

DATE IN 7/30/2018	SUSPENSE	ENGINEER	LOGGED IN 7/30/2018	TYPE Swd	APP NO. PM Am 182115532-3
----------------------	----------	----------	------------------------	-------------	------------------------------

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 _____
- [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.

J. Daniel Arthur, P.E., SPEC
 Print or Type Name

Signature

Consulting Engineer - ALL Consulting
 Title

07/23/2018
 Date

darthur@all-llc.co,
 e-mail Address

JUL 30 2018 PM02:43



July 24, 2018

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

Subject: Solaris – Shakenbake SWD #1 – Application for Authorization to Inject

To Whom It May Concern,

On behalf of Solaris Water Midstream, LLC (Solaris), ALL Consulting, LLC (ALL) is submitting the enclosed Application for Authorization to Inject for the Shakenbake SWD #1, a proposed salt water disposal well, in Eddy County, NM.

Should you have any questions regarding the enclosed application, please contact Nate Alleman at (918) 382-7581 or nalleman@all-llc.com.

Sincerely,
ALL Consulting

Nate Alleman
Project Manager

APPLICATION FOR AUTHORIZATION TO INJECT

- I. PURPOSE: Secondary Recovery Pressure Maintenance X Disposal Storage
Application qualifies for administrative approval? X Yes No
- II. OPERATOR: Solaris Water Midstream, LLC
ADDRESS: 9811 Katy Freeway, Suite 900, Houston, TX 77024
CONTACT PARTY: Bonnie Atwater PHONE: 432-203-9020
- 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: Bonnie Atwater TITLE: Reg. Tech
SIGNATURE: Bonnie Atwater DATE: 7.23.18
E-MAIL ADDRESS: bonnie.atwater@solarismidstream.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: _____

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.

Application for Authorization to Inject

Well Name: Shakenbake SWD #1

III – Well Data (*The Wellbore Diagram is included as Attachment 1*)

A.

(1) General Well Information:

Operator: Solaris Water Midstream, LLC

Lease Name & Well Number: Shakenbake SWD #1

Well Footage: 235' FSL & 2,145' FEL

Location: S1 T20S R30E

(2) Casing Information:

Type	Hole Size	Casing Size	Casing Weight	Setting Depth	Sacks of Cement	Estimated TOC	Method Determined
Surface	24"	20"	94.0 lb/ft	725'	620	Surface	Circulation
Intermediate 1	17-1/2"	13-3/8"	54.5 lb/ft	4,605'	2,750	Surface	Circulation
Intermediate 2	12-1/4"	9-5/8"	53.5 lb/ft	10,600'	2,900	Surface	Circulation
Liner	8-1/2"	7-5/8"	39 lb/ft	13,610'	250	10,400' (TOL)	CBL

(3) Tubing Information:

5-1/2" (23#) Internal Plastic Coated Tubing swedged down to 5" (18#) with setting depth of 13,590'

(4) Packer Information: Lok-set or equivalent packer set at 13,590'

B.

(1) Injection Formation Name: Devonian and Silurian-Fusselman formations

(2) Injection Interval: Open-hole injection between 13,610' – 14,610'

(3) Drilling Purpose: New Drill for Salt Water Disposal

(4) Other Perforated Intervals: No other perforated intervals exist.

(5) Overlying Oil and Gas Zones:

- Delaware (4,605')
- Bone Springs (6,830')
- Wolfcamp (10,080')
- Atoka (11,530')
- Morrow (11,770')

Underlying Oil and Gas Zones: No underlying oil and gas zones exist.

V – Well and Lease Maps

A well map and lease map are included in **Attachment 2**.

VI – AOR Well List

A list of the wells within the 1-mile AOR is included in **Attachment 2**.

VII – Proposed Operation

- (1) **Proposed Maximum Injection Rate:** 30,000 bpd
Proposed Average Injection Rate: 15,000 bpd
- (2) A closed system will be used.
- (3) **Proposed Maximum Injection Pressure:** 2,722 psi (surface)
Proposed Average Injection Pressure: approximately 1,500 – 2,000 psi (surface)
- (4) **Source Water Analysis:** It is expected that the injectate will consist of produced water from production wells completed in the Wolfcamp and Bone Springs formations. Analysis of water from these formations is included in **Attachment 3**.
- (5) **Injection Formation Water Analysis:** The proposed well will be injecting water into the Devonian and Silurian-Fusselman formations which is known to be compatible with formation water from the Wolfcamp and Bone Springs formations. Water analyses from Silurian-Fusselman could not be located; however, water analyses from the Devonian formation in the area are included in **Attachment 4**.

VIII – Geologic Description

The proposed injection interval includes the Devonian and Silurian-Fusselman formations from 13,610 – 14,610 feet. These formations consist of carbonates including light colored dolomite and chert intervals interspersed with some tight limestone intervals. Several thick sections of porous dolomite capable of taking water are present within the subject formations in the area.

The freshwater formation is the Rustler at a depth of approximately 705 feet. Water well depths in the area range from approximately 100 – 350 feet below ground surface.

IX – Proposed Stimulation Program

A small cleanup acid job may be used to remove mud and drill cuttings from the formation. However, no other formation stimulation is currently planned.

X – Logging and Test Data

Logs will be submitted to the Division upon completion of the well.

XI – Fresh Groundwater Samples

Based on a review of data from the New Mexico Office of the State Engineer, no groundwater wells are located within 1-mile of the proposed SWD location; therefore, no groundwater samples were collected in association with this application. A water well map of the area is included in **Attachment 5**.

XII – No Hydrologic Connection Statement

No faulting is present in the area that would provide a hydrologic connection between the injection interval and overlying USDWs. Additionally, the casing program has been designed to ensure there will be no hydrologic connection between the injection interval and overlying USDWs. A letter from a knowledgeable and qualified expert stating that there is a low risk of seismic activity from the proposed injection activities is included in **Attachment 6**.

XIII – Proof of Notice

A Public Notice was filed with the Carlsbad Current-Argus newspaper and an affidavit is included in **Attachment 7**.

A copy of the application was mailed to the OCD District Office, landowner, and leasehold operators within 1-mile of the proposed SWD location. A list of the recipients, as well as delivery confirmations, are included in **Attachment 7**.

Attachments

Attachment 1: Wellbore Diagram

Attachment 2: Area of Review Well Map, Lease Map, and Well Details

Attachment 3: Source Water Analyses

Attachment 4: Injection Formation Water Analyses

Attachment 5: Water Well Map

Attachment 6: Induced Seismicity Assessment Letter

Attachment 7: Public Notice Affidavit and Notice of Application Confirmations

Attachment 1

Wellbore Diagram

SURFACE ELEVATION 3,331 TOTAL DEPTH 14,710'

MUD LOGGING E LOGGING/ DIRECTIONAL	CASING SIZE (IN.) CEMENT (SACKS)	RKB DRILL DEPTH MD TVD	BOPE	FORMATION	HOLE SIZE (IN.)	MUD WT.	FRAC GRAD	TUBING
GRND LEVEL	RKB	32						
GL ELEV.		3,331						
30"		120 / 120	OPEN		32"	8.8		
GROUT TO SURFACE					SET AND GROUTED			
20"	94# J55 BTC	705 725 / 725		PERMIAN RUSTLER FM (USDW)	24"	8.4		
620 SACKS, CEMENTED TO SURFACE			26-3/4"-3M ANNULAR/DIVERTER		376' to	8.4		
MUD LOGGING TO BEGIN AT 2500'						9.5		
13 3/8"	54.5# J-55	4,605 / 4,605				9.5 to 10.0		(23#) IPC TUBING
2,750 SACKS, CEMENTED TO SURFACE			21-3/4" -5M AN					
DV TOOL AT ±3,300' IN 9 5/8" OPEN HOLE, ECP BELOW		6,830	21-3/4" -5M BO					
		10,080						
TOL		10,400 / 10,400						
9 5/8"	53.5# P110 BTC	10,600 / 10,600						
2,900 SACKS, CEMENTED TO SURFACE IN TWO STAGES		11,130	13-5/8" -10M ANN					
		11,530	13-5/8" -10M BOP					
		11,770		PENNSYLVANIAN MORROW FM.				
7 5/8"	39# P110, ST-L	13,610						
250 SACKS, EST. TOC 10,400' BACK UP INTO THE 9 5/8" CASING (VERIFIED WITH RADIAL CEMENT BOND LOG)		13,610 / 13,610	13-5/8" -10M ANNULAR					
			13-5/8" -10M BOP					
RUN #1								
GR/NEUTRON	14,710 - 0							
USIT/CBL	13,885 - 0	14,610	13-5/8" -10M ANNULAR	Base of FUSSELMAN FM	6 1/2"	9.0		
	DUAL 0"	14,710 / 14,710	13-5/8" -10M BOP					13,590

into Salado
705
725 / 725
26-3/4"-3M ANNULAR/DIVERTER
No protection of
Capitan at ~2100' to 2200'
(Protectable)

Delaware
at 4000'
4,605

30-015-27375
B/12/20S/30E
Rustler
430
Salado T 660'
Salado B 1500'
1588 (Tansill 1498)
Capitan Reef 2174 2293
4050 Lamar / Del 3962 chm
13,102 (Morrow) 3722

SHAKENBAKE SWD #1

SECTION 1 T-20-S, R-30-E
235' FSL & 2,145' FEL
EDDY COUNTY, NEW MEXICO

PN # 1680.NM.00

JULY 2018



ALL CONSULTING
GOVERNMENT RELATIONS - ENERGY - PLANNING - TECHNOLOGY
ENGINEERING - ENVIRONMENTAL

© 2018 ALL Consulting, LLC

SIZE
A

SCALE

NTS

WELL BORE DATA SHEET

A-3 and AL-2 LOK-SET Retrievable Casing Packers

Product Family No. H64630 and H64628

APPLICATION

The A-3™ LOK-SET™ packer combines advantages of a retrievable packer with the features of a permanent packer. An ability to lock down tubing forces makes the A-3 suitable for a broad range of applications, including production, injection, zone isolation, and remedial operations. The AL-2™ LOK-SET packer is similar to the A-3, and has a larger bore.

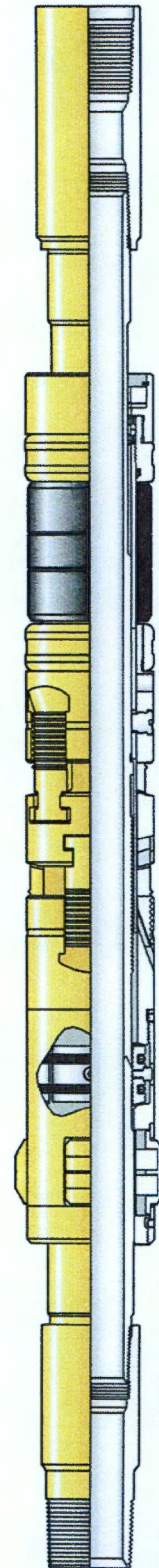
Advantages

- Holds pressure from above and below, without relying on set-down weight, tubing tension, or hydraulic hold down
- Provides tubing anchoring with tension applied, suitable for pumping wells or injection, controlling tubing forces related to change fluid temperatures
- Opposed, non-transferring, dovetail slips prevent packer movement associated with changing differential pressures, while allowing the landing of the tubing in tension, neutral or compression
- Right-hand tubing rotation controls setting and releasing
- Packing element compression locks in by ratcheting action of lock segments, which restricts rotation to one direction

Accessories

To provide a simple and reliable injection system for retrieving an injection string without having to unseat the packer:

L-10 or L-316 on-off sealing connectors, Product Family Nos. H68420 and H68422. Baker Hughes blanking plug can be used in the seating nipple profile of the on-off sealing connector to provide a means of plugging the lower zone while the tubing is being pulled.



A-3 LOK-SET
Retrievable Casing Packer
Product Family No. H64630

SPECIFICATION GUIDES

A-3™ LOK-SET Retrievable Casing Packer, Product Family No. H64630

Casing			Packer				
OD		Weight *	Size	Nom ID		Max Gage Ring OD	
in.	mm	lb/ft		in.	mm	in.	mm
4	101.6	9.5-12.9	41A2	1.500	38.1	3.244	82.4
4-1/2	144.3	21.6-23.6	41A2	1.500	38.1	3.244	82.4
4	101.6	9.5	41A4	1.500	38.1	3.423	112.4
4-1/2	114.3	18.8	41A4	1.500	38.1	3.423	112.4
		13.5-17.7	41B			3.578	90.9
		11.6-13.5	43A2			3.786	96.2
		9.5-10.5	43A4	1.978	50.2	3.786	96.2
5	127.0	15-18	43B	1.978	50.2	4.140	105.2
		11.5-15	43C			4.265	108.3
5-1/2	139.7	26	43C	1.978	50.2	4.265	108.3
		20-23	45A2			4.515	114.7
		15.5-20	45A4			4.656	118.3
		13-15.5	45B			4.796	121.8
6	152.4	26	45B	1.978	50.2	4.796	121.8
		20-23	45C			5.078	129.0
		15-18	45D			5.171	131.3
6-5/8	168.3	34	45E	1.978	50.2	5.421	137.7
		24-32	45F			5.499	139.7
		24	47A2	2.441	62.0	5.671	144.0
		17-24	45G	1.978	50.2	5.796	147.2
7	177.8	17-20	47A4	2.441	62.0	5.827	148.0
		38	47A2	2.441	62.0	5.671	144.0
		32-35	47A4			5.827	148.0
		26-29	47B2			5.983	152.0
7-5/8	193.7	23-26	47B4			6.093	154.8
		17-20	47C2			6.281	159.5
		33.7-39	47C4	2.441	62.0	6.468	164.3
		24-29.7	47D2			6.687	169.9
8-5/8	219.1	20-24	47D4			6.827	173.4
		44-49	49A2	3.500	88.9	7.327	186.1
		32-40	49A4			7.546	191.7
		20-28	49B			7.796	198.0
9-5/8	244.5	47-53.5	51A2	3.500	88.9	8.234	209.1
		40-47	51A4			8.452	214.7
		29.3-36	51B			8.608	218.6

AL-2™ Large Bore LOK-SET Retrievable Casing Packer Product Family No. H64628

Casing			Packer					
OD		Weight *	Size	Nom ID		Max Gage Ring OD		Max Diameter of Compressed Drag Block
in.	mm	lb/ft		in.	mm	in.	mm	in.
5-1/2	139.7	20	45A2 x 2-3/8	2.375	60.3	4.562	115.9	4.592
		15.5-17	45A4 x 2-3/8			4.656	118.3	4.750
		13	45B x 2-3/8			4.796	121.8	4.902
6	152.4	26	45B x 2-3/8	2.375	60.3	4.796	121.8	4.902

* When selecting a packer for a casing weight common to two weight ranges (same OD), choose the packer size shown for the lighter of the two weight ranges. Example: for 7-in. (177.8 mm) OD 26 lb/ft casing use packer size 47B4. Under certain circumstances the other packer size may be run, such as when running in mixed casing strings.

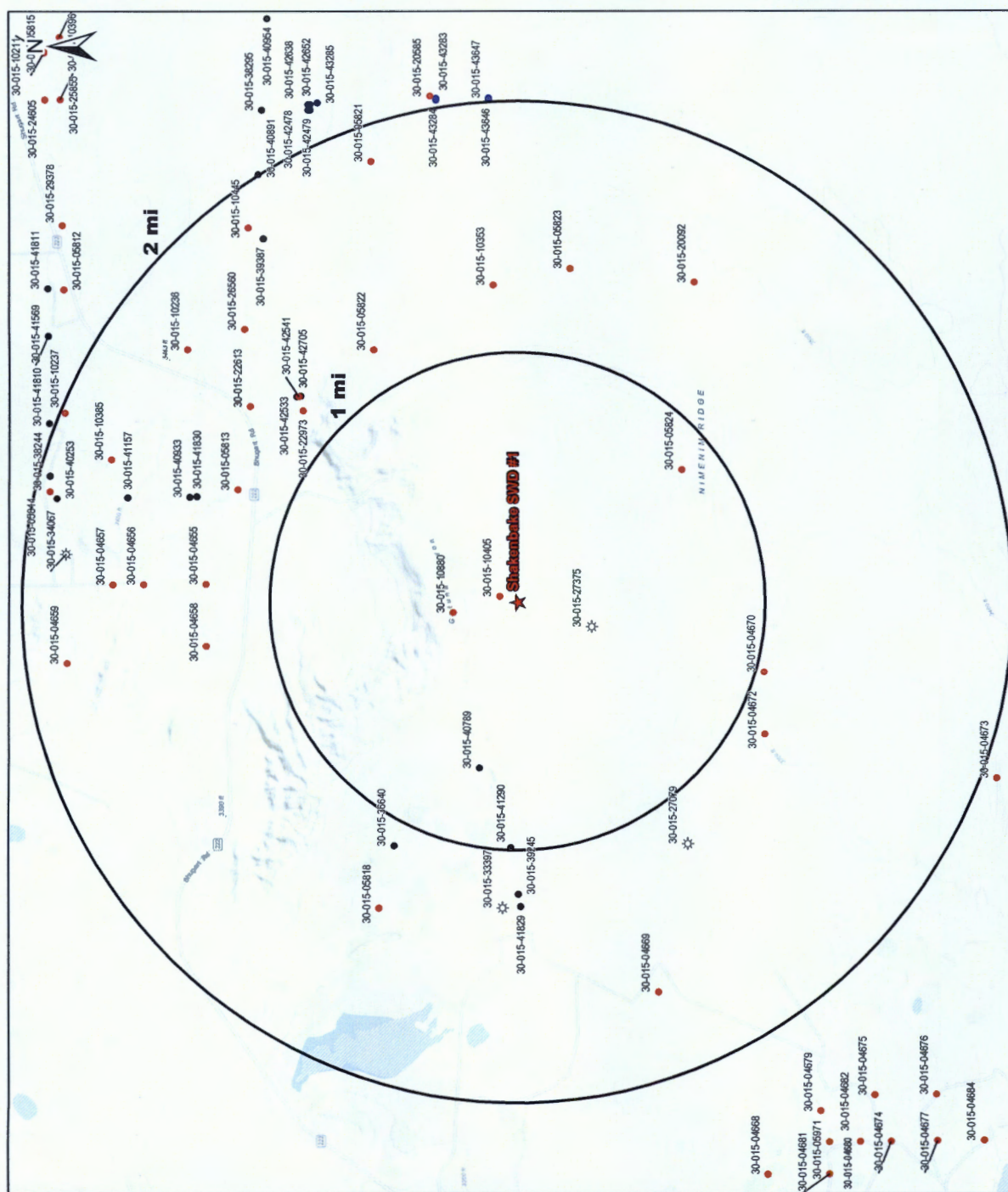
Repair kits, including such items as packing elements, seal rings, etc., are available for redressing Baker Retrievable Packers. Contact your Baker Hughes representative. Use only Baker Hughes repair parts.

Attachment 2

Area of Review Well Map, Lease Map, and Well Details



- ★ Proposed SWD
- ☼ Gas, Active (4)
- Oil, Active (23)
- Oil, New (5)
- Oil, Plugged (48)



Service Layer Credits: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

O&G Wells Area of Review

Shakenbake SWD #1
Eddy, New Mexico

Proj Mgr: Dan Arthur	July 06, 2018	Mapped by: Ben Bockelmann
-------------------------	---------------	------------------------------

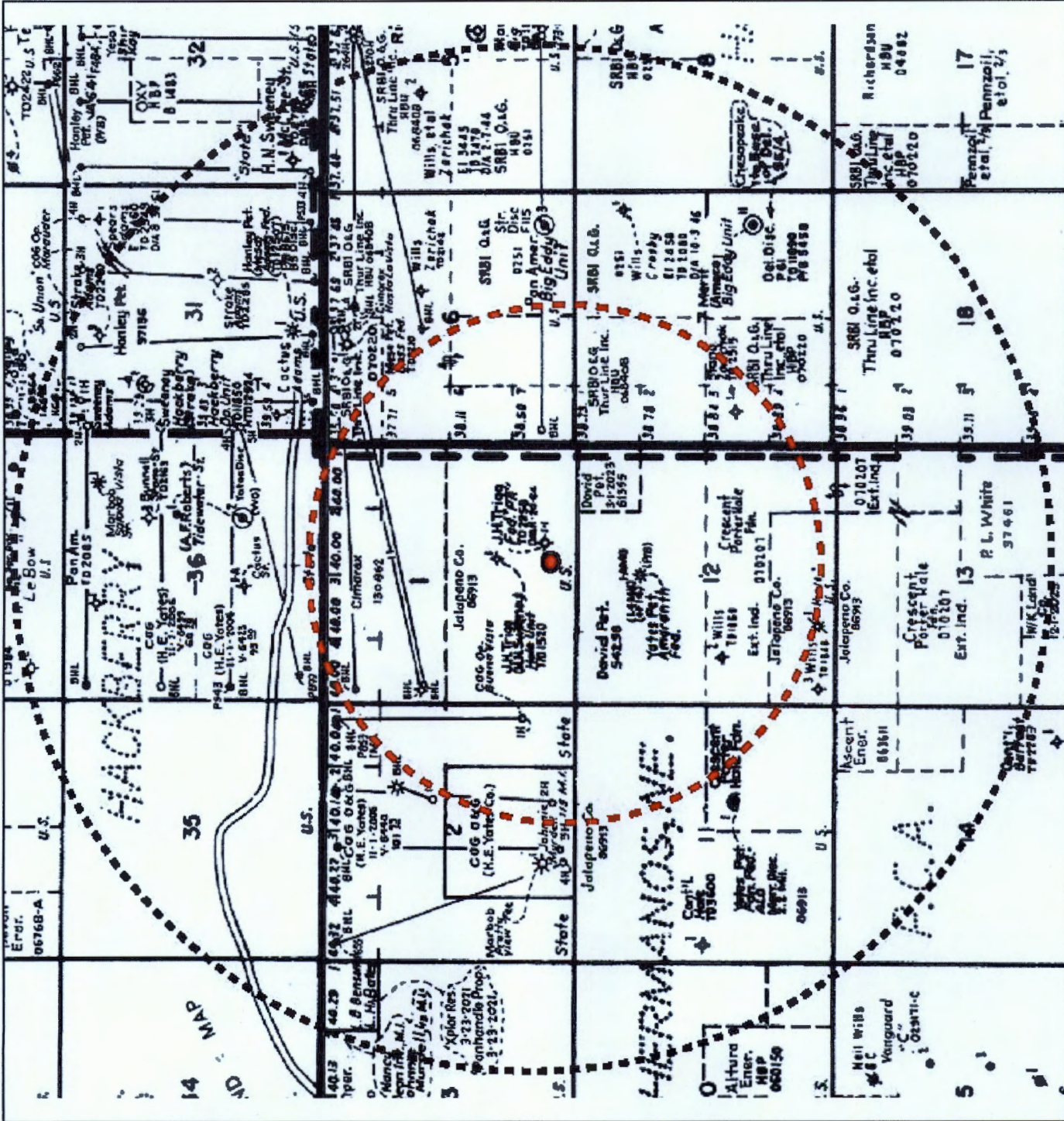
Prepared by:

ALJ CONSULTING



- Legend**
- Proposed SWD
 - 1- mile Radius
 - 2 - mile Radius

Shakenbake SWD #1 Offset Leases Eddy County, NM	
Proj Mgr: JDA	July 10, 2018
Mapped by: BJB	
Prepared by: ALL CONSULTING	



AOR Tabulation for Shakenbake SWD #1 (Top of Injection Interval: 13,610')

Well Name	API#	Well Type	Operator	Spud Date	Location (Sec., Tn., Rng.)	Footage Location	Total Depth	Penetrate inj. zone?
AMARANTH AMG FEDERAL COM #001	30-015-27375	G	EOG Y RESOURCES, INC.	4/7/1993	B-12-20S-30E	1301 FNL 2630 FEL	13,102	No
BUENA VISTA 2 STATE #001H	30-015-40789	O	COG OPERATING LLC	11/30/2012	P-02-20S-30E	1130 FSL 330 FEL	8,572	No
BUENA VISTA 2 STATE COM #002H	30-015-41290	O	COG OPERATING LLC	5/30/2013	O-02-20S-30E	480 FSL 2030 FEL	12,781	No
STANOLIND WELL #001	30-015-05824	P&A	ZORICHAK	1/1/1900	L-07-20S-31E	1980 FSL 660 FWL	-	No
HALE UNIT WELL #001	30-015-10880	P&A	H N SWEENEY/JOHN H TRIGG	10/29/1966	J-01-20S-30E	1650 FSL 2310 FEL	1,518	No
FEDERAL PA WELL #001	30-015-10405	P&A	JOHN H TRIGG	10/30/1964	O-01-20S-30E	660 FSL 1980 FEL	2,258	No

Notes:

- (1) No wells within the 1-mile AOR penetrate the injection interval.
(2) No well details or files were found on OCD's database for API 30-015-05824.

Attachment 3
Source Water Analyses

Wolfcamp



Water Analysis

Date: 23-Aug-11

2708 West County Road, Hobbs NM 88240

Phone (575) 392-5556 Fax (575) 392-7307

Analyzed For

Brushy Draw 1#1

Company	Well Name	County	State
	BD	Lea	New Mexico

Sample Source

Swab Sample

Sample #

Eddy 1-265-298
1

Formation

Depth

Specific Gravity	1.170	SG @ 60 °F	1.172
pH	6.30	Sulfides	Absent
Temperature (°F)	70	Reducing Agents	

Cations

Sodium (Calc)	in Mg/L	77,962	in PPM	66,520
Calcium	in Mg/L	4,000	in PPM	3,413
Magnesium	in Mg/L	1,200	in PPM	1,024
Soluble Iron (FE2)	in Mg/L	10.0	in PPM	9

Anions

Chlorides	in Mg/L	130,000	in PPM	110,922
Sulfates	in Mg/L	250	in PPM	213
Bicarbonates	in Mg/L	127	in PPM	108

Total Hardness (as CaCO3)	in Mg/L	15,000	in PPM	12,799
Total Dissolved Solids (Calc)	in Mg/L	213,549	in PPM	182,209
Equivalent NaCl Concentration	in Mg/L	182,868	in PPM	156,031

Scaling Tendencies

*Calcium Carbonate Index 567,520

Below 500,000 Remote / 500,000 - 1,000,000 Possible / Above 1,000,000 Probable

*Calcium Sulfate (Gyp) Index 1,000,000

Below 500,000 Remote / 500,000 - 10,000,000 Possible / Above 10,000,000 Probable

**This Calculation is only an approximation and is only valid before treatment of a well or several weeks after treatment.

Remarks RW=.048@70F

Report # 3188

Sec 22, T25S, R28E

North Permian Basin Region

P.O. Box 740

Sundown, TX 79372-0740

(806) 228-8121

Lab Team Leader - Sheila Hernandez

(432) 495-7240

Bone Spring

Water Analysis Report by Baker Petrolite

Company:		Sales RDT:	33514.1
Region:	PERMIAN BASIN	Account Manager:	TONY HERNANDEZ (575) 910-7135
Area:	ARTESIA, NM	Sample #:	534665
Lease/Platform:	PINOCHLE 'BPN' STATE COM	Analysis ID #:	106795
Entity (or well #):	2 H	Analysis Cost:	\$90.00
Formation:	UNKNOWN		
Sample Point:	WELLHEAD		

Summary		Analysis of Sample 534665 @ 75 F					
Sampling Date:	03/10/11	Anions	mg/l	meq/l	Cations	mg/l	meq/l
Analysis Date:	03/18/11	Chloride:	109618.0	3091.92	Sodium:	70276.7	3056.82
Analyst:	SANDRA GOMEZ	Bicarbonate:	2135.0	34.99	Magnesium:	195.0	18.04
TDS (mg/l or g/m3):	184911.1	Carbonate:	0.0	0.	Calcium:	844.0	42.12
Density (g/cm3, tonne/m3):	1.113	Sulfate:	747.0	15.55	Strontium:	220.0	5.02
Anion/Cation Ratio:	1	Phosphate:			Barium:	0.8	0.01
		Borate:			Iron:	6.5	0.23
		Silicate:			Potassium:	889.0	22.22
Carbon Dioxide:	0.50 PPM	Hydrogen Sulfide:		0 PPM	Aluminum:		
Oxygen:		pH at time of sampling:		7	Chromium:		
Comments:		pH at time of analysis:			Copper:		
		pH used in Calculation:		7	Lead:		
					Manganese:	0.100	0.
					Nickel:		

Conditions		Values Calculated at the Given Conditions - Amounts of Scale in lb/1000 bbl										
Temp	Gauge Press.	Calcite CaCO ₃		Gypsum CaSO ₄ ·2H ₂ O		Anhydrite CaSO ₄		Celestite SrSO ₄		Barite BaSO ₄		CO ₂ Press
F	psi	Index	Amount	Index	Amount	Index	Amount	Index	Amount	Index	Amount	psi
80	0	1.08	188.52	-1.20	0.00	-1.18	0.00	-0.11	0.00	0.58	0.29	1.72
100	0	1.10	206.05	-1.29	0.00	-1.20	0.00	-0.15	0.00	0.35	0.29	2.36
120	0	1.12	224.17	-1.38	0.00	-1.19	0.00	-0.17	0.00	0.16	0.00	3.17
140	0	1.13	243.17	-1.42	0.00	-1.18	0.00	-0.18	0.00	0.00	0.00	4.21

Note 1: When assessing the severity of the scale problem, both the saturation index (SI) and amount of scale must be considered.

Note 2: Precipitation of each scale is considered separately. Total scale will be less than the sum of the amounts of the five scales.

Note 3: The reported CO₂ pressure is actually the calculated CO₂ fugacity. It is usually nearly the same as the CO₂ partial pressure.

Attachment 4

Injection Formation Water Analyses

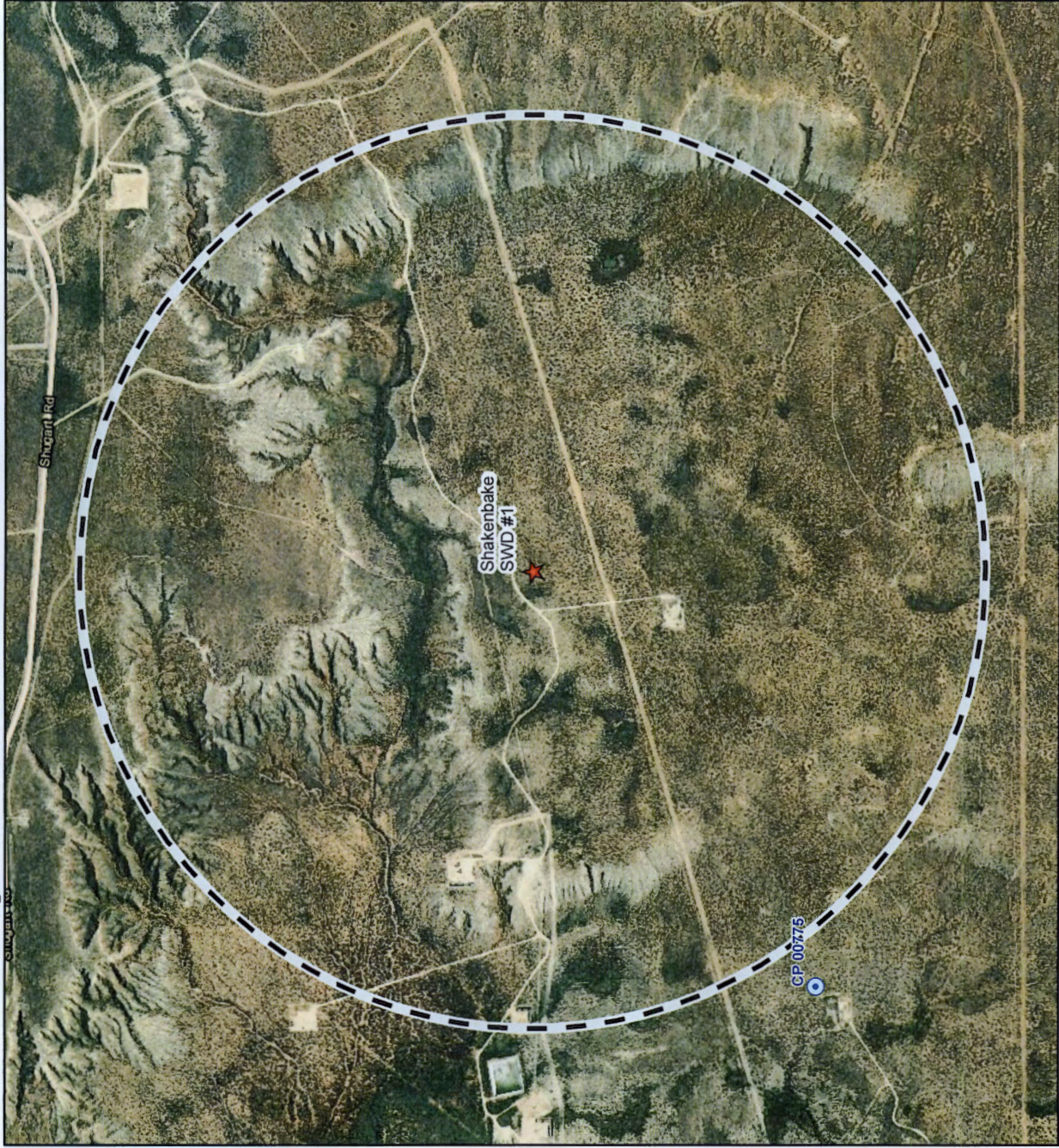
wellname	well	section	township	range	county	state	formation	completion	ph	specificgravity	specificgravity_temp_f	tdr_mgd	resistivity_ohm_cm	resistivity_ohm_cm_temp_f	sodium_mg	calcium_mg	magnesium_mg	chloride_mg	bicarbonate_mg	sulfate_mg		
JURNEGAN POINT #001	3001510280	5	24S	24E	EDDY	NM	DEVONIAN	12/14/1964 0000	7	1.012	60	253100	0.36	75	23396	64	6072	1002	132	121100	175	220
WHITE CITY PENN GAS COM UNIT 1 #001	3001500408	29	24S	26E	EDDY	NM	DEVONIAN	3/1/1960 0000	7	1.012	80	253100	0.36	75	23396	64	6072	1002	132	10120	653	138

Sources: Go-Tech (<http://go-tech.nmt.edu/go-tech/Water/producedwater.aspx>)

Attachment 5

Water Well Map

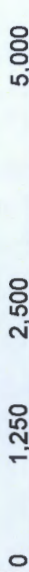
Proposed SWD & Water Wells within 1 mile



Legend

- ★ Proposed SWD
- Water Well (iWATERS)
- Proposed SWD 1-mi Buffer



Shakenbake SWD #1				
County: Eddy, NM	Date: 7/9/2018			
Lat: 32.5958113	PM: J Daniel Arthur		1:22,000	Service Layer Credits: Esri, HERE, Garmin, © OpenStreetMap contributors Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Long: -103.9239689	Map: Ben Bockelmann			

Attachment 6

Induced Seismicity Assessment Letter

July 11, 2018

Mr. Phillip Goetze, P.G.
NM EMNRD – Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Subject: Induced Seismicity Potential Statement for the Shakenbake SWD #1

Dear Mr. Goetze,

This letter provides information regarding the seismic potential associated with injection operations associated with Solaris Water Midstream, LLC's (Solaris), proposed Shakenbake SWD #1, hereinafter referred to as the "Subject Well".

As outlined herein, based on my experience as an expert on the issue of induced seismicity, it is my opinion that the potential for the proposed injection well to cause injection-induced seismicity is expected to be minimal, at best. This conclusion is based on (1) the lack of historic seismic activity and faulting in the area, (2) the low fault slip potential (FSP) of Precambrian faults in the area, (3) the presence of confining layers, and (4) the overall vertical distance between the proposed injection zone and basement rock.

The Subject Well, is located 235' FSL & 2,145' FEL of Section 1, in T20-S and R30-E of Eddy County, New Mexico. Historically, the Eddy County area has experienced very limited recorded seismic activity (per the U.S. Geological Survey [USGS] earthquake catalog database). There have been two known seismic events located within a 25-mile radius of the proposed subject well. The closest recorded seismic event was a M3.1 that occurred on March 18, 2012, and was located approximately 21.77 miles south of the subject well (See Exhibit 1). The second closest recorded seismic event was a M3.9 that occurred on April 11, 1974, and was located approximately 23.42 miles southwest of the Subject Well. The closest Class IID well injecting into the same formations (Devonian-Silurian) of the Subject Well is approximately 4.28 miles to the east (See Exhibit 1).

Solaris does not own either 2D or 3D seismic reflection data in the area of the Subject Well. Fault data from USGS indicates that the closest known fault is approximately 25.44 miles southwest of the Subject Well (See Exhibit 1).

In a recent paper written by Snee and Zoback (2018) entitled "State of Stress in the Permian Basin, Texas and New Mexico: Implications for Induced Seismicity," the authors found that large groups of mostly north-south striking Precambrian basement faults, predominantly located along the Central Basin Platform, the western Delaware Basin, and large parts of the Northwest Shelf (which includes Eddy and Lea counties, New Mexico) have low FSP at the modeled fluid-pressure

perturbation. The map in Exhibit 2 depicts the low probability risk of FSP for the Delaware Basin and Northwest Shelf areas (Snee and Zoback 2018).

Geologic analysis indicates that the proposed Devonian-Silurian injection zone is overlain by approximately 200 to 400 feet of Woodford Shale, which is the upper confining zone and will serve as a barrier for upward injection fluid migration. Additionally, the Simpson Group that lies directly below the Montoya Formation will act as a lower confining zone to prohibit fluids from migrating downward into the underlying Ellenberger Formation and Precambrian basement rock. See the stratigraphic column for the Delaware Basin included in Exhibit 3.

In the Eddy and Lea Counties area of New Mexico, the Simpson Group is comprised of a series of Middle to Upper Ordovician carbonates, several sandstones, and sandy shales that range from approximately 350 to 650 feet thick (Jones 2008). This group of rocks is capped by the limestones of the Bromide Formation, which is approximately 200 feet thick in this area (Jones 2008). The closest deep well drilled into the Precambrian basement was completed by the Skelly Oil Company in 1975. This well is located in Section 17, Range 36E, Township 25S of Lea County (API No.30-025-25046) and encountered 602 feet of Ellenburger Formation before reaching the top of the Precambrian granite at a depth of 18,920 feet. Based on the estimated thickness of the Simpson Group and Ellenburger Formation in this area, the Precambrian basement should be approximately 1,000 to 1,200 feet below the bottom of the proposed injection zones in the Subject Well.

Conclusion

As an expert on the issue of induced seismicity, it is my opinion that the potential for the proposed injection well to cause injection-induced seismicity is expected to be minimal, at best. This conclusion is based on (1) the lack of historic seismic activity and faulting in the area, (2) the low FSP of Precambrian faults in the area, (3) the presence of confining layers, and (4) the overall vertical distance between the proposed injection zone and basement rock.

Sincerely,
ALL Consulting



J. Daniel Arthur, P.E., SPEC
President and Chief Engineer

Enclosures
References
Exhibits

Induced Seismicity Potential Statement for the Shakenbake SWD #1
July 11, 2018

References

Ball, Mahlon M. 1995. "Permian Basin Province (044)." In *National Assessment of United States Oil and Gas Resources—Results, Methodology, and Supporting Data*. U.S. Geological Survey. <https://certmapper.cr.usgs.gov/data/noga95/prov44/text/prov44.pdf> (accessed June 18, 2018).

Green, G.N., and G.E. Jones. 1997. "The Digital Geologic Map of New Mexico in ARC/INFO Format." U.S. Geological Survey Open-File Report 97-0052. <https://mrdata.usgs.gov/geology/state/state.php?state=NM> (accessed June 14, 2018).

Jones, Rebecca H. 2008. "The Middle-Upper Ordovician Simpson Group of the Permian Basin: Deposition, Diagenesis, and Reservoir Development." http://www.beg.utexas.edu/resprog/permianbasin/PBGSP_members/writ_synth/Simpson.pdf (accessed June 19, 2018).

Snee, Jens-Erik Lund, and Mark D. Zoback. 2018. "State of Stress in the Permian Basin, Texas and New Mexico: Implications for Induced Seismicity." *The Leading Edge* 37, no. 2 (February 2018): 127-34.

U.S. Geological Survey (USGS). No date. Earthquakes Hazard Program: Earthquake Catalog. <https://earthquake.usgs.gov/earthquakes/search/> (accessed June 14, 2018).

Induced Seismicity Potential Statement for the Shakenbake SWD #1
July 11, 2018

Exhibits

Induced Seismicity Potential Statement for the Shakenbake SWD #1
July 11, 2018

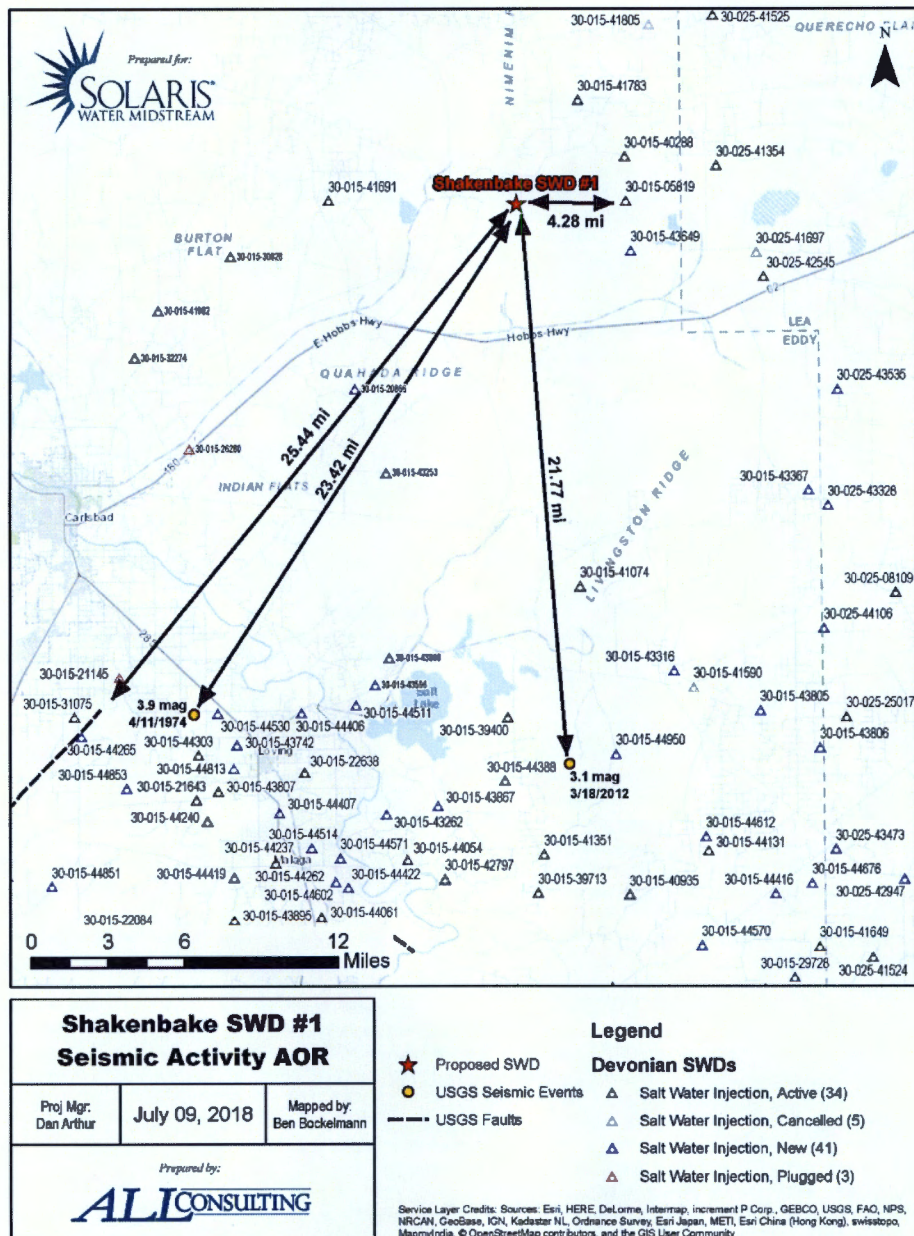


Exhibit 1. Map Showing the Distances from Known and Inferred Faults, Seismic Event, and Closest Deep Injection Well

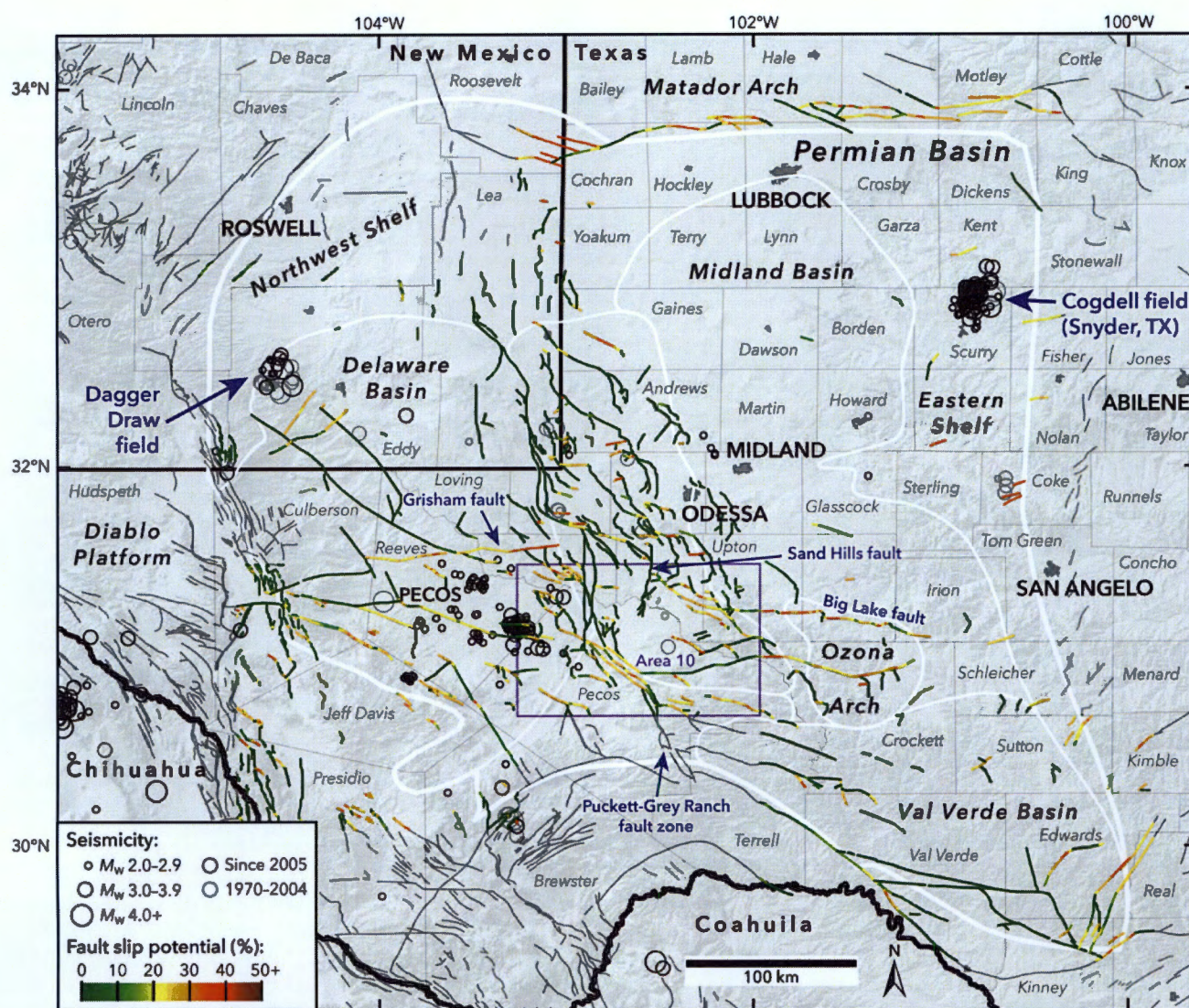


Exhibit 2. Results of the Snee and Zoback (2018) Probabilistic FSP Analysis Across the Permian Basin

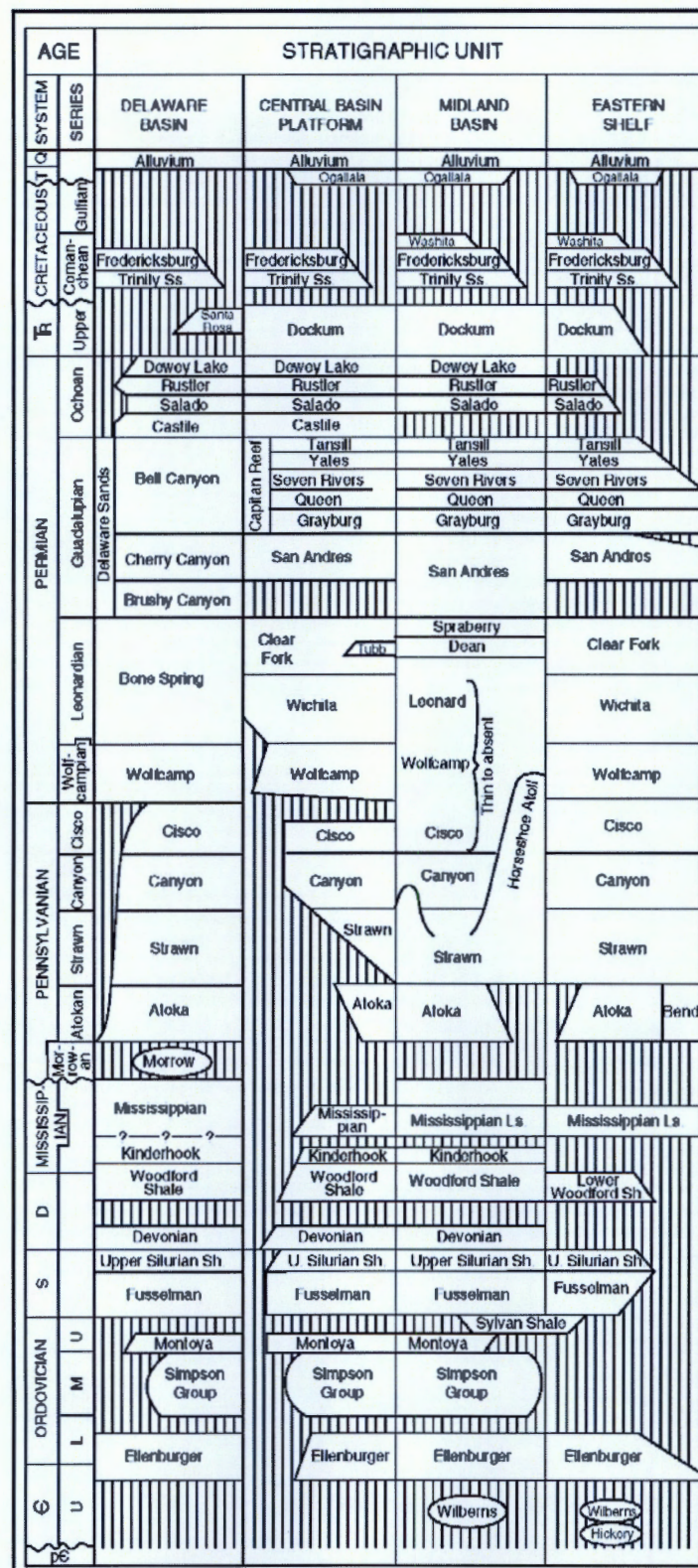


Exhibit 3. Delaware Basin Stratigraphic Chart (Ball 1995)

Attachment 7

Public Notice Affidavit and Notice of Application Confirmations

CARLSBAD
CURRENT-ARGUS

AFFIDAVIT OF PUBLICATION

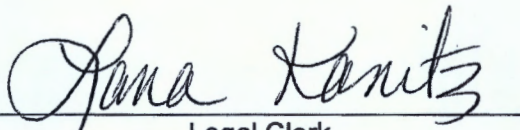
Ad No.
0001254605

ALL CONSULTING- CARLSBAD
1718 SOUTH CHEYENNE AVENUE

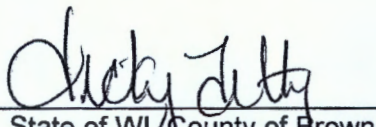
TULSA OK 74119

I, a legal clerk of the **Carlsbad Current-Argus**, a newspaper published daily at the City of Carlsbad, in said county of Eddy, state of New Mexico and of general paid circulation in said county; that the same is a duly qualified newspaper under the laws of the State wherein legal notices and advertisements may be published; that the printed notice attached hereto was published in the regular and entire edition of said newspaper and not in supplement thereof on the date as follows, to wit:

07/14/18


Legal Clerk

Subscribed and sworn before me this
16th of July 2018.


State of WI, County of Brown
NOTARY PUBLIC

9-19-21
My Commission Expires

Ad#:0001254605
P O :
of Affidavits :0.00

**APPLICATION FOR AUTHORIZATION TO
INJECT**

NOTICE IS HEREBY GIVEN: That Solaris Water Midstream, LLC, 9811 Katy Freeway, Suite 900, Houston, TX 77024, is requesting that the New Mexico Oil Conservation Division administratively approve the APPLICATION FOR AUTHORIZATION TO INJECT as follows:

PURPOSE: The intended purpose of the injection well is to dispose of salt water produced from permitted oil and gas wells.

WELL NAME AND LOCATION: Shakenbake SWD #1

SW ¼ SE ¼, Section 1, Township 20S,
Range 30E

235' FSL & 2,145' FEL

Eddy County, NM

NAME AND DEPTH OF DISPOSAL ZONE:

Devonian-Silurian (13,610' - 14,610')

EXPECTED MAXIMUM INJECTION RATE:
30,000 Bbls/day

EXPECTED MAXIMUM INJECTION PRESSURE:
2,722 psi (surface)

Objections or requests for hearing must be filed with the New Mexico Oil Conservation Division within fifteen (15) days. Any objection or request for hearing should be mailed to the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505.

Additional information may be obtained by contacting Bonnie Atwater (Solaris - Regulatory Technician) at 432-203-9020.

Pub: July 14, 2018 #1254605



Shakenbake SWD #1 Notice of Application Recipients				
Entity	Address	City	State	Zip Code
Landowner				
New Mexico BLM	620 E. Greene St.	Carlsbad	NM	88220
OCD District				
OCD District 2	811 S. First St.	Artesia	NM	88210
Leasehold Operators				
Cimarex Energy Company	600 N. Marienfeld Street, Suite 600	Midland	TX	79701
COG Operating, LLC	600 W. Illinois Ave.	Midland	TX	79701
Crescent Porter Hale Foundation	1660 Bush Street, Ste. 300	San Francisco	CA	94109
David Petroleum Corporation	116 West First Street	Roswell	NM	88201
EOG Resources	P.O. Box 4362	Houston	TX	77210
Jalapeno Corporation	P.O. Box 1668	Albuquerque	NM	87103-1668
John H. Trigg	P.O. Box 520	Roswell	NM	88201
Marbob Energy Corporation	P.O. Box 227	Artesia	NM	88211-0227
Mesa Petroleum Corporation	P.O. Box 2009	Amarillo	TX	79189
SRBI Oil & Gas New Mexico, LLC.	201 Main Street	Fort Worth	TX	76102
Yates Petroleum	105 S. Fourth Street	Artesia	NM	88210

Certified Mail™ Labels⬆ **Top of the page**

Print postage using Stamps.com Template SDC-3610

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1772 72

Cimarex Energy Company
600 N. Marienfeld Street Suite 600
Midland TX 79701-4405

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1778 07

Crescent Porter Hale Foundation
1660 Bush Street Suite 300
San Francisco CA 94109-5308

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1778 38

EOG Resources
P.O. Box 4362
Houston TX 77210-4362

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1777 60

Mr. John H. Trigg
P.O. Box 520
Roswell NM 88202-0520

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991



Place label at top of the center of the envelope and fold at dotted line.



9414 8118 9956 0126 1777 77

Mesa Petroleum Corporation
P.O. Box 2009
Amarillo TX 79105-2009

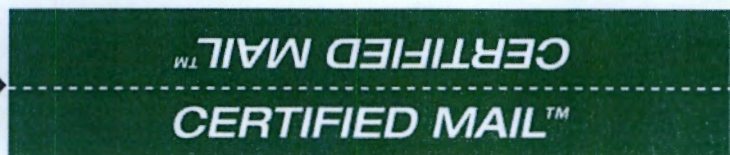
ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991



Place label at top of the center of the envelope and fold at dotted line.



9414 8118 9956 0126 1779 20

Yates Petroleum
105 S. Fourth Street
Artesia NM 88210-2177

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991



Place label at top of the center of the envelope and fold at dotted line.



9414 8118 9956 0126 1779 82

SRBI Oil & Gas New Mexico, LLC
201 Main Street
Fort Worth TX 76102-3105

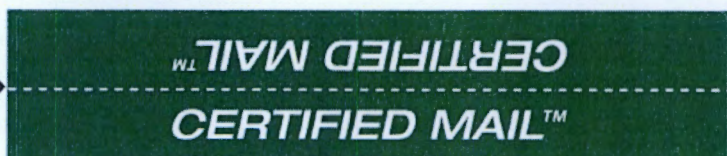
ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S000863991



Place label at top of the center of the envelope and fold at dotted line.



9414 8118 9956 0126 1776 47

Marbob Energy Corporation
P.O. Box 227
Artesia NM 88211-0227

Certified Mail™ Labels⬆ **Top of the page**

Print postage using Stamps.com Template SDC-3610

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S0008663991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1776 78

Jalapeno Corporation
P.O. Box 1668
Albuquerque NM 87103-1668

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S0008663991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1771 28

David Petroleum Corporation
116 West First Street
Roswell NM 88203-4702

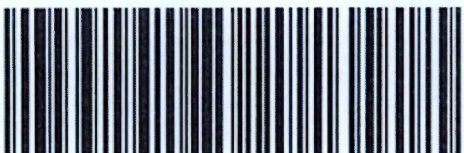
ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S0008663991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1773 57

COG Operating, LLC
600 W. Illinois Ave.
Midland TX 79701-4882

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

062S0008663991

Place label at top of the center of the
envelope and fold at dotted line.

CERTIFIED MAIL™



9414 8118 9956 0126 1773 95

OCD District 2
811 S. First St.
Artesia NM 88210-2834

Certified Mail™ Labels

Top of the page

Print postage using Stamps.com Template SDC-3610

ALL Consulting
1718 S. Cheyenne Ave.
Tulsa, OK 74119

\$5.420
US POSTAGE
FIRST-CLASS
FROM 74119
JUL 23 2018
stamps.com

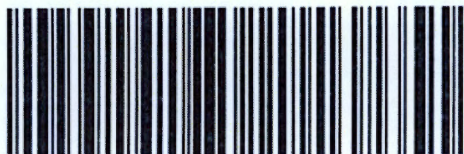
062S000863991

Place label at top of the center of the envelope and fold at dotted line.

Place label at top of the center of the envelope and fold at dotted line.

CERTIFIED MAIL™
CERTIFIED MAIL™

CERTIFIED MAIL™
CERTIFIED MAIL™



9414 8118 9956 0126 1773 71

New Mexico BLM
620 E. Greene St.
Carlsbad NM 88220-6292

Place label at top of the center of the envelope and fold at dotted line.

Place label at top of the center of the envelope and fold at dotted line.

CERTIFIED MAIL™
CERTIFIED MAIL™

CERTIFIED MAIL™
CERTIFIED MAIL™

