



NEW MEXICO ENERGY, MINERALS
& NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION
2040 South Pacheco Street
Santa Fe, New Mexico 87505
(505) 827-7131

June 23, 1997

Sonat Exploration Company
110 W. Louisiana
Suite 500
Midland, Texas 79701

Attention: Ms. Laura Clepper

Re: Littlefield SWD Well No.1
Unit B, Section 11, T-24S, R-31E,
Eddy County, New Mexico

Dear Ms. Clepper:

In an effort to update our records concerning the Littlefield SWD Well No. 1, the Division is requesting that you supply the following described information:

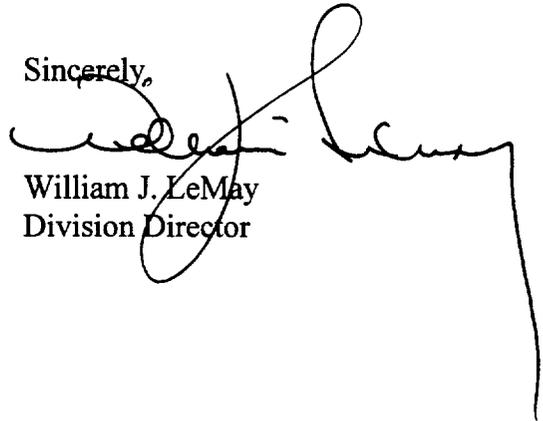
A description and analysis of the fluid being injected into the commercially operated Littlefield SWD Well No. 1. This includes an analysis of each and every water source and a description of its point of origin (i.e. San Andres produced water from the Grayburg-Jackson Pool). In addition, this includes water delivered to the well by pipeline and truck.

Division and Federal UIC Rules and Regulations require that all operators of disposal wells provide source water analysis at reasonable frequency. Our information indicates that the Littlefield SWD Well No. 1 was permitted by Bettis, Boyle and Stovall in July, 1992, and that our files have not been updated since that time.

Please provide the information requested within 60-days from the date of this letter. If you need additional time, or you wish to discuss the matter further, please contact Mr. David Catanach at (505) 827-8184.

Failure to comply may result in the imposition of fines and/or the termination of injection authority.

Sincerely,

A handwritten signature in black ink, appearing to read "William J. LeMay". The signature is written in a cursive style with a large loop at the end.

William J. LeMay
Division Director

xc: File-SWD-485 /
OCD-Artesia
UIC Enforcement File

APPLICATION FOR AUTHORIZATION TO INJECT

- I. Purpose: Secondary Recovery Pressure Maintenance Disposal Storage
Application qualifies for administrative approval? yes no
- II. Operator: SONAT Exploration Company CALL 1
Address: 110 W. Louisiana Suite 500 Midland, TX 79701 684-0433
Contact party: Todd Moehlenbrock Phone: (915) 684-0415
- 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 no
If yes, give the Division order number authorizing the project SWD 485.
- 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 geological data on the injection zone including appropriate lithologic detail, geological 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 source 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 source 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: Todd Moehlenbrock Title: Senior Petroleum Engineer
Signature: Todd W. Moehlenbrock Date: 7/8/97
- If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be duplicated and resubmitted. Please show the date and circumstance 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.

D. 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 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, P. O. Box 2000, Santa Fe, New Mexico 87501 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.

III. Well Data

A.

1. Littlefield Federal No. 1
Section 11, T-24 South, R- 31 East
660' FNL, 1980' FEL
2. Surface casing - 8-5/8" 24# set at 365'. Cement with 150 sxs, circulated 20 sxs to surface.

Production casing - 4-1/2" 10.5# set @ 4656'. Cement with 750 sxs, top of cement at 2294' by temperature survey. Perforated 4 squeeze holes from 2200'-2204', cement through squeeze holes with 650 sxs cement, top of cement at 1080' by temperature survey. Perforated four squeeze holes from 1000'-1004', cement through squeeze holes with 500 sxs cement, circulated 89 sxs to surface.

3. Injection tubing to be used will be 2-3/8" 4.7# Salta-lined tbg. Setting depth will be above all injection interval at approximately 4500'.
4. Injection packer to be used is Baker A3 Lok-set packer to be set at approximately 4500'.

B.

1. The injection formation is the Bell and Cherry Canyon sand members of the Delaware Mountain Group.
2. The injection interval will be into existing perforations 4580'-4654' (gross), existing openhole 4656'-4900', and into proposed additional openhole section from 4900'-6500'.
3. This well was initially drilled in 1964 to a TD of 4656' to test the Bell Canyon formation. It was dry and was plugged and abandoned. In July, 1992, Bettis, Boyle & Stovall received a permit to inject for SWD and re-entered the well. 4-1/2" casing was run and set at 4656' and cemented in place. The well was perforated from 4580'-4620', and 4634'-4654' and was put on injection. In January 1993, Bettis, Boyle & Stovall re-entered the well, fracture treated the perforations and deepened the well to 4900' to increase injectivity.
4. N/A
5. There are no known oil or gas zones above the injected interval within the area of review.

The nearest deeper producing zone within the area of review is in the Sonat operated Lotos 11F Federal No. 2. Its top perforation is at 6886'.

The Merit operated SDS 11 Federal #1 (Unit letter F) is a SWD well injecting into perforations 4962'- 5212'.

Littlefield Federal No. 1 SWD

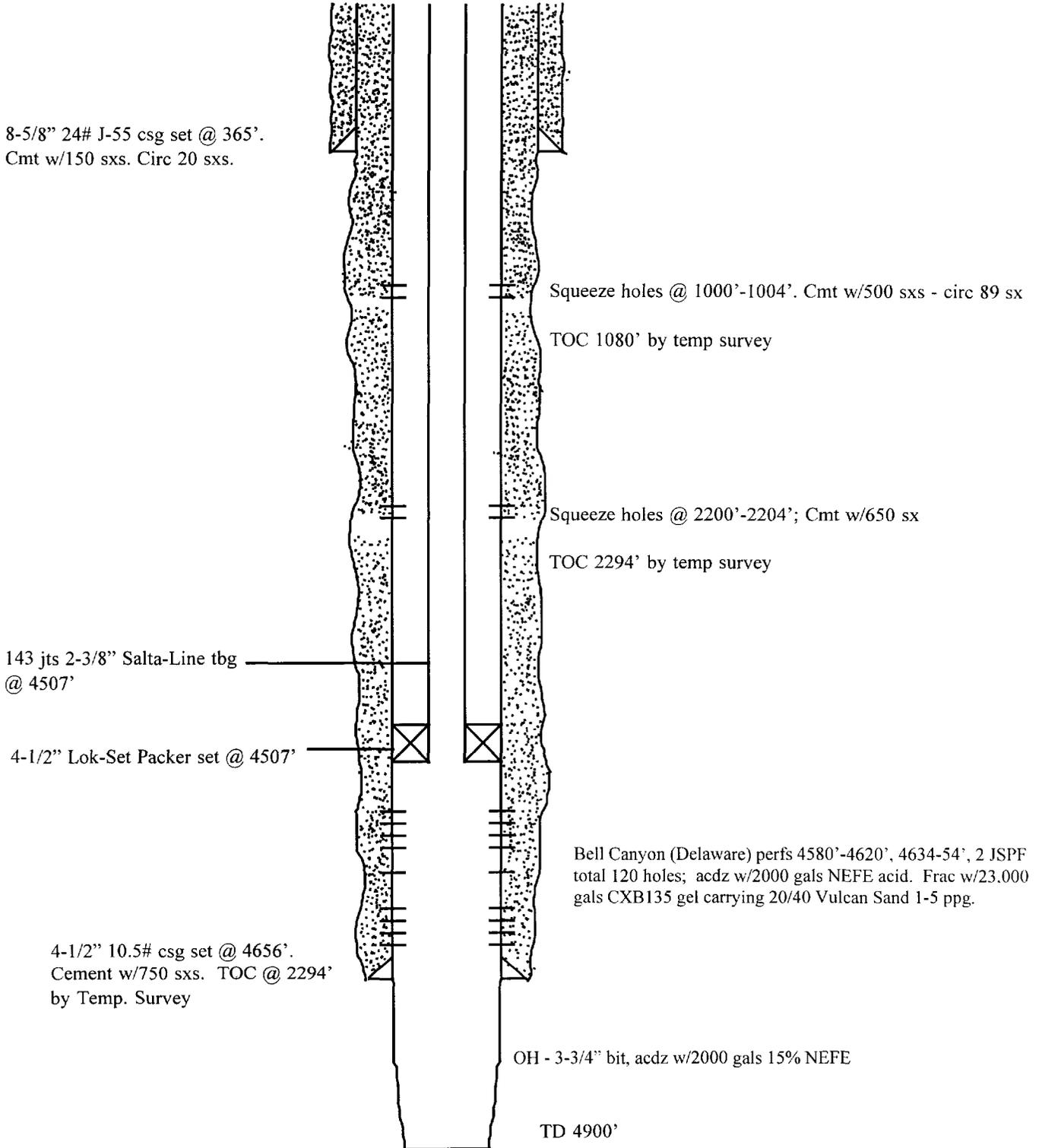
660' FNL, 1980' FEL
Section 11, Unit Letter B, T24S, R31E,
Eddy County, New Mexico

Current

Spud 2/26/64

Completion, request permit to abandon 3/4/64

Reentry, injection permit approved 7/14/92



Littlefield Federal No. 1 SWD

660' FNL, 1980' FEL
Section 11, Unit Letter B, T24S, R31E,
Eddy County, New Mexico

Proposed

Spud 2/26/64
Completion, request permit to abandon 3/4/64
Reentry, injection permit approved 7/14/92

8-5/8" 24# J-55 csg set @ 365'.
Cmt w/150 sxs. Circ 20 sxs.

Squeeze holes @ 1000'-1004'. Cmt w/500 sxs - circ 89 sx

TOC 1080' by temp survey

Squeeze holes @ 2200'-2204'; Cmt w/650 sx

TOC 2294' by temp survey

143 jts 2-3/8" Salta-Line tbg
@ 4507'

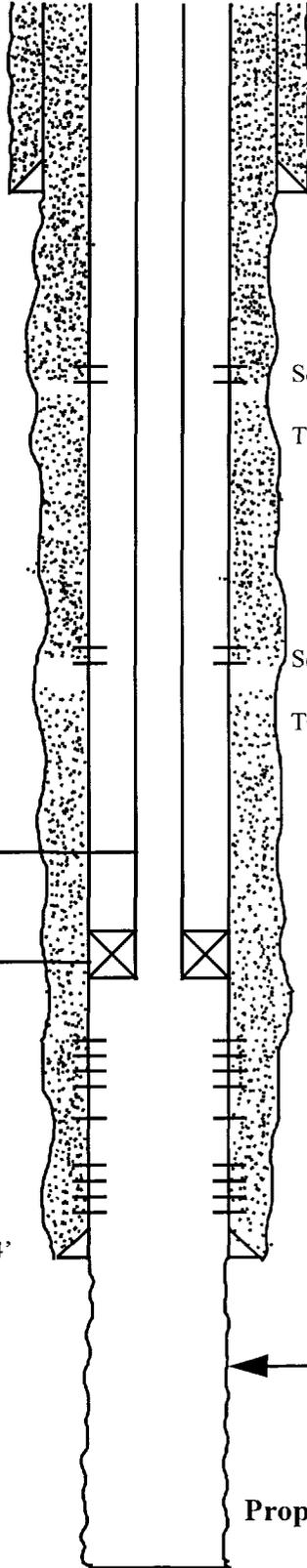
4-1/2" Lok-Set Packer set @ 4507'

Bell Canyon (Delaware) perms 4580'-4620', 4634-54', 2 JSPF
total 120 holes; acdz w/2000 gals NEFE acid. Frac w/23,000
gals CXB135 gel carrying 20/40 Vulcan Sand 1-5 ppg.

4-1/2" 10.5# csg set @ 4656'.
Cement w/750 sxs. TOC @ 2294'
by Temp. Survey

Deepen well from 4900' to 6500'
with 3-3/4" bit. Complete as openhole.

Proposed TD = 6500'



VI. Tabulation Of Data On All Wells Within Area Of Review

1. Todd 2 State No. 3

Sonat Exploration Company
Section 2, T-24 South, R - 31 East, 660' FSL & 660 FEL

Date Drilled - May, 1996

Casing Record:

Surface - 11-3/4" @ 440'. Cement with 400 sxs. Circulated 153 sxs.
Intermediate - 8-5/8" @ 4350'. Cement with 2386 sxs, circulated 90 sxs.
Production casing - 5-1/2" @ 8511'. Cement w/1460 sxs in 2 stages. TOC @ 3850' calculated.

Completion Record:

Perforations 8112' - 8136' were acidized and sand fraced
Perforations 7346' - 7360' were acidized.

Well is currently on rod pump.

2. SDS "11" Federal #1

Merit Energy Corporation
Section 11, T-24 South, R-31 East, 2090' FSL & 1980' FWL

Date Drilled - August, 1993

Casing Record:

Surface - 11-3/4" @ 418'. Cement with 685 sxs. Circulated 99 sxs.
Intermediate - 8-5/8" @ 4450'. Cement with 1753 sxs. Circulated 296 sxs.
Production - 5-1/2" @ 8440'. Cement with 974 sxs. TOC @ 3400' calculated.

Completion Record:

Perforations 8218' - 8254' were acidized and fraced. Abandoned by setting CIBP above at 8200'.
Perforations 4962' - 5212' were acidized and fraced. Current SWD injection zone.

Well is currently injecting down 2-7/8" poly-lined tubing with packer set at 4857'.

3. Lotos "11-F" Federal No. 2

Sonat Exploration Company
Section 11, T-24 South, R-31 East, 1780' FNL & 660' FEL

Date Drilled - April, 1996

Casing Record:

Surface - 11-3/4" set @ 412'. Cement with 400 sxs. Circulated 184 sxs to pit.
Intermediate - 8-5/8" @ 4430'. Cemented with 1400 sxs. Circulated 80 sxs to pit.
Production - 5-1/2" @ 8621'. Cemented with 840 sxs. TOC at 5520' by cement bond log.

Completion record:

Perforations 8026' - 8298' were acidized and fraced
Perforations 6886' - 7099' were acidized

Well is currently being rod pumped. Prior to deepening the Littlefield Federal #1, Sonat will perform remedial cement work on the Lotos Federal "11F" No. 2. Squeeze holes will be shot @ +/- 5420' and cement tied back into intermediate casing by at least 500'.

Todd "2" State No. 3

660' FSL & 660' FEL,
Section 2, Unit Letter P, T24S, R31E,
Eddy County, New Mexico
Elevation 3520' KB
KB 19' AGL

Spud 4/25/96
Rig Released 5/26/96

**11-3/4" 42# WC40 STC
Surface Casing set at 440'**
in 14-3/4" hole with:
Lead - 200 sx Class C w/ 4% gel,
2% CaCl₂, 1/4# FC
(13.5 ppg, 1.74 ft³/sx)
Tail - 200 sx Class C w/ 2% CaCl₂
and 1/4# FC (14.8 ppg, 1.32 ft³/sx).
Circ 153 sx cmt to pit.

**8-5/8" 24# J55 STC intermediate
casing set at 4350'** in 11" hole with:
Lead - 2186 sx 35/65 Poz "C" with
6% gel, 5# salt, 1/4# FC (12.4, 2.14)
Tail - 200 sx Class H w/ 2% CaCl₂
(15.6 ppg, 1.19 ft³/sx)
Circ 90 sx cement to pit.

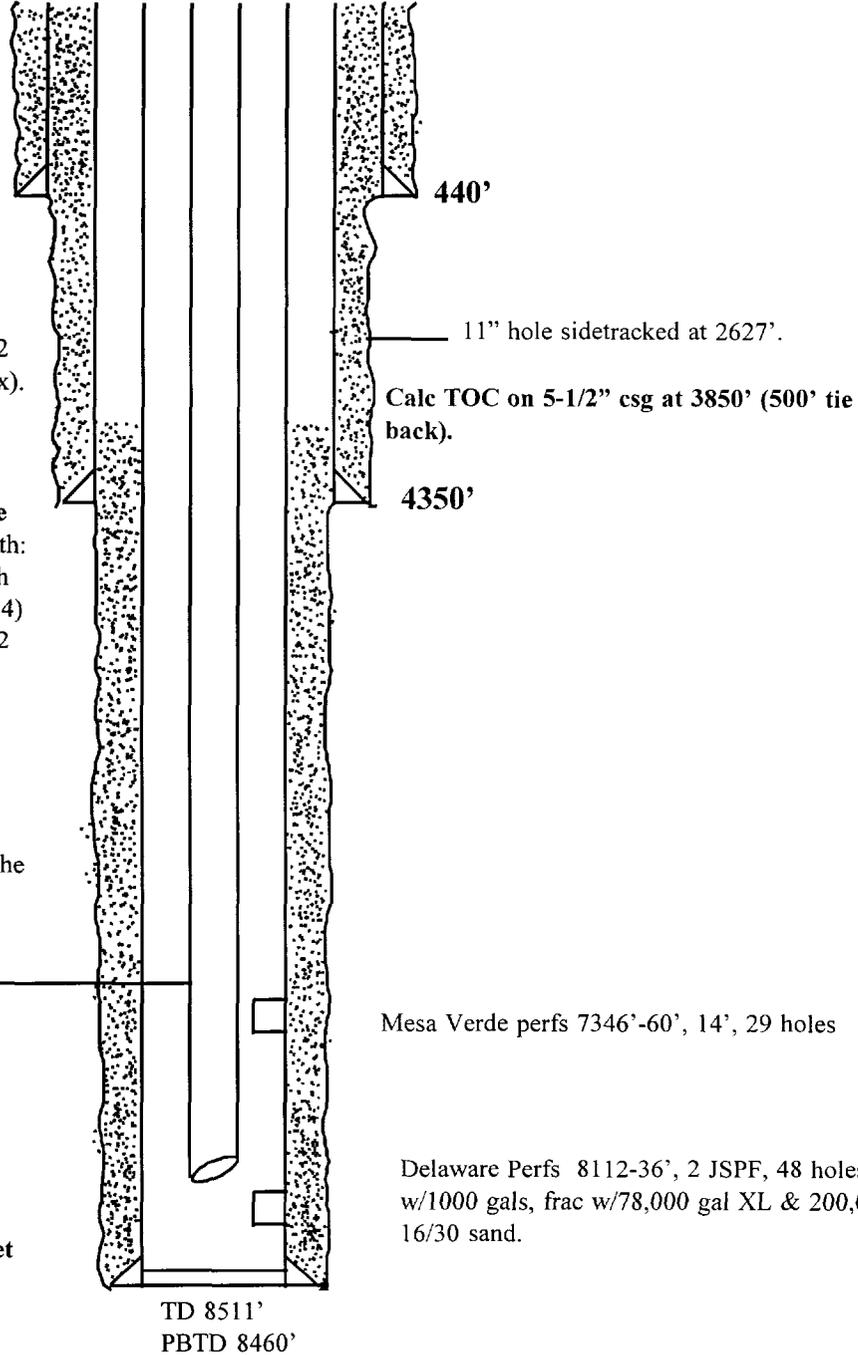
Fish left in original 11" hole.
Sidetracked hole at 2627', then
drilled 11" hole to 4350', and set the
8-5/8" casing described above.

2-7/8" 6.50 N80 8rd EUE USED
tubing

**5-1/2" 15.50 J55 and 17# K55
LTC USED production casing set
at 8511'** in 7-7/8" hole.

1st Stage:
550 sx 50/50 Poz H w/ 2% gel, 5#
salt, 1/4# FC, 0.15% D59 FLA
(14.2, 1.35). Circ 75 sx.

2nd Stage: DV tool at 6491'
910 sx 50/50 Poz H w/ 2% gel, 5#
salt, 1/4# FC, 0.15% D59 FLA
(14.2, 1.35).
Calc TOC at 3850' (500' tie back).



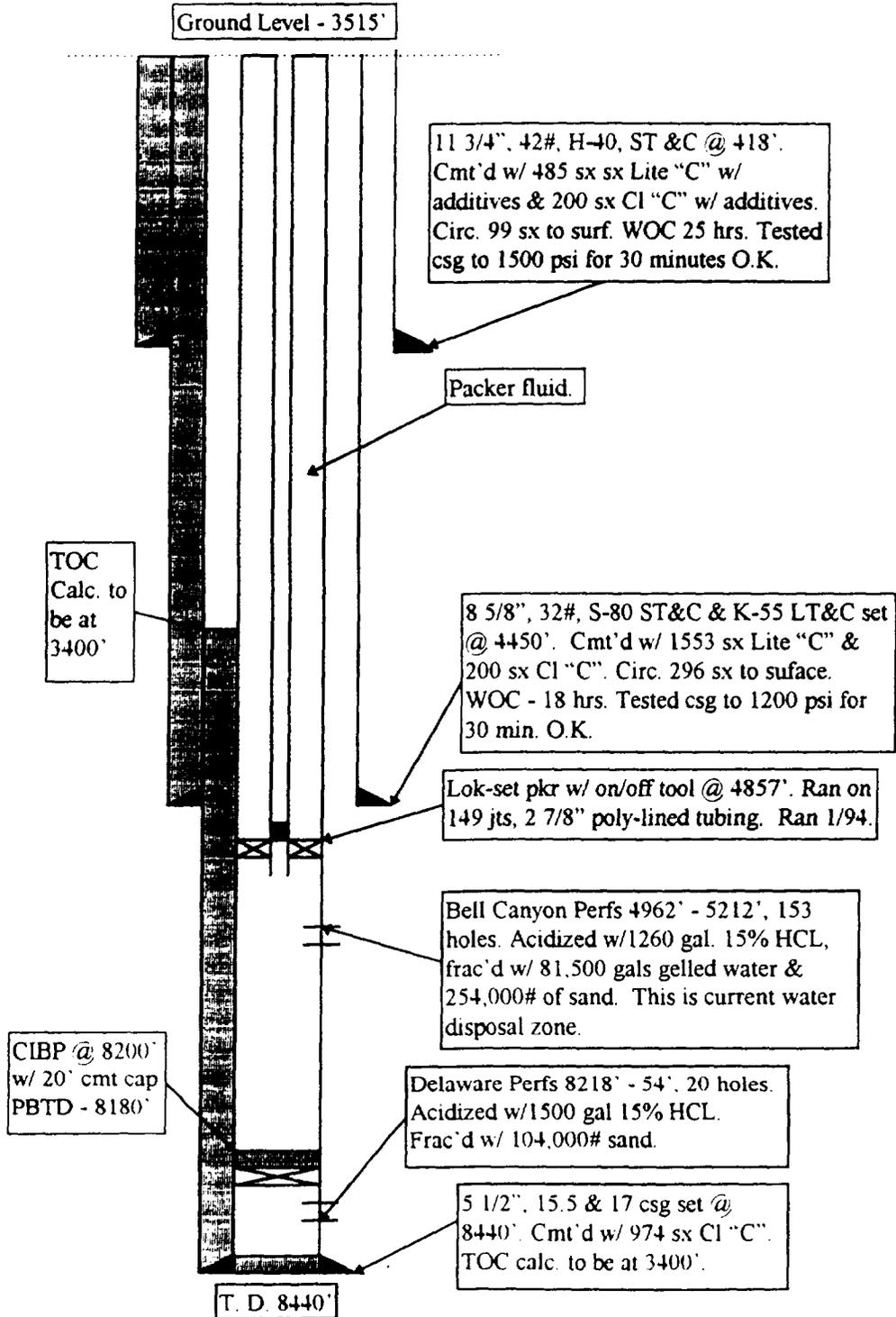
Mesa Verde perfs 7346'-60', 14', 29 holes

Delaware Perfs 8112-36', 2 JSPF, 48 holes; acdz
w/1000 gals, frac w/78,000 gal XL & 200,000#
16/30 sand.

TD 8511'
PBD 8460'

SDS "11" FEDERAL #1 - 5000
 OPERATOR - MERIT ENERGY CORPORATION
 2090' FNL & 1980' FWL
 Section 11, Unit Letter "F"
 T24S - R31E
 Eddy County, New Mexico

Spud - 08/12/93
 Currently - SWDW rate 2000 bwpd



Lotos "11-F" Federal No. 2

1780' FNL, 660' FEL,
Section 11, Unit Letter H, T24S, R31E,
Eddy County, New Mexico
KB 18' AGL

Spud 1/31/96
Rig Released 4/14/96

11-3/4" 42# WC40 STC
Surface Casing set at 412' in
14-3/4" hole with:
Lead - 200 sx Class C w/ 4% gel,
2% CaCl₂ (13.5 ppg, 1.74 ft³/sx)
Tail - 200 sx Class C w/ 2% CaCl₂
(14.8 ppg, 1.32 ft³/sx).
Circ 184 sx cmt to pit.

8-5/8" 23# M50 STC intermediate
casing set at 4430' in 11" hole with:
Lead - 1200 sx 35/65 Poz "C" with
6% gel, 5# salt, 1/4# FC (12.4, 2.14)
Tail - 200 sx Class H w/ 2% CaCl₂
(15.6 ppg, 1.19 ft³/sx)
Circ 80 sx cement to pit.

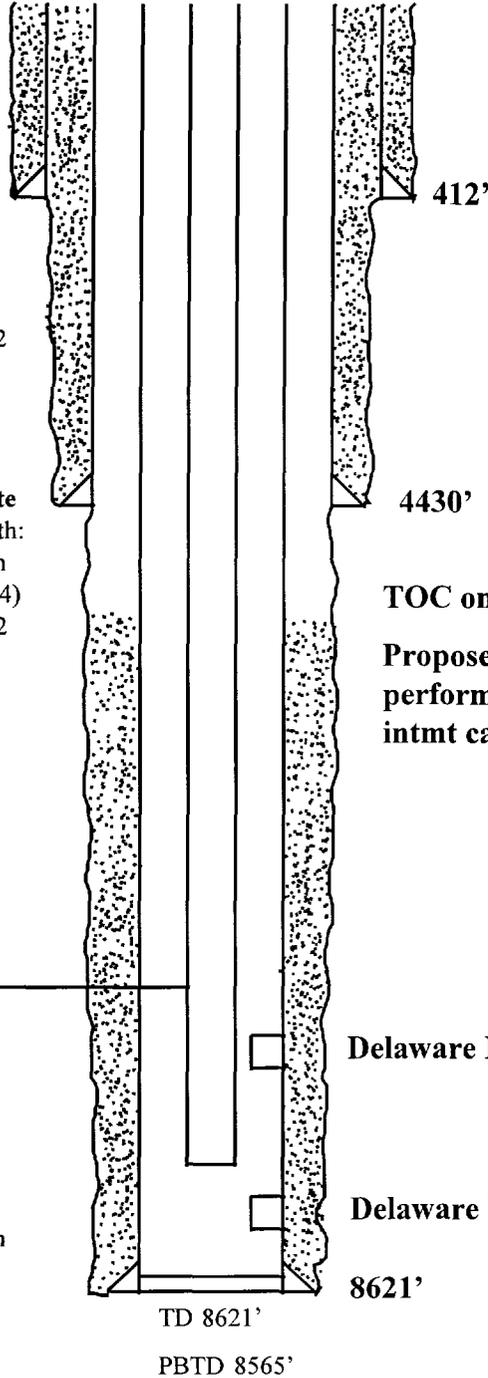
2-7/8" 6.50 N80 8rd EUE USED
tubing

5-1/2" 15.50 and 17# K55 LTC
Production Casing set at 8621' in
7-7/8" hole.

Single Stage Cement Job:

Fume Silica Lead: 340 sx Class C
with 3 gps fume silica D44, 0.09%
D604AM (FLA and disp), 0.4% L10
(anti-settling), 0.03% M45
(antifoam) (11.5 ppg, 3.14 ft³/sx)
Tail: 500 sx 50/50 Poz H w/ 2%
gel, 5# salt, 0.15% D59 FLA
(14.2, 1.35).

TOC at 5520 by CBL.



TOC on 5-1/2" csg at 5520' by CBL.
Proposed remedial cementing will be
performed to tie cement back into
intmt casing by 500'.

Delaware Perfs 6886-7099'

Delaware Perfs 8026-8298'

8621'

TD 8621'

PBTD 8565'

VII. Data On Proposed Operation

1. Anticipated average daily injection rate into the Littlefield Federal #1 is 1500 BWIPD, with maximum daily rate expected at 2500 BWIPD.
2. The system will be a closed system.
3. The maximum injection pressure will be 920 psig (current maximum allowed injection pressure). Expected average injection pressure will be 800 psig.
4. The injected fluid will be Delaware produced water, which will be re-injected into the Delaware. Therefore, the formation fluid and injected fluid will be compatible.
5. The proposed disposal zone is not productive of oil or gas within 1 mile of the Littlefield Federal #1. A Delaware (Bell Canyon) water analysis is attached from Sonat's Lotos "C" Federal No. 901. This water analysis was obtained during an unsuccessful Bell Canyon recompletion in 1996.

VIII. Geological Data

The top of the Delaware is at 4480' in the Littlefield Fed #1. The Delaware is a sequence of sand and shales that is approximately 3800' thick in this area. These numerous sands are generally porous, permeable and water bearing. Immediately above the Delaware is a massive anhydrite and salt section from approximately 1100' - 4480'. The only fresh water in the area is above 320'. The nearest fresh water well is located in Unit letter F, Section 2, T24S, R31E which is approximately 3/4's of a mile north of the Littlefield Federal No. 1. This water well is located on Sonat's Todd 2 State lease. A water analysis of this well is attached.

IX. Proposed Stimulation

This well will be completed as an openhole completion (combined with existing perfs) and will be acidized with 15% HCL and rock salt for diversion.

- X. An openhole log was submitted to the NMOCD in September, 1992.
- XI. A water analysis is attached for Sonat's fresh water well located in Unit Letter F, Section 2, T24S, R31E. A search of this area reveals that there are no other fresh water wells located within 1 mile of the Littlefield Federal #1.
- XII. The available geologic and engineering data has been reviewed and there is no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water.

In Sonat's Lotos Federal "11F" No. 2, the top of cement behind the 5-1/2" production casing is at 5520'. Before any deepening operations are performed on the Littlefield Fed #1, remedial cementing will be performed on the Lotos Federal "11F" No. 2 to bring the cement top to at least 500' into the intermediate casing set at 4430'.

P. O. BOX 1468
 MONAHANS, TEXAS 79756
 PH. 343-3234 OR 563-1040

Martin Water Laboratories, Inc.

709 W. INDIANA
 MIDLAND, TEXAS 79701
 PHONE 683-4521

RESULT OF WATER ANALYSES

TO: Mr. Selden Jones LABORATORY NO. 596167
110 W. Louisiana, Ste 500, Midland, TX 79701 SAMPLE RECEIVED 5-17-96
 RESULTS REPORTED 5-23-96

COMPANY Sonat Exploration LEASE _____
 FIELD OR POOL _____
 SECTION _____ BLOCK _____ SURVEY _____ COUNTY Eddy STATE NM

SOURCE OF SAMPLE AND DATE TAKEN:

- NO. 1 Drinking water - taken from Todd fresh water well **WELL FILE**
 NO. 2 Maximum contents for drinking water as recommended by the Texas Dept. of Health.
 NO. 3 _____
 NO. 4 _____

REMARKS:

CHEMICAL AND PHYSICAL PROPERTIES				
	NO. 1	NO. 2	NO. 3	NO. 4
Specific Gravity at 60° F.	1.0020			
pH When Sampled				
pH When Received	6.57			
Bicarbonate as HCO ₃	239			
Supersaturation as CaCO ₃				
Undersaturation as CaCO ₃				
Total Hardness as CaCO ₃	334			
Calcium as Ca	69			
Magnesium as Mg	39			
Sodium and/or Potassium	110			
Sulfate as SO ₄	288	300		
Chloride as Cl	55	300		
Iron as Fe	0.52	0.3		
Barium as Ba				
Turbidity, Electric				
Color as Pt				
Total Solids, Calculated	801	1,000		
Temperature °F.				
Carbon Dioxide, Calculated				
Dissolved Oxygen				
Hydrogen Sulfide	0.0			
Resistivity, ohms/m at 77° F.	9.73			
Suspended Oil				
Filtrable Solids as mg/l				
Volume Filtered, ml				
Nitrate, as N	0.2	10.0		

Results Reported As Milligrams Per Liter

Additional Determinations And Remarks Based on the determinations performed herein, we find this water exceeds State recommended maximum contents for drinking water in the level of iron only. It should be clarified that iron is a highly variable component due to corrosion and may not necessarily be consistently above the standard on the basis of this single analysis.

Martin Water Laboratories, Inc.

WATER CONSULTANTS SINCE 1953
BACTERIAL AND CHEMICAL ANALYSES

P. O. BOX 1468
MONAHANS, TEXAS 79756
(915) 943-3234 or 563-1040

709 W. INDIANA
MIDLAND, TEXAS 79701
(915) 683-4521

To: Mr. Selden Jones
110 W. Louisiana, Suite 500
Midland, TX 79701

Laboratory No. B59634
Sample received 5-17-96
Results reported 5-23-96

Company: Sonat Exploration
County: Eddy, NM
Field:
Lease:

Subject: To determine the presence or absence of coliform bacteria.

Method: Recommended by the American Public Health Association as follows:
Each of five tubes of multiple strength lactose broth inoculated with 10 ml of the sample for the presumptive test. If any tubes are positive, they are in turn inoculated into brilliant green lactose bile broth for confirmative tests.

Source of sample and date taken

#1. Drinking water - taken from Todd fresh water well. 5-17-96

	#1	
	Number of Positive Tubes	
Incubation period	<u>24 hours</u>	<u>48 hours</u>
Presumptive test	0	1
Confirmed test	0	1

Remarks: Based on the determinations performed above, this water is not indicated to be satisfactory for human consumption.



Waylan C. Martin, M.A.

Well File

P. O. BOX 1468
MCNAHANS, TEXAS 79756
PH 941 3234 OR 563 1040

Martin Water Laboratories, Inc

110 W. INDIANA
MIDLAND, TEXAS 79701
PHONE 681 4121

RESULT OF WATER ANALYSES

TO Mr. Tom Myers LABORATORY NO. 596215
110 W. Louisiana, Ste 500, Midland, TX 79701 SAMPLE RECEIVED 5-17-96
RESULTS REPORTED 5-29-96

COMPANY Sonat Exploration LEASE Lotos "C"
FIELD OR POOL Poker Lake
SECTION BLOCK SURVEY COUNTY Eddy STATE NM

SOURCE OF SAMPLE AND DATE TAKEN:
NO. 1 Produced water - taken from Lotos "C" #901. *unsuccessful*
NO. 2 *Bell Canyon Recompletion*
NO. 3 *From Perfs - 4832'-5064' (Bell Canyon)*
NO. 4

REMARKS:

CHEMICAL AND PHYSICAL PROPERTIES				
	NO. 1	NO. 2	NO. 3	NO. 4
Specific Gravity at 60° F.	1.1052			
pH When Sampled				
pH When Received	6.40			
Bicarbonate as HCO ₃	85			
Supersaturation as CaCO ₃				
Undersaturation as CaCO ₃				
Total Hardness as CaCO ₃	35,500			
Calcium as Ca	10,100			
Magnesium as Mg	2,491			
Sodium and/or Potassium	48,105			
Sulfate as SO ₄	0			
Chloride as Cl	99,427			
Iron as Fe	106			
Barium as Ba	256			
Turbidity, Electric				
Color as Pt				
Total Solids, Calculated	160,464			
Temperature °F.				
Carbon Dioxide, Calculated				
Dissolved Oxygen.				
Hydrogen Sulfide	0.0			
Resistivity, ohmsim at 77° F.	0.066			
Suspended Oil				
Filtrable Solids as mg/l				
Volume Filtered, ml				

Results Reported As Milligrams Per Liter

Additional Determinations And Remarks When we compare the above with our records in this field, we find it has characteristics reasonably similar to what we would expect from a natural Delaware except it has no sulfate and has a significant amount of barium, which is contrary to our records. However, different Delaware intervals occasionally have slight differences in regard to these two components. We also find the water has ratios of salts that are very similar to Morrow water, but this water shows significantly higher levels of salts. If this is a Morrow producer, then it would be possible that it is receiving some water from the Delaware in conjunction with some water from the Morrow.

By Waylan C. Martin, M.A.

ADDRESS LIST FOR:

**SONAT EXPLORATION COMPANY
LITTLEFIELD SWD PERMIT FOR DEEPENING**

Schedule of Leasehold Operators within a one-half mile radius of the Sonat - Littlefield SWD located in unit letter "B" of Section 11, T-24-S, R-31-E, N.M.P.M., Eddy County, New Mexico.

Sonat Exploration Company
Attn: Mr. Jim Brown
110 W. Louisiana St., Suite 500
Midland, Texas 79701

Louis Dreyfus Natural Gas Corporation
14000 Quail Springs Parkway, Suite 600
Oklahoma City, Oklahoma 73134

Merit Energy Company
12222 Merit Drive, Suite 1500
Dallas, Texas 75251

Pogo Producing Company
P. O. Box 10340
Midland, Texas 79702-7340

Santa Fe Energy Operating Partners, L.P.
550 W. Texas, Suite 1330
Midland, Texas 79701

P 268 437 192

US Postal Service
Receipt for Certified Mail
No Insurance Coverage Provided.
Do not use for International Mail (See reverse)

Sent to	
Pogo	
Street & Number	
Post Office, State, & ZIP Code	
Postage	\$ 1.30
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	1.20
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$3.60
Postmark or Date	

PS Form 3800 April 1995

Is your RETURN ADDRESS completed on the reverse side?

SENDER: ■ Complete items 1 and/or 2 for additional services. ■ Complete items 3, 4a, and 4b. ■ Print your name and address on the reverse of this form so that we can return this card to you. ■ Attach this form to the front of the mailpiece, or on the back if space does not permit. ■ Write "Return Receipt Requested" on the mailpiece below the article number. ■ The Return Receipt will show to whom the article was delivered and the date delivered.		I also wish to receive the following services (for an extra fee): 1. <input type="checkbox"/> Addressee's Address 2. <input type="checkbox"/> Restricted Delivery Consult postmaster for fee.
3. Article Addressed to: Pogo Producing Co. P.O. Box 10340 Midland, TX 79702-7340	4a. Article Number 268 437 192	
	4b. Service Type <input type="checkbox"/> Registered <input checked="" type="checkbox"/> Certified <input type="checkbox"/> Express Mail <input type="checkbox"/> Insured <input type="checkbox"/> Return Receipt for Merchandise <input type="checkbox"/> COD	
	7. Date of Delivery JUL - 3 1997	
5. Received By: (Print Name) L. Branch	8. Addressee's Address (Only if requested and fee is paid)	
6. Signature: (Addressee or Agent) X Linda Branch		

Thank you for using Return Receipt Service.

PS Form 3811, December 1994

Domestic Return Receipt

P 268 437 193

US Postal Service
Receipt for Certified Mail
No Insurance Coverage Provided.
Do not use for International Mail (See reverse)

Sent to	
Santa Fe Energy	
Street & Number	
Post Office, State, & ZIP Code	
Postage	\$
Certified Fee	1.35
Special Delivery Fee	
Restricted Delivery Fee	1.20
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$ 3.60
Postmark or Date	

PS Form 3800 April 1995

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Santa Fe Energy Operating Partners, L.P.
550 W. Texas Suite 1330
Midland TX 79701

4a. Article Number

268 437 193

4b. Service Type

- Registered Certified
- Express Mail Insured
- Return Receipt for Merchandise COD

7. Date of Delivery

7-9-97

5. Received By: (Print Name)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature: (Addressee or Agent)

* [Signature]

Thank you for using Return Receipt Service.

P 268 437 194

US Postal Service
Receipt for Certified Mail
No Insurance Coverage Provided.
Do not use for International Mail (See reverse)

PS Form 3800, April 1995

Sent to U.S.A.	
Street & Number Box 27115	
Post Office, State, & ZIP Code Santa Fe NM 87502	
Postage	\$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$ 3.60
Postmark or Date	

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

**U.S.A
P.O. Box 27115
Santa Fe, NM 87502-0115**

4a. Article Number

268 437 194

4b. Service Type

- | | |
|---|---|
| <input type="checkbox"/> Registered | <input checked="" type="checkbox"/> Certified |
| <input type="checkbox"/> Express Mail | <input type="checkbox"/> Insured |
| <input type="checkbox"/> Return Receipt for Merchandise | <input type="checkbox"/> COD |

7. Date of Delivery

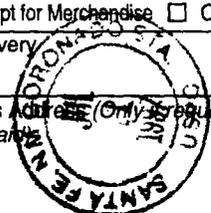
5. Received By: (Print Name)

TONY

6. Signature: (Addressee or Agent)

X

8. Addressee's Address (Only if requested and fee is paid)



Thank you for using Return Receipt Service.

P 268 437 195

US Postal Service

Receipt for Certified Mail

No Insurance Coverage Provided.

Do not use for International Mail (See reverse)

PS Form 3800, April 1995

Sent to	
Jimmy Ray Richardson	
Street & Number	
Post Office, State, & ZIP Code	
Box 487 Carlsbad NM 88221	
Postage	\$
Certified Fee	1.35
Special Delivery Fee	
Restricted Delivery Fee	1.20
Return Receipt Showing to Whom & Date Delivered	
Return Receipt Showing to Whom, Date, & Addressee's Address	
TOTAL Postage & Fees	\$3.60
Postmark or Date	

Is your RETURN ADDRESS completed on the reverse side?

SENDER:

- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):

- Addressee's Address
- Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Jimmy Ray Richardson
 c/o Richardson Cattle Co.
 P.O. Box 487
 Carlsbad, NW 88221

4a. Article Number

268 437 195

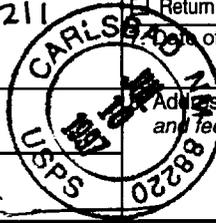
4b. Service Type

- | | |
|---|---|
| <input type="checkbox"/> Registered | <input checked="" type="checkbox"/> Certified |
| <input type="checkbox"/> Express Mail | <input type="checkbox"/> Insured |
| <input type="checkbox"/> Return Receipt for Merchandise | <input type="checkbox"/> COD |

5. Received By: (Print Name)

6. Signature: (Addressee or Agent)

X *Jim Richardson*



Addressee's Address (Only if requested and fee is paid)

Thank you for using Return Receipt Service.