UIC-I-8- _2_

EPA FALL-OFF TEST

DATE:

2017

2017 ANNUAL BOTTOM-HOLE PRESSURE SURVEY AND PRESSURE FALLOFF TEST REPORT

NAVAJO REFINING

CHUKKA WELL NO. 2

Artesia, New Mexico

February 2018

Houston, TX

Project No. 192080A

Prepared by Larry McDonald Reviewed by Ted Jose

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

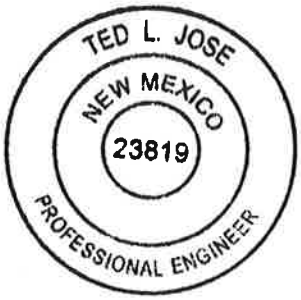
Client:	Navajo Refining Company
Well Name:	Chukka Well No. 2
Test Dates:	August 4, 2017 to August 10, 2017

Name: Ted L. Jose
Title: Project Engineer

Phone Number: 281-589-5900

Signature _____ Date Signed 2/13/18

New Mexico Professional Engineer
License No. 23819



EXECUTIVE SUMMARY

WSP USA Inc. (WSP) was contracted by Navajo Refining Company (Navajo) to perform a pressure falloff test and bottom-hole pressure survey on Navajo's Chukka Well No. 2. 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 testing plan submitted to and approved by the NM OCD. The testing consisted of a 36-hour injection period and a 50-hour falloff period.

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 2016 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 Chukka Well No. 2 wellbore schematic is presented in Figure 1. The schematic has all data as requested by the guidelines and includes the following:

a. Tubing: 3 ½ inch, 9.2 pound per foot (lb/ft), steel construction, API grade J-55, with NUE 10 round connections.

b. Packer: Arrow X-1, 5 ½ inch by 2 ⅞ inch set in tension at 7528 feet.

c. Tubing Length: 7528 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 two 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. 8 ⅝ inch, 32 lb/ft, steel construction, API grade J-55, with short thread connections (ST&C), set at a depth of 1995 feet. The casing was cemented to the surface with 800 sacks of cement. The casing was set in open hole with a diameter of 11 inches. This information was obtained from OCD records.

   ii. 5 ½ inch, 17 lb/ft, steel construction, API grade L-80 long thread connections (LT&C), set at a depth of 8869 feet. The casing was cemented to surface in two stages with 1570 sacks of cement. The casing was set in open hole with a diameter of 7 ⅞ inches. This information was obtained from OCD records.

   iii. A cement plug at 8770 feet isolates the lower section of the original borehole. This information was obtained from OCD records.

e. Top of cement: Determined from the cement bond log (CBL) run in the 8 ⅝ inch on May 9, 1999. The top of cement in the 8 ⅝ inch was found at the surface. Determined from the CBL run in the 5-1/2-inch casing string on May 28, 1999. The top of cement in the 5 ½ inch casing was found at the surface.

f. The 5 ½ inch casing: Perforated on June 1, 1999. The casing was perforated with a 0.5-inch diameter hole, at 2 shots per foot, on a 120° phasing. The perforations are located between 7570 feet and 7736 feet and from 7826 feet to 8399 feet.

g. The total depth of the well is 10,372 feet with the plug back depth at 8770 feet. On August 10, 2017, the top of fill was tagged at 8362 feet.

4. ELECTRIC LOG ENCOMPASSING THE COMPLETED INTERVAL

The dual induction log is presented as Appendix A and encompasses the completed interval between 7570 feet and 8399 feet. The dual induction log was submitted to the OCD with the original permit. The original dual induction log was completed August 27, 1973 by Amoco Production 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 as Appendix B and encompasses the completed interval between 7570 feet and 8399 feet. The neutron density log was submitted to the OCD with the original permit after the well was drilled by Amoco Production Company. The compensated neutron formation density log was completed on August 27, 1973. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well. The average 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 Chukka Well No. 2 was recompleted in June 1999, prior to the issuance of the current well testing guidelines (December 3, 2007). At that time, no directives were in place to test formation fluids or derive formation characteristics from cores. However, reservoir fluid samples were obtained and the average specific gravity 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 x 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 x 10^{-6} psi^{-1}. The total system compressibility is the sum of the fluid compressibility and the pore volume compressibility, 8.4 x 10^{-6} psi^{-1}. The temperature used with the correlations was recorded during the temperature survey conducted in the Chukka Well No. 2 on May 28, 1999 and June 5, 1999, and included in this report as Appendix E.

b. Formation Fluid Viscosity with Reference Temperature:

   The formation fluid had an average 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 specific gravity 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 of the refinery waste water averaged 1.002 (8.35pounds per gallon) during the injection portion of the reservoir testing. 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 x 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 June 20, 2017 and ends on August 8, 2017. 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 August 8, 2017, was 3,579,179,100 gallons. The total volume of fluid injected into the Mewbourne Well No. 1 was 1,749,470,495 gallons. The total volume of fluid injected into the Chukka Well No. 2 was 1,160,026,846 gallons. The volume of fluid injected into the Gaines Well No. 3 was 669,681,759 gallons. The injected volumes were obtained from plant records.

9. PRESSURE GAUGES

One (1) downhole pressure gauge (with two readings) was used for the Chukka Well No. 2 buildup and falloff testing. The downhole pressure gauge was set at 7570 feet.

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

   In the Chukka Well No. 2, an MRO pressure gauge was used to monitor the bottom-hole pressure and temperature during the pressure buildup and falloff testing. The gauge was a sapphire crystal gauge with Serial No. DC-1465. The gauge is manufactured by DataCan.

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

   In Chukka Well No. 2, the MRO pressure gauge, Serial No. DC-1465, has a full range of 14.73 psi to 15,000 psi, an accuracy of 0.02% of full scale, and a resolution of 0.01% 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 the pressure gauge 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 WSP 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 2016 update.

No new fresh water wells were reported within the search area since the submittal of the 2016 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 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 4 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 also contains a listing of all wells within the one-mile AOR, with their current status. Tables III through VII 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 2016 pressure falloff report.

Thirty-eight (38) wells were found in which the owner had changed. Fourteen (14) new wells were plugged and abandoned. Sixteen (16) wells were placed in temporarily abandoned status. No wells were found that were returned to production status. Two (2) wells were found that had been recompleted.

There were nineteen (19) 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 other injection wells that inject into 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 ID No. 861 in Table II and no changes have occurred to this well. The wellbore schematics for the Mewbourne Well No. 1 and Gaines Well No. 3 are presented as Figure 2 and Figure 3, 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	7450	-3757	7270	-3647	7303	-3678
Cisco	7816	-4123	7645	-4022	7650	-4025
Canyon	8,475	-4,782	8,390	-4767	8390	-4765
Base of Injection Zone (base of Canyon)	9016	-5323	8894	-5271	8894	-5269

d. 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 bio thermal (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.

e. 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.

f. 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 four offset wells identified in the AOR that inject into the same interval: The Federal No. 1, the Chalk Bluff Federal Com No. 3, the Gaines Well No. 3 and the Chukka Well No. 2.

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 10,860 feet from Chukka Well No. 2, the test well. The Gaines Well No. 3 is approximately 3,130 feet from the Chukka Well No. 2.

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

Both the Mewbourne Well No. 1 and the Gaines Well No. 3 were injecting at a constant rate during the buildup and falloff testing of the Chukka Well No. 2.

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

There was no impact on the testing because both offset wells were injecting at a constant rate during the buildup and falloff testing of the Chukka Well No. 2.

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 at 1701 hours on August 6, 2017 and continued until August 8, 2017 at 0457 hours when the Chukka Well No. 2 was shut-in. The falloff test ended on August 10, 2017 at 0722 hours. Prior to pulling the gauges out of the well, Navajo began injecting plant waste into the Chukka No. 2. The pressure was allowed to stabilize, the total depth of the well was tagged at 8358 feet, and five-minute gradient stops were made while pulling the pressure gauges out of the well. After the pressure gauges were pulled out of the well on August 10, 2017, the well was turned over to Navajo plant operations personnel.

b. Time of the injection period:

The buildup portion of the testing began on August 6, 2017 when the injection rate was set at an average injection rate of approximately 124 gallons per minute (gpm). The injection rate was held constant for 36 hours.

c. Type of injection fluid:

The injected fluid was non-hazardous waste water from the plant. The density of the injection fluid averaged 8.35 pounds per gallon during the 36-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 4369.13 psia and 114.07°F, respectively.

e. Total shut-in time:

The Chukka Well No. 2 was shut-in for 50 hours.

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

The final static pressure at 7570 feet was 4221.04 psia. The final temperature was 111.07°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 Chukka Well No. 2, there is one, 4-inch control valve (CV) installed on the incoming pipeline before the POD filter. Two 4-inch valves are installed between the POD filter and the wellhead. One motorized valve (MV) and injection pump is installed between the POD filter and the well. All valves were closed during the falloff portion of the testing. A diagram of the wellhead is shown in Figure 5 and a diagram of the valve locations are shown in Figure 6.

15. PRESSURE FALLOFF ANALYSIS

The following discussion of the analysis of the pressure data recorded during the falloff testing of the Chukka Well No. 2 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 VIII. 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 7 shows the pressure data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 50-hour 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 50-hour shut-in period. Figure 9 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 used in the analysis of the data. Figure 10 is a plot of the historical injection rates and surface pressures versus calendar time.

Figure 11 is a log-log diagnostic plot of the falloff data, showing change in pressure and pressure derivative versus elapsed 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 0.003 hours and continues to an elapsed shut in time of 0.019 hours. Radial flow begins at an elapsed shut in time of 3.29 hours and continues until 7.29 hours (OCD Guideline Section IX.15.b).

The reservoir permeability was determined from the radial flow region of the superposition semi-log plot, Figure 12. The radial flow regime begins at a Superposition time of 290 and continues until a Superposition time of 132 at which time the pressure data departs the semi-log straight-line. Figure 13 shows an expanded view of the radial flow regime. The slope of the radial flow period, as calculated by the analysis software, was 2.6971 psi/cycle (OCD Guideline Section IX.15.c). The injection rate just prior to shut in was 123.11 gpm which is equivalent to 4220.76 barrels per day (bbls/day).

An estimate of mobility-thickness (transmissibility, OCD Guideline Section IX.15.d), kh/μ, for the reservoir was determined to be 254,457 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

$$\frac{kh}{\mu} = 162.6\frac{(4220.76)(1.0)}{2.6971}$$

$$= 254{,}457\ \text{md} - \text{ft}/\text{cp}$$

The permeability-thickness (flow capacity, OCD Guideline Section IX.15.i), kh, was determined to be 145,040 md-ft by multiplying the mobility-thickness, kh/μ, by the viscosity of the reservoir fluid (see Section 6), $\mu_{reservoir}$, of 0.57 centipoise (cp):

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

$$= (254{,}457)(0.57)$$

$$= 145{,}040\,\text{md} - \text{ft}$$

The reservoir permeability (OCD Guideline Section IX.15.e) using the total thickness (see Section 5 and Section 11) of 175 feet was 829 md:

$$k = \frac{kh}{h}$$

$$= \frac{145{,}040}{175}$$

$$= 829\ \text{md}$$

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 1,160,026,846 gallons of waste has been injected into Chukka Well No. 2 (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 1679 feet:

$$r_{waste} = \left(\frac{(0.13368)(1{,}160{,}026{,}846)}{(\pi)(175)(0.10)} \right)^{1/2}$$

$$= 1679 \text{ feet}$$

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 x 10^{-6} psi^{-1} (see Section 6). The viscosity of the waste fluid is 0.54 cp (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 1.46 hours:

$$t_{waste} = 948 \frac{(0.10)(0.54)(8.4x10^{-6})(1679^2)}{829}$$

$$= 1.46 \text{ hours}$$

Since the time required to pass through the waste is less than the 3.29 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 4369.13 psia. The pressure determined by extrapolating the radial flow semi-log line to a Δt of one hour, p_{1hr}, was 4224.12 psia (calculated from the analysis software). The wellbore radius, r_w, is 0.3281 feet (completion records). Using these values in addition to the previously discussed parameters results in a skin of 53.85:

$$s = 1.151\left[\frac{4369.13 - 4224.12}{2.6971} - \log\left(\frac{829}{(0.10)(0.57)(8.4x10^{-6})(0.3281^2)}\right) + 3.23\right]$$

$$= 53.85$$

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 126.21 psi:

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

$$= 0.869(2.6971)(53.85)$$

$$= 126.21 \text{ psi}$$

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 0.15:

$$E = \frac{4369.13 - 126.21 - 4221.04}{4369.13 - 4221.04}$$

$$= 0.15$$

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

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

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 7240 feet:

$$R_{inv} = 0.029\sqrt{\frac{(829)(36)}{(0.10)(0.57)(8.4 \times 10^{-6})}}$$

$$R_{inv} = 7240 \text{ feet}$$

As indicated on Figure 11, the pressure data departs the radial flow region at an elapsed time from shut in of 7.29 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 14. 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 IX (OCD Guideline Section IX.19).

On August 10, 2017, a flowing pressure gradient survey (see Section 13) was conducted while pulling the pressure gauges out of the well. Static gradient stops were conducted at 7570 feet, 7000 feet, 6000 feet, 5000 feet, 4000 feet, 3000 feet, 2000 feet, 1000 feet, and at the surface. The bottom-hole pressure and temperature, after 36 hours of shut-in at 7570 feet, prior to Navajo resuming injection, were 4221.04

psia and 111.07°F, respectively. The gradient survey is summarized in Table X. The data are graphically depicted in Figure 17.

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	Mewbourne 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	LEGACY RESOURCES OPERATING LP	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
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

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
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		T/A	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		P/A	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		T/A	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		T/A	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		P/A	3/27/1960
79	30-015-22750	4	5	18S	28E	660N	150W	EMPIRE ABO UNIT #251	APACHE CORPORATION	O		P/A	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	I		ACTIVE	12/21/1959
90	30-015-21542	2	6	18S	28E	1260N	1580E	EMPIRE ABO UNIT #231	APACHE CORPORATION	O		P/A	11/1/1975
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		P/A	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		T/A	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		P/A	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

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
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	APACHE CORPORATION	O		P/A	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
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		P/A	9/7/1975
139	30-015-00711	H	1	18S	27E	1980N	660E	EMPIRE ABO UNIT #020C	BP AMERICA PRODUCTION COMPANY	O		P/A	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	I		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	APACHE CORPORATION	O		P&A	8/20/1959
148	30-015-22560	J	1	18S	27E	220S	1390E	EMPIRE ABO UNIT #192	BP AMERICA PRODUCTION COMPANY	O		T/A	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		T/A	11/14/1978
151	30-015-22559	K	1	18S	27E	2290S	2445W	EMPIRE ABO UNIT #184	APACHE CORPORATION	O		P/A	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	

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
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	30-015-00701	D	1	18S	27E	330N	330W	SOUTH RED LAKE GRAYBURG UNIT 37 WIW	FAIRWAY RESOURCES OPERATING LLC	O		ACTIVE	
748	30-015-00715	4	1	18S	27E	330N	330W	SOUTH RED LAKE GRAYBURG UNIT #037	LEGACY RESERVES OPERATING LP	I		ACTIVE	
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	BP AMERICA PRODUCTION COMPANY	O		P/A	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		T/A	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		P/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

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
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	CHEVERON USA 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	PHOENIX ENERGY	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
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	

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
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
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	30-015-40187	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
967	30-015-38240	G	36	17S	27E	1425N	1520E	KIOWA STATE NO. 3	COG OPERATING, LLC	O		ACTIVE	
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		ACTIVE	
971	30-015-39323	O	36	17S	27E	870S	1560E	BIG BOY STATE NO. 5	COG OPERATING, LLC	O		ACTIVE	
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	

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
974	30-015-39326	O	36	17S	27E	275S	1560E	BIG BOY STATE NO. 8	COG OPERATING, LLC	O		ACTIVE	
975	30-015-39401	P	36	17S	27E	1110S	630E	EMPIRE ABO UNIT NO. 417	APACHE CORPORATION	O		ACTIVE	
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		T/A	
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		T/A	
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	O			
993	30-015-32307	4	1	18S	27E	330N	990W	AAO FEDERAL NO. 1	APACHE CORPORATION	O		PERMIT TO DRILL	
994	30-015-32959	E	1	18S	27E	1650N	875W	AAO FEDERAL NO. 5	APACHE CORPORATION	O		PERMIT TO DRILL	
995	30-015-33473	G	1	18S	27E	1750N	1650E	AAO FEDERAL NO. 7	APACHE CORPORATION	O		PERMIT TO DRILL	
996	30-015-33784	H	1	18S	27E	1650N	330E	AAO FEDERAL NO. 8	APACHE CORPORATION	O		PERMIT TO DRILL	
997	30-015-34071	F	1	18S	27E	2169N	1963W	AAO FEDERAL NO. 6	APACHE CORPORATION	O		PERMIT TO DRILL	
998	30-015-34555	M	1	18S	27E	890S	660W	AAO FEDERAL NO. 11	APACHE CORPORATION	O		PERMIT TO DRILL	
999	30-015-34576	K	1	18S	27E	2060S	2160W	AAO FEDERAL NO. 10	APACHE CORPORATION	O		PERMIT TO DRILL	
1000	30-015-00735	K	2	18S	27E	1980S	1830W	EMPIRE ABO UNIT NO. 14B	APACHE CORPORATION	O		PERMIT TO DRILL	
1002	30-015-22824	M	2	18S	27E	800S	950W	EMPIRE ABO UNIT NO. 133	APACHE CORPORATION	O		PERMIT TO DRILL	
1003	30-015-22952	K	2	18S	27E	1310S	1400W	EMPIRE ABO UNIT NO. 142A	APACHE CORPORATION	O		PERMIT TO DRILL	
1004	30-015-39956	G	36	17S	27E	2176N	1858E	KIOWA STATE NO. 8	COG OPERATING, LLC	O		ACTIVE	4/30/2012
1005	30-015-40428	M	36	17S	27E	200S	485W	BIG BOY STATE NO. 2	COG OPERATING, LLC	O		ACTIVE	
1006	30-015-40429	M	36	17S	27E	492S	806W	BIG BOY STATE NO. 4	COG OPERATING, LLC	O		PERMIT TO DRILL	
1007	30-015-39898	A	1	18S	27E	1258E	1005E	EMPIRE ABO UNIT NO. 412	APACHE CORPORATION	O		PERMIT TO DRILL	
1008	30-015-39899	3	1	18S	27E	1305N	2535W	EMPIRE ABO UNIT NO. 413	APACHE CORPORATION	O		PERMIT TO DRILL	
1009	30-015-39900	4	1	18S	27E	1120N	1205W	EMPIRE ABO UNIT NO. 414	APACHE CORPORATION	O		PERMIT TO DRILL	
1011	30-015-36564	O	30	17S	28E	330S	2210E	STALEY STATE NO. 9	LRE OPERATING, LLC	O		ACTIVE	5/5/2009
1012	30-015-37673	N	30	17S	28E	330S	1650W	STALEY STATE NO. 12	LRE OPERATING, LLC	O		ACTIVE	7/7/2010
1013	30-015-38203	P	30	17S	28E	330S	990W	MAPLE STATE NO. 8	COG OPERATING LLC	O		PERMIT TO DRILL	
1014	30-015-40026	N	30	17S	28E	330S	2410W	STALEY STATE No. 17	LRE OPERATING, LLC	O		ACTIVE	4/4/2012
1015	30-015-39011	O	31	17S	28E	1190S	1320E	EMPIRE ABO UNIT NO. 419	APACHE CORPORATION	O		T/A	11/7/2011
1016	30-015-39020	O	31	17S	28E	140S	2560E	EMPIRE ABO UNIT NO. 408	APACHE CORPORATION	O		T/A	11/9/2011
1017	30-015-40257	D	31	17S	28E	184N	257W	BIG GIRL 31 STATE NO. 1	COG OPERATING, LLC	O		PERMIT TO DRILL	
1018	30-015-40258	D	31	17S	28E	195N	990W	BIG GIRL 31 STATE NO. 2	COG OPERATING, LLC	O		PERMIT TO DRILL	
1019	30-015-40259	G	31	17S	28E	2160N	2310E	BIG GIRL 31 STATE NO. 5	COG OPERATING, LLC	O		PERMIT TO DRILL	
1020	30-015-40260	D	31	17S	28E	1155N	990W	BIG GIRL 31 STATE NO. 7	COG OPERATING, LLC	O		PERMIT TO DRILL	
1021	30-015-40409	L	31	17S	28E	1920S	330W	BIG GIRL 31 STATE NO. 9H	COG OPERATING, LLC	O		PERMIT TO DRILL	
1022	30-015-40410	M	31	17S	28E	615S	10W	BIG GIRL 31 STATE NO. 11H	COG OPERATING, LLC	O		PERMIT TO DRILL	
1023	30-015-39927	K	32	17S	28E	1750S	1765W	AA STATE NO. 2	APACHE CORPORATION	O		ACTIVE	
1024	30-015-40339	D	32	17S	28E	990N	330W	ENRON STATE No. 18	LRE OPERATING, LLC	O		ACTIVE	
1025	30-015-00643	O	35	17S	27E	990S	2310E	South Red Lake Grayburg Unit #026	Legacy Reserves Operating LP	O		ACTIVE	
1026	30-015-37783	O	35	17S	27E	990S	2225E	Russell C 003	Tarco Energy, L.C.	I		ACTIVE	
1027	30-015-00644	N	35	17S	27E	330S	2310W	South Red Lake Grayburg Unit #031	Legacy Reserves Operating LP	O		ACTIVE	
1028	30-015-20104	P	35	17S	27E	990S	990E	South Red Lake Grayburg Unit #041	Legacy Reserves Operating LP	O		ACTIVE	
1029	30-015-34626	M	36	17S	27E	935N	2260E	Jeffers 36 State #4t	LRE Operating LLC	O		ACTIVE	
1030	30-015-41289	O	25	17S	27E	985S	2310E	Enron Federal #18	LRE Operating LLC	O		ACTIVE	
1031	30-015-41890	N	29	17S	28E	330S	2200E	Williams A Federal No 12	LRE Operating LLC	O		ACTIVE	

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
1032	30-015-40807	N	35	17S	27E	330N	2310W	Logan B "35" N Federal #18	Lime Rock Resources A, L.P.	O		ACTIVE	
1033	30-015-40808	P	35	17S	27E	970S	990E	Logan 35 P Federal #19	LRE Operating LLC	O		ACTIVE	
1034	30-015-41435	O	35	17S	27E	720S	1770E	Logan 35 O Federal 10	Lime Rock Resources A, L.P.	O		ACTIVE	
1035	30-015-42003	E	2	18S	27E	2515N	800W	Sb State 004	Apache Corporation	O		ACTIVE	
1036	30-015-42002	E	2	18S	27E	1900N	990W	Sb State 002	Apache Corporation	O		ACTIVE	
1037	30-015-36979	C	32	17S	28E	990N	2035W	Enron State #14	LRE Operating LLC	O		ACTIVE	
1038	30-015-41833	C	32	17S	28E	990 N	1700W	Enron State 19	LRE Operating LLC	O		ACTIVE	
1039	30-015-39996	C	32	17S	28E	230 N	2420W	Enron State 17	LRE Operating LLC	O		ACTIVE	
1040	30-015-41511	N	32	17S	28E	330 S	2365W	Ab State 647 016	Apache Corporation	O		ACTIVE	
1041	30-015-41498	M	32	17S	28E	330S	1090W	Ab State 647 014	Apache Corporation	O		ACTIVE	
1042	30-015-41493	N	32	17S	28E	1080S	2535W	Ab State 647 009	Apache Corporation	O		ACTIVE	
1043	30-015-41491	L	32	17S	28E	1650S	950W	Ab State 647 007	Apache Corporation	O		ACTIVE	
1044	30-015-41492	K	32	17S	28E	1375S	2320W	Ab State 647 008	Apache Corporation	O		ACTIVE	
1045	30-015-40783	C	2	18S	27E	990N	1500W	Logan 2c State No. 4	Lime Rock Resources A, L.P.	O		ACTIVE	
1046	30-015-38420	G	36	17S	27E	1460N	1539E	Kiowa State	COG Operating LLC	O		ACTIVE	
1047	30-015-39626	G	36	17S	27E	2152N	2103E	Kiowa State # 04	COG Operating LLC	O		ACTIVE	
1048	30-015-41500	K	32	17S	28E	2355S	2600W	Ab State 647 002	Apache Corporation	O		ACTIVE	
1049	30-015-41501	K	32	17S	28E	2370S	1650W	Ab State 647 003	Apache Corporation	O		ACTIVE	
1050	30-015-41505	L	32	17S	28E	2250S	1185W	Ab State 647 004	Apache Corporation	O		ACTIVE	
1051	30-015-41502	L	32	17S	28E	2310S	330W	Ab State 647 005	Apache Corporation	O		ACTIVE	
1052	30-015-41504	N	32	17S	28E	330S	1650W	Ab State 647 015	Apache Corporation	O		ACTIVE	
1053	30-015-41497	M	32	17S	28E	220 S	350W	Ab State 647 013	Apache Corporation	O		ACTIVE	
1054	30-015-41503	L	32	17S	28E	1730S	430W	Ab State 647 006	Apache Corporation	O		ACTIVE	
1055	30-015-41495	M	32	17S	28E	920S	960W	Ab State 647 011	Apache Corporation	O		ACTIVE	
1056	30-015-41494	N	32	17S	28E	1140S	1650W	Ab State 647 010	Apache Corporation	O		ACTIVE	
1057	30-015-41496	M	32	17S	28E	910S	930W	Ab State 647 012	Apache Corporation	O		ACTIVE	
1058	30-015-40679	B	2	18S	27E	968N	2300E	Blake State No. 4	Lime Rock Resources A, L.P.	O		ACTIVE	
1059	30-015-40621	C	2	18S	27E	968N	1650W	Brad State No. 4	Tarco Energy, L.C.	O		ACTIVE	
1060	30-015-31530	C	32	17S	28E	530N	1650W	Enron State #1	Lime Rock Resources A, L.P.	O		ACTIVE	
1061	30-015-00681	M	36	17S	27E	990S	330W	South Red Lake Grayburg Unit #027	Legacy Reserves Operating LP	O		P/A	
1062	30-015-33111	I	2	18S	27E	530N	2310W	Logan 2c State #3	Devon Energy	O		ACTIVE	
1063	30-015-22526	B	5	18S	28E	1300N	2345E	Empire Abo Unit "I" 272a	Apache Corporation	O		T/A	
1064	30-015-32070	I	2	18S	27E	660S	990W	Bb State Com #1	Apache Corporation	O		T/A	
1065	30-015-32899	I	2	18S	27E	2310S	2310W	Bm State #1	Apache Corporation	O		T/A	
1066	30-015-32900	I	2	18S	27E	1650N	2305W	Tdf State #2	Apache Corporation	O		T/A	
1067	30-015-36978	D	31	17S	28E	990N	330W	Enron State #15	LRE Operating LLC	O		ACTIVE	
1068	30-015-36513	N	29	17S	28E	1090S	1550W	Williams A Federal No. 8	LRE Operating LLC	O		ACTIVE	
1069	30-015-33232	M	29	17S	28E	690S	530W	Williams A Federal 5	LRE Operating LLC	O		ACTIVE	
1070	30-015-40480	M	29	17S	28E	600S	645W	Williams A Federal No. 10	Tarco Energy, L.C.	O		ACTIVE	
1071	30-015-40677	B	2	18S	27E	380N	1650E	Blake State No. 1	Tarco Energy, L.C.	O		Permit to Drill	
1072	30-015-40678	B	2	18S	27E	330N	2300E	Blake State No. 2	Tarco Energy, L.C.	O		Permit to Drill	
1073	30-015-41766	F	5	18S	28E	1910N	1505W	Libby State 001	Apache Corporation	O		Permit to Drill	
1074	30-015-41767	F	5	18S	28E	1570N	2245W	Libby State 002	Apache Corporation	O		Permit to Drill	
1075	30-015-41768	F	5	18S	28E	1570N	2245W	Libby State 002	Apache Corporation	O		Permit to Drill	
1076	30-015-41770	B	31	17S	28E	330N	2270E	T Rex State 001	Apache Corporation	O		Permit to Drill	
1077	30-015-41771	B	31	17S	28E	575N	1650E	T Rex State 002	Apache Corporation	O		Permit to Drill	
1078	30-015-41772	B	31	17S	28E	875N	2430E	T Rex State 003	Apache Corporation	O		Permit to Drill	
1079	30-015-41774	B	31	17S	28E	890N	1750E	T Rex State 004	Apache Corporation	O		Permit to Drill	
1080	30-015-41892	M	29	17S	28E	330S	975W	Williams A Federal 15	LRE Operating LLC	O		Permit to Drill	
1081	30-015-41959	K	2	18S	27E	2310S	1750W	Bm State 002	Apache Corporation	O		Permit to Drill	
1082	30-015-42024	1	1	18S	27E	126N	141E	Aao Federal #14	Apache Corporation	O		Permit to Drill	
1083	30-015-42025	1	1	18S	27E	1130N	2408E	Aao Federal #15	Apache Corporation	O		Permit to Drill	
1084	30-015-42026	1	1	18S	27E	1305N	2455W	Aao Federal #16	Apache Corporation	O		Permit to Drill	
1085	30-015-42029	1	1	18S	27E	1650N	865E	Aao Federal #17	Apache Corporation	O		Permit to Drill	
1086	30-015-42035	1	1	18S	27E	2310N	1650E	Aao Federal #18	Apache Corporation	O		Permit to Drill	

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
1087	30-015-42036	1	1	18S	27E	2188N	909W	Aao Federal #20	Apache Corporation	O		Permit to Drill	
1088	30-015-42051	1	1	18S	27E	2310N	2310W	Aao Federal #19	Apache Corporation	O		Permit to Drill	
1089	30-015-42116	M	29	17S	28E	990S	2160W	Williams A Federal 16	LRE Operating LLC	O		Permit to Drill	
1090	30-015-42121	C	2	18S	27E	658N	1984W	Brade State No. 5	Tarco Energy, L.C.	O		Permit to Drill	
1091	30-015-42156	D	32	17S	28E	385N	900W	Enron State 21	LRE Operating LLC	O		Permit to Drill	
1092	30-015-42334	1	1	18S	27E	1005N	1630W	Aao Federal #21	Apache Corporation	O		Permit to Drill	
1093	30-015-42335	1	1	18S	27E	790N	330W	Aao Federal #22	Apache Corporation	O		Permit to Drill	
1094	30-015-42336	1	1	18S	27E	226N	330E	Aao Federal #23	Apache Corporation	O		Permit to Drill	
1095	30-015-42337	1	1	18S	27E	984S	243E	Aao Federal #24	Apache Corporation	O		Permit to Drill	
1096	30-015-42338	1	1	18S	27E	2270S	1650W	Aao Federal #26	Apache Corporation	O		Permit to Drill	
1097	30-015-42339	1	1	18S	27E	360S	990W	Aao Federal #29	Apache Corporation	O		Permit to Drill	
1098	30-015-42358	1	1	18S	27E	183S	2497W	Aao Federal #28	Apache Corporation	O		Permit to Drill	
1099	30-015-42359	1	1	18S	27E	1960S	2063W	Aao Federal #27	Apache Corporation	O		Permit to Drill	
1100	30-015-42360	1	1	18S	27E	1261S	281W	Aao Federal #30	Apache Corporation	O		Permit to Drill	
1101	30-015-42361	1	1	18S	27E	2000S	1022W	Aao Federal #25	Apache Corporation	O		Permit to Drill	
1102	30-015-42372	D	31	17S	28E	330N	430W	Enron State #20	LRE Operating LLC	O		Permit to Drill	
1103	30-015-42555	O	29	17S	28E	330S	2310E	Outlaw State #005	Apache Corporation	O		Permit to Drill	
1104	30-015-42863	B	32	17S	28E	330S	2310E	Jackrabbit State #004	Apache Corporation	O		Permit to Drill	
1105	30-015-42864	B	32	17S	28E	1010N	2540E	Jackrabbit State #005	Apache Corporation	O		Permit to Drill	
1106	30-015-42985	G	32	17S	28E	1470N	2405E	Jackrabbit State #012	Apache Corporation	O		Permit to Drill	
1107	30-015-42986	G	32	17S	28E	2460N	2280E	Jackrabbit State #013	Apache Corporation	O		Permit to Drill	
1108	30-015-42726	O	30	17S	28E	505S	2140E	Staley State #029	LRE Operating LLC	O		ACTIVE	
1109	30-015-40983	O	30	17S	28E	330S	1650E	Staley State #020	LRE Operating LLC	O		ACTIVE	
1110	30-015-42597	A	31	17S	28E	570N	250E	Ranger State #001	Apache Corporation	O		Permit to Drill	
1111	30-015-42598	A	31	17S	28E	445N	1090E	Ranger State #002	Apache Corporation	O		Permit to Drill	
1112	--												
1113	30-015-42599	B	31	17S	28E	905N	1385E	Ranger State #001	Apache Corporation	O		Permit to Drill	
1114	30-015-42600	A	31	17S	28E	645N	250E	Ranger State #004	Apache Corporation	O		Permit to Drill	
1115	30-015-42673	H	31	17S	28E	1650N	990E	Ranger State #006	Apache Corporation	O		Permit to Drill	
1116	--												
1117	30-015-42674	H	31	17S	28E	2310N	990E	Ranger State #007	Apache Corporation	O		Permit to Drill	
1118	30-015-42675	H	31	17S	28E	1875N	110E	Ranger State #008	Apache Corporation	O		Permit to Drill	
1119	30-015-42677	I	31	17S	28E	210S	1130E	Ranger State #010	Apache Corporation	O		Permit to Drill	
1120	30-015-42676	H	31	17S	28E	2520N	195E	Ranger State #009	Apache Corporation	O		Permit to Drill	
1121	30-015-42678	I	31	17S	28E	1535S	760E	Ranger State #011	Apache Corporation	O		Permit to Drill	
1122	30-015-42679	I	31	17S	28E	1760S	245E	Ranger State #012	Apache Corporation	O		Permit to Drill	
1123	30-015-42680	I	31	17S	28E	1710S	245E	Ranger State #013	Apache Corporation	O		Permit to Drill	
1124	30-015-42681	P	16	17S	28E	225S	1300E	Ranger State #014	Apache Corporation	O		Permit to Drill	
1125	30-015-42806	P	31	17S	28E	245S	90E	Ranger State #016	Apache Corporation	O		Permit to Drill	
1126	30-015-42682	P	31	17S	28E	260S	1250E	Ranger State #015	Apache Corporation	O		Permit to Drill	
1127	30-015-42602	B	36	17S	27E	330N	2210E	Jeffers 36 State #005	LRE Operating LLC	O		Permit to Drill	
1128	30-015-42899	B	36	17S	27E	890N	1655E	Jeffers 36 State #006	LRE Operating LLC	O		ACTIVE	
1129	30-015-42027	H	1	18S	27E	1650N	865E	AAO Federal #017	Apache Corporation	O		Permit to Drill	
1130	30-015-42549	G	1	18S	27E	2470N	2380E	AAO Federal SWD #001	Apache Corporation	I		SHUT IN	
1131	30-015-25270	F	12	18S	27E	2310N	2310W	Chukka Federal #001	Bill L. Miller	O		ACTIVE	
1132	30-015-36252	N	30	17S	28E	990S	1980W	Staley State #004	LRE Operating, LLC	O		ACTIVE	
1133	30-015-37691	P	30	17S	28E	1050S	330E	Anthoney #1	LRE Operating, LLC	O		ACTIVE	
1134	30-015-40028	P	30	17S	28E	540S	837E	Anthoney State #4	LRE Operating, LLC	O		ACTIVE	
1135	30-015-40338	O	30	17S	28E	990S	2310E	Staley State #016	LRE Operating, LLC	O		ACTIVE	
1136	30-015-41065	N	30	17S	28E	990S	2335W	Staley State #24	LRE Operating, LLC	O		ACTIVE	
1137	30-015-40723	C	2	18S	28E	990N	1500W	Logan 2C State #4	Lime Rock Resources II-A, L.P.	O		ACTIVE	
1138	30-015-43066	N	35	17S	27E	870S	1640W	Logan B 35 N Federal 24	Lime Rock Resources II-A, L.P.	O		Permit to Drill	
1139	30-015-43252	O	35	17S	27E	720S	1670E	Logan 35 O Federal 22	Lime Rock Resources II-A, L.P.	O		Permit to Drill	
1140	30-015-42556	O	29	17S	28E	990S	1650E	The Outlaw State #006	Apache Corporation	O		ACTIVE	
1141	30-015-42557	O	29	17S	28E	330S	1650E	The Outlaw State #007	Apache Corporation	O		ACTIVE	

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
1142	30-015-42558	O	29	17S	28E	990S	2310E	The Outlaw State #008	Apache Corporation	O		ACTIVE	
1143	30-015-42725	O	30	17S	28E	685S	1630E	Staley State #28	LRE Operating, LLC	O		ACTIVE	
1144	30-015-42727	O	30	17S	28E	850S	1680W	Staley State #30	LRE Operating, LLC	O		ACTIVE	
1145	30-015-42601	H	31	17S	28E	1825N	110E	Ranger State 005	Apache Corporation	O		Permit to Drill	
1146	30-015-42984	G	32	17S	28E	1535N	1680E	Jack Rabbit State #11	Apache Corporation	O		Permit to Drill	
1147	30-015-32554	N	29	17S	28E	590S	2185W	WILLIAMS A FEDERAL #001Z	VANGUARD OPERATING LLC			ACTIVE	
1148	30-015-42556	O	29	17S	28E	990S	1650E	OUTLAW STATE #006	APACHE CORPORATION			ACTIVE	
1149	30-015-42557	O	29	17S	28E	330S	1650E	OUTLAW STATE #007	APACHE CORPORATION			ACTIVE	
1150	30-015-42558	O	29	17S	28E	990S	2310E	OUTLAW STATE #008	APACHE CORPORATION			ACTIVE	
1151	30-015-31285	O	30	17S	28E	890S	1650E	STALEY STATE #002	VANGUARD OPERATING LLC			ACTIVE	
1152	30-015-36564	O	30	17S	28E	330S	2210E	STALEY STATE #009	VANGUARD OPERATING LLC			ACTIVE	
1153	30-015-37673	N	30	17S	28E	330S	1650W	STALEY STATE #012	VANGUARD OPERATING LLC			ACTIVE	
1154	30-015-39638	P	30	17S	28E	412S	679E	ANTHONEY STATE #003	VANGUARD OPERATING LLC			ACTIVE	
1155	30-015-40026	N	30	17S	28E	330S	2410W	STALEY STATE #017	VANGUARD OPERATING LLC			ACTIVE	
1156	30-015-38512	P	31	17S	28E	990N	940W	ENRON STATE #016	VANGUARD OPERATING LLC			ACTIVE	
1157	30-015-01665	O	32	17S	28E	940S	1650E	NORTHWEST ARTESIA UNIT #014	VANGUARD OPERATING LLC			ACTIVE	
1158	30-015-02312	G	32	17S	28E	1980N	1650E	NORTHWEST ARTESIA UNIT #005	VANGUARD OPERATING LLC			ACTIVE	
1159	30-015-10109	B	32	17S	28E	990N	1650E	NORTHWEST ARTESIA UNIT #003	VANGUARD OPERATING LLC			ACTIVE	
1160	30-015-30684	G	32	17S	28E	1650N	1650E	NW STATE #003	VANGUARD OPERATING LLC			ACTIVE	
1161	30-015-30734	B	32	17S	28E	1140N	2277E	NW STATE #004	VANGUARD OPERATING LLC			ACTIVE	
1162	30-015-30887	J	32	17S	28E	2141S	1665E	JEFFERS 32 STATE #001	VANGUARD OPERATING LLC			ACTIVE	
1163	30-015-30890	B	32	17S	28E	330N	1650E	NW STATE #016	VANGUARD OPERATING LLC			ACTIVE	
1164	30-015-31934	G	32	17S	28E	2272N	2273E	NW STATE #018	VANGUARD OPERATING LLC			ACTIVE	
1165	30-015-34148	J	32	17S	28E	1370S	1609E	ASPEN 32 STATE COM #001	VANGUARD OPERATING LLC			ACTIVE	
1166	30-015-37045	J	32	17S	28E	1563S	2207E	JEFFERS 32 STATE #002	VANGUARD OPERATING LLC			ACTIVE	
1167	30-015-39927	K	32	17S	28E	1750S	1765W	AB STATE 647 #001	APACHE CORPORATION			ACTIVE	
1168	30-015-00634	P	35	17S	27E	330S	330E	SOUTH RED LAKE II UNIT No. 029	REMNANT OIL OPERATING LLC			TEMPORARILY ABANDONED	
1169	30-015-00645	N	35	17S	27E	330S	1650W	SOUTH RED LAKE II UNIT No. 032	REMNANT OIL OPERATING LLC			ACTIVE	
1170	30-015-01222	O	35	17S	27E	330S	2310E	SOUTH RED LAKE II UNIT No. 030	REMNANT OIL OPERATING LLC			P&A	
1171	30-015-31541	B	36	17S	27E	460N	1650E	JEFFERS 36 STATE No. 003	VANGUARD OPERATING LLC			ACTIVE	
1172	30-015-34089	B	36	17S	27E	330N	2310E	STATE A No. 003	LLJ VENTURES, LLC DBA MARKER OIL & GAS			ACTIVE	
1173	30-015-36342	B	36	17S	27E	990N	1650E	STATE A No. 004	LLJ VENTURES, LLC DBA MARKER OIL & GAS			ACTIVE	
1174	30-015-22658	J	1	18S	27E	1500S	2130E	EMPIRE ABO UNIT No. 194	APACHE CORP			T/A	
1176	30-015-32308	C	1	18S	27E	430N	2310W	AAO FEDERAL No. 002	APACHE CORP			T/A	
1177	30-015-32959	E	1	18S	27E	1650N	875W	AAO FEDERAL No. 005	APACHE CORP			P&A	
1178	30-015-00725	C	2	18S	27E	330N	2310W	SOUTH RED LAKE II UNIT No. 034	REMNANT OIL OPERAING LLC			ACTIVE	
1179	30-015-01211	B	2	18S	27E	330N	2310W	SOUTH RED LAKE II UNIT No. 035	REMNANT OIL OPERAING LLC			ACTIVE	
1180	30-015-22777	M	2	18S	27E	10S	640W	EMPIRE ABO UNIT No. 134	APACHE CORP			ACTIVE	
1181	30-015-32218	E	2	18S	27E	1650N	330W	SB STATE No. 001	APACHE CORP			ACTIVE	
1182	30-015-34632	A	14	18S	27E	660N	990E	VIOLET BIV STATE COM No. 001A	EOG Y RESOURCES, INC.			NEW	
1183	30-015-40187	A	14	18S	27E	660N	990E	VIOLET BIV STATE COM No. 001	EOG Y RESOURCES INC.			NEW	
1184	30-015-43628	E	14	18S	27E	1760N	880W	CHOATE DAVIS 14 STATE SWD No. 002	LIME ROCK RESOURCES II-A L.P.			NEW	
1185	30-015-01655	J	32	17S	28E	2310S	1650E	STATE 32 No. 001	ROVER OPERATING LLC			NEW	
1186	30-015-01656	J	32	17S	28E	1980S	1980E	STATE 32 No. 002	ROVER OPERATING LLC			NEW	
1187	30-015-22526	B	5	18S	28E	1300N	2345E	EMPIRE ABO UNIT No. 272A	APACHE CORP			T&A	
1188	30-015-25277	O	5	18S	28E	660S	1980E	SOLT STATE No. 001	ROVER OPERATING LLC			ACTIVE	
1189	30-015-25390	O	5	18S	28E	990S	1650E	SOLT STATE No. 003	ROVER OPERATING LLC			ACTIVE	
1190	30-015-35237	M	18	18S	28E	810S	660W	LEATHERSTOCKING 18 STATE COM No. 002	V-F PETROLEUM INC.			T/A	
	30-015-36281	J		18S	27E	2193S	1520W	SUN DEVILS FEDERAL NO. 001	MACK ENERGY CORPORATION			PERMIT TO DRILL 4/11/12	

TABLE III

Well Changes in the Combined One Mile Area of Review Since the 2016 PFO TEST for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
1168	30 15 634	35	P	17S	28E	330S 330E	SOUTH RED LAKE II UNIT No. 029	REMNANT OIL OPERATING LLC	NEW AND TEMPORARILY ABANDONED			[X]			[X]	
1025	30 15 643	35	O	17S	27E	990S 2310E	SOUTH RED LAKE II UNIT No. 026	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
1027	30 15 644	35	N	17S	27E	300S 2310W	SOUTH RED LAKE II UNIT No. 031	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR AND P&A	[X]	[X]					
1169	30 15 645	35	N	17S	27E	330S 1650W	SOUTH RED LAKE II UNIT No. 032	REMNANT OIL OPERATING LLC	NEW						[X]	
1170	30 15 1222	35	O	17S	27E	330S 2310E	SOUTH RED LAKE II UNIT No. 030	REMNANT OIL OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1028	30 15 20104	35	P	17S	27E	990S 990E	SOUTH RED LAKE II UNIT No. 041	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR AND P&A	[X]	[X]					
3	30 15 646	36	A	17S	27E	990N 330E	DELHI No. 007	LLJ VENTURES , LLC DBA MARKER OIL & GA	CHANGE OF OPERATOR	[X]						
6	30 15 667	36	G	17S	27E	2310N 2310E	SOUTH RED LAKE II UNIT No. 011	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
10	30 15 669	36	H	17S	27E	2310N 330E	HOMAN No. 001	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CHANGE OF OPERATOR	[X]						
8	30 15 689	36	H	17S	27E	1650N 330E	GATES STATE #001	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CHANGE OF OPERATOR	[X]						
5	30 15 690	36	G	17S	27E	1830N 2205E	CONKLIN #002	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CHANGE OF OPERATOR	[X]						
1	30 15 693	36	A	17S	27E	330N 330E	DELHI No. 001	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CHANGE OF OPERATOR	[X]						
18	30 15 5934	36	J	17S	27E	1650S 1650E	EMPIRE ABO UNIT No. 019A	APACHE CORP	TEMPORARILY ABANDONED			[X]				
912	30 15 31036	36	H	17S	27E	2310N 990E	GATES STATE No. 003	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CHANGE OF OPERATOR	[X]						
1171	30 15 31541	36	B	17S	27E	460N 1650E	JEFFERS 36 STATE No. 003	VANGUARD OPERATING LLC	NEW						[X]	
1172	30 15 34089	36	B	17S	27E	330N 2310E	STATE A No. 003	LLJ VENTURES, LLC DBA MARKER OIL & GAS	NEW AND CHANGE OF OPERATOR	[X]					[X]	
957	30 15 36116	36	G	17S	27E	2305N 1650E	SOUTH RED LAKE UNIT II No. 57	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
1173	30 15 36342	36	B	17S	27E	990N 1650E	STATE A No. 004	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CHANGE OF OPERATOR	[X]						
968	30 15 39029	36	G	17S	27E	2210N 2310E	CONKLIN No. 001Y	LLJ VENTURES , LLC DBA MARKER OIL & GA	CHANGE OF OPERATOR	[X]						
975	30 15 39401	36	P	17S	27E	1110S 630E	EMPIRE ABO UNIT No. 417	APACHE CORP	TEMPORARILY ABANDONED			[X]				
135	30 15 706	1	F	18S	27E	2310N 1980W	EMPIRE ABO UNIT No. 018A	APACHE CORP	RECOMPLETION					[X]		
154	30 15 707	1	K	18S	27E	1980S 1980W	EMPIRE ABO UNIT No. 018B	APACHE CORP	P&A	[X]						
748	30 15 715	1	D	18S	27E	330N 330W	SOUTH RED LAKE II UNIT No. 037	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
129	30 15 1215	1	D	18S	27E	667N 666E	EMPIRE ABO UNIT No. 020D	APACHE CORP	P&A		[X]					
140	30 15 21783	1	H	18S	27E	2490N 1299E	EMPIRE ABO UNIT No. 202	APACHE CORP	P&A		[X]					
155	30 15 21792	1	K	18S	27E	1533S 2370W	EMPIRE ABO UNIT No. 182	APACHE CORP	T&A			[X]				
149	30 15 21873	1	J	18S	27E	1526S 1470E	EMPIRE ABO UNIT No. 191A	APACHE CORP	P&A		[X]					
152	30 15 22096	1	K	18S	27E	2370S 1510W	EMPIRE ABO UNIT No. 183	APACHE CORP	T&A			[X]				
148	30 15 22560	1	J	18S	27E	220S 1390E	EMPIRE ABO UNIT No. 192	APACHE CORP	T&A			[X]				
146	30 15 22657	1	J	18S	27E	2490S 2200E	EMPIRE ABO UNIT No. 193	APACHE CORP	T&A			[X]				
1174	30 15 22658	1	J	18S	27E	1500S 2130E	EMPIRE ABO UNIT No. 194	APACHE CORP	NEW & T&A			[X]			[X]	
1175	30 15 26575	1	N	18S	27E	790S 2250W	WDW No. 003	NAVAJO REFINING COMPANY, LLC	NEW						[X]	
1176	30 15 32308	1	C	18S	27E	430N 2310W	AAO FEDERAL No. 002	APACHE CORP	NEW & T&A			[X]			[X]	
1177	30 15 32959	1	E	18S	27E	1650N 875W	AAO FEDERAL No. 005	APACHE CORP	NEW & P&A		[X]				[X]	
1082	30 15 42024	1	A	18S	27E	126N 141E	AAO FEDERAL No. 014	APACHE CORP	NOW ACTIVE							
1092	30 15 42334	1	C	18S	27E	1005N 1630W	AAO FEDERAL No. 021	APACHE CORP	NOW ACTIVE							
1096	30 15 42338	1	K	18S	27E	2270S 1650W	AAO FEDERAL No. 026	APACHE CORP	NOW ACTIVE							
1101	30 15 42361	1	L	18S	27E	2000S 1022W	AAO FEDERAL No. 025	APACHE CORP	NOW ACTIVE							
1130	30 15 42549	1	G	18S	27E	2470N 2380E	AAO FEDERAL SWD No. 001	APACHE CORP	NOW ACTIVE							
758	30 15 721	2	A	18S	27E	330N 990E	SOUTH RED LAKE II UNIT No. 036	REMNANT OIL OPERATING LLC	NEW						[X]	
765	30 15 724	2	A	18S	27E	990N 330E	EMPIRE ABO UNIT No. 016B	APACHE CORP	CHANGE OF OPERATOR & T&A	[X]		[X]				
1178	30 15 725	2	C	18S	27E	330N 2310W	SOUTH RED LAKE II UNIT No. 034	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
766	30 15 737	2	B	18S	27E	905N 1610E	SOUTH RED LAKE II UNIT No. 038	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
1179	30 15 1211	2	B	18S	27E	330N 2310W	SOUTH RED LAKE II UNIT No. 035	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR	[X]						
1180	30 15 22777	2	M	18S	27E	10S 640W	EMPIRE ABO UNIT No. 134	APACHE CORP	NEW						[X]	
1064	30 15 32070	2	M	18S	27E	660S 990W	BB STATE COM No. 001	APACHE CORP	P&A		[X]					
1181	30 15 32218	2	E	18S	27E	1650N 330W	SB STATE No. 001	APACHE CORP	NEW						[X]	
976	30 15 39009	2	G	18S	27E	1650N 2430E	EMPIRE ABO UNIT No. 415	APACHE CORP	P&A		[X]					
843	30 15 22833	11	D	18S	27E	450N 1175W	EMPIRE ABO UNIT No. 133B	APACHE CORP	P&A		[X]					
841	30 15 22834	11	C	18S	27E	225N 2280W	EMPIRE ABO UNIT No . 141B	APACHE CORP	P&A		[X]					
1131	30 15 25270	12	F	18S	27E	2310N 2310W	CHUKKA FEDERAL No. 001	BILL L MILLER	NOW ACTIVE							
882	30 15 883	13	D	18S	27E	990N 990W	ARTESIA STATE UNIT No. 801	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
897	30 15 895	14	H	18S	27E	1650N 330E	ARTESIA STATE UNIT No. 301	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
935	30 15 27437	14	B	18S	27E	660N 1980E	BEAUREGARD ANP STATE COM No. 001	EOG Y RESOURCES INC.	CHANGE OF OPERATOR	[X]						
1182	30 15 34632	14	B	18S	27E	660N 990E	VIOLET BIV STATE COM No. 001A	EOG Y RESOURCES INC.	NEW AND CHANGE OF OPERATOR	[X]					[X]	
955	30 15 36939	14	A	18S	27E	661N 991E	VIOLET BIV STATE COM No. 001C	EOG Y RESOURCES INC.	CHANGE OF OPERATOR	[X]						
955	30 15 40187	14	A	18S	27E	660N 990E	VIOLET BIV STATE COM No. 001	EOG Y RESOURCES INC.	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1184	30 15 43628	14	E	18S	27E	1760N 880W	CHOATE DAVIS 14 STATE SWD No. 002	LIME ROCK RESOURCES II-A L.P.	NEW						[X]	
37	30 15 1633	31	D	18S	27E	330N 330W	ASTON & FAIR A No. 001	LLJ VENTURES , LLC DBA MARKER OIL & GA	CHANGE OF OPERATOR	[X]						
54	30 15 1639	31	M	17S	28E	990S 330W	RAMPO No. 001	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
52	30 15 1640	31	L	17S	28E	2310S 330W	RAMPO No. 002	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
49	30 15 1642	31	J	17S	28E	1650S 2310E	SATE FW No. 001	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
40	30 15 2666	31	E	17S	28E	2310N 330W	HUDSON SALKIN STATE No. 001	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
57	30 15 10118	31	N	17S	28E	766S 2188W	STATE FV No. 001	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
41	30 15 24887	31	E	17S	28E	2310N 990W	HUDSON SALKIN STATE No. 002	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
984	30 15 39020	31	O	17S	28E	140S 2560E	EMPIRE ABO UNIT No. 408	APACHE CORP	P&A		[X]					
1185	30 15 1655	32	J	17S	28E	2310S 1650E	STATE 32 No. 001	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1186	30 15 1656	32	J	17S	28E	1980S 1989E	STATE 32 No. 002	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
67	30 15 1661	32	K	17S	28E	1650S 2310W	EMPIRE ABO UNIT No. 026B	APACHE CORP	T&A			[X]				
74	30 15 21539	32	N	17S	28E	150S 1400W	EMPIRE ABO UNIT No. 261	APACHE CORP	P&A		[X]					
75	30 15 22009	32	O	17S	28E	330S 2481E	EMPIRE ABO UNIT No. 272	APACHE CORP	T&A			[X]				
988	30 15 39064	32	O	17S	28E	1175S 1310E	EMPIRE ABO UNIT No. 403	APACHE CORP	P&A		[X]					
1052	30 15 41504	32	N	17S	28E	330S 1650W	AB STATE 647 No. 015	APACHE CORP	RECOMPLETION					[X]		
76	30 15 2606	5	C	18S	28E	330N 1941W	EMPIRE ABO UNIT No. 026E	APACHE CORP	T&A			[X]				
1187	30 15 22526	5	B	18S	28E	1300N 2345E	EMPIRE ABO UNIT No. 272A	APACHE CORP	T&A			[X]				
1188	30 15 25277	5	O	18S	28E	660S 1980E	SOLT STATE No. 001	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1189	30 15 25390	5	O	18S	28E	990S 1650E	SOLT STATE No. 003	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
100	30 15 10107	6	F	18S	28E	1874N 1874W	STATE FX No. 001	ROVER OPERATING LLC	CHANGE OF OPERATOR	[X]						
102	30 15 22527	6	F	18S	28E	2630N 1930W	EMPIRE ABO UNIT No. 223	APACHE CORP	T&A			[X]				
1190	30 15 35237	18	M	18S	28E	810S 660W	LEATHERSTOCKING 18 STATE COM No. 002	V-F PETROLEM INC.	T&A			[X]				

TABLE IV
Wells that have been Plugged and Abandoned since the 2016 PFO 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
1027	30	15	644	35	N	17S	27E	300S 2310W	SOUTH RED LAKE II UNIT No. 031	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR AND P&A	[X]	[X]					
1028	30	15	20104	35	P	17S	27E	990S 990E	SOUTH RED LAKE II UNIT No. 041	REMNANT OIL OPERATING LLC	CHANGE OF OPERATOR AND P&A	[X]	[X]					
154	30	15	707	1	K	18S	27E	1980S 1980W	EMPIRE ABO UNIT No. 018B	APACHE CORP	P&A		[X]					
129	30	15	1215	1	D	18S	27E	667N 666E	EMPIRE ABO UNIT No. 020D	APACHE CORP	P&A		[X]					
140	30	15	21783	1	H	18S	27E	2490N 1299E	EMPIRE ABO UNIT No. 202	APACHE CORP	P&A		[X]					
149	30	15	21873	1	J	18S	27E	1526S 1470E	EMPIRE ABO UNIT No. 191A	APACHE CORP	P&A		[X]					
1177	30	15	32959	1	E	18S	27E	1650N 875W	AAO FEDERAL No. 005	APACHE CORP	NEW & P&A		[X]				[X]	
1064	30	15	32070	2	M	18S	27E	660S 990W	BB STATE COM No. 001	APACHE CORP	P&A		[X]					
976	30	15	39009	2	G	18S	27E	1650N 2430E	EMPIRE ABO UNIT No. 415	APACHE CORP	P&A		[X]					
843	30	15	22833	11	D	18S	27E	450N 1175W	EMPIRE ABO UNIT No. 133B	APACHE CORP	P&A		[X]					
841	30	15	22834	11	C	18S	27E	225N 2280W	EMPIRE ABO UNIT No . 141B	APACHE CORP	P&A		[X]					
984	30	15	39020	31	O	17S	28E	140S 2560E	EMPIRE ABO UNIT No. 408	APACHE CORP	P&A		[X]					
74	30	15	21539	32	N	17S	28E	150S 1400W	EMPIRE ABO UNIT No. 261	APACHE CORP	P&A		[X]					
988	30	15	39064	32	O	17S	28E	1175S 1310E	EMPIRE ABO UNIT No. 403	APACHE CORP	P&A		[X]					

TABLE V
Wells that have been Temporally Abandoned since the 2016 PFO 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
1168	30	15	634	35	P	17S	28E	330S 330E	SOUTH RED LAKE II UNIT No. 029	REMNANT OIL OPERATING LLC	NEW AND TEMPORARILY ABANDONED			[X]			[X]	
18	30	15	5934	36	J	17S	27E	1650S 1650E	EMPIRE ABO UNIT No. 019A	APACHE CORP	TEMPORARILY ABANDONED			[X]				
975	30	15	39401	36	P	17S	27E	1110S 630E	EMPIRE ABO UNIT No. 417	APACHE CORP	TEMPORARILY ABANDONED			[X]				
155	30	15	21792	1	K	18S	27E	1533S 2370W	EMPIRE ABO UNIT No. 182	APACHE CORP	T&A			[X]				
152	30	15	22096	1	K	18S	27E	2370S 1510W	EMPIRE ABO UNIT No. 183	APACHE CORP	T&A			[X]				
148	30	15	22560	1	J	18S	27E	220S 1390E	EMPIRE ABO UNIT No. 192	APACHE CORP	T&A			[X]				
146	30	15	22657	1	J	18S	27E	2490S 2200E	EMPIRE ABO UNIT No. 193	APACHE CORP	T&A			[X]				
1174	30	15	22658	1	J	18S	27E	1500S 2130E	EMPIRE ABO UNIT No. 194	APACHE CORP	NEW & T&A			[X]			[X]	
1176	30	15	32308	1	C	18S	27E	430N 2310W	AAO FEDERAL No. 002	APACHE CORP	NEW & T&A			[X]			[X]	
765	30	15	724	2	A	18S	27E	990N 330E	EMPIRE ABO UNIT No. 016B	APACHE CORP	CHANGE OF OPERATOR & T&A	[X]		[X]				
67	30	15	1661	32	K	17S	28E	1650S 2310W	EMPIRE ABO UNIT No. 026B	APACHE CORP	T&A			[X]				
75	30	15	22009	32	O	17S	28E	330S 2481E	EMPIRE ABO UNIT No. 272	APACHE CORP	T&A			[X]				
76	30	15	2606	5	C	18S	28E	330N 1941W	EMPIRE ABO UNIT No. 026E	APACHE CORP	T&A			[X]				
1187	30	15	22526	5	B	18S	28E	1300N 2345E	EMPIRE ABO UNIT No. 272A	APACHE CORP	T&A			[X]				
102	30	15	22527	6	F	18S	28E	2630N 1930W	EMPIRE ABO UNIT No. 223	APACHE CORP	T&A			[X]				
1190	30	15	35237	18	M	18S	28E	810S 660W	LEATHERSTOCKING 18 STATE COM	V-F PETROLEM INC.	T&A			[X]				

TABLE VI
Wells that have been Recompleted in Upper Zones since the 2016 PFO 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
135	30 15 706	1	F	18S	27E	2310N 1980W	EMPIRE ABO UNIT No. 018A	APACHE CORP	RECOMPLETION					[X]		
1052	30 15 41504	32	N	17S	28E	330S 1650W	AB STATE 647 No. 015	APACHE CORP	RECOMPLETION					[X]		

TABLE VII
Newly Drilled Wells in the Area of Review since the 2016 PFO REPORT
Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

												Changes						
ID	API No.			Unit	Sect	Town	Range	Footages	Well Name	Operator	Change of Owner		P&A	T&A	Prod	Recomp	New	Total
758	30	15	721	2	A	18S	27E	330N 990E	SOUTH RED LAKE II UNIT No. 036	REMNANT OIL OPERATING LLC	NEW						[X]	
955	30	15	40187	14	A	18S	27E	660N 990E	VIOLET BIV STATE COM No. 001	EOG Y RESOURCES INC.	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1168	30	15	634	35	P	17S	28E	330S 330E	SOUTH RED LAKE II UNIT No. 029	REMNANT OIL OPERATING LLC	NEW AND TEMPORARILY ABANDONED			[X]			[X]	
1169	30	15	645	35	N	17S	27E	330S 1650W	SOUTH RED LAKE II UNIT No. 032	REMNANT OIL OPERATING LLC	NEW						[X]	
1170	30	15	1222	35	O	17S	27E	330S 2310E	SOUTH RED LAKE II UNIT No. 030	REMNANT OIL OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1171	30	15	31541	36	B	17S	27E	460N 1650E	JEFFERS 36 STATE No. 003	VANGUARD OPERATING LLC	NEW						[X]	
1172	30	15	34089	36	B	17S	27E	330N 2310E	STATE A No. 003	LLJ VENTURES, LLC DBA MARKER OIL & GAS	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1174	30	15	32218	2	E	18S	27E	1650N 330W	SB STATE No. 001	APACHE CORP	NEW			[X]			[X]	
1175	30	15	34632	14	B	18S	27E	660N 990E	VIOLET BIV STATE COM No. 001A	EOG Y RESOURCES INC.	NEW AND CHANGE OF OPERATOR			[X]			[X]	
1176	30	15	43628	14	E	18S	27E	1760N 880W	CHOATE DAVIS 14 STATE SWD No.	LIME ROCK RESOURCES II-A L.P.	NEW		[X]				[X]	
1177	30	15	1655	32	J	17S	28E	2310S 1650E	STATE 32 No. 001	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR						[X]	
1178	30	15	1656	32	J	17S	28E	1980S 1989E	STATE 32 No. 002	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	
1179	30	15	25277	5	O	18S	28E	660S 1980E	SOLT STATE No. 001	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR						[X]	
1180	30	15	25390	5	O	18S	28E	990S 1650E	SOLT STATE No. 003	ROVER OPERATING LLC	NEW AND CHANGE OF OPERATOR	[X]					[X]	

TABLE VIII

FIGURES INCLUDED IN THE REPORT

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

TABLE VIII, Continued

Figure	Description	OCD Reference
13	Chukka Well #2 Expanded Superposition Horner (Semi-Log) Plot	Section IX.18.d
14	Chukka Well #2 Hall Plot	Section IX.18.h
15	Chukka Well #2 Flowing Pressure Gradient Survey	n/a

TABLE IX

Chukka Well No. 2
Comparison of Permeability, Mobility-Thickness, Skin, False Extrapolated Pressure and Fill Depth

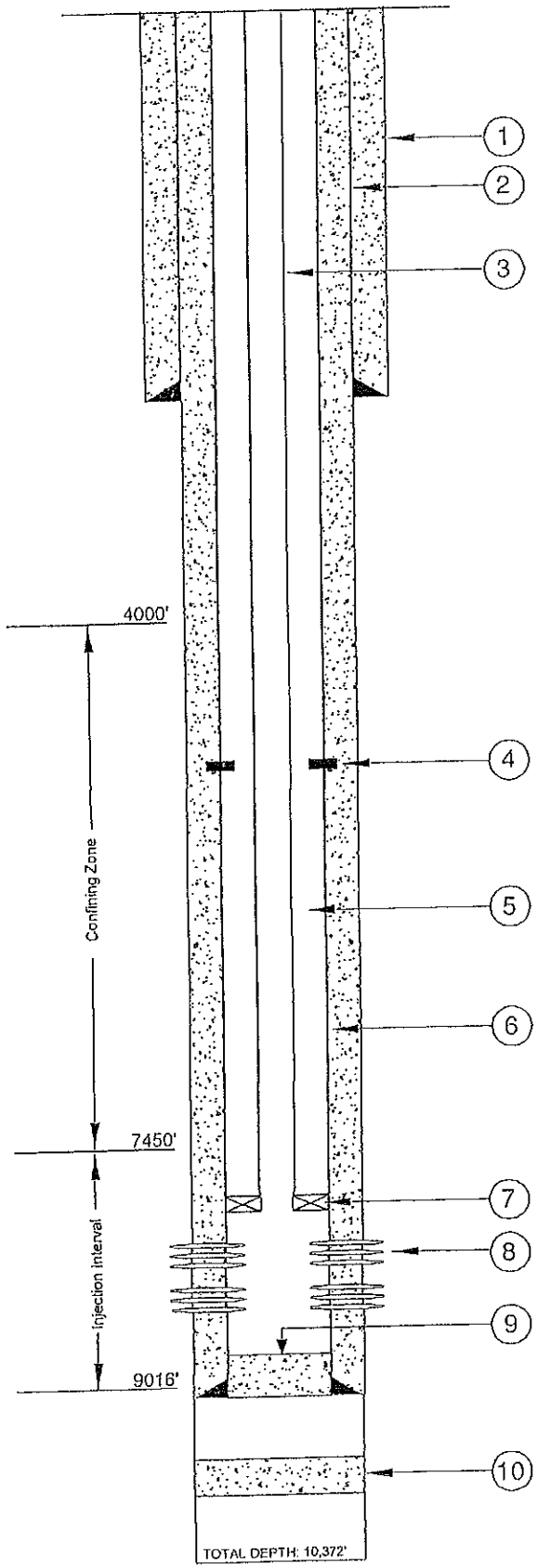
Date of Test	Permeability (k)	Mobility-Thickness (kh/u)	Skin (s)	False Extrapolated Pressure (p*)	Fill Depth
August 4, 2017 to August 10, 2017	829 md	254,457 md-ft/cp	53.85	4216.11 psia	8356 feet
July 22, 2016 to July 27, 2016	510 md	156,606 md-ft/cp	25.83	4259.41 psia	8362 feet
June 30, 2014 to July 2, 2014	1080 md	320,328 md-ft/cp	38.57	4,285.19 psia	8773 feet
November 2-3, 2012	1848 md	548,069 md-ft/cp	25.99	3898.55 psia	8775 feet
October 17-22, 2011	1451 md	430,405 md-ft/cp	29.41	3697.29 psia	8335 feet
September 28-October1, 2010	820 md	243,351 md-ft/cp	86.50	3576.58 psia	8,775 feet
October 1-4, 2009	856 md	253,821 md-ft/cp	39.74	3445.89 psia	8775 feet
April 1-4, 2008	1,091 md	265,300 md-ft/cp	155	3393.47 psia	N/A
April 3-6, 2006	2184 md	707,629 md-ft/cp	81.55	3393.63 psia	N/A
April 2005	2496 md	808,946 md-ft/cp	23.45	3347.95 psia	N/A
April 2001	2211 md	716,551 md-ft/cp	54.07	3236.42 psia	N/A
April 1999	4712 md	1,527,060 md-ft/cp	59.71	2844.45	N/A
Permit Parameters	250 md	40,094 md-ft-cp	N/A	N/A	N/A

TABLE X

NAVAJO REFINING COMPANY
FLOWING PRESSURE GRADIENT SURVEY – CHUKKA WELL No. 2
August 10, 2017

Depth (ft)	Pressure (psia)	Pressure Gradient (psi/ft)	Temperature (°F)
7570	4568.59	0.432	115.96
7000	3973.63	0.434	114.68
6000	3539.77	0.434	108.90
5000	3105.96	0.435	102.23
4000	2671.41	0.434	97.68
3000	2237.30	0.434	93.83
2000	1803.40	0.433	90.89
1000	1370.72	0.432	85.41
0	938.44		

FIGURES



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

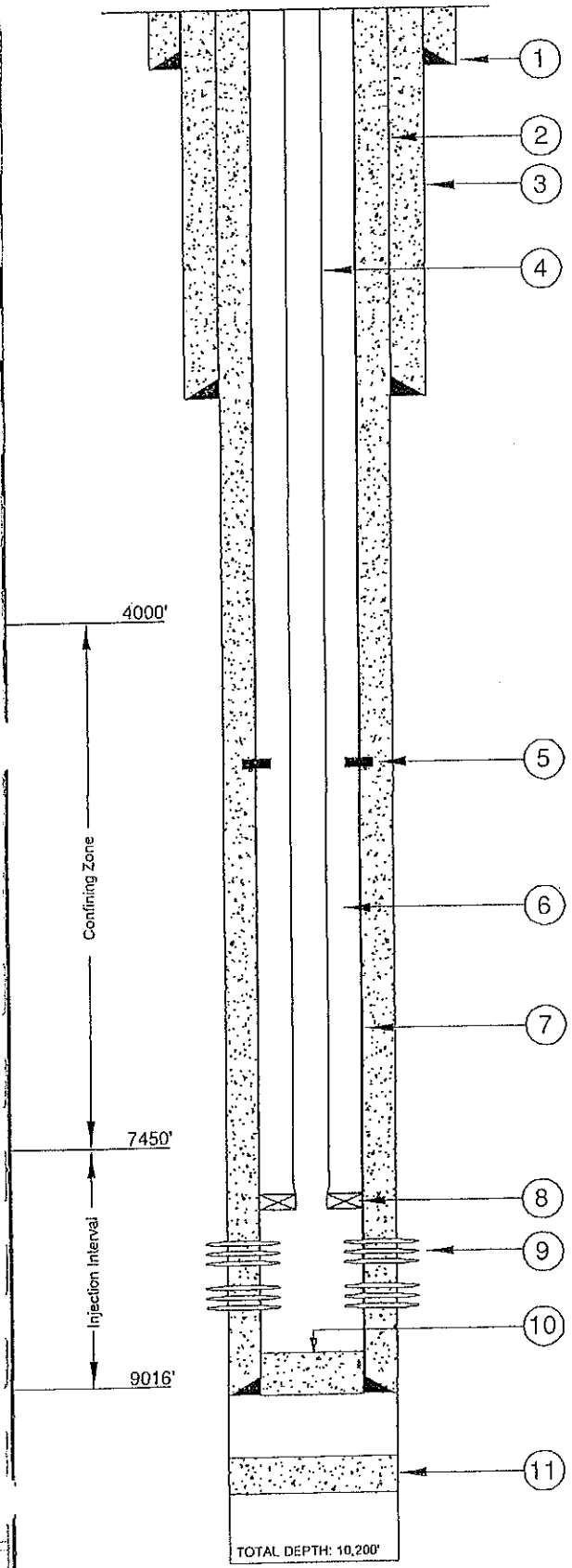
HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS
WASTE DISPOSAL WELL NO. 2

DATE: 07/13/01	CHECKED BY:	JOB NO: 70D5256
DRAWN BY: WDL	APPROVED BY:	DWG. NO:

FIGURE 1



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: 70D5256
DRAWN BY: WDL	APPROVED BY:	DWG. NO:

FIGURE 2

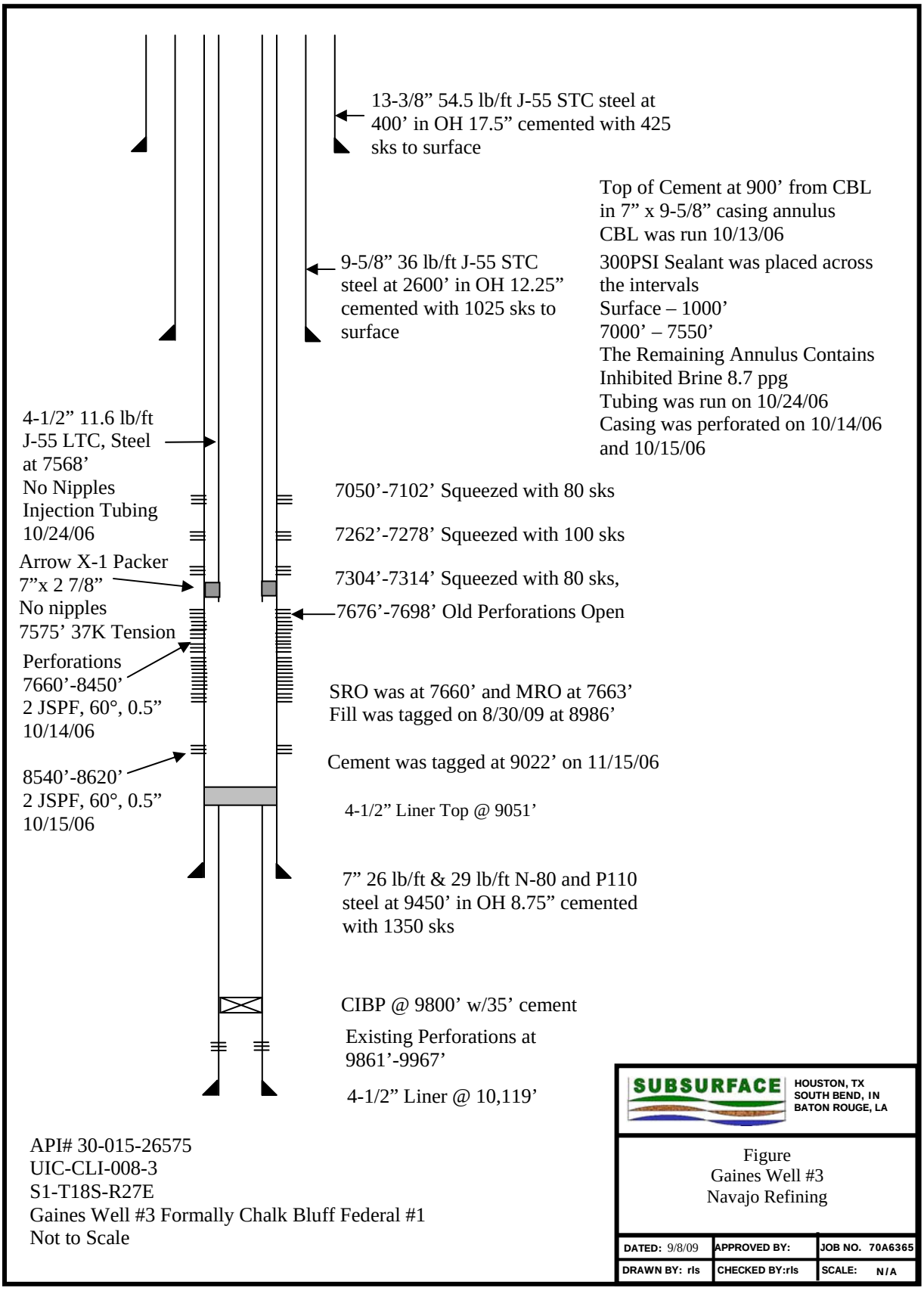
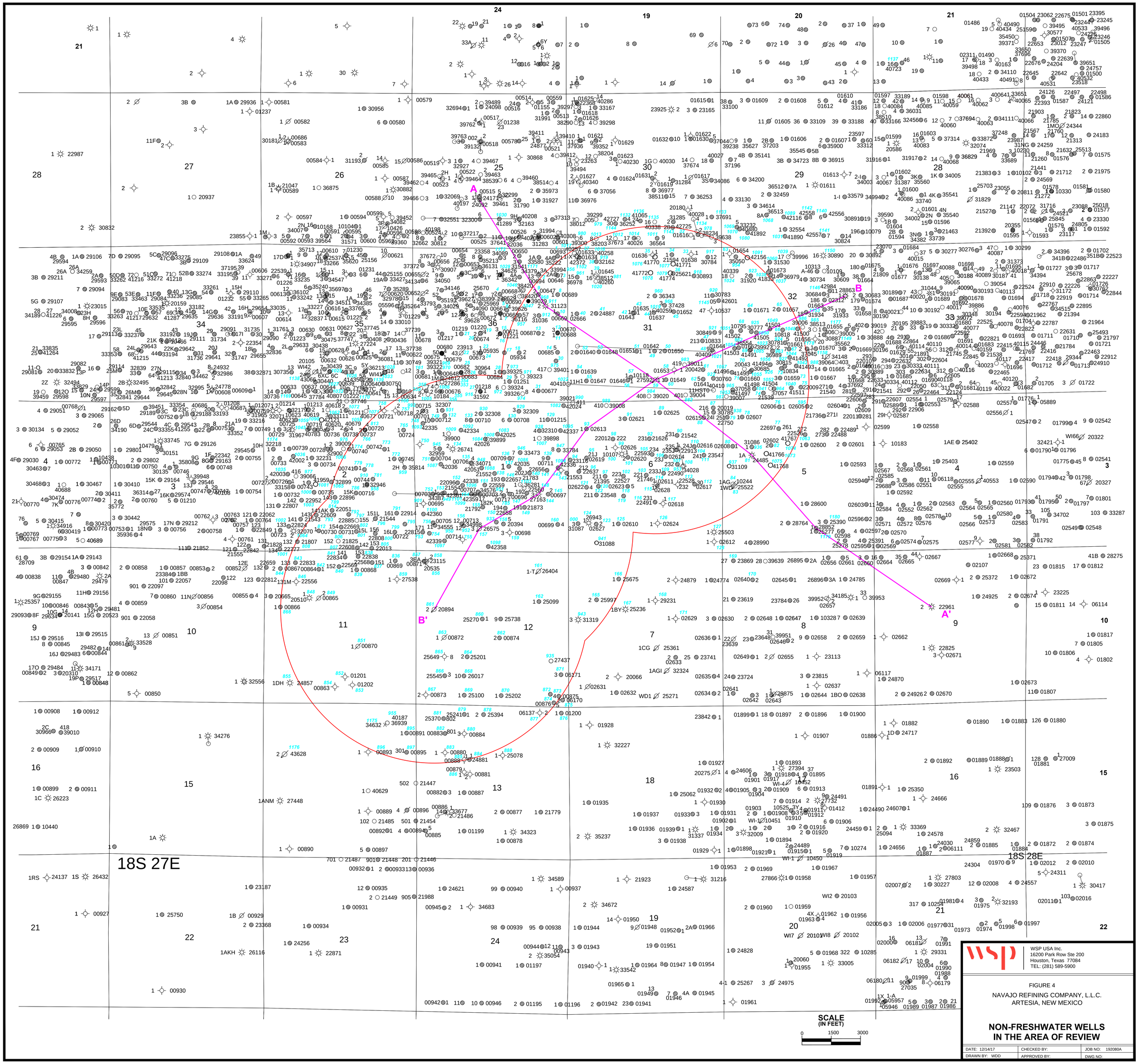

13-3/8" 54.5 lb/ft J-55 STC steel at 400' in OH 17.5" cemented with 425 sks to surface
Top of Cement at 900' from CBL in 7" x 9-5/8" casing annulus CBL was run 10/13/06
9-5/8" 36 lb/ft J-55 STC steel at 2600' in OH 12.25" cemented with 1025 sks to surface
300PSI Sealant was placed across the intervals
Surface – 1000'
7000' – 7550'
The Remaining Annulus Contains Inhibited Brine 8.7 ppg
Tubing was run on 10/24/06
Casing was perforated on 10/14/06 and 10/15/06
4-1/2" 11.6 lb/ft J-55 LTC, Steel at 7568'
No Nipples
Injection Tubing 10/24/06
7050'-7102' Squeezed with 80 sks
7262'-7278' Squeezed with 100 sks
Arrow X-1 Packer 7"x 2 7/8"
No nipples
7575' 37K Tension
7304'-7314' Squeezed with 80 sks,
7676'-7698' Old Perforations Open
Perforations 7660'-8450' 2 JSPF, 60°, 0.5" 10/14/06
SRO was at 7660' and MRO at 7663'
Fill was tagged on 8/30/09 at 8986'
Cement was tagged at 9022' on 11/15/06
8540'-8620' 2 JSPF, 60°, 0.5" 10/15/06
4-1/2" Liner Top @ 9051'
7" 26 lb/ft & 29 lb/ft N-80 and P110 steel at 9450' in OH 8.75" cemented with 1350 sks
CIBP @ 9800' w/35' cement
Existing Perforations at 9861'-9967'
4-1/2" Liner @ 10,119'
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



WSP USA Inc.
16200 Park Row Ste 200
Houston, Texas 77084
TEL: (281) 589-5900

FIGURE 4

NAVAJO REFINING COMPANY, L.L.C.
ARTESIA, NEW MEXICO

NON-FRESHWATER WELLS IN THE AREA OF REVIEW

DATE: 12/14/17	CHECKED BY:	JOB NO: 192080A	
DRAWN BY: WDD	APPROVED BY:	DWG NO:	

SUBSURFACE TECHNOLOGY

FIGURE 5

WELL: NAVAJO REFINING WDW #2

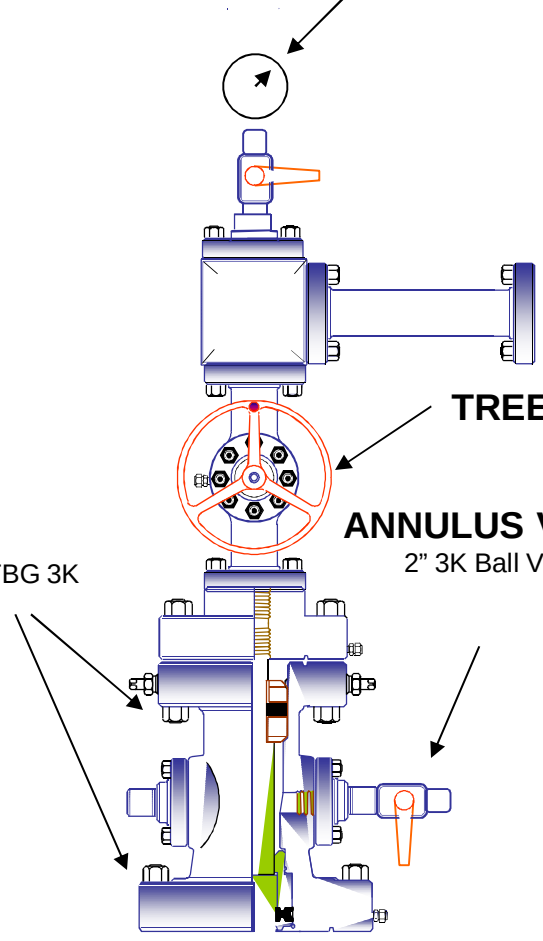
TOP CONNECTION
2-3/8” 8rd x 4-1/16” 3K
2” x 2-3/8” Ball Valve
2-3/8” Bull Plug 1/2” NPT
5000 LB Pressure Guage

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

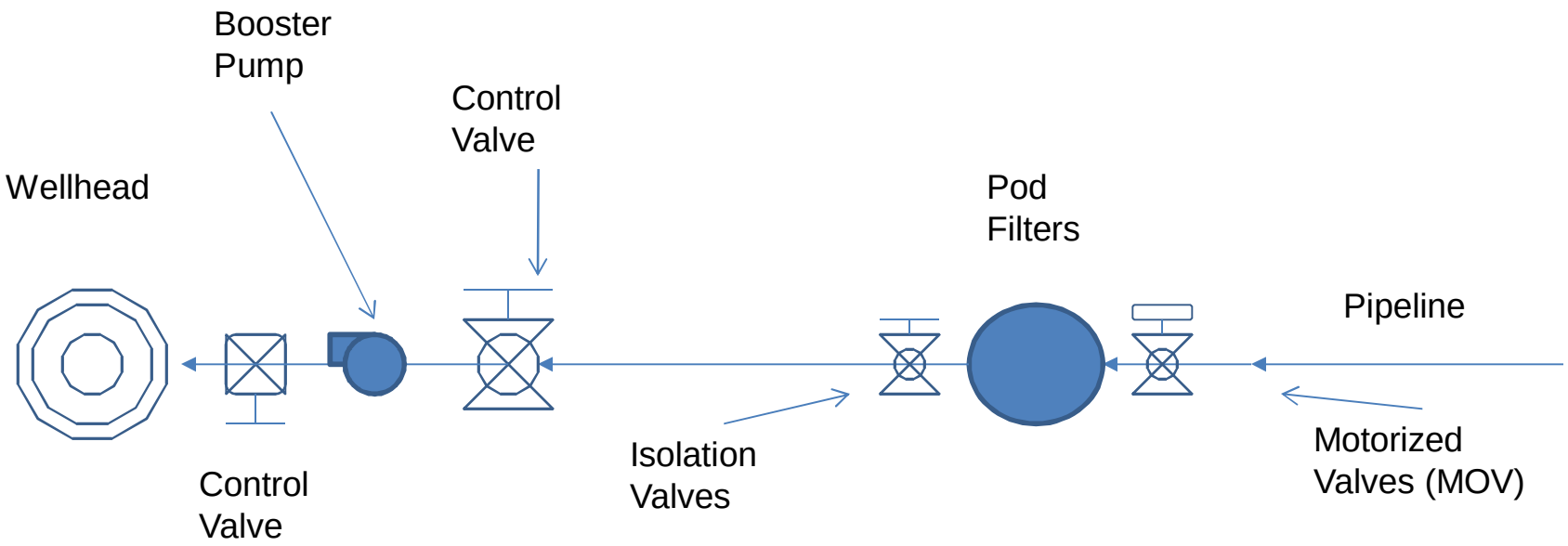


SUPERIOR WELLHEAD

FIGURE 6

Chukka Well No. 2

Diagram of Shut-in Valve Control



At Shut-in

- Close MOV
- Close Control Valve
- Close Isolation Valves
- Close Control Valve
- Drain POD Filters

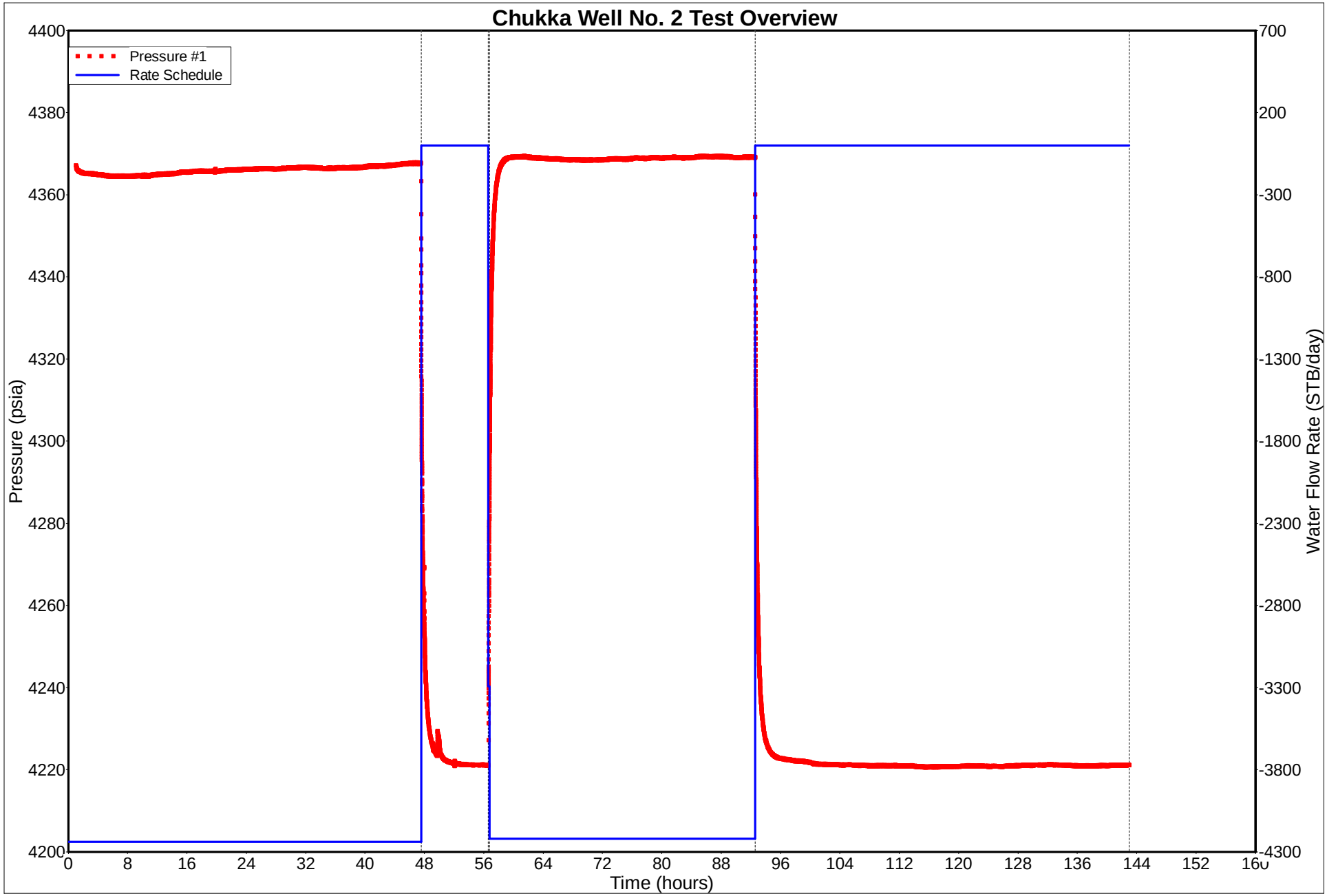

Chukka Well No. 2 Test Overview
Pressure #1
Rate Schedule
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
4400
4380
4360
4340
4320
4300
4280
4260
4240
4220
4200
700
200
-300
-800
-1300
-1800
-2300
-2800
-3300
-3800
-4300
0
8
16
24
32
40
48
56
64
72
80
88
96
104
112
120
128
136
144
152
160

FIGURE 7

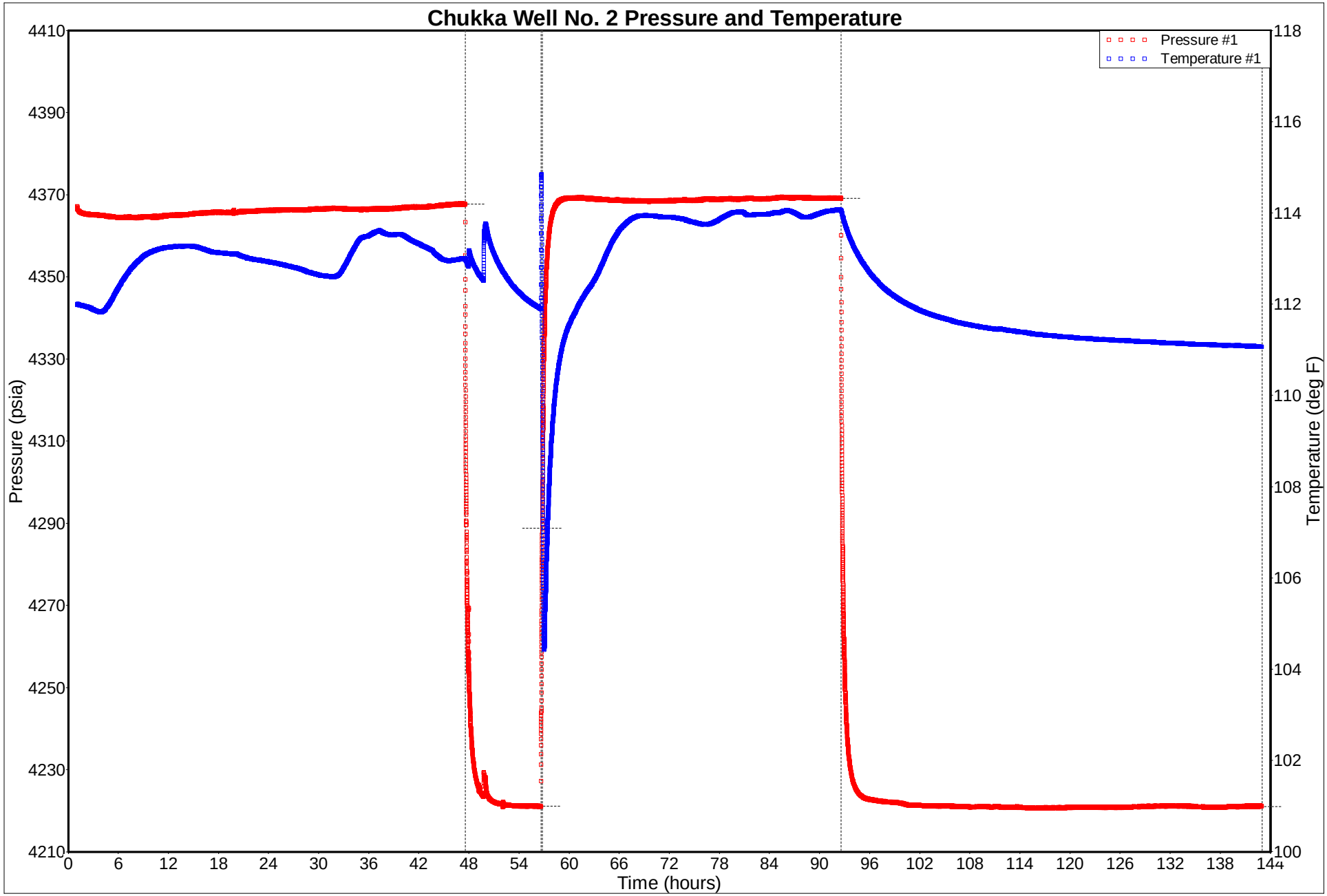

Chukka Well No. 2 Pressure and Temperature
Pressure #1
Temperature #1
Pressure (psia)
Temperature (deg F)
Time (hours)
4410
4390
4370
4350
4330
4310
4290
4270
4250
4230
4210
118
116
114
112
110
108
106
104
102
100
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108
114
120
126
132
138
144

FIGURE 8

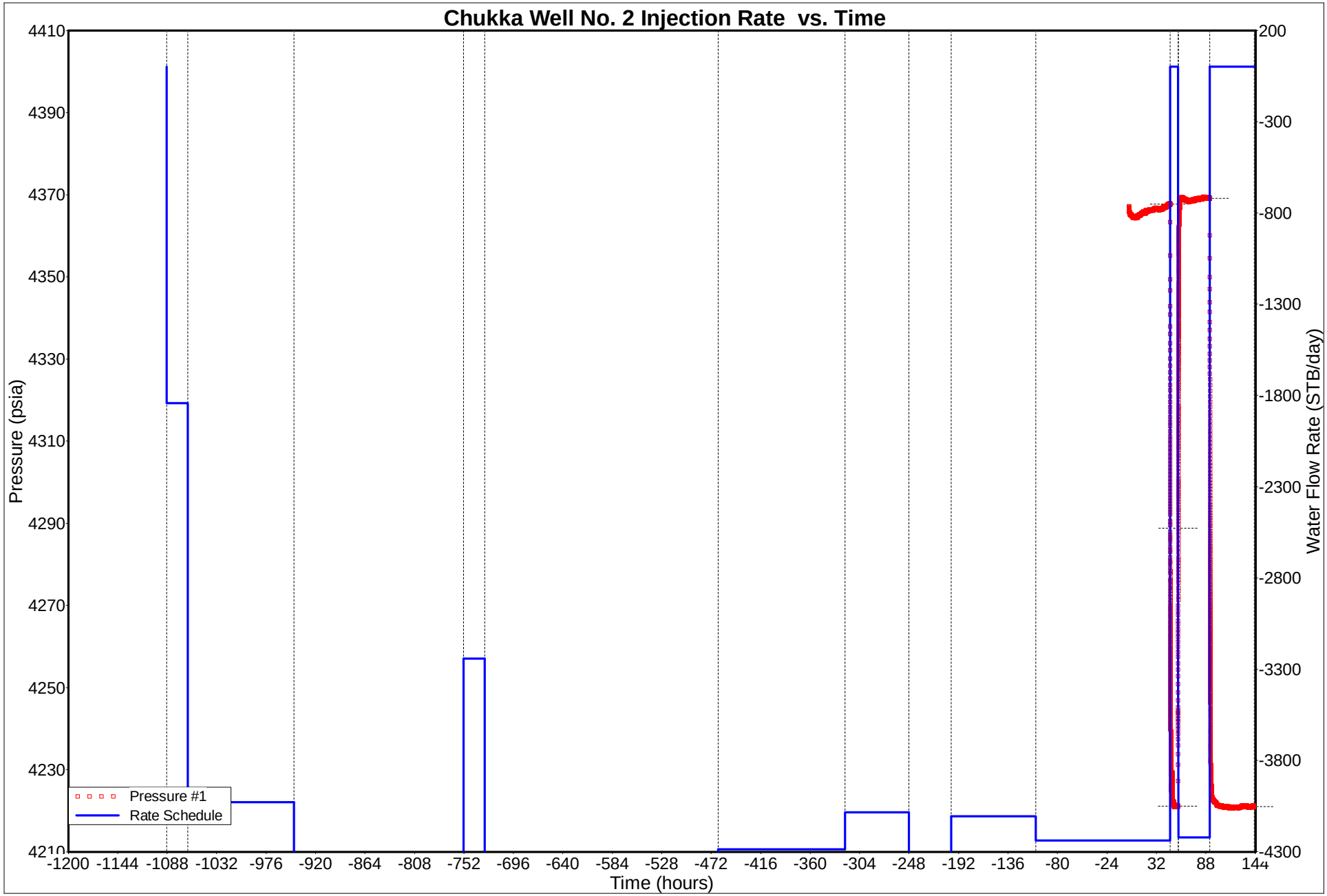

Chukka Well No. 2 Injection Rate vs. Time
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
Pressure #1
Rate Schedule
4410
4390
4370
4350
4330
4310
4290
4270
4250
4230
4210
200
-300
-800
-1300
-1800
-2300
-2800
-3300
-3800
-4300
-1200 -1144 -1088 -1032 -976 -920 -864 -808 -752 -696 -640 -584 -528 -472 -416 -360 -304 -248 -192 -136 -80 -24 32 88 144

FIGURE 9

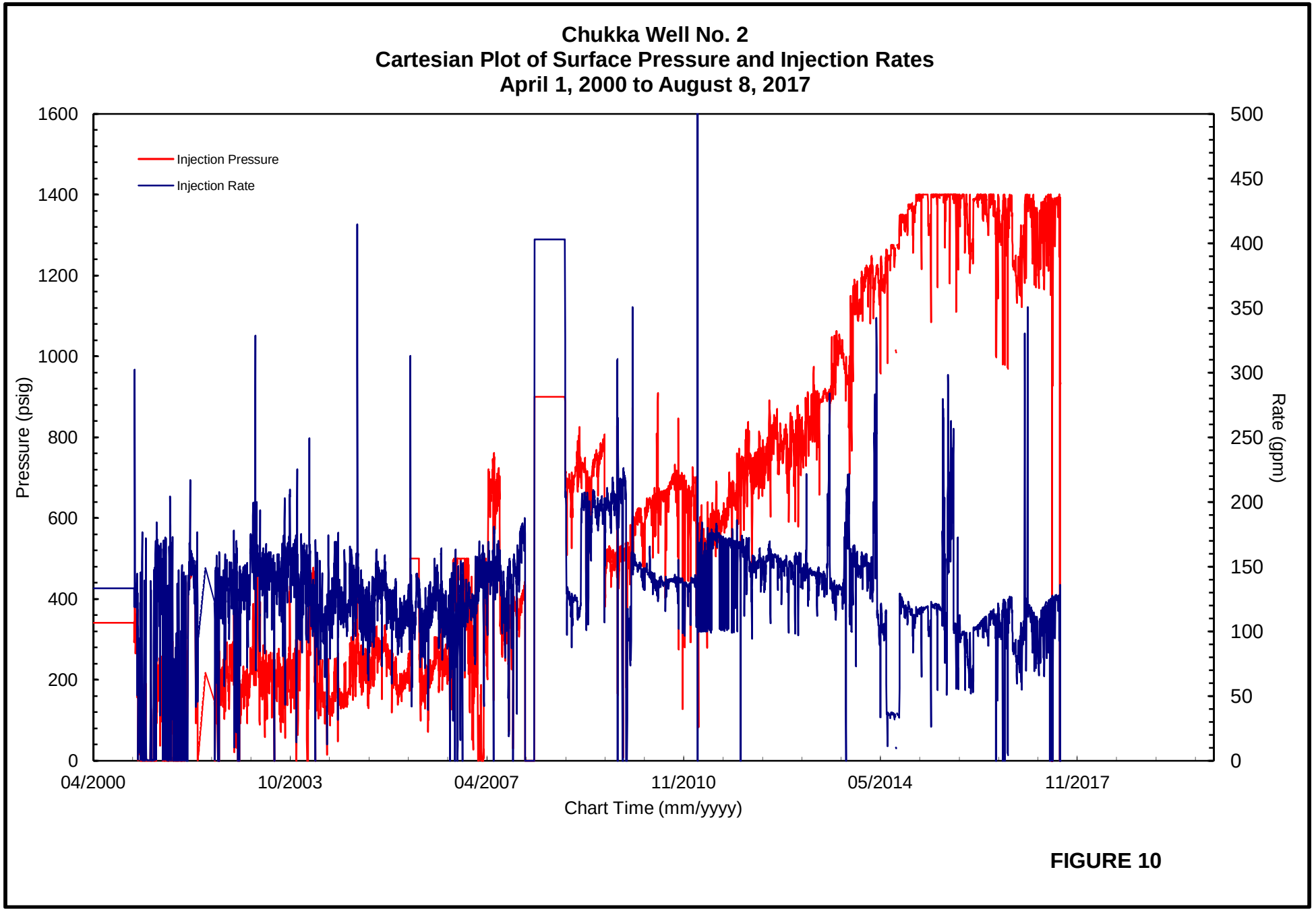

Chukka Well No. 2
Cartesian Plot of Surface Pressure and Injection Rates
April 1, 2000 to August 8, 2017
Injection Pressure
Injection Rate
Pressure (psig)
Rate (gpm)
Chart Time (mm/yyyy)
1600
1400
1200
1000
800
600
400
200
0
500
450
400
350
300
250
200
150
100
50
0
04/2000
10/2003
04/2007
11/2010
05/2014
11/2017

FIGURE 10

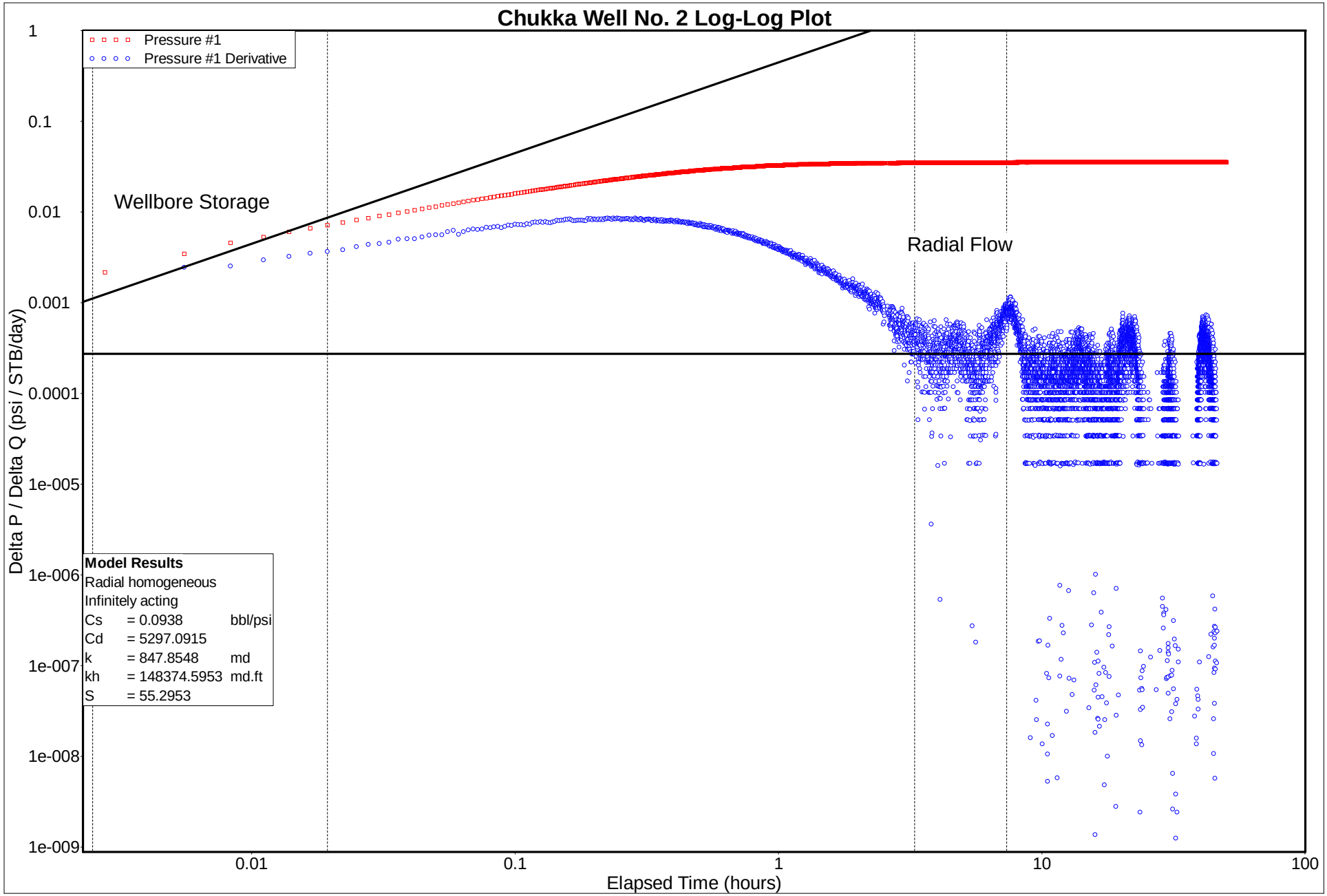

Chukka Well No. 2 Log-Log Plot
Pressure #1
Pressure #1 Derivative
Wellbore Storage
Radial Flow
Model Results
Radial homogeneous
Infinitely acting
Cs = 0.0938 bbl/psi
Cd = 5297.0915
k = 847.8548 md
kh = 148374.5953 md.ft
S = 55.2953
Delta P / Delta Q (psi / STB/day)
1
0.1
0.01
0.001
0.0001
1e-005
1e-006
1e-007
1e-008
1e-009
0.01
0.1
1
10
100
Elapsed Time (hours)

FIGURE 11

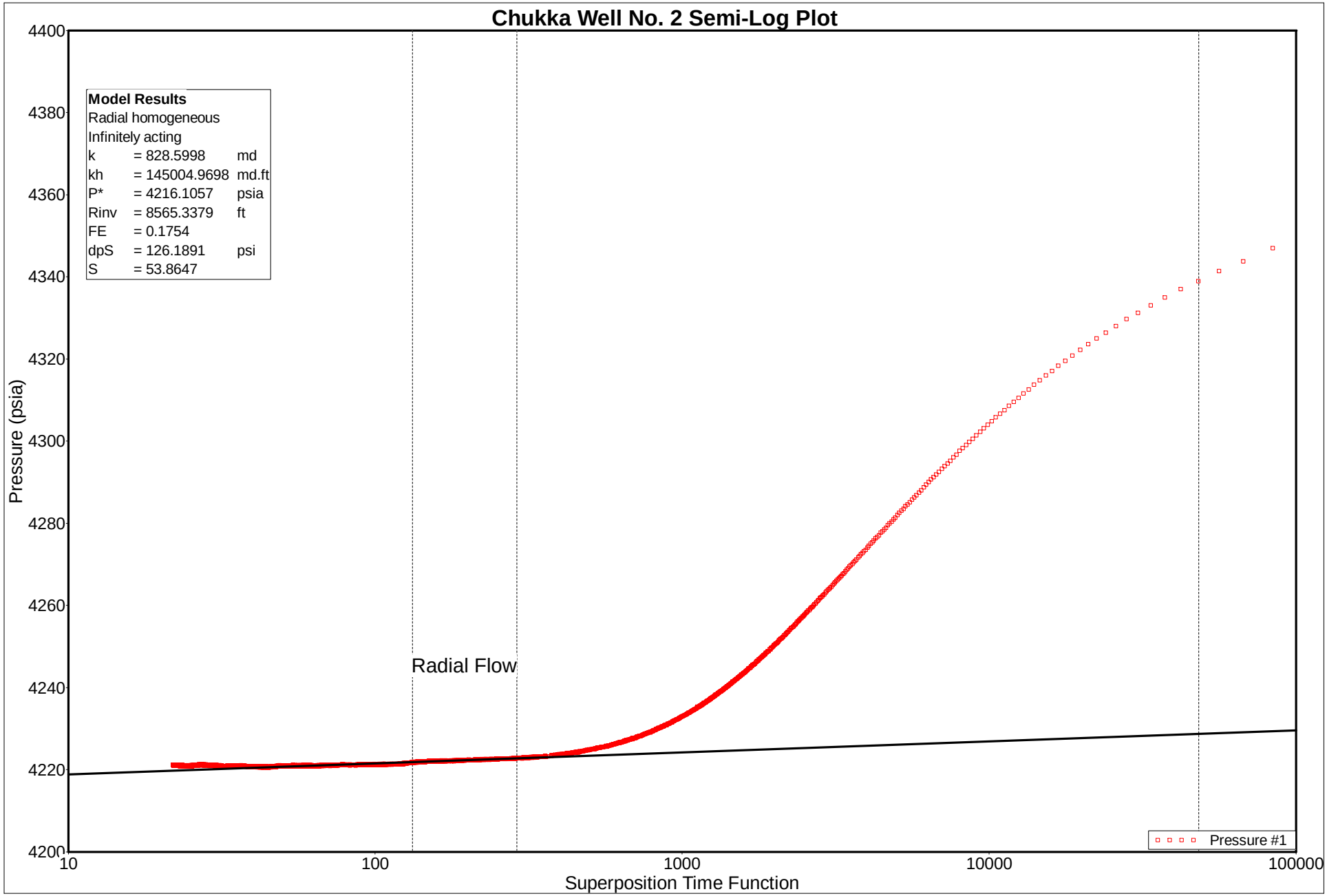

Chukka Well No. 2 Semi-Log Plot
Model Results
Radial homogeneous
Infinitely acting
k = 828.5998 md
kh = 145004.9698 md.ft
P* = 4216.1057 psia
Rinv = 8565.3379 ft
FE = 0.1754
dpS = 126.1891 psi
S = 53.8647
Radial Flow
Pressure (psia)
4400
4380
4360
4340
4320
4300
4280
4260
4240
4220
4200
10
100
1000
10000
100000
Superposition Time Function
Pressure #1

FIGURE 12

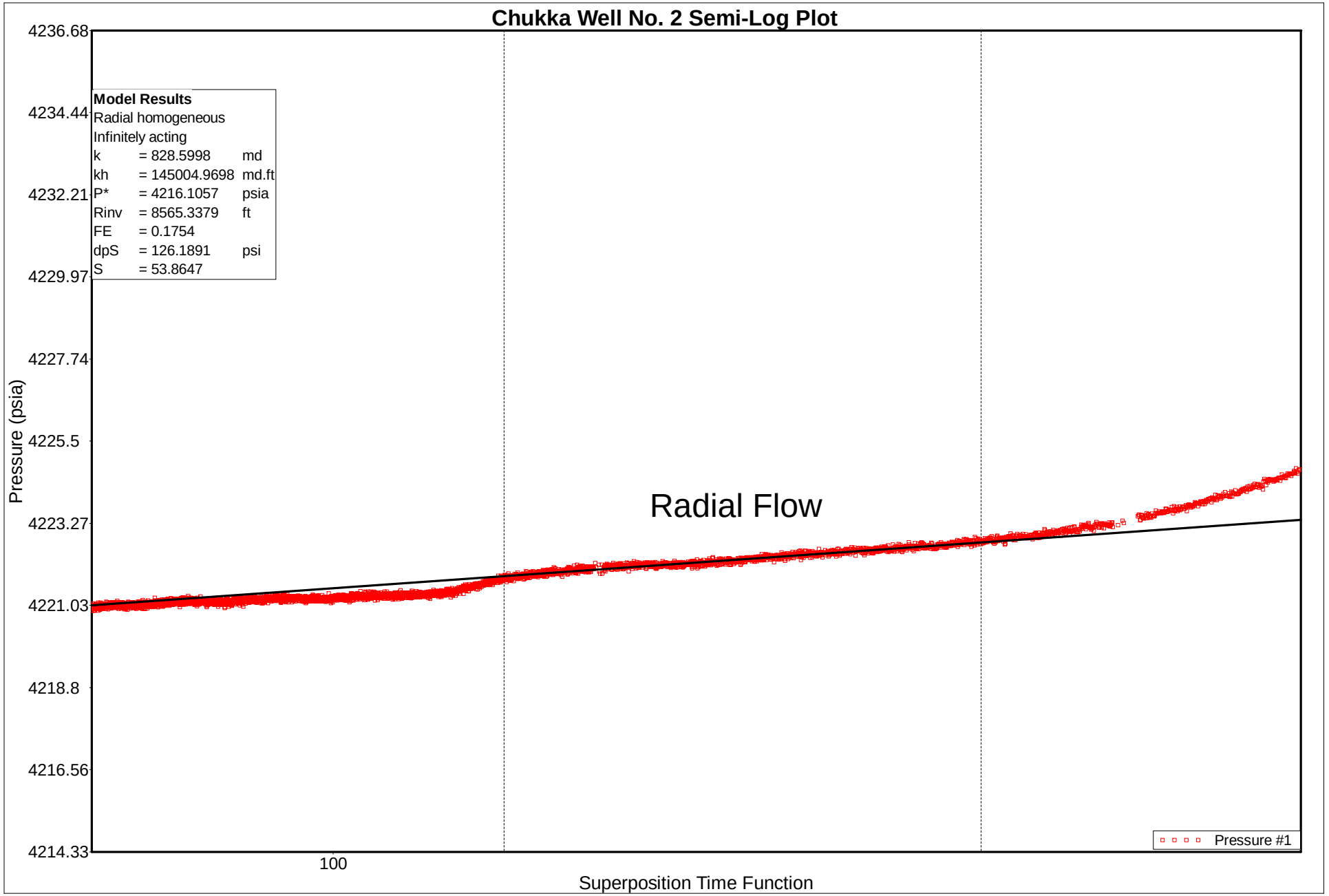

Chukka Well No. 2 Semi-Log Plot
Model Results
Radial homogeneous
Infinitely acting
k = 828.5998 md
kh = 145004.9698 md.ft
P* = 4216.1057 psia
Rinv = 8565.3379 ft
FE = 0.1754
dpS = 126.1891 psi
S = 53.8647
Radial Flow
Pressure (psia)
4236.68
4234.44
4232.21
4229.97
4227.74
4225.5
4223.27
4221.03
4218.8
4216.56
4214.33
100
Superposition Time Function
Pressure #1

FIGURE 13

Chukka Well No. 2
Hall Plot
July 1, 2017 to August 8, 2017

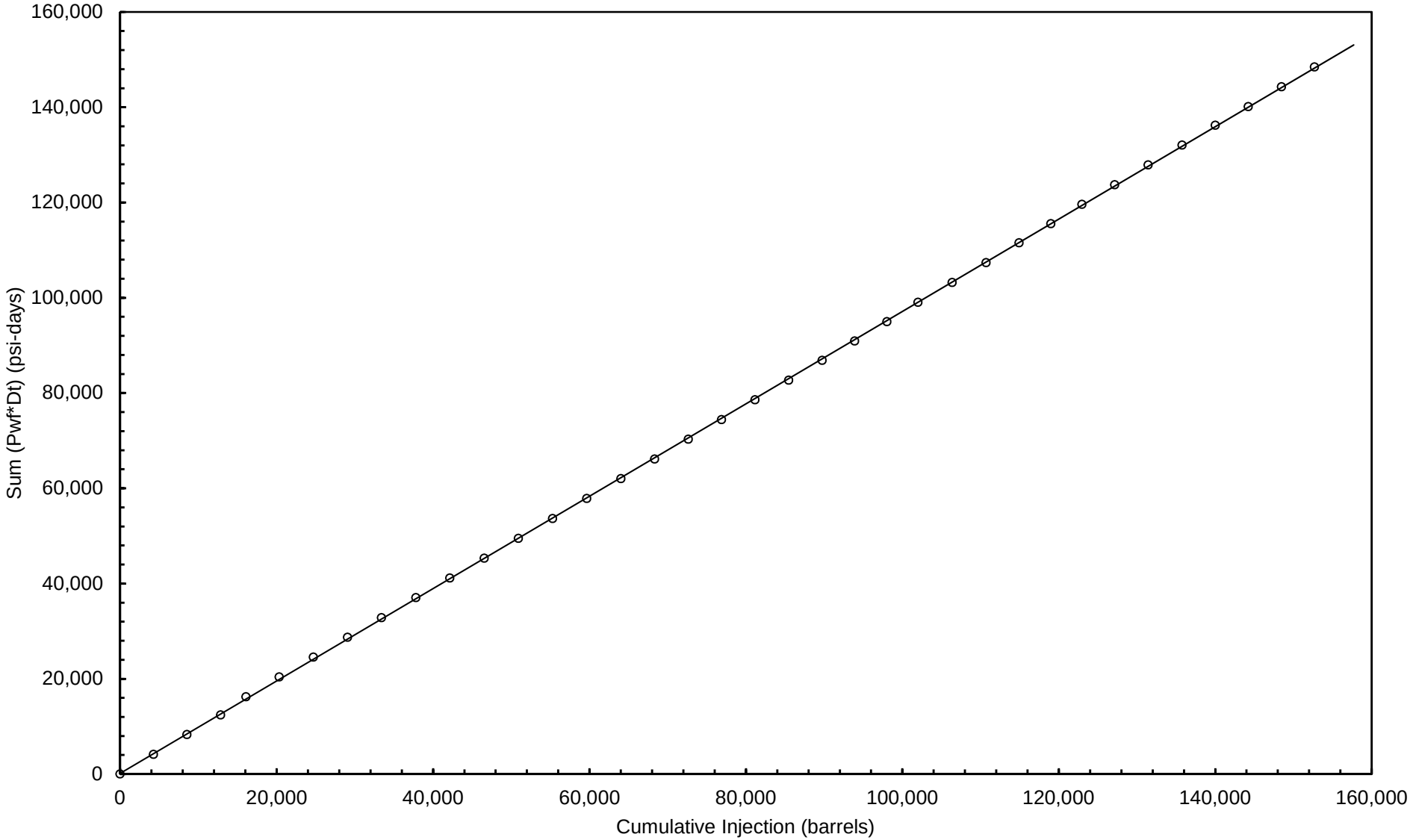


FIGURE 14

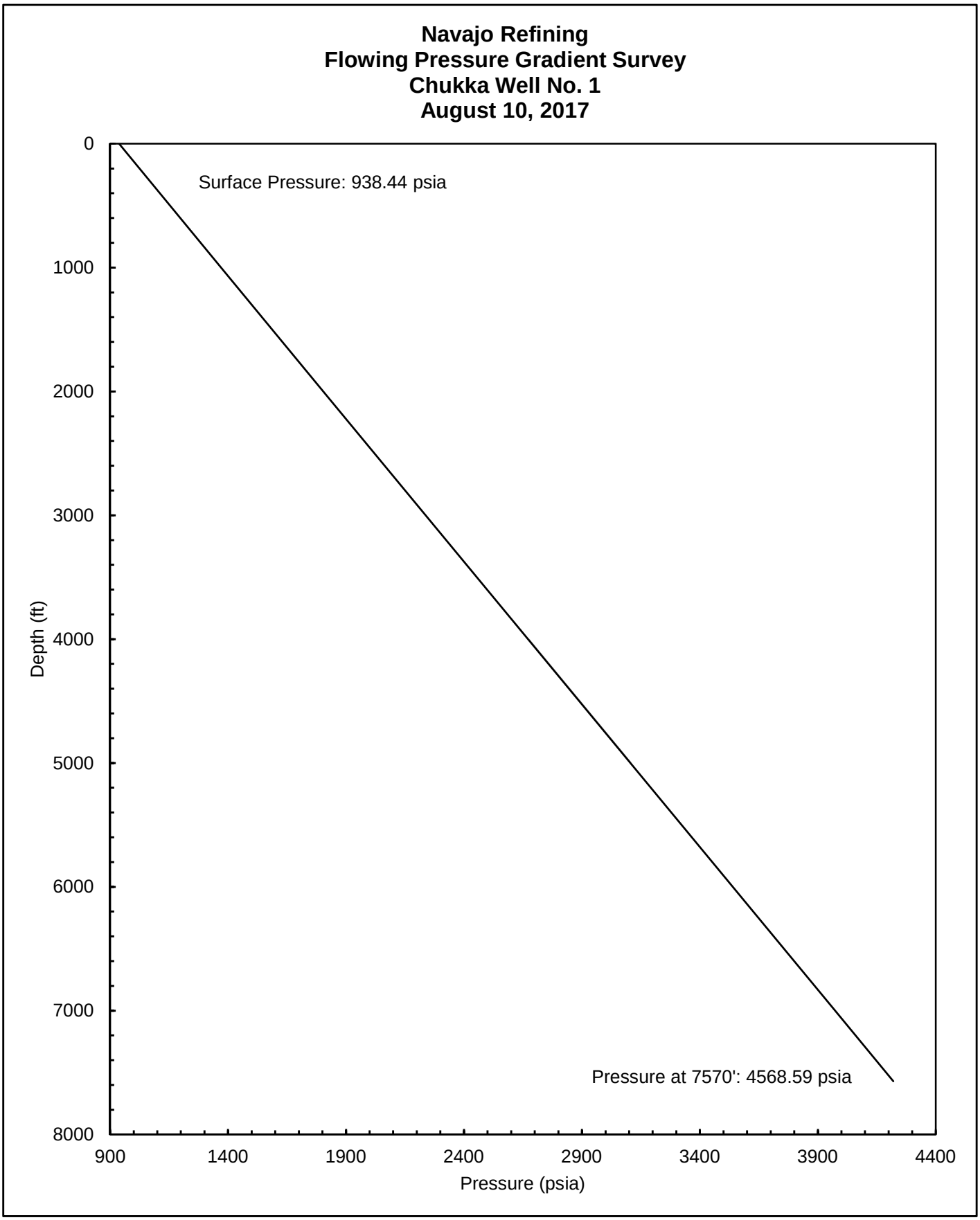

Navajo Refining
Flowing Pressure Gradient Survey
Chukka Well No. 1
August 10, 2017
Surface Pressure: 938.44 psia
Pressure at 7570': 4568.59 psia
Depth (ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
900
1400
1900
2400
2900
3400
3900
4400
Pressure (psia)

FIGURE 15

APPENDICES

APPENDIX A

DUAL INDUCTION LOG SECTIONS FROM 7924 FEET TO 8476 FEET

APPENDIX B

NEUTRON DENSITY LOG SECTIONS FROM 7924 FEET TO 8476 FEET

APPENDIX C

COMPRESSIBILITY OF FLUID

APPENDIX C

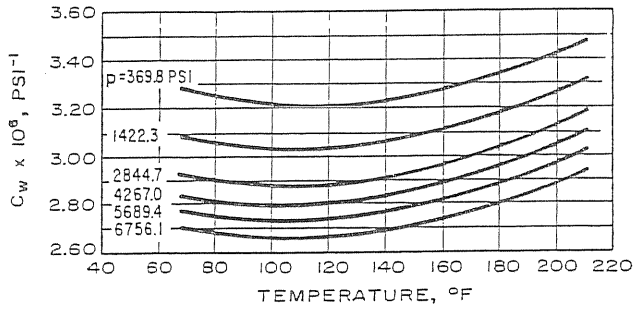


Fig. D.16 Average compressibility of distilled water. After Long and Chierici.[13]

Source: Earlougher, 1977, Advances in Well Test Analysis

COMPRESSIBILITY OF PORE VOLUME AND DISTILLED WATER

APPENDIX D

COMPRESSIBILITY OF PORE VOLUME

APPENDIX D

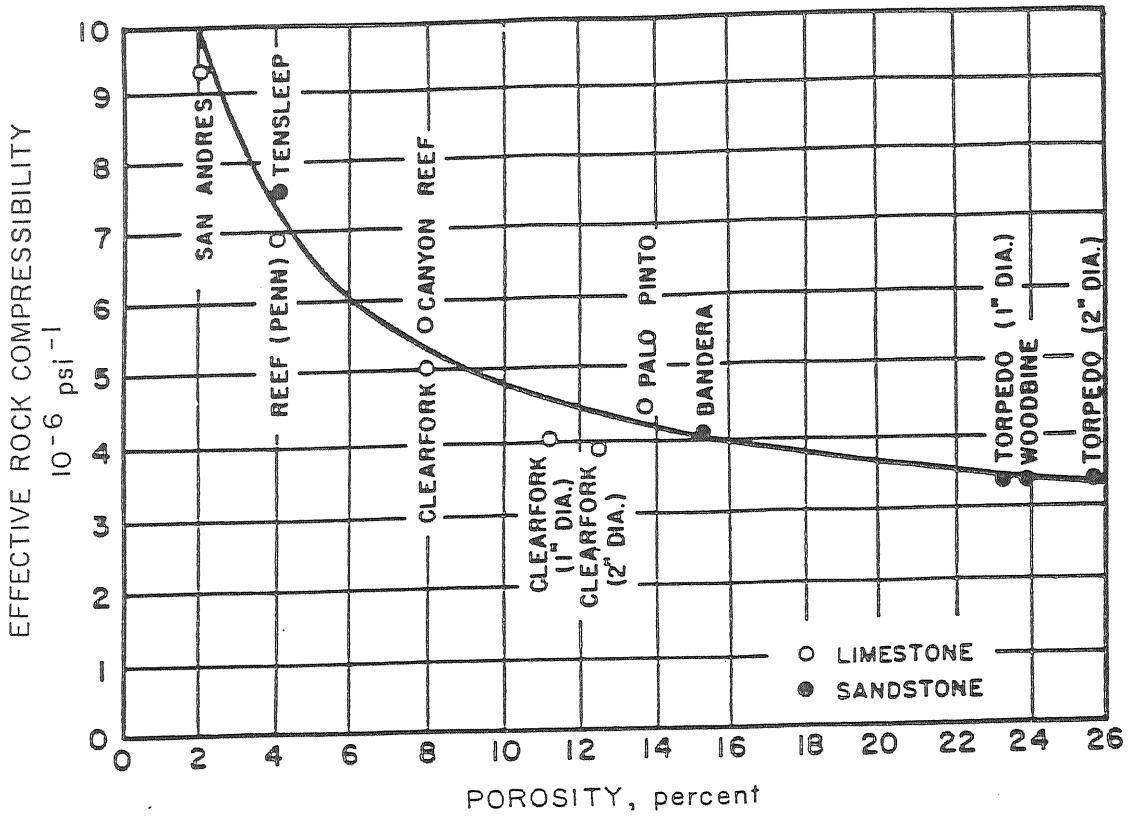


Fig. G.5 Effective formation (rock) compressibility. From Hall, *Trans.*, AIME (1953) 198, 309.

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

APPENDIX E

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

APPENDIX F

WATER VISCOSITIES AT VARIOUS SALINTIES AND TEMPERATURES

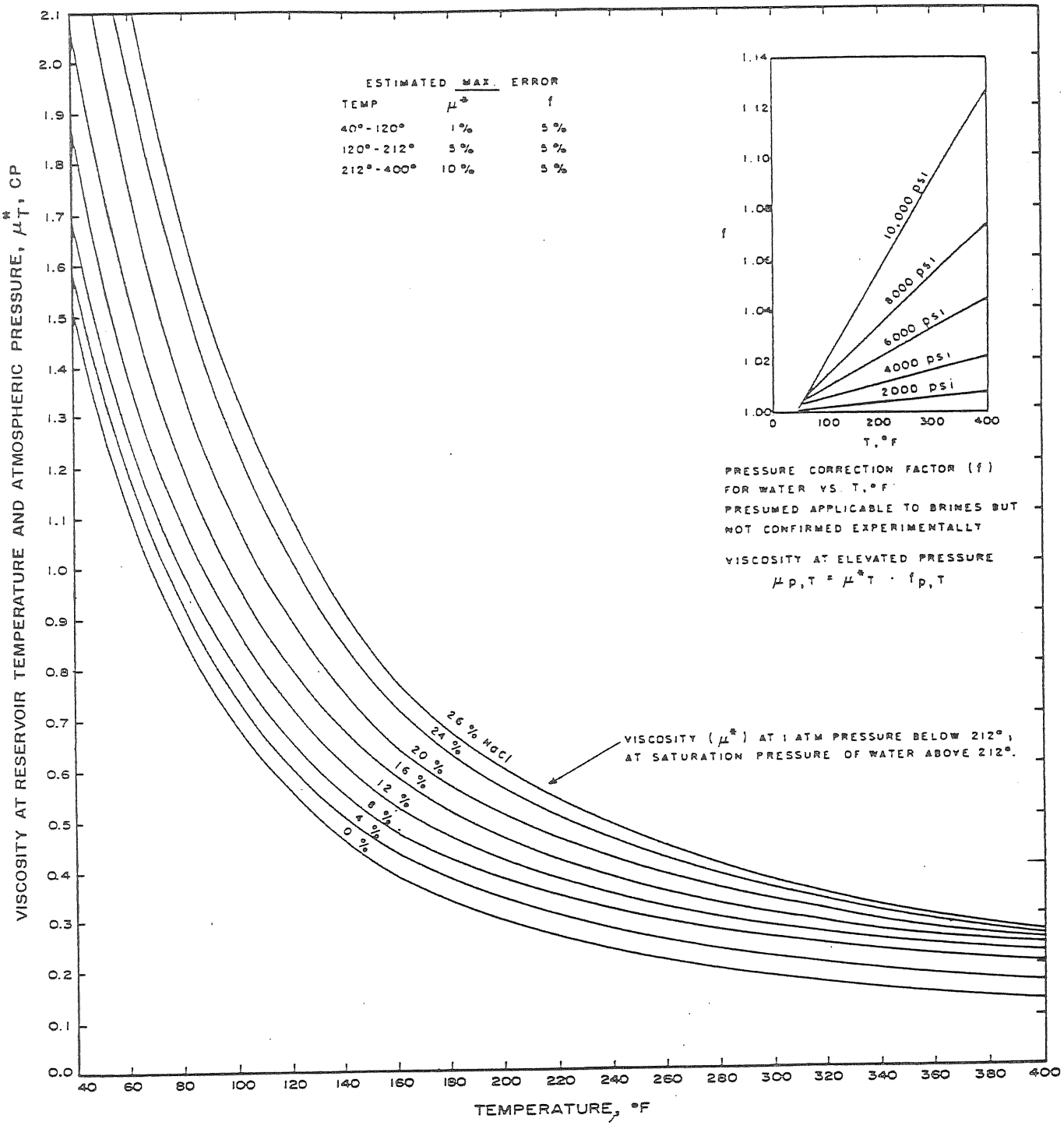


Fig. D.35 Water viscosity at various salinities and temperatures. After Matthews and Russell, data of Chesnut.[18]

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

APPENDIX G

DAILY RATE HISTORY DATA

APPENDIX G
Chukka Well No. 2
Daily Rate History

Date	Chukka No. 2 Daily Rates (gpm)	Chukka No. 2 Pressure (psig)
07/01/17 00:00	126.64	1390.11
07/02/17 00:00	123.91	1378.44
07/03/17 00:00	125.17	1380.05
07/04/17 00:00	125.52	1380.08
07/05/17 00:00	94.56	1272.07
07/06/17 00:00	123.83	1375.07
07/07/17 00:00	127.87	1390.15
07/08/17 00:00	127.18	1386.70
07/09/17 00:00	126.55	1382.75
07/10/17 00:00	128.05	1390.13
07/11/17 00:00	126.34	1378.87
07/12/17 00:00	128.27	1390.11
07/13/17 00:00	127.86	1390.12
07/14/17 00:00	127.55	1390.12
07/15/17 00:00	127.06	1392.07
07/16/17 00:00	127.63	1392.21
07/17/17 00:00	125.69	1380.07
07/18/17 00:00	125.32	1380.08
07/19/17 00:00	124.18	1375.97
07/20/17 00:00	125.24	1380.09
07/21/17 00:00	124.99	1378.61
07/22/17 00:00	124.93	1378.53
07/23/17 00:00	121.68	1365.02
07/24/17 00:00	119.54	1350.87
07/25/17 00:00	116.08	1344.43
07/26/17 00:00	127.52	1395.10
07/27/17 00:00	126.92	1391.46
07/28/17 00:00	122.81	1376.61
07/29/17 00:00	118.60	1350.05
07/30/17 00:00	115.59	1343.67
07/31/17 00:00	121.95	1369.72
08/01/17 00:00	124.73	1390.16
08/02/17 00:00	126.86	1400.11
08/03/17 00:00	123.36	1380.09
08/06/17 17:10	123.28	1297.12
08/07/17 00:00	124.00	1390.67
08/08/17 00:00	123.00	1390.00

APPENDIX H

GAUGE CALIBRATION SHEETS

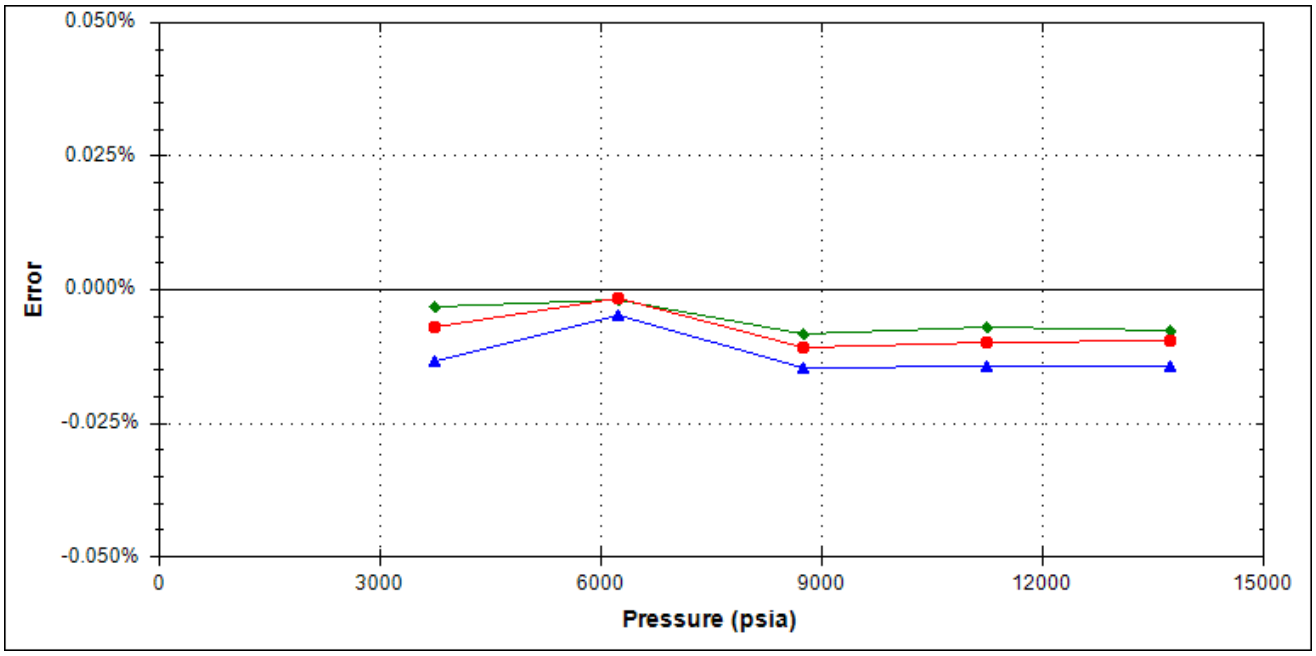
DataCan

"The Next Generation of Down Hole Tools"

Calibration Date: 12-Dec-16
Max Pressure Error: 0.015% F.S.
Max Temperature Error: 0.116 °C
Part Number: 104199
Serial Number: DC1465

1.25 OD_P3 RTD_Assembly_I-718			
Max Pressure		Max Temperature	
psi	kPa	ºF	ºC
15,000	103,421	351	177

Accuracy: As shown in the graph below, this DataCan Pressure gauge conforms to within +/- 0.030% F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading.



Working Standards

Sun Electronic Systems Environmental Chamber, Model: EC127
DHI Instruments Pressure Controller, Model: PPCH-200M (30,000psi Reference)

Traceability Statement

All working standards are traceable to nationally or internationally recognized standards.

Approved By:
DataCan Services Corp.

Calibrated By:
Angelo Pulido

DataCan

"The Next Generation of Down Hole Tools"

SO SO44827 Shipping Date Dec 13, 2016

Cal Certificate

Certificate Date Dec 12, 2016

Serial Number DC1465

Max P 15000 Pressure Error 0.015 % FS

Max T 177 Temperature Error 0.116 °C

- [x] Flash Drive Loaded
- [x] Calibration files
- [x] USB cable functions

Tool Info

- [x] Serial Number
- [x] Max P
- [x] Max T

Calibration Date Dec 12, 2016

Part Marking

- [x] Serial Number
- [x] Max P
- [x] Max T

Utilities - Diagnostics - Start Sampling

FW Week 1 Pressure 12.199 psia

FW Year 2015 Temperature 18.851 degC

Sleep Current 1.54 mA

Sampling Current 2.92 mA

- [x] Memory Clear
- [x] Checked By Renato Herrera Dec 13, 2016

7465 - 45 Avenue Close - Red Deer - Alberta - Canada - T4P 4C2
Phone: +1.403.352.2245 Fax: +1.403.352.2258 info@datacan.ca

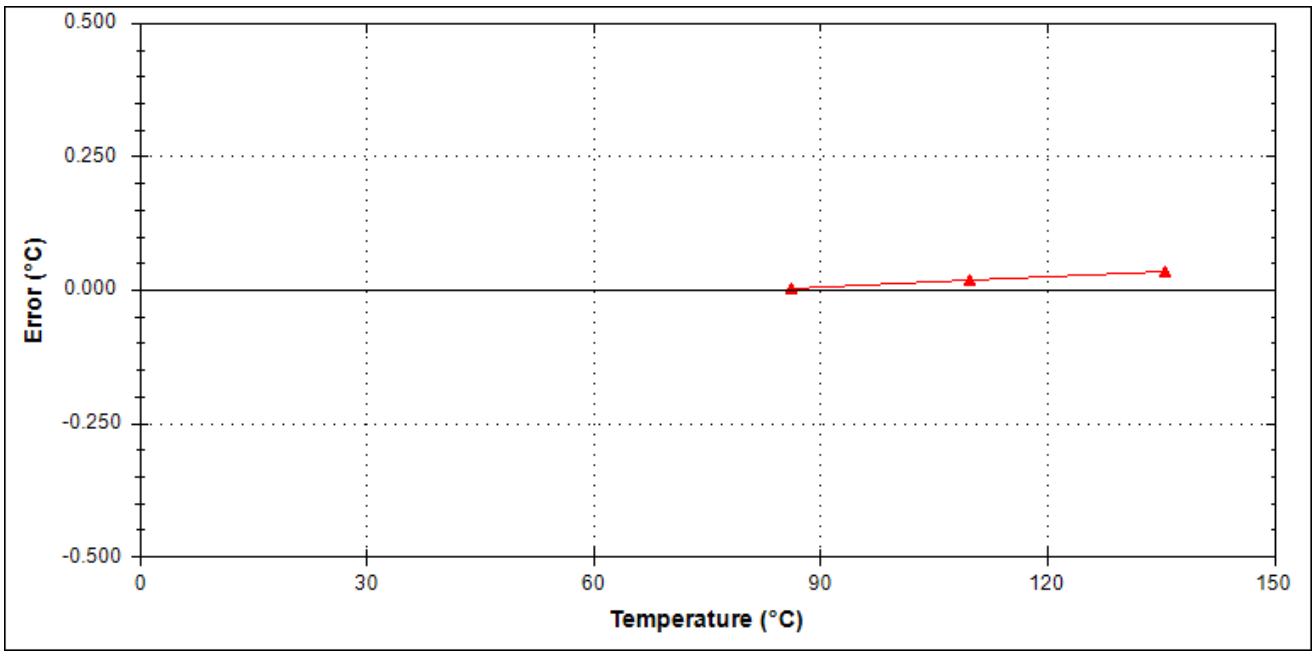
DataCan

"The Next Generation of Down Hole Tools"

Calibration Date:	12-Dec-16	**Calibration System:**	CALIBRATION03
Max Temperature Error:	0.033 °C	**Batch Number:**	20150310.143657
Part Number:	104199		
Serial Number:	DC1465		

1.25 OD_P3 RTD_Assembly_I-718	
Max Temperature	
ºF	ºC
302	150

Accuracy: As shown in the graph below, this DataCan Pressure gauge conforms to within 0.250 °C of the temperature standard used in calibration, which is accurate to within 0.065 °C of reading.



Working Standards

Sun Electronic Systems Environmental Chamber, Model: EC127, Serial: EC0020

Traceability Statement

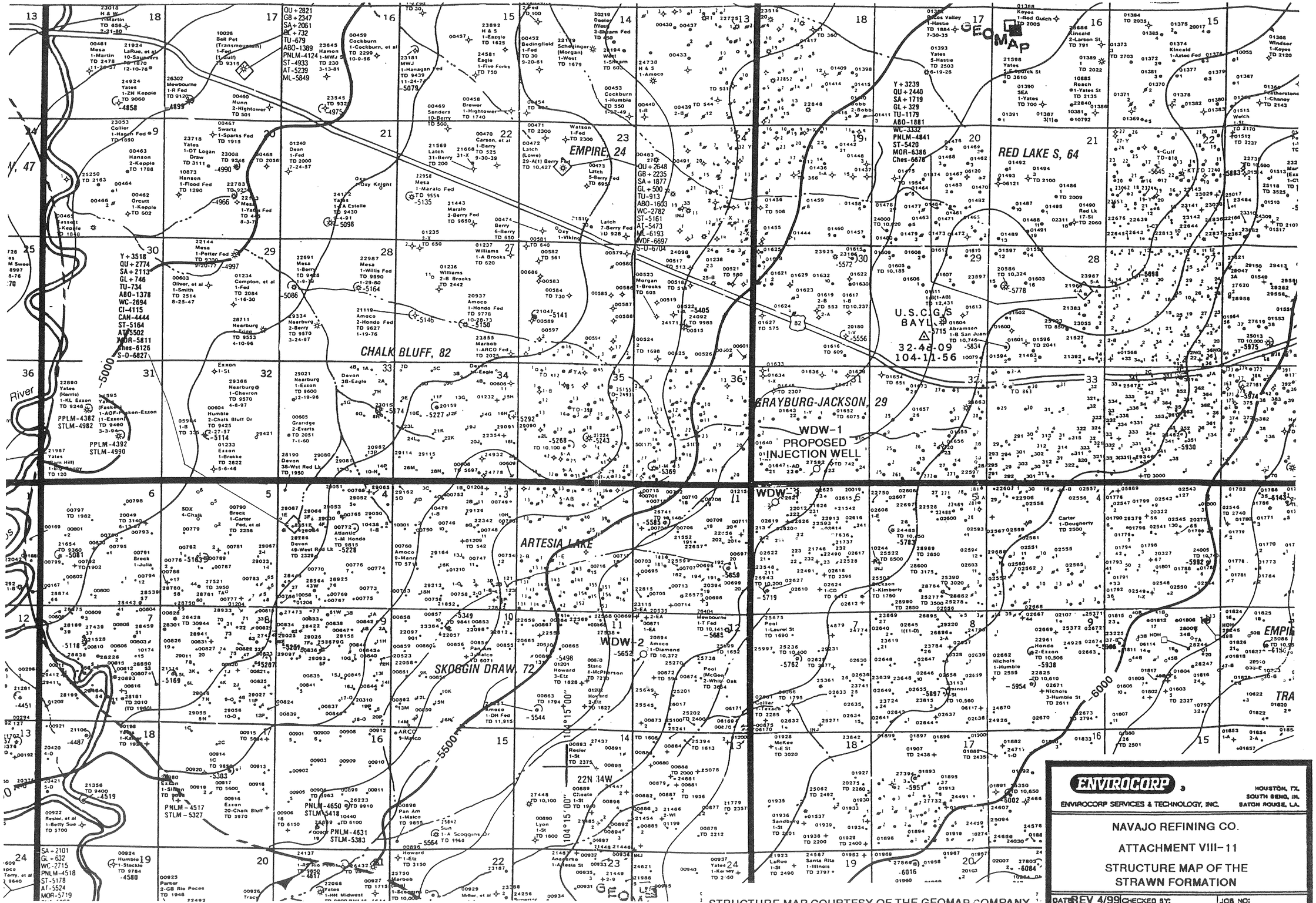
All working standards are traceable to nationally or internationally recognized standards.

Approved By:
DataCan Services Corp.

Calibrated By:
Angelo Pulido

APPENDIX I

STRAWN STRUCTURE MAPS



STRUCTURE MAP COURTESY OF THE GEOMAP COMPANY
Poster July 1997

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

NAVAJO REFINING CO.

ATTACHMENT VIII-11

STRUCTURE MAP OF THE STRAWN FORMATION

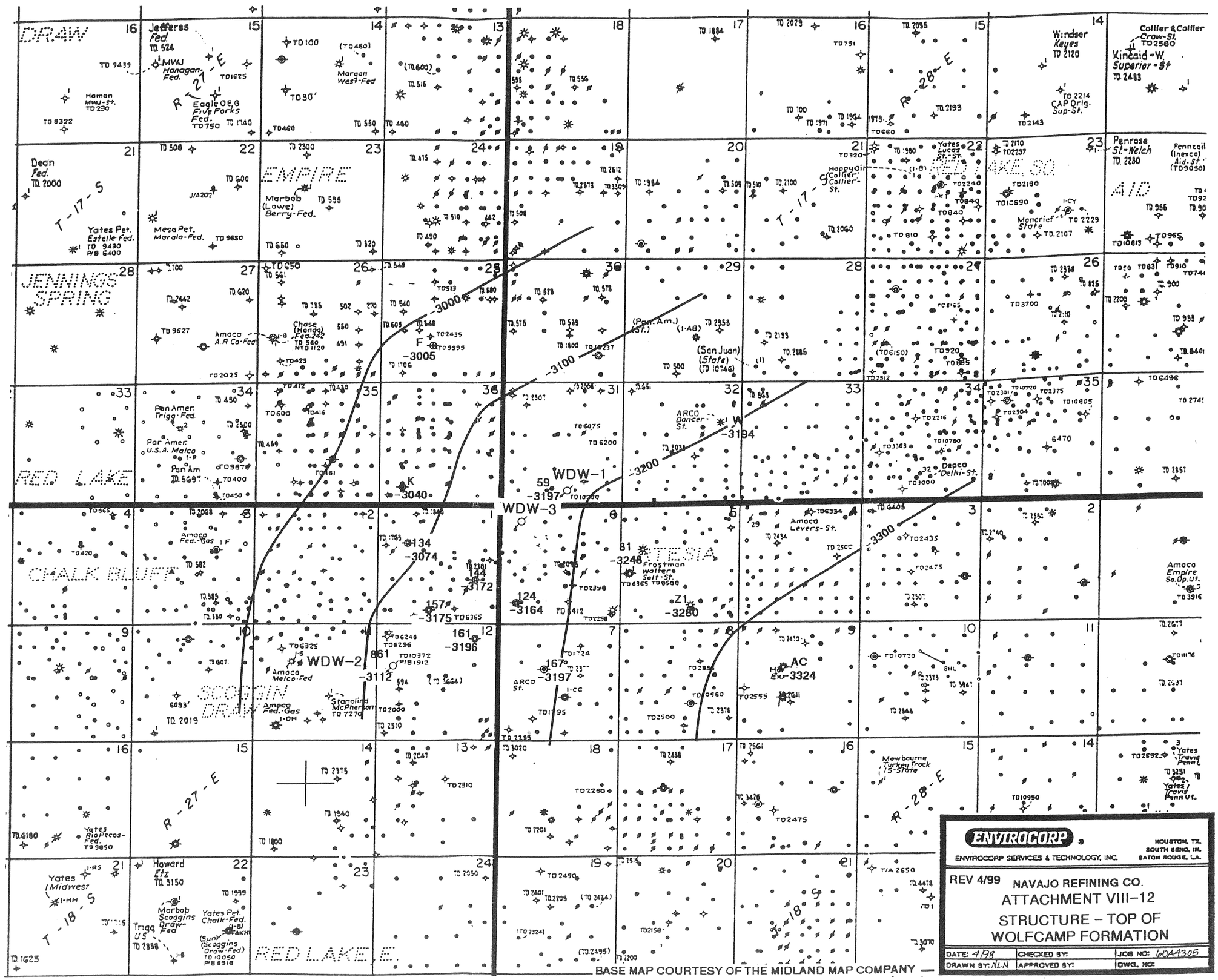
DATE: REV 4/99	CHECKED BY:	JOB NO:	
DRAWN BY:	APPROVED BY:	DWG. NO:	

APPENDIX I

APPENDIX J

WOLFCAMP STRUCTURE MAPS

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.

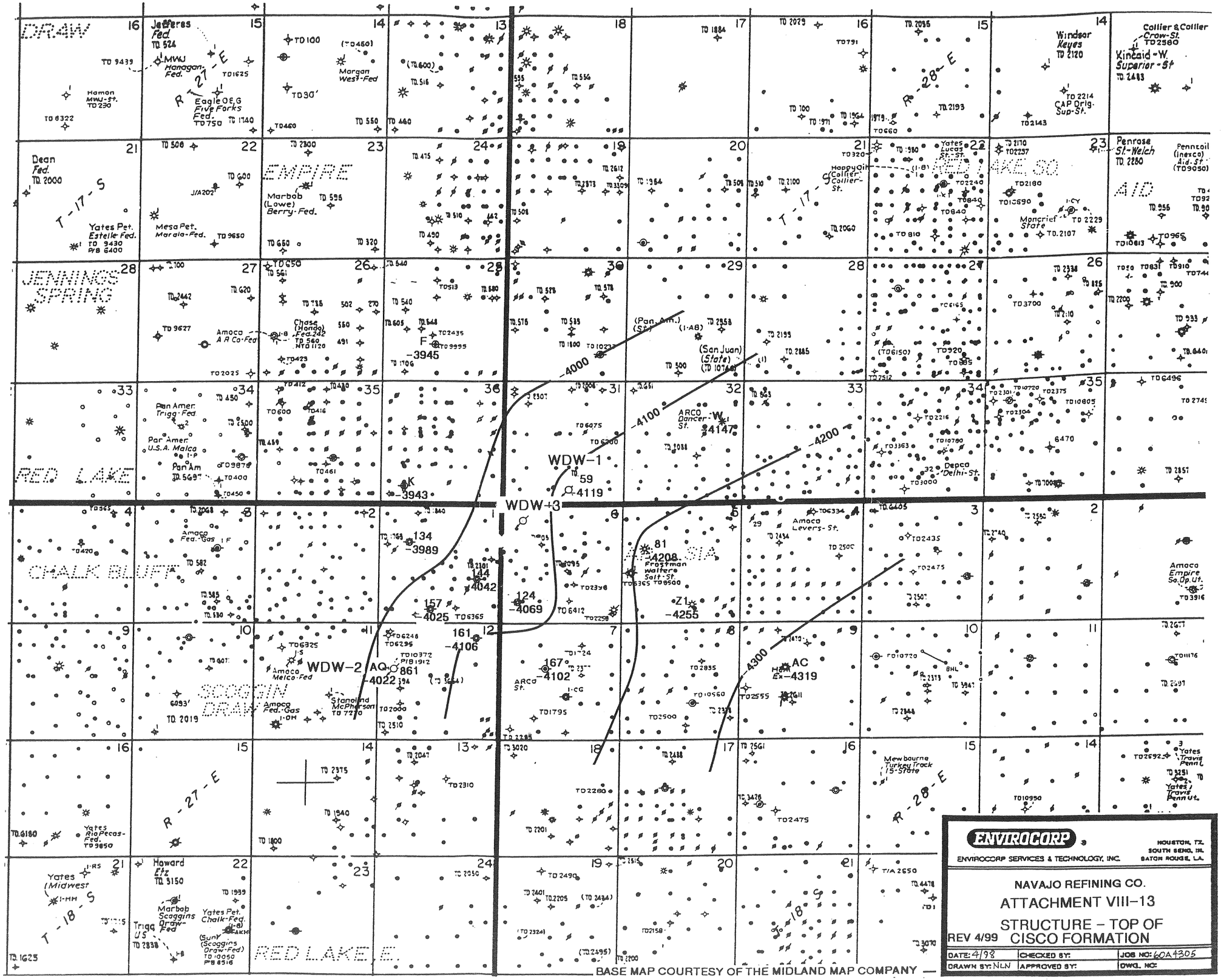
ATTACHMENT VIII-12

STRUCTURE – TOP OF WOLFCAMP FORMATION

DATE: 4/98	CHECKED BY:	JOB NO: 60A4305
DRAWN BY: NLN	APPROVED BY:	DWG. NO:

APPENDIX K

CISCO STRUCTURE MAPS



157 -4025 ID NO. SUBSEA DEPTH

BASE MAP COURTESY OF THE MIDLAND MAP COMPANY

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: 60A4305
DRAWN BY: NLN	APPROVED BY:	DWG. NO:

APPENDIX L

CHRONOLOGY OF FIELD ACTIVITIES

16200 Park Row., Suite 200
Houston, Texas 77084
(281) 589-5900

FIELD ACTIVITY REPORT

Company:	**Navajo Holly Frontier**	Project No:	**192080A**
Well:	**WDW-2**	Date:	**8/4/2017**
City	**Artesia**	FAR Report No.:	**1**
County/Parrish:	**Eddy**	WSP | PB Rep.:	**Gabe Holmes**
State:	**NM**		
Work Performed:	__ New Well __Workover _X_ Wireline Consulting __ Other		

Breakdown of Operations

From	To	Hrs	
8:00	8:30	0.50	Arrive on location and talked with
8:30	10:30	1.00	Rig up wireline units and set pressure gauges at 7570 feet
10:30			Tool set at 7570 feet
10:30	11:30	1.00	Secure and leave location
11:30			Leave location
Total		**2.50**	

Safety Topics

Working in a Ecoserv Facility, pinch points, working near wildlife, and working at height.

16200 Park Row., Suite 200
Houston, Texas 77084
(281) 589-5900

FIELD ACTIVITY REPORT

Company:	**Navajo Holly Frontier**	Project No:	**192080A**
Well:	**WDW-2**	Date:	**8/10/2017**
City	**Artesia**	FAR Report No.:	**2**
County/Parrish:	**Eddy**	WSP | PB Rep.:	**Gabe Holmes**
State:	**NM**		
Work Performed:	__ New Well __Workover _X_ Wireline Consulting __ Other		

Breakdown of Operations

From	To	Hrs	
8:00	8:15	0.25	Arrive on location
8:15	10:30	2.25	End PFO, TD at 8358 feet uncorrected, and made gradient stops every 1000 feet
8:20			End PFO on Navajo WDW-2 surface pressure 931.1 psig
8:39	8:46		Gradient stop at 7000 feet
8:52	8:58		Gradient stop at 6000 feet
9:04	9:11		Gradient stop at 5000 feet
9:17	9:23		Gradient stop at 4000 feet
9:29	9:36		Gradient stop at 3000 feet
9:41	9:49		Gradient stop at 2000 feet
9:54	10:02		Gradient stop at 1000 feet
10:10	10:22		Gradient stop at surface
10:30	12:00	1.50	Rig down wireline unit and turn well over to Navajo Holly Frontier
12:00			Leave location
Total		**4.00**	

Safety Topics

Working in a Ecoserv Facility, pinch points, working near wildlife, and working at height.

APPENDIX M

PANSYSTEM© ANALYSIS OUTPUT

Company	Navajo Refining Company
Location	Artesia, NM
Well	Chukka Well No. 2
Test Date	August 4, 2017 to August 10, 2017
Test Type	Buildup/Falloff Test
Gauge Type/Serial Number	DataCan/DC-1465
Gauge Depth	7570 feet
Injection Interval	7570 feet to 8390 feet
Completion Type	Perforated 2 SPF on 120 deg Phasing
Top of Fill	8356 feet GL
Analyst	LKM
WSP	192080A

Reservoir Description
Fluid type : Water
Well orientation : Vertical
Number of wells : 1
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	4216.105678 psia
Temperature	0.000000 deg F

Well Parameters Data

	Chukka #2
Well radius	0.3281 ft
Distance from observation to active well	0.000000 ft
Wellbore storage coefficient	0.093763 bbl/psi
Storage Amplitude	0.000000 psi
Storage Time Constant	0.000000 hr
Second Wellbore Storage	0.000000 bbl/psi
Time Change for Second Storage	0.000000 hr
Well offset - x direction	0.0000 ft
Well offset - y direction	0.0000 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	4259.406000 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

Fluid Parameters Data (cont)

	Layer 1
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

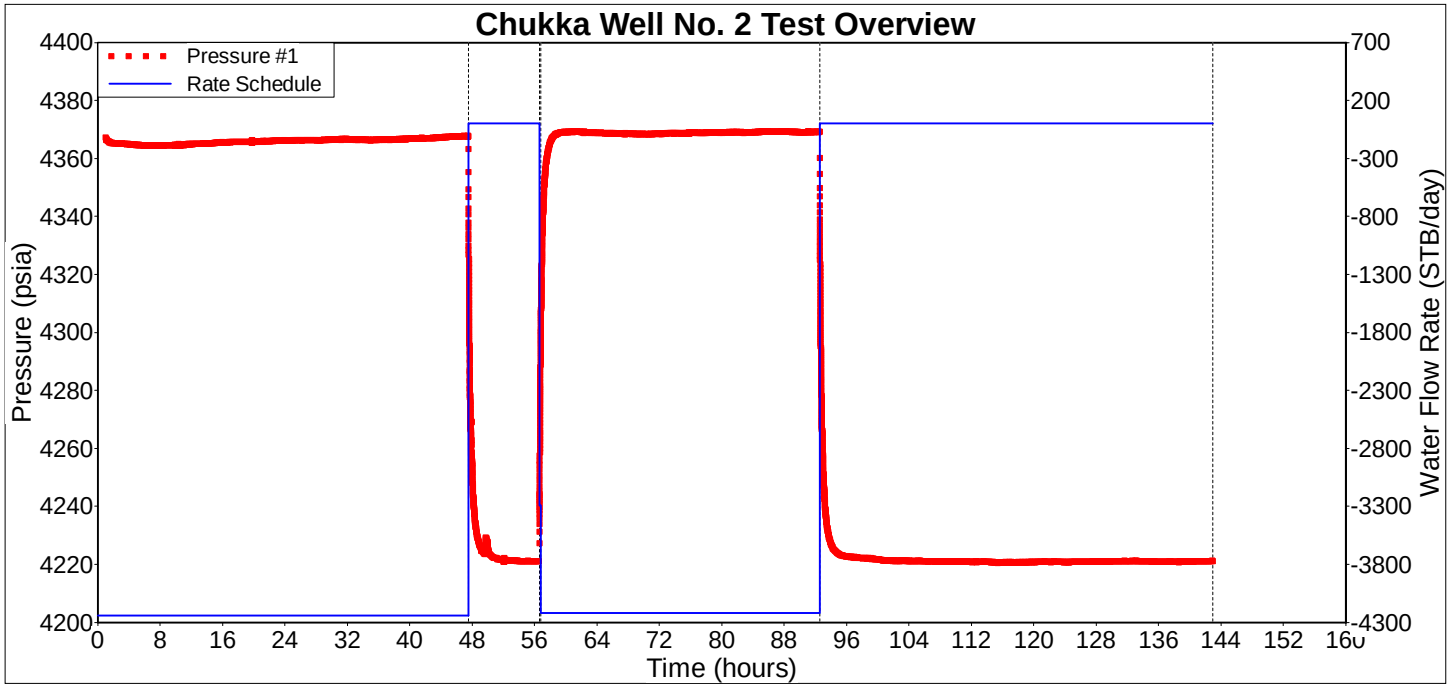
Layer 1 Correlations
Not Used

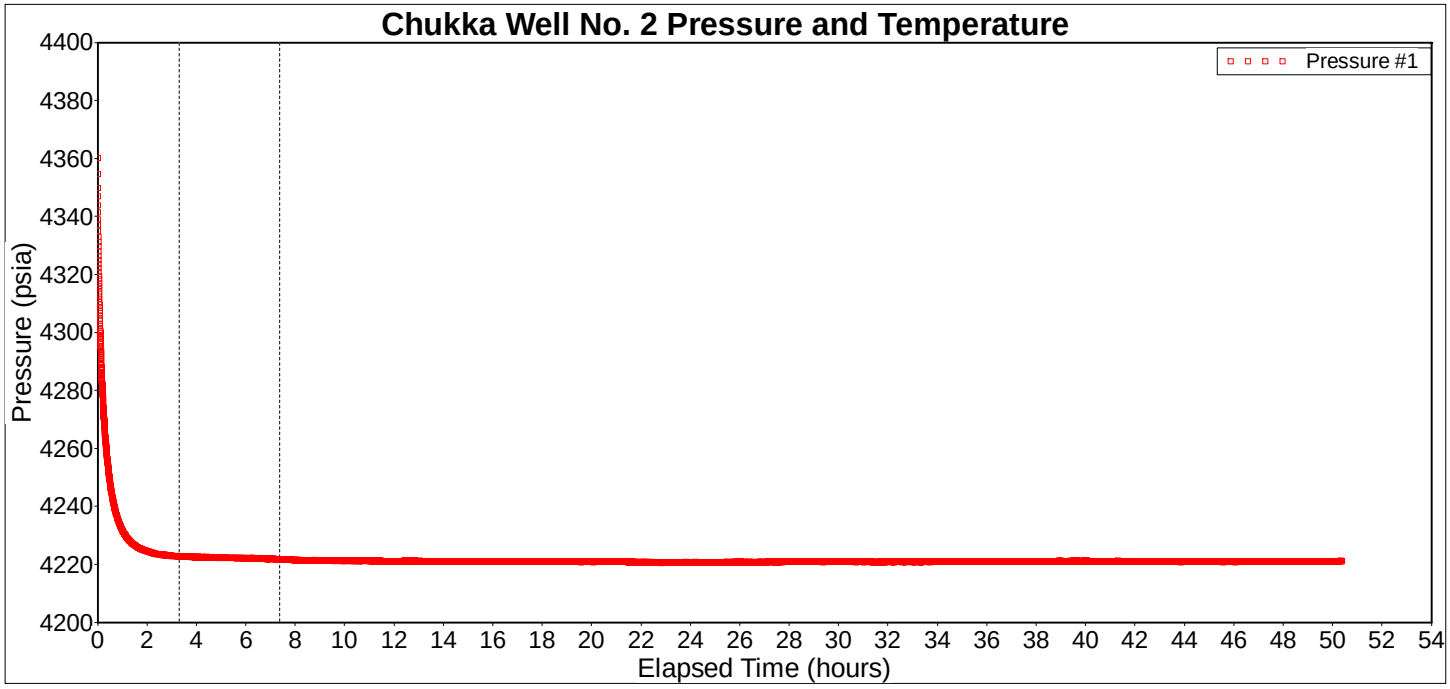
Layer 1 Model Data
Layer 1 Model Type : Radial homogeneous

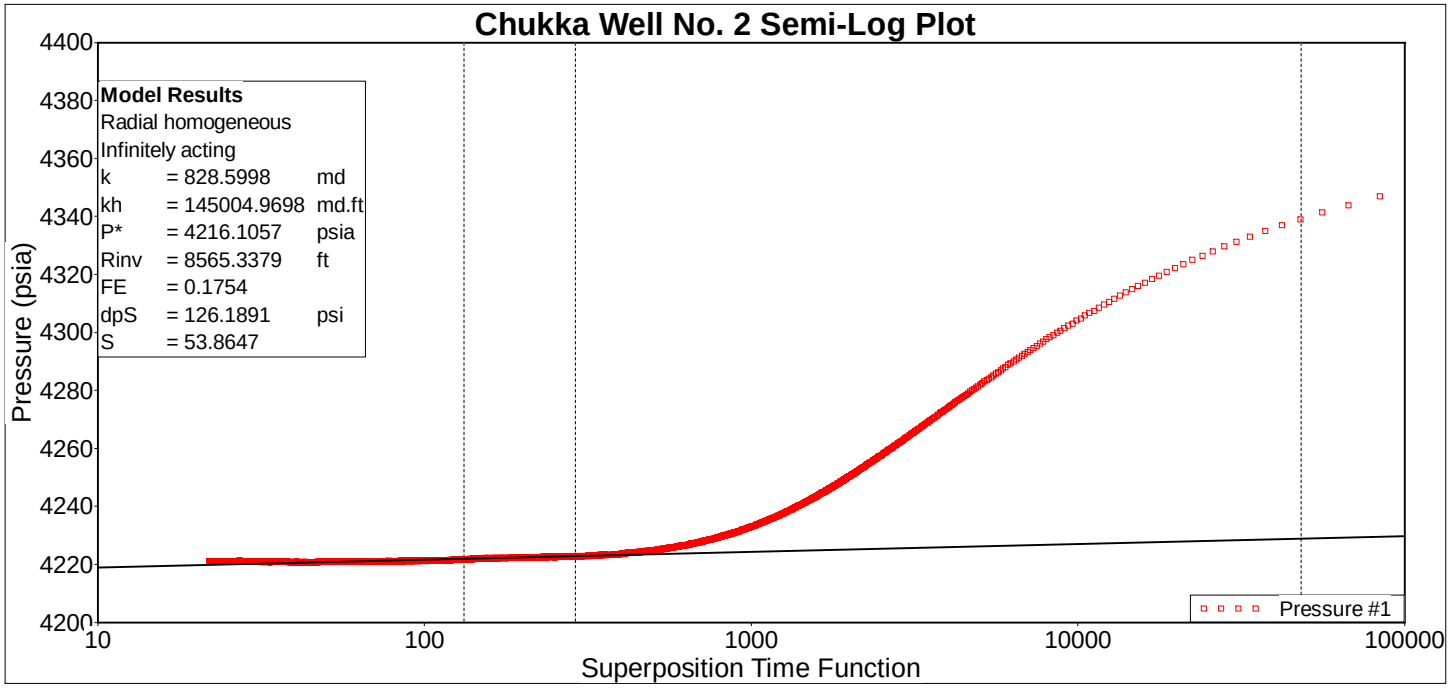
	Layer 1
Permeability	828.599828 md
Skin factor (Well 1)	53.864739

Rate Change Data

Time Hours	Pressure psia	Rate STB/day
-1088.359280	0.000000	0.000000
-1064.359280	0.000000	-1842.120000
-944.359280	0.000000	-4028.250000
-752.359280	0.000000	-4305.210000
-728.359280	0.000000	-3242.060000
-464.359280	0.000000	-4357.990000
-320.359280	0.000000	-4287.720000
-248.359280	0.000000	-4083.490000
-200.359280	0.000000	-4361.770000
-104.359280	0.000000	-4105.190000
47.554880	4367.652000	-4239.540000
56.635541	4221.072000	0.000000
56.781390	4288.800000	-3292.340000
92.592500	4369.130000	-4220.760000
143.000830	4221.040000	0.000000


Chukka Well No. 2 Test Overview
Pressure #1
Rate Schedule
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
4400
4380
4360
4340
4320
4300
4280
4260
4240
4220
4200
700
200
-300
-800
-1300
-1800
-2300
-2800
-3300
-3800
-4300
0 8 16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 136 144 152 160


Chukka Well No. 2 Pressure and Temperature
Pressure #1
Pressure (psia)
4400
4380
4360
4340
4320
4300
4280
4260
4240
4220
4200
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54
Elapsed Time (hours)



Chukka Well No. 2 Semi-Log Plot Model Results
Radial homogeneous - Infinitely acting

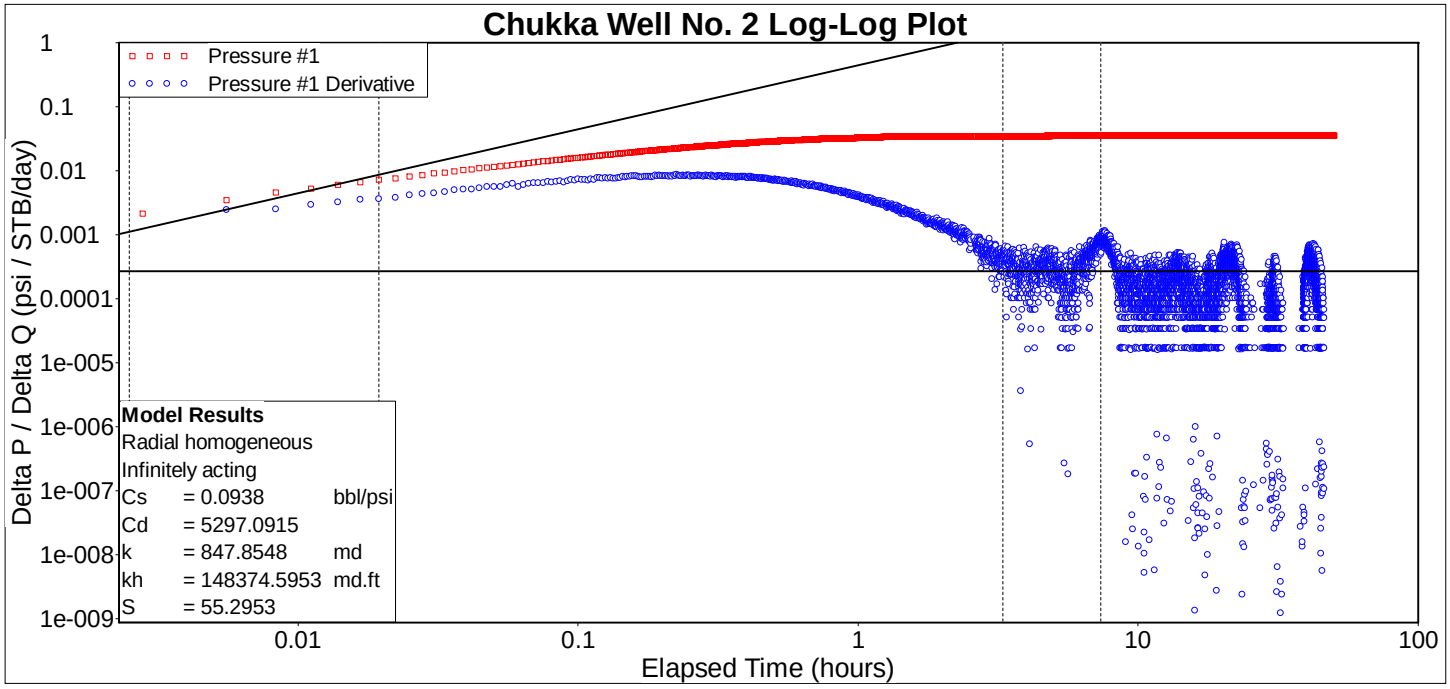
Classic Wellbore Storage

	Value
Permeability	828.599828 md
Permeability-thickness	1.4500e5 md.ft
Extrapolated pressure	4216.105678 psia
Radius of investigation	8565.337915 ft
Flow efficiency	0.175366
dP skin (constant rate)	126.189111 psi
Skin factor	53.864739

Chukka Well No. 2 Semi-Log Plot Line Details
Line type : Radial flow
Slope : 2.69714
Intercept : 4216.11
Coefficient of Determination : 0.957429

	Radial flow
Extrapolated pressure	4216.105678 psia
Pressure at dt = 1 hour	4224.119852 psia

Number of Intersections = 0



Chukka Well No. 2 Log-Log Plot Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.093763 bbl/psi
Dimensionless wellbore storage	5297.091545
Permeability	847.85483 md
Permeability-thickness	1.4837e5 md.ft
Skin factor	55.295319

Chukka Well No. 2 Log-Log Plot Line Details
Line type : Wellbore storage
Slope : 1
Intercept : 0.444385
Coefficient of Determination : Not Used

Line type : Radial flow
Slope : 0
Intercept : 0.000271219
Coefficient of Determination : Not Used

Number of Intersections = 0