USgpm]
Wellbore storage	Isolated	

Test Zone Curves

Curve object to use	Create Curve	
Curve type	Pressure	
Start sequence	H_01	
End sequence	H_02	
Curve time base	Test	
Curve Y data units	[psi]	
Curve Y data is log 10	no	

Simulation Results Setup

Output ID	DAT	
Output type	Pressure	
Pressure capture type	Test Zone	
Output units	[psi]	

Information Only

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[USgpm]

DOE-2 Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\DOE-2\DOE-
2.nPre
```

Control Settings

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Information Only

Formation thickness	6.7056	[m]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	190.000	[psi]
Maximum value	200.000	[psi]
Estimate value	192.346	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-02	[m/sec]
Estimate value	2.07413E-09	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-10	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	2.58689E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1180.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]
Volume change from normal	0.0	[m^3]
Test-zone compressibility	Optimization	
Minimum value	1.00000E-10	[1/Pa]
Maximum value	1.00000E-06	[1/Pa]
Estimate value	7.42748E-08	[1/Pa]
Range type	Log	
Sigma	1.00000E+00	

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.58503E-11	[USgpm]

Information Only

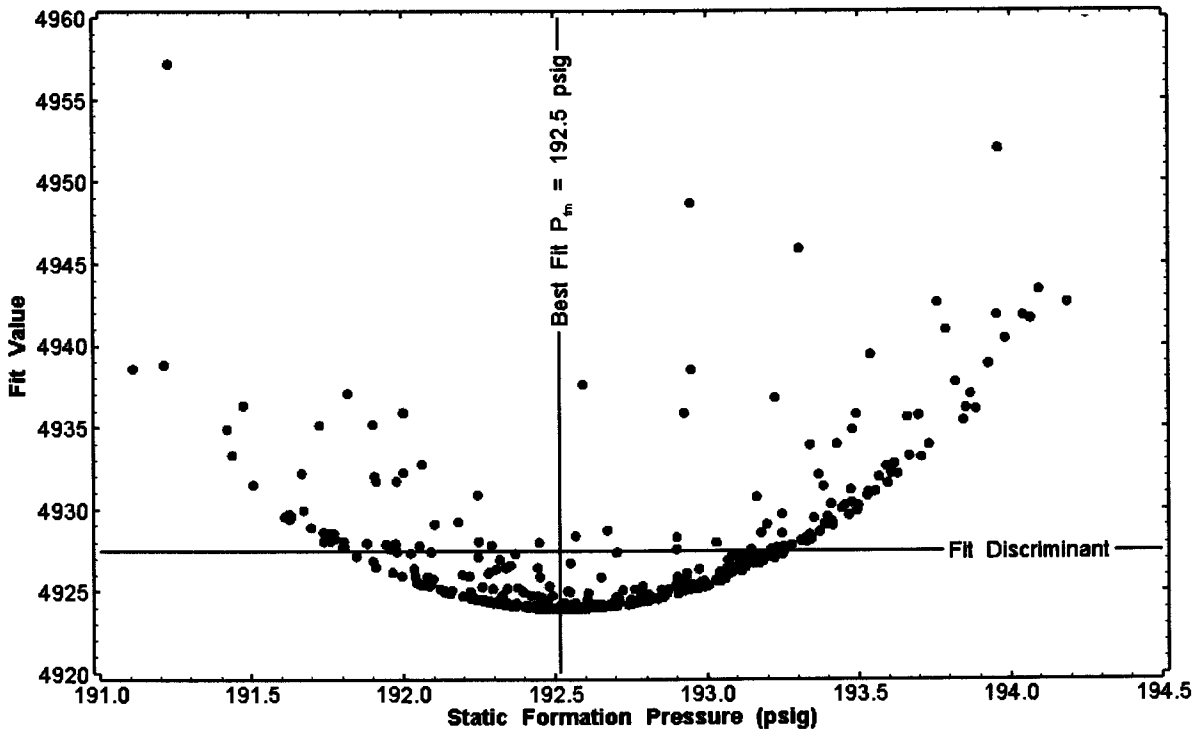

Figure B-1. X-Y scatter plot showing the static formation pressure parameter space derived from DOE-2 perturbation analysis with the fit discriminant and best fit values.

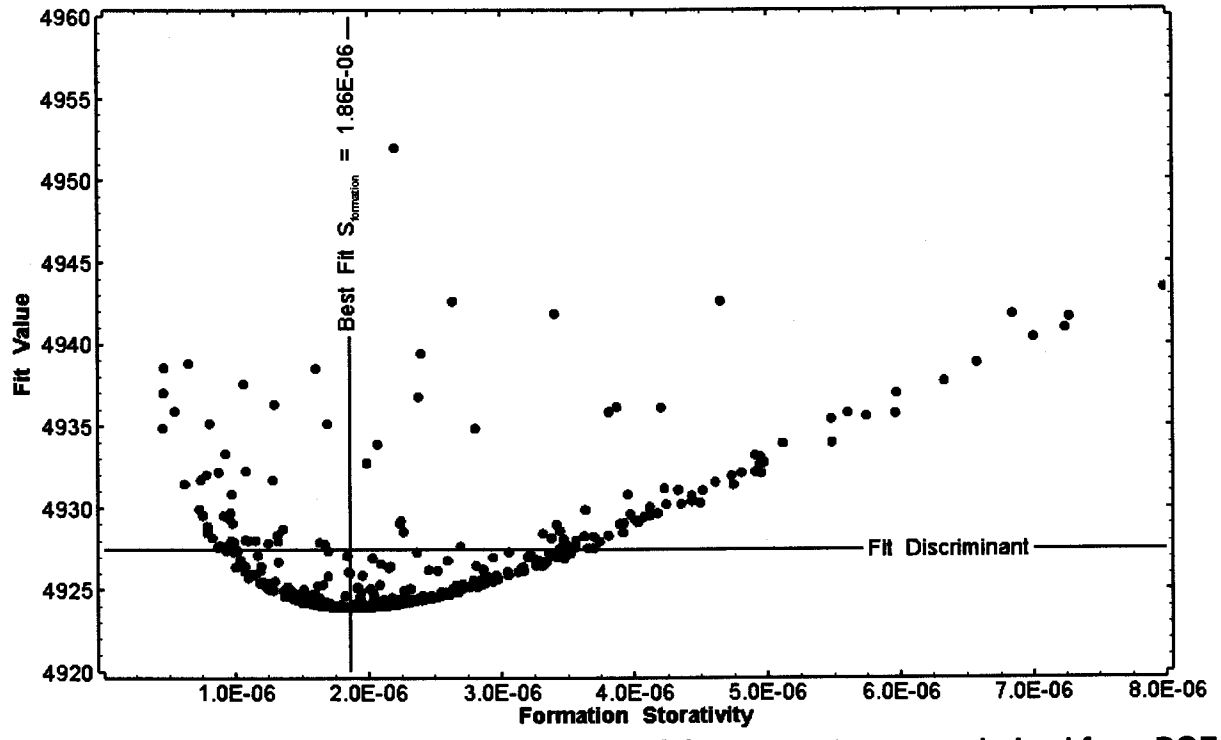

Figure B-2. X-Y scatter plot showing the storativity parameter space derived from DOE-2 perturbation analysis with the fit discriminant and best fit values.

Information Only

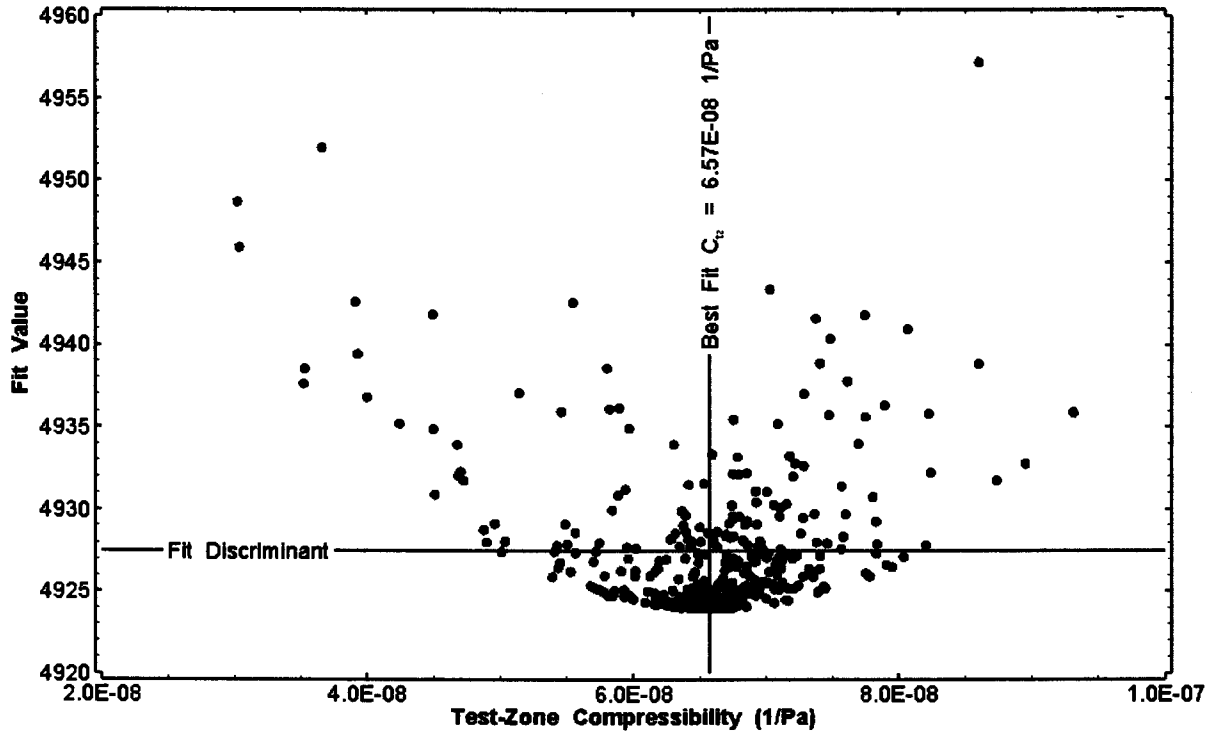

Figure B-3. X-Y scatter plot showing the test zone compressibility parameter space derived from DOE-2 perturbation analysis with the fit discriminant and best fit values.

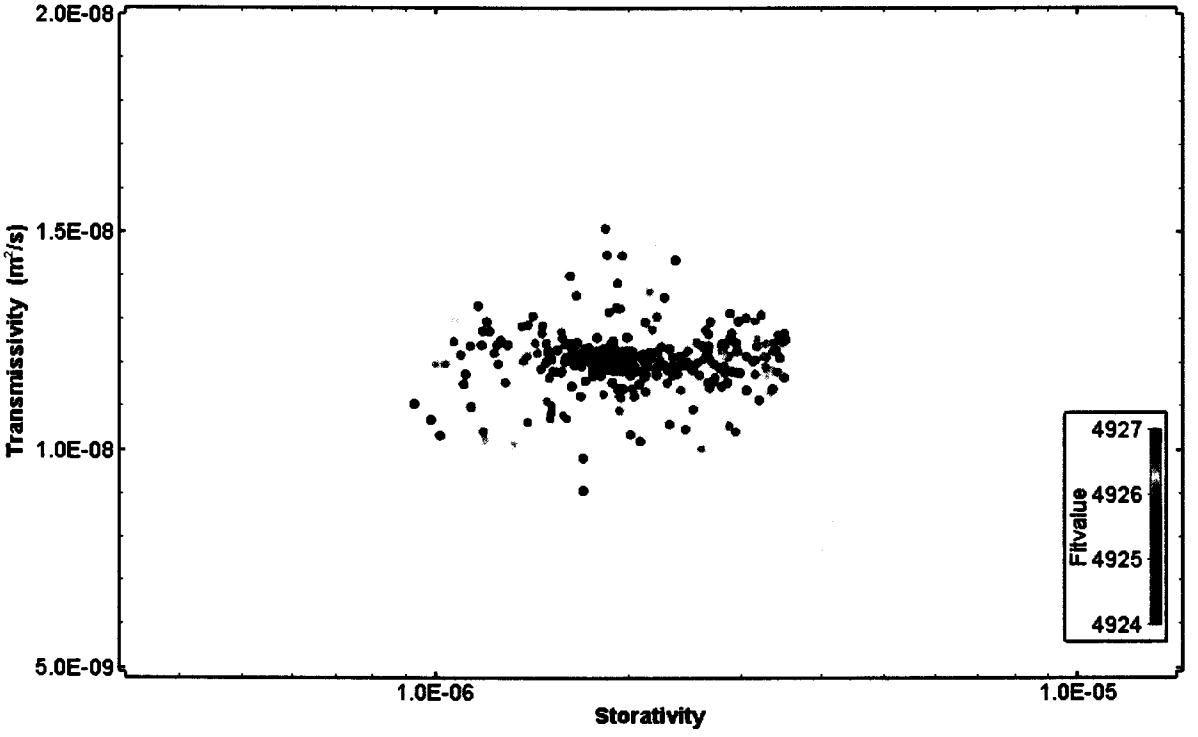

Figure B-4. Estimates of transmissivity and storativity derived from the DOE-2 perturbation analysis.

Information Only

B.2 H-2a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-2a\H-
2aM_slug.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-2a was performed by the USGS from 2-15-1979
through 2-19-1979.
Testing consisted of a slug-injection test followed by a shut-in test.
Only the slug test is analyzed here.
The data are reported in Huff and Gregory (2006; USGS OFR 2006-1129, p. 45-
51.)
Data are given in terms of freshwater head (ft) above the measuring point.
Data were converted to pressure assuming freshwater density (1000 kg/m
The Magenta in H-2a extends from 515 to 543 ft bgs, and is exposed in a 4.75-
inch open hole.
The slug test was conducted using a PIP on 2.375-inch tubing set inside
5.921-inch ID casing.
Initial period of inertial effects/sloshing is included as a history
sequence.
```

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no
Test zone compressibility can vary	no
Test zone temperature can vary	no

Information Only

Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	8.5344	[m]
Flow dimension	2.0	[]
Static formation pressure	92.735	[psi]
External boundary radius	1000000	[m]
Formation conductivity	3.18258E-10	[m/sec]
Formation spec. storage	1.11155E-04	[1/m]

Fluid

Fluid density	1000.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	2.71614E-09	[m^2/sec]
Storativity	9.48640E-04	[]
Diffusivity	2.86319E-06	[m^2/sec]

Test Zone

Open hole well-bore storage	2.05656E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06676	[]
First grid increment	4.16484E-03	[m]

Information Only

Sequences

Sequence: H_01

Sequence type	History	
Start time	28901.418750	[day]
Duration	0.002870	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	28901.421620	[day]
Duration	2.978380	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	219.310	[psi]

Test Zone Curves

Curve object to use	Pressure curve
Curve type	Pressure
Start sequence	H_01
End sequence	S_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-2a Optimization Settings

****
nPre/32 2.41Q
****

Version date 1 Mar 2007

Information Only

```
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-2a\H-
2aM_slug.nPre
```

Control Settings

Test Description

Testing of the Magenta in H-2a was performed by the USGS from 2-15-1979 through 2-19-1979.
Testing consisted of a slug-injection test followed by a shut-in test.
Only the slug test is analyzed here.
The data are reported in Huff and Gregory (2006; USGS OFR 2006-1129, p. 45-51.)
Data are given in terms of freshwater head (ft) above the measuring point.
Data were converted to pressure assuming freshwater density (1000 kg/m
The Magenta in H-2a extends from 515 to 543 ft bgs, and is exposed in a 4.75-inch open hole.
The slug test was conducted using a PIP on 2.375-inch tubing set inside 5.921-inch ID casing.
Initial period of inertial effects/sloshing is included as a history sequence.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Information Only

Formation

Formation thickness	8.5344	[m]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	90.000	[psi]
Maximum value	140.000	[psi]
Estimate value	92.735	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	3.18258E-10	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	1.11155E-04	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1000.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Information Only

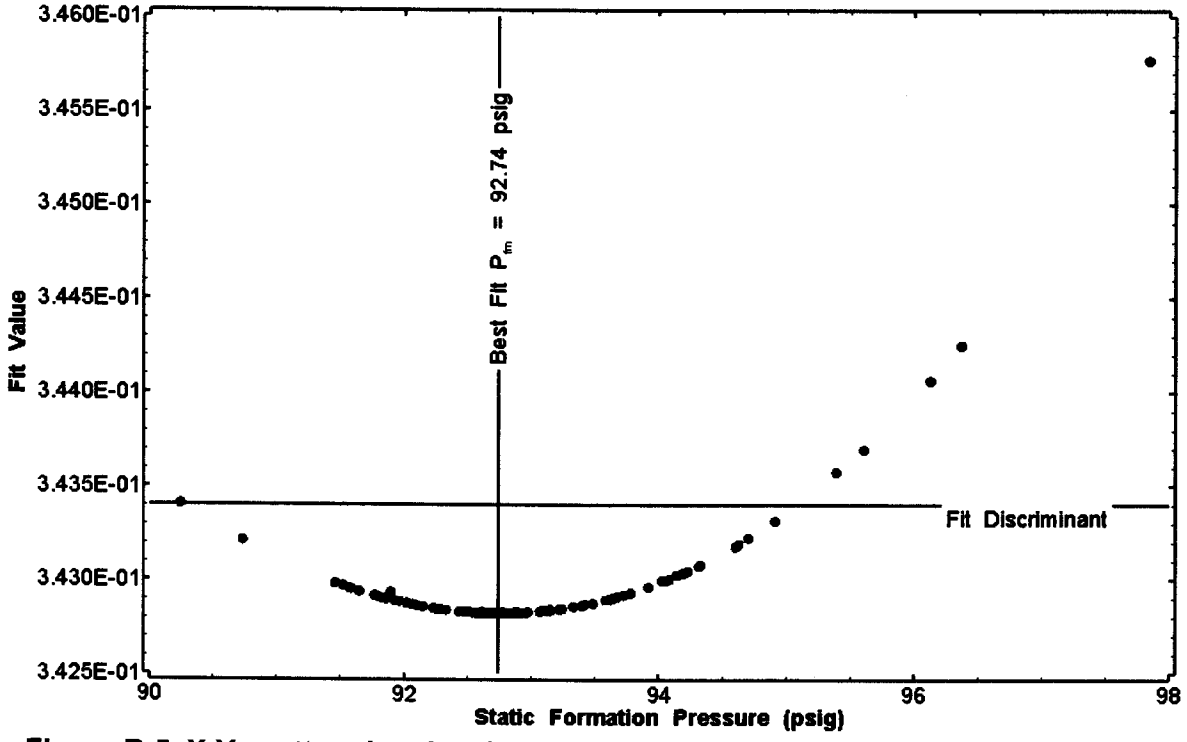

Figure B-5. X-Y scatter plot showing the static formation pressure parameter space derived from H-2a perturbation analysis with the fit discriminant and best fit values.

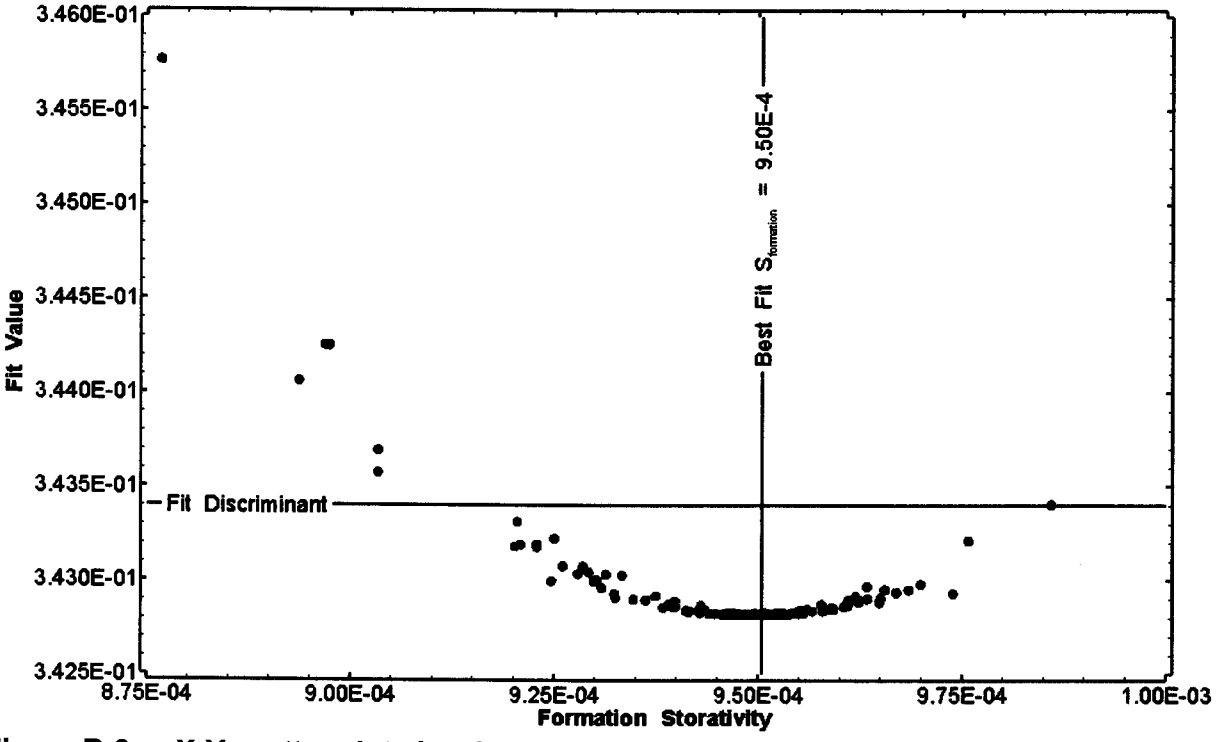

Figure B-6. X-Y scatter plot showing the storativity parameter space derived from H-2a perturbation analysis with the fit discriminant and best fit values.

Information Only

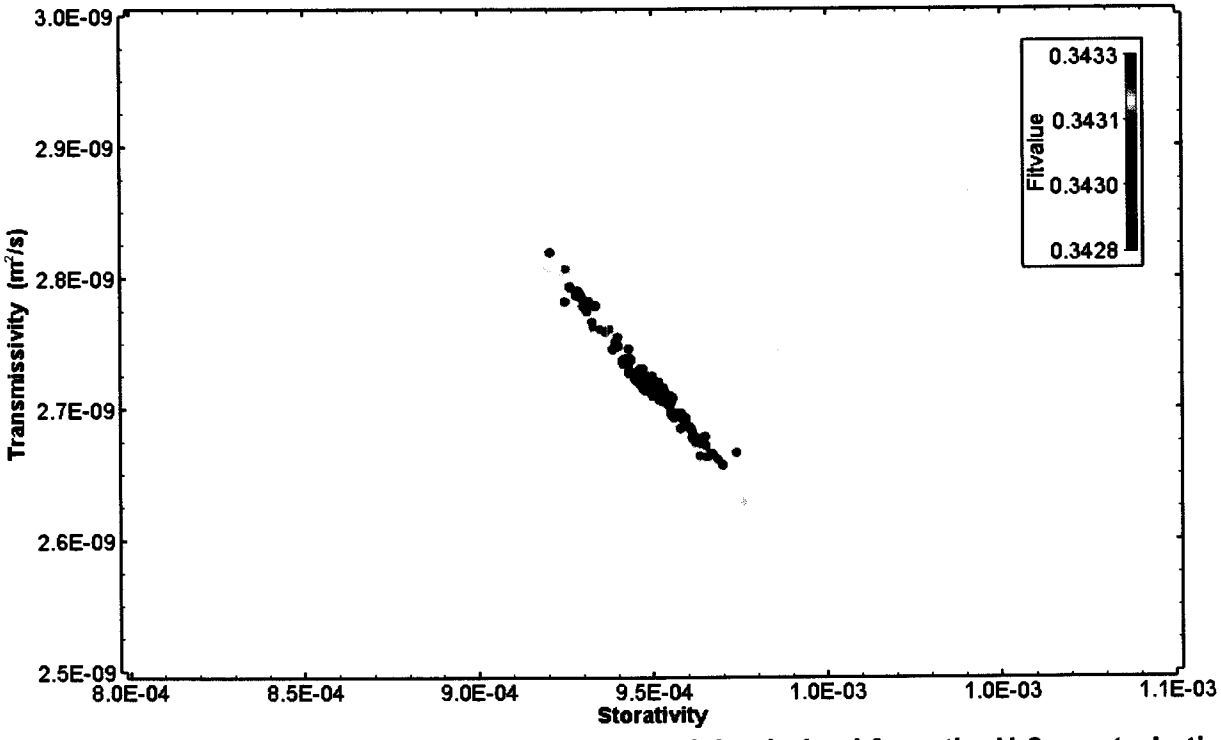

Figure B-7. Estimates of transmissivity and storativity derived from the H-2a perturbation analysis.

Information Only

B.3 H-3b1 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-3b1\H-
3b1M_slug.nPre
```

Control Settings

Test Description

```
A slug-injection test of the Magenta was performed in H-3(b1) by the USGS on
5-7-1979 to 5-9-1979.
The data are reported in Huff and Gregory (2006; USGS OFR 2006-1139, p. 85-
88.)
Data are given in terms of freshwater head (ft) above the measuring point.
The Magenta in H-3b1 extends from 560 to 584 ft bgs, and is accessed through
perforations from 564 to 592 ft bgs in 5.921-inch ID casing.
The test was conducted using a PIP on 2.375-inch tubing set inside the
casing.
Data after 17:00 on 5/8/1979 were not used in analysis because of oscillatory
behavior.
```

Main Settings

```
Simulation type                          Forward
Simulation subtype                        Normal
Phase to simulate                         Liquid
Skin zone ?                                  yes
External boundary                 Fixed Pressure
Curve data source                        Objects
```

Liquid Phase Settings

```
Aquifer type                             Confined
Aquifer horizontal permeability          Isotropic
System porosity                             Single
Compensate flow dimension geometry             yes
Leakage                                       None
```

Test Zone Settings

```
Test zone volume can vary                        no
Test zone compressibility can vary               no
Test zone temperature can vary                   no
Default test-zone temperature                20.00     [C]
Solution variable                         Pressure
Allow negative head/pressure                     yes
```


Information Only

Parameters

Formation

Formation thickness	24.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	130.245	[psi]
External boundary radius	1000000	[m]
Formation conductivity	6.98810E-09	[m/sec]
Formation spec. storage	3.01455E-05	[1/m]

Skin

Radial thickness of skin	4.3700941	[m]
Skin zone conductivity	1.60296E-08	[m/sec]
Skin zone spec. storage	5.44777E-06	[1/m]

Fluid

Fluid density	1006.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.9605	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	5.11193E-08	[m^2/sec]
Storativity	2.20520E-04	[]
Diffusivity	2.31813E-04	[m^2/sec]

Skin Zone

Transmissivity	1.17260E-07	[m^2/sec]
Storativity	3.98515E-05	[]
Diffusivity	2.94242E-03	[m^2/sec]
Skin factor	-2.30104E+00	[]

Information Only

Test Zone

Open hole well-bore storage	2.04430E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06193	[]
First grid increment	2.83991E-01	[m]
Skin grid increment delta	0.08325	[]
Skin first grid increment	6.52849E-03	[m]
Skin last grid increment	3.55105E-01	[m]
Increment ratio	7.99736E-01	[]

Sequences

Sequence: H_01

Sequence type	History	
Start time	28982.558333	[day]
Duration	0.000405	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	28982.558738	[day]
Duration	1.148902	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	238.380	[psi]

Test Zone Curves

Curve object to use	Create Curve	
Curve type	Pressure	
Start sequence	H_01	
End sequence	H_01	
Curve time base	Test	
Curve Y data units	[psi]	
Curve Y data is log 10	no	

Simulation Results Setup

Output ID	DAT	
Output type	Pressure	

Information Only

Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-3b1 Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-3b1\H-
3b1M_slug.nPre
```

Control Settings

Test Description

A slug-injection test of the Magenta was performed in H-3(b1) by the USGS on 5-7-1979 to 5-9-1979.
The data are reported in Huff and Gregory (2006; USGS OFR 2006-1139, p. 85-88.)
Data are given in terms of freshwater head (ft) above the measuring point.
The Magenta in H-3b1 extends from 560 to 584 ft bgs, and is accessed through perforations from 564 to 592 ft bgs in 5.921-inch ID casing.
The test was conducted using a PIP on 2.375-inch tubing set inside the casing.
Data after 17:00 on 5/8/1979 were not used in analysis because of oscillatory behavior.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Information Only

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	125.000	[psi]
Maximum value	135.000	[psi]
Estimate value	130.245	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	6.98810E-09	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	3.01455E-05	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	Optimization	
Minimum value	0.01	[m]
Maximum value	20.0	[m]
Estimate value	4.3700941	[m]
Range type	Linear	
Sigma	1.00000E+00	
Skin zone conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	1.60296E-08	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Skin zone spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	5.44777E-06	[1/m]

Information Only

Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1006.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.9605	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

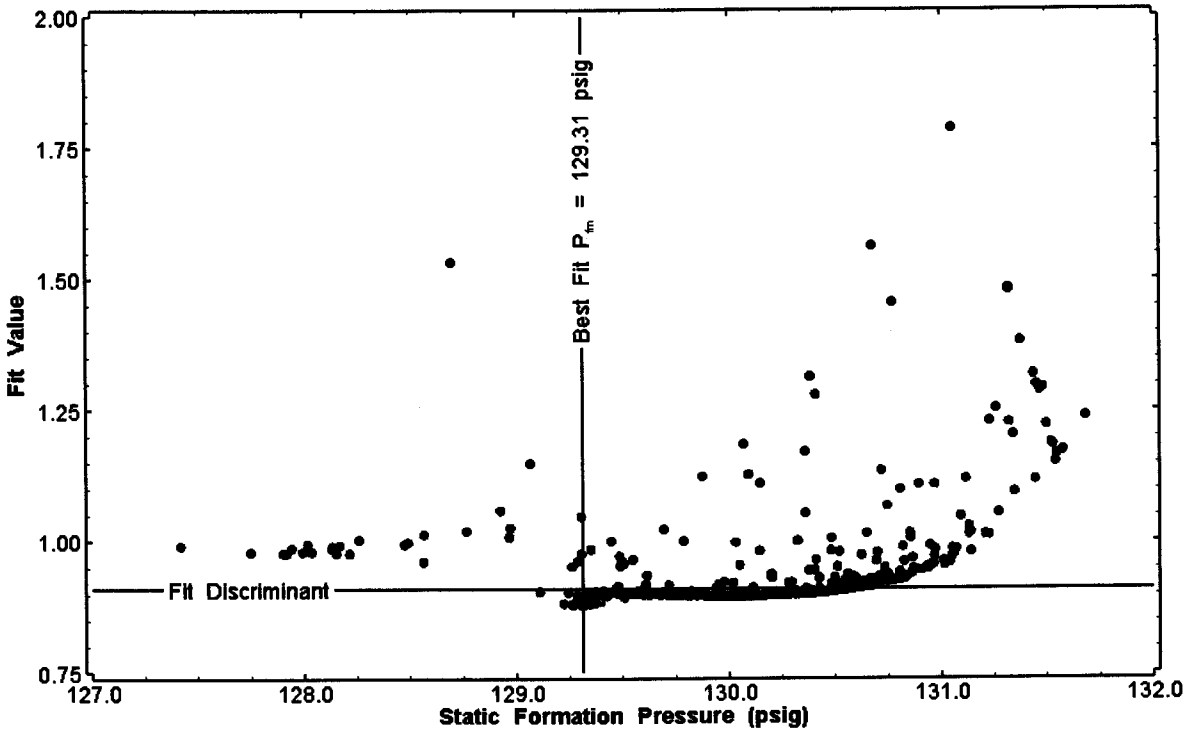

Figure B-8. X-Y scatter plot showing of the static formation pressure parameter space derived from the H-3b1 perturbation analysis with the fit discriminant and best fit values.

Information Only

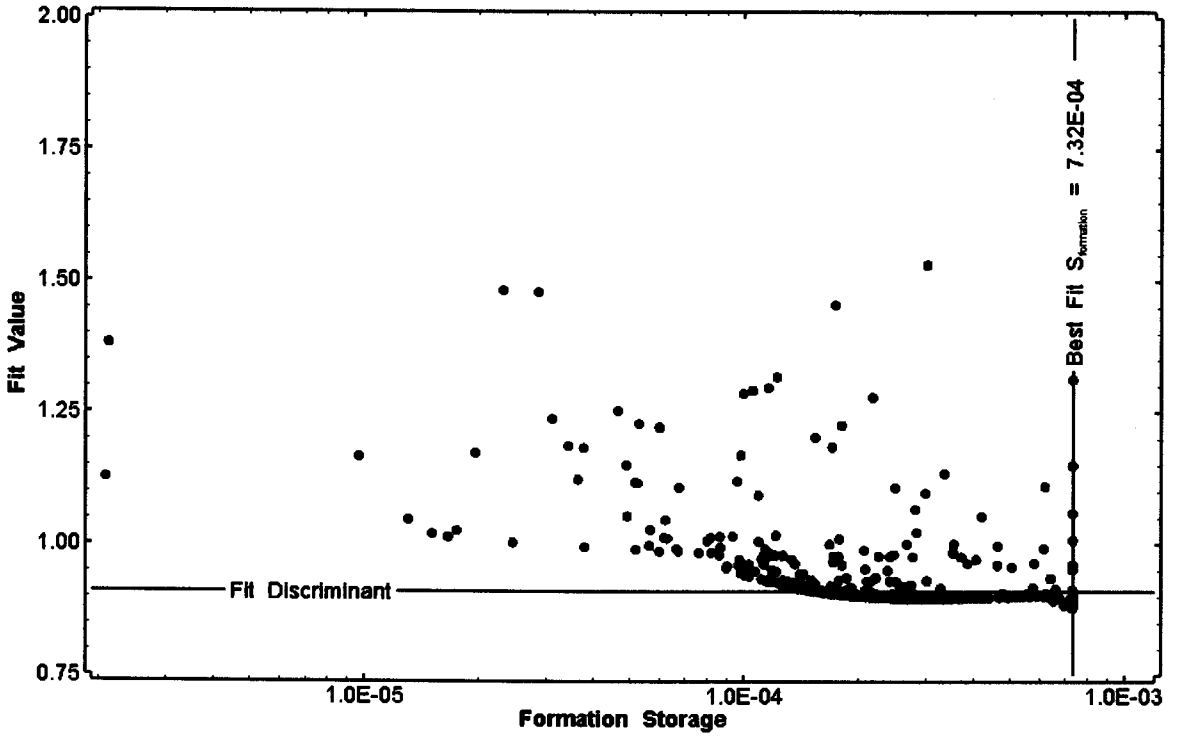

Figure B-9. X-Y scatter plot showing the storativity parameter space derived from the H-3b1 perturbation analysis with fit discriminant and best fit values.

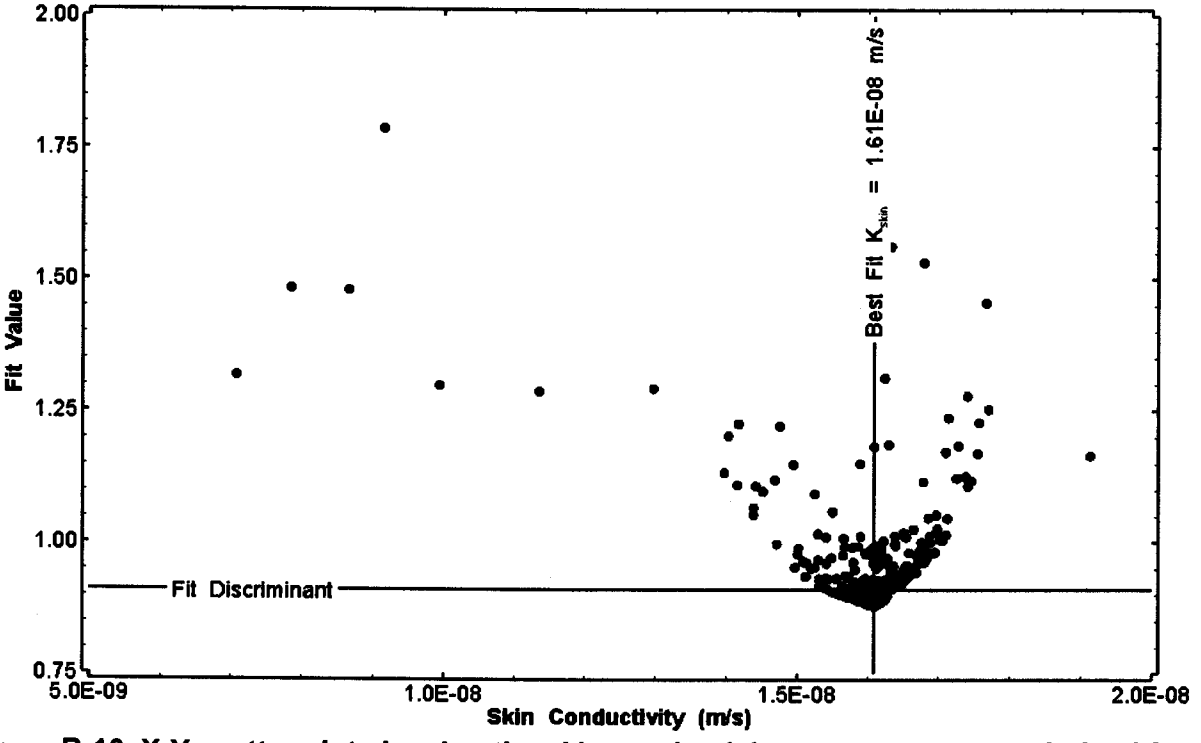

Figure B-10. X-Y scatter plot showing the skin conductivity parameter space derived from the H-3b1 perturbation analysis with the fit discriminant and best fit value.

Information Only

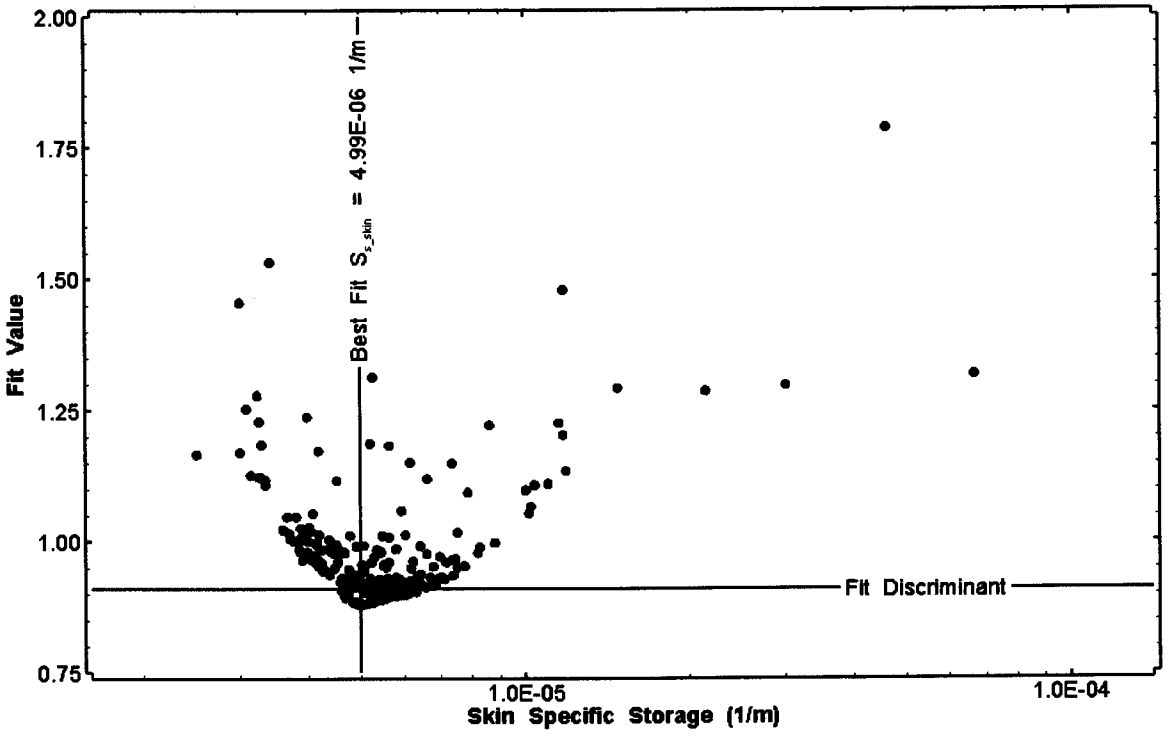

Figure B-11. X-Y scatter plot showing the skin specific storage parameter space derived from the H-3b1 perturbation analysis with the fit discriminant and best fit.

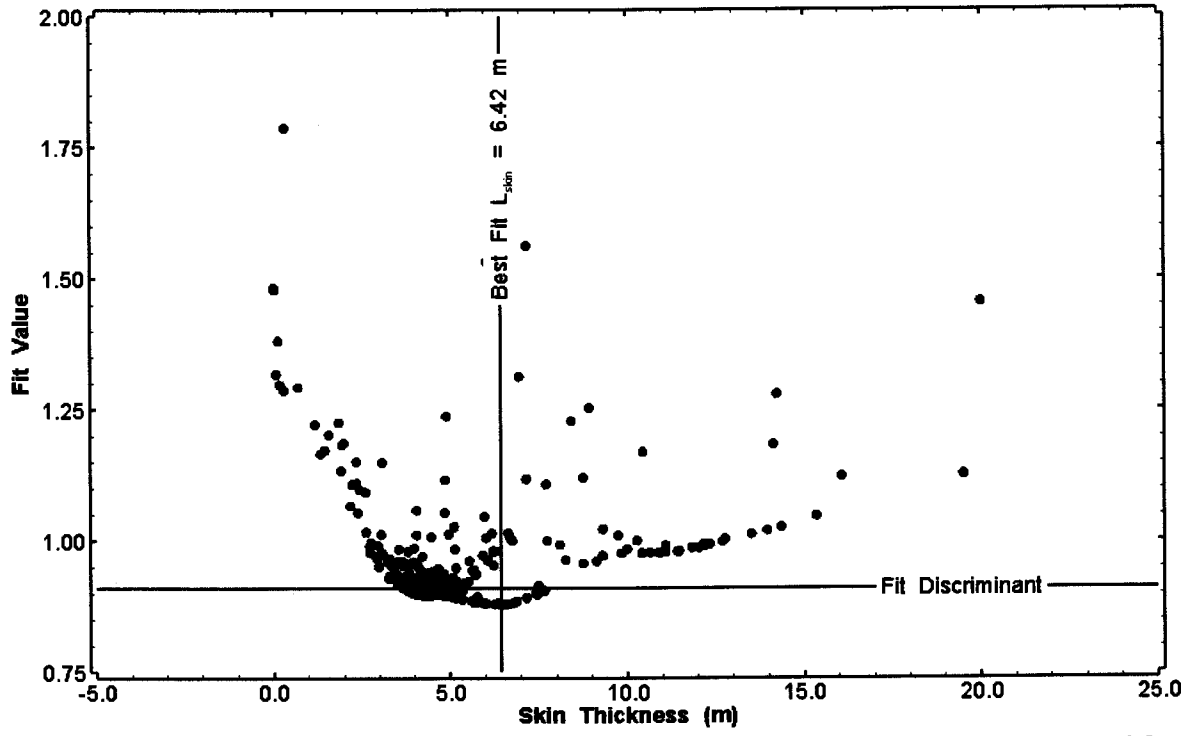

Figure B-12. X-Y scatter plot showing the skin thickness parameter space derived from the H-3b1 perturbation analysis with the fit discriminant and best fit.

Information Only

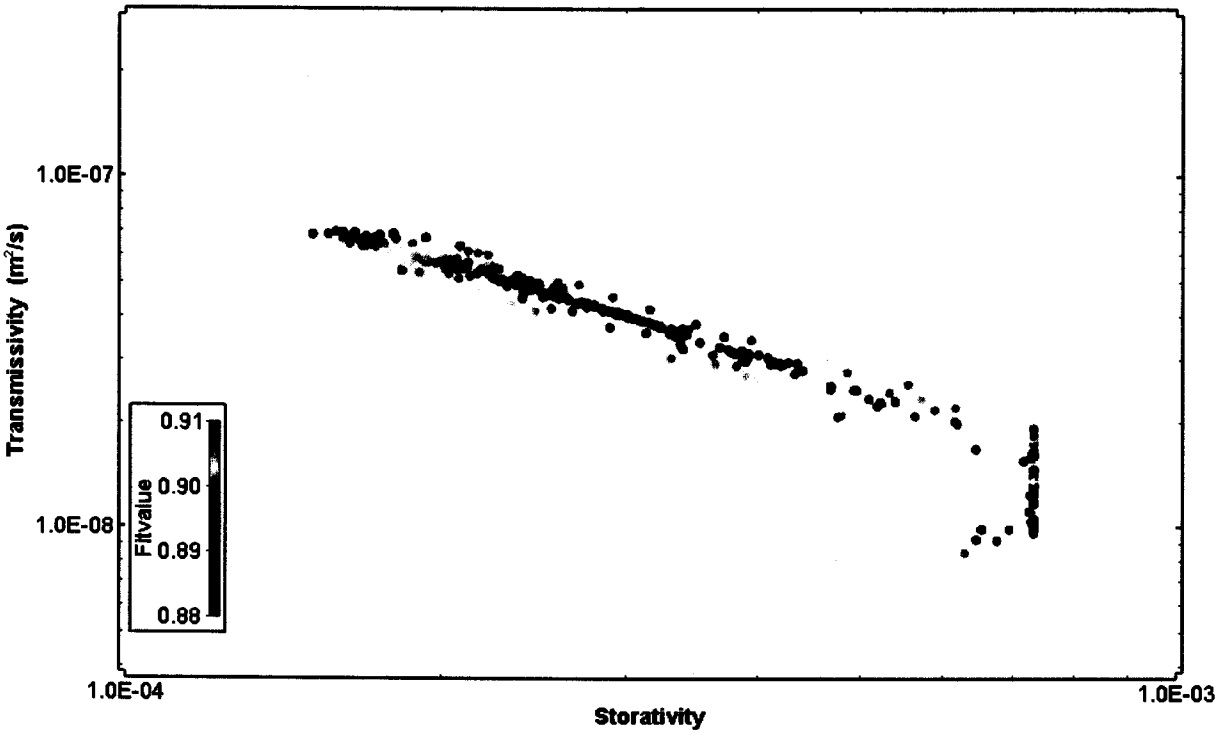

Figure B-13. Estimates of transmissivity and storativity derived from the H-3b1 perturbation analysis.

Information Only

B.4 H-4a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-4a\H-
4aM_slug.nPre
```

Control Settings

Test Description

```
Two slug-injection tests of the Magenta were performed in H-4a by the USGS on
12-2-1978 and 12-4-1978.
The data are reported in Mercer et al. (1981; USGS WRI 81-36, p. 43-57.)
Only the first test, the longer of the two, is analyzed here.
Data are given in terms of freshwater head (ft) above the measuring point.
The Magenta in H-4a extends from 375 to 400 ft bgs, and is exposed in a 4.75-
inch open hole.
The test was conducted using a PIP on 2.375-inch tubing set inside 4.95-inch
ID casing.
```

Main Settings

Simulation type	Forward	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	no	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Information Only

Parameters

Formation

Formation thickness	25.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	70.700	[psi]
External boundary radius	1000000	[m]
Formation conductivity	8.36523E-09	[m/sec]
Formation spec. storage	7.42567E-07	[1/m]

Fluid

Fluid density	1019.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	6.37430E-08	[m^2/sec]
Storativity	5.65836E-06	[]
Diffusivity	1.12653E-02	[m^2/sec]

Test Zone

Open hole well-bore storage	2.01822E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06676	[]
First grid increment	4.16484E-03	[m]

Sequences

Sequence: H_01

Sequence type	History

Information Only

Start time	28826.468461	[day]
Duration	0.000752	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	28826.469213	[day]
Duration	0.120787	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	154.010	[psi]

Test Zone Curves

Curve object to use	Create Curve
Curve type	Pressure
Start sequence	H_01
End sequence	H_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-4a Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date   1 Mar 2007
Listing date   11 Aug 2010
QA status      QA: Q
Config file    C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-4a\H-
4aM_slug.nPre
```


Information Only

Control Settings

Test Description

Two slug-injection tests of the Magenta were performed in H-4a by the USGS on 12-2-1978 and 12-4-1978.
The data are reported in Mercer et al. (1981; USGS WRI 81-36, p. 43-57.)
Only the first test, the longer of the two, is analyzed here.
Data are given in terms of freshwater head (ft) above the measuring point.
The Magenta in H-4a extends from 375 to 400 ft bgs, and is exposed in a 4.75-inch open hole.
The test was conducted using a PIP on 2.375-inch tubing set inside 4.95-inch ID casing.

Main Settings

Simulation type	Optimization	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	no	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	25.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	70.700	[psi]
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	8.36523E-09	[m/sec]

Information Only

Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	7.42567E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1019.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

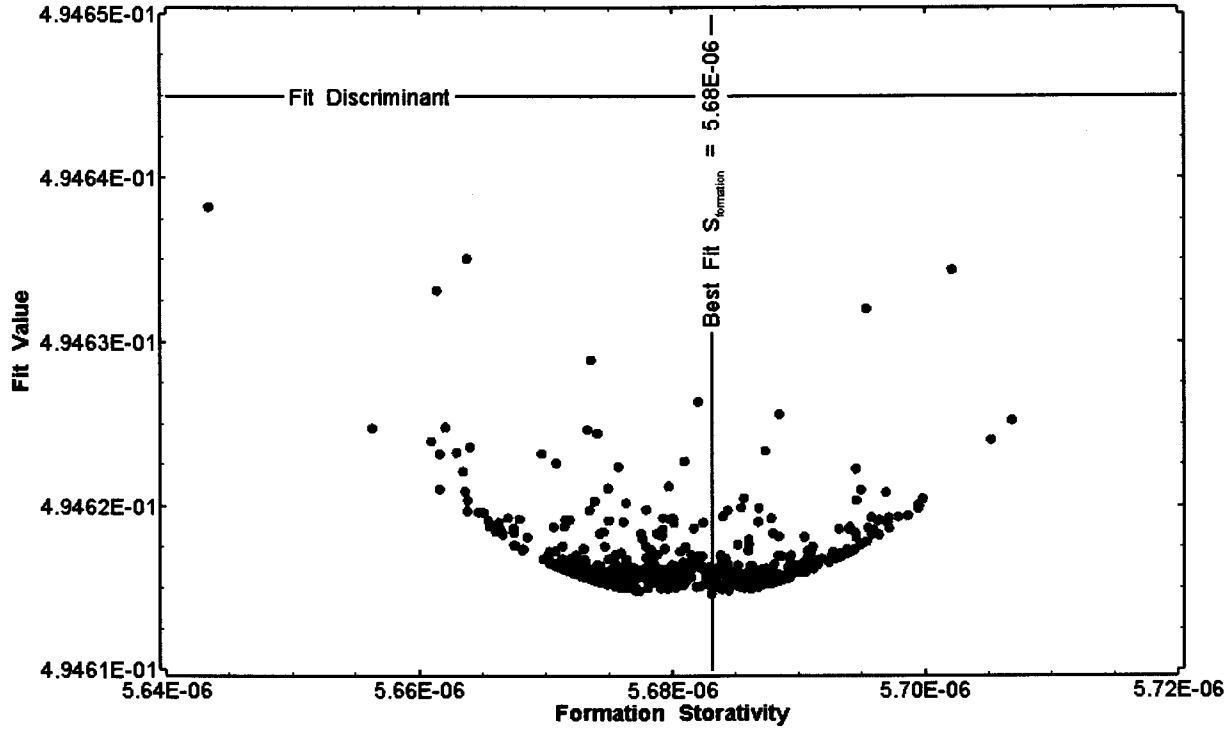

Figure B-14. X-Y scatter plot showing estimates of storativity derived from the H-4a perturbation analysis with the fit discriminant and best fit values.

Information Only

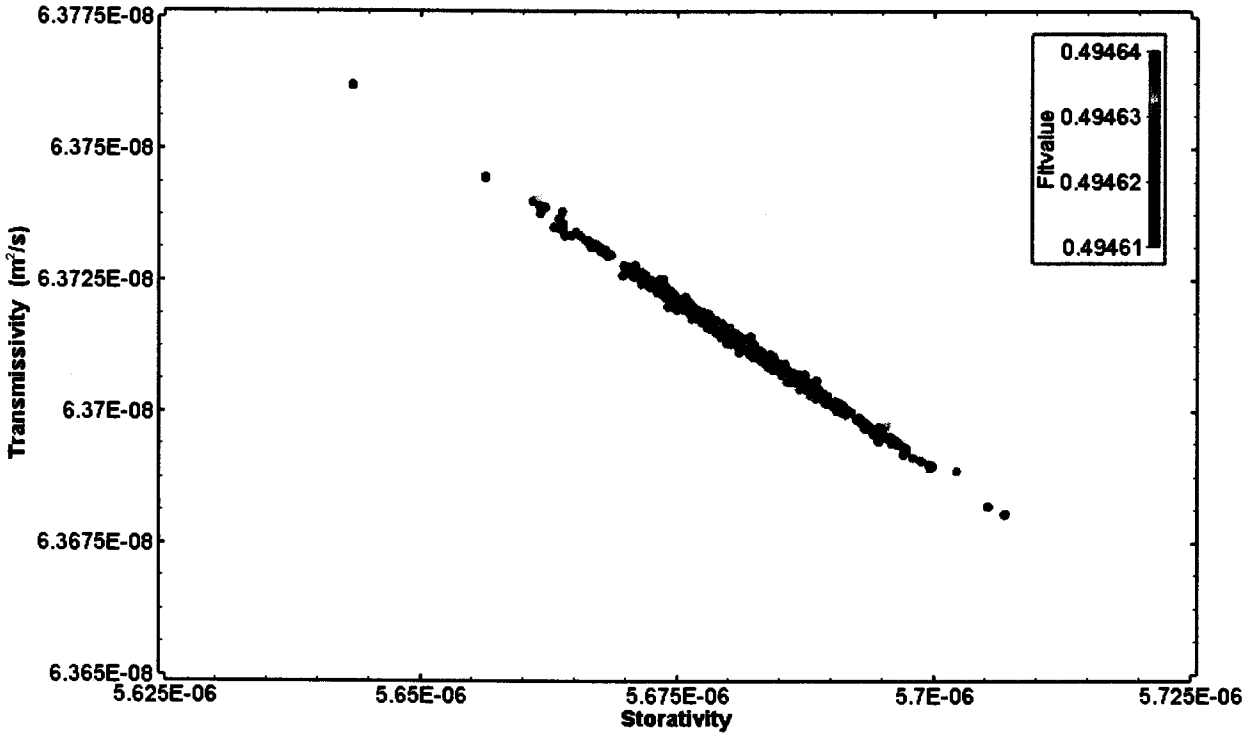

Figure B-15. Estimates of transmissivity and storativity derived from the H-4a perturbation analysis.

Information Only

B.5 H-5a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-5a\H-
5aM_slug.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-5a was performed by the USGS from 12-9-1978
through 12-11-1978.
Approximately 383 gallons of water were bailed on 12-9-1978, followed by a
nearly 4-hr open-hole recovery.
A PIP was then installed and recovery continued for nearly 41 hr under shut-
in conditions.
A slug test was initiated on 12-11-1978 by knocking a plug out of the PIP.
The slug test was converted to a shut-in recovery test after 6.5 hr.
The data are reported in Dennehy and Mercer (1982; USGS WRI 82-19, p. 38-48.)
Data are given in terms of freshwater head (ft) above the measuring point
The Magenta in H-5a extends from 783 to 810 ft bgs, and is exposed in a 4.75-
inch open hole.
The slug test was conducted using a PIP on 2.375-inch tubing set inside 4.95-
inch ID casing.
The period from the start of 12-10-1978 to the start of the slug test is
included as a history sequence.
```

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no

Information Only

Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	27.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	175.225	[psi]
External boundary radius	1000000	[m]
Formation conductivity	1.41158E-08	[m/sec]
Formation spec. storage	1.50571E-05	[1/m]

Fluid

Fluid density	1008.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	1.16168E-07	[m^2/sec]
Storativity	1.23914E-04	[]
Diffusivity	9.37488E-04	[m^2/sec]

Test Zone

Open hole well-bore storage	2.04024E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06676	[]
First grid increment	4.16484E-03	[m]

Information Only

Sequences

Sequence: H_01

Sequence type	History	
Start time	28835.297220	[day]
Duration	0.066960	[day]
Time step type	Static	
Static time step	10.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	28835.364180	[day]
Duration	0.280680	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	332.500	[psi]

Sequence: H_02

Sequence type	History	
Start time	28835.644860	[day]
Duration	0.083340	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	None	

Test Zone Curves

Curve object to use	Create Curve
Curve type	Pressure
Start sequence	H_01
End sequence	H_02
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT	
Output type	Pressure	
Pressure capture type	Test Zone	
Output units	[psi]	

Information Only

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-5a Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-5a\H-
5aM_slug.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-5a was performed by the USGS from 12-9-1978
through 12-11-1978.
Approximately 383 gallons of water were bailed on 12-9-1978, followed by a
nearly 4-hr open-hole recovery.
A PIP was then installed and recovery continued for nearly 41 hr under shut-
in conditions.
A slug test was initiated on 12-11-1978 by knocking a plug out of the PIP.
The slug test was converted to a shut-in recovery test after 6.5 hr.
The data are reported in Dennehy and Mercer (1982; USGS WRI 82-19, p. 38-48.)
Data are given in terms of freshwater head (ft) above the measuring point
The Magenta in H-5a extends from 783 to 810 ft bgs, and is exposed in a 4.75-
inch open hole.
The slug test was conducted using a PIP on 2.375-inch tubing set inside 4.95-
inch ID casing.
The period from the start of 12-10-1978 to the start of the slug test is
included as a history sequence.
```

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes

Information Only

Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	27.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	150.000	[psi]
Maximum value	200.000	[psi]
Estimate value	175.225	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	1.41158E-08	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	1.50571E-05	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1008.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Information Only

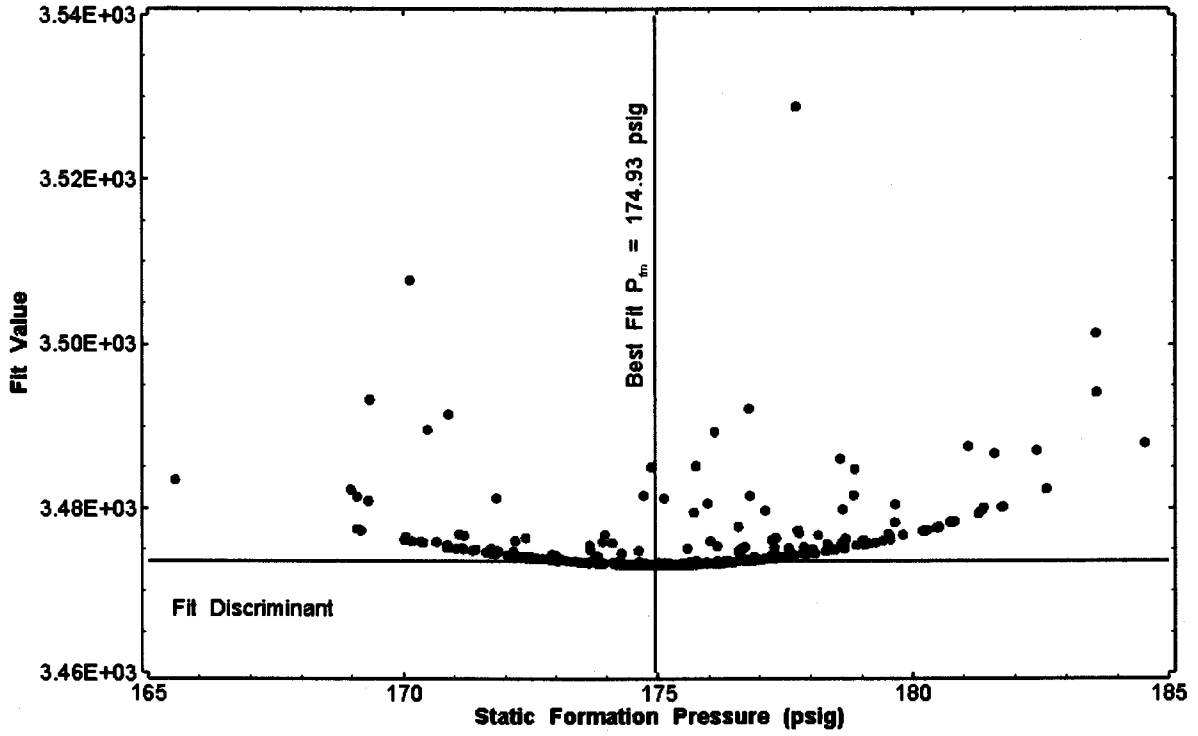

Figure B-16. X-Y scatter plot showing the static formation pressure parameter space derived from the H-5a perturbation analysis with the fit discriminant and best fit values.

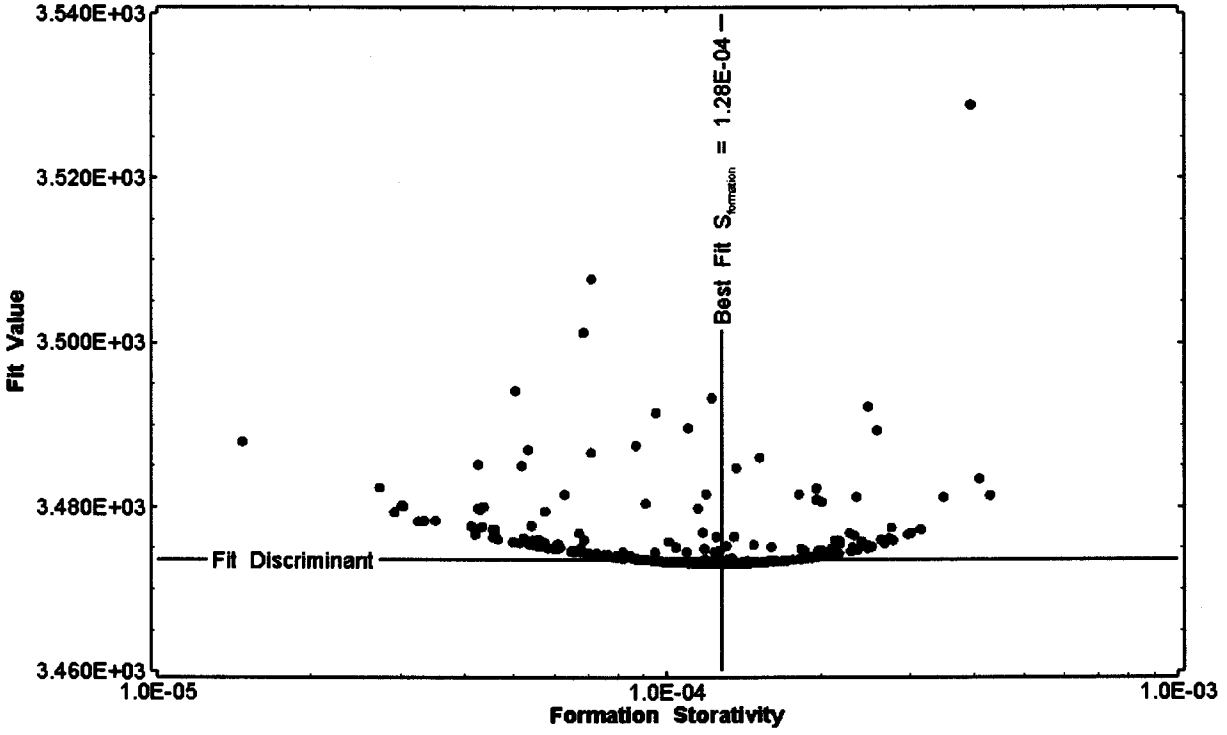

Figure B-17. X-Y scatter plot showing the storativity parameter space derived from the H-5a perturbation analysis with the fit discriminant and best fit values.

Information Only

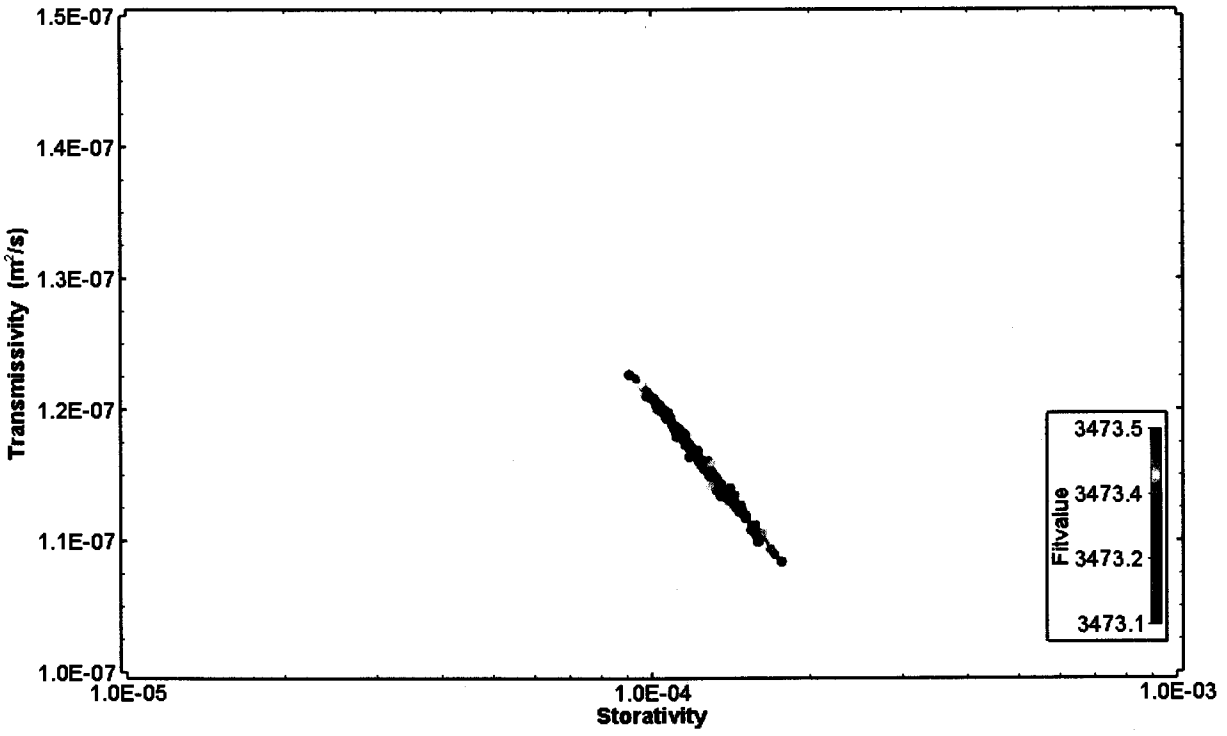

Figure B-18. Estimates of transmissivity and storativity derived from the H-5a perturbation analysis.

Information Only

B.6 H-6a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-6a\H-
6aM_slug.nPre
```

Control Settings

Test Description

```
A slug-injection test of the Magenta was performed in H-6a by the USGS on 12-
17-1978 to 12-18-1978.  The data are reported in Dennehy (1982; USGS WRI 82-
8, p. 41-46.)
Data are given in terms of freshwater head (ft) above the measuring point.
The Magenta in H-6a extends from 492 to 511 ft bgs, and is exposed in a 4.75-
inch open hole.
The test was conducted using a PIP on 2.375-inch tubing set inside 4.95-inch
ID casing.
```

Main Settings

Simulation type	Forward	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	yes	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Information Only

Parameters

Formation

Formation thickness	19.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	77.377	[psi]
External boundary radius	1000000	[m]
Formation conductivity	1.44231E-07	[m/sec]
Formation spec. storage	1.00003E-07	[1/m]

Skin

Radial thickness of skin	0.4476732	[m]
Skin zone conductivity	3.35938E-08	[m/sec]
Skin zone spec. storage	1.09381E-04	[1/m]

Fluid

Fluid density	1003.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	8.35268E-07	[m^2/sec]
Storativity	5.79136E-07	[]
Diffusivity	1.44227E+00	[m^2/sec]

Skin Zone

Transmissivity	1.94548E-07	[m^2/sec]
Storativity	6.33447E-04	[]
Diffusivity	3.07127E-04	[m^2/sec]
Skin factor	7.01728E+00	[]

Test Zone

Information Only

Open hole well-bore storage	2.05041E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.07283	[]
First grid increment	3.83770E-02	[m]
Skin grid increment delta	0.04348	[]
Skin first grid increment	2.68106E-03	[m]
Skin last grid increment	2.16166E-02	[m]
Increment ratio	1.77535E+00	[]

Sequences

Sequence: H_01

Sequence type	History	
Start time	28841.467361	[day]
Duration	0.001215	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	28841.468576	[day]
Duration	0.853644	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	202.970	[psi]

Test Zone Curves

Curve object to use	Create Curve	
Curve type	Pressure	
Start sequence	H_01	
End sequence	H_01	
Curve time base	Test	
Curve Y data units	[psi]	
Curve Y data is log 10	no	

Simulation Results Setup

Output ID	DAT	
Output type	Pressure	
Pressure capture type	Test Zone	
Output units	[psi]	

Information Only

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-6a Optimization Settings

****
nPre/32 2.41Q
****

Version date	1 Mar 2007
Listing date	11 Aug 2010
QA status	QA: Q
Config file	C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-6a\H-6aM_slug.nPre

Control Settings

Test Description

A slug-injection test of the Magenta was performed in H-6a by the USGS on 12-17-1978 to 12-18-1978. The data are reported in Dennehy (1982; USGS WRI 82-8, p. 41-46.)
Data are given in terms of freshwater head (ft) above the measuring point.
The Magenta in H-6a extends from 492 to 511 ft bgs, and is exposed in a 4.75-inch open hole.
The test was conducted using a PIP on 2.375-inch tubing set inside 4.95-inch ID casing.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no
Test zone compressibility can vary	no

Information Only

Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	19.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	70.000	[psi]
Maximum value	90.000	[psi]
Estimate value	77.377	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	1.44231E-07	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-07	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	1.00003E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	Optimization	
Minimum value	0.01	[m]
Maximum value	20.0	[m]
Estimate value	0.4476732	[m]
Range type	Linear	
Sigma	1.00000E+00	
Skin zone conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	3.35938E-08	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Skin zone spec. storage	Optimization	
Minimum value	1.00000E-07	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	1.09381E-04	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Information Only

Fluid density	1003.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

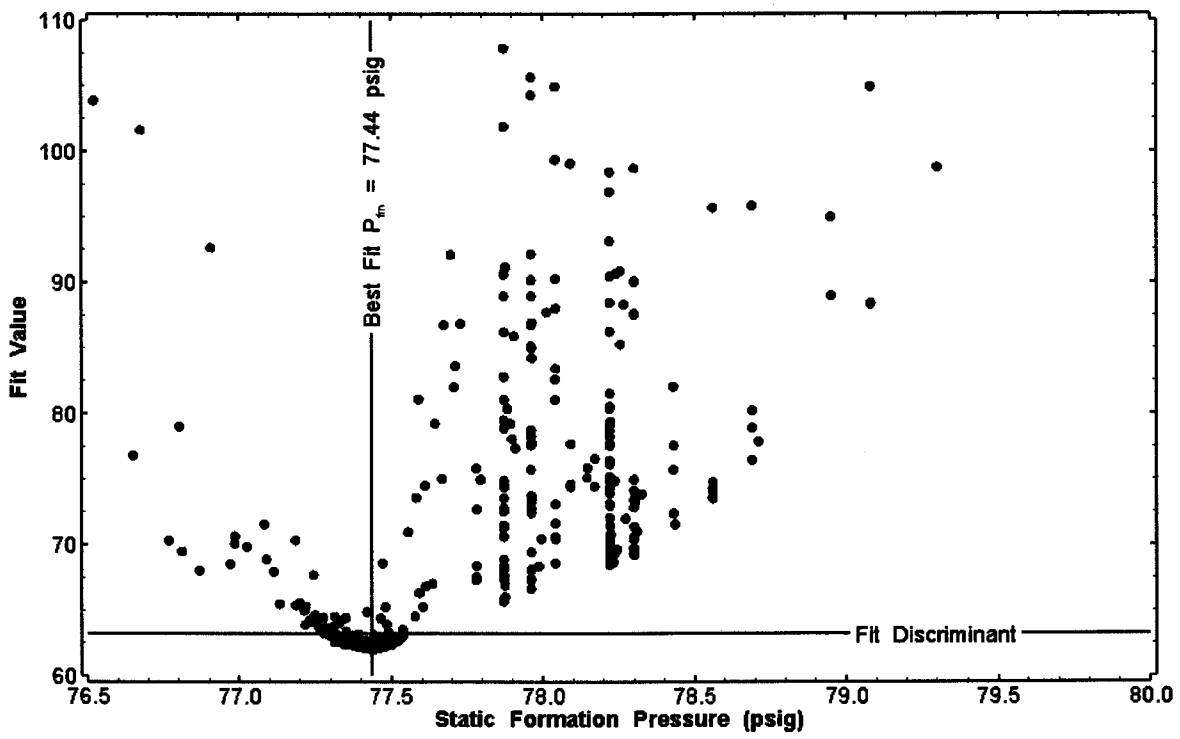

Figure B-19. X-Y scatter plot showing the static formation pressure parameter space derived from the H-6a perturbation analysis with the fit discriminant and best fit values.

Information Only

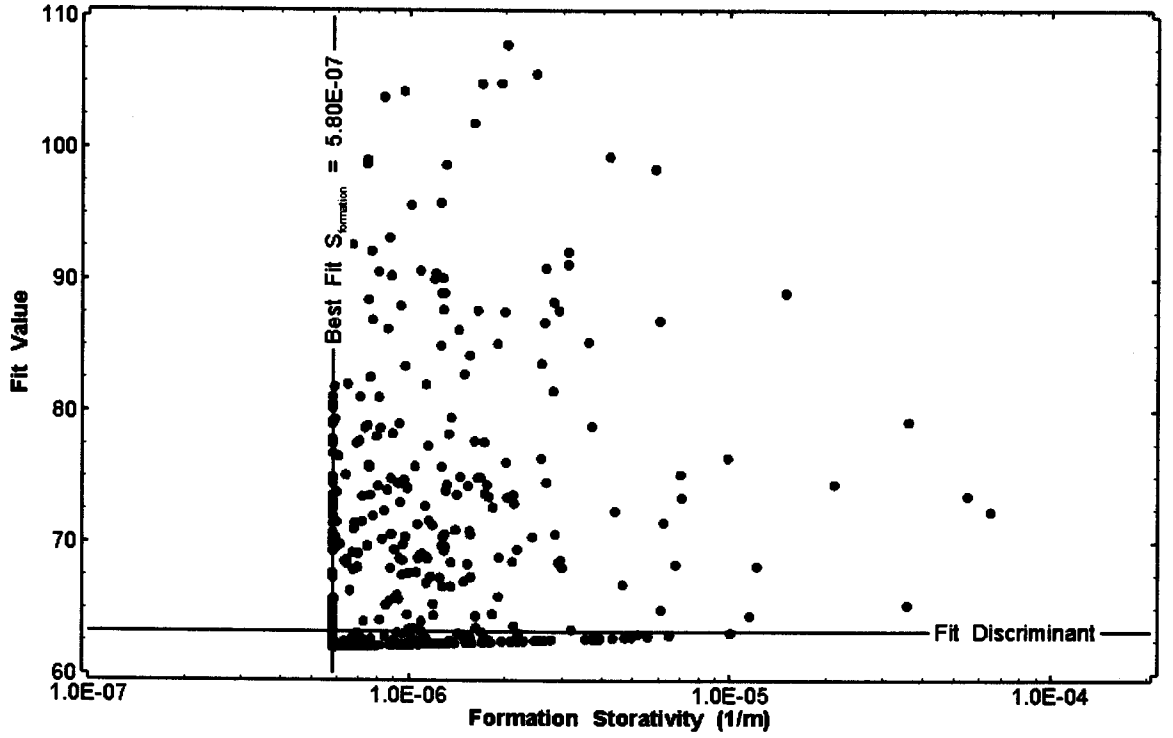

Figure B-20. X-Y scatter plot showing the storativity parameter space derived from H-6a perturbation analysis with the fit discriminant and best fit values.

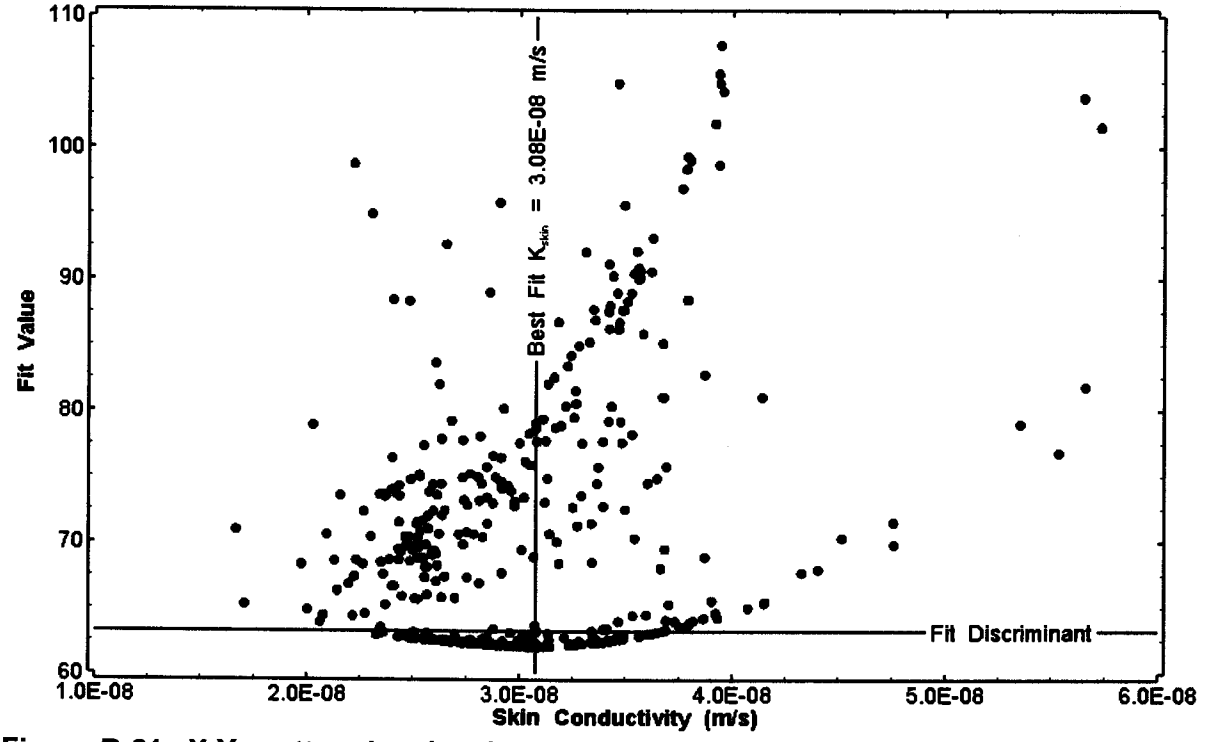

Figure B-21. X-Y scatter plot showing the skin conductivity parameter space derived from H-6a perturbation analysis with the fit discriminant and best fit values.

Information Only

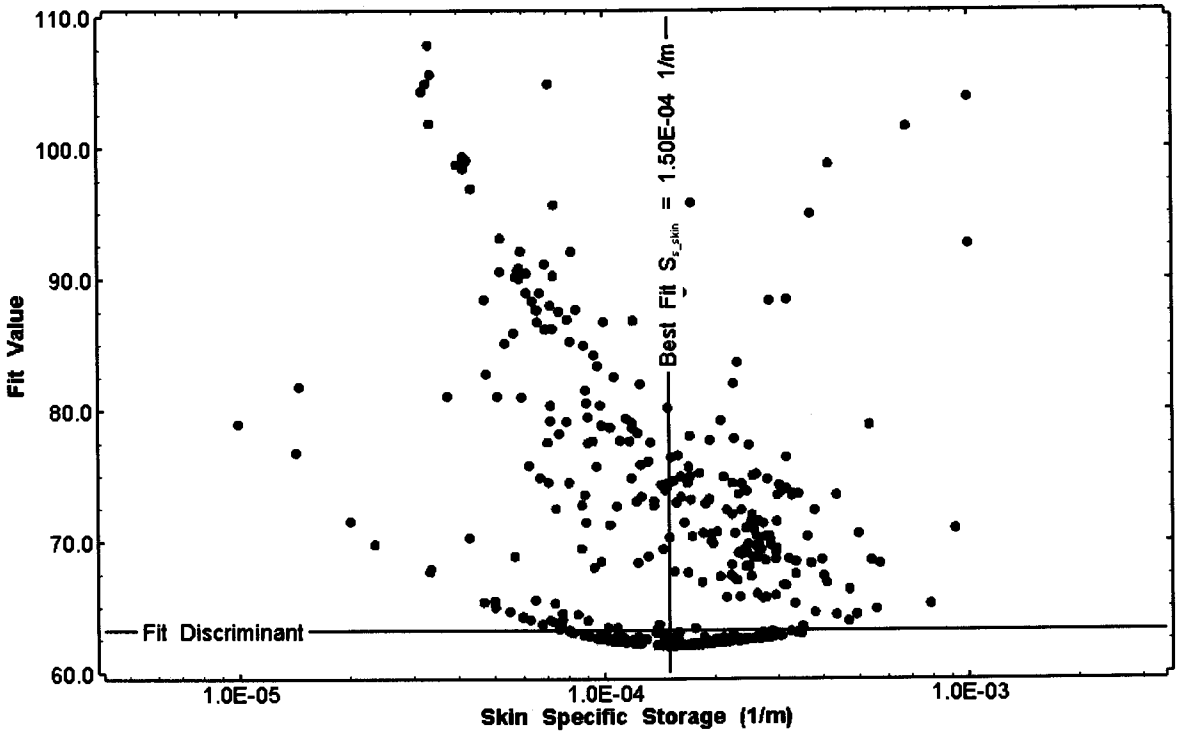

Figure B-22. X-Y scatter plot showing the skin specific storage parameter space derived from H-6a perturbation analysis with the fit discriminant and best fit values.

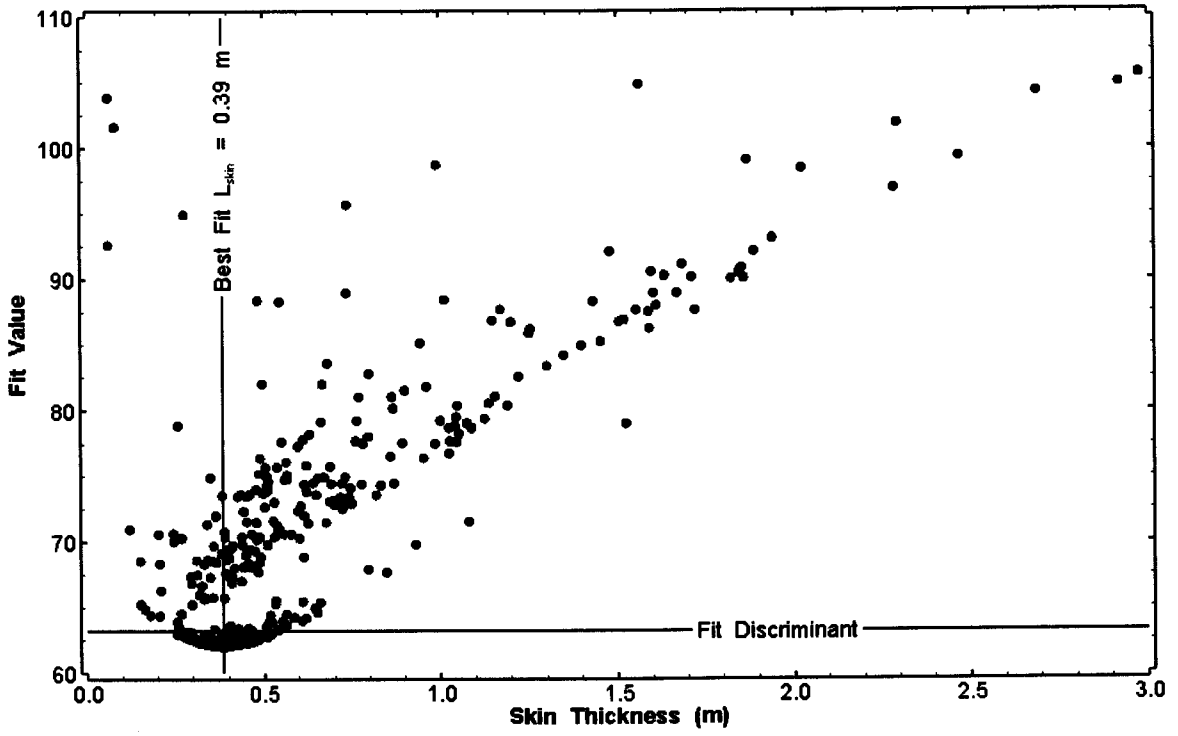

Figure B-23. X-Y scatter plot showing the thickness parameter space derived from H-6a perturbation analysis with the fit discriminant and best fit values.

Information Only

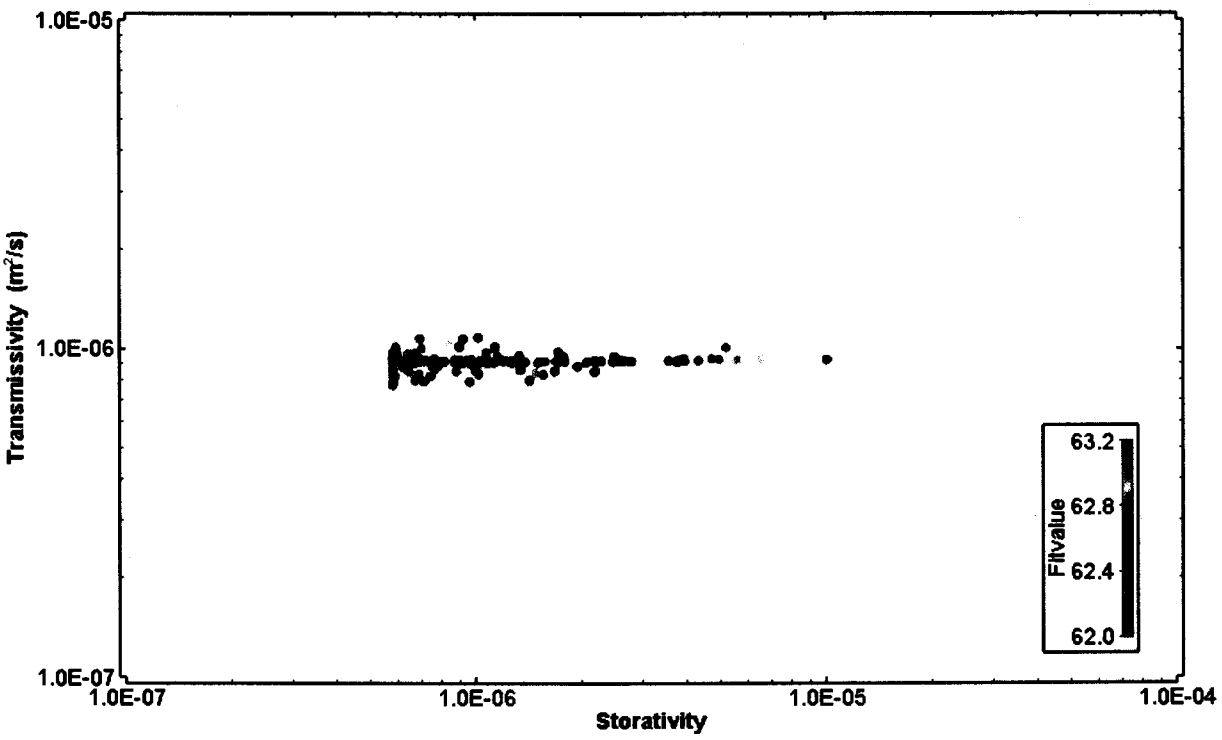

Figure B-24. Estimates of transmissivity and storativity derived from the H-6a perturbation analysis.

Information Only

B.7 H-8a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-8a\H-
8aM_slug.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-8a was performed by the USGS from 1-29-1980
through 2-4-1980.
Approximately 60 gallons of water were bailed over a 12-minute period
(ignored in these simulations).
Open-hole recovery was monitored for ~21 hr, after which a PIP was installed
and recovery continued for another day under shut-in conditions.
A slug test was initiated on 1-31-1980 by opening a valve in the PIP.
The data are reported in Richey (1986; USGS OFR 86-413, p. 28-34.)
Data are given in terms of psi
The Magenta in H-8a extends from 469.5 to 492.5 ft bgs, and is exposed in a
6.125-inch open hole (Wells and Drellack, 1982; USGS WRI 82-4118, Figure 2
and Table 5).
The slug test was conducted using a PIP on 2.375-inch tubing set inside 7-
inch casing.
The period from the end of bailing to the start of the slug test is included
as a history sequence.
```

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Information Only

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	23.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	31.692	[psi]
External boundary radius	1000000	[m]
Formation conductivity	1.04165E-09	[m/sec]
Formation spec. storage	9.03526E-07	[1/m]

Fluid

Fluid density	1007.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.0625	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	7.30237E-09	[m^2/sec]
Storativity	6.33408E-06	[]
Diffusivity	1.15287E-03	[m^2/sec]

Test Zone

Open hole well-bore storage	2.04837E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06574	[]

Information Only

First grid increment	5.28559E-03	[m]

Sequences

Sequence: H_01

Sequence type	History	
Start time	29249.572917	[day]
Duration	1.906111	[day]
Time step type	Static	
Static time step	35.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	29251.479028	[day]
Duration	4.520973	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	195.500	[psi]

Test Zone Curves

Curve object to use	Create Curve
Curve type	Pressure
Start sequence	H_01
End sequence	H_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-8a Optimization Settings

****

Information Only

```
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-8a\H-
8aM_slug.nPre
```

Control Settings

Test Description

Testing of the Magenta in H-8a was performed by the USGS from 1-29-1980 through 2-4-1980.
Approximately 60 gallons of water were bailed over a 12-minute period (ignored in these simulations).
Open-hole recovery was monitored for ~21 hr, after which a PIP was installed and recovery continued for another day under shut-in conditions.
A slug test was initiated on 1-31-1980 by opening a valve in the PIP.
The data are reported in Richey (1986; USGS OFR 86-413, p. 28-34.)
Data are given in terms of psi
The Magenta in H-8a extends from 469.5 to 492.5 ft bgs, and is exposed in a 6.125-inch open hole (Wells and Drellack, 1982; USGS WRI 82-4118, Figure 2 and Table 5).
The slug test was conducted using a PIP on 2.375-inch tubing set inside 7-inch casing.
The period from the end of bailing to the start of the slug test is included as a history sequence.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]

Information Only

Solution variable	Pressure
Allow negative head/pressure	yes

Parameters

Formation

Formation thickness	23.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	10.000	[psi]
Maximum value	50.000	[psi]
Estimate value	31.692	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	1.04165E-09	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	9.03526E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1007.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.0625	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Information Only

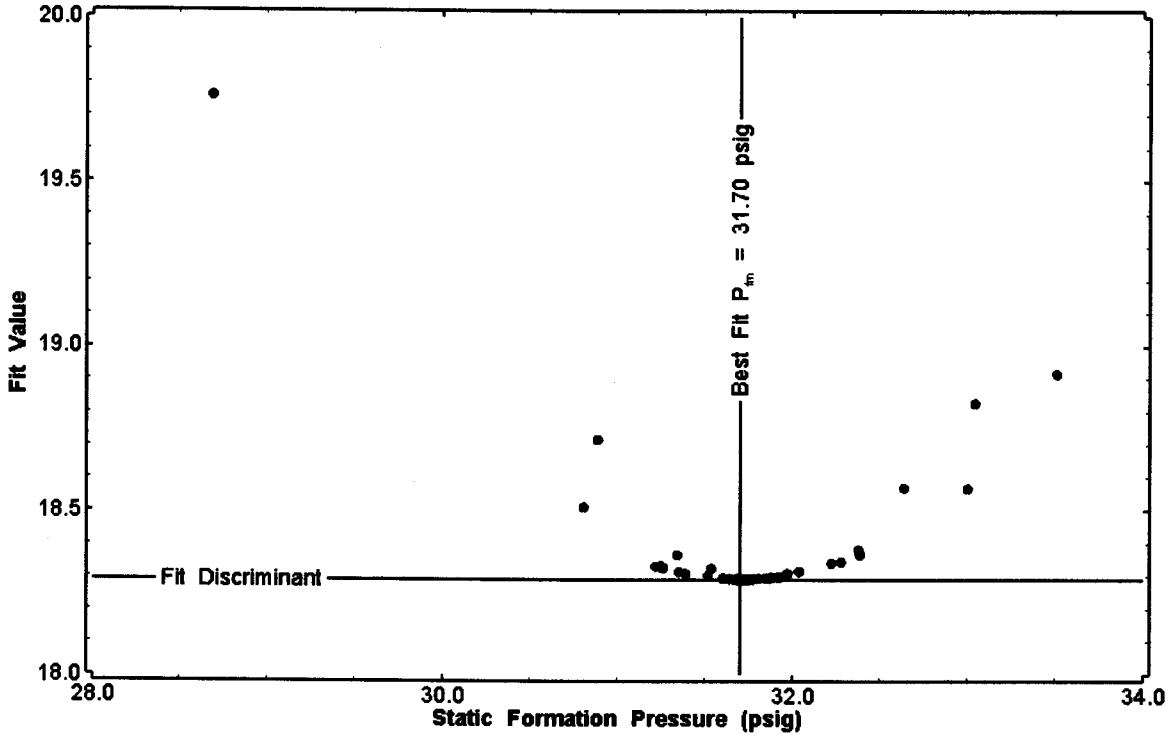

Figure B-25. X-Y scatter plot showing the static formation pressure parameter space derived from H-8a perturbation analysis with the fit discriminant and best fit values.

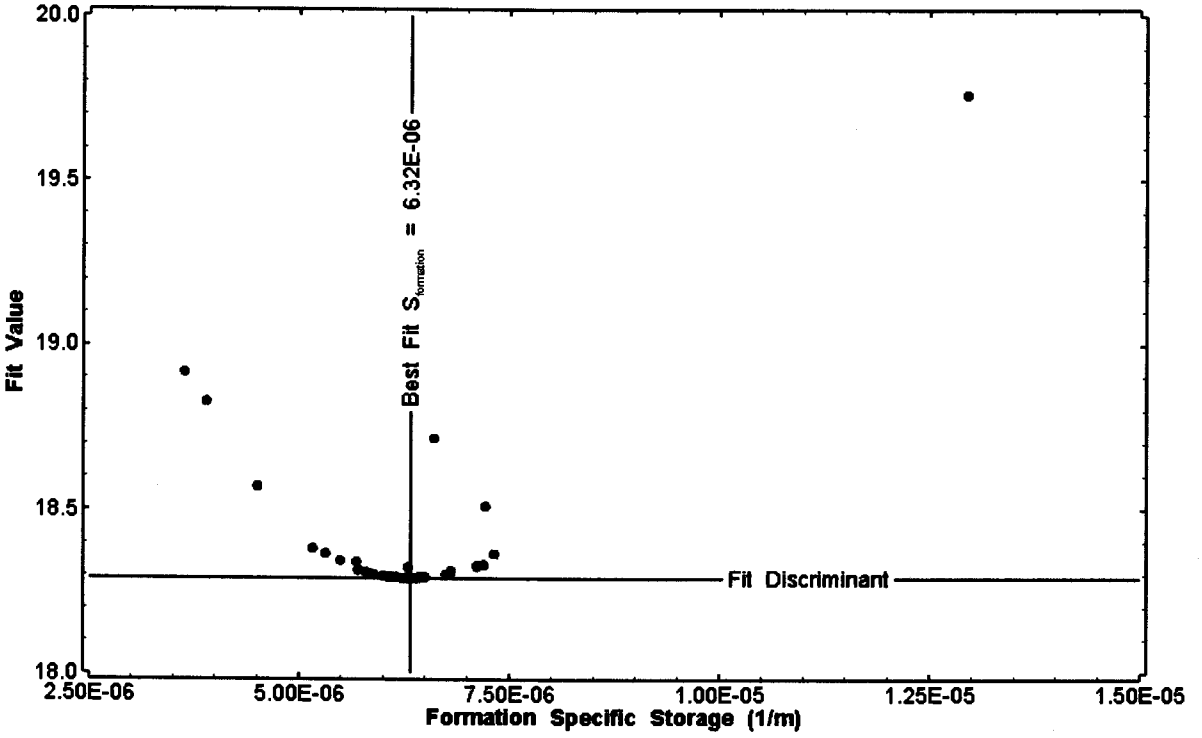

Figure B-26. X-Y scatter plot showing the storativity parameter space derived from the H-8a perturbation analysis with the fit discriminant and best fit values.

Information Only

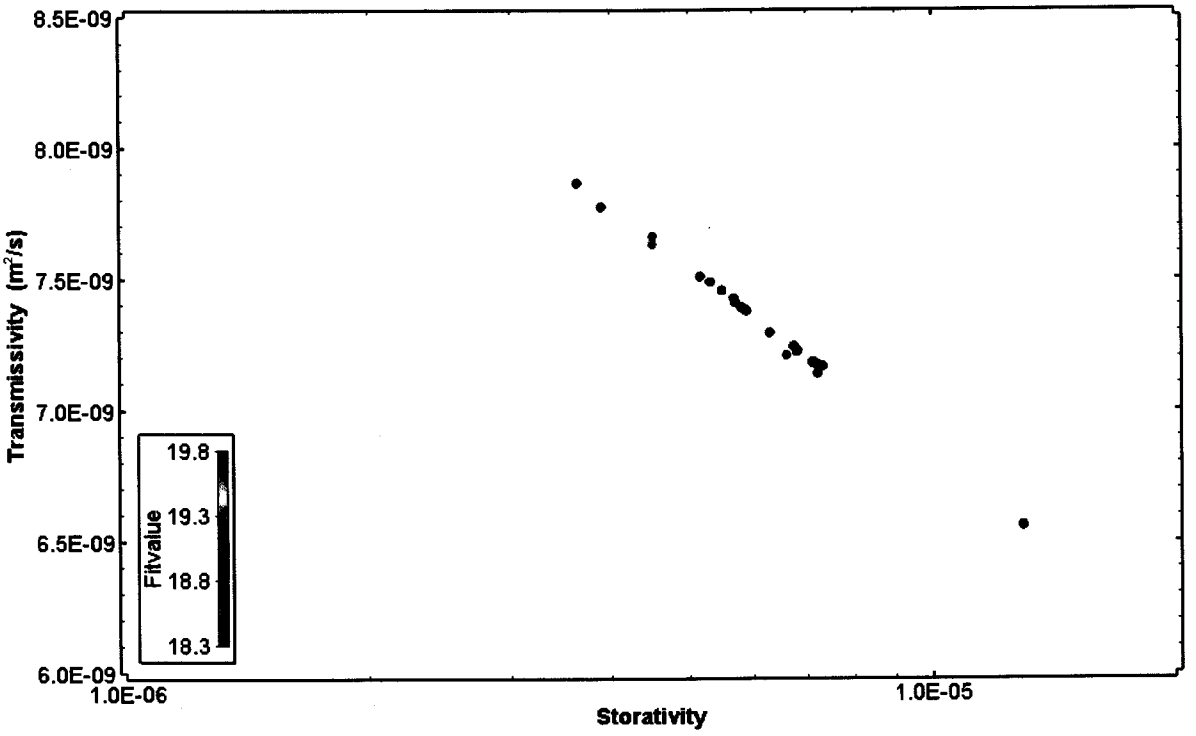

Figure B-27. Estimates of transmissivity and storativity derived from the H-8a perturbation analysis.

Information Only

B.8 H-9a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-9a\H-
9aM_slug.nPre
```

Control Settings

Test Description

A slug-injection test of the Magenta was performed in H-9a by the USGS from 2-4-1980 through 2-5-1980.
The data are reported in Richey (1986; USGS OFR 86-413, p. 68-69.)
Data are given in terms of psi
The Magenta in H-9a extends from 521.4 to 547.5 ft bgs, and is exposed in a 6.125-inch open hole.
The test was conducted using a PIP on 2.375-inch tubing set inside 7-inch casing.
Test data were truncated at 17:00 on 2-4-1980 because pressure went flat thereafter.
Data from 10:35 on 2-4-1980 onward were shifted back 3.6 minutes because of obvious offset in data.

Main Settings

Simulation type	Forward	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	yes	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]

Information Only

Solution variable	Pressure
Allow negative head/pressure	yes

Parameters

Formation

Formation thickness	26.100	[ft]
Flow dimension	2.0	[]
Static formation pressure	91.254	[psi]
External boundary radius	1000000	[m]
Formation conductivity	1.63170E-07	[m/sec]
Formation spec. storage	1.00113E-07	[1/m]

Skin

Radial thickness of skin	1.067837	[m]
Skin zone conductivity	7.24835E-08	[m/sec]
Skin zone spec. storage	1.64140E-07	[1/m]

Fluid

Fluid density	1006.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.0625	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	1.29807E-06	[m^2/sec]
Storativity	7.96428E-07	[]
Diffusivity	1.62986E+00	[m^2/sec]

Skin Zone

Transmissivity	5.76626E-07	[m^2/sec]
Storativity	1.30578E-06	[]

Information Only

Diffusivity	4.41597E-01	[m^2/sec]
Skin factor	3.36522E+00	[]

Test Zone

Open hole well-bore storage	2.05041E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06874	[]
First grid increment	8.15218E-02	[m]
Skin grid increment delta	0.05489	[]
Skin first grid increment	4.38931E-03	[m]
Skin last grid increment	6.11912E-02	[m]
Increment ratio	1.33225E+00	[]

Sequences

Sequence: H_01

Sequence type	History	
Start time	29255.416667	[day]
Duration	0.000173	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	29255.416840	[day]
Duration	0.293160	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	214.400	[psi]

Test Zone Curves

Curve object to use	Create Curve	
Curve type	Pressure	
Start sequence	H_01	
End sequence	H_01	
Curve time base	Test	
Curve Y data units	[psi]	
Curve Y data is log 10	no	

Simulation Results Setup

Information Only

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-9a Optimization Settings

****
nPre/32 2.41Q
****

Version date	1 Mar 2007
Listing date	11 Aug 2010
QA status	QA: Q
Config file	C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-9a\H-9aM_slug.nPre

Control Settings

Test Description

A slug-injection test of the Magenta was performed in H-9a by the USGS from 2-4-1980 through 2-5-1980.
The data are reported in Richey (1986; USGS OFR 86-413, p. 68-69.)
Data are given in terms of psi
The Magenta in H-9a extends from 521.4 to 547.5 ft bgs, and is exposed in a 6.125-inch open hole.
The test was conducted using a PIP on 2.375-inch tubing set inside 7-inch casing.
Test data were truncated at 17:00 on 2-4-1980 because pressure went flat thereafter.
Data from 10:35 on 2-4-1980 onward were shifted back 3.6 minutes because of obvious offset in data.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic

Information Only

System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	26.100	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	80.000	[psi]
Maximum value	100.000	[psi]
Estimate value	91.254	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	1.63170E-07	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-07	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	1.00113E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	Optimization	
Minimum value	0.01	[m]
Maximum value	20.0	[m]
Estimate value	1.067837	[m]
Range type	Linear	
Sigma	1.00000E+00	
Skin zone conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	7.24835E-08	[m/sec]
Range type	Log	
Sigma	1.00000E+00	

Information Only

Skin zone spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	1.64140E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1006.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.0625	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

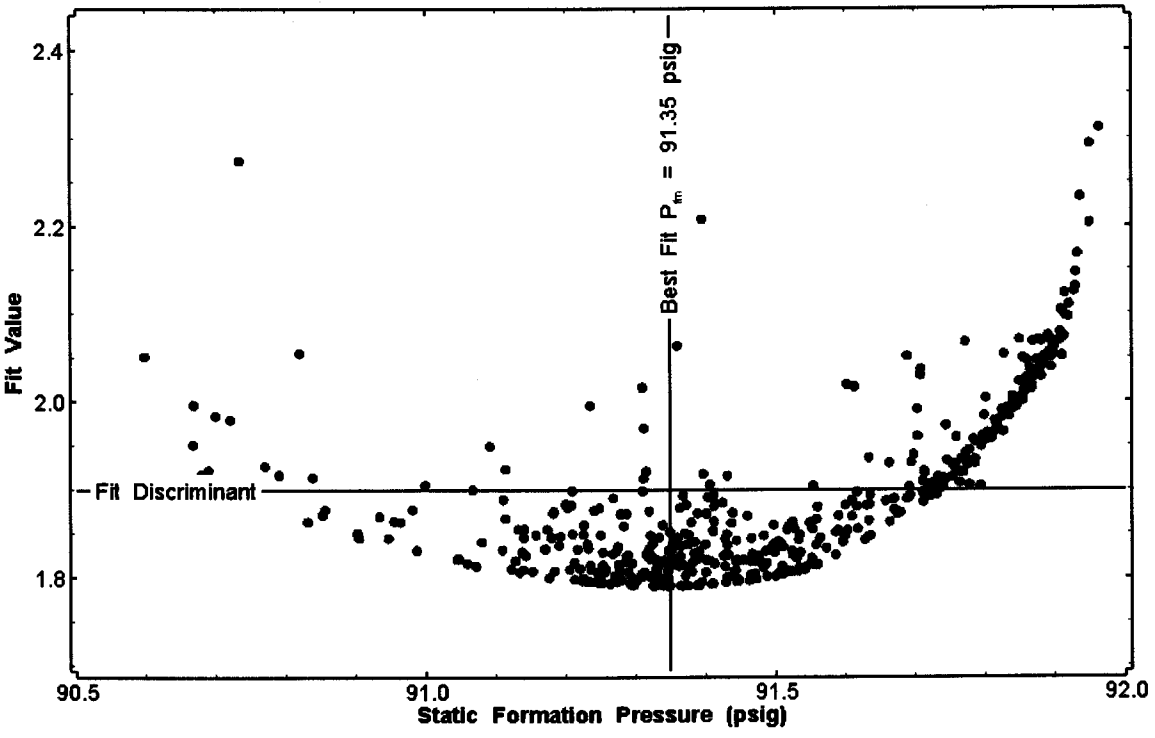

Figure B-28. X-Y scatter plot showing the static formation pressure parameter space derived from H-9a perturbation analysis with the fit discriminant and best fit values.

Information Only

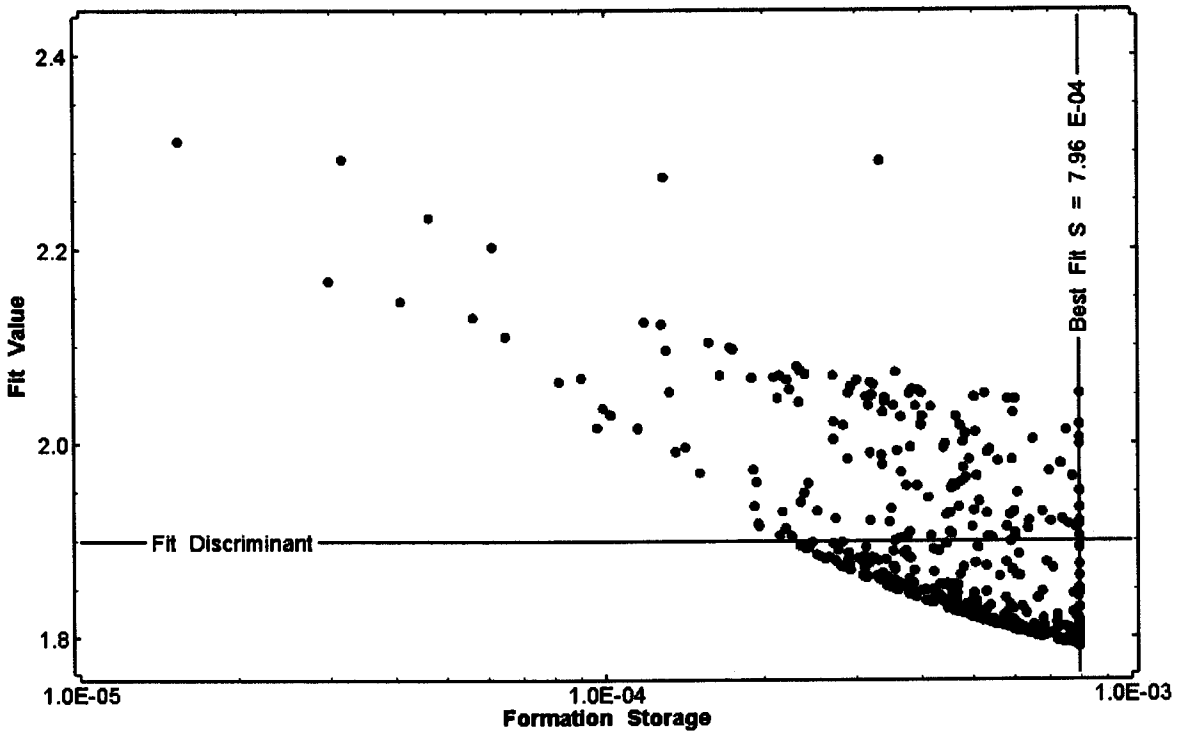

Figure B-29. X-Y scatter plot showing the storativity parameter space derived from H-9a perturbation analysis with the fit discriminant and best fit values.

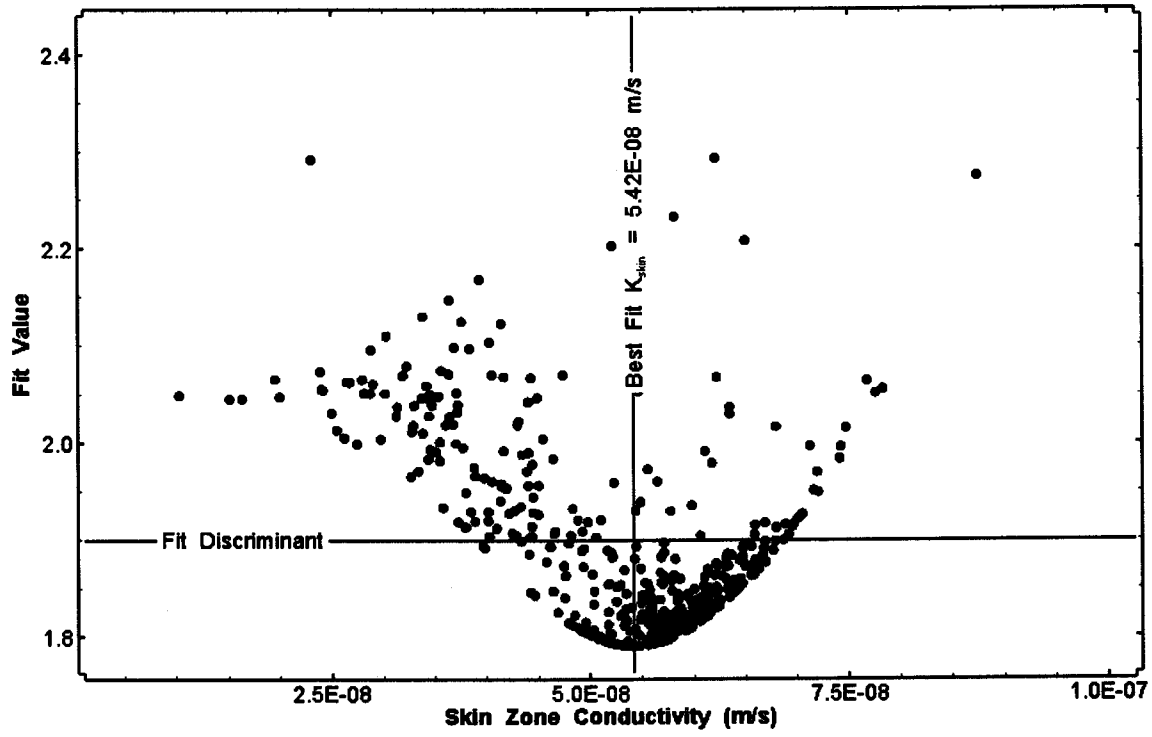

Figure B-30. X-Y scatter plot showing the skin conductivity parameter space derived from H-9a perturbation analysis with the fit discriminant and best fit values.

Information Only

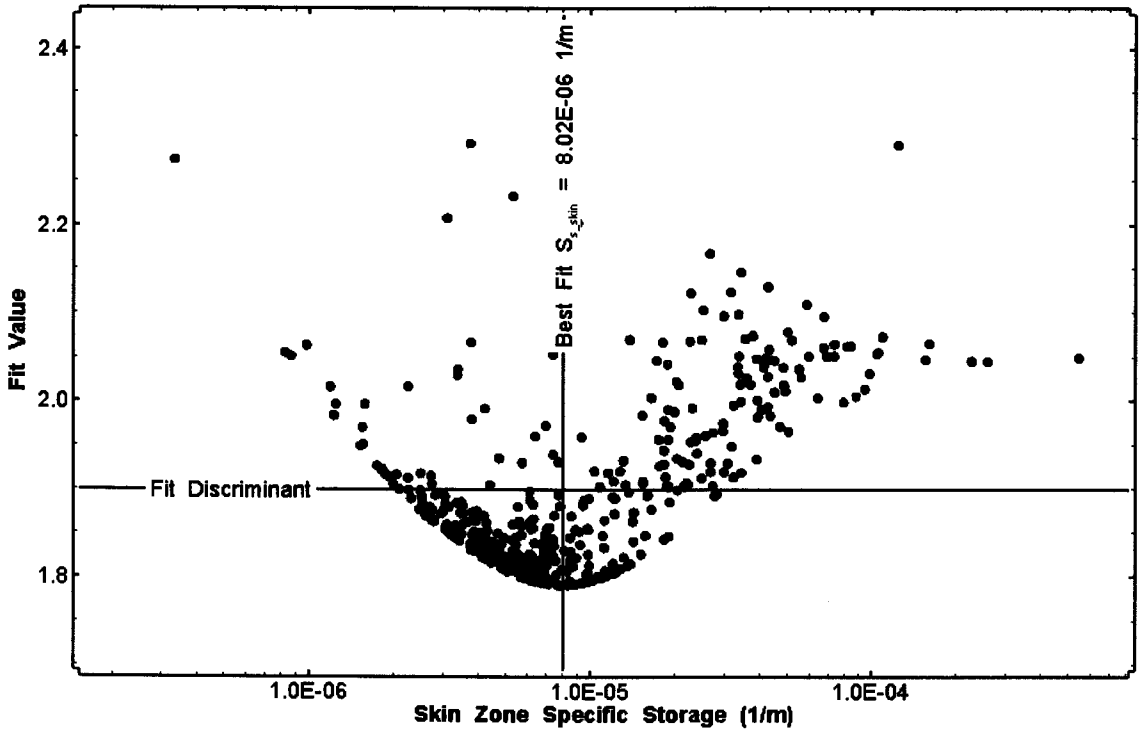

Figure B-31. X-Y scatter plot showing the skin specific storage parameter space derived from H-9a perturbation analysis with the fit discriminant and best fit values.

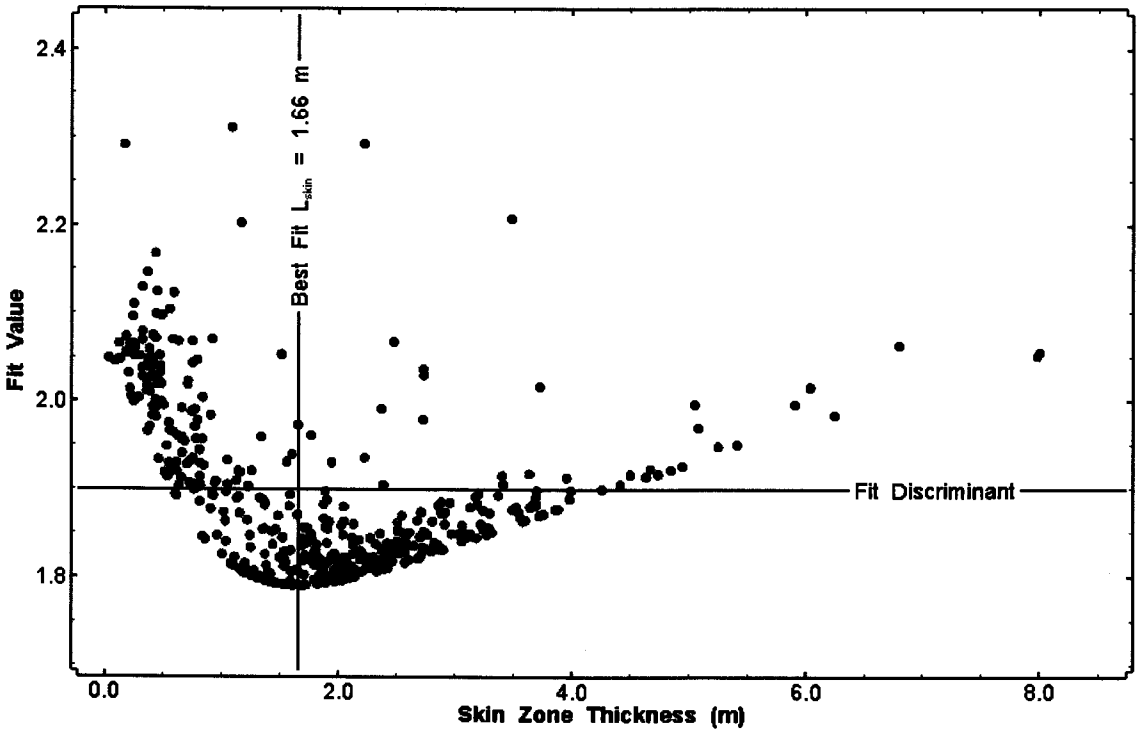

Figure B-32. X-Y scatter plot showing the skin thickness parameter space derived from H-9a perturbation analysis with the fit discriminant and best fit values.

Information Only

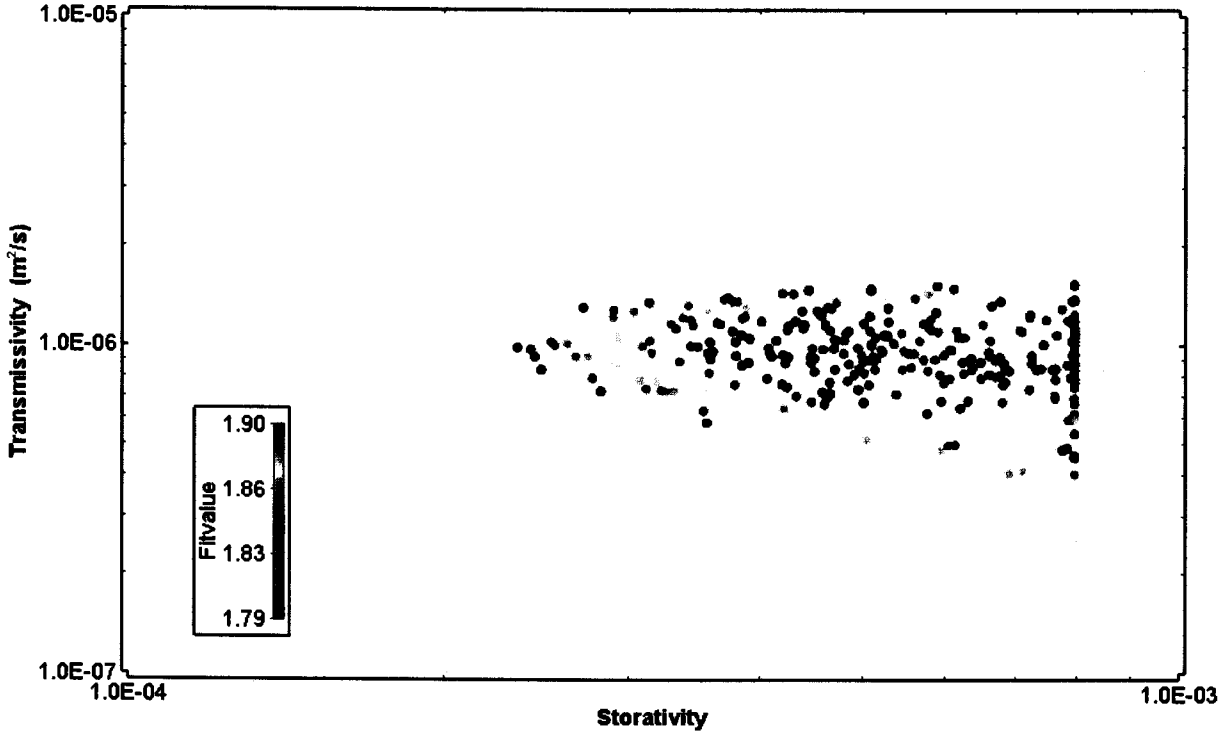

Figure B-33. Estimates of transmissivity and storativity derived from the H-9a perturbation analysis.

Information Only

B.9 H-10a nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a\H-
10aM_slug.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-10a was performed by the USGS from 2-20-1980
through 2-23-1980.
Testing consisted of a bailing test, a shut-in test, and two slug tests.
Only the final slug test is analyzed here because of abnormalities during the
first slug test.
The data are reported in Richey (1986; USGS OFR 86-413, p. 86-96.)
Data are given in terms of pressure (psi) above the measuring point.
Fluid density was approximately 1170 kg/m
The Magenta in H-10a extends from 1250.9 to 1275.2 ft bgs, and is exposed in
a 6.125-inch open hole (Wells and Drellack, 1983; USGS WRI 83-4124).
The slug test was conducted using a PIP on 2.375-inch tubing set inside 7-
inch OD casing.
Initial period of inertial effects/sloshing is included as a history
sequence.
```

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no
Test zone compressibility can vary	no

Information Only

Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.300	[ft]
Flow dimension	2.0	[]
Static formation pressure	257.156	[psi]
External boundary radius	1000000	[m]
Formation conductivity	5.73836E-07	[m/sec]
Formation spec. storage	5.36036E-06	[1/m]

Skin

Radial thickness of skin	0.014	[m]
Skin zone conductivity	1.44000E-09	[m/sec]
Skin zone spec. storage	1.25000E-10	[1/m]

Fluid

Fluid density	1170.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.063	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	4.25020E-06	[m^2/sec]
Storativity	3.97023E-05	[]
Diffusivity	1.07052E-01	[m^2/sec]

Skin Zone

Information Only

Transmissivity	1.06656E-08	[m^2/sec]
Storativity	9.25830E-10	[]
Diffusivity	1.15200E+01	[m^2/sec]
Skin factor	6.57741E+01	[]

Test Zone

Open hole well-bore storage	2.05656E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.08143	[]
First grid increment	7.78762E-03	[m]
Skin grid increment delta	0.00338	[]
Skin first grid increment	2.63171E-04	[m]
Skin last grid increment	3.09482E-04	[m]
Increment ratio	2.51634E+01	[]

Sequences

Sequence: H_01

Sequence type	History	
Start time	29274.403588	[day]
Duration	0.001099	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Curve	
Wellbore storage	None	

Sequence: S_01

Sequence type	Slug	
Start time	29274.404687	[day]
Duration	0.695313	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	420.000	[psi]

Test Zone Curves

Curve object to use	P_Curve	
Curve type	Pressure	
Start sequence	H_01	
End sequence	H_01	
Curve time base	Test	
Curve Y data units	[psi]	
Curve Y data is log 10	no	

Information Only

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-10a Optimization Settings

****
nPre/32 2.41Q
****

Version date 1 Mar 2007
Listing date 11 Aug 2010
QA status QA: Q
Config file C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a\H-10aM_slug.nPre

---

Control Settings

Test Description

Testing of the Magenta in H-10a was performed by the USGS from 2-20-1980 through 2-23-1980.
Testing consisted of a bailing test, a shut-in test, and two slug tests.
Only the final slug test is analyzed here because of abnormalities during the first slug test.
The data are reported in Richey (1986; USGS OFR 86-413, p. 86-96.)
Data are given in terms of pressure (psi) above the measuring point.
Fluid density was approximately 1170 kg/m
The Magenta in H-10a extends from 1250.9 to 1275.2 ft bgs, and is exposed in a 6.125-inch open hole (Wells and Drellack, 1983; USGS WRI 83-4124).
The slug test was conducted using a PIP on 2.375-inch tubing set inside 7-inch OD casing.
Initial period of inertial effects/sloshing is included as a history sequence.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Information Only

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.300	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	240.000	[psi]
Maximum value	270.000	[psi]
Estimate value	257.156	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-02	[m/sec]
Estimate value	5.73836E-07	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-08	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	5.36036E-06	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	0.014	[m]
Skin zone conductivity	1.44000E-09	[m/sec]
Skin zone spec. storage	1.25000E-10	[1/m]

Fluid

Fluid density	1170.00	[kg/m^3]

Information Only

Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.063	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

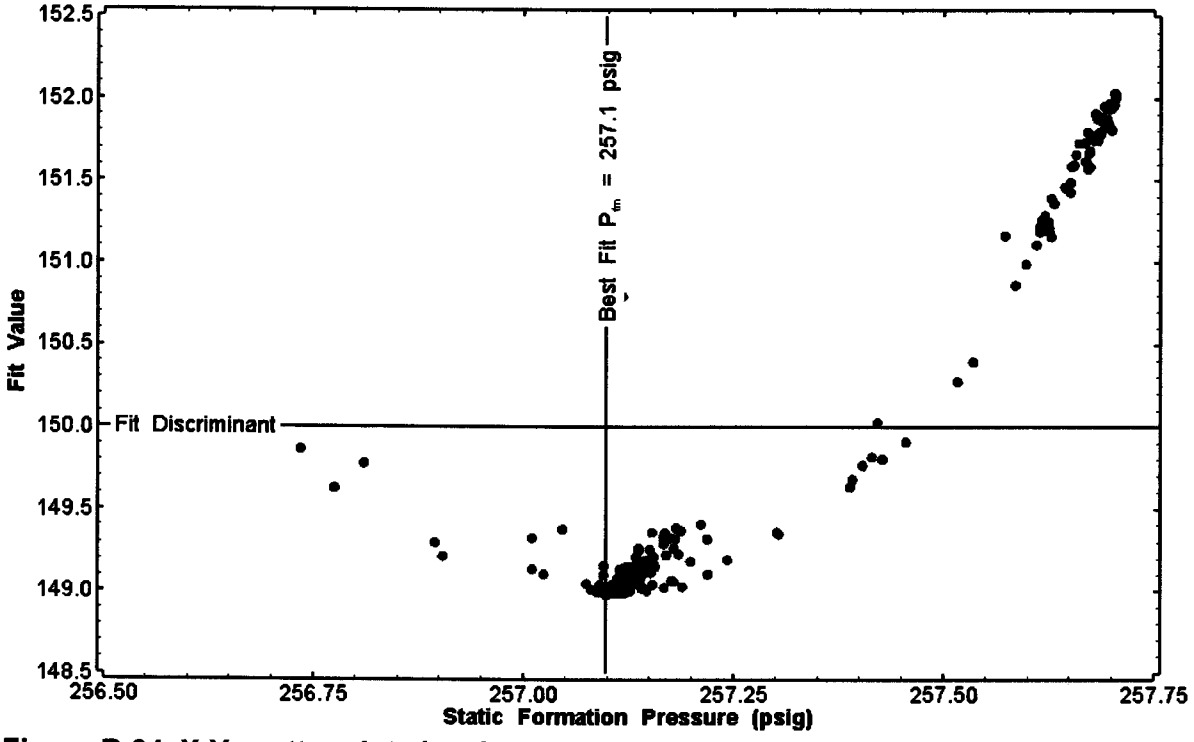

Figure B-34. X-Y scatter plot showing the static formation pressure parameter space derived from H-10a perturbation analysis with the fit discriminant and best fit values.

Information Only

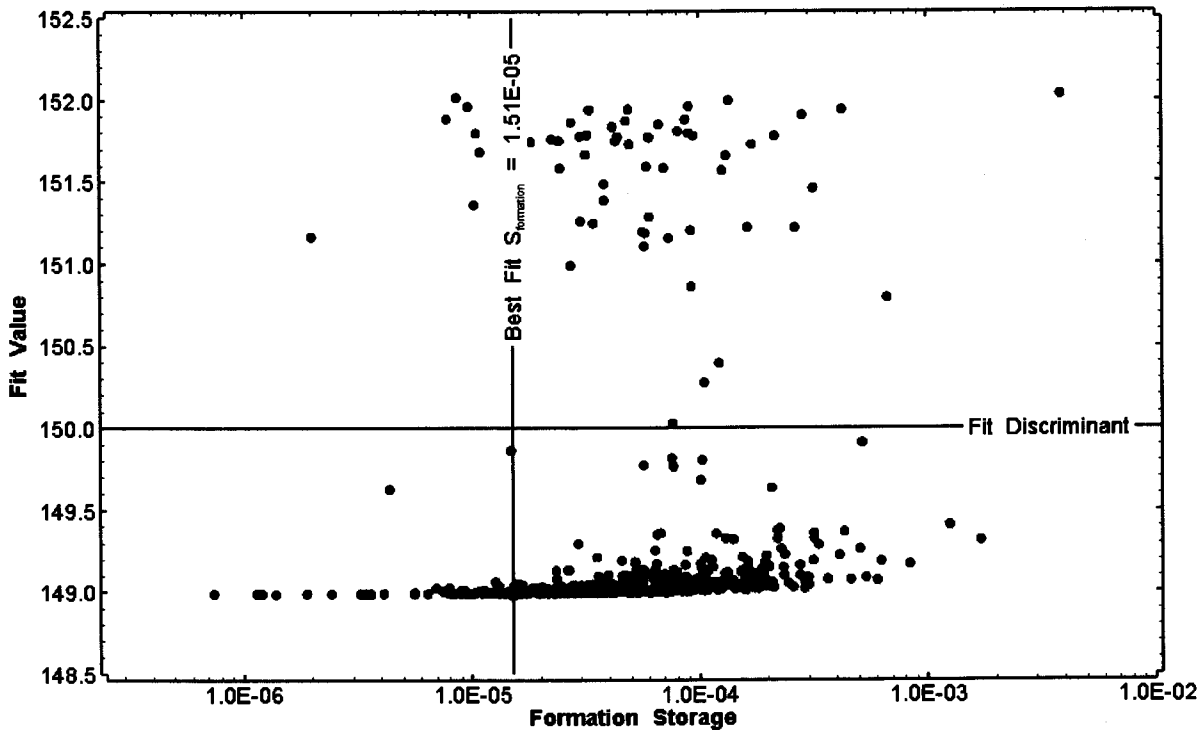

Figure B-35. X-Y scatter plot showing the storativity parameter space derived from H-10a perturbation analysis with the fit discriminant and best fit values.

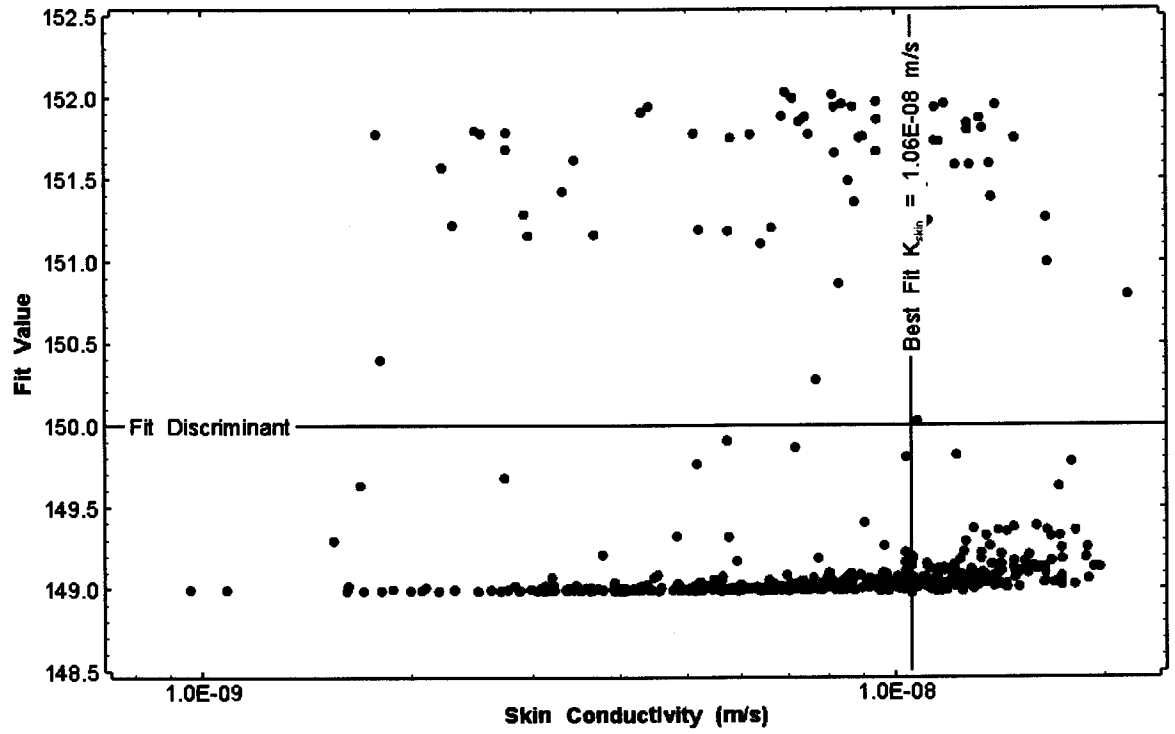

Figure B-36. X-Y scatter plot showing the skin conductivity parameter space derived from H-10a perturbation analysis with the fit discriminant and best fit values.

Information Only

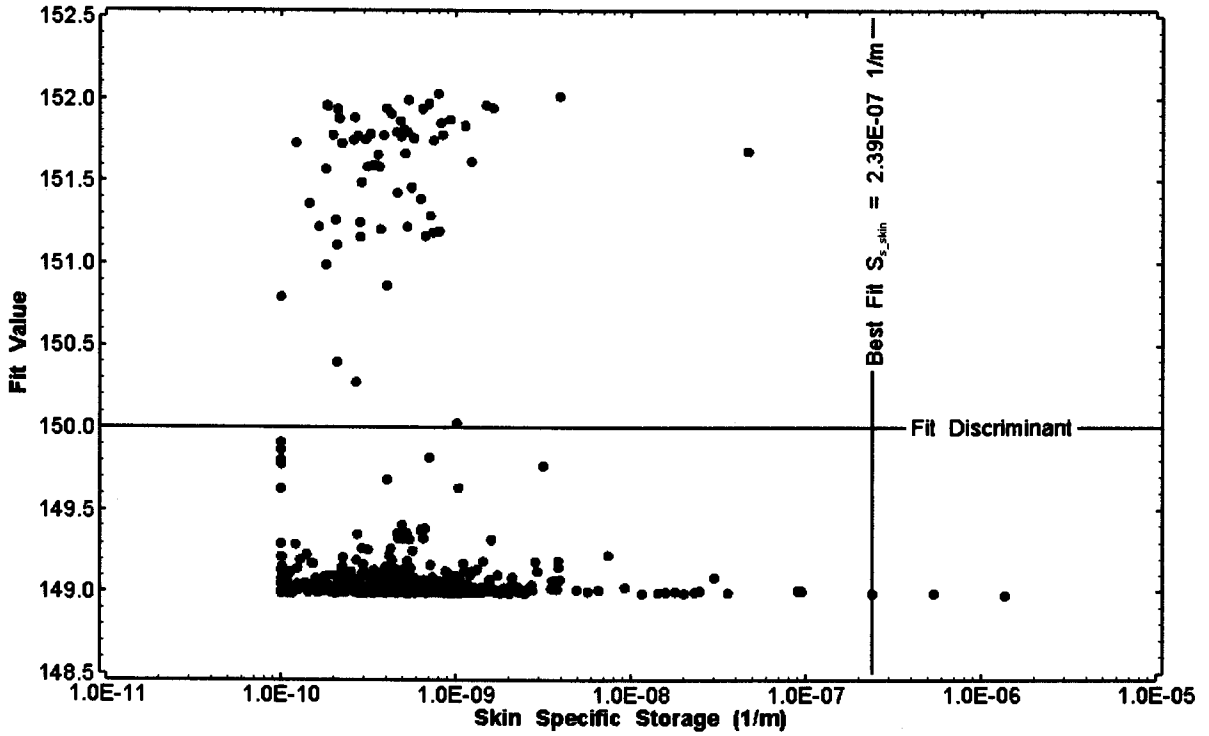

Figure B-37. X-Y scatter plot showing the skin specific storage parameter space derived from H-10a perturbation analysis with the fit discriminant and best fit values.

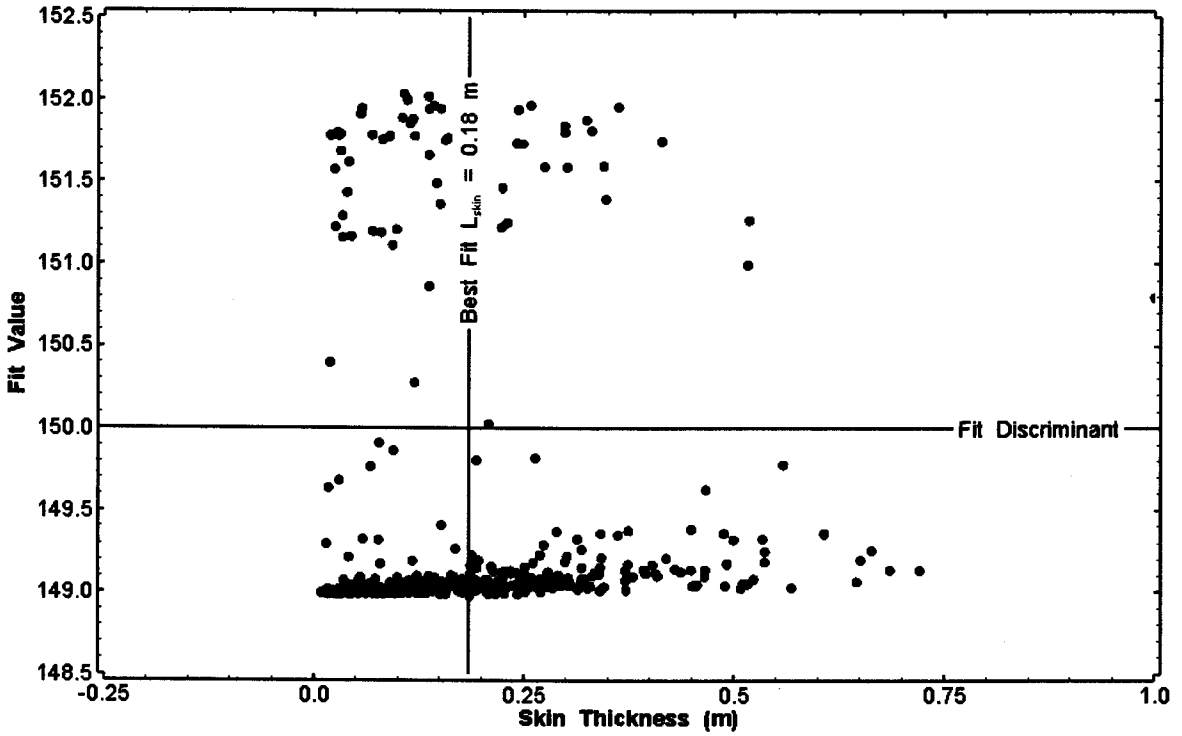

Figure B-38. X-Y scatter plot showing the skin thickness parameter space derived from H-10a perturbation analysis with the fit discriminant and best fit values.

Information Only

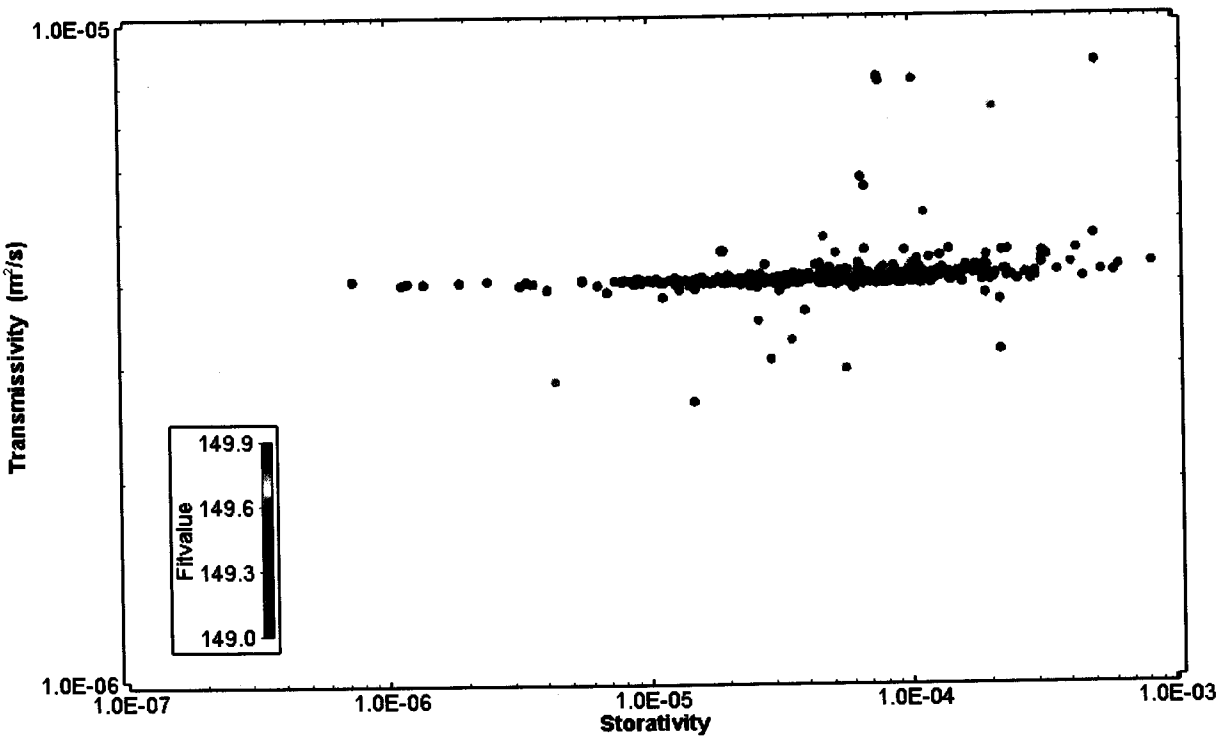

Figure B-39. Estimates of transmissivity and storativity derived from the H-10a perturbation analysis.

Information Only

B.10 H-14 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-14\H-
14M_DST.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-14 was performed by SNL from October 10-13, 1986.
Testing consisted of three DSTs.
Testing was performed using the Baker straddle-packer test tool and quartz
transducers.
The data are reported in Stensrud et al. (1987; HDR#5, SAND87-7125)
Data are given in terms of psia.
The Magenta in H-14 extends from 422.4 to 448.0 ft bgs, and was exposed in a
7.875-inch open hole.
The Magenta was penetrated by drilling on October 2, 1986 using saturated
brine for circulation.
The period from drilling penetration to the start of testing is included as a
history sequence.
```

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	

Information Only

Allow negative head/pressure	yes

Parameters

Formation

Formation thickness	25.600	[ft]
Flow dimension	2.0	[]
Static formation pressure	98.795	[psi]
External boundary radius	1000000	[m]
Formation conductivity	4.26938E-10	[m/sec]
Formation spec. storage	1.07098E-05	[1/m]

Fluid

Fluid density	1200.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.9375	[in]
Tubing string radius	0.9975	[in]
Volume change from normal	0.0	[ft^3]
Test-zone compressibility	1.87609E-09	[1/Pa]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	3.33135E-09	[m^2/sec]
Storativity	8.35676E-05	[]
Diffusivity	3.98641E-05	[m^2/sec]

Test Zone

Test-zone volume	0.245196	[m^3]
Isolated well-bore storage	4.60010E-10	[m^3/Pa]
Open hole well-bore storage	1.71380E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06473	[]
First grid increment	6.68801E-03	[m]

Information Only

Sequences

Sequence: H_01

Sequence type	History	
Start time	31687.666667	[day]
Duration	0.062503	[day]
Time step type	Static	
Static time step	0.002000	[day]
Type	Fixed	
Fixed value	240.000	[psi]
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	31687.729170	[day]
Duration	0.125000	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Initial pressure type	Absolute	
Initial pressure	240.000	[psi]

Sequence: H_02

Sequence type	History	
Start time	31687.854170	[day]
Duration	0.083330	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Type	Fixed	
Fixed value	240.000	[psi]
Wellbore storage	Open	

Sequence: S_02

Sequence type	Slug	
Start time	31687.937500	[day]
Duration	0.031250	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Initial pressure type	Absolute	
Initial pressure	240.000	[psi]

Sequence: H_03

Sequence type	History	
Start time	31687.968750	[day]

Information Only

Duration	0.114580	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Type	Fixed	
Fixed value	240.000	[psi]
Wellbore storage	Open	

Sequence: S_03

Sequence type	Slug	
Start time	31688.083330	[day]
Duration	0.250000	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Initial pressure type	Absolute	
Initial pressure	240.000	[psi]

Sequence: H_04

Sequence type	History	
Start time	31688.333330	[day]
Duration	0.812500	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Type	Fixed	
Fixed value	240.000	[psi]
Wellbore storage	Open	

Sequence: S_04

Sequence type	Slug	
Start time	31689.145830	[day]
Duration	2.208340	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Initial pressure type	Absolute	
Initial pressure	240.000	[psi]

Sequence: H_05

Sequence type	History	
Start time	31691.354170	[day]
Duration	0.145830	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Type	Fixed	
Fixed value	240.000	[psi]
Wellbore storage	Open	

Information Only

Sequence: S_05

Sequence type	Slug	
Start time	31691.500000	[day]
Duration	0.958330	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Initial pressure type	Absolute	
Initial pressure	240.000	[psi]

Sequence: H_06

Sequence type	History	
Start time	31692.458330	[day]
Duration	0.041670	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Type	Fixed	
Fixed value	240.000	[psi]
Wellbore storage	Open	

Sequence: S_06

Sequence type	Slug	
Start time	31692.500000	[day]
Duration	0.222230	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	100	
Initial pressure type	Absolute	
Initial pressure	240.000	[psi]

Sequence: H_07

Sequence type	History	
Start time	31692.722230	[day]
Duration	1.909730	[day]
Time step type	Static	
Static time step	350.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_07

Sequence type	Slug	
Start time	31694.631960	[day]
Duration	0.879151	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	155.570	[psi]

Information Only

Sequence: H_08

Sequence type	History	
Start time	31695.511111	[day]
Duration	0.126969	[day]
Time step type	Static	
Static time step	25.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_08

Sequence type	Slug	
Start time	31695.638080	[day]
Duration	0.010280	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	38.320	[psi]

Sequence: F_01

Sequence type	Flow	
Start time	31695.648360	[day]
Duration	0.769371	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[m^3/sec]
Wellbore storage	Isolated	

Sequence: H_09

Sequence type	History	
Start time	31696.417731	[day]
Duration	0.000859	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_09

Sequence type	Slug	
Start time	31696.418590	[day]
Duration	0.020300	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	39.380	[psi]

Information Only

Sequence: F_02

Sequence type	Flow	
Start time	31696.438890	[day]
Duration	0.970879	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[m^3/sec]
Wellbore storage	Isolated	

Sequence: H_10

Sequence type	History	
Start time	31697.409769	[day]
Duration	0.008041	[day]
Time step type	Static	
Static time step	2.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_10

Sequence type	Slug	
Start time	31697.417810	[day]
Duration	0.041148	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	40.810	[psi]

Sequence: F_03

Sequence type	Flow	
Start time	31697.458958	[day]
Duration	0.941042	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[m^3/sec]
Wellbore storage	Isolated	

Test Zone Curves

Curve object to use	Create Curve
Curve type	Pressure
Start sequence	H_07
End sequence	F_03
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Information Only

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-14 Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-14\H-
14M_DST.nPre
```

Control Settings

Test Description

Testing of the Magenta in H-14 was performed by SNL from October 10-13, 1986.
Testing consisted of three DSTs.
Testing was performed using the Baker straddle-packer test tool and quartz transducers.
The data are reported in Stensrud et al. (1987; HDR#5, SAND87-7125)
Data are given in terms of psia.
The Magenta in H-14 extends from 422.4 to 448.0 ft bgs, and was exposed in a 7.875-inch open hole.
The Magenta was penetrated by drilling on October 2, 1986 using saturated brine for circulation.
The period from drilling penetration to the start of testing is included as a history sequence.

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Information Only

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	25.600	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	80.000	[psi]
Maximum value	125.000	[psi]
Estimate value	98.795	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	4.26938E-10	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	1.07098E-05	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1200.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.9375	[in]
Tubing string radius	0.9975	[in]

Information Only

Volume change from normal	0.0	[ft^3]
Test-zone compressibility	Optimization	
Minimum value	1.00000E-11	[1/Pa]
Maximum value	1.00000E-07	[1/Pa]
Estimate value	1.87609E-09	[1/Pa]
Range type	Log	
Sigma	1.00000E+00	

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

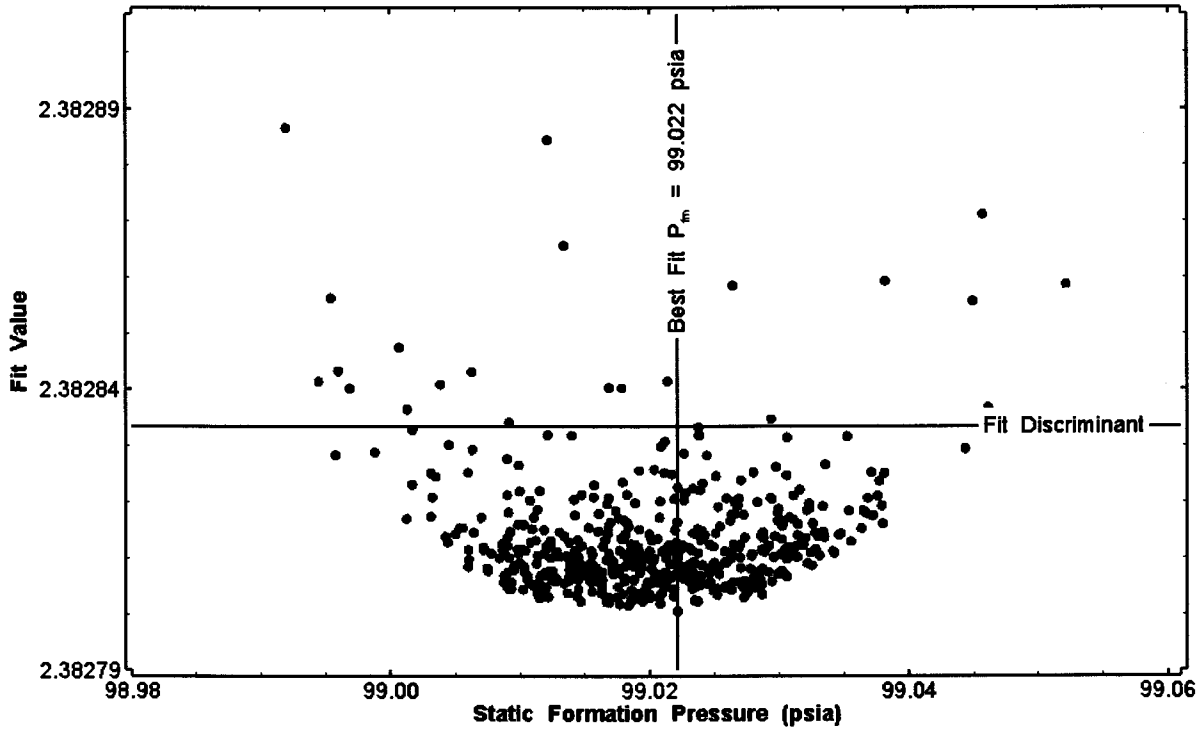

Figure B-40. X-Y scatter plot showing the static formation pressure parameter space derived from H-14 perturbation analysis with the fit discriminant and best fit values.

Information Only

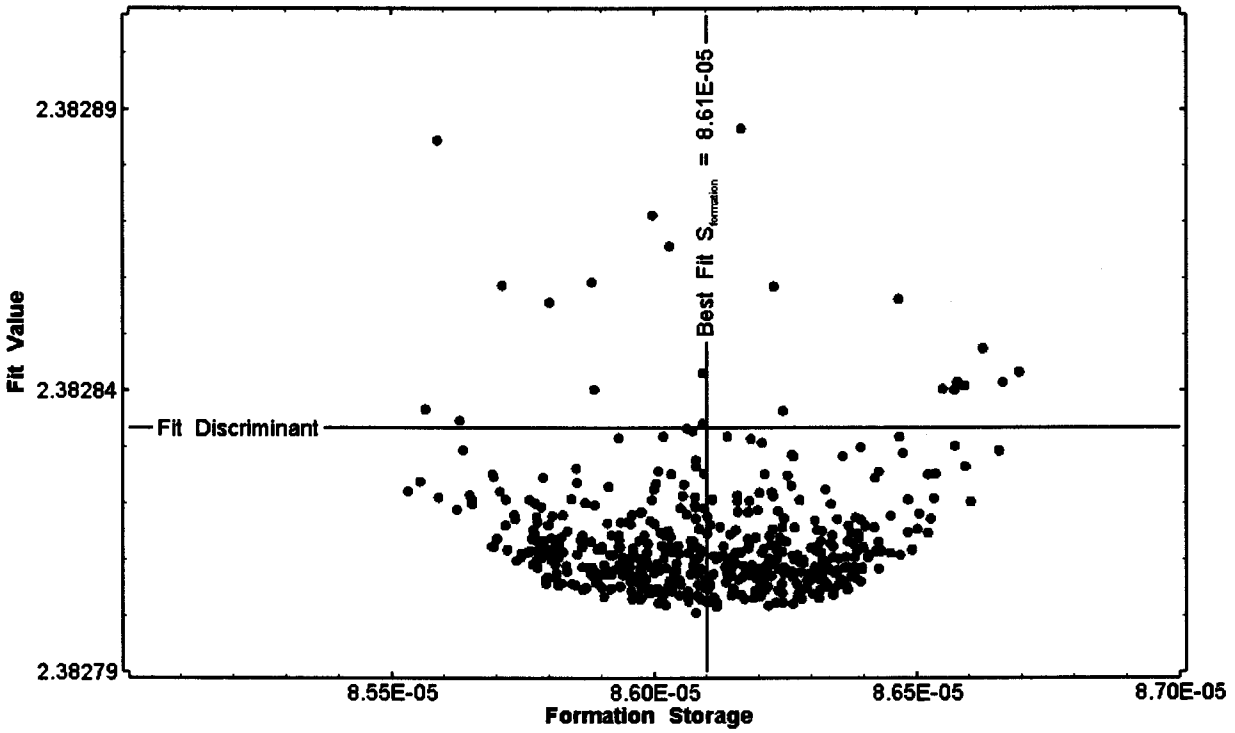

Figure B-41. X-Y scatter plot showing the storativity parameter space derived from H-14 perturbation analysis with the fit discriminant and best fit values.

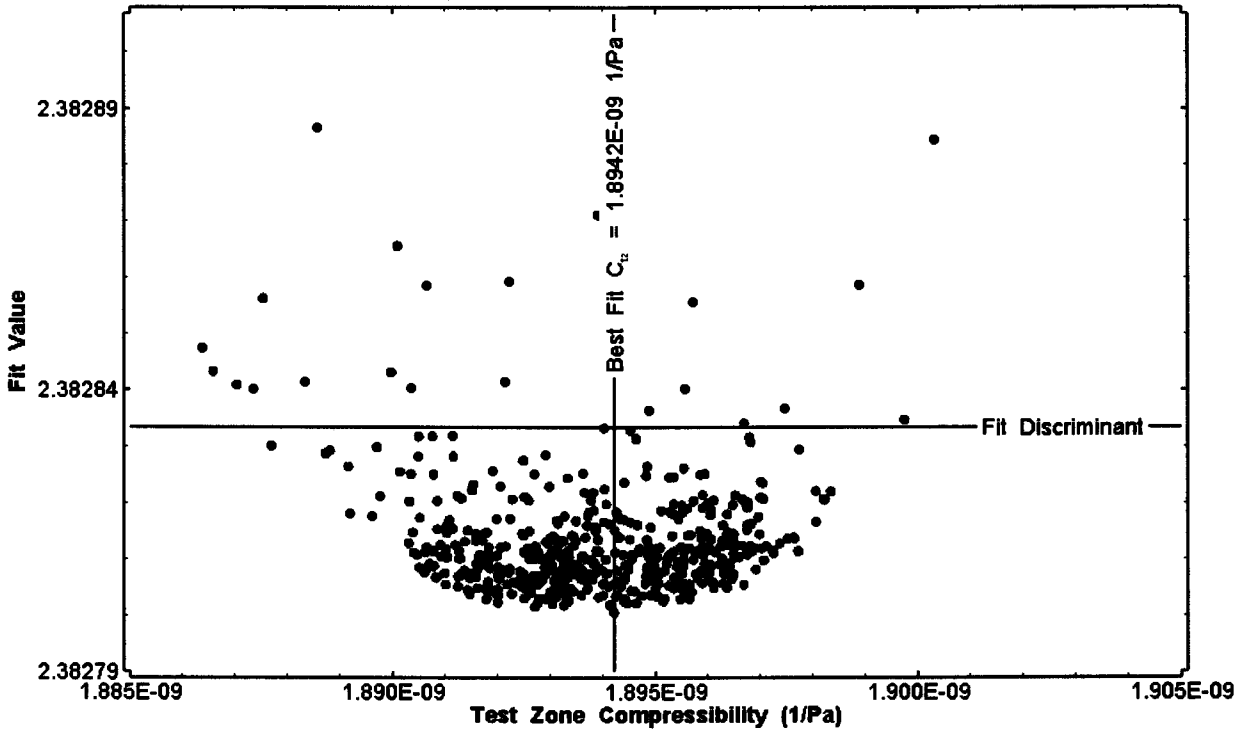

Figure B-42. X-Y scatter plot showing the test-zone compressibility parameter space derived from H-14 perturbation analysis with the fit discriminant and best fit values.

Information Only

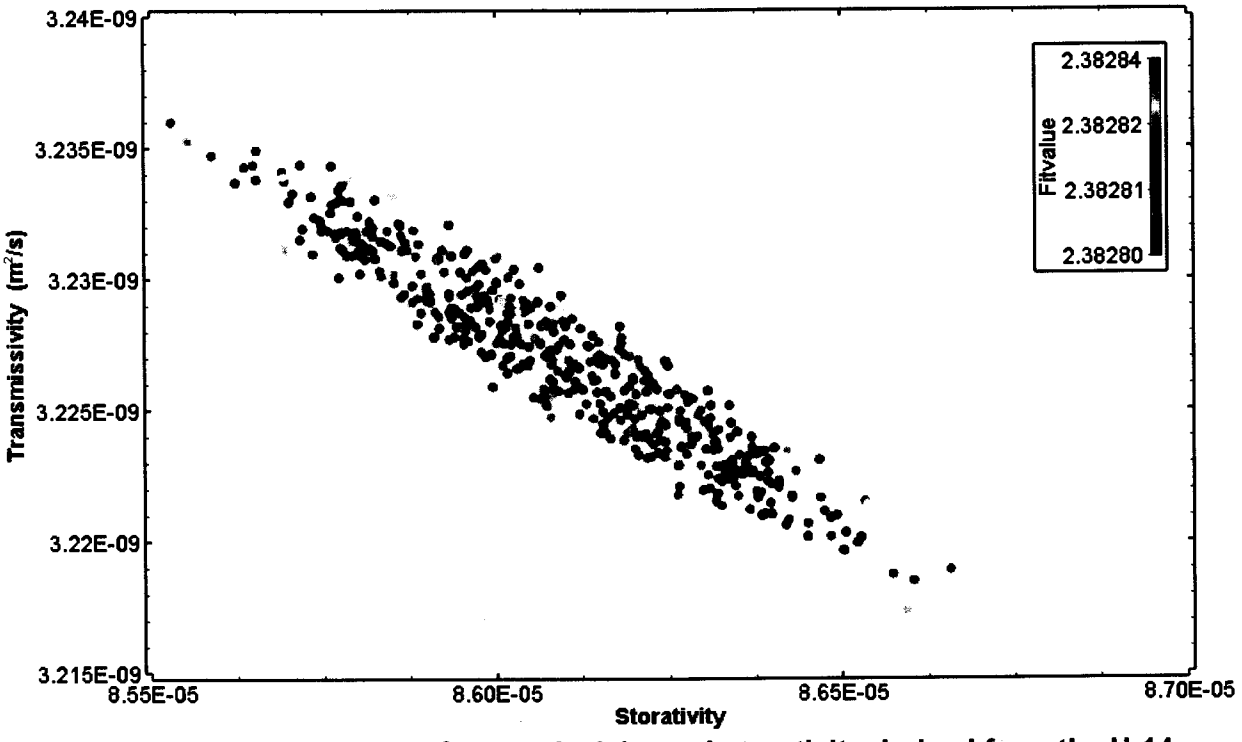

Figure B-43. Estimates of transmissivity and storativity derived from the H-14 perturbation analysis.

Information Only

B.11 H-16 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-16\H-
16M_DSTs.nPre
```

Control Settings

Test Description

```
Testing of the Magenta in H-16 was performed by SNL from 7-29-1987 through 7-
31-1987.
Testing comprised two DSTs and a slug test.
Testing was performed using Baker's single-packer system (testing against the
bottom of the hole) with quartz transducers.
Data are reported in HDR#6 (SAND87-7166).
The Magenta in H-16 extends from 590.2 to 615.6 ft bgs, and was exposed in a
4.75-inch open hole.
Test interval was 589.2 to 620.7 ft bgs.
The test interval was reamed to 4.75 inches on 7-29-1987 using brine, and
then blown down to about 475 ft prior to tool installation.
```

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	

Information Only

Allow negative head/pressure	yes

Parameters

Formation

Formation thickness	25.400	[ft]
Flow dimension	2.0	[]
Static formation pressure	134.054	[psi]
External boundary radius	1000000	[m]
Formation conductivity	3.86294E-09	[m/sec]
Formation spec. storage	7.11321E-06	[1/m]

Fluid

Fluid density	1200.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]
Volume change from normal	0.0	[ft^3]
Test-zone compressibility	2.75873E-09	[1/Pa]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	2.99066E-08	[m^2/sec]
Storativity	5.50699E-05	[]
Diffusivity	5.43065E-04	[m^2/sec]

Test Zone

Test-zone volume	0.0885102	[m^3]
Isolated well-bore storage	2.44175E-10	[m^3/Pa]
Open hole well-bore storage	1.71380E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06676	[]
First grid increment	4.16484E-03	[m]

Information Only

Sequences

Sequence: H_01

Sequence type	History	
Start time	31987.858060	[day]
Duration	0.484430	[day]
Time step type	Static	
Static time step	10.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	31988.342490	[day]
Duration	0.013765	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	45.180	[psi]

Sequence: H_02

Sequence type	History	
Start time	31988.356255	[day]
Duration	0.000737	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: F_01

Sequence type	Flow	
Start time	31988.356992	[day]
Duration	0.323568	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[m^3/sec]
Wellbore storage	Isolated	

Sequence: H_03

Sequence type	History	
Start time	31988.680560	[day]
Duration	0.002998	[day]
Time step type	Static	

Information Only

Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_02

Sequence type	Slug	
Start time	31988.683558	[day]
Duration	0.018527	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	49.650	[psi]

Sequence: H_04

Sequence type	History	
Start time	31988.702085	[day]
Duration	0.001266	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: F_02

Sequence type	Flow	
Start time	31988.703351	[day]
Duration	0.643877	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[m^3/sec]
Wellbore storage	Isolated	

Sequence: H_05

Sequence type	History	
Start time	31989.347228	[day]
Duration	0.003258	[day]
Time step type	Static	
Static time step	1.00	[sec]
Type	Curve	
Wellbore storage	Open	

Sequence: S_03

Sequence type	Slug	
Start time	31989.350486	[day]
Duration	0.349514	[day]
Time step type	Log	
First log step	1.15741E-07	[day]

Information Only

# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	55.000	[psi]

Test Zone Curves

Curve object to use	Create Curve
Curve type	Pressure
Start sequence	H_01
End sequence	S_03
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

H-16 Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date   1 Mar 2007
Listing date   11 Aug 2010
QA status      QA: Q
Config file    C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-16\H-
16M_DSTs.nPre
```

Control Settings

Test Description

Testing of the Magenta in H-16 was performed by SNL from 7-29-1987 through 7-31-1987.
Testing comprised two DSTs and a slug test.
Testing was performed using Baker's single-packer system (testing against the bottom of the hole) with quartz transducers.
Data are reported in HDR#6 (SAND87-7166).
The Magenta in H-16 extends from 590.2 to 615.6 ft bgs, and was exposed in a 4.75-inch open hole.
Test interval was 589.2 to 620.7 ft bgs.

Information Only

The test interval was reamed to 4.75 inches on 7-29-1987 using brine, and then blown down to about 475 ft prior to tool installation.

Main Settings

Simulation type	Optimization	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	no	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	25.400	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	100.000	[psi]
Maximum value	150.000	[psi]
Estimate value	134.054	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	3.86294E-09	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	7.11321E-06	[1/m]
Range type	Log	

Information Only

Sigma	1.00000E+00	

Fluid

Fluid density	1200.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.375	[in]
Tubing string radius	0.9975	[in]
Volume change from normal	0.0	[ft^3]
Test-zone compressibility	Optimization	
Minimum value	1.00000E-10	[1/Pa]
Maximum value	1.00000E-07	[1/Pa]
Estimate value	2.75873E-09	[1/Pa]
Range type	Log	
Sigma	1.00000E+00	

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	min/max	
Minimum	7.74192E-12	[m^2/sec]
Maximum	7.74192E-06	[m^2/sec]
Storativity	min/max	
Minimum	7.74192E-09	[]
Maximum	7.74192E-04	[]
Diffusivity	min/max	
Minimum	1.00000E-08	[m^2/sec]
Maximum	1.00000E+03	[m^2/sec]

Test Zone

Test-zone volume	0.0885102	[m^3]
Isolated well-bore storage	min/max	
Minimum	8.85102E-12	[m^3/Pa]
Maximum	8.85102E-09	[m^3/Pa]
Open hole well-bore storage	1.71380E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06676	[]
First grid increment	4.16484E-03	[m]

Information Only

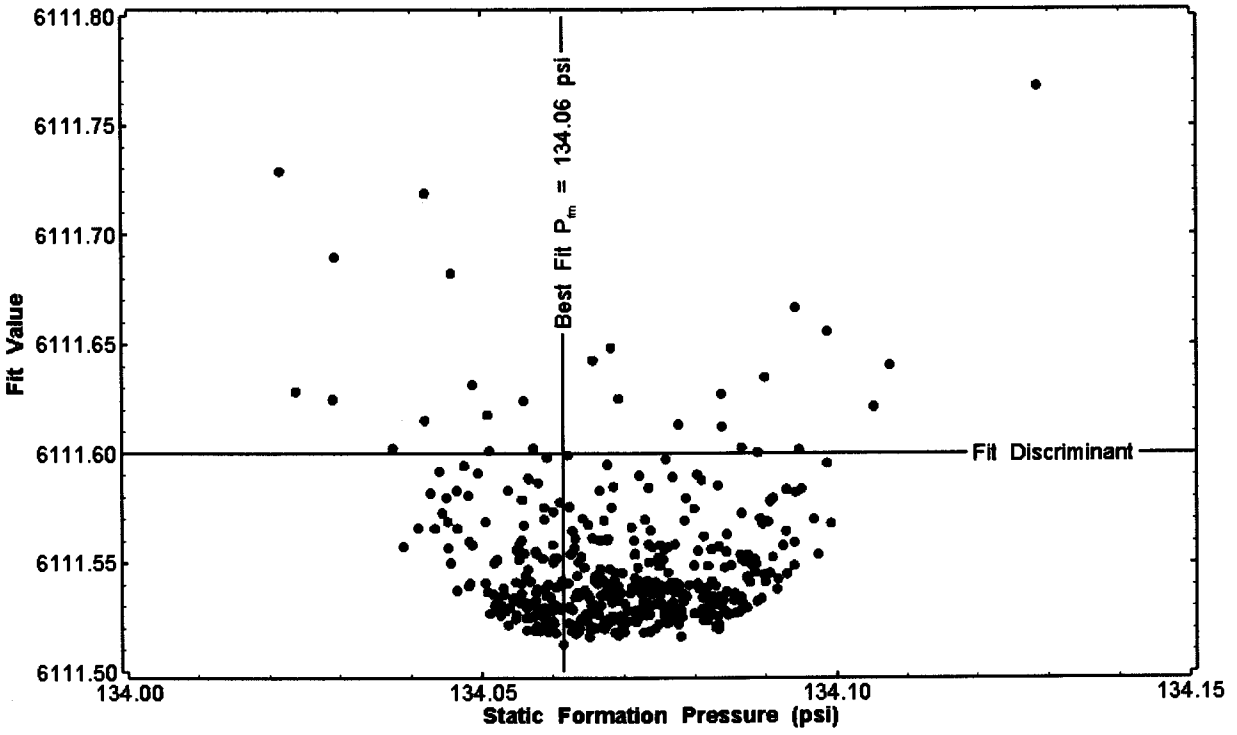

Figure B-44. X-Y scatter plot showing the static formation pressure parameter space derived from H-16 perturbation analysis with the fit discriminant and fit values.

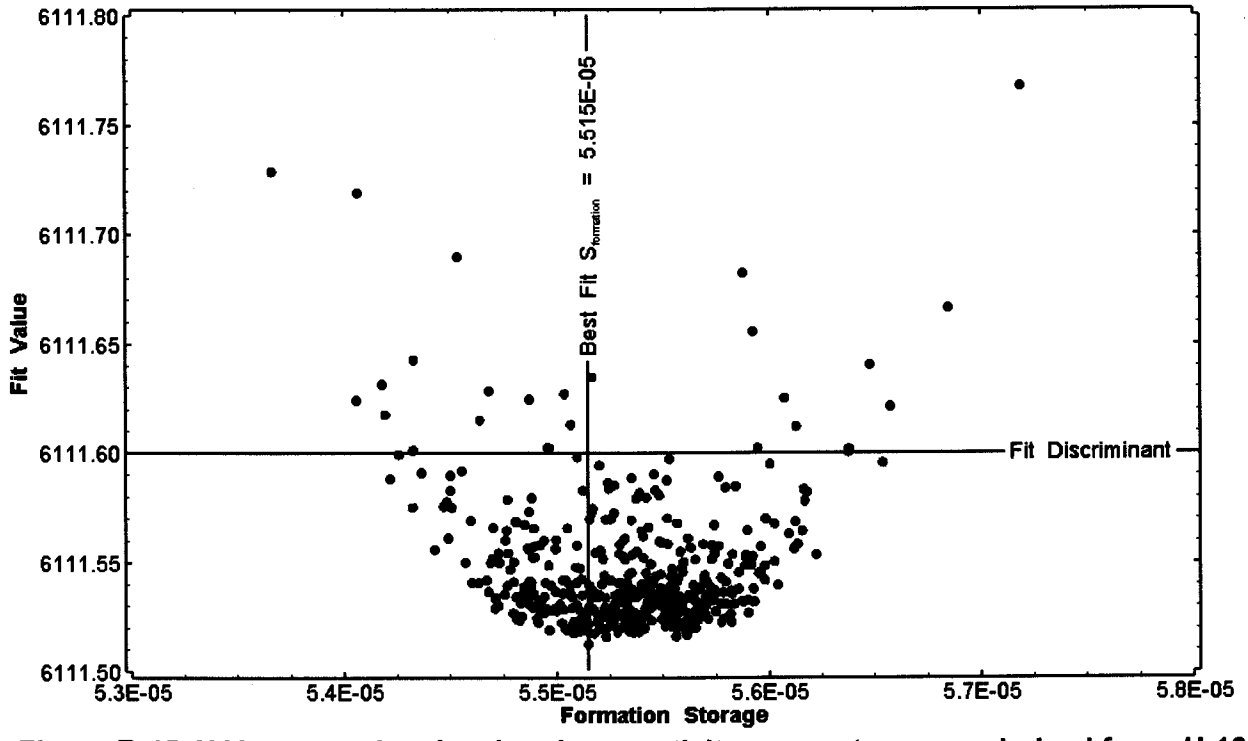

Figure B-45. X-Y scatter plot showing the storativity parameter space derived from H-16 perturbation analysis with the fit discriminant and fit values.

Information Only

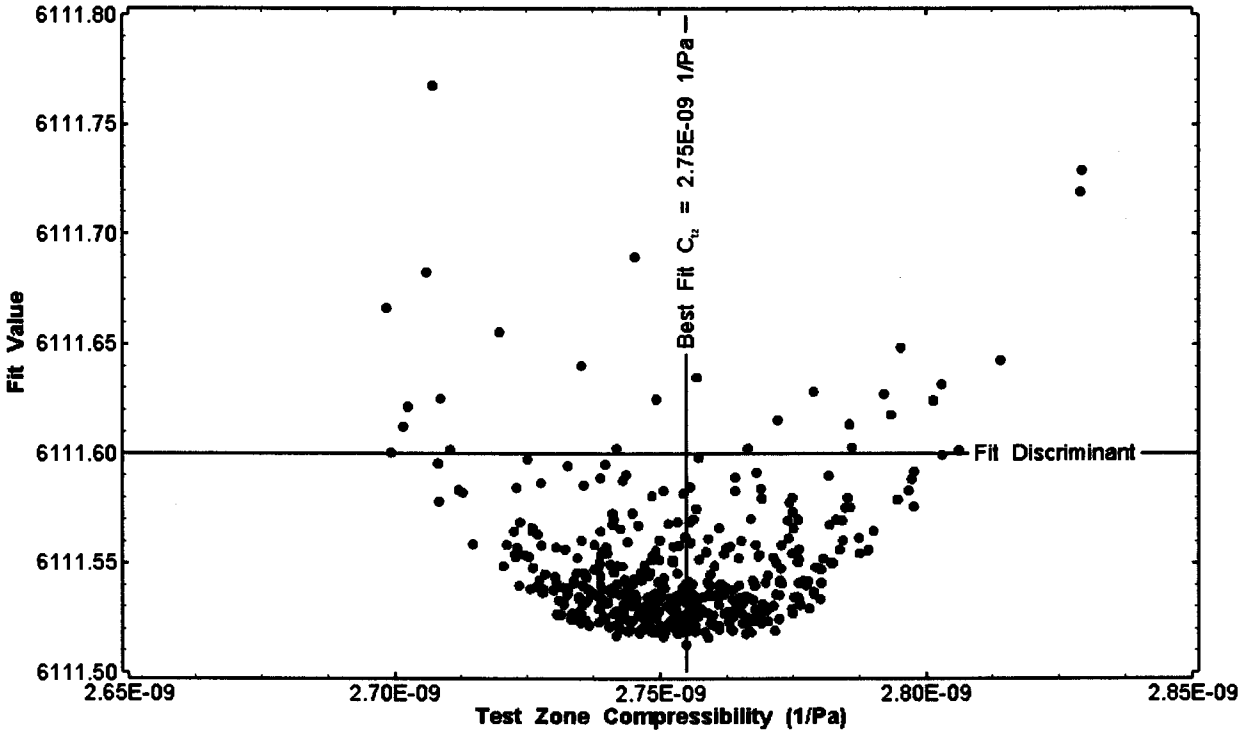

Figure B-46. X-Y scatter plot showing the test-zone compressibility parameter space derived from H-16 perturbation analysis with the fit discriminant and fit values.

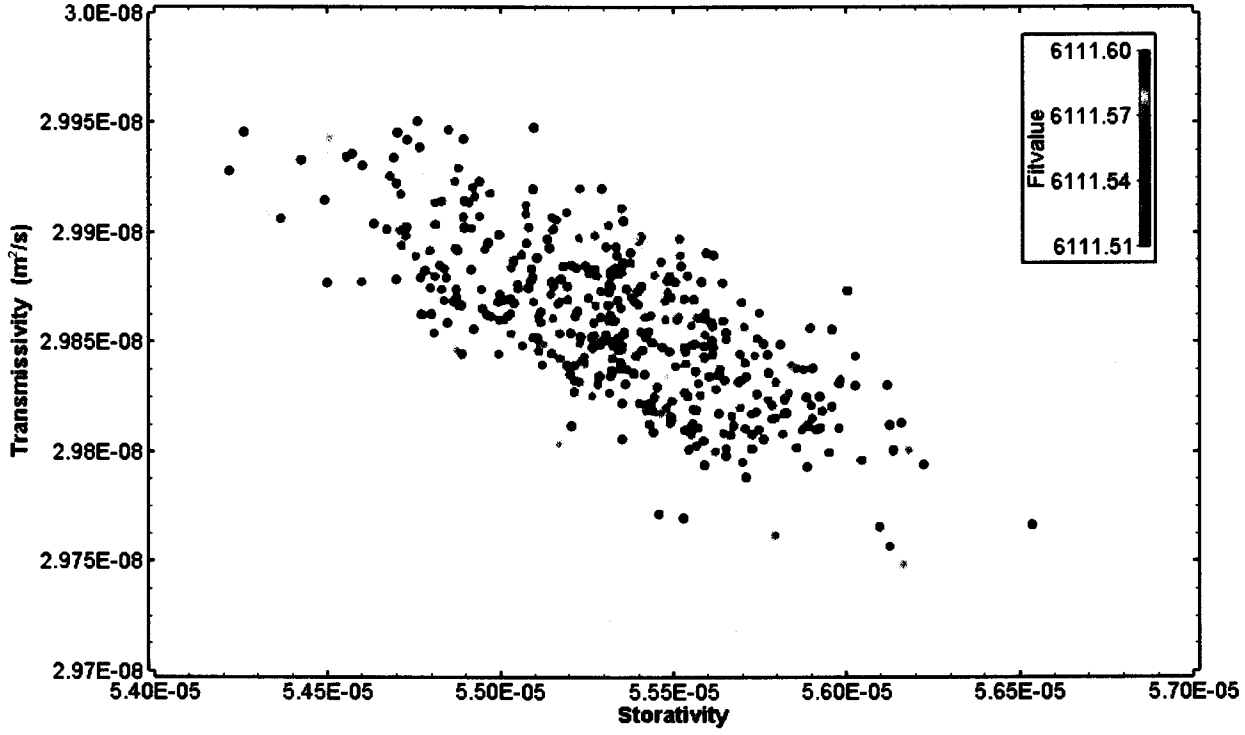

Figure B-47. Estimates of transmissivity and storativity derived from the H-16 perturbation analysis.

Information Only

B.12 H-18 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-18\H-18.nPre
```

Control Settings

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	23.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	138.786	[psi]
External boundary radius	1000000	[m]
Formation conductivity	f(r) point	
Formation spec. storage	5.30518E-07	[1/m]

Information Only

Skin

Radial thickness of skin	1.859137	[m]
Skin zone conductivity	2.21542E-04	[m/sec]
Skin zone spec. storage	1.00189E-07	[1/m]

Fluid

Fluid density	1008.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.183	[in]
Tubing string radius	3.09338	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.58503E-11	[USgpm]

f(x) Points Parameters

Formation conductivity

Points type	f(r)	
Radius #1	7.8299891	[m]
Y value#1	7.04416E-08	[m/sec]
Radius #2	159.7745566	[m]
Y value#2	8.85866E-09	[m/sec]
Parameter curve type	Linear	

Calculated Parameters

Formation

Transmissivity	f(r)	
Storativity	3.71915E-06	[]
Diffusivity	f(r)	

Skin Zone

Transmissivity	1.55310E-03	[m^2/sec]
Storativity	7.02364E-07	[]
Diffusivity	2.21125E+03	[m^2/sec]
Skin factor	f(r)	

Information Only

Test Zone

Open hole well-bore storage	1.96210E-06	[m^3/Pa]

Grid Properties

Grid increment delta	0.06609	[]
First grid increment	1.32555E-01	[m]
Skin grid increment delta	0.06485	[]
Skin first grid increment	5.41712E-03	[m]
Skin last grid increment	1.21823E-01	[m]
Increment ratio	1.08809E+00	[]

Sequences

Sequence: H_01

Sequence type	History	
Start time	39916.562500	[day]
Duration	0.063947	[day]
Time step type	Log	
First log step	1.00000E-05	[day]
# of time steps	250	
Type	Curve	
Wellbore storage	Open	

Sequence: F_01

Sequence type	Flow	
Start time	39916.626447	[day]
Duration	3.716078	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Curve	
Wellbore storage	Open	

Sequence: F_02

Sequence type	Flow	
Start time	39920.342525	[day]
Duration	53.857475	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Fixed	
Fixed value	0.0	[USgpm]
Wellbore storage	Open	

Test Zone Curves

Curve object to use	P_Curve

Information Only

Curve type	Pressure
Start sequence	H_01
End sequence	H_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no
Curve object to use	Q_Curve
Curve type	Flow Rate
Start sequence	F_01
End sequence	F_01
Curve time base	Test
Curve Y data units	[USgpm]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[USgpm]

H-18 Optimization Settings

```
*************
nPre/32 2.41Q
*************
```

Version date	1 Mar 2007
Listing date	11 Aug 2010
QA status	QA: Q
Config file	C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-18\H-18.nPre

Control Settings

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Information Only

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	23.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	130.000	[psi]
Maximum value	160.000	[psi]
Estimate value	138.786	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	f(r) point	
Formation spec. storage	Optimization	
Minimum value	1.00000E-07	[1/m]
Maximum value	1.00000E-04	[1/m]
Estimate value	5.30518E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	Optimization	
Minimum value	0.001	[m]
Maximum value	3.0	[m]
Estimate value	1.859137	[m]
Range type	Linear	
Sigma	1.00000E+00	
Skin zone conductivity	Optimization	
Minimum value	1.00000E-10	[m/sec]
Maximum value	1.00000E-02	[m/sec]
Estimate value	2.21542E-04	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Skin zone spec. storage	Optimization	
Minimum value	1.00000E-07	[1/m]
Maximum value	1.00000E-04	[1/m]

Information Only

Estimate value	1.00189E-07	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1008.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	3.183	[in]
Tubing string radius	3.09338	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.58503E-11	[USgpm]

f(x) Points Parameters

Formation conductivity

Points type	f(r)	
Radius #1	Optimized	
Minimum	0.1	[m]
Estimat	7.8299891	[m]
Maximum	25.0	[m]
Y value#1	Optimized	
Radius #2	Optimized	
Minimum	50.01	[m]
Estimat	159.7745566	[m]
Maximum	500.0	[m]
Y value#2	Optimized	
X opt range type	Linear	
X opt sigma	1.00000E+00	
Y opt minimum value	1.00000E-10	[m/sec]
Y opt maximum value	1.00000E-02	[m/sec]
Y opt range type	Log	
Y opt sigma	1.00000E+00	
Parameter curve type	Linear	

Information Only

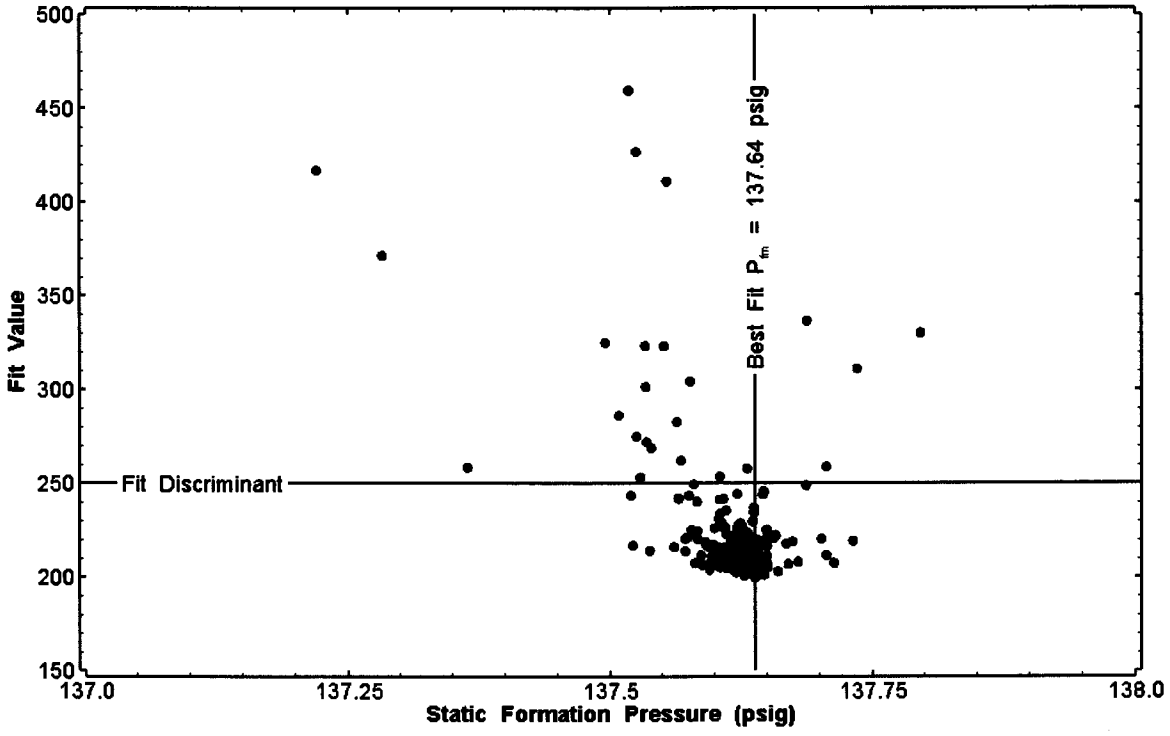

Figure B-48. X-Y scatter plot showing the static formation pressure parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit values.

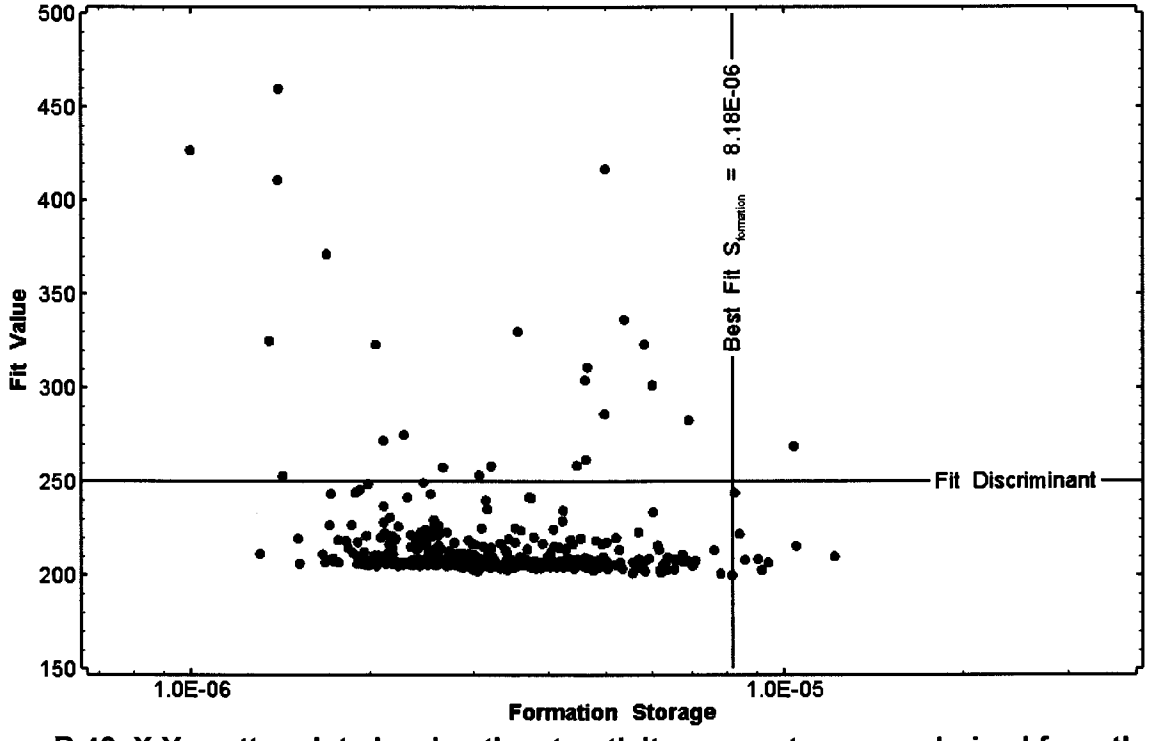

Figure B-49. X-Y scatter plot showing the storativity parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit values.

Information Only

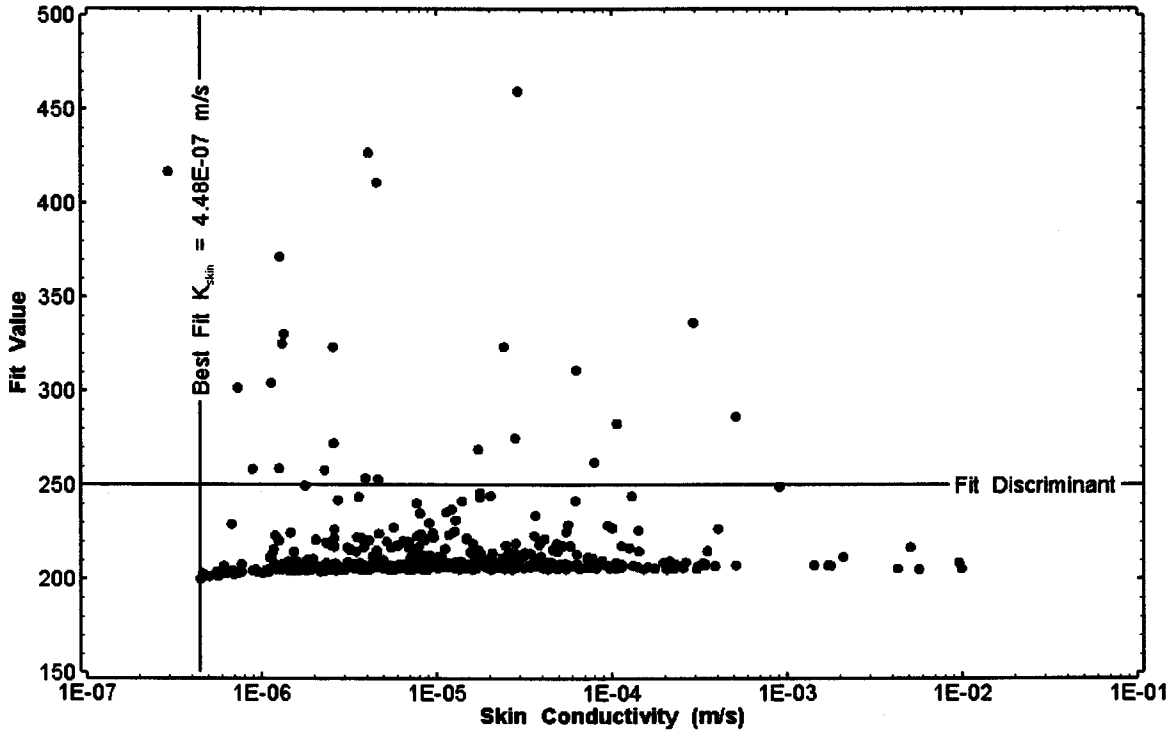

Figure B-50. X-Y scatter plot showing the skin conductivity parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit values.

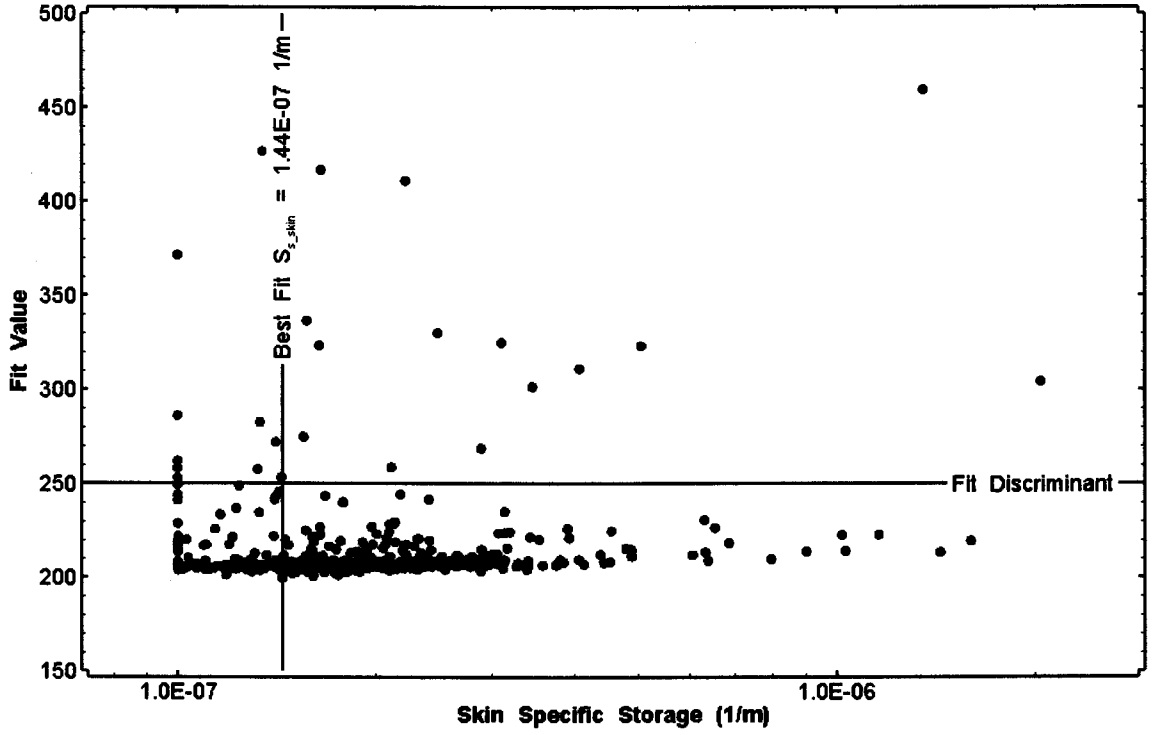

Figure B-51. X X-Y scatter plot showing the skin specific storage parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit values.

Information Only

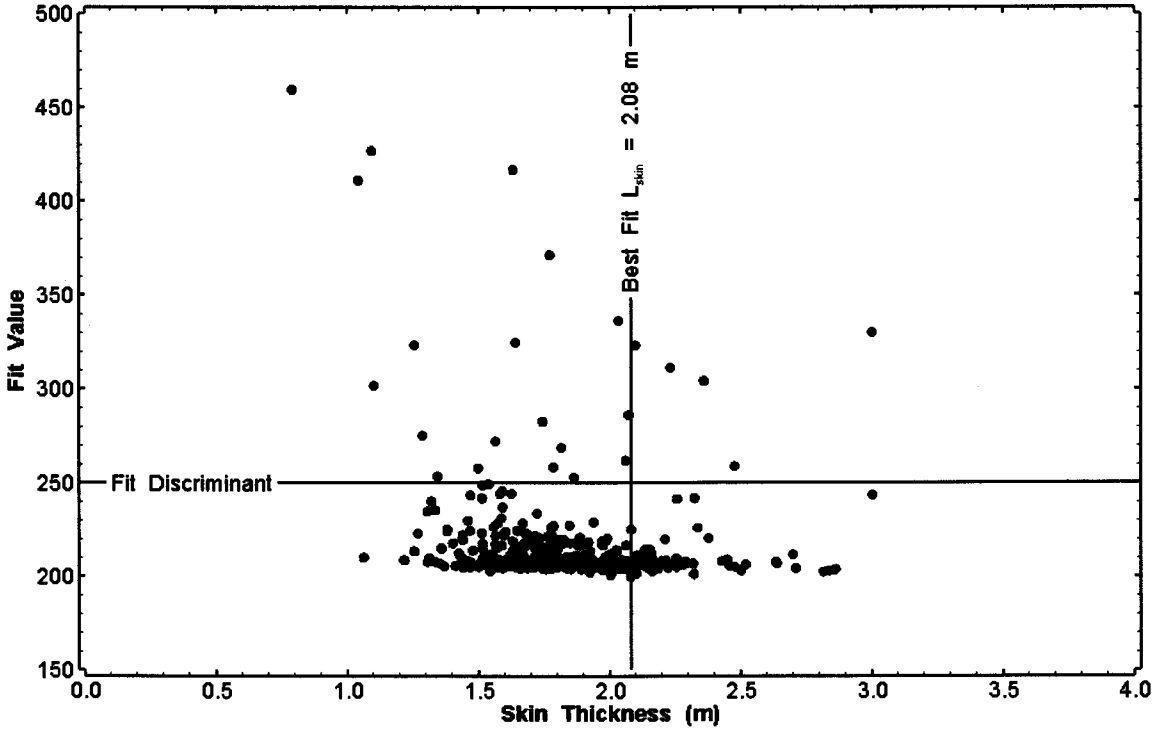

Figure B-52. X-Y scatter plot showing the skin thickness parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit value.

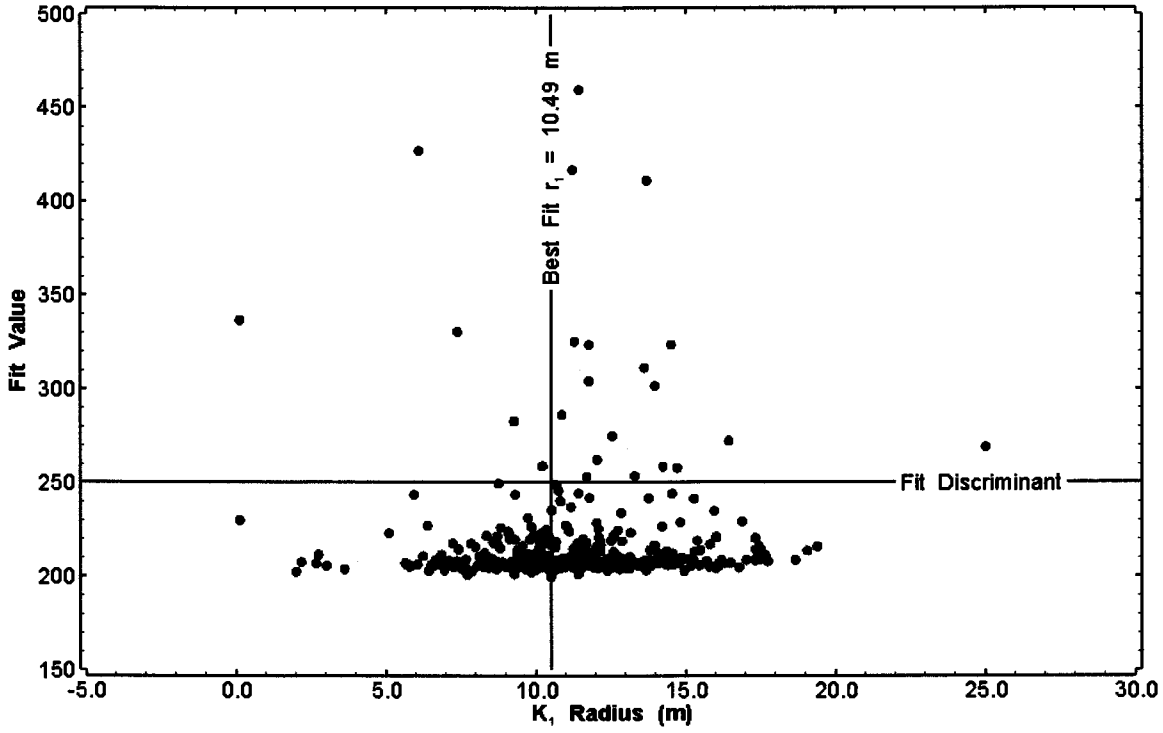

Figure B-53. X-Y scatter plot showing the near-field transmissivity parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit value.

Information Only

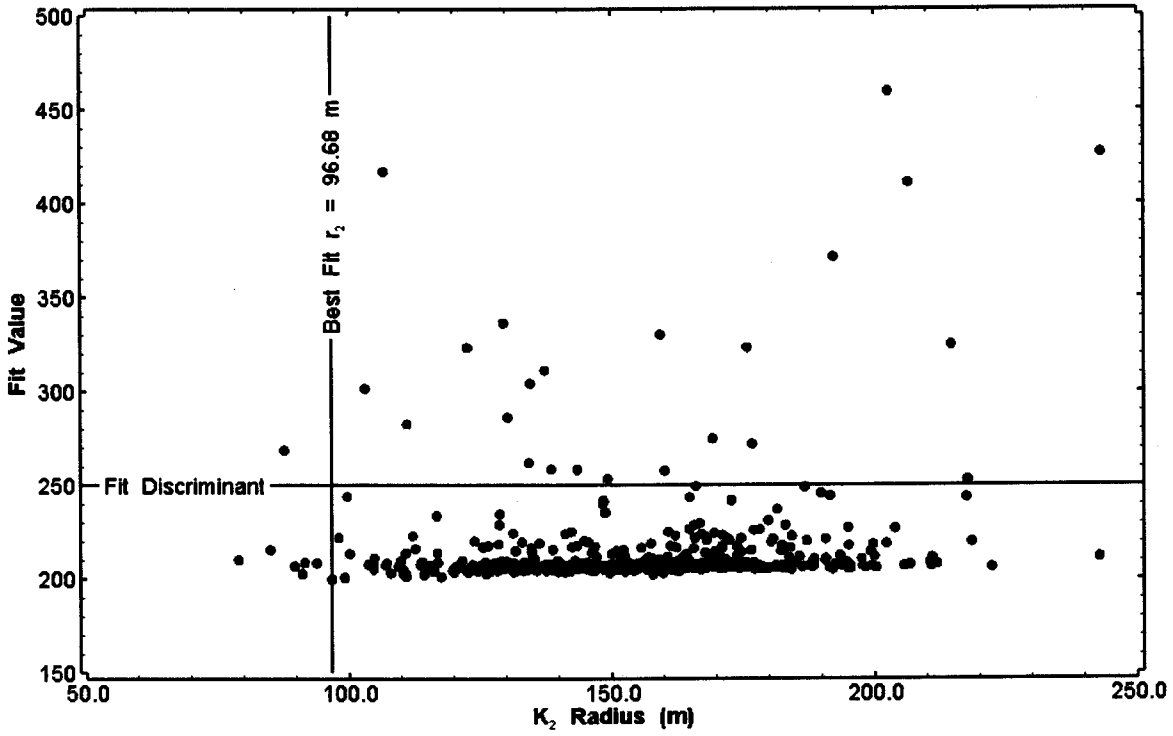

Figure B-54. X-Y scatter plot showing the far-field radius parameter space derived from the H-18 perturbation analysis with the fit discriminant and best fit value.

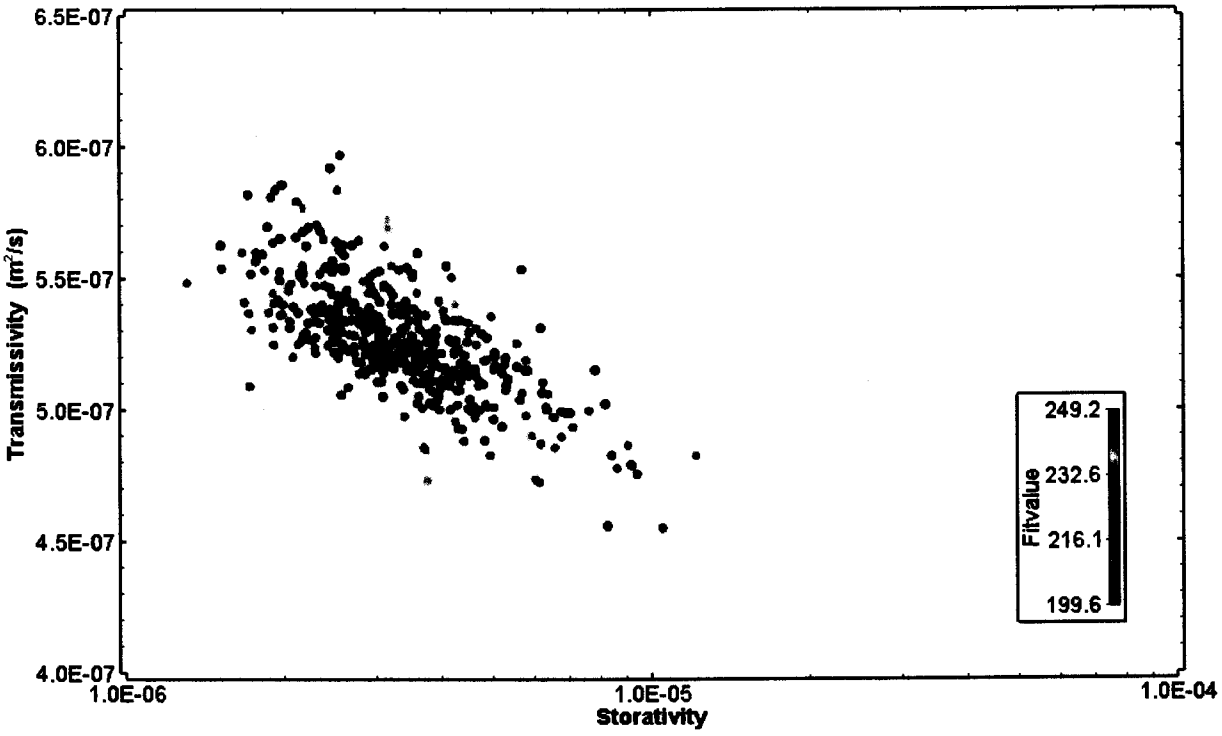

Figure B-55. Estimates of transmissivity and storativity derived from the H-18 perturbation analysis.

Information Only

B.13 WIPP-18 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-18\WIPP-
18.nPre
```

Control Settings

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	176.500	[psi]
External boundary radius	1000000	[m]
Formation conductivity	2.84283E-08	[m/sec]
Formation spec. storage	2.22000E-04	[1/m]

Information Only

Skin

Radial thickness of skin	1.3846734	[m]
Skin zone conductivity	3.07865E-09	[m/sec]
Skin zone spec. storage	2.87000E-05	[1/m]

Fluid

Fluid density	1012.50	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.475	[in]
Tubing string radius	2.35863	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.58503E-11	[USgpm]

Calculated Parameters

Formation

Transmissivity	2.07959E-07	[m^2/sec]
Storativity	1.62397E-03	[]
Diffusivity	1.28056E-04	[m^2/sec]

Skin Zone

Transmissivity	2.25209E-08	[m^2/sec]
Storativity	2.09946E-04	[]
Diffusivity	1.07270E-04	[m^2/sec]
Skin factor	2.58271E+01	[]

Test Zone

Open hole well-bore storage	1.13564E-06	[m^3/Pa]

Grid Properties

Grid increment delta	0.06757	[]
First grid increment	1.01184E-01	[m]
Skin grid increment delta	0.06401	[]
Skin first grid increment	4.15576E-03	[m]
Skin last grid increment	8.97576E-02	[m]
Increment ratio	1.12731E+00	[]

Information Only

Sequences

Sequence: H_01

Sequence type	History	
Start time	40157.125000	[day]
Duration	7.604500	[day]
Time step type	Static	
Static time step	0.011574	[day]
Type	Curve	
Wellbore storage	None	

Sequence: S_01

Sequence type	Slug	
Start time	40164.729500	[day]
Duration	18.687170	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	13.965	[psi]

Test Zone Curves

Curve object to use	P_Curve
Curve type	Pressure
Start sequence	H_01
End sequence	H_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[USgpm]

WIPP-18 Optimization Settings

****
nPre/32 2.41Q
****

Version date 1 Mar 2007

Information Only

Listing date 11 Aug 2010
QA status QA: Q
Config file C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-18\WIPP-18.nPre

Control Settings

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	176.500	[psi]
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-10	[m/sec]
Maximum value	1.00000E-03	[m/sec]
Estimate value	2.84283E-08	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-10	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	2.22000E-04	[1/m]

Information Only

Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	Optimization	
Minimum value	0.01	[m]
Maximum value	5.0	[m]
Estimate value	1.3846734	[m]
Range type	Linear	
Sigma	1.00000E+00	
Skin zone conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-02	[m/sec]
Estimate value	3.07865E-09	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Skin zone spec. storage	Optimization	
Minimum value	1.00000E-10	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	2.87000E-05	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1012.50	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.475	[in]
Tubing string radius	2.35863	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.58503E-11	[USgpm]

Information Only

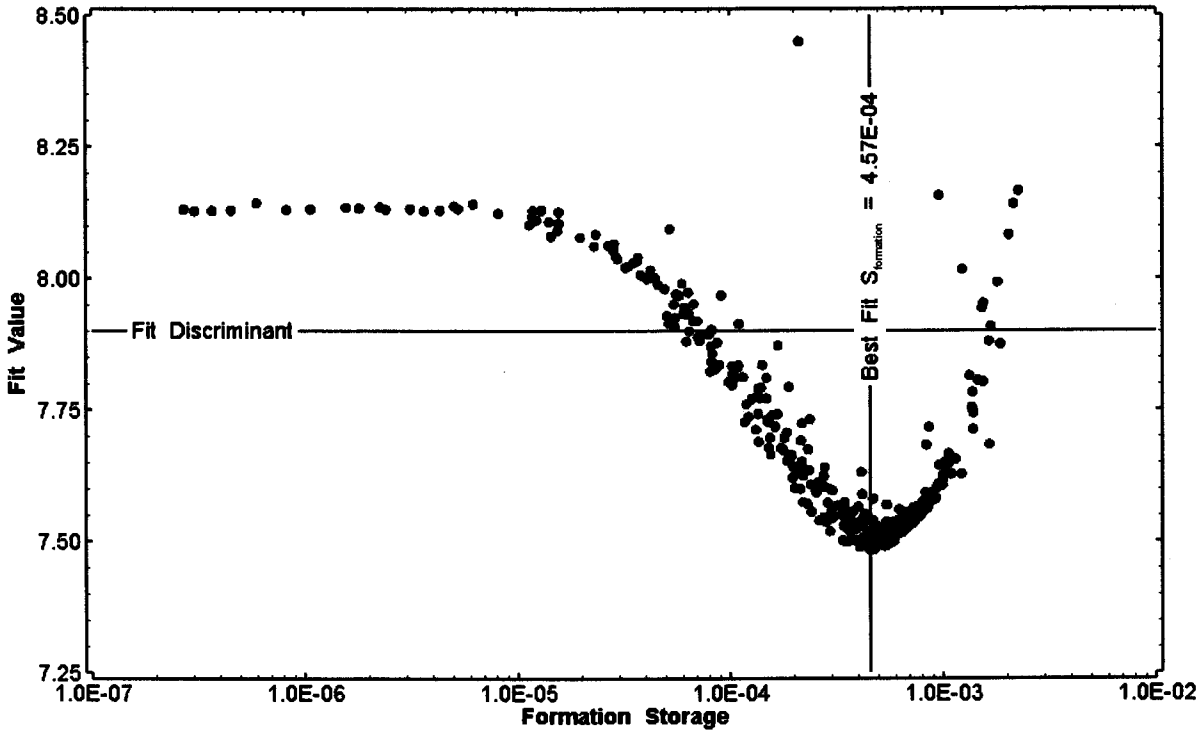

Figure B-56. X-Y scatter plot showing the storativity parameter space derived from the WIPP-18 perturbation analysis with the discriminant and best fit values.

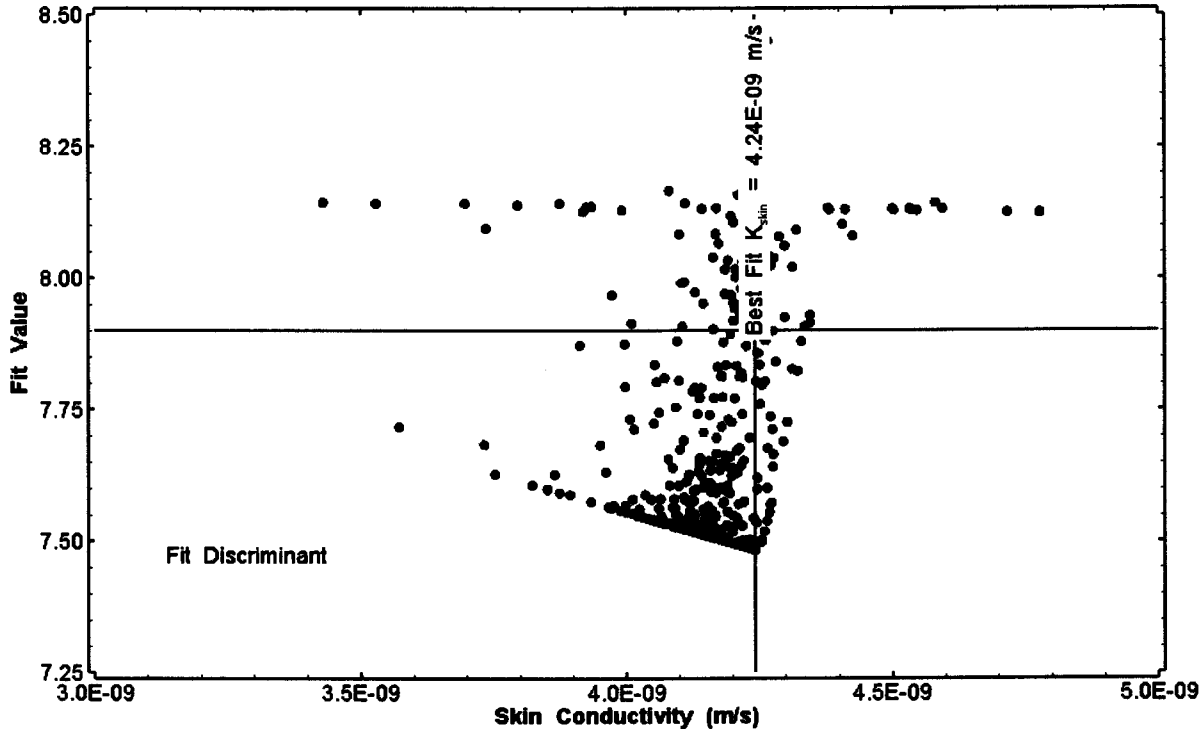

Figure B-57. X-Y scatter plot showing the skin conductivity parameter space derived from the WIPP-18 perturbation analysis with the discriminant and best fit values.

Information Only

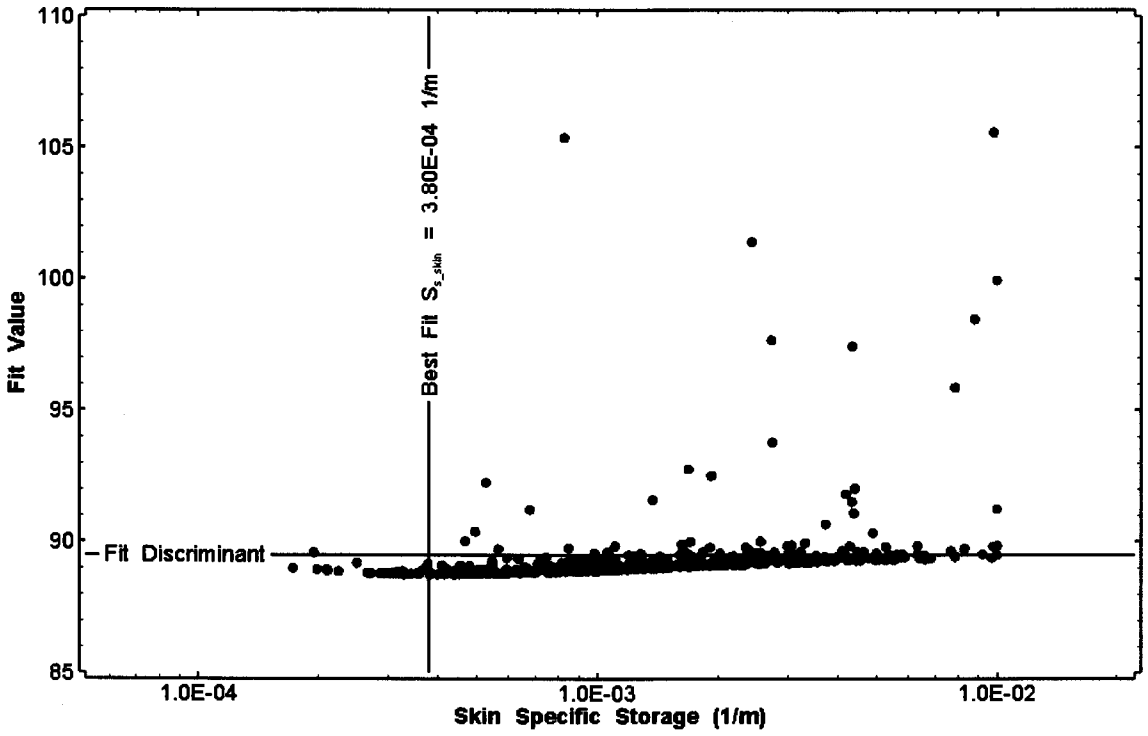

Figure B-58. X-Y scatter plot showing the skin specific storage parameter space derived from the WIPP-18 perturbation analysis with the discriminant and best fit values.

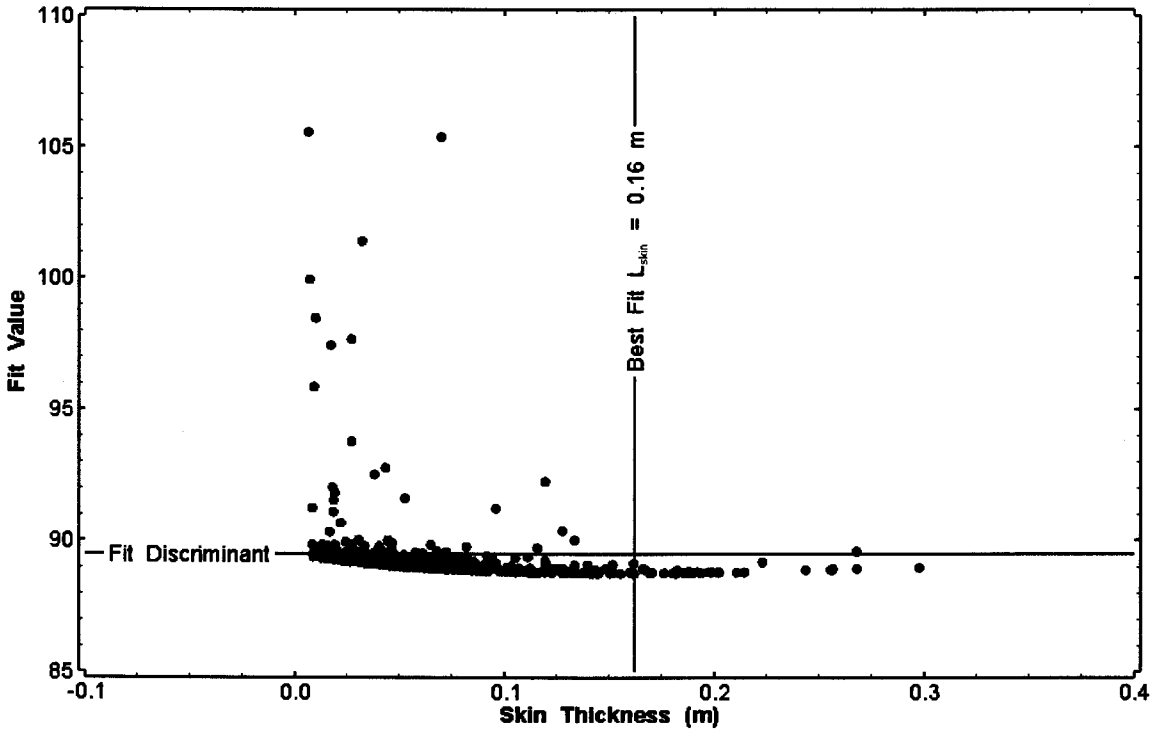

Figure B-59. X-Y scatter plot showing the skin thickness parameter space derived from the WIPP-18 perturbation analysis with the discriminant and best fit values.

Information Only

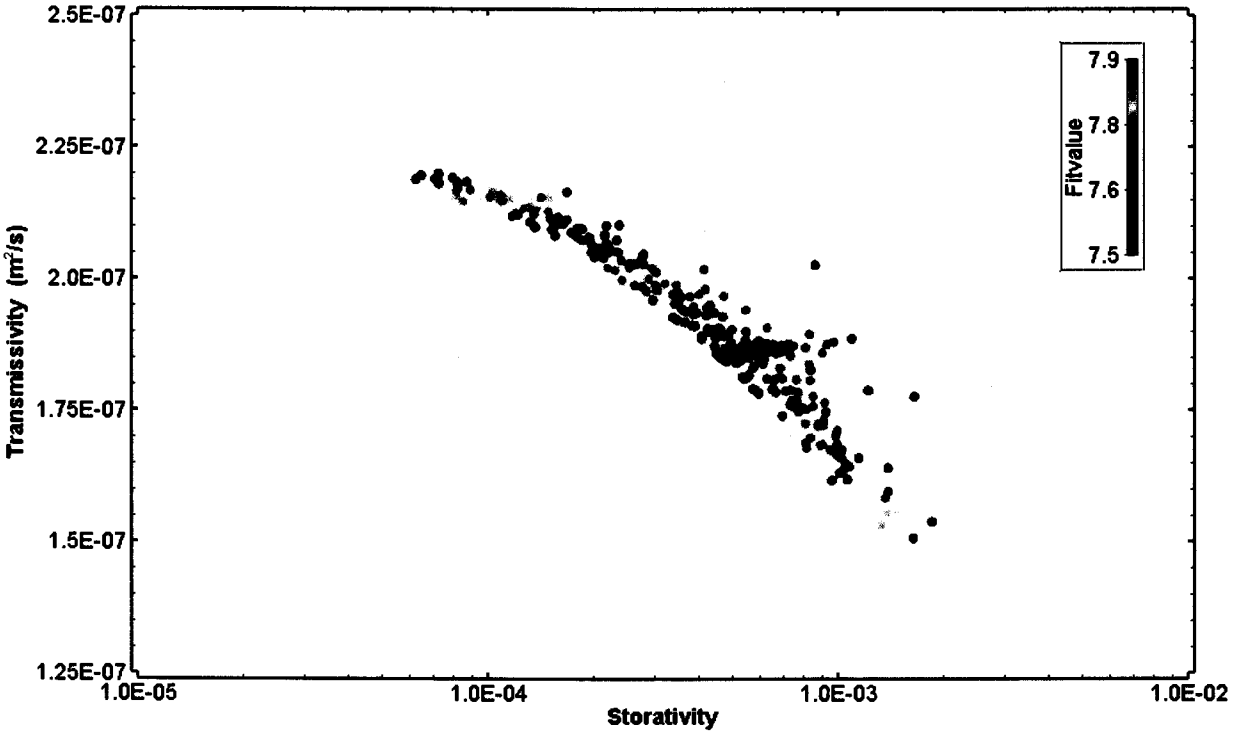

Figure B-60. Estimates of transmissivity and storativity derived from the WIPP-18 perturbation analysis.

Information Only

B.14 WIPP-27 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-27\WIPP-
27.nPre
```

Control Settings

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Zero Flow
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	18.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	98.660	[psi]
External boundary radius	10000	[m]
Formation conductivity	f(r) point	
Formation spec. storage	1.04018E-06	[1/m]

Information Only

Fluid

Fluid density	1100.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	0.0636524	[m]
Tubing string radius	2.506	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

f(x) Points Parameters

Formation conductivity

Points type	f(r)	
Radius #1	0.0636524	[m]
Y value#1	2.21806E-07	[m/sec]
Radius #2	65.9935357	[m]
Y value#2	4.48996E-03	[m/sec]
Parameter curve type	Linear	

Calculated Parameters

Formation

Transmissivity	f(r)	
Storativity	5.70685E-06	[]
Diffusivity	f(r)	

Test Zone

Open hole well-bore storage	1.18001E-06	[m^3/Pa]

Grid Properties

Grid increment delta	0.04805	[]
First grid increment	3.13323E-03	[m]

Sequences

Sequence: S_01

Information Only

Sequence type	Slug	
Start time	29484.458912	[day]
Duration	0.020893	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	149.700	[psi]

Sequence: H_01

Sequence type	History	
Start time	29484.479805	[day]
Duration	0.001040	[day]
Time step type	Static	
Static time step	0.000012	[day]
Type	Curve	
Wellbore storage	Open	

Sequence: S_02

Sequence type	Slug	
Start time	29484.480845	[day]
Duration	0.015683	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	135.800	[psi]

Test Zone Curves

Curve object to use	Pressure
Curve type	Pressure
Start sequence	H_01
End sequence	H_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]

Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

Information Only

WIPP-27 Optimization Settings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-27\WIPP-
27.nPre
```

Control Settings

Main Settings

Simulation type	Optimization
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	no
External boundary	Zero Flow
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	18.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	80.000	[psi]
Maximum value	110.000	[psi]
Estimate value	98.660	[psi]

Information Only

Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	10000	[m]
Formation conductivity	f(r) point	
Formation spec. storage	Optimization	
Minimum value	1.00000E-06	[1/m]
Maximum value	1.00000E-03	[1/m]
Estimate value	1.04018E-06	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1100.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	0.0636524	[m]
Tubing string radius	2.506	[in]

Numeric

# of radial nodes	250	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

f(x) Points Parameters

Formation conductivity

Points type	f(r)	
Radius #1	0.0636524	[m]
Y value#1	Optimized	
Radius #2	Optimized	
Minimum	0.064	[m]
Estimat	65.9935357	[m]
Maximum	100.0	[m]
Y value#2	Optimized	
X opt range type	Linear	
X opt sigma	1.00000E+00	
Y opt minimum value	1.00000E-15	[m/sec]
Y opt maximum value	1.00000E+00	[m/sec]
Y opt range type	Log	
Y opt sigma	1.00000E+00	
Parameter curve type	Linear	

Information Only

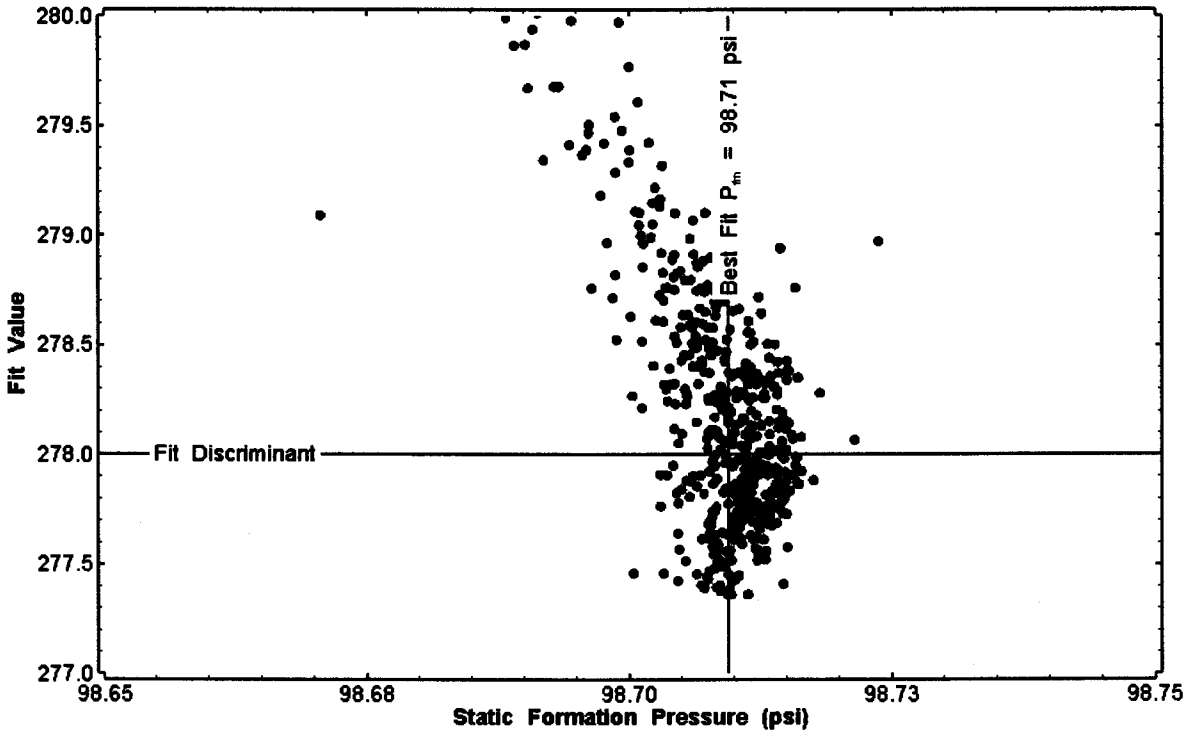

Figure B-61. X-Y scatter plot showing the static formation pressure parameter space derived from the WIPP-27 perturbation analysis with fit discriminant and best fit values.

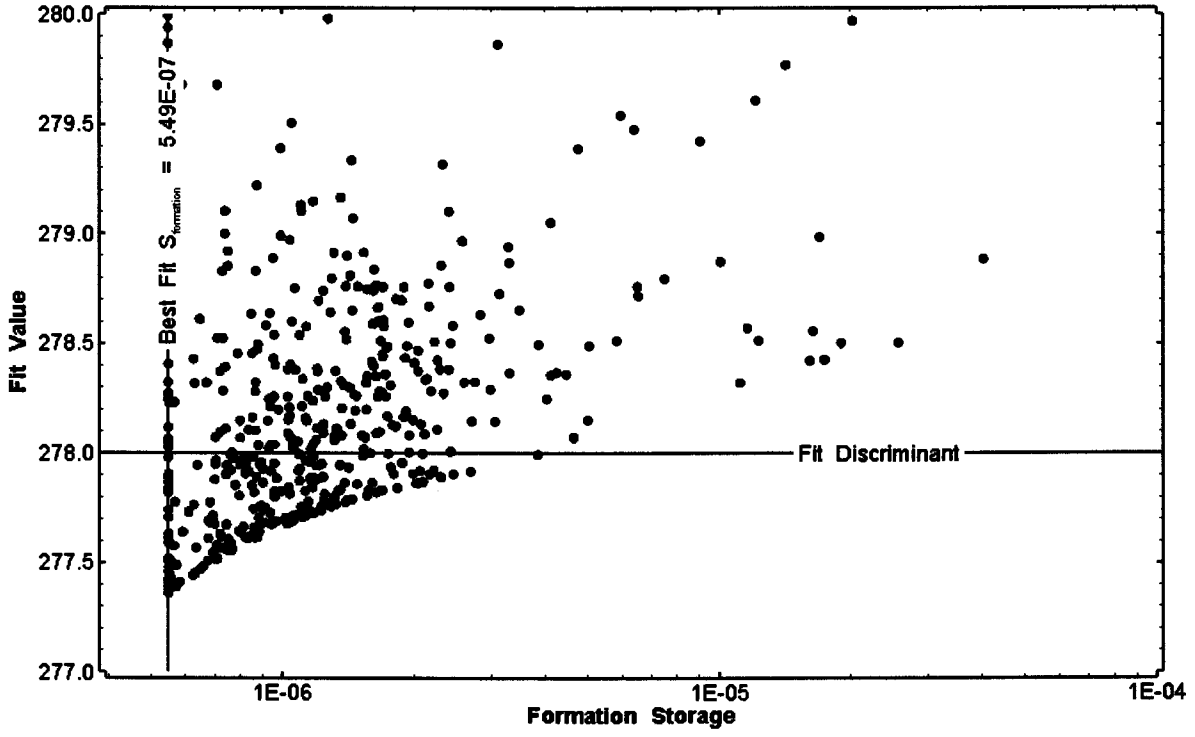

Figure B-62. X-Y scatter plot showing the storativity parameter space derived from the WIPP-27 perturbation analysis with the fit discriminant and best fit values.

Information Only

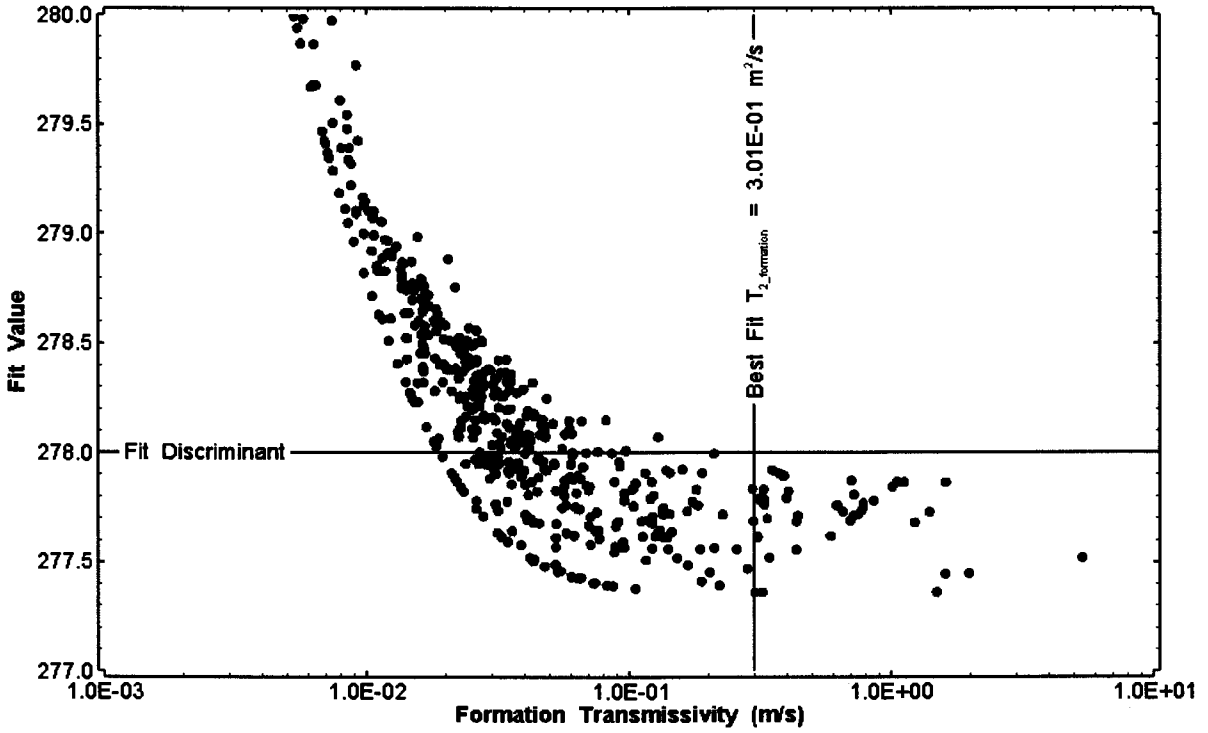

Figure B-63. X-Y scatter plot showing the far-field transmissivity parameter space derived from the WIPP-27 perturbation analysis with fit discriminant and best fit values.

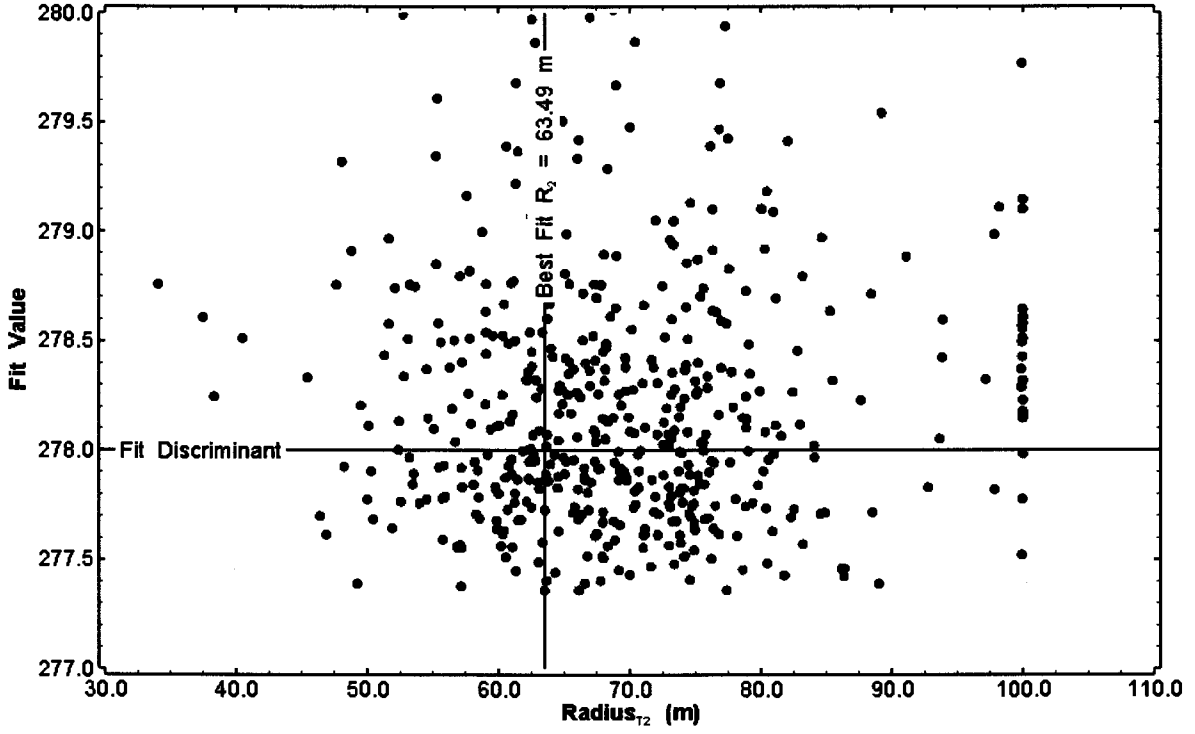

Figure B-64. X-Y scatter plot showing the far-field radius parameter space derived from the WIPP-27 perturbation analysis with fit discriminant and best fit values.

Information Only

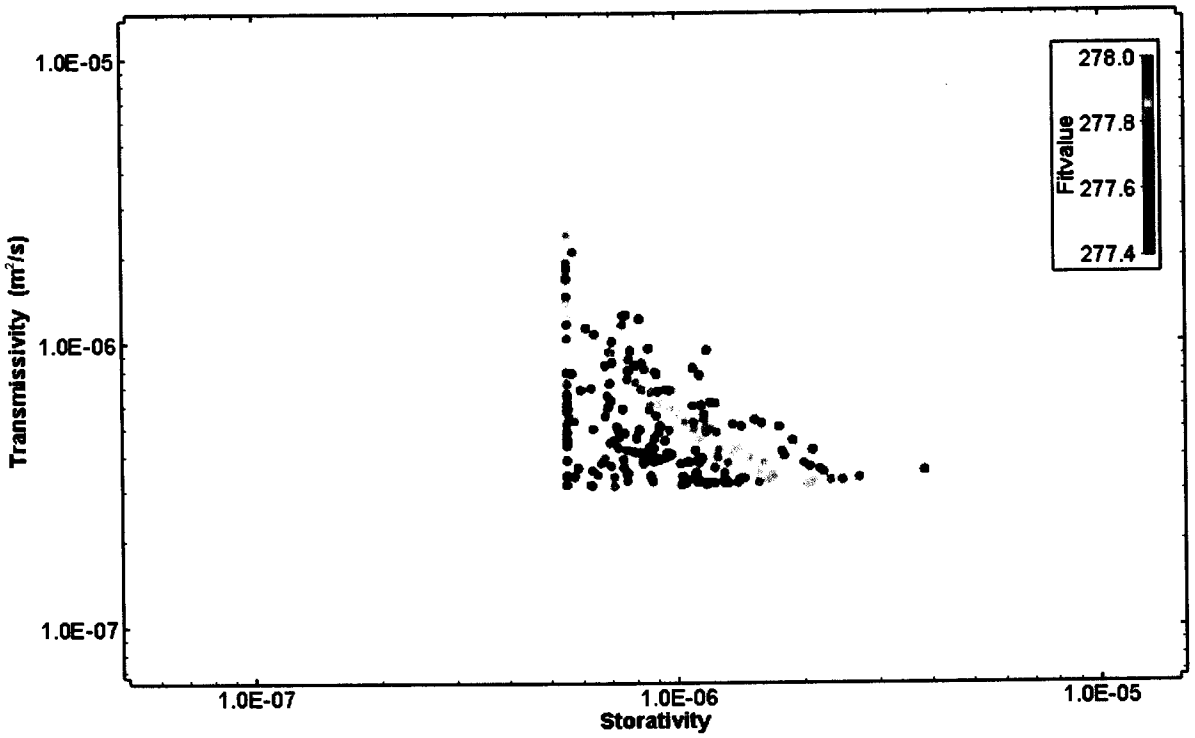

Figure B-65. Estimates of transmissivity and storativity derived from the WIPP-27 perturbation analysis.

Information Only

B.15 WIPP-30 nSIGHTS Listings

```
*************
nPre/32 2.41Q
*************

Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30\WIPP-
30m_slug.nPre
```

Control Settings

Main Settings

Simulation type	Forward
Simulation subtype	Normal
Phase to simulate	Liquid
Skin zone ?	yes
External boundary	Fixed Pressure
Curve data source	Objects

Liquid Phase Settings

Aquifer type	Confined
Aquifer horizontal permeability	Isotropic
System porosity	Single
Compensate flow dimension geometry	yes
Leakage	None

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	49.996	[psi]
External boundary radius	1000000	[m]
Formation conductivity	1.46703E-09	[m/sec]
Formation spec. storage	3.26640E-06	[1/m]

Information Only

Skin

Radial thickness of skin	1.3534694	[m]
Skin zone conductivity	2.91210E-09	[m/sec]
Skin zone spec. storage	2.33913E-05	[1/m]

Fluid

Fluid density	1010.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.475	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Calculated Parameters

Formation

Transmissivity	1.07316E-08	[m^2/sec]
Storativity	2.38943E-05	[]
Diffusivity	4.49128E-04	[m^2/sec]

Skin Zone

Transmissivity	2.13026E-08	[m^2/sec]
Storativity	1.71112E-04	[]
Diffusivity	1.24495E-04	[m^2/sec]
Skin factor	-1.54568E+00	[]

Test Zone

Open hole well-bore storage	2.03620E-07	[m^3/Pa]

Grid Properties

Grid increment delta	0.06768	[]
First grid increment	9.91691E-02	[m]
Skin grid increment delta	0.06357	[]
Skin first grid increment	4.12596E-03	[m]
Skin last grid increment	8.72318E-02	[m]
Increment ratio	1.13685E+00	[]

Information Only

Sequences

Sequence: H_01

Sequence type	History	
Start time	29496.395833	[day]
Duration	0.000903	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Type	Curve	
Wellbore storage	Open	

Sequence: S_01

Sequence type	Slug	
Start time	29496.396736	[day]
Duration	7.703264	[day]
Time step type	Log	
First log step	1.15741E-07	[day]
# of time steps	250	
Initial pressure type	Absolute	
Initial pressure	189.700	[psi]

Test Zone Curves

Curve object to use	Create Curve
Curve type	Pressure
Start sequence	H_01
End sequence	H_01
Curve time base	Test
Curve Y data units	[psi]
Curve Y data is log 10	no

Simulation Results Setup

Output ID	DAT
Output type	Pressure
Pressure capture type	Test Zone
Output units	[psi]
Output ID	DAT
Output type	Flow Rate
Flow rate output type	Well
Output units	[m^3/sec]

WIPP-30 Optimization Settings
****
nPre/32 2.41Q
****

Information Only

```
Version date    1 Mar 2007
Listing date    11 Aug 2010
QA status       QA: Q
Config file     C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30\WIPP-
30m_slug.nPre
```

Control Settings

Main Settings

Simulation type	Optimization	
Simulation subtype	Normal	
Phase to simulate	Liquid	
Skin zone ?	yes	
External boundary	Fixed Pressure	
Curve data source	Objects	

Liquid Phase Settings

Aquifer type	Confined	
Aquifer horizontal permeability	Isotropic	
System porosity	Single	
Compensate flow dimension geometry	yes	
Leakage	None	

Test Zone Settings

Test zone volume can vary	no	
Test zone compressibility can vary	no	
Test zone temperature can vary	no	
Default test-zone temperature	20.00	[C]
Solution variable	Pressure	
Allow negative head/pressure	yes	

Parameters

Formation

Formation thickness	24.000	[ft]
Flow dimension	2.0	[]
Static formation pressure	Optimization	
Minimum value	40.000	[psi]
Maximum value	55.000	[psi]
Estimate value	49.996	[psi]
Range type	Linear	
Sigma	1.00000E+00	
External boundary radius	1000000	[m]
Formation conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	1.46703E-09	[m/sec]

Information Only

Range type	Log	
Sigma	1.00000E+00	
Formation spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-02	[1/m]
Estimate value	3.26640E-06	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Skin

Radial thickness of skin	Optimization	
Minimum value	0.01	[m]
Maximum value	2.0	[m]
Estimate value	1.3534694	[m]
Range type	Linear	
Sigma	1.00000E+00	
Skin zone conductivity	Optimization	
Minimum value	1.00000E-12	[m/sec]
Maximum value	1.00000E-06	[m/sec]
Estimate value	2.91210E-09	[m/sec]
Range type	Log	
Sigma	1.00000E+00	
Skin zone spec. storage	Optimization	
Minimum value	1.00000E-09	[1/m]
Maximum value	1.00000E-02	[1/m]
Estimate value	2.33913E-05	[1/m]
Range type	Log	
Sigma	1.00000E+00	

Fluid

Fluid density	1010.00	[kg/m^3]
Fluid thermal exp. coeff.	0.00000E+00	[1/C]

Test-Zone

Well radius	2.475	[in]
Tubing string radius	0.9975	[in]

Numeric

# of radial nodes	250	[]
# of skin nodes	50	[]
Pressure solution tolerance	1.45038E-11	[psi]
STP flow solution tolerance	1.00000E-15	[m^3/sec]

Information Only

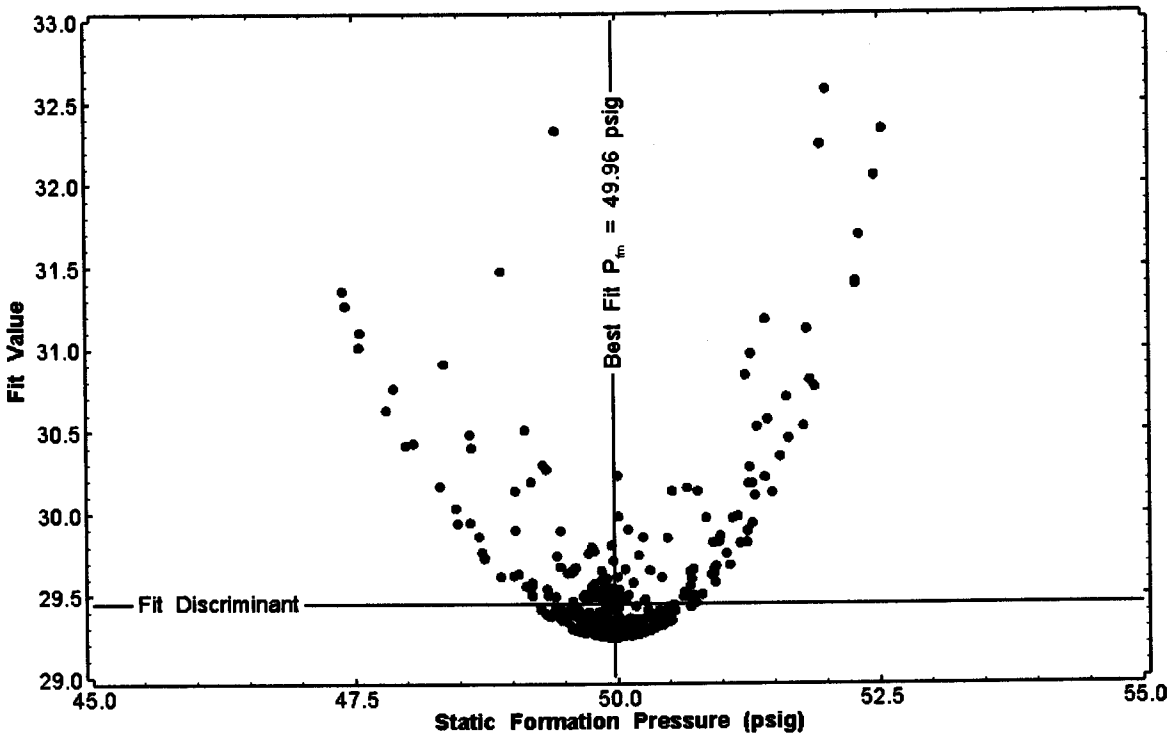

Figure B-66. X-Y scatter plot showing the static formation pressure parameter space derived from the WIPP-30 perturbation analysis with fit discriminant and best fit values.

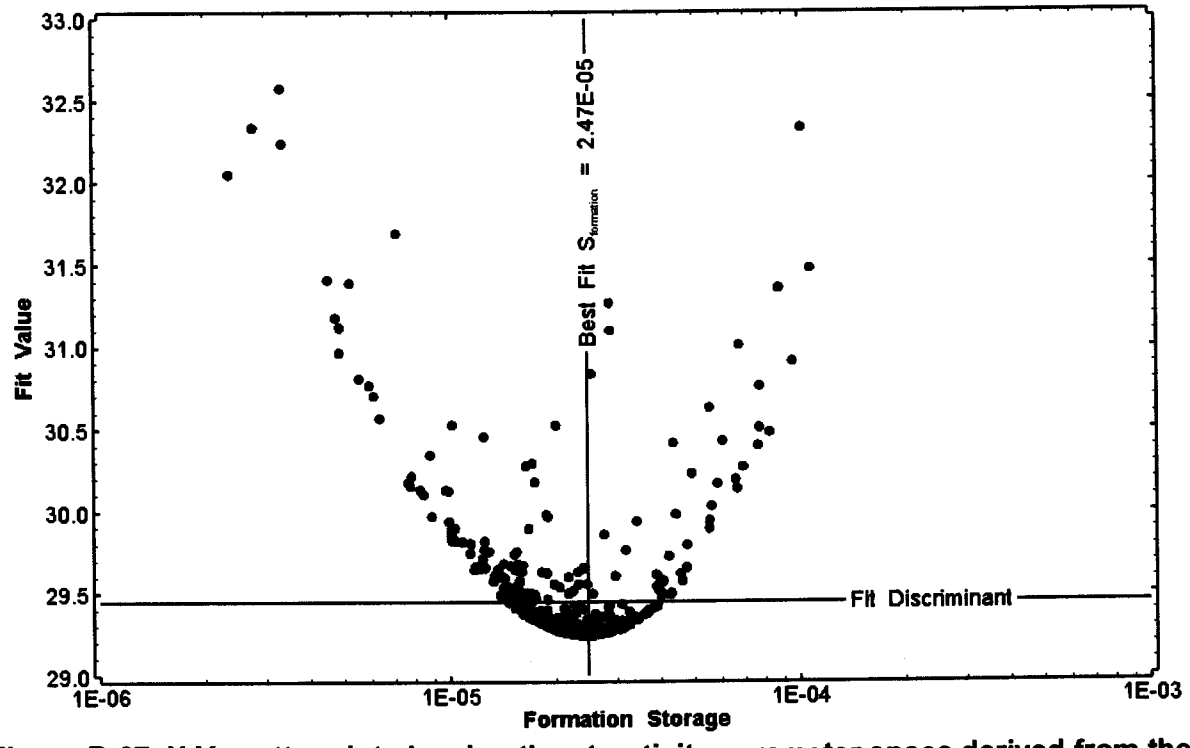

Figure B-67. X-Y scatter plot showing the storativity parameter space derived from the WIPP-30 perturbation analysis with the fit discriminant and best fit values.

Information Only

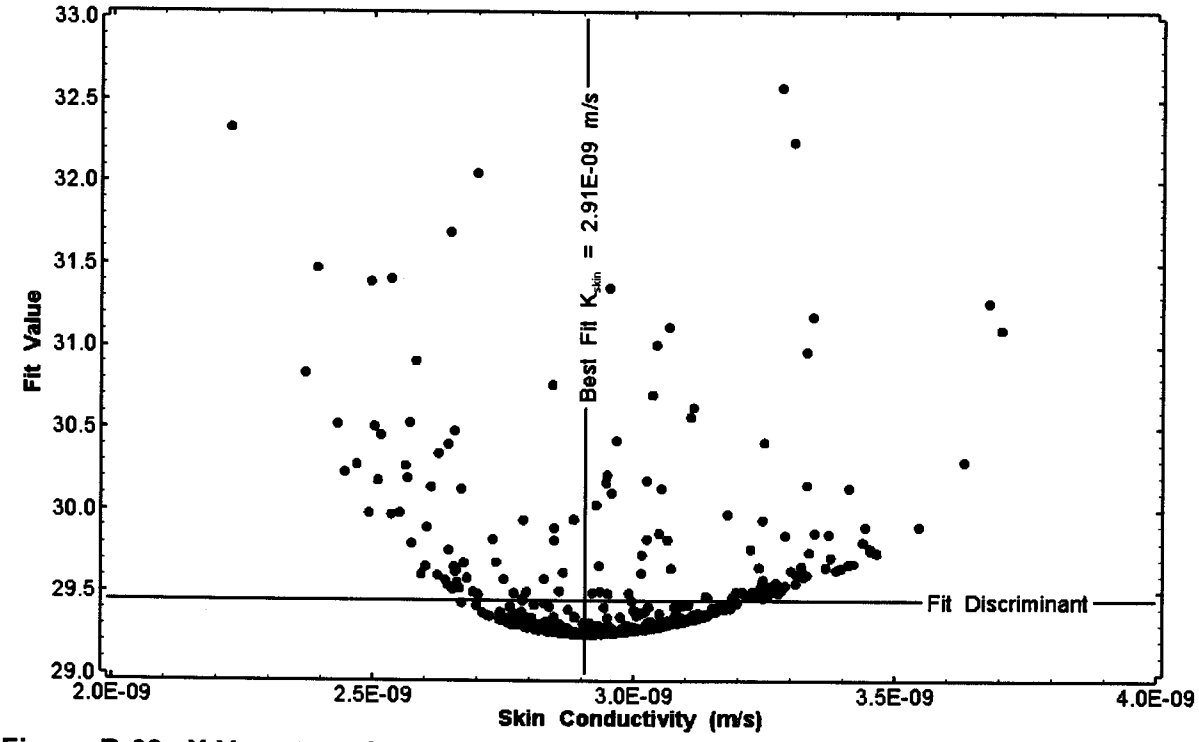

Figure B-68. X-Y scatter plot showing the skin conductivity parameter space derived from the WIPP-30 perturbation analysis with the fit discriminant and best fit values.

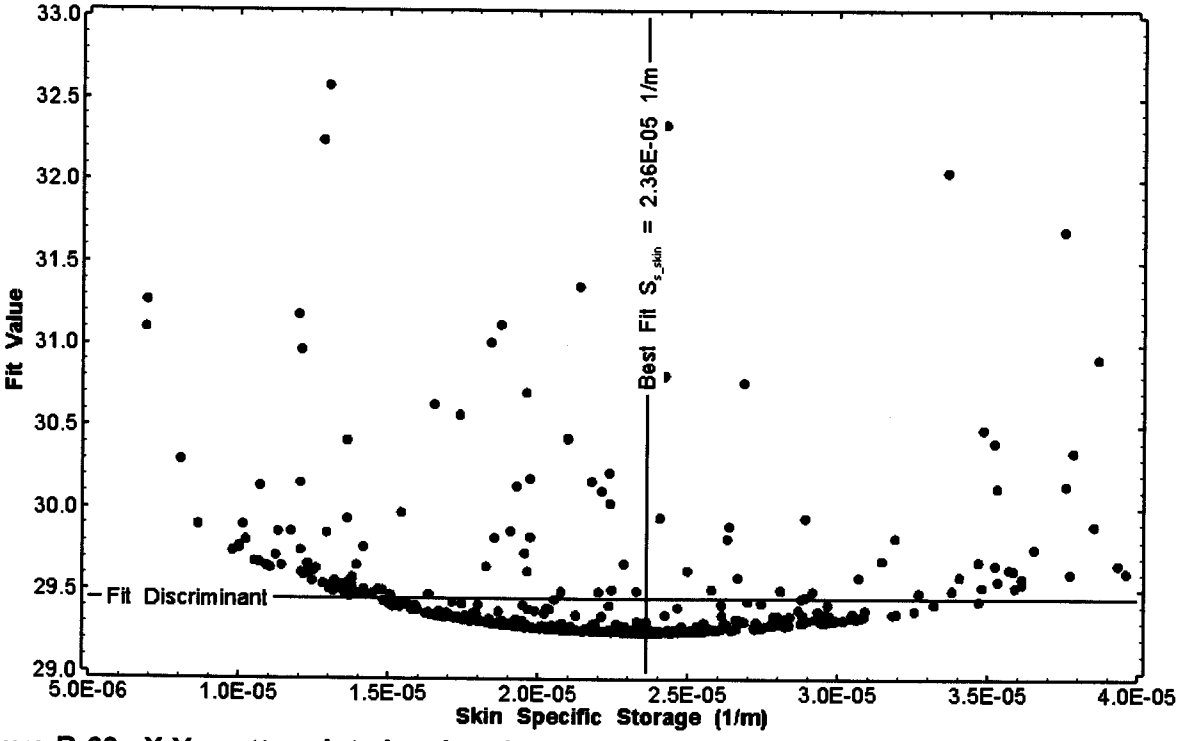

Figure B-69. X-Y scatter plot showing the skin specific storage parameter space derived from the WIPP-30 perturbation analysis with the fit discriminant and best fit values.

Information Only

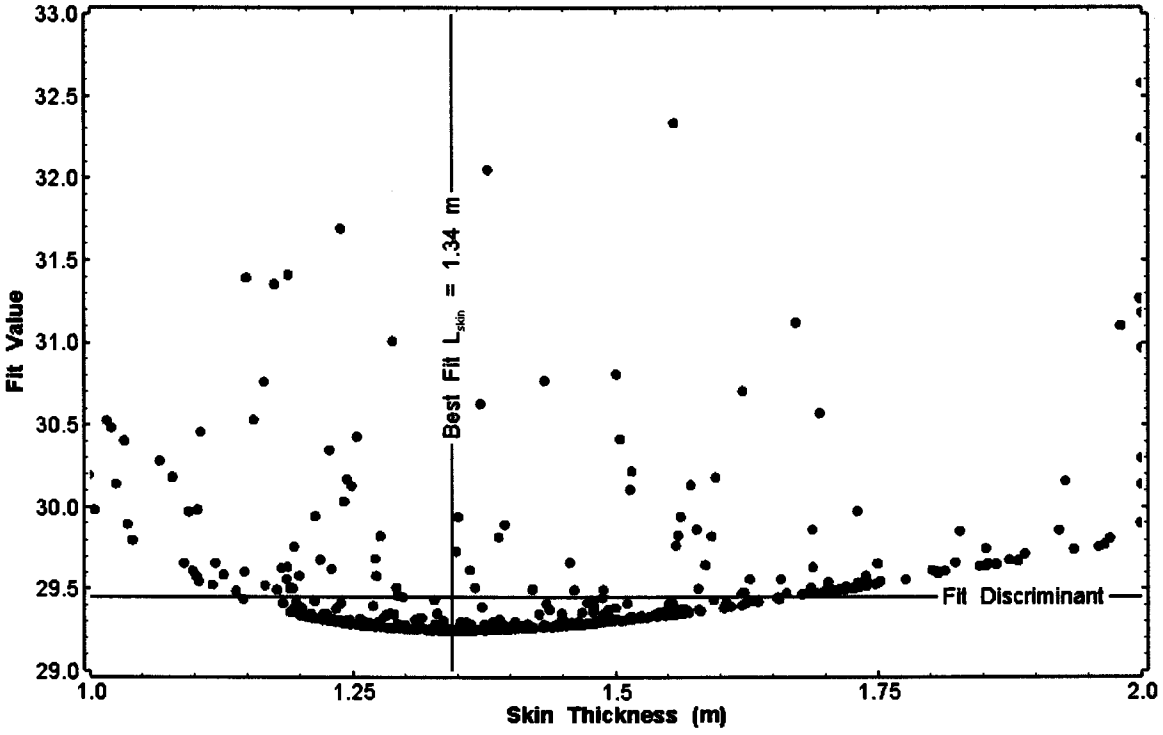

Figure B-70. X-Y scatter plot showing the skin thickness parameter space derived from the WIPP-30 perturbation analysis with the fit discriminant and best fit values.

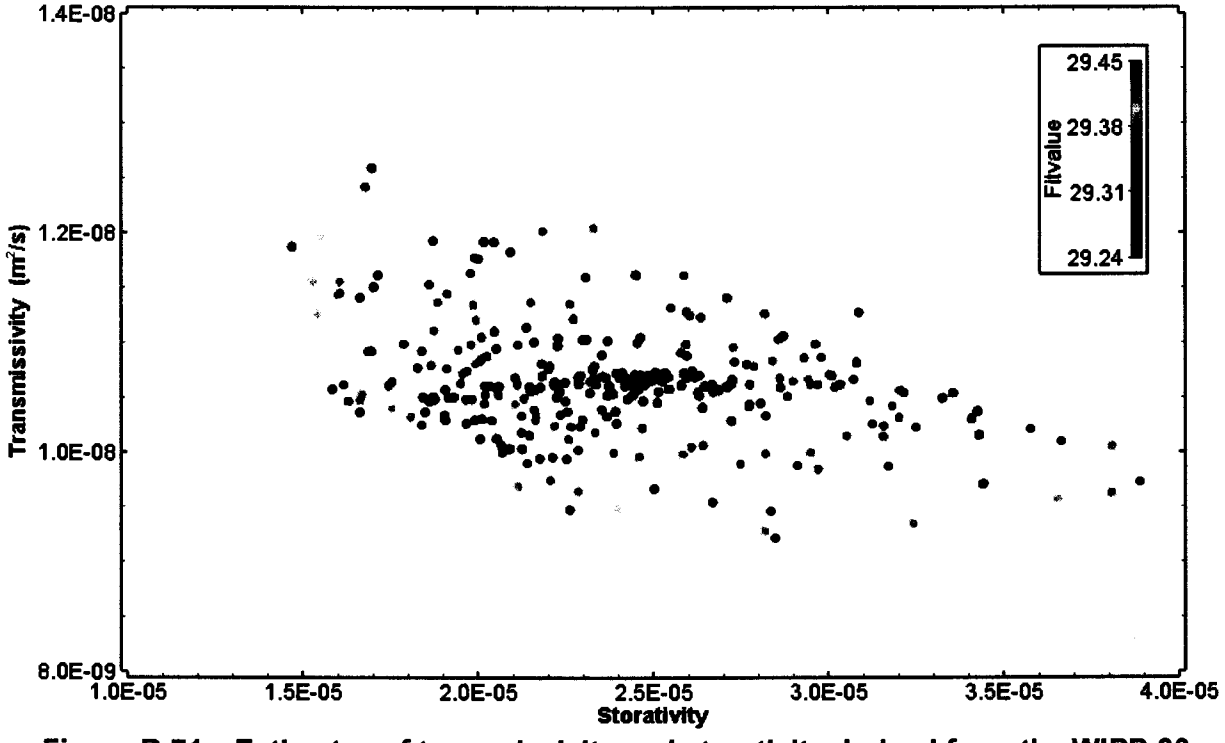

Figure B-71. Estimates of transmissivity and storativity derived from the WIPP-30 perturbation analysis.

Information Only

Information Only

Appendix C – File Directories

Table C-1. File descriptions.

File Extension	Function/Use
<filename>.nPre	Files used for initial well test analysis.
<filename>X.nPre	Files used to generate perturbation analysis of .nPre results.
.nPost	Post-processing files used to visualize .nPre and perturbation analysis.
.nOpt	Optimization data used for post processing in .nPost files.
<filename>.nXYSim	Simulation data used for post processing in .nPost files.
<filename>FieldData.nXYSim	Field data used for post processing in .nPost files.
.jpg	Graphic output from .nPost files.
.csv,.xls, .dat	Data files used as input for .nPre files.

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\DOE-2

08/17/2010 09:44 AM <DIR> .
08/17/2010 09:44 AM <DIR> ..
08/11/2010 10:14 AM <DIR> Data
06/02/2010 11:34 AM 48,618 DOE-2.nPre
08/17/2010 09:22 AM <DIR> Plots
08/17/2010 09:44 AM <DIR> Post
1 File(s) 48,618 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\DOE-2\Data

08/11/2010 10:14 AM <DIR> .
08/11/2010 10:14 AM <DIR> ..
02/03/2010 04:57 PM 7,764 DOE-2_Magenta.csv
1 File(s) 7,764 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\DOE-2\Plots

08/17/2010 09:22 AM <DIR> .
08/17/2010 09:22 AM <DIR> ..
05/17/2010 02:40 PM 114,709 DOE-2 Cartesian0007.JPG
05/27/2010 10:21 AM 141,819 DOE-2_Bourdet0008.JPG
08/10/2010 08:58 AM 140,685 DOE-2_Fitvalue_Ctz0007.JPG
08/10/2010 08:59 AM 138,787 DOE-2_Fitvalue_Pfm0008.JPG
08/10/2010 09:04 AM 135,679 DOE-2_Fitvalue_S0009.JPG
08/10/2010 08:58 AM 135,029 DOE-2_Fitvalue_T0009.JPG
05/27/2010 10:22 AM 93,748 DOE-2_Slug_RameyA_Horsetail0009.JPG
05/27/2010 10:23 AM 127,016 DOE-2_Slug_RameyC_Horsetail0009.JPG

Information Only

```
05/27/2010  10:21 AM         133,678 DOE-2_Stand_Diag0008.JPG
08/13/2010  01:42 PM         147,830 T vs S0002.JPG
          10 File(s)     1,308,980 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\DOE-2\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
05/17/2010  01:19 PM       6,160,384 DOE-2.nOpt
08/13/2010  01:42 PM          36,272 DOE-2.nPost
05/17/2010  01:19 PM      30,736,384 DOE-2.nXYSim
05/17/2010  01:07 PM          25,928 DOE-2X.nPre
05/17/2010  01:07 PM          65,536 DOE-2_fielddata.nXYSim
          5 File(s)     37,024,504 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-2a

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  09:25 AM    <DIR>          data
06/01/2010  08:37 AM          33,184 H-2aM_slug.nPre
08/17/2010  09:23 AM    <DIR>          Plots
08/17/2010  09:44 AM    <DIR>          Post
          1 File(s)         33,184 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-2a\data

08/11/2010  09:25 AM    <DIR>          .
08/11/2010  09:25 AM    <DIR>          ..
03/10/2010  10:17 AM           2,483 H-2a Magenta slug test.csv
03/09/2010  02:20 PM           2,821 Original H-2a Magenta slug test.csv
          2 File(s)          5,304 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-2a\Plots

08/17/2010  09:23 AM    <DIR>          .
08/17/2010  09:23 AM    <DIR>          ..
05/17/2010  04:10 PM         100,296 H-2a_Cartesian0008.JPG
05/28/2010  10:09 AM          65,216 H-2a_data0001.JPG
05/17/2010  04:09 PM          91,398 H-2a_Fitvalue_K0005.JPG
08/10/2010  09:28 AM          92,559 H-2a_Fitvalue_Pfm0007.JPG
08/10/2010  09:23 AM         103,151 H-2a_Fitvalue_S0010.JPG
05/17/2010  04:09 PM          99,872 H-2a_Fitvalue_Ss0008.JPG
08/10/2010  09:19 AM         101,550 H-2a_Fitvalue_T0007.JPG
05/28/2010  10:12 AM         123,597 H-2a_Slug_RameyA0009.JPG
05/17/2010  04:10 PM         123,320 H-2a_Slug_RameyB0008.JPG
```


Information Only

```
05/28/2010  10:12 AM         126,051 H-2a_Slug_RameyC0009.JPG
08/13/2010  01:45 PM          67,976 T vs S0003.JPG
          11 File(s)     1,094,986 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-2a\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
03/18/2010  02:50 PM        6,160,384 H-2a.nOpt
08/13/2010  01:45 PM           29,816 H-2a.nPost
03/18/2010  02:50 PM       16,400,384 H-2a.nXYSim
03/18/2010  02:52 PM           20,320 H-2aM_slugX.nPre
03/18/2010  02:17 PM           28,672 H-2a_fielddata.nXYSim
          5 File(s)     22,639,576 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-3b1

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  09:25 AM    <DIR>          Data
06/02/2010  03:18 PM           27,318 H-3b1M_slug.nPre
08/17/2010  09:23 AM    <DIR>          Plots
08/17/2010  09:44 AM    <DIR>          Post
          1 File(s)         27,318 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-3b1\Data

08/11/2010  09:25 AM    <DIR>          .
08/11/2010  09:25 AM    <DIR>          ..
10/21/2009  04:02 PM        1,310,891 H-3b1 (M)_5-sec_Flow Data_07-20 to 07-22-
2009.csv
10/21/2009  04:02 PM        1,307,615 H-3b1 (M)_5-sec_Flow Data_07-22 to 07-24-
2009.csv
10/21/2009  04:02 PM        2,038,083 H-3b1 (M)_5-sec_Flow Data_07-27 to 07-30-
2009.csv
02/03/2010  05:12 PM            2,008 H-3Mag(2).csv
          4 File(s)      4,658,597 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-3b1\Plots

08/17/2010  09:23 AM    <DIR>          .
08/17/2010  09:23 AM    <DIR>          ..
06/02/2010  03:11 PM           93,074 Cartesian_data0001.JPG
05/25/2010  02:50 PM           96,595 H-3b1 Cartesian0008.JPG
06/02/2010  09:18 AM          119,991 H-3b1_Fitvalue_K.JPG
08/10/2010  09:41 AM          116,996 H-3b1_Fitvalue_Pfm0011.JPG
```


Information Only

```
08/10/2010  09:40 AM           112,230 H-3b1_Fitvalue_S0012.JPG
08/10/2010  09:45 AM            91,141 H-3b1_Fitvalue_skinK.JPG0009.JPG
08/10/2010  09:43 AM           103,063 H-3b1_Fitvalue_skinL.JPG0011.JPG
08/10/2010  09:44 AM            92,764 H-3b1_Fitvalue_skinSs.JPG0012.JPG
06/01/2010  10:01 AM           114,240 H-3b1_Fitvalue_Ss_new.JPG
08/10/2010  09:39 AM           116,089 H-3b1_Fitvalue_T0010.JPG
06/02/2010  09:15 AM           137,733 H-3b1_Slug_RameyA_Horsetail0011.JPG
06/02/2010  09:15 AM           130,386 H-3b1_Slug_RameyB_Horsetail0010.JPG
08/13/2010  01:51 PM           130,442 T vs S0003.JPG
              13 File(s)      1,454,744 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-3b1\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
06/02/2010  09:09 AM        10,256,384 H-31b.nXYSim
06/02/2010  09:02 AM            24,576 H-31b_fielddata.nXYSim
06/02/2010  09:09 AM         6,160,384 H-3b1.nOpt
08/13/2010  01:51 PM            35,127 H-3b1.nPost
06/02/2010  09:05 AM            17,488 H-3b1M_slugX.nPre
              5 File(s)     16,493,959 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-4a

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  10:15 AM    <DIR>          data
06/03/2010  09:53 AM            32,058 H-4aM_slug.nPre
08/17/2010  09:23 AM    <DIR>          Plots
08/17/2010  09:44 AM    <DIR>          Post
              1 File(s)         32,058 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-4a\data

08/11/2010  10:15 AM    <DIR>          .
08/11/2010  10:15 AM    <DIR>          ..
02/05/2010  11:22 AM             3,440 H-4a Magenta.csv
              1 File(s)          3,440 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-4a\Plots

08/17/2010  09:23 AM    <DIR>          .
08/17/2010  09:23 AM    <DIR>          ..
05/17/2010  04:02 PM            93,963 H-4a_Cartesian0007.JPG
06/03/2010  10:10 AM            87,326 H-4a_Cartesian_data0000.JPG
05/17/2010  04:00 PM           144,264 H-4a_Fitvalue_K0004.JPG
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Information Only

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08/10/2010  09:56 AM         115,269 H-4a_Fitvalue_S0011.JPG
05/17/2010  04:01 PM         137,554 H-4a_Fitvalue_Ss0008.JPG
08/10/2010  09:54 AM         124,638 H-4a_Fitvalue_T0007.JPG
06/03/2010  09:54 AM         109,066 H-4a_Slug_RameyA0008.JPG
05/17/2010  04:05 PM         108,423 H-4a_Slug_RameyB0007.JPG
06/03/2010  09:54 AM         111,579 H-4a_Slug_RameyC0008.JPG
08/13/2010  02:16 PM          97,549 T vs S0003.JPG
              10 File(s)    1,129,631 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-4a\Post

08/17/2010  09:44 AM   <DIR>         .
08/17/2010  09:44 AM   <DIR>         ..
05/17/2010  03:24 PM       6,160,384 H-4a.nOpt
08/13/2010  02:35 PM          27,299 H-4a.nPost
05/17/2010  03:24 PM      16,400,384 H-4a.nXYSim
05/17/2010  03:23 PM          36,864 H-4afielddata.nXYSim
05/17/2010  03:23 PM          18,947 H-4aM_slugX.nPre
               5 File(s)   22,643,878 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-5a

08/17/2010  09:44 AM   <DIR>         .
08/17/2010  09:44 AM   <DIR>         ..
08/11/2010  10:16 AM   <DIR>         data
06/07/2010  11:28 AM          30,851 H-5aM_slug.nPre
08/17/2010  09:24 AM   <DIR>         Plots
08/17/2010  09:44 AM   <DIR>         Post
               1 File(s)      30,851 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-5a\data

08/11/2010  10:16 AM   <DIR>         .
08/11/2010  10:16 AM   <DIR>         ..
02/08/2010  10:44 AM           2,800 H-5a Magenta tests.csv
02/09/2010  11:33 AM           2,519 H-5a Magenta tests_edited.csv
               2 File(s)       5,319 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-5a\Plots

08/17/2010  09:24 AM   <DIR>         .
08/17/2010  09:24 AM   <DIR>         ..
06/07/2010  11:26 AM          84,525 Cartesian_Data0001.JPG
06/07/2010  11:27 AM          87,701 Cartesian_Data0002.JPG
03/22/2010  11:03 AM         118,860 H-5a_Cartesian0008.JPG
03/22/2010  11:03 AM         112,498 H-5a_Fitvalue_K0005.JPG
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Information Only

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08/10/2010  10:23 AM         100,114 H-5a_Fitvalue_P_fm0008.JPG
08/10/2010  10:25 AM          97,519 H-5a_Fitvalue_S0010.JPG
03/22/2010  11:10 AM         117,640 H-5a_Fitvalue_Ss0007.JPG
08/10/2010  10:22 AM         105,875 H-5a_Fitvalue_T0007.JPG
06/07/2010  11:06 AM         124,494 H-5a_Slug_RameyA0008.JPG
03/22/2010  11:04 AM         121,591 H-5a_Slug_RameyB0007.JPG
08/13/2010  02:20 PM          86,356 T vs S0005.JPG
              11 File(s)     1,157,173 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-5a\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
03/18/2010  03:03 PM         6,160,384 H-5a.nOpt
08/13/2010  02:21 PM            27,452 H-5a.nPost
03/18/2010  03:03 PM       137,232,384 H-5a.nXYSim
03/18/2010  02:55 PM            21,005 H-5aM_slugX.nPre
03/18/2010  02:55 PM            24,576 H-5a_fielddata.nXYSim
               5 File(s)    143,465,801 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-6a

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  10:16 AM    <DIR>          Data
07/01/2010  10:46 AM            27,771 H-6aM_slug.nPre
08/17/2010  09:24 AM    <DIR>          Plots
08/17/2010  09:44 AM    <DIR>          Post
               1 File(s)         27,771 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-6a\Data

08/11/2010  10:16 AM    <DIR>          .
08/11/2010  10:16 AM    <DIR>          ..
02/03/2010  03:19 PM             4,068 H-6a Magenta slug.csv
               1 File(s)          4,068 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-6a\Plots

08/17/2010  09:24 AM    <DIR>          .
08/17/2010  09:24 AM    <DIR>          ..
06/17/2010  11:18 AM            94,156 H-6a Cartesian0008.JPG
07/01/2010  10:46 AM            89,656 H-6a_Cartesian_data0000.JPG
06/17/2010  11:23 AM           136,734 H-6a_Fitvalue0007.JPG
08/10/2010  10:52 AM           126,158 H-6a_Fitvalue_Pfm0010.JPG
08/10/2010  10:51 AM           161,931 H-6a_Fitvalue_S0011.JPG
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Information Only

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08/10/2010  10:56 AM           139,912 H-6a_Fitvalue_skinK0009.JPG
08/10/2010  10:53 AM           126,399 H-6a_Fitvalue_skinL0008.JPG
08/10/2010  10:54 AM           142,510 H-6a_Fitvalue_skinSs0008.JPG
06/17/2010  11:17 AM           154,867 H-6a_Fitvalue_Ss0009.JPG
08/10/2010  10:50 AM           135,328 H-6a_Fitvalue_T0009.JPG
06/17/2010  11:19 AM           143,870 H-6a_Slug_RameyA_Horsetail0011.JPG
06/17/2010  11:18 AM           137,522 H-6a_Slug_RameyB_Horsetail0010.JPG
08/13/2010  02:24 PM           147,662 T vs S0004.JPG
              13 File(s)      1,736,705 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-6a\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
05/18/2010  01:05 PM         6,160,384 H-6a.nOpt
08/13/2010  02:24 PM            35,060 H-6a.nPost
05/18/2010  01:05 PM        10,256,384 H-6a.nXYSim
05/18/2010  01:01 PM            17,933 H-6aM_slugX.nPre
05/17/2010  04:20 PM            32,768 H-6a_fielddata.nXYSim
               5 File(s)     16,502,529 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-8a

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  10:17 AM    <DIR>          data
07/01/2010  03:48 PM            28,237 H-8aM_slug.nPre
08/17/2010  09:24 AM    <DIR>          Plot
08/17/2010  09:44 AM    <DIR>          Post
               1 File(s)         28,237 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-8a\data

08/11/2010  10:17 AM    <DIR>          .
08/11/2010  10:17 AM    <DIR>          ..
02/05/2010  12:09 PM             5,419 H-8a Magenta tests.csv
               1 File(s)          5,419 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-8a\Plot

08/17/2010  09:24 AM    <DIR>          .
08/17/2010  09:24 AM    <DIR>          ..
05/18/2010  10:13 AM           114,008 H-8a Cartesian0008.JPG
07/01/2010  03:47 PM            94,712 H-8a Cartesian_data0001.JPG
05/18/2010  10:13 AM            69,671 H-8a_Fitvalue_K0007.JPG
08/10/2010  01:18 PM            67,420 H-8a_Fitvalue_Pfm0008.JPG
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Information Only

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08/10/2010  01:20 PM            74,401 H-8a_Fitvalue_S0010.JPG
05/18/2010  10:15 AM            66,890 H-8a_Fitvalue_Ss0008.JPG
08/10/2010  01:19 PM            71,429 H-8a_Fitvalue_T0009.JPG
07/01/2010  03:53 PM           129,865 H-8a_Slug_RameyA_Horsetail0012.JPG
05/18/2010  10:13 AM           128,919 H-8a_Slug_RameyB_Horsetail0010.JPG
08/13/2010  02:28 PM            65,780 T vs S0003.JPG
              10 File(s)        883,095 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-8a\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
02/05/2010  02:42 PM         6,160,384 H-8a.nOpt
08/13/2010  02:28 PM            27,639 H-8a.nPost
02/05/2010  02:42 PM        47,120,384 H-8a.nXYSim
02/05/2010  02:33 PM            18,399 H-8aM_slugX.nPre
02/05/2010  02:34 PM            28,672 H-8a_fielddata.nXYSim
               5 File(s)     53,355,478 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  10:18 AM    <DIR>          Data
07/29/2010  04:53 PM            28,941 H-10aM_slug.nPre
08/17/2010  09:25 AM    <DIR>          Plots
08/17/2010  09:44 AM    <DIR>          Post
               1 File(s)         28,941 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a\Data

08/11/2010  10:18 AM    <DIR>          .
08/11/2010  10:18 AM    <DIR>          ..
03/15/2010  02:25 PM             2,162 H-10a Magenta slug 2.csv
06/25/2010  04:14 PM             2,162 Original_H-10a Magenta slug 2.csv
               2 File(s)          4,324 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a\Plots

08/17/2010  09:25 AM    <DIR>          .
08/17/2010  09:25 AM    <DIR>          ..
07/30/2010  02:27 PM           112,974 H-10a Cartesian0014.JPG
07/30/2010  02:26 PM            94,433 H-10a Cartesian_data0015.JPG
07/30/2010  02:33 PM            78,492 H-10a_Fitvalue_Pfm0012.JPG
07/30/2010  03:06 PM            88,885 H-10a_Fitvalue_S0011.JPG
07/30/2010  02:37 PM            91,648 H-10a_Fitvalue_skinK0011.JPG
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Information Only

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07/30/2010  02:43 PM            80,322 H-10a_Fitvalue_skinL0011.JPG
07/30/2010  02:40 PM            93,116 H-10a_Fitvalue_skinSs0011.JPG
07/30/2010  02:57 PM           100,729 H-10a_Fitvalue_T0010.JPG
07/30/2010  03:06 PM           141,530 H-10a_RameyA_Horsetail0017.JPG
07/30/2010  03:07 PM           143,874 H-10a_RameyB_Horsetail0015.JPG
07/30/2010  02:27 PM           138,947 H-10a_RameyC_Horsetail0014.JPG
08/13/2010  02:41 PM           166,290 T vs S0003.JPG
              12 File(s)      1,331,240 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
07/30/2010  10:21 AM         6,160,384 H-10a.nOpt
08/13/2010  02:41 PM            39,396 H-10a.nPost
07/30/2010  10:20 AM        16,400,384 H-10a.nXYSim
07/30/2010  10:16 AM            16,250 H-10aM_slug.nPre
07/29/2010  04:55 PM            28,672 H-10a_fielddata.nXYSim
08/11/2010  09:26 AM    <DIR>          old
               5 File(s)     22,645,086 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-10a\Post\old

08/11/2010  09:26 AM    <DIR>          .
08/11/2010  09:26 AM    <DIR>          ..
07/29/2010  04:23 PM         6,160,384 H-10a.nOpt
07/29/2010  04:23 PM        14,352,384 H-10a.nXYSim
07/29/2010  04:21 PM            20,247 H-10aM_slug-RB2DBX.nPre
07/29/2010  04:21 PM            28,672 H-10a_fielddata.nXYSim
               4 File(s)     20,561,687 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-14

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
08/11/2010  09:26 AM    <DIR>          data
06/21/2010  03:00 PM            77,750 H-14M_DST.nPre
08/17/2010  09:25 AM    <DIR>          Plots
08/17/2010  09:44 AM    <DIR>          Post
               1 File(s)         77,750 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-14\data

08/11/2010  09:26 AM    <DIR>          .
08/11/2010  09:26 AM    <DIR>          ..
03/29/2010  02:38 PM            18,512 H-14 Magenta DST wHist.csv
```


Information Only

```
               1 File(s)         18,512 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-14\Plots

08/17/2010  09:25 AM    <DIR>          .
08/17/2010  09:25 AM    <DIR>          ..
05/27/2010  09:59 AM           135,331 H-14 Cartesian0014.JPG
07/26/2010  03:24 PM            96,911 H-14 Cartesian_data0015.JPG
05/27/2010  09:58 AM           123,914 H-14_F1_StdDiag0019.JPG
05/27/2010  09:58 AM           129,000 H-14_F2_StdDiag0018.JPG
05/27/2010  09:58 AM           129,741 H-14_F3_StdDiag0018.JPG
07/26/2010  03:26 PM           141,812 H-14_Fitvalue_Ctz0014.JPG
05/27/2010  09:56 AM           165,996 H-14_Fitvalue_K0011.JPG
07/26/2010  03:28 PM           138,140 H-14_Fitvalue_Pfm0014.JPG
07/26/2010  03:37 PM           138,438 H-14_Fitvalue_S0013.JPG
05/27/2010  09:56 AM           164,456 H-14_Fitvalue_Ss0012.JPG
07/26/2010  03:39 PM           155,416 H-14_Fitvalue_T0016.JPG
05/27/2010  10:00 AM            87,263 H-14_S1_RameyA_Horsetail0018.JPG
05/27/2010  10:01 AM           102,746 H-14_S1_RameyC_Horsetail0015.JPG
05/27/2010  10:00 AM            89,263 H-14_S2_RameyA_Horsetail0017.JPG
05/27/2010  10:02 AM           106,918 H-14_S2_RameyC_Horsetail0015.JPG
05/27/2010  10:00 AM            95,899 H-14_S3_RameyA_Horsetail0017.JPG
05/27/2010  10:02 AM           104,946 H-14_S3_RameyC_Horsetail0015.JPG
08/13/2010  02:48 PM            90,708 T vs S0003.JPG
              18 File(s)      2,196,898 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-14\Post

08/17/2010  09:44 AM    <DIR>          .
08/17/2010  09:44 AM    <DIR>          ..
04/21/2010  09:35 AM         6,160,384 H-14.nOpt
08/13/2010  03:43 PM            54,708 H-14.nPost
04/21/2010  09:35 AM        65,552,384 H-14.nXYSim
04/21/2010  09:22 AM            45,420 H-14M_DSTX.nPre
04/21/2010  09:22 AM            53,248 H-14_fielddata.nXYSim
               5 File(s)     71,866,144 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-16

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/11/2010  10:19 AM    <DIR>          data
02/09/2010  03:04 PM            57,538 H-16M_DSTs.nPre
08/17/2010  09:25 AM    <DIR>          Plots
08/17/2010  09:45 AM    <DIR>          Post
               1 File(s)         57,538 bytes
```


Information Only

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 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-16\data

08/11/2010  10:19 AM    <DIR>          .
08/11/2010  10:19 AM    <DIR>          ..
02/09/2010  02:57 PM            11,836 H-16 Magenta DSTs.csv
               1 File(s)         11,836 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-16\Plots

08/17/2010  09:25 AM    <DIR>          .
08/17/2010  09:25 AM    <DIR>          ..
05/25/2010  03:45 PM           121,790 H-16 Cartesian0009.JPG
08/04/2010  10:56 AM            92,572 H-16 Cartesian_data0010.JPG
05/25/2010  03:47 PM           146,719 H-16_Fitvalue_K0007.JPG
08/04/2010  11:13 AM           140,683 H-16_Fitvalue_Pfm0008.JPG
08/04/2010  11:24 AM           141,736 H-16_Fitvalue_S0009.JPG
05/25/2010  03:48 PM           149,683 H-16_Fitvalue_Ss0008.JPG
08/04/2010  11:23 AM           143,715 H-16_Fitvalue_T0009.JPG
08/04/2010  11:11 AM           145,161 H-16_Fitvalue_Tzc0007.JPG
05/26/2010  10:59 AM            88,863 H-16_Slug1_RameyA_Horsetail0013.JPG
05/25/2010  03:45 PM            86,842 H-16_Slug1_RameyB_Horsetail0010.JPG
05/25/2010  03:45 PM           132,386 H-16_Slug1_StanDiag_Horsetail0011.JPG
05/26/2010  10:59 AM            88,791 H-16_Slug2_RameyA_Horsetail0012.JPG
05/25/2010  03:46 PM            79,889 H-16_Slug2_RameyB_Horsetail0010.JPG
05/25/2010  03:45 PM           127,441 H-16_Slug2_StanDiag_Horsetail0011.JPG
05/26/2010  10:58 AM           115,930 H-16_Slug3_RameyA_Horsetail0012.JPG
05/25/2010  03:46 PM           106,519 H-16_Slug3_RameyB_Horsetail0010.JPG
08/13/2010  10:17 AM            79,007 T vs S0002.JPG
              17 File(s)      1,987,727 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-16\Post

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
02/09/2010  03:17 PM         6,160,384 H-16.nOpt
08/13/2010  10:17 AM            49,655 H-16.nPost
02/09/2010  03:17 PM        77,840,384 H-16.nXYSim
02/09/2010  03:08 PM            34,942 H-16M_DSTsX.nPre
02/09/2010  03:08 PM            40,960 H-16_fielddata.nXYSim
               5 File(s)     84,126,325 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-18

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
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Information Only

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08/11/2010  10:20 AM    <DIR>          Data
07/30/2010  03:08 PM            36,380 H-18.nPre
08/17/2010  09:26 AM    <DIR>          Plots
08/17/2010  09:45 AM    <DIR>          Post
               1 File(s)         36,380 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-18\Data

08/11/2010  10:20 AM    <DIR>          .
08/11/2010  10:20 AM    <DIR>          ..
04/09/2010  01:43 PM         1,663,816 H-18 (M)_5-sec_Flow Data_04-13 to 04-17-2
009 rev.csv
02/03/2010  11:36 AM           114,844 H-18 (Mpump4bu and m10).csv
               2 File(s)      1,778,660 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-18\Plots

08/17/2010  09:26 AM    <DIR>          .
08/17/2010  09:26 AM    <DIR>          ..
08/05/2010  09:17 AM           103,496 H-18 Cartesian0011.JPG
08/05/2010  09:18 AM            82,342 H-18 Cartesian_data0012.JPG
08/05/2010  09:17 AM           133,469 H-18_F01_Horsetail0014.JPG
08/05/2010  09:17 AM           142,004 H-18_F02_Horsetail0013.JPG
08/05/2010  03:55 PM           130,858 H-18_Fitvalue_Kr10010.JPG
08/05/2010  03:53 PM           138,781 H-18_Fitvalue_Kr20011.JPG
08/05/2010  02:52 PM           129,099 H-18_Fitvalue_Pfm0012.JPG
08/05/2010  04:06 PM           141,818 H-18_Fitvalue_S0015.JPG
08/05/2010  02:56 PM           131,116 H-18_Fitvalue_skinK0011.JPG
08/05/2010  03:50 PM           146,317 H-18_Fitvalue_skinL0011.JPG
08/05/2010  03:58 PM           132,809 H-18_Fitvalue_skinSs0011.JPG
08/05/2010  09:52 AM           122,737 H-18_Fitvalue_T10010.JPG
08/05/2010  04:02 PM           123,397 H-18_Fitvalue_T20010.JPG
08/13/2010  11:19 AM           106,346 T vs S0002.JPG
              14 File(s)      1,764,589 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\H-18\Post

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/05/2010  09:01 AM         6,160,384 H-18.nOpt
08/13/2010  11:19 AM            47,641 H-18.nPost
07/28/2010  08:36 AM        16,400,384 H-18.nXYSim
08/05/2010  08:35 AM            21,277 H-18X.nPre
08/05/2010  09:01 AM        18,448,384 H-18_fielddata.nXYSim
               5 File(s)     41,078,070 bytes
```


Information Only

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Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-18

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/11/2010  09:27 AM    <DIR>          Data
08/17/2010  09:26 AM    <DIR>          Plots
08/17/2010  09:45 AM    <DIR>          Post
08/02/2010  02:32 PM            26,035 WIPP-18.nPre
               1 File(s)         26,035 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-18\Data

08/11/2010  09:27 AM    <DIR>          .
08/11/2010  09:27 AM    <DIR>          ..
01/13/2010  05:02 PM            23,230 Pressure_last_bit.csv
01/13/2010  04:20 PM           147,055 SN116306 061009 WIPP-18 (M8) 2010-01-05 1
0.43.17.csv
               2 File(s)        170,285 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-18\Plots

08/17/2010  09:26 AM    <DIR>          .
08/17/2010  09:26 AM    <DIR>          ..
08/13/2010  11:22 AM           105,592 T vs S0002.JPG
06/01/2010  04:40 PM           101,067 WIPP-18 Cartesian0010.JPG
08/02/2010  09:38 AM            89,035 WIPP-18 Cartesian_data0011.JPG
08/09/2010  09:14 AM           118,510 WIPP-18_Fitvalue_S0016.JPG
08/09/2010  09:28 AM           123,611 WIPP-18_Fitvalue_skinK0009.JPG
08/09/2010  09:24 AM           124,006 WIPP-18_Fitvalue_skinL0010.JPG
08/09/2010  09:26 AM           112,790 WIPP-18_Fitvalue_skinSs0009.JPG
08/09/2010  09:11 AM           113,118 WIPP-18_Fitvalue_T0008.JPG
08/02/2010  03:02 PM           139,850 WIPP-18_Slug_RameyA_Horsetail0011.JPG
08/02/2010  03:03 PM           132,048 WIPP-18_Slug_RameyB_Horsetail0011.JPG
              10 File(s)      1,159,627 bytes

Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-18\Post

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/09/2010  09:03 AM         6,160,384 WIPP-18.nOpt
08/13/2010  11:22 AM            34,162 WIPP-18.nPost
08/09/2010  09:02 AM        16,400,384 WIPP-18.nXYSim
08/09/2010  08:57 AM            16,521 WIPP-18X.nPre
08/02/2010  02:35 PM            98,304 WIPP-18_fielddata.nXYSim
               5 File(s)     22,709,755 bytes
```


Information Only

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 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-27

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/11/2010  09:27 AM    <DIR>          Data
08/17/2010  09:26 AM    <DIR>          Plots
08/17/2010  09:45 AM    <DIR>          Post
07/29/2010  10:50 AM            46,832 WIPP-27.nPre
               1 File(s)         46,832 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-27\Data

08/11/2010  09:27 AM    <DIR>          .
08/11/2010  09:27 AM    <DIR>          ..
01/04/1999  03:04 PM             1,672 w27slug.dat
04/07/2010  11:07 AM             3,794 WIPP-27 Magenta slug tests.csv
               2 File(s)          5,466 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-27\Plots

08/17/2010  09:26 AM    <DIR>          .
08/17/2010  09:26 AM    <DIR>          ..
08/13/2010  11:26 AM           168,474 T vs S0002.JPG
07/29/2010  02:28 PM           125,687 WIPP-27 Cartesian0013.JPG
07/29/2010  02:29 PM            95,841 WIPP-27 Cartesian_data0013.JPG
07/29/2010  04:07 PM            79,163 WIPP-27_Fitvalue_Pfm0011.JPG
07/29/2010  04:15 PM           127,504 WIPP-27_Fitvalue_R20013.JPG
07/29/2010  04:10 PM           104,599 WIPP-27_Fitvalue_S0011.JPG
07/29/2010  03:53 PM            93,835 WIPP-27_Fitvalue_T10013.JPG
07/29/2010  03:59 PM            87,983 WIPP-27_Fitvalue_T20012.JPG
07/29/2010  03:40 PM           140,881 WIPP-27_S1_RameyA_Horsetail0016.JPG
07/29/2010  03:42 PM           124,877 WIPP-27_S1_RameyB_Horsetail0014.JPG
07/29/2010  03:44 PM           122,306 WIPP-27_S1_RameyC_Horsetail0014.JPG
07/29/2010  03:41 PM           134,503 WIPP-27_S2_RameyA_Horsetail0018.JPG
07/29/2010  03:43 PM           120,223 WIPP-27_S2_RameyB_Horsetail0015.JPG
07/29/2010  03:45 PM           116,650 WIPP-27_S2_RameyC_Horsetail0014.JPG
              14 File(s)      1,642,526 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-27\Post

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
07/29/2010  10:57 AM         6,160,384 WIPP-27.nOpt
08/13/2010  11:26 AM            48,810 WIPP-27.nPost
07/29/2010  10:57 AM        30,736,384 WIPP-27.nXYSim
07/29/2010  10:53 AM            24,164 WIPP-27X.nPre
```


Information Only

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07/29/2010  10:45 AM         36,864 WIPP-27_fielddata.nXYSim
               5 File(s)     37,006,606 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/11/2010  09:27 AM    <DIR>          Data
08/17/2010  09:26 AM    <DIR>          Plots
08/17/2010  09:45 AM    <DIR>          Post
07/27/2010  01:28 PM            23,915 WIPP-30m_slug.nPre
               1 File(s)         23,915 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30\Data

08/11/2010  09:27 AM    <DIR>          .
08/11/2010  09:27 AM    <DIR>          ..
02/02/2010  05:26 PM             3,729 WIPP-30 Magenta slug.csv
               1 File(s)          3,729 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30\Plots

08/17/2010  09:26 AM    <DIR>          .
08/17/2010  09:26 AM    <DIR>          ..
08/13/2010  11:44 AM           103,754 T vs S0002.JPG
08/02/2010  04:46 PM           104,590 WIPP-30 Cartesian0012.JPG
08/02/2010  04:46 PM            84,983 WIPP-30 Cartesian_data0013.JPG
08/02/2010  05:00 PM           113,367 WIPP-30_Fitvalue_Pfm0013.JPG
08/02/2010  05:16 PM           108,174 WIPP-30_Fitvalue_S0010.JPG
08/02/2010  05:05 PM           128,171 WIPP-30_Fitvalue_skinK0011.JPG
08/02/2010  05:01 PM           131,757 WIPP-30_Fitvalue_skinL0011.JPG
08/02/2010  05:08 PM           145,728 WIPP-30_Fitvalue_skinSs0011.JPG
08/02/2010  05:12 PM           123,730 WIPP-30_Fitvalue_T0010.JPG
08/02/2010  04:48 PM           133,639 WIPP-30_RameyA_Horsetail0016.JPG
08/02/2010  04:49 PM           129,797 WIPP-30_RameyB_Horsetail0014.JPG
              11 File(s)      1,307,690 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30\Post

08/17/2010  09:45 AM    <DIR>          .
08/17/2010  09:45 AM    <DIR>          ..
08/11/2010  09:27 AM    <DIR>          safe
07/27/2010  01:47 PM         6,160,384 WIPP-30.nOpt
08/13/2010  11:44 AM            36,610 WIPP-30.nPost
07/27/2010  01:47 PM        12,304,384 WIPP-30.nXYSim
07/27/2010  01:33 PM            16,571 WIPP-30m_slug.nPre
```


Information Only

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07/27/2010  01:33 PM          28,672 WIPP-30_fielddata.nXYSim
               5 File(s)     18,546,621 bytes

 Directory of C:\SANDIA_PROJECTS\WIPP_wells\Magenta_analysis\WIPP-30\Post\safe

08/11/2010  09:27 AM    <DIR>          .
08/11/2010  09:27 AM    <DIR>          ..
05/26/2010  03:33 PM         6,160,384 WIPP-30.nOpt
05/26/2010  03:33 PM        22,544,384 WIPP-30.nXYSim
05/26/2010  03:28 PM            98,304 WIPP-30_fielddata.nXYSim
               3 File(s)     28,803,072 bytes

    Total Files Listed:
              21 File(s)     48,685,027 bytes
              14 Dir(s)  163,769,774,080 bytes free
```

Acknowledgements

The authors of this report would like to acknowledge Jeff Palmer of Intera, Inc. for contributing well configuration plots and Patricia Johnson also of Intera, Inc. for contributing the well location map of the WIPP.

Information Only

Bowman, Dale O 11-2-10

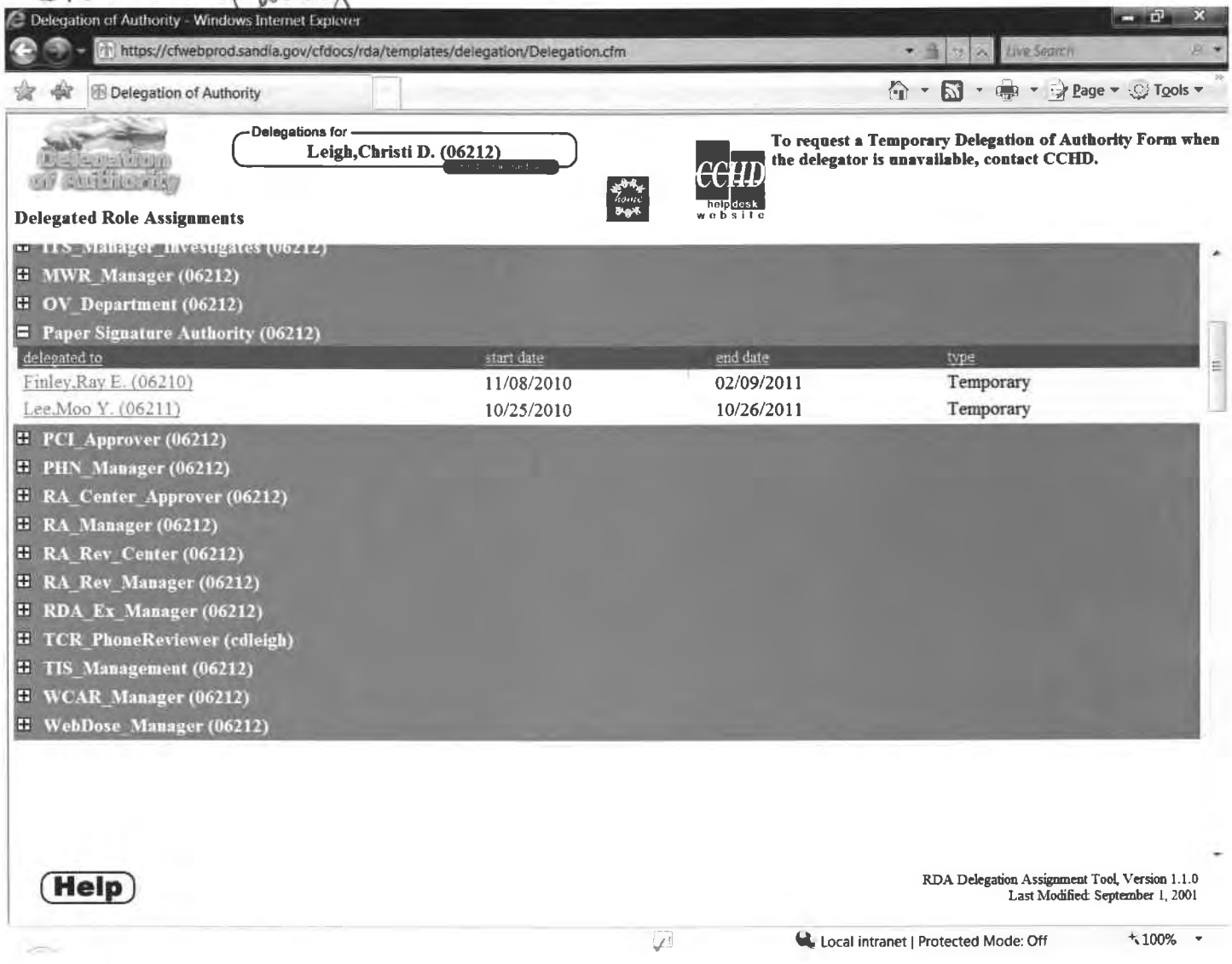
From: Randall Roberts [rroberts@hydroresolutions.com]
Sent: Tuesday, November 02, 2010 10:43 AM
To: Bowman, Dale O
Subject: Signature Authority

I have read and completed the technical review of the Magenta *Analysis Report for AP-070: Analysis of Magenta Hydraulic Tests Performed Between December 1978 and June 2009*. Dale has adequately addressed all of my comments. I give signature authority to Shelly Johnsen pertaining to my technical review DRC.

Randy Roberts
HydroResolutions
1536 Ricasoli Dr SE
Rio Rancho NM
505-934-8979

Information Only

Shannon Casey



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