CASE 6248: MOBIL OIL CORPORATION FOR A PRESSURE MAINENANCE PROJECT, LEA COUNTY, NEW MEXICO

CASE NO.

6248

APPLICATION,
TRANSCRIPTS,
SMALL EXHIBITS,

ETC.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

September 22, 1978

Re: CASE NO. 6248
ORDER NO. R-5801

Mr. James E. Sperling
Modrall, Sperling, Roehl,
Harris & Sisk
Attorneys At Law
Post Office Box 2168
Albuquerque, New Mexico 87103

Applicant:

Mobil Oil Corporation

Dear Sir:

Enclosed herewith are two copies of the above-referenced Division order recently entered in the subject case.

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCC x
Artesia OCC x
Aztec OCC

Other Tom Kellahin

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6248
Order No. R-5801

APPLICATION OF MOBIL OIL CORPORATION
FOR A PRESSURE MAINTENANCE PROJECT,
LEA COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on June 7, 1978, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 20th day of September, 1978, 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 notive having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Mobil Oil Corporation, seeks authority to institute a pressure maintenance project in the North Vacuum-Abo Pool in its North Vacuum-Abo East Unit Area, Lea County, New Mexico, by the injection of water into the Abo formation through five wells located in Units N and P of Section 7 and Units F, H and N of Section 18, all in Township 17 South, Range 35 East, NMPM, Lea County, New Mexico.

(3) That the applicant further seeks the designation of the project area and the promulgation of special rules and regulations governing said project including a provision for administrative approval for unorthodox locations for injection wells and producing wells.

(4) That the project area should comprise the following-described area:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 7: S/2
Section 18: N/2, SW/4, and W/2 SE/4

(5) That injection should be through corrosion-resistant lined tubing installed in a packer set as near to the uppermost perforation as practicable; that the casing-tubing annulus should be loaded with an inert fluid and equipped with a pressure gauge; and that the injection system or each of the injection wells should be equipped with a pop-off valve or other acceptable device to limit the injection pressure to 3500 psi unless the Division Director shall have approved a higher injection pressure upon showing by the operator that formation fracturing will not result therefrom.

(6) That a pressure maintenance project, designated the Mobil North Vacuum-Abo East Pressure Maintenance Project, comprising the above-described area is in the interest of conservation and should result in greater ultimate recovery of oil, thereby preventing waste.

(7) That an administrative procedure should be established whereby said project area may be expanded for good cause shown and whereby additional injection wells and producing wells at orthodox and unorthodox locations in the project area may be approved without the necessity of notice and hearing.

(8) That special rules and regulations for the operation of the Mobil North Vacuum-Abo East Pressure Maintenance Project should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project area in any proportion, provided that no well in the project area which directly or diagonally offsets a well on another lease producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the North Vacuum-Abo Pool until such time as the well has experienced a substantial response to water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the North Vacuum-Abo Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant, Mobil Oil Corporation, is hereby authorized to institute a pressure maintenance project in the North Vacuum-Abo Pool in its North Vacuum-Abo East Unit Area, Lea County, New Mexico, to be designated the Mobil North Vacuum Abo East Pressure Maintenance Project, by the injection of water into the Abo formation, through the following-described wells in Township 17 South, Range 35 East, NMPM:

Operator	Lease	Well No.	Unit	Section
Mobil	State "A" Com	1	N	7
Mobil	State "MM"	1	P	7
Texaco	State "DJ"	3	H	18
Texaco	State "DJ"	4	F	18
Mobil	Elk State Com	1	N	18

(2) That injection into each of the aforesaid wells should be accomplished through corrosion-resistant lined tubing set in a packer as close as is practicable to the uppermost Abo perforation. The casing-tubing annulus in each injection well shall be loaded with an inert fluid and a pressure gauge installed to facilitate detection of leakage in the casing, tubing, or packer.

(3) That the injection system or wells shall be equipped with a pop-off valve or other acceptable device which will limit the surface injection pressure to 3500 psi unless the Division Director shall have administratively authorized a higher injection pressure.

(4) That Special Rules and Regulations governing the operation of the Mobil North Vacuum-Abo East Pressure Maintenance Project, Lea County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE
MOBIL NORTH VACUUM-ABO EAST PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Mobil North Vacuum-Abo East Pressure Maintenance Project, hereinafter referred to as the Project, shall comprise the area described as follows:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 7: S/2
Section 18: N/2, SW/4, and W/2 SE/4

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies,

or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3 which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the North Vacuum-Abo Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Division Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Division, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Division, if they so desire.

RULE 7. The basic allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the pool, whichever is less. Wells capable of producing more than top unit allowable may also receive transfer allowable, provided however, that no producing well in the project area which directly or diagonally offsets a well on another lease producing from the same common source of supply shall receive an allowable or produce in excess of two times top unit allowable for the pool. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the pool.

RULE 8. Each month the project operator shall submit to the Division a Pressure Maintenance Project Operator's Report, on a form prescribed by the Division, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total project allowable based upon the pool's depth bracket allowable and the market demand percentage factor in effect. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 9. The Division shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well on another lease producing from the same common source of supply shall produce in excess of two times top unit allowable for the pool.

RULE 10. The Director of the Division is hereby authorized to approve such additional producing wells and injection wells at orthodox and unorthodox locations within the boundaries of the North Vacuum-Abo East Unit Area as may be necessary to complete an efficient production and injection pattern, provided said wells are drilled no closer than 460 feet to the outer boundary of said unit nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary. To obtain such approval, the project operator shall file proper application with the Division, which application, if it seeks authorization to convert additional wells to injection or to drill additional production or injection wells shall include the following:

(1) A plat showing the location of proposed well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed well which fully describes the casing, tubing, perforated interval, and depth.

(3) A letter stating that all offset operators to the proposed well have been furnished a complete copy of the application and the date of notification.

The Director may approve the proposed well if, within 20 days after receiving the application, no objection to the proposal is received. The Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Director of the Division administratively when good cause is shown therefor.

(5) 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.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

fd/

EXHIBIT 11
~~APPENDIX I~~

NORTH VAC ABO EAST UNIT
BACK UP DATA PERTAINING TO
MAXIMUM INJECTION PRESSURE OF ~~4800~~ PSIG.

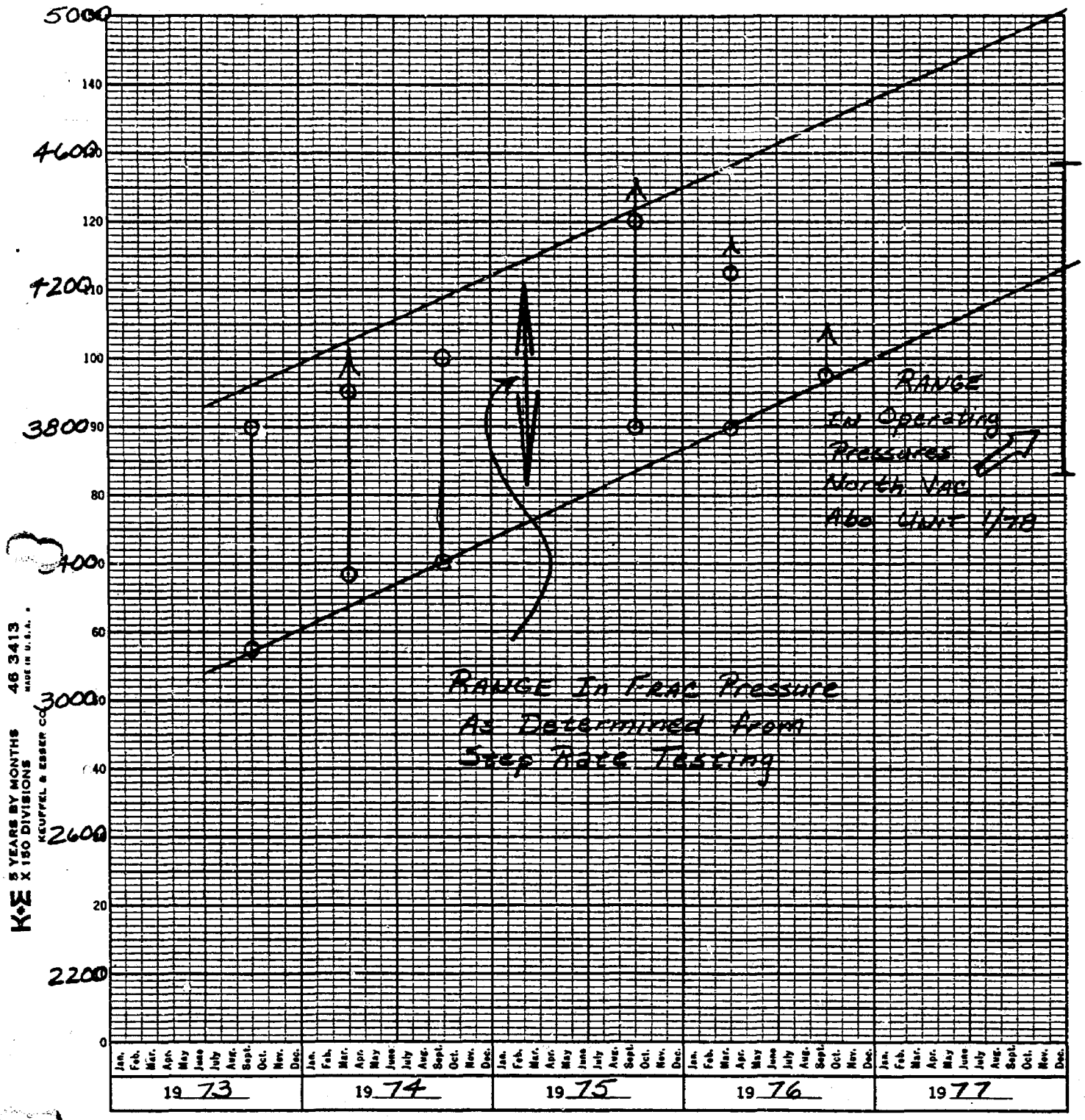
BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
EXHIBIT NO. 11
CASE NO. 6248

The NMOCC approved unitization and fluid injection into the Abo on October 27, 1972. Injection began August 1, 1973 using a five spot pattern. Inejction profiles have been run on 35 of 38 injectors. This type survey work was initiated early in the flood life as soon as increasing wellhead pressures were noted. Results of each of these surveys concluded there was confinement of the injected water to the Abo reservoir.

Sixty-two step rate tests were run from late 1973 through 1976. The test results are plotted on the attached graph. They show that the present frac pressure ranges from 4250 psig to 5000 psig at the surface. Current operating pressures range from 3650 psig to 4560 psig, which is well below the maximum frac pressure. The graph also illustrates that frac pressure increases as more water is injected.

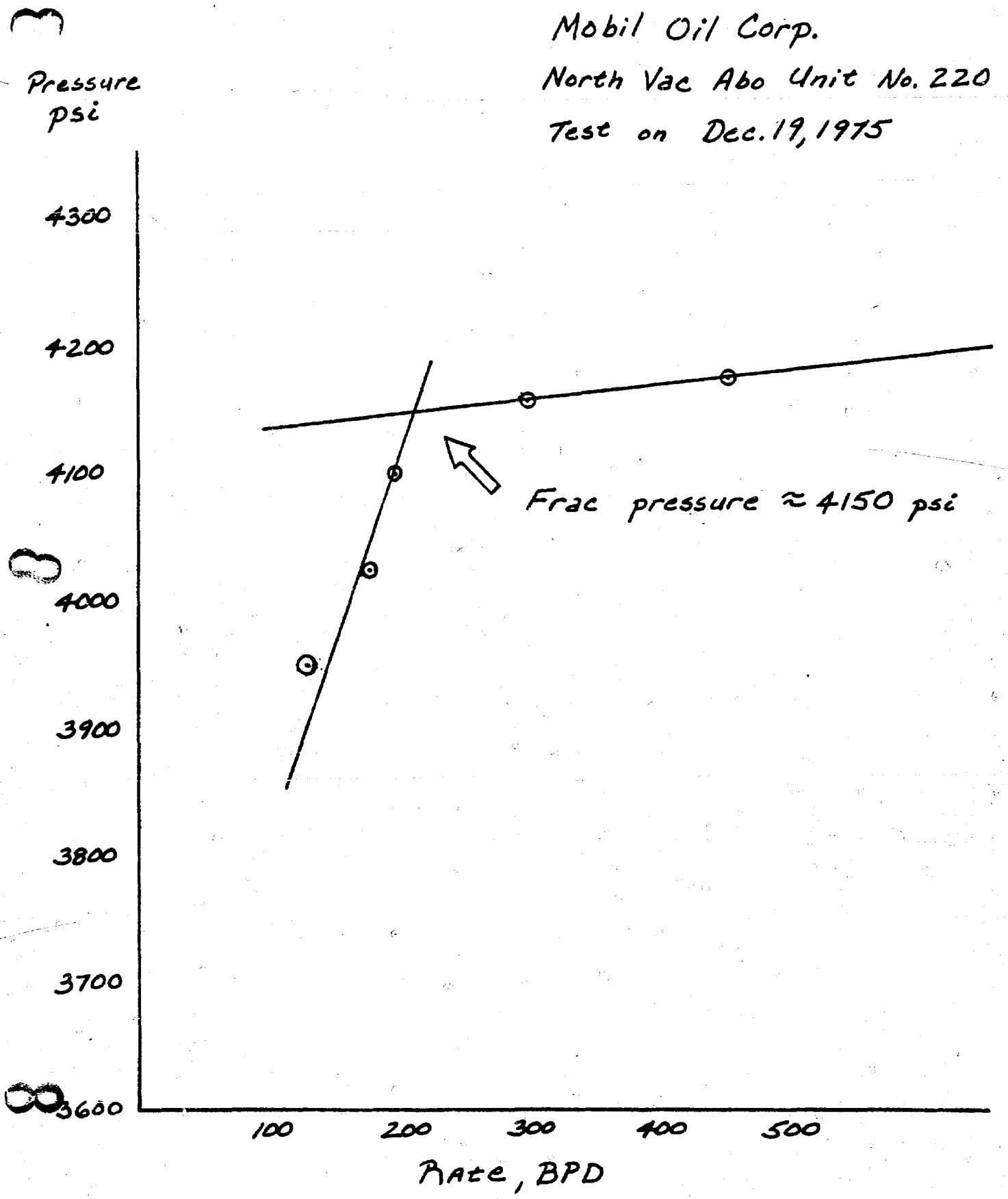
Water injection in the Abo reservoir has been at pressures below frac pressure. This is supported by the excellent performance of the project as shown in Exhibit 8. The oil production rate has increased from a low of 1150 BOPD to 4043 BOPD, and March water production was only 81 BWPD. This is less than the water rate prior to flooding and after 14.5 million barrels of cumulative water injection. Production response occurred at about 71% fillup with the initial response noted at 50% fillup which is considered normal.

Mobil Oil Corporation
North Vac Abo Unit
Frac Pressure Determination
By Step Rate Tests

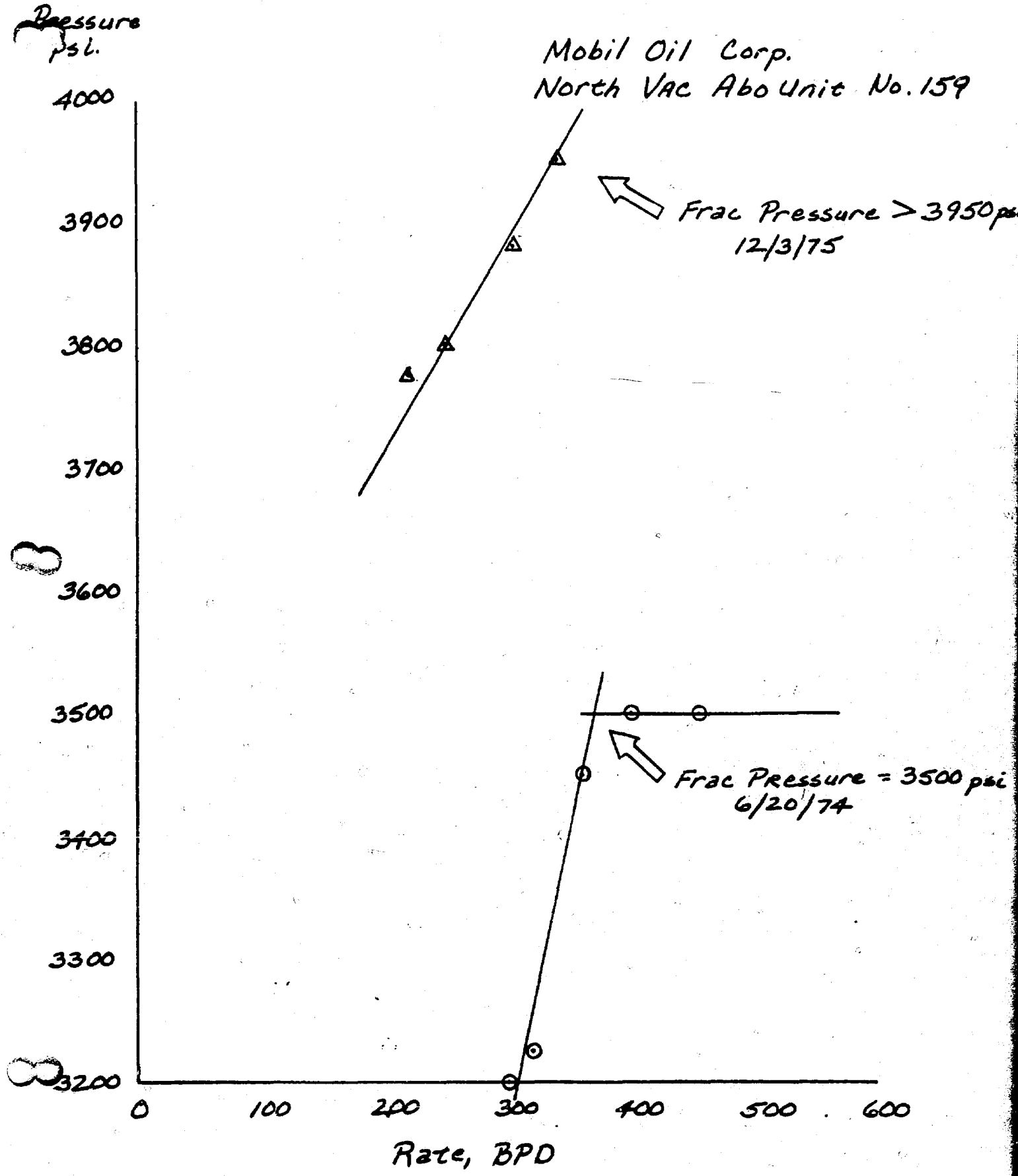


Typical Step Rate Test

Mobil Oil Corp.
North Vac Abo Unit No. 220
Test on Dec. 19, 1975

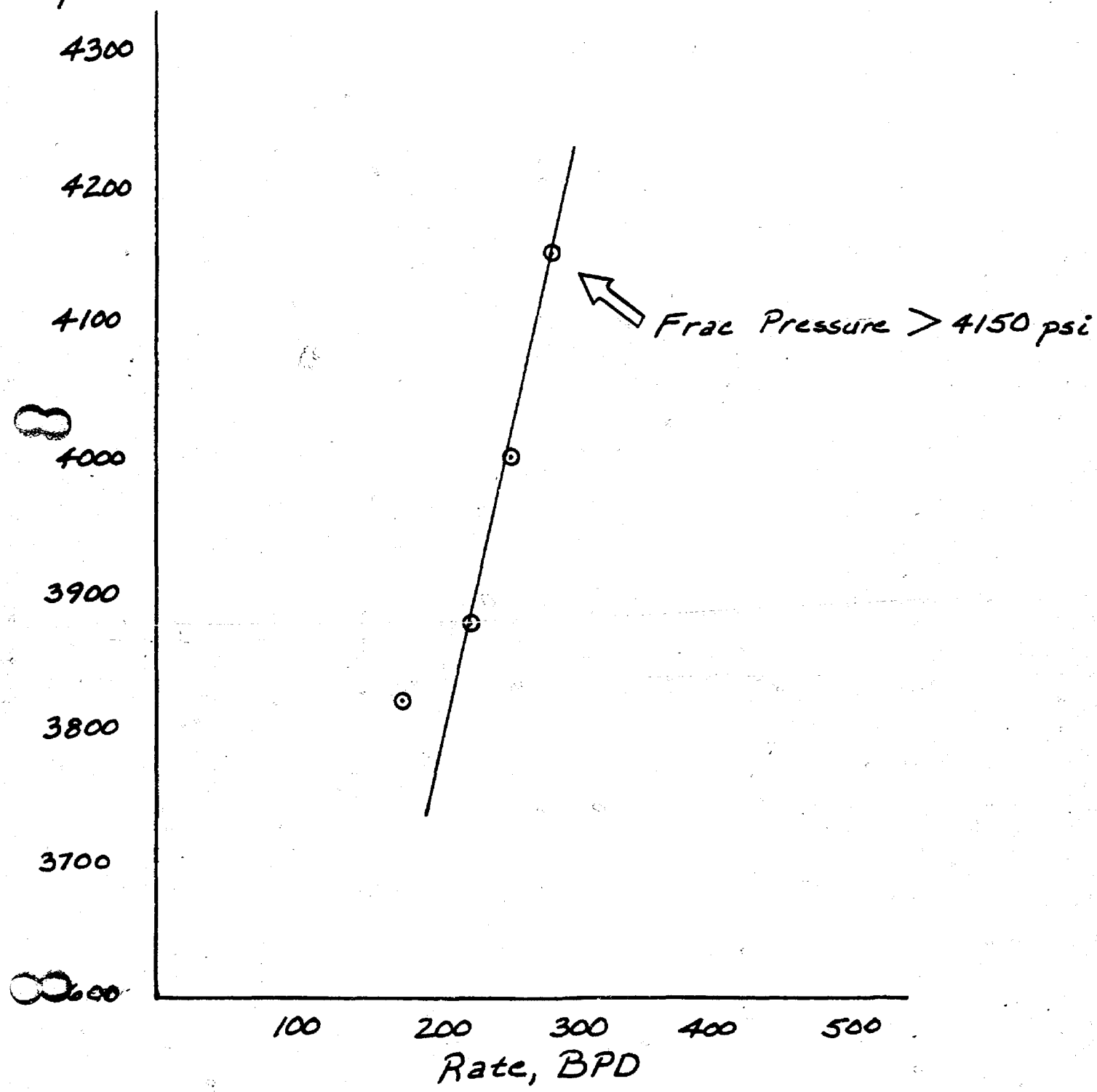


Typical Step Rate Test



Typical Step Rate Test

Mobil Oil Corp.
North Vac Abo Unit No. 172
Test on Dec. 19, 1975



Case #6248

TESTIMONY AND EXHIBITS

PROPOSED NORTH VACUUM ABO EAST UNIT

VACUUM ABO, NORTH POOL

LEA COUNTY, NEW MEXICO

Exhibit 1 is a completion map of the multi-reservoir Vacuum Pool showing all wells within a two-mile radius of the proposed project and the zones in which they are completed or have been completed.

Exhibit 2 is a map of the project showing only the wells which have penetrated the Abo or deeper horizons, the proposed injectors, and the proposed unit well numbers in parentheses.

HISTORY

The North Vacuum Abo pool is located about 25 miles northwest of Hobbs, New Mexico in Lea County. The first well completed in the proposed unit interval was Mobil's Bridges-State Well No. 112, for a flowing potential of 312 BOPD on June 15, 1966. The original pressure was 3230 psi with a bubble point of 2800 psi. The oil gravity is 36° API. The reservoir produces by solution gas drive although a large portion of the field has been unitized and is under pressure maintenance by water injection. The Mobil-operated North Vacuum Abo Unit became effective 12-1-72 and has responded very favorably to water injection using a 5-spot pattern. Current production of this project is 4100 BO and 76 BWPD.

RESERVOIR DESCRIPTION

Exhibit No. 3 shows a structure map contoured on the top of the Abo pay and Exhibit No. 4 is an East-West cross section of the Abo horizon. Exhibit 5 is a log of Mobil's State UU Com. No. 1, a deeper Atoka-Morrow gas well, defining the unit interval as that portion of the Abo reservoir between 8420 feet and 9260 feet subsurface.

The Abo reservoir is a back reef deposit of anhydritic dolomite with interbedded shales. The gross section exhibiting scattered porosity is about 550 feet thick and is capped by dense anhydritic dolomite. The productive interval is almost entirely limited to the top 100 feet of porosity. The porosity within this producing interval has good continuity throughout the proposed unit area as shown by the E-W cross-section Exhibit 4.

Project Data for North Vacuum Abo East Unit

The proposed unit shown on Exhibit 2 covers 866 productive acres and includes 11 active producing wells. The cumulative oil and gas production as of 1-1-78 was 767,529 barrels and 762,878 MCF respectively. The oil producing rate for December, 1977 was 293 barrels per day and the average gas-oil ratio was 1220 cubic feet per barrel. Water production amounts to only 2.1% of total fluids produced. Exhibits No. 6 and No. 7 are production histories of the proposed unit area in tabular and graphic form.

The effective pay thickness is estimated at 18 feet with an average porosity of 11.3% and average permeability of 1 to 2 md. The original oil-in-place was approximately 7.0 million barrels. The ultimate primary recovery is estimated to be 1.0 million barrels or 14.4% of the original oil-in-place.

It is estimated the proposed unitization and water injection project will recover an additional 1.0 million barrels of oil that would not be recovered under primary means. Total recovery, primary plus secondary, is calculated to be 2.0 million barrels or approximately 29% of the original oil-in-place.

Tract participation in the unit is divided into two periods, and participation shall govern the allocation of unitized substances after the effective date of the unit. Tract participation is defined in Article 13, pages 6 and 7, of the proposed unit agreement, and is based on a fair, reasonable and equitable basis. The proposed unit agreement was submitted with our application and marked therein as Exhibit "7".

Performance of the proposed project should be comparable to the North Vacuum Abo Unit (Exhibit 8). This project has responded well to water injection, and is expected to recovery an additional 12.4 million barrels from secondary recovery operations.

Plan of Operation

Mobil plans to initiate a 5-spot water injection program using Ogallala water similar to our North Vacuum Abo project. The

Ogallala water will be obtained from Mobil wells on the Bridges-State Lease under permits authorizing useage of 1200 acre-feet per year or 25,500 BPD. At a later date we may consider injection of CO_2 or other substances.

Initial injection well rates are estimated to be 500 BPD/well and the maximum injection pressure anticipated later in the project life is 4800 psi which is below the estimated frac pressure. This is in line with performance of the offsetting North Vacuum Abo Unit which is currently operating at well head pressures of 3700 to 4500 psi. Step rate tests indicate that current frac pressures range from 4250 psi to 5000 psi at the North Vacuum Abo Unit. Results of the step rate tests are included in Appendix I. Injection in a typical well will be through corrosion-resistant lined tubing below a mechanical packer. The annulus will be filled with treated fresh water and a pressure relief valve will be installed on the casing at the surface. Sketches of all well bores penetrating the Abo within 1/2 mile of the proposed injectors in project are shown in Exhibit 9. Exhibit 10 is a tabulation of those wells in Exhibit 9 showing the casing size and setting depths, volume of cement, and cement tops, etc. Our initial plan is to inject all produced water in our Vacuum Grayburg-San Andres injection wells.

In summary, Mobil Oil Corporation respectfully asks the Commission for the following:

1. Approval of the North Vacuum Abo East Unit Agreement.
2. Approval of the plan of operation to inject fluids into the Abo formation through the 5 wells described in Exhibit 2. *At pressures NOT to exceed the lesser of 4800psi well head pressure or frac pressure.*

3. An allowable formula to be fixed by the Commission to provide for a maximum daily unit allowable not to exceed the number of 80-acre proration units times the daily top unit allowable set for wells in the North Vacuum Abo Pool. Such unit allowable may be produced from any well or wells on the project area in any proportion.

4. Establishment of an administrative procedure whereby the Commission may authorize the completion of a second producing well on the 80-acre proration units at unorthodox locations within said unit, providing such wells are located no closer than 467 feet from the outer unit boundary nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary. In explanation of this, the 80-acre spacing and the large pattern areas (160 acres) coupled with the low permeability of the reservoir and its effect on project response may make it necessary to infill drill producers in certain areas of the project.

5. That the project area be fixed as the total area within the boundaries of the said North Vacuum Abo East Unit as described in this application, and with further provisions that the project area may be expanded administratively by the Commission upon meeting the conditions set forth by the Commission.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
State Land Office Building
Santa Fe, New Mexico
7 June, 1978

EXAMINER HEARING

IN THE MATTER OF: (Consolidated)	)	
Application of Mobil Oil Corporation for a unit agreement, Lea County, New Mexico, or statutory unitization.	)	CASE 6247
AND	)	
Application of Mobil Oil Corporation for a pressure maintenance project, Lea County, New Mexico.	)	CASE 6248

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Applicant: James E. Sperling, Esq.
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KELLAHIN & FOX
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SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
730 Bishop's Lodge Road • Phone (505) 988-3404
Santa Fe, New Mexico 87501

I N D E X

E X H I B I T S

E X H I B I T S CONT'D

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Santa Fe, New Mexico 87501

MR. NUTTER: Call Case Number 6247, which is actually two applications in one.

The first is the application of Mobil Oil Corporation for a voluntary unit agreement in Lea County, New Mexico.

The second portion of the application is the application of Mobil Oil Corporation for statutory unitization of its North Vacuum Abo East Unit Area in Township 17 South, Range 35 East, Lea County, New Mexico.

MR. SPERLING: James E. Sperling of Modrall, Sperling, Roehl, Harris and Sisk, appearing for the applicant.

We'd like to request, Mr. Examiner, that the two cases to which you referred be combined for purposes of the hearing.

MR. NUTTER: Off the record.

(There followed a discussion off the record.)

MR. NUTTER: Back on the record. We have, as I mentioned, we have the two cases in Case Number 6247, one for voluntary unitization; the other for statutory unitization.

MR. SPERLING: I would like to request at this time, Mr. Examiner, that for the purposes of the hearing Case 6247 and Case 6248 be combined, consolidated.

MR. NUTTER: We'll call now Case 6248, which is in the application of Mobil Oil Corporation for a pressure maintenance project, Lea County, New Mexico.

And you do have 100 percent voluntary unitization in Case Number 6247, so you have requested the statutory unitization portion of that application be dismissed.

MR. SPERLING: Yes, sir.

MR. NUTTER: And we'll proceed, then, with the hearing for the voluntary unitization and the pressure maintenance project.

MR. SPERLING: Yes, sir, we have two witnesses, one whose testimony will be with respect to 6247 and one with respect to 6248.

MR. NUTTER: Will they both stand and be sworn, please.

(Witnesses sworn.)

MR. KELLAHIN: If the Examiner please, I desire to enter my appearance in both these cases on behalf of Pennzoil Corporation.

Pennzoil Corporation is a working interest owner in the adjoining North Vacuum Abo Unit. We are an interested party in this proceeding and we don't know that we are objecting to what -- what Mobil's doing. We're seeking information at this point but we did want

to participate and be able to ask the witnesses some questions about the unit.

MR. NUTTER: You're not sure whether you're friend or foe, is that right?

MR. KELLAHIN: That's right.

MR. SPERLING: Mr. Examiner, before we begin, at the time of the submission of the application we were one log short with respect to an injection well, and I would like to have added to the file, with respect to Case Number 6247, the log of Texaco, Inc., New Mexico State VJ No. 3 Well.

MR. NUTTER: Thank you, Mr. Sperling.

E. R. FRAZIER

being called as a witness and having been duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. SPERLING:

Q. Would you please state for the record your name, your place of residence, the name of your employer, the capacity in which you are employed?

A. Yes. I'm E. R. Frazier, employed by Mobil Oil Corporation in Houston, Texas, as Joint Interest Administrator.

Q. What do your duties consist of in connection with being Joint Interest Administrator?

A. Well, it consists of, among other things, of negotiating unit agreements and the preparation of unit agreements such as we're considering here today.

Q. In that connection, Mr. Frazier, have you on any previous occasions testified as a witness before the Commission and have your qualifications in the capacity that you have described been accepted?

A. Yes.

Q. As a part of the application originally filed in this matter, there was submitted a copy of the unit agreement, proposed unit agreement. We have also marked the Unit Agreement as an exhibit in 6247.

Would you please refer to Exhibit Number One in that case at this time? And describe for the record what the Unit Agreement consists of and some of its features?

MR. KELLAHIN: Excuse me, Mr. Sperling, do you have an extra copy of that we might look at?

MR. SPERLING: Yeah, I'll get you one.

MR. KELLAHIN: Thank you.

MR. NUTTER: Is that Unit Agreement there identical with the one that was submitted with the application?

MR. SPERLING: Yes, sir.

A. Shall I --

Q. (Mr. Sperling continuing.) Yes, go ahead.

A. Exhibit One is a copy of the Unit Agreement of the North Vacuum Abo East Unit, and the Unit Agreement is for the unitization of the Abo formation only, and the interval being unitized is described in Section 2 (j), page 2 of the Unit Agreement, and that's the same interval that was described on the call of the hearing.

Exhibit "A" of the Unit Agreement is a map of the Unit Area, showing the Unit outline and the tract numbers.

Q. How many acres does the unit area consist of?

A. The unit consists of 865.74 acres and the working interest owners owning 100 percent of the working interests in the unit have approved the Unit Agreement and the Unit Operating Agreement.

The State of New Mexico has all the mineral interest ownership in the proposed unit and the New Mexico State Land Office has reviewed this Unit Agreement.

Exhibit Two is a letter from the Public Lands Office Oil and Gas Division, which indicates that it meets with their approval. All tracts in the unit area qualify for inclusion in the unit and there is one over-riding royalty interest in Tract Seven which has also been

committed to the unit.

I'd like to call the attention to an ipso facto termination date in Article 26, page 14 of the Unit Agreement. That ipso facto date was July 1, 1978, and Mobil has requested approval from the working interest owners to extend this termination date one year and working interest owners owing 95+ percent have approved this extension, will extend the ipso facto termination date to July 1, 1979.

And pending approval of the Commission and the State Public Lands Office, we anticipate making the unit effective August the 1st of '78.

It is respectfully requested that the Commission approve the North Vacuum Abo East Unit as proposed in the Unit Agreement.

Q. Do you have anything further with respect to the Unit Agreement?

A. I don't think I have unless there's some questions.

Q. All right.

MR. SPERLING: We would offer Exhibits One and Two in Case Number 6247 at this time, Mr. Examiner.

MR. NUTTER: Mobil Exhibits One and Two will be admitted in evidence.

CROSS EXAMINATION

BY MR. NUTTER:

Q. Mr. Frazier, you mentioned that the ipso facto termination date has been proposed to be changed to 7-1-79.

A. That's right.

Q. Did you state that 95 percent of the working interest has --

A. That's right.

Q. -- approved that proposition?

A. That's correct.

Q. Has the State Land Office approved it yet?

A. No, sir, it has not been submitted to them.

Q. Uh-huh.

A. I guess I overlooked that.

Q. Okay.

MR. NUTTER: Are there any further questions of Mr. Frazier?

MR. KELLAHIN: If the Examiner please.

CROSS EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Frazier, what if any working relationship do you have with the North Vacuum Abo Unit to the west of this subject unit?

A. Mobil is the operator of that unit as well.

Q. Let me -- let me show you what I have marked as Pennzoil Exhibit One, and ask you if you can identify that exhibit?

A. Yes, I believe I can.

Q. That's the boundary for the North Vacuum Abo Unit that adjoins this subject unit, is it not,sir?

A. That appears to be, yes.

Q. Let me trade copies with you, Mr. Frazier. It appears from looking at this exhibit, Mr. Frazier, that the subject unit for which you seek approval consists of the south half of Section 7, the north half of Section 8, the southwest quarter of 18 and the west half of the southeast quarter of 18. Is that all of it?

A. Yes. That's all of it.

Q. As opposed to creating a new separate unit, Mr. Frazier, what if any efforts have you made to expand the existing North Vacuum Abo Unit to include this area?

A. Well, there was not any effort made to expand the North Vacuum Abo Unit. You want to know the reason why?

Q. Yes, sir.

A. Okay. The reason why that there had been some response already in the North Vacuum Abo Unit and we felt like it would be easier and expedite matters by forming

a new unit rather than expanding the old unit.

Q. You indicate it would be easier. In what ways, Mr. Frazier?

A. Well, the fact that we could -- we would negotiate participation for the new unit and would not have to go into all the production history, and so forth, of the unit that was already in effect, and the fact that the production -- we had production increases in the old unit.

Q. Now, all the wells in the subject unit, they were all in existence prior to November of '76, were they not, sir?

A. Well, that I can't say without checking the records out, but you probably know more about that than I do. I don't know offhand.

Q. When was the last time you expanded the North Vacuum Abo Unit?

A. Let's see, the last time was when they expanded it to take in the Texaco tract there in the southeast quarter of 13, and I believe at that same time there was a Shell Tract 19 -- let's see, it would be -- okay, it's now Tract 19 in the North Vacuum Abo Unit; it's in the southwest quarter of Section 10, 34 East, 17 South. Those two tracts, I believe, were expanded. I believe that's the last time it was expanded.

Q. That expansion of the North Vacuum Abo Unit

took place about November of 1976, did it not?

A. I believe that's probably true.

Q. And at the time you made that expansion you had to work out different parameters for the unit itself to include those tracts.

A. Yes, sir, I believe so.

Q. In addition, you made investment adjustments at that time.

A. That's correct.

Q. Now, prior to that date, with regards to the North Vacuum Abo Unit, did you ever propose and consider the expansion of the existing unit to include any portion of that acreage now proposed for the new unit?

A. No, it never was proposed for expansion.

Q. To the best of your recollection, then, in August of 1973, none of this acreage now in question was considered for expansion to inclusion in the existing North Vacuum Abo Unit.

A. You mean August of '73 or '76?

Q. Yes, sir, I believe '73.

A. '73?

Q. Yes, sir.

A. Well, to my recollection, all of these wells were not drilled then in August of '73. They're in the new unit.

Q. To the best of your memory, none of the existing acreage now under consideration for this unit was ever proposed for inclusion in the North Vacuum Abo Unit.

MR. SPERLING: Not of 1973, as you asked him.

A. I don't believe so, no.

Q. Other than '73 at any time?

A. We never proposed this for an expansion in '73. The reason is that this was being developed over here and I would have to, like I say, I don't recall exactly when every well was drilled, but this was developed later than the part that's in the North Vacuum Abo Unit.

Q. If I understand you by your answer, Mr. Frazier, you then have not made any feasibility studies to consider whether the existing unit could have been expanded to include any of the acreage now under consideration?

A. Well, I guess that would be hard to answer just yes or no. We considered that, expanding the unit, but the main reason we didn't try to expand it was the fact that we felt like it would be more expedient and that it would be more difficult to expand the unit than it would be to form a new unit.

Q. Is the area of the North Vacuum Abo Unit and the new unit all within the Abo Pool?

A. Yes.

Q. You said you, in response to a question, I

believe, asked earlier, that the existing unit was receiving some response from the offset acreage on the east side?

A. No. You mean -- which unit are you talking about now?

Q. Well, I'm not sure and that was --

A. Oh.

Q. -- the question.

A. The one I'm talking about the response was in the old unit, in the North Vacuum Abo Unit.

Q. The North Vacuum Abo Unit as it now exists was receiving response from the injection --

A. In that unit. See, we haven't started injection in the new unit yet.

Q. All right. What if any lease line agreements do you anticipate between the two units in order to protect the correlative rights of each?

A. We anticipate protecting the correlative rights by maintaining corresponding injection wells across the line. In other words, protect the equity across the lease line of the two units, and I would suppose we would make a unit -- a cooperative agreement to that effect, but anyway, we do anticipate protecting correlative rights of the two units by corresponding injection across the two -- across the common lease line.

Q. Mobil, as the unit operator for the North Vacuum Abo Unit, has not called a working interest owners meeting in order to accomplish that at this point?

A. That's right.

Q. You've never made demand upon any of the working interest owners of the existing unit to expand, or proposed to expand, in this easterly direction?

A. That's correct.

Q. I don't recall exactly what you said, Mr. Frazier, you have or you have not made any economic studies to determine whether this acreage could be reasonably included in the existing unit?

A. I don't believe -- to my knowledge there wasn't any economic studies made just for that purpose. There have been economic studies made for the new unit but to my knowledge we didn't compare one to the other.

Q. And again, why didn't you make that comparison?

A. Well, the reason is that we intend to protect the correlative rights of the two units across that common boundary and that we felt like it would be more expedient and easier to form a new unit than it would to expand the old one.

Q. Do you have any particular lease problems within the acreage included in the new unit?

A. Lease problems?

Q. Yeah, you running into the end of the primary term on any of your leases?

A. No, sir.

MR. KELLAHIN: Mr. Examiner, I have nothing else. Thank you, Mr. Frazier.

MR. NUTTER: Are there any further questions of Mr. Frazier?

MR. SPERLING: I have one question.

REDIRECT EXAMINATION

BY MR. SPERLING:

Q. I believe the application, Mr. Frazier, showed the percentage working interest of Mobil to have been 50.05455. What is the correct working interest percentage attributable to Mobil's ownership?

A. In the unit under discussion?

Q. The unit under discussion, which is the North Vacuum Abo --

A. The East unit?

Q. Yes.

A. It has two phases, Mr. Sperling, and the Phase One participation is 52.05455 and the Phase Two is 52.32657.

Q. What is the most significant feature with -- that causes the percentage interest to vary as between

Phase One and Phase Two?

A. Well, it's almost exactly the same for Mobil. The basis of participation was Phase One was 50 percent current production and 50 percent remaining primary, and the basis of Phase Two was the ultimate primary recovery estimated from each tract.

Q. Was -- is there any difference in the participation factor as between the existing North Vacuum Abo Unit and the proposed unit?

A. I believe that there is a difference. I don't recall exactly what the basis was on the old unit. Do you have it there?

MR. KELLAHIN: Yes, sir, I believe it --

MR. RAINEY: I don't know whether you can read my writing. Can I read it for him?

MR. NUTTER: Read it into the record.

MR. RAINEY: Okay. The initial parameters for the -- before the unit was ever expanded, was 65 percent net pore -- net hydrocarbon pore volume; 17-1/2 percent current production, which was the first six months of '71; 17-1/2 percent remaining primary.

On the first expansion the parameters remained the same.

On the second expansion, which included the Texaco and Shell acreage, was effective on 11-1-76, the

parameters were 24 percent primary reserve, 38 percent ultimate primary production, and 38 percent net hydrocarbon pore volume.

MR. NUTTER: Would you state for the record your name, Mr. Rainey?

MR. RAINEY: J. C. Rainey, Petroleum Engineer with Pennzoil.

MR. NUTTER: Thank you.

RECROSS EXAMINATION

BY MR. NUTTER:

Q. Mr. Frazier, in response to Mr. Sperling's question on that Mobil interest, would you repeat those figures you gave again?

A. Okay. Phase One participation, Mobil's interest if 52.05455.

Q. Wait just a minute, 52.0 --

A. 5455.

Q. Phase One, huh?

A. Yes, sir. Phase Two is 52.32657.

MR. NUTTER: Did you want to amend your application, Mr. Sperling, to reflect that combined figure rather than the --

MR. SPERLING: Yes, we do make that request.

MR. NUTTER: -- figure that you gave?

MR. SPERLING: Yes.

MR. NUTTER: Okay, fine, thank you. The application is being amended.

Are there any further questions of Mr. Frazier? He may be excused.

A. J. HANKINSON

being called as a witness and having been duly sworn upon his oath, testified as follows, to-wit:

DIRECT EXAMINATION

BY MR. SPERLING:

Q. Would you please state your name, your place of residence, your occupation, and by whom you're employed?

A. My name is Jim Hankinson. My place of residence is now Denver, Colorado. I'm employed by Mobil Oil and I'm a Staff Engineer.

Q. Have you on any prior occasions testified before the Commission as an expert witness and have you made your qualifications in that capacity a matter of record? And have those qualifications been accepted?

A. Yes, sir.

MR. SPERLING: Is the witness considered qualified, Mr. Edaminer?

MR. NUTTER: Yes, he is.

Q. (Mr. Sperling continuing.) You, as a matter of fact, were a witness at the time of the hearing on the application for approval of the North Vacuum Abo Unit, the existing unit?

A. Yes, sir, I was.

Q. Would you now please refer to what has been marked as Exhibit One and describe for the record what that exhibit is supposed to show?

MR. KELLAHIN: Excuse me, do you have another one of those?

MR. HANKINSON: I think so.

A. Exhibit Number One is a map showing the well-bores in the area that we're proposing unitization and color coded to mark the reservoir that they have or are completed in. And as you will notice from this map, the red color, which is what we've used to designate the Abo formation, is rather extensive and continues on across from the older North Vacuum Abo Unit to the proposed unit area.

Q. The legend in the lower lefthand corner of the exhibit is color coded to indicate the conclusions that you have described?

A. Yes, sir, these are the reservoirs they have or are currently completed in.

Q. And also shown are existing injection wells?

A. Yes, both the Abo injectors and San Andres injectors.

Q. Okay. Now would you please refer to what's been marked as Exhibit Two and describe the purpose of that exhibit, what is shown upon it?

A. To clarify the situation, Exhibit Two is a map of the project showing only the wells which have penetrated the Abo or deeper horizons. It also shows the proposed injectors in the new unit area and the proposed unit well numbers.

Q. Now would you review for us a brief history of the North Vacuum Abo Pool in Lea County, New Mexico?

A. Yes, sir. The North Vacuum Abo Pool is located about 25 miles northwest of Hobbs, New Mexico, in Lea County.

The first well was completed in the proposed unit interval was Mobil's Bridges-State No. 112 for a flowing potential of 312 barrels per day on June 15th, 1966. The original pressure was 3230 psi and the bubble point was 2800 psi. Oil gravity is 36 API. The reservoir produces by solution gas drive, although a large portion of the field has been unitized and is under, now, pressure maintenance by water injection.

The Mobil operated North Vacuum Abo Unit became effective 12-1-72 and has responded very favorably

to water injection using a 5-spot pattern. Current production of this older unit is 4100 barrels of oil and 76 barrels of water per day.

Q. Now would you describe for us by reference to Exhibit Number Three the characteristics of the reservoir in which the proposed unit is located?

A. Yes, sir. Exhibit Number Three is a structure map on top of the Abo pay. It's a north/south trending anticline and shows that the old unit and the new unit are on the same Abo structure, just a continuation to the east.

Exhibit Number Four is an east/west cross section of the Abo horizon. As you might note on the righthand side of this exhibit it shows the line of continuity or cross sectional position from Well No. 158 in the North Vac Abo Unit to Mobil State JJ, to the State "U" No. 1, to the TT No. 1, and finally to the State MM No. 1.

The red interval is the Abo pay and where you see the interval marked with sort of a rectangular appearance, this is the overall perforated interval. Within that overall interval there it's selectively perforated.

MR. NUTTER: I take it then that this Mobil State UU, the one that's in the center, is not perforated in the interval?

A. No, sir, it is not.

MR. NUTTER: Okay.

A. This shows that the structure dips to the east, as the previous exhibit showed.

Exhibit Number Five is a reference log of the proposed North Vacuum Abo East Unit. This is a log of Mobil's State UU Com. No. 1, a deeper Atoka-Morrow gas well. On this exhibit the unit -- proposed unit interval is defined as that point from 8420 feet t0 9260 feet sub-surface.

I might make a few comments about the Abo It is a back reef deposit anhydritic dolomite with inter-bedded shales. The gross section is about 550 feet thick and is capped by dense dolomite. The productive interval is confined almost entirely to the upper 100 feet. The porosity within the producing interval has good continuity through the proposed unit area as shown by this cross section, Exhibit Number Five.

Q. Now, would you furnish us with a description of the pertinent data which relate to the project which has been identified as the proposed North Vacuum Abo East Unit?

A. The proposed unit shown on Exhibit Two covers 866 productive acres and includes 11 active producing wells. Cumulative oil and gas production as of 1-1-78 was

767,529 barrels and 762,878 Mcf respectively.

Oil producing rate for December, '77, was 293 barrels per day and the average gas/oil ratio was 1220 cubic feet per barrel. Water production was extremely small, only 2.1 percent of total fluids produced.

MR. NUTTER: How many producing wells are in that?

A. At the present time there are eleven.

Q. With respect to the production to date, would you please refer to Exhibits Six and Seven and briefly describe those for the record and what they're intended to show?

A. Yes, sir. Exhibit Number Six is a production history for the proposed unit area. The units and columns are self-explanatory.

Q. And Exhibit Seven contains the same information in different form?

A. Yes, sir. Exhibit Seven contains the same information in graphic form, showing gas/oil ratio, oil production, and water production. I would like to call your note to the water production curve. The scale that applies to the water production is on the righthand side of this curve. This means that the average water production is less than 10 barrels per day, whereas the oil production is in the range of 290 barrels per day; the gas/oil ratio

is a little over 1200 cubic feet per barrel.

Continuing, the effective pay was estimated at 18 feet. The porosity is estimated at 11.3 percent and average permeability of 1 to 2 md. The original oil in place was approximately 7,000,000 barrels and the ultimate primary recovery is estimated to be 1,000,000 barrels, or 14.4 percent of the original oil in place.

It is estimated that the proposed unitization and water injection project will recover an additional 1,000,000 barrels of oil that would not be recovered under primary means. Total recovery, primary plus secondary, is calculated to be 2,000,000 barrels with approximately 29 percent of the oil in place.

Q. Mr. Frazier made reference to tract participation and the factors taken into consideration for the purpose of establishing those factors, would you elaborate on the participation a little more?

A. All right. The tract participation was divided into two periods.

Q. That's what you call Phase One and Two?

A. Phase One and Phase Two. Phase One was 50 percent primary reserves and current production. The primary reserves were determined by extrapolation of primary decline curves and the current rate was for the period mentioned in the Unit Agreement.

Q. In view of the history which you have developed by actual operation with respect to the North Vacuum Abo Unit, what would you anticipate by way of performance for the proposed unit?

A. Well, as I mentioned, I would anticipate a recovery of an additional 1,000,000 barrels of oil, which is more or less equal to the primary recovery.

Q. Would you describe for the record the plan of operation which is proposed mechanically for the operation of the unit? Proposed unit?

A. Yes, sir. I'm sorry, but I forgot to mention one thing that I think is pertinent, and that's what we call our Exhibit Number Eight. This is the performance curve of the existing North Vacuum Abo Unit. I would like to discuss this very briefly to show that the current production now exceeds the primary production in this unit area. That's a little over 4000 barrels per day, whereas the peak primary from this area was averaged in the range of 3500 barrels per day. The gas/oil ratio, which is the curve with little circles, has shown a classic decrease and is currently approximately 600 cubic feet per barrel, and our produced water is a little over 80 barrels per day, which is substantially less than what was produced under primary, after injection of a little over 14-1/2 million barrels of water.

Q. Well, do I understand from that that you anticipate excellent results from the introduction of the proposed plan of operation into the East Unit area?

A. Yes, sir, we hope that it would perform as well on a comparable size basis.

Q. Now, describe for us the pattern, the injection pattern, that you expect to use, the source of water for the purpose of injection, the disposition of produced water, and those relevant matters pertaining to the plan of operation.

A. Mobil plans to initiate a 5-spot water injection program using Ogallala water similar to our North Vacuum Abo project.

Ogallala water will be obtained from Mobil wells on the Bridges-State lease under permits authorizing usage of 1200 acre feet per year, or 25,500 barrels per day. At a later date we may consider injection of CO_2 or other substances. Initially, we plan to inject approximately 500 barrels per day per well and we anticipate a maximum injection pressure later in the project life of 4800 psi, which is below the estimated frac pressure.

This is in line with performance of our offsetting North Vacuum Abo Unit, which is currently operating at wellhead pressures of 3700 to 4500 psi. Step rate tests that we have performed indicate that the cur-

rent frac pressures range from 4250 psi to 5000 psi at the North Vacuum Abo Unit.

Q. Have you prepare an exhibit, which I believe is marked Nine, which --

A. I believe that's Eleven?

Q. I believe -- yeah, the step rate tests are reflected in Eleven.

A. Right.

Q. Yeah, refer to Eleven. I was a little out of order but I don't think it will make any difference.

A. Exhibit Eleven is information concerning step rate tests that we've run in the Abo project supporting the maximum injection pressure of 4800 psi. The first curve behind the written work that shows more or less two parallel lines and a series of circles connected by lines, is an average by time period of the step rate tests that we've conducted within the project. For example, during the latter part of 1973 the average of our step rate tests for frac pressure indication varied from a low of around, oh, 3300 psi to a high of 3800 psi, and at each time period thereon, you can notice that these curves generally increased. The point I'm trying to make is that frac pressure increases with fill-up. As we continue to inject and put additional water in the ground, our frac pressure measurements continued to increase.

MR. NUTTER: Why?

A. This is customary. This is typical reservoir performance. The frac pressure under a depleted condition is much lower than the frac pressure under initial conditions.

MR. NUTTER: Why would this happen?

A. The reservoir, when you inject water, you build a bubble of water around that injection well. You provide it with a reservoir pressure, and this pressure in turn pushes back, is a resistance, so the frac pressure determined under depleted conditions is not the same value as the frac pressure determined under initial conditions or under partial fill-up conditions, as you conduct your injection program.

MR. NUTTER: I'll have to think about that.

A. The next curve, which shows a typical step rate test conducted on our North Vacuum Abo Unit No. 220. The point I'd like to show on this is rate increases with pressure linearally in the first part of the curve but at the point of intersection you can see that the rate continues to increase but there's only a very, very shallow increase in pressure. This means that we have exceeded the capability of the rock to contain the water and it is parted. So the intercept there represents the frac pressure determination in Well 220 at that point in time,

which was December, 1975. We estimate the frac pressure to be 4150 psi.

The next curve is on Well 159. As you will note on the lower curve on the test dated 6-20-74, after I don't know exactly how many barrels of water injected, we determined that the frac pressure was 3500 psi surface wellhead duty. The curve above on a test some six months later, which is dated 12-3-75, we see no break in the curve, at approximately the same injection rates. Therefore, the only thing that we could conclude, since there is no break in the curve, it's linear, that the frac pressure is somewhat above the final pressure reading of 3950 psi, meaning that in that six-month interval our frac pressure has increased approximately 450 pounds on the same well through nothing more than fill-up in our reservoir.

Q. Is that -- are those tests the basis for your conclusion that with injection that the frac pressures increase?

A. Yes, sir.

Q. Do you have anything further to add with respect to Exhibit Nine?

A. You mean Eleven?

Q. I mean Eleven.

A. Yes, sir, I do. I'd like to point out that

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in view of our very successful flood, if we are limited to a .2 psi per foot surface pressure measurement, or approximately 1750 psi, it is doubtful that we will be able to inject water after about two months of operation.

Q. Now are you making reference to Memo Number 3-77 dated August 24, 1977, from the Commission to operators and attorneys?

A. Yes, sir, I am.

Q. Okay. Which appears to place some restraint upon surface injection pressures.

A. Yes, sir.

Q. And your testimony is that with respect to the proposed project, that is the East Abo Unit project, that you require relief from the requirements set forth in that memo?

A. Yes, sir, we request it.

Continuing on our plan of operation, injection in a typical well will be through corrosion-resistant lined tubing below a mechanical packer. The annulus will be filled with treated fresh water and a pressure relief valve will be installed on the casing at the surface. Sketches of all wellbores penetrating the Abo within one-half mile of the proposed injectors in the project are shown on Exhibit Number Nine.

Q. Now to complete the description of exhibits,

would you refer now to what's been marked as Exhibit Number Ten and explain the information contained in that exhibit and its purpose?

A. Yes, sir, Exhibit Ten is a tabulation of the wells shown in graphic form in Exhibit Nine and does show the casing size, setting depths, volume of cement, cement tops, et cetera. It's the same information in tabular form.

Q. Okay. What do you propose with respect to the disposition of produced water?

A. We plan to dispose of our produced water through Mobil's waterflood project in the Vacuum-Grayburg-San Andres.

Q. Do you have recommendations to make to the Commission with respect to the application and the proposed unit project?

A. Yes, sir. Mobil Oil Corporation respectfully asks the Commission for the following:

Number 1. Approval of the North Vacuum Abo East Unit Agreement.

2, Approval of the plan of operation to inject fluids into the Abo formation to the five wells described in Exhibit Two at pressures not to exceed the lessor of 4800 psi of wellhead pressure or frac pressure.

Number 3, an allowable formula to be fixed by

the Commission to provide for a maximum daily unit allowable not to exceed the number of 80-acre proration units times the daily top unit allowable set for the wells in the North Vacuum Abo Pool; such unit allowable may be produced from any well or wells in the project area in any proportion.

4, Establishment of an administrative procedure, whereby the Commission may authorize the completion of the second producing well on the 80-acre proration units at unorthodox locations within said unit providing such wells are located no closer than 467 feet from the outer unit boundary, nor closer than 10 feet to any quarter quarter section or subdivision inner boundary.

In explanation of this, the 80-acre spacing in the large pattern areas, 160-acre 5-spot, coupled with low permeability of the reservoir and its effect on project response, may make it necessary in this area to infill drill producers in certain areas of the project. We're not prepared to say which area yet may require this, but it quite well may require it.

MR. NUTTER: Have you done any infill drilling in the North Vacuum Unit?

A. Yes, sir, we have.

Number 5. That the project area be fixed as the total area within the boundaries of the said North Vacuum Abo East Unit as described in this application and

with further provisions that the project area may be expanded administratively by the Commission upon meeting the conditions set forth by the Commission.

Q. Is the allowable formula suggested in your recommendation the same as or at variance with that which is established for the North Vacuum Abo Unit?

A. To my knowledge, it's the same.

Q. Do you have an opinion, Mr. Hankinson, as to whether or not the granting of the application in these cases will be in the interests of conservation, will prevent waste, and will protect correlative rights of the operators in the area?

A. Yes, sir, we believe it will.

MR. SPERLING: At this time I'd like to offer Exhibits One through Eleven.

MR. NUTTER: Mobil Exhibits One through Eleven will be admitted in evidence.

CROSS EXAMINATION

BY MR. NUTTER:

Q. Mr. Hankinson, I missed writing the figures down when you were giving the estimated primary and secondary and total ultimate, and so forth.

A. All right.

Q. Would you repeat those figures again, please?

A. Yes, sir, I will.

The estimated primary ultimate is 1,000,000, or approximately 14.4 percent of the oil in place. I estimate the secondary recovery, or rather pressure maintenance recovery, to be an additional 1,000,000 barrels. Therefore the primary plus secondary would be 2,000,000 barrels, or approximately 29 percent of the original oil in place.

Q. Well, if I'd known they were good round numbers like this -- I had the 29 percent. That's all I had.

Okay, now, Mr. Hankinson, on these frac pressures, if you refer to your Exhibit Number Eleven, we see that the second paragraph states there that present frac pressure ranges from 4250 to 5000 psig. Now, I understand that some of this variation is due to the interval of time in which these tests were taken because, as you show in your exhibits, the frac pressure seems to go up with time and fill-up.

A. Uh-huh.

Q. However, there is a variation, is there not, in the reservoir at a given time? I mean every well doesn't have the same frac pressure, does it?

A. No, sir, not all -- not exactly the same.

Q. Well, don't you think that the Commission should restrict the injection pressures to the frac pressure

that's indicated in an area by the lowest pressure of any well?

I mean that's the breakdown pressure for the formation at some point in that reservoir around there.

A. No, sir, I don't. I think our proposal accomplishes what you're trying to get at, in that if we set a pressure that we've determined by actual tests or -- which is this 4800 psi -- or the lessor as determined by frac pressure -- individual frac pressure tests.

Q. You'd take a frac pressure test on every single well, then?

A. Yes, sir, we do.

As you might note, our water production in the North Vacuum Abo Unit, after approximately five years of operation is 81 barrels per day.

Q. Uh-huh, and with 14,000,000 barrels --

A. After 14-1/2 million. We're most concerned about fracturing that reservoir and have attempted to operate at all times under frac pressure so that the water injected is confined to the Abo and does its job of displacing oil to our Abo producers.

Q. Well, you've got such wide spacing there, it's obvious that you haven't had the complete sweep of the reservoir and one of these days you will be producing more than 80 barrels out of those wells.

A. Yes, sir, absolutely, but the point I'm trying to make, I guess, is if we were fracturing these wells, one of the best things that -- not the best things, but best indicators of fracturing is rather imminent water production in one of the offset wells.

Q. Or breakthrough sometimes in an inside well.

A. Yes, right.

Q. And you've experienced no breakthrough in any of the wells --

A. No, sir.

Q. --in that other unit.

A. No, sir. It's our calculation both from hand calculations and from simulator studies that we have very well controlled volumetric flood that is doing what it should do.

Q. I know the responses given on Exhibit Eight has been rather gratifying.

A. Yes, sir, it has.

Q. Those proposed rules that you had for the operation of the project, are they contained in any of these things you submitted to us here today?

A. Yes, sir, they are. Now, with the exception of a little amendment on Item Two.

Q. What are they in?

MR. SPERLING: No, they haven't been. We

propose to do that, right.

A. I stand corrected.

MR. SPERLING: We were going to leave a copy of that with the reporter for the purpose of her being assured that she got all of this.

MR. NUTTER: I'd like to have a copy of it.

MR. SPERLING: Sure, we can certainly do that.

MR. NUTTER: Are there any other questions of the witness? Mr. Kellahin?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q. Mr. Hankinson, you testified a moment ago about one of the similarities between the unit agreement for the North Vacuum Abo and the North Vacuum East Abo, with regards to assignment of allowables.

Are the two unit agreements materially different in any respect, and if so, what are they?

MR. FRAZIER: As far as -- may I answer that?

MR. NUTTER: Yes, sir. The record will show that Mr. Frazier is answering that.

MR. FRAZIER: Essentially there is no difference between -- there's probably some difference in wording but the -- basically they're practically the same.

Q. Let me ask you, Mr. Hankinson, on one of your exhibits you've shown the wells in both the existing unit and the proposed new unit. If you'll locate one of those for yourself.

Are any of the wells in the proposed new unit receiving any response from wells in the existing unit, and if so, which ones?

A. I believe there is some degree of response indicated on the Mobil well which is called the State JJ No. 1.

Q. In the northwest corner?

A. Which would be proration unit H, J, --

Q. L.

A. -- K, L. Seven-L.

Q. Do you know how much response it's receiving?

A. No, sir, I don't have that well curve in front of me, but it is receiving some response.

Q. All right. Do you have any recollection of an approximate amount of response it's receiving from the offset unit?

A. Not specifically. I'd hate to give you a number and that not be correct.

Q. Could you furnish that to us when you get the curve?

A. I certainly will.

Q. I'd appreciate that. In addition to that one well are there any other wells that are receiving responses from the existing unit?

A. I think I'd have to refer to the production curve. There may have been more than one along that edge, but as I remember, that was the only well of any significance, where you might say there was any significant amount of oil.

Since Mr. Rainey is in Midland, it's quite possible that we could send production curves directly to him of those offset wells, if you would wish.

Q. I'd appreciate it. I'd appreciate that, Mr. Hankinson, that would be just fine.

A. All right.

Q. Let me ask you this about your methods for calculating the participation factors on the new unit.

Is your method for conducting or calculating those participation factors any different from the method used to determine the participation factors on the existing unit?

A. Method, no, formula, yes.

Q. All right. Tell me what different formulas were used for each.

A. Well, as you mentioned, from your own testimony, that there was 65 percent net pore volume, 17-1/2 percent,

and so on, whereas, in this we've testified that Phase One is 50 percent primary reserves, 50 percent current production, and Phase Two is 100 percent alternate primary.

Q. Why did you not use the same method as in the existing unit?

A. Because our control, our log control, the status of being more towards the edge of the reservoir, possibly higher water saturation, indicated to engineering that it may be more desireable to go on an ultimate primary basis as an indicator of secondary rather than something indicating pore volume.

Q. Would that cause you to want to change the method of use for participation in the existing flood from the pore volume calculation to this other method?

A. This is why we selected the method. We prepared a number of parameters data, ultimate, primary, oil in place estimates, and submitted these to the working interest owners, who in turn negotiated a formula of equity.

Q. Did you conduct any studies or to your knowledge were any studies conducted that would consider the question of expanding the existing unit to include the area under consideration for your new unit?

A. Not complete studies. We have thought of the idea, and as Mr. Frazier pointed out, the fact that one unit has made their investment, the production is re-

sponding very favorably, whereas, the other unit the production is down, they haven't made it, would cause a rather difficult time with regard to obtaining each individual's equity on a participation formula.

Q. You're talking about in investment adjustment?

A. Yes, that and the difference in production in time. In other words, you have production response, a significant production response in our present unit. These people have invested their money and are seeing response.

The new unit, there is no response. Production is down. It's under partially depleted primary and the problems involved in determining equity between those two areas with those differences we believe would require considerable more time in order to accomplish the same purpose than approaching it from a new unit concept.

Q. Other than the factor of time, it still could be economic to expand the existing unit to include the -- expand the existing unit to include the acreage under the new unit, could it not?

A. You put the word "economic" to it, and I am not prepared to answer that. I do know that because of the pressures involved in our project the addition of lines for additional wells may not be feasible to our present wells, because of limitation of injection lines.

In other words, you may have four or five injection wells on a present injection line. It's physically impossible without substantial pressure drop to add another three or four injectors onto it. So I really am not prepared to agree with your --

Q. In your opinion will it be more profitable for Mobil to create a new unit for this acreage as opposed to including it in an expanded participation in the existing unit?

A. We prepared economics on the new unit and it will be profitable to all the working interest owners. I have not, as I've stated, I have not prepared economics of expanding the unit to the original --

Q. Mobil's been the unit operator of this North Vacuum Abo Unit from its inception, has it not?

A. That's correct.

Q. As the unit operator, would you not think it your responsibility to conduct such kinds of analyses to determine whether it's better for expansion of the existing unit as opposed to creating the new unit? Would that not be your responsibility as the unit operator?

A. Yes, I suppose it would be. It calls for a conclusion, I guess, and we in turn believe that it would be more advantageous to all concerned to do the method that we have, which would protect lease lines, people

would participate equitably, we came up with a formula that they could agree with, rather than go through the expansion problems and sometimes quite lengthy negotiations required to achieve expansion.

Some of the original expansions were necessitated and were brought forth because these people participated in the original unit concept, but were in the development phase and decided by -- voluntarily to keep these areas out until they were developed, but asked that they be considered in this unit at a later date. This is true of that Shell tract.

Q. The operators and working interest owners of the new unit all participated in the existing unit.

MR. FRAZIER: No, that's not correct.

A. Not true. Let's see. Elk Oil is not in the existing unit.

Q. Are there any other exceptions?

A. No.

Q. Which -- what acreage is the Elk Oil acreage?

A. This would be the -- what is called the Elk State Com No. 1 and No. 2, located in the south half of Section 18.

Q. I see it, okay. You've not made this proposal or informed the working interest owners of the existing unit of your desire to create a new unit, have you?

A. This has been published in whatever papers that all the operators normally subscribe to for information with regard to the Commission activities.

Q. Apart from that notice you've not made any effort to contact the working interest owners of the existing unit to propose the possibility, or have them consider for a vote the possibility of expanding the existing unit to include any portion of the new unit?

A. No.

MR. KELLAHIN: Thank you very much.

MR. NUTTER: Are there any other questions of Mr. Hankinson?

He may be excused. Did you have anything further, Mr. Sperling?

MR. SPERLING: No, sir.

MR. NUTTER: Does anyone have anything they wish to offer in Case Number 6247, 6248, consolidated?

MR. KELLAHIN: Move the introduction of Pennzoil Exhibit One. I believe it's a duplicate of one of Mr. Sperling's exhibits.

MR. NUTTER: It's very close to it. Pennzoil Exhibit Number One will be admitted in evidence.

Does anyone have anything further to offer in either of these cases? We'll take the cases under advisement.

(Hearing concluded.)

SALLY WALTON BOYD
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REPORTER'S CERTIFICATE

I, SALLY WALTON BOYD, a Court Reporter, DO HEREBY CERTIFY that the foregoing and attached Transcript of Hearing before the Oil Conservation Division was reported by me; that said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability, knowledge, and skill from my notes taken at the time of the hearing.

Sally Walton Boyd CSR
Sally Walton Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6247-48 heard by me on 6/7, 1972.

Examiner
New Mexico Oil Conservation Commission

CASE 6204: (Reopened and Readvertised)

Application of Producing Royalties, Inc., for an exemption from the Natural Gas Pricing Act, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks a determination as to whether the proration unit consisting of the NW/4 of Section 12, Township 29 North, Range 12 West, San Juan County, New Mexico, on which the Carroll-Cornell Well No. 2 is located was producing or capable of producing natural gas prior to January 1, 1975, from the Fulcher Kutz-Pictured Cliffs reservoir; if so, applicant seeks exemption from the Natural Gas Pricing Act for two replacement Pictured Cliffs wells in the same proration unit pursuant to a finding that the wells are justified for reasons other than avoiding the application of the Act.

CASE 6244: Application of Tom L. Ingram for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Abo Reef formation through the perforated interval from 8915 feet to 8992 feet in his State M Well No. 1 located in Unit O of Section 18, Township 17 South, Range 36 East, Vacuum-Abo Pool, Lea County, New Mexico.

CASE 6245: Application of Germany Investment Company for downhole commingling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to commingle Wolfcamp and Canyon production in the wellbore of its USA 9 Well No. 1 located in Unit I of Section 9, Township 20 South, Range 28 East, North Burton Flat Field, Eddy County, New Mexico.

CASE 6246: Application of Exxon Corporation for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location for a Silurian test to be drilled 1880 feet from the South line and 825 feet from the West line of Section 30, Township 26 South, Range 26 East, Eddy County, New Mexico, the S/2 of said Section 30 to be dedicated to the well.

CASE 6247: Application of Mobil Oil Corporation for a unit agreement, Lea County, New Mexico, or statutory unitization. Applicant, in the above-styled cause, seeks approval of its North Vacuum Abo East Unit Area, comprising 866 acres, more or less, of State lands in Township 17 South, Range 35 East, Lea County, New Mexico.

In the absence of voluntary unitization, applicant seeks statutory unitization, for the purpose of pressure maintenance, of all mineral interests in the North Vacuum Abo East Unit underlying the following described lands in Township 17 South, Range 35 East, Lea County, New Mexico:

Section 7: S/2
Section 18: N/2, SW/4, and W/2 SE/4

The unitized interval would be from a depth of 4385 feet subsea to 5225 feet subsea in the Mobil State "UU" Com. Well No. 1, located in Unit F of the aforesaid Section 7.

Among the matters to be considered at the hearing will be the necessity of unit operations; the designation of a unit operator; the determination of the horizontal and vertical limits of the unit area; the determination of a fair, reasonable, and equitable allocation of production and costs of production, including capital investment, to each of the various tracts in the unit area; the determination of credits and charges to be made among the various owners in the unit area for their investment in wells and equipment; and such other matters as may be necessary and appropriate for carrying on efficient unit operations, including, but not necessarily limited to, unit voting procedures, selection, removal, or substitution of unit operator, and time of commencement and termination of unit operations.

CASE 6248: Application of Mobil Oil Corporation for a pressure maintenance project, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a pressure maintenance project in the North Vacuum Abo East Unit Area by the injection of water into the Abo formation through five wells located in Units N and P of Section 7, and Units F, H, and N of Section 18, all in Township 17 South, Range 35 East, North Vacuum Abo Pool, Lea County, New Mexico, and the promulgation of special rules governing said project.

CASE 6249: In the matter of the hearing called by the Oil Conservation Division on its own motion for an order creating, abolishing, and extending certain pools in Chaves, Lea, and Eddy Counties, New Mexico:

(a) CREATE a new pool in Lea County, New Mexico, classified as an oil pool for Mississippian production and designated as the Bar U-Mississippian Pool. The discovery well is Charles F. Harding State "3" Well No. 1 located in Unit G of Section 3, Township 9 South, Range 32 East, NMPM. Said pool would comprise:

TOWNSHIP 9 SOUTH, RANGE 32 EAST, NMPM
Section 3: NE/4

PRODUCTION HISTORY

PROPOSED NO. VACUUM ABO EAST UNIT

Year	OIL, BBLS Annual	OIL, BBLS Cum.	GAS, MCF Annual	GAS, MCF Cum.	WATER, BBLS Annual	WATER, BBLS Cum.
1971	5,645	5,645	4,291	4,291	96	96
1972	129,859	135,504	85,773	90,064	6,128	6,224
1973	132,658	268,162	119,535	209,599	3,478	9,702
1974	130,230	398,392	146,278	355,877	4,172	13,874

1975	OIL, BBLS Monthly	OIL, BBLS Daily	OIL, BBLS Cum.	GAS, MCF Monthly	GAS, MCF Daily	GAS, MCF Cum.	WATER, BBLS Monthly	WATER, BBLS Daily	WATER, BBLS Cum.
Jan	106,699	345		8,678	280		459	15	
Feb	9,665	345		8,099	289		389	14	
Mar	10,951	353		11,736	379		593	19	
Apr	12,192	406		12,486	416		962	32	
May	11,837	382		13,222	427		542	17	
June	11,402	380		12,680	423		417	14	
July	11,743	379		11,780	380		405	13	
Aug	11,356	366		12,873	415		274	9	
Sept	11,200	373		11,355	379		235	8	
Oct	11,447	369		11,273	364		305	10	
Nov	10,956	365		11,669	389		295	10	
Dec	11,088	358		10,239	330		233	8	
	134,526		532,918	136,090		491,957	5,109		18,983

1976	OIL, BBLS Monthly	OIL, BBLS Daily	OIL, BBLS Cum.	GAS, MCF Monthly	GAS, MCF Daily	GAS, MCF Cum.	WATER, BBLS Monthly	WATER, BBLS Daily	WATER, BBLS Cum.
Jan	10,760	347		10,538	340		492	9	
Feb	9,636	344		9,671	345		250	9	
Mar	10,913	352		10,339	334		287	9	
Apr	10,736	358		10,348	345		325	11	
May	10,823	349		10,936	353		327	11	
June	10,546	352		10,153	338		269	9	
July	10,670	344		11,518	372		268	9	
Aug	10,558	341		11,900	384		233	8	
Sept	9,998	333		10,430	348		238	8	
Oct	10,459	337		10,249	331		252	8	
Nov	9,719	324		12,148	405		225	8	
Dec	9,827	327		12,542	405		220	7	
	124,645		657,563	130,772		622,739	3,186		22,169

1977	OIL, BBLS Monthly	OIL, BBLS Daily	OIL, BBLS Cum.	GAS, MCF Monthly	GAS, MCF Daily	GAS, MCF Cum.	WATER, BBLS Monthly	WATER, BBLS Daily	WATER, BBLS Cum.
Jan	9,677	312		12,278	376		188	6	
Feb	8,792	314		11,311	404		76	3	
Mar	9,656	311		12,302	397		131	4	
Apr	9,212	307		10,023	334		134	4	
May	9,576	309		12,349	398		134	4	
June	8,860	295		12,058	402		138	5	
July	9,256	299		12,574	406		264	9	
Aug	9,175	296		13,030	420		262	8	
Sept	8,863	295		11,821	394		267	9	
Oct	9,124	294		11,090	358		310	10	
Nov	8,695	290		10,223	341		217	7	
Dec	9,080	293		11,080	357		199	6	
	109,966		767,529	140,139		762,878	2,320		24,489

11 producing wells @ present time

AJHankinson
4/26/78

EXHIBIT 9

RESERVOIR ENGINEERING
OCT 28 1977

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
EXHIBIT NO. 9
CASE NO. 6248

Mobil

North Vacuum Abo East Unit
Vacuum Abo (North) Field
Lea County, New Mexico
Remedial Cementing Study

R. D. George
10/25/77

Attached is a map of the North Vacuum Abo East Unit, and diagrammatic wellbore sketches of the following wells that penetrate the Abo formation:

Wells that lie within the boundaries of the proposed unit:

State "A" Com #1	State "TT" #1
Elk State Com #1	Texaco State DJ #1
ELK State Com #2	Texaco State DJ #2
State "K" #10	Texaco State DJ #3
State "JJ" #1	Texaco State DJ #4
State "mm" #1	Texaco State DK #1

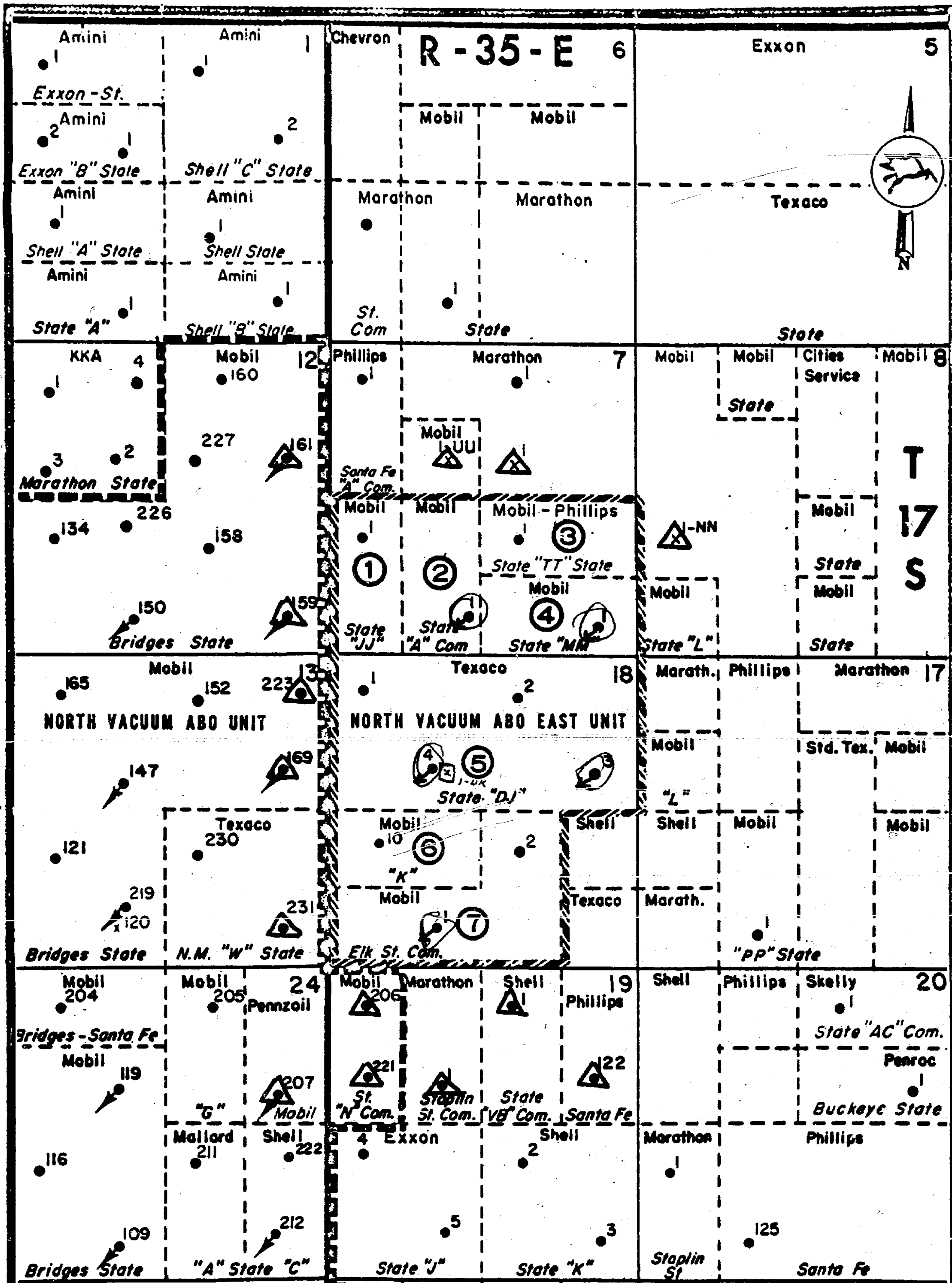
Wells that lie within ½ mile of the proposed injectors:

NVAU #159	State "NN" #1
NVAU #161	State "UU" #1
NVAU #169	Marathon Staplin St. Com #1
NVAU #206	Marathon Sec 7 Com #1
NVAU #207	Phillips Santa Fe #122
NVAU #221	Shell State "VB" Com #1
NVAU #223	NVAU #231 (Form Texaco NM "W" #4)

I feel that none of these wells are completed in such a manner that they might serve as channels for injected water to migrate from the Abo pay to other formations, or to the surface. Therefore, none of the wells should require additional wellbore protection.

R.D. George 10/26/77

Agree [signature] 10-26-77


R-35-E
T 17 S
Amini
Exxon-St.
Exxon "B" State
Shell "C" State
Shell "A" State
Shell State
State "A"
Shell "B" State
Chevron
Mobil
Marathon
St. Com
State
Exxon
Texaco
KKA
Marathon State
Phillips
Santa Fe "A" Com.
Mobil - Phillips
State "TT" State
Cities Service
State "JJ"
State "A" Com
State "MM"
State "L"
Bridges State
NORTH VACUUM ABO UNIT
NORTH VACUUM ABO EAST UNIT
Marath.
Std. Tex.
State "DJ"
Shell
"K"
Elk St. Com.
N.M. "W" State
"PP" State
Bridges-Santa Fe
Pennzoil
Skelly
State "AC" Com.
Penroc
Buckeye State
"G"
St. "N" Com.
Staplin St. Com.
State "VB" Com.
Santa Fe
Mallard
"A" State "C"
State "J"
State "K"
Staplin St

LEGEND

Abo penetrations within ½ mile of injectors

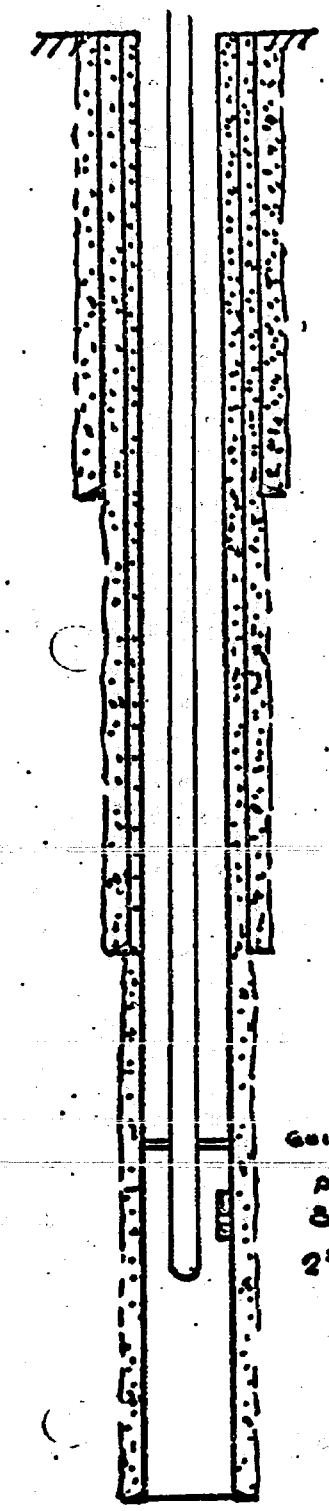
- ABO PRODUCER
- ABO PENETRATION
- ABO LOCATION
- DRY HOLE
- UNIT BOUNDARY
- INJECTION WELL
- TRACT NUMBERS

Mobil Oil Corporation
Houston E&P Division

EXHIBIT "A"
TO UNIT AGREEMENT
NORTH VACUUM ABO EAST UNIT
Lea County, New Mexico

Scale 1"=2000'
Date 6-9-77
Drawn ECM
Checked
Approved
Revised

FIELD	OPERATOR	DATE
Vacuum, Abo, North	Mobil Oil Corp	5-6-76
LEASE	**WELL NO**	**LOCATION**
State A Com	1	N- Sec 7, T17S, R35E



12 3/4" casing set at 296' with 450 sx of _____ cement
Hole size 17 1/2" cement circ.

8 5/8" casing set at 3220' with 1400 sx of _____ cement
Hole size 11" cement circ.

Guib. T.A. Catcher - 8591'

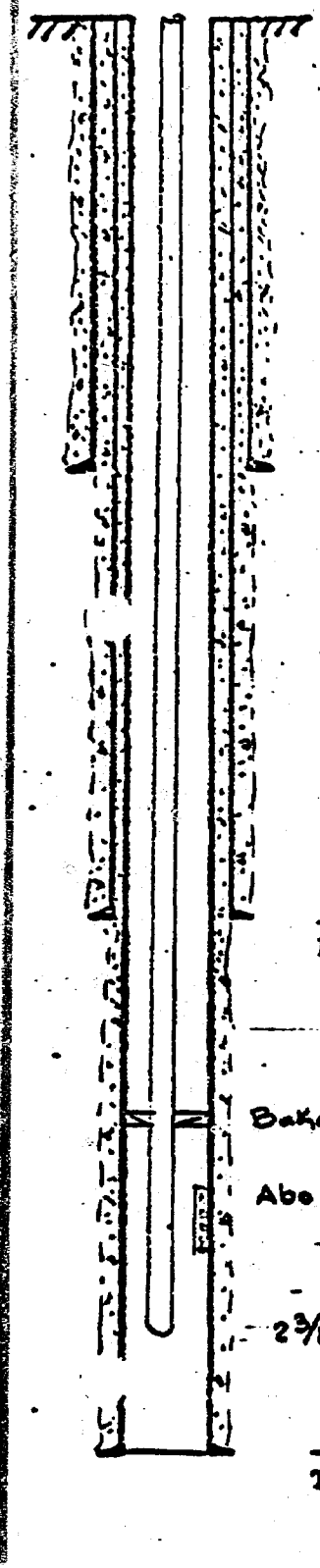
Abo Perf.
8657' - 8759'

2 3/8" tubing - 8817'

5 1/2" casing set at 8850' with 2300 sx of _____ cement
Total Depth 8850' Hole size 7 7/8" cement circ.

5-7-76

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp	5-7-76
LEASE	**WELL NO.**	**LOCATION**
Elk State Com	1	N. Sec 18, T17S, R35E



12¾" casing set at 290' with 450 sx of Cl. H cement
Hole size 17½" cement circ.

8⅝" casing set at 3200' with 1400 sx of _____ cement
Hole size 11" cement circ.

Baker TA Catcher - 8643'

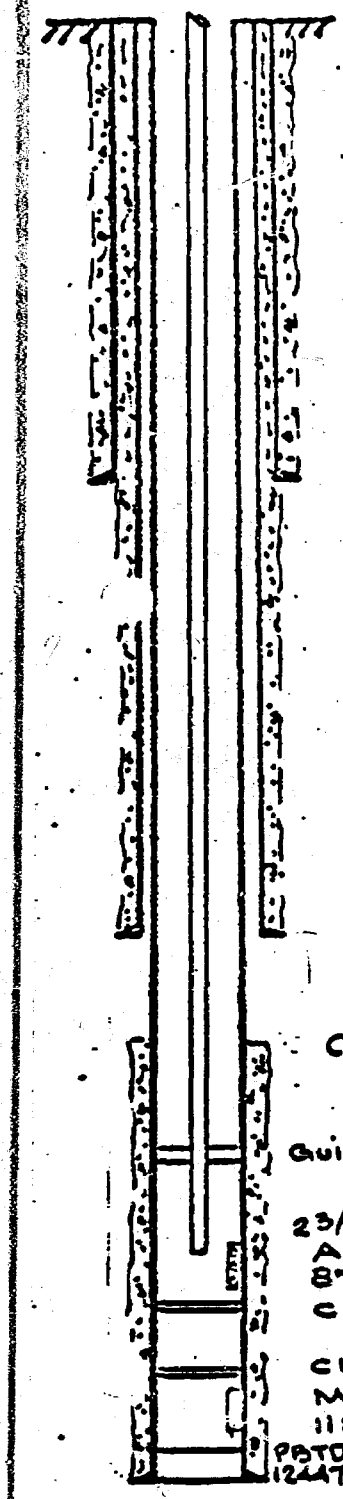
Abo Perf. 8672'-8782'

2⅜ Tubing - 8810'

5½" casing set at 8850' with 1750 sx of _____ cement
Total Depth 8850' Hole size 7⅞" cement. circ.

5-7-76
JHS

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp	5-6-76
LEASE Elk State Com.	WELL NO 2	LOCATION J - Sec 18 T17S, R35E



13 3/8" casing set at 376 ' with 400 sx of _____ cement
Hole size 17 1/2" cement circ. (calc.)

8 5/8" casing set at 5000 ' with 1250 sx of _____ cement
Hole size 11" cement circ. (calc.)

Cement Top 6291' (calc.)

Guib. T.A. - 8638'

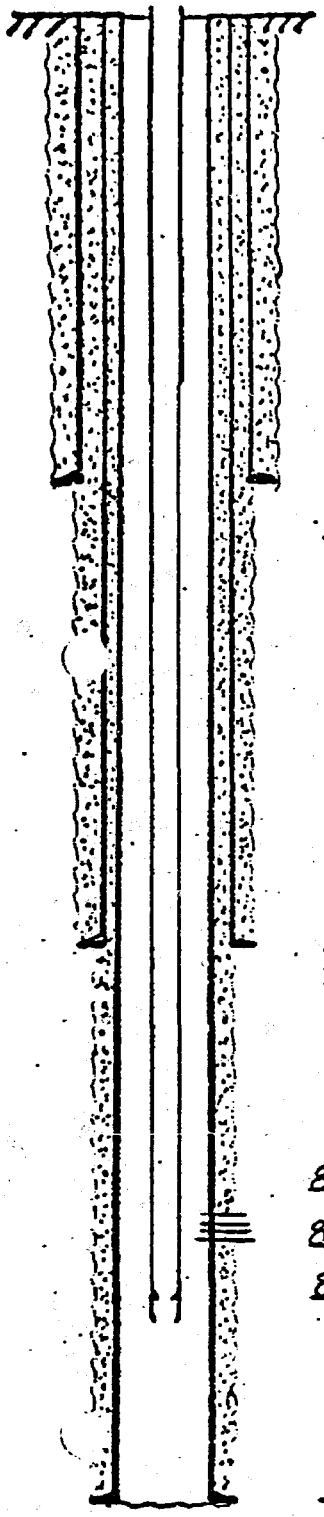
2 3/8" Tubing - 8830'
Abo Perf.
8796'-8800' (TBG. PERFS) - Csg perfs (8711'-8773')
CIBP - 8850'

CIBP - 11480
Morrow Perf
11550'-12066

PBTD 12447 4 1/2" casing set at 12515 ' with 1350 sx of _____ cement
Total Depth 12515 ' Hole size 7 7/8"

5-6-76

FIELD	OPERATOR	DATE
VACUUM ABO NORTH	MOBIL OIL CORP.	5-10-76
LEASE STATE K	WELL NO 10	LOCATION L-18-17S-35E



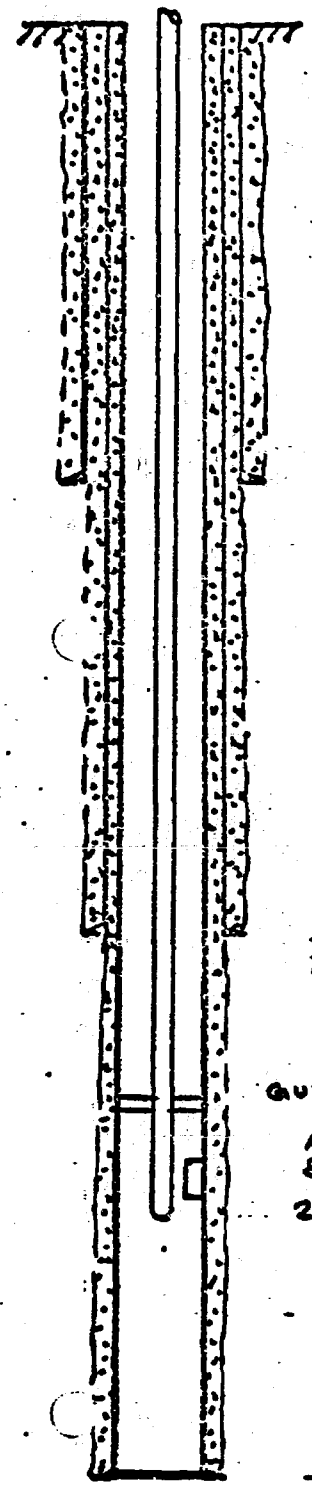
12 3/4" casing set at 250' with 300 sx of Class H cement
Hole size 17 1/2"
CEMENT CIRCULATED

8 5/8" casing set at 3210' with 1600 sx of TILW + cement
Class C tail
Hole size 11"
CEMENT CIRCULATED

8633' GUIB. TA CATCHER set w/ 14,000 # Tension
8655'-8717' 21 PERFS O.A.
8726' S.N. on 213 jts. 2 3/8" tubing and 64 jts. 2 7/8" tubing

5 1/2" casing set at 8800' with 2400 sx of TILW + cement
flocele + Class C-tail
Total Depth 8800' Hole size 7 7/8"
CEMENT CIRCULATED

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp.	5-6-76
LEASE	WELL NO	LOCATION
State "JJ"	1	L - Sec. 7 T 17S R 35E



12 3/4" casing set at 270' with 450 sx of _____ cement
Hole size 17 1/2" cement circ.

8 5/8" casing set at 3170' with 1200 sx of _____ cement
Hole size 11" cement circ.

Guib. T. A. Catcher. 8636'

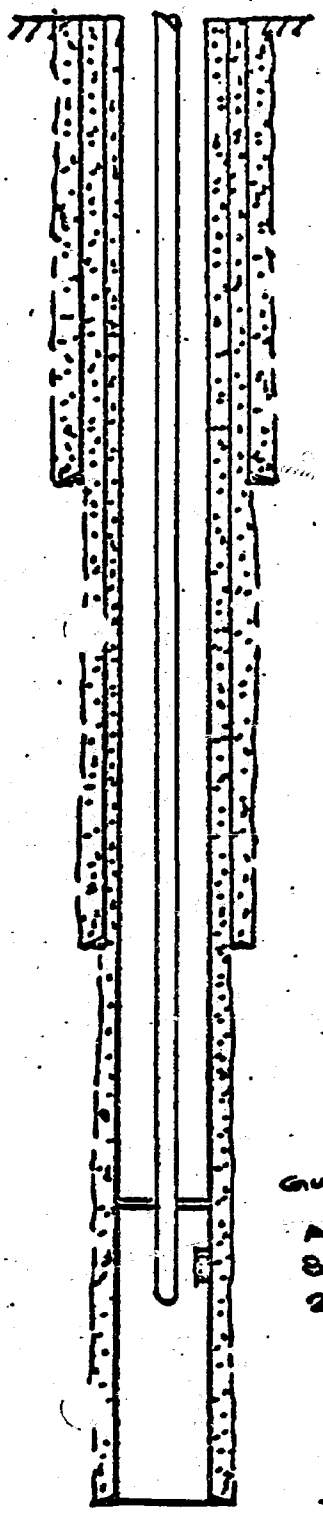
Abo Perf:
8605' - 8668'

2 3/8" Tubing 8701'

5 1/2" casing set at 8850' with 2300 sx of _____ cement
Total Depth 8850' Hole size 7 7/8" cement circ.

5-6-76

FIELD	OPERATOR	DATE
Vacuum, Abo, North	Mobil Oil Corp	5-7-76
LEASE	WELL NO.	LOCATION
State "MM"	1	P Sec 7 T17S, R35E



12 3/4" casing set at 291' with 450 sx of _____ cement
Hole size 17 1/2" cement circ.

8 5/8" casing set at 3260' with 1450 sx of _____ cement
Hole size 11" cement circ.

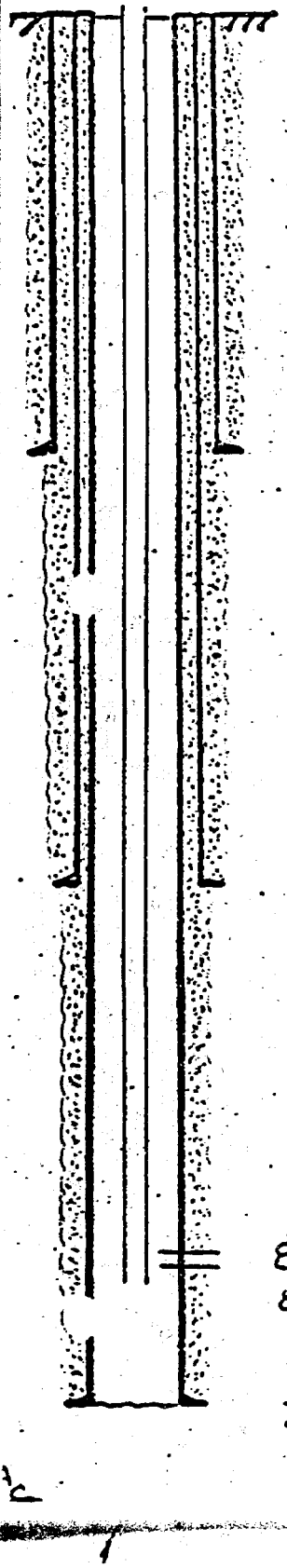
Guib. T.A. Catcher - 8760'

Abo Perf.
8776'-8877'
2 3/8" Tubing - 8975'

5 1/2" casing set at 8975' with 2500 sx of _____ cement
Total Depth 8975' Hole size 7 5/8" cement circ.

5-7-76
JLS

FIELD	OPERATOR	DATE
N. VACUUM ABO	MOBIL OIL CORP	5-7-76
LEASE STATE TT COM	**WELL NO** 1	**LOCATION** J-7-17S-35E



Cemented to surface on all three strings.

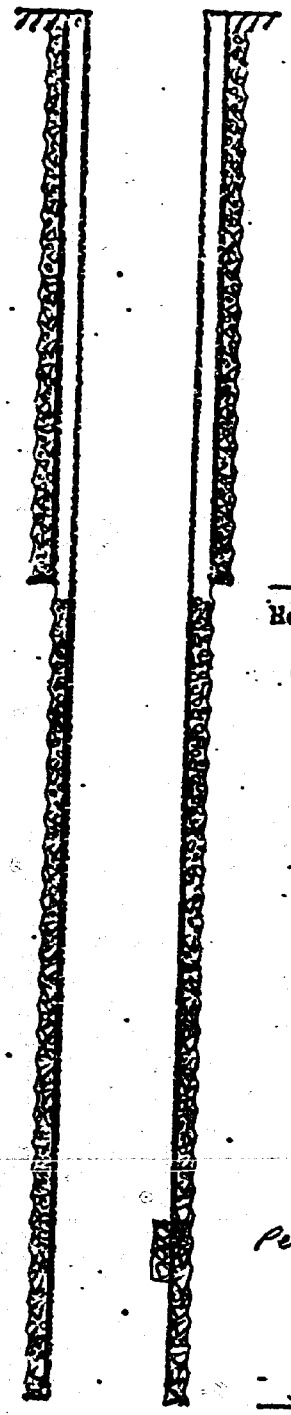
12 3/4" casing set at 258' with 400 sx of Class H cement
Hole size 17 1/2"
Cement circ. to surface

8 5/8" casing set at 3250' with 1450 sx of TLW + C cement
Hole size 11" + H to surface

8699', 8700', 04, 06, 39, 40, 48, 49, 50, 61, 8791-99 W/1 JSP
8848' 2 3/8" TUBING

5 1/2" casing set at 8930' with 2000 sx of TLW+Cell cement
Total Depth 8930' Hole size 7 7/8" + Class C tail
Cement circ.

FIELD	OPERATOR	DATE
Vacuum Abo North	Texaco Inc.	May 3, 1976
LEASE	**WELL NO.**	**LOCATION**
N. M. "DS" State	1	D-12-17S-35E



650 sx TLW

8 5/8" casing set at 1800' with 900 sx of 25:75:2 cl "C" cement
Hole size 11"

Cmt. Circ.

Cement Top 1810' Temp. Survey

Perf: 8642-8694'

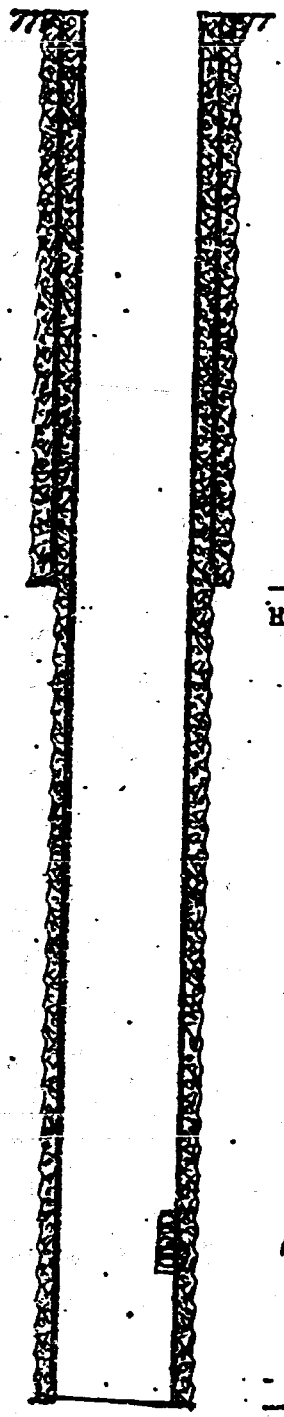
2770 sx TLW

5 1/2" casing set at 8800' with 3070 sx of 50:50:12 w/10# Salt/sx cement
Total Depth 8800' Hole size 7 7/8"

Cmt Top @ 1810' TS

FIELD	OPERATOR	DATE
Vacuum Abo North	Texaco Inc	May 3, 1976

LEASE	WELL No	LOCATION
N.M "DI" State	2	B-18-17S-35E



600 sx Lt C 4% gel

8 5/8 " casing set at 1820 ' with 850 sx of 250 sx Lt C 1% CaCl cement

Hole size 11 "

Cmt. Circ.

Perf 8792-8810

2700 sx TLW

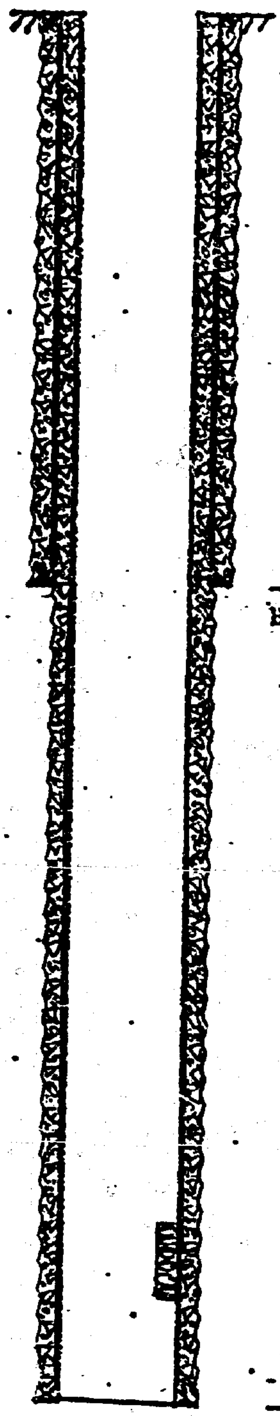
5 1/2 " casing set at 8850 ' with 3000 sx of 300 sx Cl C w/ 10 # salt/sx cement

Total Depth 8850 ' Hole size 7 7/8 "

Cmt Circ.

FIELD	OPERATOR	DATE
Vacuum Abo North	Texaco Inc.	May 3, 1976

LEASE	WELL No.	LOCATION
N.M. "DJ" State	3	H - 19 - 17S - 35E



800 sx Cl "C" 4% gel
550 sx Cl "C" 1% CaCl

8 5/8 " casing set at 1810 ' with 1850 sx of 500 sx Cl "C" cement
Hole size 12 1/4 "
Cmt Circ

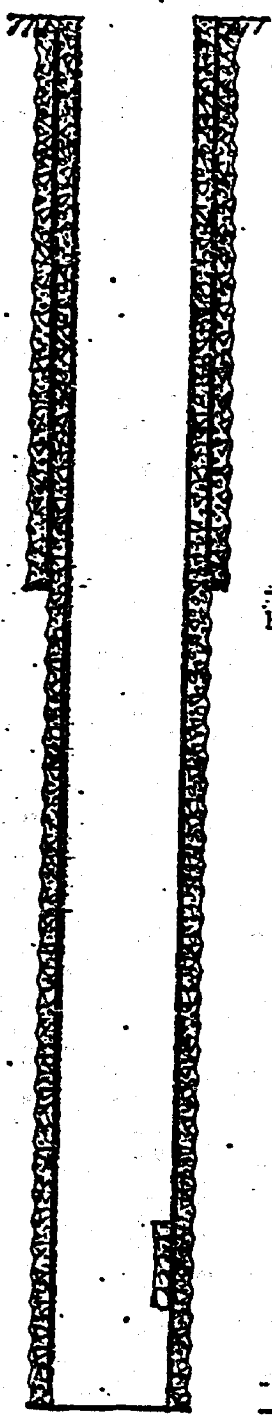
Perf: 8733 - 8873'

100 sx Cl "C"
1500 sx Cl "C" w/12% gel

5 1/2 " casing set at 8910 ' with 1900 sx of 300 sx Cl "C" w/15# salt/sx cement
Total Depth 8910 ' Hole size 7 7/8 "

Cmt Circ.

FIELD	OPERATOR		DATE
Vacuum Abo North	Texaco Inc.		May 3, 1976
LEASE	WELL No.	LOCATION	
N.M. "DJ" State	4	F-18-17S-35E	



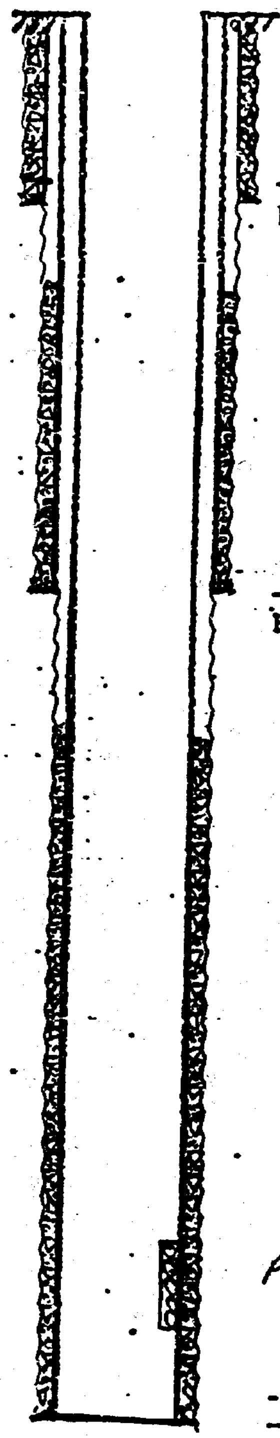
8 5/8 " casing set at 1850 ' with 1090 sx of 840 sx cl 'C' 4% gel [struck: 300 cl 'C' neat] cement
Hole size 12 1/4 "
Cmt. Circ.

Perf. 8661' - 8848'

5 1/2 " casing set at 8850 ' with 1800 sx of 100 sx cl 'C' / 1400 sx cl 'C' 12 % gel / [struck: 300 sx cl 'C' w/...] salt/sx cement
Total Depth 8850 ' Hole size 7 7/8 "
Cmt. Circ

FIELD	OPERATOR	DATE
Vacuum Morrow	Texaco Inc	May 3, 1976

LEASE	WELL No.	LOCATION
N.M. "DK" State	1	F-18-17S-35E



13 3/8 " casing set at 375 ' with 400 sx of Cl "C" 2% CaCl cement
Hole size 17 1/2 "
Cmt. Circ.

Cement Top 2780' Temp. Survey

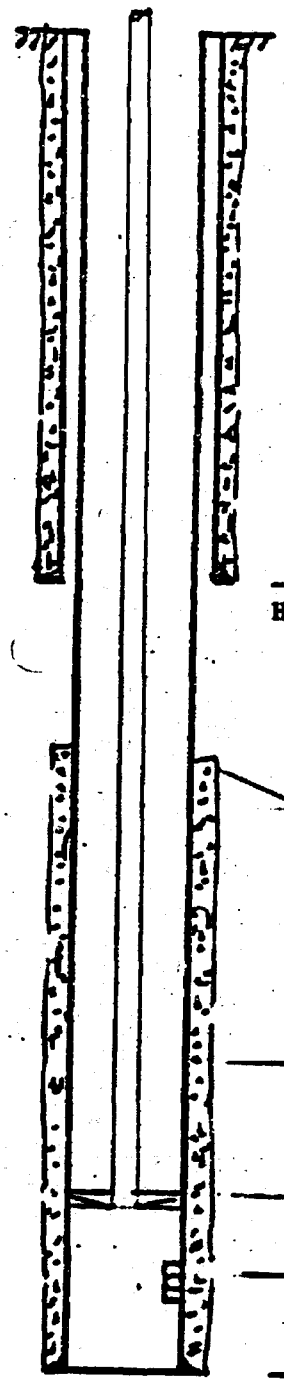
750 sx Cl "C" 4% gel
8 5/8 " casing set at 4954 ' with 1050 sx of 300 sx Cl "C" w/ [illegible] cement
3 lb/sx
Hole size 11 "
Cmt Top @ 2780' TS

Cement Top 5745 Temp Survey

Perf: 11,485 - 11,856

50 sx Cl "C"
700 sx TLW
4 1/2 " casing set at 12,500 ' with 1350 sx of 600 sx H w/ .5% Halad 9 cement
Total Depth 8300 12,500 ' Hole size 7 7/8 "
Cmt Top @ 5745' TS

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp	5-13-76
LEASE	**WELL NO**	**LOCATION**
North Vacuum Abo Unit	159	P, Sec 12, T17S, R34E

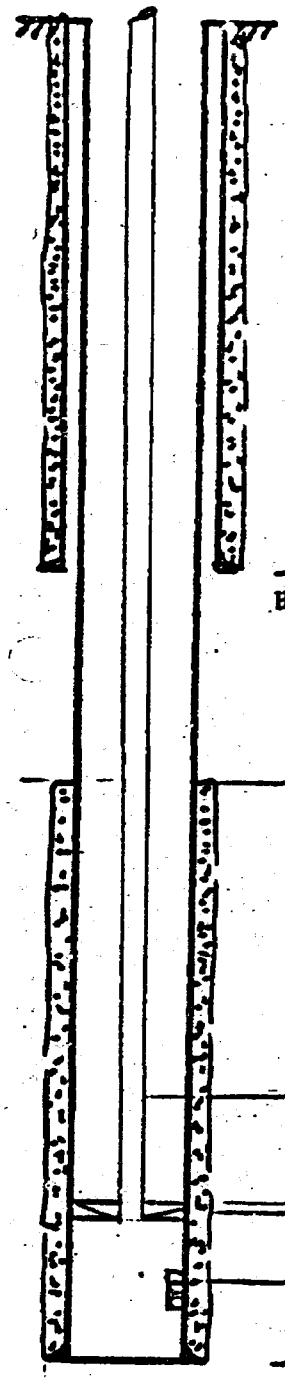


8 5/8" casing set at 1775' with 900 sx of Class C cement
Hole size 12 1/4" cement circ

5 1/2" casing set at 8750' with 3000 sx of TLW cement
Total Depth 8750' Hole size 7 7/8"

5-13-76
JHS

FIELD	OPERATOR	DATE
Vacuum Abo North	Mobil Oil Corp.	5-13-76
LEASE	WELL NO	LOCATION
North Vacuum Abo Unit	161	H Sec 12 T17S R34E



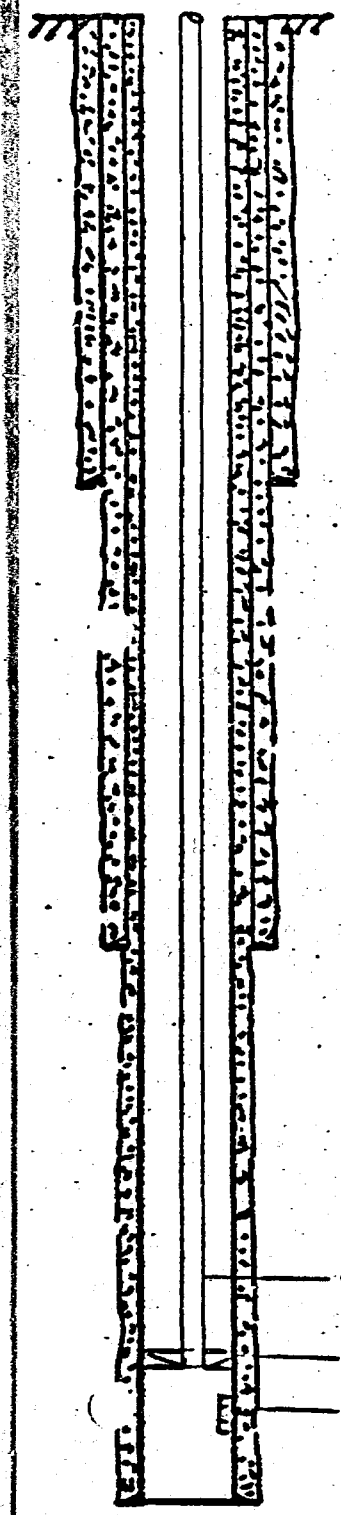
8 5/8" casing set at 1775' with 900 sx of cl. H + gel cement
Hole size 12 1/4" cement Circ

5 1/2" casing set at 8800' with 3100 sx of TLW cement
Total Depth 8800' Hole size 7 7/8"

6-13-76
JHS

FIELD	OPERATOR	DATE
Vacuum, Abo, North	Mobil Oil Corp.	5-14-76

LEASE	WELL NO	LOCATION
North Vacuum Abo Unit	169 (old)	H, Sec 13, T17S, R34E



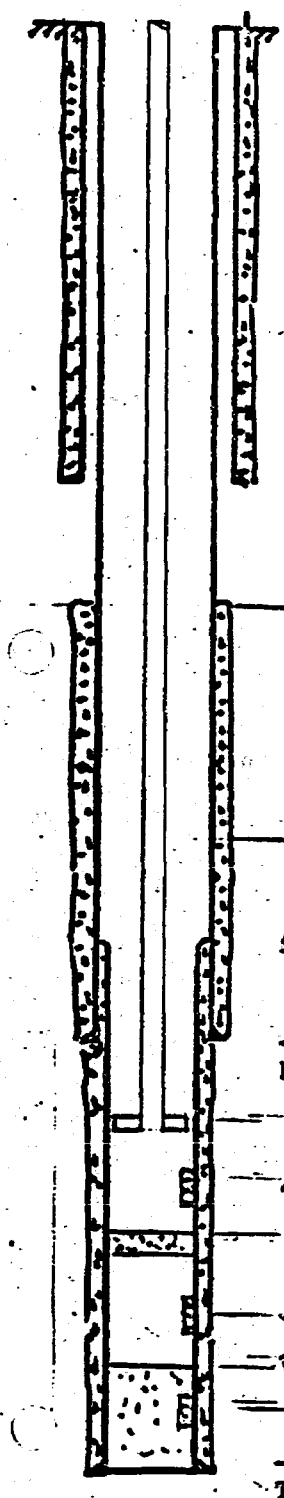
12 3/4" casing set at 270' with 450 sx of Cl. C cement
Hole size 17 1/2" cement circ

8 5/8" casing set at 3160' with 1400 sx of TLW cement
Hole size 11" cement circ

5 1/2" casing set at 8800' with 2300 sx of TLW cement
Total Depth 8800' Hole size 7 7/8" cement circ.

5-14-76

FIELD	OPERATOR	DATE
Vacuum, Abo, North	Mobil Oil Corp.	5-17-76
LEASE North Vacuum Abo Unit	**WELL No** 205	**LOCATION** B - Sec. 24, T17S, R34E



13 3/8" casing set at 336' with 350 sx of Incor Neat cement
Hole size 17 1/2"
cement circ.

Cement Top - 1290' - Temp. Survey

2 3/8 Tubing

4791' Liner top

9 5/8" casing set at 5000' with 2260 sx of Incor Lgt cement
Hole size 12 1/4"

Taylor H.D - 8508'

Abo Perf - 8523'-8570'

PBTD - 9492'

Wolfcamp Perf. 9671'-10014' Sqzd w/100 Sx Cement

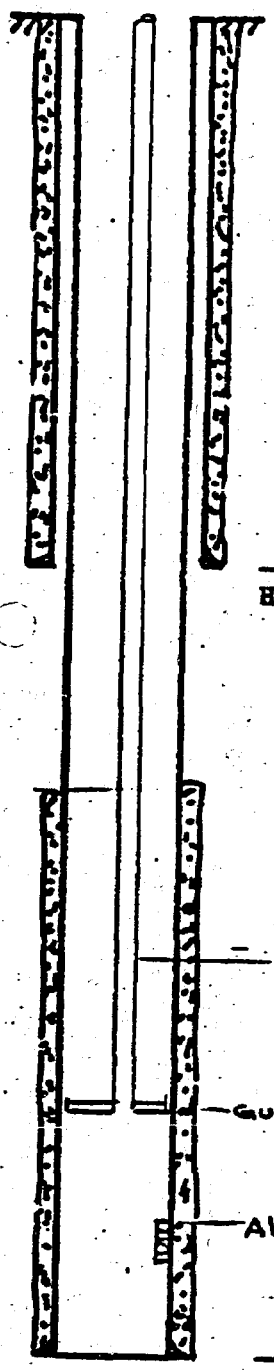
PBTD - 10082'

U. Penn Perf 10334-10352' Sqzd. w/100 Sx Cement

7" liner set at 10399' with 900 sx of Incor Nat cement
Total Depth 10401' Hole size 8 3/4"
cement circ.

5-17-76
JHS

FIELD	OPERATOR		DATE
Vacuum Abo North	Mobil Oil Corp.		5-17-76
LEASE	WELL No	LOCATION	
North Vacuum Abo Unit	306	D-Sec. 12, T17S, R35E	



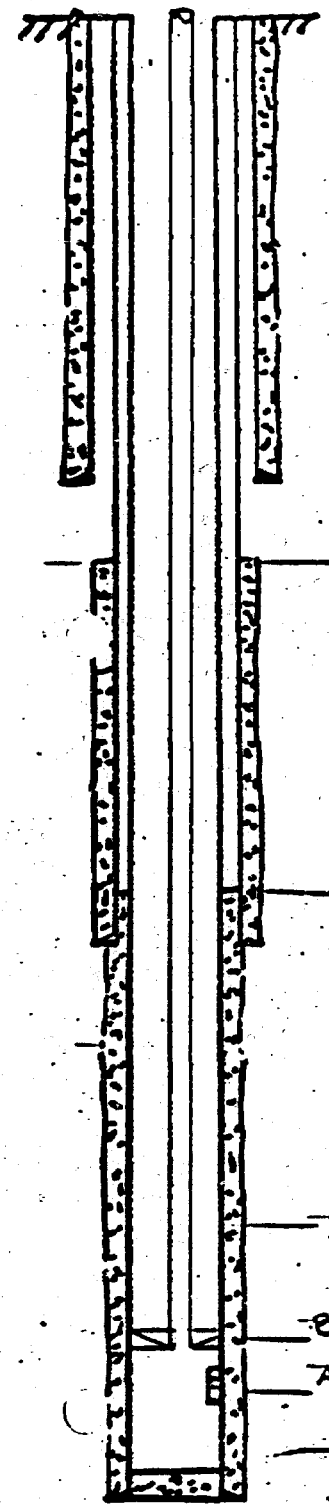
8 5/8" casing set at 1795' with 900 sx of Cl. H cement
Hole size 12¼" Cement Circ.

5 1/2" casing set at 8800' with 3100 sx of TLW cement
Total Depth 8800' Hole size 7 7/8"

5-17-76
JHS

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp.	5-17-76

LEASE	WELL NO	LOCATION
North Vacuum Abo Unit (Formerly PENNZOIL - Mobil ST #1-24)	207 WIW	H- Sec 24, T17S, R34E



13 3/8" casing set at 352' with 290 sx of cl. A+gel cement
Hole size 17 1/2" Cement circ.

Cement Top - 2430' - Temp. Survey

Cement Top - 3950' - Temp. Survey

8 5/8" casing set at 4000' with 720 sx of cl. H cement
Hole size 11"

2 3/8" Tubing

Baker Mod. FB. Pkr. - 8475'

Abo Perf. 8525'-8587'

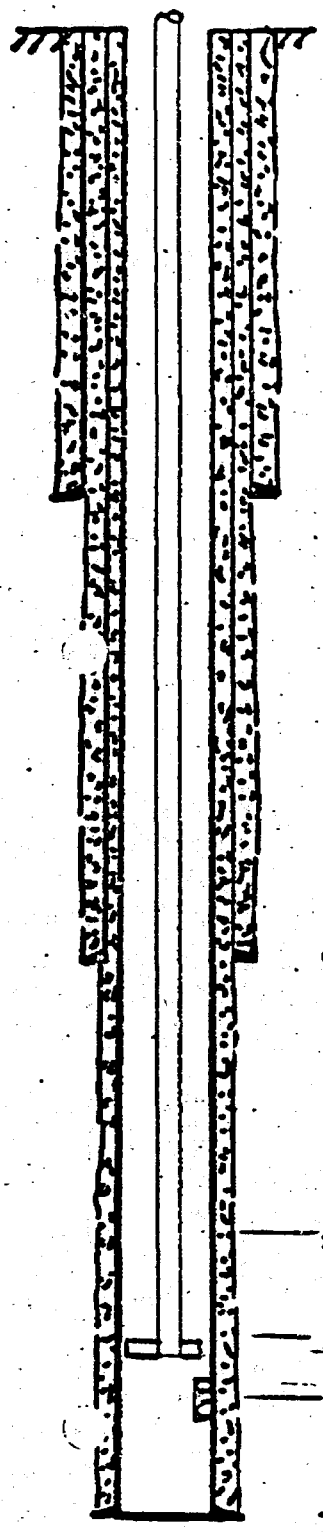
PBTD- 8620'

4 1/2" casing set at 8653' with 585 sx of cl. C cement
Total Depth 8653' Hole size 7 7/8"

5-17-76
JHS

FIELD	OPERATOR	DATE
Vacuum, Abo, North	Mobil Oil Corp	5-19-76

LEASE	WELL NO	LOCATION
North Vacuum Abo Unit	331	E. Sec 19, T17S, R35E



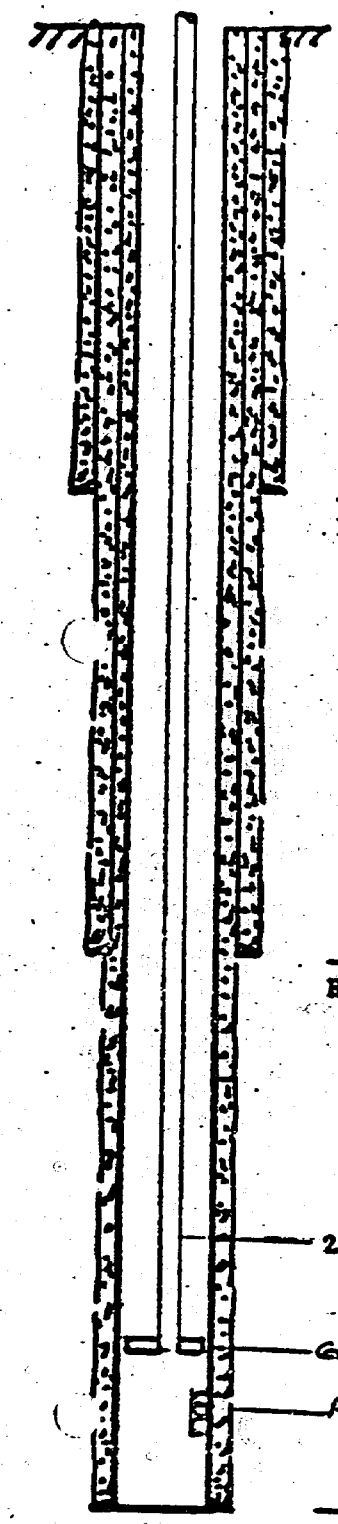
12 3/4" casing set at 295 ' with 350 sx of Cl. C cement
Hole size 17 1/2 "
Cement Circ

8 5/8" casing set at 3165 ' with 1600 sx of TLW cement
Hole size 11 "
Cement Circ

5 1/2" casing set at 8720 ' with 2000 sx of TLW cement
Total Depth 8720 ' Hole size 7 7/8 "
Cement Circ

5-19-76
JHS

FIELD	OPERATOR	DATE
Vacuum Abo North	Mobil Oil Corp	5-19-76
LEASE	WELL NO.	LOCATION
North Vacuum Abo Unit	223	A - Sec 13, T17S, R34E



12¾" casing set at 263' with 510 sx of Cl. H cement
Hole size 17½" cement circ.

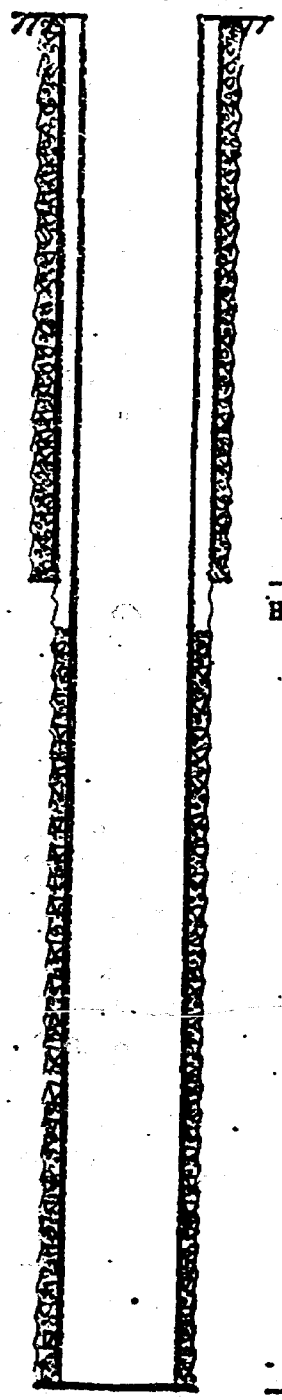
8⅝" casing set at 3140' with 1600 sx of TLW cement
Hole size 11" cement circ.

5½" casing set at 8750' with 2000 sx of TLW cement
Total Depth 8750' Hole size 7⅞" cement circ

5-19-76

FIELD	OPERATOR	DATE
Vacuum Abo North	TEXACO INC	5-4-76
LEASE ~~N.M. "W" State (Acct 1)~~	WELL NO. 4	LOCATION P-13-17S-34E

North Vacuum Abo Unit # 231

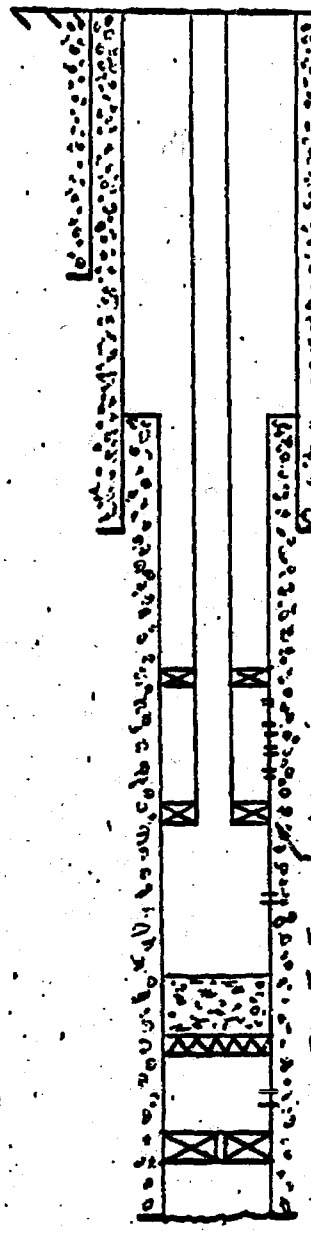


8 5/8 " casing set at 1800 ' with 750 sx of 500 "C" w/4% Gel 250 "C" w/2% CaCl cement
Hole size 11 "
Cement Top 1810' Temp Survey
Circulated

PERF: 8584'-8730'

5 1/2 " casing set at 8800 ' with 1801 sx of 1500 TLW 300 "C" w/1/4% Salt cement
Total Depth 8800 ' Hole size 7 7/8 "
Cmt. Top @ 1810
By TS

FIELD	OPERATOR		DATE
North Vacuum Field	Mobil		7/29/76
LEASE	WELL NO.	COUNTY, STATE	
State NN	1	Lea	New Mexico
LOCATION	COMPLETION DATE		ELEVATION
1980' FSL, 660' FWL, 8-17S-35E	2/25/73		3984' GL



13 3/8" 48 lb. CASING SET AT 320' WITH 400 SX CEMENT. CIRC HOLE SIZE 17 1/2"

LINER TOP 4786'.

9 5/8" 40 lb. CASING SET AT 4990' WITH 2900 SX CEMENT. CIRC HOLE SIZE 12 1/4".

8,864'-8954' ABO PERFS SQZD W/ 150 SX CMT. 50 HOLES.

10,895 MIDDLE PENN PERFS SQZD W/ 150 SX CMT. 13 HOLES.

11,789' BAKER MODEL "F-1" PKR W/ MODEL "E" SEAL ASSBY.

ATOKA PERFS — 53 HOLES - 2 JSPF
11,866'-872'; 11,932-938'; 12,014'-022'; 12,058-12,065'

2 7/8" ___ lb. TUBING AT 12,085' ~~WITH SN~~
12,085' BAKER MODEL "F-1" PKR

12,114'-12,122' ATOKA PERFS 18 HOLES OA

12,290'- 10' CMT ON CIBP

12,300' CIBP

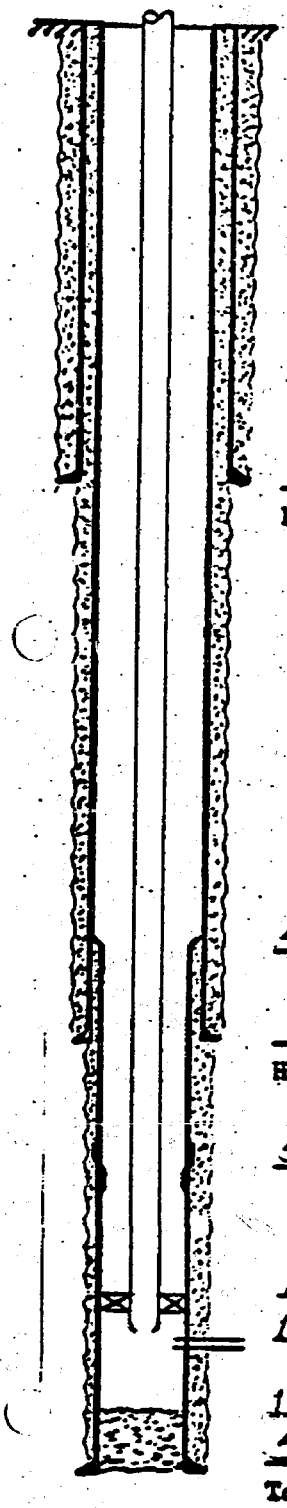
12,323'-12,334' MORROW PERFS 22 HOLES O.A.

12,373' BAKER 7" MODEL D PACKER

7" 26 lb. CASING OR LINER SET AT 12,419' WITH 1800 SX. CEMENT. CIRC
8 3/4" HOLE

MWB

FIELD	OPERATOR	DATE
NORTH VACUUM ATOKA	MOBIL OIL CORP.	5-24-76
LEASE	WELL No	LOCATION
STATE U.U	1	F - 7 - 17S - 35E



13 3/4" casing set at 340' with 400 sx of Class H cement
Hole size 17½"
CEMENT CIRC.

4675' Liner top

9 5/8" casing set at 5000' with 3700 sx of Class C + cement
Hole size 12 ¼"
Flocele + neat tail
CEMENT CIRC.

5917' BASH ROSS Csg. BOWL

11750' BAKER 5½" MODEL F PACKER - 2⅞" TUBING
11802'-11897' ATOKA Perfs 20 Holes O.A.

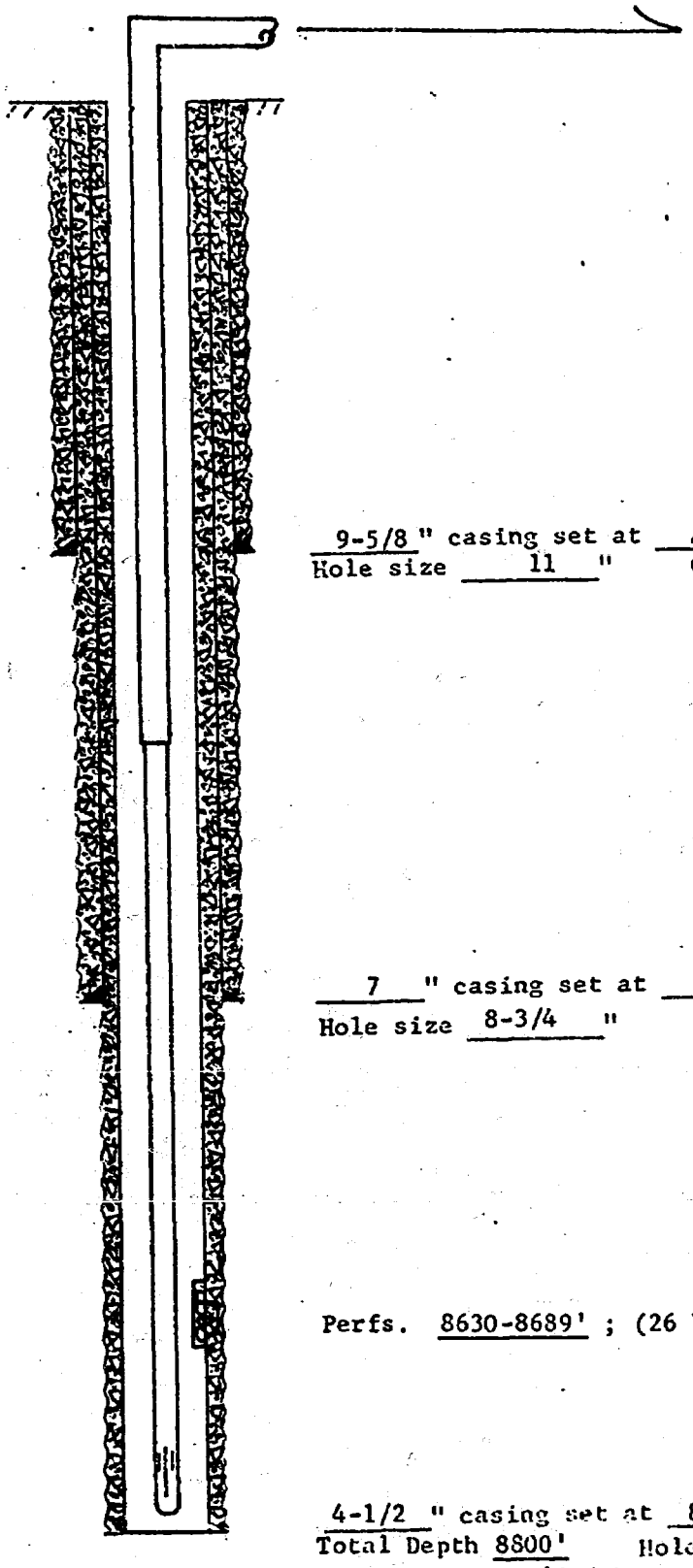
12,100' PBTD

5½" liner set at 12,152' with 2310 sx of TILW+ cement
Total Depth 12100' Hole size 8 ½"
Flocele + class H

Ac

FIELD	OPERATOR	DATE
VACUUM ABO, NORTH	MARATHON OIL COMPANY	6-17-76

LEASE	WELL NO	LOCATION
STAPLIN STATE a/c 2 Com.	1	Sec.19-T17S-R35E



Tbg. set @ 8732'
2-7/8" to 1715'
2-3/8" from 1715' to 8732'

9-5/8 " casing set at 498 ' with 195 sx of Oil Well cement
Hole size 11 " Cement Top Circ'd (Calculated)

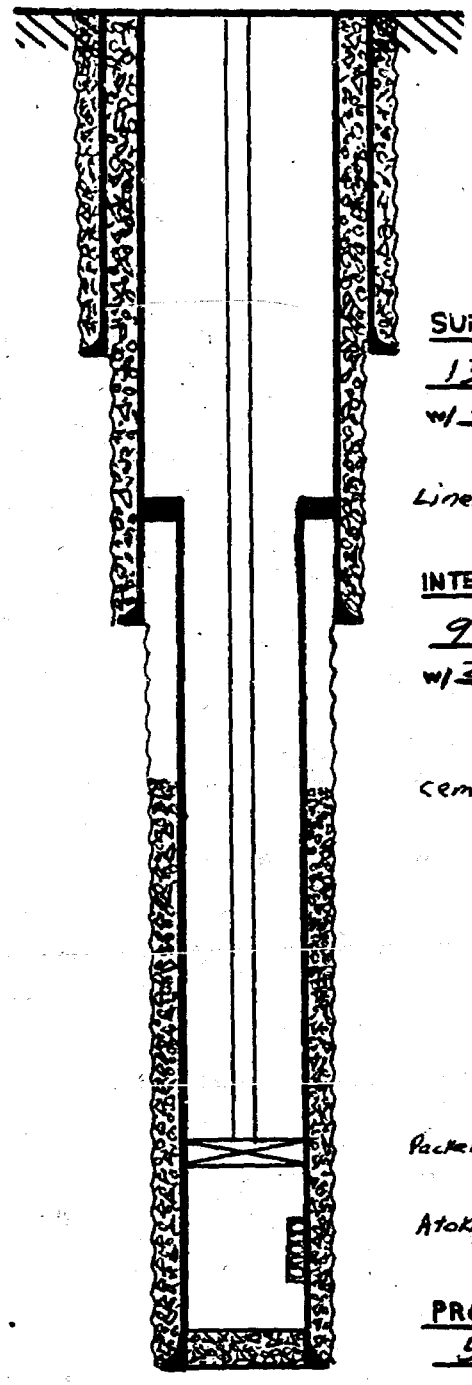
7 " casing set at 3939 ' with 800 sx of Oil Well cement
Hole size 8-3/4 " Cement Top Circ'd (Calculated)

Perfs. 8630-8689' ; (26 holes)

4-1/2 " casing set at 8799 ' with 525 sx of Low Dense cement
Total Depth 8800' Hole size 6-1/8 " Followed w/300 sx Class "C"
Cement Top Circ'd (Observed)

Diagrammatic Wellbore Sketch

LEASE Marathon Sec 7
FIELD North Vacuum Atoka
WELL # 1
COMPLETION DATE _____
LOCATION G/S7/T17S/R35E
COUNTY & STATE Lea, NM
ELEVATION 4,027
DRAWN BY: RPG
DATE 10/25/77



SURFACE

13 3/8" _____ lb at 353'
w/ 425 sx cmt. Cmt top circ.
125 sx to pit

Liner Top 4522' Squeezed w/ 300 sx

INTERMEDIATE

9 5/8" _____ lb at 5012'
w/ 2550 sx cmt. Cmt top circ.
180 sx to pit

Cement top 7450' (Bond Log)

Packer set @ 11,971 on 2 7/8" tubing

Atoka perfs 12,078'-12,141'

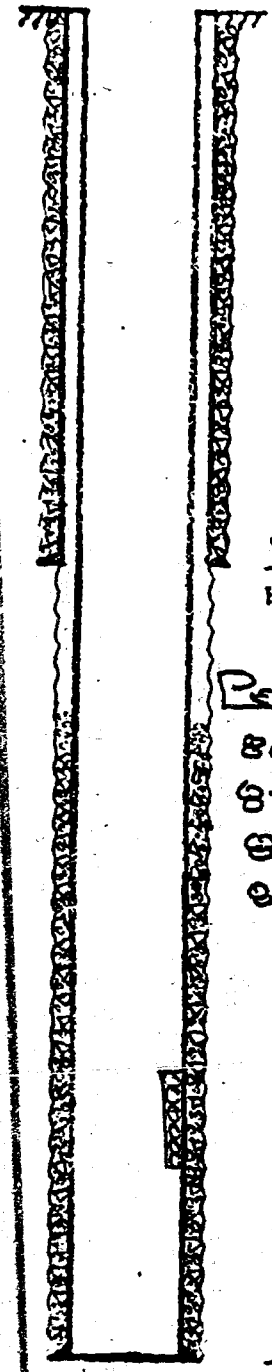
PRODUCTION

5½" _____ lb. at 12,220'
w/ 17000sx cmt. Cmt top 7450.
T.D. 12,220' P.B.T.D. 12,173'

MWB

FIELD	OPERATOR	DATE
VACUUM	PHILLIPS PETROLEUM CO.	5-4-76
LEASE	WELL NO.	LOCATION
SANTA FE	122	1890' FNL, 760' FEL, Sec. 19 T-17S

R-35-E, LEA CO., N. M.
Unit H



8-5/8" casing set at 1750' with 600 sx of _____ cement
Hole size 12-1/4"
(350 sx INCOR SR w/ 20% DD
250 sx INCOR SR w/ 2% CaCl2)

PERFS:
8676'-80'
8702'-16'
8710'-14'
8718-22'

TBG: 2-3/8 @ 8632'

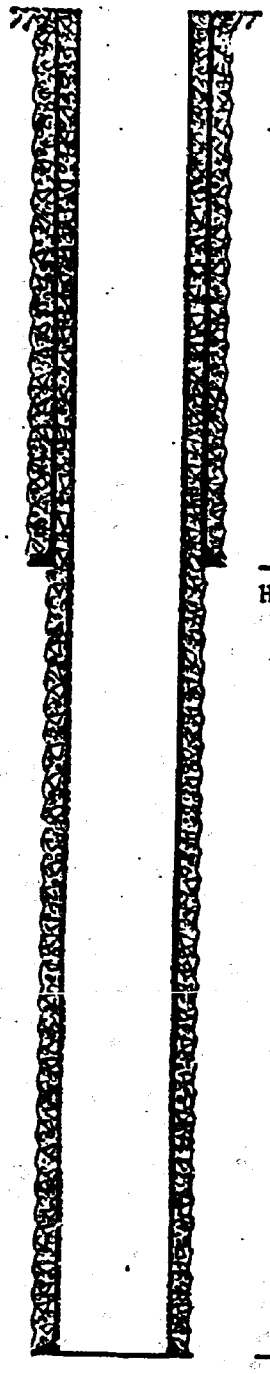
Cement Top 2950' (Temp Survey)

5-1/2" casing set at 8997' with 2050 sx of _____ cement
Total Depth 9000' Hole size 7-7/8"
(1900 SKS. TRINITY LITEWATE
+ 250 SKS. CL H NEAT)
PBTD: 8963'
TOC: 2950' (SURVEY)

FIELD	OPERATOR	DATE
State 16 Vacuum	SHELL	5-15-76

LEASE	WELL No.	LOCATION
STATE 16 B	1	Sec. 19 T-17-S R-35-E

2130' FEL + 660' FNL, Sec. 19



9 5/8" casing set at 1722' with 1000 sx of Class "C" cement
Hole size 12 1/4"
47#
Cal - Circulated

5 1/2" casing set at 8975' with 5465 sx of Trinity Light / Class C / Class H cement
Total Depth 8975' Hole size 7 7/8"
CW - Circulated

RDG
10/27/77

TABULATION OF ABO OR DEEPER PENETRATION
WELLS WITHIN 1/2 MILE OF PROPOSED INJECTORS -
PROPOSED NORTH VACUUM ABO EAST UNIT
LEA COUNTY, NEW MEXICO

BEFORE EXAMINER NUTTER
OIL CON[illegible] COMMISSION
[illegible] NO. 10
CASE NO. 6208

Operator	Lease	Well No.	Location Letter	Sec.	Township	Range	Total Depth	Producing Interval	Casing Size	Set @ Depth	Sx. Cmt. Used	Cement Top
Mobil	Elk State Com	2	J	18	17S	35E	12515'	8711-8773' (Abo)	4-1/2"	12515'	1350	6291 (calc)
									8-5/8"	5000'	1250	circ (calc)
									13-3/8"	375'	400	circ (calc)
Mobil	State K	10	L	18	17S	35E	8800'	8655-8717' (Abo)	5-1/2"	8800'	2400	circ.
									8-5/8"	3210'	1600	circ.
									12-3/4"	250'	300	circ.
Mobil	State JJ	1	L	7	17S	35E	8850'	8605-8668' (Abo)	5-1/2"	8850'	2300	circ.
									8-5/8"	3170'	1200	circ.
									12-3/4"	270'	450	circ.
Mobil	State TT	1	J	7	17S	35E	8930'	8699-8799' (Abo)	5-1/2"	8930'	2000	circ.
									8-5/8"	3250'	1450	circ.
									12-3/4"	258'	400	circ.
Texaco	State DJ	1	D	18	17S	35E	8800'	8642-8694' (Abo)	5-1/2"	8800'	3070	1810' (TS)
									8-5/8"	1800'	900	circ.
Texaco	State DJ	2	B	18	17S	35E	8850'	8792-8810' (Abo)	5-1/2"	8850'	3000	circ.
									8-5/8"	1820'	850	circ.
Texaco	State DK	1	F	18	17S	35E	12500'	11485-11856' (Atoka)	4-1/2"	12500'	1350	5745' (TS)
									8-5/8"	4954'	1050	2780' (TS)
									13-3/8"	375'	400	circ.
Mobil	NVAU	159	P	12	17S	34E	8750'	8561-8621' (Abo) WIW	5-1/2"	8750'	3800	2515 (TS)
									8-5/8"	1775'	900	circ.
Mobil	NVAU	161	H	12	17S	34E	8800'	8584-8641' (Abo) WIW	5-1/2"	8800'	3100	2660' (TS)
									8-5/8"	1775'	900	circ.
Mobil	NVAU	169	H	13	17S	34E	8800'	8607-8666' (Abo) WIW	5-1/2"	8800'	2300	circ.
									8-5/8"	3160'	1400	circ.
									12-3/4"	270'	450	circ.
Mobil	NVAU	206	D	19	17S	35E	8800'	8597-8658' (Abo)	5-1/2"	8800'	3100	2770' (TS)
									8-5/8"	1795'	900	circ.
Mobil	NVAU	207	H	24	17S	34E	8653'	8525-8587' (Abo) WIW	4-1/2"	8653'	585	3950' (TS)
									8-5/8"	4000'	720	2430' (TS)
									13-3/8"	352'	290	circ.
Mobil	NVAU	221	E	19	17S	35E	8720'	8584-8653' (Abo)	5-1/2"	8720'	2000	circ.
									8-5/8"	3165'	1600	circ.
									12-3/4"	298'	350	circ.

TABULATION OF ABO OR DEEPER PENETRATION
WELLS WITHIN 1/2 MILE OF PROPOSED INJECTORS -
PROPOSED NORTH VACUUM ABO EAST UNIT
LEA COUNTY, NEW MEXICO

Operator	Lease	Well No.	Location				Total Depth	Producing Interval	Casing Size	Set @ Depth	Sx. Cmt. Used	Cement Top
			Letter	Sec.	Township	Range						
Mobil	NVAU	223	A	13	17S	34E	8750'	8590'-8641' (Abo)	5-1/2"	8750'	2000	circ.
									8-5/8"	3140'	1600	circ.
									12-3/4"	263'	510	circ.
Mobil	NVAU	231	P	13	17S	34E	8800'	8584'-8720' (Abo)	5-1/2"	8800'	1800	1810' (TS)
									8-5/8"	1800'	750	circ.
Mobil	State NN	1	L	8	17S	35E	12419	12114'-12122' (Atoka)	7" liner	4786-12419	1800	circ.
									9-5/8"	4990'	2900	circ.
									13-3/8"	320'	400	circ.
Mobil	State UU	1	F	7	17S	35E	12100'	11802'-11897' (Atoka)	5-1/2"liner	4675-12152'	2310	circ.
									9-5/8"	5000'	3700	circ.
									13-3/8"	340'	400	circ.
Marathon	Staplin State Com.	1	F	19	17S	35E	8800'	8630'-8689' (Abo)	4-1/2"	8799'	825	circ.
									7"	3939'	800	circ. (calc)
									9-5/8"	498'	195	circ. (calc)
Marathon	Sec. 7 Com. 1	1	B	7	17S	35E	12200	12078'-12141' (Atoka)	5-1/2"liner	4522-12220	17000	7450 (BL)
											300 squeeze top liner	
									9-5/8"	5012'	2550	circ.
									13-3/8"	353'	425	circ.
Phillips	Santa Fe	122	H	19	17S	35E	9000'	8676'-8722' (Abo)	5-1/2"	8997'	2050	2950 (TS)
									8-5/8"	1750'	600	circ.
Shell	State VB Com.	1	B	19	17S	35E	8975'	8678'-8728' (Abo)	5-1/2"	8975'	5465	circ.
									9-5/8"	1722'	1000	circ.

NOTE: (TS) - Temperature Survey
(BL) - Bond Log
NVAU - North Vacuum Abo Unit

Exhibit 10
Case 6248

TABULATION OF ABO OR DEEPER PENETRATION
WELLS WITHIN 1/2 MILE OF PROPOSED INJECTORS -
PROPOSED NORTH VACUUM ABO EAST UNIT
LEA COUNTY, NEW MEXICO

Operator	Lease	Well No.	Location Letter	Sec.	Township	Range	Total Depth	Producing Interval	Casing Size	Set @ Depth	Sx. Cmt. Used	Cement Top
Mobil	Elk State Com	2	J	18	17S	35E	12515'	8711'-8773' (Abo)	4-1/2"	12515'	1350	6291 (calc)
									8-5/8"	5000'	1250	circ (calc)
									13-3/8"	375'	400	circ (calc)
Mobil	State K	10	L	18	17S	35E	8800'	8655'-8717' (Abo)	5-1/2"	8800'	2400	circ.
									8-5/8"	3210'	1600	circ.
									12-3/4"	250'	300	circ.
Mobil	State JJ	1	L	7	17S	35E	8850'	8605'-8668' (Abo)	5-1/2"	8850'	2300	circ.
									8-5/8"	3170'	1200	circ.
									12-3/4"	270'	450	circ.
Mobil	State TT	1	J	7	17S	35E	8930'	8699'-8799' (Abo)	5-1/2"	8930'	2000	circ.
									8-5/8"	3250'	1450	circ.
									12-3/4"	258'	400	circ.
Texaco	State DJ	1	D	18	17S	35E	8800'	8642'-8694' (Abo)	5-1/2"	8800'	3070	1810' (TS)
									8-5/8"	1800'	900	circ.
Texaco	State DJ	2	B	18	17S	35E	8850'	8792'-8810' (Abo)	5-1/2"	8850'	3000	circ.
									8-5/8"	1820'	850	circ.
Texaco	State DK	1	F	18	17S	35E	12500'	11485'-11856' (Atoka)	4-1/2"	12500'	1350	5745' (TS)
									8-5/8"	4954'	1050	2780' (TS)
									13-3/8"	375'	400	circ.
Mobil	NVAU	159	P	12	17S	34E	8750'	8561'-8621' (Abo) WIW	5-1/2"	8750'	3800	2515 (TS)
									8-5/8"	1775'	900	circ.
Mobil	NVAU	161	H	12	17S	34E	8800'	8584'-8641' (Abo) WIW	5-1/2"	8800'	3100	2660' (TS)
									8-5/8"	1775'	900	circ.
Mobil	NVAU	169	H	13	17S	34E	8800'	8607'-8666' (Abo) WIW	5-1/2"	8800'	2300	circ.
									8-5/8"	3160'	1400	circ.
									12-3/4"	270'	450	circ.
Mobil	NVAU	206	D	19	17S	35E	8800'	8597'-8658' (Abo)	5-1/2"	8800'	3100	2770' (TS)
									8-5/8"	1795'	900	circ.
Mobil	NVAU	207	H	24	17S	34E	8653'	8525'-8587' (Abo) WIW	4-1/2"	8653'	585	3950' (TS)
									8-5/8"	4000'	720	2430' (TS)
									13-3/8"	352'	290	circ.
Mobil	NVAU	221	E	19	17S	35E	8720'	8584'-8653' (Abo)	5-1/2"	8720'	2000	circ.
									8-5/8"	3165'	1600	circ.
									12-3/4"	298'	350	circ.

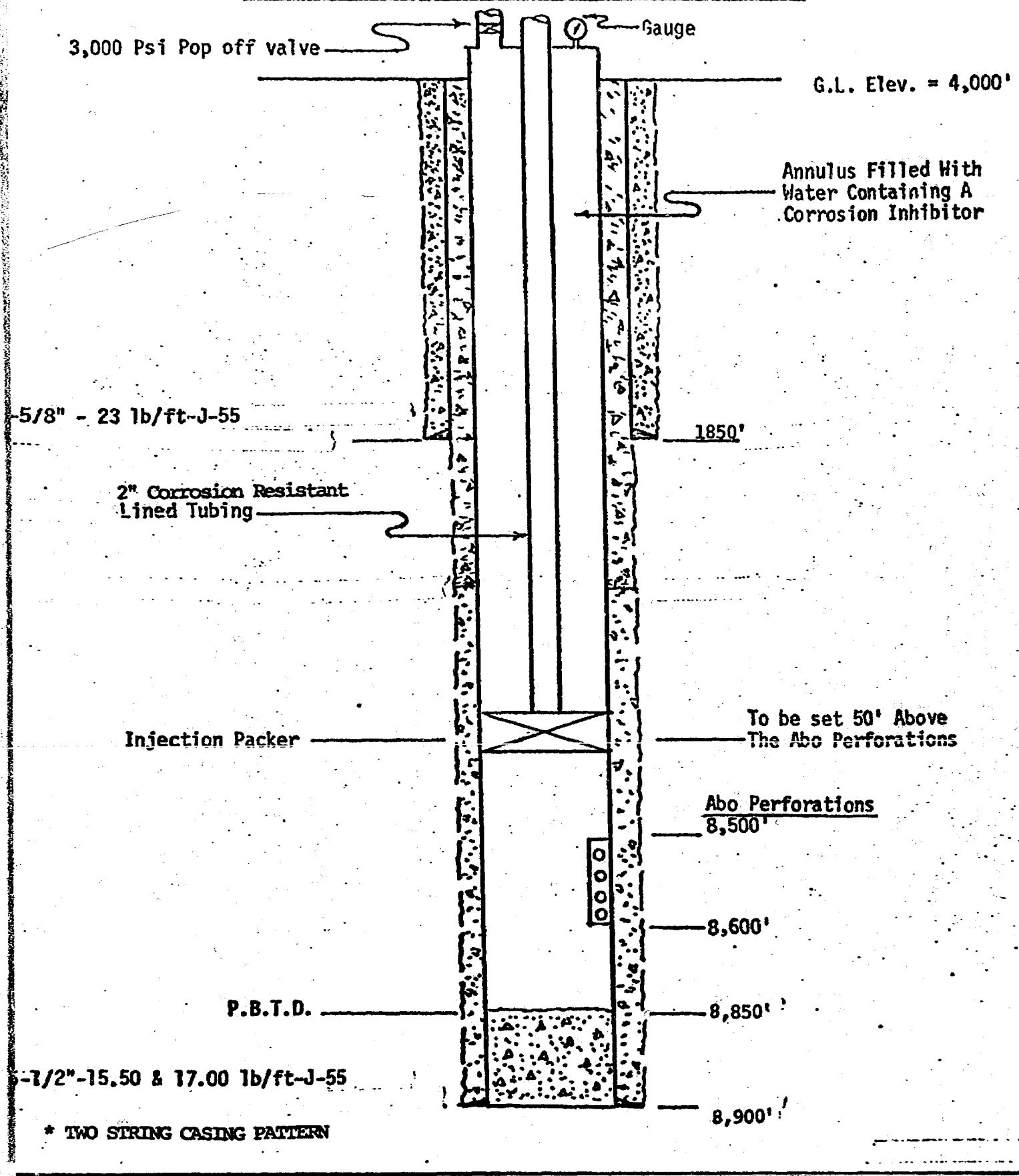
TABULATION OF ABO OR DEEPER PENETRATION
WELLS WITHIN 1/2 MILE OF PROPOSED INJECTORS -
PROPOSED NORTH VACUUM ABO EAST UNIT
LEA COUNTY, NEW MEXICO

Operator	Lease	Well No.	Location Letter	Sec.	Township	Range	Total Depth	Producing Interval	Casing Size	Set @ Depth	Sx. Cmt. Used	Cement Top
Mobil	NVAU	223	A	13	17S	34E	8750'	8590'-8641' (Abo)	5-1/2"	8750'	2000	circ.
									8-5/8"	3140'	1600	circ.
									12-3/4"	263'	510	circ.
Mobil	NVAU	231	P	13	17S	34E	8800'	8584'-8720' (Abo)	5-1/2"	8800'	1800	1810' (TS)
									8-5/8"	1800'	750	circ.
Mobil	State NN	1	L	8	17S	35E	12419	12114'-12122' (Atoka)	7" liner	4786-12419	1800	circ.
									9-5/8"	4990'	2900	circ.
									13-3/8"	320'	400	circ.
Mobil	State UU	1	F	7	17S	35E	12100'	11802'-11897' (Atoka)	5-1/2"liner	4675-12152'	2310	circ.
									9-5/8"	5000'	3700	circ.
									13-3/8"	340'	400	circ.
Marathon	Staplin State Com.	1	F	19	17S	35E	8800'	8630'-8689' (Abo)	4-1/2"	8799'	825	circ.
									7"	3939'	800	circ. (calc)
									9-5/8"	498'	195	circ. (calc)
Marathon	Sec. 7 Com. 1	1	B	7	17S	35E	12200	12078'-12141' (Atoka)	5-1/2"liner	4522-12220	17000	7450 (BL)
											300 squeeze top liner	
									9-5/8"	5012'	2550	circ.
									13-3/8"	353'	425	circ.
Phillips	Santa Fe	122	H	19	17S	35E	9000'	8676'-8722' (Abo)	5-1/2"	8997'	2050	2950 (TS)
									8-5/8"	1750'	600	circ.
Shell	State VB Com.	1	B	19	17S	35E	8975'	8678'-8728' (Abo)	5-1/2"	8975'	5465	circ.
									9-5/8"	1722'	1000	circ.

NOTE: (TS) - Temperature Survey
(BL) - Bond Log
NVAU - North Vacuum Abo Unit

DIAGRAMMATIC WELL SKETCH

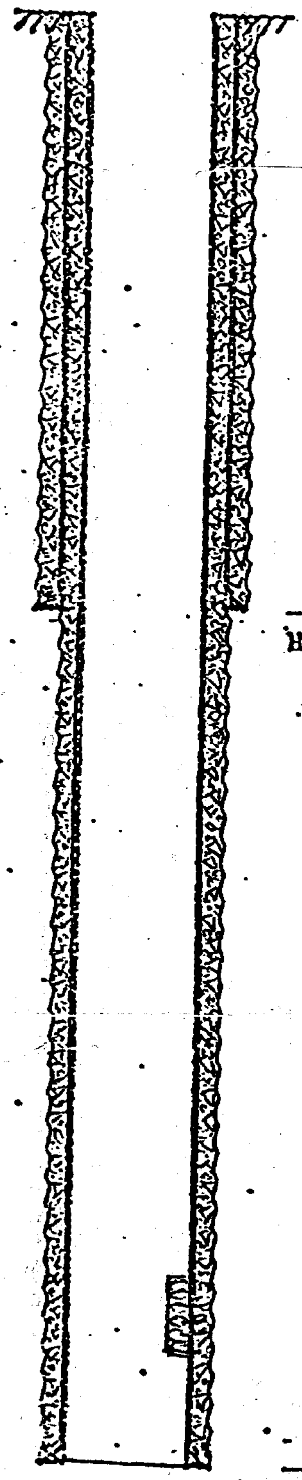
TYPICAL SINGLE — W. I. WELL *
NORTH VACUUM ABO — EAST UNIT
NORTH VACUUM (ABO) FIELD
LEA COUNTY, NEW MEXICO



* TWO STRING CASING PATTERN

FIELD	OPERATOR	DATE
Vacuum Abo North	Texaco Inc.	May 3, 1976

LEASE	WELL No.	LOCATION
N.M. "DJ" State	3	11-18-17S-35E



800 sx Cl "C" 4% gel
550 sx Cl "C" 1% CaCl

8 5/8 " casing set at 1810 ' with 1850 sx of 500 sx Cl "C" cement
Hole size 12 1/4 "
Cmt. Circ

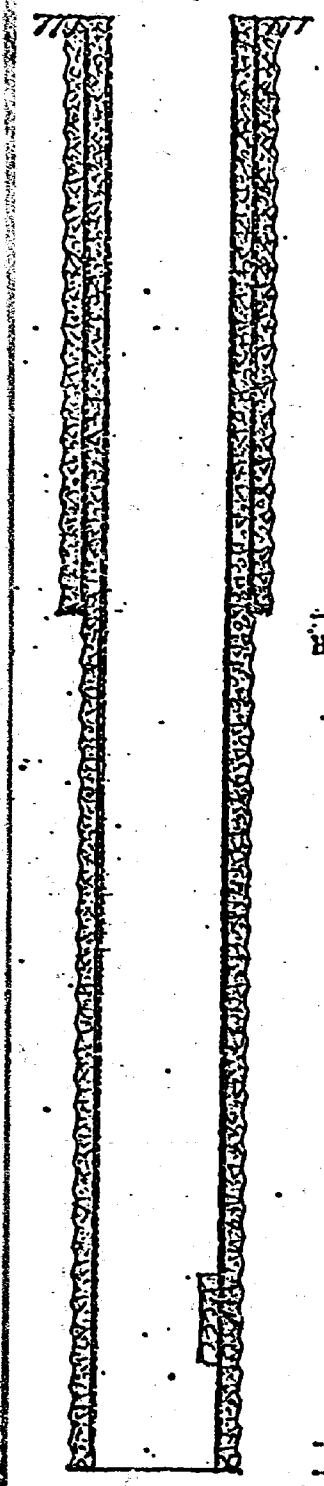
Perf: 8733 - 8873'

100 sx Cl "C"
1500 sx Cl "C" w/12% gel

5 1/2 " casing set at 8910 ' with 1900 sx of 300 sx Cl "C" w/15# salt/sx cement
Total Depth 8910 ' Hole size 7 7/8 "

Cmt Circ.

FIELD	OPERATOR	DATE
Vacuum Abo North	Texaco Inc.	May 3, 1976
LEASE	**WELL NO.**	**LOCATION**
N.M. "DJ" State	4	E-18-17S-35E



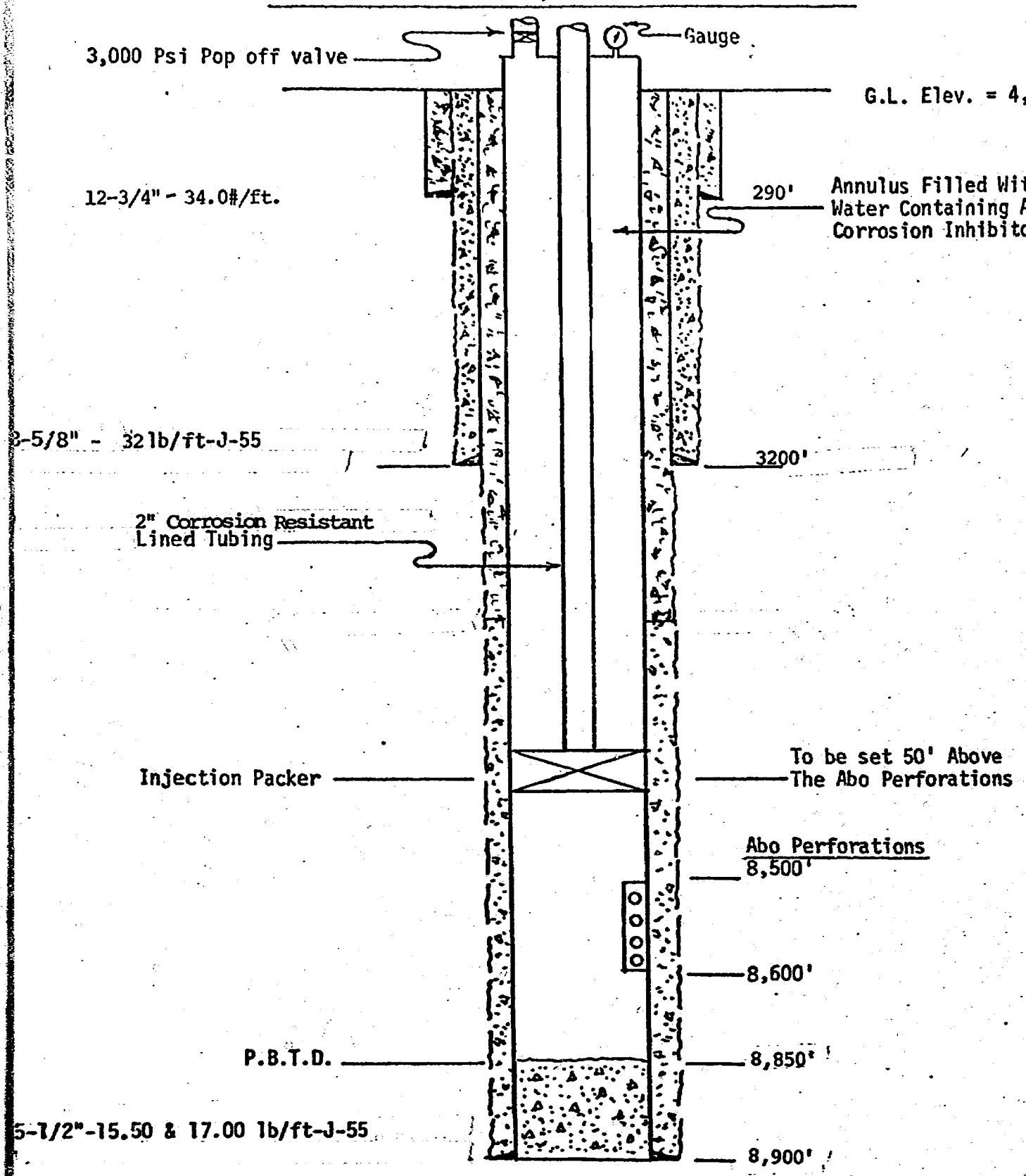
8 5/8 " casing set at 1850 ' with 1090 sx of 840 sx cl "C" Pozmix cement
Hole size 12 1/4 "
Cmt Circ.

Perf. 8661' – 8848'

5 1/2 " casing set at 8850 ' with 1800 sx of 100 sx cl "C" 1401 sx cl "C" 12 3/4 gel 300 sx cl "C" Pozmix cement
Total Depth 8850 ' Hole size 7 7/8 "
Cmt. Circ

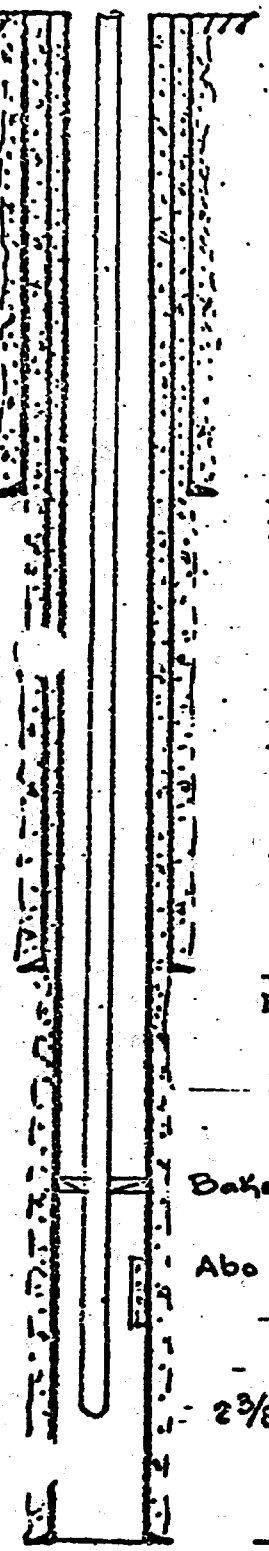
DIAGRAMMATIC WELL SKETCH

TYPICAL SINGLE W. I. WELL *
NORTH VACUUM ABO EAST UNIT
NORTH VACUUM (ABO) FIELD
LEA COUNTY, NEW MEXICO



* THREE STRING CASING PATTERN

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp	5-7-76
LEASE	**WELL No**	**LOCATION**
Elk State Com	1	N · Sec 18, T17S, R35E



12 3/4 " casing set at 290 ' with 450 sx of cl. H. cement
Hole size 17 1/2 " cement circ.

8 5/8 " casing set at 3200 ' with 1400 sx of _____ cement
Hole size 11 " cement circ.

Baker TA Catcher - 8643'

Abo Perf. 8672' - 8722'

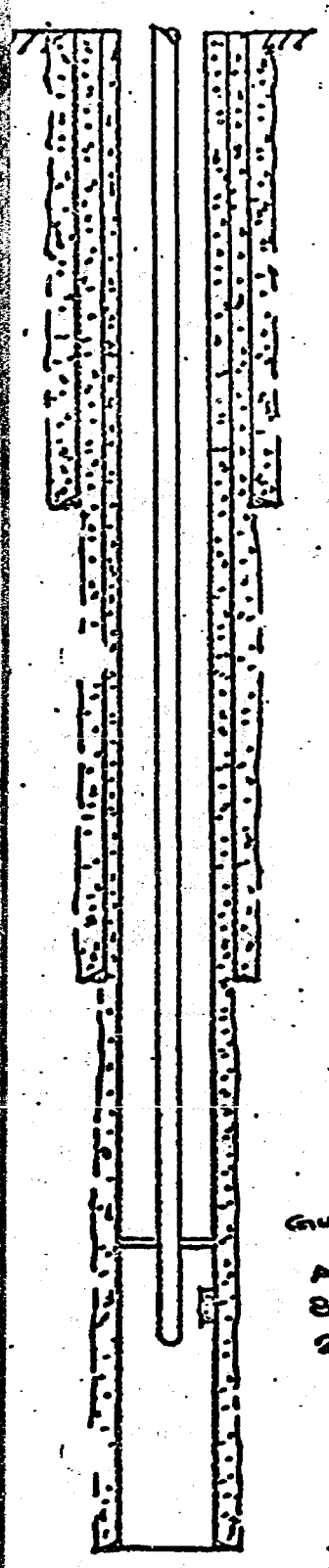
2 3/8 Tubing - 8810'

5 1/2 " casing set at 8850 ' with 1750 sx of _____ cement
Total Depth 8850 ' Hole size 7 7/8 " cement. circ.

5-7-76
JHS

FIELD	OPERATOR	DATE
Vacuum, Abo North	Mobil Oil Corp	5-7-76

LEASE	WELL NO.	LOCATION
State "MM"	1	P Sec 7, T17S, R35E



12 3/4" casing set at 291' with 450 sx of _____ cement
Hole size 17 1/2" cement circ.

8 5/8" casing set at 3260' with 1450 sx of _____ cement
Hole size 11" cement circ.

Guib. T.A. Catcher - 8760'

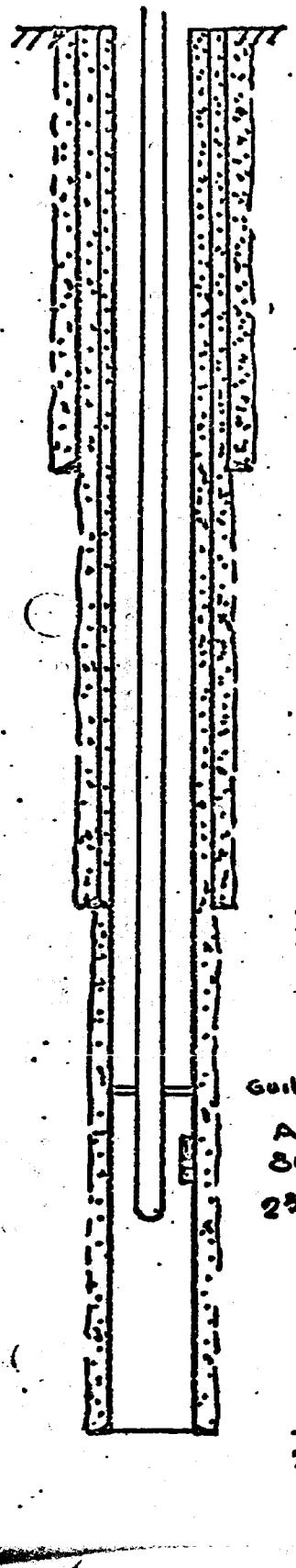
Abo Perf.
8776'-8877'
2 3/8" Tubing - 8975'

5 1/2" casing set at 8975' with 2500 sx of _____ cement
Total Depth 8975' Hole size 7 7/8" cement circ.

5-7-76
JK

1

FIELD	OPERATOR	DATE
Vacuum, Abo, North	Mobil Oil Corp	5-6-76
LEASE	**WELL No**	**LOCATION**
State A Com	1	N-Sec 7, T17S, R35E



12 3/4" casing set at 296' with 450 sx of _____ cement
Hole size 17 1/2" cement circ.

8 5/8" casing set at 3220' with 1400 sx of _____ cement
Hole size 11" cement circ.

Guib. T.A. Catcher - 8591'

Abo Perf.
8657' - 8759'

2 3/8" tubing - 8817'

5 1/2" casing set at 8850' with 2300 sx of _____ cement
Total Depth 8850' Hole size 7 7/8" cement circ.

Application of Mobil Oil Corporation
for a Pressure Maintenance
Project, Lea County, New Mexico

Applicant, in the above styled cause,
seeks authority to institute a
pressure maintenance project
in the North Vacuum Abo East
Unit Area by the injection of
water into the Abo formation
through five wells located in
Units N and P of Section 7, and
Units F, H, and N of Section 18,
all in Township 17 South, Range 35
East, North Vacuum Abo Pool,
Lea County, New Mexico, ~~Applicant~~
and ~~further seeks~~ the promulgation
of special rules governing said
project.

LAW OFFICES

MODRALL, SPERLING, ROEHL, HARRIS & SISK

JAMES E. SPERLING
JOSEPH E. ROEHL
GEORGE T. HARRIS, JR.
DANIEL A. SISK
LELAND S. SEOBERRY, JR.
ALLEN C. DEWEY, JR.
FRANK H. ALLEN, JR.
JAMES A. PARKER
JOHN R. COONEY
KENNETH L. HARRIGAN
PETER J. ADANG
DALE W. EK
DENNIS J. FALK
JOE R. G. FULCHER
ARTHUR D. MELENDRES
JAMES P. HOUGHTON

PUBLIC SERVICE BUILDING
P. O. BOX 2168
ALBUQUERQUE, NEW MEXICO 87103
505-243-4511

JOHN F. SIMMS
(1885-1954)
AUGUSTUS T. SEYMOUR
(1907-1965)
J. R. MODRALL
(1902-1977)

GEORGE J. HOPKINS
PAUL M. FISH
JUDY A. FRY
MARK B. THOMPSON III
JEFFREY W. LOUBET
RUTH M. SCHIFANI
THOMAS L. JOHNSON
LYNN H. SLADE
ALAN KONRAD
ZACHARY L. McCORMICK
ROGER VonK. EATON

May 25, 1978

Mr. Joe D. Ramey
Secretary-Director
Department of Energy & Minerals
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Dan Nutter

Re: Mobil Oil Corporation's Application for an Order Providing for Unit Operation of a Portion of the North Vacuum Abo Formation, Lea County, New Mexico

Dear Mr. Ramey:

In connection with the above-captioned application, I enclose herewith the following supplemental data required by the rule with respect to waterflood applications:

1. Plat showing the proposed injectors and the location of all wells within a radius of two miles from the proposed injectors and the formation from which the wells are producing or have produced.

2. Well log of each proposed injector, except Texaco, Inc. New Mexico State "DJ" No. 3.

3. A diagrammatic sketch of the proposed injectors, plus a sketch of a typical injection well with two strings of casing and one with three strings of casing.

4. A tabular summary of all wells within one-half mile of the proposed injectors which have penetrated the injection zone showing all casing strings, setting depths, sacks of cement used, cement tops, total depth, producing interval, well identification and location.

There are no plugged and abandoned wells that have penetrated the Abo Zone which are within one-half mile of the proposed injectors.

It would be appreciated if you would consider the above-listed data to be a part of the captioned application as originally filed. If additional information is required, please advise.

Very truly yours,

James E. Sperling

James E. Sperling

/jev
Enclosures

cc: Mr. J. A. Morris (Attn: Hap Weaver), w/o encl.

JAMES E. SPERLING
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LAW OFFICES OF
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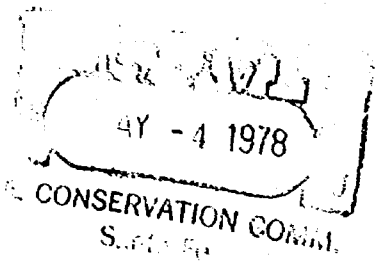
TELEPHONE 243-4511
AREA CODE 505

May 2, 1978



Mr. Joe D. Ramey
Secretary-Director
Department of Energy & Minerals
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Mobil Oil Corporation's Application for an Order Providing for Unit Operation of a Portion of the North Vacuum Abo Formation, Lea County, New Mexico

Dear Mr. Ramey:

Enclosed herewith, please find original and two copies of Mobil Oil Corporation's application for hearing concerning the above-captioned matter.

It would be appreciated if this matter can be scheduled for hearing before an Examiner at the hearing to be held on June 7, 1978.

Very truly yours,

James E. Sperling

/jev
Enclosures

cc: J. A. Morris, w/encl. (attn: H. F. Weaver)

ROUGH

dr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6248

Order No. R- 5801

APPLICATION OF MOBIL OIL
CORPORATION FOR A PRESSURE
MAINTENANCE PROJECT, LEA
COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on June 7, 1978, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this _____ day of September, 1978, 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, Mobil Oil Corporation, seeks authority to institute a pressure maintenance project in the North Vacuum-Abo ~~East~~ Pool in its North Vacuum-Abo East Unit Area, Lea County, New Mexico, by the injection of ~~gas and~~ water into the Abo formation through five wells located in Units N and P of Section 7 and Units F, H and N of Section 18, all in Township 17 South, Range 35 East, NMPM, Lea County, New Mexico.

(3) That the applicant further seeks the designation of the project area and the promulgation of special rules and regulations governing said project including a provision for administrative approval for unorthodox locations for injection wells and producing wells.

(4) That ~~initially~~ the project area should comprise ~~only~~ the following-described area:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 7: S/2
Section 18: N/2, SW/4, and W/2 SE/4

(5) That injection should be through corrosion-resistant lined tubing installed in a packer set as near to the uppermost perforation as practicable; that the casing-tubing annulus should be loaded with an inert fluid and equipped with a pressure gauge; and that the injection system or injection wells should be equipped with a pop-off valve ~~or similar~~ or other acceptable device to limit the injection pressure to 3500 psi unless the ~~Director~~ Division Director shall have approved a higher injection pressure upon showing by the operator that formation fracturing will not result therefrom.

(6) That a pressure maintenance project, designated the Mobil North Vacuum-Abo East Pressure Maintenance Project, comprising the above-described area is in the interest of conservation and should result in greater ultimate recovery of oil, thereby preventing waste.

(7) That an administrative procedure should be established whereby said project area may be expanded for good cause shown and whereby additional injection wells and producing wells at orthodox and unorthodox locations in the project area may be approved without the necessity of notice and hearing.

(8) That special rules and regulations for the operation of the Mobil North Vacuum-Abo East Pressure Maintenance Project should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project area in any proportion, provided that no well in the project area which directly or diagonally offsets a well on another lease producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the North Vacuum-Abo Pool until such time as the well has experienced a substantial response to water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the North Vacuum-Abo Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant, Mobil Oil Corporation, is hereby authorized to institute a pressure maintenance project in the

North Vacuum-Abo ~~East~~ Pool in its North Vacuum-Abo East Unit Area, Lea County, New Mexico, to be designated the Mobil North Vacuum Abo East Pressure Maintenance Project, by the injection of ~~gas and~~ water into the Abo formation, through the following-described wells in Township 17 South, Range 35 East, NMPM:

Operator	Lease	Well No.	Unit	Section
Mobil	State "A" Com	1	N	7
Mobil	State "MM"	1	P	7
Texaco	State "DJ"	3	H	18
Texaco	State "DJ"	4	F	18
Mobil	Elk State Com	1	N	18

(2) That injection into each of the aforesaid wells should be accomplished through corrosion-resistant lined tubing set in a packer as close as is practicable to the uppermost Abo perforation. The casing-tubing annulus in each injection well shall be loaded with an inert fluid and a pressure gauge installed to facilitate detection of leakage in the casing, tubing, or packer.

(3) That the injection ~~well~~ system or ~~system~~ wells shall be equipped with a pop-off valve or other acceptable device which will limit the surface injection pressure to 3500 psi unless the Division Director shall have advanced administratively authorized a higher injection pressure.

(4) That Special Rules and Regulations governing the operation of the Mobil North Vacuum-Abo East Pressure Maintenance Project, Lea County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE
MOBIL NORTH VACUUM-ABO EAST PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Mobil North Vacuum-Abo East Pressure Maintenance Project, hereinafter referred to as the Project, shall comprise the area described as follows:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 7: S/2
Section 18: N/2, SW/4, and N/2 SE/4

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3 which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the North Vacuum-Abo Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in ~~Commission~~ Division Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the ~~Commission~~ Division, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the ~~Commission~~ Division, if they so desire.

RULE 7. The basic allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the pool, whichever is less. Wells capable of producing more than top unit allowable may also receive transfer allowable, provided however, that no producing well in the project area which directly or diagonally offsets a well on another lease producing from the same common source of supply shall receive an allowable or produce in excess of two times top unit allowable for the pool. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the pool.

RULE 8. Each month the project operator shall submit to the ~~Commission~~ Division a Pressure Maintenance Project Operator's Report, on a form prescribed by the ~~Commission~~ Division, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total project allowable based upon the pool's depth bracket allowable and the market demand percentage factor in effect. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 9. The ~~Commission~~ Division shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well on another lease producing from the same common source of supply shall produce in excess of two times top unit allowable for the pool.

RULE 10. The Director of the ~~Commission~~ Division is hereby authorized to approve such additional producing wells and injection wells at orthodox and unorthodox locations within the boundaries of the North Vacuum-Abo Unit Area as may be necessary to complete an efficient production and injection pattern, provided said wells are drilled no closer than 460 feet to the outer boundary of said unit nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary. To obtain such approval, the project operator shall file proper application with the ~~Commission~~ Division, which application, if it seeks authorization to convert additional wells to injection or to drill additional production or injection wells shall include the following:

(1) A plat showing the location of proposed well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed well which fully describes the casing, tubing, perforated interval, and depth.

(3) A letter stating that all offset operators to the proposed well have been furnished a complete copy of the application and the date of notification.

The ~~Secretary~~-Director may approve the proposed well if, within 20 days after receiving the application, no objection to the proposal is received. The ~~Secretary~~-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the ~~Secretary~~-Director of the ~~Commission~~ Division administratively when good cause is shown therefor.

(5) 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.