Schlumberger

COMPUTER PROCESSED LOG

A SYNERGETIC* LOG SYSTEM

Program:

LDT PASS 1

Using the following logs:

CNL/LDT

COMPANY PHILLIPS PETROLEUM COMPANY

WELL PHILMEX #16

FIELD LEAMEX PADDOCK

COUNTY LEA

STATE NEW MEXICO

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 5
CASE NO. 9678

DATE LOGGED 4-8-82 DATE COMPUTED 4-20-82

LOCATION 660' FSL & 330' FWL,

SEC. 26, T-17-S, R-33-E

ELEVATION KB 4136 DF GL 4125 API NO

MALJAMAR POOL
(Texaco Grayburg-San Andres Waterflood)
Lea County, New Mexico

Order No. 2710, Authorizing Texaco Inc. to Institute a Waterflood Project in the Grayburg-San Andres Formation in the Maljamar Pool, Lea County, New Mexico, June 3, 1964.

Application of Texaco Inc. for a Waterflood Project, Lea County, New Mexico.

CASE NO. 3053
Order No. R-2710

ORDER OF THE COMMISSION

BY THE COMMISSION: This cause came on for hearing at 9 o'clock a.m. on May 27, 1964, at Santa Fe, New Mexico, before Examiner Elvis A. Utz.

NOW, on this 3rd day of June, 1964, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:
(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Texaco Inc., seeks authority to institute a waterflood project in the Maljamar Pool by the injection of water into the Grayburg-San Andres formation through two wells located in Section 12, Township 17 South, Range 32 East, NMPM, Lea County, New Mexico.

(3) That the wells in the proposed project area are in an advanced state of depletion and should properly be classified as "stripper" wells.

(4) That the proposed waterflood project is in the interest of conservation and should result in recovery of otherwise unrecoverable oil, thereby preventing waste.

(5) That the subject application should be approved and the project should be governed by the provisions of Rule 701 of the Commission Rules and Regulations.

IT IS THEREFORE ORDERED:
(1) That the applicant, Texaco Inc., is hereby authorized to institute a waterflood project in the Maljamar Pool by the injection of water into the Grayburg-San Andres formation through the following-described two wells in Section 12, Township 17 South, Range 32 East, NMPM, Lea County, New Mexico:

(a) Texaco Inc. State of New Mexico "O" (NCT-3) Well No. 20 located 1980 feet from the North line and 660 feet from the East line.

(b) Texaco Inc. State of New Mexico "O" (NCT-3) Well No. 22 located 1980 feet from the North line and 1982 feet from the West line.

(2) That the subject waterflood project shall be governed by the provisions of Rule 701 of the Commission Rules and Regulations, including the allowable provisions thereof, and including the provisions with respect to expansion of the waterflood project.

(3) That monthly progress reports of the waterflood project herein authorized shall be submitted to the Commission in accordance with Rules 704 and 1119 of the Commission Rules and Regulations.

(4) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

MALJAMAR GRAYBURG-SAN ANDRES POOL
(Maljamar Cooperative Area Unit Pilot Carbon Dioxide/Wate. Injection)
Lea County, New Mexico

Order No. R-6157, Authorizing Continental Oil Company to Conduct a Pilot Carbon Dioxide/Water Injection Project in the Maljamar Cooperative Area Unit in the Maljamar Grayburg-San Andres Pool, Lea County, New Mexico, October 30, 1979.

Application of Continental Oil Company for a Carbon Dioxide Injection Project, Lea County, New Mexico.

CASE NO. 6580
Order No. R-6157

ORDER OF THE DIVISION

BY THE DIVISION: This cause came on for hearing at 9 a.m. on September 19, 1979, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 30th day of October, 1979, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:
(1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Continental Oil Company, seeks authority to initiate a pilot carbon dioxide injection project in the Grayburg-San Andres formation in Units H and I of Section 20, Township 17 South, Range 32 East, NMPM, Maljamar Pool, Lea County, New Mexico, for tertiary recovery purposes.

(3) That said pilot project is in an area wherein primary recovery and secondary recovery operations have been conducted.

(4) That the proposed pilot project is of an experimental nature to evaluate the effectiveness of carbon dioxide injection into the subject reservoir, and as such, will require the drilling of a number of wells at close proximity to each other for purposes of injection and production, and to provide a study of zone isolation, vertical heterogeneity, reservoir directional variation, and the carbon dioxide displacement process.

(MALJAMAR GRAYBURG-SAN ANDRES (MALJAMAR COOPERATIVE AREA UNIT PILOT CARBON DIOXIDE/WATER INJECTION) POOL - Cont'd.)

(5) That in the event the pilot project is successful and indicates the desirability and economic feasibility of process, the pilot project would be expanded to include additional lands and wells, and would result in the production of otherwise unrecoverable oil, thereby preventing waste.

(6) That the pilot project is to be conducted well within the boundaries of the Maljamar Cooperative Area, a unitized area, and will therefore not impair correlative rights.

(7) That the proposed pilot project should be approved, as well as certain non-standard locations and provisions for additional injection, production, and observation wells at orthodox and unorthodox locations, and expansion of the pilot.

IT IS THEREFORE ORDERED:

(1) That the applicant, Continental Oil Company, is hereby authorized to initiate and conduct a pilot carbon dioxide/water injection project in the Maljamar Cooperative Area Unit, Maljamar Grayburg-San Andres Pool, Lea County, New Mexico.

(2) That the applicant is hereby authorized to continue to inject water in its MCA Unit Well No. 48, located 1980 feet from the North line and 660 feet from the East line of Section 20, Township 17 South, Range 32 East, NMPM, and to convert to water injection its MCA Unit Well No. 256, located 2590 feet from the South line and 1310 feet from the East line of said Section 20, Well No. 66, located 1980 feet from the South line and 660 feet from the East line of said Section 20, and Well No. 262 located 2615 feet from the North line and 25 feet from the West line of Section 21, Township 17 South, Range 32 East, NMPM.

(3) That the applicant is hereby authorized to drill its MCA Unit Well No. 358 at a point 2600 feet from the North line and 660 feet from the East line of the aforesaid Section 20, and to place said well on temporary production.

(4) That the applicant is hereby authorized to drill four production wells, to be known as the P-1, P-2, P-3, and P-4, said wells to be located approximately 330 feet Northeast, 330 feet Northwest, 330 feet Southwest, and 330 feet Southeast, respectively, of the above described MCA Unit Well No. 358, and to drill two logging, testing, and observation wells, to be known as the L-1 and L-2, said wells to be located approximately midway between the aforesaid MCA Unit Well No. 358 and P-1, and 358 and P-4, respectively.

(5) That upon completion of testing and evaluation of the wells and the reservoir in the pilot area, applicant is authorized to convert the aforesaid MCA Unit Well No. 358 to selective water/carbon dioxide injection into the Grayburg Sixth Zone and the San Andres Ninth Massive Zone.

(6) That the above-described P-1, P-2, P-3, and P-4 producing wells shall be equipped with surface casing set at approximately 700 feet with cement circulated to the surface, and with a long string set at approximately 4150 feet with cement circulated to the surface by means of a DV tool; that said wells shall be dually completed in the Grayburg Sixth Zone and the San Andres Ninth Massive Zone with parallel strings of tubing and separation of the zones by means of a packer.

(7) That the above-described MCA Unit Well No. 358 shall be cased and cemented in like manner to the aforesaid P-1, P-2, P-3, and P-4 wells, and for injection purposes, shall be dually completed equipped with parallel strings of plastic-lined tubing for water/carbon dioxide injection into the Grayburg Sixth Zone and the San Andres Ninth Massive Zone with separation of the zones achieved by means of a packer; further that another packer shall be installed above the uppermost Grayburg perforations and the casing-tubing annulus loaded with an inert fluid; that a pressure gauge shall be attached to the annulus or the annulus shall be equipped with an approved leak detection device to facilitate detection of leakage in the casing, tubing, or packer.

(8) That the injection wells or injection system shall be equipped with a pressure regulator or other acceptable device which will limit the wellhead pressure on the injection wells to no more than 2150 psi.

(9) That the operator shall notify the Supervisor of the Hobbs district office of the Division when the injection system installation has been completed so that an inspection of the same may be made prior to its operation.

(10) That the operator shall immediately notify the Supervisor of the Hobbs district office of the Division of the failure of the tubing, casing, packer, or cement in any well in the project area, or of the leakage of water or oil from or around any of said wells, and shall take such timely steps as may be necessary to correct such failure or leakage.

(11) That the operator shall have the flexibility to drill its production, injection, and observation wells at locations other than those described above, dependent upon analysis of reservoir and fluid characteristics, provided however, that it shall notify the Santa Fe office of the Division of any such location change and provided further that none of the unauthorized injection/production/observation wells shall be located outside the project area as defined below.

(12) That the subject project shall be known as the Conoco Maljamar CO_2 Injection Project, and the project area shall comprise the following described lands:

TOWNSHIP 17 SOUTH, RANGE 32 EAST, NMPM
Section 20: S/2 NE/4 and SE/4
Section 21: SW/4 NW/4 and W/2 SW/4

(13) That said project area may be expanded and additional wells drilled and placed on production and/or water/carbon dioxide injection at orthodox and unorthodox locations upon filing written request therefor with the Division Director, with copies of such request being furnished to the operator of any directly or diagonally offsetting 40-acre proration unit not committed to and participating in the MCA Unit. The Division Director may approve the request if, after a period of 20 days, no such offset operator has objected thereto.

(14) That the Conoco Maljamar CO_2 Injection Project shall be governed by this order and the rules contained herein and by the provisions of Rules 701, 702, and 703 of the Division Rules which are not in conflict herewith.

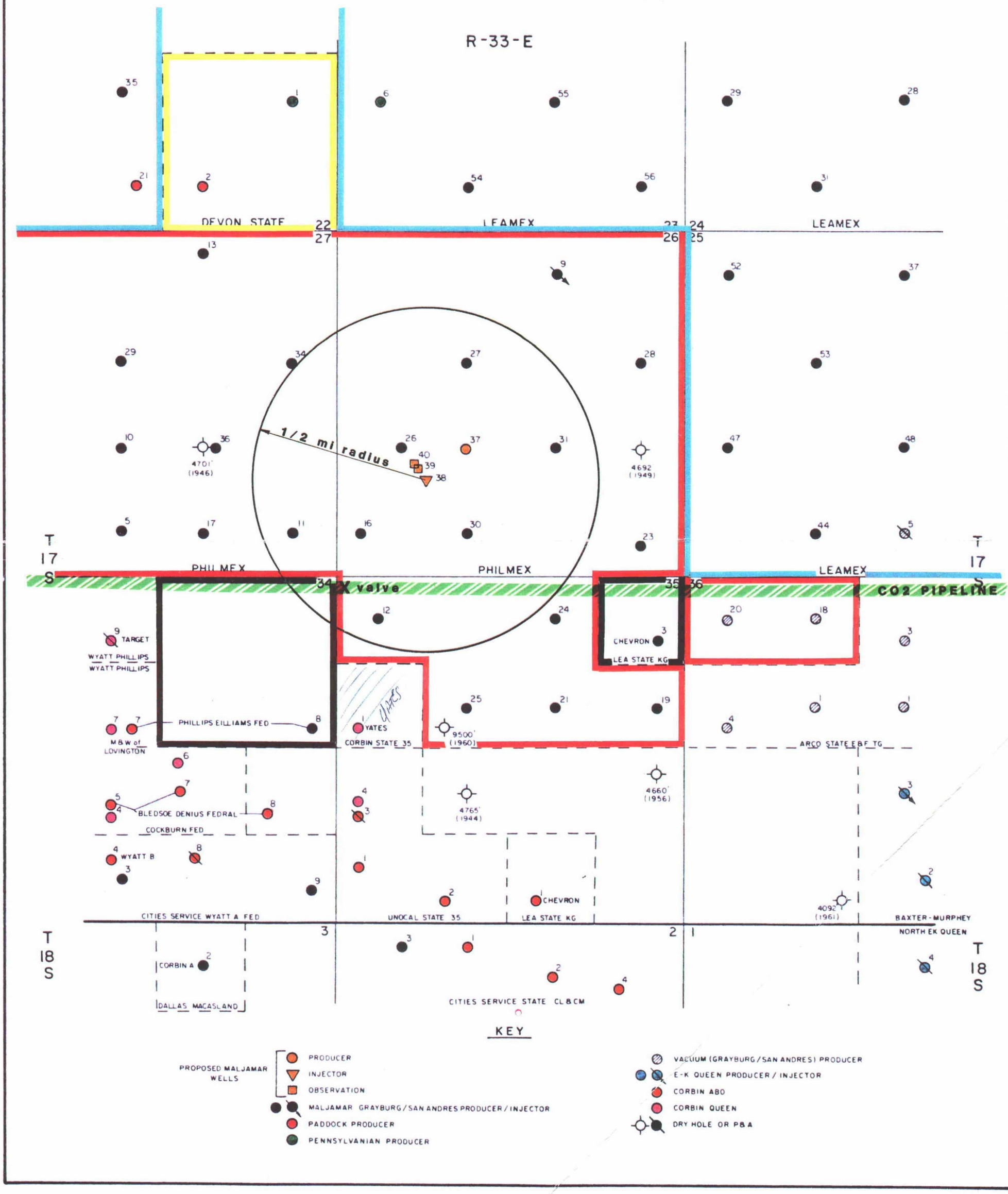
(15) That monthly project reports of the project herein authorized shall be submitted to the Division in accordance with Rule 704 of the Division Rules, provided however, that a separate supplemental report on Form C-115 shall also be filed each month reporting volumes of water and carbon dioxide injected.

(16) That jurisdiction of this cause is retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

MALJAMAR CO_2 PILOT PROJECT

PHILLIPS PETROLEUM COMPANY



KEY

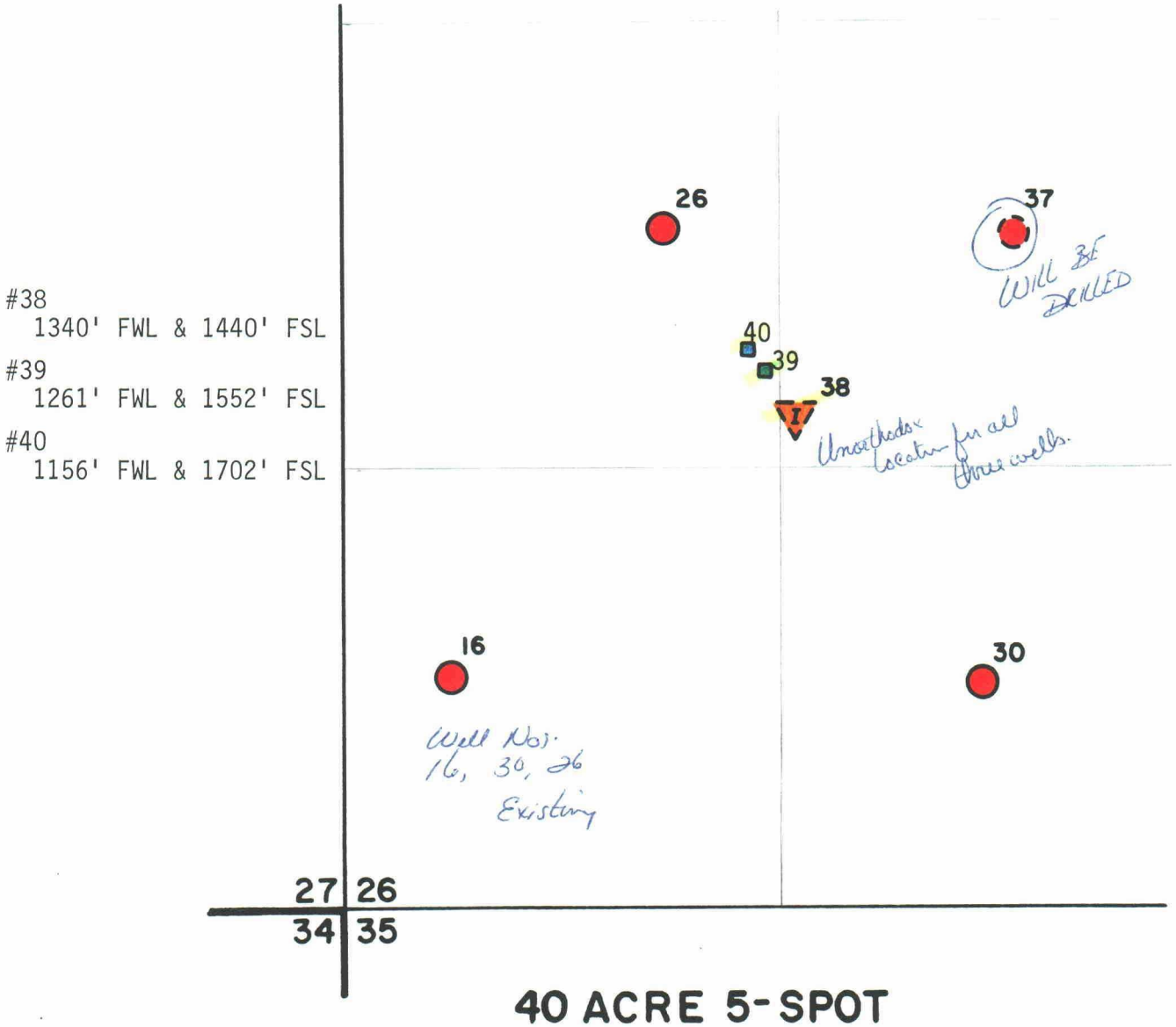
PROPOSED MALJAMAR WELLS
- PRODUCER
- INJECTOR
- OBSERVATION

MALJAMAR GRAYBURG/SAN ANDRES PRODUCER/INJECTOR
PADDOCK PRODUCER
PENNSYLVANIAN PRODUCER
VACUUM (GRAYBURG/SAN ANDRES) PRODUCER
E-K QUEEN PRODUCER/INJECTOR
CORBIN ABO
CORBIN QUEEN
DRY HOLE OR P&A

ATTACHMENT NO. 3

MALJAMAR CO_2 PILOT PROJECT

MALJAMAR GRAYBURG/SAN ANDRES FIELD



40 ACRE 5-SPOT

PHILMEX LEASE

SW/4 SEC 26-17S-33E

LEA COUNTY, NEW MEXICO

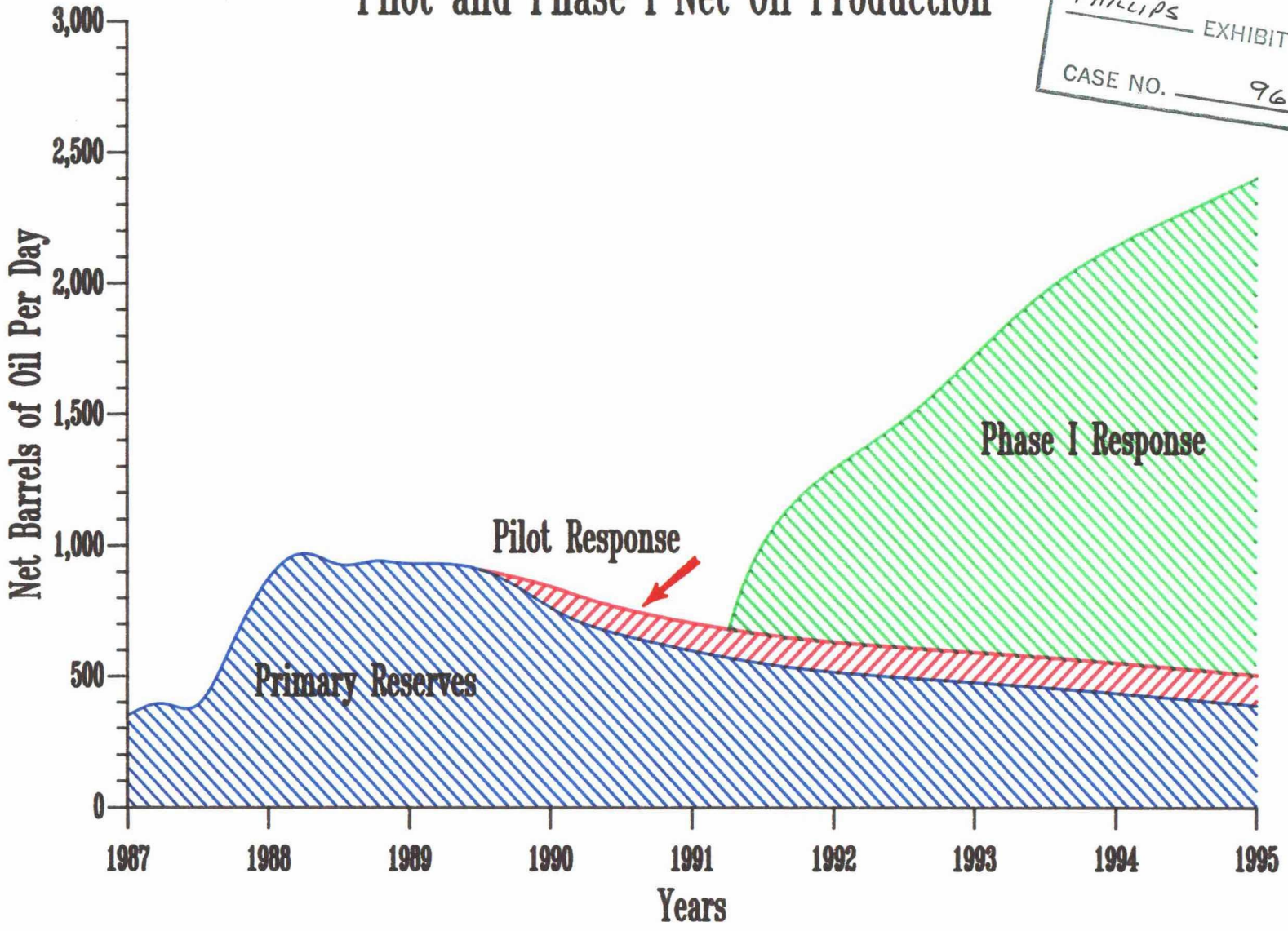
■ OBSERVATION WELL

⁄ TO BE DRILLED

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 8
CASE NO. 9678

Maljamar CO_2 Project

Pilot and Phase I Net Oil Production



MALJAMAR CO_2 PILOT PROJECT

Phillips Petroleum Company

Description	Cost ($m)*
Production Well	286.2
Injection Well	301.0
Observation Well No. 1	173.4
Observation Well No. 2	173.4
Tank Battery Equipment	176.6
Miscellaneous Lines	54.1
TOTAL	$ 1164.8

* amount x 1000

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

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

FORM C-108
Revised 7-1-81

APPLICATION FOR AUTHORIZATION TO INJECT

I. Purpose: [X] Secondary Recovery [ ] Pressure Maintenance [ ] Disposal [ ] Storage
Application qualifies for administrative approval? [ ] yes [X] no

II. Operator: PHILLIPS PETROLEUM COMPANY

Address: 4001 PENBROOK, ODESSA, TEXAS 79762

Contact party: L. M. SANDERS Phone: (915) 367-1488

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? [X] yes [ ] no
If yes, give the Division order number authorizing the project R-3668.

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.

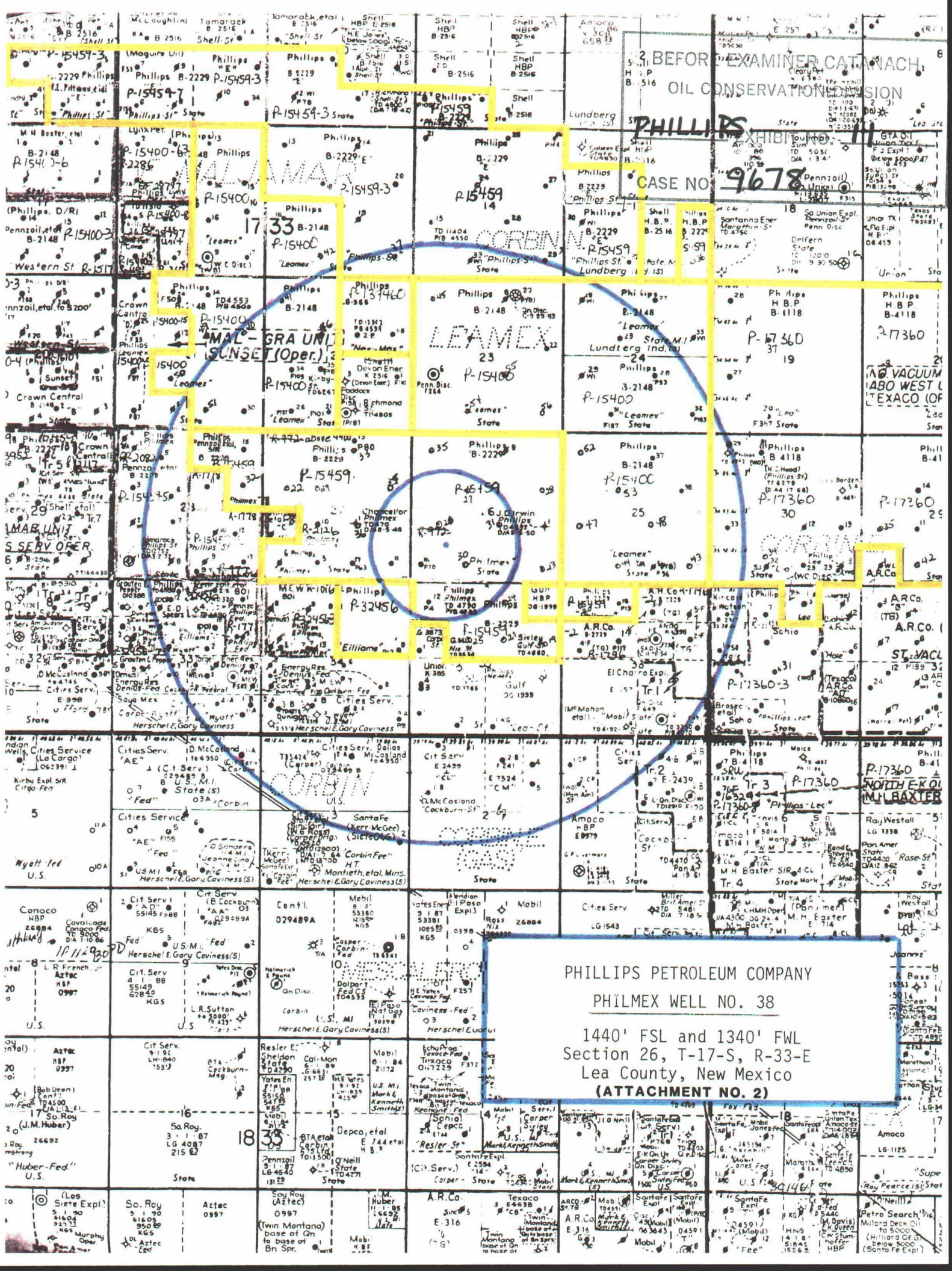
XIV. Certification

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

Name: W. J. Mueller Title Resv. Engr. Supv.

Signature: W. J. Mueller Date: 2 May 1989

* 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.

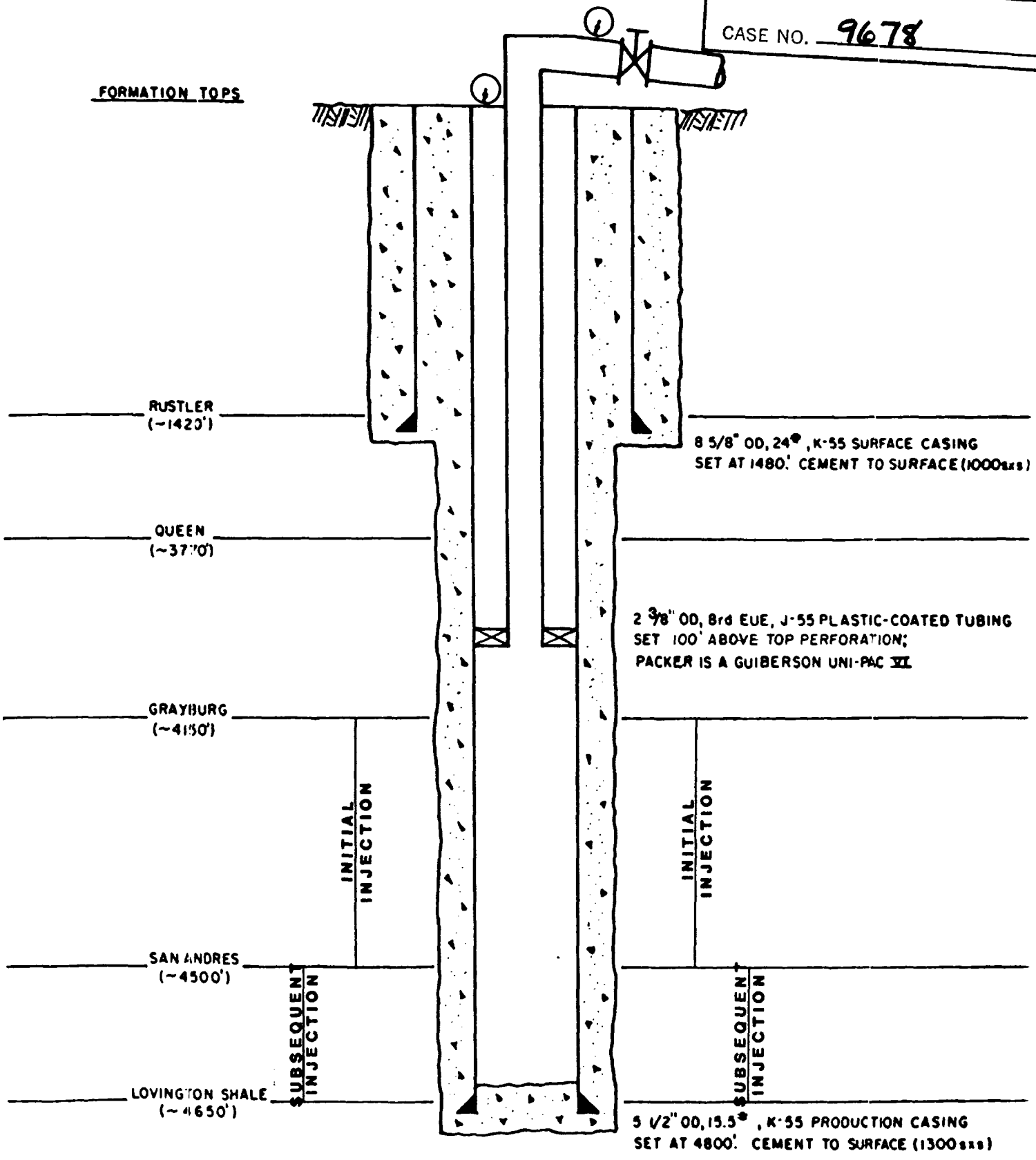

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 11
CASE NO. 9678
MAL-MAR
SUNSET (Oper.)
CORBIN
LEAMEX
PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NO. 38
1440' FSL and 1340' FWL
Section 26, T-17-S, R-33-E
Lea County, New Mexico
(ATTACHMENT NO. 2)

BEFORE EXAMINER
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 11
CASE NO. 9678

PROPOSED INJECTION WELL SCHEMATIC

PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NUMBER 38
1440' FSL & 1340' FWL
SECTION 26, T-17-S, R-33-E
LEA COUNTY, NEW MEXICO

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 12
CASE NO. 9678



ATTACHMENT NO. 1

Application for Authorization to Inject

PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NO. 38

III. WELL DATA

(See Attachment No. 1 - Wellbore Schematic)

A. Production Well

1.	Name and Location	Philmex Well Number 38 1440' FSL and 1340' FWL Section 26, T-17-S, R-33-E Lea County, New Mexico
2.	Casing Surface:	8 - 5/8" OD, 24#, K-55 set at 1480' (12 - 1/4" hole). To be cemented with 1000 sxs Class C; calculated TOC** at surface (circulate).
	Production:	5 - 1/2" OD, 15.5#, K-55 set at 4800' (7 - 7/8" hole). To be cemented with 1300 sxs Class C; calculated TOC** at surface (circulate).
3.	Tubing:	2 - 3/8" OD, 8rd EUE, J-55 set 100' above top perforation (internally plastic coated).
4.	Packer:	Guiberson Uni-Pac VI Retrievable Packer set 100' above top perforation.

Observation Wells

1.	Names and Locations:	Philmex Well Number 39 1552' FSL and 1261' FWL Section 26, T-17-S, R-33-E Lea County, New Mexico Philmex Well Number 40 1702' FSL and 1156' FWL Section 26, T-17-S, R-33-E Lea County, New Mexico
2.	Casing Surface:	9 - 5/8" OD, 32.3#, H-40 set at 1480' (12 - 1/4" hole). To be cemented with 800 sxs Class C; calculated TOC** at surface (circulate).
	Production:	5 - 1/2" OD, 15.5#,J-55 set at 4050' AND 5 - 1/2" OD fiberglass from 4050' to 4850' (8 - 1/2" hole). To be cemented based on caliper + 30% excess.

NOTE: two observation wells will be drilled in close proximity to injection well

** actual TOCs will be reported on Form C-105

Application for Authorization to Inject

PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NO. 38

III. WELL DATA (con't)

B. 1.	Formation:	Maljamar (Grayburg/San Andres)
2.	Interval:	4130' - 4530'**
3.	Original Intent:	Well drilled for CO_2 injection.
4.	Perforated Intervals:	no other perforated intervals; no bridge plugs in wellbore
5.	Productive Zones Higher:	Queen - 3770' (1 1/2 miles southwest)
	Lower:	Corbin Abo Reef - 8200' (1 1/4 miles south)

V. AREA OF REVIEW
(See Attachments No. 2 and 3 - Project Map and Detail Map)

VII. PROPOSED CO_2 INJECTION OPERATIONS

1.	CO_2 Rates:	estimated average - 400 mcfpd estimated maximum - 500 mcfpd
2.	System:	closed
3.	Pressures:	average - 1400 psi maximum - 1700 psi
4.	Fluid:	CO_2 source from McElmo Dome in Colorado; transported by Shell in the Cortez line and by Big Three in the Llano pipeline. Compatibility with receiving formation is evidenced by Phillips Petroleum East Vacuum Unit and Conoco's MCA (respectively, six miles east and west of Philmex lease).

** actual perforations will be reported on Form C-105

Application for Authorization to Inject

PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NO. 38

VIII. GEOLOGICAL DATA

A. Injection Zone: Initially, injection will be within the Grayburg Formation, a 400′ thick sequence of interbedded sands and dolomites. The primary pays are very fine grained sandstones that are one to ten feet thick and are bound by low porosity anhydritic dolomites.

After Grayburg pilot evaluation, subsequent injection will be into the San Andres Formation, a dolomite underlying the Grayburg Sands.

B. Fresh Water Sources: Ogallala - base at 220′
Santa Rosa - base at 1280′

IX. PROPOSED STIMULAION PROGRAM

After perforation, well will be acidized with 15% NEFE HCl and fractured with 60-Quality CO_2 Foam. Exact sand volumes will be determined after well logs are available.

X. LOGGING DATA

Well logs will be submitted, by logging company, after injection and observation wells are drilled.

Logging suite will include:
- CNL/LDT/Cal/GR
- DISF

XI. FRESH WATER ANALYSES

(no fresh water wells within 1 mile radius)

Fresh Water Well Locations -- see Attachment No. 4

Fresh Water Analyses -- see Attachments No. 5 and 6

APPLICATION for AUTHORIZATION to INJECT

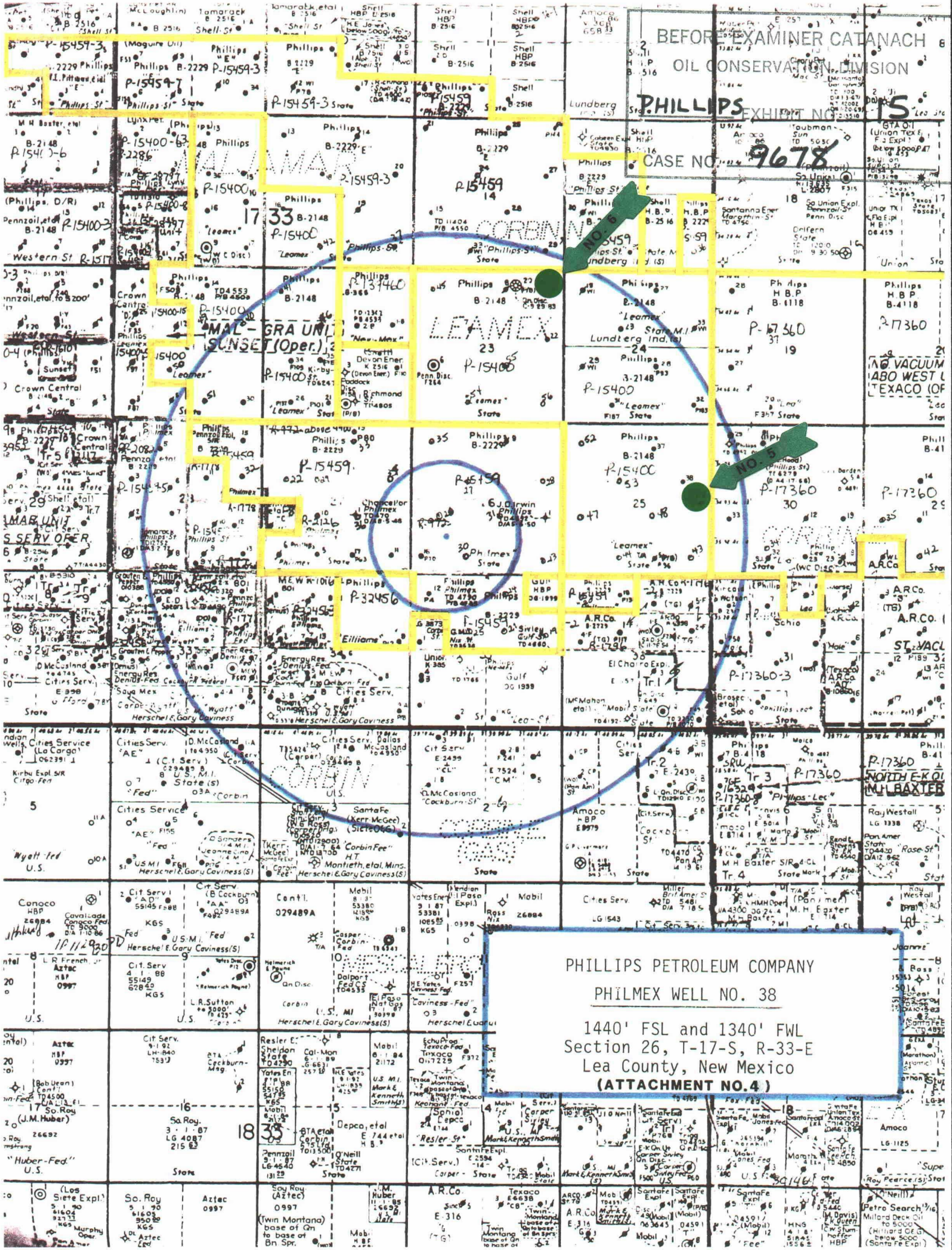
PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NUMBER 38

VI. WELLS WITHIN THE AREA OF INTEREST
(radius of investigation = +1/2 mile)

Operator	Well Name	Location	Date Spudded	Total Depth (Well Type)	Surface Casing Size (in)	Surface Casing Depth (ft)	Surface Casing Cement (sx) (TOC)	Production Casing Size (in)	Production Casing Depth (ft)	Production Casing Cement (sx) (TOC)	Producing Perforations (zone)
PHILLIPS PETR. COMPANY	Philmex #11	660' FSL & 660' FEL Section 27-17S-33E Lea County, NM	14 August 1970	4702' (oil)	8 5/8	360	300 (surf:circ)	4 1/2	4702	275 (2625':ts)	4298' - 4664' Maljamar (GB/SA)
	Philmex #12	660' FNL & 660' FWL Section 35-17S-33E Lea County, NM	03 Nov. 1970	4789' (oil)	8 5/8	370	350 (surf:circ)	4 1/2	4789	300 (2750':ts)	4297' - 4420' Maljamar (GB/SA)
	Philmex #16	660' FSL & 330' FWL Section 26-17S-33E Lea County, NM	26 March 1982	6200' (oil)	8 5/8	1450	770 (surf:circ)	4 1/2	6200	876 (surf:circ)	4264' - 4581' Maljamar (GB/SA)
	Philmex #24	660' FNL &1980' FEL Section 35-17S-33E Lea County, NM	21 October 1987	4800 (oil)	8 5/8	1485	1000 (surf:circ)	5 1/2	4800	1600 (surf:circ)	4197' - 4666' Maljamar (GB/SA)
	Philmex #26	1980' FSL & 960' FWL Section 26-17S-33E Lea County, NM	23 Nov. 1987	4800' (oil)	8 5/8	1478	1000 (surf:circ)	5 1/2	4800	1650 (surf:circ)	4192' - 4599' Maljamar (GB/SA)
	Philmex #27	1980' FNL & 1980' FWL Section 26-17S-33E Lea County, NM	08 Febr. 1988	4800' (oil)	8 5/8	1500	1000 (surf:circ)	5 1/2	4800	1800 (surf:circ)	4218' - 4607' Maljamar (GB/SA)
	Philmex #30	660' FSL & 1880' FWL Section 26-17S-33E Lea County, NM	22 June 1988	4800' (oil)	8 5/8	1510	1000 (surf:circ)	5 1/2	4800	1300 (surf:circ)	4194' - 4612' Maljamar (GB/SA)
	Philmex #31	1980' FSL & 2105' FEL Section 26-17S-33E Lea County, NM	30 June 1988	4800' (oil)	8 5/8	1480	1000 (surf:circ)	5 1/2	4800	1300 (surf:circ)	4218' - 4596' Maljamar (GB/SA)
	Philmex #34	1980' FNL & 660' FEL Section 27-17S-33E Lea County, NM	09 August 1988	4800' (oil)	8 5/8	1482	1000 (surf:circ)	5 1/2	4800	1200 (surf:circ)	4094' - 4588' Maljamar (GB/SA)

ts = temperature survey

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 14
CASE NO. 9678


BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIBIT NO. 5
CASE NO. 9678
NO. 6
NO. 5
PHILLIPS PETROLEUM COMPANY
PHILMEX WELL NO. 38
1440' FSL and 1340' FWL
Section 26, T-17-S, R-33-E
Lea County, New Mexico
(ATTACHMENT NO. 4)

BEFORE EXAMINER CATANACH
OIL CONSERVATION DIVISION
PHILLIPS EXHIDIT NO. 15
CASE NO. 9678

Unichem International

707 North Leech P.O.Box 1499

Hobbs, New Mexico 88240

Company : PHILLIPS PETROLEUM
Date : 05-02-1989
Location: AMEX #1 (on 05-02-1989)

	Sample 1
Specific Gravity:	1.000
Total Dissolved Solids:	345
pH:	7.05
IONIC STRENGTH:	0.007

CATIONS:		me/liter	mg/liter
Calcium	(Ca^{+2})	2.80	56.0
Magnesium	(Mg^{+2})	1.30	15.8
Sodium	(Na^{+1})	0.538	12.4
Iron (total)	(Fe^{+2})	0.018	0.500
ANIONS:			
Bicarbonate	(HCO_3^{-1})	3.60	220
Carbonate	(CO_3^{-2})	0	0
Hydroxide	(OH^{-1})	0	0
Sulfate	(SO_4^{-2})	0.333	16.0
Chloride	(Cl^{-1})	0.705	25.0

SCALING INDEX (positive value indicates scale)

Temperature		Calcium Carbonate	Calcium Sulfate
86°F	30°C	-0.34	-18

ATTACHMENT NO. 5

Unichem International

707 North Leech P.O.Box 1499

Hobbs, New Mexico 88240

Company : PHILLIPS PETROLEUM
Date : 05-02-1989
Location: DJVAL (on 05-02-1989)

	Sample 1
Specific Gravity:	1.000
Total Dissolved Solids:	322
pH:	7.08
IONIC STRENGTH:	0.007

CATIONS:		me/liter	mg/liter
Calcium	(Ca^{+2})	2.80	56.0
Magnesium	(Mg^{+2})	1.40	17.0
Sodium	(Na^{+1})	0.205	4.71
Iron (total)	(Fe^{+2})	0.021	0.600
ANIONS:			
Bicarbonate	(HCO_3^{-1})	3.20	195
Carbonate	(CO_3^{-2})	0	0
Hydroxide	(OH^{-1})	0	0
Sulfate	(SO_4^{-2})	0.500	24.0
Chloride	(Cl^{-1})	0.705	25.0

SCALING INDEX (positive value indicates scale)

Temperature		Calcium Carbonate	Calcium Sulfate
86°F	30°C	-0.36	-18

ATTACHMENT NO. 6