HollyFrontier Navajo Refining LLC
Class I Nonhazardous Permit Renewal Application

Artesia, NM

WDW-4

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performance bond, generally in conjunction with another type of financial assurance; such bond or materials shall be approved and executed prior to discharge permit issuance and shall become effective upon commencement of construction; if an adequate bond is posted by the discharger to a federal or another state agency, and this bond covers all of the measures referred to above, the secretary shall consider this bond as satisfying the bonding requirements of 20.6.2.5000 through 20.6.2.5299 NMAC wholly or in part, depending upon the extent to which such bond is adequate to ensure that the discharger will fully perform the measures required hereinabove; X-17

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I. Introduction and Facility Name

Through the submittal of this document, HollyFrontier Navajo Refining LLC (HFNR) requests continued authorization from the New Mexico Energy, Minerals and Natural Resources Department Oil Conservation Division (OCD) to operate the non-hazardous Class I disposal well located at the Artesia, New Mexico facility pursuant to the applicable Underground Injection Control (UIC) regulations. Waste Disposal Well No. 4 (WDW-4) is located in Eddy County, New Mexico and is approximately 8.5 miles to the southeast of the refinery. A map identifying the facility location within the state is included as Figure I.1. Figure I.2 shows the location of the injection well. A completed copy of OCD form C-108 for WDW-4 is included in this Response, and required attachments to this form are included in this document.

HFNR proposes to continue operating the non-hazardous, underground injection well, WDW-4, for the disposal of process wastewater generated at its refinery in Artesia, New Mexico. HFNR owns and operates both the facility and the injection well. The well is used to dispose of non-hazardous oil field waste fluids. The waste fluids are transported to the well via a waste water conveyance pipeline emanating from the Artesia refinery. WDW-4 is permitted to inject non-hazardous waste water into a subsurface Injection Zone consisting of the Silurian-Devonian age strata.

Shallow aquifers in the vicinity of the well are protected by multiple strings of casing and cement. Injected fluids are delivered to the injection interval under positive pressure flow through tubing and a packer. The well will continue to have at least one cemented long string protective casing extending into the injection interval. The wellbore is an openhole completion within the injection interval. The annulus area between the protective casing and injection tubing string is filled with inhibited water. Annulus pressure will be continuously monitored to detect any leaks in the tubing or casing and annulus pressure will continue to be maintained at levels required by the OCD.

This renewal application is intended to satisfy all requirements set forth in the Discharge Permit Application for Class I Waste Injection Well Facility Form.

II. Operator, Address, Contact

Operator: HollyFrontier Navajo Refining LLC

Address: 501 East Main, Artesia, NM 88210

Contact Person: Travis Gibb

Phone: (575) 746-5281

III. Location

A map identifying the facility location within the state is included as Figure I.1. Figure I.2 shows the location of the WDW-4 injection well. The well location is below.

WDW-4 (API No. 30-015-42872) is located 1,221 feet from the south line and 2,829 feet from the east line of SE/4, SW/4, Section 23, Township 17 South, Range 27 East, Latitude 32°48'56.92"N, Longitude 104°15'0.11"W, in Eddy County, New Mexico.

IV. Attach the name and address of the landowner of the facility site.

The parcel of land where WDW-4 is located is owned by the following:

U.S. Department of the Interior
Bureau of Land Management
620 Greene Street
Carlsbad, New Mexico 88220
(575) 887-6544

V. Attach a description of the types and quantities of fluids at the facility.

The fluid injected into the HFNR injection wells is comprised of exempt and nonexempt non-hazardous oilfield waste that is generated in the refining process. Waste waters from process units, cooling towers, boilers, streams from water purification units, desalting units, recovered and treated ground water, renewable diesel units, and general waste waters will be blended to form the fluid to be injected into the injection wells. In addition, stimulation and workover fluids may be injected periodically. Appendix V.1 presents data characterizing the injection fluid. More information regarding the requested information is included in Section X of this document.

VI. Attach a description of all fluid transfer and storage and fluid and solid disposal facilities.

The requested information regarding surface facilities is provided in Section X.M of this document.

VII. Attach a description of underground facilities (well diagrams etc. including a C-101 or C-103, and C-108).

The requested information regarding underground facilities is provided in Section XI of this document.

VIII. Attach a contingency plan for reporting and clean-up of spills or releases.

The requested information regarding contingency plans is provided in Section X.O of this document.

IX. Attach geological/hydrological evidence demonstrating that operations will not adversely impact fresh water.

The requested information regarding geology and hydrogeology is provided in Sections X.E, X.F, and X.G of this document.

X. Attach such other information as is necessary to demonstrate compliance with any other OCD rules, regulations and/or orders.

The following subsections present the information requested under Subsection B and C of Section 20.6.2.5210 NMAC.

A. Information required in Subsection C of 20.6.2.3106 NMAC.

The portions of Subsection C of 20.6.2.3106 NMAC that are relevant to Class I non-hazardous UIC are addressed in subsections B through W.

B. A map showing the Class I well, or Class III well or well fields, for which approval is sought and the applicable area of review; within the area of review, the map must show, in so far as is known or is reasonably available from the public records, the number, name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines (surface and subsurface), quarries, water wells and other pertinent surface features, including residences and roads.

A map showing the WDW-4 injection well and all other wells including oil and gas and water wells within two miles is provided as Figure X.1. A one-mile regulatory area of review (AOR) is identified on this map. Per OCD guidance, a map showing all drilled and plugged and abandoned wells since the most recent permit application (2017) within the one-mile AOR is provided as Figure X.2.

C. A tabulation of data on all wells within the area of review which may penetrate into the proposed injection zone; such data shall include, as available, a description of each well's type, the distance and direction to the injection well or well field, construction, date drilled, location, depth, record of plugging or completion, and any additional information the secretary may require.

A tabulation of all oil and gas artificial penetrations and freshwater wells in the AOR were provided most recently in the 2017 Permit Application for Class I Non-Hazardous Waste Injection Well WDW-4. These referenced tables are Tables 1 and 2, respectively. All publicly available well records including completion records, plugging records, and schematics for wells penetrating the injection zone were submitted as Attachment 1 in the above referenced document.

Per OCD guidance, Table X.1 provides a tabulation of all wells drilled and plugged and abandoned since the most recent permit application in 2017. The publicly available operator or owner, well number, lease name, date drilled, depth, and status of these wells are provided in this table. There are two water wells identified within the AOR based on publicly available information from the NM Office of the State Engineer data site.

A total of 3 artificial penetrations within the one-mile AOR were identified as drilled or plugged since 2017. None of these artificial penetrations were determined to penetrate the injection zone.

D. For wells within the area of review which penetrate the injection zone, but are not properly completed or plugged, the corrective action proposed to be taken under 20.6.2.5203 NMAC.

Each well identified within the regulatory AOR has been examined to determine status and construction and have been shown to be properly completed and/or plugged. Therefore, no corrective action is necessary to be proposed.

Available well records for the one well that was drilled and plugged prior to 2017 that penetrates the injection interval were submitted as Attachment 1 of the 2017 application.

E. Maps and cross-sections indicating the general vertical and lateral limits of all ground water having 10,000 mg/l or less TDS within the area of review, the position of such ground water within the area of review relative to the injection formation, and the direction of water movement, where known, in each zone of ground water which may be affected by the proposed injection operation.

Per Form C-108 Application for Authorization to Inject and guidance from OCD staff, information required in this section need not be resubmitted as it has been previously submitted and accepted. The following provides a list of references to the previously approved permit application and drilling report submittals and brief summary for the purpose of regulatory review.

Maps and cross-sections were most recently provided in the Permit Application for Class I Non-Hazardous Waste Injection Well WDW-4, 2017. The following figures and drawings from the referenced document provide the requirement information for this section:

- Figure 3: Generalized Hydrogeologic Cross-Section
- Figure 4: Generalized Direction of Movement of Groundwater in Eddy County, New Mexico
- Drawing 4: Geologic Cross-section Index Map
- Drawing 5: West-East Dip Geologic Cross-Section A-A’
- Drawing 6: North-South Strike Geologic Cross-Section B-B’

As confirmed during drilling and completion operations in 2018, the lowermost USDW for WDW-4 is identified as the Tansill Formation. Information and logs

regarding the USDW were submitted in the Navajo Refining LLC Drilling Report, WDW-4, 2018. The base of the lowermost USDW observed at WDW-4 is shown in the table below.

Table X.2: Base of USDW

	WDW-4 (KB = 3,563 ft MSL)	
	Depth KB (ft)	*Depth (ft MSL)*
Base of USDW	500	3,063

Details regarding the position of the USDW, direction of water movement, and other required information are provided in the above referenced permit application and drilling report.

F. Maps and cross-sections detailing the geology and geologic structure of the local area, including faults, if known or suspected.

Maps and cross-sections were most recently provided in the 2017 Permit Application for Class I Non-Hazardous Waste Injection Well WDW-4. The following figures and drawings from the referenced document provide the requirement information for this section:

- Figure 6: Stratigraphic Column
- Drawing 7: Structure Contour Map, Top of Injection Zone
- Drawing 8: Structure Contour Map, Top of Confining Zone
- Drawing 9: Isopach Map of Confining Zone

The permitted injection zone for WDW-4 consists of the Silurian-Devonian age strata. As determined in the submitted and approved 2018 Navajo Refining LLC Drilling Report, WDW-4, the top of the Silurian-Devonian injection zone is encountered at a depth of 10,220 feet KB. The gross thickness of this injection zone is approximately 665 feet thick. The proposed injection depths, based on drilling operations, are presented in Table X.3.

Table X.3: As-drilled Injection Zone

Injection Zone Formations	WDW-1 (KB = 3,563 ft MSL)	
	Depth KB (ft)	*Depth (ft MSL)*
Top Silurian-Devonian	10,220	6,657
Estimated Base of Injection Zone (top of Montoya)	10,885	7,322

Details regarding the geology and geologic structure of the local area and other required information are provided in the above referenced permit application and drilling report.

G. Generalized maps and cross-sections illustrating the regional geologic setting.

Maps and cross-sections were most recently provided in the 2017 Permit Application for Class I Non-Hazardous Waste Injection Well WDW-4. The following figures and drawings from the referenced document provide the requirement information for this section:

- Figure 5: Permian Basin Map
- Figure 6: Stratigraphic Column
- Figure 7: Regional Geologic Features
- Figure 8: Published Structure Map (Top of Siluro-Devonian)
- Figure 10: Surface Geologic Map

Details regarding the regional geologic setting and other required information are provided in the above referenced permit application.

Seismicity

The HFNR Artesia Refinery area in southeastern New Mexico has been designated as a low seismic risk area by the USGS. Figure X.3 presents earthquakes at or greater than M2.5 magnitude in the last 50 years within approximately 150 miles of the refinery based on the USGS database of earthquakes. The peak ground acceleration that has a 2% probability of

exceedance in 50 years is less than 4%g near the project (Figure X.3) and no active faults have been mapped in the vicinity. No data are available to suggest that deep well injection presents a risk of induced seismicity in the project area.

H. Proposed operating data, including:

H.1 Average and maximum daily flow rate and volume of the fluid to be injected;

The injection rate for WDW-4 will not exceed 500 gallons per minute (gpm). The total monthly injected volume will not exceed 21,600,000 gallons per month, based on a 30-day month (21,600,000 gallons = 500 gpm x 60 min/hr x 24 hr/day x 30 days). The total annual injected volume will not exceed 262,800,000 gallons per year based on a 365-day year (262,800,000 gallons = 500 gpm x 60 min/hr x 24 hr/day x 365 days). Historical volumes for WDW-4 are provided in Table X.4.

H.2 Average and maximum injection pressure;

Average injection pressures over the previous 5-year period are provided as Table X.4. Maximum allowable surface injection pressure (MASIP) is calculated according to EMNRD OCD Proposed Rule 21.B(7), dated October 6, 1997, and is as follows:

WDW-4: 2,040 psig (10,200 feet x 0.2 psi/ft = 2,040 psi)

H.3 Source of injection fluids and an analysis or description, whichever the secretary requires, of their chemical, physical, radiological and biological characteristics;

The fluid injected into the HFNR injection wells is comprised of exempt and nonexempt non-hazardous oilfield waste that is generated in the refining process. Waste waters from process units, cooling towers, boilers, streams from water purification units, desalting units, recovered and treated ground water, renewable diesel units, and general waste waters will be blended to form the fluid to be injected into the injection wells. In addition, stimulation and workover fluids may be injected periodically. Appendix V.1 presents data characterizing the injection fluid.

I. Results of the formation testing program to obtain an analysis or description, whichever the secretary requires, of the chemical, physical, and radiological characteristics of, and other information on, the receiving formation, provided that the secretary may issue a conditional approval of a discharge permit if he finds that further formation testing is necessary for final approval;

As detailed in the previously submitted drilling and completion report, formation testing was conducted to determine site-specific chemical, physical, and radiological characteristics of the receiving interval. Formation testing included logging, reservoir falloff and gradient surveys, and core sampling. No formation fluid sampling activities were performed as approved by the OCD.

J. Expected pressure changes, native fluid displacement, and direction of movement of the injected fluid;

Pressure Buildup Predictions Within the AOR

The predictions of reservoir pressure have been conducted based on the following assumptions:

- **The injection interval consists of horizontal, homogenous, porous, and permeable formation with low-permeability confining layers stratigraphically above and below. The geological data previously presented supports this assumption. Although the porosity and permeability of rocks are rarely homogenous on all scales, injection interval parameters have been conservatively estimated so that this assumption of homogenous conditions is acceptable.**

- **The physical properties of the injected fluids do not differ significantly from those of the formation fluids at reservoir temperatures and pressures; namely, the viscosity and density of the injected liquid do not change under reservoir conditions. No changes are expected to occur since the temperature and pressure characteristics of the injection interval are essentially uniform within the area of review.**

- **The third assumption is that the injected liquids move uniformly and radially away from the wellbore and that the relative thickness of the injection interval remains fairly constant within the area of review.**

In the subsurface, fluid storage is achieved by the compression of the reservoir rock along with the injected and native fluid. With the onset of injection, a pressure transient develops with a maximum at the wellbore and generally moves outward radially. The amount of pressure build up is determined by injection flow rates and fluid and reservoir properties. The pressure effects are spread over a larger area than is actually invaded by the injected fluid.

The pressure build up was calculated based on superposition of the analytical solution of the radial diffusivity equation (oilfield units) (Lee 1982):

$$dP = -70.6\ Bq\mu\ /kh * \ln\left([\ 1{,}688\ \Phi\ \mu ctr2\ /kt\ ] - 2s \right)$$

Conservative geologic and injectate input values, as summarized in Table X.5 were used to estimate pressure rise. Pressure rise due to injection according to the above equation by Lee (1982) was evaluated at a single location, based on the maximum injection rate of 500 gpm, and this one-dimensional solution was applied radially with respect to the well to characterize a two-dimensional evaluation of pressure rise. Pressure rise was modeled for an injection duration of five years, equal to the permit duration for the well.

The net thickness of the injection interval is conservatively assigned a value of 85 feet, less than 13% of the permitted injection interval thickness of the well. This value is lower than historical reservoir analyses values as a conservative measure. The permeability is assigned a value of 251 millidarcies (md), based on the results of recent falloff testing and historical permitting values used at neighboring HFNR wells WDW-1, WDW-2, and WDW-3. This results in a permeability-thickness of 21,335 millidarcy-ft (md-ft). Historical falloff testing data for the well is summarized in Table X.6. Note that the modeled value of permeability is significantly lower than values derived from falloff testing in order to conservatively calculate pressure rise at the well.

Formation fluid samples of connate brine from the injection interval were not collected from the WDW-4 during drilling and completion. Therefore, the average total dissolved solids (TDS) of the formation fluid is estimated to be 25,000 mg/l per the previously submitted and approved UIC permit application, data acquired from offset wells, and consistent with the falloff test analysis from 2018.

The formation viscosity, fluid compressibility, and total compressibility were estimated using the average brine salinity along with the bottom hole temperature and pressure recorded in the well at the depth of the injection zone in conjunction with industry standard correlations. The correlations used are presented in the SPE textbook on Pressure Transient Testing which was published as part of the SPE Textbook Series as Volume 9. For the sake of brevity, only page, equation, and figure numbers from this volume are listed subsequently in this document as a reference for all correlations presented for the PVT data.

The percent solids for the fluid was approximated as 2.5%, based on the average 25,000 mg/l TDS brine concentration discussed above. A bottom hole temperature of 159 °F has been used as representative of the formation for these correlations. This value was derived from the original temperature log, run in 2018 when the well was completed. This log is can be found online on the OCD site as part of the WDW-4 well files.

Fluid viscosity was estimated using multiple equations developed by McCain that first are used to estimate fluid viscosity at atmospheric conditions (equations B-72, 73, and 74), which is then converted to viscosity at bottom hole conditions (equation B-75) by using a correction factor. These equations can be found on page 527. As a primary input for the correlation, pressure is required. The pre-

injection formation pressure has been estimated at a depth of 10,200 feet BGL using the pressure measurement from completion in 2018. Pressure was measured to be 4,517 psi at a depth of 10,307 feet BGL. Using this value and an SG of 1.02, a value of 4,470 psi has been estimated as the initial pressure at the top of the injection interval (10,200 feet BGL). At this pressure and a temperature of 159 °F, the following equations have been used to derive viscosity:

$$\mu_{w1} = AT^{B} \quad \text{(B-72)}$$

$$A = 109.574 - 8.40564 * S + 0.313314 * S^2 + 8.72213 * 10^{-3} * S^3 \quad \text{(B-73)}$$

$$B = -1.12166 + 2.63951 * 10^{-2} * S - 6.79461 * 10^{-4} * S^2 - 5.47119 * 10^{-5} * S^3 + 1.55586 * 10^{-6} * S^4 \quad \text{(B-74)}$$

$$\frac{\mu_w}{\mu_{w1}} = 0.9994 + 4.0295 * 10^{-5} * P + 3.1062 * 10^{-9} * P^2 \quad \text{(B-75)}$$

Where,

μ_{w1} is the viscosity of the formation fluid at atmospheric conditions
T_F is the bottom hole temperature in °F
S is the percent of solids
P is the bottom hole pressure in psi
μ_w is the viscosity of the brine at bottom hole conditions

Using these equations, a value of 0.52 centipoise is calculated for the formation fluid viscosity.

Formation Compressibility was estimated using equation L-89 provided on page 337. This equation was developed for limestone formations, consistent with the primary composition of the effective injection interval (see discussion in Section 11).

$$c_f = \frac{a}{(1+bc\Phi)^{\frac{1}{b}}} \quad \text{(L-89)}$$

Where,

a = 0.8535
b = 1.075
c = 2.303 * 10^6
Φ = 0.25

Based on this equation, a value of 3.50E-6 psi^{-1} is derived for formation compressibility.

Fluid compressibility was estimated using figures L-30 and L-31 on page 338 with a bottom hole temperature of 159 °F, a bottom hole pressure of 4,470 psi, and a dissolved solids weight of 2.6%. Using Figure L-31 to first estimate freshwater

compressibility, a value of 2.86E-06 psi^{-1} is derived. Using Figure L-30, the coefficient of isothermal compressibility (ratio of brine compressibility over freshwater compressibility) was determined to be approximately 0.95. This results in a value of 2.70E-06 psi^{-1} for the formation fluid compressibility (c_w).

By combining the formation and formation fluid compressibility, the total system compressibility is determined. The total system compressibility (c_t) is approximately 6.20 E-06 psi^{-1}.

Table X.5. Reservoir Parameters for Modeling

Parameter	Source/Calculation	Value
Flow rate, q	500 gpm *1440 min/day* bbl/42 gal	17,143 bbl/day
Net Thickness, h	Portion of the ~665-foot injection interval gross thickness	85 feet
Formation Volume Factor, B	Correlation	1.00
Porosity, ϕ	Logs	0.25
Permeability, k	Well tests, Historical value	251 millidarcies
Viscosity, μ	Correlation	0.52 centipoise
Total Compressibility, C_t	$3.1x10^{-6}$ psi^{-1} + $4.5x10^{-6}$ psi^{-1}	$6.20x10^{-6}$ psi^{-1}
Radius, r	Illustrative assumption	10,560 feet
Time, t	5 years * 365.25 days/yr * 24hr/day	43,830 hours

Table X.6. Historical Falloff Testing Data

Date	Depth (ft BGL)	kh (md-ft)	k (md)	Skin (units)
WDW-4				
2021	10,307	1,364,220	4,134	6.6
2020	10,307	816,420	2,474	-1.9
2018	10,307	2,191,860	6,642	-3.5

The calculated pressure build-up values for selected radial distances from the well for the modeled injection duration are provided in Table X.7. Note that this calculation was conducted assuming a single well scenario at a single point. Figure X.4 presents a pressure plot of the 5-year injection duration scenario. As depicted on this plot, the cone of influence (COI) pressure occurs at a radial distance of approximately 781 feet from the well (further discussed in this section).

Cone of Influence (COI) Determination and Calculations

The Cone of Influence is the area around the injection well within which increased injection zone pressures caused by injection activities could be sufficient to drive fluids into an underground source of drinking water (USDW).

The determination of the COI requires the calculation of the maximum allowable pressure increase in the injection interval without causing fluid movement into an USDW. To conservatively estimate this pressure, HFNR proposes that the following worst-case scenario be utilized:

> *It is assumed that a hypothetical bore hole is located within the area of review. This borehole is constructed to represent a mud filled conduit open to the injection interval and the lowermost USDW.*

It is assumed that the borehole is filled with drilling mud with a density of 9.0 pounds per gallon. Drilling mud in an abandoned wellbore is a barrier to upward movement because the hydrostatic pressure of the mud column in the wellbore exceeds the reservoir pressure. To calculate the hydrostatic pressure of a mud column, the weight of the drilling mud is required. Typical mud weights in the region range from 9.0 pounds per gallon (ppg) to over 12.0 ppg. A mud weight of 9.0 ppg (Specific Gravity of 1.08) will result in a pressure gradient of 0.468 psi/ft. Historically, gelled muds with a specific gravity greater than 1.08 (> 9.0 ppg) have been used to drill wells within the area of review. An assumed minimum mud weight of 9.0 in an abandoned wellbore is conservative.

It is assumed that the 9.0 ppg mud column does not extend to the surface. A 50' fallback is incorporated into the calculated hydrostatic pressure of the mud column.

The following calculations determine the minimum pressure required to balance the minimum hydrostatic overbalance created by the mud.

Top of Injection Interval = 10,200 feet BGL
Minimum Density of Mud = 9.0 pounds per gallon (0.468 psi/ft.)
Initial Reservoir Pressure = 4,470 psi

Calculation of COI Pressure:

COI pressure = (hydrostatic pressure of 9.0 ppg mud from 50' to the top of the injection interval) - (static reservoir pressure at top of injection interval)

COI pressure = [(0.468 psi/ft)(10,200 feet - 50 feet)] – 4,470 psi

COI pressure = 280 psi (with 9.0 ppg mud)

This calculated value of critical pressure rise, which represents the pressure required to cause vertical migration through a hypothetical open borehole to the lowermost USDW, must be evaluated versus the calculated reservoir pressure rise from injection. Table X.8 presents the results of the calculated pressure rise due to injection, based on parameters presented in Table X.5.

As shown in Table X.7, the calculated pressure rise due to injection at a distance of one mile (5,280 feet) is approximately 167 psi, which is less than the calculated critical pressure rise of 280 psi. Based on these calculations, the distance to the calculated critical pressure rise is approximately 781 feet. Note that the calculated COI is determined as a conservative measure, and is substantially less than the one-mile regulatory AOR that is utilized for this permit application.

Extent of Waste Plume

The predicted positions of the current and 5-year waste fronts for WDW-4 were calculated, assuming a future injection rate of 500 gpm for 5 years. Injection into the well at a continuous rate of 500 gpm for 5 years will generate a volume of 1,314,000,000 gallons. The modeled thickness of the formation is 85 feet and the porosity is 25%. The radial distance of displacement was calculated using the following equation:

$$r = \sqrt{\frac{Q}{\pi h \phi}}$$ (Green, 1983)

where:

r = radial distance of fluid front from well, feet;
Q = cumulative volume of fluid injected, ft^3
ϕ = porosity of receiving formation (in order to be conservative, the effective porosity was assumed to be 80% of the assigned porosity)
h = thickness of formation, feet.

An estimate of the influence of dispersion was made with the following equation (Warner and Lehr, 1977):

$$r' = r + 2.3\sqrt{Dr}$$

where:

r' = radial distance of travel with dispersion
D = dispersion coefficient; 65 feet for carbonate aquifer.

Table X.8 presents the results of the above calculations for WDW-4.

Table X.8: Extent of Waste Plume

	Parameter	WDW-4
Current Plume	Total Injected Volume (gal)	378,429,618
	Radial Distance of Fluid Front (feet)	973
	Radial Distance of Fluid Front with Dispersion (feet)	1,552
Projected 5-year Plume	Total Injected Volume (gal)	1,692,429,618
	Radial Distance of Fluid Front (feet)	2,058
	Radial Distance of Fluid Front with Dispersion (feet)	2,900

K. Proposed stimulation program;

HFNR does not propose any changes to the current stimulation program. Future stimulations will likely consist of stimulation via coiled tubing and/or bullhead chemical treatment. Procedures and schedules on any future stimulations will be sent the OCD in advance for approval.

L. Proposed or actual injection procedure;

HFNR will continue to maintain a system for monitoring and control of injection operations, complete with digital data recording equipment, alarms, and automatic shutdown equipment. HFNR will operate the well to ensure that the permitted operating parameters are not exceeded.

The facilities associated with the injection well will have the same preventive maintenance schedules as other plant process equipment. This includes routine, regular servicing of instrumentation, lubricators, and like equipment. Pressure equipment tests, over-speed checks, relief valve tests, and tank internal inspections will be made at regular intervals.

The well annulus between the long-string protection casing and the injection tubing will be kept full of a fluid approved and at an annulus pressure both approved by the OCD (except during workovers or other maintenance activities as allowed by OCD regulation).

Digital devices will be used to measure and record the injection tubing pressure, injection flow rates and temperatures, and totalized injection volume. Annulus

pressures will also be monitored and recorded continuously. Instrumentation will be enclosed in weatherproof housings.

Allowable operating set-points for the maximum and minimum values of injection pressure, injection rate, and annulus pressure will be programmed into the monitoring system. Operator notifications and/or alarms will be triggered when any of the limiting set-point values are detected. In the event of an alarm or shutdown, the trained deep well operator will immediately respond to the notification and take appropriate action as required. In the event of a loss of mechanical integrity, HFNR will comply with the regulatory provisions.

Prior to commencing any workover operation, HFNR will notify the OCD in advance in writing of the plans for the proposed work and receive approval to conduct the work. Pressure control equipment will be installed and maintained during workovers that involve removal of the tubing.

Plant personnel responsible for operation of the wells and associated facilities will be trained. Training will include details about permit conditions, fluid quality, alarms, shutdowns, and notification procedures. Practical classroom instruction will be followed by on-the-job training alongside experienced personnel. This training will continue until the trainee exhibits the knowledge of an experienced operator. Oversight of operations and compliance will be performed by specialists with appropriate operating experience, with assistance from supervisors, managers, and technical specialists. For more significant, specialized or long-range issues, additional technical staff will be utilized as needed.

M. Schematic or other appropriate drawings of the surface and subsurface construction details of the well;

A schematic of the WDW-4 surface facilities is presented as Figure X.5. A schematic of the WDW-4 subsurface details is presented as Figure X.6. A schematic of the WDW-4 wellhead is presented as Figure X.7. These schematics depict details regarding well construction materials and methods.

N. Construction procedures, including a cementing and casing program, logging procedures, deviation checks, and a drilling, testing, and coring program;

The following presents a summary of the well construction for WDW-4. Information regarding construction history, well details, cementing, wellhead, and the annulus system are presented herein. Information regarding logging procedures, deviation checks, drilling, testing, and coring was submitted to EMNRD OCD previously and is not included in this document.

Well Construction History

WDW-4 was drilled by HFNR in 2018. After site preparation, 20-inch conductor casing was driven to a depth of 80 feet KB. 13 3/8-inch surface casing was set in a 17 ½-inch hole at 1,680 feet KB. The surface casing was cemented to surface. 9 5/8-inch protection casing was set in a 12 ¼-inch hole at 10,327 feet KB. The protection casing was cemented to surface in two stages with a DV tool set at 5,800 feet KB. The well was drilled and completed required OCD specifications.

Well Construction Details

The surface casing depth and specifications for WDW-4 were selected and designed to protect the lowermost USDW. The casing and injection tubing are designed to satisfy installation requirements and to suit the existing subsurface geologic, formation fluid, and injected fluid environment. Details regarding the tubing, casing, and packer along with their mechanical properties are included in Tables X.9.

Table X.9: WDW-4 Construction Details

Equipment	Depth (KB)	Description	Collapse (psi)	Yield (psi)	Tensile (lbs)
Conductor Casing	0 to 80 feet	20-inch, 129.33 lb/ft, API 5LX-56, Plain-end	N/A	N/A	N/A
Surface Casing	0 to 1,680 feet	13 3/8-inch, 54.5 lb/ft, K-55, STC	1,130	2,730	547,000
Protection Casing	0 to 10,327 feet	9 5/8-inch, 47 lb/ft, N-80, LTC	4,761	6,870	905,000
Injection Tubing	0 to 10,265 feet	7-inch, 26 lb/ft, K-55, LTC	4,320	4,980	401,000
Packer	10,265 feet	7-inch x 9-5/8-inch Arrow X-1	N/A	N/A	N/A

Cement Details

Figure X.6 presents the wellbore diagram for WDW-4. The injection well is completed and cemented. Basic cementing information is presented on this figure and detailed in the 2018 Drilling Report on file with OCD.

Wellhead

A schematic of the WDW-4 wellhead is presented as Figure X.7. The wellhead is pressure rated to withstand maximum injection pressures for the life of the project. The outer surface of the wellhead is protected at all times with protective paint as a corrosion preventative.

Annulus System

WDW-4 has a positive annulus pressure operating and monitoring system and a system to cut power to the injection pump if permit conditions are exceeded or if unsafe conditions exist. Operating systems have preset limits, which can be adjusted depending upon specific operating conditions and reporting requirements.

The annulus pressure system consists of an annulus fluid tank connected to a pressure source. The annulus tank will have sufficient reservoir capacity to accommodate the anticipated volume fluctuations due to temperature and pressure limitations.

A digital recorder is used to record the annulus pressure and injection pressure. Pressure transducers are located in appropriate taps in the flow line and annulus line near the wellhead to measure pressures.

O. Contingency plans to cope with all shut-ins or well failures so as to prevent movement of fluids into ground water having 10,000 mg/l or less TDS except for fluid movement approved pursuant to 20.6.2.5103 NMAC;

HFNR has an Integrated Contingency Plan detailing responses to spills of all types, reporting spills/releases, mitigation and corrective actions, clean up and disposal as applicable. WDW-4 is equipped with a high-pressure shutoff switch to prevent operation of the injection pump at pressures greater than the designated MASIP. The well is equipped with a low pressure shutoff switch that will deactivate the injection pump in the event of a surface leak. In addition, the well is equipped with a high/low pressure shutdown switch with a pressure sensor on the tubing/casing annulus. This pressure switch is intended to stop the injection pump in the event of 1) a tubing leak, or 2) a casing, packer, or wellhead leak.

If an alarm or shutdown is triggered at the wellhead, electronic signals are sent to the control room at the refinery notifying of the shutdown and the cause of the alarm or shutdown will be immediately investigated.

Operators will immediately cease injection operations at the wellhead and divert flow to another well, and notify maintenance and environmental to take all necessary steps to determine the presence or absence of a leak, and environmental will provide verbal notification to OCD within 24 hours.

If the alarm or shutdown is not related to mechanical integrity and the cause of the alarm or shutdown is corrected, injection operations will be resumed. If the mechanical integrity of the well is in question, the well will remain out of service until the mechanical integrity of the well is restored to the satisfaction of OCD and the agency approves resumption of injection operations.

P. Plans, including maps, for meeting the monitoring requirements of 20.6.2.5207 NMAC;

Mechanical Integrity

Periodic monitoring is performed to conform to both Part I and Part II mechanical integrity requirements. Annual testing including reservoir (ambient) monitoring and annulus pressure testing is conducted once each calendar year. Bradenhead testing will be conducted annually on WDW-4. In addition, required Part II testing is performed according to applicable regulatory standards once every five years. Casing inspection logs may be conducted to investigate casing condition if it is determined to be necessary due to operational or regulatory concerns when tubing is already removed from the borehole during a workover or stimulation.

Injected Fluid Analysis

Injectate characteristics are monitored by collecting a representative sample of plant produced injectate during each quarter during which operations take place. HFNR is currently in the process of commencing operations on a Renewable Diesel Unit (RDU) at the refinery. The implementation of the RDU is not expected to affect the currently permitted limits regarding effluent discharge quantity and quality. Appendix X.1 presents the current injected fluids monitoring plan as well as the proposed monitoring plan amendments pertaining to the addition of the RDU. Appendix X.1 also contains information regarding the proposed pilot sampling plan to be implemented to ensure waste stream compliance once the RDU is operational.

Continuous Monitoring

Both the injection pressure and the annulus pressure are continuously monitored and recorded. Electronic pressure transducers are maintained in pressure taps on the annulus system and injection flow lines. Flow rate and volume are also continuously monitored and recorded. The flow rate to the wells is determined using a liquid flow meter designed for continuous monitoring.

Monitoring Wells

Appendix X.2 presents information regarding monitoring wells.

Q. The ability of the discharger to undertake measures necessary to prevent contamination of ground water having 10,000 mg/l or less TDS after the cessation of operation, including the proper closing, plugging and abandonment of a well, ground water restoration if applicable, and any post-operational monitoring as may be needed; methods by which the discharger shall demonstrate the ability to undertake these measures shall include submission of a surety bond or other adequate assurances, such as financial statements or other materials acceptable to the secretary, such as: (1) a surety bond; (2) a trust fund with a New Mexico bank in the name of the state of New Mexico, with the state as beneficiary; (3) a non-renewable letter of credit made out to the state of New Mexico; (4) liability insurance specifically covering the contingencies listed in this paragraph; or (5) a performance bond, generally in conjunction with another type of financial assurance; such bond or materials shall be approved and executed prior to discharge permit issuance and shall become effective upon commencement of construction; if an adequate bond is posted by the discharger to a federal or another state agency, and this bond covers all of the measures referred to above, the secretary shall consider this bond as satisfying the bonding requirements of 20.6.2.5000 through 20.6.2.5299 NMAC wholly or in part, depending upon the extent to which such bond is adequate to ensure that the discharger will fully perform the measures required hereinabove;

Plugging of WDW-4 will entail the protection casing string be filled with a series of cement plugs from just above the injection packer depth to the surface, as detailed in Appendix X.3.

Closure costs for plugging the well in accordance to applicable OCD regulations were estimated using current costs for services and equipment. The estimated cost for plugging WDW-4 is $281,196. Appendix X.4 details the estimated cost of plugging the well with cement.

HFNR currently has a financial surety instrument in place that has been provided to the OCD demonstrating sufficient financial assurance is available to manage well abandonment and estimated costs for the existing well WDW-4. This financial surety instrument will be updated during the permit renewal process and will be provided to the OCD under separate cover demonstrating sufficient financial assurance is available pertaining to abandonment of WDW-4

R. All available logging and testing program data on the well;

Logging and testing program data were most recently provided in the 2018 Navajo Refining LLC Drilling Report, WDW-4. Exhibits 10.1-10.29 from the referenced document provide the requirement information for this section including openhole, cased, and Part II MIT logs.

S. The demonstration of mechanical integrity pursuant to 20.6.2.5204 NMAC;

Annual testing including reservoir (ambient) monitoring and annulus pressure testing is conducted once each calendar year on WDW-4. Bradenhead testing will also be conducted annually on WDW-4. In addition, required Part II testing is performed according to applicable regulatory standards once every five years. The most recent reservoir monitoring and annulus pressure testing report (2021) has been submitted and are on file with the OCD. The most recent Part II mechanical integrity testing occurred during completion operations in 2018 and consisted of a radioactive tracer survey and temperature logs. Copies of historical MIT reports have been submitted and are on file with OCD.

T. The anticipated maximum pressure and flow rate at which the permittee will operate;

The requested information is provided in Section X.H of this document.

U. The results of the formation testing program;

The requested information is provided in Section X.I of this document.

V. The physical, chemical, and biological interactions between the injected fluids and fluids in the injection zone, and minerals in both the injection zone and the confining zone; and,

A detailed compatibility report was most recently provided in the 2017 Permit Application for Class I Non-Hazardous Waste Injection Wells WDW-1, WDW-2, and WDW-3. Appendix F-2 from the referenced document provides the requirement information for this section as it relates to WDW-4. Core analysis was also provided to the OCD following the drilling activities in 2018.

Additional details regarding fluid interaction and other required information are provided in the original permit application.

W. The status of corrective action on defective wells in the area of review.

As detailed in Section X.D, there are no wells within the AOR that require a corrective action plan.

REFERENCES

Green, C.J., 1983, Underground Injection Control Technical Assistance Manual, Subsurface Disposal and Solution Mining: Texas Water Development Board, Report 274

Lee, J., 1982. Well Testing. Society of Petroleum Engineers of AIME, SPE Textbook Series. Volume 1

Lee, John, et al. Pressure Transient Testing. Vol. 9, Henry L. Doherty Memorial Fund of AIME, Society of Petroleum Engineers, 2003

Warner, D.L., and Lehr, Jay H., 1977, An Introduction to the Technology of Subsurface Wastewater Injection: Environmental Protection Agency rept. 600/ 2-77-240, 345

XI. Attach completed Form C-108 with geologic/hydrogeologic/well design and construction evidence demonstrating that well operations will not adversely impact fresh water.

A completed copy of the OCD Form C-108, “Application for Authorization to Inject”, is provided as Appendix XI.1 for the existing well WDW-4 and the required attachments to this form are included in this appendix.

XII. Attach copies of Waste Analysis Plan (40 C.F.R. 146.68), AoR Corrective Action Plan (20.6.2.5354 NMAC), Closure Plan (40 C.F.R. 146.71), Post-Closure Plan (20.6.2.5362 NMAC, 40 § C.F.R. 146.72 and 40 § C.F.R. 261), Completion Report (20.6.2.5360B NMAC), Public Notice (20.6.2.3108 NMAC) and Waste Minimization & Practicability Certification (20.6.2.5360D NMAC).

Not applicable to Class I non-hazardous wells.

XIII. Attach copy of EPA Region 6 (Dallas, TX) "No Migration Petition" submittal (20.6.2.5360B(9) NMAC) if application is for a hazardous injection well. Final permit approval is contingent on EPA approval of the petition. All variances to regulations must be approved by the EPA. All hazardous well permits shall comply with 20.6.2.5360 NMAC.

Not applicable to Class I non-hazardous wells.

XIV. Certification

I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: Travis Gibb TITLE: Vice President and Refinery Manager

SIGNATURE: _____ DATE: 8/12/2022

Figures

★ Navajo Refinery Location

0 25 50 75 100 Miles

XY Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

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Figure I.1
Site Location Map
2022 WDW-4 Permit Renewal

Scale: 1:4,000,000	Date: July 2022	
Fig_I.01_HF_NM_2022_WDW04	By: WEK	Checked: NB

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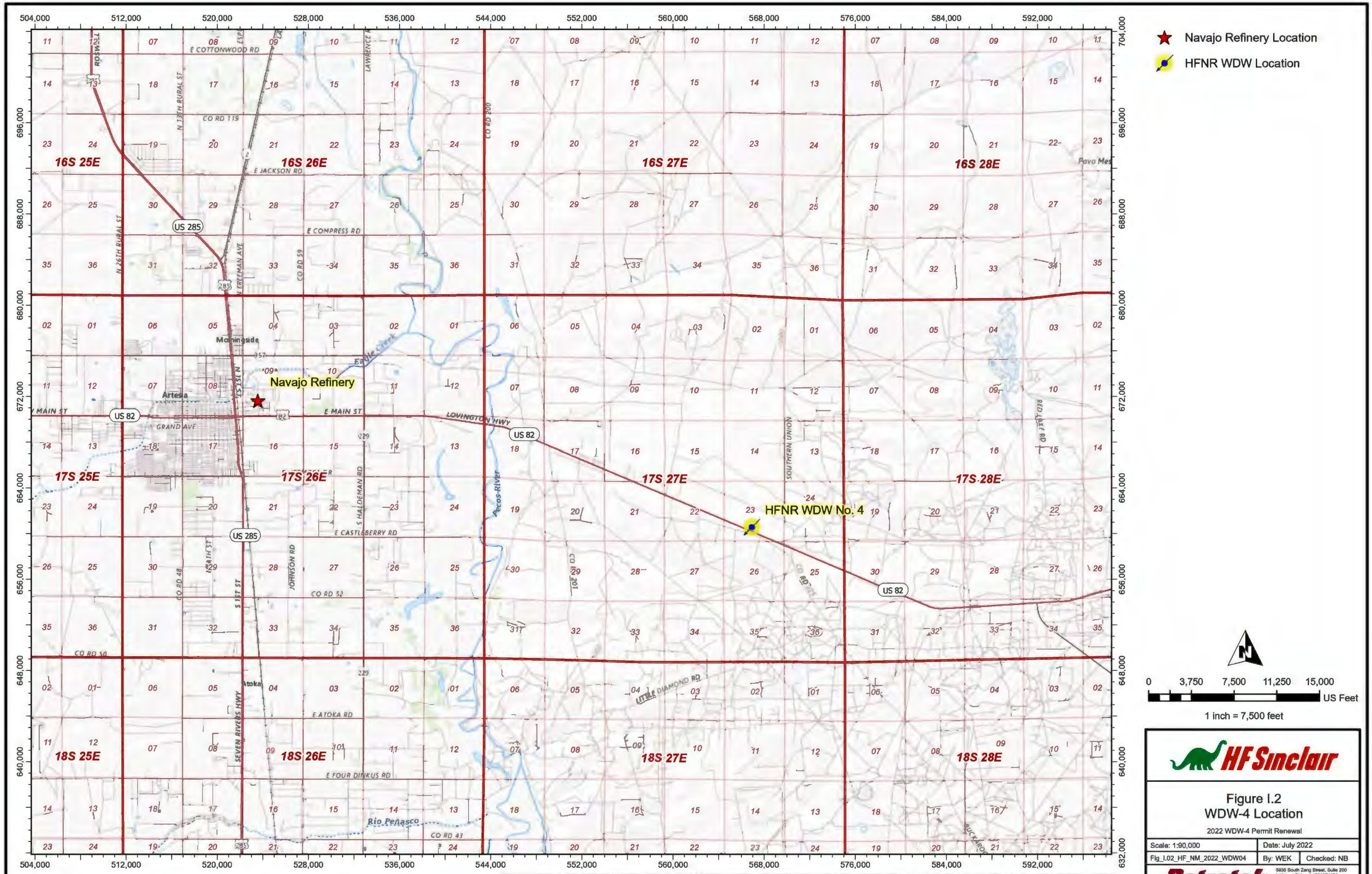

XY Coordinate System: NAD 1983 StatePlane New Mexico East FIPS 3001 (US Feet)

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed June, 2022.

0 3,750 7,500 11,250 15,000 US Feet

1 inch = 7,500 feet

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Figure I.2
WDW-4 Location

2022 WDW-4 Permit Renewal

Scale: 1:90,000	Date: July 2022	
Fig_I.02_HF_NM_2022_WDW04	By: WEK	Checked: NB

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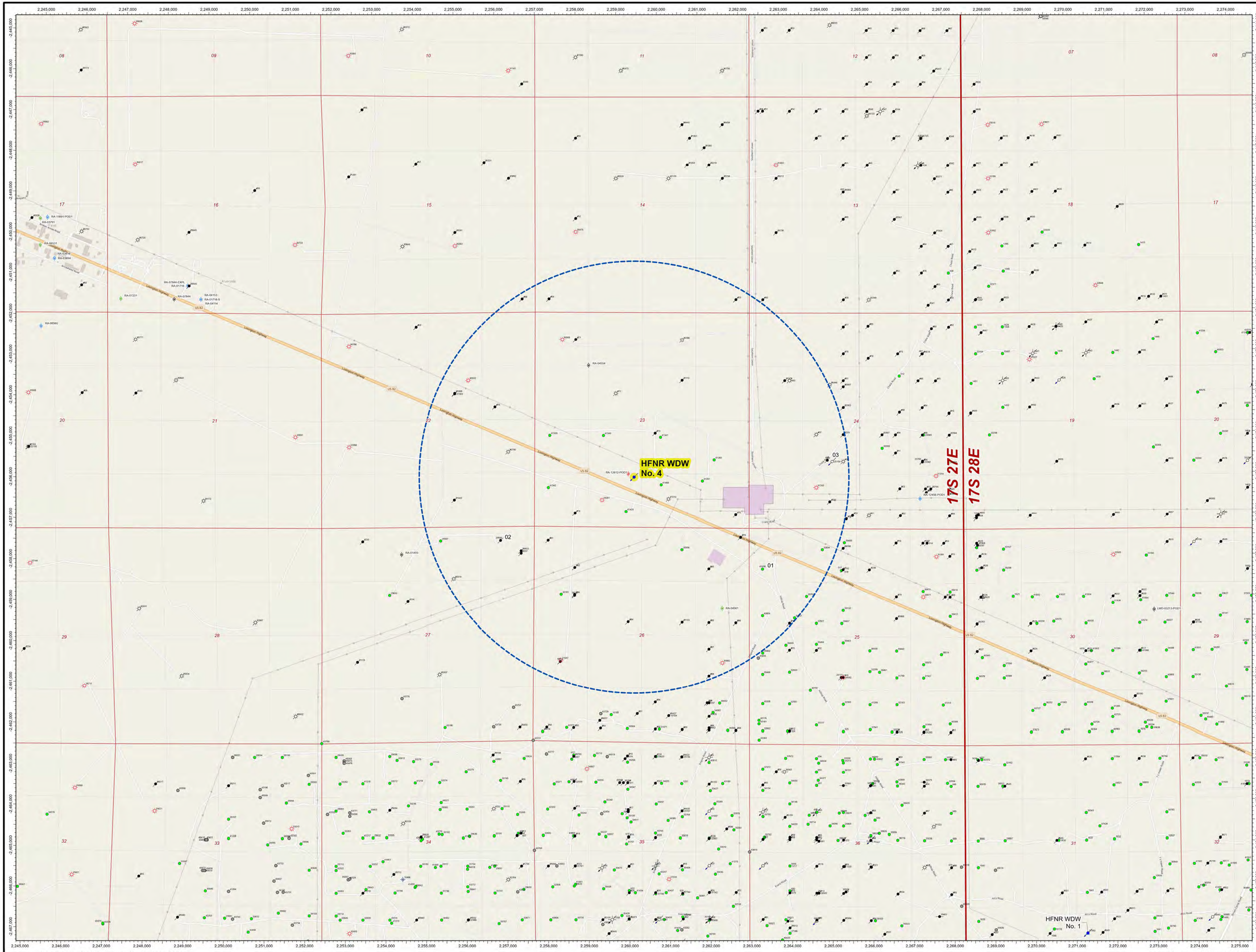

HollyFrontier Navajo Refining Wells
- HFNR WDW No. 4
- HFNR WDW No. 1

Area of Review
- One-Mile Radius

Well Locations
- Active Injection Well
- Plugged Injection Well
- Active Salt Water Disposal
- Plugged Salt Water Disposal
- Active Oil Well
- New/Permitted Well
- Temporarily Abandoned Oil Well
- Plugged Oil Well
- Active Gas Well
- Temporarily Abandoned Gas Well
- Plugged Gas Well
- Plugged Water Well

Water Wells Locations
- Active
- Pending
- Plugged
- Unknown

Note:
Map extent is within Eddy County, New Mexico.

One-Mile radius extends from HFNR WDW No. 4.

Wells are labeled with the last five digits of their associated API number. Wells drilled or plugged since 2017 have been labeled with a unique map identifier. These labels correspond with the numbers found in table X.1.

Oil & Gas well data from the EMNRD, OCD GIS Public FTP Site, accessed and downloaded 05/10/2022.

Water wells are labeled with their associated Point of Diversion file number.

Water well data from the NM Office of the State Engineer Water Rights Database, accessed and downloaded 07/20/2022.

0 500 1,000 1,500 2,000 US Feet

1 inch = 1,000 feet

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Figure X.1
Area of Review Map, All Wells

2022 WDW-4 Permit Renewal

Scale: 1:12,000	Date: July 2022
Fig_X.01_HF_NM_2022_WDW04	By: WEK | Checked: NB

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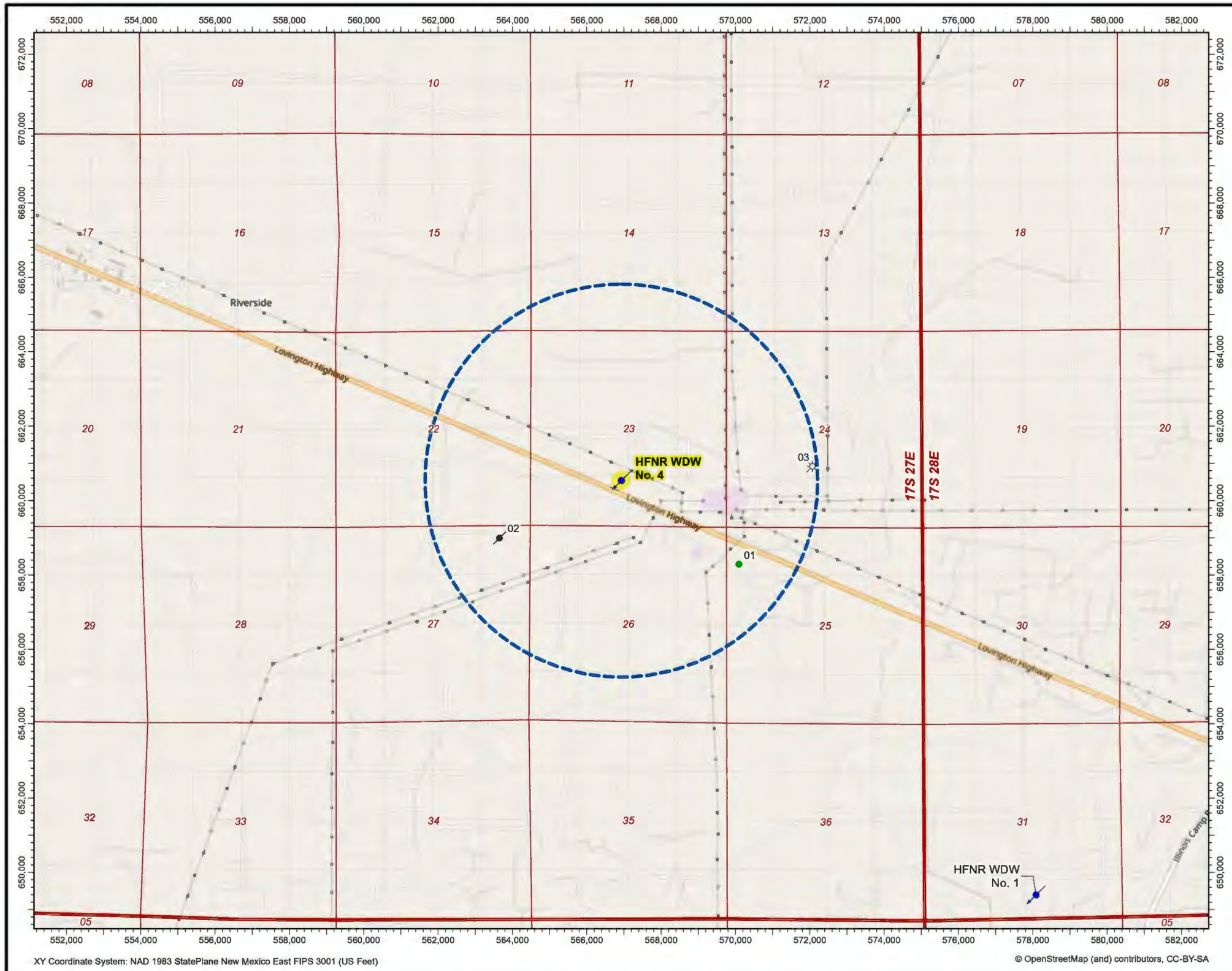

HollyFrontier Navajo Refining Wells

- HFNR WDW No. 4
- HFNR WDW No. 1

Area of Review

- One-Mile Radius

Well Locations

- Active Oil Well
- Plugged Oil Well
- Plugged Gas Well

Note:
Map extent is within Eddy County, New Mexico.

One-Mile radius extends from HFNR WDW No. 4.

Wells drilled or plugged since 2017 have been labeled with a unique map identifier. These labels correspond with the numbers found in table X.1.

Oil & Gas well data from the EMNRD, OCD GIS Public FTP Site, accessed and downloaded 05/10/2022.

0 1,250 2,500 3,750 5,000 US Feet

1 inch = 2,500 feet

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Figure X.2
Area of Review Map,
5-Year Update
2022 WDW-4 Permit Renewal

Scale: 1:30,000	Date: July 2022	
Fig_X.02_HF_NM_2022_WDW04	By: WEK	Checked: NB

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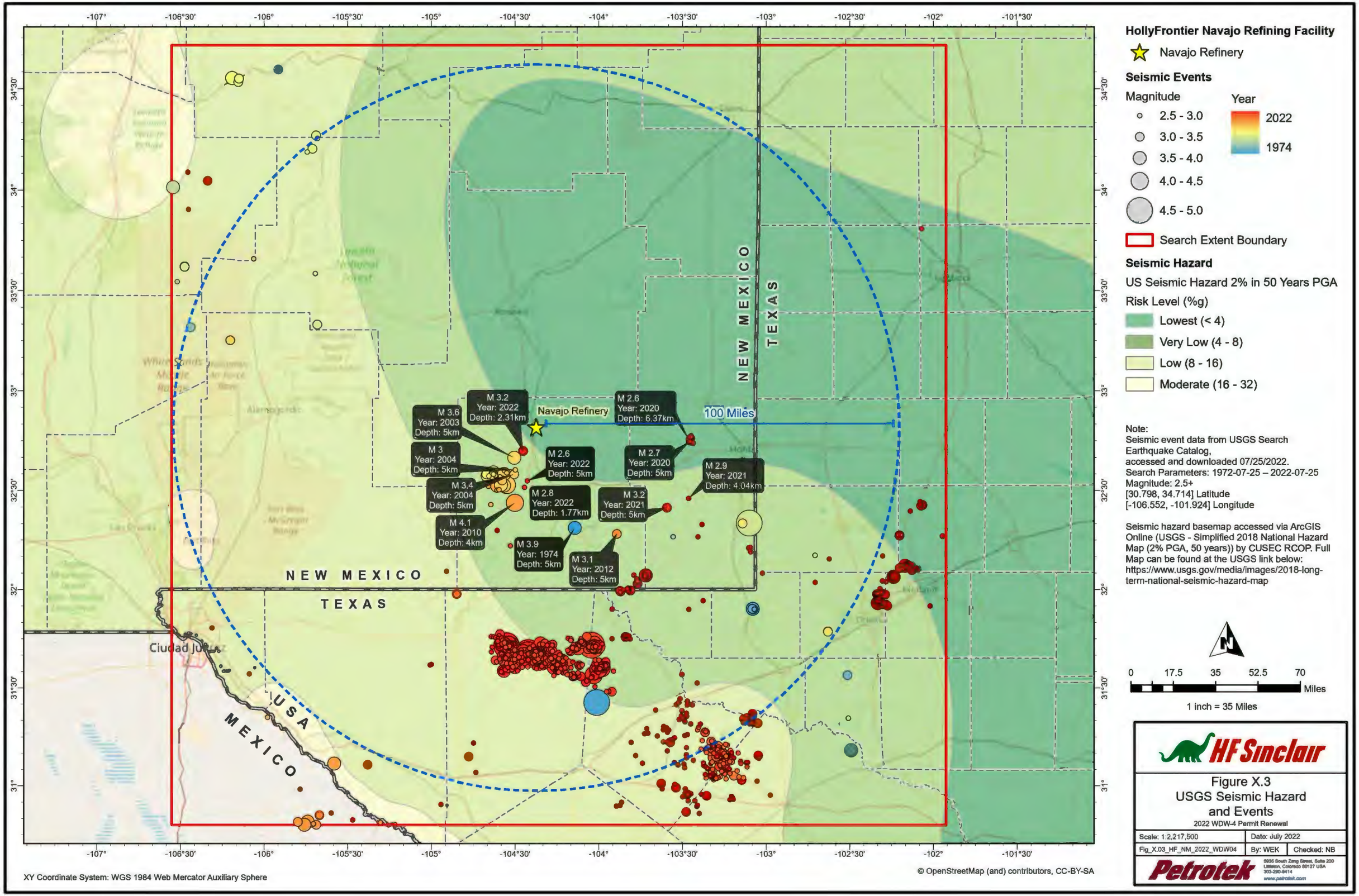

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Figure X.3
USGS Seismic Hazard and Events
2022 WDW-4 Permit Renewal

Scale: 1:2,217,500	Date: July 2022	
Fig_X.03_HF_NM_2022_WDW04	By: WEK	Checked: NB

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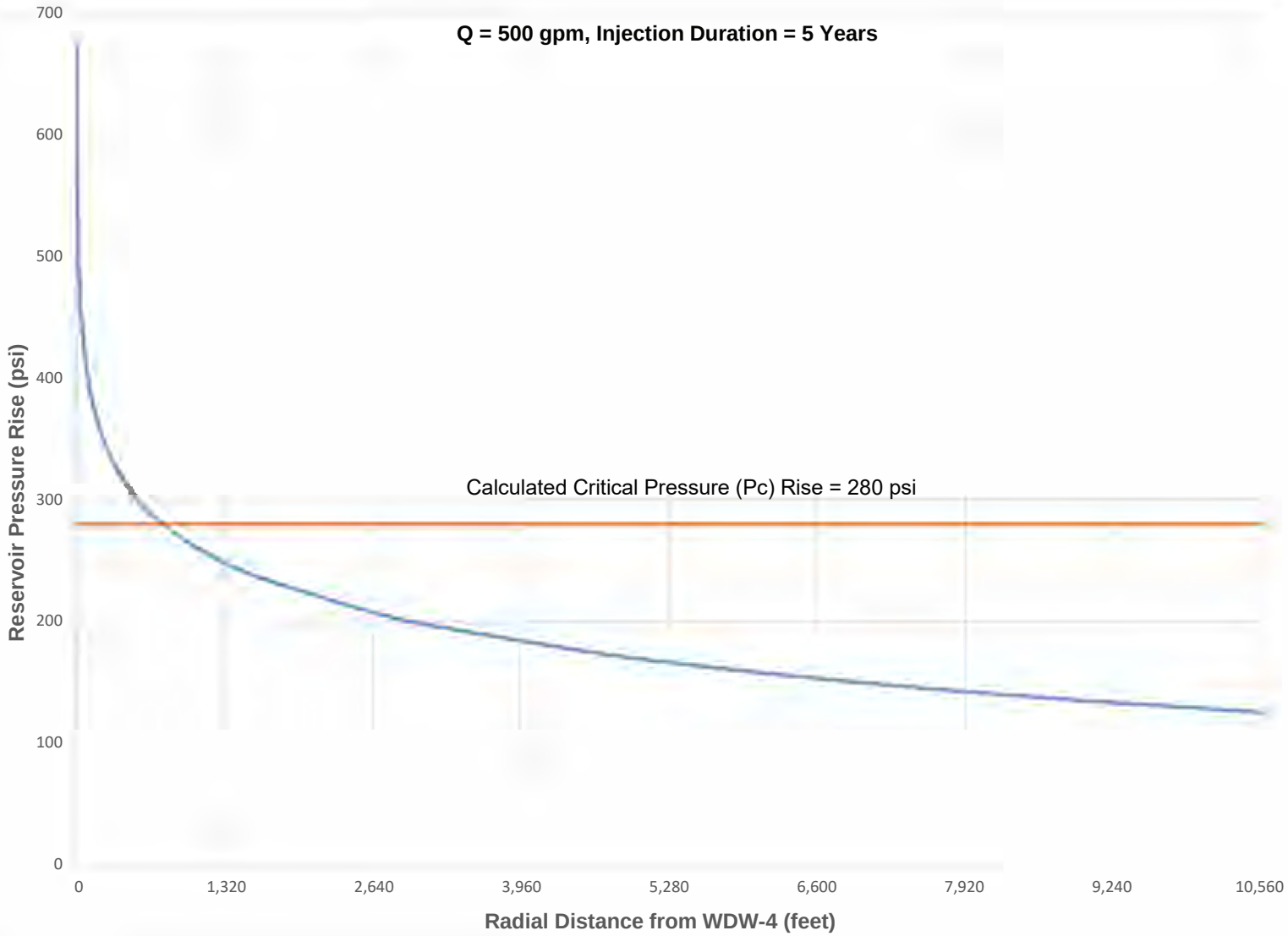

Figure X.4
Modeled Pressure vs. Distance

2022 WDW-4 Permit Renewal

Scale: NTS	Date: July 2022	
Fig_X.04_HF_NM_2022_WDW04.pdf	By: WEK	Checked: NB

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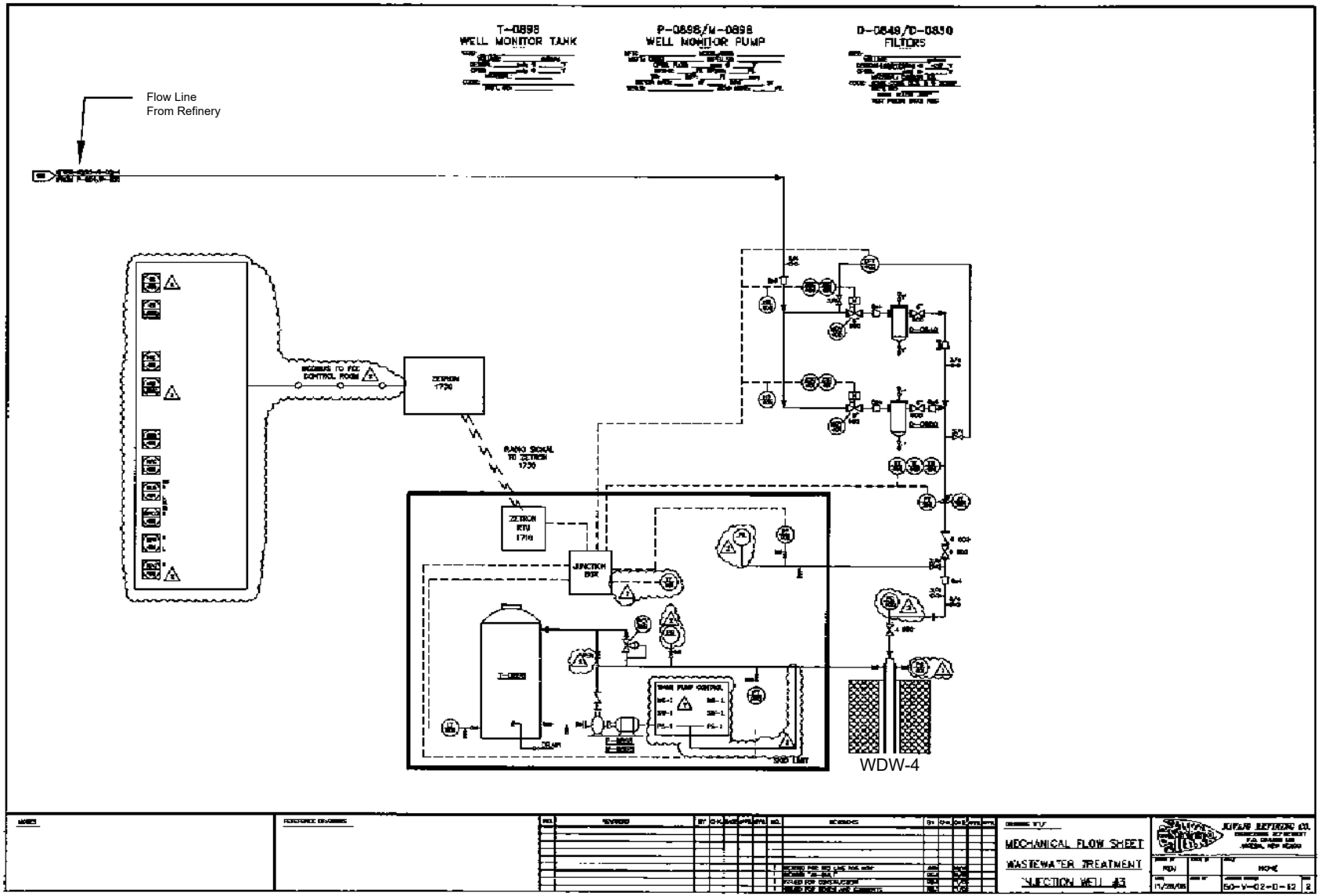

Figure X.5
Surface Facilities Schematic, WDW-4

2022 WDW-4 Permit Renewal

Scale: NTS	Date: August 2022	
Fig_X.05_HF_NM_2022_WDW04.pdf	By: WEK	Checked: NB

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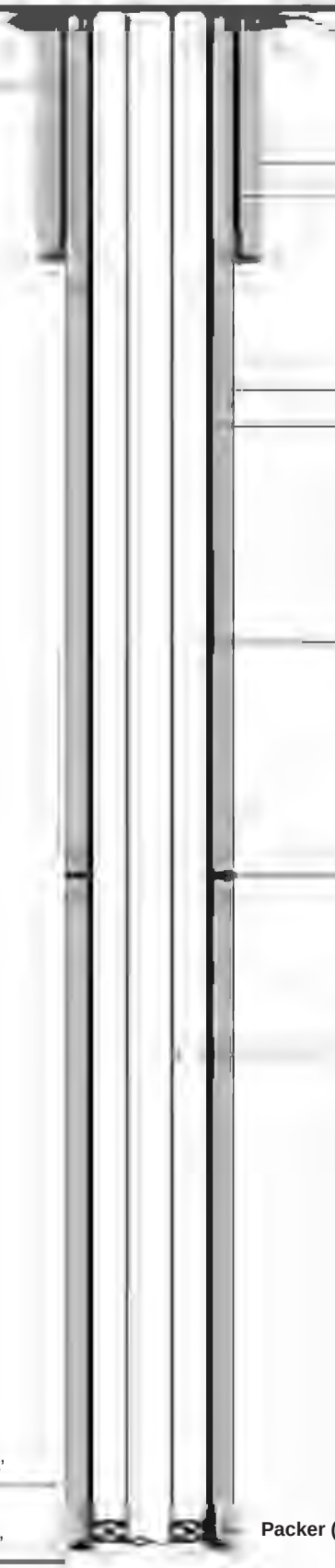
OCD UIC Permit: UICI-008-4
Well API Number: 30-015-44677
Eddy County, New Mexico
Sec. 23, T17S-R27E
Lat. 32.815970° / Long. -104.250174° (NAD 83)

All depths referenced to Kelly Bushing (KB)
elevation 20' above ground level.
Ground Level Elevation: +3,563'



Base of USDW: +/- 500'

Conductor Casing (0' - 80'): 20", 129.33 lb/ft 0.625" wall, API 5LX-56, plain-end, beveled conductor, cemented to surface with 15 yars redi-mix in a 24" hole.

17-1/2" Hole

Surface Casing (0' - 1,680'): 13-3/8", 54.5 lb/ft, K-55, ST&C, cemented to surfce with 3,225 sacks of cement.

12-1/4" Hole

Protection Casing (0' - 10,327'): 9-5/8", 47 lb/ft, N-80, LT&C, cemented to surface.

Annulus Fluid: Injection tubing and protection casing annulus filled with 263 bbl of brine water containing a corrosion inhibitor, a bactericide and an oxygen scavenger.

DV Tool (5,800'): 9-5/8"

Injection Tubing (0' - 10,265'): 7", 26 lb/ft, K-55, LT&C.

Top of Confining Zone: 9,805'

Top of Injection Zone: 10,220'

Base of Injection Zone: ~10,885'

Packer (10,265'): 7" x 9-5/8"

Open Hole: 8-1/2" to 10,700'.

TD: 10,700'

NOT TO SCALE

Wellbore information from: Figure 8.2, HollyFrontier Navajo Refining LLC, Artesia, New Mexico, As Built Below Ground Well Schematic by WSP and information found in the 2017 WDW-4 Permit.

HF Sinclair

Figure X.6
Wellbore Schematic,
WDW No. 4

2022 WDW-4 Permit Renewal

Scale: NTS	Date: July 2022
Fig_X.06_HF_NM_2022_WDW04.pdf	By: WEK | Checked: NB

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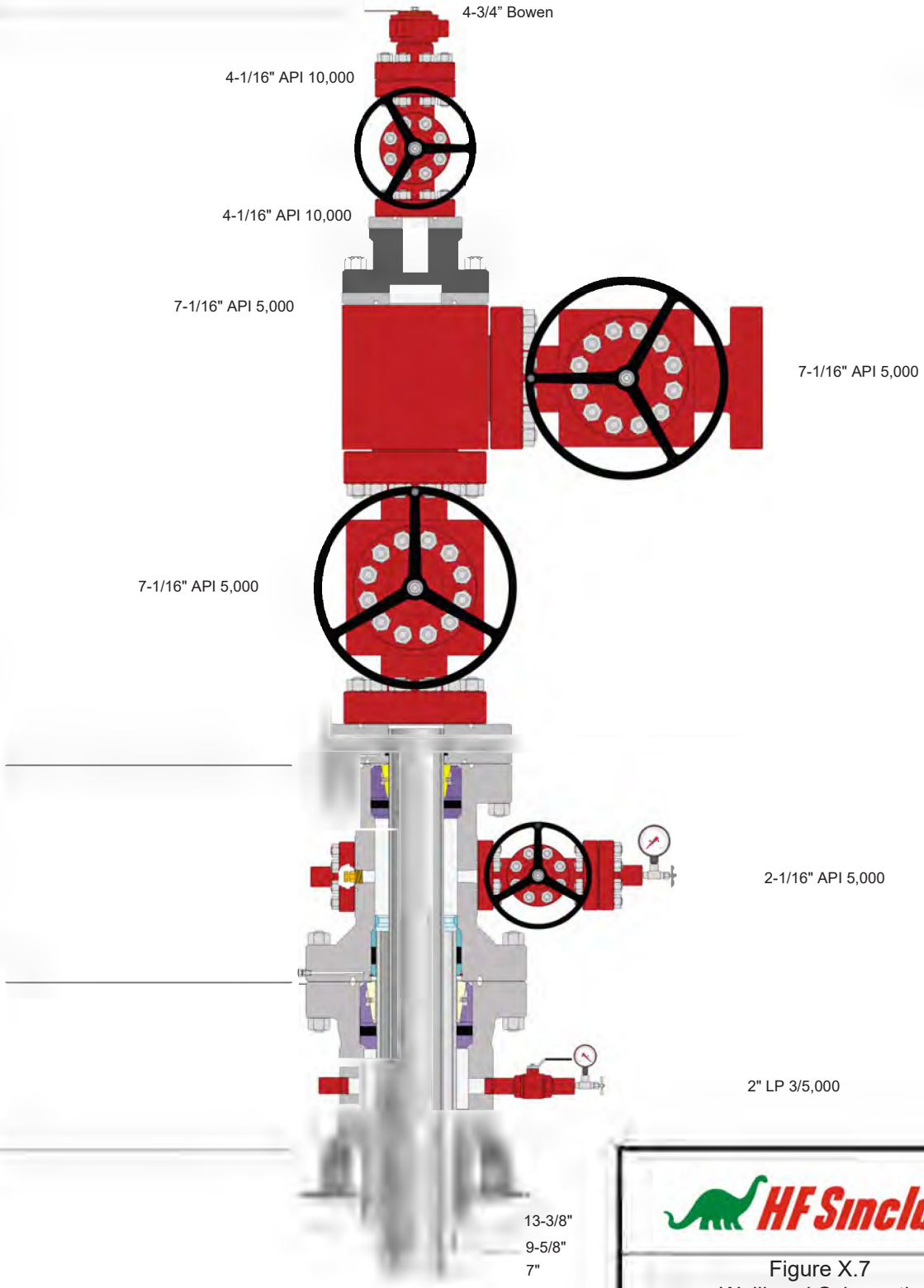
OCD UIC Permit: UICI-008-4
Well API Number: 30-015-44677
Eddy County, New Mexico
Sec. 31, T17S-R27E
Lat. 32.81581° / Long. -104.25003° (NAD 83)



Wellhead information from:
Figure 8.3, Navajo Refining - HollyFrontier
by Weatherford.

NOT TO SCALE

HF Sinclair

Figure X.7
Wellhead Schematic
WDW No. 4

2022 WDW-4 Permit Renewal

Scale: NTS	Date: July 2022
Fig_X.07_HF_NM_2022_WDW04.pdf	By: WEK | Checked: NB

Petrotek
5935 South Zang Street, Suite 200
Littleton, Colorado 80127 USA
303-290-9414
www.petrotek.com

Tables

TABLE X.1
Wells within the AOR, Drilled or P&A Since 2017

Map ID	API	Operator Name	Well Name	Type Code	Type	Status	Surface Location	Latitude	Longitude	Directional	Spud Date	MD	TVD	Pool ID	Plug Date
1	30-015-41698	Redwood Operating LLC	MATTHEWS 25 FEDERAL #003	O	Oil	Active	D-25-17S-27E	32.809628	-104.2397614	V	1/18/2017	4860	4860	[96836] RED LAKE, GLORIETA-YESO, NORTHEAST	12/31/9999
2	30-015-29936	Redwood Operating LLC	EAGLE 27 FEDERAL #001	O	Oil	Plugged (site released)	A-27-17S-27E	32.811573	-104.2607193	V	10/15/1998	2700	2700	[51300] RED LAKE, QUEEN-GRAYBURG-SA	12/23/2021
3	30-015-00498	ALAMO PERMIAN RESOURCES, LLC	BERRY A #011	G	Gas	Plugged (site released)	K-24-17S-27E	32.816841	-104.2332993	V	12/31/9999	2150	2150	[51300] RED LAKE, QUEEN-GRAYBURG-SA	11/29/2021

TABLE X.4
Historical Injection Data (2019-2022)

		WDW-4	
Year	**Month**	**Volume (bbls)**	**Pressure (psig)**
2019	Jan	228,480	50
2019	Feb	228,480	50
2019	Mar	279,531	80
2019	Apr	240,686	70
2019	May	223,200	75
2019	Jun	274,629	98
2019	Jul	272,091	163
2019	Aug	312,480	115
2019	Sep	246,857	101
2019	Oct	247,646	100
2019	Nov	231,429	100
2019	Dec	268,903	109
2020	Jan	262,526	107
2020	Feb	239,623	119
2020	Mar	292,286	127
2020	Apr	202,629	110
2020	May	168,994	97
2020	Jun	162,514	97
2020	Jul	190,251	110
2020	Aug	177,497	109
2020	Sep	157,371	99
2020	Oct	189,189	115
2020	Nov	203,657	122
2020	Dec	200,880	134
2021	Jan	172,183	114
2021	Feb	139,200	263
2021	Mar	215,760	129
2021	Apr	212,914	135
2021	May	215,760	143
2021	Jun	208,800	185
2021	Jul	187,063	141
2021	Aug	203,006	152
2021	Sep	280,400	167
2021	Oct	164,743	145
2021	Nov	163,543	143
2021	Dec	255,086	171
2022	Jan	327,360	230
2022	Feb	349,440	339
2022	Mar	212,571	167
2022	Apr	200,571	170

TABLE X.8
Calculated Pressure Rise vs. Distance

		WDW-4	
Based on Equations 1.7 and 1.9 (Lee, 1982; p. 3-5)		Injection Rate (bpd)=	17,143
dp = -70.6(qBu/kh) * [Ei(-948*por*u*ct*rw^2/kt)		Injection Days=	1,826
Where Ei = Exponential Integral			
Solution Ignores Skin Factor			
Where:			
Term	**Description**	**Value**	**Units**
dp =	pressure differential	Solve	psi
q =	flowrate (STB/d)	17,143	bbl/d
B =	formation volume factor (RB/STB)	1.00	RB/STB
u =	viscosity (cp)	0.520	cp
k =	permeability (md)	251.0	md
h =	reservior thickness (feet)	85	feet
por =	formation effective porosity (percent)	0.25	--
ct =	total matrix and fluid compressibility (1/psi)	6.20E-06	1/psi
rw =	wellbore radius (feet)	Variable	feet
t =	injection time (hours)	43,830	hours
s =	skin factor (units)	0	
	Term 1	70.6(qBu/kh)	
	Term 2	(-948*por*u*ct*rw^2/kt)	

dp = Term 1 * Term 2

Radius (ft)	Term 1	Term 2	Ei(Term 2)	dp (psi)
1	29.498	-6.95E-11	22.813	673
13	29.498	-1.17E-08	17.683	522
20	29.498	-2.78E-08	16.822	496
30	29.498	-6.25E-08	16.011	472
50	29.498	-1.74E-07	14.989	442
60	29.498	-2.50E-07	14.624	431
80	29.498	-4.45E-07	14.049	414
100	29.498	-6.95E-07	13.603	401
120	29.498	-1.00E-06	13.238	391
140	29.498	-1.36E-06	12.930	381
160	29.498	-1.78E-06	12.663	374
180	29.498	-2.25E-06	12.427	367
200	29.498	-2.78E-06	12.217	360
225	29.498	-3.52E-06	11.981	353
250	29.498	-4.34E-06	11.770	347
300	29.498	-6.25E-06	11.406	336
350	29.498	-8.51E-06	11.097	327
400	29.498	-1.11E-05	10.830	319
450	29.498	-1.41E-05	10.595	313
500	29.498	-1.74E-05	10.384	306
550	29.498	-2.10E-05	10.193	301
600	29.498	-2.50E-05	10.019	296
700	29.498	-3.40E-05	9.711	286
781	29.498	-4.24E-05	9.492	280
1000	29.498	-6.95E-05	8.998	265
1200	29.498	-1.00E-04	8.633	255
1600	29.498	-1.78E-04	8.058	238
2640	29.498	-4.84E-04	7.057	208
3200	29.498	-7.11E-04	6.672	197
4600	29.498	-1.47E-03	5.947	175
5280	29.498	-1.94E-03	5.672	167
6000	29.498	-2.50E-03	5.417	160
7000	29.498	-3.40E-03	5.109	151
8000	29.498	-4.45E-03	4.843	143
9000	29.498	-5.63E-03	4.609	136
10560	29.498	-7.75E-03	4.291	127

Appendix V.1 - Injection 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

January 20, 2022

Randy Dade

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

RE: Quarterly WDW 1 2 3 4 Inj Well OrderNo.: 2112C79

Dear Randy Dade:

Hall Environmental Analysis Laboratory received 2 sample(s) on 12/22/2021 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#: **2112C79**
Date: **1/20/2022**

CLIENT: Navajo Refining Company
Project: Quarterly WDW 1 2 3 4 Inj Well

Analytical Notes Regarding EPA Method 8270:
Pyridine is reported with an "E" flag. The "E" flag is used to represent an estimated value. Pyridine was not detected in the sample, but the calibration curve for this compound did not meet the method requirements.

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,3 & 4 Effluent
Project: Quarterly WDW 1 2 3 4 Inj Well
Collection Date: 12/21/2021 10:15:00 AM
Lab ID: 2112C79-001
Matrix: AQUEOUS
Received Date: 12/22/2021 7:25:00 AM

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 8081: PESTICIDES TCLP							Analyst: **LSB**	
Chlordane	ND	0.0012	0.075		mg/L	1	1/11/2022 7:03:42 PM	64757
Surr: Decachlorobiphenyl	73.2	0	73-119		%Rec	1	1/11/2022 7:03:42 PM	64757
Surr: Tetrachloro-m-xylene	60.2	0	36.6-84.1		%Rec	1	1/11/2022 7:03:42 PM	64757
EPA METHOD 300.0: ANIONS							Analyst: **MRA**	
Fluoride	57	0.80	2.0	*	mg/L	20	12/22/2021 3:16:42 PM	R84756
Chloride	800	25	50	*	mg/L	100	1/8/2022 2:29:50 PM	R85040
Nitrogen, Nitrite (As N)	ND	0.027	0.50		mg/L	5	12/22/2021 3:04:18 PM	R84756
Bromide	0.80	0.25	0.50		mg/L	5	12/22/2021 3:04:18 PM	R84756
Nitrogen, Nitrate (As N)	0.45	0.050	0.50	J	mg/L	5	12/22/2021 3:04:18 PM	R84756
Phosphorus, Orthophosphate (As P)	ND	1.2	2.5		mg/L	5	12/22/2021 3:04:18 PM	R84756
Sulfate	1800	25	50	*	mg/L	100	1/8/2022 2:29:50 PM	R85040
EPA METHOD 7470A: MERCURY							Analyst: **VP**	
Mercury	ND	0.20	0.0010		mg/L	5	12/27/2021 5:00:11 PM	64706
EPA METHOD 6010B: DISSOLVED METALS							Analyst: **JLF**	
Calcium	340	0.29	5.0		mg/L	5	12/22/2021 8:17:59 PM	A84757
Magnesium	110	0.17	5.0		mg/L	5	12/22/2021 8:17:59 PM	A84757
Potassium	140	1.0	5.0		mg/L	5	12/22/2021 8:17:59 PM	A84757
Sodium	850	21	50		mg/L	50	12/22/2021 8:20:16 PM	A84757
EPA 6010B: TOTAL RECOVERABLE METALS							Analyst: **JLF**	
Arsenic	ND	0.22	5.0		mg/L	10	1/4/2022 5:19:46 PM	64703
Barium	0.041	0.011	100	J	mg/L	10	1/4/2022 4:12:19 PM	64703
Cadmium	ND	0.012	1.0		mg/L	10	1/4/2022 7:10:30 PM	64703
Chromium	ND	0.017	5.0		mg/L	10	1/4/2022 4:12:19 PM	64703
Lead	0.19	0.13	5.0	J	mg/L	10	1/18/2022 7:46:25 AM	64703
Selenium	ND	0.25	1.0		mg/L	10	1/4/2022 7:10:30 PM	64703
Silver	0.015	0.013	5.0	J	mg/L	10	1/4/2022 4:12:19 PM	64703
EPA METHOD 8270C TCLP							Analyst: **JME**	
2-Methylphenol	0.016	0.0010	200	JD	mg/L	2	1/5/2022 4:05:58 AM	64755
3+4-Methylphenol	0.026	0.00090	200	JD	mg/L	2	1/5/2022 4:05:58 AM	64755
2,4-Dinitrotoluene	ND	0.0012	0.13	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Hexachlorobenzene	ND	0.0013	0.13	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Hexachlorobutadiene	ND	0.0016	0.50	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Hexachloroethane	ND	0.00090	3.0	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Nitrobenzene	ND	0.0010	2.0	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Pentachlorophenol	ND	0.0012	100	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Pyridine	ND	0.0019	40	ED	mg/L	2	1/5/2022 4:05:58 AM	64755
2,4,5-Trichlorophenol	ND	0.0012	400	D	mg/L	2	1/5/2022 4:05:58 AM	64755

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	Estimated value
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 interference		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,3 & 4 Effluent
Project: Quarterly WDW 1 2 3 4 Inj Well
Collection Date: 12/21/2021 10:15:00 AM
Lab ID: 2112C79-001
Matrix: AQUEOUS
Received Date: 12/22/2021 7:25:00 AM

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed	Batch ID
EPA METHOD 8270C TCLP							Analyst: **JME**	
2,4,6-Trichlorophenol	ND	0.00087	2.0	D	mg/L	2	1/5/2022 4:05:58 AM	64755
Cresols, Total	0.042	0.0010	200	JD	mg/L	2	1/5/2022 4:05:58 AM	64755
Surr: 2-Fluorophenol	0.497	0	15-118	SD	%Rec	2	1/5/2022 4:05:58 AM	64755
Surr: Phenol-d5	11.8	0	15-92.9	SD	%Rec	2	1/5/2022 4:05:58 AM	64755
Surr: 2,4,6-Tribromophenol	1.36	0	15-150	SD	%Rec	2	1/5/2022 4:05:58 AM	64755
Surr: Nitrobenzene-d5	71.4	0	15-136	D	%Rec	2	1/5/2022 4:05:58 AM	64755
Surr: 2-Fluorobiphenyl	69.9	0	15-134	D	%Rec	2	1/5/2022 4:05:58 AM	64755
Surr: 4-Terphenyl-d14	110	0	15-168	D	%Rec	2	1/5/2022 4:05:58 AM	64755
TCLP VOLATILES BY 8260B							Analyst: **RAA**	
Benzene	0.27	0.00023	0.50	J	mg/L	200	12/27/2021 9:36:53 PM	T84811
1,2-Dichloroethane (EDC)	ND	0.00025	0.50		mg/L	200	12/27/2021 9:36:53 PM	T84811
2-Butanone	ND	0.0020	200		mg/L	200	12/27/2021 9:36:53 PM	T84811
Carbon Tetrachloride	ND	0.00018	0.50		mg/L	200	12/27/2021 9:36:53 PM	T84811
Chloroform	ND	0.00013	6.0		mg/L	200	12/27/2021 9:36:53 PM	T84811
1,4-Dichlorobenzene	ND	0.00021	7.5		mg/L	200	12/27/2021 9:36:53 PM	T84811
1,1-Dichloroethene	ND	0.00020	0.70		mg/L	200	12/27/2021 9:36:53 PM	T84811
Tetrachloroethene (PCE)	ND	0.00036	0.70		mg/L	200	12/27/2021 9:36:53 PM	T84811
Trichloroethene (TCE)	ND	0.00020	0.50		mg/L	200	12/27/2021 9:36:53 PM	T84811
Vinyl chloride	ND	0.00032	0.20		mg/L	200	12/27/2021 9:36:53 PM	T84811
Chlorobenzene	0.069	0.00016	100	J	mg/L	200	12/27/2021 9:36:53 PM	T84811
Surr: 1,2-Dichloroethane-d4	107	0	70-130		%Rec	200	12/27/2021 9:36:53 PM	T84811
Surr: 4-Bromofluorobenzene	98.7	0	70-130		%Rec	200	12/27/2021 9:36:53 PM	T84811
Surr: Dibromofluoromethane	110	0	70-130		%Rec	200	12/27/2021 9:36:53 PM	T84811
Surr: Toluene-d8	91.3	0	70-130		%Rec	200	12/27/2021 9:36:53 PM	T84811
SM2510B: SPECIFIC CONDUCTANCE							Analyst: **JRR**	
Conductivity	7400	10	10		µmhos/c	1	12/27/2021 1:08:18 PM	R84794
SM2320B: ALKALINITY							Analyst: **JRR**	
Bicarbonate (As CaCO3)	826.6	20.00	20.00		mg/L Ca	1	12/27/2021 1:08:18 PM	R84794
Carbonate (As CaCO3)	ND	2.000	2.000		mg/L Ca	1	12/27/2021 1:08:18 PM	R84794
Total Alkalinity (as CaCO3)	826.6	20.00	20.00		mg/L Ca	1	12/27/2021 1:08:18 PM	R84794
SPECIFIC GRAVITY							Analyst: **JRR**	
Specific Gravity	1.002	0	0			1	1/7/2022 12:54:00 PM	R85017
SM2540C MOD: TOTAL DISSOLVED SOLIDS							Analyst: **CJS**	
Total Dissolved Solids	5340	100	100	*D	mg/L	1	12/30/2021 10:03:00 A	64762

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	Estimated value
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 interference		

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW 1 2 3 4 Inj Well
Collection Date:
Lab ID: 2112C79-002
Matrix: TRIP BLANK
Received Date: 12/22/2021 7:25:00 AM

Analyses	Result	MDL	PQL	Qual	Units	DF	Date Analyzed	Batch ID
TCLP VOLATILES BY 8260B							Analyst: **RAA**	
Benzene	ND	0.00023	0.50		mg/L	1	12/27/2021 10:03:52 P	T84811
1,2-Dichloroethane (EDC)	ND	0.00025	0.50		mg/L	1	12/27/2021 10:03:52 P	T84811
2-Butanone	ND	0.0020	200		mg/L	1	12/27/2021 10:03:52 P	T84811
Carbon Tetrachloride	ND	0.00018	0.50		mg/L	1	12/27/2021 10:03:52 P	T84811
Chloroform	ND	0.00013	6.0		mg/L	1	12/27/2021 10:03:52 P	T84811
1,4-Dichlorobenzene	ND	0.00021	7.5		mg/L	1	12/27/2021 10:03:52 P	T84811
1,1-Dichloroethene	ND	0.00020	0.70		mg/L	1	12/27/2021 10:03:52 P	T84811
Tetrachloroethene (PCE)	ND	0.00036	0.70		mg/L	1	12/27/2021 10:03:52 P	T84811
Trichloroethene (TCE)	ND	0.00020	0.50		mg/L	1	12/27/2021 10:03:52 P	T84811
Vinyl chloride	ND	0.00032	0.20		mg/L	1	12/27/2021 10:03:52 P	T84811
Chlorobenzene	ND	0.00016	100		mg/L	1	12/27/2021 10:03:52 P	T84811
Surr: 1,2-Dichloroethane-d4	105	0	70-130		%Rec	1	12/27/2021 10:03:52 P	T84811
Surr: 4-Bromofluorobenzene	93.3	0	70-130		%Rec	1	12/27/2021 10:03:52 P	T84811
Surr: Dibromofluoromethane	105	0	70-130		%Rec	1	12/27/2021 10:03:52 P	T84811
Surr: Toluene-d8	102	0	70-130		%Rec	1	12/27/2021 10:03:52 P	T84811

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	Estimated value
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 interference		

ANALYTICAL REPORT

January 04, 2022

Hall Environmental Analysis Laboratory

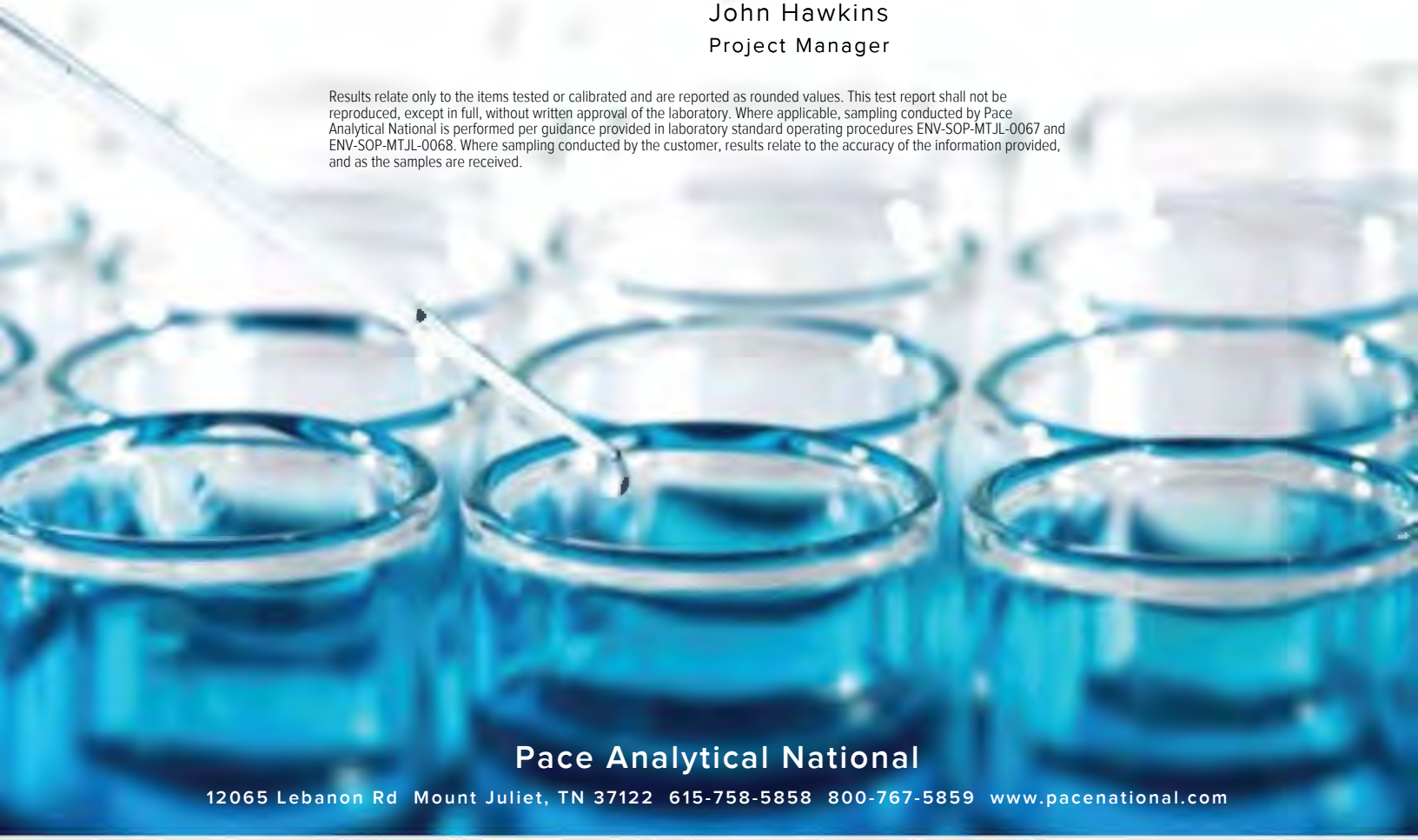
Sample Delivery Group:	L1445523
Samples Received:	12/23/2021
Project Number:	
Description:	

Report To: Andy Freeman
4901 Hawkins NE
Albuquerque, NM 87109

Entire Report Reviewed By:

[Preliminary Report]

John Hawkins
Project Manager



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SAMPLE SUMMARY

2112C79-001F WDW-1,2,3 & 4 EFFLUENT L1445523-01 GW

Collected by	Collected date/time	Received date/time
	12/21/21 10:15	12/23/21 09:50

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Wet Chemistry by Method 2580	WG1794960	1	01/02/22 08:47	01/02/22 08:47	ARD	Mt. Juliet, TN
Wet Chemistry by Method 4500 CN E-2016	WG1794923	10	12/26/21 22:40	12/28/21 14:51	KEG	Mt. Juliet, TN
Wet Chemistry by Method 4500 S2 D-2011	WG1797616	1	01/03/22 21:51	01/03/22 21:51	BMD	Mt. Juliet, TN
Wet Chemistry by Method 9040C	WG1795243	1	12/27/21 16:31	12/27/21 16:31	SCM	Mt. Juliet, TN
Wet Chemistry by Method D93/1010A	WG1794911	1	12/27/21 00:35	12/27/21 00:35	WOS	Mt. Juliet, TN

CASE NARRATIVE

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.

[Preliminary Report]

John Hawkins
Project Manager

Project Narrative

All Reactive Cyanide results reported in the attached report were determined as totals using method 4500 CN E-2016.
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	-10.4	T8	1	01/02/2022 08:47	WG1794960

Wet Chemistry by Method 4500 CN E-2016

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Reactive Cyanide	ND		0.0500	10	12/28/2021 14:51	WG1794923

Wet Chemistry by Method 4500 S2 D-2011

Analyte	Result	Qualifier	RDL	Dilution	Analysis	Batch
	mg/l		mg/l		date / time	
Reactive Sulfide	0.334	T8	0.0500	1	01/03/2022 21:51	WG1797616

Wet Chemistry by Method 9040C

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	su			date / time	
Corrosivity by pH	7.39	T8	1	12/27/2021 16:31	WG1795243

Sample Narrative:

L1445523-01 WG1795243: 7.39 at 20.1C

Wet Chemistry by Method D93/1010A

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	deg F			date / time	
Flashpoint	DNF at 170		1	12/27/2021 00:35	WG1794911

L1445523-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1445523-01 01/02/22 08:47 • (DUP) R3746662-3 01/02/22 08:47

Analyte	Original Result mV	DUP Result mV	Dilution	DUP Diff mV	DUP Qualifier	DUP Diff Limits mV
ORP	-10.4	-11.2	1	0.000		20

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

(LCS) R3746662-1 01/02/22 08:47 • (LCSD) R3746662-2 01/02/22 08:47

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	108	108	110	99.9	102	86.0-105			2.40	20

QUALITY CONTROL SUMMARY

L1445523-01

Method Blank (MB)

(MB) R3745581-1 12/28/21 14:30

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

L1445069-02 Original Sample (OS) • Duplicate (DUP)

(OS) L1445069-02 12/28/21 14:42 • (DUP) R3745581-5 12/28/21 14:43

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

L1445536-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1445536-01 12/28/21 14:55 • (DUP) R3745581-6 12/28/21 14:56

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) R3745581-2 12/28/21 14:31

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Cyanide	0.100	0.0965	96.5	87.1-120	

L1445053-03 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1445053-03 12/28/21 14:36 • (MS) R3745581-3 12/28/21 14:37 • (MSD) R3745581-4 12/28/21 14:38

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	0.00500	ND	0.103	0.000	98.0	1	90.0-110	J6	J3	200	20

L1445536-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L1445536-02 12/28/21 14:57 • (MS) R3745581-7 12/28/21 14:58 • (MSD) R3745581-8 12/28/21 14:59

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	0.100	0.105	100	105	1	90.0-110			4.88	20

QUALITY CONTROL SUMMARY

L1445523-01

Method Blank (MB)

(MB) R3747054-1 01/03/22 21:06

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

Laboratory Control Sample (LCS)

(LCS) R3747054-2 01/03/22 21:06

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Reactive Sulfide	0.500	0.545	109	85.0-115	

L1445523-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1445523-01 12/27/21 16:31 • (DUP) R3745144-3 12/27/21 16:31

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
	su	su		%		%
Corrosivity by pH	7.39	7.38	1	0.135		1

Sample Narrative:

OS: 7.39 at 20.1C

DUP: 7.38 at 19.9C

Laboratory Control Sample (LCS)

(LCS) R3745144-1 12/27/21 16:31

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: 10.01 at 20C

L1444846-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1444846-01 12/27/21 00:35 • (DUP) R3744823-3 12/27/21 00:35

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

L1445523-01 Original Sample (OS) • Duplicate (DUP)

(OS) L1445523-01 12/27/21 00:35 • (DUP) R3744823-4 12/27/21 00:35

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) R3744823-1 12/27/21 00:35 • (LCSD) R3744823-2 12/27/21 00:35

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	124	130	98.3	103	96.0-104			4.73	10

GLOSSARY OF TERMS

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

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.

ACCREDITATIONS & LOCATIONS

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	LAO000356
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.

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

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

CHAIN OF CUSTODY RECORD

PAGE: 1 OF: 1

B208

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			

LL445523

ITEM	SAMPLE	CLIENT SAMPLE ID	BOTTLE TYPE	MATRIX	COLLECTION DATE	# CONTAINERS	ANALYTICAL COMMENTS	
1	2112C79-001F	WDW-1,2,3 & 4 Effluent	500HDPE	Aqueous	12/21/2021 10:15:00 AM	1	RCI, ORP	-01
2	2112C79-001G	WDW-1,2,3 & 4 Effluent	500PLNAOH ZNAC	Aqueous	12/21/2021 10:15:00 AM	1	RCI, ORP	-01
3	2112C79-001H	WDW-1,2,3 & 4 Effluent	500PL-NaOH	Aqueous	12/21/2021 10:15:00 AM	1	RCI, ORP	-02

5528 5948 0150

DKA7

5.3+0=5.3

Sample Receipt Checklist

COC Seal Present Intact: Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
RAD Screen <0.5 mR/hr: Y N

If Applicable
VOA Zero Headspace: Y N

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: 12/22/2021	Time: 9:04 AM	Received By:	Date: 12/23/21	Time: 9:50
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By	Date	Time

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 _____ °C Attempt to Cool ? _____

Comments _____

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB**	SampType: **mblk**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R84756**	RunNo: **84756**
Prep Date:	Analysis Date: **12/22/2021**	SeqNo: **2980681** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Chloride	ND	0.50								
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: **R84756**	RunNo: **84756**
Prep Date:	Analysis Date: **12/22/2021**	SeqNo: **2980682** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.49	0.10	0.5000	0	97.8	90	110			
Chloride	4.9	0.50	5.000	0	98.2	90	110			
Nitrogen, Nitrite (As N)	0.99	0.10	1.000	0	99.5	90	110			
Bromide	2.5	0.10	2.500	0	101	90	110			
Nitrogen, Nitrate (As N)	2.6	0.10	2.500	0	104	90	110			
Phosphorus, Orthophosphate (As P	4.9	0.50	5.000	0	97.0	90	110			
Sulfate	9.7	0.50	10.00	0	96.8	90	110			

Sample ID: **MB**	SampType: **mblk**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R85040**	RunNo: **85040**
Prep Date:	Analysis Date: **1/8/2022**	SeqNo: **2991990** Units: **mg/L**

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

Sample ID: **LCS**	SampType: **lcs**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R85040**	RunNo: **85040**
Prep Date:	Analysis Date: **1/8/2022**	SeqNo: **2991991** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.6	0.50	5.000	0	91.4	90	110			
Sulfate	9.1	0.50	10.00	0	90.6	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB-64757**	SampType: **MBLK**	TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **PBW**	Batch ID: **64757**	RunNo: **85069**
Prep Date: **12/28/2021**	Analysis Date: **1/11/2022**	SeqNo: **2993207** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chlordane	ND	0.030								
Surr: Decachlorobiphenyl	0.0022		0.002500		87.1	73	119			
Surr: Tetrachloro-m-xylene	0.0014		0.002500		56.3	36.6	84.1			

Sample ID: **MB-64757**	SampType: **MBLK**	TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **PBW**	Batch ID: **64757**	RunNo: **85069**
Prep Date: **12/28/2021**	Analysis Date: **1/11/2022**	SeqNo: **2993208** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chlordane	ND	0.030								
Surr: Decachlorobiphenyl	0.0022		0.002500		88.2	73	119			
Surr: Tetrachloro-m-xylene	0.0014		0.002500		55.4	36.6	84.1			

Sample ID: **LCS-64757**	SampType: **LCS**	TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **LCSW**	Batch ID: **64757**	RunNo: **85069**
Prep Date: **12/28/2021**	Analysis Date: **1/11/2022**	SeqNo: **2993315** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	0.0022		0.002500		90.0	73	119			
Surr: Tetrachloro-m-xylene	0.0015		0.002500		62.0	36.6	84.1			

Sample ID: **LCS-64757**	SampType: **LCS**	TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **LCSW**	Batch ID: **64757**	RunNo: **85069**
Prep Date: **12/28/2021**	Analysis Date: **1/11/2022**	SeqNo: **2993316** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	0.0023		0.002500		91.7	73	119			
Surr: Tetrachloro-m-xylene	0.0016		0.002500		62.3	36.6	84.1			

Sample ID: **LCSD-64757**	SampType: **LCSD**	TestCode: **EPA Method 8081: Pesticides TCLP**
Client ID: **LCSS02**	Batch ID: **64757**	RunNo: **85069**
Prep Date: **12/28/2021**	Analysis Date: **1/11/2022**	SeqNo: **2993320** Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	0.0023		0.002500		93.3	73	119	0	0	
Surr: Tetrachloro-m-xylene	0.0014		0.002500		56.2	36.6	84.1	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **LCSD-64757**	SampType: **LCSD**	TestCode: **EPA Method 8081: Pesticides TCLP**	
Client ID: **LCSS02**	Batch ID: **64757**	RunNo: **85069**	
Prep Date: **12/28/2021**	Analysis Date: **1/11/2022**	SeqNo: **2993321**	Units: **%Rec**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Decachlorobiphenyl	0.0024		0.002500		94.7	73	119	0	0	
Surr: Tetrachloro-m-xylene	0.0014		0.002500		56.7	36.6	84.1	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **100ng lcs**	SampType: **LCS**	TestCode: **TCLP Volatiles by 8260B**
Client ID: **LCSW**	Batch ID: **T84811**	RunNo: **84811**
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2983267** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	0.017	0.00023	0.02000	0	86.5	70	130			
1,1-Dichloroethene	0.017	0.00020	0.02000	0	85.8	70	130			
Trichloroethene (TCE)	0.017	0.00020	0.02000	0	82.9	70	130			
Chlorobenzene	0.018	0.00016	0.02000	0	88.3	70	130			
Surr: 1,2-Dichloroethane-d4	0.0094		0.01000		94.4	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		100	70	130			
Surr: Dibromofluoromethane	0.0095		0.01000		95.0	70	130			
Surr: Toluene-d8	0.0093		0.01000		92.7	70	130			

Sample ID: **mb**	SampType: **MBLK**	TestCode: **TCLP Volatiles by 8260B**
Client ID: **PBW**	Batch ID: **T84811**	RunNo: **84811**
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2983270** 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	0.0090		0.01000		90.0	70	130			
Surr: 4-Bromofluorobenzene	0.010		0.01000		101	70	130			
Surr: Dibromofluoromethane	0.0094		0.01000		94.3	70	130			
Surr: Toluene-d8	0.0094		0.01000		93.6	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB-64755**	SampType: **MBLK**	TestCode: **EPA Method 8270C TCLP**
Client ID: **PBW**	Batch ID: **64755**	RunNo: **84935**
Prep Date: **12/28/2021**	Analysis Date: **1/5/2022**	SeqNo: **2989261** 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	40								E
2,4,5-Trichlorophenol	ND	400								
2,4,6-Trichlorophenol	ND	2.0								
Cresols, Total	ND	200								
Surr: 2-Fluorophenol	0.12		0.2000		60.0	15	118			
Surr: Phenol-d5	0.091		0.2000		45.7	15	92.9			
Surr: 2,4,6-Tribromophenol	0.15		0.2000		76.6	15	150			
Surr: Nitrobenzene-d5	0.063		0.1000		63.4	15	136			
Surr: 2-Fluorobiphenyl	0.060		0.1000		60.3	15	134			
Surr: 4-Terphenyl-d14	0.11		0.1000		110	15	168			

Sample ID: **LCS-64755**	SampType: **LCS**	TestCode: **EPA Method 8270C TCLP**
Client ID: **LCSW**	Batch ID: **64755**	RunNo: **84935**
Prep Date: **12/28/2021**	Analysis Date: **1/5/2022**	SeqNo: **2989262** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.075	0.00010	0.1000	0	75.5	19	106			
3+4-Methylphenol	0.16	0.00010	0.2000	0	80.5	16.3	112			
2,4-Dinitrotoluene	0.068	0.00010	0.1000	0	67.8	15	99.6			
Hexachlorobenzene	0.088	0.00010	0.1000	0	88.4	41.8	111			
Hexachlorobutadiene	0.057	0.00010	0.1000	0	57.1	15	91.5			
Hexachloroethane	0.066	0.00010	0.1000	0	65.5	15	87.5			
Nitrobenzene	0.072	0.00010	0.1000	0	71.8	19.3	114			
Pentachlorophenol	0.083	0.00010	0.1000	0	82.5	29	103			
Pyridine	0.023	0.00010	0.1000	0	23.0	15	92.6			E
2,4,5-Trichlorophenol	0.087	0.00010	0.1000	0	87.0	25.2	114			
2,4,6-Trichlorophenol	0.078	0.00010	0.1000	0	78.1	25.7	112			
Cresols, Total	0.24	0.00010	0.3000	0	78.9	15	145			
Surr: 2-Fluorophenol	0.13		0.2000		63.0	15	118			
Surr: Phenol-d5	0.10		0.2000		49.9	15	92.9			
Surr: 2,4,6-Tribromophenol	0.18		0.2000		91.2	15	150			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **LCS-64755** SampType: **LCS** TestCode: **EPA Method 8270C TCLP**

Client ID: **LCSW** Batch ID: **64755** RunNo: **84935**

Prep Date: **12/28/2021** Analysis Date: **1/5/2022** SeqNo: **2989262** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Surr: Nitrobenzene-d5	0.076		0.1000		75.7	15	136			
Surr: 2-Fluorobiphenyl	0.078		0.1000		78.0	15	134			
Surr: 4-Terphenyl-d14	0.12		0.1000		122	15	168			

Sample ID: **2112C79-001BMS** SampType: **MS** TestCode: **EPA Method 8270C TCLP**

Client ID: **WDW-1,2,3 & 4 Efflu** Batch ID: **64755** RunNo: **84935**

Prep Date: **12/28/2021** Analysis Date: **1/5/2022** SeqNo: **2989264** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.10	0.00020	0.1000	0.01601	85.0	15.8	101			D
3+4-Methylphenol	0.18	0.00020	0.2000	0.02632	79.2	16.9	97.9			D
2,4-Dinitrotoluene	0.059	0.00020	0.1000	0	59.5	20.1	90.5			D
Hexachlorobenzene	0.085	0.00020	0.1000	0	84.9	34	108			D
Hexachlorobutadiene	0.061	0.00020	0.1000	0	61.4	15	99.7			D
Hexachloroethane	0.071	0.00020	0.1000	0	70.7	15	86.4			D
Nitrobenzene	0.071	0.00020	0.1000	0	70.9	15	109			D
Pentachlorophenol	ND	0.00020	0.1000	0	0	15	130			SD
Pyridine	0.051	0.00020	0.1000	0	50.7	15	82			ED
2,4,5-Trichlorophenol	0.0052	0.00020	0.1000	0	5.25	28.1	105			SD
2,4,6-Trichlorophenol	0.0048	0.00020	0.1000	0	4.76	21.5	110			SD
Cresols, Total	0.35	0.00020	0.3000	0.04232	102	15	127			D
Surr: 2-Fluorophenol	0.0083		0.2000		4.13	15	118			SD
Surr: Phenol-d5	0.049		0.2000		24.5	15	92.9			D
Surr: 2,4,6-Tribromophenol	0.010		0.2000		5.07	15	150			SD
Surr: Nitrobenzene-d5	0.076		0.1000		76.0	15	136			D
Surr: 2-Fluorobiphenyl	0.079		0.1000		78.8	15	134			D
Surr: 4-Terphenyl-d14	0.11		0.1000		107	15	168			D

Sample ID: **2112C79-001BMSD** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**

Client ID: **WDW-1,2,3 & 4 Efflu** Batch ID: **64755** RunNo: **84935**

Prep Date: **12/28/2021** Analysis Date: **1/5/2022** SeqNo: **2989265** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Methylphenol	0.086	0.00020	0.1000	0.01601	69.9	15.8	101	16.2	20	D
3+4-Methylphenol	0.14	0.00020	0.2000	0.02632	55.7	16.9	97.9	29.1	20	RD
2,4-Dinitrotoluene	0.063	0.00020	0.1000	0	62.8	20.1	90.5	5.42	20	D
Hexachlorobenzene	0.092	0.00020	0.1000	0	92.3	34	108	8.35	20	D
Hexachlorobutadiene	0.059	0.00020	0.1000	0	59.0	15	99.7	3.86	20	D
Hexachloroethane	0.067	0.00020	0.1000	0	67.2	15	86.4	5.18	20	D
Nitrobenzene	0.072	0.00020	0.1000	0	71.7	15	109	1.12	20	D

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **2112C79-001BMSD** SampType: **MSD** TestCode: **EPA Method 8270C TCLP**

Client ID: **WDW-1,2,3 & 4 Efflu** Batch ID: **64755** RunNo: **84935**

Prep Date: **12/28/2021** Analysis Date: **1/5/2022** SeqNo: **2989265** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Pentachlorophenol	ND	0.00020	0.1000	0	0	15	130	0	20	SD
Pyridine	0.049	0.00020	0.1000	0	48.6	15	82	4.15	20	ED
2,4,5-Trichlorophenol	0.0021	0.00020	0.1000	0	2.09	28.1	105	86.2	20	RSD
2,4,6-Trichlorophenol	0.0035	0.00020	0.1000	0	3.52	21.5	110	30.0	20	RSD
Cresols, Total	0.26	0.00020	0.3000	0.04232	74.0	15	127	27.0	20	RD
Surr: 2-Fluorophenol	0.0028		0.2000		1.41	15	118	0	0	SD
Surr: Phenol-d5	0.030		0.2000		15.1	15	92.9	0	0	D
Surr: 2,4,6-Tribromophenol	0.0062		0.2000		3.08	15	150	0	0	SD
Surr: Nitrobenzene-d5	0.073		0.1000		72.8	15	136	0	0	D
Surr: 2-Fluorobiphenyl	0.078		0.1000		77.8	15	134	0	0	D
Surr: 4-Terphenyl-d14	0.11		0.1000		109	15	168	0	0	D

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **lcs-1 99.3uS eC**	SampType: **lcs**	TestCode: **SM2510B: Specific Conductance**
Client ID: **LCSW**	Batch ID: **R84794**	RunNo: **84794**
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982430** Units: **µmhos/cm**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	100	10	99.30	0	101	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 interference
B	Analyte detected in the associated Method Blank
E	Estimated value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB-64706**	SampType: **MBLK**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **PBW**	Batch ID: **64706**	RunNo: **84787**
Prep Date: **12/23/2021**	Analysis Date: **12/27/2021**	SeqNo: **2982004** Units: **mg/L**

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

Sample ID: **LCSLL-64706**	SampType: **LCSLL**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **BatchQC**	Batch ID: **64706**	RunNo: **84787**
Prep Date: **12/23/2021**	Analysis Date: **12/27/2021**	SeqNo: **2982005** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.00017	0.00020	0.0001501	0	115	50	150			J

Sample ID: **LCS-64706**	SampType: **LCS**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **LCSW**	Batch ID: **64706**	RunNo: **84787**
Prep Date: **12/23/2021**	Analysis Date: **12/27/2021**	SeqNo: **2982006** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0049	0.00020	0.005000	0	98.3	85	115			

Sample ID: **2112C79-001EMS**	SampType: **MS**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **WDW-1,2,3 & 4 Efflu**	Batch ID: **64706**	RunNo: **84787**
Prep Date: **12/23/2021**	Analysis Date: **12/27/2021**	SeqNo: **2982150** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.0010	0.005000	0	0	75	125			S

Sample ID: **2112C79-001EMSD**	SampType: **MSD**	TestCode: **EPA Method 7470A: Mercury**
Client ID: **WDW-1,2,3 & 4 Efflu**	Batch ID: **64706**	RunNo: **84787**
Prep Date: **12/23/2021**	Analysis Date: **12/27/2021**	SeqNo: **2982151** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.0010	0.005000	0	0	75	125	0	20	S

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB**	SampType: **MBLK**	TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **PBW**	Batch ID: **A84757**	RunNo: **84757**
Prep Date:	Analysis Date: **12/22/2021**	SeqNo: **2980772** Units: **mg/L**

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

Sample ID: **LCS**	SampType: **LCS**	TestCode: **EPA Method 6010B: Dissolved Metals**
Client ID: **LCSW**	Batch ID: **A84757**	RunNo: **84757**
Prep Date:	Analysis Date: **12/22/2021**	SeqNo: **2980774** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	47	1.0	50.00	0	94.0	80	120			
Magnesium	47	1.0	50.00	0	93.4	80	120			
Potassium	46	1.0	50.00	0	92.8	80	120			
Sodium	46	1.0	50.00	0	92.1	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB-64703**	SampType: **MBLK**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW**	Batch ID: **64703**	RunNo: **84926**
Prep Date: **12/22/2021**	Analysis Date: **1/4/2022**	SeqNo: **2989056** 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								
Chromium	ND	0.0060								
Silver	ND	0.0050								

Sample ID: **LCS-64703**	SampType: **LCS**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW**	Batch ID: **64703**	RunNo: **84926**
Prep Date: **12/22/2021**	Analysis Date: **1/4/2022**	SeqNo: **2989063** 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	89.3	80	120			
Barium	0.44	0.0020	0.5000	0	87.2	80	120			
Chromium	0.40	0.0060	0.5000	0	80.0	80	120			
Silver	0.091	0.0050	0.1000	0	90.6	80	120			

Sample ID: **LCSD-64703**	SampType: **LCSD**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSS02**	Batch ID: **64703**	RunNo: **84926**
Prep Date: **12/22/2021**	Analysis Date: **1/4/2022**	SeqNo: **2989064** 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	88.4	80	120	0.960	20	
Barium	0.44	0.0020	0.5000	0	87.1	80	120	0.0742	20	
Chromium	0.41	0.0060	0.5000	0	81.1	80	120	1.36	20	
Silver	0.090	0.0050	0.1000	0	90.3	80	120	0.388	20	

Sample ID: **MB-64703**	SampType: **MBLK**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW**	Batch ID: **64703**	RunNo: **84926**
Prep Date: **12/22/2021**	Analysis Date: **1/4/2022**	SeqNo: **2989221** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cadmium	ND	0.0020								
Selenium	ND	0.050								

Sample ID: **LCS-64703**	SampType: **LCS**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW**	Batch ID: **64703**	RunNo: **84926**
Prep Date: **12/22/2021**	Analysis Date: **1/4/2022**	SeqNo: **2989223** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cadmium	0.48	0.0020	0.5000	0	96.6	80	120			
Selenium	0.49	0.050	0.5000	0	97.9	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 interference
B	Analyte detected in the associated Method Blank
E	Estimated value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **LCSD-64703**	SampType: **LCSD**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSS02**	Batch ID: **64703**	RunNo: **84926**
Prep Date: **12/22/2021**	Analysis Date: **1/4/2022**	SeqNo: **2989224** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cadmium	0.48	0.0020	0.5000	0	95.9	80	120	0.745	20	
Selenium	0.49	0.050	0.5000	0	97.7	80	120	0.211	20	

Sample ID: **MB-64703**	SampType: **MBLK**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW**	Batch ID: **64703**	RunNo: **85207**
Prep Date: **12/22/2021**	Analysis Date: **1/12/2022**	SeqNo: **2997505** Units: **mg/L**

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

Sample ID: **LCS-64703**	SampType: **LCS**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW**	Batch ID: **64703**	RunNo: **85207**
Prep Date: **12/22/2021**	Analysis Date: **1/12/2022**	SeqNo: **2997517** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.41	0.020	0.5000	0	82.0	80	120			

Sample ID: **LCSD-64703**	SampType: **LCSD**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSS02**	Batch ID: **64703**	RunNo: **85207**
Prep Date: **12/22/2021**	Analysis Date: **1/12/2022**	SeqNo: **2997518** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.42	0.020	0.5000	0	83.9	80	120	2.38	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 interference
B	Analyte detected in the associated Method Blank
E	Estimated value
J	Analyte detected below quantitation limits
P	Sample pH Not In Range
RL	Reporting Limit

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **mb-1 alk**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R84794**	RunNo: **84794**							
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982456**	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: **R84794**	RunNo: **84794**							
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982457**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	74.80	20.00	80.00	0	93.5	90	110			

Sample ID: **mb-2 alk**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R84794**	RunNo: **84794**							
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982479**	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: **R84794**	RunNo: **84794**							
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982480**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	75.32	20.00	80.00	0	94.2	90	110			

Sample ID: **mb-3 alk**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R84794**	RunNo: **84794**							
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982502**	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-3 alk**	SampType: **lcs**	TestCode: **SM2320B: Alkalinity**							
Client ID: **LCSW**	Batch ID: **R84794**	RunNo: **84794**							
Prep Date:	Analysis Date: **12/27/2021**	SeqNo: **2982503**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	74.96	20.00	80.00	0	93.7	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **2112C79-001CDUP**	SampType: **DUP**			TestCode: **Specific Gravity**						
Client ID: **WDW-1,2,3 & 4 Efflu**	Batch ID: **R85017**			RunNo: **85017**						
Prep Date:	Analysis Date: **1/7/2022**			SeqNo: **2991233**	Units:					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	1.001	0						0.0999	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **2112C79**

21-Jan-22

Client: Navajo Refining Company

Project: Quarterly WDW 1 2 3 4 Inj Well

Sample ID: **MB-64762**	SampType: **MBLK**	TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW**	Batch ID: **64762**	RunNo: **84892**
Prep Date: **12/28/2021**	Analysis Date: **12/30/2021**	SeqNo: **2986299** 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-64762**	SampType: **LCS**	TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW**	Batch ID: **64762**	RunNo: **84892**
Prep Date: **12/28/2021**	Analysis Date: **12/30/2021**	SeqNo: **2986300** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1000	20.0	1000	0	100	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Estimated value
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 interference		

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: Navajo Refining | Work Order Number: 2112C79 | RcptNo: 1

Received By: Isaiah Ortiz 12/22/2021 7:25:00 AM I-Ox

Completed By: Sean Livingston 12/22/2021 8:57:18 AM Sean Livingston

Reviewed By: HPQ 12/22/21

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 ☑ jn 12/22/21.	NA ☐
9. Received at least 1 vial with headspace <1/4" for AQ VOA?	Yes ☑	No ☐	NA ☐
10. Were any sample containers received broken?	Yes ☐	No ☑	
11. Does paperwork match bottle labels? (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: 3 2 (<2 or >12 unless noted)
Adjusted? yes
Checked by: jn 12/22/21

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: 0.5ml of HNO3 was added to sample 001E for pH<2. jn 12/22/21

17. Cooler Information

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

Chain-of-Custody Record

Client: Navajo Refining Co.	Turn-Around Time: Standard X Rush
	Project Name: Quarterly WDW-1, 2, 3 & 4 Inj Well
Mailing Address: P.O. Box 159 Artesia, NM 88211-0159	Project #: P.O. # 251841
Phone #: 575-748-3311	
email or Fax#: 575-746-5451	Project Manager: Randy Dade
QA/QC Package: ☐ Standard ☐ Level 4 (Full Validation) ☐ Other ☐ EDD (Type)	Sampler: Brady Hubbard
	On Ice: ☒ Yes ☐ No
	Sample Temperature: 0.5°C

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

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

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 2112C79	Specific Gravity, HCO3, CO3, Cl, SO4, TDS, pH, cond., Fl, Cation/anion bal., Br, Eh/40	VOCs/SW-846 Method 8260C (see attached list 'VOCs')	SVOCs/SW-846 Method 8270D (see attached list 'SVOCs')	R,C,I/40 CFR part 261	Metals/SW-846 Mthd 6010, 7470 (see attached list 'Metals')	Ca, K, Mg, Na/40 CFR 136.3	TCLP Metals, only /40 CFR Part 261/ SW-846 Method 1311	Chlordane 8081 A
12/21/21	10:15	Liquid	WDW-1, 2, 3 & 4 Effluent	3	Neat/H2SO4	001	X						X	
12/21/21	10:15	Liquid	WDW-1, 2, 3 & 4 Effluent	1	HNO3						X	X		
12/21/21	10:15	Liquid	WDW-1, 2, 3 & 4 Effluent	3	HCL			X						
12/21/21	10:15	Liquid	WDW-1, 2, 3 & 4 Effluent	2	Neat				X					
12/21/21	10:15	Liquid	WDW-1, 2, 3 & 4 Effluent	2	Neat					X				
12/21/21	10:15	Liquid	WDW-1, 2, 3 & 4 Effluent	1	Neat									x
			Trip Blank per sample bottle 12/22/21			002								

Analysis Request

Date:	Time:	Relinquished by:	Received by:	Date Time	Remarks: Send results to Scott Denton, Mike Holder, and Randy Dade.
12/21/21	11:30	Brady Hubbard		12/21/21 1130	
12/21/21	1900		In Office 12/22/21 0725		pH 6.97, 34.8C

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 X.1 – Injected Fluids Monitoring Plan

HollyFrontier Navajo Refining LLC
501 East Main, Artesia, New Mexico 88210
Tel: 575-748-3311
hollyfrontier.com

HOLLYFRONTIER.

January 28, 2022 **(REVISED MARCH 11, 2022)**

Via Electronic Mail

Phillip Goetze
Supervisor – UIC Permitting
New Mexico Oil Conservation Division (Albuquerque Office)
Energy Minerals and Natural Resources Department
5200 Oakland Avenue, NE
Albuquerque, New Mexico 87113

RE: HollyFrontier Navajo Refining LLC / Artesia Refinery / Renewable Diesel Unit / Verification of Non-Hazardous Injection Fluids from RDU Process – Pilot Sampling Plan

Dear Mr. Goetze:

Per our December 8, 2021 conference call, enclosed herein is the requested "Verification of Non-hazardous Injection Fluids from RDU Process - Pilot Sampling Plan" (presented as Appendix A). This Pilot Sampling Plan ("PSP") is intended to characterize the HollyFrontier Navajo Refining LLC ("Navajo") effluent discharge from the on-site wastewater treatment plant ("WWTP") and the blowdown from certain cooling towers at Navajo's Artesia Refinery once operations from the new Renewable Diesel Unit ("RDU") have commenced. The WWTP effluent is currently discharged to both the City of Artesia POTW as well as four underground injection control ("UIC") wells regulated collectively under the December 2017 Class I Non-Hazardous Waste Injection Well Discharge Permit UICI-8 as follows:

- Well WDW-1
  - API #30-015-27592 under Permit UICI-8-1 (Facility ID = fCJC2117350329)
- Well WDW-2
  - API #30-015-20894 under Permit UICI-8-2 (Facility ID = fCJC2117351808)
- Well WDW-3
  - API #30-015-26575 under Permit UICI-8-3 (Facility ID = fCJC2117354810)
- Well WDW-4
  - API #30-015-44677 under Permit UICI-8-4 (Facility ID = fCJC2117357871)

The New Mexico Oil Conservation Division, Engineering Bureau ("OCD") has requested the PSP and subsequent sampling program to confirm that RDU operations will not result in the WWTP effluent to the UIC wells becoming characteristically hazardous under RCRA. The results of the sampling will be compared to the characteristic levels contained in 40 Code of Federal Regulations (CFR) Section 261.21 through 261.24 for ignitability, corrosivity, reactivity, and toxicity. Specific parameters of concern given in the PSP are not only those in 40 CFR 261.24(b), but also include those listed in Section 2.A of the December 2017 UICI-8 Discharge Permit. The December 2017 Permit parameters are currently monitored (and will continue to be once the RDU is in operation)

on a quarterly basis. To determine if the new RDU operations have any additional potential effect on the quality (concentration) of the discharge to the UIC wells, the results from the PSP program will also be compared to historical monitoring data (pre-RDU).

Appendix B is the November 6, 2021 letter from Navajo to OCD. As explained in this letter, and pending confirmation by the PSP program:

- Current Refinery WWTP capacity will be sufficient to treat the additional RDU wastewater stream, and any corresponding increase in constituent concentrations will be reduced via treatment such that Navajo will be able to maintain compliance with current limitations set forth in Discharge Permit UICI-8.

- The RDU wastewater stream will not change the current flow and concentration characteristics of the Refinery WWTP discharge to the UIC well network; therefore, the RDU project will not affect the current terms of the UICI-8 Discharge Permit. In other words, effluent discharge quantity (flow), quality (concentrations), and injection pressure will meet current permitted limits/levels.

Navajo has reviewed all provisions of the December 2017 Class I Non-Hazardous Waste Injection Well Discharge Permit UICI-8 and cannot identify any amendments/changes that need to be made to accommodate the RDU discharge. The addition of RDU activities will not alter the operation, maintenance, or monitoring of the four underground injection wells. Specifically, under Section 1.G (Modification and Termination), and subject to confirmation by the PSP program, Navajo believes that permit modification for the existing UICI Discharge Permit should not be necessary. Based on results from the PSP program, OCD and Navajo can together make a determination as to whether further sampling may be warranted and/or if any other changes/revisions to the current Discharge Permit UICI-8 are necessary during permit renewal in 2022.

If you have any questions, please contact me by e-mail at kawika.tupou@hollyfrontier.com or by phone at 575-748-3311.

Sincerely,

Signed Jan 28, 2022

Kawika Tupou
Environmental Manager

Cc: Becca Crumpler, HollyFrontier Renewables
Mike Holder, HollyFrontier Corporation

Purpose

This Pilot Sampling Plan ("PSP") is intended to characterize the HollyFrontier Navajo Refining LLC ("Navajo") effluent discharge from the on-site wastewater treatment plant ("WWTP") at Navajo's Artesia Refinery once operations from the new Renewable Diesel Unit ("RDU") have commenced. The WWTP effluent is currently discharged to both the City of Artesia POTW as well as four underground injection control ("UIC") wells regulated collectively under Class I Non-Hazardous Waste Injection Well Discharge Permit UICI-8 as follows:

1. Well WDW-1 (API #30-015-27592) under Permit UICI-8-1
2. Well WDW-2 (API #30-015-20894) under Permit UICI-8-2
3. Well WDW-3 (API #30-015-26575) under Permit UICI-8-3
4. Well WDW-4 (API #30-015-44677 under Permit UICI-8-4

In addition to the WWTP effluent, this PSP also covers sampling of the cooling tower blowdown ("CTB") from units Y-1, Y-2, Y-11, and Y-12 (which currently exist for refinery operations) as well as Y-26 (new cooling tower for RDU operations). The CTB sampling is included due to the potential discharge of these sources to the UIC wells as shown in Attachment 1. During normal conditions, all CTB discharges directly to the City POTW; however, CTB can be rerouted to the Refinery's onsite WWTP during emergency conditions for ultimate discharge to the City POTW and/or to the Refinery's UIC well network.

Sample Locations for WWTP Effluent and Cooling Tower Blowdown

Under Discharge Permit UICI-8, Section 2.A, Navajo collects quarterly samples of injected waste fluids (i.e., WWTP effluent) at the injection well pumps. This routine quarterly sampling is performed by AquaMicrobics according to the Procedure document provided in Attachment 2, which includes a map of the sampling location. This same sampling location will be utilized for the PSP to allow comparison of the historical quarterly data with data representative of RDU operations. The injection well pumps sampling site is representative of the WWTP effluent and is shown schematically on Attachment 1.

The PSP sample location for the CTB will be the current sample location for the combined CTB (from Y-1, Y-2, Y-11, and Y-12) and WWTP effluent that discharges to the POTW (schematically shown on Attachment 1). However, prior to the PSP sampling events, all WWTP effluent will be physically blocked from the City POTW (i.e., using the control valve as well as a manual block valve) and diverted to the injection wells so that the resulting discharge to the POTW only consists of CTB and can be sampled without the contribution of the WWTP effluent. A separate sampling point for just CTB does not currently exist; hence the procedure above. The CTB sampling Procedure document is provided in Attachment 3.

Sample Type and Parameters

In accordance with Attachments 2 and 3, both samples (WWTP effluent to injection wells and CTB to City POTW) will be collected as grab samples representative of normal discharge flow conditions. The list of parameters for both the WWTP effluent and the CTB discharge will include those given in 40 CFR 261.24(b) as well as those required under Discharge Permit UICI-8, Section 2.A (quarterly monitoring); a summary of these parameters along with corresponding analytical methods and laboratory reporting levels (RLs) is given in Attachment 4. These parameters and methods have been identified in conjunction with the New Mexico Oil Conservation Division (OCD) as the most appropriate for the UIC well program at Navajo over the life of the program and serve to characterize the Refinery effluent. Hall Environmental Laboratory (NELAP Certified) will perform all analyses under the chain-of-custody shown in Attachment 2, along with Level I standard QA/QC procedures.

Sample Frequency and Duration

Prior to RDU startup, sampling of cooling tower blowdown to the City POTW will occur once per week for three weeks since no historical data for CTB exist for all the parameters of concern given in Attachment 4. No weekly pre-RDU sampling for the WWTP effluent to the wells is planned or necessary due to the existence of the historical quarterly database required under the December 2017 Permit.

Once the RDU is online and corresponding operations are normal and representative, samples for the WWTP effluent and CTB will be collected concurrently once per week for four weeks(i.e., a total of four sampling events post-RDU startup). Individual sample events will be collected on the same day of the week and at the same time of the day. However, if the day/time must be slightly altered due to weather, safety, or operational issues (e.g., upset conditions that prevent discharge), Navajo will notify OCD at the time of sampling.

Data Compilation and Comparison

Per OCD request, Navajo will expedite lab results. According to Hall Environmental Analysis Laboratory (contractor), the standard turnaround time for the December 2017 Permit quarterly UIC sampling is 10 days, but this will be expedited to about 5 days for this PSP.

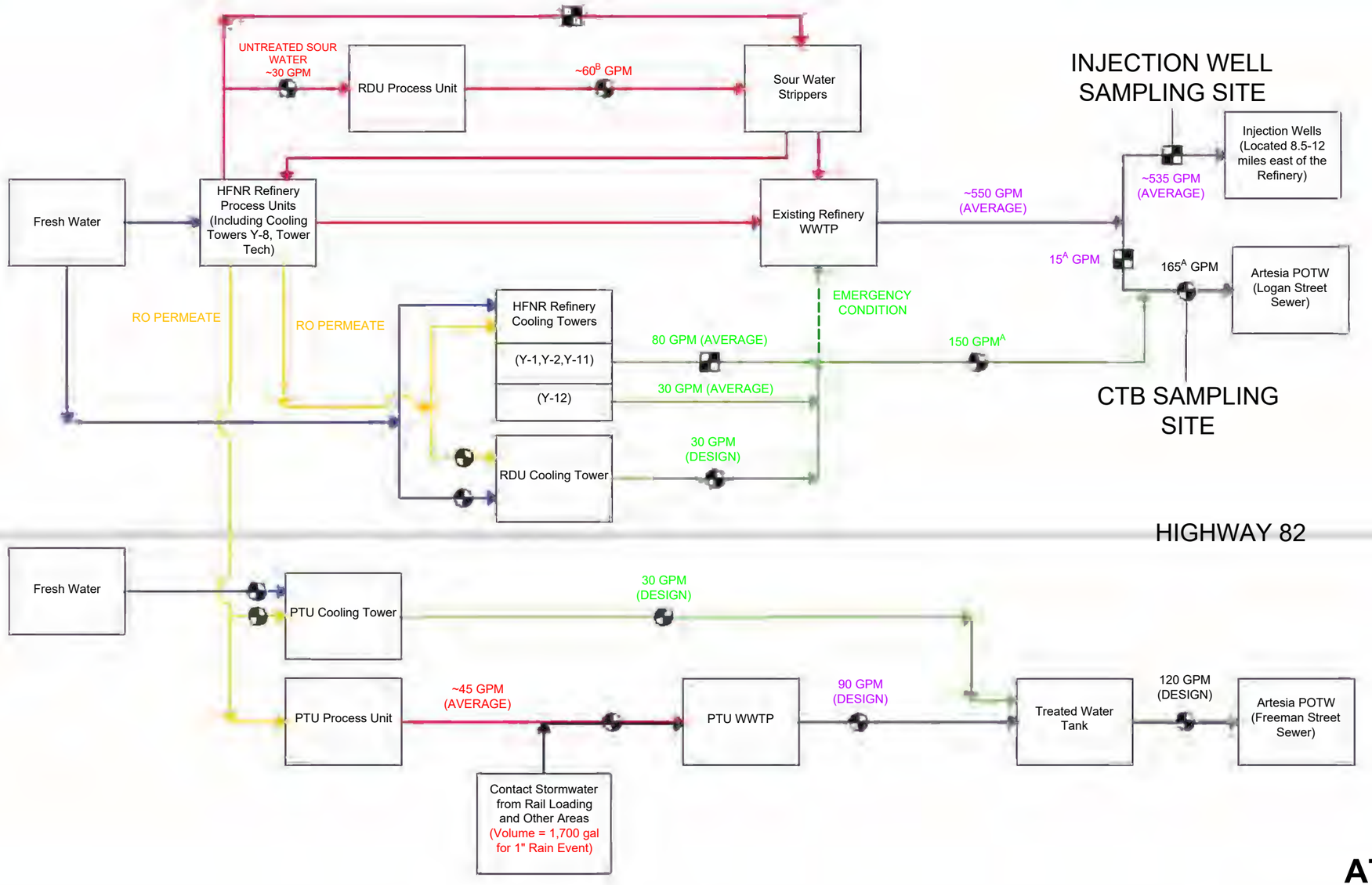
Analytical results from the three pre-RDU and four post-RDU sampling events will be compiled into Excel spreadsheets to allow statistical processing (i.e., averages, maximums, variability, UCL 95%, etc.). Results will be documented along with the corresponding laboratory reporting levels.

The primary purpose of this sampling program is to confirm that RDU operations will not result in the WWTP effluent to the UIC wells becoming characteristically hazardous under RCRA. The results of the sampling will be compared to the characteristic levels contained in 40 Code of Federal Regulations (CFR) Section 261.21-261.24 for ignitability, corrosivity, reactivity, and toxicity. To

determine if the new RDU operations have any additional potential effect on the quality (concentration) of the discharge to the UIC wells, the results from the four sampling events (post-RDU) will be compared to WWTP effluent historical quarterly monitoring data (pre-RDU) as well as the three CTB samples collected prior to RDU start-up (i.e., without Y-26). Differences in average and maximum concentrations will be noted as well as variations from UCL 95% baseline concentrations. Again, comparisons will be made for both the WWTP effluent to the injection wells and the CTB to the City POTW.

PSP Reporting

Each of the four weekly post-RDU sample results will be submitted individually to OCD upon Navajo receipt/review from the lab to facilitate dialog for any potential actions/corrections during the program. After the last sample event, a summary report will be prepared and include full pre- and post-RDU comparisons (including the use of UCL 95% baseline calculations and other statistical methods, as appropriate based on the data set) as well as evaluation against TCLP and ICR regulatory criteria. The summary report of the PSP program will be submitted to the Oil Conservation Division (OCD) within four weeks of receipt of the lab report for the final (fourth) sampling event. Based on this report, it is anticipated that OCD and Navajo will together make a determination as to whether further sampling may be warranted and/or if any other changes/revisions to the current Discharge Permit UICI-8 are necessary during permit renewal in 2022. If during the PSP program no impacts from RDU operations are observed on the discharge to the UIC wells , quarterly monitoring will continue in accordance with the current UICI-8 Discharge Permit, including assessment for one year of any changes over PSP baseline levels.



ATTACHMENT 1

NOTES
A DENOTES CURRENT LIMIT
B INCLUDES 30 GPM CREATED FROM RDU PROCESS

LEGEND
- FRESH WATER SUPPLY
- RO PERMEATE
- COOLING TOWER BLOWDOWN
- PROCESS UNIT DISCHARGE
- WWTP EFFLUENT
- STORMWATER

CURRENT FLOW MONITORING LOCATION
PLANNED FLOW MONITORING LOCATION

HollyFrontier - Artesia, New Mexico

Drawing
Refinery/RDU & PTU Updated Water Flow Diagram

Date	June 6, 2021	Scale	AS SHOWN	Drawing No.
File Name	HF Artesia RDU WW - Alternate	Project No.	122.01368.00026	2

SLR

Drawing path: N:\Portland\Figures\123.01368 - HollyFrontier Navajo Refining Artesia\HF Artesia RDU WW - Alternate.dwg

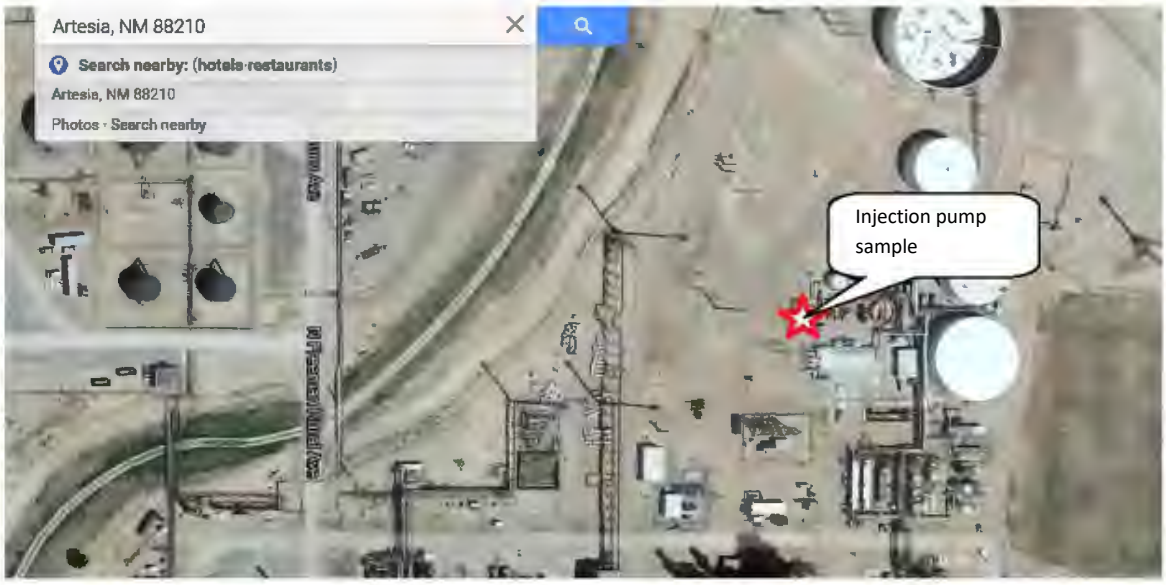
Quarterly WDW 1, 2, 3, & 4 Injection Well

Materials

- Pre-packaged ice chest that contains all sample bottles
- Quarterly WDW 1, 2, 3, & 4 Injection Well chain of custody
- Detailed Attachment of WDW 1, 2, 3, & 4 Injection Well
- Job Safety Analysis
- Portable pH meter
- Portable thermometer
- Clock
- Latex gloves
- Safety glasses
- Ice
- Ziploc bags
- Black tape
- Clear tape
- Keynote slip
- Sharpie or Good Quality Pen

Procedures

- Acquire the pre-prepared WDW 1, 2, 3, & 4 ice chest from the environmental storage unit (the white shed between Carbon filters and Pipeline sample point)
- Confirm all bottles are labeled (you will need to add the time, date, and person who collected sample)
- Go to injection well pumps (red star on map below)



- Take note of the time you begin sampling
- Using the portable pH probe obtain the pH of the water and write it down (make sure pH probe is calibrated)
- Using a portable thermometer obtain the temperature of the water sample and write it down
- Fill all the empty containers with water from the sample point.

- One sample bottle is labeled to be filtered (use the filter provided in the ice chest). This sample bottle is for calcium, potassium, magnesium, and sodium.
- Take note of the time you cease sampling
- Wrap black tape tightly around the lids of the bottles taking care that all the lid is covered so that none of the sample can leak
- Place the sample bottles in Ziploc bags (you will need multiple bags in order to hold all sample bottles)
- Fill out the chain of custody shown in Attachment 5 (make sure the time on the sheet is the same time listed on the bottles)
- Place chain of custody in a Ziploc bag and place inside ice chest
- Confirm all bottles are sealed in Ziploc bags
- Collect ice in ice chest making sure to cover all sides of sample
- Tape the outside of the ice chest with the clear tape
- When currier arrives, go to main gate and relinquish the samples

If you need to ship the samples

- Take ice chest and extra Ziploc bags to Navajo lab
- Before entering Navajo Labs put on clear safety glasses
- Place ice inside of a Ziploc bag and seal completely so no water leaks
- Do this with multiple Ziploc bags until the entire sample is covered in ice
- Take ice chest to the welcome desk which is located in Navajo Main office
- Weigh ice chest on the scale provided to the right of computer
- Fill out a shipping label using the computer; type in the shipping location, the weight, of your package, mark that it is your shipping material, charge to sender, and charge environmental department (if you have any questions ask the person working at the front desk)
- At 3:00 pm go to Navajo lab and replace the ice that is in the Ziploc bags (making sure that nothing leaks)
- Add the shipping label to the outside of ice chest
- Hold on to copy of tracking number
- Make sure to completely seal the ice chest by wrapping all corners with clear tape
- Place the sealed ice chest in the FedEx shed located at the warehouse by 3:30 p.m.

Chain of Custody Sample Information

Please be sure to include accurate **Field Temperature** and **pH** of any sample collected. Upon being collected, samples are to be immediately taken to the AquaMicrobics lab so that a pH test can be performed. It is also acceptable to use the Temperature reading from the pH probe for the field temperature reading of the sample.

ATTACHMENT 3 – Cooling Tower Blowdown (CTB) Sample Collection Procedure

Purpose

This procedure is for sampling events for wastewater discharged from the Artesia facility to the City of Artesia POTW, which can include discharges from the onsite wastewater treatment plant (WWTP) and cooling tower blowdown (CTB) streams from Y-1, Y-2, Y-11, Y-12, and Y-26 (post-RDU).

Scope and Application

This guideline applies to all HollyFrontier Navajo Refining LLC (Navajo or HFNR) employees, contractors and visitors.

The sampling is located at the sample station near the Artesia WWTP Effluent Outfall to the POTW, downstream of the confluence of the cooling tower blowdown (CTB from Y-1, Y-2, Y-11, Y-12, and Y-26) and Walnut Shell Filter (WWTP) effluent (see map below). Prior to the PSP sampling events, all WWTP effluent will be physically blocked from the City POTW (i.e., using the control valve as well as a manual block valve) and diverted to the injection wells so that the resulting discharge to the POTW only consists of CTB and can be sampled without the contribution of the WWTP effluent. A separate sampling point for just CTB does not currently exist; hence the procedure above.

Reference Document

This procedure has been prepared in accordance with the US EPA guidance document on wastewater sampling: https://www.epa.gov/sites/production/files/2017-07/documents/wastewater_sampling306_af.r4.pdf

Needed Materials

ATTACHMENT 3 – Cooling Tower Blowdown (CTB) Sample Collection Procedure

- Job Safety Analysis
- Appropriate Personal Protective Equipment (PPE) as dictated by HFNR requirements. These include, but are not limited to: FRC clothing, safety glasses, hardhat, steel-toe boots, nitrile gloves, and hearing protection;
- Sample Chain of Custody (COC) form (provided by contract laboratory – see Attachment 5);
- Labeled Sample Bottles: Date, time, sample location, preservation method, and analyses (provided by contract laboratory);
- Five-gallon bucket;
- Glass beaker for sample pouring (if needed) and pH measurement;
- Calibrated pH probe / meter (refer to pH Meter Calibration SOP);
- Ice chest filled with ice;
- Appropriate material to wipe sample bottles clean; and
- Electrical tape.

Please Note- All safety and PPE precautions should be taken in accordance with Navajo SDS and safety procedures applicable for the material being sampled. Navajo personnel will comply with all safety, handling and disposal information and precautions set forth in those documents.

Special Sampling Considerations

- A clean pair of new, non-powdered disposable nitrile gloves will be worn each time the CTB location is sampled, and the gloves should be donned immediately prior to sampling;
- CTB samples will typically be collected either by directly filling the sample container or by using an interim container that fills the sample container;
- During sample collection, if transferring the sample from a collection device or container, make sure the device or interim container does not come in contact with the sample containers;
- Place the samples into the appropriate, labeled containers as provided by the contract laboratory;
- All samples requiring preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection. Note: The contract laboratory will add the appropriate preservatives to the corresponding sample bottles; and
- Do not overfill sample bottles containing preservative to prevent any loss.

Manual Sampling

Manual sampling is normally used for collecting grab samples and/or for immediate in-situ field analyses. The best method to manually collect a sample is to use the actual sample container which will be used to transport the sample to the laboratory. This eliminates the possibility of contaminating the sample with intermediate collection containers.

If the CTB stream cannot be physically reached by the sampling personnel or it is not safe to reach for the sample, an intermediate collection container may be used, from which the sample can be redistributed to other containers.

If the CTB sample can be collected from a sample port, valve, or spigot, place a five-gallon bucket

under the sample location and allow the sample to run for at least one minute before collection to clear the lines.

Quality Control and Documentation

Equipment blanks should be collected if equipment is field cleaned and re-used on-site or if necessary, to document that low-level contaminants were not introduced by the sampling equipment.

Chain of Custody forms (Attachment 5) must stay with the samples at all times and must be filled out each time sample control is transferred to another individual or entity.

Sample Bottles and Collection

Trace metals and organics detection limits are typically in the parts per billion (ppb or µg/L), so extreme care must be exercised to ensure sample integrity. When possible, the sample should be collected directly into the appropriate sample container. If the material to be sampled cannot be physically reached, an intermediate collection device may be used.

The sample container to be analyzed may contain a preservative. Care should be taken not to flush any preservative out of the container during fill.

Sampling Procedure

1. Don PPE.

2. Inspect all sample bottles to ensure that they are clean and in good condition.

3. Verify all sample bottles are labeled with the appropriate preservative. Labels shall include:
    a. Sample location;
    b. Date;
    c. Time;
    d. Sampler's initials;
    e. Requested analyses; and
    f. Preservative type.

4. After confirming that the WWTP effluent is being diverted to the injection wells, proceed to the sample station near the Artesia WWTP Effluent Outfall to the POTW. This location is downstream of the confluence of the cooling tower blowdown (CTB) and WWTP Effluent (see map above).

5. Collect samples:
    a. Don new, clean gloves;
    b. Place a five-gallon bucket under the sample point to collect the flush water and any spillage;
    c. Open the sample tap and allow the sample to run for at least one minute to flush the lines;
    d. **NEVER** leave an open sample point unattended for any reason;

e. Place each bottle under the open, running sample port. A clean, glass beaker may be used as an interim container for ease of pouring, if needed. Fill each bottle to near the top, ensuring not to overfill to retain all the sample preservative (if present);
f. Close the sample tap;
g. Tape down all sample bottle lids with electrical tape;
h. Place sample bottles in cooler filled with ice;
i. Fill glass beaker with sample for pH and temperature measurement;
j. Using a calibrated pH meter and probe, measure the pH and temperature of the CTB sample and record results on the Chain of Custody form;
k. Fully complete the sample Chain of Custody, ensuring the COC contains:
    i. Date;
    ii. Time;
    iii. Sampler's name, initials, and signature;
    iv. Line item for each sample bottle; and
    v. Requested analyses;
l. Place completed COC into plastic bag and place on top of sample inside the cooler;
m. Close and secure cooler lid; and
n. Relinquish sample to contract laboratory courier.

6. If any quantity of material has spilled onto the ground, it must be cleaned up immediately as per HFNR's spill response procedures.

7. Dispose of any material from the five-gallon bucket and excess sample in the glass beaker used in temperature and pH measurement by emptying into an approved drain. This is either the sewer box near the Talon tanks or the laboratory sink.

8. Decontaminate and triple rinse all interim sample containers and PPE used, except for nitrile gloves, which should be disposed of in an appropriate trash receptacle.

9. **If any conditions arise which would alter or prevent sampling as described in this document or if there are any questions or concerns regarding the sampling of a particular source or location, contact the HFNR Supervisor immediately for further guidance prior to performing sampling.**

END OF PROCEDURE

ATTACHMENT 4 - LIST OF PSP PARAMETERS
SOURCE: DISCHARGE PERMIT UICI-8 SECTION 2.A AND 40 CFR 261.24(b)

EPA Haz Waste #	Parameter	Laboratory Method (a)	Laboratory Reporting Level (mg/L) (b)
D004	Arsenic	6010B	5
D005	Barium	6010B	100
D018	Benzene	8260B	0.5
D006	Cadmium	6010B	1
D019	Carbon tetrachloride	8260B	0.5
D020	Chlordane	8081A	0.03
D021	Chlorobenzene	8260B	100
D022	Chloroform	8260B	6
D007	Chromium	6010B	5
D023	o-Cresol	8270C	200
D024	m-Cresol	8270C	200
D025	p-Cresol	8270C	200
D026	Cresol	8270C	200
D016	2,4-D	8151	10
D027	1,4-Dichlorobenzene	8260B	7.5
D028	1,2-Dichloroethane	8260B	0.5
D029	1,1-Dichloroethylene	8260B	0.7
D030	2,4-Dinitrotoluene	8270C	0.13
D012	Endrin	8081A	0.02
D031	Heptachlor (and its epoxide)	8081A	0.008
D032	Hexachlorobenzene	8270C	0.13
D033	Hexachlorobutadiene	8270C	0.5
D034	Hexachloroethane	8270C	3
D008	Lead	6010B	5
D013	Lindane	8081A	0.4
D009	Mercury	7470B	0.2
D014	Methoxychlor	8081A	10
D035	Methyl ethyl ketone	8260B	200
D036	Nitrobenzene	8270C	2
D037	Pentachlorophenol	8270C	100
D038	Pyridine	8270C	5
D010	Selenium	6010B	1
D011	Silver	6010B	5
D039	Tetrachloroethylene	8260B	0.7
D015	Toxaphene	8081A	0.5
D040	Trichloroethylene	8260B	0.5
D041	2,4,5-Trichlorophenol	8270C	400
D042	2,4,6-Trichlorophenol	8270C	2
D017	2,4,5-TP (Silvex)	8151	1
D043	Vinyl chloride	8260B	0.2
--	pH	9040C	--
--	Eh (ORP)	2580	--
--	Specific Conductance	2510B	10 umho/cm
--	Specific Gravity	not given	1
--	Temperature	provided with pH	--
--	Fluoride	300.0	0.1
--	Calcium	200.7	1
--	Potassium	200.7	1
--	Magnesium	200.7	1
--	Sodium	200.7	1
--	Bicarbonate	2320B	20
--	Carbonate	2320B	2
--	Chloride	300.0	0.5
--	Sulfate	300.0	0.5
--	Bromide	300.0	0.1
--	Total Dissolved Solids	2540C	40
--	Total Suspended Solids	2540D	4
--	Cation/anion balance	Calculation	--
D001	Ignitability	Flashpoint (D93/1010A)	--
D002	Corrosivity	Corrosivity by pH (9040C)	--
D003	Reactivity	Reactive Cyanide, Sulfide (4500 CN/S2)	--

For metals and organics with an EPA Hazardous Waste Number:
(a) = Laboratory method performed on total sample per July 1992 EPA SW-846 Test Method 1311 Section 1.2 (TCLP)
(b) = Laboratory Reporting Level equivalent to TCLP Regulatory Level given in 40 CFR 261.24(b)

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159

Artesia, NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

Accreditation: ☐ Az Compliance

☐ NELAC ☐ Other_____

☐ EDD (Type) _____

Turn-Around Time:

☐ Standard ☐ **Rush**_____

Project Name:

PSP WDW-1, 2, 3 & 4 Inj Well

Project #:

Project Manager:

Randy Dade

Sampler:

On Ice: ☐ Yes ☐ No

# of Coolers:

Cooler Temp(including CF):

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.	Specific Gravity, C/A Balance, ORP, pH, TSS	8260 TCLP Compounds	8270 TCLP Compounds	RCI	RCRA 8 Metals	8081 TCLP Compounds	8151 TCLP Compounds								
		Liquid	WDW-1, 2, 3 & 4 Effluent	**	**		x														
		Liquid	WDW-1, 2, 3 & 4 Effluent	**3-40ml VOA**	**HCL**			x													
		Liquid	WDW-1, 2, 3 & 4 Effluent	**1-1L Amber**	**none**				x												
		Liquid	WDW-1, 2, 3 & 4 Effluent	***	***					x											
		Liquid	WDW-1, 2, 3 & 4 Effluent	**1-250ml P**	**HNO3**						x										
		Liquid	WDW-1, 2, 3 & 4 Effluent	**1-1L Amber**	**none**							x									
		Liquid	WDW-1, 2, 3 & 4 Effluent	**1-1L Amber**	**none**								x								
		Liquid	CTB to City POTW	**	**		x														
		Liquid	CTB to City POTW	**3-40ml VOA**	**HCL**			x													
		Liquid	CTB to City POTW	**1-1L Amber**	**none**				x												
		Liquid	CTB to City POTW	***	***					x											
		Liquid	CTB to City POTW	**1-250ml P**	**HNO3**						x										
		Liquid	CTB to City POTW	**1-1L Amber**	**none**							x									
		Liquid	CTB to City POTW	**1-1L Amber**	**none**								x								

Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time
Date:	Time:	Relinquished by:	Received by:	Via:	Date	Time

Remarks: Dissolved Cations by EPA Method 200.7. ** 1-500ml unpreserved plastic, 1-125ml H2SO4 plastic, 1-125ml HNO3 plastic. *** 1-500ml unpreserved plastic, 1-500ml NaOH plastic, 1-500ml NaOH/ZnAcetate plastic

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.

ATTACHMENT 5.

Appendix X.2 – Monitoring Wells Information

Petrotek Corporation 5935 S. Zang St., Suite 200 Littleton, Colorado 80127 (303) 290-9414 FAX (303) 290-9580

DATE: August 2, 2022

TO: Phillip Goetze (Oil Conservation Division)
Carl Chavez (Oil Conservation Division)

FROM: Wes Janes, Nolan Beasley, & David Huffington (Petrotek Corporation)

CC: Mike Holder (HF Sinclair)
Randy Dade (HollyFrontier Navajo Refining)
Alberto Gutierrez (Geolex)

SUBJECT: Discharge Permits (UICI-008-1, UICI-008-2, UICI-008-3, and UICI-008-4) Groundwater Monitoring Wells

Based on the conference call with New Mexico Energy, Minerals, and Natural Resources Department Oil Conservation Division (OCD) on June 2, 2022, it was requested that HollyFrontier Navajo Refining (HFNR) install groundwater monitoring wells into the uppermost water bearing unit downgradient from the injection wells WDW-1, 2, 3, and 4 (Permits: UICI-008-1, UICI-008-2, UICI-008-3, and UICI-008-4). Alternatively, it was also discussed that HFNR demonstrate groundwater quality via a search for existing data. The existing groundwater quality data is presented in this document. The findings outlined in this document show that there is no regulatory or technical basis requiring a shallow groundwater monitoring well near each of the above-referenced wells. Furthermore, installing shallow monitor wells provides no environmental benefit and creates a potential pathway for surface contamination to enter shallow groundwater. As such, HFNR is requesting the requirements of Section 2.B be removed from the upcoming permits during the renewal process.

As discussed on the call, HollyFrontier Navajo Refining (HFNR) has significant concerns with the installation of groundwater monitoring wells in the vicinity of the four UIC wells. These concerns are discussed further below and include the fact that the uppermost water bearing unit sits less than 400 feet below ground level (BGL), which is more than 7,000 feet above the injection zone. Furthermore, in addition to being isolated by surface casing that extends well below the depth of groundwater in the area, the injection zone is separated from the shallow groundwater zone by several hydrocarbon producing zones, saline aquifers, and layers of impermeable shale. The four Class I non-hazardous injection wells also sit in an area of historical oil & gas activity, may have historical spills, Class II salt water disposal (SWD) well activity, and active production, none of which are associated with HFNR activities. In addition, questions concerning the regulatory requirement(s) for the installation of the groundwater monitoring wells and related thoughts are presented below.

As a possible alternative to the installation of monitoring wells, it was discussed that a demonstration of groundwater quality might be possible through the location of existing groundwater data. As part of this effort, a comprehensive search for available data was performed. The results are summarized in this document.

Based on the information presented in this document, HFNR is requesting that the requirements of Section 2.B of the current permits be removed and not included in the renewal applications currently under preparation, nor in the renewal permits.

An excerpt of the New Mexico UIC regulations referring to monitoring wells is included below.

> **20.6.2.5207 MONITORING REQUIREMENTS FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELLS AND CLASS III WELLS:**
>
> **A.** The discharger shall demonstrate mechanical integrity for each Class I non-hazardous waste injection well or Class III well at least once every five years during the life of the well pursuant to Section 20.6.2.5204 NMAC.
>
> **B.** Additional monitoring requirements for Class I non-hazardous waste injection wells.
>
> **(1)** The discharger shall provide analysis of the injected fluids at least quarterly or, if necessary, more frequently to yield data representative of their characteristics.
>
> **(2)** Continuous monitoring devices shall be used to provide a record of injection pressure, flow rate, flow volume, and pressure on the annulus between the tubing and the long string of casing.
>
> **(3)** The discharger shall provide wells within the area of review as required by the discharge permit to be used by the discharger to monitor pressure in, and possible fluid movement into, ground water having 10,000 mg/l or less TDS except for such ground waters designated pursuant to Section 20.6.2.5103 NMAC. **This Section does not require monitoring wells for Class I non-hazardous waste injection wells unless monitoring wells are necessary due to possible flow paths within the area of review.**

NMAC 20.6.2.5207 (B)(3) directly applies to HFNR's four Class I non-hazardous disposal wells in Artesia, stating, "This Section does not require monitoring wells for Class I non-hazardous waste injection wells unless monitoring wells are necessary due to possible flow paths within the area of review." As the previous and upcoming permit renewal applications demonstrate, there are no potential flow paths through the confining zone to the shallowest water bearing unit. No flow paths were identified in the form of artificial penetrations as no corrective action plans were needed based on the records of the wells within the AOR indicating that they are sufficiently cemented and plugged. In addition, no faults near the area of review (AOR) have been identified which also have the potential to allow fluid to migrate out of the permitted injection zones. There is sufficient evidence of no fluid migration from the respective injection zones in WDW-1, 2, 3, and 4 based on the annual MIT requirements and continuous pressure monitoring. As there are no

possible flow paths identified, groundwater monitoring wells should not be required in the permits for WDW-1, 2, 3, and 4 Class I non-hazardous wells in these instances. Monitoring wells are not mandated by rule but may be required only if there are possible flow paths in the area of review. NMAC 20.6.2.5358 (E)(1) further provides that monitoring requirements are to be based on a "site-specific assessment of the potential for fluid movement from the injection zone, and on the potential value of monitoring wells to detect such movement." No such "site-specific assessment" has been conducted, nor has there been a determination of the potential value of the proposed monitoring wells to detect fluid movement. Note that HFNR, Petrotek, and Geolex are unaware of any example at any facility in the country where shallow groundwater monitoring wells are required for Class I non-hazardous injection. If such a case exists, it is certainly the exception rather than the rule and would most likely be responsive to unusually shallow injection zones that have potential flow paths to affect groundwater in the event of injectate migration out of the injection zone.

The HFNR injection wells (WDW-1, 2, 3, and 4) are constructed to Class I standards with multiple intervals of casing and cement separating the wellbore from the surrounding formations. In addition, the cement quality of the annuli are suitable to prevent vertical fluid migration. Injection was approved by the OCD based on the as-built construction of these wells. This is further confirmed by the continuous monitoring of the annular space between the tubing and production casing and the annual MIT testing required for these wells.

Geolex, Inc. (Geolex) was contracted to identify local groundwater and well data in the vicinity of the four injection wells, as well as provide additional information and support of this document. Geolex was able to identify 63 groundwater wells in the greater vicinity of the four injection wells. The map (Figure 1 of Attachment 1), list of the wells identified (Table 1 of Attachment 1), and water quality data (Tables 2, 3, and 4 of Attachment 1) are all included within Attachment 1. Geolex identified historical data from 1952 (Table 2 of Attachment 1) that had water quality data to assess potential baseline shallow water quality. From the wells identified in Table 1, recent water quality data from the Riverside water system facilities is shown on Tables 3 and 4. The Riverside wells are located approximately 2.3 miles west-northwest from WDW-4. The historical and current datasets are believed to be representative of the groundwater quality in the vicinity of the HFNR UIC wells, thus additional monitoring is not required

An estimate of the water quality can also be calculated from logs using the Schlumberger Generation-9 chart, which substitutes NaCl content as TDS in parts-per-million (ppm). WDW-4 openhole log data were used for this calculation because of data availability; specifically, the porosity and the deep resistivity logs were used for this estimate. Note that the resistivity and porosity log data have wide variations throughout most of the surface section, most likely due to hole conditions at the time of logging. It is most likely a combination of washout (some identified in the surface section), drilling fluid used, and highly permeable formations in the shallow section, leading to deeper invasion of the drilling fluids. Most of the calculations were off the Gen-9 chart, but the two that were present indicated NaCl content of approximately 2,500 ppm. This range is on the same order as the published data from Table 2 of Attachment 1. The two points used to

calculate reasonable values were from depths of 258 and 260 feet measured depth. The Gen-9 chart of the two points is included as Attachment 2. While confidence in this estimate is low based on the data quality, this method is usually effective as a substitute for sampling.

The shallow monitoring wells required by the permits would have to be installed in the midst of an active and long-operating oil field. Hence, any water sampled from a new monitoring well could be subject to contamination from historical practices in that field (e.g., surface spills or mechanical integrity issues with producing wells) that in no way relate to the operation of the subject HFNR Class I UIC wells. Further, there are Class II injection wells in the area which are not operated nor constructed under Class I standards. The result is that any theoretical potential shallow groundwater contamination more than 7,000 feet above HFNR injection activities would most likely be linked to other sources separate from HFNR well operations. HFNR has not had any significant releases of injectate to the surface at any of the injection well locations.

Considering the findings within the regulations, the specific construction of the wells, the lack of potential conduits out of the injection zone including no identified potential flow pathways that may affect shallow groundwater, the lack of water production wells within the AOR, the availability of nearby groundwater quality data, and the successful history of MITs on WDW-1, 2, 3, and 4, there seems to be no reasonable regulatory basis for, or technical merit, to require monitoring wells for these Class I non-hazardous waste injection wells. Based on the information presented in this document, HFNR is requesting that the requirements of Section 2.B of the current permits be removed and not included in the renewal applications currently under preparation, nor in the renewal permits. If the Division is aware of a regulatory requirement or factual circumstance relating to the HFNR injection wells that justifies requiring installation of groundwater monitoring wells, please bring that information to our attention at your earliest convenience so we can evaluate it.

Please contact Mike Holder (Michael.Holder@HFSinclair.com), Randy Dade (Lewis.Dade@HFSinclair.com), or Wes Janes (wjanes@petrotek.com) if you have any comments or questions.

Attachment 1 – Geolex Water Well Info in WDW Vicinity
Attachment 2 – Shallow Groundwater Gen-9 Input Chart

Attachment 1
Geolex Water Well Info in WDW Vicinity

Water Wells Near WDW Injection Wells

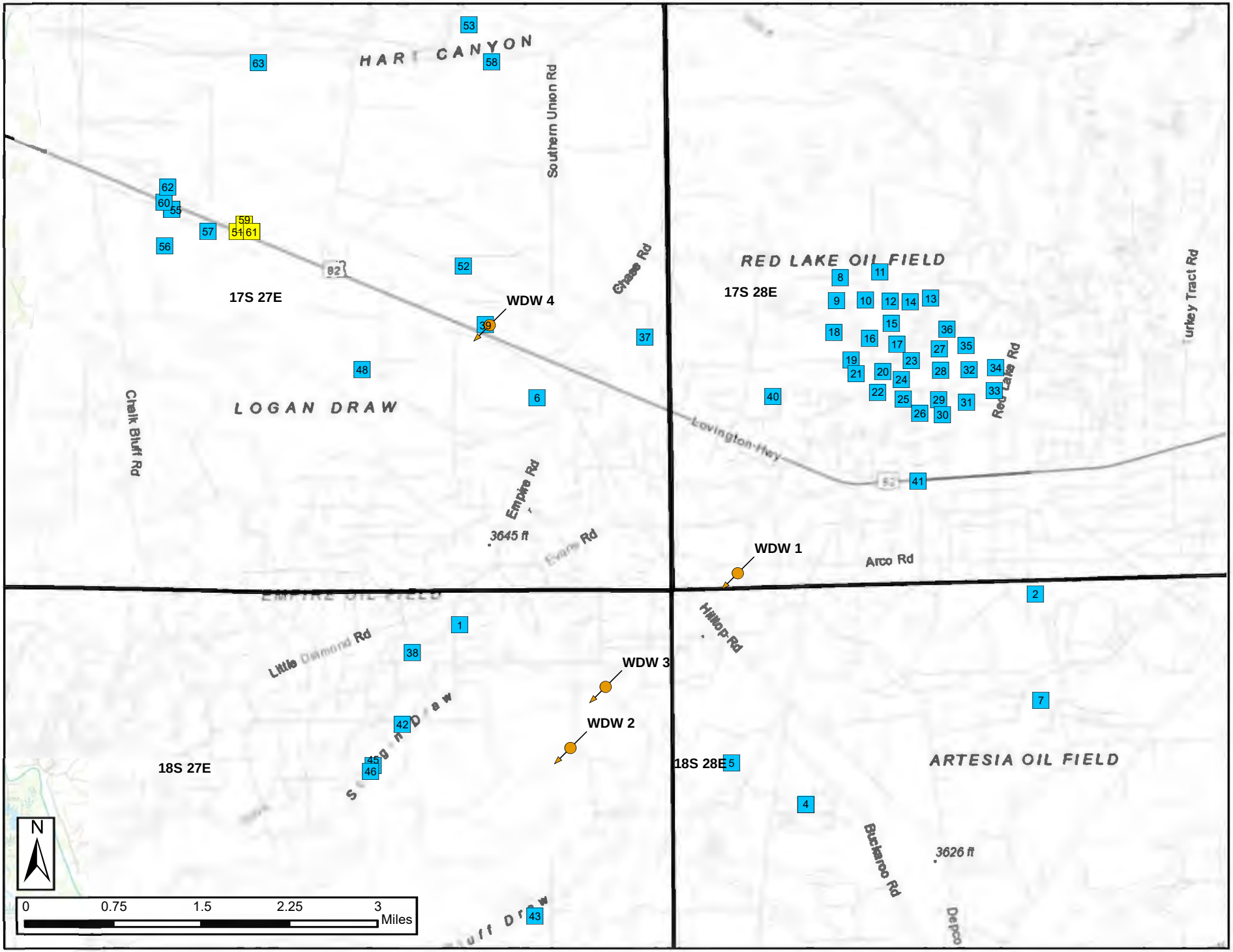


Figure 1. Water wells in the vicinity of WDW injection wells #1 - #4. Water wells are labeled with their corresponding numbers found in Table 1.

Table 1. All nearby water wells within a 3-mile vicinity of WDW #1 - #4 injection wells.

Well No.	Name	Use of Well	Pod Status	Owner Name	Total Depth (ft)	Depth Water (ft)	Dist. From WDW 1 (mi)	LAT 83	LONG 83	Completion Date	GS Elevation
1	RA 02996	DOMESTIC	PMT	PATON BROTHERS	-	-	2.306	32.77892643	-104.2545799	N/A	
2	RA 09001	OIL FIELD MAINT	DCL	ATLANTIC RICHFIELD COMPANY	-	-	2.638	32.78222054	-104.170205	N/A	
3	RA 08237	LIVESTOCK	DCL	BOGLE FARMS	-	-	2.037	32.75640759	-104.2040712	N/A	
4	RA 08236	LIVESTOCK	DCL	BOGLE FARMS	-	-	2.037	32.75640759	-104.2040712	N/A	
5	RA 08235	LIVESTOCK	DCL	BOGLE FARMS	-	-	1.567	32.76162662	-104.214914	N/A	
6	RA 04561	PROSP/DEV	PEN	LOWE DRILLING CO	250	-	2.234	32.80697337	-104.2429917	N/A	
7	RA 11857 POD1	DOM/LIVESTOCK	PMT	VERDUGO, JESSIE	235	95	2.876	32.76904171	-104.1694999	Sep 30 2012	
8	RA 12030 POD2	MONITOR	PEN	OXY USA WTP LP	-	-	2.749	32.82158301	-104.1984171	N/A	
9	RA 12030 POD3	MONITOR	PEN	OXY USA WTP LP	-	-	2.552	32.81869484	-104.1989996	N/A	
10	RA 12030 POD4	MONITOR	PEN	OXY USA WTP LP	-	-	2.657	32.81874984	-104.1947773	N/A	
11	RA 12030 POD5	MONITOR	PEN	OXY USA WTP LP	-	-	2.929	32.82225019	-104.1926113	N/A	
12	RA 12030 POD9	MONITOR	PEN	OXY USA WTP LP	-	-	2.751	32.81861093	-104.191139	N/A	
13	RA 12030 POD21	MONITOR	PEN	OXY USA WTP LP	-	-	2.961	32.81891695	-104.1851946	N/A	
14	RA 12030 POD22	MONITOR	PEN	OXY USA WTP LP	-	-	2.838	32.818528	-104.1882224	N/A	
15	RA 12030 POD23	MONITOR	PEN	OXY USA WTP LP	-	-	2.596	32.81586137	-104.1909717	N/A	
16	RA 12030 POD24	MONITOR	PEN	OXY USA WTP LP	-	-	2.391	32.81405555	-104.1941948	N/A	
17	RA 12030 POD25	MONITOR	PEN	OXY USA WTP LP	-	-	2.476	32.81327745	-104.1901939	N/A	
18	RA 12030 POD26	MONITOR	PEN	OXY USA WTP LP	-	-	2.296	32.81480526	-104.1994169	N/A	
19	RA 12030 POD27	MONITOR	PEN	OXY USA WTP LP	-	-	2.149	32.811361	-104.1969718	N/A	
20	RA 12030 POD28	MONITOR	PEN	OXY USA WTP LP	-	-	2.218	32.80991642	-104.1922774	N/A	
21	RA 12030 POD29	MONITOR	PEN	OXY USA WTP LP	-	-	2.073	32.80966651	-104.1961945	N/A	
22	RA 12030 POD30	MONITOR	PEN	OXY USA WTP LP	-	-	2.052	32.80736148	-104.1930557	N/A	
23	RA 12030 POD31	MONITOR	PEN	OXY USA WTP LP	-	-	2.442	32.81122249	-104.1880837	N/A	
24	RA 12030 POD32	MONITOR	PEN	OXY USA WTP LP	-	-	2.263	32.80888874	-104.1895833	N/A	
25	RA 12030 POD33	MONITOR	PEN	OXY USA WTP LP	-	-	2.151	32.80644443	-104.1893331	N/A	
26	RA 12030 POD34	MONITOR	PEN	OXY USA WTP LP	-	-	2.174	32.80469488	-104.1868891	N/A	
27	RA 12030 POD35	MONITOR	PEN	OXY USA WTP LP	-	-	2.676	32.81266697	-104.183972	N/A	
28	RA 12030 POD36	MONITOR	PEN	OXY USA WTP LP	-	-	2.551	32.80997243	-104.1838054	N/A	
29	RA 12030 POD37	MONITOR	PEN	OXY USA WTP LP	-	-	2.369	32.80633312	-104.1841388	N/A	
30	RA 12030 POD38	MONITOR	PEN	OXY USA WTP LP	-	-	2.315	32.80450036	-104.1836108	N/A	
31	RA 12030 POD39	MONITOR	PEN	OXY USA WTP LP	-	-	2.544	32.80602771	-104.180055	N/A	
32	RA 12030 POD40	MONITOR	PEN	OXY USA WTP LP	-	-	2.734	32.81002819	-104.1796391	N/A	
33	RA 12030 POD41	MONITOR	PEN	OXY USA WTP LP	-	-	2.792	32.80741637	-104.1759994	N/A	
34	RA 12030 POD42	MONITOR	PEN	OXY USA WTP LP	-	-	2.92	32.81027776	-104.1757498	N/A	

35	RA 12030 POD43	MONITOR	PEN	OXY USA WTP LP	-	-	2.855	32.81302817	-104.1800281	N/A	
36	RA 12030 POD46	MONITOR	PEN	OXY USA WTP LP	-	-	2.843	32.81508329	-104.1828336	N/A	
37	RA 12456 POD1	LIVESTOCK	ACT	KEY LIVESTOCK LLC	220	92	2.174	32.81433912	-104.227155	Sep 08 2016	
38	RA 12568 POD1	MONITOR	PEN	AKA ENERGY GROUP	-	-	2.749	32.77550023	-104.2615414	N/A	
39	RA 12612 POD1	PROSP/DEV	PLG	HOLLYFRONTIER NAVAJO REFINING	300	-	2.985	32.81602804	-104.2505005	May 06 2018	
40	LWD 03213 POD1	NONLVSTK WATER	DCL	BOGLE FARMS	-	-	1.605	32.806895	-104.2084387	N/A	
41	LWD 03214 POD1	NONLVSTK WATER	DCL	BOGLE FARMS	-	-	1.836	32.79630487	-104.1872688	N/A	
Well No.	**Name**	**Use of Well**	**Pod Status**	**Owner Name**	**Total Depth (ft)**	**Depth Water (ft)**	**Dist. from WDW 2 (mi)**	**LAT 83**	**LONG 83**	**Completion Date**	**GS Elevation**
42	RA 03917	PROSP/DEV	PMT	PAN AMERICAN PETROLEUM CORP.	130	50	1.439	32.76666404	-104.2631058	Jul 30 1958	
43	RA 04048	OBSERVATION	PMT	WESTERN OIL FIELDS INC.	2096	-	1.463	32.74282567	-104.2438549	Jan 02 1948	3514
44	RA 08239	LIVESTOCK	DCL	KEY LIVESTOCK LLC	-	-	2.935	32.72358272	-104.2213622	N/A	
45	RA 12433 POD1	MONITOR	PEN	CENTURION PIPELINE LP	-	-	1.678	32.7615836	-104.2673892	N/A	
46	RA 12433 POD2	MONITOR	PEN	CENTURION PIPELINE LP	-	-	1.707	32.76083373	-104.2678053	N/A	
Well No.	**Name**	**Use of Well**	**Pod Status**	**Owner Name**	**Total Depth (ft)**	**Depth Water (ft)**	**Dist. from WDW 4 (mi)**	**LAT 83**	**LONG 83**	**Completion Date**	**GS Elevation**
47	RA 04153	DOMESTIC	ACT	MOORE, J. HIRAM	1220	175	2.193	32.82776679	-104.2846743	Mar 14 1960	
48	RA 01493	IRRIGATION	DCL	MONTOYA, JULIAN	876	-	1.165	32.81061661	-104.2686289	Dec 31 1907	
49	RA 01716	COMMERCIAL	PMT	RIVERSIDE MUTUAL DOMESTIC ASSO	-	-	2.273	32.82868384	-104.2857246	N/A	
50	RA 03816	DOMESTIC	ACT	COLLIER, R.D.	945	931	2.898	32.83054834	-104.2963938	Jan 21 1958	
51	RA 07844	EXPLORATION	PMT	RIVERSIDE WATER USERS ASSOC.	1300	180	2.309	32.82777898	-104.2868109	Sep 06 1990	
52	RA 04554	PROSP/DEV	PMT	LOWE DRILLING COMPANY	220	40	0.556	32.82331913	-104.2536645	Feb 19 1962	
53	RA 07774	LIVESTOCK	ACT	BOGLE FARMS	100	50	2.563	32.85311597	-104.2526243	Dec 19 1989	
54	RA 04114	DOMESTIC	ACT	MOORE, J. HIRAM	1042	260	2.193	32.82776679	-104.2846743	Jan 14 1960	
55	RA 03694	DOMESTIC	ACT	BERRY, C.M.	300	90	2.898	32.83054834	-104.2963938	Feb 01 1957	
56	RA 06560	DOMESTIC	ACT	HALL, TONY	133	80	2.866	32.82600811	-104.2974659	Aug 23 1979	
57	RA 07231	MULTI DOM HOUSE	EXP	WILSON, FERN	-	-	2.544	32.8278213	-104.2910841	N/A	
58	RA 07936	LIVESTOCK	DCL	BOGLE FARMS	-	-	2.244	32.84857702	-104.2493176	N/A	
59	RA 07844 EXPL	EXPLORATION	PMT	RIVERSIDE WATER USERS ASSOC.	1300	180	2.273	32.82868384	-104.2857246	Sep 06 1990	
60	RA 06531	DOMESTIC	PEN	POWELL, CHARLES C.	200	-	2.982	32.83145675	-104.2975299	N/A	
61	RA 01716 S	COMMERCIAL	ACT	RIVERSIDE MUTUAL DOMESTIC ASSO	1200	-	2.193	32.82776679	-104.2846743	Aug 02 2004	
62	RA 11691 POD1	MONITOR	ACT	INTEGRATED WATER SERVIES	150	0	2.999	32.8333333	-104.2969445	Mar 03 2011	
63	LWD 02481 POD1	NONLVSTK WATER	DCL	BOGLE FARMS	-	-	2.988	32.84861519	-104.2835239	N/A	

*Highlighted PODs indicate the water wells associated with Riverside water system facilities

POD STATUS Key:

PMT = Permited
DCL = Declared
PEN = Pending
ACT = Active
EXP = Expired

Table 2. Historical water quality data from *Geology and Ground-Water Resources of Eddy County, New Mexico* by Hendrickson & Jones (1952).

Well Location	TDS (ppm)	Cl (ppm)	SO4 (ppm)	Depth H2O (ft)
17.27.11 (1948)	2690	33	1780	18
18.29.24 (1950)	1730	110	911	158

Table 3. Water quality data of various chemical constituents from recent available Riverside water system facilities. The TDS in these water wells are consistent with TDS values for USDW (static water level at 180' below ground surface).

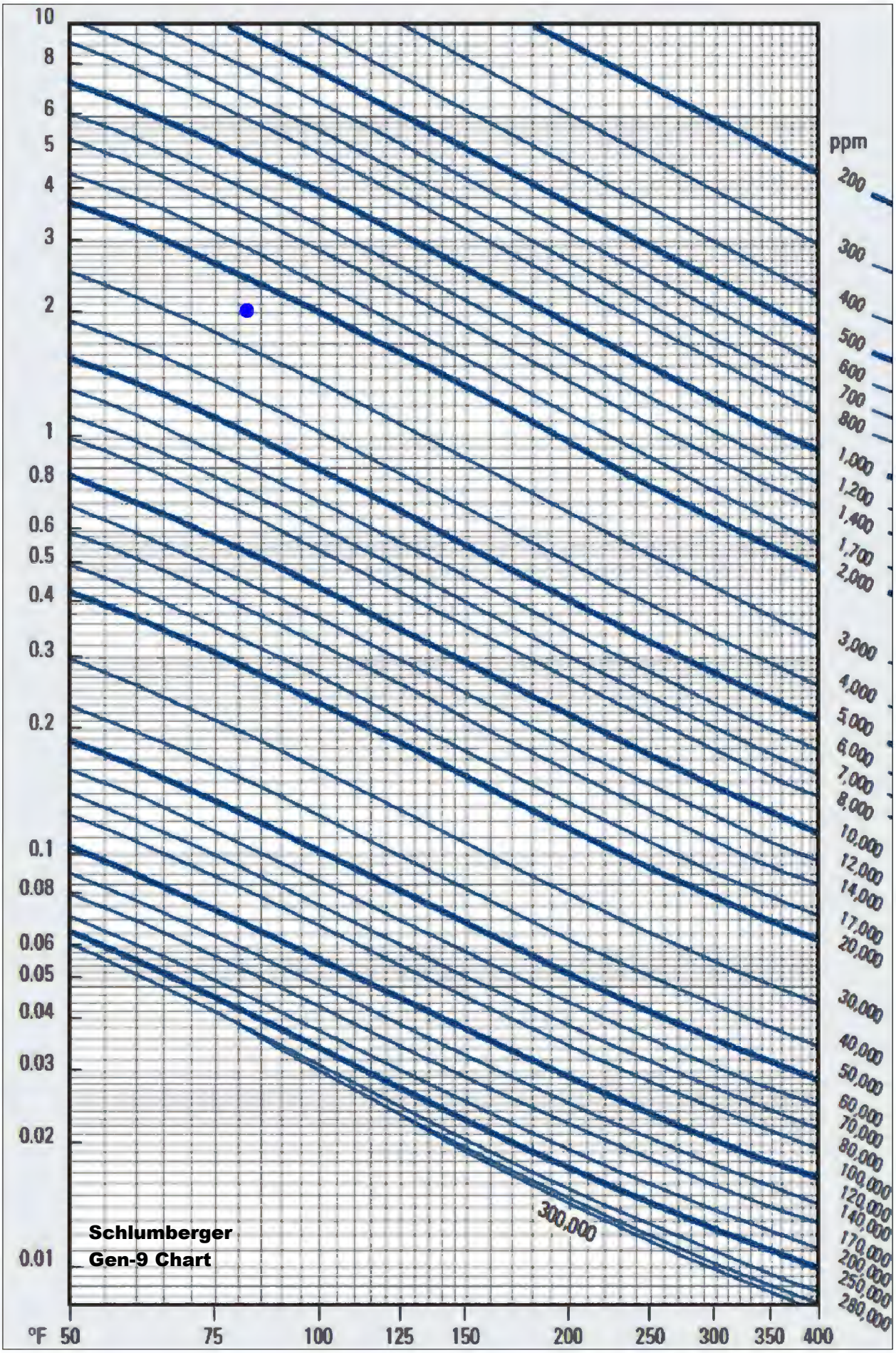
Date of Sample	Analyte	TDS (mg/L)
2/21/2022	ANTIMONY, TOTAL	ND
2/21/2022	ARSENIC	0.001
2/21/2022	BARIUM	0.017
2/21/2022	BERYLLIUM, TOTAL	ND
2/21/2022	CADMIUM	ND
2/21/2022	CHROMIUM	ND
2/21/2022	CYANIDE	ND
2/21/2022	FLUORIDE	0.95
2/21/2022	MERCURY	ND
2/21/2022	NICKEL	ND
2/21/2022	SELENIUM	ND
2/21/2022	THALLIUM, TOTAL	ND

Table 4. Recent chlorine concentration data from water wells in Riverside facilities measured on a monthly basis, showing very little concentration of contaminants in the USDW (Static water level at 180' below ground surface).

Date of Sample (2022)	Analyte	TDS (mg/l)
January	Chlorine	0.5
February	Chlorine	0.4
March	Chlorine	0.4
April	Chlorine	0.4
May	Chlorine	0.4
June	Chlorine	0.5

Attachment 2
Shallow Groundwater Gen-9 Input Chart

Calculated Water Quality as NaCl; WDW-4 258 and 260' MD



Appendix X.3 – Closure Plan

WDW-4 CLOSURE PLAN

WDW-4 will be plugged and abandoned following applicable OCD requirements. Prior to closing the well, HFNR will observe and record the pressure decay for the period specified by the Executive Director. In addition, appropriate mechanical integrity testing shall be conducted to provide reasonable assurance of the integrity of that portion of the long-string casing and cement that will be left in the ground after closure. In reality, it would be extremely difficult to remove the cemented casing strings from the subsurface. Also, removing the casing strings would provide much greater potential of a conduit for movement of fluids vertically than cementing the casing and leaving it in place. A casing inspection and cement bond/variable density log will also be conducted prior to closure.

HFNR intends to accomplish plugging of the injection well by cementing the well from the base of casing to surface using premium cement. This method of closure will not allow the movement of fluids out of the injection zone either into or between USDWs or freshwater aquifers. The procedure utilized for the closure of WDW-4 is as follows:

1. At least 60 days before commencing plugging and abandonment, notify the OCD of estimated start time for plugging operations.

2. Prepare the location to receive the rig and associated equipment.

3. Move in and rig up the workover rig. Spot additional support equipment.

4. Perform an annulus pressure test by pressurizing the tubing-casing annulus to the required pressure with an OCD inspector present, if required, for a one-hour period. Record the results of the test.

5. Perform and record a reservoir pressure falloff test for a length of time specified by the Executive Director.

6. Run a radioactive tracer survey to verify the external mechanical integrity of the well.

7. Pump fresh water (nonhazardous buffer fluid) down the tubing for decontamination and flushing the well. If surface pressure has been indicated on the well, pump sufficient brine down the tubing to bring the well into static equilibrium.

8. Remove the tree and install blowout preventers. Rig up the pump to the well annulus. Use brine as necessary to maintain control of the well.

9. Pull the tubing and packer from the well and dispose of properly or decontaminate for salvage value.

10. Run a cement bond log and casing inspection log on the long-string casing.

11. Run in the hole with a squeeze retainer on the tubing. Set the retainer in the protection casing above the injection packer historical depth. Unsting from the retainer and pressure test the retainer and casing string.

12. Sting back into the retainer and establish an injection rate. Pump premium cement plus additives below the cement retainer in the well. Cement volume is to be approximately 1.5 times the calculated casing volume below the retainer and above the fill.

13. Unsting from the retainer and pump 200 feet cement plug on top of the retainer. Pull up hole and reverse circulate the tubing to clear it of cement.

14. Wait approximately 12 hours for the cement to cure.

15. Tag and test the plug for seal and stability and record the depth. Pressure test the plug to 1000 psi, or as required. Circulate the well with freshwater, bentonite-laden drilling fluid (~9 ppg).

16. From this point, spot successive balanced, premium cement plugs in 1,000 feet interval from the top of the retainer cement plug to surface.

17. After bringing the tubing out of the hole with the cement at the surface, remove the blowout preventer and tubing head. Cut off the protection casing casinghead.

18. Allow the cement to cure for 24 hours, then test for seal and stability.

19. Cut off casings three feet below ground level and weld 1/2 inch thick steel plate caps into the remaining casings.

20. Install a permanent marker on the wellsite with the permit number, date of abandonment, and company name.

21. Release the workover rig and support equipment.

A closure report certifying that the well was closed in accordance with applicable requirements will be submitted to the proper agencies within 30 days of plugging the well. This report, stating that the abandonment is complete and was in accordance with OCD regulations, will be certified by HFNR and by an independent registered professional engineer.

Appendix X.4 – Closure Cost Estimate

WDW-4

Well Closure Cost Estimate
PBTD 9,004 feet

Intangible Cost	Units Req'd.	Unit Rate	Total Cost
Mob/Demob	1	$ 10,000	$ 10,000
Cement (Yield = 1.18 ft^3/sack)	3,803	$ 32	$ 121,696
Workover Rig	5	$ 6,500	$ 32,500
Fuel (diesel/LNG & propane)	5	$ 1,000	$ 5,000
Water	5	$ 500	$ 2,500
Mud, Chemicals, Engineering	5	$ 500	$ 2,500
Logging - Cased Hole	1	$ 25,000	$ 25,000
Communication	5	$ 500	$ 2,500
Transportation	5	$ 1,000	$ 5,000
Project Management/Office Support	5	$ 2,000	$ 10,000
Equipment Rental: BOPs, forklift, tubing, subs	5	$ 4,000	$ 20,000
Trailer, drinking water, toilets, septic, trash baskets	5	$ 500	$ 2,500
Location Trucking & Setup (trailers, sewer, water)	1	$ 5,000	$ 5,000
Contract Labor	1	$ 2,000	$ 2,000
Welder	1	$ 5,000	$ 5,000
Travel & Expenses	5	$ 500	$ 2,500
Pump Truck & BOP Testing	2	$ 5,000	$ 10,000
Reservoir Testing	1	$ 2,500	$ 2,500
Test Analysis & Reporting	1	$ 15,000	$ 15,000
		Total Estimated Well Closure Cost:	**$ 281,196**

Petrotek

Appendix XI.1 – Form C-108

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL
RESOURCES DEPARTMENT

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

FORM C-108
Revised June 10, 2003

APPLICATION FOR AUTHORIZATION TO INJECT

I. PURPOSE: _____Secondary Recovery _____Pressure Maintenance _X_____Disposal _____Storage
Application qualifies for administrative approval? _____Yes _____No

II. OPERATOR: HollyFrontier Navajo Refining LLC

ADDRESS:501 East Main, Artesia, New Mexico, 88210

CONTACT PARTY: Travis Gibb PHONE: (575) 748-3311

III. WELL DATA: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? _____Yes _X_____No
If yes, give the Division order number authorizing the project: _____

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

The requested AOR map is included in Section X.B of the Class I Nonhazardous Permit Application, 2022.

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

The requested AOR data tabulation is included in Section X.C of the Class I Nonhazardous Permit Application, 2022.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
   The requested rate and volume information are included in Section X.H of the Class I Nonhazardous Permit Application, 2022.
2. Whether the system is open or closed;
   Surface facilities and wellbores for WDW-1, WDW-2, and WDW-3 are designed as a closed system.
3. Proposed average and maximum injection pressure;
   The requested injection pressure information is included in Section X.H of the Class I Nonhazardous Permit Application, 2022.
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and,
   The requested injection fluid information is included in Sections X.H and X.V of the Class I Nonhazardous Permit Application, 2022.
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).
   The requested injection fluid information is included in Sections X.I of the Class I Nonhazardous Permit Application, 2022.

*VIII. Attach appropriate geologic data on the injection zone including appropriate lithologic detail, geologic name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval.

The requested geologic information is included in Sections X.E, X.H, and X.G of the Class I Nonhazardous Permit Application, 2022.

VIII. Describe the proposed stimulation program, if any.

The requested stimulation information is included in Section X.K of the Class I Nonhazardous Permit Application, 2022.

*X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted).

The requested information is included in Sections X.I and X.R of the Class I Nonhazardous Permit Application, 2022.

*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water.

The requested information is included in Section X.P of the Class I Nonhazardous Permit Application, 2022.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

The proof of notice is attached to this form.

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: Travis Gibb TITLE: Vice President and Refinery Manager

SIGNATURE: DATE: 8/12/2022

E-MAIL ADDRESS:

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstances of the earlier submittal:

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

Side 2

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and the name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the Section, Township, and Range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and,

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

Side 1

INJECTION WELL DATA SHEET

OPERATOR: HollyFrontier Navajo Refining LLC

WELL NAME & NUMBER: WDW-4

WELL LOCATION: 1,221 feet from the south line and 2,829 feet from the east line of SE/4, SW/4 | 23 | 17 South | 27 East

FOOTAGE LOCATION | UNIT LETTER | SECTION | TOWNSHIP | RANGE

WELLBORE SCHEMATIC (See Attached)

WELL CONSTRUCTION DATA

Surface Casing

Hole Size: 24” Casing Size: 20”

Cemented with: sx. ***or 405*** ft^3

Top of Cement: Surface Method Determined: NM OCD

Intermediate Casing

Hole Size: 17 1/2” Casing Size: 13 3/8”

Cemented with: 1,080 sx. ***or*** ft^3

Top of Cement: Surface Method Determined: N/A

Production Casing

Hole Size: 12 1/4” Casing Size: 9 5/8”

Cemented with: 3,225 sx. ***or*** ft^3

Top of Cement: Surface Method Determined: NM OCD

Total Depth: 10,700

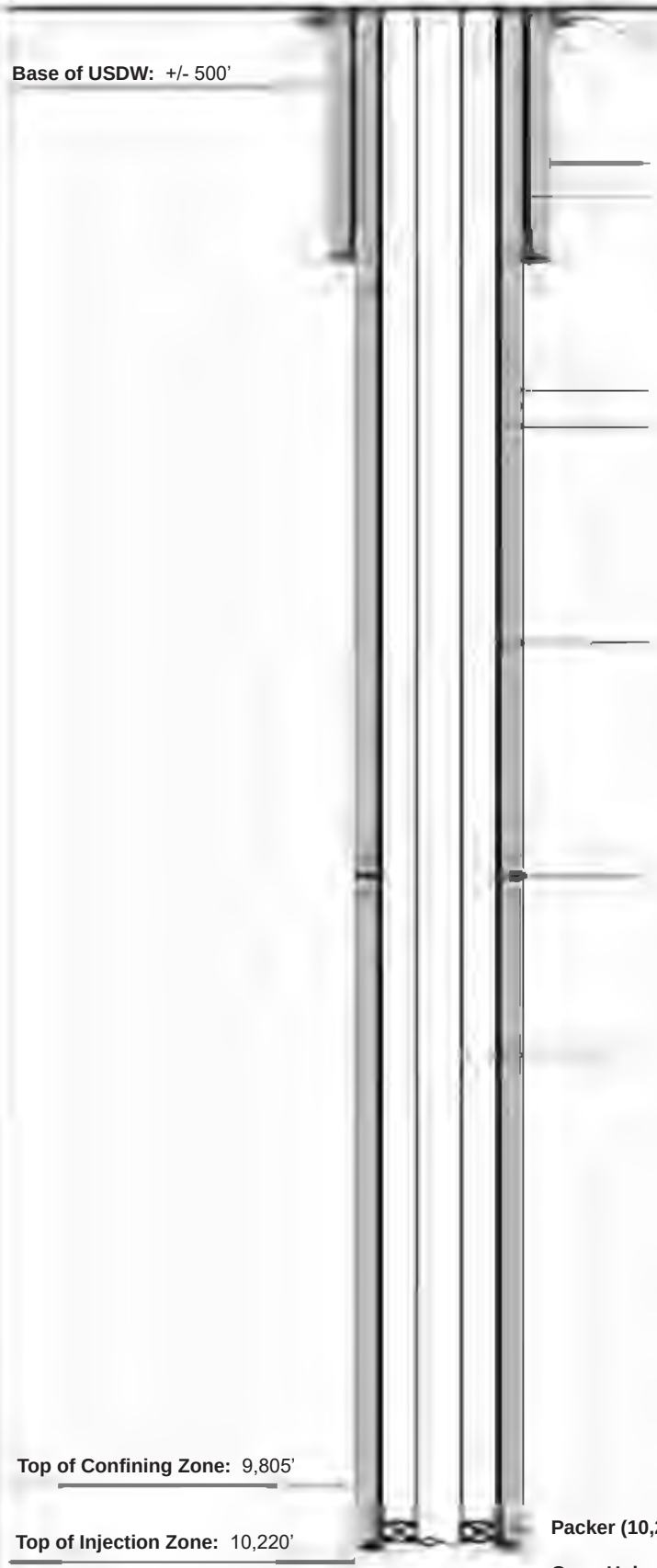
Injection Interval

10,327 feet to 10,700

(Openhole)

OCD UIC Permit: UICI-008-4
Well API Number: 30-015-44677
Eddy County, New Mexico
Sec. 23, T17S-R27E
Lat. 32.815970° / Long. -104.250174° (NAD 83)

All depths referenced to Kelly Bushing (KB)
elevation 20' above ground level.
Ground Level Elevation: +3,563'



Base of USDW: +/- 500'

Conductor Casing (0' - 80'): 20", 129.33 lb/ft 0.625" wall, API 5LX-56, plain-end, beveled conductor, cemented to surface with 15 yars redi-mix in a 24" hole.

17-1/2" Hole

Surface Casing (0' - 1,680'): 13-3/8", 54.5 lb/ft, K-55, ST&C, cemented to surfce with 3,225 sacks of cement.

12-1/4" Hole

Protection Casing (0' - 10,327'): 9-5/8", 47 lb/ft, N-80, LT&C, cemented to surface.

Annulus Fluid: Injection tubing and protection casing annulus filled with 263 bbl of brine water containing a corrosion inhibitor, a bactericide and an oxygen scavenger.

DV Tool (5,800'): 9-5/8"

Injection Tubing (0' - 10,265'): 7", 26 lb/ft, K-55, LT&C.

Top of Confining Zone: 9,805'

Top of Injection Zone: 10,220'

Base of Injection Zone: ~10,885'

Packer (10,265'): 7" x 9-5/8"

Open Hole: 8-1/2" to 10,700'.

TD: 10,700'

NOT TO SCALE

Wellbore information from: Figure 8.2, HollyFrontier Navajo Refining LLC, Artesia, New Mexico, As Built Below Ground Well Schematic by WSP and information found in the 2017 WDW-4 Permit.

HF Sinclair

Figure X.6
Wellbore Schematic,
WDW No. 4

2022 WDW-4 Permit Renewal

Scale: NTS | Date: July 2022
Fig_X.06_HF_NM_2022_WDW04.pdf | By: WEK | Checked: NB

Petrotek
5935 South Zang Street, Suite 200
Littleton, Colorado 80127 USA
303-290-9414
www.petrotek.com

INJECTION WELL DATA SHEET

Tubing Size: 7” Lining Material: Steel tubing

Type of Packer: Arrow X-1

Packer Setting Depth: 10,265’

Other Type of Tubing/Casing Seal (if applicable): N/A

Additional Data

1. Is this a new well drilled for injection? X Yes ____ No

   If no, for what purpose was the well originally drilled? N/A

2. Name of the Injection Formation: Silurian-Devonian

3. Name of Field or Pool (if applicable): N/A

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e. sacks of cement or plug(s) used.
   N/A

5. Give the name and depths of any oil or gas zones underlying or overlying the proposed injection zone in this area:
   Queen, Grayburg and San Andres (approximately 2,500 feet) and Morrow (approximately 9,500 feet)

Draft Public Notice

WDW-4

(UICI-8-4) HollyFrontier Navajo Refining LLC, Travis Gibb, Vice President and Refinery Manager, 501 E. Main Street, Artesia, New Mexico, at (575) 748-3311 has submitted a renewal application for an Underground Injection Control (UIC) Class I (Non-Hazardous) Injection Well Discharge Permit for WDW-4. WDW-4 (API# 30-015-44677). WDW-4 is located in the SE/4, SW/4 of Section 23, Township 17 South, Range 27 East, NMPM, Eddy County, New Mexico. WDW-1 is located approximately 8.5 miles E-SE of the intersection of Hwy 285 and Hwy 82 on the north side of Hwy 82.

Non-hazardous oilfield waste fluids are injected within the Silurian-Devonian age strata. Underground injection at WDW-4 occurs within the injection interval from 10,220 to 10,885 feet KB. The injection rate into WDW-4 will not exceed 500 gpm and the maximum allowable surface injection pressure is 2,040 psig.

The injected refinery waste water quality is approximately 3,400 mg/L TDS. Formation fluids within the permitted injection interval exceeds 10,000 mg/L TDS. Groundwater is first encountered in the area of the wells is at a depth range of approximately 50 to 150 feet below ground level. The groundwater quality ranges from approximately 1,500 to 2,200 mg/L TDS.

Interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.