UICI - 8 - 4

WDW-4 PERMITS, RENEWALS, & MODS (4 of 4)

2017

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

Ken McQueen
Cabinet Secretary

Matthias Sayer
Deputy Cabinet Secretary

David R. Catanach, Division Director
Oil Conservation Division

JULY 26, 2017

CERTIFIED MAIL
RETURN RECEIPT NO: 7913 8152

Mr. Randy Dade
HollyFrontier Navajo Refining, LLC
501 East Main
Artesia, New Mexico 88210

Re: Dear Mr. Dade:

Re: Discharge Permit (UICI-008-4)
HollyFrontier Navajo Refining, LLC
UIC Class I (Non-hazardous) Disposal Well
Disposal Well No. 4 (WDW-4)
UL: N, Section 23 Township 17 South, Range 27 East, 1,215 FSL 2,445 FWL (Lat./Long.: 32.81581/104.25003), NMPM, Eddy County, New Mexico

The New Mexico Oil Conservation Division (OCD) is in receipt of HollyFrontier Navajo Refining, LLC's (Navajo) discharge permit application for WDW-4 a new UIC Class I non-hazardous waste injection well. After review, OCD has determined that your application is "*administratively complete*" pursuant to New Mexico Water Quality Control Commission regulations (20.6.2.3108 NMAC).

Navajo must now provide public notice and demonstrate that it has done so to OCD in a timely manner. OCD will also provide notice to various governmental groups. Depending upon the level of public interest, a hearing may be scheduled on this matter. Regardless, OCD will continue our review of the application and may request additional information.

If you have any questions, please do not hesitate to contact me by phone at (505) 476-3490, mail at the address below, or email at CarlJ.Chavez@state.nm.us. On behalf of the OCD, I wish to thank you and your staff for your cooperation during this discharge permit review process.

Sincerely,

Carl J. Chávez
Environmental Engineer

cc: Jim Griswold, OCD- Environmental Bureau Chief
OCD Artesia Office
Scott Denton, Navajo Refining, LLC

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

Ken McQueen
Cabinet Secretary

Matthias Sayer
Deputy Cabinet Secretary

David R. Catanach, Division Director
Oil Conservation Division

JULY 26, 2017

CERTIFIED MAIL
RETURN RECEIPT NO: 7913 8152

Mr. Randy Dade
HollyFrontier Navajo Refining, LLC
501 East Main
Artesia, New Mexico 88210

Re: Dear Mr. Dade:

Re: Discharge Permit (UICI-008-4)
HollyFrontier Navajo Refining, LLC
UIC Class I (Non-hazardous) Disposal Well
Disposal Well No. 4 (WDW-4)
UL: N, Section 23 Township 17 South, Range 27 East, 1,215 FSL 2,445 FWL (Lat./Long.: 32.81581/104.25003), NMPM, Eddy County, New Mexico

The New Mexico Oil Conservation Division (OCD) is in receipt of HollyFrontier Navajo Refining, LLC's (Navajo) discharge permit application for WDW-4 a new UIC Class I non-hazardous waste injection well. After review, OCD has determined that your application is "*administratively complete*" pursuant to New Mexico Water Quality Control Commission regulations (20.6.2.3108 NMAC).

Navajo must now provide public notice and demonstrate that it has done so to OCD in a timely manner. OCD will also provide notice to various governmental groups. Depending upon the level of public interest, a hearing may be scheduled on this matter. Regardless, OCD will continue our review of the application and may request additional information.

If you have any questions, please do not hesitate to contact me by phone at (505) 476-3490, mail at the address below, or email at CarlJ.Chavez@state.nm.us. On behalf of the OCD, I wish to thank you and your staff for your cooperation during this discharge permit review process.

Sincerely,

Carl J. Chávez
Environmental Engineer

cc: Jim Griswold, OCD- Environmental Bureau Chief
OCD Artesia Office
Scott Denton, Navajo Refining, LLC

Description:

A new Underground Injection Control (UIC) Class I (Non-hazardous) Disposal Well discharge permit application in Eddy County was received on April 14, 2017 for:

Waste Disposal Well No. 4 (WDW-4) - API No. (TBD)
UL: N, Section 23 Township 17 South, Range 27 East, NMPM, 1,215 FSL 2,445 FWL, Eddy County, New Mexico. WDW-4 is located approximately 8.5 miles east-southeast of the intersection of Hwy 285 and Hwy-82 on the north side of Hwy 82. Disposal is into the undifferentiated Silurian-Devonian Formation in the open-hole injection interval from 10,400 to 10,900 ft. bgs. The maximum surface injection pressure (MSIP) is approximately 1,980 psig inclusive of a 100 psig factor of safety.

The injection well consists of: Conductor pipe 20-inch to 80 ft. below ground surface- bgs; Surface casing 13-3/8 inch casing to 1,500 ft. bgs; Protection casing 9-5/8-inch to 10,400 ft. bgs cemented to surface in 2-stages: Stage I (5,600 - 10,400 ft.) and Stage II (Surface – 5,800 ft.); Injection tubing 7-inch set in packer at approximately 10,300 ft. bgs; and Open hole 8-1/2-inch to approximately 11,000 ft. bgs.

The Confining Zone overlying the WDW-4 Injection Zone is composed of the upper Devonian Woodford Formation and the overlying undifferentiated Mississippian strata. The Woodford Formation consists of low permeability shale and the undifferentiated Mississippian age strata are low permeability carbonates. Both formations are laterally continuous throughout the region. the process units, cooling towers, boilers, streams from water purification units, desalting units, recovered and treated groundwater is pumped through a series of filtration units before disposal down WDW-4, which is one of four (WDW-1, WDW-2 and WDW-3) Class I (Non-hazardous) disposal wells permitted by Navajo Refining, LLC. WDW-4 injection rate will not exceed 150 gpm, 5,143 bbls per day or ~1,877,143 bbls per year.

The Injection Zone into which WDW-4 will be injecting is undifferentiated Silurian-Devonian age strata composed of shallow water carbonates, dolostone and/or limestones. This stratum includes the Lower Devonian Thirty-one equivalent, Lower Devonian to Upper Silurian Wristen Group and Lower Silurian to Upper Ordovician Fusselman Formation (Figure 6). The top of the zone will be near the base of the Upper Devonian Woodford Shale and is expected to be encountered at depths of approximately 10,400 feet BGL at the point of injection. The thickness of the Injection Zone will be approximately 600 feet in total, which includes the main target of approximately 500 feet plus approximately 100 feet at the bottom required for full log data acquisition. Depths and thicknesses will be finalized upon evaluation of open-hole logs.

WDW-4 injects into approximately 500 ft. of open-hole beginning at 10,400 ft. bgs inclusive of the undifferentiated Silurian-Devonian Formations with an estimated thickness of approximately 500 feet from 10,400 – 10,900 ft. bgs. The top of the WDW-4 Injection Zone is separated from the base of the USDW by several thousand feet of lower permeability carbonates, siltstones and shales. The injection well strata indicates there is an average ~ 4 – 8% porosity with some 8 – 14% porosity present. Porosity is believed to be caused by Karst and cave development with collapse features. The proposed well location will tap into the massive porosity in the major karst

system which connects the well to both upper, middle, and lower Devonian formation porosity as well as the Fusselman porosity. Porosity in the Devonian and Fusselman is thought to be created or modified by Karst and cave development.

Reservoir characteristics of the Silurian-Devonian Age Injection Zone indicate the reservoir has sufficient properties to accommodate the planned injection rate, volume and pressure from WDW-4. Based on information gathered from the existing Navajo injection well system, which has been operating for an extended period, there are no adverse reactions identified between the waste stream and the planned well components of construction or with the Silurian-Devonian age Injection Zone matrix and formation fluid. Artesia Refinery wastewater is generated from the treatment of water streams from the processing of crude oil, including the removal of water entrained in crude oil, the washing of crude oil to remove salts and sediment, water used for heating and cooling during refining, boiler blowdown, Reverse Osmosis reject water, and stormwater collected from process areas of the refinery. The injected refinery wastewater quality is approximately 3,000 mg/L total dissolved solids (TDS).

PERMIT APPLICATION FOR CLASS I NON-HAZARDOUS WASTE INJECTION WELL WDW-4 (PROPOSED)

HollyFrontier Navajo Refining LLC
Artesia, NM

WSP | PB Project No. 50904E

MARCH 2017

Prepared By:

PB Energy Storage Services, Inc.
WSP | Parsons Brinckerhoff
16200 Park Row, Suite 200
Houston, Texas 77084

DATE IN	SUSPENSE	ENGINEER	LOGGED IN	TYPE	APP NO.

ABOVE THIS LINE FOR DIVISION USE ONLY

NEW MEXICO OIL CONSERVATION DIVISION
- Engineering Bureau -
1220 South St. Francis Drive, Santa Fe, NM 87505

ADMINISTRATIVE APPLICATION CHECKLIST

THIS CHECKLIST IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS WHICH REQUIRE PROCESSING AT THE DIVISION LEVEL IN SANTA FE

Application Acronyms:

[NSL-Non-Standard Location] [NSP-Non-Standard Proration Unit] [SD-Simultaneous Dedication]
[DHC-Downhole Commingling] [CTB-Lease Commingling] [PLC-Pool/Lease Commingling]
[PC-Pool Commingling] [OLS - Off-Lease Storage] [OLM-Off-Lease Measurement]
[WFX-Waterflood Expansion] [PMX-Pressure Maintenance Expansion]
[SWD-Salt Water Disposal] [IPI-Injection Pressure Increase]
[EOR-Qualified Enhanced Oil Recovery Certification] [PPR-Positive Production Response]

[1] **TYPE OF APPLICATION** - Check Those Which Apply for [A]

[A] Location - Spacing Unit - Simultaneous Dedication
☐ NSL ☐ NSP ☐ SD

Check One Only for [B] or [C]

[B] Commingling - Storage - Measurement
☐ DHC ☐ CTB ☐ PLC ☐ PC ☐ OLS ☐ OLM

[C] Injection - Disposal - Pressure Increase - Enhanced Oil Recovery
☐ WFX ☐ PMX ☐ SWD ☐ IPI ☐ EOR ☐ PPR

[D] Other: Specify Class I – Non-Hazardous

[2] **NOTIFICATION REQUIRED TO:** - Check Those Which Apply, or ☐ Does Not Apply

[A] ☐ Working, Royalty or Overriding Royalty Interest Owners

[B] ☐ Offset Operators, Leaseholders or Surface Owner

[C] ☒ Application is One Which Requires Published Legal Notice

[D] ☐ Notification and/or Concurrent Approval by BLM or SLO
U.S. Bureau of Land Management - Commissioner of Public Lands, State Land Office

[E] ☐ For all of the above, Proof of Notification or Publication is Attached, and/or,

[F] ☐ Waivers are Attached

[3] **SUBMIT ACCURATE AND COMPLETE INFORMATION REQUIRED TO PROCESS THE TYPE OF APPLICATION INDICATED ABOVE.**

[4] **CERTIFICATION:** I hereby certify that the information submitted with this application for administrative approval is **accurate** and **complete** to the best of my knowledge. I also understand that **no action** will be taken on this application until the required information and notifications are submitted to the Division.

Note: Statement must be completed by an individual with managerial and/or supervisory capacity.

Lewis R. Dade	L R Dade	Env. Specialist	3/30/2017
Print or Type Name	Signature	Title	Date

Lewis.Dade@hollyfrontier.com
e-mail Address

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLES

FIGURES

TABLE OF CONTENTS (Continued)

FIGURES (CONT'D)

DRAWINGS

TABLE OF CONTENTS (Continued)

APPENDICES

ATTACHMENT

INTRODUCTION

HollyFrontier Navajo Refining LLC (Navajo), located in Artesia, New Mexico, is applying to permit new Class I Nonhazardous Waste Disposal Well No. 4 (WDW-4) to be located approximately eight and one half (8-1/2) miles to the east-southeast of Navajo's Artesia refinery.

Navajo's Artesia refinery is located at 501 East Main Street in Artesia, Eddy County, New Mexico. The new WDW-4 will be the fourth Class I nonhazardous waste injection well operated by Navajo. The three existing injection wells are designated WDW-1, WDW-2 and WDW-3. All three of the existing wells are permitted to inject nonhazardous waste water into a subsurface Injection Zone consisting of the lower portion of the Wolfcamp Formation and the underlying Cisco and Canyon Formations. The depth and thickness of the permitted Injection Zone at the three existing Navajo injection wells are as follows:

- WDW-1: 7,450 to 9,016 ft KB
- WDW-2: 7,270 to 8,894 ft KB
- WDW-3: 7,303 to 8,894 ft KB

WDW-4 will be permitted to inject nonhazardous waste water into a subsurface Injection Zone consisting of undifferentiated Silurian-Devonian age strata. The depth and thickness of the Silurian-Devonian Injection Zone into which WDW-4 is to be installed is expected to be approximately 10,400 to 10,900 feet below land surface. The actual depth and thickness of the Injection Zone will be determined when the well is drilled and completed.

Information concerning the locations of oil and gas wells and freshwater wells within the regulatory 1-mile radius area of review (AOR) surrounding the planned WDW-4 location were obtained from New Mexico Oil Conservation Division (OCD) and New Mexico Water Rights Reporting System, respectively. No corrective action is needed for any of the artificial penetrations that penetrate the Injection Zone within the 1-mile radius AOR.

The regional and local geology have been evaluated, and no problems have been identified that will cause adverse effects as a result of the planned injection operations at WDW-4.

Reservoir characteristics of the Silurian-Devonian Age Injection Zone indicate the reservoir has sufficient properties to accommodate the planned injection rate, volume and pressure from WDW-4. Based on information gathered from the existing Navajo injection well system which has been operating for an extended period of time, there are no adverse reactions identified between the waste stream and the planned well components of construction or with the Silurian-Devonian age Injection Zone matrix and formation fluid.

WDW-4 will be constructed and operated to meet or exceed the construction and operating standards set forth in 20.6.2.2505 NMAC. A procedure to permanently plug and abandon the well has been included per the requirements of 20.6.2.5209 NMAC.

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, NM 88210

CONTACT PARTY: Randy Dade PHONE: (575) 746-5281

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.

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.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and,
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.).

*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.

IX. Describe the proposed stimulation program, if any.

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

*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.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of 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: Lewis R. Dade TITLE: Env. Specialist

SIGNATURE: LRDade DATE: 3/30/2017

E-MAIL ADDRESS: Lewis.Dade@hollyfrontier.com

* 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

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

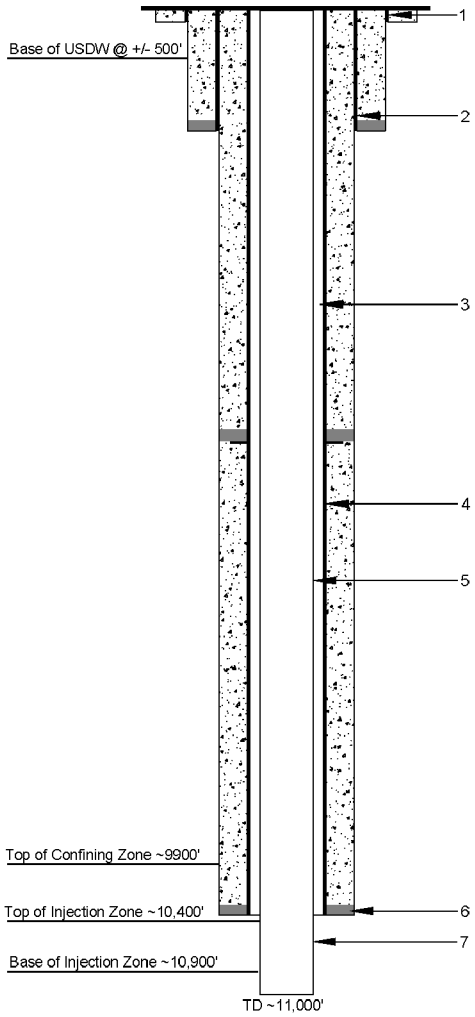
INJECTION WELL DATA SHEET

OPERATOR: **Facility**: HollyFrontier Navajo Refining LLC, 501 East Main, Artesia, New Mexico 88210;
Contact: Randy Dade, Environmental Specialist, (575) 746-5281, Lewis.Dade@HollyFrontier.com

WELL NAME & NUMBER: WDW-4

WELL LOCATION: 1000 feet from the south line and 2,500 feet from the east line of SE/4, SW/4 | 23 | 17 South | 27 East
FOOTAGE LOCATION | UNIT LETTER | SECTION | TOWNSHIP | RANGE

WELLBORE SCHEMATIC



BELOW GROUND DETAILS
(feet below Ground Level)

1. Conductor Pipe - 20", 129.33 lb/ft (0.625" wall), API 5LX-56, plain-end, beveled conductor set in 24" augered hole at 80' and cemented to the surface with redi-mix.
2. Surface Casing - $13\frac{3}{8}$", 54.5 lb/ft, K-55, ST&C, set at 1,500' in a 17½" hole and cemented to the surface.
3. Annulus Fluid - injection tubing and protection casing annulus filled with 250 bbl of brine water containing a corrosion inhibitor, a bactericide and an oxygen scavenger.
4. Protection Casing - $9\frac{5}{8}$", 47 lb/ft, N-80, LT&C set in a 12¼" hole at 10,400' with a DV Tool at 5,800' and cemented to the surface in two stages as follows:
   Stage I (5,600' - 10,400')
   Stage II (Surface - 5,800')
5. Injection Tubing - 7", 26 lb/ft, K-55, LT&C set in packer at approximately 10,300'.
6. Injection Packer - 7" x $9\frac{5}{8}$" set at approximately 10,300'. Final depth determined by Openhole Log.
7. Open Hole - $8\frac{1}{2}$" to 11,000'

WELL CONSTRUCTION DATA

Surface Casing

Hole Size: 20-inches Casing Size: 13-3/8-inch

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

Top of Cement: surface Method Determined: _____

Intermediate Casing

Hole Size: 12.25-inches Casing Size: 9-5/8-inch _____

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

Top of Cement: surface Method Determined: _____

Production Casing

Hole Size: 8.75-inches Casing Size: 7-inch

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

Top of Cement: surface Method Determined: _____

Total Depth: ~11,000 feet

Injection Interval

~10,400 feet to ~10,900 feet
(Open-Hole)

INJECTION WELL DATA SHEET

Tubing Size: 7-inch Lining Material: steel construction

Type of Packer: 9-5/8" X 7" retrievable injection packer

Packer Setting Depth: ~10,300 feet

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

Additional Data

1. Is this a new well drilled for injection? ___X___Yes _____No

   If no, for what purpose was the well originally drilled? _____

   _____

2. Name of the Injection Formation: Silurian-Devonian

3. Name of Field or Pool (if applicable): _____

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. No

   _____

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)

   _____

   _____

1.0 Underground Well Control Well Class

Waste Disposal Well No. 4 (WDW-4) will be classified as a Class I Nonhazardous Waste Injection Well.

2.0 Operator

The operator information for WDW-4 is provided below:

Facility Address

HollyFrontier Navajo Refining LLC
501 East Main
Artesia, New Mexico 88210
(575) 748-3310

Contact Person

Randy Dade, Environmental Specialist
(575) 746-5281
Lewis.Dade@hollyfrontier.com

3.0 Location

WDW-4 will be located in the SE/4, SW/4, Section 23, Township 17 South, Range 27 East (approximately 1000 feet from the south line and 2,500 feet from the west line of Section 23).

A topographic map showing the location of the Navajo's Artesia refinery and the location where WDW-4 will be installed is provided as Figure 1. An enlarged version of the topographic map showing the planned location of WDW-4 is provided as Figure 2.

4.0 Landowner

The parcel of land where WDW-4 will be 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

The parcel of land where WDW-4 will be located is surrounded by additional land owned by the Federal Bureau of Land Management, as shown on the map included in Appendix A.

5.0 Facility Description

WDW-4 will be located approximately eight and one half (8.5) miles southeast of Navajo's Artesia refinery, the largest refinery in the State of New Mexico. Drawing 1 presents an aerial photograph of the refinery's location with respect to the planned WDW-4, identifying pertinent features between the two sites. The injection well facility will be located on a 2.5 acre tract of Federally-owned land. The well location will be surrounded by a security fence that encloses the well, injection pumps, filters and piping, wellhead annulus measurement system (WAMS) on a contained concrete pad, a well control system that provides real-time, continuous monitoring of key operating parameters (pressure, flow rate, etc.) to the Refinery Control Room responsible for well operations and a power panel. The pumps and filters will be located on a separate, contained concrete pad from the wellhead. There will be no buildings or tanks, other than a 250-gallon glycol tank, associated with the WAMS unit.

6.0 Proposed Discharge Plan (see 20.6.2.3106C NMAC)

This permit application is for a new Class I nonhazardous waste injection well. Those portions of 20.6.2.3106C that are relevant to underground injection, especially 20.6.2.3103C (8), are addressed within Section 7.0 of this document.

6(a) is addressed in 7(f)
6(b) is addressed in 7(a)
6(c) is addressed in 7(d)

6(d) is addressed in 7(e)

6(e) measurement of flow is a flow meter at the wellhead with information transmitted electronically to the refinery control room.

6(f) is addressed in 7(e)

6(g) is addressed in 7(e)

7.0 Information for Class I Nonhazardous Waste Injection Well and Class III Brine Wells (20.6.2.5210 NMAC)

The following sections present the information required in Subsection B of Section 20.6.2.5210 NMAC.

7 (a) Area of Review

The WDW-4 Area of Review (AOR) consists of the area within a 1-mile radius surrounding the planned well location as shown on Drawing 2. All potential sources of information relevant to the location of non-freshwater artificial penetrations (oil and gas wells, exploratory tests, disposal wells, etc.) and freshwater wells within the AOR were reviewed.

Non-Freshwater Wells in Area of Review

The locations of non-freshwater artificial penetrations (oil and gas wells, exploratory tests, disposal wells, etc.) within the 1-mile radius AOR surrounding WDW-4 are identified in Drawing 2. A total of 91 non-freshwater artificial penetrations are present in the 1-mile radius AOR as shown on the map. Each artificial penetration is identified by a Map ID number. Table 1 presents a tabulation of the 91 non-freshwater artificial penetrations in the WDW-4 AOR. Only one (1) of the 91 non-freshwater artificial penetrations identified within the AOR (Map ID No. 5) was advanced to a depth to penetrate the top of the planned WDW-4 Silurian-Devonian age Injection Zone. The well record is included as Attachment 1.

Freshwater Wells in Area of Review

Based upon information obtained from records maintained by the New Mexico Water Rights Reporting System, there are 2 freshwater wells within the 1-mile radius AOR surrounding the planned WDW-4 (Table 2).

Drawing 3 presents a topographic map depicting the 1-mile radius AOR and the locations of the 2 water wells listed on Table 2. The map contains surface bodies of water, mines (surface and subsurface), quarries, springs, and other surface features, including roads and residences. There are no subsurface faults in the AOR known to have surface expression; therefore, no surface fault traces have been included on this map.

7 (b) Data Tabulation

Table 1 presents a tabulation of the 91 non-freshwater artificial penetrations in the 1-mile radius AOR surrounding the planned location of WDW-4. Only one (1) of the 91 non-freshwater artificial penetrations identified within the AOR (Map ID No. 5) were advanced to a depth deep enough to penetrate the top of the planned WDW-4 Injection Zone.

7 (c) Corrective Action

Corrective action is not required. The one (1) artificial penetration identified within the AOR that was advanced to a depth to penetrate the top of the planned WDW-4 Injection Zone (Map ID No. 5) was constructed properly and was plugged and abandoned properly. A copy of the OCD well file for this artificial penetration is provided in Attachment 1 of this application.

7 (d) Maps and Cross-Sections

The base of the Underground Source of Drinking Water (USDW), groundwater with total dissolved solids concentration with less than 10,000 milligrams per liter (mg/L), is projected to occur at a depth of approximately 450 to 500 feet below ground level (BGL) in the area of WDW-4 location which is situated at an elevation of approximately 3,565 feet above mean sea level. Figure 3 presents a generalized hydrogeologic cross-section for the local area. Figure 4 presents a published map indicating the direction of shallow groundwater movement in the local area.

The top of the WDW-4 Injection Zone is separated from the base of the USDW by several thousand feet of low permeability carbonates, siltstones and shale as depicted on the geologic cross-sections presented on Drawings 5 and 6. Drawing 4 is a cross-section index map.

7 (e) Geology

WDW-4 will be located in Eddy County, New Mexico on the Northwest Shelf of the larger Permian Basin as shown on Figure 5. Figure 6 is stratigraphic column presenting the geologic formations relevant to the planned underground injection operations. WDW-4 will be located on the northern flank, close to the crest of the Artesia-Vacuum anticline (also referred to as the Vacuum Arch), which trends east to west across the area as shown Figure 7. Figure 8 is a published regional structural map of the top of the undifferentiated Silurian-Devonian age strata.

As depicted on the two geologic cross-sections presented on Drawings 5 and 6, the subsurface geology in the area where WDW-4 will be located is rather simplistic. As presented on Drawings 7 and 8, structural dip of all geologic formations is about 125 feet/mile to the southeast away from the Vacuum Arch depicted on Figure 7.

Injection Zone

The Injection Zone into which WDW-4 will be injecting is undifferentiated Silurian-Devonian age strata composed of shallow water carbonates, dolostone and/or limestones. This strata includes the Lower Devonian Thirtyone equivalent, Lower Devonian to Upper Silurian Wristen Group and Lower Silurian to Upper Ordovician Fusselman Formation (Figure 6). The top of the zone will be near the base of the Upper Devonian Woodford Shale and is expected to be encountered at depths of approximately 10,400 feet BGL at the point of injection. The thickness of the Injection Zone will be approximately 600 feet in total, which includes the main target of approximately 500 feet plus approximately 100 feet at the bottom required for full log data acquisition. Depths and thicknesses will be finalized upon evaluation of open-hole logs.

The top of the Silurian-Devonian Injection Zone is over 1,000 feet below the base of the Injection Zone into which the three existing injection wells (WDW-1, WDW-2, and WDW-3; Figure 4) operated by Navajo are injecting. The three existing injection wells are injecting into the lower portion of the Permian age Wolfcamp Formation and the underlying Pennsylvanian age Cisco and Canyon Formations that are encountered at depths of 7,270 to 9,016 feet KB.

Drawing 7 presents a structure contour map of the WDW-4 Injection Zone. Most artificial penetrations drilled deep enough to encounter the Devonian were not advanced to a sufficient depth to fully ascertain the thickness of the Silurian-Devonian; therefore, an isopach map of the Injection Zone could not be constructed. However, the thickness of the Injection Zone is expected to remain fairly consistent throughout the Eddy County area. The zone is anticipated to be approximately 500 feet thick as depicted on the two geologic cross-sections presented on Drawings 5 and 6.

A three-dimensional seismic survey (3D), approximately 3-miles by 3-miles, was obtained by Navajo and given to Geolex for evaluation and interpretation. The survey area (Drawing 2 and Drawing 4) is in Township 17 South, Range 27 East and covers all of Sections 22, 23, 26 and 27, with partial coverage of bordering sections (13, 14, 15, 16, 21, 24, 25, 28, 33, 34, 35 and 36). Geolex created a seismic inversion volume from the 3D to help provide indications of relative porosity. There are only two wells within the seismic survey that reached the top of the Devonian: Berry Federal #29 (API: 30-015-00472) and Trigg Federal B #1 (API: 30-015-20159). A third well, Federal 'DH' #1 well (API: 30-015-24857), which is not inside the 3D Survey area, was used to calibrate the deeper section of the 3D seismic inversion. The well is located approximately 2 miles south of the southern edge of the 3D Survey and was the closest well with Sonic and Density well log data covering the entire Silurian-Devonian injection interval. The seismic inversion volume was used to pick the well location, which targets an area indicating relatively higher porosity, possibly due to karsting. A karst model is suggested by Geolex, to enhance porosity and connectedness (see Geolex report in Appendix B-1).

Confining Zone

The Confining Zone overlying the WDW-4 Injection Zone is composed of the upper Devonian Woodford Formation and the overlying undifferentiated Mississippian strata. The Woodford Formation consists of low permeability shale and the undifferentiated Mississippian age strata are low permeability carbonates. Both formations are laterally continuous throughout the region as depicted on the two geologic cross-sections presented on Drawings 5 and 6.

Drawing 8 presents a structure contour map of the WDW-4 Confining Zone and Drawing 9 presents an isopach map of the WDW-4 Confining Zone.

Faulting

No evidence has been found of subsurface faulting within and immediately surrounding the 1-mile AOR radius surrounding the planned location of WDW-4 that would provide hydraulic connection between the WDW-4 Injection Zone and the shallow USDW. The nearest documented subsurface fault is the “K-M” fault located approximately 15 miles to the northwest, well outside the geologic study area for WDW-4.

Seismicity

The southeastern portion of New Mexico is historically an area of low seismicity with naturally occurring earthquakes being rare and of low magnitude. WDW-4 will be located in one of the areas recognized as having the lowest level of seismic risk in the continental United States (Figure 9).

The potential for earthquakes to occur in the vicinity of the planned WDW-4 well site is minimal. Appendix B-2 presents a listing of all recorded seismic events within 200 miles of the planned WDW-4 well site for the period from 1973 through 2012.

The planned injection operations do not have the potential to cause any seismic activity which could alter the confining capability of the subsurface Injection Zone and overlying Confining Zone.

Surface Geology and Flooding Potential

The surface geology of the local area is shown on Figure 10. The Pecos River, located about three miles east of Artesia is the only surface water body in the area of the planned WDW-4 well site. Local annual rainfall is approximately 13.5 inches. As indicated on the topographic map on Figure 2, the land surface elevation of approximately 3,565 ft msl at the planned well location is higher than the 100-year flood elevation of approximately 3,400 ft msl in Logan Draw; therefore the potential for flooding at the planned WDW-4 well site is minimal.

7 (f) Proposed Operating Parameters

Source and Description of Injection Fluid

The fluid to be injected into WDW-4 is the same waste stream that is currently injected into the three existing Navajo injection wells, WDW-1, WDW-2 and

WDW-3. This waste stream is comprised of exempt and nonexempt nonhazardous oilfield waste that is generated in the refining process at Navajo's Artesia refinery; e.g., process units, cooling towers, etc. Waste waters from process units, cooling towers and boilers, streams from water purification units and desalting units, recovered and treated groundwater, and general wash waters are blended to form the waste stream that will be injected into WDW-4. This injectate is consistent with the authorized waste stream injected into WDW-1, WDW-2 and WDW-3. Table 3A and Appendix C present data characterizing the injection fluid.

Navajo anticipates the addition of another waste stream to the existing waste stream being injected into the three existing injection wells and the planned WDW-4. The new waste stream will originate from a reverse osmosis (RO) unit to be constructed within the refinery. Table 3B and Appendix C present data characterizing the planned new waste stream from the RO unit.

Average and Maximum Daily Flow Rate and Volume

The estimated average injection rate into WDW-4 is 150 gpm (216,000 gallons per day) and the maximum instantaneous injection rate into WDW-4 will be 500 gpm.

Average and Maximum Surface Injection Pressure

The estimated average injection pressure is approximately 1,000 pounds per square inch gauge (psig) and the estimated maximum surface injection pressure is 2,080 psig (see Maximum Allowable Surface Injection Pressure Calculation below).

Maximum Allowable Surface Injection Pressure (MASIP) Calculation

The maximum operating injection wellhead pressure (MASIP) will not exceed 2,080 psi or 0.2 psi per foot of depth to the top of the Injection Interval at 10,400 feet, as required by the OCD Proposed Rule 21.B(7), dated October 6, 1997.

The depth to the top of injection interval in WDW-4 is expected to be approximately 10,400 feet. The maximum allowable surface injection pressure is calculated as follows:

- 10,400 feet x 0.2 psi/ft = 2,080 psi

The actual depth to the top of the WDW-4 injection interval will be determined when the well is being drilled and completed. The MASIP will be revised at that time to correspond to the actual top of the Silurian-Devonian age injection interval.

7 (g) Formation Testing Program

Formation testing will be conducted during the installation of WDW-4 to obtain site-specific data relating to the chemical, physical and radiological characteristics of the Silurian-Devonian age Injection Zone.

7 (h) Fluids and Pressure

The following are calculations of the predicted pressure changes over the initial 5-year permit life for WDW-4 and over the expected 30-year life of the well due to emplacement of the permitted maximum volume into the Silurian-Devonian Injection Zone at the average injection rate of 150 gpm.

The interface between injected waste and the formation brine (the waste front) will expand radially away from the WDW-4 wellbore. As fluid is injected, the Injection Zone will continue to pressurize due to the resistance of fluid movement and the compression of the fluid and rock matrix.

Future Cone of Influence and Waste Plume Front

The predicted pressure rise during the initial 5-year permit time frame and the projected 30-year life of WDW-4 were calculated using the software program PredictW. The equations used in the program are presented in Appendix D-1.

The maximum lateral spread of the waste front was determined using the equations published by Warner and Lehr.

Calculated Cone of Influence (5-Years)

The projected cone of influence within the Injection Zone at the end of the initial 5-year permit period is presented on Drawing 10. The cone of influence is based on emplacement of the permitted maximum volume at the average injection rate of 150 gpm. The cone of influence calculations are included in Appendix D-4 (output from PredictW).

Calculated Cone of Influence (30-Years)

The projected cone of influence within the Injection Zone at the end of the projected 30-year life of the well is presented on Drawing 11. The cone of influence is based on emplacement of the permitted maximum volume at the average permitted injection rate of 150 gpm. The cone of influence calculations are included in Appendix D-4 (output from PredictW).

The cone of influence is defined as the area with increased Injection Zone pressure caused by injection of wastes that would be sufficient to cause vertical fluid movement through any wellbore or other conduits into a USDW. This demonstration shows that the conservative worst-case cone of influence of the injection operations is smaller than the regulatory 1-mile radius AOR in which artificial penetrations were investigated.

In the worst case, an undocumented abandoned well is imagined to be open to both the Injection Zone and the base of the USDW. In addition, the well is filled to within 100 feet of the ground surface with formation brine from the Injection Zone and fresh water from the base of the USDW. The cone of influence can be calculated by comparing the hydraulic heads of the Injection Zone and the lowermost USDW. It is only where the Injection Zone head is above the USDW head that fluid movement from the Injection Zone into the USDW could occur. This worst-case model of the potential effect of injection on the USDW is conservative. No wells within the 1-mile radius AOR surrounding WDW-4 are open to both the Injection Zone and the USDW.

Because of the limited amount of information available in the records for wells drilled into the Silurian-Devonian aged Formations, the estimated initial pressure for WDW-4 was extrapolated from the initial pressure measured in Navajo's injection well WDW-2. Additionally, the reservoir parameters from the WDW-2 permit renewal were used to calculate pressure buildup and plume migration for WDW-4.

Once WDW-4 is drilled, the cone of influence and plume migration results will be recalculated using the reservoir parameters determined from the drilling and testing of WDW-4.

The following calculations are based on an average total dissolved solids (TDS) content of 25,000 parts per million (ppm) which corresponds to a specific gravity of approximately 1.02.

The pre-injection pressure, P_i, at the top of the Injection Zone in Navajo's WDW-2 at 7,570 feet BGL was measured on June 5, 1999. The pre-injection pressure was 2,845 pounds per square inch absolute (psia).

The pre-injection pressure, P_i, at the top of the WDW-4 Injection Zone at 10,200 feet BGL is calculated to be 4,095 psia as follows:

$$\begin{aligned} P_{i(10,400\ feet)} &= P_{i(7,570\ feet)} + (10,400\ feet - 7,570\ feet)(0.433\ psi/ft)(1.02) \\ &= 2,845\ psia + 1,250\ psi \\ &= 4,095\ psia \end{aligned}$$

The hydraulic head of the lowermost USDW is estimated to be 100 feet BGL. This estimate is reasonably conservative, as it is based on a static water level measurement of 81 feet. The base of the USDW is at approximately 450 to 500 feet.

The critical pressure, P_c at 10,400 feet BGL that would be necessary to raise the hydrostatic head of the injection interval to the head of the lowermost USDW at 100 feet BGL is 4,546 psia, and is calculated as follows:

P_c = (Top of Injection Zone - Base of USDW) (0.433 psi/ft)(specific gravity) + (Base of USDW - Head of USDW) (0.433 psi/ft)

= (10,400 feet - 500 feet) (0.433 psi/ft) (1.02) + (500 feet - 100 feet) (0.433 psi/ft)

= 4,546 psia

The critical increase in reservoir pressure, ΔP_c, above the native pressure that is necessary to raise the hydrostatic head of the WDW-4 Injection Zone to the head of the lowermost USDW is 451 psi, and is calculated as follows:

$$\begin{aligned} \Delta P_c &= P_c - P_i \\ &= 4,546\ psia - 4,095\ psia \\ &= 451\ psi \end{aligned}$$

An increase in reservoir pressure greater than 451 psi would be sufficient to raise the head of the Injection Zone above the head of the lowermost USDW. The Cone of Influence is the area around the injection well within which the increase in reservoir pressure caused by injection is greater than 451 psi.

The gridded pressure increases created with PredictW were contoured using Surfer, a commercial contouring software package. The contour plots of the predicted pressure increase in the Injection Zone (Drawings 10 and 11) were generated using the average injection rate of 150 gpm over the initial 5-year permit time frame and the 30-year expected life of the well.

Conservative values for reservoir thickness and permeability were used to overestimate the predicted increase in reservoir pressure. The porosity was assumed to be 8.5 percent. The reservoir was assumed to have a consistent thickness of 75 feet. The permeability of the reservoir was assumed to be 32 millidarcies (md).

Using a low kh yields a predicted pressure increase that is greater than expected and a cone of influence that is larger than expected.

The viscosity of the formation fluid with TDS concentration of 25,000 ppm at 130 °F is 0.57 cp (Appendix D-2). The compressibility of the pore volume of the formation is c_r, is 5.5×10^{-6} psi $^{-1}$. The compressibility of the formation fluid is c_w, is 2.9×10^{-6} psi $^{-1}$. The total compressibility ($c_t = c_r + c_w$) is 8.4×10^{-6} psi $^{-1}$ (Appendix D-3).

WDW-4 was modeled as injecting for a 5-year period at a continuous rate of 150 gpm.

The 451-psi pressure-increase contour, which defines the outline of the worst-case Cone of Influence, is located less than 2.5 miles from WDW-4 as shown on Drawing 10. An improperly abandoned wellbore or other conduit filled with formation fluid that is located farther than 2.5 miles from the WDW-4 location would not transmit sufficient pressure from the Injection Zone to move fluids into the USDW. Navajo researched public and private sources of information about wells within the 1-mile radius AOR. Information is presented in Section 7(b) that demonstrates that each of the artificial penetrations that penetrate into the Injection Zone is properly constructed to prevent migration of fluids into the USDW. The output from PredictW is presented in Appendix D-4.

Modeled Plume Front Migration (5-Years)

The lithologic character of the Injection Zone, with the resulting hydrodynamic characteristics, is expected to be horizontally uniform. Given the anticipated homogeneity of the Injection Zone, plume geometry during the active injection phase is expected to be cylindrical. The plume radius is determined from the following equations published by Warner and Lehr. The radius of the concentrated plume is determined from the following:

$$r_C = \sqrt{\frac{0.1337V}{0.80\,\pi\,\phi\,h}}$$

where:

r_C	=	radius of the concentrated plume, feet
0.1337	=	factor to convert gallons to cubic feet
V	=	total injected volume, gallons
0.80	=	factor to compensate for immovable connate water
ϕ	=	formation porosity, fraction
h	=	thickness of the injection reservoir, feet

The radius of the dispersed plume is determined from:

$$r_D = 2.3\sqrt{C_D\,r_C} + r_C$$

where:

r_D	=	radius of the dispersed plume, feet
2.3	=	constant
c_D	=	coefficient of dispersion; for sandstone = 3, for limestone = 65
r_C	=	concentrated plume radius, feet

Plume Front Following 5-Year Injection Period

Approximately 500 feet of formation is anticipated to exist in the Injection Zone at the location of WDW-4. For a conservative estimate of the injection plume size, the plume radius is calculated on the basis of all flow emplaced in a 75-foot thick interval with 8.5% porosity. Assuming a continuous injection rate of 150 gpm over a 5-year injection period, the volume of fluid injected into WDW-4 is 394,470,000 gallons. Using the total volume of fluid injected and the following equation, the

radius of the concentrated plume will be approximately 1,814 feet at the end of the initial 5-year permit period.

$$r_C = \sqrt{\frac{0.1337\,(394{,}470{,}000}{0.80\,\pi\,(0.085)(75)}}$$
$$= 1{,}814 \text{ feet}$$

The radius of the dispersed plume from WDW-4 on at the end of the initial 5-year injection period is calculated to be 2,604 feet as follows:

$$r_D = 2.3\sqrt{(65)\,(1{,}814)} + 1{,}814$$
$$= 2{,}604 \text{ feet}$$

The plume radius calculations for WDW-4 are presented in Appendix D-5. Drawing 12 presents the projected plume radius following the initial 5-year injection period.

Plume Front Following 30-Year Injection Period

Assuming a continuous maximum injection rate of 150 gpm over a 30-year life of the injection well, the volume of fluid injected into WDW-4 is 2,366,820,000 gallons. The radius of the concentrated plume will be approximately 4,444 feet at the end of the 30-year life of the well.

$$r_C = \sqrt{\frac{0.1337(2{,}366{,}820{,}000}{0.80\,\pi\,(0.085)(75)}}$$
$$= 4{,}444 \text{ feet}$$

The radius of the dispersed plume from WDW-4 on at the end of the projected 30-year well life is calculated to be 5,680 feet as follows:

$$r_D = 2.3\sqrt{(65)\,(4{,}444)} + 4{,}444$$
$$= 5{,}680 \text{ feet}$$

The plume radius calculations for WDW-4 are presented in Appendix D-5. Drawing 13 presents the projected plume radius following the projected 30-year life of the well.

7 (i) Stimulation Program

The need for any type of stimulation program will be determined after the well has been drilled and tested. Should the results of the injectivity testing program performed after the well has been constructed indicate stimulation is necessary to achieve the desired injection rate, Form C-103 will be completed and submitted describing the planned stimulation program. The most likely stimulation would be an acid fracture of the dolomite Injection Interval.

7 (j) Injection Procedure

Injection into WDW-4 will occur on a continuous basis. The injection fluid will be routed from the refinery process areas via pipeline to the injection well. Figure 11 presents the pre-injection facilities for WDW-4.

Predicted Injection Rates and Volumes

The estimated average injection rate is 150 gpm which is equal to 216,000 gallons per day or 78,840,000 gallons per year or 394,416,000 gallons into the Injection Zone over the initial 5-year permit time frame and 2,366,496,000 gallons over the projected 30-year life of the well.

7 (k) Drawings

Figure 11 presents a schematic of the pre-injection surface facilities. Figure 12 presents a diagram of the below ground portions of WDW-4. Figure 13 presents a diagram of the WDW-4 wellhead.

7 (l) Construction

WDW-4 will be drilled and installed utilizing typical oil field well installation procedures. The well has been conservatively designed to meet more stringent hazardous waste injection well standards. Appendix E includes a description of the procedures for drilling and construction of WDW-4. Appendix F includes a description of the procedures for testing WDW-4 following installation.

Figure 12 presents a diagram of the below ground portions of WDW-4. Figure 13 presents a diagram of the WDW-4 wellhead. Pressure gauges to be used to indicate the pressure on the injection tubing and on the tubing-casing annulus are depicted on the wellhead.

Open-Hole Logging and Coring Program

Open-hole electric logs will be run from the base of conductor pipe to the total depth of the drilled borehole advanced for well construction. Conventional cores will be collected from the Injection Zone and Confining Zone. Table 4 summarizes the WDW-4 open-hole logging and coring program.

Casing and Cementing Program

Table 5 summarizes the WDW-4 casing program and design factors. Table 6 provides a summary of the WDW-4 cementing program. Figure 12 presents a proposed diagram of the below ground portions of WDW-4.

Cased-Hole Logging Program

Cased-hole electric logs will be run following the installation of the surface casing and protection casing. Table 7 summarizes the WDW-4 cased-hole logging program.

Injection Tubing, Packer and Annular Fluid

Figure 12 provides a schematic of the proposed below ground construction details for WDW-4. The injection tubing, packer and annular fluid proposed for use in the well are depicted on the schematic.

Depth to Injection Zone

The WDW-4 Injection Zone is expected to be encountered approximately 10,400 to 10,900 feet BGL. The actual Injection Interval (open-hole) will be selected within the Injection Zone based on evaluation of open-hole logs run in the borehole prior to casing installation.

Pressures and Other Stresses That May Cause Well Failure

There are no known subsurface pressures or stresses that may cause failure of WDW-4.

Hole Size

The borehole advanced for WDW-4 is projected to be 13-3/8 inches in diameter.

Well Casing Information

Figure 12 and Appendix E include information about the planned WDW-4 well casing. Tables 5 and 6 provide an overview of the casing and cementing information.

Cement Information

Table 6, Figure 12 and Appendix E include information about the WDW-4 cementing program.

Rate, Temperature and Volume of Injected Fluid

Average and Maximum Daily Flow Rate and Volume

The average injection rate for WDW-4 will be approximately 150 gpm and the maximum instantaneous injection rate for the well is 500 gpm.

Temperature

The temperature of the injected fluid is within average ambient temperature ranges.

Volume of Injected Fluid

The following are expected injection volumes based on an average injection rate of 150 gpm:

- Daily maximum injection volume: 216,000 gallons
- Annual maximum injection volume: 78,840,000 gallons
- 5-Year permit life injection volume: 394,416,000 gallons
- 30-Year well life injection volume: 2,366,496,000 gallons

Chemical and Physical Characteristics of Injected Fluid

The fluid to be injected into WDW-4 is the same waste stream that is currently injected into the three existing Navajo injection wells WDW-1, WDW-2 and WDW-3. This waste stream is comprised of exempt and nonexempt nonhazardous oilfield waste that is generated in the refining process. Waste waters from process units, cooling towers and boilers, streams from water purification units and desalting units, recovered and treated groundwater, and general wash waters are blended to form the fluid injected into WDW-4. Table 3A and Appendix C present data characterizing the injection fluid.

Navajo anticipates the addition of another waste stream to the existing waste stream being injected into the three existing injection wells and the planned WDW-4. The new waste stream will originate from a reverse osmosis (RO) unit to be constructed within the refinery. Table 3B and Appendix C present data characterizing the planned new waste stream from the RO unit.

Chemical and Physical Characteristics of Formation Fluid

Formation testing will be conducted during the construction of WDW-4 to obtain site-specific data relating to the chemical, physical and radiological characteristics of the formation fluids contained within the Injection Zone.

The formation fluid contained in the Injection Zone is compatible with the well construction components and the injected fluid. Formation fluid information pertinent to the reservoir calculations is included in Appendix D.

Chemical and Physical Characteristics of the Injection Zone

The Injection Zone is Silurian-Devonian age carbonates (dolostones and limestones).

Chemical and Physical Characteristics of the Confining Zone

The Confining Zone is low permeability shale of the Woodford Formation and low permeability limestone of Mississippian age.

Depth, Thickness and Chemical Characteristics of Penetrated Formations Containing Ground Water

The base of the USDW, groundwater with total dissolved solids concentration with less than 10,000 milligrams per liter (mg/L), occurs at the base of the Tansill Formation. The Tansill Formation and the underlying Yates Formation comprise the Three Twins Member of the Chalk Bluff Formation known in outcrops in the region (Hendrickson and Jones, 1952), and listed as a freshwater-producing interval. Figure 3 presents a hydrostratigraphic cross-section for the local area. Figure 4 presents a potentiometric surface map indicating the direction of groundwater movement in the freshwater aquifers.

The base of the USDW occurs at the following approximate depths in Navajo's three existing injection wells. The base of the USDW in WDW-4 is expected to be at a similar depth.

- WDW-1: approximately 493 feet KB (3,200 feet above mean sea level)
- WDW-2: approximately 473 feet KB (3,150 feet above mean sea level)
- WDW-3: approximately 420 feet KB (3,150 feet above mean sea level)

The top of the WDW-4 Injection Zone is separated from the base of the USDW by several thousand feet of lower permeability carbonates, siltstones and shales.

7 (m) Contingency Plans

WDW-4 will be equipped with a high-level shutoff switch to prevent operation of the injection pump at pressures greater than the designated MASIP. The well will be equipped with a low pressure shutoff switch that will deactivate the injection pump in the event of a surface leak. In addition, the well will be 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, the following procedures will be implemented.

- Immediately cease injection operations;
- Immediately investigate the cause of the alarm or shutdown;
- Take all necessary steps to determine the presence or absence of a leak;
- 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.

7 (n) MIT Monitoring Plans (20.6.2.5207 NMAC)

Navajo will implement a MIT monitoring program that satisfies all applicable requirements of Section 20.6.2.5207.NMAC.

- The mechanical integrity of WDW-4 will be demonstrated on an annual basis.
- Continuous monitoring devices will be used to provide a record of injection pressure, flow rate, flow volume, and annular pressure.

The results of these monitoring activities will be reported to OCD as required by regulation.

7 (o) Additional Monitoring Plans for Class I Non-Hazardous Waste Injection Wells (20.6.2.5207B NMAC)

Appendix G includes an Injected Fluids Monitoring Plan that describes the procedures to be carried out on a quarterly basis to obtain a detailed chemical and physical analysis of a representative sample of the injected fluid, including the quality assurance procedures. The plan will be updated as necessary.

The plan includes the following elements:

- The parameters for which the injected fluid will be analyzed and the rationale for the selection of these parameters;
- The test methods that will be used to test for these parameters;
- The sampling method that will be used to obtain a representative sample of the injected fluid being analyzed;
- Field sampling documentation methodologies;
- The commercial laboratory who performs the analysis; and
- Method of reporting analytical results to OCD.

7 (p) Additional Monitoring Plans for Class III Wells (20.6.2.5207C NMAC)

This section is Not Applicable; WDW-4 is not a Class III well.

7 (q) Financial Assurance

Appendix H includes a well closure plan for WDW-4. Figure 14 presents a schematic of the plugged and abandoned well. The estimated cost to plug and abandon WDW-4 is presented in the table below. This cost estimate has been

prepared to reflect the estimated costs that would be incurred by Navajo to abandon the well in accordance with the procedures in Appendix H.

Description of Service	Estimated Cost
Wireline (BHP, RTS, PFOT, Perforate)	35,000
Rental Tools	5,000
Pumping Service	20,000
Cementing Service	30,000
Excavating	2,500
Mud/Brine	7,500
Frac Tanks	2,500
Vacuum Trucks	2,500
Welder	2,500
Miscellaneous	2,500
SUBTOTAL	**110,000**
Field Supervision, Project Management, Procurement	30,000
Total Estimated Cost	**$140,000**

Appendix I includes a copy of the financial assurance instrument that Navajo has established to provide the appropriate monies for plugging and abandoning WDW-4, any groundwater restoration that may be necessary, and any post-operational monitoring that may be required.

7 (r) Logging and Testing Data

Open-hole electric logs will be run from the base of conductor pipe to the total depth of the drilled borehole advanced for well installation. Conventional cores will be collected from the Injection Zone and Confining Zone. Table 4 summarizes the WDW-4 open-hole logging and coring program. Appendix E provides more specific information about the well installation program including the planned open-hole logging and testing program.

7 (s) Mechanical Integrity Data (20.6.2.5204 NMAC)

Mechanical Integrity Testing (MIT) will be conducted on WDW-4 as part of the well completion activities described in Appendix F and in accordance with applicable regulatory requirements throughout the life of the well.

7 (t) Maximum Pressure and Flow Rate

The maximum injection rate and the calculated maximum surface injection pressure at WDW-4 are as follows:

- Maximum Instantaneous Injection Rate: 500 gpm (average rate: 150 gpm)
- Maximum Surface Injection Pressure: 2,080 psi

7 (u) Formation Testing Program Data

The following open-hole formation testing will be performed during the drilling of WDW-4:

- Collect conventional cores from Confining Zone and Injection Zone
- Run suite of open-hole electric logs from base of conductor pipe to total drilled depth

The following cased-hole formation testing will be performed during the completion of WDW-4:

- Injectivity test

Appendices E and F provide more specific information about the planned formation testing program.

7 (v) Compatibility

The fluid to be injected into WDW-4 is the same waste stream that is currently injected into the three existing Navajo injection wells WDW-1, WDW-2 and WDW-3. This waste stream is comprised of exempt and nonexempt nonhazardous oilfield waste that is generated in the refining process. Waste waters from process units, cooling towers and boilers, streams from water purification units and desalting units, recovered and treated groundwater, and

general wash waters are blended to form the fluid injected into WDW-4. Table 3A and Appendix C present data characterizing the injection fluid.

Navajo anticipates the addition of another waste stream to the current waste stream being injected into the three existing injection wells and the planned WDW-4. The new waste stream will originate from a reverse osmosis (RO) unit to be constructed within the Artesia refinery. Table 3B and Appendix C present data characterizing the planned new waste stream from the RO unit.

The three existing injection wells are constructed of carbon steel and have shown no detrimental effects from the current waste stream or the Injection Zone formation fluids. The planned WDW-4 will be constructed of similar materials of construction.

Neither of the waste streams characterized in Tables 3A and 3B are corrosive in nature. As indicated below, the new RO reject waste stream to be added into the current waste stream already being directed to the three existing injection wells is less corrosive (lower salinity) than the current waste stream. Therefore there are no concerns about any compatibility problems between the waste stream and the materials of construction.

	Current Waste Stream	**RO Reject Waste Stream**
TDS (mg/L)	5,000	3,000
Chloride (mg/L)	650	250
Sulfate (mg/L)	3,000	1,500

The current waste stream has not demonstrated any incompatibilities with the Injection Zone formation fluid. There are no concerns about waste stream compatibility with the formation fluids in the Silurian-Devonian Injection Zone.

7 (w) Area of Review Corrective Actions

No corrective action plan is required. Only one (1) of the 91 penetrations were advanced to a depth to encounter the top of the planned WDW-4 Injection Zone, and both were properly constructed and one was plugged and abandoned properly.

8.0 Modification(s)

This application does not include any proposed modifications to existing discharge processes.

9.0 Inspection/Maintenance and Reporting

Navajo performs daily visual inspections of their injection wells and the pipeline and performs required maintenance (PM) activities as scheduled to ensure safe operation of the wells.

Navajo performs routine reporting in accordance with the requirements of 20.6.2.5208.A NMAC for Class I nonhazardous waste injection wells.

10.0 Contingency Plans

Navajo 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. Injection well WDW-4 will be equipped with a high-pressure shutoff switch to prevent operation of the injection pump at pressures greater than the designated MASIP. The well will be equipped with a low pressure shutoff switch that will deactivate the injection pump in the event of a surface leak. In addition, the well will be 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, 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 is restored to the satisfaction of OCD and the agency approves resumption of injection operations.

11.0 Other Information

No additional information is required to demonstrate that the discharge permit will not result in concentrations in excess of the standards of Section 20.6.2.3103 NMAC or the presence of any toxic pollutant at any place of withdrawal of water for present or reasonably foreseeable future use.

12.0 Filing Fee

A check in the amount of $100, made payable to Water Quality Management Fund, accompanies this permit application document.

13.0 Draft Public Notice

20.6.2.3108.C requires that Navajo provide notice in accordance with 20.6.2.3108.F within thirty (30) days of OCD deeming the permit application to be administratively complete. Appendix J includes a DRAFT copy of the public notice that will be published following receipt of written notification from OCD that this discharge permit renewal application has been deemed administratively complete.

Navajo understands the requirement to submit to OCD within 15 days of completion of public notice requirements stipulated Subsection C of 20.6.2.3108 NMAC proof of notice, including an affidavit of mailing(s) and the list of property owner(s), proof of publication, and an affidavit of posting, as appropriate.

14.0 Certification

The required certification language is included at the end of the completed OCD Discharge Permit Application Form in the front of this permit renewal application. The appropriate Artesia refinery authority has signed the form.

15.0 References

Hendrickson, G.E., and Jones, R.S. *Geology and ground-water resources of Eddy County, New Mexico.* New Mexico Bureau of Mines and Mineral Resources. Ground-water Report 3.

TABLE 1
NON-FRESHWATER (OIL AND GAS) WELLS IN WDW-4 AREA OF REVIEW
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

Map ID	API	Twp-Rng-Sec	Footage	Lease Name	Well Num	Current Operator	Status and Type	Plug Date	Drill Date	Depth (ft)
1	3001500454	17S 27E 14	330 FSL 330 FWL CONGRESS SECTION	FED	1	JOHNSON BOB	D&A-O	---	1959-05-15	437
2	3001500458	17S 27E 15	330 FSL 330 FEL CONGRESS SECTION	HIGHTOWER	1	BREWER DRLG CO	D&A	---	1948-08-17	1740
3	3001500470	17S 27E 22	2310 FNL 990 FEL CONGRESS SECTION	BERRY	1	CARSON & KELLY	D&A-O	---	1939-09-05	525
4	3001500471	17S 27E 23	660 FNL 990 FWL CONGRESS SECTION	BERRY	1	BRAINARD FRED	D&A-G	---	1936-11-09	2300
5	3001500472	17S 27E 23 C SE NW	1980 FNL 1980 FWL CONGRESS SECTION	BERRY	29	ALAMO PERMIAN RES	ABD-GW	30-Jan-2013	1965-01-28	10427
6	3001500473	17S 27E 23	2310 FSL 2310 FEL CONGRESS SECTION	BERRY	5	BERRY W H	D&A-G	---	1939-11-11	595
7	3001500474	17S 27E 23	330 FSL 990 FWL CONGRESS SECTION	BERRY	6	BERRY W H	D&A	---	1939-12-01	650
8	3001500475	17S 27E 23	330 FSL 330 FEL CONGRESS SECTION	BERRY	7	BERRY W H	D&A-O	---	1939-12-18	520
9	3001500519	17S 27E 25	2310 FNL 990 FWL CONGRESS SECTION	J TRAVIS	3	JOHNSTON R J	D&A-OG	---	1941-06-02	540
10	3001500579	17S 27E 26	210 FNL 210 FEL CONGRESS SECTION	HARBOLD PERMIT	1	JONES CL	D&A	---	1939-05-16	522
11	3001500580	17S 27E 26	990 FNL 990 FEL CONGRESS SECTION	HARBOLD-FEDERAL	6	HAYNES OWEN	OIL	---	1951-08-10	633
12	3001500581	17S 27E 26	330 FNL 330 FWL CONGRESS SECTION	FEDERAL 242-A	1	HONDO OIL & GAS CO	D&A-O	---	1961-10-29	640
13	3001500582	17S 27E 26	990 FNL 990 FWL CONGRESS SECTION	HB TRAVIS	1	JOHNSTON R J	TA-O	---	1939-07-24	561
14	3001500583	17S 27E 26	1675 FNL 990 FWL CONGRESS SECTION	DB ANDERSON FEDERAL	1	JOHNSTON R J	TA	---	1952-03-03	460
15	3001500584	17S 27E 26	2310 FNL 2310 FWL CONGRESS SECTION	CUCCA-BARRENTOS	1	JOHNSTON R J	D&A-O	---	1940-10-21	730
16	3001500585	17S 27E 26	2310 FNL 990 FEL CONGRESS SECTION	HARBOLD	14	HAYNES OWEN	D&A	21-Feb-1985	1958-01-23	502
17	3001500586	17S 27E 26	2310 FNL 330 FEL CONGRESS SECTION	HARBOLD	15	HAYNES OWEN	TA	6-Jan-1965	1958-06-04	270
18	3001500587	17S 27E 26	2310 FSL 990 FEL CONGRESS SECTION	HARBOLD	1	JOHNSTON R J	D&A-OG	---	1940-05-08	555
19	3001500588	17S 27E 26	1650 FSL 990 FEL CONGRESS SECTION	HARBOLD	10	HAYNES OWEN	TA-G	2-Apr-1958	1953-07-13	491
20	3001500589	17S 27E 26	1946 FSL 650 FWL CONGRESS SECTION	FEDERAL 242	1	CHASE GEORGE A	D&AW	---	1963-10-31	1120
21	3001500594	17S 27E 26	990 FSL 2310 FEL CONGRESS SECTION	TRIGG-FEDERAL	1	S D X RESOURCES INC	ABD-OW	---	1951-09-24	415
22	3001500686	17S 27E 26	1650 FNL 990 FWL CONGRESS SECTION	TRAVIS	2	PRE-ONGARD WELL OPERAT	D&A-OG	27-Mar-2002	1940-01-15	621
23	3001501237	17S 27E 27	650 FNL 330 FEL CONGRESS SECTION	BROOKS A	1	PRE-ONGARD WELL OPERAT	D&A-O	---	1942-03-10	620
24	3001521443	17S 27E 22	660 FSL 1980 FEL CONGRESS SECTION	BERRY FEDERAL	2	PRE-ONGARD WELL OPERAT	D&A-G	15-Jan-1975	1974-12-05	9650
25	3001521511	17S 27E 23 N2 SW SE	700 FSL 1980 FEL CONGRESS SECTION	BERRY	30	ALAMO PERMIAN RES	GAS-WO	30-Nov-2012	1979-03-12	2210
26	3001521569	17S 27E 22	1980 FNL 1980 FEL CONGRESS SECTION	BERRY	31	PRE-ONGARD WELL OPERAT	J&A	15-Oct-1975	1975-09-10	200
27	3001521668	17S 27E 22	1968 FNL 1980 FEL CONGRESS SECTION	BERRY	31X	S D X RESOURCES INC	TA	20-Jun-2000	1975-10-29	2210
28	3001529281	17S 27E 23	660 FSL 1650 FWL CONGRESS SECTION	OXY VIKING FEDERAL	1	OXY USA WTP LP	GAS	---	1996-12-28	9650
29	3001529936	17S 27E 27 NE NE	330 FNL 840 FEL CONGRESS SECTION	EAGLE `27` FEDERAL	1	LIME ROCK RES IIA LP	OIL	---	1998-10-15	2700
30	3001529937	17S 27E 27 NW NE	330 FNL 2310 FEL CONGRESS SECTION	EAGLE `27B` FEDERAL	3	LIME ROCK RES IIA LP	OIL	---	1998-01-22	2750
31	3001530181	17S 27E 26 N2 SW NW	1650 FNL 660 FWL CONGRESS SECTION	OXY CHARLEMAGNE FEDERAL	1	OXY USA WTP LP	GAS	---	1998-06-23	9660
32	3001530386	17S 27E 23 E2 NW NE	660 FNL 1650 FEL CONGRESS SECTION	OXY WODEN FEDERAL	1	OXY U S A INC	D&A	6-Aug-1999	1999-07-15	9630
32	3001530386	17S 27E 23 E2 NW NE	660 FNL 1650 FEL CONGRESS SECTION	WODEN FEDERAL	1	S D X RESOURCES INC	CANCEL	---		9800
33	3001530532	17S 27E 22 SW NE	1650 FNL 1650 FEL CONGRESS SECTION	MARALO FEDERAL	2	MURCHISON O&G INC	GAS	---	1998-12-19	9650
34	3001530795	17S 27E 22 S2 NE SE	1830 FSL 660 FEL CONGRESS SECTION	MARALO FEDERAL	4	MURCHISON O&G INC	ABD-GW	27-Feb-2007	1999-12-10	9720
35	3001530882	17S 27E 26 NE SE	1980 FSL 660 FEL CONGRESS SECTION	OXY HARVESTER FEDERAL	1	OXY USA WTP LP	GAS	---	2000-03-07	9820
36	3001530908	17S 27E 23 C NW NW	660 FNL 660 FWL CONGRESS SECTION	OXY ROSENKAVLIER FEDERAL	1	OXY USA WTP LP	GAS	---	2000-02-05	9800
37	3001530956	17S 27E 26 NE NW NE	530 FNL 1650 FEL CONGRESS SECTION	TRIGG FEDERAL	1	VANGUARD OPRTNG LLC	OIL-WO	---	2002-08-27	3600
38	3001531113	17S 27E 23 NE SW NE	1650 FNL 1650 FEL CONGRESS SECTION	BERRY FEDERAL	34	HANSON ENERGY	ABD-OW	18-Jan-2008	2000-05-09	3075

TABLE 1
NON-FRESHWATER (OIL AND GAS) WELLS IN WDW-4 AREA OF REVIEW
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

Map ID	API	Twp-Rng-Sec	Footage	Lease Name	Well Num	Current Operator	Status and Type	Plug Date	Drill Date	Depth (ft)
39	3001531193	17S 27E 26 SW SW NE	2310 FNL 1650 FEL CONGRESS SECTION	TRIGG FEDERAL	2	LIME ROCK RES A LP	OIL-WO	5-Oct-2010	2002-11-19	3690
39	3001531193	17S 27E 26 SW SW NE	2310 FNL 1650 FEL CONGRESS SECTION	TRIGG FEDERAL	2	LIME ROCK RES A LP	ABD-OW	5-Oct-2010	2000-08-28	3690
40	3001532614	17S 27E 27 S2 NW NE	1260 FNL 1980 FEL CONGRESS SECTION	HONDO FEDERAL GAS COM	3	CONCHO EXPLORATION	D&A	13-Jun-2003	2003-05-17	9670
41	3001536875	17S 27E 26 C NE SW	1980 FSL 1980 FWL CONGRESS SECTION	OXY COMMODORE FEDERAL	1	OXY USA WTP LP	AB-LOC	---	---	10525
42	3001539462	17S 27E 25 NW SW	2235 FSL 330 FWL CONGRESS SECTION	FIR FEDERAL	4	COG OPERATING LLC	OIL	---	2011-12-11	4750
43	3001521047	17S 27E 26 C NW SW	1980 FSL 660 FWL CONGRESS SECTION	ARCO FEDERAL GAS	1	COG OPERATING LLC	GAS	---	1973-12-31	9740
44	3001539763	17S 27E 25 SE NW	1650 FNL 1410 FWL CONGRESS SECTION	DOGWOOD FEDERAL	3	COG OPERATING LLC	OIL	---	2012-04-06	4766
45	3001540804	17S 27E 25 SW NW	2130 FNL 330 FWL CONGRESS SECTION	MATTHEWS `25` FEDERAL	1	LIME ROCK RES IIA LP	OIL-WO	---	2016-05-25	4717
45	3001540804	17S 27E 25 SW NW	2130 FNL 330 FWL CONGRESS SECTION	MATTHEWS `25` FEDERAL	1	LIME ROCK RES IIA LP	OIL	---	2012-11-08	4717
46	3001541261	17S 27E 23 SE	1150 FSL 1150 FEL CONGRESS SECTION	YESO VIKING FEDERAL	9	OXY USA WTP LP	OIL	---	2013-12-19	4520
47	3001541339	17S 27E 23 SW	2230 FSL 360 FWL CONGRESS SECTION	YESO VIKING FEDERAL	2	OXY USA WTP LP	OIL	---	2013-11-06	4505
48	3001541340	17S 27E 23 SW	2240 FSL 1680 FWL CONGRESS SECTION	YESO VIKING FEDERAL	3	OXY USA WTP LP	OIL	---	2013-07-22	4534
49	3001541341	17S 27E 23 SE	2210 FSL 2180 FEL CONGRESS SECTION	YESO VIKING FEDERAL	4	OXY USA WTP LP	OIL	---	2013-07-30	4507
50	3001541342	17S 27E 23 SW	950 FSL 330 FWL CONGRESS SECTION	YESO VIKING FEDERAL	6	OXY USA WTP LP	OIL	---	2013-11-28	4525
51	3001541425	17S 27E 23 SW	380 FSL 2240 FWL CONGRESS SECTION	YESO VIKING FEDERAL	7	OXY USA WTP LP	OIL	---	2013-12-27	4525
52	3001541468	17S 27E 23 SE	1045 FSL 2160 FEL CONGRESS SECTION	YESO VIKING FEDERAL	8	OXY USA WTP LP	OIL	---	2014-01-04	4520
53	3001541698	17S 27E 25 NW NW	985 FNL 330 FWL CONGRESS SECTION	MATTHEWS `25` FEDERAL	3	LIME ROCK RES IIA LP	AT-TD	---	2017-01-18	4500
54	3001541699	17S 27E 25 NW NW	370 FNL 985 FWL CONGRESS SECTION	MATTHEWS `25` FEDERAL	4	LIME ROCK RES IIA LP	PERMIT	---	---	4850
55	3001541721	17S 27E 25	2180 FNL 1115 FWL CONGRESS SECTION	MATTHEWS `25` FEDERAL	2	LIME ROCK RES IIA LP	OIL-WO	---	2015-04-30	4969
56	3001541853	17S 27E 23 SW	240 FSL 210 FWL CONGRESS SECTION	YESO VIKING FEDERAL	26	OXY USA WTP LP	AB-LOC	---	---	---
57	3001541854	17S 27E 23	2555 FSL 890 FWL CONGRESS SECTION	YESO VIKING FEDERAL	19	OXY USA WTP LP	AB-LOC	---	---	---
58	3001541870	17S 27E 23	1755 FSL 900 FWL CONGRESS SECTION	YESO VIKING FEDERAL	10	OXY USA WTP LP	AB-LOC	---	---	---
59	3001541871	17S 27E 23	1435 FSL 2261 FWL CONGRESS SECTION	YESO VIKING FEDERAL	11	OXY USA WTP LP	AB-LOC	---	---	---
60	3001541872	17S 27E 23	1720 FSL 1650 FEL CONGRESS SECTION	YESO VIKING FEDERAL	12	OXY USA WTP LP	AB-LOC	---	---	---
61	3001541873	17S 27E 23 SE	2480 FSL 451 FEL CONGRESS SECTION	YESO VIKING FEDERAL	13	OXY USA WTP LP	AB-LOC	---	---	---
62	3001541874	17S 27E 23	1017 FSL 2040 FEL CONGRESS SECTION	YESO VIKING FEDERAL	16	OXY USA WTP LP	AB-LOC	---	---	---
63	3001541875	17S 27E 23	1202 FSL 903 FEL CONGRESS SECTION	YESO VIKING FEDERAL	17	OXY USA WTP LP	AB-LOC	---	---	---
64	3001541876	17S 27E 23	2080 FSL 360 FWL CONGRESS SECTION	YESO VIKING FEDERAL	18	OXY USA WTP LP	AB-LOC	---	---	---
65	3001541877	17S 27E 23	1670 FSL 1680 FWL CONGRESS SECTION	YESO VIKING FEDERAL	20	OXY USA WTP LP	AB-LOC	---	---	---
66	3001541878	17S 27E 23	2200 FSL 2240 FWL CONGRESS SECTION	YESO VIKING FEDERAL	21	OXY USA WTP LP	AB-LOC	---	---	---
67	3001541879	17S 27E 23	1670 FSL 2130 FEL CONGRESS SECTION	YESO VIKING FEDERAL	22	OXY USA WTP LP	AB-LOC	---	---	---
68	3001541880	17S 27E 23 SE	2210 FSL 1680 FEL CONGRESS SECTION	YESO VIKING FEDERAL	23	OXY USA WTP LP	AB-LOC	---	---	---
69	3001541881	17S 27E 23	2409 FSL 876 FEL CONGRESS SECTION	YESO VIKING FEDERAL	24	OXY USA WTP LP	AB-LOC	---	---	---
70	3001541882	17S 27E 23	1670 FSL 710 FEL CONGRESS SECTION	YESO VIKING FEDERAL	25	OXY USA WTP LP	AB-LOC	---	---	---
71	3001541883	17S 27E 23 SW	380 FSL 1640 FWL CONGRESS SECTION	YESO VIKING FEDERAL	28	OXY USA WTP LP	AB-LOC	---	---	---
72	3001541884	17S 27E 23 SE	25 FSL 2327 FEL CONGRESS SECTION	YESO VIKING FEDERAL	30	OXY USA WTP LP	AB-LOC	---	---	---
73	3001541885	17S 27E 23	978 FSL 1920 FEL CONGRESS SECTION	YESO VIKING FEDERAL	31	OXY USA WTP LP	AB-LOC	---	---	---
74	3001541997	17S 27E 23	360 FSL 770 FWL CONGRESS SECTION	YESO VIKING FEDERAL	14	OXY USA WTP LP	AB-LOC	---	---	---
75	3001541998	17S 27E 23	714 FSL 1277 FWL CONGRESS SECTION	YESO VIKING FEDERAL	15	OXY USA WTP LP	AB-LOC	---	---	---
76	3001541999	17S 27E 23 SW	850 FSL 860 FWL CONGRESS SECTION	YESO VIKING FEDERAL	27	OXY USA WTP LP	AB-LOC	---	---	---

TABLE 1
NON-FRESHWATER (OIL AND GAS) WELLS IN WDW-4 AREA OF REVIEW
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

Map ID	API	Twp-Rng-Sec	Footage	Lease Name	Well Num	Current Operator	Status and Type	Plug Date	Drill Date	Depth (ft)
77	3001542301	17S 27E 26 SE	1720 FSL 920 FEL CONGRESS SECTION	EAGLE `26` I FEDERAL	7	LIME ROCK RES IIA LP	AB-LOC	---	---	---
78	3001500453	17S 27E 14	330 FSL 330 FEL CONGRESS SECTION	HUMBLE	1	COCKBURN BARNEY	D&A-O	25-May-1955	1948-12-31	550
79	3001531179	17S 27E 24 NE SW NW	1650 FNL 870 FWL CONGRESS SECTION	BERRY `A` FEDERAL	36	S D X RESOURCES INC	AB-LOC	---	---	---
80	3001500483	17S 27E 24	1650 FNL 990 FWL CONGRESS SECTION	BERRY /A/	27	ALAMO PERMIAN RES	D&A - Gas	13-Dec-2011	1974-07-01	1200
81	3001500497	17S 27E 24	2310 FSL 1650 FWL CONGRESS SECTION	BERRY	22	ALAMO PERMIAN RES	D&A - Oil	9-Jun-2012	1955-12-01	2192
82	3001500499	17S 27E 24	2310 FSL 1920 FWL CONGRESS SECTION	BERRY-FEDERAL	19	PRE-ONGARD WELL OPERAT	ABD-OW	5-Oct-1984	1941-10-17	477
83	3001525154	17S 27E 24	1650 FSL 2040 FWL CONGRESS SECTION	BERRY `A`	WI-33	ALAMO PERMIAN RES	W-INJ	---	1985-04-02	626
84	3001500498	17S 27E 24	1650 FSL 2310 FWL CONGRESS SECTION	BERRY-FEDERAL	11	ALAMO PERMIAN RES	D&A - Oil	5-Dec-2012	1941-01-28	482
85	3001531743	17S 27E 24 NW SE SW	1010 FSL 1650 FWL CONGRESS SECTION	OXY CHOPSTICKS FEDERAL	2	OXY USA WTP LP	GAS	---	2001-06-04	9800
86	3001501532	17S 27E 24	660 FSL 1980 FWL CONGRESS SECTION	BERRY	1	FLINT & BERRY	D&A-O	---	1936-02-22	490
87	3001500500	17S 27E 24	250 FSL 2390 FWL CONGRESS SECTION	MCCLAY	1	PRE-ONGARD WELL OPERAT	D&A-OG	---	1927-07-17	2000
88	3001532694	17S 27E 25 NW NE NW	503 FNL 1800 FWL CONGRESS SECTION	REDBUD FEDERAL	1	COG OPERATING LLC	OIL-WO	---	10-Apr-2003	7130
89	3001533980	17S 27E 23 S2 NE SE	1830 FSL 660 FEL CONGRESS SECTION	OXY VIKING FEDERAL	2	OXY USA WTP LP	AB-LOC	---	---	---
90	3001541852	17S 27E 23 SW	432 FSL 2100 FWL CONGRESS SECTION	YESO VIKING FEDERAL	29	OXY USA WTP LP	AB-LOC	---	---	---
91	3001541260	17S 27E 23 SW	1670 FSL 860 FEL CONGRESS SECTION	YESO VIKING FEDERAL	5	OXY USA WTP LP	OIL	---	2013-12-09	4500

TABLE 2
FRESHWATER WELLS IN WDW-4 AREA OF REVIEW
HOLLYFRONTIER NAVAJO REFINING LLC
WASTE DISPOSAL WELL NO. 4
ARTESIA, NEW MEXICO

WR File Nbr	Use	Owner	County	Depth (ft)	Date	Sec	Tws	Rng	Easting	Northing
RA 04554	Other	LOWE DRILLING COMPANY	Eddy	220	2/19/1962	23	17S	27E	569,859	3,631,947
RA 04561	Other	LOWE DRILLING COMPANY	Eddy	250	unknown	26	17S	27E	570,871	3,630,142

NOTES:
Source: New Mexico Office of the State Engineer (http://gisdata-ose.opendata.arcgis.com/datasets)
Datum: NAD83

TABLE 3A
INJECTION FLUID CHARACTERATION
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

Mar-14		
MISC		
ANALYTE	**RESULT**	**UNIT**
Bicarbonate (As CaCO3)	270	mg/L CaCO3
Bromide	1.6	mg/L
Carbonate (As CaCO3)	< 2.0	mg/L CaCO3
Chloride	410	mg/L
Fluoride	5.5	mg/L
Ignitability	>200	°F
Nitrogen, Nitrate (As N)	< 1.0	mg/L
Nitrogen, Nitrite (As N)	< 1.0	mg/L
pH	7.45	pH Units
Phosphorus, Orthophosphate (As P)	< 5.0	mg/L
Reactive Cyanide	< 1.00	mg/Kg
Reactive Sulfide	5.1	mg/Kg
Specific Conductance	7000	µmhos/cm
Specific Gravity	1.006	
Sulfate	3900	mg/L
Total Alkalinity (as CaCO3)	270	mg/L CaCO3
Total Dissolved Solids	6180	mg/L

Jun-14		
ANALYTE	**RESULT**	**UNIT**
Bicarbonate (As CaCO3)	290	mg/L CaCO3
Bromide	0.72	mg/L
Carbonate (As CaCO3)	< 2.0	mg/L CaCO3
Chloride	290	mg/L
Cyanide, Reactive	< 1.00	mg/L
Fluoride	28	mg/L
Ignitability	>200	°F
Nitrogen, Nitrate (As N)	< 0.50	mg/L
Nitrogen, Nitrite (As N)	1.5	mg/L
pH	7.91	pH units
Phosphorus, Orthophosphate (As P)	< 2.5	mg/L
Reactive Sulfide	< 1.0	mg/L
Specific Conductance	6000	µmhos/cm
Specific Gravity	1.003	
Sulfate	2600	mg/L
Total Alkalinity (as CaCO3)	290	mg/L CaCO3
Total Dissolved Solids	4440	mg/L

Sep-14		
ANALYTE	**RESULT**	**UNIT**
Bicarbonate (As CaCO3)	120	mg/L CaCO3
Bromide	< 0.50	mg/L
Carbonate (As CaCO3)	< 2.0	mg/L CaCO3
Chloride	350	mg/L
Cyanide, Reactive	< 1.00	mg/L
Fluoride	7.0	mg/L
Ignitability	>200	°F
Nitrogen, Nitrate (As N)	< 0.50	mg/L
Nitrogen, Nitrite (As N)	< 0.50	mg/L
pH	6.61	pH Units
Phosphorus, Orthophosphate (As P)	< 10	mg/L
Reactive Sulfide	< 1.0	mg/L
Specific Conductance	5400	µmhos/cm
Specific Gravity	1.001	
Sulfate	2500	mg/L
Total Alkalinity (as CaCO3)	120	mg/L CaCO3
Total Dissolved Solids	4700	mg/L

TOTAL METALS

Aluminum	2.3	mg/L
Antimony	< 0.050	mg/L
Arsenic	< 0.020	mg/L
Barium	0.049	mg/L
Beryllium	< 0.0030	mg/L
Cadmium	< 0.0020	mg/L
Calcium	93	mg/L
Chromium	< 0.0060	mg/L
Cobalt	< 0.0060	mg/L
Copper	0.0092	mg/L
Iron	3.3	mg/L
Lead	< 0.0050	mg/L
Magnesium	30	mg/L
Manganese	0.12	mg/L
Mercury	< 0.00020	mg/L
Nickel	0.016	mg/L
Potassium	37	mg/L
Selenium	0.13	mg/L
Silver	< 0.0050	mg/L
Sodium	1400	mg/L
Thallium	< 0.050	mg/L
Vanadium	< 0.050	mg/L
Zinc	0.15	mg/L

Aluminum	1.2	mg/L
Antimony	< 0.050	mg/L
Arsenic	0.027	mg/L
Barium	< 0.020	mg/L
Beryllium	< 0.0030	mg/L
Cadmium	< 0.0020	mg/L
Calcium	27	mg/L
Chromium	< 0.0060	mg/L
Cobalt	< 0.0060	mg/L
Copper	< 0.0060	mg/L
Iron	0.21	mg/L
Lead	< 0.0050	mg/L
Magnesium	9.2	mg/L
Manganese	0.032	mg/L
Mercury	< 0.00020	mg/L
Nickel	< 0.010	mg/L
Potassium	69	mg/L
Selenium	0.069	mg/L
Silver	< 0.0050	mg/L
Sodium	1200	mg/L
Thallium	< 0.050	mg/L
Vanadium	< 0.050	mg/L
Zinc	< 0.020	mg/L

Aluminum	0.18	mg/L
Antimony	< 0.050	mg/L
Arsenic	0.061	mg/L
Barium	0.022	mg/L
Beryllium	< 0.0030	mg/L
Cadmium	< 0.0020	mg/L
Calcium	80	mg/L
Chromium	< 0.0060	mg/L
Cobalt	< 0.0060	mg/L
Copper	< 0.0060	mg/L
Iron	0.50	mg/L
Lead	< 0.0050	mg/L
Magnesium	28	mg/L
Manganese	0.21	mg/L
Mercury	< 0.00020	mg/L
Nickel	0.012	mg/L
Potassium	58	mg/L
Selenium	< 0.050	mg/L
Silica	9.8	mg/L
Silver	< 0.0050	mg/L
Thallium	< 0.050	mg/L
Titanium	< 0.0050	mg/L

TCLP METALS

Mar-14		
Arsenic	<0.10	mg/L
Barium	<0.010	mg/L
Cadmium	<0.010	mg/L
Chromium	<0.010	mg/L
Lead	<0.010	mg/L
Mercury	<0.020	mg/L
Selenium	<0.010	mg/L
Silver	<0.010	mg/L

Jun-14		
Arsenic	< 5.0	mg/L
Barium	< 100	mg/L
Cadmium	< 1.0	mg/L
Chromium	< 5.0	mg/L
Lead	< 5.0	mg/L
Mercury	< 0.020	mg/L
Selenium	< 1.0	mg/L
Silver	< 5.0	mg/L

Sep-14		
Arsenic	< 5.0	mg/L
Barium	< 100	mg/L
Cadmium	< 1.0	mg/L
Chromium	< 5.0	mg/L
Lead	< 5.0	mg/L
Mercury	< 0.020	mg/L
Selenium	< 1.0	mg/L
Silver	< 5.0	mg/L

TABLE 3A
INJECTION FLUID CHARACTERATION
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

MARCH 2014

SEMI-VOLATILES AND VOLATILES

1,1,1,2-Tetrachloroethane	< 0.50	3-Nitroaniline	< 10	Chloromethane	< 0.50	Methylcyclohexane	1.2
1,1,1-Trichloroethane	< 0.50	4,6-Dinitro-2-methylphenol	< 10	Chloroprene	< 0.50	Methylene Chloride	< 2.5
1,1,2,2-Tetrachloroethane	< 0.50	4-Bromophenyl phenyl ether	< 10	Chrysene	< 0.10	mp-Xylenes	< 1.0
1,1,2-Trichloroethane	< 0.50	4-Chloro-3-methylphenol	< 5.0	cis-1,2-DCE	< 0.50	n-Amyl acetate	< 0.50
1,1-Biphenyl	< 1.0	4-Chloroaniline	< 10	cis-1,3-Dichloropropene	< 0.50	Naphthalene	< 10
1,1-Dichloroethane	< 0.50	4-Chlorophenyl phenyl ether	< 10	Cyclohexane	1.6	n-Butylbenzene	< 0.50
1,1-Dichloroethene	< 0.50	4-Chlorotoluene	< 0.50	Dibenz(a,h)anthracene	< 1.0	n-Hexane	< 0.50
1,1-Dichloropropene	< 0.50	4-Isopropyltoluene	< 0.50	Dibenzofuran	< 10	Nitrobenzene	< 5.0
1,2,3-Trichlorobenzene	< 0.50	4-Nitroaniline	< 10	Dibromochloromethane	< 0.50	N-Nitroso-di-n-butylamine	< 1.0
1,2,3-Trichloropropane	< 0.50	4-Nitrophenol	< 10	Dibromomethane	< 0.50	N-Nitrosodi-n-propylamine	< 10
1,2,4,5-Tetrachlorobenzene	< 10	Acenaphthene	< 10	Dichlorodifluoromethane	< 0.50	N-Nitrosodiphenylamine	< 2.0
1,2,4-Trichlorobenzene	< 0.50	Acenaphthylene	< 10	Diethyl ether	< 0.50	n-Propylbenzene	< 0.50
1,2,4-Trimethylbenzene	< 0.50	Acetone	42	Diethyl phthalate	< 10	o-Toluidine	< 1.0
1,2-Dibromo-3-chloropropane	< 0.50	Acetonitrile	< 10	Diisopropyl ether	< 0.50	o-Xylene	< 0.50
1,2-Dibromoethane (EDB)	< 0.50	Acetophenone	< 10	Dimethyl phthalate	< 10	Pentachloroethane	< 5.0
1,2-Dichlorobenzene	< 0.50	Acrolein	< 10	Di-n-butyl phthalate	< 10	Pentachlorophenol	< 10
1,2-Dichloroethane (EDC)	< 0.50	Acrylonitrile	< 10	Di-n-octyl phthalate	< 10	Phenanthrene	< 10
1,2-Dichloropropane	< 0.50	Allyl chloride	< 0.50	Epichlorohydrin	< 5.0	Phenol	< 5.0
1,3,5-Trimethylbenzene	< 0.50	Anthracene	< 10	Ethyl acetate	< 0.50	p-isopropyltoluene	< 0.50
1,3-Dichlorobenzene	< 0.50	Benz(a)anthracene	< 1.0	Ethyl methacrylate	< 0.50	Propionitrile	< 0.50
1,3-Dichloropropane	< 0.50	Benzene	0.63	Ethyl tert-butyl ether	< 0.50	Pyrene	< 10
1,4-Dichlorobenzene	< 0.50	Benzo(a)pyrene	< 1.0	Ethylbenzene	< 0.50	Pyridine	< 1.0
1,4-Dioxane	< 20	Benzo(b)fluoranthene	< 1.0	Fluoranthene	< 10	sec-Butylbenzene	< 0.50
1-Methylnaphthalene	< 10	Benzo(g,h,i)perylene	< 1.0	Fluorene	< 10	Styrene	< 0.50
2,2-Dichloropropane	< 0.50	Benzo(k)fluoranthene	< 1.0	Freon-113	< 0.50	tert-Amyl methyl ether	< 0.50
2,3,4,6-Tetrachlorophenol	< 10	Bis(2-chloroethoxy)methane	< 10	Hexachlorobenzene	< 1.0	tert-Butyl alcohol	< 20
2,4,5-Trichlorophenol	< 10	Bis(2-chloroethyl)ether	< 10	Hexachlorobutadiene	< 10	tert-Butylbenzene	< 0.50
2,4,6-Trichlorophenol	< 10	Bis(2-chloroisopropyl)ether	< 10	Hexachlorocyclopentadiene	< 10	Tetrachloroethene (PCE)	< 0.50
2,4-Dichlorophenol	< 10	Bis(2-ethylhexyl)phthalate	< 5.0	Hexachloroethane	< 10	Tetrahydrofuran	< 0.50
2,4-Dimethylphenol	< 10	Bromobenzene	< 0.50	Indeno(1,2,3-cd)pyrene	< 1.0	Toluene	< 0.50
2,4-Dinitrophenol	< 10	Bromochloromethane	< 0.50	Iodomethane	< 0.50	trans-1,2-DCE	< 0.50
2,4-Dinitrotoluene	< 10	Bromodichloromethane	< 0.50	Isobutanol	< 20	trans-1,3-Dichloropropene	< 0.50
2-Chloroethyl vinyl ether	< 1.0	Bromoform	< 0.50	Isophorone	< 10	trans-1,4-Dichloro-2-butene	< 0.50
2-Chloronaphthalene	< 10	Bromomethane	< 0.50	Isopropyl acetate	< 0.50	Trichloroethene (TCE)	< 0.50
2-Chlorophenol	< 10	Butyl benzyl phthalate	< 10	Isopropylbenzene	< 0.50	Trichlorofluoromethane	< 0.50
2-Chlorotoluene	< 0.50	Caprolactam	< 0.10	Methacrylonitrile	< 0.50	Vinyl acetate	< 0.50
2-Hexanone	< 0.50	Carbazole	< 10	Methyl acetate	< 0.50	Vinyl chloride	< 0.50
2-Methylnaphthalene	< 10	Carbon disulfide	5.6	Methyl ethyl ketone	5.6		
2-Methylphenol	< 10	Carbon Tetrachloride	< 0.50	Methyl isobutyl ketone	< 2.5		
2-Nitroaniline	< 10	Chlorobenzene	< 0.50	Methyl methacrylate	< 0.50		
2-Nitrophenol	< 10	Chloroethane	< 0.50	Methyl methacrylate	< 0.50		
3,3´-Dichlorobenzidine	< 10	Chloroform	0.64	Methyl tert-butyl ether (MTBE	< 10		

All parameters reported in µg/L

TABLE 3A
JUNE 2014 INJECTION FLUID CHARACTERATION
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

JUNE 2014
SEMI-VOLATILES AND VOLATILES

1,1,1,2-Tetrachloroethane	< 0.50
1,1,1,2-Tetrachloroethane	< 0.50
1,1,1-Trichloroethane	< 0.50
1,1,2,2-Tetrachloroethane	< 0.50
1,1,2-Trichloroethane	< 0.50
1,1-Biphenyl	< 0.10
1,1-Dichloroethane	< 0.50
1,1-Dichloroethene	< 0.50
1,1-Dichloropropene	< 0.50
1,2,3-Trichlorobenzene	< 0.50
1,2,3-Trichloropropane	< 0.50
1,2,4,5-Tetrachlorobenzene	< 10
1,2,4-Trichlorobenzene	< 0.50
1,2,4-Trimethylbenzene	< 0.50
1,2-Dibromo-3-chloropropane	< 0.50
1,2-Dibromoethane (EDB)	< 0.50
1,2-Dichlorobenzene	< 0.50
1,2-Dichloroethane (EDC)	< 0.50
1,2-Dichloropropane	< 0.50
1,3-Dichlorobenzene	< 0.50
1,3-Dichloropropane	< 0.50
1,4-Dichlorobenzene	< 0.50
1,4-Dioxane	< 20
1-Methylnaphthalene	< 10
2,2-Dichloropropane	< 0.50
2,3,4,6-Tetrachlorophenol	< 10
2,4,5-Trichlorophenol	< 10
2,4,6-Trichlorophenol	< 10
2,4-Dichlorophenol	< 10
2,4-Dimethylphenol	< 10
2,4-Dinitrophenol	< 10
2,4-Dinitrotoluene	< 10
2-Chloroethyl vinyl ether	< 2.5
2-Chloronaphthalene	< 10
2-Chlorophenol	< 10
2-Chlorotoluene	< 0.50
2-Hexanone	< 0.50
2-Methylnaphthalene	< 10

3,3´-Dichlorobenzidine	< 10
3-Nitroaniline	< 10
4,6-Dinitro-2-methylphenol	< 10
4-Bromophenyl phenyl ether	< 10
4-Chloro-3-methylphenol	< 5.0
4-Chloroaniline	< 10
4-Chlorophenyl phenyl ether	< 10
2-Methylphenol	< 10
2-Nitroaniline	< 10
2-Nitrophenol	< 10
4-Chlorotoluene	< 0.50
4-Nitroaniline	< 10
4-Nitrophenol	< 10
Acenaphthene	< 10
Acenaphthylene	< 10
Acetone	15
Acetonitrile	< 2.5
Acetophenone	< 10
Acrolein	< 2.5
Acrylonitrile	< 10
Allyl chloride	< 0.50
Anthracene	< 10
Atrazine	< 0.10
Benz(a)anthracene	< 0.10
Benzaldehyde	< 0.10
Benzene	0.64
Benzo(a)pyrene	< 0.10
Benzo(b)fluoranthene	< 0.10
Benzo(g,h,i)perylene	< 10
Benzo(k)fluoranthene	< 0.10
Bis(2-chloroethoxy)methane	< 10
Bis(2-chloroethyl)ether	< 10
Bis(2-chloroisopropyl)ether	< 10
Bis(2-ethylhexyl)phthalate	< 5.0
Bromobenzene	< 0.50
Bromochloromethane	< 0.50
Bromodichloromethane	< 0.50
Bromoform	< 0.50

Bromomethane	< 0.50
Butyl benzyl phthalate	< 10
Caprolactam	< 0.10
Carbazole	< 10
Carbon disulfide	< 0.50
Carbon Tetrachloride	< 0.50
Chlorobenzene	< 0.50
Chloroethane	< 0.50
Chloroform	< 0.50
Chloromethane	< 0.50
Chloroprene	< 0.50
Chrysene	< 0.10
cis-1,2-DCE	< 0.50
cis-1,3-Dichloropropene	< 0.50
Cyclohexane	< 2.5
Cyclohexane	< 0.50
Dibenz(a,h)anthracene	< 0.10
Dibenzofuran	< 10
Dibromochloromethane	< 0.50
Dibromomethane	< 0.50
Dichlorodifluoromethane	< 0.50
Diethyl ether	< 0.50
Diethyl phthalate	< 10
Diisopropyl ether	< 0.50
Dimethyl phthalate	< 10
Di-n-butyl phthalate	< 10
Di-n-octyl phthalate	< 10
Epichlorohydrin	< 5.0
Ethyl acetate	< 0.50
Ethyl methacrylate	< 2.5
Ethyl tert-butyl ether	< 0.50
Ethylbenzene	< 0.50
Fluoranthene	< 10
Fluorene	< 10
Freon-113	< 0.50
Hexachlorobenzene	< 1.0
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10

Hexachloroethane	< 10
Indeno(1,2,3-cd)pyrene	< 0.10
Iodomethane	< 0.50
Isobutanol	< 50
Isophorone	< 10
Isopropyl acetate	< 0.50
Isopropylbenzene	< 0.50
Methacrylonitrile	< 2.5
Methyl acetate	< 0.50
Methyl ethyl ketone	< 2.5
Methyl isobutyl ketone	< 2.5
Methyl methacrylate	< 2.5
Methyl tert-butyl ether (MTBE)	< 10
Methylcyclohexane	< 1.0
Methylene Chloride	< 2.5
mp-Xylenes	< 1.0
n-Amyl acetate	< 0.50
Naphthalene	< 10
n-Butylbenzene	< 0.50
n-Hexane	< 0.50
Nitrobenzene	< 5.0
N-Nitroso-di-n-butylamine	< 0.10
N-Nitrosodi-n-propylamine	< 10
N-Nitrosodiphenylamine	< 2.0
n-Propylbenzene	< 0.50
o-Toluidine	< 0.10
o-Xylene	< 0.50
Pentachloroethane	< 5.0
Pentachlorophenol	< 10
Phenanthrene	< 10
Phenol	< 5.0
p-isopropyltoluene	< 0.50
Propionitrile	< 2.5
Pyrene	< 10
Pyridine	< 0.10
sec-Butylbenzene	< 0.50
Styrene	< 0.50
tert-Amyl methyl ether	< 0.50

tert-Butyl alcohol	< 10
tert-Butylbenzene	< 0.50
Tetrachloroethene (PCE)	< 0.50
Tetrahydrofuran	< 0.50
Toluene	< 0.50
trans-1,2-DCE	< 0.50
trans-1,3-Dichloropropene	< 0.50
trans-1,4-Dichloro-2-butene	< 0.50
Trichloroethene (TCE)	< 0.50
Trichlorofluoromethane	< 0.50
Vinyl acetate	< 0.50
Vinyl acetate	< 0.50
Vinyl chloride	< 0.50

All parameters measured in µg/l

TABLE 3A
SEPTEMBER 2014 INJECTION FLUID CHARACTERATION
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

SEPTEMBER 2014
SEMI-VOLATILES AND VOLATILES

1,1,1,2-Tetrachloroethane	< 0.50
1,1,1-Trichloroethane	< 0.50
1,1,2,2-Tetrachloroethane	< 0.50
1,1,2-Trichloroethane	< 0.50
1,1-Biphenyl	< 5.0
1,1-Dichloroethane	< 0.50
1,1-Dichloropropene	< 0.50
1,2,3-Trichlorobenzene	< 0.50
1,2,3-Trichloropropane	< 0.50
1,2,4,5-Tetrachlorobenzene	< 10
1,2,4-Trichlorobenzene	< 0.50
1,2,4-Trimethylbenzene	< 0.50
1,2-Dibromo-3-chloropropane	< 0.50
1,2-Dibromoethane (EDB)	< 0.50
1,2-Dichlorobenzene	< 0.50
1,2-Dichloroethane (EDC)	< 0.50
1,2-Dichloropropane	< 0.50
1,3,5-Trimethylbenzene	< 0.50
1,3-Dichlorobenzene	< 0.50
1,3-Dichloropropane	< 0.50
1,4-Dichlorobenzene	< 0.50
1,4-Dioxane	< 20
1-Methylnaphthalene	< 10
2,2-Dichloropropane	< 0.50
2,3,4,6-Tetrachlorophenol	< 10
2,4,5-Trichlorophenol	< 10
2,4,6-Trichlorophenol	< 10
2,4-Dichlorophenol	< 10
2,4-Dimethylphenol	< 10
2,4-Dinitrophenol	< 10
2,4-Dinitrotoluene	< 10
2,6-Dinitrotoluene	< 10
2-Chloroethyl vinyl ether	< 0.50
2-Chloronaphthalene	< 10
2-Chlorophenol	< 10
2-Chlorotoluene	< 0.50
2-Hexanone	< 0.50
2-Methylnaphthalene	< 10
2-Methylphenol	< 10

2-Nitroaniline	< 10
2-Nitrophenol	< 10
3,3´-Dichlorobenzidine	< 10
3-Nitroaniline	< 10
4,6-Dinitro-2-methylphenol	< 10
4-Bromophenyl phenyl ether	< 10
4-Chloro-3-methylphenol	< 5.0
4-Chloroaniline	< 10
4-Chlorophenyl phenyl ether	< 10
4-Chlorotoluene	< 0.50
4-Isopropyltoluene	< 0.50
4-Methyl-2-pentanone	< 0.50
4-Nitroaniline	< 10
4-Nitrophenol	< 10
Acenaphthene	< 10
Acenaphthylene	< 10
Acetone	18
Acetonitrile	73
Acetophenone	< 10
Acrolein	< 0.50
Acrylonitrile	< 10
Allyl chloride	< 0.50
Anthracene	< 10
Atrazine	< 5.0
Benz(a)anthracene	< 0.10
Benzaldehyde	< 5.0
Benzene	< 0.50
Benzo(a)pyrene	< 0.10
Benzo(b)fluoranthene	< 0.10
Benzo(g,h,i)perylene	< 10
Benzo(k)fluoranthene	< 0.10
Bis(2-chloroethoxy)methane	< 10
Bis(2-chloroethyl)ether	< 10
Bis(2-chloroisopropyl)ether	< 10
Bis(2-ethylhexyl)phthalate	< 5.0
Bromobenzene	< 0.50
Bromochloromethane	< 0.50
Bromodichloromethane	< 0.50
Bromoform	< 0.50

Bromomethane	< 0.50
Butyl benzyl phthalate	< 10
Caprolactam	< 5.0
Carbazole	< 10
Carbon disulfide	0.56
Carbon Tetrachloride	< 0.50
Chlorobenzene	< 0.50
Chloroethane	< 0.50
Chloroform	< 0.50
Chloromethane	< 0.50
Chloroprene	< 0.50
Chrysene	< 0.10
cis-1,2-DCE	< 0.50
cis-1,3-Dichloropropene	< 0.50
Cyclohexane	< 0.50
Dibenz(a,h)anthracene	< 0.10
Dibenzofuran	< 10
Dibromochloromethane	< 0.50
Dibromomethane	< 0.50
Dichlorodifluoromethane	< 0.50
Diethyl ether	< 0.50
Diethyl phthalate	< 10
Diisopropyl ether	< 0.50
Dimethyl phthalate	< 10
Di-n-butyl phthalate	< 10
Di-n-octyl phthalate	< 10
Epichlorohydrin	< 5.0
Ethyl acetate	< 0.50
Ethyl methacrylate	< 0.50
Ethyl tert-butyl ether	< 0.50
Ethylbenzene	< 0.50
Fluoranthene	< 10
Fluorene	< 10
Freon-113	< 0.50
Hexachlorobenzene	< 1.0
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	< 10
Indeno(1,2,3-cd)pyrene	< 5.0

Iodomethane	< 0.50
Isobutanol	< 50
Isophorone	< 10
Isopropyl acetate	< 0.50
Isopropylbenzene	< 0.50
Methacrylonitrile	< 0.50
Methyl acetate	< 0.50
Methyl ethyl ketone	< 2.5
Methyl isobutyl ketone	< 2.5
Methyl methacrylate	< 0.50
Methyl tert-butyl ether (MTBE)	< 10
Methylcyclohexane	< 1.0
Methylene Chloride	< 2.5
mp-Xylenes	< 1.0
n-Amyl acetate	< 0.50
Naphthalene	< 10
n-Butylbenzene	< 0.50
n-Hexane	< 0.50
Nitrobenzene	< 10
N-Nitroso-di-n-butylamine	< 5.0
N-Nitrosodi-n-propylamine	< 10
N-Nitrosodiphenylamine	< 2.0
n-Propylbenzene	< 0.50
o-Toluidine	< 5.0
o-Xylene	< 0.50
Pentachloroethane	< 5.0
Pentachlorophenol	< 10
Phenanthrene	< 10
Phenol	< 5.0
p-isopropyltoluene	< 0.50
Propionitrile	0.97
Pyrene	< 10
Pyridine	< 5.0
sec-Butylbenzene	< 0.50
Styrene	< 0.50
tert-Amyl methyl ether	< 0.50
tert-Butyl alcohol	23
tert-Butylbenzene	< 0.50
Tetrachloroethene (PCE)	< 0.50

Tetrahydrofuran	< 0.50
Toluene	< 0.50
trans-1,2-DCE	< 0.50
trans-1,3-Dichloropropene	< 0.50
trans-1,4-Dichloro-2-butene	< 0.50
Trichloroethene (TCE)	< 0.50
Trichlorofluoromethane	< 0.50
Vinyl acetate	< 0.50
Vinyl chloride	< 0.50
Xylenes, Total	< 1.0

All parameters measured in µg/L

TABLE 3B
INJECTION FLUID CHARACTERIZATION DATA
RO REJECT
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO
JUNE 2014

Miscellaneous	
Total Cyanide (mg/L)	<0.010
Chloride (mg/L)	36.0
Fluoride (mg/L)	2.3
Sulfate (mg/L)	1,200
Nitrite (mg/L)	<0.10
Nitrate (mg/L)	1.2
pH (S.U.)	7.92
TDS (mg/L)	2,460
Radionuclides	
Radium-226 (pCi/L)	0.667
Radium-226+/- (pCi/L)	0.599
Radium-228 (pCi/L)	-0.136
Radium-228 +/- (pCi/L)	0.352
PCBs	
Aroclor 1016 (ug/L)	<1.0
Aroclor 1221 (ug/L)	<1.0
Aroclor 1232 (ug/L)	<1.0
Aroclor 1242 (ug/L)	<1.0
Aroclor 1248 (ug/L)	<1.0
Aroclor 1254 (ug/L)	<1.0
Aroclor 1260 (ug/L)	<1.0
TPH Ranges	
TPH-DRO (mg/L)	<1.0
TPH-ORO (mg/L)	<5.0
TPH-GRO (mg/L)	<0.050

Metals (Total)	
Arsenic	0.0036
Barium	0.054
Cadmium	<0.001
Calcium	470
Chromium	<0.001
Iron	<0.010
Lead	<0.001
Manganese	<0.001
Nickel	<0.001
Potassium	1.2
Selenium	<0.010
Sodium	39.0
Vanadium	0.0075

Semivolatiles	
1,1-Biphenyl	<0.50
1-Methylnaphthalene	<0.50
2-Methylnaphthalene	<0.50
Benz(a)pyrene	<0.50
Naphthalene	<0.50
Phenol	<0.50
Phenol	<0.50

Metals (Dissolved)	
Aluminum	<0.010
Arsenic	0.0012
Barium	0.045
Boron	<0.10
Cadmium	<0.001
Calcium	460
Chromium	0.0016
Cobalt	<0.001
Iron	<0.10
Lead	<0.001
Manganese	0.0013
Mercury	<0.0002
Molybdenum	0.0084
Nickel	0.0013
Potassium	1.4
Selenium	0.0076
Silver	<0.001
Sodium	39.0
Uranium	0.0034
Vanadium	0.0077
Zinc	0.21

Volatiles	
1,1,1-Trichloroethane	<0.50
1,1,1,2-Tetrachloroethane	<0.50
1,1,2,2-Tetrachloroethane	<0.50
1,1,2-Trichloroethane	<0.50
1,2-Dibromomethane	<0.50
1,1-Dichloroethane	<0.50
1,1-Dichloroethene	<0.50
1,2-Dichloroethane	<0.50
1,2-Dichloropropane	<0.50
1,2,4-Trimethylbenzene	<0.50
1,3,5-Trimethylbenzene	<0.50
2-Butanone	<5.0
2-Hexanone	<2.5
Acetone	<2.5
Benzene	<0.50
Bromodichloromethane	<0.50
Bromoform	<0.50
Bromomethane	<0.50
Carbon disulfide	<0.50
Carbon tetrachloride	<0.50
Chlorobenzene	<0.50
Chloroethane	<0.50
Chloroform	<0.50
Chloromethane	<0.50
cis-1,2-DCE	<0.50

Volatiles	
cis-1,3-Dichloropropene	<0.50
Dibromochloromethane	<0.50
Isopropylbenzene	<0.50
Methylene chloride	<0.50
Methyl isobutyl ketone	<2.5
MTBE	<0.50
Naphthalene	<0.50
n-Butylbenzene	<0.50
n-Propylbenzene	<0.50
p-isopropyltoluene	<0.50
sec-Butylbenzene	<0.50
Styrene	<0.50
Tetrachloroethene	<0.50
Toluene	<0.50
trans-1,2-DCE	<0.50
trans-1,3-Dichloropropene	<0.50
Trichloroethene	<0.50
Vinyl chloride	<0.50
mp-Xylenes	<0.50
o-Xylenes	<0.50

mg/L	Milligrams per liter.
pCi/L	Picocurries per liter.
ug/L	Micrograms per liter.
S.U.	Standard Units.
<	Less than.

All concentrations reported in milligrams per liter (mg/L).

TABLE 4

OPEN-HOLE LOGGING AND CORING PROGRAM

HOLLYFRONTIER NAVAJO REFINING LLC
WASTE DISPOSAL WELL NO. 4
ARTESIA, NEW MEXICO

Interval	Open Hole Log Description
Surface Borehole (80' – 1,500')	Gamma Ray/Induction Resistivity/Spontaneous Potential/Formation Density/ Compensated Neutron/Caliper/
	Four Arm Caliper
Protection Borehole (1,500' – 10,400')	Gamma Ray/Laterolog Resistivity/Formation Density/ Compensated Neutron/Caliper/Sonic/Mineralogy(~100' over cored interval)
	Four Arm Caliper
Injection Borehole (10,400' – 11,000')	Gamma Ray/Laterolog Resistivity/Formation Density/ Compensated Neutron/Caliper/Sonic/Borehole Image/Mineralogy
	Four Arm Caliper

Interval	Coring Description
Confining Zone (9,700' – 10,200')	4" Diameter x 30' Long Conventional Core
Injection Interval (10,200' – 10,700')	4" Diameter x 60' Long Conventional Core

TABLE 5

WELL TUBULAR INFORMATION
HOLLYFRONTIER NAVAJO REFINING LLC
WASTE DISPOSAL WELL NO. 4
ARTESIA, NEW MEXICO

Ref	Section	Outside Diameter (in)	Depth Interval (feet BGL)	Material	Collapse Resistance (psi)	Internal Yield (psi)	Tensile Strength (lbs)	Body Yield (lbs)	Max. External Press (psi)	Max. Internal Press (psi)	Maximum Tensile Load (lbs)	Safety Factor Collapse	Safety Factor Burst	Safety Factor Tension
	Conductor	20	0 - 80	129.33 ppf; 0.625" wall, Welded	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	Surface Casing	13⅜	0 - 1500	54.5 ppf, K-55, ST&C	1,130	2,730	547,000	853,000	624	1,000	81,750	1.81	2.73	6.69
2	Protection	9⅝	0 - 10,400	47 ppf, N-80, LT&C	4,760	6,870	905,000	1,086,000	3,894	1,500	488,800	1.22	4.58	1.85
3	Injection Tubing	7	0 - 10,300	26 ppf, K-55, LT&C	4,320	4,980	401,000	415,000	2,057	2,348	267,800	2.10	2.12	1.50

References:

1. Maximum external pressure after cementing 16.4 ppg cement with fresh water inside. Assumed gradient equal to 8.0 ppg (16.4-8.4). Maximum internal pressure during pressure test at 1000 psi excluding external pressure.

2. Maximum external pressure after cementing 15.6 ppg cement with fresh water inside. Assumed gradient equal to 7.2 (15.6-8.4) ppg. Maximum internal pressure during pressure test at 1500 psi excluding external pressure.

3. Maximum external pressure pressure during APT assumes 10 ppg water in 7" x 9⅝" annulus with 1200 psi surface test pressure and 8.4 ppg fluid inside tubing. Maximum internal pressure = Hydrostatic pressure inside 7" tubing (9 ppg*0.052*10300') + Maximum Permitted Surface Injection Pressure (2080) - Minimum Expected Annulus Pressure (8.5*0.052*10300).

TABLE 6

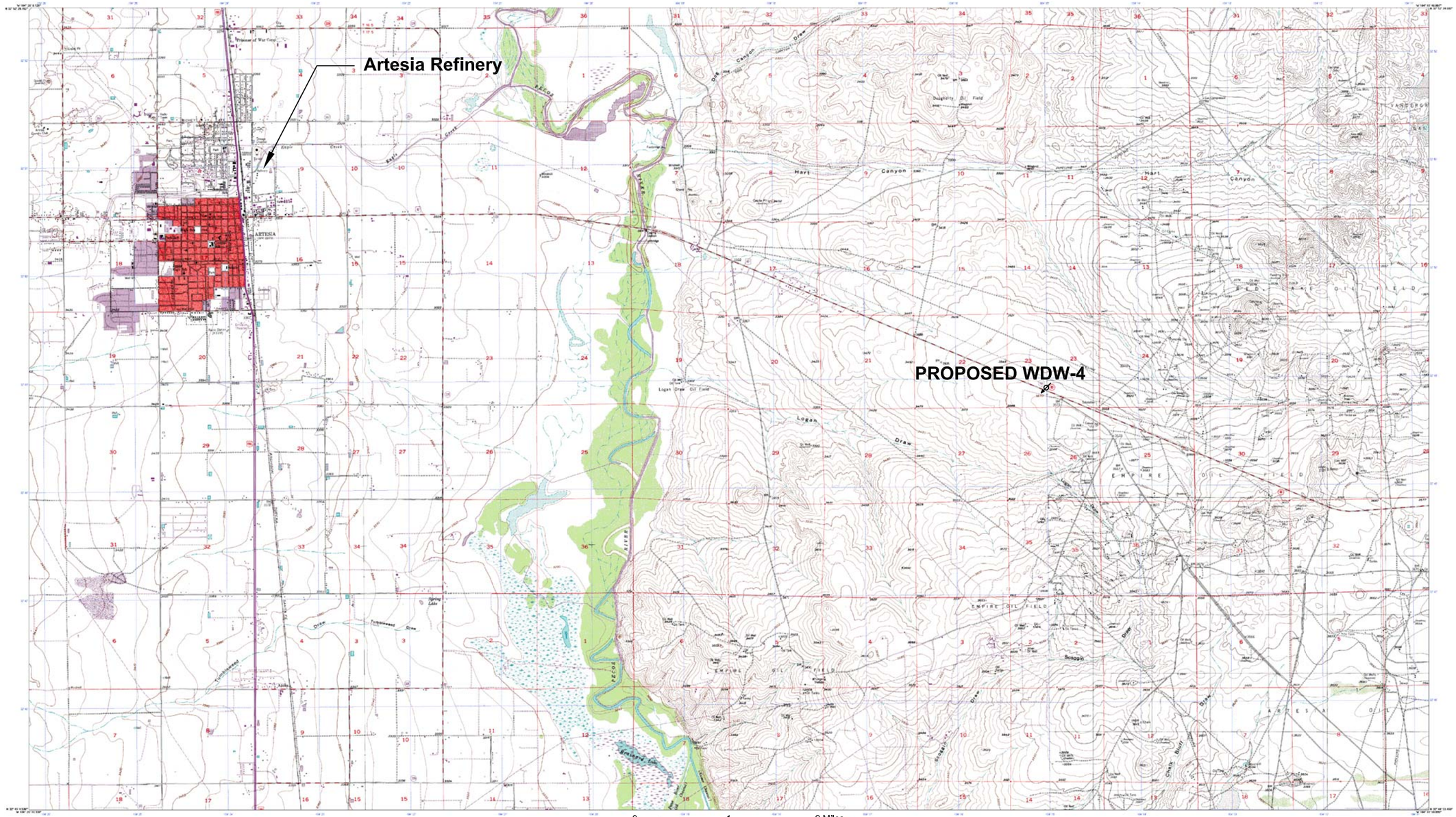
WELL CASING AND CEMENTING PROGRAM
HOLLYFRONTIER NAVAJO REFINING LLC
WASTE DISPOSAL WELL NO. 4
ARTESIA, NEW MEXICO

Cemented Casing Description	Cemented Interval Top (ft BGL)	Cemented Interval Bottom (ft BGL)	Borehole Type	Hole Size (in)	Casing OD (in)	Cement Volumes Subtotal (ft^3)	Cement Volumes Excess Factor	Cement Volumes Excess (ft^3)	Cement Volumes Total (ft^3)	Estimated Cement Requirements Slurry Type	Estimated Cement Requirements Volume (ft^3)	Estimated Cement Requirements Description
Surface Casing	0	80	Conductor Pipe	18.750	13.375	75.3	0%	0.0	75.3			
(0 - 1,500')	80	1,300	Open Hole	17.500	13.375	847.5	20%	169.5	1016.9	Lead	1092	Lightweight Class A
13⅜", 54.5#,	1,300	1,500	Open Hole	17.500	13.375	138.9	20%	27.8	166.7			
K-55, ST&C	1,455	1,500	Shoe-Track	12.615		39.1	0%	0.0	39.1	Tail	206	Class A
Protection Casing: Stage II	0	1,500	Surface Casing	12.615	9.625	544.0	0%	0.0	544.0			
(0 - 5,800')	1,500	5,400	Open Hole	12.250	9.625	1221.4	20%	244.3	1465.7	Lead	2010	Lightweight Class H
9⅝", 47#, N-80, LT&C	5,400	5,800	Open Hole	12.250	9.625	125.3	20%	25.1	150.3	Tail	150	Class H
Protection Casing: Stage I	5,800	10,000	Open Hole	12.250	9.625	1315.4	20%	263.1	1578.5	Lead	1578	Lightweight Class H
(5,800 - 10,400')	10,000	10,400	Open Hole	12.250	9.625	125.3	20%	25.1	150.3			
9⅝", 47#, N-80, LT&C	10,355	10,400	Shoe-Track	9.681		23.0	0%	0.0	23.0	Tail	173	Class H

TABLE 7

CASED HOLE LOGGING PROGRAM
HOLLYFRONTIER NAVAJO REFINING LLC
WASTE DISPOSAL WELL NO. 4
ARTESIA, NEW MEXICO

Interval	Log Description
13⅜" Surface Casing (Surface – 1500')	Cement Bond /Variable Density/Gamma Ray Log
9⅝" Protection Casing (Surface – 10,400')	Cement Bond /Variable Density/Gamma Ray Log, Casing Inspection Log
7" Injection Tubing & 9⅝" Protection Casing (Surface – 10,400')	Temperature Survey, Bottomhole Pressure, Pressure Falloff Test, Radioactive Tracer Survey



Maps compiled from USGS Quads: Artesia, NM; Artesia NE, NM; Diamond Mound, NM; Espuela, NM; Spring Lake, NM; Red Lake, NM;

QUADRANGLE LOCATION

WSP | PARSONS BRINCKERHOFF

FIGURE 1

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

SITE LOCATION MAP

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:

PROPOSED WDW-4

Logan Draw Oil Field

EMPIRE OIL FIELD

Spring Lake

N

NEW MEXICO

QUADRANGLE LOCATION

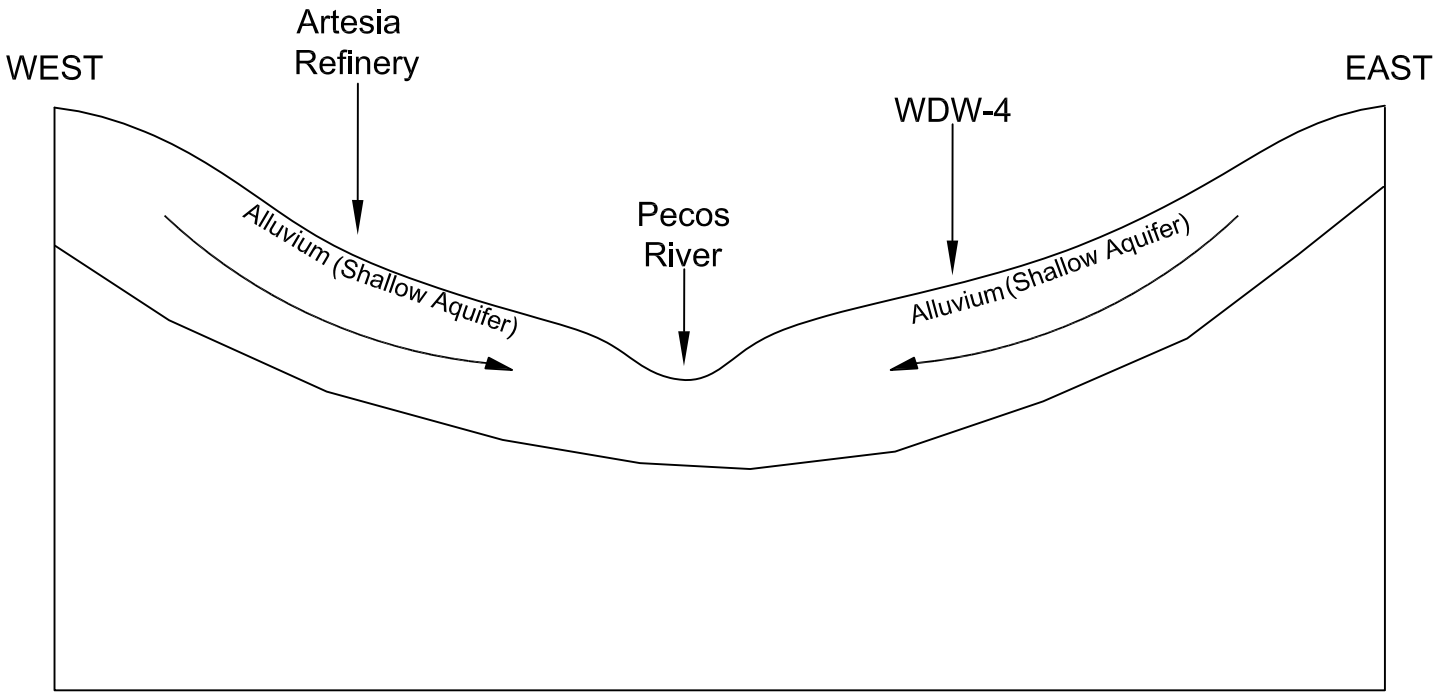
WSP | PARSONS BRINCKERHOFF

FIGURE 2

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

SITE MAP

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



NOT TO SCALE

EXPLANATION

Direction of Groundwater Movement

WSP | PARSONS BRINCKERHOFF

FIGURE 3

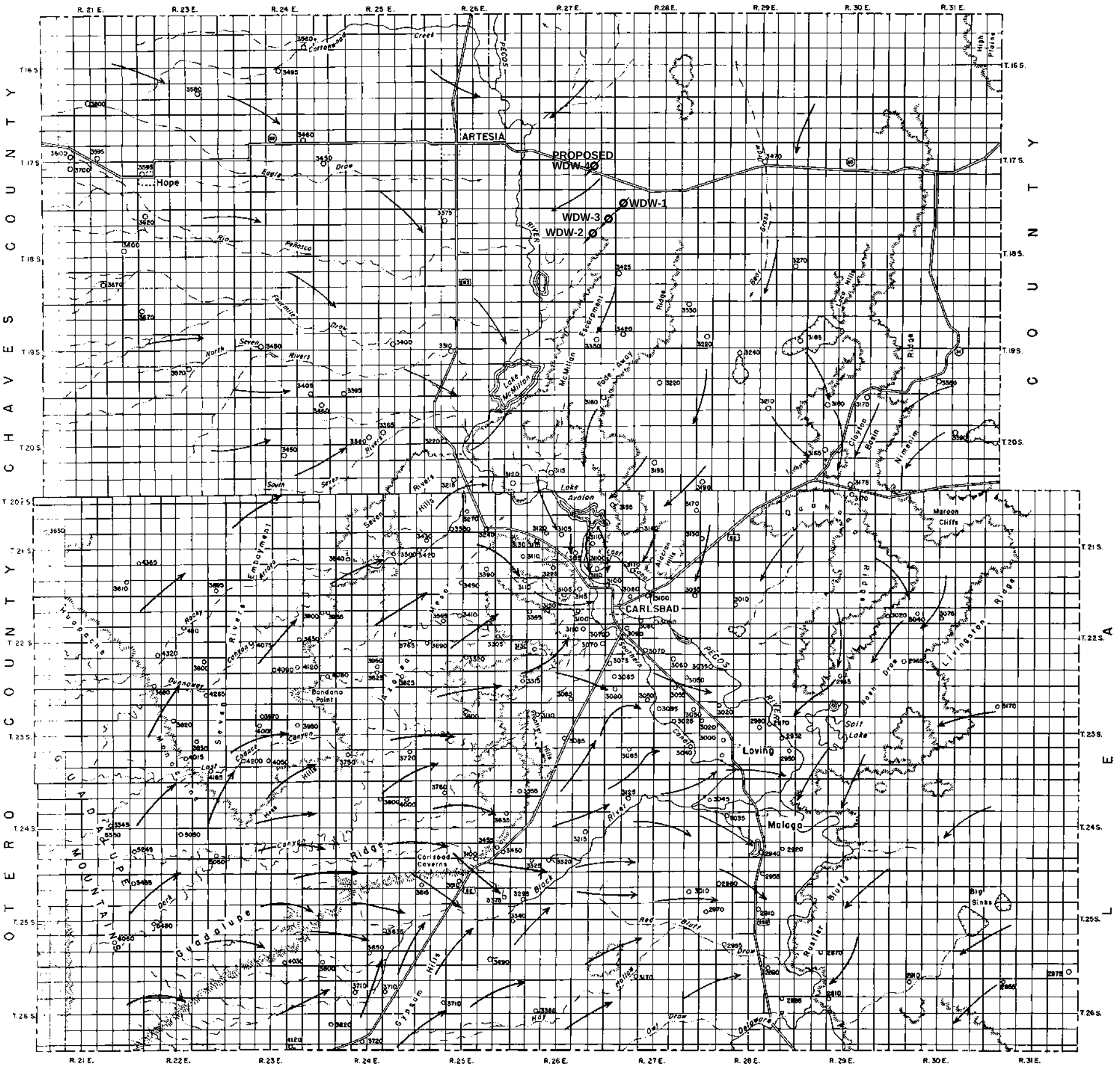
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

GENERALIZED HYDROGEOLOGIC CROSS-SECTION

DATE: 02/17/15	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:

NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES

GROUND-WATER REPORT 3 PLATE 3



GENERAL DIRECTION OF MOVEMENT OF GROUND WATER IN EDDY COUNTY, NEW MEXICO

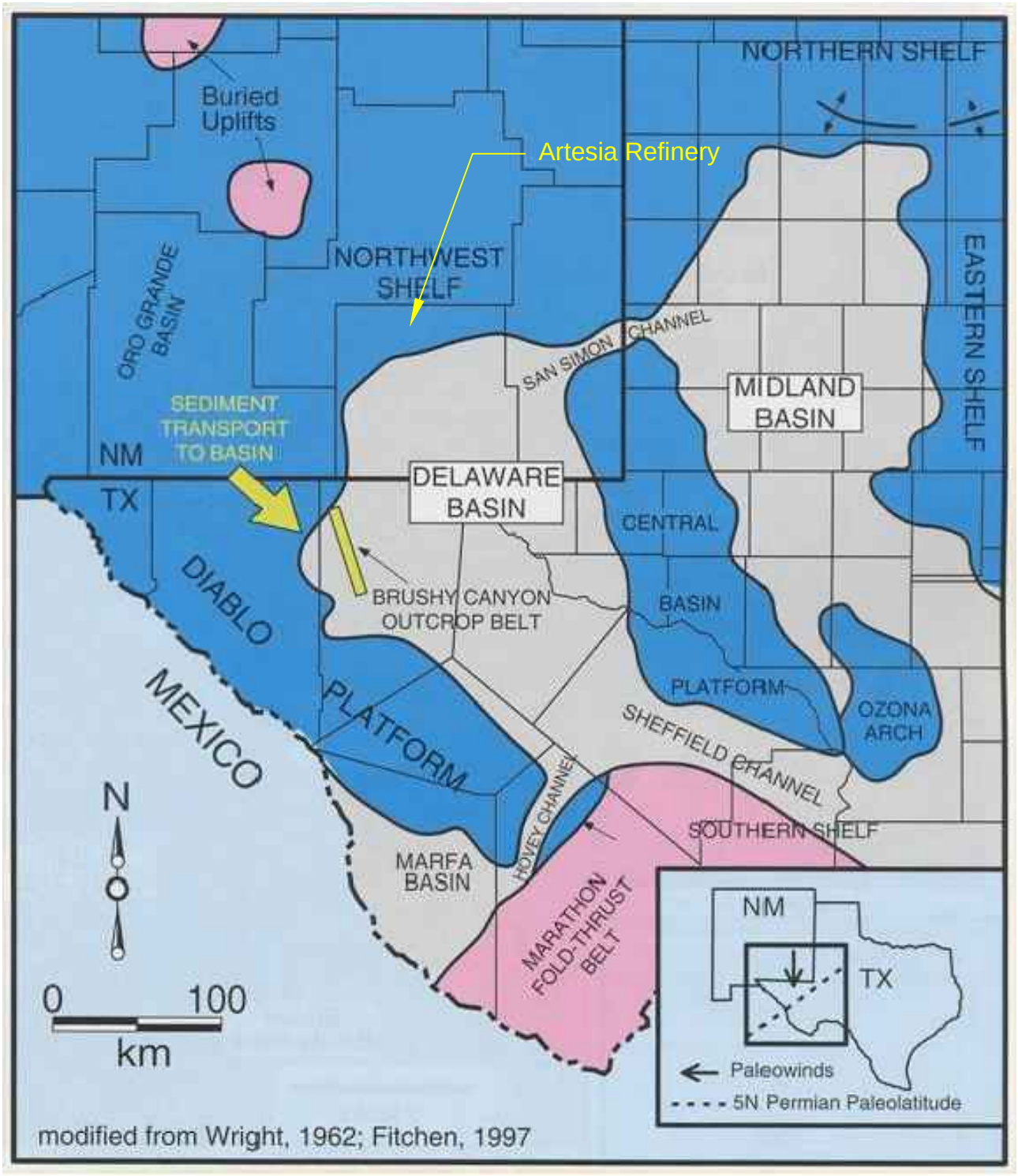
SCALE

5 0 5 10 MILES

EXPLANATION

- o Well
- a Spring
- Direction of ground water movements
- 3360 Altitudes (feet above sea level) of ground water levels

FIGURE 4



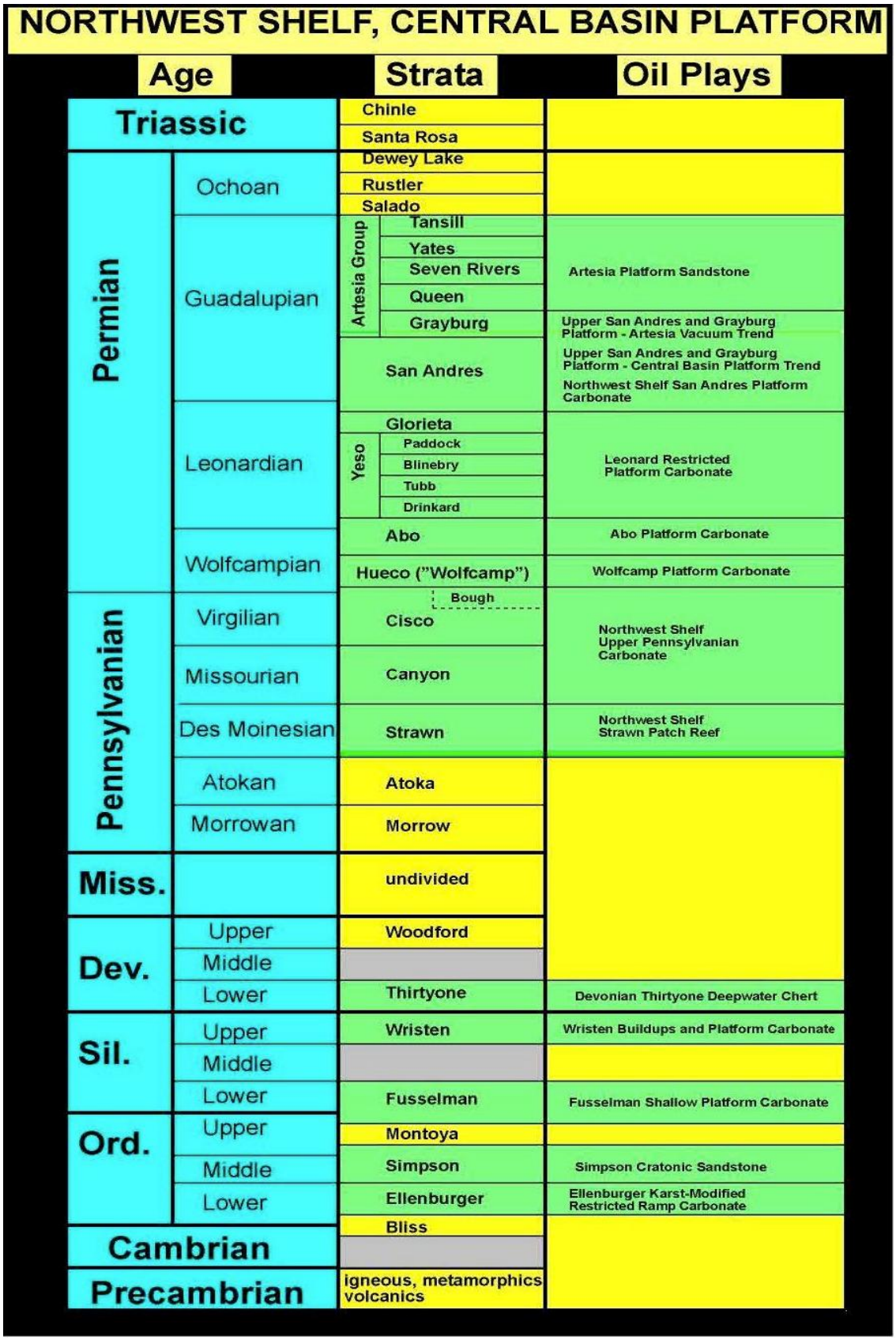
WSP | PARSONS BRINCKERHOFF

FIGURE 5

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PERMIAN BASIN MAP

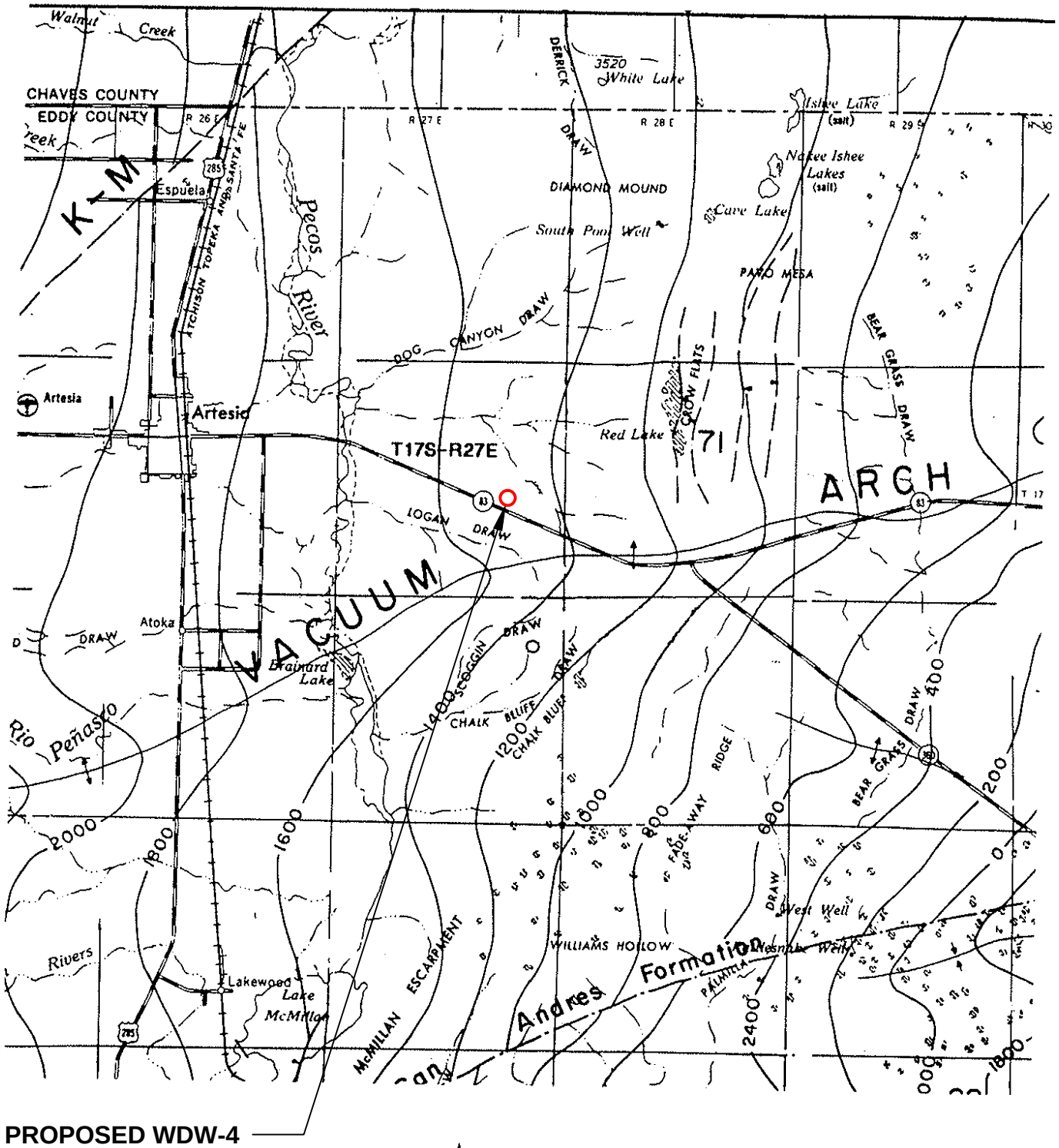
DATE: 02/17/15	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



STRATIGRAPHIC COLUMN

Source: Broadhead, et al., 2004. *Play Analysis of Major Oil Reservoirs in the New Mexico Part of the Permian Basin: Enhanced Production Through Advanced Technologies.* New Mexico Bureau of Geology and Mineral Resources. Open File Report 479.

FIGURE 6



Source: Kelley, V.C., 1971, Geology of the Pecos country, southeastern New Mexico; Plate 5S, Tectonic map of the Pecos Country, South Half

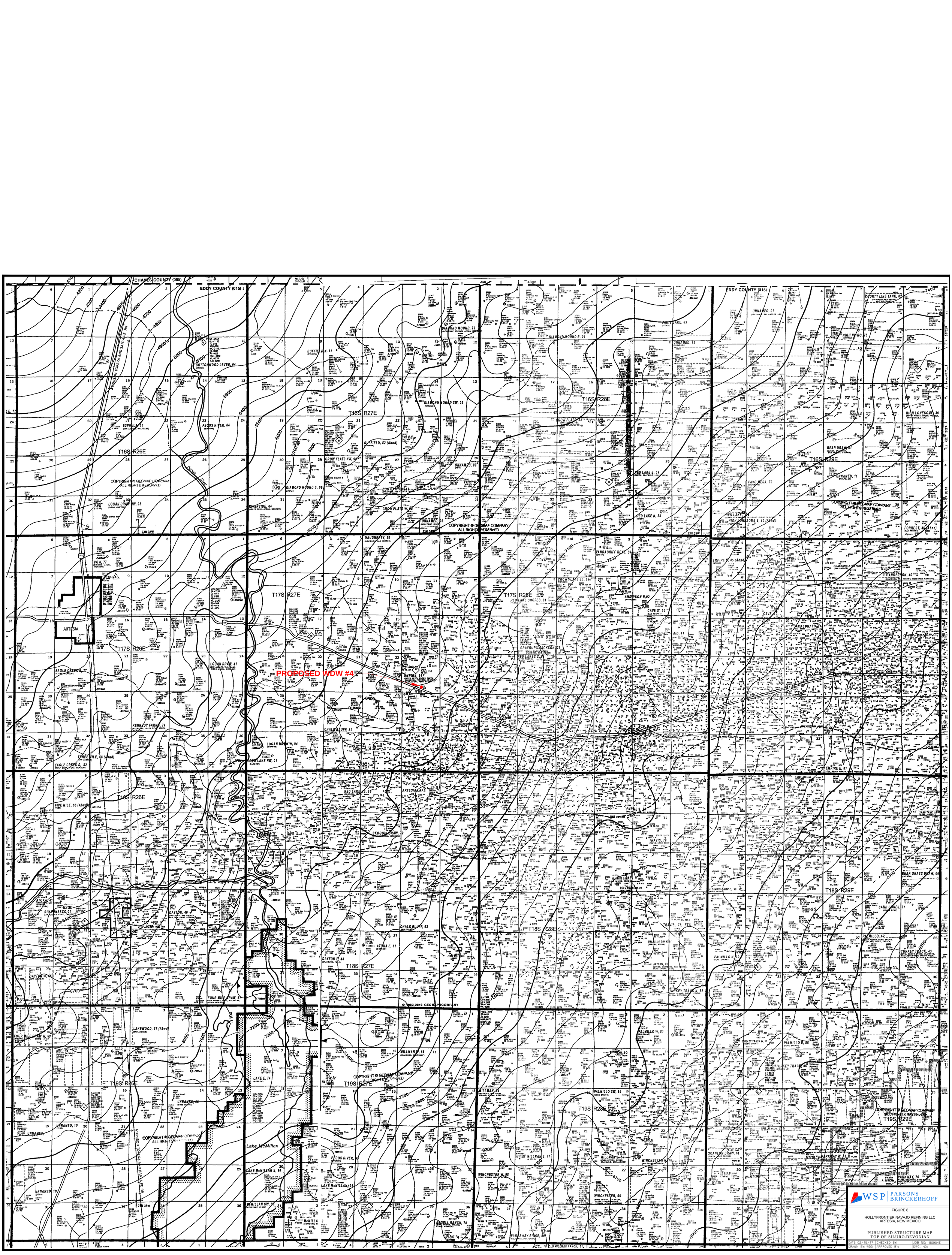
WSP | PARSONS BRINCKERHOFF

FIGURE 7

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

REGIONAL GEOLOGIC FEATURES

DATE: 02/15/17	CHECKED BY:	JOB NO: 185818-6944
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



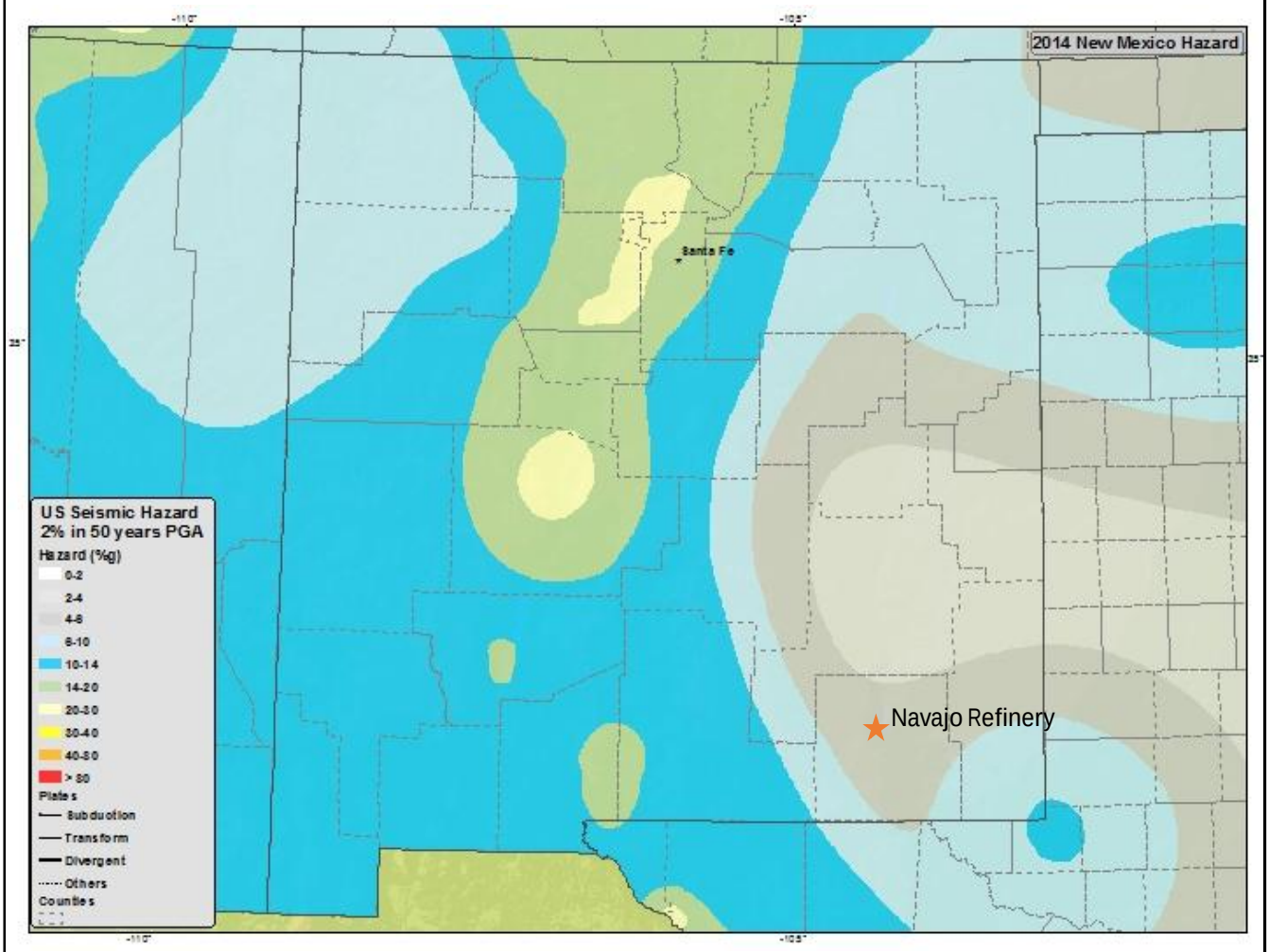
WSP | PARSONS BRINCKERHOFF

FIGURE 8

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PUBLISHED STRUCTURE MAP
TOP OF SILURO-DEVONIAN

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E	
DRAWN BY: WDD	APPROVED BY:	DWG. NO:	



Source: USGS, 2017. *Information by Region – New Mexico; 2014 Seismic Hazard Map.* Earthquake Hazards Program. https://earthquake.usgs.gov/earthquakes/byregion/newmexico-haz.php

WSP | PARSONS BRINCKERHOFF

FIGURE 9

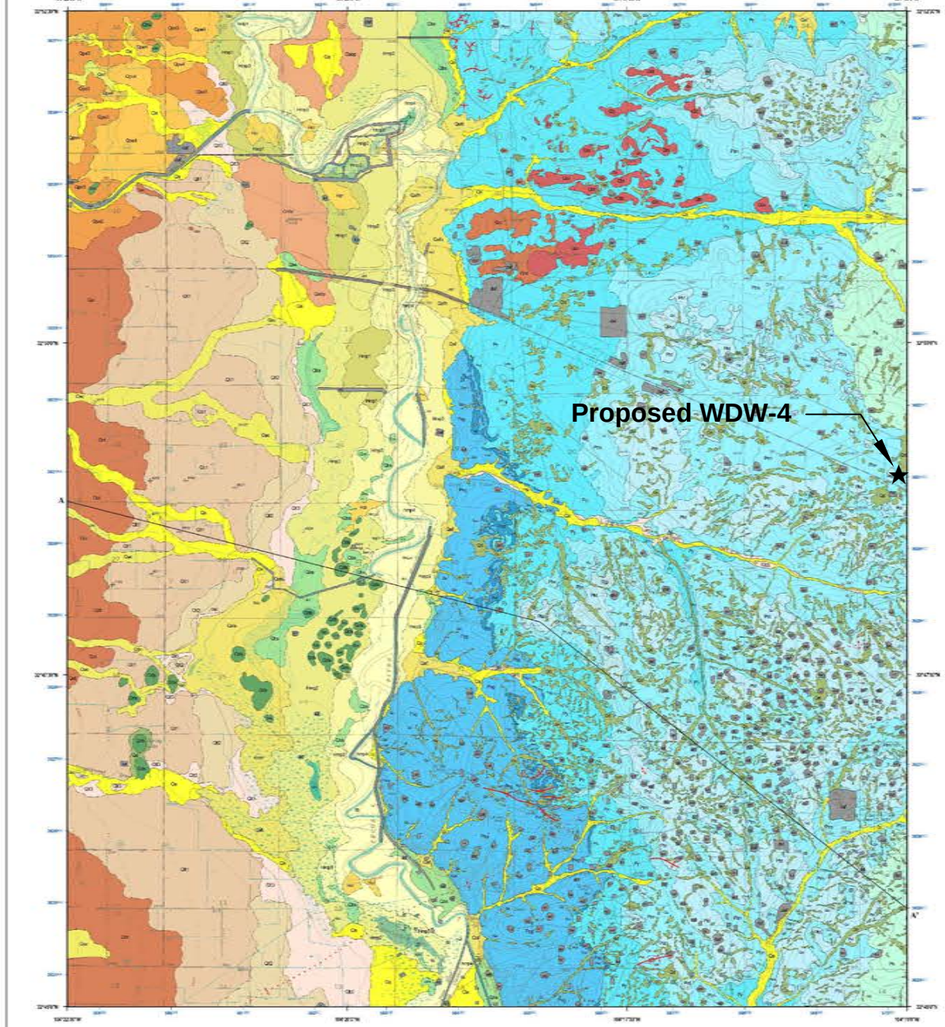
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

SEISMIC RISK MAP

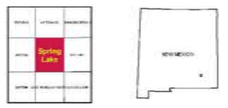
DATED: 1/16/2017	APPROVED BY:	JOB NO. 50904D
DRAWN BY: GEM	CHECKED BY:	SCALE: N/A

NEW MEXICO BUREAU OF GEOLOGY AND MINERAL RESOURCES, A DIVISION OF NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

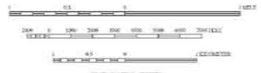
NMBGMR Open-file Geologic Map 214
Last Modified June 2011



1:24,000



QUADRANGLE LOCATION



CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Mapping of this quadrangle was funded by a matching funds grant from the USGS/NMBGMR program of the National Cooperative Geologic Mapping Act, administered by the U.S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, Dr. Peter A. Scholle, Director and State Geologist. Dr. J. Michael Timmons, Geologic Mapping Program Manager.

New Mexico Bureau of Geology and Mineral Resources
Open-file Geologic Map 214

Geologic map of the Spring Lake quadrangle, Eddy County, New Mexico.

May 2011

by
David J. McCraw, Lewis A. Land, and Shannon Williams

New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM 87801

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
801 Leroy Place
Socorro, New Mexico
87801-4796

(575) 835-5490

This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu

EXPLANATION OF MAP SYMBOLS

A — A' Location of geologic cross section

Geologic contact. Solid where exposed or known, dashed where approximately known, dotted where concealed or inferred.

Trace of synclinal axial plane associated with tectonic collapse.

Trace of anticline axial plane associated with tectonic collapse.

Arrows - Plunges: bold, Subsurface inferred and mapping; Pertinent, and dip angle.

Inclined bedding showing degree of dip.

Oil & gas exploration well used in cross section construction.

COMMENTS TO MAP USERS

A geologic map displays information on the distribution, nature, orientations, and age relationships of rock and deposits and the structures of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle may not be based on any of the following: nonexistence field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map. Therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown.

Cross sections are constructed based upon the interpretations of the surface shown on the geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross-sections should be used as an aid to understanding the general geologic framework of the map area, and are not to be relied on as a source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

This map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. The names and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

DESCRIPTION OF MAP UNITS

CENOZOIC

QUATERNARY and NEOGENE

Alluvium, lacustrine, and anthropogenic deposits

Disturbed land and/or artificial fill (Historic) — Dumped fill and areas affected by human disturbance, mapped where deposits or excavations are locally extensive. Especially notable are the numerous constructed oil and gas well pads. Also includes the U.S. Bureau of Reclamation's Kaiser Channel of the Pecos River, as well as other straightened reaches.

Quaternary tributary alluvium and valley-fill alluvium, undifferentiated (Historic to uppermost Pleistocene) — Brown (7.5YR4/2) to pinkish gray (7.5YR6/2) (rubefaction) to light reddish brown (5YR 6/4) to reddish brown (2.5YR4/4) (Pecos floodplain) valley-fills; unconsolidated, moderately sorted, pebbly sand, silt, and clay. Varies considerably in thickness from <1 to 3 m in tributaries and up to 13-12 m in the floodplain.

Quaternary alluvial channel swale and/or depression fill deposits of the Eagle Creek piedmont alluvial complex (upper Pleistocene to Holocene) — Light brown (7.5YR5/6) to pinkish gray (7.5YR6/2), unconsolidated, poorly sorted, fine-grained sand, silt, and clay with mostly carbonate gravels and pebbles occupying tens (+2-1.5 m) channels, swales, and coalescing depressions draining the Eagle Creek piedmont complex. (Qtrpe)

Quaternary alluvial channel swale and/or depression fill deposits originating from either Eagle Creek or Rio Peñasco piedmont complexes extending across Pecos Valley terraces (upper Pleistocene to Holocene) — Light brown (7.5YR6/4) to pinkish gray (7.5YR6/2), unconsolidated, poorly sorted, fine-grained sand, silt, and clay, occasional carbonate pebbles, occupying tens (+1-1.5 m) channels, swales, and coalescing depressions.

Alluvial-fan deposits, undivided (Historic to uppermost Pleistocene) Predominantly carbonate gravels to pebbles, often in stringers, in a brown (7.5YR4/2) to pinkish gray (7.5YR6/2), unconsolidated, poorly sorted, and coarse- to fine-grained sand to silty sand. Two large fans built by both historic former channels of Eagle Creek. (Qafe), and by Tumbleweed Draw (Qafd), debouch from these western tributaries into the western floodplain margin, interfingering with and/or spreading out onto Pecos floodplain deposits. Thicknesses decrease from tributary mouths from >6 m to <1 m at their distal margins. Fans debouching onto the floodplain from eastern tributaries vary considerably in thickness from <1 m for small fans and up to ~8 m at the apices of fans built by large tributaries (e.g., Hart Canyon. (Qafh, and Logan Draw, (Qafl). Many of these fans have been truncated and their deposits removed by the eastward migrating Pecos River from meander belts Hmq2 to Imp4 (e.g., Dog Canyon. (Qafd)

Quaternary playa deposits (upper Pleistocene to Holocene) Pinkish white (7.5YR8/2), unconsolidated, well-sorted, fine-grained sand, silt, and clay. Thickness unknown (+ 3m)

Pecos River alluvial valley floor

(Historic map and labels are given relative age "A" to differentiate them from Holocene map units.)

Pecos River meanderbelt alluvial deposits (Historic to lower Holocene) — At the onset of the Holocene, the Pecos River switched from a braided regime to a meandering one, and proceeded to build four distinguishable meanderbelts on top of the basal, upper Pleistocene Pecos River braided alluvial valley-fill deposits. Crossing of channel, channel bar, point bar, and natural levee deposits, undivided, these meanderbelts are differentiated based upon cross-cutting relationships observed in the field, as well as aerial photographic work area an historic strat (Imrp) and three older Holocene units (Imrp...). These older Holocene units reveal a pattern of progressive meanderbelt shifting from west to east across the floodplain.

Historic meander belt deposits (Historic to upper Holocene) — Occasional pebbles of dolomite, limestone, sandstone, chert, and quartzite in a very pale brown (10YR7/4) to reddish brown (2.5YR4/4), unconsolidated, moderately to well-sorted, coarse- to fine-grained sand in the former modern channel and adjacent bar zones, grading to silty sand and sandy clay with features from this channel. Several reaches of the Pecos River on the quad have been channelized by the U.S. Bureau of Reclamation during the mid 20th Century. The northernmost section of the Kaiser Channel extends into the southernmost part of the quad. Meanderbelt thicknesses commonly range from 1 to 5 m

Young meanderbelt deposits (upper Holocene) — Very pale brown (10YR7/4) to reddish brown (2.5YR4/4), unconsolidated, moderately sorted, occasionally pebbly (dolomite, limestone, sandstone, chert, and quartzite), coarse- to fine-grained sand, silty sand and sandy clay. Unit primarily lies immediately west of Imp, in the center of the floodplain. Thickness 2-5 m.

Older Holocene meander belt deposits (upper to middle Holocene) — Very pale brown (10YR7/4) to reddish brown (2.5YR4/4), unconsolidated, moderately sorted, occasionally pebbly (dolomitic, limestone, sandstone, chert, and quartzite), coarse- to fine-grained sand, silty sand and sandy clay. Unit lies immediately west of Imp,. Thickness 3-5 m.

Old Holocene meander belt deposits (lower to middle Holocene) — Very pale brown (10YR7/4) to reddish brown (2.5YR4/4), unconsolidated, moderately sorted, occasionally pebbly (dolomitic, limestone, sandstone, chert, and quartzite), coarse- to fine-grained sand, silty sand, and sandy clay. Thickness 3-5 m.

Holocene cervasse splay deposits (middle to upper Holocene) Very pale brown (10YR7/4) to reddish brown (2.5YR4/4), unconsolidated, graded sand to fly sand closest to the channel bank breached by the crevasse to sandy clay at the distal margins. Thickness <8 to 2 m.

Floodplain alluvial backswamp deposits (Historic to upper Pleistocene) — Light reddish-brown (5YR6/4) to very dark gray (7.5YR3/1), unconsolidated, well-sorted, silty sand, sandy clay, marl clay in low-lying, poorly drained areas. These areas commonly preserved only fine-grained, thick water flood deposition, prior to channelization. Thickness range from 3-15 (?) m.

Pecos River braided alluvial deposits (upper Pleistocene to lower Holocene) — Gravels and pebbles of dolomite, limestone, sandstone, chert, and quartzite in a reddish-brown (2.5YR4/4) to light reddish-brown (5YR6/4), unconsolidated, poorly to moderately sorted, coarse- to fine-grained sand, silty sand, sandy clay, and clay. Braided channels and bars topply the surface of *Qafp* alluvium, but on the Spring Lake quad, its largely featureless. Mostly buried by Holocene meanderbelt. Thicknesses very (based upon Lyford, 1973) from about 5 to 30 m.

Pecos Valley alluvial terrace complex

Alluvial terraces of the Pecos River and its tributaries were first described in the classic study of Fiedler and Nye (1933). They recognized 3 terraces flanking the floodplain (from lowest to highest) the Lakewood, the Orchard Park, and the Blackdom. All three terraces are present on the Spring Lake quad.

Lakewood terrace alluvial deposits (upper to middle Pleistocene) The Lakewood terrace, with an elevation of 6 to 9 m above the floodplain, flanks the most Pecos floodplain and extends up many of its tributaries. Following McCraw, et al. (2007) and McCraw and Land (2008), three distinct, flowing (upper to uppermost middle(?) Pleistocene) "Lakewood terraces" are recognized. The highest and oldest of which (*Qtl*) would be Fiedler and Nye's original. Surface road elevations above the floodplain for these three are: +8-2 m, 2-6 m, and 6-9 m, respectively. They are conveyed of occasional gravels and pebbles, brown (10YR5/3) to dark yellowish brown (10YR3/4), unconsolidated, moderately sorted, coarse- to fine- grained sand, silty sand, silt and sandy clay. Pedogenic carbonate expresses from stage I to stage II+ (occasionally III) from *Qtl*, to *Qtr*. Mostly not-gypsiferous.

Youngest Lakewood terrace alluvial deposits (upper Pleistocene) — Thickness <1 to 1 m.

Young Lakewood terrace alluvial deposits (upper Pleistocene) Thickness 1.5 to 2 m.

Older Lakewood terrace alluvial deposits (upper to middle Pleistocene) — Thickness <2 to 9 m.

Orchard Park terrace alluvial deposits (upper Pliocene (?) to upper Pleistocene) — According to Fiedler and Nye (1933), the Orchard Park terrace rises 8.5-3 m above the Lakewood terrace and 10.5-20 m above the Pecos floodplain. It is comprised of gravels and pebbles of dolomite, limestone, sandstone, chert, and quartzite in a very pale brown (10YR7/4) to reddish brown (5YR4/4), unconsolidated, moderately sorted, coarse- to fine- grained sand, silty sand, silt, and sandy clay. Pedogenic carbonate is a strong stage III. Thickness ranges from 3 to 15 m.

Blackdom terrace alluvial deposits (middle to lower Pleistocene) — The Blackdom terrace occurs in isolated remnants primarily atop the Permian Yates formation (*Py*), 25-42 m above and east of the Pecos floodplain. It is comprised of gravels and pebbles of dolomite, limestone, sandstone, chert, and quartzite in a very pale brown (10YR7/4) to reddish brown (5YR4/4), unconsolidated, moderately sorted, coarse- to fine-grained sand, silty sand, silt, and sandy clay. Pedogenic carbonate is III-III+. Thickness ~17 m

Eagle Creek alluvial piedmont complex

Eagle Creek alluvial piedmont deposits (Upper to middle Pleistocene) — Eagle Creek (or Eagle Draw further west) heads on the easternmost flank of the southern Sacramento Mountains in San Andres Formation (Psan) rocks and forms east to the Pecos River. Where it leaves the Permian highlands, it has built a large piedmont alluvial complex, which coalesces with the War Fulw to the north and the Rio Peñasco to the south. This piedmont complex grades to and onto the Pecos Valley alluvial terraces. Oldest, highest remnant surfaces may be as old as Pliocene, which possibly grades to a river system which forms Gatuña formation deposits today. It is comprised of gravels that are almost exclusively limestone derived from Psal, supported in a matrix of light brown (7.5YR6/3), unconsolidated, moderately sorted, coarse- to fine- grained sand, silty sand, silt (largely eolianosal), and sandy clay. On the Spring Lake quad, only the two youngest piedmont deposits (*Qpe...*) are mapped. Topographic expression between these deposits are often to entire to practically non-existent. Destruction is often based upon a stronger developed pedogenic carbonate. (*Qpe...* = stage III - II+; *Qpe...* = stage III- (*Qpe*, grades to (*Qal*,

Youngest Quaternary alluvial piedmont deposit (upper Pleistocene) Thickness 1 to 3 m

Younger Quaternary alluvial piedmont deposit (upper to uppermost middle Pleistocene) — Thickness 2 to 4 m.

Quaternary depression fill and sinkhole deposits

Quaternary depression fill, undifferentiated (Holocene to middle Pleistocene) — Unconsolidated, well-sorted, fine-grained (fine sands to clay) complexes of alluvial, colluvial, eolian, and occasional lacustrine deposits within closed depressions. Colors variable. Depressions are created by either gradual subsidence or sudden collapse followed by gradual subsidence of underlying gypsiferous carbonate bedrock. These complexes are often significantly modified by stream erosion and deposition, playa deposition, deflation, and mass wasting. Depression fills have been active since the middle Pleistocene and are usually 1-3 m thick, but can reach thicknesses in excess of 30 m.

Quaternary sinkhole deposits, primarily caused by collapse (Historic to middle Pleistocene) — Complexes of unconsolidated, well- to poorly-sorted, coarse- to fine-grained sands to clay, alluvial, colluvial, eolian, and occasional lacustrine deposits within closed depressions. Colors variable. Thickness <1 to 3 m.

PALEOZOIC

Permian Artesia Group

Salado formation, mixed gypsiferous facies (Guadalupian) — Irregular masses of gypsum, dolomite, and salt in outcrops with chaotic bedding interactions. Exposed in eastern part of quadrangle. Thickness unknown.

Tansill formation, dolomitic facies (Guadalupian) — Light gray dolomite, forming the basal part of the section, grading upward into interbedded mixed facies. Thickness <1 to 3 m.

View looking north-northwest of northernmost exposure of *Tsd* as it plunges beneath the alluvium. The roadcut businesses on the north side of U.S. Highway 82 sits on alluvial fan (*Qafp*) east of the modern Pecos River meanderbelt (Imrp,). Photo by D. McCraw.

Tansill formation, mixed silty gypsiferous facies (Guadalupian) — Interbedded mixed gray silty dolomite, siltstone and gypsum, and yellowish sandstone with subthurmitic and orange-tail chert grains. Thickness 2 to 50 m.

Yates formation, mixed gypsiferous facies (Guadalupian) — Very light gray, massive to vesicular gypsum interbedded with pink dolomite, green to white and orange to red siltstone and minor sandstone. Folded into domes and basins on a meter to several decimeter scale. Forms cavern. Outcrop exposures poor. Thickness increases westward from 2 to 50 m.

Seven Rivers formation, dolomitic facies (Guadalupian) — Light gray to yellowish to pink, thinly to thickly bedded, vesicular to massive dolomite interbedded with pink dolomitic siltstone, yellowish sandstone and thin beds of milky gypsum. Thickness 1 to 3 m.

Seven Rivers formation, gypsiferous facies (Guadalupian) — White to gray, occasionally yellow to red massive gypsum interbedded with thin- to medium-bedded, light gray dolomite and red gypsiferous siltstone, all as containing gypsum nodules, and yellowish sandstone, which often exhibit soft sediment deformation. Commonly fractured, occasionally forming caverns, with many low amplitude folds varying in scale from meters to kilometers. Thickness unknown.

Queen and Grayburg formations, undifferentiated ((undifferentiated)) — Cross section only.

Lower Permian Formations

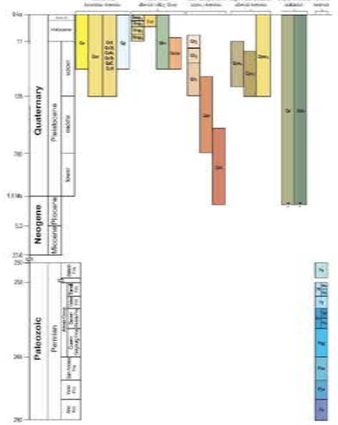
San Andres formation — Cross section only.

Glorieta sandstone tongue Cross section only.

Yeso formation, undifferentiated — Cross section only.

Abo formation, undifferentiated — Cross section only.

CORRELATION OF MAP UNITS



View looking north of eastern edge of turmill warped to reveal basin floor/capital of Yates formation (*Py*). The uncormon evident exposed bed of gypsum on the far right curving from truck in the distance resurfaces roughly 20 m away to the left out of the photo. Younger interbedded (alluvial and gypsum making up the majority of the photo also resurface to the left within this bed. Photo by D. McCraw.

REFERENCES

Fiedler, A. G., and Nye, S. S., 1933, Geology and ground-water resources of the Roswell artesian basin, New Mexico: U.S. Geological Survey Water-supply Paper 639, 372 p.

Hawley, J. W., 1993, The Ogallala and Gatuña formations in the southeastern New Mexico Region, a progress report: New Mexico Geological Society Guidebook, 44th Field Conference, p. 261-269.

Kelley, V. C., 1971, Geology of the Pecos country, southeastern New Mexico: New Mexico Bureau of Mines and Mineral Resources Memoir 24, 78 p.

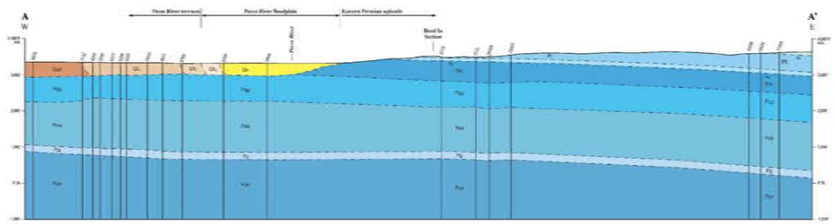
Lyford, F. P., 1973, Valley fill in the Roswell–Artesia area, New Mexico: U.S. Geological Survey Open-file Report 75-163, 26 p.

McCraw, D. J., 2008, Preliminary geology of the South Spring Quadrangle, Chaves County, New Mexico: N.M. Bureau of Geology and Mineral Resources, Open-file OF-GM 171, 32 p. + map.

McCraw, D. J. and Land, L. A., 2008, Preliminary geology of the Lake McMillan North Quadrangle, Eddy County, New Mexico: N.M. Bureau of Geology and Mineral Resources, Open-file OF-GM 167, 32 p. + map.

McCraw, D. J., Rawling, G., and Land, L. A., 2007, Preliminary geology of the Bitter Lake Quadrangle, Chaves County, New Mexico: N.M. Bureau of Geology and Mineral Resources, Open-file OF-GM 141, 32 p. + map.

GEOLOGIC CROSS SECTION



WSP | PARSONS BRINCKERHOFF

FIGURE 10

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

SURFACE GEOLOGIC MAP

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:

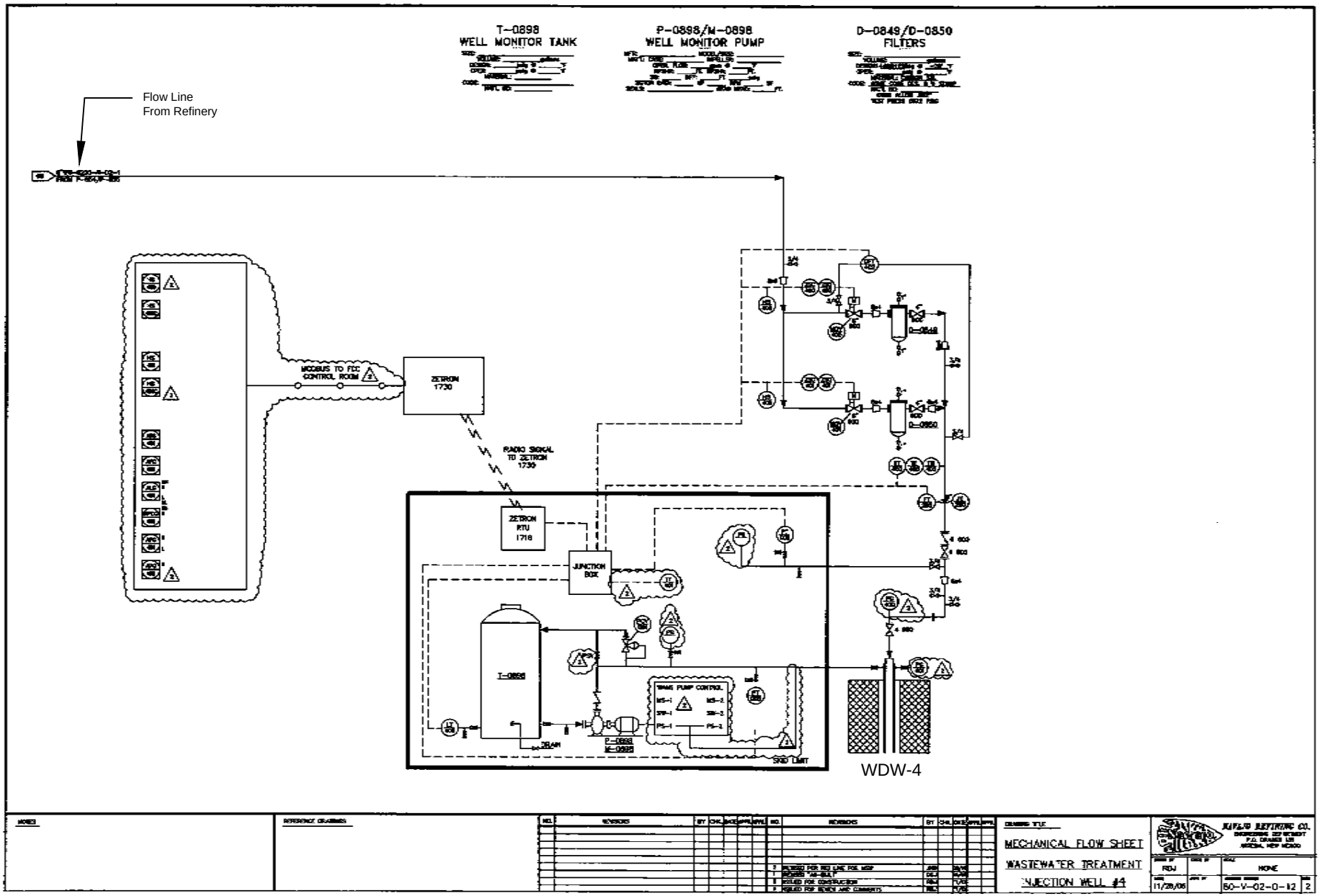
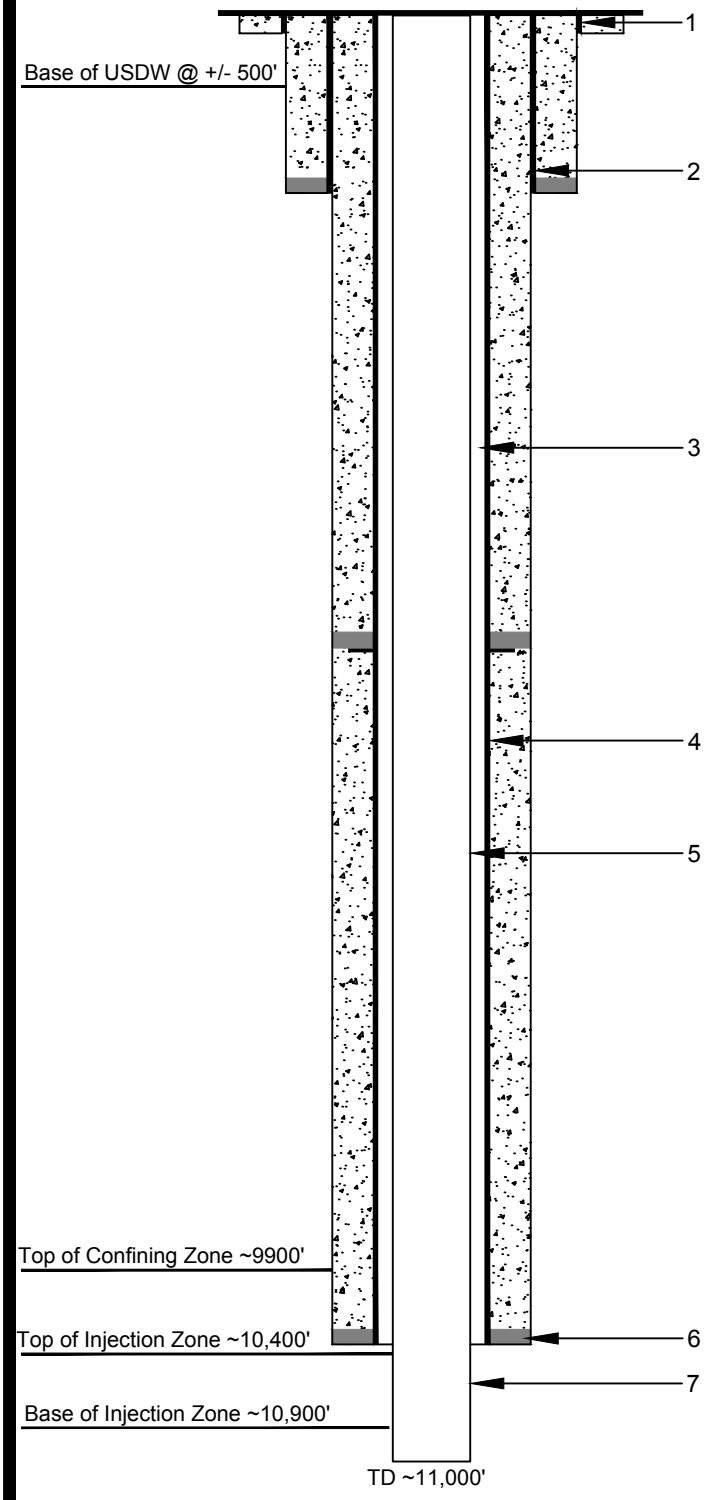


FIGURE 11
PRE-INJECTION SURFACE FACILITIES
HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO



BELOW GROUND DETAILS
(feet below Ground Level)

1. Conductor Pipe - 20", 129.33 lb/ft (0.625" wall), API 5LX-56, plain-end, beveled conductor set in 24" augered hole at 80' and cemented to the surface with redi-mix.

2. Surface Casing - $13\frac{3}{8}$", 54.5 lb/ft, K-55, ST&C, set at 1,500' in a 17½" hole and cemented to the surface.

3. Annulus Fluid - injection tubing and protection casing annulus filled with 250 bbl of brine water containing a corrosion inhibitor, a bactericide and an oxygen scavenger.

4. Protection Casing - $9\frac{5}{8}$", 47 lb/ft, N-80, LT&C set in a 12¼" hole at 10,400' with a DV Tool at 5,800' and cemented to the surface in two stages as follows:
   Stage I (5,600' - 10,400')
   Stage II (Surface - 5,800')

5. Injection Tubing - 7", 26 lb/ft, K-55, LT&C set in packer at approximately 10,300'.

6. Injection Packer - 7" x $9\frac{5}{8}$" set at approximately 10,300'. Final depth determined by Openhole Log.

7. Open Hole - $8\frac{1}{2}$" to 11,000'

NOTE: Final below ground well depths, configuration, specifications and volumes will be presented in the post-installation Well Construction Report.

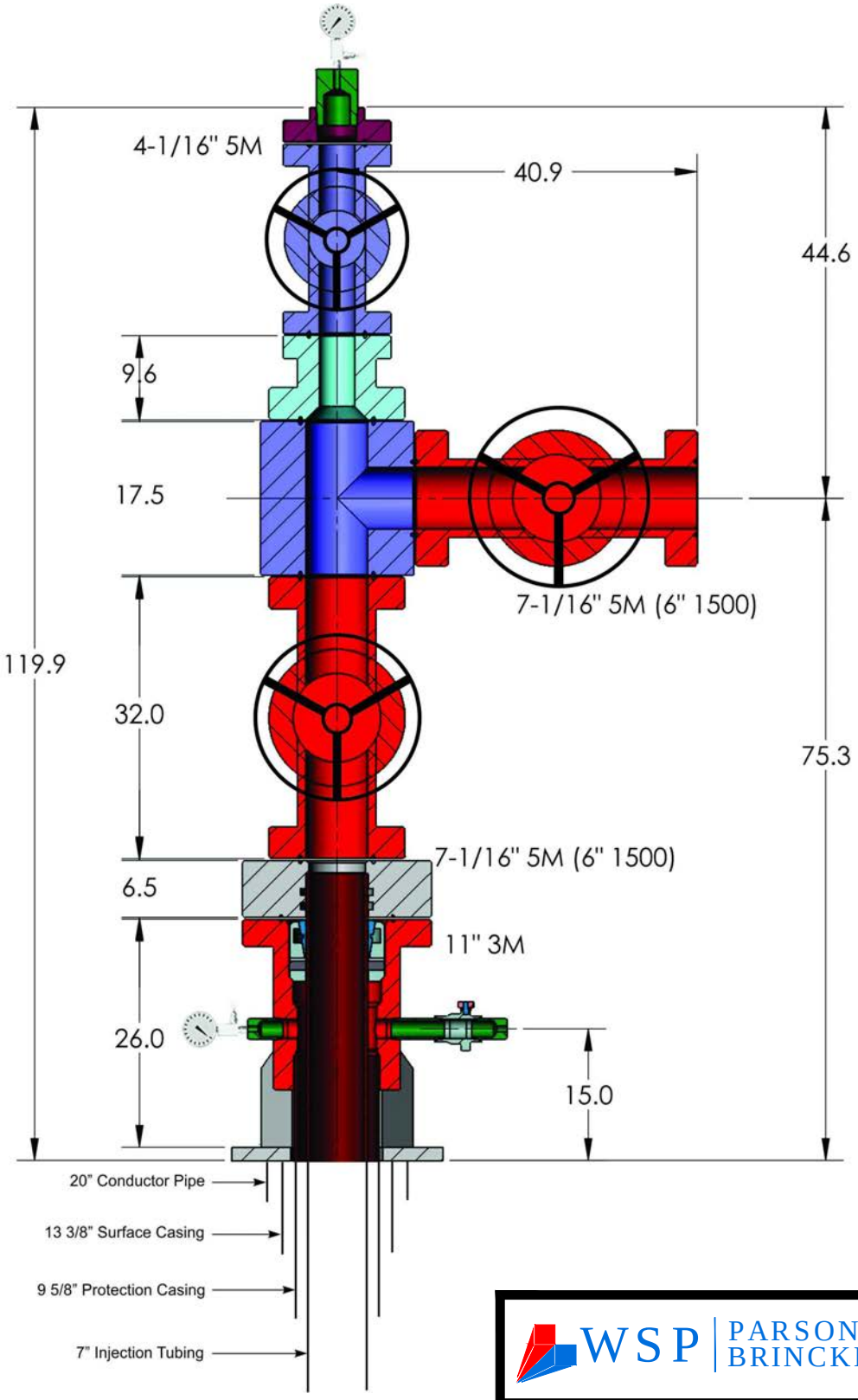
WSP | PARSONS BRINCKERHOFF

FIGURE 12

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROPOSED BELOW GROUND
WELL SCHEMATIC

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



NOTE: Final wellhead configuration, specifications and dimensions will be presented in the post-installation Well Construction Report.

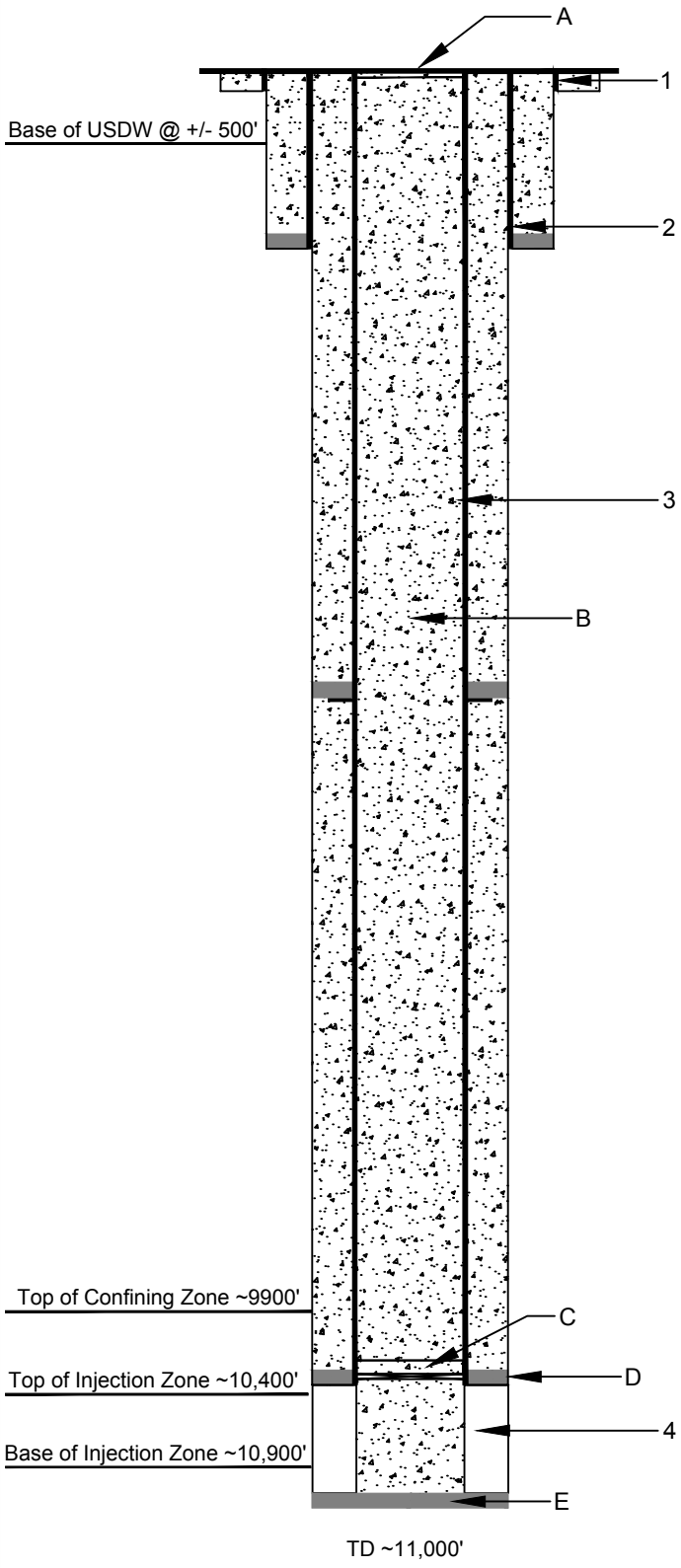
WSP | PARSONS BRINCKERHOFF

FIGURE 13

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROPOSED WELLHEAD SCHEMATIC

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



BELOW GROUND DETAILS

(feet below Ground Level)

1. Conductor Pipe - 20", 129.33 lb/ft (0.625" wall), API 5LX-56, plain-end, beveled conductor set in 24" augered hole at 80' and cemented to the surface with 3 yd³ of redi-mix.

2. Surface Casing - 13⅜", 54.5 lb/ft, K-55, ST&C, set at 1,500' in a 17½" hole and cemented to the surface with 1,092 ft³ of lightweight Class A lead cement followed by 206 ft³ of Class A tail cement.

3. Protection Casing - 9⅝", 47 lb/ft, N-80, LT&C set in a 12¼" hole at 10,400' with a DV Tool at 5,800' and cemented to the surface in two stages as follows:
   Stage I (5,600' - 10,400')
   Stage II (Surface - 5,800')

4. Open Hole - Silurian-Devonian Injection Interval 10,400' - 11,000'.

Plugging and Abandonment

A. Inscribed Steel Plate Cover - All casings cut-off 3j' below the surface and a ½" steel plate inscribed with operator name, well API no. and P&A Date welded over the 13 ⅜" surface casing.

B. Cement Plug - Class A cement (1.18 ft³/ sack) spotted in balanced plugs from 9,950' - 3'.

C. Cement Plug Above Retainer - 100-foot Class A (1.18 ft³/ sack) cement plug spotted above cement retainer 9,950' - 10,050'.

D. Cement Retainer - set in 9 ⅝" casing at 10,250'.

E. Cement Plug Below Retainer - 250 sacks of Class A (1.18 ft³/ sack) cement pumped below cement retainer from 10,250' - 10,400' and across open-hole from 10,400' - 11,000'.

NOTE: Final below ground well depths, configuration, specifications and volumes will be presented in the post-installation Well Construction Report.

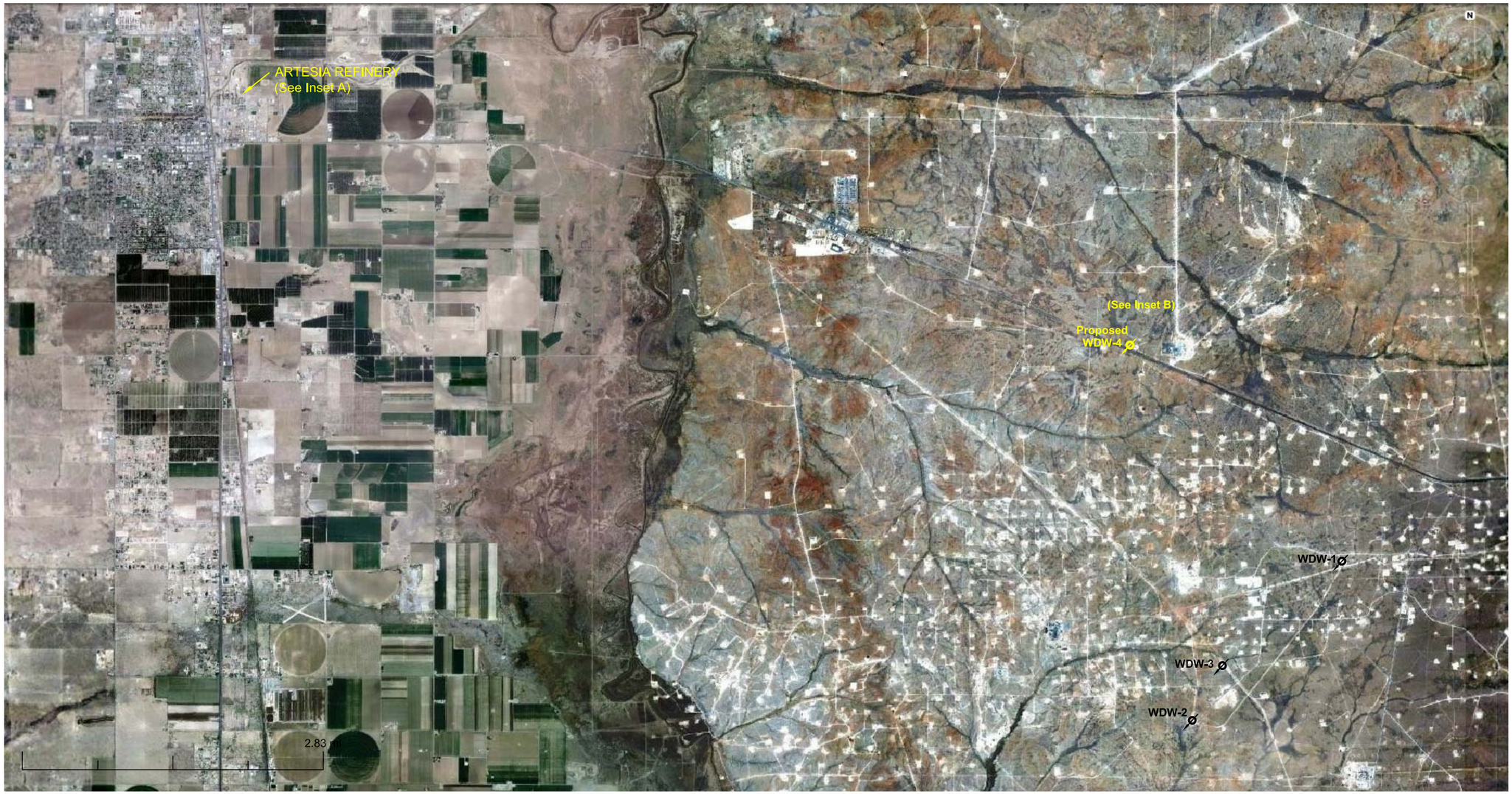
WSP | PARSONS BRINCKERHOFF

FIGURE 14

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROPOSED PLUG AND ABANDONED WELL SCHEMATIC

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



INSET A

INSET B

WSP | PARSONS BRINCKERHOFF

DRAWING 1

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

FACILITY MAP

DATE: 02/15/17	CHECKED BY:	JOB NO:185818-6944
DRAWN BY: WDD	APPROVED BY:	DWG. NO:

17S 27E

16 14 13 18 21 22 23 19 28 27 26 25 30 34 35 36

N

LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- 3-D SEISMIC SURVEY OUTLINE

SCALE
(IN FEET)

0 1000 2000

Well Number — API Number
Total Depth of Well — Map ID Number (see Table 1)

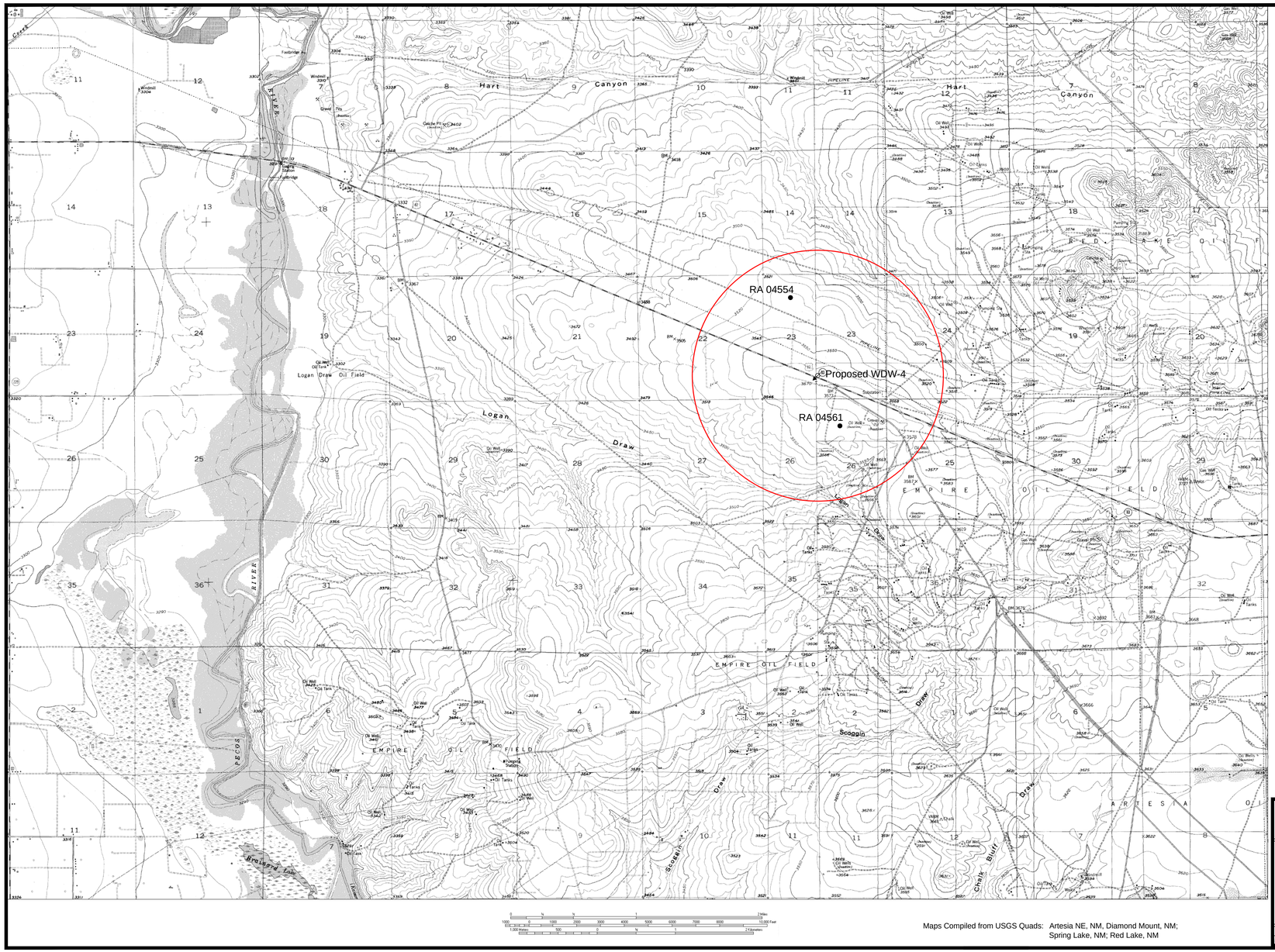
WSP | PARSONS BRINCKERHOFF

DRAWING 2

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

AREA OF REVIEW MAP

DATE: 03/02/17	CHECKED BY: RM	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY: GM	DWG NO:



LEGEND:

04561 (Refer to Table 2)

1-Mile Radius Area of Review

ROAD CLASSIFICATION

Heavy-duty ——— Light-duty ———

Medium-duty ——— Unimproved dirt - - - -

U.S. Route ○ State Route

NEW MEXICO

QUADRANGLE LOCATION

UTM GRID AND 1955 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Maps Compiled from USGS Quads: Artesia NE, NM, Diamond Mount, NM; Spring Lake, NM; Red Lake, NM

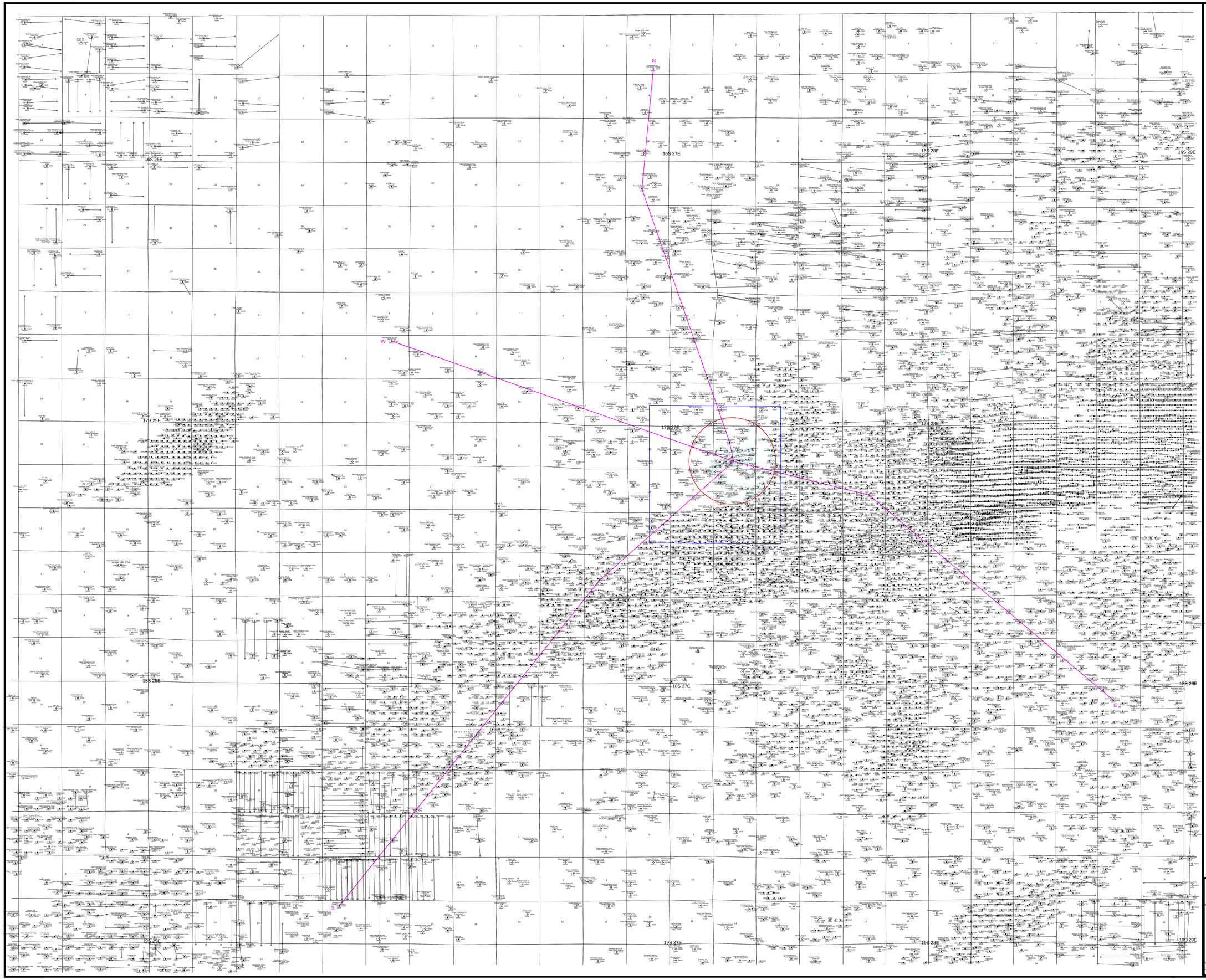
WSP | PARSONS BRINCKERHOFF

DRAWING 3

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

FRESHWATER WELLS IN AREA OF REVIEW

DATE: 02/15/17	CHECKED BY:	JOB NO:50904E
DRAWN BY: WDD	APPROVED BY:	DWG. NO:



LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- GEOLOGIC CROSS-SECTION LINE
- 3-D SEISMIC SURVEY OUTLINE

Well Number — API Number — 30-015-31290 — 00190 — Map ID Number (see Table 1) — Total Depth of Well

SCALE
0 1/2 1 MILES

WSP | PARSONS BRINCKERHOFF

DRAWING 4

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

GEOLOGIC CROSS-SECTION INDEX MAP

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDO	APPROVED BY:	DWG NO:

WEST

EAST

PRE-ONGARD WELL OPERATOR
PRE-ONGARD WELL NO. 001
SEC. 9 T17S R26E
TD: 9,018' KB: 3,364'
PLUGGED WATER WELL
API NUMBER 30-015-20913

44,128'

NAVAJO REFINING COMPANY, L.L.C.
PROPOSED WDW NO. 4
SEC. 23 T17S R27E

17,066'

COG OPERATING INC.
STATE B GAS COM NO. 1
SEC. 29 T17S R28E
TD: 12,431' KB: 3,715'
ACTIVE GAS WELL
API NUMBER 30-015-01611

38,872'

OXY USA INC.
SOUTH LOCO HILLS UNIT NO. 10
SEC. 20 T18S R29E
TD: 9,304' KB: 3,570'
PLUGGED OIL WELL
API NUMBER 30-015-03449

Elevation (ft msl)

Elevation (ft msl)

GROUND LEVEL

GRAYBURG

SAN ANDRES

GLORIETA

TUBB

YESO

ABO

WOLFCAMP

CISCO

CANYON

STRAWN

CHESTER

MISSISSIPPIAN

SILURIAN-DEVONIAN

MONTOYA

SIMPSON

ELLENBURGER

CONFINING ZONE

INJECTION ZONE

PTD: 11,000'

(See Drawing 4 for larger scale)

VERTICAL SCALE 1" = 200'

HORIZONTAL SCALE 1" = 2000'

WSP | PARSONS BRINCKERHOFF

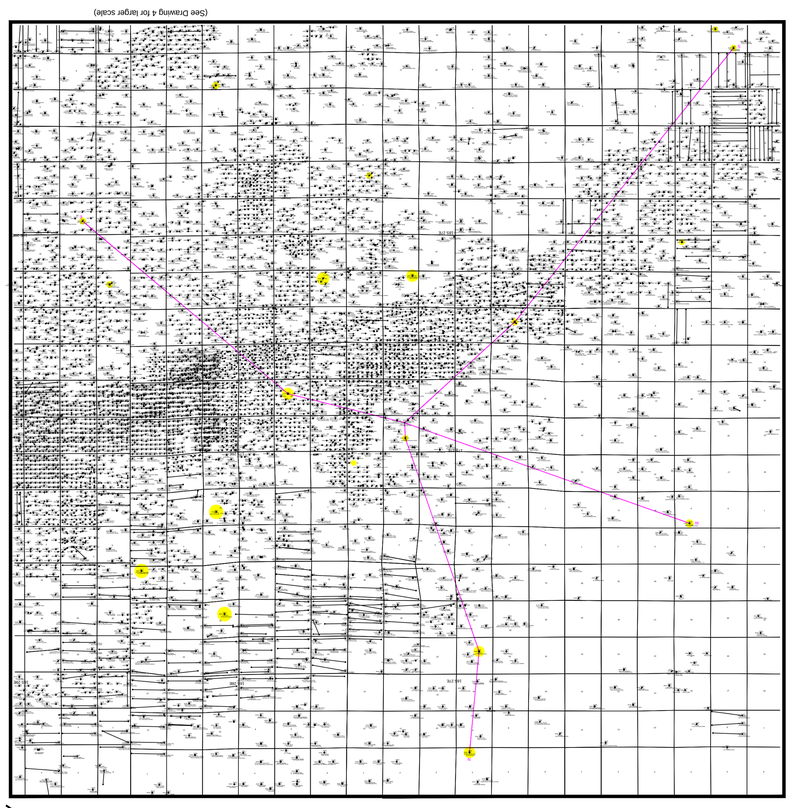
DRAWING 5

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

WEST - EAST DIP
GEOLOGIC CROSS-SECTION A-A'

DATE	01/02/17	CHECKED BY:	JOB NO. 50904E
DRAWN BY:	AGG	APPROVED BY:	DWG. NO.

(See Drawing 4 for larger scale)



VERTICAL SCALE
0
200

HORIZONTAL SCALE (Feet)
0
3000

WSP | PARSONS BRINCKERHOFF

DRAWING 6

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

NORTH - SOUTH
GEOLOGIC CROSS-SECTION B-B'

DATE: 03/02/17	CHECKED BY:
JOB NO: 50904E	
DRAWN BY: WDD	APPROVED BY:
DWG. NO:	

NORTH

PRE-ONGARD WELL OPERATOR
PRE-ONGARD WELL NO. 001
SEC. 11 T16S R27E
TD: 10,767' KB: 3,668'
PLUGGED OIL WELL
API NUMBER 30-015-00561

18,803'

SNOW OIL & GAS INC.
DUFFIELD NO. 1
SEC. 21 T16S R27E
TD: 10,185' KB: 3,572'
ACTIVE GAS WELL
API NUMBER 30-015-00565

32,668'
(NTS)

ALAMO PERMIAN RESOURCES
BERRY FEDERAL NO. 29
SEC. 23 T17S R27E
TD: 10,472' KB: 3,545'
PLUGGED GAS WELL
API NUMBER 30-015-00472

2,376'
(NTS)

NAVAJO REFINING COMPANY, L.L.C.
PROPOSED WDW NO. 4
SEC. 23 T17S R27E

21,751'
(NTS)

LRE OPERATING LLC
CHALK BLUFF FED NO. 1
SEC. 5 T18S R27E
TD: 10,397' KB: 3,512'
ACTIVE SALTWATER DISPOSAL WELL
API NUMBER 30-015-00789

50,899'
(NTS)

PRE-ONGARD WELL OPERATOR
PRE-ONGARD WELL NO. 1
SEC. 17 T19S R26E
TD: 10,200' KB: 3,396'
PLUGGED OIL WELL
API NUMBER 30-015-10338

SOUTH

PTD: 11,000'

INJECTION ZONE

CONFINING ZONE

MISSISSIPPIAN

SILURIAN-DEVONIAN

MONTOYA

SIMPSON

ELLENBURG

WOODFORD

CHESTER

STRAWN

CANYON

CISCO

WOLFCAMP

ABO

YESO

TUBB

GLORIETA

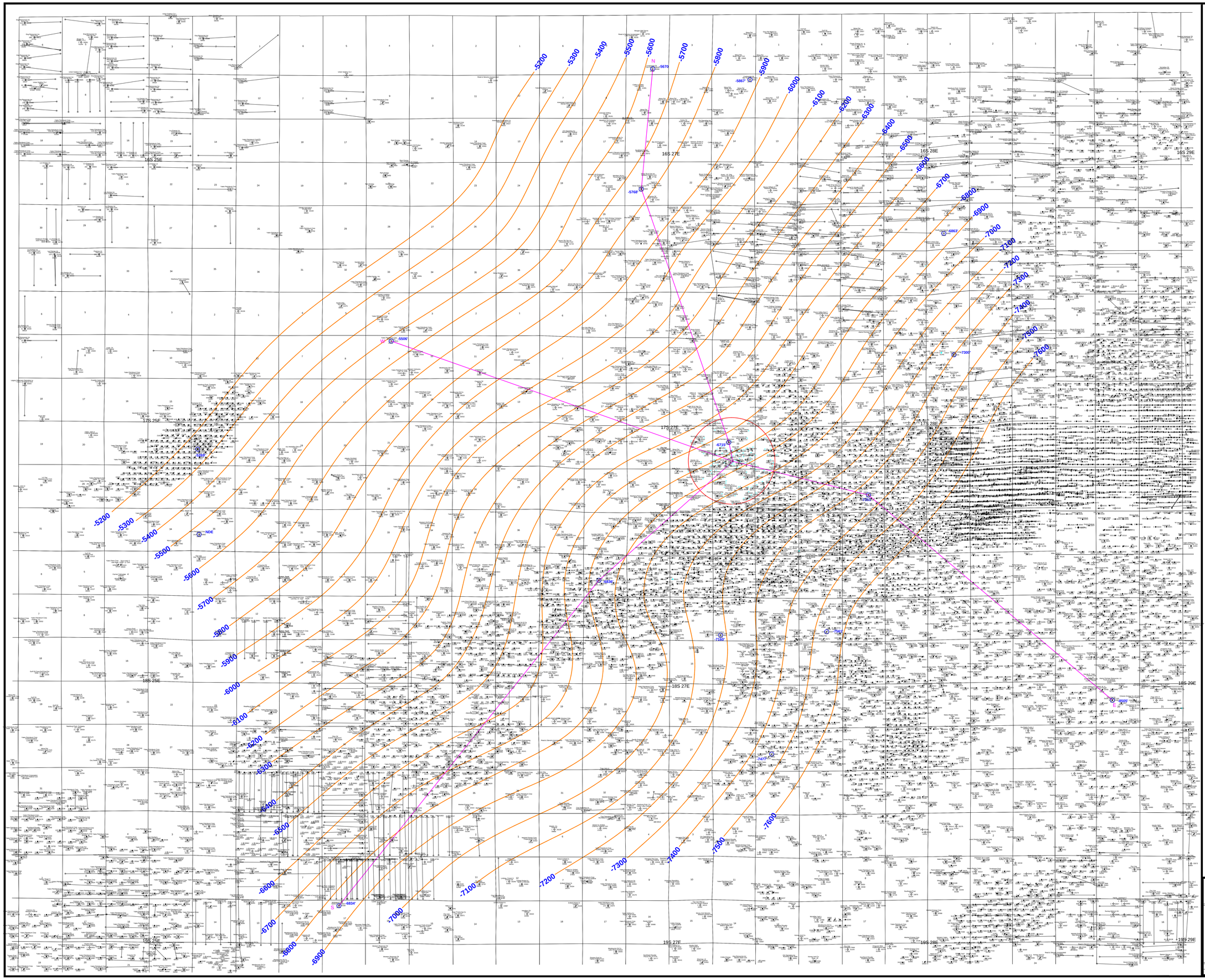
SAN ANDRES

GRAYBURG

GROUND LEVEL

Elevation (ft msl)

-7,800' -7,700' -7,600' -7,500' -7,400' -7,300' -7,200' -7,100' -7,000' -6,900' -6,800' -6,700' -6,600' -6,500' -6,400' -6,300' -6,200' -6,100' -6,000' -5,900' -5,800' -5,700' -5,600' -5,500' -5,400' -5,300' -5,200' -5,100' -5,000' -4,900' -4,800' -4,700' -4,600' -4,500' -4,400' -4,300' -4,200' -4,100' -4,000' -3,900' -3,800' -3,700' -3,600' -3,500' -3,400' -3,300' -3,200' -3,100' -3,000' -2,900' -2,800' -2,700' -2,600' -2,500' -2,400' -2,300' -2,200' -2,100' -2,000' -1,900' -1,800' -1,700' -1,600' -1,500' -1,400' -1,300' -1,200' -1,100' -1,000' -900' -800' -700' -600' -500' -400' -300' -200' -100' 0' 100' 200' 300' 400' 500' 600' 700' 800' 900' 1,000' 1,100' 1,200' 1,300' 1,400' 1,500' 1,600' 1,700' 1,800' 1,900' 2,000' 2,100' 2,200' 2,300' 2,400' 2,500' 2,600' 2,700' 2,800' 2,900' 3,000' 3,100' 3,200' 3,300' 3,400' 3,500' 3,600' 3,700' 3,800'



LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- GEOLOGIC CROSS-SECTION LINE
- -5600 STRUCTURE CONTOUR OF TOP OF INJECTION ZONE

Well Number — API Number — Map ID Number (see Table 1) — Top of Injection Zone Elevation (ft msl) — Total Depth of Well

SCALE (in FEET): 0, 1000, 2000

CI = 100'

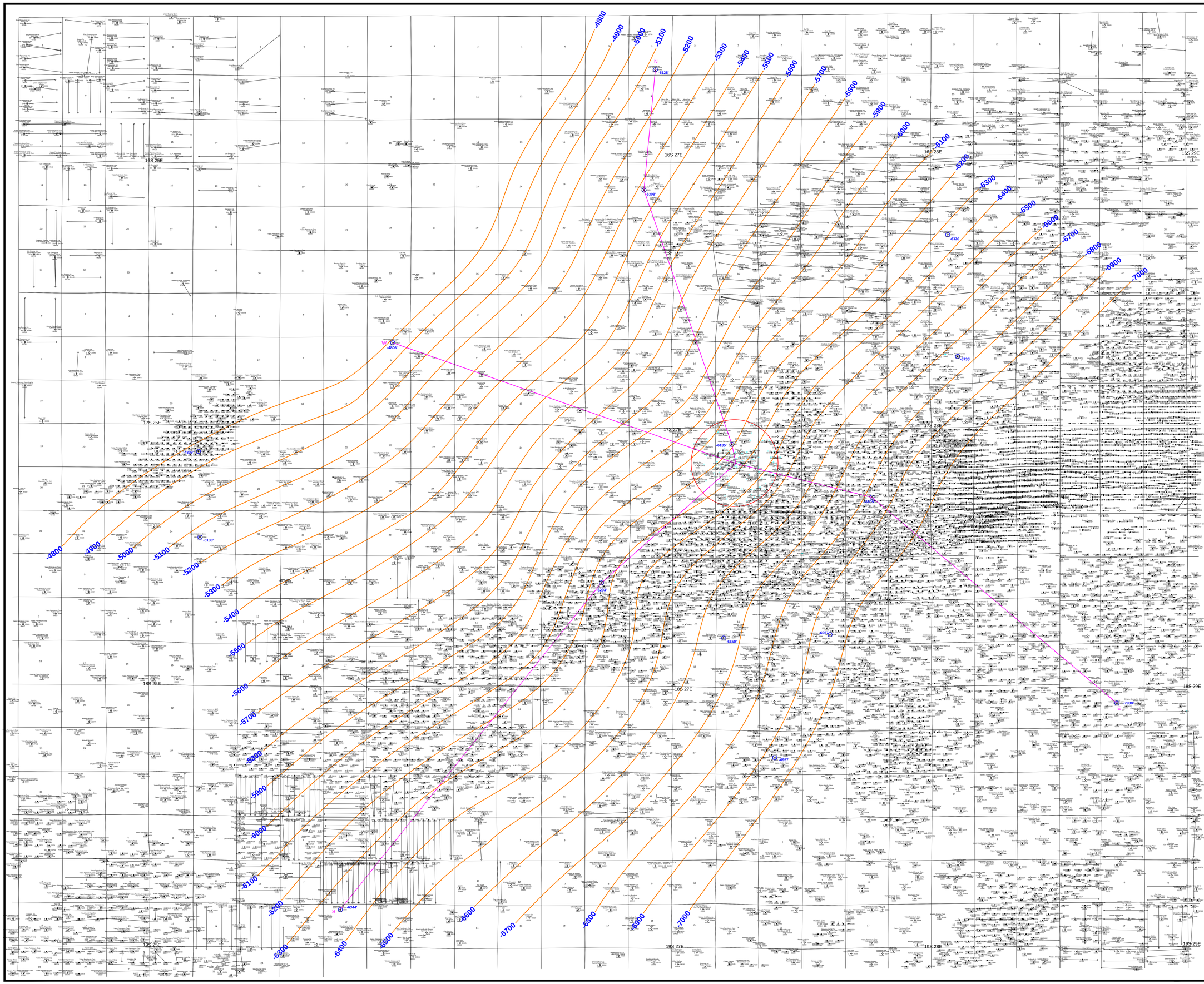
WSP | PARSONS BRINCKERHOFF

DRAWING 7

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

STRUCTURE CONTOUR MAP TOP OF INJECTION ZONE

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG NO:



LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- GEOLOGIC CROSS-SECTION LINE
- -5900 STRUCTURE CONTOUR OF TOP OF CONFINING ZONE

Well Number — API Number — Map ID Number (see Table 1) — -6,185' Top of Confining Zone Elevation (ft msl) — Total Depth of Well

SCALE IN FEET

0 2000 4000

CI = 100'

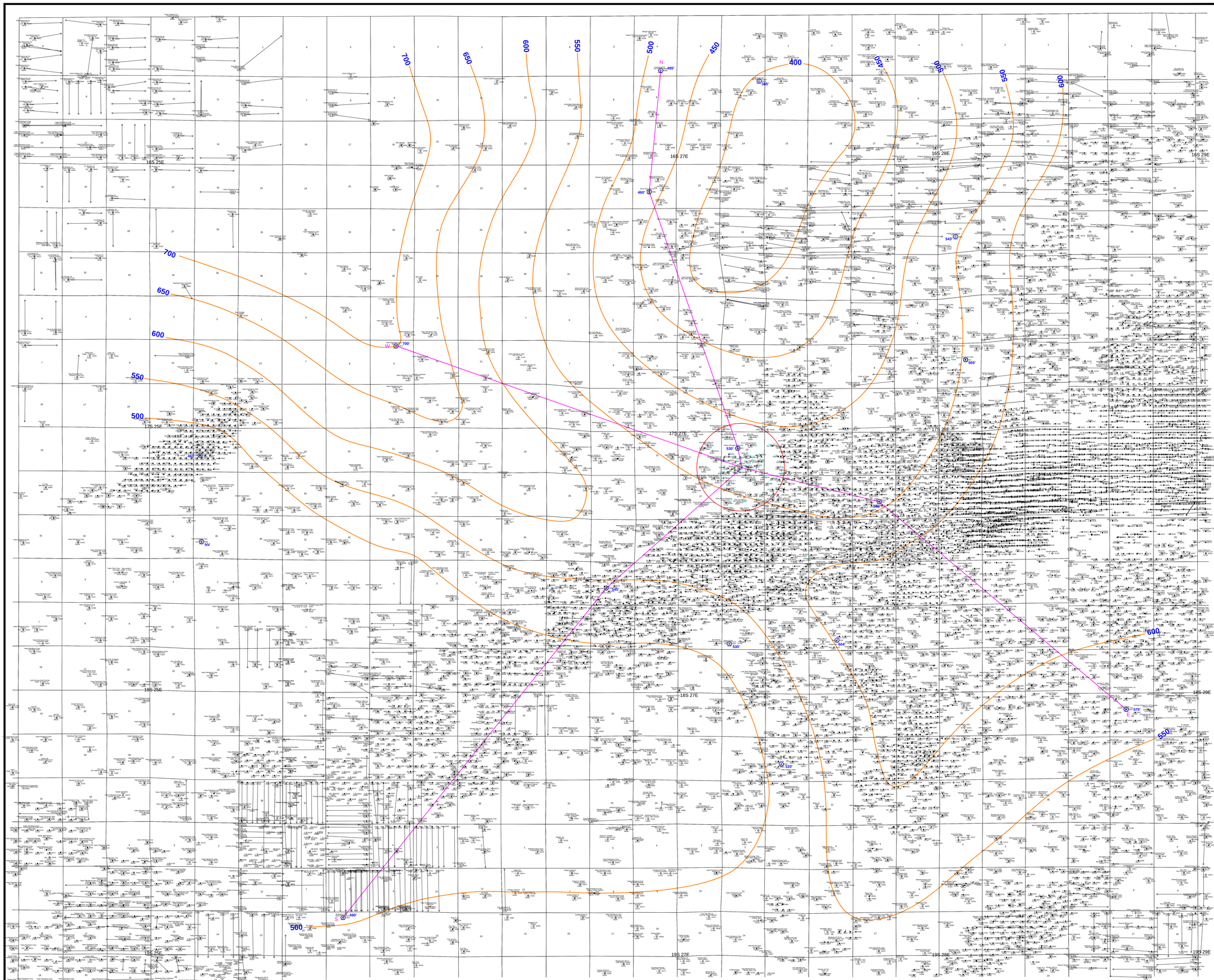
WSP | PARSONS BRINCKERHOFF

DRAWING 8

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

STRUCTURE CONTOUR MAP TOP OF CONFINING ZONE

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG NO:



LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- GEOLOGIC CROSS-SECTION LINE
- 500 — ISOPACH CONTOUR OF THE CONFINING ZONE

Well Number — API Number
Map ID Number (see Table 1)
Total Depth of Well — Confining Zone Thickness (feet)

SCALE (IN FEET)
0 1000 2000

CI = 50'

WSP | PARSONS BRINCKERHOFF

DRAWING 9

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

ISOPACH MAP OF CONFINING ZONE MAP

DATE: 02/15/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG NO:

17S 27E

N

LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW

SCALE (IN FEET)
0 1000 2000

Well Number
API Number
1 30-025-31266
Map ID Number (see Table 1)
Total Depth of Well

WSP | PARSONS BRINCKERHOFF

DRAWING 10

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROJECTED CONE OF INFLUENCE IN INJECTION ZONE, INITIAL 5-YEAR PERMIT PERIOD

DATE: 03/02/17	CHECKED BY:	
DRAWN BY: WDD	APPROVED BY:	JOB NO: 50904E
		DWG NO:

17S 27E

N

LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- 200 PRESSURE INCREASE CONTOURS (PSI)

NOTE: CRITICAL PRESSURE OF 452 PSI NOT REACHED

SCALE (IN FEET)

0 1000 2000

Well Number — API Number: 1-ST-30396

Total Depth of Well — Map ID Number (see Table 1)

WSP | PARSONS BRINCKERHOFF

DRAWING 11

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROJECTED CONE OF INFLUENCE IN INJECTION ZONE, EXPECTED 30-YEAR LIFE OF WELL

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG NO:

17S 27E

N

LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- 2,972 FEET RADIUS PROJECTED PLUME FRONT INITIAL 5-YEAR PERMIT PERIOD

SCALE (IN FEET)
0 1000 2000

Well Number
API Number
30-025-31396
Map ID Number (see Table 1)
Total Depth of Well

WSP | PARSONS BRINCKERHOFF

DRAWING 12

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROJECTED PLUME FRONT IN INJECTION ZONE, INITIAL 5-YEAR PERMIT PERIOD

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG NO:

17S 27E

N

LEGEND

- PERMITTED WELL
- DRY HOLE
- PLUGGED AND ABANDONED WELL
- GAS WELL
- OIL WELL
- OIL & GAS WELL
- ABANDONED GAS WELL
- ABANDONED OIL WELL
- ABANDONED OIL & GAS WELL
- INJECTION WELL
- PLUGGED & ABANDONED INJECTION WELL
- SALTWATER DISPOSAL WELL
- PLUGGED SALTWATER DISPOSAL WELL
- 1-MILE RADIUS AREA OF REVIEW
- 7,028 FEET RADIUS PROJECTED PLUME FRONT EXPECTED 30-YEAR LIFE OF WELL

SCALE (IN FEET)
0 1000 2000

Well Number — API Number 1-ID: 30366 2-OGRID: 15694
Map ID Number (see Table 1)
Total Depth of Well

WSP | PARSONS BRINCKERHOFF

DRAWING 13

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

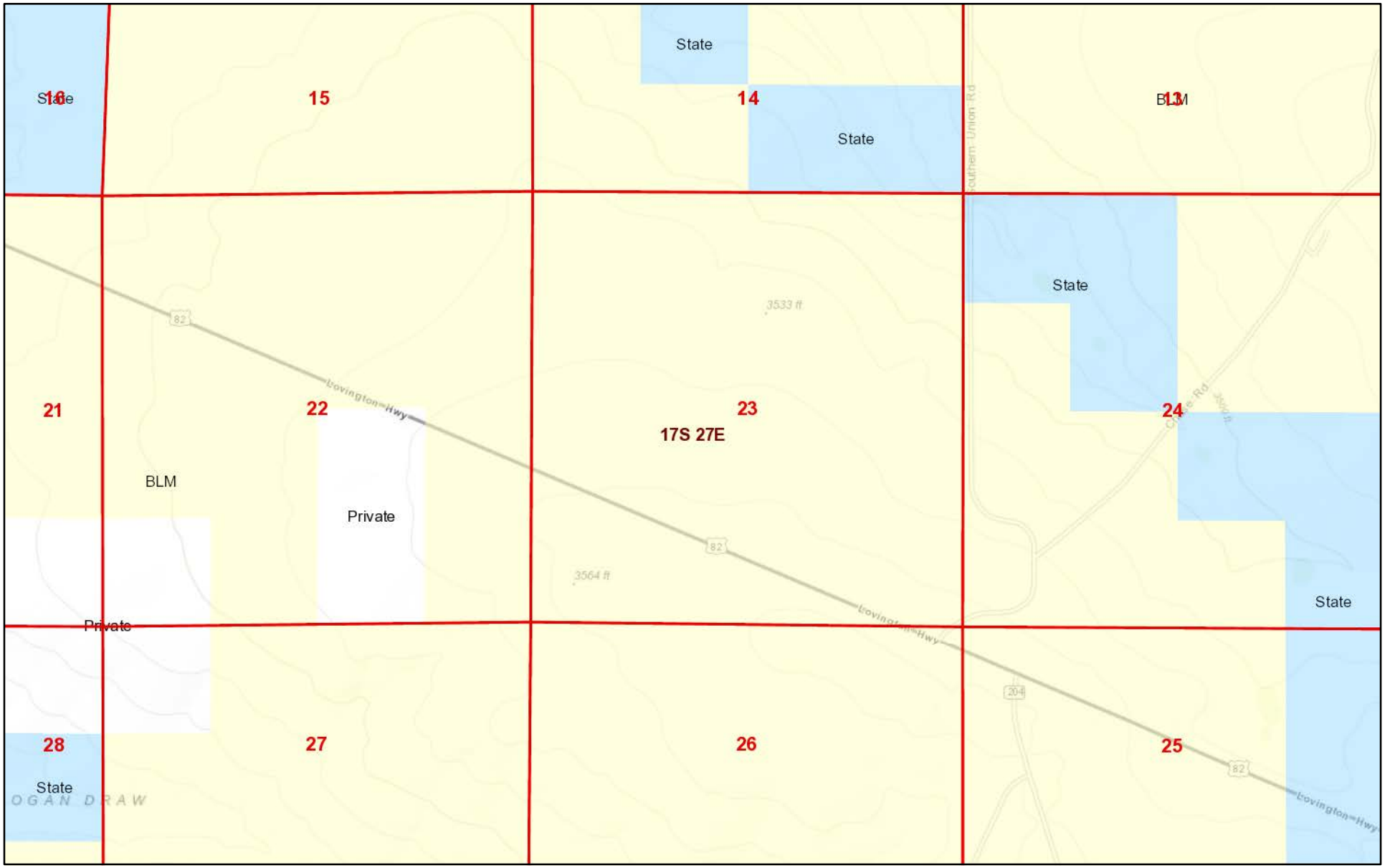
PROJECTED PLUME FRONT IN INJECTION ZONE, EXPECTED 30-YEAR LIFE OF WELL

DATE: 03/02/17	CHECKED BY:	JOB NO: 50904E
DRAWN BY: WDD	APPROVED BY:	DWG NO:

APPENDIX A

SURROUNDING LAND OWNERSHIP INFORMATION

ArcGIS Web Map



February 9, 2017

PLSSTownship

PLSSFirstDivision

Land Ownership

BLM

BOR

DOD FWS P SP

DOE I S USDA

FS NPS SGF VCNP

1:24,000

0 0.2 0.4 0.8 mi

0 0.225 0.45 0.9 km

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey,

Web AppBuilder for ArcGIS

NM OSE | U.S. BLM | US Census Bureau, NMDOT | BLM | OCD | dsilcock, OCD | Texas Parks & Wildlife, Esri, HERE, Garmin, INCREMENT P, Intermap, USGS, METI/NASA, EPA, USDA |

APPENDIX B-1

GEOLEX 3D SEISMIC INTERPRETATION REPORT

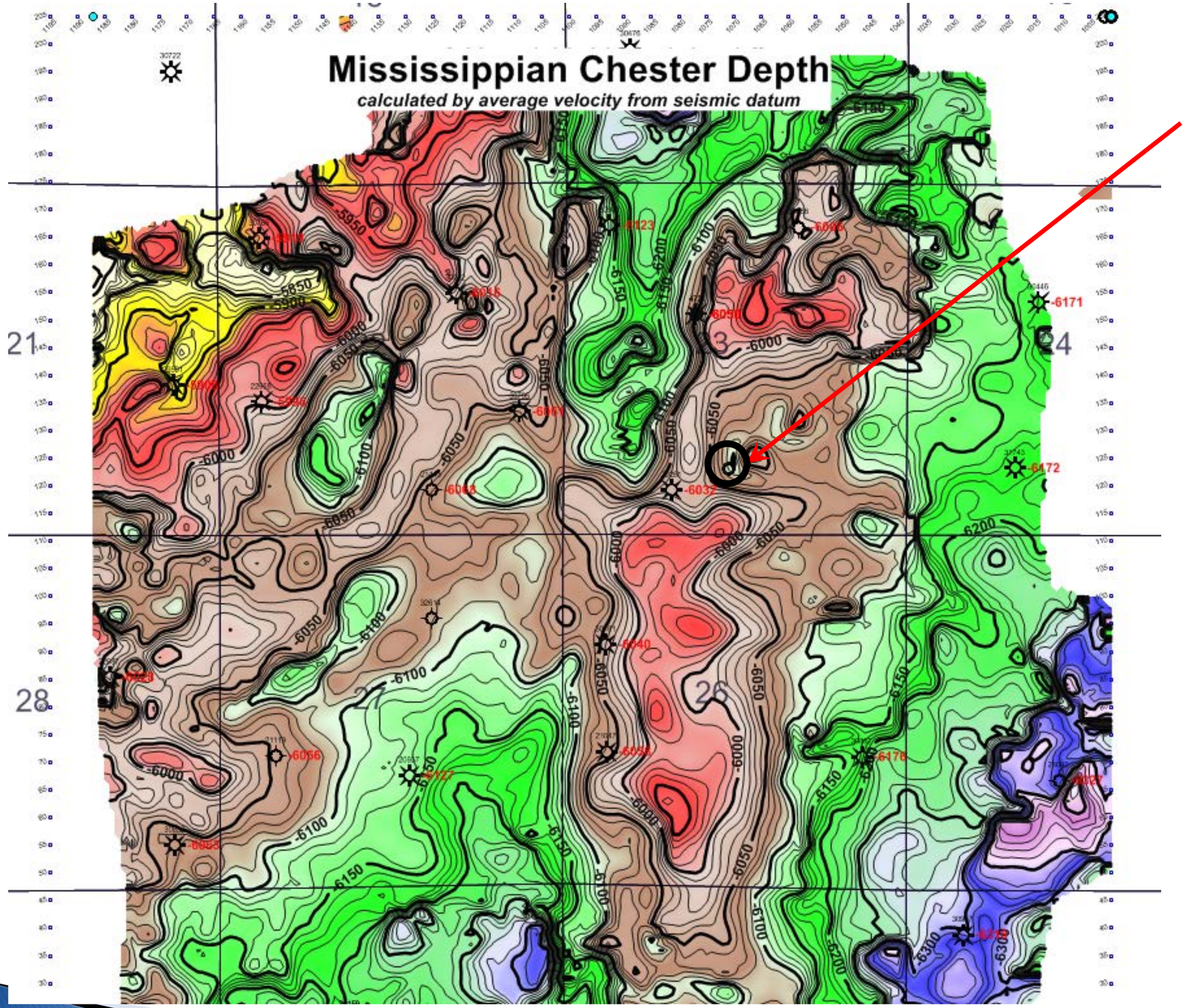
Seismic Evaluation of Eddy County Devonian Reservoir Quality

Prepared for:
Holly Frontier/Navajo Refining Company
Artesia, NM

February 27, 2017

Prepared by:
Geolex, Inc.
Albuquerque, NM

GEOLEX® INCORPORATED



Proposed location
X=525861
Y= 660225

State Plane NAD 27
New Mexico East

Approx. 2500’ FWL & 1000’ FSL

Structural mapping at the closest mapable horizon, the Chester, indicates the proposed location is approximately 130 feet down dip from the crest of the structure in section 26 and in a structural sag, probably caused by karst collapse in the Devonian.

There appears to be no faulting in the vicinity of the location.

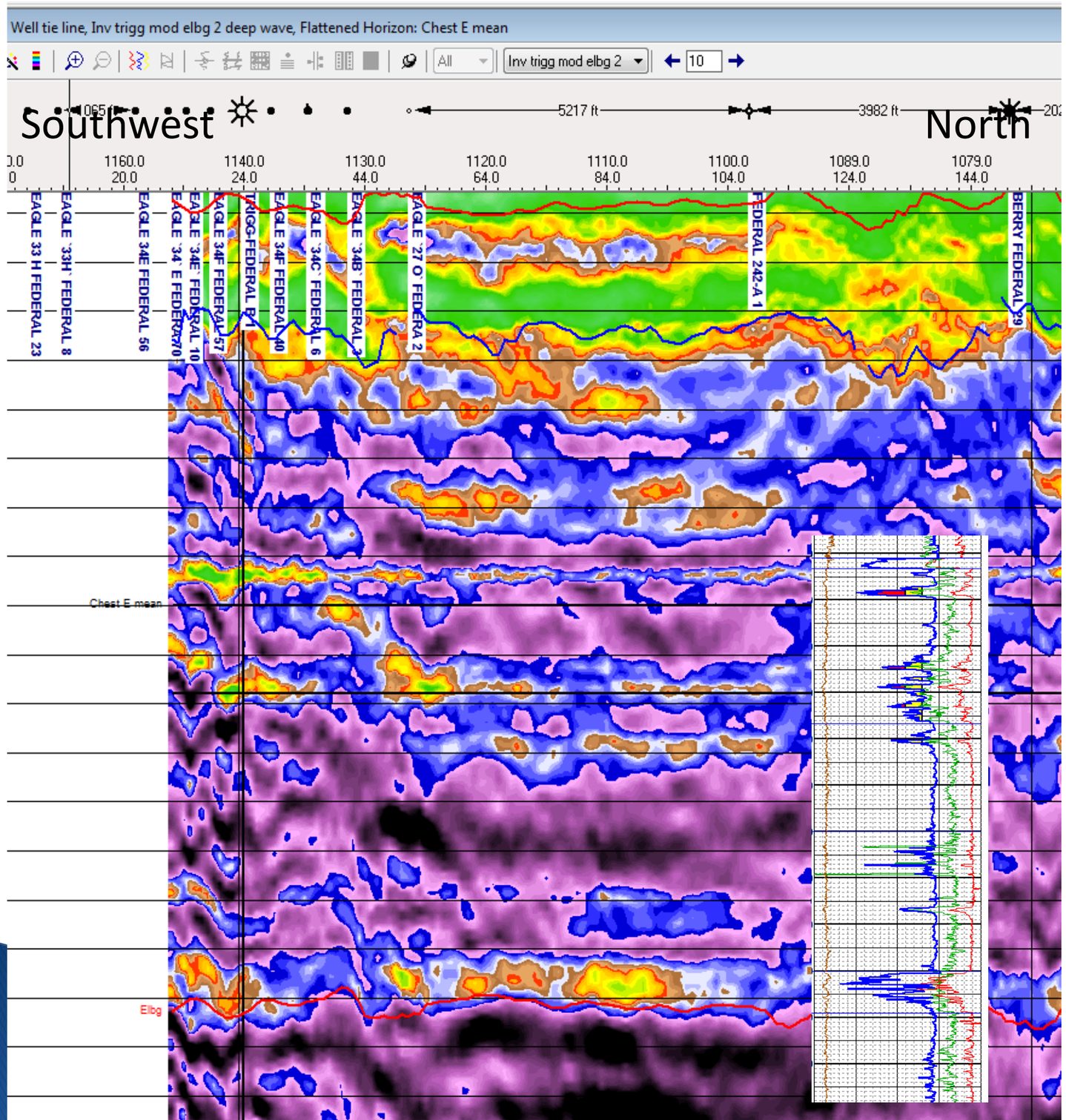
GEOLEX® INCORPORATED

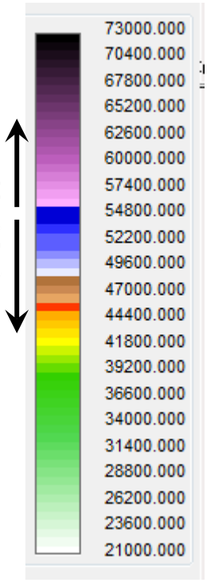
Model based Seismic Trace Inversion is used to increase the seismic resolution and determine porosity distribution in the Devonian and Fusselman.

Only the Devonian will be shown because it will be the largest contributor to reservoir connectivity and storage.

GEOLEX® INCORPORATED

Inversion Interpretation From Chester Through Ellenburger





Tight

Increasing Porosity

Shale

Chester

Osage

Woodford

Devonian

Lower D porosity

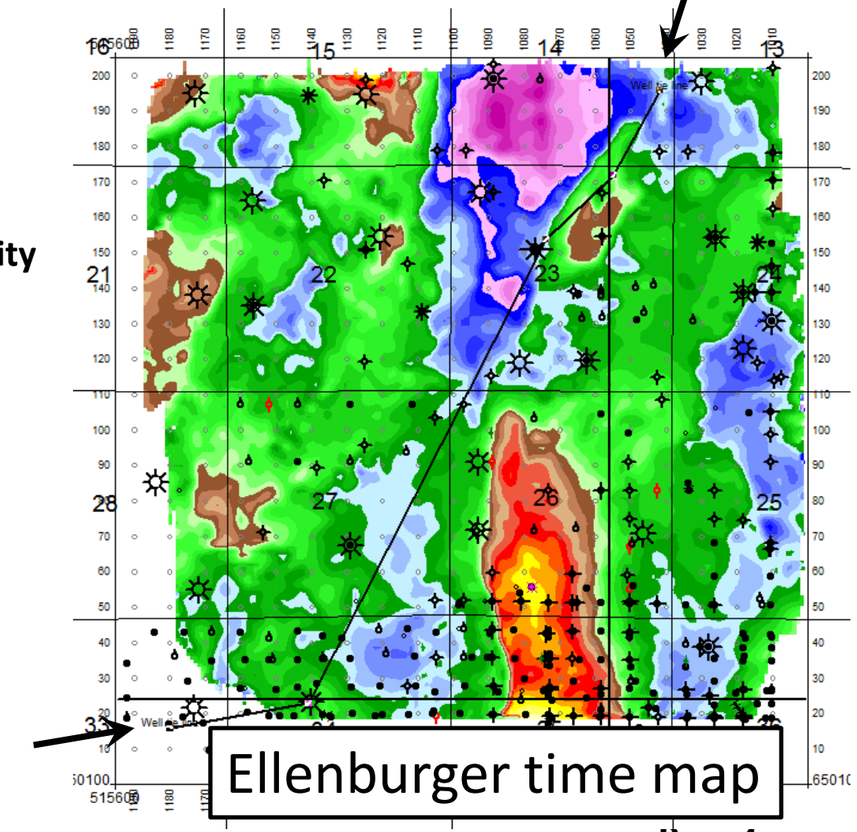
Fuss. Porosity

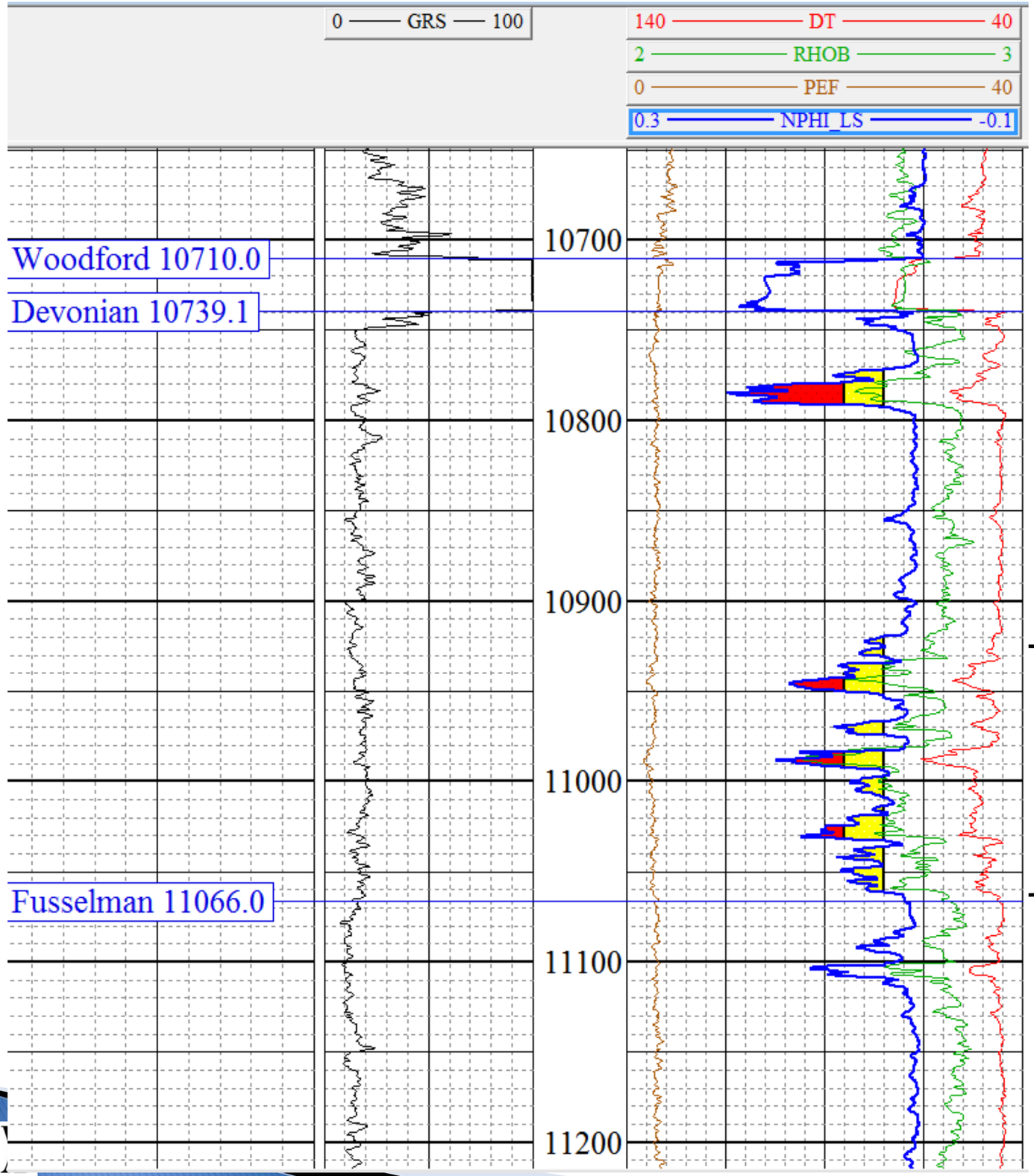
Simpson

Ellenburger

Well tie line

Flattened on Wdfd





24857 Fed DH #1

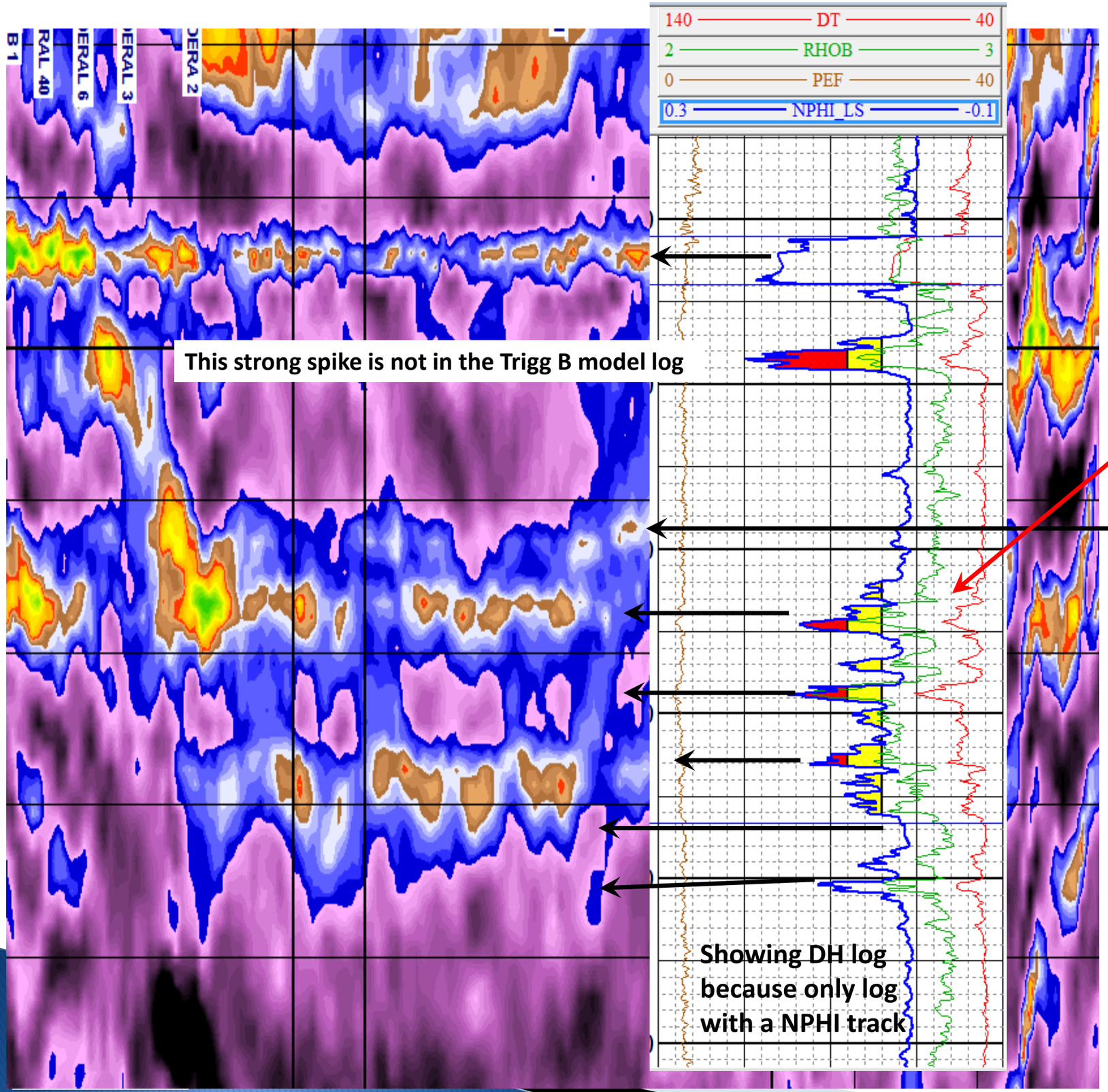
Model for the geologic section below the upper Devonian

Upper porosity Not included in model because the drilled wells penetrated the zone
20 ft of 4-8% porosity
12 ft of 8-19% porosity
26 bbl W in 2 hrs. swab

Lower Devonian
140 foot interval
100 ft of 4-8% porosity
32 ft of 8-14% porosity
No test

Fusselman porosity

GEOLEX INCORPORATED

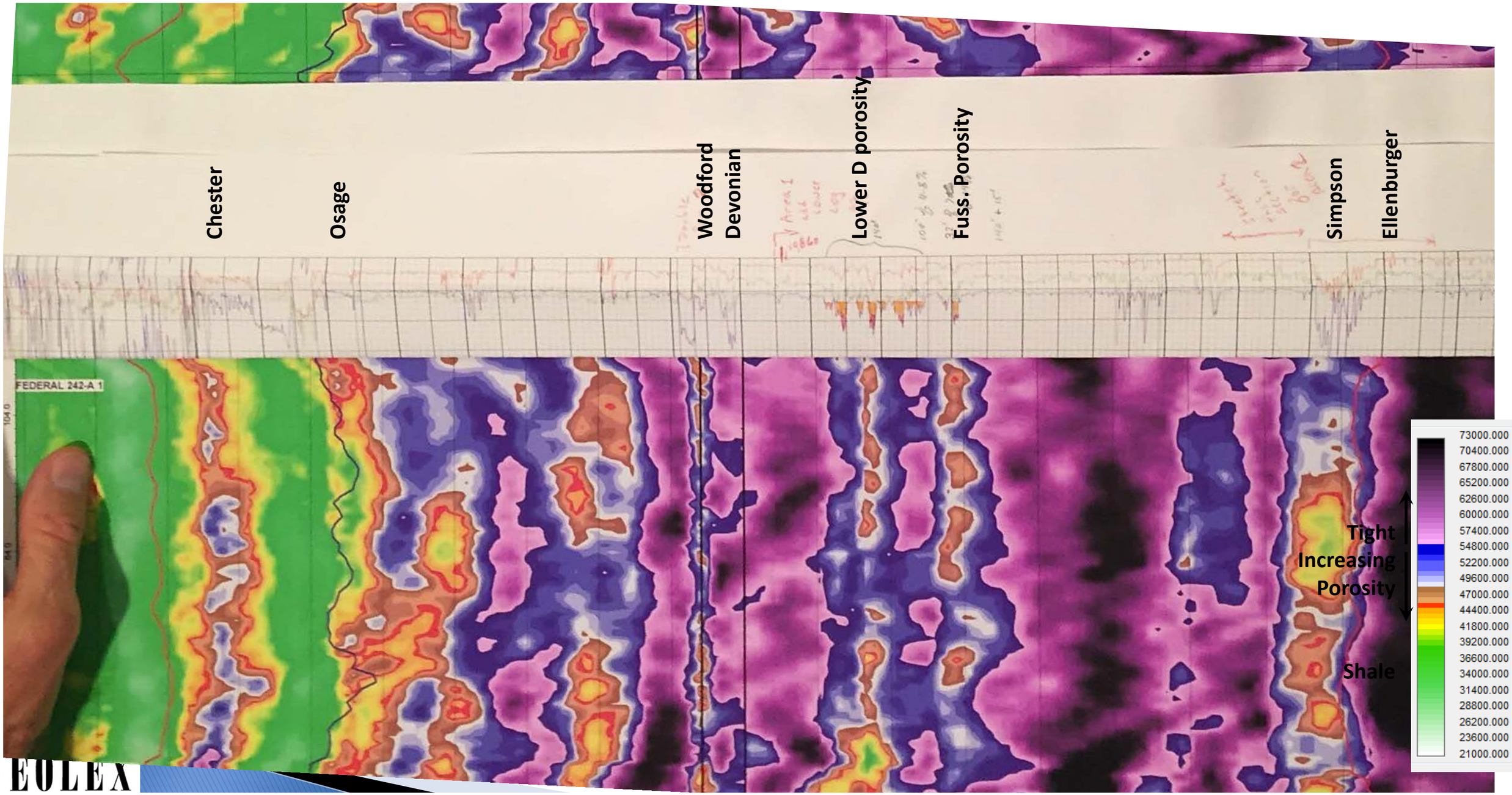


The model well ties fairly well. Resolution on the inversion is about 10-20 ft. Note that the massive Karst system has tremendously better porosity than that on the log shown on the previous page:

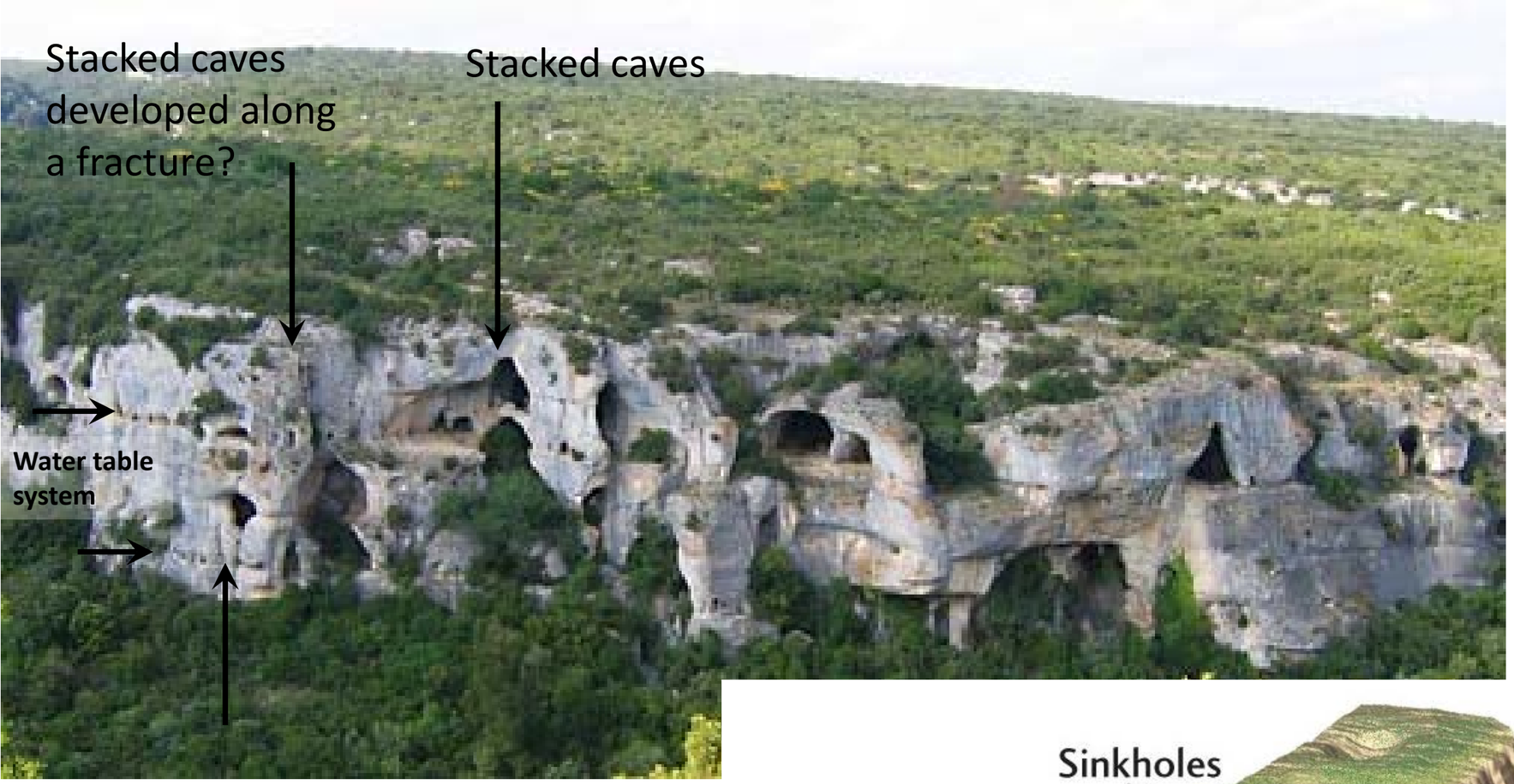
Lower Devonian
140 foot interval
100 ft of 4-8% porosity
32 ft of 8-14% porosity

To scale tying the 1” scale log to the inverted data

Porosity in the Devonian and Fusselman is thought to be created / modified by Karst and cave development



EOLEX

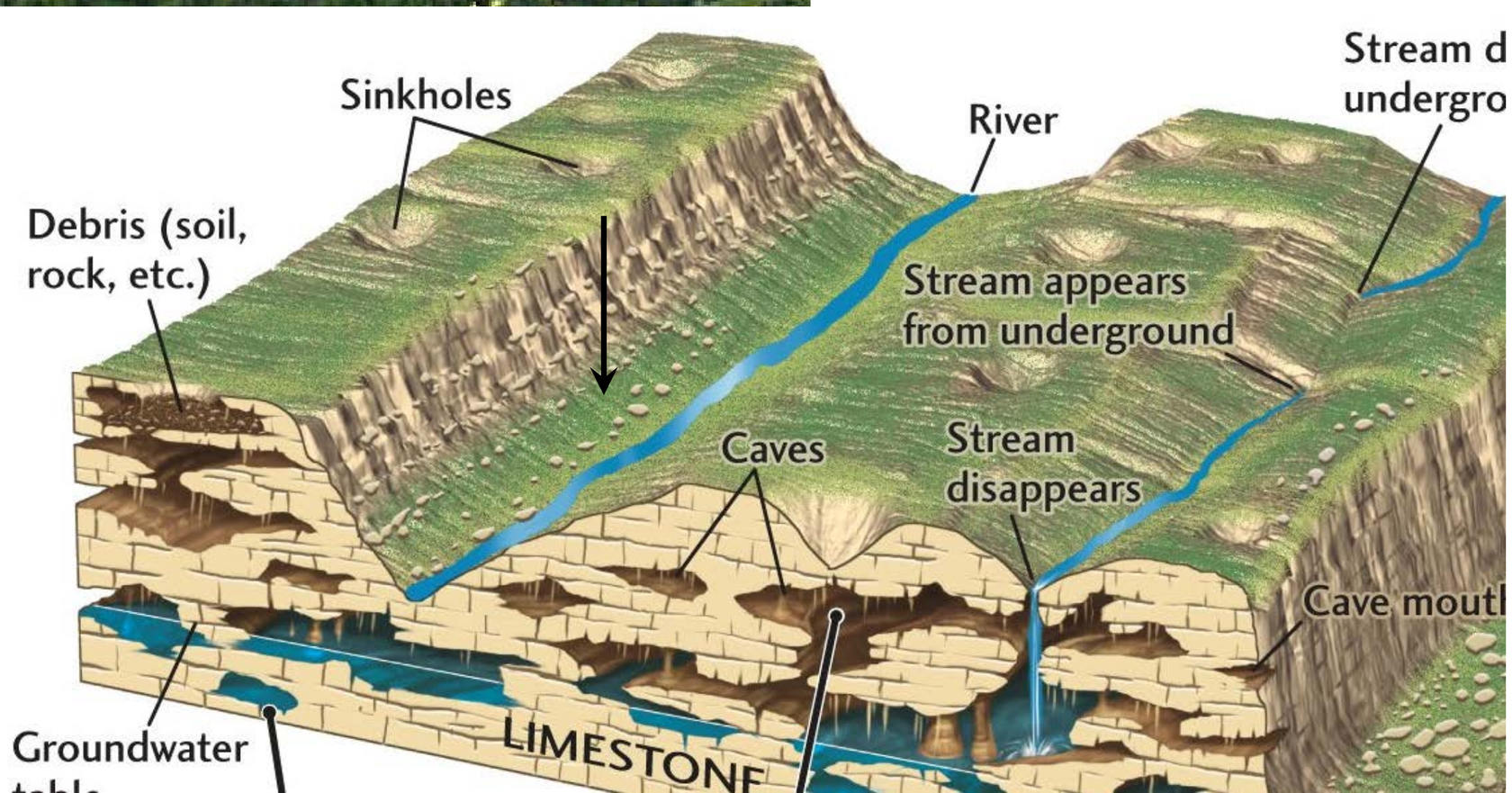


The caves of a karst landscape, Minerve, Hérault, France.
Hugo Soria

Porosity in the Devonian and Fusselman is thought to be created and/or modified by Karst and cave development.

Note: after the karsting episode, upon further burial, the open voids tend to fill with collapse from above, but retain significant enhanced porosity and permeability.

Karst images from Google

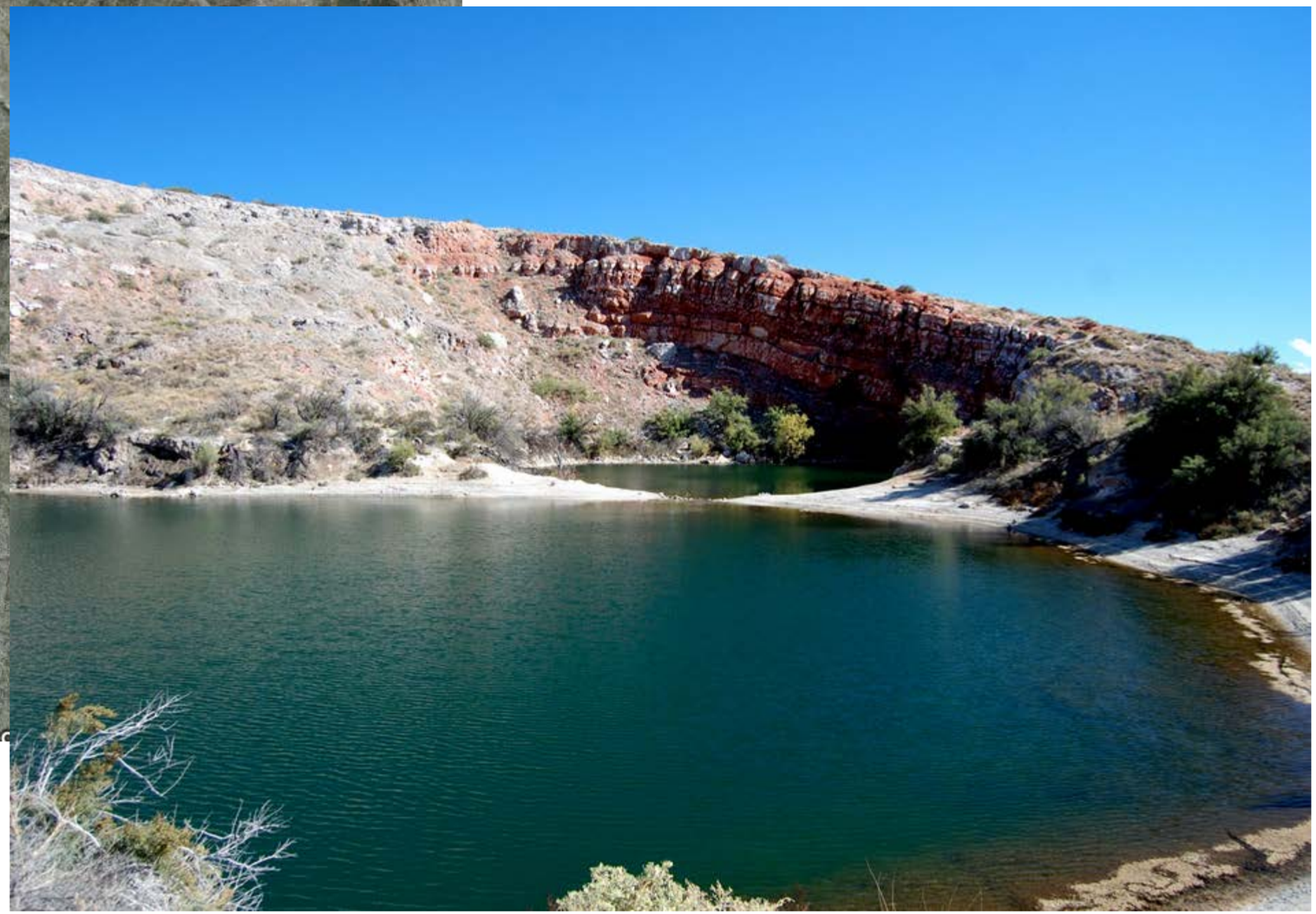


GEOLEX INCORPORATED

Modern day Karsting

Bottomless lakes New Mexico – sink holes in Karst system.

Google Earth

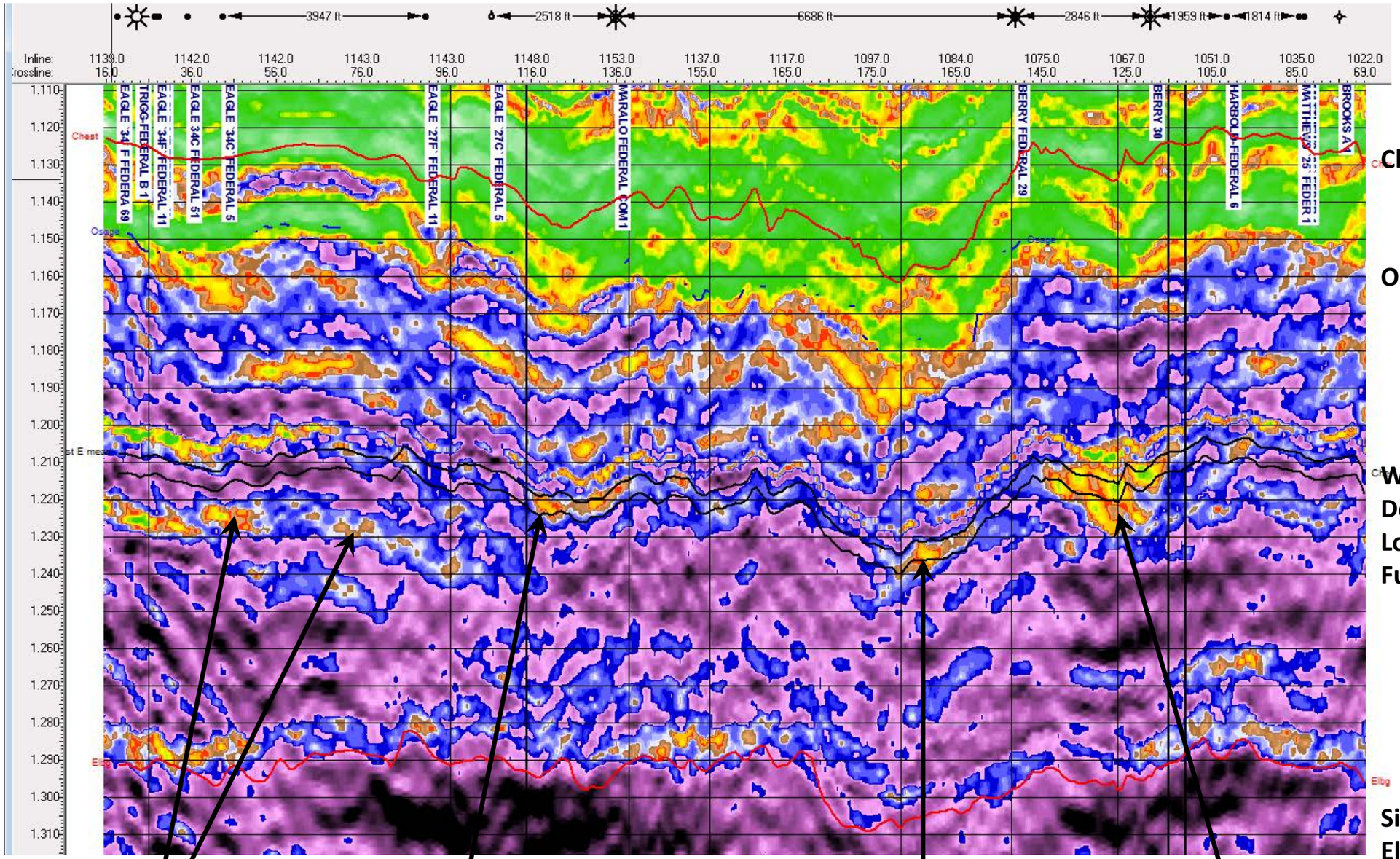


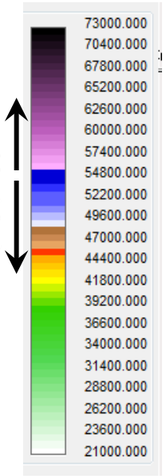
Cultreri

Seismic line, not flattened, showing some of the various Karst features – best porosity Yellow

SW

SE





Tight

Increasing Porosity

Shale

Chester

Osage

Woodford

Devonian

Lower D porosity

Fuss. Porosity

Simpson

Ellenburger

L. Dev porosity

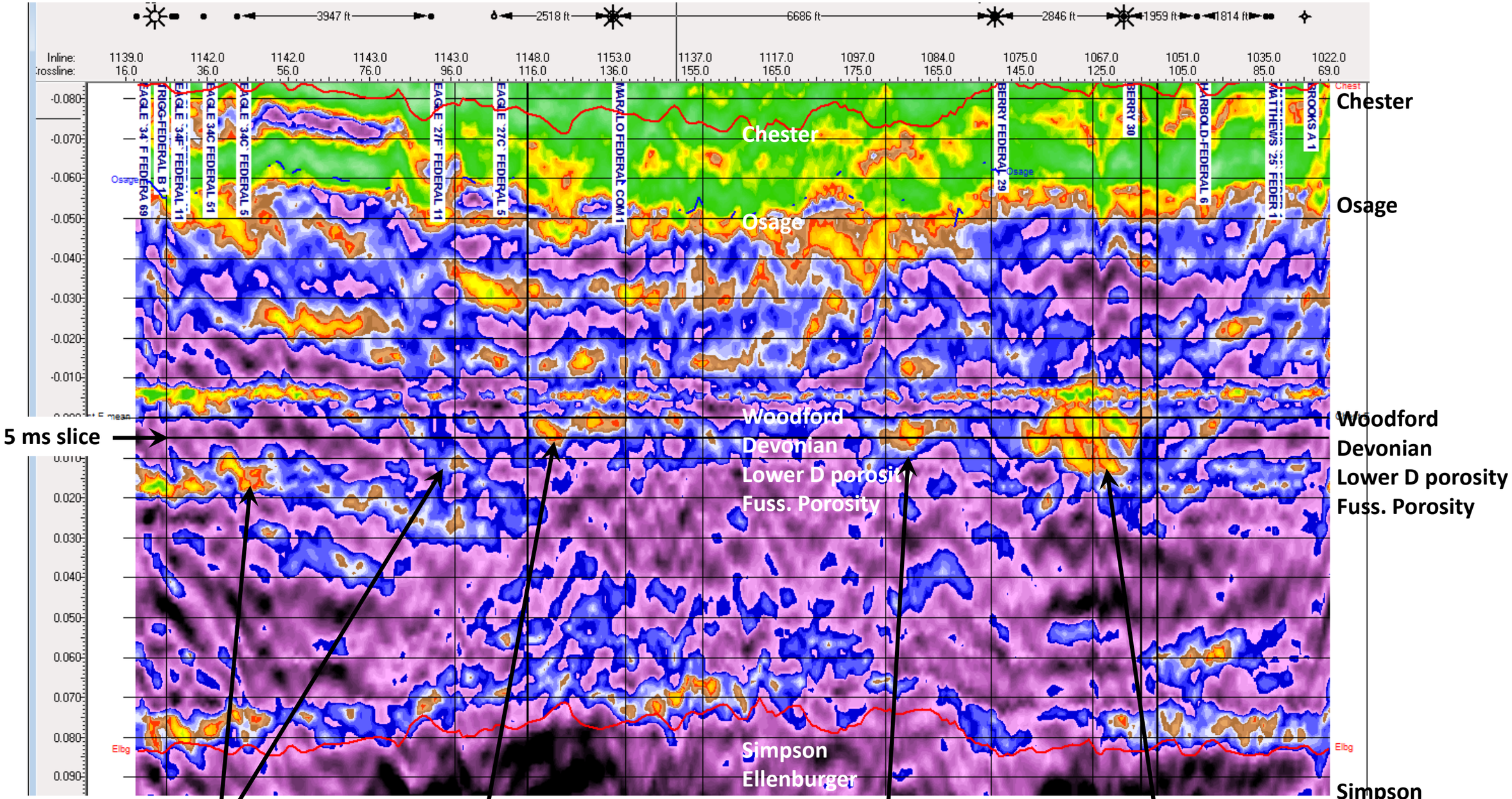
Karst system with collapse

Karst system in Graben

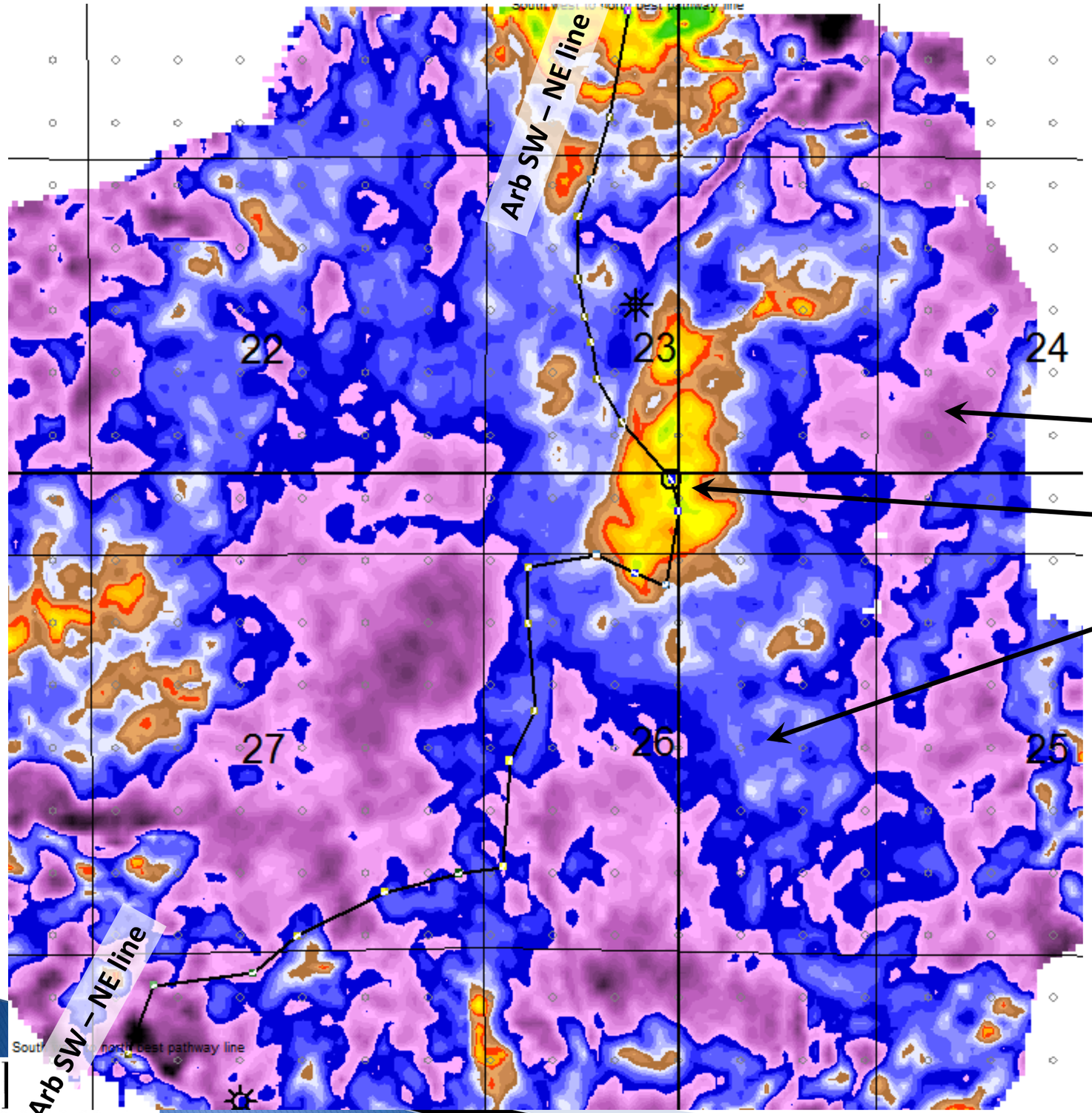
Major Karst system with collapse

GEOLEX® INCORPORATED

Seismic line, flattened showing some of the various Karst features – best porosity Yellow



Volume Average from 4ms to 11 ms below the Chester Datum

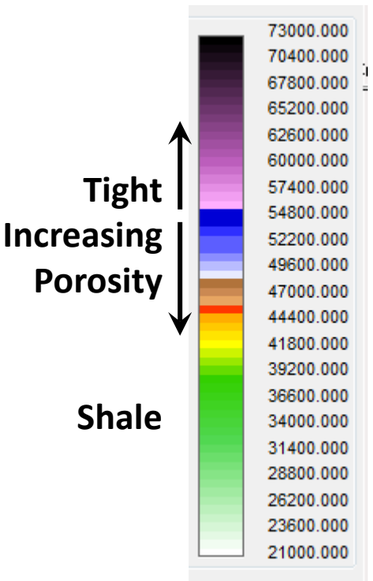


A Volume Average from 4ms to 11 ms below the Chester Datum shows the area of the major karst system and massive porosity as well as where and how it ties into the regional Devonian porosity.

Tight

Location in Massive Porosity

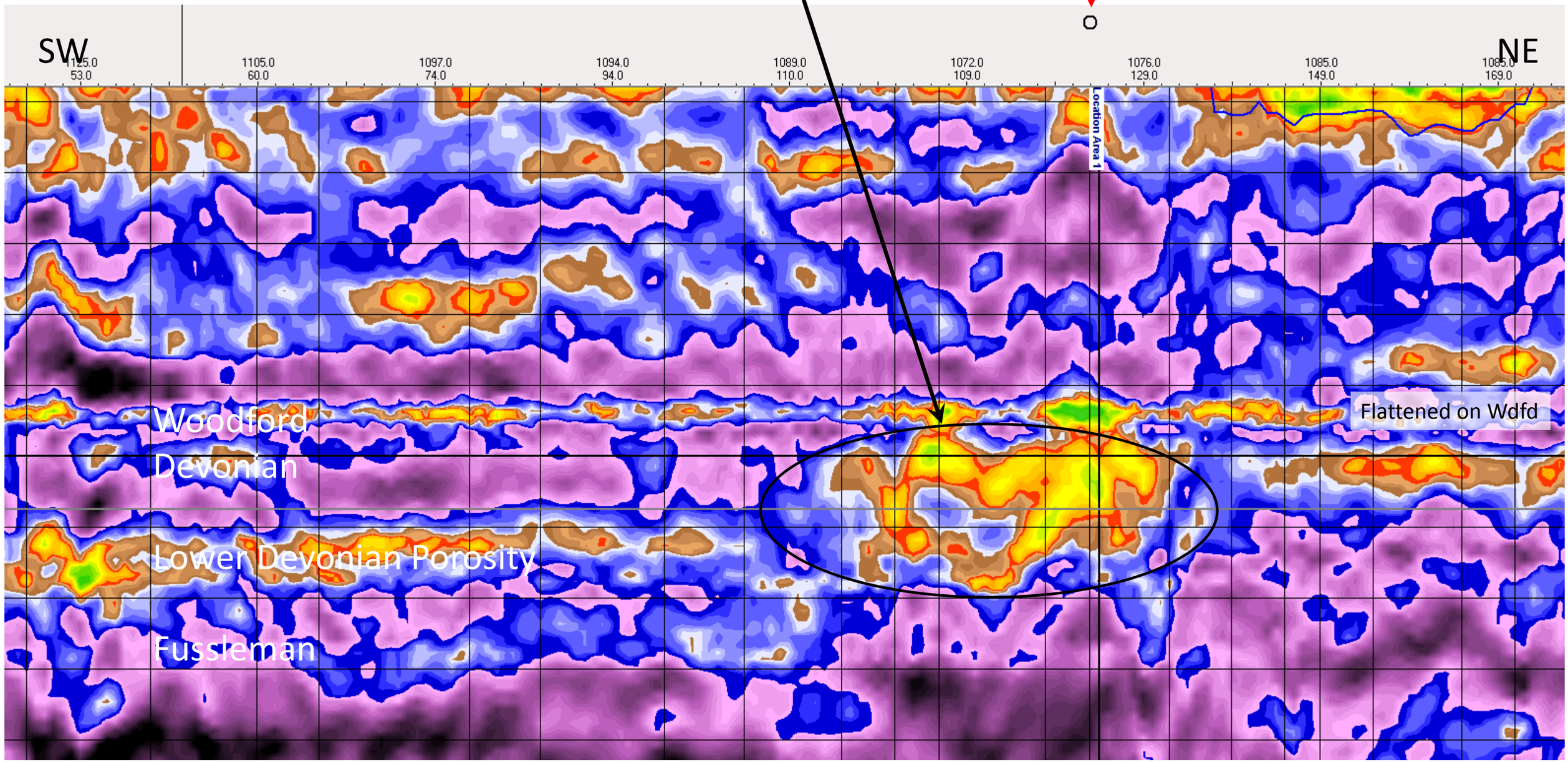
Regional porosity



Arbitrary Cross Section line SW to NE

massive Karst porosity Green – yellow – red to brown

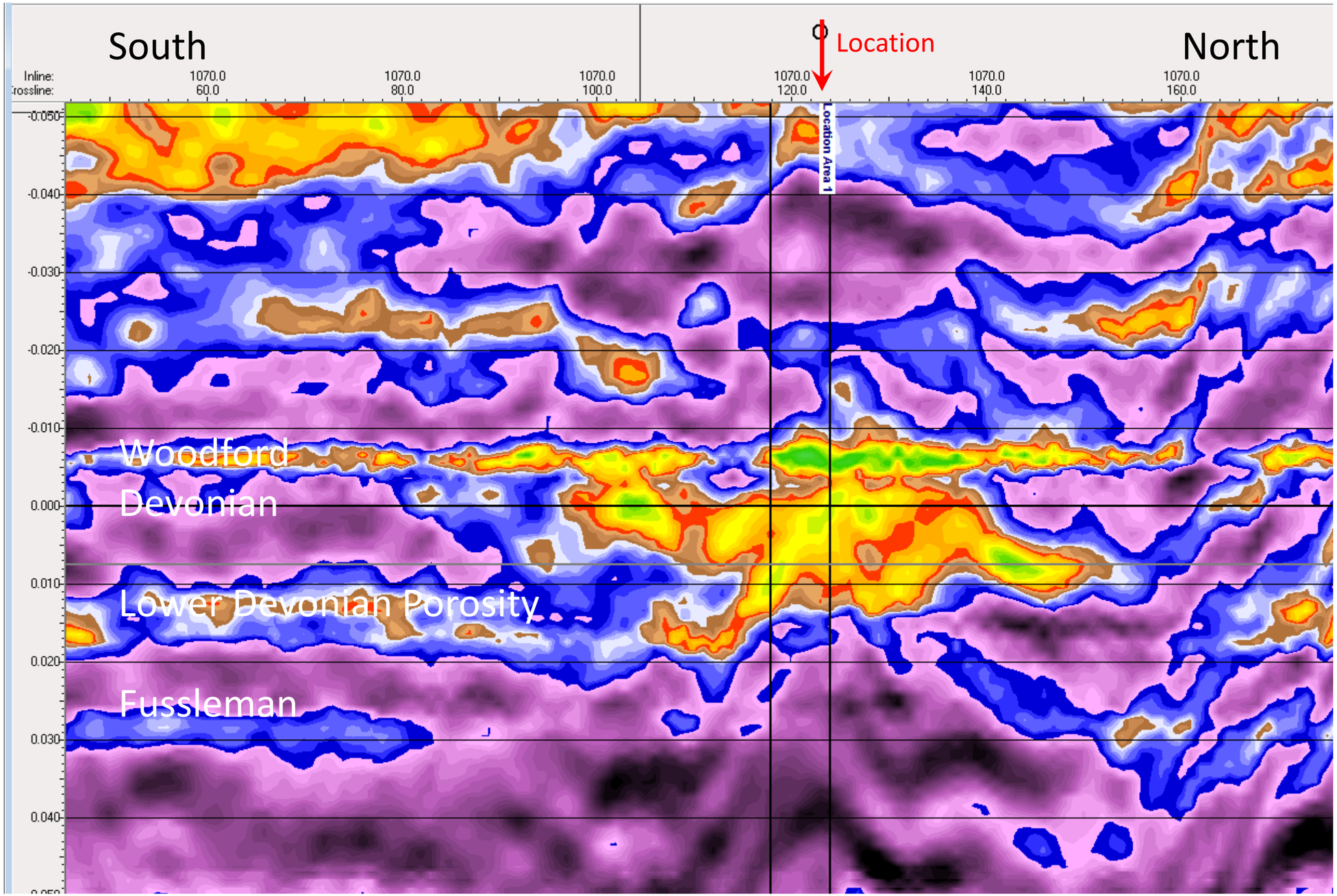
Proposed Location



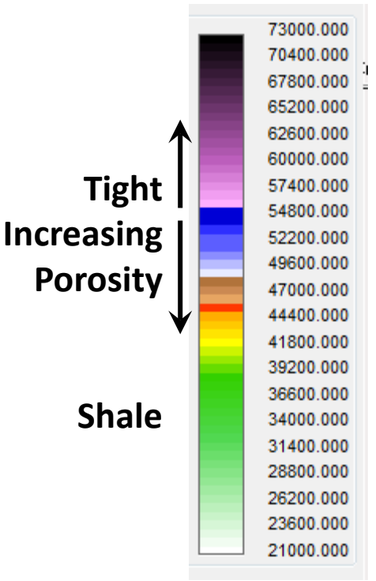
The proposed well at the location indicated will tap into the massive porosity in the major karst system which connects well to both the upper, middle, and lower Devonian porosity as well as the Fusselman porosity

GEOLEX® INCORPORATED

Line 1070 shows the massive porosity and its connection to upper and lower Devonian porosity



Flattened on Woodford



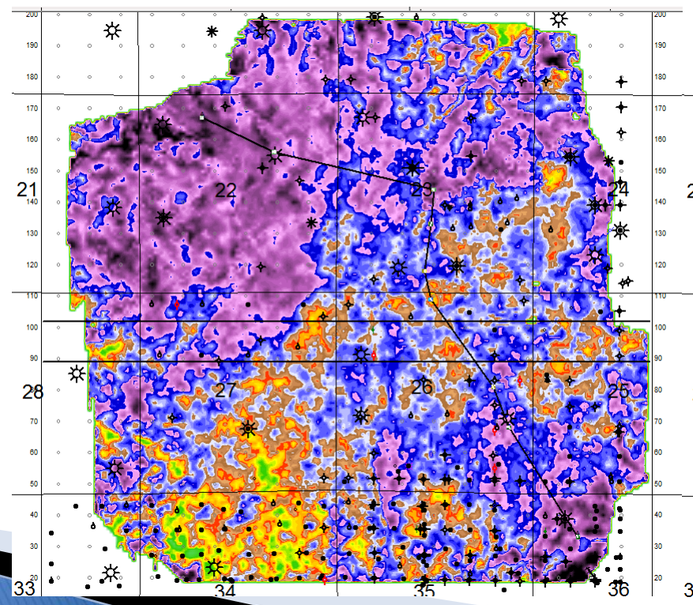
GEOLEX INCORPORATED

Eddy Area 1 porosity acreage					Net acreage				Gross acre feet
Horizon	**blue**	**brown**	**yellow**		**Yellow**	**Brown**	**Blue**	Isopach	
-3 +3	2658	243	66		66	177	2415	63	**167,454**
4-11	2716	395	182		182	213	2321	72	**195,552**
12-15	3146	1238	490		490	748	1908	36	**113,256**
16-20	3204	1368	567		567	801	1836	45	**144,180**
21-31	2516	395			0	395	2121	90	**226,440**
Total Acre Feet					1,305	2,334	10,601		**846,882**
Note that the Permian Basin is approximately 75000 square miles.									
It has been aruged that the Devonian is, at least somewhat, pressure connected across the basin.									
As of 1990 approximately 1 billion BBO has been produced from the Devonian reservoir. (Ruppel BEG)									

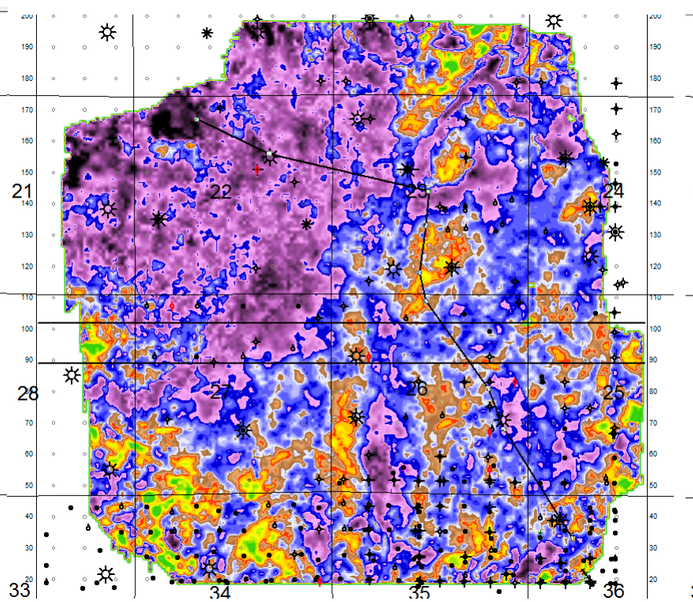
Perhaps more important is the connectivity in the best layers – Slices showing connectivity

Blue through Green is porous

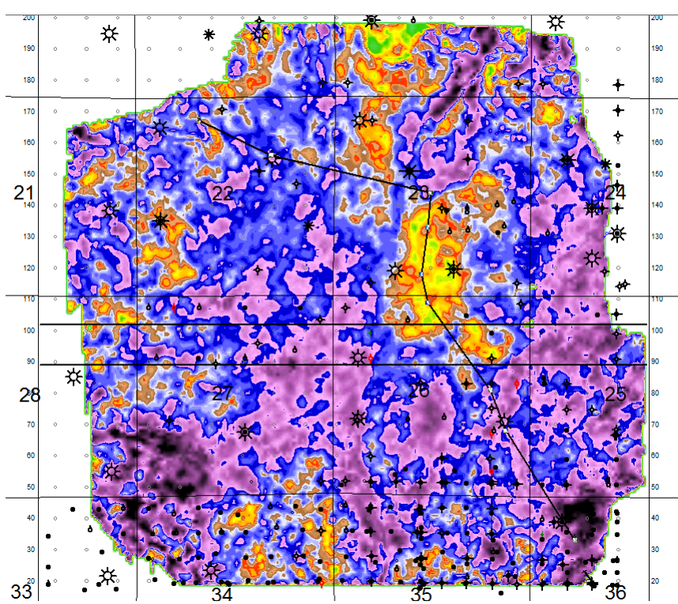
Slice datum +.017



Slice datum +.013



Slice datum +.002



GEOLEX INCORPORATED

APPENDIX B-2

USGS EARTHQUAKE DATA

NEIC: Earthquake Search Results

U. S. GEOLOGICAL SURVEY

EARTHQUAKE DATA BASE

FILE CREATED: Mon Jun 4 16:13:25 2012
Circle Search Earthquakes= 225
Circle Center Point Latitude: 32.772N Longitude: 104.233W
Radius: 321.860 km
Catalog Used: PDE
Data Selection: Historical & Preliminary Data

CAT	YEAR	MO	DA	ORIG TIME	LAT	LONG	DEP	MAGNITUDE	IEM NFO TF	DTSVNWG	DIST km
PDE	1973	09	22	233835.80	34.47	-106.95	5	3.1 MLGS	...	.....	314
PDE	1974	11	28	033520.50	32.31	-104.14	5	3.7 MLGS	...	.....	51
PDE	1975	08	01	072757.30	31.42	-104.01	5	3.0 LgTUL	.F.	.....	150
PDE	1976	01	19	040330.50	31.90	-103.08	1	3.5 MDGS	.F.	.....	145
PDE	1976	01	22	072157	31.90	-103.07	1	2.8 MDGS	...	.....	145
PDE	1976	01	25	044827.90	31.90	-103.08	2	3.9 MDGS	5F.	.....	145
PDE	1977	01	04	183137.60	32.36	-106.92	5	3.2 MLGS	5F.	.....	256
PDE	1977	04	26	090307.30	31.90	-103.08	4	3.3 MLGS	.F.	.....	144
PDE	1977	11	28	014050.50	32.95	-100.84	5	3.5 MLGS	...	.....	318
PDE	1978	03	02	100452.70	31.56	-102.51	11	3.5 MLGS	.F.	.....	210
PDE	1979	07	05	010501	32.95	-100.89	4	2.7 UKTUL	.H.	.....	312
PDE	1980	03	22	004912.50	34.60	-105.92	5	3.4 MLGS	4F.	.....	255
PDE	1981	05	09	123550.80	33.99	-107.03	5	3.1 MLGS	5F.	.....	293
PDE	1982	01	04	165608.05	31.18	-102.49	5	3.9 LgTUL	3F.	.....	240
PDE	1982	03	16	110302.67	35.36	-103.27	5	3.1 LgTUL	3F.	.....	300
PDE	1982	04	26	083147.79	33.02	-100.84	5	2.8 LgGS	...	.....	318
PDE	1982	05	18	060008.50	34.17	-106.95	9	2.8 MLGS	.F.	.....	296
PDE	1982	05	18	060838.40	34.20	-106.90	6	2.8 MLGS	.F.	.....	293
PDE	1982	05	24	063251.70	34.17	-106.95	6	2.9 MLGS	.F.	.....	295
PDE	1982	09	20	035517.20	33.95	-107.06	11	3.5 LgTUL	4F.	.....	293
PDE	1982	10	07	124125.99	34.31	-106.82	4	2.4 MLGS	.F.	.....	294
PDE	1982	11	28	023648.51	33.00	-100.84	5	3.3 LgTUL	4F.	.....	318
PDE	1983	03	02	232219.40	34.30	-106.89	8	4.3 LgTUL	6D.	.....	299
PDE	1983	04	30	073420.18	33.32	-106.44	7	3.5 MLGS	...	.....	214
PDE	1983	09	15	232536.05	35.14	-104.39	5	3.2 LgTUL	5F.	.....	263
PDE	1983	09	29	074408.43	35.24	-104.30	5	2.7 MDGS	...	.....	274
PDE	1984	05	21	133113.54	35.07	-102.23	5	3.1 LgTUL	...	.....	314
PDE	1984	08	26	021954	34.31	-106.80	5	2.9 MLGS	.F.	.....	292
PDE	1984	12	04	203636.02	32.26	-103.56	5	2.9 MLGS	...	.....	84
PDE	1985	06	05	103600.60	32.56	-106.92	6	2.9 MLGLD	4F.	.....	252
PDE	1985	06	27	182000.03	33.62	-106.47	0	3.4 LgGS	...	....E..	229
PDE	1985	08	16	145652.96	34.13	-106.83	7	4.1 MLGS	6D.	.....	284

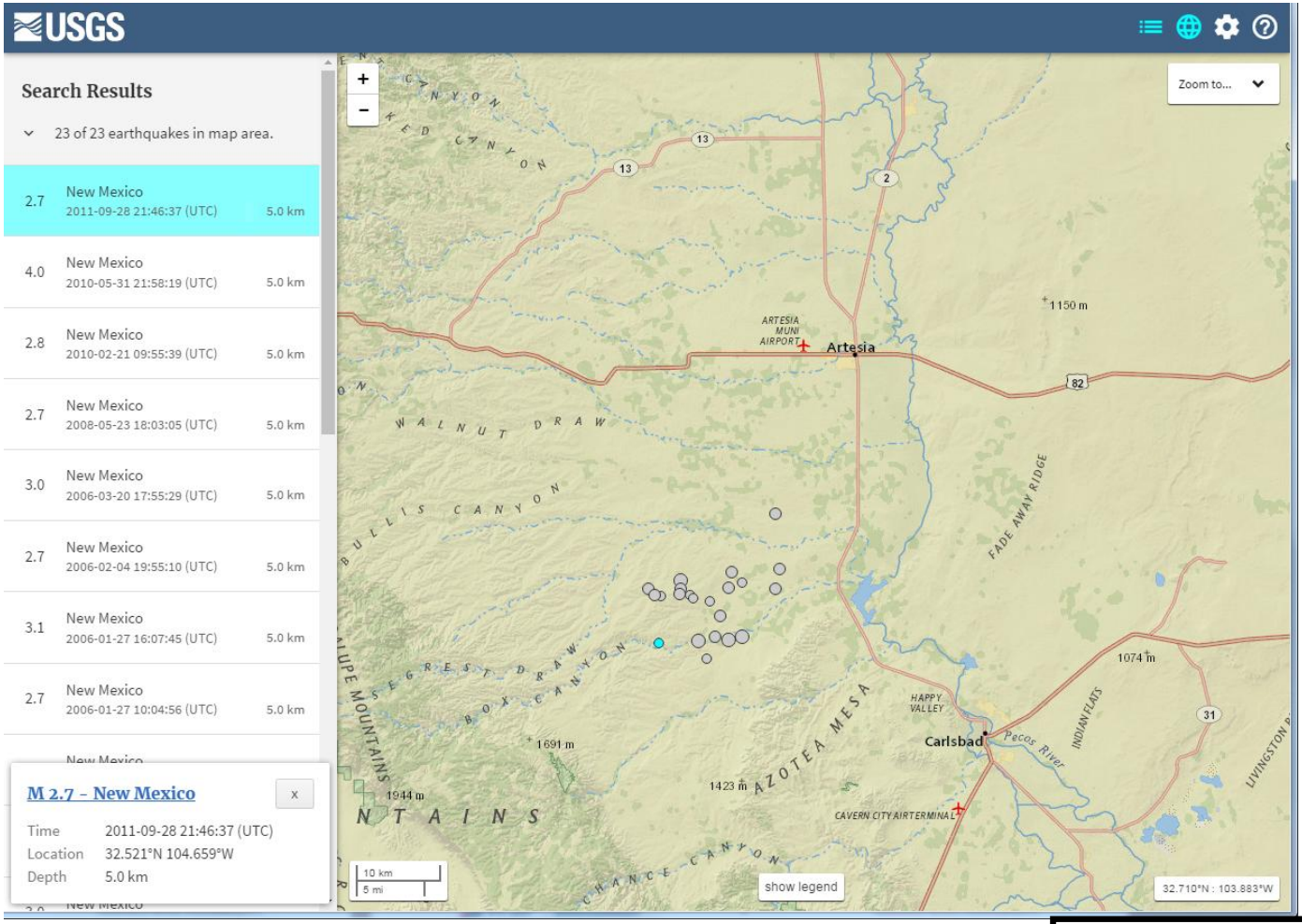
PDE	1985	09	06	052246.20	32.54	-106.94	5	2.6	MDGLD	.F. 255
PDE	1985	12	15	071452.23	35.28	-104.64	5	3.6	LgTUL	.F. 280
PDE	1986	04	17	210430.30	32.59	-106.91	5	2.7	MDGLD	.F. 251
PDE	1986	04	28	130016	34.01	-106.82	5	2.6	MDGLD	.F. 276
PDE	1986	08	27	180656.38	35.16	-105.09	5	3.2	MLGS	.F. 276
PDE	1987	05	14	155958.46	33.54	-106.52	0	2.9	MLGS	... .E.. 229
PDE	1988	12	25	075233.93	35.12	-105.96	0	2.8	MDSNM	.F. 304
PDE	1989	01	29	050715.33	35.22	-104.09	7	3.4	MDSNM	 271
PDE	1989	11	29	065438.50	34.46	-106.89	13	4.7	MDSNM	5F. 309
PDE	1990	01	29	131610.68	34.46	-106.88	12	4.8	LgTUL	6D. 308
PDE	1990	01	31	010819.29	34.44	-106.86	10	4.0	LgTUL	5F. 306
PDE	1990	02	21	120219.34	34.01	-106.54	5	3.6	MLGS	.F. 255
PDE	1990	02	27	132322	33.95	-106.59	5	3.9	MDSNM	4F. 255
PDE	1990	05	05	162622.89	34.45	-106.88	6	3.6	MDSNM	.F. 307
PDE	1990	07	21	192822.79	34.46	-106.86	11	3.0	MDSNM	 306
PDE	1990	07	21	203031.34	34.46	-106.86	7	3.1	MDSNM	 306
PDE	1990	07	21	234804.92	34.45	-106.85	7	3.2	MDSNM	 306
PDE	1990	07	22	212705.13	34.84	-106.01	10	3.7	MDSNM	 281
PDE	1990	07	31	073240.18	34.46	-106.86	7	3.3	MDSNM	.F. 307
PDE	1990	11	08	104653.77	34.45	-106.86	6	4.3	MDSNM	4F. 306
PDE	1990	11	08	110346.51	34.45	-106.86	8	3.1	MDSNM	.F. 306
PDE	1990	11	10	121816.85	34.45	-106.85	7	3.1	MDSNM	 305
PDE	1990	11	15	072524.38	34.46	-106.86	6	3.6	MDSNM	4F. 306
PDE	1990	12	05	033644.30	34.45	-106.86	8	2.6	MDSNM	 306
PDE	1991	03	05	201711.40	34.44	-106.87	9	2.9	MDSNM	3F. 306
PDE	1991	03	06	143659.07	34.44	-106.88	7	2.5	MDSNM	 307
PDE	1991	06	05	184414.90	34.45	-106.85	4	3.0	MDSNM	.F. 305
PDE	1991	06	20	1605	33.62	-106.47	0	3.5	MLGS	... .E.. 229
PDE	1991	12	09	124716.50	34.85	-106.55	14	3.1	LgTUL	3F. 314
PDE	1992	01	02	114535.61	32.33	-103.10	5	5.0	LgTUL	5F. 116
PDE	1992	02	23	161752.51	30.65	-105.51	5	3.4	LgTUL	 264
PDE	1992	08	24	012535.20	34.01	-106.86	5	2.6	MDSNM	.F. 280
PDE	1992	08	26	032452.67	32.17	-102.71	5	3.0	LgGS	 157
PDE	1993	03	24	023203.50	35.39	-104.19	5	3.0	LgGS	2F. 290
PDE	1993	06	10	1510	33.62	-106.47	0	3.2	MLGS	... .E.. 229
PDE	1993	06	23	032312.28	31.35	-102.51	5	2.8	MDSNM	 226
PDE	1993	12	22	192511.39	33.33	-105.68	10	3.2	MDSNM	 148
PDE	1994	01	01	025131.29	34.44	-106.98	10	2.5	MDSNM	 314
PDE	1995	03	19	183643.97	35.00	-104.21	5	3.3	LgGS	 246
PDE	1995	04	14	003256.17	30.28	-103.35	17	5.7	MwGS	6CM 287
PDE	1995	04	14	011148.40	30.30	-103.35	10	2.7	LgGS	 286
PDE	1995	04	14	021426	30.30	-103.35	10	2.8	LgGS	 286
PDE	1995	04	14	021938.50	30.30	-103.35	10	3.3	LgGS	.F. 286
PDE	1995	04	14	034842	30.30	-103.35	10	2.6	LgGS	.F. 286
PDE	1995	04	14	041116	30.30	-103.35	10	2.4	LgGS	.F. 286
PDE	1995	04	14	055339	30.30	-103.35	10	2.7	LgGS	 286
PDE	1995	04	14	073936.50	30.30	-103.35	10	2.4	LgGS	.F. 286
PDE	1995	04	14	082712.50	30.30	-103.35	10	2.8	LgGS	.F. 286
PDE	1995	04	14	100258	30.30	-103.35	10	2.9	LgGS	.F. 286
PDE	1995	04	14	105720.40	30.30	-103.35	10	2.3	LgGS	.F. 286
PDE	1995	04	15	031805	30.30	-103.35	10	2.4	LgGS	.F. 286
PDE	1995	04	15	143329.51	30.27	-103.32	10	4.0	LgGS	6D. 290
PDE	1995	04	16	004043.30	30.30	-103.35	10	2.3	LgGS	 286
PDE	1995	04	16	102625.50	30.30	-103.35	10	2.5	LgGS	 286
PDE	1995	04	16	161609.60	30.30	-103.35	10	2.4	LgGS	 286
PDE	1995	04	17	085000.50	30.30	-103.35	10	2.5	LgGS	 286
PDE	1995	04	21	044144	30.30	-103.35	10	2.9	LgGS	3F. 286
PDE	1995	06	01	010615.70	30.30	-103.35	10	3.5	LgGS	4F. 286
PDE	1995	07	06	024151	30.30	-103.35	10	2.7	LgGS	.F. 286
PDE	1995	07	06	024704	30.30	-103.35	10	2.6	LgGS	.F. 286

PDE	1995	08	28	151339.05	34.21	-106.94	3	2.8	LgGS	5F.	297
PDE	1995	11	12	174559.40	30.30	-103.35	10	3.6	LgGS	.F.	286
PDE	1996	03	15	131757.22	33.59	-105.69	10	2.9	LgGS	.F.	163
PDE	1996	03	24	201612.70	34.26	-105.68	10	3.5	LgGS	.F.	212
PDE	1996	03	24	201923.10	34.27	-105.69	10	3.7	LgGS	.F.	214
PDE	1996	07	22	100614.98	34.20	-105.71	10	3.5	LgGS	.F.	209
PDE	1997	05	20	094105.82	34.19	-105.74	10	3.2	LgGS	.F.	210
PDE	1997	12	31	132830.05	34.53	-106.15	5	3.5	MLGS	.F.	264
PDE	1997	12	31	133206.60	34.55	-106.15	5	3.5	MLGS	... .	265
PDE	1997	12	31	133358.90	34.55	-106.15	5	3.4	MLGS	... .	265
PDE	1998	01	04	080531.87	34.55	-106.19	5	4.0	MLGS	.F.	268
PDE	1998	04	15	103342.42	30.19	-103.30	10	3.6	LgGS	.F.	299
PDE	1998	07	14	053848.75	35.34	-103.47	5	3.0	MDSNM	.F.	293
PDE	1999	03	01	080023.50	32.57	-104.66	1	2.9	LgGS	... .	45
PDE	1999	03	14	224317.97	32.59	-104.63	1	4.0	MDSNM	.F.	42
PDE	1999	03	17	122923.11	32.58	-104.67	1	3.5	MDSNM	... .	46
PDE	1999	05	30	190425.60	32.58	-104.66	10	3.9	MDSNM	... .	45
PDE	1999	08	09	065122.97	32.57	-104.59	5	2.9	MDSNM	... .	40
PDE	2000	02	02	071420.26	32.58	-104.63	5	2.7	LgGS	... .	42
PDE	2000	02	26	030100.83	30.24	-103.61	5	2.8	LgGS	.F.	286
PDE	2001	06	02	015553.72	32.33	-103.14	5	3.3	LgGS	... .	113
PDE	2001	11	22	000708.02	31.79	-102.63	5	3.1	LgGS	... .	186
PDE	2002	09	17	154514.47	32.58	-104.63	10	3.5	LgGS	... .	42
PDE	2002	09	17	233419.35	32.58	-104.63	10	3.3	LgGS	... .	43
PDE	2003	06	21	020309.56	32.67	-104.50	5	3.6	LgGS	... .	28
PDE	2004	05	23	092205.28	32.53	-104.57	5	4.0	mbGS	3F.	41
PDE	2004	05	24	213628.56	34.47	-106.90	5	3.5	MLGS	.F.	310
PDE	2004	06	22	085528.23	32.53	-104.58	5	3.7	LgGS	.F.	42
PDE	2004	08	26	184518.62	32.58	-104.50	5	3.4	MLGS	... .	33
PDE	2004	10	28	025904.82	32.60	-104.50	5	3.0	LgGS	... .	31
PDE	2004	11	14	212749.90	33.25	-106.20	5	3.5	LgGS	... .	191
PDE	2005	10	30	025734.81	34.07	-106.98	5	2.4	MLGS	.F.	292
PDE	2005	12	19	202740.37	32.53	-104.55	5	4.1	MwSLM	3FM	40
PDE	2005	12	22	143011.67	32.58	-104.57	5	3.6	LgGS	.F.	37
PDE	2006	01	27	100456.45	32.59	-104.55	5	2.7	LgGS	... .	35
PDE	2006	01	27	160745.84	32.55	-104.58	5	3.1	LgGS	... .	40
PDE	2006	02	04	195510.68	32.58	-104.62	5	2.7	MLGS	... .	42
PDE	2006	03	04	171458.25	30.29	-103.67	5	2.7	LgGS	... .	280
PDE	2006	03	20	175529.12	32.60	-104.56	5	3.0	MLGS	... .	36
PDE	2006	04	08	180835.23	31.95	-101.42	5	2.9	MLGS	... .	279
PDE	2006	08	12	104909.67	32.90	-100.89	5	2.8	LgGS	.F.	312
PDE	2007	05	23	051655.15	34.07	-106.94	5	3.4	MLGS	3F.	289
PDE	2008	01	29	102453.24	32.90	-100.84	5	3.3	LgGS	.F.	317
PDE	2008	02	18	1415	32.27	-101.42	0	2.1	LgGS	.C. ....E..	269
PDE	2008	04	16	090604.36	33.66	-106.06	5	2.7	MLGS	... .	196
PDE	2008	05	23	180305.86	32.50	-104.60	5	2.7	LgGS	... .	45
PDE	2008	07	18	173109.40	32.89	-100.84	5	2.7	LgGS	... .	317
PDE	2008	12	28	205659.99	30.44	-103.36	5	2.6	MLGS	... .	271
PDE	2009	01	30	014121.66	32.50	-104.61	5	2.7	LgGS	... .	46
PDE	2009	06	05	171732.94	31.35	-105.98	0	2.4	MLEPT	.F.	227
PDE	2009	06	05	181023.63	31.35	-105.98	0	2.6	MLEPT	.F.	227
PDE	2009	08	20	015723.10	34.03	-106.87	5	2.7	MLGS	3F.	282
PDE	2009	08	30	003100.29	34.22	-106.89	5	2.5	MLGS	.F.	293
PDE	2009	08	30	063947.47	34.16	-106.86	5	2.6	MLGS	.F.	289
PDE	2009	08	30	070943.72	34.19	-106.88	5	2.1	MLGS	.F.	291
PDE	2009	11	17	185306.84	32.43	-104.64	5	3.0	LgGS	... .	54
PDE	2010	01	27	045933.05	32.90	-100.83	5	3.1	LgGS	.F.	318
PDE	2010	02	21	095539.77	32.57	-104.61	5	2.8	LgGS	... .	41
PDE	2010	03	28	000355.08	32.44	-104.50	4	4.1	MwRMT	3FM	44
PDE	2010	04	11	195632.67	32.41	-101.06	5	2.9	LgGS	... .	300

PDE	2010	04	12	002005.97	32.94	-100.88	5	2.8	LgGS	... .	314
PDE	2010	05	09	071807.37	34.04	-106.83	5	2.1	MLGS	.F.	279
PDE	2010	05	27	204721.87	31.11	-105.58	5	3.7	MLGS	... .	223
PDE	2010	05	31	215819.17	32.52	-104.61	5	4.0	MLGS	... .	44
PDE	2010	08	08	011238.07	32.90	-100.85	5	3.4	MwRMT	2FM	316
PDE	2010	08	25	020514.32	32.95	-100.86	5	2.8	LgGS	... .	315
PDE	2010	08	29	124836.61	32.91	-100.92	5	2.6	LgGS	... .	310
PDE-W	2010	10	09	074227.63	32.93	-100.89	5	3.1	LgGS	... .	313
PDE-W	2010	10	26	065629.79	32.92	-100.85	5	3.1	LgGS	... .	316
PDE-W	2010	11	01	091058.42	33.00	-100.82	5	2.8	LgGS	... .	320
PDE-W	2011	01	11	043415.77	34.39	-106.99	5	2.7	MLGS	... .	312
PDE-W	2011	02	17	182534.41	30.11	-103.30	5	3.3	LgGS	... .	307
PDE-W	2011	03	01	033012.76	32.88	-100.84	5	3.1	LgGS	2F.	317
PDE-W	2011	03	01	063159.89	32.84	-100.80	5	2.5	LgGS	... .	321
PDE-W	2011	03	12	152200.86	32.88	-100.90	5	3.0	LgGS	... .	312
PDE-W	2011	03	14	001948.80	32.96	-100.81	5	3.0	LgGS	... .	320
PDE-W	2011	03	28	091211.95	32.91	-100.82	5	3.0	LgGS	... .	320
PDE-W	2011	04	06	233835.45	34.40	-107.02	5	3.2	MLGS	... .	315
PDE-W	2011	04	25	165631.88	32.82	-100.84	5	2.5	LgGS	... .	317
PDE-W	2011	04	28	010341.97	30.74	-105.71	6	4.4	mbGS	.F.	264
PDE-W	2011	04	28	035625.61	30.74	-105.78	10	4.0	mbGS	... .	268
PDE-W	2011	04	28	045834.59	30.68	-105.75	9	3.6	MwRMT	.FM	272
PDE-W	2011	04	28	074903.45	30.82	-105.80	5	3.1	LgGS	... .	262
PDE-W	2011	04	28	075418.94	30.58	-105.85	5	2.7	LgGS	... .	286
PDE-W	2011	04	30	010716.82	30.76	-105.75	10	4.6	MDUNM	... .	265
PDE-W	2011	05	02	114328.24	30.73	-105.72	10	4.2	MwRMT	2FM	266
PDE-W	2011	05	02	115836.35	30.74	-105.70	10	3.3	MLGS	... .	264
PDE-W	2011	05	02	134032.64	30.69	-105.75	10	3.3	MLGS	... .	271
PDE-W	2011	05	02	135536.79	30.73	-105.67	5	4.4	mbGS	2F.	264
PDE-W	2011	05	03	025830.18	30.67	-105.73	10	3.8	MwRMT	.FM	273
PDE-W	2011	05	03	114203.84	30.49	-105.68	10	2.8	MLGS	... .	287
PDE-W	2011	05	04	162627.03	30.71	-105.79	10	3.7	MwRMT	..M	271
PDE-W	2011	05	05	052010.02	30.79	-105.76	10	3.6	MLGS	... .	262
PDE-W	2011	05	06	002426.09	30.75	-105.73	10	2.8	MLGS	... .	264
PDE-W	2011	05	06	004559.26	30.81	-105.71	10	2.8	MLGS	... .	258
PDE-W	2011	05	07	045100.88	30.64	-105.73	10	4.1	MDUNM	2F.	275
PDE-W	2011	05	08	132449.65	30.75	-105.81	10	3.1	MLGS	... .	269
PDE-W	2011	05	08	134616.49	30.72	-105.76	10	3.2	MLGS	... .	269
PDE-W	2011	05	08	135758.52	30.71	-105.75	10	2.9	MLGS	... .	269
PDE-W	2011	05	08	190732.13	30.81	-105.31	10	3.0	MLGS	... .	239
PDE-W	2011	05	08	225459.93	30.74	-105.74	10	3.3	MLGS	... .	266
PDE-W	2011	05	09	064019.15	30.76	-105.69	10	3.9	MDUNM	.F.	261
PDE-W	2011	05	10	184118.44	30.72	-105.72	10	3.4	MLGS	... .	267
PDE-W	2011	05	13	124916.26	30.76	-105.45	10	2.6	MLGS	... .	250
PDE-W	2011	05	14	220751.11	30.82	-105.74	10	3.9	MDUNM	.F.	259
PDE-W	2011	05	17	200820	30.75	-105.74	10	4.2	MDUNM	... .	265
PDE-W	2011	05	19	103523.51	30.80	-105.69	10	3.4	MwRMT	..M	258
PDE-W	2011	05	19	115649.90	30.72	-105.59	10	2.9	MLGS	... .	260
PDE-W	2011	05	20	231419.06	30.20	-105.55	10	2.7	MLGS	... .	310
PDE-W	2011	05	25	100301.09	30.70	-105.63	10	2.8	MLGS	... .	264
PDE-W	2011	05	27	014128.20	30.80	-105.76	10	3.6	MLGS	... .	261
PDE-W	2011	05	27	014908.92	30.98	-105.78	10	3.0	MLGS	... .	246
PDE-W	2011	07	14	102913.60	32.93	-100.81	5	2.5	LgGS	... .	321
PDE-W	2011	09	11	183635.11	32.74	-100.84	5	2.5	LgGS	3F.	318
PDE-W	2011	09	11	203158.11	32.89	-100.85	5	2.8	LgGS	2F.	316
PDE-W	2011	09	12	003149.11	32.80	-100.88	5	2.7	LgGS	2F.	314
PDE-W	2011	09	12	022931.34	32.73	-100.85	5	2.5	LgGS	.H.	317
PDE-W	2011	09	12	091946.71	32.85	-100.85	5	2.6	LgGS	... .	316
PDE-W	2011	09	12	092612.90	32.76	-100.84	5	2.7	LgGS	2F.	317
PDE-W	2011	09	12	141834.05	32.82	-100.87	7	3.4	LgGS	3F.	314

PDE-W	2011	09	28	214637.55	32.52	-104.66	5	2.7	LgGS	... .	48
PDE-W	2011	11	24	064959.99	32.95	-100.81	5	2.8	LgGS	... .	320
PDE-W	2011	11	24	231549.01	32.94	-100.85	5	3.1	LgGS	... .	317
PDE-W	2011	12	09	184733.24	32.94	-100.86	5	3.5	LgGS	3F.	315
PDE-W	2011	12	17	144658.46	32.81	-100.85	5	3.2	LgGS	3F.	316
PDE-W	2011	12	29	061907.64	32.81	-100.91	5	2.5	LgGS	... .	311
PDE-W	2011	12	29	114808.28	32.88	-100.83	5	2.5	LgGS	.F.	318
PDE-W	2012	01	15	092901.68	31.23	-103.61	5	2.7	LgGS	2F.	181
PDE-W	2012	01	24	182102.61	30.32	-103.38	5	3.6	LgGS	4F.	283
PDE-W	2012	02	06	040024.75	32.09	-104.91	5	2.7	LgGS	... .	98
PDE-W	2012	03	06	031149.71	31.81	-106.31	5	2.5	MLGS	3F.	223
PDE-W	2012	03	18	105722.43	32.28	-103.89	5	3.1	LgGS	... .	63
PDE-Q	2012	04	05	091115.95	31.57	-106.09	5	2.9	MLGS	.F.	219

USGS National Earthquake Information Center



Blue highlight indicates most recent seismic event.

Source: USGS, 2017. *Earthquake Catalog.* https://earthquake.usgs.gov/earthquakes/search

WSP | PARSONS BRINCKERHOFF

Appendix B-2

SEISMIC ACTIVITY NEAR ARTESIA

DATED: 1/16/2017	APPROVED BY:	JOB NO. 50904E
DRAWN BY: GEM	CHECKED BY:	SCALE: N/A

Appendix B-2
Seismic Activity
1999 - 2011

time	latitude	longitude	depth	mag	magType	nst	gap	rms	net	id	updated	place	type	magNst	status	locationSource	magSource
2011-09-28T21:46:37.550Z	32.521	-104.659	5	2.7	mblg	8	102.1	0.83	us	usp000j8pv	2014-11-07T01:45:57.965Z	New Mexico	earthquake		reviewed	us	us
2010-05-31T21:58:19.170Z	32.524	-104.607	5	4	ml	16	83.8	1.09	us	usp000hdec	2014-11-07T01:41:34.416Z	New Mexico	earthquake		reviewed	us	us
2010-02-21T09:55:39.770Z	32.571	-104.613	5	2.8	mblg	21	51.7	1.07	us	usp000h7hr	2014-11-07T01:40:44.022Z	New Mexico	earthquake		reviewed	us	us
2008-05-23T18:03:05.860Z	32.504	-104.596	5	2.7	mblg	11	90.5	0.98	us	usp000g7k8	2014-11-07T01:36:04.867Z	New Mexico	earthquake		reviewed	us	us
2006-03-20T17:55:29.120Z	32.6	-104.563	5	3	ml	7	98	0.75	us	usp000ecjj	2014-11-07T01:28:33.765Z	New Mexico	earthquake		reviewed	us	us
2006-02-04T19:55:10.680Z	32.575	-104.617	5	2.7	ml	9	148.1	1.13	us	usp000e9fv	2014-11-07T01:28:16.284Z	New Mexico	earthquake		reviewed	us	us
2006-01-27T16:07:45.840Z	32.551	-104.577	5	3.1	mblg	9	148.3	0.91	us	usp000e8yn	2014-11-07T01:28:10.026Z	New Mexico	earthquake		reviewed	us	us
2006-01-27T10:04:56.450Z	32.589	-104.549	5	2.7	mblg	8	127.9	1.44	us	usp000e8ya	2014-11-07T01:28:10.009Z	New Mexico	earthquake		reviewed	us	us
2005-12-22T14:30:11.670Z	32.583	-104.566	5	3.6	mblg	15	52	0.98	us	usp000e6mh	2014-11-07T01:27:55.770Z	New Mexico	earthquake		reviewed	us	us
2005-12-19T20:27:40.370Z	32.528	-104.549	5	4.1	mwr	45	54.4	0.85	us	usp000e6f9	2015-03-24T01:48:26.590Z	New Mexico	earthquake		reviewed	us	slm
2004-10-28T02:59:04.820Z	32.604	-104.499	5	3	mblg	11	140.2	0.52	us	usp000d77p	2014-11-07T01:23:49.973Z	New Mexico	earthquake		reviewed	us	us
2004-08-26T18:45:18.620Z	32.582	-104.505	5	3.4	ml	11	131.8	0.67	us	usp000d2x7	2014-11-07T01:23:16.071Z	New Mexico	earthquake		reviewed	us	us
2004-06-22T08:55:28.230Z	32.528	-104.584	5	3.7	mblg	12	82.5	0.65	us	usp000cygp	2014-11-07T01:22:40.419Z	New Mexico	earthquake		reviewed	us	us
2004-05-23T09:22:05.280Z	32.525	-104.566	5	4	mb	19	68.2	0.74	us	usp000cvz7	2015-03-24T01:59:38.918Z	New Mexico	earthquake	2	reviewed	us	us
2003-06-21T02:03:09.560Z	32.665	-104.505	5	3.6	mblg	15	130.9	0.94	us	usp000c0e4	2014-11-07T01:18:58.170Z	New Mexico	earthquake		reviewed	us	us
2002-09-17T23:34:19.350Z	32.576	-104.631	10	3.1	md	17			us	usp000bchy	2014-11-07T01:16:32.406Z	New Mexico	earthquake		reviewed	snm	snm
2002-09-17T15:45:14.470Z	32.581	-104.63	10	3.4	md	23			us	usp000bcgs	2014-11-07T01:16:32.321Z	New Mexico	earthquake		reviewed	snm	snm
2000-02-02T07:14:20.260Z	32.582	-104.629	5	2.7	mblg			0.88	us	usp0009myc	2014-11-07T01:09:25.504Z	New Mexico	earthquake		reviewed	us	us
1999-08-09T06:51:22.970Z	32.568	-104.591	5	2.9	md			0.64	us	usp0009ctq	2014-11-07T01:08:15.290Z	New Mexico	earthquake		reviewed	us	snm
1999-05-30T19:04:25.600Z	32.575	-104.664	10	3.9	md				us	usp000991w	2014-11-07T01:07:44.921Z	New Mexico	earthquake		reviewed	snm	snm
1999-03-17T12:29:23.110Z	32.582	-104.672	1	3.5	md				us	usp00094ny	2014-11-07T01:07:14.229Z	New Mexico	earthquake		reviewed	snm	snm
1999-03-14T22:43:17.970Z	32.591	-104.63	1	4	md				us	usp00094hc	2014-11-07T01:07:13.801Z	New Mexico	earthquake		reviewed	snm	snm
1999-03-01T08:00:23.500Z	32.573	-104.656	1	2.7	md				us	usp00093nw	2014-11-07T01:07:07.639Z	New Mexico	earthquake		reviewed	snm	snm

APPENDIX C

INJECTION FLUID ANALYTICAL DATA

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

February 15, 2016

Micki Schultz

Navajo Refining Company
P.O. Box 159
Artesia, NM 88211-0159
TEL: (575) 746-5281
FAX

RE: Quarterly WDW-1, 2, & 3 Inj Well OrderNo.: 1601864

Dear Micki Schultz:

Hall Environmental Analysis Laboratory received 2 sample(s) on 1/22/2016 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 qualifers 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 #NM0190

Sincerely,

Andy Freeman

Laboratory Manager

4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
IGNITABILITY METHOD 1010						Analyst: **SUB**	
Ignitability	>200	0		°F	1	1/29/2016	R32136
SULFIDE, REACTIVE						Analyst: **SUB**	
Reactive Sulfide	ND	1.0		mg/L	1	1/29/2016	R32136
SPECIFIC GRAVITY						Analyst: **JRR**	
Specific Gravity	1.006	0			1	1/27/2016 3:13:00 PM	R31723
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Fluoride	20	2.0	*	mg/L	20	1/23/2016 12:57:44 AM	R31638
Chloride	570	25		mg/L	50	1/26/2016 11:44:39 PM	R31714
Nitrogen, Nitrite (As N)	ND	0.50		mg/L	5	1/23/2016 12:45:19 AM	R31638
Bromide	2.1	2.0		mg/L	20	1/23/2016 12:57:44 AM	R31638
Nitrogen, Nitrate (As N)	ND	0.50		mg/L	5	1/23/2016 12:45:19 AM	R31638
Phosphorus, Orthophosphate (As P)	ND	2.5		mg/L	5	1/23/2016 12:45:19 AM	R31638
Sulfate	2000	25		mg/L	50	1/26/2016 11:44:39 PM	R31714
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**	
Conductivity	5600	0.010		µmhos/cm	1	1/25/2016 8:12:02 PM	R31664
SM2320B: ALKALINITY						Analyst: **JRR**	
Bicarbonate (As CaCO3)	220.4	20.00		mg/L CaCO3	1	1/25/2016 8:12:02 PM	R31664
Carbonate (As CaCO3)	ND	2.000		mg/L CaCO3	1	1/25/2016 8:12:02 PM	R31664
Total Alkalinity (as CaCO3)	220.4	20.00		mg/L CaCO3	1	1/25/2016 8:12:02 PM	R31664
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**	
Total Dissolved Solids	3780	40.0	*D	mg/L	1	1/28/2016 6:43:00 PM	23428
CORROSIVITY						Analyst: **SUB**	
pH	7.16			pH Units	1	1/28/2016	R32136
CYANIDE, REACTIVE						Analyst: **SUB**	
Cyanide, Reactive	ND	1.00		mg/L	1	2/4/2016	R32136
EPA METHOD 7470: MERCURY						Analyst: **pmf**	
Mercury	ND	0.00020		mg/L	1	1/25/2016 4:48:50 PM	23378
MERCURY, TCLP						Analyst: **pmf**	
Mercury	ND	0.020		mg/L	1	1/28/2016 11:50:30 AM	23438
EPA METHOD 6010B: TCLP METALS						Analyst: **MED**	
Arsenic	ND	5.0		mg/L	1	1/25/2016 11:17:08 AM	23359
Barium	ND	100		mg/L	1	1/25/2016 11:17:08 AM	23359
Cadmium	ND	1.0		mg/L	1	1/25/2016 11:17:08 AM	23359
Chromium	ND	5.0		mg/L	1	1/25/2016 11:17:08 AM	23359

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 6010B: TCLP METALS						Analyst: **MED**	
Lead	ND	5.0		mg/L	1	1/25/2016 11:17:08 AM	23359
Selenium	ND	1.0		mg/L	1	1/25/2016 11:17:08 AM	23359
Silver	ND	5.0		mg/L	1	1/25/2016 11:17:08 AM	23359
EPA 6010B: TOTAL METALS						Analyst: **MED**	
Aluminum	1.0	0.020		mg/L	1	1/27/2016 10:18:42 AM	23359
Antimony	ND	0.050		mg/L	1	1/27/2016 10:18:42 AM	23359
Arsenic	ND	0.020		mg/L	1	1/27/2016 10:18:42 AM	23359
Barium	ND	0.020		mg/L	1	1/27/2016 10:18:42 AM	23359
Beryllium	ND	0.0030		mg/L	1	1/27/2016 10:18:42 AM	23359
Cadmium	ND	0.0020		mg/L	1	1/27/2016 10:18:42 AM	23359
Calcium	39	1.0		mg/L	1	1/27/2016 10:18:42 AM	23359
Chromium	ND	0.0060		mg/L	1	1/27/2016 10:18:42 AM	23359
Cobalt	ND	0.0060		mg/L	1	1/28/2016 10:29:14 AM	23359
Copper	0.012	0.0060		mg/L	1	1/27/2016 10:18:42 AM	23359
Iron	7.6	0.25		mg/L	5	1/27/2016 10:20:32 AM	23359
Lead	ND	0.0050		mg/L	1	1/27/2016 10:18:42 AM	23359
Magnesium	13	1.0		mg/L	1	1/27/2016 10:18:42 AM	23359
Manganese	0.15	0.0020		mg/L	1	1/27/2016 10:18:42 AM	23359
Nickel	0.042	0.010		mg/L	1	1/27/2016 10:18:42 AM	23359
Potassium	72	1.0		mg/L	1	1/27/2016 10:18:42 AM	23359
Selenium	0.53	0.050		mg/L	1	1/27/2016 10:18:42 AM	23359
Silver	ND	0.0050		mg/L	1	1/27/2016 10:18:42 AM	23359
Sodium	1200	50		mg/L	50	1/29/2016 11:10:54 AM	23359
Thallium	ND	0.050		mg/L	1	1/27/2016 10:18:42 AM	23359
Vanadium	ND	0.050		mg/L	1	1/27/2016 10:18:42 AM	23359
Zinc	0.035	0.020		mg/L	1	1/27/2016 10:18:42 AM	23359
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Acetonitrile	ND	12		µg/L	1	2/2/2016	R32136
Allyl chloride	ND	2.5		µg/L	1	2/2/2016	R32136
Chloroprene	ND	2.5		µg/L	1	2/2/2016	R32136
Cyclohexane	ND	2.5		µg/L	1	2/2/2016	R32136
Diethyl ether	ND	2.5		µg/L	1	2/2/2016	R32136
Diisopropyl ether	ND	2.5		µg/L	1	2/2/2016	R32136
Epichlorohydrin	ND	25		µg/L	1	2/2/2016	R32136
Ethyl acetate	ND	2.5		µg/L	1	2/2/2016	R32136
Ethyl methacrylate	ND	12		µg/L	1	2/2/2016	R32136
Ethyl tert-butyl ether	ND	2.5		µg/L	1	2/2/2016	R32136
Freon-113	ND	2.5		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Isobutanol	ND	25		µg/L	1	2/2/2016	R32136
Isopropyl acetate	ND	2.5		µg/L	1	2/2/2016	R32136
Methacrylonitrile	ND	12		µg/L	1	2/2/2016	R32136
Methyl acetate	ND	2.5		µg/L	1	2/2/2016	R32136
Methyl ethyl ketone	ND	12		µg/L	1	2/2/2016	R32136
Methyl isobutyl ketone	ND	12		µg/L	1	2/2/2016	R32136
Methyl methacrylate	ND	12		µg/L	1	2/2/2016	R32136
Methylcyclohexane	ND	5.0		µg/L	1	2/2/2016	R32136
n-Amyl acetate	ND	2.5		µg/L	1	2/2/2016	R32136
n-Hexane	ND	2.5		µg/L	1	2/2/2016	R32136
Nitrobenzene	ND	25		µg/L	1	2/2/2016	R32136
Pentachloroethane	ND	25		µg/L	1	2/2/2016	R32136
p-isopropyltoluene	ND	2.5		µg/L	1	2/2/2016	R32136
Propionitrile	ND	12		µg/L	1	2/2/2016	R32136
Tetrahydrofuran	ND	2.5		µg/L	1	2/2/2016	R32136
Benzene	ND	2.5		µg/L	1	2/2/2016	R32136
Toluene	ND	2.5		µg/L	1	2/2/2016	R32136
Ethylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
Methyl tert-butyl ether (MTBE)	3.2	2.5		µg/L	1	2/2/2016	R32136
1,2,4-Trimethylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,3,5-Trimethylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,2-Dichloroethane (EDC)	ND	2.5		µg/L	1	2/2/2016	R32136
1,2-Dibromoethane (EDB)	ND	2.5		µg/L	1	2/2/2016	R32136
Naphthalene	ND	2.5		µg/L	1	2/2/2016	R32136
Acetone	100	12		µg/L	1	2/2/2016	R32136
Bromobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
Bromodichloromethane	ND	2.5		µg/L	1	2/2/2016	R32136
Bromoform	ND	2.5		µg/L	1	2/2/2016	R32136
Bromomethane	ND	2.5		µg/L	1	2/2/2016	R32136
Carbon disulfide	ND	2.5		µg/L	1	2/2/2016	R32136
Carbon Tetrachloride	ND	2.5		µg/L	1	2/2/2016	R32136
Chlorobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
Chloroethane	ND	2.5		µg/L	1	2/2/2016	R32136
Chloroform	ND	2.5		µg/L	1	2/2/2016	R32136
Chloromethane	ND	2.5		µg/L	1	2/2/2016	R32136
2-Chlorotoluene	ND	2.5		µg/L	1	2/2/2016	R32136
4-Chlorotoluene	ND	2.5		µg/L	1	2/2/2016	R32136
cis-1,2-DCE	ND	2.5		µg/L	1	2/2/2016	R32136
cis-1,3-Dichloropropene	ND	2.5		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
1,2-Dibromo-3-chloropropane	ND	2.5		µg/L	1	2/2/2016	R32136
Dibromochloromethane	ND	2.5		µg/L	1	2/2/2016	R32136
Dibromomethane	ND	2.5		µg/L	1	2/2/2016	R32136
1,2-Dichlorobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,3-Dichlorobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,4-Dichlorobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
Dichlorodifluoromethane	ND	2.5		µg/L	1	2/2/2016	R32136
1,1-Dichloroethane	ND	2.5		µg/L	1	2/2/2016	R32136
1,1-Dichloroethene	ND	2.5		µg/L	1	2/2/2016	R32136
1,2-Dichloropropane	ND	2.5		µg/L	1	2/2/2016	R32136
1,3-Dichloropropane	ND	2.5		µg/L	1	2/2/2016	R32136
2,2-Dichloropropane	ND	2.5		µg/L	1	2/2/2016	R32136
1,1-Dichloropropene	ND	2.5		µg/L	1	2/2/2016	R32136
Hexachlorobutadiene	ND	2.5		µg/L	1	2/2/2016	R32136
2-Hexanone	ND	2.5		µg/L	1	2/2/2016	R32136
Isopropylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
Methylene Chloride	ND	12		µg/L	1	2/2/2016	R32136
n-Butylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
n-Propylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
sec-Butylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
Styrene	ND	2.5		µg/L	1	2/2/2016	R32136
tert-Butylbenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,1,1,2-Tetrachloroethane	ND	2.5		µg/L	1	2/2/2016	R32136
1,1,2,2-Tetrachloroethane	ND	2.5		µg/L	1	2/2/2016	R32136
Tetrachloroethene (PCE)	ND	2.5		µg/L	1	2/2/2016	R32136
trans-1,2-DCE	ND	2.5		µg/L	1	2/2/2016	R32136
trans-1,3-Dichloropropene	ND	2.5		µg/L	1	2/2/2016	R32136
1,2,3-Trichlorobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,2,4-Trichlorobenzene	ND	2.5		µg/L	1	2/2/2016	R32136
1,1,1-Trichloroethane	ND	2.5		µg/L	1	2/2/2016	R32136
1,1,2-Trichloroethane	ND	2.5		µg/L	1	2/2/2016	R32136
Trichloroethene (TCE)	ND	2.5		µg/L	1	2/2/2016	R32136
Trichlorofluoromethane	ND	2.5		µg/L	1	2/2/2016	R32136
1,2,3-Trichloropropane	ND	2.5		µg/L	1	2/2/2016	R32136
Vinyl chloride	ND	2.5		µg/L	1	2/2/2016	R32136
mp-Xylenes	ND	5.0		µg/L	1	2/2/2016	R32136
o-Xylene	ND	2.5		µg/L	1	2/2/2016	R32136
tert-Amyl methyl ether	ND	2.5		µg/L	1	2/2/2016	R32136
tert-Butyl alcohol	ND	25		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Acrolein	ND	12		µg/L	1	2/2/2016	R32136
Acrylonitrile	ND	2.5		µg/L	1	2/2/2016	R32136
Bromochloromethane	ND	2.5		µg/L	1	2/2/2016	R32136
2-Chloroethyl vinyl ether	ND	2.5		µg/L	1	2/2/2016	R32136
Iodomethane	ND	2.5		µg/L	1	2/2/2016	R32136
trans-1,4-Dichloro-2-butene	ND	2.5		µg/L	1	2/2/2016	R32136
Vinyl acetate	ND	2.5		µg/L	1	2/2/2016	R32136
1,4-Dioxane	ND	100		µg/L	1	2/2/2016	R32136
Surr: 1,2-Dichlorobenzene-d4	89.2	70-130		%Rec	1	2/2/2016	R32136
Surr: 4-Bromofluorobenzene	94.0	70-130		%Rec	1	2/2/2016	R32136
Surr: Toluene-d8	99.6	70-130		%Rec	1	2/2/2016	R32136
EPA 8270D: SEMIVOLATILES						Analyst: **SUB**	
1,1-Biphenyl	ND	5.0		µg/L	1	2/2/2016	R32136
1,4-Dioxane	ND	5.0		µg/L	1	2/2/2016	R32136
Atrazine	ND	5.0		µg/L	1	2/2/2016	R32136
Benzaldehyde	ND	5.0		µg/L	1	2/2/2016	R32136
Caprolactam	ND	5.0		µg/L	1	2/2/2016	R32136
N-Nitroso-di-n-butylamine	ND	5.0		µg/L	1	2/2/2016	R32136
Acetophenone	ND	5.0		µg/L	1	2/2/2016	R32136
1-Methylnaphthalene	ND	5.0		µg/L	1	2/2/2016	R32136
2,3,4,6-Tetrachlorophenol	ND	5.0		µg/L	1	2/2/2016	R32136
2,4,5-Trichlorophenol	ND	5.0		µg/L	1	2/2/2016	R32136
2,4,6-Trichlorophenol	ND	5.0		µg/L	1	2/2/2016	R32136
2,4-Dichlorophenol	ND	5.0		µg/L	1	2/2/2016	R32136
2,4-Dimethylphenol	ND	5.0		µg/L	1	2/2/2016	R32136
2,4-Dinitrophenol	ND	5.0		µg/L	1	2/2/2016	R32136
2,4-Dinitrotoluene	ND	5.0		µg/L	1	2/2/2016	R32136
2,6-Dinitrotoluene	ND	5.0		µg/L	1	2/2/2016	R32136
2-Chloronaphthalene	ND	5.0		µg/L	1	2/2/2016	R32136
2-Chlorophenol	ND	5.0		µg/L	1	2/2/2016	R32136
2-Methylnaphthalene	ND	5.0		µg/L	1	2/2/2016	R32136
2-Methylphenol	ND	5.0		µg/L	1	2/2/2016	R32136
2-Nitroaniline	ND	5.0		µg/L	1	2/2/2016	R32136
2-Nitrophenol	ND	5.0		µg/L	1	2/2/2016	R32136
3,3´-Dichlorobenzidine	ND	5.0		µg/L	1	2/2/2016	R32136
3-Nitroaniline	ND	5.0		µg/L	1	2/2/2016	R32136
4,6-Dinitro-2-methylphenol	ND	5.0		µg/L	1	2/2/2016	R32136
4-Bromophenyl phenyl ether	ND	5.0		µg/L	1	2/2/2016	R32136
4-Chloro-3-methylphenol	ND	5.0		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 8270D: SEMIVOLATILES						Analyst: **SUB**	
4-Chloroaniline	ND	5.0		µg/L	1	2/2/2016	R32136
4-Chlorophenyl phenyl ether	ND	5.0		µg/L	1	2/2/2016	R32136
4-Nitroaniline	ND	5.0		µg/L	1	2/2/2016	R32136
4-Nitrophenol	ND	5.0		µg/L	1	2/2/2016	R32136
Acenaphthene	ND	5.0		µg/L	1	2/2/2016	R32136
Acenaphthylene	ND	5.0		µg/L	1	2/2/2016	R32136
Anthracene	ND	5.0		µg/L	1	2/2/2016	R32136
Benzo(g,h,i)perylene	ND	5.0		µg/L	1	2/2/2016	R32136
Benz(a)anthracene	ND	0.50		µg/L	1	2/2/2016	R32136
Benzo(a)pyrene	ND	0.50		µg/L	1	2/2/2016	R32136
Benzo(b)fluoranthene	ND	0.50		µg/L	1	2/2/2016	R32136
Benzo(k)fluoranthene	ND	0.50		µg/L	1	2/2/2016	R32136
Bis(2-chloroethoxy)methane	ND	5.0		µg/L	1	2/2/2016	R32136
Bis(2-chloroethyl)ether	ND	5.0		µg/L	1	2/2/2016	R32136
Bis(2-chloroisopropyl)ether	ND	5.0		µg/L	1	2/2/2016	R32136
Bis(2-ethylhexyl)phthalate	ND	5.0		µg/L	1	2/2/2016	R32136
Butyl benzyl phthalate	ND	5.0		µg/L	1	2/2/2016	R32136
Carbazole	ND	5.0		µg/L	1	2/2/2016	R32136
Chrysene	ND	0.50		µg/L	1	2/2/2016	R32136
Dibenz(a,h)anthracene	ND	0.50		µg/L	1	2/2/2016	R32136
Dibenzofuran	ND	5.0		µg/L	1	2/2/2016	R32136
Diethyl phthalate	ND	5.0		µg/L	1	2/2/2016	R32136
Dimethyl phthalate	ND	5.0		µg/L	1	2/2/2016	R32136
Di-n-butyl phthalate	ND	5.0		µg/L	1	2/2/2016	R32136
Di-n-octyl phthalate	ND	5.0		µg/L	1	2/2/2016	R32136
Fluoranthene	ND	5.0		µg/L	1	2/2/2016	R32136
Fluorene	ND	5.0		µg/L	1	2/2/2016	R32136
Hexachlorobenzene	ND	5.0		µg/L	1	2/2/2016	R32136
Hexachlorobutadiene	ND	5.0		µg/L	1	2/2/2016	R32136
Hexachlorocyclopentadiene	ND	5.0		µg/L	1	2/2/2016	R32136
Hexachloroethane	ND	5.0		µg/L	1	2/2/2016	R32136
Indeno(1,2,3-cd)pyrene	ND	0.50		µg/L	1	2/2/2016	R32136
Isophorone	ND	5.0		µg/L	1	2/2/2016	R32136
Naphthalene	ND	5.0		µg/L	1	2/2/2016	R32136
Nitrobenzene	ND	5.0		µg/L	1	2/2/2016	R32136
N-Nitrosodi-n-propylamine	ND	5.0		µg/L	1	2/2/2016	R32136
N-Nitrosodiphenylamine	ND	5.0		µg/L	1	2/2/2016	R32136
Pentachlorophenol	ND	5.0		µg/L	1	2/2/2016	R32136
Phenanthrene	ND	5.0		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date: 1/21/2016 7:35:00 AM
Lab ID: 1601864-001
Matrix: AQUEOUS
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 8270D: SEMIVOLATILES						Analyst: **SUB**	
Phenol	ND	5.0		µg/L	1	2/2/2016	R32136
Pyrene	ND	5.0		µg/L	1	2/2/2016	R32136
o-Toluidine	ND	5.0		µg/L	1	2/2/2016	R32136
Pyridine	ND	5.0		µg/L	1	2/2/2016	R32136
1,2,4,5-Tetrachlorobenzene	ND	5.0		µg/L	1	2/2/2016	R32136
Surr: 2,4,6-Tribromophenol	94.2	10-123		%Rec	1	2/2/2016	R32136
Surr: 2-Fluorobiphenyl	80.4	19-130		%Rec	1	2/2/2016	R32136
Surr: 2-Fluorophenol	82.8	21-120		%Rec	1	2/2/2016	R32136
Surr: Nitrobenzene-d5	89.6	25-130		%Rec	1	2/2/2016	R32136
Surr: Phenol-d5	86.0	10-130		%Rec	1	2/2/2016	R32136
Surr: Terphenyl-d14	32.8	20-137		%Rec	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date:
Lab ID: 1601864-002
Matrix: TRIP BLANK
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Acetonitrile	ND	2.5		µg/L	1	2/2/2016	R32136
Allyl chloride	ND	0.50		µg/L	1	2/2/2016	R32136
Chloroprene	ND	0.50		µg/L	1	2/2/2016	R32136
Cyclohexane	ND	0.50		µg/L	1	2/2/2016	R32136
Diethyl ether	ND	0.50		µg/L	1	2/2/2016	R32136
Diisopropyl ether	ND	0.50		µg/L	1	2/2/2016	R32136
Epichlorohydrin	ND	5.0		µg/L	1	2/2/2016	R32136
Ethyl acetate	ND	0.50		µg/L	1	2/2/2016	R32136
Ethyl methacrylate	ND	2.5		µg/L	1	2/2/2016	R32136
Ethyl tert-butyl ether	ND	0.50		µg/L	1	2/2/2016	R32136
Freon-113	ND	0.50		µg/L	1	2/2/2016	R32136
Isobutanol	ND	5.0		µg/L	1	2/2/2016	R32136
Isopropyl acetate	ND	0.50		µg/L	1	2/2/2016	R32136
Methacrylonitrile	ND	2.5		µg/L	1	2/2/2016	R32136
Methyl acetate	ND	0.50		µg/L	1	2/2/2016	R32136
Methyl ethyl ketone	ND	2.5		µg/L	1	2/2/2016	R32136
Methyl isobutyl ketone	ND	2.5		µg/L	1	2/2/2016	R32136
Methyl methacrylate	ND	2.5		µg/L	1	2/2/2016	R32136
Methylcyclohexane	ND	1.0		µg/L	1	2/2/2016	R32136
n-Amyl acetate	ND	0.50		µg/L	1	2/2/2016	R32136
n-Hexane	ND	0.50		µg/L	1	2/2/2016	R32136
Nitrobenzene	ND	5.0		µg/L	1	2/2/2016	R32136
Pentachloroethane	ND	5.0		µg/L	1	2/2/2016	R32136
p-isopropyltoluene	ND	0.50		µg/L	1	2/2/2016	R32136
Propionitrile	ND	2.5		µg/L	1	2/2/2016	R32136
Tetrahydrofuran	ND	0.50		µg/L	1	2/2/2016	R32136
Benzene	ND	0.50		µg/L	1	2/2/2016	R32136
Toluene	ND	0.50		µg/L	1	2/2/2016	R32136
Ethylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	1	2/2/2016	R32136
1,2,4-Trimethylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
1,3,5-Trimethylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
1,2-Dichloroethane (EDC)	ND	0.50		µg/L	1	2/2/2016	R32136
1,2-Dibromoethane (EDB)	ND	0.50		µg/L	1	2/2/2016	R32136
Naphthalene	ND	0.50		µg/L	1	2/2/2016	R32136
Acetone	ND	2.5		µg/L	1	2/2/2016	R32136
Bromobenzene	ND	0.50		µg/L	1	2/2/2016	R32136
Bromodichloromethane	ND	0.50		µg/L	1	2/2/2016	R32136
Bromoform	ND	0.50		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date:
Lab ID: 1601864-002
Matrix: TRIP BLANK
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Bromomethane	ND	0.50		µg/L	1	2/2/2016	R32136
Carbon disulfide	ND	0.50		µg/L	1	2/2/2016	R32136
Carbon Tetrachloride	ND	0.50		µg/L	1	2/2/2016	R32136
Chlorobenzene	ND	0.50		µg/L	1	2/2/2016	R32136
Chloroethane	ND	0.50		µg/L	1	2/2/2016	R32136
Chloroform	ND	0.50		µg/L	1	2/2/2016	R32136
Chloromethane	ND	0.50		µg/L	1	2/2/2016	R32136
2-Chlorotoluene	ND	0.50		µg/L	1	2/2/2016	R32136
4-Chlorotoluene	ND	0.50		µg/L	1	2/2/2016	R32136
cis-1,2-DCE	ND	0.50		µg/L	1	2/2/2016	R32136
cis-1,3-Dichloropropene	ND	0.50		µg/L	1	2/2/2016	R32136
1,2-Dibromo-3-chloropropane	ND	0.50		µg/L	1	2/2/2016	R32136
Dibromochloromethane	ND	0.50		µg/L	1	2/2/2016	R32136
Dibromomethane	ND	0.50		µg/L	1	2/2/2016	R32136
1,2-Dichlorobenzene	ND	0.50		µg/L	1	2/2/2016	R32136
1,3-Dichlorobenzene	ND	0.50		µg/L	1	2/2/2016	R32136
1,4-Dichlorobenzene	ND	0.50		µg/L	1	2/2/2016	R32136
Dichlorodifluoromethane	ND	0.50		µg/L	1	2/2/2016	R32136
1,1-Dichloroethane	ND	0.50		µg/L	1	2/2/2016	R32136
1,1-Dichloroethene	ND	0.50		µg/L	1	2/2/2016	R32136
1,2-Dichloropropane	ND	0.50		µg/L	1	2/2/2016	R32136
1,3-Dichloropropane	ND	0.50		µg/L	1	2/2/2016	R32136
2,2-Dichloropropane	ND	0.50		µg/L	1	2/2/2016	R32136
1,1-Dichloropropene	ND	0.50		µg/L	1	2/2/2016	R32136
Hexachlorobutadiene	ND	0.50		µg/L	1	2/2/2016	R32136
2-Hexanone	ND	0.50		µg/L	1	2/2/2016	R32136
Isopropylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
Methylene Chloride	ND	2.5		µg/L	1	2/2/2016	R32136
n-Butylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
n-Propylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
sec-Butylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
Styrene	ND	0.50		µg/L	1	2/2/2016	R32136
tert-Butylbenzene	ND	0.50		µg/L	1	2/2/2016	R32136
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	1	2/2/2016	R32136
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	1	2/2/2016	R32136
Tetrachloroethene (PCE)	ND	0.50		µg/L	1	2/2/2016	R32136
trans-1,2-DCE	ND	0.50		µg/L	1	2/2/2016	R32136
trans-1,3-Dichloropropene	ND	0.50		µg/L	1	2/2/2016	R32136
1,2,3-Trichlorobenzene	ND	0.50		µg/L	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, & 3 Inj Well
Collection Date:
Lab ID: 1601864-002
Matrix: TRIP BLANK
Received Date: 1/22/2016 9:40:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	2/2/2016	R32136
1,1,1-Trichloroethane	ND	0.50		µg/L	1	2/2/2016	R32136
1,1,2-Trichloroethane	ND	0.50		µg/L	1	2/2/2016	R32136
Trichloroethene (TCE)	ND	0.50		µg/L	1	2/2/2016	R32136
Trichlorofluoromethane	ND	0.50		µg/L	1	2/2/2016	R32136
1,2,3-Trichloropropane	ND	0.50		µg/L	1	2/2/2016	R32136
Vinyl chloride	ND	0.50		µg/L	1	2/2/2016	R32136
mp-Xylenes	ND	1.0		µg/L	1	2/2/2016	R32136
o-Xylene	ND	0.50		µg/L	1	2/2/2016	R32136
tert-Amyl methyl ether	ND	0.50		µg/L	1	2/2/2016	R32136
tert-Butyl alcohol	ND	5.0		µg/L	1	2/2/2016	R32136
Acrolein	ND	2.5		µg/L	1	2/2/2016	R32136
Acrylonitrile	ND	0.50		µg/L	1	2/2/2016	R32136
Bromochloromethane	ND	0.50		µg/L	1	2/2/2016	R32136
2-Chloroethyl vinyl ether	ND	0.50		µg/L	1	2/2/2016	R32136
Iodomethane	ND	0.50		µg/L	1	2/2/2016	R32136
trans-1,4-Dichloro-2-butene	ND	0.50		µg/L	1	2/2/2016	R32136
Vinyl acetate	ND	0.50		µg/L	1	2/2/2016	R32136
1,4-Dioxane	ND	20		µg/L	1	2/2/2016	R32136
Surr: 1,2-Dichlorobenzene-d4	89.2	70-130		%Rec	1	2/2/2016	R32136
Surr: 4-Bromofluorobenzene	93.2	70-130		%Rec	1	2/2/2016	R32136
Surr: Toluene-d8	99.6	70-130		%Rec	1	2/2/2016	R32136

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R31638**	RunNo: **31638**
Prep Date:	Analysis Date: **1/22/2016**	SeqNo: **968134** Units: **mg/L**

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

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R31638**	RunNo: **31638**
Prep Date:	Analysis Date: **1/22/2016**	SeqNo: **968135** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.49	0.10	0.5000	0	98.4	90	110			
Nitrogen, Nitrite (As N)	0.94	0.10	1.000	0	94.1	90	110			
Bromide	2.5	0.10	2.500	0	98.2	90	110			
Nitrogen, Nitrate (As N)	2.5	0.10	2.500	0	99.2	90	110			
Phosphorus, Orthophosphate (As P	4.7	0.50	5.000	0	93.3	90	110			

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R31714**	RunNo: **31714**
Prep Date:	Analysis Date: **1/26/2016**	SeqNo: **970466** 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: **R31714**	RunNo: **31714**
Prep Date:	Analysis Date: **1/26/2016**	SeqNo: **970467** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.8	0.50	5.000	0	96.5	90	110			
Sulfate	9.8	0.50	10.00	0	98.3	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB-R32136**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982421** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Acetonitrile	ND	0.50								
Allyl chloride	ND	0.50								
Chloroprene	ND	0.50								
Cyclohexane	ND	0.50								
Diethyl ether	ND	0.50								
Diisopropyl ether	ND	0.50								
Epichlorohydrin	ND	0.50								
Ethyl acetate	ND	0.50								
Ethyl methacrylate	ND	2.5								
Ethyl tert-butyl ether	ND	0.50								
Freon-113	ND	0.50								
Isobutanol	ND	10								
Isopropyl acetate	ND	0.50								
Methacrylonitrile	ND	2.5								
Methyl acetate	ND	0.50								
Methyl ethyl ketone	ND	2.5								
Methyl isobutyl ketone	ND	2.5								
Methyl methacrylate	ND	2.5								
Methylcyclohexane	ND	0.50								
n-Amyl acetate	ND	0.50								
n-Hexane	ND	0.50								
Nitrobenzene	ND	0.50								
Pentachloroethane	ND	0.50								
p-isopropyltoluene	ND	0.50								
Propionitrile	ND	2.5								
Tetrahydrofuran	ND	0.50								
Benzene	ND	0.50								
Toluene	ND	0.50								
Ethylbenzene	ND	0.50								
Methyl tert-butyl ether (MTBE)	ND	0.50								
1,2,4-Trimethylbenzene	ND	0.50								
1,3,5-Trimethylbenzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
1,2-Dibromoethane (EDB)	ND	0.50								
Naphthalene	ND	0.50								
Acetone	ND	2.5								
Bromobenzene	ND	0.50								
Bromodichloromethane	ND	0.50								
Bromoform	ND	0.50								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB-R32136**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982421** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Bromomethane	ND	0.50								
Carbon disulfide	ND	0.50								
Carbon Tetrachloride	ND	0.50								
Chlorobenzene	ND	0.50								
Chloroethane	ND	0.50								
Chloroform	ND	0.50								
Chloromethane	ND	0.50								
2-Chlorotoluene	ND	0.50								
4-Chlorotoluene	ND	0.50								
cis-1,2-DCE	ND	0.50								
cis-1,3-Dichloropropene	ND	0.50								
1,2-Dibromo-3-chloropropane	ND	0.50								
Dibromochloromethane	ND	0.50								
Dibromomethane	ND	0.50								
1,2-Dichlorobenzene	ND	0.50								
1,3-Dichlorobenzene	ND	0.50								
1,4-Dichlorobenzene	ND	0.50								
Dichlorodifluoromethane	ND	0.50								
1,1-Dichloroethane	ND	0.50								
1,1-Dichloroethene	ND	0.50								
1,2-Dichloropropane	ND	0.50								
1,3-Dichloropropane	ND	0.50								
2,2-Dichloropropane	ND	0.50								
1,1-Dichloropropene	ND	0.50								
Hexachlorobutadiene	ND	0.50								
2-Hexanone	ND	0.50								
Isopropylbenzene	ND	0.50								
Methylene Chloride	ND	2.5								
n-Butylbenzene	ND	0.50								
n-Propylbenzene	ND	0.50								
sec-Butylbenzene	ND	0.50								
Styrene	ND	0.50								
tert-Butylbenzene	ND	0.50								
1,1,1,2-Tetrachloroethane	ND	0.50								
1,1,2,2-Tetrachloroethane	ND	0.50								
Tetrachloroethene (PCE)	ND	0.50								
trans-1,2-DCE	ND	0.50								
trans-1,3-Dichloropropene	ND	0.50								
1,2,3-Trichlorobenzene	ND	0.50								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB-R32136**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982421** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,2,4-Trichlorobenzene	ND	0.50								
1,1,1-Trichloroethane	ND	0.50								
1,1,2-Trichloroethane	ND	0.50								
Trichloroethene (TCE)	ND	0.50								
Trichlorofluoromethane	ND	0.50								
1,2,3-Trichloropropane	ND	0.50								
Vinyl chloride	ND	0.50								
mp-Xylenes	ND	1.0								
o-Xylene	ND	0.50								
tert-Amyl methyl ether	ND	0.50								
tert-Butyl alcohol	ND	0.50								
Acrolein	ND	2.5								
Acrylonitrile	ND	2.5								
Bromochloromethane	ND	0.50								
2-Chloroethyl vinyl ether	ND	0.50								
Iodomethane	ND	0.50								
trans-1,4-Dichloro-2-butene	ND	0.50								
Vinyl acetate	ND	0.50								
1,4-Dioxane	ND	0.50								

Sample ID **LCS-R32136**	SampType: **LCS**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **LCSW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982422** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	9.8		10.00	0	97.7	80	120			
Toluene	9.8		10.00	0	98.4	80	120			
Ethylbenzene	10		10.00	0	102	80	120			
Chlorobenzene	9.6		10.00	0	96.0	80	120			
1,1-Dichloroethene	9.6		10.00	0	96.4	80	120			
Tetrachloroethene (PCE)	9.2		10.00	0	92.4	80	120			
Trichloroethene (TCE)	9.8		10.00	0	98.0	80	120			
o-Xylene	10		10.00	0	104	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB-R32136**	SampType: **MBLK**	TestCode: **EPA 8270D: Semivolatiles**
Client ID: **PBW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982533** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,1-Biphenyl	ND	5.0								
1,4-Dioxane	ND	5.0								
Atrazine	ND	5.0								
Benzaldehyde	ND	5.0								
Caprolactam	ND	5.0								
N-Nitroso-di-n-butylamine	ND	5.0								
Acetophenone	ND	5.0								
1-Methylnaphthalene	ND	5.0								
2,3,4,6-Tetrachlorophenol	ND	5.0								
2,4,5-Trichlorophenol	ND	5.0								
2,4,6-Trichlorophenol	ND	5.0								
2,4-Dichlorophenol	ND	5.0								
2,4-Dimethylphenol	ND	5.0								
2,4-Dinitrophenol	ND	5.0								
2,4-Dinitrotoluene	ND	5.0								
2,6-Dinitrotoluene	ND	5.0								
2-Chloronaphthalene	ND	5.0								
2-Chlorophenol	ND	5.0								
2-Methylnaphthalene	ND	5.0								
2-Methylphenol	ND	5.0								
2-Nitroaniline	ND	5.0								
2-Nitrophenol	ND	5.0								
3,3´-Dichlorobenzidine	ND	5.0								
3-Nitroaniline	ND	5.0								
4,6-Dinitro-2-methylphenol	ND	5.0								
4-Bromophenyl phenyl ether	ND	5.0								
4-Chloro-3-methylphenol	ND	5.0								
4-Chloroaniline	ND	5.0								
4-Chlorophenyl phenyl ether	ND	5.0								
4-Nitroaniline	ND	5.0								
4-Nitrophenol	ND	5.0								
Acenaphthene	ND	5.0								
Acenaphthylene	ND	5.0								
Anthracene	ND	5.0								
Benzo(g,h,i)perylene	ND	5.0								
Benz(a)anthracene	ND	0.10								
Benzo(a)pyrene	ND	0.10								
Benzo(b)fluoranthene	ND	0.10								
Benzo(k)fluoranthene	ND	0.10								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB-R32136**	SampType: **MBLK**	TestCode: **EPA 8270D: Semivolatiles**
Client ID: **PBW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982533** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Bis(2-chloroethoxy)methane	ND	5.0								
Bis(2-chloroethyl)ether	ND	5.0								
Bis(2-chloroisopropyl)ether	ND	5.0								
Bis(2-ethylhexyl)phthalate	ND	5.0								
Butyl benzyl phthalate	ND	5.0								
Carbazole	ND	5.0								
Chrysene	ND	0.10								
Dibenz(a,h)anthracene	ND	0.10								
Dibenzofuran	ND	5.0								
Diethyl phthalate	ND	5.0								
Dimethyl phthalate	ND	5.0								
Di-n-butyl phthalate	ND	5.0								
Di-n-octyl phthalate	ND	5.0								
Fluoranthene	ND	5.0								
Fluorene	ND	5.0								
Hexachlorobenzene	ND	1.0								
Hexachlorobutadiene	ND	5.0								
Hexachlorocyclopentadiene	ND	5.0								
Hexachloroethane	ND	5.0								
Indeno(1,2,3-cd)pyrene	ND	0.10								
Isophorone	ND	5.0								
Naphthalene	ND	5.0								
Nitrobenzene	ND	5.0								
N-Nitrosodi-n-propylamine	ND	5.0								
N-Nitrosodiphenylamine	ND	2.0								
Pentachlorophenol	ND	5.0								
Phenanthrene	ND	1.0								
Phenol	ND	5.0								
Pyrene	ND	5.0								
o-Toluidine	ND	2.0								
Pyridine	ND	5.0								
1,2,4,5-Tetrachlorobenzene	ND	5.0								

Sample ID **LCS-R32136**	SampType: **LCS**	TestCode: **EPA 8270D: Semivolatiles**
Client ID: **LCSW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982534** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2,4-Dinitrotoluene	4.6		5.000	0	93.0	49	134			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **LCS-R32136**	SampType: **LCS**	TestCode: **EPA 8270D: Semivolatiles**
Client ID: **LCSW**	Batch ID: **R32136**	RunNo: **32136**
Prep Date:	Analysis Date: **2/2/2016**	SeqNo: **982534** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2-Chlorophenol	4.6		5.000	0	91.6	50	131			
4-Chloro-3-methylphenol	4.7		5.000	0	94.4	42	139			
4-Nitrophenol	4.5		5.000	0	90.2	19	137			
Acenaphthene	5.0		5.000	0	100	36	122			
Bis(2-ethylhexyl)phthalate	5.2		5.000	0	105	50	150			
N-Nitrosodi-n-propylamine	4.7		5.000	0	93.6	46	135			
Pentachlorophenol	3.7		5.000	0	73.2	22	138			
Phenol	5.2		5.000	0	103	45	134			
Pyrene	4.7		5.000	0	93.2	45	139			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID	**MB-23378**	SampType: **MBLK**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**PBW**	Batch ID: **23378**			RunNo: **31658**					
Prep Date:	**1/25/2016**	Analysis Date: **1/25/2016**			SeqNo: **968855**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID	**LCS-23378**	SampType: **LCS**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**LCSW**	Batch ID: **23378**			RunNo: **31658**					
Prep Date:	**1/25/2016**	Analysis Date: **1/25/2016**			SeqNo: **968856**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0052	0.00020	0.005000	0	104	80	120			

Sample ID	**1601864-001BMS**	SampType: **MS**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID: **23378**			RunNo: **31658**					
Prep Date:	**1/25/2016**	Analysis Date: **1/25/2016**			SeqNo: **968858**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0040	0.00020	0.005000	.00006177	79.6	75	125			

Sample ID	**1601864-001BMSD**	SampType: **MSD**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID: **23378**			RunNo: **31658**					
Prep Date:	**1/25/2016**	Analysis Date: **1/25/2016**			SeqNo: **968859**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0041	0.00020	0.005000	.00006177	80.1	75	125	0.688	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**
15-Feb-16

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

Sample ID	**MB-23438**	SampType: **MBLK**			TestCode: **MERCURY, TCLP**					
Client ID:	**PBW**	Batch ID: **23438**			RunNo: **31746**					
Prep Date:	**1/27/2016**	Analysis Date: **1/28/2016**			SeqNo: **971551**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.020								

Sample ID	**LCS-23438**	SampType: **LCS**			TestCode: **MERCURY, TCLP**					
Client ID:	**LCSW**	Batch ID: **23438**			RunNo: **31746**					
Prep Date:	**1/27/2016**	Analysis Date: **1/28/2016**			SeqNo: **971552**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.020	0.005000	0	102	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID	**MB-23359**	SampType:	**MBLK**	TestCode:	**EPA Method 6010B: TCLP Metals**				
Client ID:	**PBW**	Batch ID:	**23359**	RunNo:	**31646**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/25/2016**	SeqNo:	**968535**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0								
Barium	ND	100								
Cadmium	ND	1.0								
Chromium	ND	5.0								
Lead	ND	5.0								
Selenium	ND	1.0								
Silver	ND	5.0								

Sample ID	**LCS-23359**	SampType:	**LCS**	TestCode:	**EPA Method 6010B: TCLP Metals**				
Client ID:	**LCSW**	Batch ID:	**23359**	RunNo:	**31646**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/25/2016**	SeqNo:	**968536**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0	0.5000	0	96.1	80	120			
Barium	ND	100	0.5000	0	94.0	80	120			
Cadmium	ND	1.0	0.5000	0	92.5	80	120			
Chromium	ND	5.0	0.5000	0	93.7	80	120			
Lead	ND	5.0	0.5000	0	92.9	80	120			
Selenium	ND	1.0	0.5000	0	95.8	80	120			
Silver	ND	5.0	0.1000	0	92.0	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID **MB-23359**	SampType: **MBLK**	TestCode: **EPA 6010B: Total Metals**
Client ID: **PBW**	Batch ID: **23359**	RunNo: **31646**
Prep Date: **1/22/2016**	Analysis Date: **1/25/2016**	SeqNo: **968316** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020								
Antimony	ND	0.050								
Arsenic	ND	0.020								
Barium	ND	0.020								
Beryllium	ND	0.0030								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Copper	ND	0.0060								
Iron	ND	0.050								
Lead	ND	0.0050								
Manganese	ND	0.0020								
Nickel	ND	0.010								
Potassium	ND	1.0								
Selenium	ND	0.050								
Silver	ND	0.0050								
Thallium	ND	0.050								
Vanadium	ND	0.050								
Zinc	ND	0.020								

Sample ID **LCS-23359**	SampType: **LCS**	TestCode: **EPA 6010B: Total Metals**
Client ID: **LCSW**	Batch ID: **23359**	RunNo: **31646**
Prep Date: **1/22/2016**	Analysis Date: **1/25/2016**	SeqNo: **968317** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.46	0.020	0.5000	0	91.9	80	120			
Antimony	0.48	0.050	0.5000	0	95.5	80	120			
Arsenic	0.48	0.020	0.5000	0	96.1	80	120			
Barium	0.47	0.020	0.5000	0	94.0	80	120			
Beryllium	0.49	0.0030	0.5000	0	99.0	80	120			
Cadmium	0.46	0.0020	0.5000	0	92.5	80	120			
Chromium	0.47	0.0060	0.5000	0	93.7	80	120			
Copper	0.47	0.0060	0.5000	0	94.5	80	120			
Iron	0.48	0.050	0.5000	0	95.5	80	120			
Lead	0.46	0.0050	0.5000	0	92.9	80	120			
Manganese	0.47	0.0020	0.5000	0	93.5	80	120			
Nickel	0.46	0.010	0.5000	0	92.2	80	120			
Potassium	44	1.0	50.00	0	88.6	80	120			
Selenium	0.48	0.050	0.5000	0	95.8	80	120			
Silver	0.092	0.0050	0.1000	0	92.0	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID	**LCS-23359**	SampType:	**LCS**		TestCode:	**EPA 6010B: Total Metals**				
Client ID:	**LCSW**	Batch ID:	**23359**		RunNo:	**31646**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/25/2016**		SeqNo:	**968317**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Thallium	0.47	0.050	0.5000	0	93.8	80	120			
Vanadium	0.49	0.050	0.5000	0	98.1	80	120			
Zinc	0.48	0.020	0.5000	0	95.2	80	120			

Sample ID	**MB-23359**	SampType:	**MBLK**		TestCode:	**EPA 6010B: Total Metals**				
Client ID:	**PBW**	Batch ID:	**23359**		RunNo:	**31648**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/25/2016**		SeqNo:	**968397**	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								
Sodium	ND	1.0								

Sample ID	**LCS-23359**	SampType:	**LCS**		TestCode:	**EPA 6010B: Total Metals**				
Client ID:	**LCSW**	Batch ID:	**23359**		RunNo:	**31648**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/25/2016**		SeqNo:	**968398**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	50	1.0	50.00	0	99.1	80	120			
Magnesium	49	1.0	50.00	0	98.8	80	120			
Sodium	48	1.0	50.00	0	96.6	80	120			

Sample ID	**MB-23359**	SampType:	**MBLK**		TestCode:	**EPA 6010B: Total Metals**				
Client ID:	**PBW**	Batch ID:	**23359**		RunNo:	**31737**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/28/2016**		SeqNo:	**971326**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cobalt	ND	0.0060								

Sample ID	**LCS-23359**	SampType:	**LCS**		TestCode:	**EPA 6010B: Total Metals**				
Client ID:	**LCSW**	Batch ID:	**23359**		RunNo:	**31737**				
Prep Date:	**1/22/2016**	Analysis Date:	**1/28/2016**		SeqNo:	**971327**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cobalt	0.46	0.0060	0.5000	0	91.5	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**
15-Feb-16

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

Sample ID	**MB-R32136**	SampType:	**MBLK**	TestCode:	**CYANIDE, Reactive**					
Client ID:	**PBW**	Batch ID:	**R32136**	RunNo:	**32136**					
Prep Date:		Analysis Date:	**2/4/2016**	SeqNo:	**982430**	Units:	**mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	ND	1.00								

Sample ID	**LCS-R32136**	SampType:	**LCS**	TestCode:	**CYANIDE, Reactive**					
Client ID:	**LCSW**	Batch ID:	**R32136**	RunNo:	**32136**					
Prep Date:		Analysis Date:	**2/4/2016**	SeqNo:	**982431**	Units:	**mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	0.542		0.5000	0	108	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**
15-Feb-16

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

Sample ID	**MB-R32136**	SampType:	**MBLK**	TestCode:	**SULFIDE, Reactive**					
Client ID:	**PBW**	Batch ID:	**R32136**	RunNo:	**32136**					
Prep Date:		Analysis Date:	**1/29/2016**	SeqNo:	**982433**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	ND	1.0								

Sample ID	**LCS-R32136**	SampType:	**LCS**	TestCode:	**SULFIDE, Reactive**					
Client ID:	**LCSW**	Batch ID:	**R32136**	RunNo:	**32136**					
Prep Date:		Analysis Date:	**1/29/2016**	SeqNo:	**982434**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	0.18		0.2000	0	90.0	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**
15-Feb-16

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

Sample ID **mb-1**	SampType: **MBLK**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R31664**	RunNo: **31664**							
Prep Date:	Analysis Date: **1/25/2016**	SeqNo: **968939**	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**	SampType: **LCS**	TestCode: **SM2320B: Alkalinity**							
Client ID: **LCSW**	Batch ID: **R31664**	RunNo: **31664**							
Prep Date:	Analysis Date: **1/25/2016**	SeqNo: **968940**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	75.44	20.00	80.00	0	94.3	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**
15-Feb-16

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

Sample ID **1601864-001ADUP** SampType: **DUP** TestCode: **Specific Gravity**
Client ID: **WDW-1,2,&3 Effluen** Batch ID: **R31723** RunNo: **31723**
Prep Date: Analysis Date: **1/27/2016** SeqNo: **970796** Units:

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	1.004	0						0.179	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1601864**

15-Feb-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, & 3 Inj Well

Sample ID	**MB-23428**	SampType:	**MBLK**		TestCode:	**SM2540C MOD: Total Dissolved Solids**				
Client ID:	**PBW**	Batch ID:	**23428**		RunNo:	**31755**				
Prep Date:	**1/27/2016**	Analysis Date:	**1/28/2016**		SeqNo:	**971754**	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-23428**	SampType:	**LCS**		TestCode:	**SM2540C MOD: Total Dissolved Solids**				
Client ID:	**LCSW**	Batch ID:	**23428**		RunNo:	**31755**				
Prep Date:	**1/27/2016**	Analysis Date:	**1/28/2016**		SeqNo:	**971755**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1020	20.0	1000	0	102	80	120			

Sample ID	**1601864-001AMS**	SampType:	**MS**		TestCode:	**SM2540C MOD: Total Dissolved Solids**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**23428**		RunNo:	**31755**				
Prep Date:	**1/27/2016**	Analysis Date:	**1/28/2016**		SeqNo:	**971765**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	5800	40.0	2000	3784	101	80	120			D

Sample ID	**1601864-001AMSD**	SampType:	**MSD**		TestCode:	**SM2540C MOD: Total Dissolved Solids**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**23428**		RunNo:	**31755**				
Prep Date:	**1/27/2016**	Analysis Date:	**1/28/2016**		SeqNo:	**971766**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	5820	40.0	2000	3784	102	80	120	0.379	5	D

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: NAVAJO REFINING CO Work Order Number: 1601864 RcptNo: 1

Received by/date: LM 01/22/16

Logged By: **Michelle Garcia** 1/22/2016 9:40:00 AM Michelle Garcia

Completed By: **Michelle Garcia** 1/22/2016 11:23:27 AM Michelle Garcia

Reviewed By: IO 01/27/16

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: 2,2 (<2 or >12 unless noted)

Adjusted? No

Checked by: MG

Special Handling (if applicable)

16. 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: ____

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.2	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia,

NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

☐ Standar ☐ **Rush**

Project Name:

Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 167796

Project Manager:

Micki Schultz / Scott Denton / Mike Holder

Sampler: Elizabeth Salsberry

On Ice: ☑ Yes ☐ No

Sample Temperature: 1.2

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

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

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1601864	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-845 Method 1311
1/21/16	7:35	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X
1/21/16	7:35	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3	-001					X	X	
1/21/16	7:35	Liquid	WDW-1, 2, & 3 Effluent	3	HCL	-001		X					
1/21/16	7:35	Liquid	WDW-1, 2, & 3 Effluent	2	Neat	-001			X				
1/21/16	7:35	Liquid	WDW-1, 2, & 3 Effluent	2	Neat	-001				X			
1/21/16	7:35	Liquid	Trip Blank	2	Neat	-002		X					
1/21/16	7:35	Liquid	Temperature Blank	1	Neat								

Date	Time	Relinquished by	Received by	Date	Time
1/21/2016	1:00	Elizabeth Salsberry			
Date:	Time:	Relinquished by:	Received by:	01/22/16	0740

Remarks: Send results to Scott Denton, Mike Holder, Micki Schultz, Robert Combs and Andrew Contreras.

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.

Navajo Refining Company, LLC
501 E. Main
Artesia, NM 88210
(Tel) 575.748.3311
(Fax) 575.746.5451

Injection Well Quarterly Sample Details Attachment

HOLLYFRONTIER
The HollyFrontier Companies

Project Name	WDW-1,2, & 3 Qrtly Inj Well
Samplers Name	Elizabeth Salsberry
Samplers Affiliation	Navajo Refining Co. LLC
Start Date and Time	1/21/2016 @ 7:30 a.m.
End Date and Time	1/21/2016 @ 7:40 a.m.

Sample Type	
Grab	☑
Time Weighted Composite	☐
Flow Weighted Composite	☐

Physical Property	
Solid	☐
Liquid	☑
Sludge	☐

Parts / Sample Intervals	One
Type of Sampler	Directly to sample jars

Outfall / Sample Location: Waste water effluent pumps to injection wells.

☐ P-849 sample point (first from east)
☑ P-854 sample point (second from east)
☐ P-856 sample point (third from east)
☐ P-857 sample point (fourth from east)

				Preservatives								
Container	Size	Material	# of Containers	Neat (None)	HCL	HNO3	H2SO4	NaOH	Na2S2O3	NaHSO4	Other	Analysis and/or Method Requested
1			3	X			X					Specific Gravity,HCO3, CO3, Cl, SO4, TDS, pH, cond.,Fl, Cation/anion bal., Br, Eh/40 CFR 136.3
2			1			X						VOCs/SW-846 Method 8260C (see attached list 'VOCs')
3			3		X							SVOCs/SW-846 Method 8270D (see attached list 'SVOCs')
4			2	X								R,C,I/40 CFR part 261
5			2	X								Metals/SW-846 Mthd 6010, 7470 (see attached list 'Metals')
6			2	X								Ca, K, Mg, Na/40 CFR 136.3
7			1	X								TCLP Metals, only /40 CFR Part 261/ SW-846 Method 1311
8												
9												
10												

Field Data (Weather, Observations, Etc): 1/21/2016 Temp. 37.4 °F Humidity 70% Wind direction NW Wind Speed 11.5 mph Condition: Clear

Date and Time

Field Temp 40.7C Field pH 7.49

Storage Method	
Ice	☑
Refrigerated	☐
Other	☐

Shipping Media	
Ice	☑
Other	☐

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

August 01, 2016

Scott Denton

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

RE: Quarterly WDW-1, 2, &3 Inj Well OrderNo.: 1607300

Dear Scott Denton:

Hall Environmental Analysis Laboratory received 2 sample(s) on 7/7/2016 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 qualifers 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 #NM0190

Sincerely,

Andy Freeman

Laboratory Manager

4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 300.0: ANIONS						Analyst: **LGT**
Fluoride	8.9	2.0	*	mg/L	20	7/8/2016 1:28:08 AM
Chloride	400	10		mg/L	20	7/8/2016 1:28:08 AM
Bromide	0.78	0.10		mg/L	1	7/8/2016 1:15:44 AM
Phosphorus, Orthophosphate (As P)	ND	10	H	mg/L	20	7/8/2016 1:28:08 AM
Sulfate	1700	50		mg/L	100	7/8/2016 11:57:26 PM
Nitrate+Nitrite as N	ND	1.0		mg/L	5	7/8/2016 2:05:22 AM
EPA METHOD 7470: MERCURY						Analyst: **pmf**
Mercury	ND	0.00020		mg/L	1	7/15/2016 10:35:40 AM
MERCURY, TCLP						Analyst: **ELS**
Mercury	ND	0.020		mg/L	1	7/21/2016 2:26:41 PM
EPA METHOD 6010B: TCLP METALS						Analyst: **ELS**
Arsenic	ND	5.0		mg/L	1	7/20/2016 6:42:47 AM
Barium	ND	100		mg/L	1	7/20/2016 6:42:47 AM
Cadmium	ND	1.0		mg/L	1	7/20/2016 6:42:47 AM
Chromium	ND	5.0		mg/L	1	7/20/2016 6:42:47 AM
Lead	ND	5.0		mg/L	1	7/20/2016 6:42:47 AM
Selenium	ND	1.0		mg/L	1	7/20/2016 6:42:47 AM
Silver	ND	5.0		mg/L	1	7/20/2016 6:42:47 AM
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: **ELS**
Aluminum	0.87	0.10		mg/L	5	7/21/2016 11:41:44 AM
Antimony	ND	0.050		mg/L	1	7/21/2016 11:36:00 AM
Arsenic	0.038	0.020		mg/L	1	7/21/2016 11:36:00 AM
Barium	ND	0.020		mg/L	1	7/21/2016 11:36:00 AM
Beryllium	ND	0.0030		mg/L	1	7/21/2016 11:36:00 AM
Cadmium	ND	0.0020		mg/L	1	7/21/2016 11:36:00 AM
Calcium	150	20		mg/L	20	7/21/2016 11:48:56 AM
Chromium	ND	0.0060		mg/L	1	7/21/2016 11:36:00 AM
Cobalt	ND	0.0060		mg/L	1	7/21/2016 11:36:00 AM
Copper	ND	0.0060		mg/L	1	7/21/2016 11:36:00 AM
Iron	0.23	0.050		mg/L	1	7/21/2016 11:36:00 AM
Lead	ND	0.0050		mg/L	1	7/21/2016 11:36:00 AM
Magnesium	45	1.0		mg/L	1	7/21/2016 11:36:00 AM
Manganese	0.096	0.0020		mg/L	1	7/21/2016 11:36:00 AM
Nickel	ND	0.010		mg/L	1	7/21/2016 11:36:00 AM
Potassium	69	5.0		mg/L	5	7/21/2016 11:41:44 AM
Selenium	ND	0.050		mg/L	1	7/21/2016 11:36:00 AM
Silver	ND	0.0050		mg/L	1	7/21/2016 11:36:00 AM

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 6010B: TOTAL RECOVERABLE METALS						Analyst: **ELS**
Sodium	760	20		mg/L	20	7/21/2016 11:48:56 AM
Strontium	2.3	0.20		mg/L	20	7/21/2016 11:48:56 AM
Thallium	ND	0.25		mg/L	5	7/21/2016 11:41:44 AM
Zinc	0.042	0.020		mg/L	1	7/21/2016 11:36:00 AM
Silica	18	5.4		mg/L	5	7/21/2016 11:41:44 AM
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**
Acetonitrile	110	0.50		µg/L	1	7/19/2016
Allyl chloride	ND	0.50		µg/L	1	7/19/2016
Chloroprene	ND	0.50		µg/L	1	7/19/2016
Cyclohexane	ND	0.50		µg/L	1	7/19/2016
Diethyl ether	ND	0.50		µg/L	1	7/19/2016
Diisopropyl ether	ND	0.50		µg/L	1	7/19/2016
Epichlorohydrin	ND	5.0		µg/L	1	7/19/2016
Ethyl acetate	ND	0.50		µg/L	1	7/19/2016
Ethyl methacrylate	ND	2.5		µg/L	1	7/19/2016
Ethyl tert-butyl ether	ND	0.50		µg/L	1	7/19/2016
Freon-113	ND	0.50		µg/L	1	7/19/2016
Isobutanol	ND	10		µg/L	1	7/19/2016
Isopropyl acetate	ND	0.50		µg/L	1	7/19/2016
Methacrylonitrile	ND	2.5		µg/L	1	7/19/2016
Methyl acetate	ND	0.50		µg/L	1	7/19/2016
Methyl ethyl ketone	ND	2.5		µg/L	1	7/19/2016
Methyl isobutyl ketone	ND	2.5		µg/L	1	7/19/2016
Methyl methacrylate	ND	2.5		µg/L	1	7/19/2016
Methylcyclohexane	ND	1.0		µg/L	1	7/19/2016
n-Amyl acetate	ND	0.50		µg/L	1	7/19/2016
n-Hexane	ND	0.50		µg/L	1	7/19/2016
Nitrobenzene	ND	5.0		µg/L	1	7/19/2016
Pentachloroethane	ND	5.0		µg/L	1	7/19/2016
p-isopropyltoluene	ND	0.50		µg/L	1	7/19/2016
Propionitrile	ND	2.5		µg/L	1	7/19/2016
Tetrahydrofuran	ND	0.50		µg/L	1	7/19/2016
Benzene	ND	0.50		µg/L	1	7/19/2016
Toluene	2.4	0.50		µg/L	1	7/19/2016
Ethylbenzene	ND	0.50		µg/L	1	7/19/2016
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	1	7/19/2016
1,2,4-Trimethylbenzene	ND	0.50		µg/L	1	7/19/2016
1,3,5-Trimethylbenzene	ND	0.50		µg/L	1	7/19/2016
1,2-Dichloroethane (EDC)	ND	0.50		µg/L	1	7/19/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**
1,2-Dibromoethane (EDB)	ND	0.50		µg/L	1	7/19/2016
Naphthalene	ND	0.50		µg/L	1	7/19/2016
Acetone	4.6	2.5		µg/L	1	7/19/2016
Bromobenzene	ND	0.50		µg/L	1	7/19/2016
Bromodichloromethane	ND	0.50		µg/L	1	7/19/2016
Bromoform	ND	0.50		µg/L	1	7/19/2016
Bromomethane	ND	0.50		µg/L	1	7/19/2016
2-Butanone	ND	2.5		µg/L	1	7/19/2016
Carbon disulfide	ND	0.50		µg/L	1	7/19/2016
Carbon Tetrachloride	ND	0.50		µg/L	1	7/19/2016
Chlorobenzene	ND	0.50		µg/L	1	7/19/2016
Chloroethane	ND	0.50		µg/L	1	7/19/2016
Chloroform	ND	0.50		µg/L	1	7/19/2016
Chloromethane	1.4	0.50		µg/L	1	7/19/2016
2-Chlorotoluene	ND	0.50		µg/L	1	7/19/2016
4-Chlorotoluene	ND	0.50		µg/L	1	7/19/2016
cis-1,2-DCE	ND	0.50		µg/L	1	7/19/2016
cis-1,3-Dichloropropene	ND	0.50		µg/L	1	7/19/2016
1,2-Dibromo-3-chloropropane	ND	0.50		µg/L	1	7/19/2016
Dibromochloromethane	ND	0.50		µg/L	1	7/19/2016
Dibromomethane	ND	0.50		µg/L	1	7/19/2016
1,2-Dichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,3-Dichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,4-Dichlorobenzene	ND	0.50		µg/L	1	7/19/2016
Dichlorodifluoromethane	ND	0.50		µg/L	1	7/19/2016
1,1-Dichloroethane	ND	0.50		µg/L	1	7/19/2016
1,1-Dichloroethene	ND	0.50		µg/L	1	7/19/2016
1,2-Dichloropropane	ND	0.50		µg/L	1	7/19/2016
1,3-Dichloropropane	ND	0.50		µg/L	1	7/19/2016
2,2-Dichloropropane	ND	0.50		µg/L	1	7/19/2016
1,1-Dichloropropene	ND	0.50		µg/L	1	7/19/2016
Hexachlorobutadiene	ND	0.50		µg/L	1	7/19/2016
2-Hexanone	ND	0.50		µg/L	1	7/19/2016
Isopropylbenzene	ND	0.50		µg/L	1	7/19/2016
Methylene Chloride	ND	2.5		µg/L	1	7/19/2016
n-Butylbenzene	ND	0.50		µg/L	1	7/19/2016
n-Propylbenzene	ND	0.50		µg/L	1	7/19/2016
sec-Butylbenzene	ND	0.50		µg/L	1	7/19/2016
Styrene	ND	0.50		µg/L	1	7/19/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**
tert-Butylbenzene	ND	0.50		µg/L	1	7/19/2016
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	1	7/19/2016
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	1	7/19/2016
Tetrachloroethene (PCE)	ND	0.50		µg/L	1	7/19/2016
trans-1,2-DCE	ND	0.50		µg/L	1	7/19/2016
trans-1,3-Dichloropropene	ND	0.50		µg/L	1	7/19/2016
1,2,3-Trichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,1,1-Trichloroethane	ND	0.50		µg/L	1	7/19/2016
1,1,2-Trichloroethane	ND	0.50		µg/L	1	7/19/2016
Trichloroethene (TCE)	ND	0.50		µg/L	1	7/19/2016
Trichlorofluoromethane	ND	0.50		µg/L	1	7/19/2016
1,2,3-Trichloropropane	ND	0.50		µg/L	1	7/19/2016
Vinyl chloride	ND	0.50		µg/L	1	7/19/2016
mp-Xylenes	ND	1.0		µg/L	1	7/19/2016
o-Xylene	ND	0.50		µg/L	1	7/19/2016
tert-Amyl methyl ether	ND	0.50		µg/L	1	7/19/2016
tert-Butyl alcohol	ND	0.50		µg/L	1	7/19/2016
Acrolein	ND	2.5		µg/L	1	7/19/2016
Acrylonitrile	ND	2.5		µg/L	1	7/19/2016
Bromochloromethane	ND	0.50		µg/L	1	7/19/2016
2-Chloroethyl vinyl ether	ND	0.50		µg/L	1	7/19/2016
Iodomethane	ND	0.50		µg/L	1	7/19/2016
trans-1,4-Dichloro-2-butene	ND	0.50		µg/L	1	7/19/2016
Vinyl acetate	ND	0.50		µg/L	1	7/19/2016
1,4-Dioxane	ND	20		µg/L	1	7/19/2016
Surr: 1,2-Dichlorobenzene-d4	98.8	70-130		%Rec	1	7/19/2016
Surr: 4-Bromofluorobenzene	95.6	70-130		%Rec	1	7/19/2016
Surr: Toluene-d8	101	70-130		%Rec	1	7/19/2016
EPA 8270C: SEMIVOLATILES/MOD						Analyst: **SUB**
1,1-Biphenyl	ND	2.5		µg/L	1	7/15/2016
Atrazine	ND	2.5		µg/L	1	7/15/2016
Benzaldehyde	ND	2.5		µg/L	1	7/15/2016
Caprolactam	ND	2.5		µg/L	1	7/15/2016
N-Nitroso-di-n-butylamine	ND	2.5		µg/L	1	7/15/2016
Acetophenone	ND	25		µg/L	1	7/15/2016
1-Methylnaphthalene	ND	25		µg/L	1	7/15/2016
2,3,4,6-Tetrachlorophenol	ND	25		µg/L	1	7/15/2016
2,4,5-Trichlorophenol	ND	25		µg/L	1	7/15/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 8270C: SEMIVOLATILES/MOD						Analyst: **SUB**
2,4,6-Trichlorophenol	ND	25		µg/L	1	7/15/2016
2,4-Dichlorophenol	ND	25		µg/L	1	7/15/2016
2,4-Dimethylphenol	ND	25		µg/L	1	7/15/2016
2,4-Dinitrophenol	ND	25		µg/L	1	7/15/2016
2,4-Dinitrotoluene	ND	25		µg/L	1	7/15/2016
2,6-Dinitrotoluene	ND	25		µg/L	1	7/15/2016
2-Chloronaphthalene	ND	25		µg/L	1	7/15/2016
2-Chlorophenol	ND	25		µg/L	1	7/15/2016
2-Methylnaphthalene	ND	25		µg/L	1	7/15/2016
2-Methylphenol	ND	25		µg/L	1	7/15/2016
2-Nitroaniline	ND	25		µg/L	1	7/15/2016
2-Nitrophenol	ND	25		µg/L	1	7/15/2016
3,3´-Dichlorobenzidine	ND	25		µg/L	1	7/15/2016
3-Nitroaniline	ND	25		µg/L	1	7/15/2016
4,6-Dinitro-2-methylphenol	ND	25		µg/L	1	7/15/2016
4-Bromophenyl phenyl ether	ND	25		µg/L	1	7/15/2016
4-Chloro-3-methylphenol	ND	25		µg/L	1	7/15/2016
4-Chloroaniline	ND	25		µg/L	1	7/15/2016
4-Chlorophenyl phenyl ether	ND	25		µg/L	1	7/15/2016
4-Nitroaniline	ND	25		µg/L	1	7/15/2016
4-Nitrophenol	ND	25		µg/L	1	7/15/2016
Acenaphthene	ND	25		µg/L	1	7/15/2016
Acenaphthylene	ND	25		µg/L	1	7/15/2016
Anthracene	ND	25		µg/L	1	7/15/2016
Benzo(g,h,i)perylene	ND	25		µg/L	1	7/15/2016
Benz(a)anthracene	ND	0.50		µg/L	1	7/15/2016
Benzo(a)pyrene	ND	0.50		µg/L	1	7/15/2016
Benzo(b)fluoranthene	ND	0.50		µg/L	1	7/15/2016
Benzo(k)fluoranthene	ND	0.50		µg/L	1	7/15/2016
Bis(2-chloroethoxy)methane	ND	25		µg/L	1	7/15/2016
Bis(2-chloroethyl)ether	ND	25		µg/L	1	7/15/2016
Bis(2-chloroisopropyl)ether	ND	25		µg/L	1	7/15/2016
Bis(2-ethylhexyl)phthalate	ND	25		µg/L	1	7/15/2016
Butyl benzyl phthalate	ND	25		µg/L	1	7/15/2016
Carbazole	ND	25		µg/L	1	7/15/2016
Chrysene	ND	0.50		µg/L	1	7/15/2016
Dibenz(a,h)anthracene	ND	0.50		µg/L	1	7/15/2016
Dibenzofuran	ND	25		µg/L	1	7/15/2016
Diethyl phthalate	ND	25		µg/L	1	7/15/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA 8270C: SEMIVOLATILES/MOD						Analyst: **SUB**
Dimethyl phthalate	ND	25		µg/L	1	7/15/2016
Di-n-butyl phthalate	ND	25		µg/L	1	7/15/2016
Di-n-octyl phthalate	ND	25		µg/L	1	7/15/2016
Fluoranthene	ND	25		µg/L	1	7/15/2016
Fluorene	ND	25		µg/L	1	7/15/2016
Hexachlorobenzene	ND	5.0		µg/L	1	7/15/2016
Hexachlorobutadiene	ND	25		µg/L	1	7/15/2016
Hexachlorocyclopentadiene	ND	25		µg/L	1	7/15/2016
Hexachloroethane	ND	25		µg/L	1	7/15/2016
Indeno(1,2,3-cd)pyrene	ND	0.50		µg/L	1	7/15/2016
Isophorone	ND	25		µg/L	1	7/15/2016
Naphthalene	ND	25		µg/L	1	7/15/2016
Nitrobenzene	ND	25		µg/L	1	7/15/2016
N-Nitrosodi-n-propylamine	ND	25		µg/L	1	7/15/2016
N-Nitrosodiphenylamine	ND	10		µg/L	1	7/15/2016
Pentachlorophenol	ND	25		µg/L	1	7/15/2016
Phenanthrene	ND	25		µg/L	1	7/15/2016
Phenol	ND	25		µg/L	1	7/15/2016
Pyrene	ND	25		µg/L	1	7/15/2016
o-Toluidine	ND	10		µg/L	1	7/15/2016
Pyridine	ND	25		µg/L	1	7/15/2016
1,2,4,5-Tetrachlorobenzene	ND	25		µg/L	1	7/15/2016
Surr: 2,4,6-Tribromophenol	98.8	63-110		%Rec	1	7/15/2016
Surr: 2-Fluorobiphenyl	83.2	58-112		%Rec	1	7/15/2016
Surr: 2-Fluorophenol	61.0	47-109		%Rec	1	7/15/2016
Surr: Nitrobenzene-d5	91.2	58-110		%Rec	1	7/15/2016
Surr: Phenol-d5	75.6	52-105		%Rec	1	7/15/2016
Surr: Terphenyl-d14	51.2	22-133		%Rec	1	7/15/2016
CORROSIVITY						Analyst: **SUB**
pH	7.54			pH Units	1	7/13/2016
IGNITABILITY METHOD 1010						Analyst: **SUB**
Ignitability	>200	0		°F	1	7/21/2016
CYANIDE, REACTIVE						Analyst: **SUB**
Cyanide, Reactive	ND	0.0100		mg/L	1	7/19/2016
SULFIDE, REACTIVE						Analyst: **SUB**
Reactive Sulfide	ND	0.46		mg/L	1	7/14/2016
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 7/5/2016 8:30:00 AM
Lab ID: 1607300-001
Matrix: AQUEOUS
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**
Conductivity	4600	1.0		µmhos/cm	1	7/8/2016 12:37:31 PM
SM4500-H+B: PH						Analyst: **JRR**
pH	7.61	1.68	H	pH units	1	7/8/2016 12:37:31 PM
SM2320B: ALKALINITY						Analyst: **JRR**
Bicarbonate (As CaCO3)	271.4	20.00		mg/L CaCO3	1	7/8/2016 12:37:31 PM
Carbonate (As CaCO3)	ND	2.000		mg/L CaCO3	1	7/8/2016 12:37:31 PM
Total Alkalinity (as CaCO3)	271.4	20.00		mg/L CaCO3	1	7/8/2016 12:37:31 PM
SPECIFIC GRAVITY						Analyst: **JRR**
Specific Gravity	1.004	0			1	7/8/2016 12:11:00 PM
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**
Total Dissolved Solids	3160	20.0	*	mg/L	1	7/8/2016 4:07:00 PM

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date:
Lab ID: 1607300-002
Matrix: TRIP BLANK
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**
Acetonitrile	ND	0.50		µg/L	1	7/19/2016
Allyl chloride	ND	0.50		µg/L	1	7/19/2016
Chloroprene	ND	0.50		µg/L	1	7/19/2016
Cyclohexane	ND	0.50		µg/L	1	7/19/2016
Diethyl ether	ND	0.50		µg/L	1	7/19/2016
Diisopropyl ether	ND	0.50		µg/L	1	7/19/2016
Epichlorohydrin	ND	5.0		µg/L	1	7/19/2016
Ethyl acetate	ND	0.50		µg/L	1	7/19/2016
Ethyl methacrylate	ND	2.5		µg/L	1	7/19/2016
Ethyl tert-butyl ether	ND	0.50		µg/L	1	7/19/2016
Freon-113	ND	0.50		µg/L	1	7/19/2016
Isobutanol	ND	10		µg/L	1	7/19/2016
Isopropyl acetate	ND	0.50		µg/L	1	7/19/2016
Methacrylonitrile	ND	2.5		µg/L	1	7/19/2016
Methyl acetate	ND	0.50		µg/L	1	7/19/2016
Methyl ethyl ketone	ND	2.5		µg/L	1	7/19/2016
Methyl isobutyl ketone	ND	2.5		µg/L	1	7/19/2016
Methyl methacrylate	ND	2.5		µg/L	1	7/19/2016
Methylcyclohexane	ND	1.0		µg/L	1	7/19/2016
n-Amyl acetate	ND	0.50		µg/L	1	7/19/2016
n-Hexane	ND	0.50		µg/L	1	7/19/2016
Nitrobenzene	ND	5.0		µg/L	1	7/19/2016
Pentachloroethane	ND	5.0		µg/L	1	7/19/2016
p-isopropyltoluene	ND	0.50		µg/L	1	7/19/2016
Propionitrile	ND	2.5		µg/L	1	7/19/2016
Tetrahydrofuran	ND	0.50		µg/L	1	7/19/2016
Benzene	ND	0.50		µg/L	1	7/19/2016
Toluene	ND	0.50		µg/L	1	7/19/2016
Ethylbenzene	ND	0.50		µg/L	1	7/19/2016
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	1	7/19/2016
1,2,4-Trimethylbenzene	ND	0.50		µg/L	1	7/19/2016
1,3,5-Trimethylbenzene	ND	0.50		µg/L	1	7/19/2016
1,2-Dichloroethane (EDC)	ND	0.50		µg/L	1	7/19/2016
1,2-Dibromoethane (EDB)	ND	0.50		µg/L	1	7/19/2016
Naphthalene	ND	0.50		µg/L	1	7/19/2016
Acetone	ND	2.5		µg/L	1	7/19/2016
Bromobenzene	ND	0.50		µg/L	1	7/19/2016
Bromodichloromethane	ND	0.50		µg/L	1	7/19/2016
Bromoform	ND	0.50		µg/L	1	7/19/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date:
Lab ID: 1607300-002
Matrix: TRIP BLANK
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**
Bromomethane	ND	0.50		µg/L	1	7/19/2016
2-Butanone	ND	2.5		µg/L	1	7/19/2016
Carbon disulfide	ND	0.50		µg/L	1	7/19/2016
Carbon Tetrachloride	ND	0.50		µg/L	1	7/19/2016
Chlorobenzene	ND	0.50		µg/L	1	7/19/2016
Chloroethane	ND	0.50		µg/L	1	7/19/2016
Chloroform	ND	0.50		µg/L	1	7/19/2016
Chloromethane	ND	0.50		µg/L	1	7/19/2016
2-Chlorotoluene	ND	0.50		µg/L	1	7/19/2016
4-Chlorotoluene	ND	0.50		µg/L	1	7/19/2016
cis-1,2-DCE	ND	0.50		µg/L	1	7/19/2016
cis-1,3-Dichloropropene	ND	0.50		µg/L	1	7/19/2016
1,2-Dibromo-3-chloropropane	ND	0.50		µg/L	1	7/19/2016
Dibromochloromethane	ND	0.50		µg/L	1	7/19/2016
Dibromomethane	ND	0.50		µg/L	1	7/19/2016
1,2-Dichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,3-Dichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,4-Dichlorobenzene	ND	0.50		µg/L	1	7/19/2016
Dichlorodifluoromethane	ND	0.50		µg/L	1	7/19/2016
1,1-Dichloroethane	ND	0.50		µg/L	1	7/19/2016
1,1-Dichloroethene	ND	0.50		µg/L	1	7/19/2016
1,2-Dichloropropane	ND	0.50		µg/L	1	7/19/2016
1,3-Dichloropropane	ND	0.50		µg/L	1	7/19/2016
2,2-Dichloropropane	ND	0.50		µg/L	1	7/19/2016
1,1-Dichloropropene	ND	0.50		µg/L	1	7/19/2016
Hexachlorobutadiene	ND	0.50		µg/L	1	7/19/2016
2-Hexanone	ND	0.50		µg/L	1	7/19/2016
Isopropylbenzene	ND	0.50		µg/L	1	7/19/2016
Methylene Chloride	ND	2.5		µg/L	1	7/19/2016
n-Butylbenzene	ND	0.50		µg/L	1	7/19/2016
n-Propylbenzene	ND	0.50		µg/L	1	7/19/2016
sec-Butylbenzene	ND	0.50		µg/L	1	7/19/2016
Styrene	ND	0.50		µg/L	1	7/19/2016
tert-Butylbenzene	ND	0.50		µg/L	1	7/19/2016
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	1	7/19/2016
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	1	7/19/2016
Tetrachloroethene (PCE)	ND	0.50		µg/L	1	7/19/2016
trans-1,2-DCE	ND	0.50		µg/L	1	7/19/2016
trans-1,3-Dichloropropene	ND	0.50		µg/L	1	7/19/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date:
Lab ID: 1607300-002
Matrix: TRIP BLANK
Received Date: 7/7/2016 10:15:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**
1,2,3-Trichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	7/19/2016
1,1,1-Trichloroethane	ND	0.50		µg/L	1	7/19/2016
1,1,2-Trichloroethane	ND	0.50		µg/L	1	7/19/2016
Trichloroethene (TCE)	ND	0.50		µg/L	1	7/19/2016
Trichlorofluoromethane	ND	0.50		µg/L	1	7/19/2016
1,2,3-Trichloropropane	ND	0.50		µg/L	1	7/19/2016
Vinyl chloride	ND	0.50		µg/L	1	7/19/2016
mp-Xylenes	ND	1.0		µg/L	1	7/19/2016
o-Xylene	ND	0.50		µg/L	1	7/19/2016
tert-Amyl methyl ether	ND	0.50		µg/L	1	7/19/2016
tert-Butyl alcohol	ND	0.50		µg/L	1	7/19/2016
Acrolein	ND	2.5		µg/L	1	7/19/2016
Acrylonitrile	ND	2.5		µg/L	1	7/19/2016
Bromochloromethane	ND	0.50		µg/L	1	7/19/2016
2-Chloroethyl vinyl ether	ND	0.50		µg/L	1	7/19/2016
Iodomethane	ND	0.50		µg/L	1	7/19/2016
trans-1,4-Dichloro-2-butene	ND	0.50		µg/L	1	7/19/2016
Vinyl acetate	ND	0.50		µg/L	1	7/19/2016
1,4-Dioxane	ND	20		µg/L	1	7/19/2016
Surr: 1,2-Dichlorobenzene-d4	99.6	70-130		%Rec	1	7/19/2016
Surr: 4-Bromofluorobenzene	94.0	70-130		%Rec	1	7/19/2016
Surr: Toluene-d8	100	70-130		%Rec	1	7/19/2016

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **PBW**	Batch ID: **R35519**	RunNo: **35519**							
Prep Date:	Analysis Date: **7/7/2016**	SeqNo: **1099779**	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								
Bromide	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								
Nitrate+Nitrite as N	ND	0.20								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **LCSW**	Batch ID: **R35519**	RunNo: **35519**							
Prep Date:	Analysis Date: **7/7/2016**	SeqNo: **1099780**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.50	0.10	0.5000	0	100	90	110			
Chloride	4.7	0.50	5.000	0	93.8	90	110			
Bromide	2.4	0.10	2.500	0	96.6	90	110			
Phosphorus, Orthophosphate (As P	4.8	0.50	5.000	0	96.3	90	110			
Nitrate+Nitrite as N	3.4	0.20	3.500	0	97.1	90	110			

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **PBW**	Batch ID: **A35552**	RunNo: **35552**							
Prep Date:	Analysis Date: **7/8/2016**	SeqNo: **1100904**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	ND	0.50								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **LCSW**	Batch ID: **A35552**	RunNo: **35552**							
Prep Date:	Analysis Date: **7/8/2016**	SeqNo: **1100905**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	9.7	0.50	10.00	0	96.9	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **MB-R36111**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R36111**	RunNo: **36111**
Prep Date:	Analysis Date: **7/19/2016**	SeqNo: **1118577** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Acetonitrile	ND	0.50								
Allyl chloride	ND	0.50								
Chloroprene	ND	0.50								
Ethyl methacrylate	ND	2.5								
Isobutanol	ND	10								
Methacrylonitrile	ND	2.5								
Methyl ethyl ketone	ND	2.5								
Methyl isobutyl ketone	ND	2.5								
Methyl methacrylate	ND	2.5								
Propionitrile	ND	2.5								
Benzene	ND	0.50								
Toluene	ND	0.50								
Ethylbenzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
1,2-Dibromoethane (EDB)	ND	0.50								
Acetone	ND	2.5								
Bromodichloromethane	ND	0.50								
Bromoform	ND	0.50								
Bromomethane	ND	0.50								
2-Butanone	ND	2.5								
Carbon disulfide	ND	0.50								
Carbon Tetrachloride	ND	0.50								
Chlorobenzene	ND	0.50								
Chloroethane	ND	0.50								
Chloroform	ND	0.50								
Chloromethane	ND	0.50								
cis-1,2-DCE	ND	0.50								
cis-1,3-Dichloropropene	ND	0.50								
1,2-Dibromo-3-chloropropane	ND	0.50								
Dibromochloromethane	ND	0.50								
Dibromomethane	ND	0.50								
1,2-Dichlorobenzene	ND	0.50								
1,4-Dichlorobenzene	ND	0.50								
Dichlorodifluoromethane	ND	0.50								
1,1-Dichloroethane	ND	0.50								
1,1-Dichloroethene	ND	0.50								
1,2-Dichloropropane	ND	0.50								
1,3-Dichloropropane	ND	0.50								
2,2-Dichloropropane	ND	0.50								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-R36111**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R36111**	RunNo: **36111**
Prep Date:	Analysis Date: **7/19/2016**	SeqNo: **1118577** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,1-Dichloropropene	ND	0.50								
2-Hexanone	ND	0.50								
Methylene Chloride	ND	2.5								
Styrene	ND	0.50								
1,1,1,2-Tetrachloroethane	ND	0.50								
1,1,2,2-Tetrachloroethane	ND	0.50								
Tetrachloroethene (PCE)	ND	0.50								
trans-1,2-DCE	ND	0.50								
trans-1,3-Dichloropropene	ND	0.50								
1,1,1-Trichloroethane	ND	0.50								
1,1,2-Trichloroethane	ND	0.50								
Trichloroethene (TCE)	ND	0.50								
Trichlorofluoromethane	ND	0.50								
1,2,3-Trichloropropane	ND	0.50								
Vinyl chloride	ND	0.50								
mp-Xylenes	ND	1.0								
o-Xylene	ND	0.50								
Acrolein	ND	2.5								
Acrylonitrile	ND	2.5								
Bromochloromethane	ND	0.50								
Iodomethane	ND	0.50								
trans-1,4-Dichloro-2-butene	ND	0.50								
Vinyl acetate	ND	0.50								

Sample ID **LCS-R36111**	SampType: **LCS**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **LCSW**	Batch ID: **R36111**	RunNo: **36111**
Prep Date:	Analysis Date: **7/19/2016**	SeqNo: **1118578** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	9.6	0	10.00	0	95.9	80	120			
Toluene	9.9	0	10.00	0	98.8	80	120			
Ethylbenzene	9.8	0	10.00	0	98.4	80	120			
Chlorobenzene	9.6	0	10.00	0	96.2	80	120			
1,1-Dichloroethene	9.8	0	10.00	0	98.3	80	120			
Tetrachloroethene (PCE)	9.2	0	10.00	0	92.5	80	120			
Trichloroethene (TCE)	9.5	0	10.00	0	95.2	80	120			
o-Xylene	11	0	10.00	0	107	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **MB-R36111**	SampType: **MBLK**	TestCode: **EPA 8270C: Semivolatiles/Mod**
Client ID: **PBW**	Batch ID: **R36111**	RunNo: **36111**
Prep Date:	Analysis Date: **7/15/2016**	SeqNo: **1118582** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Acetophenone	ND	5.0								
1-Methylnaphthalene	ND	5.0								
2,3,4,6-Tetrachlorophenol	ND	5.0								
2,4,5-Trichlorophenol	ND	5.0								
2,4,6-Trichlorophenol	ND	5.0								
2,4-Dichlorophenol	ND	5.0								
2,4-Dimethylphenol	ND	5.0								
2,4-Dinitrophenol	ND	5.0								
2,4-Dinitrotoluene	ND	5.0								
2,6-Dinitrotoluene	ND	5.0								
2-Chloronaphthalene	ND	5.0								
2-Chlorophenol	ND	5.0								
2-Methylnaphthalene	ND	5.0								
2-Methylphenol	ND	5.0								
2-Nitroaniline	ND	5.0								
2-Nitrophenol	ND	5.0								
3,3´-Dichlorobenzidine	ND	5.0								
3-Nitroaniline	ND	5.0								
4,6-Dinitro-2-methylphenol	ND	5.0								
4-Bromophenyl phenyl ether	ND	5.0								
4-Chloro-3-methylphenol	ND	5.0								
4-Chloroaniline	ND	5.0								
4-Chlorophenyl phenyl ether	ND	5.0								
4-Nitroaniline	ND	5.0								
4-Nitrophenol	ND	5.0								
Acenaphthene	ND	5.0								
Acenaphthylene	ND	5.0								
Anthracene	ND	5.0								
Benzo(g,h,i)perylene	ND	5.0								
Benz(a)anthracene	ND	0.10								
Benzo(a)pyrene	ND	0.10								
Benzo(b)fluoranthene	ND	0.10								
Benzo(k)fluoranthene	ND	0.10								
Bis(2-chloroethoxy)methane	ND	5.0								
Bis(2-chloroethyl)ether	ND	5.0								
Bis(2-chloroisopropyl)ether	ND	5.0								
Bis(2-ethylhexyl)phthalate	ND	5.0								
Butyl benzyl phthalate	ND	5.0								
Carbazole	ND	5.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **MB-R36111**	SampType: **MBLK**	TestCode: **EPA 8270C: Semivolatiles/Mod**
Client ID: **PBW**	Batch ID: **R36111**	RunNo: **36111**
Prep Date:	Analysis Date: **7/15/2016**	SeqNo: **1118582** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chrysene	ND	0.10								
Dibenz(a,h)anthracene	ND	0.10								
Dibenzofuran	ND	5.0								
Diethyl phthalate	ND	5.0								
Dimethyl phthalate	ND	5.0								
Di-n-butyl phthalate	ND	5.0								
Di-n-octyl phthalate	ND	5.0								
Fluoranthene	ND	5.0								
Fluorene	ND	5.0								
Hexachlorobenzene	ND	1.0								
Hexachlorobutadiene	ND	5.0								
Hexachlorocyclopentadiene	ND	5.0								
Hexachloroethane	ND	5.0								
Indeno(1,2,3-cd)pyrene	ND	0.10								
Isophorone	ND	5.0								
Naphthalene	ND	5.0								
Nitrobenzene	ND	5.0								
N-Nitrosodi-n-propylamine	ND	5.0								
N-Nitrosodiphenylamine	ND	2.0								
Pentachlorophenol	ND	5.0								
Phenanthrene	ND	1.0								
Phenol	ND	5.0								
Pyrene	ND	5.0								
o-Toluidine	ND	2.0								
Pyridine	ND	5.0								
1,2,4,5-Tetrachlorobenzene	ND	5.0								

Sample ID **LCS-R36111**	SampType: **LCS**	TestCode: **EPA 8270C: Semivolatiles/Mod**
Client ID: **LCSW**	Batch ID: **R36111**	RunNo: **36111**
Prep Date:	Analysis Date: **7/15/2016**	SeqNo: **1118583** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2,4-Dinitrotoluene	5.4	0	5.000	0	107	49	134			
2-Chlorophenol	3.2	0	5.000	0	64.6	50	131			
4-Chloro-3-methylphenol	3.5	0	5.000	0	69.4	42	139			
4-Nitrophenol	1.9	0	5.000	0	38.2	19	137			
Acenaphthene	4.9	0	5.000	0	97.4	36	122			
Bis(2-ethylhexyl)phthalate	6.2	0	5.000	0	124	43	142			
N-Nitrosodi-n-propylamine	4.2	0	5.000	0	84.4	46	140			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**LCS-R36111**	SampType:	**LCS**	TestCode:	**EPA 8270C: Semivolatiles/Mod**					
Client ID:	**LCSW**	Batch ID:	**R36111**	RunNo:	**36111**					
Prep Date:		Analysis Date:	**7/15/2016**	SeqNo:	**1118583**	Units:	**µg/L**			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Pentachlorophenol		3.4	0	5.000	0	68.6	22	138			
Phenol		3.8	0	5.000	0	75.8	45	134			
Pyrene		5.2	0	5.000	0	105	45	138			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **1607300-001a dup**	SampType: **dup**			TestCode: **SM2510B: Specific Conductance**					
Client ID: **WDW-1,2,&3 Effluen**	Batch ID: **R35550**			RunNo: **35550**					
Prep Date:	Analysis Date: **7/8/2016**			SeqNo: **1100752**	Units: **µmhos/cm**				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Conductivity	4700	1.0						0.603	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID	**MB-26407**	SampType: **MBLK**		TestCode: **EPA Method 7470: Mercury**					
Client ID:	**PBW**	Batch ID: **26407**		RunNo: **35726**					
Prep Date:	**7/14/2016**	Analysis Date: **7/15/2016**		SeqNo: **1105600**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID	**LCS-26407**	SampType: **LCS**		TestCode: **EPA Method 7470: Mercury**					
Client ID:	**LCSW**	Batch ID: **26407**		RunNo: **35726**					
Prep Date:	**7/14/2016**	Analysis Date: **7/15/2016**		SeqNo: **1105601**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0052	0.00020	0.005000	0	103	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-26510**	SampType:	**MBLK**	TestCode:	**MERCURY, TCLP**					
Client ID:	**PBW**	Batch ID:	**26510**	RunNo:	**35874**					
Prep Date:	**7/20/2016**	Analysis Date:	**7/21/2016**	SeqNo:	**1110461**	Units:	**mg/L**			

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

Sample ID	**LCS-26510**	SampType:	**LCS**	TestCode:	**MERCURY, TCLP**					
Client ID:	**LCSW**	Batch ID:	**26510**	RunNo:	**35874**					
Prep Date:	**7/20/2016**	Analysis Date:	**7/21/2016**	SeqNo:	**1110462**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.020	0.005000	0	104	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-26475**	SampType:	**MBLK**	TestCode:	**EPA Method 6010B: TCLP Metals**				
Client ID:	**PBW**	Batch ID:	**26475**	RunNo:	**35810**				
Prep Date:	**7/19/2016**	Analysis Date:	**7/20/2016**	SeqNo:	**1108224**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0								
Barium	ND	100								
Cadmium	ND	1.0								
Chromium	ND	5.0								
Lead	ND	5.0								
Selenium	ND	1.0								
Silver	ND	5.0								

Sample ID	**LCS-26475**	SampType:	**LCS**	TestCode:	**EPA Method 6010B: TCLP Metals**				
Client ID:	**LCSW**	Batch ID:	**26475**	RunNo:	**35810**				
Prep Date:	**7/19/2016**	Analysis Date:	**7/20/2016**	SeqNo:	**1108225**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0	0.5000	0	105	80	120			
Barium	ND	100	0.5000	0	95.4	80	120			
Cadmium	ND	1.0	0.5000	0	99.9	80	120			
Chromium	ND	5.0	0.5000	0	95.8	80	120			
Lead	ND	5.0	0.5000	0	93.5	80	120			
Selenium	ND	1.0	0.5000	0	107	80	120			
Silver	ND	5.0	0.1000	0	98.7	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-26511**	SampType: **MBLK**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **PBW**	Batch ID: **26511**	RunNo: **35864**
Prep Date: **7/20/2016**	Analysis Date: **7/21/2016**	SeqNo: **1110316** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020								
Antimony	ND	0.050								
Arsenic	ND	0.020								
Barium	ND	0.020								
Beryllium	ND	0.0030								
Cadmium	ND	0.0020								
Calcium	ND	1.0								
Chromium	ND	0.0060								
Cobalt	ND	0.0060								
Copper	ND	0.0060								
Iron	ND	0.050								
Lead	ND	0.0050								
Magnesium	ND	1.0								
Manganese	ND	0.0020								
Nickel	ND	0.010								
Potassium	ND	1.0								
Selenium	ND	0.050								
Silver	ND	0.0050								
Sodium	ND	1.0								
Strontium	ND	0.010								
Thallium	ND	0.050								
Zinc	ND	0.020								
Silica	ND	1.1								

Sample ID **LCS-26511**	SampType: **LCS**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW**	Batch ID: **26511**	RunNo: **35864**
Prep Date: **7/20/2016**	Analysis Date: **7/21/2016**	SeqNo: **1110317** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.53	0.020	0.5000	0	106	80	120			
Antimony	0.52	0.050	0.5000	0	103	80	120			
Arsenic	0.50	0.020	0.5000	0	100	80	120			
Barium	0.50	0.020	0.5000	0	99.6	80	120			
Beryllium	0.52	0.0030	0.5000	0	103	80	120			
Cadmium	0.49	0.0020	0.5000	0	97.5	80	120			
Calcium	50	1.0	50.00	0	99.2	80	120			
Chromium	0.49	0.0060	0.5000	0	98.1	80	120			
Cobalt	0.47	0.0060	0.5000	0	94.8	80	120			
Copper	0.51	0.0060	0.5000	0	102	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **LCS-26511**	SampType: **LCS**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **LCSW**	Batch ID: **26511**	RunNo: **35864**
Prep Date: **7/20/2016**	Analysis Date: **7/21/2016**	SeqNo: **1110317** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Iron	0.48	0.050	0.5000	0	96.1	80	120			
Lead	0.48	0.0050	0.5000	0	95.7	80	120			
Magnesium	50	1.0	50.00	0	99.2	80	120			
Manganese	0.49	0.0020	0.5000	0	98.2	80	120			
Nickel	0.48	0.010	0.5000	0	95.8	80	120			
Potassium	48	1.0	50.00	0	95.3	80	120			
Selenium	0.48	0.050	0.5000	0	97.0	80	120			
Silver	0.10	0.0050	0.1000	0	100	80	120			
Sodium	48	1.0	50.00	0	96.1	80	120			
Strontium	0.11	0.010	0.1000	0	112	80	120			
Thallium	0.49	0.050	0.5000	0	98.7	80	120			
Zinc	0.48	0.020	0.5000	0	96.4	80	120			
Silica	5.6	1.1	5.350	0	105	80	120			

Sample ID **1607300-001BMS**	SampType: **MS**	TestCode: **EPA 6010B: Total Recoverable Metals**
Client ID: **WDW-1,2,&3 Effluen**	Batch ID: **26511**	RunNo: **35864**
Prep Date: **7/20/2016**	Analysis Date: **7/21/2016**	SeqNo: **1110319** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.50	0.050	0.5000	0	101	75	125			
Arsenic	0.54	0.020	0.5000	0.03838	99.6	75	125			
Barium	0.49	0.020	0.5000	0.01824	95.1	75	125			
Beryllium	0.49	0.0030	0.5000	0.0001500	97.2	75	125			
Cadmium	0.48	0.0020	0.5000	0	95.7	75	125			
Chromium	0.47	0.0060	0.5000	0	94.2	75	125			
Cobalt	0.47	0.0060	0.5000	0.002470	92.9	75	125			
Copper	0.54	0.0060	0.5000	0.001890	107	75	125			
Iron	0.68	0.050	0.5000	0.2264	90.4	75	125			
Lead	0.46	0.0050	0.5000	0	92.8	75	125			
Magnesium	90	1.0	50.00	45.07	90.4	75	125			
Manganese	0.56	0.0020	0.5000	0.09587	93.0	75	125			
Nickel	0.46	0.010	0.5000	0.003580	91.1	75	125			
Selenium	0.48	0.050	0.5000	0	96.3	75	125			
Silver	0.097	0.0050	0.1000	0	96.9	75	125			
Zinc	0.50	0.020	0.5000	0.04167	90.8	75	125			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**1607300-001BMSD**	SampType:	**MSD**	TestCode:	**EPA 6010B: Total Recoverable Metals**
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**26511**	RunNo:	**35864**
Prep Date:	**7/20/2016**	Analysis Date:	**7/21/2016**	SeqNo:	**1110320** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Antimony	0.50	0.050	0.5000	0	100	75	125	0.483	20	
Arsenic	0.54	0.020	0.5000	0.03838	99.9	75	125	0.203	20	
Barium	0.49	0.020	0.5000	0.01824	95.0	75	125	0.111	20	
Beryllium	0.49	0.0030	0.5000	0.0001500	97.3	75	125	0.0781	20	
Cadmium	0.47	0.0020	0.5000	0	94.4	75	125	1.32	20	
Chromium	0.46	0.0060	0.5000	0	92.8	75	125	1.49	20	
Cobalt	0.46	0.0060	0.5000	0.002470	91.5	75	125	1.51	20	
Copper	0.54	0.0060	0.5000	0.001890	108	75	125	0.211	20	
Iron	0.71	0.050	0.5000	0.2264	96.0	75	125	4.06	20	
Lead	0.46	0.0050	0.5000	0	91.8	75	125	1.00	20	
Magnesium	91	1.0	50.00	45.07	92.8	75	125	1.31	20	
Manganese	0.56	0.0020	0.5000	0.09587	93.5	75	125	0.393	20	
Nickel	0.46	0.010	0.5000	0.003580	91.3	75	125	0.194	20	
Selenium	0.49	0.050	0.5000	0	97.8	75	125	1.56	20	
Silver	0.097	0.0050	0.1000	0	97.3	75	125	0.350	20	
Zinc	0.50	0.020	0.5000	0.04167	92.4	75	125	1.56	20	

Sample ID	**1607300-001BMS**	SampType:	**MS**	TestCode:	**EPA 6010B: Total Recoverable Metals**
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**26511**	RunNo:	**35864**
Prep Date:	**7/20/2016**	Analysis Date:	**7/21/2016**	SeqNo:	**1110322** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	1.4	0.10	0.5000	0.8700	99.2	75	125			
Potassium	110	5.0	50.00	68.56	86.8	75	125			
Thallium	0.58	0.25	0.5000	0	116	75	125			

Sample ID	**1607300-001BMSD**	SampType:	**MSD**	TestCode:	**EPA 6010B: Total Recoverable Metals**
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**26511**	RunNo:	**35864**
Prep Date:	**7/20/2016**	Analysis Date:	**7/21/2016**	SeqNo:	**1110323** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	1.4	0.10	0.5000	0.8700	96.3	75	125	1.09	20	
Potassium	110	5.0	50.00	68.56	82.1	75	125	2.13	20	
Thallium	0.57	0.25	0.5000	0	114	75	125	1.89	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID	**1607300-001a dup**	SampType:	**dup**	TestCode:	**SM4500-H+B: pH**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**R35550**	RunNo:	**35550**					
Prep Date:		Analysis Date:	**7/8/2016**	SeqNo:	**1100761**	Units:	**pH units**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
pH	7.62	1.68								H

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-R36111**	SampType:	**MBLK**	TestCode:	**CYANIDE, Reactive**					
Client ID:	**PBW**	Batch ID:	**R36111**	RunNo:	**36111**					
Prep Date:		Analysis Date:	**7/19/2016**	SeqNo:	**1118586**	Units:	**mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	ND	1.00								

Sample ID	**LCS-R36111**	SampType:	**LCS**	TestCode:	**CYANIDE, Reactive**					
Client ID:	**LCSW**	Batch ID:	**R36111**	RunNo:	**36111**					
Prep Date:		Analysis Date:	**7/19/2016**	SeqNo:	**1118587**	Units:	**mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	0.551		0.5000	0	110	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **MB-R36111**	SampType: **MBLK**	TestCode: **SULFIDE, Reactive**							
Client ID: **PBW**	Batch ID: **R36111**	RunNo: **36111**							
Prep Date:	Analysis Date: **7/14/2016**	SeqNo: **1118597**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	ND	1.0								

Sample ID **LCS-R36111**	SampType: **LCS**	TestCode: **SULFIDE, Reactive**							
Client ID: **LCSW**	Batch ID: **R36111**	RunNo: **36111**							
Prep Date:	Analysis Date: **7/14/2016**	SeqNo: **1118598**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	0.18		0.2000	0	90.0	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **mb-1**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R35550**	RunNo: **35550**							
Prep Date:	Analysis Date: **7/8/2016**	SeqNo: **1100788**	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**	SampType: **lcs**	TestCode: **SM2320B: Alkalinity**							
Client ID: **LCSW**	Batch ID: **R35550**	RunNo: **35550**							
Prep Date:	Analysis Date: **7/8/2016**	SeqNo: **1100789**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	77.36	20.00	80.00	0	96.7	90	110			

Sample ID **mb-2**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R35550**	RunNo: **35550**							
Prep Date:	Analysis Date: **7/8/2016**	SeqNo: **1100812**	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**	SampType: **lcs**	TestCode: **SM2320B: Alkalinity**							
Client ID: **LCSW**	Batch ID: **R35550**	RunNo: **35550**							
Prep Date:	Analysis Date: **7/8/2016**	SeqNo: **1100813**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	78.56	20.00	80.00	0	98.2	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**
01-Aug-16

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

Sample ID **1607300-001ADUP**	SampType: **DUP**			TestCode: **Specific Gravity**						
Client ID: **WDW-1,2,&3 Effluen**	Batch ID: **R35525**			RunNo: **35525**						
Prep Date:	Analysis Date: **7/8/2016**			SeqNo: **1100039**	Units:					
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	0.9991	0						0.489	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1607300**

01-Aug-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-26273**	SampType:	**MBLK**	TestCode:	**SM2540C MOD: Total Dissolved Solids**					
Client ID:	**PBW**	Batch ID:	**26273**	RunNo:	**35537**					
Prep Date:	**7/7/2016**	Analysis Date:	**7/8/2016**	SeqNo:	**1100261**	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-26273**	SampType:	**LCS**	TestCode:	**SM2540C MOD: Total Dissolved Solids**					
Client ID:	**LCSW**	Batch ID:	**26273**	RunNo:	**35537**					
Prep Date:	**7/7/2016**	Analysis Date:	**7/8/2016**	SeqNo:	**1100262**	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	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

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

Sample Log-In Check List

Client Name: NAVAJO REFINING CO Work Order Number: 1607300 RcptNo: 1

Received by/date: AS 07/07/16

Logged By: Lindsay Mangin 7/7/2016 10:15:00 AM

Completed By: Lindsay Mangin 7/7/2016 12:11:31 PM

Reviewed By: 07/07/16

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: 2
(<2 or >12 unless noted)
Adjusted? No
Checked by: AJ

Special Handling (if applicable)

16. 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: ____

17. Additional remarks:

18. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.0	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia, NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:
☐ Standard ☐ Level 4 (Full Validation)
☐ Other
☐ EDD (Type)

Turn-Around Time: X Standard ☐ Rush

Project Name: Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 167796

Project Manager: Micki Schultz / Scott Denton / Mike Holder

Sampler: Brady Hubbard

On Ice: ☑ Yes ☐ No

Sample Temperature: 1.0°C

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

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

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1607300	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
7/5/16	8:30	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X
7/5/16	8:30	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3	-001					X	X	
7/5/16	8:30	Liquid	WDW-1, 2, & 3 Effluent	3	HCL	-001		X					
7/5/16	8:30	Liquid	WDW-1, 2, & 3 Effluent	2	Neat	-001			X				
7/5/16	8:30	Liquid	WDW-1, 2, & 3 Effluent	2	Neat	-001				X			
7/5/16	8:30	Liquid	Trip Blank	2	Neat	-002		X					
7/5/16	8:30	Liquid	Temperature Blank	1	Neat								

Date:	Time:	Relinquished by:	Received by:	Date	Time
7-6-16	10:30	Brady Hubbard		7-7-16	1015
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: Send results to Scott Denton, Mike Holder, Robert Combs and Andrew Contreras.

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

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

November 16, 2016

Scott Denton

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

RE: Quarterly WDW-1, 2, &3 Inj Well OrderNo.: 1610612

Dear Scott Denton:

Hall Environmental Analysis Laboratory received 2 sample(s) on 10/13/2016 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 qualifers 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 #NM0190

Sincerely,

Andy Freeman

Laboratory Manager

4901 Hawkins NE
Albuquerque, NM 87109

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Case Narrative

WO#: **1610612**
Date: **11/16/2016**

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

Analytical Comments for WDW-1,2, & 3 Effluent:
The above referenced water sample was analyzed by EPA 8260C and the corresponding analytical report is attached in the following pages. The analyst also performed an NIST library review of the sample and the tentatively identified compounds (TIC's) are listed with estimated concentrations; 3-chloro-2-methyl-1-propene (~1 ppb), dibromofluoromethane (~9 ppb) and dimethyl disulfide (~1 ppb).
The above referenced water sample was also analyzed by EPA 8270D and the corresponding analytical report is attached in the following pages.

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
IGNITABILITY METHOD 1010						Analyst: **SUB**	
Ignitability	>200	0		°F	1	10/18/2016	R38745
SULFIDE, REACTIVE						Analyst: **SUB**	
Reactive Sulfide	ND	0.40		mg/L	1	10/18/2016	R38745
SPECIFIC GRAVITY						Analyst: **LGT**	
Specific Gravity	0.9997	0			1	10/27/2016 10:52:00 AM	R38258
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Fluoride	35	2.0	*	mg/L	20	10/14/2016 12:19:11 AM	R37942
Chloride	360	25		mg/L	50	10/25/2016 9:50:38 PM	R38187
Bromide	0.72	0.10		mg/L	1	10/14/2016 12:06:47 AM	R37942
Phosphorus, Orthophosphate (As P)	ND	10	H	mg/L	20	10/14/2016 12:19:11 AM	R37942
Sulfate	1500	25		mg/L	50	10/25/2016 9:50:38 PM	R38187
Nitrate+Nitrite as N	ND	1.0		mg/L	5	10/14/2016 1:21:13 AM	R37942
SM2510B: SPECIFIC CONDUCTANCE						Analyst: **JRR**	
Conductivity	4900	1.0		µmhos/cm	1	10/18/2016 4:54:00 PM	R38048
SM2320B: ALKALINITY						Analyst: **JRR**	
Bicarbonate (As CaCO3)	288.8	20.00		mg/L CaCO3	1	10/18/2016 4:54:00 PM	R38048
Carbonate (As CaCO3)	ND	2.000		mg/L CaCO3	1	10/18/2016 4:54:00 PM	R38048
Total Alkalinity (as CaCO3)	288.8	20.00		mg/L CaCO3	1	10/18/2016 4:54:00 PM	R38048
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**	
Total Dissolved Solids	3210	20.0	*	mg/L	1	10/18/2016 6:58:00 PM	28098
CORROSIVITY						Analyst: **SUB**	
pH	8.23			pH Units	1	10/17/2016	R38745
CYANIDE, REACTIVE						Analyst: **SUB**	
Cyanide, Reactive	0.0250	0.0100		mg/L	1	10/25/2016	R38745
SM4500-H+B: PH						Analyst: **JRR**	
pH	8.10	1.68	H	pH units	1	10/18/2016 4:54:00 PM	R38048
EPA METHOD 7470: MERCURY						Analyst: **DBD**	
Mercury	ND	0.00020		mg/L	1	10/18/2016 5:17:17 PM	28113
MERCURY, TCLP						Analyst: **DBD**	
Mercury	ND	0.020		mg/L	1	10/19/2016 5:06:28 PM	28165
EPA METHOD 6010B: TCLP METALS						Analyst: **MED**	
Arsenic	ND	5.0		mg/L	1	10/24/2016 8:45:55 AM	28191
Barium	ND	100		mg/L	1	10/24/2016 8:45:55 AM	28191

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 6010B: TCLP METALS						Analyst: **MED**	
Cadmium	ND	1.0		mg/L	1	10/24/2016 8:45:55 AM	28191
Chromium	ND	5.0		mg/L	1	10/24/2016 8:45:55 AM	28191
Lead	ND	5.0		mg/L	1	10/24/2016 8:45:55 AM	28191
Selenium	ND	1.0		mg/L	1	10/24/2016 8:45:55 AM	28191
Silver	ND	5.0		mg/L	1	10/24/2016 8:45:55 AM	28191
EPA 6010B: METALS						Analyst: **MED**	
Aluminum	0.31	0.020		mg/L	1	10/31/2016 10:15:38 AM	28190
Antimony	ND	0.050		mg/L	1	10/31/2016 10:15:38 AM	28190
Arsenic	0.040	0.020		mg/L	1	10/31/2016 10:15:38 AM	28190
Barium	ND	0.020		mg/L	1	10/31/2016 10:15:38 AM	28190
Beryllium	ND	0.0030		mg/L	1	10/31/2016 10:15:38 AM	28190
Cadmium	ND	0.0020		mg/L	1	10/31/2016 10:15:38 AM	28190
Calcium	96	5.0		mg/L	5	11/7/2016 12:08:14 PM	28190
Chromium	ND	0.0060		mg/L	1	10/31/2016 10:15:38 AM	28190
Cobalt	ND	0.0060		mg/L	1	10/31/2016 10:15:38 AM	28190
Copper	0.017	0.0060		mg/L	1	10/31/2016 10:15:38 AM	28190
Iron	0.14	0.050		mg/L	1	10/31/2016 10:15:38 AM	28190
Lead	ND	0.0050		mg/L	1	10/31/2016 10:15:38 AM	28190
Magnesium	36	1.0		mg/L	1	11/7/2016 12:04:39 PM	28190
Manganese	0.052	0.0020		mg/L	1	10/31/2016 10:15:38 AM	28190
Nickel	ND	0.010		mg/L	1	10/31/2016 10:15:38 AM	28190
Potassium	120	5.0		mg/L	5	10/31/2016 10:22:16 AM	28190
Selenium	ND	0.050		mg/L	1	10/31/2016 10:15:38 AM	28190
Silver	ND	0.0050		mg/L	1	10/31/2016 10:15:38 AM	28190
Sodium	800	10		mg/L	10	11/7/2016 12:15:14 PM	28190
Thallium	ND	0.050		mg/L	1	10/31/2016 10:15:38 AM	28190
Vanadium	ND	0.050		mg/L	1	10/31/2016 10:15:38 AM	28190
Zinc	0.027	0.020		mg/L	1	10/31/2016 10:15:38 AM	28190
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
2-isopropyltoluene	ND	0.50		µg/L	1	10/20/2016	R38745
Acetonitrile	58	5.0		µg/L	1	10/20/2016	R38745
Allyl chloride	ND	0.50		µg/L	1	10/20/2016	R38745
Chloroprene	ND	0.50		µg/L	1	10/20/2016	R38745
Cyclohexane	ND	0.50		µg/L	1	10/20/2016	R38745
Diethyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
Epichlorohydrin	ND	100		µg/L	1	10/20/2016	R38745
Ethyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Ethyl methacrylate	ND	2.5		µg/L	1	10/20/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Ethyl tert-butyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
Freon-113	ND	0.50		µg/L	1	10/20/2016	R38745
Isobutanol	ND	100		µg/L	1	10/20/2016	R38745
Isopropyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Methacrylonitrile	ND	2.5		µg/L	1	10/20/2016	R38745
Methyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Methyl ethyl ketone	ND	2.5		µg/L	1	10/20/2016	R38745
Methyl isobutyl ketone	ND	2.5		µg/L	1	10/20/2016	R38745
Methyl methacrylate	ND	2.5		µg/L	1	10/20/2016	R38745
Methylcyclohexane	ND	1.0		µg/L	1	10/20/2016	R38745
n-Amyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
n-Hexane	ND	0.50		µg/L	1	10/20/2016	R38745
Nitrobenzene	ND	5.0		µg/L	1	10/20/2016	R38745
Pentachloroethane	ND	5.0		µg/L	1	10/20/2016	R38745
p-isopropyltoluene	ND	0.50		µg/L	1	10/20/2016	R38745
Propionitrile	ND	2.5		µg/L	1	10/20/2016	R38745
Tetrahydrofuran	ND	0.50		µg/L	1	10/20/2016	R38745
Benzene	ND	0.50		µg/L	1	10/20/2016	R38745
Toluene	ND	0.50		µg/L	1	10/20/2016	R38745
Ethylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	1	10/20/2016	R38745
1,2,4-Trimethylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,3,5-Trimethylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dichloroethane (EDC)	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dibromoethane (EDB)	ND	0.50		µg/L	1	10/20/2016	R38745
Naphthalene	ND	0.50		µg/L	1	10/20/2016	R38745
Acetone	4.2	2.5		µg/L	1	10/20/2016	R38745
Bromobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Bromodichloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
Bromoform	ND	0.50		µg/L	1	10/20/2016	R38745
Bromomethane	ND	0.50		µg/L	1	10/20/2016	R38745
2-Butanone	ND	2.5		µg/L	1	10/20/2016	R38745
Carbon disulfide	0.96	0.50		µg/L	1	10/20/2016	R38745
Carbon Tetrachloride	ND	0.50		µg/L	1	10/20/2016	R38745
Chlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Chloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
Chloroform	ND	0.50		µg/L	1	10/20/2016	R38745
Chloromethane	1.1	0.50		µg/L	1	10/20/2016	R38745
2-Chlorotoluene	ND	0.50		µg/L	1	10/20/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
4-Chlorotoluene	ND	0.50		µg/L	1	10/20/2016	R38745
cis-1,2-DCE	ND	0.50		µg/L	1	10/20/2016	R38745
cis-1,3-Dichloropropene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dibromo-3-chloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
Dibromochloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
Dibromomethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,3-Dichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,4-Dichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Dichlorodifluoromethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1-Dichloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1-Dichloroethene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
1,3-Dichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
2,2-Dichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1-Dichloropropene	ND	0.50		µg/L	1	10/20/2016	R38745
Hexachlorobutadiene	ND	0.50		µg/L	1	10/20/2016	R38745
2-Hexanone	ND	0.50		µg/L	1	10/20/2016	R38745
Isopropylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Methylene Chloride	ND	2.5		µg/L	1	10/20/2016	R38745
n-Butylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
n-Propylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
sec-Butylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Styrene	ND	0.50		µg/L	1	10/20/2016	R38745
tert-Butylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
Tetrachloroethene (PCE)	ND	0.50		µg/L	1	10/20/2016	R38745
trans-1,2-DCE	ND	0.50		µg/L	1	10/20/2016	R38745
trans-1,3-Dichloropropene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2,3-Trichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,1-Trichloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,2-Trichloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
Trichloroethene (TCE)	ND	0.50		µg/L	1	10/20/2016	R38745
Trichlorofluoromethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,2,3-Trichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
Vinyl chloride	ND	0.50		µg/L	1	10/20/2016	R38745
mp-Xylenes	ND	1.0		µg/L	1	10/20/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
o-Xylene	ND	0.50		µg/L	1	10/20/2016	R38745
tert-Amyl methyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
tert-Butyl alcohol	ND	0.50		µg/L	1	10/20/2016	R38745
Acrolein	ND	2.5		µg/L	1	10/20/2016	R38745
Acrylonitrile	ND	2.5		µg/L	1	10/20/2016	R38745
Bromochloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
2-Chloroethyl vinyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
Iodomethane	ND	0.50		µg/L	1	10/20/2016	R38745
trans-1,4-Dichloro-2-butene	ND	0.50		µg/L	1	10/20/2016	R38745
Vinyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Surr: 1,2-Dichlorobenzene-d4	105	0-0	S	%Rec	1	10/20/2016	R38745
Surr: 4-Bromofluorobenzene	96.8	70-130		%Rec	1	10/20/2016	R38745
Surr: Toluene-d8	100	70-130		%Rec	1	10/20/2016	R38745
EPA 8270C: SEMIVOLATILES/MOD						Analyst: **SUB**	
1,1-Biphenyl	ND	1.0		µg/L	1	10/29/2016	R38745
Atrazine	ND	1.0		µg/L	1	10/29/2016	R38745
Benzaldehyde	2.5	1.0		µg/L	1	10/29/2016	R38745
Caprolactam	ND	1.0		µg/L	1	10/29/2016	R38745
N-Nitroso-di-n-butylamine	ND	1.0		µg/L	1	10/29/2016	R38745
Acetophenone	ND	5.0		µg/L	1	10/29/2016	R38745
1-Methylnaphthalene	ND	5.0		µg/L	1	10/29/2016	R38745
2,3,4,6-Tetrachlorophenol	ND	5.0		µg/L	1	10/29/2016	R38745
2,4,5-Trichlorophenol	ND	5.0		µg/L	1	10/29/2016	R38745
2,4,6-Trichlorophenol	ND	5.0		µg/L	1	10/29/2016	R38745
2,4-Dichlorophenol	ND	5.0		µg/L	1	10/29/2016	R38745
2,4-Dimethylphenol	ND	5.0		µg/L	1	10/29/2016	R38745
2,4-Dinitrophenol	ND	5.0		µg/L	1	10/29/2016	R38745
2,4-Dinitrotoluene	ND	5.0		µg/L	1	10/29/2016	R38745
2,6-Dinitrotoluene	ND	5.0		µg/L	1	10/29/2016	R38745
2-Chloronaphthalene	ND	5.0		µg/L	1	10/29/2016	R38745
2-Chlorophenol	ND	5.0		µg/L	1	10/29/2016	R38745
2-Methylnaphthalene	ND	5.0		µg/L	1	10/29/2016	R38745
2-Methylphenol	ND	5.0		µg/L	1	10/29/2016	R38745
2-Nitroaniline	ND	5.0		µg/L	1	10/29/2016	R38745
2-Nitrophenol	ND	5.0		µg/L	1	10/29/2016	R38745
3,3´-Dichlorobenzidine	ND	5.0		µg/L	1	10/29/2016	R38745
3-Nitroaniline	ND	5.0		µg/L	1	10/29/2016	R38745
4,6-Dinitro-2-methylphenol	ND	5.0		µg/L	1	10/29/2016	R38745
4-Bromophenyl phenyl ether	ND	5.0		µg/L	1	10/29/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 8270C: SEMIVOLATILES/MOD						Analyst: **SUB**	
4-Chloro-3-methylphenol	ND	5.0		µg/L	1	10/29/2016	R38745
4-Chloroaniline	ND	5.0		µg/L	1	10/29/2016	R38745
4-Chlorophenyl phenyl ether	ND	5.0		µg/L	1	10/29/2016	R38745
4-Nitroaniline	ND	5.0		µg/L	1	10/29/2016	R38745
4-Nitrophenol	ND	5.0		µg/L	1	10/29/2016	R38745
Acenaphthene	ND	5.0		µg/L	1	10/29/2016	R38745
Acenaphthylene	ND	5.0		µg/L	1	10/29/2016	R38745
Anthracene	ND	5.0		µg/L	1	10/29/2016	R38745
Benzo(g,h,i)perylene	ND	5.0		µg/L	1	10/29/2016	R38745
Benz(a)anthracene	ND	0.10		µg/L	1	10/29/2016	R38745
Benzo(a)pyrene	ND	0.10		µg/L	1	10/29/2016	R38745
Benzo(b)fluoranthene	ND	0.10		µg/L	1	10/29/2016	R38745
Benzo(k)fluoranthene	ND	0.10		µg/L	1	10/29/2016	R38745
Bis(2-chloroethoxy)methane	ND	5.0		µg/L	1	10/29/2016	R38745
Bis(2-chloroethyl)ether	ND	5.0		µg/L	1	10/29/2016	R38745
Bis(2-chloroisopropyl)ether	ND	5.0		µg/L	1	10/29/2016	R38745
Bis(2-ethylhexyl)phthalate	ND	5.0		µg/L	1	10/29/2016	R38745
Butyl benzyl phthalate	ND	5.0		µg/L	1	10/29/2016	R38745
Carbazole	ND	5.0		µg/L	1	10/29/2016	R38745
Chrysene	ND	0.10		µg/L	1	10/29/2016	R38745
Dibenz(a,h)anthracene	ND	0.10		µg/L	1	10/29/2016	R38745
Dibenzofuran	ND	5.0		µg/L	1	10/29/2016	R38745
Diethyl phthalate	ND	5.0		µg/L	1	10/29/2016	R38745
Dimethyl phthalate	ND	5.0		µg/L	1	10/29/2016	R38745
Di-n-butyl phthalate	ND	5.0		µg/L	1	10/29/2016	R38745
Di-n-octyl phthalate	ND	5.0		µg/L	1	10/29/2016	R38745
Fluoranthene	ND	5.0		µg/L	1	10/29/2016	R38745
Fluorene	ND	5.0		µg/L	1	10/29/2016	R38745
Hexachlorobenzene	ND	1.0		µg/L	1	10/29/2016	R38745
Hexachlorobutadiene	ND	5.0		µg/L	1	10/29/2016	R38745
Hexachlorocyclopentadiene	ND	5.0		µg/L	1	10/29/2016	R38745
Hexachloroethane	ND	5.0		µg/L	1	10/29/2016	R38745
Indeno(1,2,3-cd)pyrene	ND	0.10		µg/L	1	10/29/2016	R38745
Isophorone	ND	5.0		µg/L	1	10/29/2016	R38745
Naphthalene	ND	5.0		µg/L	1	10/29/2016	R38745
Nitrobenzene	ND	5.0		µg/L	1	10/29/2016	R38745
N-Nitrosodi-n-propylamine	ND	5.0		µg/L	1	10/29/2016	R38745
N-Nitrosodiphenylamine	ND	2.0		µg/L	1	10/29/2016	R38745
Pentachlorophenol	ND	5.0		µg/L	1	10/29/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: WDW-1,2,&3 Effluent
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date: 10/11/2016 9:00:00 AM
Lab ID: 1610612-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 8270C: SEMIVOLATILES/MOD						Analyst: **SUB**	
Phenanthrene	ND	5.0		µg/L	1	10/29/2016	R38745
Phenol	ND	5.0		µg/L	1	10/29/2016	R38745
Pyrene	ND	5.0		µg/L	1	10/29/2016	R38745
o-Toluidine	ND	2.0		µg/L	1	10/29/2016	R38745
Pyridine	ND	5.0		µg/L	1	10/29/2016	R38745
1,2,4,5-Tetrachlorobenzene	ND	5.0		µg/L	1	10/29/2016	R38745
Surr: 2,4,6-Tribromophenol	103	63-110		%Rec	1	10/29/2016	R38745
Surr: 2-Fluorobiphenyl	92.4	58-112		%Rec	1	10/29/2016	R38745
Surr: 2-Fluorophenol	87.2	47-109		%Rec	1	10/29/2016	R38745
Surr: Nitrobenzene-d5	83.6	58-110		%Rec	1	10/29/2016	R38745
Surr: Phenol-d5	85.4	52-105		%Rec	1	10/29/2016	R38745
Surr: Terphenyl-d14	46.0	22-133		%Rec	1	10/29/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date:
Lab ID: 1610612-002
Matrix: TRIP BLANK
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
Acetonitrile	ND	5.0		µg/L	1	10/20/2016	R38745
Allyl chloride	ND	0.50		µg/L	1	10/20/2016	R38745
Chloroprene	ND	0.50		µg/L	1	10/20/2016	R38745
Cyclohexane	ND	0.50		µg/L	1	10/20/2016	R38745
Diethyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
Epichlorohydrin	ND	100		µg/L	1	10/20/2016	R38745
Ethyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Ethyl methacrylate	ND	2.5		µg/L	1	10/20/2016	R38745
Ethyl tert-butyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
Freon-113	ND	0.50		µg/L	1	10/20/2016	R38745
Isobutanol	ND	100		µg/L	1	10/20/2016	R38745
Isopropyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Methacrylonitrile	ND	2.5		µg/L	1	10/20/2016	R38745
Methyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Methyl ethyl ketone	ND	2.5		µg/L	1	10/20/2016	R38745
Methyl isobutyl ketone	ND	2.5		µg/L	1	10/20/2016	R38745
Methyl methacrylate	ND	2.5		µg/L	1	10/20/2016	R38745
Methylcyclohexane	ND	1.0		µg/L	1	10/20/2016	R38745
n-Amyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
n-Hexane	ND	0.50		µg/L	1	10/20/2016	R38745
Nitrobenzene	ND	5.0		µg/L	1	10/20/2016	R38745
Pentachloroethane	ND	5.0		µg/L	1	10/20/2016	R38745
p-isopropyltoluene	ND	0.50		µg/L	1	10/20/2016	R38745
Propionitrile	ND	2.5		µg/L	1	10/20/2016	R38745
Tetrahydrofuran	ND	0.50		µg/L	1	10/20/2016	R38745
Benzene	ND	0.50		µg/L	1	10/20/2016	R38745
Toluene	ND	0.50		µg/L	1	10/20/2016	R38745
Ethylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Methyl tert-butyl ether (MTBE)	ND	10		µg/L	1	10/20/2016	R38745
1,2,4-Trimethylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,3,5-Trimethylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dichloroethane (EDC)	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dibromoethane (EDB)	ND	0.50		µg/L	1	10/20/2016	R38745
Naphthalene	ND	0.50		µg/L	1	10/20/2016	R38745
Acetone	ND	2.5		µg/L	1	10/20/2016	R38745
Bromobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Bromodichloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
Bromoform	ND	0.50		µg/L	1	10/20/2016	R38745
Bromomethane	ND	0.50		µg/L	1	10/20/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date:
Lab ID: 1610612-002
Matrix: TRIP BLANK
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
2-Butanone	ND	2.5		µg/L	1	10/20/2016	R38745
Carbon disulfide	ND	0.50		µg/L	1	10/20/2016	R38745
Carbon Tetrachloride	ND	0.50		µg/L	1	10/20/2016	R38745
Chlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Chloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
Chloroform	ND	0.50		µg/L	1	10/20/2016	R38745
Chloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
2-Chlorotoluene	ND	0.50		µg/L	1	10/20/2016	R38745
4-Chlorotoluene	ND	0.50		µg/L	1	10/20/2016	R38745
cis-1,2-DCE	ND	0.50		µg/L	1	10/20/2016	R38745
cis-1,3-Dichloropropene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dibromo-3-chloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
Dibromochloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
Dibromomethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,3-Dichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,4-Dichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Dichlorodifluoromethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1-Dichloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1-Dichloroethene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2-Dichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
1,3-Dichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
2,2-Dichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1-Dichloropropene	ND	0.50		µg/L	1	10/20/2016	R38745
Hexachlorobutadiene	ND	0.50		µg/L	1	10/20/2016	R38745
2-Hexanone	ND	0.50		µg/L	1	10/20/2016	R38745
Isopropylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Methylene Chloride	ND	2.5		µg/L	1	10/20/2016	R38745
n-Butylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
n-Propylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
sec-Butylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
Styrene	ND	0.50		µg/L	1	10/20/2016	R38745
tert-Butylbenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,1,2-Tetrachloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,2,2-Tetrachloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
Tetrachloroethene (PCE)	ND	0.50		µg/L	1	10/20/2016	R38745
trans-1,2-DCE	ND	0.50		µg/L	1	10/20/2016	R38745
trans-1,3-Dichloropropene	ND	0.50		µg/L	1	10/20/2016	R38745
1,2,3-Trichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: TRIP BLANK
Project: Quarterly WDW-1, 2, &3 Inj Well
Collection Date:
Lab ID: 1610612-002
Matrix: TRIP BLANK
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **SUB**	
1,2,4-Trichlorobenzene	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,1-Trichloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,1,2-Trichloroethane	ND	0.50		µg/L	1	10/20/2016	R38745
Trichloroethene (TCE)	ND	0.50		µg/L	1	10/20/2016	R38745
Trichlorofluoromethane	ND	0.50		µg/L	1	10/20/2016	R38745
1,2,3-Trichloropropane	ND	0.50		µg/L	1	10/20/2016	R38745
Vinyl chloride	ND	0.50		µg/L	1	10/20/2016	R38745
mp-Xylenes	ND	1.0		µg/L	1	10/20/2016	R38745
o-Xylene	ND	0.50		µg/L	1	10/20/2016	R38745
tert-Amyl methyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
tert-Butyl alcohol	ND	0.50		µg/L	1	10/20/2016	R38745
Acrolein	ND	2.5		µg/L	1	10/20/2016	R38745
Acrylonitrile	ND	2.5		µg/L	1	10/20/2016	R38745
Bromochloromethane	ND	0.50		µg/L	1	10/20/2016	R38745
2-Chloroethyl vinyl ether	ND	0.50		µg/L	1	10/20/2016	R38745
Iodomethane	ND	0.50		µg/L	1	10/20/2016	R38745
trans-1,4-Dichloro-2-butene	ND	0.50		µg/L	1	10/20/2016	R38745
Vinyl acetate	ND	0.50		µg/L	1	10/20/2016	R38745
Surr: 1,2-Dichlorobenzene-d4	102	0-0	S	%Rec	1	10/20/2016	R38745
Surr: 4-Bromofluorobenzene	96.4	70-130		%Rec	1	10/20/2016	R38745
Surr: Toluene-d8	98.0	70-130		%Rec	1	10/20/2016	R38745

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **PBW**	Batch ID: **R37942**	RunNo: **37942**							
Prep Date:	Analysis Date: **10/13/2016**	SeqNo: **1182401**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	ND	0.10								
Bromide	ND	0.10								
Phosphorus, Orthophosphate (As P	ND	0.50								
Nitrate+Nitrite as N	ND	0.20								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **LCSW**	Batch ID: **R37942**	RunNo: **37942**							
Prep Date:	Analysis Date: **10/13/2016**	SeqNo: **1182402**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.54	0.10	0.5000	0	107	90	110			
Bromide	2.6	0.10	2.500	0	103	90	110			
Phosphorus, Orthophosphate (As P	4.7	0.50	5.000	0	93.6	90	110			
Nitrate+Nitrite as N	3.4	0.20	3.500	0	97.3	90	110			

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**							
Client ID: **PBW**	Batch ID: **R38187**	RunNo: **38187**							
Prep Date:	Analysis Date: **10/25/2016**	SeqNo: **1193019**	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: **R38187**	RunNo: **38187**							
Prep Date:	Analysis Date: **10/25/2016**	SeqNo: **1193020**	Units: **mg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chloride	4.8	0.50	5.000	0	96.7	90	110			
Sulfate	9.9	0.50	10.00	0	99.1	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**
16-Nov-16

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

Sample ID **MB-R38745**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R38745**	RunNo: **38745**
Prep Date:	Analysis Date: **10/20/2016**	SeqNo: **1210379** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Acetonitrile	ND	0.50								
Allyl chloride	ND	0.50								
Chloroprene	ND	0.50								
Ethyl methacrylate	ND	2.5								
Isobutanol	ND	10								
Methacrylonitrile	ND	2.5								
Methyl ethyl ketone	ND	2.5								
Methyl isobutyl ketone	ND	2.5								
Methyl methacrylate	ND	2.5								
Propionitrile	ND	2.5								
Benzene	ND	0.50								
Toluene	ND	0.50								
Ethylbenzene	ND	0.50								
1,2-Dichloroethane (EDC)	ND	0.50								
1,2-Dibromoethane (EDB)	ND	0.50								
Acetone	ND	2.5								
Bromodichloromethane	ND	0.50								
Bromoform	ND	0.50								
Bromomethane	ND	0.50								
2-Butanone	ND	2.5								
Carbon disulfide	ND	0.50								
Carbon Tetrachloride	ND	0.50								
Chlorobenzene	ND	0.50								
Chloroethane	ND	0.50								
Chloroform	ND	0.50								
Chloromethane	ND	0.50								
cis-1,2-DCE	ND	0.50								
cis-1,3-Dichloropropene	ND	0.50								
1,2-Dibromo-3-chloropropane	ND	0.50								
Dibromochloromethane	ND	0.50								
Dibromomethane	ND	0.50								
1,2-Dichlorobenzene	ND	0.50								
1,4-Dichlorobenzene	ND	0.50								
Dichlorodifluoromethane	ND	0.50								
1,1-Dichloroethane	ND	0.50								
1,1-Dichloroethene	ND	0.50								
1,2-Dichloropropane	ND	0.50								
1,3-Dichloropropane	ND	0.50								
2,2-Dichloropropane	ND	0.50								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-R38745**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R38745**	RunNo: **38745**
Prep Date:	Analysis Date: **10/20/2016**	SeqNo: **1210379** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,1-Dichloropropene	ND	0.50								
2-Hexanone	ND	0.50								
Methylene Chloride	ND	2.5								
Styrene	ND	0.50								
1,1,1,2-Tetrachloroethane	ND	0.50								
1,1,2,2-Tetrachloroethane	ND	0.50								
Tetrachloroethene (PCE)	ND	0.50								
trans-1,2-DCE	ND	0.50								
trans-1,3-Dichloropropene	ND	0.50								
1,1,1-Trichloroethane	ND	0.50								
1,1,2-Trichloroethane	ND	0.50								
Trichloroethene (TCE)	ND	0.50								
Trichlorofluoromethane	ND	0.50								
1,2,3-Trichloropropane	ND	0.50								
Vinyl chloride	ND	0.50								
mp-Xylenes	ND	1.0								
o-Xylene	ND	0.50								
Acrolein	ND	2.5								
Acrylonitrile	ND	2.5								
Bromochloromethane	ND	0.50								
Iodomethane	ND	0.50								
trans-1,4-Dichloro-2-butene	ND	0.50								
Vinyl acetate	ND	0.50								

Sample ID **LCS-R38745**	SampType: **LCS**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **LCSW**	Batch ID: **R38745**	RunNo: **38745**
Prep Date:	Analysis Date: **10/20/2016**	SeqNo: **1210380** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	9.7	0	10.00	0	96.7	80	120			
Toluene	9.7	0	10.00	0	97.2	80	120			
Ethylbenzene	9.8	0	10.00	0	98.0	80	120			
Chlorobenzene	9.8	0	10.00	0	97.8	80	120			
1,1-Dichloroethene	9.7	0	10.00	0	96.7	80	120			
Tetrachloroethene (PCE)	9.5	0	10.00	0	95.0	80	120			
Trichloroethene (TCE)	9.7	0	10.00	0	96.6	80	120			
o-Xylene	10	0	10.00	0	102	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-R38745**	SampType: **MBLK**	TestCode: **EPA 8270C: Semivolatiles/Mod**
Client ID: **PBW**	Batch ID: **R38745**	RunNo: **38745**
Prep Date:	Analysis Date: **10/29/2016**	SeqNo: **1210383** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Acetophenone	ND	5.0								
1-Methylnaphthalene	ND	5.0								
2,3,4,6-Tetrachlorophenol	ND	5.0								
2,4,5-Trichlorophenol	ND	5.0								
2,4,6-Trichlorophenol	ND	5.0								
2,4-Dichlorophenol	ND	5.0								
2,4-Dimethylphenol	ND	5.0								
2,4-Dinitrophenol	ND	5.0								
2,4-Dinitrotoluene	ND	5.0								
2,6-Dinitrotoluene	ND	5.0								
2-Chloronaphthalene	ND	5.0								
2-Chlorophenol	ND	5.0								
2-Methylnaphthalene	ND	5.0								
2-Methylphenol	ND	5.0								
2-Nitroaniline	ND	5.0								
2-Nitrophenol	ND	5.0								
3,3´-Dichlorobenzidine	ND	5.0								
3-Nitroaniline	ND	5.0								
4,6-Dinitro-2-methylphenol	ND	5.0								
4-Bromophenyl phenyl ether	ND	5.0								
4-Chloro-3-methylphenol	ND	5.0								
4-Chloroaniline	ND	5.0								
4-Chlorophenyl phenyl ether	ND	5.0								
4-Nitroaniline	ND	5.0								
4-Nitrophenol	ND	5.0								
Acenaphthene	ND	5.0								
Acenaphthylene	ND	5.0								
Anthracene	ND	5.0								
Benzo(g,h,i)perylene	ND	5.0								
Benz(a)anthracene	ND	0.10								
Benzo(a)pyrene	ND	0.10								
Benzo(b)fluoranthene	ND	0.10								
Benzo(k)fluoranthene	ND	0.10								
Bis(2-chloroethoxy)methane	ND	5.0								
Bis(2-chloroethyl)ether	ND	5.0								
Bis(2-chloroisopropyl)ether	ND	5.0								
Bis(2-ethylhexyl)phthalate	ND	5.0								
Butyl benzyl phthalate	ND	5.0								
Carbazole	ND	5.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**
16-Nov-16

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

Sample ID **MB-R38745**	SampType: **MBLK**	TestCode: **EPA 8270C: Semivolatiles/Mod**
Client ID: **PBW**	Batch ID: **R38745**	RunNo: **38745**
Prep Date:	Analysis Date: **10/29/2016**	SeqNo: **1210383** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Chrysene	ND	0.10								
Dibenz(a,h)anthracene	ND	0.10								
Dibenzofuran	ND	5.0								
Diethyl phthalate	ND	5.0								
Dimethyl phthalate	ND	5.0								
Di-n-butyl phthalate	ND	5.0								
Di-n-octyl phthalate	ND	5.0								
Fluoranthene	ND	5.0								
Fluorene	ND	5.0								
Hexachlorobenzene	ND	1.0								
Hexachlorobutadiene	ND	5.0								
Hexachlorocyclopentadiene	ND	5.0								
Hexachloroethane	ND	5.0								
Indeno(1,2,3-cd)pyrene	ND	0.10								
Isophorone	ND	5.0								
Naphthalene	ND	5.0								
Nitrobenzene	ND	5.0								
N-Nitrosodi-n-propylamine	ND	2.0								
N-Nitrosodiphenylamine	ND	2.0								
Pentachlorophenol	ND	5.0								
Phenanthrene	ND	1.0								
Phenol	ND	5.0								
Pyrene	ND	5.0								
o-Toluidine	ND	5.0								
Pyridine	ND	5.0								
1,2,4,5-Tetrachlorobenzene	ND	5.0								

Sample ID **LCS-R38745**	SampType: **LCS**	TestCode: **EPA 8270C: Semivolatiles/Mod**
Client ID: **LCSW**	Batch ID: **R38745**	RunNo: **38745**
Prep Date:	Analysis Date: **10/29/2016**	SeqNo: **1210384** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
2,4-Dinitrotoluene	5.5	0	5.000	0	110	49	134			
2-Chlorophenol	4.6	0	5.000	0	91.4	50	131			
4-Chloro-3-methylphenol	5.1	0	5.000	0	102	42	139			
4-Nitrophenol	5.5	0	5.000	0	110	19	137			
Acenaphthene	5.0	0	5.000	0	101	36	122			
Bis(2-ethylhexyl)phthalate	4.9	0	5.000	0	98.6	43	142			
N-Nitrosodi-n-propylamine	4.3	0	5.000	0	86.8	46	140			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**LCS-R38745**	SampType:	**LCS**	TestCode:	**EPA 8270C: Semivolatiles/Mod**					
Client ID:	**LCSW**	Batch ID:	**R38745**	RunNo:	**38745**					
Prep Date:		Analysis Date:	**10/29/2016**	SeqNo:	**1210384**	Units:	**µg/L**			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Pentachlorophenol		5.5	0	5.000	0	111	22	138			
Phenol		4.7	0	5.000	0	94.4	45	134			
Pyrene		4.5	0	5.000	0	90.8	45	138			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-28113**	SampType: **MBLK**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**PBW**	Batch ID: **28113**			RunNo: **38030**					
Prep Date:	**10/17/2016**	Analysis Date: **10/18/2016**			SeqNo: **1185736**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.00020								

Sample ID	**LCS-28113**	SampType: **LCS**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**LCSW**	Batch ID: **28113**			RunNo: **38030**					
Prep Date:	**10/17/2016**	Analysis Date: **10/18/2016**			SeqNo: **1185737**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0047	0.00020	0.005000	0	93.6	80	120			

Sample ID	**1610612-001BMS**	SampType: **MS**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID: **28113**			RunNo: **38030**					
Prep Date:	**10/17/2016**	Analysis Date: **10/18/2016**			SeqNo: **1185804**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0061	0.00020	0.005000	0.0001625	118	75	125			

Sample ID	**1610612-001BMSD**	SampType: **MSD**			TestCode: **EPA Method 7470: Mercury**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID: **28113**			RunNo: **38030**					
Prep Date:	**10/17/2016**	Analysis Date: **10/18/2016**			SeqNo: **1185805**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0059	0.00020	0.005000	0.0001625	114	75	125	3.16	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-28165**	SampType:	**MBLK**	TestCode:	**MERCURY, TCLP**					
Client ID:	**PBW**	Batch ID:	**28165**	RunNo:	**38056**					
Prep Date:	**10/19/2016**	Analysis Date:	**10/19/2016**	SeqNo:	**1186813**	Units:	**mg/L**			

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

Sample ID	**LCS-28165**	SampType:	**LCS**	TestCode:	**MERCURY, TCLP**					
Client ID:	**LCSW**	Batch ID:	**28165**	RunNo:	**38056**					
Prep Date:	**10/19/2016**	Analysis Date:	**10/19/2016**	SeqNo:	**1186814**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	ND	0.020	0.005000	0	104	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-28191**	SampType: **MBLK**	TestCode: **EPA Method 6010B: TCLP Metals**
Client ID: **PBW**	Batch ID: **28191**	RunNo: **38144**
Prep Date: **10/20/2016**	Analysis Date: **10/24/2016**	SeqNo: **1190360** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0								
Barium	ND	100								
Cadmium	ND	1.0								
Chromium	ND	5.0								
Lead	ND	5.0								
Selenium	ND	1.0								
Silver	ND	5.0								

Sample ID **LCS-28191**	SampType: **LCS**	TestCode: **EPA Method 6010B: TCLP Metals**
Client ID: **LCSW**	Batch ID: **28191**	RunNo: **38144**
Prep Date: **10/20/2016**	Analysis Date: **10/24/2016**	SeqNo: **1190361** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0	0.5000	0	108	80	120			
Barium	ND	100	0.5000	0	96.0	80	120			
Cadmium	ND	1.0	0.5000	0	101	80	120			
Chromium	ND	5.0	0.5000	0	97.0	80	120			
Lead	ND	5.0	0.5000	0	93.2	80	120			
Selenium	ND	1.0	0.5000	0	106	80	120			
Silver	ND	5.0	0.1000	0	106	80	120			

Sample ID **TCLP FL#2-2661**	SampType: **MBLK**	TestCode: **EPA Method 6010B: TCLP Metals**
Client ID: **PBW**	Batch ID: **28191**	RunNo: **38144**
Prep Date: **10/20/2016**	Analysis Date: **10/24/2016**	SeqNo: **1190451** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	5.0								
Barium	ND	100								
Cadmium	ND	1.0								
Chromium	ND	5.0								
Lead	ND	5.0								
Selenium	ND	1.0								
Silver	ND	5.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-28190**	SampType: **MBLK**	TestCode: **EPA 6010B: Metals**
Client ID: **PBW**	Batch ID: **28190**	RunNo: **38332**
Prep Date: **10/20/2016**	Analysis Date: **10/31/2016**	SeqNo: **1196520** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020								
Antimony	ND	0.050								
Arsenic	ND	0.020								
Barium	ND	0.020								
Beryllium	ND	0.0030								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Cobalt	ND	0.0060								
Copper	ND	0.0060								
Iron	ND	0.050								
Lead	ND	0.0050								
Manganese	ND	0.0020								
Nickel	ND	0.010								
Potassium	ND	1.0								
Selenium	ND	0.050								
Silver	ND	0.0050								
Thallium	ND	0.050								
Vanadium	ND	0.050								
Zinc	ND	0.020								

Sample ID **LCS-28190**	SampType: **LCS**	TestCode: **EPA 6010B: Metals**
Client ID: **LCSW**	Batch ID: **28190**	RunNo: **38332**
Prep Date: **10/20/2016**	Analysis Date: **10/31/2016**	SeqNo: **1196521** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.55	0.020	0.5000	0	109	80	120			
Antimony	0.49	0.050	0.5000	0	98.4	80	120			
Arsenic	0.52	0.020	0.5000	0	104	80	120			
Barium	0.50	0.020	0.5000	0	100	80	120			
Beryllium	0.53	0.0030	0.5000	0	106	80	120			
Cadmium	0.51	0.0020	0.5000	0	101	80	120			
Chromium	0.50	0.0060	0.5000	0	99.5	80	120			
Cobalt	0.49	0.0060	0.5000	0	97.7	80	120			
Copper	0.50	0.0060	0.5000	0	99.6	80	120			
Iron	0.50	0.050	0.5000	0	101	80	120			
Lead	0.50	0.0050	0.5000	0	99.5	80	120			
Manganese	0.50	0.0020	0.5000	0	100	80	120			
Nickel	0.50	0.010	0.5000	0	99.9	80	120			
Potassium	50	1.0	50.00	0	100	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**
16-Nov-16

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

Sample ID	**LCS-28190**	SampType: **LCS**		TestCode: **EPA 6010B: Metals**					
Client ID:	**LCSW**	Batch ID: **28190**		RunNo: **38332**					
Prep Date:	**10/20/2016**	Analysis Date: **10/31/2016**		SeqNo: **1196521**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Selenium	0.49	0.050	0.5000	0	99.0	80	120			
Silver	0.10	0.0050	0.1000	0	103	80	120			
Thallium	0.49	0.050	0.5000	0	98.9	80	120			
Vanadium	0.53	0.050	0.5000	0	105	80	120			
Zinc	0.50	0.020	0.5000	0	101	80	120			

Sample ID	**1610612-001BMS**	SampType: **MS**		TestCode: **EPA 6010B: Metals**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID: **28190**		RunNo: **38332**					
Prep Date:	**10/20/2016**	Analysis Date: **10/31/2016**		SeqNo: **1196523**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.89	0.020	0.5000	0.3134	115	75	125			
Antimony	0.47	0.050	0.5000	0	94.3	75	125			
Arsenic	0.57	0.020	0.5000	0.04017	106	75	125			
Barium	0.50	0.020	0.5000	0.01602	96.0	75	125			
Beryllium	0.51	0.0030	0.5000	0	102	75	125			
Cadmium	0.50	0.0020	0.5000	0	99.7	75	125			
Chromium	0.47	0.0060	0.5000	0	94.3	75	125			
Cobalt	0.47	0.0060	0.5000	0.003260	93.6	75	125			
Copper	0.53	0.0060	0.5000	0.01704	103	75	125			
Iron	0.63	0.050	0.5000	0.1353	98.3	75	125			
Lead	0.47	0.0050	0.5000	0	94.8	75	125			
Manganese	0.53	0.0020	0.5000	0.05227	95.7	75	125			
Nickel	0.49	0.010	0.5000	0.006520	95.7	75	125			
Selenium	0.52	0.050	0.5000	0	103	75	125			
Silver	0.10	0.0050	0.1000	0	104	75	125			
Thallium	0.46	0.050	0.5000	0.01260	89.8	75	125			
Vanadium	0.52	0.050	0.5000	0.006120	103	75	125			
Zinc	0.53	0.020	0.5000	0.02719	99.6	75	125			

Sample ID	**1610612-001BMSD**	SampType: **MSD**		TestCode: **EPA 6010B: Metals**					
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID: **28190**		RunNo: **38332**					
Prep Date:	**10/20/2016**	Analysis Date: **10/31/2016**		SeqNo: **1196524**		Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.88	0.020	0.5000	0.3134	114	75	125	0.858	20	
Antimony	0.45	0.050	0.5000	0	90.8	75	125	3.77	20	
Arsenic	0.55	0.020	0.5000	0.04017	103	75	125	2.57	20	
Barium	0.49	0.020	0.5000	0.01602	94.6	75	125	1.42	20	
Beryllium	0.51	0.0030	0.5000	0	101	75	125	1.17	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**1610612-001BMSD**	SampType:	**MSD**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38332**				
Prep Date:	**10/20/2016**	Analysis Date:	**10/31/2016**		SeqNo:	**1196524**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cadmium	0.49	0.0020	0.5000	0	98.2	75	125	1.47	20	
Chromium	0.46	0.0060	0.5000	0	92.6	75	125	1.81	20	
Cobalt	0.46	0.0060	0.5000	0.003260	91.8	75	125	1.92	20	
Copper	0.54	0.0060	0.5000	0.01704	104	75	125	0.996	20	
Iron	0.64	0.050	0.5000	0.1353	102	75	125	2.59	20	
Lead	0.47	0.0050	0.5000	0	93.8	75	125	1.05	20	
Manganese	0.52	0.0020	0.5000	0.05227	94.4	75	125	1.23	20	
Nickel	0.48	0.010	0.5000	0.006520	94.3	75	125	1.45	20	
Selenium	0.51	0.050	0.5000	0	102	75	125	1.76	20	
Silver	0.10	0.0050	0.1000	0	103	75	125	1.49	20	
Thallium	0.45	0.050	0.5000	0.01260	86.9	75	125	3.22	20	
Vanadium	0.51	0.050	0.5000	0.006120	101	75	125	1.60	20	
Zinc	0.52	0.020	0.5000	0.02719	98.2	75	125	1.35	20	

Sample ID	**1610612-001BMS**	SampType:	**MS**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38332**				
Prep Date:	**10/20/2016**	Analysis Date:	**10/31/2016**		SeqNo:	**1196526**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Potassium	180	5.0	50.00	123.0	104	75	125			

Sample ID	**1610612-001BMSD**	SampType:	**MSD**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38332**				
Prep Date:	**10/20/2016**	Analysis Date:	**10/31/2016**		SeqNo:	**1196527**	Units:	**mg/L**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Potassium	180	5.0	50.00	123.0	123	75	125	5.31	20	

Sample ID	**MB-28190**	SampType:	**MBLK**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**PBW**	Batch ID:	**28190**		RunNo:	**38490**				
Prep Date:	**10/20/2016**	Analysis Date:	**11/7/2016**		SeqNo:	**1202197**	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								
Sodium	ND	1.0								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**LCS-28190**	SampType:	**LCS**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**LCSW**	Batch ID:	**28190**		RunNo:	**38490**				
Prep Date:	**10/20/2016**	Analysis Date:	**11/7/2016**		SeqNo:	**1202198**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	51	1.0	50.00	0	102	80	120			
Magnesium	52	1.0	50.00	0	103	80	120			
Sodium	51	1.0	50.00	0	102	80	120			

Sample ID	**1610612-001BMS**	SampType:	**MS**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38490**				
Prep Date:	**10/20/2016**	Analysis Date:	**11/7/2016**		SeqNo:	**1202200**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Magnesium	86	1.0	50.00	35.82	100	75	125			

Sample ID	**1610612-001BMSD**	SampType:	**MSD**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38490**				
Prep Date:	**10/20/2016**	Analysis Date:	**11/7/2016**		SeqNo:	**1202201**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Magnesium	86	1.0	50.00	35.82	101	75	125	0.560	20	

Sample ID	**1610612-001BMS**	SampType:	**MS**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38490**				
Prep Date:	**10/20/2016**	Analysis Date:	**11/7/2016**		SeqNo:	**1202203**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	140	5.0	50.00	95.77	95.5	75	125			

Sample ID	**1610612-001BMSD**	SampType:	**MSD**		TestCode:	**EPA 6010B: Metals**				
Client ID:	**WDW-1,2,&3 Effluen**	Batch ID:	**28190**		RunNo:	**38490**				
Prep Date:	**10/20/2016**	Analysis Date:	**11/7/2016**		SeqNo:	**1202211**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Calcium	150	5.0	50.00	95.77	105	75	125	3.14	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-R38745**	SampType:	**MBLK**	TestCode:	**CYANIDE, Reactive**					
Client ID:	**PBW**	Batch ID:	**R38745**	RunNo:	**38745**					
Prep Date:		Analysis Date:	**10/25/2016**	SeqNo:	**1210388**	Units:	**mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	ND	1.00								

Sample ID	**LCS-R38745**	SampType:	**LCS**	TestCode:	**CYANIDE, Reactive**					
Client ID:	**LCSW**	Batch ID:	**R38745**	RunNo:	**38745**					
Prep Date:		Analysis Date:	**10/25/2016**	SeqNo:	**1210389**	Units:	**mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide, Reactive	0.542		0.5000	0	108	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID	**MB-R38745**	SampType:	**MBLK**	TestCode:	**SULFIDE, Reactive**					
Client ID:	**PBW**	Batch ID:	**R38745**	RunNo:	**38745**					
Prep Date:		Analysis Date:	**10/18/2016**	SeqNo:	**1210391**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	ND	1.0								

Sample ID	**LCS-R38745**	SampType:	**LCS**	TestCode:	**SULFIDE, Reactive**					
Client ID:	**LCSW**	Batch ID:	**R38745**	RunNo:	**38745**					
Prep Date:		Analysis Date:	**10/18/2016**	SeqNo:	**1210392**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Reactive Sulfide	0.16		0.2000	0	80.0	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**
16-Nov-16

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

Sample ID **mb-1**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R38048**	RunNo: **38048**							
Prep Date:	Analysis Date: **10/18/2016**	SeqNo: **1186486**	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**	SampType: **lcs**	TestCode: **SM2320B: Alkalinity**							
Client ID: **LCSW**	Batch ID: **R38048**	RunNo: **38048**							
Prep Date:	Analysis Date: **10/18/2016**	SeqNo: **1186487**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	80.60	20.00	80.00	0	101	90	110			

Sample ID **mb-2**	SampType: **mblk**	TestCode: **SM2320B: Alkalinity**							
Client ID: **PBW**	Batch ID: **R38048**	RunNo: **38048**							
Prep Date:	Analysis Date: **10/18/2016**	SeqNo: **1186510**	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**	SampType: **lcs**	TestCode: **SM2320B: Alkalinity**							
Client ID: **LCSW**	Batch ID: **R38048**	RunNo: **38048**							
Prep Date:	Analysis Date: **10/18/2016**	SeqNo: **1186511**	Units: **mg/L CaCO3**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Alkalinity (as CaCO3)	81.52	20.00	80.00	0	102	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**
16-Nov-16

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

Sample ID **1610612-001ADUP**	SampType: **DUP**			TestCode: **Specific Gravity**						
Client ID: **WDW-1,2,&3 Effluen**	Batch ID: **R38258**			RunNo: **38258**						
Prep Date:	Analysis Date: **10/27/2016**			SeqNo: **1193976**		Units:				
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Specific Gravity	0.9993	0						0.0400	20	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610612**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly WDW-1, 2, &3 Inj Well

Sample ID **MB-28098**	SampType: **MBLK**	TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW**	Batch ID: **28098**	RunNo: **38034**
Prep Date: **10/17/2016**	Analysis Date: **10/18/2016**	SeqNo: **1185818** 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-28098**	SampType: **LCS**	TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW**	Batch ID: **28098**	RunNo: **38034**
Prep Date: **10/17/2016**	Analysis Date: **10/18/2016**	SeqNo: **1185819** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1050	20.0	1000	0	105	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: NAVAJO REFINING CO Work Order Number: 1610612 RcptNo: 1

Received by/date: AC 10/13/16

Logged By: Ashley Gallegos 10/13/2016 8:30:00 AM

Completed By: Ashley Gallegos 10/13/2016 11:20:49 AM

Reviewed By: JC 10/23/16 JC 10/13/16

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: 2 2 (<2 or >12 unless noted)

Adjusted? No

Checked by: AJS

Special Handling (if applicable)

16. 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:

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.0	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refining Co.

Mailing Address: P.O. Box 159 Artesia,

NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

☐ Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush

Project Name:

Quarterly WDW-1, 2, & 3 Inj Well

Project #: P.O. # 167796

Project Manager:

Micki Schultz / Scott Denton / Mike Holder

Sampler: Brady Hubbard

On Ice: X Yes ☐ No

Sample Temperature: 1.0

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. 1610612	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
10/11/16	9:00	Liquid	WDW-1, 2, & 3 Effluent	3	Neat/H2SO4	-001	X						X
10/11/16	9:00	Liquid	WDW-1, 2, & 3 Effluent	1	HNO3						X	X	
10/11/16	9:00	Liquid	WDW-1, 2, & 3 Effluent	3	HCL			X					
10/11/16	9:00	Liquid	WDW-1, 2, & 3 Effluent	2	Neat				X				
10/11/16	9:00	Liquid	WDW-1, 2, & 3 Effluent	2	Neat					X			
10/11/16	9:00	Liquid	Trip Blank	2	Neat	-002		X					
10/11/16	9:00	Liquid	Temperature Blank	1	Neat								

Analysis Request

Date:	Time:	Relinquished by:	Received by:	Date	Time
10-11-16	11:00	Brady Hubbard	Lindsey Coneha	10/13/16	0830
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks: Send results to Scott Denton, Mike Holder, Robert Combs and Andrew Contreras.

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

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

November 16, 2016

Robert Combs

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

RE: Quarterly RO Reject OrderNo.: 1610613

Dear Robert Combs:

Hall Environmental Analysis Laboratory received 2 sample(s) on 10/13/2016 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 qualifers 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 #NM0190

Sincerely,

Andy Freeman

Laboratory Manager

4901 Hawkins NE
Albuquerque, NM 87109

Analytical Report
Lab Order **1610613**
Date Reported: **11/16/2016**

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: R.O. Reject
Project: Quarterly RO Reject
Collection Date: 10/11/2016 11:00:00 AM
Lab ID: 1610613-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 200.8: DISSOLVED METALS						Analyst: **JLF**	
Arsenic	ND	0.0050		mg/L	5	10/28/2016 2:36:13 PM	A38300
Lead	ND	0.00050		mg/L	1	10/25/2016 7:44:19 PM	B38214
Selenium	0.0089	0.0010		mg/L	1	10/25/2016 7:44:19 PM	B38214
Uranium	0.0064	0.00050		mg/L	1	10/25/2016 7:44:19 PM	B38214
EPA 903.1: RA 226 AND EPA 904.0: RA 228-SUBBED						Analyst: **SUB**	
Radium-226	0.525	0.552		pCi/L	1	11/16/2016	R38749
Radium-226 ±	0.445	0.552		pCi/L	1	11/16/2016	R38749
Radium-228	0.442	0.785		pCi/L	1	11/16/2016	R38749
Radium-228 ±	0.389	0.785		pCi/L	1	11/16/2016	R38749
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Fluoride	3.6	2.0		mg/L	20	10/14/2016 12:43:59 AM	R37942
Chloride	280	10		mg/L	20	10/14/2016 12:43:59 AM	R37942
Sulfate	1900	50		mg/L	100	10/25/2016 4:52:17 PM	R38212
Nitrate+Nitrite as N	1.9	1.0		mg/L	5	10/14/2016 1:33:37 AM	R37942
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**	
Total Dissolved Solids	3960	20.0	*	mg/L	1	10/20/2016 2:01:00 PM	28134
EPA 335.4: TOTAL CYANIDE SUBBED						Analyst: **SUB**	
Cyanide	ND	0.0100		mg/L	1	10/19/2016	R38749
SM4500-H+B: PH						Analyst: **JRR**	
pH	7.82	1.68	H	pH units	1	10/18/2016 1:22:12 PM	R38048
EPA METHOD 200.7: DISSOLVED METALS						Analyst: **MED**	
Aluminum	ND	0.020		mg/L	1	10/25/2016 12:47:24 PM	A38197
Barium	0.079	0.0020		mg/L	1	10/21/2016 6:01:00 PM	B38141
Boron	0.092	0.040		mg/L	1	10/21/2016 6:01:00 PM	B38141
Cadmium	ND	0.0020		mg/L	1	10/21/2016 6:01:00 PM	B38141
Chromium	ND	0.0060		mg/L	1	10/21/2016 6:01:00 PM	B38141
Cobalt	ND	0.0060		mg/L	1	10/21/2016 6:01:00 PM	B38141
Copper	ND	0.0060		mg/L	1	10/25/2016 12:47:24 PM	A38197
Iron	ND	0.020		mg/L	1	10/25/2016 12:47:24 PM	A38197
Manganese	ND	0.0020		mg/L	1	10/21/2016 6:01:00 PM	B38141
Molybdenum	ND	0.0080		mg/L	1	10/21/2016 6:01:00 PM	B38141
Nickel	ND	0.010		mg/L	1	10/21/2016 6:01:00 PM	B38141
Silver	ND	0.0050		mg/L	1	10/21/2016 6:01:00 PM	B38141
Zinc	0.014	0.010		mg/L	1	10/21/2016 6:01:00 PM	B38141
EPA METHOD 245.1: MERCURY						Analyst: **JLF**	
Mercury	ND	0.00020		mg/L	1	10/21/2016 12:15:12 PM	28201

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: R.O. Reject
Project: Quarterly RO Reject
Collection Date: 10/11/2016 11:00:00 AM
Lab ID: 1610613-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **AG**	
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	10/19/2016 9:14:28 PM	W38060
Surr: BFB	90.7	70-130		%Rec	1	10/19/2016 9:14:28 PM	W38060
EPA METHOD 8011/504.1: EDB						Analyst: **JME**	
1,2-Dibromoethane	ND	0.010		µg/L	1	10/17/2016 4:51:55 PM	28082
EPA METHOD 8082: PCB'S						Analyst: **SCC**	
Aroclor 1016	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Aroclor 1221	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Aroclor 1232	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Aroclor 1242	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Aroclor 1248	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Aroclor 1254	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Aroclor 1260	ND	1.0		µg/L	1	10/19/2016 8:28:00 AM	28040
Surr: Decachlorobiphenyl	117	26.1-140		%Rec	1	10/19/2016 8:28:00 AM	28040
Surr: Tetrachloro-m-xylene	112	15-123		%Rec	1	10/19/2016 8:28:00 AM	28040
EPA METHOD 8015M/D: DIESEL RANGE						Analyst: **TOM**	
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	10/14/2016 10:46:55 PM	28063
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	10/14/2016 10:46:55 PM	28063
Surr: DNOP	117	77.1-144		%Rec	1	10/14/2016 10:46:55 PM	28063
EPA METHOD 8310: PAHS						Analyst: **SCC**	
Naphthalene	ND	2.0		µg/L	1	10/20/2016 3:19:37 PM	28041
1-Methylnaphthalene	ND	2.0		µg/L	1	10/20/2016 3:19:37 PM	28041
2-Methylnaphthalene	ND	2.0		µg/L	1	10/20/2016 3:19:37 PM	28041
Benzo(a)pyrene	ND	0.070		µg/L	1	10/20/2016 3:19:37 PM	28041
Surr: Benzo(e)pyrene	80.6	20-153		%Rec	1	10/20/2016 3:19:37 PM	28041
EPA METHOD 8260B: VOLATILES						Analyst: **AG**	
Benzene	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Toluene	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Ethylbenzene	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Carbon Tetrachloride	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Chloroform	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
1,1-Dichloroethane	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
1,1-Dichloroethene	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Methylene Chloride	ND	3.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: R.O. Reject
Project: Quarterly RO Reject
Collection Date: 10/11/2016 11:00:00 AM
Lab ID: 1610613-001
Matrix: AQUEOUS
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **AG**	
1,1,1-Trichloroethane	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
1,1,2-Trichloroethane	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Trichloroethene (TCE)	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Vinyl chloride	ND	1.0		µg/L	1	10/14/2016 10:07:29 AM	R37973
Xylenes, Total	ND	1.5		µg/L	1	10/14/2016 10:07:29 AM	R37973
Surr: 1,2-Dichloroethane-d4	96.3	70-130		%Rec	1	10/14/2016 10:07:29 AM	R37973
Surr: 4-Bromofluorobenzene	100	70-130		%Rec	1	10/14/2016 10:07:29 AM	R37973
Surr: Dibromofluoromethane	103	70-130		%Rec	1	10/14/2016 10:07:29 AM	R37973
Surr: Toluene-d8	97.8	70-130		%Rec	1	10/14/2016 10:07:29 AM	R37973
TOTAL PHENOLICS BY SW-846 9067						Analyst: **SCC**	
Phenolics, Total Recoverable	ND	2.5		µg/L	1	10/18/2016	28115

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Client Sample ID: Trip Blank
Project: Quarterly RO Reject
Collection Date:
Lab ID: 1610613-002
Matrix: TRIP BLANK
Received Date: 10/13/2016 8:30:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8011/504.1: EDB						Analyst: **JME**	
1,2-Dibromoethane	ND	0.010		µg/L	1	10/17/2016 5:07:17 PM	28082
EPA METHOD 8260B: VOLATILES						Analyst: **AG**	
Benzene	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Toluene	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Ethylbenzene	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Carbon Tetrachloride	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Chloroform	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,1-Dichloroethane	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,1-Dichloroethene	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Methylene Chloride	ND	3.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,1,1-Trichloroethane	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
1,1,2-Trichloroethane	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Trichloroethene (TCE)	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Vinyl chloride	ND	1.0		µg/L	1	10/14/2016 11:33:59 AM	R37973
Xylenes, Total	ND	1.5		µg/L	1	10/14/2016 11:33:59 AM	R37973
Surr: 1,2-Dichloroethane-d4	93.1	70-130		%Rec	1	10/14/2016 11:33:59 AM	R37973
Surr: 4-Bromofluorobenzene	95.7	70-130		%Rec	1	10/14/2016 11:33:59 AM	R37973
Surr: Dibromofluoromethane	98.5	70-130		%Rec	1	10/14/2016 11:33:59 AM	R37973
Surr: Toluene-d8	104	70-130		%Rec	1	10/14/2016 11:33:59 AM	R37973

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **MB-B**	SampType: **MBLK**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **PBW**	Batch ID: **B38141**	RunNo: **38141**
Prep Date:	Analysis Date: **10/21/2016**	SeqNo: **1190207** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	ND	0.0020								
Boron	ND	0.040								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Cobalt	ND	0.0060								
Manganese	ND	0.0020								
Molybdenum	ND	0.0080								
Nickel	ND	0.010								
Silver	ND	0.0050								
Zinc	ND	0.010								

Sample ID **LLLCS-B**	SampType: **LCSLL**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC**	Batch ID: **B38141**	RunNo: **38141**
Prep Date:	Analysis Date: **10/21/2016**	SeqNo: **1190211** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.0026	0.0020	0.002000	0	130	50	150			
Boron	0.040	0.040	0.04000	0	101	50	150			
Cadmium	ND	0.0020	0.002000	0	84.5	50	150			
Chromium	0.0062	0.0060	0.006000	0	103	50	150			
Cobalt	0.0064	0.0060	0.006000	0	106	50	150			
Manganese	0.0021	0.0020	0.002000	0	106	50	150			
Molybdenum	ND	0.0080	0.008000	0	97.5	50	150			
Nickel	ND	0.010	0.005000	0	96.6	50	150			
Silver	ND	0.0050	0.005000	0	99.4	50	150			
Zinc	ND	0.010	0.005000	0	105	50	150			

Sample ID **LCS-B**	SampType: **LCS**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW**	Batch ID: **B38141**	RunNo: **38141**
Prep Date:	Analysis Date: **10/21/2016**	SeqNo: **1190212** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.51	0.0020	0.5000	0	101	85	115			
Boron	0.53	0.040	0.5000	0	106	85	115			
Cadmium	0.52	0.0020	0.5000	0	104	85	115			
Chromium	0.50	0.0060	0.5000	0	101	85	115			
Cobalt	0.49	0.0060	0.5000	0	97.8	85	115			
Manganese	0.50	0.0020	0.5000	0	100	85	115			
Molybdenum	0.53	0.0080	0.5000	0	105	85	115			
Nickel	0.48	0.010	0.5000	0	96.3	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID	**LCS-B**	SampType:	**LCS**		TestCode:	**EPA Method 200.7: Dissolved Metals**				
Client ID:	**LCSW**	Batch ID:	**B38141**		RunNo:	**38141**				
Prep Date:		Analysis Date:	**10/21/2016**		SeqNo:	**1190212**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Silver	0.10	0.0050	0.1000	0	99.9	85	115			
Zinc	0.49	0.010	0.5000	0	97.9	85	115			

Sample ID	**MB-A**	SampType:	**MBLK**		TestCode:	**EPA Method 200.7: Dissolved Metals**				
Client ID:	**PBW**	Batch ID:	**A38197**		RunNo:	**38197**				
Prep Date:		Analysis Date:	**10/25/2016**		SeqNo:	**1192092**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020								
Copper	ND	0.0060								
Iron	ND	0.020								

Sample ID	**LCS-A**	SampType:	**LCS**		TestCode:	**EPA Method 200.7: Dissolved Metals**				
Client ID:	**LCSW**	Batch ID:	**A38197**		RunNo:	**38197**				
Prep Date:		Analysis Date:	**10/25/2016**		SeqNo:	**1192093**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.57	0.020	0.5000	0	114	85	115			
Copper	0.49	0.0060	0.5000	0	97.8	85	115			
Iron	0.50	0.020	0.5000	0	99.1	85	115			

Sample ID	**LLLCS-A**	SampType:	**LCSLL**		TestCode:	**EPA Method 200.7: Dissolved Metals**				
Client ID:	**BatchQC**	Batch ID:	**A38197**		RunNo:	**38197**				
Prep Date:		Analysis Date:	**10/25/2016**		SeqNo:	**1192094**	Units:	**mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020	0.01000	0	123	50	150			
Copper	0.0064	0.0060	0.006000	0	106	50	150			
Iron	0.021	0.020	0.02000	0	107	50	150			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID	**LCS**	SampType: **LCS**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**LCSW**	Batch ID: **B38214**			RunNo: **38214**				
Prep Date:		Analysis Date: **10/25/2016**			SeqNo: **1192768**		Units: **mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.012	0.00050	0.01250	0	95.6	85	115			
Selenium	0.025	0.0010	0.02500	0	99.1	85	115			
Uranium	0.012	0.00050	0.01250	0	96.0	85	115			

Sample ID	**LLLCS**	SampType: **LCSLL**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**BatchQC**	Batch ID: **B38214**			RunNo: **38214**				
Prep Date:		Analysis Date: **10/25/2016**			SeqNo: **1192770**		Units: **mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	0.00051	0.00050	0.0005000	0	101	50	150			
Selenium	0.0011	0.0010	0.001000	0	113	50	150			
Uranium	ND	0.00050	0.0005000	0	97.5	50	150			

Sample ID	**MB**	SampType: **MBLK**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**PBW**	Batch ID: **B38214**			RunNo: **38214**				
Prep Date:		Analysis Date: **10/25/2016**			SeqNo: **1192772**		Units: **mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Lead	ND	0.00050								
Selenium	ND	0.0010								
Uranium	ND	0.00050								

Sample ID	**LCS**	SampType: **LCS**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**LCSW**	Batch ID: **A38300**			RunNo: **38300**				
Prep Date:		Analysis Date: **10/28/2016**			SeqNo: **1195760**		Units: **mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.025	0.0010	0.02500	0	98.3	85	115			

Sample ID	**LLLCS**	SampType: **LCSLL**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**BatchQC**	Batch ID: **A38300**			RunNo: **38300**				
Prep Date:		Analysis Date: **10/28/2016**			SeqNo: **1195761**		Units: **mg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.0010	0.001000	0	99.2	50	150			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**
16-Nov-16

Client: Navajo Refining Company
Project: Quarterly RO Reject

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA 200.8: Dissolved Metals**
Client ID: **PBW**	Batch ID: **A38300**	RunNo: **38300**
Prep Date:	Analysis Date: **10/28/2016**	SeqNo: **1195762** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.0010								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**
16-Nov-16

Client: Navajo Refining Company
Project: Quarterly RO Reject

Sample ID	**MB-28201**	SampType:	**MBLK**	TestCode:	**EPA Method 245.1: Mercury**					
Client ID:	**PBW**	Batch ID:	**28201**	RunNo:	**38122**					
Prep Date:	**10/20/2016**	Analysis Date:	**10/21/2016**	SeqNo:	**1189575**	Units:	**mg/L**			

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

Sample ID	**LCS-28201**	SampType:	**LCS**	TestCode:	**EPA Method 245.1: Mercury**					
Client ID:	**LCSW**	Batch ID:	**28201**	RunNo:	**38122**					
Prep Date:	**10/20/2016**	Analysis Date:	**10/21/2016**	SeqNo:	**1189576**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Mercury	0.0049	0.00020	0.005000	0	97.4	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R37942**	RunNo: **37942**
Prep Date:	Analysis Date: **10/13/2016**	SeqNo: **1182401** 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								
Nitrate+Nitrite as N	ND	0.20								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R37942**	RunNo: **37942**
Prep Date:	Analysis Date: **10/13/2016**	SeqNo: **1182402** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Fluoride	0.54	0.10	0.5000	0	107	90	110			
Chloride	4.7	0.50	5.000	0	93.9	90	110			
Nitrate+Nitrite as N	3.4	0.20	3.500	0	97.3	90	110			

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R38212**	RunNo: **38212**
Prep Date:	Analysis Date: **10/25/2016**	SeqNo: **1192608** Units: **mg/L**

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

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R38212**	RunNo: **38212**
Prep Date:	Analysis Date: **10/25/2016**	SeqNo: **1192609** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	9.7	0.50	10.00	0	96.9	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID	**MB-28082**	SampType:	**MBLK**	TestCode:	**EPA Method 8011/504.1: EDB**					
Client ID:	**PBW**	Batch ID:	**28082**	RunNo:	**37992**					
Prep Date:	**10/17/2016**	Analysis Date:	**10/17/2016**	SeqNo:	**1183982**	Units:	**µg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,2-Dibromoethane	ND	0.010								

Sample ID	**LCS-28082**	SampType:	**LCS**	TestCode:	**EPA Method 8011/504.1: EDB**					
Client ID:	**LCSW**	Batch ID:	**28082**	RunNo:	**37992**					
Prep Date:	**10/17/2016**	Analysis Date:	**10/17/2016**	SeqNo:	**1183984**	Units:	**µg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,2-Dibromoethane	0.093	0.010	0.1000	0	93.2	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **1610613-001AMS**	SampType: **MS**	TestCode: **EPA Method 8015M/D: Diesel Range**
Client ID: **R.O. Reject**	Batch ID: **28063**	RunNo: **37940**
Prep Date: **10/14/2016**	Analysis Date: **10/14/2016**	SeqNo: **1183256** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	6.1	1.0	5.000	0	121	79.6	148			
Surr: DNOP	0.51		0.5000		103	77.1	144			

Sample ID **1610613-001AMSD**	SampType: **MSD**	TestCode: **EPA Method 8015M/D: Diesel Range**
Client ID: **R.O. Reject**	Batch ID: **28063**	RunNo: **37940**
Prep Date: **10/14/2016**	Analysis Date: **10/14/2016**	SeqNo: **1183257** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	5.8	1.0	5.000	0	115	79.6	148	5.02	20	
Surr: DNOP	0.49		0.5000		98.6	77.1	144	0	0	

Sample ID **LCS-28063**	SampType: **LCS**	TestCode: **EPA Method 8015M/D: Diesel Range**
Client ID: **LCSW**	Batch ID: **28063**	RunNo: **37940**
Prep Date: **10/14/2016**	Analysis Date: **10/14/2016**	SeqNo: **1183264** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	5.8	1.0	5.000	0	116	63.2	155			
Surr: DNOP	0.49		0.5000		97.8	77.1	144			

Sample ID **MB-28063**	SampType: **MBLK**	TestCode: **EPA Method 8015M/D: Diesel Range**
Client ID: **PBW**	Batch ID: **28063**	RunNo: **37940**
Prep Date: **10/14/2016**	Analysis Date: **10/14/2016**	SeqNo: **1183265** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	ND	1.0								
Motor Oil Range Organics (MRO)	ND	5.0								
Surr: DNOP	1.1		1.000		114	77.1	144			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**
16-Nov-16

Client: Navajo Refining Company
Project: Quarterly RO Reject

Sample ID **MB-28040**	SampType: **MBLK**	TestCode: **EPA Method 8082: PCB's**							
Client ID: **PBW**	Batch ID: **28040**	RunNo: **38063**							
Prep Date: **10/13/2016**	Analysis Date: **10/18/2016**	SeqNo: **1187392**	Units: **µg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1016	ND	1.0								
Aroclor 1221	ND	1.0								
Aroclor 1232	ND	1.0								
Aroclor 1242	ND	1.0								
Aroclor 1248	ND	1.0								
Aroclor 1254	ND	1.0								
Aroclor 1260	ND	1.0								
Surr: Decachlorobiphenyl	2.7		2.500		110	26.1	140			
Surr: Tetrachloro-m-xylene	2.7		2.500		108	15	123			

Sample ID **LCS-28040**	SampType: **LCS**	TestCode: **EPA Method 8082: PCB's**							
Client ID: **LCSW**	Batch ID: **28040**	RunNo: **38063**							
Prep Date: **10/13/2016**	Analysis Date: **10/18/2016**	SeqNo: **1187408**	Units: **µg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1016	5.2	1.0	5.000	0	103	15	147			
Aroclor 1260	5.2	1.0	5.000	0	105	15	200			
Surr: Decachlorobiphenyl	2.8		2.500		112	26.1	140			
Surr: Tetrachloro-m-xylene	2.8		2.500		112	15	123			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **100ng lcs**	SampType: **LCS**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **LCSW**	Batch ID: **R37973**	RunNo: **37973**
Prep Date:	Analysis Date: **10/14/2016**	SeqNo: **1183336** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	20	1.0	20.00	0	100	70	130			
Toluene	20	1.0	20.00	0	98.9	70	130			
1,1-Dichloroethene	18	1.0	20.00	0	90.7	70	130			
Trichloroethene (TCE)	16	1.0	20.00	0	78.5	70	130			
Surr: 1,2-Dichloroethane-d4	9.6		10.00		96.5	70	130			
Surr: 4-Bromofluorobenzene	10		10.00		102	70	130			
Surr: Dibromofluoromethane	9.7		10.00		97.1	70	130			
Surr: Toluene-d8	10		10.00		103	70	130			

Sample ID **1610613-001bms**	SampType: **MS**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **R.O. Reject**	Batch ID: **R37973**	RunNo: **37973**
Prep Date:	Analysis Date: **10/14/2016**	SeqNo: **1183339** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	20	1.0	20.00	0	98.2	70	130			
Toluene	19	1.0	20.00	0	97.4	70	130			
1,1-Dichloroethene	18	1.0	20.00	0	88.0	70	130			
Trichloroethene (TCE)	16	1.0	20.00	0	77.8	70	130			
Surr: 1,2-Dichloroethane-d4	9.9		10.00		98.7	70	130			
Surr: 4-Bromofluorobenzene	9.6		10.00		96.3	70	130			
Surr: Dibromofluoromethane	9.9		10.00		99.3	70	130			
Surr: Toluene-d8	10		10.00		100	70	130			

Sample ID **1610613-001bmsd**	SampType: **MSD**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **R.O. Reject**	Batch ID: **R37973**	RunNo: **37973**
Prep Date:	Analysis Date: **10/14/2016**	SeqNo: **1183340** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	19	1.0	20.00	0	97.0	70	130	1.25	20	
Toluene	18	1.0	20.00	0	92.4	70	130	5.28	20	
1,1-Dichloroethene	17	1.0	20.00	0	86.1	70	130	2.18	20	
Trichloroethene (TCE)	15	1.0	20.00	0	76.1	70	130	2.11	20	
Surr: 1,2-Dichloroethane-d4	9.9		10.00		98.9	70	130	0	0	
Surr: 4-Bromofluorobenzene	9.9		10.00		99.2	70	130	0	0	
Surr: Dibromofluoromethane	9.9		10.00		98.9	70	130	0	0	
Surr: Toluene-d8	9.7		10.00		97.3	70	130	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **rb**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **R37973**	RunNo: **37973**
Prep Date:	Analysis Date: **10/14/2016**	SeqNo: **1183360** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
1,2-Dichloroethane (EDC)	ND	1.0								
1,2-Dibromoethane (EDB)	ND	1.0								
Carbon Tetrachloride	ND	1.0								
Chloroform	ND	1.0								
1,1-Dichloroethane	ND	1.0								
1,1-Dichloroethene	ND	1.0								
Methylene Chloride	ND	3.0								
1,1,2,2-Tetrachloroethane	ND	2.0								
Tetrachloroethene (PCE)	ND	1.0								
1,1,1-Trichloroethane	ND	1.0								
1,1,2-Trichloroethane	ND	1.0								
Trichloroethene (TCE)	ND	1.0								
Vinyl chloride	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	9.8		10.00		97.6	70	130			
Surr: 4-Bromofluorobenzene	9.8		10.00		97.6	70	130			
Surr: Dibromofluoromethane	10		10.00		105	70	130			
Surr: Toluene-d8	9.9		10.00		99.2	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **MB-28041**	SampType: **MBLK**	TestCode: **EPA Method 8310: PAHs**
Client ID: **PBW**	Batch ID: **28041**	RunNo: **38100**
Prep Date: **10/13/2016**	Analysis Date: **10/20/2016**	SeqNo: **1188744** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	ND	2.0								
1-Methylnaphthalene	ND	2.0								
2-Methylnaphthalene	ND	2.0								
Acenaphthylene	ND	2.5								
Acenaphthene	ND	2.0								
Fluorene	ND	0.80								
Phenanthrene	ND	0.60								
Anthracene	ND	0.60								
Fluoranthene	ND	0.30								
Pyrene	ND	0.30								
Benz(a)anthracene	ND	0.070								
Chrysene	ND	0.20								
Benzo(b)fluoranthene	ND	0.10								
Benzo(k)fluoranthene	ND	0.070								
Benzo(a)pyrene	ND	0.070								
Dibenz(a,h)anthracene	ND	0.12								
Benzo(g,h,i)perylene	ND	0.12								
Indeno(1,2,3-cd)pyrene	ND	0.25								
Surr: Benzo(e)pyrene	13		20.00		64.1	20	153			

Sample ID **LCS-28041**	SampType: **LCS**	TestCode: **EPA Method 8310: PAHs**
Client ID: **LCSW**	Batch ID: **28041**	RunNo: **38100**
Prep Date: **10/13/2016**	Analysis Date: **10/20/2016**	SeqNo: **1188746** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	81	2.0	80.00	0	101	55.6	124			
1-Methylnaphthalene	82	2.0	80.20	0	102	55.3	124			
2-Methylnaphthalene	79	2.0	80.00	0	99.2	55.4	124			
Acenaphthylene	85	2.5	80.20	0	106	60.2	119			
Acenaphthene	81	2.0	80.00	0	101	56	126			
Fluorene	7.5	0.80	8.020	0	93.9	51.6	129			
Phenanthrene	3.4	0.60	4.020	0	84.6	58.8	129			
Anthracene	4.0	0.60	4.020	0	98.8	59.9	121			
Fluoranthene	7.4	0.30	8.020	0	92.4	48	145			
Pyrene	8.2	0.30	8.020	0	102	56.2	130			
Benz(a)anthracene	0.81	0.070	0.8020	0	101	50.4	142			
Chrysene	3.9	0.20	4.020	0	95.8	54.7	134			
Benzo(b)fluoranthene	0.93	0.10	1.002	0	92.8	61.8	120			
Benzo(k)fluoranthene	0.49	0.070	0.5000	0	98.0	55.9	134			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **LCS-28041**	SampType: **LCS**	TestCode: **EPA Method 8310: PAHs**								
Client ID: **LCSW**	Batch ID: **28041**	RunNo: **38100**								
Prep Date: **10/13/2016**	Analysis Date: **10/20/2016**	SeqNo: **1188746**	Units: **µg/L**							
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzo(a)pyrene	0.51	0.070	0.5020	0	102	51.3	137			
Dibenz(a,h)anthracene	0.98	0.12	1.002	0	97.8	57.8	134			
Benzo(g,h,i)perylene	1.0	0.12	1.000	0	100	57.2	134			
Indeno(1,2,3-cd)pyrene	2.2	0.25	2.004	0	108	58.2	137			
Surr: Benzo(e)pyrene	20		20.00		100	20	153			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**
16-Nov-16

Client: Navajo Refining Company
Project: Quarterly RO Reject

Sample ID	**MB-28115**	SampType:	**MBLK**	TestCode:	**Total Phenolics by SW-846 9067**					
Client ID:	**PBW**	Batch ID:	**28115**	RunNo:	**38004**					
Prep Date:	**10/18/2016**	Analysis Date:	**10/18/2016**	SeqNo:	**1184471**	Units:	**µg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phenolics, Total Recoverable	ND	2.5								

Sample ID	**LCS-28115**	SampType:	**LCS**	TestCode:	**Total Phenolics by SW-846 9067**					
Client ID:	**LCSW**	Batch ID:	**28115**	RunNo:	**38004**					
Prep Date:	**10/18/2016**	Analysis Date:	**10/18/2016**	SeqNo:	**1184472**	Units:	**µg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phenolics, Total Recoverable	22	2.5	20.00	0	109	64.4	135			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID	**MB-R38749**	SampType:	**MBLK**	TestCode:	**EPA 335.4: Total Cyanide Subbed**					
Client ID:	**PBW**	Batch ID:	**R38749**	RunNo:	**38749**					
Prep Date:		Analysis Date:	**10/19/2016**	SeqNo:	**1210509**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide	ND	0.0100								

Sample ID	**LCS-R38749**	SampType:	**LCS**	TestCode:	**EPA 335.4: Total Cyanide Subbed**					
Client ID:	**LCSW**	Batch ID:	**R38749**	RunNo:	**38749**					
Prep Date:		Analysis Date:	**10/19/2016**	SeqNo:	**1210510**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide	0.543		0.5000	0	109	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID **1610613-001bms**	SampType: **MS**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **R.O. Reject**	Batch ID: **W38060**	RunNo: **38060**
Prep Date:	Analysis Date: **10/20/2016**	SeqNo: **1187259** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	0.49	0.050	0.5000	0	97.8	53.8	128			
Surr: BFB	9.2		10.00		92.3	70	130			

Sample ID **1610613-001bmsd**	SampType: **MSD**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **R.O. Reject**	Batch ID: **W38060**	RunNo: **38060**
Prep Date:	Analysis Date: **10/20/2016**	SeqNo: **1187260** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	0.44	0.050	0.5000	0	88.0	53.8	128	10.6	20	
Surr: BFB	8.6		10.00		86.5	70	130	0	0	

Sample ID **rb**	SampType: **MBLK**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **PBW**	Batch ID: **W38060**	RunNo: **38060**
Prep Date:	Analysis Date: **10/19/2016**	SeqNo: **1187443** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	ND	0.050								
Surr: BFB	8.9		10.00		88.8	70	130			

Sample ID **2.5ug gro lcs**	SampType: **LCS**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **LCSW**	Batch ID: **W38060**	RunNo: **38060**
Prep Date:	Analysis Date: **10/19/2016**	SeqNo: **1188464** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	0.53	0.050	0.5000	0	105	75.4	118			
Surr: BFB	9.3		10.00		93.3	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT
Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**
16-Nov-16

Client: Navajo Refining Company
Project: Quarterly RO Reject

Sample ID	**MB-R38749**	SampType:	**MBLK**	TestCode:	**EPA 903.1: Ra 226 and EPA 904.0: Ra 228-Subbed**
Client ID:	**PBW**	Batch ID:	**R38749**	RunNo:	**38749**
Prep Date:		Analysis Date:	**11/16/2016**	SeqNo:	**1210512** Units: **pCi/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Radium-226	0	0.518								
Radium-226 ±	0.321	0.518								
Radium-228	0.2	0.627								
Radium-228 ±	0.292	0.627								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1610613**

16-Nov-16

Client: Navajo Refining Company

Project: Quarterly RO Reject

Sample ID	**MB-28134**	SampType:	**MBLK**	TestCode:	**SM2540C MOD: Total Dissolved Solids**					
Client ID:	**PBW**	Batch ID:	**28134**	RunNo:	**38086**					
Prep Date:	**10/18/2016**	Analysis Date:	**10/20/2016**	SeqNo:	**1188295**	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-28134**	SampType:	**LCS**	TestCode:	**SM2540C MOD: Total Dissolved Solids**					
Client ID:	**LCSW**	Batch ID:	**28134**	RunNo:	**38086**					
Prep Date:	**10/18/2016**	Analysis Date:	**10/20/2016**	SeqNo:	**1188296**	Units:	**mg/L**			

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1010	20.0	1000	0	101	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: NAVAJO REFINING CO Work Order Number: 1610613 RcptNo: 1

Received by/date: JC 10/13/16

Logged By: **Ashley Gallegos** 10/13/2016 8:30:00 AM

Completed By: **Ashley Gallegos** 10/13/2016 11:53:15 AM

Reviewed By: JC 10/13/16

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: 5 1 (<2 or >12 unless noted)

Adjusted? No

Checked by: AJ

Special Handling (if applicable)

16. 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: _____

17. Additional remarks:

18. **Cooler Information**

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.0	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refinery

Mailing Address: P.O. Box 159 Artesia, NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

X Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

X Standard ☐ Rush _____

Project Name: Quarterly R.O. Reject

Project #: P.O. # 167796

Project Manager: Robert Combs

Sampler: Brady Hubbard

On Ice: X Yes ☐ No

Sample Temperature: 2.6

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

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

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1610013	8260B:WQCC List VOCs	8270C: WQCC list SVOCs	6010B: WQCC Metals	335.4: Total Cyanide	7470: Mercury	8015: GRO, DRO, ORO	8082: PCBs	Radioactivity (Ra-226+Ra-228)	Sulfate Chloride	Phenols	Fluoride	Nitrate/Nitrite	Total Dissolved Solids	PH	504.1:EDB	Air Bubbles (Y or N)
10-11	10:00	liquid	R.O. Reject	2 - 500ml P	1-unpres 1-H2SO4	-001									X		X	X	X	X		Y
10-11	10:00	liquid	R.O. Reject	3-40ml VOA	HCL		X															
10-11	10:00	liquid	R.O. Reject	1-500ml P	HNO3						X											
10-11	10:00	liquid	R.O. Reject	1-125ml P	HNO3				X													
10-11	10:00	liquid	R.O. Reject	1-500ml P	NaOH					X												
10-11	10:00	liquid	R.O. Reject	2- 1L P	HNO3									X								
10-11	10:00	liquid	R.O. Reject	3-40ml VOA	Na2S2O3																X	
10-11	10:00	liquid	R.O. Reject	2 - 1L Glass	unpres								X									
10-11	10:00	liquid	R.O. Reject	1 - 1L Glass	unpres			X														
10-11	10:00	liquid	R.O. Reject	3-40ml VOA	HCl							X										
10/11	10:00	liquid	R.O. Reject	1-250mlGlass	unpres							X										
10-11	10:00	liquid	R.O. Reject	1 - 1L Glass	H2SO4											X						
10-11	10:00	liquid	Trip Blank	2-40ml VOA	HCL	-002																

Date:	Time:	Relinquished by:	Received by:	Date	Time
10-12	11:00	Brady Hubbard	Lindsay Concha	10/13/16	0830
Date:	Time:	Relinquished by:	Received by:	Date	Time

Remarks:

Metals: As, Al, Ba, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, U, Zn

VOCs: 1,1,1-Trichloroethane; 1,1,2,2-Tetrachloroethane; 1,1,2,2-Tetrachloroethylene; 1,1,2-Trichloroethane; 1,1,2-Trichloroethylene; 1,1-Dichloroethane; 1,1-Dichloroethene; 1,2-Dibromoethane; 1,2-Dichloroethane; Benzene; Carbon Tetrachloride; Chloroform; Dichloromethane; Ethylbenzene; Toluene; Total Xylenes; Vinyl Chloride

SVOCs: benzo(a)pyrene, phenol, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene

HOLLYFRONTIER

February 15, 2017

Submitted electronically via email to jim.griswold@state.nm.us and carlj.chavez@state.nm.us

Oil Conservation Division
New Mexico Energy, Minerals & Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: Discharge Permit GW-028
Monthly Report – January 2017 Reporting Period

Dear Sirs:

In accordance with Condition 4.B.7 of Discharge Permit GW-028 (the Permit), the HollyFrontier Navajo Refining LLC (Navajo), Artesia, New Mexico, Refinery (the Refinery) hereby submits the required monthly report to the New Mexico Energy, Minerals, and Natural Resources Department, Oil Conservation Division (OCD). This letter and all attachments provided herein constitute Navajo's January 2016 monthly report, for the period of January 1-31, 2017, under the Permit.

Specifically, this report covers the January 2017 reporting period and includes the following data and information as required by Condition 4.B.7:

- Daily discharge flow measurements for each reverse osmosis (RO) unit, which were collected as required by Condition 4.B.4.

Flow rates, volumes, and discharge locations for the RO reject fluid is monitored from the three permanent RO units on a daily basis. Daily discharge rates and volumes are provided in Attachment 1. Per Mr. Chavez' request, the total discharge for the month is also shown in Attachment 1.

To satisfy the quarterly sampling requirement of Condition 4.B.1 of the Permit for the fourth quarter, samples were collected for the RO reject streams from the permanent units on January 5, 2017. The samples were analyzed for the constituents listed in sections 20.6.2.3103A, B, and C of the New Mexico Administrative Code (NMAC) and using the methods specified in Navajo's Facility Wide Groundwater Monitoring Program (FWGWMP). The corresponding analytical results are provided in Attachment 2.

On October 21, 2016, Navajo notified OCD of its selection of a Class 1 disposal well as an alternative disposal method for the RO reject. Navajo submitted a revised application to renew and modify Discharge Permit GW-028 on January 13, 2017, to reflect this selection.

Navajo is committed to proactively meeting the requirements of the Permit and working cooperatively with OCD. If you have any questions or comments, please contact me at 575-746-5487.

Sincerely,

Scott M. Denton
Environmental Manager

Enclosures:

Attachment 1: Daily Discharge Flowrates and Volumes
Attachment 2: Analytical Lab Report

cc. HFC: D. McWatters, R. O'Brien, M. Holder
OCD: A. Marks, B. Brancard

Attachment 1
Daily Discharge Flowrates and Volumes

Daily RO Reject Discharge Flow Rate Measurements and Calculated Daily Discharge

	Permanent RO Units				Daily Discharge Volume
	Metered Data			Combined RO Reject Discharge (Calculated)	
	GPM SOUTH	GPM NORTH	GPM MIDDLE	GPM	BBL/DAY
1/1/2017	0.00	128.70	125.72	254.42	8,722.97
1/2/2017	0.00	128.90	125.67	254.57	8,728.11
1/3/2017	0.00	128.73	125.77	254.50	8,725.71
1/4/2017	0.00	128.72	125.61	254.33	8,719.89
1/5/2017	0.15	128.90	125.86	254.90	8,739.43
1/6/2017	0.00	126.99	125.41	252.40	8,653.71
1/7/2017	0.00	124.68	124.50	249.19	8,543.66
1/8/2017	0.00	124.60	124.03	248.63	8,524.46
1/9/2017	0.00	115.64	116.60	232.25	7,962.86
1/10/2017	0.00	121.95	125.59	247.54	8,487.09
1/11/2017	0.00	122.38	126.03	248.41	8,516.91
1/12/2017	0.00	122.27	127.79	250.06	8,573.49
1/13/2017	21.23	107.10	128.94	257.27	8,820.69
1/14/2017	134.75	38.19	129.63	302.57	10,373.83
1/15/2017	136.47	39.28	130.72	306.47	10,507.54
1/16/2017	135.08	38.13	130.27	303.48	10,405.03
1/17/2017	135.69	38.65	130.06	304.40	10,436.57
1/18/2017	138.87	10.23	132.21	281.31	9,644.91
1/19/2017	123.39	64.66	131.14	319.18	10,943.31
1/20/2017	100.50	123.69	129.28	353.46	12,118.63
1/21/2017	97.46	122.80	129.00	349.26	11,974.63
1/22/2017	110.04	72.43	130.03	312.49	10,713.94
1/23/2017	125.38	42.27	131.51	299.15	10,256.57
1/24/2017	126.09	44.09	131.21	301.39	10,333.37
1/25/2017	126.86	43.15	131.16	301.16	10,325.49
1/26/2017	127.32	42.46	131.19	300.98	10,319.31
1/27/2017	127.20	42.55	130.96	300.72	10,310.40
1/28/2017	127.16	40.74	130.99	298.89	10,247.66
1/29/2017	127.49	16.81	131.11	275.41	9,442.63
1/30/2017	127.90	0.10	131.11	259.11	8,883.77
1/31/2017	127.71	0.07	130.88	258.66	8,868.34
TOTAL (bbls/month)					**297,824.91**

Attachment 2
Analytical Lab Report

HALL
ENVIRONMENTAL
ANALYSIS
LABORATORY

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

February 14, 2017

Mike Holder

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

RE: Quarterly R.O. Reject

OrderNo.: 1701253

Dear Mike Holder:

Hall Environmental Analysis Laboratory received 2 sample(s) on 1/9/2017 for the analyses presented in the following report.

This report is a revised report and it replaces the original report issued February 06, 2017.

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. 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. All samples are reported as received unless otherwise indicated.

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

Sincerely,

Andy Freeman
Laboratory Manager
4901 Hawkins NE
Albuquerque, NM 87109

Hall Environmental Analysis Laboratory, Inc.

Analytical Report
Lab Order **1701253**
Date Reported: **2/14/2017**

CLIENT: Navajo Refining Company
Project: Quarterly R.O. Reject
Lab ID: 1701253-001 **Matrix:** AQUEOUS

Client Sample ID: R.O. Reject
Collection Date: 1/5/2017 4:30:00 PM
Received Date: 1/9/2017 9:20:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA 200.8: DISSOLVED METALS						Analyst: **JLF**	
Arsenic	ND	0.0050		mg/L	5	1/13/2017 5:17:37 PM	C40026
Lead	ND	0.0025		mg/L	5	1/13/2017 5:17:37 PM	C40026
Selenium	0.010	0.0050		mg/L	5	1/13/2017 5:17:37 PM	C40026
Uranium	0.0052	0.0025		mg/L	5	1/13/2017 5:17:37 PM	C40026
EPA 903.1: RA 226 AND EPA 904.0: RA 228-SUBBED						Analyst: **SUB**	
Radium-226	1.29	0.662		pCi/L	1	2/2/2017	R40526
Radium-226 ±	0.644	0.662		pCi/L	1	2/2/2017	R40526
Radium-228	0.624	1.02		pCi/L	1	2/2/2017	R40526
Radium-228 ±	0.507	1.02		pCi/L	1	2/2/2017	R40526
EPA METHOD 300.0: ANIONS						Analyst: **LGT**	
Fluoride	3.5	2.0		mg/L	20	1/9/2017 10:08:12 PM	R39919
Chloride	74	10		mg/L	20	1/9/2017 10:08:12 PM	R39919
Sulfate	1400	50		mg/L	100	1/11/2017 1:08:20 AM	R39952
Nitrate+Nitrite as N	2.3	1.0		mg/L	5	1/10/2017 12:12:18 AM	R39919
SM2540C MOD: TOTAL DISSOLVED SOLIDS						Analyst: **KS**	
Total Dissolved Solids	3410	20.0	*	mg/L	1	1/11/2017 5:59:00 PM	29623
EPA 335.4: TOTAL CYANIDE SUBBED						Analyst: **LSB**	
Cyanide	ND	0.0100		mg/L	1	1/16/2017	R40523
SM4500-H+B: PH						Analyst: **JRR**	
pH	7.87	1.68	H	pH units	1	1/9/2017 3:34:06 PM	R39934
EPA METHOD 200.7: DISSOLVED METALS						Analyst: **TES**	
Aluminum	ND	0.020		mg/L	1	1/22/2017 9:55:24 PM	A40181
Barium	0.066	0.0020		mg/L	1	1/24/2017 11:12:53 AM	A40223
Boron	0.10	0.040		mg/L	1	1/24/2017 11:12:53 AM	A40223
Cadmium	ND	0.0020		mg/L	1	1/24/2017 11:12:53 AM	A40223
Chromium	ND	0.0060		mg/L	1	1/24/2017 11:12:53 AM	A40223
Cobalt	ND	0.0060		mg/L	1	1/24/2017 11:12:53 AM	A40223
Copper	ND	0.0060		mg/L	1	1/26/2017 9:36:42 AM	A40288
Iron	ND	0.020		mg/L	1	1/24/2017 11:12:53 AM	A40223
Manganese	ND	0.0020		mg/L	1	1/24/2017 11:12:53 AM	A40223
Molybdenum	0.0088	0.0080		mg/L	1	1/24/2017 11:12:53 AM	A40223
Nickel	ND	0.010		mg/L	1	1/24/2017 11:12:53 AM	A40223
Silver	ND	0.0050		mg/L	1	1/24/2017 11:12:53 AM	A40223
Zinc	0.023	0.010		mg/L	1	1/24/2017 11:40:30 AM	A40223
EPA METHOD 245.1: MERCURY						Analyst: **MED**	
Mercury	ND	0.00020		mg/L	1	1/10/2017 12:14:44 PM	29608

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Project: Quarterly R.O. Reject
Lab ID: 1701253-001 **Matrix:** AQUEOUS

Client Sample ID: R.O. Reject
Collection Date: 1/5/2017 4:30:00 PM
Received Date: 1/9/2017 9:20:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **DJF**	
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	1/12/2017 2:15:17 PM	G39990
Surr: BFB	87.6	70-130		%Rec	1	1/12/2017 2:15:17 PM	G39990
EPA METHOD 8011/504.1: EDB						Analyst: **JME**	
1,2-Dibromoethane	ND	0.010		µg/L	1	1/10/2017 10:10:43 AM	29609
EPA METHOD 8082: PCB'S						Analyst: **SCC**	
Aroclor 1016	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Aroclor 1221	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Aroclor 1232	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Aroclor 1242	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Aroclor 1248	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Aroclor 1254	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Aroclor 1260	ND	1.0		µg/L	1	1/11/2017 10:44:00 AM	29618
Surr: Decachlorobiphenyl	60.4	26.1-140		%Rec	1	1/11/2017 10:44:00 AM	29618
Surr: Tetrachloro-m-xylene	53.2	15-123		%Rec	1	1/11/2017 10:44:00 AM	29618
EPA METHOD 8015M/D: DIESEL RANGE						Analyst: **TOM**	
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	1/12/2017 4:33:48 PM	29657
Motor Oil Range Organics (MRO)	ND	5.0		mg/L	1	1/12/2017 4:33:48 PM	29657
Surr: DNOP	115	77.1-144		%Rec	1	1/12/2017 4:33:48 PM	29657
EPA METHOD 8310: PAHS						Analyst: **SCC**	
Naphthalene	ND	2.0		µg/L	1	1/11/2017 12:16:05 PM	29615
1-Methylnaphthalene	ND	2.0		µg/L	1	1/11/2017 12:16:05 PM	29615
2-Methylnaphthalene	ND	2.0		µg/L	1	1/11/2017 12:16:05 PM	29615
Benzo(a)pyrene	ND	0.070		µg/L	1	1/11/2017 12:16:05 PM	29615
Surr: Benzo(e)pyrene	81.0	24.4-130		%Rec	1	1/11/2017 12:16:05 PM	29615
EPA METHOD 8260B: VOLATILES						Analyst: **DJF**	
Benzene	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Toluene	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Ethylbenzene	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Carbon Tetrachloride	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Chloroform	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
1,1-Dichloroethane	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
1,1-Dichloroethene	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Methylene Chloride	ND	3.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Project: Quarterly R.O. Reject
Lab ID: 1701253-001 **Matrix:** AQUEOUS

Client Sample ID: R.O. Reject
Collection Date: 1/5/2017 4:30:00 PM
Received Date: 1/9/2017 9:20:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8260B: VOLATILES						Analyst: **DJF**	
1,1,1-Trichloroethane	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
1,1,2-Trichloroethane	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Trichloroethene (TCE)	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Vinyl chloride	ND	1.0		µg/L	1	1/9/2017 5:53:01 PM	W39912
Xylenes, Total	ND	1.5		µg/L	1	1/9/2017 5:53:01 PM	W39912
Surr: 1,2-Dichloroethane-d4	107	70-130		%Rec	1	1/9/2017 5:53:01 PM	W39912
Surr: 4-Bromofluorobenzene	86.6	70-130		%Rec	1	1/9/2017 5:53:01 PM	W39912
Surr: Dibromofluoromethane	118	70-130		%Rec	1	1/9/2017 5:53:01 PM	W39912
Surr: Toluene-d8	87.9	70-130		%Rec	1	1/9/2017 5:53:01 PM	W39912
TOTAL PHENOLICS BY SW-846 9067						Analyst: **SCC**	
Phenolics, Total Recoverable	ND	2.5		µg/L	1	1/25/2017	29866

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Navajo Refining Company
Project: Quarterly R.O. Reject
Lab ID: 1701253-002

Client Sample ID: Trip Blank
Collection Date:
Matrix: TRIP BLANK **Received Date:** 1/9/2017 9:20:00 AM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 8015D: GASOLINE RANGE						Analyst: **DJF**	
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	1/12/2017 3:43:50 PM	G39990
Surr: BFB	83.7	70-130		%Rec	1	1/12/2017 3:43:50 PM	G39990
EPA METHOD 8011/504.1: EDB						Analyst: **JME**	
1,2-Dibromoethane	ND	0.010		µg/L	1	1/10/2017 10:25:50 AM	29609
EPA METHOD 8260B: VOLATILES						Analyst: **DJF**	
Benzene	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Toluene	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Ethylbenzene	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,2-Dichloroethane (EDC)	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,2-Dibromoethane (EDB)	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Carbon Tetrachloride	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Chloroform	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,1-Dichloroethane	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,1-Dichloroethene	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Methylene Chloride	ND	3.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,1,2,2-Tetrachloroethane	ND	2.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Tetrachloroethene (PCE)	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,1,1-Trichloroethane	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
1,1,2-Trichloroethane	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Trichloroethene (TCE)	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Vinyl chloride	ND	1.0		µg/L	1	1/9/2017 6:22:09 PM	W39912
Xylenes, Total	ND	1.5		µg/L	1	1/9/2017 6:22:09 PM	W39912
Surr: 1,2-Dichloroethane-d4	103	70-130		%Rec	1	1/9/2017 6:22:09 PM	W39912
Surr: 4-Bromofluorobenzene	86.8	70-130		%Rec	1	1/9/2017 6:22:09 PM	W39912
Surr: Dibromofluoromethane	116	70-130		%Rec	1	1/9/2017 6:22:09 PM	W39912
Surr: Toluene-d8	88.9	70-130		%Rec	1	1/9/2017 6:22:09 PM	W39912

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

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company
Project: Quarterly R.O. Reject

Sample ID **MB-A**	SampType: **MBLK**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **PBW**	Batch ID: **A40181**	RunNo: **40181**
Prep Date:	Analysis Date: **1/22/2017**	SeqNo: **1259966** Units: **mg/L**

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

Sample ID **LLLCS-A**	SampType: **LCSLL**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC**	Batch ID: **A40181**	RunNo: **40181**
Prep Date:	Analysis Date: **1/22/2017**	SeqNo: **1259967** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	ND	0.020	0.01000	0	104	50	150			

Sample ID **LCS-A**	SampType: **LCS**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW**	Batch ID: **A40181**	RunNo: **40181**
Prep Date:	Analysis Date: **1/22/2017**	SeqNo: **1259968** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aluminum	0.53	0.020	0.5000	0	106	85	115			

Sample ID **MB-A**	SampType: **MBLK**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **PBW**	Batch ID: **A40223**	RunNo: **40223**
Prep Date:	Analysis Date: **1/24/2017**	SeqNo: **1261933** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	ND	0.0020								
Boron	ND	0.040								
Cadmium	ND	0.0020								
Chromium	ND	0.0060								
Cobalt	ND	0.0060								
Iron	ND	0.020								
Manganese	ND	0.0020								
Molybdenum	ND	0.0080								
Nickel	ND	0.010								
Silver	ND	0.0050								
Zinc	ND	0.010								

Sample ID **LCS-A**	SampType: **LCS**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW**	Batch ID: **A40223**	RunNo: **40223**
Prep Date:	Analysis Date: **1/24/2017**	SeqNo: **1261934** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.48	0.0020	0.5000	0	96.4	85	115			
Boron	0.50	0.040	0.5000	0	99.6	85	115			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **LCS-A**	SampType: **LCS**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **LCSW**	Batch ID: **A40223**	RunNo: **40223**
Prep Date:	Analysis Date: **1/24/2017**	SeqNo: **1261934** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cadmium	0.49	0.0020	0.5000	0	97.1	85	115			
Chromium	0.48	0.0060	0.5000	0	95.4	85	115			
Cobalt	0.46	0.0060	0.5000	0	91.8	85	115			
Iron	0.47	0.020	0.5000	0	93.5	85	115			
Manganese	0.47	0.0020	0.5000	0	94.2	85	115			
Molybdenum	0.50	0.0080	0.5000	0	101	85	115			
Nickel	0.45	0.010	0.5000	0	90.4	85	115			
Silver	0.098	0.0050	0.1000	0	97.9	85	115			
Zinc	0.47	0.010	0.5000	0	93.5	85	115			

Sample ID **LLLCS-A**	SampType: **LCSLL**	TestCode: **EPA Method 200.7: Dissolved Metals**
Client ID: **BatchQC**	Batch ID: **A40223**	RunNo: **40223**
Prep Date:	Analysis Date: **1/24/2017**	SeqNo: **1261935** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Barium	0.0022	0.0020	0.002000	0	112	50	150			
Boron	0.040	0.040	0.04000	0	101	50	150			
Cadmium	ND	0.0020	0.002000	0	98.5	50	150			
Chromium	0.0060	0.0060	0.006000	0	101	50	150			
Cobalt	ND	0.0060	0.006000	0	98.5	50	150			
Iron	ND	0.020	0.02000	0	99.3	50	150			
Manganese	ND	0.0020	0.002000	0	92.5	50	150			
Molybdenum	0.0092	0.0080	0.008000	0	115	50	150			
Nickel	ND	0.010	0.005000	0	110	50	150			
Silver	0.0052	0.0050	0.005000	0	105	50	150			
Zinc	ND	0.010	0.005000	0	109	50	150			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company
Project: Quarterly R.O. Reject

Sample ID	**1701253-001GMSDL**	SampType: **MSD**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**R.O. Reject**	Batch ID: **C40026**			RunNo: **40026**				
Prep Date:		Analysis Date: **1/13/2017**			SeqNo: **1254502**	Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.14	0.0050	0.1250	0.002183	108	70	130	0.715	20	
Lead	0.064	0.0025	0.06250	0	102	70	130	0.187	20	
Selenium	0.14	0.0050	0.1250	0.01048	106	70	130	1.86	20	
Uranium	0.071	0.0025	0.06250	0.005175	105	70	130	0.245	20	

Sample ID	**1701253-001GMSLL**	SampType: **MS**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**R.O. Reject**	Batch ID: **C40026**			RunNo: **40026**				
Prep Date:		Analysis Date: **1/13/2017**			SeqNo: **1254503**	Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.14	0.0050	0.1250	0.002183	107	70	130			
Lead	0.064	0.0025	0.06250	0	102	70	130			
Selenium	0.14	0.0050	0.1250	0.01048	104	70	130			
Uranium	0.071	0.0025	0.06250	0.005175	105	70	130			

Sample ID	**LCS**	SampType: **LCS**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**LCSW**	Batch ID: **C40026**			RunNo: **40026**				
Prep Date:		Analysis Date: **1/13/2017**			SeqNo: **1254506**	Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	0.025	0.0010	0.02500	0	98.8	85	115			
Lead	0.013	0.00050	0.01250	0	100	85	115			
Selenium	0.026	0.0010	0.02500	0	103	85	115			
Uranium	0.012	0.00050	0.01250	0	98.4	85	115			

Sample ID	**LLLCS**	SampType: **LCSLL**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**BatchQC**	Batch ID: **C40026**			RunNo: **40026**				
Prep Date:		Analysis Date: **1/13/2017**			SeqNo: **1254507**	Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.0010	0.001000	0	98.2	50	150			
Lead	0.00052	0.00050	0.0005000	0	104	50	150			
Selenium	0.0010	0.0010	0.001000	0	102	50	150			
Uranium	0.00050	0.00050	0.0005000	0	100	50	150			

Sample ID	**MB**	SampType: **MBLK**			TestCode: **EPA 200.8: Dissolved Metals**				
Client ID:	**PBW**	Batch ID: **C40026**			RunNo: **40026**				
Prep Date:		Analysis Date: **1/13/2017**			SeqNo: **1254508**	Units: **mg/L**			
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA 200.8: Dissolved Metals**
Client ID: **PBW**	Batch ID: **C40026**	RunNo: **40026**
Prep Date:	Analysis Date: **1/13/2017**	SeqNo: **1254508** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Arsenic	ND	0.0010								
Lead	ND	0.00050								
Selenium	ND	0.0010								
Uranium	ND	0.00050								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID	**MB-29608**	SampType:	**MBLK**	TestCode:	**EPA Method 245.1: Mercury**					
Client ID:	**PBW**	Batch ID:	**29608**	RunNo:	**39928**					
Prep Date:	**1/9/2017**	Analysis Date:	**1/10/2017**	SeqNo:	**1251284**	Units:	**mg/L**			

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

Sample ID	**LCS-29608**	SampType:	**LCS**	TestCode:	**EPA Method 245.1: Mercury**					
Client ID:	**LCSW**	Batch ID:	**29608**	RunNo:	**39928**					
Prep Date:	**1/9/2017**	Analysis Date:	**1/10/2017**	SeqNo:	**1251285**	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	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R39919**	RunNo: **39919**
Prep Date:	Analysis Date: **1/9/2017**	SeqNo: **1251098** 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								
Nitrate+Nitrite as N	ND	0.20								

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R39919**	RunNo: **39919**
Prep Date:	Analysis Date: **1/9/2017**	SeqNo: **1251099** 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	4.8	0.50	5.000	0	96.8	90	110			
Nitrate+Nitrite as N	3.5	0.20	3.500	0	101	90	110			

Sample ID **MB**	SampType: **MBLK**	TestCode: **EPA Method 300.0: Anions**
Client ID: **PBW**	Batch ID: **R39952**	RunNo: **39952**
Prep Date:	Analysis Date: **1/10/2017**	SeqNo: **1251860** Units: **mg/L**

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

Sample ID **LCS**	SampType: **LCS**	TestCode: **EPA Method 300.0: Anions**
Client ID: **LCSW**	Batch ID: **R39952**	RunNo: **39952**
Prep Date:	Analysis Date: **1/10/2017**	SeqNo: **1251861** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Sulfate	9.4	0.50	10.00	0	94.5	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **MB-29609**	SampType: **MBLK**	TestCode: **EPA Method 8011/504.1: EDB**
Client ID: **PBW**	Batch ID: **29609**	RunNo: **39918**
Prep Date: **1/10/2017**	Analysis Date: **1/10/2017**	SeqNo: **1251243** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,2-Dibromoethane	ND	0.010								

Sample ID **LCS-29609**	SampType: **LCS**	TestCode: **EPA Method 8011/504.1: EDB**
Client ID: **LCSW**	Batch ID: **29609**	RunNo: **39918**
Prep Date: **1/10/2017**	Analysis Date: **1/10/2017**	SeqNo: **1251245** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
1,2-Dibromoethane	0.094	0.010	0.1000	0	93.8	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **LCS-29657**	SampType: **LCS**	TestCode: **EPA Method 8015M/D: Diesel Range**
Client ID: **LCSW**	Batch ID: **29657**	RunNo: **39973**
Prep Date: **1/12/2017**	Analysis Date: **1/12/2017**	SeqNo: **1252916** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	5.5	1.0	5.000	0	110	63.2	155			
Surr: DNOP	0.56		0.5000		111	77.1	144			

Sample ID **MB-29657**	SampType: **MBLK**	TestCode: **EPA Method 8015M/D: Diesel Range**
Client ID: **PBW**	Batch ID: **29657**	RunNo: **39973**
Prep Date: **1/12/2017**	Analysis Date: **1/12/2017**	SeqNo: **1252917** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Diesel Range Organics (DRO)	ND	1.0								
Motor Oil Range Organics (MRO)	ND	5.0								
Surr: DNOP	1.1		1.000		108	77.1	144			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company
Project: Quarterly R.O. Reject

Sample ID **MB-29618** SampType: **MBLK** TestCode: **EPA Method 8082: PCB's**
Client ID: **PBW** Batch ID: **29618** RunNo: **39949**
Prep Date: **1/10/2017** Analysis Date: **1/11/2017** SeqNo: **1251667** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1016	ND	1.0								
Aroclor 1221	ND	1.0								
Aroclor 1232	ND	1.0								
Aroclor 1242	ND	1.0								
Aroclor 1248	ND	1.0								
Aroclor 1254	ND	1.0								
Aroclor 1260	ND	1.0								
Surr: Decachlorobiphenyl	1.6		2.500		63.2	26.1	140			
Surr: Tetrachloro-m-xylene	1.4		2.500		55.2	15	123			

Sample ID **LCS-29618(1221)** SampType: **LCS** TestCode: **EPA Method 8082: PCB's**
Client ID: **LCSW** Batch ID: **29618** RunNo: **39949**
Prep Date: **1/10/2017** Analysis Date: **1/11/2017** SeqNo: **1251690** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1221	3.1	1.0	5.000	0	61.8	15	200			
Surr: Decachlorobiphenyl	1.8		2.500		71.6	26.1	140			
Surr: Tetrachloro-m-xylene	1.2		2.500		48.0	15	123			

Sample ID **LCSD-29618(1221)** SampType: **LCSD** TestCode: **EPA Method 8082: PCB's**
Client ID: **LCSS02** Batch ID: **29618** RunNo: **39949**
Prep Date: **1/10/2017** Analysis Date: **1/11/2017** SeqNo: **1252020** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1221	3.4	1.0	5.000	0	68.4	15	200	10.1	0	
Surr: Decachlorobiphenyl	1.8		2.500		72.8	26.1	140	0	0	
Surr: Tetrachloro-m-xylene	1.3		2.500		50.8	15	123	0	0	

Sample ID **LCS-29618(1232)** SampType: **LCS** TestCode: **EPA Method 8082: PCB's**
Client ID: **LCSW** Batch ID: **29618** RunNo: **39949**
Prep Date: **1/10/2017** Analysis Date: **1/11/2017** SeqNo: **1252021** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1232	3.6	1.0	5.000	0	73.0	15	200			
Surr: Decachlorobiphenyl	1.8		2.500		70.4	26.1	140			
Surr: Tetrachloro-m-xylene	1.6		2.500		62.4	15	123			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **LCSD-29618(1232)**	SampType: **LCSD**	TestCode: **EPA Method 8082: PCB's**							
Client ID: **LCSS02**	Batch ID: **29618**	RunNo: **39949**							
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252022**	Units: **µg/L**						
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Aroclor 1232	3.6	1.0	5.000	0	72.0	15	200	1.38	0	
Surr: Decachlorobiphenyl	1.7		2.500		68.8	26.1	140	0	0	
Surr: Tetrachloro-m-xylene	1.5		2.500		61.6	15	123	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **rb**	SampType: **MBLK**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **PBW**	Batch ID: **W39912**	RunNo: **39912**
Prep Date:	Analysis Date: **1/9/2017**	SeqNo: **1250932** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	ND	1.0								
Toluene	ND	1.0								
Ethylbenzene	ND	1.0								
1,2-Dichloroethane (EDC)	ND	1.0								
1,2-Dibromoethane (EDB)	ND	1.0								
Carbon Tetrachloride	ND	1.0								
Chloroform	ND	1.0								
1,1-Dichloroethane	ND	1.0								
1,1-Dichloroethene	ND	1.0								
Methylene Chloride	ND	3.0								
1,1,2,2-Tetrachloroethane	ND	2.0								
Tetrachloroethene (PCE)	ND	1.0								
1,1,1-Trichloroethane	ND	1.0								
1,1,2-Trichloroethane	ND	1.0								
Trichloroethene (TCE)	ND	1.0								
Vinyl chloride	ND	1.0								
Xylenes, Total	ND	1.5								
Surr: 1,2-Dichloroethane-d4	9.1		10.00		91.4	70	130			
Surr: 4-Bromofluorobenzene	9.1		10.00		91.2	70	130			
Surr: Dibromofluoromethane	9.7		10.00		97.5	70	130			
Surr: Toluene-d8	8.9		10.00		88.9	70	130			

Sample ID **100ng lcs**	SampType: **LCS**	TestCode: **EPA Method 8260B: VOLATILES**
Client ID: **LCSW**	Batch ID: **W39912**	RunNo: **39912**
Prep Date:	Analysis Date: **1/9/2017**	SeqNo: **1250933** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzene	23	1.0	20.00	0	115	70	130			
Toluene	19	1.0	20.00	0	97.2	70	130			
1,1-Dichloroethene	20	1.0	20.00	0	102	70	130			
Trichloroethene (TCE)	22	1.0	20.00	0	109	70	130			
Surr: 1,2-Dichloroethane-d4	9.4		10.00		93.8	70	130			
Surr: 4-Bromofluorobenzene	9.0		10.00		89.5	70	130			
Surr: Dibromofluoromethane	9.8		10.00		98.4	70	130			
Surr: Toluene-d8	9.1		10.00		91.5	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **MB-29615**	SampType: **MBLK**	TestCode: **EPA Method 8310: PAHs**
Client ID: **PBW**	Batch ID: **29615**	RunNo: **39968**
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252566** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	ND	2.0								
1-Methylnaphthalene	ND	2.0								
2-Methylnaphthalene	ND	2.0								
Acenaphthylene	ND	2.5								
Acenaphthene	ND	2.0								
Fluorene	ND	0.80								
Phenanthrene	ND	0.60								
Anthracene	ND	0.60								
Fluoranthene	ND	0.30								
Pyrene	ND	0.30								
Benz(a)anthracene	ND	0.070								
Chrysene	ND	0.20								
Benzo(b)fluoranthene	ND	0.10								
Benzo(k)fluoranthene	ND	0.070								
Benzo(a)pyrene	ND	0.070								
Dibenz(a,h)anthracene	ND	0.12								
Benzo(g,h,i)perylene	ND	0.12								
Indeno(1,2,3-cd)pyrene	ND	0.25								
Surr: Benzo(e)pyrene	17		20.00		83.8	24.4	130			

Sample ID **LCS-29615**	SampType: **LCS**	TestCode: **EPA Method 8310: PAHs**
Client ID: **LCSW**	Batch ID: **29615**	RunNo: **39968**
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252567** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	47	2.0	80.00	0	59.0	33.3	141			
1-Methylnaphthalene	45	2.0	80.20	0	56.4	35.5	139			
2-Methylnaphthalene	43	2.0	80.00	0	54.1	30.7	139			
Acenaphthylene	53	2.5	80.20	0	65.8	60.2	119			
Acenaphthene	49	2.0	80.00	0	61.9	56	126			
Fluorene	5.0	0.80	8.020	0	61.7	51.6	129			
Phenanthrene	2.8	0.60	4.020	0	69.7	58.8	129			
Anthracene	2.7	0.60	4.020	0	66.9	59.9	121			
Fluoranthene	5.9	0.30	8.020	0	72.9	48	145			
Pyrene	6.3	0.30	8.020	0	78.7	56.2	130			
Benz(a)anthracene	0.58	0.070	0.8020	0	72.3	50.4	142			
Chrysene	3.0	0.20	4.020	0	73.9	54.7	134			
Benzo(b)fluoranthene	0.73	0.10	1.002	0	72.9	61.8	120			
Benzo(k)fluoranthene	0.37	0.070	0.5000	0	74.0	55.9	134			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **LCS-29615**	SampType: **LCS**	TestCode: **EPA Method 8310: PAHs**
Client ID: **LCSW**	Batch ID: **29615**	RunNo: **39968**
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252567** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Benzo(a)pyrene	0.36	0.070	0.5020	0	71.7	49.1	142			
Dibenz(a,h)anthracene	0.76	0.12	1.002	0	75.8	57.8	134			
Benzo(g,h,i)perylene	0.77	0.12	1.000	0	77.0	57.2	134			
Indeno(1,2,3-cd)pyrene	1.4	0.25	2.004	0	68.9	58.2	137			
Surr: Benzo(e)pyrene	15		20.00		75.3	24.4	130			

Sample ID **LCSD-29615**	SampType: **LCSD**	TestCode: **EPA Method 8310: PAHs**
Client ID: **LCSS02**	Batch ID: **29615**	RunNo: **39968**
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252568** Units: **µg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Naphthalene	43	2.0	80.00	0	53.3	33.3	141	10.2	20.3	
1-Methylnaphthalene	41	2.0	80.20	0	51.0	35.5	139	10.0	22.7	
2-Methylnaphthalene	39	2.0	80.00	0	49.0	30.7	139	9.91	22.6	
Acenaphthylene	48	2.5	80.20	0	59.6	60.2	119	9.90	22.6	S
Acenaphthene	45	2.0	80.00	0	56.1	56	126	9.70	21.4	
Fluorene	4.6	0.80	8.020	0	57.1	51.6	129	7.76	23.6	
Phenanthrene	2.5	0.60	4.020	0	62.2	58.8	129	11.3	24.7	
Anthracene	2.4	0.60	4.020	0	59.5	59.9	121	11.8	23.9	S
Fluoranthene	5.3	0.30	8.020	0	65.6	48	145	10.6	25.1	
Pyrene	5.7	0.30	8.020	0	70.8	56.2	130	10.5	23.7	
Benz(a)anthracene	0.52	0.070	0.8020	0	64.8	50.4	142	10.9	19.2	
Chrysene	2.6	0.20	4.020	0	65.7	54.7	134	11.8	19.8	
Benzo(b)fluoranthene	0.66	0.10	1.002	0	65.9	61.8	120	10.1	22.1	
Benzo(k)fluoranthene	0.33	0.070	0.5000	0	66.0	55.9	134	11.4	27.2	
Benzo(a)pyrene	0.32	0.070	0.5020	0	63.7	49.1	142	11.8	30.2	
Dibenz(a,h)anthracene	0.69	0.12	1.002	0	68.9	57.8	134	9.66	23.8	
Benzo(g,h,i)perylene	0.69	0.12	1.000	0	69.0	57.2	134	11.0	19.1	
Indeno(1,2,3-cd)pyrene	1.2	0.25	2.004	0	61.4	58.2	137	11.5	19.6	
Surr: Benzo(e)pyrene	14		20.00		67.6	24.4	130	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID	**MB-29866**	SampType:	**MBLK**		TestCode:	**Total Phenolics by SW-846 9067**				
Client ID:	**PBW**	Batch ID:	**29866**		RunNo:	**40252**				
Prep Date:	**1/25/2017**	Analysis Date:	**1/25/2017**		SeqNo:	**1262095**	Units:	**µg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phenolics, Total Recoverable	ND	2.5								

Sample ID	**LCS-29866**	SampType:	**LCS**		TestCode:	**Total Phenolics by SW-846 9067**				
Client ID:	**LCSW**	Batch ID:	**29866**		RunNo:	**40252**				
Prep Date:	**1/25/2017**	Analysis Date:	**1/25/2017**		SeqNo:	**1262096**	Units:	**µg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phenolics, Total Recoverable	21	2.5	20.00	0	104	62.4	146			

Sample ID	**LCSD-29866**	SampType:	**LCSD**		TestCode:	**Total Phenolics by SW-846 9067**				
Client ID:	**LCSS02**	Batch ID:	**29866**		RunNo:	**40252**				
Prep Date:	**1/25/2017**	Analysis Date:	**1/25/2017**		SeqNo:	**1262097**	Units:	**µg/L**		
Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Phenolics, Total Recoverable	23	2.5	20.00	0	113	62.4	146	8.32	21	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID	**MB-R40523**	SampType:	**MBLK**		TestCode:	**EPA 335.4: Total Cyanide Subbed**					
Client ID:	**PBW**	Batch ID:	**R40523**		RunNo:	**40523**					
Prep Date:		Analysis Date:	**1/16/2017**		SeqNo:	**1269895**	Units:	**mg/L**			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide		ND	0.0100								

Sample ID	**LCS-R40523**	SampType:	**LCS**		TestCode:	**EPA 335.4: Total Cyanide Subbed**					
Client ID:	**LCSW**	Batch ID:	**R40523**		RunNo:	**40523**					
Prep Date:		Analysis Date:	**1/16/2017**		SeqNo:	**1269896**	Units:	**mg/L**			
Analyte		Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Cyanide		0.485		0.5000	0	97.0	90	110			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company
Project: Quarterly R.O. Reject

Sample ID **rb**	SampType: **MBLK**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **PBW**	Batch ID: **G39990**	RunNo: **39990**
Prep Date:	Analysis Date: **1/12/2017**	SeqNo: **1253120** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	ND	0.050								
Surr: BFB	8.8		10.00		87.5	70	130			

Sample ID **2.5ug gro lcs**	SampType: **LCS**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **LCSW**	Batch ID: **G39990**	RunNo: **39990**
Prep Date:	Analysis Date: **1/12/2017**	SeqNo: **1253121** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	0.55	0.050	0.5000	0	110	75.4	118			
Surr: BFB	9.2		10.00		92.5	70	130			

Sample ID **1701253-001a msd**	SampType: **MSD**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **R.O. Reject**	Batch ID: **G39990**	RunNo: **39990**
Prep Date:	Analysis Date: **1/12/2017**	SeqNo: **1253124** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	0.46	0.050	0.5000	0.01760	89.1	70	130	12.9	20	
Surr: BFB	9.0		10.00		89.7	70	130	0	0	

Sample ID **1701253-001a ms g**	SampType: **MS**	TestCode: **EPA Method 8015D: Gasoline Range**
Client ID: **R.O. Reject**	Batch ID: **G39990**	RunNo: **40004**
Prep Date:	Analysis Date: **1/13/2017**	SeqNo: **1254101** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Gasoline Range Organics (GRO)	0.53	0.050	0.5000	0.01760	102	70	130			
Surr: BFB	8.8		10.00		87.8	70	130			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **MB-R40526**	SampType: **MBLK**	TestCode: **EPA 903.1: Ra 226 and EPA 904.0: Ra 228-Subbed**
Client ID: **PBW**	Batch ID: **R40526**	RunNo: **40526**
Prep Date:	Analysis Date: **2/2/2017**	SeqNo: **1269905** Units: **pCi/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Radium-226	0.127	0.468								
Radium-226 ±	0.291	0.468								
Radium-228	0.0949	0.653								
Radium-228 ±	0.29	0.653								

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

QC SUMMARY REPORT

Hall Environmental Analysis Laboratory, Inc.

WO#: **1701253**

14-Feb-17

Client: Navajo Refining Company

Project: Quarterly R.O. Reject

Sample ID **MB-29623**	SampType: **MBLK**	TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **PBW**	Batch ID: **29623**	RunNo: **39966**
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252489** 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-29623**	SampType: **LCS**	TestCode: **SM2540C MOD: Total Dissolved Solids**
Client ID: **LCSW**	Batch ID: **29623**	RunNo: **39966**
Prep Date: **1/10/2017**	Analysis Date: **1/11/2017**	SeqNo: **1252490** Units: **mg/L**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Total Dissolved Solids	1060	20.0	1000	0	106	80	120			

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
S	% Recovery outside of range due to dilution or matrix	W	Sample container temperature is out of limit as specified

HALL ENVIRONMENTAL ANALYSIS LABORATORY

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

Sample Log-In Check List

Client Name: NAVAJO REFINING CO Work Order Number: 1701253 RcptNo: 1

Received by/date: RE 01/09/17

Logged By: Ashley Gallegos 1/9/2017 9:20:00 AM

Completed By: Ashley Gallegos 1/9/2017 9:54:08 AM

Reviewed By: 01/09/17

Chain of Custody

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

Log In

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

# of preserved bottles checked for pH: 6 (1) (<2 or >12 unless noted)

Adjusted? No

Checked by: Re

Special Handling (if applicable)

16. 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:

17. Additional remarks:

18. Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	1.7	Good	Yes			

Chain-of-Custody Record

Client: Navajo Refinery

Mailing Address: P.O. Box 159 Artesia, NM 88211-0159

Phone #: 575-748-3311

email or Fax#: 575-746-5451

QA/QC Package:

X Standard ☐ Level 4 (Full Validation)

☐ Other _____

☐ EDD (Type) _____

Turn-Around Time:

X Standard ☐ Rush _____

Project Name:

Quarterly ~~Monthly~~ R.O. Reject

Project #: P.O. # 167796

Project Manager:

Robert Combs

Sampler: Brady Hubbard

On Ice: X Yes ☐ No

Sample Temperature: 1.7

HALL ENVIRONMENTAL ANALYSIS LABORATORY

www.hallenvironmental.com

4901 Hawkins NE - Albuquerque, NM 87109

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

Analysis Request

Date	Time	Matrix	Sample Request ID	Container Type and #	Preservative Type	HEAL No. 1701253	8260B:WQCC List VOCs	8270C: WQCC list SVOCs	6010B: WQCC Metals	335.4: Total Cyanide	7470: Mercury	8015: GRO, DRO, ORO	8082: PCBs	Radioactivity (Ra-226+Ra-228)	Sulfate Chloride	Phenols	Fluoride	Nitrate/Nitrite	Total Dissolved Solids	PH	504.1:EDB	Air Bubbles (Y or N)
1/5/17	4:30	liquid	R.O. Reject	2 - 500ml P	1-unpres 1-H2SO4	-001									X		X	X	X	X		Y
1/5/17	4:30	liquid	R.O. Reject	3-40ml VOA	HCL		X															
1/5/17	4:30	liquid	R.O. Reject	1-500ml P	HNO3						X											
1/5/17	4:30	liquid	R.O. Reject	1-125ml P	HNO3				X													
1/5/17	4:30	liquid	R.O. Reject	1-500ml P	NaOH					X												
1/5/17	4:30	liquid	R.O. Reject	2- 1L P	HNO3									X								
1/5/17	4:30	liquid	R.O. Reject	3-40ml VOA	Na2S2O3																X	
1/5/17	4:30	liquid	R.O. Reject	2 - 1L Glass	unpres								X									
1/5/17	4:30	liquid	R.O. Reject	1 - 1L Glass	unpres			X														
1/5/17	4:30	liquid	R.O. Reject	3-40ml VOA	HCl							X										
1/5/17	4:30	liquid	R.O. Reject	1-250mlGlas	unpres							X										
1/5/17	4:30	liquid	R.O. Reject	1 - 1L Glass	H2SO4											X						
1/5/17	XXX	liquid	Trip Blank	2-40ml VOA	HCL	-002																

Date	Time	Relinquished by	Received by	Date	Time
1-6-17	1:30	Brady Hubbard		1/9/17	0920

Remarks:
Metals: As, Al, Ba, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, U, Zn
VOCs: 1,1,1-Trichloroethane; 1,1,2,2-Tetrachloroethane; 1,1,2,2-Tetrachloroethylene; 1,1,2-Trichloroethane; 1,1,2-Trichloroethylene; 1,1-Dichloroethane; 1,1-Dichloroethene; 1,2-Dibromoethane; 1,2-Dichloroethane; Benzene; Carbon Tetrachloride; Chloroform; Dichloromethane; Ethylbenzene; Toluene; Total Xylenes; Vinyl Chloride
SVOCs: benzo(a)pyrene, phenol, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene

Navajo Refining Company, LLC
501 E. Main
Artesia, NM 88210
(Tel) 575.748.3311
(Fax) 575.746.5451

Quarterly RO Reject Sample Details Attachment

HOLLYFRONTIER
The HollyFrontier Companies

Project Name	Quarterly RO Reject
Samplers Name	Brady Hubbard
Samplers Affiliation	Navajo Refining Co. LLC
Start Date and Time	1/5/17 @ 4:23 pm
End Date and Time	1/5/17 @ 4:51 pm

Sample Type	
Grab	☑
Time Weighted Composite	☐
Flow Weighted Composite	☐

Parts / Sample Intervals	One

Physical Property	
Solid	☐
Liquid	☑
Sludge	☐

Type of Sampler	Directly to sample jars

Outfall / Sample Location: ☐ North Field R.O. Reject Discarge ☑ South Field R.O. Reject Discarge

Container	Size	Material	# of Containers	Preservatives: Neat (None)	HCL	HNO3	H2SO4	NaOH	Na2S2O3	NaHSO4	Other	Analysis and/or Method Requested
1	500ml	Plastic	2	X			X					pH, Cl, F, S04, NO2/NO3, TDS
2	40ml	VOA	3		X							8015 GRO
3	500ml	Plastic	1			X						6020 total metals, 7470 Hg
4	125ml	Plastic	1			X						6020 Dissolved Metals
5	500ml	Plastic	2					X				Cyanide
6	1L	Plastic	3			X						Radium 226/228
7	40ml	VOA	2		X							8260 see attached list
8	1L	Glass	1	X								8270 see attached list
9	1L	Glass	2	X								8082 PCBs
10	40ml	VOA	2	X								8015 DRO
11	40ml	VOA	2		X							Radium 226/228

Field Data (Weather Observations, Etc): 1/5/17 Tmp.42.8°F, Humidity 42% , Wind Dir. East, Wind Speed 10.4 mph, Conditions Clear
Date and Time:

Field Temp. 17.1C Field pH 7.69

Storage Method	
Ice	☑
Refrigerated	☐
Other	☐

Shipping Media	
Ice	☑
Other	☐

APPENDIX D

FLUIDS AND PRESSURE CALCULATIONS

APPENDIX D-1

PREDICTW EQUATIONS

Mathematical Basis of Equations Used in Modeling Pressure Buildup

The following discussion reviews the mathematical and physical basis of determining reservoir pressure buildup. The model presented is based on the line source solution to the radial diffusivity equation for pressure behavior in a homogeneous reservoir. The model was implemented using the Visual Basic program PredictW.

Exponential-Integral Formulation

The pressure response for radial flow of a slightly compressible fluid in a planar (porous) injection layer with spatially-constant properties is determined by the well known diffusivity equation (Lee, 1982):

$$\frac{\partial^2 p}{\partial r^2} + \frac{1}{r}\frac{\partial p}{\partial r} = \frac{\phi \mu c_t}{0.000264\, k}\frac{\partial p}{\partial t} \qquad \text{Equation 1}$$

where ϕ, μ, c_t, and k refer to porosity, viscosity (cp), compressibility (psi^{-1}), and permeability (md), respectively. The pressure, p, is expressed in psi; radial distance, r, is in feet; and time, t, is indicated in days. For an infinite reservoir of thickness h (ft) with $p \rightarrow p_o$ (initial pressure) as $r \rightarrow \infty$, the transient pressure, p (r, t), for a single line source injector at r = 0 is determined from Equation 1 as (Muskat, 1982):

$$p(r,t) = p_o - \frac{70.6\, q\mu}{kh}\, Ei\left(\frac{-39.5\phi\mu c_t r^2}{kt}\right), \qquad \text{Equation 2}$$

where Ei represents the exponential integral defined by:

$$Ei(-x) = -\int_x^\infty \frac{e^{-\varepsilon}}{\varepsilon}\, d\varepsilon \qquad \text{Equation 3}$$

and q represents the (constant) injection rate in barrels per day.

For the general case of multiple wells in a single layer, in which injection from each is represented by a succession of piece-wise constant flow rate intervals, the pressure response is readily obtained by superposition of elementary solutions

given by Equation 2. In terms of Cartesian coordinates, the pressure transient at an arbitrary point (x, y) at time "t" is given by:

$$p(x,y,t) = p_o + \sum_{j=1}^{N} \frac{70.6 q_1^j \mu}{kh} \mathrm{Ei}\left(\frac{-39.5\phi\mu c_t[(x-x_j)^2 + (y-y_j)^2]}{kt}\right)$$
$$+ \sum_{j=1}^{N} \sum_{i=1}^{n_{j-1}} 70.6[(q_{i-1}^j - q_i^j)\mu/kh] \mathrm{Ei}\left(\frac{-39.5\phi\mu c_t[(x-x_j)^2 + (y-y_j)^2]}{k(t-t_i^j)}\right)$$

Equation 4

for all $t_i^j < t$. In Equation 4, the following notation is employed:

N	=	number of wells injecting into the reservoir
n_j	=	number of constant flow rate increments for well j operative over time t
i	=	flow rate summation index ($1 < i < n_j$)
j	=	well number summation index ($1 < j < N$)
t_i	=	cumulative time corresponding to the end of injection rate interval i for well j
x_j, y_j	=	cartesian coordinates of well j
q_i^j	=	flow rate from well j during flow increment i

Equation 4 forms the basis for determining the COI for a general multi-well system.

To determine shutin or flowing pressures at a generic wellbore location, Equation 4 is modified to include a dimensionless skin factor, s_b, which reflects the effects of altered properties in the near-wellbore region (Van Everdingen, 1953). The associated augmentation, Δp_{skin}^b, of the theoretical flowing pressure is assumed to be of the form:

$$\Delta p_{skin}^b \text{ (psi)} = 141.2 \frac{q_i^b \mu}{kh} s_b$$

Equation 5

Incorporation of Equation 5 into Equation 4 and replacement of the quantity $[(x-x_b)^2 + (y-y_b)^2]$ in the Ei-function argument by $r^2_{w,b}$ (wellbore radius squared) leads to the following expression for the transient flowing pressure at a generic wellbore (b):

$$p^b_{wf}(x_b,y_b,t) = p_o + \sum_{j=1}^{N} \frac{70.6q^j_1\mu}{kh} Ei\left(\frac{-39.5\phi\mu c_t[(x_b-x_j)^2+(y_b-y_j)^2]}{kt}\right)$$
$$+ \sum_{j=1(j\neq b)}^{N} \sum_{i=1}^{n_{j-1}} \frac{70.6(q^j_{i+1}-q^j_i)\mu}{kh} Ei\left(\frac{-39.5\phi\mu c_t[x_b-x_j)^2+(y_b-y_j)^2]}{k(t-t^j_i)}\right)$$
$$+ \frac{70.6q^b_1\mu}{kh}\left[Ei\left(\frac{-39.5\phi\mu c_t r^2_{w,b}}{kt}\right)-2s_b\right]$$
$$+ \sum_{i=1}^{n_{j-1}} \frac{70.6(q^b_{i+1}-q^b_i)\mu}{kh}\left[Ei\left(\frac{-39.5\phi\mu c_t r^2_{w,b}}{k(t-t^b_i)}\right)-2s_b\right]$$

Equation 6

where x_b, y_b denote the wellbore coordinates at well b where the pressure response is evaluated.

Application of Equations 4 and 6 to address actual operational conditions often requires inclusion of many wells (including image injectors), each having several hundred flow rate increments. Accordingly, a Visual Basic computer program, PredictW, was created to evaluate these equations. The exponential integral is determined utilizing numerical methods (Abramowitz and Stegun, 1972). When isobaric contours at a given time in a given injection zone (unit) are desired, then Equation 4, actually $p - p_o$, is evaluated at each node of a predefined uniform grid. The resulting Δp-x-y array is then plotted to visualize the COI using Surfer (®Golden Software, Inc.). When the transient wellbore response is desired, Equation 6 is utilized by PredictW. The output in this case consists of a record of $\Delta p = p - p_o$ at a single well location over a specified time interval.

TECHNICAL REFERENCES

Lee, J., Well Testing, SPE Textbook Series, Vol. 1., Dallas, TX, 1982.

Muskat, M., The Flow of Homogeneous Fluids Through Porous Media, International Human Resources Development Corporation, 2nd Ed., Boston, 1982.

Van Everdingen, A.F., "The Skin Effect and its Influence on the Productive Capacity of a Well," Transactions, AIME, 1953.

Abramowitz, M., and Stegun, I.A., Handbook of Mathematical Functions, Dover, New York, 1972.

APPENDIX D-2

VISCOSITY CORRELATIONS

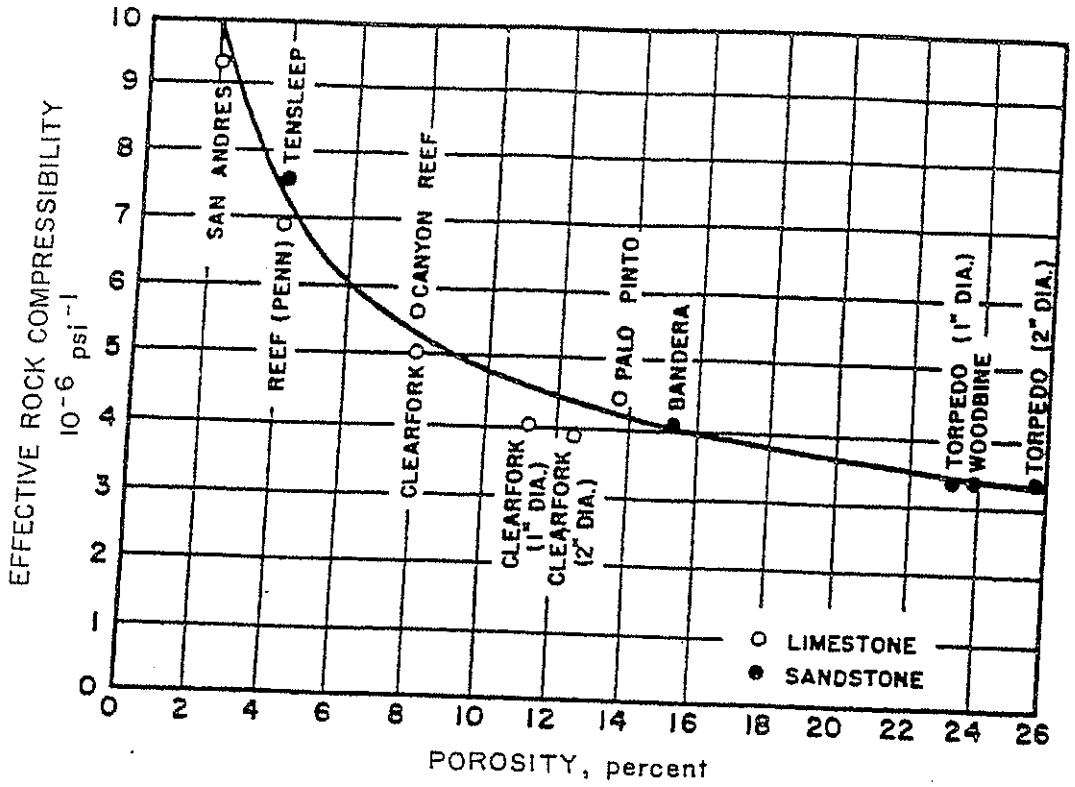


Fig. G.5 Effective formation (rock) compressibility. From Hall, *Trans.*, AIME (1953) **198**, 309.

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

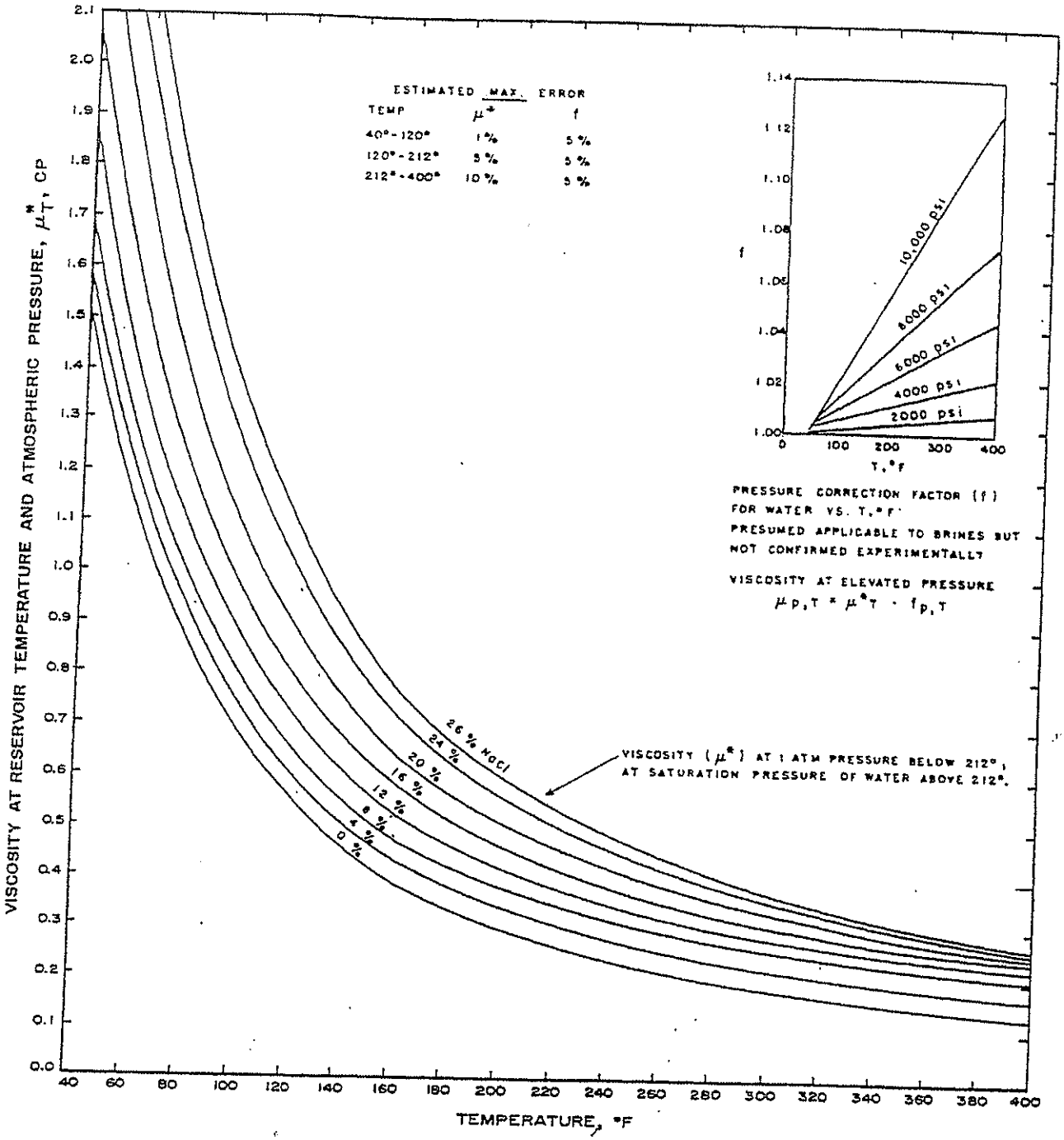


Fig. D-35 Water viscosity at various salinities and temperatures. After Matthews and Russell, data of Chesnut.[18]

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

APPENDIX D-3

COMPRESSIBILITY CORRELATIONS

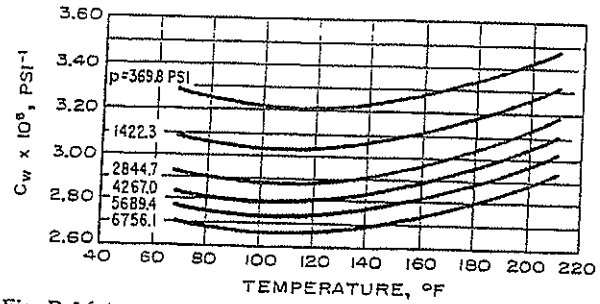


Fig. D.16 Average compressibility of distilled water. After Long and Chierici.[13]

Source: Earlougher, 1977, Advances in Well Test Analysis

COMPRESSIBILITY OF PORE VOLUME AND DISTILLED WATER

APPENDIX D-4

PREDICTED PRESSURE RISE CALCULATIONS

Appendix D-4

Predicted Pressure Increase Calculations

Navajo Refining Company, L.L.C.

Permeability (md) =	32	Compressibility (psi^{-1}) =	8.40E-06
Porosity (%) =	8.5	Viscosity (cp) =	0.57
Thickness (feet) =	75	Wellbore Radius (feet) =	0.51042

Modeled Rate = 150 gpm

Date		Time (days)	Pressure Increase (psi)		
			Wellbore	1-mile	2.5-miles
2017					
	06/01	0	0.00	0.00	0.00
	07/01	30	1610.22	51.92	1.25
	08/01	61	1671.42	95.83	9.51
	09/01	92	1706.85	125.19	20.54
	10/01	122	1731.19	146.51	31.18
	11/01	153	1750.72	164.13	41.47
	12/01	183	1766.16	178.32	50.62
2018	01/01	214	1779.65	190.90	59.28
	02/01	245	1791.32	201.87	67.24
	03/01	273	1800.65	210.71	73.89
	04/01	304	1809.92	219.54	80.74
	05/01	334	1818.04	227.31	86.90
	06/01	365	1825.69	234.66	92.86
	07/01	395	1832.50	241.23	98.27
	08/01	426	1839.02	247.52	103.53
	09/01	457	1845.08	253.39	108.50
	10/01	487	1850.56	258.71	113.05
	11/01	518	1855.88	263.89	117.52
	12/01	548	1860.74	268.62	121.64
2019	01/01	579	1865.48	273.25	125.70
	02/01	610	1869.98	277.64	129.59
	03/01	638	1873.85	281.42	132.95
	04/01	669	1877.94	285.43	136.53
	05/01	699	1881.72	289.13	139.86
	06/01	730	1885.46	292.80	143.17
	07/01	760	1888.94	296.21	146.25
	08/01	791	1892.39	299.60	149.33
	09/01	822	1895.70	302.86	152.31
	10/01	852	1898.79	305.90	155.09
	11/01	883	1901.87	308.93	157.88
	12/01	913	1904.75	311.76	160.49
2020	01/01	944	1907.63	314.60	163.11
	02/01	975	1910.42	317.35	165.65
	03/01	1004	1912.95	319.84	167.97
	04/01	1035	1915.57	322.42	170.37
	05/01	1065	1918.03	324.86	172.64
	06/01	1096	1920.51	327.30	174.92
	07/01	1126	1922.84	329.60	177.08
	08/01	1157	1925.18	331.91	179.24
	09/01	1188	1927.46	334.16	181.36
	10/01	1218	1929.61	336.29	183.36
	11/01	1249	1931.78	338.43	185.38
	12/01	1279	1933.82	340.46	187.29

Date		Time (days)	Pressure Increase (psi)		
			Wellbore	1-mile	2.5-miles
2021	01/01	1310	1935.89	342.50	189.22
	02/01	1341	1937.91	344.50	191.11
	03/01	1369	1939.69	346.26	192.78
	04/01	1400	1941.62	348.17	194.59
	05/01	1430	1943.45	349.98	196.31
	06/01	1461	1945.30	351.81	198.05
	07/01	1491	1947.05	353.55	199.70
	08/01	1522	1948.82	355.31	201.38
	09/01	1553	1950.56	357.03	203.02
	10/01	1583	1952.21	358.67	204.58
	11/01	1614	1953.88	360.32	206.16
	12/01	1644	1955.47	361.90	207.67
2022	01/01	1675	1957.08	363.49	209.19
	02/01	1706	1958.66	365.06	210.70
	03/01	1734	1960.07	366.46	212.03
	04/01	1765	1961.60	367.97	213.48
	05/01	1795	1963.05	369.41	214.87
	06/01	1826	1964.53	370.88	216.27
	07/01	1856	1965.93	372.27	217.61
	08/01	1887	1967.36	373.69	218.98
	09/01	1918	1968.77	375.09	220.32
	10/01	1948	1970.10	376.41	221.60
	11/01	1979	1971.47	377.77	222.90
	12/01	2009	1972.76	379.05	224.14
2023	01/01	2040	1974.08	380.37	225.41
	02/01	2071	1975.38	381.66	226.65
	03/01	2099	1976.54	382.81	227.76
	04/01	2130	1977.81	384.06	228.98
	05/01	2160	1979.01	385.26	230.13
	06/01	2191	1980.24	386.48	231.32
	07/01	2221	1981.41	387.65	232.44
	08/01	2252	1982.61	388.84	233.59
	09/01	2283	1983.79	390.01	234.73
	10/01	2313	1984.91	391.13	235.81
	11/01	2344	1986.06	392.27	236.92
	12/01	2374	1987.16	393.36	237.97
2024	01/01	2405	1988.28	394.47	239.05
	02/01	2436	1989.38	395.57	240.12
	03/01	2465	1990.40	396.58	241.10
	04/01	2496	1991.48	397.65	242.14
	05/01	2526	1992.51	398.68	243.14
	06/01	2557	1993.56	399.73	244.15
	07/01	2587	1994.57	400.73	245.12
	08/01	2618	1995.59	401.75	246.12
	09/01	2649	1996.61	402.76	247.10
	10/01	2679	1997.58	403.72	248.04
	11/01	2710	1998.57	404.71	249.00
	12/01	2740	1999.52	405.65	249.92

Appendix D-4

Predicted Pressure Increase Calculations

Navajo Refining Company, L.L.C.

Permeability (md) =	32	Compressibility (psi^{-1}) =	8.40E-06
Porosity (%) =	8.5	Viscosity (cp) =	0.57
Thickness (feet) =	75	Wellbore Radius (feet) =	0.51042

Modeled Rate = 150 gpm

	Date	Time (days)	Pressure Increase (psi) Wellbore	1-mile	2.5-miles
2025	01/01	2771	2000.49	406.62	250.86
	02/01	2802	2001.45	407.57	251.79
	03/01	2830	2002.31	408.43	252.62
	04/01	2861	2003.25	409.36	253.53
	05/01	2891	2004.15	410.26	254.40
	06/01	2922	2005.07	411.17	255.30
	07/01	2952	2005.95	412.05	256.15
	08/01	2983	2006.85	412.95	257.02
	09/01	3014	2007.74	413.83	257.89
	10/01	3044	2008.60	414.68	258.72
	11/01	3075	2009.47	415.55	259.57
	12/01	3105	2010.31	416.39	260.38
2026	01/01	3136	2011.16	417.24	261.22
	02/01	3167	2012.01	418.08	262.04
	03/01	3195	2012.77	418.84	262.78
	04/01	3226	2013.60	419.67	263.59
	05/01	3256	2014.40	420.46	264.37
	06/01	3287	2015.22	421.28	265.16
	07/01	3317	2016.00	422.06	265.93
	08/01	3348	2016.80	422.86	266.71
	09/01	3379	2017.60	423.65	267.48
	10/01	3409	2018.36	424.41	268.22
	11/01	3440	2019.14	425.18	268.99
	12/01	3470	2019.89	425.93	269.72
2027	01/01	3501	2020.66	426.69	270.46
	02/01	3532	2021.42	427.45	271.20
	03/01	3560	2022.10	428.13	271.87
	04/01	3591	2022.85	428.87	272.60
	05/01	3621	2023.56	429.59	273.30
	06/01	3652	2024.30	430.32	274.02
	07/01	3682	2025.00	431.02	274.71
	08/01	3713	2025.73	431.74	275.41
	09/01	3744	2026.44	432.46	276.11
	10/01	3774	2027.13	433.14	276.78
	11/01	3805	2027.84	433.85	277.47
	12/01	3835	2028.51	434.52	278.14
2028	01/01	3866	2029.21	435.21	278.81
	02/01	3897	2029.90	435.90	279.49
	03/01	3926	2030.54	436.54	280.11
	04/01	3957	2031.22	437.21	280.78
	05/01	3987	2031.87	437.86	281.41
	06/01	4018	2032.53	438.53	282.07
	07/01	4048	2033.18	439.17	282.69
	08/01	4079	2033.83	439.82	283.34
	09/01	4110	2034.49	440.47	283.98
	10/01	4140	2035.11	441.10	284.59
	11/01	4171	2035.76	441.74	285.22
	12/01	4201	2036.38	442.35	285.83

	Date	Time (days)	Pressure Increase (psi) Wellbore	1-mile	2.5-miles
2029	01/01	4232	2037.01	442.99	286.45
	02/01	4263	2037.64	443.61	287.06
	03/01	4291	2038.20	444.18	287.62
	04/01	4322	2038.82	444.80	288.22
	05/01	4352	2039.42	445.39	288.81
	06/01	4383	2040.03	446.00	289.41
	07/01	4413	2040.62	446.59	289.99
	08/01	4444	2041.22	447.19	290.58
	09/01	4475	2041.82	447.79	291.17
	10/01	4505	2042.40	448.36	291.73
	11/01	4536	2042.99	448.95	292.31
	12/01	4566	2043.56	449.52	292.87
2030	01/01	4597	2044.14	450.10	293.44
	02/01	4628	2044.72	450.68	294.01
	03/01	4656	2045.24	451.19	294.52
	04/01	4687	2045.82	451.76	295.08
	05/01	4717	2046.37	452.31	295.62
	06/01	4748	2046.93	452.88	296.18
	07/01	4778	2047.47	453.42	296.71
	08/01	4809	2048.03	453.97	297.26
	09/01	4840	2048.59	454.53	297.80
	10/01	4870	2049.12	455.06	298.32
	11/01	4901	2049.67	455.60	298.86
	12/01	4931	2050.19	456.13	299.38
2031	01/01	4962	2050.73	456.67	299.91
	02/01	4993	2051.27	457.20	300.44
	03/01	5021	2051.75	457.68	300.91
	04/01	5052	2052.28	458.21	301.43
	05/01	5082	2052.79	458.72	301.93
	06/01	5113	2053.32	459.24	302.45
	07/01	5143	2053.82	459.75	302.95
	08/01	5174	2054.34	460.26	303.46
	09/01	5205	2054.85	460.78	303.96
	10/01	5235	2055.35	461.27	304.45
	11/01	5266	2055.86	461.78	304.95
	12/01	5296	2056.35	462.27	305.43
2032	01/01	5327	2056.85	462.77	305.93
	02/01	5358	2057.35	463.27	306.42
	03/01	5387	2057.82	463.73	306.88
	04/01	5418	2058.31	464.23	307.36
	05/01	5448	2058.79	464.70	307.83
	06/01	5479	2059.28	465.19	308.31
	07/01	5509	2059.75	465.66	308.78
	08/01	5540	2060.23	466.14	309.25
	09/01	5571	2060.71	466.62	309.73
	10/01	5601	2061.18	467.09	310.18
	11/01	5632	2061.65	467.56	310.65
	12/01	5662	2062.11	468.02	311.10

Appendix D-4

Predicted Pressure Increase Calculations

Navajo Refining Company, L.L.C.

Permeability (md) =	32	Compressibility (psi^{-1}) =	8.40E-06
Porosity (%) =	8.5	Viscosity (cp) =	0.57
Thickness (feet) =	75	Wellbore Radius (feet) =	0.51042

Modeled Rate = 150 gpm

	Date	Time (days)	Pressure Increase (psi) Wellbore	1-mile	2.5-miles
2033	01/01	5693	2062.58	468.49	311.57
	02/01	5724	2063.05	468.95	312.03
	03/01	5752	2063.47	469.37	312.44
	04/01	5783	2063.94	469.84	312.90
	05/01	5813	2064.38	470.28	313.34
	06/01	5844	2064.84	470.74	313.79
	07/01	5874	2065.28	471.18	314.23
	08/01	5905	2065.74	471.63	314.67
	09/01	5936	2066.19	472.08	315.12
	10/01	5966	2066.62	472.52	315.55
	11/01	5997	2067.07	472.96	315.99
	12/01	6027	2067.50	473.39	316.41
2034	01/01	6058	2067.94	473.83	316.85
	02/01	6089	2068.38	474.27	317.28
	03/01	6117	2068.78	474.67	317.67
	04/01	6148	2069.21	475.10	318.10
	05/01	6178	2069.63	475.52	318.51
	06/01	6209	2070.06	475.95	318.94
	07/01	6239	2070.48	476.37	319.35
	08/01	6270	2070.91	476.79	319.77
	09/01	6301	2071.33	477.22	320.19
	10/01	6331	2071.74	477.63	320.59
	11/01	6362	2072.16	478.05	321.01
	12/01	6392	2072.57	478.45	321.41
2035	01/01	6423	2072.99	478.87	321.82
	02/01	6454	2073.40	479.28	322.23
	03/01	6482	2073.78	479.65	322.60
	04/01	6513	2074.19	480.06	323.00
	05/01	6543	2074.58	480.46	323.40
	06/01	6574	2074.99	480.87	323.80
	07/01	6604	2075.38	481.26	324.19
	08/01	6635	2075.79	481.66	324.58
	09/01	6666	2076.19	482.06	324.98
	10/01	6696	2076.58	482.45	325.36
	11/01	6727	2076.97	482.85	325.76
	12/01	6757	2077.36	483.23	326.13
2036	01/01	6788	2077.75	483.62	326.52
	02/01	6819	2078.15	484.01	326.91
	03/01	6848	2078.51	484.38	327.27
	04/01	6879	2078.90	484.77	327.66
	05/01	6909	2079.28	485.14	328.03
	06/01	6940	2079.66	485.53	328.41
	07/01	6970	2080.03	485.90	328.78
	08/01	7001	2080.42	486.28	329.16
	09/01	7032	2080.80	486.66	329.53
	10/01	7062	2081.17	487.03	329.89
	11/01	7093	2081.54	487.41	330.27
	12/01	7123	2081.91	487.77	330.63

	Date	Time (days)	Pressure Increase (psi) Wellbore	1-mile	2.5-miles
2037	01/01	7154	2082.28	488.14	331.00
	02/01	7185	2082.65	488.51	331.36
	03/01	7213	2082.99	488.85	331.70
	04/01	7244	2083.36	489.22	332.06
	05/01	7274	2083.72	489.57	332.41
	06/01	7305	2084.08	489.94	332.78
	07/01	7335	2084.44	490.29	333.13
	08/01	7366	2084.80	490.66	333.48
	09/01	7397	2085.16	491.02	333.84
	10/01	7427	2085.51	491.37	334.19
	11/01	7458	2085.87	491.72	334.54
	12/01	7488	2086.22	492.07	334.88
2038	01/01	7519	2086.57	492.42	335.24
	02/01	7550	2086.93	492.78	335.59
	03/01	7578	2087.25	493.10	335.90
	04/01	7609	2087.60	493.45	336.25
	05/01	7639	2087.94	493.79	336.59
	06/01	7670	2088.29	494.14	336.93
	07/01	7700	2088.62	494.47	337.26
	08/01	7731	2088.97	494.82	337.61
	09/01	7762	2089.32	495.16	337.95
	10/01	7792	2089.65	495.49	338.28
	11/01	7823	2089.99	495.84	338.62
	12/01	7853	2090.32	496.17	338.94
2039	01/01	7884	2090.66	496.51	339.28
	02/01	7915	2091.00	496.84	339.61
	03/01	7943	2091.30	497.15	339.91
	04/01	7974	2091.64	497.48	340.25
	05/01	8004	2091.96	497.81	340.57
	06/01	8035	2092.30	498.14	340.90
	07/01	8065	2092.62	498.46	341.21
	08/01	8096	2092.95	498.79	341.54
	09/01	8127	2093.28	499.12	341.87
	10/01	8157	2093.60	499.44	342.18
	11/01	8188	2093.92	499.76	342.51
	12/01	8218	2094.24	500.08	342.82
2040	01/01	8249	2094.56	500.40	343.14
	02/01	8280	2094.89	500.72	343.46
	03/01	8309	2095.19	501.02	343.76
	04/01	8340	2095.51	501.35	344.07
	05/01	8370	2095.82	501.65	344.38
	06/01	8401	2096.14	501.97	344.70
	07/01	8431	2096.44	502.28	345.00
	08/01	8462	2096.76	502.60	345.31
	09/01	8493	2097.08	502.91	345.63
	10/01	8523	2097.38	503.21	345.93
	11/01	8554	2097.69	503.53	346.24
	12/01	8584	2098.00	503.83	346.54

Appendix D-4

Predicted Pressure Increase Calculations

Navajo Refining Company, L.L.C.

Permeability (md) =	32	Compressibility (psi^{-1}) =	8.40E-06
Porosity (%) =	8.5	Viscosity (cp) =	0.57
Thickness (feet) =	75	Wellbore Radius (feet) =	0.51042

Modeled Rate = 150 gpm

	Date	Time (days)	Pressure Increase (psi) Wellbore	1-mile	2.5-miles
2041	01/01	8615	2098.31	504.14	346.84
	02/01	8646	2098.62	504.45	347.15
	03/01	8674	2098.89	504.73	347.43
	04/01	8705	2099.20	505.03	347.73
	05/01	8735	2099.50	505.33	348.02
	06/01	8766	2099.80	505.63	348.33
	07/01	8796	2100.10	505.93	348.62
	08/01	8827	2100.40	506.23	348.92
	09/01	8858	2100.70	506.53	349.22
	10/01	8888	2101.00	506.82	349.51
	11/01	8919	2101.30	507.12	349.80
	12/01	8949	2101.59	507.41	350.09
2042	01/01	8980	2101.88	507.71	350.39
	02/01	9011	2102.18	508.01	350.68
	03/01	9039	2102.45	508.27	350.95
	04/01	9070	2102.74	508.57	351.24
	05/01	9100	2103.03	508.85	351.52
	06/01	9131	2103.32	509.15	351.81
	07/01	9161	2103.61	509.43	352.09
	08/01	9192	2103.90	509.72	352.38
	09/01	9223	2104.19	510.01	352.67
	10/01	9253	2104.47	510.29	352.94
	11/01	9284	2104.76	510.58	353.23
	12/01	9314	2105.03	510.86	353.51
2043	01/01	9345	2105.32	511.14	353.79
	02/01	9376	2105.61	511.43	354.07
	03/01	9404	2105.86	511.68	354.33
	04/01	9435	2106.15	511.97	354.61
	05/01	9465	2106.42	512.24	354.88
	06/01	9496	2106.70	512.52	355.16
	07/01	9526	2106.97	512.79	355.43
	08/01	9557	2107.25	513.07	355.71
	09/01	9588	2107.53	513.35	355.98
	10/01	9618	2107.80	513.62	356.25
	11/01	9649	2108.08	513.90	356.52
	12/01	9679	2108.35	514.17	356.79
2044	01/01	9710	2108.62	514.44	357.06
	02/01	9741	2108.90	514.71	357.34
	03/01	9770	2109.16	514.97	357.59
	04/01	9801	2109.43	515.24	357.86
	05/01	9831	2109.69	515.51	358.12
	06/01	9862	2109.96	515.78	358.39
	07/01	9892	2110.23	516.04	358.65
	08/01	9923	2110.50	516.31	358.92
	09/01	9954	2110.76	516.58	359.18
	10/01	9984	2111.02	516.84	359.44
	11/01	10015	2111.29	517.10	359.71
	12/01	10045	2111.55	517.36	359.96

	Date	Time (days)	Pressure Increase (psi) Wellbore	1-mile	2.5-miles
2045	01/01	10076	2111.81	517.63	360.23
	02/01	10107	2112.08	517.89	360.49
	03/01	10135	2112.32	518.13	360.72
	04/01	10166	2112.58	518.39	360.99
	05/01	10196	2112.84	518.65	361.24
	06/01	10227	2113.10	518.91	361.50
	07/01	10257	2113.35	519.16	361.75
	08/01	10288	2113.61	519.42	362.01
	09/01	10319	2113.87	519.68	362.26
	10/01	10349	2114.12	519.93	362.51
	11/01	10380	2114.38	520.19	362.77
	12/01	10410	2114.63	520.43	363.01
2046	01/01	10441	2114.88	520.69	363.27
	02/01	10472	2115.14	520.95	363.52
	03/01	10500	2115.37	521.18	363.75
	04/01	10531	2115.62	521.43	364.00
	05/01	10561	2115.87	521.67	364.25
	06/01	10592	2116.12	521.93	364.50
	07/01	10622	2116.37	522.17	364.74
	08/01	10653	2116.62	522.42	364.99
	09/01	10684	2116.87	522.67	365.24
	10/01	10714	2117.11	522.91	365.48
	11/01	10745	2117.36	523.16	365.72
	12/01	10775	2117.60	523.40	365.96
2047	01/01	10806	2117.85	523.65	366.21
	02/01	10837	2118.09	523.90	366.45
	03/01	10865	2118.32	524.12	366.67
	04/01	10896	2118.56	524.36	366.92
	05/01	10926	2118.80	524.60	367.15
	06/01	10957	2119.04	524.85	367.39

APPENDIX D-5

PREDICTED PLUME MIGRATION CALCULATIONS

APPENDIX D-5

Plume Calculations — Navajo Well WDW-4

Radius of Concentrated Plume

$$r_C = \sqrt{\frac{0.1337 \quad V}{0.8 \ \pi \phi \, h}}$$

where:

r_C	=	Radius to concentrated plume front, feet
V	=	Total volume injected, gallons
ϕ	=	Porosity of formation, fraction
h	=	Thickness of formation, feet
0.1337	=	Conversion factior (cubic feet / gallon)
0.8	=	Factor to compensate for immovable connate water

Radius of Dispersed Plume

$$r_D = 2.3 \sqrt{C_D r_C} + r_C$$

where:

r_D	=	Radius to dispersed plume front, feet
C_D	=	Coefficient of dispersion (SS=3; LS = 65)

Parameters	Symbol	Value
Porosity of Formation (fraction)	ϕ	0.085
Thickness of Formation (feet)	h	75
Dispersion Coefficient Limestone	D	65
Injection Rate (gpm)	q	150

Time Period t (years)	Total Injection Volume V (gallons)	Radial Distance to Concentrated Plume Front r_C (feet)	Radial Distance to Dispersed Plume Front r_D (feet)
5	394,470,000	1814	2604
30	2,366,820,000	4444	5680

APPENDIX E

WDW-4 CONSTRUCTION PROCEDURES

APPENDIX E

HollyFrontier Navajo Refining LLC
Artesia, New Mexico

WDW-4 CONSTRUCTION PROCEDURE

(Depths referenced to Ground Level)

1. Survey and stake well location.
2. Level and grade the location with caliche or comparable material, as required.
3. Install a corrugated steel cellar around well location.
4. Drill a fresh water supply well near the well location capable of delivering 50 gpm.
5. Auger a 24 inch hole to approximately 80 feet and set 20 inch, 129.33 lb/ft (0.625 inch wall), API 5LX-56, plain-end, beveled conductor pipe. Cement conductor pipe to the surface using approximately 3 yd^3 of redi-mix cement.
6. Install a 4 inch outlet for draining the conductor pipe after cementing the surface casing.
7. Excavate a rathole and mousehole with an auger.
8. Move in and rig up drilling rig and associated equipment.
9. Move in and rig up a closed-loop system for handling drill cuttings and drilling fluid.
10. Weld a flange to the 20 inch conductor pipe and install an annular blowout preventer (BOP). Install 20 inch riser pipe with bell nipple and flowline to the BOP.
11. Mix a spud mud for the surface hole.
12. Make up a bottomhole assembly (BHA) with a 17½ inch drill bit and drill ahead to 1,500 feet taking deviation surveys at approximately 250 feet intervals and maintaining hole deviation below 2°. Circulate and condition mud for running logs.
13. Move in and rig up an open hole wireline unit. Run the following open hole logs from 1,500 feet to the base of conductor pipe: gamma ray, induction resistivity, compensated neutron, formation density and caliper. Run a 4-arm caliper and revise cement volumes accordingly with 20% excess included for the open hole section.
14. Move in and rig up a casing crew and run centralized 13⅜", 54.50 lb/ft, K-55, ST&C, surface casing to approximately 1,500 feet. Run two bow spring centralizers on the float joint (1 in center of joint on a stop ring and 1 on collar), and 1 centralizer per every third joint at the collars back to surface. The float

joint will consist of a float shoe, 1 joint of casing, and a float collar. Circulate and condition the mud for cementing.

Dimensional data and minimum performance properties of the surface casing are presented below:

Wall Thickness, inches	0.380
Internal Diameter, inches	12.615
Drift ID, inches	12.459
Coupling OD, inches	14.375
Collapse Pressure, psi	1,130
Internal Yield Pressure, psi	2,730
Pipe Body Strength, lb	853,000
Joint Strength, lb	547,000
Capacity, bbl/ft	0.15459

15. Move in and rig up cementing equipment. Cement the surface casing to the surface as follows: pump a freshwater spacer followed by a tuned spacer designed for the rheology of the drilling fluid and lead cement; pump 1,092 ft^3 of a Class A light-weight lead cement blend followed by 206 ft^3 of a Class A tail cement blend. Drop wiper plug, and displace with 226 bbls of drilling fluid. Bump wiper plug and pressurize over final circulating pressure. Monitor pressure for 5 minutes, and bleed off to cement unit to ensure floats are holding. Wait on cement at least 24 hours. (Cement volumes presented above are based on bit size, plus 20% excess for open hole section. Actual cement volumes will be based on calipered hole volume, plus 20% excess.)
16. After waiting at least 24 hours for cement to set, release the 13⅜ inch surface casing and lift the stack to make a rough cut on the 13⅜ inch protection casing. Nipple down the bell nipple, flow line and BOP. If necessary, perform a top out operation between the 20-inch and 13⅜-inch casings using 1-inch tremie pipe to place up to 200 sacks of standard cement. Cut the 20 inch conductor and make a final cut on the 13⅜ inch casing. Weld on a temporary flange to the 13⅜ inch casing. Re-install the BOP. Nipple up the bell nipple with flow line and riser pipe to the top of the BOP and test. Pressure test and function test the BOP.
17. Make up a 12¼ inch drill bit and trip in the hole to the float collar. Drill out the float collar and approximately 30 feet of cement in the shoe track joint.
18. Pull out of the hole and run a cement evaluation log from the top of cement in the surface casing to the surface.

19. Trip in the hole with a 12¼ inch bit and BHA which includes straight-hole motor and MWD system. Pressure test the 13⅜ inch surface casing to 1,000 psi for at least 30 minutes and record the test on a chart recorder. Drill the remainder of the shoe track cement and the float shoe. Drill 10 feet of formation and perform a Formation Integrity Test to 100 psi for 30 minutes. Continue drilling a 12¼ inch hole to the Confining Zone core point in the Mississippian Formation between 9,900 feet and 10,400 feet. Circulate and condition mud for coring. Pull the 12¼ inch drilling assembly out of the hole and pick up an 8½-inch by 4-inch by 30-foot core barrel.
20. Trip in well and cut a 30-foot Confining Zone core. Pull out of the hole and lay down core. Mark core and prepare for shipment to core laboratory.
21. Trip back in the hole with the 12¼ inch drilling assembly and ream the 8½-inch core hole. Continue drilling a 12¼ inch hole to the top of the Injection Zone core point in the Silurian-Devonian at approximately 10,400 feet, maintaining a low fluid loss mud system.
22. Move in and rig up an open hole wireline unit. Run the following open hole logs from 10,400 feet to the base of surface casing at 1,500 feet: gamma ray, laterolog resistivity, compensated neutron, formation density, caliper, sonic log, and mineralogy log (approximately 100 feet over cored interval). Run a 6-arm caliper and revise cement volumes to include calipered annular volume, plus 20% excess for the open hole section.
23. Move in and rig up a casing crew and run centralized 9⅝ inch, 47 lb/ft, N-80, LT&C protection to 10,400 feet. Run two bow spring centralizers on the float joint (1 in center of joint on a stop ring and 1 on collar), and 1 centralizer per every third joint at the collars back to surface. The float joint will consist of a float shoe, 1 joint of casing, and a float collar. A stage collar will be positioned in the casing string at approximately 5,800 feet for the second cement stage. Circulate and condition the mud for cementing.

    Dimensional data and minimum performance properties of the protection casing are presented below:

Wall Thickness, inches	0.472
Internal Diameter, inches	8.681
Drift ID, inches	8.525
Coupling OD, inches	10.625
Collapse Pressure, psi	4,760
Internal Yield Pressure, psi	6,870
Pipe Body Strength, lb	1,086,000

Joint Strength, lb.....905,000
Capacity, bbl/ft.....0.073206

24. Cement the 9⅝ inch casing back to the surface in the following two stages:
    Stage One – Establish circulation and condition the mud for optimum cementing conditions: pump a freshwater spacer followed by a tuned spacer designed for the rheology of the drilling fluid and lead cement; pump 1,578 ft^3 of a Class H light-weight lead cement blend followed by 173 ft^3 of a Class H tail cement blend. Drop wiper plug, and displace with ~761 bbls of drilling fluid. Bump wiper plug and pressurize over final circulating pressure. Monitor pressure for 5 minutes, and bleed off to cement unit to ensure floats are holding.
    Stage Two – Drop stage collar opening plug and wait for it reach stage collar. Pressure up on casing until stage collar opens. Establish circulation through the stage collar and continue circulating for 8 to 12 hours. Pump a freshwater spacer followed by a tuned spacer designed for the rheology of the drilling fluid and lead cement; pump 2,010 ft^3 of a Class H light-weight lead cement blend followed by 150 ft^3 of a Class H tail cement blend. Drop stage collar wiper/closing plug, and displace with 450 bbls of drilling fluid. Bump wiper/closing plug and close stage collar with required pressure over final circulating pressure. Release pressure and assure that stage collar is holding. Flush and drain surface equipment. Wait on cement at least 24 hours. (Cement volumes presented above are based on bit size, plus 20% excess for open hole section. Actual cement volumes will be based on calipered hole volume, plus 20% excess.)
25. After waiting at least 24 hours for cement to set, release the 9⅝ inch protection casing and lift the stack to make a rough cut on the 9⅝ inch protection casing. Nipple down the bell nipple, flow line and BOP. If necessary, perform a top out operation between the 13⅜ inch and 9⅝ inch casings using 1-inch tremie pipe to place up to 200 sacks of standard cement. Cut the 13⅜ inch surface casing and make a final cut on the 9⅝ inch casing. Weld on a 9⅝ inch by 11 inch, 3,000 psi, Slip-on-Weld (SOW) casing head with a hanger bowl for 7 inch tubing to the 9⅝ inch protection casing. Nipple up an 11 inch by 13⅝ inch DSA to the casing head and re-install the BOP. Nipple up the bell nipple with flow line and riser pipe to the top of the BOP and test.
26. Make up an 8½ inch bit to the BHA and trip in the hole to the stage collar. Perform a pressure test to 1,500 psi for at least 30 minutes and record the test on a chart recorder. Drill out the stage collar and trip down the float collar at approximately 10,400 feet. Trip out with 81/2-inch BHA.
27. Pick up an 8½-inch by 4-inch by 60-foot core barrel and core BHA.

28. Trip in well to approximately 10,400 feet and cut an Injection Zone core from approximately 10,400 feet to 10,460 feet. Pull out of the hole and lay down core. Mark core and prepare for shipment to core laboratory.
29. Trip back in the hole with the 8-1/2 inch drilling assembly and continue drilling to the total depth of the well at 11,000 feet. Circulate and condition the mud for running logs.
30. Move in and rig up an open hole wireline unit. Run the following open hole logs from 11,000 feet to 10,400 feet: gamma ray, laterolog resistivity, compensated neutron, formation density, caliper, and sonic log, borehole image, and mineralogy.
31. Make up a casing scraper for 9⅝ inch, 47 lb/ft casing and trip in the hole to approximately 10,400 feet. Circulate the hole clean and pull out of the hole, laying down the BHA.
32. Move in and rig up a cased hole wireline unit. Run the following cased hole logs from approximately 10,400 feet to the surface: cement evaluation log with gamma ray and casing inspection log. Rig down and move out the wireline unit.
33. Clean the rig mud tanks and displace the drilling mud in the casing with approximately 760 bbl of 9.0 lb/gal brine water. Pull out of the hole.
34. Move in and rig up a casing crew to run the injection tubing. Make up an injection packer to the first joint of tubing. Run 7 inch, 26 lb/ft, K-55, LT&C injection tubing in the hole top approximately 10,300 feet or 100 feet above the top of the injection interval. Fill the tubing annulus with approximately 264 bbl of 9.0 lb/gal brine water containing a corrosion inhibitor, a bactericide and an oxygen scavenger. Set the injection packer and set the slips in the casing head after distributing the tubing weight appropriately between the packer and casing head. Rig down and move out the casing crew and equipment.

    Dimensional data and minimum performance properties of the injection tubing are presented below:

Wall Thickness, inches	0.362
Internal Diameter, inches	6.276
Drift ID, inches	6.151
Coupling OD, inches	7.656
Collapse Pressure, psi	4,320
Internal Yield Pressure, psi	4,980
Pipe Body Strength, lb	415,000
Joint Strength, lb	401,000

Capacity, bbl/ft.....0.038263

34. Cut the 7 inch injection tubing and install an adapter flange with P-seals for the 7 inch tubing. Conduct a preliminary pressure test on the 7 inch tubing annulus to 1,000 psi.
35. Install the upper wellhead assembly.
36. Rig down and move out the drilling rig and associated equipment.

APPENDIX F

WDW-4 COMPLETION AND TESTING PROCEDURES

APPENDIX F

HollyFrontier Navajo Refining LLC
Artesia, New Mexico

WDW-4 COMPLETION & TESTING PROCEDURE

(Depths referenced to Ground Level)

1. Move in and rig up a cased hole wireline unit with pressure control equipment and a crane.
2. Run a temperature survey with pressure gauge from the surface to the total depth of the well at approximately 10,955 feet. Pull pressure gauge up to 10,500 feet and record a static bottomhole pressure for one hour. Pull out of hole with wireline tools and move out the wireline unit and crane.
3. Move in a 2 inch coil tubing unit and associated equipment. Trip in the hole with the 2 inch coil tubing, and nitrogen backwash the well across the perforated interval until a representative sample of formation fluid has been obtained. Rig down and move out the nitrogen truck. Send a sample of the formation fluid to a laboratory for analysis (physical and chemical properties).
4. Move in acid transport trucks. Spot approximately 20 bbl of 15% HCl across the completion interval using the coil tubing unit. Acidize the completion interval with an additional 218 bbl of 15% HCl while moving the end of the coil tubing across the entire openhole injection interval. Flush the coil tubing and pull out of the hole with coil tubing. Flush the 7 inch tubing and formation with approximately 200 bbl of clean brine water. Rig down and move out coil tubing unit and associated equipment.
5. Move in and rig up a wireline unit, mast truck and pressure control lubricator. Rig up 8 frac tanks and fill each tank with 9.0 lb/gal brine water. Move in a pump truck capable of injecting into the well at approximately 12 bpm.
6. Connect a certified pressure gauge to the annulus and pressurize the casing – tubing annulus to approximately 1,200 psi. Record an annulus pressure test for at least 1 hour. A State representative will be notified at least 48 hours prior to conducting the Annulus Pressure Test for witnessing the test and inspecting the well.
7. Conduct a Radioactive Tracer Survey per regulatory guidelines.
8. Run in the hole with a bottomhole pressure gauge and position the gauge at approximately 10,500 feet or at the top perforation and record the static pressure for approximately 30 minutes.

9. Initiate injection into the well at approximately 12 bpm or at a rate appropriate for the injectivity of the perforated injection interval. Continue injecting at a constant rate until the 4,000 bbl of 9.0 lb/gal brine water have been injected. Terminate injection and record the pressure falloff for at least 24 hour. Rig down and move out the pump truck and frac tanks.
10. At the conclusion of the pressure falloff test, pull out of hole with pressure gauge, making 5 minute gradient stops at 1,000-foot intervals. Rig down the wireline unit, pressure control lubricator and crane or mast unit.
11. Restore location.
12. Prepare a Completion Report for submittal to the State Regulatory Agency.

APPENDIX G

INJECTED FLUID MONITORING PLAN

APPENDIX G

INJECTED FLUID MONITORING PLAN

HOLLYFRONTIER NAVAJO REFINING LLC
ARTESIA, NEW MEXICO

PROJECT NO. 50904E

SUBMITTED
MARCH 2017

WSP | PARSONS BRINCKERHOFF
HOUSTON, TEXAS

TABLE OF CONTENTS

1.0 INTRODUCTION

This injected fluid monitoring plan (plan) has been prepared per the requirements of 20.6.2.5207B NMAC. This plan allows for consistent characterization of the injected fluids that are being injected into the nonhazardous waste injection wells operated by HollyFrontier Navajo Refining LLC (Navajo) at their refinery in Artesia, New Mexico. The plan shall be updated as necessary to remain accurate and the analysis remains representative of the fluids being injected into the three nonhazardous waste injection wells.

2.0 INJECTED FLUID DESCRIPTION

The fluid injected into all Navajo injection wells is comprised of exempt and nonexempt nonhazardous 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, and general waste waters, all waters will be blended to form the injected fluid into the injection wells.

Navajo anticipates the addition of a new waste stream to be added to the existing waste stream. The new waste stream will originate from a reverse osmosis (RO) unit to be constructed at the refinery. The characteristics of this waste stream will be similar to that already being injected.

3.0 INJECTED FLUID CHARACTERIZATION SAMPLING PROGRAM

The following sampling program shall be used to collect a representative sample of the injected fluid for chemical analysis to demonstrate the consistency of the fluid composition.

3.1 Sampling Frequency

The injected fluid shall be sampled on a quarterly basis unless a change in the injected fluid composition occurs as a result of operating changes at the Navajo refinery. If the injected fluid composition does change, a representative sample of the waste stream shall be collected at that time and reported to OCD.

3.2 Sampling Location

A representative sample of the injected fluid shall be obtained from the discharge side of the wastewater transfer pump that sends wastewater to the wellheads. The sample port is located at the refinery's wastewater treatment unit.

3.3 Sample Collection Equipment

The fluid samples shall be collected directly from the sample port on the wastewater transfer line into appropriately prepared sample containers required for specific analyses.

3.4 Sample Containers

The injected fluid sample shall be collected in new and previously unused sample containers as provided by the off-site commercial laboratory performing the analyses.

3.5 Sampling Methodology

The injected fluid sample shall be poured directly into the new and previously unused sample containers provided by the off-site commercial laboratory performing the analyses.

3.6 Sample Preservation

EPA and/or ASTM sampling protocols shall be used, including provisions for preserving samples when required. Sampling personnel shall verify that appropriate preservatives are present in sample containers if required by analytical protocol.

3.7 Field Measurements

Field measurements of pH, specific conductance, and temperature shall be recorded on a representative sample of the injected fluid during each quarterly monitoring event.

3.8 Sampling Personnel

Navajo environmental staff or qualified contractor sampling personnel shall be responsible for collecting the injected fluid samples in accordance with the procedures presented in this plan.

4.0 FIELD DOCUMENTATION

The following procedures shall be implemented to properly document each injected fluid characterization sampling event as described in Section 3.0.

4.1 Water Sampling Log

A water sampling log shall be completed at the time the sample is collected. The type of information to be recorded on the water sampling log includes, but is not limited to, the following:

- Date and time of sampling
- Weather conditions
- Sampling location
- Sampling method
- Sample identification
- Field measurements
- Laboratory analyses
- Sampling personnel

4.2 Sample Container Label

Each laboratory provided sample container shall have a label adhered to the outside of the container providing pertinent information identifying the sample,

location and time the sample was collected, analytical parameters, preservatives, and sampler identification.

4.3 Chain-of-Custody Form

A chain-of-custody form shall be completed and accompany each shipment of samples to the off-site commercial laboratory. Each transfer of sample custody shall be signed by both parties on the chain-of-custody form.

4.4 Custody Seal

A custody seal shall be affixed over the opening of the ice chest used to store and transport samples to the receiving laboratory. The laboratory shall note in their Check-In Form that the seal is properly attached and has not been broken.

4.5 Field Equipment Calibration Log

Calibration and maintenance of field equipment (pH, specific conductance, turbidity, and temperature meters) shall be in compliance with the manufacturers' recommended calibration or maintenance procedures. Field logs shall be completed in the field to properly document all calibration and maintenance activities to field equipment.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

A trip blank will be prepared during each waste stream characterization sampling event as described in Section 3.0.

6.0 SAMPLE CUSTODY AND TRANSPORT

Injected fluid characterization samples shall be maintained in the custody of the sampling personnel until the samples are transported to the laboratory or transferred to a representative of the receiving laboratory. Upon transfer of custody, the chain-of-custody record shall be completed and signed by the sampling personnel. The signed chain-of-custody record shall be placed in a plastic bag inside the shipment cooler containing the properly labeled injected fluid

samples. A signed and dated custody seal shall be placed over the lid of the opening of the sample cooler to indicate if the cooler has been opened during delivery prior to receipt by the laboratory.

The chain-of-custody record shall be signed and returned by the laboratory no later than the date the analytical results are available. If the samples are delivered in person by the sampling personnel or picked up by a laboratory employee, the chain-of-custody record shall be signed by the laboratory representative immediately upon relinquishment of the samples by the sampling personnel. One of the copies shall be maintained by the sampling personnel and the remaining copies kept with the samples.

7.0 WASTE STREAM ANALYTICAL PROGRAM

The following describes the injected fluid characterization analytical program.

7.1 Laboratory Requirements

The laboratory performing the analytical services for this project shall be an accredited laboratory. The laboratory shall possess a quality control/ quality assurance (QA/QC) manual prepared in accordance with the requirements of the NELAC certification program. A current copy of the plan shall be sent by the laboratory to the project manager in charge. When the manual is updated by the laboratory the updated version of the manual shall be sent to the project manager. The previously issued copy of the manual must be archived by the project manager to insure traceability of the data generated using the applicable QA/QC manual.

Navajo is currently utilizing ALS Environmental, a commercial laboratory located in Houston, Texas. ALS is a NELAC accredited laboratory.

7.2 Analytical Parameters and Methods

The injected fluid samples are analyzed for the following listing of parameters that are representative of the injected fluid:

- pH
- Specific Conductance
- Temperature
- Redox Potential
- Specific Gravity
- Chloride
- Sulfate
- TDS
- Fluoride
- Calcium
- Potassium
- Magnesium
- Sodium Bicarbonate
- Carbonate
- Bromide
- Cations and Anions
- Cation / Anion Balance

The parameter listing shall be updated as necessary to remain accurate and the waste analysis remains representative of the injected fluid being injected.

8.0 REPORTING

The laboratory performing the injected fluid characterization analyses shall generate a report of the analytical results. These analytical results shall be compiled with the field measurement results and tabularized. The results of each waste stream characterization sampling event, including tabularization of analytical results, copies of laboratory reports, and copies of water sampling logs, shall be provided to OCD within 90 days following each sampling episode. The report shall document any obvious fluctuations in the injected fluid composition.

APPENDIX H

INJECTION WELL CLOSURE PLAN

APPENDIX H

INJECTION WELL CLOSURE PLAN
HOLLYFRONTIER NAVAJO REFINING LLC
(WDW-4)

Final Testing Program

After ceasing injection in the well and prior to commencing physical closure procedures of the injection well, a pressure falloff test will be conducted in order to determine if the transient pressure data have conformed with predicted values within the injection interval. The brine injected for the falloff test will be nonhazardous and will also act as a buffer between the injectate and the well. Appropriate mechanical integrity testing shall also be conducted to ensure the integrity of the long casing string and cement that will remain in the ground after closure. Notify the OCD of mechanical integrity and pressure falloff testing procedures of the long casing string and cement that will remain.

Mechanical Integrity Testing

An annular pressure test and radioactive tracer survey will be conducted prior to removing the injection tubing and packer. Subsequent to tubing and packer removal, a casing inspection and a cement bond/variable density log will be conducted from total depth to the surface.

Pressure Falloff Testing

A wireline unit with pressure control equipment will be rigged up to run in the hole with a surface recording bottom-hole pressure transducer with temperature capabilities to position the transducer at the top of the injection interval. The transducer will be stabilized prior to injecting brine.

Two thousand barrels of brine will be injected at a constant rate. The brine will be compatible with the injection zone reservoir fluid as determined by compatibility testing. The pressure buildup will be recorded. After pumping is ceased, the pressure falloff will be recorded for a minimum of 24 hours after shut in. The pressure derivative curve to will be monitored confirm the test has investigated beyond the wellbore storage effect.

APPENDIX H (Continued)

Regulatory Notification

Navajo will notify OCD at least 60 days before commencing plugging and abandonment procedures on any waste disposal well.

Plug and Abandonment Procedures

The balance plug method will be employed to plug and abandon this well. This technique involves displacing the cement through a work string which has been run into the casing. The cement slurry is pumped down the work string and up the annulus to a calculated height which would balance the cement inside and outside the work string. The work string is then slowly pulled out of the cement leaving a solid, uniform plug. After all cement plugs are set, the well casings will be cut off 3 feet below grade and capped by welding a ½ inch steel plate to the outermost casing string.

The plugging and abandonment procedures for a typical well are described as follows:

1. Prepare the well and location for plugging. Remove the well monitoring equipment and wellhead injection piping.
2. Notify the OCD of the MIT schedule. Conduct an annulus pressure test and a radioactive tracer survey to satisfy OCD mechanical integrity requirements.
3. Move in and rig up the frac tanks and pump for the pressure falloff test. Fill frac tanks with 2,000 barrels of brine.
4. Rig up the wireline unit with pressure control equipment. Run into the hole with a surface recording bottom-hole pressure transducer with temperature capabilities and position the transducer at the top of the perforated injection interval. Allow the transducer to stabilize prior to injecting brine.
5. Commence injecting 2,000 barrels of brine at a constant rate. The brine will be compatible with the injection zone reservoir fluid, as determined by compatibility testing. Record the pressure buildup. Cease pumping and record the pressure falloff. Measure the pressure falloff for a minimum of 24 hours after shut in. Monitor the pressure derivative curve to confirm the test has investigated beyond the wellbore storage effect.
6. Rig down the wireline unit.

APPENDIX H (Continued)

7. Move in and rig up the well service unit with BOP equipment and a 2 7/8 inch work string.
8. Remove the wellhead and install the BOP equipment and stripper head.
9. Spear the 7 inch injection tubing and unseat the injection packer. Trip out of the hole laying down the 7-inch injection tubing.
10. Rig up the wireline unit and run a casing inspection log and a cement bond/variable density log from approximately 10,400 feet to the surface. Pick up and run a wireline set cement retainer at 10,350 feet. Rig down the wireline unit.
11. Rig up cement service equipment. Cement shall be Class "A" (or comparable), weighing 15.6 pounds/gallon. Pressure test the surface lines as required.
12. Run in the well with the work string and sting into the cement retainer at 10,350 feet. Establish a pump-in rate into the openhole interval and pump 350 sx of Class “A” cement below the retainer. Pull out of the retainer and spot sufficient Class "A" (or comparable) cement slurry to develop a 100-foot plug above the cement retainer (10,250 – 10,350 feet). Pull the tubing up above the top of cement and reverse out excess cement. Catch a sample of cement to check curing time and compressive strength. Allow the cement to set overnight (8-hour minimum) before tagging top of plug to confirm proper setup and location. Pressure test the plug to the pressure recommended by the OCD.
13. Set a balanced cement plug using Class “A” cement from the top of cement at approximately 10,250 feet to approximately three (3) feet below land surface.
14. Allow cement to set overnight (8-hour minimum), then “top off” cement as needed until the entire top of cement remains approximately three (3) feet below land surface.
15. Cut casing strings ±3 feet below ground level.
16. Weld a ½ inch steel plate across the 13⅜-inch casing. Inscribe on plate, in a permanent manner, the following information: (1) operator name, (2) P&A date, and (3) API number.
17. Release all equipment and clean up the location.
18. Submit closure data to the OCD.

APPENDIX H (Continued)

Once closure operations are complete and the well is officially plugged and abandoned, a closure report certifying that the well or wells were closed in accordance with applicable requirements, will be submitted to the OCD within 30 days. The report will include any newly constructed or discovered wells or information, including proposed well data, within the area of review. When plugging and abandonment is complete, Navajo will submit certification to the OCD that the injection well has been closed in accordance with applicable OCD regulations.

APPENDIX I

FINANCIAL ASSURANCE DOCUMENTATION

Form ___WQCC-1____
Adopted 5-24-2011

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION (OCD)
WATER QUALITY CONTROL COMMISSION (WQCC) OCD DISCHARGE PERMIT BOND

BOND NO. **_____6186996**
OCD PERMIT **___UICI-008-1**
AMOUNT OF BOND **___$95,000.00**
COUNTY **__Eddy County**

File with the Oil Conservation Division, 1220 South St. Francis Drive, Santa Fe, NM 87505

KNOW ALL MEN BY THESE PRESENTS:

That Navajo Refining Company, (~~an individual~~ **if dba must read Example: John Doe dba ABC Services**) (~~a general partnership~~) (a corporation), (limited liability company) (limited partnership) organized in the State of New Mexico, and authorized to do business in the State of New Mexico, as PRINCIPAL, and Safeco Insurance Company of America, a corporation organized and existing under the laws of the State of Delaware and authorized to do business in the State of New Mexico, as SURETY, are firmly bound unto the State of New Mexico, for the use and benefit of the Oil Conservation Division of the Energy, Minerals and Natural Resources Department (or successor agency) (the DIVISION), pursuant to 20.6.2.5210.B(17) NMAC, 20.6.2.5006 NMAC, and 20.6.2.3107.A(11) NMAC, in the sum of $95,000.00, for the payment of which the PRINCIPAL and SURETY hereby bind themselves, their successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that:

WHEREAS, the PRINCIPAL does or may own or operate a "Facility" (identified by location only below) and/or one or more wells (identified by location(s) below) for the injection of fresh and non-fresh water, remediation fluids (i.e., Class I (NH) Disposal Well or Class V Pump & Treat Injection Well), oilfield exempt, non-exempt and/or geothermal produced fluid waste(s) into the subsurface for use in connection with oil, gas and/or geothermal activities, which well is classified as a Division Underground Injection Control Class I, III or V Injection Well pursuant to the 20.6.2.5002 et seq. NMAC, the identification and location(s) of said well(s) being:

_____WDW-4_____API No. _____, located___1,000___feet from the
(**Name of Well**)
____South_____ (~~North~~/**South**) line and _____2,500_____feet from the _____West_____ (~~East~~/**West**) line

of Section___23_____ Township_____17S_____ (~~North~~) (**South**), Range_____27_____ (**East**) (~~West~~),

NMPM, and Latitude 32.815065_ Longitude -104.249687°_ County _____Eddy_____, New Mexico.

NOW, THEREFORE, if the PRINCIPAL and SURETY or either of them, or their successors or assigns or any of them, shall: (a) cause said well(s) to be properly plugged and abandoned when no longer productive or useful for other beneficial purpose in accordance with the WQCC rules and/or orders of the DIVISION; and (b) take all measures necessary, as required by the DIVISION by OCD Permit No. UICI-008-1 pursuant to 20.6.2 and 20.6.4 NMAC, as such rules now exist or may hereafter be amended, to prevent contamination of ground water having 10,000 milligrams per liter (mg/l) or less concentration of total dissolved solids (TDS), including, but not limited to, surface and ground water restoration if applicable, and post-operational monitoring.

THEN AND IN THAT EVENT, this obligation shall be null and void; otherwise and in default of complete compliance with any and all of said obligations, the same shall remain in full force and effect.

_____	_____
PRINCIPAL	**SURETY**
_____	_____
Address	**Address**
By_____	_____
Signature	**Attorney-in-Fact**
_____	
Title	
If PRINCIPAL is a corporation, affix Corporate seal here	**Corporate surety affix Corporate seal here**

Form WQCC-1

ACKNOWLEDGMENT FORM FOR INDIVIDUAL

(If dba, must read – Example: John Doe dba Well Services)

STATE OF _____)
ss.
COUNTY OF_____)

This instrument was acknowledged before me on this _____ day of _____20_____

by_____.
(Name of Individual)

_____
Notary Public

SEAL

_____
My Commission Expires

ACKNOWLEDGMENT FORM FOR PARTNERSHIP, CORPORATION, OR LIMITED LIABILITY COMPANY

STATE OF_____)
ss.
COUNTY OF_____)

This instrument was acknowledged before me on _____day of _____20____by_____
(Name of Person Signing Instrument)

as _____of_____
(**Capacity, e.g., partner, president, manager, member**) (**Name of partnership, corporation or limited liability company**)

_____
Notary Public

SEAL

_____
My Commission Expires

ACKNOWLEDGMENT FORM FOR CORPORATE SURETY

STATE OF _____)
ss.
COUNTY OF_____)

This instrument was acknowledged before me on this _____day of _____, 20____,

by_____, as Attorney-in-Fact for _____
(Name of Attorney-in-Fact) (Name of Corporate Surety)

_____
Notary Public

SEAL

_____
My Commission Expires

Corporate Surety attach Power of Attorney

APPROVED BY:

OIL CONSERVATION DIVISION OF NEW MEXICO

By_____

Date_____

APPENDIX J

DRAFT PUBLIC NOTICE

PUBLIC NOTICE

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

In accordance with 20.6.2.3108.F NMAC, HollyFrontier Navajo Refining LLC, hereby gives public notice of its application to the New Mexico Oil Conservation Division (OCD) for a discharge permit to inject treated nonhazardous waste water effluent from the refinery's on-site wastewater treatment plant into a Class I (nonhazardous) injection well, WDW-4. The well will be located in the SE/4, SW/4, Section 23, Township 17 South, Range 27 East, NMPM, Eddy County, New Mexico. The WDW-4 location is approximately 8.5 miles E-SE of the intersection of Hwy 285 and Hwy 82 on the north side of Hwy 82. The Navajo Refinery is located at 501 E. Main Street, Artesia, New Mexico.

Waste water from the refinery is generated from the treatment of waters from the processing of crude oil and recovered oil, including the removal of water entrained in these oils, the washing of these oils to remove salts and sediment, other process unit waters, water used for heating and cooling during refining, boiler blowdown, recovered and treated groundwater, general wash waters, and stormwater collected from process portions of the refinery.

Underground injection at WDW-4 will occur into undifferentiated Silurian-Devonian age strata within the injection interval from approximately 10,400 to 10,900 feet below ground surface (log depth). The injection rate into WDW-4 will not exceed 150 gallons per minute (gpm) and the maximum allowable surface injection pressure is 2,080 pounds per square inch gauge (psig).

The injected refinery waste water quality is approximately 3,000 mg/L total dissolved solids (TDS). Naturally occurring formation fluid within the proposed injection interval exceeds 10,000 milligrams per liter (mg/L) TDS. The base of the Underground Source of Drinking Water (USDW), groundwater with total dissolved solids concentration with less than 10,000 mg/L, is projected to occur at a depth of approximately 450 to 500 feet below land surface in the area of WDW-4 location The naturally occurring groundwater quality at this depth ranges from about 1,500 to 2,200 mg/L TDS.

Persons interested in obtaining further information, submitting comments, or requesting to be on a facility-specific mailing list for future notices may contact the Environmental Bureau Chief of the New Mexico Oil Conservation Division.

Comments and inquiries on regulations should be directed to:

Director
Conservation Division
Energy Minerals and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, New Mexico 87505
Telephone: (505) 476-3440

When corresponding, please reference the name of the applicant and the well name.

ATTACHMENT 1

OCD WELL FILES FOR API 30-015-00472 (MAP ID NO. 5)

30-015-00472

Ogrid - 20451
prop - 25541
POOL - 51300

4 Mg CK

1-9-80
Comp. Resistivity
401-10284
Microlog
8828-10285
Sonic
0-10,282

1058810
1058830
1058850

NUMBER OF COPIES RECEIVED		
DISTRIBUTION		
SANTA FE		
FILE		
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL / GAS		
PRORATION OFFICE		
OPERATOR		

NEW MEXICO OIL CONSERVATION COMMISSION

FORM C-128
Revised 5/1/57

WELL LOCATION AND ACREAGE DEDICATION PLAT

SEE INSTRUCTIONS FOR COMPLETING THIS FORM ON THE REVERSE SIDE

SECTION A

Operator	Lease	Well No.
Ralph Lowe	Federal (Perry) NM 025527A	1

Unit Letter	Section	Township	Range	County
F	23	T-17-S	R-27-E	Eddy

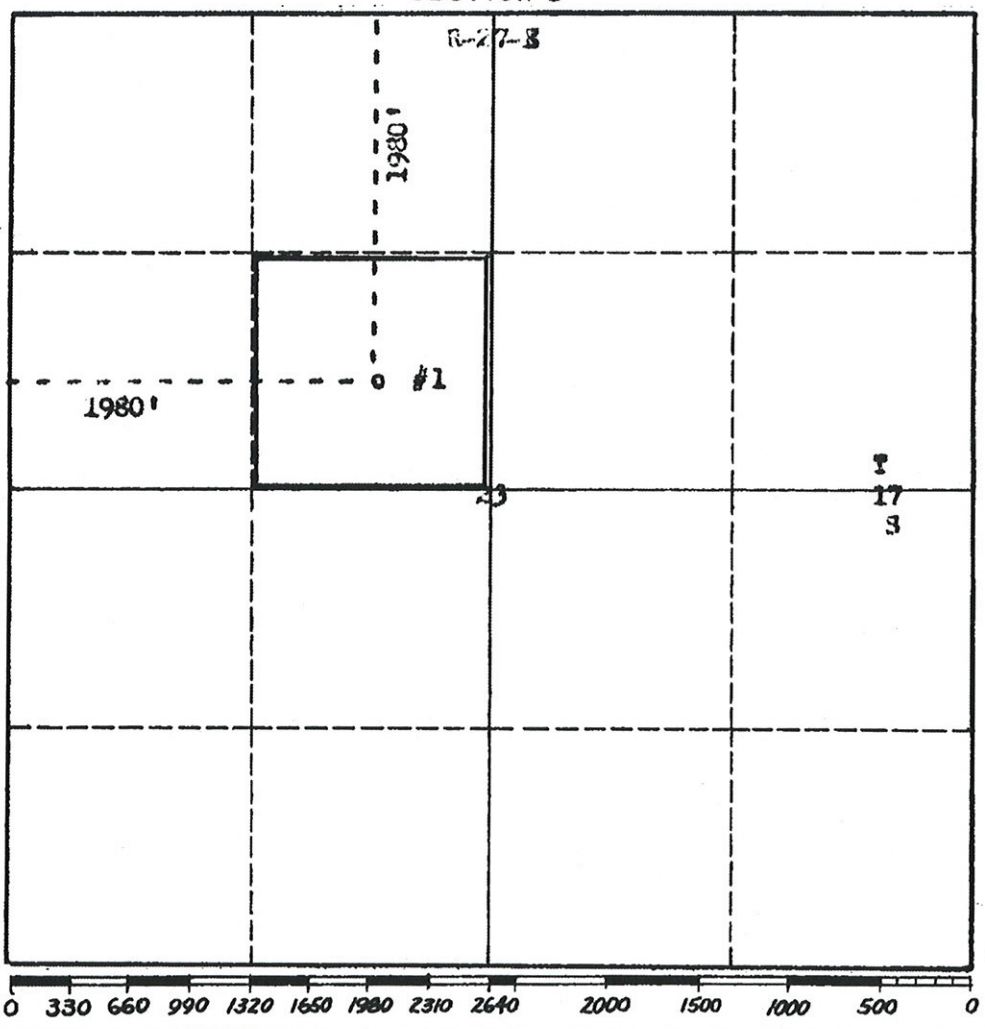
Actual Footage Location of Well:
1980 feet from the North line and 1980 feet from the West line

Ground Level Elev.	Producing Formation	Pool	Dedicated Acreage:
3525	Devonian	Undesignated	40 Acres

1. Is the Operator the only owner in the dedicated acreage outlined on the plat below? YES X NO _____. *("Owner" means the person who has the right to drill into and to produce from any pool and to appropriate the production either for himself or for himself and another. (65-3-29 (e) NMSA 1935 Comp.).*
2. If the answer to question one is "no," have the interests of all the owners been consolidated by communitization agreement or otherwise? YES_____ NO _____. If answer is "yes," Type of Consolidation _____
3. If the answer to question two is "no," list all the owners and their respective interests below:

Owner	Land Description

SECTION B



CERTIFICATION

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

E. L. Murray
Name

Agent
Position

Ralph Lowe
Company

January 11, 1962
Date

I hereby certify that the well location shown on the plat in *SECTION B* was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

Date Surveyed
January 8, 1962
Registered Professional Engineer and/or Land Surveyor

Joe J. Hewett Jr.
Certificate No.
3280

INSTRUCTIONS FOR COMPLETION OF FORM C-128

1. Operator shall furnish and certify to the information called for in Section A.

2. Operator shall outline the dedicated acreage for *both* oil and gas wells on the plat in Section B.

3. A registered professional engineer or land surveyor registered in the State of New Mexico or approved by the Commission shall show on the plat the location of the well and certify this information in the space provided.

4. All distances shown on the plat must be from the outer boundaries of the Section.

5. If additional space is needed for listing owners and their respective interests as required in question 3 of Section A, please use space below.

N. M. O. C. C. COPY

Form 9-331a
(Feb. 1951)

(SUBMIT IN TRIPLICATE)

Artesia
Budget Bureau No. 42-R358.4.
Approval expires 12-31-60.
Land Office New Mexico
Lease No. NM 025527A
Unit F

APPROVED
JAN 17 1962
JAMES A. KNAUF
DISTRICT ENGINEER

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

RECEIVED
JAN 22 1962
O. C. C.
ARTESIA, OFFICE

SUNDRY NOTICES AND REPORTS ON WELLS

NOTICE OF INTENTION TO DRILL	X	SUBSEQUENT REPORT OF WATER SHUT-OFF	
NOTICE OF INTENTION TO CHANGE PLANS		SUBSEQUENT REPORT OF SHOOTING OR ACIDIZING	
NOTICE OF INTENTION TO TEST WATER SHUT-OFF		SUBSEQUENT REPORT OF ALTERING CASING	
NOTICE OF INTENTION TO RE-DRILL OR REPAIR WELL		SUBSEQUENT REPORT OF RE-DRILLING OR REPAIR	
NOTICE OF INTENTION TO SHOOT OR ACIDIZE		SUBSEQUENT REPORT OF ABANDONMENT	
NOTICE OF INTENTION TO PULL OR ALTER CASING		SUPPLEMENTARY WELL HISTORY	
NOTICE OF INTENTION TO ABANDON WELL			

(INDICATE ABOVE BY CHECK MARK NATURE OF REPORT, NOTICE, OR OTHER DATA)

FEDERAL (BERRY) January 11, 19 62

Well No. 1 is located 1980 ft. from {N/S} line and 1980 ft. from {E/W} line of sec. 23

SE/4 ~~SE~~ NW/4 (¼ Sec. and Sec. No.) | 17-S (Twp.) | 27-E (Range) | N.M.P.M. (Meridian)

Undesignated (Field) | Eddy (County or Subdivision) | New Mexico (State or Territory)

The elevation of the ~~derrick floor~~ G.L. above sea level is 3535 ft.

DETAILS OF WORK

(State names of and expected depths to objective sands; show sizes, weights, and lengths of proposed casings; indicate mudding jobs, cementing points, and all other important proposed work)

We Plan to drill a 10,500' test to the Devonian Formation, and plan to test all shows of oil and gas between 3000' and T.D. 13 3/8" 48# surface casing will be set at 400' in Seven Rivers anhydrite and cemented to the surface. 9 5/8" 36# Intermediate casing will be set at 1700' in the San Andres dolomite and will be cemented to the surface or to the surface string. If production seems possible, 5 1/2" 17# casing will be run to the producing horizon.

RECEIVED
JAN 12 1962
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

I understand that this plan of work must receive approval in writing by the Geological Survey before operations may be commenced.

Company Ralph Lowe

Address Box 832,

Midland, Texas

By [signature]

Title Agent

GPO 862040

N. M. O. C. C. COPY

Form 9-331a
(Feb. 1951)

APPROVED
APR 24 1963
RONNIE E. SHOOK
ACTING DISTRICT ENGINEER

(SUBMIT IN TRIPLICATE)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Budget Bureau No. 42-R358.4.
Form Approved.
Land Office New Mexico
Lease No. NM 025527A
Unit E

SUNDRY NOTICES AND REPORTS ON WELLS

NOTICE OF INTENTION TO DRILL		SUBSEQUENT REPORT OF WATER SHUT-OFF	
NOTICE OF INTENTION TO CHANGE PLANS		SUBSEQUENT REPORT OF SHOOTING OR ACIDIZING	
NOTICE OF INTENTION TO TEST WATER SHUT-OFF		SUBSEQUENT REPORT OF ALTERING CASING	
NOTICE OF INTENTION TO RE-DRILL OR REPAIR WELL		SUBSEQUENT REPORT OF RE-DRILLING OR REPAIR	
NOTICE OF INTENTION TO SHOOT OR ACIDIZE		SUBSEQUENT REPORT OF ABANDONMENT	
NOTICE OF INTENTION TO PULL OR ALTER CASING		SUPPLEMENTARY WELL HISTORY	X
NOTICE OF INTENTION TO ABANDON WELL			

(INDICATE ABOVE BY CHECK MARK NATURE OF REPORT, NOTICE, OR OTHER DATA)

Berry (Federal)

April 22, 19 63

Well No. 1 is located 1980 ft. from {N} line and 1980 ft. from {E} line of sec. 23

SE/4 NW/4 Sec. 23 (¼ Sec. and Sec. No.) | 17-S (Twp.) | 27-E (Range) | NMPM (Meridian)

Undesignated (Field) | Eddy (County or Subdivision) | New Mexico (State or Territory)

G.L.

The elevation of the derrick floor above sea level is 3535 ft.

DETAILS OF WORK

(State names of and expected depths to objective sands; show sizes, weights, and lengths of proposed casings; indicate mudding jobs, cementing points, and all other important proposed work)

We are blowing well occasionally trying to clean it up. Well could be classified as temporarily abandoned, until we decide to either complete as a gas well or abandon.

RECEIVED
APR 25 1963
U. S. G.
ARTESIA, OFFICE

RECEIVED
APR 24 1963
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

I understand that this plan of work must receive approval in writing by the Geological Survey before operations may be commenced.

Company RALPH LOWE

Address Box 832

Midland, Texas

By Earl Mowery
Agent

Title

GPO 914974

Ralph Lowe
Berry-Federal NM 025527A
Well No. 1, Unit F
Section 23, TWP-17-S, R-27-E
Eddy County, New Mexico

DEVIATION SURVEY

Degree	Feet	Degree	Feet
1-1/2	861	1	8050
0	1318	1	8244
1/4	1413	1	8382
1/4	2306	1	8480
1-1/4	3054	1	8662
1/4	3555	1	8743
1/4	3850	1	8828
3/4	4437	1	8965
1/2	4751	3/4	9027
3/4	5131	3/4	9096
3/4	5701	1/2	9250
1-1/2	5987	1-1/4	9325
1-1/4	6305	1-1/4	9405
1-1/4	6622	1/2	9461
1-1/2	7085	3/4	9669
1	7198	1	9736
3/4	7537	1/2	9798
1	7650	3/4	9956
1	7789	3/4	10083
1	7898	1/2	10189

RECEIVED
OCT 28 1963
O. C. C.
ARTESIA, OFFICE

STATE OF TEXAS)
COUNTY OF MIDLAND)

Before me, the undersigned authority, on this day personally appeared C. W. Murray, known to me to be the person whose name is subscribed to this instrument, who after by me duly sworn on oath, states that to the best of his knowledge the facts stated above are true and correct.

C. W. Murray

Subscribed and sworn to before me on this the 23rd. day of October, 1963

Jeanne Coughran, Notary Public
in and for Midland County, Texas

It is of the greatest importance to have a complete history of the well. Please state in detail the dates of redrilling, together with the reasons for the work and its results. If there were any changes made in the casing, state fully, and if any casing was "sidetracked" or left in the well, give its size and location. If the well has been dynamited, give date, size, position, and number of shots. If plugs or bridges were put in to test for water, state kind of material used, position, and results of pumping or bailing.

Drill Stem Tests

9096'-9162' Gas 5 Min. open 1 hrs. rec. 30' Mud. (SIP 323/-2770#) FP 46# (Hyd 4786#)

9318-9405' open 17 Min. rec 3000' Mud (ISIP 2280#) (IFP 220#).

9490-9537' open 1 hr Gas 17 Min rec 650' gassy mud. (SIP 2746-2781) (FP 384-360#) (Hyd 5054-5054#)

9589-9669' 2 hrs. 40 min Gas 13 Mcf Made 650 MCF rec 2450' GCM. (SIP 5790-5675#) (FP 1200-1500#) (Hyd 5835-5815#)

10278-10318 op. 1 hr. rec. 100' Mud (SIP 1154#) FP 100# - 170#)

10285-10385' op. 1 hr. rec. 230' Mud (SIP 1380-290#) (FP 197#)

10277-10427 op 1 hr. rec. 500' Mud 9700' SW (SIP 4360#) FP 3380-4360#) Set retainer @ 10200' Mud to surf.

Perf. 9541-9550, 9578-9584 Trt w 500 gal mud acid 1 to 3 BPM - 5700# - 5500# Well flwg. 1 MCF TSTP, pressure 0 on 4 frac w 3000 gal. Jel Kero W 1500# sd - Max pressure 8100# - Trt w 3 BPM @ 7350# Swb dry @ Rec. 2180 gal.

Set ret. @ 9300' Perf 9154-9164 Trt. w 590 gal acid Swb dry. frac w 5000 gal oil - 3500# Sd 3 BPM Max 9200# - 6400#

Perf 9192-9198, 9313-9318, 9328-9332, 9376-86, 9400-9406, 9445-9453 Trt w 500 gal Mud acid 10000 gal Jel acid w 3500# sd 800# Walnut Hulls. Tested well Made 660 MCF/in 7 hrs. after Testing well Several months, well declined and was not a Commercial Producer.

FORM 9-330

DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LEASE OR PERMIT TO PROSPECT
SERIAL NUMBER
U. S. LAND OFFICE

RECEIVED
OCT 28 1963
O. C. C.
ARTESIA, OFFICE

FOLD

PLUGS AND ADAPTERS

Heaving plug—Material ..... Length ..... Depth set .....

Adapters—Material ..... Size .....

SHOOTING RECORD

Size	Shell used	Explosive used	Quantity	Date	Depth shot	Depth cleaned out

TOOLS USED

Rotary tools were used from 0 feet to 10427 feet, and from ..... feet to ..... feet

Cable tools were used from ..... feet to ..... feet, and from ..... feet to ..... feet

DATES

....., 19..... Put to producing Dry Hole, 19.....

The production for the first 24 hours was ..... barrels of fluid of which .....% was oil; .....% emulsion; .....% water; and .....% sediment. Gravity, °Bé. .....

If gas well, cu. ft. per 24 hours ..... Gallons gasoline per 1,000 cu. ft. of gas .....

Rock pressure, lbs. per sq. in. .....

EMPLOYEES

Percy Wirt, Driller G.W. Mallard, Driller

Frank Cromwell, Driller ....., Driller

FORMATION RECORD

FROM—	TO—	TOTAL FEET	FORMATION
0	155	155	Red Shale, Gypsum, & Dolomite
155	400	245	Sand
400	880	480	Dolomite
880	1670	790	Dolomite and Sand (Elev. 3548 DF)
1670	3050	1380	Dolomite
3050	5150	2100	Dolomite & Sand
5150	6325	1175	Shale & Dolomite
6325	9290	2965	Lime and Shale
9290	9740	450	Shale, Lime, & Sand
9740	10245	505	Limestone
10245	10253	8	Shale
10253	10428	175	Dolomite

RECEIVED
OCT 28 1963
O. C. C.
ARTESIA, OFFICE

L. Morrow 9320
Up Miss 9593
L. Miss. 9738
Woodford 10243

Geol. Tops

Yates	156
7R	396
Qn	880
Grybg	1313
SA	1667
Glor.	3048
Tubb	4455
Abo	5149
WC	6325
Cisco	7588
Canyon	8179
L. Str. Ls	8532
Bend	9020
Morrow Ls.	9218

FROM— TO— TOTAL FEET FORMATION

[OVER] FORMATION RECORD

S-Dev. 10253

E.L.

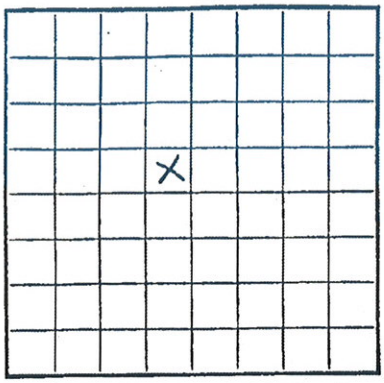
15—43094-5

1

Form 9-330

Form approved.
Budget Bureau No. 42-R355.4.

U. S. LAND OFFICE New Mexico
SERIAL NUMBER NM 025527 A
LEASE OR PERMIT TO PROSPECT



LOCATE WELL CORRECTLY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LOG OF OIL OR GAS WELL

Company Ralph Lowe Address Box 837, Midland, Texas
Lessor or Tract Berry (Federal) Field Undesignated State New Mexico
Well No. 1 Sec. 23 T. 17-S R. 27-E Meridian NMPM County Eddy
Location 1980 ft. {N./S.} of N. Line and 1980 ft. {E./W.} of W. Line of Sec. 23 Elevation 3535
(Derrick floor relative to sea level)

The information given herewith is a complete and correct record of the well and all work done thereon so far as can be determined from all available records.

Signed

Date October 23, 1963 Title Agent

The summary on this page is for the condition of the well at above date.

Commenced drilling January 22, 1963 Finished drilling April 18, 1963

OIL OR GAS SANDS OR ZONES

(Denote gas by G)

No. 1, from 9541- to 9550 (G)
No. 2, from 9578 to 9581 (G)
No. 3, from to
No. 4, from to
No. 5, from to
No. 6, from to

RECEIVED
OCT 28 1963
O. C. C.
ARTESIA, OFFICE

IMPORTANT WATER SANDS

No. 1, from to
No. 2, from to
No. 3, from to
No. 4, from to

CASING RECORD

Size casing	Weight per foot	Threads per inch	Make	Amount	Kind of shoe	Cut and pulled from	Perforated From—	Perforated To—	Purpose
13 3/8	48#	8	Spang	400			See attached		
9 5/8	36#	8	Lone Star	1690					
5 1/2	17#	LT&C	CF&I	10278		8200			

MUDDING AND CEMENTING RECORD

Size casing	Where set	Number sacks of cement	Method used	Mud gravity	Amount of mud used
13 3/8	400	400	Pump		
9 5/8	1690	950	Pump		
5 1/2	10278	525	Pump		

MARK

N. M. O. C. C. COPY

Form 9-331a
(Feb. 1951)

Budget Bureau No. 42-R358.4.
Form Approved.

Land Office New Mexico
Lease No. NM 025527 A
Unit F

(SUBMIT IN TRIPLICATE)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUNDRY NOTICES AND REPORTS ON WELLS

NOTICE OF INTENTION TO DRILL		SUBSEQUENT REPORT OF WATER SHUT-OFF	
NOTICE OF INTENTION TO CHANGE PLANS		SUBSEQUENT REPORT OF SHOOTING OR ACIDIZING	
NOTICE OF INTENTION TO TEST WATER SHUT-OFF		SUBSEQUENT REPORT OF ALTERING CASING	
NOTICE OF INTENTION TO RE-DRILL OR REPAIR WELL		SUBSEQUENT REPORT OF RE-DRILLING OR REPAIR	
NOTICE OF INTENTION TO SHOOT OR ACIDIZE		SUBSEQUENT REPORT OF ABANDONMENT	
NOTICE OF INTENTION TO PULL OR ALTER CASING		SUPPLEMENTARY WELL HISTORY	
NOTICE OF INTENTION TO ABANDON WELL			
Notice of Intention to plug back	X		

(INDICATE ABOVE BY CHECK MARK NATURE OF REPORT, NOTICE, OR OTHER DATA)

Berry (Federal) October 21, 1963

Well No. 1 is located 1980 ft. from [N/S] line and 1980 ft. from [E/W] line of sec. 23

SE/4 NW/4 Sec. 23 (¼ Sec. and Sec. No.) 17-S (Twp.) 27-E (Range) NMPM (Meridian)

Undesignated (Field) Eddy (County or Subdivision) New Mexico (State or Territory)

The elevation of the ~~derrick~~ GL floor above sea level is 3535 ft.

DETAILS OF WORK

(State names of and expected depths to objective sands; show sizes, weights, and lengths of proposed casings; indicate mudding jobs, cementing points, and all other important proposed work)

Well to be Plugged back to 3000', and turned over to Leonard Latch for Completion. Well to be plugged back per instructions of U.S.G.S.

RECEIVED
DEC 3 1963
ARTESIA, NEW MEXICO

RECEIVED
OCT 24 1963
GEOLOGICAL SURVEY
ROSWELL, NEW MEXICO

Formerly TD 3000 ft

I understand that this plan of work must receive approval in writing by the Geological Survey before operations may be commenced.

Company Ralph Lowe

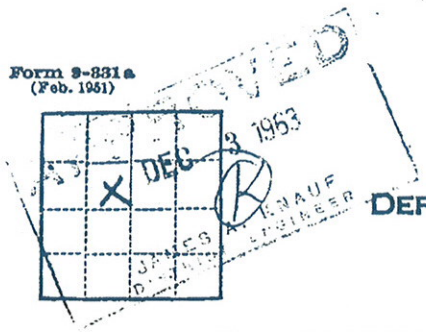
Address Box 837
Midland, Texas

By [signature]

Title agent

GPO 914974

Form 9-331a
(Feb. 1951)



(SUBMIT IN TRIPLICATE)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Budget Bureau No. 42-R358.4.
Form Approved.
Land Office New Mexico
Lease No. NM 025527A
Unit F

Copy to 57

SUNDRY NOTICES AND REPORTS ON WELLS

NOTICE OF INTENTION TO DRILL		SUBSEQUENT REPORT OF WATER SHUT-OFF	
NOTICE OF INTENTION TO CHANGE PLANS		SUBSEQUENT REPORT OF SHOOTING OR ACIDIZING	
NOTICE OF INTENTION TO TEST WATER SHUT-OFF		SUBSEQUENT REPORT OF ALTERING CASING	
NOTICE OF INTENTION TO RE-DRILL OR REPAIR WELL		SUBSEQUENT REPORT OF RE-DRILLING OR REPAIR	
NOTICE OF INTENTION TO SHOOT OR ACIDIZE		SUBSEQUENT REPORT OF ~~ABANDONMENT~~ Plug back	X
NOTICE OF INTENTION TO PULL OR ALTER CASING		SUPPLEMENTARY WELL HISTORY	
NOTICE OF INTENTION TO ABANDON WELL			

(INDICATE ABOVE BY CHECK MARK NATURE OF REPORT, NOTICE, OR OTHER DATA)

Berry Federal October 23, 1963

Well No. 1 is located 1980 ft. from ~~S~~ N line and 1980 ft. from ~~E~~ W line of sec. 23

SE/4 NW/4 Sec. 23 (¼ Sec. and Sec. No.) 17-S (Twp.) 27-E (Range) N.M.P.M. (Meridian)

Undesignated (Field) Eddy (County or Subdivision) New Mexico (State or Territory)

The elevation of the ~~derrick floor~~ GL above sea level is 3535 ft.

DETAILS OF WORK

(State names of and expected depths to objective sands; show sizes, weights, and lengths of proposed casings; indicate mudding jobs, cementing points, and all other important proposed work)

Well plugged back to 3000' and turned over to Leonard Latch. 35 sacks at 9200'-8920', 40 sacks at 7664'-7384', 35 sacks at 6370'-6090', 35 sacks at 5200'-4920', and 35 sacks at 3280-3000'. as per instructions of U.S.G.S.

RECEIVED
DEC 6 1963
U.S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

I understand that this plan of work must receive approval in writing by the Geological Survey before operations may be commenced.

Company Ralph Lowe

Address Box 832

Midland, Texas

By [signature]

Title agent

GPO 914974

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
DEC 20 1963
O. C. C.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

2. NAME OF OPERATOR: Leonard Latch

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements. See also space 17 below.) At surface: 1980/N+W

5. LEASE DESIGNATION AND SERIAL NO.: NM 025527-A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Berry

9. WELL NO.: 1

10. FIELD AND POOL, OR WILDCAT: Empire

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: 23-17S-27E

12. COUNTY OR PARISH: Eddy

13. STATE: N. Mex.

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545DF

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☒	(Other)			
(Other)				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Well drilled by Ralph Lowe as a deep test. Set intermediate string of 9 5/8" casing at 1690', circulated cement. A cement plug was set at 3000'.

Leonard Latch attempted to log hole in early December, 1963---found mud so heavy that logging instruments would not go down. Will move on drilling rig early in 1964 and attempt to complete in Greyburg or San Andres between the depth of 1690 & 3000ft.

RECEIVED
DEC 19 1963
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED: Chester L. Adamson TITLE: Agent DATE: 12-17-63

(This space for Federal or State office use)

APPROVED BY: _____ TITLE: _____ DATE: _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
DEC 19 1963
R. L. HEENAN
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE : 1963—O-685229

Form 9-330
(Rev. 5-63)

N. M. O. C. C. COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN DUPL. TE* (See other instructions on reverse side) copy to J.

Form approved.
Budget Bureau No. 42-R355.5.

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Berry

9. WELL NO.: 29

10. FIELD AND POOL, OR WILDCAT: Empire Yates

11. SEC., T., R., M., OR BLOCK AND SURVEY OR AREA: Sec. 23 T17S R 27E

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

WELL COMPLETION OR RECOMPLETION REPORT AND LOG*

1a. TYPE OF WELL: OIL WELL ☐ GAS WELL ☒ DRY ☐ Other RECEIVED

b. TYPE OF COMPLETION: NEW WELL ☐ WORK OVER ☐ DEEP-EN ☐ PLUG BACK ☒ DIFF. RESVR. ☒ Other

AUG 13 1965

O. C. C.
ARTESIA, OFFICE

2. NAME OF OPERATOR: Leonard Latch ✓

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

4. LOCATION OF WELL (*Report location clearly and in accordance with any State requirements*)*
At surface: 1980' N & W.
At top prod. interval reported below
At total depth

14. PERMIT NO.	DATE ISSUED

15. DATE SPUDDED	16. DATE T.D. REACHED	17. DATE COMPL. (*Ready to prod.*)	18. ELEVATIONS (DF, RKB, RT, GR, ETC.)*	19. ELEV. CASINGHEAD
Turned in by Ralph Lowe		8-9-65	3545DF	3535DF

20. TOTAL DEPTH, MD & TVD	21. PLUG, BACK T.D., MD & TVD	22. IF MULTIPLE COMPL., HOW MANY*	23. INTERVALS DRILLED BY	ROTARY TOOLS	CABLE TOOLS
	1550'	None	→	X	

RECEIVED
AUG 10 '65
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

24. PRODUCING INTERVAL(S), OF THIS COMPLETION—TOP, BOTTOM, NAME (MD AND TVD)*: 1148'-49' & 1162-63'

25. WAS DIRECTIONAL SURVEY MADE

26. TYPE ELECTRIC AND OTHER LOGS RUN: Gamaray- Nurton Filed by Ralph Lowe.

27. WAS WELL CORED

28. CASING RECORD (*Report all strings set in well*)

CASING SIZE	WEIGHT, LB./FT.	DEPTH SET (MD)	HOLE SIZE	CEMENTING RECORD	AMOUNT PULLED
9 5/8"		1690'		Cement Circulated	

29. LINER RECORD

SIZE	TOP (MD)	BOTTOM (MD)	SACKS CEMENT*	SCREEN (MD)

30. TUBING RECORD

SIZE	DEPTH SET (MD)	PACKER SET (MD)
2"	1100'	No

31. PERFORATION RECORD (*Interval, size and number*): 1148'-49' & 1162-63'

32. ACID, SHOT, FRACTURE, CEMENT SQUEEZE, ETC.

DEPTH INTERVAL (MD)	AMOUNT AND KIND OF MATERIAL USED
1148-49-62-63	1000 Gal. Acid

33.* PRODUCTION

DATE FIRST PRODUCTION	PRODUCTION METHOD (*Flowing, gas lift, pumping—size and type of pump*)	WELL STATUS (*Producing or shut-in*)
4-10-65	Flowing	Small gas well. Shut in

DATE OF TEST	HOURS TESTED	CHOKE SIZE	PROD'N. FOR TEST PERIOD →	OIL—BBL.	GAS—MCF.	WATER—BBL.	GAS-OIL RATIO
							Small Gas well

FLOW. TUBING PRESS.	CASING PRESSURE	CALCULATED 24-HOUR RATE →	OIL—BBL.	GAS—MCF.	WATER—BBL.	OIL GRAVITY-API (CORR.)

34. DISPOSITION OF GAS (*Sold, used for fuel, vented, etc.*): Shut in

TEST WITNESSED BY

35. LIST OF ATTACHMENTS

36. I hereby certify that the foregoing and attached information is complete and correct as determined from all available records

SIGNED Chester L. Anderson TITLE Agent DATE 8-9-65

*(See Instructions and Spaces for Additional Data on Reverse Side)

INSTRUCTIONS

General: This form is designed for submitting a complete and correct well completion report and log on all types of lands and leases to either a Federal agency or a State agency, or both, pursuant to applicable Federal and/or State laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office. See instructions on items 22 and 24, and 33, below regarding separate reports for separate completions.

If not filed prior to the time this summary record is submitted, copies of all currently available logs (drillers, geologists, sample and core analysis, all types electric, etc.), formation and pressure tests, and directional surveys, should be attached hereto, to the extent required by applicable Federal and/or State laws and regulations. All attachments should be listed on this form, see item 35.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 18: Indicate which elevation is used as reference (where not otherwise shown) for depth measurements given in other spaces on this form and in any attachments.

Items 22 and 24: If this well is completed for separate production from more than one interval zone (multiple completion), so state in item 22, and in item 24 show the producing interval, or intervals, top(s), bottom(s) and name(s) (if any) for only the interval reported in item 33. Submit a separate report (page) on this form, adequately identified, for each additional interval to be separately produced, showing the additional data pertinent to such interval.

Item 29: "*Sacks Cement*": Attached supplemental records for this well should show the details of any multiple stage cementing and the location of the cementing tool.

Item 33: Submit a separate completion report on this form for each interval to be separately produced. (See instruction for items 22 and 24 above.)

37. SUMMARY OF POROUS ZONES: SHOW ALL IMPORTANT ZONES OF POROSITY AND CONTENTS THEREOF; CORED INTERVALS; AND ALL DRILL-STEM TESTS, INCLUDING DEPTH INTERVAL TESTED, CUSHION USED, TIME TOOL OPEN, FLOWING AND SHUT-IN PRESSURES, AND RECOVERIES				38. GEOLOGIC MARKERS		
FORMATION	TOP	BOTTOM	DESCRIPTION, CONTENTS, ETC.	NAME	TOP	
					MEAS. DEPTH	TRUE VERT. DEPTH

U.S. GOVERNMENT PRINTING OFFICE: 1963—O-683636

N. M. O. C. C. COPY

Copy to J.T.

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

1. OIL WELL [X] GAS WELL [ ] OTHER

2. NAME OF OPERATOR: Leonard Latch

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface

1980/N & W

5. LEASE DESIGNATION AND SERIAL NO.: NM25527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Berry

9. WELL NO.: 29

10. FIELD AND POOL, OR WILDCAT: Empire Yates

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23 T. 17S R. 27E

12. COUNTY OR PARISH: Eddy

13. STATE: N. Mex.

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545 DF

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	[ ]	PULL OR ALTER CASING	[ ]	WATER SHUT-OFF	[ ]	REPAIRING WELL	[ ]
FRACTURE TREAT	[ ]	MULTIPLE COMPLETE	[ ]	FRACTURE TREATMENT	[ ]	ALTERING CASING	[ ]
SHOOT OR ACIDIZE	[ ]	ABANDON*	[ ]	SHOOTING OR ACIDIZING	[ ]	ABANDONMENT*	[ ]
REPAIR WELL	[ ]	CHANGE PLANS	[X]	(Other)			
(Other)				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Drilled out cement from 1700 to 2120' well started making a bail and one half of water in 10 hrs. no oil.

Put 20 sack cement plug from 1750 to 1600'

Put 20 sack cement plug from 1500 to 1550'

Plan to attempt completion in Queen Sand approximatly 1150'.

RECEIVED
FEB 2 1965
O. C. C.
ARTESIA, OFFICE

18. I hereby certify that the foregoing is true and correct

SIGNED Chester J. Anderson TITLE Agent DATE 1-28-65

(This space for Federal or State office use)

APPROVED BY Rudolph C. Baier Jr. TITLE ACTING DISTRICT ENGINEER DATE FEB 1 1965

CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O-685229

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Copy to Roswell

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1. OIL WELL [X] GAS WELL [ ] OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Berry

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 1

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: SE 1/4 NW 1/4 Sec.23 T.17S R 27E

10. FIELD AND POOL, OR WILDCAT: Empire

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec.23 T17S R27E

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545DF

12. COUNTY OR PARISH: Eddy

13. STATE: N.Mex.

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	[ ]	PULL OR ALTER CASING	[ ]	WATER SHUT-OFF	[ ]	REPAIRING WELL	[ ]
FRACTURE TREAT	[ ]	MULTIPLE COMPLETE	[ ]	FRACTURE TREATMENT	[ ]	ALTERING CASING	[ ]
SHOOT OR ACIDIZE	[ ]	ABANDON*	[ ]	SHOOTING OR ACIDIZING	[ ]	ABANDONMENT*	[ ]
REPAIR WELL	[ ]	CHANGE PLANS	[ ]	(Other)			
(Other) To Change Operator Name & Well No.				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

To Change the Operator Name from Ralph Lowe to Leonard Latch

and change the well Number from Well # 1 to Well No. 29

RECEIVED
JAN 26 1965
O. C. C.
ARTESIA, OFFICE

18. I hereby certify that the foregoing is true and correct

SIGNED Charles L Robinson TITLE Agent DATE 1-21-65

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
JAN 25 1965
R. L. BEERMAN
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O-685229

N. M. O. C. C. Copy to Roswell

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: NM 025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1. OIL WELL [X] GAS WELL [ ] OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Perry

3. ADDRESS OF OPERATOR

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: SE1/4 NW 1/4 Sec. 23 T.17S R 27E

10. FIELD AND POOL, OR WILDCAT: Wildcat

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec.23 T.17S R. 27E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545DF

12. COUNTY OR PARISH: Eddy

13. STATE: N.Mex.

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	[ ]	PULL OR ALTER CASING	[ ]	WATER SHUT-OFF	[ ]	REPAIRING WELL	[ ]
FRACTURE TREAT	[ ]	MULTIPLE COMPLETE	[ ]	FRACTURE TREATMENT	[ ]	ALTERING CASING	[ ]
SHOOT OR ACIDIZE	[ ]	ABANDON*	[ ]	SHOOTING OR ACIDIZING	[ ]	ABANDONMENT*	[ ]
REPAIR WELL	[ ]	CHANGE PLANS	[X]	(Other)			
(Other)				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Well drilled by Ralph Lowe as a deep test. Set Intermediate string of 9 5/8" Casing at 1690', circulated cement. A cement plug was set at 3000'

Leonard Latch will go into well with cable tool and drill out mud and attempt to complete in Greyburg or San Andres between the depth of 1690' & 3000'. Will move rig on well about 1-28-65.

RECEIVED
JAN 26 1965
O. C. C.
ARTESIA, OFFICE

18. I hereby certify that the foregoing is true and correct

SIGNED Charles F Gardner TITLE Agent DATE 1-21-65

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
JAN 25 1965
R. L. BEERMAN
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O—685229

N. M. O. C. C. COPY

Copy of Fr.

Form 9-331
(May 1963)

NITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN [illegible]LICATE* (Other instru. on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1. OIL WELL [X] GAS WELL [ ] OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Berry

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: SE/4 NW/4 Sec. 23 T.17S R.27E 1980/North

10. FIELD AND POOL, OR WILDCAT: Empire and

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec.23T.17S R.27E

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545GR

12. COUNTY OR PARISH: Eddy

13. STATE: New Mex

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	[ ]	PULL OR ALTER CASING	[ ]	WATER SHUT-OFF	[ ]	REPAIRING WELL	[ ]
FRACTURE TREAT	[ ]	MULTIPLE COMPLETE	[ ]	FRACTURE TREATMENT	[ ]	ALTERING CASING	[ ]
SHOOT OR ACIDIZE	[X]	ABANDON*	[ ]	SHOOTING OR ACIDIZING	[X]	ABANDONMENT*	[ ]
REPAIR WELL	[ ]	CHANGE PLANS	[ ]	(Other)			
(Other)				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Perforated 9 5/8" casing at 1148-49' and from 1162-63'

3-9-65 Treated w/1,000 Gal. acid and frac well w/ 20,000gal. water and 10,000# sand well now in process of cleaning up after frac. job.

RECEIVED
MAR 23 1965
O. C. C.
ARTESIA, OFFICE

18. I hereby certify that the foregoing is true and correct

SIGNED Charles E Anderson TITLE Agent DATE 3-18-65

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
MAR 22 1965
H. L. Bellamy
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O—685229

N. M. O. C. C. COPY

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Copy to F.

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
MAY 19 1965
O. C. C.
ARTESIA, OFFICE

1. OIL WELL [X] GAS WELL [ ] OTHER

2. NAME OF OPERATOR: Leonard Latch

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980 N & W

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Berry

9. WELL NO.: 29

10. FIELD AND POOL, OR WILDCAT: Empire

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23T. 17S R 27E

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545DF

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	[ ]	PULL OR ALTER CASING	[ ]	WATER SHUT-OFF	[ ]	REPAIRING WELL	[ ]
FRACTURE TREAT	[ ]	MULTIPLE COMPLETE	[ ]	FRACTURE TREATMENT	[ ]	ALTERING CASING	[ ]
SHOOT OR ACIDIZE	[ ]	ABANDON*	[ ]	SHOOTING OR ACIDIZING	[ ]	ABANDONMENT*	[ ]
REPAIR WELL	[ ]	CHANGE PLANS	[ ]	(Other) or less report after acid			
(Other)							

(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

5-15-65 Well still cleaning up after acid job 3-9-65 shows small amount of Sweet Gas.

(Note this well originally drilled in name of Ralph Lowe well # 1 you should have filed in your office form 9-330 also the Geologic logs should also be filed) Our office does not have this information.

RECEIVED
MAY 18 1965
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Chester L. Anderson TITLE Agent DATE 5-15-65

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
MAY 18 1965
RUDOLPH C. BAIER, JR.
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

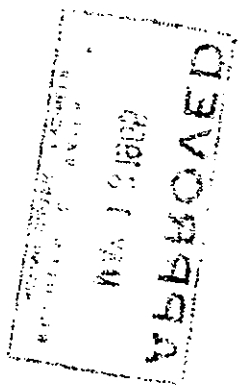
Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE : 1963—O-685229



N. M. O. C. C. COPY

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Berry

3. ADDRESS OF OPERATOR: 1317 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980 N & W

10. FIELD AND POOL, OR WILDCAT: Capitan Limit.

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec 23 T17S R27E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.)

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other)			
(Other) Well Status			X	(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

Well still shut in. Not producing enough gas for a 4-point test.

We are XX trying to find a market for gas before we go any XXXXXX XXXXX further with treating this well.

RECEIVED
MAR 21 1966
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Christine T. Anderson TITLE Bookkeeper DATE 3-17-66

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
MAR 18 1966
R. L. BEERMAN
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O—685229

847-851

[illegible] COPY

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

5. LEASE DESIGNATION AND SERIAL NO.: 025527

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Leach

8. FARM OR LEASE NAME: Perry

3. ADDRESS OF OPERATOR: 1812 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: SE-NW

10. FIELD AND POOL, OR WILDCAT: Undesignated Empire

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: 23-17-27

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.):

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other) Temporary Abandon.			
(Other)				(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

We have shut this well in and it will continue to be shut in until we can find a sale for the gas.

RECEIVED
JUL 24 1969
U. S. GEOLOGICAL SURVEY
ARTESIA, OFFICE

RECEIVED
JUL 23 1969
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Charles Thilson TITLE Bookkeeper DATE 7-17-69

(This space for Federal or State office use)

APPROVED BY: TITLE DATE

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
JUL 23
R. L. BEEKMA

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O-685229
GPO 837-499 867-851

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Berry

3. ADDRESS OF OPERATOR: 1812 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980 N & W

10. FIELD AND POOL, OR WILDCAT: ~~Empire~~ Pecos Slope

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23 T17S R27E

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545 DF

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☒	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other)			
(Other) Return to Production			☒	(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

Will Trip Rods Temp. Abd.
Will treat Queen Sand Peforations 1148-49 and 1162-63 with Approx. 18,000 lbs sand and jelled water. and ~~return~~ put in production

RECEIVED
SEP 14 1971
O. C. C.
ARTESIA, OFFICE

RECEIVED
SEP 10 1971
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Chester L Anderson TITLE Agent DATE 9-9-71

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
SEP 13 1971
/s/ H. L. BEEKMAN
ACTING DISTRICT ENGINEER

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O—685229

667-851

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
P. O. DRAWER DD - ARTESIA
88210

GOVERNOR
BRUCE KING
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMIJO
MEMBER

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY – DIRECTOR

September 12, 1972

Leonard Latch
1812 Texas Avenue
Lubbock, Texas 79401

Re: Berry #29-F, 23-17-27
Berry A #22-K, 24-17-27
Berry B #25-G, 25-17-27

Dear Mr. Latch:

This will acknowledge receipt of Form C-104, Request for an Allowable, on the above captioned wells. However, no allowable will be assigned the wells until notice of gas connection is received from Southern Union Gas Company.

Very truly yours,

OIL CONSERVATION COMMISSION

W. A. Gressett

W. A. Gressett
Supervisor, District II

WAG:jw

N. M. O. C. C. COPY

Copy

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
OCT 4 - 1972
O. C. C.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Berry

3. ADDRESS OF OPERATOR: 1812 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980N & W

10. FIELD AND POOL, OR WILDCAT: Redlake [illegible]

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23 T17S R 27E

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545DF

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☒	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other)			☐
(Other)	☐			(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

We treated the Queen Sand Perforations 1140-49 and 1162-63 with 18,000 lbs. sand and jelled water. Well will make 70,000 MCF in 24 hr. test. The well is now shut in waiting on a pipe line connection with Southern Union Gas Co. who has contracted the gas.

RECEIVED
OCT - 2 1972
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Chester L. Anderson TITLE Accountant DATE 9-29-72

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
OCT - 3 1972
/s/ R. L. BEEKMAN
R. L. BEEKMAN
ACTING DISTRICT ENGINEER

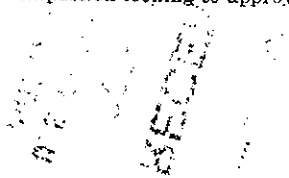
*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.



U.S. GOVERNMENT PRINTING OFFICE: 1963—O-685229

847 - 485

N. M. O. C. C. Copy to O. C. C.

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
APR 26 1973
O. C. C.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

2. NAME OF OPERATOR: Leonard Latch

3. ADDRESS OF OPERATOR: 1612 Texas Ave. Lubbock, Texas 79401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements. See also space 17 below.) At surface: 1980' N & W

5. LEASE DESIGNATION AND SERIAL NO.: 025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Derry

9. WELL NO.: 29

10. FIELD AND POOL, OR WILDCAT: Redlake [illegible]

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: 23-17S-27E

12. COUNTY OR PARISH: Eddy

13. STATE: New Mex.

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.):

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other)			☐
(Other) Well Status			☒	(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

We reported on 9-29-72 that this well shut in waiting on pipe line connection from Southern Union Gas Co.
4-24-73 have gas connection from Southern Union Gas Company and we started producing this well.

RECEIVED
APR 25 1973
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Chester L. Anderson TITLE Accountant DATE 4-24-73

(This space for Federal or State office use)

APPROVED BY [signature] TITLE DISTRICT ENGINEER DATE APR 25 1973
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O—685229

847 - 485

MEXICO OIL CONSERVATION COMMISS

RECEIVED

JUL 5 1972

O. C. C.
ARTESIA, OFFICE

File
USGS

Form C-102
Supersedes C-128
Effective 1-1-65

WELL LOCATION AND ACREAGE DEDICATION PLAT

All distances must be from the outer boundaries of the Section

Operator: Leonard Leteh		Lease: Bezzy		Well No.: 29
Unit Letter: F	Section: 23	Township: 17S	Range: 27E	County: Eddy
Actual Footage Location of Well: 1980 feet from the N line and 1980 feet from the W line				
Ground Level Elev.: 3545	Producing Formation: Queen Sand	Pool: Redlake		Dedicated Acreage: 40 Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

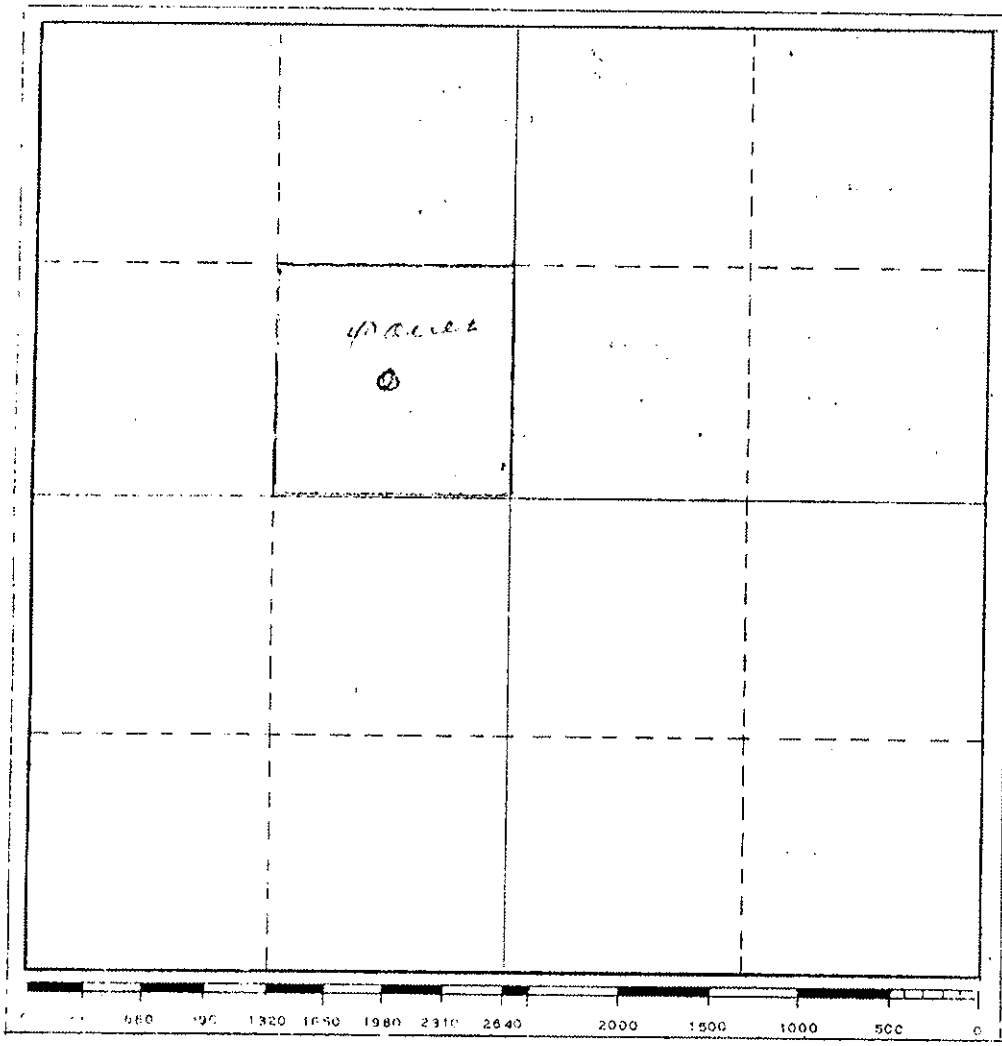
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling, etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

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

Chester L Anderson

Name: Chester L. Anderson

Position: Accountant

Company: Leonard Leteh

Date: 7-3-72

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

See Original Survey
By James H. Brown

Date Surveyed

Registered Professional Engineer and/or Land Surveyor

Certificate No.

OIL CONSERVATION COMMISSION

BOX 2045

ARTESIA, NEW MEXICO

RECEIVED

APR 30 1973

O. C. C.

NOTICE OF GAS CONNECTION

DATE April 27, 1973

This is to notify the Oil Conservation Commission that connection for the purchase of gas from the Leonard Latch (Operator), Group #1 Lands (Lease), Unknown (Well Unit), 23 - 17S - 27E (S.T.R.), unknown (Pool), Southern Union Gas Co. (Name of Purchaser) was made on April 24, 1973.

Producer is gathering, compressing, and delivering gas to us at a Central Location, do not know how many or location of wells from gas is being gathered.

Berry #29-F-23-17-27
Berry A #22 K-24-17-27
Berry B #25 G-25-17-27

Southern Union Gas Company
Purchaser

James F. Cocon
Representative

Transmission Manager
Title

cc: To operator: Leonard Latch, 1812 Texas Avenue, Lubbock, Tx. 79401
Oil Conservation Commission - Santa Fe
E. R. Corliss - Dallas - Engineering
W. B. Richardson - Gas Meas.- Dallas
R. J. McCrary - Dallas - Purchase & Prorations
E. H. Redden - Carlsbad - Dispatch Office

No. of copies received	4	
DISTRIBUTION		
SANTA FE	1	
FILE	1	✓
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	1	
PRORATION OFFICE		

NEW MEXICO OIL CONSERVATION COMMISSION
REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-110
Effective 1-1-65

RECEIVED.

AUG 16 1972

O. C. C.
ARTESIA, OFFICE

I.

Operator: Leonard Latch ✓

Address: 1812 Texas Ave. Lubbock, Texas 79401

Reason(s) for filing *(Check proper box)*

New Well	X	Change in Transporter of:			
Recompletion	X	Oil		Dry Gas	X
Change in Ownership		Casinghead Gas		Condensate	

Other *(Please explain)*

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry	29	~~Redlake Queen Gas~~	State, Federal or Fee Federal	025527A

Location
Unit Letter F ; 1980' Feet From The N Line and 1980' Feet From The W

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address *(Give address to which approved copy of this form is to be sent)*
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas X	Address *(Give address to which approved copy of this form is to be sent)*
Southern Union Gas Co.	Fidelity Union Tower, Dallas, Texas 75201 Attention Gene L. Hazelting

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					~~No~~ yes	~~Name Future~~ 4-24-73

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v.	Diff. Res'v.
		X	X			~~1550'~~		

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
	8-9-65	~~1690'~~ 10427	1550
Elevations *(DF, RKB, RT, GR, etc.)*	**Name of Producing Formation**	**Top Oil/Gas Pay**	**Tubing Depth**
3545DF	Queen Sand	1148'	1100'
Perforations			**Depth Casing Shoe**
1148-49' & 1162-63'			1690

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT
	~~5 3/8"~~	~~1690~~	~~Not Available~~
	13 3/8"	400	400
	9 5/8"	1690	950

V. TEST DATA AND REQUEST FOR ALLOWABLE

(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method *(Flow, pump, gas lift, etc.)*	
Length of Test	**Tubing Pressure**	**Casing Pressure**	**Choke Size**
Actual Prod. During Test	**Oil-Bbls.**	**Water-Bbls.**	**Gas-MCF**

GAS WELL

Actual Prod. Test-MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
78,828	24 hrs.	Dry Gas	
Testing Method *(pitot, back pr.)*	**Tubing Pressure** (Shut-in)	**Casing Pressure** (Shut-in)	**Choke Size**
Flow	378	488	1/2"

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Chester L Anderson
(Signature)

Agent
(Title)

Aug. 15, 1972
(Date)

OIL CONSERVATION COMMISSION

APPROVED APR 27 1973, 19____

BY W. A. Gressett

TITLE OIL AND GAS INSPECTOR

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

Separate Forms C-104 must be filed for each pool in multiply

4

FILE	1	1
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	1	
PRORATION OFFICE		

REQUEST FOR ALLOWABLE AND AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-1.
Effective 1-1-65

RECEIVED
SEP - 1 1976
O. C. C.
ARTESIA, OFFICE

Operator: Leonard Latch ✓

Address: 1812 Texas Ave. Lubbock, Texas 79401

Reason(s) for filing (Check proper box)

New Well		Change in Transporter of:			
Recompletion		Oil		Dry Gas	X
Change in Ownership		Casinghead Gas		Condensate	

Other (Please explain): from 54

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry	29	Redlake; Q-G-SA	State, Federal or Fee Federal	025527A

Location

Unit Letter F : 1980 Feet From The North Line and 1980 Feet From The West

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address (Give address to which approved copy of this form is to be sent)
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas ☑	Address (Give address to which approved copy of this form is to be sent)
Gas Company of New Mexico	Fidelity Union Tower Dallas, Tex. 75201

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					Yes	4-24-73

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion → (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v.	Diff. Res'v.

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT

V. TEST DATA AND REQUEST FOR ALLOWABLE

(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil-Bbls.	Water-Bbls.	Gas-MCF

GAS WELL

Actual Prod. Test-MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method (pitot, back pr.)	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

(Signature)

Accountant
(Title)

Aug. 31, 1976
(Date)

OIL CONSERVATION COMMISSION

APPROVED SEP 14 1976, 19____

BY W. A. Gressett

TITLE SUPERVISOR, DISTRICT II

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

Separate Forms C-104 must be filed for each pool in multiply

Form 3160-5
November 1983)
(Formerly 9-331)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 1004-0135
Expires August 31, 1985

5. LEASE DESIGNATION AND SERIAL NO.: NM 025527-A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
JUL 30 1984
O. C. D.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Marbob Energy Corporation

8. FARM OR LEASE NAME: Berry A

3. ADDRESS OF OPERATOR: P.O. Drawer 217, Artesia, N.M. 88210

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980 FNL 1980 FWL

10. FIELD AND POOL, OR WILDCAT: Red Lake Qn Grbg SA

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23-T17S-R27E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.)

12. COUNTY OR PARISH: Eddy

13. STATE: N.M.

16. **Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data**

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other) Change of operator			☒
(Other)	☐			(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

This is to change operator from Latch Operations, P.O. Box 10108, Lubbock, Texas 79408, to Marbob Energy Corporation, effective 7/1/84.

18. I hereby certify that the foregoing is true and correct

SIGNED Carolyn Norris TITLE Production Clerk DATE 7/2/84

ACCEPTED FOR RECORD

(This space for Federal or State office use)

APPROVED BY GWO TITLE DATE

CONDITIONS OF APPROVAL, IF ANY:

JUL 26 1984

Carlsbad, New Mexico

*See Instructions on Reverse Side

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NO. OF COPIES RECEIVED	5	
DISTRIBUTION		
SANTA FE	1	
FILE	1	
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	2	
PRORATION OFFICE		

NEW MEXICO OIL CONSERVATION COMMISSION
REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-110
Effective 1-1-65

RECEIVED
MAR 27 1978
O. C. D.
ARTESIA, OFFICE

Operator
LEONARD LATCH

Address
Suite 507 Texas Commerce Bank Bldg. Lubbock, Texas 79401

Reason(s) for filing *(Check proper box)*

New Well	☐	Change in Transporter of:			
Recompletion	☐	Oil	☐	Dry Gas	☒
Change in Ownership	☐	Casinghead Gas	☐	Condensate	☐

Other *(Please explain)*

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry	20	Redlake Q-G-SA	State, Federal or Fee Federal	025507A

Location
Unit Letter F ; 1980 Feet From The North Line and 1980 Feet From The West

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address *(Give address to which approved copy of this form is to be sent)*
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas XX	Address *(Give address to which approved copy of this form is to be sent)*
Phillips Petroleum Co.	Bartlesville, Oklahoma 74004

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					Yes	2-23-78

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Resv.	Diff. Resv.

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations *(DF, RKB, RT, GR, etc.)*	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT

V. TEST DATA AND REQUEST FOR ALLOWABLE

(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method *(Flow, pump, gas lift, etc.)*	
		Pump	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil - Bbls.	Water - Bbls.	Gas - MCF

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method *(pitot, back pr.)*	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Chester L. Anderson
(Signature)

Accountant
(Title)

3-23-78
(Date)

OIL CONSERVATION COMMISSION

APPROVED APR 11 1978, 19

BY W. A. Gressett

TITLE SUPERVISOR, DISTRICT II

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

NO. OF COPIES RECEIVED		
DISTRIBUTION	4	
SANTA FE	1	
FILE	1	✓
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	1	
PRORATION OFFICE		

NEW MEXICO OIL CONSERVATION COMM. ON

REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-110
Effective 1-1-65

RECEIVED
MAR 6 1979
O. C. C.
ARTESIA, OFFICE

I. Operator: LATCH OPERATIONS ✓

Address: Suite 507 Texas Commerce Bank Bldg. - Lubbock, Texas 79401

Reason(s) for filing (Check proper box)
- New Well ☐
- Recompletion ☐
- Change in Ownership ☐
- Change in Transporter of: Oil ☐ Dry Gas ☐ Casinghead Gas ☐ Condensate ☐

Other (Please explain): Change in name operator. Leonard Latch deceased. Business now carried on by his estate in the name of Latch Operations.

If change of ownership give name and address of previous owner: Leonard Latch-Suite 507 Texas Comm. Bank Bldg.-Lubbock, Texas 79401

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry A	29	Redlake Queen Gas G-SA	State, Federal or Fee Federal	025527A

Location: Unit Letter F : 1980 Feet From The North Line and 1980 Feet From The West

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address (Give address to which approved copy of this form is to be sent)
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas XX: Phillips Petroleum Co.	Address (Give address to which approved copy of this form is to be sent): Bartlesville, Oklahoma 74004

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					Yes	2-23-78

If this production is commingled with that from any other lease or pool, give commingling order number:

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Resv.	Diff. Resv.

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT

V. TEST DATA AND REQUEST FOR ALLOWABLE (Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil - Bbls.	Water - Bbls.	Gas - MCF

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method (pitot, back pr.)	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Leonard Latch
(Signature)

Agent
(Title)

2-28-79
(Date)

OIL CONSERVATION COMMISSION

APPROVED APR 19 1979, 19

BY W. A. Gressett

TITLE SUPERVISOR, DISTRICT II

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

NEW MEXICO
OIL CONSERVATION COMMISSION
P. O. DRAWER DD
ARTESIA, NEW MEXICO

Sept. thru Dec. 1974

No. 2190 G

SUPPLEMENT TO THE OIL PRORATION SCHEDULE

DATE 11/12/74

PURPOSE: ALLOWABLE ASSIGNMENT FOR GAS WELLS IN AN OIL POOL

The following Leonard Latch wells located in the Red Lake Q-G-SA Pol Pool have been completed as gas wells and effective 11-1-74 a casinghead gas allowable is hereby assigned.

Berry #27-E, 24-17-27
" #29-F, "
Berry A #22-K, 24-17-27
" #26-O, "

WAG:jw

Leonard Latch

Southern Union

OIL CONSERVATION COMMISSION

W. A. Gressett

Supervisor, District No. 2

OPERATOR'S COPY

OIL CONSERVATION COMMISSION
BOX 1980
HOBBS, NEW MEXICO

RECEIVED
MAR - 1 1978
O. C. C.
ARTESIA, OFFICE

NOTICE OF GAS CONNECTION

DATE February 28, 1978

This is to notify the Oil Conservation Commission that connection for the purchase of gas from the Leonard Latch Operator

Lease	Well Unit	S.T.R.	Pool
Berry "A" Well #22	K	24-17-27	
Berry "A" Well #26	O	24-17-27	
Berry "A" Well #27	E	24-17-27	
Berry "B" Well #29	F	23-17-27	
Berry "B" Well #25	G	25-17-27	Red Lake/Queen

Phillips Petroleum Company (Name of Purchaser) was made on February 23, 1978

Phillips Petroleum Company
Purchaser

J. E. Whitson
Representative

Prod. Records Supr.
Title

cc: To Operator
Oil Conservation Commission - Santa Fe

N.M. Oil Cons. Division
811 S. 1st Street
Artesia, NM 88210-2834

Form 3160-5
(November 1994)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB No. 1004-0135
Expires July 31, 1996

C151

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side

5. Lease Serial No.
NM 02552?-A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
Berry B #29

2. Name of Operator
Harvey Energy

9. API Well No.
30015004720~~00~~

3a. Address
R 342 S. Halderman Rd. Artesia

3b. Phone No. *(include area code)*
N.M. (505) 746-2262

10. Field and Pool, or Exploratory Area
Rd-Lake Qn, GbSA

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
1980 FNL 1980' FWL Sec. 23 T17S R27E

11. County or Parish, State
Eddy, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☒ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Well Returned to production 3/1/00

ACCEPTED FOR RECORD
MAR 08 2000
BLM

14. I hereby certify that the foregoing is true and correct
Name *(Printed/Typed)*

Title Operator

Signature
Warren Harvey

Date 3/6/2000

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by	Title	Date
Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.	Office	

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on reverse)

District I
PO Box 1980, Hobbs, NM 88241-1980
District II
811 South First, Artesia, NM 88210
District III
1000 Rio Brazos Rd., Aztec, NM 87410
District IV
2040 South Pacheco, Santa Fe, NM 87505

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
2040 South Pacheco
Santa Fe, NM 87505

Form C-104
Revised October 18, 1994
Instructions on back
Submit to Appropriate District Office
5 Copies

☐ AMENDED REPORT

I. REQUEST FOR ALLOWABLE AND AUTHORIZATION TO TRANSPORT

1 Operator name and Address	2 OGRID Number
SDX Resources, Inc. PO Box 5061 Midland, TX 79704	020451
	3 Reason for Filing Code: Change of Operator Effective 2/1/00

4 API Number	5 Pool Name	6 Pool Code
30 - 0 15-00472	Redlake, QN-GB-SA	51300
7 Property Code	**8 Property Name**	**9 Well Number**
25541	Berry	29

II. 10 Surface Location

Ul or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South Line	Feet from the	East/West line	County
F	23	17S	27E		1980	N	1980	W	Eddy

11 Bottom Hole Location

Ul or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South Line	Feet from the	East/West line	County

12 Lse Code	13 Producing Method Code	14 Gas Connection Date	15 C-129 Permit Number	16 C-129 Effective Date	17 C-129 Expiration Date
SF	S				

III. Oil and Gas Transporters

18 Transporter OGRID	19 Transporter Name and Address	20 POD	21 O/G	22 POD ULSTR Location and Description
015694	Navajo PO Box 159 Artesia, NM 88211		O	
009171	GPM 4001 Penbrook Odessa, TX 79762		G	

RECEIVED
OCD
ARTESIA

IV. Produced Water

23 POD	24 POD ULSTR Location and Description

V. Well Completion Data

25 Spud Date	26 Ready Date	27 TD	28 PBTD	29 Perforations	30 DHC, DC, MC

31 Hole Size	32 Casing & Tubing Size	33 Depth Set	34 Sacks Cement
			Sacked 4-7-00

VI. Well Test Data

35 Date New Oil	36 Gas Delivery Date	37 Test Date	38 Test Length	39 Tbg. Pressure	40 Csg. Pressure

41 Choke Size	42 Oil	43 Water	44 Gas	45 AOF	46 Test Method

47 I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Signature: John Pool
Printed name: John Pool
Title: Vice-President
Date: 02/02/00 Phone: 915/685-1761

OIL CONSERVATION DIVISION

Approved by: ORIGINAL SIGNED BY TIM W. GUM
Title: DISTRICT II SUPERVISOR
Approval Date: MAR 27 2000

48 If this is a change of operator fill in the OGRID number and name of the previous operator

009946 Hanson Energy

Previous Operator Signature	Printed Name	Title	Date
Warren Hanson	WARREN HANSON.		02/02/00

Appropriate District Office
DISTRICT I
P.O. Box 1980, Hobbs, NM 88240

DISTRICT II
P.O. Drawer DD, Artesia, NM 88210

DISTRICT III
1000 Rio Brazos Rd., Aztec, NM 87410

Energy, Minerals and Natural Resources Department

OIL CONSERVATION DIVISION
P.O. Box 2088
Santa Fe, New Mexico 87504-2088

Revised 1-1-89
See Instructions at Bottom of Page

RECEIVED
AUG - 9 1993
O. C. D.

REQUEST FOR ALLOWABLE AND AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

I.

Operator	Well API No.
Hanson energy	300150047200

Address: P.O. 342 S. Haldeman Rd. Artesia, N.M. 88210

Reason(s) for Filing (Check proper box) — Other (Please explain)

- New Well [ ]
- Recompletion [ ]
- Change in Operator [X]
- Change in Transporter of: Oil [ ] Dry Gas [ ] Casinghead Gas [ ] Condensate [ ]

Effective 8/1/93

If change of operator give name and address of previous operator: Marbob Energy Corporation, Drawer 217, Artesia, N.M. 88210

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease (State, Federal or Fee)	Lease No.
Berry	29	Red Lk, Qn, Grb, SA		NM025527-A

Location

Unit Letter F : 1980 Feet From The North Line and 1980 Feet From The West Line

Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil [ ] or Condensate [ ]	Address (Give address to which approved copy of this form is to be sent)
Name of Authorized Transporter of Casinghead Gas [ ] or Dry Gas [X]	Address (Give address to which approved copy of this form is to be sent)
GPM Gas Corp	4001 Penbrook, Odessa, Tx. 79762

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When ?
					Yes	2/23/78

If this production is commingled with that from any other lease or pool, give commingling order number:

IV. COMPLETION DATA

Designate Type of Completion - (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v	Diff Res'v

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT
			Post ID-3
			8-20-93
			okay

V. TEST DATA AND REQUEST FOR ALLOWABLE

OIL WELL *(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours.)*

Date First New Oil Run To Tank	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil - Bbls.	Water - Bbls.	Gas- MCF

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method (pitot, back pr.)	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. OPERATOR CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Division have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Kathie Hanson
Signature

Kathie Hanson — Secretary
Printed Name — Title

7/30/93 — 746-2262
Date — Telephone No.

OIL CONSERVATION DIVISION

Date Approved: AUG 11 1993

By: ~~ORIGINAL SIGNED BY~~ MIKE WILLIAMS

Title: SUPERVISOR, DISTRICT II

INSTRUCTIONS: This form is to be filed in compliance with Rule 1104

1) Request for allowable for newly drilled or deepened well must be accompanied by tabulation of deviation tests taken in accordance with Rule 111.
2) All sections of this form must be filled out for allowable on new and recompleted wells.
3) Fill out only Sections I, II, III, and VI for changes of operator, well name or number, transporter, or other such changes.
4) Separate Form C-104 must be filed for each pool in multiply completed wells.

District II
1301 W. Grand Ave., Artesia, NM 88210
Phone:(505) 748-1283 Fax:(505) 748-9720

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

Form C-104A
Permit 16648

RECEIVED
OCT 14 2005
OCD-ARTESIA

Change of Operator

Previous Operator Information		New Operator Information	
		Effective Date:	9/1/2005
OGRID:	20451	OGRID:	9946
Name:	SDX RESOURCES INC	Name:	HANSON ENERGY
Address:	PO Box 5061	Address:	PO BOX 1348
Address:		Address:	
City, State, Zip:	Midland , TX 79704	City, State, Zip:	ARTESIA , NM 88211

I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information on this form and the certified list of wells is true to the best of my knowledge and belief.

Previous Operator		New Operator	
Signature:		Signature:	Warren Hanson
Printed Name:	John Pool	Printed Name:	Warren Hanson
Title:	Vice President	Title:	Hanson Energy
Date:	10/10/05	Date:	
Phone:	432/685-1761	Phone:	505/746-2262

NMOCD Approval
Electronic Signature: Carmen Reno, District 2
Date: October 25, 2005

NEW MEXICO ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT

BILL RICHARDSON
Governor
Joanna Prukop
Cabinet Secretary

Mark E. Fesmire, P.E.
Director
Oil Conservation Division

29-May-07

HANSON ENERGY
PO BOX 1348
ARTESIA NM 88210

LOV NO. 62/3007

LETTER OF VIOLATION - Inspection

Dear Operator:

The following inspection(s) indicate that the well, equipment, location or operational status of the well(s) failed to meet standards of the New Mexico Oil Conservation Division as described in the detail section below. To comply with standards imposed by Rules and Regulations of the Division, corrective action must be taken immediately and the situation brought into compliance. The detail section indicates preliminary findings and/or probable nature of the violation. This determination is based on an inspection of your well or facility by an inspector employed by the Oil Conservation Division on the date(s) indicated.

Please notify the proper district office of the Division, in writing, of the date corrective actions are scheduled to be made so that arrangements can be made to reinspect the well and/or facility.

INSPECTION DETAIL SECTION

BERRY FEDERAL **No.029** F-23-17S-27E **30-015-00472-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714141197

Comments on Inspection: Violation of rule 19.15.4.201. Last report of production 1/1/2005. Pull rod in hole.

SAUNDERS A No.007 B-13-17S-27E **30-015-01244-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714148764

Comments on Inspection: Violation of rule 19.15.4.201. Reporting one barrel of oil since 4/1/2006. No pumping equipment on site. Pull rod in hole. New high pressure hose connected to casing valve. Well does not appear capable of producing. Please indicate how production is being accomplished.

SAUNDERS A No.002 B-13-17S-27E **30-015-01247-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714148206

Comments on Inspection: Violation of rule 19.15.4.201. Last injection reported 5/1/2004.

BERRY FEDERAL **No.030** O-23-17S-27E **30-015-21510-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714140576

Comments on Inspection: Violation of rule 19.15.4.201. Last production report 1/1/2005. Electricity turned off.

SAUNDERS B No.003 A-13-17S-27E **30-015-22725-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714149746

Comments on Inspection: violation of rule 19.15.4.201. Last production report 9/01/2005. Does not appear to be any recent activity. Road to site almost overgrown.

SAUNDERS A No.011 B-13-17S-27E **30-015-24123-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714147816

Comments on Inspection: violation of rule 19.15.4.201. Last production report 9/01/1988. Pumpjack disassembled. Tubing in hole capped with bull plug. Electric meter removed.

BERRY FEDERAL **No.034** G-23-17S-27E **30-015-31113-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714141778

Comments on Inspection: Violation of rule 19.15.4.201. Last production reported 1/1/2005. Only casing sticking out of hole. Growth in front of tank battery.

In the event that a satisfactory response is not received to this letter of direction by the "Corrective Action Due By:" date shown above, further enforcement will occur. Such enforcement may include this office applying to the Division for an order summoning you to a hearing before a Divison Examiner in Santa Fe to show cause why you should not be ordered to permanently plug and abandon this well. Such a hearing may result in imposition of CIVIL PENALTIES for your violation of OCD rules.

Sincerely,

RICHARD INGE

Artesia OCD District Office

Note: Information in Detail Section comes directly from field inspector data entries - not all blanks will contain data.
*Significant Non-Compliance events are reported directly to the EPA, Region VI, Dallas, Texas.

Form 3160-5
(April 2004)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD-ARTESIA

FORM APPROVED
OMB No 1004-0137
Expires March 31, 2007

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE- Other instructions on reverse side.

5. Lease Serial No.
NM025527

6 If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No

1. Type of Well
☐ Oil Well ☑ Gas Well ☐ Other

8 Well Name and No.
BERRY FEDERAL #29

2. Name of Operator
HANSON ENERGY

9. API Well No.
30-015-00472

3a Address
P.O. BOX 1348 ARTESIA, NM 88211

3b Phone No *(include area code)*
575-746-2262

10. Field and Pool, or Exploratory Area
RED LAKE,QN,GB,SA

4 Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
UNIT F 1980 FNL 1980 FWL SEC 23-17S-27E

FEB 12 2008
OCD-ARTESIA

11. County or Parish, State
EDDY NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☑ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ After Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13 Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

INSTALLED COMPRESSOR

TURNED GAS DOWN LINE

ACCEPTED FOR RECORD

FEB 10 2008

J. Amos

BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

* Submit date returned to prod

14 I hereby certify that the foregoing is true and correct
Name *(Printed/Typed)*
KATHIE HANSON

Title PRODUCTION CLERK

Signature Kathie Hanson

Date 01/30/2008

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by

Title

Date

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

Accepted for record - NMOCD

District II
1301 W. Grand Ave., Artesia, NM 88210
Phone (505) 748-1283 Fax (505) 748-9720

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

Form C-145
Permit 79544

Change of Operator

Previous Operator Information		New Operator Information	
		Effective Date:	8/1/2008
OGRID:	9946	OGRID:	261198
Name:	HANSON ENERGY	Name:	DORAL ENERGY CORP.
Address:	PO BOX 1348	Address:	3000 N.GARFIELD ST, SUITE 210
Address:		Address:	
City, State, Zip:	ARTESIA, NM 88210	City, State, Zip:	MIDLAND, TX 79705

I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information on this form and the certified list of wells is true to the best of my knowledge and belief.

Previous Operator		New Operator	
Signature:	Warren Hanson	Signature:	Joanne Keating
Printed Name:	WARREN HANSON	Printed Name:	Joanne Keating
Title:	OWNER/OPERATOR	Title:	Regulatory Affairs Manager
Date:	07/31/2008 Phone: 575/746-1262	Date:	07/31/2008 Phone: 432-218-9824

NMOCD Approval
Electronic Signature: Carmen Reno, District 2
Date: August 04, 2008

District II
1301 W Grand Ave., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720

State of New Mexico
Energy, Minerals and Natural Resources

Form C-145
Permit 120455

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

Change of Operator

Previous Operator Information		New Operator Information	
		Effective Date:	Effective on the date of approval by the OCD
OGRID:	261198	OGRID:	274841
Name:	DORAL ENERGY CORP	Name:	ALAMO PERMIAN RESOURCES, LLC
Address:	415 W. WALL ST. SUITE 500	Address:	820 GESSNER RD
			SUITE 1650
City, State, Zip:	MIDLAND , TX 79701	City, State, Zip:	HOUSTON , TX 77024

I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information on this form and the certified list of wells is true to the best of my knowledge and belief.

Additionally, by signing below, ALAMO PERMIAN RESOURCES, LLC certifies that it has read and understands the following synopsis of applicable rules.

Previous Operator		New Operator	
Signature:	E.W. Gray II	Signature:	
Printed Name:	E.W. GRAY II	Printed Name:	CARL D. CAMPBELL
Title:	CHAIRMAN & CEO	Title:	EVP/COO
Date:	9-16-2010 Phone: 432.789.1180	Date:	17-SEPT-10 Phone: 713-224-2500

NMOCD Approval
Electronic Signature: Randy Dade, District 2
Date: October 26, 2010

ALAMO PERMIAN RESOURCES, LLC certifies that all below-grade tanks constructed and installed prior to June 16, 2008 associated with the selected wells are in compliance with 19.15.17 NMAC, have been closed pursuant to 19.15.17.13 NMAC, or have been retrofitted to comply with Paragraphs (1) through (4) of Subsection I of 19.15.17.11 NMAC.

ALAMO PERMIAN RESOURCES, LLC understands that the OCD's approval of this operator change:

1. constitutes approval of the transfer of the permit for any permitted pit, below-grade tank or closed-loop system associated with the selected wells; and
2. constitutes approval of the transfer of any below-grade tanks constructed and installed prior to June 16, 2008 associated with the selected wells, regardless of whether the transferor has disclosed the existence of those below-grade tanks to the transferee or to the OCD, and regardless of whether the below-grade tanks are in compliance with 19.15.17 NMAC.

As the operator of record of wells in New Mexico, ALAMO PERMIAN RESOURCES, LLC agrees to the following statements:

1. I am responsible for ensuring that the wells and related facilities comply with applicable statutes and rules, and am responsible for all regulatory filings with the OCD. I am responsible for knowing all applicable statutes and rules, not just the rules referenced in this list. I understand that the OCD's rules are available on the OCD website under "Rules," and that the Water Quality Control Commission rules are available on the OCD website on the "Publications" page.
2. I understand that if I acquire wells from another operator, the OCD must approve the operator change before I begin operating those wells. See 19.15.9.9.B NMAC. I understand that if I acquire wells or facilities subject to a compliance order addressing inactive wells or environmental cleanup, before the OCD will approve the operator change it may require me to enter into an enforceable agreement to return those wells to compliance. See 19.15.9.9.C(2) NMAC.
3. I must file a monthly C-115 report showing production for each non-plugged well completion for which the OCD has approved an allowable and authorization to transport, and injection for each injection well. See 19.15.7.24 NMAC. I understand that the OCD may cancel my authority to transport from or inject into all the wells I operate if I fail to file C-115 reports. See 19.15.7.24.C NMAC.
4. I understand that New Mexico requires wells that have been inactive for certain time periods to be plugged or placed on approved temporary abandonment. See 19.15.25.8 NMAC. I understand the requirements for plugging and approved temporary abandonment in 19.15.25 NMAC. I understand that I can check my compliance with the basic requirements of 19.15.25.8 NMAC by using the "Inactive Well List" on OCD's website.
5. I must keep current with financial assurances for well plugging. I understand that New Mexico requires each state or fee well that has been inactive for more than two years and has not been plugged and released to be covered by a single-well financial assurance, even if the well is also covered by a blanket financial assurance and even if the well is on approved temporary abandonment status. See 19.15.8.9.C NMAC. I understand that I can check my compliance with the single-well financial assurance requirement by using the "Inactive Well Additional Financial Assurance Report" on the OCD's website.
6. I am responsible for reporting releases as defined by 19.15.29 NMAC. I understand the OCD will look to me as the operator of record to take corrective action for releases at my wells and related facilities, including releases that occurred before I became operator of record.
7. I have read 19.15.5.9 NMAC, commonly known as "Part 5.9," and understand that to be in compliance with its requirements I must have the appropriate financial assurances in place, comply with orders requiring corrective action, pay penalties assessed by the courts or agreed to by me in a settlement agreement, and not have too many wells out of compliance with the inactive well rule (19.15.25.8 NMAC). If I am in violation of Part 5.9, I may not be allowed to drill, acquire or produce any additional wells, and will not be able to obtain any new injection permits. See 19.15.16.19 NMAC, 19.15.26.8 NMAC, 19.15.9.9 NMAC and 19.15.14.10 NMAC. If I am in violation of Part 5.9 the OCD may, after notice and hearing, revoke my existing injection permits. See 19.15.26.8 NMAC.
8. For injection wells, I understand that I must report injection on my monthly C-115 report and must operate my wells in compliance with 19.15.26 NMAC and the terms of my injection permit. I understand that I must conduct mechanical integrity tests on my injection wells at least once every five years. See 19.15.26.11 NMAC. I understand that when there is a continuous one-year period of non-injection into all wells in an injection or storage project or into a saltwater disposal well or special purpose injection well, authority for that injection automatically terminates. See 19.15.26.12 NMAC. I understand that if I transfer

operation of an injection well to another operator, the OCD must approve the transfer of authority to inject, and the OCD may require me to demonstrate the well's mechanical integrity prior to approving that transfer. See 19.15.26.15 NMAC.

9. I am responsible for providing the OCD with my current address of record and emergency contact information, and I am responsible for updating that information when it changes. See 19.15.9.8.C NMAC. I understand that I can update that information on the OCD's website under "Electronic Permitting."
10. If I transfer well operations to another operator, the OCD must approve the change before the new operator can begin operations. See 19.15.9.9.B NMAC. I remain responsible for the wells and related facilities and all related regulatory filings until the OCD approves the operator change. I understand that the transfer will not relieve me of responsibility or liability for any act or omission which occurred while I operated the wells and related facilities.

ChangeOp Comments

OGRID: [261198] DORAL ENERGY CORP.
Permit Number: 120455
Permit Type: ChangeOp

Created By	Comment	Comment Date
DPHILLIPS	I cannot approve the change of operator as one well on you list requires additional bonding - Spruck State No. 9 - $7980. Upon receipt of the bond, I continue with the processing. Questions? Call me at 505-476-3461.	9/27/2010
DPHILLIPS	Received the bond.	10/15/2010

Form 3160-5
(February 2005)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD Artesia

FORM APPROVED
OMB No. 1004-0137
Expires: March 31, 2007

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE- Other instructions on reverse side.

5. Lease Serial No.
NM 025527-A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☑ Oil Well ☐ Gas Well ☐ Other

8. Well Name and No.
Berry A Lease; see attached list

2. Name of Operator **Alamo Permian Resources, LLC**

9. API Well No.
See attached list

3a. Address
415 W. Wall Street, Suite 500 Midland, TX 79701

3b. Phone No. *(include area code)*
432.897.0673

10. Field and Pool, or Exploratory Area
See attached list

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
See attached list

11. County or Parish, State
Eddy County, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☑ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☑ Other **Change of Operator**
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

This is a notification of Change of Operator for the attached referenced wells.

Alamo Permian Resources, LLC, as new operator, accepts all applicable terms, conditions, stipulations and restrictions concerning operations conducted on this lease or portion of lease described.

Bond Coverage: BLM Bond File No.: NMB000709

Change of Operator effective: October 26, 2010

Former Operator: Doral Energy Corp. (ORGID No. 261198)

SEE ATTACHED FOR
CONDITIONS OF APPROVAL

Accepted for record - NMOCD

APPROVED
JAN 18 2011
/s/ JD Whitlock Jr
BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

14. I hereby certify that the foregoing is true and correct
Name *(Printed/Typed)*
Joanne Keating Title **Regulatory Affairs Coordinator**

Signature Joanne Keating Date **11/09/2010**

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by _____ Title _____ Date _____

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon. Office

RECEIVED
FEB 07 2011
NMOCD ARTESIA

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

ENTERED
KMG

ALAMO PERMIAN RESOURCES, LLC

Alamo Permian Resources, LLC (OGRID No. 274841)

Doral Energy Corp (OGRID No. 261198) — Hanson Energy Acquisition, Eddy County, New Mexico

LEASE NAME	WELL No.	LEASE TYPE	LEASE NO.	WELL API NUMBER	FIELD; POOL(s)	LOCATION											WELL TYPE
						LOT	UNIT	SEC	TWNSHP	RANGE	Feet	N or S	Feet	E or W	CO	STATE	
BERRY A	6	F	NM 025527-A	3001500512	22230 - EMPIRE; Yates-Seven Rivers		G	24	17.0S	27E	1534	N	1550	E	Eddy	NM	Oil
BERRY A	11	F	NM 025527-A	3001500498	51300 - RED LAKE; Queen-Grayburg-SA		K	24	17.0S	27E	1650	S	2310	W	Eddy	NM	Gas
BERRY A	22	F	NM 025527-A	3001500497	51300 - RED LAKE; Queen-Grayburg-SA		K	24	17.0S	27E	2310	S	1650	W	Eddy	NM	Gas
BERRY A	26	F	NM 025527-A	3001500501	51300 - RED LAKE; Queen-Grayburg-SA		O	24	17.0S	27E	330	S	2310	E	Eddy	NM	Gas
BERRY A	27	F	NM 025527-A	3001500483	51300 - RED LAKE; Queen-Grayburg-SA		E	24	17.0S	27E	1650	N	990	W	Eddy	NM	Gas
BERRY A	29	F	NM 025527-A	3001500472	51300 - RED LAKE; Queen-Grayburg-SA		F	23	17.0S	27E	1980	N	1980	W	Eddy	NM	Gas
BERRY A	32Y	F	NM 025527-A	3001524614	51300 - RED LAKE; Queen-Grayburg-SA		A	24	17.0S	27E	990	N	980	E	Eddy	NM	Oil
BERRY A	33	F	NM 025527-A	3001525154	22230 - EMPIRE; Yates-Seven Rivers		K	24	17.0S	27E	1650	S	2040	W	Eddy	NM	Inj

BUREAU OF LAND MANAGEMENT
Carlsbad Field Office
620 East Greene Street
Carlsbad, New Mexico 88220
575-234-5972

Conditions of Approval Change of Operator 1/25/2011

Alamo Permian Resources, LLC

1. Tank battery must be bermed/diked (must be able to contain 1 1/2 times the volume of the largest tank).
2. All above ground structures and equipment on the lease shall be painted Shale Green (5Y 4/2). This is to be done within 90 days, if you have not already done so.
3. Submit for approval of water disposal method.
4. Submit updated facility diagrams as per Onshore Order #3
5. This agency shall be notified of any spill or discharge as required by NTL-3A.
6. All outstanding environmental issue must be addressed within 90 days. Contact Jim Amos for inspection and to resolve environmental issues. 575-234-5909

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD-Artesia
RECEIVED
JAN 23 2013
NMOCD ARTESIA

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMNM025527A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
BERRY A 029 Jed

2. Name of Operator
ALAMO PERMIAN RESOURCES
Contact: CARIE STOKER
E-Mail: cstoker@alamoresources.com

9. API Well No.
30-015-00472

3a. Address
415 WEST WALL STREET SUITE 500
MIDLAND, TX 79701

3b. Phone No. (include area code)
Ph: 432-897-0673

10. Field and Pool, or Exploratory
RED LAKE; QN-G-SA

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 23 T17S R27E SENW 1980FNL 1980FWL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☒ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.).

Proposed P&A Plan

RECLAMATION PROCEDURE ATTACHED

-Notify BLM 24 hrs prior to PU RU.
-Have open top frac tank on location & a 20 lb. bag of sugar in case of circuation.
-RU PU; Install a 2M BOP & TIH w/ tubing to 1500' (TD). SPOT Plug from 1500-1400, WOC Tag
-Circulate hole w/ clean FW.
-Spot a neat Class C cement plug in open hole (1148' to 1163') up to 1000'.
-PUH & WOC for 4 hrs.
-Tag cement plug at 1000' or shallower.
-POOH filling 9 5/8" casing w/ neat Class C cement to 500'.
-MIRU Wireline & shoot 4 perforations at 400'.
-Open all annuli valves; RIH w/ packer and set at 350'; try to establish a rate of cement

SEE ATTACHED FOR CONDITIONS OF APPROVAL

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #183331 verified by the BLM Well Information System
For ALAMO PERMIAN RESOURCES, sent to the Carlsbad
Committed to AFMSS for processing by KURT SIMMONS on 01/16/2013 ()

Name *(Printed/Typed)* CARIE STOKER — Title REGULATORY AFFAIRS COORDINATOR

Signature (Electronic Submission) — Date 01/15/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By James A. Amos — Title SEPS — Date 1-20-13

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office CFO

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ****

Additional data for EC transaction #183331 that would not fit on the form

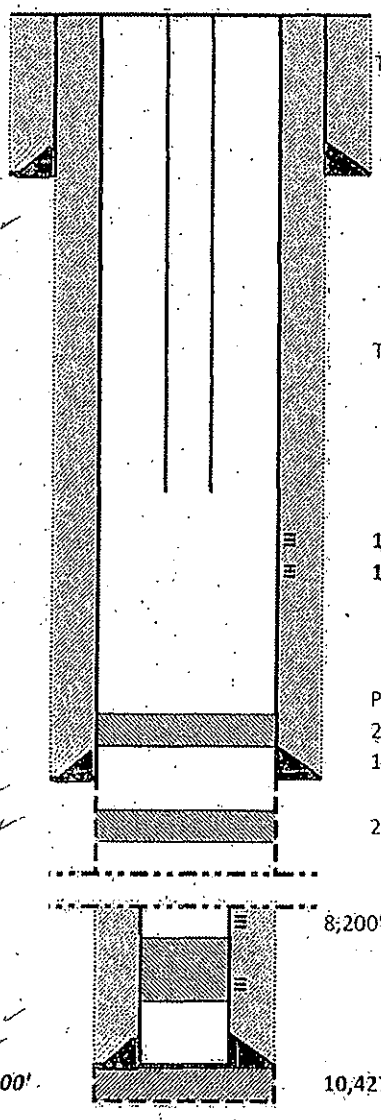
32. Additional remarks, continued

circulaiton; If circulation is established then pump cement until it comes out each annulus valve.
-POOH filling casing w/ cement to surface.
-Removed BOP.
-Get approval from BLM before RD PU.
-Notify BLM 4 hrs prior to WH cut off.
-Cut off welhead; fill any voids w/ cement; Install P&A marker.
-Reclaim location.

ALAMO PERMIAN RESOURCES, LLC
WELLBORE DIAGRAM

Lease/Well No.:	BERRY FEDERAL No. 29	ELEVATION, GL:	3,535 ft
Location:	1,980' FNL & 1,980' FWL		
	UL: F, SEC: 23, T: 17-S, R: 27-E	FIELD:	RED LAKE; QN-GB-SA
	EDDY County, NM	Original Hole	Re-Entry
LEASE No.:	NM - 02557-A	Spudded:	6/22/1962 1/28/1965
API No.:	30-015-00472	Drlg Stopped:	4/18/1962 4/9/1965
		Completed:	4/9/1965
		LAT:	
		LONG:	

ROTARY TOOLS



17-1/2" HOLE

Surface Csg:
13-3/8" 48# ✓
Csg Set @ 400' ✓
Cmt'd w/ 400 sx ✓

12-1/4" HOLE

Intermediate Csg:
9-5/8" 36# J-55 ✓
Csg Set @ 1,690' ✓
Cmt'd w/ 950 sx ✓

7-7/8" HOLE
Production Csg:
5-1/2" 17# J-55
Csg Set @ 10,278' ✓
Cmt'd w/ 525 sx ✓
Cut & Pulled @ 8,200'

TOC Est'd @ Surface
Calculated 75% SF
400'

TOC - 9-5/8" csg = Surface
Calculated 75% SF

8,200'

10,427' TD

TOPS	DEPTH, ft
SALT	
YATES	156
SEVEN RIVERS	396
BOWERS	
QUEEN	880
GRAYBURG	1,313
SAN ANDRES	1,667

1,148' - 1,149' ✓	**QUEEN**	**1 spf - 2 perfs**
1,162' - 1,163' ✓	**QUEEN**	**1 spf - 2 perfs**

PBTD = 1500'
20 sx Cmt Plug: 1500'-1550' 50' plug
1,690' Csg Set

20 sx Cmt Plug: 1750'-1800' 50' plug

35 sx Cmt Plug: 3000'-3280' ✓ GL
35 sx Cmt Plug: 4920'-5200' ✓ SA
35 sx Cmt Plug: 6090'-6370' ✓ QN
40 sx Cmt Plug: 7384'-7664' ✓ Perfs
35 sx Cmt Plug: 8920'-9200' ✓ Perfs 9292 9453 (WT)

TOC 8409' (TS)

Well was originally drilled as Berry Fed #1 to 10,427' in 1962 by Ralph Lowe - Dry Hole.
Well was P&A'd as Dry Hole in October 1963 - 5-1/2" csg cut & pulled @ 8200'.
Well was acquired by Leonard Latch in January 1965 & Re-Entered 01/28/1965 & Completed as a Queen Gas Well. Re-Named Berry Fed #29 - 01/25/65.
Initial Gas Sales to Southern Union Gas Co. 04/24/1973.

Cumulative Prod. (12/31/11):	
OIL	0.000 MBO
GAS	65.578 MMCF
WATER	0.000 MBW
INJECT.	---- MBW

HPS: 11/15/2012

DV 10289 9395 Miss 9353 Penn 7590 WC 6320 Bo 5114 GL 3050 SA 1667 GL 1314 Dra 880 TR 395 YT 155

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RECEIVED
OCD Artesia
FEB 20 2013
NMOCD ARTESIA

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMNM025527A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
BERRY A 29

2. Name of Operator
ALAMO PERMIAN RESOURCES LLC
Contact: CARIE STOKER
E-Mail: cstoker@helmsoil.com

9. API Well No.
30-015-00472-00-S1

3a. Address
415 WEST WALL STREET SUITE 500
MIDLAND, TX 79701

3b. Phone No. (include area code)
Ph: 432-664-7659

10. Field and Pool, or Exploratory
RED LAKE

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 23 T17S R27E SENW 1980FNL 1980FWL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☒ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☒ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

1/25/2013
Laid down polish rod, POOH w/ 4' 8' 2' sub(5/8), (50) 5/8 rods, (1) 12' X 1.5 pump. ND well head. NU BOP. RIH picking up 5 joints of 2 3/8 tbg and tagged bottom. PUH laying down 5 joints tbg. POOH w/ (1) 4 ft 2 3/8 sub, then POOH into derrick w/ 41 joints of 2 3/8 tbg. Closed BOP. Strapped pipe @1492'.

RECLAMATION
DUE 8-4-13
RDade 2/21/13
Accepted for record
NMOCD

1/29/2013
Open BOP, well had 0 psi. RIH w/ 44 joints @1461'. Pumped 85 bbl FW and broke circulation. Switched to cement. Pumped 11 1/2 bbl =48 sx w/ 2% calcium. Switched to FW water, pumped 38 bbl. PUH with 3 stands. Reversed out with fresh water. POOH out of hole with tubing into derrick. Rigged up wireline. RIH. Tagged cement plug @1060'. PUH. Shot perf @400'. POOH with wireline. RIH with 11 joints of tubing and packer, tried to set packer but couldn't. PUH every stand trying to set packer.

Accepted as to plugging of the well bore. Liability under bond is retained until surface restoration is completed.

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #197402 verified by the BLM Well Information System
For ALAMO PERMIAN RESOURCES LLC, sent to the Carlsbad
Committed to AFMSS for processing by KURT SIMMONS on 02/12/2013 (13KMS4465SE)

Name *(Printed/Typed)* CARIE STOKER — Title REGULATORY AFFAIRS COORDINATOR

Signature (Electronic Submission) — Date 02/07/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By ACCEPTED — JAMES A AMOS, Title SUPERVISOR EPS — Date 02/17/2013

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office Carlsbad

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****

Additional data for EC transaction #197402 that would not fit on the form

32. Additional remarks, continued

but couldn't. Finaly set packer @ 8' below ground level. POOH with tubing into derrick and laid down packer. Closed BOP. Pumped FW trying to get a rate. Pumped 4 bbl and well pressured up to 200. Bled well down through bleed off lines. Pumped 1/2 bbl, psi went to 400. Bled well down. RIH w/ 15 joints below perfs and pump 5 bbl FW, got circulation. Switched to cement. Pumped 66 bbls = 278sx. Got cement back to surface. Shut pump down. ND BOP. Topped cement to surface with hose.

1/30/2013
Met w/ Joe from BLM. The welder cut off the 9 5/8 casing even with the surface casing. Cement was visable inside the 9 5/8 casing and between surface casing. Welder welded the well marker on.

2/05/2013
Backhoe pulled out all cellar boards and back filled cellar.

OCD Artesia

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMNM025527A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
BERRY A 29

2. Name of Operator
ALAMO PERMIAN RESOURCES LLC
Contact: CARIE STOKER
E-Mail: cstoker@helmsoil.com

9. API Well No.
30-015-00472-00-S1

3a. Address
415 WEST WALL STREET SUITE 500
MIDLAND, TX 79701

3b. Phone No. (include area code)
Ph: 432-664-7659

10. Field and Pool, or Exploratory
RED LAKE

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 23 T17S R27E SENW 1980FNL 1980FWL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☒ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☒ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

2/05/2013
Tilled and seeded location with 25 lbs of BLM seed; fenced around location

RECEIVED
APR 11 2013
NMOCD ARTESIA

Accepted for record
NMOCD KDade 4/15/2013

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #197398 verified by the BLM Well Information System
For ALAMO PERMIAN RESOURCES LLC, sent to the Carlsbad
Committed to AFMSS for processing by KURT SIMMONS on 02/12/2013 (13KMS4876SE)

Name *(Printed/Typed)* CARIE STOKER — Title REGULATORY AFFAIRS COORDINATOR

Signature (Electronic Submission) — Date 02/07/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By ACCEPTED — JAMES A AMOS — Title SUPERVISOR EPS — Date 04/07/2013

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office Carlsbad

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****

N. M. O. C. C. COPY

Copy

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

5. LEASE DESIGNATION AND SERIAL NO.: NM025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
OCT 4 - 1972
O. C. C.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Leonard Latch

8. FARM OR LEASE NAME: Berry

3. ADDRESS OF OPERATOR: 1812 Texas Ave. Lubbock, Texas 79401

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980N & W

10. FIELD AND POOL, OR WILDCAT: Redlake [illegible]

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23 T17S R 27E

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.): 3545DF

12. COUNTY OR PARISH: Eddy

13. STATE: New Mexico

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☒	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other)			☐
(Other)	☐			(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

We treated the Queen Sand Perforations 1140-49 and 1162-63 with 18,000 lbs. sand and jelled water. Well will make 70,000 MCF in 24 hr. test. The well is now shut in waiting on a pipe line connection with Southern Union Gas Co. who has contracted the gas.

RECEIVED
OCT - 2 1972
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Chester L. Anderson TITLE Accountant DATE 9-29-72

(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

CONDITIONS OF APPROVAL, IF ANY:

APPROVED
OCT - 3 1972
/s/ R. L. BEEKMAN
R. L. BEEKMAN
ACTING DISTRICT ENGINEER

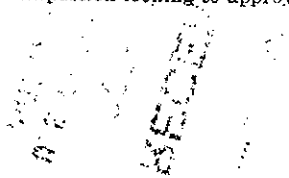
*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.



U.S. GOVERNMENT PRINTING OFFICE: 1963—O-685229

847 - 485

N. M. O. C. C. Copy to O. C. C.

Form 9-331
(May 1963)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMIT IN TRIPLICATE (Other instructions on reverse side)

Form approved.
Budget Bureau No. 42-R1424.

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
APR 26 1973
O. C. C.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

2. NAME OF OPERATOR: Leonard Latch

3. ADDRESS OF OPERATOR: 1612 Texas Ave. Lubbock, Texas 79401

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements. See also space 17 below.) At surface: 1980' N & W

5. LEASE DESIGNATION AND SERIAL NO.: 025527A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

7. UNIT AGREEMENT NAME:

8. FARM OR LEASE NAME: Derry

9. WELL NO.: 29

10. FIELD AND POOL, OR WILDCAT: Redlake [illegible]

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: 23-17S-27E

12. COUNTY OR PARISH: Eddy

13. STATE: New Mex.

14. PERMIT NO.:

15. ELEVATIONS (Show whether DF, RT, GR, etc.):

16. Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other)			☐
(Other) Well Status			☒	(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.) *

We reported on 9-29-72 that this well shut in waiting on pipe line connection from Southern Union Gas Co.
4-24-73 have gas connection from Southern Union Gas Company and we started producing this well.

RECEIVED
APR 25 1973
U. S. GEOLOGICAL SURVEY
ARTESIA, NEW MEXICO

18. I hereby certify that the foregoing is true and correct

SIGNED Chester L. Anderson TITLE Accountant DATE 4-24-73

(This space for Federal or State office use)

APPROVED BY [signature] TITLE DISTRICT ENGINEER DATE APR 25 1973
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side

Instructions

General: This form is designed for submitting proposals to perform certain well operations, and reports of such operations when completed, as indicated, on Federal and Indian lands pursuant to applicable Federal law and regulations, and, if approved or accepted by any State, on all lands in such State, pursuant to applicable State law and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from, the local Federal and/or State office.

Item 4: If there are no applicable State requirements, locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local State or Federal office for specific instructions.

Item 17: Proposals to abandon a well and subsequent reports of abandonment should include such special information as is required by local Federal and/or State offices. In addition, such proposals and reports should include reasons for the abandonment; data on any former or present productive zones, or other zones with present significant fluid contents not sealed off by cement or otherwise; depths (top and bottom) and method of placement of cement plugs; mud or other material placed below, between and above plugs; amount, size, method of parting of any casing, liner or tubing pulled and the depth to top of any left in the hole; method of closing top of well; and date well site conditioned for final inspection looking to approval of the abandonment.

U.S. GOVERNMENT PRINTING OFFICE: 1963—O—685229

847 - 485

MEXICO OIL CONSERVATION COMMISS

RECEIVED

JUL 5 1972

O. C. C.
ARTESIA, OFFICE

File
USGS

Form C-102
Supersedes C-128
Effective 1-1-65

WELL LOCATION AND ACREAGE DEDICATION PLAT

All distances must be from the outer boundaries of the Section

Operator: Leonard Leteh		Lease: Bezzy		Well No.: 29
Unit Letter: F	Section: 23	Township: 17S	Range: 27E	County: Eddy
Actual Footage Location of Well: 1980 feet from the N line and 1980 feet from the W line				
Ground Level Elev.: 3545	Producing Formation: Queen Sand	Pool: Redlake		Dedicated Acreage: 40 Acres

1. Outline the acreage dedicated to the subject well by colored pencil or hachure marks on the plat below.

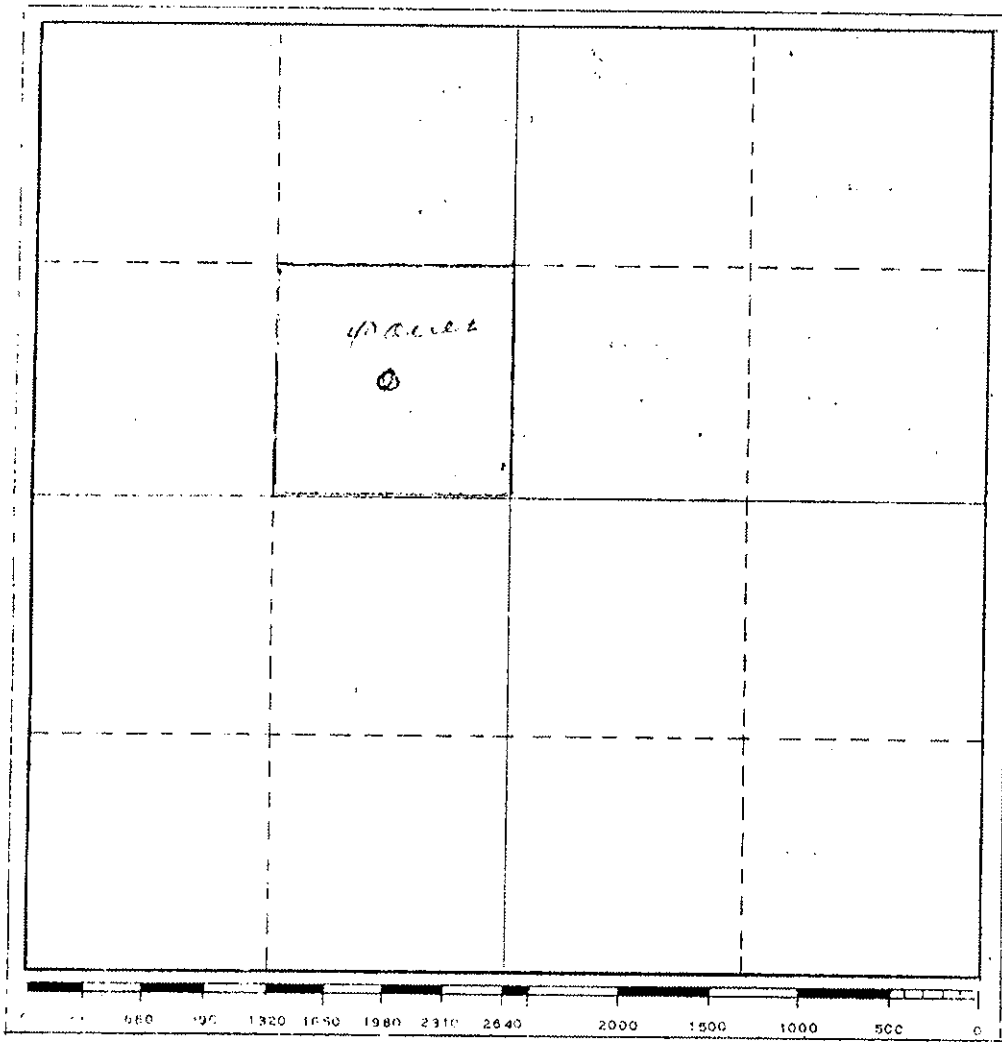
2. If more than one lease is dedicated to the well, outline each and identify the ownership thereof (both as to working interest and royalty).

3. If more than one lease of different ownership is dedicated to the well, have the interests of all owners been consolidated by communitization, unitization, force-pooling, etc?

☐ Yes ☐ No If answer is "yes," type of consolidation _____

If answer is "no," list the owners and tract descriptions which have actually been consolidated. (Use reverse side of this form if necessary.) _____

No allowable will be assigned to the well until all interests have been consolidated (by communitization, unitization, forced-pooling, or otherwise) or until a non-standard unit, eliminating such interests, has been approved by the Commission.



CERTIFICATION

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

Chester L Anderson

Name: Chester L. Anderson

Position: Accountant

Company: Leonard Leteh

Date: 7-3-72

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my knowledge and belief.

See Original Survey
By James H. Brown

Date Surveyed

Registered Professional Engineer and/or Land Surveyor

Certificate No.

OIL CONSERVATION COMMISSION

BOX 2045

ARTESIA, NEW MEXICO

RECEIVED

APR 30 1973

O. C. C.

NOTICE OF GAS CONNECTION

DATE April 27, 1973

This is to notify the Oil Conservation Commission that connection for the purchase of gas from the Leonard Latch (Operator), Group #1 Lands (Lease), Unknown (Well Unit), 23 - 17S - 27E (S.T.R.), unknown (Pool), Southern Union Gas Co. (Name of Purchaser) was made on April 24, 1973.

Producer is gathering, compressing, and delivering gas to us at a Central Location, do not know how many or location of wells from gas is being gathered.

Berry #29-F-23-17-27
Berry A #22 K-24-17-27
Berry B #25 G-25-17-27

Southern Union Gas Company
Purchaser

James F. Cocon
Representative

Transmission Manager
Title

cc: To operator: Leonard Latch, 1812 Texas Avenue, Lubbock, Tx. 79401
Oil Conservation Commission - Santa Fe
E. R. Corliss - Dallas - Engineering
W. B. Richardson - Gas Meas.- Dallas
R. J. McCrary - Dallas - Purchase & Prorations
E. H. Redden - Carlsbad - Dispatch Office

No. of copies received	4	
DISTRIBUTION		
SANTA FE	1	
FILE	1	✓
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	1	
PRORATION OFFICE		

NEW MEXICO OIL CONSERVATION COMMISSION
REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-110
Effective 1-1-65

RECEIVED.

AUG 16 1972

O. C. C.
ARTESIA, OFFICE

I.

Operator: Leonard Latch ✓

Address: 1812 Texas Ave. Lubbock, Texas 79401

Reason(s) for filing *(Check proper box)*

New Well	X	Change in Transporter of:			
Recompletion	X	Oil		Dry Gas	X
Change in Ownership		Casinghead Gas		Condensate	

Other *(Please explain)*

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry	29	~~Redlake Queen Gas~~	State, Federal or Fee Federal	025527A

Location
Unit Letter F ; 1980' Feet From The N Line and 1980' Feet From The W

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address *(Give address to which approved copy of this form is to be sent)*
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas X	Address *(Give address to which approved copy of this form is to be sent)*
Southern Union Gas Co.	Fidelity Union Tower, Dallas, Texas 75201 Attention Gene L. Hazelting

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					~~No~~ yes	~~Name Future~~ 4-24-73

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v.	Diff. Res'v.
		X	X			~~1550'~~		

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
	8-9-65	~~1690'~~ 10427	1550
Elevations *(DF, RKB, RT, GR, etc.)*	**Name of Producing Formation**	**Top Oil/Gas Pay**	**Tubing Depth**
3545DF	Queen Sand	1148'	1100'
Perforations			**Depth Casing Shoe**
1148-49' & 1162-63'			1690

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT
	~~5 3/8"~~	~~1690~~	~~Not Available~~
	13 3/8"	400	400
	9 5/8"	1690	950

V. TEST DATA AND REQUEST FOR ALLOWABLE

(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method *(Flow, pump, gas lift, etc.)*	
Length of Test	**Tubing Pressure**	**Casing Pressure**	**Choke Size**
Actual Prod. During Test	**Oil-Bbls.**	**Water-Bbls.**	**Gas-MCF**

GAS WELL

Actual Prod. Test-MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
78,828	24 hrs.	Dry Gas	
Testing Method *(pitot, back pr.)*	**Tubing Pressure** (Shut-in)	**Casing Pressure** (Shut-in)	**Choke Size**
Flow	378	488	1/2"

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Chester L Anderson
(Signature)

Agent
(Title)

Aug. 15, 1972
(Date)

OIL CONSERVATION COMMISSION

APPROVED APR 27 1973, 19____

BY W. A. Gressett

TITLE OIL AND GAS INSPECTOR

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

Separate Forms C-104 must be filed for each pool in multiply

4

FILE	1	1
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	1	
PRORATION OFFICE		

REQUEST FOR ALLOWABLE AND AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-1.
Effective 1-1-65

RECEIVED
SEP - 1 1976
O. C. C.
ARTESIA, OFFICE

Operator: Leonard Latch ✓

Address: 1812 Texas Ave. Lubbock, Texas 79401

Reason(s) for filing (Check proper box)

New Well		Change in Transporter of:			
Recompletion		Oil		Dry Gas	X
Change in Ownership		Casinghead Gas		Condensate	

Other (Please explain): from 54

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry	29	Redlake; Q-G-SA	State, Federal or Fee Federal	025527A

Location

Unit Letter F : 1980 Feet From The North Line and 1980 Feet From The West

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address (Give address to which approved copy of this form is to be sent)
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas ☑	Address (Give address to which approved copy of this form is to be sent)
Gas Company of New Mexico	Fidelity Union Tower Dallas, Tex. 75201

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					Yes	4-24-73

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion → (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v.	Diff. Res'v.

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT

V. TEST DATA AND REQUEST FOR ALLOWABLE

(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil-Bbls.	Water-Bbls.	Gas-MCF

GAS WELL

Actual Prod. Test-MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method (pitot, back pr.)	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

(Signature)

Accountant
(Title)

Aug. 31, 1976
(Date)

OIL CONSERVATION COMMISSION

APPROVED SEP 14 1976, 19____

BY W. A. Gressett

TITLE SUPERVISOR, DISTRICT II

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

Separate Forms C-104 must be filed for each pool in multiply

Form 3160-5
November 1983)
(Formerly 9-331)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SUBMIT IN TRIPLICATE* (Other instructions on reverse side)

Form approved.
Budget Bureau No. 1004-0135
Expires August 31, 1985

5. LEASE DESIGNATION AND SERIAL NO.: NM 025527-A

6. IF INDIAN, ALLOTTEE OR TRIBE NAME:

SUNDRY NOTICES AND REPORTS ON WELLS

(Do not use this form for proposals to drill or to deepen or plug back to a different reservoir. Use "APPLICATION FOR PERMIT—" for such proposals.)

RECEIVED
JUL 30 1984
O. C. D.
ARTESIA, OFFICE

1. OIL WELL ☐ GAS WELL ☒ OTHER

7. UNIT AGREEMENT NAME:

2. NAME OF OPERATOR: Marbob Energy Corporation

8. FARM OR LEASE NAME: Berry A

3. ADDRESS OF OPERATOR: P.O. Drawer 217, Artesia, N.M. 88210

9. WELL NO.: 29

4. LOCATION OF WELL (Report location clearly and in accordance with any State requirements.* See also space 17 below.) At surface: 1980 FNL 1980 FWL

10. FIELD AND POOL, OR WILDCAT: Red Lake Qn Grbg SA

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA: Sec. 23-T17S-R27E

14. PERMIT NO.

15. ELEVATIONS (Show whether DF, RT, GR, etc.)

12. COUNTY OR PARISH: Eddy

13. STATE: N.M.

16. **Check Appropriate Box To Indicate Nature of Notice, Report, or Other Data**

NOTICE OF INTENTION TO:				SUBSEQUENT REPORT OF:			
TEST WATER SHUT-OFF	☐	PULL OR ALTER CASING	☐	WATER SHUT-OFF	☐	REPAIRING WELL	☐
FRACTURE TREAT	☐	MULTIPLE COMPLETE	☐	FRACTURE TREATMENT	☐	ALTERING CASING	☐
SHOOT OR ACIDIZE	☐	ABANDON*	☐	SHOOTING OR ACIDIZING	☐	ABANDONMENT*	☐
REPAIR WELL	☐	CHANGE PLANS	☐	(Other) Change of operator			☒
(Other)	☐			(NOTE: Report results of multiple completion on Well Completion or Recompletion Report and Log form.)			

17. DESCRIBE PROPOSED OR COMPLETED OPERATIONS (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work. If well is directionally drilled, give subsurface locations and measured and true vertical depths for all markers and zones pertinent to this work.)*

This is to change operator from Latch Operations, P.O. Box 10108, Lubbock, Texas 79408, to Marbob Energy Corporation, effective 7/1/84.

18. I hereby certify that the foregoing is true and correct

SIGNED Carolyn Norris TITLE Production Clerk DATE 7/2/84

ACCEPTED FOR RECORD

(This space for Federal or State office use)

APPROVED BY GWO TITLE DATE

CONDITIONS OF APPROVAL, IF ANY:

JUL 26 1984

Carlsbad, New Mexico

*See Instructions on Reverse Side

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

NO. OF COPIES RECEIVED	5	
DISTRIBUTION		
SANTA FE	1	
FILE	1	
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	2	
PRORATION OFFICE		

NEW MEXICO OIL CONSERVATION COMMISSION
REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-110
Effective 1-1-65

RECEIVED
MAR 27 1978
O. C. D.
ARTESIA, OFFICE

Operator
LEONARD LATCH

Address
Suite 507 Texas Commerce Bank Bldg. Lubbock, Texas 79401

Reason(s) for filing *(Check proper box)*

New Well	☐	Change in Transporter of:			
Recompletion	☐	Oil	☐	Dry Gas	☒
Change in Ownership	☐	Casinghead Gas	☐	Condensate	☐

Other *(Please explain)*

If change of ownership give name and address of previous owner _____

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry	20	Redlake Q-G-SA	State, Federal or Fee Federal	025507A

Location
Unit Letter F ; 1980 Feet From The North Line and 1980 Feet From The West

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address *(Give address to which approved copy of this form is to be sent)*
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas XX	Address *(Give address to which approved copy of this form is to be sent)*
Phillips Petroleum Co.	Bartlesville, Oklahoma 74004

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					Yes	2-23-78

If this production is commingled with that from any other lease or pool, give commingling order number: _____

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Resv.	Diff. Resv.

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations *(DF, RKB, RT, GR, etc.)*	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT

V. TEST DATA AND REQUEST FOR ALLOWABLE

(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method *(Flow, pump, gas lift, etc.)*	
		Pump	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil - Bbls.	Water - Bbls.	Gas - MCF

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method *(pitot, back pr.)*	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Chester L. Anderson
(Signature)

Accountant
(Title)

3-23-78
(Date)

OIL CONSERVATION COMMISSION

APPROVED APR 11 1978, 19

BY W. A. Gressett

TITLE SUPERVISOR, DISTRICT II

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

NO. OF COPIES RECEIVED		
DISTRIBUTION	4	
SANTA FE	1	
FILE	1	✓
U.S.G.S.		
LAND OFFICE		
TRANSPORTER OIL		
TRANSPORTER GAS	1	
OPERATOR	1	
PRORATION OFFICE		

NEW MEXICO OIL CONSERVATION COMM. ON

REQUEST FOR ALLOWABLE
AND
AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

Form C-104
Supersedes Old C-104 and C-110
Effective 1-1-65

RECEIVED
MAR 6 1979
O. C. C.
ARTESIA, OFFICE

I. Operator: LATCH OPERATIONS ✓

Address: Suite 507 Texas Commerce Bank Bldg. - Lubbock, Texas 79401

Reason(s) for filing (Check proper box)
- New Well ☐
- Recompletion ☐
- Change in Ownership ☐
- Change in Transporter of: Oil ☐ Dry Gas ☐ Casinghead Gas ☐ Condensate ☐

Other (Please explain): Change in name operator. Leonard Latch deceased. Business now carried on by his estate in the name of Latch Operations.

If change of ownership give name and address of previous owner: Leonard Latch-Suite 507 Texas Comm. Bank Bldg.-Lubbock, Texas 79401

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease	Lease No.
Berry A	29	Redlake Queen Gas G-SA	State, Federal or Fee Federal	025527A

Location: Unit Letter F : 1980 Feet From The North Line and 1980 Feet From The West

Line of Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil ☐ or Condensate ☐	Address (Give address to which approved copy of this form is to be sent)
Name of Authorized Transporter of Casinghead Gas ☐ or Dry Gas XX: Phillips Petroleum Co.	Address (Give address to which approved copy of this form is to be sent): Bartlesville, Oklahoma 74004

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When
					Yes	2-23-78

If this production is commingled with that from any other lease or pool, give commingling order number:

IV. COMPLETION DATA

Designate Type of Completion – (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Resv.	Diff. Resv.

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING, AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT

V. TEST DATA AND REQUEST FOR ALLOWABLE (Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours)

OIL WELL

Date First New Oil Run To Tanks	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil - Bbls.	Water - Bbls.	Gas - MCF

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method (pitot, back pr.)	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Commission have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Leonard Latch
(Signature)

Agent
(Title)

2-28-79
(Date)

OIL CONSERVATION COMMISSION

APPROVED APR 19 1979, 19

BY W. A. Gressett

TITLE SUPERVISOR, DISTRICT II

This form is to be filed in compliance with RULE 1104.

If this is a request for allowable for a newly drilled or deepened well, this form must be accompanied by a tabulation of the deviation tests taken on the well in accordance with RULE 111.

All sections of this form must be filled out completely for allowable on new and recompleted wells.

Fill out only Sections I, II, III, and VI for changes of owner, well name or number, or transporter, or other such change of condition.

NEW MEXICO
OIL CONSERVATION COMMISSION
P. O. DRAWER DD
ARTESIA, NEW MEXICO

Sept. thru Dec. 1974

No. 2190 G

SUPPLEMENT TO THE OIL PRORATION SCHEDULE

DATE 11/12/74

PURPOSE: ALLOWABLE ASSIGNMENT FOR GAS WELLS IN AN OIL POOL

The following Leonard Latch wells located in the Red Lake Q-G-SA Pol Pool have been completed as gas wells and effective 11-1-74 a casinghead gas allowable is hereby assigned.

Berry #27-E, 24-17-27
" #29-F, "
Berry A #22-K, 24-17-27
" #26-O, "

WAG:jw

Leonard Latch

Southern Union

OIL CONSERVATION COMMISSION

W. A. Gressett

Supervisor, District No. 2

OPERATOR'S COPY

OIL CONSERVATION COMMISSION
BOX 1980
HOBBS, NEW MEXICO

RECEIVED
MAR - 1 1978
O. C. C.
ARTESIA, OFFICE

NOTICE OF GAS CONNECTION

DATE February 28, 1978

This is to notify the Oil Conservation Commission that connection for the purchase of gas from the Leonard Latch Operator

Lease	Well Unit	S.T.R.	Pool
Berry "A" Well #22	K	24-17-27	
Berry "A" Well #26	O	24-17-27	
Berry "A" Well #27	E	24-17-27	
Berry "B" Well #29	F	23-17-27	
Berry "B" Well #25	G	25-17-27	Red Lake/Queen

Phillips Petroleum Company (Name of Purchaser) was made on February 23, 1978

Phillips Petroleum Company
Purchaser

J. E. Whitson
Representative

Prod. Records Supr.
Title

cc: To Operator
Oil Conservation Commission - Santa Fe

N.M. Oil Cons. Division
811 S. 1st Street
Artesia, NM 88210-2834

Form 3160-5
(November 1994)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB No. 1004-0135
Expires July 31, 1996

C151

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side

5. Lease Serial No.
NM 02552?-A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
Berry B #29

2. Name of Operator
Harvey Energy

9. API Well No.
30015004720~~00~~

3a. Address
R 342 S. Halderman Rd. Artesia

3b. Phone No. *(include area code)*
N.M. (505) 746-2262

10. Field and Pool, or Exploratory Area
Rd-Lake Qn, GbSA

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
1980 FNL 1980' FWL Sec. 23 T17S R27E

11. County or Parish, State
Eddy, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☒ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

Well Returned to production 3/1/00

ACCEPTED FOR RECORD
MAR 08 2000
BLM

14. I hereby certify that the foregoing is true and correct
Name *(Printed/Typed)*

Title Operator

Signature
Warren Harvey

Date 3/6/2000

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by	Title	Date
Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.	Office	

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on reverse)

District I
PO Box 1980, Hobbs, NM 88241-1980
District II
811 South First, Artesia, NM 88210
District III
1000 Rio Brazos Rd., Aztec, NM 87410
District IV
2040 South Pacheco, Santa Fe, NM 87505

State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION
2040 South Pacheco
Santa Fe, NM 87505

Form C-104
Revised October 18, 1994
Instructions on back
Submit to Appropriate District Office
5 Copies

☐ AMENDED REPORT

I. REQUEST FOR ALLOWABLE AND AUTHORIZATION TO TRANSPORT

1 Operator name and Address	2 OGRID Number
SDX Resources, Inc. PO Box 5061 Midland, TX 79704	020451
	3 Reason for Filing Code: Change of Operator Effective 2/1/00

4 API Number	5 Pool Name	6 Pool Code
30 - 0 15-00472	Redlake, QN-GB-SA	51300
7 Property Code	**8 Property Name**	**9 Well Number**
25541	Berry	29

II. 10 Surface Location

Ul or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South Line	Feet from the	East/West line	County
F	23	17S	27E		1980	N	1980	W	Eddy

11 Bottom Hole Location

Ul or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South Line	Feet from the	East/West line	County

12 Lse Code	13 Producing Method Code	14 Gas Connection Date	15 C-129 Permit Number	16 C-129 Effective Date	17 C-129 Expiration Date
SF	S				

III. Oil and Gas Transporters

18 Transporter OGRID	19 Transporter Name and Address	20 POD	21 O/G	22 POD ULSTR Location and Description
015694	Navajo PO Box 159 Artesia, NM 88211		O	
009171	GPM 4001 Penbrook Odessa, TX 79762		G	

RECEIVED
OCD
ARTESIA

IV. Produced Water

23 POD	24 POD ULSTR Location and Description

V. Well Completion Data

25 Spud Date	26 Ready Date	27 TD	28 PBTD	29 Perforations	30 DHC, DC, MC

31 Hole Size	32 Casing & Tubing Size	33 Depth Set	34 Sacks Cement
			Sacked 4-7-00

VI. Well Test Data

35 Date New Oil	36 Gas Delivery Date	37 Test Date	38 Test Length	39 Tbg. Pressure	40 Csg. Pressure

41 Choke Size	42 Oil	43 Water	44 Gas	45 AOF	46 Test Method

47 I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Signature: John Pool
Printed name: John Pool
Title: Vice-President
Date: 02/02/00 Phone: 915/685-1761

OIL CONSERVATION DIVISION

Approved by: ORIGINAL SIGNED BY TIM W. GUM
Title: DISTRICT II SUPERVISOR
Approval Date: MAR 27 2000

48 If this is a change of operator fill in the OGRID number and name of the previous operator

009946 Hanson Energy

Previous Operator Signature	Printed Name	Title	Date
Warren Hanson	WARREN HANSON.		02/02/00

Appropriate District Office
DISTRICT I
P.O. Box 1980, Hobbs, NM 88240

DISTRICT II
P.O. Drawer DD, Artesia, NM 88210

DISTRICT III
1000 Rio Brazos Rd., Aztec, NM 87410

Energy, Minerals and Natural Resources Department

OIL CONSERVATION DIVISION
P.O. Box 2088
Santa Fe, New Mexico 87504-2088

Revised 1-1-89
See Instructions at Bottom of Page

RECEIVED
AUG - 9 1993
O. C. D.

REQUEST FOR ALLOWABLE AND AUTHORIZATION TO TRANSPORT OIL AND NATURAL GAS

I.

Operator	Well API No.
Hanson energy	300150047200

Address: P.O. 342 S. Haldeman Rd. Artesia, N.M. 88210

Reason(s) for Filing (Check proper box) — Other (Please explain)

- New Well [ ]
- Recompletion [ ]
- Change in Operator [X]
- Change in Transporter of: Oil [ ] Dry Gas [ ] Casinghead Gas [ ] Condensate [ ]

Effective 8/1/93

If change of operator give name and address of previous operator: Marbob Energy Corporation, Drawer 217, Artesia, N.M. 88210

II. DESCRIPTION OF WELL AND LEASE

Lease Name	Well No.	Pool Name, Including Formation	Kind of Lease (State, Federal or Fee)	Lease No.
Berry	29	Red Lk, Qn, Grb, SA		NM025527-A

Location

Unit Letter F : 1980 Feet From The North Line and 1980 Feet From The West Line

Section 23 Township 17S Range 27E , NMPM, Eddy County

III. DESIGNATION OF TRANSPORTER OF OIL AND NATURAL GAS

Name of Authorized Transporter of Oil [ ] or Condensate [ ]	Address (Give address to which approved copy of this form is to be sent)
Name of Authorized Transporter of Casinghead Gas [ ] or Dry Gas [X]	Address (Give address to which approved copy of this form is to be sent)
GPM Gas Corp	4001 Penbrook, Odessa, Tx. 79762

If well produces oil or liquids, give location of tanks.	Unit	Sec.	Twp.	Rge.	Is gas actually connected?	When ?
					Yes	2/23/78

If this production is commingled with that from any other lease or pool, give commingling order number:

IV. COMPLETION DATA

Designate Type of Completion - (X)	Oil Well	Gas Well	New Well	Workover	Deepen	Plug Back	Same Res'v	Diff Res'v

Date Spudded	Date Compl. Ready to Prod.	Total Depth	P.B.T.D.
Elevations (DF, RKB, RT, GR, etc.)	Name of Producing Formation	Top Oil/Gas Pay	Tubing Depth
Perforations			Depth Casing Shoe

TUBING, CASING AND CEMENTING RECORD

HOLE SIZE	CASING & TUBING SIZE	DEPTH SET	SACKS CEMENT
			Post ID-3
			8-20-93
			okay

V. TEST DATA AND REQUEST FOR ALLOWABLE

OIL WELL *(Test must be after recovery of total volume of load oil and must be equal to or exceed top allowable for this depth or be for full 24 hours.)*

Date First New Oil Run To Tank	Date of Test	Producing Method (Flow, pump, gas lift, etc.)	
Length of Test	Tubing Pressure	Casing Pressure	Choke Size
Actual Prod. During Test	Oil - Bbls.	Water - Bbls.	Gas- MCF

GAS WELL

Actual Prod. Test - MCF/D	Length of Test	Bbls. Condensate/MMCF	Gravity of Condensate
Testing Method (pitot, back pr.)	Tubing Pressure (Shut-in)	Casing Pressure (Shut-in)	Choke Size

VI. OPERATOR CERTIFICATE OF COMPLIANCE

I hereby certify that the rules and regulations of the Oil Conservation Division have been complied with and that the information given above is true and complete to the best of my knowledge and belief.

Kathie Hanson
Signature

Kathie Hanson — Secretary
Printed Name — Title

7/30/93 — 746-2262
Date — Telephone No.

OIL CONSERVATION DIVISION

Date Approved: AUG 11 1993

By: ~~ORIGINAL SIGNED BY~~ MIKE WILLIAMS

Title: SUPERVISOR, DISTRICT II

INSTRUCTIONS: This form is to be filed in compliance with Rule 1104

1) Request for allowable for newly drilled or deepened well must be accompanied by tabulation of deviation tests taken in accordance with Rule 111.
2) All sections of this form must be filled out for allowable on new and recompleted wells.
3) Fill out only Sections I, II, III, and VI for changes of operator, well name or number, transporter, or other such changes.
4) Separate Form C-104 must be filed for each pool in multiply completed wells.

District II
1301 W. Grand Ave., Artesia, NM 88210
Phone:(505) 748-1283 Fax:(505) 748-9720

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

Form C-104A
Permit 16648

RECEIVED
OCT 14 2005
OCD-ARTESIA

Change of Operator

Previous Operator Information		New Operator Information	
		Effective Date:	9/1/2005
OGRID:	20451	OGRID:	9946
Name:	SDX RESOURCES INC	Name:	HANSON ENERGY
Address:	PO Box 5061	Address:	PO BOX 1348
Address:		Address:	
City, State, Zip:	Midland , TX 79704	City, State, Zip:	ARTESIA , NM 88211

I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information on this form and the certified list of wells is true to the best of my knowledge and belief.

Previous Operator		New Operator	
Signature:		Signature:	Warren Hanson
Printed Name:	John Pool	Printed Name:	Warren Hanson
Title:	Vice President	Title:	Hanson Energy
Date:	10/10/05	Date:	
Phone:	432/685-1761	Phone:	505/746-2262

NMOCD Approval
Electronic Signature: Carmen Reno, District 2
Date: October 25, 2005

NEW MEXICO ENERGY, MINERALS and NATURAL RESOURCES DEPARTMENT

BILL RICHARDSON
Governor
Joanna Prukop
Cabinet Secretary

Mark E. Fesmire, P.E.
Director
Oil Conservation Division

29-May-07

HANSON ENERGY
PO BOX 1348
ARTESIA NM 88210

LOV NO. 62/3007

LETTER OF VIOLATION - Inspection

Dear Operator:

The following inspection(s) indicate that the well, equipment, location or operational status of the well(s) failed to meet standards of the New Mexico Oil Conservation Division as described in the detail section below. To comply with standards imposed by Rules and Regulations of the Division, corrective action must be taken immediately and the situation brought into compliance. The detail section indicates preliminary findings and/or probable nature of the violation. This determination is based on an inspection of your well or facility by an inspector employed by the Oil Conservation Division on the date(s) indicated.

Please notify the proper district office of the Division, in writing, of the date corrective actions are scheduled to be made so that arrangements can be made to reinspect the well and/or facility.

INSPECTION DETAIL SECTION

BERRY FEDERAL **No.029** F-23-17S-27E **30-015-00472-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714141197

Comments on Inspection: Violation of rule 19.15.4.201. Last report of production 1/1/2005. Pull rod in hole.

SAUNDERS A No.007 B-13-17S-27E **30-015-01244-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714148764

Comments on Inspection: Violation of rule 19.15.4.201. Reporting one barrel of oil since 4/1/2006. No pumping equipment on site. Pull rod in hole. New high pressure hose connected to casing valve. Well does not appear capable of producing. Please indicate how production is being accomplished.

SAUNDERS A No.002 B-13-17S-27E **30-015-01247-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714148206

Comments on Inspection: Violation of rule 19.15.4.201. Last injection reported 5/1/2004.

BERRY FEDERAL **No.030** O-23-17S-27E **30-015-21510-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714140576

Comments on Inspection: Violation of rule 19.15.4.201. Last production report 1/1/2005. Electricity turned off.

SAUNDERS B No.003 A-13-17S-27E **30-015-22725-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714149746

Comments on Inspection: violation of rule 19.15.4.201. Last production report 9/01/2005. Does not appear to be any recent activity. Road to site almost overgrown.

SAUNDERS A No.011 B-13-17S-27E **30-015-24123-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714147816

Comments on Inspection: violation of rule 19.15.4.201. Last production report 9/01/1988. Pumpjack disassembled. Tubing in hole capped with bull plug. Electric meter removed.

BERRY FEDERAL **No.034** G-23-17S-27E **30-015-31113-00-00**

Inspection Date	Type Inspection	Inspector	Violation?	*Significant Non-Compliance?	Corrective Action Due By:	Inspection No.
05/21/2007	Inactive Well Verification	Richard Inge	Yes	No	6/14/2007	iREI0714141778

Comments on Inspection: Violation of rule 19.15.4.201. Last production reported 1/1/2005. Only casing sticking out of hole. Growth in front of tank battery.

In the event that a satisfactory response is not received to this letter of direction by the "Corrective Action Due By:" date shown above, further enforcement will occur. Such enforcement may include this office applying to the Division for an order summoning you to a hearing before a Divison Examiner in Santa Fe to show cause why you should not be ordered to permanently plug and abandon this well. Such a hearing may result in imposition of CIVIL PENALTIES for your violation of OCD rules.

Sincerely,

RICHARD INGE

Artesia OCD District Office

Note: Information in Detail Section comes directly from field inspector data entries - not all blanks will contain data.
*Significant Non-Compliance events are reported directly to the EPA, Region VI, Dallas, Texas.

Form 3160-5
(April 2004)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD-ARTESIA

FORM APPROVED
OMB No 1004-0137
Expires March 31, 2007

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE- Other instructions on reverse side.

5. Lease Serial No.
NM025527

6 If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No

1. Type of Well
☐ Oil Well ☑ Gas Well ☐ Other

8 Well Name and No.
BERRY FEDERAL #29

2. Name of Operator
HANSON ENERGY

9. API Well No.
30-015-00472

3a Address
P.O. BOX 1348 ARTESIA, NM 88211

3b Phone No *(include area code)*
575-746-2262

10. Field and Pool, or Exploratory Area
RED LAKE,QN,GB,SA

4 Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
UNIT F 1980 FNL 1980 FWL SEC 23-17S-27E

FEB 12 2008
OCD-ARTESIA

11. County or Parish, State
EDDY NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☑ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ After Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13 Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

INSTALLED COMPRESSOR

TURNED GAS DOWN LINE

ACCEPTED FOR RECORD

FEB 10 2008

J. Amos

BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

* Submit date returned to prod

14 I hereby certify that the foregoing is true and correct
Name *(Printed/Typed)*
KATHIE HANSON

Title PRODUCTION CLERK

Signature Kathie Hanson

Date 01/30/2008

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by

Title

Date

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

Accepted for record - NMOCD

District II
1301 W. Grand Ave., Artesia, NM 88210
Phone (505) 748-1283 Fax (505) 748-9720

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

Form C-145
Permit 79544

Change of Operator

Previous Operator Information		New Operator Information	
		Effective Date:	8/1/2008
OGRID:	9946	OGRID:	261198
Name:	HANSON ENERGY	Name:	DORAL ENERGY CORP.
Address:	PO BOX 1348	Address:	3000 N.GARFIELD ST, SUITE 210
Address:		Address:	
City, State, Zip:	ARTESIA, NM 88210	City, State, Zip:	MIDLAND, TX 79705

I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information on this form and the certified list of wells is true to the best of my knowledge and belief.

Previous Operator		New Operator	
Signature:	Warren Hanson	Signature:	Joanne Keating
Printed Name:	WARREN HANSON	Printed Name:	Joanne Keating
Title:	OWNER/OPERATOR	Title:	Regulatory Affairs Manager
Date:	07/31/2008 Phone: 575/746-1262	Date:	07/31/2008 Phone: 432-218-9824

NMOCD Approval
Electronic Signature: Carmen Reno, District 2
Date: August 04, 2008

District II
1301 W Grand Ave., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720

State of New Mexico
Energy, Minerals and Natural Resources

Form C-145
Permit 120455

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

Change of Operator

Previous Operator Information		New Operator Information	
		Effective Date:	Effective on the date of approval by the OCD
OGRID:	261198	OGRID:	274841
Name:	DORAL ENERGY CORP	Name:	ALAMO PERMIAN RESOURCES, LLC
Address:	415 W. WALL ST. SUITE 500	Address:	820 GESSNER RD
			SUITE 1650
City, State, Zip:	MIDLAND , TX 79701	City, State, Zip:	HOUSTON , TX 77024

I hereby certify that the rules of the Oil Conservation Division have been complied with and that the information on this form and the certified list of wells is true to the best of my knowledge and belief.

Additionally, by signing below, ALAMO PERMIAN RESOURCES, LLC certifies that it has read and understands the following synopsis of applicable rules.

Previous Operator		New Operator	
Signature:	E.W. Gray II	Signature:	
Printed Name:	E.W. GRAY II	Printed Name:	CARL D. CAMPBELL
Title:	CHAIRMAN & CEO	Title:	EVP/COO
Date:	9-16-2010 Phone: 432.789.1180	Date:	17-SEPT-10 Phone: 713-224-2500

NMOCD Approval
Electronic Signature: Randy Dade, District 2
Date: October 26, 2010

ALAMO PERMIAN RESOURCES, LLC certifies that all below-grade tanks constructed and installed prior to June 16, 2008 associated with the selected wells are in compliance with 19.15.17 NMAC, have been closed pursuant to 19.15.17.13 NMAC, or have been retrofitted to comply with Paragraphs (1) through (4) of Subsection I of 19.15.17.11 NMAC.

ALAMO PERMIAN RESOURCES, LLC understands that the OCD's approval of this operator change:

1. constitutes approval of the transfer of the permit for any permitted pit, below-grade tank or closed-loop system associated with the selected wells; and
2. constitutes approval of the transfer of any below-grade tanks constructed and installed prior to June 16, 2008 associated with the selected wells, regardless of whether the transferor has disclosed the existence of those below-grade tanks to the transferee or to the OCD, and regardless of whether the below-grade tanks are in compliance with 19.15.17 NMAC.

As the operator of record of wells in New Mexico, ALAMO PERMIAN RESOURCES, LLC agrees to the following statements:

1. I am responsible for ensuring that the wells and related facilities comply with applicable statutes and rules, and am responsible for all regulatory filings with the OCD. I am responsible for knowing all applicable statutes and rules, not just the rules referenced in this list. I understand that the OCD's rules are available on the OCD website under "Rules," and that the Water Quality Control Commission rules are available on the OCD website on the "Publications" page.
2. I understand that if I acquire wells from another operator, the OCD must approve the operator change before I begin operating those wells. See 19.15.9.9.B NMAC. I understand that if I acquire wells or facilities subject to a compliance order addressing inactive wells or environmental cleanup, before the OCD will approve the operator change it may require me to enter into an enforceable agreement to return those wells to compliance. See 19.15.9.9.C(2) NMAC.
3. I must file a monthly C-115 report showing production for each non-plugged well completion for which the OCD has approved an allowable and authorization to transport, and injection for each injection well. See 19.15.7.24 NMAC. I understand that the OCD may cancel my authority to transport from or inject into all the wells I operate if I fail to file C-115 reports. See 19.15.7.24.C NMAC.
4. I understand that New Mexico requires wells that have been inactive for certain time periods to be plugged or placed on approved temporary abandonment. See 19.15.25.8 NMAC. I understand the requirements for plugging and approved temporary abandonment in 19.15.25 NMAC. I understand that I can check my compliance with the basic requirements of 19.15.25.8 NMAC by using the "Inactive Well List" on OCD's website.
5. I must keep current with financial assurances for well plugging. I understand that New Mexico requires each state or fee well that has been inactive for more than two years and has not been plugged and released to be covered by a single-well financial assurance, even if the well is also covered by a blanket financial assurance and even if the well is on approved temporary abandonment status. See 19.15.8.9.C NMAC. I understand that I can check my compliance with the single-well financial assurance requirement by using the "Inactive Well Additional Financial Assurance Report" on the OCD's website.
6. I am responsible for reporting releases as defined by 19.15.29 NMAC. I understand the OCD will look to me as the operator of record to take corrective action for releases at my wells and related facilities, including releases that occurred before I became operator of record.
7. I have read 19.15.5.9 NMAC, commonly known as "Part 5.9," and understand that to be in compliance with its requirements I must have the appropriate financial assurances in place, comply with orders requiring corrective action, pay penalties assessed by the courts or agreed to by me in a settlement agreement, and not have too many wells out of compliance with the inactive well rule (19.15.25.8 NMAC). If I am in violation of Part 5.9, I may not be allowed to drill, acquire or produce any additional wells, and will not be able to obtain any new injection permits. See 19.15.16.19 NMAC, 19.15.26.8 NMAC, 19.15.9.9 NMAC and 19.15.14.10 NMAC. If I am in violation of Part 5.9 the OCD may, after notice and hearing, revoke my existing injection permits. See 19.15.26.8 NMAC.
8. For injection wells, I understand that I must report injection on my monthly C-115 report and must operate my wells in compliance with 19.15.26 NMAC and the terms of my injection permit. I understand that I must conduct mechanical integrity tests on my injection wells at least once every five years. See 19.15.26.11 NMAC. I understand that when there is a continuous one-year period of non-injection into all wells in an injection or storage project or into a saltwater disposal well or special purpose injection well, authority for that injection automatically terminates. See 19.15.26.12 NMAC. I understand that if I transfer

operation of an injection well to another operator, the OCD must approve the transfer of authority to inject, and the OCD may require me to demonstrate the well's mechanical integrity prior to approving that transfer. See 19.15.26.15 NMAC.

9. I am responsible for providing the OCD with my current address of record and emergency contact information, and I am responsible for updating that information when it changes. See 19.15.9.8.C NMAC. I understand that I can update that information on the OCD's website under "Electronic Permitting."
10. If I transfer well operations to another operator, the OCD must approve the change before the new operator can begin operations. See 19.15.9.9.B NMAC. I remain responsible for the wells and related facilities and all related regulatory filings until the OCD approves the operator change. I understand that the transfer will not relieve me of responsibility or liability for any act or omission which occurred while I operated the wells and related facilities.

ChangeOp Comments

OGRID: [261198] DORAL ENERGY CORP.
Permit Number: 120455
Permit Type: ChangeOp

Created By	Comment	Comment Date
DPHILLIPS	I cannot approve the change of operator as one well on you list requires additional bonding - Spruck State No. 9 - $7980. Upon receipt of the bond, I continue with the processing. Questions? Call me at 505-476-3461.	9/27/2010
DPHILLIPS	Received the bond.	10/15/2010

Form 3160-5
(February 2005)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD Artesia

FORM APPROVED
OMB No. 1004-0137
Expires: March 31, 2007

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use Form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE- Other instructions on reverse side.

5. Lease Serial No.
NM 025527-A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☑ Oil Well ☐ Gas Well ☐ Other

8. Well Name and No.
Berry A Lease; see attached list

2. Name of Operator **Alamo Permian Resources, LLC**

9. API Well No.
See attached list

3a. Address
415 W. Wall Street, Suite 500 Midland, TX 79701

3b. Phone No. *(include area code)*
432.897.0673

10. Field and Pool, or Exploratory Area
See attached list

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
See attached list

11. County or Parish, State
Eddy County, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☑ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☑ Other **Change of Operator**
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

This is a notification of Change of Operator for the attached referenced wells.

Alamo Permian Resources, LLC, as new operator, accepts all applicable terms, conditions, stipulations and restrictions concerning operations conducted on this lease or portion of lease described.

Bond Coverage: BLM Bond File No.: NMB000709

Change of Operator effective: October 26, 2010

Former Operator: Doral Energy Corp. (ORGID No. 261198)

SEE ATTACHED FOR
CONDITIONS OF APPROVAL

Accepted for record - NMOCD

APPROVED
JAN 18 2011
/s/ JD Whitlock Jr
BUREAU OF LAND MANAGEMENT
CARLSBAD FIELD OFFICE

14. I hereby certify that the foregoing is true and correct
Name *(Printed/Typed)*
Joanne Keating Title **Regulatory Affairs Coordinator**

Signature Joanne Keating Date **11/09/2010**

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by _____ Title _____ Date _____

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon. Office

RECEIVED
FEB 07 2011
NMOCD ARTESIA

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

ENTERED
KMG

ALAMO PERMIAN RESOURCES, LLC

Alamo Permian Resources, LLC (OGRID No. 274841)

Doral Energy Corp (OGRID No. 261198) — Hanson Energy Acquisition, Eddy County, New Mexico

LEASE NAME	WELL No.	LEASE TYPE	LEASE NO.	WELL API NUMBER	FIELD; POOL(s)	LOCATION											WELL TYPE
						LOT	UNIT	SEC	TWNSHP	RANGE	Feet	N or S	Feet	E or W	CO	STATE	
BERRY A	6	F	NM 025527-A	3001500512	22230 - EMPIRE; Yates-Seven Rivers		G	24	17.0S	27E	1534	N	1550	E	Eddy	NM	Oil
BERRY A	11	F	NM 025527-A	3001500498	51300 - RED LAKE; Queen-Grayburg-SA		K	24	17.0S	27E	1650	S	2310	W	Eddy	NM	Gas
BERRY A	22	F	NM 025527-A	3001500497	51300 - RED LAKE; Queen-Grayburg-SA		K	24	17.0S	27E	2310	S	1650	W	Eddy	NM	Gas
BERRY A	26	F	NM 025527-A	3001500501	51300 - RED LAKE; Queen-Grayburg-SA		O	24	17.0S	27E	330	S	2310	E	Eddy	NM	Gas
BERRY A	27	F	NM 025527-A	3001500483	51300 - RED LAKE; Queen-Grayburg-SA		E	24	17.0S	27E	1650	N	990	W	Eddy	NM	Gas
BERRY A	29	F	NM 025527-A	3001500472	51300 - RED LAKE; Queen-Grayburg-SA		F	23	17.0S	27E	1980	N	1980	W	Eddy	NM	Gas
BERRY A	32Y	F	NM 025527-A	3001524614	51300 - RED LAKE; Queen-Grayburg-SA		A	24	17.0S	27E	990	N	980	E	Eddy	NM	Oil
BERRY A	33	F	NM 025527-A	3001525154	22230 - EMPIRE; Yates-Seven Rivers		K	24	17.0S	27E	1650	S	2040	W	Eddy	NM	Inj

BUREAU OF LAND MANAGEMENT
Carlsbad Field Office
620 East Greene Street
Carlsbad, New Mexico 88220
575-234-5972

Conditions of Approval Change of Operator 1/25/2011

Alamo Permian Resources, LLC

1. Tank battery must be bermed/diked (must be able to contain 1 1/2 times the volume of the largest tank).
2. All above ground structures and equipment on the lease shall be painted Shale Green (5Y 4/2). This is to be done within 90 days, if you have not already done so.
3. Submit for approval of water disposal method.
4. Submit updated facility diagrams as per Onshore Order #3
5. This agency shall be notified of any spill or discharge as required by NTL-3A.
6. All outstanding environmental issue must be addressed within 90 days. Contact Jim Amos for inspection and to resolve environmental issues. 575-234-5909

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OCD-Artesia
RECEIVED
JAN 23 2013
NMOCD ARTESIA

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMNM025527A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
BERRY A 029 Jed

2. Name of Operator
ALAMO PERMIAN RESOURCES
Contact: CARIE STOKER
E-Mail: cstoker@alamoresources.com

9. API Well No.
30-015-00472

3a. Address
415 WEST WALL STREET SUITE 500
MIDLAND, TX 79701

3b. Phone No. (include area code)
Ph: 432-897-0673

10. Field and Pool, or Exploratory
RED LAKE; QN-G-SA

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 23 T17S R27E SENW 1980FNL 1980FWL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☒ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.).

Proposed P&A Plan

RECLAMATION PROCEDURE ATTACHED

-Notify BLM 24 hrs prior to PU RU.
-Have open top frac tank on location & a 20 lb. bag of sugar in case of circuation.
-RU PU; Install a 2M BOP & TIH w/ tubing to 1500' (TD). SPOT Plug from 1500-1400, WOC Tag
-Circulate hole w/ clean FW.
-Spot a neat Class C cement plug in open hole (1148' to 1163') up to 1000'.
-PUH & WOC for 4 hrs.
-Tag cement plug at 1000' or shallower.
-POOH filling 9 5/8" casing w/ neat Class C cement to 500'.
-MIRU Wireline & shoot 4 perforations at 400'.
-Open all annuli valves; RIH w/ packer and set at 350'; try to establish a rate of cement

SEE ATTACHED FOR CONDITIONS OF APPROVAL

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #183331 verified by the BLM Well Information System
For ALAMO PERMIAN RESOURCES, sent to the Carlsbad
Committed to AFMSS for processing by KURT SIMMONS on 01/16/2013 ()

Name *(Printed/Typed)* CARIE STOKER — Title REGULATORY AFFAIRS COORDINATOR

Signature (Electronic Submission) — Date 01/15/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By James A. Amos — Title SEPS — Date 1-20-13

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office CFO

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ** OPERATOR-SUBMITTED ****

Additional data for EC transaction #183331 that would not fit on the form

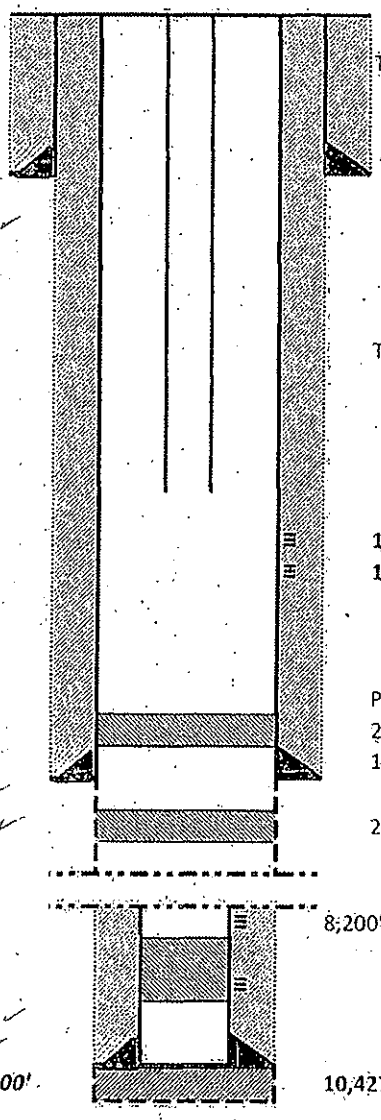
32. Additional remarks, continued

circulaiton; If circulation is established then pump cement until it comes out each annulus valve.
-POOH filling casing w/ cement to surface.
-Removed BOP.
-Get approval from BLM before RD PU.
-Notify BLM 4 hrs prior to WH cut off.
-Cut off welhead; fill any voids w/ cement; Install P&A marker.
-Reclaim location.

ALAMO PERMIAN RESOURCES, LLC
WELLBORE DIAGRAM

Lease/Well No.:	BERRY FEDERAL No. 29	ELEVATION, GL:	3,535 ft
Location:	1,980' FNL & 1,980' FWL		
	UL: F, SEC: 23, T: 17-S, R: 27-E	FIELD:	RED LAKE; QN-GB-SA
	EDDY County, NM	Original Hole	Re-Entry
LEASE No.:	NM - 02557-A	Spudded:	6/22/1962 1/28/1965
API No.:	30-015-00472	Drlg Stopped:	4/18/1962 4/9/1965
		Completed:	4/9/1965
		LAT:	
		LONG:	

ROTARY TOOLS



17-1/2" HOLE

Surface Csg:
13-3/8" 48# ✓
Csg Set @ 400' ✓
Cmt'd w/ 400 sx ✓

12-1/4" HOLE

Intermediate Csg:
9-5/8" 36# J-55 ✓
Csg Set @ 1,690' ✓
Cmt'd w/ 950 sx ✓

7-7/8" HOLE
Production Csg:
5-1/2" 17# J-55
Csg Set @ 10,278' ✓
Cmt'd w/ 525 sx ✓
Cut & Pulled @ 8,200'

TOC Est'd @ Surface
Calculated 75% SF
400'

TOC - 9-5/8" csg = Surface
Calculated 75% SF

8,200'

10,427' TD

TOPS	DEPTH, ft
SALT	
YATES	156
SEVEN RIVERS	396
BOWERS	
QUEEN	880
GRAYBURG	1,313
SAN ANDRES	1,667

1,148' - 1,149' ✓	**QUEEN**	**1 spf - 2 perfs**
1,162' - 1,163' ✓	**QUEEN**	**1 spf - 2 perfs**

PBTD = 1500'
20 sx Cmt Plug: 1500'-1550' 50' plug
1,690' Csg Set

20 sx Cmt Plug: 1750'-1800' 50' plug

35 sx Cmt Plug: 3000'-3280' ✓ GL
35 sx Cmt Plug: 4920'-5200' ✓ SA
35 sx Cmt Plug: 6090'-6370' ✓ QN
40 sx Cmt Plug: 7384'-7664' ✓ Perfs
35 sx Cmt Plug: 8920'-9200' ✓ Perfs 9292 9453 (WT)

TOC 8409' (TS)

Well was originally drilled as Berry Fed #1 to 10,427' in 1962 by Ralph Lowe - Dry Hole.
Well was P&A'd as Dry Hole in October 1963 - 5-1/2" csg cut & pulled @ 8200'.
Well was acquired by Leonard Latch in January 1965 & Re-Entered 01/28/1965 & Completed as a Queen Gas Well. Re-Named Berry Fed #29 - 01/25/65.
Initial Gas Sales to Southern Union Gas Co. 04/24/1973.

Cumulative Prod. (12/31/11):	
OIL	0.000 MBO
GAS	65.578 MMCF
WATER	0.000 MBW
INJECT.	---- MBW

HPS: 11/15/2012

DV 10289 9395 Miss 9353 Penn 7590 WC 6320 Bo 5114 GL 3050 SA 1667 GL 1314 Dra 880 TR 395 YT 155

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

RECEIVED
OCD Artesia
FEB 20 2013
NMOCD ARTESIA

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMNM025527A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
BERRY A 29

2. Name of Operator
ALAMO PERMIAN RESOURCES LLC
Contact: CARIE STOKER
E-Mail: cstoker@helmsoil.com

9. API Well No.
30-015-00472-00-S1

3a. Address
415 WEST WALL STREET SUITE 500
MIDLAND, TX 79701

3b. Phone No. (include area code)
Ph: 432-664-7659

10. Field and Pool, or Exploratory
RED LAKE

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 23 T17S R27E SENW 1980FNL 1980FWL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☒ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☒ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

1/25/2013
Laid down polish rod, POOH w/ 4' 8' 2' sub(5/8), (50) 5/8 rods, (1) 12' X 1.5 pump. ND well head. NU BOP. RIH picking up 5 joints of 2 3/8 tbg and tagged bottom. PUH laying down 5 joints tbg. POOH w/ (1) 4 ft 2 3/8 sub, then POOH into derrick w/ 41 joints of 2 3/8 tbg. Closed BOP. Strapped pipe @1492'.

RECLAMATION
DUE 8-4-13
RDade 2/21/13
Accepted for record
NMOCD

1/29/2013
Open BOP, well had 0 psi. RIH w/ 44 joints @1461'. Pumped 85 bbl FW and broke circulation. Switched to cement. Pumped 11 1/2 bbl =48 sx w/ 2% calcium. Switched to FW water, pumped 38 bbl. PUH with 3 stands. Reversed out with fresh water. POOH out of hole with tubing into derrick. Rigged up wireline. RIH. Tagged cement plug @1060'. PUH. Shot perf @400'. POOH with wireline. RIH with 11 joints of tubing and packer, tried to set packer but couldn't. PUH every stand trying to set packer.

Accepted as to plugging of the well bore. Liability under bond is retained until surface restoration is completed.

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #197402 verified by the BLM Well Information System
For ALAMO PERMIAN RESOURCES LLC, sent to the Carlsbad
Committed to AFMSS for processing by KURT SIMMONS on 02/12/2013 (13KMS4465SE)

Name *(Printed/Typed)* CARIE STOKER — Title REGULATORY AFFAIRS COORDINATOR

Signature (Electronic Submission) — Date 02/07/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By ACCEPTED — JAMES A AMOS, Title SUPERVISOR EPS — Date 02/17/2013

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office Carlsbad

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****

Additional data for EC transaction #197402 that would not fit on the form

32. Additional remarks, continued

but couldn't. Finaly set packer @ 8' below ground level. POOH with tubing into derrick and laid down packer. Closed BOP. Pumped FW trying to get a rate. Pumped 4 bbl and well pressured up to 200. Bled well down through bleed off lines. Pumped 1/2 bbl, psi went to 400. Bled well down. RIH w/ 15 joints below perfs and pump 5 bbl FW, got circulation. Switched to cement. Pumped 66 bbls = 278sx. Got cement back to surface. Shut pump down. ND BOP. Topped cement to surface with hose.

1/30/2013
Met w/ Joe from BLM. The welder cut off the 9 5/8 casing even with the surface casing. Cement was visable inside the 9 5/8 casing and between surface casing. Welder welded the well marker on.

2/05/2013
Backhoe pulled out all cellar boards and back filled cellar.

OCD Artesia

Form 3160-5
(August 2007)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB NO. 1004-0135
Expires: July 31, 2010

SUNDRY NOTICES AND REPORTS ON WELLS

Do not use this form for proposals to drill or to re-enter an abandoned well. Use form 3160-3 (APD) for such proposals.

SUBMIT IN TRIPLICATE - Other instructions on reverse side.

5. Lease Serial No.
NMNM025527A

6. If Indian, Allottee or Tribe Name

7. If Unit or CA/Agreement, Name and/or No.

1. Type of Well
☐ Oil Well ☒ Gas Well ☐ Other

8. Well Name and No.
BERRY A 29

2. Name of Operator
ALAMO PERMIAN RESOURCES LLC
Contact: CARIE STOKER
E-Mail: cstoker@helmsoil.com

9. API Well No.
30-015-00472-00-S1

3a. Address
415 WEST WALL STREET SUITE 500
MIDLAND, TX 79701

3b. Phone No. (include area code)
Ph: 432-664-7659

10. Field and Pool, or Exploratory
RED LAKE

4. Location of Well *(Footage, Sec., T., R., M., or Survey Description)*
Sec 23 T17S R27E SENW 1980FNL 1980FWL

11. County or Parish, and State
EDDY COUNTY, NM

12. CHECK APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☐ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☒ Subsequent Report	☐ Alter Casing	☐ Fracture Treat	☒ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☐ Other
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation (clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports shall be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 shall be filed once testing has been completed. Final Abandonment Notices shall be filed only after all requirements, including reclamation, have been completed, and the operator has determined that the site is ready for final inspection.)

2/05/2013
Tilled and seeded location with 25 lbs of BLM seed; fenced around location

RECEIVED
APR 11 2013
NMOCD ARTESIA

Accepted for record
NMOCD KDade 4/15/2013

14. I hereby certify that the foregoing is true and correct.

Electronic Submission #197398 verified by the BLM Well Information System
For ALAMO PERMIAN RESOURCES LLC, sent to the Carlsbad
Committed to AFMSS for processing by KURT SIMMONS on 02/12/2013 (13KMS4876SE)

Name *(Printed/Typed)* CARIE STOKER — Title REGULATORY AFFAIRS COORDINATOR

Signature (Electronic Submission) — Date 02/07/2013

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

Approved By ACCEPTED — JAMES A AMOS — Title SUPERVISOR EPS — Date 04/07/2013

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office Carlsbad

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ****