TENNECO OIL COMPANY
Exhibits
Case 9393
Blanco Mesaverde Gas Pool
San Juan County, New Mexico

Application for Well-head Price Ceiling Category Determination for certain infill wells, for exception to order R-1670-T, and exceptions from well location requirements.

BEFORE EXAMINER STOGNER
OIL CONSERVATION DIVISION
Tenneco EXHIBIT NO.
CASE NO. 9393

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May 2, 1988

Mr. William J. LeMay
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87504 "Hand Delivered"

Re: Tenneco Oil Company for Well-Head Price Ceiling Category Determination for certain Infill Wells, for Exception to Order R-1670-T, and for Well Location Requirements, Blanco Mesa-Verde Gas Pool, San Juan County, New Mexico

Dear Mr. LeMay:

On behalf of Tenneco Oil Company, please set the enclosed application for hearing on the next available examiner's docket now set for May 25, 1988.

By copy of this letter and application sent certified mail return-receipt to all offset operators, we are notifying each of them of the right to appear at the hearing either in support or in opposition to this application. Should any such party desire more information about this matter or about the procedures to hearing this application, they may call the Division or the undersigned.

Very truly yours,

W. Thomas Kellahin

WTK:ca
Enc.

cc: David Motloch, Esq. (Tenneco)
Mr. Tim Hower (Tenneco)

"<u>Certified-Return Receipt Requested</u>"

All Interested Parties in Application

STATE OF NEW MEXICO
DEPARTMENT OF ENERGY AND MINERALS
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE APPLICATION OF TENNECO OIL COMPANY FOR WELL-HEAD PRICE CEILING CATEGORY DETERMINATION FOR CERTAIN INFILL WELLS, FOR EXCEPTION TO ORDER R-1670-T, AND EXCEPTIONS FROM WELL LOCATION REQUIREMENTS, BLANCO MESA-VERDE GAS POOL, SAN JUAN COUNTY, NEW MEXICO.

CASE:

A P P L I C A T I O N

COMES NOW TENNECO OIL COMPANY, by and through its attorneys, Kellahin, Kellahin & Aubrey, and applies to the New Mexico Oil Conservation Division for an order for well-head price ceiling category (Section 103) determination that sixteen infill wells in the Blanco Mesa Verde Gas Pool qualify as New Onshore Production Wells under the exceptions of Section 271.304 and 271.305 of the FERC regulations implementing the Natural Gas Policy Act of 1978, for exception from Order R-1670-T and from well location requirements of the Blanco Mesa Verde Pool Rules, and in support thereof would show the Division:

1. Applicant is the operator of sixteen Blanco Mesa Verde 320-acre spacing and proration units, each of which currently has an original well and an infill well.

2. Applicant has determined that in each instance, the original well has reached a stage of depletion whereby a second infill well is now necessary to effectively and efficiently drain a portion of the reservoir covered by the proration and spacing unit which cannot be effectively and efficiently drained by any existing well within the proration unit.

3. Applicant seeks this determination prior to drilling each of the subject wells as exceptions which will qualify under the higher "New Onshore Production Well" category (Section 103) of the FERC regulations.

4. The following are the subject infill wells for which the applicant seeks the necessary jurisdictional agency findings and exceptions from Division Order R-1670-T and Order R-6013 (Administrative procedures for Infill Wells):

EXH.	WELL NAME	LOCATION	SPACING UNIT
1	Fields LS 7B	965' FNL & 2060' FEL	N/2, Sec 34, T32N, R11W
2	Neil LS 8B	2055' FNL & 885' FEL	E/2, Sec 4, T31N, R11W
3	Gartner LS 1B	1720' FSL & 1610' FWL	W/2, Sec 28, T30N, R8W
4	Gartner LS 5B	1620' FSL & 1005' FWL	W/2, Sec 27, T30N, R8W
5	Gartner LS 6B	300' FNL & 1230' FEL	E/2, Sec 27, T30N, R8W
6	Mudge LS 9B	2160' FNL & 395' FEL	E/2, Sec 3, T31N, R11W
7	Mudge LS 8B	845' FNL & 1740' FEL	E/2, Sec 12, T31N, R11W
8	Day A LS 3B	790' FNL & 1800' FEL	E/2, Sec 8, T29N, R8W
9	Hughes A LS 2B	1125' FNL & 1828' FEL	E/2, Sec 27, T29N, R8W
10	Scott LS 3B	790' FSL & 1850' FWL	S/2, Sec 29, T32N, R10W
11	Riddle F LS 1B	1850' FSL & 1500' FWL	W/2, Sec 17, T28N, R8W
12	Mudge LS 5B	900' FSL & 1190' FWL	W/2, Sec 3, T31N, R11W
13	Jacques LS 1B	790' FNL & 790' FEL	E/2, Sec 29, T31N, R9W
14	Jones A LS 2B	1650' FSL & 990' FWL	S/2, Sec 11, T28N, R8W
15	Fields LS 4B	1850' FNL & 1450' FEL	E/2, Sec 28, T32N, R11W
16	Barrett LS 2B	790' FNL & 790' FEL	E/2, Sec 19, T31N, R9W

5. In addition, applicant seeks approval of the respective well locations as exceptions to the well location requirements (Rule 2) of the Special Rules and Regulations of the Blanco Mesa Verde Gas Pool.

6. Copies of the plat showing the spacing units, the Blanco Mesa Verde wells and the proposed infill wells are shown on Exhibit 1-16 attached hereto and incorporated by reference.

7. Attached as Exhibit 17 is a list of the offset operators who have been notified of this application pursuant to Division Notice Rules.

8. Applicant requests that this application be set for hearing on the Examiner docket now scheduled for May 25, 1988.

WHEREFORE, APPLICANT requests that after notice and hearing the application be granted as required.

Respectfully submitted:

W. Thomas Kellahin, Esq.
P. O. Box 2265
Santa Fe, NM 87501

DeGolyer and MacNaughton
One Energy Square
Dallas, Texas 75206

PREPARED TESTIMONY by A. F. van EVERDINGEN
on the
NEED of INFILL DEVELOPMENT of the BLANCO-MESA VERDE FORMATIONS
in the
SAN JUAN BASIN

Dallas, Texas
February 1974

(Revised July 1974)

EXHIBIT 1

DEGOLYER AND MACNAUGHTON
ONE ENERGY SQUARE
DALLAS, TEXAS 75206

ENCLOSURES to PREPARED TESTIMONY
on the
BLANCO-MESA VERDE FORMATIONS

1. Structure map on "Green Marker Horizon" in the San Juan basin, indicating the synclinal nature of the gas accumulation.

2. Distribution of estimated ultimate production per well over the accumulation.

3. The Schlumberger logs of two wells 1 mile apart.

4a-4h. Horner-type curves of long-term pressure buildups.

5. Table of pressure data.

6. Table of production data.

7. Detailed data on long-term pressure buildup tests (2 sheets).

8. Pressure data in psia.

9. P/Z values from 7-day averages versus cumulative production.

10. P/Z values from long-term buildup pressures versus cumulative production.

11. P/Z values from strat-test pressures versus cumulative production.

12. Computed initial gas volume versus yearly average rate per well.

13. Computed initial gas volume versus yearly Mesa Verde production.

14. Details on computing gas initially in place.

15. Graph of strat-test pressure.

DeGOLYER AND MacNAUGHTON
ONE ENERGY SQUARE
DALLAS, TEXAS 75206

PREPARED TESTIMONY by A. F. van EVERDINGEN on the NEED of INFILL DEVELOPMENT of the BLANCO-MESA VERDE FORMATIONS in the SAN JUAN BASIN

Q-1 Will you give your name and address, please?

A. My name is Antonius F. van Everdingen. I reside at 6138 Bandera, Apartment D., Dallas, Texas 75225.

Q-2 What is your occupation?

A. I am a senior vice president of DeGolyer and MacNaughton, a firm of petroleum consultants and evaluation engineers in Dallas, Texas. I am employed as a reservoir engineering specialist.

Q-3 Will you give us a resume of your education, qualifications, and experience?

A. In 1923, I was graduated from the Technical University in Delft, The Netherlands, as a mining engineer. In 1924, I went to Curacao, Dutch West Indies, to work as a geologist on the fresh-water supply of a subsidiary of the Royal Dutch. I did similar work in Aruba; returned to Holland in 1927; spent some months in Rumania to familiarize myself with rotary drilling; and for the next 4 years worked in Indonesia as an exploitation engineer, returning to The Hague in 1932 to work in the Royal Dutch offices. In 1935, I was lent to the Shell Oil Company. During the succeeding years, while stationed in Houston, I analyzed the production and pressure behavior of reservoirs and prepared estimates of their ultimate production and their value. These reservoirs were located in the United States, Canada, Venezuela, and Colombia. I was head of Shell's Reservoir Engineering Section in Houston until my transfer to New York in 1956. There followed 6 years of work on economic problems in the New York office and in The Hague. I retired at the end of 1962 after 38 years of service. Late in 1963, I joined the firm of DeGolyer and MacNaughton.

Q-4 What was your primary field of interest during your service with Shell Oil Company and DeGolyer and MacNaughton?

A. The estimation of ultimate production of gas and oil wells and reservoirs. I always felt the need to understand thoroughly the laws of the flow of fluids through permeable formations. When I was graduated, the flow of fluids was recognized to follow Darcy's law, but fluids were considered incompressible - two-phase flow was still unknown. During the 1930's, fluid compressibility and two-phase flow were recognized as important. Taking fluid compressibility into account, Mr. Hurst and I established procedures to express quantitatively the amounts of water entering into the oil- and gas-bearing portions of reservoirs due to a pressure reduction and to compute quantitatively the pressure drops in reservoirs caused by fluid withdrawals. The results are available in the Transactions of the AIME in "The Applications of LaPlace Transformation to Flow Problems in Reservoirs," Volume 186 (1949), page 305. The methods enable engineers to use the material-balance equation with greater accuracy and more facility than before. In 1953, "The Skin-Effect and Its Influence on the Productive Capacity of a Well" was published in Volume 198, page 171, giving a method of anlayzing well pressures in such a way that the quality of well completions and well treatments could be expressed quantitively. I have lectured on the "Performance Predictions of Several Reservoir Mechanisms" at The University of Texas at Austin, Texas.

Q-5 Are you a member of any technical societies?

A. I am a member of the Society of Petroleum Engineers of the AIME. I was a member of the API Committee on Petroleum Reserves from 1955 until my transfer to The Hague in 1960. I am a registered engineer in Texas.

Q-6 Have you received any professional awards?

A. Yes sir. The Lester C. Uren award in 1970 for "distinguished achievement in technology of petroleum engineering" and the Anthony F. Lucas Gold Medal in 1968 for "improving the technique of producing petroleum."

Q-6a What is your experience with the San Juan Basin and the Blanco-Mesa Verde Gas Pool?

A. The firm of DeGolyer and MacNaughton has worked on various problems in the San Juan practically continuously from 1953 until 1960. I joined the firm in 1963. During the first few years my opinion on some problems in the Blanco-Mesa Verde and Basin Dakota Gas Pools was asked occassionally. My work started in earnest early in 1972. Since then I have spent most of my time analyzing the rates and pressures of the accumulations in the San Juan Basin.

Q-7 Have you made a reservoir engineering study of the Mesa Verde formation in the Blanco-Mesa Verde Gas Pool in San Juan and Rio Arriba Counties of New Mexico?

A. Yes, I have, by reviewing and studying the publications and reports on the gas-producing formations in the two counties. In addition, I have reviewed and analyzed core data, logs, and a great number of pressure data on wells in the Mesa Verde. Invariably more than one, sometimes several, productive zones were found present in a well.

Q-8 What was the purpose of your study?

A. To determine the effectiveness and the efficiency of the existing wells in draining the resevoir. This requires a determination of the amount of gas initially in place and an estimate of the ultimate production, and in addition, a determination as to whether wells drilled between existing producers would substantially increase the ultimate production of the reservoir.

Q-9 Please describe the sources of the basic data and other information used in connection with your study.

A. Good geological descriptions on these formations and reservoirs can be found in the following reports and publications:

1. "A Brief Discussion of the Subsurface Cretaceous Rocks of the San Juan Basin" by Dan Bozanic in the 1955 Four Corners Geological Society Guide Book.

2. "Stratigraphic Gas Development in the Blanco-Mesa Verde Pool of the San Juan Basin" by R. W. Allen in the same publication.

3. "Reservoir Characteristics of Cretaceous Sands of the San Juan Basin" by Wilbur E. Reneau and J. D. Harris, which appears in the 1957 Guide Book.

Furthermore, El Paso made available a mass of pressure data from which buildup curves were prepared. Most of these tests extend over a considerable shut-in period, the maximum being slightly over 3 years. Moreover, 7 days' shut-in pressure data, numerous electric logs, and the results of core analyses, already available in my office were utilized.

Q-10 Before going into the details of your study, please state generally the conclusions which you have reached concerning the feasibility of infill drilling in the Blanco-Mesa Verde Gas Pool.

A. I have made a performance study which entailed consideration of all of the pressure and production data available from all of the wells producing in the Blanco-Mesa Verde Gas Pool. In my opinion, the best information from which to determine the gas in place is contained in the data of the 65 long-term buildup pressure tests. Such data were obtained in the 38 wells distributed throughout the reservoir. By an analysis of this buildup information, together with field production data, I have concluded that 25,000 Bcf of gas and perhaps even more could have been present in the reservoir. Furthermore, the number of wells provided under the current field rules (one well on a 320-acre drill site) are estimated to yield 9,000 Bcf ultimately. It is my opinion that this recovery can be increased to a 15,000 Bcf if the field rules were changed to allow two wells on a 320-acre drilling site as set out in the application.

I have concluded that the producing formations are made up of lenses, some of considerable extent, stacked on top of another. The most permeable lenses occur near the deepest portions of the basin, and their permeability is reduced towards the topographically higher-out boundaries. As a result, the accumulation is saucer-shaped instead of dome-shaped (Exhibit 1). A reduction in permeability and shaling out toward the outside boundaries must occur in all sand bodies, as is plainly evidenced by the presence of gas itself and by the ultimate production per well distributed over the field (Exhibit 2). The form of the reservoir is the inverse of normal accumulations which are emitted by a water-gas contact at their deepest structural position. The sands are so fine grained that small variations in the grain size can reduce the permeability to practically nothing so that sand lenses appearing on one log disappear or have been displaced vertically on the log of the next well. The Schlumberger logs for two wells 1 mile apart, shown in Exhibit 3, clearly demonstrate the variation in position and thickness of such lenses. The occurrence of lenses also introduces uncertainty in the ability of a well to effectively drain the area of the drill site. The combination of these conditions causes me to conclude that infill development of the 320-acre drill site will substantially increase the ultimate gas production from this reservoir.

Q-11 Does the conclusion you have just expressed concerning infill drilling in the Blanco-Mesa Verde Gas Pool differ from one you previously reached regarding the effect of spacing on recovery efficiency? If I remember, you co-authored the paper "The Relation between Well Spacing and Recovery," published in the API Drilling and Production Practice of 1945, in which any relation between spacing and ultimate production was denied.

A. Yes sir, over the years my opinion has changed. I now recognize that conditions do occur which cause such a relationship to exist. Firstly, the Blanco-Mesa Verde Pool of the San Juan Basin is lying in the deepest portion of a large asymmetrical syncline in which the gas accumulation could only be (and has been) kept in place by the lenticular development of the gas-bearing sands.

Secondly, because sands become nonpermeable towards boundaries of the reservoir, the same variations can also be present within the boundaries of the Mesa Verde formations so that gas-bearing sand pockets could exist which have no satisfactory connection to a well.

Thirdly, variations in the size of the small-sized sand grains or in the mixture of these grains not only could cause lenses to exist, but also result in appreciable variations in the productivity of the same lense. Considering the dimensions of the Mesa Verde accumulation, about 50 by 40 miles, and an average net sand thickness of approximately 100 feet in a total gross thickness of 700 feet in the northwest increasing to more than 1,000 feet in the southwest, the existence of such variations appears entirely plausible.

Finally, because the Mesa Verde formation producing in a well often contains several lenses, we can expect a far more complicated pressure behavior than the patterns obtained on wells producing from one, homogeneous horizon. Applying the conclusions of pressure analysis learned from homogeneous sand to the Mesa Verde wells is to say the least unwarranted and probably misleading.

Q-12 Just how do these comments relate to the feasibility of infill drilling in the Blanco-Mesa Verde Gas Pool?

A. From a net sand thickness map, I compute that the Mesa Verde contains 50 million acre-feet of gas-bearing formation. Using the figures published by Reneau and Harris (an average porosity of 9.64 percent and a connate water content of 33.25 percent), and, in addition, a reservoir temperature of 160 degrees F., an initial reservoir pressure of 1.315 psia, a Z-Factor of 0.8631, and 15.025 psia as pressure base, the original gas content is computed to be 11,900 Bcf (5.70 billion for an average well) present in 140 Bcf of net pore space. Accepting an ultimate production of 8,900 Bcf, the figure represents a recovery efficiency of 75 percent.

The volume of gas-bearing sand depends a lot on the quality and availability of the electric logs, the estimator's opinion in interpreting the percentage of connate water present, the assumed lower limit of permeability, etc. As net sand thickness constitutes some 10 percent of the total thickness of the Mesa Verde, the problem is to show that more gas-bearing sand could be present, or better yet, that initially there was more than 12,000 Bcf present in the accumulation.

Q-13 That, in itself, is not sufficient. You will also have to make it appear highly probable that infill drilling will result in increases in ultimate gas production.

A. I agree. Little additional information can be gleaned from further refinement of the old electric logs or reinterpretation of core data. In my opinion, the outcome of such work depends too heavily on the interpreter's opinion on the amount of connate water present and the minimum permeability required in a sand to be productive.

I, therefore, switch to a consideration of the various sets of pressures which can only reflect the effect of gas still present. The pressures to be considered are:

1. Those obtained by averaging the casinghead (or tubinghead) pressures of all wells, measured yearly, after 7-day shut in;

2. the data of long-term, shut-in pressures available on 38 wells; and,

3. the pressures observed in El Paso's three strat tests.

Q-14 Please discuss all pressures and their determination in some detail.

A. We will start with:

(1) The average of the pressures read after 7-day shut in.

The orders as promulgated by the New Mexico Oil Conservation Commission require that annually a 7-day shut-in casinghead and tubinghead pressure be determined and reported in psia. It is customary to use the highest of the two figures. Measurements have been made in the majority of the producers. The yearly field average appears in Column 4 of Enclosure 5.

The pressures, measured at the surface, have been converted to bottom-hole pressures and results are given in Column (5) of the same enclosure.

During the late fifties and early sixties, El Paso Gas conducted 65 long-term pressure buildups in 38 different wells. The data were sufficient to determine average reservoir pressures during the 10-year period 1955-1965. They were 380 psi above the average of all 7-day wellhead pressures, and 267 pounds above the average bottom-hole pressure derived from the 7-day tests. The figures mentioned are all listed on Enclosure 5.

When I mention fully built-up pressures, I have in mind the pressures read on the Horner-type plots above the point where $\Delta t/(t+\Delta t)$ = unity. They are commonly referred to as P* values. The use of these pressures has not found as many advocates as they deserve because, so the argument goes, it takes an infinitely long time to reach the point where $\Delta t/(t + \Delta t)$ = unity, and no infinitely long time is available. Because the P* values cannot be derived from the 7-day pressures measured in gas wells of the Blanco-Mesa Verde reservoir in any way I am familiar with, and because I consider the P* values the best source of pressure information and will use or refer to such data continuously, I will first clarify their determination, their meaning, and their merits.

(2) Fully built-up reservoir pressures, P* values.

Several times during the productive life of the Blanco-Mesa Verde reservoir, El Paso Natural gas conducted a series of long-term buildup tests. Eight of the curves prepared from their data are shown on Enclosures 4a through 4h. The horizontal scale is always a log scale because the pressure in any well produced at constant rate declines proportional to the log of the time it has been produced so that a straight line is formed by subsequent observations. For wells produced at a constant rate and then shut in, the horizontal scale is used for the log of the shut-in time divided by the time elapsed since completion. The pressure increases (and also the pressures themselves) again form a straight line when plotted on the normal, vertical scale and again can easily be extended and interpreted.

In oil- or water-producing wells (where fluids produced have small and constant compressibility), pressure points start forming a straight line within hours after a well is closed in. Extending this straight line relation to the right and reading the pressure above the point where the ratio of shut-in time divided by the total time is unity gives P*. This pressure reflects the formation pressure (at the well's location) after correcting for the effect of the withdrawals by the well itself. Stated in a slightly different way, it reflects the pressure at the well's location had no fluid ever been taken out of the well. The difference between P* and the initial reservoir pressure, therefore, is equal to the effect of all other wells, their total interference. That drop reflects the sum of the interference effects of every well in the reservoir since the moment of their first production.

In gas wells producing from tight formations, more time than 7 days is required before the time-pressure relation straightens out; e.g., the points for the Gartner No. 4 (Enclosures 4e and 4f) do not fall on a straight line until 5 to 6 weeks after the well is shut in, and that period is among the shortest of shut-in times required before straight-line relations are established in the 8 buildup curves composing Enclosure 4. Three months had to elapse before the pressure points in San Juan Unit 28-7 No. 56 did the same (Enclosure 4a), and in the case of Stewart No. 4a, a P* value could not be obtained until the well was shut in more than a year (Enclosure 4d). The other five examples required a shut-in period intermediate between these two figures. In my opinion, such a behavior clearly shows that the Blanco-Mesa Verde is a multilayered reservoir. In such reservoirs, the transient pressure stages are an order of magnitude longer than in a single-layered reservoir. (Lefkovits, Hazebroek, Allen and Matthews in "A Study of the Behavior of Bounded Reservoirs Composed of Stratified Layers" in the March 1961 issue of the Society of Petroleum Engineers Journal)

In all cases, straightening out occurs when the pressures are within 10-20 percent of their maximum value; that is, the pressures are in the range in which the compressibility of gas apparently approaches a sufficiently small value so that the flow equation can be used in its simplest form when constant production rates cause pressure drops proportional to the rate times the log of the production time.

The information and values from the P*'s determined in the 38 wells are collected on Enclosure 7 (2 sheets).

The data are available from 1956 through 1962. By assuming that in each of the 38 wells the fully built-up, bottom-hole pressure measured later increased the same percentage above the reported 7-day pressures as measured during the long-term buildup tests, we obtained fully built-up pressures on all 38 wells through 1965. The outcome is given on Enclosure 5 and will be discussed after presenting data from the strat tests.

(3) Strat-test pressures.

In 1957 and the beginning of 1958, El Paso drilled three wells through the Mesa Verde, put in casing, fractured the formations, cleaned out the wells, and then shut them in. They are usually referred to as the three-strat tests; their location is shown on Enclosure 2. The average of the pressures in these three wells appears in column 7 of Enclosure 5. Never produced, they were used solely for the purpose of measuring reservoir pressures and, hence, form the only source of pressure data at points midway between producers. During the years since their completion and up to 1970, the bottom pressures in all three wells roughly parallel each other (Enclosure 15). Since 1971 the pressures are diverging somewhat; those in strat-tests 1 and 3 decline more than the pressures in strat-test 2.

First observe that during the 5 years that pressure data are available on strat tests and on the 38-well group, the average of the strat-tests' pressure is consistently 50 pounds higher (Enclosure 8). To any one doubting whether pressure as high as P* values can be found, this excess should be convincing. It is presented as proof that the average P* value of the 38 wells is a valid determination of the pressure existing in the formation drained by the wells. At the same time it shows that still higher pressures are existing in areas not directly drained by a well.

Q-15 Explain that statement in more detail.

A. The pressures in the strat-test wells are higher than those derived from the long-term buildup tests due to the fact that some formations in the strat tests are not present up in the surrounding producers. The surrounding wells will lower the pressures in the most permeable formation easily as far out as the strat tests. These formations are then continuously refilled, that is, repressured by gas from strata in the strat test, not present in the producers, hence the pressures measured are above those in the permeable formations and below the pressures in the least permeable formations. The actual reservoir pressure in the strat test is therefore always higher than measured.

Q-16 Then are you going to use these three pressure series?

A. No, sir. Each series is converted to the P/Z values because these values are proportional to the amount of gas in a unit of pore space. The P/Z data are shown on Enclosure 6. As is customary, we relate all P/Z values to cumulative production; therefore, instead of discussing the pressure series, we will direct our attention to Graphs 9, 10, and 11, where the P/Z values are plotted versus the cumulative production of the Blanco-Mesa Verde.

(The Z factors used reflect conditions in the reservoir and for details of these P/Z calculations, see Enclosure 14)

In normal, single-layered depletion-type reservoirs, these values form a straight line when plotted versus the cumulative withdrawals. Here, several straight lines can be drawn tangential to the points shown.

Q-17 Just what do those lines mean and how do you use them?

A. Each line is drawn through three or more points and is tangential to the P/Z curve. Its slope gives the number of P/Z units lost versus a certain increase in cumulative production.

For instance, if we read a P/Z value of 900 when the cumulative gas production is 2,500 Bcf and 800 when the cumulative production is 4,000 Bcf, then such a line indicates a loss of 100 units per 1,500 Bcf of gas produced. At the same time it indicates an amount of gas in place equal to (800/100) x 1,500 + 4,000 = 16,000 Bcf. The slope indicates a decrease of 15 Bcf per unit decrease of P/Z so that the original amount of gas present equals the total number of P/Z values at the time of reading times 15 Bcf, plus the gas already produced.

There is a very clear but not precisely definable connection between the rate of production of an average well and the amount of gas computed as initially present in the Blanco-Mesa Verde formation. *The smaller the rate, the larger the volume initially present.* For rates, we can also use the yearly production for the entire Mesa Verde so that we have two bases to estimate the gas initially present. Moreover, we can use the average pressure data of the entire field, of the long-term buildup tests, or the strat tests.

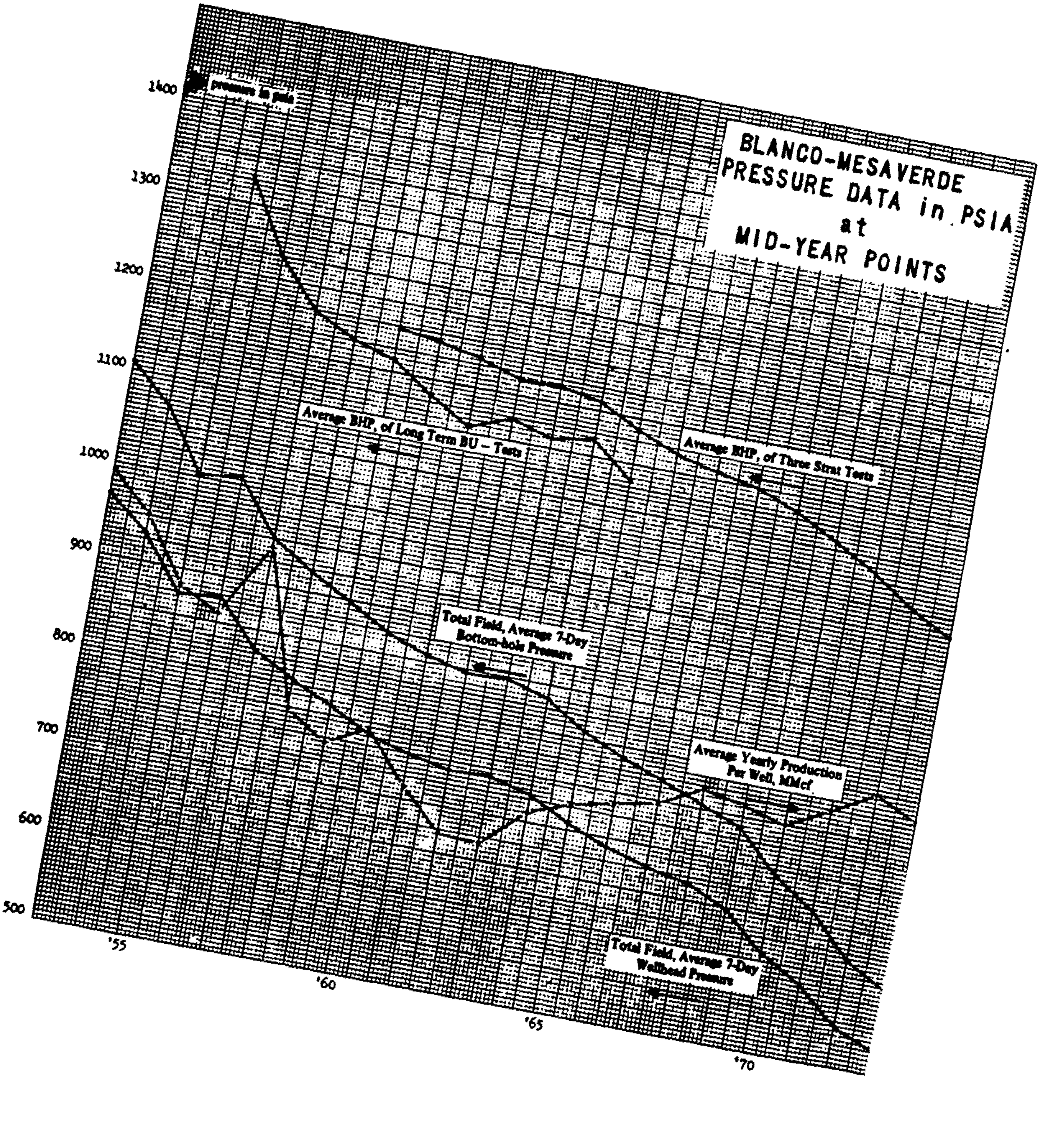
Hence, I computed the average yearly production rate per well during the years the straight lines on Enclosures 9, 10, and 11 are tangential to the pressure curve and plotted the volume of gas indicated by the straight line versus these average rates (Enclosures 12 and 13). Both enclosures show that the smaller the rate the higher the volume of gas present, which is, after all, exactly what we should expect in so heteregeneous a reservoir. The smaller the rate the better the gas can even out pressure differences due to the variations in character of the formations. I think it very safe to conclude that the general trend on both Enclosures 12 and 13 indicates more than 25,000 Bcf of gas as initially present in the Mesa Verde.

Q-18 Do you have any idea about the magnitude of the additional reserves that could be obtained by a complete infill-drilling program?

A. Yes sir,I have some. Current estimates of an ultimate production of 9,000 Bcf are not unreasonable. It represents a 75-percent recovery efficiency. I consider the 75-percent efficiency too liberal. This type of reservoirs, and under the increased density of development, could produce with an efficiency of 60 percent so that the ultimate production is around 15,000 Bcf.

Q-19 Do you consider that the ultimate production from all areas can be increased by the same percentage?

A. No sir, very definitely not. In the center portion of the field the ratio between tight and permeable formations is less than unity so that there infill drilling will produce the least increase in ultimate production, expressed as a percentage. The volume per well may be even smaller than will be obtained from wells in the more outlying areas. In some of these areas, the ultimate of the new wells could well match the ultimate of the existing wells. Locations in areas at present not or barely affected by the withdrawals, are regarded as the major source of gas to bring the ultimate production to the figure quoted.



BLANCO-MESAVERDE
PRESSURE DATA in PSIA
at
MID-YEAR POINTS
pressure in psia
1400
1300
1200
1100
1000
900
800
700
600
500
'55
'60
'65
'70
Average BHP, of Long Term BU – Tests
Average BHP, of Three Strat Tests
Total Field, Average 7-Day
Bottom-hole Pressure
Average Yearly Production
Per Well, MMcf
Total Field, Average 7-Day
Wellhead Pressure

EXHIBIT 2

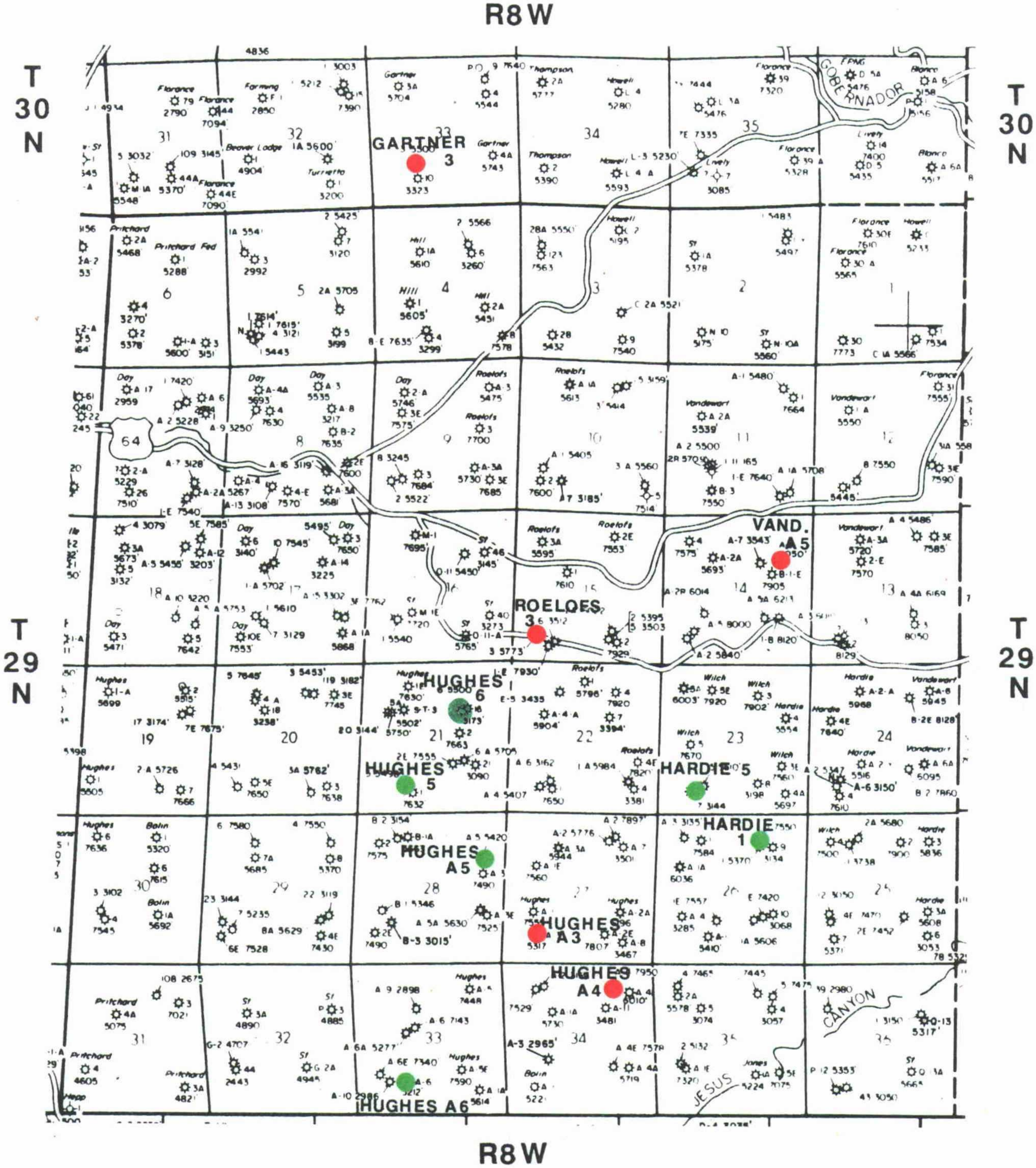
fully built at Res. Press.

diff in press over a 7 day period

MESAVERDE LONG TERM PRESSURE BUILD-UP DATA
FROM VAN EVERDINGEN'S TESTIMONY - 1974

WELL NAME	COMP TYPE	SEC	TWP	RNG	COMP DATE	TEST DATE	DAYS ON	7 DAY PSI	P-STAR ~~LNG-TRM~~ PBU	DELTA PRESS	CUMUL PROD
HOWELL 2D	OH ,SNG	29	31	8	Aug-51	Jul-56	1784	1042	1058	16	2645
HOWELL 2E	OH ,SNG	14	30	8	Oct-51	Oct-56	1823	1050	1083	33	2059
PRITCHARD 2	OH ,SNG	34	31	9	Jul-52	Jul-58	2197	991	1028	37	1651
BARNES 7	OH ,SOF	23	32	11	Oct-54	Jun-59	1698	934	989	55	957
PRITCHARD 2	OH ,SNG	34	31	9	Jul-52	Jul-56	1452	980	1040	60	1250
ATLANTIC 5	OH ,SNG	22	31	10	Jun-53	May-56	1042	987	1055	68	1177
SJ 32-9 #29	OH ,SOF	36	32	10	Sep-55	Aug-58	1057	890	960	70	973
BARNES 7	OH ,SOF	23	32	11	Oct-54	May-57	923	959	1037	78	624
SJ 30-6 #74	OH ,SNG	23	30	7	Apr-53	Jun-59	2265	951	1029	78	1360
SJ 32-9 #29	OH ,SOF	36	32	10	Sep-55	May-56	232	967	1049	82	157
HOWELL 2D	OH ,SNG	29	31	8	Aug-51	Aug-51	8	1067	1150	83	7
SJ 32-9 #29	OH ,SOF	36	32	10	Sep-55	Feb-61	1982	851	935	84	1441
SCHWERDFEGER 2	OH ,SNG	27	31	9	Jul-52	May-57	1770	921	1006	85	1238
JACQUES 1	OH ,SNG	29	31	9	Dec-52	Apr-56	1228	980	1068	88	1087
GARTNER 2	OH ,SNG	28	30	8	Oct-51	Jun-59	2805	886	975	89	1402
ATLANTIC 5	OH ,SNG	22	31	10	Jun-53	Jul-58	1862	893	983	90	1855
ATLANTIC 5	OH ,SNG	22	31	10	Jun-53	Feb-61	2792	852	942	90	2301
GRAMBLING 3	OH ,SNG	22	29	9	Aug-51	Aug-56	1843	933	1025	92	483
HUGHES 1	OH ,SNG	19	29	8	Apr-51	Jun-59	2988	858	955	97	895
GRAMBLING 3	OH ,SNG	22	29	9	Aug-51	Jul-58	2556	872	972	100	781
GRAMBLING 3	OH ,SNG	22	29	9	Aug-51	Nov-62	4139	837	939	102	1083
SJ 30-6 #74	OH ,SNG	23	30	7	Apr-53	May-57	1506	950	1056	106	1055
LUCERNE 2A	OH ,SOF	9	31	10	Sep-54	Jun-59	1733	866	974	108	776
HOWELL 3A	OH ,SNG	4	30	8	Jul-51	Apr-62	3923	836	951	115	1245
ATLANTIC 5A	OH ,SNG	26	31	10	Jan-53	Jun-59	2327	852	981	129	725
RIDDLE 2	OH ,SNG	3	30	9	Jul-53	Jun-59	2160	828	962	134	621
BARRETT 2	OH ,SOF	19	31	9	Apr-54	Jun-59	1901	859	995	136	1348
GRAMBLING 1A	OH ,SNG	21	28	8	Mar-51	May-51	52	989	1127	138	15
GARTNER 2	OH ,SNG	28	30	8	Oct-51	May-57	2046	868	1007	139	1166
MUDGE 5	OH ,SNG	3	31	11	Nov-53	May-56	924	931	1072	141	543
GARTNER 4	OH ,SNG	33	30	8	Dec-52	Feb-56	1180	923	1066	143	1127
HUGHES 1	OH ,SNG	19	29	8	Apr-51	Oct-57	2368	864	1015	151	734
ATLANTIC 8A	OH ,SOF	29	31	10	May-55	Jun-59	1480	801	953	152	777
SUNRAY A2	OH ,SOF	10	30	10	Mar-55	Jun-56	440	914	1068	154	178
GARTNER 4	OH ,SNG	33	30	8	Dec-52	Jul-58	2063	877	1034	157	1894
FIELDS 1	OH ,SNG	25	32	11	May-53	May-56	1093	916	1076	160	312
FIELDS 1	OH ,SNG	25	32	11	May-53	Jul-58	1898	892	1057	165	485
LUCERNE 2A	OH ,SOF	9	31	10	Sep-54	May-57	974	865	1036	171	498
ATLANTIC 5A	OH ,SNG	26	31	10	Jan-53	May-57	1568	868	1046	178	564
HUGHES 3A	OH ,SNG	27	29	8	Jun-53	May-57	1417	840	1020	180	861
BARRETT 2	OH ,SOF	19	31	9	Apr-54	May-57	1142	855	1037	182	1028
DAY 4A	OH ,SNG	8	29	8	Jan-56	Jul-56	193	871	1060	189	401
SJ 28-6 #37	CSD,FRAC	6	27	6	Oct-55	Apr-57	553	817	1013	196	296
RIDDLE 2	OH ,SNG	3	30	9	Jul-53	May-57	1400	797	995	198	438
ATLANTIC 8A	OH ,SOF	29	31	10	May-55	May-57	721	803	1007	204	433
HOWELL 3A	OH ,SNG	4	30	8	Jul-51	Aug-58	2562	782	1005	223	1056
CASE 2	~~OH ,SOF~~	8	31	11	Apr-55	May-57	757	821	1073	252	339
FIELDS 5	CSD,FRAC	28	32	11	Dec-55	May-56	168	820	1075	255	67
FIELDS 5	CSD,FRAC	28	32	11	Dec-55	Jul-58	967	745	1011	266	534
SJ 28-6 #30	CSD,FRAC	28	28	6	Nov-55	May-57	543	776	1055	279	197
SJ 28-7 #49	CSD,FRAC	21	28	7	Sep-56	Nov-62	2275	715	1008	293	519
FIELDS 1	CSD,FRAC	25	32	11	May-53	Feb-64	3925	626	935	309	685
SJ 28-7 #49	CSD,FRAC	21	28	7	Sep-56	Jul-58	691	747	1075	328	229
SJ 28-6 #56	CSD,FRAC	13	28	7	May-56	Apr-57	329	767	1111	344	159
LINDSEY 1A	CSD,FRAC	19	30	8	Mar-56	Jul-56	122	764	1125	361	165
ZACHARY 1	CSD,FRAC	25	31	11	Dec-55	Jul-56	199	717	1079	362	88
JONES 4A	CSD,FRAC	13	28	8	Apr-56	Apr-57	363	738	1102	364	203
SJ 28-6 #56	CSD,FRAC	13	28	7	May-56	Jun-59	1118	695	1094	399	378
SJ 30-6 #100	CSD,FRAC	35	30	7	Dec-55	Jul-58	954	646	1081	435	534
STEWART 4	CSD,FRAC	28	30	10	Mar-56	Jul-56	862	648	1176	526	112

EXHIBIT 3



Tenneco Oil
Exploration and Production
ROCKY MOUNTAIN DIVISION

TENNECO

BLANCO MESAVERDE

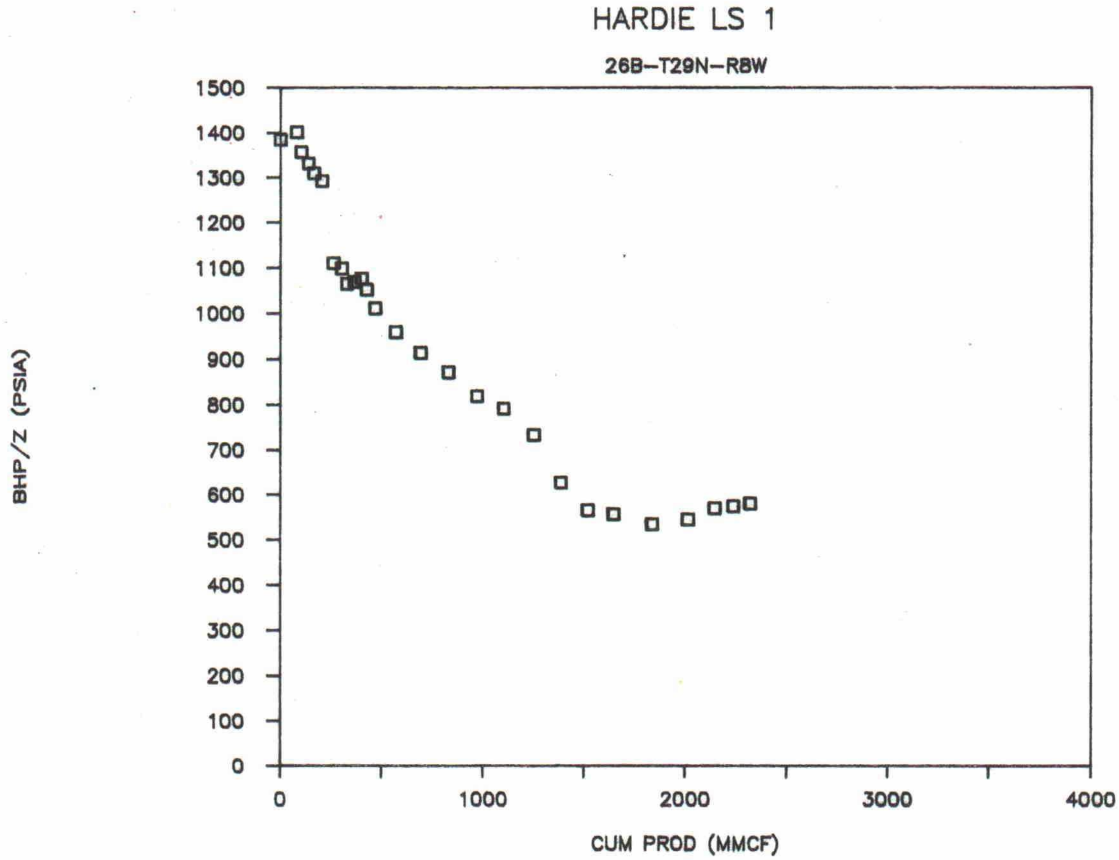
● 1960's EPNG LINER WELL

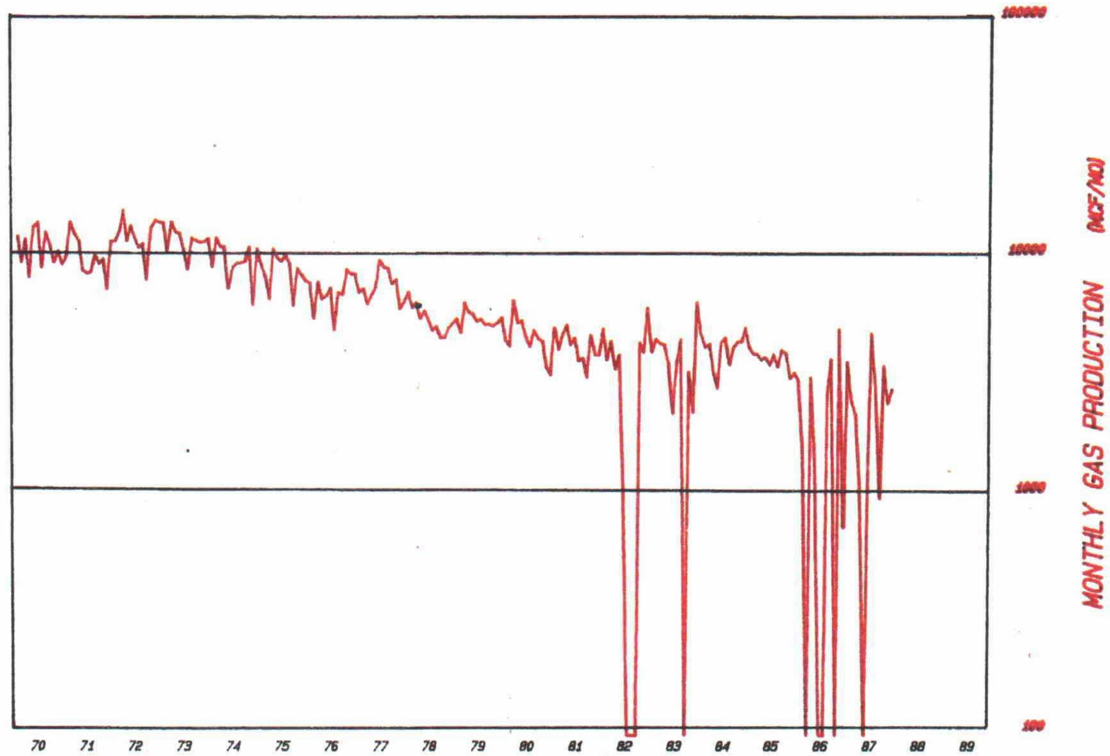
● 1985/86 TOC SIDETRACK

0 FEET

BY: DATE:

EXHIBIT 4

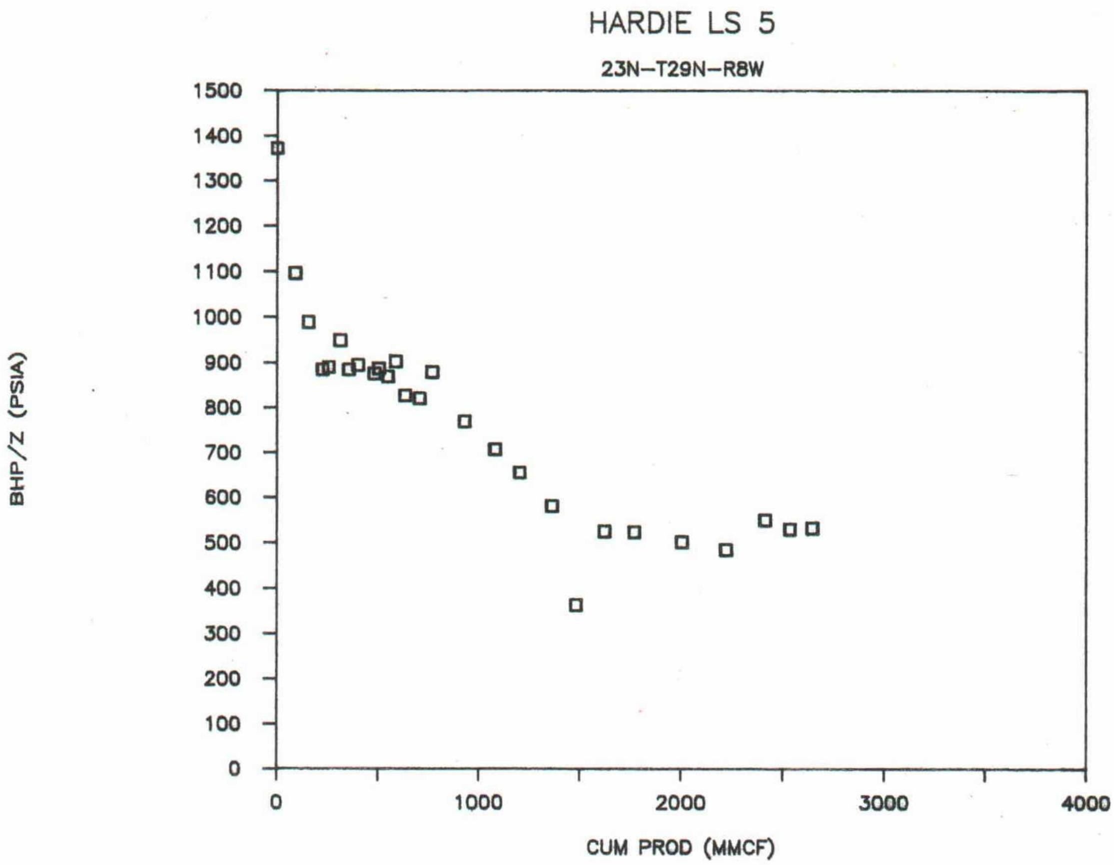


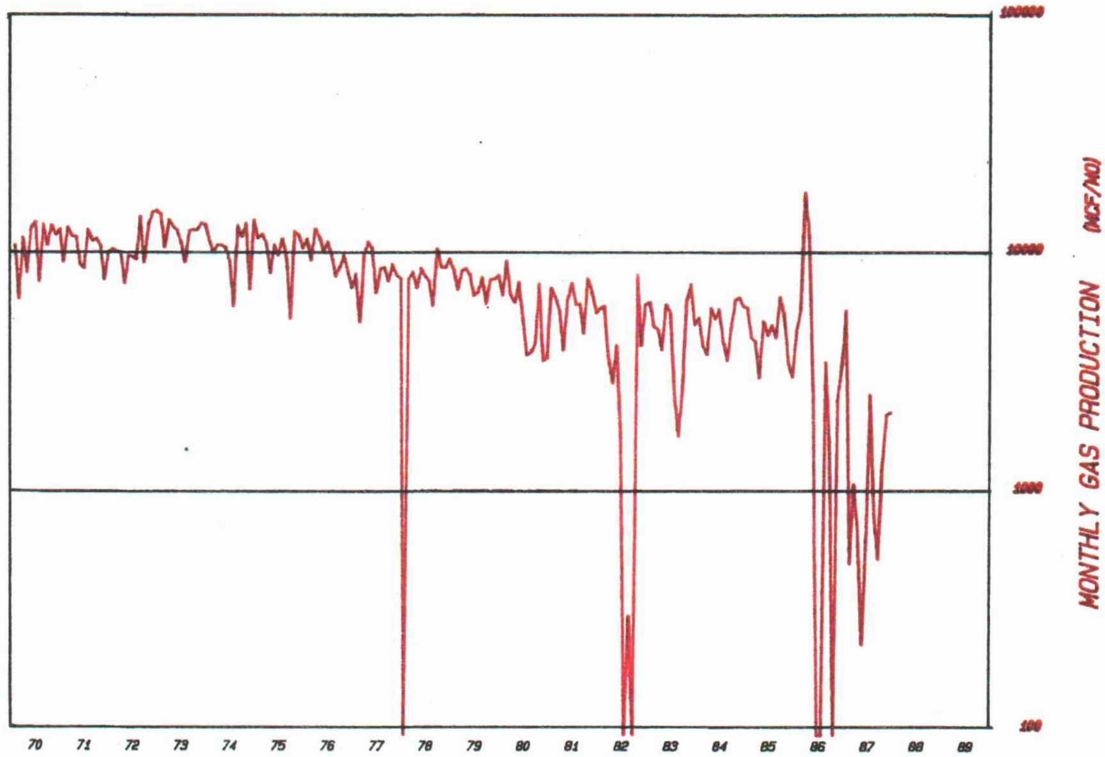


Lease: HARDIE LS
Well # 000001
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 26B 29N 8W

Date: 05-09-88

EXHIBIT 5

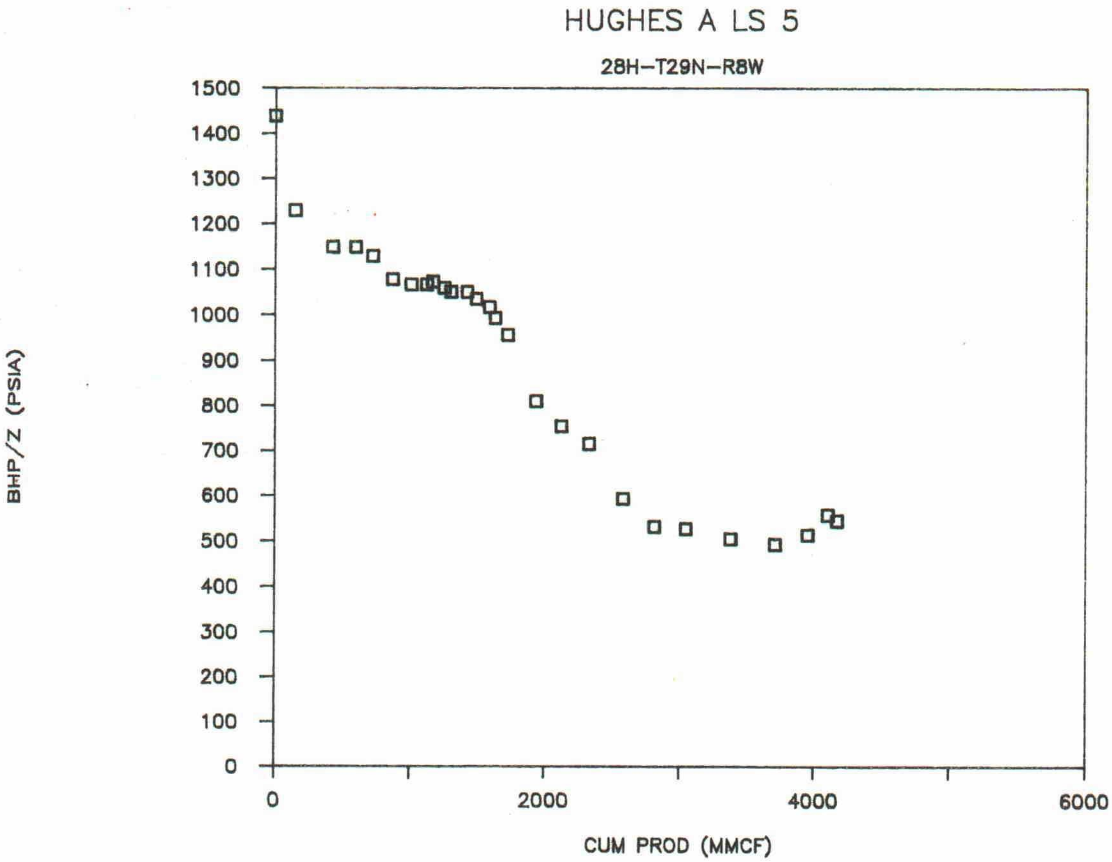


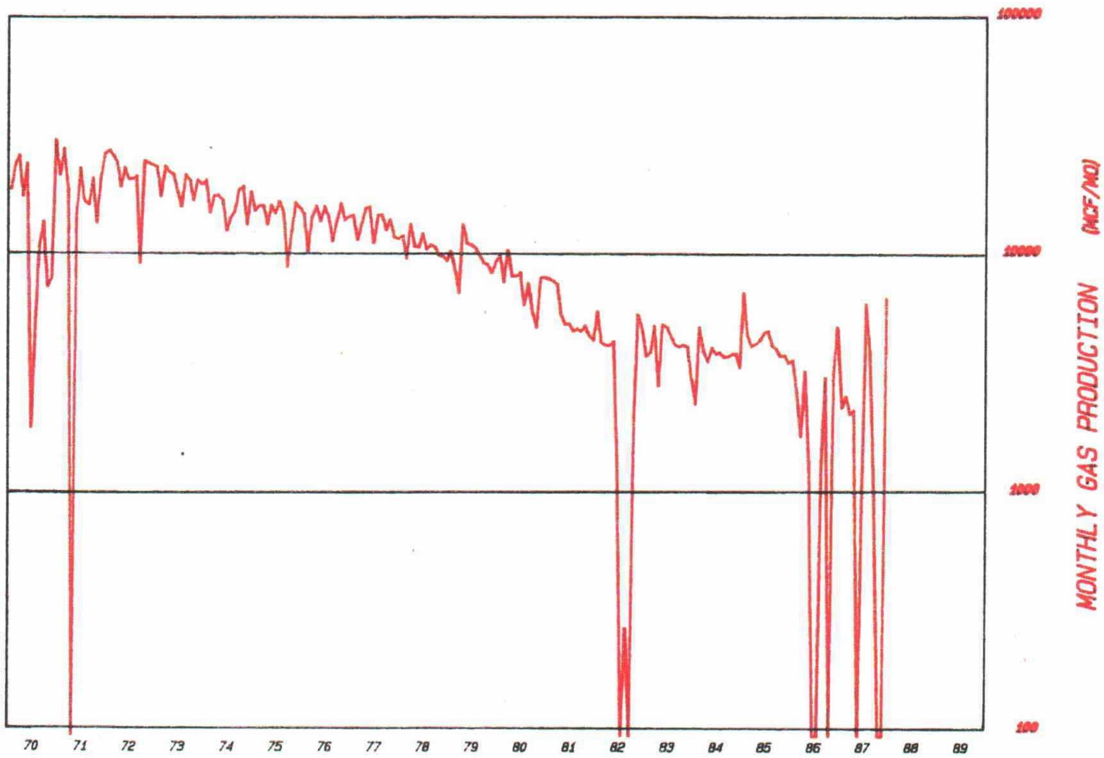


Lease: HARDIE LS
Well #: 000005
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) NV
Reservoir:
County: SANJUAN NM
Location: 23N 29N 8W

Date: 06-09-88

EXHIBIT 6





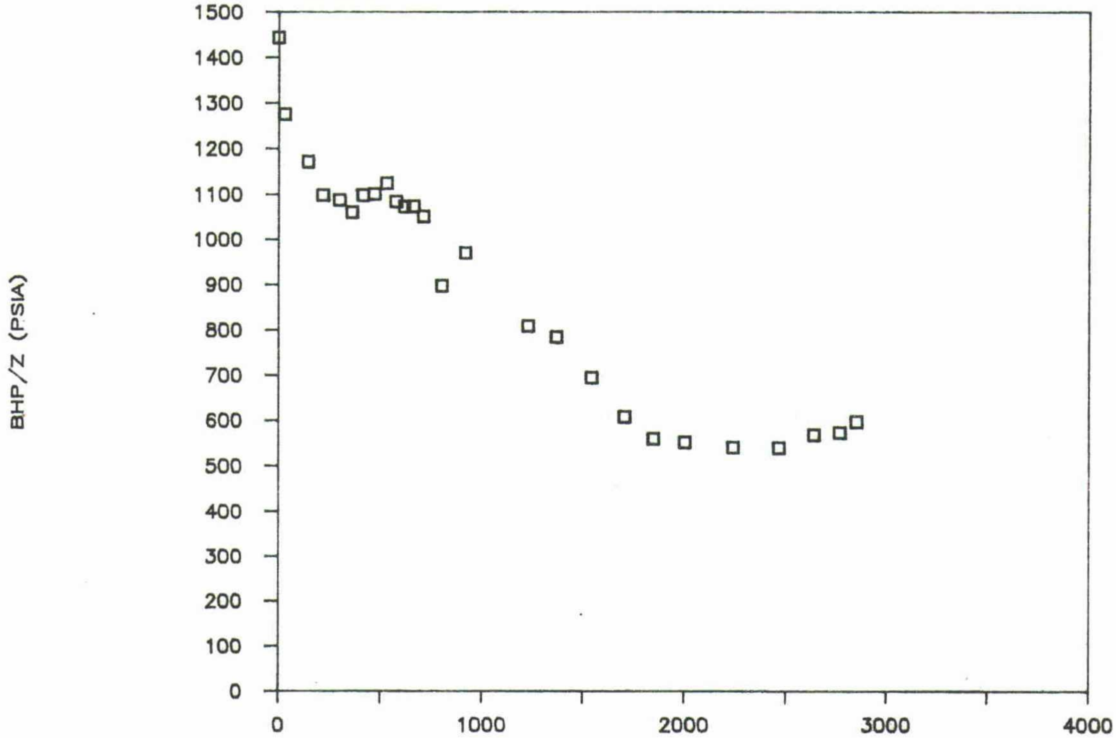
Lease: HUGHES A LS
Well # 000005
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 28H 29N 8W

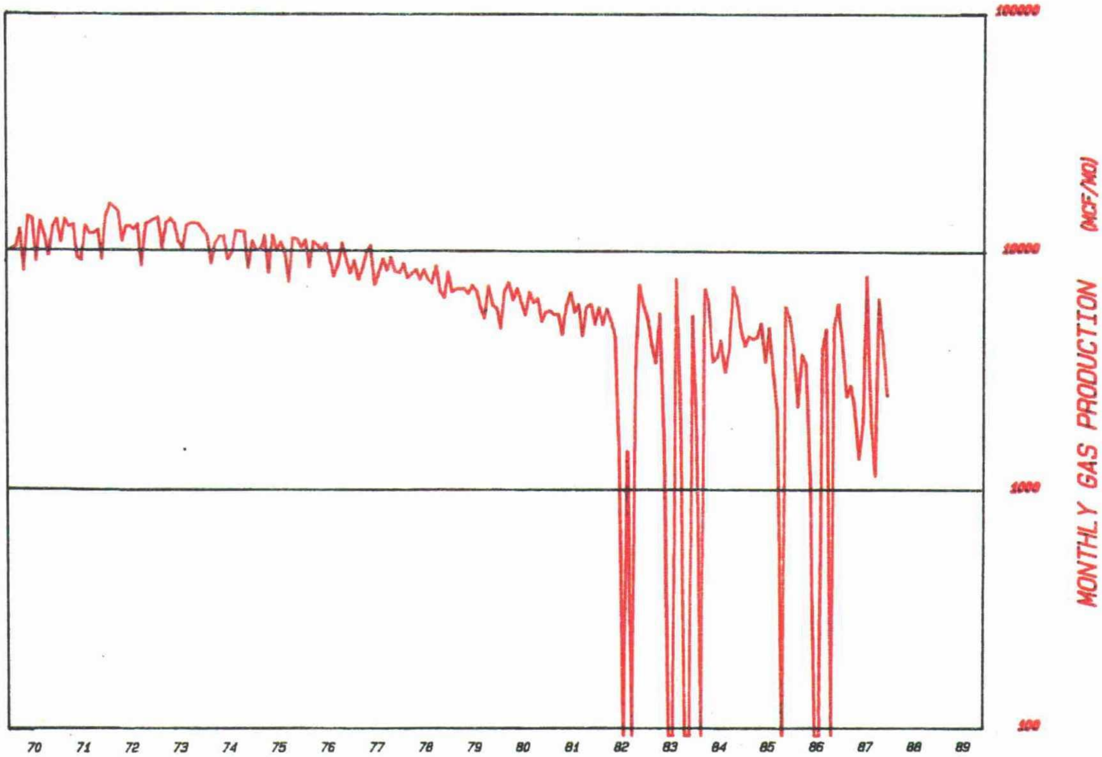
Date: 05-09-88

EXHIBIT 7

HUGHES A LS 6

33N-T29N-R8W

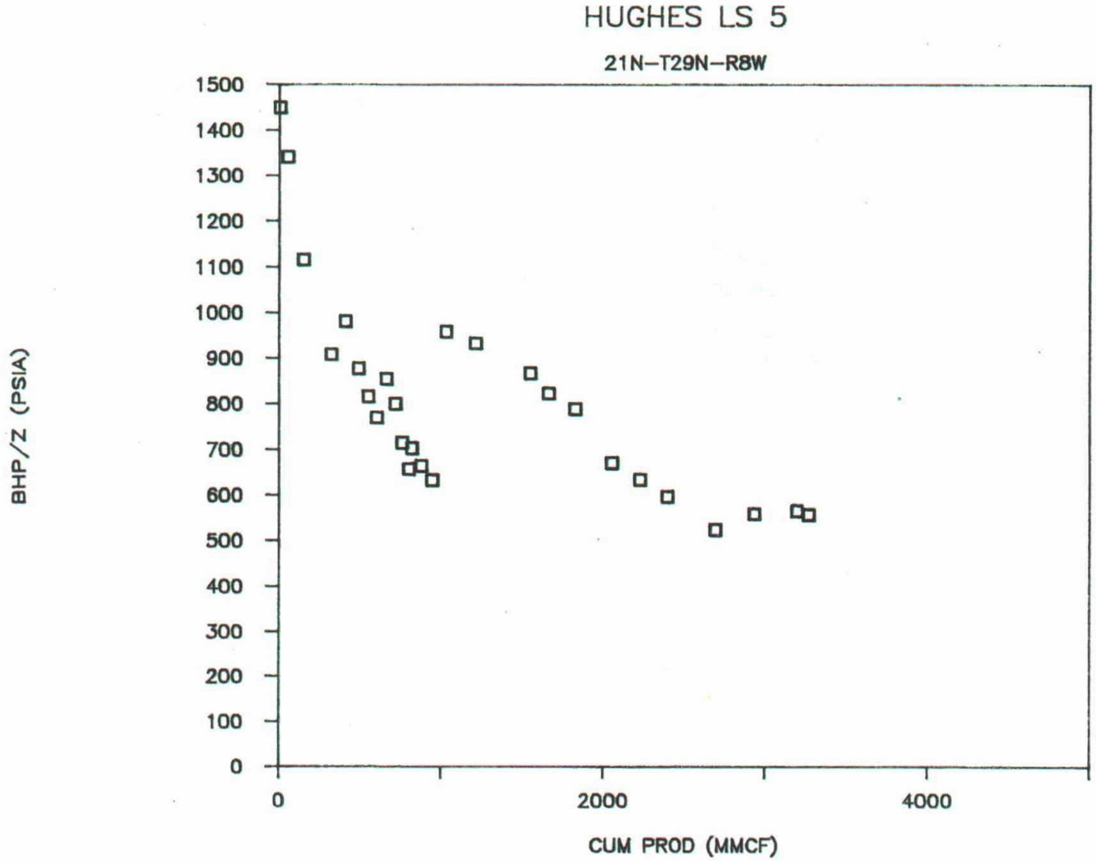


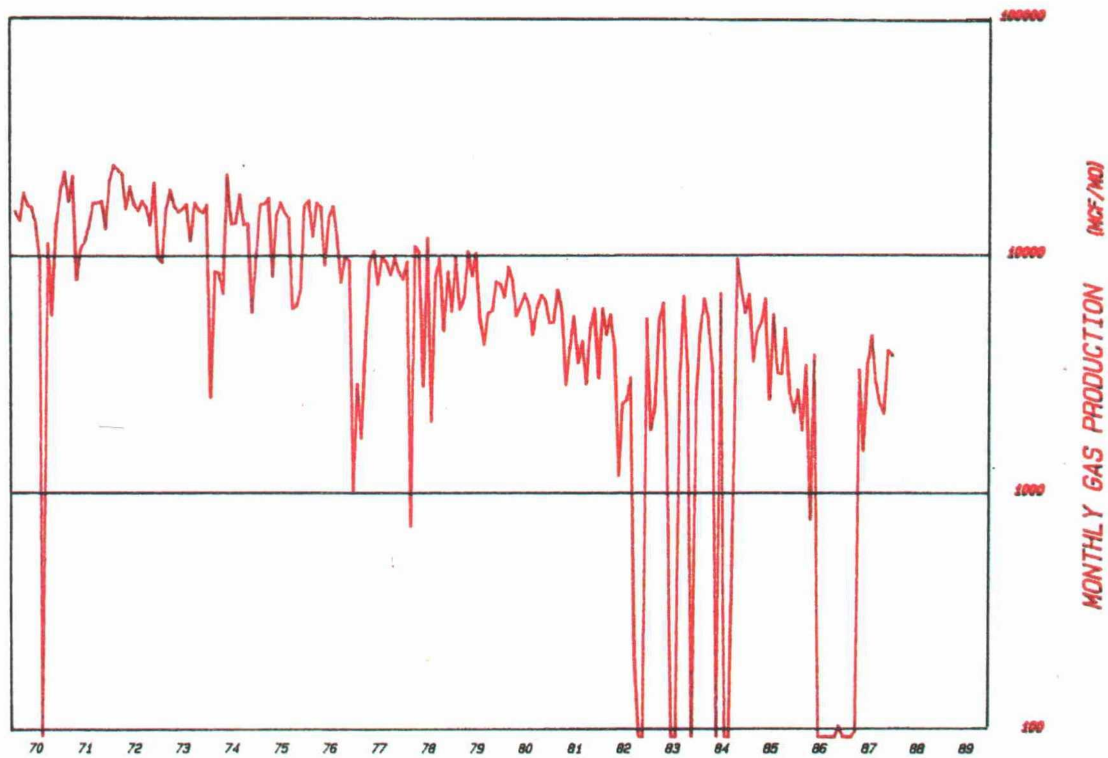


Lease: HUGHES A LS
Well # 000006
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 33N 29N 8W

Date: 05-09-88

EXHIBIT 8

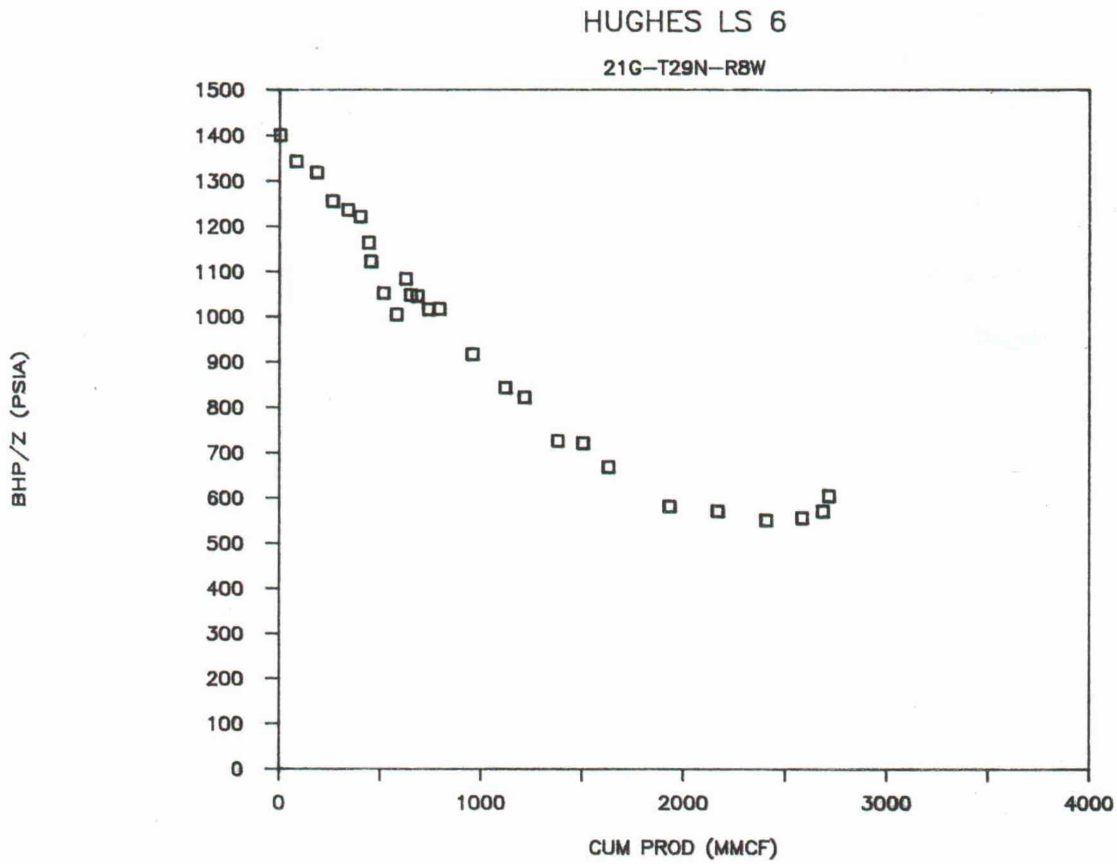


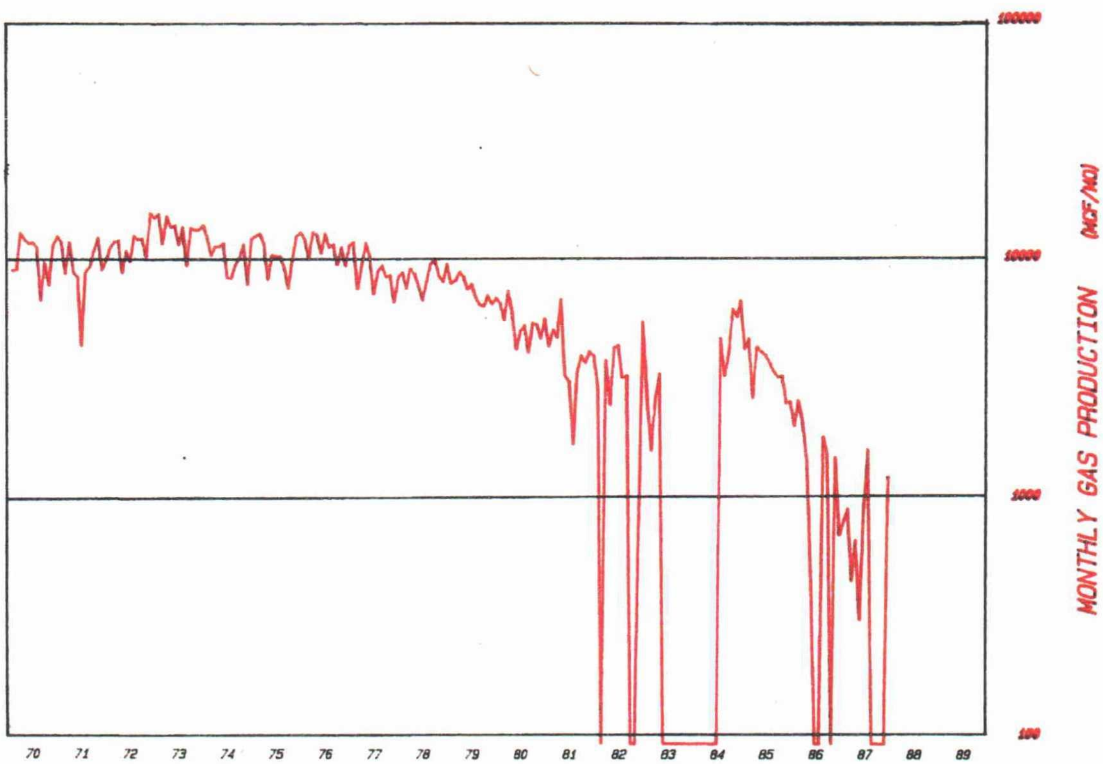


Lease: HUGHES LS
Well # 000005
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 21N 29N 8W

Date: 05-09-88

EXHIBIT 9





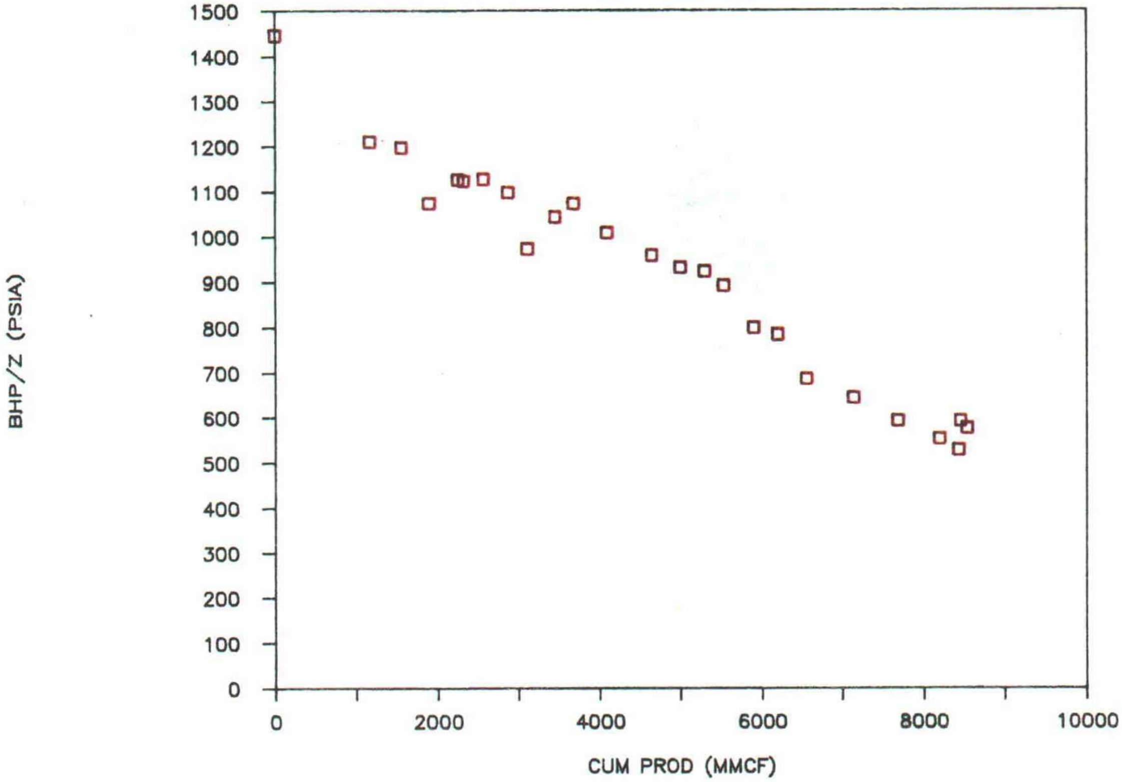
Lease: HUGHES LS
Well # 000006
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 21G 29N 8W

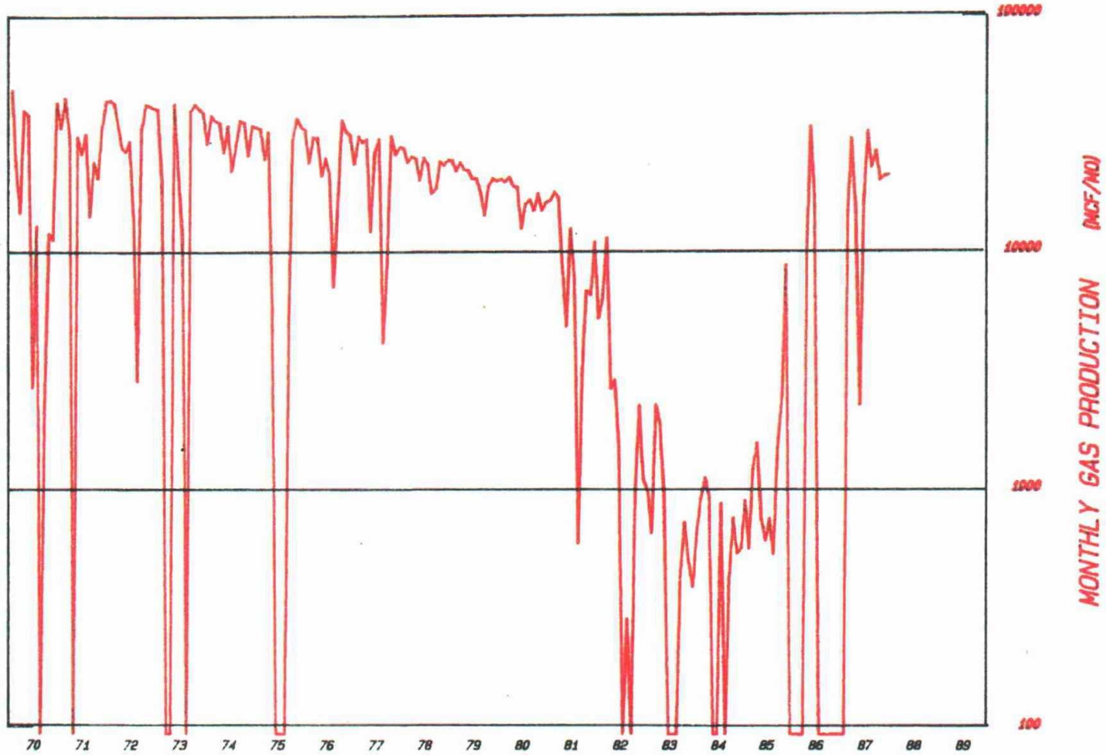
Date: 05-09-88

EXHIBIT 10

GARTNER LS 3

33N-T30N-R8W

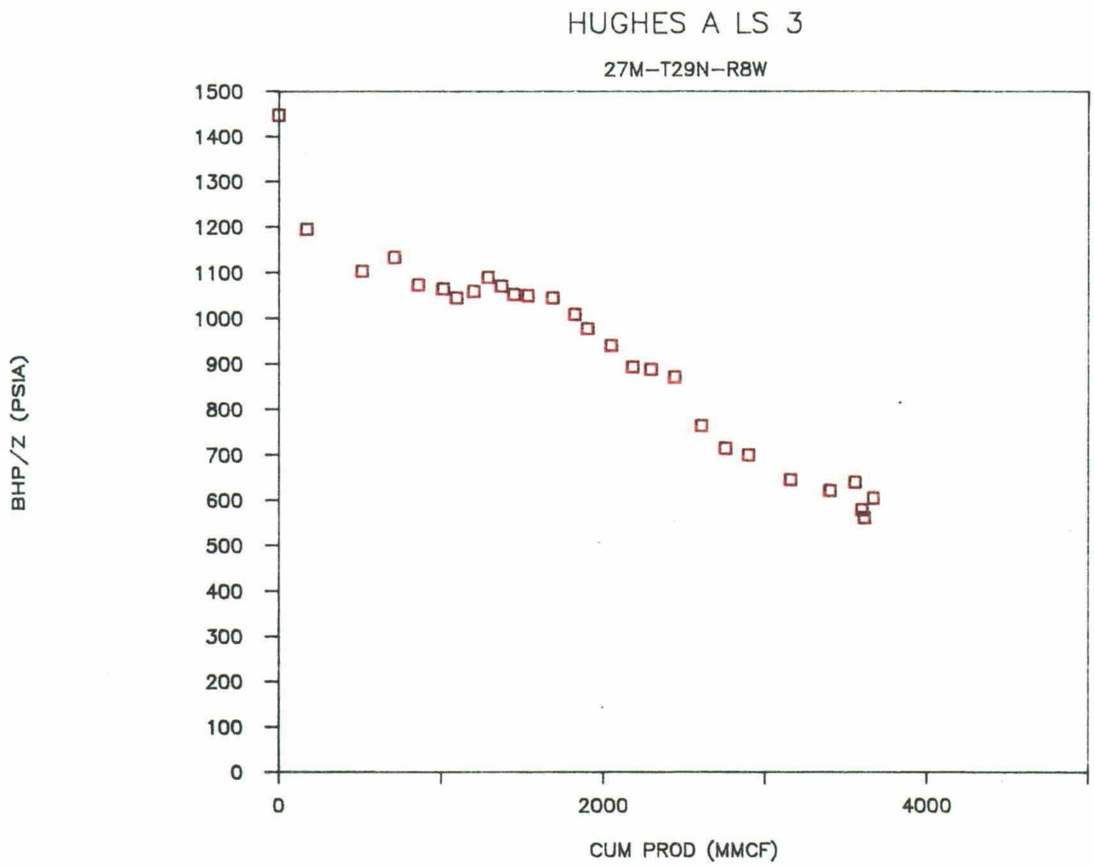


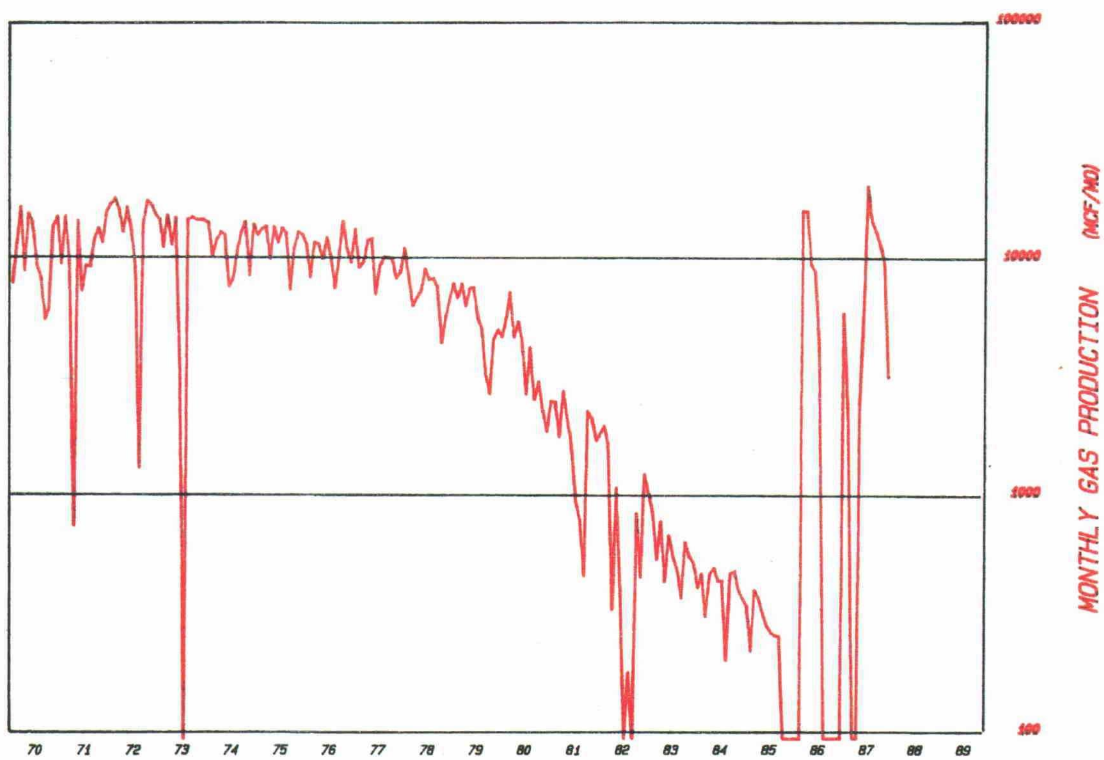


Lease: GARTNER LS
Well # 000003
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 33N 30N 8W

Date: 05-09-88

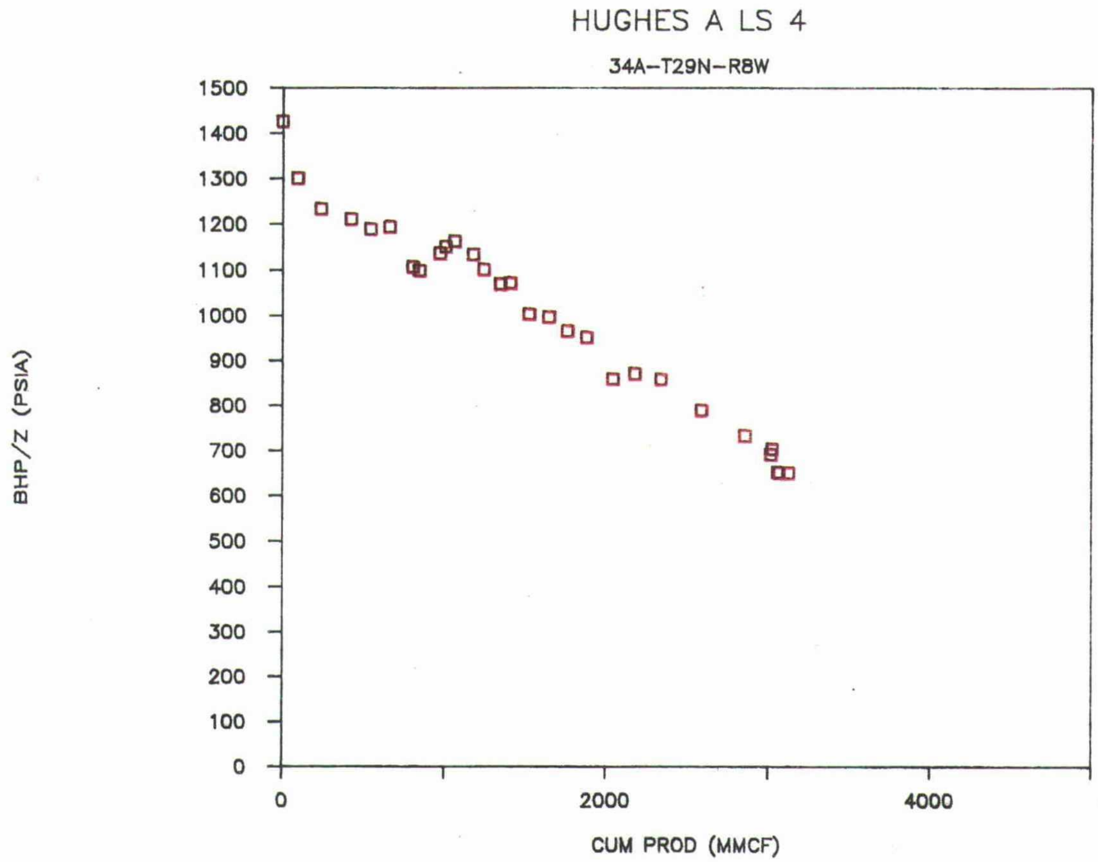
EXHIBIT 11

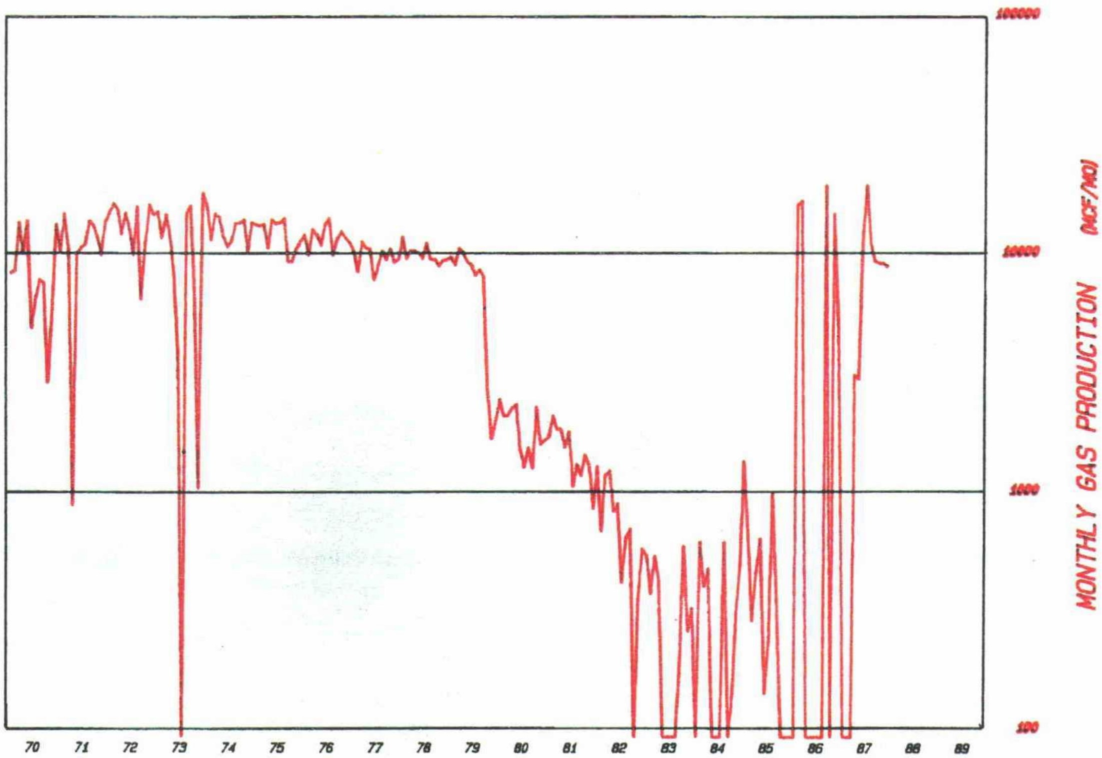




Lease:	*HUGHES A LS*		
Well #	*000003*		
Operator:	*TENNECO OIL CO*		
Field:	*BLANCO MESAVERDE (PRORATED GAS)*	*MV*	
Reservoir:			
County:	*SANJUAN*	*NM*	
Location:	*27N 29N 8W*		*Date: 05-09-88*

EXHIBIT 12





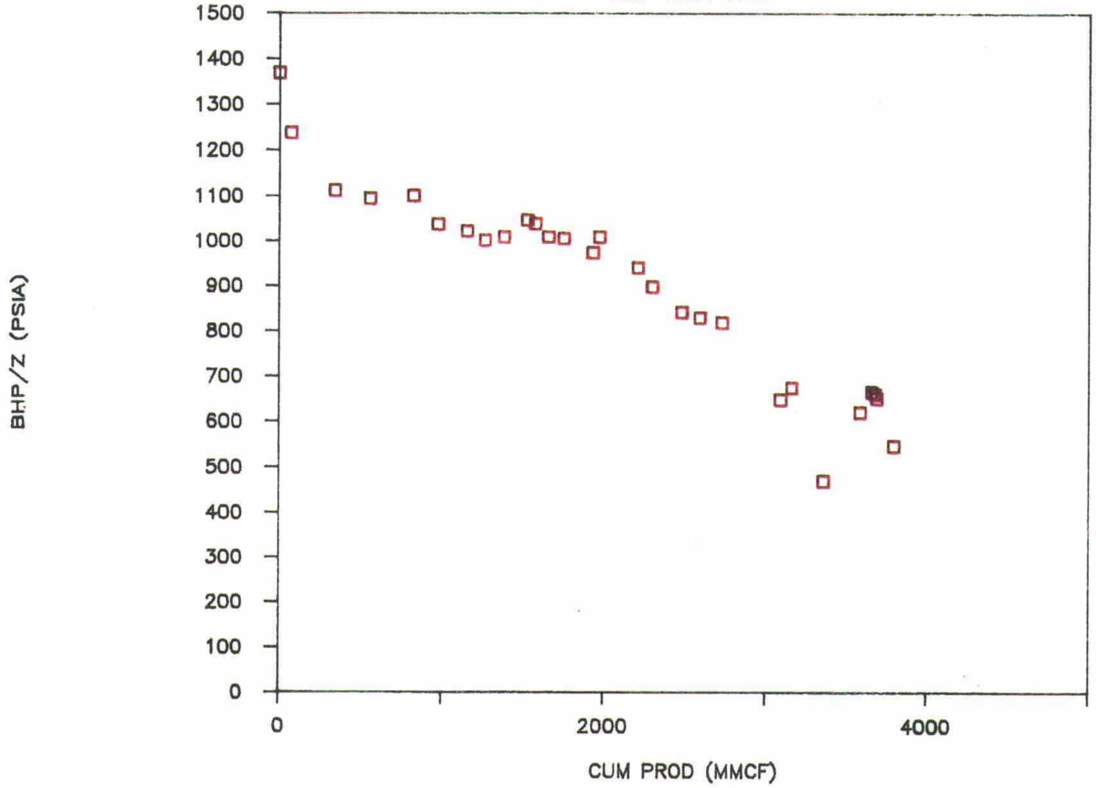
Lease: HUGHES A LS
Well #: 000004
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) NV
Reservoir:
County: SANJUAN NM
Location: 34A 29N 8W

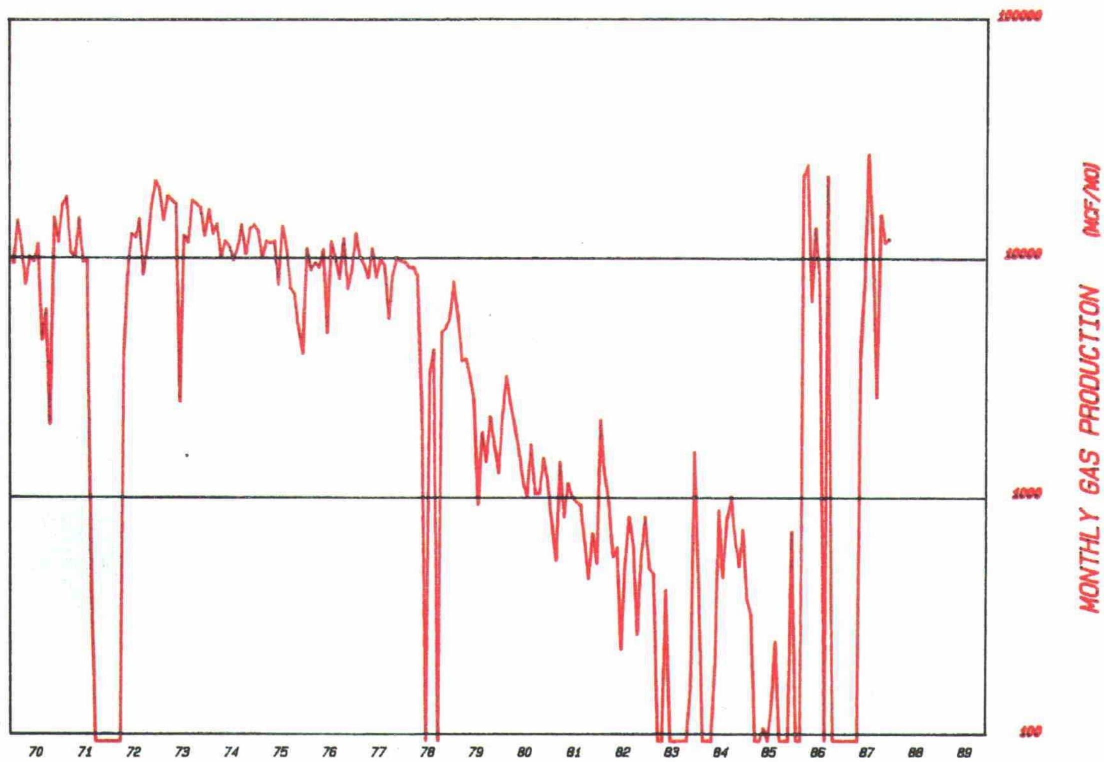
Date: 05-09-88

EXHIBIT 13

ROELOFS LS 3

15M–T29N–R8W



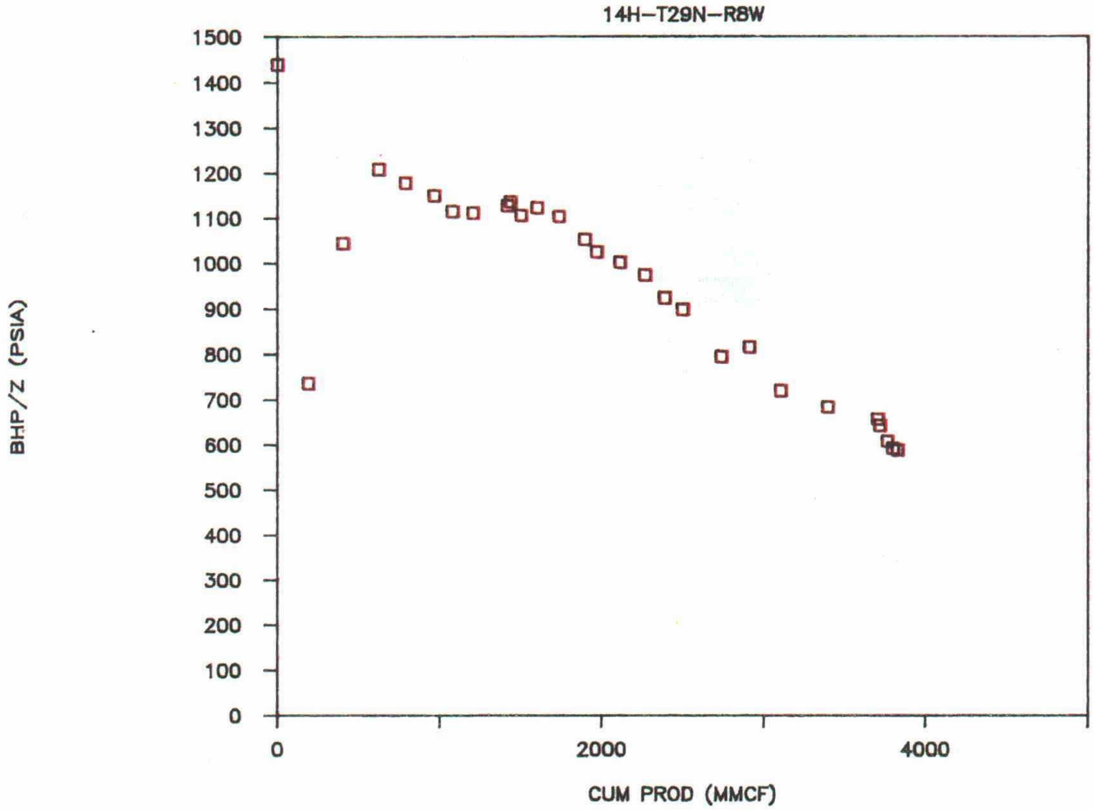


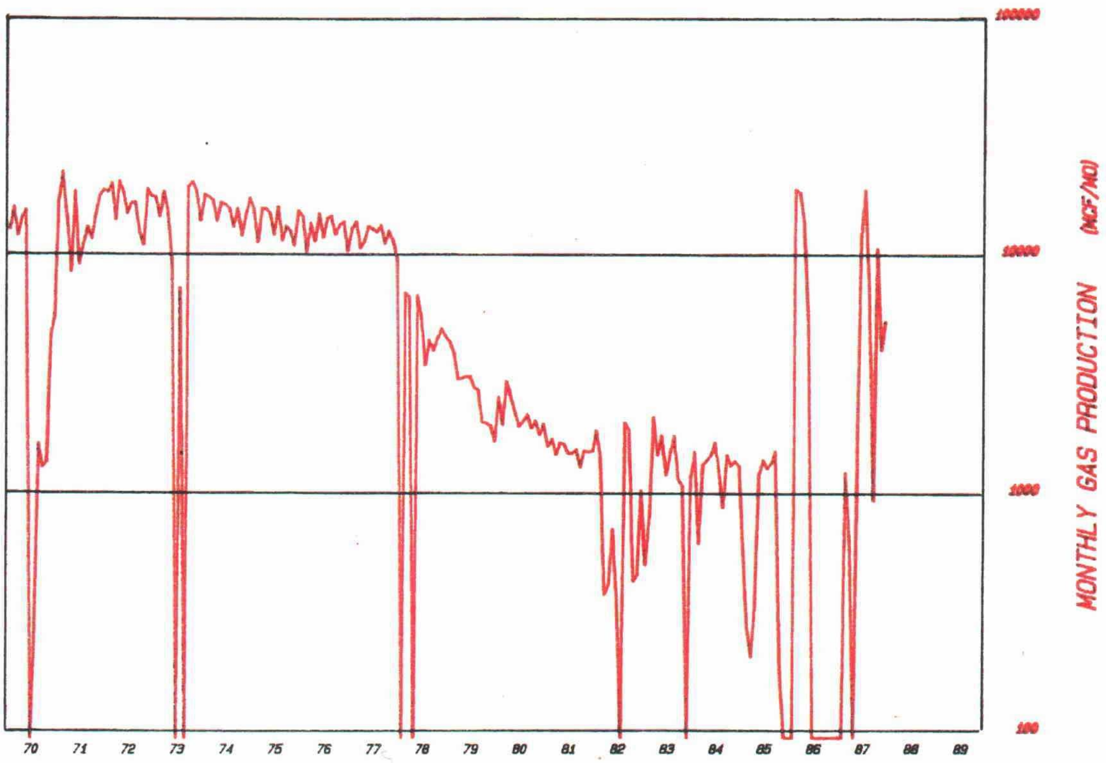
Lease: ROELOFS LS
Well # 000003
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) NV
Reservoir:
County: SANJUAN NM
Location: 15M 29N 8W

Date: 05-09-88

EXHIBIT 14

VANDERWART A LS 5





Lease:	VANDERWART A LS
Well #	000005
Operator:	TENNECO OIL CO
Field:	BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:	
County:	SANJUAN NM
Location:	14H 29N 8W

Date: 05-09-88

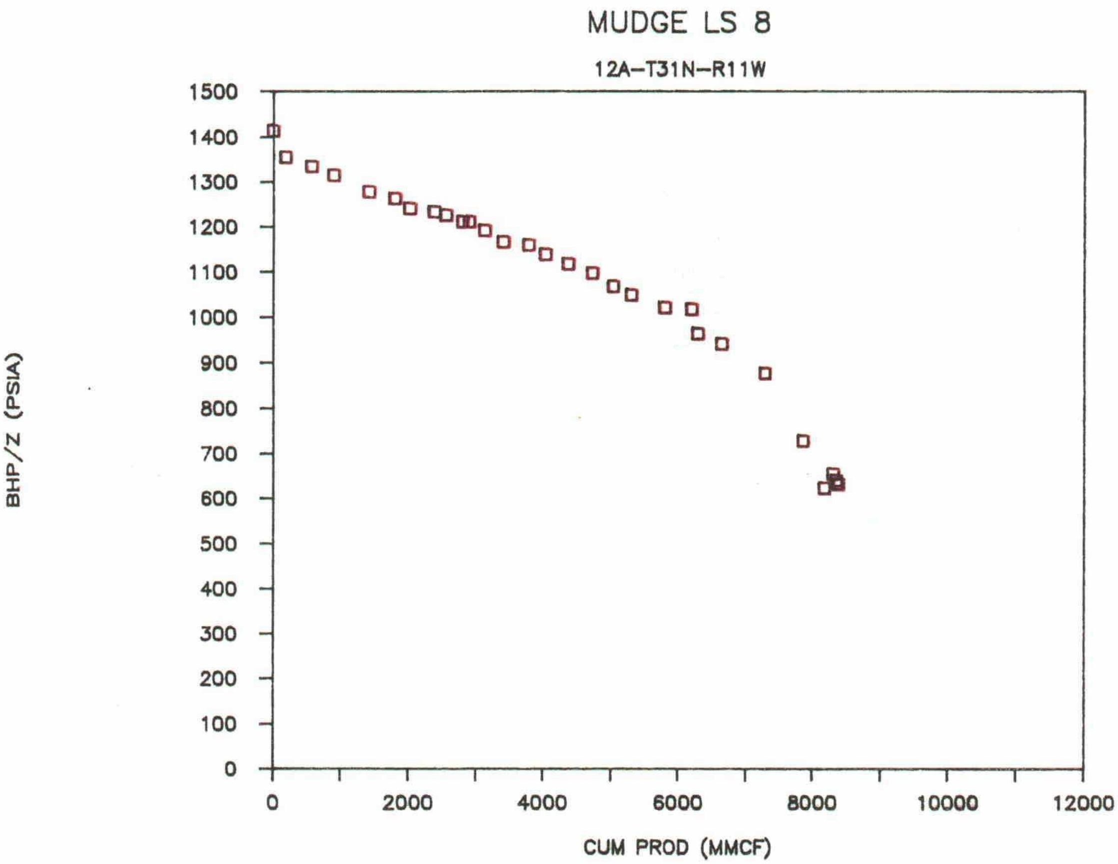
EXHIBIT 15

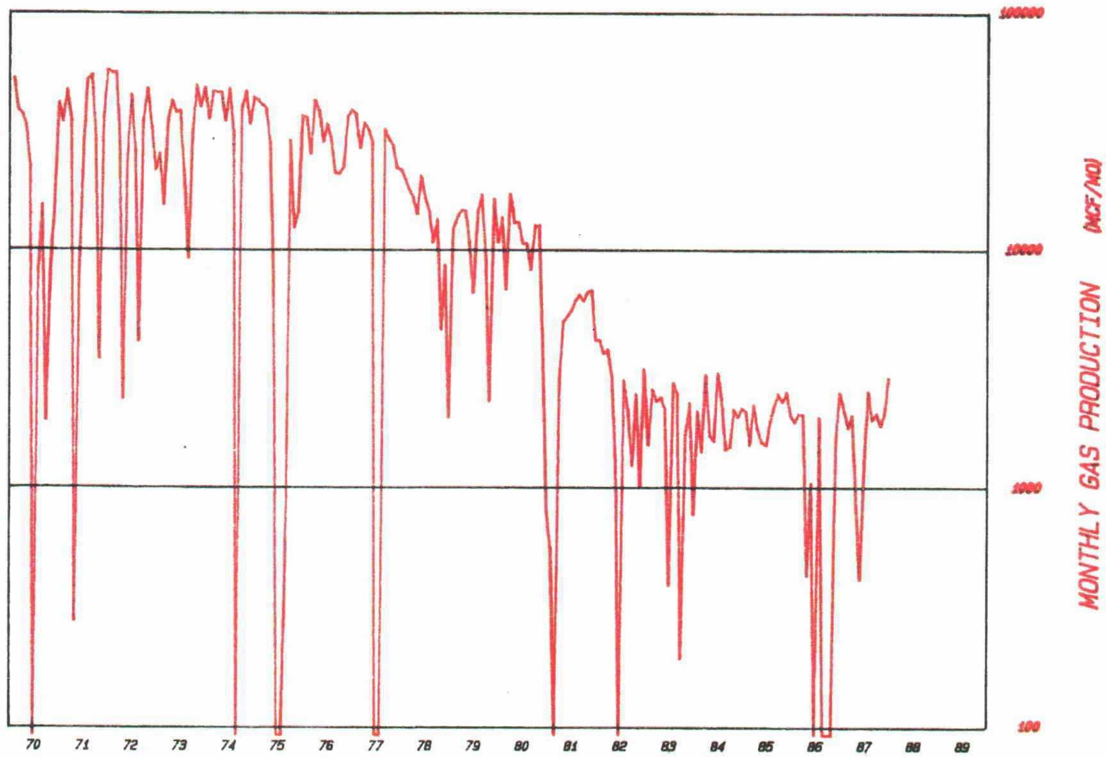
1985/86 MESAVERDE SIDETRACK PROGRAM

	PRE-ST RATE (MCFD)	STABILIZED POST-ST RATE (MCFD)
HUGHES A LS 3	10	525
HUGHES A LS 4	23	660
VANDEWART A LS 5	40	625
HEATON LS 3	10	850
GARTNER LS 3	25	1100
JONES A LS 1	33	430
BOLACK B LS 1	60	500
ATLANTIC A LS 6	30	650
ROELOFS LS 3	0	800
SJ 28-7 UNIT #6	20	560
SJ 28-7 UNIT #9	15	485
SJ 28-7 UNIT #23	30	440
SJ 28-7 UNIT #26	40	630
SJ 28-7 UNIT #32	27	640
AVERAGE	26	635

AVERAGE INCREMENTAL INCREASE = 609 MCFD

EXHIBIT 16

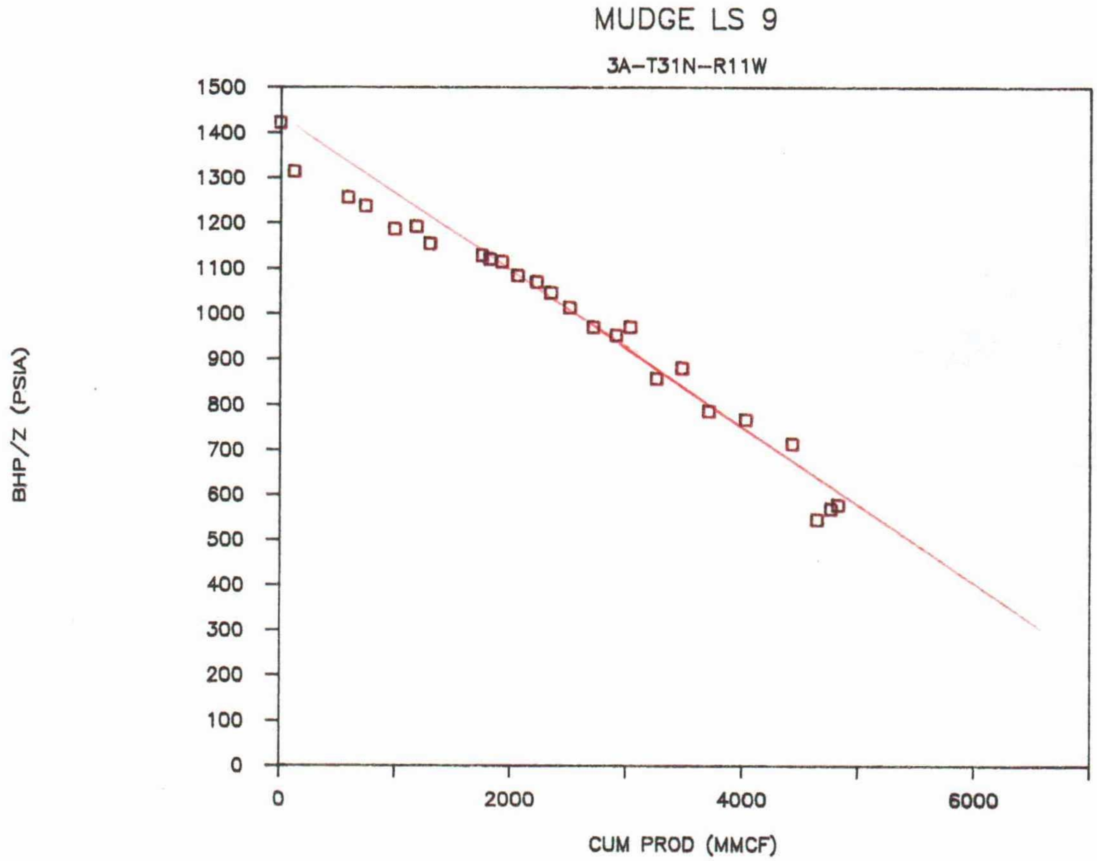


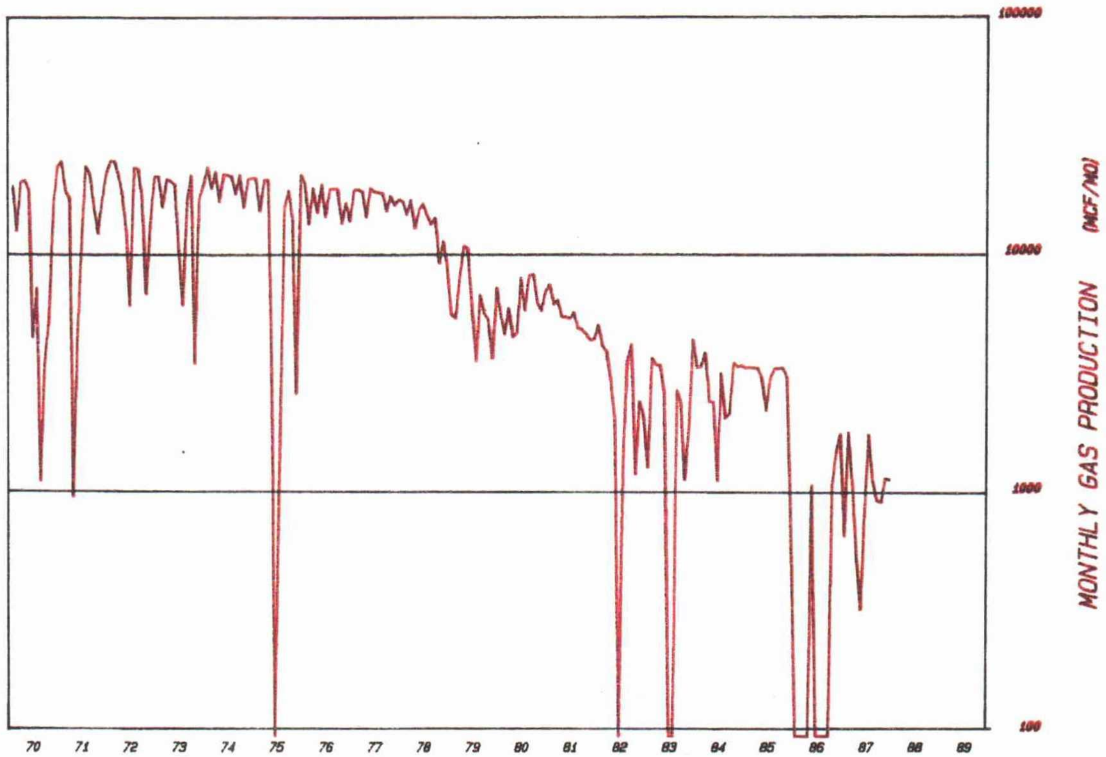


Lease: MUDGE LS
Well #: 000008
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 12A 31N 11W

Date: 05-09-88

EXHIBIT 17





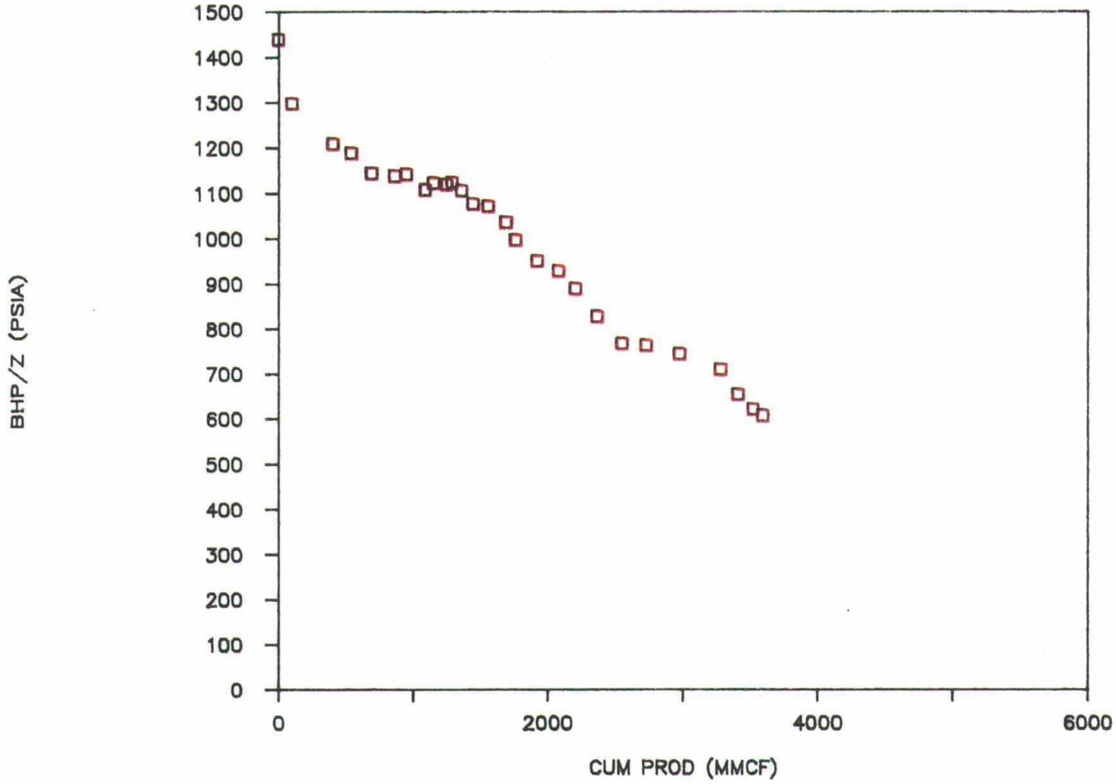
Lease: MUDGE LS
Well # 000009
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 3A 31N 11W

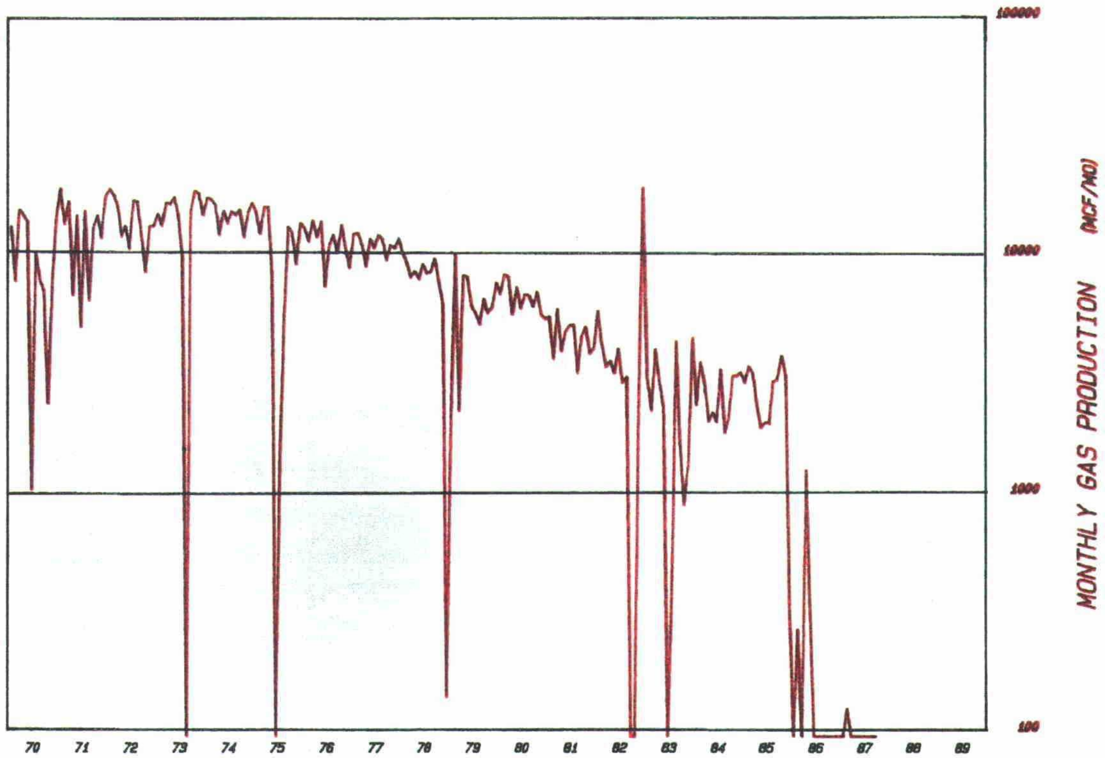
Date: 05-09-88

EXHIBIT 18

MUDGE LS 5

3K-T31N-R11W





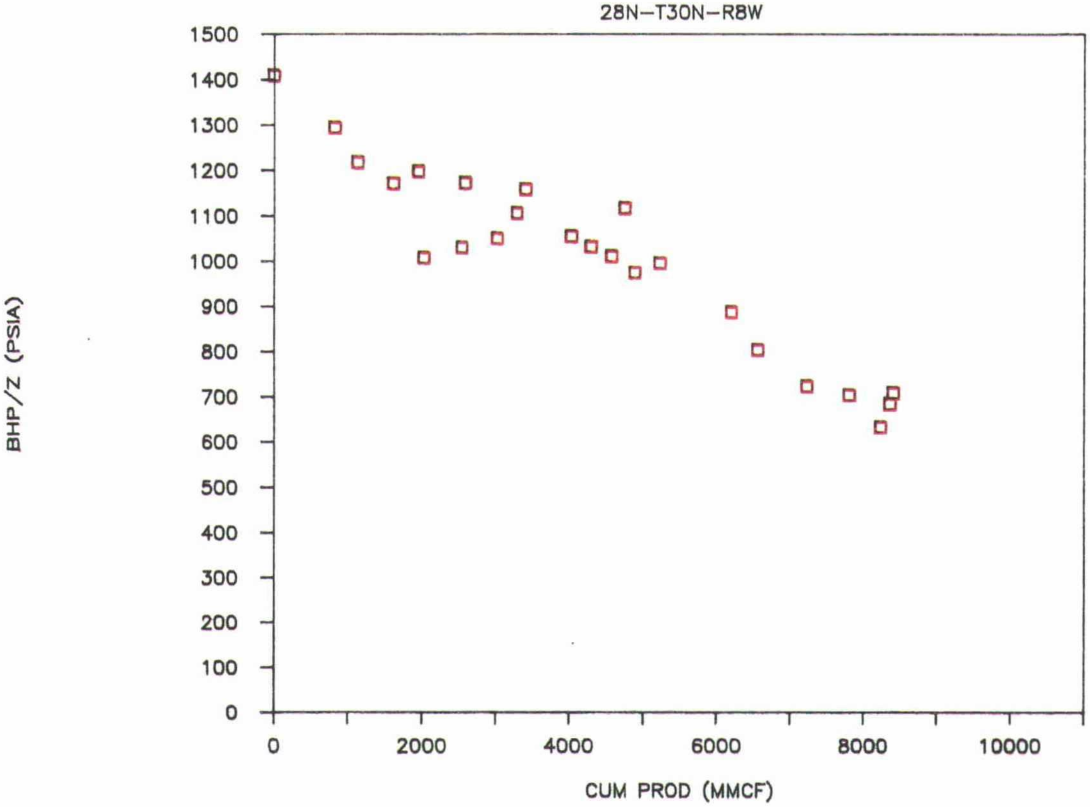
Lease:	MUDGE LS
Well #	000005
Operator:	TENNECO OIL CO
Field:	BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:	
County:	SANJUAN NM
Location:	3K 31N 11W

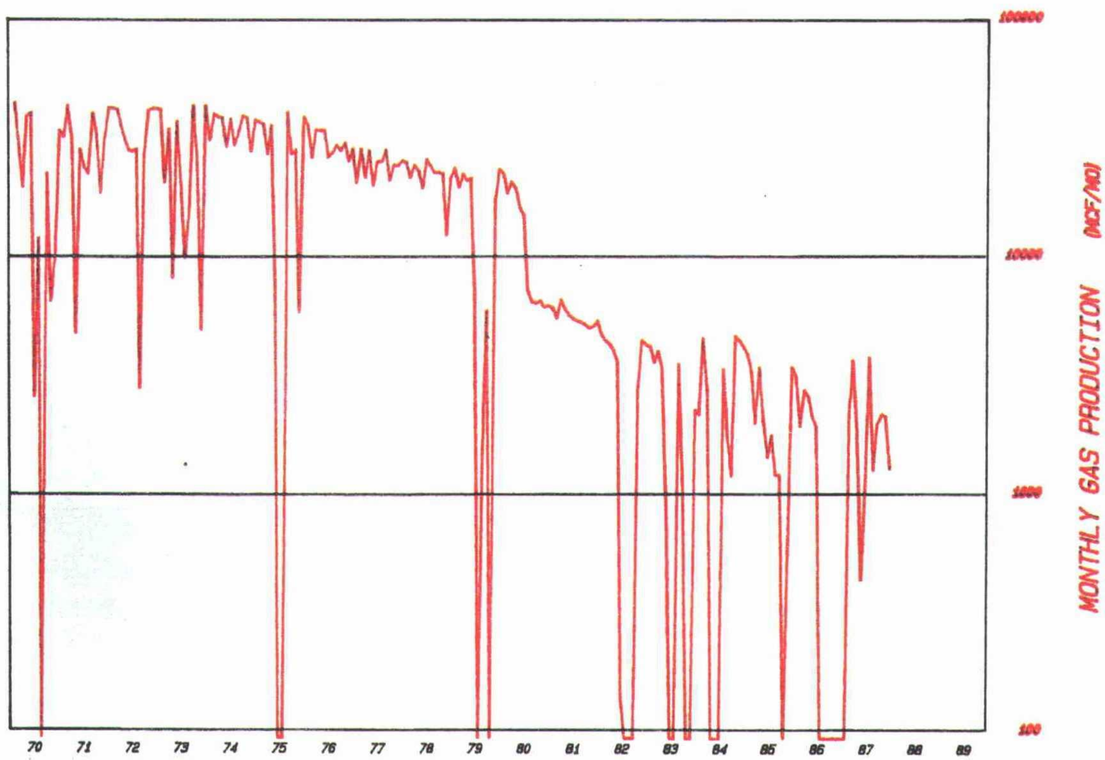
Date: 05-09-88

EXHIBIT 19

GARTNER LS 1

28N–T30N–R8W

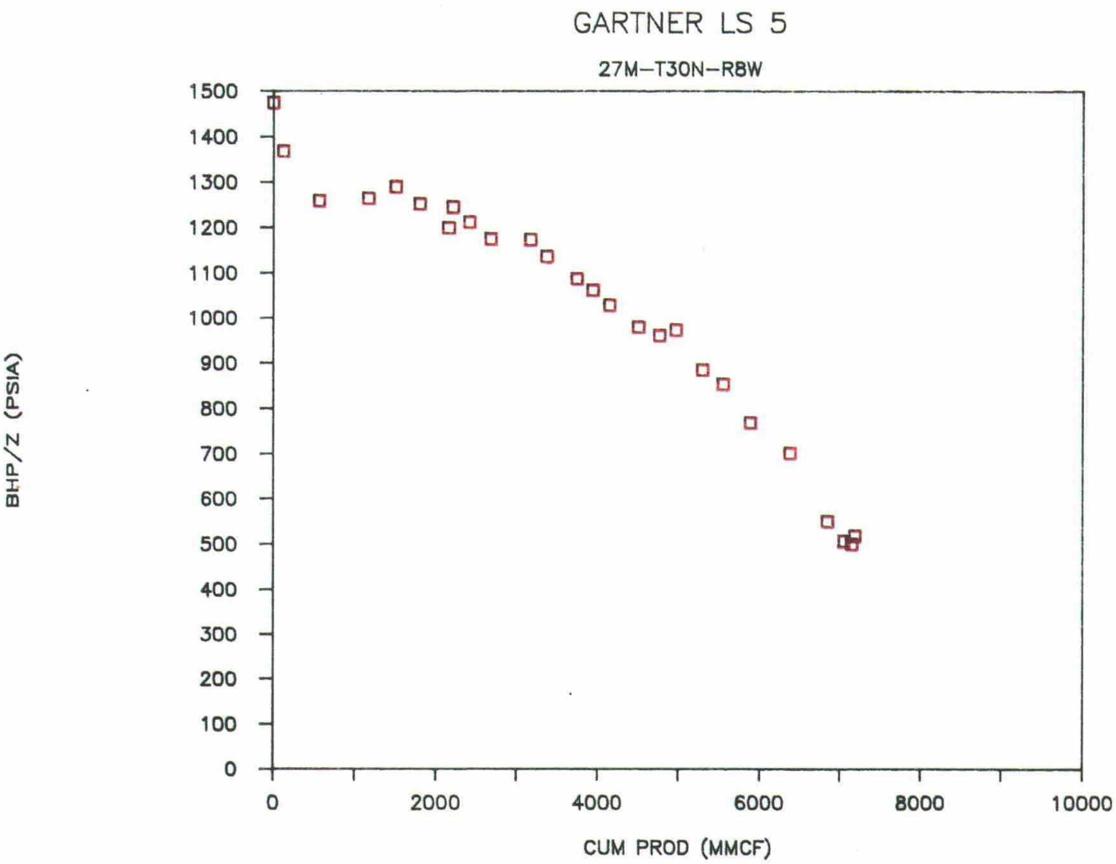


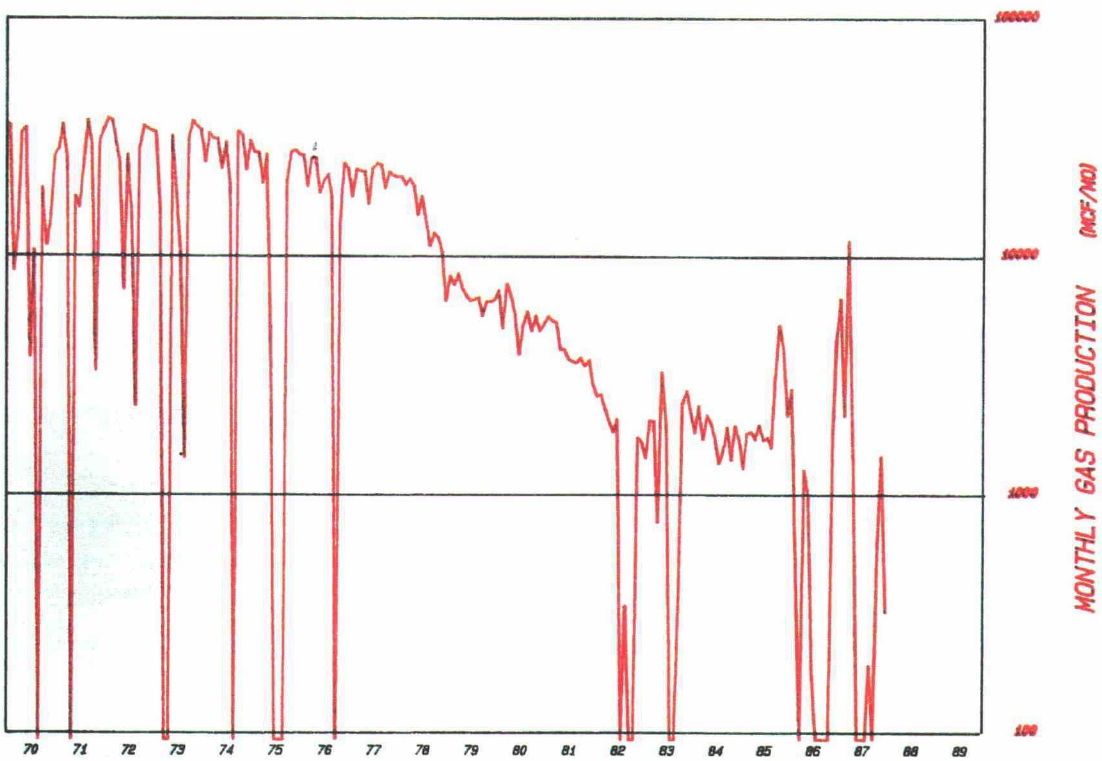


Lease: GARTNER LS
Well # 000001
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 28N 30N 8W

Date: 05-09-88

EXHIBIT 20

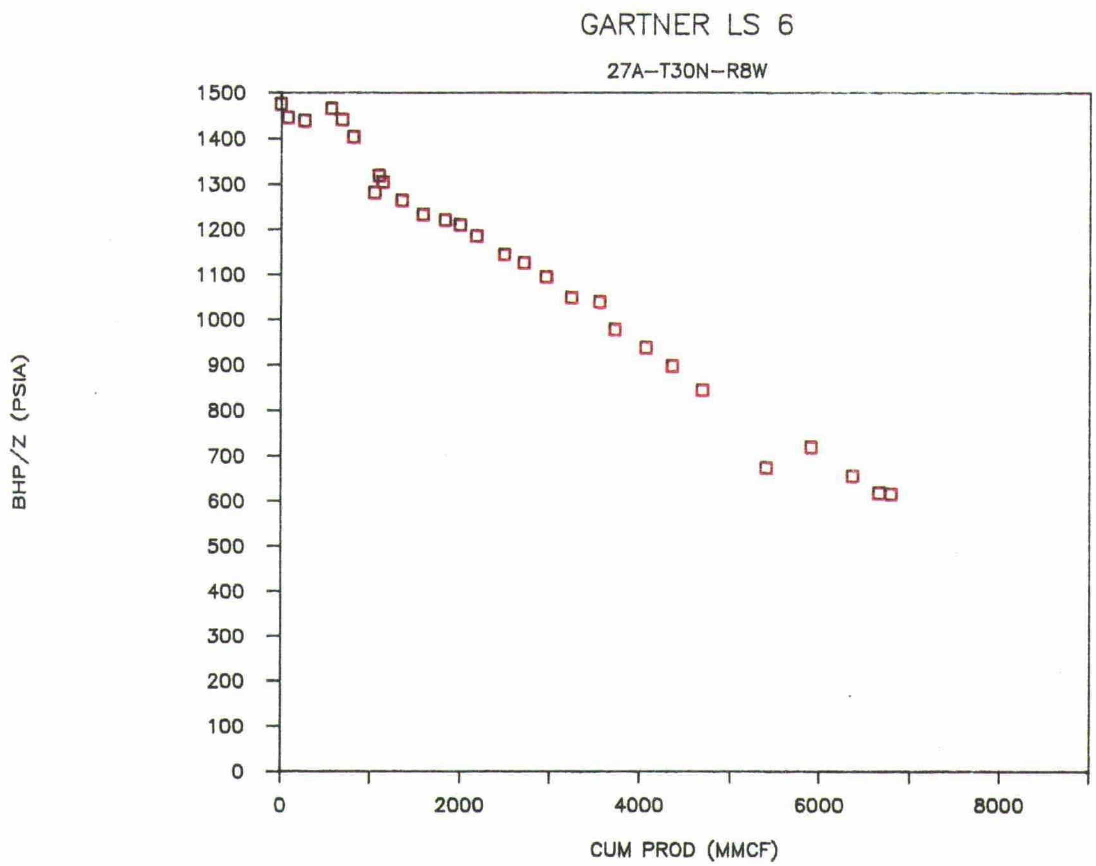


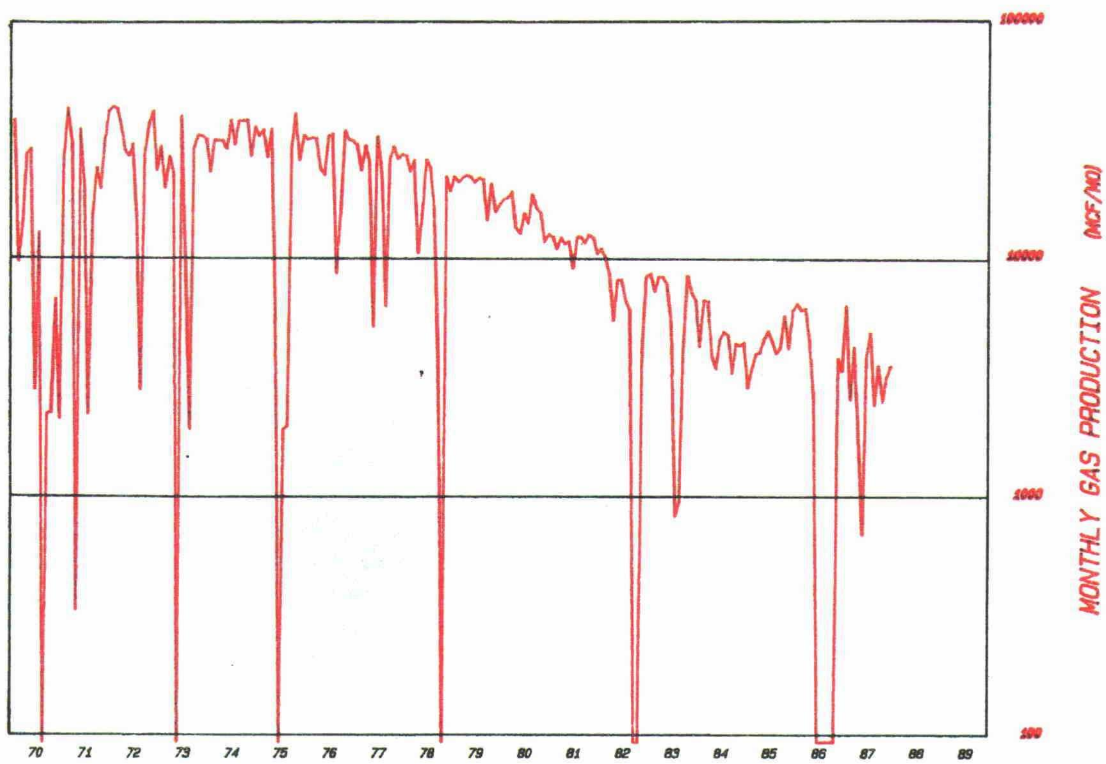


Lease: GARTNER LS
Well #: 000005
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) NV
Reservoir:
County: SANJUAN NM
Location: 27M 30N 8W

Date: 05-09-88

EXHIBIT 21

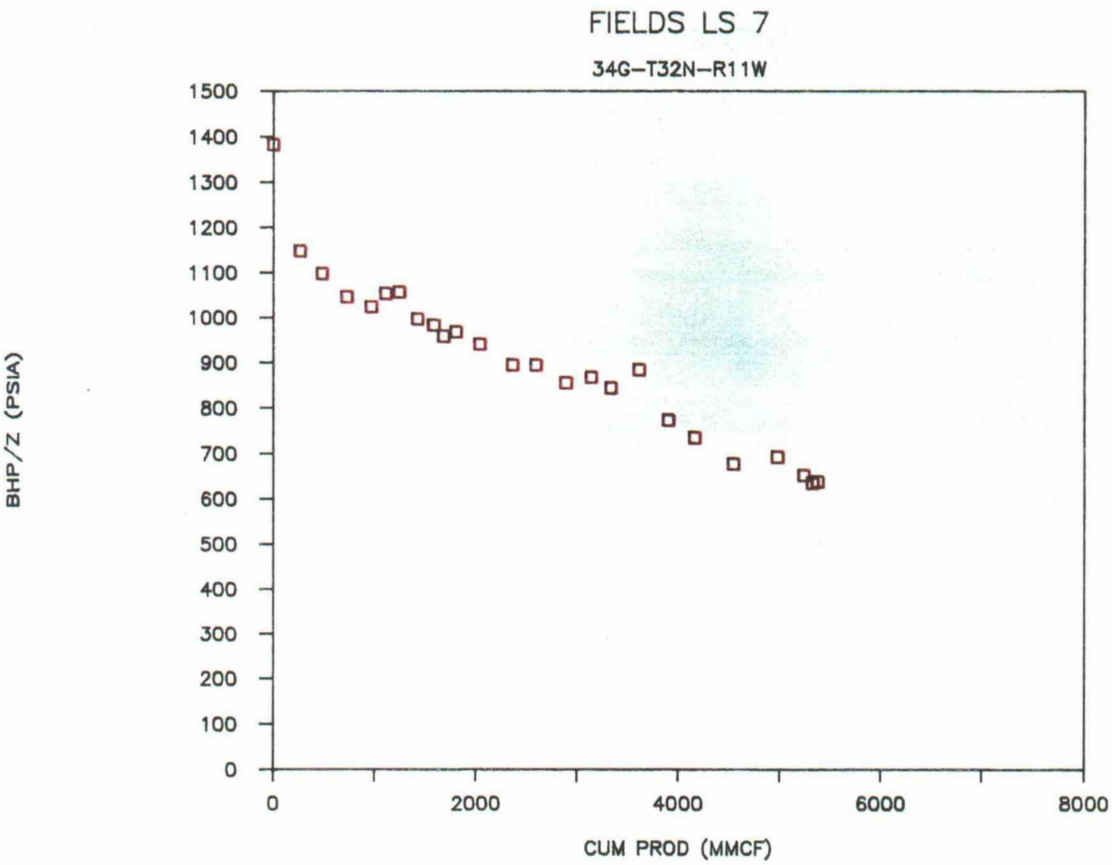


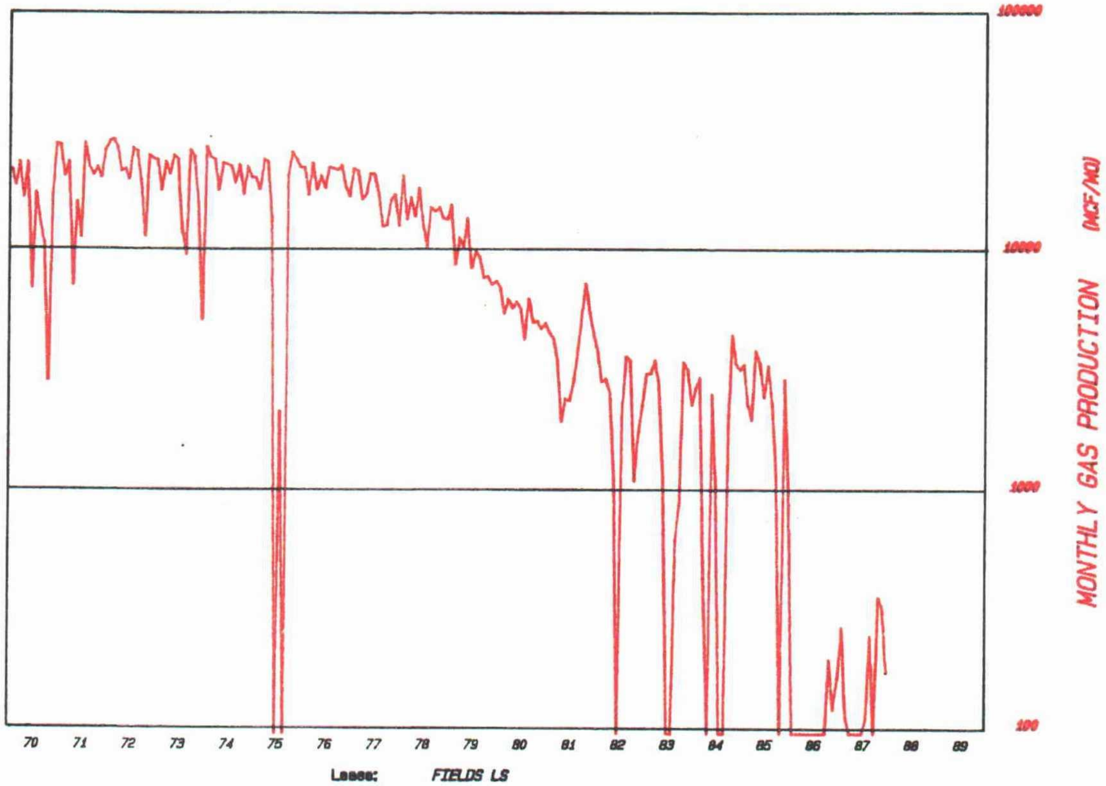


Lease: GARTNER LS
Well #: 000006
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 27A 30N 8W

Date: 05-09-88

EXHIBIT 22

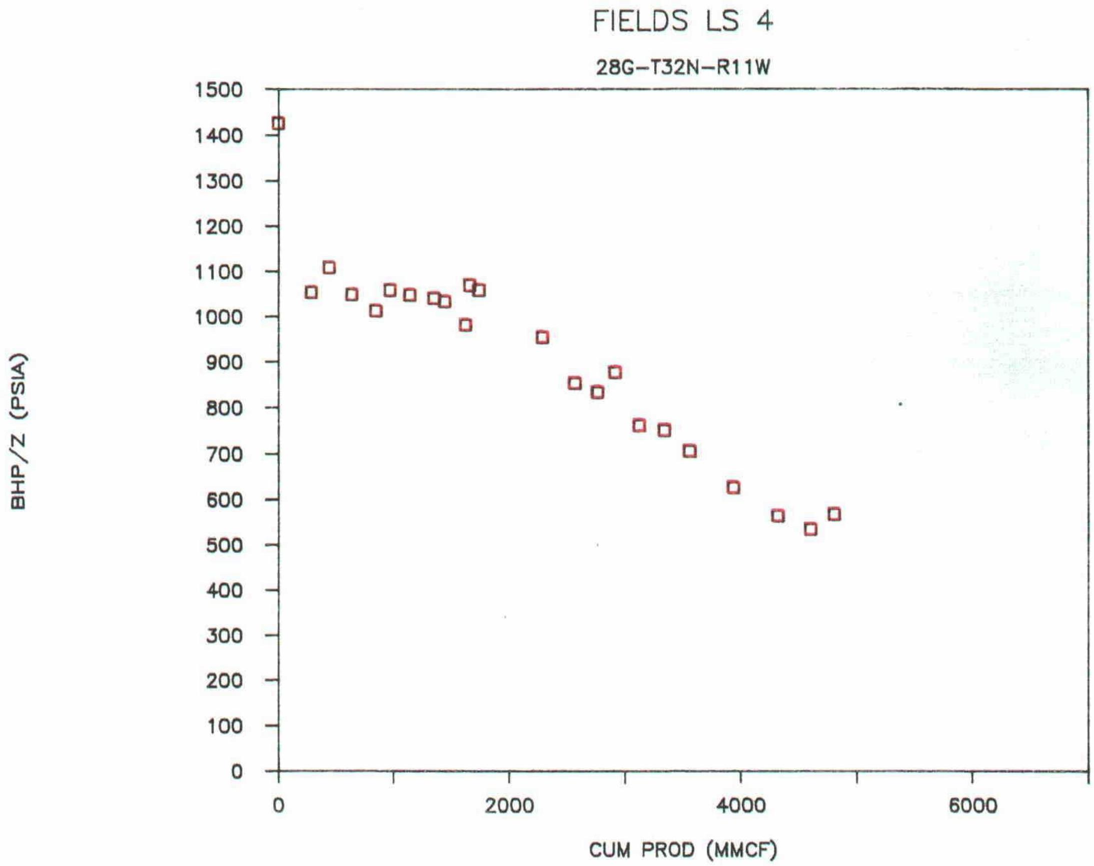


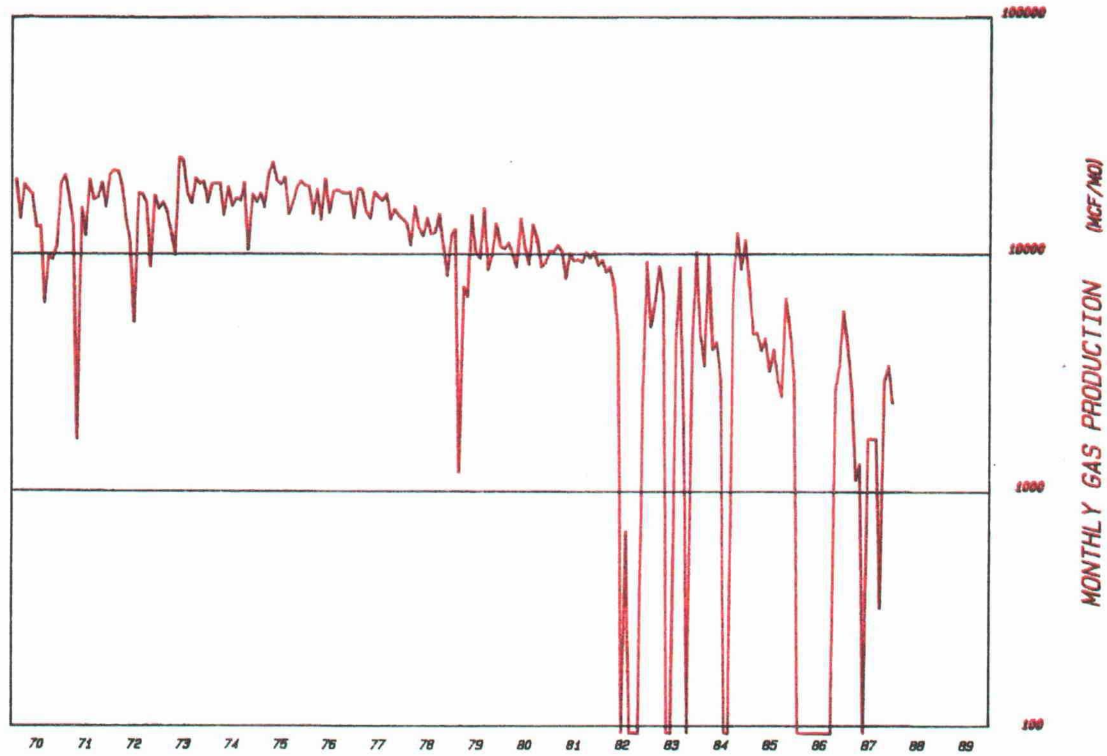


Lease: FIELDS LS
Well # 000007
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 34G 32N 11W

Date: 05-09-88

EXHIBIT 23





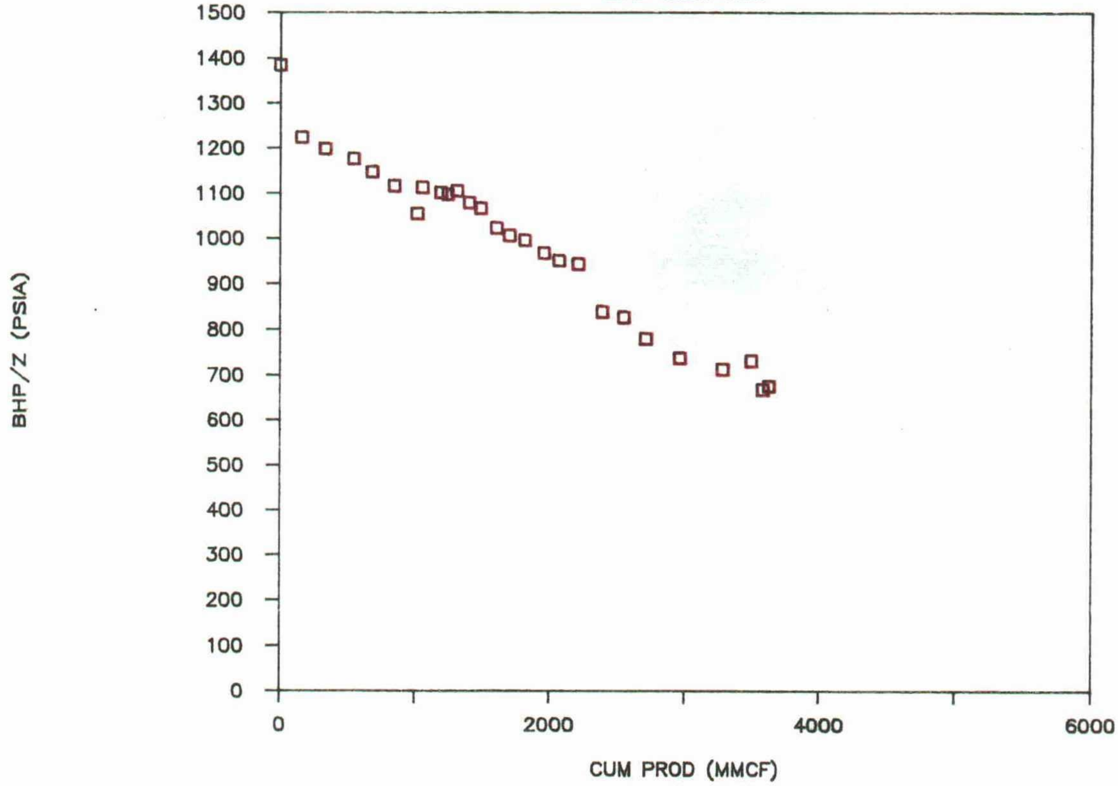
Lease: FIELDS LS
Well #: 000004
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) NV
Reservoir:
County: SANJUAN NM
Location: 28G 32N 11W

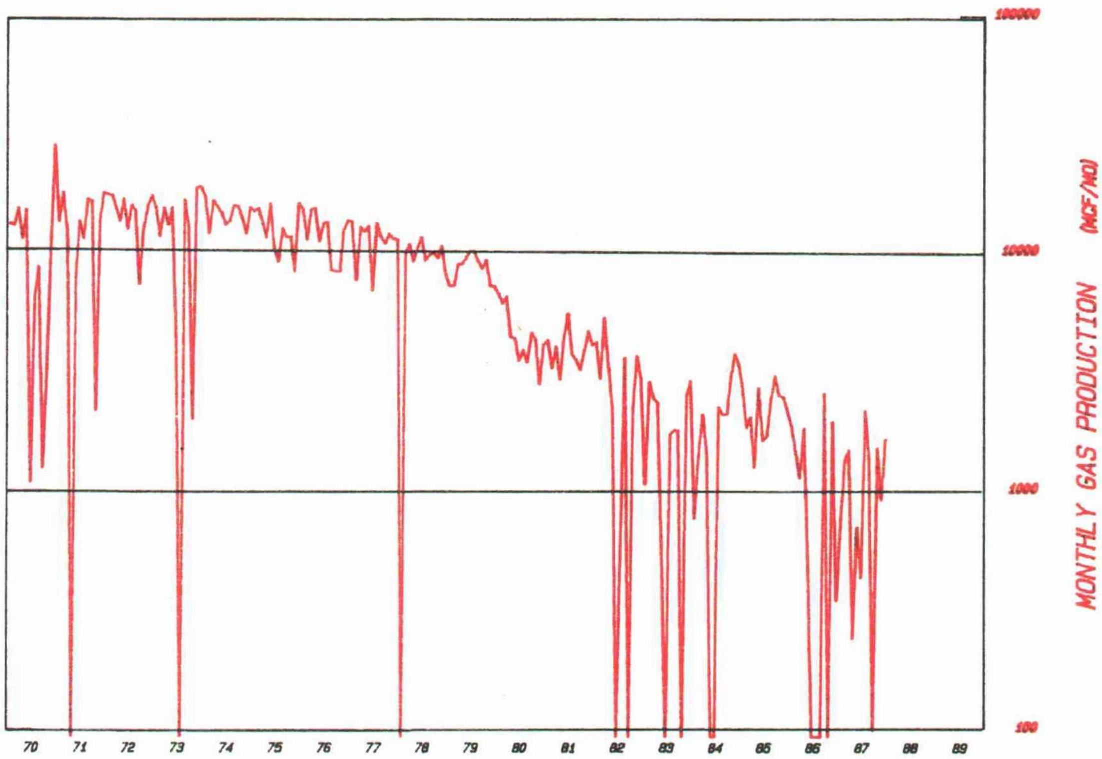
Date: 05-09-88

EXHIBIT 24

HUGHES A LS 2

27B–T29N–R8W

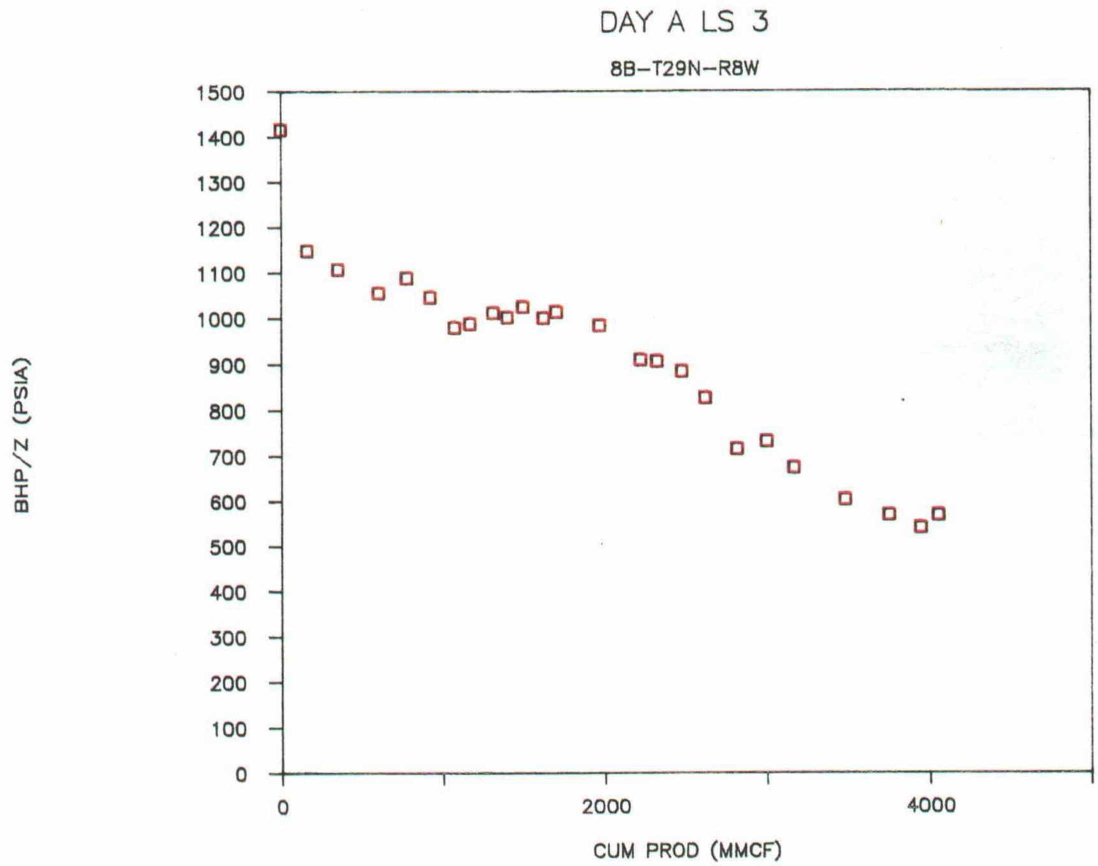


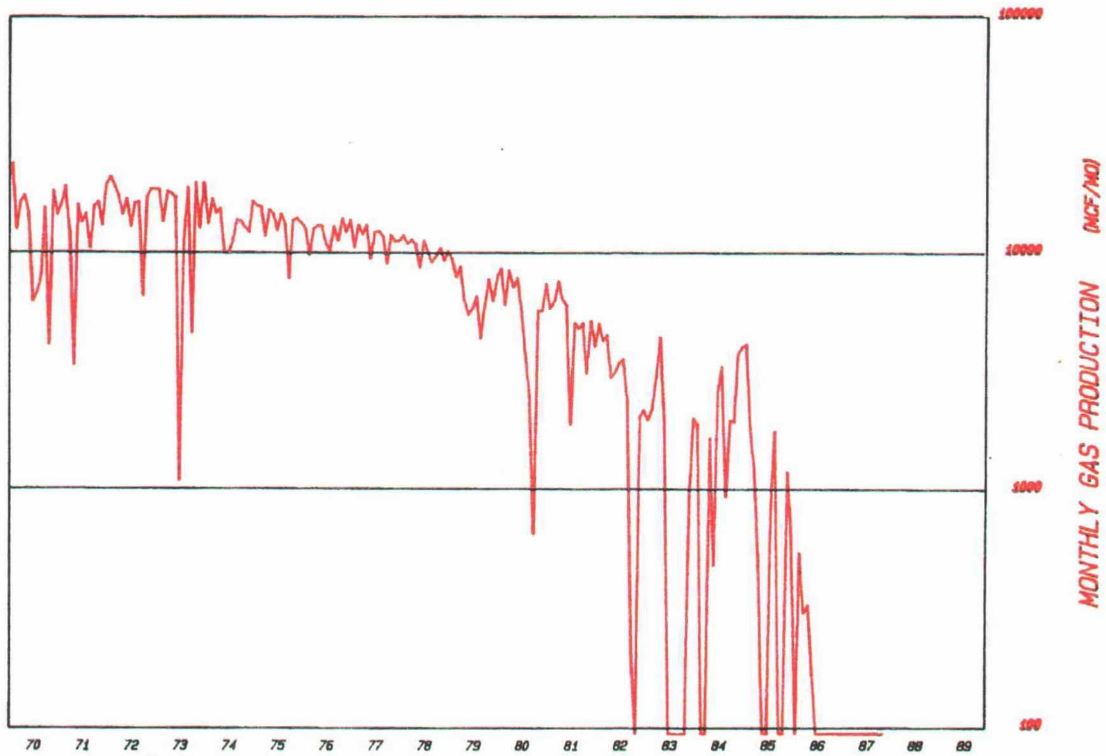


Lease: HUGHES A LS
Well #: 000002
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 27B 29N 8W

Date: 05-09-88

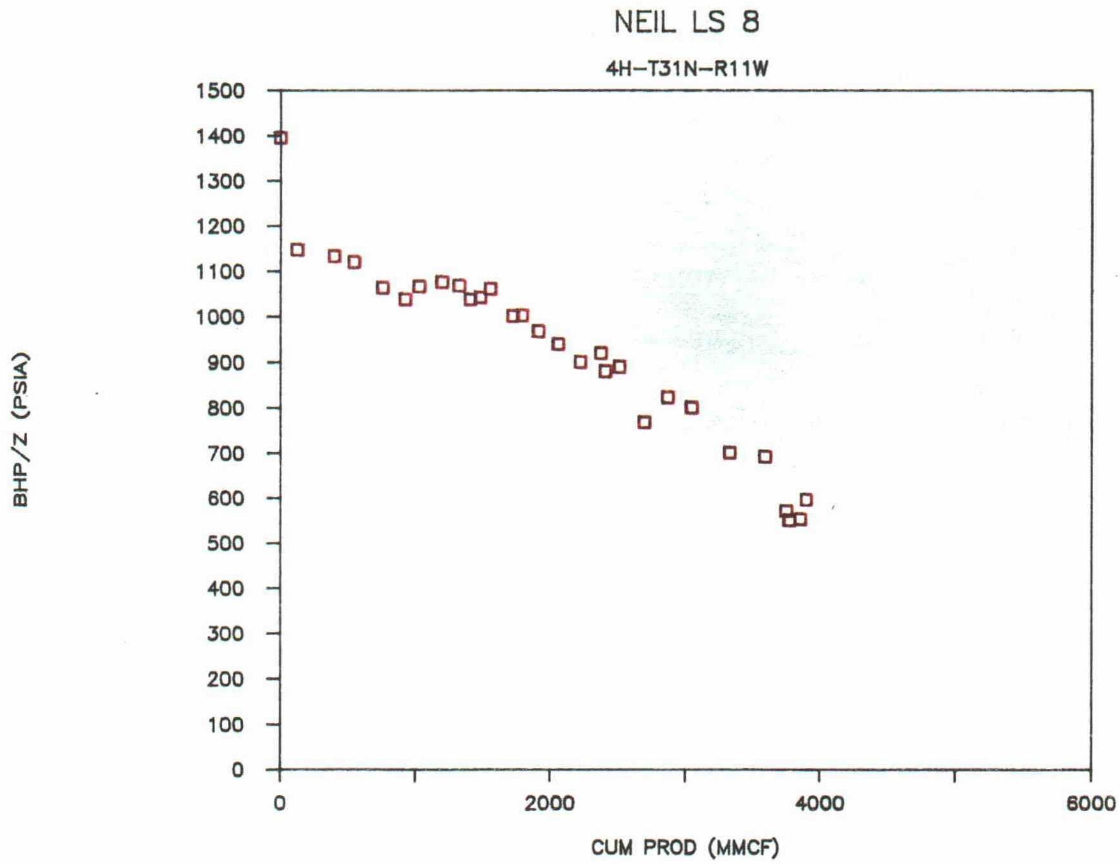
EXHIBIT 25

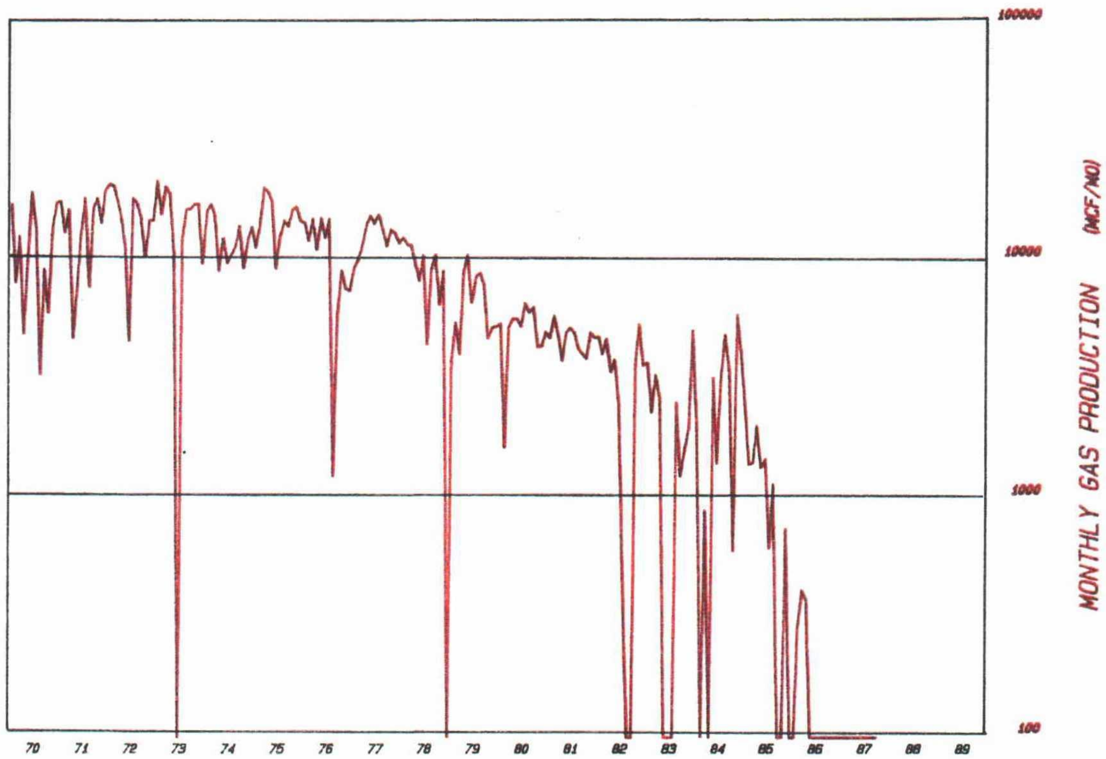




Lease: DAY A LS
Well # 000003
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 8B 29N 8W
Date: 05-09-88

EXHIBIT 26



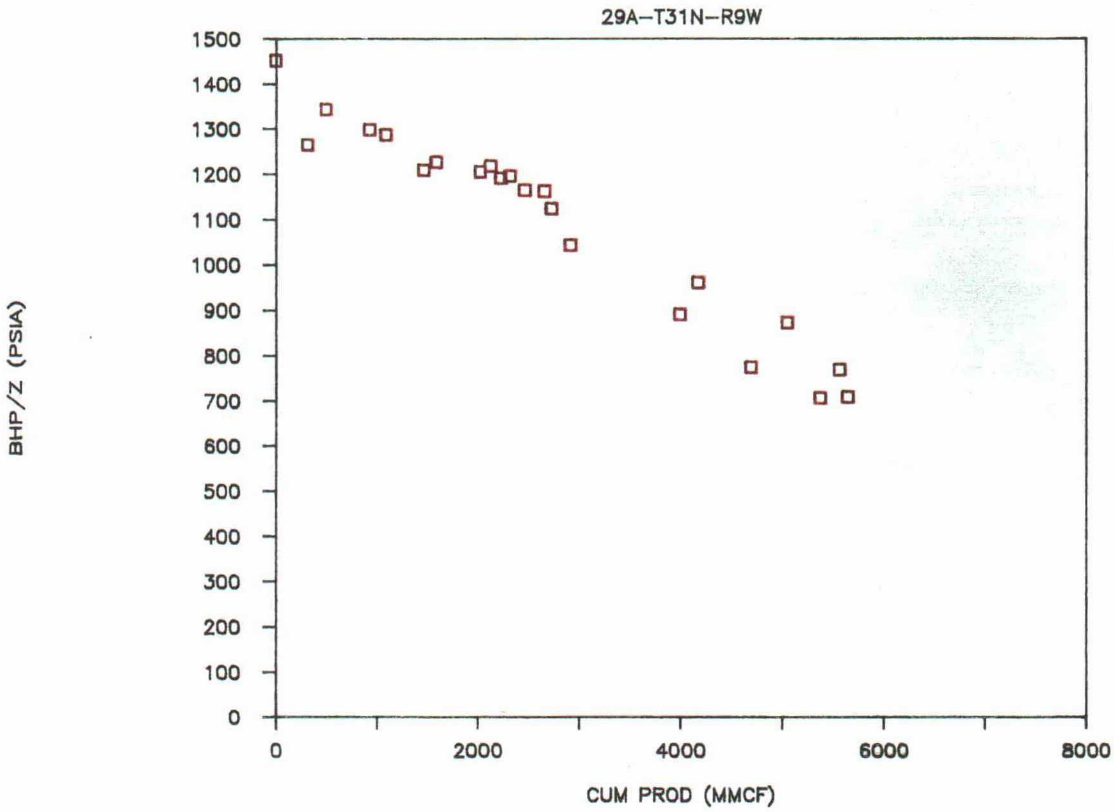


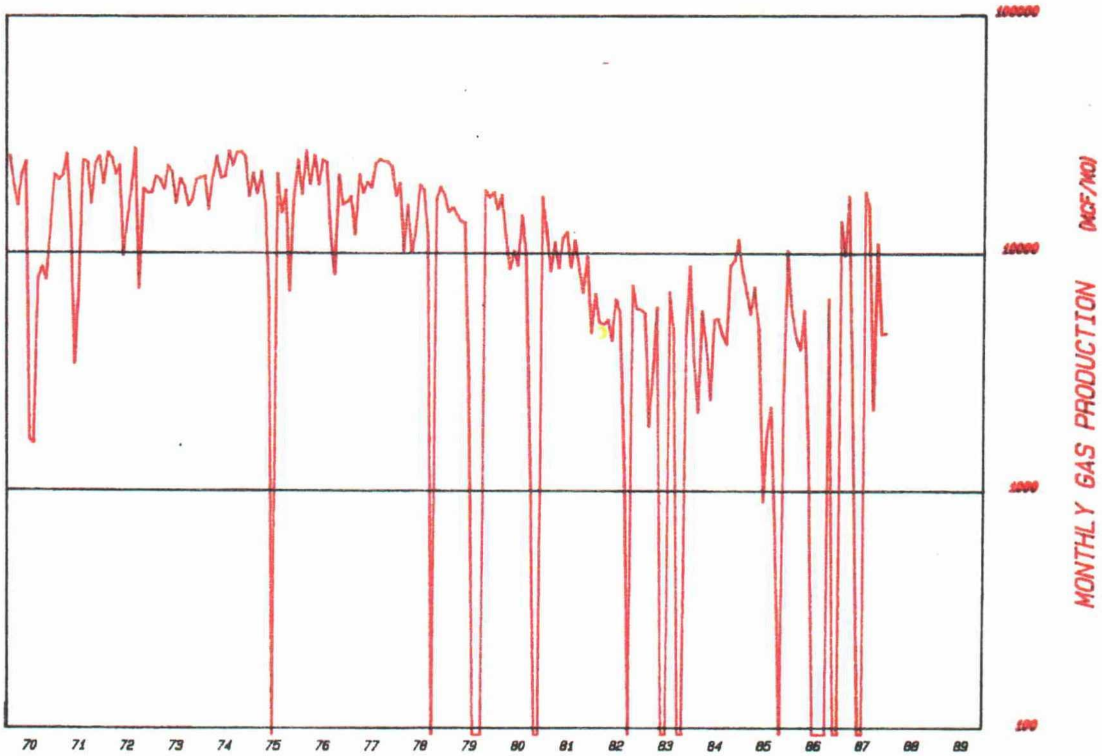
Lease: NEIL LS
Well # 000008
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 4H 31N 11W

Date: 05-09-88

EXHIBIT 27

JACQUES LS 1

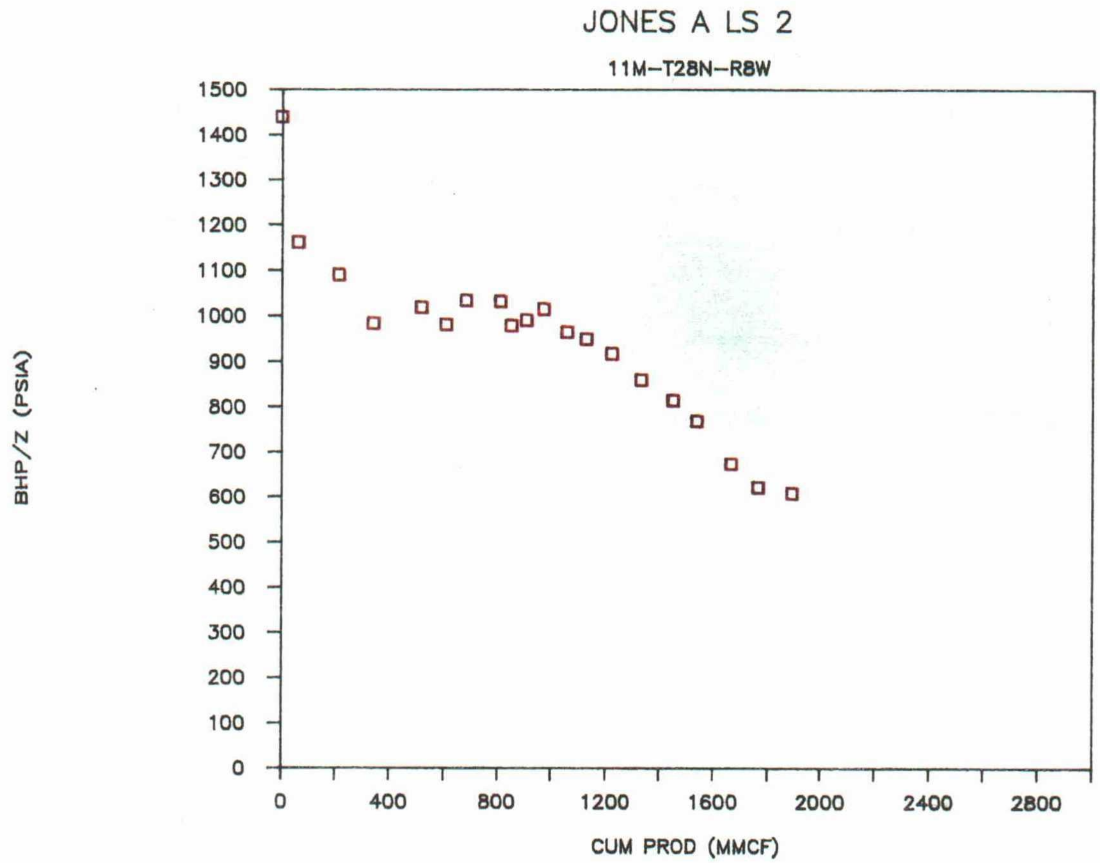


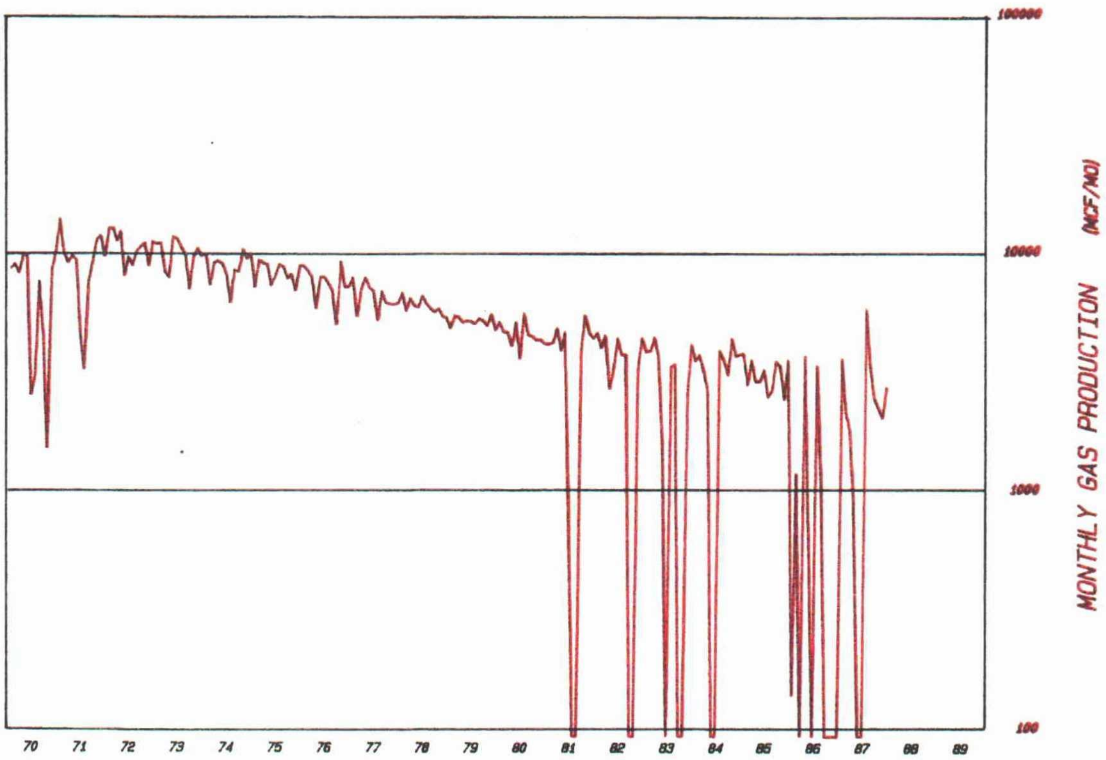


Lease: JACQUES LS
Well # 000001
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) NV
Reservoir:
County: SANJUAN NM
Location: 29A 31N 9W

Date: 05-09-88

EXHIBIT 28





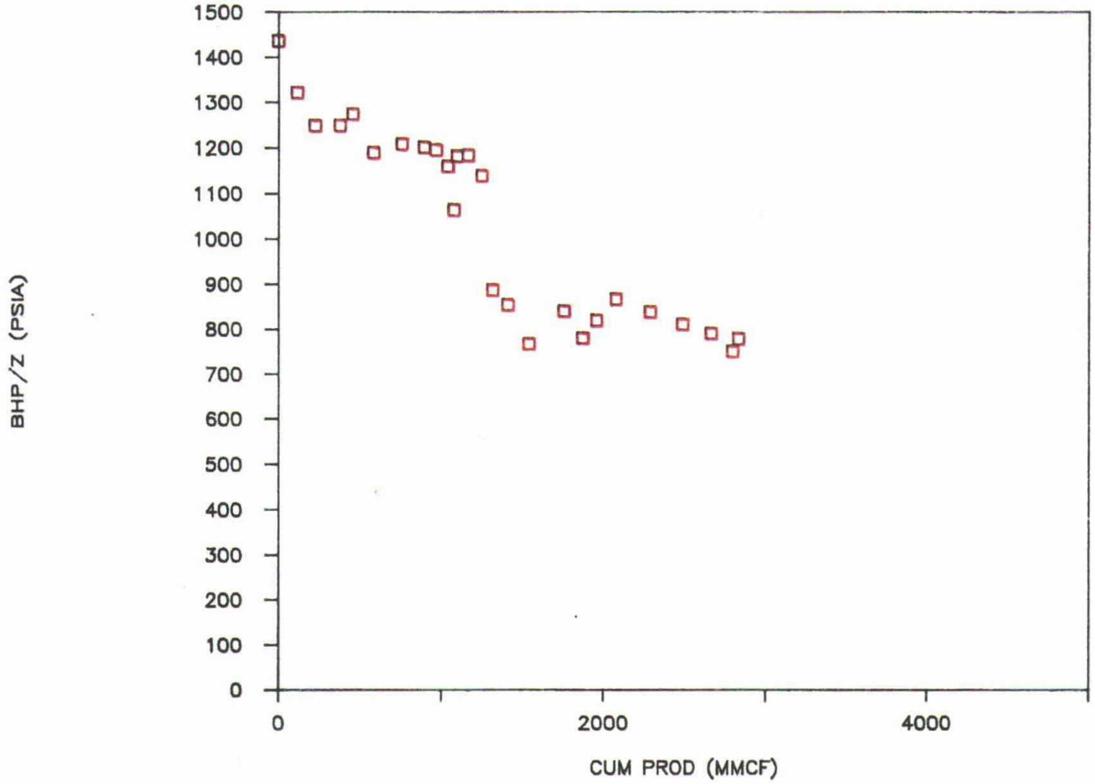
Lease: JONES A LS
Well # 000002
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 11M 28N 8W

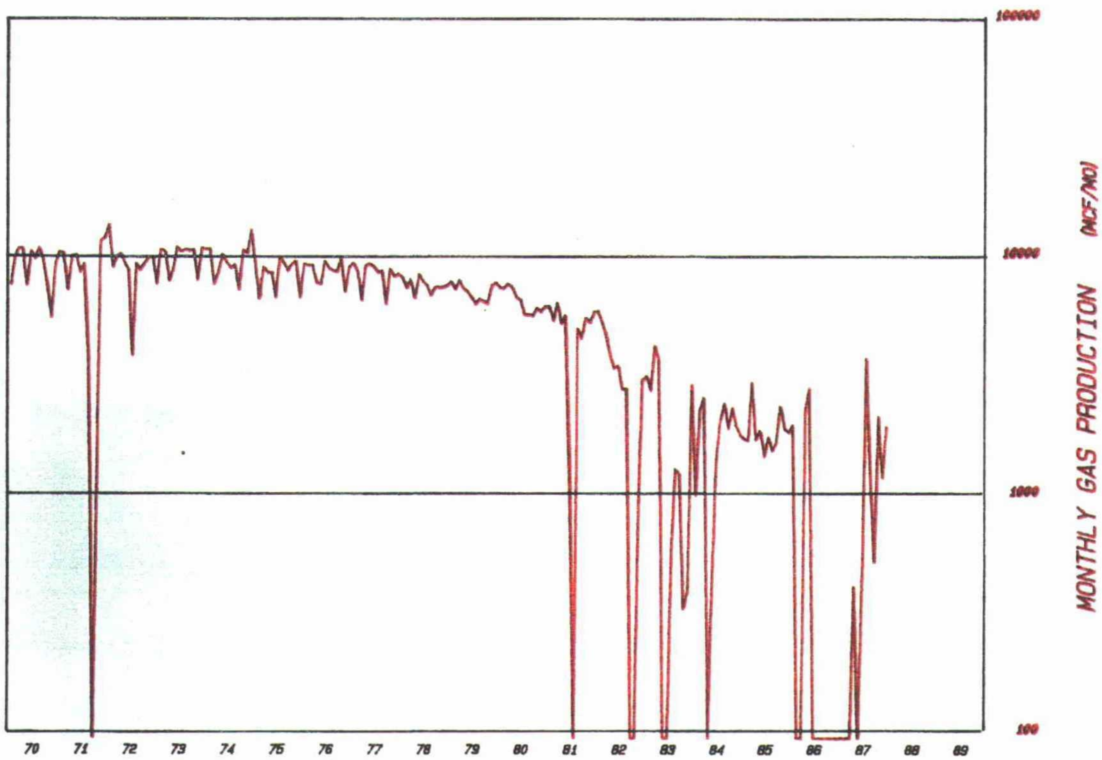
Date: 05-09-88

EXHIBIT 29

RIDDLE F LS 1

17L–T28N–R8W

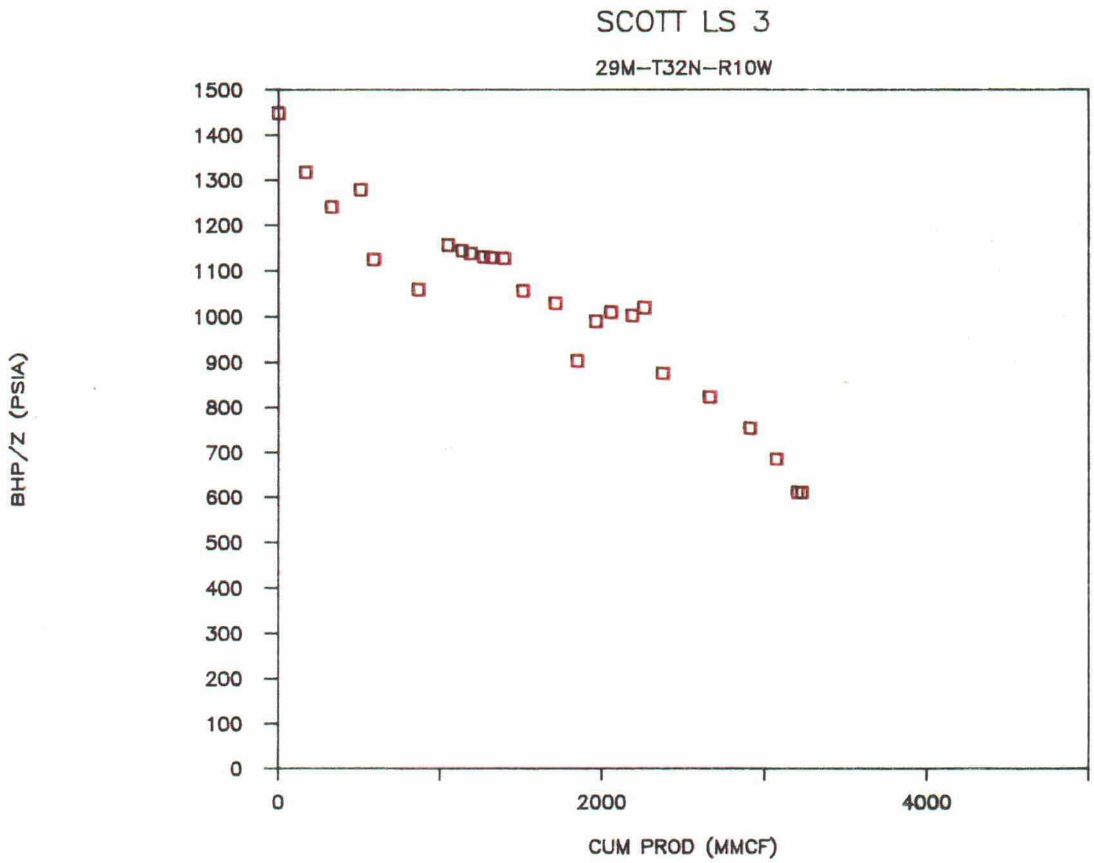


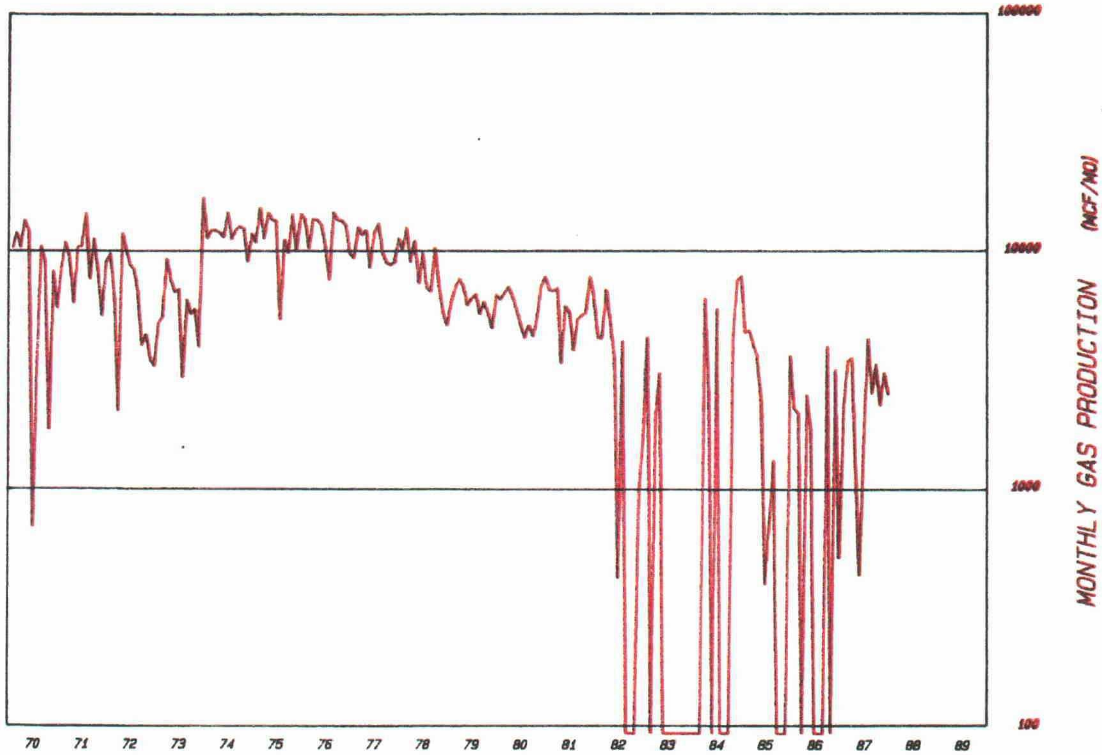


Lease: RIDDLE F LS
Well # 000001
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 17L 28N 8W

Date: 05-09-88

EXHIBIT 30

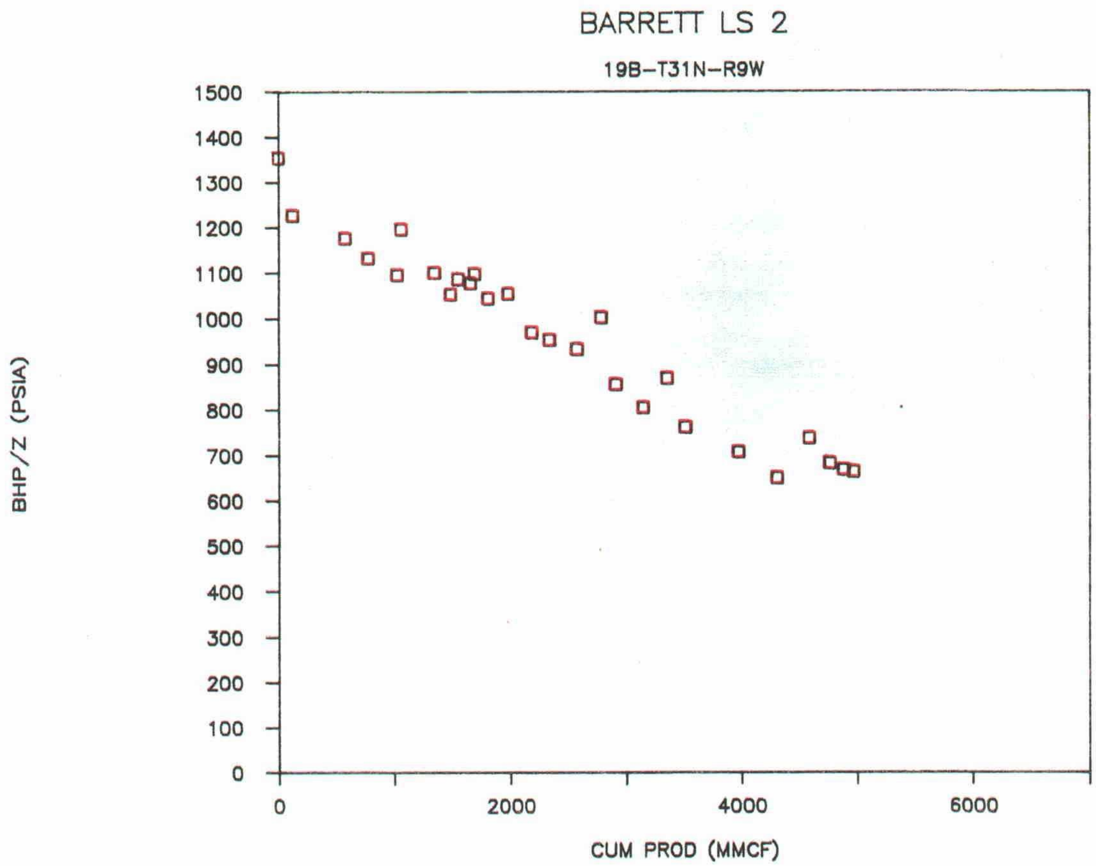


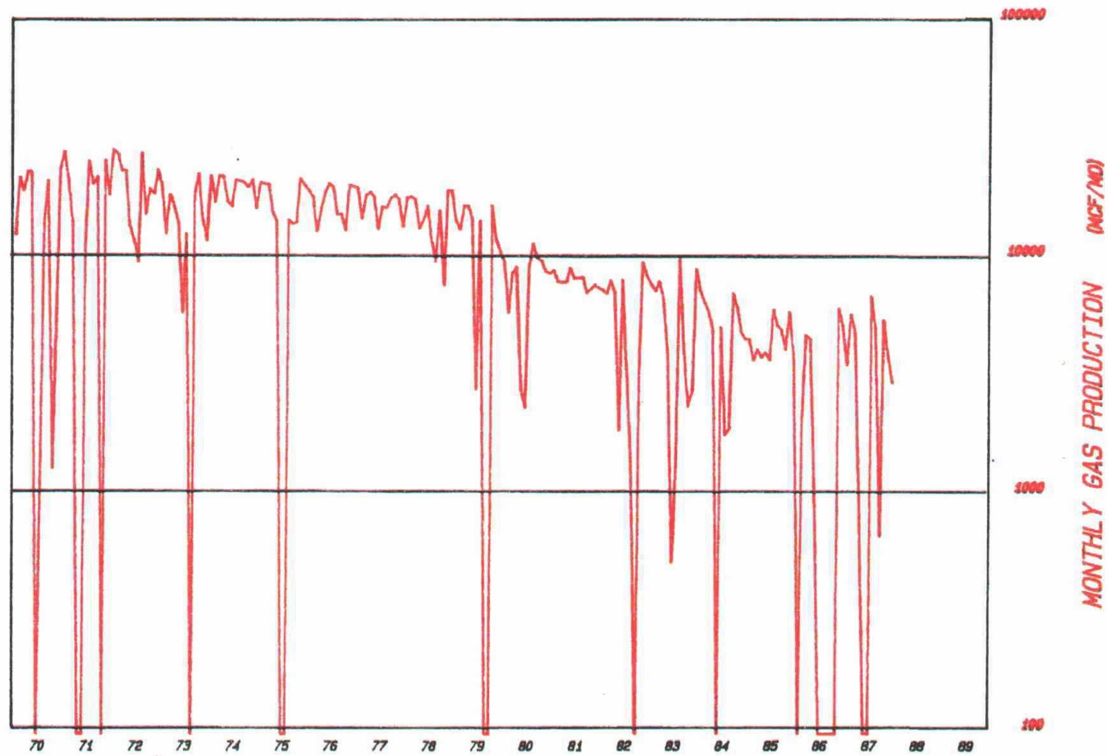


Lease: SCOTT LS
Well # 000003
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 29M 32N 10W

Date: 05-09-88

EXHIBIT 31

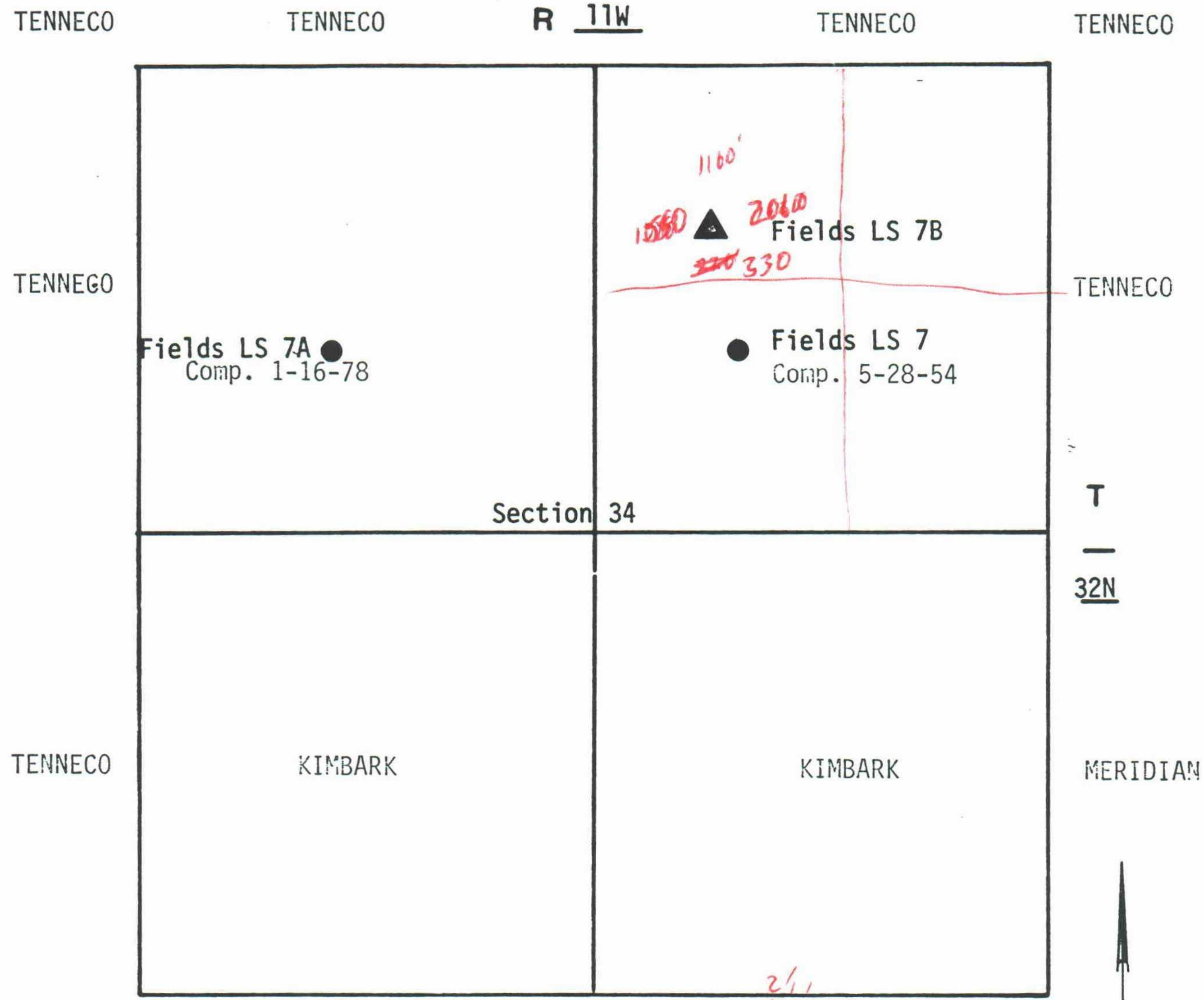




Lease: BARRETT LS
Well #: 000002
Operator: TENNECO OIL CO
Field: BLANCO MESAVERDE (PRORATED GAS) MV
Reservoir:
County: SANJUAN NM
Location: 19B 31N 9W

Date: 05-09-88

EXHIBIT 32



Fields LS 7B
965' FNL, 2060' FEL

Fields LS 7
1610' FNL, 1830' FEL

Fields LS 7A
1620' FNL, 1100' FWL

2640
1620
1020

2,1
1820
965
355

51
2440
2060
580

1320
11
220

1326
2
2640

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

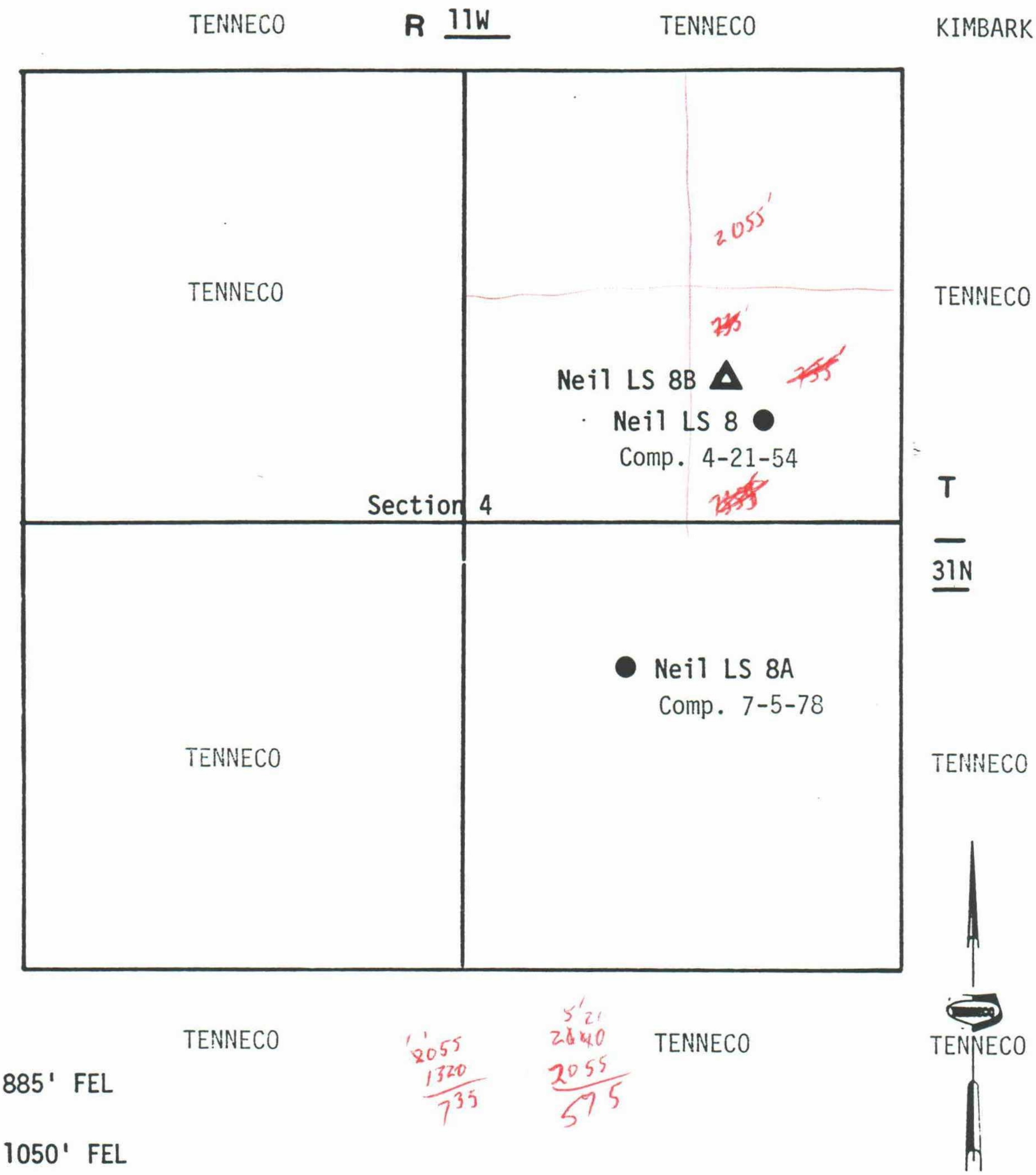
▲ Location Currently Staked

FIELDS LS 7B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT A



Neil LS 8B
2055' FNL, 885' FEL

Neil LS 8
1815' FNL, 1050' FEL

Neil LS 8A
1800' FSL, 1665' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

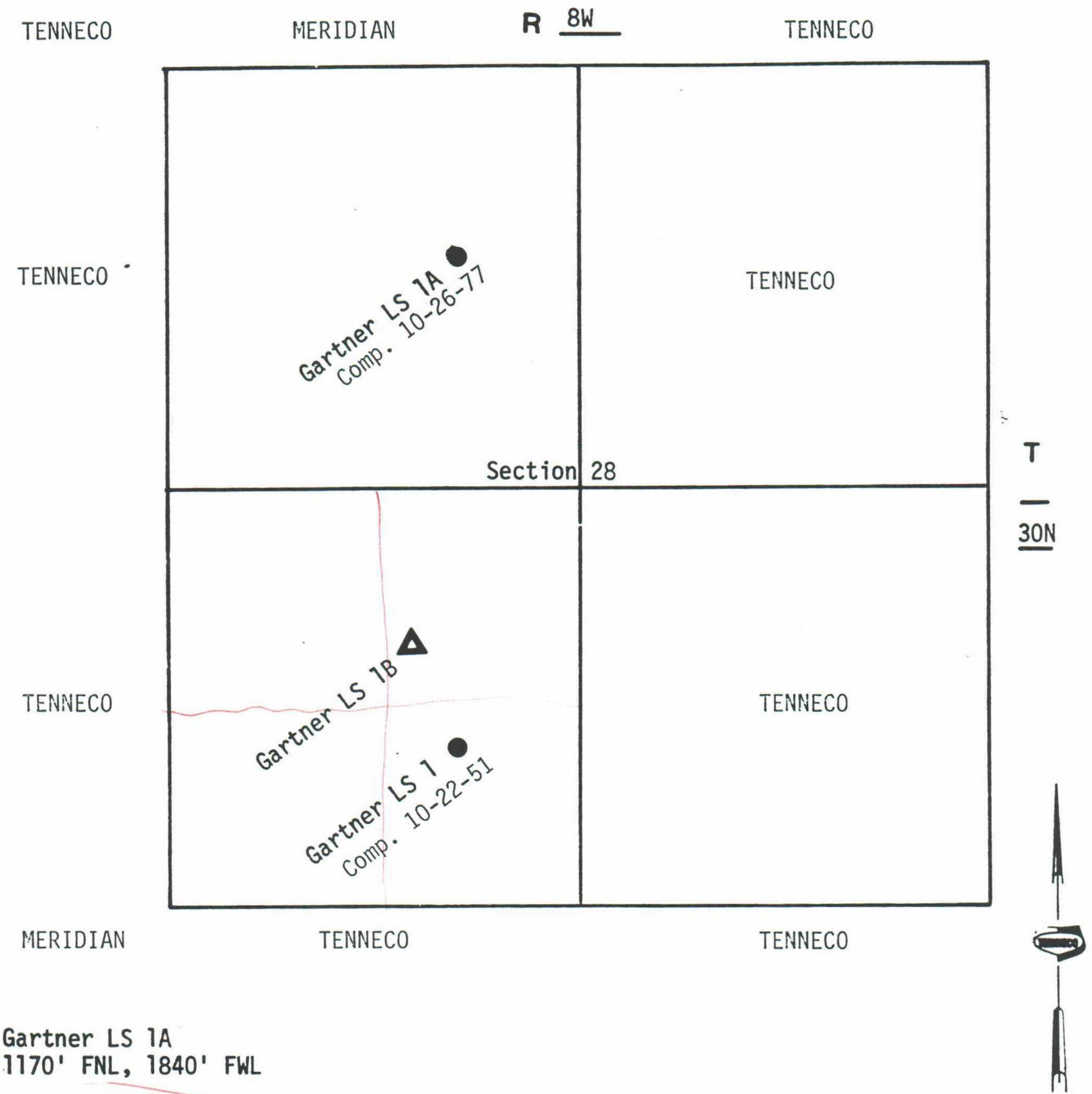
▲ Location Currently Staked

NEIL LS 8B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT B



Gartner LS 1A
1170' FNL, 1840' FWL

Gartner LS 1B
1720' FSL, 1610' FWL

Gartner LS 1
990' FSL, 1845' FWL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

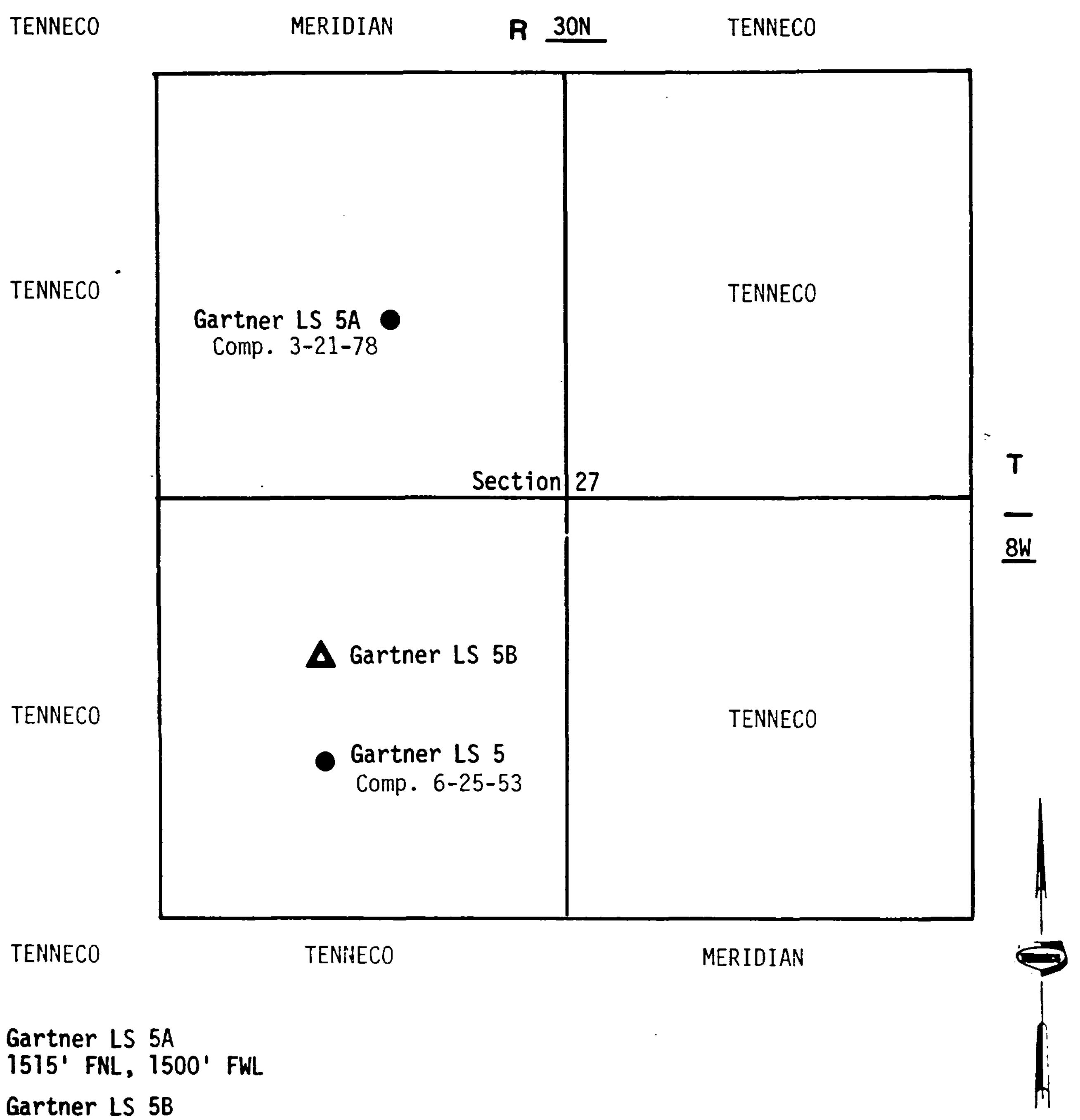
△ Location Currently Staked

GARTNER LS 1B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT C



Gartner LS 5A
1515' FNL, 1500' FWL

Gartner LS 5B
1620' FSL, 1005' FWL

Gartner LS 5
990' FSL, 1090' FWL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

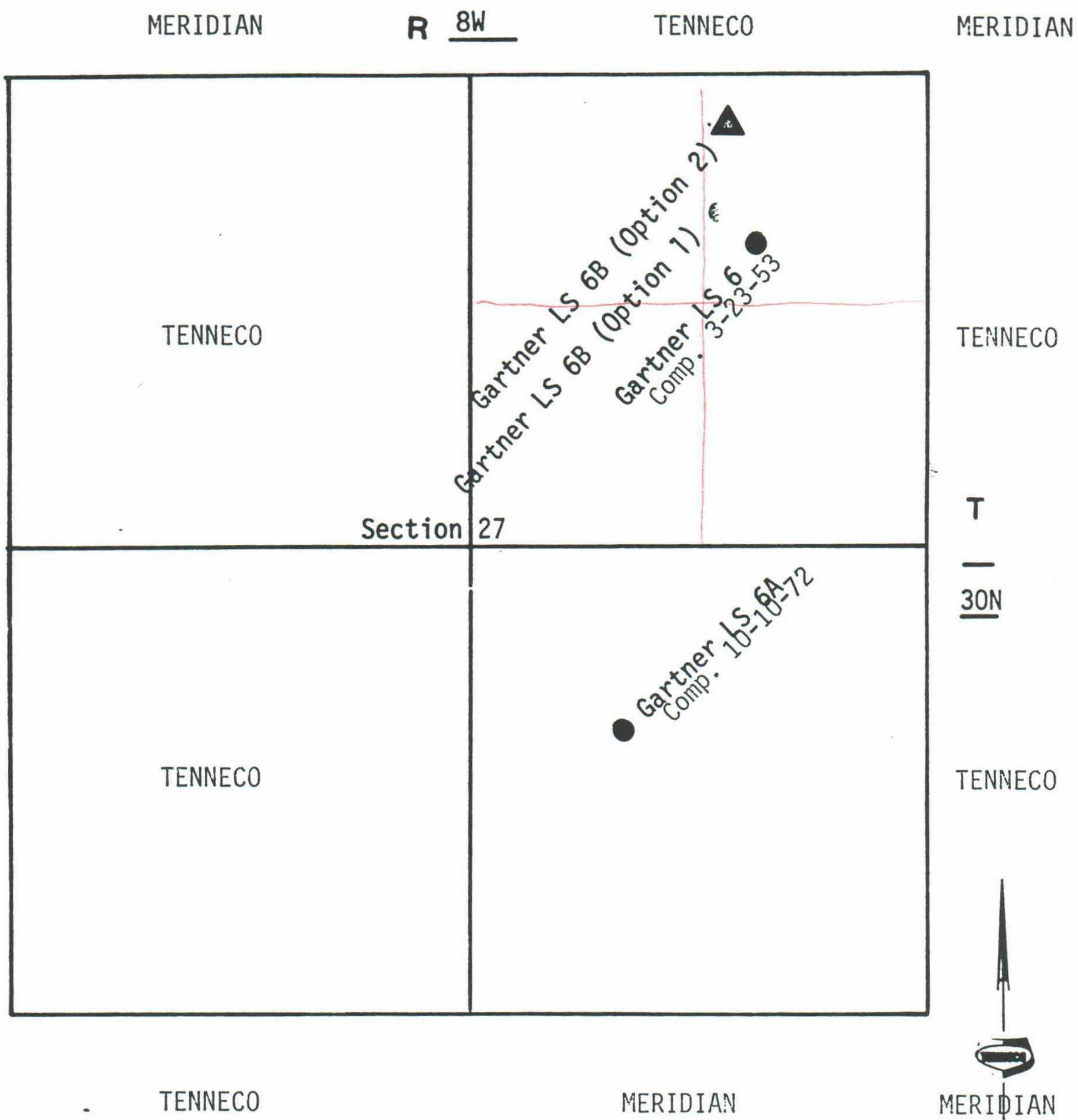
▲ Location Currently Staked

GARTNER LS 5B

SCALE IN FEET
0

EXHIBIT D

#3



Gartner LS 6B
(Option 1) 790' FNL, 1190' FEL
(Option 2) 300' FNL, 1230' FEL (Unorthodox Location)

Gartner LS 6
990' FNL, 990' FEL

Gartner LS 6A
1630' FSL, 1780' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

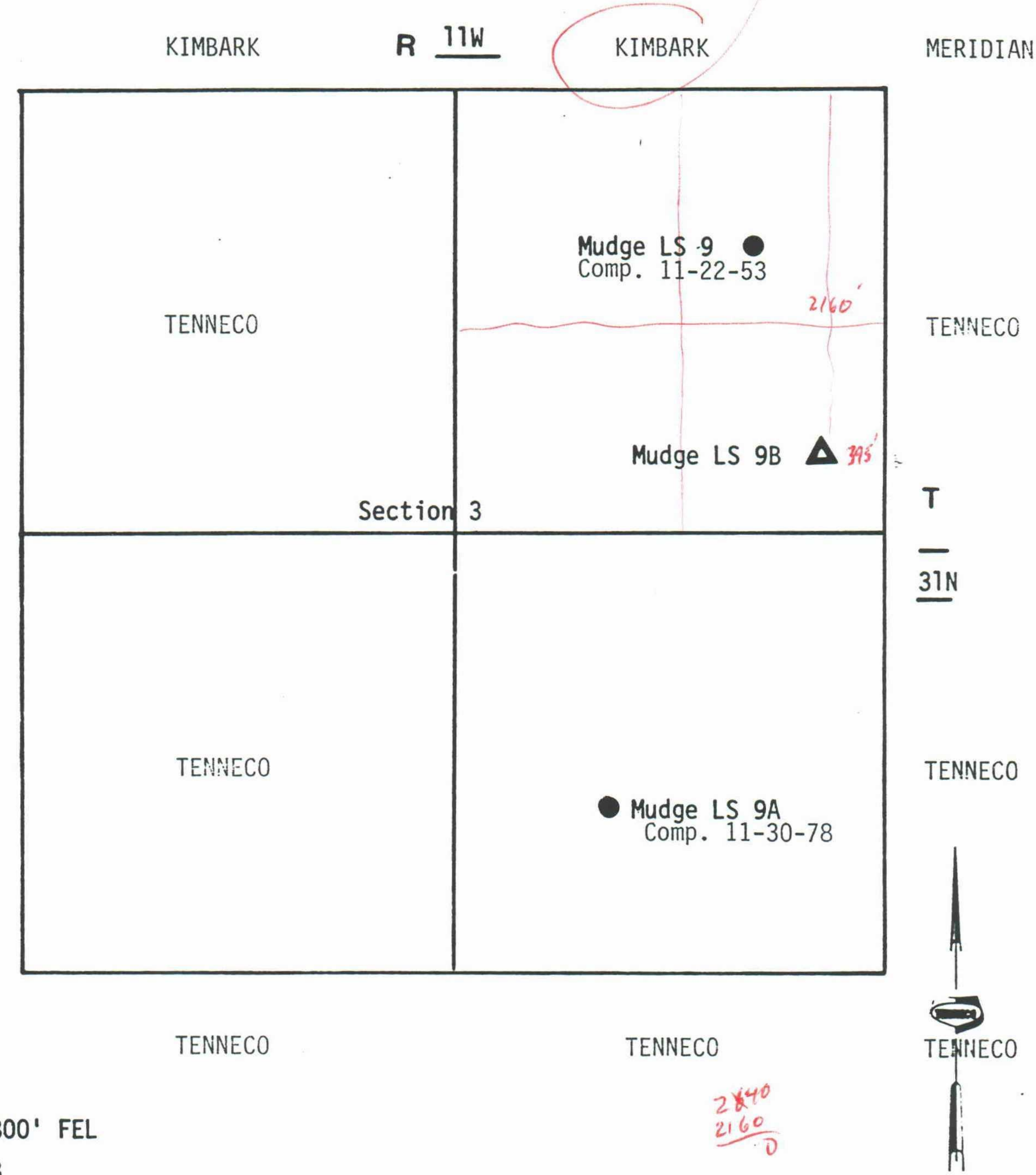
▲ Location Currently Staked

GARTNER LS 6B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT E



Mudge LS 9
990' FNL, 800' FEL

Mudge LS 9B
2160' FNL, 395' FEL

Mudge LS 9A
1000' FSL, 1695' FEL

EXHIBIT F

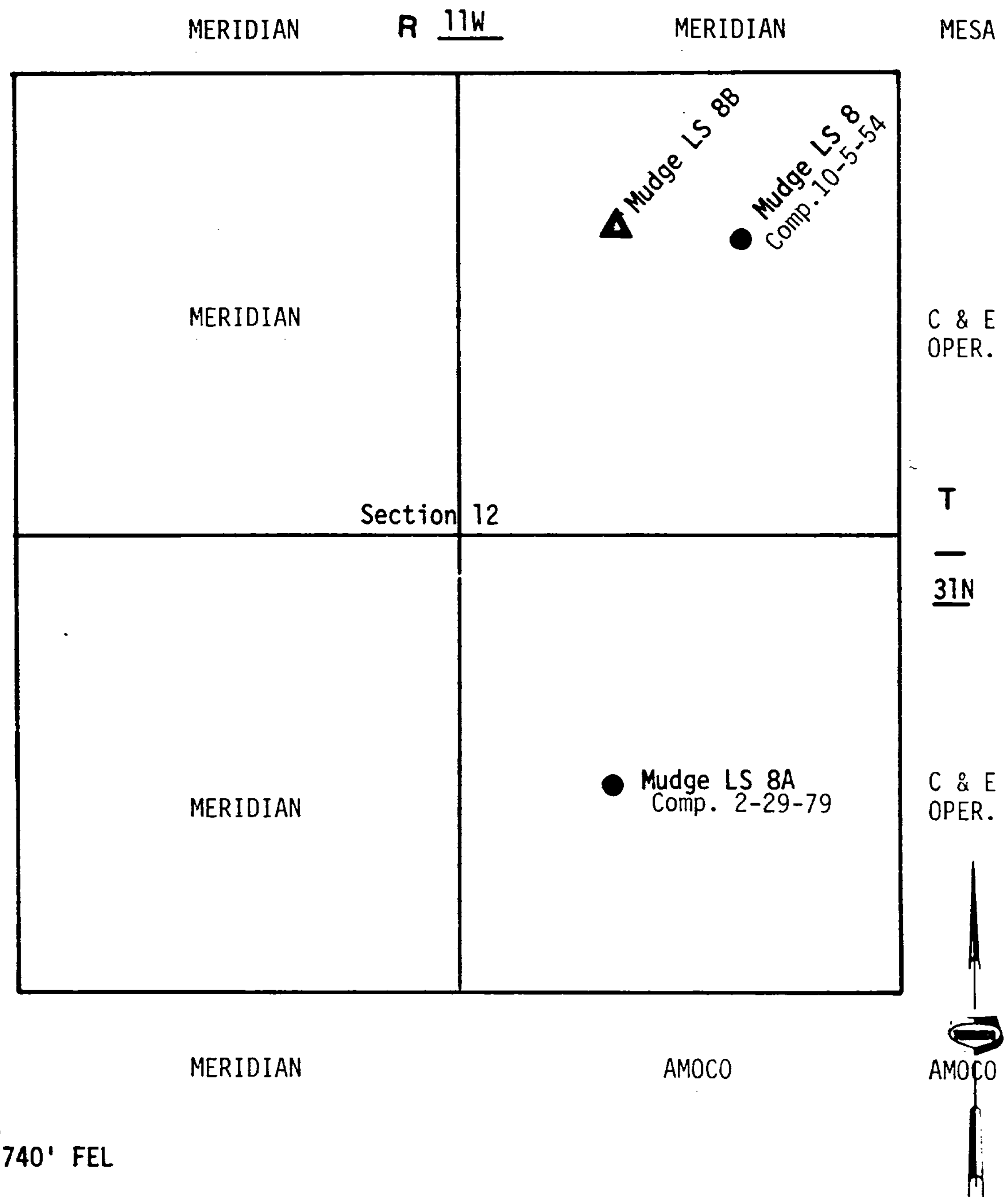
TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

△ Location Currently Staked

MUDGE LS 9B

SCALE IN FEET
0

DENVER, COLORADO



Mudge LS 8B
845' FNL, 1740' FEL

Mudge LS 8
990' FNL, 990' FEL

Mudge LS 8A
1715' FSL, 1180' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

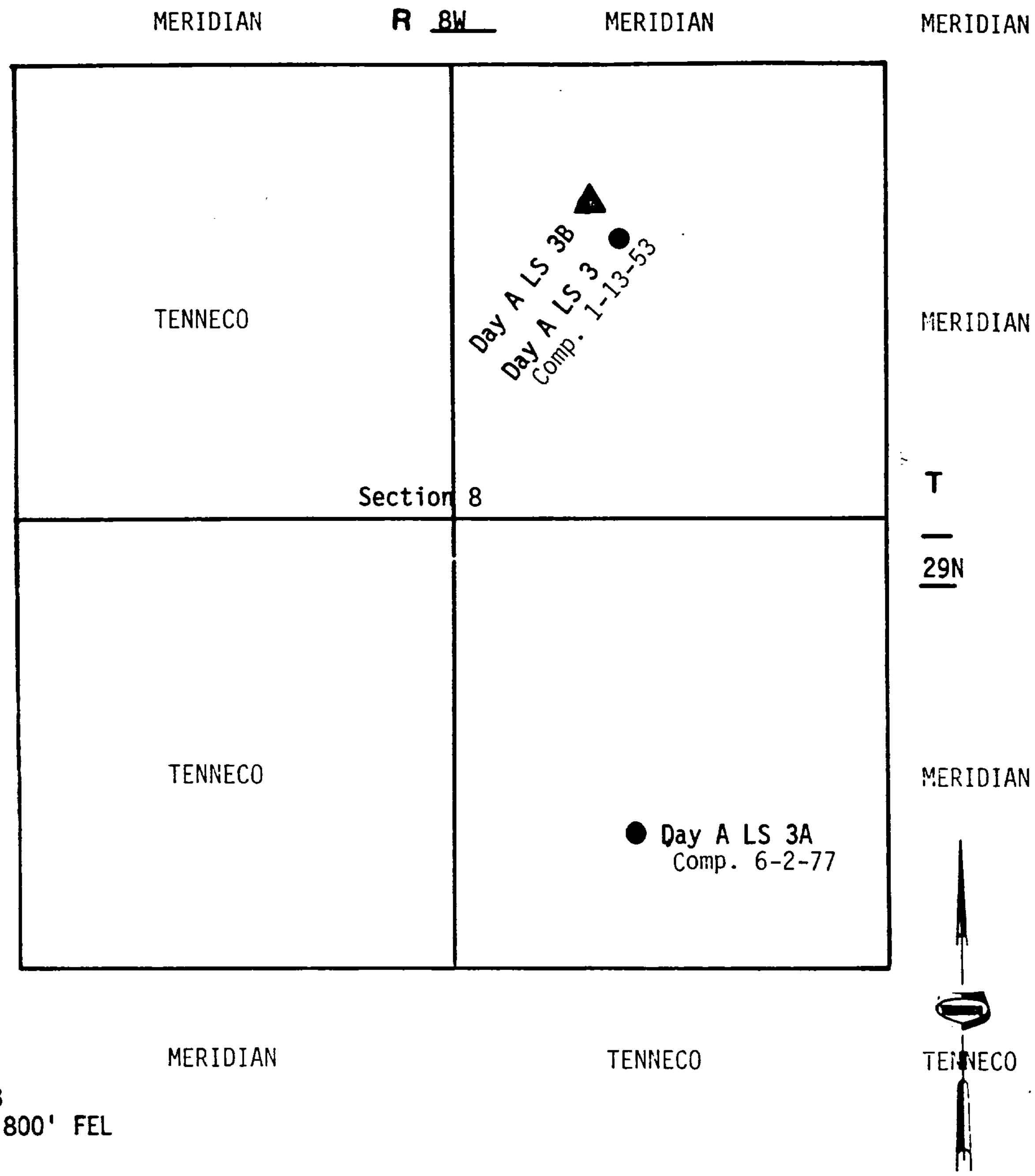
△ Location Currently Staked

MUDGE LS 8B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT G



Day A LS 3B
790' FNL, 1800' FEL

Day A LS 3
979' FNL, 1639' FEL

Day A LS 3A
800' FSL, 1530' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

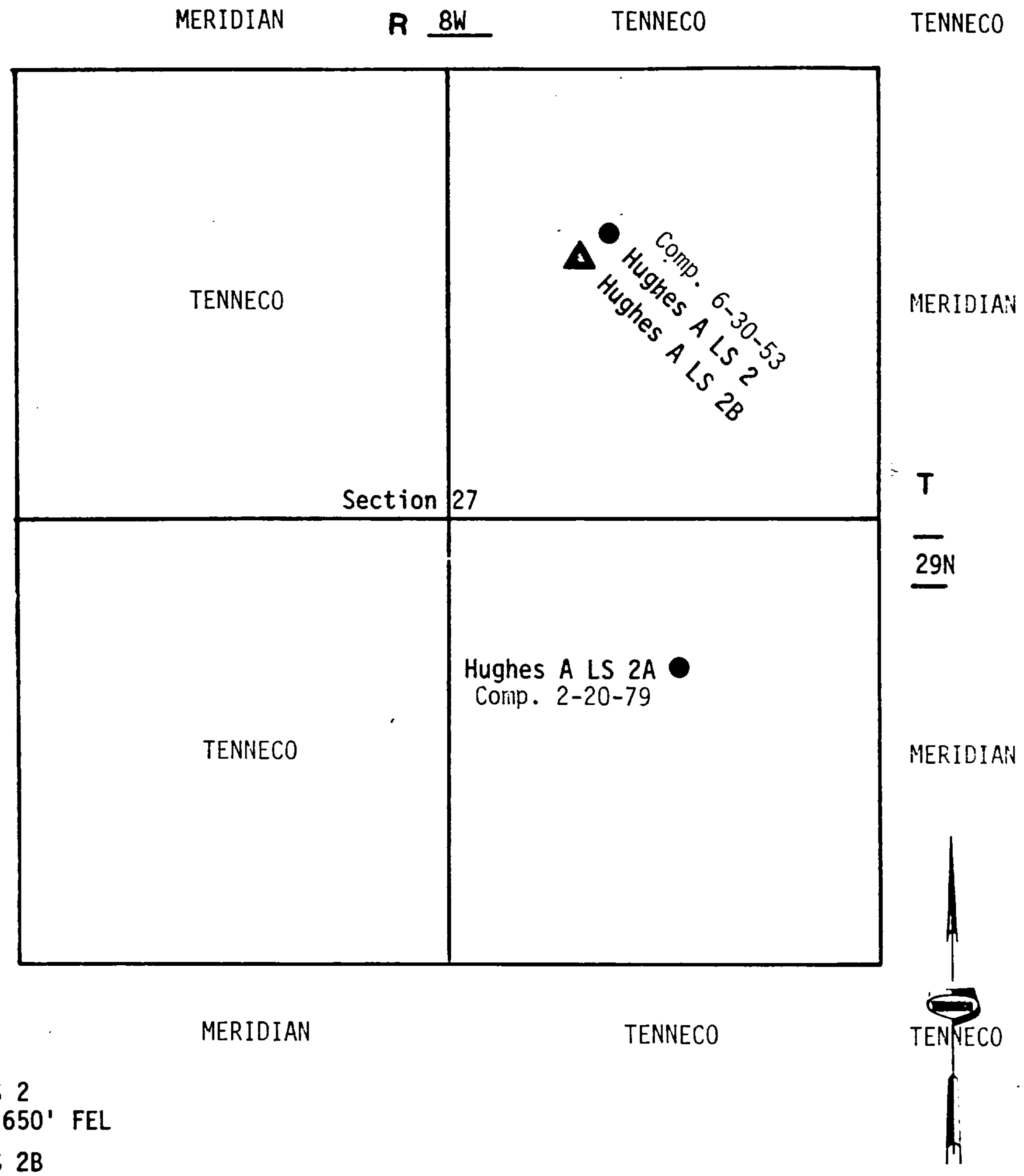
△ Location Currently Staked

DAY A LS 3B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT H



Hughes A LS 2
990' FNL, 1650' FEL

Hughes A LS 2B
1125' FNL, 1828' FEL

Hughes A LS 2A
1780' FSL, 1178' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

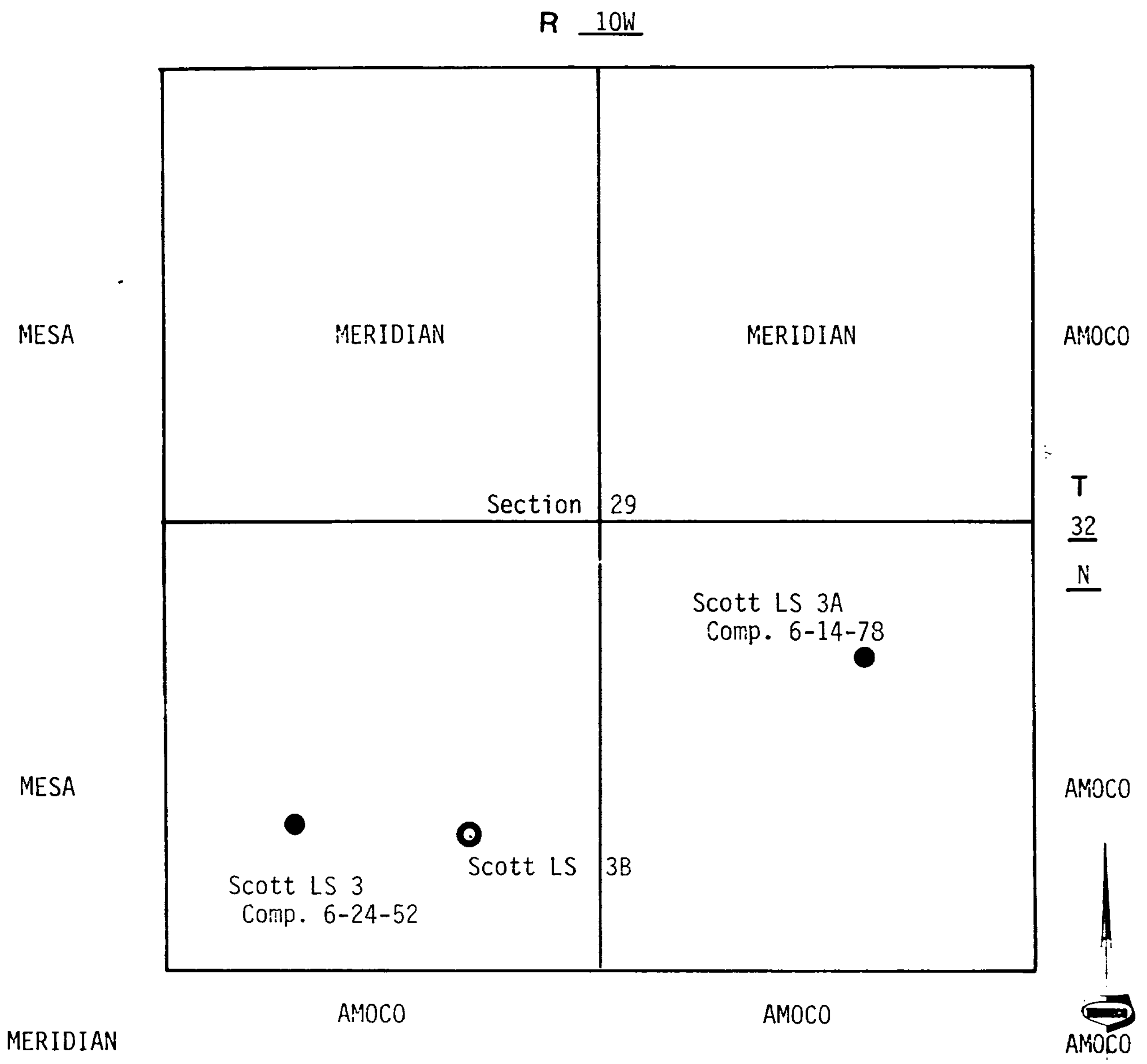
Δ Location Currently Staked

HUGHES A LS 2B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT I



Scott LS 3
990' FSL, 790' FWL

Scott LS 3A
1800' FSL, 1090' FEL

Scott LS 3B
790' FSL, 1850' FWL

EXHIBIT J

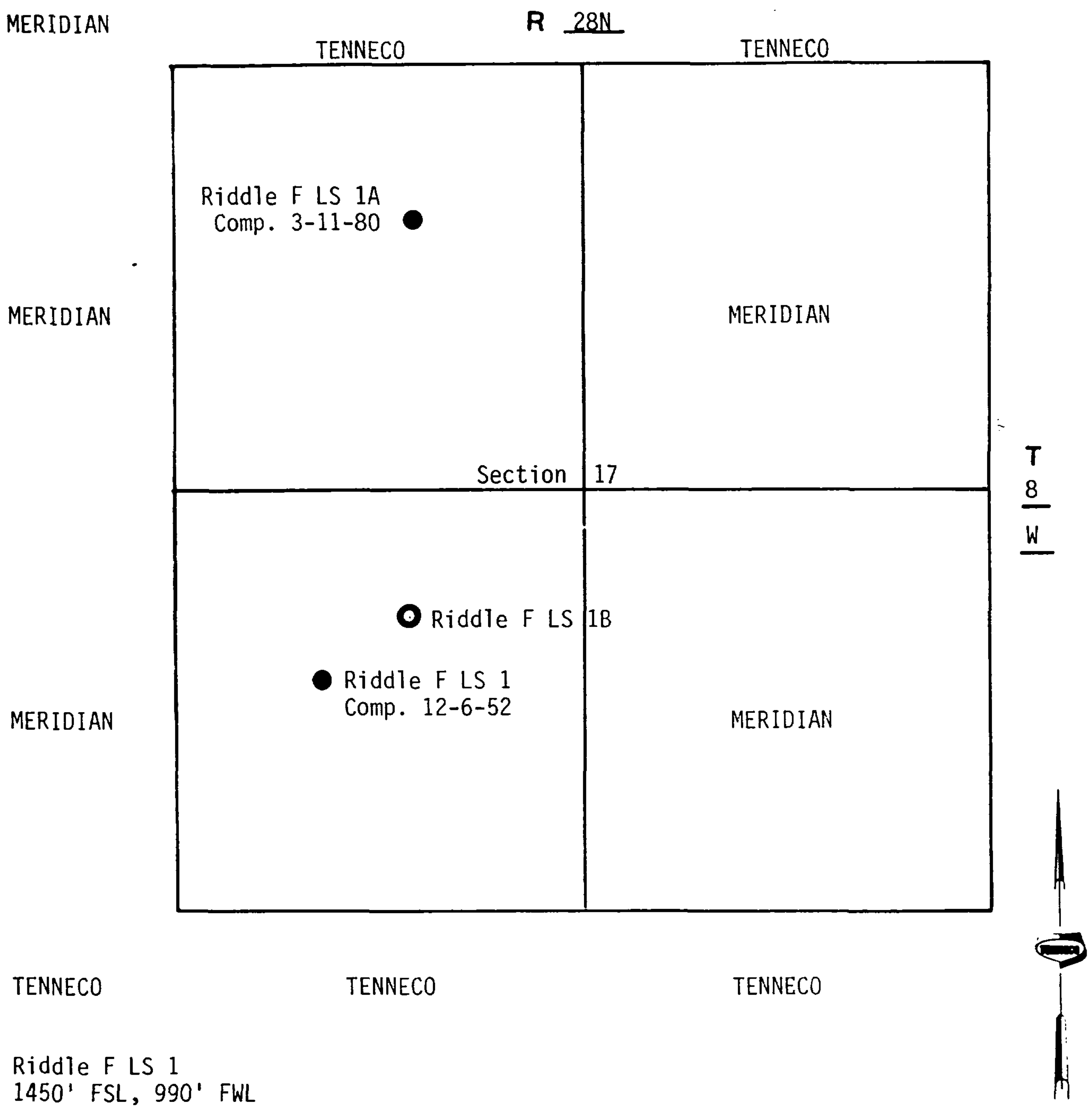
TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

O Tentative Location SW/4 (Unstaked)

SCOTT LS 3B

SCALE IN FEET
0

DENVER, COLORADO



Riddle F LS 1
1450' FSL, 990' FWL

Riddle F LS 1A
950' FNL, 1600' FWL

Riddle F LS 1B
1850' FSL, 1500' FWL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

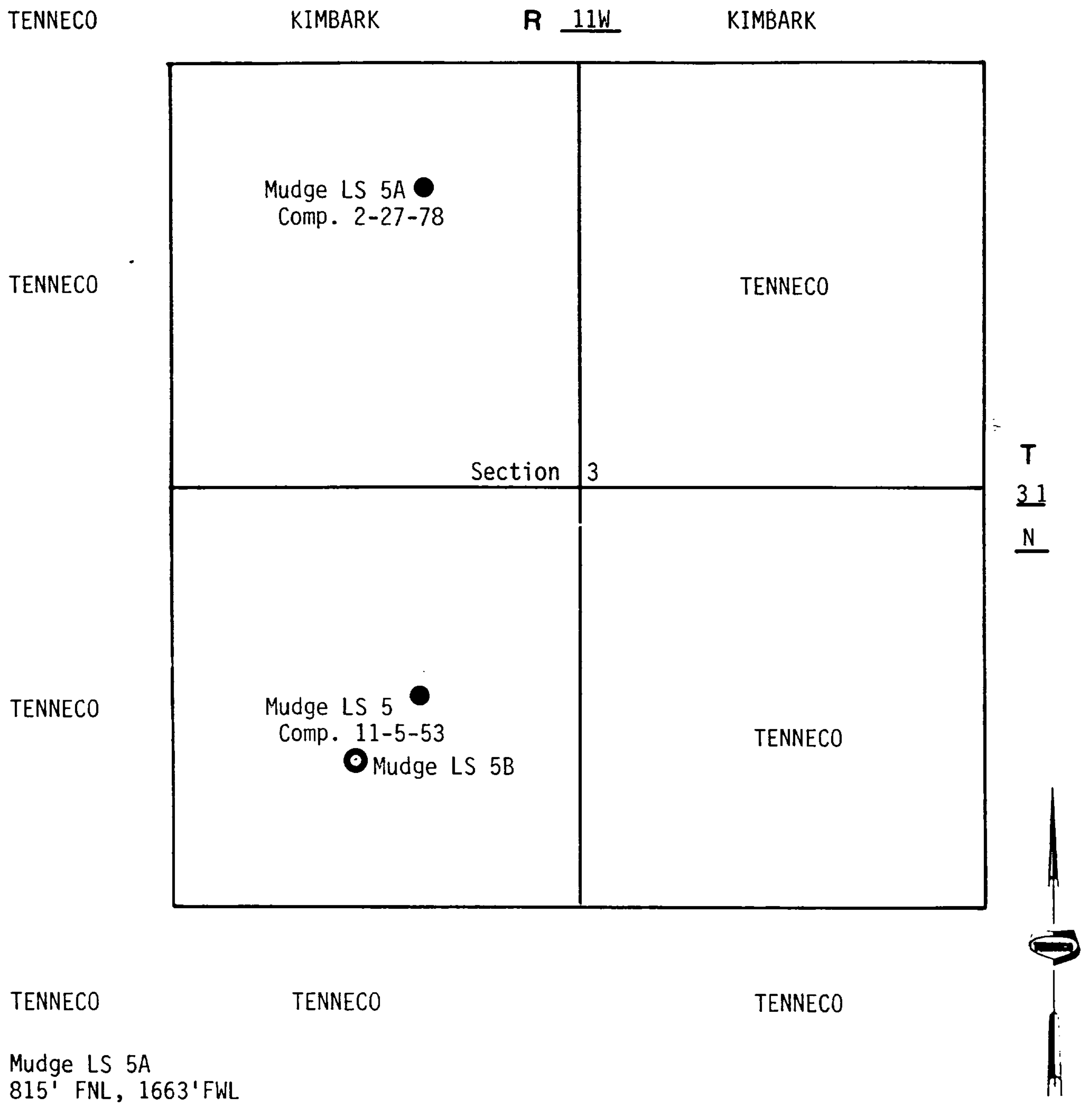
○ Tentative Location SW/4 (Unstaked)

RIDDLE F LS 1B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT K



Mudge LS 5A
815' FNL, 1663'FWL

Mudge LS 5
1450' FSL, 1650' FWL

Mudge LS 5B
900' FSL, 1190' FWL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

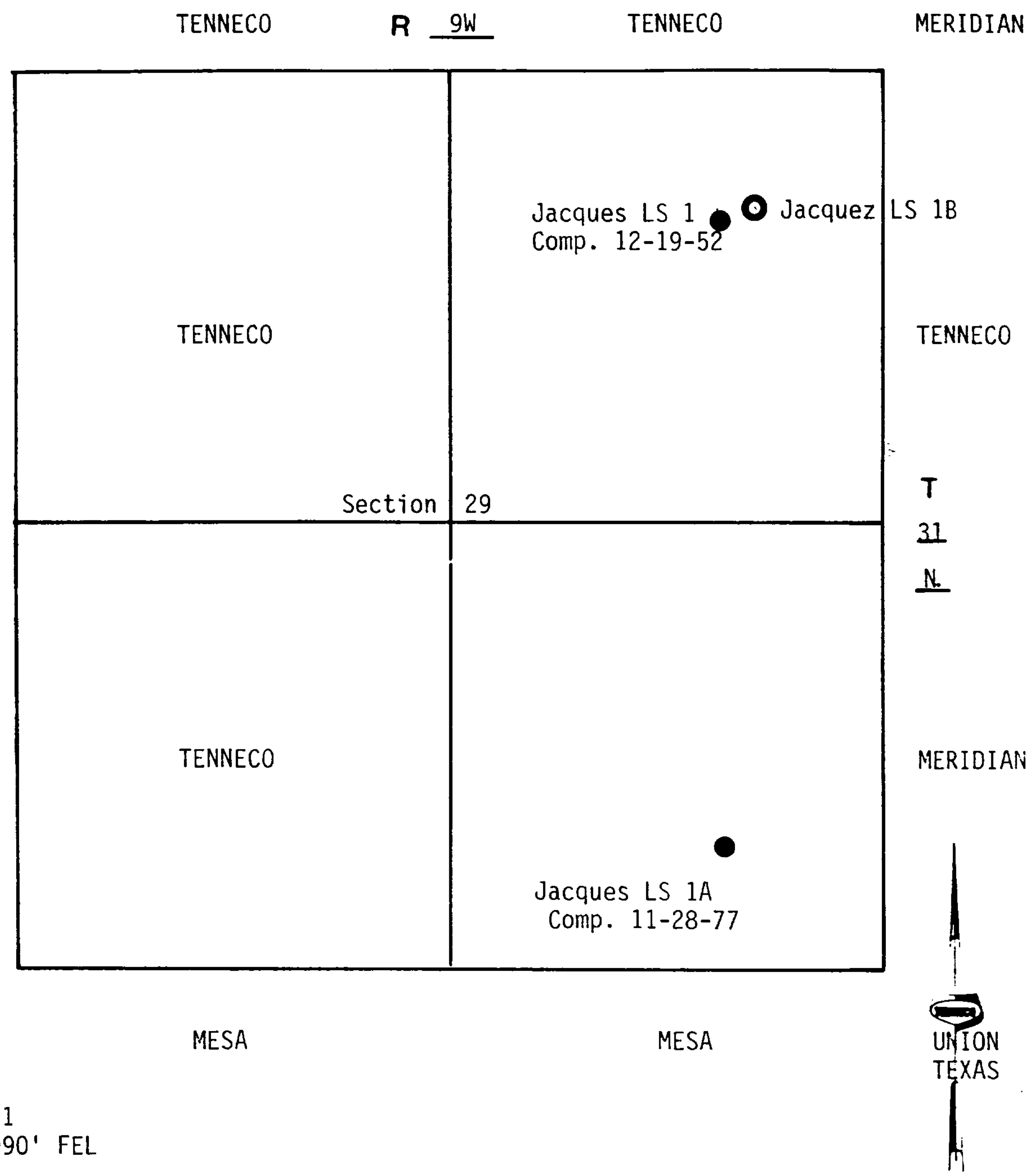
Tentative Location SW/4 (Unstaked)

MUDGE LS 5B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT L



Jacques LS 1
990' FNL, 990' FEL

Jacques LS 1A
850' FSL, 900' FEL

Jacquez LS 1B
790' FNL, 790' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

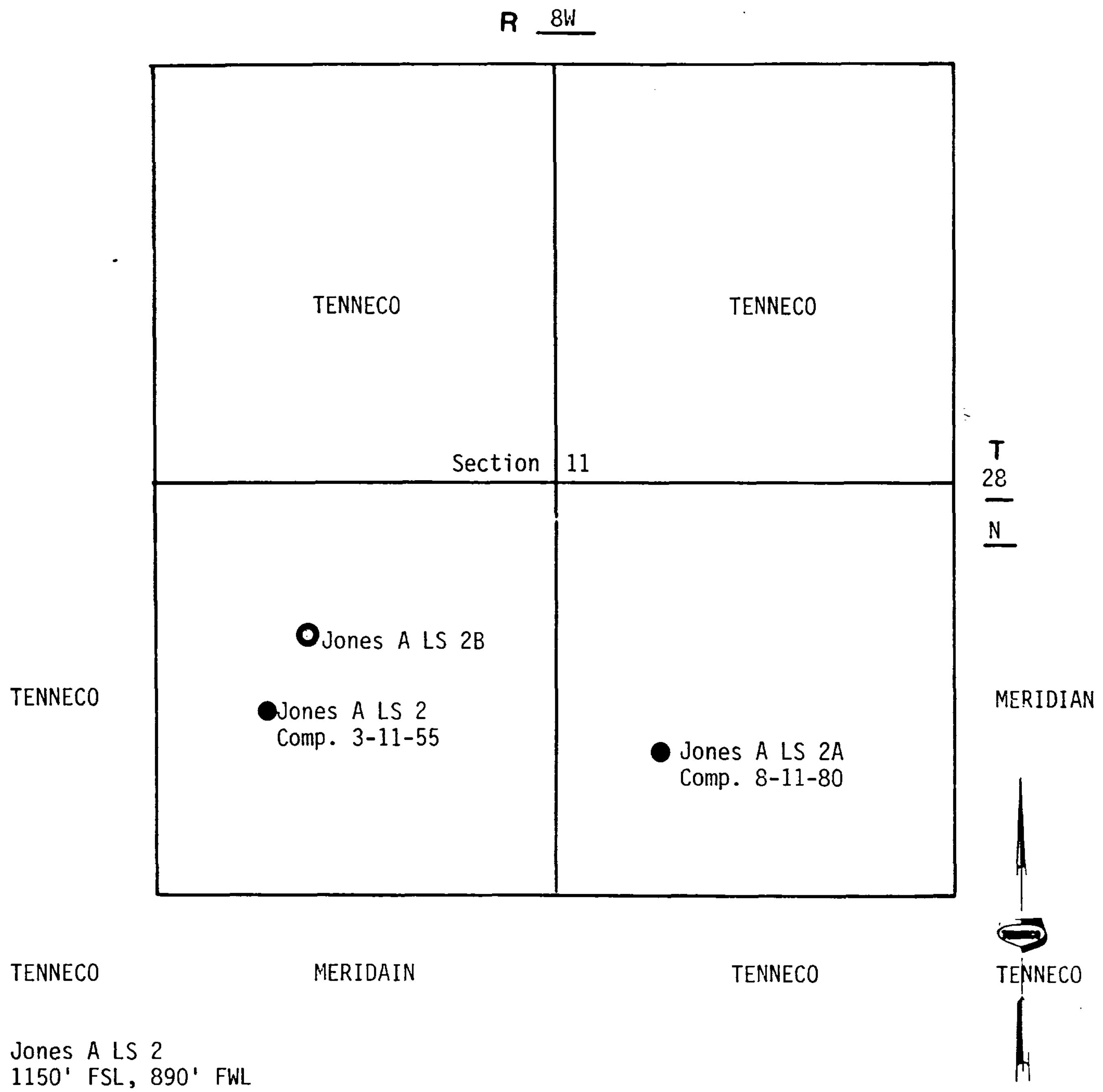
○ Tentative Location NE/4 (Unstaked)

JACQUES LS 1B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT M



Jones A LS 2
1150' FSL, 890' FWL

Jones A LS 2A
930' FSL, 1830' FEL

Jones A LS 2B
1650'FSL, 990'FWL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

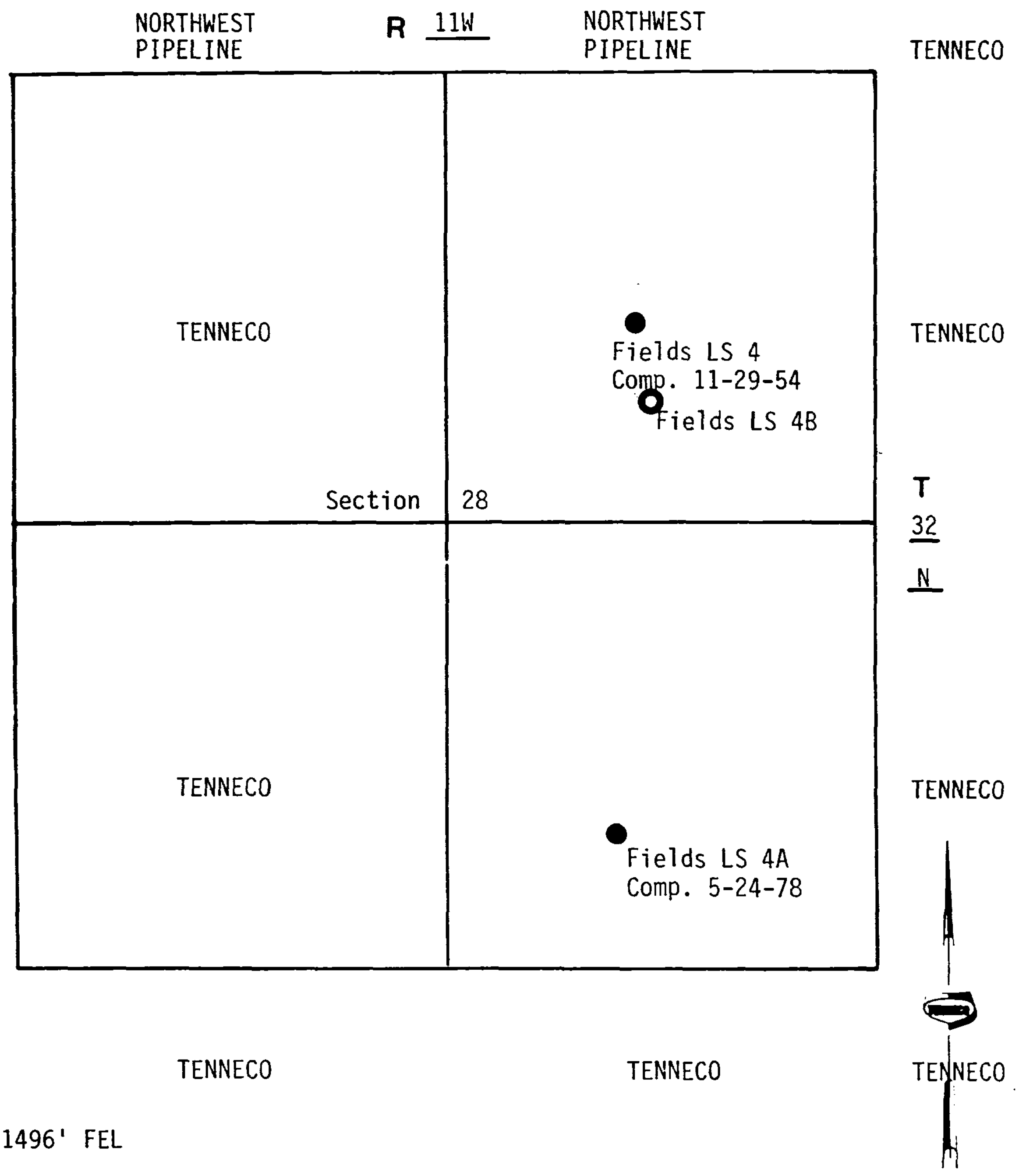
Tentative Location SW/4 (Unstaked)

JONES A LS 2B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT N



Fields LS 4
1488' FNL, 1496' FEL

Fields LS 4A
840' FSL, 1580' FEL

Fields LS 4B
1850' FNL, 1450' FEL

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

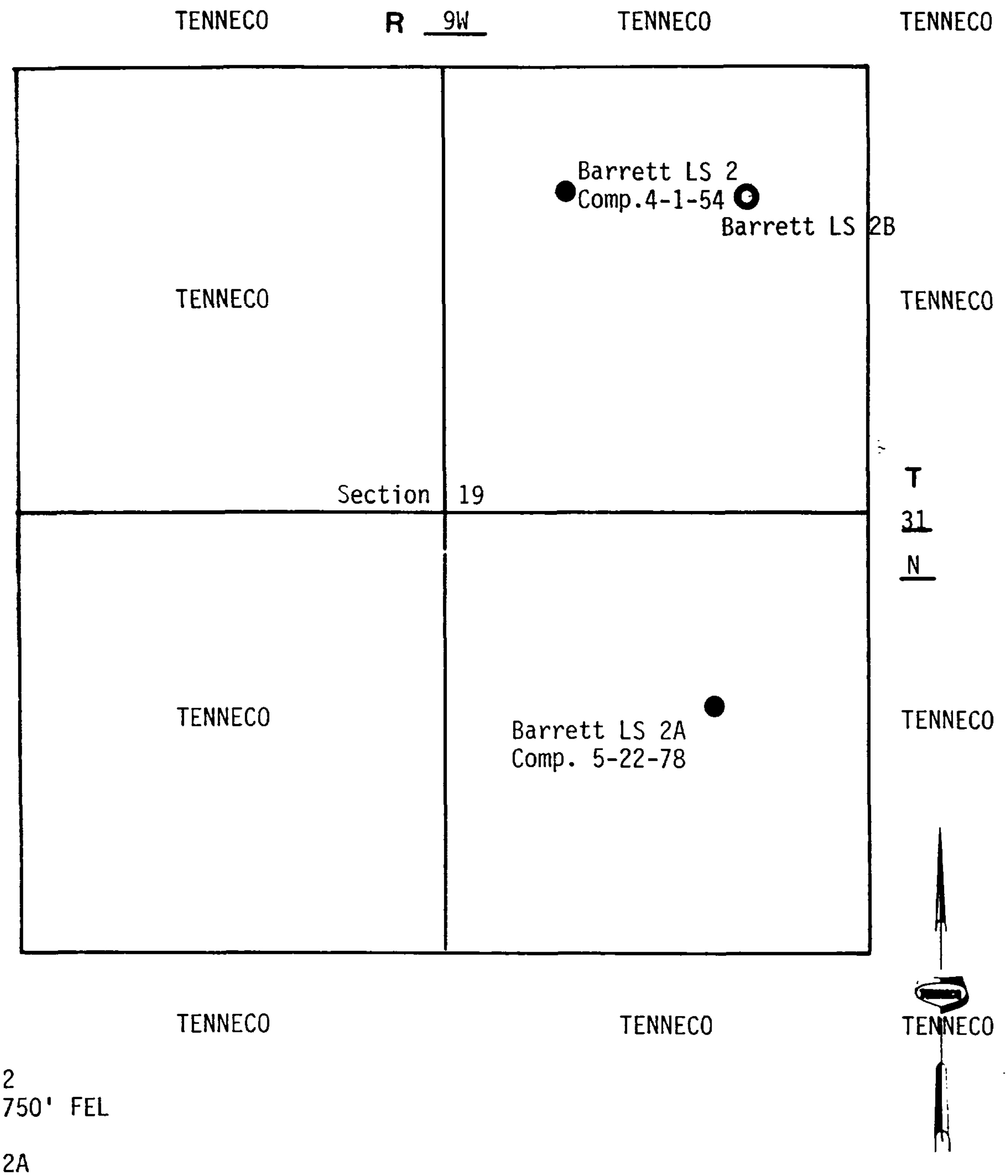
O Tentative Location NE/4 (Unstaked)

FIELDS LS 4B

SCALE IN FEET
0

DENVER, COLORADO

EXHIBIT O



Barrett LS 2
790' FNL, 1750' FEL

Barrett LS 2A
1500' FSL, 920' FEL

Barrett LS 2B
790' FNL, 790' FEL

EXHIBIT P

TENNECO OIL COMPANY
SUBSIDIARY OF TENNECO INC.

Tentative Location NE/4 (Unstaked)

BARRETT LS 2B

SCALE IN FEET
0

DENVER, COLORAD