UICI - 8 - 3

WDW-3
FOT

2019

HOLLYFRONTIER.

March 31, 2020

Mr. Carl Chavez, CHMM
NM Energy, Minerals & Natural Resources Department
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr.
Santa Fe, NM 87505-5472

Certified Mail/Return Receipt

7018 0040 0000 9065 6664

RE: 2019 Annual Class I Non-Hazardous Waste Injection Wells (WDW-1, WDW-2, WDW-3, WDW-4) Report from HollyFrontier Navajo Refining LLC

Dear Mr. Chavez,

Enclosed, please find the annual injection well report for fluids that HollyFrontier Navajo Refining LLC (permittee) injected into wells WDW-1, WDW-2, WDW-3 and WDW-4 during 2019 as required under permits UICI-008-1, UICI-008-2, UICI-008-3 and UICI-008-4, Permit Condition 20.6.2.3107 NMAC Annual Report, for all four wells. The API numbers for the wells are: (WDW-1) 30-015-27592, (WDW-2) 30-015-20894, (WDW-3) 30-015-26575, (WDW-4) 30-015-44677

This report is signed and certified in accordance with 20.6.2.3107 NMAC. If there are any questions, please contact me at Scott.Denton@holiyfrontier.com or 575-748-5487 or Randy.Dade@hollyfrontier.com.

Respectfully,

Scott M. Denton
Environmental Manager
HollyFrontier Navajo Refining LLC

Summary of WDW-1, WDW-2, WDW-3 and WDW-4 Operations for 2019

The wells themselves did not have any remedial or major work performed during 2019. The wells did have Pressure Fall Off Tests in 2019. WDW-1 (30-015-27592) FOT was done in June 2019, WDW-2 (30-015-20894) FOT was done in July 2019. WDW-3 (30-015-26575) FOT was done in August 2019 and WDW-4 did not have a FOT in 2019 as per approval of the OCD due to the well being new. FOT results will be uploaded to the OCD website. No MIT's were done due to WAM's being in place and casing being cemented to surface.
No Deviations from Normal Operations: No Leaks or Spills in 2019

Water Sales: No Water Sales made in 2019

Monthly Injection/Disposal Volume with Cumulative Totals

Flows, pressures and volume reports have been submitted to OCD as monthly C-115's and also Quarterly Injection Reports are submitted. These are resubmitted as Attachment A.

Maximum and Average Injection Pressures

Maximum and average injection pressures are resubmitted as Attachment B.

Copies of Fall Off Tests

Fall Off Tests were performed on three wells in 2019. All FOT results with pressure charts and AOC's of area wells will be mailed to the OCD in April 2020 when finalized and approved and will be uploaded to the OCD website. .

An Area of Review (AOR) Annual Update Summary

Area of Review data was noted in the 2019 Fall Off Tests and that information will be uploaded to the OCD in April 2020. Wells with in One Mile Area of Review are resubmitted as Attachment B. There are no new wells in the AOR.

Summary of all major facility activities or events which occurred in 2019

There were 3 major facility events in 2019. In Attachment B
3/26/2019: Tank 106 release; Copy of C-141 Attached
5/28/2019: Cooling Tower Blowdown Line to City Sample Point; Copy of C-141 Attached
9/3/2019: Cooling Tower Blowdown Line to City Sample Point; Copy of C-141 Attached

Quarterly Chemical Analyses with QA/QC Data Summary Tables

Quarterly chemical analyses, including QA/QC and summary tables for 2019 are Attachment C. The four wells share a common transmission pipe from the Refinery wastewater treatment facility to the wellhead areas. The single sample point for all four wells is taken off the main pipeline.

2019 ANNUAL BOTTOM-HOLE PRESSURE SURVEY AND PRESSURE FALLOFF TEST REPORT

NAVAJO REFINING

GAINES WELL NO. 3

Artesia, New Mexico

March 2020

Houston, TX

Project No. 192080G

Prepared by Larry McDonald

Reviewed by Jeffry Tahtouh

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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 Gaines Well No. 3. 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 32-hour injection period and a 39-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 2018 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: Section 1, Township 18 South, Range 27 East

2. WELL INFORMATION

a. OCD UIC Permit Number: UIC-CLI-008-3
b. Well Classification: Class I Non-hazardous
c. Well Name and Number: Gaines Well No. 3
d. API Number: 30-015-26575
e. Well Legal Location: 760 FSL, 2250 FWL

3. CURRENT WELLBORE SCHEMATIC

The Gaines Well No. 3 wellbore schematic is presented in Figure 1. The schematic contains data, as requested by the guidelines and includes the following:

a. Tubing: 4-1/2-inch, 11.6 pound per foot, steel construction, API grade J-55, with long thread connections (LT&C).

b. Packer: Arrow X-1, 7-inch by 2-7/8-inch set in tension (37,000 pounds) at 7575 feet.

c. Tubing Length: 7568 feet with a 0.54-foot, 4-1/2-inch by 2-7/8-inch crossover in the top of the packer. 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 four casing strings in the well and one below the injection interval. The information for these casing strings was obtained from OCD records on file with the state and geophysical logs. The casing strings are:

   i. 13-3/8-inch, 54.5 pound per foot, steel construction, API grade J-55, with short thread connections (ST&C), set at a depth of 400 feet. The casing was cemented to the surface with 425 sacks of cement. The casing was set in open hole with a diameter of 17.5 inches. This information was obtained from OCD records.

   ii. 9-5/8-inch, 36 pound per foot, steel construction, API grade J-55, ST&C, set at a depth of 2600 feet. The casing was cemented to the surface with 1025 sacks of cement. The casing was set in open hole with a diameter of 12.25 inches. This information was obtained from OCD records.

   iii. 7-inch, 26 pound per foot and 29 pound per foot, steel construction, API grade N-80 and P-110, ST&C, set at a depth of 9450 feet. The casing was cemented with 1350 sacks of cement to 900 feet from surface. The casing was set in open hole with a diameter of 8.75 inches. The top

cement and weight of the pipe was verified with a CBL and caliper log run on October 13, 2006. The remainder of the information was obtained from OCD records.

iv. Below the cement plug at 9022 feet is the top of a 4-1/2-inch liner. The liner is a string of 4-1/2-inch casing installed to a depth of 10,119 feet. There is a cast iron bridge plug set in the liner at 9800 feet, which is above the original perforations, between 9861 feet and 9967 feet. The current injection interval is above the plug at 9022 feet. The cement plug also isolates the lower section of the original wellbore. This information was obtained from OCD records.

e. The top of cement was determined from a CBL run in the 7-inch casing string on October 13, 2006. The top of cement in the 7-inch casing was found at 900 feet below the surface. The top of cement in the 9-5/8-inch and 13-3/8-inch casing strings was verified through OCD records and volume calculations.

f. The 7-inch casing was perforated on October 14 and October 15, 2006. The casing was perforated with a 0.5-inch diameter hole at 2 shots per foot on a 60° phasing. The perforations are located between 7660 feet and 8450 feet and from 8540 feet to 8620 feet.

4. ELECTRIC LOG ENCOMPASSING THE COMPLETED INTERVAL

The dual induction log is presented in Appendix A and encompasses the completed interval between 7660 feet and 8620 feet. The dual induction log was submitted to the OCD with the original permit after the well was drilled by the Mewbourne Oil Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well.

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

The neutron density log is presented in Appendix B and encompasses the completed interval between 7660 feet and 8620 feet. The neutron density log was submitted to the OCD with the original permit after the well was drilled by Mewbourne Oil Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well. The porosity of the formation, 10%, and the reservoir thickness, 175 feet, were determined from this log. These values were used in the analysis of the pressure falloff data (Section 15). Additional information concerning the geology of the injection reservoir is discussed in Section 11.

6. PVT DATA OF THE FORMATION AND INJECTION FLUID

The Gaines Well No. 3 was recompleted in October 2006, prior to the issuance of the current well testing guidelines (December 3, 2007). At the time, no directives were in place to test formation fluids or derive formation characteristics from cores. However, reservoir fluid samples were obtained and the average density and 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 Gaines Well No. 3 on October 13, 2006, and included in this report as Appendix E.

d. 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.

e. 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 (8.35 pounds 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 July 20, 2019 and ends on August 26, 2019. 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 26, 2019, was 3,919,137,260 gallons. The total volume of fluid injected into the Mewbourne Well No. 1 was 1,937,169,118 gallons. The total volume of fluid injected into the Chukka Well No. 2 was 1,237,284,242 gallons. The volume of fluid injected into the Gaines Well No. 3 was 744,683,900 gallons. The injected volumes were obtained from plant records.

9. PRESSURE GAUGES

One (1) downhole pressure gauge (with two readings) was used for the Gaines Well No. 3 buildup and falloff testing. The downhole pressure gauge was set at 7660 feet, ground level.

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

   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-3540. The gauge is manufactured by DataCan.

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

   The MRO pressure gauge, Serial No. DC-3540, 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 certificates of calibration for the pressure gauge used during the testing are included as Appendix H. The pressure gauge was last calibrated on June 3, 2019 and is within the recommended calibration frequency as recommended by DataCan.

10. ONE MILE AREA OF REVIEW (AOR)

Federal Abstract Company was contracted by WSP and contracted 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. The current update of the one-mile area of review includes all existing wells within the one-mile AOR and any changes that have occurred to these wells since the 2018 update.

No new freshwater wells were reported within the search area since the submittal of the 2018 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 2018 pressure falloff report.

Four (4) wells were found in which the owner had changed. Four (4) new wells were plugged and abandoned. No wells were placed in temporarily abandoned status. No wells were found that were returned to production status. No wells were found that had been recompleted.

No new wells were drilled and no permits were issued to drill new wells. 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 7900 feet from Gaines Well No. 3, the test well. The Gaines Well No. 3 is approximately 3130 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 Chukka Well No. 2 were injecting at a constant rate during the buildup and falloff testing of the Gaines Well No. 3.

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 Gaines Well No. 3.

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

a. Date of the testing:

The buildup portion of the testing started on August 25, 2019 at 0900 hours and continued until August 26, 2019 at 1717 hours when the Gaines Well No. 3 was shut-in. The falloff test ended on August 28, 2019 at 0836 hours. The total depth of the well was tagged at 8632 feet below ground level, 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, 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 25, 2019 when the injection rate was set at an average injection rate of approximately 123 gallons per minute (gpm). The bottom-hole pressure and temperature were monitored for 32 hours after which time the well was shut in.

c. Type of injection fluid:

The injected fluid was non-hazardous wastewater from the plant. The density of the injection fluid averaged 8.36 pounds per gallon during the 32-hour injection period.

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

The final flowing pressure feet (P_{wf}) and temperature (T_{wf}) were 4299.60 psia and 103.08°F, respectively.

e. Total shut-in time:

The Gaines Well No. 3 was shut-in for 39 hours.

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

The final static pressure (P_{static}) and temperature (T_{static}) were 4176.37 psia and 104.84°F, respectively.

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 Gaines Well No. 3, there are two, 4-inch motor-controlled valves installed on the incoming pipeline before the pod filters. Two 4-inch valves are installed between the pod filters and the wellhead. There is one, 6-inch valve installed in the main line between the pod filters and the

booster pump. A 4-1/16-inch wing valve is installed on the wellhead. All valves were closed during the falloff portion of the testing. A diagram of the wellhead is shown in Figure 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 Gaines Well No. 3 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 L 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 39-hour shut-in period. Figure 8 shows the pressure and temperature data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 39-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 if present, 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 0.002 hours and continues to an elapsed shut in time of 0.017 hours. Radial flow begins at an elapsed shut in time of 9.37 hours and continues to an elapsed time of 34.68 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 29.21 and continues to 9.99. 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 6.6835 psi/cycle (OCD Guideline Section IX.15.c). The injection rate just prior to shut in was 123 gpm which is equivalent to 4285.71 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 104,265 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

$$\frac{kh}{\mu} = 162.6\frac{(4285.71)(1.0)}{6.6835}$$

$$= 104{,}265 \text{ md} - \text{ft}/\text{cp}$$

The permeability-thickness (flow capacity, OCD Guideline Section IX.15.i), kh, was determined to be 59,431 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):

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

$$= (104{,}265)(0.57)$$

$$= 59{,}431 \text{md} - \text{ft}$$

The reservoir permeability (OCD Guideline Section IX.15.e) using the total thickness (see Section 5 and Section 11) of 175 feet was 340 md:

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

$$= \frac{59{,}431}{175}$$

$$= 340 \text{ md}$$

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:

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

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 774,683,900 gallons of waste has been injected into Gaines Well No. 3 (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 1372 feet:

$$r_{waste} = \left(\frac{(0.13368)(774,683,900)}{(\pi)(175)(0.10)} \right)^{1/2}$$

$$= 1372 \text{ feet}$$

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

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

where,

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

The pore volume compressibility is 8.4×10^{-6} psi^{-1} (see Section 6). The 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 2.38 hours:

$$t_{waste} = 948 \frac{(0.10)(0.54)(8.4 \times 10^{-6})(1372^2)}{340}$$

$$= 2.38 \text{ hours}$$

Since the time required to pass through the waste is less than the 9.37 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 4299.60 psia. The pressure determined by extrapolating the radial flow semi-log line to a Δt of one hour, p_{1hr}, was 4185.96 psia (calculated from the analysis software). The wellbore radius, r_w, is 0.3246 feet (completion records). Using these values in addition to the previously discussed parameters results in a skin of 11.98

$$s = 1.151\left[\frac{4299.60 - 4185.96}{6.6835} - \log\left(\frac{340}{(0.10)(0.57)(8.4\text{x}10^{-6})(0.3246^2)}\right) + 3.23\right]$$

$$= 11.98$$

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 69.58 psi:

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

$$= 0.869(6.6835)(11.98)$$

$$= 69.58 \text{ psi}$$

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 0.44:

$$E = \frac{4299.60 - 69.58 - 4176.37}{4299.60 - 4176.37}$$

$$= 0.44$$

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

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

where,

k	=	formation permeability, millidarcies
Δt_s	=	elapsed shut-in time, hours
ϕ	=	formation porosity, fraction
μ	=	viscosity of the fluid the pressure transient is traveling through, cp

c_t = total compressibility of the formation plus fluid, psi^{-1}
0.029 = constant

The radius of investigation, r_{inv}, using the previously defined values was determined to be 4826 feet:

$$R_{inv} = 0.029\sqrt{\frac{(340)(39)}{(0.10)(0.57)(8.4 \times 10^{-6})}}$$

$$R_{inv} = 4826 \text{ feet}$$

As indicated on Figure 11, the pressure data departs the radial flow region at an elapsed time from shut in of 34.68 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 Gaines Well No. 3 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 28, 2019, a static pressure gradient survey (see Section 13) was conducted while pulling the pressure gauges out of the well. Static gradient stops were conducted at 7660 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 39 hours of shut-in at 7660 feet were 4176.37 psia and 104.84°F, respectively. The gradient survey is summarized in Table X. The data are graphically depicted in Figure 15.

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	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
	MACK ENERGY CORPORATION	SUN DEVILS FEDERAL NO. 001	30-015-36281	O	1		18S	27E	2193S	1520W	PERMIT TO DRILL 4/11/12		
0						32							
1	LLJ VENTURES, LLC DBA MARKER OIL & GAS	DELHI #001	30-015-00693	O	A	36	17S	27E	330N	330E	T/A	8/30/1941	
2	DELHI OIL CORP.	STATE #013	30-015-00694	O	A	36	17S	27E	990N	990E	P&A	6/24/1948	6/24/1948
3	LLJ VENTURES, LLC DBA MARKER OIL & GAS	DELHI #007	30-015-00646	O	A	36	17S	27E	990N	330E	ACTIVE	4/21/1950	
4	LEGACY RESERVES OPERATING, LP	SOUTH RED LAKE GRAYBURG UNIT #010	30-015-00668	O	G	36	17S	27E	1650N	2310E	SHUT IN	12/6/1947	
5	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CONKLIN #002	30-015-00690	O	G	36	17S	27E	1830N	2205E	ACTIVE	3/6/1949	
6	REMNANT OIL OPERATING LLC	SOUTH RED LAKE GRAYBURG UNIT #011	30-015-00667	I	G	36	17S	27E	2310N	2310E	ACTIVE	3/23/1949	
7	GEORGE A CHASE & C SERVICE	CONKLIN #001	30-015-00666	O	G	36	17S	27E	2310N	2310E	ACTIVE 1/12/10 P&A 9/10/07	1/10/1942	9/10/2007
8	LLJ VENTURES, LLC DBA MARKER OIL & GAS	GATES STATE #001	30-015-00689	O	H	36	17S	27E	1650N	330E	ACTIVE	8/4/1950	
9	ASPEN OIL INC	GATES STATE #002	30-015-00647	O	H	36	17S	27E	1650N	990E	ACTIVE	10/21/2003	10/21/2003
10	LLJ VENTURES, LLC DBA MARKER OIL & GAS	HOMAN #001	30-015-00669	O	H	36	17S	27E	2310N	330E	ACTIVE	5/6/2008	5/6/2008
11	KERSEY & CO	RAMAPO #001	30-015-00688	O	I	36	17S	27E	2310S	330E	P&A	10/28/1941	10/28/1941
12	KERSEY & CO	RAMAPO #003	30-015-00670	O	I	36	17S	27E	2970N	330E	P&A	1/3/1950	1/3/1950
13	KERSEY & CO	RAMAPO #002	30-015-00687	G	I	36	17S	27E	2310S	990E	P&A	5/7/1948	5/7/1948
14	ARCO OIL & GAS	EMPIRE ABO UNIT G #020	30-015-00685	O	I	36	17S	27E	1650S	330E	P&A	7/10/1989	7/10/1989
15	ROJO GRANDE COMPANY LLC	RAMAPO #003	30-015-00671	O	J	36	17S	27E	2310S	2310E	ZONE ABAN	2/13/1942	1/24/2000
16	MCQUADRANGLE, LC	SOUTH RED LAKE GRAYBURG UNIT #023	30-015-01221	O	J	36	17S	27E	2300S	2300E	ZONE ABAN	2/27/1948	8/13/2002
17	MARTIN YATES III	DOOLEY STATE #3			J	36	17S	27E				4/22/1961	
18	APACHE CORP	EMPIRE ABO UNIT #019A	30-015-05934	O	J	36	17S	27E	1650S	1650E	T/A	2/26/1961	
19	MCQUADRANGLE, LC	SOUTH RED LAKE GRAYBURG UNIT #022	30-015-01220	O	K	36	17S	27E	2310S	2330W	ZONE ABAN	2/3/1949	7/17/2002
20	ROJO GRANDE COMPANY LLC	RAMAPO #002	30-015-00674	O	K	36	17S	27E	2310S	2310W	ACTIVE	5/15/1947	
21	MCQUADRANGLE, LC	SOUTH RED LAKE GRAYBURG UNIT #021	30-015-01219	I	K	36	17S	27E	2310S	1650W	ACTIVE	1/20/1948	
22	MCQUADRANGLE, LC	SOUTH RED LAKE GRAYBURG UNIT #043	30-015-23913	O	K	36	17S	27E	1650S	1650W	ACTIVE	12/11/1981	
23	MARTIN YATES III	DOOLEY STATE ABO #3		O	K	36	17S	27E			ACTIVE	4/19/1961	
24	ROJO GRANDE COMPANY LLC	RAMAPO #001	30-015-00673	O	K	36	17S	27E	1650S	2310W	ZONE ABAN	1/24/2000	1/24/2000
25	ROJO GRANDE COMPANY LLC	RAMAPO #004	30-015-00682	O	N	36	17S	27E	990S	1650W	ZONE ABAN	1/24/2000	1/24/2000
26	FAIRWAY RESOURCES OPERATING INC	SOUTH RED LAKE GRAYBURG UNIT #028	30-015-00683	I	N	36	17S	27E	965S	1650W	ACTIVE	4/16/1948	
27	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #018	30-015-01218	O	N	36	17S	27E	330S	2310W	P&A	3/11/2009	3/11/2009
28	BURNHAM OIL COMPANY	STATE B-6961 NO. 1-A	30-015-00684	O	O	36	17S	27E	990S	2310E	P&A	5/13/1947	5/13/1947
29	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #019	30-015-01251	O	O	36	17S	27E	660S	1980E	P&A	9/8/1959	4/27/2009
30					I	36	17S	27E			MISPLOT OF 14		
31	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #020	30-015-00677	O	P	36	17S	27E	330S	990E	P&A	4/13/2009	4/10/2009
32	C F M OIL CO	BLAKE STATE #001	30-015-01616	O	P	30	17S	28E	330S	990E	ACTIVE	3/7/1953	
33	ALAMO PERMIAN RESOURCES LLC	STATE NO. 1	30-015-01638	O	A	31	17S	28E	330N	990E	ACTIVE	7/15/1952	7/15/1952
34	FINNEY OIL COMPANY	POWCO STATE #001	30-015-21594	O	B	31	17S	28E	330N	1650E	ACTIVE	11/15/1975	
35	BEDINGFIELD, J E	DELHI-STATE NO. 1	30-015-01636	O	C	31	17S	28E	330N	2310E	P&A	12/23/1952	12/23/1952
36	FINNEY OIL COMPANY	POWCO STATE #002	30-015-25621	O	B	31	17S	28E	980N	1620E	ACTIVE	7/15/1986	
37	LLJ VENTURES LLC DBA MARKER OIL & GAS	ASTON & FAIR A #001	30-015-01633	O	1	31	17S	28E	330N	330W	ACTIVE	6/23/1942	
38	ASTON & FAIR	STATE 31 NO. 1X	30-015-01634	O	D	31	17S	28E	350N	345W	NO COMPL	1/5/1946	
39	MCLAUGHLIN, C T	BEDINGFIELD STATE 1 NO. 1	30-015-01645	O	F	31	17S	28E	990N	990W	P&A	2/16/1950	2/16/1950
40	ROVER OPERATING LLC	HUDSON SAIKIN STATE #001	30-015-02666	O	2	31	17S	28E	2310N	330W	ACTIVE	5/29/1948	
41	ROVER OPERATING LLC	HUDSON SAIKIN STATE #002	30-015-24887	O	2	31	17S	28E	2310N	990W	ACTIVE	7/7/1984	
42	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022	30-015-01643	O	F	31	17S	28E	2310N	2260W	P&A	6/7/1960	7/10/2009
43	GEORGE A CHASE JR DBA G AND C SERVICE	ASTON & FAIR #001Y	30-015-01635	O	F	31	17S	28E	2310N	2310W	ACTIVE	5/8/1948	
44	GEORGE A CHASE JR DBA G AND C SERVICE	MALCO STATE #001	30-015-01637	O	G	31	17S	28E	2310N	2310E	ACTIVE	10/12/1953	
45	KERSEY & CO	BOLING #001	30-015-01652	O	G	31	17S	28E	2288N	1625E	ACTIVE	8/10/1960	
46	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #004	30-015-10537	O	H	31	17S	28E	2277N	330E	ACTIVE	9/23/1965	
47	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #010	30-015-10833	O	I	31	17S	28E	1980S	660E	ACTIVE	6/17/1966	
48	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #024A	30-015-01644	O	I	31	17S	28E	1650S	330E	P&A	4/29/1960	6/12/2009
49	ROVER OPERATING LLC	STATE FW #001	30-015-01642	O	J	31	17S	28E	1650S	2310E	ACTIVE	12/23/1962	
50	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #023A	30-015-01650	O	J	31	17S	28E	1650S	1958E	P&A	9/17/2003	9/17/2003
51	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022B	30-015-01651	O	K	31	17S	28E	1650S	2387W	P&A	4/10/1960	10/22/2009
52	ROVER OPERATING LLC	RAMPO #002	30-015-01640	O	3	31	17S	28E	2310S	330W	ACTIVE	7/16/1955	
53	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #021A	30-015-01648	O	3	31	17S	28E	1651S	1089E	ZONE ABAN	8/24/2002	8/24/2002
54	ROVER OPERATING LLC	RAMPO #001	30-015-01639	O	4	31	17S	28E	990S	330W	ACTIVE	5/1/1948	
55	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #021	30-015-01647	O	4	31	17S	28E	660S	660W	P&A	1/31/1960	7/23/2005
56	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022A	30-015-01646	O	N	31	17S	28E	660S	2082W	P&A	1/22/1960	
57	ROVER OPERATING LLC	STATE FV #001	30-015-10118	O	N	31	17S	28E	766S	2188W	ACTIVE	3/1/1963	
58	OTIS A ROBERTS	PARKER-STATE NO. 1	30-015-01653	O	O	31	17S	28E	990S	1650E	P&A	1/18/1942	1/18/1942
59	NAVAJO REFINING CO. PIPELINE DIVISION	WDW #001	30-015-27592	I	O	31	17S	28E	660S	2310E	ACTIVE	8/4/1998	

TABLE II

TABULATION OF WELLS WITHIN ONE MILE AREA OF REVIEW

ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
60	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #023	30-015-01649	O	O	31	17S	28E	660S	1939E	P&A	2/24/1960	8/14/2009
61	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #011	30-015-20042	O	P	31	17S	28E	990S	660E	ACTIVE	5/8/1967	
62	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #024	30-015-01641	O	P	31	17S	28E	660S	660E	ACTIVE	3/12/1960	
63	BEDINGFIELD, J E	ASTON-STATE NO. 1	30-015-01654	O	D	32	17S	28E	330N	330W	P&A	5/12/1953	5/12/1953
64	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #025B	30-015-01671	O	E	32	17S	28E	2280N	978W	P&A	9/13/1960	8/14/2008
65	MARBOB ENERGY CORP	AA STATE NO. 1	30-015-01657	O	F	32	17S	28E	2280N	1980W	ACTIVE	8/24/1960	
66	SDX RESOURCES INC	NORTHWEST ARTESIA UNIT #008	30-015-10818	O	K	32	17S	28E	2310S	2105W	P&A	11/6/2006	11/6/2006
67	APACHE CORP	EMPIRE ABO UNIT #026B	30-015-01661	O	K	32	17S	28E	1650S	2310W	T/A	3/27/1960	
68	LIME ROCK RESOURCES A, LP	NORTHWEST ARTESIA UNIT #009	30-015-10795	O	L	32	17S	28E	2310S	660W	P&A	5/15/1966	5/28/2008
69	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #025A	30-015-01662	O	L	32	17S	28E	1650S	990W	ACTIVE	4/13/1960	
70	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #012	30-015-20043	O	M	32	17S	28E	990S	760W	ACTIVE	5/9/1967	
71	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #025	30-015-01660	O	M	32	17S	28E	660S	660W	P&A	3/5/1960	1/14/2009
72	SDX RESOURCES INC	NORTHWEST ARTESIA UNIT #013	30-015-10834	O	N	32	17S	28E	990S	2030W	P&A	9/15/2006	9/15/2006
73	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #026A	30-015-01659	O	N	32	17S	28E	660S	1980W	ACTIVE	2/14/1960	
74	APACHE CORP	EMPIRE ABO UNIT #261	30-015-21539	O	N	32	17S	28E	150S	1400W	P&A	7/25/1975	
75	APACHE CORP	EMPIRE ABO UNIT #272	30-015-22009	O	O	32	17S	28E	330S	2481E	T/A	7/18/1977	
76	APACHE CORP	EMPIRE ABO UNIT #026E	30-015-02606	O	3	5	18S	28E	330N	1941W	T/A	7/18/1960	
77	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #261A	30-015-22697	O	3	5	18S	28E	1080N	1914W	P&A	1/4/1979	6/16/2009
78	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #025C	30-015-02607	O	4	5	18S	28E	660N	660W	ACTIVE	3/27/1960	
79	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #251	30-015-22750	O	4	5	18S	28E	660N	150W	SHUT IN	1/12/1979	
80	CONOCOPHILLIPS COMPANY	STATE E AI #001	30-015-02608	O	E	5	18S	28E	1660N	330W	P&A	1/13/2006	1/13/2006
81	CONOCOPHILLIPS COMPANY	ILLINOIS CAMP A COM #001	30-015-24485	G	E	5	18S	28E	1980N	990W	ACTIVE	8/10/1983	
82	APACHE CORP	EMPIRE ABO UNIT #026D	30-015-02602	O	F	5	18S	28E	1650N	1650W	ACTIVE	12/30/1959	
83	I & W INC	WALTER SOLT STATE #001	30-015-25522	S	L	5	18S	28E	2240S	400W	ACTIVE	8/12/1983	
84	MACK ENERGY CORP	STATE AG #001	30-015-10244	O	L	5	18S	28E	2310S	330W	ZONE ABAN	3/27/2001	3/27/2001
87	LIME ROCK RESOURCES A, LP	NORTHWEST ARTESIA UNIT #016	30-015-20019	O	1	6	18S	28E	330N	330E	ACTIVE	3/14/1967	
88	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #024B	30-015-02615	O	1	6	18S	28E	660N	660E	ACTIVE	2/29/1960	
89	APACHE CORP	EMPIRE ABO UNIT #023C	30-015-02625	O	2	6	18S	28E	470N	2170E	T/A	12/21/1959	
90	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #231	30-015-21542	O	2	6	18S	28E	1260N	1580E	ACTIVE	11/1/1975	
91	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022E	30-015-02621	O	3	6	18S	28E	660N	1980W	ACTIVE	12/29/1959	
92	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #231A	30-015-21626	O	G	6	18S	28E	1361N	2531E	SHUT IN	10/22/1975	
93	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #021B	30-015-02613	O	4	6	18S	28E	990N	660W	ACTIVE	12/30/1959	
94	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #213	30-015-23116	O	5	6	18S	28E	2050N	100W	ACTIVE	6/2/1980	
95	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #021C	30-015-02619	O	5	6	18S	28E	1990N	660W	ACTIVE	10/30/1959	
96	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #212	30-015-22637	O	5	6	18S	28E	2450N	400W	ACTIVE	12/28/1978	
97	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #211	30-015-21395	O	5	6	18S	28E	2630N	1300W	ACTIVE	2/11/1975	
98	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #222	30-015-22012	O	F	6	18S	28E	1350N	1572W	ACTIVE	3/13/1977	
99	SARKIN, DAVID C & OLIVER, HENRY F	STATE NO. 1	30-015-02626	O	F	6	18S	28E	1650N	1650W	P&A	2/21/1942	2/21/1942
100	ROVER OPERATING LLC	STATE FX #001	30-015-10107	O	F	6	18S	28E	1874N	1874W	ACTIVE	8/8/1963	
101	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022D	30-015-02620	O	F	6	18S	28E	1990N	2082W	ACTIVE	11/26/1959	
102	APACHE CORP	EMPIRE ABO UNIT #223	30-015-22527	O	F	6	18S	28E	2630N	1930W	T/A	5/19/1978	
103	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #221	30-015-21746	O	F	6	18S	28E	2610N	2713W	ACTIVE	4/23/1976	
104	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #235	30-015-22913	O	G	6	18S	28E	1750N	1600E	ACTIVE	7/8/1979	
105	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #234	30-015-22593	O	G	6	18S	28E	1900N	2441E	P&A	8/27/1978	12/3/2008
106	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #023B	30-015-02614	O	G	6	18S	28E	1980N	1980E	ACTIVE	1/26/1960	
107	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #232	30-015-21737	O	G	6	18S	28E	2253N	1576E	P&A	4/13/1976	5/7/2009
108					H	6	18S	28E			MISPLOT OF 107		
109	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #233	30-015-22490	O	G	6	18S	28E	2550N	2050E	P&A	6/5/1978	4/3/2009
110	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #024C	30-015-02616	O	H	6	18S	28E	1650N	990E	ACTIVE	3/24/1960	
111	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #241	30-015-23547	O	H	6	18S	28E	1950N	660E	P&A	4/12/1981	9/19/2008
112	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #024K	30-015-02617	O	I	6	18S	28E	2310S	990E	P&A	12/12/2002	12/12/2002
113	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #232A	30-015-22528	O	J	6	18S	28E	2300S	1570E	P&A	2/5/1979	4/7/2009
114	BARNEY COCKBURN	STATE NO. 1	30-015-02611	O	J	6	18S	28E	2310S	2310E	P&A	8/15/1949	8/15/1949
115	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #023D	30-015-02628	O	J	6	18S	28E	2260S	2270E	ACTIVE	5/23/1979	
116	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #231B	30-015-22491	O	J	6	18S	28E	1700S	2350E	P&A	8/13/1978	9/2/2009
117	MILLER BROS OIL CO	CAPITOL STATE NO. 1	30-015-02618	G	J	6	18S	28E	1647S	2076E	P&A	3/21/1955	3/21/1955
118	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022F	30-015-02623	O	K	6	18S	28E	2248S	2075W	ACTIVE	2/22/1960	
119					K	6	18S	28E			MISPLOT		
120	NAVAJO REFINING COMPANY	WDW-2 (ORIGINAL LOCATION)			L	6	18S	28E					

TABLE II

TABULATION OF WELLS WITHIN ONE MILE AREA OF REVIEW

ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
121	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #021D	30-015-02622	O	6	6	18S	28E	2219S	660W	ACTIVE	1/23/1960	
122	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #211A	30-015-23548	O	6	6	18S	28E	1950S	1000W	ACTIVE	7/17/1980	
123	RUTH OIL CO, LLC	STATE M-AI #002	30-015-02627	O	7	6	18S	28E	949S	990W	ACTIVE	10/21/1960	
124	MEWBOURNE OIL CO	CHALK BLUFF 6 STATE #001	30-015-26943	G	7	6	18S	28E	990S	730W	ACTIVE	4/16/1992	
125	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #022C	30-015-02610	O	N	6	18S	28E	955S	1750W	ACTIVE	8/5/1960	
126	PAN AMERICAN PETROLEUM CO	STATE CD NO. 1	30-015-02624	O	O	6	18S	28E	968S	2270E	P&A	5/1/1961	5/1/1961
127	DICKSON PETROLEUM CO	KIMBERLY STATE NO. 1	30-015-25503	O	P	6	18S	28E	660S	330E	P&A	12/30/1985	12/30/1985
128	D & H OIL CO	STATE NO. 1	30-015-02612	O	P	6	18S	28E	330S	330E	P&A	5/13/1952	5/13/1952
129	APACHE CORP	EMPIRE ABO UNIT #020D	30-015-01215	O	1	1	18S	27E	667N	666E	P&A	11/5/1959	
130	APACHE CORP	EMPIRE ABO UNIT #019B	30-015-00708	O	2	1	18S	27E	660N	1980E	P&A	7/7/1959	5/22/2013
131	MALCO REFINERIES	HILL #4			C	1	18S	27E			P&A	5/10/1948	5/10/1948
132					C	1	18S	27E			MISPLOT		
133	MARBOB ENERGY CORP	AAO FEDERAL No. 013	30-015-00710	O	3	1	18S	27E	660N	1980W	ACTIVE	7/21/2004	
134	MEWBOURNE OIL CO	CHALK BLUFF FEDERAL COM #002	30-015-26741	G	F	1	18S	27E	1650N	1350W	ACTIVE	8/24/1991	
135	APACHE CORP	EMPIRE ABO UNIT #018A	30-015-00706	O	F	1	18S	27E	2310N	1980W	ACTIVE	5/31/1959	
136	APACHE CORP	EMPIRE ABO UNIT #019C	30-015-00709	O	G	1	18S	27E	1980N	1980E	P&A	8/2/1959	2/18/2013
137					G	1	18S	27E			MISPLOT		
138	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #191	30-015-21552	O	G	1	18S	27E	2500N	2500E	ACTIVE	9/7/1975	
139	APACHE CORP	EMPIRE ABO UNIT #020C	30-015-00711	O	H	1	18S	27E	1980N	660E	P&A	10/13/1959	7/8/2013
140	APACHE CORP	EMPIRE ABO UNIT #202	30-015-21783	O	H	1	18S	27E	2490N	1299E	P&A	5/13/1976	
141	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #203	30-015-22656	O	H	1	18S	27E	2400N	700E	ACTIVE	10/10/1978	
142	MANHATTAN OIL	CRONIN #1			H	1	18S	27E			P&A	7/1/1927	7/1/2027
143	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #201	30-015-21553	O	H	1	18S	27E	2501N	20E	ACTIVE	7/19/1975	
144	MEWBOURNE OIL CO	CHALK BLUFF FEDERAL COM #003	30-015-27163	G	I	1	18S	27E	1980S	990E	ACTIVE	1/16/1993	
145	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #020K	30-015-00697	O	I	1	18S	27E	1980S	660E	P&A	1/5/2003	1/5/2003
146	APACHE CORP	EMPIRE ABO UNIT #193	30-015-22657	O	J	1	18S	27E	2490S	2200E	T/A	10/26/1978	
147	APACHE CORP	EMPIRE ABO UNIT #019Q	30-015-00696	O	J	1	18S	27E	1980S	1980E	P&A	8/20/1959	7-12-203
148	APACHE CORP	EMPIRE ABO UNIT #192	30-015-22560	O	J	1	18S	27E	220S	1390E	T/A	6/25/1978	
149	APACHE CORP	EMPIRE ABO UNIT #191A	30-015-21873	O	J	1	18S	27E	1526S	1470E	P&A	9/23/1976	
150	APACHE CORP	EMPIRE ABO UNIT #194	30-015-22658	O	J	1	18S	27E	1500S	2130E	T/A	11/14/1978	11/1/2011
151	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #184	30-015-22559	O	K	1	18S	27E	2290S	2445W	SHUT IN	7/25/1978	
152	APACHE CORP	EMPIRE ABO UNIT #183	30-015-22096	O	K	1	18S	27E	2370S	1510W	T/A	7/24/1977	
153	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #181	30-015-21554	O	K	1	18S	27E	1367S	1440W	P&A	4/17/2003	4/17/2003
154	APACHE CORP	EMPIRE ABO UNIT #018B	30-015-00707	O	K	1	18S	27E	1980S	1980W	P&A	5/22/1959	
155	APACHE CORP	EMPIRE ABO UNIT #182	30-015-21792	O	K	1	18S	27E	1533S	2370W	T/A	6/1/1976	
156	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #018D	30-015-00713	O	N	1	18S	27E	995S	1644W	P&A	9/27/2003	9/27/2003
157	NAVAJO REFINING COMPANY	WDW-3	30-015-26575	I	N	1	18S	27E	790S	2250W	ACTIVE	3/7/1991	
158	HUMBLE OIL & REFINING CO	EMPIRE ABO FEDERAL NO. 5	30-015-20394	O	O	1	18S	27E	953S	2197E	P&A	4/9/1971	4/9/1971
159	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #191	30-015-00698	S	O	1	18S	27E	660S	1980E	ACTIVE	11/8/1959	
160	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #020B	30-015-00699	O	P	1	18S	27E	940S	330E	ACTIVE	12/2/1961	
161	DEVON ENERGY PRODUCTION COMPANY LP	FEDERAL T #001	30-015-26404	I	A	12	18S	27E	660N	990E	ACTIVE	9/13/1990	
162	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #006	30-015-25099	O	H	12	18S	27E	1809N	990E	ACTIVE	9/11/1985	
165	EASTLAND OIL CO	LAUREL STATE #001	30-015-25997	O	C	7	18S	28E	940N	1757W	ACTIVE	2/23/1987	
166	EASTLAND OIL CO	LAUREL STATE #002	30-015-25675	O	2	7	18S	28E	940N	1757W	ACTIVE	11/10/1988	
167	MOREXCO INC	STATE BY #001	30-015-25236	O	F	7	18S	28E	1980N	1980W	ACTIVE	6/10/1985	
168	DYAD PE	PRE-ONGUARD WELL #213	30-015-22636	O	J	7	18S	28E	1950N	1300W	ABAN LOCATION		
169	DYAD PE	PRE-ONGUARD WELL #212	30-015-22635	O	J	8	18S	28E	1900N	100W	ABAN LOCATION		
170	DYAD PE	PRE-ONGUARD WELL #001	30-015-24372	O	J	8	18S	28E	1980S	990E	ABAN LOCATION		
171	PHILLIPS PETROLEUM	CHALK BLUFF 6 STATE #002	30-015-27636	O	H	7	18S	28E	2310N	810E	ABAN LOCATION		
353	MEWBOURNE OIL CO	CHALK BLUFF 36 STATE #001	30-015-27286	O	M	36	17S	27E	660S	990W	ACTIVE	3/30/1993	
354	PRONGHORN MANAGEMENT CORP	STATE M #001	30-015-24612	O	M	36	17S	27E	790S	990W	P&A	10/11/1983	4/21/2009
355	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #017	30-015-00676	O	M	36	17S	27E	330N	990W	ACTIVE		
356	ASPEN OIL INC	STATE #006	30-015-10184	O	M	36	17S	27E	330S	920W	ACTIVE		
358	GEORGE A CHASE JR & C SERVICE	STATE #007	30-015-21623	O	M	36	17S	27E	360S	455W	ACTIVE		
359	ACREY, B L & F D	STATE NO. 2	30-015-00662	O	M	36	17S	27E	330S	330W	P&A	10/15/1942	10/15/1942
595	BP AMERICA PRODUCTION UNIT	EMPIRE ABO UNIT NO. 27 E	30-015-02605	O	B	5	18S	28E	930N	2271E	P&A	3/30/1960	6/12/2009
748	FAIRWAY RESOURCES OPERATING LLC	SOUTH RED LAKE GRAYBURG UNIT 37 WIW	30-015-00701	O	D	1	18S	27E	330N	330W	ACTIVE		
748	REMNANT OIL OPERATING LLC	SOUTH RED LAKE GRAYBURG UNIT #037	30-015-00715	I	4	1	18S	27E	330N	330W	ACTIVE		
749	ARCO OIL & GAS	EMPIRE ABO UNIT I NO. 17	30-015-00712	O	D	1	18S	27E	647N	667W	P&A	1/24/1987	1/24/1987
750	JONES	BRAINARD		O	E	1	18S	27E	1650N	330W	P&A	5/10/1939	5/10/1939
751	ARCO OIL & GAS	EMPIRE ABO UNIT J NO. 17	30-015-00704	O	E	1	18S	27E	1980N	660W	P&A	3/26/1959	3/26/1959
752	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #017A	30-015-00703	O	L	1	18S	27E	1980S	660W	P&A	5/22/1995	3/27/2009
753	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #171	30-015-22815	O	M	1	18S	27E	670S	330W	ACTIVE	5/22/1979	
754					M	1	18S	27E			MISPLOT OF 756		
755	VALLEY REFINING CO	HILL #1	30-015-00714		N	1	18S	27E			P&A	12/20/1943	12/20/1943
756	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #017B	30-015-00705	O	M	1	18S	27E	990S	660W	P&A	6/25/1959	7/21/2004
757	BRAINARD & GUY	STATE 2			A	2	18S	27E	330N	610E	NO COMPL	1/31/1942	1/31/1942

TABLE II

TABULATION OF WELLS WITHIN ONE MILE AREA OF REVIEW

ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
758	REMNANT OIL OPERAING LLC	SOUTH RED LAKE GRAYBURG UNIT #036	30-015-00721	O	1	2	18S	27E	330N	990E	ACTIVE	11/6/1947	
765	APACHE CORP	EMPIRE ABO UNIT #016B	30-015-00724	O	1	2	18S	27E	990N	330E	T/A		
766	REMNANT OIL OPERAING LLC	SOUTH RED LAKE GRAYBURG UNIT #038	30-015-00737	O	B	2	18S	27E	905N	1601E	ACTIVE	5/23/1948	
772	MACK ENERGY CORPORATION	STATE H #001	30-015-00745	O	H	2	18S	27E	1980N	660E	P&A	3/7/2008	3/7/2008
773	S&J OPERATING COMPANY	SOUTH RED LAKE GRAYBURG UNIT 39 WIW	30-015-00742	O	H	2	18S	27E	1650N	990E	P&A	2/8/1991	2/8/1991
774	MCQUADRANGLE, LC	SOUTH RED LAKE GRAYBURG UNIT #040	30-015-00740	I	G	2	18S	27E	1650N	2197E	P&A	7/10/2002	7/10/2002
778	RUTTER & WILBANKS	HUDSON #2		O	G	2	18S	27E	2310N	1650E		1/1/1957	
779	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #015B	30-015-00741	O	G	2	18S	27E	2310N	1980E	ACTIVE	6/6/1959	
781	MALCO REFINING CO	STATE B-2		O	J	2	18S	27E	2310S	2310E	P&A	1/1/1947	1/1/1947
785	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #016	30-015-00717	O	I	2	18S	27E	1980S	660E	ACTIVE	2/6/1995	
786	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #015	30-015-00716	O	J	2	18S	27E	1980S	1830E	ACTIVE	3/23/1959	
789	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #143A	30-015-22896	O	K	2	18S	27E	1820S	2550W	ACTIVE	5/13/1979	
791	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #161	30-015-22914	O	I	2	18S	27E	1310S	590E	ACTIVE	9/13/1979	
792					O	2	18S	27E			MISPLOT OF 814		
793	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #143	30-015-22609	O	N	2	18S	27E	1200S	1900W	ACTIVE	12/20/1978	
795					P	2	18S	27E			MISPLOT OF 765		
796	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #151	30-015-21544	O	O	2	18S	27E	1110S	1322E	T/A	11/4/1975	
797	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #155	30-015-22885	O	O	2	18S	27E	1040S	2025E	T/A	5/1/1979	
799	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #016A	30-015-00722	O	P	2	18S	27E	660S	660E	P&A	1/20/1959	2/24/2009
800	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #156	30-015-22808	O	O	2	18S	27E	600S	1330E	P&A	4/12/1979	2/5/2009
801	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #015A	30-015-00731	O	O	2	18S	27E	660S	1980E	P&A	11/19/1958	2/11/2009
802	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #154	30-015-22669	O	O	2	18S	27E	800S	2500E	P&A	12/4/1978	1/27/2009
805	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #153	30-015-22013	O	O	2	18S	27E	90S	1456E	P&A	4/20/1977	10/30/2008
806	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #152	30-015-21825	O	O	2	18S	27E	320S	2602E	T/A	6/17/1976	
807	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #142	30-015-22608	O	N	2	18S	27E	100S	1950W	P&A (No Info on dates)		
808	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #132	30-015-21807	O	M	2	18S	27E	275S	1243W	ACTIVE	7/1/1976	
812	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #014	30-015-00730	O	N	2	18S	27E	660S	1980W	ACTIVE	10/21/1958	
813	BP AMERICA PRODUCTION COMPANY	RIVERWOLF UNIT #004	30-015-00720	O	A	2	18S	27E	990N	1650E	P&A	10/21/1959	12/12/2008
814	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #141A	30-015-22051	O	K	2	18S	27E	1370S	2445W	ACTIVE	5/17/1977	
836	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #016C	30-015-00869	O	A	11	18S	27E	330N	653E	P&A	10/25/2004	10/25/2004
837	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #151B	30-015-22568	O	B	11	18S	27E	400N	1450E	P&A	8/16/2006	8/16/2006
838	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #153B	30-015-22838	O	B	11	18S	27E	200N	1925E	P&A	5/6/1979	1/4/2009
839	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #015C	30-015-00868	O	B	11	18S	27E	660N	1980E	P&A	7/16/2004	7/16/2004
840	BP AMERICA PRODUCTION COMPANY	EMPIRE ABO UNIT #152B	30-015-22569	O	B	11	18S	27E	560N	2588E	P&A	8/23/1978	9/24/2008
841	APACHE CORP	EMPIRE ABO UNIT #141B	30-015-22834	O	C	11	18S	27E	225N	2280W	P&A	5/21/1979	
842	ARCO OIL & GAS	EMPIRE ABO UNIT M NO. 14	30-015-00864	O	C	11	18S	27E	660N	1980W	P&A	9/5/1957	9/5/1957
843	APACHE CORP	EMPIRE ABO UNIT #133B	30-015-22833	O	D	11	18S	27E	450N	1175W	P&A	5/23/1979	
844	ARCO OIL & GAS	EMPIRE ABO UNIT M NO. 13	30-015-00867	O	D	11	18S	27E	660N	660W	P&A	4/26/1958	4/26/1958
846	ARCO OIL & GAS	EMPIRE ABO UNIT M NO. 131	30-015-22556	O	D	11	18S	27E	1100N	1200W	P&A	7/10/1978	7/10/1978
848	AMOCO PRODUCTION CO	MALCO S NO. 1	30-015-20510	O	F	11	18S	27E	1650N	1653W	P&A	10/16/1971	10/16/1971
849	ARCO OIL & GAS	EMPIRE ABO UNIT N NO. 14	30-015-00865	O	F	11	18S	27E	1650N	1980W	P&A	2/3/1961	2/3/1961
850	ARCO OIL & GAS	EMPIRE ABO UNIT N NO. 131	30-015-00866	O	E	11	18S	27E	1980N	660W	P&A	3/27/1958	3/27/1958
851	AMOCO PRODUCTION CO	SMITH-MCPHERSON NO. 1	30-015-00870	O	J	11	18S	27E	1980S	1980E	P&A	9/1/1956	9/1/1956
852	OSCAR HOWARD	AN ETZ #3	30-015-01201		N	11	18S	27E			P&A		4/15/2027
853	OSCAR HOWARD	AN ETZ #2	30-015-01202		O	11	18S	27E			P&A		2/4/2027
854	B.R. POLK, JR.	VICKERS #1	30-015-00863		N	11	18S	27E			P&A	10/14/1949	10/14/1949
855	CHESAPEAKE OPERATING INC	FEDERAL DH GAS COM #001	30-015-24857	G	M	11	18S	27E	700S	990W	ACTIVE	5/18/1984	
856	ROBERT G COX	FEDERAL EA 2	30-015-20535	O	D	12	18S	27E	330N	455W	P&A	8/7/1973	8/7/1973
857	RHONDA OPERATING CO	FEDERAL EA #001	30-015-00871	O	D	12	18S	27E	330N	330W	P&A	4/12/1994	4/12/1994
858	RHONDA OPERATING CO	FEDERAL EA NO. 3	30-015-23115	O	D	12	18S	27E	330N	380W	D&A	3/16/1980	3/16/1980
859	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #009	30-015-25738	O	G	12	18S	27E	2310N	2310E	ACTIVE	4/25/1987	
860	BILL MILLER	CHUKKA FEDERAL #001	30-015-25270	O	F	12	18S	27E	2310N	2310W	ACTIVE	4/23/1985	
861	NAVAJO REFINING COMPANY	WDW #002	30-015-20894	I	E	12	18S	27E	1980N	660W	ACTIVE	7/18/1973	
862	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #007	30-015-00874	O	J	12	18S	27E	2310S	2355E	ACTIVE	6/29/1948	
863	MCKEE-JONES	MAGRUDER NO. 1	30-015-00872	O	L	12	18S	27E	310S	990W	D&A		2/18/1943
864	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #002	30-015-25201	O	K	12	18S	27E	1650S	1770W	ACTIVE	3/16/1985	
865	FRED POOL DRILLING CO	COMSTOCK FEDERAL NO. 8	30-015-25649	O	L	12	18S	27E	1650S	990W	D&A		10/10/1986
866	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #003	30-015-25545	O	M	12	18S	27E	990S	990W	ACTIVE	5/19/1986	
867	R.E. McKEE ET AL	MAGRUDER #2	30-015-00873		M	12	18S	27E			P&A	2/27/1945	2/27/1945
868	EASTLAND OIL CO	COMSTOCK FEDERAL #010	30-015-26017	O	N	12	18S	27E	990S	1650W	P&A	1/23/2003	1/23/2003
869	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #001	30-015-25100	O	N	12	18S	27E	330S	1650W	ACTIVE	12/10/1984	
870	HARLOW ENTERPRISES LLC	COMSTOCK FEDERAL #005	30-015-25202	O	O	12	18S	27E	330S	2310E	ACTIVE	4/19/1985	
871	PILCHER OIL & GAS	MICHAEL CRONIN NO. 3	30-015-06171	O	I	12	18S	27E	1069S	251E	P&A		5/20/2026

TABLE II

TABULATION OF WELLS WITHIN ONE MILE AREA OF REVIEW

ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
872	PILCHER OIL & GAS	MICHAEL CRONIN #1			P	12	18S	27E			P&A	2/15/1932	2/15/1932
873	CITIES SERVICE OIL CO	MAGRUDER NO. B-4	30-015-00875	O	P	12	18S	27E	330S	330E	P&A	7/30/1952	7/30/1952
874	ROBERT E MCKEE	MAGRUDER NO. 5	30-015-00876	O	P	12	18S	27E	100S	500E	P&A	2/8/1954	2/8/1954
875	PILCHER OIL & GAS	MICHAEL CRONIN NO. 2	30-015-06170	O	P	12	18S	27E	200S	200E	P&A		2/22/2026
876	HASSENFUSH-DONNELLY	STATE NO. 1	30-015-01200	O	A	13	18S	27E	0	0	P&A		1/1/2026
877	EASTLAND OIL CO	STATE NO. 2	30-015-06137	O	A	13	18S	27E	250N	990E	D&A		1/1/2026
878	BILL MILLER	ARTESIA STATE #002	30-015-25394	O	C	13	18S	27E	330N	2310W	ACTIVE	9/28/1985	
879	BILL MILLER	ARTESIA STATE #001	30-015-25241	O	C	13	18S	27E	330N	1650W	ACTIVE	4/13/1985	
880	DALE RESLER	STATE NO. 3	30-015-00884	O	C	13	18S	27E	990N	1650W	P&A	1/29/1945	1/29/1945
881	CBS OPERATING CORP	ARTESIA STATE UNIT #002A	30-015-25370	O	D	13	18S	27E	480N	940W	ACTIVE	8/27/1985	
882	ROVER OPERATING LLC	ARTESIA STATE UNIT #001	30-015-00883	O	D	13	18S	27E	990N	990W	ACTIVE	12/11/1944	
883	DALE RESLER - JONES	STATE NO. 1	30-015-00880	O	E	13	18S	27E	1650N	990W	P&A	1/26/1945	1/26/1945
884	DAVID G HAMMOND	ANADARKO 13 FEDERAL #001	30-015-24881	O	F	13	18S	27E	1880N	1830W	ACTIVE	6/18/1984	
885	RALPH NIX & JERRY CURTIS	PAGE NO. 1	30-015-00888	O	F	13	18S	27E	1980N	1650W	P&A	11/28/1954	11/28/1954
886	DALE RESLER	JONES-GOVT NO. 1	30-015-00879	O	F	13	18S	27E	2310N	1650W	D&A	3/14/1945	3/14/1945
888	DICKSON PETROLEUM, INC	ANADARKO 13 FEDERAL NO. 1	30-015-25078	O	G	13	18S	27E	1724N	2279E	D&A	12/30/1984	12/30/1984
895	ANADARKO PETROLEUM CORP	ARTESIA STATE UNIT TRACT 4 NO. 1	30-015-00891	O	A	14	18S	27E	990N	330E	P&A	6/30/1944	6/30/1944
896	RESLER	STATE NO. 1	30-015-00893	O	G	14	18S	27E	1650N	1650E	D&A	1/2/1900	1/2/1900
897	ROVER OPERATING LLC	ARTESIA STATE UNIT #301	30-015-00895	O	H	14	18S	27E	1650N	330E	ACTIVE	2/8/1945	
901	WILLIAM & EDWARD HUDSON	HILL NO. 1	30-015-00695	O	L	1	18S	27E	1650S	330W	D&A	6/18/1948	6/18/1948
910	COMPTON-SMITH	STATE 1	30-015-00744	O	J	2	18S	27E	2310S	1640E	P&A		
911	LIME ROCK RESOURCES A, LP	NO BLUFF 36 STATE COM #002	30-015-31123	G	H	36	17S	27E	1980N	760E	ACTIVE		
912	LLJ VENTURES, LLC DBA MARKER OIL & GAS	GATES STATE #003	30-015-31036	O	H	36	17S	27E	2310N	990E	ACTIVE		
916	ROJO GRANDE COMPANY LLC	RAMAPO #007	30-015-31592	O	N	36	17S	27E	330S	2310E	P&A	12/21/2001	12/21/2001
917	VANGUARD OPERATING LLC	NW STATE #012	30-015-30784	O	A	31	17S	28E	330N	480E	ACTIVE		
918	VANGUARD OPERATING LLC	NW STATE #028	30-015-30893	O	A	31	17S	28E	973N	959E	ACTIVE		
919	VANGUARD OPERATING LLC	ENRON STATE #004	30-015-32162	O	1	31	17S	28E	460N	990W	ACTIVE	4/3/2003	
920	VANGUARD OPERATING LLC	NW STATE #011	30-015-30783	O	H	31	17S	28E	1650N	330E	ACTIVE		
921	VANGUARD OPERATING LLC	NW STATE #009	30-015-30849	O	I	31	17S	28E	2310S	270E	ACTIVE		
922	VANGUARD OPERATING LLC	NW STATE #010	30-015-30760	O	P	31	17S	28E	735S	330E	ACTIVE		
923	VANGUARD OPERATING LLC	ENRON STATE #002	30-015-31920	O	D	32	17S	28E	990N	990W	ACTIVE		
924	LIME ROCK RESOURCES A, LP	NW STATE #005	30-015-30781	I	K	32	17S	28E	1900S	2146W	ACTIVE		
925	VANGUARD OPERATING LLC	NW STATE #006	30-015-30777	O	L	32	17S	28E	2310S	990W	ACTIVE		
926	VANGUARD OPERATING LLC	NW STATE #007	30-015-30685	O	M	32	17S	28E	990S	990W	ACTIVE		
927	VANGUARD OPERATING LLC	NW STATE #008	30-015-30815	I	N	32	17S	28E	1090S	2126W	ACTIVE		
928	MARBOB ENERGY CORP	AAO FEDERAL #004	30-015-32310	O	1	1	18S	27E	990N	990E	ACTIVE	5/4/2004	
929	MARBOB ENERGY CORP	AAO FEDERAL #003	30-015-32309	O	2	1	18S	27E	330N	1690E	ACTIVE	4/10/2003	
930	APACHE CORP	AAO FEDERAL #002	30-015-32308	O	3	1	18S	27E	430N	2310W	T/A	9/19/2002	2/2/2018
931	MARBOB ENERGY CORP	AAO FEDERAL #001	30-015-32307	O	4	1	18S	27E	330N	990W	ACTIVE	12/10/2002	
932	ARCO OIL & GAS	EMPIRE ABO UNIT L #192	30-015-22816	O	O	1	18S	27E	1120S	1440E	ABAN LOCATION	6/28/1980	6/23/1980
933	ARCO OIL & GAS	EMPIRE ABO #5	30-015-20388	O	N	1	18S	27E	990S	2297E	SAME AS 158		12/31/9999
934	MEWBOURNE OIL CO	CHALK BLUFF 12 FED #001	30-015-27719	G	I	12	18S	27E	1650S	990E	ABAN LOCATION		
935	EOG Y RESOURCES INC.	BEAUREGARD ANP STATE COM #001	30-015-27437	G	B	14	18S	27E	660N	1980E	ABAN LOCATION		
936	MARBOB ENERGY CORP	LP STATE #001	30-015-31086	O	E	5	18S	28E	1650N	990W	P&A	3/11/2008	3/11/2008
937	MARBOB ENERGY CORP	LP STATE #002	30-015-31109	O	E	5	18S	28E	2301N	230W	PROPOSED		
938	LIME ROCK RESOURCES A, LP	NW STATE #015	30-015-30785	O	1	6	18S	28E	430N	330E	ACTIVE		
939	BARNEY COCKBURN	CAPITAL STATE NO. 1	30-015-00264	O	J	6	18S	28E	2310S	2310E	SAME AS 114	5/23/1979	
940	MARBOB ENERGY CORP	LP STATE #003	30-015-31087	O	7	6	18S	28E	990S	330W	P&A	7/15/2000	3/17/2008
941	MARBOB ENERGY CORP	LP STATE #004	30-015-31088	O	7	6	18S	28E	330S	990W	PROPOSED		
942	BP AMERICA PRODUCTION COMPANY		30-015-06250	O	O	6	18S	28E	470S	2170E	SAME AS 89		
943	EASTLAND OIL CO	LAUREL STATE #003	30-015-31319	O	3	7	18S	28E	2310N	330W	ACTIVE	1/31/2001	
944	NAVAJO REFINING COMPANY	WDW-3 (ORIGINAL LOC.)	30-015-26575	I	D	6	18S	28E	778N	995W	ACTIVE		
945	APACHE CORP	AAO FEDERAL #005	30-015-32959	O	E	1	18S	27E	1650N	875W	P&A	10/12/2004	6/14/2017
946	MARBOB ENERGY CORP	AAO FEDERAL #007	30-015-33473	O	G	1	18S	27E	1750N	1650S	ACTIVE	4/4/2005	
947	MARBOB ENERGY CORP	AAO FEDERAL #008	30-015-33784	O	H	1	18S	27E	1650N	330W	ACTIVE	2/25/2005	
948	MARBOB ENERGY CORP	AAO FEDERAL #006	30-015-34071	O	F	1	18S	27E	2169N	1963W	ACTIVE	8/5/2005	
949	MARBOB ENERGY CORP	AAO FEDERAL #009	30-015-34387	O	L	1	18S	27E	1980S	630W	ACTIVE	1/17/2006	
950	MARBOB ENERGY CORP	AAO FEDERAL #011	30-015-34555	O	M	1	18S	27E	890S	660W	ACTIVE	3/9/2006	
951	MARBOB ENERGY CORP	AAO FEDERAL #010	30-015-34576	O	K	1	18S	27E	2060S	2160W	ACTIVE	10/26/2006	
952	MARBOB ENERGY CORP	AAO FEDERAL #012	30-015-34998	O	N	1	18S	27E	890S	1650W	ACTIVE	9/21/2006	
953	BP AMERICA PRODUCTION COMPANY	SLIDER 6 STATE NO. 001	30-015-34028	O	G	6	18S	28E	2285N	1366E	P&A	12/17/2006	12/17/2006
954	VANGUARD OPERATING LLC	ENRON STATE NO 012	30-015-35050	O	D	32	17S	28E	330N	500W	ACTIVE	12/21/2006	
955	EOG Y RESOURCES INC.	VIOLET BIV STATE COM #1C	30-015-36939	O	A	14	18S	27E	661N	991E	EXT PERMIT TO DRILL	2/20/2009	
956	EDGE PETROLEUM OPERATING COMPANY, INC	RED LAKE 36 A STATE #2	30-015-33994	O	A	36	17S	27E	915N	420E	ACTIVE	4/20/2005	
957	REMNANT OIL OPERATING LLC	SOUTH RED LAKE UNIT II #57	30-015-36116	O	G	36	17S	27E	2305N	1650E	ACTIVE	6/6/2008	
958	MARBOB ENERGY CORPORATION	SCBP STATE #1	30-015-32946	O	J	2	18S	27E	2210S	1650E	ACTIVE	4/26/2005	
959	MACK ENERGY CORPORATION	STATE H NO 2	30-015-35814	O	H	2	18S	27E	2063N	441E	ACTIVE	1/11/2008	
960	GEORGE A CHASE JR DBA G AND C SERVICE	MALCO STATE NO. 002	30-015-36343	O	G	31	17S	28E	1650N	2310E	ACTIVE	7/9/2008	
961	VANGUARD OPERATING LLC	ENRON STATE NO. 015	30-015-36978	O	D	31	17S	28E	990N	330W	ACTIVE	7/3/2009	
962	VANGUARD OPERATING LLC	NW STATE NO. 029	30-015-36554	O	L	32	17S	28E	1770S	550W	ACTIVE	1/30/2009	
963	VANGUARD OPERATING LLC	NW STATE NO. 030	30-015-36989	O	K	32	17S	28E	1630S	1710W	ACTIVE	7/14/2009	
964	VANGUARD OPERATING LLC	NW STATE NO. 031	30-015-37057	O	N	32	17S	28E	330S	1750W	ACTIVE	7/28/2009	
965	VANGUARD OPERATING LLC	NW STATE NO. 032	30-015-37058	O	M	32	17S	28E	330S	330W	ACTIVE	8/23/2009	
966	G&C SERVICE	MALCO STATE NO. 3	30-015-37428	O	G	31	17S	28E	1980N	1980E	ACTIVE	2/10/2010	
967	COG OPERATING LLC	MAPLE STATE 008	30-015-38203	O	N	30	17S	28E	330S	990W	PERMIT TO DRILL		
968	LLJ VENTURES, LLC DBA MARKER OIL & GAS	CONKLIN STATE NO. 1-Y	30-015-39029		G	36	17S	27E	2210N	2310E	ACTIVE		
969	COG OPERATING LLC	BIG BOY STATE NO. 1	30-015-39321		M	36	17S	27E	990S	890W	PERMIT TO DRILL		

TABLE II

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ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
970	COG OPERATING LLC	BIG BOY STATE NO. 3	30-015-39322		M	36	17S	27E	840S	425W	PERMIT TO DRILL		
971	COG OPERATING LLC	BIG BOY STATE NO. 5	30-015-39323		O	36	17S	27E	870S	1560E	PERMIT TO DRILL		
972	COG OPERATING LLC	BIG BOY STATE NO. 6	30-015-39324		O	36	17S	27E	480S	2210E	PERMIT TO DRILL		
973	COG OPERATING LLC	BIG BOY STATE NO. 7	30-015-39325		O	36	17S	27E	990S	2210E	PERMIT TO DRILL		
974	COG OPERATING LLC	BIG BOY STATE NO. 8	30-015-39326		O	36	17S	27E	275S	1560E	PERMIT TO DRILL		
975	APACHE CORP	EMPIRE ABO UNIT NO. 417	30-015-39401		P	36	17S	27E	1110S	630E	APPROVED T/A		
976	APACHE CORP	EMPIRE ABO UNIT NO. 415	30-015-39009		G	2	18S	27E	1650N	2430E	P&A		
977	APACHE CORP	EMPIRE ABO UNIT NO. 416	30-015-39066		L	2	18S	27E	2551S	1170W	PERMIT TO DRILL		
978	VANGUARD OPERATING LLC	ANTHONY NO. 2	30-015-38234		P	30	17S	28E	430S	800E	ACTIVE		
979	COG OPERATING LLC	MAPLE STATE NO. 5	30-015-39299		M	30	17S	28E	990S	990W	PERMIT TO DRILL		
980	COG OPERATING LLC	MAPLE STATE NO. 6	30-015-39300		M	30	17S	28E	330S	330W	PERMIT TO DRILL		
981	LIME ROCK RESOURCES	ENRON STATE NO. 16	30-015-38512		D	30	17S	28E	990N	940W	ACTIVE		
982	APACHE CORP	EMPIRE ABO UNIT NO. 401	30-015-39004		P	31	17S	28E	150S	1300E	PERMIT TO DRILL		
983	APACHE CORP	EMPIRE ABO UNIT NO. 419	30-015-39011		O	31	17S	28E	1190S	1320E	PERMIT TO DRILL		
984	APACHE CORP	EMPIRE ABO UNIT NO. 408	30-015-39020		O	31	17S	28E	140S	2560E	P&A		
985	VANGUARD OPERATING LLC	JEFFERS 32 STATE NO. 3	30-015-38513		J	32	17S	28E	2310S	2032E	ACTIVE		
986	APACHE CORP	EMPIRE ABO UNIT NO. 407	30-015-39006		J	32	17S	28E	2400S	2450E	PERMIT TO DRILL		
987	APACHE CORP	EMPIRE ABO UNIT NO. 409	30-015-39007		M	32	17S	28E	70S	100W	PERMIT TO DRILL		
988	APACHE CORP	EMPIRE ABO UNIT NO. 403	30-015-39064		O	32	17S	28E	1175S	1310E	P/A		
989	APACHE CORP	EMPIRE ABO UNIT NO. 410	30-015-39008		D	6	18S	28E	160N	1300W	PERMIT TO DRILL		
990	APACHE CORP	EMPIRE ABO UNIT NO. 411	30-015-39021		D	6	18S	28E	40N	145W	PERMIT TO DRILL		
991	APACHE CORP	SCBP STATE NO. 001	30-015-32946		J	2	18S	27E	2210S	1650E	ACTIVE		
992	LEGACY RESERVES OPERATING LP	SOUTH RED LAKE UNIT NO. 37	30-015-00715		D	1	18S	27E	330N	330W	ACTIVE		
993	APACHE CORP	AAO FEDERAL NO. 1	30-015-32307		4	1	18S	27E	330N	990W	ACTIVE		
994	APACHE CORP	AAO FEDERAL NO. 5	30-015-32959		E	1	18S	27E	1650N	875W	ACTIVE		
995	APACHE CORP	AAO FEDERAL NO. 7	30-015-33473		G	1	18S	27E	1750N	1650E	ACTIVE		
996	APACHE CORP	AAO FEDERAL NO. 8	30-015-33784		H	1	18S	27E	1650N	330E	ACTIVE		
997	APACHE CORP	AAO FEDERAL NO. 6	30-015-34071		F	1	18S	27E	2169N	1963W	ACTIVE		
998	APACHE CORP	AAO FEDERAL NO. 11	30-015-34555		M	1	18S	27E	890S	660W	ACTIVE		
999	APACHE CORP	AAO FEDERAL NO. 10	30-015-34576		K	1	18S	27E	2060S	2160W	ACTIVE		
1001	APACHE CORP	EMPIRE ABO UNIT No. 134	30-015-22777		M	2	18S	27E	10S	640W	ACTIVE		
1005	LRE OPERATING LLC	BIG BOY STATE NO 2	30-015-40428		M	36	17S	28E	200S	485W	ACTIVE		
1023	LRE OPERATING LLC	AB STATE 647	30-015-39927		K	32	17S	28E	1750S	1765W	ACTIVE		
1024	VANGUARD OPERATING LLC	ENRON STATE 18	30-015-40339		D	32	17S	28E	990N	330W	ACTIVE		
1025	REMNANT OIL OPERATING LLC	SOUTH RED LAKE GRAYBURG UNIT NO 26	30-015-00643		O	35	17S	27E	990S	2310E	ACTIVE		
1026	TARCO ENERGY LC	RUSSELL C 003	30-015-37783		O	35	17S	27E	990S	2225E	ACTIVE		
1027	REMNANT OIL OPERATING LLC	SOUTH RED LAKE GRABURG UNIT 31	30-015-00644		N	35	17S	27E	300S	2310W	P&A		
1028	REMNANT OIL OPERATING LLC	SOUTH RED LAKE GRAYBURG UNIT 41	30-015-20104		P	35	17S	27E	990S	990E	P&A		
1029	LRE OPERATING LLC	JEFFERS 36 STATE #4t	30-015-34626		M	36	17S	27E	935N	2260E	ACTIVE		
1030	LRE OPERATING LLC	ENRON FEDERAL NO 18	30-015-41829		O	25	17S	27E	985S	2310E	ACTIVE		
1031	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL NO 12	30-015-41890		N	29	17S	28E	330S	2200N	ACTIVE		
1032	LIME ROCK RESOURCES A, LP	LOGAN B "35" N FEDERAL #18	30-015-40807		N	35	17S	27E	330N	2310W	ACTIVE		
1033	LRE OPERATING LLC	LOGAN 35 P FEDERAL #19	30-015-40808		P	35	17S	27E	970S	990E	ACTIVE		
1034	LIME ROCK RESOURCES A LP	LOGAN 35 FEDERAL 10	30-015-41435		O	35	17S	27E	720S	1770E	ACTIVE		
1035	APACHE CORPORATION	SB STATE 004	30-015-42003		E	2	18S	27E	2515N	800W	ACTIVE		
1036	APACHE COPORATION	SB STATE 002	30-015-42002		E	2	18S	27E	1900N	990W	ACTIVE		
1037	VANGUARD OPERATING LLC	ENRON STATE NO 14	30-015-36979		C	32	17S	28E	990N	2035W	ACTIVE		
1038	VANGUARD OPERATING LLC	ENRON STATE 19	30-015-41833		C	32	17S	28E	990N	1700W	ACTIVE		
1039	VANGUARD OPERATING LLC	ENRON STATE 17	30-015-39996		C	32	17S	28E	230N	2420W	ACTIVE		
1040	APACHE CORP	AB State 647 016	30-015-41511		N	32	17S	28E	330S	2365W	ACTIVE		
1041	APACHE CORP	Ab State 647 014	30-015-41498		M	32	17S	28E	330S	1090W	ACTIVE		
1042	APACHE CORP	Ab State 647 009	30-015-41493		N	32	17S	28E	1080S	2535W	ACTIVE		
1043	APACHE CORP	Ab State 647 007	30-015-41491		L	32	17S	28E	1650S	950W	ACTIVE		
1044	APACHE CORP	Ab State 647 008	30-015-41492		K	32	17S	28E	1375S	2320W	ACTIVE		
1045	LIME ROCK RESOURCES A LP	LOGAN 2c STATE NO. 4	30-015-40783		C	2	18S	27E	990N	1500W	ACTIVE		
1046	COG OPERATING LLC	KIOWA STATE	30-015-38420		G	36	17S	27E	1460N	1539E	ACTIVE		
1048	APACHE CORP	Ab State 647 002	30-015-41500		K	32	17S	28E	2355S	2600W	ACTIVE		
1049	APACHE CORP	Ab State 647 003	30-015-41501		K	32	17S	28E	2370S	1650W	ACTIVE		
1050	APACHE CORP	Ab State 647 004	30-015-41505		L	32	17S	28E	2250S	1185W	ACTIVE		
1051	APACHE CORP	Ab State 647 005	30-015-41502		L	32	17S	28E	2310S	330W	ACTIVE		
1052	APACHE CORP	Ab State 647 15	30-015-41504		N	32	17S	28E	330S	1650W	ACTIVE		
1053	APACHE CORP	Ab State 647 013	30-015-41497		M	32	17S	28E	220S	350W	ACTIVE		
1054	APACHE CORP	Ab State 647 006	30-015-41503		L	32	17S	28E	1730S	430W	ACTIVE		
1055	APACHE CORP	Ab State 647 011	30-015-41495		M	32	17S	28E	920S	960W	ACTIVE		
1056	APACHE CORP	Ab State 647 010	30-015-41494		N	32	17S	28E	1140S	1650W	ACTIVE		
1057	APACHE CORP	Ab State 647 012	30-015-41496		M	32	17S	28E	910S	930W	ACTIVE		
1058	LIME ROCK RESOURCES A LP	BLAKE STATE NO. 4	30-015-40679		B	2	18S	27E	968N	2300E	ACTIVE		
1059	TARCO ENERGY LC	BRAD STATE NO. 4	30-015-40621		C	2	18S	27E	968N	1650W	ACTIVE		
1060	VANGUARD OPERATING LLC	ENRON STATE NO. 1	30-015-31530		C	32	17S	28E	530N	1650W	ACTIVE		
1061	LEGACY RESERVES OPERATING LP	SOUTH RED LAKE GRAYBURG UNIT 027	30-015-00681		M	36	17S	27E	990S	330W	PLUGGED		
1062	DEVON ENERGY	LOGAN 2c STATE #3			I	2	18S	27E	530N	2310W	ACTIVE		
1063	APACHE CORP	EMPIRE ABO UNIT "I" 272a	30-015-22536		B	5	18S	28E	1300N	2345E	T/A	9/8/1980	2/1/2016
1064	APACHE CORP	Bb State Com #1	30-015-32070		I	2	18S	27E	660S	990W	P&A		
1065	APACHE CORP	Bm State #1	30-015-32899		I	2	18S	27E	2310S	2310W	T/A		
1066	APACHE CORP	Tdf State #2	30-015-32900		I	2	18S	27E	1650N	2305W	T/A		
1068	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL NO. 8	30-015-36513		N	29	17S	28E	1090S	1550W	ACTIVE		
1069	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL NO. 5	30-015-33232		M	29	17S	28E	690S	530W	RECOMPLETED		
1070	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL NO 10	30-015-40480		M	29	17S	28E	600S	645W	ACTIVE		
1071	TARCO ENERGY LC	BLAKE STATE NO 1	30-015-40677		B	2	18S	27E	380N	1650E	PERMIT TO DRILL		

TABLE II

TABULATION OF WELLS WITHIN ONE MILE AREA OF REVIEW

ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
1072	TARCO ENERGY LC	BLAKE STATE NO 2	30-015-40678		B	2	18S	27E	330N	2300E	PERMIT TO DRILL		
1073	APACHE CORP	LIBBY STATE No. 001	30-015-41766		F	5	18S	28E	1910N	1505W	PERMIT TO DRILL		
1074	APACHE CORP	LIBBY STATE NO. 002	30-015-41767		F	5	18S	28E	1570N	2245W	PERMIT TO DRILL		
1075	APACHE CORP	LIBBY STATE NO. 003	30-015-41768		F	5	18S	28E	1570N	2245W	PERMIT TO DRILL		
1076	APACHE CORP	T REX STATE 001	30-015-41770		B	31	17S	28E	330N	2270E	PERMIT TO DRILL		
1077	APACHE CORP	T REX STATE 002	30-015-41771		B	31	17S	28E	575N	1650E	PERMIT TO DRILL		
1078	APACHE CORP	T REX STATE 003	30-015-41772		B	31	17S	28E	875N	2430E	PERMIT TO DRILL		
1079	APACHE CORP	T REX STATE 004	30-015-41774		B	31	17S	28E	890N	1750E	PERMIT TO DRILL		
1080	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL 15	30-015-41892		M	29	17S	28E	330S	975W	ACTIVE		
1081	APACHE CORP	BM State 002	30-015-41959		K	2	18S	27E	2310S	1750W	PERMIT TO DRILL		
1082	APACHE CORP	AAO FEDERAL #14	30-015-42024		1	1	18S	27E	126N	141E	ACTIVE		
1083	APACHE CORP	AAO FEDERAL #15	30-015-42025		1	1	18S	27E	1130N	2408E	PERMIT TO DRILL		
1084	APACHE CORP	AAO FEDERAL #16	30-015-42026		1	1	18S	27E	1305N	2455W	PERMIT TO DRILL		
1085	APACHE CORP	AAO FEDERAL #17	30-015-42029		1	1	18S	27E	1650N	865E	PERMIT TO DRILL		
1086	APACHE CORP	AAO FEDERAL #18	30-015-42035		1	1	18S	27E	2310N	1650E	PERMIT TO DRILL		
1087	APACHE CORP	AAO FEDERAL #20	30-015-42036		1	1	18S	27E	2188N	909W	PERMIT TO DRILL		
1088	APACHE CORP	AAO FEDERAL #19	30-015-42051		1	1	18S	27E	2310N	2310W	PERMIT TO DRILL		
1089	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL 16	30-015-42116		M	29	17S	28E	990S	2160W	ACTIVE		
1090	TARCO ENERGY LLC	BRADE STATE NO. 5	30-015-42121		C	2	18S	27E	658N	1984W	CANCELED		
1091	VANGUARD OPERATING LLC	ENRON STATE 21	30-015-42156		D	32	17S	28E	385N	900W	ACTIVE		
1092	APACHE CORP	AAO FEDERAL #21	30-015-42334		1	1	18S	27E	1005N	1630W	ACTIVE		
1093	APACHE CORP	AAO FEDERAL #22	30-015-42335		1	1	18S	27E	790N	330W	PERMIT TO DRILL		
1094	APACHE CORP	AAO FEDERAL #23	30-015-42336		1	1	18S	27E	2265N	330E	PERMIT TO DRILL		
1095	APACHE CORP	AAO FEDERAL #24	30-015-42337		1	1	18S	27E	984N	243E	PERMIT TO DRILL		
1096	APACHE CORP	AAO FEDERAL #26	30-015-42338		1	1	18S	27E	2270S	1650W	ACTIVE		
1097	APACHE CORP	AAO FEDERAL #29	30-015-42339		1	1	18S	27E	360S	990W	PERMIT TO DRILL		
1098	APACHE CORP	AAO FEDERAL #28	30-015-42358		1	1	18S	27E	183S	2497W	PERMIT TO DRILL		
1099	APACHE CORP	AAO FEDERAL #27	30-015-42359		1	1	18S	27E	1960S	2063W	PERMIT TO DRILL		
1100	APACHE CORP	AAO FEDERAL #30	30-015-42360		1	1	18S	27E	1261S	281W	PERMIT TO DRILL		
1101	APACHE CORP	AAO FEDERAL #25	30-015-42361		1	1	18S	27E	2000S	1022W	ACTIVE		
1102	VANGUARD OPERATING LLC	ENRON STATE #20	30-015-42372		D	31	17S	28E	330N	430W	ACTIVE		
1103	APACHE CORP	OUTLAW STATE #005	30-015-42555		O	29	17S	28E	330S	2310E	ACTIVE		
1104	APACHE CORP	JACKRABBIT STATE #004	30-015-42863		B	32	17S	28E	330S	2310E	PERMIT TO DRILL		
1105	APACHE CORP	JACKRABBIT STATE #005	30-015-42864		B	32	17S	28E	1010N	2540E	PERMIT TO DRILL		
1106	APACHE CORP	JACKRABBIT STATE #012	30-015-42985		G	32	17S	28E	1470N	2405E	PERMIT TO DRILL		
1107	APACHE CORP	JACKRABBIT STATE #013	30-015-42986		G	32	17S	28E	2460N	2280E	PERMIT TO DRILL		
1108	VANGUARD OPERATING LLC	STALEY STATE #029	30-015-42726		O	30	17S	28E	505S	2140E	ACTIVE		
1109	VANGUARD OPERATING LLC	STALEY STATE #020	30-015-40983		O	30	17S	28E	330S	1650E	ACTIVE		
1110	APACHE CORP	RANGER STATE #001	30-015-42597		A	31	17S	28E	570N	250E	PERMIT TO DRILL		
1111	APACHE CORP	RANGER STATE #002	30-015-42598		A	31	17S	28E	445N	1090E	PERMIT TO DRILL		
1113	APACHE CORP	RANGER STATE #001	30-015-42599		B	31	17S	28E	905N	1385E	PERMIT TO DRILL		
1114	APACHE CORP	RANGER STATE #004	30-015-42600		A	31	17S	28E	645N	250E	PERMIT TO DRILL		
1115	APACHE CORP	RANGER STATE #006	30-015-42673		H	31	17S	28E	1650N	990E	PERMIT TO DRILL		
1117	APACHE CORP	RANGER STATE #007	30-015-42674		H	31	17S	28E	2310N	990E	PERMIT TO DRILL		
1118	APACHE CORP	RANGER STATE #008	30-015-42675		H	31	17S	28E	1875N	110E	PERMIT TO DRILL		
1119	APACHE CORP	RANGER STATE #010	30-015-42677		I	31	17S	28E	2310S	1130E	PERMIT TO DRILL		
1120	APACHE CORP	RANGER STATE #009	30-015-42676		H	31	17S	28E	2520N	195E	PERMIT TO DRILL		
1121	APACHE CORP	RANGER STATE #011	30-015-42678		I	31	17S	28E	1535S	760E	PERMIT TO DRILL		
1122	APACHE CORP	RANGER STATE #012	30-015-42679		I	31	17S	28E	1760S	245E	PERMIT TO DRILL		
1123	APACHE CORP	RANGER STATE #013	30-015-42680		I	31	17S	28E	1710S	245E	PERMIT TO DRILL		
1124	APACHE CORP	RANGER STATE #014	30-015-42681		P	16	17S	28E	225S	1300E	PERMIT TO DRILL		
1125	APACHE CORP	RANGER STATE #016	30-015-42806		P	31	17S	28E	245S	90E	NEW		
1126	APACHE CORP	RANGER STATE #015	30-015-42682		P	31	17S	28E	260S	1250E	PERMIT TO DRILL		
1127	LRE OPERATING LLC	JEFFERS 36 STATE #005	30-015-42602		B	36	17S	27E	330N	2210E	PERMIT TO DRILL		
1128	LRE OPERATING LLC	JEFFERS 36 STATE #006	30-015-42899		B	36	17S	27E	890N	1655E	PERMIT TO DRILL		
1129	APACHE CORP	AAO FEDERAL #017	30-015-42027		H	1	18S	27E	1650N	865E	PERMIT TO DRILL		
1130	APACHE CORP	AAO FEDERAL SWD #001	30-015-42549		G	1	18S	27E	2470N	2380E	ACTIVE		
1131	BILL L MILLER	CHUKKA FEDERAL #001	30-015-25270		F	12	18S	27E	2310N	2310W	ACTIVE		
1132	VANGUARD OPERATING LLC	Staley State #004	30-015-36252		N	30	17S	28E	990S	1980W	ACTIVE		
1133	VANGUARD OPERATING LLC	Anthoney #1	30-015-37691		P	30	17S	28E	1050S	330E	ACTIVE		
1134	LRE Operating LLC	Anthoney State #4	30-015-40028		P	30	17S	28E	540S	837E	RECOMPLETE		
1135	VANGUARD OPERTING LLC	Staley State #016	30-015-40338		O	30	17S	28E	990S	2310E	ACTIVE		
1136	LRE Operating LLC	Staley State #24	30-015-41065		N	30	17S	28E	990S	2335W	RECOMPLETE		
1137	Lime Rock Resources II-A LP	Logan 2C State #4	30-015-40723		C	30	18S	28E	990N	1500W	COMPLETED		
1138	Lime Rock Resources II-A LP	Logan B 35 N Federal 24	30-015-43066		N	30	17S	27E	870S	1640W	PERMIT TO DRILL		
1139	Lime Rock Resources II-A LP	Logan 35 O Federal 22	30-015-43252		O	30	17S	27E	720S	1670E	PERMIT TO DRILL		
1140	Apache Corporation	The Outlaw State #006	30-015-42556		O	30	17S	28E	990S	1650E	COMPLETED		
1141	Apache Corporation	The Outlaw State #007	30-015-42557		O	30	17S	28E	330S	1650E	COMPLETED		
1142	Apache Corporation	The Outlaw State #008	30-015-42558		O	30	17S	28E	990S	2310E	COMPLETED		
1143	VANGUARD OPERATING LLC	STALEY STATE #28	30-015-42725		O	30	17S	28E	685S	1630E	ACTIVE		
1144	VANGUARD OPERATING LLC	STALEY STATE #30	30-015-42727		O	30	17S	28E	850S	1680W	ACTIVE		
1145	APACE CORPORATION	RANGER STATE #005	30-015-42601		H	30	17S	28E	1825N	110E	PERMIT TO DRILL		
1146	APACHE CORPORATION	JACK RABBIT STATE #11	30-015-42984		G	30	17S	28E	1535N	1680E	PERMIT TO DRILL		
1147	VANGUARD OPERATING LLC	WILLIAMS A FEDERAL #001Z	30-015-32554		N	29	17S	28E	590S	2185W	ACTIVE		
1148	APACHE CORPORATION	OUTLAW STATE #006	30-015-42556		O	29	17S	28E	990S	1650E	ACTIVE		
1149	APACHE CORPORATION	OUTLAW STATE #007	30-015-42557		O	29	17S	28E	330S	1650E	ACTIVE		
1150	APACHE CORPORATION	OUTLAW STATE #008	30-015-42558		O	29	17S	28E	990S	2310E	ACTIVE		
1151	VANGUARD OPERATING LLC	STALEY STATE #002	30-015-31285		O	30	17S	28E	890S	1650E	ACTIVE		
1152	VANGUARD OPERATING LLC	STALEY STATE #009	30-015-36564		O	30	17S	28E	330S	2210E	ACTIVE		
1153	VANGUARD OPERATING LLC	STALEY STATE #012	30-015-37673		N	30	17S	28E	330S	1650W	ACTIVE		
1154	VANGUARD OPERATING LLC	ANTHONEY STATE #003	30-015-39638		P	30	17S	28E	412S	679E	ACTIVE		
1155	VANGUARD OPERATING LLC	STALEY STATE #017	30-015-40026		N	30	17S	28E	330S	2410W	ACTIVE		

TABLE II

TABULATION OF WELLS WITHIN ONE MILE AREA OF REVIEW

ID NO	OPERATOR	WELL NAME	API	WELL TYPE	UL	SECTION	TOWNSHIP	RANGE	NS FTG	EW FTG	STATUS	DATE - Comp or Plug	PLUG DATE
1156	VANGUARD OPERATING LLC	ENRON STATE #016	30-015-38512		P	31	17S	28E	990N	940W	ACTIVE		
1157	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #014	30-015-01665		O	32	17S	28E	940S	1650E	ACTIVE		
1158	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #005	30-015-02312		G	32	17S	28E	1980N	1650E	ACTIVE		
1159	VANGUARD OPERATING LLC	NORTHWEST ARTESIA UNIT #003	30-015-10109		B	32	17S	28E	990N	1650E	ACTIVE		
1160	VANGUARD OPERATING LLC	NW STATE #003	30-015-30684		G	32	17S	28E	1650N	1650E	ACTIVE		
1161	VANGUARD OPERATING LLC	NW STATE #004	30-015-30734		B	32	17S	28E	1140N	2277E	ACTIVE		
1162	VANGUARD OPERATING LLC	JEFFERS 32 STATE #001	30-015-30887		J	32	17S	28E	2141S	1665E	ACTIVE		
1163	VANGUARD OPERATING LLC	NW STATE #016	30-015-30890		B	32	17S	28E	330N	1650E	ACTIVE		
1164	VANGUARD OPERATING LLC	NW STATE #018	30-015-31934		G	32	17S	28E	2272N	2273E	ACTIVE		
1165	VANGUARD OPERATING LLC	ASPEN 32 STATE COM #001	30-015-34148		J	32	17S	28E	1370S	1609E	ACTIVE		
1166	VANGUARD OPERATING LLC	JEFFERS 32 STATE #002	30-015-37045		J	32	17S	28E	1563S	2207E	ACTIVE		
1167	APACHE CORPORATION	AB STATE 647 #001	30-015-39927		K	32	17S	28E	1750S	1765W	ACTIVE		
1168	REMNANT OIL OPERATING LLC	SOUTH RED LAKE II UNIT No. 029	30-015-00634		P	35	17S	27E	330S	330E	TEMPORARILY ABANDONED		
1169	REMNANT OIL OPERATING LLC	SOUTH RED LAKE II UNIT No. 032	30-015-00645		N	35	17S	27E	330S	1650W	ACTIVE		
1170	REMNANT OIL OPERATING LLC	SOUTH RED LAKE II UNIT No. 030	30-015-01222		O	35	17S	27E	330S	2310E	P&A		
1171	VANGUARD OPERATING LLC	JEFFERS 36 STATE No. 003	30-015-31541		B	36	17S	27E	460N	1650E	ACTIVE		
1172	LLJ VENTURES, LLC DBA MARKER OIL & GAS	STATE A No. 003	30-015-34089		B	36	17S	27E	330N	2310E	ACTIVE		
1173	LLJ VENTURES, LLC DBA MARKER OIL & GAS	STATE A No. 004	30-015-36342		B	36	17S	27E	990N	1650E	ACTIVE		
1174	APACHE CORP	SB STATE No. 001	30-015-32218		E	2	18S	27E	1650N	330W	ACTIVE		
1175	EOG Y RESOURCES, INC.	VIOLET BIV STATE COM No. 001A	30-015-34632		A	14	18S	27E	660N	990E	CANCELLED		2/20/2009
1176	LIME ROCK RESOURCES II-A L.P.	CHOATE DAVIS 14 STATE SWD No. 002	30-015-43628		E	14	18S	27E	1760N	880W	ACTIVE		
1177	ROVER OPERATING LLC	STATE 32 No. 001	30-015-01655		J	32	17S	28E	2310S	1650E	ACTIVE		
1178	ROVER OPERATING LLC	STATE 32 No. 002	30-015-01656		J	32	17S	28E	1980S	1980E	ACTIVE		
1179	ROVER OPERATING LLC	SOLT STATE No. 001	30-015-25277		O	5	18S	28E	660S	1980E	ACTIVE		
1180	ROVER OPERATING LLC	SOLT STATE No. 003	30-015-25390		O	5	18S	28E	990S	1650E	ACTIVE		
1181	REMNANT OIL OPERAING LLC	SOUTH RED LAKE II UNIT No. 034	30-015-00725		C	2	18S	27E	330N	2310W	ACTIVE		
1182	REMNANT OIL OPERAING LLC	SOUTH RED LAKE II UNIT No. 035	30-015-01211		B	2	18S	27E	330N	2310W	ACTIVE		
1183	EOG Y RESOURCES INC.	VIOLET BIV STATE COM No. 001	30-015-40187		A	14	18S	27E	660N	990E	CANCELLED		4/18/2014
1184	V-F PETROLEUM INC.	LEATHERSTOCKING 18 STATE COM No. 002	30-015-35237		M	18	18S	28E	810S	660W	T/A	11/27/2008	10/6/2015
1185	LIME ROCK RESOURCES II-A L.P.	LOGAN 35 P FEDERAL 23	30-015-44784		P	35	17S	28E	380S	330E	PERMIT TO DRILL		

TABLE III

Well Changes in the Combined Area of Review Since 2018

ID	API No.			Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
147	30	15	00696	J	1	18S	27E	1980S 1980E	EMPIRE ABO UNIT #019Q	APACHE CORP	P&A	[X]						
130	30	15	00708	2	1	18S	27E	660N 1980E	EMPIRE ABO UNIT #019B	APACHE CORP	P&A	[X]						
136	30	15	00709	G	1	18S	27E	1980N 1980E	EMPIRE ABO UNIT #019C	APACHE CORP	P&A	[X]						
139	30	15	00711	H	1	18S	27E	1980N 660E	EMPIRE ABO UNIT #020C	APACHE CORP	P&A	[X]						

TABLE IV

Wells that have been Plugged and Abandoned since 2018

ID	API No.			Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
147	30	15	00696	J	1	18S	27E	1980S 1980E	EMPIRE ABO UNIT #019Q	APACHE CORP	P&A		[X]					
130	30	15	00708	2	1	18S	27E	660N 1980E	EMPIRE ABO UNIT #019B	APACHE CORP	P&A		[X]					
136	30	15	00709	G	1	18S	27E	1980N 1980E	EMPIRE ABO UNIT #019C	APACHE CORP	P&A		[X]					
139	30	15	00711	H	1	18S	27E	1980N 660E	EMPIRE ABO UNIT #020C	APACHE CORP	P&A		[X]					

TABLE V

Wells that have been Temporally Abandoned since 2018

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
									NO CHANGES							

TABLE VI

Wells that have been Recompleted since 2018

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
									NO CHANGES							

TABLE VII

Newly Drilled Wells in the Area of Review since 2018

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
									NO NEW WELLS							

TABLE VIII

FIGURES INCLUDED IN THE REPORT

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

TABLE VIII, Continued

Figure	Description	OCD Reference
13	Gaines Well #3 Expanded Superposition Horner (Semi-Log) Plot	Section IX.18.d
14	Gaines Well #3 Hall Plot	Section IX.18.h
15	Gaines Well #3 Flowing Pressure Gradient Survey	n/a

TABLE IX

Gaines Well No. 3
Comparison of Permeability, Transmissibility,
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 25 – 28, 2019	340 md	104,265 md-ft/cp	11.98	4170.04 psia	8632 feet
August 10 – 15, 2018	366 md	112,353 md-ft/cp	8.80	4287.61 psia	8632 feet
August 28 – 30, 2017	533 md	163,612 md-ft/cp	12.21	4259.25 psia	9060 feet
August 27 – 30, 2016	409 md	125,443 md-ft/cp	8.13	4281.04 psia	9093 feet
August 22 – 28, 2014	730 md	224,096 md-ft/cp	10.53	4351.64 psia	8946 feet
November 20 - 25, 2012	1248 md	383,087 md-ft/cp	8.34	3941.88 psia	8972 feet
January 22 - 27, 2012	597 md	183,293 md-ft/cp	27.26	3792.34 psia	8986 feet
November 10 - 13, 2010	568 md	174,376 md-ft/cp	14.64	3622.16 psia	8986 feet
August 27 – 30, 2009	719 md	233,008 md-ft/cp	54.07	3475.68 psia	8986 feet
April 1 – 2, 2008	1322 md	321,411 md-ft/cp	107	3430.27 psia	N/A
Permit Parameters	250 md	40,094 md-ft-cp	N/A	N/A	N/A

TABLE X

GAINES WELL No. 3
STATIC PRESSURE GRADIENT DATA
AUGUST 28, 2019

Depth (feet)	Pressure (psia)	Pressure Gradient (psi/ft)	Temperature (°F)
0	850.53	-	85.45
1000	1283.97	0.433	84.12
2000	1716.84	0.433	87.94
3000	2151.40	0.435	91.96
4000	2585.74	0.434	95.33
5000	3020.22	0.434	99.55
6000	3454.55	0.434	104.28
7000	3888.32	0.434	108.92
7660	4176.82	0.437	104.80

FIGURES

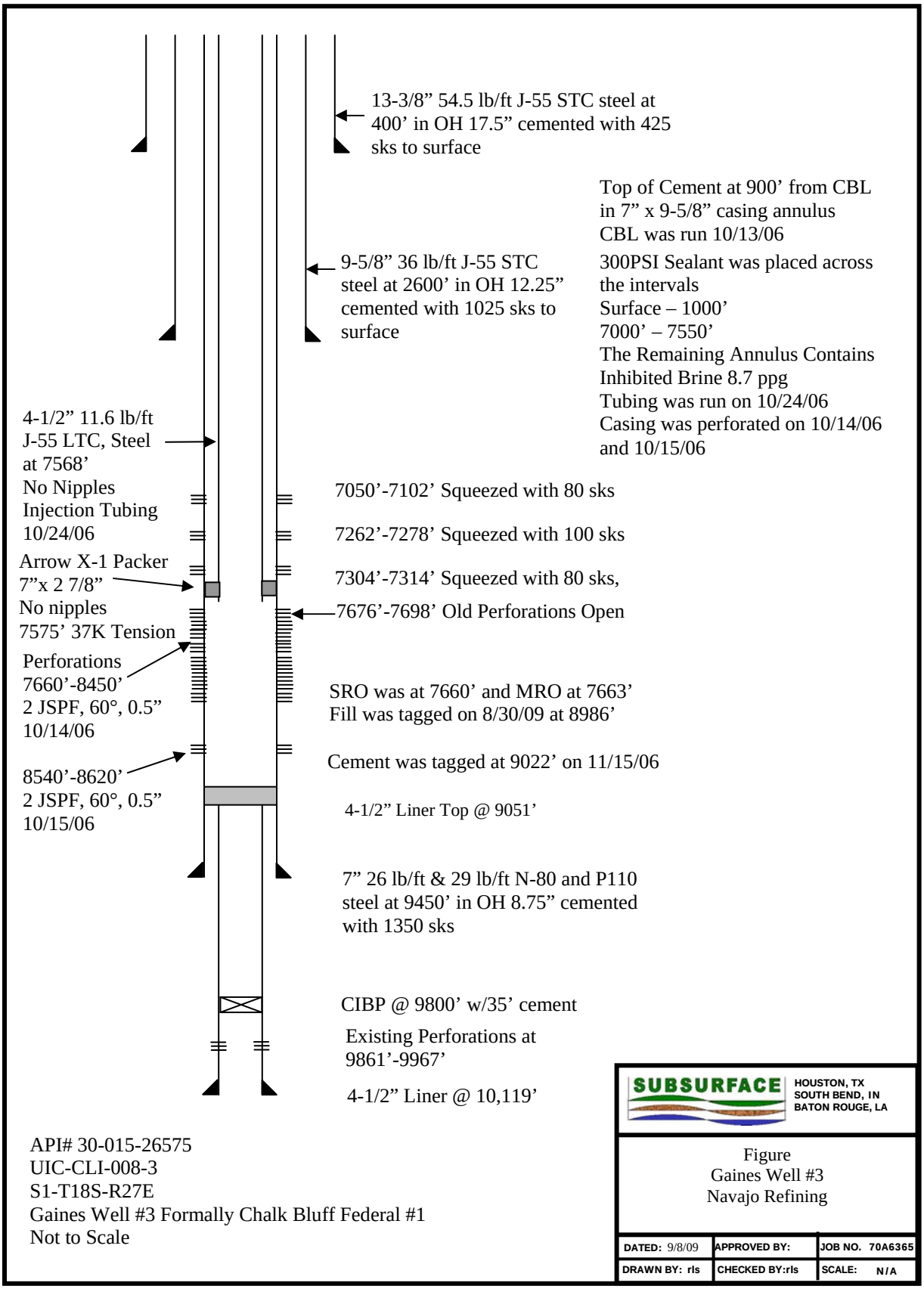
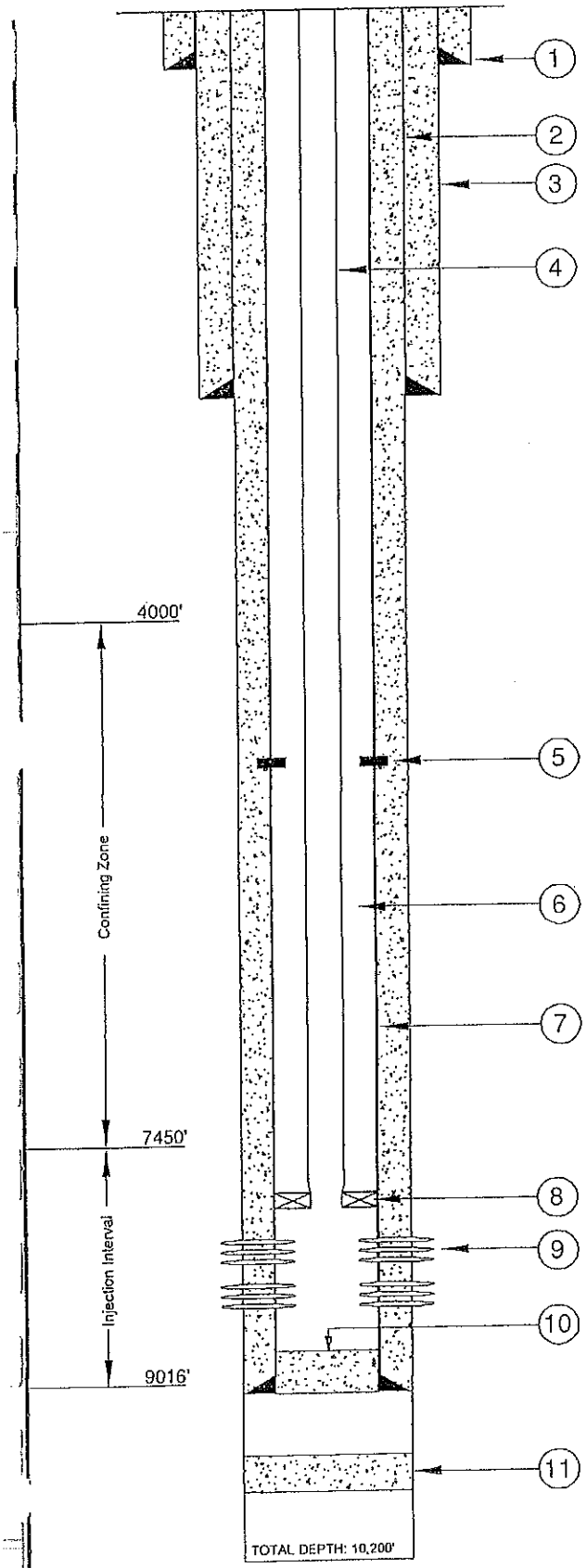

13-3/8” 54.5 lb/ft J-55 STC steel at 400’ in OH 17.5” cemented with 425 sks to surface
Top of Cement at 900’ from CBL in 7” x 9-5/8” casing annulus CBL was run 10/13/06
9-5/8” 36 lb/ft J-55 STC steel at 2600’ in OH 12.25” cemented with 1025 sks to surface
300PSI Sealant was placed across the intervals
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 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

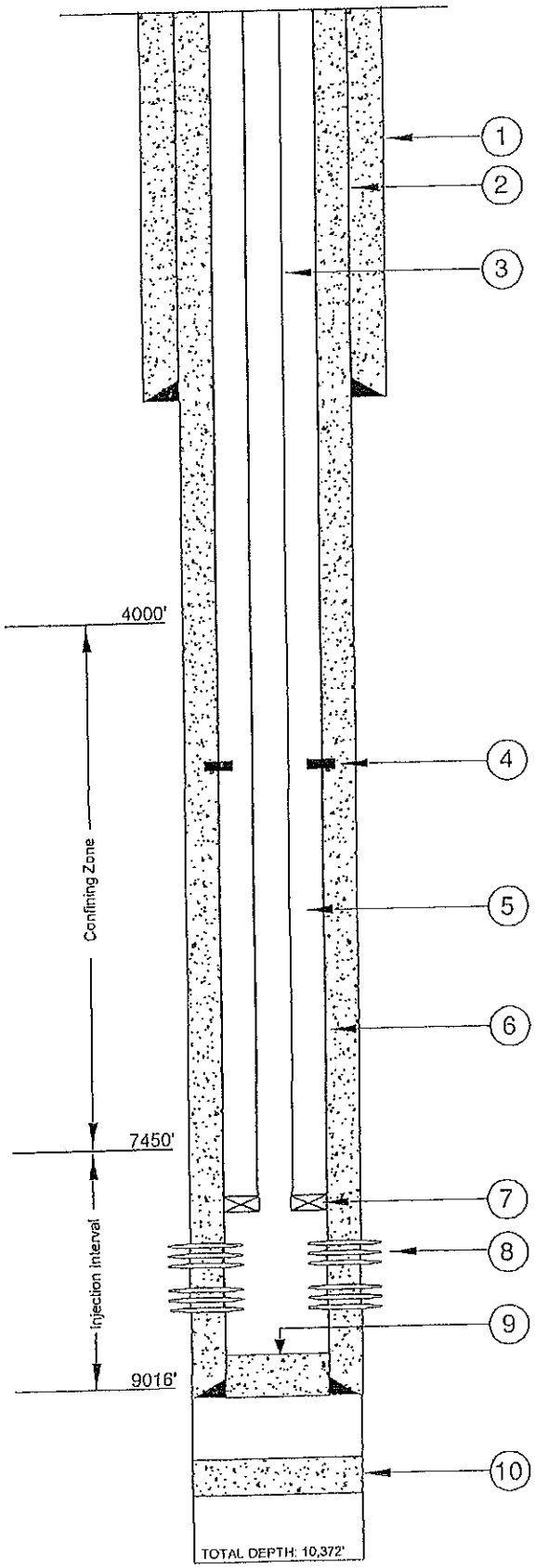
HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

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



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 ⅝", 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 ⅞" 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 ⅞" Weatherford Completion Tools (Arrow) Model X-1 retrievable packer set at 7528'. Minimum ID is 2.4375". Wireline re-entry guide is on bottom. To release: turn ¼ turn to the right and pick up.
8. Perforations (2 SPF):

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

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

SUBSURFACE

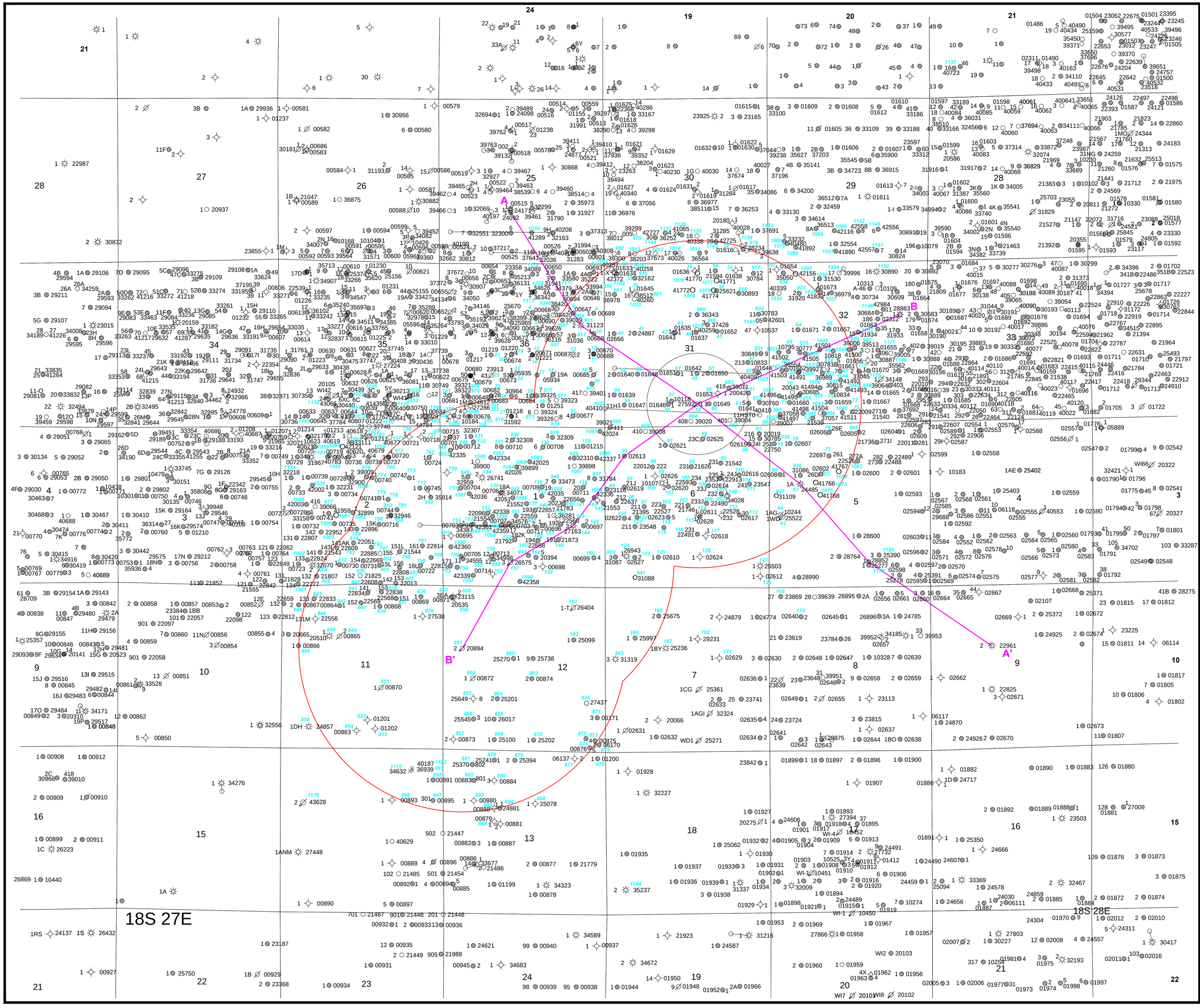
HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS
WASTE DISPOSAL WELL NO. 2

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

FIGURE 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: 10/19/2019	CHECKED BY:	JOB NO: 192080G
DRAWN BY: WDD	APPROVED BY:	DWG NO:

SUBSURFACE TECHNOLOGY

WELL: NAVAJO REFINING WDW #3

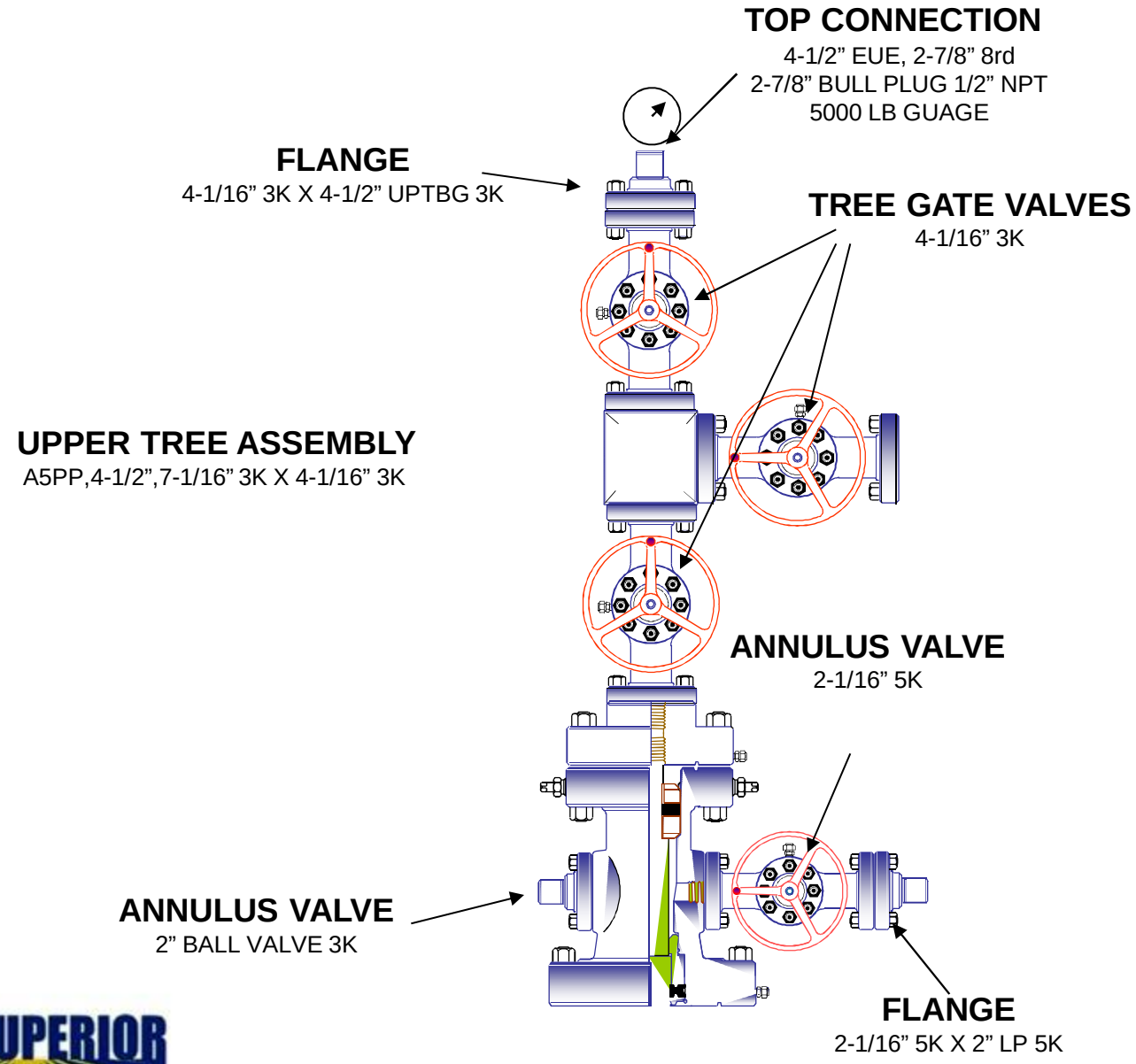
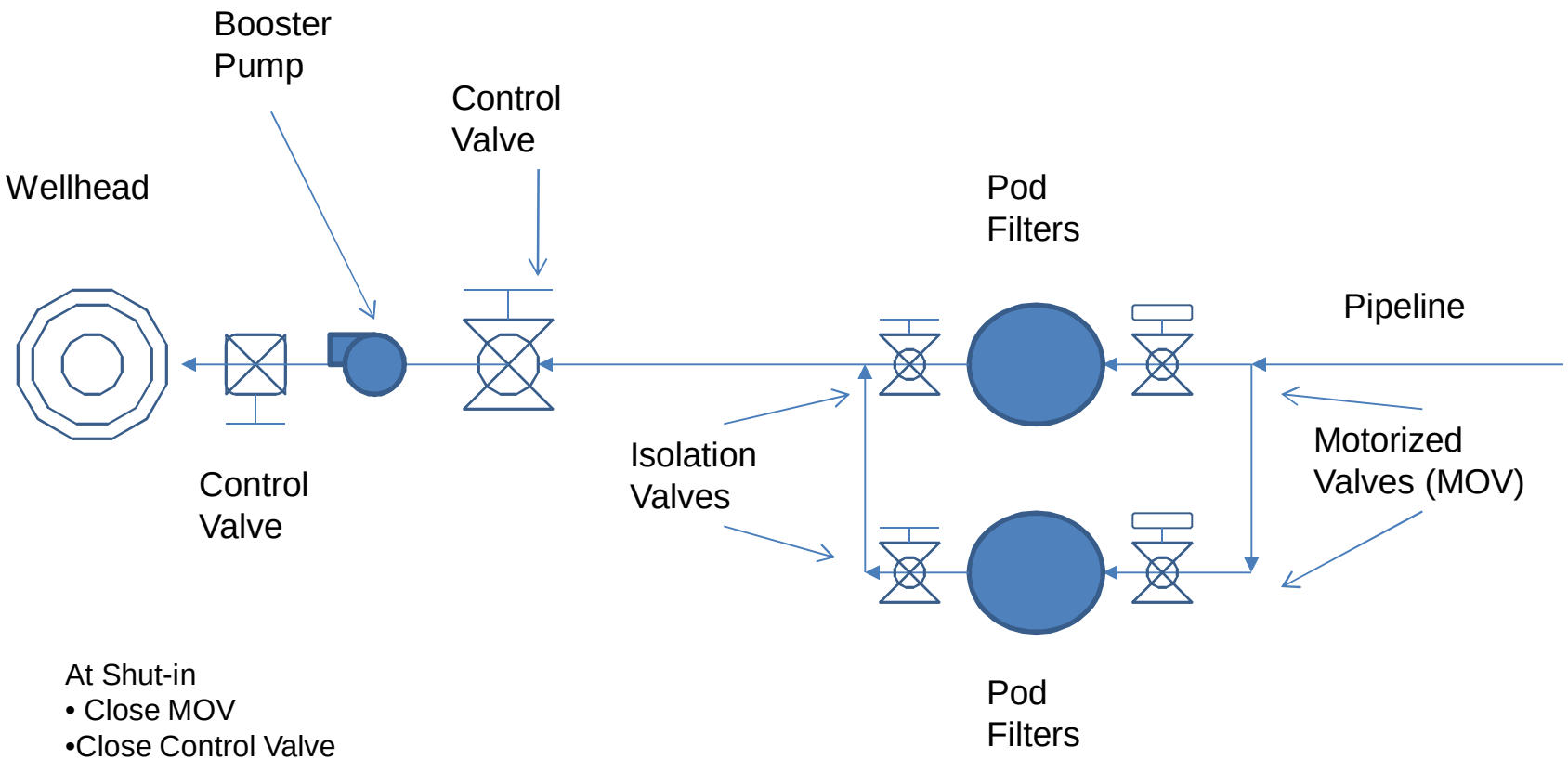


FIGURE 5

FIGURE 6
Gaines Well No. 3
Diagram of Shut-in Valve Control



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

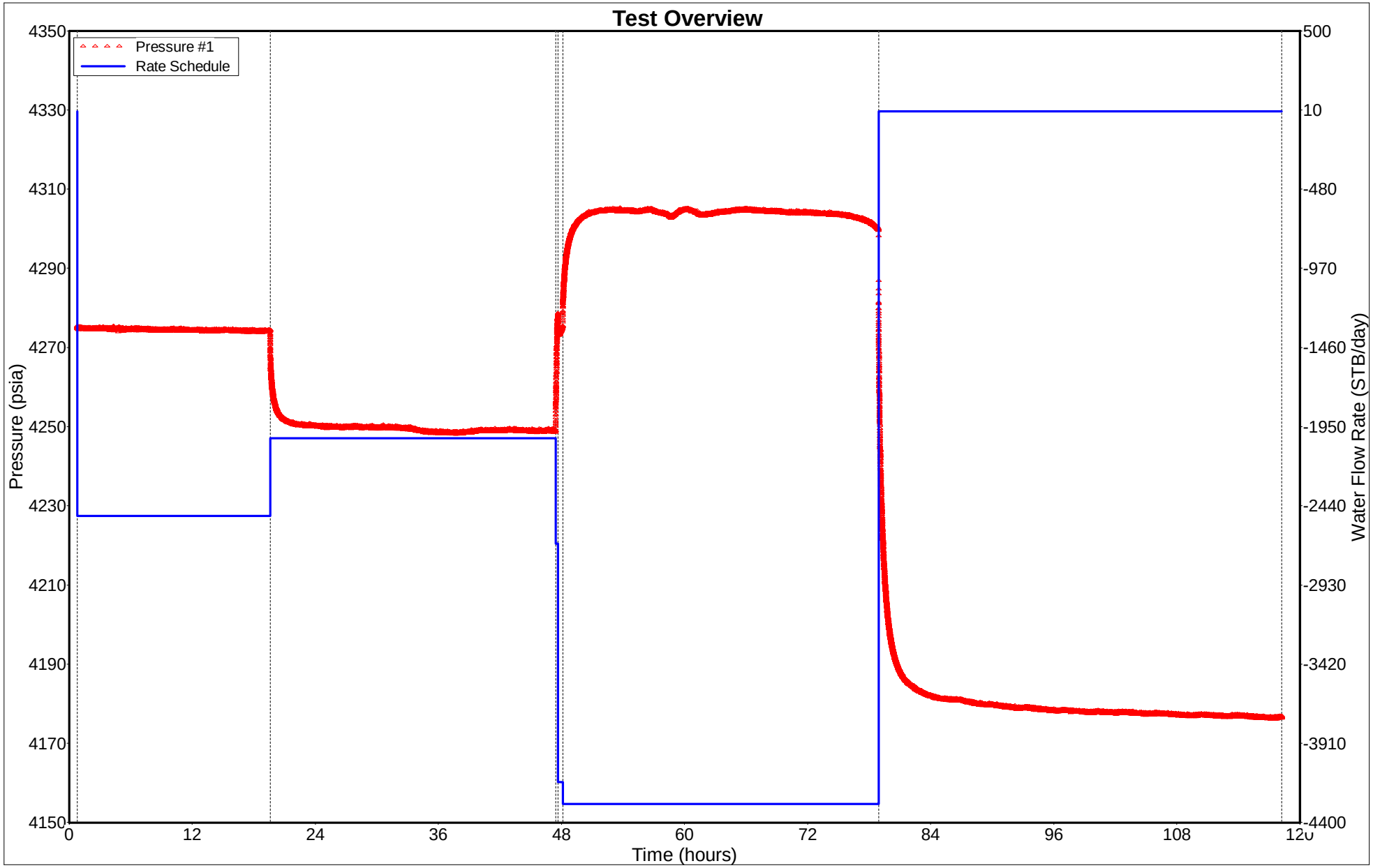

Test Overview
Pressure #1
Rate Schedule
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
4350
4330
4310
4290
4270
4250
4230
4210
4190
4170
4150
500
10
-480
-970
-1460
-1950
-2440
-2930
-3420
-3910
-4400
0
12
24
36
48
60
72
84
96
108
120

FIGURE 7

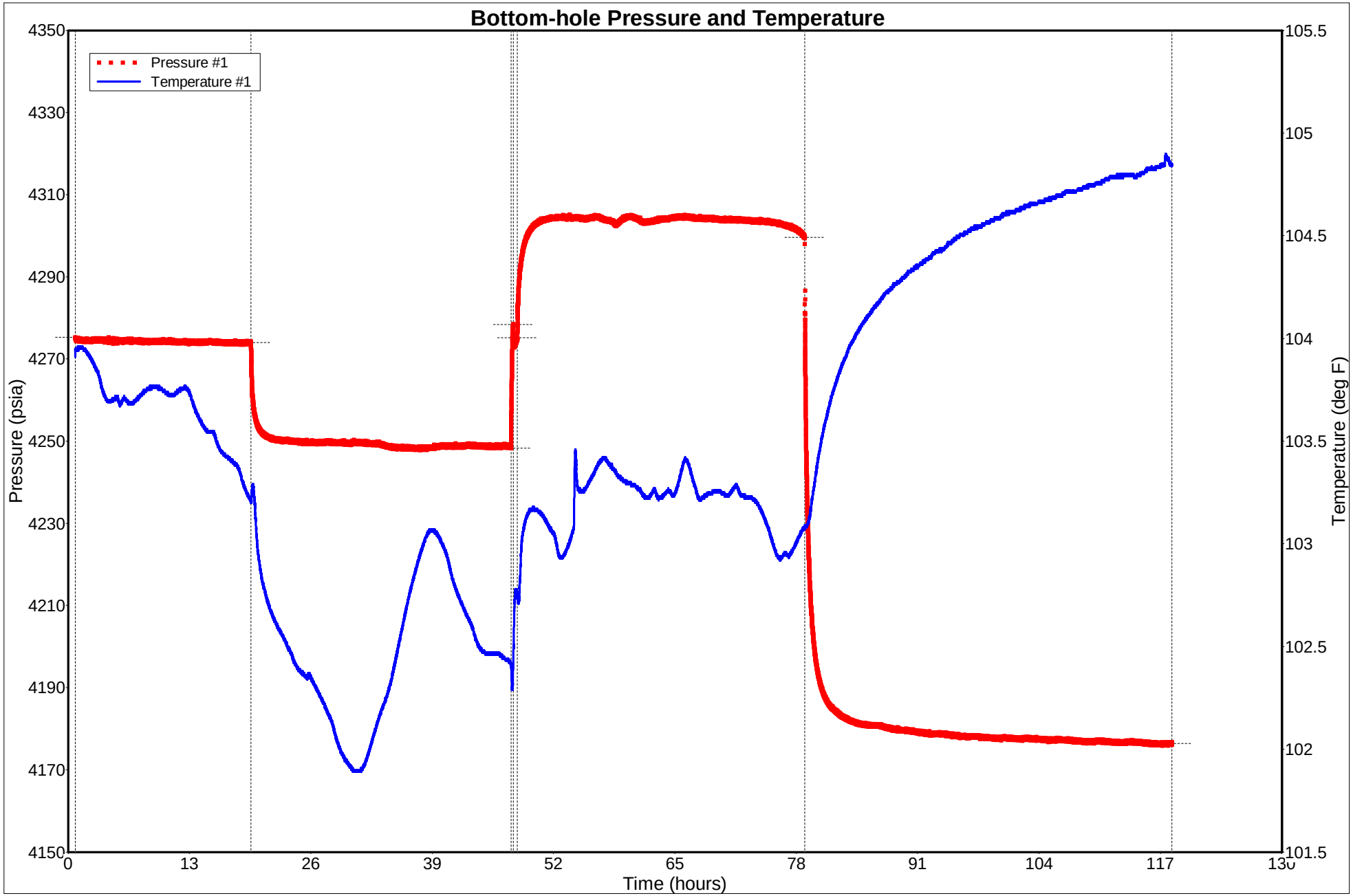

Bottom-hole Pressure and Temperature
Pressure #1
Temperature #1
Pressure (psia)
Temperature (deg F)
Time (hours)
4350
4330
4310
4290
4270
4250
4230
4210
4190
4170
4150
105.5
105
104.5
104
103.5
103
102.5
102
101.5
0
13
26
39
52
65
78
91
104
117
130

FIGURE 8

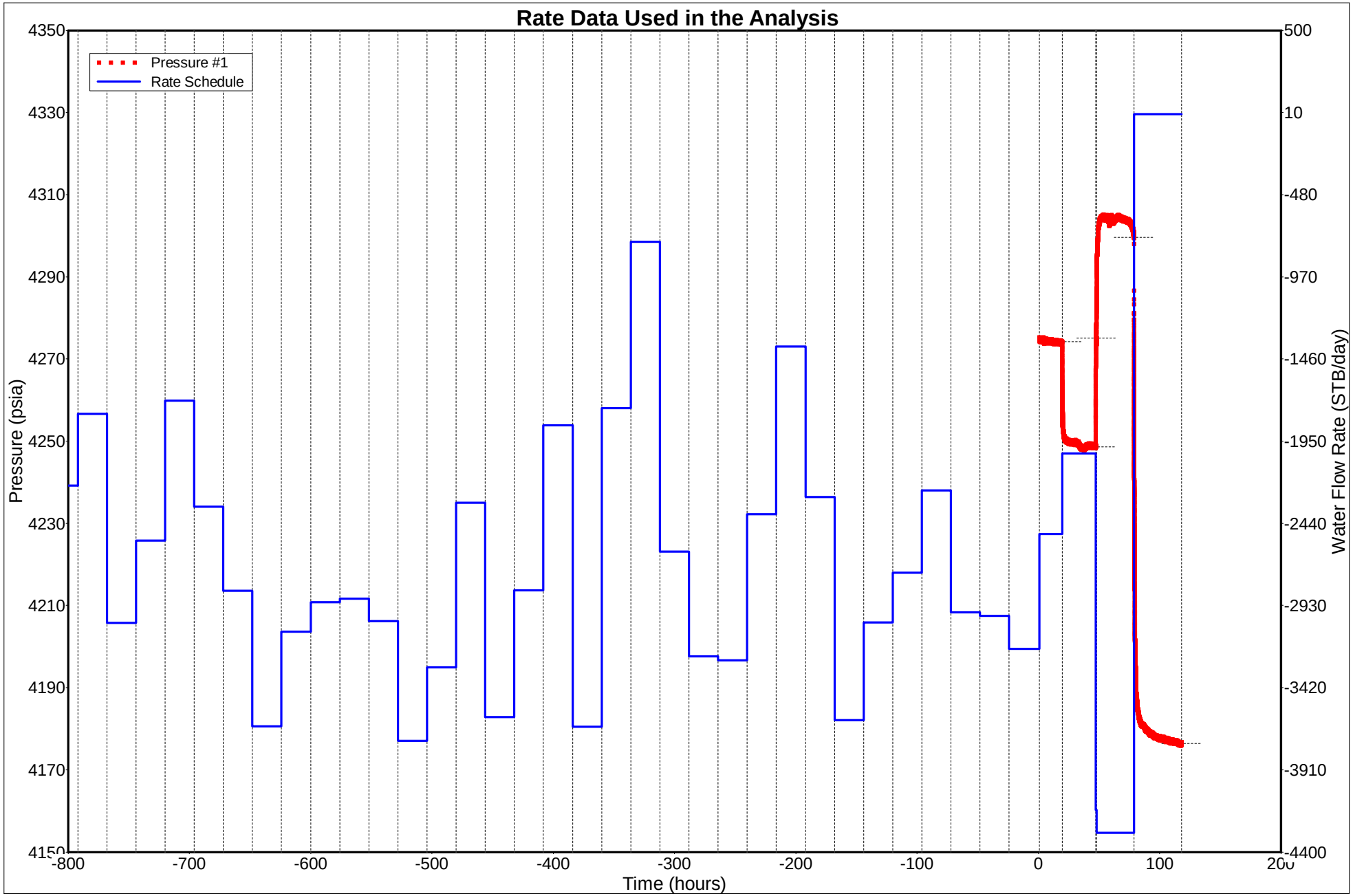

Rate Data Used in the Analysis
Pressure #1
Rate Schedule
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
4350
4330
4310
4290
4270
4250
4230
4210
4190
4170
4150
500
10
-480
-970
-1460
-1950
-2440
-2930
-3420
-3910
-4400
-800
-700
-600
-500
-400
-300
-200
-100
0
100
200

FIGURE 9

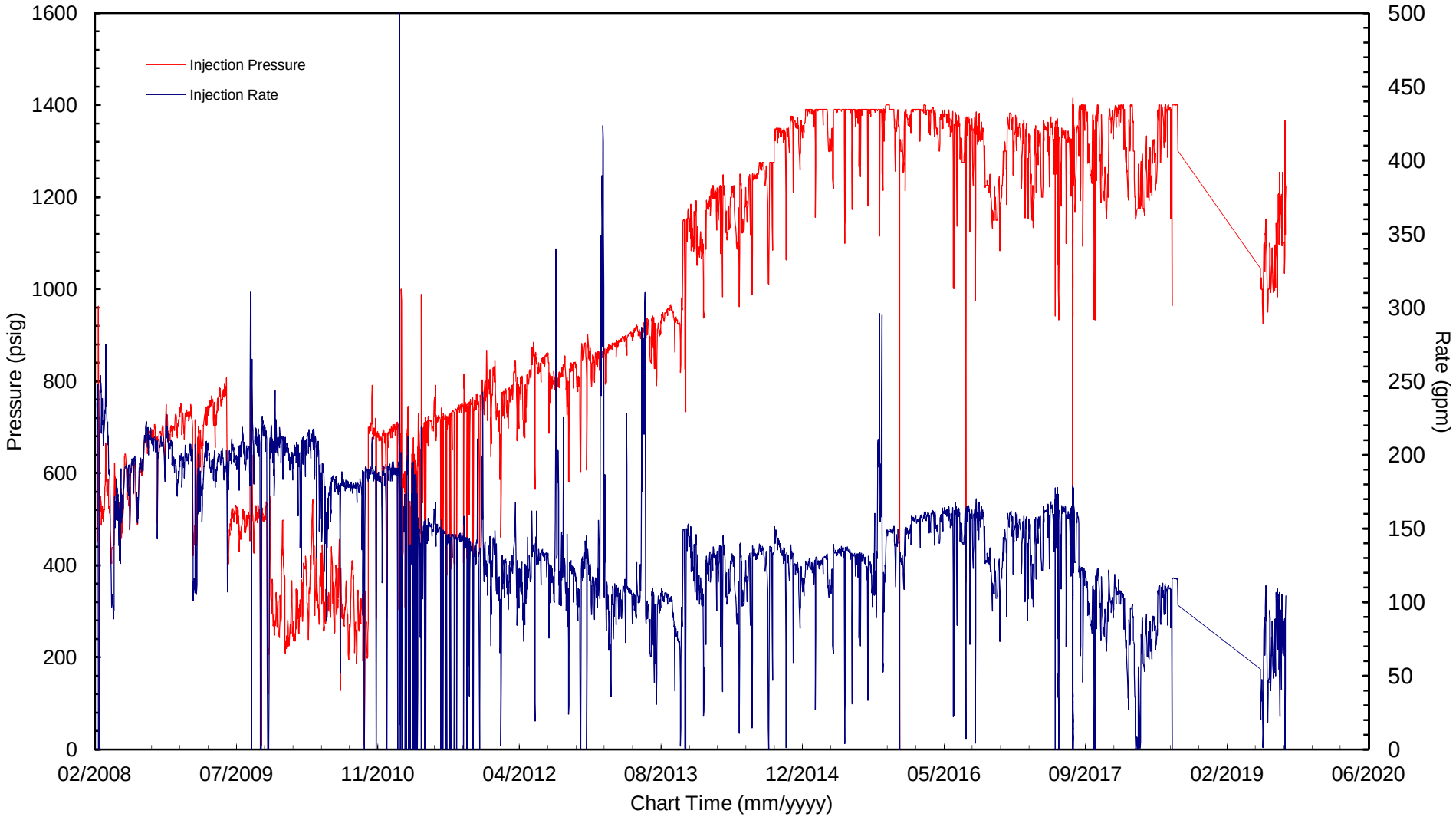

Gaines Well No. 3
Cartesian Plot of Surface Pressure and Injection Rates
March 1, 2008 to August 26, 2019
Injection Pressure
Injection Rate
Pressure (psig)
Rate (gpm)
Chart Time (mm/yyyy)
1600
1400
1200
1000
800
600
400
200
0
500
450
400
350
300
250
200
150
100
50
0
02/2008
07/2009
11/2010
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020

FIGURE 10

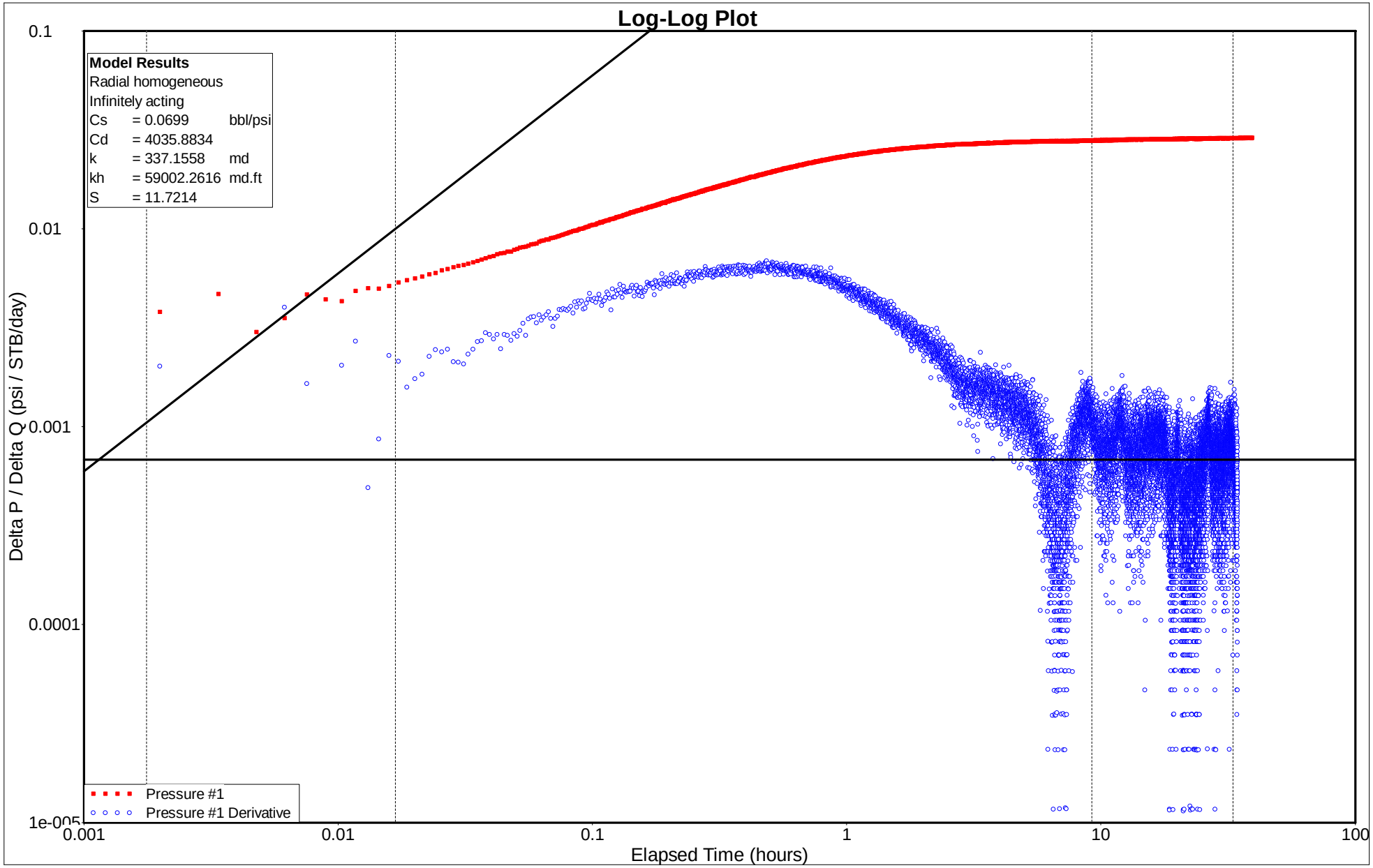

Log-Log Plot
Model Results
Radial homogeneous
Infinitely acting
Cs = 0.0699 bbl/psi
Cd = 4035.8834
k = 337.1558 md
kh = 59002.2616 md.ft
S = 11.7214
Pressure #1
Pressure #1 Derivative
Delta P / Delta Q (psi / STB/day)
Elapsed Time (hours)
0.1
0.01
0.001
0.0001
1e-005
0.001
0.01
0.1
1
10
100

FIGURE 11

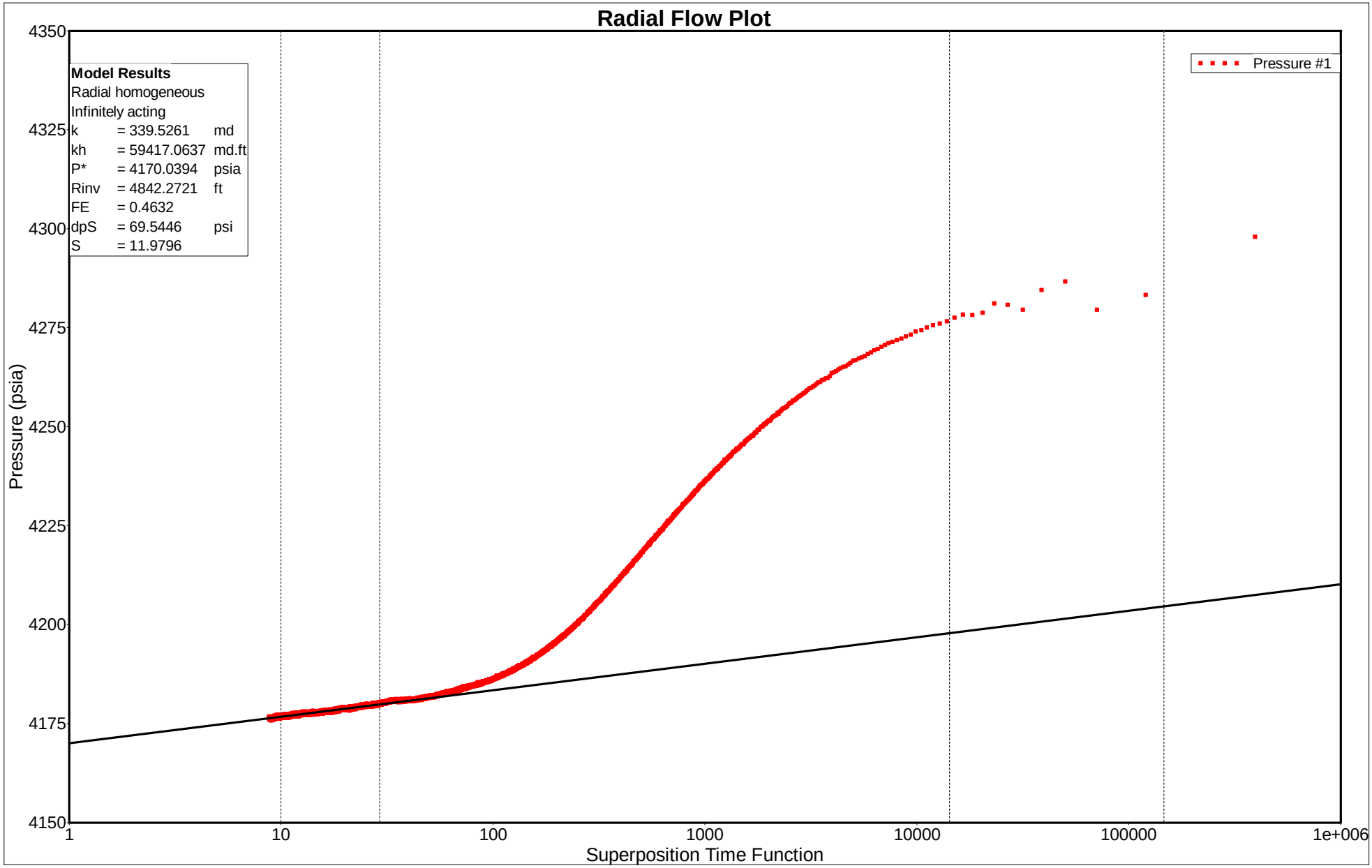

Radial Flow Plot
Model Results
Radial homogeneous
Infinitely acting
k = 339.5261 md
kh = 59417.0637 md.ft
P* = 4170.0394 psia
Rinv = 4842.2721 ft
FE = 0.4632
dpS = 69.5446 psi
S = 11.9796
Pressure #1
Pressure (psia)
4350
4325
4300
4275
4250
4225
4200
4175
4150
1
10
100
1000
10000
100000
1e+006
Superposition Time Function

FIGURE 12

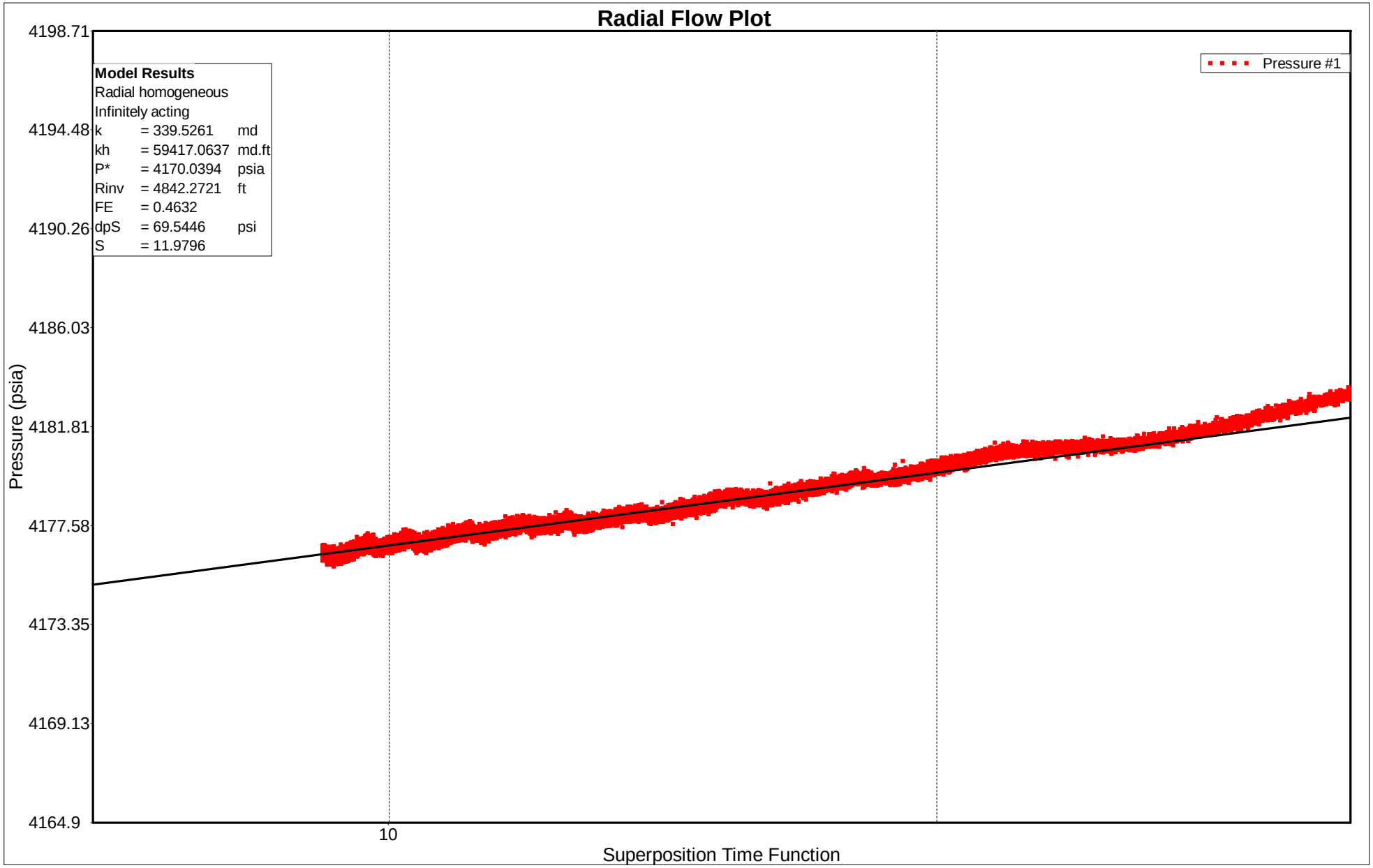

Radial Flow Plot
Model Results
Radial homogeneous
Infinitely acting
k = 339.5261 md
kh = 59417.0637 md.ft
P* = 4170.0394 psia
Rinv = 4842.2721 ft
FE = 0.4632
dpS = 69.5446 psi
S = 11.9796
Pressure #1
4198.71
4194.48
4190.26
4186.03
4181.81
4177.58
4173.35
4169.13
4164.9
Pressure (psia)
10
Superposition Time Function

FIGURE 13

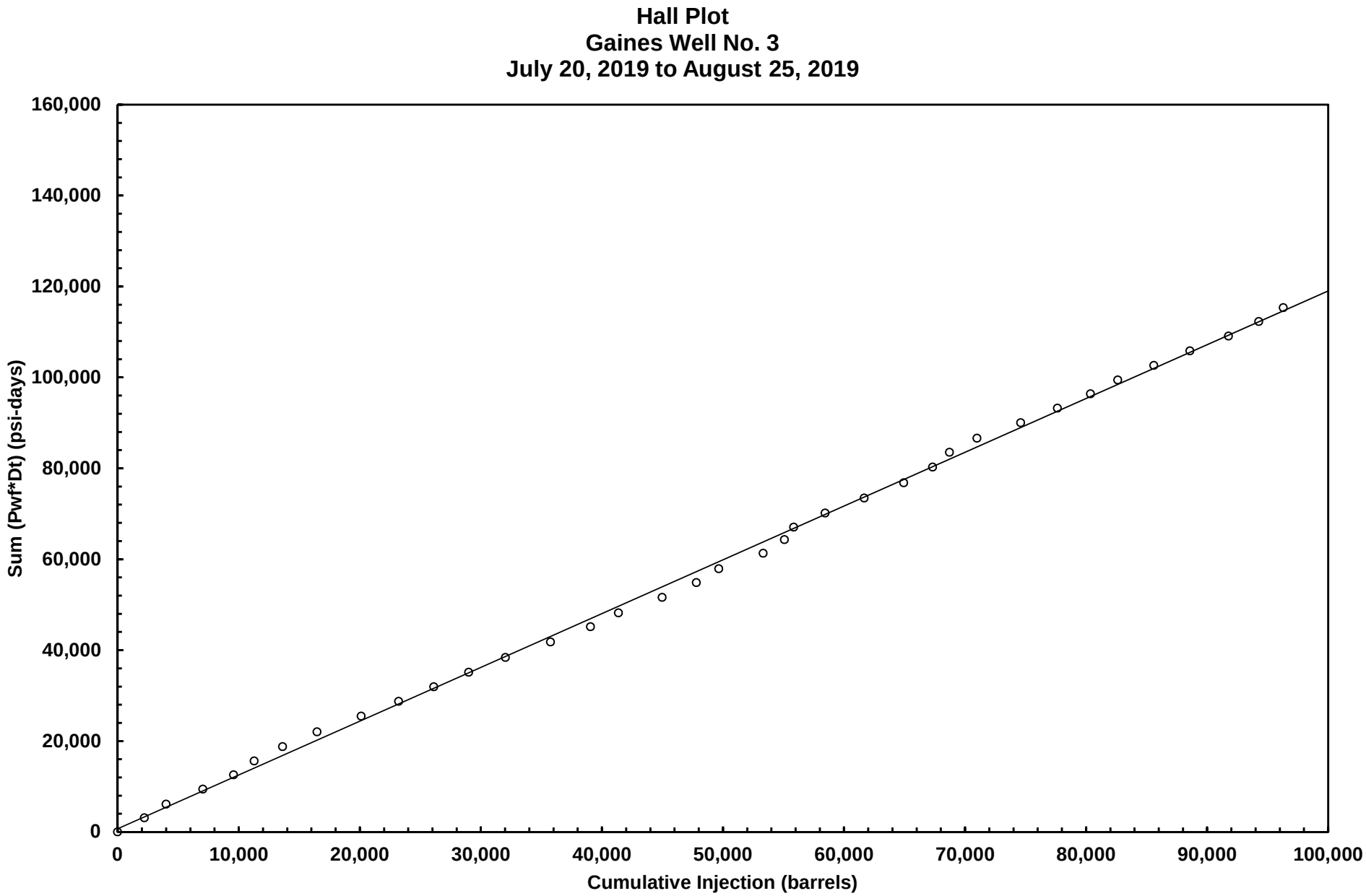

Hall Plot
Gaines Well No. 3
July 20, 2019 to August 25, 2019
Sum (Pwf*Dt) (psi-days)
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
Cumulative Injection (barrels)

FIGURE 14

Navajo Refining
Static Pressure Gradient Survey
Gaines Well No. 3
August 28, 2019

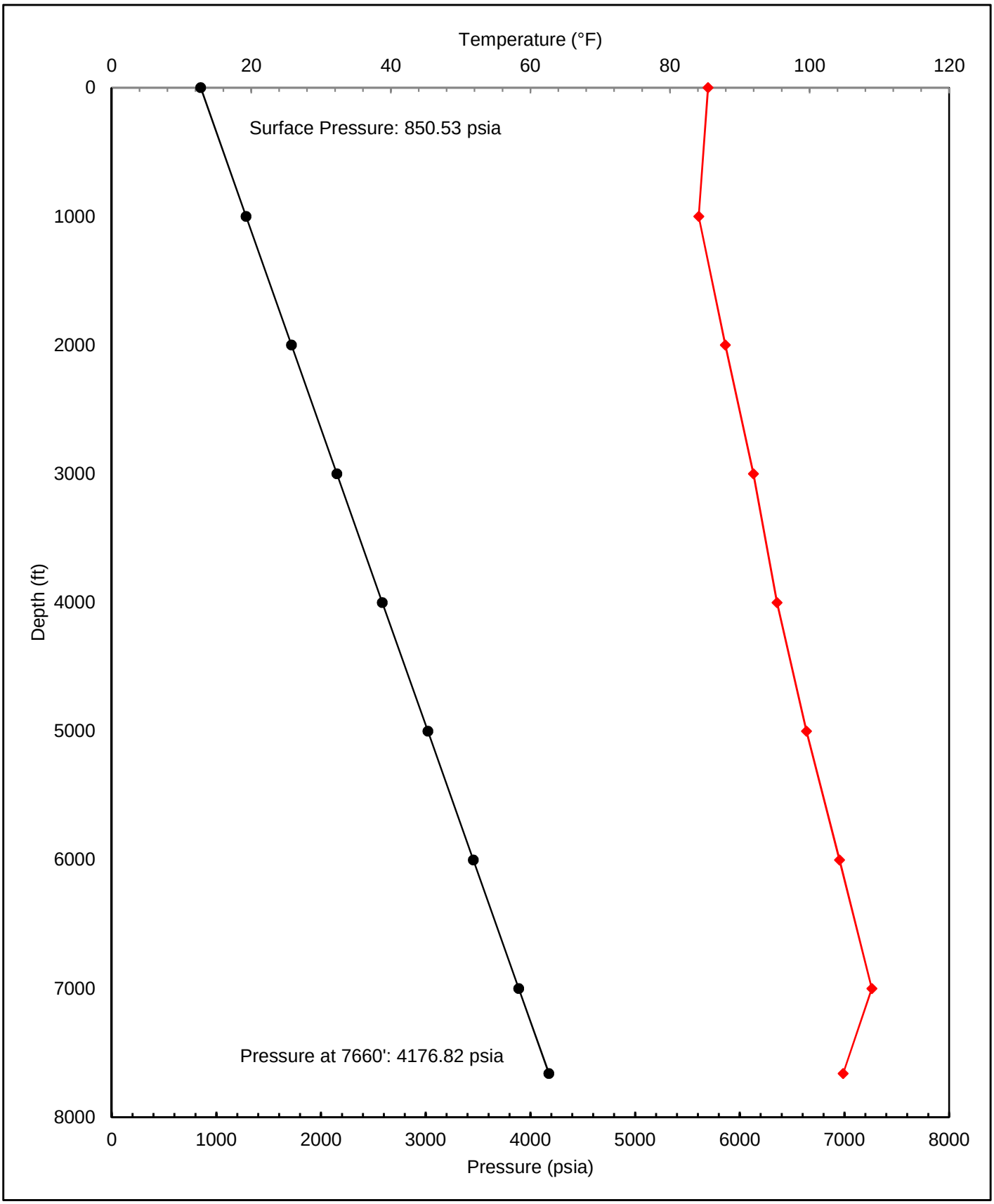


FIGURE 15

APPENDICES

APPENDIX A

DUAL INDUCTION LOG SECTIONS FROM 7660 FEET TO 8620 FEET

APPENDIX B

NEUTRON DENSITY LOG SECTIONS FROM 7660 FEET TO 8620 FEET

APPENDIX C

COMPRESSIBILITY OF FLUID

APPENDIX C

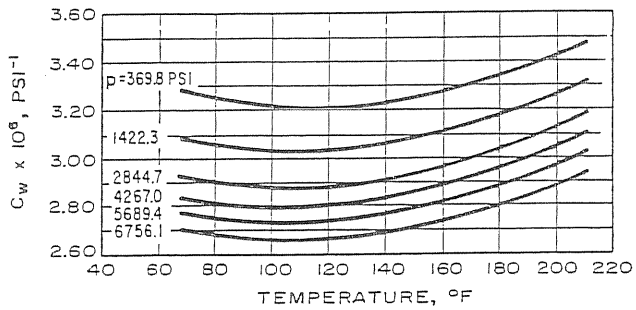


Fig. D.16 Average compressibility of distilled water. After Long and Chierici.[13]

Source: Earlougher, 1977, Advances in Well Test Analysis

COMPRESSIBILITY OF PORE VOLUME AND DISTILLED WATER

APPENDIX D

COMPRESSIBILITY OF PORE VOLUME

APPENDIX D

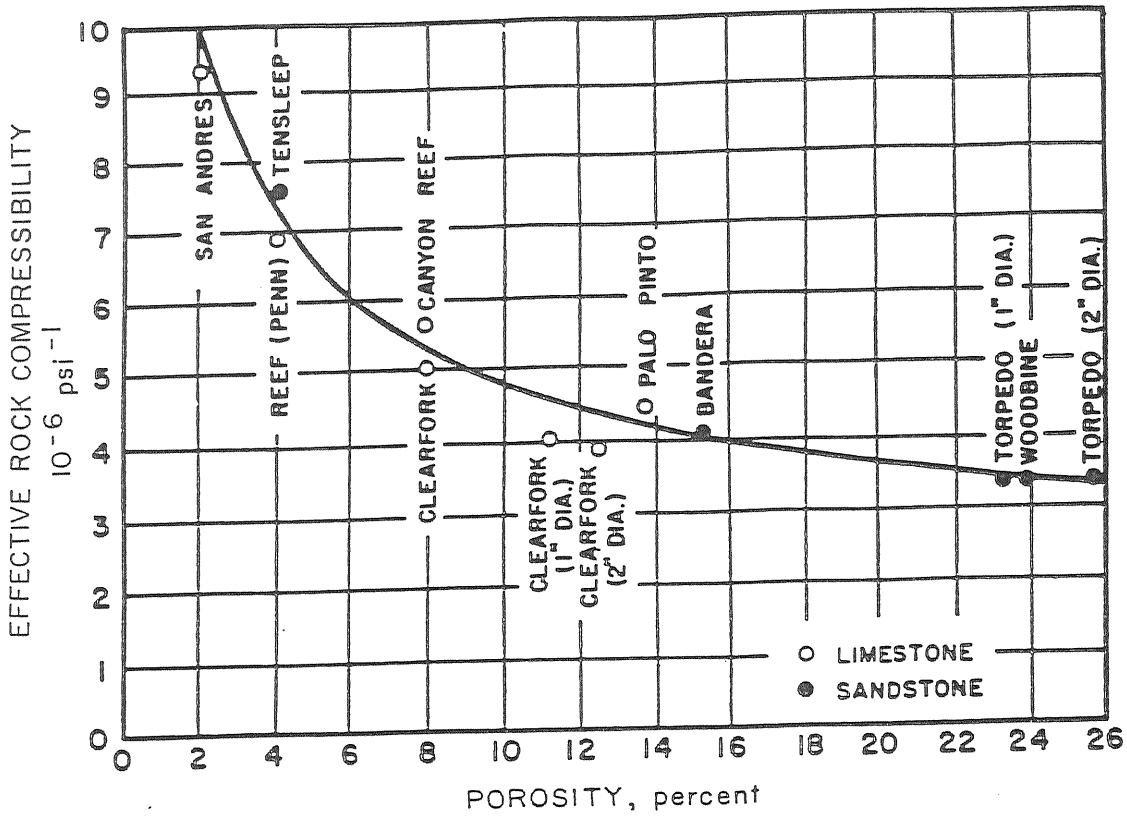


Fig. G.5 Effective formation (rock) compressibility. From Hall, *Trans.*, AIME (1953) 198, 309.

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

APPENDIX E

GAINES WELL NO. 3, TEMPERATURE LOG, OCTOBER 13, 2006

APPENDIX F

WATER VOSCOSITIES AT VARIOUS SALINTIES AND TEMPERATURES

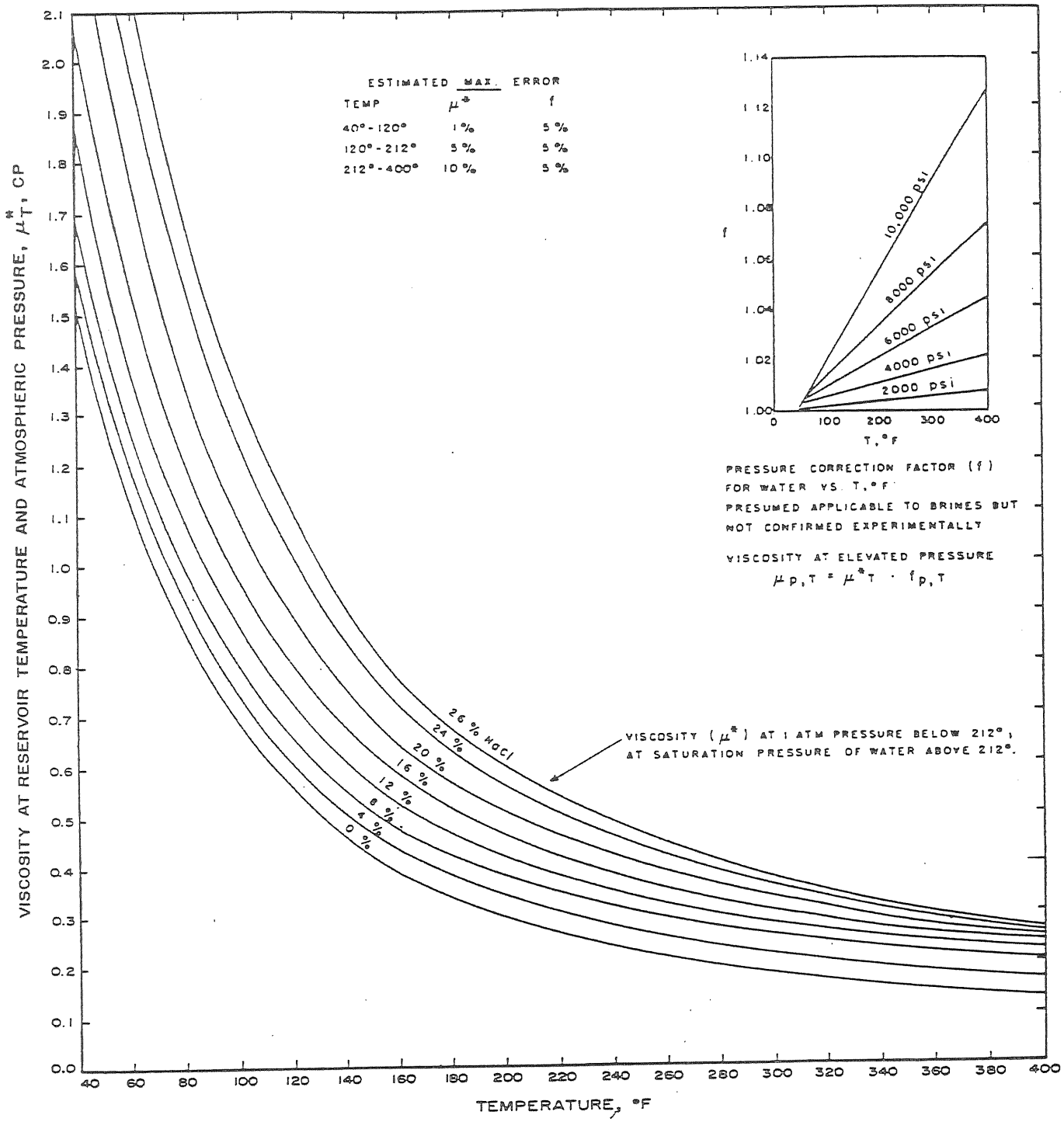


Fig. D.35 Water viscosity at various salinities and temperatures. After Matthews and Russell, data of Chesnut.[18]

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

APPENDIX G

DAILY RATE HISTORY DATA

APPENDIX G

Gaines Well No. 3
Daily Rate History

Date	Gaines Well No. 3 Daily Rates (gpm)	Gaines Well No. 3 Pressure (psig)
07/20/19	78.18	1059.37
07/21/19	64.57	1038.98
07/22/19	52.09	997.51
07/23/19	88.46	1096.48
07/24/19	74.14	1062.58
07/25/19	49.83	1003.64
07/26/19	68.27	1059.73
07/27/19	82.91	1082.96
07/28/19	106.46	1142.90
07/29/19	89.99	1084.19
07/30/19	84.91	1070.10
07/31/19	84.24	1070.12
08/01/19	88.18	1079.79
08/02/19	109.02	1143.48
08/03/19	96.20	1105.58
08/04/19	67.63	1027.74
08/05/19	104.84	1133.93
08/06/19	82.79	1081.49
08/07/19	54.16	1010.28
08/08/19	106.58	1139.79
08/09/19	51.17	997.77
08/10/19	22.20	911.27
08/11/19	76.08	1046.66
08/12/19	94.31	1099.99
08/13/19	95.02	1106.77
08/14/19	69.55	1150.01
08/15/19	40.44	1084.88
08/16/19	66.63	1034.67
08/17/19	105.41	1136.12
08/18/19	88.44	1075.05
08/19/19	79.76	1048.29
08/20/19	65.41	1012.20
08/21/19	86.68	1068.86
08/22/19	87.23	1073.96
08/23/19	93.00	1075.04
08/24/19	73.00	1075.05
08/25/19	59.00	1020.35

APPENDIX H

GAUGE CALIBRATION SHEETS

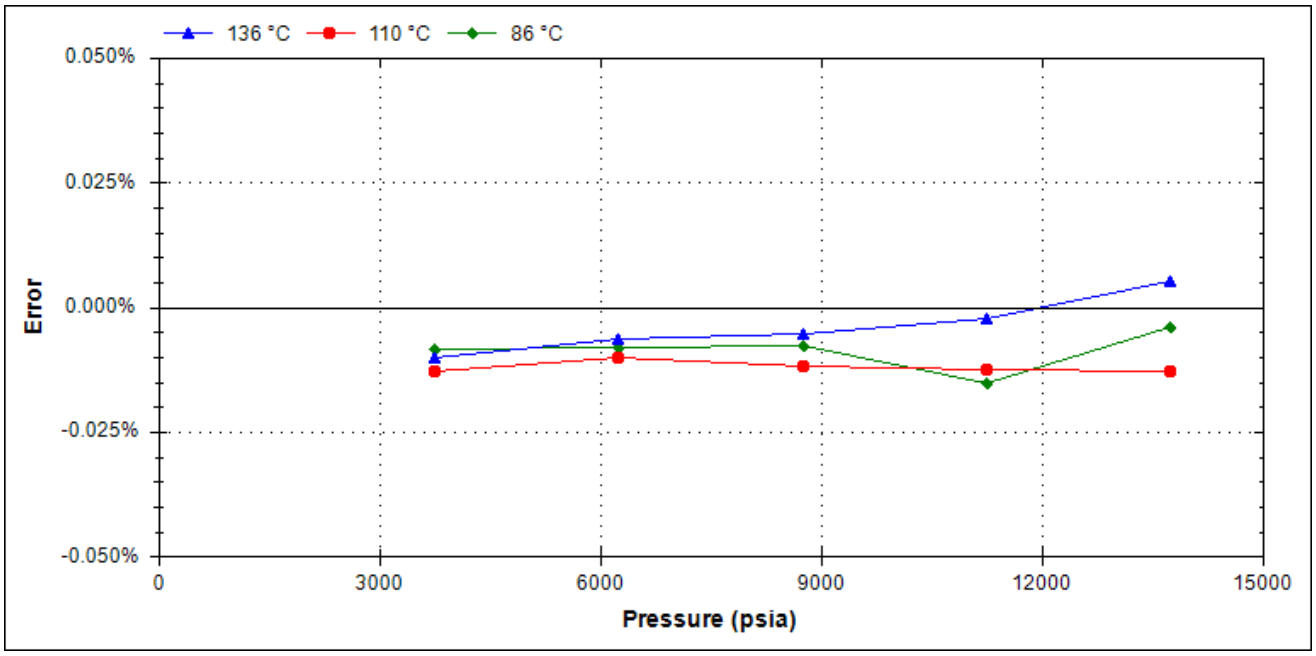
DataCan

"The Next Generation of Down Hole Tools"

Calibration Date:	03-Jun-19	**Calibration System:**	CALIBRATION04
Max Pressure Error:	0.015% F.S.	**Batch Number:**	20190530.164905
Max Temperature Error:	0.082 °C		
Part Number:	101250		
Serial Number:	DC3540		

1.375 OD_Welded Piezo IV_Calibrated Assy			
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, Serial: EC0180
DHI Instruments Pressure Controller, Model: PPCH-200M (30,000psi Reference), Serial: 3171

Traceability Statement

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

Approved By:
DataCan Services Corp.

Calibrated By:
Angelo Pulido

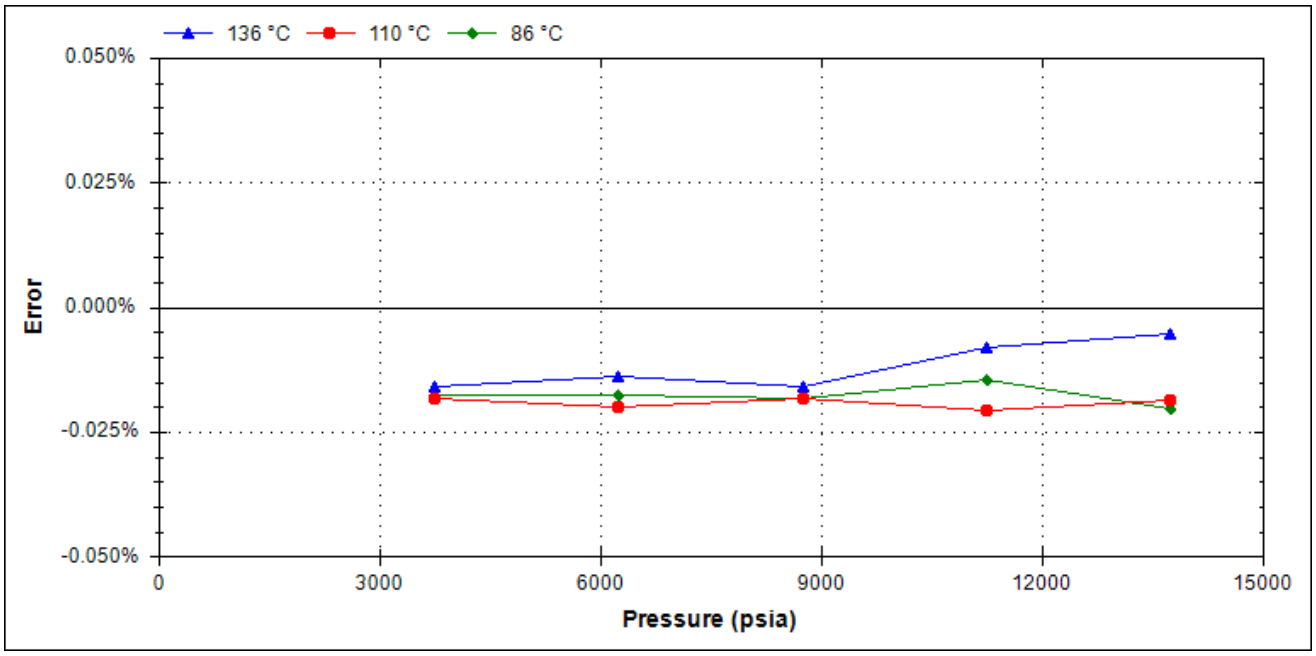
DataCan

"The Next Generation of Down Hole Tools"

Calibration Date:	03-Jun-19	**Calibration System:**	CALIBRATION04
Max Pressure Error:	0.021% F.S.	**Batch Number:**	20190530.164905
Max Temperature Error:	0.091 °C		
Part Number:	101250		
Serial Number:	DC3539		

1.375 OD_Welded Piezo IV_Calibrated Assy			
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, Serial: EC0180
DHI Instruments Pressure Controller, Model: PPCH-200M (30,000psi Reference), Serial: 3171

Traceability Statement

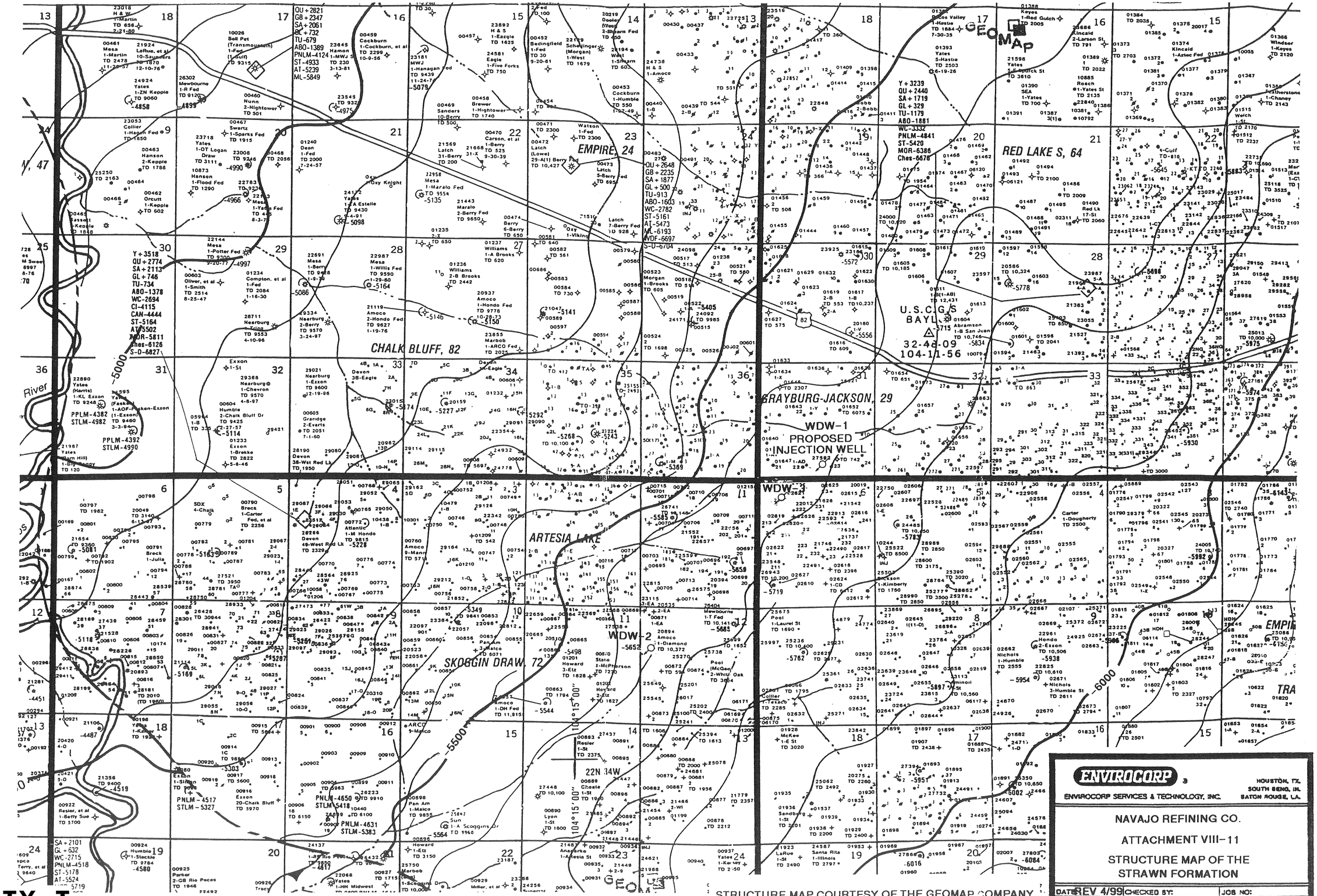
All working standards are traceable to nationally or internationally recognized standards.

Approved By:
DataCan Services Corp.

Calibrated By:
Angelo Pulido

APPENDIX I

STRAWN STRUCTURE MAPS



STRUCTURE MAP COURTESY OF THE GEOMAP COMPANY
Poster July 1997

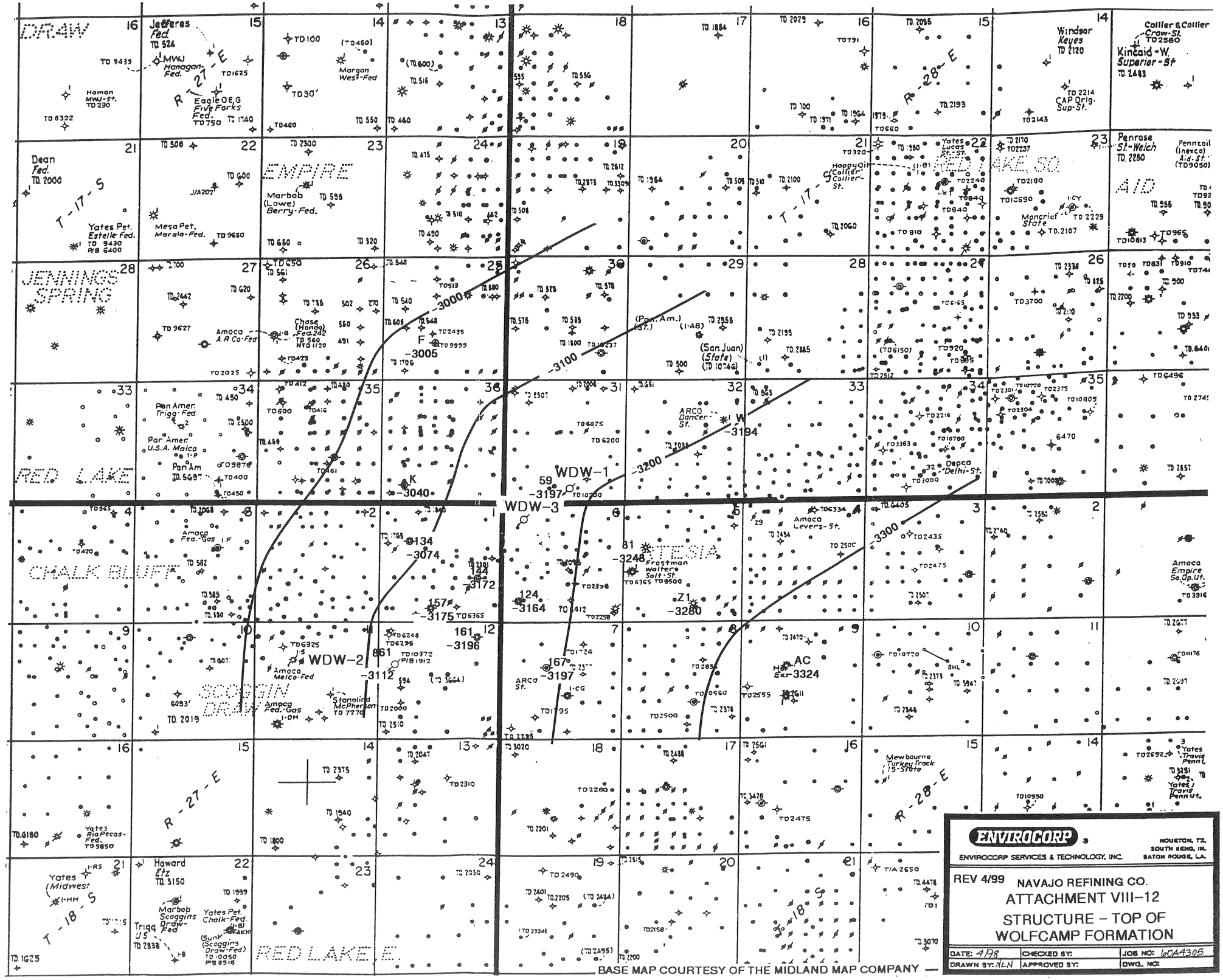
APPENDIX I

APPENDIX J

WOLFCAMP STRUCTURE MAPS

157 ID NO.
-4025 SUBSEA DEPTH

APPENDIX J



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

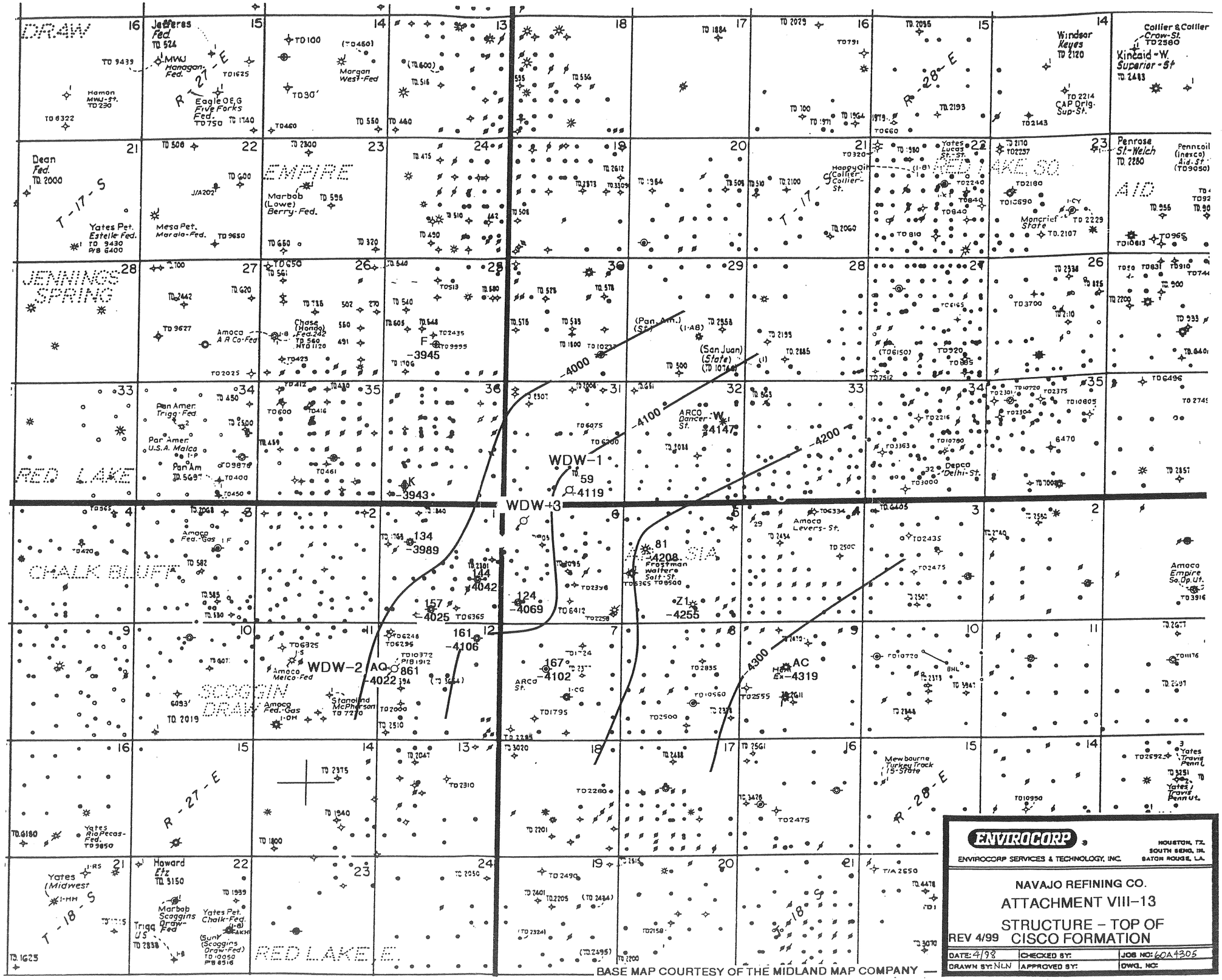
DATE: 4/98	CHECKED BY:	JOB NO: 60A4305
DRAWN BY: NLN	APPROVED BY:	DWG. NO:

APPENDIX K

CISCO STRUCTURE MAPS

157 ☼ ID NO.
-4025 SUBSEA DEPTH

APPENDIX K



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

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

DATE: 4/98	CHECKED BY:	JOB NO: 60A4306
DRAWN BY: NLN	APPROVED BY:	DWG. NO:

APPENDIX L

PANSYSTEM© ANALYSIS OUTPUT

Company	Navajo Refining Company
Location	Artesia, New Mexico
Well	Gaines Well No. 3
Date	August 23 - 28, 2019
Gauge Type / Serial Number	DataCan/#DC-3540
Guage Depth	7660 feet
Injection Interval	7660 feet to 8620 feet
Completion Type	Perforated
Top of Fill	8632 feet
Analyst	LKM
WSP USA Project No.	192080G

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	4170.039448 psia
Temperature	111.540000 deg F

Well Parameters Data

	WDW-3
Well radius	0.3246 ft
Distance from observation to active well	0.000000 ft
Wellbore storage coefficient	0.069922 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	4275.660000 psia
Check Temperature	111.540000 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	339.526078 md
Skin factor (Well 1)	11.979592

Rate Change Data

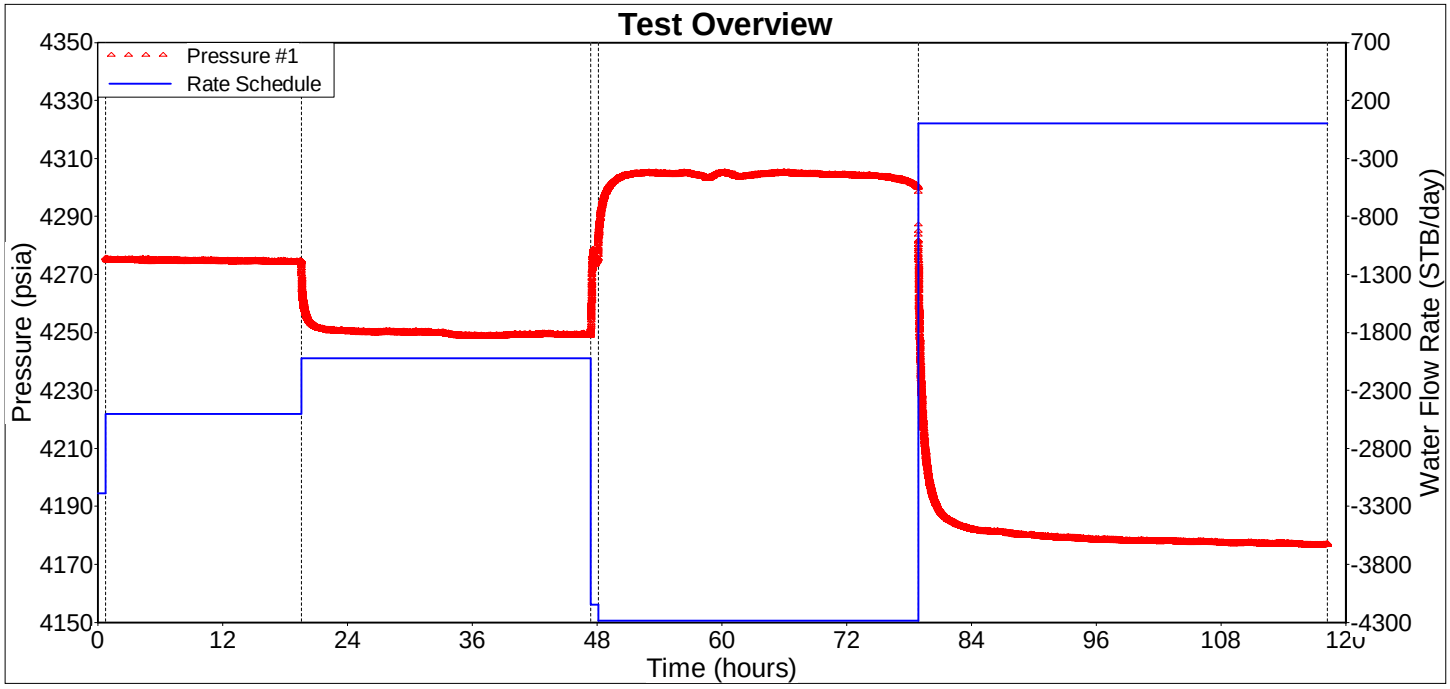
Time Hours	Pressure psia	Rate STB/day
-816.000000	0.000000	-2680.318172
-792.000000	0.000000	-2213.837906
-768.000000	0.000000	-1786.101910
-744.000000	0.000000	-3032.867061
-720.000000	0.000000	-2542.108681
-696.000000	0.000000	-1708.542913
-672.000000	0.000000	-2340.747535
-648.000000	0.000000	-2842.483430
-624.000000	0.000000	-3650.047910
-600.000000	0.000000	-3085.407510
-576.000000	0.000000	-2911.049819
-552.000000	0.000000	-2888.277197
-528.000000	0.000000	-3023.435073
-504.000000	0.000000	-3737.896683

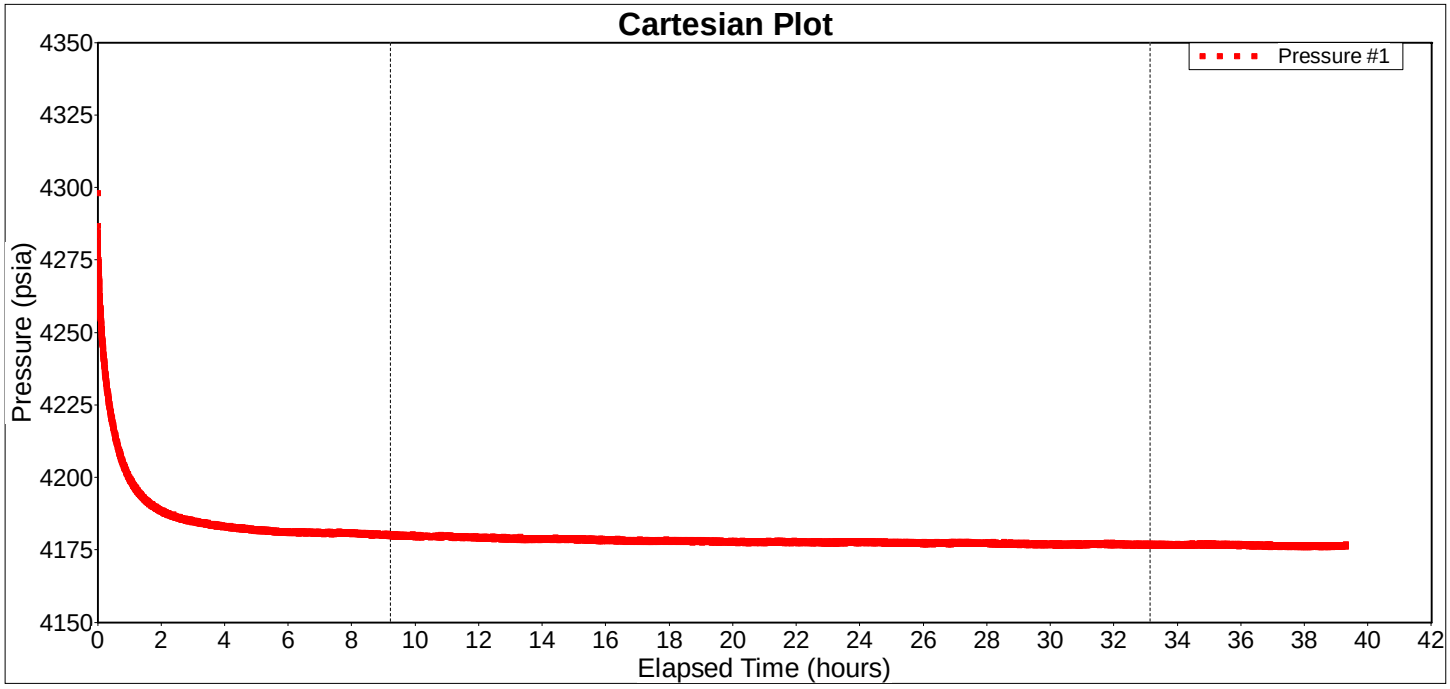
Rate Change Data (cont)

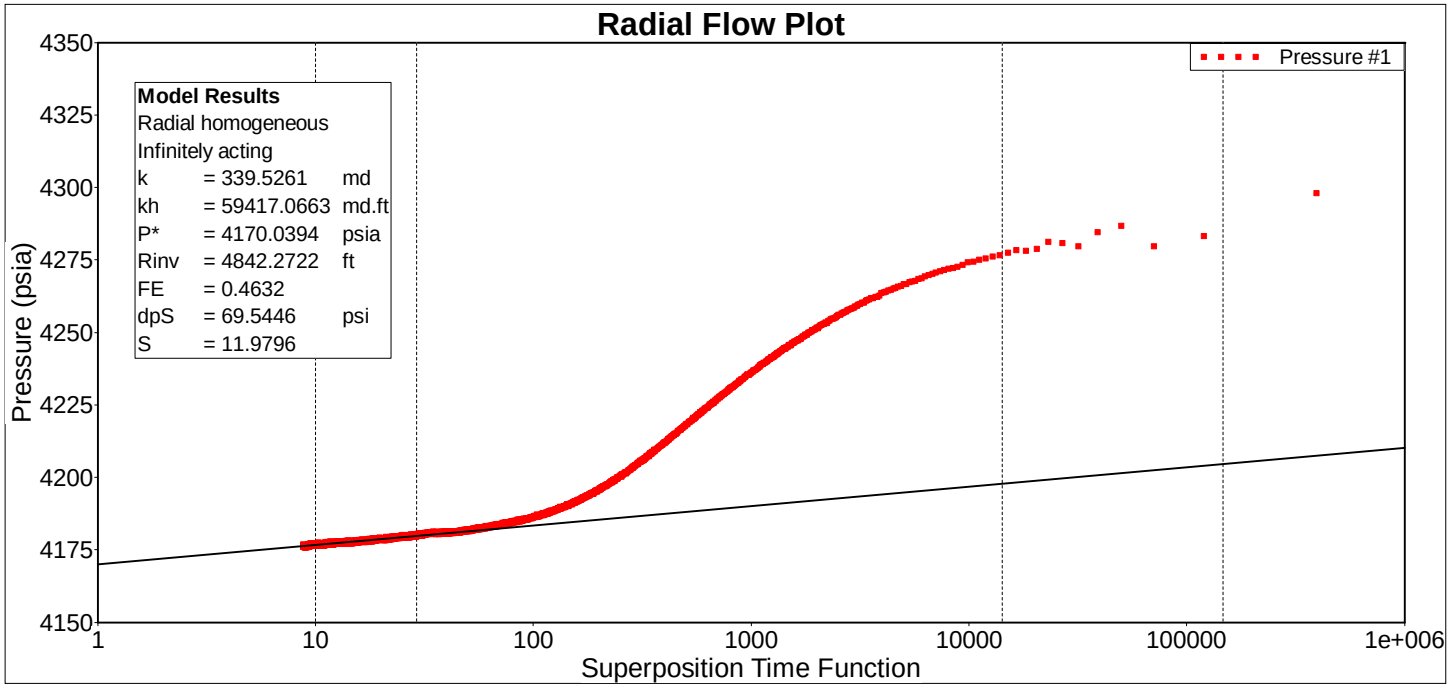
Time Hours	Pressure psia	Rate STB/day
-480.000000	0.000000	-3298.118783
-456.000000	0.000000	-2318.576506
-432.000000	0.000000	-3594.365054
-408.000000	0.000000	-2838.566089
-384.000000	0.000000	-1856.823444
-360.000000	0.000000	-3654.185866
-336.000000	0.000000	-1754.359133
-312.000000	0.000000	-760.977041
-288.000000	0.000000	-2608.364924
-264.000000	0.000000	-3233.384054
-240.000000	0.000000	-3257.940624
-216.000000	0.000000	-2384.678893
-192.000000	0.000000	-1386.612336
-168.000000	0.000000	-2284.626300

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-144.000000	0.000000	-3614.053368
-120.000000	0.000000	-3032.153112
-96.000000	0.000000	-2734.682459
-72.000000	0.000000	-2242.711199
-48.000000	0.000000	-2971.752799
-24.000000	0.000000	-2990.677175
0.786740	0.000000	-3188.570000
19.604972	4274.229000	-2502.860000
47.437511	4248.622000	-2022.860000
48.140347	4275.052000	-4148.570000
78.930782	4299.602000	-4285.710000
118.249444	4176.370000	0.000000


Test Overview
Pressure #1
Rate Schedule
Pressure (psia)
4350
4330
4310
4290
4270
4250
4230
4210
4190
4170
4150
Water Flow Rate (STB/day)
700
200
-300
-800
-1300
-1800
-2300
-2800
-3300
-3800
-4300
0
12
24
36
48
60
72
84
96
108
120
Time (hours)


Cartesian Plot
Pressure #1
Pressure (psia)
4350
4325
4300
4275
4250
4225
4200
4175
4150
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
Elapsed Time (hours)



Radial Flow Plot Model Results
Radial homogeneous - Infinitely acting

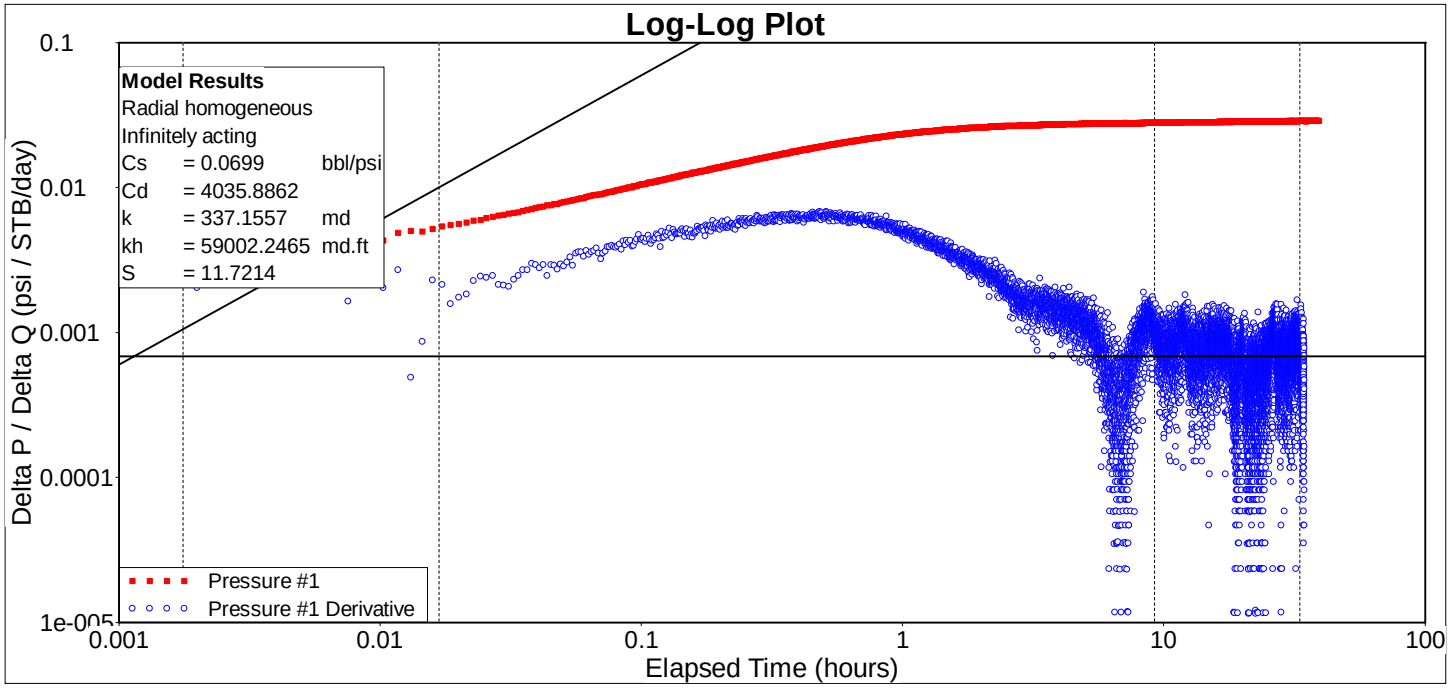
Classic Wellbore Storage

	Value
Permeability	339.526093 md
Permeability-thickness	5.9417e4 md.ft
Extrapolated pressure	4170.039448 psia
Radius of investigation	4842.272240 ft
Flow efficiency	0.463236
dP skin (constant rate)	69.544563 psi
Skin factor	11.979593

Radial Flow Plot Line Details
Line type : Radial flow
Slope : 6.68354
Intercept : 4170.04
Coefficient of Determination : 0.961775

	Radial flow
Extrapolated pressure	4170.039448 psia
Pressure at dt = 1 hour	4185.955045 psia

Number of Intersections = 0



Log-Log Plot Model Results
Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.069922 bbl/psi
Dimensionless wellbore storage	4035.886167
Permeability	337.155694 md
Permeability-thickness	5.9002e4 md.ft
Skin factor	11.721441

Log-Log Plot Line Details
Line type : Wellbore storage
Slope : 1
Intercept : 0.595899
Coefficient of Determination : Not Used

Line type : Radial flow
Slope : 0
Intercept : 0.000682042
Coefficient of Determination : Not Used

Number of Intersections = 0

LOGS

- **Dual Induction Log Sections from 7660 feet to 8620 feet**
- **Neutron Density Log Sections from 7660 feet to 8620 feet**
- **Gaines Well No. 3, Temperature Log, October 13, 2006**

ATTACHMENT A

Monthly Injection Volume with Cumulative Totals

District I
1625 North French, Hobbs, NM 88241
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos, Aztec, NM 84710

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South Saint Francis Drive
Santa Fe, NM 87505
OPERATOR'S MONTHLY REPORT

Form C-115 First Page
Revised January 22, 2004
Instruction on Reverse Side
1 ☐ Amended Report

2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 1/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	263,589	1,272	W												
30-015-20894 WDW - 2	D	75,463	1,262	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	92,469	1,177	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	202560	58	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
District II
811 S. First St., Artesia, NM 88210
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2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 2/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	188,160	1,270	W												
30-015-20894 WDW - 2	D	61,440	1,252	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	66,240	1,116	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	228480	50	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
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State of New Mexico
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2 Operator NAVAJO REFINERY CO.	3 OGRID: 15694	3/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210		6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	132,857	1,184	W												
30-015-20894 WDW - 2	D	53,143	1,157	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	59,520	1,064	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	279531	80	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
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		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	138,857	1,240	W												
30-015-20894 WDW - 2	D	48,343	1,140	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	52,457	1,047	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	240686	70	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
District II
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1000 Rio Brazos, Aztec, NM 84710

State of New Mexico
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OIL CONSERVATION DIVISION
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2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 5/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	148,800	1,283	W												
30-015-20894 WDW - 2	D	62,709	1,215	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	64,834	1,064	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	223200	75	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
District II
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District III
1000 Rio Brazos, Aztec, NM 84710

State of New Mexico
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2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 6/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	134,743	1,223	W												
30-015-20894 WDW - 2	D	62,743	1,247	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	55,543	1,031	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	274629	98	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos, Aztec, NM 84710

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South Saint Francis Drive
Santa Fe, NM 87505
OPERATOR'S MONTHLY REPORT

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2 Operator NAVAJO REFINERY CO.	3 OGRID: 15694	7/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210		6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	139,234	1,219	W												
30-015-20894 WDW - 2	D	60,583	1,224	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	73,337	1,045	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	272091	163	W												

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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2 Operator NAVAJO REFINERY CO.	3 OGRID: 15694	8/2019
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		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	129,669	1,099	W												
30-015-20894 WDW - 2	D	54,206	1,160	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	81,840	1,062	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	312480	115	W												

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	126,514	1,133	W												
30-015-20894 WDW - 2	D	48,343	1,137	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	51,429	993	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	246857	101	W												

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	125,417	1,117	W												
30-015-20894 WDW - 2	D	46,766	1,142	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	69,086	1,033	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	247,646	100	W												

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		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	134,743	1,246	W												
30-015-20894 WDW - 2	D	45,257	1,227	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	49,371	1,052	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	231,429	100	W												

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	INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	123,291	1,117	W												
30-015-20894 WDW - 2	D	38,263	1,207	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	53,143	1,097	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	268,903	109	W												

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

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ATTACHMENT B

Maximum and Average Injection Pressures

2019 FIRST QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											**Previous Quar**	43,261,695
Jan-19	1,272	248	301	80	576	734	219	263,589	319,920	85,029	**263,589**	43,525,284
Feb-19	1,270	196	293	97	364	576	170	188,160	281,280	103,097	**188,160**	43,713,444
Mar-19	1,184	125	150	106	456	701	323	132,857	159,429	112,663	**132,857**	43,846,301
Monthly Avg	1,242	190								**TOTAL**	584,606	
30-015-20894 WDW-2											**Previous Quar**	27,836,942
Jan-19	1,262	71	94	8	390	543	230	75,463	99,909	8,503	**75,463**	27,912,405
Feb-19	1,252	64	81	29	410	588	284	61,440	77,760	27,840	**61,440**	27,973,845
Mar-19	1,157	50	77	26	432	659	304	53,143	81,840	27,634	**53,143**	28,026,988
Monthly Avg	1,224	62								**TOTAL**	190,046	
30-015-26575 WDW-3											**Previous Quar**	19,438,780
Jan-19	1,177	87	144	0	741	938	598	92,469	153,051	0	**92,469**	19,531,249
Feb-19	1,116	69	109	0	700	930	561	66,240	104,640	0	**66,240**	19,597,489
Mar-19	1,064	56	86	25	659	839	592	59,520	91,406	26,571	**59,520**	19,657,009
Monthly Avg	1,119	71								**TOTAL**	218,229	
30-015-44677 WDW-4											**Previous Quar**	0
Jan-19	58	422	683	178	152	227	107	202,560	327,840	72,960	**202,560**	202,560
Feb-19	50	238	729	82	159	226	111	228,480	699,840	78,720	**228,480**	431,040
Mar-19	80	263	351	192	167	253	96	279,531	373,063	204,069	**279,531**	710,571
Monthly Avg	63	308								**TOTAL**	710,571	

	Total BBLS	Beginning Volume	Ending Volume
WDW1	584,606	43,261,695	43,846,301
WDW2	190,046	27,836,942	28,026,988
WDW3	218,229	19,438,780	19,657,009
WDW4	710,571	0	710,571
	1,703,452	90,537,417	92,240,869

	Q1 Disposal bbls	Max Flow gpm
WDW-1	584,606	301
WDW-2	190,046	94
WDW-3	218,229	144
WDW-4	710,571	729

2019 SECOND QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											**Previous Quar**	43,846,301
Apr-19	1,240	135	148	107	540	726	404	138,857	152,229	110,057	**138,857**	43,985,158
May-19	1,283	140	149	123	587	729	459	148,800	158,366	130,731	**148,800**	44,133,958
Jun-19	1,223	131	146	100	397	518	193	134,743	150,171	102,857	**134,743**	44,268,701
Monthly Avg	1,249	135								**TOTAL**	422,400	
30-015-20894 WDW-2											**Previous Quar**	28,026,988
Apr-19	1,141	47	76	0	510	661	282	48,343	78,171	0	**48,343**	28,075,331
May-19	1,215	59	78	34	463	629	309	62,709	82,903	36,137	**62,709**	28,138,040
Jun-19	1,247	61	78	40	372	418	300	62,743	80,229	41,143	**62,743**	28,200,783
Monthly Avg	1,201	56								**TOTAL**	173,795	
30-015-26575 WDW-3											**Previous Quar**	19,657,009
Apr-19	1,047	51	117	9	653	750	549	52,457	120,343	9,257	**52,457**	19,709,466
May-19	1,064	61	111	10	541	652	387	64,834	117,977	10,629	**64,834**	19,774,300
Jun-19	1,031	54	111	1	397	515	300	55,543	114,171	1,029	**55,543**	19,829,843
Monthly Avg	1,047	55								**TOTAL**	172,834	
30-015-44677 WDW-4											**Previous Quar**	710,571
Apr-19	70	234	309	146	184	243	126	240,686	317,829	150,171	**240,686**	951,257
May-19	75	210	317	154	167	239	101	223,200	336,926	163,680	**223,200**	1,174,457
Jun-19	98	267	296	190	172	254	100	274,629	304,457	195,429	**274,629**	1,449,086
Monthly Avg	81	237								**TOTAL**	738,515	

	Q2 Disposal bbls	Max Flow gpm
WDW-1	422,400	148
WDW-2	173,795	77
WDW-3	172,834	113
WDW-4	738,515	307

	Total BBLS	Beginning Volume	Ending Volume
WDW1	422,400	43,846,301	44,268,701
WDW2	173,795	28,026,988	28,200,783
WDW3	172,834	19,657,009	19,829,843
WDW4	738,515	710,571	1,449,086
	1,507,544	92,240,869	

2019 THIRD QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											**Previous Quar**	44,268,701
Jul-19	1,219	131	147	113	438	606	271	139,234	156,240	120,103	**139,234**	44,407,935
Aug-19	1,099	122	151	95	273	487	104	129,669	160,491	100,971	**129,669**	44,537,604
Sep-19	1,133	123	144	105	397	518	193	126,514	148,114	108,000	**126,514**	44,664,118
Monthly Avg	1,150	125								**TOTAL**	395,417	
30-015-20894 WDW-2											**Previous Quar**	28,200,783
Jul-19	1,224	57	69	0	397	501	325	60,583	73,337	0	**60,583**	28,261,366
Aug-19	1,160	51	77	23	631	1,040	360	54,206	81,840	24,446	**54,206**	28,315,572
Sep-19	1,137	47	63	32	372	418	300	48,343	64,800	32,914	**48,343**	28,363,915
Monthly Avg	1,174	52								**TOTAL**	163,132	
30-015-26575 WDW-3											**Previous Quar**	19,829,843
Jul-19	1,045	69	106	40	383	555	250	73,337	112,663	42,514	**73,337**	19,903,180
Aug-19	1,062	77	109	0	394	593	218	81,840	115,851	0	**81,840**	19,985,020
Sep-19	993	50	112	5	397	515	300	51,429	115,200	5,143	**51,429**	20,036,449
Monthly Avg	1,033	65								**TOTAL**	206,606	
30-015-44677 WDW-4											**Previous Quar**	1,449,086
Jul-19	102	256	317	109	163	237	90	272,091	336,926	115,851	**272,091**	1,721,177
Aug-19	115	294	344	164	178	248	102	312,480	365,623	174,309	**312,480**	2,033,657
Sep-19	101	240	326	177	172	254	100	246,857	335,314	182,057	**246,857**	2,280,514
Monthly Avg	106	263								**TOTAL**	831,428	

	Q3 Disposal bbls	Max Flow gpm
WDW-1	395,417	147
WDW-2	163,132	70
WDW-3	206,606	109
WDW-4	831,428	329

	Total BBLS	Beginning Volume	Ending Volume
WDW1	395,417	44,268,701	44,664,118
WDW2	163,132	28,200,783	28,363,915
WDW3	206,606	19,829,843	20,036,449
WDW4	831,428	1,449,086	2,280,514
	1,596,583	93,748,413	

2019 FOURTH QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											**Previous Quar**	44,664,118
Oct-19	1,117	118	135	109	472	638	342	125,417	143,486	115,851	**125,417**	44,789,535
Nov-19	1,246	131	147	118	538	700	352	134,743	151,200	121,371	**134,743**	44,924,278
Dec-19	1,117	116	146	102	535	794	338	123,291	155,177	108,411	**123,291**	45,047,569
Monthly Avg	1,160	122								**TOTAL**	383,451	
30-015-20894 WDW-2											**Previous Quar**	28,363,915
Oct-19	1,142	44	78	24	510	766	342	46,766	82,903	25,509	**46,766**	28,410,681
Nov-19	1,227	44	83	4	581	805	380	45,257	85,371	4,114	**45,257**	28,455,938
Dec-19	1,207	36	48	23	511	693	388	38,263	51,017	24,446	**38,263**	28,494,201
Monthly Avg	1,192	41								**TOTAL**	130,286	
30-015-26575 WDW-3											**Previous Quar**	20,036,449
Oct-19	1,033	64	97	6	356	615	210	69,086	103,097	6,377	**69,086**	20,105,535
Nov-19	1,052	48	118	2	530	693	416	49,371	121,371	2,057	**49,371**	20,154,906
Dec-19	1,097	50	92	9	570	713	416	53,143	97,783	9,566	**53,143**	20,208,049
Monthly Avg	1,061	54								**TOTAL**	171,600	
30-015-44677 WDW-4											**Previous Quar**	2,280,514
Oct-19	100	233	318	100	126	177	92	247,646	337,989	106,286	**247,646**	2,528,160
Nov-19	100	225	294	135	177	248	119	231,429	302,400	138,857	**231,429**	2,759,589
Dec-19	109	253	323	182	162	246	105	268,903	343,303	193,440	**268,903**	3,028,492
Monthly Avg	103	237								**TOTAL**	747,978	

	Total BBLS	Beginning Volume	Ending Volume
WDW1	383,451	44,664,118	45,047,569
WDW2	130,286	28,363,915	28,494,201
WDW3	171,600	20,036,449	20,208,049
WDW4	747,978	2,280,514	3,028,492

	Q4 Disposal bbls	Max Flow gpm
WDW-1	383,451	143
WDW-2	130,286	70
WDW-3	171,600	102
WDW-4	747,978	312

C-141's

03/26/2019

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

Incident ID	
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party: HollyFrontier Navajo Refining LLC	OGRID: 15694
Contact Name: Randy Dade	Contact Telephone: 575-746-5281
Contact email: Lewis.Dade@hollyfrontier.com	Incident # *(assigned by OCD)*
Contact mailing address: 501 E Main Street, Artesia, NM 88210	

Location of Release Source

Latitude: 32.50'38.92" Longitude: 104.23'32.79"
(NAD 83 in decimal degrees to 5 decimal places)

Site Name: Tank 106	Site Type: Bermed Storage Tank Area
Date Release Discovered: 03/26/2019	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
	9	17S	26E	EDDY

Surface Owner: ☐ State ☐ Federal ☐ Tribal ☒ Private (*Name: HollyFrontier Corp*_____)

Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

☐ Crude Oil	Volume Released (bbls)	Volume Recovered (bbls)
☒ SOUR WATER/OIL	Volume Released (bbls): < 50 bblS	Volume Recovered (bbls): > 40 bblS
	Is the concentration of dissolved chloride in the produced water >10,000 mg/l?	☐ Yes ☐ No
☐ Condensate	Volume Released (bbls)	Volume Recovered (bbls)
☐ Natural Gas	Volume Released (Mcf)	Volume Recovered (Mcf)
☐ Other (describe)	Volume/Weight Released (provide units)	Volume/Weight Recovered (provide units)

Cause of Release: Release was caused due to local guage and transmitter malfunction. When release was discovered, level in tank was started to be brought down, vacuum truck picked up free liquid. Impacted soil was picked up and put in Hard Top RollOffs.

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? Release was more than 25 barrels

If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?
Notice was given by Randy Dade. Carl Chaves was notified by phone on 3/26/2019 at 1:00 pm.

Initial Response

The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury

☒ The source of the release has been stopped.

☒ The impacted area has been secured to protect human health and the environment.

☒ Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices.

☒ All free liquids and recoverable materials have been removed and managed appropriately.

If all the actions described above have not been undertaken, explain why:

Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Lewis R Dade Title: Environmental Specialist

Signature: Lewis R Dade Date: 3/27/2019

email: Lewis.Dade@hollyfrontier.com Telephone: 575-746-5281

OCD Only

Received by: _____ Date: _____

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Site Assessment/Characterization

This information must be provided to the appropriate district office no later than 90 days after the release discovery date.

What is the shallowest depth to groundwater beneath the area affected by the release?	_____ (ft bgs)
Did this release impact groundwater or surface water?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse?	☐ Yes ☒ No
Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church?	☐ Yes ☒ No
Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes?	☐ Yes ☒ No
Are the lateral extents of the release within 1000 feet of any other fresh water well or spring?	☐ Yes ☒ No
Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a wetland?	☐ Yes ☒ No
Are the lateral extents of the release overlying a subsurface mine?	☐ Yes ☒ No
Are the lateral extents of the release overlying an unstable area such as karst geology?	☐ Yes ☒ No
Are the lateral extents of the release within a 100-year floodplain?	☐ Yes ☒ No
Did the release impact areas **not** on an exploration, development, production, or storage site?	☐ Yes ☒ No

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

Characterization Report Checklist: ***Each of the following items must be included in the report.***

- ☐ Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
- ☐ Field data
- ☐ Data table of soil contaminant concentration data
- ☐ Depth to water determination
- ☐ Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
- ☐ Boring or excavation logs
- ☐ Photographs including date and GIS information
- ☐ Topographic/Aerial maps
- ☐ Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Lewis.Dade_ Title: Environmental Specialist___

Signature: Lewis R Dade Date: 3/27/2019

email: Lewis.Dade@hollyfrontier.com Telephone: 575-746-5281

OCD Only

Received by: _____ Date: _____

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Remediation Plan

Remediation Plan Checklist: ***Each of the following items must be included in the plan.***

- ☐ Detailed description of proposed remediation technique
- ☐ Scaled sitemap with GPS coordinates showing delineation points
- ☐ Estimated volume of material to be remediated
- ☐ Closure criteria is to Table 1 specifications subject to 19.15.29.12(C)(4) NMAC
- ☐ Proposed schedule for remediation (note if remediation plan timeline is more than 90 days OCD approval is required)

Deferral Requests Only: ***Each of the following items must be confirmed as part of any request for deferral of remediation.***

☐ Contamination must be in areas immediately under or around production equipment where remediation could cause a major facility deconstruction.

☐ Extents of contamination must be fully delineated.

☐ Contamination does not cause an imminent risk to human health, the environment, or groundwater.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

email: _____ Telephone: _____

OCD Only

Received by: _____ Date: _____

☐ Approved ☐ Approved with Attached Conditions of Approval ☐ Denied ☐ Deferral Approved

Signature: _____ Date: _____

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Closure

The responsible party must attach information demonstrating they have complied with all applicable closure requirements and any conditions or directives of the OCD. This demonstration should be in the form of a comprehensive report (electronic submittals in .pdf format are preferred) including a scaled site map, sampling diagrams, relevant field notes, photographs of any excavation prior to backfilling, laboratory data including chain of custody documents of final sampling, and a narrative of the remedial activities. Refer to 19.15.29.12 NMAC.

Closure Report Attachment Checklist: ***Each of the following items must be included in the closure report.***

☐ A scaled site and sampling diagram as described in 19.15.29.11 NMAC

☐ Photographs of the remediated site prior to backfill or photos of the liner integrity if applicable (Note: appropriate OCD District office must be notified 2 days prior to liner inspection)

☐ Laboratory analyses of final sampling (Note: appropriate ODC District office must be notified 2 days prior to final sampling)

☐ Description of remediation activities

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations. The responsible party acknowledges they must substantially restore, reclaim, and re-vegetate the impacted surface area to the conditions that existed prior to the release or their final land use in accordance with 19.15.29.13 NMAC including notification to the OCD when reclamation and re-vegetation are complete.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

email: _____ Telephone: _____

OCD Only

Received by: _____ Date: _____

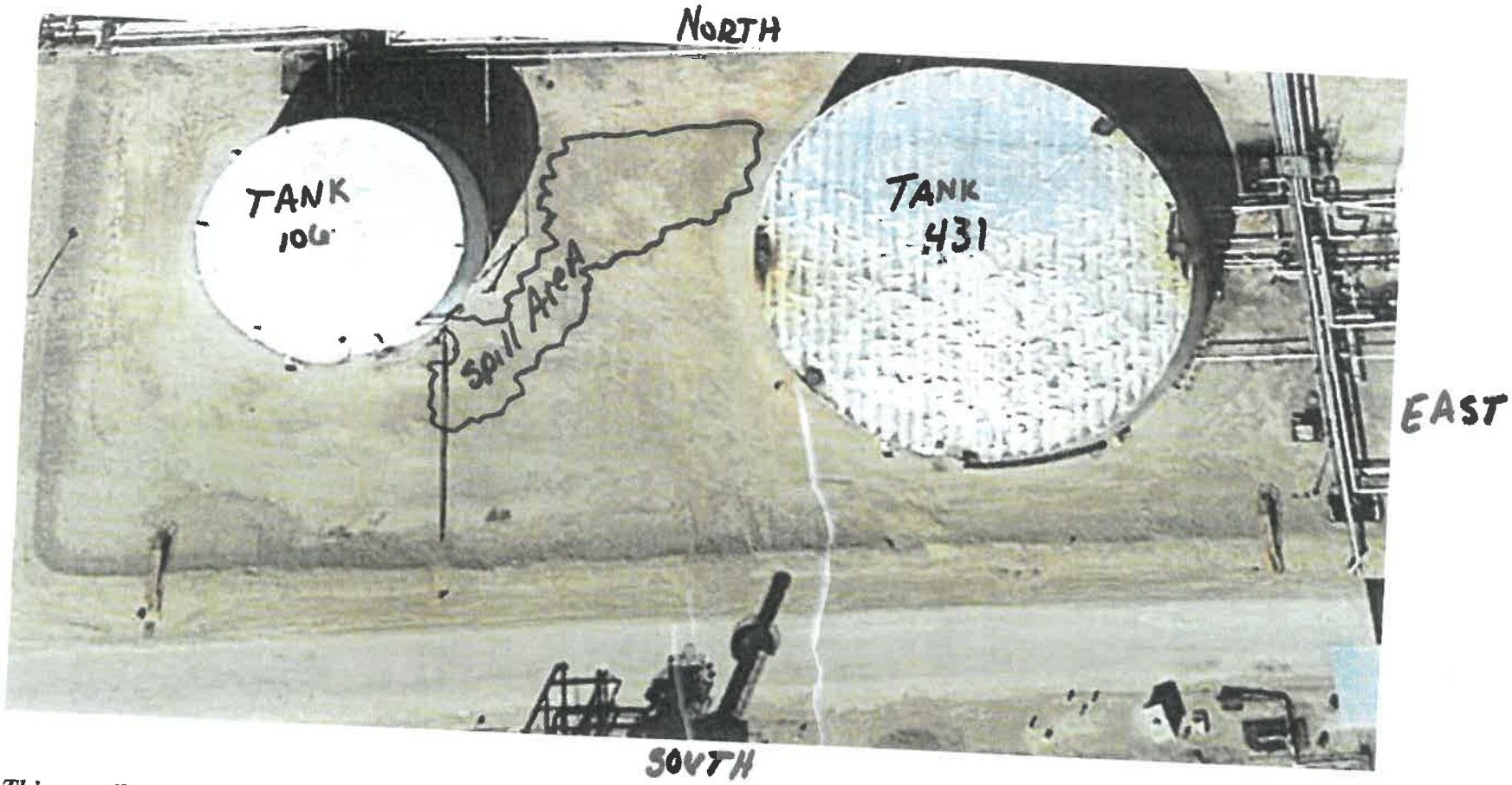
Closure approval by the OCD does not relieve the responsible party of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to groundwater, surface water, human health, or the environment nor does not relieve the responsible party of compliance with any other federal, state, or local laws and/or regulations.

Closure Approved by: _____ Date: _____

Printed Name: _____ Title: _____

Dade, Lewis (Randy)

From: Dade, Lewis (Randy)
Sent: Thursday, March 28, 2019 9:17 AM
To: Dade, Lewis (Randy)
Subject: Tank 106 Release 3/26/2019



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NORTH
SOUTH
EAST
WEST

05/28/2019

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

Incident ID	
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party: HollyFrontier Navajo Refining LLC	OGRID: 15694
Contact Name: Randy Dade	Contact Telephone: 575-746-5281
Contact email: Lewis.Dade@hollyfrontier.com	Incident # *(assigned by OCD)*
Contact mailing address: 501 E. Main St. Artesia, NM 88210	

Location of Release Source

Latitude 32.8520059 N_____ Longitude 104.39487032W_____
(NAD 83 in decimal degrees to 5 decimal places)

Site Name: Navajo Refinery	Site Type: Petroleum Refinery
Date Release Discovered: 5/28/2019	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
	9	17S	28E	EDDY

Surface Owner: ☐ State ☐ Federal ☐ Tribal ☒ Private (*Name: HollyFrontier Navajo Refining LLC*_____)

Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

☐ Crude Oil	Volume Released (bbls)	Volume Recovered (bbls)
☐ Produced Water	Volume Released (bbls)	Volume Recovered (bbls)
	Is the concentration of dissolved chloride in the produced water >10,000 mg/l?	☐ Yes ☐ No
☐ Condensate	Volume Released (bbls)	Volume Recovered (bbls)
☐ Natural Gas	Volume Released (Mcf)	Volume Recovered (Mcf)
☒ Other (describe): Non-hazardous cooling tower blowdown to city POTW	Volume/Weight Released (provide units): Greater than 25 bbls	Volume/Weight Recovered (provide units): None

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Cause of Release: Plastic Tubing line to sample station broke releasing water on ground. Water was shut off and tubing line repaired.

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? Release volume is estimated to be greater than 25 bbls.

If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?
Notice was made by Randy Dade to OCD Santa Fe, Carl Chavez at 3:40 pm by phone.

Initial Response

The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury

☒ The source of the release has been stopped.

☒ The impacted area has been secured to protect human health and the environment.

☒ Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices.

☐ All free liquids and recoverable materials have been removed and managed appropriately.

If all the actions described above have not been undertaken, explain why: Released material was in an area inside of plant but out of normal traffic area. Soil is compacted dirt and caliche with no chance of impacting any waterways or community entities. There was no chance to recover any free liquids.

Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Lewis R. Dade Title: Environmental Specialist

Signature: Lewis R Dade Date: 5/30/2019

email: Lewis.Dade@hollyfrontier.com Telephone: 575-746-5281

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

OCD Only

Received by: _____ Date: _____

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Site Assessment/Characterization

This information must be provided to the appropriate district office no later than 90 days after the release discovery date.

What is the shallowest depth to groundwater beneath the area affected by the release?	_____ (ft bgs)
Did this release impact groundwater or surface water?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a continuously flowing watercourse or any other significant watercourse?	☐ Yes ☒ No
Are the lateral extents of the release within 200 feet of any lakebed, sinkhole, or playa lake (measured from the ordinary high-water mark)?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of an occupied permanent residence, school, hospital, institution, or church?	☐ Yes ☒ No
Are the lateral extents of the release within 500 horizontal feet of a spring or a private domestic fresh water well used by less than five households for domestic or stock watering purposes?	☐ Yes ☒ No
Are the lateral extents of the release within 1000 feet of any other fresh water well or spring?	☐ Yes ☒ No
Are the lateral extents of the release within incorporated municipal boundaries or within a defined municipal fresh water well field?	☐ Yes ☒ No
Are the lateral extents of the release within 300 feet of a wetland?	☐ Yes ☒ No
Are the lateral extents of the release overlying a subsurface mine?	☐ Yes ☒ No
Are the lateral extents of the release overlying an unstable area such as karst geology?	☐ Yes ☒ No
Are the lateral extents of the release within a 100-year floodplain?	☐ Yes ☒ No
Did the release impact areas **not** on an exploration, development, production, or storage site?	☐ Yes ☒ No

Attach a comprehensive report (electronic submittals in .pdf format are preferred) demonstrating the lateral and vertical extents of soil contamination associated with the release have been determined. Refer to 19.15.29.11 NMAC for specifics.

Characterization Report Checklist: ***Each of the following items must be included in the report.***

- ☐ Scaled site map showing impacted area, surface features, subsurface features, delineation points, and monitoring wells.
- ☐ Field data
- ☐ Data table of soil contaminant concentration data
- ☐ Depth to water determination
- ☐ Determination of water sources and significant watercourses within ½-mile of the lateral extents of the release
- ☐ Boring or excavation logs
- ☐ Photographs including date and GIS information
- ☐ Topographic/Aerial maps
- ☐ Laboratory data including chain of custody

If the site characterization report does not include completed efforts at remediation of the release, the report must include a proposed remediation plan. That plan must include the estimated volume of material to be remediated, the proposed remediation technique, proposed sampling plan and methods, anticipated timelines for beginning and completing the remediation. The closure criteria for a release are contained in Table 1 of 19.15.29.12 NMAC, however, use of the table is modified by site- and release-specific parameters.

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Lewis R. Dade Title: Environmental Specialist

Signature: Date: 5/30/2019

email: Lewis.Dade@hollyfrontier.com Telephone: 575-746-5281

OCD Only

Received by: Date:

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Remediation Plan

Remediation Plan Checklist: ***Each of the following items must be included in the plan.***

- ☐ Detailed description of proposed remediation technique
- ☐ Scaled sitemap with GPS coordinates showing delineation points
- ☐ Estimated volume of material to be remediated
- ☐ Closure criteria is to Table 1 specifications subject to 19.15.29.12(C)(4) NMAC
- ☐ Proposed schedule for remediation (note if remediation plan timeline is more than 90 days OCD approval is required)

Deferral Requests Only: ***Each of the following items must be confirmed as part of any request for deferral of remediation.***

☐ Contamination must be in areas immediately under or around production equipment where remediation could cause a major facility deconstruction.

☐ Extents of contamination must be fully delineated.

☐ Contamination does not cause an imminent risk to human health, the environment, or groundwater.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Lewis R. Dade Title: Environmental Specialist

Signature: _____ Date: 5/30/2019

email: Lewis.Dade@hollyfrontier.com Telephone: _____

OCD Only

Received by: _____ Date: _____

☐ Approved ☐ Approved with Attached Conditions of Approval ☐ Denied ☐ Deferral Approved

Signature: _____ Date: _____

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Closure

The responsible party must attach information demonstrating they have complied with all applicable closure requirements and any conditions or directives of the OCD. This demonstration should be in the form of a comprehensive report (electronic submittals in .pdf format are preferred) including a scaled site map, sampling diagrams, relevant field notes, photographs of any excavation prior to backfilling, laboratory data including chain of custody documents of final sampling, and a narrative of the remedial activities. Refer to 19.15.29.12 NMAC.

Closure Report Attachment Checklist: ***Each of the following items must be included in the closure report.***

☐ A scaled site and sampling diagram as described in 19.15.29.11 NMAC

☐ Photographs of the remediated site prior to backfill or photos of the liner integrity if applicable (Note: appropriate OCD District office must be notified 2 days prior to liner inspection)

☐ Laboratory analyses of final sampling (Note: appropriate ODC District office must be notified 2 days prior to final sampling)

☐ Description of remediation activities

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations. The responsible party acknowledges they must substantially restore, reclaim, and re-vegetate the impacted surface area to the conditions that existed prior to the release or their final land use in accordance with 19.15.29.13 NMAC including notification to the OCD when reclamation and re-vegetation are complete.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

email: _____ Telephone: _____

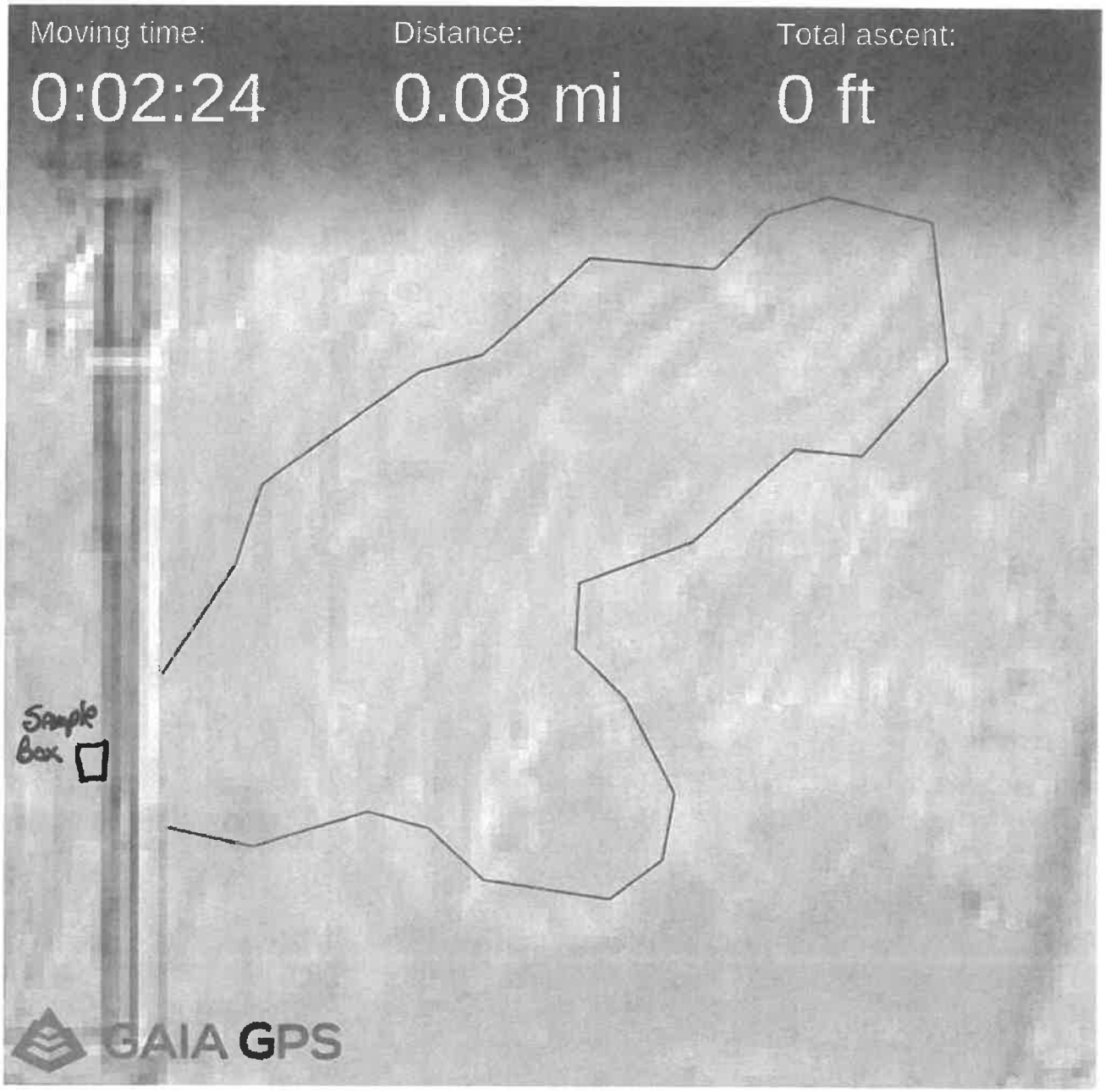
OCD Only

Received by: _____ Date: _____

Closure approval by the OCD does not relieve the responsible party of liability should their operations have failed to adequately investigate and remediate contamination that poses a threat to groundwater, surface water, human health, or the environment nor does not relieve the responsible party of compliance with any other federal, state, or local laws and/or regulations.

Closure Approved by: _____ Date: _____

Printed Name: _____ Title: _____


Moving time:
0:02:24
Distance:
0.08 mi
Total ascent:
0 ft
Sample Box
GAIA GPS

Untitled Map
Write a description for your map.
Legend
Feature 1
Google Earth
©2018 Google
N
100 ft

09/03/2019

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources Department

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-141
Revised August 24, 2018
Submit to appropriate OCD District office

Incident ID	
District RP	
Facility ID	
Application ID	

Release Notification

Responsible Party

Responsible Party: HollyFrontier Navajo Refining LLC	OGRID: 15694
Contact Name: Randy Dade	Contact Telephone: 575-746-5281
Contact email: Lewis.Dade@hollyfrontier.com	Incident # *(assigned by OCD)*
Contact mailing address: 501 E. Main St. Artesia, NM 88210	

Location of Release Source

Latitude 32,51'7.21" N_____ Longitude 104,23'41.39"W_____
(NAD 83 in decimal degrees to 5 decimal places)

Site Name: HollyFrontier Navajo Refining LLC	Site Type: Refinery
Date Release Discovered: 09/03/2019	API# *(if applicable)*

Unit Letter	Section	Township	Range	County
	9	17S	28E	EDDY

Surface Owner: ☐ State ☐ Federal ☐ Tribal ☒ Private (*Name: HollyFrontier Navajo Refining LLC*)

Nature and Volume of Release

Material(s) Released (Select all that apply and attach calculations or specific justification for the volumes provided below)

☐ Crude Oil	Volume Released (bbls):	Volume Recovered (bbls):
☐ Produced Water	Volume Released (bbls)	Volume Recovered (bbls)
	Is the concentration of dissolved chloride in the produced water >10,000 mg/l?	☐ Yes ☐ No
☐ Condensate	Volume Released (bbls)	Volume Recovered (bbls)
☐ Natural Gas	Volume Released (Mcf)	Volume Recovered (Mcf)
☒ Other (describe) Non-Hazardous Cooling Tower blowdown to city POTW	Volume/Weight Released (provide units) Greater than 25 BBLs	Volume/Weight Recovered (provide units) No recovered fluid

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

Cause of Release: Tubing line (½ inch) on Sample Station from Cooling Tower Blowdown line to City failed. Fluid sprayed to the East onto the ground. Water was shut off and tubing line repaired.

Was this a major release as defined by 19.15.29.7(A) NMAC? ☒ Yes ☐ No	If YES, for what reason(s) does the responsible party consider this a major release? Release volume is estimated to be greater than 25 bbls.

If YES, was immediate notice given to the OCD? By whom? To whom? When and by what means (phone, email, etc)?
Notice was made by Randy Dade to OCD Santa Fe, Carl Chavez at 8:30 am, 9/4/2019 pm by phone.

Initial Response

The responsible party must undertake the following actions immediately unless they could create a safety hazard that would result in injury

☒ The source of the release has been stopped.

☒ The impacted area has been secured to protect human health and the environment. Release was entirely contained in a secured and active operating facility

☒ Released materials have been contained via the use of berms or dikes, absorbent pads, or other containment devices.

☐ All free liquids and recoverable materials have been removed and managed appropriately.

If all the actions described above have not been undertaken, explain why:

Per 19.15.29.8 B. (4) NMAC the responsible party may commence remediation immediately after discovery of a release. If remediation has begun, please attach a narrative of actions to date. If remedial efforts have been successfully completed or if the release occurred within a lined containment area (see 19.15.29.11(A)(5)(a) NMAC), please attach all information needed for closure evaluation.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to OCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the OCD does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to groundwater, surface water, human health or the environment. In addition, OCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Printed Name: Lewis Dade Title: Environmental Specialist

Signature: Lewis R Dade Date: 9/4/2019

email: Lewis.Dade@hollyfrontier.com Telephone: 575-746-5281

State of New Mexico
Oil Conservation Division

Incident ID	
District RP	
Facility ID	
Application ID	

OCD Only

Received by: _____ Date: _____

2019 FIRST QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Maximum Pressure (psig)	Minimum Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1													**Previous Quarter**	43,261,695
Jan-19	1,272	1,400	897	248	301	80	576	734	219	263,589	319,920	85,029	**263,589**	43,525,284
Feb-19	1,270	1,400	885	196	293	97	384	576	170	188,160	281,280	103,097	**188,160**	43,713,444
Mar-19	1,184	1,356	1,100	125	150	106	456	701	323	132,857	159,429	112,663	**132,857**	43,846,301
Monthly Avg	1,242			190								**TOTAL**	584,606	
30-015-20884 WDW-2													**Previous Quarter**	27,836,942
Jan-19	1,262	1,400	932	71	94	8	390	543	230	75,463	99,909	8,503	**75,463**	27,912,405
Feb-19	1,252	1,381	1,057	64	81	29	410	588	284	61,440	77,760	27,840	**61,440**	27,973,845
Mar-19	1,157	1,300	1,044	50	77	26	432	659	304	53,143	81,840	27,634	**53,143**	28,026,988
Monthly Avg	1,224			62								**TOTAL**	190,046	
30-015-26575 WDW-3													**Previous Quarter**	19,438,760
Jan-19	1,177	1,400	906	67	144	0	741	938	598	92,469	153,051	0	**92,469**	19,531,249
Feb-19	1,116	1,258	899	69	109	0	700	930	561	66,240	104,640	0	**66,240**	19,597,489
Mar-19	1,064	1,151	999	56	86	25	659	839	592	59,520	91,406	26,571	**59,520**	19,657,009
Monthly Avg	1,119			71								**TOTAL**	218,229	
30-015-44677 WDW-4													**Previous Quarter**	0
Jan-19	58	89	37	422	683	178	162	227	107	202,560	327,840	72,960	**202,560**	202,560
Feb-19	50	98	36	238	729	82	159	226	111	228,480	699,840	78,720	**228,480**	431,040
Mar-19	80	337	51	263	351	192	167	253	96	279,531	373,083	204,069	**279,531**	710,571
Monthly Avg	63			308								**TOTAL**	710,571	

	Total BBLS	Beginning Volume	Ending Volume
WDW1	584,606	43,261,695	43,846,301
WDW2	190,046	27,836,942	28,026,988
WDW3	218,229	19,438,760	19,657,009
WDW4	710,571	0	710,571
	1,703,452	90,537,417	92,240,869

2019 SECOND QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											**Previous Quar**	43,846,301
Apr-19	1,240	135	148	107	540	726	404	138,857	152,229	110,057	138,857	43,985,158
May-19	1,283	140	149	123	587	729	459	148,800	158,366	130,731	148,800	44,133,958
Jun-19	1,223	131	146	100	397	618	193	134,743	150,171	102,857	134,743	44,268,701
Monthly Avg	1,249	135								TOTAL	422,400	
30-015-20894 WDW-2											**Previous Quar**	28,026,988
Apr-19	1,141	47	76	0	510	661	282	48,343	78,171	0	48,343	28,075,331
May-19	1,215	59	78	34	463	629	309	62,709	82,903	36,137	62,709	28,138,040
Jun-19	1,247	61	78	40	372	418	300	62,743	80,229	41,143	62,743	28,200,783
Monthly Avg	1,201	58								TOTAL	173,795	
30-015-26575 WDW-3											**Previous Quar**	19,657,009
Apr-19	1,047	51	117	9	653	750	549	52,457	120,343	9,257	52,457	19,709,466
May-19	1,064	61	111	10	541	652	387	64,834	117,977	10,629	64,834	19,774,300
Jun-19	1,031	54	111	1	397	515	300	55,543	114,171	1,029	55,543	19,829,843
Monthly Avg	1,047	55								TOTAL	172,834	
30-015-44677 WDW-4											**Previous Quar**	710,571
Apr-19	70	234	309	146	184	243	126	240,686	317,829	150,171	240,686	951,257
May-19	75	210	317	154	167	239	101	223,200	336,926	163,680	223,200	1,174,457
Jun-19	98	267	296	190	172	254	100	274,629	304,457	195,429	274,629	1,449,086
Monthly Avg	81	237								TOTAL	738,515	

	Total BBLS	Beginning Volume	Ending Volume
WDW1	422,400	43,846,301	44,268,701
WDW2	173,795	28,026,988	28,200,783
WDW3	172,834	19,657,009	19,829,843
WDW4	738,515	710,571	1,449,086
	1,507,544	92,240,869	

	Q2 Disposal bbls	Max Flow gpm
WDW-1	422,400	148
WDW-2	173,795	77
WDW-3	172,834	113
WDW-4	738,515	307

2019 THIRD QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											Previous Quar	44,268,701
Jul-19	1,219	131	147	113	438	606	271	139,234	156,240	120,103	139,234	44,407,935
Aug-19	1,099	122	151	95	273	487	104	129,669	160,491	100,971	129,669	44,537,604
Sep-19	1,133	123	144	105	397	618	193	126,514	148,114	108,000	126,514	44,664,118
Monthly Avg	1,150	125								TOTAL	395,417	
30-015-20894 WDW-2											Previous Quar	28,200,783
Jul-19	1,224	57	69	0	397	501	325	60,583	73,337	0	60,583	28,261,366
Aug-19	1,160	51	77	23	631	1,040	360	54,206	81,840	24,446	54,206	28,315,572
Sep-19	1,137	47	63	32	372	418	300	48,343	64,800	32,914	48,343	28,363,915
Monthly Avg	1,174	52								TOTAL	163,132	
30-015-28575 WDW-3											Previous Quar	19,829,843
Jul-19	1,045	69	106	40	383	555	250	73,337	112,663	42,514	73,337	19,903,180
Aug-19	1,062	77	109	0	394	593	218	81,840	115,851	0	81,840	19,985,020
Sep-19	993	50	112	5	397	515	300	51,429	115,200	5,143	51,429	20,036,449
Monthly Avg	1,033	65								TOTAL	206,606	
30-015-44877 WDW-4											Previous Quar	1,449,086
Jul-19	102	256	317	109	163	237	90	272,091	336,926	115,851	272,091	1,721,177
Aug-19	115	294	344	164	178	248	102	312,480	365,623	174,309	312,480	2,033,657
Sep-19	101	240	326	177	172	254	100	246,857	335,314	182,057	246,857	2,280,514
Monthly Avg	106	263								TOTAL	831,428	

	Q3 Disposal bbls	Max Flow gpm
WDW-1	395,417	147
WDW-2	163,132	70
WDW-3	206,606	109
WDW-4	831,428	329

	Total BBLS	Beginning Volume	Ending Volume
WDW1	395,417	44,268,701	44,664,118
WDW2	163,132	28,200,783	28,363,915
WDW3	206,606	19,829,843	20,036,449
WDW4	831,428	1,449,086	2,280,514
	1,596,583	93,748,413	

2019 FOURTH QUARTER MONTHLY INJECTION PRESSURES, RATES, AND VOLUMES

	Average Pressure (psig)	Average Flow (gpm)	Maximum Flow (gpm)	Minimum Flow (gpm)	Average Annular Pressure Av (psig)	Maximum Annular Pressure Mx (psig)	Minimum Annular Pressure Mn (psig)	Average Volume (bpd)	Maximum Volume (bpd)	Minimum Volume (bpd)	Volume (barrels)	TOTAL CUMULATIVE Volume (barrels)
30-015-27592 WDW-1											**Previous Quar**	44,664,118
Oct-19	1,117	118	135	109	472	638	342	125,417	143,486	115,851	**125,417**	44,789,535
Nov-19	1,246	131	147	118	538	700	352	134,743	151,200	121,371	**134,743**	44,924,278
Dec-19	1,117	116	146	102	535	794	338	123,291	155,177	108,411	**123,291**	45,047,569
Monthly Avg	1,160	122								**TOTAL**	383,451	
30-015-20994 WDW-2											**Previous Quar**	28,363,915
Oct-19	1,142	44	78	24	510	766	342	46,766	82,903	25,509	**46,766**	28,410,681
Nov-19	1,227	44	83	4	581	805	360	45,257	85,371	4,114	**45,257**	28,455,938
Dec-19	1,207	36	48	23	511	693	368	38,263	51,017	24,446	**38,263**	28,494,201
Monthly Avg	1,192	41								**TOTAL**	130,286	
30-015-25575 WDW-3											**Previous Quar**	20,036,449
Oct-19	1,033	64	97	6	356	615	210	69,086	103,097	6,377	**69,086**	20,105,535
Nov-19	1,052	48	118	2	530	693	416	49,371	121,371	2,057	**49,371**	20,154,906
Dec-19	1,097	50	92	9	570	713	416	53,143	97,783	9,566	**53,143**	20,208,049
Monthly Avg	1,061	54								**TOTAL**	171,600	
30-015-44677 WDW-4											**Previous Quar**	2,280,514
Oct-19	100	233	318	100	128	177	92	247,646	337,989	106,286	**247,646**	2,528,160
Nov-19	100	225	294	135	177	248	119	231,429	302,400	138,857	**231,429**	2,759,589
Dec-19	109	253	323	162	162	246	105	268,903	343,303	193,440	**268,903**	3,028,492
Monthly Avg	103	237								**TOTAL**	747,978	

	Q4 Disposal bbls	Max Flow gpm
WDW-1	383,451	143
WDW-2	130,286	70
WDW-3	171,600	102
WDW-4	747,978	312

	Total BBLS	Beginning Volume	Ending Volume
WDW1	383,451	44,664,118	45,047,569
WDW2	130,286	28,363,915	28,494,201
WDW3	171,600	20,036,449	20,208,049
WDW4	747,978	2,280,514	3,028,492

District I
1625 North French, Hobbs, NM 88241
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos, Aztec, NM 87410

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South Saint Francis Drive
Santa Fe, NM 87505
OPERATOR'S MONTHLY REPORT

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Revised January 22, 2004
Instruction on Reverse Side
1 ☐ Amended Report

2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 1/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	263,589	1,272	W												
30-015-20894 WDW - 2	D	75,463	1,262	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	92,469	1,177	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	202560	58	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

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7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	188,160	1,270	W												
30-015-20894 WDW - 2	D	61,440	1,252	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	66,240	1,116	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	228480	50	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

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7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	INJECTION 9 Volume	INJECTION 10 Pressure	11 CODE 2	PRODUCTION 12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	DISPOSITION OF OIL, GAS, AND WATER 17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	132,857	1,184	W												
30-015-20894 WDW - 2	D	53,143	1,157	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	59,520	1,064	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	279531	80	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	138,857	1,240	W												
30-015-20894 WDW - 2	D	48,343	1,140	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	52,457	1,047	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	240686	70	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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	INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	148,800	1,283	W												
30-015-20894 WDW - 2	D	62,709	1,215	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	64,834	1,064	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	223200	75	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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	INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	134,743	1,223	W												
30-015-20894 WDW - 2	D	62,743	1,247	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	55,543	1,031	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	274629	98	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
District II
811 S. First St., Artesia, NM 88210
District III
1000 Rio Brazos, Aztec, NM 84710

State of New Mexico
Energy, Minerals & Natural Resources Department
OIL CONSERVATION DIVISION
1220 South Saint Francis Drive
Santa Fe, NM 87505
OPERATOR'S MONTHLY REPORT

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1 ☐ Amended Report

2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 7/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	139,234	1,219	W												
30-015-20894 WDW - 2	D	60,583	1,224	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	73,337	1,045	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	272091	163	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

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2 Operator NAVAJO REFINERY CO.	3 OGRID: 15694	8/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210		6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	129,669	1,099	W												
30-015-20894 WDW - 2	D	54,206	1,160	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	81,840	1,062	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	312480	115	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
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5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	126,514	1,133	W												
30-015-20894 WDW - 2	D	48,343	1,137	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	51,429	993	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	246857	101	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
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2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 10/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	INJECTION 9 Volume	INJECTION 10 Pressure	11 CODE 2	PRODUCTION 12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	DISPOSITION OF OIL, GAS, AND WATER 17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	125,417	1,117	W												
30-015-20894 WDW - 2	D	46,766	1,142	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	69,086	1,033	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	247,646	100	W												

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	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
1625 North French, Hobbs, NM 88241
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1000 Rio Brazos, Aztec, NM 87410

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2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 11/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

		INJECTION			PRODUCTION				DISPOSITION OF OIL, GAS, AND WATER							
7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	9 Volume	10 Pressure	11 CODE 2	12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	134,743	1,246	W												
30-015-20894 WDW - 2	D	45,257	1,227	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	49,371	1,052	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	231,429	100	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
24

Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	6 Page 2 of 4

District I
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2 Operator NAVAJO REFINERY CO. | 3 OGRID: 15694 | 12/2019
5 Address: 501 E. MAIN PO BOX 159, ARTESIA, NM. 88210 | 6 Page 1 of 4

7 POOL NO. AND NAME Property No. and Name Well No. & U-L-S-T-R API No.	8 CODE 1	INJECTION 9 Volume	INJECTION 10 Pressure	11 CODE 2	PRODUCTION 12 Barrels of Oil/condensate produced	13 Barrels of water produced	14 MCF Gas Produced	15 Days Produced	16 CODE 3	DISPOSITION OF OIL, GAS, AND WATER 17 Point of Disposition	18 Gas BTU or Oil API Gravity	19 Oil on hand at beginning of month	20 Volume (Bbls/mcf)	21 Transporter Ogrid	22 CODE 4	23 Oil on hand at end of month
96918 NAVAJO PERMO-PENN																
30-015-27592 WDW - 1	D	123,291	1,117	W												
30-015-20894 WDW - 2	D	38,263	1,207	W												
78890 ILLINOIS CAMP; MORROW NORTH																
30-015-26575 WDW - 3	D	53,143	1,097	W												
96101 SWD-DEVONIAN																
30-015-44677 WDW-4	D	268,903	109	W												

I hereby certify that the information contained in this report is true and complete to the best of my knowledge.
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Signature	Printed Name & Title	E-Mail Address	Date	Phone Number
	L. R. DADE ENVIR. SPEC.	Lewis.Dade@hollyfrontier.com	0	575-746-5281

2 Operator	3 OGRID	4 Month/Year	5 Page 2 of 4

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

April 18, 2019

Robert Combs
Navajo Refining Company
P.O. Box 159
Artesia, NM 88211-0159
TEL: (575) 748-3311
FAX:

RE: Quarterly WDW 1 2 3 Inj Well OrderNo.: 1903D14

Dear Robert Combs:

Hall Environmental Analysis Laboratory received 2 sample(s) on 3/27/2019 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

Analytical Report
Lab Order **1903D14**
Date Reported: **4/18/2019**

CLIENT: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well
Lab ID: 1903D14-001 **Matrix:** AQUEOUS

Client Sample ID: WDW-1,2,&3 Effluent
Collection Date: 3/26/2019 8:15:00 AM
Received Date: 3/27/2019 8:40:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8081: PESTICIDES TCLP						Analyst:	**JME**
Chlordane	ND	0.030		mg/L	1	4/16/2019 12:06:41 PM	43999
Surr: Decachlorobiphenyl	26.3	29.4-99.8	S	%Rec	1	4/16/2019 12:06:41 PM	43999
Surr: Tetrachloro-m-xylene	25.0	20.7-100		%Rec	1	4/16/2019 12:06:41 PM	43999
EPA METHOD 8270C TCLP						Analyst:	**JDC**
2-Methylphenol	ND	200		mg/L	1	4/13/2019 10:55:55 PM	44003
3+4-Methylphenol	ND	200		mg/L	1	4/13/2019 10:55:55 PM	44003
2,4-Dinitrotoluene	ND	0.13		mg/L	1	4/13/2019 10:55:55 PM	44003
Hexachlorobenzene	ND	0.13		mg/L	1	4/13/2019 10:55:55 PM	44003
Hexachlorobutadiene	ND	0.50		mg/L	1	4/13/2019 10:55:55 PM	44003
Hexachloroethane	ND	3.0		mg/L	1	4/13/2019 10:55:55 PM	44003
Nitrobenzene	ND	2.0		mg/L	1	4/13/2019 10:55:55 PM	44003
Pentachlorophenol	ND	100		mg/L	1	4/13/2019 10:55:55 PM	44003
Pyridine	ND	5.0		mg/L	1	4/13/2019 10:55:55 PM	44003
2,4,5-Trichlorophenol	ND	400		mg/L	1	4/13/2019 10:55:55 PM	44003
2,4,6-Trichlorophenol	ND	2.0		mg/L	1	4/13/2019 10:55:55 PM	44003
Cresols, Total	ND	200		mg/L	1	4/13/2019 10:55:55 PM	44003
Surr: 2-Fluorophenol	45.0	15-82.5		%Rec	1	4/13/2019 10:55:55 PM	44003
Surr: Phenol-d5	35.3	15-74.2		%Rec	1	4/13/2019 10:55:55 PM	44003
Surr: 2,4,6-Tribromophenol	73.2	18.6-118		%Rec	1	4/13/2019 10:55:55 PM	44003
Surr: Nitrobenzene-d5	67.3	30.4-106		%Rec	1	4/13/2019 10:55:55 PM	44003
Surr: 2-Fluorobiphenyl	48.9	15-104		%Rec	1	4/13/2019 10:55:55 PM	44003
Surr: 4-Terphenyl-d14	51.6	15-133		%Rec	1	4/13/2019 10:55:55 PM	44003
SPECIFIC GRAVITY						Analyst:	**JRR**
Specific Gravity	1.001	0			1	4/3/2019 10:28:00 AM	R58847
EPA METHOD 300.0: ANIONS						Analyst:	**smb**
Fluoride	9.6	0.50	*	mg/L	5	4/1/2019 10:44:34 PM	R58816
Chloride	420	25	*	mg/L	50	4/8/2019 2:18:56 PM	R58998
Bromide	0.94	0.50		mg/L	5	4/1/2019 10:44:34 PM	R58816
Phosphorus, Orthophosphate (As P)	ND	2.5	H	mg/L	5	4/1/2019 10:44:34 PM	R58816
Sulfate	1500	25	*	mg/L	50	4/8/2019 2:18:56 PM	R58998
Nitrate+Nitrite as N	ND	1.0		mg/L	5	4/1/2019 11:09:23 PM	R58816
SM2510B: SPECIFIC CONDUCTANCE						Analyst:	**JRR**
Conductivity	4100	5.0		µmhos/c	1	4/3/2019 1:19:58 PM	R58867
SM2320B: ALKALINITY						Analyst:	**JRR**
Bicarbonate (As CaCO3)	488.6	20.00		mg/L Ca	1	4/3/2019 1:19:58 PM	R58867
Carbonate (As CaCO3)	ND	2.000		mg/L Ca	1	4/3/2019 1:19:58 PM	R58867
Total Alkalinity (as CaCO3)	488.6	20.00		mg/L Ca	1	4/3/2019 1:19:58 PM	R58867

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well
Lab ID: 1903D14-001 **Matrix:** AQUEOUS

Client Sample ID: WDW-1,2,&3 Effluent
Collection Date: 3/26/2019 8:15:00 AM
Received Date: 3/27/2019 8:40:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst:	**CJS**
Total Dissolved Solids	3130	100	*D	mg/L	1	4/3/2019 5:30:00 PM	44042
EPA METHOD 7470: MERCURY						Analyst:	**pmf**
Mercury	ND	0.00020		mg/L	1	4/5/2019 12:09:40 PM	44137
EPA METHOD 6010B: DISSOLVED METALS						Analyst:	**ELS**
Calcium	330	5.0		mg/L	5	4/3/2019 10:55:32 AM	A58849
Magnesium	100	5.0		mg/L	5	4/3/2019 10:55:32 AM	A58849
Potassium	64	5.0		mg/L	5	4/3/2019 10:55:32 AM	A58849
Sodium	360	5.0		mg/L	5	4/3/2019 10:55:32 AM	A58849
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst:	**ELS**
Arsenic	ND	0.020		mg/L	1	4/3/2019 9:09:22 AM	44006
Barium	0.045	0.020		mg/L	1	4/3/2019 9:09:22 AM	44006
Cadmium	ND	0.0020		mg/L	1	4/3/2019 9:09:22 AM	44006
Chromium	ND	0.0060		mg/L	1	4/3/2019 9:09:22 AM	44006
Lead	ND	0.0050		mg/L	1	4/5/2019 10:10:57 AM	44006
Selenium	ND	0.050		mg/L	1	4/3/2019 9:09:22 AM	44006
Silver	ND	0.0050		mg/L	1	4/3/2019 9:09:22 AM	44006
TCLP VOLATILES BY 8260B						Analyst:	**RAA**
Benzene	ND	0.50		mg/L	200	4/3/2019 12:15:00 AM	R58834
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	200	4/3/2019 12:15:00 AM	R58834
2-Butanone	ND	200		mg/L	200	4/3/2019 12:15:00 AM	R58834
Carbon Tetrachloride	ND	0.50		mg/L	200	4/3/2019 12:15:00 AM	R58834
Chloroform	ND	6.0		mg/L	200	4/3/2019 12:15:00 AM	R58834
1,4-Dichlorobenzene	ND	7.5		mg/L	200	4/3/2019 12:15:00 AM	R58834
1,1-Dichloroethene	ND	0.70		mg/L	200	4/3/2019 12:15:00 AM	R58834
Tetrachloroethene (PCE)	ND	0.70		mg/L	200	4/3/2019 12:15:00 AM	R58834
Trichloroethene (TCE)	ND	0.50		mg/L	200	4/3/2019 12:15:00 AM	R58834
Vinyl chloride	ND	0.20		mg/L	200	4/3/2019 12:15:00 AM	R58834
Chlorobenzene	ND	100		mg/L	200	4/3/2019 12:15:00 AM	R58834
Surr: 1,2-Dichloroethane-d4	104	70-130		%Rec	200	4/3/2019 12:15:00 AM	R58834
Surr: 4-Bromofluorobenzene	99.5	70-130		%Rec	200	4/3/2019 12:15:00 AM	R58834
Surr: Dibromofluoromethane	101	70-130		%Rec	200	4/3/2019 12:15:00 AM	R58834
Surr: Toluene-d8	96.7	70-130		%Rec	200	4/3/2019 12:15:00 AM	R58834

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW 1 2 3 Inj Well
Collection Date:
Lab ID: 1903D14-002
Matrix: TRIP BLANK
Received Date: 3/27/2019 8:40:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
TCLP VOLATILES BY 8260B						Analyst: **RAA**	
Benzene	ND	0.50		mg/L	1	4/3/2019 1:27:00 AM	R58834
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	1	4/3/2019 1:27:00 AM	R58834
2-Butanone	ND	200		mg/L	1	4/3/2019 1:27:00 AM	R58834
Carbon Tetrachloride	ND	0.50		mg/L	1	4/3/2019 1:27:00 AM	R58834
Chloroform	ND	6.0		mg/L	1	4/3/2019 1:27:00 AM	R58834
1,4-Dichlorobenzene	ND	7.5		mg/L	1	4/3/2019 1:27:00 AM	R58834
1,1-Dichloroethene	ND	0.70		mg/L	1	4/3/2019 1:27:00 AM	R58834
Tetrachloroethene (PCE)	ND	0.70		mg/L	1	4/3/2019 1:27:00 AM	R58834
Trichloroethene (TCE)	ND	0.50		mg/L	1	4/3/2019 1:27:00 AM	R58834
Vinyl chloride	ND	0.20		mg/L	1	4/3/2019 1:27:00 AM	R58834
Chlorobenzene	ND	100		mg/L	1	4/3/2019 1:27:00 AM	R58834
Surr: 1,2-Dichloroethane-d4	101	70-130		%Rec	1	4/3/2019 1:27:00 AM	R58834
Surr: 4-Bromofluorobenzene	101	70-130		%Rec	1	4/3/2019 1:27:00 AM	R58834
Surr: Dibromofluoromethane	97.9	70-130		%Rec	1	4/3/2019 1:27:00 AM	R58834
Surr: Toluene-d8	97.5	70-130		%Rec	1	4/3/2019 1:27:00 AM	R58834

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

Wet Chemistry by Method 4500 CN E-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Reactive Cyanide	0.0141		0.00500	1	04/06/2019 17:13	WG1261158

Wet Chemistry by Method 4500H+ B-2011

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.56	T8	1	04/02/2019 17:45	WG1259617

Sample Narrative:

L1084745-01 WG1259617: 7.56 at 14.8C

Wet Chemistry by Method 9034-9030B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Reactive Sulfide	0.123		0.0500	1	04/02/2019 18:35	WG1259688

Wet Chemistry by Method D93/1010A

Analyte	Result deg F	Qualifier	Dilution	Analysis date / time	Batch
Flashpoint	DNF at 170		1	04/05/2019 22:16	WG1261310

Method Blank (MB)

(MB) R3399162-1 04/06/19 16:41

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Reactive Cyanide	U		0.00180	0.00500

L1084328-06 Original Sample (OS) • Duplicate (DUP)

(OS) L1084328-06 04/06/19 16:48 • (DUP) R3399162-3 04/06/19 16:49

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Reactive Cyanide	ND	0.000	1	0.000		20

L1084328-14 Original Sample (OS) • Duplicate (DUP)

(OS) L1084328-14 04/06/19 17:07 • (DUP) R3399162-8 04/06/19 17:08

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Reactive Cyanide	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3399162-2 04/06/19 16:42

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Cyanide	0.100	0.0978	97.8	85.0-115	

L1084328-07 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1084328-07 04/06/19 16:50 • (MS) R3399162-4 04/06/19 16:54 • (MSD) R3399162-5 04/06/19 16:55

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Reactive Cyanide	0.100	ND	0.0790	0.0859	79.0	85.9	1	75.0-125			8.37	20

L1084328-13 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1084328-13 04/06/19 17:02 • (MS) R3399162-6 04/06/19 17:05 • (MSD) R3399162-7 04/06/19 17:06

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Reactive Cyanide	0.100	ND	0.0801	0.0703	80.1	70.3	1	75.0-125		J6	13.0	20

Laboratory Control Sample (LCS)

(LCS) R3397714-1 04/02/19 17:45

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
Corrosivity by pH	10.0	9.97	99.7	99.0-101	

Sample Narrative:

LCS: 9.97 at 17.6C

QUALITY CONTROL SUMMARY

L1084745-01

Method Blank (MB)

(MB) R3397727-1 04/02/19 18:18

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Reactive Sulfide	U		0.00650	0.0500

Laboratory Control Sample (LCS)

(LCS) R3397727-2 04/02/19 18:19

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Sulfide	0.500	0.476	95.2	85.0-115	

L1084808-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1084808-02 04/05/19 22:16 • (DUP) R3399058-2 04/05/19 22:16

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	deg F	deg F		%		%
Flashpoint	DNF at 170	DNF at 170	1	0.000		10

L1085800-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1085800-01 04/05/19 22:16 • (DUP) R3399058-3 04/05/19 22:16

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	deg F	deg F		%		%
Flashpoint	DNF at 170	DNF at 170	1	0.000		10

Laboratory Control Sample (LCS)

(LCS) R3399058-1 04/05/19 22:16

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	deg F	deg F	%	%	
Flashpoint	82.0	81.6	99.5	96.0-104	

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.
T8	Sample(s) received past/too close to holding time expiration.

Wet Chemistry by Method 2580

Analyte	Result mV	Qualifier	Dilution	Analysis date / time	Batch
ORP	192	T8	1	04/06/2019 11:25	WG1261694

L1084668-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1084668-01 04/06/19 11:25 • (DUP) R3399096-2 04/06/19 11:25

Analyte	Original Result mV	DUP Result mV	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
ORP	192	191	1	0.522		20

Laboratory Control Sample (LCS)

(LCS) R3399096-1 04/06/19 11:25

Analyte	Spike Amount mV	LCS Result mV	LCS Rec. %	Rec. Limits %	LCS Qualifier
ORP	228	228	100	95.7-104	

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
T8	Sample(s) received past/too close to holding time expiration.

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R58816** RunNo: **58816**
Prep Date: Analysis Date: **4/1/2019** SeqNo: **1976714** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Bromide	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								
Nitrate+Nitrite as N	ND	0.20								

Sample ID: **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R58816** RunNo: **58816**
Prep Date: Analysis Date: **4/1/2019** SeqNo: **1976715** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.50	0.10	0.5000	0	101	90	110			
Bromide	2.4	0.10	2.500	0	95.1	90	110			
Phosphorus, Orthophosphate (As P	4.7	0.50	5.000	0	93.6	90	110			
Nitrate+Nitrite as N	3.4	0.20	3.500	0	98.1	90	110			

Sample ID: **MB** SampType: **mblk** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R58998** RunNo: **58998**
Prep Date: Analysis Date: **4/8/2019** SeqNo: **1985185** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								
Sulfate	ND	0.50								

Sample ID: **LCS** SampType: **lcs** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R58998** RunNo: **58998**
Prep Date: Analysis Date: **4/8/2019** SeqNo: **1985187** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.9	0.50	5.000	0	98.9	90	110			
Sulfate	10	0.50	10.00	0	100	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **1903D14-001BMS** SampType: **MS** TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **43999** RunNo: **59212**
Prep Date: **4/1/2019** Analysis Date: **4/16/2019** SeqNo: **1993657** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	0.00088		0.002500		35.2	29.4	99.8			
Surr: Tetrachloro-m-xylene	0.00076		0.002500		30.6	20.7	100			

Sample ID: **1903D14-001BMSD** SampType: **MSD** TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **43999** RunNo: **59212**
Prep Date: **4/1/2019** Analysis Date: **4/16/2019** SeqNo: **1993658** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	0.0017		0.002500		66.0	29.4	99.8	0	0	
Surr: Tetrachloro-m-xylene	0.0015		0.002500		59.0	20.7	100	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **100ng lcs2** SampType: **LCS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **LCSW** Batch ID: **R58834** RunNo: **58834**
Prep Date: Analysis Date: **4/2/2019** SeqNo: **1978496** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.50	0.02000	0	100	70	130			
1,1-Dichloroethene	ND	0.70	0.02000	0	95.1	70	130			
Trichloroethene (TCE)	ND	0.50	0.02000	0	90.3	70	130			
Chlorobenzene	ND	100	0.02000	0	95.6	70	130			
Surr: 1,2-Dichloroethane-d4	0.011		0.01000		109	70	130			
Surr: 4-Bromofluorobenzene	0.0099		0.01000		99.2	70	130			
Surr: Dibromofluoromethane	0.010		0.01000		103	70	130			
Surr: Toluene-d8	0.0097		0.01000		97.3	70	130			

Sample ID: **rb2** SampType: **MBLK** TestCode: **TCLP Volatiles by 8260B**
Client ID: **PBW** Batch ID: **R58834** RunNo: **58834**
Prep Date: Analysis Date: **4/2/2019** SeqNo: **1978497** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
2-Butanone	ND	200								
Carbon Tetrachloride	ND	0.50								
Chloroform	ND	6.0								
1,4-Dichlorobenzene	ND	7.5								
1,1-Dichloroethene	ND	0.70								
Tetrachloroethene (PCE)	ND	0.70								
Trichloroethene (TCE)	ND	0.50								
Vinyl chloride	ND	0.20								
Chlorobenzene	ND	100								
Surr: 1,2-Dichloroethane-d4	0.010		0.01000		104	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		100	70	130			
Surr: Dibromofluoromethane	0.010		0.01000		99.5	70	130			
Surr: Toluene-d8	0.0099		0.01000		98.6	70	130			

Sample ID: **1903d14-001ams** SampType: **MS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **R58834** RunNo: **58834**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978503** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	4.1	0.00017	4.000	0.02440	102	70	130			
1,1-Dichloroethene	4.1	0.00021	4.000	0	102	67.6	130			
Trichloroethene (TCE)	3.9	0.00017	4.000	0	97.2	70	130			
Chlorobenzene	4.2	0.00019	4.000	0.03160	105	70	130			
Surr: 1,2-Dichloroethane-d4	2.1		2.000		104	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **1903d14-001ams** SampType: **MS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **R58834** RunNo: **58834**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978503** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: 4-Bromofluorobenzene	1.9		2.000		96.7	70	130			
Surr: Dibromofluoromethane	1.9		2.000		96.5	70	130			
Surr: Toluene-d8	2.0		2.000		97.7	70	130			

Sample ID: **1903d14-001amsd** SampType: **MSD** TestCode: **TCLP Volatiles by 8260B**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **R58834** RunNo: **58834**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978504** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	4.1	0.00017	4.000	0.02440	101	70	130	1.10	20	
1,1-Dichloroethene	4.0	0.00021	4.000	0	99.0	67.6	130	3.29	20	
Trichloroethene (TCE)	3.8	0.00017	4.000	0	95.6	70	130	1.68	20	
Chlorobenzene	4.0	0.00019	4.000	0.03160	99.7	70	130	5.04	20	
Surr: 1,2-Dichloroethane-d4	2.1		2.000		106	70	130	0	0	
Surr: 4-Bromofluorobenzene	2.0		2.000		102	70	130	0	0	
Surr: Dibromofluoromethane	2.0		2.000		100	70	130	0	0	
Surr: Toluene-d8	2.0		2.000		98.2	70	130	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **1903D14-001Bms** SampType: **MS** TestCode: **EPA Method 8270C TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44003** RunNo: **59132**
Prep Date: **4/1/2019** Analysis Date: **4/13/2019** SeqNo: **1990636** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.056	0.0063	0.1000	0	56.5	23.9	129			
3+4-Methylphenol	0.10	0.0054	0.2000	0	51.9	15	167			
2,4-Dinitrotoluene	0.064	0.0058	0.1000	0	64.4	15	147			
Hexachlorobenzene	0.073	0.0062	0.1000	0	73.0	41.4	136			
Hexachlorobutadiene	0.023	0.0064	0.1000	0	23.4	16.2	134			
Hexachloroethane	0.024	0.0060	0.1000	0	23.9	20.6	124			
Nitrobenzene	0.059	0.0060	0.1000	0	59.0	39.5	134			
Pentachlorophenol	0.033	0.0053	0.1000	0	33.5	15	137			
Pyridine	0.016	0.0060	0.1000	0	16.0	15	129			
2,4,5-Trichlorophenol	0.070	0.0054	0.1000	0	70.4	15	158			
2,4,6-Trichlorophenol	0.069	0.0058	0.1000	0	68.7	15	153			
Cresols, Total	0.16	0.012	0.3000	0	53.4	10.6	179			
Surr: 2-Fluorophenol	0.085		0.2000		42.3	15	82.5			
Surr: Phenol-d5	0.067		0.2000		33.3	15	74.2			
Surr: 2,4,6-Tribromophenol	0.14		0.2000		72.0	18.6	118			
Surr: Nitrobenzene-d5	0.068		0.1000		67.8	30.4	106			
Surr: 2-Fluorobiphenyl	0.046		0.1000		46.3	15	104			
Surr: 4-Terphenyl-d14	0.058		0.1000		57.7	15	133			

Sample ID: **1903D14-001Bmsd** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44003** RunNo: **59132**
Prep Date: **4/1/2019** Analysis Date: **4/13/2019** SeqNo: **1990637** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.049	0.0063	0.1000	0	48.9	23.9	129	14.3	20	
3+4-Methylphenol	0.094	0.0054	0.2000	0	47.0	15	167	9.96	20	
2,4-Dinitrotoluene	0.055	0.0058	0.1000	0	54.9	15	147	16.0	23.2	
Hexachlorobenzene	0.063	0.0062	0.1000	0	62.5	41.4	136	15.5	20	
Hexachlorobutadiene	0.023	0.0064	0.1000	0	23.1	16.2	134	1.38	20	
Hexachloroethane	0.022	0.0060	0.1000	0	21.7	20.6	124	9.57	31.3	
Nitrobenzene	0.054	0.0060	0.1000	0	54.2	39.5	134	8.44	26.6	
Pentachlorophenol	0.028	0.0053	0.1000	0	28.2	15	137	16.9	27.9	
Pyridine	0.021	0.0060	0.1000	0	21.0	15	129	26.8	47.4	
2,4,5-Trichlorophenol	0.058	0.0054	0.1000	0	57.7	15	158	19.7	36.9	
2,4,6-Trichlorophenol	0.062	0.0058	0.1000	0	61.9	15	153	10.4	37.2	
Cresols, Total	0.14	0.012	0.3000	0	47.6	10.6	179	11.5	27.4	
Surr: 2-Fluorophenol	0.072		0.2000		36.0	15	82.5	0	0	
Surr: Phenol-d5	0.057		0.2000		28.6	15	74.2	0	0	
Surr: 2,4,6-Tribromophenol	0.13		0.2000		63.4	18.6	118	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **1903D14-001Bmsd** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44003** RunNo: **59132**
Prep Date: **4/1/2019** Analysis Date: **4/13/2019** SeqNo: **1990637** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Nitrobenzene-d5	0.062		0.1000		61.7	30.4	106	0	0	
Surr: 2-Fluorobiphenyl	0.041		0.1000		40.8	15	104	0	0	
Surr: 4-Terphenyl-d14	0.049		0.1000		49.1	15	133	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **lcs-1 99.0uS eC** SampType: **LCS** TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW** Batch ID: **R58867** RunNo: **58867**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978677** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	99	5.0	99.00	0	100	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-44137** SampType: **MBLK** TestCode: **EPA Method 7470: Mercury**
Client ID: **PBW** Batch ID: **44137** RunNo: **58933**
Prep Date: **4/4/2019** Analysis Date: **4/5/2019** SeqNo: **1981797** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID: **LCS-44137** SampType: **LCS** TestCode: **EPA Method 7470: Mercury**
Client ID: **LCSW** Batch ID: **44137** RunNo: **58933**
Prep Date: **4/4/2019** Analysis Date: **4/5/2019** SeqNo: **1981798** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0043	0.00020	0.005000	0	85.5	80	120			

Sample ID: **LCSD-44137** SampType: **LCSD** TestCode: **EPA Method 7470: Mercury**
Client ID: **LCSS02** Batch ID: **44137** RunNo: **58933**
Prep Date: **4/4/2019** Analysis Date: **4/5/2019** SeqNo: **1981844** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0050	0.00020	0.005000	0	99.7	80	120	15.3	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-A** SampType: **MBLK** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **PBW** Batch ID: **A58849** RunNo: **58849**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978089** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	ND	1.0								
Magnesium	ND	1.0								
Potassium	ND	1.0								
Sodium	ND	1.0								

Sample ID: **LCS-A** SampType: **LCS** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSW** Batch ID: **A58849** RunNo: **58849**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978091** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	50	1.0	50.00	0	99.2	80	120			
Magnesium	50	1.0	50.00	0	99.5	80	120			
Potassium	49	1.0	50.00	0	98.4	80	120			
Sodium	48	1.0	50.00	0	96.3	80	120			

Sample ID: **LCSD-A** SampType: **LCSD** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSS02** Batch ID: **A58849** RunNo: **58849**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978092** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	50	1.0	50.00	0	100	80	120	1.07	20	
Magnesium	50	1.0	50.00	0	101	80	120	1.09	20	
Potassium	50	1.0	50.00	0	99.4	80	120	1.05	20	
Sodium	49	1.0	50.00	0	98.6	80	120	2.32	20	

Sample ID: **1903D14-001DMS** SampType: **MS** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **A58849** RunNo: **58849**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978153** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Magnesium	350	5.0	250.0	100.9	101	75	125			
Potassium	310	5.0	250.0	63.59	100	75	125			

Sample ID: **1903D14-001DMSD** SampType: **MSD** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **A58849** RunNo: **58849**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978154** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Magnesium	360	5.0	250.0	100.9	102	75	125	0.849	20	
Potassium	320	5.0	250.0	63.59	101	75	125	0.298	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-44006** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **44006** RunNo: **58849**
Prep Date: **4/1/2019** Analysis Date: **4/3/2019** SeqNo: **1978079** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.020								
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-44006** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **44006** RunNo: **58849**
Prep Date: **4/1/2019** Analysis Date: **4/3/2019** SeqNo: **1978084** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.47	0.020	0.5000	0	94.0	80	120			
Barium	0.48	0.020	0.5000	0	96.7	80	120			
Cadmium	0.49	0.0020	0.5000	0	98.3	80	120			
Chromium	0.48	0.0060	0.5000	0	96.7	80	120			
Selenium	0.50	0.050	0.5000	0	99.3	80	120			
Silver	0.10	0.0050	0.1000	0	100	80	120			

Sample ID: **1903D14-001EMS** SampType: **MS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44006** RunNo: **58849**
Prep Date: **4/1/2019** Analysis Date: **4/3/2019** SeqNo: **1978105** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.49	0.020	0.5000	0.01859	93.7	75	125			
Barium	0.50	0.020	0.5000	0.04539	90.9	75	125			
Cadmium	0.48	0.0020	0.5000	0	95.6	75	125			
Chromium	0.46	0.0060	0.5000	0	91.6	75	125			
Selenium	0.52	0.050	0.5000	0.04001	95.3	75	125			
Silver	0.11	0.0050	0.1000	0.003795	101	75	125			

Sample ID: **1903D14-001EMSD** SampType: **MSD** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44006** RunNo: **58849**
Prep Date: **4/1/2019** Analysis Date: **4/3/2019** SeqNo: **1978106** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.49	0.020	0.5000	0.01859	94.3	75	125	0.602	20	
Barium	0.50	0.020	0.5000	0.04539	91.6	75	125	0.717	20	
Cadmium	0.48	0.0020	0.5000	0	95.7	75	125	0.0812	20	
Chromium	0.46	0.0060	0.5000	0	91.2	75	125	0.359	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **1903D14-001EMSD** SampType: **MSD** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44006** RunNo: **58849**
Prep Date: **4/1/2019** Analysis Date: **4/3/2019** SeqNo: **1978106** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Selenium	0.53	0.050	0.5000	0.04001	97.3	75	125	1.89	20	
Silver	0.11	0.0050	0.1000	0.003795	103	75	125	1.41	20	

Sample ID: **MB-44006** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **44006** RunNo: **58923**
Prep Date: **4/1/2019** Analysis Date: **4/5/2019** SeqNo: **1981494** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	ND	0.0050								

Sample ID: **LCS-44006** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **44006** RunNo: **58923**
Prep Date: **4/1/2019** Analysis Date: **4/5/2019** SeqNo: **1981495** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.51	0.0050	0.5000	0	101	80	120			

Sample ID: **1903D14-001EMS** SampType: **MS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44006** RunNo: **58923**
Prep Date: **4/1/2019** Analysis Date: **4/5/2019** SeqNo: **1981515** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.48	0.0050	0.5000	0	95.7	75	125			

Sample ID: **1903D14-001EMSD** SampType: **MSD** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **44006** RunNo: **58923**
Prep Date: **4/1/2019** Analysis Date: **4/5/2019** SeqNo: **1981516** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.48	0.0050	0.5000	0	96.9	75	125	1.26	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **mb-1 alk** SampType: **MBLK** TestCode: **SM2320B: Alkalinity**
Client ID: **PBW** Batch ID: **R58867** RunNo: **58867**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978652** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20.00								

Sample ID: **lcs-1 alk** SampType: **LCS** TestCode: **SM2320B: Alkalinity**
Client ID: **LCSW** Batch ID: **R58867** RunNo: **58867**
Prep Date: Analysis Date: **4/3/2019** SeqNo: **1978653** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	76.56	20.00	80.00	0	95.7	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1903D14**
18-Apr-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-44042** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **44042** RunNo: **58866**
Prep Date: ***4/2/2019*** Analysis Date: ***4/3/2019*** SeqNo: **1978621** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: **LCS-44042** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **44042** RunNo: **58866**
Prep Date: ***4/2/2019*** Analysis Date: ***4/3/2019*** SeqNo: **1978622** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1030	20.0	1000	0	103	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified at testcode

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **NAVAJO REFINING CO** Work Order Number: **1903D14** RcptNo: **1**

Received By: **Yazmine Garduno** **3/27/2019 8:40:00 AM** Yazmine Garduno

Completed By: **Leah Baca** **3/27/2019 1:57:18 PM** Leah Baca

Reviewed By: ENH 3/29/19

Labeled by YG 3/29/19

Chain of Custody

1. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
4. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☑ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
8. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
9. VOA vials have zero headspace? Yes ☑ No ☐ No VOA Vials ☐
10. Were any sample containers received broken? Yes ☐ No ☑
11. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
12. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
13. Is it clear what analyses were requested? Yes ☑ No ☐
14. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 4, 2 (<2 or >12 unless noted)
Adjusted? no
Checked by: YG 3/29/19

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

16. Additional remarks:

17. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	0.1	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia,

NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush

Project Name:

Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 251841

Project Manager:

Robert Combs / Scott Denton / Randy Dade

Sampler:

On Ice: ☑ Yes ☐ No

Sample Temperature: 0.1

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1903D14	Specific Gravity, HCO3, CO3, Cl, SO4, TDS, pH, cond., Fl, Cation/anion bal., Br, Eh/40	VOCs/SW-846 Method 8260C (see attached list 'VOCs')	SVOCs/SW-846 Method 8270D (see attached list 'SVOCs')	R,C,I/40 CFR part 261	Metals/SW-846 Mthd 6010, 7470 (see attached list 'Metals')	Ca, K, Mg, Na/40 CFR 136.3	TCLP Metals, only /40 CFR Part 261/ SW-846 Method 1311	Chlordane 8081 A
3/26/19	8:15	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X	
3/26/19	8:15	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3	~~-002~~					X	X		
3/26/19	8:15	Liquid	WDW-1, 2, & 3 Effluent	3	HCL	~~-003~~		X						
3/26/19	8:15	Liquid	WDW-1, 2, & 3 Effluent	2	Neat				X					
3/26/19	8:15	Liquid	WDW-1, 2, & 3 Effluent	2	Neat					X				

Date:	Time:	Relinquished by:	Received by:	Date	Time
3.26.19	1:00	Brady Hubbard / Brady Hubbard	courier / Maximum Chlorination	3/27/19	8:40
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: Send results to Scott Denton, Mike Holder, Robert Combs and Randy Dade. 7.32 pH, 31.0°C

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

July 17, 2019

Robert Combs
Navajo Refining Company
P.O. Box 159
Artesia, NM 88211-0159
TEL: (575) 748-3311
FAX:

RE: Quarterly WDW 1 2 3 Inj Well OrderNo.: 1907003

Dear Robert Combs:

Hall Environmental Analysis Laboratory received 2 sample(s) on 6/28/2019 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

Analytical Report
Lab Order **1907003**
Date Reported: **7/17/2019**

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1, 2 & 3 Effluent
Project: Quarterly WDW 1 2 3 Inj Well
Collection Date: 6/26/2019 2:30:00 PM
Lab ID: 1907003-001
Matrix: AQUEOUS
Received Date: 6/28/2019 10:40:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8270C TCLP						Analyst:	**DAM**
2-Methylphenol	ND	200		mg/L	1	7/5/2019 2:00:31 PM	45933
3+4-Methylphenol	ND	200		mg/L	1	7/5/2019 2:00:31 PM	45933
2,4-Dinitrotoluene	ND	0.13		mg/L	1	7/5/2019 2:00:31 PM	45933
Hexachlorobenzene	ND	0.13		mg/L	1	7/5/2019 2:00:31 PM	45933
Hexachlorobutadiene	ND	0.50		mg/L	1	7/5/2019 2:00:31 PM	45933
Hexachloroethane	ND	3.0		mg/L	1	7/5/2019 2:00:31 PM	45933
Nitrobenzene	ND	2.0		mg/L	1	7/5/2019 2:00:31 PM	45933
Pentachlorophenol	ND	100		mg/L	1	7/5/2019 2:00:31 PM	45933
Pyridine	ND	5.0		mg/L	1	7/5/2019 2:00:31 PM	45933
2,4,5-Trichlorophenol	ND	400		mg/L	1	7/5/2019 2:00:31 PM	45933
2,4,6-Trichlorophenol	ND	2.0		mg/L	1	7/5/2019 2:00:31 PM	45933
Cresols, Total	ND	200		mg/L	1	7/5/2019 2:00:31 PM	45933
Surr: 2-Fluorophenol	63.5	15-82.5		%Rec	1	7/5/2019 2:00:31 PM	45933
Surr: Phenol-d5	46.8	15-74.2		%Rec	1	7/5/2019 2:00:31 PM	45933
Surr: 2,4,6-Tribromophenol	83.3	18.6-118		%Rec	1	7/5/2019 2:00:31 PM	45933
Surr: Nitrobenzene-d5	87.2	30.4-106		%Rec	1	7/5/2019 2:00:31 PM	45933
Surr: 2-Fluorobiphenyl	77.3	15-104		%Rec	1	7/5/2019 2:00:31 PM	45933
Surr: 4-Terphenyl-d14	78.0	15-133		%Rec	1	7/5/2019 2:00:31 PM	45933
SPECIFIC GRAVITY						Analyst:	**JRR**
Specific Gravity	1.002	0			1	7/2/2019 10:32:00 AM	R61110
EPA METHOD 300.0: ANIONS						Analyst:	**smb**
Fluoride	23	2.0	*	mg/L	20	7/1/2019 3:42:01 PM	R61084
Chloride	570	50	*	mg/L	100	7/10/2019 2:28:41 PM	R61309
Bromide	0.59	0.50		mg/L	5	7/1/2019 3:29:36 PM	R61084
Phosphorus, Orthophosphate (As P)	ND	2.5		mg/L	5	7/1/2019 3:29:36 PM	R61084
Sulfate	2300	50	*	mg/L	100	7/10/2019 2:28:41 PM	R61309
Nitrate+Nitrite as N	1.2	1.0		mg/L	5	7/1/2019 3:54:26 PM	R61084
SM2510B: SPECIFIC CONDUCTANCE						Analyst:	**JRR**
Conductivity	6100	5.0		µmhos/c	1	7/1/2019 10:22:40 PM	R61065
SM2320B: ALKALINITY						Analyst:	**JRR**
Bicarbonate (As CaCO3)	537.6	20.00		mg/L Ca	1	7/1/2019 10:22:40 PM	R61065
Carbonate (As CaCO3)	ND	2.000		mg/L Ca	1	7/1/2019 10:22:40 PM	R61065
Total Alkalinity (as CaCO3)	537.6	20.00		mg/L Ca	1	7/1/2019 10:22:40 PM	R61065
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst:	**CJS**
Total Dissolved Solids	4570	40.0	*D	mg/L	1	7/9/2019 2:54:00 PM	45992
SM4500-H+B / 9040C: PH						Analyst:	**JRR**

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well
Lab ID: 1907003-001 **Matrix:** AQUEOUS

Client Sample ID: WDW-1, 2 & 3 Effluent
Collection Date: 6/26/2019 2:30:00 PM
Received Date: 6/28/2019 10:40:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
SM4500-H+B / 9040C: PH						Analyst:	**JRR**
pH	7.80		H	pH units	1	7/1/2019 10:22:40 PM	R61065
EPA METHOD 7470: MERCURY						Analyst:	**rde**
Mercury	ND	0.00020		mg/L	1	7/11/2019 4:43:47 PM	46125
EPA METHOD 6010B: DISSOLVED METALS						Analyst:	**bcv**
Calcium	470	5.0		mg/L	5	7/3/2019 11:45:32 AM	A61162
Magnesium	140	5.0		mg/L	5	7/3/2019 11:45:32 AM	A61162
Potassium	69	5.0		mg/L	5	7/3/2019 11:45:32 AM	A61162
Sodium	640	10		mg/L	10	7/3/2019 12:00:27 PM	A61162
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst:	**bcv**
Arsenic	ND	0.020		mg/L	1	7/5/2019 10:53:46 AM	46005
Barium	0.048	0.020		mg/L	1	7/5/2019 10:03:23 AM	46005
Cadmium	ND	0.0020		mg/L	1	7/5/2019 10:03:23 AM	46005
Chromium	ND	0.0060		mg/L	1	7/5/2019 10:03:23 AM	46005
Lead	ND	0.0050		mg/L	1	7/5/2019 10:03:23 AM	46005
Selenium	ND	0.050		mg/L	1	7/5/2019 10:03:23 AM	46005
Silver	0.0053	0.0050		mg/L	1	7/5/2019 10:03:23 AM	46005
TCLP VOLATILES BY 8260B						Analyst:	**RAA**
Benzene	ND	0.50		mg/L	200	7/9/2019 4:50:00 AM	T61220
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	200	7/9/2019 4:50:00 AM	T61220
2-Butanone	ND	200		mg/L	200	7/9/2019 4:50:00 AM	T61220
Carbon Tetrachloride	ND	0.50		mg/L	200	7/9/2019 4:50:00 AM	T61220
Chloroform	ND	6.0		mg/L	200	7/9/2019 4:50:00 AM	T61220
1,4-Dichlorobenzene	ND	7.5		mg/L	200	7/9/2019 4:50:00 AM	T61220
1,1-Dichloroethene	ND	0.70		mg/L	200	7/9/2019 4:50:00 AM	T61220
Tetrachloroethene (PCE)	ND	0.70		mg/L	200	7/9/2019 4:50:00 AM	T61220
Trichloroethene (TCE)	ND	0.50		mg/L	200	7/9/2019 4:50:00 AM	T61220
Vinyl chloride	ND	0.20		mg/L	200	7/9/2019 4:50:00 AM	T61220
Chlorobenzene	ND	100		mg/L	200	7/9/2019 4:50:00 AM	T61220
Surr: 1,2-Dichloroethane-d4	114	70-130		%Rec	200	7/9/2019 4:50:00 AM	T61220
Surr: 4-Bromofluorobenzene	97.3	70-130		%Rec	200	7/9/2019 4:50:00 AM	T61220
Surr: Dibromofluoromethane	104	70-130		%Rec	200	7/9/2019 4:50:00 AM	T61220
Surr: Toluene-d8	93.6	70-130		%Rec	200	7/9/2019 4:50:00 AM	T61220

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW 1 2 3 Inj Well
Collection Date:
Lab ID: 1907003-002
Matrix: TRIP BLANK
Received Date: 6/28/2019 10:40:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
TCLP VOLATILES BY 8260B						Analyst:	**RAA**
Benzene	ND	0.50		mg/L	1	7/9/2019 5:14:00 AM	T61220
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	1	7/9/2019 5:14:00 AM	T61220
2-Butanone	ND	200		mg/L	1	7/9/2019 5:14:00 AM	T61220
Carbon Tetrachloride	ND	0.50		mg/L	1	7/9/2019 5:14:00 AM	T61220
Chloroform	ND	6.0		mg/L	1	7/9/2019 5:14:00 AM	T61220
1,4-Dichlorobenzene	ND	7.5		mg/L	1	7/9/2019 5:14:00 AM	T61220
1,1-Dichloroethene	ND	0.70		mg/L	1	7/9/2019 5:14:00 AM	T61220
Tetrachloroethene (PCE)	ND	0.70		mg/L	1	7/9/2019 5:14:00 AM	T61220
Trichloroethene (TCE)	ND	0.50		mg/L	1	7/9/2019 5:14:00 AM	T61220
Vinyl chloride	ND	0.20		mg/L	1	7/9/2019 5:14:00 AM	T61220
Chlorobenzene	ND	100		mg/L	1	7/9/2019 5:14:00 AM	T61220
Surr: 1,2-Dichloroethane-d4	112	70-130		%Rec	1	7/9/2019 5:14:00 AM	T61220
Surr: 4-Bromofluorobenzene	101	70-130		%Rec	1	7/9/2019 5:14:00 AM	T61220
Surr: Dibromofluoromethane	105	70-130		%Rec	1	7/9/2019 5:14:00 AM	T61220
Surr: Toluene-d8	94.0	70-130		%Rec	1	7/9/2019 5:14:00 AM	T61220

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Wet Chemistry by Method 4500 CN E-2011

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Reactive Cyanide	0.0269		0.00500	1	07/09/2019 20:24	WG1308181

Wet Chemistry by Method 4500H+ B-2011

Analyte	Result su	Qualifier	Dilution	Analysis date / time	Batch
Corrosivity by pH	7.47	T8	1	07/06/2019 11:52	WG1306715

Sample Narrative:

L1114999-01 WG1306715: 7.47 at 20.8C

Wet Chemistry by Method 9034-9030B

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Reactive Sulfide	ND		0.0500	1	07/03/2019 19:54	WG1305508

Wet Chemistry by Method D93/1010A

Analyte	Result deg F	Qualifier	Dilution	Analysis date / time	Batch
Flashpoint	DNF at 170		1	07/09/2019 12:16	WG1308093

Wet Chemistry by Method 2580

Analyte	Result mV	Qualifier	Dilution	Analysis date / time	Batch
ORP	50.0	T8	1	07/13/2019 10:12	WG1310279

L1114999-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1114999-02 07/13/19 10:12 • (DUP) R3430311-2 07/13/19 10:12

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	mV	mV		%		%
ORP	50.0	54.0	1	7.69		20

Laboratory Control Sample (LCS)

(LCS) R3430311-1 07/13/19 10:12

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	mV	mV	%	%	
ORP	228	228	100	95.7-104	

Method Blank (MB)

(MB) R3429064-1 07/09/19 19:47

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Reactive Cyanide	U		0.00180	0.00500

L1111966-04 Original Sample (OS) • Duplicate (DUP)

(OS) L1111966-04 07/09/19 19:53 • (DUP) R3429064-3 07/09/19 19:54

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Reactive Cyanide	U	0.000	1	0.000		20

L1112351-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1112351-03 07/09/19 20:06 • (DUP) R3429064-6 07/09/19 20:07

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Reactive Cyanide	ND	0.000	1	0.000		20

Laboratory Control Sample (LCS)

(LCS) R3429064-9 07/09/19 20:18

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Cyanide	0.100	0.110	110	85.0-115	

L1112351-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1112351-02 07/09/19 20:03 • (MS) R3429064-4 07/09/19 20:04 • (MSD) R3429064-5 07/09/19 20:05

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Reactive Cyanide	0.100	ND	0.107	0.0924	107	92.4	1	75.0-125			14.6	20

L1113239-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1113239-01 07/09/19 20:15 • (MS) R3429064-7 07/09/19 20:16 • (MSD) R3429064-8 07/09/19 20:17

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Reactive Cyanide	0.100	ND	0.105	0.0832	105	83.2	1	75.0-125		J3	23.2	20

Laboratory Control Sample (LCS)

(LCS) R3428109-1 07/06/19 11:52

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
Corrosivity by pH	10.0	9.95	99.5	99.0-101	

Sample Narrative:

LCS: 9.95 at 22.8C

QUALITY CONTROL SUMMARY

L1114999-01

Method Blank (MB)

(MB) R3427441-1 07/03/19 19:48

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Reactive Sulfide	U		0.00650	0.0500

Laboratory Control Sample (LCS)

(LCS) R3427441-2 07/03/19 19:48

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Sulfide	0.500	0.543	109	85.0-115	

L1114999-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1114999-01 07/03/19 19:54 • (MS) R3427441-5 07/03/19 19:54 • (MSD) R3427441-6 07/03/19 19:55

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Reactive Sulfide	1.00	ND	0.927	0.942	92.7	94.2	1	80.0-120			1.61	20

L1114968-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1114968-01 07/09/19 12:16 • (DUP) R3428833-2 07/09/19 12:16

	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Analyte	deg F	deg F		%		%
Flashpoint	DNF at 170	DNF at 170	1	0.000		10

Laboratory Control Sample (LCS)

(LCS) R3428833-1 07/09/19 12:16

	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
Analyte	deg F	deg F	%	%	
Flashpoint	82.0	83.8	102	96.0-104	

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
J3	The associated batch QC was outside the established quality control range for precision.
T8	Sample(s) received past/too close to holding time expiration.

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R61084** RunNo: **61084**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2069013** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Bromide	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								
Nitrate+Nitrite as N	ND	0.20								

Sample ID: **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R61084** RunNo: **61084**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2069014** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.50	0.10	0.5000	0	99.4	90	110			
Bromide	2.4	0.10	2.500	0	95.6	90	110			
Phosphorus, Orthophosphate (As P	4.7	0.50	5.000	0	94.9	90	110			
Nitrate+Nitrite as N	3.4	0.20	3.500	0	96.8	90	110			

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R61309** RunNo: **61309**
Prep Date: Analysis Date: **7/10/2019** SeqNo: **2078288** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								
Sulfate	ND	0.50								

Sample ID: **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R61309** RunNo: **61309**
Prep Date: Analysis Date: **7/10/2019** SeqNo: **2078289** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.9	90	110			
Sulfate	9.8	0.50	10.00	0	98.2	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **100ng lcs2** SampType: **LCS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **LCSW** Batch ID: **T61220** RunNo: **61220**
Prep Date: Analysis Date: **7/9/2019** SeqNo: **2075609** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	0.022	0.00017	0.02000	0	109	70	130			
1,1-Dichloroethene	0.020	0.00021	0.02000	0	98.0	70	130			
Trichloroethene (TCE)	0.020	0.00017	0.02000	0	102	70	130			
Chlorobenzene	0.020	0.00019	0.02000	0	101	70	130			
Surr: 1,2-Dichloroethane-d4	0.012		0.01000		117	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		102	70	130			
Surr: Dibromofluoromethane	0.011		0.01000		111	70	130			
Surr: Toluene-d8	0.0095		0.01000		94.9	70	130			

Sample ID: **rb2** SampType: **MBLK** TestCode: **TCLP Volatiles by 8260B**
Client ID: **PBW** Batch ID: **T61220** RunNo: **61220**
Prep Date: Analysis Date: **7/9/2019** SeqNo: **2075612** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
2-Butanone	ND	200								
Carbon Tetrachloride	ND	0.50								
Chloroform	ND	6.0								
1,4-Dichlorobenzene	ND	7.5								
1,1-Dichloroethene	ND	0.70								
Tetrachloroethene (PCE)	ND	0.70								
Trichloroethene (TCE)	ND	0.50								
Vinyl chloride	ND	0.20								
Chlorobenzene	ND	100								
Surr: 1,2-Dichloroethane-d4	0.011		0.01000		114	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		99.7	70	130			
Surr: Dibromofluoromethane	0.011		0.01000		107	70	130			
Surr: Toluene-d8	0.0093		0.01000		93.2	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **lcs-1 99.8uS eC** SampType: **lcs** TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW** Batch ID: **R61065** RunNo: **61065**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2068823** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	99	5.0	99.80	0	99.6	85	115			

Sample ID: **lcs-2 99.8uS eC** SampType: **lcs** TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW** Batch ID: **R61065** RunNo: **61065**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2068863** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	100	5.0	99.80	0	102	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-46125** SampType: **MBLK** TestCode: **EPA Method 7470: Mercury**
Client ID: **PBW** Batch ID: **46125** RunNo: **61319**
Prep Date: **7/11/2019** Analysis Date: **7/11/2019** SeqNo: **2078629** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID: **LCS-46125** SampType: **LCS** TestCode: **EPA Method 7470: Mercury**
Client ID: **LCSW** Batch ID: **46125** RunNo: **61319**
Prep Date: **7/11/2019** Analysis Date: **7/11/2019** SeqNo: **2078630** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0050	0.00020	0.005000	0	99.6	80	120			

Sample ID: **1907003-001EMS** SampType: **MS** TestCode: **EPA Method 7470: Mercury**
Client ID: **WDW-1, 2 & 3 Efflue** Batch ID: **46125** RunNo: **61319**
Prep Date: **7/11/2019** Analysis Date: **7/11/2019** SeqNo: **2078632** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0048	0.00020	0.005000	.00005580	94.2	75	125			

Sample ID: **1907003-001EMSD** SampType: **MSD** TestCode: **EPA Method 7470: Mercury**
Client ID: **WDW-1, 2 & 3 Efflue** Batch ID: **46125** RunNo: **61319**
Prep Date: **7/11/2019** Analysis Date: **7/11/2019** SeqNo: **2078633** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0045	0.00020	0.005000	.00005580	89.7	75	125	4.84	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-A** SampType: **MBLK** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **PBW** Batch ID: **A61162** RunNo: **61162**
Prep Date: Analysis Date: **7/3/2019** SeqNo: **2072741** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	ND	1.0								
Magnesium	ND	1.0								
Potassium	ND	1.0								
Sodium	ND	1.0								

Sample ID: **LCS-A** SampType: **LCS** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSW** Batch ID: **A61162** RunNo: **61162**
Prep Date: Analysis Date: **7/3/2019** SeqNo: **2072742** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	49	1.0	50.00	0	97.5	80	120			
Magnesium	49	1.0	50.00	0	97.1	80	120			
Potassium	48	1.0	50.00	0	96.8	80	120			
Sodium	49	1.0	50.00	0	98.5	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-46005** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **46005** RunNo: **61169**
Prep Date: **7/3/2019** Analysis Date: **7/5/2019** SeqNo: **2073329** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Lead	ND	0.0050								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-46005** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **46005** RunNo: **61169**
Prep Date: **7/3/2019** Analysis Date: **7/5/2019** SeqNo: **2073330** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.48	0.020	0.5000	0	95.9	80	120			
Cadmium	0.50	0.0020	0.5000	0	100	80	120			
Chromium	0.49	0.0060	0.5000	0	99.0	80	120			
Lead	0.49	0.0050	0.5000	0	97.9	80	120			
Selenium	0.48	0.050	0.5000	0	95.9	80	120			
Silver	0.10	0.0050	0.1000	0	101	80	120			

Sample ID: **MB-46005** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **46005** RunNo: **61169**
Prep Date: **7/3/2019** Analysis Date: **7/5/2019** SeqNo: **2073365** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.020								

Sample ID: **LCS-46005** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **46005** RunNo: **61169**
Prep Date: **7/3/2019** Analysis Date: **7/5/2019** SeqNo: **2073366** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.51	0.020	0.5000	0	102	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **mb-1 alk** SampType: **mblk** TestCode: **SM2320B: Alkalinity**
Client ID: **PBW** Batch ID: **R61065** RunNo: **61065**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2068770** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20.00								

Sample ID: **lcs-1 alk** SampType: **lcs** TestCode: **SM2320B: Alkalinity**
Client ID: **LCSW** Batch ID: **R61065** RunNo: **61065**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2068771** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	75.24	20.00	80.00	0	94.1	90	110			

Sample ID: **mb-2 alk** SampType: **mblk** TestCode: **SM2320B: Alkalinity**
Client ID: **PBW** Batch ID: **R61065** RunNo: **61065**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2068793** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20.00								

Sample ID: **lcs-2 alk** SampType: **lcs** TestCode: **SM2320B: Alkalinity**
Client ID: **LCSW** Batch ID: **R61065** RunNo: **61065**
Prep Date: Analysis Date: **7/1/2019** SeqNo: **2068794** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	77.60	20.00	80.00	0	97.0	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1907003**
17-Jul-19

Client: Navajo Refining Company
Project: Quarterly WDW 1 2 3 Inj Well

Sample ID: **MB-45992** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **45992** RunNo: **61248**
Prep Date: **7/3/2019** Analysis Date: **7/9/2019** SeqNo: **2076089** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: **LCS-45992** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **45992** RunNo: **61248**
Prep Date: **7/3/2019** Analysis Date: **7/9/2019** SeqNo: **2076090** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	988	20.0	1000	0	98.8	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **NAVAJO REFINING CO** Work Order Number: **1907003** RcptNo: **1**

Received By: **Jevon Campisi** **6/28/2019 10:40:00 AM** Jevon Campisi

Completed By: **Leah Baca** **7/1/2019 6:52:49 AM** Leah S Baca

Reviewed By: JC 7/1/19

Chain of Custody

1. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
4. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☑ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
8. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
9. VOA vials have zero headspace? Yes ☑ No ☐ No VOA Vials ☐
10. Were any sample containers received broken? Yes ☐ No ☑
11. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
12. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
13. Is it clear what analyses were requested? Yes ☑ No ☐
14. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 3 1 1 >9 (<2 or >12 unless noted)
Adjusted? NO
Checked by: LB 7/1/19

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

16. Additional remarks:

17. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	0.2	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia,

NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush

Project Name:

Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 251841

Project Manager:

Robert Combs / Scott Denton / Randy Dade

Sampler:

On Ice: ☑ Yes ☐ No

Sample Temperature: -0.2°C + 0.0CF = 0.2°C (not frozen)

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1907003	Specific Gravity, HCO3, CO3, Cl, SO4, TDS, pH, cond., Fl, Cation/anion bal., Br, Eh/40	VOCs/SW-846 Method 8260C (see attached list 'VOCs')	SVOCs/SW-846 Method 8270D (see attached list 'SVOCs')	R,C,I/40 CFR part 261	Metals/SW-846 Mthd 6010, 7470 (see attached list 'Metals')	Ca, K, Mg, Na/40 CFR 136.3	TCLP Metals, only /40 CFR Part 261/ SW-846 Method 1311	Chlordane 8081 A
6/26/19	2:30	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X	
6/26/19	2:30	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3						X	X		
6/26/19	2:30	Liquid	WDW-1, 2, & 3 Effluent	3	HCL			X						
6/26/19	2:30	Liquid	WDW-1, 2, & 3 Effluent	2	Neat				X					
6/26/19	2:30	Liquid	WDW-1, 2, & 3 Effluent	2	Neat					X				

Date:	Time:	Relinquished by:	Received by:	Date	Time
6-27-19	10:00	Brady Hibbard	Courier	6-28-19	10:40
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: Send results to Scott Denton, Mike Holder, Robert Combs and Randy Dade. Field details: 7.24 pH, 41.7°C

89°F, 20% humidity

Wind: SSW 15 mph

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

The written notice shall be signed by both the Permittee and transferee, include an acknowledgment by the transferee that they will be responsible for compliance with the permit upon taking possession of the facility; set a specific date for transfer of the permit and include information related to the transferee's financial responsibility as required by 20.6.2.5210B(17) NMAC.

1.I. Compliance and Enforcement. If the Permittee violates any condition of this permit, OCD may issue a compliance order requiring compliance immediately or within a specified time period, and/or assess a civil penalty, or both (74-6-10 NMSA 1978). The compliance order may also include a suspension or termination of this permit. OCD may also commence a civil action in district court for appropriate relief, including injunctive relief (74-6-10(A)(2) NMSA 1978). The Permittee may be subject to criminal penalties for discharging a water contaminant without a permit or in violation of a condition of a permit; making any false material statement, representation, certification or omission of material fact in a renewal application, record, report, plan or other document filed, submitted or required to be maintained under the Water Quality Act; falsifying, tampering with or rendering inaccurate any monitoring device, method or record required to be maintained under the Water Quality Act; or failing to monitor, sample or report as required by a discharge permit issued pursuant to a state or federal law or regulation (74-6-10.2 NMSA 1978).

2. GENERAL FACILITY OPERATIONS

2.A. Quarterly Monitoring Requirements. The Permittee shall properly conduct operations at its facility by injecting only RCRA exempt and RCRA non-hazardous, non-exempt oil field waste fluids. Injected waste fluids shall not exhibit the toxicity characteristics of ignitability, reactivity, corrosivity, or toxicity under 40 CFR 261 Subpart "C" 261.21 – 261.24 (July 1, 1992), at the point of injection into WDW-1 based upon environmental analytical laboratory testing and/or monitoring data results. Pursuant to 20.6.2.5207B, the Permittee shall provide analyses of the injected fluids at least quarterly to yield data representative of their toxicity characteristics. OCD shall be notified via a C-141 Form release report if waste fluids test positive for the above.

The Permittee shall also analyze the injected fluids quarterly for the following characteristics:

- pH as determined by Method 9040
- Eh
- Specific conductance
- Specific gravity
- Temperature
- Concentrations of major dissolved cations and anions, including: fluoride, calcium, potassium, magnesium, sodium bicarbonate, carbonate, chloride, sulfate, bromide, total dissolved solids, and cation/anion balance using the methods specified in 40 CFR 136.3
- RCRA Characteristics for ignitability (ASTM Methods), corrosivity (SW-846), and reactivity (determined through Permittee's application of knowledge or generating process)

The Permittee shall also analyze the injected fluids quarterly for the constituents identified in the Quarterly Monitoring List below to demonstrate that the injected fluids do not exhibit the characteristic of toxicity using the Toxicity Characteristic Leaching Procedure, EPA SW-846 Test Method 1311 (see Table 1, 40 CFR 261.24(b)).

QUARTERLY MONITORING LIST			
EPA Hazardous Waste No.	**Contaminant**	**SW-846 Method**	**Regulatory Level (mg/l)**
D004	Arsenic	1311	5.0
D005	Barium	1311	100.0
D018	Benzene	8021B	0.5
D006	Cadmium	1311	1.0
D019	Carbon tetrachloride	8021B 8260B	0.5
D020	Chlordane	8081A	0.03

D021	Chlorobenzene	8021B 8260B	100.0
D022	Chloroform	8021B 8260B	6.0
D007	Chromium	1311	5.0
D023	o-Cresol	8270D	200.0
D024	m-Cresol	8270D	200.0
D025	p-Cresol	8270D	200.0
D026	Cresol	8270D	200.0
D027	1,4-Dichlorobenzene	8021B 8121 8260B 8270D	7.5
D028	1,2-Dichloroethane	8021B 8260B	0.5
D029	1,1-Dichloroethylene	8021B 8260B	0.7
D030	2,4-Dinitrotoluene	8091 8270D	0.13
D032	Hexachlorobenzene	8121	0.13
D033	Hexachlorobutadiene	8021B 8121 8260B	0.5
D034	Hexachloroethane	8121	3.0
D008	Lead	1311	5.0
D009	Mercury	7470A 7471B	0.2
D035	Methyl ethyl ketone	8015B 8260B	200.0
D036	Nitrobenzene	8091 8270D	2.0
D037	Pentrachlorophenol	8041	100.0
D038	Pyridine	8260B 8270D	5.0
D010	Selenium	1311	1.0
D011	Silver	1311	5.0
D039	Tetrachloroethylene	8260B	0.7
D040	Trichloroethylene	8021B 8260B	0.5
D041	2,4,5-Trichlorophenol	8270D	400.0
D042	2,4,6-Trichlorophenol	8041A 8270D	2.0
D043	Vinyl chloride	8021B 8260B	0.2

If o-, m-, and p-cresol concentrations cannot be differentiated, then the total cresol concentration is used.
If the quantitation limit is greater than the regulatory level, then the quantitation limit becomes the regulatory level.
If dissolved metals, EPA Method 1311 TCLP is required with the exception of total mercury.

2.B. Groundwater Monitoring Wells. At least one groundwater monitoring well shall be installed in proximity of and hydrogeologically downgradient from WDW-1. The monitoring well(s) shall be screened into the uppermost water-bearing unit using 15 feet of well screen with the top of the screened interval positioned 5 feet above the water table. The Permittee shall propose a monitoring frequency with analytic and monitoring parameters to detect potential groundwater contamination.

Shallow to 200 - 250 ft bgs

Need All

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

November 01, 2019

Robert Combs
Navajo Refining Company
P.O. Box 159
Artesia, NM 88211-0159
TEL: (575) 748-3311
FAX

RE: Quarterly WDW-1, 2, & 3 Inj Well OrderNo.: 1910144

Dear Robert Combs:

Hall Environmental Analysis Laboratory received 2 sample(s) on 10/2/2019 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Case Narrative

WO#: **1910144**
Date: **11/1/2019**

CLIENT: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Analytical Notes Regarding EPA Method 8270:
The recovery of pyridine in the LCS was low when compared to our SOP limits.

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well
Lab ID: 1910144-001 **Matrix:** AQUEOUS

Client Sample ID: WDW-1,2,&3 Effluent
Collection Date: 9/30/2019 4:05:00 PM
Received Date: 10/2/2019 9:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **CJS**
Fluoride	31	2.0	*	mg/L	20	10/3/2019 11:52:11 PM
Chloride	430	25	*	mg/L	50	10/14/2019 2:16:22 PM
Bromide	ND	0.50		mg/L	5	10/3/2019 11:39:50 PM
Phosphorus, Orthophosphate (As P)	ND	2.5	H	mg/L	5	10/3/2019 11:39:50 PM
Sulfate	1700	25	*	mg/L	50	10/14/2019 2:16:22 PM
Nitrate+Nitrite as N	1.2	1.0		mg/L	5	10/4/2019 12:16:52 AM
EPA METHOD 7470: MERCURY						Analyst: **rde**
Mercury	ND	0.020		mg/L	1	10/4/2019 3:15:56 PM
EPA METHOD 6010B: DISSOLVED METALS						Analyst: **rde**
Calcium	340	10		mg/L	10	10/30/2019 1:32:00 PM
Magnesium	110	10		mg/L	10	10/30/2019 1:32:00 PM
Potassium	100	10		mg/L	10	10/30/2019 1:32:00 PM
Sodium	570	10		mg/L	10	10/30/2019 1:32:00 PM
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: **bcv**
Arsenic	ND	5.0		mg/L	5	10/21/2019 2:24:21 PM
Barium	ND	100		mg/L	5	10/14/2019 11:43:53 AM
Cadmium	ND	1.0		mg/L	5	10/14/2019 11:43:53 AM
Chromium	ND	5.0		mg/L	5	10/14/2019 11:43:53 AM
Lead	ND	5.0		mg/L	5	10/21/2019 2:24:21 PM
Selenium	ND	1.0		mg/L	5	10/14/2019 11:43:53 AM
Silver	ND	5.0		mg/L	5	10/14/2019 11:43:53 AM
EPA METHOD 8270C TCLP						Analyst: **DAM**
2-Methylphenol	ND	200		mg/L	1	10/14/2019 6:38:07 PM
3+4-Methylphenol	ND	200		mg/L	1	10/14/2019 6:38:07 PM
2,4-Dinitrotoluene	ND	0.13		mg/L	1	10/14/2019 6:38:07 PM
Hexachlorobenzene	ND	0.13		mg/L	1	10/14/2019 6:38:07 PM
Hexachlorobutadiene	ND	0.50		mg/L	1	10/14/2019 6:38:07 PM
Hexachloroethane	ND	3.0		mg/L	1	10/14/2019 6:38:07 PM
Nitrobenzene	ND	2.0		mg/L	1	10/14/2019 6:38:07 PM
Pentachlorophenol	ND	100		mg/L	1	10/14/2019 6:38:07 PM
Pyridine	ND	5.0		mg/L	1	10/14/2019 6:38:07 PM
2,4,5-Trichlorophenol	ND	400		mg/L	1	10/14/2019 6:38:07 PM
2,4,6-Trichlorophenol	ND	2.0		mg/L	1	10/14/2019 6:38:07 PM
Cresols, Total	ND	200		mg/L	1	10/14/2019 6:38:07 PM
Surr: 2-Fluorophenol	42.6	15-82.5		%Rec	1	10/14/2019 6:38:07 PM
Surr: Phenol-d5	34.0	15-74.2		%Rec	1	10/14/2019 6:38:07 PM
Surr: 2,4,6-Tribromophenol	51.3	18.6-118		%Rec	1	10/14/2019 6:38:07 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 9/30/2019 4:05:00 PM
Lab ID: 1910144-001
Matrix: AQUEOUS
Received Date: 10/2/2019 9:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8270C TCLP						Analyst: **DAM**
Surr: Nitrobenzene-d5	64.8	30.4-106		%Rec	1	10/14/2019 6:38:07 PM
Surr: 2-Fluorobiphenyl	53.0	15-104		%Rec	1	10/14/2019 6:38:07 PM
Surr: 4-Terphenyl-d14	61.1	15-133		%Rec	1	10/14/2019 6:38:07 PM
NOTES:						
* See the case narrative for notes.						
TCLP VOLATILES BY 8260B						Analyst: **JMR**
Benzene	ND	0.50		mg/L	1	10/4/2019 4:16:04 AM
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	1	10/4/2019 4:16:04 AM
2-Butanone	ND	200		mg/L	1	10/4/2019 4:16:04 AM
Carbon Tetrachloride	ND	0.50		mg/L	1	10/4/2019 4:16:04 AM
Chloroform	ND	6.0		mg/L	1	10/4/2019 4:16:04 AM
1,4-Dichlorobenzene	ND	7.5		mg/L	1	10/4/2019 4:16:04 AM
1,1-Dichloroethene	ND	0.70		mg/L	1	10/4/2019 4:16:04 AM
Tetrachloroethene (PCE)	ND	0.70		mg/L	1	10/4/2019 4:16:04 AM
Trichloroethene (TCE)	ND	0.50		mg/L	1	10/4/2019 4:16:04 AM
Vinyl chloride	ND	0.20		mg/L	1	10/4/2019 4:16:04 AM
Chlorobenzene	ND	100		mg/L	1	10/4/2019 4:16:04 AM
Surr: 1,2-Dichloroethane-d4	88.0	70-130		%Rec	1	10/4/2019 4:16:04 AM
Surr: 4-Bromofluorobenzene	93.4	70-130		%Rec	1	10/4/2019 4:16:04 AM
Surr: Dibromofluoromethane	98.6	70-130		%Rec	1	10/4/2019 4:16:04 AM
Surr: Toluene-d8	104	70-130		%Rec	1	10/4/2019 4:16:04 AM
CORROSIVITY						Analyst: **PAC**
pH	7.69			su	1	10/6/2019
IGNITABILITY METHOD 1010						Analyst: **PAC**
Ignitability	>170			°F	1	10/14/2019
OXIDATION REDUCTION POTENTIAL						Analyst: **PAC**
Oxidation-Reduction Potential	190			mV	1	10/6/2019
CYANIDE, REACTIVE						Analyst: **PAC**
Cyanide, Reactive	0.0927	0.00500		mg/L	1	10/15/2019
SULFIDE, REACTIVE						Analyst: **PAC**
Reactive Sulfide	ND	0.050		mg/L	1	10/7/2019
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**
Conductivity	5100	5.0		µmhos/c	1	10/7/2019 11:56:48 AM
SM2320B: ALKALINITY						Analyst: **JRR**
Bicarbonate (As CaCO3)	408.2	20.00		mg/L Ca	1	10/3/2019 5:57:44 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 9/30/2019 4:05:00 PM
Lab ID: 1910144-001
Matrix: AQUEOUS
Received Date: 10/2/2019 9:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
SM2320B: ALKALINITY						Analyst: **JRR**
Carbonate (As CaCO3)	ND	2.000		mg/L Ca	1	10/3/2019 5:57:44 PM
Total Alkalinity (as CaCO3)	408.2	20.00		mg/L Ca	1	10/3/2019 5:57:44 PM
SPECIFIC GRAVITY						Analyst: **JRR**
Specific Gravity	1.000	0			1	10/10/2019 12:45:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**
Total Dissolved Solids	3520	40.0	*D	mg/L	1	10/7/2019 2:22:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date:
Lab ID: 1910144-002
Matrix: TRIP BLANK
Received Date: 10/2/2019 9:30:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
TCLP VOLATILES BY 8260B						Analyst: **JMR**
Benzene	ND	0.50		mg/L	1	10/4/2019 5:42:29 AM
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	1	10/4/2019 5:42:29 AM
2-Butanone	ND	200		mg/L	1	10/4/2019 5:42:29 AM
Carbon Tetrachloride	ND	0.50		mg/L	1	10/4/2019 5:42:29 AM
Chloroform	ND	6.0		mg/L	1	10/4/2019 5:42:29 AM
1,4-Dichlorobenzene	ND	7.5		mg/L	1	10/4/2019 5:42:29 AM
1,1-Dichloroethene	ND	0.70		mg/L	1	10/4/2019 5:42:29 AM
Tetrachloroethene (PCE)	ND	0.70		mg/L	1	10/4/2019 5:42:29 AM
Trichloroethene (TCE)	ND	0.50		mg/L	1	10/4/2019 5:42:29 AM
Vinyl chloride	ND	0.20		mg/L	1	10/4/2019 5:42:29 AM
Chlorobenzene	ND	100		mg/L	1	10/4/2019 5:42:29 AM
Surr: 1,2-Dichloroethane-d4	91.6	70-130		%Rec	1	10/4/2019 5:42:29 AM
Surr: 4-Bromofluorobenzene	93.8	70-130		%Rec	1	10/4/2019 5:42:29 AM
Surr: Dibromofluoromethane	100	70-130		%Rec	1	10/4/2019 5:42:29 AM
Surr: Toluene-d8	101	70-130		%Rec	1	10/4/2019 5:42:29 AM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB** SampType: **mblk** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R63431** RunNo: **63431**
Prep Date: Analysis Date: **10/3/2019** SeqNo: **2166069** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Bromide	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								
Nitrate+Nitrite as N	ND	0.20								

Sample ID: **LCS** SampType: **lcs** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R63431** RunNo: **63431**
Prep Date: Analysis Date: **10/3/2019** SeqNo: **2166070** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.54	0.10	0.5000	0	108	90	110			
Bromide	2.5	0.10	2.500	0	98.5	90	110			
Phosphorus, Orthophosphate (As P	4.7	0.50	5.000	0	94.8	90	110			
Nitrate+Nitrite as N	3.5	0.20	3.500	0	99.8	90	110			

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R63681** RunNo: **63681**
Prep Date: Analysis Date: **10/14/2019** SeqNo: **2176160** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								
Sulfate	ND	0.50								

Sample ID: **LCS** SampType: **LCS** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R63681** RunNo: **63681**
Prep Date: Analysis Date: **10/14/2019** SeqNo: **2176161** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	5.0	0.50	5.000	0	99.4	90	110			
Sulfate	10	0.50	10.00	0	101	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **100ng lcs** SampType: **LCS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **LCSW** Batch ID: **T63413** RunNo: **63413**
Prep Date: Analysis Date: **10/4/2019** SeqNo: **2165302** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	4.0	0.30	4.000	0	99.0	70	130			
1,1-Dichloroethene	3.7	0.30	4.000	0	91.8	70	130			
Trichloroethene (TCE)	3.7	0.30	4.000	0	91.3	70	130			
Chlorobenzene	4.2	0.30	4.000	0	106	70	130			
Surr: 1,2-Dichloroethane-d4	1.8		2.000		89.9	70	130			
Surr: 4-Bromofluorobenzene	1.9		2.000		96.3	70	130			
Surr: Dibromofluoromethane	2.0		2.000		97.7	70	130			
Surr: Toluene-d8	2.1		2.000		103	70	130			

Sample ID: **1910144-001a ms** SampType: **MS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **T63413** RunNo: **63413**
Prep Date: Analysis Date: **10/4/2019** SeqNo: **2165304** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	4.0	0.30	4.000	0.1900	95.7	70	130			
1,1-Dichloroethene	3.7	0.30	4.000	0	92.9	70	130			
Trichloroethene (TCE)	3.5	0.30	4.000	0	87.0	70	130			
Chlorobenzene	4.1	0.30	4.000	0	102	70	130			
Surr: 1,2-Dichloroethane-d4	1.8		2.000		91.0	70	130			
Surr: 4-Bromofluorobenzene	1.8		2.000		88.4	70	130			
Surr: Dibromofluoromethane	2.0		2.000		99.4	70	130			
Surr: Toluene-d8	2.1		2.000		106	70	130			

Sample ID: **1910144-001a msd** SampType: **MSD** TestCode: **TCLP Volatiles by 8260B**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **T63413** RunNo: **63413**
Prep Date: Analysis Date: **10/4/2019** SeqNo: **2165305** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	3.9	0.30	4.000	0.1900	93.1	70	130	2.64	20	
1,1-Dichloroethene	3.6	0.30	4.000	0	89.0	70	130	4.24	20	
Trichloroethene (TCE)	3.4	0.30	4.000	0	85.3	70	130	2.00	20	
Chlorobenzene	4.0	0.30	4.000	0	100	70	130	1.70	20	
Surr: 1,2-Dichloroethane-d4	1.8		2.000		90.5	70	130	0	0	
Surr: 4-Bromofluorobenzene	1.8		2.000		91.4	70	130	0	0	
Surr: Dibromofluoromethane	2.0		2.000		99.6	70	130	0	0	
Surr: Toluene-d8	2.1		2.000		103	70	130	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **rb2** SampType: **MBLK** TestCode: **TCLP Volatiles by 8260B**
Client ID: **PBW** Batch ID: **T63413** RunNo: **63413**
Prep Date: Analysis Date: **10/4/2019** SeqNo: **2165310** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
2-Butanone	ND	200								
Carbon Tetrachloride	ND	0.50								
Chloroform	ND	6.0								
1,4-Dichlorobenzene	ND	7.5								
1,1-Dichloroethene	ND	0.70								
Tetrachloroethene (PCE)	ND	0.70								
Trichloroethene (TCE)	ND	0.50								
Vinyl chloride	ND	0.20								
Chlorobenzene	ND	100								
Surr: 1,2-Dichloroethane-d4	1.9		2.000		95.2	70	130			
Surr: 4-Bromofluorobenzene	1.9		2.000		93.5	70	130			
Surr: Dibromofluoromethane	2.0		2.000		99.0	70	130			
Surr: Toluene-d8	2.0		2.000		101	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **1910144-001bms** SampType: **MS** TestCode: **EPA Method 8270C TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **47936** RunNo: **63667**
Prep Date: **10/4/2019** Analysis Date: **10/14/2019** SeqNo: **2175826** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.14	0.0010	0.1000	0	135	30.5	98.2			S
3+4-Methylphenol	0.30	0.0010	0.2000	0	149	27.4	98.6			S
2,4-Dinitrotoluene	0.14	0.0010	0.1000	0	140	34.3	87.4			S
Hexachlorobenzene	0.15	0.0010	0.1000	0	146	36.5	100			S
Hexachlorobutadiene	0.12	0.0010	0.1000	0	124	15	108			S
Hexachloroethane	0.11	0.0010	0.1000	0	113	15	90.7			S
Nitrobenzene	0.14	0.0010	0.1000	0	144	39	100			S
Pentachlorophenol	0.12	0.0010	0.1000	0	124	15	97.5			S
Pyridine	0.022	0.0010	0.1000	0	22.5	15	65.8			
2,4,5-Trichlorophenol	0.14	0.0010	0.1000	0	137	36.1	109			S
2,4,6-Trichlorophenol	0.14	0.0010	0.1000	0	138	37.8	104			S
Cresols, Total	0.43	0.0010	0.3000	0	145	27.1	99.8			S
Surr: 2-Fluorophenol	0.096		0.2000		48.0	15	82.5			
Surr: Phenol-d5	0.076		0.2000		37.9	15	74.2			
Surr: 2,4,6-Tribromophenol	0.14		0.2000		67.6	18.6	118			
Surr: Nitrobenzene-d5	0.080		0.1000		79.9	30.4	106			
Surr: 2-Fluorobiphenyl	0.066		0.1000		66.3	15	104			
Surr: 4-Terphenyl-d14	0.071		0.1000		70.6	15	133			

Sample ID: **1910144-001bmsd** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **47936** RunNo: **63667**
Prep Date: **10/4/2019** Analysis Date: **10/14/2019** SeqNo: **2175827** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.065	0.0010	0.1000	0	65.2	30.5	98.2	69.7	44.3	R
3+4-Methylphenol	0.13	0.0010	0.2000	0	63.1	27.4	98.6	81.2	50	R
2,4-Dinitrotoluene	0.068	0.0010	0.1000	0	67.6	34.3	87.4	69.9	45.1	R
Hexachlorobenzene	0.067	0.0010	0.1000	0	67.3	36.5	100	73.8	47.2	R
Hexachlorobutadiene	0.059	0.0010	0.1000	0	58.9	15	108	71.4	43.4	R
Hexachloroethane	0.055	0.0010	0.1000	0	54.9	15	90.7	69.6	39.2	R
Nitrobenzene	0.071	0.0010	0.1000	0	71.2	39	100	67.6	42.1	R
Pentachlorophenol	0.057	0.0010	0.1000	0	57.0	15	97.5	74.4	50	R
Pyridine	0.0028	0.0010	0.1000	0	2.80	15	65.8	156	50	RS
2,4,5-Trichlorophenol	0.070	0.0010	0.1000	0	70.0	36.1	109	65.0	49.7	R
2,4,6-Trichlorophenol	0.069	0.0010	0.1000	0	69.3	37.8	104	66.6	47	R
Cresols, Total	0.19	0.0010	0.3000	0	63.8	27.1	99.8	77.5	27.4	R
Surr: 2-Fluorophenol	0.046		0.2000		23.2	15	82.5	0	0	
Surr: Phenol-d5	0.038		0.2000		18.9	15	74.2	0	0	
Surr: 2,4,6-Tribromophenol	0.061		0.2000		30.6	18.6	118	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **1910144-001bmsd** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **47936** RunNo: **63667**
Prep Date: **10/4/2019** Analysis Date: **10/14/2019** SeqNo: **2175827** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Nitrobenzene-d5	0.036		0.1000		36.4	30.4	106	0	0	
Surr: 2-Fluorobiphenyl	0.034		0.1000		33.9	15	104	0	0	
Surr: 4-Terphenyl-d14	0.031		0.1000		31.1	15	133	0	0	

Sample ID: **lcs-47936** SampType: **LCS** TestCode: **EPA Method 8270C TCLP**
Client ID: **LCSW** Batch ID: **47936** RunNo: **63667**
Prep Date: **10/4/2019** Analysis Date: **10/14/2019** SeqNo: **2175828** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.14	0.0010	0.1000	0	139	33.8	121			S
3+4-Methylphenol	0.33	0.0010	0.2000	0	163	33.6	109			S
2,4-Dinitrotoluene	0.14	0.0010	0.1000	0	144	50.4	124			S
Hexachlorobenzene	0.15	0.0010	0.1000	0	152	50.1	120			S
Hexachlorobutadiene	0.12	0.0010	0.1000	0	116	16.1	103			S
Hexachloroethane	0.11	0.0010	0.1000	0	112	15	94.2			S
Nitrobenzene	0.15	0.0010	0.1000	0	150	32.4	125			S
Pentachlorophenol	0.12	0.0010	0.1000	0	124	44.6	114			S
Pyridine	0.0031	0.0010	0.1000	0	3.08	15	67			S
2,4,5-Trichlorophenol	0.15	0.0010	0.1000	0	147	49.4	118			S
2,4,6-Trichlorophenol	0.16	0.0010	0.1000	0	160	50.3	116			S
Cresols, Total	0.46	0.0010	0.3000	0	155	33.8	109			S
Surr: 2-Fluorophenol	0.10		0.2000		50.0	15	82.5			
Surr: Phenol-d5	0.083		0.2000		41.6	15	74.2			
Surr: 2,4,6-Tribromophenol	0.14		0.2000		67.6	18.6	118			
Surr: Nitrobenzene-d5	0.081		0.1000		81.2	30.4	106			
Surr: 2-Fluorobiphenyl	0.073		0.1000		73.2	15	104			
Surr: 4-Terphenyl-d14	0.075		0.1000		74.8	15	133			

Sample ID: **mb-47936** SampType: **MBLK** TestCode: **EPA Method 8270C TCLP**
Client ID: **PBW** Batch ID: **47936** RunNo: **63667**
Prep Date: **10/4/2019** Analysis Date: **10/14/2019** SeqNo: **2175829** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	ND	200								
3+4-Methylphenol	ND	200								
2,4-Dinitrotoluene	ND	0.13								
Hexachlorobenzene	ND	0.13								
Hexachlorobutadiene	ND	0.50								
Hexachloroethane	ND	3.0								
Nitrobenzene	ND	2.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **mb-47936** SampType: **MBLK** TestCode: **EPA Method 8270C TCLP**
Client ID: **PBW** Batch ID: **47936** RunNo: **63667**
Prep Date: **10/4/2019** Analysis Date: **10/14/2019** SeqNo: **2175829** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Pentachlorophenol	ND	100								
Pyridine	ND	5.0								
2,4,5-Trichlorophenol	ND	400								
2,4,6-Trichlorophenol	ND	2.0								
Cresols, Total	ND	200								
Surr: 2-Fluorophenol	0.11		0.2000		53.1	15	82.5			
Surr: Phenol-d5	0.086		0.2000		42.9	15	74.2			
Surr: 2,4,6-Tribromophenol	0.15		0.2000		73.7	18.6	118			
Surr: Nitrobenzene-d5	0.076		0.1000		75.6	30.4	106			
Surr: 2-Fluorobiphenyl	0.071		0.1000		70.9	15	104			
Surr: 4-Terphenyl-d14	0.080		0.1000		80.0	15	133			

NOTES:
*See the case narrative for notes.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **lcs-1 99.8uS eC** SampType: **lcs** TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW** Batch ID: **R63466** RunNo: **63466**
Prep Date: Analysis Date: **10/7/2019** SeqNo: **2168649** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	98	5.0	99.80	0	98.7	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-47939** SampType: **MBLK** TestCode: **EPA Method 7470: Mercury**
Client ID: **PBW** Batch ID: **47939** RunNo: **63437**
Prep Date: **10/4/2019** Analysis Date: **10/4/2019** SeqNo: **2166383** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID: **LCS-47939** SampType: **LCS** TestCode: **EPA Method 7470: Mercury**
Client ID: **LCSW** Batch ID: **47939** RunNo: **63437**
Prep Date: **10/4/2019** Analysis Date: **10/4/2019** SeqNo: **2166384** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0050	0.00020	0.005000	0	99.0	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-A** SampType: **MBLK** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **PBW** Batch ID: **A64097** RunNo: **64097**
Prep Date: Analysis Date: **10/30/2019** SeqNo: **2192808** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	ND	1.0								
Magnesium	ND	1.0								
Potassium	ND	1.0								
Sodium	ND	1.0								

Sample ID: **LCS-A** SampType: **LCS** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSW** Batch ID: **A64097** RunNo: **64097**
Prep Date: Analysis Date: **10/30/2019** SeqNo: **2192809** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	52	1.0	50.00	0	104	80	120			
Magnesium	52	1.0	50.00	0	104	80	120			
Potassium	52	1.0	50.00	0	103	80	120			
Sodium	50	1.0	50.00	0	101	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-47925** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **47925** RunNo: **63528**
Prep Date: **10/3/2019** Analysis Date: **10/8/2019** SeqNo: **2170148** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Lead	ND	0.0050								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-47925** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **47925** RunNo: **63528**
Prep Date: **10/3/2019** Analysis Date: **10/8/2019** SeqNo: **2170150** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.46	0.020	0.5000	0	92.6	80	120			
Cadmium	0.48	0.0020	0.5000	0	95.6	80	120			
Chromium	0.47	0.0060	0.5000	0	94.4	80	120			
Lead	0.48	0.0050	0.5000	0	95.5	80	120			
Selenium	0.48	0.050	0.5000	0	96.3	80	120			
Silver	0.092	0.0050	0.1000	0	92.2	80	120			

Sample ID: **MB-47925** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **47925** RunNo: **63528**
Prep Date: **10/3/2019** Analysis Date: **10/8/2019** SeqNo: **2170241** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-47925** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **47925** RunNo: **63528**
Prep Date: **10/3/2019** Analysis Date: **10/8/2019** SeqNo: **2170243** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.47	0.020	0.5000	0	94.0	80	120			
Cadmium	0.48	0.0020	0.5000	0	96.4	80	120			
Chromium	0.48	0.0060	0.5000	0	95.2	80	120			
Selenium	0.47	0.050	0.5000	0	93.5	80	120			
Silver	0.093	0.0050	0.1000	0	93.2	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-47925** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **47925** RunNo: **63528**
Prep Date: **10/3/2019** Analysis Date: **10/8/2019** SeqNo: **2170263** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Lead	ND	0.0050								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-47925** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **47925** RunNo: **63528**
Prep Date: **10/3/2019** Analysis Date: **10/8/2019** SeqNo: **2170265** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.47	0.020	0.5000	0	94.7	80	120			
Cadmium	0.49	0.0020	0.5000	0	97.6	80	120			
Chromium	0.48	0.0060	0.5000	0	96.4	80	120			
Lead	0.48	0.0050	0.5000	0	96.6	80	120			
Selenium	0.47	0.050	0.5000	0	93.4	80	120			
Silver	0.094	0.0050	0.1000	0	93.9	80	120			

Sample ID: **MB-47925** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **47925** RunNo: **63599**
Prep Date: **10/3/2019** Analysis Date: **10/10/2019** SeqNo: **2172999** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.020								
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-47925** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **47925** RunNo: **63599**
Prep Date: **10/3/2019** Analysis Date: **10/10/2019** SeqNo: **2173001** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.45	0.020	0.5000	0	89.4	80	120			
Barium	0.45	0.020	0.5000	0	90.1	80	120			
Cadmium	0.44	0.0020	0.5000	0	88.6	80	120			
Chromium	0.44	0.0060	0.5000	0	88.1	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **LCS-47925** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **47925** RunNo: **63599**
Prep Date: **10/3/2019** Analysis Date: **10/10/2019** SeqNo: **2173001** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Selenium	0.46	0.050	0.5000	0	92.1	80	120			
Silver	0.088	0.0050	0.1000	0	88.1	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-R63747** SampType: **MBLK** TestCode: **CYANIDE, Reactive**
Client ID: **PBW** Batch ID: **R63747** RunNo: **63747**
Prep Date: Analysis Date: **10/15/2019** SeqNo: **2179127** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	ND	0.00500								

Sample ID: **LCS-R63747** SampType: **LCS** TestCode: **CYANIDE, Reactive**
Client ID: **LCSW** Batch ID: **R63747** RunNo: **63747**
Prep Date: Analysis Date: **10/15/2019** SeqNo: **2179128** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	0.101		0.1000	0	101	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-R63747** SampType: **MBLK** TestCode: **SULFIDE, Reactive**
Client ID: **PBW** Batch ID: **R63747** RunNo: **63747**
Prep Date: Analysis Date: **10/7/2019** SeqNo: **2179130** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	ND	0.050								

Sample ID: **LCS-R63747** SampType: **LCS** TestCode: **SULFIDE, Reactive**
Client ID: **LCSW** Batch ID: **R63747** RunNo: **63747**
Prep Date: Analysis Date: **10/7/2019** SeqNo: **2179131** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	0.47		0.5000	0	93.6	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **mb-1 alk** SampType: **mblk** TestCode: **SM2320B: Alkalinity**
Client ID: **PBW** Batch ID: **R63435** RunNo: **63435**
Prep Date: Analysis Date: **10/3/2019** SeqNo: **2166170** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20.00								

Sample ID: **lcs-1 alk** SampType: **lcs** TestCode: **SM2320B: Alkalinity**
Client ID: **LCSW** Batch ID: **R63435** RunNo: **63435**
Prep Date: Analysis Date: **10/3/2019** SeqNo: **2166171** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	79.64	20.00	80.00	0	99.6	90	110			

Sample ID: **mb-2 alk** SampType: **mblk** TestCode: **SM2320B: Alkalinity**
Client ID: **PBW** Batch ID: **R63435** RunNo: **63435**
Prep Date: Analysis Date: **10/3/2019** SeqNo: **2166193** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20.00								

Sample ID: **lcs-2 alk** SampType: **lcs** TestCode: **SM2320B: Alkalinity**
Client ID: **LCSW** Batch ID: **R63435** RunNo: **63435**
Prep Date: Analysis Date: **10/3/2019** SeqNo: **2166194** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	78.84	20.00	80.00	0	98.5	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **1910144-001CDUP** SampType: **DUP** TestCode: **Specific Gravity**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **R63579** RunNo: **63579**
Prep Date: Analysis Date: **10/10/2019** SeqNo: **2172149** Units:

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	0.9995	0						0.0600	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1910144**
01-Nov-19

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-47951** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **47951** RunNo: **63462**
Prep Date: **10/4/2019** Analysis Date: **10/7/2019** SeqNo: **2167775** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: **LCS-47951** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **47951** RunNo: **63462**
Prep Date: **10/4/2019** Analysis Date: **10/7/2019** SeqNo: **2167776** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1010	20.0	1000	0	101	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **NAVAJO REFINING CO** Work Order Number: **1910144** RcptNo: **1**

Received By: Juan Rojas **10/2/2019 9:30:00 AM**

Completed By: **Leah Baca** **10/2/2019 1:17:37 PM** Leah Baca

Reviewed By: LB 10/3/19

Chain of Custody

1. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
2. How was the sample delivered? Courier

Log In

3. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
4. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☑ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
8. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
9. VOA vials have zero headspace? Yes ☑ No ☐ No VOA Vials ☐
10. Were any sample containers received broken? Yes ☐ No ☑
11. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
12. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
13. Is it clear what analyses were requested? Yes ☑ No ☐
14. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 3 ; 2
(<2 or >12 unless noted)
Adjusted? NO
Checked by: DAD 10/3/19

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

16. Additional remarks:

17. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	0.8	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia,

NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush

Project Name:

Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 251841

Project Manager:

Robert Combs / Scott Denton / Randy Dade

Sampler: Brady Hubbard

On Ice: ☑ Yes ☐ No

Sample Temperature: -6-2=-8

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1910144	Specific Gravity, HCO3, CO3, Cl, SO4, TDS, pH, cond., Fl, Cation/anion bal., Br, Eh/40	VOCs/SW-846 Method 8260C (see attached list 'VOCs')	SVOCs/SW-846 Method 8270D (see attached list 'SVOCs')	R,C,I/40 CFR part 261	Metals/SW-846 Mthd 6010, 7470 (see attached list 'Metals')	Ca, K, Mg, Na/40 CFR 136.3	TCLP Metals, only /40 CFR Part 261/ SW-846 Method 1311	Chlordane 8081 A
9/30/19	16:05	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X	
9/30/19	16:05	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3						X	X		
9/30/19	16:05	Liquid	WDW-1, 2, & 3 Effluent	3	HCL			X						
9/30/19	16:05	Liquid	WDW-1, 2, & 3 Effluent	2	Neat				X					
9/30/19	16:05	Liquid	WDW-1, 2, & 3 Effluent	2	Neat					X				

Date	Time	Relinquished by	Received by	Date	Time
10-1-19	11:45	Brady Hubbard	carrier	10/2/19	9:30
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: Send results to Scott Denton, Mike Holder, Robert Combs and Randy Dade.

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

January 23, 2020

Robert Combs
Navajo Refining Company
P.O. Box 159
Artesia, NM 88211-0159
TEL: (575) 748-3311
FAX

RE: Quarterly WDW-1, 2, & 3 Inj Well OrderNo.: 2001084

Dear Robert Combs:

Hall Environmental Analysis Laboratory received 2 sample(s) on 1/3/2020 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. In order to properly interpret your results, it is imperative that you review this report in its entirety. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. When necessary, data qualifiers are provided on both the sample analysis report and the QC summary report, both sections should be reviewed. All samples are reported, as received, unless otherwise indicated. Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH and residual chlorine are qualified as being analyzed outside of the recommended holding time.

Please don't hesitate to contact HEAL for any additional information or clarifications.

ADHS Cert #AZ0682 -- NMED-DWB Cert #NM9425 -- NMED-Micro Cert #NM0901

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Case Narrative

WO#: **2001084**
Date: **1/23/2020**

CLIENT: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Analytical Notes for EPA Method 8270:
The laboratory control spike (LCS) recovery for pentachlorophenol was slightly low.

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 12/30/2019 1:35:00 PM
Lab ID: 2001084-001
Matrix: AQUEOUS
Received Date: 1/3/2020 9:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8081: PESTICIDES TCLP						Analyst: **JME**
Chlordane	ND	0.030		mg/L	1	1/14/2020 12:21:38 PM
Surr: Decachlorobiphenyl	77.0	29.4-99.8		%Rec	1	1/14/2020 12:21:38 PM
Surr: Tetrachloro-m-xylene	70.3	20.7-100		%Rec	1	1/14/2020 12:21:38 PM
EPA METHOD 300.0: ANIONS						Analyst: **MRA**
Fluoride	10	0.50	*	mg/L	5	1/3/2020 6:22:56 PM
Chloride	620	25	*	mg/L	50	1/8/2020 6:53:02 PM
Bromide	0.88	0.50		mg/L	5	1/3/2020 6:22:56 PM
Phosphorus, Orthophosphate (As P)	ND	2.5	H	mg/L	5	1/3/2020 6:22:56 PM
Sulfate	2200	25	*	mg/L	50	1/8/2020 6:53:02 PM
Nitrate+Nitrite as N	ND	1.0		mg/L	5	1/8/2020 7:05:55 PM
EPA METHOD 7470: MERCURY						Analyst: **pmf**
Mercury	ND	0.020		mg/L	1	1/7/2020 4:56:36 PM
EPA METHOD 6010B: DISSOLVED METALS						Analyst: **ELS**
Calcium	420	5.0		mg/L	5	1/9/2020 11:44:43 AM
Magnesium	130	5.0		mg/L	5	1/9/2020 11:44:43 AM
Potassium	52	5.0		mg/L	5	1/9/2020 11:44:43 AM
Sodium	650	10		mg/L	10	1/13/2020 9:07:35 AM
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: **ELS**
Arsenic	ND	5.0		mg/L	1	1/9/2020 8:33:50 AM
Barium	ND	100		mg/L	1	1/9/2020 8:33:50 AM
Cadmium	ND	1.0		mg/L	1	1/9/2020 8:33:50 AM
Chromium	ND	5.0		mg/L	1	1/9/2020 8:33:50 AM
Lead	ND	5.0		mg/L	1	1/9/2020 8:33:50 AM
Selenium	ND	1.0		mg/L	1	1/9/2020 8:33:50 AM
Silver	ND	5.0		mg/L	1	1/9/2020 8:33:50 AM
EPA METHOD 8270C TCLP						Analyst: **JDC**
2-Methylphenol	ND	200		mg/L	1	1/7/2020 1:06:40 PM
3+4-Methylphenol	ND	200		mg/L	1	1/7/2020 1:06:40 PM
2,4-Dinitrotoluene	ND	0.13		mg/L	1	1/7/2020 1:06:40 PM
Hexachlorobenzene	ND	0.13		mg/L	1	1/7/2020 1:06:40 PM
Hexachlorobutadiene	ND	0.50		mg/L	1	1/7/2020 1:06:40 PM
Hexachloroethane	ND	3.0		mg/L	1	1/7/2020 1:06:40 PM
Nitrobenzene	ND	2.0		mg/L	1	1/7/2020 1:06:40 PM
Pentachlorophenol	ND	100		mg/L	1	1/7/2020 1:06:40 PM
Pyridine	ND	5.0		mg/L	1	1/7/2020 1:06:40 PM
2,4,5-Trichlorophenol	ND	400		mg/L	1	1/7/2020 1:06:40 PM
2,4,6-Trichlorophenol	ND	2.0		mg/L	1	1/7/2020 1:06:40 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 12/30/2019 1:35:00 PM
Lab ID: 2001084-001
Matrix: AQUEOUS
Received Date: 1/3/2020 9:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
EPA METHOD 8270C TCLP						Analyst: **JDC**
Cresols, Total	ND	200		mg/L	1	1/7/2020 1:06:40 PM
Surr: 2-Fluorophenol	41.0	15-82.5		%Rec	1	1/7/2020 1:06:40 PM
Surr: Phenol-d5	38.0	15-74.2		%Rec	1	1/7/2020 1:06:40 PM
Surr: 2,4,6-Tribromophenol	58.6	18.6-118		%Rec	1	1/7/2020 1:06:40 PM
Surr: Nitrobenzene-d5	75.7	30.4-106		%Rec	1	1/7/2020 1:06:40 PM
Surr: 2-Fluorobiphenyl	61.1	15-104		%Rec	1	1/7/2020 1:06:40 PM
Surr: 4-Terphenyl-d14	54.8	15-133		%Rec	1	1/7/2020 1:06:40 PM
NOTES:						
* See the case narrative for notes.						
TCLP VOLATILES BY 8260B						Analyst: **DJF**
Benzene	ND	0.50		mg/L	1	1/6/2020 5:25:38 PM
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	1	1/6/2020 5:25:38 PM
2-Butanone	ND	200		mg/L	1	1/6/2020 5:25:38 PM
Carbon Tetrachloride	ND	0.50		mg/L	1	1/6/2020 5:25:38 PM
Chloroform	ND	6.0		mg/L	1	1/6/2020 5:25:38 PM
1,4-Dichlorobenzene	ND	7.5		mg/L	1	1/6/2020 5:25:38 PM
1,1-Dichloroethene	ND	0.70		mg/L	1	1/6/2020 5:25:38 PM
Tetrachloroethene (PCE)	ND	0.70		mg/L	1	1/6/2020 5:25:38 PM
Trichloroethene (TCE)	ND	0.50		mg/L	1	1/6/2020 5:25:38 PM
Vinyl chloride	ND	0.20		mg/L	1	1/6/2020 5:25:38 PM
Chlorobenzene	ND	100		mg/L	1	1/6/2020 5:25:38 PM
Surr: 1,2-Dichloroethane-d4	91.5	70-130		%Rec	1	1/6/2020 5:25:38 PM
Surr: 4-Bromofluorobenzene	92.6	70-130		%Rec	1	1/6/2020 5:25:38 PM
Surr: Dibromofluoromethane	106	70-130		%Rec	1	1/6/2020 5:25:38 PM
Surr: Toluene-d8	96.9	70-130		%Rec	1	1/6/2020 5:25:38 PM
CORROSIVITY						Analyst: **PAC**
pH	7.39			su	1	1/13/2020
IGNITABILITY METHOD 1010						Analyst: **PAC**
Ignitability	>170			°F	1	1/10/2020
OXIDATION REDUCTION POTENTIAL						Analyst: **PAC**
Oxidation-Reduction Potential	80			mV	1	1/8/2020
CYANIDE, REACTIVE						Analyst: **PAC**
Cyanide, Reactive	0.00549	0.00500		mg/L	1	1/9/2020
SULFIDE, REACTIVE						Analyst: **PAC**
Reactive Sulfide	0.050	0.050		mg/L	1	1/8/2020
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

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H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 12/30/2019 1:35:00 PM
Lab ID: 2001084-001
Matrix: AQUEOUS
Received Date: 1/3/2020 9:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**
Conductivity	6400	5.0		µmhos/c	1	1/7/2020 3:14:21 PM
SM2320B: ALKALINITY						Analyst: **JRR**
Bicarbonate (As CaCO3)	460.7	20.00		mg/L Ca	1	1/7/2020 3:14:21 PM
Carbonate (As CaCO3)	ND	2.000		mg/L Ca	1	1/7/2020 3:14:21 PM
Total Alkalinity (as CaCO3)	460.7	20.00		mg/L Ca	1	1/7/2020 3:14:21 PM
SPECIFIC GRAVITY						Analyst: **JRR**
Specific Gravity	1.010	0			1	1/16/2020 1:10:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **JMT**
Total Dissolved Solids	4480	20.0	*	mg/L	1	1/7/2020 1:59:00 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date:
Lab ID: 2001084-002
Matrix: TRIP BLANK
Received Date: 1/3/2020 9:00:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
TCLP VOLATILES BY 8260B						Analyst: **DJF**
Benzene	ND	0.50		mg/L	1	1/6/2020 5:55:01 PM
1,2-Dichloroethane (EDC)	ND	0.50		mg/L	1	1/6/2020 5:55:01 PM
2-Butanone	ND	200		mg/L	1	1/6/2020 5:55:01 PM
Carbon Tetrachloride	ND	0.50		mg/L	1	1/6/2020 5:55:01 PM
Chloroform	ND	6.0		mg/L	1	1/6/2020 5:55:01 PM
1,4-Dichlorobenzene	ND	7.5		mg/L	1	1/6/2020 5:55:01 PM
1,1-Dichloroethene	ND	0.70		mg/L	1	1/6/2020 5:55:01 PM
Tetrachloroethene (PCE)	ND	0.70		mg/L	1	1/6/2020 5:55:01 PM
Trichloroethene (TCE)	ND	0.50		mg/L	1	1/6/2020 5:55:01 PM
Vinyl chloride	ND	0.20		mg/L	1	1/6/2020 5:55:01 PM
Chlorobenzene	ND	100		mg/L	1	1/6/2020 5:55:01 PM
Surr: 1,2-Dichloroethane-d4	101	70-130		%Rec	1	1/6/2020 5:55:01 PM
Surr: 4-Bromofluorobenzene	96.0	70-130		%Rec	1	1/6/2020 5:55:01 PM
Surr: Dibromofluoromethane	115	70-130		%Rec	1	1/6/2020 5:55:01 PM
Surr: Toluene-d8	97.8	70-130		%Rec	1	1/6/2020 5:55:01 PM

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
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S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB** SampType: **mblk** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R65559** RunNo: **65559**
Prep Date: Analysis Date: **1/3/2020** SeqNo: **2252044** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Bromide	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								

Sample ID: **LCS** SampType: **lcs** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R65559** RunNo: **65559**
Prep Date: Analysis Date: **1/3/2020** SeqNo: **2252045** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.49	0.10	0.5000	0	98.6	90	110			
Bromide	2.4	0.10	2.500	0	97.6	90	110			
Phosphorus, Orthophosphate (As P	4.6	0.50	5.000	0	91.8	90	110			

Sample ID: **MB** SampType: **mblk** TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW** Batch ID: **R65656** RunNo: **65656**
Prep Date: Analysis Date: **1/8/2020** SeqNo: **2255102** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								
Sulfate	ND	0.50								
Nitrate+Nitrite as N	ND	0.20								

Sample ID: **LCS** SampType: **lcs** TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW** Batch ID: **R65656** RunNo: **65656**
Prep Date: Analysis Date: **1/8/2020** SeqNo: **2255103** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.7	0.50	5.000	0	94.9	90	110			
Sulfate	9.6	0.50	10.00	0	95.5	90	110			
Nitrate+Nitrite as N	3.4	0.20	3.500	0	97.0	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **RB** SampType: **MBLK** TestCode: **TCLP Volatiles by 8260B**
Client ID: **PBW** Batch ID: **T65591** RunNo: **65591**
Prep Date: Analysis Date: **1/6/2020** SeqNo: **2252856** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
2-Butanone	ND	200								
Carbon Tetrachloride	ND	0.50								
Chloroform	ND	6.0								
1,4-Dichlorobenzene	ND	7.5								
1,1-Dichloroethene	ND	0.70								
Tetrachloroethene (PCE)	ND	0.70								
Trichloroethene (TCE)	ND	0.50								
Vinyl chloride	ND	0.20								
Chlorobenzene	ND	100								
Surr: 1,2-Dichloroethane-d4	0.0092		0.01000		91.8	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		99.7	70	130			
Surr: Dibromofluoromethane	0.011		0.01000		105	70	130			
Surr: Toluene-d8	0.0096		0.01000		96.2	70	130			

Sample ID: **100ng lcs** SampType: **LCS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **LCSW** Batch ID: **T65591** RunNo: **65591**
Prep Date: Analysis Date: **1/6/2020** SeqNo: **2252859** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	0.50	0.02000	0	93.3	70	130			
1,1-Dichloroethene	ND	0.70	0.02000	0	94.9	70	130			
Trichloroethene (TCE)	ND	0.50	0.02000	0	89.2	70	130			
Chlorobenzene	ND	100	0.02000	0	88.5	70	130			
Surr: 1,2-Dichloroethane-d4	0.0093		0.01000		92.5	70	130			
Surr: 4-Bromofluorobenzene	0.0096		0.01000		95.9	70	130			
Surr: Dibromofluoromethane	0.0096		0.01000		96.1	70	130			
Surr: Toluene-d8	0.0099		0.01000		99.3	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **mb-49628** SampType: **MBLK** TestCode: **EPA Method 8270C TCLP**
Client ID: **PBW** Batch ID: **49628** RunNo: **65621**
Prep Date: **1/6/2020** Analysis Date: **1/7/2020** SeqNo: **2254214** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	ND	200								
3+4-Methylphenol	ND	200								
2,4-Dinitrotoluene	ND	0.13								
Hexachlorobenzene	ND	0.13								
Hexachlorobutadiene	ND	0.50								
Hexachloroethane	ND	3.0								
Nitrobenzene	ND	2.0								
Pentachlorophenol	ND	100								
Pyridine	ND	5.0								
2,4,5-Trichlorophenol	ND	400								
2,4,6-Trichlorophenol	ND	2.0								
Cresols, Total	ND	200								
Surr: 2-Fluorophenol	0.091		0.2000		45.4	15	82.5			
Surr: Phenol-d5	0.080		0.2000		40.2	15	74.2			
Surr: 2,4,6-Tribromophenol	0.14		0.2000		69.7	18.6	118			
Surr: Nitrobenzene-d5	0.078		0.1000		77.9	30.4	106			
Surr: 2-Fluorobiphenyl	0.076		0.1000		75.8	15	104			
Surr: 4-Terphenyl-d14	0.077		0.1000		77.2	15	133			

Sample ID: **lcs-49628** SampType: **LCS** TestCode: **EPA Method 8270C TCLP**
Client ID: **LCSW** Batch ID: **49628** RunNo: **65621**
Prep Date: **1/6/2020** Analysis Date: **1/7/2020** SeqNo: **2254215** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.069	0.010	0.1000	0	69.0	33.8	121			
3+4-Methylphenol	0.13	0.010	0.2000	0	64.5	33.6	109			
2,4-Dinitrotoluene	0.064	0.010	0.1000	0	63.8	50.4	124			
Hexachlorobenzene	0.069	0.010	0.1000	0	69.5	50.1	120			
Hexachlorobutadiene	0.066	0.010	0.1000	0	66.2	16.1	103			
Hexachloroethane	0.056	0.010	0.1000	0	56.0	15	94.2			
Nitrobenzene	0.071	0.010	0.1000	0	70.8	32.4	125			
Pentachlorophenol	0.043	0.010	0.1000	0	43.2	44.6	114			S
Pyridine	0.067	0.010	0.1000	0	66.6	15	67			
2,4,5-Trichlorophenol	0.069	0.010	0.1000	0	68.8	49.4	118			
2,4,6-Trichlorophenol	0.061	0.010	0.1000	0	61.1	50.3	116			
Cresols, Total	0.20	0.010	0.3000	0	66.0	33.8	109			
Surr: 2-Fluorophenol	0.096		0.2000		48.2	15	82.5			
Surr: Phenol-d5	0.085		0.2000		42.3	15	74.2			
Surr: 2,4,6-Tribromophenol	0.12		0.2000		60.4	18.6	118			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **lcs-49628** SampType: **LCS** TestCode: **EPA Method 8270C TCLP**
Client ID: **LCSW** Batch ID: **49628** RunNo: **65621**
Prep Date: **1/6/2020** Analysis Date: **1/7/2020** SeqNo: **2254215** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Nitrobenzene-d5	0.077		0.1000		77.2	30.4	106			
Surr: 2-Fluorobiphenyl	0.071		0.1000		71.0	15	104			
Surr: 4-Terphenyl-d14	0.073		0.1000		72.8	15	133			

NOTES:
* See the case narrative for analytical notes

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **lcs-1 99.9uS eC** SampType: **lcs** TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW** Batch ID: **R65634** RunNo: **65634**
Prep Date: Analysis Date: **1/7/2020** SeqNo: **2254575** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	100	5.0	99.90	0	100	85	115			

Sample ID: **lcs-2 99.9uS eC** SampType: **lcs** TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW** Batch ID: **R65634** RunNo: **65634**
Prep Date: Analysis Date: **1/7/2020** SeqNo: **2254601** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	100	5.0	99.90	0	101	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-49667** SampType: **MBLK** TestCode: **EPA Method 7470: Mercury**
Client ID: **PBW** Batch ID: **49667** RunNo: **65616**
Prep Date: **1/7/2020** Analysis Date: **1/7/2020** SeqNo: **2253871** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID: **LCSLL-49667** SampType: **LCSLL** TestCode: **EPA Method 7470: Mercury**
Client ID: **BatchQC** Batch ID: **49667** RunNo: **65616**
Prep Date: **1/7/2020** Analysis Date: **1/7/2020** SeqNo: **2253872** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020	0.0001500	0	76.7	50	150			

Sample ID: **LCS-49667** SampType: **LCS** TestCode: **EPA Method 7470: Mercury**
Client ID: **LCSW** Batch ID: **49667** RunNo: **65616**
Prep Date: **1/7/2020** Analysis Date: **1/7/2020** SeqNo: **2253873** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0049	0.00020	0.005000	0	97.5	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **PBW** Batch ID: **A65667** RunNo: **65667**
Prep Date: Analysis Date: **1/9/2020** SeqNo: **2255583** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	ND	1.0								
Magnesium	ND	1.0								
Potassium	ND	1.0								

Sample ID: **LCS** SampType: **LCS** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSW** Batch ID: **A65667** RunNo: **65667**
Prep Date: Analysis Date: **1/9/2020** SeqNo: **2255584** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	51	1.0	50.00	0	102	80	120			
Magnesium	51	1.0	50.00	0	101	80	120			
Potassium	50	1.0	50.00	0	100	80	120			

Sample ID: **MB** SampType: **MBLK** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **PBW** Batch ID: **A65725** RunNo: **65725**
Prep Date: Analysis Date: **1/13/2020** SeqNo: **2257503** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sodium	ND	1.0								

Sample ID: **LCS** SampType: **LCS** TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSW** Batch ID: **A65725** RunNo: **65725**
Prep Date: Analysis Date: **1/13/2020** SeqNo: **2257505** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sodium	50	1.0	50.00	0	100	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-49636** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **49636** RunNo: **65667**
Prep Date: **1/6/2020** Analysis Date: **1/9/2020** SeqNo: **2255552** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.020								
Barium	ND	0.020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Lead	ND	0.0050								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-49636** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **49636** RunNo: **65667**
Prep Date: **1/6/2020** Analysis Date: **1/9/2020** SeqNo: **2255556** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.46	0.020	0.5000	0	92.3	80	120			
Barium	0.47	0.020	0.5000	0	94.6	80	120			
Cadmium	0.47	0.0020	0.5000	0	94.2	80	120			
Chromium	0.46	0.0060	0.5000	0	92.8	80	120			
Lead	0.48	0.0050	0.5000	0	95.6	80	120			
Selenium	0.47	0.050	0.5000	0	94.4	80	120			
Silver	0.098	0.0050	0.1000	0	97.6	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-R66014** SampType: **MBLK** TestCode: **CYANIDE, Reactive**
Client ID: **PBW** Batch ID: **R66014** RunNo: **66014**
Prep Date: Analysis Date: **1/9/2020** SeqNo: **2267180** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	ND	0.00500								

Sample ID: **LCS-R66014** SampType: **LCS** TestCode: **CYANIDE, Reactive**
Client ID: **LCSW** Batch ID: **R66014** RunNo: **66014**
Prep Date: Analysis Date: **1/9/2020** SeqNo: **2267181** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	0.103		0.1000	0	103	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-R66014** SampType: **MBLK** TestCode: **SULFIDE, Reactive**
Client ID: **PBW** Batch ID: **R66014** RunNo: **66014**
Prep Date: Analysis Date: **1/8/2020** SeqNo: **2267183** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	ND	0.0050								

Sample ID: **LCS-R66014** SampType: **LCS** TestCode: **SULFIDE, Reactive**
Client ID: **LCSW** Batch ID: **R66014** RunNo: **66014**
Prep Date: Analysis Date: **1/8/2020** SeqNo: **2267184** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	0.53		0.5000	0	106	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **mb-1 alk** SampType: **mblk** TestCode: **SM2320B: Alkalinity**
Client ID: **PBW** Batch ID: **R65634** RunNo: **65634**
Prep Date: Analysis Date: **1/7/2020** SeqNo: **2254554** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	ND	20.00								

Sample ID: **lcs-1 alk** SampType: **lcs** TestCode: **SM2320B: Alkalinity**
Client ID: **LCSW** Batch ID: **R65634** RunNo: **65634**
Prep Date: Analysis Date: **1/7/2020** SeqNo: **2254555** Units: **mg/L CaCO3**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	75.80	20.00	80.00	0	94.7	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2001084**
23-Jan-20

Client: Navajo Refining Company
Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID: **MB-49644** SampType: **MBLK** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW** Batch ID: **49644** RunNo: **65609**
Prep Date: **1/6/2020** Analysis Date: **1/7/2020** SeqNo: **2253491** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	ND	20.0								

Sample ID: **LCS-49644** SampType: **LCS** TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW** Batch ID: **49644** RunNo: **65609**
Prep Date: **1/6/2020** Analysis Date: **1/7/2020** SeqNo: **2253492** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1010	20.0	1000	0	101	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of range due to dilution or matrix		

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental Analysis Laboratory
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975 FAX: 505-345-4107
Website: www.hallenvironmental.com

Sample Log-In Check List

Client Name: **NAVAJO REFINING CO** Work Order Number: **2001084** RcptNo: **1**

Received By: **Yazmine Garduno** **1/3/2020 9:00:00 AM** [signature]

Completed By: **Yazmine Garduno** **1/3/2020 3:20:50 PM** [signature]

Reviewed By: DAD 1/3/20

Chain of Custody

1. Is Chain of Custody sufficiently complete? Yes ☑ No ☐ Not Present ☐
2. How was the sample delivered? FedEx

Log In

3. Was an attempt made to cool the samples? Yes ☑ No ☐ NA ☐
4. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
5. Sample(s) in proper container(s)? Yes ☑ No ☐
6. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
7. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
8. Was preservative added to bottles? Yes ☐ No ☑ NA ☐
9. Received at least 1 vial with headspace <1/4" for AQ VOA? Yes ☑ No ☐ NA ☐
10. Were any sample containers received broken? Yes ☐ No ☑
11. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
12. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
13. Is it clear what analyses were requested? Yes ☑ No ☐
14. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

# of preserved bottles checked for pH: 3 2 (<2 or >12 unless noted)
Adjusted? NO
Checked by: JR 1/3/20

Special Handling (if applicable)

15. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified: Date
By Whom: Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:
Client Instructions:

16. Additional remarks:

17. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	0.5	Good				

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia,

NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush

Project Name:

Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 251841

Project Manager:

Robert Combs / Scott Denton / Randy Dade

Sampler: Brady Hubbard

On Ice: X Yes ☐ No

Sample Temperature: 0.6-0.1-0.5

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

Tel. 505-345-3975 Fax 505-345-4107

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 2001084	Specific Gravity, HCO3, CO3, Cl, SO4, TDS, pH, cond., Fl, Cation/anion bal., Br, Eh/40	VOCs/SW-846 Method 8260C (see attached list 'VOCs')	SVOCs/SW-846 Method 8270D (see attached list 'SVOCs')	R,C,I/40 CFR part 261	Metals/SW-846 Mthd 6010, 7470 (see attached list 'Metals')	Ca, K, Mg, Na/40 CFR 136.3	TCLP Metals, only /40 CFR Part 261/ SW-846 Method 1311	Chlordane 8081 A
12/30/19	13:35	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X	
12/30/19	13:35	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3						X	X		
12/30/19	13:35	Liquid	WDW-1, 2, & 3 Effluent	3	HCL			X						
12/30/19	13:35	Liquid	WDW-1, 2, & 3 Effluent	2	Neat				X					
12/30/19	13:35	Liquid	WDW-1, 2, & 3 Effluent	2	Neat					X				X

Date:	Time:	Relinquished by:	Received by:	Date	Time
1.2.20	16:25	Brady Hubbard			
Date:	Time:	Relinquished by:	Received by:	Date	Time
			FED EX	1/3/20	0900

Remarks: Send results to Scott Denton, Mike Holder, Robert Combs and Randy Dade.

Field Details: 7.50 pH, 33.3°C

Outside Temp: 43°F, 30% Humidity, Wind: SW 6mph, Conditions: Clear

If necessary, samples submitted to Hall Environmental may be subcontracted to other accredited laboratories. This serves as notice of this possibility. Any sub-contracted data will be clearly notated on the analytical report.

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

April 02, 2019

ROBERT COMBS

HOLLYFRONTIER NAVAJO REFINING

501 EAST MAIN STREET

ARTESIA, NM 88210

RE: WW MONITORING

Enclosed are the results of analyses for samples received by the laboratory on 03/13/19 14:30.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-18-11. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Total Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Cardinal Laboratories is accredited through the State of New Mexico Environment Department for:

Method SM 9223-B	Total Coliform and E. coli (Colilert MMO-MUG)
Method EPA 524.2	Regulated VOCs and Total Trihalomethanes (TTHM)
Method EPA 552.2	Total Haloacetic Acids (HAA-5)

Accreditation applies to public drinking water matrices for State of Colorado and New Mexico.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WW EFFLUENT TO WDW - 1	H900996-01	Wastewater	12-Mar-19 10:00	13-Mar-19 14:30

Cardinal Laboratories

*=Accredited Analyte

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WW EFFLUENT TO WDW - 1

H900996-01 (Wastewater)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories										
Inorganic Compounds										
Ammonia	**52.2**		1.25	mg/L	25	9031909	AC	19-Mar-19	350.1	
Biochemical Oxygen Demand	**68.0**			mg/L	1	9032907	CK	19-Mar-19	SM 5210B	SUB-AA
Chloride*	**790**		4.00	mg/L	1	9031501	AC	18-Mar-19	4500-Cl-B	
General Heterotrophic Bacteria	<3.00		3.00	MPN/mL	1	9012315	CK	01-Apr-19	GHB	SUB_LS
Sulfate*	**1770**		250	mg/L	25	9031908	AC	19-Mar-19	375.4	
TDS*	**3640**		5.00	mg/L	1	9031208	AC	18-Mar-19	160.1	
Alkalinity, Total*	**344**		4.00	mg/L	1	9031804	AC	18-Mar-19	310.1	
TSS*	**78.0**		2.00	mg/L	1	9031502	AC	18-Mar-19	160.2	
Volatile Organic Compounds by EPA Method 8260B										
Benzene*	**0.002**	0.001	0.005	mg/L	10	9030810	ms	14-Mar-19	8260B	J
Toluene*	**0.002**	0.001	0.005	mg/L	10	9030810	ms	14-Mar-19	8260B	J
Ethylbenzene*	<0.0007	0.0007	0.005	mg/L	10	9030810	ms	14-Mar-19	8260B	
Total Xylenes*	**0.025**	0.003	0.015	mg/L	10	9030810	ms	14-Mar-19	8260B	
Total BTEX	**0.030**	0.004	0.030	mg/L	10	9030810	ms	14-Mar-19	8260B	
Surrogate: Dibromofluoromethane			*99.2 %*	*86.5-122*		*9030810*	ms	*14-Mar-19*	*8260B*	
Surrogate: Toluene-d8			*101 %*	*85.7-112*		*9030810*	ms	*14-Mar-19*	*8260B*	
Surrogate: 4-Bromofluorobenzene			*99.9 %*	*86.3-117*		*9030810*	ms	*14-Mar-19*	*8260B*	
Green Analytical Laboratories										
General Chemistry										
Cyanide, Total*	**0.0127**		0.0100	mg/L	1	B903139	LLG	15-Mar-19	EPA335.4	M5
Fluoride*	**9.70**		0.500	mg/L	5	B903202	JDA	22-Mar-19	4500-F- C	
Nitrate/Nitrite as N*	**0.537**		0.200	mg/L	10	B903159	LLG	19-Mar-19	EPA353.2	
Total Kjeldahl Nitrogen*	**59.7**		0.500	mg/L	1	B903162	LLG	22-Mar-19	EPA351.2	

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Celey D. Keene, Lab Director/Quality Manager

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

WW EFFLUENT TO WDW - 1

H900996-01 (Wastewater)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Green Analytical Laboratories										
Total Recoverable Metals by ICP (E200.7)										
Boron	<0.300		0.300	mg/L	1	B903150	AES	19-Mar-19	EPA200.7	
Calcium*	**538**		0.500	mg/L	5	B903150	AES	19-Mar-19	EPA200.7	
Iron*	**3.57**		0.050	mg/L	1	B903150	AES	19-Mar-19	EPA200.7	
Magnesium*	**164**		0.500	mg/L	5	B903150	AES	19-Mar-19	EPA200.7	
Potassium*	**44.2**		1.00	mg/L	1	B903150	AES	19-Mar-19	EPA200.7	
Sodium*	**548**		5.00	mg/L	5	B903150	AES	19-Mar-19	EPA200.7	
Strontium*	**6.92**		0.100	mg/L	1	B903150	AES	19-Mar-19	EPA200.7	
Total Recoverable Metals by ICPMS (E200.8)										
Barium*	**0.0523**		0.0005	mg/L	1	B903152	AES	22-Mar-19	EPA200.8	
Selenium*	**0.0278**		0.0010	mg/L	1	B903152	AES	22-Mar-19	EPA200.8	

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9031208 - Filtration										
Blank (9031208-BLK1)				Prepared: 12-Mar-19 Analyzed: 14-Mar-19						
TDS	5.00	5.00	mg/L							
LCS (9031208-BS1)				Prepared: 12-Mar-19 Analyzed: 14-Mar-19						
TDS	514		mg/L	527		97.5	80-120			
Duplicate (9031208-DUP1)		**Source: H900963-01**		Prepared: 12-Mar-19 Analyzed: 14-Mar-19						
TDS	1130	5.00	mg/L		1160			2.27	20	
Batch 9031501 - General Prep - Wet Chem										
Blank (9031501-BLK1)				Prepared: 15-Mar-19 Analyzed: 18-Mar-19						
Chloride	ND	4.00	mg/L							
LCS (9031501-BS1)				Prepared: 15-Mar-19 Analyzed: 18-Mar-19						
Chloride	100	4.00	mg/L	100		100	80-120			
LCS Dup (9031501-BSD1)				Prepared: 15-Mar-19 Analyzed: 18-Mar-19						
Chloride	100	4.00	mg/L	100		100	80-120	0.00	20	
Duplicate (9031501-DUP1)		**Source: H900961-01**		Prepared: 15-Mar-19 Analyzed: 18-Mar-19						
Chloride	160	4.00	mg/L		160			0.00	20	
Matrix Spike (9031501-MS1)		**Source: H900961-01**		Prepared: 15-Mar-19 Analyzed: 18-Mar-19						
Chloride	260	4.00	mg/L	100	160	100	80-120			
Batch 9031502 - Filtration										
Blank (9031502-BLK1)				Prepared: 15-Mar-19 Analyzed: 19-Mar-19						
TSS	ND	2.00	mg/L							

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9031502 - Filtration										
Duplicate (9031502-DUP1)		**Source: H900979-01**		Prepared: 15-Mar-19 Analyzed: 19-Mar-19						
TSS	115	2.00	mg/L		69.0			50.0	52.7	
Batch 9031804 - General Prep - Wet Chem										
Blank (9031804-BLK1)				Prepared & Analyzed: 18-Mar-19						
Alkalinity, Total	4.00	4.00	mg/L							
LCS (9031804-BS1)				Prepared & Analyzed: 18-Mar-19						
Alkalinity, Total	260	10.0	mg/L	250		104	80-120			
LCS Dup (9031804-BSD1)				Prepared & Analyzed: 18-Mar-19						
Alkalinity, Total	240	10.0	mg/L	250		96.0	80-120	8.00	20	
Duplicate (9031804-DUP1)		**Source: H900983-01**		Prepared & Analyzed: 18-Mar-19						
Alkalinity, Total	596	4.00	mg/L		600			0.669	20	
Matrix Spike (9031804-MS1)		**Source: H900983-01**		Prepared & Analyzed: 18-Mar-19						
Alkalinity, Total	820	10.0	mg/L	250	600	88.0	70-130			
Batch 9031908 - General Prep - Wet Chem										
Blank (9031908-BLK1)				Prepared & Analyzed: 19-Mar-19						
Sulfate	ND	10.0	mg/L							
LCS (9031908-BS1)				Prepared & Analyzed: 19-Mar-19						
Sulfate	22.7	10.0	mg/L	20.0		113	80-120			

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9031908 - General Prep - Wet Chem										
LCS Dup (9031908-BSD1)				Prepared & Analyzed: 19-Mar-19						
Sulfate	23.0	10.0	mg/L	20.0		115	80-120	1.31	20	
Duplicate (9031908-DUP1)		**Source: H900994-01**		Prepared & Analyzed: 19-Mar-19						
Sulfate	514	10.0	mg/L		519			0.871	20	
Matrix Spike (9031908-MS1)		**Source: H900994-01**		Prepared & Analyzed: 19-Mar-19						
Sulfate	737	125	mg/L	250	519	87.3	70-130			
Batch 9031909 - General Prep - Wet Chem										
Blank (9031909-BLK1)				Prepared & Analyzed: 19-Mar-19						
Ammonia	ND	0.0500	mg/L							
LCS (9031909-BS1)				Prepared & Analyzed: 19-Mar-19						
Ammonia	1.71	0.0500	mg/L	2.00		85.5	80-120			
Duplicate (9031909-DUP1)		**Source: H900996-01**		Prepared & Analyzed: 19-Mar-19						
Ammonia	54.5	0.0500	mg/L		52.2			4.22	20	
Matrix Spike (9031909-MS1)		**Source: H900996-01**		Prepared & Analyzed: 19-Mar-19						
Ammonia	198	4.17	mg/L	167	52.2	87.6	70-130			
Batch 9032907 - General Prep										
Blank (9032907-BLK1)				Prepared: 14-Mar-19 Analyzed: 19-Mar-19						
Biochemical Oxygen Demand	0.0400		mg/L							

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9032907 - General Prep										
LCS (9032907-BS1)				Prepared: 14-Mar-19 Analyzed: 19-Mar-19						
Biochemical Oxygen Demand	216		mg/L	198		109	85-115			
LCS Dup (9032907-BSD1)				Prepared: 14-Mar-19 Analyzed: 19-Mar-19						
Biochemical Oxygen Demand	208		mg/L	198		105	85-115	4.08	20	

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Volatile Organic Compounds by EPA Method 8260B - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9030810 - Volatiles										
Blank (9030810-BLK1)				Prepared: 08-Mar-19 Analyzed: 13-Mar-19						
Benzene	ND	0.0005	mg/L							
Toluene	ND	0.0005	mg/L							
Ethylbenzene	ND	0.0005	mg/L							
Total Xylenes	ND	0.002	mg/L							
Total BTEX	ND	0.003	mg/L							
Surrogate: Dibromofluoromethane	*0.0240*		mg/L	*0.0250*		*96.0*	*86.5-122*			
Surrogate: Toluene-d8	*0.0251*		mg/L	*0.0250*		*101*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0249*		mg/L	*0.0250*		*99.5*	*86.3-117*			
LCS (9030810-BS1)				Prepared: 08-Mar-19 Analyzed: 13-Mar-19						
Benzene	0.020	0.0005	mg/L	0.0200		102	84.9-121			
Toluene	0.021	0.0005	mg/L	0.0200		103	76.1-122			
Ethylbenzene	0.021	0.0005	mg/L	0.0200		103	78.5-126			
m+p - Xylene	0.041	0.001	mg/L	0.0400		103	81.1-129			
Total Xylenes	0.062	0.002	mg/L	0.0600		103	80.2-130			
o-Xylene	0.020	0.0005	mg/L	0.0200		102	77.5-134			
Surrogate: Dibromofluoromethane	*0.0252*		mg/L	*0.0250*		*101*	*86.5-122*			
Surrogate: Toluene-d8	*0.0250*		mg/L	*0.0250*		*99.9*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0246*		mg/L	*0.0250*		*98.6*	*86.3-117*			
LCS Dup (9030810-BSD1)				Prepared: 08-Mar-19 Analyzed: 13-Mar-19						
Benzene	0.021	0.0005	mg/L	0.0200		103	84.9-121	1.07	7.79	
Toluene	0.020	0.0005	mg/L	0.0200		102	76.1-122	0.293	9.78	
Ethylbenzene	0.020	0.0005	mg/L	0.0200		102	78.5-126	1.31	8.74	
m+p - Xylene	0.041	0.001	mg/L	0.0400		102	81.1-129	0.850	8.94	
Total Xylenes	0.061	0.002	mg/L	0.0600		102	80.2-130	0.961	9.04	
o-Xylene	0.020	0.0005	mg/L	0.0200		101	77.5-134	1.19	11.4	
Surrogate: Dibromofluoromethane	*0.0251*		mg/L	*0.0250*		*100*	*86.5-122*			
Surrogate: Toluene-d8	*0.0248*		mg/L	*0.0250*		*99.1*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0250*		mg/L	*0.0250*		*99.9*	*86.3-117*			

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9030810 - Volatiles										
Matrix Spike (9030810-MS1)		**Source: H900905-01**		Prepared: 08-Mar-19 Analyzed: 14-Mar-19						
Benzene	0.845	0.025	mg/L	1.00	0.869	NR	47.6-148			QM-07
Toluene	1.61	0.025	mg/L	1.00	1.79	NR	41.4-144			QM-07
Ethylbenzene	0.416	0.025	mg/L	1.00	0.600	NR	40.6-151			QM-07
m+p - Xylene	0.694	0.050	mg/L	2.00	1.04	NR	42-155			QM-07
Total Xylenes	1.00	0.075	mg/L	3.00	1.48	NR	42.4-153			QM-07
o-Xylene	0.310	0.025	mg/L	1.00	0.440	NR	42.6-152			QM-07
Surrogate: Dibromofluoromethane	*1.24*		mg/L	*1.25*		*99.0*	*86.5-122*			
Surrogate: Toluene-d8	*1.26*		mg/L	*1.25*		*101*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*1.27*		mg/L	*1.25*		*101*	*86.3-117*			
Matrix Spike Dup (9030810-MSD1)		**Source: H900905-01**		Prepared: 08-Mar-19 Analyzed: 14-Mar-19						
Benzene	0.850	0.025	mg/L	1.00	0.869	NR	47.6-148	0.561	12.5	QM-07
Toluene	1.59	0.025	mg/L	1.00	1.79	NR	41.4-144	1.33	11.5	QM-07
Ethylbenzene	0.424	0.025	mg/L	1.00	0.600	NR	40.6-151	1.97	17.6	QM-07
m+p - Xylene	0.700	0.050	mg/L	2.00	1.04	NR	42-155	0.842	18.6	QM-07
o-Xylene	0.307	0.025	mg/L	1.00	0.440	NR	42.6-152	0.971	18.1	QM-07
Total Xylenes	1.01	0.075	mg/L	3.00	1.48	NR	42.4-153	0.286	18.3	QM-07
Surrogate: Dibromofluoromethane	*1.25*		mg/L	*1.25*		*99.7*	*86.5-122*			
Surrogate: Toluene-d8	*1.25*		mg/L	*1.25*		*99.9*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*1.25*		mg/L	*1.25*		*100*	*86.3-117*			

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Celey D. Keene, Lab Director/Quality Manager

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

General Chemistry - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B903139 - General Prep - Wet Chem										
Blank (B903139-BLK1)				Prepared: 14-Mar-19 Analyzed: 15-Mar-19						
Cyanide, Total	ND	0.0100	mg/L							
LCS (B903139-BS1)				Prepared: 14-Mar-19 Analyzed: 15-Mar-19						
Cyanide, Total	0.0958	0.0100	mg/L	0.100		95.8	90-110			
LCS Dup (B903139-BSD1)				Prepared: 14-Mar-19 Analyzed: 15-Mar-19						
Cyanide, Total	0.105	0.0100	mg/L	0.100		105	90-110	8.69	20	
Batch B903159 - General Prep - Wet Chem										
Blank (B903159-BLK1)				Prepared: 18-Mar-19 Analyzed: 19-Mar-19						
Nitrate/Nitrite as N	ND	0.020	mg/L							
LCS (B903159-BS1)				Prepared: 18-Mar-19 Analyzed: 19-Mar-19						
Nitrate/Nitrite as N	1.06	0.020	mg/L	1.00		106	90-110			
LCS Dup (B903159-BSD1)				Prepared: 18-Mar-19 Analyzed: 19-Mar-19						
Nitrate/Nitrite as N	1.04	0.020	mg/L	1.00		104	90-110	1.54	20	
Batch B903162 - General Prep - Wet Chem										
Blank (B903162-BLK1)				Prepared: 18-Mar-19 Analyzed: 22-Mar-19						
Total Kjeldahl Nitrogen	ND	0.500	mg/L							
LCS (B903162-BS1)				Prepared: 18-Mar-19 Analyzed: 22-Mar-19						
Total Kjeldahl Nitrogen	10.6	0.500	mg/L	10.0		106	90-110			

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

General Chemistry - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B903162 - General Prep - Wet Chem										
LCS Dup (B903162-BSD1)				Prepared: 18-Mar-19 Analyzed: 22-Mar-19						
Total Kjeldahl Nitrogen	9.87	0.500	mg/L	10.0		98.7	90-110	6.84	20	
Batch B903202 - General Prep - Wet Chem										
Blank (B903202-BLK1)				Prepared & Analyzed: 22-Mar-19						
Fluoride	ND	0.100	mg/L							
LCS (B903202-BS1)				Prepared & Analyzed: 22-Mar-19						
Fluoride	1.05	0.100	mg/L	1.00		105	85-115			
LCS Dup (B903202-BSD1)				Prepared & Analyzed: 22-Mar-19						
Fluoride	1.05	0.100	mg/L	1.00		105	85-115	0.476	20	

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

Total Recoverable Metals by ICP (E200.7) - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B903150 - Total Rec. 200.7/200.8/200.2										
Blank (B903150-BLK1)				Prepared: 18-Mar-19 Analyzed: 19-Mar-19						
Boron	ND	0.300	mg/L							
Iron	ND	0.050	mg/L							
Calcium	ND	0.100	mg/L							
Potassium	ND	1.00	mg/L							
Magnesium	ND	0.100	mg/L							
Sodium	ND	1.00	mg/L							
Strontium	ND	0.100	mg/L							
LCS (B903150-BS1)				Prepared: 18-Mar-19 Analyzed: 19-Mar-19						
Potassium	8.14	1.00	mg/L	8.00		102	85-115			
Strontium	3.98	0.100	mg/L	4.00		99.6	85-115			
Magnesium	19.8	0.100	mg/L	20.0		98.8	85-115			
Sodium	3.18	1.00	mg/L	3.24		98.0	85-115			
Calcium	4.25	0.100	mg/L	4.00		106	85-115			
Iron	3.89	0.050	mg/L	4.00		97.3	85-115			
Boron	3.95	0.300	mg/L	4.00		98.8	85-115			
LCS Dup (B903150-BSD1)				Prepared: 18-Mar-19 Analyzed: 19-Mar-19						
Boron	3.93	0.300	mg/L	4.00		98.2	85-115	0.621	20	
Magnesium	19.6	0.100	mg/L	20.0		98.2	85-115	0.633	20	
Strontium	3.95	0.100	mg/L	4.00		98.8	85-115	0.758	20	
Sodium	3.12	1.00	mg/L	3.24		96.4	85-115	1.64	20	
Calcium	4.09	0.100	mg/L	4.00		102	85-115	3.80	20	
Potassium	8.07	1.00	mg/L	8.00		101	85-115	0.860	20	
Iron	3.88	0.050	mg/L	4.00		97.0	85-115	0.334	20	

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Celey D. Keene, Lab Director/Quality Manager

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 02-Apr-19 15:17

Total Recoverable Metals by ICPMS (E200.8) - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B903152 - Total Rec. 200.7/200.8/200.2										
Blank (B903152-BLK1)				Prepared: 18-Mar-19 Analyzed: 22-Mar-19						
Barium	ND	0.0005	mg/L							
Selenium	ND	0.0010	mg/L							
LCS (B903152-BS1)				Prepared: 18-Mar-19 Analyzed: 22-Mar-19						
Selenium	0.236	0.0010	mg/L	0.250		94.5	85-115			
Barium	0.0477	0.0005	mg/L	0.0500		95.5	85-115			
LCS Dup (B903152-BSD1)				Prepared: 18-Mar-19 Analyzed: 22-Mar-19						
Barium	0.0444	0.0005	mg/L	0.0500		88.8	85-115	7.27	20	
Selenium	0.231	0.0010	mg/L	0.250		92.5	85-115	2.10	20	

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

SUB-AA	Analysis subcontracted to Advanced Analysis, Inc.
SUB_LS	Analysis subcontracted to Laboratory Services, Inc.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
M5	Sample was chosen for matrix spike. Spike recovery did not meet laboratory acceptance criteria, possible matrix interference in sample.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES
101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name: Hollyfrontier Navajo Refining LCC (HFNR)	BILL TO
Project Manager: Robert Combs / Scott Denton	P.O. #: 271426
Address: P.O. Box 159	Company: HFNR
City: Artesia State: NM Zip: 88211-0159	Attn: Susie Aguilar
Phone #: 575-748-3311 Fax #:	Address: P.O. Box 159
Project #: Project Owner:	City: Artesia
Project Name: WW Monitoring	State: NM Zip: 88211-0159
Project Location: Navajo Refinery	Phone #: 575-748-3311
Sampler Name: ~~Brady Hubbard~~ FCC operator	Fax #:

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV.: ACID/BASE: HNO3	ICE / COOL	OTHER : H2SO4	SAMPLING: DATE	TIME	Chloride, Sulfate, TDS, TSS	BOD	Ammonia	Total Metals 200.7/200.8	NO3+NO2, Fluoride, TKN	BTEX	Oil and Grease	Cyanide	Total Alkalinity (as HCO3-)	Bacteria (GHB)		
H900996	WW Effluent to WDW-1	G	12		x								3/12/19	10:00	x	x	x	x	x	x	~~x~~ T.P.	x	x	x		

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Relinquished By: Brady Hubbard	Date: 3-13-19	Received By: Tamara Oldaker	Phone Result: ☐ Yes ☐ No Add'l Phone #:
	Time: 14:30		Fax Result: ☐ Yes ☐ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS: no O+G Containers
	Time:		

Delivered By: (Circle One)	Sample Condition Cool	Intact	CHECKED BY: (Initials)
Sampler - UPS - Bus - Other: 2.9° #97	☑ Yes ☐ No	☑ Yes ☐ No	T.P.

† Cardinal cannot accept verbal changes. Please fax written changes to 575-393-2476

FORM-006
Revision 1.0

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

May 14, 2019

ROBERT COMBS

HOLLYFRONTIER NAVAJO REFINING

501 EAST MAIN STREET

ARTESIA, NM 88210

RE: WW MONITORING

Enclosed are the results of analyses for samples received by the laboratory on 04/25/19 15:00.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-18-11. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (*). For a complete list of accredited analytes and matrices visit the TCEQ website at www.tceq.texas.gov/field/qa/lab_accred_certif.html.

Cardinal Laboratories is accreditated through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Total Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Cardinal Laboratories is accredited through the State of New Mexico Environment Department for:

Method SM 9223-B	Total Coliform and E. coli (Colilert MMO-MUG)
Method EPA 524.2	Regulated VOCs and Total Trihalomethanes (TTHM)
Method EPA 552.2	Total Haloacetic Acids (HAA-5)

Accreditation applies to public drinking water matrices for State of Colorado and New Mexico.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WW EFFLUENT TO WDW - 4	H901494-01	Wastewater	25-Apr-19 13:00	25-Apr-19 15:00

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

WW EFFLUENT TO WDW - 4

H901494-01 (Wastewater)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Cardinal Laboratories										
Inorganic Compounds										
Ammonia	**111**		2.50	mg/L	50	9040507	AC	03-May-19	350.1	
Biochemical Oxygen Demand	**168**			mg/L	1	9050211	CK	01-May-19	SM 5210B	SUB-AA
Chloride*	**604**		4.00	mg/L	1	9042507	AC	30-Apr-19	4500-Cl-B	
General Heterotrophic Bacteria	<3.00		3.00	MPN/mL	1	9012315	CK	09-May-19	GHB	SUB_LS
Sulfate*	**2550**		500	mg/L	50	9043009	AC	01-May-19	375.4	
TDS*	**3790**		5.00	mg/L	1	9042617	AC	01-May-19	160.1	
Alkalinity, Total*	**630**		4.00	mg/L	1	9042605	AC	26-Apr-19	310.1	
TSS*	**300**		2.00	mg/L	1	9042616	AC	30-Apr-19	160.2	
Volatile Organic Compounds by EPA Method 8260B										
Benzene*	<0.007	0.007	0.025	mg/L	50	9050120	ms	03-May-19	8260B	
Toluene*	<0.006	0.006	0.025	mg/L	50	9050120	ms	03-May-19	8260B	
Ethylbenzene*	<0.004	0.004	0.025	mg/L	50	9050120	ms	03-May-19	8260B	
Total Xylenes*	<0.017	0.017	0.075	mg/L	50	9050120	ms	03-May-19	8260B	
Total BTEX	<0.020	0.020	0.150	mg/L	50	9050120	ms	03-May-19	8260B	
Surrogate: Dibromofluoromethane			*101 %*	*86.5-122*		*9050120*	ms	*03-May-19*	*8260B*	
Surrogate: Toluene-d8			*100 %*	*85.7-112*		*9050120*	ms	*03-May-19*	*8260B*	
Surrogate: 4-Bromofluorobenzene			*107 %*	*86.3-117*		*9050120*	ms	*03-May-19*	*8260B*	
Green Analytical Laboratories										
General Chemistry										
Cyanide, Total*	**0.0189**		0.0100	mg/L	1	B904258	LLG	30-Apr-19	EPA335.4	
Fluoride*	**11.5**		2.00	mg/L	20	B905019	VJL	03-May-19	4500-F- C	
Nitrate/Nitrite as N*	**0.719**		0.020	mg/L	1	B905013	LLG	02-May-19	EPA353.2	
Total Kjeldahl Nitrogen*	**122**		6.00	mg/L	10	B904257	LLG	01-May-19	EPA351.2	
Oil & Grease (HEM)	**93.7**		5.00	mg/L	1	B904166	VJL	29-Apr-19	EPA1664 A	

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

WW EFFLUENT TO WDW - 4

H901494-01 (Wastewater)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Analyst	Analyzed	Method	Notes
Green Analytical Laboratories										
Total Recoverable Metals by ICP (E200.7)										
Boron	<1.50		1.50	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Calcium*	**511**		0.500	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Iron*	**5.90**		0.250	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Magnesium*	**156**		0.500	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Potassium*	**67.1**		5.00	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Sodium*	**700**		5.00	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Strontium*	**7.48**		0.500	mg/L	5	B904268	AES	03-May-19	EPA200.7	
Total Recoverable Metals by ICPMS (E200.8)										
Barium*	**0.0671**		0.0005	mg/L	1	B904269	AES	01-May-19	EPA200.8	
Selenium*	**0.0153**		0.0010	mg/L	1	B904269	AES	01-May-19	EPA200.8	

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040507 - General Prep - Wet Chem										
Blank (9040507-BLK1)				Prepared & Analyzed: 05-Apr-19						
Ammonia	ND	0.0500	mg/L							
LCS (9040507-BS1)				Prepared & Analyzed: 05-Apr-19						
Ammonia	1.72	0.0500	mg/L	2.00		86.0	80-120			
Duplicate (9040507-DUP1)		**Source: H901229-03**		Prepared & Analyzed: 05-Apr-19						
Ammonia	218	0.0500	mg/L		211			2.92	20	
Matrix Spike (9040507-MS1)		**Source: H901229-03**		Prepared & Analyzed: 05-Apr-19						
Ammonia	1090	25.0	mg/L	1000	211	87.9	70-130			
Batch 9042507 - General Prep - Wet Chem										
Blank (9042507-BLK1)				Prepared & Analyzed: 25-Apr-19						
Chloride	ND	4.00	mg/L							
LCS (9042507-BS1)				Prepared & Analyzed: 25-Apr-19						
Chloride	108	4.00	mg/L	100		108	80-120			
LCS Dup (9042507-BSD1)				Prepared & Analyzed: 25-Apr-19						
Chloride	104	4.00	mg/L	100		104	80-120	3.77	20	
Duplicate (9042507-DUP1)		**Source: H901458-01**		Prepared & Analyzed: 25-Apr-19						
Chloride	1680	4.00	mg/L		1680			0.00	20	
Matrix Spike (9042507-MS1)		**Source: H901458-01**		Prepared & Analyzed: 25-Apr-19						
Chloride	2240	4.00	mg/L	500	1680	112	80-120			

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9042605 - General Prep - Wet Chem										
Blank (9042605-BLK1)				Prepared & Analyzed: 26-Apr-19						
Alkalinity, Total	4.00	4.00	mg/L							
LCS (9042605-BS1)				Prepared & Analyzed: 26-Apr-19						
Alkalinity, Total	270	10.0	mg/L	250		108	80-120			
LCS Dup (9042605-BSD1)				Prepared & Analyzed: 26-Apr-19						
Alkalinity, Total	240	10.0	mg/L	250		96.0	80-120	11.8	20	
Duplicate (9042605-DUP1)		**Source: H901428-23**		Prepared & Analyzed: 26-Apr-19						
Alkalinity, Total	124	4.00	mg/L		128			3.17	20	
Matrix Spike (9042605-MS1)		**Source: H901428-23**		Prepared & Analyzed: 26-Apr-19						
Alkalinity, Total	228	4.00	mg/L	100	128	100	70-130			
Batch 9042616 - Filtration										
Blank (9042616-BLK1)				Prepared: 29-Apr-19 Analyzed: 01-May-19						
TSS	2.00	2.00	mg/L							
Duplicate (9042616-DUP1)		**Source: H901466-01**		Prepared: 29-Apr-19 Analyzed: 01-May-19						
TSS	72.0	2.00	mg/L		66.0			8.70	52.7	
Batch 9042617 - Filtration										
Blank (9042617-BLK1)				Prepared: 29-Apr-19 Analyzed: 01-May-19						
TDS	ND	5.00	mg/L							

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9042617 - Filtration										
LCS (9042617-BS1)				Prepared: 29-Apr-19 Analyzed: 01-May-19						
TDS	554		mg/L	527		105	80-120			
Duplicate (9042617-DUP1)		**Source: H901465-01**		Prepared: 29-Apr-19 Analyzed: 01-May-19						
TDS	870	5.00	mg/L		1130			26.0	20	QR-05
Batch 9043009 - General Prep - Wet Chem										
Blank (9043009-BLK1)				Prepared & Analyzed: 01-May-19						
Sulfate	ND	10.0	mg/L							
LCS (9043009-BS1)				Prepared & Analyzed: 01-May-19						
Sulfate	20.5	10.0	mg/L	20.0		103	80-120			
LCS Dup (9043009-BSD1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Sulfate	23.3	10.0	mg/L	20.0		117	80-120	12.7	20	
Duplicate (9043009-DUP1)		**Source: H901465-04**		Prepared & Analyzed: 01-May-19						
Sulfate	15000	10.0	mg/L		16100			6.97	20	
Matrix Spike (9043009-MS1)		**Source: H901465-04**		Prepared & Analyzed: 01-May-19						
Sulfate	26100	5000	mg/L	10000	16100	99.4	70-130			
Batch 9050211 - General Prep										
Blank (9050211-BLK1)				Prepared: 26-Apr-19 Analyzed: 01-May-19						
Biochemical Oxygen Demand	0.110		mg/L							

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Inorganic Compounds - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9050211 - General Prep										
LCS (9050211-BS1)				Prepared: 26-Apr-19 Analyzed: 01-May-19						
Biochemical Oxygen Demand	224		mg/L	198		113	85-115			
LCS Dup (9050211-BSD1)				Prepared: 26-Apr-19 Analyzed: 01-May-19						
Biochemical Oxygen Demand	218		mg/L	198		110	85-115	3.05	20	

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Volatile Organic Compounds by EPA Method 8260B - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9050120 - Volatiles										
Blank (9050120-BLK1)				Prepared: 01-May-19 Analyzed: 02-May-19						
Benzene	ND	0.0005	mg/L							
Toluene	ND	0.0005	mg/L							
Ethylbenzene	ND	0.0005	mg/L							
Total Xylenes	ND	0.002	mg/L							
Total BTEX	ND	0.003	mg/L							
Surrogate: Dibromofluoromethane	*0.0243*		mg/L	*0.0250*		*97.4*	*86.5-122*			
Surrogate: Toluene-d8	*0.0248*		mg/L	*0.0250*		*99.2*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0252*		mg/L	*0.0250*		*101*	*86.3-117*			
LCS (9050120-BS1)				Prepared: 01-May-19 Analyzed: 02-May-19						
Benzene	0.019	0.0005	mg/L	0.0200		93.6	84.9-121			
Toluene	0.019	0.0005	mg/L	0.0200		93.1	76.1-122			
Ethylbenzene	0.019	0.0005	mg/L	0.0200		93.3	78.5-126			
m+p - Xylene	0.038	0.001	mg/L	0.0400		95.9	81.1-129			
o-Xylene	0.019	0.0005	mg/L	0.0200		96.4	77.5-134			
Total Xylenes	0.058	0.002	mg/L	0.0600		96.1	80.2-130			
Surrogate: Dibromofluoromethane	*0.0252*		mg/L	*0.0250*		*101*	*86.5-122*			
Surrogate: Toluene-d8	*0.0247*		mg/L	*0.0250*		*98.8*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0250*		mg/L	*0.0250*		*100*	*86.3-117*			
LCS Dup (9050120-BSD1)				Prepared: 01-May-19 Analyzed: 02-May-19						
Benzene	0.019	0.0005	mg/L	0.0200		95.8	84.9-121	2.38	7.79	
Toluene	0.019	0.0005	mg/L	0.0200		94.3	76.1-122	1.33	9.78	
Ethylbenzene	0.019	0.0005	mg/L	0.0200		96.9	78.5-126	3.84	8.74	
m+p - Xylene	0.039	0.001	mg/L	0.0400		98.6	81.1-129	2.78	8.94	
o-Xylene	0.019	0.0005	mg/L	0.0200		97.4	77.5-134	0.981	11.4	
Total Xylenes	0.059	0.002	mg/L	0.0600		98.2	80.2-130	2.18	9.04	
Surrogate: Dibromofluoromethane	*0.0257*		mg/L	*0.0250*		*103*	*86.5-122*			
Surrogate: Toluene-d8	*0.0248*		mg/L	*0.0250*		*99.2*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0255*		mg/L	*0.0250*		*102*	*86.3-117*			

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Analytical Results For:

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Volatile Organic Compounds by EPA Method 8260B - Quality Control

Cardinal Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9050120 - Volatiles										
Matrix Spike (9050120-MS1)		**Source: H901444-01**		Prepared: 01-May-19 Analyzed: 02-May-19						
Benzene	0.020	0.0005	mg/L	0.0200	ND	99.3	47.6-148			
Toluene	0.020	0.0005	mg/L	0.0200	ND	97.8	41.4-144			
Ethylbenzene	0.020	0.0005	mg/L	0.0200	ND	101	40.6-151			
m+p - Xylene	0.041	0.001	mg/L	0.0400	ND	102	42-155			
o-Xylene	0.020	0.0005	mg/L	0.0200	ND	101	42.6-152			
Total Xylenes	0.061	0.002	mg/L	0.0600	ND	102	42.4-153			
Surrogate: Dibromofluoromethane	*0.0254*		mg/L	*0.0250*		*102*	*86.5-122*			
Surrogate: Toluene-d8	*0.0245*		mg/L	*0.0250*		*98.1*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0252*		mg/L	*0.0250*		*101*	*86.3-117*			
Matrix Spike Dup (9050120-MSD1)		**Source: H901444-01**		Prepared: 01-May-19 Analyzed: 02-May-19						
Benzene	0.021	0.0005	mg/L	0.0200	ND	103	47.6-148	3.90	12.5	
Toluene	0.021	0.0005	mg/L	0.0200	ND	104	41.4-144	5.85	11.5	
Ethylbenzene	0.021	0.0005	mg/L	0.0200	ND	106	40.6-151	4.74	17.6	
m+p - Xylene	0.044	0.001	mg/L	0.0400	ND	109	42-155	6.61	18.6	
o-Xylene	0.021	0.0005	mg/L	0.0200	ND	106	42.6-152	5.60	18.1	
Total Xylenes	0.065	0.002	mg/L	0.0600	ND	108	42.4-153	6.28	18.3	
Surrogate: Dibromofluoromethane	*0.0254*		mg/L	*0.0250*		*102*	*86.5-122*			
Surrogate: Toluene-d8	*0.0250*		mg/L	*0.0250*		*99.8*	*85.7-112*			
Surrogate: 4-Bromofluorobenzene	*0.0254*		mg/L	*0.0250*		*102*	*86.3-117*			

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General Chemistry - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B904166 - General Prep - Wet Chem										
Blank (B904166-BLK1)				Prepared: 17-Apr-19 Analyzed: 22-Apr-19						
Oil & Grease (HEM)	ND	5.00	mg/L							
LCS (B904166-BS1)				Prepared: 17-Apr-19 Analyzed: 22-Apr-19						
Oil & Grease (HEM)	34.6	5.00	mg/L	40.0		86.5	85-115			
LCS Dup (B904166-BSD1)				Prepared: 17-Apr-19 Analyzed: 23-Apr-19						
Oil & Grease (HEM)	35.8	5.00	mg/L	40.0		89.5	85-115	3.41	20	
Batch B904257 - General Prep - Wet Chem										
Blank (B904257-BLK1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Total Kjeldahl Nitrogen	ND	0.500	mg/L							
LCS (B904257-BS1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Total Kjeldahl Nitrogen	10.1	0.500	mg/L	10.0		101	90-110			
LCS Dup (B904257-BSD1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Total Kjeldahl Nitrogen	9.90	0.500	mg/L	10.0		99.0	90-110	2.45	20	
Batch B904258 - General Prep - Wet Chem										
Blank (B904258-BLK1)				Prepared & Analyzed: 30-Apr-19						
Cyanide, Total	ND	0.0100	mg/L							
LCS (B904258-BS1)				Prepared & Analyzed: 30-Apr-19						
Cyanide, Total	0.0977	0.0100	mg/L	0.100		97.7	90-110			

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Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

General Chemistry - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B904258 - General Prep - Wet Chem										
LCS Dup (B904258-BSD1)				Prepared & Analyzed: 30-Apr-19						
Cyanide, Total	0.101	0.0100	mg/L	0.100		101	90-110	3.32	20	
Batch B905013 - General Prep - Wet Chem										
Blank (B905013-BLK1)				Prepared: 01-May-19 Analyzed: 02-May-19						
Nitrate/Nitrite as N	ND	0.020	mg/L							
LCS (B905013-BS1)				Prepared: 01-May-19 Analyzed: 02-May-19						
Nitrate/Nitrite as N	1.05	0.020	mg/L	1.00		105	90-110			
LCS Dup (B905013-BSD1)				Prepared: 01-May-19 Analyzed: 02-May-19						
Nitrate/Nitrite as N	1.05	0.020	mg/L	1.00		105	90-110	0.218	20	
Batch B905019 - General Prep - Wet Chem										
Blank (B905019-BLK1)				Prepared: 02-May-19 Analyzed: 03-May-19						
Fluoride	ND	0.100	mg/L							
LCS (B905019-BS1)				Prepared: 02-May-19 Analyzed: 03-May-19						
Fluoride	1.13	0.100	mg/L	1.00		113	85-115			
LCS Dup (B905019-BSD1)				Prepared: 02-May-19 Analyzed: 03-May-19						
Fluoride	1.14	0.100	mg/L	1.00		114	85-115	1.50	20	

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

Total Recoverable Metals by ICP (E200.7) - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B904268 - Total Rec. 200.7/200.8/200.2										
Blank (B904268-BLK1)				Prepared: 30-Apr-19 Analyzed: 02-May-19						
Calcium	ND	0.100	mg/L							
Iron	ND	0.050	mg/L							
Potassium	ND	1.00	mg/L							
Strontium	ND	0.100	mg/L							
Sodium	ND	1.00	mg/L							
Magnesium	ND	0.100	mg/L							
Boron	ND	0.300	mg/L							
LCS (B904268-BS1)				Prepared: 30-Apr-19 Analyzed: 02-May-19						
Strontium	4.09	0.100	mg/L	4.00		102	85-115			
Sodium	3.21	1.00	mg/L	3.24		99.0	85-115			
Potassium	7.93	1.00	mg/L	8.00		99.2	85-115			
Magnesium	20.5	0.100	mg/L	20.0		103	85-115			
Boron	4.07	0.300	mg/L	4.00		102	85-115			
Calcium	4.08	0.100	mg/L	4.00		102	85-115			
Iron	4.06	0.050	mg/L	4.00		101	85-115			
LCS Dup (B904268-BSD1)				Prepared: 30-Apr-19 Analyzed: 02-May-19						
Strontium	4.03	0.100	mg/L	4.00		101	85-115	1.32	20	
Boron	4.07	0.300	mg/L	4.00		102	85-115	0.0563	20	
Magnesium	20.1	0.100	mg/L	20.0		100	85-115	2.20	20	
Calcium	4.02	0.100	mg/L	4.00		100	85-115	1.64	20	
Sodium	3.17	1.00	mg/L	3.24		97.8	85-115	1.28	20	
Potassium	7.94	1.00	mg/L	8.00		99.2	85-115	0.0393	20	
Iron	4.02	0.050	mg/L	4.00		101	85-115	0.883	20	

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Analytical Results For:

HOLLYFRONTIER NAVAJO REFINING 501 EAST MAIN STREET ARTESIA NM, 88210	Project: WW MONITORING Project Number: NONE GIVEN Project Manager: ROBERT COMBS Fax To: NONE	Reported: 14-May-19 14:27

Total Recoverable Metals by ICPMS (E200.8) - Quality Control

Green Analytical Laboratories

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B904269 - Total Rec. 200.7/200.8/200.2										
Blank (B904269-BLK1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Barium	ND	0.0005	mg/L							
Selenium	ND	0.0010	mg/L							
LCS (B904269-BS1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Selenium	0.254	0.0010	mg/L	0.250		101	85-115			
Barium	0.0490	0.0005	mg/L	0.0500		98.0	85-115			
LCS Dup (B904269-BSD1)				Prepared: 30-Apr-19 Analyzed: 01-May-19						
Barium	0.0484	0.0005	mg/L	0.0500		96.8	85-115	1.26	20	
Selenium	0.250	0.0010	mg/L	0.250		100	85-115	1.32	20	

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

SUB-AA	Analysis subcontracted to Advanced Analysis, Inc.
SUB_LS	Analysis subcontracted to Laboratory Services, Inc.
QR-05	The RPD exceeded historical limits.
ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C
	Samples reported on an as received basis (wet) unless otherwise noted on report

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Celey D. Keene, Lab Director/Quality Manager

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

CARDINAL LABORATORIES
101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

Company Name: Holly Frontier Navajo Refining, LLC (HFNR)	**BILL TO**
Project Manager: Robert Combs / Scott Denton	P.O. #: 122783
Address: P.O. Box 159	Company: Navajo Refinery LLC
City: Artesia State: NM Zip: 88211-0159	Attn: Susie Aguilar
Phone #: 575-748-3311 Fax #:	Address: P.O. Box 159
Project #: Project Owner:	City: Artesia
Project Name: WW Monitoring	State: NM Zip: 88211-0159
Project Location: Navajo Refinery	Phone #: 575-748-3311
Sampler Name: Brady Hubbard	Fax #:

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV.: ACID/BASE: HNO3	ICE / COOL	OTHER : H2SO4	SAMPLING: DATE	TIME	Chloride, Sulfate, TDS, TSS	BOD	Ammonia	Total Metals 200.7/200.8	NO3+NO2, Fluoride, TKN	BTEX	Oil and Grease	Cyanide	Total Alkalinity (as HCO3-)	Bacteria (GHB)		
H901494 1	WW Effluent to WDW-4	G	12		x								4/25/19	1:00	x	x	x	x	x	x	x	x	x	x		

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Relinquished By: Brady Hubbard	Date: 4/25/19	Received By: Jodi Henson	Phone Result: ☐ Yes ☐ No Add'l Phone #:
	Time: 15:00		Fax Result: ☐ Yes ☐ No Add'l Fax #:
Relinquished By:	Date:	Received By:	REMARKS:
	Time:		
Delivered By: (Circle One) Sampler - UPS - Bus - Other: 4.9°C #97	Sample Condition Cool ☑ Yes ☐ No Intact ☑ Yes ☐ No	CHECKED BY: (Initials)	

FORM-006
Revision 1.0

† Cardinal cannot accept verbal changes. Please fax written changes to 575-393-2476