CASE 3223: Appli. of TENNECO OIL CO. for salt water disposal, Lea County, New Mexico.

CASE NO.
3223

APPLICATION,
TRANSCRIPTS,
SMALL EXHIBITS
ETC.

TENNECO

TENNECO OIL COMPANY · P. O. BOX 1031 · 1800 WILCO BUILDING · MIDLAND, TEXAS 79701

February 24, 1965

New Mexico Oil Conservation Commission
P.O. Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.

Re: Saltwater Disposal
Kemnitz (Wolfcamp) Field
Lea County, New Mexico

Gentlemen:

Tenneco Oil Company respectfully requests that administrative approval be granted to dispose of produced saltwater from the Kemnitz (Wolfcamp) Unit into the lower Wolfcamp zone.

The proposed injection well is the State A.A. Kemnitz "A" No. 6 to be called Kemnitz (Wolfcamp) Unit Well #30-SWD. The proposed injection interval is an open hole section from 10,537 - 10,970 feet. Included are application forms (C-108) with the required attachments.

Yours very truly,

TENNECO OIL COMPANY

A. W. Lang
District Production Superintendent

ACT:jo

DOCKET MAILED

Date 3-9-65

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

April 19, 1965

Mr. Booker Kelly
Gilbert, White & Gilbert
Attorneys at Law
Post Office Box 787
Santa Fe, New Mexico

Re: Case No. 3223
Order No. R-2893
Applicant:

TENNECO OIL COMPANY

Dear Sir:

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

Very truly yours,

A. L. Porter, Jr.
A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC
OTHER

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 3223
Order No. R-2893

APPLICATION OF TENNECO OIL COMPANY
FOR SALT WATER DISPOSAL, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on March 24, 1965, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 16th day of April, 1965, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Tenneco Oil Company, is the owner and operator of the Kemnitz Wolfcamp Unit Well No. 6 located in Unit I of Section 30, Township 16 South, Range 34 East, NMPM, Kemnitz-Wolfcamp Pool, Lea County, New Mexico.

(3) That the applicant proposes to designate the subject well the Kemnitz Wolfcamp Unit Well No. 30-SWD and to utilize said well to dispose of produced salt water into the Lower Wolfcamp formation, with injection into the open hole interval from 10,537 to 10,970 feet.

(4) That the injection should be accomplished through 2 3/8-inch tubing installed in packers set above and below the perforated interval from 10,288 to 10,295 feet; that said tubing should be internally plastic-coated between the packers; that the casing-tubing annulus should be filled with an inert fluid; and

that a pressure gauge should be attached to the annulus in order to determine leakage in the tubing or packer.

(5) That approval of the subject application will prevent the drilling of unnecessary wells and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Tenneco Oil Company, is hereby authorized to dispose of produced salt water into the Lower Wolfcamp formation through its Kemnitz Wolfcamp Unit Well No. 6 to be designated the Kemnitz Wolfcamp Unit Well No. 30-SWD located in Unit I of Section 30, Township 16 South, Range 34 East, NMPM, Lea County, New Mexico, injection to be accomplished through 2 3/8-inch tubing installed in packers set above and below the perforated interval from 10,288 to 10,295 feet, with injection into the open hole interval from 10,537 to 10,970 feet;

PROVIDED HOWEVER, that the tubing shall be internally plastic-coated between the packers; that the casing-tubing annulus shall be filled with an inert fluid; and that a pressure gauge shall be attached to the annulus in order to determine leakage in the tubing or packer.

(2) That the applicant shall submit monthly reports of its disposal operations in accordance with Rules 704 and 1120 of the Commission Rules and Regulations.

(3) 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 herein-above designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Jack M Campbell
JACK M. CAMPBELL, Chairman

Guyton B. Hays
GUYTON B. HAYS, Member

A. L. Porter, Jr.
A. L. PORTER, Jr., Member & Secretary

esr/

Docket No. 9-65

DOCKET: EXAMINER HEARING - WEDNESDAY - MARCH 24, 1965

9 A. M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Elvis A. Utz, Examiner, or Daniel S. Nutter, Alternate Examiner:

CASE 3219: (Continued from March 10, 1965 Examiner Hearing)
Application of Humble Oil & Refining Company for a waterflood expansion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to expand its State "M" Lease waterflood project by the conversion to water injection of 13 additional wells located in Sections 19, 20, 29, 30 and 31, Township 22 South, Range 37 East, Langlie-Mattix Pool, Lea County, New Mexico.

CASE 3221: Application of Shoreline Exploration Company for an unorthodox location and special cementing and casing program, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to drill and complete its Snyder #2 at an unorthodox location 1090 feet from the South line and 2310 feet from the East line of Section 16, Township 20 South, Range 33 East, Lea County, New Mexico. Casing, cementing and plug and abandon procedure would conform to statewide rules and regulations, and would be in exception to the casing and cementing rules prescribed for the oil and potash area by Order No. R-111-A.

CASE 3222: Application of Gulf Oil Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of the dual completion (conventional) of its Harry Leonard (NCT-C) Well No. 11 located in Unit K of Section 36, Township 21 South, Range 36 East, Lea County, New Mexico, to produce oil from an undesignated Blinebry Pool and from the Arrowhead Drinkard Pool through parallel strings of tubing.

CASE 3223: Application of Tenneco Oil Company for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Wolfcamp formation through the open-hole interval from 10,537 feet to 10,970 feet in its Kemnitz Wolfcamp Unit Well No. 6 located in Unit I of Section 30, Township 16 South, Range 34 East, Lea County, New Mexico.

CASE 3224: Application of Sinclair Oil & Gas Company for a non-standard proration unit and an unorthodox location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of a 320-acre non-standard gas proration unit comprising the S/2 of Section 1, Township 24 South, Range 36 East, Jalmat Gas Pool, Lea County, New Mexico, to be dedicated to its Curry WN Well No. 1 at an unorthodox location 660 feet from the South and East lines of said Section 1.

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 4/1/60

CASE 3283 Hearing Date 9 am 3/24/60
DSN @ SF

My recommendations for an order in the above numbered cases are as follows:

Enter an order authorizing Tenneco Oil Company to dispose of produced salt water in the Lower Wolfcamp formation in its Kennitz (Wolfcamp) Unit Well No 30-SWD located in Unit I, Sec 30 T 16S R 34E, Kennitz Wolfcamp Pool Lea County, New Mexico. Disposal is to be in the open hole interval ~~the~~ down tubing and ~~ng~~ from 10,537 to 10,970 feet. ~~The~~ Packers shall be set immediately above and below the perforated interval 10,288-10,295 and intervally plastic coated ~~set~~ tubing run between the packers. The annulus between the 2 3/8" tubing and the 5 1/2 inch casing shall be loaded with ~~be~~ inhibited fresh water and periodic observations made of said annulus ~~to~~ in an effort to detect ~~in~~ leaks or packer failure.

Jason Kellahin

February 23, 1965

New Mexico Oil Conservation Commission
P.O. Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.

Re: Saltwater Disposal
Kemnitz (Wolfcamp) Field
Lea County, New Mexico

Gentlemen:

I have received notification that Tenneco Oil Company is requesting permission to dispose of saltwater produced by the Kemnitz (Wolfcamp) Unit into the State A.A. Kemnitz "A" No. 6 located in Unit I, Section 30, T-16-S, R-34-E, Lea County, New Mexico. It is my understanding that injection is proposed into the Lower Wolfcamp zone through an open-hole section from 10,537 to 10,970 feet.

I am the surface lessee of the land around this well. I have no objections to Tenneco Oil Company's proposal.

Yours very truly,

Mrs. Jennie Martin

Mrs. Jennie Martin
910 S. 8th
Artesia, N.M.

DOCKET MAILED
Date 3/9/65

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

3283

S. E. REYNOLDS
STATE ENGINEER

March 5, 1965

ADDRESS CORRESPONDENCE TO:
STATE CAPITOL
SANTA FE, N. M.

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Porter:

Reference is made to the application of Tenneco Oil Company which seeks administrative approval for disposal of produced salt water from the Kemnitz (Wolfcamp) Unit into the lower Wolfcamp zone through the State A.A. Kemnitz "A" No. 6 to be called Kemnitz Unit Well No. 30-SWD.

From the application and the diagrammatic sketch submitted by Tenneco, it appears that the top of the cement surrounding the long string is at 9450 feet by temperature survey and the packer on the tubing through which injection will be made is to be set at 10,450.

This office offers no objection to the granting of the application provided the tubing is internally coated. If internally coated tubing is not used, then the perforations between 10,280 and 10,295 feet should be squeezed with cement and adequately tested.

Yours truly,

S. E. Reynolds
State Engineer

By: Frank E. Irby
Frank E. Irby
Chief
Water Rights Div.

FEI/ma
cc-Tenneco Oil Co.
F. H. Hennighausen

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-50)

SYMBOLS
DL = Day Letter
NL = Night Letter
LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

'65 FEB 23 PM 3 11

LA120 SSF179

L RWA053 PD=ROSWELL NMEX 23 233P NST=
:NMEX OIL CONSERVATION COMM=
STATE LAND OFFICE BLDG SANTA FE NMEX=

ATTN E A UTZ EXAMINER,
RE CASE 3223 SHELL OIL CO CONCURS WITH APPLICATION TENNECO OIL CO TO DISPOSE PRODUCED SALT WATER INTO WOLFCAMP FORMATION IN KEMNITZ WOLFCAMP UNIT WELL NO 6 LEA COUNTY NMEX=
:T H DWYER DIVISION PRODUTION MGR SHELL OIL CO=

'65 FEB 23 PM 3 11

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

Form C-108
Revised 1-1-65

NEW MEXICO OIL CONSERVATION COMMISSION

APPLICATION TO DISPOSE OF SALT WATER BY INJECTION INTO A POROUS FORMATION

OPERATOR		ADDRESS
Tenneco Oil Company		P.O. Box 1031, Midland, Texas
LEASE NAME	**WELL NO.**	**FIELD** / **COUNTY**
Kemnitz (Wolfcamp) Unit	30-SWD #6	Kemnitz (Wolfcamp) / Lea

LOCATION

UNIT LETTER I ; WELL IS LOCATED 660 FEET FROM THE East LINE AND 1980 FEET FROM THE South LINE, SECTION 30 TOWNSHIP 16-S RANGE 34-E NMPM.

CASING AND TUBING DATA

NAME OF STRING	SIZE	SETTING DEPTH	SACKS CEMENT	TOP OF CEMENT	TOP DETERMINED BY
SURFACE CASING	13 3/8"O.D.	358	400	Surface	circulated
INTERMEDIATE	8 5/8"O.D.	4548	2300	Surface	circulated
LONG STRING	5½" O.D.	10,537	230	9450	Temp.Survey
TUBING	2 3/8"O.D.	10,450	NAME, MODEL AND DEPTH OF TUBING PACKER: Guiberson KVL-30 10,450'		

NAME OF PROPOSED INJECTION FORMATION	TOP OF FORMATION	BOTTOM OF FORMATION
Wolfcamp	9723	10,970+

IS INJECTION THROUGH TUBING, CASING, OR ANNULUS?	PERFORATIONS OR OPEN HOLE?	PROPOSED INTERVAL(S) OF INJECTION
Tubing	Open hole	10,537- 10,970

IS THIS A NEW WELL DRILLED FOR DISPOSAL?	IF ANSWER IS NO, FOR WHAT PURPOSE WAS WELL ORIGINALLY DRILLED?	HAS WELL EVER BEEN PERFORATED IN ANY ZONE OTHER THAN THE PROPOSED INJECTION ZONE?
No	oil production	yes

LIST ALL SUCH PERFORATED INTERVALS AND SACKS OF CEMENT USED TO SEAL OFF OR SQUEEZE EACH

10,288-295' will be isolated behind packer.

DEPTH OF BOTTOM OF DEEPEST FRESH WATER ZONE IN THIS AREA	DEPTH OF BOTTOM OF NEXT HIGHER OIL OR GAS ZONE IN THIS AREA	DEPTH OF TOP OF NEXT LOWER OIL OR GAS ZONE IN THIS AREA
300'	None	None

ANTICIPATED DAILY INJECTION VOLUME (BBLS.) MINIMUM	MAXIMUM	OPEN OR CLOSED TYPE SYSTEM	IS INJECTION TO BE BY GRAVITY OR PRESSURE?	APPROX. PRESSURE (PSI)
500	1000	Closed	Gravity	0

ANSWER YES OR NO WHETHER THE FOLLOWING WATERS ARE MINERALIZED TO SUCH A DEGREE AS TO BE UNFIT FOR DOMESTIC, STOCK, IRRIGATION, OR OTHER GENERAL USE —	WATER TO BE DISPOSED OF	NATURAL WATER IN DISPOSAL ZONE	ARE WATER ANALYSES ATTACHED?
	yes	yes	no

NAME AND ADDRESS OF SURFACE OWNER (OR LESSEE, IF STATE OR FEDERAL LAND)

Mrs. Jennie Martin, 210 So. Eighth Street, Artesia, New Mexico

DOCKET MAILED

Date 3-9-65

LIST NAMES AND ADDRESSES OF ALL OPERATORS WITHIN ONE-HALF (½) MILE OF THIS INJECTION WELL

Tenneco Oil Company

HAVE COPIES OF THIS APPLICATION BEEN SENT TO EACH OF THE FOLLOWING? SURFACE OWNER	EACH OPERATOR WITHIN ONE-HALF MILE OF THIS WELL	THE NEW MEXICO STATE ENGINEER
yes	no other operator	yes

ARE THE FOLLOWING ITEMS ATTACHED TO THIS APPLICATION (SEE RULE 701-B) PLAT OF AREA	ELECTRICAL LOG	DIAGRAMMATIC SKETCH OF WELL
yes	yes	yes

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

J.F.Carnes — (Signature) | District Production Foreman — (Title) | February 24, 1965 — (Date)

NOTE: Should waivers from the State Engineer, the surface owner, and all operators within one-half mile of the proposed injection well not accompany this application, the New Mexico Oil Conservation Commission will hold the application for a period of 15 days from the date of receipt by the Commission's Santa Fe office. If at the end of the 15-day waiting period no protest has been received by the Santa Fe office, the application will be processed. If a protest is received, the application will be set for hearing, if the applicant so requests. SEE RULE 701.

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
March 24, 1965

EXAMINER HEARING

IN THE MATTER OF: Application of Tenneco Oil Company for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Wolfcamp formation through the open-hole interval from 10,537 feet to 10,970 feet in its Kemnitz Wolfcamp Unit Well No. 6 located in Unit I of Section 30, Township 16 South, Range 34 East, Lea County, New Mexico.

Case No. 3223

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

MR. NUTTER: We will call Case 3223.

MR. DURRETT: Application of Tenneco Oil Company for salt water disposal, Lea County, New Mexico.

MR. KELLY: Booker Kelly, Gilbert, White and Gilbert, Santa Fe, appearing on behalf of Tenneco. I have one witness, and ask that he be sworn.

(Witness sworn.)

(Whereupon, Applicant's Exhibits 1 through 5 marked for identification.)

ALAN TEEL, called as a witness, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLY:

Q Would you state your name, your position, and employer, please?

A My name is Alan C. Teel. I'm a petroleum engineer with Tenneco Oil Company, in Texas.

Q Have you previously testified before the New Mexico Oil Conservation Commission?

A No, I haven't.

Q Would you give the Examiner a brief resume of your professional and educational background?

A Petroleum. Graduated from the University of Oklahoma in 1957, as a petroleum engineer. Prior to Tenneco I worked for Humble as petroleum engineer, and now petroleum engineer for Tenneco. I'm a registered professional engineer in the State of Texas.

Q Have you had professional experience in Lea County?

A Yes, sir.

MR. KELLY: Are the witness' qualifications acceptable?

MR. NUTTER: They are.

Q What does Tenneco seek by this application?

A Tenneco seeks to provide salt water disposal facilities for this Kemnitz Wolfcamp Unit operation with our proposed well to be the one shown circled in green on Exhibit 1.

MR. KELLY: I think we supplied a book of exhibits to all interested parties.

Q Referring to Exhibit 1, would you explain this to the Examiner?

A Exhibit 1 is an isopac map of the Kemnitz Wolfcamp Field; showing the productive area above the oil-water contact in the field. The heavy dashed dotted line shows the unit outline. The well circled in green in Section 30 shows our proposed salt water disposal well; the wells encircled in red show our gas injection wells for our pressure maintenance project in the unit.

Q Are all the wells in the unit producing from the Wolfcamp?

A They are.

Q Are there any dual completions?

A There are no dual completions.

Q Would you point out to the Examiner which wells are within a two-mile radius of the proposed well which is not in the unit?

A In Section 25, which is the adjacent section to the west of Section 30, Phillips Petroleum Company has two wells completed in the Wolfcamp section, shown to be their New Mexico State "A" Wells Number 1 and 3. In Section 28, in the northeast corner, Sam Boren and others have a well that is completed in

the Kemnitz Wolfcamp section.

Q Have both of those operators been notified?

A They have been notified, yes, sir.

Q Could you give the Examiner a brief history of the proposed injection well?

A This well was one of the later wells drilled as a field development well and this well encountered the porosity interval within the Wolfcamp below the oil-water contact, such that it was non-productive in the field pay, and the well at that time then was completed in an upper Wolfcamp porosity stringer and produced for a short period of time, approximately 3,000 barrels of total oil production from this well; at which time the well was considered to be depleted, and has been non-productive now for approximately four years.

Q Going on to Exhibit 2, would you go through that with the Examiner?

A The Exhibit 2 is a structure map of the Wolfcamp formation, contoured on top of the lime. It shows the general nature of the structural configuration there of a dipping condition from the north toward the south.

Q And Exhibit Number 3, your GOR diagram?

A The Exhibit 3 is a gas-oil ratio map that was prepared with data that was effective as of October 1, 1964 for presentation to the other unit interest owners, and this shows

the advance of our gas front there as our operations are being conducted under gas injection pressure maintenance.

Q And the proposed well is Number 6 there in Section 30, the southeast corner?

A Yes, sir.

Q Now, you have prepared a diagramatic sketch of the well?

A Yes, sir, this is the proposed sketch of the well as it will be equipped for salt water disposal into the open-hole section extending from the casing shoe at 10,537 feet to the drilled total depth of the well to 10,970 feet.

Q Would you explain the type of installation that Tenneco proposes?

A The installation as we have proposed here is to isolate the depleted production interval of perforations at 10,288 to 10,295 feet behind a tubing string through which our salt water injection will be done, with the tubing being packed off at the bottom of the tubing string with a packer.

Q Are you going to have fresh water in your annulus?

A The annulus will be loaded with fresh water containing a corrosion inhibitor.

Q Is there any type of barrier between your stringer perforations and the main zone?

A The log, as previously submitted with our application, does show that dense limestone exists between the porosity

stringers and to the best of our knowledge, no communication exists between those strings.

Q When you were producing out of that stringer did you get any water?

A There was no appreciable water production at all.

Q What will you have to do to go in and clean out that bottom section?

A It will be necessary to drill out the float collar, float joint and shoe, and clean out the open-hole section that presently contains mud.

Q So what you are doing is to reinject this fluid into the structure zone from which it came?

A That is correct.

Q But, it's going to be outside of the production zone?

A Outside of the productive limits of the field, yes, sir.

Q Do you feel that there's adequate porosity down there to allow for all this water --

A Yes, sir, we do.

Q What is the estimated life of this field?

A We estimate that this unit has a remaining life of nine to ten years.

Q What will be your average water production?

A Our average water production at the present time is

between five and six hundred barrels per day, and based on the curve as shown on Exhibit 5 we are experiencing a slight increase in water production, and have been for the past five years. We can anticipate that this will continue, and that over the nine to ten year remaining life of the field that our water production will average approximately a thousand barrels per day.

Q How long has Tenneco been in this unit?

A When the unit was formed on June 1st of 1961, Tenneco by their majority of the operation was elected unit operator.

Q How long is their history in this field?

A The field was initially developed back between 1953, 1954, and Tenneco was one of the first operators in the field. We did not have the discovery well, but have been in the field for its entire life.

Q Have you experienced any problems with corrosion on your tubing?

A We have had no corrosion problems at all that have any significance in this field.

Q Have you had occasion in the past to pull tubing out of your wells to inspect them?

A Over the period of the last few years we have had occasion to do quite a bit of remedial work in this field on producing and injection wells, gas injection wells. Some of the

producing wells are the ones who make the majority of the water that we're producing in the field, and we have seen no evidence of any corrosion existing on our tubing strings or any of our installations in the field.

Q What are you doing with this water now?

A At the present time the water is being collected in surface pits which has been the procedure ever since water production began in the field, and at the present rate of wat[illegible]on our facilities are no longer adequate, and we [illegible]rudent operator we need to look for subsurface [illegible]ater.

[illegible]here's any danger of contamination of any [illegible] subsurface disposal, no, sir.

Is there any evidence of fresh water in this area?

A Our estimate of the deepest fresh water in this area is approximately 300 feet.

Q Will you have to pull your tubing in the proposed injection well?

A It will be necessary to pull the tubing out of this well in order for us to be able to drill out this float joint.

Q I assume you will examine it to see if you have any corrosion problem?

A This tubing will be inspected very closely, yes, sir.

Q Is Tenneco agreeable to reasonable tests and inspections to see that no corrosion problem develops as you use this well for injection purposes?

A Yes, sir, we anticipate this.

Q Do you feel that the proposal submitted by Tenneco is the most economical for the proper economic development of this unit?

A We do.

Q Were Exhibits 1 through 5 prepared by you or under your direction?

A They were.

MR. KELLY: I move the introduction of Exhibits 1 through 5.

MR. NUTTER: Tenneco's Exhibits 1 through 5 will be admitted in evidence.

(Whereupon, Applicant's Exhibits 1 through 5 were admitted in evidence.)

MR. KELLY: I have no further questions at this time.

MR. NUTTER: Does anyone have any questions of Mr. Teel?

MR. IRBY: Yes, sir.

MR. NUTTER: Mr. Irby.

MR. IRBY: Frank Irby, State Engineer's Office.

CROSS EXAMINATION

BY MR. IRBY:

Q I would like to ask you about the 8 and 5/8s-inch string of casing set at 4548, and the application says that that cement is circulated to the surface. What size hole is this 8 and 5/8s casing in?

A That was an 11 and 1/4-inch hole, I believe, Mr. Irby.

Q 11 and 1/4. What's the O. D. on the collars on this 8 and 5/8s?

A I think they're approximately nine and five.

Q Nine and five. Are you familiar with what kind of a hole they got on this that would indicate in some way the adequacy of the cement of the string?

A You mean with the unifo[illegible]ess of the hole size?

Q Well, is the hole straight, and are we going to have voids in our cement in this annulus, or is it leaning over against the wall, or have you got a good cement job?

A We feel that the cement job on the 8 and 5/8s intermediate casing was adequate to completely give us a good cement job on that string, yes, sir, we think it did.

Q Do you feel that there's no bare pipe exposed in the natural formation?

A Not on the 8 and 5/8s, no, sir.

Q On your Exhibit 1, does this unit cover the entire Kennitz Pool?

A No, sir, it doesn't. There has been new development out there in this field within the last year, primarily over there on the east by Humble and Sam Boren and others; that's the reason that Exhibit 1 is shown to be a revised isopac map, effective NOvember, 1964, to show that development over there in the pay interval.

Q Do your future plans include taking in this area for disposal purposes?

A There has been, to the best of my knowledge, some contact between Tenneco and these other operators about the possibility of enlarging the unit to include these operators, and these leases on the east end of the field, but I do not know at this time what the status of those negotiations are.

Q Do your calculations indicate that this well would take care of this additional water production in the event it is brought in to the system?

A No, sir, they don't, in view of the fact that we, or at least I personally am not familiar with exactly what their water production problems on the east end of the field, outside of our unit operations, consist of at the present time.

As it stands now, the proposal is for a well to serve only the unit area; at the time that the unit would be enlarged we would anticipate that if the well was not capable of handling the salt water produced volume for the enlarged unit, then we

would provide supplemental disposal for this well.

Q Approximately how much water is going to be injected through this well per day?

A Right now our water production is between five and six hundred barrels per day. Over the next nine or ten-year life of the unit, as we anticipate it, we estimate that the average production would approximate a thousand barrels per day. We anticipate that probably a maximum water production toward the end of the life of the field would be in the neighborhood of maybe fifteen to sixteen hundred barrels per day. These are extrapolations based upon the production curve as shown in Exhibit 5.

Q At what pressure are you going to inject, in order to accomplish the disposal of the fifteen to sixteen, what is that, thousand barrels per month?

A A thousand barrels per day.

Q A thousand barrels per day. Pardon me.

A At the present time we anticipate that the disposal interval will accept this water at a vacuum, as far as our surface pressure is concerned. The reservoir pressure in this field is a thousand psi, approximately, and based on this the pressure will not support a full hydrostatic column of salt water, and therefore we feel that a vacuum injection will be the initial condition.

Q And the ultimate?

A We don't anticipate much change in the ultimate in view of the fact that our withdrawals from the reservoir will exceed the salt water produced, and consequently the reservoir pressure will never be appreciably above a thousand pounds again.

Q What oil-water ratio do you need to maintain economic operation at this depth, approximately?

A Water-oil ratio, a well that would begin to produce in the range of 85 percent water would begin to approach the economic limit. This would be for reasons that it would take an enormous amount of gas to lift this amount of fluid out of the well.

Q For the overall unit could you continue economic production with 84 percent of your production being water?

A Not at our current rates, no, sir; but as our gas front advances, of course, our production rate has been declining, and this also is evident by Exhibit 5 showing the declining rate of our oil production.

Q I'm sure you see what I'm working toward is your previous statement that as you continue to produce you are extracting oil, making space for more water in there. These statements lead me to believe that unless you have considerable space there already, in other words, after you achieve fill-up

you are going to have a pressure problem on your injection?

A Well, we only visualize that the amount of water we are going to be disposing of in this well will never achieve any degree of fill-up. Our bottom hole pressure originally in this field was approximately 3,700 pounds, and it's approximately now a thousand pounds. The voidage that we would be putting back in the reservoir is still less than the voidage we would still be continuing to withdraw from the reservoir, so we would never achieve a fill-up situation.

Q Your purpose in this is basically to dispose of the salt water rather than a pressure maintenance?

A Yes, sir, our pressure maintenance program, as previously outlined, and under which we are currently operating is a pressure maintenance program by gas injection. Our application here is for purposes of obtaining permission to inject our produced salt water back into the pay, not for pressure maintenance purposes, but strictly for disposal purposes. We don't ask for an additional allowable as a result of this reinjected volume or anything.

Q I want to get before the hearing officer some of the information in our private discussion, Mr. Teel. Going to your Exhibit 4, the diagramatic sketch of the proposed injection well, would you relate to the Examiner the pressures encountered in the various wells in the Kemnitz Wolfcamp Pool, including

this proposed injection well, and bring into your discussion the pressures in this stringer at 10,223 to 10,295, which you consider isolated from the main porosity of the pool, or permeability and porosity?

A Yes, sir. In order to do this it will be necessary to recall from memory some of the pressures, since I do not have the actual data here before me, but this particular well was one of the later development wells in the field.

When this Kemnitz Wolfcamp Field was initially discovered the original bottom hole pressure approximated 3,700 psi, at this depth of 6,600 feet subsea. At the time that this well was drilled, production had already begun in the field proper, and as a result of this production the bottom hole pressure had started to decline.

When this well was drilled a drillstem test was taken of the porosity interval encountered close to the total depth of the well right there close to 10,970, and our drillstem test data indicated that the pressure had been decreased as a result of the field production.

Our drillstem test data also confirmed to us that the porosity interval encountered in this well was below the oil-water contact for the field, and consequently a completion could not be made in this porosity interval.

Examination of the logs of the well indicated another

interval up the hole that showed some slight amount of porosity and a lesser degree of permeability and we made a completion after running casing there at shown perforations of 10,288 feet to 10,295 feet.

Our initial pressure information from this interval indicated that it approximated very closely the virgin pressure encountered in the reservoir when the lower porosity was initially discovered and developed. This indicated to us that the two porosity stringers were not in effective communication with each other.

However, our production history of this upper Wolfcamp stringer there was short lived, a total fluid production from this well approximated 3,000 barrels of oil, 90 percent of that being by pumping methods, and at that time we could no longer get any influx of oil into the wellbore, and the well was temporarily abandoned as being depleted. Did that set out the pressures that you wished to show?

MR. IRBY: Yes.

MR. NUTTER: I might make an observation. At the time of the original spacing case in this pool in 1957, it was recognized by the Commission that this upper stringer was present, but that it was not commercially feasible to even dual complete these wells, and permission was given in the order which authorized the original spacing to perforate in

that upper stringer, but only if the well was producing from the lower stringer. Evidently this well was not capable of producing from the lower, so you completed in the upper.

A That's correct. It is all part of a Wolfcamp formation in which a dual completion would not be allowed, I am sure.

MR. NUTTER: That's correct.

Q (By Mr. Irby) As I understand, you are going to have fluid in the annulus, is this inhibited fluid?

A Yes, it will be a fresh water with a sufficient corrosion inhibitor to completely neutralize the water.

Q I would like to know what will prohibit this water from draining off into the porosity where the perforations are starting at 10,228?

A We feel that the upper interval there does not have sufficient permeability to accept that water by normal gravity means.

Q Is this annulus going to remain open?

A It will be open to the extent that pressure tests or evidences of vacuum could be determined at the casinghead, yes, sir.

Q Will the pressure, or the head of the fluid in this annulus be one of the tests that you will normally conduct on this well?

A Yes, sir. It is our practice, wherever we are injecting salt water through a tubing string to maintain a close surveillance on the condition of the annulus.

Q And if this porosity does accept some of the fluid that's put in the annulus, do you propose to put sufficient fluid in there to have a standing head?

A Yes, sir.

Q At what level?

A We don't know at the present time, exactly what pressure is exhibited in that upper zone. Our best estimate was that at the time that the well was last produced that the bottom hole pressure in this upper zone probably did not exceed 500 pounds. However, with the low permeability that is also characteristic of this upper zone, I feel that there's a possibility that this hydrostatic head in the annulus, if it will not stand completely full, will be very close to the surface.

Q Just because of low permeability do you anticipate that there will be a slow diminution of the head in this annulus?

A It's possible that it will, the level will go down some, yes, sir.

Q This will be replenished from time to time?

A If we find it has a tendency to leak off we will

continue to load it.

Q Certainly it will be loaded above the perforations at all times?

A Very definitely. It wouldn't be possible for it to actually go below the perforations with this type of mechanical set-up that we propose; not without a leak in the packer or a leak in this tubing. We don't visualize this to be the case.

Q I could understand how it couldn't go below the perforations, but I can understand how it might go below the uppermost of those perforations in that seven-foot interval.

A I concur with you there. However, we certainly will keep it under observation to see that the annulus is remained fluid loaded.

BY MR. NUTTER:

Q Why don't you squeeze the perforations off and you wouldn't have any problem with them?

A We considered that very strongly, Mr. Nutter, but the final consensus of that of our company was that we preferred to leave them as they were. We have no prospects in mind for what we might do in the future with that interval, but we propose to leave it as it is. One of the reasons was economic. It would cost us $3,000.00, approximately, to squeeze those off and we didn't feel that we were justified in doing so.

Q Well, how about setting the packer above those

perforations?

A We considered that, but we felt like also that there was no advantage on our part to having the two zones in communication within the wellbore. We preferred to have the upper zone isolated.

Q But you still don't have any plans for this upper zone?

A We don't have any concrete plans, no, sir, nothing definite that we have in a proposal stage or in a working stage.

Q This Exhibit Number 2, that's contoured on top of the Wolfcamp lime, is that the main pay, or is that the top of the Wolfcamp formation?

A That's actually the top of the Wolfcamp lime formation.

Q The producing interval for the main take is how far above the top of the Wolfcamp?

A It's roughly 150 feet.

Q Do you have an oil-water contact that you could pick on this Exhibit Number 2?

A Yes, sir, the water-oil contact is approximately 6670 subsea.

Q 6670?

A Yes, sir.

Q There was porosity and permeability in this Number 6

Well?

A Yes, sir.

Q Down in the lower Wolfcamp, but below this oil-water contact?

A It was below the oil-water contact, yes, sir. The reason that we chose this, or our company maps this on top of the lime is because you can pick this point correlative throughout the field, and throughout the whole area. The porosity varies within the section considerably, and it is difficult to actually draw a structure map on the porosity.

Q Is it your anticipation that the nearest well, say that Number 24 Well in Section 30 might receive some response from the water disposal in the Number 6 Well?

A If it does we feel that it would be perhaps negligible. We do feel that in our pressure maintenance operation with the gas front being as shown on Exhibit 3, there, of moving down structure, that there would be some area between the last producing well and the actual oil-water contact that would not be effectively swept with the gas. We feel that a slight possibility exists that the injection of water will cause a slight rise in the oil-water contact, to the extent that we would get some effect in the last producing row of wells. However, we feel that this is insignificant and

consequently we don't consider that this disposal is an effective part of the pressure maintenance plan. It is strictly for salt water disposal.

Q There wouldn't be anything to prevent you from converting the bottom row of wells, the Number 6, 27, 28 to water injection and put a squeeze on the oil, so to speak, in the event you did get some response here though, would there, pressure maintenance from top and bottom both?

A Well, at the time that secondary recovery was considered for this field, a considerable amount of investigation was given to the possibility of water flooding this, and the test that we had from the performance of this field and from tests conducted by Shell in the Townsend Field indicated that the possibility of building a water bank was so slight that water flooding would not be effective, and therefore, pressure maintenance by gas injection was chosen as a secondary recovery method for this field.

MR. NUTTER: Did you have any more questions, Mr. Irby?

MR. IRBY: Yes.

BY MR. IRBY:

Q I can't understand why Tenneco prefers to isolate this upper perforation from the water. The only thing I can see, and in our private conversation you told me there were

some 300 barrels of oil removed from --

A No, sir, 3,000, approximately 3,000.

Q Thank you. 3,000 is right. With the pressure you had here, I would assume that you'd get fill-up with 3,000 barrels of water.

A We assumed that, too.

Q I see no prohibitive cost in this. In fact, I think that in all likelihood the shortening of the tubing might pay for that water right quick. What I'm getting at is, I haven't heard you express any good reason for wanting to maintain these open perforations here at all. I feel that this may be a threat; that this water can get out into this porosity, even though you consider it -- and permeability, even though you consider it isolated, and we know that this water has contaminates in it, and I think that unless there is good reason shown why the packer should not be set above this, that the perforations should be squeezed.

MR. KELLY: Mr. Irby. I should direct my question to Mr. Teel. From the other wells in the field, have you encountered this porosity zone, is it uniform throughout or spotty?

A No, sir, it is not uniform throughout the field. From my own knowledge, my ability to recall, I believe it is present in some areas in the field of somewhat limited areal

extent; as pointed out by the Examiner, Mr. Nutter, a few moments ago, it was not considered by our company to be of economic significance and worthy of development within the field. At the time that we began to evaluate the possibility of using this well for a salt water disposal well, it was very much to our advantage to be able to use this upper set of perforations for disposal rather than go to the expense of drilling out this casing shoe and making a completion down in the main porosity interval. These being strictly economic incentives.

However, in view of the fact that this well produced such a relatively small amount of fluid, we felt that this would only give us a salt water disposal well that would have very short life, and consequently not be suitable for our purposes. So we chose the alternate proposal of going to the lower porosity interval, which does have some areal distribution, some areal extent so that we would have room to actually put this water back in there and have a salt water disposal well that would last us for the life of this unit.

In doing so we do not propose to have the two stringers, even though we feel that they're isolated outside of the wellbore, we did not want them in communication in the wellbore, even though we have no plans for the upper perforations at this present time, and we are talking about between the differences

of setting the packer slightly below those perforations, or setting it above the perforation, because we want to protect the majority of the casing string with this tubing. So we are talking about maybe a couple of hundred feet of tubing as versus setting the packer above or below the perforation.

BY MR. NUTTER:

Q I think that Mr. Irby is probably concerned, and I am too; now, for protection and observation purposes, you are going to fill this annulus here with an inhibited fresh water?

A Yes, sir.

Q You have taken 3,000 barrels of oil out of that zone at 288, and it seems reasonable to me to expect that it's going to take 3,000 barrels of water poured in there every few days. You have 10,000 feet of hydrostatic head against that formation, and to maintain this annulus full of the inhibited water is going to be a problem. It seems to me it's going to have to be continuously filled.

A We felt that the permeability of that zone, as indicated by our production performance of the well, was such that we would not be faced with an excessive leak-off in that formation.

Q There undoubtedly would be a continuous minor leak-off, wouldn't there, so you are going to have to be filling this

annulus up from time to time? There's some permeability there or it wouldn't have made 3,000 barrels of oil.

A That's true. However, we have experienced in other places where it takes a lot more than just an equal pressure to pump back into these formations, or to have water go back into them than it takes to produce out of them.

Q How do you expect to determine what the fluid level is in the annulus?

A We'll start off with it full, and the valve at the casing will be closed. We will periodically open this valve and check this annulus for evidence of either vacuum or pressure. If we have evidence of vacuum we can, I think, be quite certain that there is being some lowering of the fluid level in this annulus, at which time we will continue to fill it up.

Q Then you'll get a water truck and fill it back up to the surface?

A Yes, sir.

Q How often do you expect to make these observations to see if the fluid level is holding?

A We'll make the observation quite frequently in the early life of the well used as a salt water disposal well, if our application is approved, until we develop enough experience to determine whether this is actually going to occur.

I would say weekly to start with. Every day for the first week or so; weekly, and then possibly monthly until we determine actually how it is going to act.

We considered the possibility of putting mud in this annulus, but in view of the solid settling attributes or the characteristics of mud and the possibility that remedial operations on this lower zone might be necessary at some time in the future, and the difficulties encountered in retrieving these packers that we chose to go to non-solid fluid for the annulus fluid.

Q If you had to pull your packer you would probably have to wash down over your tubing to get the thing out?

A If we put mud in there, we anticipated that, so we chose not to put a solid containing fluid in the annulus.

BY MR. IRBY:

Q Is there other production in this upper zone?

A No, sir, this is the only well out there that has ever had a completion attempt made in the upper porosity stringer.

Q Is there indication that it is productive in other areas?

A Not sufficiently that would warrant our making a completion attempt in it.

Q Your attitude toward this zone creates considerable

suspicion in my mind, and that's what's bothering me. I'll be perfectly frank with you; I can't understand why you are so determined to hang on to these perforations here.

A Well, I hope that I'm not giving you the impression of trying to be evasive. As I indicated earlier, we would like to have been able to dispose of our water through those perforations, but we didn't feel they would be a suitable salt water disposal zone. The other part of our objection to actually going ahead and squeezing those perforations off is one of economics. It would cost us approximately $3,000.00 to do this, and we feel that we can adequately isolate it by just putting them behind the packer.

Q As I understood you in our private conversation, this tubing that you are going to use for this injection is the same tubing that's been in this well since it was completed in 1954 or '55.

A Our plans at the present time call for using the well tubing, yes, sir. However, it will be necessary for us to retrieve this tubing out of the well, and at which time it is actually out where it can be examined, it will be inspected quite critically, and if there is any reason at all, upon this examination, to cull or rule out the use of this tubing, then we will do so and use tubing that is in condition to be adequate to maintain a good tubing string. We have other

tubing strings in the producing wells of the field that have been there for the life of the field. We have had occasion to examine them and test them, and we find them still to be in good condition. We assume, until we have a chance to look at this tubing, that this will be, too.

Q What were the tests on this tubing?

A Of the producing wells?

Q That you have retrieved from other wells.

A We have visually inspected some. We have hydrostatically tested some to determine that the working pressure on the tubing is adequate for producing operations. We have tested some of the tubing back in the hole for 5,000 pounds hydrostatic test.

Q In your direct examination you stated that reasonable tests and inspections would be made. I would like for you to tell me what constitutes reasonable tests and inspections, and what intervals they would be made.

A We don't have a particular set rule formulated at the present time of what would constitute reasonable observation of this well to determine that the tubing string remains intact. However, our observation of the annulus, the performance of the injection of the well will be kept under close observation. We feel like we could go to caliper surveys, or subsurface flow meter surveys if necessary, if there was any indication given

that the tubing was not still intact, with no holes in it.

Q Well, you are speaking in generalities, Mr. Teel, about the things that might or could be done, but you are not getting quite down to specifics.

A Well, we don't, first off, anticipate that this tubing is going to suffer a severe corrosion problem. We have not experienced any in the field so far. As a prudent operator, we anticipate that if this proposal, application is approved that we will put the water back in the zone that we have asked for permission to inject into, and that the tubing string will be kept intact. At this particular time, not being able to foretell the future, I can't say what particular investigations might be required, but we certainly shall make every effort to see that this tubing string does not develop any leaks and that this water is going right down that tubing string. I mentioned in generalities a couple of things that we could do to determine what the condition of this tubing will be, yes, as time goes by.

MR. IRBY: Mr. Examiner, I would like to say that I am strongly in favor of the basic idea that Tenneco has for the disposal of the salt water. My concern is the control of it. I think I have gone as far as I can with this witness. I'm afraid that he doesn't have the authority to say Tenneco will do this, or that. I'm willing to go along with whatever you

and the Commission decide will be adequate for the absolute control of this injected fluid.

I do make this request; that I be furnished a complete analysis, and I emphasize the word "complete", of the water to be injected.

MR. NUTTER: Now, that's the disposal water that's going into the main pay?

MR. IRBY: Yes, sir.

MR. KELLY: We will furnish that, Mr. Irby.

MR. IRBY: Thank you very much, Mr. Kelly, and Mr. Teel.

MR. KELLY: Could I ask you a couple of questions, Mr. Irby, to see if there is a sclution to our common differences? Are you more concerned with the pipe corroding up structure and getting out into any other formation, or are you concerned with travelling up the annulus somehow around that packer?

MR. IRBY: I feel that if Mr. Teel's estimate of the impermeability of this upper section is correct, that any water that escapes the tubing is going to show up in this annulus almost instantly, very, very quickly. If his estimate of the permeability in this section here is not good and if this section has channelled extent rather than general areal extent, then this water is going out in here, and where it will go, I don't know. I don't think there is enough basic data in the

area to determine this.

I know that it's natural inclination and general practice for an engineer or a geologist to think that where they have missed this in many drillings around here that it may be just a small lens and there may be another one over here, but we can't know this. I just can't get away from this apprehension that I have concerning that.

MR. KELLY: Then your main concern is the possibility of liquids coming out of the perforations and getting into a structure, you just don't know where it might go?

MR. IRBY: That's right.

MR. KELLY: Would this possibility be acceptable to you; setting packers where they are now, and up here, and possibly putting plastic lining in between, a 30 foot section?

MR. IRBY: That would relieve me greatly.

MR. KELLY: What would Tenneco's position be on that?

A If this would resolve his problem, we would be happy to take the steps.

MR. NUTTER: And set the packer above the upper perforations?

A Yes, we would set a packer there and plasticote the tubing between the two packers.

MR. NUTTER: I think that would give you more assurance that you wouldn't have to call the water truck out

very often to fill that annulus. You don't need that assurance but I think that water truck is going to be going out there pretty often, frankly.

Are there any other questions of Mr. Teel?

MR. IRBY: I have nothing further.

REDIRECT EXAMINATION

BY MR. KELLY:

Q Do you feel that the proposed installation, with the addition of the 30-foot section of lined pipe and additional packers, would sufficiently protect against the water traveling up the annulus and out into the structure?

A Let us put it this way, my feeling for plastic coated tubing is not one that I have great enough faith in it to feel that this would be a complete and conclusive measure. However, if this would help, and if this helps to resolve our differences of opinion, we would be happy to make this correction to our mechanical set-up there.

MR. NUTTER: Actually, Mr. Kelly, it would take more than a 30-foot joint, because the packer is set at 10,450, I believe.

A That is where we would have proposed setting it. However, with your concurrence, if we set two packers and plasticote the tubing in between, we would ask permission to raise that packer up to the extent that there would only be

about 30 feet of separation between the two packers.

MR. NUTTER: So you would have one joint of tubing opposite the perforations, and a packer above and below?

A And below.

Q (By Mr. Kelly) You feel that would be a substantial protection as far as water getting up in the annulus and out into the structure?

A Yes, that would certainly isolate our annulus from our perforations then.

MR. NUTTER: Does anyone else have any questions of the witness? The witness may be excused.

(Witness excused.)

MR. NUTTER: Do you have anything further, Mr. Kelly? Does anyone have anything they wish to offer in Case 3223?

MR. [illegible]RRETT: I would like to state for the record that the Commission has received a telegram from Shell Oil Company concurring with Tenneco's application. We have also received a letter from Mrs. Ginnie Martin, stating that she is the surface lessee, and that she has no objection to Tenneco's proposal.

MR. NUTTER: Thank you. If there's nothing further in Case 3223 we will take the case under advisement.

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

I, ADA DEARNLEY, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission Examiner at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 4th day of April, 1965.

Ada Dearnley
Notary Public - Court Reporter

My Commission Expires:

June 19, 1967.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2723 heard by me on 3/24, 1965.

[illegible]
New Mexico Oil Conservation Commission

Exh #9

13-3/8" Surface Casing

358'

8-5/8" Int. Casing

4548'

TOP OF WOLFCAMP 9723'

2-3/8" Tubing

Perfs 10,288-10,295'

10,450'

10,537'

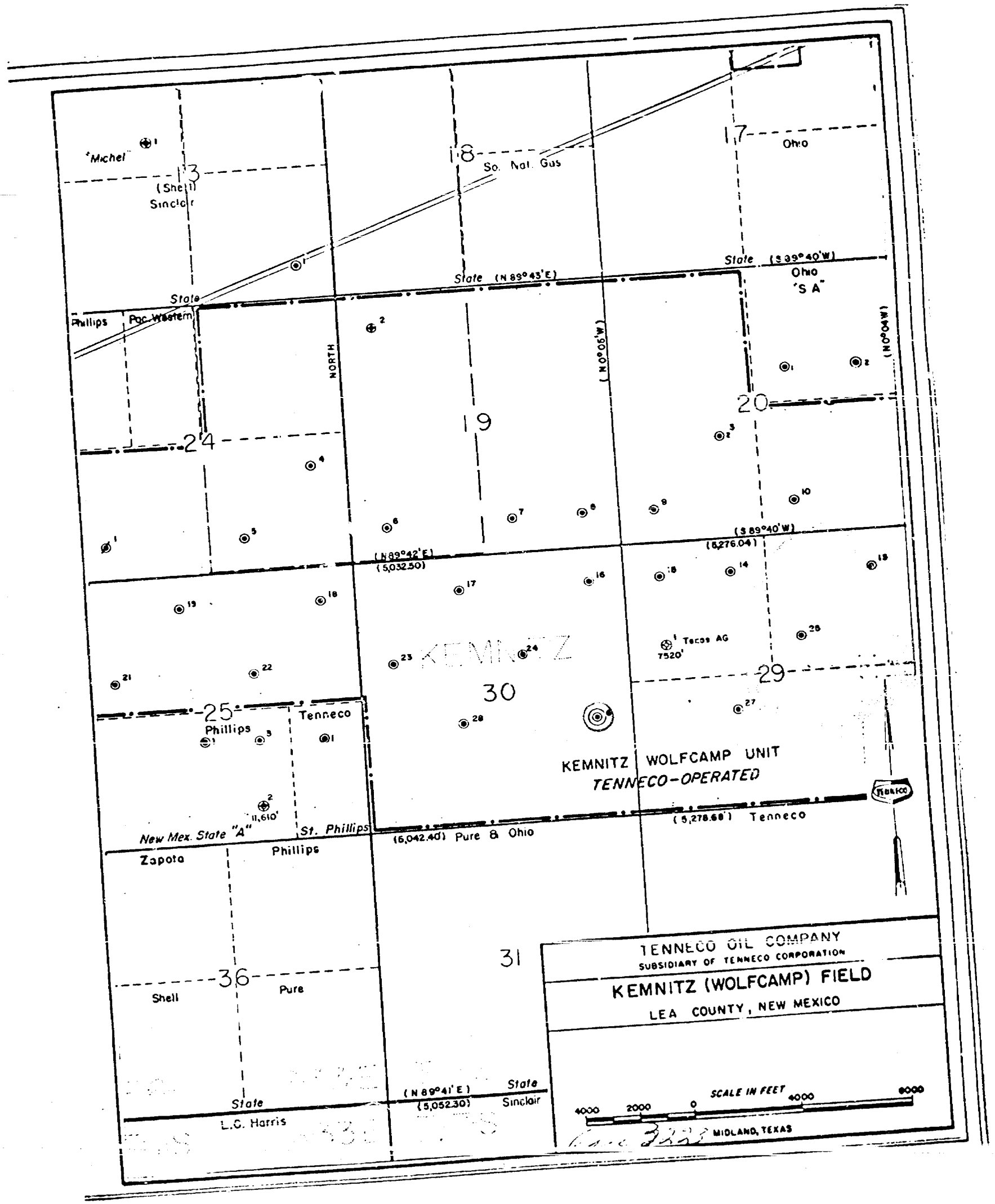
TD 10,970'

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Tenneco EXHIBIT NO. 4
CASE NO. 5333

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO CORPORATION

KEMNITZ (WOLFCAMP) FIELD
Lea County, New Mexico

DIAGRAMMATIC SKETCH
PROPOSED SALT WATER DISPOSAL WELL


"Michel"
13
(Shell)
Sinclair
18
So. Nat. Gas
17
Ohio
State (S 89°40'W)
State (N 89°43'E)
State
Phillips
Pac. Western
NORTH
(N 0°05'W)
(N 0°04'W)
Ohio
"S A"
24
9
20
(N 89°42'E)
(5,032.50)
(S 89°40'W)
(5,276.04)
Texas AG
7520'
KEMNITZ
30
29
25
Phillips
Tenneco
11,610'
New Mex. State "A"
St. Phillips
(6,042.40) Pure & Ohio
(5,278.68') Tenneco
KEMNITZ WOLFCAMP UNIT
TENNECO-OPERATED
Zapata
Phillips
31
36
Shell
Pure
State
(N 89°41'E)
(5,052.30)
State
Sinclair
L.C. Harris
TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO CORPORATION
KEMNITZ (WOLFCAMP) FIELD
LEA COUNTY, NEW MEXICO
SCALE IN FEET
4000 2000 0 4000 8000
MIDLAND, TEXAS