The Oil and Gas Fields of Southeastern New Mexico

1960 Supplement

A SYMPOSIUM

Edited by

Henry N. Sweeney, Editor-in-Chief
E. S. Dietrich
D. A. Dunn
R. L. Fay
R. D. Holt
W. G. McCampbell
T. F. Stipp

Published by the
ROSWELL GEOLOGICAL SOCIETY
(A New Mexico Corporation)
Roswell, New Mexico, U.S.A.
1960

Data prepared by: G. E. Upp
Affiliation: Mobil Oil Company
Date: July 15, 1960

Field Name: South Vacuum Devonian
Location: T. 18 S., R. 35 E.
County & State: Lea Co., N. Mex.
Unit

DISCOVERY WELL: Union of Calif. #1-35 South Vacuum COMPLETION DATE: Jan 26, 1958

PAY ZONE: Devonian dolomite, fine to coarse crystalline, light gray to white, fractured, with vuggy and intercrystalline porosity.

TYPICAL CORE ANALYSIS OF A PAY INTERVAL IN THIS FIELD:

Perm. in millidarcys		% Porosity	Liquid Saturation (% of pore space)	
Horizontal	Vertical		Water	Oil
116	86	5.9	32.3	25.3

OTHER SHOWS ENCOUNTERED IN THIS FIELD: Bone Spring (See South Vacuum-Bone Spring data sheet), Wolfcamp, Pennsylvanian, McKee.

TRAP TYPE: Faulted Anticline
NATURE OF OIL: Gravity 48° API
NATURE OF GAS: Sweet
NATURE OF PRODUCING ZONE WATER: Resistivity: 0.26 ohm-meters @ 68 °F.

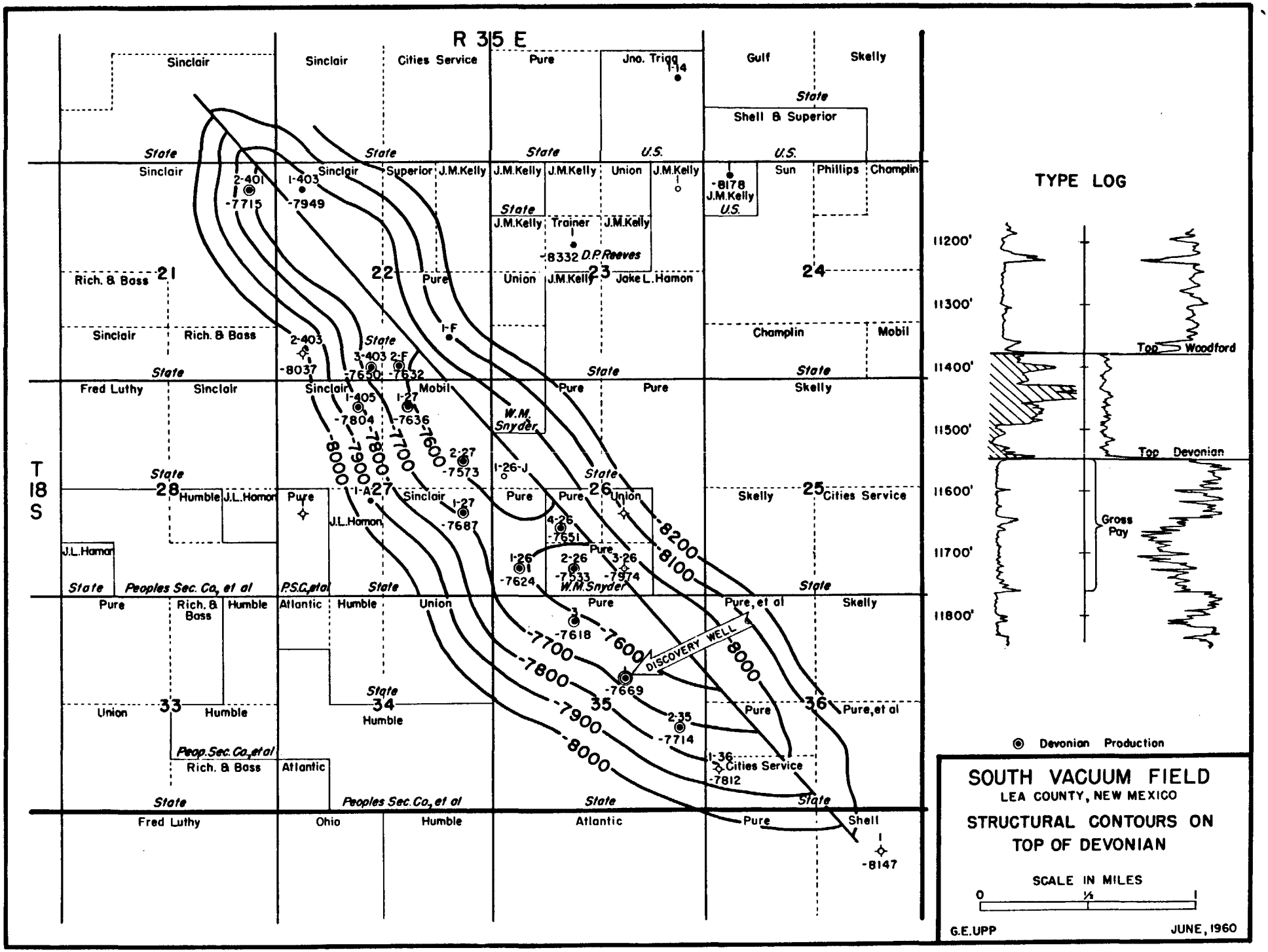
	Total Solids	Na+K	Ca	Mg	Fe	SO_4	Cl	CO_3	HCO_3	OH	H_2S
ppm	27121	4868	3996	783	2	1444	15504				

INITIAL FIELD PRESSURE: 4800 psi
TYPE OF DRIVE: Water Drive
NORMAL COMPLETION PRACTICES: Set casing through pay zone, perforate and acidize if necessary.

PRODUCTION DATA:

Year	Type	No. of wells @ yr. end		Production Oil in barrels Gas in MMCF	
		Producing	Shut in or Abnd.	Annual	Cumulative
1956	oil				
	gas				
1957	oil				
	gas				
1958	oil	4		139,773	139,773
	gas			7.6	7.6
1959	oil	10		442,257	592,663
	gas			35.9	43.5
1960*	oil	13		335,173	927,836
	gas			26.5	70.0

* 1960 Figure is production to July 1, 1960.


R 35 E
T 18 S
Sinclair
Cities Service
Pure
Jno. Triqg
Gulf
Skelly
State
Shell & Superior
U.S.
Superior
J.M.Kelly
Union
Sun
Phillips
Champlin
Trainer
D.P.Reeves
Jake L.Hamon
Rich. & Bass
Mobil
Fred Luthy
Ohio
Humble
Atlantic
Peoples Sec. Co, et al
P.S.C.,etal
Pure, et al
Skelly
Cities Service
W.M. Snyder
J.L.Hamon
Peop.Sec.Co.,et al
2-401
-7715
1-403
-7949
-8178
2-403
-8037
3-403
2-F
-7650
-7632
1-405
-7804
1-27
-7636
2-27
-7573
1-A
1-27
-7687
1-26-J
4-26
-7651
1-26
-7624
2-26
-7533
3-26
-7974
-7618
-7669
2-35
-7714
1-36
-7812
-8147
-8000
-7900
-7800
-7700
-7600
-8200
-8100
DISCOVERY WELL
TYPE LOG
11200'
11300'
11400'
11500'
11600'
11700'
11800'
Top Woodford
Top Devonian
Gross Pay
Devonian Production
SOUTH VACUUM FIELD
LEA COUNTY, NEW MEXICO
STRUCTURAL CONTOURS ON TOP OF DEVONIAN
SCALE IN MILES
0
½
1
G.E.UPP
JUNE, 1960

Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

Oil Conservation Division
P. O. Box 2088
Sante Fe, New Mexico, 87501

WATER DISPOSAL WELL
STATE SEC. 27 LEASE
WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

Gentlemen:

Mobil Exploration & Producing U.S. Inc., as agent for Mobil Producing Texas & New Mexico, Inc. (MPTM), respectfully requests authority to dispose of produced water into the Devonian formation in the subject well.

Conversion of this well to a water disposal well is necessary to economically dispose of lease and off lease water.

The supporting information for this application is organized in accordance with Form C-108.

If any further information is needed concerning this application, please call C. A. Moore at (915) 688-1772.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Case No. 9331 Exhibit No. 9
Submitted by MOBIL
Hearing Date 4-21-88

Yours very truly,

M. E. Sweeney
Environmental & Regulatory Manager

Mobil Exploration & Producing U.S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: w/attach
Offset Operators
Surface Owner
New Mexico State Land Office
Distist Director OCD - Hobbs

bcc: Central Files
Proration Acct. - Houston
Reservoir Engr. Mgr.
Dist. Op. Mgr. - Hobbs
Area Prod. Supv. - Buckeye
Prod. Geology Mgr.

A:M804749E.CAM
(3)

Mobil Exploration & Producing U.S. Inc.

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MIDLAND, TEXAS 79702

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March 2, 1988

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Environmental & Regulatory Manager

Mobil Exploration & Producing U.S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: w/attach
Offset Operators
Surface Owner
New Mexico State Land Office
Distist Director OCD - Hobbs

A:M804749E.CAM
(3)

ENERGY AND MINERALS DEPARTMENT

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501

Revised 7-1-81

APPLICATION FOR AUTHORIZATION TO INJECT

I. Purpose: ☐ Secondary Recovery ☐ Pressure Maintenance ☒ Disposal ☐ Storage
Application qualifies for administrative approval? ☐ yes ☒ no

II. Operator: Mobil Producing Texas & New Mexico, Inc.

Address: c/o Mobil Exploration & Producing U.S. Inc., P. O. Box 633, Midland, Texas 79702

Contact party: C. A. Moore Phone: (915) 688-1772

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 _____.

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: M. E. Sweeney Title Environmental & Regulatory Manager

Signature: M E Sweeney Date: March 2, 1988

* 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. _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate Division 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 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 2088, 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.

DATE 3-21-88 WELL NO. 2 LEASE State 27

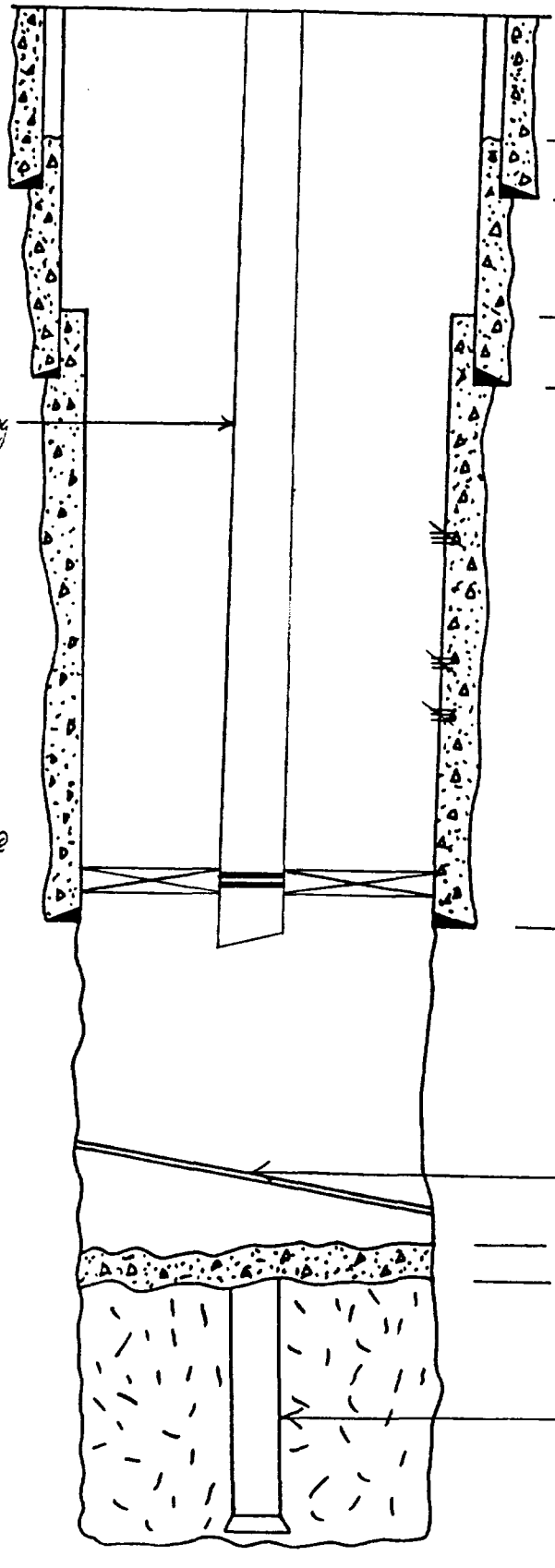
FIELD Vacuum South LOCATION Lea County, New Mexico

Section 27
Township 18 S
Range 35 E

SIGNED D. G. Elwood

GL 3887'
DF 3898'
KB 3899'
ZERO 12' AGL

PROPOSED WELLBORE DIAGRAM



TOC 13 3/8" - 9 5/8" @ 380'

13 3/8" 48 lb/ft csg set to 422' w/ 465 sks circ

Top of 7" csg @ 3849' (7" cut w/ dia-log, milled to good csg @ 3849' & dress top of 7" csg

9 5/8" 36 lb/ft csg set to 3900' w/ 2270 sks

Proposed
4 1/2" Duolined Tbg + 7" Permanent Pkr

Bone Springs Perfs
8823 - 8968' squeezed w/ 100 sks

Devonian Perfs
11,473 - 11,513' squeezed w/ 300 sks
11,570 - 11,600' squeezed w/ 300 sks

Permanent pkr @ ± 11,850'

7" 23 lb/ft J-55 csg set to 11,950' w/ 476 sks

Houston, Inc Profile Logging Tool (12,206 - 12,223'): 19' long + 1" neck

PBTD (drillers 13,683')

Top of junk @ 13,718'

3 4 1/4" DC + 6" bit

TD: 13,813' PBTD: (drillers) 13,683' (wireline) 13,712'

III.

A.

1. State Sec. 27 #2, 660' FEL & 1980' FNL, Sec. 27, T-18-S, R-35-E

2. 13-3/8" Csg. @ 422' cemented with 465 sx. of cmt - did not circulate but calculates to surface in a 17-1/2" hole.

   9-5/8" Csg. @ 3900' cemented with 2270 sx. in a 12-1/4" hole. Top of cmt @ 308' as determined by temperature survey.

   7" Csg. @ 11,950' cmt with 476 sx. of cmt in a 8-3/8" hole. Top of cmt @ 3850' as determined by temperature survey.

3. 4-1/2" lined with Douline 20 and set @ approx. 11,875'.

4. 7" permanent packer & seal assembly set @ approx. 11,875'.

B.

1. Devonian, South Vacuum

2. Open hole interval from 11,950' to 13,718'.

3. Well originally drilled as a Devonian producer.

4. Bone Spring perfs. @ 8823'-8968' sqz w/100 sx. cement; Devonian Perfs @ 11,570'-11,600' and 11,473'-11,513' sqz'd w/300 sx. cmt. each.

5. The next higher zone is the Bone Spring @ 8850'; there is no zone below the Devonian that is productive.

V. Map attached, Exhibit "A"

VII.

1. Average rate: 9,000
   Maximum rate: 12,000

2. Closed system

3. Avg. injection pressure: 200 PSI

   Maximum injection pressure: 2390 PSI

4. Attached, EXHIBIT "B", chemical analysis of source waters and statement from Reservoir Engineer;

5. Attached, "EXHIBIT "C", chemical analysis of disposal zone formation water and compatibility statement from N. L. Treating Chemical Co.

VIII.

1. Lithologic detail

   a. Composition - Devonian, white to tan, medium to coarse crystalline with muggy to cavernous porosity;

   b. Type structure - Faulted anticline;

   c. Average porosity - 13%;

   d. Average of Permeability - 5 to 30 md

2. Geological Name - Devonian;

3. Thickness - Average 500';

4. Depth - Average to top of pay - 12,000';

5. Overlying fresh water zones;
   (10,000 ml/l or less TDS)

   a. Ogalalla @ 300'

   b. Santa Rosa @ 1400'

6. There are no fresh waters immediately underlying the injection zone.

IX. Acidize 02/27/88 the Lower Devonian (11,950'-13,718') w/14,000 gals. of 15% HCL + 10,000 lbs. of rock salt as follows:

   (a) Load the backside w/fresh water and pressure up to 300 psi.

   (b) Pump 14,000 gals. of 15% HCL in four stages w/2500 lbs. rock salt per stage;

   (c) Flush to 13,718' w/300 bbls. fresh water and 600 bbls. produced water;

   (d) Maximum TTP - 5190 PSI; Form broke @ 1200 PSI; AIR - 15 BPM @ 3800 PSI.

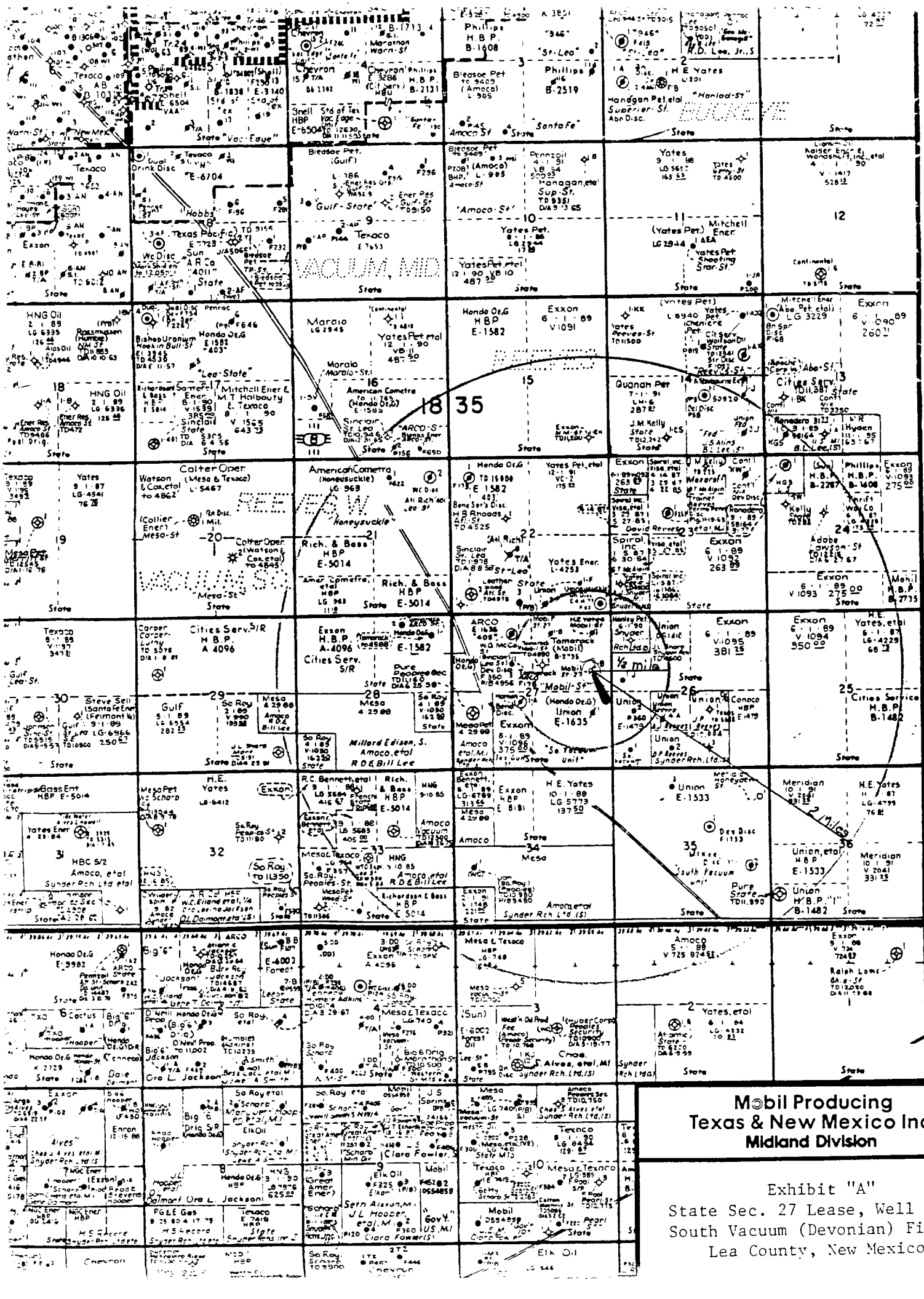
   (e) Well went on strong vacuum.

X. Logs already submitted to District NMOCD w/original drill & completion, September, 1959.

XI. Analyses attached, EXHIBIT "D";

XII. MPTM has examined the available geological and engineering data and finds no evidence of open faults or any other hydrological connection between the Devonian zone and any underground source of drinking water.

XIII. Proof of Notice attached, EXHIBITS "E" AND "F"



Mobil Producing
Texas & New Mexico Inc.
Midland Division

Exhibit "A"
State Sec. 27 Lease, Well #2
South Vacuum (Devonian) Field
Lea County, New Mexico

Exhibit "B"

INTEROFFICE CORRESPONDENCE

DATE: Feb. 15, 1988

TO: Ann Moore CC:

With regards to the water capatability test conducted on fluids to be injected into the State 27 well #2 SWDW, the following statement can be made :

> A composite of produced water which represents the typical injection fluid consists of Abo (46%), San Andres (48%), Glorieta (2%), Pennsylvania (3%), and Blinebry (1%). This water was combined with Devonian produced water in varying amounts. In summary, the Devonian water alone, and mixtures of Devonian from 0 to 50% with the proposed injection fluid formed carbonate scale. Calcium sulfate becomes evident in the high percent composite range of 80 - 100%. Thus a scale prevention program is needed and chemical treatment of the well will be done as required to control both types of scale.

Ann, attached is a copy of the analysis performed by NL Treating Chemicals. If you have any questions, please give me a call at ext. 2076.

Thanks

Jack Hamner
RM - 240
Project Reservoir Engineer

NL Treating Chemicals
NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 2

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: ~~Bridges State Leases~~ North Vacuum Abo Unit

SAMPLE SOURCE: #235

WATER SOURCE (FORMATION): Abo

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY
			64			

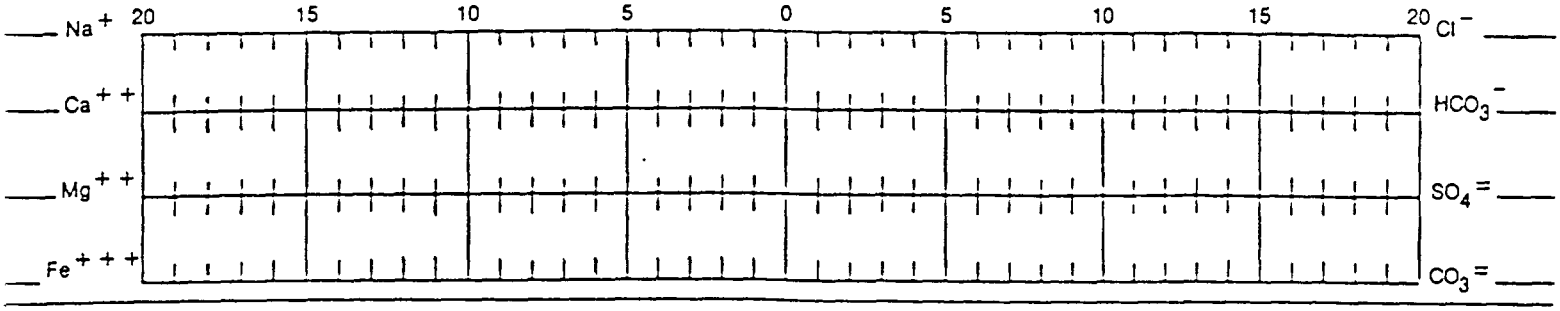
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	128	
Calcium, Ca^{++}	50	1,000
Magnesium, Mg^{++}	78	952
Iron (Total) $Fe^{+,++}$		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	75.1	1,727
ANIONS		
Chloride, Cl^{-}	169.0	6,000
Sulfate, $SO_4^{=}$	30.7	1,475
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	3.4	207
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$		

DISSOLVED GASES

Hydrogen Sulfide, H_2S		mg/l
Carbon Dioxide, CO_2		mg/l
Oxygen, O_2		mg/l

PHYSICAL PROPERTIES

pH (Field)	7.2	
Eh (Redox Potential)		MV
Specific Gravity		
Turbidity, FTU Units		
Total Dissolved Solids (Calc.)	11,361	mg/l
Stability Index @ 80 °F	+0.81	
@ 100 °F	+0.30	
@ 120 °F	+0.45	
$CaSO_4$ Solubility @ ____ °F		mg/l
@ ____ °F		mg/l
Max. $CaSO_4$ Possible (Calc.)		mg/l
Max. $BaSO_4$ Possible (Calc.)		mg/l
Residual Hydrocarbons		ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

SPEED BY	DATE	DISTRIBUTION ☐ CUSTOMER	☐ REGION	☐ DISTRICT
LF				

NL Treating Chemicals
NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 1

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Bridges-State Leases

SAMPLE SOURCE: #193

WATER SOURCE (FORMATION): San Andres

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY
			70			

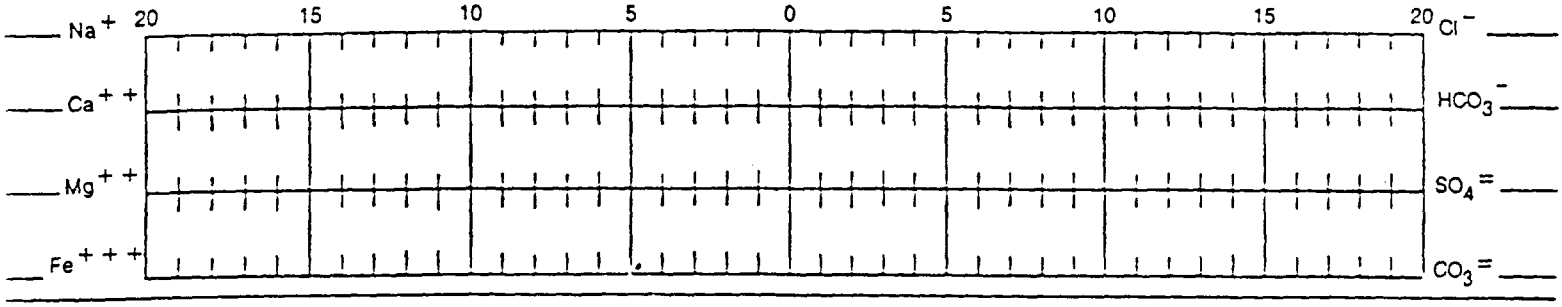
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	282	
Calcium, Ca^{++}	156	3,120
Magnesium, Mg^{++}	126	1,537
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	974.7	22,418
ANIONS		
Chloride, Cl^{-}	1,183.1	42,000
Sulfate, $SO_4^{=}$	57.3	2,750
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	12.2	744
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$	4.1	65

DISSOLVED GASES

Hydrogen Sulfide, H_2S	mg/l
Carbon Dioxide, CO_2	mg/l
Oxygen, O_2	mg/l

PHYSICAL PROPERTIES

pH (Field)	6.63
Eh (Redox Potential)	MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	72,634 mg/l
Stability Index @ 80 °F	+0.21
@ 100 °F	+0.35
@ 120 °F	+0.52
$CaSO_4$ Solubility @ ____ °F	mg/l
@ ____ °F	mg/l
Max. $CaSO_4$ Possible (Calc.)	mg/l
Max. $BaSO_4$ Possible (Calc.)	mg/l
Residual Hydrocarbons	ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

ANALYZED BY	DATE	RECEIVED ☐ CUSTOMER	SAMPLE NO.

NL Treating Chemicals

NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 3

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Bridges-State Leases

SAMPLE SOURCE: #114

WATER SOURCE (FORMATION): Glorieta

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY
			53			

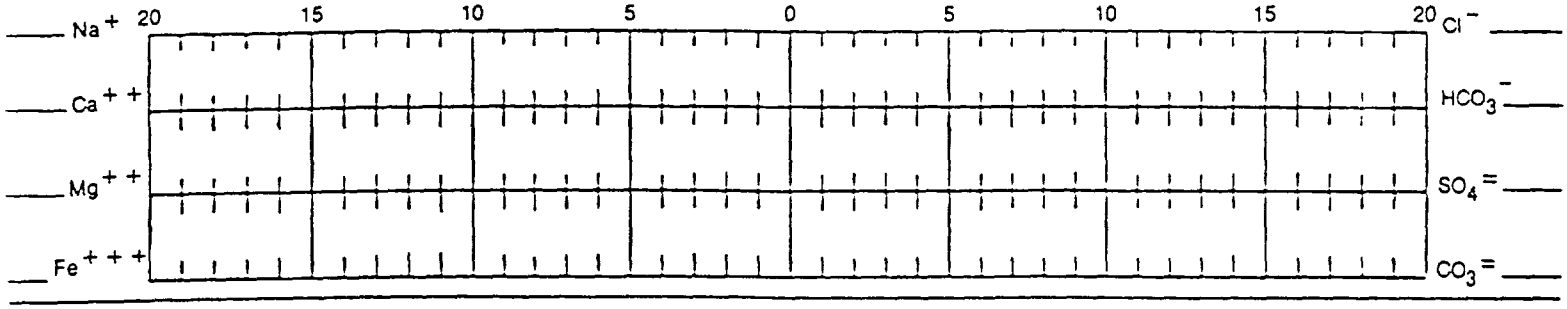
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	276	
Calcium, Ca^{++}	188	3,760
Magnesium, Mg^{++}	88	107
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	3,698.9	85,075
ANIONS		
Chloride, Cl^{-}	3,915.5	139,000
Sulfate, $SO_4^{=}$	47.4	2,275
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	7.5	458
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$	4.5	72

DISSOLVED GASES

Hydrogen Sulfide, H_2S		mg/l
Carbon Dioxide, CO_2		mg/l
Oxygen, O_2		mg/l

PHYSICAL PROPERTIES

pH (Field)	6.45	
Eh (Redox Potential)		MV
Specific Gravity		
Turbidity, FTU Units		
Total Dissolved Solids (Calc.)	231,712	mg/l
Stability Index @ 80 °F	+0.77	
@ 100 °F	+0.96	
@ 120 °F	+1.21	
$CaSO_4$ Solubility @ ____ °F		mg/l
@ ____ °F		mg/l
Max. $CaSO_4$ Possible (Calc.)		mg/l
Max. $BaSO_4$ Possible (Calc.)		mg/l
Residual Hydrocarbons		ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

TO ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

ANALYZED BY | DATE | DISTRIBUTION ☐ CUSTOMER ☐ REGION ☐ DISTRICT

NL Treating Chemicals
NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 5

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Bridges-State Leases

SAMPLE SOURCE: #120

WATER SOURCE (FORMATION): Upper Penn

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY
			72			

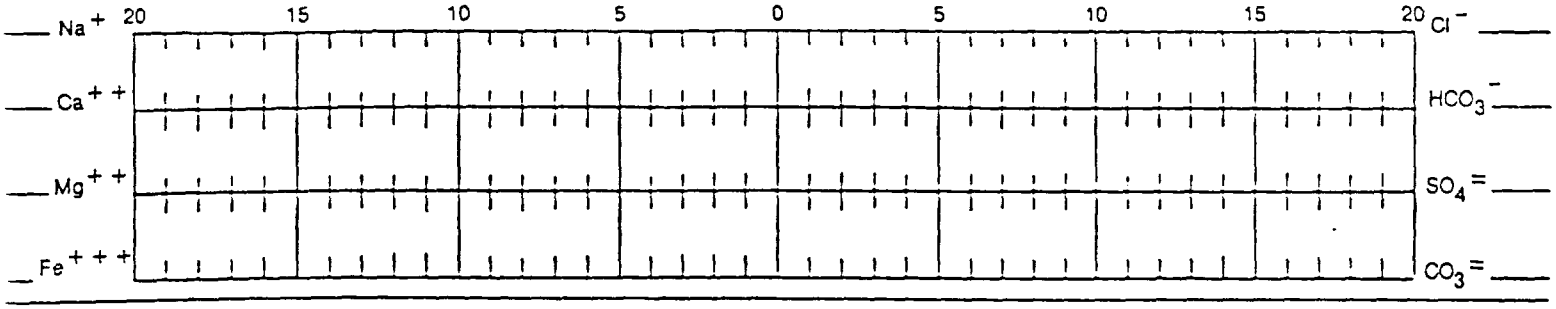
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	246	
Calcium, Ca^{++}	132	2,640
Magnesium, Mg^{++}	114	1,391
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	2,197	50,531
ANIONS		
Chloride, Cl^{-}	2,366.2	84,000
Sulfate, $SO_4^{=}$	46.4	3,225
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	12	732
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$	18.4	294

DISSOLVED GASES

Hydrogen Sulfide, H_2S	mg/l
Carbon Dioxide, CO_2	mg/l
Oxygen, O_2	mg/l

PHYSICAL PROPERTIES

pH (Field)	6.16
Eh (Redox Potential)	MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	141,813 mg/l
Stability Index @ 80°F	+0.13
@ 100°F	+0.03
@ 120°F	+0.22
$CaSO_4$ Solubility @ °F	mg/l
@ °F	mg/l
Max. $CaSO_4$ Possible (Calc.)	mg/l
Max. $BaSO_4$ Possible (Calc.)	mg/l
Residual Hydrocarbons	ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

ANALYZED BY	DATE	DISTRIBUTION			
JC	12/17/87	☐ CUSTOMER	☐ REGION	☐ DISTRICT	
		☐ NL/TC SALES ENGINEER		☐	

NL Treating Chemicals

NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 7

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Bridges-State Leases

SAMPLE SOURCE: #165

WATER SOURCE (FORMATION): Middle Penn

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY

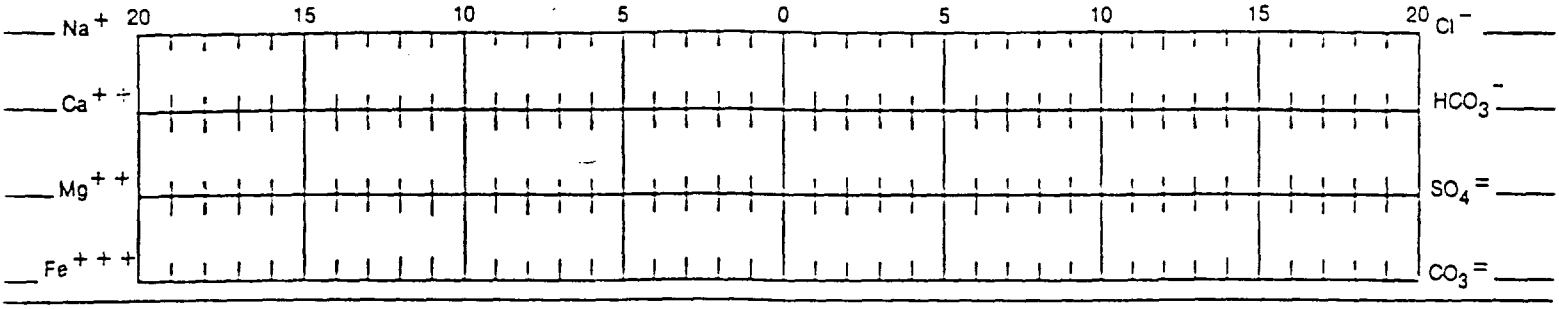
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	172	
Calcium, Ca^{++}	100	2,000
Magnesium, Mg^{++}	72	878
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)		

ANIONS	me/l	mg/l
Chloride, Cl^{-}	647.9	23,000
Sulfate, $SO_4^{=}$	33.9	1,625
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}		
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$		

DISSOLVED GASES

Hydrogen Sulfide, H_2S	mg/l
Carbon Dioxide, CO_2	mg/l
Oxygen, O_2	mg/l

PHYSICAL PROPERTIES

pH (Lab)	7.7
Eh (Redox Potential)	MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	mg/l
Stability Index @ °F	
@ °F	
@ °F	
$CaSO_4$ Solubility @ °F	mg/l
@ °F	mg/l
Max. $CaSO_4$ Possible (Calc.)	mg/l
Max. $BaSO_4$ Possible (Calc.)	mg/l
Residual Hydrocarbons	ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

Note: Small sample of water obtained.

TO ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

ANALYZED BY | DATE | DISTRIBUTION ☐ CUSTOMER ☐ REGION ☐ DISTRICT

NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 4

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Bridges-State Leases

SAMPLE SOURCE: #27

WATER SOURCE (FORMATION): Blinebry

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY
			52			

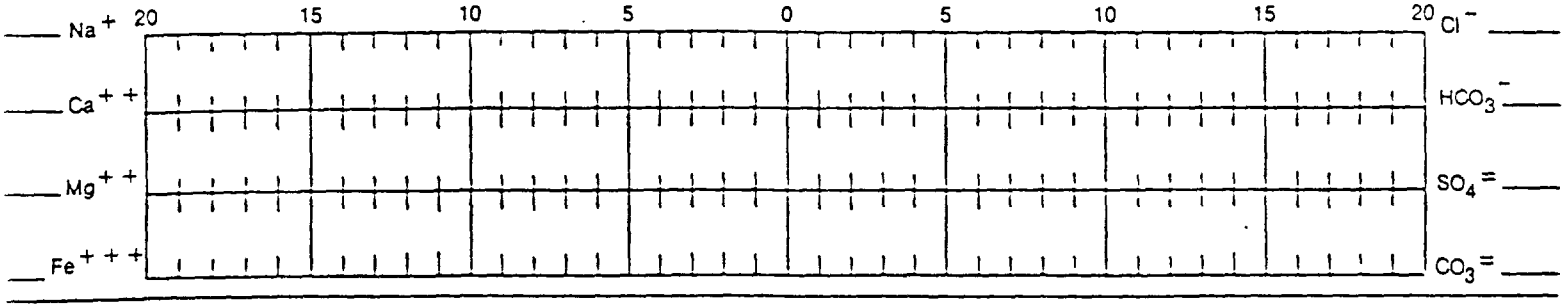
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	734	
Calcium, Ca^{++}	546	10,920
Magnesium, Mg^{++}	188	2,294
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	2,665.7	61,311

ANIONS		
Chloride, Cl^{-}	3,352.1	119,000
Sulfate, $SO_4^{=}$	41.7	2,000
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	5.9	360
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$		

DISSOLVED GASES

Hydrogen Sulfide, H_2S	mg/l
Carbon Dioxide, CO_2	mg/l
Oxygen, O_2	mg/l

PHYSICAL PROPERTIES

pH (Field)	7.05
Eh (Redox Potential)	MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	195,885 mg/l
Stability Index @ 80°F	+1.55
@ 100°F	+1.74
@ 120°F	+1.97
$CaSO_4$ Solubility @ °F	mg/l
@ °F	mg/l
Max. $CaSO_4$ Possible (Calc.)	mg/l
Max. $BaSO_4$ Possible (Calc.)	mg/l
Residual Hydrocarbons	ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

TO ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

ANALYZED BY	DATE	DISTRIBUTION ☐ CUSTOMER	☐ REGION	☐ DISTRICT

Exhibit "C"

NL Treating Chemicals
A Division of EXXON CHEMICAL COMPANY

January 20, 1988

Mr. David Howell
Mobil Producing Texas & New Mexico
P. O. Box 1800
Hobbs, New Mexico 88240

Subject: Vacuum Area Waters - Compatibility Study with Devonian Brine

Dear Mr. Howell:

Appended are individual produced water analyses pertaining to those Mr. Dickerson and I took with you on December 16, 1987. Also included is the Union's Devonian water analysis.

A mixture of your produced water was made as follows:

Abo	46%
San Andres	48%
Glorieta	2%
Pennsylvania	3%
Blinebry	1%

That mixture was blended with Devonian water in 10% increments. Samples were placed in an oven for 5 days at 100°.

The "Compatibility" appendage describes how samples reacted. Brief general summary comments are these:

1. No major initial incompatibility was seen at the time of mixing.

2. Moderate calcium carbonate deposition was found in the Devonian by itself (100%).

3. Mixtures were stable and stayed clear in the 90%-60% Devonian range.

4. Calcium carbonate deposition was seen in all samples from 50% Devonian to 0% (or 100% composite produced water mixture).

5. Calcium sulfate deposition was observed in the 80%-100% composite produced water ratios.

200 N. Loraine, Suite 250, Midland, TX 79701
Tel. (915) 684-7869 FAX: (915) 682-3917

In summary, the Devonian alone, and mixtures of Devonian from 50% to 0% formed carbonate scale. Calcium sulfate becomes a known in the high percent composite mixture range.

In other words, scale prevention treatment is advisable throughout most of the mixing range. One treatment can handle both kinds of scale.

We would be pleased to discuss this report with you at a mutually agreeable time.

Very truly yours,

Wayne Dickerson John V. Slyker

Wayne Dickerson
Sales Engineer

John V. Slyker
Sales Representative

/cg

cc: W. Reeves
D. Seale

NL Treating Chemicals/NL Industries, Inc.
P. O. Box 4305 Houston, Texas 77210

REPORT OF TEST

SHEET NUMBER

COMPANY: Mobil Producing Texas & New Mexico
DATE: 12-16-87
FIELD OR PLANT: Vacuum Area Leases
COUNTY OR PARISH: Lea
STATE: New Mexico
LEASE OR UNIT:
WELL(S) NAME & NO.:
SAMPLE SOURCE: See Below
TYPE SAMPLE:
TYPE TEST: Compatibility of Devonian with Mix
REASON FOR TEST: Possible Salt Water Disposal

RESULTS:

Compatibility Mixture %		Observations (100°F)	
Devonian	Composite Produced Waters	Initial Appearance	5 days
100	0	Clear	Moderate calcium carbonate Deposition
90	10	Clear	No deposition
80	20	Clear	No deposition
70	30	Clear	No deposition
60	40	Slightly hazy	No deposition
50	50	Slightly hazy	Moderate calcium carbonate deposition
40	60	Slightly hazy; slight gray cast	Slight calcium carbonate deposition
30	70	Slightly hazy, slight gray cast	Slight calcium carbonate deposition
20	80	Slightly hazy, slight gray cast	Moderate calcium sulfate & slight calcium carbonate depositions; slight iron compounds precipitated.
10	90	Slightly hazy; slight gray cast	Heavy calcium sulfate deposition; moderate calcium carbonate formed, + moderate iron compounds deposited.
0	100	Slightly hazy, slight gray cast	Heavy calcium sulfate deposited; moderate calcium carbonate precipitation moderate amount of insoluble iron compounds formed

REMARKS & RECOMMENDATIONS:

Composite Produced Water Ratios

Source	Mixture %
Abo	46
San Andres	48
Glorieta	2
Pennsylvania	3
Blinebry	1

SALES ENGINEER: Dickerson
DIST. NO.: 821
ADDRESS:
OFFICE PHONE:
HOME PHONE:

NL Treating Chemicals

NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Repo

SHEET NUMBER: 8

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Union Oil Co. ~~Bridges State Lease~~

SAMPLE SOURCE: Lee "J" State #1

WATER SOURCE (FORMATION): Devonian

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY
			26			

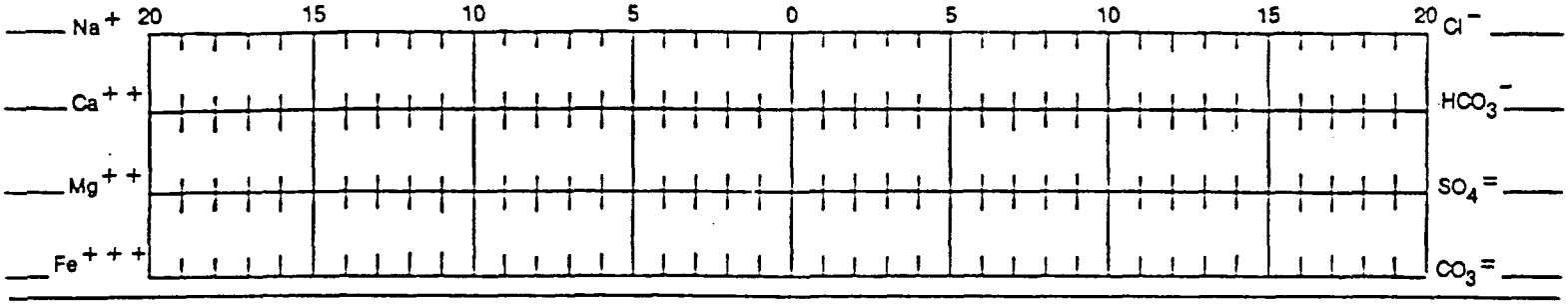
DATE SAMPLED: 12-16-87

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	142	
Calcium, Ca^{++}	68	1,360
Magnesium, Mg^{++}	74	903
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	405.8	9,333
ANIONS		
Chloride, Cl^{-}	507.0	18,000
Sulfate, $SO_4^{=}$	27.1	1,300
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	9.5	580
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$	4.2	67

DISSOLVED GASES

Hydrogen Sulfide, H_2S	____ mg/l
Carbon Dioxide, CO_2	____ mg/l
Oxygen, O_2	____ mg/l

PHYSICAL PROPERTIES

pH (Field)	6.32
Eh (Redox Potential)	____ MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	31,542 mg/l
Stability Index @ 80 °F	+0.41
@ 100 °F	+0.28
@ 120 °F	+0.12
$CaSO_4$ Solubility @ ____ °F	____ mg/l
@ ____ °F	____ mg/l
Max. $CaSO_4$ Possible (Calc.)	____ mg/l
Max. $BaSO_4$ Possible (Calc.)	____ mg/l
Residual Hydrocarbons	____ ppm (Vol/vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

NLTC ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE
Dickerson/Slyker	821			

ANALYZED BY | DATE | DISTRIBUTION ☐ CUSTOMER ☐ REGION ☐ DISTRICT

NL Treating Chemicals

NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Report

SHEET NUMBER: 9

COMPANY: Mobil Producing Texas & New Mexico

DATE:

FIELD: Vacuum

COUNTY OR PARISH: Lea

STATE: New Mexico

LEASE OR UNIT: Bridges-State Leases

SAMPLE SOURCE: Simulated Production Water Mixture

WATER SOURCE (FORMATION):

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS, MMCF/DAY

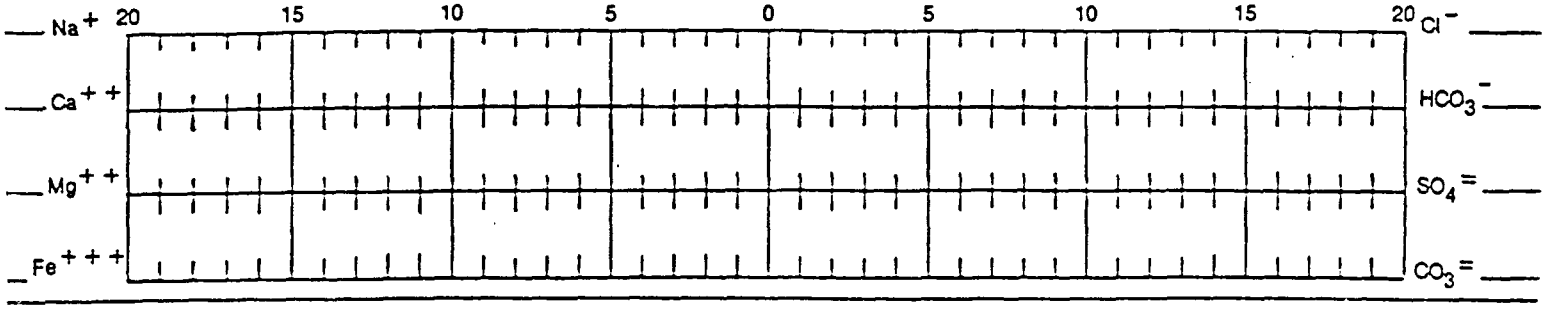
DATE SAMPLED: 12-

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	188	
Calcium, Ca^{++}	104	2,080
Magnesium, Mg^{++}	84	1,024
Iron (Total) Fe^{+++}		
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	654.4	15,051

ANIONS	me/l	mg/l
Chloride, Cl^{-}	788.7	28,000
Sulfate, $SO_4=$	45.8	2,200
Carbonate, $CO_3=$	3.2	96
Bicarbonate, HCO_3^{-}	4.7	286
Hydroxyl, OH^{-}		
Sulfide, $S=$		

DISSOLVED GASES

Hydrogen Sulfide, H_2S	mg/l
Carbon Dioxide, CO_2	mg/l
Oxygen, O_2	mg/l

PHYSICAL PROPERTIES

pH (Lab)	8.0
Eh (Redox Potential)	MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	48,739 mg/l
Stability Index @ °F	
@ °F	
@ °F	
$CaSO_4$ Solubility @ °F	mg/l
@ °F	mg/l
Max. $CaSO_4$ Possible (Calc.)	mg/l
Max. $BaSO_4$ Possible (Calc.)	mg/l
Residual Hydrocarbons	ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

Source	Mix %
Eumont	46
San Andres	48
Glorieta	2
Clinebry	1
[illegible]	[illegible]

Exhibit "D"

NL Treating Chemicals

NL Treating Chemicals/NL Industries, Inc.
P.O. Box 60020, Houston, Texas 77205
Tel. (713) 987-5400 Telex: 4620243 NLOS UI

Water Analysis Re

SHEET NUMBER

COMPANY: Mobil Producing Texas & N. M.

DATE: 1-17-

FIELD

COUNTY OR PARISH: Lea

STATE: N.M.

LEASE OR UNIT: Snyder Ranch

SAMPLE SOURCE: Water Well

WATER SOURCE (FORMATION)

DEPTH, FT.	BHT, °F	SAMPLE SOURCE	TEMP, °F	WATER, BBL/DAY	OIL, BBL/DAY	GAS MMCF/DAY

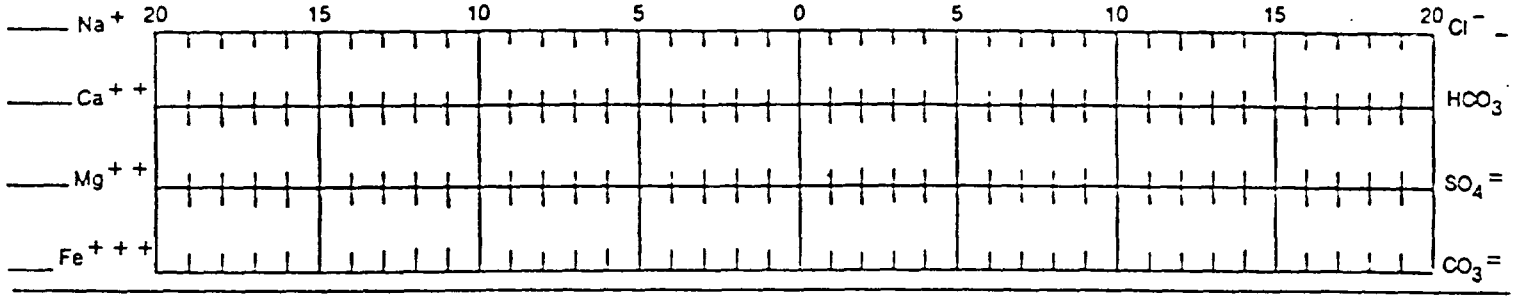
DATE SAMPLED

TYPE OF WATER: ☐ PRODUCED ☐ SUPPLY ☐ WATERFLOOD ☐ SALT WATER DISPOSAL

TYPE OF PRODUCTION: ☐ PRIMARY ☐ WATERFLOOD ☐ CO_2 FLOOD ☐ POLYMER FLOOD ☐ STEAMFLOOD

WATER ANALYSIS PATTERN

(NUMBER BESIDE ION SYMBOL INDICATES me/l SCALE UNIT)



DISSOLVED SOLIDS

CATIONS	me/l	mg/l
Total Hardness	5.0	84
Calcium, Ca^{++}	4.2	9.8
Magnesium, Mg^{++}	.8	4.3
Iron (Total) Fe^{+++}	0.2	
Barium, Ba^{++}		
Sodium, Na^{+} (Calc.)	17.4	400.2
ANIONS		
Chloride, Cl^{-}	16.9	600
Sulfate, $SO_4^{=}$	1.4	65
Carbonate, $CO_3^{=}$		
Bicarbonate, HCO_3^{-}	4.3	262.3
Hydroxyl, OH^{-}		
Sulfide, $S^{=}$	<1	

DISSOLVED GASES

Hydrogen Sulfide, H_2S	____ mg/l
Carbon Dioxide, CO_2	____ mg/l
Oxygen, O_2	____ mg/l

PHYSICAL PROPERTIES

pH	7.1
Eh (Redox Potential)	____ MV
Specific Gravity	
Turbidity, FTU Units	
Total Dissolved Solids (Calc.)	1425.6 mg/l
Stability Index @ ____ °F	
@ ____ °F	
@ ____ °F	
$CaSO_4$ Solubility @ ____ °F	____ mg/l
@ ____ °F	____ mg/l
Max. $CaSO_4$ Possible (Calc.)	____ mg/l
Max. $BaSO_4$ Possible (Calc.)	____ mg/l
Residual Hydrocarbons	____ ppm(Vol/Vol)

SUSPENDED SOLIDS (QUALITATIVE)

Iron Sulfide ☐ Iron Oxide ☐ Calcium Carbonate ☐ Calcium Sulfate ☐ Acid Insoluble ☐

REMARKS AND RECOMMENDATIONS:

Complete H_2O

Fe

NLTC ENGINEER	DIST. NO.	ADDRESS	OFFICE PHONE	HOME PHONE

NL TREATING CHEMICALS
NL INDUSTRIES. INC.

SCALING TENDENCIES OF WATERS

COMPANY: MOBIL PRODUCING TEXAS& N.M.
SAMPLE POINT: WATER WELL
LOCATION: SNYDER RANCH
DATE: 1/13/89

WATER ANALYSIS (MG/L):

SODIUM	400.2
CALCIUM	84.0
MAGNESIUM	9.8
CHLORIDE	600.0
SULFATE	65.0
BICARBONATE	262.3
IRON	4.3
BARIUM	0.0
STRONTIUM	0.0
PH:	7.1
IONIC STRENGTH =	0.0260

INDEX VALUES GREATER THAN ZERO INDICATE SCALING CONDITIONS
INDEX VALUES OF ZERO OR LESS INDICATE A STABLE WATER

TEMP.	CALCITE INDEX	GYPSUM INDEX	ANHYDRITE INDEX	BARITE INDEX	STRONTIUM INDEX
60	-0.38	-1.92	-2.17	-40.64	-1.00
80	-0.27	-1.97	-2.11	-40.79	-1.00
100	-0.15	-1.99	-2.04	-40.91	-1.00
120	-0.04	-1.99	-1.95	-41.00	-1.00
140	0.09	-1.97	-1.85	-41.07	-1.00
160	0.22	-1.95	-1.74	-41.11	-1.00
180	0.35	-1.92	-1.61	-41.14	-1.00
200	0.49	-1.88	-1.48	-41.16	-1.00
220	0.64	-1.83	-1.33	-41.16	-1.00
240	0.79	-1.79	-1.17	-41.15	-1.00
260	0.95	-1.74	-1.00	-41.13	-1.00

Affidavit of Publication

Exhibit "E"

STATE OF NEW MEXICO)
) ss.
COUNTY OF LEA)

Joyce Clemens being first duly sworn on oath deposes and says that he is Adv. Director of THE LOVINGTON DAILY LEADER, a daily newspaper of general paid circulation published in the English language at Lovington, Lea County, New Mexico; that said newspaper has been so published in such county continuously and uninterruptedly for a period in excess of Twenty-six (26) consecutive weeks next prior to the first publication of the notice hereto attached as hereinafter shown; and that said newspaper is in all things duly qualified to publish legal notices within the meaning of Chapter 167 of the 1937 Session Laws of the State of New Mexico.

That the notice which is hereto attached, entitled Application For Authorization To Inject

and numbered ..... in the ..... Court of Lea County, New Mexico, was published in a regular and entire issue of THE LOVINGTON DAILY LEADER and not in any supplement thereof, once each week on the same day of the week, for One (1) consecutive weeks, beginning with the issue of December 29, 1987

and ending with the issue of December 29, 1987

And that the cost of publishing said notice is the sum of $ 9.10

which sum has been (Paid) (~~Assessed~~) as Court Costs

Joyce Clemens

Subscribed and sworn to before me this 30 day of December, 1987

Mrs. Jean Jenkins

Notary Public, Lea County, New Mexico

My Commission Expires Sept. 28 90, 19

LEGAL NOTICE
APPLICATION FOR AUTHORIZATION TO INJECT

1. Mobil Producing TX & NM Inc., P.O. Box 633, Midland, Texas 79702 Attention: M.E. Sweeney, (915)688-1772 will apply for permission to inject produced water into the following well/wells for the purpose of Disposal.
2. Well Name and Number: State Sec. 27 No. 2
Location: 660' FEL & 1980' FNL of Sec. 27
Section: 27, T 18-S, R 35-E
County: Lea
3. Formation Name: Devonian
Injection Interval: 11,950 to 13,708'
Maximum Injection Rate: 12,000 BWPD
Maximum Pressure: 2390 PSI
4. Interested parties, who can show that they are adversely affected by this application, must file objections or requests for hearing with the Energy and Minerals Department, Oil Conservation Division, P.O. Box 2088, Santa Fe, New Mexico 87501 within 15 days after this publication.
Published in the Lovington Daily Leader December 29, 1987.

RECEIVED
JAN 11 1988
ENV. & REG.

MOBIL PRODUCING TEXAS & NEW MEXICO, INC.
STATE SEC. 27, WELL #2
SOUTH VACUUM (DEVONIAN) FIELD
LEA COUNTY, TEXAS

EXHIBIT "F"

OFFSET OPERATORS

Arco Oil & Gas Co.
P. O. Box 1710
1515 Caller Service
Hobbs, New Mexico 88240

Exxon Company, USA
P. O. Box 1600
Midland, Texas 79702

Hanley Petroleum
1500 Wilco Bldg.
Midland, Tx. 79701

Hondo Oil & Gas
P. O. Box 2819
Dallas, Tx.

UNOCAL Corporation
P. O. Box 671
Midland, Texas 79702

Yates Energy
Southwest Centre, Ste 1010
Roswell, N.M. 88201

SURFACE OWNER

SNYDER RANCHES, INC.
P. O. BOX 726
Lovington, New Mexico 88260

Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Snyder Ranches, Inc.
P. O. Box 726
Lovington, New Mexico 88260

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

Gentlemen:

Mobil Exploration & Producing U.S. Inc., as agent for Mobil Producing Texas & New Mexico, Inc., (MPTM), has made application to the Oil Conservation Division of New Mexico for authority to dispose of produced water into a reservoir not productive of oil or gas in the above captioned well.

A copy of this application is furnished to you for your information.

Yours very truly,

M. E. Sweeney
Environmental & Regulatory Manager

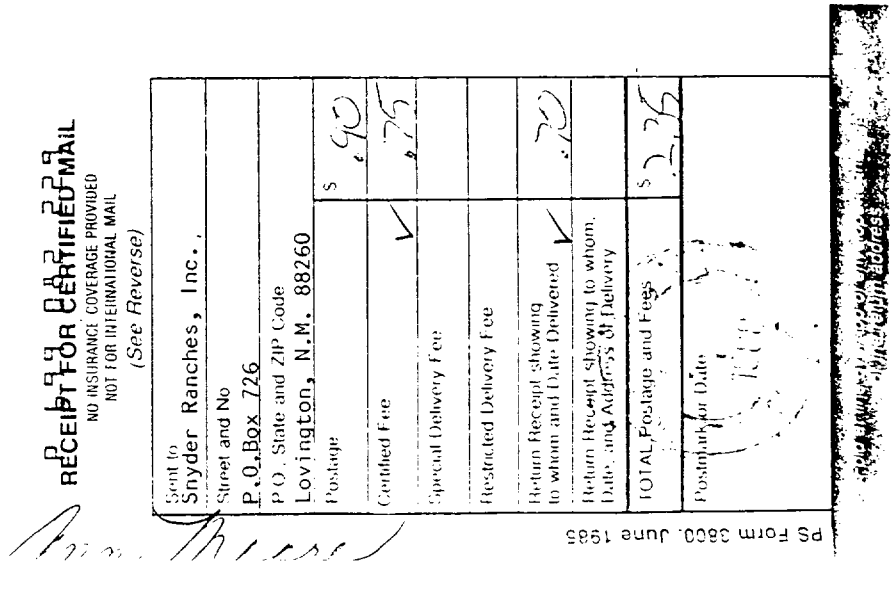
Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:N306249B.CAM
(3)



Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Hondo Oil & Gas
P. O. Box 2819
Dallas, Texas

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

Gentlemen:

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Yours very truly,

M. E. Sweeney
Environmental & Regulatory Manager

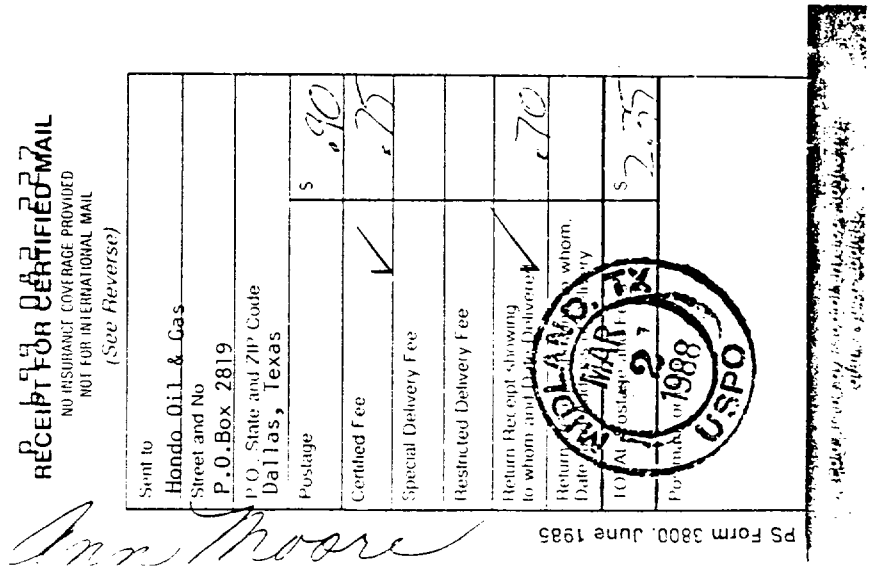
Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:M806249B.CAM
(3)



Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Yates Energy
Southwest Centre
Suite 1010
Roswell, New Mexico 88201

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

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Yours very truly,

M. E. Sweeney
Environmental & Regulatory Manager

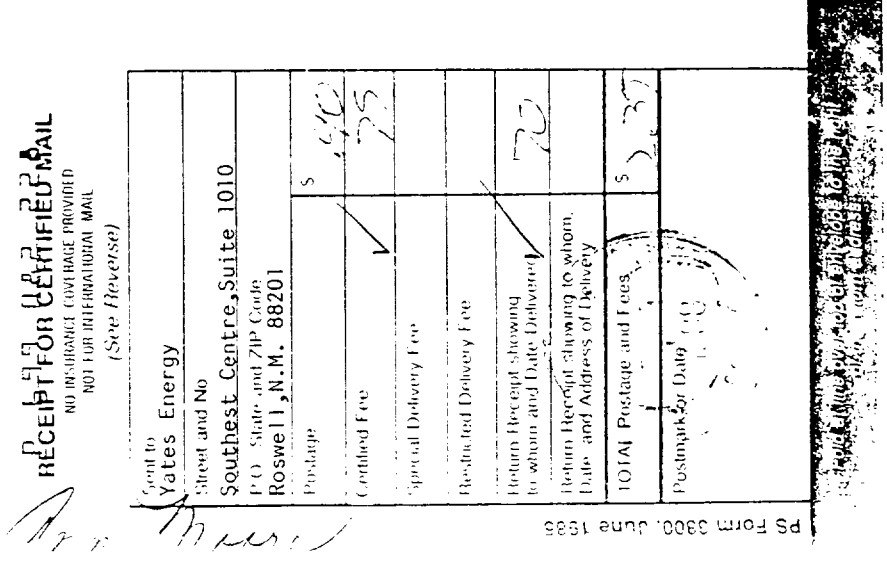
Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:M8062498.CAM
(3)



Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Exxon Company, USA
P. O. Box 1600
Midland, Texas 79702

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

Gentlemen:

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Yours very truly,

M E Sweeney

M. E. Sweeney
Environmental & Regulatory Manager

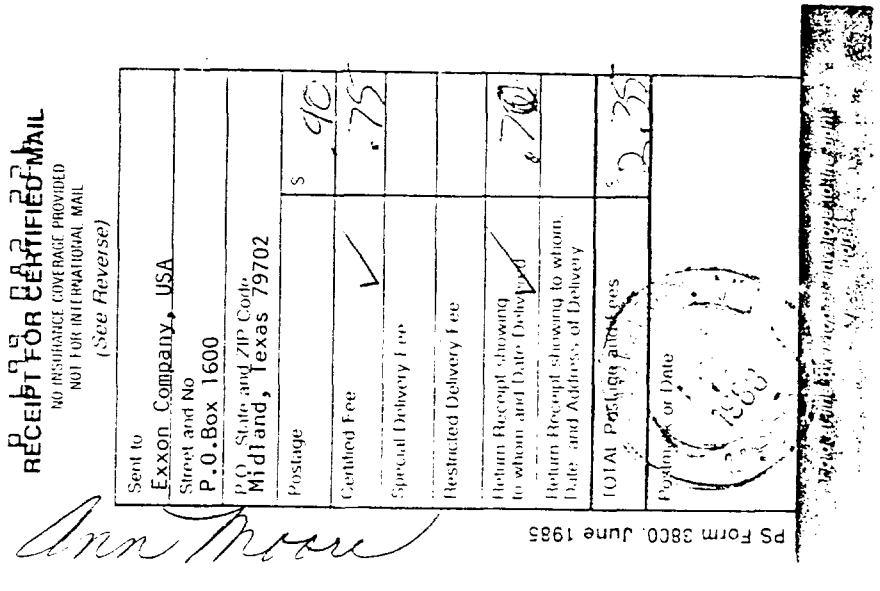
Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:M8C6249B.CAM
(3)



Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1983

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

UNOCAL Corporation
P. O. Box 671
Midland, Texas 79702

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

Gentlemen:

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Yours very truly,

M E Sweeney

M. E. Sweeney
Environmental & Regulatory Manager

Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:MS062498.CAM
(3)

RECEIPT FOR CERTIFIED MAIL
NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL
(See Reverse)

Sent to UNOCAL Corporation	
Street and No P.O.Box 671,	
P.O. State and ZIP Code Midland, Tx. 79702	
Postage	$ .40
Certified Fee	.75
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	.75
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$ 1.90
Postmark or Date	3-7-83

PS Form 3800, June 1985

Ann Moore

Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Hanley Petroleum
1500 Wilco Bldg.
Midland, Texas 79701

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

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Yours very truly,

M. E. Sweeney
Environmental & Regulatory Manager

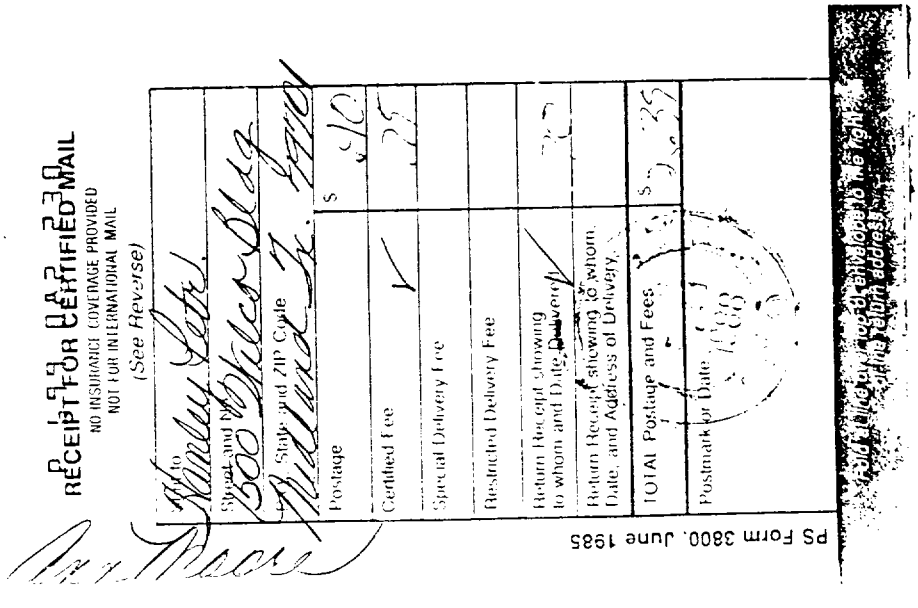
Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:M8062498.CAM
(3)



Mobil Exploration & Producing U.S. Inc.

P.O. BOX 633
MIDLAND, TEXAS 79702

MIDLAND DIVISION

March 2, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Arco Oil & Gas Co.
P. O. Box 1710
1515 Caller Service
Hobbs, New Mexico 88240

7.01
NOTICE OF APPLICATION FOR
WATER DISPOSAL WELL
STATE SEC. 27 LEASE, WELL NO. 2
VACUUM DEVONIAN, SOUTH FIELD
LEA COUNTY, NEW MEXICO

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M. E. Sweeney
Environmental & Regulatory Manager

Mobil Exploration & Producing U. S. Inc.
as Agent for
Mobil Producing Texas & New Mexico, Inc.

CAM/jlt

attachments

cc: Oil Conservation Division

A:MS062498.CAM
(3)