Initial Revision

2021 ANNUAL BOTTOM-HOLE PRESSURE SURVEY AND PRESSURE FALLOFF TEST REPORT

WESTERN REFINING SOUTHWEST LLC

WASTE DISPOSAL WELL NO. 2

Bloomfield, New Mexico

November 2021

Houston, TX

Project No. 192025AI

Prepared by Troy Gillen Reviewed by Jeffry Tahtouh

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EXECUTIVE SUMMARY

WSP USA Inc. (WSP) was contracted by Western Refining Southwest LLC (Western) to perform the annual bottom-hole pressure survey and pressure falloff test analysis on Western's Waste Disposal Well No. 2 (WDW #2). The test was performed according to New Mexico Oil Conservation Division (OCD) falloff test guidelines (*New Mexico Oil Conservation Division UIC Class I Well Fall-Off Test Guidance, December 3, 2007*).

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

The falloff testing was conducted according to the testing plan submitted to and approved by the NMOCD.

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 2020 falloff testing) is discussed in Section 10 and geology in Section 11. Information on the offset wells is discussed in Section 12, and daily testing activities in Section 13. The pressure falloff testing and analysis results are discussed in Section 14. The OCD required record keeping statement is discussed in Section 15.

1. FACILITY INFORMATION

a. Name: Western Refining Southwest LLC (subsidiary of the Marathon Petroleum Company)
b. Facility Location: 50 County Road 4990 Bloomfield, New Mexico 87413
c. Operator's Oil and Gas Remittance Identifier (OGRID) Number: 267595

2. WELL INFORMATION

a. OCD UIC Permit Number: UICI-011
b. Well Classification: Class I Non-hazardous
c. Well Name and Number: WDW #2
d. API Number: 30-045-35747
e. Well Legal Location: 2028' FNL and 111' FEL, Unit letter H of Section 27, Township 29 North, Range 11 West

3. CURRENT WELLBORE SCHEMATIC

The WDW #2 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, 10.5 pound per foot, API grade L-80, with Internal Plastic Coated (IPC) casing, set at 7230 feet.

b. Packer: Baker, 7-inch by 2-7/8-inch set in tension (37,000 pounds) at 7230 feet.

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

   i. 13-3/8-inch, 48 pounds per foot, steel construction, API grade H-40, set at a depth of 298 feet. The casing was cemented to the surface with 394 sacks of cement. The casing was set in open hole with a diameter of 17-1/2 inches.

   ii. 9-5/8-inch, 36 pounds per foot, steel construction, API grade J-55, set at a depth of 3500 feet. The casing was cemented to the surface with 857 sacks of cement. The casing was set in open hole with a diameter of 12-1/4 inches.

   iii. 7-inch, 26 pounds per foot and 23 pounds per foot, steel construction, API grade L-80, set at a depth of 7525 feet. The casing was cemented to surface with 868 sacks of cement. The casing was set in open hole with a diameter of 8-3/4 inches.

4. ELECTRIC LOG ENCOMPASSING THE COMPLETED INTERVAL

The dual induction log is presented in Appendix A and encompasses the completed interval between 7200 feet and 7532 feet. The dual induction log was submitted to the OCD with the original permit after the well was drilled.

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 7200 feet and 7532 feet. The neutron density log was submitted to the OCD with the original permit after the well was drilled. The porosity of the formation, 14.9%, and the reservoir thickness, 123 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 fluid used for the injection test is the terminal-treated wastewater (effluent). A current effluent analysis collected on (dates) has been included in Appendix C. A summary of the formation water is also in Appendix C. The formation water analyses taken on January 25, 2017, is also included.

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 from the culmination of the previous year's annual test and ends when the well was shut-in on September 19, 2021. The rate history is summarized in Appendix D.

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

Over the life of well, the cumulative volume of fluid injected into the WDW #2 was 8,923,776. The injected volumes were obtained from plant records and last year's test's reported total injected volume.

9. PRESSURE GAUGES

Two (2) downhole pressure gauges were used for the WDW #2 buildup and falloff testing. The downhole pressure gauges were set at 7312 feet below ground level.

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

MRO pressure gauges were 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. 240. The gauge is manufactured by Micro-Smart.

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

The MRO pressure gauge, Serial No. 240, has a full range of 14.73 psi to 5,000 psi and an accuracy of 0.05% of full scale. (This gauge's pressure readings were used in the PFO analysis).

The MRO pressure gauge, Serial No. 328, has a full range of 14.73 psi to 5,000 psi and an accuracy of 0.05% 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 E. The pressure gauge was last calibrated on March 10, 2020 and is within the recommended calibration frequency as recommended by Micro-Smart.

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 WDW #2. 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 2020 update.

No new freshwater wells were reported within the search area since the submittal of the 2020 report. The discharge application lists the water wells located in the Area of Review.

a. *Identify wells located within the one-mile AOR:*

Table 1 contains a listing of all wells within the one-mile AOR of Western Refining WDW #2. In total, there are 62 wells located within the one-mile radius. Figure 2 represents a base map of the area containing the one-mile AOR.

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

Table 1 also provides the current status of each well that falls within the one-mile AOR. Tables 2 through 6 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 2020 pressure falloff report. No wells have changed status since the 2020 report.

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

One of the 62 wells in the AOR, Ashcroft SWD #1, penetrates the Entrada injection zone. This well is 0.64 miles from WDW #2 and is an active water disposal well. Ashcroft SWD #1 is listed as ID No. 24 in Table 1 and no changes have occurred to the well since the last report.

No wells are currently producing from the Entrada injection zone within the one-mile AOR.

11. GEOLOGY

The injection zone is the Entrada sandstone formation. The formations occur in WDW #2 at the depths shown in the table below. The injection zone is shown in WDW #2 logs in Appendices A and B.

Injection Zone Formation	Waste Disposal Well #2 (KB elev = 5,550 ft)	
	MD below KB (ft)	SS Depth (ft)
Bluff Sandstone	Not completed	7,031
Entrada Sandstone	7,312 to 7,470	7,308

The Jurassic-aged Entrada Sandstone is thought to be one of the best water disposal rock units in the San Juan Basin. The Entrada is the basal formation of the San Rafael Group which also includes the Todilto and Wanakah Formations. The Entrada Sandstone is present throughout the basin's subsurface and crops out along its margin as step cliffs. The Entrada unconformably overlies the Chinle Formation. The Todilto Formation made up of limestone and anhydrite is dense and thought to an impermeable barrier or seal and likely seal for the injection zone.

The Entrada Sandstone consists of mottled reddish-brown very fine to medium grained wellsorted, silica cemented quartz sandstone interbedded with thinner reddish-brown siltstones. The sandstone units are assembled in high-angle, large-scale crossbeds indicating eolian environment deposition and with the siltstones representing interdue and sabkha deposition. The crossstratified sandstone is competent, laterally persistent and with homogenous reservoir properties. Entrada Sandstone gross thickness ranges from 60 feet to 330 feet across the basin.

At the WDW #2 location the Entrada is 158 feet thick. Based upon the nearby XTO Energy Ashcroft SWD #1 water disposal, well density porosities are up to 18 percent with the most porous interval found in the upper 90 feet of the formation where many of the density porosities are greater than 10 percent. WDW #2 has a density porosity of 12.1 percent. The two intervals with the highest porosity are 20 feet from 7,333 feet to 7,353 feet with 14.1 percent porosity and 26 feet from 7,442 feet to 7,468 feet with 14.9 percent porosity.

Permeability for the well as measured by this falloff test is 1.03 millidarcies (md) or less.

12. OFFSET WELLS

The offset well is discussed in Section 10.0.

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

a. *Date of the testing:*

The buildup portion of the testing started on September 13, 2021 at 1630 hours and continued until September 19, 2021 at 1130 hours when WDW #2 was shut-in. The falloff test ended on September 29, 2021, at 0938 hours. Five-minute gradient stops were made at 1000-foot intervals 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 Western plant operations personnel.

b. *Time of the injection period:*

The buildup portion of the testing began on September 13, 2021 when the injection rate was set at an average injection rate of approximately 17.82 gallons per minute (gpm). The bottom-hole pressure and temperature were monitored for 72.33 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 8.33 pounds per gallon during the 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 4560.65 psia and 141.99°F, respectively.

e. *Total shut-in time:*

WDW #2 was shut-in for 238 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 3903.28 psia and 179.93°F, respectively.

14. PRESSURE FALLOFF ANALYSIS

The following discussion of the analysis of the pressure data recorded during the falloff testing of WDW #2 satisfies Sections 15 through 19 of Section IX, Report Components, of the OCD's falloff test guidelines. Where appropriate, the specific guideline addressed is annotated. Specific parameters used in the equations and discussed previously in this report are also annotated. The plots included with this report

are summarized in Table VIII. The inclusion of these plots in this report satisfies OCD Guideline Section IX.18.

The pressure data obtained during the falloff test were analyzed using the commercially available pressure transient analysis software program PanSystem©. Appendix F contains the output from this software program. Figure 3 shows the pressure data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 238-hour shut-in period.

Figure 4 is a Cartesian plot of the pressure data recorded during the falloff period.

Figure 5 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, fracture linear flow, pseudo-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 0.004 hours and continues to an elapsed shut in time of 0.0106 hours. The bi-linear flow period begins at an elapsed shut-in time of 0.68 hours and continues until an elapsed shut-in time of 2.92 hours. The linear flow period was not apparent on the 2021 derivative log-log plot as was seen on the 2019 pressure falloff analysis report. Although the pseudo-radial flow period is not fully developed, it gives a good determination of the reservoir permeability. The pseudo-radial flow period begins at an elapsed shut in time of 210.48 hours and continues to an elapsed time of 237.84 hours (OCD Guideline Section IX.15.b).

The reservoir permeability was determined from the pseudo-radial flow region of the superposition semi-log plot, Figure 6. The superposition time function was used to account for all rate changes during the injection period used in the analysis of the data. The pseudo-radial flow regime begins at a Superposition time of 2.86 and continues to 3.02. Figure 7 shows an expanded view of the pseudo-radial flow regime. The slope of the radial flow period, as calculated by the analysis software, was 368.21. psi/cycle (OCD Guideline Section IX.15.c). The injection rate just prior to shut in was 17.82 gpm which is equivalent to 610.85 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 269.75 md-ft/cp using the following equation:

$$\frac{kh}{\mu} = 162.6\frac{qB}{m}$$

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

$$\frac{kh}{\mu} = 162.6\ \frac{(610.85)(1.0)}{368.21}$$

$$= 269.75\ md - ft/cp$$

The permeability-thickness (flow capacity, OCD Guideline Section IX.15.i), kh, was determined to be 126.78 md-ft by multiplying the mobility-thickness, kh/μ, by the viscosity of the reservoir fluid (see Section 6), $\mu_{reservoir}$, of 0.47 centipoise (cp):

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

$$= (269.75)(0.47)$$

$$= 126.78\ md - ft$$

The reservoir permeability (OCD Guideline Section IX.15.e) using the total thickness (see Section 5 and Section 11) of 123 feet was 1.03 md:

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

$$= \frac{126.78}{123}$$

$$= 1.03\ md$$

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

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

where,

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

A cumulative volume of approximately 8,923,776 gallons of waste has been injected into WDW #2 (see Section 8). The formation has a porosity of 0.149 (see Section 5 and Section 11).

The distance to the waste front was determined to be 143.94 feet:

$$r_{waste} = \left(\frac{(0.13368)(8{,}923{,}776)}{(\pi)(123)(0.149)} \right)^{\frac{1}{2}}$$

$$= 143.94\ feet$$

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 4.44 x 10^{-6} psi^{-1} (see Section 6). The viscosity of the waste fluid is 0.47 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:

$$t_{waste} = 948 \frac{(0.149)(0.47)(4.44 * 10^{-6})(143.94^2)}{1.03}$$

$$= 5.92\ hours$$

Since the time required to pass through the waste is less than the 210.48 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:

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

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 4560.65 psia. The pressure determined by extrapolating the radial flow semi-log line to a Δt of one hour, p_{1hr}, was 4631.02 psia (calculated from the analysis software). The wellbore radius, r_w, is 0.3281 feet (completion records). Using these values in addition to the previously discussed parameters results in a skin of -5.12.

$$s = 1.151\left[\frac{4560.65 - 4631.02}{368.21} - \log\left(\frac{1.03}{(0.149)(0.47)(4.44 * 10^{-6})(0.3281^2)}\right) + 3.23\right]$$

$$= -5.12$$

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 -1638.27 psi:

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

$$= 0.869(368.21)(-5.12)$$

$$= -1638.27\ psi$$

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 3.79:

$$E = \frac{4560.65 - (-1638.27) - 3903.28}{4560.65 - 3903.28}$$

$$= 3.49$$

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

$$R_{inv} = 0.029\sqrt{\frac{k\Delta t_s}{\emptyset \mu c_t}}$$

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 861 feet:

$$R_{inv} = 0.029\sqrt{\frac{(1.03)(238)}{(0.149)(0.47)(4.44 * 10^{-6})}}$$

$$= 814\ feet$$

As indicated on Figure 5, the pressure data does not depart the pseudo-radial flow region. No pressure or temperature anomalies were noted on any of the analysis plots (OCD Guideline Section VIII.9). Possible 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).

Because WDW #2 was shut in approximately 312 hours prior to the 2021 pressure falloff testing a current Hall plot (OCD Guideline Section IX.18.h) could not be constructed.

A comparison of the 2021 reservoir analysis results with previous years' (2020 and 2019) results are available in Table 8 (OCD Guideline Section IX.19).

On September 29, 2021 a static pressure gradient survey was conducted while pulling the pressure gauges out of the well. Static gradient stops were conducted at 7312 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 238 hours of shut-in at 7312 feet were 3903.28 psia and 179.93°F, respectively. The gradient survey is summarized in Table 9. The data are graphically depicted in Figure 8.

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

Western 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 1

CUMULATIVE LIST OF WELLS IN THE 1-MILE AOR

Map ID	Distance (feet)	API Number	Company	Lease	Well No.	Total Depth (feet)	Unit	Section	Township	Range	Type	Status	Plug Date	Penetrates Injection Zone
0	**0**	**30-045-35747**	**Western Refining Southwest LLC**	**Waste Disposal Well**	**1**	**7525**	**H**	**27**	**29N**	**11W**	**SWD**	**Active**		Y
1	1041	30-045-34409	Holcomb Oil & Gas Inc	Jacque	2	1897	H	27	29N	11W	Gas	Active		N
2	1141	30-045-24084	Hilcorp Energy Co	Davis Gas Com F	001E	6392	H	27	29N	11W	Gas	Active		N
3	1171	30-045-07883	Pre-Ongard Well Operator	Pre-Ongard Well	2	0	H	27	29N	11W	Gas	Plugged	12/31/1901	N
4	1380	30-045-29002	San Juan Refining Co	Disposal	1	3601	I	27	29N	11W	SWD	Plugged	10/29/2015	N
5	1582	30-045-30833	Hilcorp Energy Co	Davis Gas Com F	001R	6700	I	27	29N	11W	Gas	Active		N
6	1643	30-045-25329	Holcomb Oil & Gas Inc	Davis Gas Com J	1	4331	F	26	29N	11W	Gas	Active		N
7	1419	30-045-24083	Hilcorp Energy Co	Sullivan Gas Com D	001E	6329	F	26	29N	11W	Gas	Active		N
8	1740	30-045-07825	Bp America Production Co	Davis Gas Com F	1	6365	I	27	29N	11W	Gas	Plugged	1/19/1994	N
9	1742	30-045-23554	XTO Energy, Inc	Davis Gas Com G	1	2951	I	27	29N	11W	Gas	Plugged	11/15/2011	N
10	1756	30-045-34463	Holcomb Oil & Gas Inc	Jacque	1	1890	I	27	29N	11W	Gas	Active		N
11	1793	30-045-07812	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	I	27	29N	11W	Gas	Plugged	11/3/1982	N
12	2376	30-045-12003	Hilcorp Energy Co	Calvin	1	6450	M	26	29N	11W	Gas	Active		N
13	2640	30-045-02133	N/A	Lauren Kelly	1	3028	-	27	29N	11W	N/A	Inactive		N
14	2640	30-045-02134	N/A	B Garland	1	3028	-	27	29N	11W	N/A	Inactive		N
15	2713	30-045-34266	Holcomb Oil & Gas Inc	Mangum	001S	0	F	27	29N	11W	Gas	Cancelled	12/31/9999	N
16	2750	30-045-25612	Hilcorp Energy Co	Calvin	3	5970	K	26	29N	11W	Oil	Active		N
17	2904	30-045-31118	Hilcorp Energy Co	Calvin	100	1970	N	26	29N	11W	Gas	Active		N
18	2909	30-045-07776	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	M	26	29N	11W	Gas	Plugged	12/31/1901	N
19	3018	30-045-26721	Manana Gas Inc	Nancy Hartman	2	2824	P	22	29N	11W	Gas	Active		N
20	3025	30-045-24572	Morningstar Operating Llc	Congress	9	2960	N	26	29N	11W	Gas	Active		N
21	3121	30-045-07733	Hilcorp Energy Co	Sullivan Gas Com D	1	6260	B	26	29N	11W	Gas	Active		N
22	3146	30-045-07961	Manana Gas Inc	Hartman	1	6310	P	22	29N	11W	Gas	Plugged	6/14/1999	N
23	3391	30-045-07959	John C Pickett	Grace Pearce	1	1620	O	22	29N	11W	Gas	Plugged	3/2/2000	N
24	3412	30-045-30788	Hilcorp Energy Co	Ashcroft Swd	1	7512	B	26	29N	11W	SWD	Active		Y
25	3451	30-045-25673	Hilcorp Energy Co	Congress	18	6150	K	27	29N	11W	Oil	Active		N
26	3498	30-045-24673	Hilcorp Energy Co	Mangum	001E	6240	F	27	29N	11W	Gas	Active		N
27	3597	30-045-33093	Hilcorp Energy Co	Calvin	001F	6525	J	26	29N	11W	Gas	Active		N
28	3645	30-045-27365	Manana Gas Inc	Marian S	1	2840	F	27	29N	11W	Gas	Active		N
29	3654	30-045-27361	Manana Gas Inc	Lauren Kelly	1	1500	F	27	29N	11W	Gas	Active		N
30	3803	30-045-29107	Pre-Ongard Well Operator	Pre-Ongard Well	001X	0	G	26	29N	11W	Gas	Plugged	7/28/1955	N
31	3804	30-045-07870	Pre-Ongard Well Operator	Pre-Ongard Well	00X	0	G	26	29N	11W	Gas	Plugged	7/1/1953	N

TABLE 1

CUMULATIVE LIST OF WELLS IN THE 1-MILE AOR

Map ID	Distance (feet)	API Number	Company	Lease	Well No.	Total Depth (feet)	Unit	Section	Township	Range	Type	Status	Plug Date	Penetrates Injection Zone
32	3836	30-045-07896	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	C	27	29N	11W	Gas	Plugged	11/27/1978	N
33	3874	30-045-23163	Hilcorp Energy Co	Earl B Sullivan	1	2861	B	26	29N	11W	Gas	Active		N
34	3907	30-045-25657	Hilcorp Energy Co	Congress	16	6200	A	34	29N	11W	Oil	Active		N
35	3936	30-045-23550	Holcomb Oil & Gas Inc	State Gas Com Bs	1	2954	K	23	29N	11W	Gas	Active		N
36	3963	30-045-07985	Bp America Production Co	Pearce Gas Com	1	6230	K	23	29N	11W	Gas	Plugged	3/12/1997	N
37	4155	30-045-07835	Holcomb Oil & Gas Inc	Mangum	1	6350	L	27	29N	11W	Gas	Active		N
38	4199	30-045-26731	Manana Gas Inc	Mary Jane	1	2845	N	22	29N	11W	Gas	Active		N
39	4192	30-045-24574	Hilcorp Energy Co	Summit	9	2985	A	34	29N	11W	Gas	Active		N
40	4209	30-045-34312	Manana Gas Inc	Royal Flush	1	2045	N	22	29N	11W	Gas	Active		N
41	4364	30-045-07940	Manana Gas Inc	Cook	1	6305	N	22	29N	11W	Gas	Active		N
42	4391	30-045-13089	Manana Gas Inc	Cook	2	1440	N	22	29N	11W	Gas	Active		N
43	4588	30-045-07868	Holcomb Oil & Gas Inc	Sullivan	2	1478	H	26	29N	11W	Gas	Active		N
44	4583	30-045-08009	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	K	23	29N	11W	Gas	Plugged	8/26/1980	N
45	4649	30-045-25675	Hilcorp Energy Co	Congress	15	6030	C	35	29N	11W	Oil	Active		N
46	4722	30-045-21457	Morningstar Operating Llc	Delo	10	2900	I	26	29N	11W	Gas	Active		N
47	4736	30-045-25707	Morningstar Operating Llc	Summit	15	6216	C	34	29N	11W	Gas	Active		N
48	4773	30-045-07903	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	M	27	29N	11W	Gas	Plugged	7/1/1975	N
49	4815	30-045-24573	Morningstar Operating Llc	Garland	3	2905	M	27	29N	11W	Gas	Active		N
50	4897	30-045-25195	Hilcorp Energy Co	Calvin	2	5950	P	26	29N	11W	Oil	Active		N
51	4907	30-045-24772	Hilcorp Energy Co	Calvin	001E	6500	P	26	29N	11W	Gas	Active		N
52	4983	30-045-21732	Burlington Resources O&G Co Lp	Garland B	001R	1810	M	27	29N	11W	Gas	Plugged	8/9/2010	N
53	5038	30-045-25621	Holcomb Oil & Gas Inc	Earl B Sullivan	2	5751	H	26	29N	11W	Oil	Active		N
54	5056	30-045-24837	Hilcorp Energy Co	Congress	004E	6508	E	35	29N	11W	Gas	Active		N
55	5133	30-045-20752	Chaparral Oil & Gas Co	Lea Ann	1	1900	E	35	29N	11W	Gas	Plugged	12/18/1999	N
56	5165	30-045-22639	General Minerals Corp	Delo	11	1945	P	26	29N	11W	Gas	Plugged	7/30/2010	N
57	5221	30-045-24082	Hilcorp Energy Co	Pearce Gas Com	001E	6365	J	23	29N	11W	Gas	Active		N
58	703	30-045-25745	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	E	26	29N	11W	Gas	Cancelled		N
59	1130	30-045-23553	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	H	27	29N	11W	Gas	Plugged	12/31/1901	N
60	1658	30-045-23552	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	F	26	29N	11W	Gas	Cancelled		N
61	4766	30-045-23551	Pre-Ongard Well Operator	Pre-Ongard Well	1	0	O	23	29N	11W	Gas	Cancelled		N
62	4894	30-045-25738	Pre-Ongard Well Operator	Pre-Ongard Well	23	0	I	26	29N	11W	Gas	Cancelled		N

TABLE **2**

STATUS CHANGES SINCE THE **2020** AOR UPDATE

Unit	Sect	Twp	Rng	Map ID	API No	Well Name	Operator	Change of Owner	P&A	T&A	Prod	Recomp	New

NO CHANGES

TABLE **3**

WELLS THAT HAVE BEEN **PLUGGED & ABANDONED** SINCE THE **2020** AOR UPDATE

Unit	Sect	Twp	Rng	Map ID	API No	Well Name	Operator	Change of Owner	P&A	T&A	Prod	Recomp	New

NO CHANGES

TABLE 4

WELLS THAT HAVE BEEN TEMPORARILY ABANDONED SINCE THE **2020** AOR UPDATE

Unit	Sect	Twp	Rng	Map ID	API No	Well Name	Operator	Change of Owner	P&A	T&A	Prod	Recomp	New

NO CHANGES

TABLE 5

WELLS THAT HAVE BEEN RECOMPLETED SINCE THE **2020** AOR UPDATE

Unit	Sect	Twp	Rng	Map ID	API No	Well Name	Operator	Change of Owner	P&A	T&A	Prod	Recomp	New

NO CHANGES

TABLE **6**

NEWLY DRILLED WELLS SINCE THE 2020 AOR UPATE

Unit	Sect	Twp	Rng	Map ID	API No	Well Name	Operator	Change of Owner	P&A	T&A	Prod	Recomp	New

NO CHANGES

TABLE 7

FIGURES INCLUDED IN THE REPORT

Figure	Description	OCD Reference
1	Waste Disposal Well #2 Schematic	Section VI.1 and IX.3
2	Map of One Mile Area of Review	n/a
3	Waste Disposal Well #2 Test Overview	Section IX.18.f
4	Waste Disposal Well #2 Cartesian Plot of Data Used in the Analysis	Section IX.18.a
5	Waste Disposal Well #2 Derivative Log-Log Plot	Section IX.18.c
6	Waste Disposal Well #2 Superposition Horner (Semi-Log) Plot	Section IX.18.d
7	Waste Disposal Well #2 Expanded Superposition Horner (Semi-Log) Plot	Section IX.18.d
8	Waste Disposal Well #2 Static Pressure Gradient Survey	n/a

TABLE 8

Waste Disposal Well #2
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*)
September 19 – 29, 2021	1.03 md	269.75 md-ft/cp	-5.12	3735.42 psia
September 21 – October 1, 2020	1.14 md	297.64 md-ft/cp	-5.05	3632.37 psia
April 15 – 30, 2019	1.73 md	451 md-ft/cp	-3.80	3809.70 psia

TABLE 9

STATIC PRESSURE GRADIENT SURVEY
WASTE DISPOSAL WELL No. 2
September 29, 2021

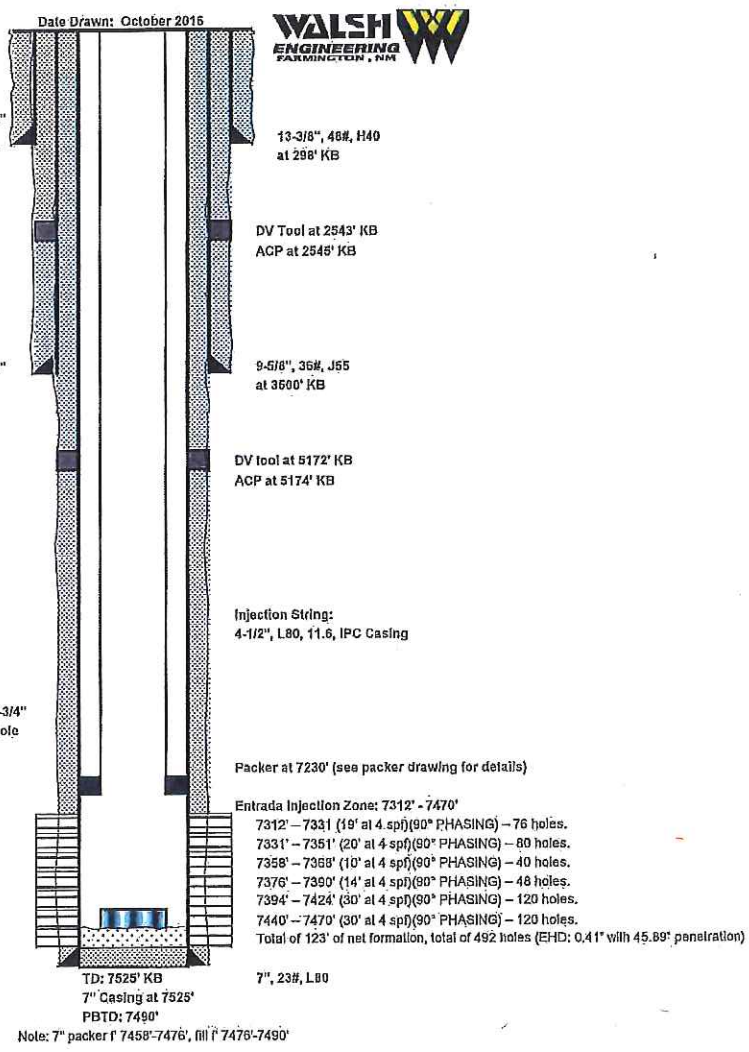
Memory Gauge Serial No. 240			
Depth (feet)	Pressure (psig)	Pressure Gradient (psi/ft)	Temperature (ºF)
0	736.65	-	71.23
1000	1174.01	0.437	75.59
2000	1606.43	0.432	94.69
3000	2039.69	0.433	108.62
4000	2470.61	0.431	127.29
5000	2899.95	0.429	146.42
6000	3328.08	0.428	167.30
7000	3756.00	0.428	184.09
7312	3888.58	0.425	179.96

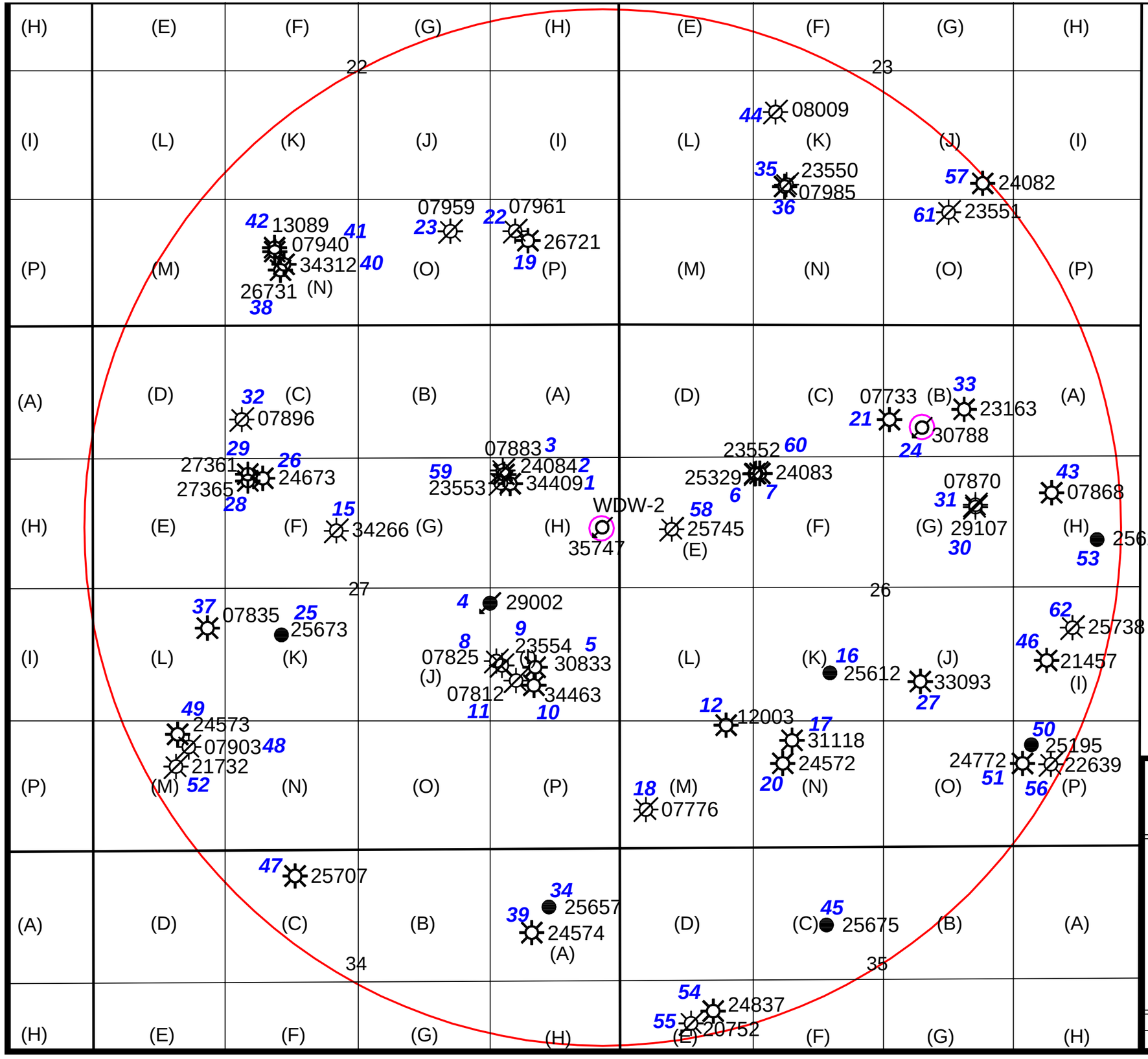
FIGURES

FIGURE 1

Well/Facility:	SWD #2	Well Status:	Current
Operator:	Western Refinery	Orig Oper:	
Lease/Op Agmt:		Inj Interval:	
Field:	Entrada	API #:	
County:	San Juan	GR/KB:	14.5'
State:	NM	TD:	7525' KB
Spud:	8/15/2016	PBTD:	7490' KB
Comp. Date:		WI:	
1st Prod:		NRI:	
Xmas tree:			
Surface Loc:	2028' fnl & 111' fel		
Sec-Twn-Rge:	Sec 27/T29N/11W		
Comments:	3/7/2017 - Started injection/Water Disposal Operations		

Geologic Markers	
MD	Formation
Surface	Quaternary Alluv
10'	Nacimiento
515'	Ojo Alamo
625'	Kirtland
1203'	Fruitland
1718'	Pictured Cliffs
1880'	Lewis
2660'	Huerfanito Bentonite
2688'	Chacra
2877'	Lower Lewis
3337'	Cliff House
3389'	Menefee
4045'	Point Lookout
4432'	Mancos Shale
5301'	Niobrara A
5400'	Niobrara B
5526'	Niobrara C
6606'	Gallup
6848'	Juana Lopez
5966'	Carlile
6055'	Greenhorn
6117'	Graneros
6161'	Dakota
6357'	Burro Canyon
6417'	Morrison
7031'	Bluff Sandstone
7150'	Wanakah
7276'	Todilto
7308'	Entrada
7470'	Chinle
7525'	TD





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

FIGURE 2

WESTERN REFINING SOUTHWEST
BLOOMFIELD, NEW MEXICO

AREA OF REVIEW MAP

DATE: 11/12/2021	CHECKED BY: JT	JOB NO: 192025AI
DRAWN BY: WDD	APPROVED BY: TG	DWG NO:

Figure 3: WDW-2 Test Overview Plot

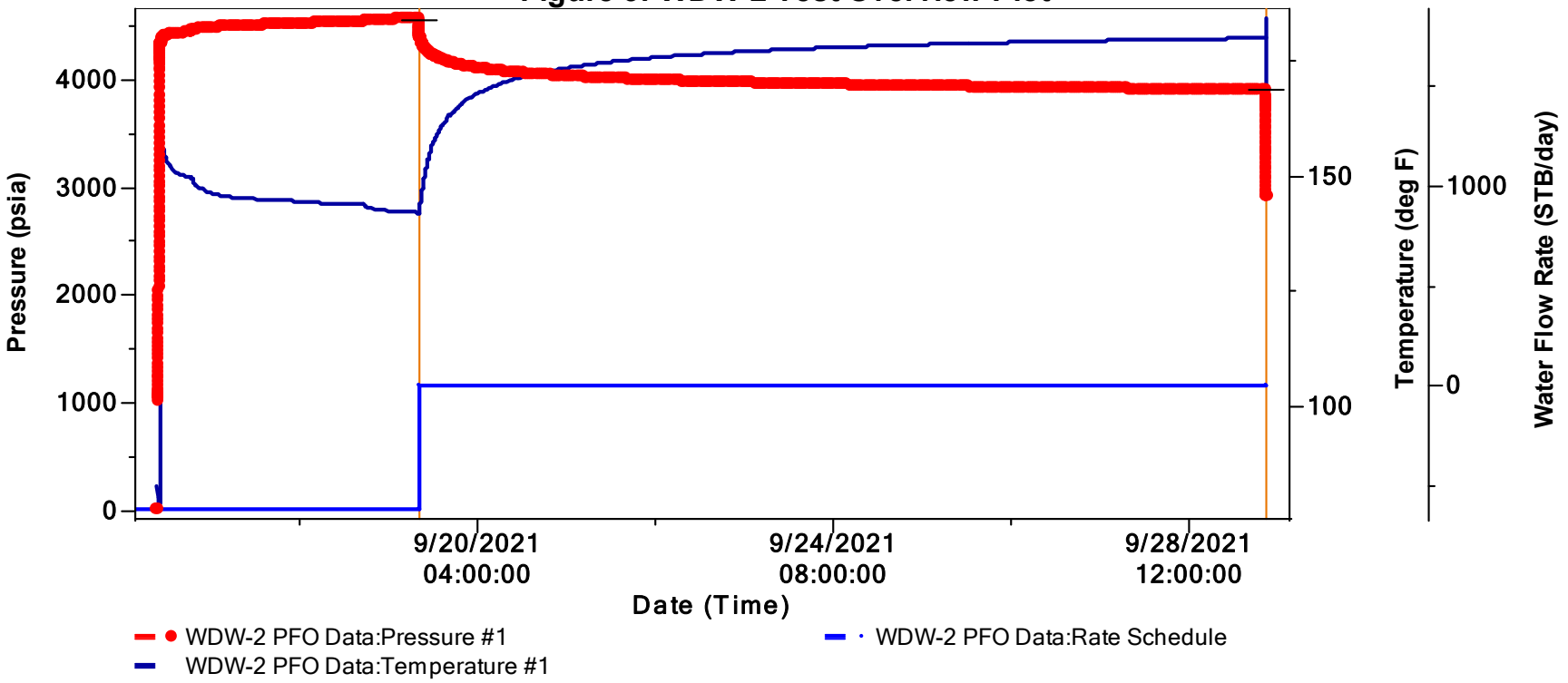


Figure 4: WDW-2 Cartesian Plot

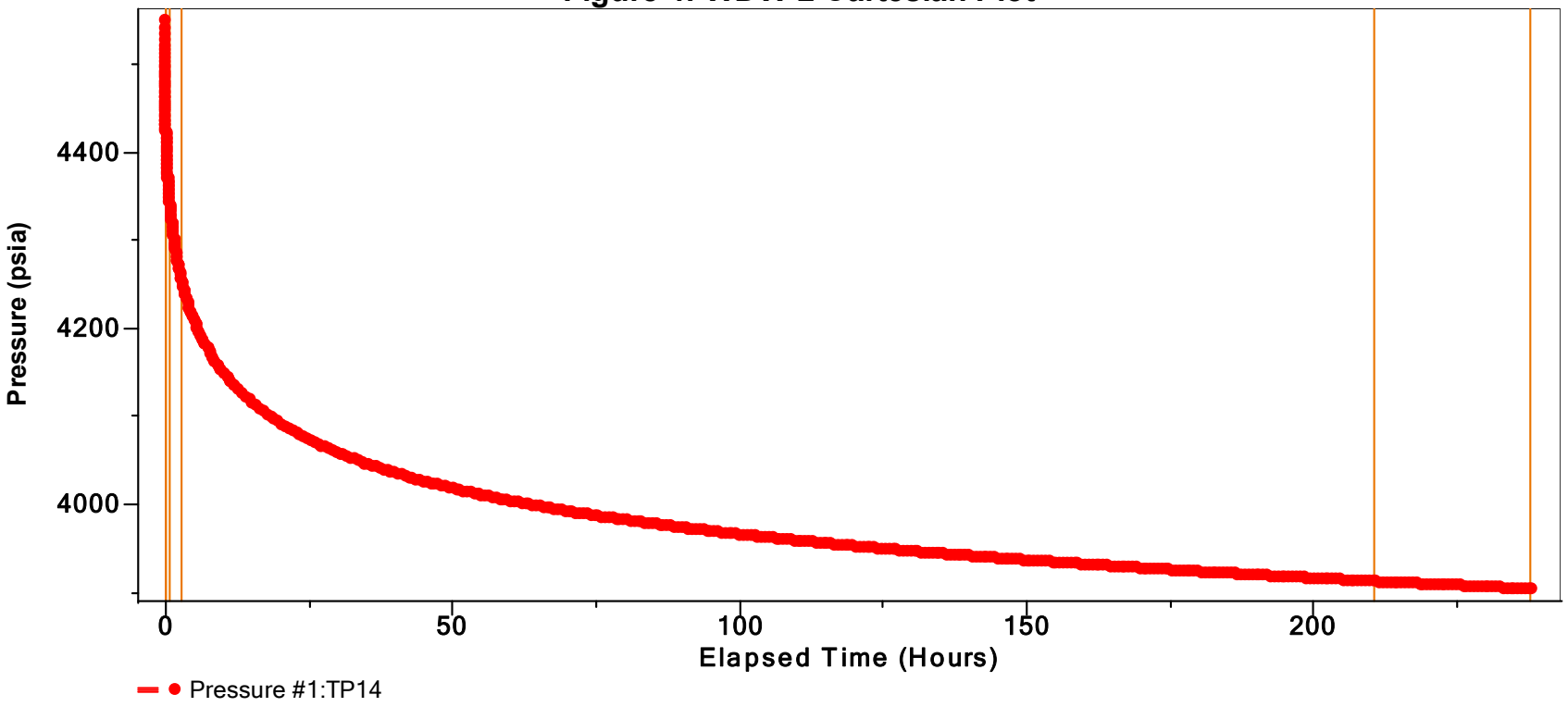


Figure 5: WDW-2 Log-Log Plot

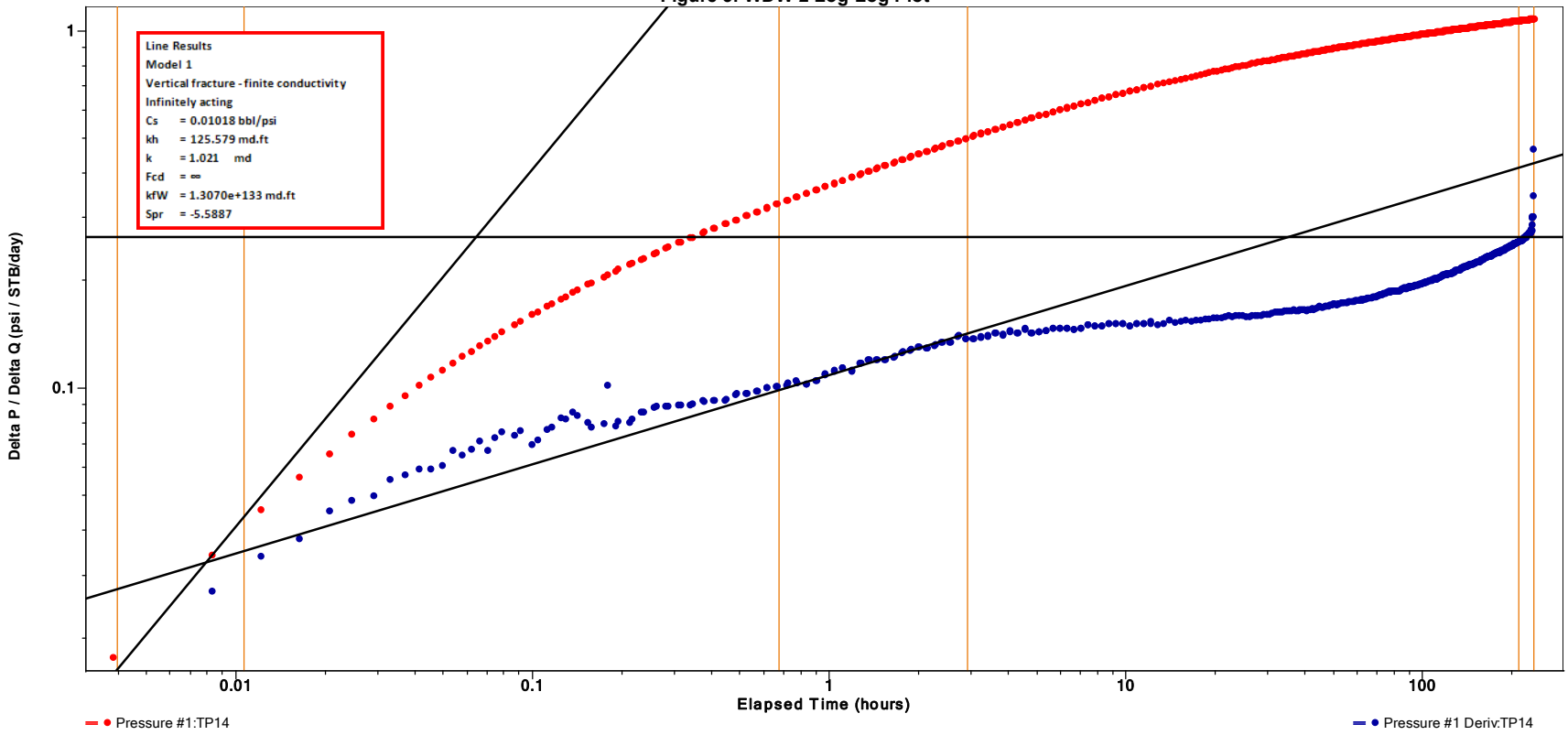


Figure 6: WDW-2 Superposition Horner Plot

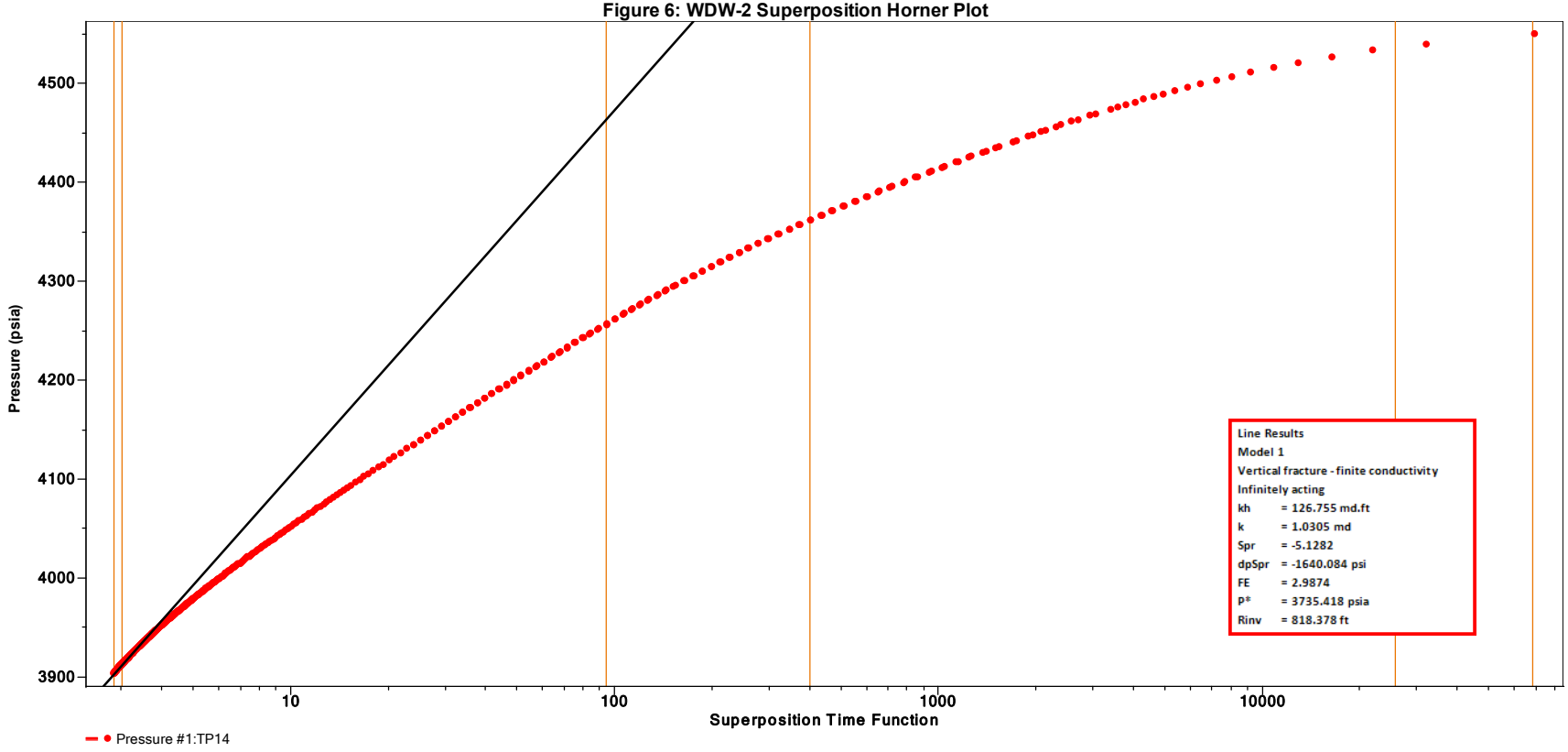
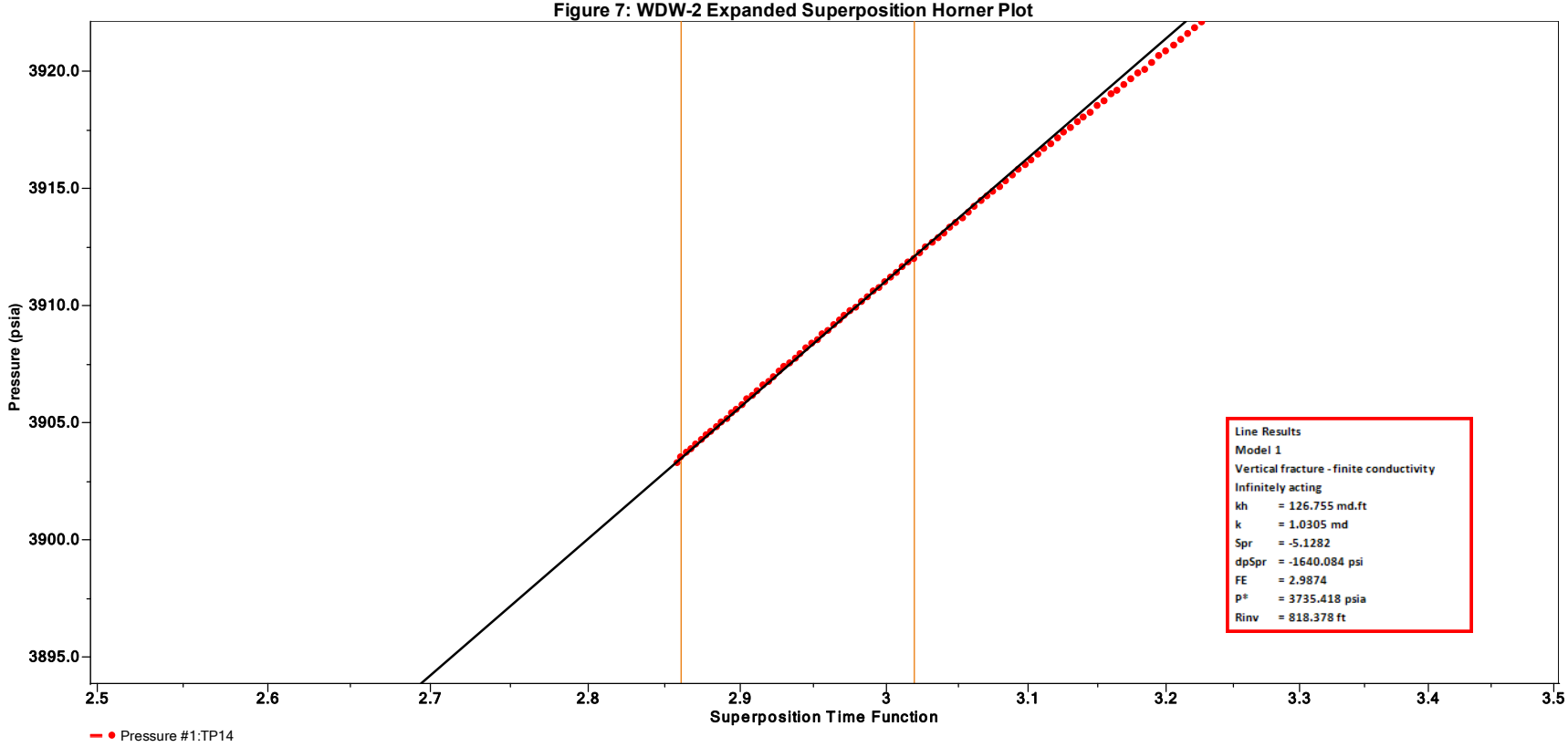


Figure 7: WDW-2 Expanded Superposition Horner Plot



STATIC PRESSURE GRADIENT SURVEY
WASTE DISPOSAL WELL No. 2
SEPTEMBER 29, 2021

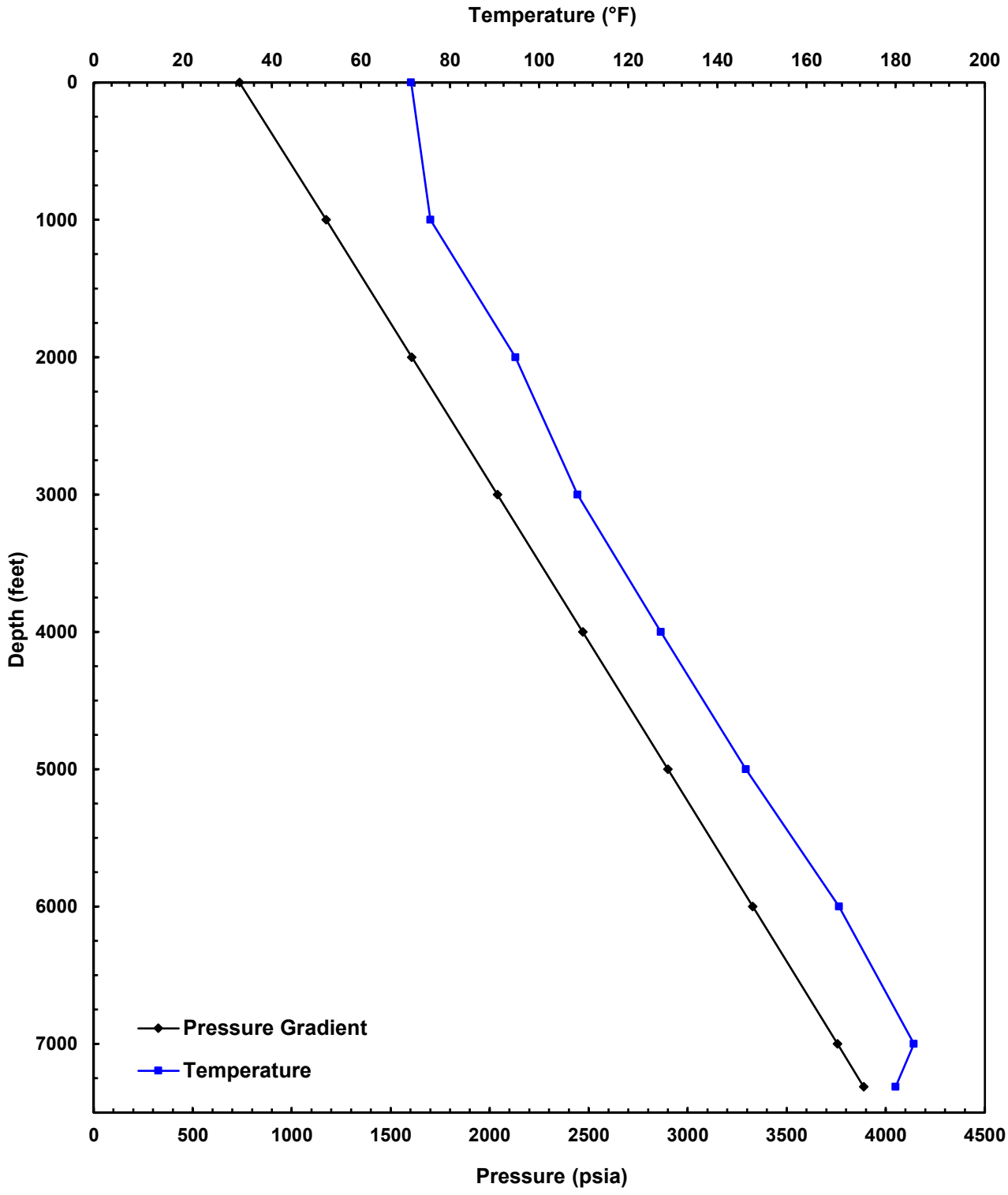


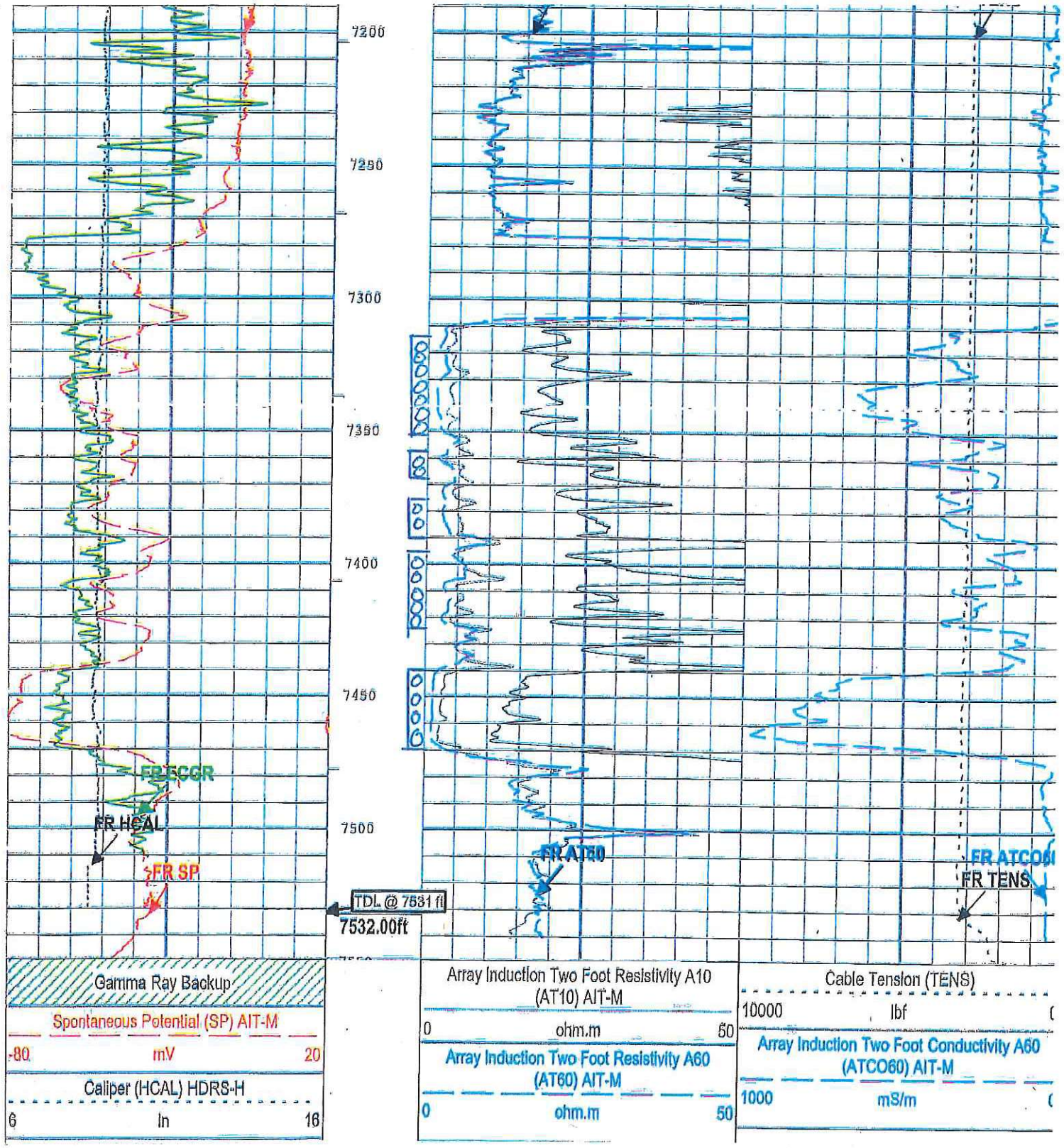
FIGURE 8

APPENDICES

APPENDIX A

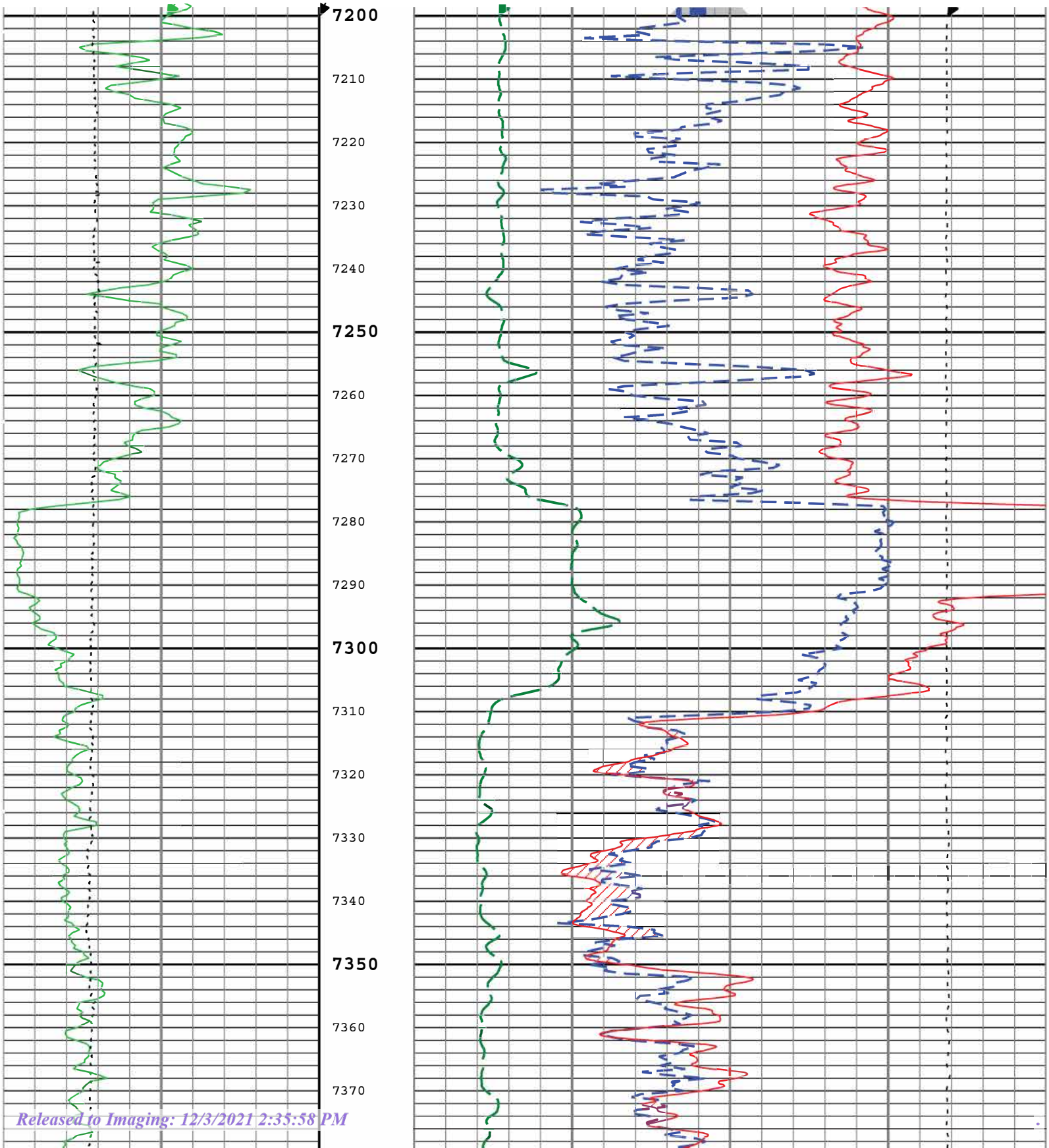
DUAL INDUCTION LOG SECTIONS FROM 7200 FEET TO 7532 FEET

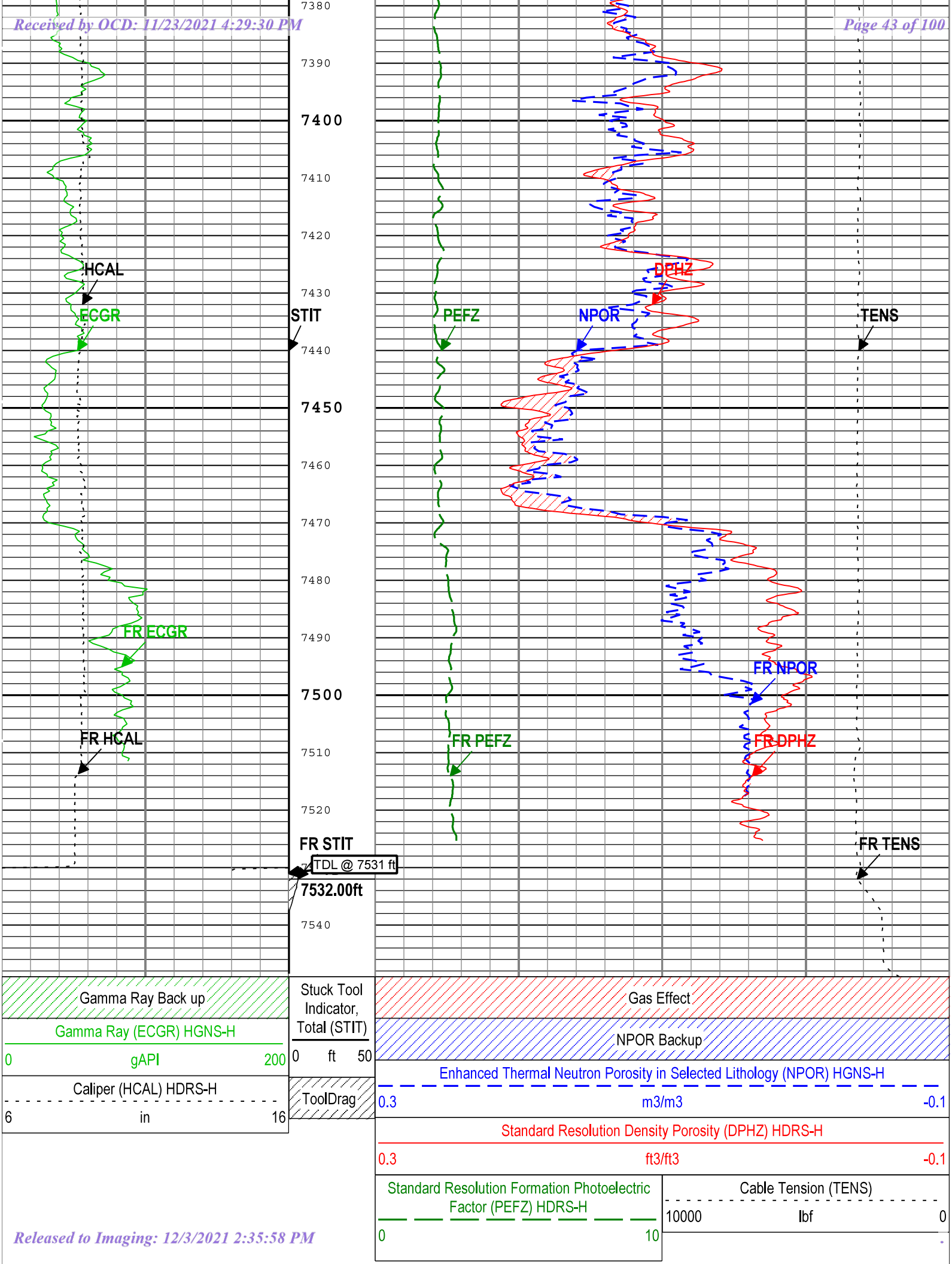
Table 1: A copy of the well log showing the Entrada interval to be tested.



APPENDIX B

POROSITY LOG SECTIONS FROM 7200 FEET TO 7532 FEET


7200
7210
7220
7230
7240
7250
7260
7270
7280
7290
7300
7310
7320
7330
7340
7350
7360
7370



APPENDIX C

INJECTION AND FORMATION FLUID ANALYSIS

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

September 16, 2021

Gary Russell

Western Refining Southwest, Inc.
#50 CR 4990
Bloomfield, NM 87413
TEL: (505) 632-4135
FAX (505) 632-3911

RE: Quarterly Injection Well 2021Q3 OrderNo.: 2108A33

Dear Gary Russell:

Hall Environmental Analysis Laboratory received 1 sample(s) on 8/19/2021 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: clients.hallenvironmental.com

Case Narrative

WO#: **2108A33**
Date: **9/16/2021**

CLIENT: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Analytical Notes Regarding 8270TCLP:
The laboratory control spike recovery for 2,4 Dinitrotoluene had a slightly low recovery. The MS/MSD had acceptable recoveries.

Analytical Report
Lab Order **2108A33**
Date Reported: **9/16/2021**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Western Refining Southwest, Inc. **Client Sample ID:** Injection Well
Project: Quarterly Injection Well 2021Q3 **Collection Date:** 8/18/2021 10:00:00 AM
Lab ID: 2108A33-001 **Matrix:** AQUEOUS **Received Date:** 8/19/2021 6:58:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8270C TCLP						Analyst: **DAM**	
2-Methylphenol	ND	200		mg/L	1	8/27/2021 11:33:11 AM	62176
3+4-Methylphenol	ND	200		mg/L	1	8/27/2021 11:33:11 AM	62176
2,4-Dinitrotoluene	ND	0.13		mg/L	1	8/27/2021 11:33:11 AM	62176
Hexachlorobenzene	ND	0.13		mg/L	1	8/27/2021 11:33:11 AM	62176
Hexachlorobutadiene	ND	0.50		mg/L	1	8/27/2021 11:33:11 AM	62176
Hexachloroethane	ND	3.0		mg/L	1	8/27/2021 11:33:11 AM	62176
Nitrobenzene	ND	2.0		mg/L	1	8/27/2021 11:33:11 AM	62176
Pentachlorophenol	ND	100		mg/L	1	8/27/2021 11:33:11 AM	62176
Pyridine	ND	5.0		mg/L	1	8/27/2021 11:33:11 AM	62176
2,4,5-Trichlorophenol	ND	400		mg/L	1	8/27/2021 11:33:11 AM	62176
2,4,6-Trichlorophenol	ND	2.0		mg/L	1	8/27/2021 11:33:11 AM	62176
Cresols, Total	ND	200		mg/L	1	8/27/2021 11:33:11 AM	62176
Surr: 2-Fluorophenol	52.1	15-91.8		%Rec	1	8/27/2021 11:33:11 AM	62176
Surr: Phenol-d5	40.4	15-69.6		%Rec	1	8/27/2021 11:33:11 AM	62176
Surr: 2,4,6-Tribromophenol	56.7	15-115		%Rec	1	8/27/2021 11:33:11 AM	62176
Surr: Nitrobenzene-d5	56.6	15-109		%Rec	1	8/27/2021 11:33:11 AM	62176
Surr: 2-Fluorobiphenyl	58.2	15-96		%Rec	1	8/27/2021 11:33:11 AM	62176
Surr: 4-Terphenyl-d14	98.2	15-133		%Rec	1	8/27/2021 11:33:11 AM	62176
SPECIFIC GRAVITY						Analyst: **CAS**	
Specific Gravity	1.003	0			1	9/10/2021 1:30:00 PM	R81197
EPA METHOD 300.0: ANIONS						Analyst: **JMT**	
Fluoride	ND	0.50		mg/L	5	8/19/2021 3:05:16 PM	R80671
Chloride	690	25	*	mg/L	50	8/30/2021 7:30:25 PM	R80904
Nitrogen, Nitrite (As N)	ND	0.50		mg/L	5	8/19/2021 3:05:16 PM	R80671
Bromide	2.5	0.50		mg/L	5	8/19/2021 3:05:16 PM	R80671
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	5	8/19/2021 3:05:16 PM	R80671
Phosphorus, Orthophosphate (As P)	ND	2.5		mg/L	5	8/19/2021 3:05:16 PM	R80671
Sulfate	36	2.5		mg/L	5	8/19/2021 3:05:16 PM	R80671
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **CAS**	
Conductivity	3000	10		µmhos/c	1	8/30/2021 3:23:00 PM	R80910
SM2320B: ALKALINITY						Analyst: **CAS**	
Bicarbonate (As CaCO3)	365.1	20.00		mg/L Ca	1	8/27/2021 11:49:10 AM	R80883
Carbonate (As CaCO3)	ND	2.000		mg/L Ca	1	8/27/2021 11:49:10 AM	R80883
Total Alkalinity (as CaCO3)	365.1	20.00		mg/L Ca	1	8/27/2021 11:49:10 AM	R80883
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **JMT**	
Total Dissolved Solids	1580	40.0	*D	mg/L	1	8/26/2021 7:26:00 AM	62152

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		

Analytical Report
Lab Order **2108A33**
Date Reported: **9/16/2021**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Western Refining Southwest, Inc. **Client Sample ID:** Injection Well
Project: Quarterly Injection Well 2021Q3 **Collection Date:** 8/18/2021 10:00:00 AM
Lab ID: 2108A33-001 **Matrix:** AQUEOUS **Received Date:** 8/19/2021 6:58:00 AM

Analyses	Result	RL	Qual	Units	DF	Date Analyzed	Batch
SM4500-H+B / 9040C: PH						Analyst: **CAS**	
pH	7.40		H	pH units	1	8/27/2021 11:49:10 AM	R80883
EPA METHOD 200.7: DISSOLVED METALS						Analyst: **ELS**	
Calcium	65	1.0		mg/L	1	8/20/2021 10:01:23 AM	A80684
Magnesium	18	1.0		mg/L	1	8/20/2021 10:01:23 AM	A80684
Potassium	6.5	1.0		mg/L	1	8/20/2021 10:01:23 AM	A80684
Sodium	490	5.0		mg/L	5	8/20/2021 10:03:10 AM	A80684
EPA METHOD 7470A: MERCURY						Analyst: **ags**	
Mercury	ND	0.00020		mg/L	1	9/2/2021 12:05:09 PM	62337
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: **JLF**	
Arsenic	ND	0.030		mg/L	1	9/2/2021 7:46:20 PM	62168
Barium	0.32	0.0020		mg/L	1	9/2/2021 3:41:19 PM	62168
Cadmium	ND	0.0020		mg/L	1	9/2/2021 3:41:19 PM	62168
Chromium	ND	0.0060		mg/L	1	9/2/2021 3:41:19 PM	62168
Lead	ND	0.020		mg/L	1	9/2/2021 7:46:20 PM	62168
Selenium	ND	0.050		mg/L	1	9/2/2021 3:41:19 PM	62168
Silver	ND	0.0050		mg/L	1	9/2/2021 7:46:20 PM	62168
EPA METHOD 8081: PESTICIDES						Analyst: **LSB**	
Chlordane	ND	1.0		µg/L	1	8/31/2021 1:55:46 PM	62173
Surr: Decachlorobiphenyl	123	41.7-129		%Rec	1	8/31/2021 1:55:46 PM	62173
Surr: Tetrachloro-m-xylene	79.0	31.8-88.5		%Rec	1	8/31/2021 1:55:46 PM	62173
TCLP VOLATILES BY 8260B						Analyst: **CCM**	
Benzene	ND	100		mg/L	200	8/21/2021 1:42:00 PM	T80700
1,2-Dichloroethane (EDC)	ND	100		mg/L	200	8/21/2021 1:42:00 PM	T80700
2-Butanone	ND	40000		mg/L	200	8/21/2021 1:42:00 PM	T80700
Carbon Tetrachloride	ND	100		mg/L	200	8/21/2021 1:42:00 PM	T80700
Chloroform	ND	1200		mg/L	200	8/21/2021 1:42:00 PM	T80700
1,4-Dichlorobenzene	ND	1500		mg/L	200	8/21/2021 1:42:00 PM	T80700
1,1-Dichloroethene	ND	140		mg/L	200	8/21/2021 1:42:00 PM	T80700
Tetrachloroethene (PCE)	ND	140		mg/L	200	8/21/2021 1:42:00 PM	T80700
Trichloroethene (TCE)	ND	100		mg/L	200	8/21/2021 1:42:00 PM	T80700
Vinyl chloride	ND	40		mg/L	200	8/21/2021 1:42:00 PM	T80700
Chlorobenzene	ND	20000		mg/L	200	8/21/2021 1:42:00 PM	T80700
Surr: 1,2-Dichloroethane-d4	83.5	70-130		%Rec	200	8/21/2021 1:42:00 PM	T80700
Surr: 4-Bromofluorobenzene	101	70-130		%Rec	200	8/21/2021 1:42:00 PM	T80700
Surr: Dibromofluoromethane	83.0	70-130		%Rec	200	8/21/2021 1:42:00 PM	T80700
Surr: Toluene-d8	98.5	70-130		%Rec	200	8/21/2021 1:42:00 PM	T80700

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		

Pace Analytical®

ANALYTICAL REPORT

August 31, 2021

Hall Environmental Analysis Laboratory

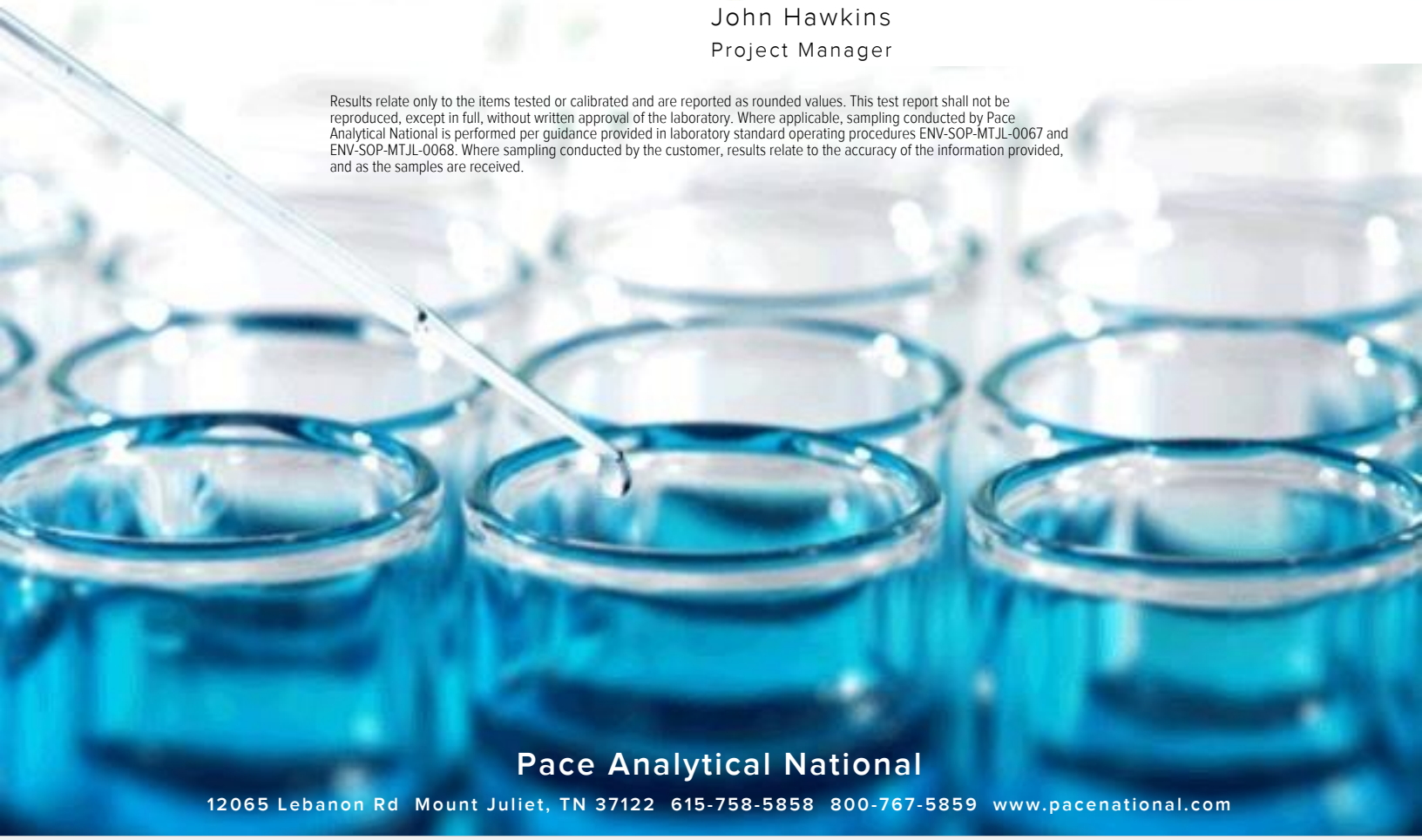
Sample Delivery Group:	L1393267
Samples Received:	08/20/2021
Project Number:	
Description:	

Report To: Jackie Bolte
4901 Hawkins NE
Albuquerque, NM 87109

Entire Report Reviewed By:

John Hawkins
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



Pace Analytical National
12065 Lebanon Rd Mount Juliet, TN 37122 615-758-5858 800-767-5859 www.pacenational.com

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SAMPLE SUMMARY

2108A33-001G L1393267-01 GW

Collected by	Collected date/time	Received date/time
	08/18/21 10:00	08/20/21 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 2580	WG1728374	1	08/25/21 17:54	08/25/21 17:54	AMH	Mt. Juliet, TN
Wet Chemistry by Method 4500 CN E-2011	WG1728696	1	08/26/21 08:59	08/26/21 21:36	SDL	Mt. Juliet, TN
Wet Chemistry by Method 4500 S2 D-2011	WG1728327	1	08/25/21 22:57	08/25/21 22:57	ARM	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1728038	1	08/30/21 18:00	08/30/21 18:00	BMD	Mt. Juliet, TN
Wet Chemistry by Method D93/1010A	WG1732000	1	08/31/21 02:43	08/31/21 02:43	WOS	Mt. Juliet, TN

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

John Hawkins
Project Manager

Project Narrative

All Reactive Cyanide results reported in the attached report were determined as totals using method 4500 CN E-2011.
All Reactive Sulfide results reported in the attached report were determined as totals using method 4500 S2 D-2011.

Wet Chemistry by Method 2580

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	mV			date / time	
ORP	116	T8	1	08/25/2021 17:54	WG1728374

Wet Chemistry by Method 4500 CN E-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Reactive Cyanide	ND		0.00500	1	08/26/2021 21:36	WG1728696

Wet Chemistry by Method 4500 S2 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Reactive Sulfide	ND		0.0500	1	08/25/2021 22:57	WG1728327

Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	su			date / time	
Corrosivity by pH	7.60	T8	1	08/30/2021 18:00	WG1728038

Sample Narrative:

L1393267-01 WG1728038: 7.6 at 20.7C

Wet Chemistry by Method D93/1010A

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	deg F			date / time	
Flashpoint	DNF at 170		1	08/31/2021 02:43	WG1732000

L1393267-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1393267-01 08/25/21 17:54 • (DUP) R3696446-3 08/25/21 17:54

Analyte	Original Result mV	DUP Result mV	Dilution	DUP Diff mV	DUP Qualifier	DUP Diff Limits mV
ORP	116	115	1	0.600		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3696446-1 08/25/21 17:54 • (LCSD) R3696446-2 08/25/21 17:54

Analyte	Spike Amount mV	LCS Result mV	LCSD Result mV	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	Diff mV	Diff Limits mV
ORP	106	106	106	100	100	86.0-105			0.100	20

Method Blank (MB)

(MB) R3697077-1 08/26/21 21:28

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

L1393189-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1393189-03 08/26/21 21:33 • (DUP) R3697077-3 08/26/21 21:34

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

L1393131-03 Original Sample (OS) • Duplicate (DUP)

(OS) L1393131-03 08/26/21 21:54 • (DUP) R3697077-4 08/26/21 21:55

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

Laboratory Control Sample (LCS)

(LCS) R3697077-2 08/26/21 21:29

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Cyanide	0.100	0.101	101	87.1-120	

L1393189-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1393189-01 08/26/21 21:57 • (MS) R3697077-5 08/26/21 21:58 • (MSD) R3697077-6 08/26/21 21:59

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	0.0956	0.0951	93.7	93.2	1	90.0-110			0.524	20

L1393189-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1393189-02 08/26/21 22:02 • (MS) R3697077-7 08/26/21 22:03 • (MSD) R3697077-8 08/26/21 22:04

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	0.0839	0.104	83.9	104	1	90.0-110	J6	J3	21.4	20

Method Blank (MB)

(MB) R3696500-1 08/25/21 22:56

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Reactive Sulfide	U		0.0250	0.0500

L1393267-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1393267-01 08/25/21 22:57 • (DUP) R3696500-3 08/25/21 22:57

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

Laboratory Control Sample (LCS)

(LCS) R3696500-2 08/25/21 22:57

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Sulfide	0.500	0.555	111	85.0-115	

Laboratory Control Sample (LCS)

(LCS) R3698250-1 08/30/21 18:00

Analyte	Spike Amount	LCS Result	LCS Rec.	Rec. Limits	LCS Qualifier
	su	su	%	%	
Corrosivity by pH	10.0	10.0	100	99.0-101	

Sample Narrative:

LCS: 10.02 at 22.9C

L1393970-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1393970-01 08/31/21 02:43 • (DUP) R3698291-3 08/31/21 02:43

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

L1395870-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1395870-01 08/31/21 02:43 • (DUP) R3698291-4 08/31/21 02:43

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

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3698291-1 08/31/21 02:43 • (LCSD) R3698291-2 08/31/21 02:43

Analyte	Spike Amount deg F	LCS Result deg F	LCSD Result deg F	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Flashpoint	126	129	125	102	99.1	96.0-104			3.15	10

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.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

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.
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.

Pace Analytical National 12065 Lebanon Rd Mount Juliet, TN 37122

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN000032021-1
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico [1]	TN00003
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina [1]	DW21704
Georgia	NELAP	North Carolina [3]	41
Georgia [1]	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky [1 6]	KY90010	South Carolina	84004002
Kentucky [2]	16	South Dakota	n/a
Louisiana	AI30792	Tennessee [1 4]	2006
Louisiana	LA018	Texas	T104704245-20-18
Maine	TN00003	Texas [5]	LAB0152
Maryland	324	Utah	TN000032021-11
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	110033
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	998093910
Montana	CERT0086	Wyoming	A2LA
A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [6] Wastewater n/a Accreditation not applicable

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace Analytical.

HALL ENVIRONMENTAL ANALYSIS LABORATORY

CHAIN OF CUSTODY RECORD

PAGE: 1 OF: 1

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

SUB CONTRATOR: Pace TN	COMPANY: PACE TN	PHONE: (800) 767-5859	FAX: (615) 758-5859		
ADDRESS: 12065 Lebanon Rd		ACCOUNT #:	EMAIL:		
CITY, STATE, ZIP: Mt. Juliet, TN 37122					

LV3932267

ITEM	SAMPLE	CLIENT SAMPLE ID	BOTTLE TYPE	MATRIX	COLLECTION DATE	# CONTAINERS	ANALYTICAL COMMENTS	
1	2108A33-001G	Injection Well	500HDPE	Aqueous	8/18/2021 10:00:00 AM	1	RCI, ORP	-01
2	2108A33-001H	Injection Well	500PLNAOH ZNAC	Aqueous	8/18/2021 10:00:00 AM	1	RCI, ORP 7I2	-01
3	2108A33-001I	Injection Well	500PL-NaOH	Aqueous	8/18/2021 10:00:00 AM	1	RCI, ORP 7I2 RCV	-01

Sample Receipt Checklist

COC Seal Present/Intact:	Y N	If Applicable	
COC Signed/Accurate:	Y N	VOA Zero Headspace:	Y N
Bottles arrive intact:	Y N	Pres.Correct/Check:	Y N
Correct bottles used:	Y N		
Sufficient volume sent:	Y N		
RAD Screen <0.5 mR/hr:	Y N		

B132

pz60
1.5-.1=1.4
COCSI

SPECIAL INSTRUCTIONS / COMMENTS:

Please include the LAB ID and the CLIENT SAMPLE ID on all final reports. Please e-mail results to lab@hallenvironmental.com. Please return all coolers and blue ice. Thank you.

Relinquished By:	Date: 8/19/2021	Time: 9:16 AM	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date: 8/20/21	Time: 9:00

TAT: Standard RUSH Next BD 2nd BD 3rd BD

REPORT TRANSMITTAL DESIRED:
HARDCOPY (extra cost) FAX EMAIL ONLINE

FOR LAB USE ONLY
Temp of samples ℃ Attempt to Cool ?
Comments:

774585666287

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB**	SampType: **MBLK**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **PBW**	Batch ID: **A80684**	RunNo: **80684**
Prep Date:	Analysis Date: **8/20/2021**	SeqNo: **2846531** 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: **LLLCS**	SampType: **LCSLL**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC**	Batch ID: **A80684**	RunNo: **80684**
Prep Date:	Analysis Date: **8/20/2021**	SeqNo: **2846532** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	ND	1.0	0.5000	0	95.0	50	150			
Magnesium	ND	1.0	0.5000	0	96.0	50	150			
Potassium	ND	1.0	0.5000	0	81.0	50	150			
Sodium	ND	1.0	0.5000	0	101	50	150			

Sample ID: **LCS**	SampType: **LCS**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW**	Batch ID: **A80684**	RunNo: **80684**
Prep Date:	Analysis Date: **8/20/2021**	SeqNo: **2846533** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	48	1.0	50.00	0	96.6	85	115			
Magnesium	49	1.0	50.00	0	98.0	85	115			
Potassium	48	1.0	50.00	0	96.7	85	115			
Sodium	49	1.0	50.00	0	97.4	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#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB**	SampType: **mblk**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **PBW**	Batch ID: **R80671**	RunNo: **80671**							
Prep Date:	Analysis Date: **8/19/2021**	SeqNo: **2845820**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Nitrogen, Nitrite (As N)	ND	0.10								
Bromide	ND	0.10								
Nitrogen, Nitrate (As N)	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								
Sulfate	ND	0.50								

Sample ID: **LCS**	SampType: **lcs**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **LCSW**	Batch ID: **R80671**	RunNo: **80671**							
Prep Date:	Analysis Date: **8/19/2021**	SeqNo: **2845821**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.51	0.10	0.5000	0	101	90	110			
Nitrogen, Nitrite (As N)	0.96	0.10	1.000	0	95.9	90	110			
Bromide	2.4	0.10	2.500	0	97.2	90	110			
Nitrogen, Nitrate (As N)	2.5	0.10	2.500	0	99.9	90	110			
Phosphorus, Orthophosphate (As P	4.5	0.50	5.000	0	90.3	90	110			
Sulfate	9.7	0.50	10.00	0	97.2	90	110			

Sample ID: **MB**	SampType: **mblk**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **PBW**	Batch ID: **R80904**	RunNo: **80904**							
Prep Date:	Analysis Date: **8/30/2021**	SeqNo: **2855470**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	ND	0.50								

Sample ID: **LCS**	SampType: **lcs**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **LCSW**	Batch ID: **R80904**	RunNo: **80904**							
Prep Date:	Analysis Date: **8/30/2021**	SeqNo: **2855478**	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	94.4	90	110			

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB-62173** SampType: **MBLK** TestCode: **EPA Method 8081: PESTICIDES**
Client ID: **PBW** Batch ID: **62173** RunNo: **81044**
Prep Date: **8/25/2021** Analysis Date: **8/31/2021** SeqNo: **2860409** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chlordane	ND	1.0								
Surr: Decachlorobiphenyl	3.0		2.500		119	41.7	129			
Surr: Tetrachloro-m-xylene	1.8		2.500		72.4	31.8	88.5			

Sample ID: **MB-62173** SampType: **MBLK** TestCode: **EPA Method 8081: PESTICIDES**
Client ID: **PBW** Batch ID: **62173** RunNo: **81044**
Prep Date: **8/25/2021** Analysis Date: **8/31/2021** SeqNo: **2860411** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chlordane	ND	1.0								
Surr: Decachlorobiphenyl	2.7		2.500		109	41.7	129			
Surr: Tetrachloro-m-xylene	1.8		2.500		70.5	31.8	88.5			

Sample ID: **LCS-62173** SampType: **LCS** TestCode: **EPA Method 8081: PESTICIDES**
Client ID: **LCSW** Batch ID: **62173** RunNo: **81044**
Prep Date: **8/25/2021** Analysis Date: **8/31/2021** SeqNo: **2860415** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	3.0		2.500		119	41.7	129			
Surr: Tetrachloro-m-xylene	1.8		2.500		73.6	31.8	88.5			

Sample ID: **LCS-62173** SampType: **LCS** TestCode: **EPA Method 8081: PESTICIDES**
Client ID: **LCSW** Batch ID: **62173** RunNo: **81044**
Prep Date: **8/25/2021** Analysis Date: **8/31/2021** SeqNo: **2860416** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	2.8		2.500		111	41.7	129			
Surr: Tetrachloro-m-xylene	1.8		2.500		72.0	31.8	88.5			

Sample ID: **LCSD-62173** SampType: **LCSD** TestCode: **EPA Method 8081: PESTICIDES**
Client ID: **LCSS02** Batch ID: **62173** RunNo: **81044**
Prep Date: **8/25/2021** Analysis Date: **8/31/2021** SeqNo: **2860417** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	3.0		2.500		118	41.7	129	0	20	
Surr: Tetrachloro-m-xylene	2.0		2.500		81.1	31.8	88.5	0	20	

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **LCSD-62173** SampType: **LCSD** TestCode: **EPA Method 8081: PESTICIDES**
Client ID: **LCSS02** Batch ID: **62173** RunNo: **81044**
Prep Date: **8/25/2021** Analysis Date: **8/31/2021** SeqNo: **2860418** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	2.7		2.500		110	41.7	129	0	20	
Surr: Tetrachloro-m-xylene	2.0		2.500		79.6	31.8	88.5	0	20	

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **100ng 8260 lcs** SampType: **LCS** TestCode: **TCLP Volatiles by 8260B**
Client ID: **LCSW** Batch ID: **T80700** RunNo: **80700**
Prep Date: Analysis Date: **8/21/2021** SeqNo: **2848650** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	0.018	0.00023	0.02000	0	90.6	70	130			
1,1-Dichloroethene	0.017	0.00020	0.02000	0	82.9	70	130			
Trichloroethene (TCE)	0.017	0.00020	0.02000	0	83.2	70	130			
Chlorobenzene	0.020	0.00016	0.02000	0	97.8	70	130			
Surr: 1,2-Dichloroethane-d4	0.0083		0.01000		82.5	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		101	70	130			
Surr: Dibromofluoromethane	0.0081		0.01000		81.4	70	130			
Surr: Toluene-d8	0.010		0.01000		101	70	130			

Sample ID: **mb** SampType: **MBLK** TestCode: **TCLP Volatiles by 8260B**
Client ID: **PBW** Batch ID: **T80700** RunNo: **80700**
Prep Date: Analysis Date: **8/21/2021** SeqNo: **2848651** 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	0.0082		0.01000		82.4	70	130			
Surr: 4-Bromofluorobenzene	0.0098		0.01000		97.8	70	130			
Surr: Dibromofluoromethane	0.0082		0.01000		81.7	70	130			
Surr: Toluene-d8	0.010		0.01000		101	70	130			

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **mb-62176** SampType: **MBLK** TestCode: **EPA Method 8270C TCLP**
Client ID: **PBW** Batch ID: **62176** RunNo: **80881**
Prep Date: **8/25/2021** Analysis Date: **8/27/2021** SeqNo: **2854301** 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	0.10		0.2000		52.2	15	91.8			
Surr: Phenol-d5	0.080		0.2000		40.0	15	69.6			
Surr: 2,4,6-Tribromophenol	0.13		0.2000		63.5	15	115			
Surr: Nitrobenzene-d5	0.061		0.1000		61.3	15	109			
Surr: 2-Fluorobiphenyl	0.059		0.1000		58.6	15	96			
Surr: 4-Terphenyl-d14	0.12		0.1000		118	15	133			

Sample ID: **lcs-62176** SampType: **LCS** TestCode: **EPA Method 8270C TCLP**
Client ID: **LCSW** Batch ID: **62176** RunNo: **80881**
Prep Date: **8/25/2021** Analysis Date: **8/27/2021** SeqNo: **2854302** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.056	0.00010	0.1000	0	56.0	33.8	121			
3+4-Methylphenol	0.11	0.00010	0.2000	0	56.0	33.6	109			
2,4-Dinitrotoluene	0.046	0.00010	0.1000	0	45.9	50.4	124			S
Hexachlorobenzene	0.068	0.00010	0.1000	0	68.1	50.1	120			
Hexachlorobutadiene	0.044	0.00010	0.1000	0	43.8	16.1	103			
Hexachloroethane	0.046	0.00010	0.1000	0	45.5	15	94.2			
Nitrobenzene	0.057	0.00010	0.1000	0	57.4	32.4	125			
Pentachlorophenol	0.055	0.00010	0.1000	0	55.4	44.6	114			
Pyridine	0.037	0.00010	0.1000	0	36.6	15	67			
2,4,5-Trichlorophenol	0.058	0.00010	0.1000	0	58.4	49.4	118			
2,4,6-Trichlorophenol	0.055	0.00010	0.1000	0	55.3	50.3	116			
Cresols, Total	0.17	0.00010	0.3000	0	56.0	33.8	109			
Surr: 2-Fluorophenol	0.094		0.2000		46.8	15	91.8			
Surr: Phenol-d5	0.075		0.2000		37.7	15	69.6			
Surr: 2,4,6-Tribromophenol	0.11		0.2000		57.1	15	115			

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **lcs-62176** SampType: **LCS** TestCode: **EPA Method 8270C TCLP**
Client ID: **LCSW** Batch ID: **62176** RunNo: **80881**
Prep Date: **8/25/2021** Analysis Date: **8/27/2021** SeqNo: **2854302** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Nitrobenzene-d5	0.059		0.1000		58.7	15	109			
Surr: 2-Fluorobiphenyl	0.060		0.1000		60.1	15	96			
Surr: 4-Terphenyl-d14	0.11		0.1000		109	15	133			

Sample ID: **2108a33-001cms** SampType: **MS** TestCode: **EPA Method 8270C TCLP**
Client ID: **Injection Well** Batch ID: **62176** RunNo: **80881**
Prep Date: **8/25/2021** Analysis Date: **8/27/2021** SeqNo: **2854304** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.054	0.00010	0.1000	0	53.9	15.8	101			
3+4-Methylphenol	0.11	0.00010	0.2000	0	54.5	16.9	97.9			
2,4-Dinitrotoluene	0.049	0.00010	0.1000	0	48.5	20.1	90.5			
Hexachlorobenzene	0.059	0.00010	0.1000	0	59.4	34	108			
Hexachlorobutadiene	0.048	0.00010	0.1000	0	47.8	15	99.7			
Hexachloroethane	0.045	0.00010	0.1000	0	45.4	15	86.4			
Nitrobenzene	0.056	0.00010	0.1000	0	55.6	15	109			
Pentachlorophenol	0.057	0.00010	0.1000	0	57.2	15	130			
Pyridine	0.035	0.00010	0.1000	0	35.5	15	82			
2,4,5-Trichlorophenol	0.062	0.00010	0.1000	0	61.9	28.1	105			
2,4,6-Trichlorophenol	0.058	0.00010	0.1000	0	57.7	21.5	110			
Cresols, Total	0.16	0.00010	0.3000	0	54.3	15	127			
Surr: 2-Fluorophenol	0.086		0.2000		43.1	15	91.8			
Surr: Phenol-d5	0.068		0.2000		34.1	15	69.6			
Surr: 2,4,6-Tribromophenol	0.14		0.2000		67.6	15	115			
Surr: Nitrobenzene-d5	0.056		0.1000		55.6	15	109			
Surr: 2-Fluorobiphenyl	0.058		0.1000		57.9	15	96			
Surr: 4-Terphenyl-d14	0.10		0.1000		102	15	133			

Sample ID: **2108a33-001cmsd** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**
Client ID: **Injection Well** Batch ID: **62176** RunNo: **80881**
Prep Date: **8/25/2021** Analysis Date: **8/27/2021** SeqNo: **2854305** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.056	0.00010	0.1000	0	56.0	15.8	101	3.89	20	
3+4-Methylphenol	0.11	0.00010	0.2000	0	55.6	16.9	97.9	2.05	20	
2,4-Dinitrotoluene	0.048	0.00010	0.1000	0	47.8	20.1	90.5	1.46	20	
Hexachlorobenzene	0.059	0.00010	0.1000	0	59.3	34	108	0.103	20	
Hexachlorobutadiene	0.051	0.00010	0.1000	0	51.4	15	99.7	7.29	20	
Hexachloroethane	0.047	0.00010	0.1000	0	46.6	15	86.4	2.53	20	
Nitrobenzene	0.057	0.00010	0.1000	0	56.5	15	109	1.58	20	

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **2108a33-001cmsd** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**
Client ID: **Injection Well** Batch ID: **62176** RunNo: **80881**
Prep Date: **8/25/2021** Analysis Date: **8/27/2021** SeqNo: **2854305** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Pentachlorophenol	0.057	0.00010	0.1000	0	57.3	15	130	0.290	20	
Pyridine	0.028	0.00010	0.1000	0	28.1	15	82	23.1	20	R
2,4,5-Trichlorophenol	0.063	0.00010	0.1000	0	63.4	28.1	105	2.36	20	
2,4,6-Trichlorophenol	0.057	0.00010	0.1000	0	57.5	21.5	110	0.427	20	
Cresols, Total	0.17	0.00010	0.3000	0	55.7	15	127	2.66	20	
Surr: 2-Fluorophenol	0.091		0.2000		45.3	15	91.8	0	0	
Surr: Phenol-d5	0.074		0.2000		36.9	15	69.6	0	0	
Surr: 2,4,6-Tribromophenol	0.13		0.2000		64.2	15	115	0	0	
Surr: Nitrobenzene-d5	0.058		0.1000		58.3	15	109	0	0	
Surr: 2-Fluorobiphenyl	0.057		0.1000		56.9	15	96	0	0	
Surr: 4-Terphenyl-d14	0.10		0.1000		101	15	133	0	0	

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **lcs-1 98.7uS eC**		SampType: **lcs**			TestCode: **SM2510B: Specific Conductance**					
Client ID: **LCSW**		Batch ID: **R80910**			RunNo: **80910**					
Prep Date:		Analysis Date: **8/30/2021**			SeqNo: **2855589**		Units: **µmhos/cm**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	100	10	98.70	0	102	85	115			

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB-62337**	SampType: **MBLK**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **PBW**	Batch ID: **62337**	RunNo: **81010**
Prep Date: **9/1/2021**	Analysis Date: **9/2/2021**	SeqNo: **2859022** Units: **mg/L**

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

Sample ID: **LLLCS-62337**	SampType: **LCSLL**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **BatchQC**	Batch ID: **62337**	RunNo: **81010**
Prep Date: **9/1/2021**	Analysis Date: **9/2/2021**	SeqNo: **2859023** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020	0.0001500	0	58.7	50	150			

Sample ID: **LCS-62337**	SampType: **LCS**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **LCSW**	Batch ID: **62337**	RunNo: **81010**
Prep Date: **9/1/2021**	Analysis Date: **9/2/2021**	SeqNo: **2859024** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0048	0.00020	0.005000	0	95.9	85	115			

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB-62168** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860014** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.030								
Barium	ND	0.0020								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Selenium	ND	0.050								
Silver	ND	0.0050								

Sample ID: **LCS-62168** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860016** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.44	0.030	0.5000	0	87.5	80	120			
Barium	0.44	0.0020	0.5000	0	88.2	80	120			
Cadmium	0.45	0.0020	0.5000	0	90.9	80	120			
Chromium	0.44	0.0060	0.5000	0	88.0	80	120			
Selenium	0.42	0.050	0.5000	0	84.7	80	120			
Silver	0.083	0.0050	0.1000	0	82.7	80	120			

Sample ID: **2108A33-001FMS** SampType: **MS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **Injection Well** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860048** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.63	0.0020	0.5000	0.3213	61.5	75	125			S
Cadmium	0.36	0.0020	0.5000	0	72.3	75	125			S
Chromium	0.34	0.0060	0.5000	0	68.1	75	125			S
Selenium	0.31	0.050	0.5000	0	62.6	75	125			S

Sample ID: **2108A33-001FMSD** SampType: **MSD** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **Injection Well** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860049** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.65	0.0020	0.5000	0.3213	65.0	75	125	2.71	20	S
Cadmium	0.39	0.0020	0.5000	0	77.2	75	125	6.61	20	
Chromium	0.34	0.0060	0.5000	0	68.7	75	125	0.764	20	S
Selenium	0.30	0.050	0.5000	0	59.8	75	125	4.63	20	S

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#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB-62168** SampType: **MBLK** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860094** Units: **mg/L**

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

Sample ID: **LCS-62168** SampType: **LCS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860096** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.50	0.020	0.5000	0	99.4	80	120			

Sample ID: **2108A33-001FMS** SampType: **MS** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **Injection Well** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860106** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.45	0.030	0.5000	0	90.5	75	125			
Lead	0.48	0.020	0.5000	0	95.2	75	125			
Silver	0.097	0.0050	0.1000	0.001512	95.5	75	125			

Sample ID: **2108A33-001FMSD** SampType: **MSD** TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **Injection Well** Batch ID: **62168** RunNo: **81035**
Prep Date: **8/24/2021** Analysis Date: **9/2/2021** SeqNo: **2860107** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.46	0.030	0.5000	0	91.6	75	125	1.18	20	
Lead	0.48	0.020	0.5000	0	95.5	75	125	0.291	20	
Silver	0.099	0.0050	0.1000	0.001512	97.1	75	125	1.59	20	

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **mb-1 alk**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R80883**	RunNo: **80883**							
Prep Date:	Analysis Date: **8/27/2021**	SeqNo: **2854313**	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: **R80883**	RunNo: **80883**							
Prep Date:	Analysis Date: **8/27/2021**	SeqNo: **2854314**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	79.76	20.00	80.00	0	99.7	90	110			

Sample ID: **mb-2 alk**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R80883**	RunNo: **80883**							
Prep Date:	Analysis Date: **8/27/2021**	SeqNo: **2854337**	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: **R80883**	RunNo: **80883**							
Prep Date:	Analysis Date: **8/27/2021**	SeqNo: **2854338**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	80.08	20.00	80.00	0	100	90	110			

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **2108A33-001DDUP** SampType: **DUP** TestCode: **Specific Gravity**
Client ID: **Injection Well** Batch ID: **R81197** RunNo: **81197**
Prep Date: Analysis Date: **9/10/2021** SeqNo: **2866320** Units:

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	0.9991	0						0.429	20	

Qualifiers:

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

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **2108A33**
17-Sep-21

Client: Western Refining Southwest, Inc.
Project: Quarterly Injection Well 2021Q3

Sample ID: **MB-62152**	SampType: **MBLK**	TestCode: **SM2540C MOD: Total Dissolved Solids**							
Client ID: **PBW**	Batch ID: **62152**	RunNo: **80795**							
Prep Date: **8/24/2021**	Analysis Date: **8/26/2021**	SeqNo: **2850857**	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-62152**	SampType: **LCS**	TestCode: **SM2540C MOD: Total Dissolved Solids**							
Client ID: **LCSW**	Batch ID: **62152**	RunNo: **80795**							
Prep Date: **8/24/2021**	Analysis Date: **8/26/2021**	SeqNo: **2850858**	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.
D	Sample Diluted Due to Matrix
H	Holding times for preparation or analysis exceeded
ND	Not Detected at the Reporting Limit
PQL	Practical Quanitative Limit
S	% Recovery outside of range due to dilution or matrix
B	Analyte detected in the associated Method Blank
E	Value above quantitation range
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: **Western Refining Southwest, Inc.** Work Order Number: **2108A33** RcptNo: 1

Received By: **Cheyenne Cason** **8/19/2021 6:58:00 AM** CM

Completed By: **Cheyenne Cason** **8/19/2021 9:08:06 AM** CM

Reviewed By: JR 8/19/21

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. Received at least 1 vial with headspace <1/4" for AQ VOA? Yes ☑ No ☐ NA ☐ HNO3, NaOH, ZN ACE
10. Were any sample containers received broken? Yes ☐ No ☑
11. Does paperwork match bottle labels? (Note discrepancies on chain of custody) Yes ☑ No ☐
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? (If no, notify customer for authorization.) Yes ☑ No ☐

# of preserved bottles checked for pH: 2 2
(<2 or >12 unless noted)
Adjusted? Yes
Checked by: KPG 8/19/21

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:

Unpreserved volume was poured off and filtered using Lot# FC7018 filter for metals analysis, then added ~ 0.4mL. HNO3 to sample 001B for pH <2. -KPG 8/19/21 Added ~3.0ml NAOH and ~4.0ml ZN ACE to 001H for Ph >12 CMC 8/19/21

17. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	0.5	Good	Yes			
2	2.7	Good	Yes			

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: **Western Refining Southwest, Inc.**

Work Order Number: **2108A33**

RcptNo: 1

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
3	1.8	Good	Yes			
4	3.2	Good	Yes			

Chain-of-Custody Record

Client: **Western Refining**

Mailing Address: **50 CR 4990**

Bloomfield, NM 87413

Phone #: **505-632-4166**

email or Fax: gfrussell@marathonpetroleum.com

QA/QC Package:
☒ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance ☐ NELAC ☐ Other

☐ EDD (Type)

Turn-Around Time:
☒ Standard ☐ **Rush**

Project Name: Quarterly Injection Well 2021Q3

Project #:

Project Manager: Gary Russell

Sampler: Gary Russell

On Ice: ☒ Yes ☐ No

# of Coolers: 1

Cooler Temp(including CF): See Remarks

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 Name	Container Type and #	Preservative Type	HEAL No. 2108A33	pH, Specific gravity	C/A Balance Dissolved	RCI and ORP	RCRA 8 Metals	Chlordane only by 8081	8260 TCLP list	8270 TCLP List
8-18-21	10:00 AM	H_2O	**Injection Well**	500ml P	none	001	x						
				1 - 125ml P 1 - 500ml P	none			x						
				3-500ml P	1- unpres, 1-NaOH, 1-NaOH/ZnAc				x				
				250ml P	HNO3					x			
				1L Amber G	none						x		
				3-40ml VOAs	HCL							x	
				1L Amber G	none								x

Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time
8/18/21	1541		Chad Ward		8/18/21	1541
8/18/21	1815				8/19/21	0658

Remarks:
0.6 - 0.1 = 0.5
2.8 - 0.1 = 2.7
1.9 - 0.1 = 1.8
3.3 - 0.1 = 3.2

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.

APPENDIX D

RATE HISTORY DATA

APPENDIX D
RATE HISTORY DATA

WDW #2

Injection Rates

Monthly Average from September 2020 to August 2021

Month	Volume (gal)	Average Rate (gpm)
September '20	99,792	2.31
October '20	274,925	6.16
November '20	20,923	0.48
December '20	588	0.01
January '21	170,352	3.82
February '21	0	-
March '21	50,904	1.14
April '21	493,920	11.43
May '21	419,328	9.39
June '21	11,634	0.27
July '21	448,266	10.04
August '21	46,536	1.04

APPENDIX D
RATE HISTORY DATA

WDW #2

Injection Rates

Daily Average from September 1, 2021 to September 16, 2021

Day	Rate (gpm)	Surf. Pressure (psig)
September 1, 2021	0.00	739.00
September 2, 2021	0.00	735.00
September 3, 2021	0.00	731.00
September 4, 2021	0.00	727.00
September 5, 2021	0.00	723.00
September 6, 2021	0.00	720.00
September 7, 2021	0.00	716.00
September 8, 2021	0.00	713.00
September 9, 2021	0.00	709.00
September 10, 2021	0.00	706.00
September 11, 2021	0.00	703.00
September 12, 2021	0.00	700.00
September 13, 2021	5.62	801.00
September 14, 2021	17.29	1132.00
September 15, 2021	17.71	1189.00
September 16, 2021	17.12	1195.00
September 17, 2021	18.60	1315.00
September 18, 2021	18.39	1344.00
September 19, 2021	19.24*	1373.00

*shut-in well at mid-day, avg. daily rate does not count shut-in time

**ended shut-in period

APPENDIX E

GAUGE CALIBRATION SHEETS

ACCURACY VERIFICATION

10-March-2020

Gauge Model **SP-2000** Pressure Range **5 K**
Gauge S/N **240** Accuracy 0.05% Full Scale

Applied Pressure psig	Recorded Pressure psig	Difference psi	Percent (%)
0.01	2.38	2.37	0.0474%
774.08	776.30	2.22	0.0444%
1498.24	1500.18	1.94	0.0388%
2222.36	2224.29	1.93	0.0386%
2946.53	2948.24	1.71	0.0342%
3670.66	3672.19	1.53	0.0306%
4394.87	4396.25	1.38	0.0276%
5119.00	5120.28	1.28	0.0256%
4394.87	4396.11	1.24	0.0248%
3670.66	3671.87	1.21	0.0242%
2946.53	2947.80	1.27	0.0254%
2222.36	2223.58	1.22	0.0244%
1498.24	1499.16	0.92	0.0184%
774.08	775.38	1.30	0.0260%
0.01	1.82	1.81	0.0362%

Oven Temperature: **254.1** °F Probe Temperature: **253.4** °F

Smart Gauge Calibration accuracy is confirmed.

Calibrated with RUSKA Pressure Standard, model # 2451-700-00
Serial #26618, Mass Set Serial #25608
Compensated to local acceleration due to gravity

Verified by: CM

ACCURACY VERIFICATION

10-March-2020

Gauge Model **SP-2000**
Gauge S/N **328**

Pressure Range **5 K**
Accuracy 0.05% Full Scale

Applied Pressure psig	Recorded Pressure psig	Difference psi	Difference Percent (%)
0.01	0.01	0.00	0.0000%
774.08	773.86	-0.22	-0.0044%
1498.24	1497.71	-0.53	-0.0106%
2222.36	2221.44	-0.92	-0.0184%
2946.53	2945.47	-1.06	-0.0212%
3670.66	3669.65	-1.01	-0.0202%
4394.87	4393.92	-0.95	-0.0190%
5119.00	5118.53	-0.47	-0.0094%
4394.87	4394.68	-0.19	-0.0038%
3670.66	3670.46	-0.20	-0.0040%
2946.53	2946.75	0.22	0.0044%
2222.36	2222.81	0.45	0.0090%
1498.24	1499.02	0.78	0.0156%
774.08	775.17	1.09	0.0218%
0.01	0.01	0.00	0.0000%

Oven Temperature: **218.7** °F Probe Temperature: **218.6** °F

Smart Gauge Calibration accuracy is confirmed.

Calibrated with RUSKA Pressure Standard, model # 2451-700-00
Serial #26618, Mass Set Serial #25608
Compensated to local acceleration due to gravity

Verified by: CM

APPENDIX F

PANSYSTEM© ANALYSIS OUTPUT

Weatherford

Production Optimization Systems

Well Test Analysis Report

File: WDW-2 PFO 2021 Analysis.panx

Date: 26-October-2021

Report Details :

Company	Western Refining Company
Well	Wastewater Disposal Well No. 2
Location	Bloomfield Terminal
Test	Reservoir Pressure Falloff
Date	September 13 - 29, 2021
Gauge Depth	7312 feet
Gauge Type	Micro-Smart Systems SP2000
Gauge Serial Number	240
WSP Analyst	Troy Gillen
WSP Project Number	192025AI

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Table of Contents

Weatherford
Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Input Data

Reservoir Configuration

Fluid type	Water
Well orientation	Vertical/Slant
Number of wells	1
Number of layers	1

Layer Parameters

Parameter	Entrada Sandstone
Formation thickness (ft)	123
Average formation porosity	0.149
Water saturation	0
Gas saturation	0
Formation compressibility (psi-1)	0.0000e+000
Total system compressibility (psi-1)	4.4000e-006
Layer pressure (psia)	0
Temperature (deg F)	0

Well Parameters

Parameter	WDW-2
Well radius (ft)	0.3281
Distance from observation to active well (ft)	0
Wellbore storage coefficient (bbl/psi)	0
Storage Amplitude (psi)	0
Storage Time Constant (hr)	0
Second Wellbore Storage (bbl/psi)	0
Time Change for Second Storage (hr)	0
Well offset - x direction (ft)	0
Well offset - y direction (ft)	0

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Fluid Parameters

Parameter	Entrada Sandstone
Oil gravity (API)	0
Gas gravity (sp grav)	0
Gas-oil ratio (produced) (scf/STB)	0
Water cut	0
Water salinity (ppm)	0
Check Pressure (psia)	0
Check Temperature (deg F)	0
Gas-oil ratio (solution) (scf/STB)	0
Bubble-point pressure (psia)	0
Oil density (lb/ft3)	0
Oil viscosity (cp)	0
Oil formation volume factor (RB/STB)	0
Gas density (lb/ft3)	0
Gas viscosity (cp)	0
Gas formation volume factor (ft3/scf)	0
Water density (lb/ft3)	0
Water viscosity (cp)	0.47
Water formation volume factor (RB/STB)	1
Oil compressibility (psi-1)	0.0000e+000
Initial Gas compressibility (psi-1)	0.0000e+000
Water compressibility (psi-1)	0.0000e+000

Correlations

Correlation Parameters	Entrada Sandstone
Cf Correlation	Hall Correlation
Young's modulus (E) (psi)	0
Poisson's Ratio (v)	0

Layer Boundaries

Boundary Parameter	Entrada Sandstone
Boundary Type	Infinitely acting

Weatherford
Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Rate Change Data

DateTime (hh:mm:ss)	Pressure (psia)	Rate (STB/day)
9/30/2020 11:59:00 PM	0	-79.2
10/31/2020 11:59:00 PM	0	-211.156
11/30/2020 11:59:00 PM	0	-16.6057
12/31/2020 11:59:00 PM	0	-0.451613
1/31/2021 11:59:00 PM	0	-130.839
2/28/2021 11:59:00 PM	0	0
3/31/2021 11:59:00 PM	0	-39.0968
4/30/2021 11:59:00 PM	0	-392
5/31/2021 11:59:00 PM	0	-322.065
6/30/2021 11:59:00 PM	0	-9.23333
7/31/2021 11:59:00 PM	0	-344.29
8/31/2021 11:59:00 PM	0	-35.7419
9/13/2021 4:30:00 PM	0	0
9/19/2021 11:30:00 AM	4560.65	-610.852
9/29/2021 9:38:00 AM	3903.28	0

Model Data

Entrada Sandstone Model Data

Model Parameter	Model Data
Model Name	Model 1
Model Type	Vertical fracture - finite conductivity
Permeability (md)	4.3709e-262
Fracture face skin	0
Fracture half-length (ft)	0
Dimensionless fracture conductivity	0

Weatherford
Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Analysis

Model - Entrada Sandstone : Model 1

Model Detail

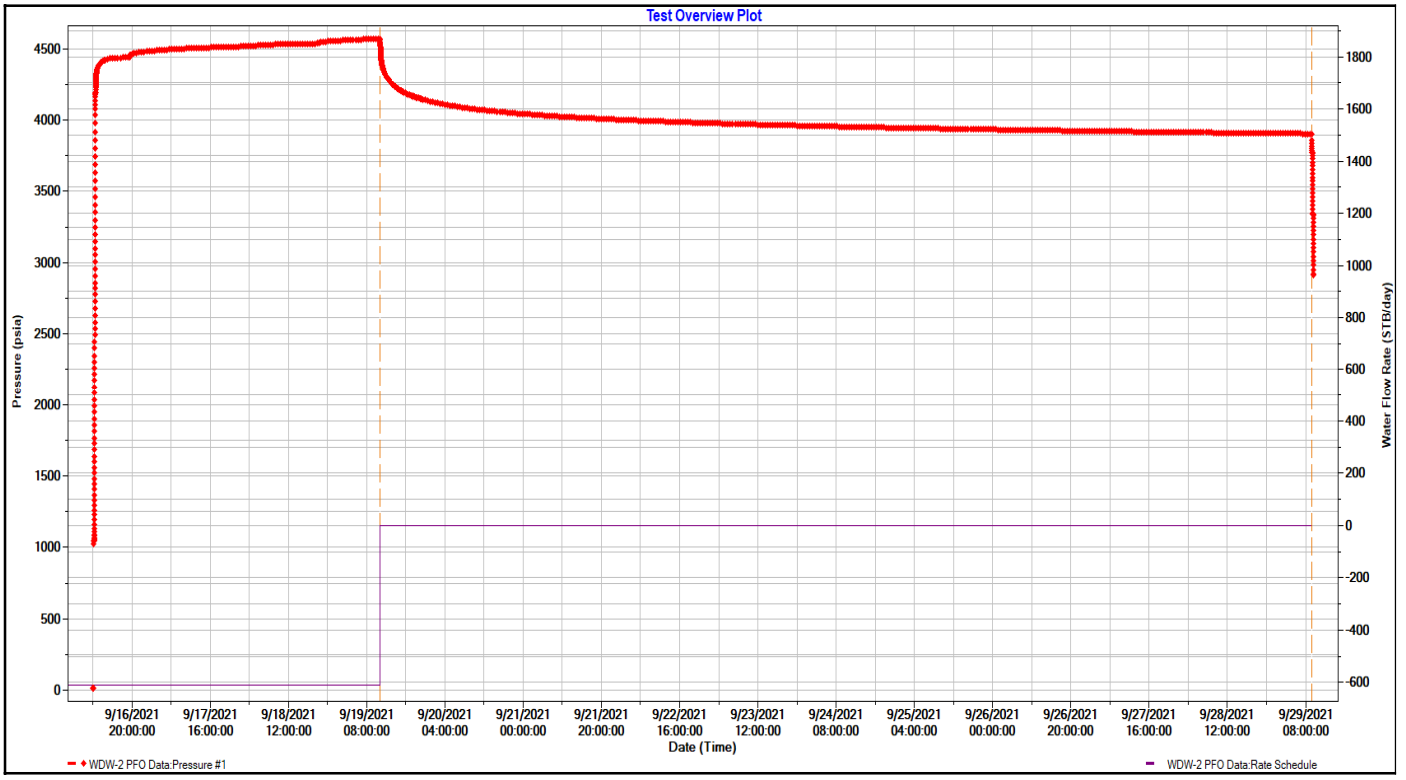
Model Parameter	Model Data
Model Name	Model 1
Model Type	Vertical fracture - finite conductivity
Layer	Entrada Sandstone
WellBore Storage Model	Classic Wellbore Storage

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Test Overview Plot



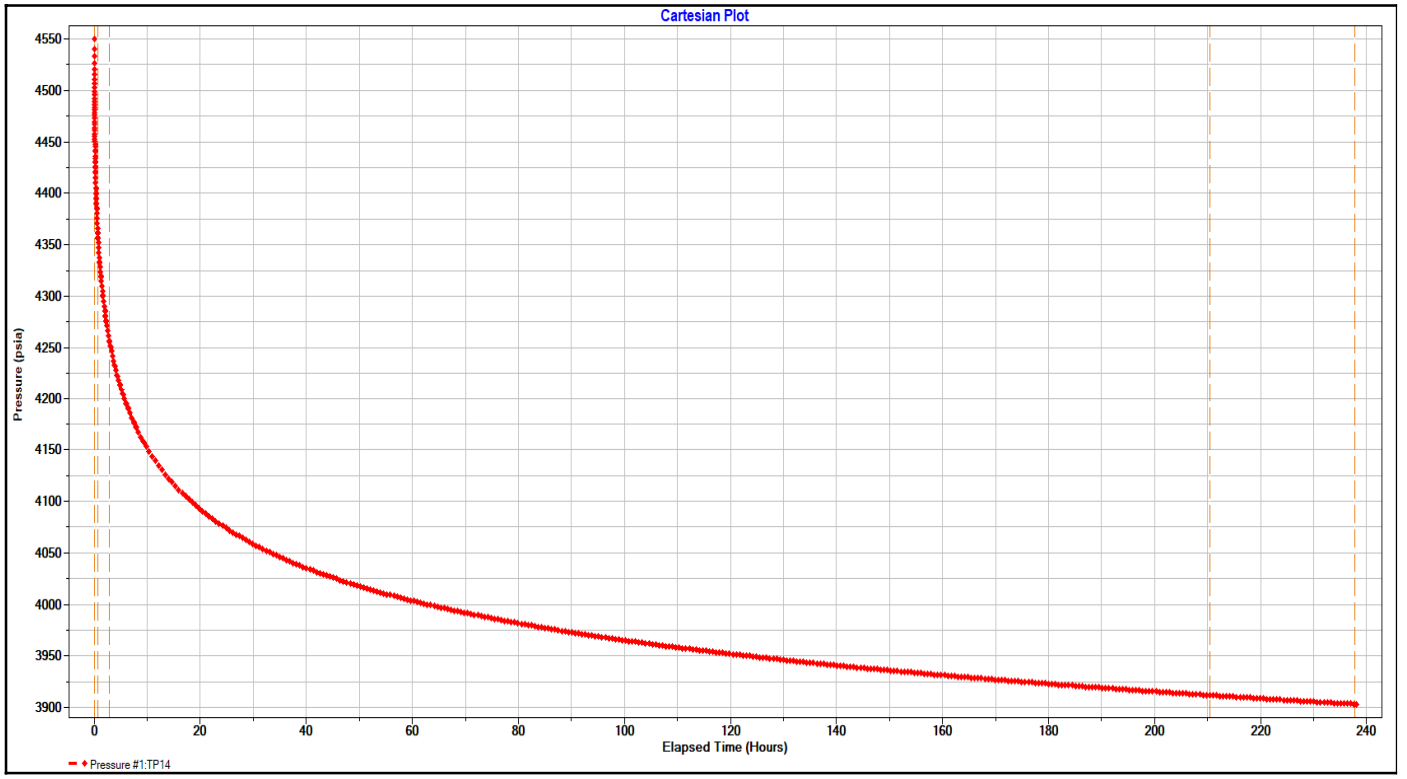
Test Overview Plot

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Cartesian Plot:TP14



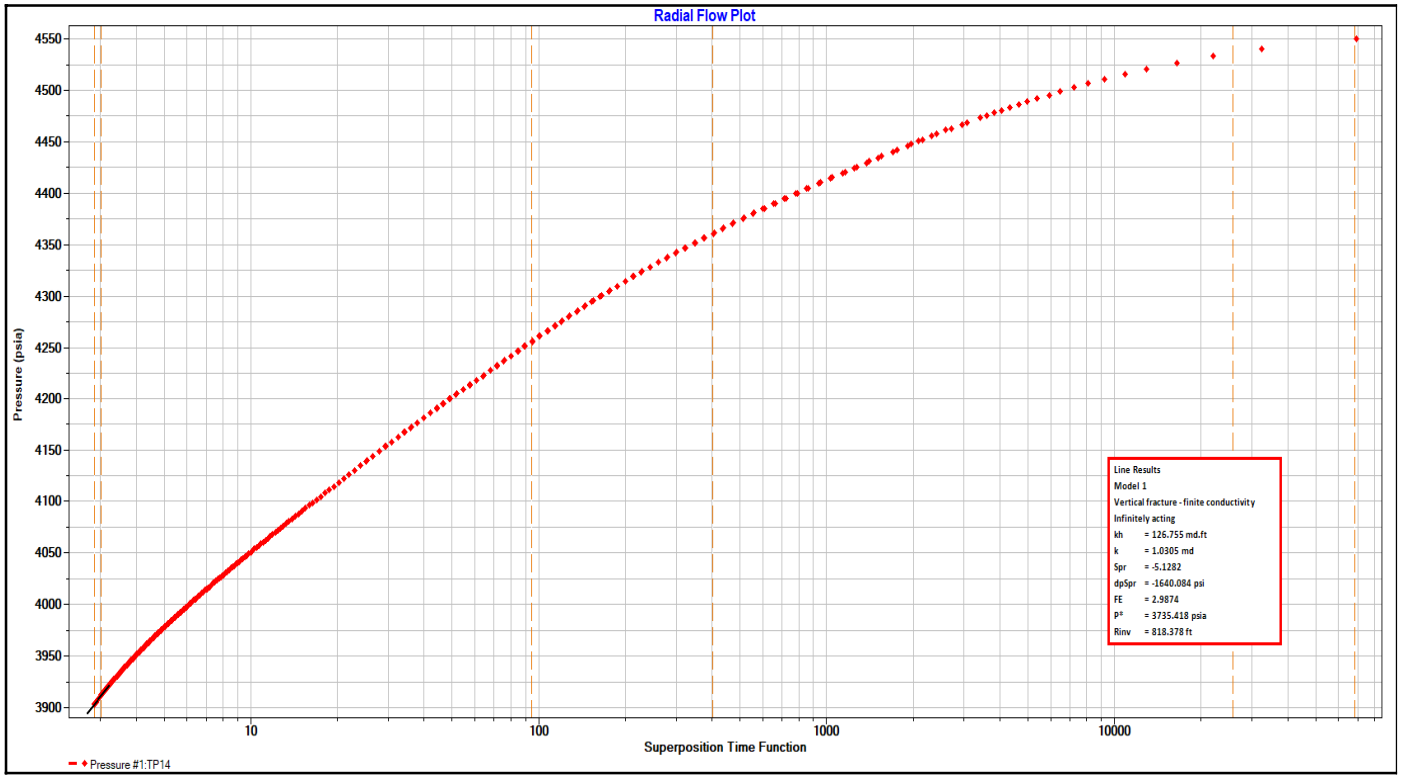
Cartesian Plot

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Radial Flow Plot:TP14



Radial Flow Plot

Line Results

Line Result Parameter	Value
Permeability (md)	1.03053
Permeability-thickness (md.ft)	126.755
Extrapolated pressure (psia)	3735.418
Radius of investigation (ft)	818.378
Flow efficiency	2.98742
dP skin (constant rate) (psi)	-1640.08
Pseudo-radial skin factor	-5.12817

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Production Optimization Systems

Line Details

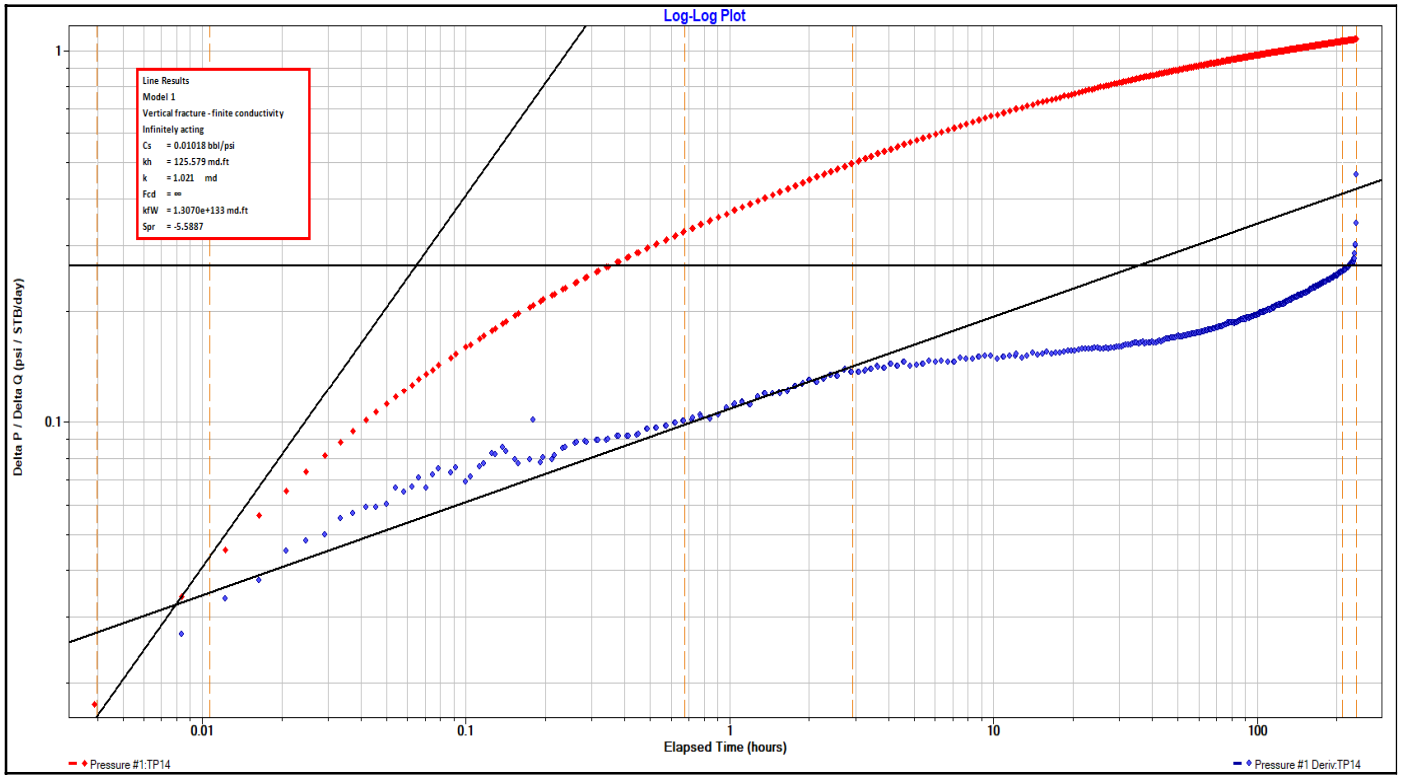
Details	Value
Line type	Pseudo-radial flow
Slope	368.205
Intercept	3735.418
Coefficient of Determination	1
Extrapolated pressure (psia)	3735.418
Pressure at dt = 1 hour (psia)	4631.023

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Log-Log Plot:TP14



Log-Log Plot

Line Results

Line Result Parameter	Value
Wellbore storage coefficient (bbl/psi)	0.0101838
Dimensionless fracture conductivity	∞
Fracture conductivity (md.ft)	1.30699e+133
Permeability (md)	1.02097
Permeability-thickness (md.ft)	125.579
Pseudo-radial skin factor	-5.58867

Weatherford

Production Optimization Systems

Production Optimization Systems
PanSystem Application
Well Test Analysis Report
Date: 10/26/2021

Line Details

Details	Value
Line type	Fracture bilinear flow
Slope	0.25
Intercept	0.108
Coefficient of Determination	Not Used

Details	Value
Line type	Wellbore storage
Slope	1
Intercept	4.091
Coefficient of Determination	Not Used

Details	Value
Line type	Pseudo-radial flow
Slope	0
Intercept	0.264
Coefficient of Determination	Not Used

District I
1625 N. French Dr., Hobbs, NM 88240
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District II
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District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

COMMENTS

Action 63499

COMMENTS

Operator: WESTERN REFINING SOUTHWEST, INC. 539 South Main Street Findlay, OH 45840	OGRID: 267595
	Action Number: 63499
	Action Type: [C-103] Sub. General Sundry (C-103Z)

COMMENTS

Created By	Comment	Comment Date
cchavez	Well utilizes surface fluid disposal systems to manage most of wastewater which has been limited to date. Well hydrogeologic conditions experience unique pressure buildup conditions with low-flow injection to near MSIP and shut-off. Operator has shown it can handle the vol. of wastewater between use of surface evaporation and well injection with possible plans to workover well at a future date as needed based on the vol. of wastewater.	12/3/2021
cchavez	Due to the current condition of the well (i.e., limited injection rate with pressure buildup), FOT is run with lower injection rate which is reflected by K and Skin values since 2019.....	12/3/2021

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CONDITIONS

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CONDITIONS

Created By	Condition	Condition Date
cchavez	None	12/3/2021