UIC - I - __8__

EPA FALL-OFF TEST (WDW-1)

DATE:

2011

Submit 1 Copy To Appropriate District Office
District I – (575) 393-6161
1625 N. French Dr., Hobbs, NM 88240
District II – (575) 748-1283
811 S. First St., Artesia, NM 88210
District III – (505) 334-6178
1000 Rio Brazos Rd., Aztec, NM 87410
District IV – (505) 476-3460
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised August 1, 2011

WELL API NO.
30-015-27592

5. Indicate Type of Lease
STATE ☒ FEE ☐

6. State Oil & Gas Lease No.
B-2071-28

SUNDRY NOTICES AND REPORTS ON WELLS
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

7. Lease Name or Unit Agreement Name
Mewbourne WDW-1

1. Type of Well: Oil Well ☐ Gas Well ☐ Other **Injection Well**

8. Well Number **WDW-1**

2. Name of Operator
Navajo Refining Company

9. OGRID Number
15694

3. Address of Operator
Post Office Box 159, Artesia, New Mexico 88211

10. Pool name or Wildcat: **Navajo Permo-Penn 96918**

4. Well Location
Unit Letter **O** : **660** feet from the **South** line and **2210** feet from the **East** line
Section **31** Township **17S** Range **28E** NMPM County **Eddy**

11. Elevation *(Show whether DR, RKB, RT, GR, etc.)*
3678' GL

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:		SUBSEQUENT REPORT OF:	
PERFORM REMEDIAL WORK ☐	PLUG AND ABANDON ☐	REMEDIAL WORK ☐	ALTERING CASING ☐
TEMPORARILY ABANDON ☐	CHANGE PLANS ☐	COMMENCE DRILLING OPNS. ☐	P AND A ☐
PULL OR ALTER CASING ☐	MULTIPLE COMPL ☐	CASING/CEMENT JOB ☐	
DOWNHOLE COMMINGLE ☐			
OTHER: **PERFORM PRESSURE FALLOFF TEST, ANNULUS PRESURE TEST** ☒		OTHER: ☐	

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 19.15.7.14 NMAC. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

May 12, 2014 - Perform annulus pressure tests on WDW-1, WDW-2, and WDW-3 at an annulus pressure above 300 psig for 30 minutes on each well.
May 13, 2014 –Install bottomhole gauges into WDW-1, WDW-2, and WDW-3 by 11:45am. Continue injection into all three wells.
May 14, 2014 – Continue injection into all three wells.
May 15, 2014 – At 2:00 PM, the offset wells WDW-2 and WDW-3 will be shut-in. A constant injection rate will be established for WDW-1 at 160 GPM and continue for a 30 hour injection period. Do not exceed 1200 psig wellhead pressure.
May 16, 2014 – At 8:00pm, WDW-1 will be shut in for a 30-hour falloff period. WDW-2 and WDW-3 will remain shut-in.
May 17, 2014– All three wells will continue to be shut in while monitoring falloff pressure in all three wells.
May 18, 2014 – At 8:00am, acquire downhole pressure gauges from all three wells. Tag bottom of fill and come out of hole very slowly, making 7-minute gradient stops while coming out of WDW-1 every 1000 feet (7000 ft, 6000 ft, 5000 ft, 4000 ft, 3000 ft, 2000 ft, 1000 ft, surface). Turn the wells back to Navajo personnel.

Spud Date: | Rig Release Date:

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Timothy Jones TITLE Project Engineer DATE 4-24-14

Type or print nam~ _____ E-mail address: _____ PHONE: _____

For State Use Only

APPROVED BY: Carl J. Chavez TITLE Environmental Engineer DATE 4/25/14

Conditions of Approval (if any):

the Fall-off Test (FOT) shall comply with section III (Developing a Test plan) of the "NM Oil Conservation Division UIC Class I Well FOT Guidance" (December 3, 2007).

SUBSURFACE

Procedure for Testing Well #1 (Mewbourne)
April 21, 2014

Sunday, May 11, 2014

Subsurface personnel travel to Artesia, NM

Monday, May 12, 2014

Subsurface personnel and Pro-Well Testing personnel attend Navajo safety orientation.
Subsurface personnel will perform an annulus pressure test on WDW-1, WDW-2, and WDW-3 using a chart recorder. The annulus pressure must be above 300 psig during testing.

Tuesday, May 13, 2014

1. Install bottom hole memory gauges in all three wells and continue normal injection for 48 hours. Downhole Gauges need to be in wells by 11:45 am. Install surface pressure recorder on Mewbourne Well No. 1. Downhole Gauges to be set at the top of the perforations in all three wells as follows:

Mewbourne Well No. 1	7924 feet
Chukka Well No. 2	7570 feet
Gaines Well No. 3	7660 feet

Subsurface personnel will return to Houston,TX.

Wednesday, May 14, 2014

Continue normal injection into the wells.

Thursday, May 15, 2014

1. At 2:00 pm, Navajo personnel will shut-in offset wells, Chukka Well No. 2 and Gaines Well No. 3, start the 30-hour injection period for Mewbourne Well No. 1 at rate of approximately 160 GPM. The Chukka Well No. 2 and Gaines Well No. 3 will have to be isolated at the wing valve, MOV, and at the main pipeline valve.
2. Navajo Refining is to maintain a constant injection rate of approximately 160 GPM into the Mewbourne Well No. 1 for a minimum of 30 hours prior to shutting in the well. The 30 hours was the agreed upon time interval by the OCD and Navajo in previous falloff tests.
3. The rate should be constant during the 30-hour injection period. This might be best accomplished

by opening the pipe line and wellhead valves wide open allowing full flow to the well. Record the rate and wellhead pressure in the control room on a minimum of 15 second intervals during the injection period. Do not exceed 1200 psig wellhead pressure.

4. Plant personnel will record rate, volume, and pressure during the injection period for all wells to confirm that a constant pre-falloff injection rate is maintained.
5. Collect a grab sample of the injection fluid every 10 hours; analyze the fluid for pH and Specific Gravity.

Friday, May 16, 2014

6. At 8:00 pm, Navajo personnel will shut in Mewbourne Well No. 1 for the 30-hour falloff period. Chukka Well No. 2 and Gaines Well No. 3 will remain shut-in during the 30-hour falloff period. The Mewbourne No. 1 will need to be isolated at the wing valve, MOV, and at the main pipeline valve.

Saturday, May 17, 2014

7. Leave all three wells shut in and continue to monitor falloff pressures in all three wells. Subsurface personnel (Tim Jones) to return to site.

Sunday, May 18, 2014

8. At 8:00 am, acquire downhole pressure memory gauges from all three wells.
9. Tag bottom of fill and come out of hole very slowly (no faster than 30 feet per minute), making 7-minute gradient stops while coming out of Mewbourne Well No. 1 every 1000 feet (7000 feet, 6000 feet, 5000 feet, 4000 feet, 3000 ft., 2000 feet, 1000 feet, Surface).
10. Turn well over to Navajo personnel. Subsurface personnel to return to Houston,TX.

Submit 1 Copy To Appropriate District Office
District I – (575) 393-6161
1625 N. French Dr., Hobbs, NM 88240
District II – (575) 748-1283
811 S. First St., Artesia, NM 88210
District III – (505) 334-6178
1000 Rio Brazos Rd., Aztec, NM 87410
District IV – (505) 476-3460
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised August 1, 2011

WELL API NO.
30-015-20894

5. Indicate Type of Lease
STATE ☒ FEE ☐

6. State Oil & Gas Lease No. **6852**

SUNDRY NOTICES AND REPORTS ON WELLS
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

7. Lease Name or Unit Agreement Name
Chukka WDW-2

1. Type of Well: Oil Well ☐ Gas Well ☐ Other **Injection Well**

8. Well Number **WDW-2**

2. Name of Operator
Navajo Refining Company

9. OGRID Number
15694

3. Address of Operator
Post Office Box 159, Artesia, New Mexico 88211

10. Pool name or Wildcat: **Navajo Permo-Penn 96918**

4. Well Location
Unit Letter **E** : **1980** feet from the **North** line and **660** feet from the **West** line
Section **12** Township **18S** Range **27E** NMPM County **Eddy**

11. Elevation *(Show whether DR, RKB, RT, GR, etc.)*
3607' GL, 3623' RKB

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
PERFORM REMEDIAL WORK	☐	PLUG AND ABANDON	☐	REMEDIAL WORK	☐	ALTERING CASING	☐
TEMPORARILY ABANDON	☐	CHANGE PLANS	☐	COMMENCE DRILLING OPNS.	☐	P AND A	☐
PULL OR ALTER CASING	☐	MULTIPLE COMPL	☐	CASING/CEMENT JOB	☐		
DOWNHOLE COMMINGLE	☐						
OTHER: **PERFORM PRESSURE FALLOFF TEST**	☒			OTHER:			☐

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 19.15.7.14 NMAC. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

June 16, 2014 –Install bottomhole gauges into WDW-1, WDW-2, and WDW-3 by 11:45am. Continue injection into all three wells.
June 17, 2014 – Continue injection into all three wells.
June 18, 2014 – At 12:00 pm, the offset wells WDW-1 and WDW-3 will be shut-in. A constant injection rate of 160 GPM will be established for WDW-2 and continue for a 30 hour injection period. Do not exceed 1200 psig wellhead pressure.
June 19, 2014 – At 6:00pm, WDW-2 will be shut in for a 30-hour falloff period. WDW-1 and WDW-3 will remain shut-in.
June 20, 2014 – All three wells will continue to be shut in while monitoring falloff pressure in all three wells.
June 21, 2014 – At 8:00am, acquire downhole pressure gauges from all three wells. Tag bottom of fill and come out of hole very slowly, making 7-minute gradient stops while coming out of the WDW-2 every 1000 feet (7000 ft, 6000 ft, 5000 ft, 4000 ft, 3000 ft, 2000 ft, 1000 ft, surface). Turn the wells back to Navajo personnel.

Spud Date: | Rig Release Date:

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Timothy Jan TITLE Project Engineer DATE 4-24-14

Type or print name _____ E-mail address: _____ PHONE: _____

For State Use Only

APPROVED BY: Carl J. Chavez TITLE Environmental Engineer DATE 4/25/14

Conditions of Approval (if any):

the Fall-Off Test (FOT) shall comply with Section III (Developing a Test Plan) of the "NM Oil Conservation Division UIC Class I Well FOT Guidance" (December 3, 2007).

SUBSURFACE

Procedure for Testing Well #2 (Chukka)
April 21, 2014

Sunday, June 15, 2014

Subsurface personnel will travel to Artesia, NM

Monday, June 16, 2014

Install bottom hole memory gauges in all three wells and continue normal injection for 48 hours. Gauges need to be in wells by 12:00 pm. Install surface pressure recorder on Chukka Well No. 2. Gauges to be set at the top of the perforations in all three wells as follows:

Mewbourne Well No. 1	7924 feet
Chukka Well No. 2	7570 feet
Gaines Well No. 3	7660 feet

Tuesday, June 17, 2014

Continue normal injection into the wells.

Wednesday, June 18, 2014

1. At 12:00 pm, Navajo personnel will shut-in offset wells, Mewbourne Well No. 1 and Gaines Well No. 3, start the 30-hour injection period for Chukka Well No. 2. The Mewbourne Well No. 1 and Gaines Well No. 3 will have to be isolated at the wing valve, MOV, and at the main pipeline valve.
2. Navajo Refining is to maintain a constant injection rate of 160 GPM into the Chukka Well No. 2 for a minimum of 30 hours prior to shutting in the well. The 30 hours was the agreed upon time interval by the OCD and Navajo in the approved test plan.
3. The rate should be constant during the 30 hour injection period. This might be best accomplished by opening the pipe line and wellhead valves wide open allowing full flow to the well. Record the rate and wellhead pressure in the control room on a minimum of 15 second intervals during the injection period. Do not exceed 1200 psig wellhead pressure.
4. Plant personnel will record rate, volume, and pressure during the injection period for all wells to confirm that a constant pre-falloff injection rate is maintained.
5. Collect a grab sample of the injection fluid every 10 hours; analyze the fluid for pH and Specific

SUBSURFACE

Gravity.

Thursday, June 19, 2014

6. At 6:00 pm, Navajo personnel will shut in Chukka Well No. 2 for the 30-hour falloff period. Mewbourne Well No. 1 and Gaines Well No. 3 will remain shut-in during the 30 hour falloff period. The Chukka Well No. 2 will need to be isolated at the wing valve, MOV, and at the main pipeline valve.

Friday, June 20, 2014

7. Continue monitoring pressure falloff in Chukka Well No. 2.

Saturday, June 21, 2014

8. Leave all three wells shut in and continue to monitor falloff pressures in all three wells. Subsurface personnel (Tim Jones) to return to site.
9. At 8:00 am, acquire downhole pressure memory gauges from all three wells.
10. Tag bottom of fill and come out of hole very slowly (no faster than 30 feet per minute), making 7-minute gradient stops while coming out of Chukka Well No. 2 every 1000 feet (7000 feet, 6000 feet, 5000 feet, 4000 feet, 3000 feet, 2000 feet, 1000 feet, Surface).
11. Turn well over to Navajo personnel. Subsurface personnel (Tim Jones) to return to Houston, TX.

Submit 1 Copy To Appropriate District Office
District I – (575) 393-6161
1625 N. French Dr., Hobbs, NM 88240
District II – (575) 748-1283
811 S. First St., Artesia, NM 88210
District III – (505) 334-6178
1000 Rio Brazos Rd., Aztec, NM 87410
District IV – (505) 476-3460
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised August 1, 2011

WELL API NO.
30-015-26575

5. Indicate Type of Lease
STATE ☒ FEE ☐

6. State Oil & Gas Lease No.
NM-0557371

SUNDRY NOTICES AND REPORTS ON WELLS
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

7. Lease Name or Unit Agreement Name
Gaines WDW-3

1. Type of Well: Oil Well ☐ Gas Well ☐ Other **Injection Well**

8. Well Number **WDW-3**

2. Name of Operator
Navajo Refining Company

9. OGRID Number
15694

3. Address of Operator
Post Office Box 159, Artesia, New Mexico 88211

10. Pool name or Wildcat: **Navajo Permo-Penn**

4. Well Location
Unit Letter **N** : **790** feet from the **South** line and **2250** feet from the **West** line
Section **01** Township **18S** Range **27E** NMPM County **Eddy**

11. Elevation *(Show whether DR, RKB, RT, GR, etc.)*
3609' GL, ' RKB

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

NOTICE OF INTENTION TO:		SUBSEQUENT REPORT OF:	
PERFORM REMEDIAL WORK ☐	PLUG AND ABANDON ☐	REMEDIAL WORK ☐	ALTERING CASING ☐
TEMPORARILY ABANDON ☐	CHANGE PLANS ☐	COMMENCE DRILLING OPNS. ☐	P AND A ☐
PULL OR ALTER CASING ☐	MULTIPLE COMPL ☐	CASING/CEMENT JOB ☐	
DOWNHOLE COMMINGLE ☐			
OTHER: **PERFORM PRESSURE FALLOFF TEST** ☒		OTHER:	☐

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 19.15.7.14 NMAC. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

July 14, 2014 –Install bottomhole gauges into WDW-1, WDW-2, and WDW-3 by 12:00 pm. Continue injection into all three wells.
July 15, 2014 – Continue injection into all three wells.
July 16, 2014 – At 12:00 pm, the offset wells WDW-1 and WDW-2 will be shut-in. A constant injection rate of 160 GPM will be established for WDW-3 and continue for a 30 hour injection period. Do not exceed 1200 psig wellhead pressure.
July 17, 2014 – At 6:00pm, WDW-3 will be shut in for a 30-hour falloff period. WDW-1 and WDW-2 will remain shut-in.
July 18, 2014 – All three wells will continue to be shut in while monitoring falloff pressure in all three wells.
July 19, 2014 – At 8:00am, acquire downhole pressure gauges from all three wells. Tag bottom of fill and come out of hole very slowly, making 7-minute gradient stops while coming out of WDW-3 every 1000 feet (7000 ft, 6000 ft, 5000 ft, 4000 ft, 3000 ft, 2000 ft, 1000 ft, surface). Turn the wells back to Navajo personnel.

Spud Date: Rig Release Date:

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Timothy J... TITLE Project Engineer DATE 4-24-14

Type or print name _____ E-mail address: _____ PHONE: _____

For State Use Only

APPROVED BY: Carly. Chavez TITLE Environmental Engineer DATE 4/25/14

Conditions of Approval (if any):

The Fall-off Test (FOT) shall comply with Section III (Developing a Test Plan) of the "NM Oil Conservation Division UIC Class I Well FOT Guidance" (December 3, 2007).

SUBSURFACE

Procedure for Testing Well #3 (Gaines)
April 21, 2014

Sunday, July 13, 2014

Subsurface personnel to travel to Artesia, NM

Monday, July 14, 2014

1. Install bottom hole memory gauges in all three wells and continue normal injection for 48 hours. Gauges need to be in wells by 12:00 pm. Install surface pressure recorder on Gaines Well No. 3. Gauges to be set at the top of the perforations in all three wells as follows;

Mewbourne Well No. 1	7924 feet
Chukka Well No. 2	7570 feet
Gaines Well No. 3	7660 feet

Subsurface personnel will return to Houston.

Tuesday, July 15, 2014

Continue normal injection into the wells.

Wednesday, July 16, 2014

1. At 12:00 pm, Navajo personnel will shut-in offset wells, Chukka Well No. 2 and Mewbourne Well No. 1, start the 30-hour injection period for Gaines Well No. 3. The Chukka Well No. 2 and Mewbourne Well No. 1 will have to be isolated at the wing valve, MOV, and at the main pipeline valve.
2. Navajo Refining is to maintain a constant injection rate at approximately 160 GPM into the Gaines Well No. 3 for a minimum of 30 hours prior to shutting in the well. The 30 hours was the agreed upon time interval by the OCD and Navajo in the approved test plan.
3. The rate should be constant at 160 GPM during the 30-hour injection period. This might be best accomplished by opening the pipe line and wellhead valves wide open allowing full flow to the well. Record the rate and wellhead pressure in the control room on a minimum of 15 second intervals during the injection period. Do not exceed 1200 psig wellhead pressure.
4. Plant personnel will record rate, volume, and pressure during the injection period for all wells to confirm that a constant pre-falloff injection rate is maintained.
5. Collect a grab sample of the injection fluid every 10 hours; analyze the fluid for pH and Specific Gravity.

SUBSURFACE

Thursday, July 17, 2014

6. Continue constant injection into Gaines Well No. 3. The offset wells Mewbourne and Chukka will remain shut-in.
7. At 6:00 pm, Navajo personnel will shut in Gaines Well No. 3 for the 30-hour falloff period. Chukka Well No. 2 and Mewbourne Well No. 1 will remain shut-in during the 30-hour falloff period. The Gaines No. 3 will need to be isolated at the wing valve, MOV, and at the main pipeline valve.

Friday, July 18, 2014

8. Continue to monitor pressure falloff in Gaines Well No. 3.

Saturday, July 19, 2014

9. At 8:00 am, acquire downhole pressure memory gauges from all three wells.
10. Tag bottom of fill and come out of hole very slowly (no faster than 30 feet per minute), making 7-minute gradient stops while coming out of Gaines Well No. 3 every 1000 feet (7000 feet, 6000 feet, 5000 feet, 4000 feet, 3000 feet, 2000 feet, 1000 feet, Surface).
11. Turn well over to Navajo personnel. Subsurface personnel to return to Houston, TX.

HOLLYFRONTIER
THE HOLLYFRONTIER COMPANIES

March 20, 2012

CERTIFIED MAIL/RETURN RECEIPT
7011 3500 0001 4786 4153

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505

Re: 2011 Falloff CD Data
Disposal Wells
Navajo Refining Company, L.L.C.
Artesia, NM Refinery

Carl,

Enclosed, you will find a CD of the 2011 Pressure Falloff Tests (PFOT) Data for our injection wells at Navajo Refinery, NM.

If there are any questions, please call me at 575-746-5382.

Sincerely,

Robert Combs
Environmental Specialist

HOLLYFRONTIER
THE HOLLYFRONTIER COMPANIES

March 2, 2012

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505

RE: 2011 Annual Bottom-Hole Pressure Survey & Pressure Falloff Test for Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3
Navajo Refining Company
Disposal Wells WDW-1, WDW-2, WDW-3

Mr. Chavez,

Enclosed, please find three (3) copies of our 2011 Pressure Falloff (PFO) Test & Bottom-Hole Pressure Survey for Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3.

If you have any questions, please contact me at the above address or by telephone at (575) 746-5382.

Sincerely,

Robert Combs, PhD
Environmental Specialist

Electronic cc (wo/enc): MGM, JEL

Environmental File: 2011 Pressure Falloff Test & Bottom-Hole Pressure Survey
Environmental Library

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Thursday, March 15, 2012 11:13 AM
To: robert.combs@hollyfrontier.com
Subject: WDWs Fall-Off Testing & Electronic Data Compilation from Individual FOTs for Software Evaluation

Robert:

Could you please send the supporting electronic data for the FOTs per well to the OCD?

Navajo should have the type of electronic data that the OCD requires in case you have questions.

Thank you.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3490
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/
"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

SUBSURFACE

2011 ANNUAL BOTTOM-HOLE PRESSURE SURVEY AND PRESSURE FALLOFF TEST FOR MEWBOURNE WELL NO. 1

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO
PROJECT NO. 70A6645

REPORT SUBMITTED:
FEBRUARY 2012

PREPARED BY:

SUBSURFACE CONSTRUCTION CORP.
6925 PORTWEST DRIVE, SUITE 110
HOUSTON, TEXAS 77024
pfh@subsurfacegroup.com

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APPENDICES

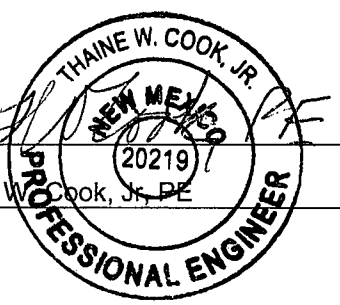
I Thaine W Cook, Jr, PE certify that the following is accurate:

1. I or my agent have visited and examined the Navajo Refining Mewbourne #1 facility;
2. This report was prepared in accordance with good engineering practice and accepted and sound industry practices and standards;
3. I either have prepared engineering portions of this report or they were prepared under my supervision and I certify that they are correct.

Signature _____ Title: Principal Consultant

Name Thane W Cook, Jr, PE Date: 2/3/2012

New Mexico PE # 20219



EXECUTIVE SUMMARY

Subsurface Construction Corp (Subsurface) was contracted by Navajo Refining Company (Navajo) to perform a pressure falloff test, bottom-hole pressure survey, and temperature survey on Navajo's Mewbourne Well No. 1. The test was performed according to New Mexico Oil Conservation Division (OCD) falloff test guidelines (*New Mexico Oil Conservation Division UIC Class I Well Fall-Off Test Guidance, December 3, 2007*).

The test provides the state regulatory agency with the necessary information to access the validity of requested or existing injection well permit conditions and satisfy the permitting objective of protecting the underground sources of drinking water (USDW). Specifically, 40 CFR Part 146 states "the Director shall require monitoring of the pressure buildup in the injection zone annually, including at a minimum, a shutdown of the well for a time sufficient to conduct a valid observation of the pressure fall-off curve" (40 CFR§146.13 for Non-hazardous Class I Wells).

The falloff testing was conducted according to the test plan submitted and approved by the OCD. The test plan stated that, all offset wells that inject into the injection interval would be shut-in for the duration of the test period. The testing consisted of a 30-hour injection period and a 30-hour falloff period. Bottom-hole pressure gauges were also placed in the offset wells Gaines Well No. 3 and Chukka Federal Well No. 2. These wells are owned by Navajo and are used to inject plant waste into the same intervals as the Mewbourne Well No. 1.

As prescribed by the guidelines, the report discusses supporting and background information in Sections 1 through 9. The one mile area of review (updated since the 2010 falloff testing) is discussed in Section 10 and geology in Section 11. Information on the offset wells is discussed in Section 12, daily testing activities in Section 13, and point of shut-in, in Section 14. The pressure falloff testing and analysis results are discussed in Section 15. The OCD required record keeping statement is discussed in Section 16.

1. FACILITY INFORMATION

a. Name: Navajo Refining Company (subsidiary of the Holly Corporation)
b. Facility Location: Highway 82 East, Artesia, New Mexico 88211
c. Operator's Oil and Gas Remittance Identifier (OGRID) Number: 223518

2. WELL INFORMATION

a. OCD UIC Permit Number: UIC-CLI-008-1
b. Well Classification: Class I Non-hazardous
c. Well Name and Number: Mewbourne Well No. 1
d. API Number: 30-015-27592
e. Well Legal Location: 660 FSL, 2310 FEL

3. CURRENT WELLBORE SCHEMATIC

The Mewbourne Well No. 1 wellbore schematic is presented in Figure 1. The schematic has all data as requested by the guidelines and includes the following:

a. Tubing: 4-1/2-inch, 11.6 pound per foot, steel construction, API grade N-80, with long thread connections (LT&C).

b. Packer: Arrow X-1, 7-inch by 3-1/2-inch set in tension at 7,879 feet.

c. Tubing Length: 7,879 feet. There are no profile nipples in the tubing or the packer as this was not a requirement of the permit.

d. Size, Type, and Depth of Casing: There are three casing strings in the well. The information for these casing strings was obtained from OCD records on file with the state and geophysical logs. The casing strings are:

   i. 13-3/8-inch, 48 pound per foot, steel construction, API grade J-55, with short thread connections (ST&C), set at a depth of 390 feet. The casing was cemented to the surface with 525 sacks of cement. The casing was set in open hole with a diameter of 17.5 inches. This information was obtained from OCD records.

ii. 9-5/8-inch, 36 pound per foot, steel construction, API grade J-55, ST&C, set at a depth of 2,555 feet. The casing was cemented to the surface with 1,000 sacks of cement. The casing was set in open hole with a diameter of 12.25 inches. This information was obtained from OCD records.

iii. 7-inch, 26 pound per foot and 29 pound per foot, steel construction, API grade N-80 and P-110, LT&C, set at a depth of 9,094 feet. The casing was cemented to surface in two stages with 1,390 sacks of cement. The casing was set in open hole with a diameter of 8.75 inches. The top cement was verified with a CBL run on July 23, 1998. The remainder of the information was obtained from OCD records.

iv. A cement plug at 9,004 feet isolates the lower section of the original borehole. This information was obtained from OCD records.

e. The top of cement was determined from a CBL run in the 7-inch casing string on July 23, 1998. The top of cement in the 7-inch casing was found at the surface. The top of cement in the 9-5/8-inch and 13-3/8-inch casing strings was verified through OCD records and volume calculations.

f. The 7-inch casing was perforated on July 24 and July 27, 1998. The casing was perforated with a 0.5-inch diameter hole at 2 shots per foot on a 60° phasing. The perforations are located between 7,924 feet and 8,188 feet and from 8,220 feet to 8,476 feet.

g. The total depth of the well is 10,200 feet with the plug back depth at 9,004 feet. On November 13, 2011, fill was tagged at 8,668 feet.

h. The bottom-hole pressure gauges run in the Mewbourne Well No. 1 for the pressure falloff testing consisted of two memory (top of the perforations) (MRO) pressure gauges were placed at 7,922 feet and the other was placed two feet lower at 7,924 feet.

4. ELECTRIC LOG ENCOMPASSING THE COMPLETED INTERVAL

The dual induction log is presented in Appendix A and encompasses the completed interval between 7,924 feet and 8,476 feet. The dual induction log was submitted to the OCD with the original permit after the well was drilled by the Mewbourne Oil Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well.

5. RELEVANT PORTIONS OF THE POROSITY LOG USED TO ESTIMATE FORMATION POROSITY

The neutron density log is presented in Appendix B and encompasses the completed interval between 7,924 feet and 8,476 feet. The neutron density log was submitted to the OCD with the original permit after the well was drilled by Mewbourne Oil Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well. The porosity of the formation, 10%, and the reservoir thickness, 175 feet, were determined from this log. These values were used in the analysis of the pressure falloff data (Section 15). Additional information concerning the geology of the injection reservoir is discussed in Section 11.

6. PVT DATA OF THE FORMATION AND INJECTION FLUID

The Mewbourne Well No. 1 was recompleted in July 1998, prior to the issuance of the current well testing guidelines (December 3, 2007). At the time, no directives were in place to test formation fluids or derive formation characteristics from cores. However, reservoir fluid samples were obtained during the recompletion and the average density and average total dissolved solids (TDS) were measured at 1.03 g/l and 26,500 mg/l, respectively. The analytical results of the analysis of the formation fluid are summarized in Table I.

The viscosity of the formation fluid, formation water compressibility, and total system compressibility were estimated in reference to bottom-hole temperature using industry accepted correlations. These correlations are found in the Society of Petroleum Engineer's "Advances in Well Test Analysis, Monograph Volume 5" and "Pressure Buildup and Flow Tests in Wells, Monograph Volume 1".

a. Estimation of formation fluid and reservoir rock compressibility:

   The fluid compressibility of the formation brine was estimated for a sodium chloride solution (26,500 mg/l) at the bottom-hole temperature of 127°F using Appendix C (Figure D.16 SPE Monograph 5). This value was 2.9×10^{-6} psi^{-1}. The formation pore volume compressibility was estimated using Appendix D (Figure G.5 SPE Monograph 1). This value was 5.5×10^{-6} psi^{-1}. The total system compressibility is the sum of the fluid compressibility and the pore volume compressibility, 8.4×10^{-6} psi^{-1}. The temperature used with the correlations was recorded during the temperature survey conducted in the Mewbourne Well No. 1 on July 23, 1998, and included in this report as Appendix E.

b. Formation fluid viscosity with reference temperature:

   The formation fluid had a TDS concentration of 26,500 mg/l. This equates to an approximate equivalent percentage of NaCl of 4.5%. The average viscosity of the formation fluid was estimated using Appendix F (Figure D.35 SPE Monograph 5). This value was 0.57 centipoise (cp) at 127°F.

c. Formation fluid specific gravity/density with reference temperature:

   The average formation fluid density was measured at 1.03 g/l at 70°F (Table I).

d. Injection fluid specific gravity, viscosity and compressibility with reference temperature:

The specific gravity and pH of the refinery waste water were measured during the injection portion of the reservoir testing. The specific gravity was 1.01 (8.41 pounds per gallon). This equates to an approximate equivalent percentage of NaCl of 4%. Using the same methodology described above, the viscosity of the injected fluid was 0.54 cp at 127°F. The compressibility of the injected plant waste was 2.9×10^{-6} psi^{-1} at 127°F.

7. DAILY RATE HISTORY DATA (MINIMUM OF ONE MONTH PRECEDING THE FALLOFF TEST)

The rate history used in the analysis of the pressure falloff data began on October 16, 2010 following the 2010 falloff testing completed on October 5, 2010. The daily rate history is summarized in Appendix G.

8. CUMULATIVE INJECTION INTO THE FORMATION FROM TEST WELL AND OFFSET WELLS

The total volume of fluid injected into all three wells as of November 14, 2011, was 2,573,523,811 gallons. The volume of fluid injected into the Mewbourne Well No. 1 was 1,409,060,054 gallons. The volume of fluid injected into the Chukka Well No. 2 was 822,255,671 gallons. The volume of fluid injected into the Gaines Well No. 3 was 342,208,086 gallons. The area of review (AOR) indicates that there are no other wells injecting into the intervals in which the Navajo wells inject. The volumes injected were obtained from plant records.

9. PRESSURE GAUGES

Two (2) down hole pressure gauges and one surface pressure gauge were used for the Mewbourne Well No. 1 buildup and falloff testing. The down hole pressure gauges were set at 7,922 feet and 7,924 feet. Bottom-hole pressure gauges were also placed in each of the offset wells: Gaines Well No. 3 and Chukka Well No. 2. The pressure gauges were set at 7,660 feet in the Gaines Well No. 3 and at 7,570 feet in the Chukka Well No. 2.

a. Describe the type of down hole surface pressure readout gauge used including manufacture and type:

In the Mewbourne Well No. 1, two MRO pressure gauges were used to record the pressure and temperature data during the injection/falloff testing. Both gauges were sapphire crystal gauges. The manufacturer of the MRO pressure gauges (Serial Nos. 76111 and 76888) is Spartek Systems. The surface pressure gauge was a quartz crystal gauge (Serial No. 10469) manufactured by Spartek Systems.

In the Gaines Well No. 3, two MRO pressure gauges were used to monitor the bottom-hole pressure and temperature during the testing of the Mewbourne Well No. 1. Both gauges were sapphire crystal gauges with Serial Nos. 76077 and 76120. Both gauges are manufactured by Spartek Systems.

In the Chukka Well No. 2, two MRO pressure gauges were used to monitor the bottom-hole pressure and temperature during the testing of the Mewbourne Well No. 1. Both gauges were sapphire crystal gauges with Serial Nos. 77120 and 76404. Both gauges are manufactured by Spartek Systems.

b. List the full range, accuracy and resolution of the gauge:

In Mewbourne Well No. 1, the MRO pressure gauges, Serial Nos. 76111 and 76888 has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale. The surface pressure gauge (Serial No. 10469) has a full range of 0 psi to 6,000 psi, an accuracy of 0.03% of full scale, and a resolution of 0.0003% of full scale.

In Gaines Well No. 3, the MRO pressure gauge, Serial No. 76077, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale. The MRO pressure gauge, Serial No. 76120, has a full range of 0 psi to 6,000 psi, and accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

In Chukka Well No. 2, the MRO pressure gauge, Serial No. 76404, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale. The MRO pressure gauge, Serial No. 77120, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

c. Provide the manufacturer's recommended frequency of calibration and a calibration certificate showing date the gauge was last calibrated:

The certificate of calibration for each of the pressure gauges used during the testing are included as Appendix H. The manufacturer's recommended calibration frequency is one year.

10. ONE MILE AREA OF REVIEW (AOR)

Federal Abstract Company was contracted by Subsurface and instructed to undertake a review of well changes made within a one-mile area of review (AOR) of the Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3. In 2009, an update of the original AOR, submitted with the Discharge Application Permit 2003, was completed within the one-mile AOR for all three wells. The current update includes all existing wells within the one-mile AOR and any changes that have occurred to these wells since the 2010 update.

No new fresh water wells were reported within the search area since the submittal of the 2010 report. The discharge application lists the water wells located in the Area of Review.

a. Identify wells located within the one mile AOR:

Table II also contains a listing of all wells within the one-mile AOR of Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3. Figure 6 is a Midland Map Company base map of the area containing the one mile AOR.

b. Ascertain the status of wells within the one mile AOR:

Table II contains a listing of all wells within the one-mile AOR, with their current status. Tables III through XIII contain a list of all wells within the one-mile AOR that have had modifications to the current permit or have had new drilling and/or completion permits issued since the 2010 annual report submittal.

Ninety-four (94) wells were found in which the owner had changed. Two (2) new plugged and abandoned oil and gas wells were found. No wells were placed in temporarily abandoned status. One (1) well was found that was returned to production status. One (1) well was found that had been recompleted.

There were thirty-two (32) new drills and permits to drill, of which none penetrated the Wolfcamp interval. All plugged and abandoned wells were successfully plugged and isolated from the Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3 injection intervals according to current OCD records.

c. Provide details on any offset producers and injectors completed in the same interval:

Navajo has two injection wells in the same interval. Mewbourne Well No. 1 is listed as ID No. 59 in Table II and no changes have occurred to this well. Chukka Well No. 2 is listed as ID No. 120 in Table II and no changes have occurred to this well. The Gaines Well No. 3 is listed as #861 in Table XI. The wellbore schematics for the Gaines Well No. 3 and Chukka Well No. 2 are presented as Figure 3 and Figure 4, respectively.

11. GEOLOGY

The injection zones are porous carbonates of the lower portion of the Wolfcamp Formation, the Cisco Formation, and the Canyon Formation. These formations occur in the Mewbourne Well No. 1, the Chukka Well No. 2, and the Gaines Well No. 3 at the depths shown in the table below.

Injection Zone Formation	Mewbourne Well No. 1 (KB = 3,693 ft)		Chukka Well No. 2 (KB = 3,623 ft)		Gaines Well No. 3 (KB = 3,625 ft)	
	MD below KB (ft)	SS Depth (ft)	MD below KB (ft)	SS Depth (ft)	MD below KB (ft)	SS Depth (ft)
Lower Wolfcamp	7,450	-3,757	7,270	-3,647	7,303	-3,678
Cisco	7,816	-4,123	7,645	-4,022	7,650	-4,025
Canyon	8,475	-4,782	8,390	-4,767	8,390	-4,765
Base of Injection Zone (base of Canyon)	9,016	-5,323	8,894	-5,271	8,894	-5,269

a. Description of the geological environment of the injection interval:

The lower portion of the Wolfcamp Formation (Lower Wolfcamp) is the shallowest porous unit in the proposed injection interval. The Wolfcamp Formation (Permian-Wolf campaign age) consists of light brown to tan, fine to medium-grained, fossiliferous limestones with variegated shale interbeds (Meyer, 1966, page 69). The top of the Wolfcamp Formation was correlated for this study to be below the base of the massive, dense dolomites of the overlying Abo Formation. The base of the Wolfcamp coincides with the top of the Cisco Formation. The thickness of log porosity greater than 5% in the entire Wolfcamp Formation ranges from 0 feet to 295 feet in a band three miles wide that trends northeast-southwest across the study area.

The Cisco Formation (Pennsylvanian-Virgilian age) of the Northwest Shelf is described by Meyer (1966, page 59) as consisting of uniform, light colored, chalky, fossiliferous limestones interbedded with variegated shales. Meyer (1966, page 59) also describes the Cisco at the edge of the Permian basin as consisting of biothermal (mound) reefs composed of thick, porous, coarse-grained dolomites. Locally, the Cisco consists of porous dolomite that is 745 feet thick in Chukka Well No. 2, 659 feet thick in Mewbourne Well No. 1, and 720 feet in Gaines Well No. 3.

The total thickness of intervals with log porosity greater than 5% is approximately 310 feet in Mewbourne Well No. 1, 580 feet in Chukka Well No. 2, and 572 feet in Gaines Well No. 3. The total thickness with log porosity greater than 10% is approximately 100 feet in Mewbourne Well No. 1, 32 feet in Chukka Well No. 2, and 65 feet in Gaines Well No. 3. The thickness of the porous intervals in the Cisco ranges from 0 feet in the northwestern part of the study area to nearly 700 feet in a band three miles wide that trends northeast-southwest.

The Canyon Formation (Pennsylvanian-Missourian age) consists of white to tan to light brown fine grained, chalky, fossiliferous limestone with gray and red shale interbeds (Meyer, 1966, page 53). Locally, the Canyon occurs between the base of the Cisco dolomites and the top of the Strawn Formation (Pennsylvanian-Desmoinesian age). The total thickness of intervals with log porosity greater than 5% is 34 feet in Mewbourne Well No. 1, 30 feet in Chukka Well No. 2, and 10 feet in Gaines Well No. 3. No intervals appear to have log porosity greater than 10% in any of the three injection wells.

b. Discuss the presence of geological features, i.e., pinchouts, channels, and faults, if applicable:

From the geological study completed and submitted in the Discharge Plan Application and Application for Authorization to Inject, the reservoir appears to be continuous, with the possibility of anisotropic conditions extending to the west-southwest. The injection intervals that were studied are well confined by the Abo and Yeso low porosity carbonate beds, Tubbs shale, and Salado salt. The Cisco and Wolfcamp formations follow the Vacuum arch and have a southeasterly dip. No faults existed in the study area although, the study also shows that faulting occurs via the K-M fault located 6 miles northwest of Artesia and trends northeast-southwest. The distance to this fault line occurs no closer than 16 miles. No faults are known to exist in the confining zone within the AOR.

c. Provide a portion of relevant structure map, if necessary:

The structure map for Strawn is presented as Appendix I. The structure map for the Wolfcamp presented as Appendix J. The structure map for the Cisco is presented as Appendix K.

12. OFFSET WELLS

There are only two offset wells identified in the AOR that inject into the same interval: the Gaines Well No. 3 and the Chukka Well No. 2. Both wells were shut-in during the buildup and falloff portions of the testing.

a. Identify the distance between the test well and any offset well completed in the same injection interval:

The Mewbourne Well No. 1 is approximately 7,900 feet from Gaines Well No. 3, the test well. The Chukka Well No. 2 is approximately 10,860 feet from the Mewbourne Well No. 1.

b. Report the status of the offset wells during both the injection and shut-in portions of the test:

Both the Gaines Well No. 3 and Chukka Well No. 2 were shut-in during the buildup and falloff portions of the testing. Bottom-hole pressure gauges were lowered into each well approximately 48 hours before shutting in the Mewbourne Well No. 1. The bottom-hole pressure and temperature data are graphically depicted in Figure 5 for the Gaines Well No. 3 and Figure 2 for the Chukka Well No. 2.

c. Describe the impact, if any, the offset wells had on the testing:

The offset wells were shut in prior to beginning the 30-hour injection period and remained shut-in during the falloff portion of the testing.

13. CHRONOLOGICAL LISTING OF THE DAILY TESTING ACTIVITIES (OPERATIONS LOG)

Appendix L contains the formal Chronology of Field Activities. This chronology was developed from the field activity reports.

a. Date of the testing:

The buildup portion of the testing started on November 10, 2011, at 1:51 p.m. and continued until November 11, 2011, at 7:25 p.m., when the Mewbourne Well No. 1 was shut-in. The falloff test ended on November 13, 2011, at 7:34 a.m. The total depth of the well was tagged at 9,001 feet and five-minute gradient stops were made while pulling the pressure gauges out of the wellbore. At 1:00 p.m., on November 13, 2011, the well was turned over to Navajo plant operations personnel.

b. Time of the injection period:

The buildup portion of the testing began on November 10, 2011, when the injection rate was set at an average injection rate of 160.00 gallons per minute (gpm). The injection rate was held constant for 29.6 hours. The total injection period used in the pressure falloff analysis was 31 hours.

c. Type of injection fluid:

The injected fluid was non-hazardous waste water from the plant. The density of the injection fluid was periodically measured and averaged 8.34 pounds per gallon during the 29.6-hour injection period.

d. Final injection pressure and temperature prior to shutting in the well:

The final flowing pressure (P_{wf}) and temperature (T_{wf}) were 4,141.75 psia and 94.9°F, respectively.

e. Total shut-in time:

The Mewbourne Well No. 1 was shut-in with offset wells shut-in for 31 hours.

f. Final static pressure and temperature at the end of the fall-off portion of the test:

The final static pressure at 7,924 feet was 3,854.83 psia. The final temperature was 100.1°F.

14. DESCRIBE THE LOCATION OF THE SHUT-IN VALVE USED TO CEASE FLOW TO THE WELL FOR THE SHUT-IN PORTION OF THE TEST

On the pipeline to the Mewbourne Well No. 1, there are two, 4-inch motor controlled valves installed on the incoming pipeline before the pod filters. Two 4-inch valves are installed between the pod filters and the wellhead. There is one 6-inch valve installed in the main line between the pod filters and the wellhead. A 4-1/16-inch wing valve is installed on the wellhead. All valves were closed during the falloff portion of the testing. A diagram of the wellhead is shown in Figure 7 and a diagram of the valve locations are shown in Figure 8.

15. PRESSURE FALLOFF ANALYSIS

The following discussion of the analysis of the pressure data recorded during the falloff testing of the Mewbourne Well No. 1 satisfies Sections 15 through 19 of Section IX, Report Components, of the OCD's falloff test guidelines. Where appropriate, the specific guideline addressed is annotated. Specific parameters used in the equations and discussed previously in this report are also annotated. The plots included with this report are summarized in Table IX. The inclusion of these plots in this report satisfies OCD Guideline Section IX.18.

The pressure data obtained during the falloff test were analyzed using the commercially available pressure transient analysis software program PanSystem©. Appendix M contains the output from this software program. Figure 9 shows the

pressure data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 36.15 hour total shut-in period. Figure 10 shows the pressure and temperature data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 31.03 hour falloff shut-in period. Figure 11 is a Cartesian plot of the injection rates versus time for the injection period used in the pressure falloff analysis. The superposition time function was used to account for all rate changes during the injection period. Figure 12 is a plot of the surface pressures and injection rates versus time for the stabilized injection period of the testing. Figure 13 is a plot of the historical injection rates and surface pressures versus calendar time.

Figure 14 is a log-log diagnostic plot of the falloff data, showing change in pressure and pressure derivative versus equivalent shut in time. The different flow regimes, wellbore storage, radial flow and change in reservoir characteristics, are indicated on the log-log plot and the superposition Horner plot (OCD Guideline Section IX.18.c and IX.18.d)

Wellbore storage begins at the beginning of the falloff test and continues to an elapsed shut in time of 0.031 hours. Radial flow begins at an elapsed shut in time of 11.075 hours and continues until 21.704 hours (OCD Guideline Section IX.15.b).

The reservoir permeability was determined from the radial flow region of the superposition Horner plot, Figure 15. The radial flow regime begins at a Horner time of 379.534 and continues until a Horner time of 201.729, at which time the pressure data departs the semi-log straight-line. Figure 16 shows an expanded view of the radial flow regime. The slope of the radial flow period, as calculated by the analysis software, was 4.22689 psi/cycle (OCD Guideline Section IX.15.c). The injection rate just prior to shut in was 159.56 gpm which is equivalent to 5,470.54 barrels per day (bbl/day).

An estimate of mobility-thickness (transmissibility, OCD Guideline Section IX.15.d), kh/μ, for the reservoir was determined to be 210,441 md-ft/cp using the following equation:

$$\frac{k\ h}{\mu} = 162.6 \frac{q\ B}{m}$$

where,

kh/μ	=	formation mobility-thickness, millidarcy-feet/centipoise
q	=	rate prior to shut in, bpd
B	=	formation volume factor, reservoir volume/surface volume
m	=	slope of radial flow period, psi/cycle

$$\frac{kh}{\mu} = 162.6 \frac{(5{,}470.54)(1.0)}{4.22689}$$

$$= 210{,}441 \text{ md- ft/cp}$$

The permeability-thickness (flow capacity, OCD Guideline Section IX.15.i), kh, was determined to be 119,951 md-ft by multiplying the mobility-thickness, kh/μ, by the viscosity of the reservoir fluid (see Section 6), $\mu_{reservoir}$, of 0.57 centipoises:

$$kh = \left(\frac{kh}{\mu} \right) \mu_{reservoir}$$

$$= 210{,}441 \times 0.57$$

$$= 119{,}951 \text{ md- ft}$$

The reservoir permeability (OCD Guideline Section IX.15.e) using the total thickness (see Section 5 and Section 11) of 175 feet was 685 md:

$$k = \frac{(k\ h)}{h}$$

$$= \frac{119{,}951}{175}$$

$$= 685\ \text{md}$$

To determine whether the proper viscosity was used in arriving at this permeability, the travel time for a pressure transient to pass beyond the waste front needs to be calculated (OCD Guideline Section VIII.5). The distance to the waste front is determined from the following equation:

$$r_{waste} = \left(\frac{0.13368\ V}{\pi h\ \phi} \right)^{1/2}$$

where,

r_{waste}	=	radius to waste front, feet
V	=	total volume injected into the injection interval, gallons
h	=	formation thickness, feet
ϕ	=	formation porosity, fraction
0.13368	=	constant

A cumulative volume of approximately 1,409,060,054 gallons of waste has been injected into Mewbourne Well No. 1 (see Section 8). The formation has a porosity of 0.10 (see Section 5 and Section 11).

The distance to the waste front was determined to be 1,851 feet:

$$r_{waste} = \left(\frac{(0.13368)(1,409,060,054)}{(\pi)(175)(0.10)} \right)^{1/2}$$

$$= 1,851 \text{ feet}$$

The time necessary for a pressure transient to traverse this distance is calculated from the following equation:

$$t_{waste} = 948 \frac{\phi \mu_{waste} c_t r^2_{waste}}{k}$$

where,

t_{waste}	=	time for pressure transient to reach waste front, hours
ϕ	=	formation porosity, fraction
μ_{waste}	=	viscosity of the waste at reservoir conditions, centipoise
r_{waste}	=	radius to waste front, feet
c_t	=	total compressibility of the formation and fluid, psi
k	=	formation permeability, millidarcies
948	=	constant

The pore volume compressibility is 8.4×10^{-6} psi^{-1} (see Section 6). The time necessary for a pressure transient to traverse the distance from the wellbore to the leading edge of the waste front would be 2.15 hours:

$$t_{waste} = 948 \frac{(0.10)(0.54)(8.4 \times 10^{-6})(1,851)^2}{685}$$

$$= 2.15 \text{ hours}$$

Since the time required to pass through the waste is less than the 11.075 hours required to reach the beginning of the radial flow period, the assumption that the pressure transient was traveling through reservoir fluid during the period of the semi-log straight line was correct.

The near wellbore skin damage (OCD Guideline Section IX.15.f) was determined from the following equation:

$$s = 1.151\left[\frac{p_{wf} - p_{1hr}}{m_1} - \log\left(\frac{k}{\phi \mu c_t r_w^2}\right) + 3.23\right]$$

where,

s	=	formation skin damage, dimensionless
1.151	=	constant
p_{wf}	=	flowing pressure immediately prior to shut in, psi
p_{1hr}	=	pressure determined from extrapolating the first radial flow semi-log line to a Δt of one hour, psi
m_1	=	slope of the first radial flow semi-log line, psi/cycle
k	=	permeability of the formation, md
ϕ	=	porosity of the injection interval, fraction
μ	=	viscosity of the fluid the pressure transient is traveling through, cp
c_t	=	total compressibility of the formation plus fluid, psi^{-1}
r_w	=	radius of the wellbore, feet
3.23	=	constant

The final measured flowing pressure was 4,141.75 psia. The pressure determined by extrapolating the radial flow semi-log line to a Δt of one hour, p_{1hr}, was 3,861.39 psia (calculated from the analysis software). The wellbore radius, r_w, is 0.3646 feet (completion records). Using these values in addition to the previously discussed parameters results in a skin of 68.51:

$$s = 1.151\left[\frac{4{,}141.75-3{,}861.39}{4.22689} - \log\left(\frac{685}{(0.10)(0.57)(8.4\times10^{-6})(0.3646)^2}\right) + 3.23\right]$$

$$= 68.51$$

The change in pressure, Δp_{skin}, in the wellbore associated with the skin factor (OCD Guideline Section IX.15.g) was calculated using the following equation:

$$\Delta p_{skin} = 0.869(m)(s)$$

where,

0.869	=	constant
m	=	slope from superposition plot of the well test, psi/cycle
s	=	skin factor calculated from the well test

The change in pressure, Δp_{skin}, using the previously calculated and defined values was determined to be 251.66 psi:

$$\Delta p_{skin} = 0.869(m)(s)$$

$$= 0.869(4.22689)(68.51)$$

$$= 251.66 \text{ psi}$$

The flow efficiency (E, OCD Guideline Section IX.15.h) was determined from the following equation:

$$E = \frac{p_{wf} - \Delta p_{skin} - p_{static}}{p_{wf} - p_{static}}$$

where,

E	=	flow efficiency, fraction
p_{wf}	=	flowing pressure prior to shutting in the well for the fall-off test,
p_{static}	=	final pressure from the pressure falloff test
Δp_{skin}	=	pressure change due to skin damage

Using the previously determined parameters, the flow efficiency was calculated to be 0.12:

$$E = \frac{4{,}141.75 - 251.66 - 3{,}854.83}{4{,}141.75 - 3{,}854.83}$$

$$= 0.12$$

The radius of investigation (OCD Guideline Section IX.15.a) was calculated using the following equation:

$$R_{inv} = 0.029\sqrt{\frac{k\,\Delta t_s}{\phi\,\mu\,C_t}}$$

where,

k	=	formation permeability, millidarcies
Δt_s	=	elapsed shut-in time, hours
ϕ	=	formation porosity, fraction
μ	=	viscosity of the fluid the pressure transient is traveling through, cp
c_t	=	total compressibility of the formation plus fluid, psi^{-1}
0.029	=	constant

The radius of investigation, r_{inv}, using the previously defined values was determined to be 6,112 feet:

$$R_{inv} = 0.029\sqrt{\frac{(685)(31.03)}{(0.10)(0.57)(8.4 \times 10^{6})}}$$

$$R_{inv} = 6,112 \text{ feet}$$

As indicated on Figure 14, the pressure data departs the radial flow region at an elapsed time from shut in of 21.704 hours. No pressure or temperature anomalies were noted that would cause this type of pressure response observed on the derivative log-log plot (OCD Guideline Section VIII.9). A review of the geology of the injection zones (see Section 11) indicates that all three of the formations in which the Mewbourne Well No. 1 injects into have varying thicknesses and porosities within the mapped area. Changes in formation thickness, porosity, and fluid viscosity can cause the slope changes seen on the derivative log-log plot. Because these changes occurred during the duration of the pressure falloff test, the reservoir analysis results are considered heterogeneous as opposed to homogeneous (OCD Guideline Section IX.17.b).

The Hall plot (OCD Guideline Section IX.18.h) is presented as Figure 17. No slope changes are seen in the plotted data.

A comparison of the current analysis results with previous analysis results as well as with the reservoir parameters submitted with the permit application is presented in Table X (OCD Guideline Section IX.19).

On November 13, 2011, a static pressure gradient survey was conducted while pulling the pressure gauges out of the well. Static gradient stops were conducted at 9,000 feet, 8,000 feet, 7,924 feet, 7,000 feet, 6,000 feet, 5,000 feet, 4,000 feet, 3,000 feet, 2,000 feet, 1,000 feet, and at the surface. The bottom-hole pressure and temperature, after 36.15 hours of shut-in at 7,924 feet, were 3,854.83 psia and 100.1°F, respectively. The gradient survey is summarized in Table XI. The data are graphically depicted in Figure 18.

16. NEW MEXICO OIL CONSERVATION DIVISION THREE YEAR RECORDING KEEPING STATEMENT

Navajo will keep the raw test data, generated during the testing, on file for a minimum of three years. The raw test data will be made available to OCD upon request.

TABLES

TABLE I

FORMATION WATER ANALYSIS SUMMARY

Chemical	Mewbourn Well No. 1	Chukka Well No. 2	Gaines Well No. 3	Average
Date	July 31, 1998	June 14, 1999	Nov 8, 2006	
Fluoride (mg/l)	2.6	9.7	Not Detected	6.15
Chloride (mg/L)	19,000	15,000	10,447	14,815.67
NO3-N (mg/L)	<10	<10	--	<10
SO4 (mg/L)	2,200	2000	1,908	2,036
CaCO3 (mg/L)	1000	1210	--	1105
Specific Gravity (g/L)	1.034	1.0249	--	1.0295
TDS (mg/L)	33,000	20,000	--	26,500
Specific Conductance (uMHOs/cm)	52,000	43,000	--	47,500
Potassium (mg/L)	213	235	85.5	177.83
Magnesium (mg/L)	143	128	155	142
Calcium (mg/L)	390	609	393	464
Sodium (mg/L)	12,770	8,074	6,080	8,974.67
pH (s.u.)	8.1	7.2	--	7.65

The data in the above table was referenced from "Discharge Plan Application and Application for Authorization to Inject per Oil Conservation Division Form C-108, into Class I Wells WDW-1 and Proposed WDW-2 and WDW-3" and the "Discharge Permit Approval Conditions", "Reentry and Completion Report Waste Disposal Well No. 2", and "Reentry and Completion Report Waste Disposal Well No. 3".

TABLE II
Tabulation of Wells Within One Mile Area of Review

ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
1	30-015-00693	A	36	17S	27E	330N	330E	DELHI #001	GEORGE A CHASE & C SERVICE	O		T/A	8/30/1941
2	30-015-00694	A	36	17S	27E	990N	990E	STATE #013	DELHI OIL CORP.	O	6/24/1948	P&A	6/24/1948
3	30-015-00646	A	36	17S	27E	990N	330E	DELHI #007	GEORGE A CHASE & C SERVICE	O		T/A	4/21/1950
4	30-015-00668	G	36	17S	27E	1650N	2310E	SOUTH RED LAKE GRAYBURG UNIT #010	LEGACY RESERVES OPERATING, LP	O		SHUT IN	12/6/1947
5	30-015-00690	G	36	17S	27E	1830N	2205E	CONKLIN #002	GEORGE A CHASE & C SERVICE	O		ACTIVE	3/6/1949
6	30-015-00667	G	36	17S	27E	2310N	2310E	SOUTH RED LAKE GRAYBURG UNIT #011	FAIRWAY RESOURCES OPERATING INC	I		ACTIVE	3/23/1949
7	30-015-00666	G	36	17S	27E	2310N	2310E	CONKLIN #001	GEORGE A CHASE & C SERVICE	O	N/A	P&A	1/10/1942
8	30-015-00689	H	36	17S	27E	1650N	330E	GATES STATE #001	GEORGE A CHASE JR & C SERVICE	O		ACTIVE	8/4/1950
9	30-015-00647	H	36	17S	27E	1650N	990E	GATES STATE #002	ASPEN OIL INC	O	10/21/2003	ACTIVE	10/21/2003
10	30-015-00669	H	36	17S	27E	2310N	330E	HOMAN #001	GEORGE A CHASE JR & C SERVICE	O	5/6/2008	P&A	5/6/2008
11	30-015-00688	I	36	17S	27E	2310S	330E	RAMAPO #001	KERSEY & CO	O	10/28/1941	P&A	10/28/1941
12	30-015-00670	I	36	17S	27E	2970N	330E	RAMAPO #003	KERSEY & CO	O	1/3/1950	P&A	1/3/1950
13	30-015-00687	I	36	17S	27E	2310S	990E	RAMAPO #002	KERSEY & CO	G	5/7/1948	P&A	5/7/1948
14	30-015-00685	I	36	17S	27E	1650S	330E	EMPIRE ABO UNIT G #020	ARCO OIL & GAS	O	7/10/1989	P&A	7/10/1989
15	30-015-00671	J	36	17S	27E	2310S	2310E	RAMAPO #003	ROJO GRANDE COMPANY LLC	O	1/24/2000	ZONE ABAN	2/13/1942
16	30-015-01221	J	36	17S	27E	2300S	2300E	SOUTH RED LAKE GRAYBURG UNIT #023	MCQUADRANGLE, LC	O	8/13/2002	ZONE ABAN	2/27/1948
17		J	36	17S	27E			DOOLEY STATE #3	MARTIN YATES III				4/22/1961
18	30-015-05934	J	36	17S	27E	1650S	1650E	EMPIRE ABO UNIT #019A	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	2/26/1961
19	30-015-01220	K	36	17S	27E	2310S	2330W	SOUTH RED LAKE GRAYBURG UNIT #022	MCQUADRANGLE, LC	O	7/17/2002	ZONE ABAN	2/3/1949
20	30-015-00674	K	36	17S	27E	2310S	2310W	RAMAPO #002	ROJO GRANDE COMPANY LLC	O		ACTIVE	5/15/1947
21	30-015-01219	K	36	17S	27E	2310S	1650W	SOUTH RED LAKE GRAYBURG UNIT #021	MCQUADRANGLE, LC	I		ACTIVE	1/20/1948
22	30-015-23913	K	36	17S	27E	1650S	1650W	SOUTH RED LAKE GRAYBURG UNIT #043	MCQUADRANGLE, LC	O		ACTIVE	12/11/1981
23		K	36	17S	27E			DOOLEY STATE ABO #3	MARTIN YATES III	O		ACTIVE	4/19/1961
24	30-015-00673	K	36	17S	27E	1650S	2310W	RAMAPO #001	ROJO GRANDE COMPANY LLC	O	1/24/2000	ZONE ABAN	1/24/2000
25	30-015-00682	N	36	17S	27E	990S	1650W	RAMAPO #004	ROJO GRANDE COMPANY LLC	O	1/24/2000	ZONE ABAN	1/24/2000
26	30-015-00683	N	36	17S	27E	965S	1650W	SOUTH RED LAKE GRAYBURG UNIT #028	FAIRWAY RESOURCES OPERATING INC	I		ACTIVE	4/16/1948
27	30-015-01218	N	36	17S	27E	330S	2310W	EMPIRE ABO UNIT #018	BP AMERICA PRODUCTION COMPANY	O	3/11/2009	P&A	3/11/2009
28	30-015-00684	O	36	17S	27E	990S	2310E	STATE B-6961 NO. 1-A	BURNHAM OIL COMPANY	O	5/13/1947	P&A	5/13/1947
29	30-015-01251	O	36	17S	27E	660S	1980E	EMPIRE ABO UNIT #019	BP AMERICA PRODUCTION COMPANY	O	4/27/2009	P&A	9/8/1959
30		I	36	17S	27E							MISPLOT OF 14	
31	30-015-00677	P	36	17S	27E	330S	990E	EMPIRE ABO UNIT #020	BP AMERICA PRODUCTION COMPANY	O	4/10/2009	P&A	4/13/2009
32	30-015-01616	P	30	17S	28E	330S	990E	BLAKE STATE #001	APACHE CORPORATION	O		ACTIVE	3/7/1953
33	30-015-01638	A	31	17S	28E	330N	990E	STATE NO. 1	BEDINGFIELD, MALCO, RESLER	O	7/15/1952	P&A	7/15/1952
34	30-015-21594	B	31	17S	28E	330N	1650E	POWCO STATE #001	FINNEY OIL COMPANY	O		ACTIVE	11/15/1975
35	30-015-01636	C	31	17S	28E	330N	2310E	DELHI-STATE NO. 1	BEDINGFIELD, J E	O	12/23/1952	P&A	12/23/1952
36	30-015-25621	B	31	17S	28E	980N	1620E	POWCO STATE #002	FINNEY OIL COMPANY	O		ACTIVE	7/15/1986
37	30-015-01633	1	31	17S	28E	330N	330W	ASTON & FAIR A #001	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	6/23/1942
38	30-015-01634	D	31	17S	28E	350N	345W	STATE 31 NO. 1X	ASTON & FAIR	O		NO COMPL	1/5/1946
39	30-015-01645	F	31	17S	28E	990N	990W	BEDINGFIELD STATE 1 NO. 1	MCLAUGHLIN, C T	O	2/16/1950	P&A	2/16/1950
40	30-015-02666	2	31	17S	28E	2310N	330W	HUDSON SAIKIN STATE #001	APACHE CORPORATION	O		ACTIVE	5/29/1948
41	30-015-24887	2	31	17S	28E	2310N	990W	HUDSON SAIKIN STATE #002	APACHE CORPORATION	O		ACTIVE	7/7/1984
42	30-015-01643	F	31	17S	28E	2310N	2260W	EMPIRE ABO UNIT #022	BP AMERICA PRODUCTION COMPANY	O	7/10/2009	P&A	6/7/1960
43	30-015-01635	F	31	17S	28E	2310N	2310W	ASTON & FAIR #001Y	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	5/8/1948
44	30-015-01637	G	31	17S	28E	2310N	2310E	MALCO STATE #001	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	10/12/1953

TABLE II
Tabulation of Wells Within One Mile Area of Review

ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
45	30-015-01652	G	31	17S	28E	2288N	1625E	BOLING #001	KERSEY & CO	O		ACTIVE	8/10/1960
46	30-015-10537	H	31	17S	28E	2277N	330E	NORTHWEST ARTESIA UNIT #004	LIME ROCK RESOURCES A, L.P.	O		ACTIVE	9/23/1965
47	30-015-10833	I	31	17S	28E	1980S	660E	NORTHWEST ARTESIA UNIT #010	LIME ROCK RESOURCES A, LP	O		ACTIVE	6/17/1966
48	30-015-01644	I	31	17S	28E	1650S	330E	EMPIRE ABO UNIT #024A	BP AMERICA PRODUCTION COMPANY	O	6/12/2009	P&A	4/29/1960
49	30-015-01642	J	31	17S	28E	1650S	2310E	STATE FW #001	APACHE CORPORATION	O		ACTIVE	12/23/1962
50	30-015-01650	J	31	17S	28E	1650S	1958E	EMPIRE ABO UNIT #023A	BP AMERICA PRODUCTION COMPANY	O	9/17/2003	P&A	9/17/2003
51	30-015-01651	K	31	17S	28E	1650S	2387W	EMPIRE ABO UNIT #022B	BP AMERICA PRODUCTION COMPANY	O	10/22/2009	P&A	4/10/1960
52	30-015-01640	3	31	17S	28E	2310S	330W	RAMPO #002	APACHE CORPORATION	O		ACTIVE	7/16/1955
53	30-015-01648	3	31	17S	28E	1651S	1089E	EMPIRE ABO UNIT #021A	BP AMERICA PRODUCTION COMPANY	O	8/24/2002	ZONE ABAN	8/24/2002
54	30-015-01639	4	31	17S	28E	990S	330W	RAMPO #001	APACHE CORPORATION	O		ACTIVE	5/1/1948
55	30-015-01647	4	31	17S	28E	660S	660W	EMPIRE ABO UNIT #021	BP AMERICA PRODUCTION COMPANY	O	7/23/2005	P&A	1/31/1960
56	30-015-01646	N	31	17S	28E	660S	2082W	EMPIRE ABO UNIT #022A	BP AMERICA PRODUCTION COMPANY	O		P&A	1/22/1960
57	30-015-10118	N	31	17S	28E	766S	2188W	STATE FV #001	APACHE CORPORATION	O		ACTIVE	3/1/1963
58	30-015-01653	O	31	17S	28E	990S	1650E	PARKER-STATE NO. 1	OTIS A ROBERTS	O	1/18/1942	P&A	1/18/1942
59	30-015-27592	O	31	17S	28E	660S	2310E	WDW #001	NAVAJO REFINING CO. PIPELINE DIVISION	I		ACTIVE	8/4/1998
60	30-015-01649	O	31	17S	28E	660S	1939E	EMPIRE ABO UNIT #023	BP AMERICA PRODUCTION COMPANY	O	8/14/2009	P&A	2/24/1960
61	30-015-20042	P	31	17S	28E	990S	660E	NORTHWEST ARTESIA UNIT #011	LIME ROCK RESOURCHES A, LP	O		ACTIVE	5/8/1967
62	30-015-01641	P	31	17S	28E	660S	660E	EMPIRE ABO UNIT #024	APACHE CORPORATION	O		ACTIVE	3/12/1960
63	30-015-01654	D	32	17S	28E	330N	330W	ASTON-STATE NO. 1	BEDINGFIELD, J E	O	5/12/1953	P&A	5/12/1953
64	30-015-01671	E	32	17S	28E	2280N	978W	EMPIRE ABO UNIT #025B	BP AMERICA PRODUCTION COMPANY	O	8/14/2008	P&A	9/13/1960
65	30-015-01657	F	32	17S	28E	2280N	1980W	AA STATE NO. 1	APACHE CORPORATION	O		ACTIVE	8/24/1960
66	30-015-10818	K	32	17S	28E	2310S	2105W	NORTHWEST ARTESIA UNIT #008	SDX RESOURCES INC	O	11/6/2006	P&A	11/6/2006
67	30-015-01661	K	32	17S	28E	1650S	2310W	EMPIRE ABO UNIT #026B	APACHE CORPORATION	O		ACTIVE	3/27/1960
68	30-015-10795	L	32	17S	28E	2310S	660W	NORTHWEST ARTESIA UNIT #009	LIME ROCK RESOURCES A, LP	O	5/28/2008	P&A	5/15/1966
69	30-015-01662	L	32	17S	28E	1650S	990W	EMPIRE ABO UNIT #025A	APACHE CORPORATION	O		ACTIVE	4/13/1960
70	30-015-20043	M	32	17S	28E	990S	760W	NORTHWEST ARTESIA UNIT #012	APACHE CORPORATION	O		T/A	5/9/1967
71	30-015-01660	M	32	17S	28E	660S	660W	EMPIRE ABO UNIT #025	BP AMERICA PRODUCTION COMPANY	O	1/14/2009	P&A	3/5/1960
72	30-015-10834	N	32	17S	28E	990S	2030W	NORTHWEST ARTESIA UNIT #013	SDX RESOURCES INC	O	9/15/2006	P&A	9/15/2006
73	30-015-01659	N	32	17S	28E	660S	1980W	EMPIRE ABO UNIT #026A	APACHE CORPORATION	O		ACTIVE	2/14/1960
74	30-015-21539	N	32	17S	28E	150S	1400W	EMPIRE ABO UNIT #261	APACHE CORPORATION	O		ACTIVE	7/25/1975
75	30-015-22009	O	32	17S	28E	330S	2481E	EMPIRE ABO UNIT #272	APACHE CORPORATION	O		ACTIVE	7/18/1977
76	30-015-02606	3	5	18S	28E	330N	1941W	EMPIRE ABO UNIT #026E	APACHE CORPORATION	O		ACTIVE	7/18/1960
77	30-015-22697	3	5	18S	28E	1080N	1914W	EMPIRE ABO UNIT #261A	BP AMERICA PRODUCTION COMPANY	O	6/16/2009	P&A	1/4/1979
78	30-015-02607	4	5	18S	28E	660N	660W	EMPIRE ABO UNIT #025C	APACHE CORPORATION	O		ACTIVE	3/27/1960
79	30-015-22750	4	5	18S	28E	660N	150W	EMPIRE ABO UNIT #251	APACHE CORPORATION	O		SHUT IN	1/12/1979
80	30-015-02608	E	5	18S	28E	1660N	330W	STATE E AI #001	CONOCOPHILLIPS COMPANY	O	1/13/2006	P&A	1/13/2006
81	30-015-24485	E	5	18S	28E	1980N	990W	ILLINOIS CAMP A COM #001	CONOCOPHILLIPS COMPANY	G		ACTIVE	8/10/1983
82	30-015-02602	F	5	18S	28E	1650N	1650W	EMPIRE ABO UNIT #026D	APACHE CORPORATION	O		ACTIVE	12/30/1959
83	30-015-25522	L	5	18S	28E	2240S	400W	WALTER SOLT STATE #001	APACHE CORPORATION	S		ACTIVE	8/12/1983
84	30-015-10244	L	5	18S	28E	2310S	330W	STATE AG #001	MACK ENERGY CORP	O	3/27/2001	ZONE ABAN	3/27/2001
87	30-015-20019	1	6	18S	28E	330N	330E	NORTHWEST ARTESIA UNIT #016	LIME ROCK RESOURCES A, LP	O		ACTIVE	3/14/1967
88	30-015-02615	1	6	18S	28E	660N	660E	EMPIRE ABO UNIT #024B	APACHE CORPORATION	O		ACTIVE	2/29/1960
89	30-015-02625	2	6	18S	28E	470N	2170E	EMPIRE ABO UNIT #023C	APACHE CORPORATION	O		T/A	12/21/1959
90	30-015-21542	2	6	18S	28E	1260N	1580E	EMPIRE ABO UNIT #231	APACHE CORPORATION	O		ACTIVE	11/1/1975

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ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
91	30-015-02621	3	6	18S	28E	660N	1980W	EMPIRE ABO UNIT #022E	APACHE CORPORATION	O		ACTIVE	12/29/1959
92	30-015-21626	G	6	18S	28E	1361N	2531E	EMPIRE ABO UNIT #231A	APACHE CORPORATION	O		SHUT IN	10/22/1975
93	30-015-02613	4	6	18S	28E	990N	660W	EMPIRE ABO UNIT #021B	APACHE CORPORATION	O		ACTIVE	12/30/1959
94	30-015-23116	5	6	18S	28E	2050N	100W	EMPIRE ABO UNIT #213	APACHE CORPORATION	O		ACTIVE	6/2/1980
95	30-015-02619	5	6	18S	28E	1990N	660W	EMPIRE ABO UNIT #021C	APACHE CORPORATION	O		ACTIVE	10/30/1959
96	30-015-22637	5	6	18S	28E	2450N	400W	EMPIRE ABO UNIT #212	APACHE CORPORATION	O		ACTIVE	12/28/1978
97	30-015-21395	5	6	18S	28E	2630N	1300W	EMPIRE ABO UNIT #211	APACHE CORPORATION	O		ACTIVE	2/11/1975
98	30-015-22012	F	6	18S	28E	1350N	1572W	EMPIRE ABO UNIT #222	APACHE CORPORATION	O		ACTIVE	3/13/1977
99	30-015-02626	F	6	18S	28E	1650N	1650W	STATE NO. 1	SARKIN, DAVID C & OLIVER, HENRY F	O	2/21/1942	P&A	2/21/1942
100	30-015-10107	F	6	18S	28E	1874N	1874W	STATE FX #001	DORAL ENERGY CORP	O		ACTIVE	8/8/1963
101	30-015-02620	F	6	18S	28E	1990N	2082W	EMPIRE ABO UNIT #022D	APACHE CORPORATION	O		ACTIVE	11/26/1959
102	30-015-22527	F	6	18S	28E	2630N	1930W	EMPIRE ABO UNIT #223	APACHE CORPORATION	O		ACTIVE	5/19/1978
103	30-015-21746	F	6	18S	28E	2610N	2713W	EMPIRE ABO UNIT #221	APACHE CORPORATION	O		ACTIVE	4/23/1976
104	30-015-22913	G	6	18S	28E	1750N	1600E	EMPIRE ABO UNIT #235	APACHE CORPORATION	O		ACTIVE	7/8/1979
105	30-015-22593	G	6	18S	28E	1900N	2441E	EMPIRE ABO UNIT #234	BP AMERICA PRODUCTION COMPANY	O	12/3/2008	P&A	8/27/1978
106	30-015-02614	G	6	18S	28E	1980N	1980E	EMPIRE ABO UNIT #023B	APACHE CORPORATION	O		ACTIVE	1/26/1960
107	30-015-21737	G	6	18S	28E	2253N	1576E	EMPIRE ABO UNIT #232	BP AMERICA PRODUCTION COMPANY	O	5/7/2009	P&A	4/13/1976
108		H	6	18S	28E							MISPLOT OF 107	
109	30-015-22490	G	6	18S	28E	2550N	2050E	EMPIRE ABO UNIT #233	BP AMERICA PRODUCTION COMPANY	O	4/3/2009	P&A	6/5/1978
110	30-015-02616	H	6	18S	28E	1650N	990E	EMPIRE ABO UNIT #024C	APACHE CORPORATION	O		ACTIVE	3/24/1960
111	30-015-23547	H	6	18S	28E	1950N	660E	EMPIRE ABO UNIT #241	BP AMERICA PRODUCTION COMPANY	O	9/19/2008	P&A	4/12/1981
112	30-015-02617	I	6	18S	28E	2310S	990E	EMPIRE ABO UNIT #024K	BP AMERICA PRODUCTION COMPANY	O	12/12/2002	P&A	12/12/2002
113	30-015-22528	J	6	18S	28E	2300S	1570E	EMPIRE ABO UNIT #232A	BP AMERICA PRODUCTION COMPANY	O	4/7/2009	P&A	2/5/1979
114	30-015-02611	J	6	18S	28E	2310S	2310E	STATE NO. 1	BARNEY COCKBURN	O	8/15/1949	P&A	8/15/1949
115	30-015-02628	J	6	18S	28E	2260S	2270E	EMPIRE ABO UNIT #023D	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	5/23/1979
116	30-015-22491	J	6	18S	28E	1700S	2350E	EMPIRE ABO UNIT #231B	BP AMERICA PRODUCTION COMPANY	O	9/2/2009	P&A	8/13/1978
117	30-015-02618	J	6	18S	28E	1647S	2076E	CAPITOL STATE NO. 1	MILLER BROS OIL CO	G	3/21/1955	P&A	3/21/1955
118	30-015-02623	K	6	18S	28E	2248S	2075W	EMPIRE ABO UNIT #022F	APACHE CORPORATION	O		ACTIVE	2/22/1960
119		K	6	18S	28E							MISPLOT	
120		L	6	18S	28E			WDW-2 (ORIGINAL LOCATION)	NAVAJO REFINING COMPANY				
121	30-015-02622	6	6	18S	28E	2219S	660W	EMPIRE ABO UNIT #021D	APACHE CORPORATION	O		ACTIVE	1/23/1960
122	30-015-23548	6	6	18S	28E	1950S	1000W	EMPIRE ABO UNIT #211A	APACHE CORPORATION	O		ACTIVE	7/17/1980
123	30-015-02627	7	6	18S	28E	949S	990W	STATE M-AI #002	RUTH OIL CO, LLC	O		ACTIVE	10/21/1960
124	30-015-26943	7	6	18S	28E	990S	730W	CHALK BLUFF 6 STATE #001	MEWBOURNE OIL CO	G		ACTIVE	4/16/1992
125	30-015-02610	N	6	18S	28E	955S	1750W	EMPIRE ABO UNIT #022C	APACHE CORPORATION	O		ACTIVE	8/5/1960
126	30-015-02624	O	6	18S	28E	968S	2270E	STATE CD NO. 1	PAN AMERICAN PETROLEUM CO	O	5/1/1961	P&A	5/1/1961
127	30-015-25503	P	6	18S	28E	660S	330E	KIMBERLY STATE NO. 1	DICKSON PETROLEUM CO	O	12/30/1985	P&A	12/30/1985
128	30-015-02612	P	6	18S	28E	330S	330E	STATE NO. 1	D & H OIL CO	O	5/13/1952	P&A	5/13/1952
129	30-015-01215	1	1	18S	27E	667N	666E	EMPIRE ABO UNIT #020D	APACHE CORPORATION	O		ACTIVE	11/5/1959
130	30-015-00708	2	1	18S	27E	660N	1980E	EMPIRE ABO UNIT #019B	LIME ROCK RESOURCES II-A, L.P.	O		ACTIVE	7/7/1959
131		C	1	18S	27E			HILL #4	MALCO REFINERIES		5/10/1948	P&A	5/10/1948
132		C	1	18S	27E							MISPLOT	
133	30-015-00710	3	1	18S	27E	660N	1980W	AAO FEDERAL No. 013	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	7/21/2004
134	30-015-26741	F	1	18S	27E	1650N	1350W	CHALK BLUFF FEDERAL COM #002	MEWBOURNE OIL CO	G		ACTIVE	8/24/1991

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ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
135	30-015-00706	F	1	18S	27E	2310N	1980W	EMPIRE ABO UNIT #018A	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	5/31/1959
136	30-015-00709	G	1	18S	27E	1980N	1980E	EMPIRE ABO UNIT #019C	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	8/2/1959
137		G	1	18S	27E							MISPLOT	
138	30-015-21552	G	1	18S	27E	2500N	2500E	EMPIRE ABO UNIT #191	CFM OIL, LLC	O		ACTIVE	9/7/1975
139	30-015-00711	H	1	18S	27E	1980N	660E	EMPIRE ABO UNIT #020C	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	10/13/1959
140	30-015-21783	H	1	18S	27E	2490N	1299E	EMPIRE ABO UNIT #202	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	5/13/1976
141	30-015-22656	H	1	18S	27E	2400N	700E	EMPIRE ABO UNIT #203	APACHE CORPORATION	O		ACTIVE	10/10/1978
142		H	1	18S	27E			CRONIN #1	MANHATTAN OIL		7/1/2027	P&A	7/1/1927
143	30-015-21553	H	1	18S	27E	2501N	20E	EMPIRE ABO UNIT #201	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	7/19/1975
144	30-015-27163	I	1	18S	27E	1980S	990E	CHALK BLUFF FEDERAL COM #003	MEWBOURNE OIL CO	G		ACTIVE	1/16/1993
145	30-015-00697	I	1	18S	27E	1980S	660E	EMPIRE ABO UNIT #020K	BP AMERICA PRODUCTION COMPANY	O	1/5/2003	P&A	1/5/2003
146	30-015-22657	J	1	18S	27E	2490S	2200E	EMPIRE ABO UNIT #193	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	10/26/1978
147	30-015-00696	J	1	18S	27E	1980S	1980E	EMPIRE ABO UNIT #019Q	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	8/20/1959
148	30-015-22560	J	1	18S	27E	220S	1390E	EMPIRE ABO UNIT #192	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	6/25/1978
149	30-015-21873	J	1	18S	27E	1526S	1470E	EMPIRE ABO UNIT #191A	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	9/23/1976
150	30-015-22658	J	1	18S	27E	1500S	2130E	EMPIRE ABO UNIT #194	APACHE CORPORATION	O		ACTIVE	11/14/1978
151	30-015-22559	K	1	18S	27E	2290S	2445W	EMPIRE ABO UNIT #184	APACHE CORPORATION	O		SHUT IN	7/25/1978
152	30-015-22096	K	1	18S	27E	2370S	1510W	EMPIRE ABO UNIT #183	APACHE CORPORATION	O		ACTIVE	7/24/1977
153	30-015-21554	K	1	18S	27E	1367S	1440W	EMPIRE ABO UNIT #181	BP AMERICA PRODUCTION COMPANY	O	4/17/2003	P&A	4/17/2003
154	30-015-00707	K	1	18S	27E	1980S	1980W	EMPIRE ABO UNIT #018B	APACHE CORPORATION	O		ACTIVE	5/22/1959
155	30-015-21792	K	1	18S	27E	1533S	2370W	EMPIRE ABO UNIT #182	LIME ROCK RESOURCES A, L.P.	O		ACTIVE	6/1/1976
156	30-015-00713	N	1	18S	27E	995S	1644W	EMPIRE ABO UNIT #018D	BP AMERICA PRODUCTION COMPANY	O	9/27/2003	P&A	9/27/2003
157	30-015-26575	N	1	18S	27E	790S	2250W	WDW-3	NAVAJO REFINING COMPANY	I		ACTIVE	3/7/1991
158	30-015-20394	O	1	18S	27E	953S	2197E	EMPIRE ABO FEDERAL NO. 5	HUMBLE OIL & REFINING CO	O	4/9/1971	P&A	4/9/1971
159	30-015-00698	O	1	18S	27E	660S	1980E	EMPIRE ABO UNIT #191	BP AMERICA PRODUCTION COMPANY	S		ACTIVE	11/8/1959
160	30-015-00699	P	1	18S	27E	940S	330E	EMPIRE ABO UNIT #020B	APACHE CORPORATION	O		ACTIVE	12/2/1961
161	30-015-26404	A	12	18S	27E	660N	990E	FEDERAL T #001	APACHE CORPORATION	I		ACTIVE	9/13/1990
162	30-015-25099	H	12	18S	27E	1809N	990E	COMSTOCK FEDERAL #006	HARLOW ENTERPRISES LLC	O		ACTIVE	9/11/1985
165	30-015-25997	C	7	18S	28E	940N	1757W	LAUREL STATE #001	EASTLAND OIL CO	O		ACTIVE	2/23/1987
166	30-015-25675	2	7	18S	28E	940N	1757W	LAUREL STATE #002	EASTLAND OIL CO	O		ACTIVE	11/10/1988
167	30-015-25236	F	7	18S	28E	1980N	1980W	STATE BY #001	MOREXCO INC	O		ACTIVE	6/10/1985
168	30-015-22636	J	7	18S	28E	1950N	1300W	PRE-ONGUARD WELL #213	DYAD PE	O		ABAN LOCATION	
169	30-015-22635	J	8	18S	28E	1900N	100W	PRE-ONGUARD WELL #212	DYAD PE	O		ABAN LOCATION	
170	30-015-24372	J	8	18S	28E	1980S	990E	PRE-ONGUARD WELL #001	DYAD PE	O		ABAN LOCATION	
171	30-015-27636	H	7	18S	28E	2310N	810E	CHALK BLUFF 6 STATE #002	PHILLIPS PETROLEUM	O		ABAN LOCATION	
353	30-015-27286	M	36	17S	27E	660S	990W	CHALK BLUFF 36 STATE #001	MEWBOURNE OIL CO	O		ACTIVE	3/30/1993
354	30-015-24612	M	36	17S	27E	790S	990W	STATE M #001	PRONGHORN MANAGEMENT CORP	O	4/21/2009	P&A	10/11/1983
355	30-015-00676	M	36	17S	27E	330N	990W	EMPIRE ABO UNIT #017	LIME ROCK RESOURCES A, L.P.	O		ACTIVE	
356	30-015-10184	M	36	17S	27E	330S	920W	STATE #006	ASPEN OIL INC	O		ACTIVE	
358	30-015-21623	M	36	17S	27E	360S	455W	STATE #007	GEORGE A CHASE JR & C SERVICE	O		ACTIVE	
359	30-015-00662	M	36	17S	27E	330S	330W	STATE NO. 2	ACREY, B L & F D	O	10/15/1942	P&A	10/15/1942
595	30-015-02605	B	5	18S	28E	930N	2271E	EMPIRE ABO UNIT NO. 27 E	BP AMERICA PRODUCTION UNIT	O	6/12/2009	P&A	3/30/1960
748	30-015-00715	4	1	18S	27E	330N	330W	SOUTH RED LAKE GRAYBURG UNIT #037	LEGACY RESERVES OPERATING LP	I		ACTIVE	
748	30-015-00701	D	1	18S	27E	330N	330W	SOUTH RED LAKE GRAYBURG UNIT 37 WIW	FAIRWAY RESOURCES OPERATING LLC	O		ACTIVE	

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ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
749	30-015-00712	D	1	18S	27E	647N	667W	EMPIRE ABO UNIT I NO. 17	ARCO OIL & GAS	O	1/24/1987	P&A	1/24/1987
750		E	1	18S	27E	1650N	330W	BRAINARD	JONES	O	5/10/1939	P&A	5/10/1939
751	30-015-00704	E	1	18S	27E	1980N	660W	EMPIRE ABO UNIT J NO. 17	ARCO OIL & GAS	O	3/26/1959	P&A	3/26/1959
752	30-015-00703	L	1	18S	27E	1980S	660W	EMPIRE ABO UNIT #017A	BP AMERICA PRODUCTION COMPANY	O	3/27/2009	P&A	5/22/1995
753	30-015-22815	M	1	18S	27E	670S	330W	EMPIRE ABO UNIT #171	LIME ROCK RESOURCES A, L.P.	O		ACTIVE	5/22/1979
754		M	1	18S	27E							MISPLOT OF 756	
755	30-015-00714	N	1	18S	27E			HILL #1	VALLEY REFINING CO		12/20/1943	P&A	12/20/1943
756	30-015-00705	M	1	18S	27E	990S	660W	EMPIRE ABO UNIT #017B	BP AMERICA PRODUCTION COMPANY	O	7/21/2004	P&A	6/25/1959
757		A	2	18S	27E	330N	610E	STATE 2	BRAINARD & GUY		1/31/1942	NO COMPL	1/31/1942
758	30-015-00721	1	2	18S	27E	330N	990E	SOUTH RED LAKE GRAYBURG UNIT #036	FAIRWAY RESOURCES OPERATING LLC	O		PROD	11/6/1947
765	30-015-00724	1	2	18S	27E	990N	330E	EMPIRE ABO UNIT #016B	LIME ROCK RESOURCES A, L.P.	O		ACTIVE	
766	30-015-00737	B	2	18S	27E	905N	1601E	SOUTH RED LAKE GRAYBURG UNIT #038	FAIRWAY RESOURCES OPERATING LLC	O		ACTIVE	5/23/1948
772	30-015-00745	H	2	18S	27E	1980N	660E	STATE H #001	MACK ENERGY CORPORATION	O	3/7/2008	P&A	3/7/2008
773	30-015-00742	H	2	18S	27E	1650N	990E	SOUTH RED LAKE GRAYBURG UNIT 39 WIW	S&J OPERATING COMPANY	O	2/8/1991	P&A	2/8/1991
774	30-015-00740	G	2	18S	27E	1650N	2197E	SOUTH RED LAKE GRAYBURG UNIT #040	MCQUADRANGLE, LC	I	7/10/2002	P&A	7/10/2002
778		G	2	18S	27E	2310N	1650E	HUDSON #2	RUTTER & WILBANKS	O			1/1/1957
779	30-015-00741	G	2	18S	27E	2310N	1980E	EMPIRE ABO UNIT #015B	APACHE CORPORATION	O		ACTIVE	6/6/1959
781		J	2	18S	27E	2310S	2310E	STATE B-2	MALCO REFINING CO	O	1/1/1947	P&A	1/1/1947
785	30-015-00717	I	2	18S	27E	1980S	660E	EMPIRE ABO UNIT #016	APACHE CORPORATION	O		ACTIVE	2/6/1995
786	30-015-00716	J	2	18S	27E	1980S	1830E	EMPIRE ABO UNIT #015	APACHE CORPORATION	O		ACTIVE	3/23/1959
789	30-015-22896	K	2	18S	27E	1820S	2550W	EMPIRE ABO UNIT #143A	WALTER SOLT, LLC	O		ACTIVE	5/13/1979
791	30-015-22914	I	2	18S	27E	1310S	590E	EMPIRE ABO UNIT #161	COG OPERATING, LLC	O		ACTIVE	9/13/1979
792		O	2	18S	27E							MISPLOT OF 814	
793	30-015-22609	N	2	18S	27E	1200S	1900W	EMPIRE ABO UNIT #143	APACHE CORPORATION	O		ACTIVE	12/20/1978
795		P	2	18S	27E							MISPLOT OF 765	
796	30-015-21544	O	2	18S	27E	1110S	1322E	EMPIRE ABO UNIT #151	APACHE CORPORATION	O		T/A	11/4/1975
797	30-015-22885	O	2	18S	27E	1040S	2025E	EMPIRE ABO UNIT #155	APACHE CORPORATION	O		T/A	5/1/1979
799	30-015-00722	P	2	18S	27E	660S	660E	EMPIRE ABO UNIT #016A	APACHE CORPORATION	O	2/24/2009	P&A	1/20/1959
800	30-015-22808	O	2	18S	27E	600S	1330E	EMPIRE ABO UNIT #156	BP AMERICA PRODUCTION COMPANY	O	2/5/2009	P&A	4/12/1979
801	30-015-00731	O	2	18S	27E	660S	1980E	EMPIRE ABO UNIT #015A	BP AMERICA PRODUCTION COMPANY	O	2/11/2009	P&A	11/19/1958
802	30-015-22669	O	2	18S	27E	800S	2500E	EMPIRE ABO UNIT #154	BP AMERICA PRODUCTION COMPANY	O	1/27/2009	P&A	12/4/1978
805	30-015-22013	O	2	18S	27E	90S	1456E	EMPIRE ABO UNIT #153	BP AMERICA PRODUCTION COMPANY	O	10/30/2008	P&A	4/20/1977
806	30-015-21825	O	2	18S	27E	320S	2602E	EMPIRE ABO UNIT #152	APACHE CORPORATION	O		T/A P&A	6/17/1976
807	30-015-22608	N	2	18S	27E	100S	1950W	EMPIRE ABO UNIT #142	BP AMERICA PRODUCTION COMPANY	O		(No Info on dates)	
808	30-015-21807	M	2	18S	27E	275S	1243W	EMPIRE ABO UNIT #132	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	7/1/1976
812	30-015-00730	N	2	18S	27E	660S	1980W	EMPIRE ABO UNIT #014	APACHE CORPORATION	O		ACTIVE	10/21/1958
813	30-015-00720	A	2	18S	27E	990N	1650E	RIVERWOLF UNIT #004	BP AMERICA PRODUCTION COMPANY	O	12/12/2008	P&A	10/21/1959
814	30-015-22051	K	2	18S	27E	1370S	2445W	EMPIRE ABO UNIT #141A	APACHE CORPORATION	O		ACTIVE	5/17/1977
836	30-015-00869	A	11	18S	27E	330N	653E	EMPIRE ABO UNIT #016C	BP AMERICA PRODUCTION COMPANY	O	10/25/2004	P&A	10/25/2004
837	30-015-22568	B	11	18S	27E	400N	1450E	EMPIRE ABO UNIT #151B	BP AMERICA PRODUCTION COMPANY	O	8/16/2006	P&A	8/16/2006
838	30-015-22838	B	11	18S	27E	200N	1925E	EMPIRE ABO UNIT #153B	BP AMERICA PRODUCTION COMPANY	O	1/4/2009	P&A	5/6/1979
839	30-015-00868	B	11	18S	27E	660N	1980E	EMPIRE ABO UNIT #015C	BP AMERICA PRODUCTION COMPANY	O	7/16/2004	P&A	7/16/2004
840	30-015-22569	B	11	18S	27E	560N	2588E	EMPIRE ABO UNIT #152B	BP AMERICA PRODUCTION COMPANY	O	9/24/2008	P&A	8/23/1978

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ID NO	API	Unit No.	Sect	TOWNSHIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
841	30-015-22834	C	11	18S	27E	225N	2280W	EMPIRE ABO UNIT #141B	APACHE CORPORATION	O		ACTIVE	5/21/1979
842	30-015-00864	C	11	18S	27E	660N	1980W	EMPIRE ABO UNIT M NO. 14	ARCO OIL & GAS	O	9/5/1957	P&A	9/5/1957
843	30-015-22833	D	11	18S	27E	450N	1175W	EMPIRE ABO UNIT #133B	APACHE CORPORATION	O		ACTIVE	5/23/1979
844	30-015-00867	D	11	18S	27E	660N	660W	EMPIRE ABO UNIT M NO. 13	ARCO OIL & GAS	O	4/26/1958	P&A	4/26/1958
846	30-015-22556	D	11	18S	27E	1100N	1200W	EMPIRE ABO UNIT M NO. 131	ARCO OIL & GAS	O	7/10/1978	P&A	7/10/1978
848	30-015-20510	F	11	18S	27E	1650N	1653W	MALCO S NO. 1	AMOCO PRODUCTION CO	O	10/16/1971	P&A	10/16/1971
849	30-015-00865	F	11	18S	27E	1650N	1980W	EMPIRE ABO UNIT N NO. 14	ARCO OIL & GAS	O	2/3/1961	P&A	2/3/1961
850	30-015-00866	E	11	18S	27E	1980N	660W	EMPIRE ABO UNIT N NO. 131	ARCO OIL & GAS	O	3/27/1958	P&A	3/27/1958
851	30-015-00870	J	11	18S	27E	1980S	1980E	SMITH-MCPHERSON NO. 1	AMOCO PRODUCTION CO	O	9/1/1956	P&A	9/1/1956
852	30-015-01201	N	11	18S	27E			AN ETZ #3	OSCAR HOWARD		4/15/2027	P&A	
853	30-015-01202	O	11	18S	27E			AN ETZ #2	OSCAR HOWARD		2/4/2027	P&A	
854	30.015-00863	N	11	18S	27E			VICKERS #1	B.R. POLK, JR.		10/14/1949	P&A	10/14/1949
855	30-015-24857	M	11	18S	27E	700S	990W	FEDERAL DH GAS COM #001	CHESAPEAKE OPERATING INC	G		ACTIVE	5/18/1984
856	30-015-20535	D	12	18S	27E	330N	455W	FEDERAL EA 2	ROBERT G COX	O	8/7/1973	P&A	8/7/1973
857	30-015-00871	D	12	18S	27E	330N	330W	FEDERAL EA #001	RHONDA OPERATING CO	O	4/12/1994	P&A	4/12/1994
858	30-015-23115	D	12	18S	27E	330N	380W	FEDERAL EA NO. 3	RHONDA OPERATING CO	O	3/16/1980	D&A	3/16/1980
859	30-015-25738	G	12	18S	27E	2310N	2310E	COMSTOCK FEDERAL #009	HARLOW ENTERPRISES LLC	O		ACTIVE	4/25/1987
860	30-015-25270	F	12	18S	27E	2310N	2310W	CHUKKA FEDERAL #001	BILL MILLER	O		ACTIVE	4/23/1985
861	30-015-20894	E	12	18S	27E	1980N	660W	WDW #002	NAVAJO REFINING COMPANY	I		ACTIVE	7/18/1973
862	30-015-00874	J	12	18S	27E	2310S	2355E	COMSTOCK FEDERAL #007	HARLOW ENTERPRISES LLC	O		ACTIVE	6/29/1948
863	30-015-00872	L	12	18S	27E	310S	990W	MAGRUDER NO. 1	MCKEE-JONES	O	2/18/1943	D&A	
864	30-015-25201	K	12	18S	27E	1650S	1770W	COMSTOCK FEDERAL #002	HARLOW ENTERPRISES LLC	O		ACTIVE	3/16/1985
865	30-015-25649	L	12	18S	27E	1650S	990W	COMSTOCK FEDERAL NO. 8	FRED POOL DRILLING CO	O	10/10/1986	D&A	
866	30-015-25545	M	12	18S	27E	990S	990W	COMSTOCK FEDERAL #003	HARLOW ENTERPRISES LLC	O		ACTIVE	5/19/1986
867	30.015-00873	M	12	18S	27E			MAGRUDER #2	R.E. McKEE ET AL		2/27/1945	P&A	2/27/1945
868	30-015-26017	N	12	18S	27E	990S	1650W	COMSTOCK FEDERAL #010	EASTLAND OIL CO	O	1/23/2003	P&A	1/23/2003
869	30-015-25100	N	12	18S	27E	330S	1650W	COMSTOCK FEDERAL #001	HARLOW ENTERPRISES LLC	O		ACTIVE	12/10/1984
870	30-015-25202	O	12	18S	27E	330S	2310E	COMSTOCK FEDERAL #005	HARLOW ENTERPRISES LLC	O		ACTIVE	4/19/1985
871	30-015-06171	I	12	18S	27E	1069S	251E	MICHAEL CRONIN NO. 3	PILCHER OIL & GAS	O	5/20/2026	P&A	
872		P	12	18S	27E			MICHAEL CRONIN #1	PILCHER OIL & GAS		2/15/1932	P&A	2/15/1932
873	30-015-00875	P	12	18S	27E	330S	330E	MAGRUDER NO. B-4	CITIES SERVICE OIL CO	O	7/30/1952	P&A	7/30/1952
874	30-015-00876	P	12	18S	27E	100S	500E	MAGRUDER NO. 5	ROBERT E MCKEE	O	2/8/1954	P&A	2/8/1954
875	30-015-06170	P	12	18S	27E	200S	200E	MICHAEL CRONIN NO. 2	PILCHER OIL & GAS	O	2/22/2026	P&A	
876	30-015-01200	A	13	18S	27E	0	0	STATE NO. 1	HASSENFUSH-DONNELLY	O	1/1/2026	P&A	
877	30-015-06137	A	13	18S	27E	250N	990E	STATE NO. 2	EASTLAND OIL CO	O	1/1/2026	D&A	
878	30-015-25394	C	13	18S	27E	330N	2310W	ARTESIA STATE #002	BILL MILLER	O		ACTIVE	9/28/1985
879	30-015-25241	C	13	18S	27E	330N	1650W	ARTESIA STATE #001	BILL MILLER	O		ACTIVE	4/13/1985
880	30-015-00884	C	13	18S	27E	990N	1650W	STATE NO. 3	DALE RESLER	O	1/29/1945	P&A	1/29/1945
881	30-015-25370	D	13	18S	27E	480N	940W	ARTESIA STATE UNIT #002A	APACHE CORPORATION	O		ACTIVE	8/27/1985
882	30-015-00883	D	13	18S	27E	990N	990W	ARTESIA STATE UNIT #001	APACHE CORPORATION	O		ACTIVE	12/11/1944
883	30-015-00880	E	13	18S	27E	1650N	990W	STATE NO. 1	DALE RESLER - JONES	O	1/26/1945	P&A	1/26/1945
884	30-015-24881	F	13	18S	27E	1880N	1830W	ANADARKO 13 FEDERAL #001	DAVID G HAMMOND	O	7/17/2011	P&A	6/18/1984
885	30-015-00888	F	13	18S	27E	1980N	1650W	PAGE NO. 1	RALPH NIX & JERRY CURTIS	O	11/28/1954	P&A	11/28/1954
886	30-015-00879	F	13	18S	27E	2310N	1650W	JONES-GOVT NO. 1	DALE RESLER	O	3/14/1945	D&A	3/14/1945

TABLE II
Tabulation of Wells Within One Mile Area of Review

ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
888	30-015-25078	G	13	18S	27E	1724N	2279E	ANADARKO 13 FEDERAL NO. 1	DICKSON PETROLEUM, INC	O	12/30/1984	D&A	12/30/1984
895	30-015-00891	A	14	18S	27E	990N	330E	ARTESIA STATE UNIT TRACT 4 NO. 1	ANADARKO PETROLEUM CORP	O	6/30/1944	P&A	6/30/1944
896	30-015-00893	G	14	18S	27E	1650N	1650E	STATE NO. 1	RESLER	O	1/1/1900	D&A	1/1/1900
897	30-015-00895	H	14	18S	27E	1650N	330E	ARTESIA STATE UNIT #001B	APACHE CORPORATION	O		ACTIVE	2/8/1945
901	30-015-00695	L	1	18S	27E	1650S	330W	HILL NO. 1	WILLIAM & EDWARD HUDSON	O	6/18/1948	D&A	6/18/1948
910	30-015-00744	J	2	18S	27E	2310S	1640E	STATE 1	COMPTON-SMITH	O		P&A	
911	30-015-31123	H	36	17S	27E	1980N	760E	NO BLUFF 36 STATE COM #002	LIME ROCK RESOURCES A, LP	G		ACTIVE	
912	30-015-31036	H	36	17S	27E	2310N	990E	GATES STATE #003	GEORGE A CHASE JR & C SERVICE	O		ACTIVE	
916	30-015-31592	N	36	17S	27E	330S	2310E	RAMAPO #007	ROJO GRANDE COMPANY LLC	O	12/21/2001	P&A	12/21/2001
917	30-015-30784	A	31	17S	28E	330N	480E	NW STATE #012	LIME ROCK RESOURCES A, LP	O		ACTIVE	
918	30-015-30893	A	31	17S	28E	973N	959E	NW STATE #028	LIME ROCK RESOURCES A, LP	O		ACTIVE	
919	30-015-32162	1	31	17S	28E	460N	990W	ENRON STATE #004	LIME ROCK RESOURCES A, LP	O		ACTIVE	4/3/2003
920	30-015-30783	H	31	17S	28E	1650N	330E	NW STATE #011	LIME ROCK RESOURCES A, LP	O		ACTIVE	
921	30-015-30849	I	31	17S	28E	2310S	270E	NW STATE #009	LIME ROCK RESOURCES A, LP	O		ACTIVE	
922	30-015-30760	P	31	17S	28E	735S	330E	NW STATE #010	LIME ROCK RESOURCES A, LP	O		ACTIVE	
923	30-015-31920	D	32	17S	28E	990N	990W	ENRON STATE #002	APACHE CORPORATION	O		ACTIVE	
924	30-015-30781	K	32	17S	28E	1900S	2146W	NW STATE #005	LIME ROCK RESOURCES A, LP	I		ACTIVE	
925	30-015-30777	L	32	17S	28E	2310S	990W	NW STATE #006	APACHE CORPORATION	O		ACTIVE	
926	30-015-30685	M	32	17S	28E	990S	990W	NW STATE #007	APACHE CORPORATION	O		ACTIVE	
927	30-015-30815	N	32	17S	28E	1090S	2126W	NW STATE #008	LIME ROCK RESOURCES A, LP	I		ACTIVE	
928	30-015-32310	1	1	18S	27E	990N	990E	AAO FEDERAL #004	APACHE CORPORATION	O		ACTIVE	5/4/2004
929	30-015-32309	2	1	18S	27E	330N	1690E	AAO FEDERAL #003	APACHE CORPORATION	O		ACTIVE	4/10/2003
930	30-015-32308	3	1	18S	27E	430N	2310W	AAO FEDERAL #002	APACHE CORPORATION	O		ACTIVE	9/19/2002
931	30-015-32307	4	1	18S	27E	330N	990W	AAO FEDERAL #001	APACHE CORPORATION	O		ACTIVE	12/10/2002
932	30-015-22816	O	1	18S	27E	1120S	1440E	EMPIRE ABO UNIT L #192	ARCO OIL & GAS	O	6/23/1980	ABAN LOCATION	6/28/1980
933	30-015-20388	N	1	18S	27E	990S	2297E	EMPIRE ABO #5	ARCO OIL & GAS	O	12/31/9999	SAME AS 158	
934	30-015-27719	I	12	18S	27E	1650S	990E	CHALK BLUFF 12 FED #001	MEWBOURNE OIL CO	G		ABAN LOCATION	
935	30-015-27437	B	14	18S	27E	660N	1980E	BEAUREGARD ANP STATE COM #001	YATES PETROLEUM CORPORATION	G		ABAN LOCATION	
936	30-015-31086	E	5	18S	28E	1650N	990W	LP STATE #001	MARBOB ENERGY CORP	O	3/11/2008	P&A	3/11/2008
937	30-015-31109	E	5	18S	28E	2301N	230W	LP STATE #002	APACHE CORPORATION	O		PROPOSED	
938	30-015-30785	1	6	18S	28E	430N	330E	NW STATE #015	APACHE CORPORATION	O		ACTIVE	
939	30-015-00264	J	6	18S	28E	2310S	2310E	CAPITAL STATE NO. 1	BARNEY COCKBURN	O		SAME AS 114	5/23/1979
940	30-015-31087	7	6	18S	28E	990S	330W	LP STATE #003	MARBOB ENERGY CORP	O	3/17/2008	P&A	7/15/2000
941	30-015-31088	7	6	18S	28E	330S	990W	LP STATE #004	MARBOB ENERGY CORP	O		PROPOSED	
942	30-015-06250	O	6	18S	28E	470S	2170E		BP AMERICA PRODUCTION COMPANY	O		SAME AS 89	
943	30-015-31319	3	7	18S	28E	2310N	330W	LAUREL STATE #003	EASTLAND OIL CO	O		ACTIVE	1/31/2001
944	30-015-26575	D	6	18S	28E	778N	995W	WDW-3 (ORIGINAL LOC.)	NAVAJO REFINING COMPANY	I		ACTIVE	
945	30-015-32959	E	1	18S	27E	1650N	875W	AAO FEDERAL #005	APACHE CORPORATION	O		ACTIVE	10/12/2004
946	30-015-33473	G	1	18S	27E	1750N	1650S	AAO FEDERAL #007	MARBOB ENERGY CORP	O		ACTIVE	4/4/2005
947	30-015-33784	H	1	18S	27E	1650N	330W	AAO FEDERAL #008	MARBOB ENERGY CORP	O		ACTIVE	2/25/2005
948	30-015-34071	F	1	18S	27E	2169N	1963W	AAO FEDERAL #006	MARBOB ENERGY CORP	O		ACTIVE	8/5/2005
949	30-015-34387	L	1	18S	27E	1980S	630W	AAO FEDERAL #009	MARBOB ENERGY CORP	O		ACTIVE	1/17/2006
950	30-015-34555	M	1	18S	27E	890S	660W	AAO FEDERAL #011	MARBOB ENERGY CORP	O		ACTIVE	3/9/2006
951	30-015-34576	K	1	18S	27E	2060S	2160W	AAO FEDERAL #010	MARBOB ENERGY CORP	O		ACTIVE	10/26/2006

TABLE II
Tabulation of Wells Within One Mile Area of Review

ID NO	API	Unit No.	Sect	TOWNS HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
952	30-015-34998	N	1	18S	27E	890S	1650W	AAO FEDERAL #012	MARBOB ENERGY CORP	O		ACTIVE	9/21/2006
953	30-015-34028	G	6	18S	28E	2285N	1366E	SLIDER 6 STATE NO. 001	BP AMERICA PRODUCTION COMPANY	O	12/17/2006	P&A	12/17/2006
954	30-015-35050	D	32	17S	28E	330N	500W	ENRON STATE NO 012	LIME ROCK RESOURCES A, LP	O		ACTIVE	12/21/2006
955	30-015-36939	A	14	18S	27E	660N	990E	VIOLET BIV STATE COM #1	YATES PETROLEUM CORP	O		EXT PERMIT TO DRILL	2/20/2009
956	30-015-33994	A	36	17S	27E	915N	420E	RED LAKE 36 A STATE #2	EDGE PETROLEUM OPERATING COMPANY, INC	O		ACTIVE	4/20/2005
957	30-015-36116	G	36	17S	27E	2305N	1650E	SOUTH RED LAKE UNIT II #57	LEGACY RESERVES OPERATING LP	O		ACTIVE	6/6/2008
958	30-015-32946	J	2	18S	27E	2210S	1650E	SCBP STATE #1	APACHE CORPORATION	O		ACTIVE	4/26/2005
959	30-015-35814	H	2	18S	27E	2063N	441E	STATE H NO 2	MACK ENERGY CORPORATION	O		ACTIVE	1/11/2008
960	30-015-36343	G	31	17S	28E	1650N	2310E	MALCO STATE NO. 002	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	7/9/2008
961	30-015-36978	D	31	17S	28E	990N	330W	ENRON STATE NO. 015	LIME ROCK RESOURCES A, LP	O		ACTIVE	7/3/2009
962	30-015-36554	L	32	17S	28E	1770S	550W	NW STATE NO. 029	LIME ROCK RESOURCES A, LP	O		ACTIVE	1/30/2009
963	30-015-36989	K	32	17S	28E	1630S	1710W	NW STATE NO. 030	LIME ROCK RESOURCES A, LP	O		NO COMPL	7/14/2009
964	30-015-37057	N	32	17S	28E	330S	1750W	NW STATE NO. 031	LIME ROCK RESOURCES A, LP	O		NO COMPL	7/28/2009
965	30-015-37058	M	32	17S	28E	330S	330W	NW STATE NO. 032	LIME ROCK RESOURCES A, LP	O		NO COMPL	8/23/2009
966	30-015-37428	G	31	17S	28E	1980N	1980E	MALCO STATE NO. 3	G&C SERVICE	O		ACTIVE	2/10/2010
	30-015-36281	1		18S	27E	2193S	1520W	SUN DEVILS FEDERAL NO. 001	MACK ENERGY CORPORATION	O		PERMIT TO DRILL 4/11/12	
967	30-015-38240	G	36	17S	27E	1425N	1520E	KIOWA STATE NO. 3	COG OPERATING, LLC	O		PERMIT TO DRILL	
968	30-015-39029	G	36	17S	27E	2210N	2310E	CONKLIN STATE NO. 1-Y	G AND C SERVICE	O		ACTIVE	
969	30-015-39321	M	36	17S	27E	990S	890W	BIG BOY STATE NO. 1	COG OPERATING, LLC	O		PERMIT TO DRILL	
970	30-015-39322	M	36	17S	27E	840S	425W	BIG BOY STATE NO. 3	COG OPERATING, LLC	O		PERMIT TO DRILL	
971	30-015-39323	O	36	17S	27E	870S	1560E	BIG BOY STATE NO. 5	COG OPERATING, LLC	O		PERMIT TO DRILL	
972	30-015-39324	O	36	17S	27E	480S	2210E	BIG BOY STATE NO. 6	COG OPERATING, LLC	O		PERMIT TO DRILL	
973	30-015-39325	O	36	17S	27E	990S	2210E	BIG BOY STATE NO. 7	COG OPERATING, LLC	O		PERMIT TO DRILL	
974	30-015-39326	O	36	17S	27E	275S	1560E	BIG BOY STATE NO. 8	COG OPERATING, LLC	O		PERMIT TO DRILL	
975	30-015-39401	P	36	17S	27E	1110S	630E	EMPIRE ABO UNIT NO. 417	APACHE CORPORATION	O		PERMIT TO DRILL	
976	30-015-39009	G	2	18S	27E	1650N	2430E	EMPIRE ABO UNIT NO. 415	APACHE CORPORATION	O		PERMIT TO DRILL	
977	30-015-39066	L	2	18S	27E	2551S	1170W	EMPIRE ABO UNIT NO. 416	APACHE CORPORATION	O		PERMIT TO DRILL	
978	30-015-38234	P	30	17S	28E	430S	800E	ANTHONY NO. 2	LIME ROCK RESOURCES	O		ACTIVE	
979	30-015-39299	M	30	17S	28E	990S	990W	MAPLE STATE NO. 5	COG OPERATING, LLC	O		PERMIT TO DRILL	
980	30-015-39300	M	30	17S	28E	330S	330W	MAPLE STATE NO. 6	COG OPERATING, LLC	O		PERMIT TO DRILL	
981	30-015-38512	D	30	17S	28E	990N	940W	ENRON STATE NO. 16	LIME ROCK RESOURCES	O		ACTIVE	
982	30-015-39004	P	31	17S	28E	150S	1300E	EMPIRE ABO UNIT NO. 401	APACHE CORPORATION	O		PERMIT TO DRILL	
983	30-015-39011	O	31	17S	28E	1190S	1320E	EMPIRE ABO UNIT NO. 419	APACHE CORPORATION	O		PERMIT TO DRILL	
984	30-015-39020	O	31	17S	28E	140S	2560E	EMPIRE ABO UNIT NO. 408	APACHE CORPORATION	O		PERMIT TO DRILL	
985	30-015-38513	J	32	17S	28E	2310S	2032E	JEFFER 32 STATE NO. 3	LIME ROCK RESOURCES	O		ACTIVE	
986	30-015-39006	J	32	17S	28E	2400S	2450E	EMPIRE ABO UNIT NO. 407	APACHE CORPORATION	O		PERMIT TO DRILL	
987	30-015-39007	M	32	17S	28E	70S	100W	EMPIRE ABO UNIT NO. 409	APACHE CORPORATION	O		PERMIT TO DRILL	
988	30-015-39064	O	32	17S	28E	1175S	1310E	EMPIRE ABO UNIT NO. 403	APACHE CORPORATION	O		PERMIT TO DRILL	
989	30-015-39008	D	6	18S	28E	160N	1300W	EMPIRE ABO UNIT NO. 410	APACHE CORPORATION	O		PERMIT TO DRILL	
990	30-015-39021	D	6	18S	28E	40N	145W	EMPIRE ABO UNIT NO. 411	APACHE CORPORATION	O		PERMIT TO DRILL	
992	30-015-00715	D	1	18S	27E	330N	330W	SOUTH RED LAKE II UNIT NO. 37	LEGACY RESERVES OPERATING LP				

TABLE III

Well Changes in the Combined One Mile Area of Review Since the 2010 Annual Report for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes
7	30 015 00666	G	36	17S	27E	2310 FNL & 2310 FEL	Conklin State No. 1	G & C Service	Intention to plug from 533' to the surface.
884	30 015 24881	F	13	18S	27E	1880 FNL & 1830 FWL	Anadarko 13 Federal No. 1	David G Hammond	Plugged - set CIBP at 1476 feet, dumped 35 feet of cement on top of plug, perforated at 374 feet and perforated at 424 feet, spotted 25 sacks of cement, perforated at 60 feet, pumped 35 sacks of cement and circulated to the surface
758	30 015 00721	A	02	18S	27E	330 FNL & 990 FEL	outh Red Lake Grayburg Unit No. 3	Legacy Reserves Operating, LP	Changed from shut-in to producing/flaring gas, changed owners from McQuadrangle to Legacy Reserves Operating, LP
5	30 015 00690	G	36	17S	27E	1830 FNL & 2205 FEL	Conklin No. 2	G and C Service	Run 4-1/2" liner to 475' and cement to surface. Continue production
967	30 015 38240	G	36	17S	27E	1425 FNL & 1520 FEL	Kiowa State No. 3	Cog Operating LLC	NEW: Currently drilling to 4850' in the Glorietta-Yeso; To be perforated in Yeso Formation; Proposed TD 4850'
968	30 015 39029	G	36	17S	27E	2210 FNL & 2310 FEL	Conklin State No. 1-Y	G and C Service	NEW: Drilled to 540' TD, producing oil
969	30 015 39321	M	36	17S	27E	990 FSL & 890 FWL	Big Boy State No. 1	Cog Operating LLC	NEW: Permit to Drill
970	30 015 39322	M	36	17S	27E	840 FSL & 425 FWL	Big Boy State No. 3	Cog Operating LLC	NEW: Permit to Drill
971	30 015 39323	O	36	17S	27E	870 FSL & 1560 FEL	Big Boy State No. 5	Cog Operating LLC	NEW: Permit to Drill
972	30 015 39324	O	36	17S	27E	480 FSL & 2210 FEL	Big Boy State No. 6	Cog Operating LLC	NEW: Permit to Drill
973	30 015 39325	O	36	17S	27E	990 FSL & 2210 FEL	Big Boy State No. 7	Cog Operating LLC	NEW: Permit to Drill
974	30 015 39326	O	36	17S	27E	275 FSL & 1560 FEL	Big Boy State No. 8	Cog Operating LLC	NEW: Permit to Drill
975	30 015 39401	P	36	17S	27E	1110 FSL & 630 FEL	Empire Abo Unit No. 417	Apache Corp	NEW: Permit to Drill
976	30 015 39009	G	02	18S	27E	1650 FNL & 2430 FEL	Empire Abo Unit No. 415	Apache Corp	NEW: Permit to Drill
977	30 015 39066	L	02	18S	27E	2551 FSL & 1170 FWL	Empire Abo Unit No. 416	Apache Corp	NEW: Permit to Drill
978	30 015 38234	P	30	17S	28E	430 FSL & 800 FEL	Anthony No. 2	Lime Rock Resources	NEW: Drilled to 4823' TD, PBTD: 4762'. Perforations in Upper Yeso: 3644'-3932', Middle Yeso: 3962'-4254', and Lower Yeso: 4355'-4719'
979	30 015 39299	M	30	17S	28E	990 FSL & 990 FWL	Maple State No. 5	Cog Operating LLC	NEW: Permit to Drill
980	30 015 39300	M	30	17S	28E	330 FSL & 330 FWL	Maple State No. 6	Cog Operating LLC	NEW: Permit to Drill
981	30 015 38512	D	30	17S	28E	990 FNL & 940 FWL	Enron State No. 16	Lime Rock Resources	NEW: Well is drilled to total depth of 3658'. Will be completed later this year.
982	30 015 39004	P	31	17S	28E	150 FSL & 1300 FEL	Empire Abo Unit No. 401	Apache Corp	NEW: Permit to Drill
983	30 015 39011	O	31	17S	28E	1190 FSL & 1320 FEL	Empire Abo Unit No. 419	Apache Corp	NEW: Permit to Drill
984	30 015 39020	O	31	17S	28E	140 FSL & 2560 FEL	Empire Abo Unit No. 408	Apache Corp	NEW: Permit to Drill
985	30 015 38513	J	32	17S	28E	2310 FSL & 2032 FEL	Jeffer 32 State No. 3	Lime Rock Resources	NEW: Drilled to 5093' TD, PBTD: 5070'. Perforations in Upper Yeso: 3441'-4727', 3768'-4076', Middle Yeso: 4130'-4476', and Lower Yeso: 4540'-5007'
986	30 015 39006	J	32	17S	28E	2400 FSL & 2450 FEL	Empire Abo Unit No. 407	Apache Corp	NEW: Permit to Drill
987	30 015 39007	M	32	17S	28E	70 FSL & 100 FWL	Empire Abo Unit No. 409	Apache Corp	NEW: Permit to Drill
988	30 015 39064	O	32	17S	28E	1175 FSL & 1310 FEL	Empire Abo Unit No. 403	Apache Corp	NEW: Permit to Drill
989	30 015 39008	D	06	18S	28E	160 FNL & 1300 FWL	Empire Abo Unit No. 410	Apache Corp	NEW: Permit to Drill
990	30 015 39021	D	06	18S	28E	40 FNL & 145 FWL	Empire Abo Unit No. 411	Apache Corp	NEW: Permit to Drill
991	30 015 32946	J	02	18S	27E	2210 FSL & 1650 FEL	SCBP State No. 001	Apache Corp	NEW to AOR. TD = 3880', Changed owner to Apache Corp from Marbob Energy Group

TABLE IV
Wells that have been Plugged and Abandoned since the 2010 Annual Report
Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes
7	30 015 00666	G	36	17S	27E	2310 FNL & 2310 FEL	Conklin State No. 1	G & C Service	Intention to plug from 533' to the surface.
884	30 015 24881	F	13	18S	27E	1880 FNL & 1830 FWL	Anadarko 13 Federal No. 1	David G Hammond	Plugged - set CIBP at 1476 feet, dumped 35 feet of cement on top of plug, perforated at 374 feet and perforated at 424 feet, spotted 25 sacks of cement, perforated at 60 feet, pumped 35 sacks of cement and circulated to the surface

TABLE V
Wells that have been Temporally Abandoned since the 2010 Annual Report
Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes

TABLE VI
Wells that have been put back into Production Since the 2010 Annual Report
Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes
758	30 015 00721	A	02	18S	27E	330 FNL & 990 FEL	South Red Lake Grayburg Unit No. 36	Legacy Reserves Operating, LP	Changed from shut-in to producing/flaring gas, changed owners from McQuadrangle to Legacy Reserves Operating, LP

TABLE VII
Wells that have been Recompleted in Upper Zones since the 2010 Annual Report
Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes
5	30 015 00690	G	36	17S	27E	1830 FNL & 2205 FEL	Conklin No. 2	G and C Service	Run 4-1/2" liner to 475' and cement to surface. Continue production

TABLE VIII
Newly Drilled Wells in the Area of Review since the 2010 Annual Report
Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes
967	30 015 38240	G	36	17S	27E	1425 FNL & 1520 FEL	Kiowa State No. 3	Cog Operating LLC	NEW: Currently drilling to 4850' in the Glorietta-Yeso; To be perforated in Yeso Formation; Proposed TD 4850'
968	30 015 39029	G	36	17S	27E	2210 FNL & 2310 FEL	Conklin State No. 1-Y	G and C Service	NEW: Drilled to 540' TD, producing oil
969	30 015 39321	M	36	17S	27E	990 FSL & 890 FWL	Big Boy State No. 1	Cog Operating LLC	NEW: Permit to Drill
970	30 015 39322	M	36	17S	27E	840 FSL & 425 FWL	Big Boy State No. 3	Cog Operating LLC	NEW: Permit to Drill
971	30 015 39323	O	36	17S	27E	870 FSL & 1560 FEL	Big Boy State No. 5	Cog Operating LLC	NEW: Permit to Drill
972	30 015 39324	O	36	17S	27E	480 FSL & 2210 FEL	Big Boy State No. 6	Cog Operating LLC	NEW: Permit to Drill
973	30 015 39325	O	36	17S	27E	990 FSL & 2210 FEL	Big Boy State No. 7	Cog Operating LLC	NEW: Permit to Drill
974	30 015 39326	O	36	17S	27E	275 FSL & 1560 FEL	Big Boy State No. 8	Cog Operating LLC	NEW: Permit to Drill
975	30 015 39401	P	36	17S	27E	1110 FSL & 630 FEL	Empire Abo Unit No. 417	Apache Corp	NEW: Permit to Drill
976	30 015 39009	G	02	18S	27E	1650 FNL & 2430 FEL	Empire Abo Unit No. 415	Apache Corp	NEW: Permit to Drill
977	30 015 39066	L	02	18S	27E	2551 FSL & 1170 FWL	Empire Abo Unit No. 416	Apache Corp	NEW: Permit to Drill
978	30 015 38234	P	30	17S	28E	430 FSL & 800 FEL	Anthony No. 2	Lime Rock Resources	NEW: Drilled to 4823' TD, PBTD: 4762'. Perforations in Upper Yeso: 3644'-3932', Middle Yeso: 3962'-4254', and Lower Yeso: 4355'-4719'
979	30 015 39299	M	30	17S	28E	990 FSL & 990 FWL	Maple State No. 5	Cog Operating LLC	NEW: Permit to Drill
980	30 015 39300	M	30	17S	28E	330 FSL & 330 FWL	Maple State No. 6	Cog Operating LLC	NEW: Permit to Drill
981	30 015 38512	D	30	17S	28E	990 FNL & 940 FWL	Enron State No. 16	Lime Rock Resources	NEW: Well is drilled to total depth of 3658'. Will be completed later this year.
982	30 015 39004	P	31	17S	28E	150 FSL & 1300 FEL	Empire Abo Unit No. 401	Apache Corp	NEW: Permit to Drill
983	30 015 39011	O	31	17S	28E	1190 FSL & 1320 FEL	Empire Abo Unit No. 419	Apache Corp	NEW: Permit to Drill
984	30 015 39020	O	31	17S	28E	140 FSL & 2560 FEL	Empire Abo Unit No. 408	Apache Corp	NEW: Permit to Drill
985	30 015 38513	J	32	17S	28E	2310 FSL & 2032 FEL	Jeffer 32 State No. 3	Lime Rock Resources	NEW: Drilled to 5093' TD, PBTD: 5070'. Perforations in Upper Yeso: 3441'-4727', 3768'-4076', Middle Yeso: 4130'-4476', and Lower Yeso: 4540'-5007'
986	30 015 39006	J	32	17S	28E	2400 FSL & 2450 FEL	Empire Abo Unit No. 407	Apache Corp	NEW: Permit to Drill
987	30 015 39007	M	32	17S	28E	70 FSL & 100 FWL	Empire Abo Unit No. 409	Apache Corp	NEW: Permit to Drill
988	30 015 39064	O	32	17S	28E	1175 FSL & 1310 FEL	Empire Abo Unit No. 403	Apache Corp	NEW: Permit to Drill
989	30 015 39008	D	06	18S	28E	160 FNL & 1300 FWL	Empire Abo Unit No. 410	Apache Corp	NEW: Permit to Drill
990	30 015 39021	D	06	18S	28E	40 FNL & 145 FWL	Empire Abo Unit No. 411	Apache Corp	NEW: Permit to Drill
995	30 015 33473	G	01	18S	27E	1750 FNL & 1650 FEL	AAO Federal No. 7	Apache Corp	NEW to AOR, change of operator from Marbob Energy Corp to Apache Corp
996	30 015 33784	H	01	18S	27E	1650 FNL & 330 FEL	AAO Federal No. 8	Apache Corp	NEW to AOR, change of operator from Marbob Energy Corp to Apache Corp
997	30 015 34071	F	01	18S	27E	2169 FNL & 1963 FWL	AAO Federal No. 6	Apache Corp	NEW to AOR, change of operator from Marbob Energy Corp to Apache Corp
998	30 015 34555	M	01	18S	27E	890 FSL & 660 FWL	AAO Federal No. 11	Apache Corp	NEW to AOR, change of operator from Marbob Energy Corp to Apache Corp
999	30 015 34576	K	01	18S	27E	2060 FSL & 2160 FWL	AAO Federal No. 10	Apache Corp	NEW to AOR, change of operator from Marbob Energy Corp to Apache Corp

TABLE IX

FIGURES INCLUDED IN THE REPORT

Figure	Description	OCD Reference
1	Mewbourne Well #1 Schematic	Section VI.1 and IX.3
2	Plot of Bottom Hole Pressure and Temperature Data Chukka Well #2	n/a
3	Gaines Well #3 Schematic	n/a
4	Chukka Well #2 Schematic	n/a
5	Plot of Bottom Hole Pressure and Temperature Data Gaines Well #3	n/a
6	Midland Map of One Mile Area of Review	n/a
7	Mewbourne Well #1 Wellhead Schematic	Section IX.14
8	Diagram of Valve Locations for Shut-in on Mewbourne Well #1	Section IX.14
9	Mewbourne Well #1 Test Overview	Section IX.18.f
10	Mewbourne Well #1 Cartesian Plot of Bottom-Hole Pressure and Temperature vs. Time	Section IX.18.a
11	Mewbourne Well #1 Cartesian Plot of Injection Rate vs. Time	Section IX.18.b
12	Mewbourne Well #1 Cartesian Plot of Surface Pressure and Injection Rates vs. Time	Section IX.18.e
13	Historical Surface Pressure and Injection Rates vs. Calendar Time	Section IX.18.g

TABLE IX (cont.)

Figure	Description	OCD Reference
14	Mewbourne Well #1 Derivative Log-Log Plot	Section IX.18.c
15	Mewbourne Well #1 Superposition Horner (Semi-Log) Plot	Section IX.18.d
16	Mewbourne Well #1 Expanded Superposition Horner (Semi-Log) Plot	Section IX.18.d
17	Mewbourne Well #1 Hall Plot	Section IX.18.h
18	Mewbourne Well #1 Static Pressure Gradient Survey	n/a

TABLE X

Comparison of Permeability, Transmissibility, Skin, False Extrapolated Pressure, and Fill Depth

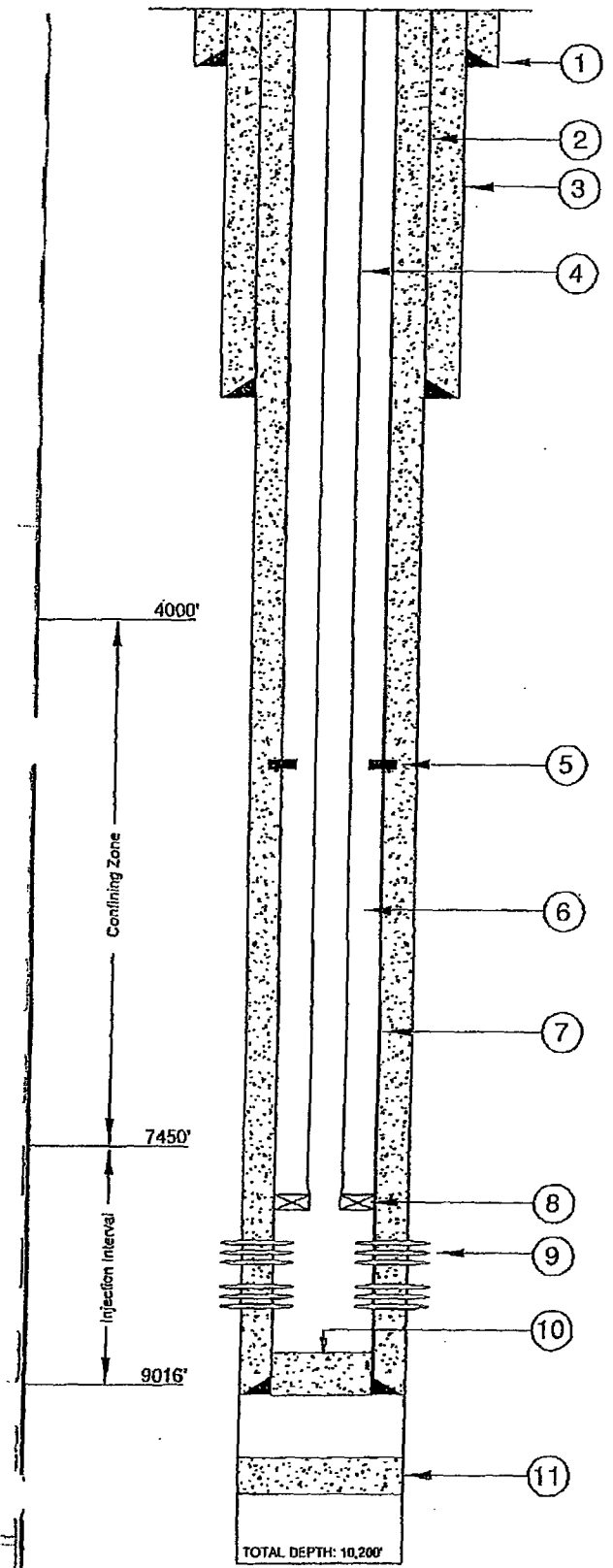
Date of Test	Permeability (k)	Transmissibility (kh/u)	Skin (s)	False Extrapolated Pressure (p*)	Fill Depth
November 10-13, 2011	685 md	210,441 md-ft/cp	68.5	3846.18 psia	9,001 feet
December 16-21, 2010	521 md	159,979 md-ft/cp	92.7	3716.9 psia	9,001 feet
October 26-29, 2009	883 md	271,155 md-ft/cp	77	3,591.62 psia	9,001 feet
April 3-4, 2008	1,592 md	488,655 md-ft/cp	262	3,527.37 psia	N/A
Permit Parameters	250 md	40,094 md-ft-cp	0	N/A	N/A

TABLE XI

NAVAJO REFINING COMPANY
STATIC PRESSURE GRADIENT SURVEY – MEWBOURNE WELL #1
November 13, 2011

Depth (ft)	Pressure (psia)	Pressure Gradient (psi/ft)	Temperature (°F)
7924	3854.83		100.10
7000	3452.69	0.435	104.30
6000	3019.24	0.434	100.96
5000	2585.70	0.434	96.90
4000	2152.00	0.434	93.00
3000	1718.19	0.434	89.70
2000	1284.89	0.433	86.25
1000	851.61	0.433	82.75
0	410.62	0.441	63.24

FIGURES



BELOW GROUND DETAILS

All depths are referenced to the Kelly bushing elevation of 12.5' above ground level. Ground level elevation is 3,678' above mean sea level.

1. Surface Casing: 13 ⅜", 48 lb/ft, J-55, ST&C set at 390' in a 17 ½" hole. Cemented with 150 sx Class C with 3 % calcium chloride, 375 sx Class C Litewate w/3% calcium chloride and ½ lb/sx flocele. Circulated 86 sx to surface.

2. Intermediate Casing: 9 ⅝", 36 lb/ft, J-55, ST&C set at 2,555' in a 12 ¼ " hole. Cemented w/800 sx of Class C Lite w/ ½ lb/sx flocele and 2 lb/sx Gilsonite and 12 % salt. Followed by 200 sx of Class C w/2 % calcium chloride. Circulated 133 sx to surface.

3. Base of the USDW at 493'.

4. Injection Tubing: 4 ½", 11.6 lb/ft, N-80, SMLS, R3, LT&C set at 7,879'.

5. DV Tool: at 5,498'.

6. Annulus Fluid: 8.7 lb/gal brine water mixed w/UniChem Techni-Hib 370 corrosion inhibitor.

7. Protection Casing: 7", 29 lb/ft, N-80, LT&C: 9094' to 7031'. 7", 29 lb/ft, P-110, LT&C: 7031' to 5845'. 7", 26 lb/ft, P-110, LT&C; 5845' to surface. Casing cemented in two stages as follows:

   First Stage - 600 sx modified Class H w/0.4 % CFR-3, 5 lb/sx Gilsonite, 0.5% Halad-344, and 1 lb/sx salt mixed at 13.0 ppg. Opened DV tool at 5498' and circulated 142 sx to surface.

   Second Stage - Lead Slurry: 220 sx Interfill "C" (35:65:6) mixed at 11.7 ppg. Tail Slurry: 550 sx modified Class H w/0.4 % CFR-3, 5 lb/sx, Gilsonite, 0.5 % Halad-344, 0.1% HR-7, and 1 lb/sx mixed at 13.0 ppg. Circulated 75 sx to surface. Top out w/20 sx permium plus 3% calcium chloride.

8. Packer: 7" x 3.5" EVI Oil Tools (Arrow), Model X-1 retrievable packer set at 7879'. Minimum I.D. is 3.0". Wireline re-entry guide on bottom. To release: turn ¼ turn to the right and pick up.

9. Perforations (2 SPF):

   Upper Zone - 7924-7942', 7974-8030', 8050-8056', 8066-8080', 8118-8127', 8132-8140', 8160-8164', 8170-8188'.

   Lower Zone - 8220-8254', 8260-8270', 8280-8302', 8360-8366', 8370-8378', 8400-8410', 8419-8423', 8430-8446', 8460-8464', 8470-8476'.

10. PBTD: 9004'.

11. Cement Plug: 45 sx Class H from 9624' to 9734'.

SUBSURFACE

HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS
WASTE DISPOSAL WELL NO. 1

DATE: 07/13/01	CHECKED BY:	JOB NO: 7005256
DRAWN BY: WDL	APPROVED BY:	DWG. NO:

FIGURE 1

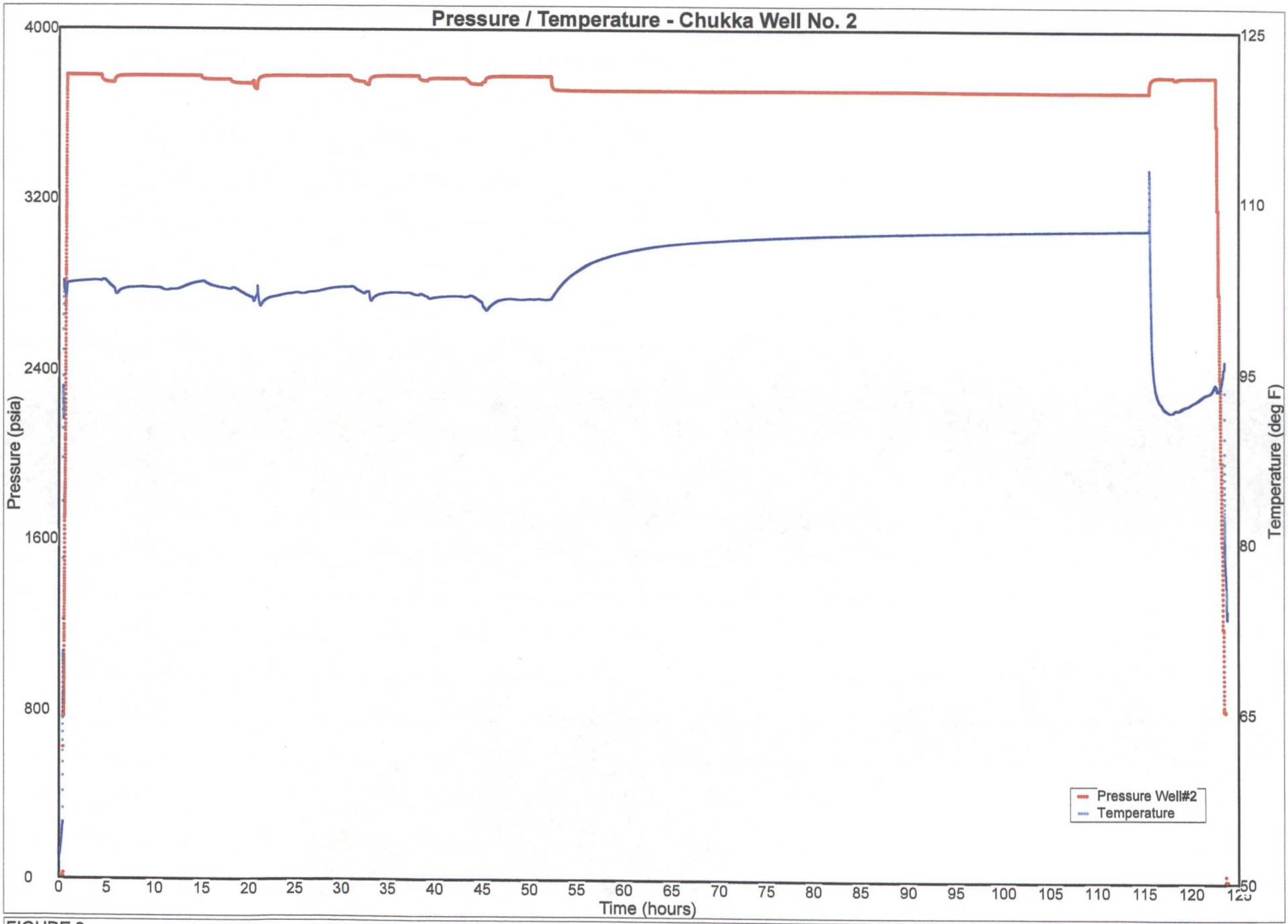
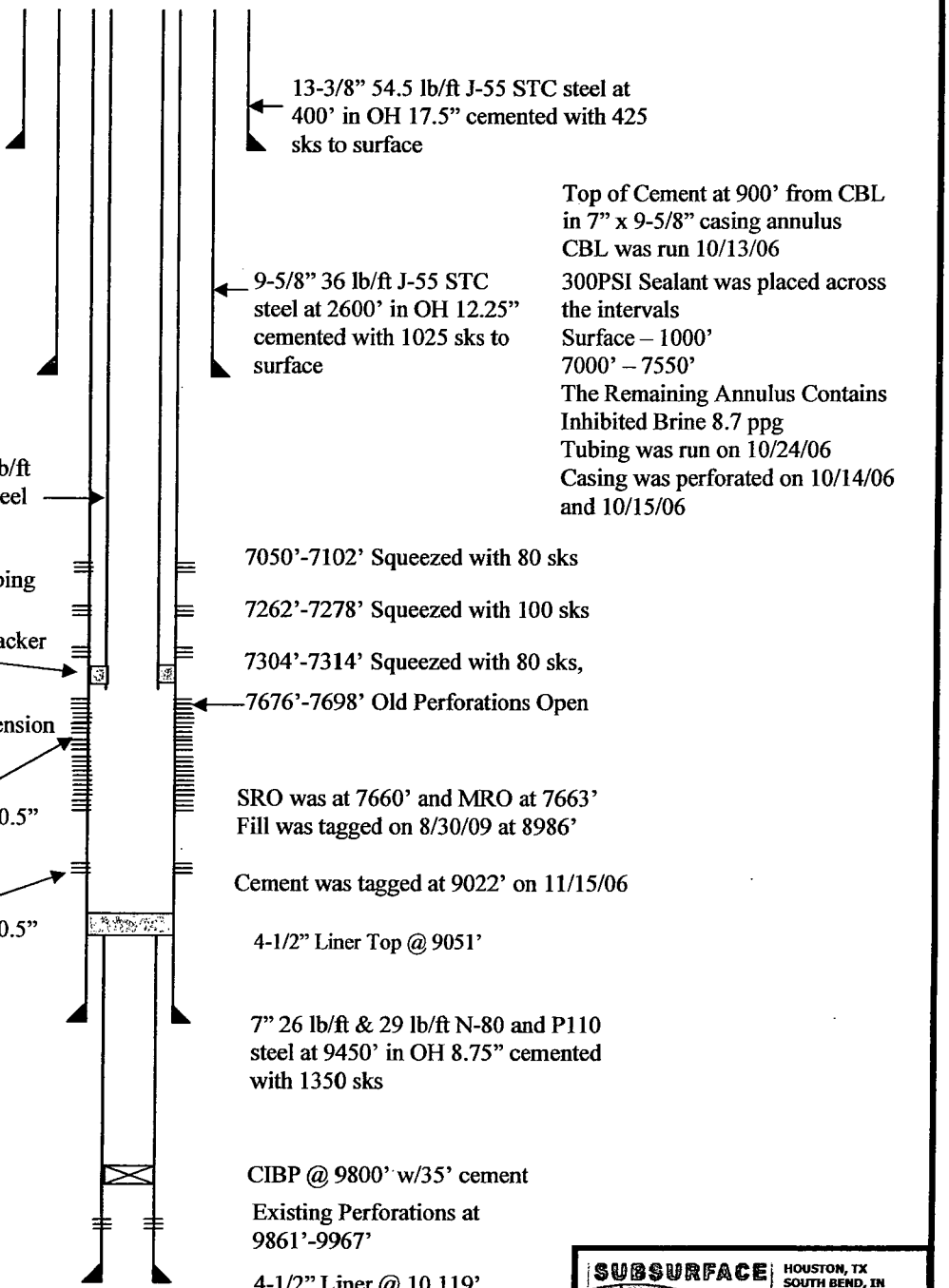

Pressure / Temperature - Chukka Well No. 2
Pressure (psia)
Temperature (deg F)
Time (hours)
4000
3200
2400
1600
800
0
125
110
95
80
65
50
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
Pressure Well#2
Temperature

FIGURE 2



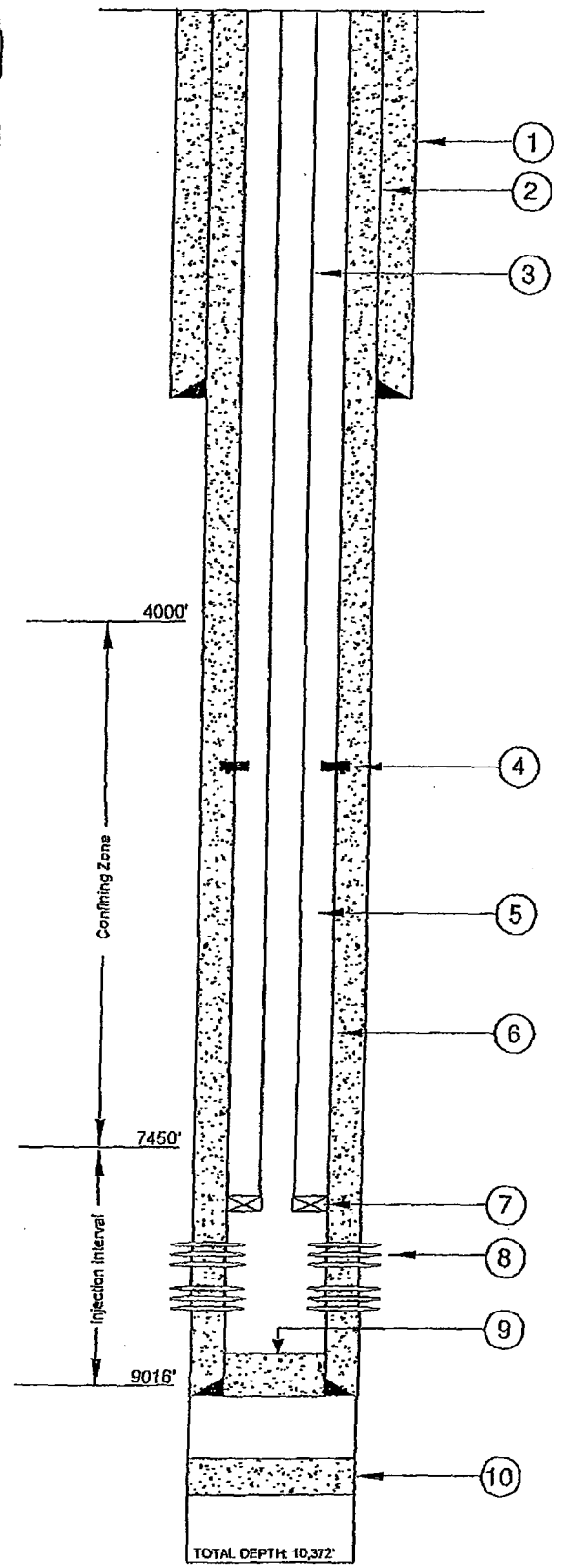
API# 30-015-26575
UIC-CLI-008-3
S1-T18S-R27E
Gaines Well #3 Formally Chalk Bluff Federal #1
Not to Scale

SUBSURFACE HOUSTON, TX SOUTH BEND, IN BATON ROUGE, LA

Figure
Gaines Well #3
Navajo Refining

DATED: 9/8/09	APPROVED BY:	JOB NO. 70A6365
DRAWN BY: rls	CHECKED BY:rls	SCALE: N/A

FIGURE 3



BELOW GROUND DETAILS

All depths are referenced to the Kelly bushing elevation of 13' above ground level. Ground level elevation is 3610' above mean sea level.

1. Base of the USDW at 473'.
2. Surface Casing: 8 5/8", 32 lb/ft, set at 1995' in an 11" hole. Cemented to surface with 800 sacks of cement.
3. Injection Tubing: 3 ½", 9.2 lb/ft, J-55, smls, NUE 10 rd. set at 7528'.
4. DV Tool: at 5,785'.
5. Annulus Fluid: 8.7 lb/gal brine water mixed w/UniChem Techni-Hib 370 corrosion inhibitor.
6. Protection Casing: 5 ½", 17 lb/ft, L-80, LT&C; 8869' to the surface and set in a 7 7/8" hole. Casing cemented in two stages as follows:

   First Stage - 575 sacks of modified Class "H" with 0.4 % CFR-3, 5 lb/sk Gilsonite, 0.5 % Halad-344, and 3 lb/sk salt. Mixed at 13.0 ppg. Opened DV tool at 5785 and circulated 20 sacks to surface.

   Second Stage - Lead Slurry: 300 sacks of Interfill "C" (35:65:6) mixed at 11.7 ppg. Tail slurry: 695 sacks modified Class "H" with 0.4% CFR-3, 5 lb/sk Gilsonite, 0.5 % Halad-344 and 3 lb/sk salt mixed at 13.0 ppg. Circulated 150 sacks to surface. Topped out with 10 yards of Redi-mix.
7. Packer: 5 ½" x 2 7/8" Weatherford Completion Tools (Arrow) Model X-1 retrievable packer set at 7528'. Minimum ID is 2.4375". Wireline re-entry guide is on bottom. To release: turn ¼ turn to the right and pick up.
8. Perforations (2 SPF):

   Zone 1: 7570-7620', 7676-7736'

   Zone 2: 7826-7834', 7858-7880', 7886-7904', 7916-7936', 7944-7964', 7990-8042', 8096-8116', 8191-8201', 8304-8319',8395-8399'.
9. PBTD: 8770'
10. Cement Plug: 45 sacks from 9675' to 9775'.

SUBSURFACE

HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS
WASTE DISPOSAL WELL NO. 2

DATE: 07/13/01	CHECKED BY:	JOB NO: 7005256
DRAWN BY: WDL	APPROVED BY:	DWG. NO:

FIGURE 4

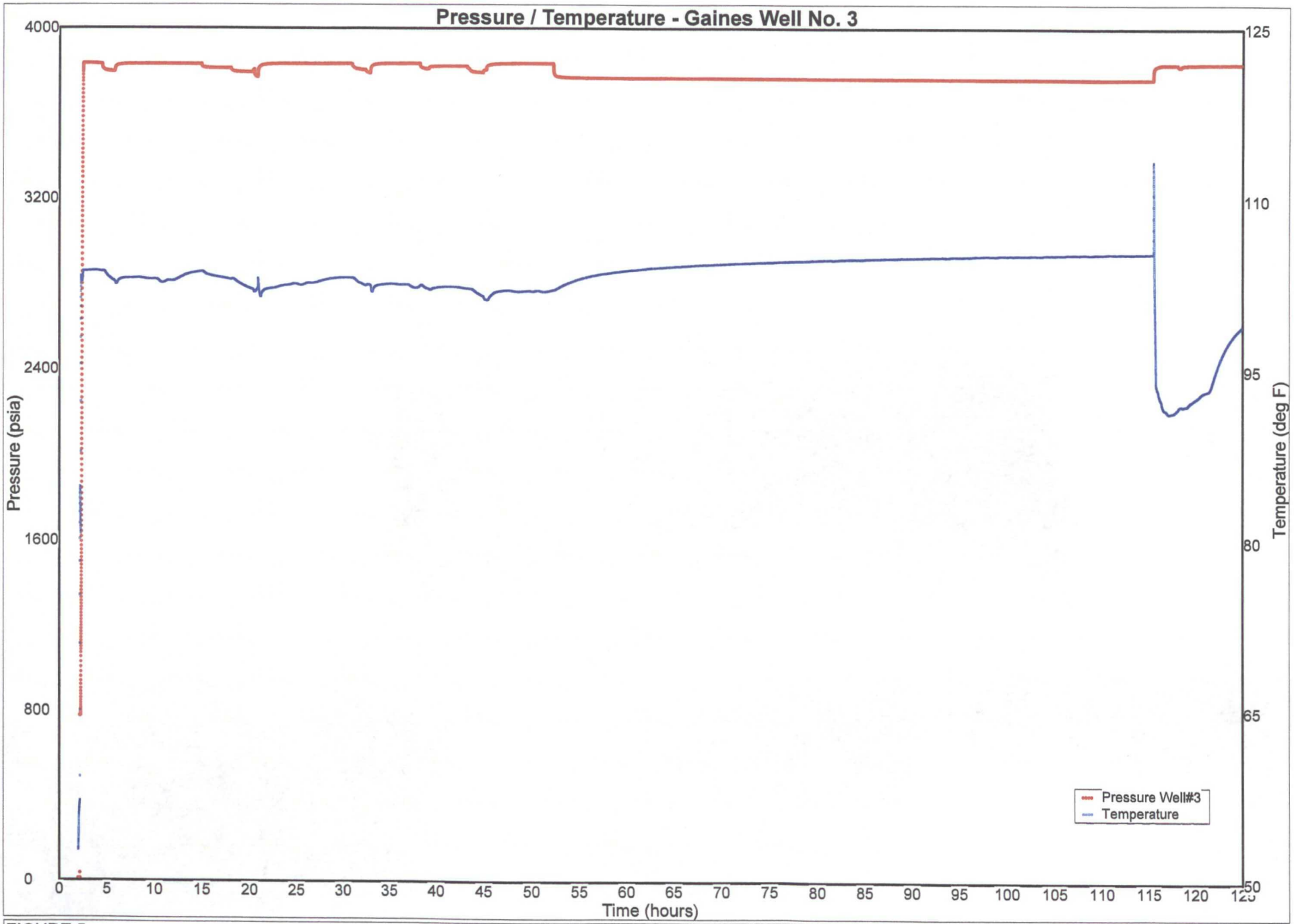

Pressure / Temperature - Gaines Well No. 3
Pressure (psia)
Temperature (deg F)
Time (hours)
4000
3200
2400
1600
800
0
125
110
95
80
65
50
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
Pressure Well#3
Temperature

FIGURE 5

SUBSURFACE TECHNOLOGY

FIGURE 7

WELL: NAVAJO REFINING MEWBOURNE WELL NO. 1

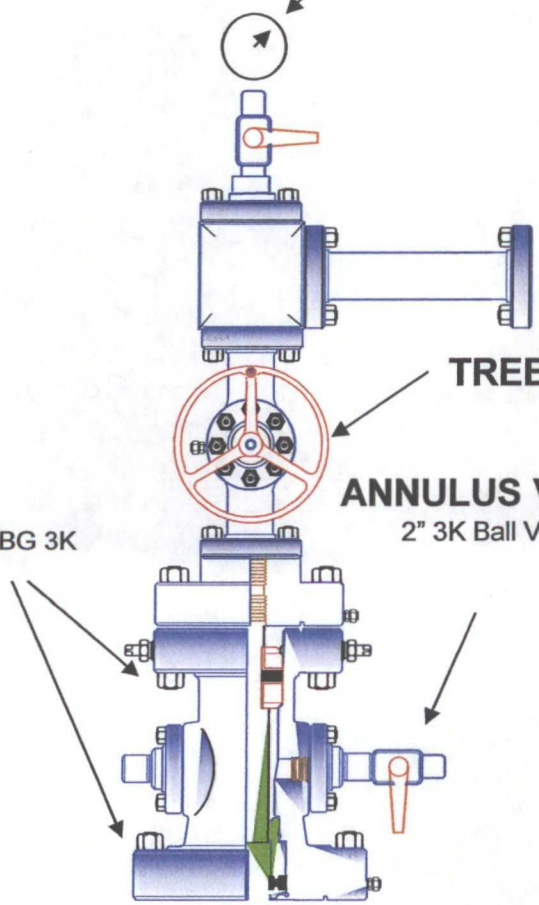
TOP CONNECTION
2-3/8" 8rd x 4-1/16" 3K
2" x 2-3/8" Ball Valve
2-3/8" Bull Plug 1/2" NPT
5000 LB Pressure Guage

UPPER TREE ASSEMBLY
A5PP,4-1/2" 3K X 4-1/16" 3K

TREE GATE VALVE
4-1/16" 3K

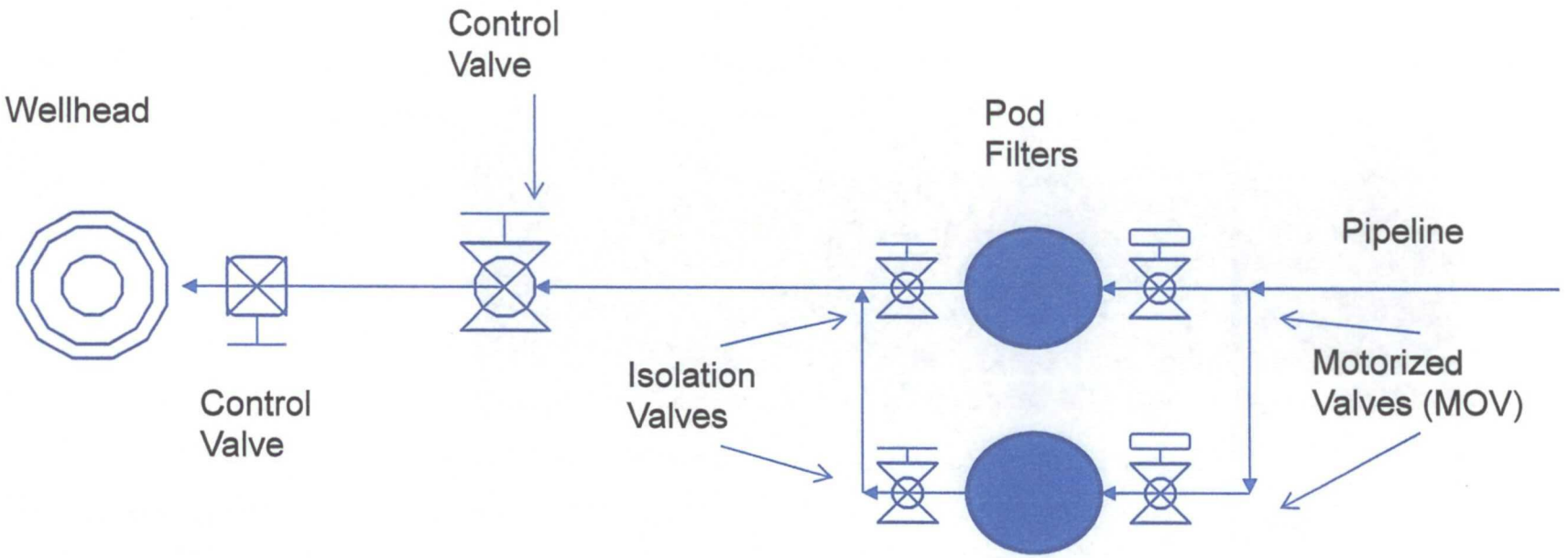
FLANGE
7-1/16", 3-1/2" 3K X 4-1/16" UPTBG 3K

ANNULUS VALVE
2" 3K Ball Valve



SUPERIOR WELLHEAD

FIGURE 8
Mewbourne Well No. 1
Diagram of Shut-in Valve Control



At Shut-in
- Close MOV
- Close Control Valve
- Close Isolation Valves
- Close Control Valve
- Drain POD Filters

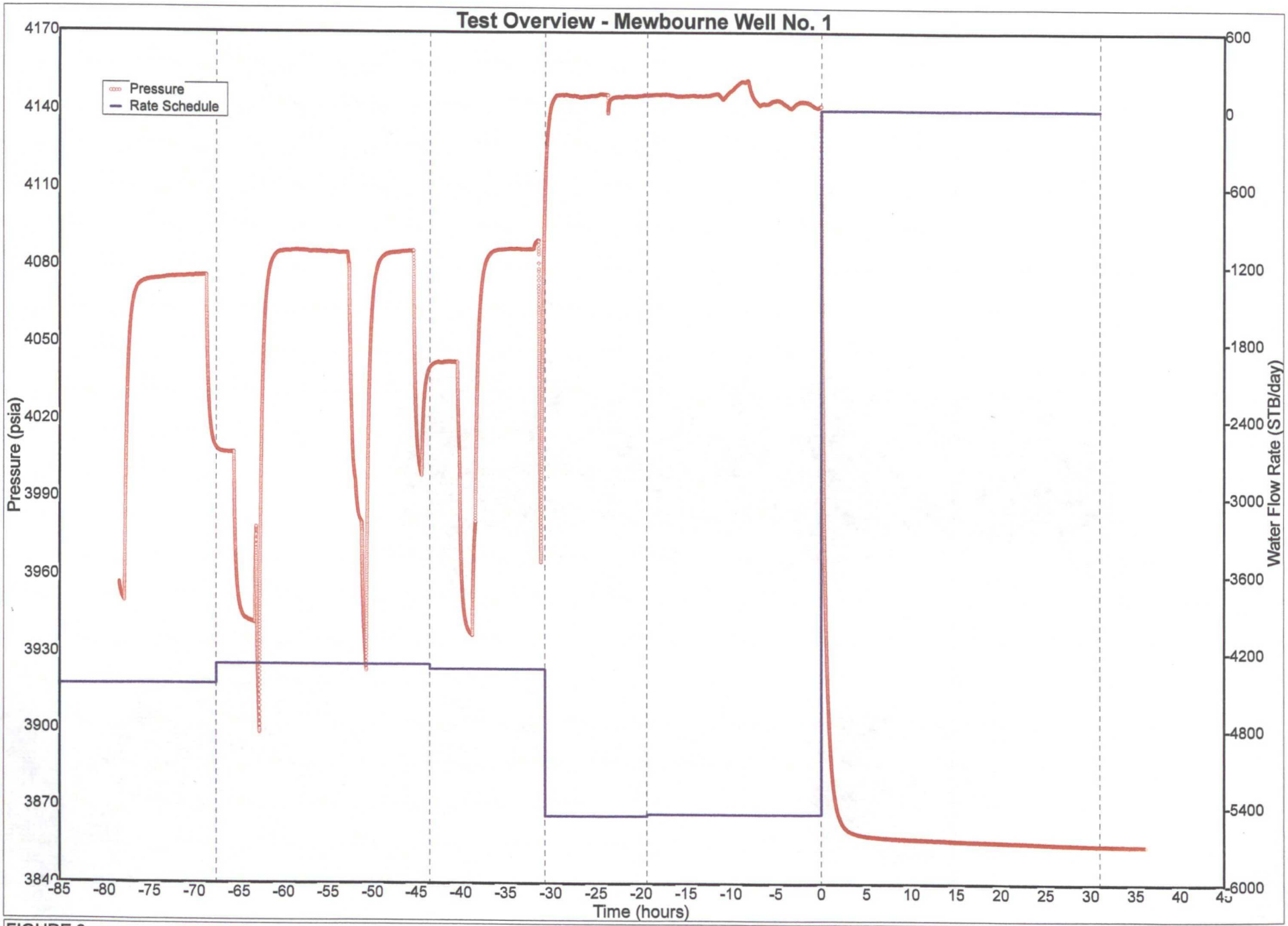

Test Overview - Mewbourne Well No. 1
Pressure
Rate Schedule
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
4170
4140
4110
4080
4050
4020
3990
3960
3930
3900
3870
3840
600
0
-600
-1200
-1800
-2400
-3000
-3600
-4200
-4800
-5400
-6000
-85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40

FIGURE 9

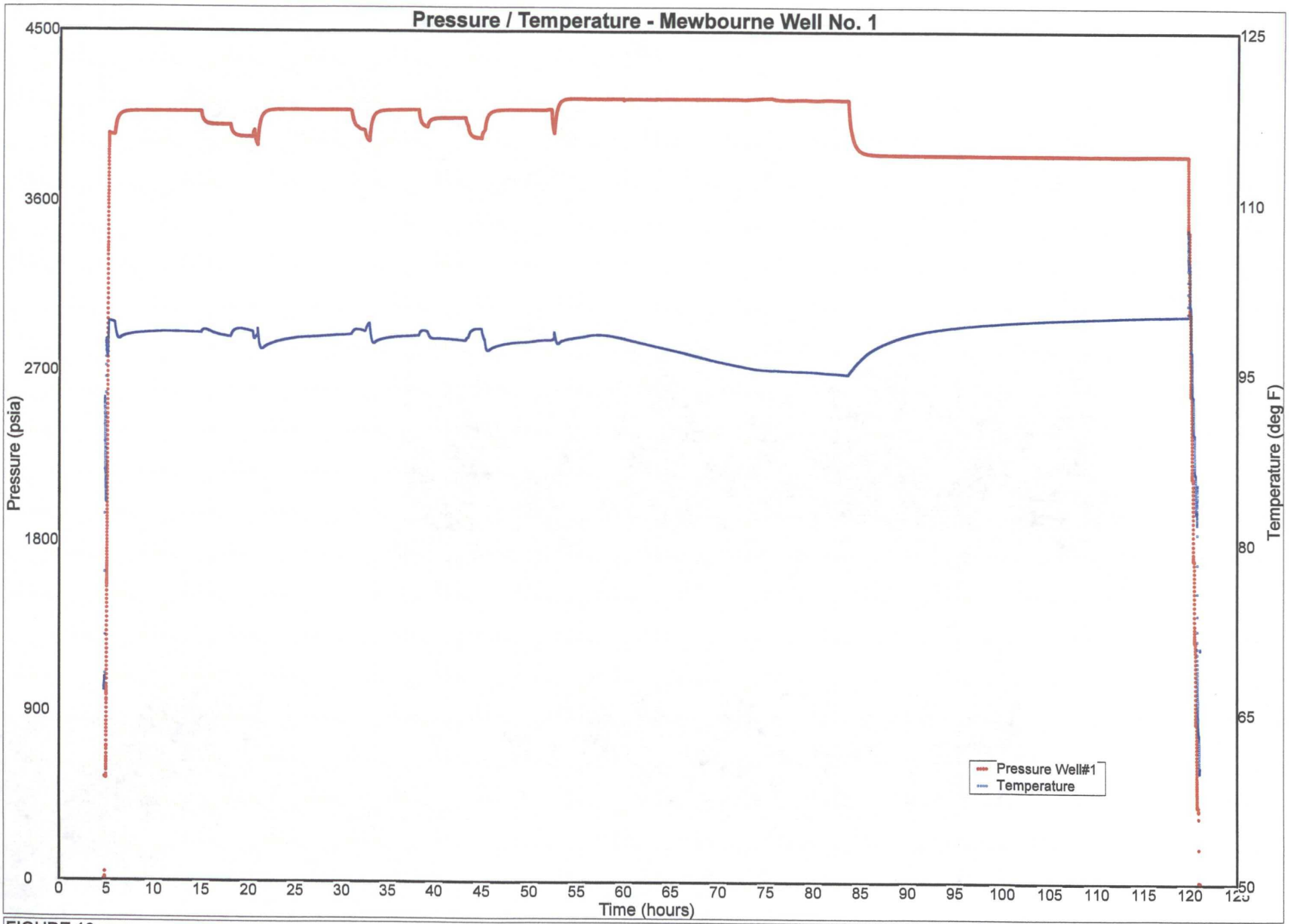

Pressure / Temperature - Mewbourne Well No. 1
Pressure (psia)
Temperature (deg F)
Time (hours)
4500
3600
2700
1800
900
0
125
110
95
80
65
50
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
Pressure Well#1
Temperature

FIGURE 10

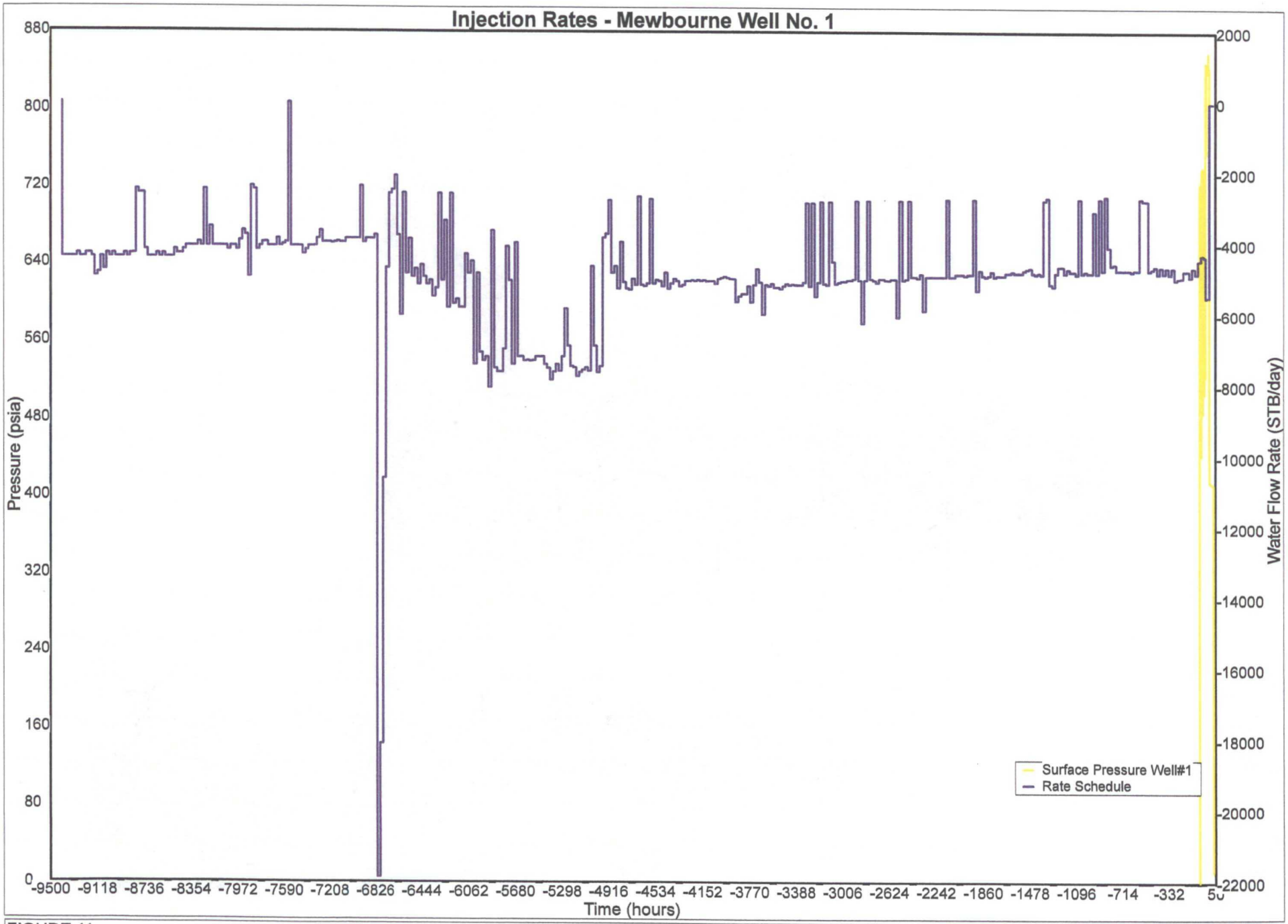

Injection Rates - Mewbourne Well No. 1
Pressure (psia)
880
800
720
640
560
480
400
320
240
160
80
0
Water Flow Rate (STB/day)
2000
0
-2000
-4000
-6000
-8000
-10000
-12000
-14000
-16000
-18000
-20000
-22000
-9500 -9118 -8736 -8354 -7972 -7590 -7208 -6826 -6444 -6062 -5680 -5298 -4916 -4534 -4152 -3770 -3388 -3006 -2624 -2242 -1860 -1478 -1096 -714 -332
Time (hours)
Surface Pressure Well#1
Rate Schedule

FIGURE 11

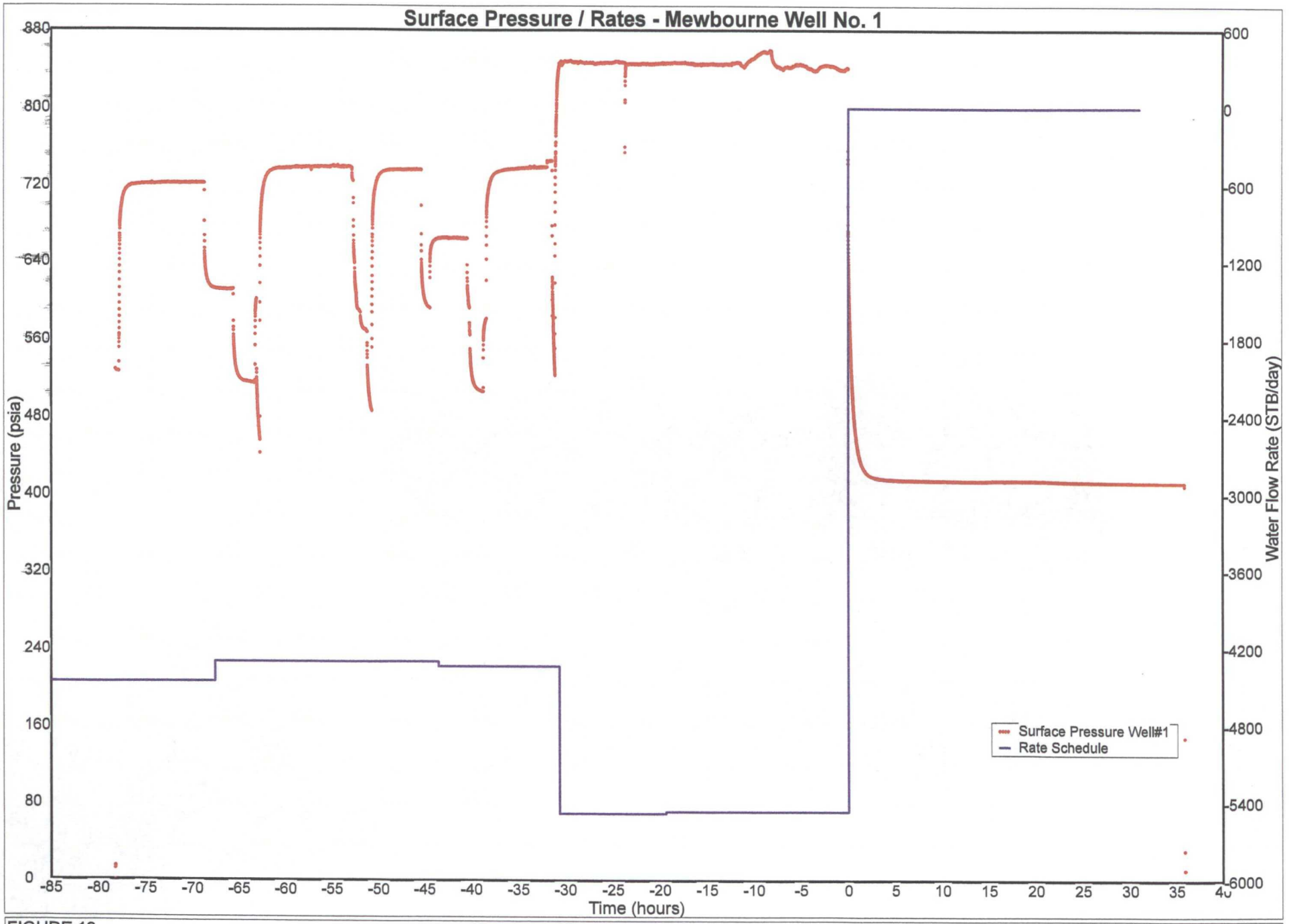

Surface Pressure / Rates - Mewbourne Well No. 1
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
880
800
720
640
560
480
400
320
240
160
80
0
600
0
-600
-1200
-1800
-2400
-3000
-3600
-4200
-4800
-5400
-6000
-85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40
Surface Pressure Well#1
Rate Schedule

FIGURE 12

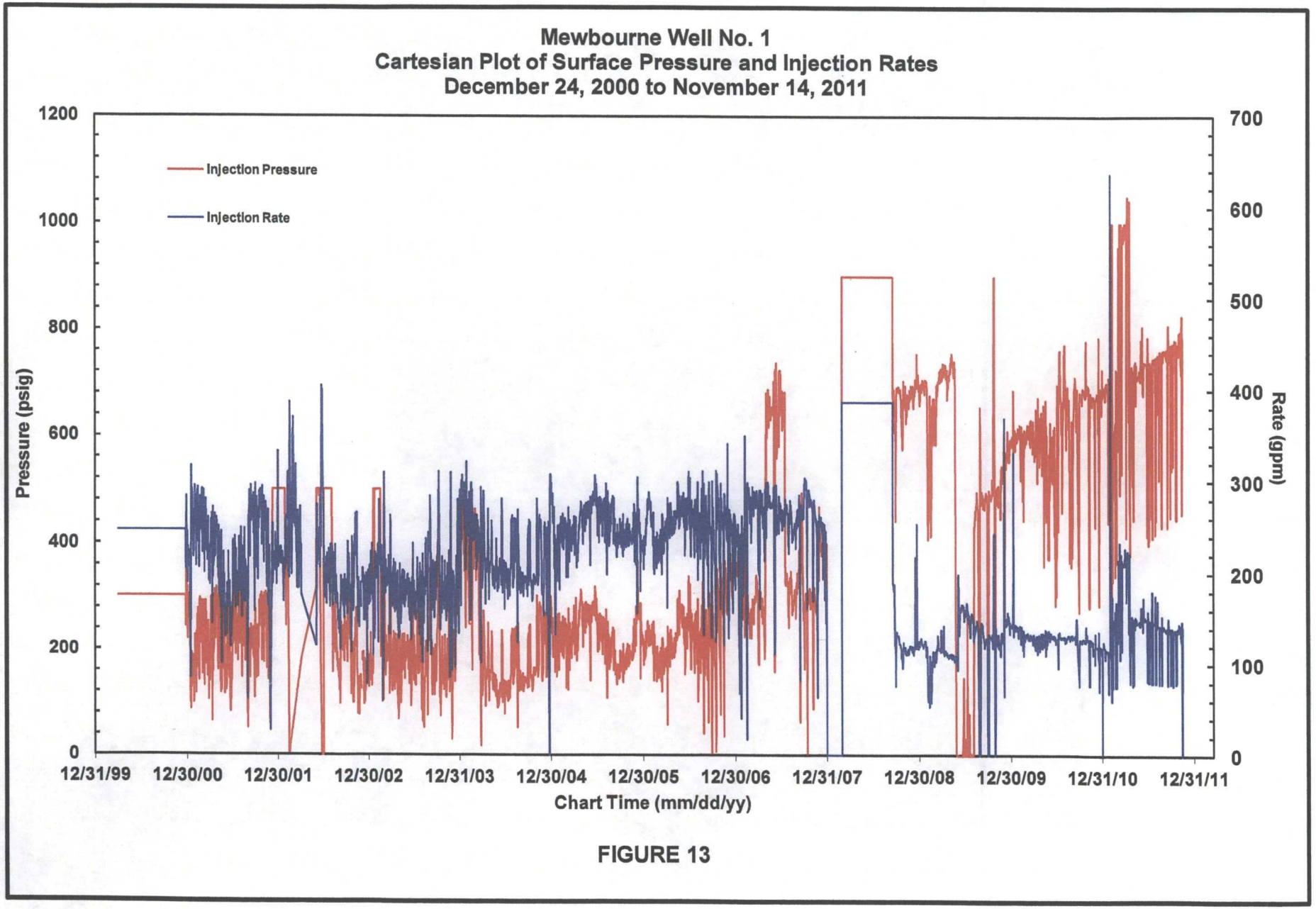

Mewbourne Well No. 1
Cartesian Plot of Surface Pressure and Injection Rates
December 24, 2000 to November 14, 2011
Injection Pressure
Injection Rate
Pressure (psig)
Rate (gpm)
1200
1000
800
600
400
200
0
700
600
500
400
300
200
100
0
12/31/99
12/30/00
12/30/01
12/30/02
12/31/03
12/30/04
12/30/05
12/30/06
12/31/07
12/30/08
12/30/09
12/31/10
12/31/11
Chart Time (mm/dd/yy)

FIGURE 13

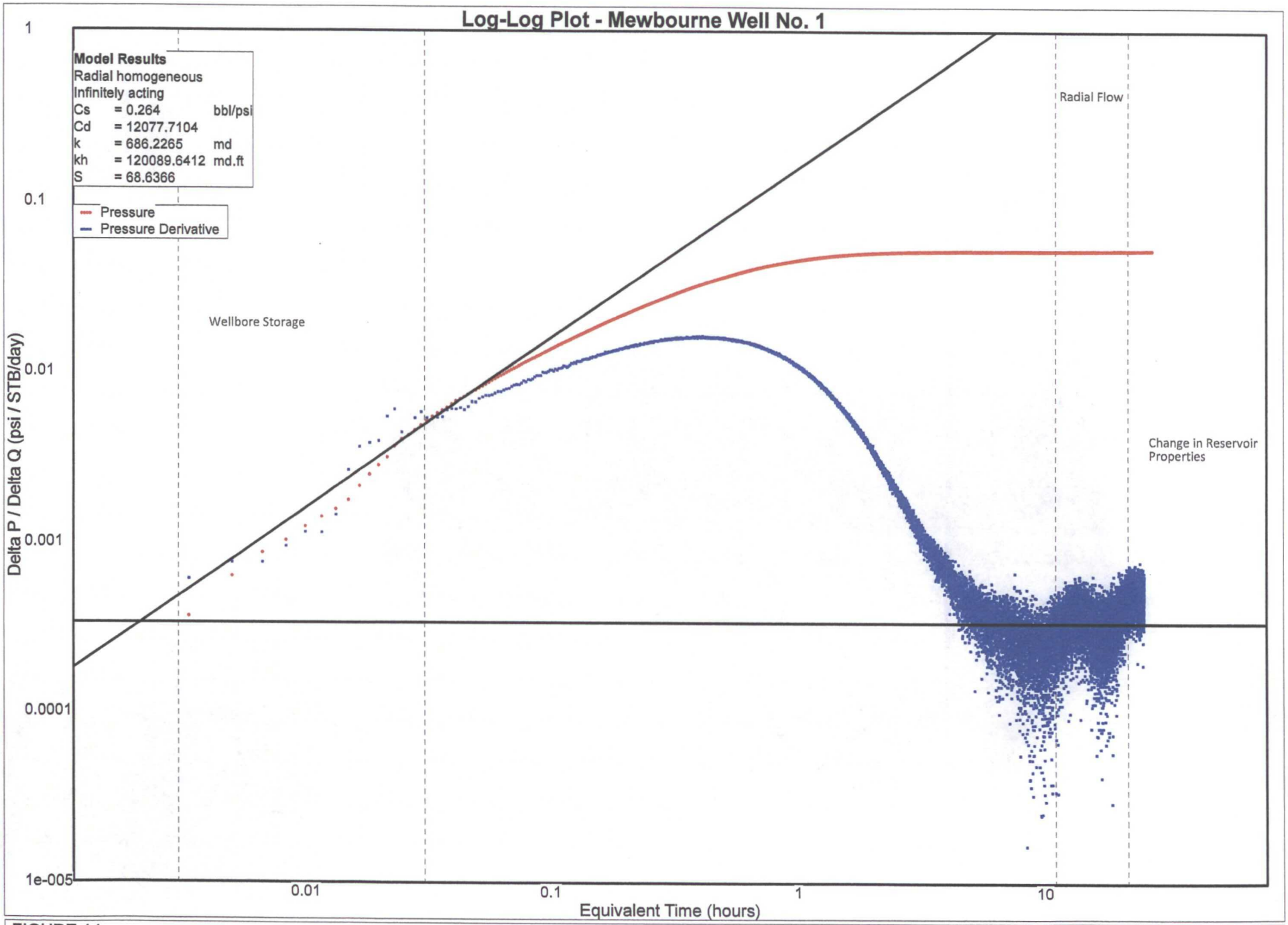

Log-Log Plot - Mewbourne Well No. 1
Model Results
Radial homogeneous
Infinitely acting
Cs = 0.264 bbl/psi
Cd = 12077.7104
k = 686.2265 md
kh = 120089.6412 md.ft
S = 68.6366
Pressure
Pressure Derivative
Wellbore Storage
Radial Flow
Change in Reservoir Properties
Delta P / Delta Q (psi / STB/day)
Equivalent Time (hours)
1
0.1
0.01
0.001
0.0001
1e-005
0.01
0.1
1
10

FIGURE 14

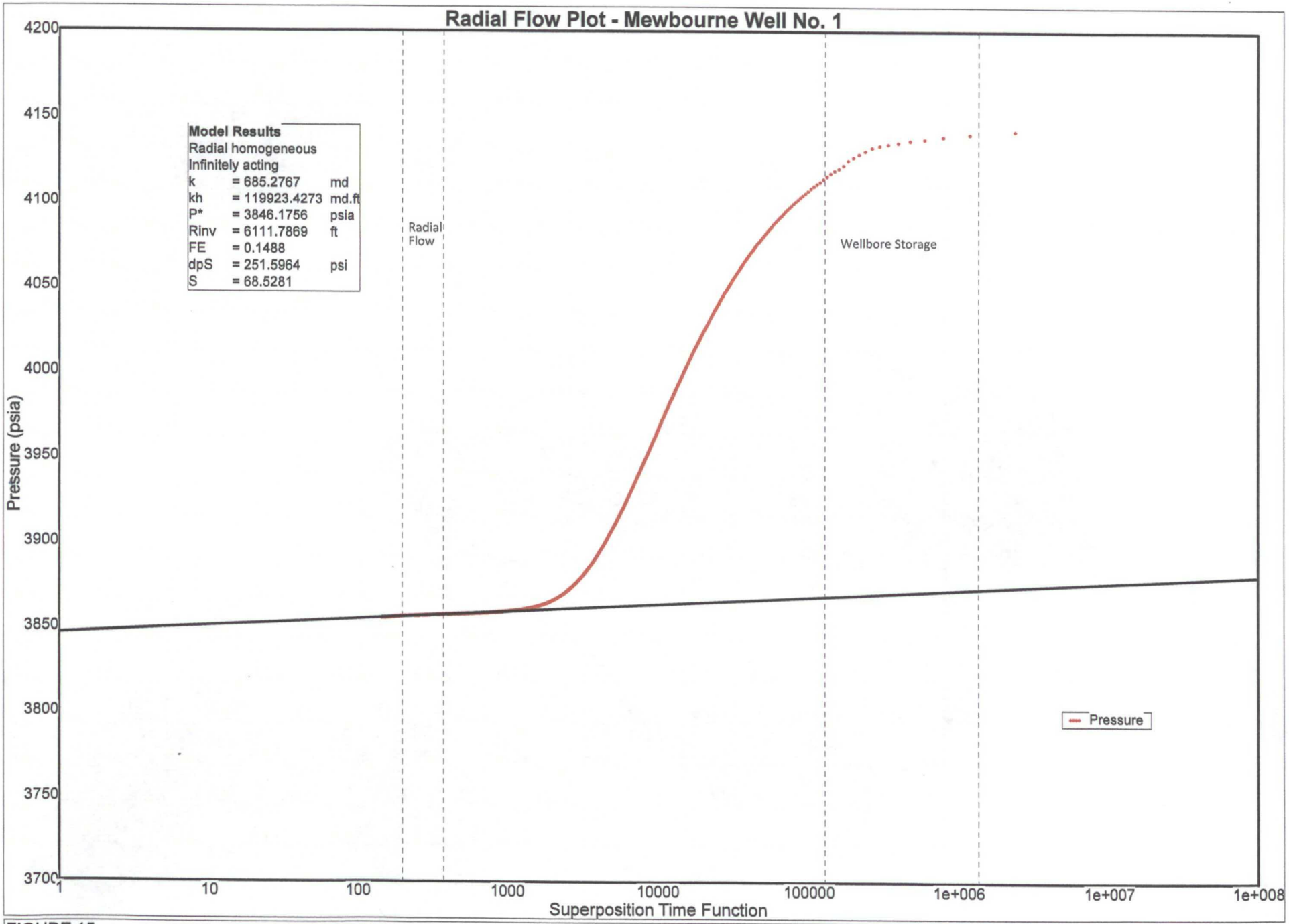

Radial Flow Plot - Mewbourne Well No. 1
Model Results
Radial homogeneous
Infinitely acting
k = 685.2767 md
kh = 119923.4273 md.ft
P* = 3846.1756 psia
Rinv = 6111.7869 ft
FE = 0.1488
dpS = 251.5964 psi
S = 68.5281
Radial Flow
Wellbore Storage
Pressure
Pressure (psia)
Superposition Time Function
4200
4150
4100
4050
4000
3950
3900
3850
3800
3750
3700
1
10
100
1000
10000
100000
1e+006
1e+007
1e+008

FIGURE 15

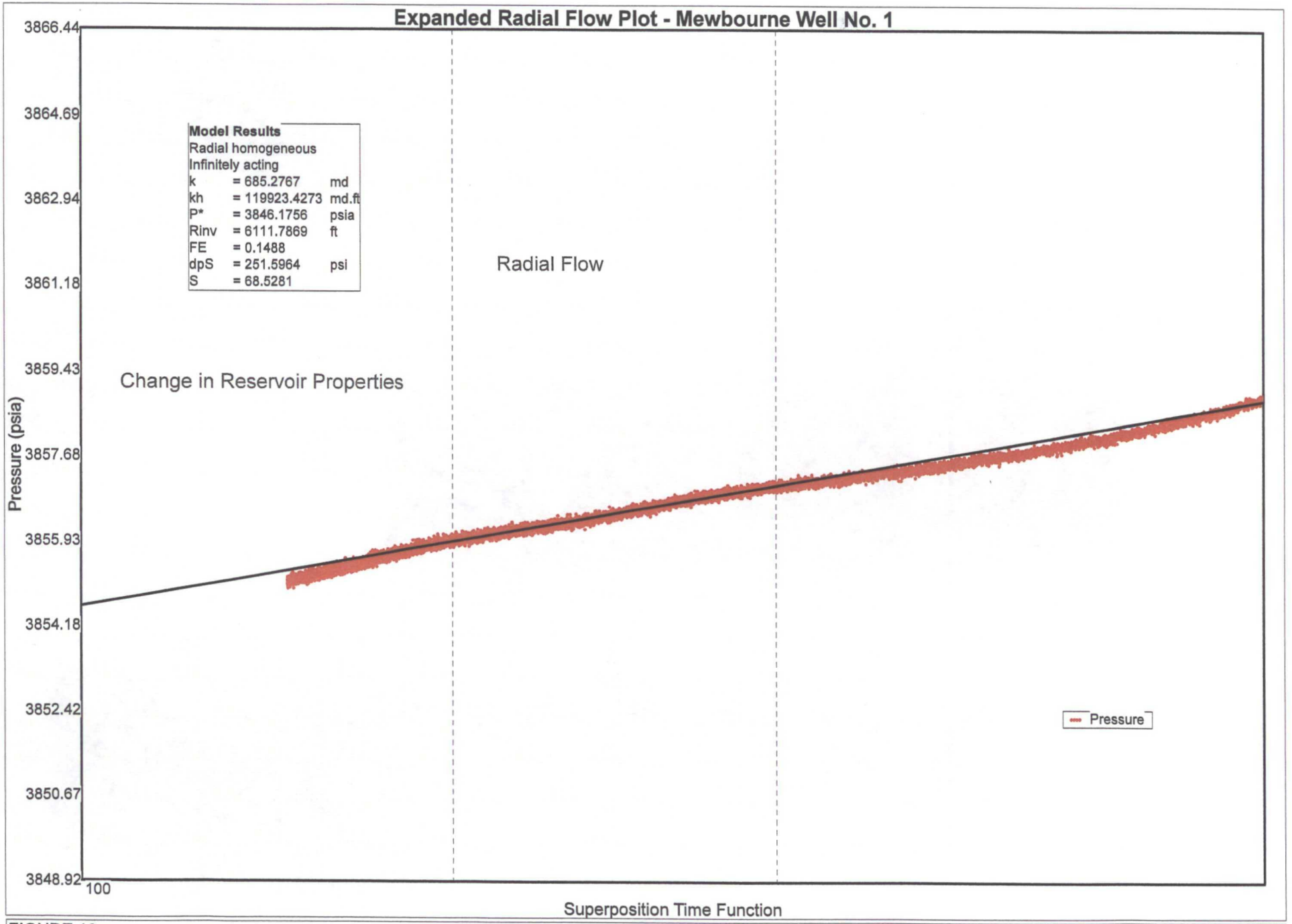

Expanded Radial Flow Plot - Mewbourne Well No. 1
3866.44
3864.69
3862.94
3861.18
3859.43
3857.68
3855.93
3854.18
3852.42
3850.67
3848.92
Pressure (psia)
100
Superposition Time Function
Model Results
Radial homogeneous
Infinitely acting
k = 685.2767 md
kh = 119923.4273 md.ft
P* = 3846.1756 psia
Rinv = 6111.7869 ft
FE = 0.1488
dpS = 251.5964 psi
S = 68.5281
Radial Flow
Change in Reservoir Properties
Pressure

FIGURE 16

Navajo Refining Company
Mewbourne Well No. 1
October 10, 2011 to November 11, 2011
Hall Plot

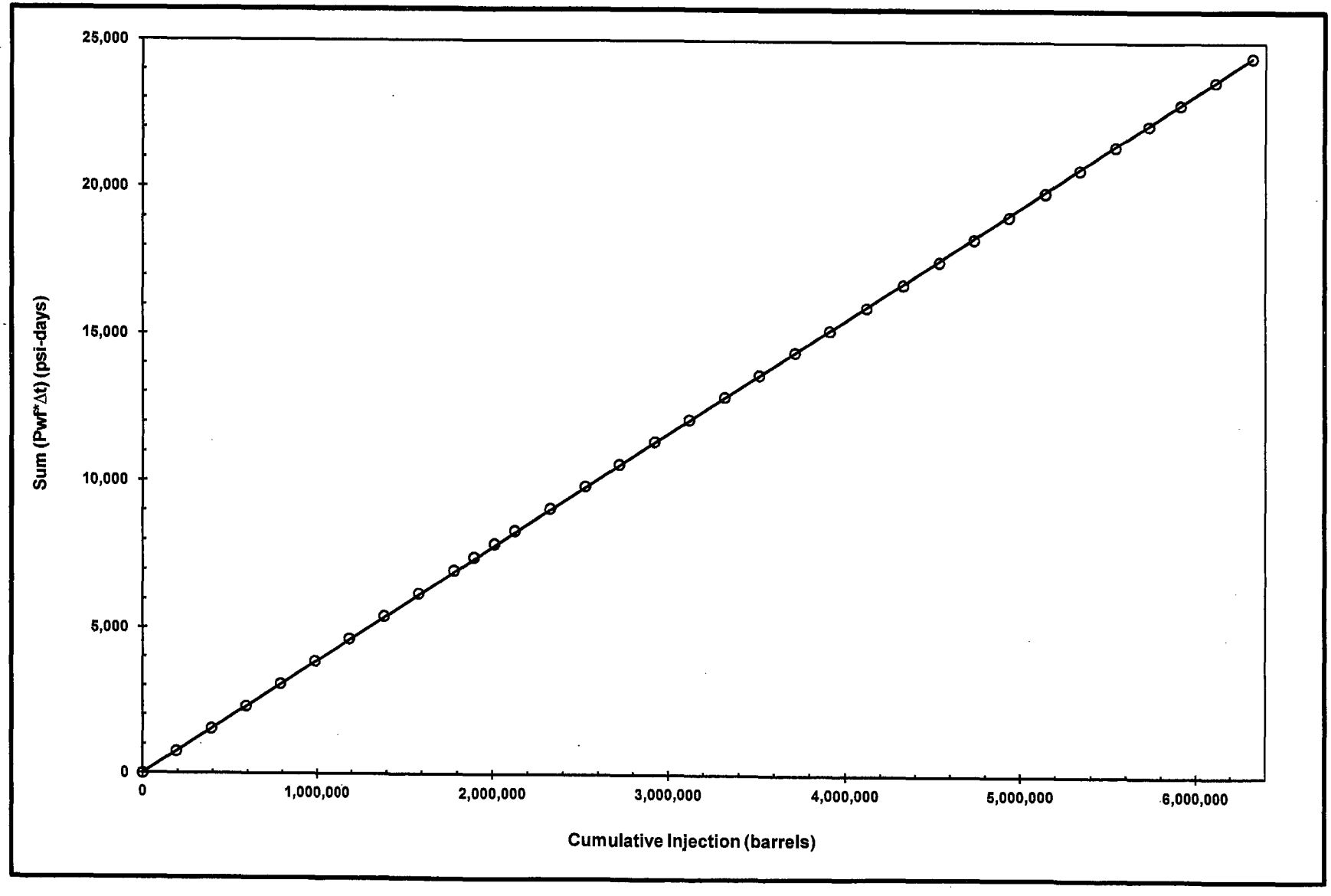


FIGURE 17

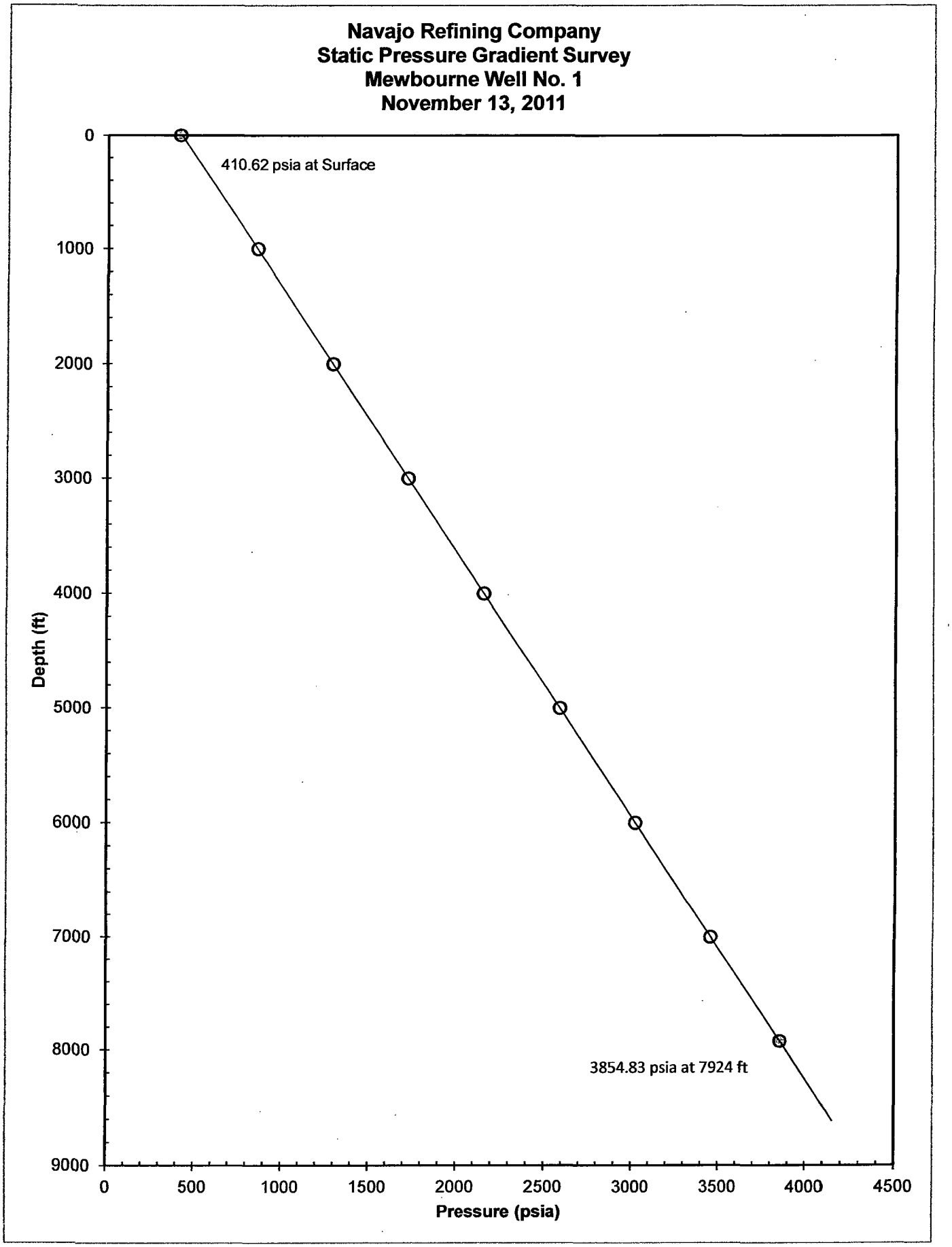

Navajo Refining Company
Static Pressure Gradient Survey
Mewbourne Well No. 1
November 13, 2011
410.62 psia at Surface
3854.83 psia at 7924 ft
Depth (ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Pressure (psia)

FIGURE 18

APPENDIX A

DUAL INDUCTION LOG SECTIONS FROM 7,924 FEET TO 8,476 FEET

SUBSURFACE

APPENDIX B

NEUTRON DENSITY LOG SECTIONS FROM 7,924 FEET TO 8,476 FEET

APPENDIX C

COMPRESSIBILITY OF FLUID

APPENDIX C

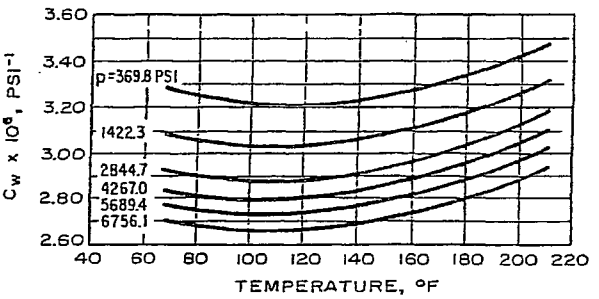


Fig. D.16 Average compressibility of distilled water. After Long and Chierici.[13]

Source: Earlougher, 1977, Advances in Well Test Analysis

COMPRESSIBILITY OF PORE VOLUME AND DISTILLED WATER

APPENDIX D

COMPRESSIBILITY OF PORE VOLUME

APPENDIX D

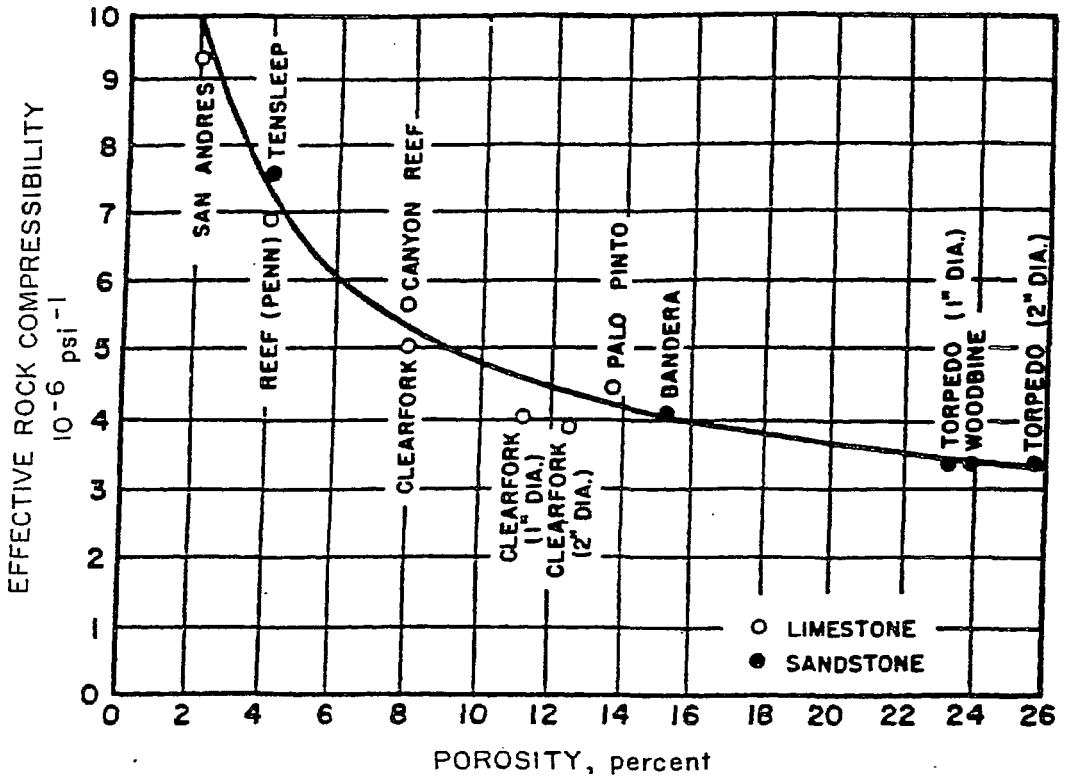


Fig. G.5 Effective formation (rock) compressibility. From Hall, *Trans.*, AIME (1953) **198**, 309.

Source: Matthews and Russell, 1967, Pressure Buildup and Flow Tests in Wells

APPENDIX E

MEWBOURNE WELL NO. 1
JULY 23, 1998, TEMPERATURE LOG

SUBSURFACE

APPENDIX F

WATER VISCOSITIES AT VARIOUS SALINITIES AND TEMPERATURES

SUBSURFACE

APPENDIX F

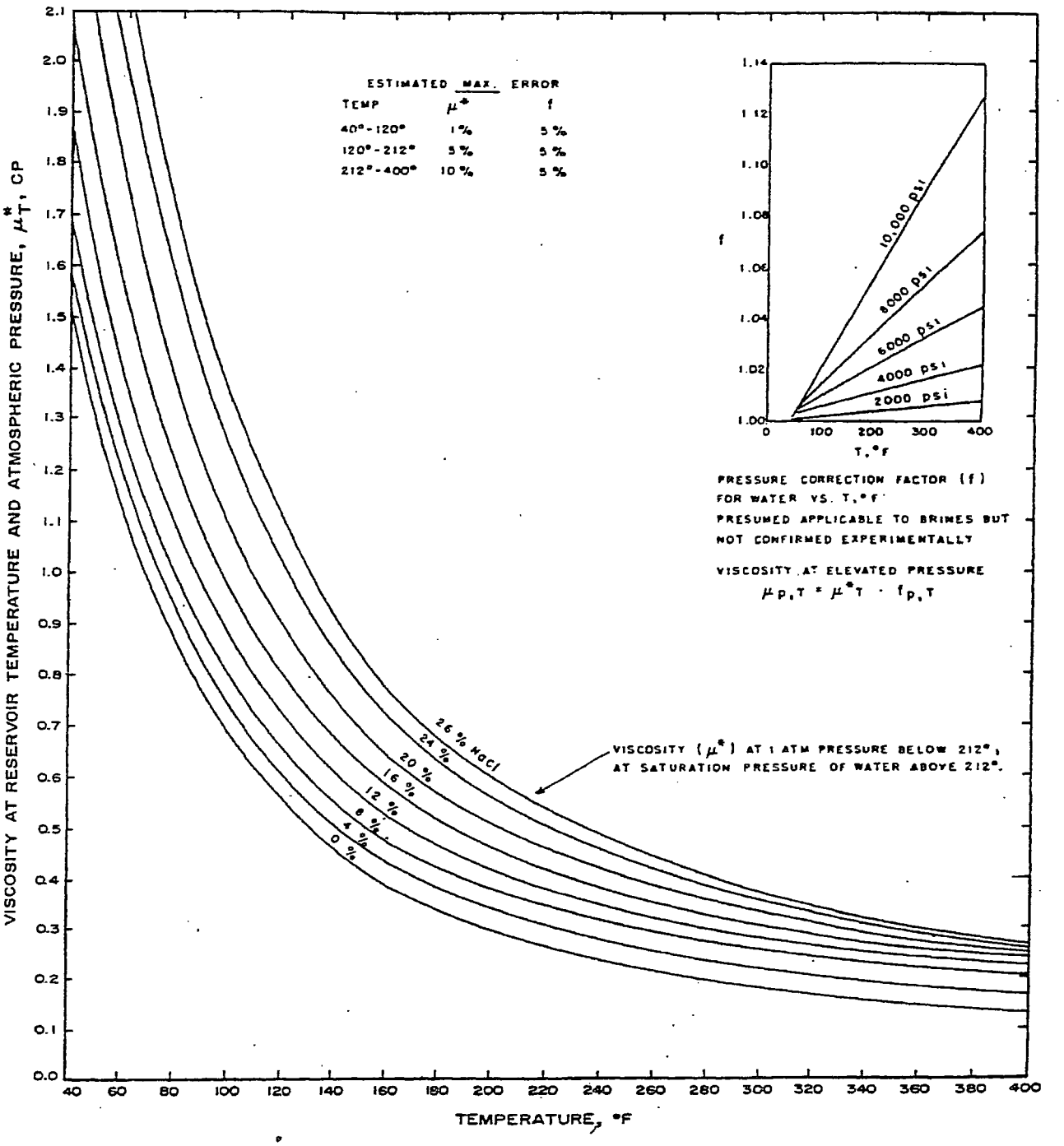


Fig. D.35 Water viscosity at various salinities and temperatures. After Matthews and Russell, data of Chesnut.[18]

FROM: Earlougher, R.C., 1977, "Advances in Well Test Analysis", SPE of AIME, Dallas, Texas

APPENDIX G

DAILY RATE HISTORY DATA

APPENDIX G

NAVAJO REFINING
INJECTION RATES USED IN ANALYSIS

Date mm/dd/yy	Rate gpm	Time hours	Surf Press psig	Rate bpd
10/16/10	128.04	-9403.5	0686.36	-4389.89
10/17/10	128.04	-9379.5	0691.29	-4389.89
10/18/10	128.04	-9355.5	0691.29	-4389.89
10/19/10	128.04	-9331.5	0686.36	-4389.89
10/20/10	128.04	-9307.5	0696.22	-4389.89
10/21/10	128.04	-9283.5	0681.42	-4389.89
10/22/10	124.90	-9259.5	0672.46	-4282.18
10/23/10	128.04	-9235.5	0676.66	-4389.89
10/24/10	128.04	-9211.5	0686.36	-4389.89
10/25/10	124.90	-9187.5	0671.73	-4282.18
10/26/10	124.90	-9163.5	0671.73	-4282.18
10/27/10	128.04	-9139.5	0676.66	-4389.89
10/28/10	143.64	-9115.5	0794.35	-4924.72
10/29/10	140.60	-9091.5	0769.69	-4820.72
10/30/10	128.04	-9067.5	0686.36	-4389.89
10/31/10	138.26	-9043.5	0713.47	-4740.42
10/31/10	124.90	-9019.5	0686.36	-4282.18
11/01/10	128.04	-8995.5	0686.36	-4389.89
11/02/10	125.05	-8971.5	0686.60	-4287.56
11/03/10	127.88	-8947.5	0681.42	-4384.50
11/04/10	128.04	-8923.5	0691.29	-4389.89
11/05/10	128.04	-8899.5	0686.36	-4389.89
11/06/10	124.90	-8875.5	0686.36	-4282.18
11/07/10	128.04	-8851.5	0686.36	-4389.89
11/08/10	125.05	-8827.5	0691.04	-4287.56
11/09/10	124.75	-8803.5	0656.94	-4276.98
11/10/10	071.82	-8779.5	0284.33	-2462.25
11/11/10	074.96	-8755.5	0279.57	-2569.96
11/12/10	074.96	-8731.5	0279.57	-2569.96
11/13/10	121.86	-8707.5	0632.69	-4178.18
11/14/10	128.04	-8683.5	0681.42	-4389.89
11/15/10	128.04	-8659.5	0686.36	-4389.89
11/16/10	128.04	-8635.5	0676.66	-4389.89
11/17/10	124.90	-8611.5	0676.66	-4282.18
11/18/10	128.04	-8587.5	0671.73	-4389.89
11/19/10	124.90	-8563.5	0671.73	-4282.18
11/20/10	127.88	-8539.5	0671.48	-4384.50
11/21/10	128.04	-8515.5	0666.80	-4389.89
11/22/10	128.04	-8491.5	0656.94	-4389.89
11/23/10	121.86	-8467.5	0652.17	-4178.18
11/24/10	124.90	-8443.5	0671.73	-4282.18
11/25/10	124.90	-8419.5	0671.73	-4282.18
11/26/10	121.86	-8395.5	0681.42	-4178.18
11/27/10	118.72	-8371.5	0671.73	-4070.47
11/28/10	118.72	-8347.5	0671.73	-4070.47
11/29/10	118.72	-8323.5	0666.80	-4070.47
11/30/10	118.72	-8299.5	0676.66	-4070.47
12/01/10	115.58	-8275.5	0656.94	-3962.76
12/02/10	118.72	-8251.5	0676.66	-4070.47
12/03/10	071.82	-8227.5	0298.39	-2462.25
12/04/10	118.72	-8203.5	0666.80	-4070.47
12/05/10	103.12	-8179.5	0666.80	-3535.64
12/06/10	118.72	-8155.5	0666.80	-4070.47
12/07/10	118.72	-8131.5	0666.80	-4070.47
12/08/10	118.72	-8107.5	0671.73	-4070.47
12/09/10	118.72	-8083.5	0676.66	-4070.47
12/10/10	118.72	-8059.5	0675.41	-4070.47
12/11/10	121.86	-8035.5	0676.66	-4178.18
12/12/10	118.72	-8011.5	0681.42	-4070.47
12/13/10	118.72	-7987.5	0671.73	-4070.47
12/14/10	121.86	-7963.5	0686.36	-4178.18
12/15/10	114.17	-7939.5	0658.75	-3914.41
12/16/10	106.16	-7915.5	0607.96	-3639.63
12/17/10	109.30	-7891.5	0632.45	-3747.34
12/18/10	143.79	-7867.5	0824.50	-4930.11
12/19/10	068.78	-7843.5	0294.20	-2358.25
12/20/10	071.82	-7819.5	0279.57	-2462.25
12/21/10	121.71	-7795.5	0676.90	-4172.80
12/22/10	118.72	-7771.5	0676.66	-4070.47
12/23/10	115.58	-7747.5	0656.94	-3962.76
12/24/10	115.42	-7723.5	0661.87	-3957.37
12/25/10	118.72	-7699.5	0691.29	-4070.47
12/26/10	118.72	-7675.5	0686.36	-4070.47
12/27/10	118.72	-7651.5	0681.42	-4070.47
12/28/10	112.44	-7627.5	0666.80	-3855.05
12/29/10	118.53	-7603.5	0676.66	-4064.00
12/30/10	117.11	-7579.5	0681.42	-4015.16
12/31/10	115.58	-7555.5	0673.03	-3962.76
01/01/11	000.00	-7531.5	0725.64	0000.00
01/02/11	118.72	-7507.5	0671.73	-4070.47
01/03/11	118.72	-7483.5	0691.29	-4070.47
01/04/11	118.72	-7459.5	0691.29	-4070.47
01/05/11	118.72	-7435.5	0686.36	-4070.47
01/06/11	124.90	-7411.5	0686.36	-4282.18
01/07/11	121.86	-7387.5	0686.36	-4178.18
01/08/11	118.72	-7363.5	0691.29	-4070.47
01/09/11	118.72	-7339.5	0681.42	-4070.47
01/10/11	118.56	-7315.5	0676.66	-4065.08
01/11/11	112.44	-7291.5	0681.42	-3855.05
01/12/11	106.16	-7267.5	0666.80	-3639.63
01/13/11	115.58	-7243.5	0671.73	-3962.76
01/14/11	115.58	-7219.5	0696.22	-3962.76
01/15/11	115.58	-7195.5	0696.22	-3962.76
01/16/11	116.27	-7171.5	0696.22	-3986.26
01/17/11	115.58	-7147.5	0701.15	-3962.76
01/18/11	114.96	-7123.5	0691.29	-3941.40
01/19/11	115.58	-7099.5	0691.29	-3962.76
01/20/11	115.58	-7075.5	0691.29	-3962.76
01/21/11	112.44	-7051.5	0686.36	-3855.05
01/22/11	112.44	-7027.5	0681.42	-3855.05
01/23/11	112.44	-7003.5	0686.60	-3855.05
01/24/11	112.44	-6979.5	0666.80	-3855.05
01/25/11	112.44	-6955.5	0691.29	-3855.05
01/26/11	068.78	-6931.5	0437.11	-2358.25
01/27/11	115.58	-6907.5	0710.85	-3962.76
01/28/11	112.44	-6883.5	0686.36	-3855.05

APPENDIX G

NAVAJO REFINING
INJECTION RATES USED IN ANALYSIS

Date	Rate	Time	Surf Press	Rate
mm/dd/yy	gpm	hours	psig	bpd
01/29/11	112.44	-6859.5	0686.36	-3855.05
01/30/11	112.44	-6835.5	0691.29	-3855.05
01/31/11	109.30	-6811.5	0686.36	-3747.34
02/01/11	637.08	-6787.5	1000.12	-21842.61
02/02/11	527.77	-6763.5	1000.12	-18095.04
02/03/11	309.16	-6739.5	1000.12	-10599.92
02/04/11	136.53	-6715.5	0725.64	-4680.89
02/05/11	074.96	-6691.5	0353.04	-2569.96
02/06/11	071.82	-6667.5	0353.04	-2462.25
02/07/11	060.14	-6643.5	0254.91	-2061.87
02/08/11	109.30	-6619.5	0656.94	-3747.34
02/09/11	174.94	-6595.5	1000.12	-5998.11
02/10/11	074.33	-6571.5	0328.55	-2548.60
02/11/11	140.60	-6547.5	0519.70	-4820.72
02/12/11	112.44	-6523.5	0480.41	-3855.05
02/13/11	143.64	-6499.5	0598.09	-4924.72
02/14/11	137.46	-6475.5	0568.92	-4713.02
02/15/11	149.92	-6451.5	0607.96	-5140.14
02/16/11	134.32	-6427.5	0558.98	-4605.31
02/17/11	143.64	-6403.5	0598.09	-4924.72
02/18/11	149.92	-6379.5	0603.03	-5140.14
02/19/11	146.78	-6355.5	0612.89	-5032.43
02/20/11	159.72	-6331.5	0573.02	-5476.08
02/21/11	153.06	-6307.5	0622.75	-5247.85
02/22/11	074.96	-6283.5	0338.24	-2569.96
02/23/11	146.78	-6259.5	0626.26	-5032.43
02/24/11	097.40	-6235.5	0398.45	-3339.31
02/25/11	168.66	-6211.5	0725.64	-5782.69
02/26/11	074.96	-6187.5	0362.90	-2569.96
02/27/11	165.52	-6163.5	0705.84	-5674.98
02/28/11	162.38	-6139.5	0686.36	-5567.27
03/01/11	168.66	-6115.5	0715.78	-5782.69
03/02/11	168.66	-6091.5	0720.71	-5782.69
03/03/11	124.90	-6067.5	0573.61	-4282.18
03/04/11	140.60	-6043.5	0647.49	-4820.72
03/05/11	131.18	-6019.5	0607.96	-4497.60
03/06/11	215.46	-5995.5	0956.07	-7387.19
03/07/11	140.60	-5971.5	0617.82	-4820.72
03/08/11	205.99	-5947.5	0896.99	-7062.39
03/09/11	212.43	-5923.5	0931.58	-7283.20
03/10/11	209.59	-5899.5	0916.79	-7186.07
03/11/11	234.20	-5875.5	1000.12	-8029.74
03/12/11	106.00	-5851.5	0490.28	-3634.43
03/13/11	218.60	-5827.5	0995.36	-7494.90
03/14/11	221.74	-5803.5	1000.12	-7602.61
03/15/11	221.74	-5779.5	1000.12	-7602.61
03/16/11	203.00	-5755.5	0902.16	-6960.07
03/17/11	118.72	-5731.5	0558.98	-4070.47
03/18/11	146.78	-5707.5	0681.42	-5032.43
03/19/11	215.46	-5683.5	0990.43	-7387.19
03/20/11	115.58	-5659.5	0529.56	-3962.76
03/21/11	209.29	-5635.5	0975.63	-7175.49
03/22/11	209.29	-5611.5	0965.69	-7175.49
03/23/11	212.43	-5587.5	0980.56	-7283.20
03/24/11	212.11	-5563.5	0965.69	-7272.43
03/25/11	212.58	-5539.5	0995.36	-7288.40
03/26/11	212.27	-5515.5	0990.43	-7277.81
03/27/11	209.29	-5491.5	0970.70	-7175.49
03/28/11	209.29	-5467.5	0970.70	-7175.49
03/29/11	209.29	-5443.5	0975.88	-7175.49
03/30/11	215.46	-5419.5	1000.12	-7387.19
03/31/11	218.60	-5395.5	1000.12	-7494.90
04/01/11	228.03	-5371.5	1000.12	-7818.03
04/02/11	221.74	-5347.5	1000.12	-7602.61
04/04/11	215.46	-5323.5	1000.12	-7387.19
04/05/11	220.98	-5299.5	1000.12	-7576.39
04/06/11	209.29	-5275.5	1000.12	-7175.49
04/07/11	169.65	-5251.5	0411.26	-5816.44
04/08/11	200.00	-5227.5	0912.00	-6857.14
04/09/11	216.92	-5203.5	1002.17	-7437.14
04/10/11	218.00	-5179.5	1010.25	-7474.29
04/11/11	225.00	-5155.5	1050.00	-7714.29
04/12/11	221.92	-5131.5	1037.17	-7608.57
04/13/11	220.00	-5107.5	1034.17	-7542.86
04/14/11	218.00	-5083.5	1020.75	-7474.29
04/15/11	220.83	-5059.5	1034.25	-7571.43
04/16/11	135.00	-5035.5	0629.00	-4628.57
04/17/11	200.00	-5011.5	0932.92	-6857.14
04/18/11	222.08	-4987.5	1043.08	-7614.29
04/19/11	216.92	-4963.5	1023.92	-7437.14
04/20/11	111.08	-4939.5	0540.08	-3808.57
04/21/11	108.00	-4915.5	0532.00	-3702.86
04/22/11	080.00	-4891.5	0377.00	-2742.86
04/23/11	140.00	-4867.5	0663.00	-4800.00
04/24/11	135.08	-4843.5	0649.00	-4631.43
04/25/11	153.08	-4819.5	0727.00	-5248.57
04/26/11	115.00	-4795.5	0564.00	-3942.86
04/27/11	147.92	-4771.5	0707.00	-5071.43
04/28/11	153.00	-4747.5	0731.00	-5245.71
04/29/11	153.92	-4723.5	0731.00	-5277.14
04/30/11	145.08	-4699.5	0695.08	-4974.29
05/01/11	150.00	-4675.5	0718.00	-5142.86
05/02/11	077.00	-4651.5	0507.50	-2640.00
05/03/11	150.00	-4627.5	0724.00	-5142.86
05/04/11	150.92	-4603.5	0722.00	-5174.29
05/05/11	149.00	-4579.5	0716.00	-5108.57
05/06/11	079.00	-4555.5	0443.25	-2708.57
05/07/11	149.00	-4531.5	0722.00	-5108.57
05/08/11	145.92	-4507.5	0701.00	-5002.86
05/09/11	147.00	-4483.5	0713.00	-5040.00
05/10/11	151.08	-4459.5	0736.00	-5180.00
05/11/11	140.00	-4435.5	0686.00	-4800.00
05/12/11	153.08	-4411.5	0742.00	-5248.57
05/13/11	149.00	-4387.5	0725.00	-5108.57
05/14/11	145.08	-4363.5	0659.92	-4974.29
05/15/11	147.00	-4339.5	0718.00	-5040.00

APPENDIX G

NAVAJO REFINING
INJECTION RATES USED IN ANALYSIS

Date mm/dd/yy	Rate gpm	Time hours	Surf Press psig	Rate bpd
05/16/11	151.17	-4315.5	0735.00	-5182.86
05/17/11	150.00	-4291.5	0719.00	-5142.86
05/18/11	146.92	-4267.5	0709.00	-5037.14
05/19/11	146.92	-4243.5	0707.00	-5037.14
05/20/11	146.08	-4219.5	0710.00	-5008.57
05/21/11	146.92	-4195.5	0710.00	-5037.14
05/22/11	146.00	-4171.5	0711.00	-5005.71
05/23/11	146.92	-4147.5	0712.00	-5037.14
05/24/11	146.08	-4123.5	0713.00	-5008.57
05/25/11	147.00	-4099.5	0715.00	-5040.00
05/26/11	146.92	-4075.5	0713.00	-5037.14
05/27/11	146.92	-4051.5	0711.00	-5037.14
05/28/11	148.92	-4027.5	0724.00	-5105.71
05/29/11	145.00	-4003.5	0709.00	-4971.43
05/30/11	144.00	-3979.5	0708.00	-4937.14
05/31/11	142.92	-3955.5	0708.00	-4900.00
06/01/11	144.00	-3931.5	0705.00	-4937.14
06/02/11	145.00	-3907.5	0705.00	-4971.43
06/03/11	145.08	-3883.5	0703.92	-4974.29
06/04/11	163.92	-3859.5	0759.00	-5620.00
06/05/11	159.00	-3835.5	0782.00	-5451.43
06/06/11	157.00	-3811.5	0773.00	-5382.86
06/07/11	157.08	-3787.5	0775.08	-5385.71
06/08/11	150.92	-3763.5	0742.00	-5174.29
06/09/11	164.08	-3739.5	0807.00	-5625.71
06/10/11	150.08	-3715.5	0735.00	-5145.71
06/11/11	137.00	-3691.5	0682.00	-4697.14
06/12/11	148.00	-3667.5	0730.00	-5074.29
06/13/11	174.08	-3643.5	0677.83	-5968.57
06/14/11	149.92	-3619.5	0736.92	-5140.00
06/15/11	151.00	-3595.5	0741.00	-5177.14
06/16/11	149.00	-3571.5	0735.00	-5108.57
06/17/11	151.92	-3547.5	0731.00	-5208.57
06/18/11	152.00	-3523.5	0736.00	-5211.43
06/19/11	153.00	-3499.5	0735.00	-5245.71
06/20/11	151.00	-3475.5	0740.00	-5177.14
06/21/11	149.08	-3451.5	0739.00	-5111.43
06/22/11	150.08	-3427.5	0739.08	-5145.71
06/23/11	149.58	-3403.5	0737.71	-5128.39
06/24/11	149.92	-3379.5	0737.00	-5139.96
06/25/11	150.00	-3355.5	0738.00	-5142.86
06/26/11	150.00	-3331.5	0735.92	-5142.86
06/27/11	148.00	-3307.5	0732.00	-5074.29
06/28/11	082.00	-3283.5	0413.08	-2811.43
06/29/11	150.92	-3259.5	0746.00	-5174.29
06/30/11	082.00	-3235.5	0418.08	-2811.43
07/01/11	159.00	-3211.5	0787.00	-5451.43
07/02/11	148.00	-3187.5	0735.00	-5074.29
07/03/11	081.00	-3163.5	0397.00	-2777.14
07/04/11	149.00	-3139.5	0740.00	-5108.57
07/05/11	149.92	-3115.5	0740.00	-5140.00
07/06/11	081.00	-3091.5	0406.08	-2777.14
07/07/11	130.92	-3067.5	0658.00	-4488.57
07/08/11	149.00	-3043.5	0741.00	-5108.57
07/09/11	148.00	-3019.5	0732.00	-5074.29
07/10/11	147.00	-2995.5	0731.00	-5040.00
07/11/11	147.00	-2971.5	0728.00	-5040.00
07/12/11	145.92	-2947.5	0728.00	-5002.86
07/13/11	145.92	-2923.5	0729.00	-5002.86
07/14/11	145.00	-2899.5	0729.00	-4971.43
07/15/11	080.00	-2875.5	0447.17	-2742.86
07/16/11	146.00	-2851.5	0735.92	-5005.71
07/17/11	181.17	-2827.5	0671.42	-6211.43
07/18/11	146.00	-2803.5	0741.00	-5005.71
07/19/11	080.00	-2779.5	0410.08	-2742.86
07/20/11	144.92	-2755.5	0730.00	-4968.57
07/21/11	146.08	-2731.5	0746.00	-5008.57
07/22/11	148.00	-2707.5	0744.00	-5074.29
07/23/11	145.00	-2683.5	0738.00	-4971.43
07/24/11	144.92	-2659.5	0740.00	-4968.57
07/25/11	145.92	-2635.5	0744.00	-5002.86
07/26/11	146.08	-2611.5	0747.00	-5008.57
07/27/11	145.08	-2587.5	0739.00	-4974.29
07/28/11	145.08	-2563.5	0744.00	-4974.29
07/29/11	176.25	-2539.5	0683.67	-6042.86
07/30/11	080.00	-2515.5	0416.08	-2742.86
07/31/11	146.00	-2491.5	0749.00	-5005.71
08/01/11	145.00	-2467.5	0744.00	-4971.43
08/02/11	080.00	-2443.5	0442.17	-2742.86
08/03/11	143.00	-2419.5	0742.00	-4902.86
08/04/11	143.00	-2395.5	0745.00	-4902.86
08/05/11	144.00	-2371.5	0736.00	-4937.14
08/06/11	140.92	-2347.5	0732.00	-4831.43
08/07/11	170.75	-2323.5	0644.00	-5854.29
08/08/11	143.00	-2299.5	0752.00	-4902.86
08/09/11	142.92	-2275.5	0752.00	-4900.00
08/10/11	143.00	-2251.5	0751.00	-4902.86
08/11/11	143.00	-2227.5	0753.00	-4902.86
08/12/11	143.00	-2203.5	0749.08	-4902.86
08/13/11	143.00	-2179.5	0751.00	-4902.86
08/14/11	143.00	-2155.5	0750.00	-4902.86
08/15/11	079.00	-2131.5	0518.33	-2708.57
08/16/11	143.00	-2107.5	0754.00	-4902.86
08/17/11	143.00	-2083.5	0759.92	-4902.86
08/18/11	141.08	-2059.5	0748.00	-4837.14
08/19/11	141.00	-2035.5	0749.00	-4834.29
08/20/11	141.00	-2011.5	0751.00	-4834.29
08/21/11	142.00	-1987.5	0748.00	-4868.57
08/22/11	141.08	-1963.5	0748.00	-4837.14
08/23/11	141.00	-1939.5	0747.00	-4834.29
08/24/11	079.00	-1915.5	0430.08	-2708.57
08/25/11	154.08	-1891.5	0721.92	-5282.86
08/26/11	138.00	-1867.5	0738.92	-4731.43
08/27/11	142.00	-1843.5	0758.00	-4868.57
08/28/11	142.92	-1819.5	0762.00	-4900.00
08/29/11	142.00	-1795.5	0760.00	-4868.57

APPENDIX G

NAVAJO REFINING
INJECTION RATES USED IN ANALYSIS

Date mm/dd/yy	Rate gpm	Time hours	Surf Press psig	Rate bpd
08/30/11	139.00	-1771.5	0742.00	-4765.71
08/31/11	142.92	-1747.5	0760.00	-4900.00
09/01/11	142.00	-1723.5	0759.00	-4868.57
09/02/11	142.08	-1699.5	0761.92	-4871.43
09/03/11	142.08	-1675.5	0763.00	-4871.43
09/04/11	140.00	-1651.5	0757.08	-4800.00
09/05/11	139.92	-1627.5	0757.00	-4797.14
09/06/11	139.00	-1603.5	0755.00	-4765.71
09/07/11	139.92	-1579.5	0762.00	-4797.14
09/08/11	140.00	-1555.5	0761.00	-4800.00
09/09/11	140.00	-1531.5	0761.00	-4800.00
09/10/11	138.00	-1507.5	0753.92	-4731.43
09/11/11	137.00	-1483.5	0751.00	-4697.14
09/12/11	136.08	-1459.5	0745.08	-4665.71
09/13/11	140.00	-1435.5	0762.92	-4800.00
09/14/11	140.92	-1411.5	0764.00	-4831.43
09/15/11	140.00	-1387.5	0762.00	-4800.00
09/16/11	141.08	-1363.5	0758.00	-4837.14
09/17/11	080.00	-1339.5	0430.00	-2742.86
09/18/11	078.00	-1315.5	0503.25	-2674.29
09/19/11	149.08	-1291.5	0806.00	-5111.43
09/20/11	150.92	-1267.5	0809.00	-5174.29
09/21/11	140.00	-1243.5	0763.92	-4800.00
09/22/11	135.00	-1219.5	0740.00	-4628.57
09/23/11	135.00	-1195.5	0746.00	-4628.57
09/24/11	140.00	-1171.5	0767.00	-4800.00
09/25/11	137.00	-1147.5	0751.00	-4697.14
09/26/11	139.00	-1123.5	0768.00	-4765.71
09/27/11	139.00	-1099.5	0770.00	-4765.71
09/28/11	140.92	-1075.5	0772.00	-4831.43
09/29/11	079.00	-1051.5	0448.00	-2708.57
09/30/11	139.92	-1027.5	0771.00	-4797.14
10/01/11	139.00	-1003.5	0772.00	-4765.71
10/02/11	140.00	-0979.5	0770.00	-4800.00
10/03/11	140.00	-0955.5	0771.00	-4800.00
10/04/11	090.00	-0931.5	0536.00	-3085.71
10/05/11	140.08	-0907.5	0774.00	-4802.86
10/06/11	078.92	-0883.5	0546.25	-2705.71
10/07/11	138.00	-0859.5	0766.00	-4731.43
10/08/11	077.00	-0835.5	0545.33	-2640.00
10/09/11	119.00	-0811.5	0686.00	-4080.00
10/10/11	134.00	-0787.5	0754.00	-4594.29
10/11/11	133.08	-0763.5	0755.00	-4562.86
10/12/11	138.08	-0739.5	0776.00	-4734.29
10/13/11	138.00	-0715.5	0777.00	-4731.43
10/14/11	138.00	-0691.5	0778.00	-4731.43
10/15/11	138.08	-0667.5	0780.00	-4734.29
10/16/11	138.08	-0643.5	0782.00	-4734.29
10/17/11	139.00	-0619.5	0781.00	-4765.71
10/18/11	137.92	-0595.5	0778.00	-4728.57
10/19/11	138.00	-0571.5	0780.08	-4731.43
10/20/11	079.00	-0547.5	0447.00	-2708.57
10/21/11	080.36	-0523.5	0445.59	-2755.37
10/22/11	080.47	-0499.5	0443.69	-2759.13
10/23/11	138.25	-0475.5	0753.73	-4739.90
10/24/11	137.01	-0451.5	0760.47	-4697.43
10/25/11	135.01	-0427.5	0751.98	-4628.98
10/26/11	140.51	-0403.5	0774.15	-4817.40
10/27/11	135.45	-0379.5	0753.99	-4644.04
10/28/11	140.09	-0355.5	0772.96	-4802.92
10/29/11	136.08	-0331.5	0752.47	-4665.66
10/30/11	140.65	-0307.5	0767.77	-4822.17
10/30/11	136.08	-0283.5	0751.06	-4665.50
10/31/11	145.54	-0259.5	0793.96	-4990.08
11/01/11	144.15	-0235.5	0792.62	-4942.17
11/02/11	143.85	-0211.5	0790.85	-4932.04
11/03/11	138.59	-0187.5	0769.46	-4751.52
11/04/11	138.30	-0163.5	0771.23	-4741.63
11/05/11	142.86	-0139.5	0796.40	-4898.20
11/06/11	136.17	-0115.5	0768.11	-4668.71
11/07/11	140.50	-0091.5	0785.24	-4817.24
11/08/11	129.90	-0067.5	0736.01	-4453.63
11/09/11	125.45	-0043.5	0716.21	-4301.09
11/10/11	126.53	-0030.5	0722.19	-4338.13
11/10/11	159.99	-0019.5	0885.70	-5485.29
11/11/11	159.56	0000.0	0884.71	-5470.54
11/11/11	000.00	0004.5	0458.02	0000.00
11/12/11	000.00	0024.0	0517.73	0000.00
11/13/11	000.00	0002.5	0496.70	0000.00

APPENDIX H

GAUGE CALIBRATION SHEETS

SPARTEK SYSTEMS
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#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
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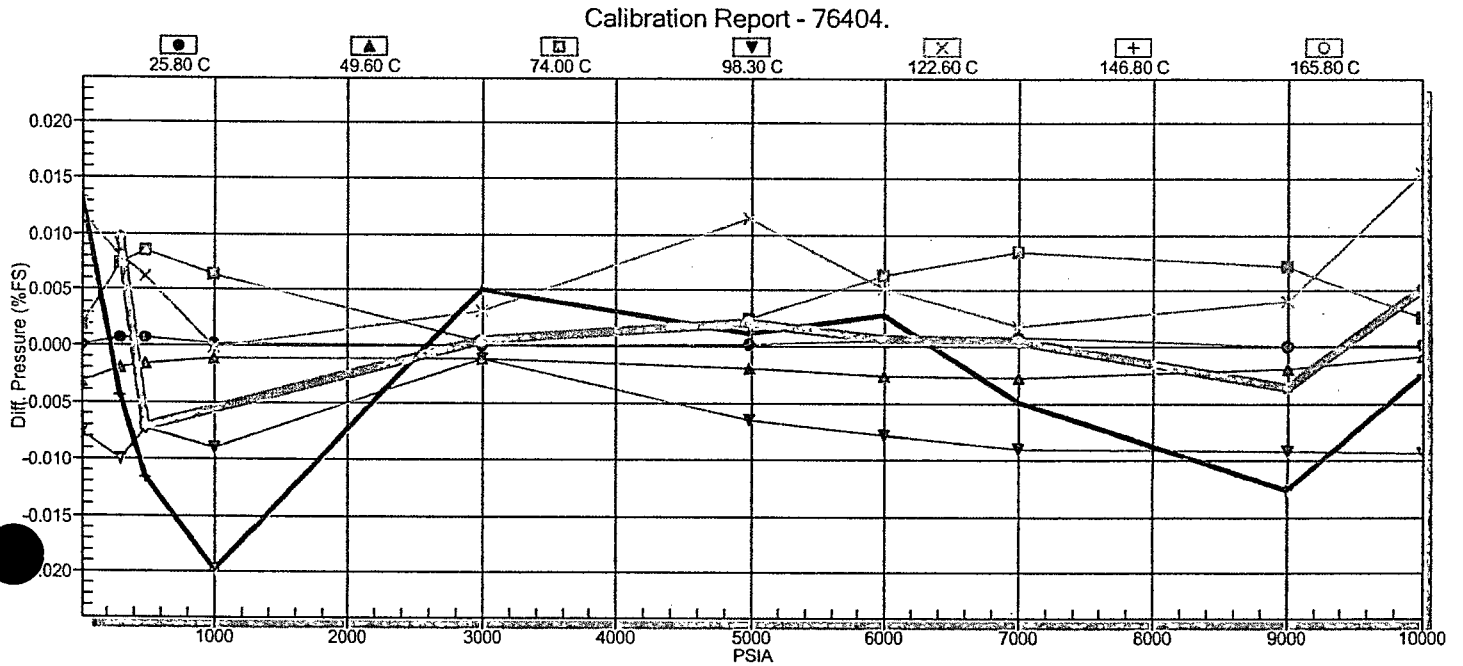
URL www.sparteksystems.com

Pressure Gauge Certificate of Calibration



GAUGE NUMBER: 76404

2-D POLYNOMIAL LMS CURVEFIT

Source of f:	Pres	Temp	Pressure Equation:
Fit Order:	3	5	Pressure (PSI) = A + xp(B + xp(C + xp(D)))
Prescale:	xp = m * (fp - fp0)	xt = m * (ft - ft0)	
m:	0.01	0.01	Temperature Compenstation:
	fp0 = 679762	ft0 = 147934	A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))
			B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))
			C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))
			D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 12.99794347	0.2330350417	0.001448503543	8.059807097E-06	2.546076087E-08
B 3.425793327E-11	2.732094734	-0.002470381242	-2.808599563E-06	-1.357774352E-08
C -9.364561627E-12	7.798827128E-15	-5.296904725E-06	1.130329865E-07	2.416253335E-09
D 1.471188786E-11	3.328730054E-14	2.832889781E-17	1.145768863E-10	-2.228504448E-11

Temperature (C) STANDARD FIT COEFFICIENTS

A 25.84508201

B -0.3744317269

C 1.894632477E-05

D -1.71314099E-07

2 points eliminated.
Error File: Gauge # 76404

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
13.02	25.80	679762.67	147934.25	0.00
303.29	25.60	690391.67	147943.75	0.06
492.47	25.70	697321.33	147956.75	0.06
1001.53	25.90	715981.67	147982.75	0.02
3005.18	25.90	789576.33	148010.25	0.00
4994.65	25.80	862809.33	147991.25	0.02
5995.36	25.90	899684.00	147968.00	0.05
6996.43	25.80	936553.00	147921.25	0.08
9002.25	25.80	1010378.00	147797.25	0.00
10004.67	25.90	1047231.00	147721.25	0.02
13.02	49.60	680117.67	141661.00	-0.33
303.29	49.70	690206.67	141675.25	-0.20
492.47	49.60	696783.67	141683.50	-0.16
1001.53	49.60	714492.00	141701.50	-0.12
3005.19	49.50	784326.67	141739.00	-0.11
4994.66	49.60	853811.33	141729.00	-0.20
5995.37	49.50	888789.67	141709.00	-0.26
6996.44	49.60	923776.33	141674.25	-0.28
9002.26	49.60	993832.67	141572.75	-0.20
10004.68	49.60	1028780.33	141499.50	-0.08
13.03	74.00	680338.67	135239.25	0.17
303.29	74.00	689952.67	135250.25	0.73
492.48	74.00	696212.67	135257.25	0.86
1001.53	74.00	713046.00	135275.25	0.64
3005.19	74.00	779388.33	135308.25	0.03
4994.65	74.10	845380.33	135306.25	0.25
5995.37	74.00	878599.00	135288.75	0.64
6996.44	74.00	911827.67	135262.50	0.86
9002.26	74.00	978373.33	135182.50	0.73
10004.67	74.20	1011573.67	135120.00	0.26
13.04	98.30	680447.67	129003.25	-0.77
303.31	98.30	689578.33	129014.00	-0.99
492.49	98.30	695543.67	129019.75	-0.73
1001.55	98.30	711576.00	129037.50	-0.90
3005.20	98.30	774797.33	129066.25	-0.12
4994.67	98.30	837614.67	129069.25	-0.65
5995.38	98.30	869227.00	129056.75	-0.79
6996.45	98.30	900849.67	129035.50	-0.90
9002.27	98.40	964183.67	128969.00	-0.92
10004.69	98.40	995802.33	128923.25	-0.93
13.05	122.60	680623.67	123046.00	1.17
303.32	122.70	689309.33	123054.00	0.80
492.50	122.60	694975.33	123060.50	0.63
1001.56	122.60	710227.67	123076.50	-0.01
3005.21	122.70	770470.33	123108.75	0.31
4994.68	122.60	830430.67	123115.50	1.15
5995.39	122.60	860569.67	123102.75	0.53
6996.47	122.60	890723.33	123084.75	0.17
9002.28	122.70	951127.00	123039.00	0.42
10004.70	122.70	981270.67	122997.75	1.55
13.06	146.80	680801.33	117455.75	1.33
303.34	146.90	689032.33	117466.50	-0.43
492.51	146.80	694413.33	117474.25	-1.17
1001.58	146.70	708942.33	117488.25	-1.99
3005.22	146.70	766486.00	117519.75	0.51
4994.69	146.80	823742.67	117526.75	0.12
5995.40	146.80	852585.67	117520.50	0.27
6996.46	146.80	881413.33	117509.50	-0.49
9002.28	146.90	939126.33	117469.75	-1.27
10004.68	146.80	967923.00	117434.25	-0.25
303.32	165.80	689042.00	113002.50	0.97
492.50	165.90	694186.67	113010.00	-0.72
3005.21	165.90	763520.67	113055.25	0.04
4994.67	165.90	818745.33	113066.25	0.21
5995.38	165.90	846580.33	113067.00	0.07
6996.44	165.90	874446.00	113064.75	0.06
9002.25	165.80	930216.00	113036.50	-0.36
10004.67	165.90	958059.00	113016.00	0.53

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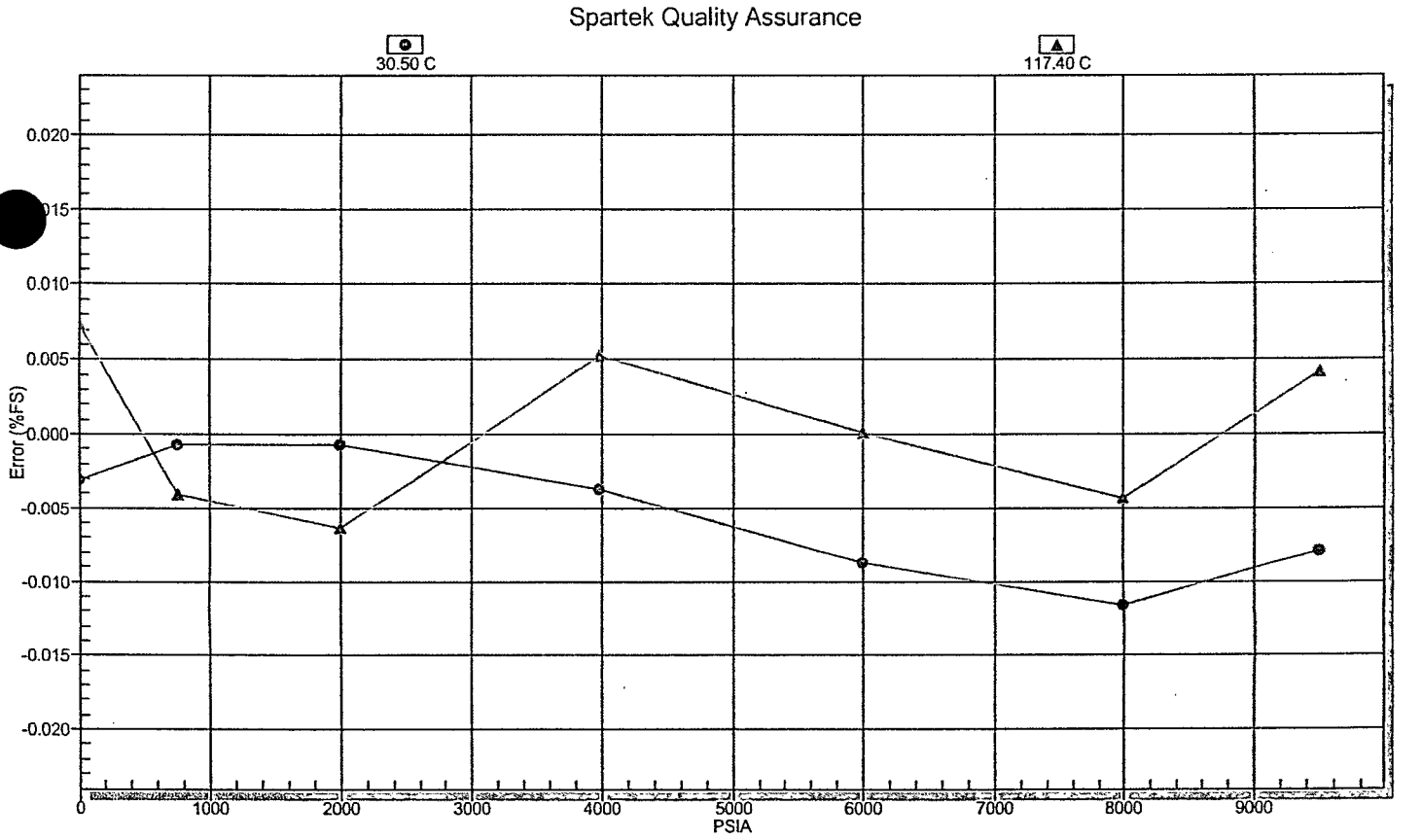
Phone (403) 887-2443
Fax (403) 887-4050
URL www.sparteksystems.com

Pressure Gauge Certificate of Conformance

SERIAL NUMBER	76404	CALIBRATION DATE	JUN 11/11
MODEL NUMBER	0 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	13.02 - 10004.67 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.80 - 165.80 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.024 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.024%F.S. + 0.01% of reading)



Accepted By: _____

Date: JUN 14/11

Ramp report: Serial # 76404
Gauge range = 10004.700 PSI. Max. DIFF. = 2.401
Ramp check result: PASS, Max Err = 0.012% F.S.

DW Pressure	Gauge Pressure	RPM4 Pressure	Differential	%F.S.	Oven Temp.	Gauge Temp.
9496.60	9495.81	9496.38	-0.79	0.0079	30.50	31.01
8000.40	7999.24	8000.21	-1.16	0.0116	30.60	30.69
5995.36	5994.48	5994.98	-0.88	0.0088	30.40	30.38
3992.86	3992.49	3992.50	-0.37	0.0037	30.30	30.22
2002.91	2002.85	2002.60	-0.07	0.0007	30.60	30.27
753.95	753.88	753.61	-0.07	0.0007	30.60	30.39
13.02	12.70	12.51	-0.32	0.0032	30.60	30.53
9496.60	9497.03	9496.30	0.42	0.0042	117.40	117.41
8000.41	7999.97	8000.16	-0.44	0.0044	117.50	117.35
5995.36	5995.38	5994.97	0.02	0.0002	117.50	117.29
3992.87	3993.39	3992.50	0.52	0.0052	117.60	117.39
2002.92	2002.29	2002.55	-0.63	0.0063	117.60	117.57
753.95	753.54	753.61	-0.41	0.0041	117.60	117.73
13.02	13.75	12.49	0.73	0.0073	117.80	117.87

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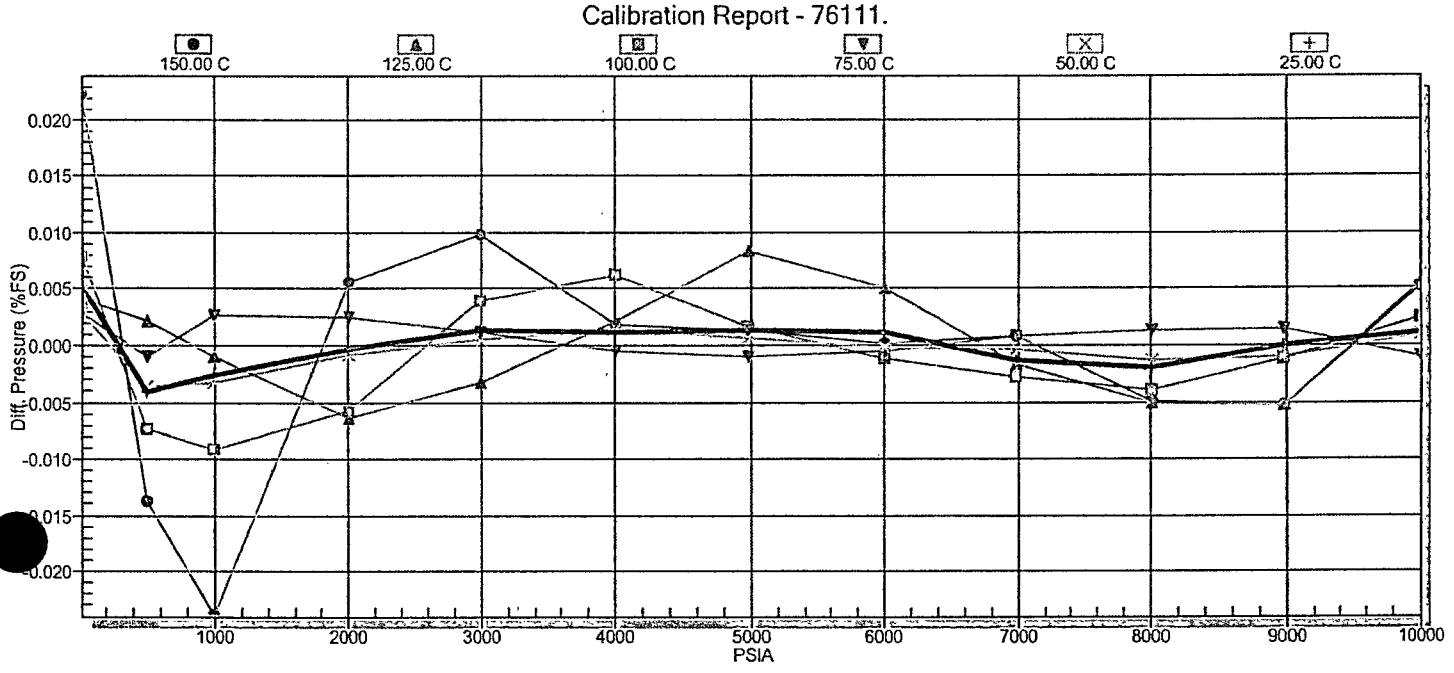
Pressure Gauge Certificate of Calibration



GAUGE NUMBER: 76111

2-D POLYNOMIAL LMS CURVEFIT

Source of f:	Pres	Temp	Pressure Equation:
Fit Order:	3	4	Pressure (PSI) = A + xp(B + xp(C + xp(D)))
Prescale:	xp = m * (fp - fp0)	xt = m * (ft - ft0)	
m:	0.01	0.01	Temperature Compenstation:
	fp0 = 679270	ft0 = 116826	A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))
			B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))
			C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))
			D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 16.91499981	0.2299796981	-0.001081970647	1.952581211E-06	5.434004799E-10
B 3.480231467	-0.00321146027	2.770196636E-06	2.540639531E-09	-1.370676188E-11
C -3.199752514E-05	1.974442629E-07	-2.947228038E-12	-4.481348121E-12	9.790790267E-15
D 3.598722956E-09	-3.108144869E-11	-4.031623283E-14	9.192935329E-16	-1.861916648E-18

Temperature (C) STANDARD FIT COEFFICIENTS

A 150.0081337

B -0.4528790111

C 0.0002627521854

D -3.082918538E-07

0 points eliminated.
Error File: Gauge # 76111

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
14.70	150.00	679270.31	116826.50	2.23
507.13	150.00	693331.00	116774.25	-1.37
999.42	150.00	707495.00	116782.25	-2.39
2013.05	150.00	736913.31	116792.75	0.56
2997.68	150.00	765550.00	116805.00	0.98
4011.27	150.00	795142.69	116848.50	0.18
4995.89	150.00	823974.69	116846.75	0.14
6009.45	150.00	853726.31	116839.25	0.02
6994.05	150.00	882693.31	116830.75	0.08
8007.57	150.00	912520.00	116811.75	-0.49
8992.13	150.00	941539.69	116795.25	-0.52
10005.64	150.00	971436.69	116770.75	0.52
14.70	125.00	678911.00	122597.50	0.40
507.13	125.00	693821.69	122608.00	0.21
999.42	125.00	708750.31	122596.50	-0.10
2013.05	125.00	739581.69	122607.25	-0.64
2997.68	125.00	769658.00	122611.25	-0.32
4011.27	125.00	800717.69	122610.50	0.22
4995.89	125.00	830970.69	122605.50	0.84
6009.45	125.00	862149.31	122594.75	0.51
6994.05	125.00	892473.69	122577.25	-0.17
8007.57	125.00	923740.69	122555.25	-0.51
8992.13	125.00	954150.00	122529.50	-0.53
10005.64	125.00	985487.00	122493.25	0.55
14.70	100.00	678737.00	128535.00	0.79
507.13	100.00	694359.69	128504.25	-0.74
999.42	100.00	710043.69	128512.75	-0.92
2013.05	100.00	742435.69	128530.75	-0.57
2997.68	100.00	774007.31	128537.50	0.39
4011.27	100.00	806566.69	128539.25	0.62
4995.89	100.00	838248.00	128535.75	0.16
6009.45	100.00	870930.69	128522.75	-0.11
6994.05	100.00	902739.69	128504.00	-0.28
8007.57	100.00	935529.00	128475.00	-0.39
8992.13	100.00	967432.31	128440.25	-0.11
10005.64	100.00	1000313.69	128400.50	0.24
14.70	75.00	678593.00	134881.00	0.29
507.13	75.00	695053.69	134883.25	-0.10
999.42	75.00	711559.69	134893.25	0.26
2013.05	75.00	745599.00	134912.75	0.25
2997.68	75.00	778752.69	134920.50	0.11
4011.27	75.00	812971.69	134921.00	-0.05
4995.89	75.00	846294.31	134911.00	-0.09
6009.45	75.00	880676.31	134893.50	-0.05
6994.05	75.00	914143.69	134867.25	0.08
8007.57	75.00	948652.00	134831.75	0.13
8992.13	75.00	982228.69	134790.50	0.15
10005.64	75.00	1016819.69	134735.75	-0.10
14.70	50.00	678422.00	141460.50	0.28
507.13	50.00	695724.31	141468.00	-0.36
999.42	50.00	713079.00	141481.00	-0.32
2013.05	50.00	748919.69	141500.25	-0.09
2997.68	50.00	783852.31	141507.00	0.05
4011.27	50.00	819922.69	141502.25	0.15
4995.89	50.00	855055.69	141489.00	0.06
6009.45	50.00	891307.31	141462.50	-0.02
6994.05	50.00	926604.69	141429.25	-0.03
8007.57	50.00	962999.31	141384.00	-0.14
8992.13	50.00	998403.69	141327.50	-0.10
10005.64	50.00	1034886.00	141256.25	0.10
14.70	25.00	678061.31	148031.25	0.53
507.13	25.00	696313.69	148041.00	-0.41
999.42	25.00	714640.31	148056.00	-0.26
2013.05	25.00	752486.31	148071.50	-0.04
2997.68	25.00	789389.69	148079.75	0.13
4011.27	25.00	827496.69	148070.75	0.12
4995.89	25.00	864625.31	148049.25	0.13
6009.45	25.00	902948.00	148016.75	0.11
6994.05	25.00	940249.69	147972.25	-0.12

8007.57	25.00	978714.69	147910.25	-0.20
8992.13	25.00	1016143.69	147838.50	-0.01
10005.64	25.00	1054710.00	147753.50	0.11

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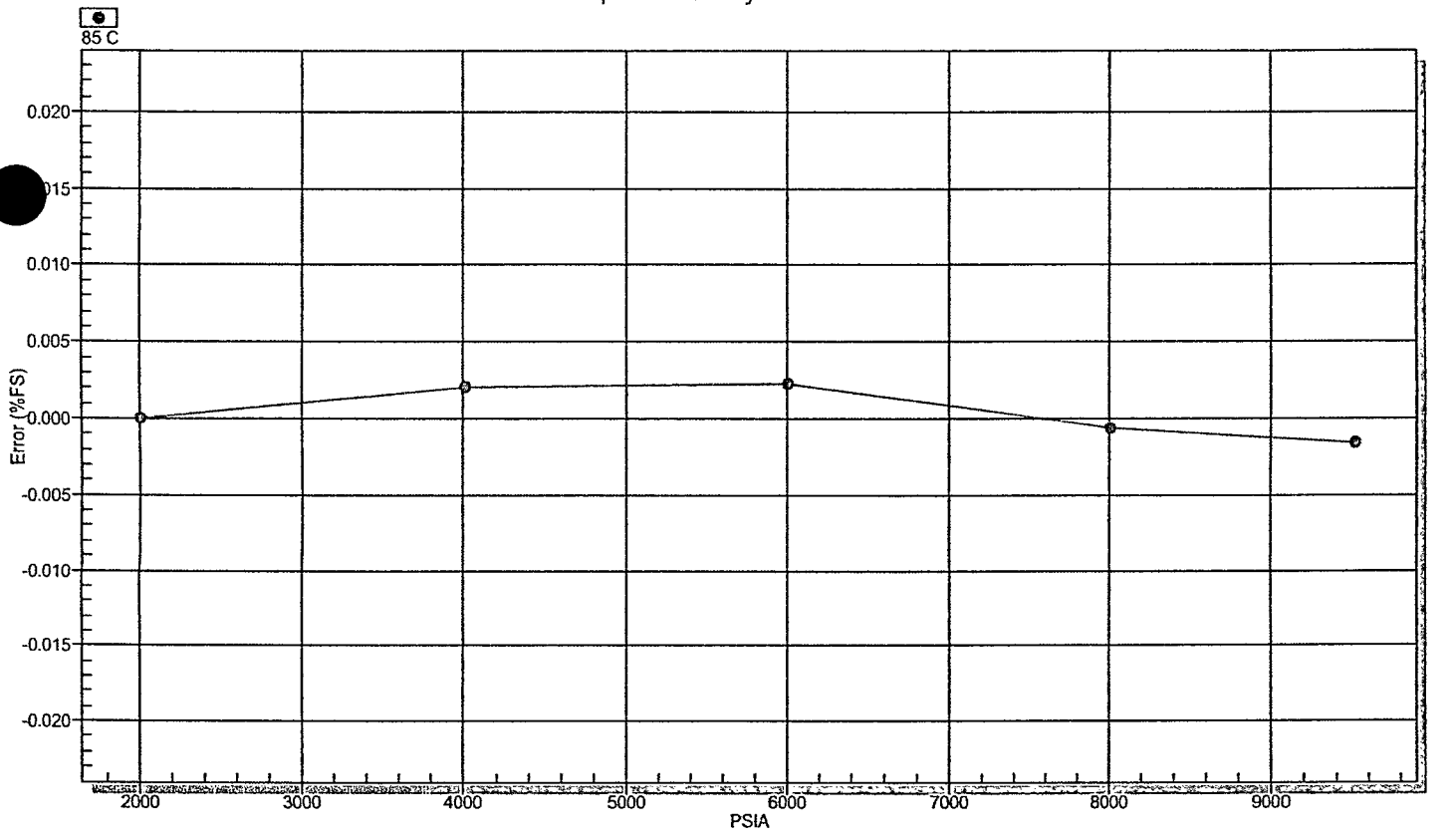
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	76111	CALIBRATION DATE	JAN 13/11
MODEL NUMBER	1139 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	14.70 - 10005.64 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.00 - 150.00 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY
As shown in the graph below, this Spartek Gauge conformed to within +/- 0.024 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.024%F.S. + 0.01% of reading)

Spartek Quality Assurance



Accepted By: Jeff Banas

Date: JAN 14/11

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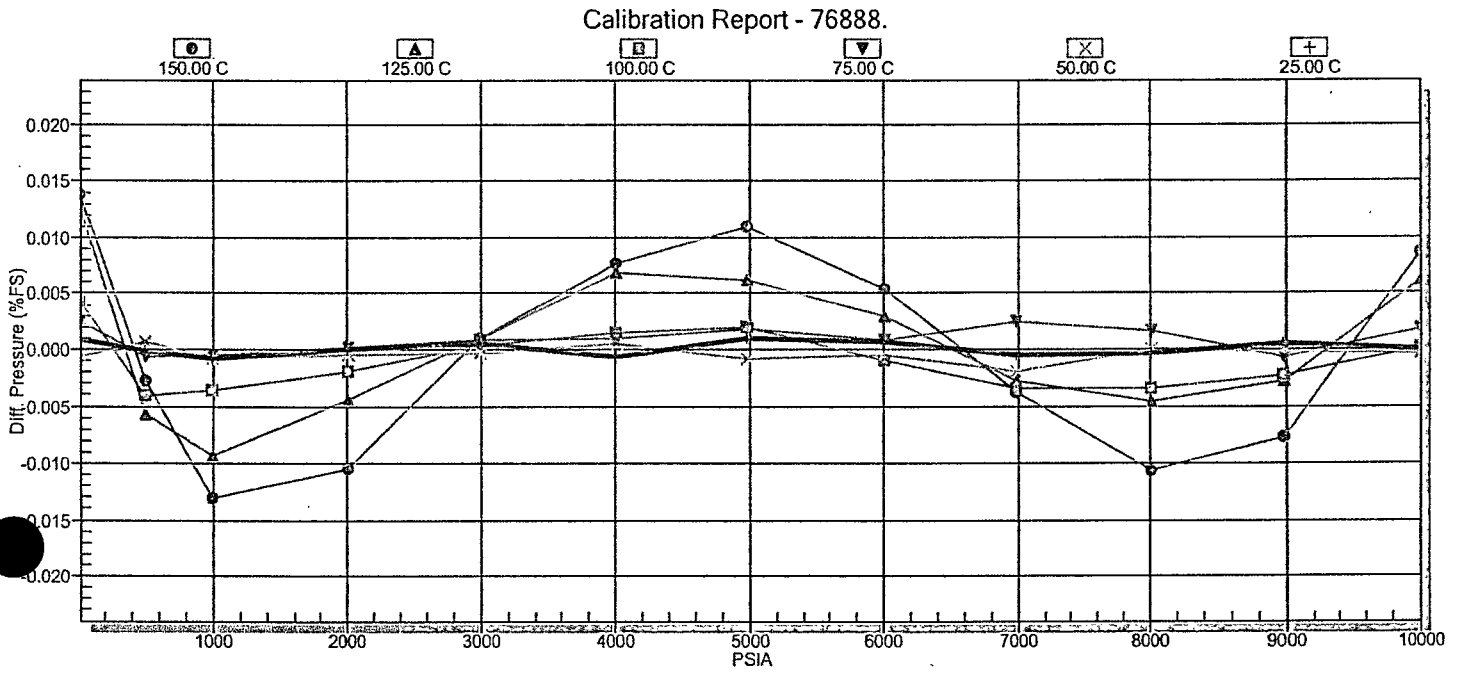

GAUGE NUMBER: 76888

2-D POLYNOMIAL LMS CURVEFIT

Source of f:	Pres	Temp	Pressure Equation:
Fit Order:	3	4	Pressure (PSI) = A + xp(B + xp(C + xp(D)))
Prescale:	xp = m * (fp - fp0)	xt = m * (ft - ft0)	
m:	0.01	0.01	Temperature Compenstation:
	fp0 = 694079	ft0 = 126998	A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))
			B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))
			C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))
			D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

Pressure (psi) STANDARD FIT COEFFICIENTS:

	0	1	2	3	4
A	16.07134192	0.3901406668	-0.001952144141	5.077063477E-06	-4.724807462E-09
B	3.969002303	-0.003676133953	5.41796378E-06	-8.95019131E-09	4.102524076E-12
C	-3.023595064E-05	4.314638646E-07	-2.000125662E-09	3.595830933E-12	-1.824536502E-15
D	7.218774821E-09	-8.533993659E-11	3.72461693E-13	-6.182561979E-16	2.408526044E-19

Temperature (C) STANDARD FIT COEFFICIENTS

A 150.1401871

B -0.4166474323

C 0.0002247169682

D -2.60415077E-07

0 points eliminated.
Error File: Gauge # 76888

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
14.70	150.00	694079.00	126998.00	1.37
507.13	150.00	706455.31	126962.25	-0.27
999.42	150.00	718862.31	126970.50	-1.31
2013.05	150.00	744533.00	126985.00	-1.05
2997.68	150.00	769560.69	126999.75	0.10
4011.27	150.00	795390.00	127049.75	0.77
4995.89	150.00	820477.31	127054.50	1.09
6009.45	150.00	846283.69	127053.50	0.54
6994.05	150.00	871335.69	127053.75	-0.38
8007.57	150.00	897088.31	127044.50	-1.06
8992.13	150.00	922083.69	127036.50	-0.77
10005.64	150.00	947774.69	127024.75	0.87
14.70	125.00	693599.00	133239.75	1.24
507.13	125.00	706656.31	133233.25	-0.57
999.42	125.00	719758.69	133248.25	-0.93
2013.05	125.00	746794.69	133264.25	-0.45
2997.68	125.00	773083.31	133277.00	0.09
4011.27	125.00	800159.69	133287.75	0.69
4995.89	125.00	826441.31	133290.00	0.62
6009.45	125.00	853478.69	133291.25	0.29
6994.05	125.00	879711.69	133287.25	-0.28
8007.57	125.00	906680.31	133273.50	-0.46
8992.13	125.00	932846.69	133260.75	-0.27
10005.64	125.00	959731.69	133239.25	0.63
14.70	100.00	693288.69	139739.50	0.42
507.13	100.00	707053.31	139715.50	-0.41
999.42	100.00	720840.00	139726.25	-0.35
2013.05	100.00	749233.69	139747.25	-0.20
2997.68	100.00	776818.69	139763.75	0.04
4011.27	100.00	805203.00	139774.25	0.14
4995.89	100.00	832758.69	139777.50	0.20
6009.45	100.00	861093.00	139777.25	-0.10
6994.05	100.00	888584.31	139767.75	-0.34
8007.57	100.00	916851.69	139753.25	-0.34
8992.13	100.00	944266.31	139732.50	-0.24
10005.64	100.00	972439.00	139707.00	0.02
14.70	75.00	693081.31	146617.00	0.24
507.13	75.00	707575.31	146599.75	-0.06
999.42	75.00	722073.69	146612.25	-0.05
2013.05	75.00	751925.00	146635.00	0.01
2997.68	75.00	780915.69	146653.00	0.08
4011.27	75.00	810742.31	146663.25	0.10
4995.89	75.00	839695.31	146664.75	0.17
6009.45	75.00	869466.00	146660.00	0.07
6994.05	75.00	898357.00	146646.75	0.24
8007.57	75.00	928048.69	146627.50	0.17
8992.13	75.00	956844.31	146604.25	-0.07
10005.64	75.00	986437.00	146568.75	0.18
14.70	50.00	692867.00	153703.50	-0.07
507.13	50.00	708143.31	153695.25	0.07
999.42	50.00	723405.69	153708.00	-0.09
2013.05	50.00	754842.31	153734.25	-0.05
2997.68	50.00	785371.00	153751.00	-0.03
4011.27	50.00	816780.69	153757.00	0.04
4995.89	50.00	847263.69	153756.50	-0.08
6009.45	50.00	878614.69	153747.75	-0.06
6994.05	50.00	909021.00	153728.50	-0.19
8007.57	50.00	940277.00	153698.75	-0.01
8992.13	50.00	970577.00	153662.00	-0.02
10005.64	50.00	1001710.00	153619.75	-0.03
14.70	25.00	692621.31	160787.25	0.08
507.13	25.00	708739.69	160756.75	-0.02
999.42	25.00	724854.00	160774.75	-0.08
2013.05	25.00	758037.31	160801.75	0.01
2997.68	25.00	790258.31	160817.00	0.06
4011.27	25.00	823402.31	160824.50	-0.06
4995.89	25.00	855573.69	160817.25	0.10
6009.45	25.00	888644.69	160800.75	0.06
6994.05	25.00	920724.31	160777.25	-0.06

8007.57	25.00	953681.00	160736.75	-0.04
8992.13	25.00	985636.31	160690.25	0.04
10005.64	25.00	1018452.31	160633.25	0.01

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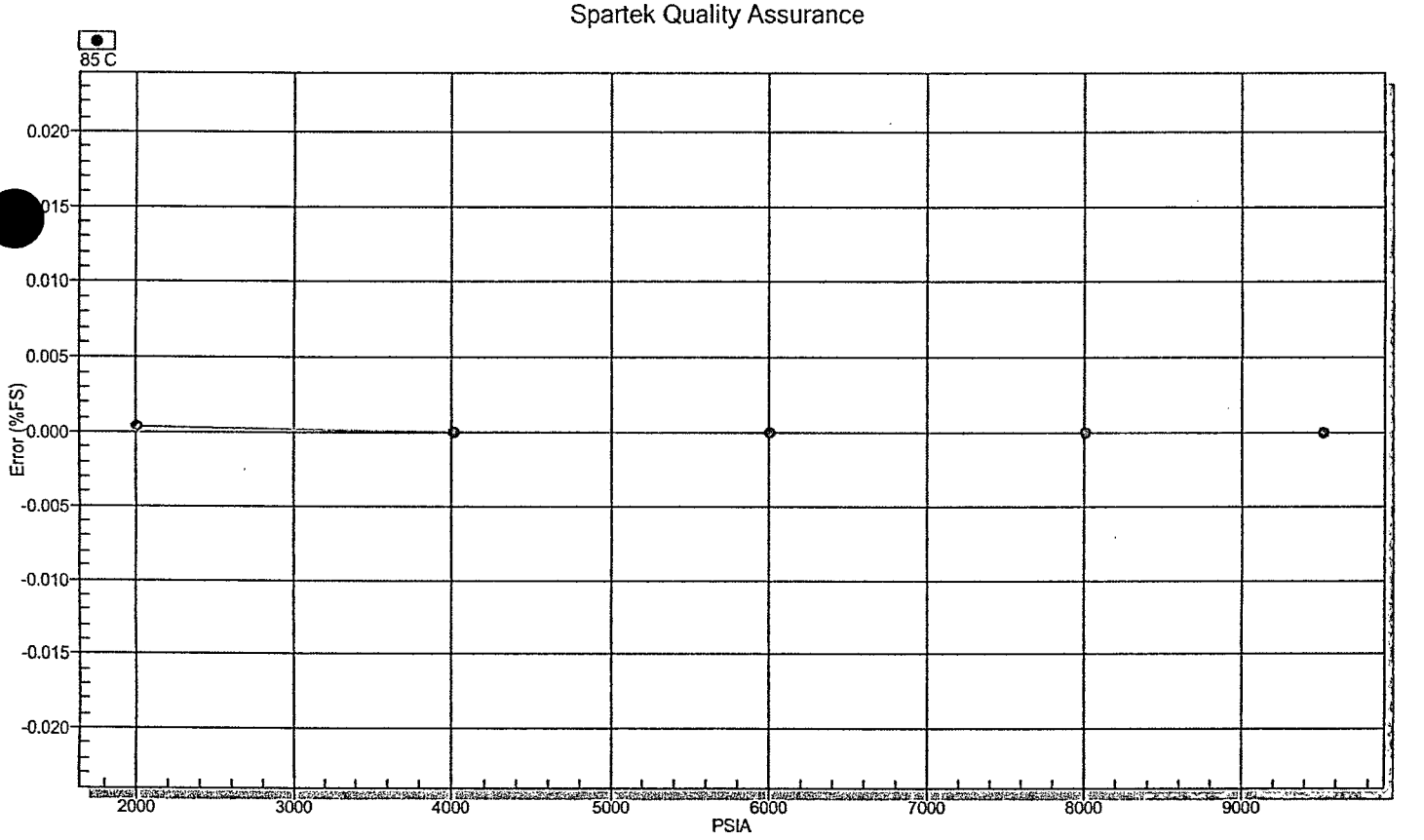
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	76888	CALIBRATION DATE	JAN 13/11
MODEL NUMBER	1139 FF4	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	14.70 - 10005.64 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.00 - 150.00 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.024 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.024%F.S. + 0.01% of reading)



Accepted By: Jeff Banas

Date: JAN 14/11

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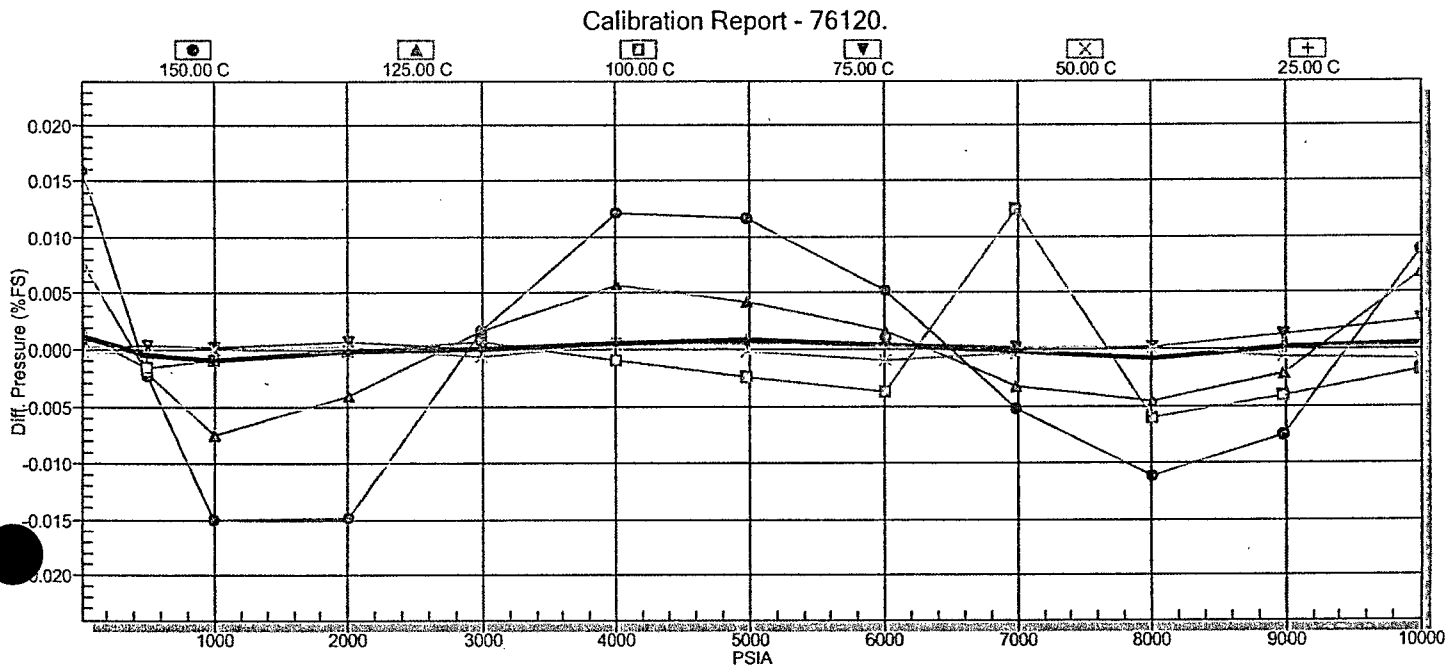
Pressure Gauge Certificate of Calibration



GAUGE NUMBER: 76120

2-D POLYNOMIAL LMS CURVEFIT

Source of f:	Pres	Temp	Pressure Equation:
Fit Order:	3	4	Pressure (PSI) = A + xp(B + xp(C + xp(D)))
Prescale:	xp = m * (fp - fp0)	xt = m * (ft - ft0)	
m:	0.01	0.01	Temperature Compenstation:
	fp0 = 696608	ft0 = 129408	A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))
			B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))
			C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))
			D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 16.25808819	0.3379612244	-0.001867626497	5.220111456E-06	-5.220941546E-09
B 3.936749564	-0.003717062066	6.601103964E-06	-1.43353432E-08	1.141099494E-11
C -2.954784519E-05	5.054920853E-07	-3.066726504E-09	8.112698923E-12	-7.879956916E-15
D 7.048819282E-09	-1.017749085E-10	5.965791034E-13	-1.558180303E-15	1.497077875E-18

Temperature (C) STANDARD FIT COEFFICIENTS

A 150.0948355

B -0.4155932248

C 0.0002384316045

D -3.026519777E-07

0 points eliminated.
Error File: Gauge # 76120

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
14.70	150.00	696608.69	129408.75	1.59
507.07	150.00	709080.69	129393.00	-0.22
999.41	150.00	721586.31	129401.50	-1.52
2013.03	150.00	747465.00	129416.00	-1.49
2997.69	150.00	772714.00	129430.25	0.16
4011.29	150.00	798738.31	129443.00	1.21
4995.91	150.00	824016.00	129448.25	1.17
6009.48	150.00	850026.69	129449.25	0.52
6994.09	150.00	875272.31	129448.50	-0.52
8007.64	150.00	901237.00	129443.50	-1.12
8992.20	150.00	926420.00	129429.25	-0.76
10005.73	150.00	952299.00	129410.75	0.89
14.70	125.00	696184.69	135642.75	0.78
507.07	125.00	709370.69	135638.50	-0.22
999.41	125.00	722576.00	135646.00	-0.75
2013.03	125.00	749824.00	135664.00	-0.42
2997.69	125.00	776320.00	135678.00	0.16
4011.29	125.00	803597.69	135686.50	0.57
4995.91	125.00	830077.00	135689.25	0.42
6009.48	125.00	857318.69	135688.50	0.17
6994.09	125.00	883747.00	135680.50	-0.32
8007.64	125.00	910928.31	135670.00	-0.46
8992.20	125.00	937299.00	135656.75	-0.21
10005.73	125.00	964399.69	135635.75	0.69
14.70	100.00	695940.00	142240.25	0.13
507.07	100.00	709833.69	142216.50	-0.16
999.41	100.00	723737.31	142225.75	-0.10
2013.03	100.00	752365.31	142246.75	-0.01
2997.69	100.00	780177.69	142267.50	0.07
4011.29	100.00	808787.00	142273.25	-0.09
4995.91	100.00	836563.00	142274.25	-0.25
6009.48	100.00	865136.00	142271.75	-0.38
6994.09	100.00	892911.00	142262.25	1.24
8007.64	100.00	921364.31	142245.50	-0.60
8992.20	100.00	949017.69	142224.50	-0.42
10005.73	100.00	977433.31	142196.50	-0.19
14.70	75.00	695785.31	149145.50	0.02
507.07	75.00	710406.00	149136.00	0.03
999.41	75.00	725024.69	149142.50	0.02
2013.03	75.00	755121.31	149158.00	0.06
2997.69	75.00	784350.69	149173.00	-0.01
4011.29	75.00	814430.00	149180.50	0.05
4995.91	75.00	843624.31	149176.75	0.06
6009.48	75.00	873659.00	149174.00	0.06
6994.09	75.00	902794.69	149158.50	0.01
8007.64	75.00	932748.31	149136.00	0.02
8992.20	75.00	961800.31	149106.50	0.12
10005.73	75.00	991651.31	149068.00	0.27
14.70	50.00	695620.69	156234.50	-0.01
507.07	50.00	711018.00	156208.75	-0.03
999.41	50.00	726416.31	156224.25	-0.01
2013.03	50.00	758118.00	156249.00	0.01
2997.69	50.00	788906.00	156265.50	-0.07
4011.29	50.00	820590.00	156271.75	0.04
4995.91	50.00	851341.31	156269.25	-0.01
6009.48	50.00	882957.69	156252.25	-0.09
6994.09	50.00	913645.31	156233.50	-0.03
8007.64	50.00	945179.31	156201.00	0.01
8992.20	50.00	975764.69	156166.50	-0.07
10005.73	50.00	1007180.31	156118.00	-0.09
14.70	25.00	695426.69	163269.25	0.11
507.07	25.00	711677.00	163252.75	-0.05
999.41	25.00	727930.69	163270.50	-0.10
2013.03	25.00	761399.31	163293.00	-0.02
2997.69	25.00	793903.69	163308.00	0.00
4011.29	25.00	827346.31	163311.00	0.05
4995.91	25.00	859805.69	163303.75	0.07
6009.48	25.00	893182.00	163286.50	0.03
6994.09	25.00	925553.00	163255.25	-0.01

8007.64	25.00	958822.69	163215.25	-0.09
8992.20	25.00	991082.69	163166.00	0.02
10005.73	25.00	1024207.31	163102.25	0.04

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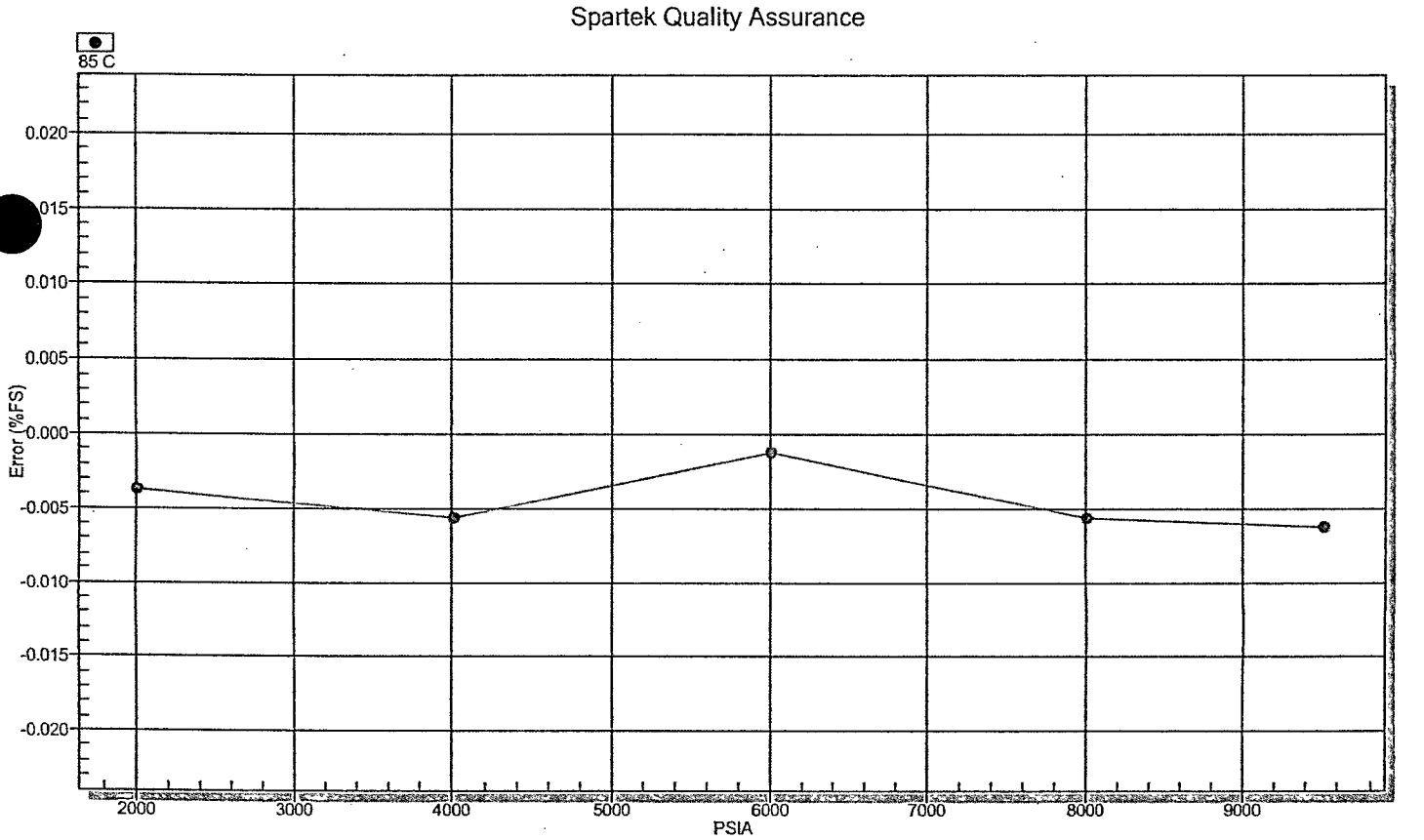
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	76120	CALIBRATION DATE	MAR 01/11
MODEL NUMBER	1139 FF4	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	14.70 - 10005.73 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.00 - 150.00 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.024 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.024%F.S. + 0.01% of reading)



Accepted By: Jeff Barnes

Date: MAR 03/11

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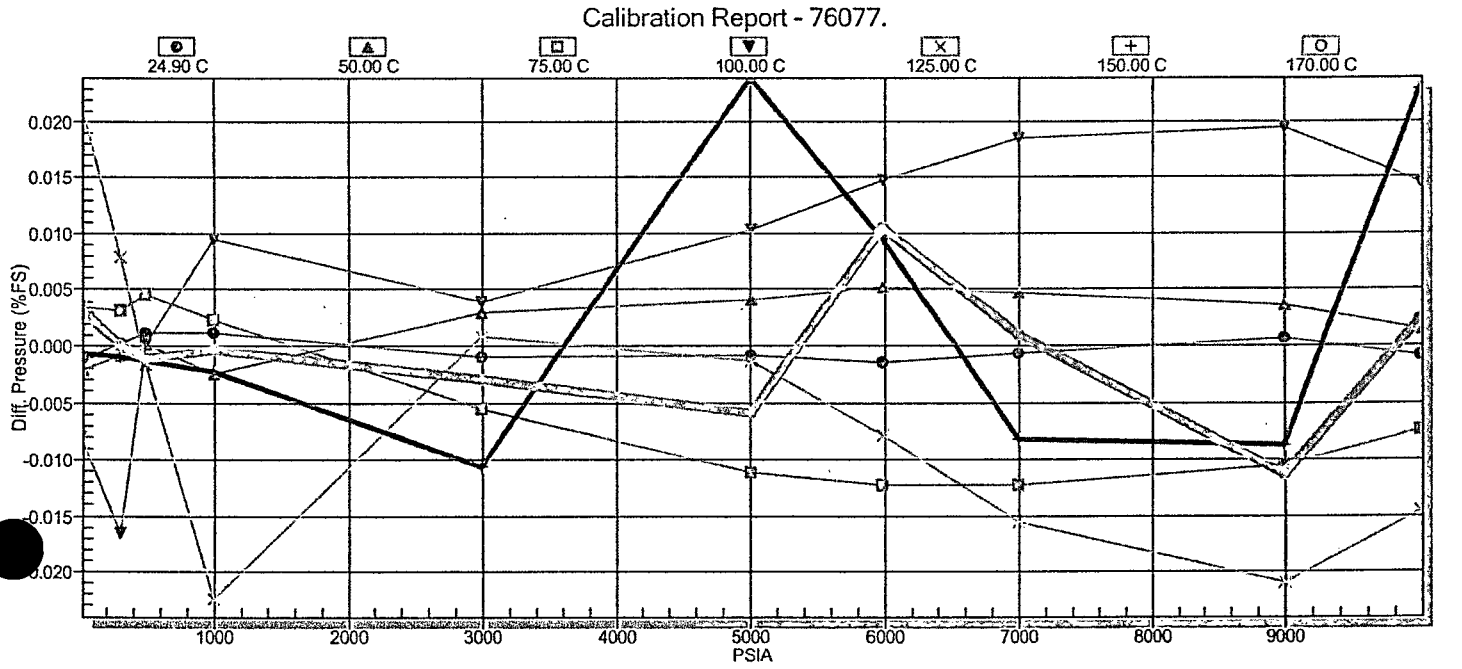
Pressure Gauge Certificate of Calibration



GAUGE NUMBER: 76077

2-D POLYNOMIAL LMS CURVEFIT

Source of f:	Pres	Temp	Pressure Equation:
Fit Order:	3	5	Pressure (PSI) = A + xp(B + xp(C + xp(D)))
Prescale:	xp = m * (fp - fp0)	xt = m * (ft - ft0)	
m:	0.01	0.01	Temperature Compenstation:
	fp0 = 696205	ft0 = 150709	A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))
			B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))
			C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))
			D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

Pressure (psi) STANDARD FIT COEFFICIENTS:

	0	1	2	3	4
A	13.0136963	-0.01597146349	-0.003409903515	-3.126272132E-05	-1.079801947E-07
B	-1.20366904E-10	2.566524369	-0.00181832986	6.893628782E-06	6.462276628E-08
C	2.439273265E-10	2.918895194E-13	2.465612196E-06	-2.155514842E-07	-6.037720502E-09
D	-5.390582477E-11	-1.859576295E-13	-2.104819019E-16	3.934133943E-10	4.404493663E-11

Temperature (C) STANDARD FIT COEFFICIENTS

A	25.09298827
B	-0.3345891166
C	0.0002234251032
D	3.202327425E-07

0 points eliminated.
Error File: Gauge # 76077

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
13.14	24.90	696205.67	150709.75	-0.11
304.14	24.90	707549.00	150725.00	0.02
492.97	25.10	714910.33	150735.25	0.12
1002.43	25.00	734759.00	150758.25	0.11
2996.09	25.00	812351.33	150789.25	-0.10
5006.81	24.90	890382.33	150760.25	-0.08
5993.35	24.90	928536.00	150727.00	-0.14
6998.81	25.00	967319.00	150681.50	-0.07
8995.36	25.00	1043926.00	150543.75	0.07
9997.60	25.00	1082145.33	150451.25	-0.09
13.14	50.00	696469.67	143706.00	-0.22
304.14	50.00	707208.67	143719.50	-0.08
492.98	50.00	714178.00	143728.25	0.02
1002.44	50.00	732959.67	143746.50	-0.24
2996.11	50.00	806452.67	143774.75	0.29
5006.82	50.00	880374.67	143759.25	0.40
5993.37	50.00	916544.67	143735.25	0.53
6998.82	50.00	953316.00	143701.00	0.47
8995.37	50.00	1025999.00	143592.50	0.36
9997.62	50.00	1062286.33	143521.00	0.14
13.13	75.00	696703.67	136798.75	0.35
304.13	75.00	706894.67	136809.25	0.32
492.96	75.00	713514.00	136819.25	0.47
1002.42	75.00	731349.67	136839.00	0.23
2996.09	75.00	801097.67	136866.25	-0.56
5006.80	75.00	871290.00	136856.25	-1.11
5993.35	75.10	905646.00	136839.00	-1.22
6998.80	75.10	940581.67	136810.00	-1.23
8995.35	75.00	1009673.33	136724.25	-1.05
9997.60	75.00	1044186.67	136663.75	-0.74
13.09	100.00	696777.00	130141.75	-0.81
304.09	100.00	706451.00	130154.00	-1.65
492.93	100.00	712802.00	130163.25	0.01
1002.38	100.00	729812.67	130178.00	0.95
2996.04	100.10	796156.67	130204.00	0.40
5006.74	100.00	862936.00	130200.25	1.03
5993.28	100.00	895628.00	130188.25	1.47
6998.73	100.00	928874.67	130163.75	1.84
8995.27	100.00	994653.67	130090.75	1.94
9997.52	100.00	1027532.67	130041.50	1.46
13.05	125.00	697214.67	123832.75	2.18
304.05	125.10	706374.67	123836.75	0.78
492.88	125.00	712319.00	123847.00	-0.17
1002.33	125.00	728379.00	123862.25	-2.24
2996.00	125.10	791594.67	123885.25	0.09
5006.69	125.10	855234.67	123884.00	-0.14
5993.24	125.10	886388.00	123871.75	-0.79
6998.69	125.00	918084.00	123856.00	-1.55
8995.23	124.90	980807.67	123795.50	-2.09
9997.47	125.00	1012148.67	123744.50	-1.45
13.03	150.00	697797.67	117358.25	-0.07
304.02	150.10	706476.33	117368.25	-0.10
492.86	150.00	712115.67	117374.50	-0.13
1002.32	150.00	727356.33	117391.50	-0.23
2995.98	150.00	787272.67	117411.75	-1.07
5006.68	150.00	848086.67	117414.00	2.39
5993.23	149.90	877838.33	117409.25	0.94
6998.68	150.00	908103.67	117395.75	-0.82
8995.23	150.00	968022.33	117346.50	-0.87
9997.48	149.90	997991.00	117315.25	2.29
12.99	170.00	698213.00	111793.50	0.33
303.99	169.80	706531.33	111800.50	-0.01
492.82	170.10	711940.67	111810.00	-0.11
1002.28	170.00	726572.33	111814.00	-0.03
2995.95	169.90	784153.00	111836.25	-0.29
5006.65	170.10	842570.67	111840.25	-0.60
5993.20	169.90	871331.00	111837.50	1.04
6998.64	169.90	900556.33	111835.25	0.09
8995.20	169.90	958388.00	111791.00	-1.14

9997.44	170.10	987328.67	111770.50	0.23

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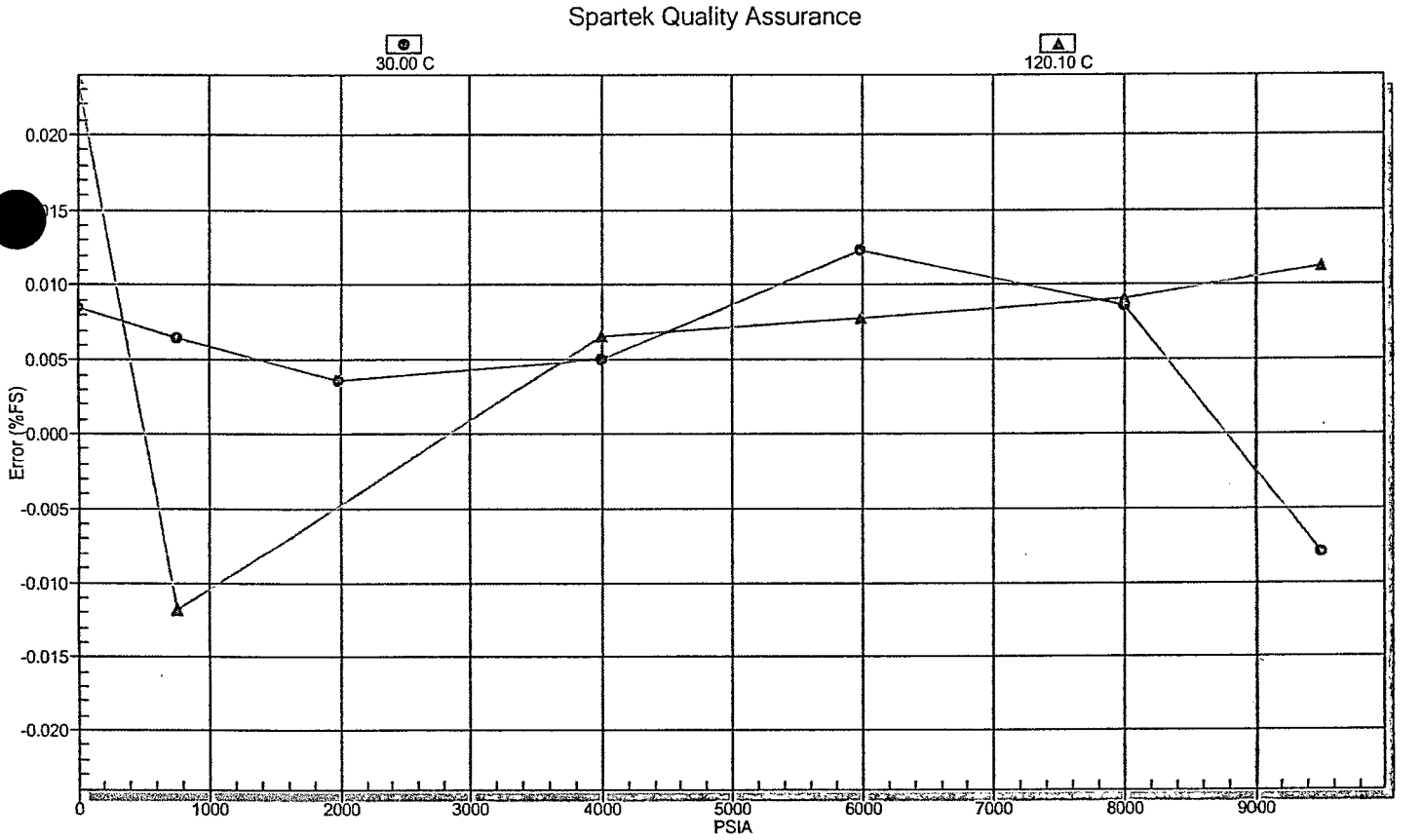
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	76077	CALIBRATION DATE	JUN 30/11
MODEL NUMBER	0 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	13.14 - 9997.60 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	24.90 - 170.00 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.024 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.024%F.S. + 0.01% of reading)



Accepted By: _____

Date: JUL 07/11

Ramp report: Serial # 76077
Gauge range = 9997.621 PSI. Max. DIFF. = 2.399
Ramp check result: PASS, Max Err = 0.024% F.S.

DW Pressure	Gauge Pressure	RPM4 Pressure	Differential	%F.S.	Oven Temp.	Gauge Temp.
9504.50	9503.71	9504.65	-0.79	0.0079	30.00	30.46
8006.05	8006.91	8006.20	0.86	0.0086	30.10	30.10
5993.35	5994.57	5993.45	1.23	0.0123	29.90	29.74
4003.83	4004.33	4003.72	0.50	0.0050	30.00	29.58
1993.77	1994.14	1993.62	0.36	0.0036	29.90	29.60
755.13	755.78	754.91	0.65	0.0065	29.90	29.71
13.15	14.00	12.54	0.85	0.0085	29.90	29.79
9504.52	9505.64	9504.44	1.12	0.0112	120.10	119.78
8006.07	8006.98	8006.00	0.91	0.0091	119.90	119.74
5993.36	5994.14	5993.25	0.78	0.0078	120.10	119.68
4003.84	4004.51	4003.68	0.66	0.0066	120.00	119.72
755.13	753.95	754.68	-1.18	0.0118	120.00	119.95
13.15	15.52	12.27	2.37	0.0237	119.90	120.06

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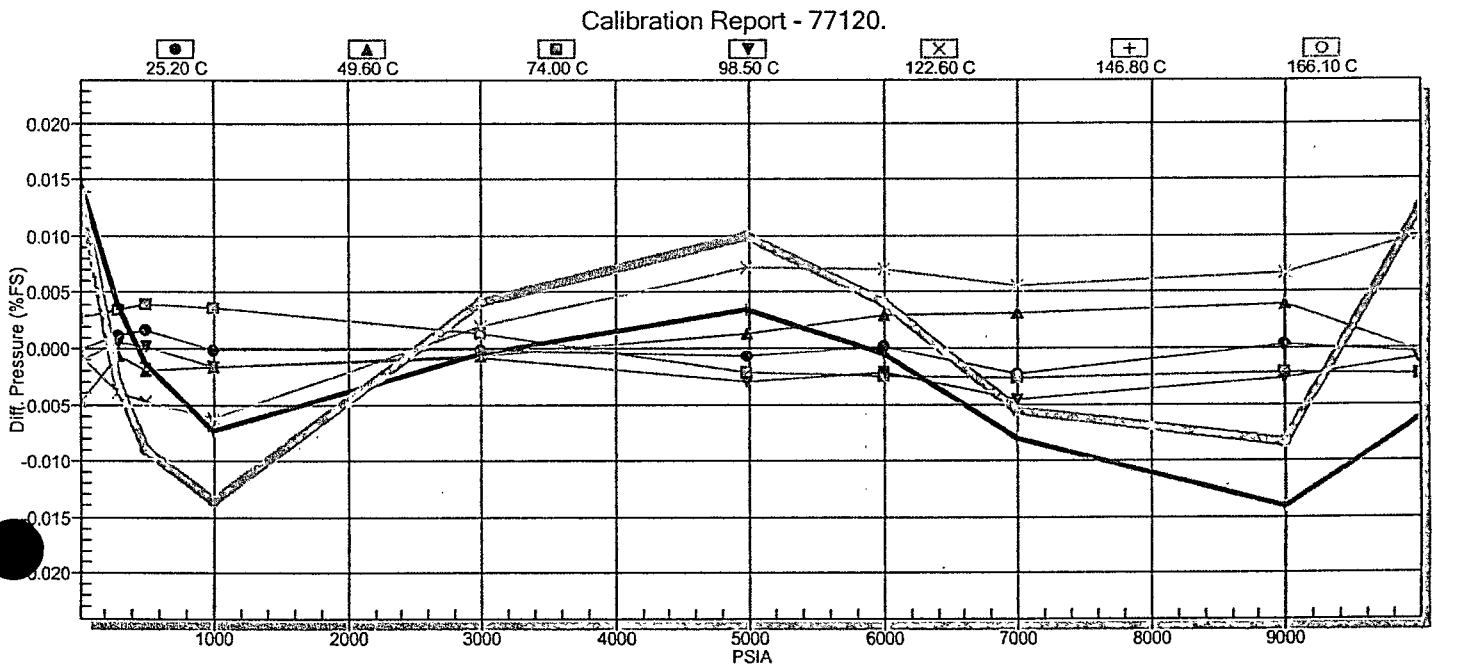
Pressure Gauge Certificate of Calibration



GAUGE NUMBER: 77120

2-D POLYNOMIAL LMS CURVEFIT

Source of f:	Pres	Temp	Pressure Equation:
Fit Order:	3	4	Pressure (PSI) = A + xp(B + xp(C + xp(D)))
Prescale:	xp = m * (fp - fp0)	xt = m * (ft - ft0)	
m:	0.01	0.01	Temperature Compenstation:
	fp0 = 699891	ft0 = 167028	A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))
			B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))
			C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))
			D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 13.0432838	0.1499180608	-3.080875207E-05	-1.263127066E-06	-3.057087791E-09
B 4.000558812	-0.003070597307	-5.067364471E-07	-9.711693386E-10	7.200526642E-12
C 2.702005388E-07	-3.059959235E-08	-7.953499894E-10	-5.804401761E-12	-1.267193684E-14
D 4.206977423E-10	1.411644212E-11	3.018115908E-13	1.922674542E-15	3.882800519E-18

Temperature (C) STANDARD FIT COEFFICIENTS

A 25.39179459

B -0.3341482087

C -1.996610629E-05

D -1.908812792E-07

0 points eliminated.
Error File: Gauge # 77120

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
13.08	25.20	699891.33	167028.75	-0.02
300.10	25.30	707069.33	167038.00	0.11
504.31	25.10	712175.67	167043.75	0.16
1000.87	25.20	724587.67	167063.75	-0.02
3003.67	25.20	774683.33	167113.00	-0.02
4989.63	25.20	824350.00	167129.75	-0.06
6003.59	25.20	849698.67	167131.00	0.01
6996.87	25.10	874506.33	167124.50	-0.22
8995.48	25.10	924358.67	167081.75	0.03
9994.76	25.20	949234.67	167050.25	-0.04
13.09	49.60	700133.67	159748.50	-0.48
300.12	49.60	706942.00	159756.00	-0.06
504.32	49.50	711776.33	159765.00	-0.19
1000.88	49.70	723542.33	159784.75	-0.16
3003.69	49.60	771010.67	159828.75	-0.06
4989.66	49.50	818087.00	159854.00	0.13
6003.62	49.60	842114.00	159855.50	0.29
6996.92	49.50	865638.67	159852.50	0.32
8995.53	49.50	912920.00	159823.25	0.40
9994.82	49.60	936516.00	159798.75	-0.03
13.07	74.00	700346.67	152463.25	0.26
300.09	74.00	706808.33	152470.75	0.34
504.30	74.00	711406.00	152482.00	0.39
1000.86	74.10	722584.00	152497.00	0.35
3003.66	74.10	767679.00	152540.25	0.13
4989.63	74.00	812391.33	152561.00	-0.21
6003.60	74.00	835215.67	152565.50	-0.24
6996.88	74.00	857566.00	152565.50	-0.26
8995.49	74.00	902490.67	152544.25	-0.21
9994.78	74.10	924917.00	152522.25	-0.24
13.05	98.50	700484.00	145396.75	-0.11
300.06	98.40	706638.00	145405.00	0.05
504.27	98.30	711013.67	145413.25	0.02
1000.83	98.30	721653.33	145430.00	-0.16
3003.64	98.40	764589.67	145466.25	-0.08
4989.60	98.40	807156.33	145488.00	-0.30
6003.54	98.50	828883.67	145490.25	-0.21
6996.81	98.40	850155.00	145491.25	-0.45
8995.43	98.40	892930.00	145475.75	-0.26
9994.72	98.40	914281.67	145452.25	-0.08
13.03	122.60	700623.33	138676.00	-0.05
300.08	122.60	706476.33	138682.75	-0.39
504.28	122.60	710644.00	138690.75	-0.48
1000.82	122.60	720781.67	138703.00	-0.63
3003.61	122.60	761726.67	138742.00	0.19
4989.58	122.70	802337.00	138761.50	0.72
6003.54	122.60	823062.67	138766.50	0.70
6996.82	122.60	843354.00	138765.25	0.56
8995.43	122.60	884160.00	138756.25	0.67
9994.72	122.70	904535.67	138740.75	1.00
13.09	146.80	700837.67	132357.75	1.48
300.12	146.80	706393.00	132365.50	0.38
504.33	146.70	710353.00	132372.50	-0.14
1000.88	146.80	720002.33	132386.50	-0.73
3003.68	146.70	759062.67	132420.00	-0.05
4989.66	146.80	797869.33	132439.25	0.35
6003.62	146.70	817682.33	132446.00	-0.05
6996.91	146.70	837080.33	132448.75	-0.80
8995.52	146.80	876083.67	132443.50	-1.41
9994.80	146.90	895561.67	132431.25	-0.63
13.09	166.10	701051.00	127439.00	1.38
300.11	166.10	706365.00	127449.50	-0.32
504.32	166.00	710162.00	127457.50	-0.91
1000.88	166.10	719427.00	127469.50	-1.36
3003.68	166.10	757029.33	127498.75	0.40
4989.65	166.10	794474.00	127521.00	1.00
6003.60	166.10	813606.33	127528.00	0.41
6996.88	166.10	832345.67	127536.00	-0.56
8995.49	166.00	870021.67	127536.50	-0.83

9994.77	166.00	888846.00	127534.25	1.25

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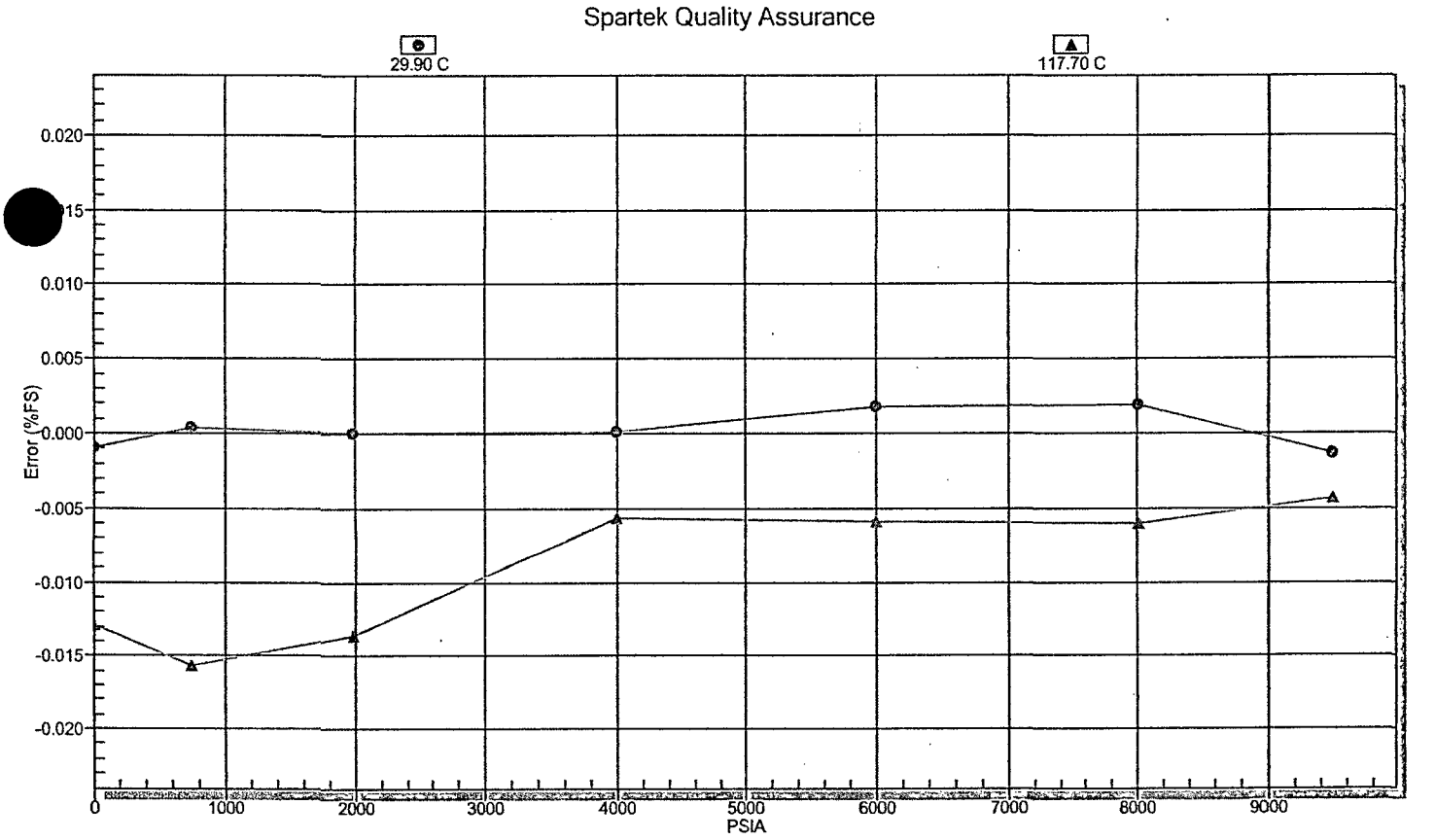
URL www.sparteksystems.com

Pressure Gauge Certificate of Conformance

SERIAL NUMBER	77120	CALIBRATION DATE	JUL 19/11
MODEL NUMBER	0 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	13.08 - 9994.76 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.20 - 166.10 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.024 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.024%F.S. + 0.01% of reading)



Accepted By: _____ Date: JUL 21/11

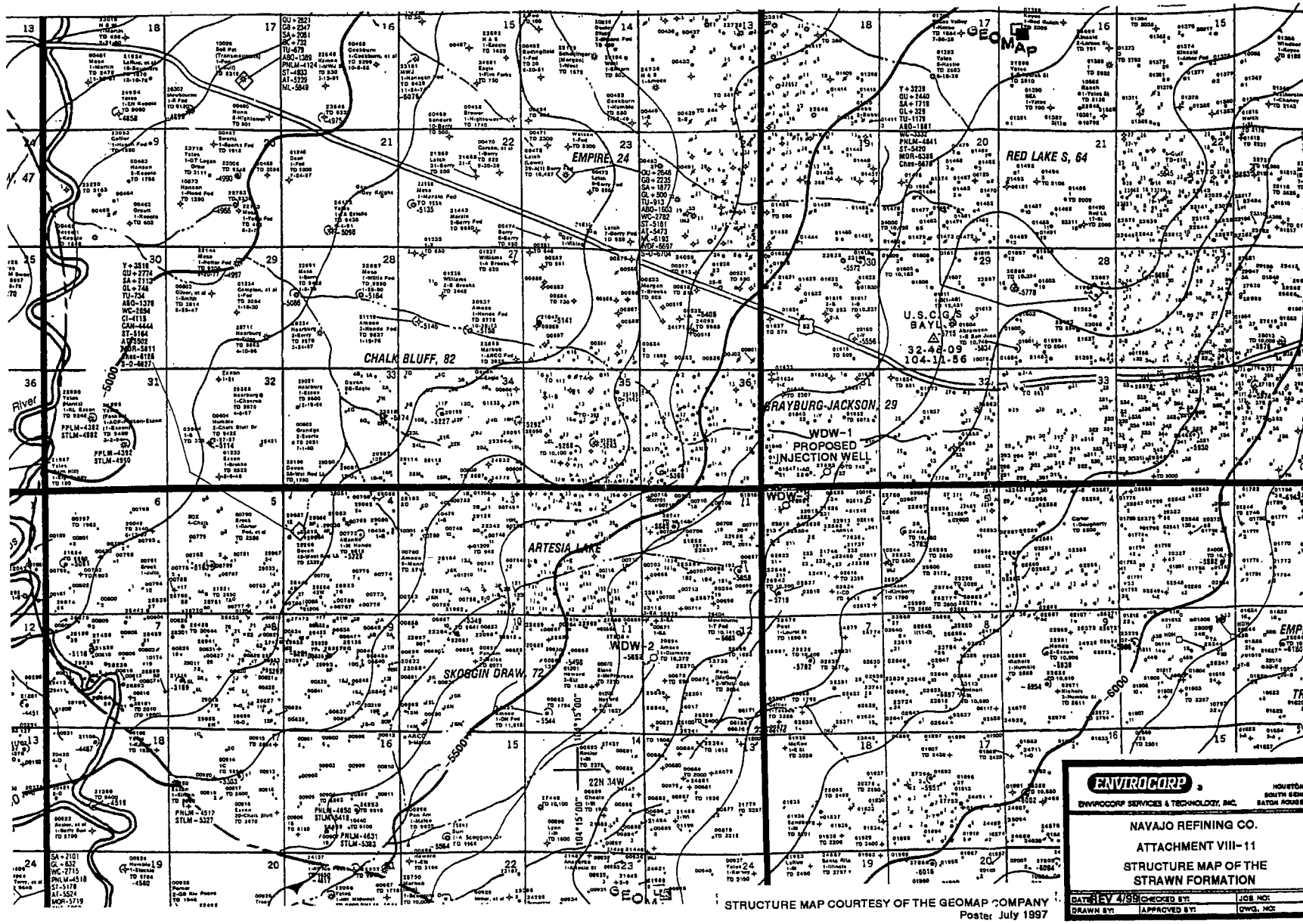
Ramp report: Serial # 77120
Gauge range = 9994.815 PSI. Max. DIFF. = 2.399
Ramp check result: PASS, Max Err = 0.016% F.S.

DW Pressure	Gauge Pressure	RPM4 Pressure	Differential	%F.S.	Oven Temp.	Gauge Temp.
9499.10	9498.97	9499.18	-0.13	0.0013	29.90	29.97
8014.48	8014.67	8014.66	0.19	0.0019	30.00	29.86
6003.61	6003.79	6003.85	0.18	0.0018	30.00	29.81
4000.87	4000.88	4000.93	0.01	0.0001	30.00	29.84
1989.27	1989.27	1989.30	0.00	0.0000	30.00	29.96
738.26	738.29	737.97	0.03	0.0003	30.10	30.10
13.08	12.99	12.45	-0.09	0.0009	30.00	30.20
9499.11	9498.67	9499.17	-0.43	0.0043	117.70	117.27
8014.49	8013.89	8014.59	-0.59	0.0059	117.70	117.33
6003.60	6003.01	6003.80	-0.59	0.0059	117.80	117.40
4000.86	4000.29	4000.94	-0.56	0.0056	117.70	117.53
1989.26	1987.89	1989.17	-1.37	0.0137	117.70	117.70
738.24	736.67	737.94	-1.57	0.0157	117.70	117.82
13.06	11.76	12.41	-1.29	0.0129	117.80	117.94

APPENDIX I

STRAWN STRUCTURE MAPS

APPENDIX I

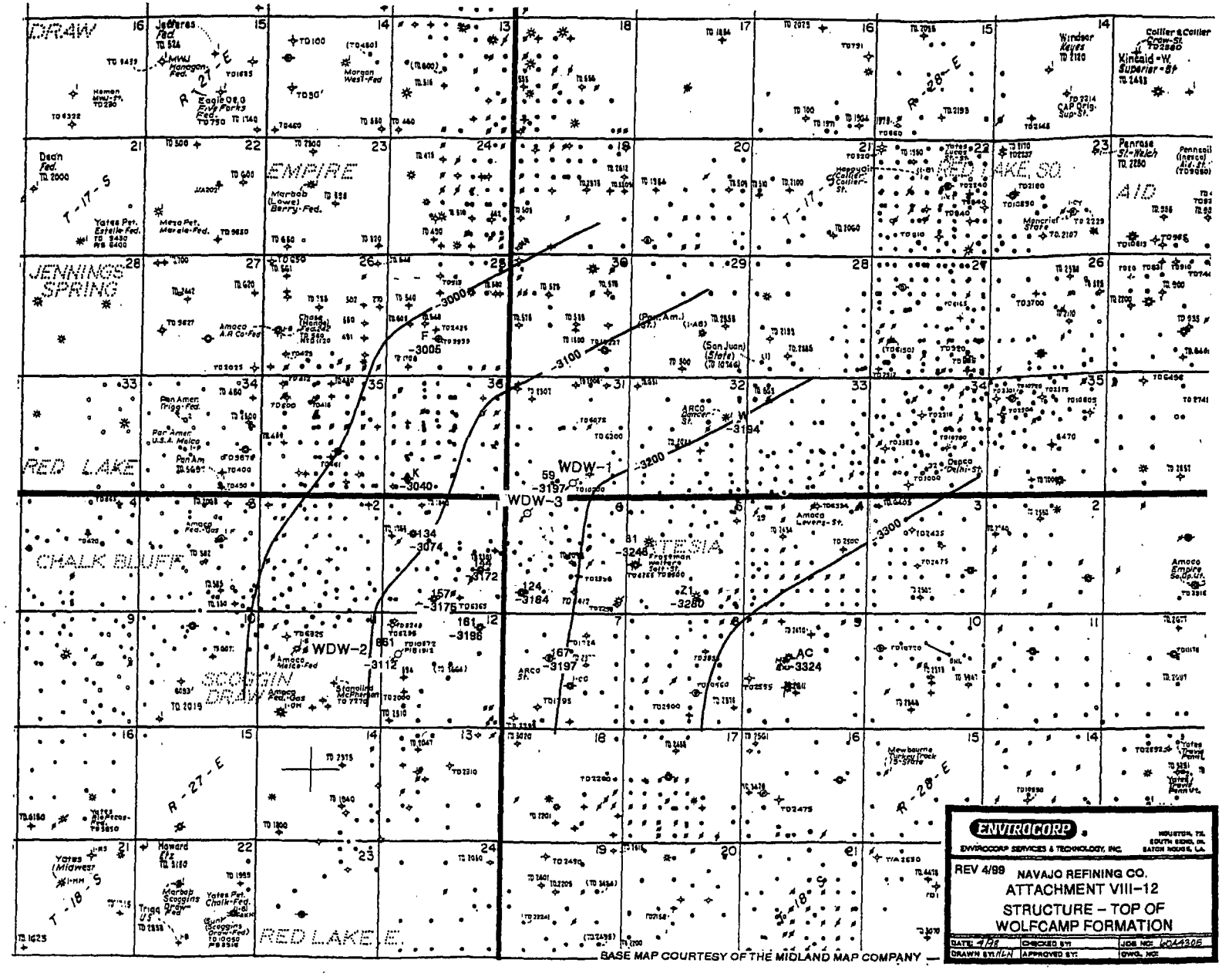


STRUCTURE MAP COURTESY OF THE GEOMAP COMPANY
Poster July 1997

APPENDIX J

WOLFCAMP STRUCTURE MAPS

SUBSURFACE



157 ID NO.
-4025 SUBSEA DEPTH

BASE MAP COURTESY OF THE MIDLAND MAP COMPANY

ENVIROCORP
ENVIROCORP SERVICES & TECHNOLOGY, INC.
HOUSTON, TX. SOUTH BEND, IN. BATON ROUGE, LA.

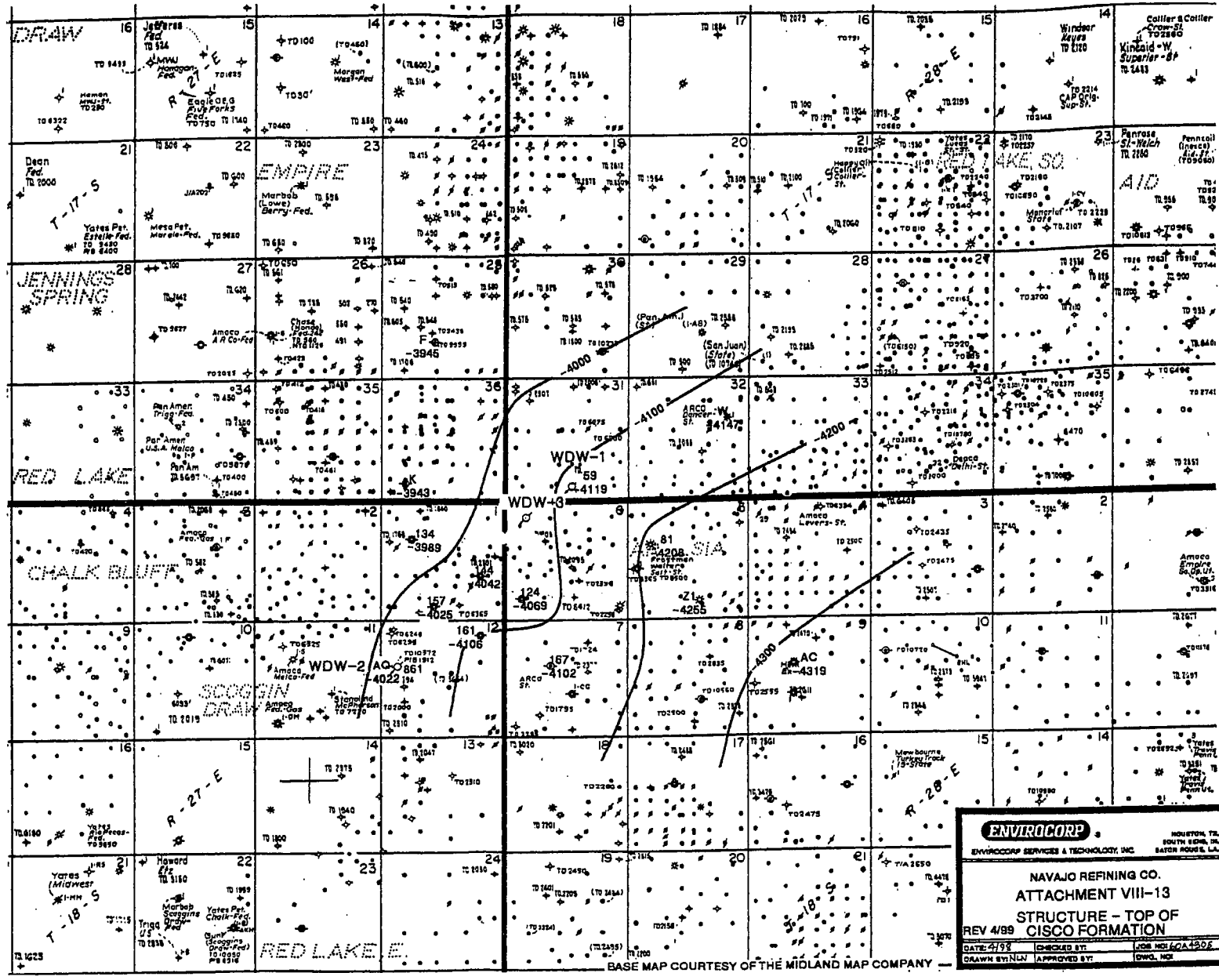
REV 4/99 NAVAJO REFINING CO.
ATTACHMENT VIII-12
STRUCTURE – TOP OF WOLFCAMP FORMATION

DATE: 4/98	CHECKED BY:	JOB NO: 6044305
DRAWN BY: MLN	APPROVED BY:	DWG. NO:

APPENDIX J

APPENDIX K

CISCO STRUCTURE MAPS



157 -4025 ID NO. SUBSEA DEPTH

ENVIROCORP
ENVIROCORP SERVICES & TECHNOLOGY, INC.
HOUSTON, TX. SOUTH BEND, IN. BATON ROUGE, LA.

NAVAJO REFINING CO.
ATTACHMENT VIII-13
STRUCTURE – TOP OF CISCO FORMATION
REV 4/99

DATE: 4/98	CHECKED BY:	JOB NO: 60A4205
DRAWN BY: NLN	APPROVED BY:	DWG. NO:

APPENDIX K

APPENDIX L

CHRONOLOGY OF FIELD ACTIVITIES

APPENDIX L

CHRONOLOGY OF FIELD ACTIVITIES

NOVEMBER 7, 2011

Timothy Jones:

Traveled to Artesia, New Mexico, and contacted contractors. Note, all times are in Mountain Standard Time (MST).

NOVEMBER 8, 2011

Subsurface arrived at the Navajo Plant at 7:00 a.m. MST. Memories read-out (MRO) gauges were placed into each well as follows:

WDW-1 --- 2 MROs spotted on depth at 7924 feet 13:02 am CST, wire was 092 carbon steel
WDW-2 --- 2 MROs spotted on depth at 7570 feet 08:41 pm CST, wire was 092 stainless steel
WDW-3 --- 2 MROs spotted on depth at 7660 feet 10:18 pm CST, wire was 092 carbon steel

Returned to Houston, Texas.

NOVEMBER 12, 2011

Traveled to Artesia, New Mexico, and contacted contractors.

NOVEMBER 13, 2011

Contractor pulled gauges making gradient stops every 1,000 feet from all three wells. Gray Wireline ran temperature survey in Mewbourne Well No. 1.

NOVEMBER 14, 2011

Subsurface personnel traveled from Artesia, New Mexico to Houston, Texas.

APPENDIX M

PANSYSTEM© ANALYSIS OUTPUT

SUBSURFACE

HOUSTON, TX • BATON ROUGE, LA • SOUTH BEND, IN

Subsurface Technology, Inc | Report File: Well No. 1 2011.pan

PanSystem Version 3.5

APPENDIX M

Well Test Analysis Report

Company	Navajo Refining Company
Location	Artesia, New Mexico
Well	Mewbourne Well No. 1
Date	November 10 - 13, 2011
Test	Falloff
Gauge Depth	7924 feet
Injection Interval	7924 feet - 8476 feet
Completion Type	Perforated
Top of Fill	9001feet
Last Stabilization	December 21, 2010
Analyst	RLS
Subsurface Project No.	70A6645

Reservoir Description

Fluid type : Water
Well orientation : Vertical
Number of wells : 3
Number of layers : 1

Layer Parameters Data

	Layer 1
Formation thickness	175.0000 ft
Average formation porosity	0.1000
Water saturation	0.0000
Gas saturation	0.0000
Formation compressibility	0.000000 psi-1
Total system compressibility	8.4000e-6 psi-1
Layer pressure	3716.931804 psia
Temperature	0.000000 deg F

Well Parameters Data

	WDW-1	WDW-2	WDW-3
Well radius	0.3646 ft	0.3281 ft	0.3281 ft
Distance from observation to active well	0.000000 ft	1.0970e4 ft	7907.000000 ft
Wellbore storage coefficient	0.0900 bbl/psi	1.0000e-3 bbl/psi	1.0000e-3 bbl/psi
Storage Amplitude	0.000000 psi	0.000000 psi	0.000000 psi
Storage Time Constant	0.000000 hr	0.000000 hr	0.000000 hr
Second Wellbore Storage	0.170000 bbl/psi	2.7000e-3 bbl/psi	1.7500e-4 bbl/psi
Time Change for Second Storage	0.050000 hr	0.017500 hr	7.5000e-3 hr
Well offset - x direction	0.0000 ft	-7590.0000 ft	-6000.0000 ft
Well offset - y direction	0.0000 ft	-7920.0000 ft	-5150.0000 ft

Fluid Parameters Data

	Layer 1
Oil gravity	0.000000 API
Gas gravity	0.000000 sp grav
Gas-oil ratio (produced)	0.000000 scf/STB
Water cut	0.000000
Water salinity	0.000000 ppm
Check Pressure	0.000000 psia
Check Temperature	0.000000 deg F
Gas-oil ratio (solution)	0.000000 scf/STB
Bubble-point pressure	0.000000 psia
Oil density	0.000 lb/ft3
Oil viscosity	0.000 cp
Oil formation volume factor	0.000 RB/STB
Gas density	0.000 lb/ft3
Gas viscosity	0.0 cp
Gas formation volume factor	0.000 ft3/scf
Water density	0.000 lb/ft3
Water viscosity	0.570 cp
Water formation volume factor	1.000 RB/STB
Oil compressibility	0.000000 psi-1
Initial Gas compressibility	0.000000 psi-1
Water compressibility	0.000000 psi-1

Layer 1 Correlations
Not Used

Layer 1 Model Data
Layer 1 Model Type : Radial homogeneous

	Layer 1
Permeability	520.6408 md
Skin factor (Well 1)	92.6608
Skin factor (Well 2)	0.0000
Skin factor (Well 3)	0.0000

Rate Change Data

Time Hours	Pressure psia	Rate STB/day
-9403.500000	0.000000	-4389.885603
-9379.500000	0.000000	-4389.885603
-9355.500000	0.000000	-4389.885603
-9331.500000	0.000000	-4389.885603
-9307.500000	0.000000	-4389.885603
-9283.500000	0.000000	-4389.885603
-9259.500000	0.000000	-4282.176688
-9235.500000	0.000000	-4389.885603
-9211.500000	0.000000	-4389.885603
-9187.500000	0.000000	-4282.176688
-9163.500000	0.000000	-4282.176688
-9139.500000	0.000000	-4389.885603
-9115.500000	0.000000	-4924.720459
-9091.500000	0.000000	-4820.724923
-9067.500000	0.000000	-4389.885603
-9043.500000	0.000000	-4740.420096
-9019.500000	0.000000	-4282.176688
-8995.500000	0.000000	-4389.885603
-8971.500000	0.000000	-4287.562081
-8947.500000	0.000000	-4384.500209
-8923.500000	0.000000	-4389.885603
-8899.500000	0.000000	-4389.885603
-8875.500000	0.000000	-4282.176688
-8851.500000	0.000000	-4389.885603
-8827.500000	0.000000	-4287.562081
-8803.500000	0.000000	-4276.977016
-8779.500000	0.000000	-2462.250105
-8755.500000	0.000000	-2569.959019
-8731.500000	0.000000	-2569.959019
-8707.500000	0.000000	-4178.180629
-8683.500000	0.000000	-4389.885603
-8659.500000	0.000000	-4389.885603
-8635.500000	0.000000	-4389.885603
-8611.500000	0.000000	-4282.176688
-8587.500000	0.000000	-4389.885603
-8563.500000	0.000000	-4282.176688
-8539.500000	0.000000	-4384.500209
-8515.500000	0.000000	-4389.885603
-8491.500000	0.000000	-4389.885603

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-8467.500000	0.000000	-4178.180629
-8443.500000	0.000000	-4282.176688
-8419.500000	0.000000	-4282.176688
-8395.500000	0.000000	-4178.180629
-8371.500000	0.000000	-4070.470145
-8347.500000	0.000000	-4070.470145
-8323.500000	0.000000	-4070.470145
-8299.500000	0.000000	-4070.470145
-8275.500000	0.000000	-3962.759399
-8251.500000	0.000000	-4070.470145
-8227.500000	0.000000	-2462.250105
-8203.500000	0.000000	-4070.470145
-8179.500000	0.000000	-3535.635027
-8155.500000	0.000000	-4070.470145
-8131.500000	0.000000	-4070.470145
-8107.500000	0.000000	-4070.470145
-8083.500000	0.000000	-4070.470145
-8059.500000	0.000000	-4070.470145
-8035.500000	0.000000	-4178.180629
-8011.500000	0.000000	-4070.470145
-7987.500000	0.000000	-4070.470145
-7963.500000	0.000000	-4178.180629
-7939.500000	0.000000	-3914.411970
-7915.500000	0.000000	-3639.630824
-7891.500000	0.000000	-3747.339739
-7867.500000	0.000000	-4930.105852
-7843.500000	0.000000	-2358.254307
-7819.500000	0.000000	-2462.250105
-7795.500000	0.000000	-4172.795236
-7771.500000	0.000000	-4070.470145
-7747.500000	0.000000	-3962.759399
-7723.500000	0.000000	-3957.374006
-7699.500000	0.000000	-4070.470145
-7675.500000	0.000000	-4070.470145
-7651.500000	0.000000	-4070.470145
-7627.500000	0.000000	-3855.050485
-7603.500000	0.000000	-4063.999721
-7579.500000	0.000000	-4015.157384
-7555.500000	0.000000	-3962.759399

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-7531.500000	0.000000	0.000000
-7507.500000	0.000000	-4070.470145
-7483.500000	0.000000	-4070.470145
-7459.500000	0.000000	-4070.470145
-7435.500000	0.000000	-4070.470145
-7411.500000	0.000000	-4282.176688
-7387.500000	0.000000	-4178.180629
-7363.500000	0.000000	-4070.470145
-7339.500000	0.000000	-4070.470145
-7315.500000	0.000000	-4065.084490
-7291.500000	0.000000	-3855.050485
-7267.500000	0.000000	-3639.630824
-7243.500000	0.000000	-3962.759399
-7219.500000	0.000000	-3962.759399
-7195.500000	0.000000	-3962.759399
-7171.500000	0.000000	-3986.257324
-7147.500000	0.000000	-3962.759399
-7123.500000	0.000000	-3941.403285
-7099.500000	0.000000	-3962.759399
-7075.500000	0.000000	-3962.759399
-7051.500000	0.000000	-3855.050485
-7027.500000	0.000000	-3855.050485
-7003.500000	0.000000	-3855.050485
-6979.500000	0.000000	-3855.050485
-6955.500000	0.000000	-3855.050485
-6931.500000	0.000000	-2358.254307
-6907.500000	0.000000	-3962.759399
-6883.500000	0.000000	-3855.050485
-6859.500000	0.000000	-3855.050485
-6835.500000	0.000000	-3855.050485
-6811.500000	0.000000	-3747.339739
-6787.500000	0.000000	-2.1843e4
-6763.500000	0.000000	-1.8095e4
-6739.500000	0.000000	-1.0600e4
-6715.500000	0.000000	-4680.888846
-6691.500000	0.000000	-2569.959019
-6667.500000	0.000000	-2462.250105
-6643.500000	0.000000	-2061.865670
-6619.500000	0.000000	-3747.339739
-6595.500000	0.000000	-5998.105643
-6571.500000	0.000000	-2548.602905
-6547.500000	0.000000	-4820.724923
-6523.500000	0.000000	-3855.050485
-6499.500000	0.000000	-4924.720459
-6475.500000	0.000000	-4713.016009
-6451.500000	0.000000	-5140.140381
-6427.500000	0.000000	-4605.305001
-6403.500000	0.000000	-4924.720459
-6379.500000	0.000000	-5140.140381

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-6355.500000	0.000000	-5032.431466
-6331.500000	0.000000	-5476.084508
-6307.500000	0.000000	-5247.850865
-6283.500000	0.000000	-2569.959019
-6259.500000	0.000000	-5032.431466
-6235.500000	0.000000	-3339.307774
-6211.500000	0.000000	-5782.685721
-6187.500000	0.000000	-2569.959019
-6163.500000	0.000000	-5674.976807
-6139.500000	0.000000	-5567.266323
-6115.500000	0.000000	-5782.685721
-6091.500000	0.000000	-5782.685721
-6067.500000	0.000000	-4282.176688
-6043.500000	0.000000	-4820.724923
-6019.500000	0.000000	-4497.596087
-5995.500000	0.000000	-7387.192906
-5971.500000	0.000000	-4820.724923
-5947.500000	0.000000	-7062.392055
-5923.500000	0.000000	-7283.196847
-5899.500000	0.000000	-7186.071429
-5875.500000	0.000000	-8029.738770
-5851.500000	0.000000	-3634.431152
-5827.500000	0.000000	-7494.901821
-5803.500000	0.000000	-7602.612305
-5779.500000	0.000000	-7602.612305
-5755.500000	0.000000	-6960.066964
-5731.500000	0.000000	-4070.470145
-5707.500000	0.000000	-5032.431466
-5683.500000	0.000000	-7387.192906
-5659.500000	0.000000	-3962.759399
-5635.500000	0.000000	-7175.486363
-5611.500000	0.000000	-7175.486363
-5587.500000	0.000000	-7283.196847
-5563.500000	0.000000	-7272.426060
-5539.500000	0.000000	-7288.396519
-5515.500000	0.000000	-7277.811454
-5491.500000	0.000000	-7175.486363
-5467.500000	0.000000	-7175.486363
-5443.500000	0.000000	-7175.486363
-5419.500000	0.000000	-7387.192906
-5395.500000	0.000000	-7494.901821
-5371.500000	0.000000	-7818.032227
-5347.500000	0.000000	-7602.612305
-5323.500000	0.000000	-7387.192906
-5299.500000	0.000000	-7576.386370
-5275.500000	0.000000	-7175.486363
-5251.500000	0.000000	-5816.444092
-5227.500000	0.000000	-6857.142857
-5203.500000	0.000000	-7437.143032

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-5179.500000	0.000000	-7474.285714
-5155.500000	0.000000	-7714.285714
-5131.500000	0.000000	-7608.571603
-5107.500000	0.000000	-7542.857143
-5083.500000	0.000000	-7474.285714
-5059.500000	0.000000	-7571.428397
-5035.500000	0.000000	-4628.571429
-5011.500000	0.000000	-6857.142857
-4987.500000	0.000000	-7614.285540
-4963.500000	0.000000	-7437.143032
-4939.500000	0.000000	-3808.571516
-4915.500000	0.000000	-3702.857143
-4891.500000	0.000000	-2742.857143
-4867.500000	0.000000	-4800.000000
-4843.500000	0.000000	-4631.428397
-4819.500000	0.000000	-5248.571254
-4795.500000	0.000000	-3942.857143
-4771.500000	0.000000	-5071.428746
-4747.500000	0.000000	-5245.714286
-4723.500000	0.000000	-5277.143032
-4699.500000	0.000000	-4974.285540
-4675.500000	0.000000	-5142.857143
-4651.500000	0.000000	-2640.000000
-4627.500000	0.000000	-5142.857143
-4603.500000	0.000000	-5174.285889
-4579.500000	0.000000	-5108.571429
-4555.500000	0.000000	-2708.571429
-4531.500000	0.000000	-5108.571429
-4507.500000	0.000000	-5002.857317
-4483.500000	0.000000	-5040.000000
-4459.500000	0.000000	-5179.999826
-4435.500000	0.000000	-4800.000000
-4411.500000	0.000000	-5248.571254
-4387.500000	0.000000	-5108.571429
-4363.500000	0.000000	-4974.285540
-4339.500000	0.000000	-5040.000000
-4315.500000	0.000000	-5182.857317
-4291.500000	0.000000	-5142.857143
-4267.500000	0.000000	-5037.143032
-4243.500000	0.000000	-5037.143032
-4219.500000	0.000000	-5008.571254
-4195.500000	0.000000	-5037.143032
-4171.500000	0.000000	-5005.714286
-4147.500000	0.000000	-5037.143032
-4123.500000	0.000000	-5008.571254
-4099.500000	0.000000	-5040.000000
-4075.500000	0.000000	-5037.143032
-4051.500000	0.000000	-5037.143032
-4027.500000	0.000000	-5105.714460

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-4003.500000	0.000000	-4971.428571
-3979.500000	0.000000	-4937.142857
-3955.500000	0.000000	-4900.000174
-3931.500000	0.000000	-4937.142857
-3907.500000	0.000000	-4971.428571
-3883.500000	0.000000	-4974.285540
-3859.500000	0.000000	-5620.000174
-3835.500000	0.000000	-5451.428571
-3811.500000	0.000000	-5382.857143
-3787.500000	0.000000	-5385.714111
-3763.500000	0.000000	-5174.285889
-3739.500000	0.000000	-5625.714111
-3715.500000	0.000000	-5145.714111
-3691.500000	0.000000	-4697.142857
-3667.500000	0.000000	-5074.285714
-3643.500000	0.000000	-5968.571254
-3619.500000	0.000000	-5140.000174
-3595.500000	0.000000	-5177.142857
-3571.500000	0.000000	-5108.571429
-3547.500000	0.000000	-5208.571603
-3523.500000	0.000000	-5211.428571
-3499.500000	0.000000	-5245.714286
-3475.500000	0.000000	-5177.142857
-3451.500000	0.000000	-5111.428397
-3427.500000	0.000000	-5145.714111
-3403.500000	0.000000	-5128.392857
-3379.500000	0.000000	-5139.955706
-3355.500000	0.000000	-5142.857143
-3331.500000	0.000000	-5142.857143
-3307.500000	0.000000	-5074.285714
-3283.500000	0.000000	-2811.428571
-3259.500000	0.000000	-5174.285889
-3235.500000	0.000000	-2811.428571
-3211.500000	0.000000	-5451.428571
-3187.500000	0.000000	-5074.285714
-3163.500000	0.000000	-2777.142857
-3139.500000	0.000000	-5108.571429
-3115.500000	0.000000	-5140.000174
-3091.500000	0.000000	-2777.142857
-3067.500000	0.000000	-4488.571603
-3043.500000	0.000000	-5108.571429
-3019.500000	0.000000	-5074.285714
-2995.500000	0.000000	-5040.000000
-2971.500000	0.000000	-5040.000000
-2947.500000	0.000000	-5002.857317
-2923.500000	0.000000	-5002.857317
-2899.500000	0.000000	-4971.428571
-2875.500000	0.000000	-2742.857143
-2851.500000	0.000000	-5005.714286

Rate Change Data (cont)

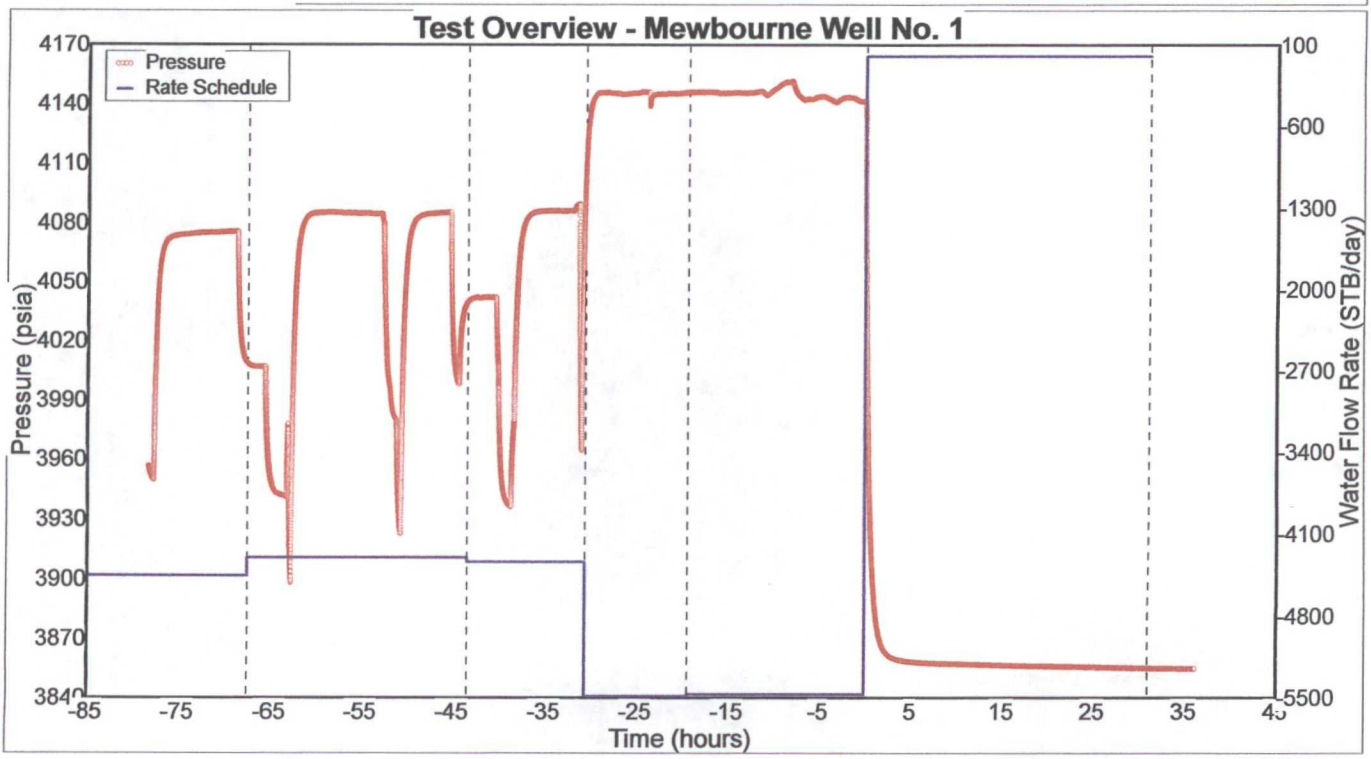
Time Hours	Pressure psia	Rate STB/day
-2827.500000	0.000000	-6211.428746
-2803.500000	0.000000	-5005.714286
-2779.500000	0.000000	-2742.857143
-2755.500000	0.000000	-4968.571603
-2731.500000	0.000000	-5008.571254
-2707.500000	0.000000	-5074.285714
-2683.500000	0.000000	-4971.428571
-2659.500000	0.000000	-4968.571603
-2635.500000	0.000000	-5002.857317
-2611.500000	0.000000	-5008.571254
-2587.500000	0.000000	-4974.285540
-2563.500000	0.000000	-4974.285540
-2539.500000	0.000000	-6042.857143
-2515.500000	0.000000	-2742.857143
-2491.500000	0.000000	-5005.714286
-2467.500000	0.000000	-4971.428571
-2443.500000	0.000000	-2742.857143
-2419.500000	0.000000	-4902.857143
-2395.500000	0.000000	-4902.857143
-2371.500000	0.000000	-4937.142857
-2347.500000	0.000000	-4831.428746
-2323.500000	0.000000	-5854.285714
-2299.500000	0.000000	-4902.857143
-2275.500000	0.000000	-4900.000174
-2251.500000	0.000000	-4902.857143
-2227.500000	0.000000	-4902.857143
-2203.500000	0.000000	-4902.857143
-2179.500000	0.000000	-4902.857143
-2155.500000	0.000000	-4902.857143
-2131.500000	0.000000	-2708.571429
-2107.500000	0.000000	-4902.857143
-2083.500000	0.000000	-4902.857143
-2059.500000	0.000000	-4837.142683
-2035.500000	0.000000	-4834.285714
-2011.500000	0.000000	-4834.285714
-1987.500000	0.000000	-4868.571429
-1963.500000	0.000000	-4837.142683
-1939.500000	0.000000	-4834.285714
-1915.500000	0.000000	-2708.571429
-1891.500000	0.000000	-5282.856968
-1867.500000	0.000000	-4731.428571
-1843.500000	0.000000	-4868.571429
-1819.500000	0.000000	-4900.000174
-1795.500000	0.000000	-4868.571429
-1771.500000	0.000000	-4765.714286
-1747.500000	0.000000	-4900.000174
-1723.500000	0.000000	-4868.571429
-1699.500000	0.000000	-4871.428397
-1675.500000	0.000000	-4871.428397

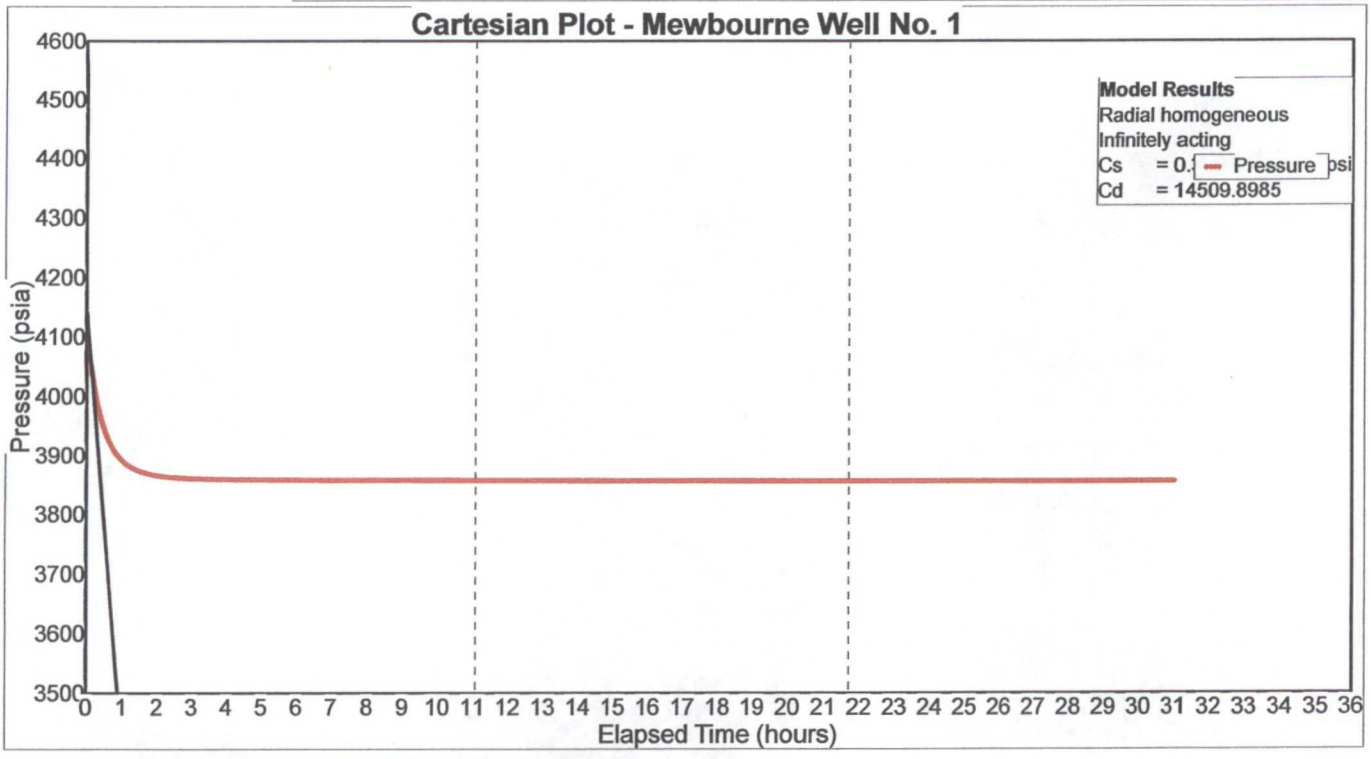
Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-1651.500000	0.000000	-4800.000000
-1627.500000	0.000000	-4797.143032
-1603.500000	0.000000	-4765.714286
-1579.500000	0.000000	-4797.143032
-1555.500000	0.000000	-4800.000000
-1531.500000	0.000000	-4800.000000
-1507.500000	0.000000	-4731.428571
-1483.500000	0.000000	-4697.142857
-1459.500000	0.000000	-4665.714111
-1435.500000	0.000000	-4800.000000
-1411.500000	0.000000	-4831.428746
-1387.500000	0.000000	-4800.000000
-1363.500000	0.000000	-4837.142683
-1339.500000	0.000000	-2742.857143
-1315.500000	0.000000	-2674.285714
-1291.500000	0.000000	-5111.428397
-1267.500000	0.000000	-5174.285889
-1243.500000	0.000000	-4800.000000
-1219.500000	0.000000	-4628.571429
-1195.500000	0.000000	-4628.571429
-1171.500000	0.000000	-4800.000000
-1147.500000	0.000000	-4697.142857
-1123.500000	0.000000	-4765.714286
-1099.500000	0.000000	-4765.714286
-1075.500000	0.000000	-4831.428746
-1051.500000	0.000000	-2708.571429
-1027.500000	0.000000	-4797.143032
-1003.500000	0.000000	-4765.714286
-979.500000	0.000000	-4800.000000
-955.500000	0.000000	-4800.000000
-931.500000	0.000000	-3085.714286
-907.500000	0.000000	-4802.856968
-883.500000	0.000000	-2705.714199
-859.500000	0.000000	-4731.428571
-835.500000	0.000000	-2640.000000
-811.500000	0.000000	-4080.000000
-787.500000	0.000000	-4594.285714
-763.500000	0.000000	-4562.856968
-739.500000	0.000000	-4734.285540
-715.500000	0.000000	-4731.428571
-691.500000	0.000000	-4731.428571
-667.500000	0.000000	-4734.285540
-643.500000	0.000000	-4734.285540
-619.500000	0.000000	-4765.714286
-595.500000	0.000000	-4728.571603
-571.500000	0.000000	-4731.428571
-547.500000	0.000000	-2708.571429
-523.500000	0.000000	-2755.367063
-499.500000	0.000000	-2759.132937

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-475.500000	0.000000	-4739.904762
-451.500000	0.000000	-4697.428571
-427.500000	0.000000	-4628.976108
-403.500000	0.000000	-4817.404845
-379.500000	0.000000	-4644.039600
-355.500000	0.000000	-4802.922702
-331.500000	0.000000	-4665.658565
-307.500000	0.000000	-4822.174851
-283.500000	0.000000	-4665.500000
-259.500000	0.000000	-4990.081184
-235.500000	0.000000	-4942.172619
-211.500000	0.000000	-4932.035714
-187.500000	0.000000	-4751.518023
-163.500000	0.000000	-4741.628886
-139.500000	0.000000	-4898.200397
-115.500000	0.000000	-4668.714368
-91.500000	0.000000	-4817.236028
-67.556421	4075.930664	-4453.633019
-43.473193	4085.119173	-4301.085152
-30.635319	4111.204427	-4338.133714
-19.379886	4145.851563	-5485.292571
-0.000011	4141.747120	-5470.539429
31.033530	3855.374219	0.000000



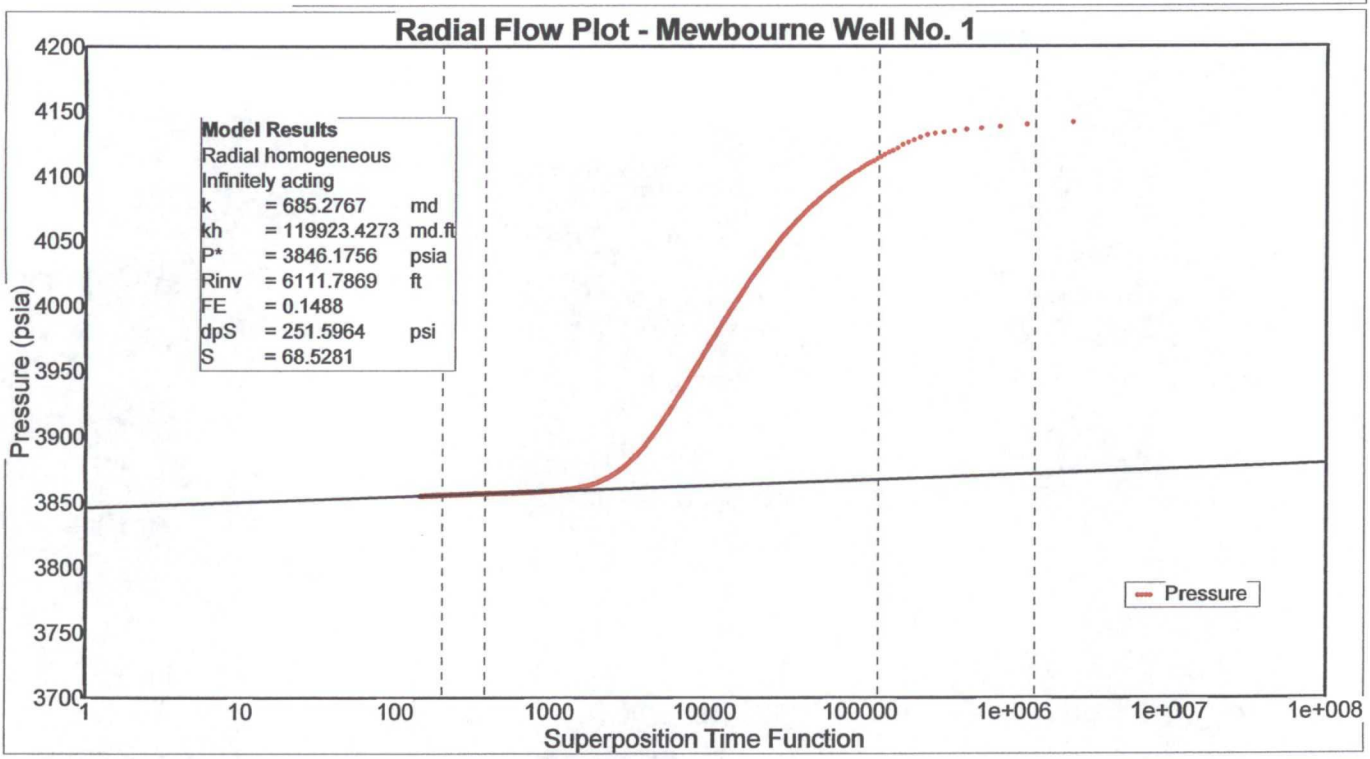


Cartesian Plot - Mewbourne Well No. 1 Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.317159 bbl/psi
Dimensionless wellbore storage	1.4510e4

Cartesian Plot - Mewbourne Well No. 1 Line Details
Line type : Wellbore storage
Slope : -718.69
Intercept : 4142.2
Coefficient of Determination : 0.987644
Number of Intersections = 0



Radial Flow Plot - Mewbourne Well No. 1 Model Results
Radial homogeneous - Infinitely acting

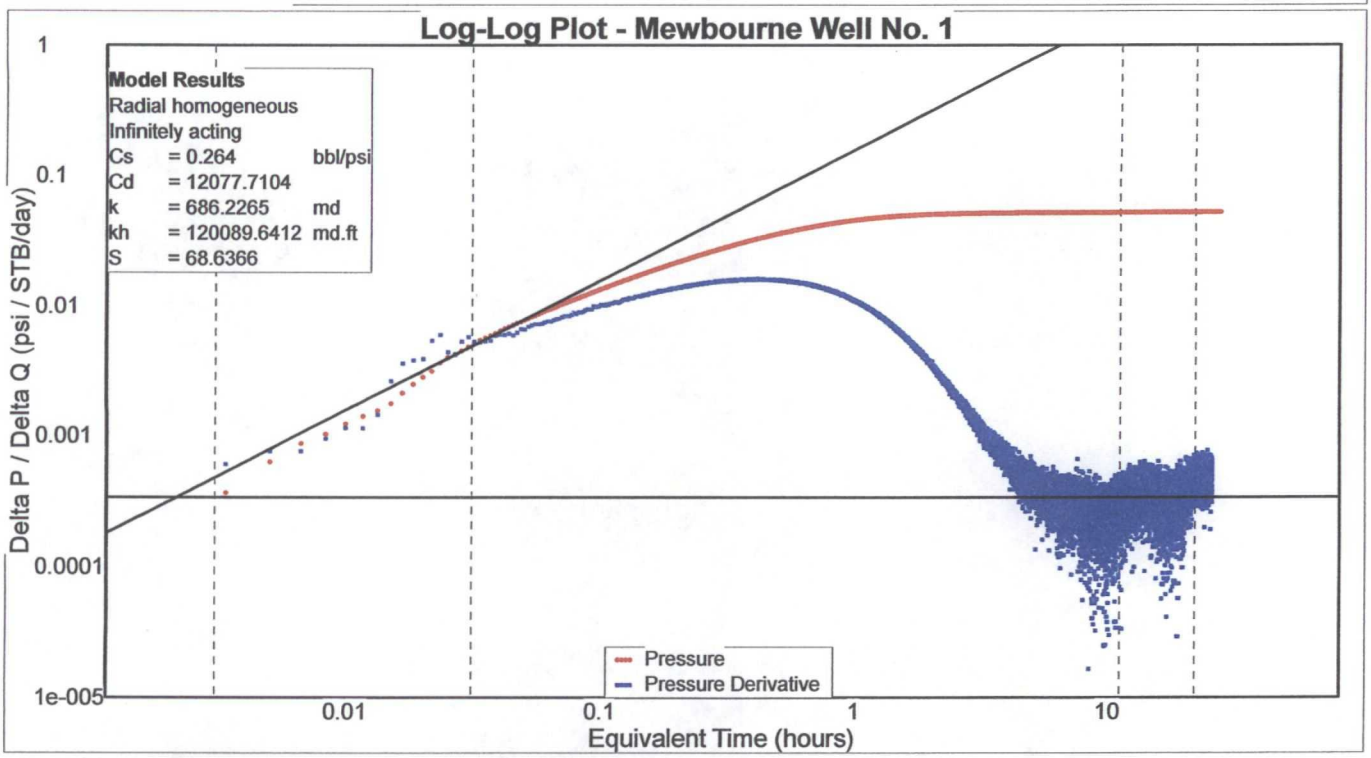
Classic Wellbore Storage

	Value
Permeability	685.276727 md
Permeability-thickness	1.1992e5 md.ft
Extrapolated pressure	3846.175567 psia
Radius of investigation	6111.786899 ft
Flow efficiency	0.148780
dP skin (constant rate)	251.596437 psi
Skin factor	68.528119

Radial Flow Plot - Mewbourne Well No. 1 Line Details
Line type : Radial flow
Slope : 4.22689
Intercept : 3846.18
Coefficient of Determination : Not Used

	Radial flow
Extrapolated pressure	3846.175567 psia
Pressure at dt = 1 hour	3861.389169 psia

Number of Intersections = 0



Log-Log Plot - Mewbourne Well No. 1 Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.263996 bbl/psi
Dimensionless wellbore storage	1.2078e4
Permeability	686.226521 md
Permeability-thickness	1.2009e5 md.ft
Skin factor	68.636593

Log-Log Plot - Mewbourne Well No. 1 Line Details
Line type : Radial flow
Slope : 0
Intercept : 0.0003351
Coefficient of Determination : Not Used
Line type : Wellbore storage
Slope : 1
Intercept : 0.157831
Coefficient of Determination : Not Used
Number of Intersections = 0

SUBSURFACE

HOUSTON, TX ♦ BATON ROUGE, LA ♦ SOUTH BEND, IN

Subsurface Technology, Inc

PanSystem Version 3.5

Well Test Analysis Report

Report File: Well No. 1 2011.pan

APPENDIX M

Company	Navajo Refining Company
Location	Artesia, New Mexico
Well	Mewbourne Well No. 1
Date	December 16 - 21, 2011
Test	Falloff
Gauge Depth	7924 feet
Injection Interval	7924 feet - 8476 feet
Completion Type	Perforated
Top of Fill	9001feet
Last Stabilization	January 2009
Analyst	RLS
Subsurface Project No.	70A6516

Reservoir Description

Fluid type : Water
Well orientation : Vertical
Number of wells : 3
Number of layers : 1

Layer Parameters Data

	Layer 1
Formation thickness	175.0000 ft
Average formation porosity	0.1000
Water saturation	0.0000
Gas saturation	0.0000
Formation compressibility	0.000000 psi-1
Total system compressibility	8.4000e-6 psi-1
Layer pressure	3716.931804 psia
Temperature	0.000000 deg F

Well Parameters Data

	WDW-1	WDW-2	WDW-3
Well radius	0.3646 ft	0.3281 ft	0.3281 ft
Distance from observation to active well	0.000000 ft	1.0970e4 ft	7907.000000 ft
Wellbore storage coefficient	0.0900 bbl/psi	1.0000e-3 bbl/psi	1.0000e-3 bbl/psi
Storage Amplitude	0.000000 psi	0.000000 psi	0.000000 psi
Storage Time Constant	0.000000 hr	0.000000 hr	0.000000 hr
Second Wellbore Storage	0.170000 bbl/psi	2.7000e-3 bbl/psi	1.7500e-4 bbl/psi
Time Change for Second Storage	0.050000 hr	0.017500 hr	7.5000e-3 hr
Well offset - x direction	0.0000 ft	-7590.0000 ft	-6000.0000 ft
Well offset - y direction	0.0000 ft	-7920.0000 ft	-5150.0000 ft

Fluid Parameters Data

	Layer 1
Oil gravity	0.000000 API
Gas gravity	0.000000 sp grav
Gas-oil ratio (produced)	0.000000 scf/STB
Water cut	0.000000

Fluid Parameters Data (cont)

	Layer 1
Water salinity	0.000000 ppm
Check Pressure	0.000000 psia
Check Temperature	0.000000 deg F
Gas-oil ratio (solution)	0.000000 scf/STB
Bubble-point pressure	0.000000 psia
Oil density	0.000 lb/ft3
Oil viscosity	0.000 cp
Oil formation volume factor	0.000 RB/STB
Gas density	0.000 lb/ft3
Gas viscosity	0.0 cp
Gas formation volume factor	0.000 ft3/scf
Water density	0.000 lb/ft3
Water viscosity	0.570 cp
Water formation volume factor	1.000 RB/STB
Oil compressibility	0.000000 psi-1
Initial Gas compressibility	0.000000 psi-1
Water compressibility	0.000000 psi-1

Layer 1 Correlations
Not Used

Rate Change Data

Time Hours	Pressure psia	Rate STB/day
-9403.500000	0.000000	-4389.885603
-9379.500000	0.000000	-4389.885603
-9355.500000	0.000000	-4389.885603
-9331.500000	0.000000	-4389.885603
-9307.500000	0.000000	-4389.885603
-9283.500000	0.000000	-4389.885603
-9259.500000	0.000000	-4282.176688
-9235.500000	0.000000	-4389.885603

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-9211.500000	0.000000	-4389.885603
-9187.500000	0.000000	-4282.176688
-9163.500000	0.000000	-4282.176688
-9139.500000	0.000000	-4389.885603
-9115.500000	0.000000	-4924.720459
-9091.500000	0.000000	-4820.724923
-9067.500000	0.000000	-4389.885603
-9043.500000	0.000000	-4740.420096

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-9019.500000	0.000000	-4282.176688
-8995.500000	0.000000	-4389.885603
-8971.500000	0.000000	-4287.562081
-8947.500000	0.000000	-4384.500209
-8923.500000	0.000000	-4389.885603
-8899.500000	0.000000	-4389.885603
-8875.500000	0.000000	-4282.176688
-8851.500000	0.000000	-4389.885603
-8827.500000	0.000000	-4287.562081
-8803.500000	0.000000	-4276.977016
-8779.500000	0.000000	-2462.250105
-8755.500000	0.000000	-2569.959019
-8731.500000	0.000000	-2569.959019
-8707.500000	0.000000	-4178.180629
-8683.500000	0.000000	-4389.885603
-8659.500000	0.000000	-4389.885603
-8635.500000	0.000000	-4389.885603
-8611.500000	0.000000	-4282.176688
-8587.500000	0.000000	-4389.885603
-8563.500000	0.000000	-4282.176688
-8539.500000	0.000000	-4384.500209
-8515.500000	0.000000	-4389.885603
-8491.500000	0.000000	-4389.885603
-8467.500000	0.000000	-4178.180629
-8443.500000	0.000000	-4282.176688
-8419.500000	0.000000	-4282.176688
-8395.500000	0.000000	-4178.180629
-8371.500000	0.000000	-4070.470145
-8347.500000	0.000000	-4070.470145
-8323.500000	0.000000	-4070.470145

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-8299.500000	0.000000	-4070.470145
-8275.500000	0.000000	-3962.759399
-8251.500000	0.000000	-4070.470145
-8227.500000	0.000000	-2462.250105
-8203.500000	0.000000	-4070.470145
-8179.500000	0.000000	-3535.635027
-8155.500000	0.000000	-4070.470145
-8131.500000	0.000000	-4070.470145
-8107.500000	0.000000	-4070.470145
-8083.500000	0.000000	-4070.470145
-8059.500000	0.000000	-4070.470145
-8035.500000	0.000000	-4178.180629
-8011.500000	0.000000	-4070.470145
-7987.500000	0.000000	-4070.470145
-7963.500000	0.000000	-4178.180629
-7939.500000	0.000000	-3914.411970
-7915.500000	0.000000	-3639.630824
-7891.500000	0.000000	-3747.339739
-7867.500000	0.000000	-4930.105852
-7843.500000	0.000000	-2358.254307
-7819.500000	0.000000	-2462.250105
-7795.500000	0.000000	-4172.795236
-7771.500000	0.000000	-4070.470145
-7747.500000	0.000000	-3962.759399
-7723.500000	0.000000	-3957.374006
-7699.500000	0.000000	-4070.470145
-7675.500000	0.000000	-4070.470145
-7651.500000	0.000000	-4070.470145
-7627.500000	0.000000	-3855.050485
-7603.500000	0.000000	-4063.999721

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-7579.500000	0.000000	-4015.157384
-7555.500000	0.000000	-3962.759399
-7531.500000	0.000000	0.000000
-7507.500000	0.000000	-4070.470145
-7483.500000	0.000000	-4070.470145
-7459.500000	0.000000	-4070.470145
-7435.500000	0.000000	-4070.470145
-7411.500000	0.000000	-4282.176688
-7387.500000	0.000000	-4178.180629
-7363.500000	0.000000	-4070.470145
-7339.500000	0.000000	-4070.470145
-7315.500000	0.000000	-4065.084490
-7291.500000	0.000000	-3855.050485
-7267.500000	0.000000	-3639.630824
-7243.500000	0.000000	-3962.759399
-7219.500000	0.000000	-3962.759399
-7195.500000	0.000000	-3962.759399
-7171.500000	0.000000	-3986.257324
-7147.500000	0.000000	-3962.759399
-7123.500000	0.000000	-3941.403285
-7099.500000	0.000000	-3962.759399
-7075.500000	0.000000	-3962.759399
-7051.500000	0.000000	-3855.050485
-7027.500000	0.000000	-3855.050485
-7003.500000	0.000000	-3855.050485
-6979.500000	0.000000	-3855.050485
-6955.500000	0.000000	-3855.050485
-6931.500000	0.000000	-2358.254307
-6907.500000	0.000000	-3962.759399
-6883.500000	0.000000	-3855.050485

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-6859.500000	0.000000	-3855.050485
-6835.500000	0.000000	-3855.050485
-6811.500000	0.000000	-3747.339739
-6787.500000	0.000000	-2.1843e4
-6763.500000	0.000000	-1.8095e4
-6739.500000	0.000000	-1.0600e4
-6715.500000	0.000000	-4680.888846
-6691.500000	0.000000	-2569.959019
-6667.500000	0.000000	-2462.250105
-6643.500000	0.000000	-2061.865670
-6619.500000	0.000000	-3747.339739
-6595.500000	0.000000	-5998.105643
-6571.500000	0.000000	-2548.602905
-6547.500000	0.000000	-4820.724923
-6523.500000	0.000000	-3855.050485
-6499.500000	0.000000	-4924.720459
-6475.500000	0.000000	-4713.016009
-6451.500000	0.000000	-5140.140381
-6427.500000	0.000000	-4605.305001
-6403.500000	0.000000	-4924.720459
-6379.500000	0.000000	-5140.140381
-6355.500000	0.000000	-5032.431466
-6331.500000	0.000000	-5476.084508
-6307.500000	0.000000	-5247.850865
-6283.500000	0.000000	-2569.959019
-6259.500000	0.000000	-5032.431466
-6235.500000	0.000000	-3339.307774
-6211.500000	0.000000	-5782.685721
-6187.500000	0.000000	-2569.959019
-6163.500000	0.000000	-5674.976807

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-6139.500000	0.000000	-5567.266323
-6115.500000	0.000000	-5782.685721
-6091.500000	0.000000	-5782.685721
-6067.500000	0.000000	-4282.176688
-6043.500000	0.000000	-4820.724923
-6019.500000	0.000000	-4497.596087
-5995.500000	0.000000	-7387.192906
-5971.500000	0.000000	-4820.724923
-5947.500000	0.000000	-7062.392055
-5923.500000	0.000000	-7283.196847
-5899.500000	0.000000	-7186.071429
-5875.500000	0.000000	-8029.738770
-5851.500000	0.000000	-3634.431152
-5827.500000	0.000000	-7494.901821
-5803.500000	0.000000	-7602.612305
-5779.500000	0.000000	-7602.612305
-5755.500000	0.000000	-6960.066964
-5731.500000	0.000000	-4070.470145
-5707.500000	0.000000	-5032.431466
-5683.500000	0.000000	-7387.192906
-5659.500000	0.000000	-3962.759399
-5635.500000	0.000000	-7175.486363
-5611.500000	0.000000	-7175.486363
-5587.500000	0.000000	-7283.196847
-5563.500000	0.000000	-7272.426060
-5539.500000	0.000000	-7288.396519
-5515.500000	0.000000	-7277.811454
-5491.500000	0.000000	-7175.486363
-5467.500000	0.000000	-7175.486363
-5443.500000	0.000000	-7175.486363

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-5419.500000	0.000000	-7387.192906
-5395.500000	0.000000	-7494.901821
-5371.500000	0.000000	-7818.032227
-5347.500000	0.000000	-7602.612305
-5323.500000	0.000000	-7387.192906
-5299.500000	0.000000	-7576.386370
-5275.500000	0.000000	-7175.486363
-5251.500000	0.000000	-5816.444092
-5227.500000	0.000000	-6857.142857
-5203.500000	0.000000	-7437.143032
-5179.500000	0.000000	-7474.285714
-5155.500000	0.000000	-7714.285714
-5131.500000	0.000000	-7608.571603
-5107.500000	0.000000	-7542.857143
-5083.500000	0.000000	-7474.285714
-5059.500000	0.000000	-7571.428397
-5035.500000	0.000000	-4628.571429
-5011.500000	0.000000	-6857.142857
-4987.500000	0.000000	-7614.285540
-4963.500000	0.000000	-7437.143032
-4939.500000	0.000000	-3808.571516
-4915.500000	0.000000	-3702.857143
-4891.500000	0.000000	-2742.857143
-4867.500000	0.000000	-4800.000000
-4843.500000	0.000000	-4631.428397
-4819.500000	0.000000	-5248.571254
-4795.500000	0.000000	-3942.857143
-4771.500000	0.000000	-5071.428746
-4747.500000	0.000000	-5245.714286
-4723.500000	0.000000	-5277.143032

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-4699.500000	0.000000	-4974.285540
-4675.500000	0.000000	-5142.857143
-4651.500000	0.000000	-2640.000000
-4627.500000	0.000000	-5142.857143
-4603.500000	0.000000	-5174.285889
-4579.500000	0.000000	-5108.571429
-4555.500000	0.000000	-2708.571429
-4531.500000	0.000000	-5108.571429
-4507.500000	0.000000	-5002.857317
-4483.500000	0.000000	-5040.000000
-4459.500000	0.000000	-5179.999826
-4435.500000	0.000000	-4800.000000
-4411.500000	0.000000	-5248.571254
-4387.500000	0.000000	-5108.571429
-4363.500000	0.000000	-4974.285540
-4339.500000	0.000000	-5040.000000
-4315.500000	0.000000	-5182.857317
-4291.500000	0.000000	-5142.857143
-4267.500000	0.000000	-5037.143032
-4243.500000	0.000000	-5037.143032
-4219.500000	0.000000	-5008.571254
-4195.500000	0.000000	-5037.143032
-4171.500000	0.000000	-5005.714286
-4147.500000	0.000000	-5037.143032
-4123.500000	0.000000	-5008.571254
-4099.500000	0.000000	-5040.000000
-4075.500000	0.000000	-5037.143032
-4051.500000	0.000000	-5037.143032
-4027.500000	0.000000	-5105.714460
-4003.500000	0.000000	-4971.428571

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-3979.500000	0.000000	-4937.142857
-3955.500000	0.000000	-4900.000174
-3931.500000	0.000000	-4937.142857
-3907.500000	0.000000	-4971.428571
-3883.500000	0.000000	-4974.285540
-3859.500000	0.000000	-5620.000174
-3835.500000	0.000000	-5451.428571
-3811.500000	0.000000	-5382.857143
-3787.500000	0.000000	-5385.714111
-3763.500000	0.000000	-5174.285889
-3739.500000	0.000000	-5625.714111
-3715.500000	0.000000	-5145.714111
-3691.500000	0.000000	-4697.142857
-3667.500000	0.000000	-5074.285714
-3643.500000	0.000000	-5968.571254
-3619.500000	0.000000	-5140.000174
-3595.500000	0.000000	-5177.142857
-3571.500000	0.000000	-5108.571429
-3547.500000	0.000000	-5208.571603
-3523.500000	0.000000	-5211.428571
-3499.500000	0.000000	-5245.714286
-3475.500000	0.000000	-5177.142857
-3451.500000	0.000000	-5111.428397
-3427.500000	0.000000	-5145.714111
-3403.500000	0.000000	-5128.392857
-3379.500000	0.000000	-5139.955706
-3355.500000	0.000000	-5142.857143
-3331.500000	0.000000	-5142.857143
-3307.500000	0.000000	-5074.285714
-3283.500000	0.000000	-2811.428571

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-3259.500000	0.000000	-5174.285889
-3235.500000	0.000000	-2811.428571
-3211.500000	0.000000	-5451.428571
-3187.500000	0.000000	-5074.285714
-3163.500000	0.000000	-2777.142857
-3139.500000	0.000000	-5108.571429
-3115.500000	0.000000	-5140.000174
-3091.500000	0.000000	-2777.142857
-3067.500000	0.000000	-4488.571603
-3043.500000	0.000000	-5108.571429
-3019.500000	0.000000	-5074.285714
-2995.500000	0.000000	-5040.000000
-2971.500000	0.000000	-5040.000000
-2947.500000	0.000000	-5002.857317
-2923.500000	0.000000	-5002.857317
-2899.500000	0.000000	-4971.428571
-2875.500000	0.000000	-2742.857143
-2851.500000	0.000000	-5005.714286
-2827.500000	0.000000	-6211.428746
-2803.500000	0.000000	-5005.714286
-2779.500000	0.000000	-2742.857143
-2755.500000	0.000000	-4968.571603
-2731.500000	0.000000	-5008.571254
-2707.500000	0.000000	-5074.285714
-2683.500000	0.000000	-4971.428571
-2659.500000	0.000000	-4968.571603
-2635.500000	0.000000	-5002.857317
-2611.500000	0.000000	-5008.571254
-2587.500000	0.000000	-4974.285540
-2563.500000	0.000000	-4974.285540

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-2539.500000	0.000000	-6042.857143
-2515.500000	0.000000	-2742.857143
-2491.500000	0.000000	-5005.714286
-2467.500000	0.000000	-4971.428571
-2443.500000	0.000000	-2742.857143
-2419.500000	0.000000	-4902.857143
-2395.500000	0.000000	-4902.857143
-2371.500000	0.000000	-4937.142857
-2347.500000	0.000000	-4831.428746
-2323.500000	0.000000	-5854.285714
-2299.500000	0.000000	-4902.857143
-2275.500000	0.000000	-4900.000174
-2251.500000	0.000000	-4902.857143
-2227.500000	0.000000	-4902.857143
-2203.500000	0.000000	-4902.857143
-2179.500000	0.000000	-4902.857143
-2155.500000	0.000000	-4902.857143
-2131.500000	0.000000	-2708.571429
-2107.500000	0.000000	-4902.857143
-2083.500000	0.000000	-4902.857143
-2059.500000	0.000000	-4837.142683
-2035.500000	0.000000	-4834.285714
-2011.500000	0.000000	-4834.285714
-1987.500000	0.000000	-4868.571429
-1963.500000	0.000000	-4837.142683
-1939.500000	0.000000	-4834.285714
-1915.500000	0.000000	-2708.571429
-1891.500000	0.000000	-5282.856968
-1867.500000	0.000000	-4731.428571
-1843.500000	0.000000	-4868.571429

Rate Change Data (cont)

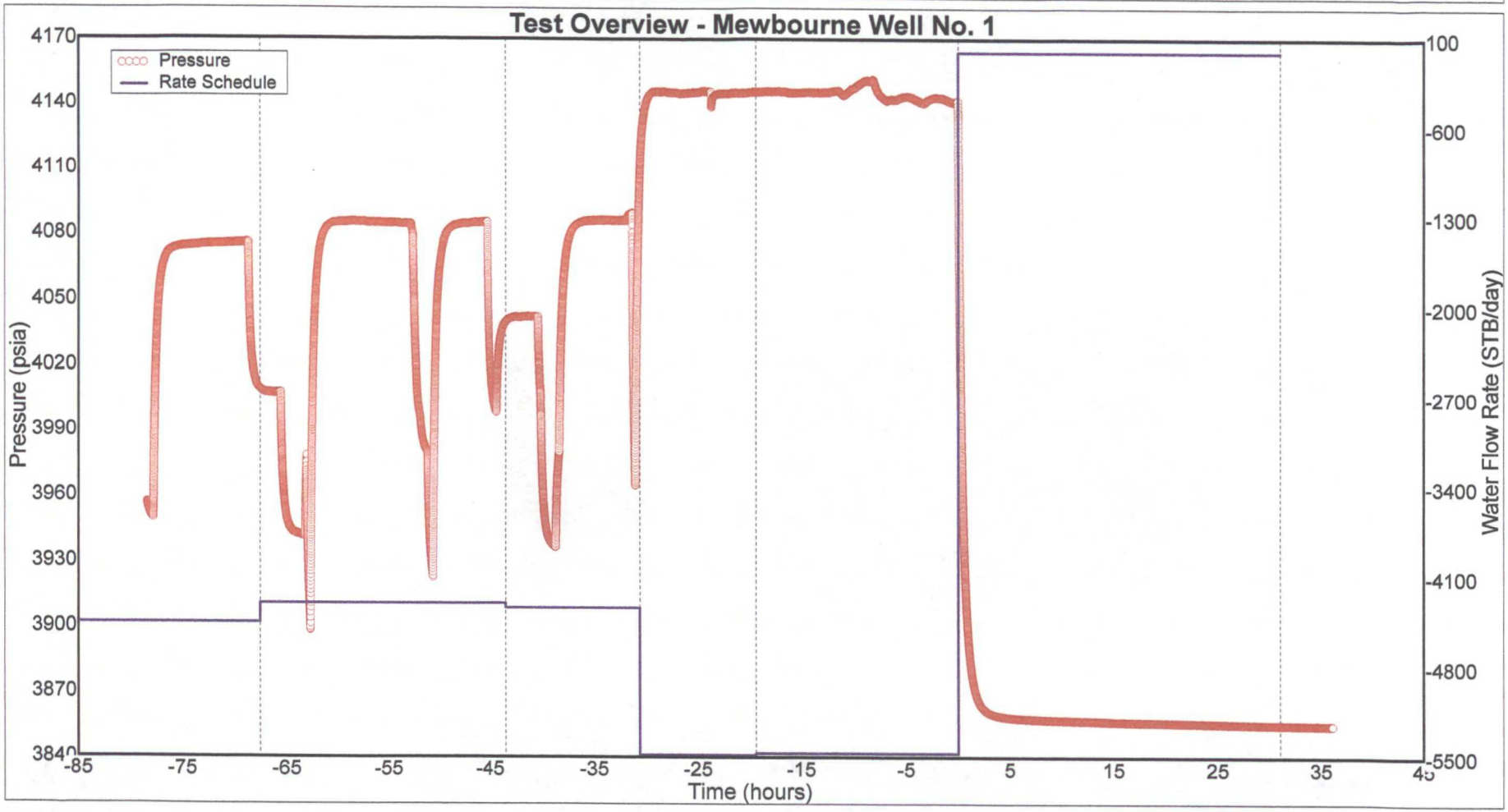
Time Hours	Pressure psia	Rate STB/day
-1819.500000	0.000000	-4900.000174
-1795.500000	0.000000	-4868.571429
-1771.500000	0.000000	-4765.714286
-1747.500000	0.000000	-4900.000174
-1723.500000	0.000000	-4868.571429
-1699.500000	0.000000	-4871.428397
-1675.500000	0.000000	-4871.428397
-1651.500000	0.000000	-4800.000000
-1627.500000	0.000000	-4797.143032
-1603.500000	0.000000	-4765.714286
-1579.500000	0.000000	-4797.143032
-1555.500000	0.000000	-4800.000000
-1531.500000	0.000000	-4800.000000
-1507.500000	0.000000	-4731.428571
-1483.500000	0.000000	-4697.142857
-1459.500000	0.000000	-4665.714111
-1435.500000	0.000000	-4800.000000
-1411.500000	0.000000	-4831.428746
-1387.500000	0.000000	-4800.000000
-1363.500000	0.000000	-4837.142683
-1339.500000	0.000000	-2742.857143
-1315.500000	0.000000	-2674.285714
-1291.500000	0.000000	-5111.428397
-1267.500000	0.000000	-5174.285889
-1243.500000	0.000000	-4800.000000
-1219.500000	0.000000	-4628.571429
-1195.500000	0.000000	-4628.571429
-1171.500000	0.000000	-4800.000000
-1147.500000	0.000000	-4697.142857
-1123.500000	0.000000	-4765.714286

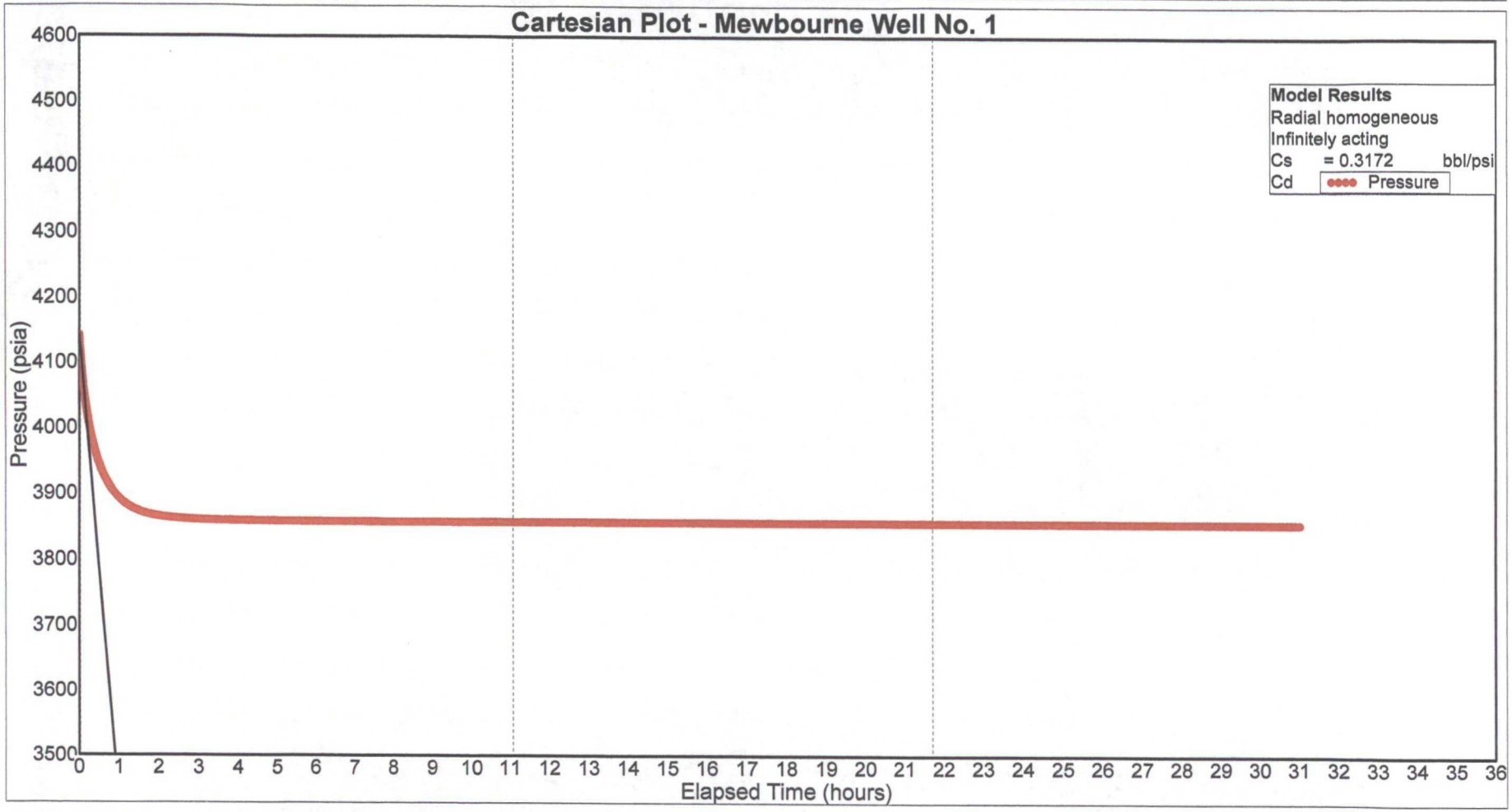
Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-1099.500000	0.000000	-4765.714286
-1075.500000	0.000000	-4831.428746
-1051.500000	0.000000	-2708.571429
-1027.500000	0.000000	-4797.143032
-1003.500000	0.000000	-4765.714286
-979.500000	0.000000	-4800.000000
-955.500000	0.000000	-4800.000000
-931.500000	0.000000	-3085.714286
-907.500000	0.000000	-4802.856968
-883.500000	0.000000	-2705.714199
-859.500000	0.000000	-4731.428571
-835.500000	0.000000	-2640.000000
-811.500000	0.000000	-4080.000000
-787.500000	0.000000	-4594.285714
-763.500000	0.000000	-4562.856968
-739.500000	0.000000	-4734.285540
-715.500000	0.000000	-4731.428571
-691.500000	0.000000	-4731.428571
-667.500000	0.000000	-4734.285540
-643.500000	0.000000	-4734.285540
-619.500000	0.000000	-4765.714286
-595.500000	0.000000	-4728.571603
-571.500000	0.000000	-4731.428571
-547.500000	0.000000	-2708.571429
-523.500000	0.000000	-2755.367063
-499.500000	0.000000	-2759.132937
-475.500000	0.000000	-4739.904762
-451.500000	0.000000	-4697.428571
-427.500000	0.000000	-4628.976108
-403.500000	0.000000	-4817.404845

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-379.500000	0.000000	-4644.039600
-355.500000	0.000000	-4802.922702
-331.500000	0.000000	-4665.658565
-307.500000	0.000000	-4822.174851
-283.500000	0.000000	-4665.500000
-259.500000	0.000000	-4990.081184
-235.500000	0.000000	-4942.172619
-211.500000	0.000000	-4932.035714
-187.500000	0.000000	-4751.518023
-163.500000	0.000000	-4741.628886
-139.500000	0.000000	-4898.200397
-115.500000	0.000000	-4668.714368
-91.500000	0.000000	-4817.236028
-67.556421	4075.930664	-4453.633019
-43.473193	4085.119173	-4301.085152
-30.635319	4111.204427	-4338.133714
-19.379886	4145.851563	-5485.292571
-0.000011	4141.747120	-5470.539429
31.033530	3855.374219	0.000000





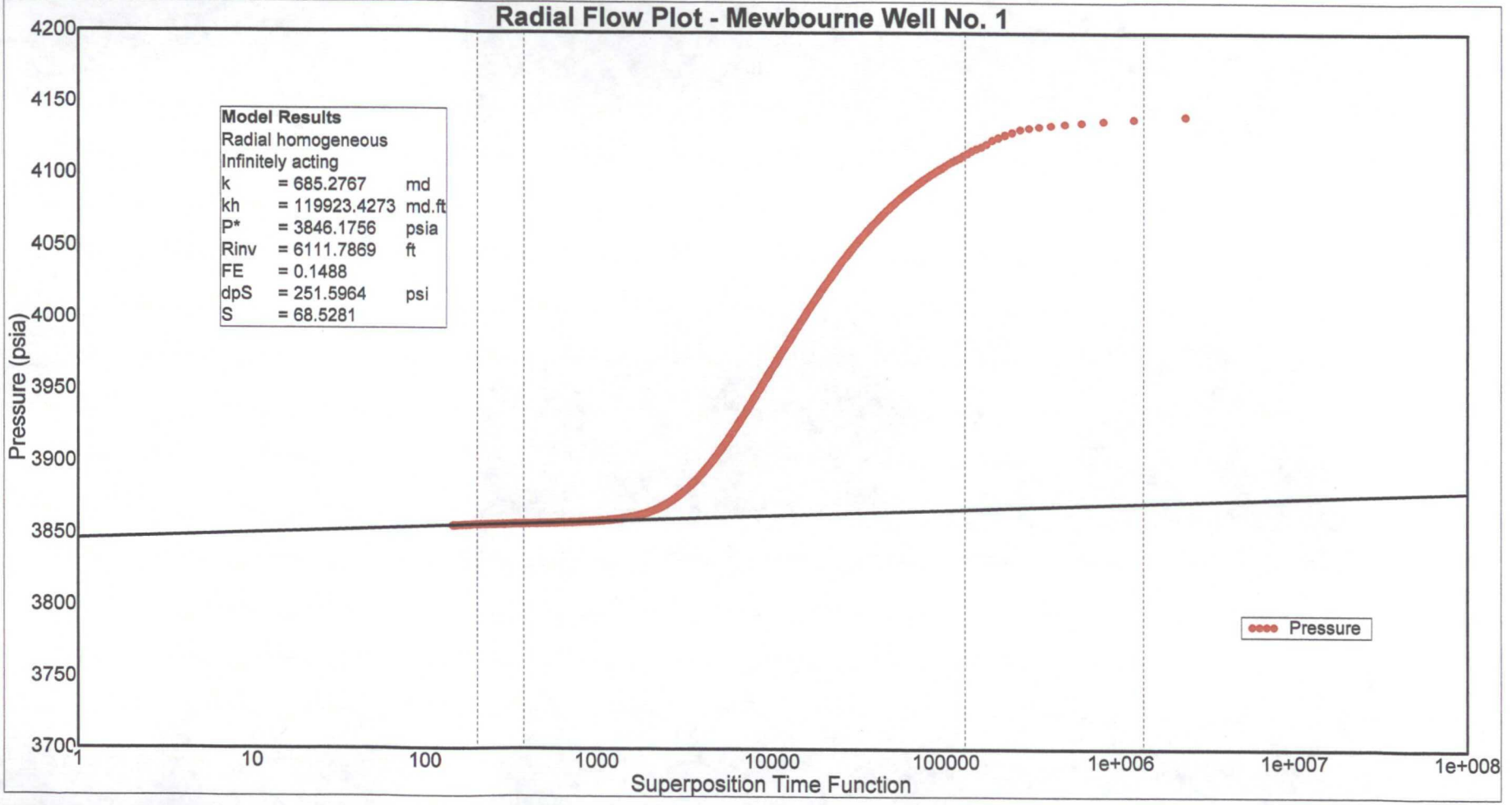
Cartesian Plot - Mewbourne Well No. 1 Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.317159 bbl/psi
Dimensionless wellbore storage	1.4510e4

Cartesian Plot - Mewbourne Well No. 1 Line Details
Line type : Wellbore storage
Slope : -718.69
Intercept : 4142.2
Coefficient of Determination : 0.987644

Number of Intersections = 0



Radial Flow Plot - Mewbourne Well No. 1 Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

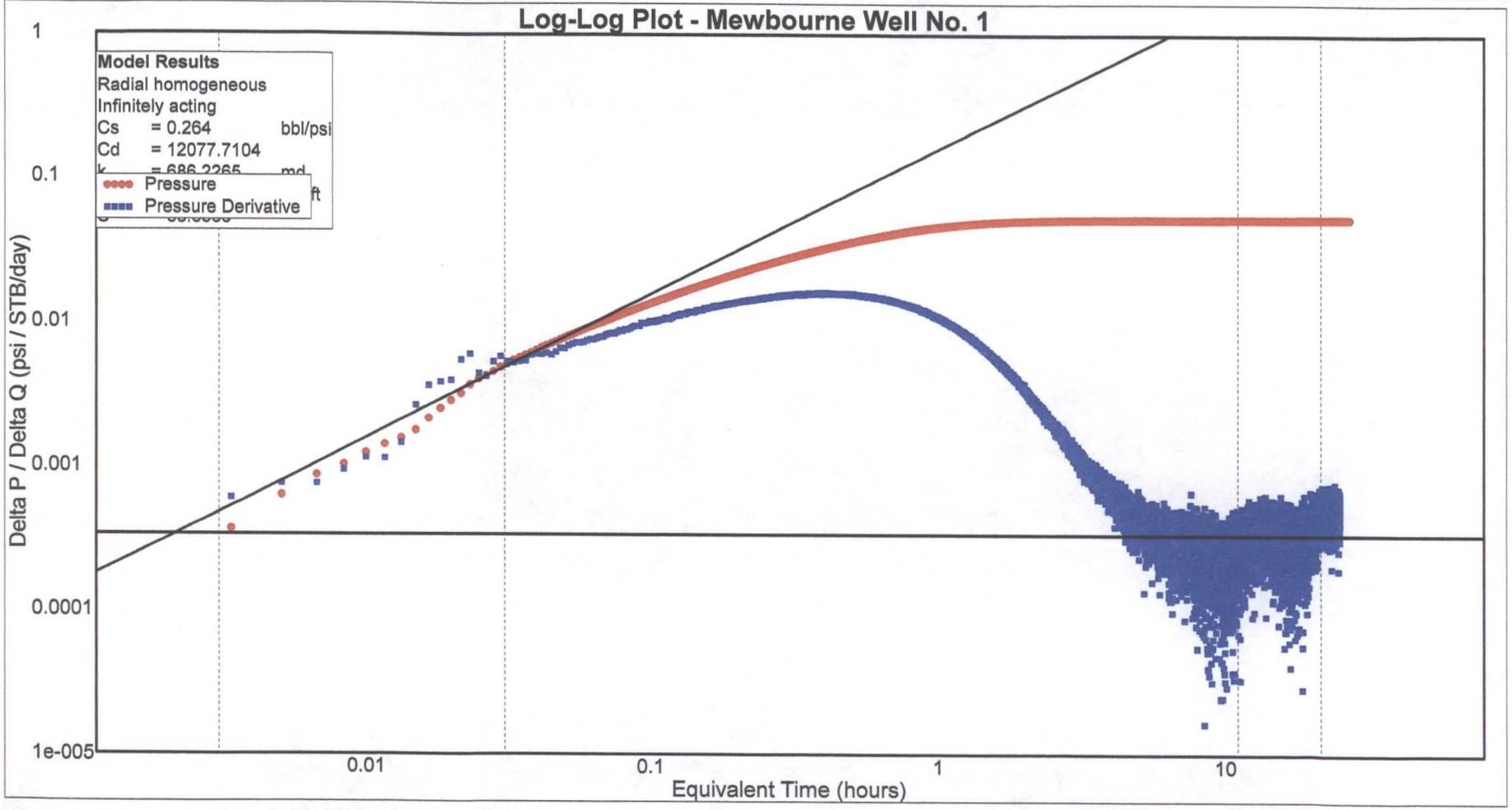
	Value
Permeability	685.276727 md
Permeability-thickness	1.1992e5 md.ft
Extrapolated pressure	3846.175567 psia
Radius of investigation	6111.786899 ft
Flow efficiency	0.148780
dP skin (constant rate)	251.596437 psi
Skin factor	68.528119

Radial Flow Plot - Mewbourne Well No. 1 Line Details

Line type : Radial flow
Slope : 4.22689
Intercept : 3846.18
Coefficient of Determination : Not Used

	Radial flow
Extrapolated pressure	3846.175567 psia
Pressure at dt = 1 hour	3861.389169 psia

Number of Intersections = 0



Log-Log Plot - Mewbourne Well No. 1 Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.263996 bbl/psi
Dimensionless wellbore storage	1.2078e4
Permeability	686.226521 md
Permeability-thickness	1.2009e5 md.ft
Skin factor	68.636593

Log-Log Plot - Mewbourne Well No. 1 Line Details

Line type : Radial flow
Slope : 0
Intercept : 0.0003351
Coefficient of Determination : Not Used

Line type : Wellbore storage
Slope : 1
Intercept : 0.157831
Coefficient of Determination : Not Used

Number of Intersections = 0

APPENDIX N

TEMPERATURE SURVEY CONDUCTED NOVEMBER 13, 2011

SUBSURFACE