ASE 6965: GETTY OIL COMPANY TO REOPEN TABLE NO. 6608, LEA COUNTY, NEW MEXICO

# CASE NO.

6865

APPlication,
Transcripts,
Small Exhibits,

ETC.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
9 April 1980

EXAMINER HEARING

IN THE MATTER OF:

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Application of Getty Oil Company to re-open Case No. 6608, Lea County, New Mexico.

BEFORE: Daniel S. Nutter

TPANSCRIPT OF HEARING

APPEARANCES

For the Oil Conservation Division:

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Santa Fe, New Mexico 87501

CASE

6865

For the Applicant:

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CAMPBELL & BLACK P. A.

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Santa Fe, New Mexico 87501

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MR. NUTTER: We'll call next Case Number

MR. PADILLA: Application of Getty Oil

Company to re-open Case Number 6608, Lea County, New Mexico.

MR. CARR: May it please the Examiner,

I'm William F. Carr, Campbell & Black, P. A., Santa Fe,

appearing on behalf of the applicant. I have two witnesses

who need to be sworn.

(Witnesses sworn.)

# HERMAN W. TERRY

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

## DIRECT EXAMINATION

BY MR. CARR:

will you state your name and place of

residence?

My name is Herman W. Terry. I reside in

Hobbs, New Mexico.

Mr. Terry, by whom are you employed and

in what capacity?

I'm employed by Getty Oil Company as the

Area Engineer for the Hobbs Area.

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Q Have you previously testified before this Commission and had your credentials accepted and made a matter of record?

A Yes, sir, I have.

And were you qualified at that time, as a petroleum engineer?

A Yes, sir, I was.

Are you familiar with the application in this case and the subject area?

A Yes, I am.

MR. CARR: Are the witness' qualifications

acceptable?

MR. NUTTER: Yes, they are.

Q Would you briefly state what Getty seeks with this application?

A We seek - the purpose of this hearing is to present evidence to establish the proper rate of production for wells in the Grama Ridge-Wolfcamp Pool.

Mr. Terry, would you summarize the events which have led up to this hearing?

Wolfcamp, the Wolfcamp zone was initially tested July 4th, 1979, and an Examiner Hearing was held July 25th, 1979.

At this hearing we requested permission to dually complete the well and we further requested temporary oil pool rules,

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which provided for 160-acre spacing.

At this hearing it was indicated that with a producing GOR of 5082-to-1, the liquid gravity of 49.7 degrees, and the physical appearance of the liquid, that we were not sure if it was an oil or a gas reservoir.

We requested that the case be re-opened in January of 1980 to allow us time to get further data to determine the actual nature of the reservoir.

Order Number R-6088 entered by the Division on August 28th, 1979, provided for temporary oil pool rules, which provided for 160-acre spacing, and that the case be re-opened in January of 1980.

A re-combination of reservoir gas and liquid was obtained and analyzed by Core Laboratories in Dallas. This re-combination indicated that the Wolfcamp Pool present in this well was in fact a retrograde condensate gas reservoir. This evidence was introduced at the Examiner Hearing held on January 16th, 1980, and it was requested that the Wolfcamp be reclassified as a gas reservoir.

Order Number R-6088-B was entered by
the Division on February 26th, 1980. This order reclassified
the Grama Ridge-Wolfcamp as a retrograde gas condensate
reservoir. It established special pool rules. It established a temporary daily allowable of 1500 Mcf per day, and

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it provided that the case be re-opened at an Examiner Hearing during May, 1920, to present evidence to establish the maximum efficient rate of withdrawal.

It further provided that the -- any cumulative casinghead gas overproduction at the beginning, as of March 1st, 1980, be the beginning status for the well, the gas -- as the beginning gas production status. The order allowed a maximum of three times the monthly allowable as the overproduced status for the well.

Because we were overproduced at this time, we shut the well in on March 4th, 1980. The well was reopened on April 4th, 1980, at which time the overproduction status was within the three times the monthly allowable. It was opened at a rate of 1500 Mcf per day.

MR. NUTTER: Now the sequence of orders, the first order, 6088, was the one that created the pool and classified it as an oil pool.

Yes, sir.

MR. NUTTER: And 6088-A was that nunc pro tunc order that changed the effective date of the 6088 --

Yes, sir, I didn't mention that, but essentially all that did was change the effective date of the order.

MR. NUTTER: And 6088-B was the one that reclassified it as a gas reservoir.

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Yes, sir, that's correct.

MR. NUTTER: Okay.

Mr. Terry, will you refer to what has been marked for identification as Getty Exhibit Number One and review this for Mr. Nutter?

Yes, sir. This is a plat of the Grama Ridge area and the subject well, Getty 36 State Com No. 1 is indicated in red. The location of this well is 1980 from the north line, 1650 from the west line, Section 36, Township 21 South, Range 34 East.

This plat also shows several other wells that have been drilled to the Morrow in this area in Sections 1, 2, and 35. These are wells that we've drilled.

The nearest offset wells to the Getty 36 State Com No. 1 is the Getty 36 State Com No. 2, which was completed in December of 1979, and we are presently drilling the Getty 35 State No. 2; we're drilling below 12,000 feet.

Both of these wells have penetrated the Wolfcamp interval. In the Getty 36 State Com No. 2 this interval was found nonporous.

In the Getty 35 State No. 2 the correlative interval in the 36 -- productive interval in the 36-1 was not found in the 35-2 Well.

MR. NUTTER: Which well is the first one

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that you mentioned, the Getty State Com No. 2?

A Yes, sir, that's down in the southeast quarter.

MR. NUTTER: That's on the Sabine lease there?

A. Yes, sir.

MR. NUTTER: Okay, and the Wolfcamp was nonproductive in that one.

A It was nonporous in that -- in that well.

MR. NUTTER: Okay.

A It was not -- the same correlative interval was not present in the 35-2 that we are presently drilling.

And the Getty State 36 No. 1 Well, then, is the only well producing from the Grama Ridge-Wolfcamp Gas Pool?

A Yes, sir, it is.

Q. Mr. Terry, will you now refer to Exhibit
Two and review that for Mr. Nutter?

A Yes, sir, this is a diagrammatic sketch of the dual completion in the Getty 36 State Com No. 1.

This has been presented at the other hearings. Basically,

I'd like to point out that none of this has been changed.

The well is still completed as it was originally completed.

This indicates the Wolfcamp perforations to be from 11,320

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to 11,335.

Now, Mr. Terry, would you refer to both Exhibits Three and Four and explain the information contained thereon?

Yes, sir. Exhibit Three is a tabulation of daily test data. What it is, it's a representative test taken during the week indicated in the far lefthand column, and what I'd like to point out is that by looking at Exhibit Four, this is a graphical representation of this data tabulated in Exhibit Three, and from this it can be seen that beginning approximately the first part of November the gas producing rate has been approximately 2-million per day; the condensate production rate has steadily declined, with the result that our condensate yield has exhibited a steady decline.

This well has been produced on a constant choke size of 13/64ths with one exception, which I'd like to point out this anomaly here in the middle of January. resulted when the well was shut in for a packer leakage test. When the well was re-opened it was produced for a short period of time on a 14/64ths inch choke at a rate of slightly over 3-million per day and 470 barrels of condensate per day.

> MR. NUTTER: What was the size of the

choke there?

A That was 14/64ths inch choke.

The well was then returned to the 13/64ths and the production stabilized to 2-million a day.

The well -- this graph depicts production history up to March the 4th, when the well was shut in due to the overproduced status. The well, as I've indicated earlier, the well was open to production on April 4th at the million and a half per day rate.

Q Will you now refer to Exhibit Number Five and review this for Mr. Nutter?

A Exhibit Number Five is a tabulation of monthly -- total monthly production from the Getty 36 State Com No. 1 Wolfcamp completion through February of 1980.

February's gas production has been estimated.

It indicates that the well has produced as of March 1st, 1980, a total of 82,258 barrels of condensate, and just over 417-million cubic feet of gas. These total cumulative production figures were used in our material balance calculations, which Mr. Eakin will present later.

Ω Do you have anything further to add to
your testimony?

A No, sir, I don't.

Q. Were Exhibits One through Five prepared either by you or under your direction and supervision?

A Yes, they were.

MR. CARR: At this time, Mr. Nutter, we would offer into evidence Applicant's Exhibits One through Five.

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

MR. CARR: I have nothing further on direct.

# CROSS EXAMINATION

BY MR. NUTTER:

Mr. Terry, after that packer leakage test, you said the well was opened up and put on a 14/64ths inch choke. How long did it produce on that choke?

Slightly over one day. It was just slightly over 24 hours, and actually we tried to put it back on the 13 and the choke was hard to read and it was determined later it was -- it was closer to a 14, rather than the 13 we --

And it was on such a short period of time that that increased production isn't reflected in the total monthly production there.

A No, it was just slightly over 24 hours at most.

Uh-huh. And now you say that ---

A However, it was --

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at this rate.

Q.

-- since April the 4th the well has returned to an under three times overproduced status and was turned back on. Yes, sir, that's correct. But it was shut in a total of about 30 days. It was shut in a total of 30 days there and then on the packer leakage test it was shut in approximately 48 hours for that, in January. Well now, what choke size have you got it on now to hold it down to 1500? I'm not -- I'm not sure. It would be something less than 13/64ths? Yes, sir, something less than 13. And you're not trying to produce at the regular setting and then just shut it in for a few days --No, sir. -- just to stay within that 1500 per day for the month. No, sir, we've stabilized production at 1500 Mcf per day. Per day? Yes, sir. We'll produce it all month

Now in this 36 No. 2, you say the Wolf-

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camp was not porous a half a mile to the southeast of the subject well, and the Wolfcamp producing interval was not present in the 35-2 Well.

No, sir, the same correlative interval was not present in the 35-2. We did penetrate some Wolfcamp lower to the 36-1 productive interval.

And those two wells are being taken on down to the Morrow, then?

Yes, sir, that's correct.

Is the Morrow still producing in this Q. subject well?

Yes, sir, it is.

What's it making?

Almost 2-million a day.

MR. NUTTER: Are there any further ques-

tions of mr. Torry? "- "- be excused,

MR. CARR: I'd call Mr. Jim Eakin.

### JAMES E. EAKIN, JR.

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

### DIRECT EXAMINATION

BY MR. CARR:

Will you state your name and place of

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### residence?

James E. Eakin, Junior, Midland, Texas.

Mr. Eakin, by whom are you employed and in what capacity?

By Getty Oil Company in Midland as Lead Reservoir Engineer

Have you previously testified before this Commission, had your credentials accepted and made a matter of record?

Yes, sir.

And were you previously qualified as a petroleum engineer?

Yes, sir.

Are you familiar with the subject application and the general area involved in this case?

Yes, sir, I am.

MR. CARR: Are the witness' qualification accepted?

MR. NUTTER: Yes, they are.

Will you please refer to what has been marked for identification as Getty's Exhibit Number Six and review for the Examiner the data contained thereon?

Exhibit Number Six is the build up test taken by Jarrel Service, Incorporated, of Hobbs, New Mexico. And this is a buildup test run with the well initially

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producing at a rate of 2.2-million a day. The bomb was run in the hole on February 26, with the well flowing; pressures were measured at a depth of 10,485 feet, extrapolated to mid-perfs of 11,328 feet.

Flowing bottom hole pressure at the time the bomb was run in the hole was 3,963 psi. After being shutin on that day and after being shutin for a period of 72 hours, the final builtup pressure at mid-perfs of 11,328, was 4,600 psi.

The third page of this buildup data is a pressure gradient, flowing pressure gradient, taken on February 26th at the time -- prior to the time the well was shutin.

Page four is a semilog plot made by Jarrel Services of the data, showing shutin time versus bottom hole pressure.

Page five of this buildup test is the shutin pressure gradient taken at the end of the 72 hours on February 29th of 1980.

Q. Mr. Eakin, will you now refer to what has been marked Exhibit Number Seven and review this for Mr. Nutter?

Exhibit Number Seven is the final reservoir fluid study, prepared by Core Laboratories in Dallas on the subject well.

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Since this data, or most of this data, was presented in the preliminary form on January 16th hearing, most of this has been submitted before and I will not go through all of the data again. I'll catch a few high points and note for you the additions to the data from the additional tests that Core Laboratories ran.

On the first page is a letter; indicated that dual samples were taken on September 9th, as Mr. Terry also recounted; that the recombined separator samples were entered into a PVT cell and analysis was then run on that. They determined that it was a retrograde gas condensate reservoir with a dewpoint of 5018 psi.

On page two I'll call attention to paragraphs two and three, which are additional paragraphs concerning the work done since the preliminary analysis. main points to be gathered here is that a larger volume of the fluid was charged into a larger high pressure cell. As the -- a depletion study was run and as the fluid, or the gas was drawn off of the cell, it was analyzed for composition, and volume measurements were made in order to determine compressibilities or Z factors for the gas produced at each pressure step.

As described in the last -- or next to the last paragraph, the compositions and the volumetric data was used to calculate surface recoveries, and these

calculations should be pointed out that these were formed on the basis of reservoir fluid in place at the dewpoint pressure not the original reservoir pressure.

Page one of the analysis by Core Laboratories is the same as that in the preliminary study. I would call attention to the original reservoir pressure of 7,255 psig at 11,328. This is mid-perfs.

September 12th, 1979, a pressure test at that time indicated 6,846 pounds pressure.

page two is a repeat of what was in the preliminary report.

The same for page three with the exception of the deviation factors being refined.

Page four is an additional page. This is the depletion study performed by Core Laboratories on the larger volume. This is a -- shows the analysis or the components of the produced we'll stream from that cell at the various pressures, beginning with the dewpoint pressure of 5,018 pounds and going down to 700 pounds in several steps.

Page five is further data concerning the calculated cumulative recovery during depletion and relates to the different components on the same pressure steps.

Page six is a repetition of the preliminary study; same data was presented there.

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Page seven is a graphical representation of the depletion study, showing the components and their percentages as a function of pressure depletion.

Page eight is the deviation factor or the Z factor compressabilities for the well stream gas produced from the cell.

Page nine is the volume of well stream produced during depletion, from pages four and five. This begins with zero cum as of the dewpoint pressure, function of pressure.

Page ten is cumulative recovery during completion. I would point out that we have another exhibit in our analysis, Exhibit Eight, will put this particular recovery in a form which is directly -- can be directly read, as far as depletion pressures, instead of yields, that can be read directly.

rage eleven is the cumulative recovery of plant products in the well stream below dewpoint.

And page twelve is the retrograde liquid accumulation during depletion, percent of hydrocarbon pore space occupied by liquids below dewpoint. This is a repetition of the preliminary study, also.

Mr. Eakin, will you now refer to Getty's Exhibit Number Eight and review this?

A Yes, sir. Exhibit Number Eight is an analysis of the Exhibit Seven and -- excuse me, Six and Seven that we have just covered. This was done by --

MR. NUTTER: Six was the Jacrel Services

A The bottom hole pressure buildup, yes.

MR. NUTTER: -- report and Seven is the

Core Lab report, right?

A Fluid analysis, that is correct, or PVT analysis.

I requested that Dr. Jim Varnon on my staff analyze the buildup data and the PVT analysis from Core Laboratories with the purpose in mind of determining the reserves, reservoir size, any increase in reserves that could be recovered by compression, the percent of recovery of the gas and of the liquids, and if the recovery efficiency was rate sensitive.

I'll take you through the analysis that he has here. We'll start with the cover letter as it brings out the high points of his detailed calculations in the attachment.

The analysis of both of these previous exhibits indicates that this is a limited reservoir, and this is confirmation of a buildup test that was taken in September of '79. The September '79 buildup analysis was not submitted previously because there was an apparent

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mechanical failure of the recording equipment during that test and it threw a doubt on the validity of the data, and therefor it was not presented and we decided to wait until a later date and we had a little more cumulative production and we could tie down the reservoir withdrawals and get a material balance calculation that was valid for this well.

Original reservoir pressure, July 4th,
'79, 7,255 psi. The buildup pressure on February 29th of
1980, 4,600 psi. That's a decrease of 2,655 psi, which does
indicate considerable depletion in the reservoir.

MR. NUTTER: On that Jarrel's report, that 4600 is in the righthand column there. Where are those two columns? The first one is a --

A The first one is the actual measured depth at which the pressure bomb was located, 10,485 feet.

MR. NUTTER: Uh-huh, that's the actual depth.

measuring device.

The second column, 11,328 feet, is the mid-perfs location, and this is an extrapolated pressure found at 10,485, using the pressure gradients.

MR. NUTTER: He did not lower the bomb to the mid-perfs, then.

A. No, sir, did not.

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MR. NUTTER: So that's an extrapolated pressure to mid-perfs.

A Yes, sir.

MR. NUTTER: Okay, go ahead.

A All right. Transmissibility, or normally referred to as kh, was calculated from the buildup as 288 millidarcy feet.

Skin factor calculated as +17, which is rather high. I will explain that further down in the letter.

The reservoir pressure drawdown for the 2.2-million cubic feet per day rate was 193 psi.

Original separator gas reserves with surface compression, 2.46 billion cubic feet of gas. That is approximately 72 percent.

n That's without.

A Excuse me, what did I say? Oh, without, pardon me. The first one here is without surface compression, 2.46 billion cubic feet of gas. This is approximately 72 percent of the original gas in place.

would be 2.73 billion cubic feet of gas, or 80 percent recovery of the original gas in place. This would be an increase of 270 million cubic feet of gas, an increase of 8 percent.

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MR. NUTTER: What kind of surface compression are you talking about there?

This would be taking pressure from zero wellhead pressure up to 500 pounds line pressure.

MR. NUTTER: In other words, you're producing down to zero surface pressure.

Zero surface pressure. A.

MR. NUTTER: And the other one would be

just down to 500?

Down to the line pressure of 500 pounds. MR. NUTTER: Okay, so this is down to --We'll cover this a little bit more in detail in the -- his detailed analysis in the back. I'll go through this and point these out.

MR NUTTER: Okay.

All right. The original condensate reserves without surface compression, 147,000 stock cank harrels. This is 18.9 percent recovery.

With surface compression, 151,000 stock tank barrels, a 19.4 percent recovery of the original liquids in place. This is an increase of 4000 barrels of condensate This is only a half of 1 percent increase in recovery.

Further down in the letter he indicates that the large skin factor is caused by the narrow perforate interval in this well and can be eliminated at any time by

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additional perforations.

The perforated interval is approximately 16 feet out of a 116 feet gross pay, approximately 94 feet net pay. The small pressure drawdown, 193 psi, is the result of the large reservoir kh, good permeability, thick reservoir, and low production rate, 2.2 million per day, which is an indication that the rate could be increased considerably without any expected effect on the ultimate recovery.

Liquid yield, as indicated in his last paragraph summing this up, has dropped from 230 stock tank barrels per day -- excuse me, stock tank barrels per million, to 125 stock tank barrels per million, and it will continue to drop below 50 barrels per million.

Pressure maintenance, he indicates, is probably not feasible. We'll describe this later. And is less feasible as liquids drop out in the reservoir.

pages, which he has marked as Exhibits 1, 2, and 3, I will refer to those as the attachment exhibits, 1, 2, and 3.

If you would mark this attachment exhibit

1, or hold this place, and turn to the first page of his

detailed analysis, and follow me through on the high points

of his detailed analysis here.

Paragraph I, he describes that a log-log

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plot was prepared of this buildup data, but that all of the afterflow had taken place before the first data point was recorded or indicated, and therefor the log-log plot was a flat line and had no significance, so therefor it was not included in this attachment.

Second paragraph, a semilog plot is Exhibit 1, which I asked you to hold the place there. The thing to note here is that this curve is typical of a limited reservoir and also of a good reservoir in its producing characteristics, in that it builds up rather rapidly, and you will note that at a shutin time of .25 Delta T, which is your shutin time in hours, approximately 15 minutes, almost all of the pressure has been builtup at that time, at about 40 pounds away from final buildup pressure.

Slope calculations of the final buildup stages on this well show a P of 4600 psig, slope of 30 psi per cycle, from which is calculated the 288 millidarcy feet, using 94 net feet of pay in this well, calculate a 3.1 millidarcies as permeability for the well.

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Pressure drawdown of the reservoir itself to achieve a 2.2 million rate is only 193 pounds, and this is a very small reservoir drawdown for the amount of deple-

tion, the 2655 psi drawdown that we have had on the reservoir

This is one indication that this well produces, or the reservoir produces, almost like a tank, which is similar to the cell in which Core Laboratories ran their analysis. This is indicative or significant later in this -- in his analysis here.

Page two of his detailed work, paragraph III, is basic data for buildup calculation, showing 94 feet of net pay in the wellbore; porosity of 15 percent; water saturation 20 percent; reservoir temperature, of course, 196 degrees Fahrenheit.

Paragraph IV a standy State rate prein which he calculated a rate that corresponds -- a theoretical rate which corresponds very well with the actual producing rate of 2.2 million.

Page three and page four is the determination of abandonment pressure of the reservoir. He goes through his calculations. Significantly, he has used the 200 pounds, or approximately 200 pounds as the reservoir differential in order for the well to produce down to apan-

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donment pressures, and assumed a skin factor, or a  $\Delta P$  skin of zero, presuming that we would additionally perforate the well in the later stages of its production.

On page four, top of page four, he indicates that with no surface compressor, Pwh, or wellhead pressure of 500 pounds line pressure, that the abandonment pressure in the reservoir would be 1300 psi.

With surface compressor, the wellhead pressure would be drawn down to zero compressor suction. The reservoir abandonment pressure would be 1000 psi.

We observed no water production at all for this well, other than, I believe, the very first day of production, which a little bit of the stimulation water.

On page four the reserves paragraph, paragraph VI, A, is the original gas in place calculation of 4.1 billion cubic feet of gas.

Page five, under B, is the reserves of gas and condensate, and this is shown graphically, this is taken from Core Laboratories depletion and flash calculations and is shown graphically as Exhibit 2, if you would turn to the attached Exhibit 2.

This is the cumulative production , cumulative separator gas scale at the bottom and the bottom curve, cumulative condensate stock tank barrels for the scale at the top and the top -- uppermost curve, versus

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reservoir pressure. You can see the initial reservoir pressure of 7,255 pounds and the test in September of about 6846, and the current pressure indicated there of about 4600 psi.

reservoir, the predicted data from Core Laboratories information and from their analysis, is the solid line; another evidence that this is producing similar to a tank or similar to Core Laboratories analysis is that the field data, the points located within the circles, fall almost on top of the predicted line.

This is almost a textbook case. We seldon ever see this in actual practice.

By looking at -- reading in at the abandonment reservoir pressures, you can read directly the cumulative gas and the cumulative condensate to be recovered trom this reservoir.

Back on page five of his detailed work,
these numbers -- we've outlined these numbers. Lower portion
of the page, without surface compression, the abandonment
pressure reservoir-wise would be 1300 psig; gas reserves,
2,460 MMCF; condensate reserves, 147,000 stock tank barrels.

With surface compression, reservoir abandonment pressure of 1000 psig; gas reserves, 2,760 -- excuse me, 2,730 MMCF; condensate reserves of 151,000 barrels.

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On page six, C, --

MR. NUTTER: Excuse me, Exhibit 2 there, which shows your cumulative condensate and separator gas, this is taking it down to that reservoir abandonment pressure of 1300 pounds, isn't it?

Yes, it is extrapolated on down to 1000.

You can see the dashed line is the extrapolation of those -
MR. NUTTER: Right, where their points

meet there at 1300, apparently.

A. Yes.

MR. NUTTER: And that's the -- where you get the 147,000 barrels of condensate and the 2700 -- or wait a minute -- and 2460 --

A. Yes, sir.

MR. NUTTER: -- million cubic feet.

A Yes, sir. The only reason these curves cross at that point is that -- the way the scale was presented. A different scale would have had them cross at different points.

By readingit at 1000 pounds and extrapolated lines on this, you'd come out with these other -- the other reserve numbers.

MR. NUTTER: Go ahead.

A Okay. On page six, paragraph C, liquid yield versus cumulative gas production, is the attachment

Exhibit 3, another example of the field data falling very close to the prediction, and another indication of it being produced like a tank.

This is a slightly different representation, or presentation, compared to I believe it was Exhibit Four, where Mr. Terry presented, showing yields and producing rates versus time. This is the yield versus cumulative gas production.

You'll notice that the prediction has a very sharp drop in the yields, and it also indicated that the field data is following this very well, not that we're happy about that.

Paragraph D on page six is a reservoir radius, or calculations that can be used to determine approximate reservoir extent. Calculations from 4.1 billion cubic feet of gas indicate an acre feet of 2,585. From this using the net pay observed in the wellbore of 94 feet, a circular reservoir would have a radius of 618 feet. This is equivalent to approximately 28 acres in areal extent.

If an average pay thickness of the reservoir is used of 47 feet, you come up with 873 feet for the radius and equivalent acreage of 55 acres. This is a very small reservoir, obviously.

> MR. NUTTER: What was the 618 feet? The 618 feet is equivalent to approxi-

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mately 28 acres.

MR. NUTTER: 28 acres.

And the 873, approximately 55 acres.

This limited reservoir is confirmed by the Exhibit One, the plat that Mr. Terry presented, showing that the nearest wells, which are approximately half a mile in distance from this well, have not penetrated the same interval.

On page seven, paragraph E, Mr. Varnon has prepared some additional information and some remarks concerning the additional recovery.

It shows that the original gas in place,
4.1 billion cubic feet of gas; shows a recovery of approximately 80 percent; original stock tank liquids in place of
778,000 stock tank barrels, with a recovery efficiency of
approximately 19 percent.

He indicates in his write-up here in this last main paragraph, the pressure depletion will give excellent gas recovery but will leave some 627,000 stock tank barrels of condensate in the ground. It may be advisable to consider some type of inert gas pressure maintenance project, but there are some discouraging factors to be considered with any type of pressure maintenance on this reservoir.

First, is that due to the limited size and the wells that have already been drilled offsetting this,

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near offsets, and then we have not penetrated, and probably will not penetrate this reservoir with any other wells, that the potential reserves are not large enough to support much, if any, expense to develop any source of injection gas, whether it be inert, nitrogen, CO2, any type of additional recovery for pressure maintenance.

The reservoir pressure is already below dewpoint and he indicates that retrograde dropout is about 70 percent of the maximum already.

MR. NUTTER: It's already achieved 70 percent dropout?

Dropout, of what it would dropout, and its revaporization with inert gas is, or may not be possible.

Sould another well be drilled -- should another well penetrate this, the recovery would be not the best, sweep efficiency would not be the best with a two-well reservoir, sweeping between two wells. We would not get a pattern effect or areal sweep; probably channel straight through is the case most times with either water injection, waterflood operations, or gas injection or cycling project.

Now, Mr. Eakin, you may have testified to this, but let me be sure I understand it. Is this reservoir, in your opinion, rate sensitive?

There are a couple of things that we can mention concerning whether or not it's rate sensitive,

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based on exhibits that we've seen and data of drilling the well.

We have had no indication of any kind that this reservoir contains any mobile fines, or any movable small particles in the reservoir that might move toward the wellbore and plug it, causing a restriction or reducing the ability due to rate.

There's no indication of any water influx to the reservoir. It appears to be a closed reservoir, depletion type drive, and therefor a restriction of the rate in order to have withdrawals less than a water influx to maintain the pressure above the dewpoint is not — is not feasible. And on this basis, if there is no water influx, it's not possible to outrun a drive mechanism, a water drive type mechanism, since there's no water drive.

This data is confirmed, or the rate sensitivity is confirmed, partially by Exhibit Four, if you'll refer to that, at the same size choke, a 13/64ths, held a constant rate of about 2-million a day for several months, approximately November, October and November, through March with no indication at the surface that there was any problems with producing -- or with production.

The reservoir pressure has been estimated to be below dewpoint, approximately mid to late January of 1980, and you can then see by the exhibit Four that there was

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no drastic change in the producing characteristics either by rate or by yield, and that the well is also capable of producing 3 billion a day with no significant changes to rates or yields, shown on that same exhibit.

Do you have a recommendation to make to the Examiner concerning the maximum rates with withdrawal from this reservoir?

A We would recommend the rate of 3-million cubic feet a day, based on the capabilities or capacities of the production facilities on that lease.

Q And are you requesting that this order be made retroactive to March 1, 1980?

A. Yes, sir, we are asking that it be made retroactive to March 1, which was the date the last order set the rate of a million and a half a day until a maximum effective rate could be determined. We ask that it be made retroactive to that.

Mr. Eakin, in your opinion will granting this application be in the interest of conservation, the prevention of waste, and the protection of correlative rights?

- A Yes, sir, I do.
- Q Have you reviewed Exhibits Six through
  Eight and can you testify from your own information and your
  own knowledge as to their accuracy?

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Yes, sir.

MR. CARR: At this time, Mr. Examiner, we would offer into evidence Getty Exhibits Six through Eight.

MR. NUTTER: Getty Exhibits Six through Eight will be admitted in evidence.

### CROSS EXAMINATION

BY MR. NUTTER:

Now, Mr. Eakin, you've likened this a number of times in your testimony to producing gas out of a tank.

Yes, sir, that's right.

We've already got 70 percent of the liquids in the gas have dropped out in the reservoir, and we Com see that the condensate production as going down rather rapidly, which I suppose is a reflection of this condensate having dropped out --

Yes, sir.

-- and not being producable now.

Yes, sir. The assumption is that the -and the calculations that the -- in Mr. Varnon's analysis -that the liquid that has dropped out is not mobile.

Just dropped out to the bottom of the tank and it's sitting there?

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Well, it's not actually a tank. We could put a pump on it and produce it. would be great.

It does -- the reason we say it produces like a tank is that the pressure response throughout the reservoir, because it is a small reservoir, because of the permeability and porosity in this reservoir, that the pressure response to the boundaries is very rapid, similar to what you would have in a tank. It is similar in its producing characteristics. It is not a tank; it only represents it.

Yeah, well, I can see when you're talking about a radius of drainage of either 618 or 873 feet that you don't have a very large reservoir there, and of course, the smaller the reservoir, the less effect a rapid drawdown would have.

What I had visualized on this reservoir was a bigger structure and with a high rate of withdrawal, a rapid depletion of pressure around the wellbore with a resultant dropout of fluids and a reduction of the permeability of the reservoir's gas, because of the liquids that had dropped out around the wellbore. But you don't feel that's happening here?

- No, sir, it does not appear to be.
- You're having a more --
- The rapid response.
- You're having a more uniform dropout Ç.

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throughout the reservoir.

That is correct, sir.

Because of its small size.

Right, pressure is coming down in the entire reservoir very rapidly, or I say timewise very rapidly from the response. The response to the boundaries of the reservoir is very rapid and therefor your pressure is coming down throughout the reservoir --

Uniformly.

-- uniformly, and the pressure, the dropout appears to be throughout the reservoir with no response or no restriction in rate due to dropout of the liquids near the wellbore.

I'd like to figure out some way where we could write an order that's going to produce 627,000 stock tank barrels of condensate that Varnon says is in the ground and going to stay there.

I wish we could, too. I could point out that in quite a few of the oil reservoirs that are depletion type drive, that 19 - 20 percent, some of our reservoirs, the San Andres and others, that 15 percent recovery by primary methods is -- is normal, and requires waterflooding when the reservoirs are large enough.

Well, we have some depletion type reservoirs that get 35 percent, too,

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MR. NUTTER: Are there any further questions of Mr. Eakin? He may be excused.

Do you have anything further, Mr. Carr?

MR. CARR: Nothing further, Mr. Hutter.

MR. NUTTER: Does anyone have anything to

offer in Case Number 6865?

We'll take the case under advisement.

(Hearing concluded.)

LLY W. BOYD, C.8 Rt. 1 Box 193-B

# REPORTER'S CERTIFICATE

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sacry W. Poyd C. D.R.

do hereby certificthat the foregoing is a complete record of the proceedings in the Examiner hearing of Color to. 6865 heard by me on Examiner Examiner

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STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
9 April 1980

#### EXAMINER HEARING

IN THE MATTER OF:

Application of Getty Oil Company to re-open Case No. 6608, Lea County, New Mexico.

CASE 6865

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

### APPEARANCES

For the Oil Conservation Division:

Ernest L. Padilla. Esq. Legal Counsel to the Division State Land Office Bldg. Santa Fe, New Mexico 87501

For the Applicant:

William P. Carr, Esq. CAMPBELL & BLACK P. A. Jefferson Place Santa Fe, New Mexico 87501

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MR NUTTER: We'll call next Case Number

MR. PADILLA: Application of Getty Oil
Company to re-open Case Number 6608, Lea County, New Mexico.

MR. CARR: May it please the Examiner,

I'm William F. Carr, Campbell & Black, P. A., Santa Fe,

appearing on behalf of the applicant. I have two witnesses
who need to be sworn.

#### (Witnesses sworn.)

#### HERMAN W. TERRY

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

#### DIRECT EXAMINATION

BY MR. CARR:

Q Will you state your name and place of residence?

My name is Herman W. Terry. I reside in Hobbs, New Mexico.

Q Mr. Terry, by whom are you employed and in what capacity?

A I'm employed by Getty Oil Company as the Area Engineer for the Hobbs Area.

LY W. BOYD, C.S.F R. 1 Box 193-B Inta Fe, New Mexico 87301 Brane (ASD 45, 2400

	Page
Co	Have you previously testified before this manission and had your credentials accepted and made a mat-
t	er of record?
	Yes, sir, I have.
	And were you qualified at that time, as
Z	petrolewn engineer?
	Yes, sir, I was.
	Are you familiar with the application in
	this case and the subject area?
	Yes. I am.
	MR. CARR: Are the witness' qualification
	acceptable?
	MR. NUTTER: Yes, they are.
	Q Would you briefly state what Getty seeks
	with this application?
	we seek the purpose of this near
	to present evidence to establish the proper rate of production
В	Ridge-Wolfcamp Pool.
9	for wells in the Grammarize the events  Ar. Terry, would you summarize the events
<b>3</b> 0	which have led up to this hearing?
21	yes, sir. The Getty 36 State out
22	wolfcamp zone was initially tested July 4th,
23	number Hearing was held buly and
24	requested permission to duality
25	At this hearing we requested temporary oil pool rules, the well and we further requested temporary oil pool rules,

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21 **22**  which provided for 160-acre spacing.

At this hearing it was indicated that with a producing GOP of 5082-to-1, the liquid gravity of 49.7 degrees, and the physical appearance of the liquid, that we were not sure if it was an oil or a gas reservoir.

We requested that the case be re-opened in January of 1980 to allow us time to get further data to determine the actual nature of the reservoir.

Order Number R-6088 entered by the Division on August 28th, 1979, provided for temporary oil pool rules, which provided for 160-acre spacing, and that the case be re-opened in January of 1980.

A re-combination of reservoir gas and liquid was obtained and analyzed by Core Laboratories in Dallas. This re-combination indicated that the Wolfcamp Pool present in this well was in fact a retrograde condensate gas reservoir. This evidence was introduced at the Examiner Hearing held on January 16th, 1980, and it was requested that the Wolfcamp be reclassified as a gas reservoir.

Order Number R-6088-B was entered by the Division on February 26th, 1980. This order reclassified the Grama Ridge-Wolfcamp as a retrograde gas condensate reservoir. It established special pool rules. It established a temporary daily allowable of 1500 Mcf per day, and

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it provided that the case be re-opened at an Examiner Hearing during May, 1980, to present evidence to establish the maximum efficient rate of withdrawal.

It further provided that the -- any cumulative casinghead gas overproduction at the beginning, as of March 1st, 1980, be the beginning status for the well, the gas -- as the beginning gas production status. The order allowed a maximum of three times the monthly allowable as the overproduced status for the well.

Because we were overproduced at this time, we shut the well in on March 4th, 1980. The well was reopened on April 4th, 1980, at which time the overproduction status was within the three times the monthly allowable. It was opened at a rate of 1500 Mcf per day.

MR. NUTTER: Now the sequence of orders, the first order, 6088, was the one that created the pool and classified it as an oil pool.

Yes, sir.

MR. NUTTER: And 6088-A was that nunc pro tunc order that changed the effective date of the 6088 --

Yes, sir, I didn't mention that, but essentially all that did was change the effective date of the order.

MR. NUTTER: And 6088-B was the one that reclassified it as a gas reservoir.

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Yes, sir, that's correct.

MR. NUTTER: Okay.

Mr. Terry, will you refer to what has been marked for identification as Getty Exhibit Number One and review this for Mr. Nutter?

Yes, sir. This is a plat of the Grama Ridge area and the subject well, Getty 36 State Com No. 1 is indicated in red. The location of this well is 1980 from the north line, 1650 from the west line, Section 36, Township 21 South, Range 34 East.

This plat also shows several other wells that have been drilled to the Morrow in this area in Sections 1, 2, and 35. These are wells that we've drilled.

The nearest offset wells to the Getty 36 State Com No. 1 is the Getty 36 State Com No. 2, which was completed in December of 1979, and we are presently drilling the Getty 35 State No. 2; we're drilling below 12,000 feet.

Both of these wells have penetrated the Wolfcamp interval. In the Getty 36 State Com No. 2 this interval was found nonporous.

In the Getty 35 State No. 2 the correlative interval in the 36 -- productive interval in the 36-1 was not found in the 35-2 Well.

MR. NUTTER: Which well is the first one

that you mentioned, the Getty State Com No. 27

Yes, sir, that's down in the southeast quarter.

That's on the Sabino lease

Yes, sir.

MR. NUTTER: Okay, and the Wolfcamp was nonproductive in that one.

> It was nonporous in that -- in that well. MR. NUTTER: Okay.

It was not -- the same correlative interval was not present in the 35-2 that we are presently drilling.

And the Getty State 36 No. 1 Well, then, is the only well producing from the Grama Ridge-Wolfcamp Gas Pool?

Yes, sir, it is.

Mr. Torry, will you now refer to Exhibit Two and review that for Mr. Nutter?

Yes, sir, this is a diagrammatic sketch of the dual completion in the Getty 36 State Com No. 1. This has been presented at the other hearings. Basically, I'd like to point out that none of this has been changed. The well is still completed as it was originally completed. This indicates the Wolfcamp perforations to be from 11,320

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there?

to 11,335.

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Now, Mr. Terry, would you refer to both Exhibits Three and Four and explain the information contained thereon?

Yes, sir. Exhibit Three is a tabulation of daily test data. What it is, it's a representative test taken during the week indicated in the far lefthand column, and what I'd like to point out is that by looking at Exhibit Four, this is a graphical representation of this data tabulated in Exhibit Three, and from this it can be seen that beginning approximately the first part of November the gas producing rate has been approximately 2-million per day; the condensate production rate has steadily declined, with the result that our condensate yield has exhibited a steady decline.

This well has been produced on a constant choke size of 13/64ths with one exception, which I'd like to point out this anomaly here in the middle of January. This resulted when the well was shut in for a packer leakage test. When the well was re-opened it was produced for a short period of time on a 14/64ths inch choke at a rate of slightly over 3-million per day and 470 barrels of condensate per day.

> What was the size of the MR. NUTTER:

choke there?

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A That was 14/64ths inch choke.

The well was then returned to the 13/64ths and the production stabilized to 2-million a day.

The well -- this graph depicts production history up to March the 4th, when the well was shut in du to the overproduced status. The well, as I've indicated earlier, the well was open to production on April 4th at the million and a half per day rate.

Q Will you now refer to Exhibit Number Five and review this for Mr. Nutter?

A Exhibit Number Five is a tabulation of monthly -- total monthly production from the Getty 36 State Com No. 1 Wolfcamp completion through February of 1980.

February's gas production has been estimated.

as of March 1st, 1980, a total of 82,258 barrels of condensate, and just over 417-million cubic feet of gas. These total cumulative production figures were used in our material balance calculations, which Mr. Eakin will present later.

Q Do you have anything further to add to your testimony?

A No, sir, I don't.

Q Were Exhibits One through Five prepared either by you or under your direction and supervision?

A Yes, they were.

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MR. CARR: At this time, Mr. Nutter, we would offer into evidence Applicant's Exhibits One through Five.

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

MR. CARR: I have nothing further on

### CROSS EXAMINATION

BY MR. NUTTER:

direct.

Mr. Terry, after that packer leakage test, you said the well was opened up and put on a 14/64ths inch choke. How long did it produce on that choke?

slightly over one day. It was just slightly over 24 hours, and actually we tried to put it back on the 13 and the choke was hard to read and it was determined later it was -- it was closer to a 14, rather than the 13 we --

And it was on such a short period of time that that increased production isn't reflected in the total monthly production there.

A No, it was just slightly over 24 hours at most.

Q Uh-huh. And now you say that --

A. However, it was --

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Q	si	nce Ap	ril the	4th	the	well	has	re-
turned to an under	three	times	overpro	oduce	d st	tatus	and	was
turned back on.								

- A. Yes, sir, that's correct.
- Q But it was shut in a total of about 30 days.

A It was shut in a total of 30 days there and then on the packer leakage test it was shut in approximately 48 hours for that, in January.

Q. Well now, what choke size have you got it on now to hold it down to 1500?

- A I'm not -- I'm not sure.
- Q It would be something less than 13/64ths?
- A Yes, sir, something less than 13.
- Q. And you're not trying to produce at the regular setting and then just shut it in for a few days --
  - A. No, sir.
- 0 -- just to stay within that 1500 per day for the month.

No, sir, we've stabilized production at 1300 Mcf per day.

- 2 Per day?
- A. Yes, sir. We'll produce it all month at this rate.
  - Q. Now in this 36No. 2, you say the Wolf-

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camp was not porous a half a mile to the southeast of the subject well, and the Wolfcamp producing interval was not present in the 35-2 Well.

No, sir, the same correlative interval was not present in the 35-2. We did penetrate some Wolfcamp lower to the 36-1 productive interval.

And those two wells are being taken on down to the Morrow, then?

Yes, sir, that's correct.

Is the Morrow still producing in this subject well?

Yes, sir, it is.

What's it making?

Almost 2-million a day.

MR. NUTTER: Are there any further questions of Mr. Terry? He may be excused.

MP CAPP: I'd call Mr. Jim Eakin.

JAMES E. EAKIN, JR.

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

#### DIRECT EXAMINATION

BY MR. CARR:

Will you state your name and place of

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residence?

James E. Eakin, Junior, Midland, Texas.

Mr. Eakin, by whom are you employed and in what capacity?

By Getty Oil Company in Midland as Lead Reservoir Engineer.

Have you previously testified before this Commission, had your credentials accepted and made a matter of record?

Yes, sir.

And were you previously qualified as a petroleum engineer?

Yes, sir.

Are you familiar with the subject application and the general area involved in this case?

Yes, sir, I am.

MR. CARR: Are the witness' qualification accepted?

MR. NUTTER: Yes, they are.

Will you please refer to what has been marked for identification as Getty's Exhibit Number Six and review for the Examiner the data contained thereon?

Exhibit Number Six is the build up test taken by Jarrel Service, Incorporated, of Hobbs, New Mexico. And this is a buildup test run with the well initially

producing at a rate of 2.2-million a day. The bomb was run in the hole on February 26, with the well flowing; pressures were measured at a depth of 10,485 feet, extrapolated to mid-perfs of 11,328 feet.

the bomb was run in the hole was 3,963 psi. After being shutin on that day and after being shutin for a period of 72 hours, the final builtup pressure at mid-perfs of 11,328, was 4,600 psi.

The third page of this buildup data is a pressure gradient, flowing pressure gradient, taken on February 26th at the time -- prior to the time the well was shutin.

Page four is a semilog plot made by

Jarrel Services of the data, showing shutin time versus

bottom hole pressure.

Page five of this buildup test is the shutin pressure gradient taken at the end of the 72 hours on February 29th of 1980.

Mr. Eakin, will you now refer to what has been marked Exhibit Number Seven and review this for Mr. Nutter?

Exhibit Number Seven is the final reservoir fluid study, prepared by Core Laboratories in Dallas on the subject well.

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Since this data, or most of this data,
was presented in the preliminary form on January 16th hearing,
most of this has been submitted before and I will not go
through all of the data again. I'll catch a few high points
and note for you the additions to the data from the additional tests that Core Laboratories ran.

On the first page is a letter; indicated that dual samples were taken on September 9th, as Mr. Terry also recounted; that the recombined separator samples were entered into a PVT cell and analysis was then run on that. They determined that it was a retrograde gas condensate reservoir with a dewpoint of 5018 psi.

On page two I'll call attention to paragraphs two and three, which are additional paragraphs concerning the work done since the preliminary analysis. The main points to be gathered here is that a larger volume of the fluid was charged into a larger high pressure cell. As the — a depletion study was run and as the fluid, or the gas was drawn off of the cell, it was analyzed for composition, and volume measurements were made in order to determine compressibilities or 2 factors for the gas produced at each pressure step.

As described in the last -- or next to the last paragraph, the compositions and the volumetric data was used to calculate surface recoveries, and these

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calculations should be pointed out that these were formed on the basis of reservoir fluid in place at the dewpoint pressure not the original reservoir pressure.

Page one of the analysis by Core Laboratories is the same as that in the preliminary study. I would call attention to the original reservoir pressure of 7,255 psig at 11,328. This is mid-perfs.

September 12th, 1979, a pressure test at that time indicated 6,846 pounds pressure.

Page two is a repeat of what was in the preliminary report.

The same for page three with the exception of the deviation factors being refined.

Page four is an additional page. This is the depletion study performed by Core Laboratories on the larger volume. This is a -- shows the analysis or the components of the produced well stream from that cell at the various pressures, beginning with the dewpoint pressure of 5,018 pounds and going down to 700 pounds in several steps.

Page five is further data concerning the calculated cumulative recovery during depletion and relates to the different components on the same pressure steps.

Page six is a repetition of the preliminary study; same data was presented there.

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Page seven is a graphical representation of the depletion study, showing the components and their percentages as a function of pressure depletion.

Page eight is the deviation factor or the Z factor compressabilities for the well stream gas produced from the cell.

Page nine is the volume of well stream produced during depletion, from pages four and five. This begins with zero cum as of the dewpoint pressure, function of pressure.

Page ten is cumulative recovery during completion. I would point out that we have another exhibit in our analysis, Exhibit Eight, will put this particular recovery in a form which is directly -- can be directly read, as far as depletion pressures, instead of yields, that can be read directly.

Page eleven is the cumulative recovery of plant products in the well stream below dewpoint.

accumulation during depletion, percent of hydrocarbon pore space occupied by liquids below dewpoint. This is a repetition of the preliminary study, also.

Q Mr. Eakin, will you now refer to Getty's Exhibit Number Eight and review this?

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A Yes, sir. Exhibit Number Eight is an analysis of the Exhibit Seven and -- excuse me, Six and Seven that we have just covered. This was done by --

MR. NUTTER: Six was the Jarrel Services

A. The bottom hole pressure buildup, yes.

MR. NUTTER: -- report and Seven is the

Core Lab report, right?

A. Fluid analysis, that is correct, or PVT analysis.

I requested that Dr. Jim Varnon on my staff analyze the buildup data and the PVT analysis from Core Laboratories with the purpose in mind of determining the reserves, reservoir size, any increase in reserves that could be recovered by compression, the percent of recovery of the gas and of the liquids, and if the recovery efficiency was rate sensitive.

I'll take you through the analysis that he has here. We'll start with the cover letter as it brings out the high points of his detailed calculations in the attachment.

exhibits indicates that this is a limited reservoir, and this is confirmation of a buildup test that was taken in September of '79. The September '79 buildup analysis was not submitted previously because there was an apparent

mechanical failure of the recording equipment during that test and it threw a doubt on the validity of the data, and therefor it was not presented and we decided to wait until a later date and we had a little more cumulative production and we could tie down the reservoir withdrawals and get a material balance calculation that was valid for this well.

Original reservoir pressure, July 4th, '79, 7,255 psi. The buildup pressure on February 29th of 1980, 4,600 psi. That's a decrease of 2,655 psi, which does indicate considerable depletion in the reservoir.

MR. NUTTER: On that Jarrel's report, that 4600 is in the righthand column there. Where are those two columns? The first one is a ---

The first one is the actual measured depth at which the pressure bomb was located, 10,485 feet.

MR. NUTTER: Uh-huh, that's the actual

That's the actual depth of the pressure measuring device.

The second column, 11,328 feet, is the mid-perfs location, and this is an extrapolated pressure found at 10,485, using the pressure gradients.

MR. NUTTER: He did not lower the bomb to the mid-perfs, then.

No, sir, did not.

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depth.

MR. NUTTER: So that's an extrapolated pressure to mid-perfs.

A Yes, sir.

MR. NUTTER: Okay, go ahead.

All right. Transmissibility, or normally referred to as kh, was calculated from the buildup as 288 millidarcy feet.

Skin factor calculated as +17, which is rather high. I will explain that further down in the letter.

The reservoir pressure drawdown for the 2.2-million cubic feet per day rate was 193 psi.

Original separator gas reserves with surface compression, 2.46 billion cubic feet of gas. That is approximately 72 percent.

n That's without.

A. Excuse me, what did I say? Oh, without, pardon me. The first one here is without surface compression, 2.46 billion cubic feet of gas. This is approximately 72 percent of the original gas in place.

would be 2.73 billion cubic feet of gas, or 80 percent recovery of the original gas in place. This would be an increase of 270 million cubic feet of gas, an increase of 8 percent.

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SALLY W. BOYD, C.S.R Rt. 1 Box 193-B Santa Fe, New Medico 67501 Phone (505) 455-7409 MR. NUTTER: What kind of surface compression are you talking about there?

A This would be taking pressure from zero wellhead pressure up to 500 pounds line pressure.

MR. NUTTER: In other words, you're producing down to zero surface pressure.

A Zero surface pressure.

MR. NUTTER: And the other one would be just down to 500?

A. Down to the line pressure of 500 pounds.

MR. NUTTER: Okay, so this is down to --

A We'll cover this a little bit more in detail in the -- his detailed analysis in the back. I'll go through this and point these out.

MR NUTTER: Okay.

A All right. The original condensate reserves without suffice complession, 147,000 stock tank barrels. This is 18.9 percent recovery.

With surface compression, 151,000 stock tank barrels, a 19.4 percent recovery of the original liquids in place. This is an increase of 4000 barrels of condensate. This is only a half of I percent increase in recovery.

that the large skin factor is caused by the narrow perforated interval in this well and can be eliminated at any time by

additional perforations.

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The perforated interval is approximately 16 feet out of a 116 feet gross pay, approximately 94 feet net pay. The small pressure drawdown, 193 psi, is the result of the large reservoir kh, good permeability, thick reservoir, and low production rate, 2.2 million per day, which is an indication that the rate could be increased considerably without any expected effect on the ultimate recovery.

Liquid yield, as indicated in his last paragraph summing this up, has dropped from 230 stock tank barrels per day -- excuse me, stock tank barrels per million, to 125 stock tank barrels per million, and it will continue to drop below 50 barrels per million.

Pressure maintenance, he indicates, is probably not feasible. We'll describe this later. And is less feasible as liquids drop out in the manufer

To eliminate confusion on the next three pages, which he has marked as Exhibits 1, 2, and 3, I will refer to those as the attachment exhibits, 1, 2, and 3.

If you would mark this attachment exhibit 1, or hold this place, and turn to the first page of his detailed analysis, and follow me through on the high points of his detailed analysis here.

Paragraph I, he describes that a log-log

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plot was prepared of this buildup data, but that all of the afterflow had taken place before the first data point was recorded or indicated, and therefor the log-log plot was a flat line and had no significance, so therefor it was not included in this attachment.

Second paragraph, a semilog plot is Exhibit 1, which I asked you to hold the place there. The thing to note here is that this curve is typical of a limited reservoir and also of a good reservoir in its producing characteristics, in that it builds up rather rapidly, and you will note that at a shutin time of .25 Delta T, which is your shutin time in hours, approximately 15 minutes, almost all of the pressure has been builtup at that time, at about 40 pounds away from final buildup pressure.

Slope calculations of the final buildup stages on this well show a P of 4600 paig, slope of 30 psi per cycle, from which is calculated the 288 millidarcy feet, using 94 net feet of pay in this well, calculate a 3.1 millidarcies as permeability for the well.

Skin factor calculations are shown. The AP skin of 444 psi appears very high, and that's the reason the skin factor is calculated high, and this is really a restriction, partial restriction due to the limited number of perfs and it would have to be additionally perforated near the end of its life in order to draw the pressure on

down.

Pressure drawdown of the reservoir itself to achieve a 2.2 million rate is only 193 pounds, and this is a very small reservoir drawdown for the amount of deple-

tion, the 2655 psi drawdown that we have had on the reservoir

This is one indication that this well produces, or the reservoir produces, almost like a tank, which is similar to the cell in which Core Laboratories ran their analysis. This is indicative or significant later in this — in his analysis here.

Page two of his detailed work, paragraph III, is basic data for buildup calculation, showing 94 feet of net pay in the wellbore; porosity of 15 percent; water saturation 20 percent; reservoir temperature, of course, 196 degrees Fahrenheit.

Paragraph IV a steady-state rate prediction in which he calculated a rate that corresponds -- a theoretical rate which corresponds very well with the actual producing rate of 2.2 million.

Page three and page four is the determination of abandonment pressure of the reservoir. He goes through his calculations. Significantly, he has used the 200 pounds, or approximately 200 pounds as the reservoir differential in order for the well to produce down to aban-

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donment pressures, and assumed a skin factor, or a AP skin of zero, presuming that we would additionally perforate the well in the later stages of its production.

On page four, top of page four, he indicates that with no surface compressor, Pwh, or wellhead pressure of 500 pounds line pressure, that the abandonment pressure in the reservoir would be 1300 psi.

With surface compressor, the wellhead pressure would be drawn down to zero compressor suction.

The reservoir abandonment pressure would be 1000 psi.

We observed no water production at all for this well, other than, I believe, the very first day of production, which a little bit of the stimulation water.

On page four the reserves paragraph, paragraph VI, A, is the original gas in place calculation of 4.1 billion cubic feet of gas.

page five, under B, is the reserves of gas and condensate, and this is shown graphically, this is taken from Core Laboratories depletion and flash calculations and is shown graphically as Exhibit 2, if you would turn to the attached Exhibit 2.

This is the cumulative production, cumulative separator gas scale at the bottom and the bottom curve, cumulative condensate stock tank barrels for the scale at the top and the top --- uppermost curve, versus

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reservoir pressure. You can see the initial reservoir pressure of 7,255 pounds and the test in September of about 6846, and the current pressure indicated there of about 4600 psi.

The predicted data, this is an unusual reservoir, the predicted data from Core Laboratories information and from their analysis, is the solid line; another evidence that this is producing similar to a tank or similar to Core Laboratories analysis is that the field data, the points located within the circles, fall almost on top of the predicted line.

This is almost a textbook case. We seldon ever see this in actual practice.

By looking at -- reading in at the abandonment reservoir pressures, you can read directly the cumulative gas and the cumulative condensate to be recovered
from this reservoir.

these numbers -- we've outlined these numbers. Lower portion of the page, without surface compression, the abandonment pressure reservoir-wise would be 1300 psig; gas reserves, 2,460 MMCF; condensate reserves, 147,000 stock tank barrels.

with surface compression, reservoir

abandonment pressure of 1000 psig; gas reserves, 2,760 -
excuse me, 2,730 MMCF; condensate reserves of 151,000 bar
rels.

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Ft. 1) Sama Pe, Ne Phone (5) On page six, C, --

MR. NUTTER: Excuse me, Exhibit 2 there, which shows your cumulative condensate and separator gas, this is taking it down to that reservoir abandonment pressure of 1300 pounds, isn't it?

Yes, it is extrapolated on down to 1000.

You can see the dashed line is the extrapolation of those -
MR. NUTTER: Right, where their points

meet there at 1300, apparently.

A Yes.

MR. NUTTER: And that's the -- where you get the 147,000 barrels of condensate and the 2700 -- or wait a minute -- and 2460 --

A. Yes, sir.

MR. NUTTER: -- million cubic feet.

Yes, sir. The only reason these curves cross at that point is that -- the way the scale was presented. A different scale would have had them cross at different points.

By readingit at 1000 pounds and extrapolated lines on this, you'd come out with these other -- the other reserve numbers.

MR. NUTTER: Go ahead.

A Ohay. On page six, paragraph C, liquid yield versus sumulative gas production, is the attachment

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Exhibit 3, another example of the field data falling very close to the prediction, and another indication of it being produced like a tank.

This is a slightly different representation, or presentation, compared to I believe it was Exhibit Four, where Mr. Terry presented, showing yields and producing rates versus time. This is the yield versus cumulative gas production.

You'll notice that the prediction has a very sharp drop in the yields, and it also indicated that the field data is following this very well, not that we're happy about that.

Paragraph D on page six is a reservoir radius, or calculations that can be used to determine approximate reservoir extent. Calculations from 4.1 billion cubic feet of gas indicate an acre feet of 2,585. From this, using the net pay observed in the wellbore of 94 feet, a circular reservoir would have a radius of 618 feet. This is equivalent to approximately 28 acres in areal extent.

If an average pay thickness of the reservoir is used of 47 feet, you come up with 873 feet for the radius and equivalent acreage of 55 acres. This is a very small reservoir, obviously.

MR. NUTTER: What was the 618 feet? The 618 feet is equivalent to approxi-

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mately 28 acres.

MR. NUTTER: 28 acres.

A. And the 873, approximately 55 acres.

This limited reservoir is confirmed by the Exhibit One, the plat that Mr. Terry presented, showing that the nearest wells, which are approximately half a mile in distance from this well, have not penetrated the same interval.

On page seven, paragraph E, Mr. Varnon has prepared some additional information and some remarks concerning the additional recovery.

It shows that the original gas in place,
4.1 billion cubic feet of gas; shows a recovery of approximately 80 percent; original stock tank liquids in place of
778,000 stock tank barrels, with a recovery efficiency of
approximately 19 percent.

lest main paragraph, the pressure depletion will give excellent gas recovery but will leave some 627,000 stock tank barrels of condensate in the ground. It may be advisable to consider some type of inert gas pressure maintenance project, but there are some discouraging factors to be considered with any type of pressure maintenance on this reservoir.

First, is that due to the limited size and the wells that have already been drilled offsetting this,

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near offsets, and then we have not penetrated, and probably will not penetrate this reservoir with any other wells, that the potential reserves are not large enough to support much, if any, expense to develop any source of injection gas, whether it be inert, nitrogen, CO<sub>2</sub>, any type of additional recovery for pressure maintenance.

The reservoir pressure is already below dewpoint and he indicates that retrograde dropout is about 70 percent of the maximum already.

MR. NUTTER: It's already achieved 70 percent dropout?

A Dropout, of what it would dropout, and its revaporisation with inert gas is, or may not be possible.

another well be drilled -- should another well penetrate this, the recovery would be not the best, sweep efficiency would not be the best with a two well reservoir, sweeping between two wells. We would not get a pattern effect or areal sweep; probably channel straight through is the case most times with either water injection, waterflood operations, or gas injection or cycling project.

- Now, Mr. Eakin, you may have testified to this, but let me be sure I understand it. Is this reservoir, in your opinion, rate sensitive?
- A. There are a couple of things that we can mention concerning whether or not it's rate sensitive,

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based on exhibits that we've seen and data of drilling the well.

We have had no indication of any kind that this reservoir contains any mobile fines, or any movable small particles in the reservoir that might move toward the wellbore and plug it, causing a restriction or reducing the ability due to rate.

There's no indication of any water influx to the reservoir. It appears to be a closed reservoir, depletion type drive, and therefor a restriction of the rate in order to have withdrawals less than a water influx to maintain the pressure above the dewpoint is not -- is not feasible. And on this basis, if there is no water influx, it's not possible to outrun a drive mechanism, a water drive type mechanism, since there's no water drive.

This data is confirmed, or the rate sensitivity is confirmed, partially by Exhibit Four, if you'll refer to that, at the same size choke, a 13/64ths, held a constant rate of about 2-million a day for several months, approximately November, October and November, through March with no indication at the surface that there was any problems with producing -- or with production.

The reservoir pressure has been estimated to be below dewpoint, approximately mid to late January of 1980, and you can then see by the exhibit Four that there was

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no drastic change in the producing characteristics either by rate or by yield, and that the well is also capable of producing 3 billion a day with no significant changes to rates or yields, shown on that same exhibit.

Q Do you have a recommendation to make to the Examiner concerning the maximum rates with withdrawal from this reservoir?

A We would recommend the rate of 3-million cubic feet a day, based on the capabilities or capacities of the production facilities on that lease.

Q And are you requesting that this order be made retroactive to March 1, 1980?

Yes, sir, we are asking that it be made retroactive to March 1, which was the date the last order set the rate of a million and a half a day until a maximum effective rate could be determined. We ask that it be made retroactive to that.

Mr. Eakin, in your opinion will granting this application be in the interest of conservation, the prevention of waste, and the protection of correlative rights?

A Yes, sir, I do.

A Have you reviewed Exhibits Six through

Eight and can you testify from your own information and your

own knowledge as to their accuracy?

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Yes, sir.

MR. CARR: At this time, Mr. Examiner, we would offer into evidence Getty Exhibits Six through Eight.

MR. NUTTER: Getty Exhibits Six through Eight will be admitted in evidence.

### CROSS EXAMINATION

BY MR. NUTTER:

Now, Mr. Eakin, you've likened this a number of times in your testimony to producing gas out of a tank.

Yes, sir, that's right.

We've already got 70 percent of the liquids in the gas have dropped out in the reservoir, and we can see that the condengate production is going down rather rapidly, which I suppose is a reflection of this condensate having dropped out --

Yes, sir.

-- and not being producable now.

Yes, sir. The assumption is that the -and the calculations that the -- in Mr. Varnon's analysis -that the liquid that has dropped out is not mobile.

Just dropped out to the bottom of the tank and it's sitting there?

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A Well, it's not actually a tank. That would be great. We could put a pump on it and produce it.

It does -- the reason we say it produces like a tank is that the pressure response throughout the reservoir, because it is a small reservoir, because of the permeability and porosity in this reservoir, that the pressure response to the boundaries is very rapid, similar to what you would have in a tank. It is similar in its producing characteristics. It is not a tank; it only represents it.

Yeah, well, I can see when you're talking about a radius of drainage of either 613 or 873 feet that you don't have a very large reservoir there, and of course, the smaller the reservoir, the less effect a rapid drawdown would have.

was a bigger structure and with a high rate of withdrawal, a rapid depletion of pressure around the wellbore with a resultant dropout of fluids and a reduction of the permeability of the reservoir's gas, because of the liquids that had dropped out around the wellbore. But you don't feel that's happening here?

- A No, sir, it does not appear to be.
- You're having a more --
- A The rapid response.
- You're having a more uniform dropout

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throughout the reservoir.

A That is correct, sir.

Pecause of its small size.

A Right, pressure is coming down in the entire reservoir very rapidly, or I say timewise very rapidly from the response. The response to the boundaries of the reservoir is very rapid and therefor your pressure is coming down throughout the reservoir --

Q Uniformly.

A —— uniformly, and the pressure, the dropout appears to be throughout the reservoir with no response —
or no restriction in rate due to dropout of the liquids near
the wellbore.

Q I'd like to figure out some way where we could write an order that's going to produce 627,000 stock tank barrels of condensate that Varnon says is in the ground and going to stay there.

that in quite a few of the oil reservoirs that are depletion type drive, that 19 - 20 percent, some of our reservoirs, the San Andres and others, that 15 percent recovery by primary methods is -- is normal, and requires waterflooding when the reservoirs are large enough.

Q Well, we have some depletion type reservoirs that get 35 percent, too,

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MR. NUTTER: Are there any further questions of Mr. Eakin? He may be excused. Do you have anything further, ifr. Carr? MR. CARR: Nothing further, Mr. Nutter. MR. NUTTER: Does anyone have anything to offer in Case Number 6865? We'll take the case under advisement. (Hearing concluded.) 11 12 21 22 23

## REPORTER'S CERTIFICATE

I, SALLY W. BOYD, C.S.R., DO HEREBY CERTIFY that the foregoing Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

> I do hereby cartify that the foregoing is a complete record of the proceedings in the Examiner hearing of the proceedings in heard by me on 4/9 1980. heard by me on

Oil Conservation Division

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# STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

April 24, 1980

POST OFFICE BOX 2088 STATE LAND OFFICE BUILDING SANTA FE, NEW MEXICO 8750 ISOSI 827-2434

	Re: CASE NO. 0005
Mr. William F. Carr	ORDER NO. R-6088-C
Campbell and Black	
Attorneys at Law Post Office Box 2208	
	Applicant:
Santa Fe, New Mexico	
•	Cather Odd Company
	Getty Oil Company
Dear Sir:	
Enclosed herewith are two conditions order recently enterested	opies of the above-referenced ered in the subject case.
Mours very truly,	
THE HERWEY	
// JOE D. RAMEY	
// Director	
	•
JDR/fd	
Copy of order also sent to:	
Hobbs OCD X	
ALCESIA OCD	
Aztec OCD	
Other	

### STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

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

> CASE NO. 6865 Order No. R-6098-C

APPLICATION OF GETTY OIL COMPANY TO RIOPEN CASE NO. 6508, LEA COUNTY, NEW MEXICO.

### ORDER OF THE DIVISION

### BY THE DIVISIONS

This cause came on for hearing at 9 a.m. on April 9, 1980, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 24th day of April, 1980, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

### FINDS:

- (1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.
- (2) That by its Orders Nos. R-6088 and R-6088-A, the Division created and defined the Grama Ridge-Wolfcamp Pool effective September 1, 1979, and classified the same as an oil pool pending further study.
- (3) That by its Order No. R-6088-B, the Division reclassified said Grama Ridge-Wolfcamp Pool as a retrograde gas condensate pool effective March 1, 1980, promulgated special rules for said pool, including a production limitation of 1500 MCF of gas per day, and ordered reopening of the case at an examiner hearing during May, 1980, to permit the operators in said pool to appear and present evidence to establish the proper rates of production for wells in the pool.
- (4) That pursuant to the application of Getty Oil Company filed March 6, 1980, this cause came on for hearing on April 9, 1980, and Case No. 6608 was reopened to consider evidence relating to the proper rates of production for wells in the Grama Ridge-Wolfcamp Gas Pool.

-2-Case No. 6865 Order No. R-6088-C

- (5) That the evidence presented clearly establishes that the Grama Ridge-Wolfcamp Gas Pool is producing from a retrograde gas condensate reservoir.
- (6) That the reservoir covers an extremely limited geographic area, perhaps no more than 55 acres, and that the transmissibility of the reservoir is relatively high.
- (7) That due to the small reservoir size and its high transmissibility, the reservoir experiences a relatively low pressure drawdown at a production rate of 2200 MCF/day, and appears to be non-rate sensitive at least up to this rate of production.
- (8) That analysis of all data available indicates that a maximum production rate of 2500 MCF of gas per day for each well in the Grama Ridge-Wolfdamp Gas Pool will not cause waste nor impair correlative rights, and should be approved.
- (9) That Rule 4 of the Special Rules and Regulations for the Grama Ridge-Wolfcamp Gas Pool should be amended to read in its entirety as follows:
  - "RULE 4. A gas well on a standard unit in the Grama Ridge-Wolfcamp Gas Pool shall be permitted to produce no more than 2,500 MCF of gas per day at standard surface conditions during the effective period of these pool rules. This shall be known as the daily allowable."
  - (10) That this order should be effective March 1, 1980.

### IT IS THEREFORE ORDERED:

- (1) That effective March 1, 1980, Rule 4 of the Special Rules and Regulations for the Grama Ridge-Wolfcamp Gas Pool, as promulgated by Division Order No. R-6088-B effective March 1, 1980, is hereby amended to read in its entirety as follows:
  - "RULE 4. A gas well on a standard unit in the Grama Ridge-Wolfcamp Gas Pool shall be permitted to produce no more than 2,500 MCF of gas per day at standard surface conditions during the effective period of these pool rules. This shall be known as the daily allowable."
- (2) That Order No. 4 of "It Is Further Ordered" of said Order No. R-6088-B, which called for Case No. 6608 to be reopened in May, 1980, to hear evidence as to proper rates of production for wells in the subject pool, is hereby stricken.

-3-Case No. 6865 Order No. R-6088-C

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

DONE at Santa Fe, New Mexico, on the day and year herein-

STATE OF NEW MEXICO OIL CONSERVATION DIVISION

JOE D. RAMEY Director

SBAL

Dockets Nos. 12-80 and 13-80 are tentatively set for April 23 and May 7, 1980. Applications for hearing must be filed at least 22 days in advance of hearing date.

### DOCKET: EXAMINER HEARING - WEDNESDAY - APRIL 9, 1980

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

The following cases will be heard before Daniel S. Nutter, Examiner, or Richard L. Stamets, Alternate Examiner:

- CASE 6850: In the matter of the hearing called by the Oil Conservation Division on its own motion to permit Jack F. Grimm, N. B. Hunt, George R. Brown, Am-Arctic, Ltd., The Travelers Indemnity Company, and all other interested parties to appear and show cause why the Mobil 32 Well No. 1 located in Unit D of Section 32, Township 25 South, Range I East, Dona Ana County, should not be plugged and abandoned in accordance with a Division-approved plugging program.
- CASE 6851: In the matter of the hearing called by the Oil Conservation Division on its own motion to consider amendments to its SPECIAL RULES FOR APPLICATIONS FOR WELLIEAU PRICE CEILING CATEGORY DETERMINATIONS as promulgated by Division Order No. R-5878 and amended by R-5878-A. The proposed amendments would make said SPECIAL RULES conform to FERC Order No. 65 which promulgated final regulations implementing filing requirements of the Natural Cas Policy Act of 1978.
- CASE 6852: In the matter of the hearing called by the Oil Conservation Division on its own motion to consider special rules and procedures for the designation of "cight formations" or "tight sands" as outlined in the FERC interim rules and regulations issued February 20, 1980, relating to Section 107(b) of the Natural Cas Policy Act of 1978.
- Application of Caribou Four Corners, Inc. for compulsory pooling, San Juan County, New Mexico.

  Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Cha Cha
  Gallup Pool underlying the N/2 NE/4 of Section 18, Township 29 North, Range 14 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.
- CASE 6854: Application of Jack A. Cole for an unorthodox gas well location, Rio Arriba County, New Mexico.

  Applicant, in the above-styled cause, seeks approval for the unorthodox location of his Apache
  Hills Well No. 6, 1326 feet from the North line and 1843 feet from the West line of Section 17,
  Township 23 North, Range 3 West, Ballard-Pictured Cliffs Pool, the NW/4 of said Section 17 to be
  dedicated to the well.
- CASE 6841: (Continued from March 26, 1980, Examiner Hearing)

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Application of CIG Exploration, Inc. for two non-standard gas proration units, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of two non-standard gas proration units in Township 16 South, Range 28 East, the first being 219.6 acres comprising Lots 1 thru 8 of Section 1 and the second being 219.92 acres comprising Lots 1 thru 8 of Section 2, for the Wolfcamp, Pennsylvanian, and Mississippian formations, each unit to be dedicated to a well to be drilled at a standard location thereon.

- Application of Dome Petroleum Corporation for an unorthodox well location, McKinley County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its Santa Fe 3 Well No. 1 to be drilled 1220 feet from the North line and 900 feet from the West line of Section 3. The sale 21 March Research 10 March 10 Ma
- CASE 6856: Application of Texaco Inc. for downhole commingling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Blinebry, Tubb-Drinkard, and Fusselman production in the wellbore of its C. C. Fristoe "B" Federal NCT-2 Well No. 6 located in Unit H of Section 34, Township 24 South, Range 37 East, Justis Field.
- CASE 6857: Application of Holly Energy, Inc. for an unorthodox gas well location, Eddy County, New Mexico.

  Applicant, in the above-styled cause, seeks approval for the unorthodox location of its State 14

  Well No. 1, a Morrow test to be drilled 660 feet from the South line and 990 feet from the East

  line of Section 14, Township 18 South, Range 28 East, the S/2 of said Section 14 to be dedicated to the well.

CASE 6843: (Continued from March 26, 1980, Examiner Hearing)

Application of Yates Petroleum Corporation for two compulsory poolings, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Yeso formation underlying two 40-acre proration units, the first being the SE/4 SE/4 and the second being the SW/4 SE/4 of Section 6, Township 19 South, Range 25 East, Penasco Draw Field, each unit to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said wells and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the wells and a charge for risk involved in drilling

- CASE 6858: Application of H. L. Brown, Jr. for gas well commingling, Roosevelt County, New Mexico.

  Applicant, in the above-styled cause, seeks authority to commingle Bluitt-Wolfcamp gas and condensate production from ten federal wells located as follows: Units K and P of Section 33 and L of 34, Township 7 South, Range 37 East; Units D and L of Section 3, C and J of 4, I of 5, C of 9 and G of 10; and one fee well in D of 10, all in Township 8 South, Range 37 East. Applicant would separate and meter the gas and condensate production from each well, then recombine the well's stream and commingle all wells into a small gasoline plant. Allocation of gas and condensate to each well would be on the basis of wellhead meter readings and allocation of gasoline plant production would be on the basis of gas production and BTU content at each well.
- CASE 6859: Application of R & G Drilling Company for an unorthodox gas well location, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be drilled 1890 feet from the North line and 1830 feet from the East line of Section 28, Township 28 North, Range 11 West, Kutz-Fruitland Pool, the NE/4 of said Section 28 to be dedicated to the well.
- CASE 6860: Application of Flag-Redfern Oil Company for an exception to Order No. R-3221, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an exception to Order No. R-3221 to permit disposal of produced brine into an unlined surface pit located in Unit P of Section 3, Township 19 South. Range 31 East.
- CASE 6861: Application of Zia Energy, Inc. for pool creation, special pool rules, and an NGPA determination, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the creation of a new San Andres oil pool for its State "C" Well No. 1 located in Unit F of Section 17, Township 22 South, Range 37 East, and special rules therefor, including a provision for a limiting gas-oil ratio of 10,000 to 1. Applicant further seeks a new onshore reservoir determination for said State "C" Well Mo. 1.
- CASE 6837: (Continued from March 26, 1980, Examiner Hearing)

Application of Curtis Little for compulsory pooling, Rio Arriba County, New Mexico.

Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Dakota formation underlying the W/2 of Section 7, Township 25 North, Range 3 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.

- Application of ARCO Oil and Gas Company for an unorthodox oil well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its State 157 "D" Well No. 11 drilled 2123 feet from the South line and 1644 feet from the East line of Section 12, Township 22 South, Range 36 East, Drinkard Pool, the NW/4 SE/4 of said Section 12 to be dedicated to the well.
- CASE 6863: Application of Bass Enterprises Production Co. for a dual completion, Eddy County, New Mexico.

  Applicant, in the above-styled cause, seeks approval for the dual completion (conventional) of its
  Big Eddy Unit Well No. 72 located in Unit R of Section 3, Township 21 South, Range 28 East, to
  produce undesignated Atoks and Morrow gas thru parallel strings of tubing.
- CASE 6864: Application of Grace Petroleum Corporation for an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its Smith Ranch Well No. 11, to be drilled 1980 feet from the North line and 660 feet from the West line of Section 11, Township 20 South, Range 33 East, Teas-Penn Gas Pool, the N/2 of said Section 11 to L2 dedicated to the well.

Page 3 of 3 Examiner Hearing - Wednesday - April 9, 1980 Docket No. 9-80

CASE 6846: (Amended)

In the matter of Case No. 6846 being amended to reflect that the location for the unorthodox location of the well on the second unit is 330 feet from the North line and 2310 feet from the East line of Section 13, Township 21 South, Range 36 East, Lea County.

CASE 6846: (Continued from March 26, 1980, Examiner Rearing)

Application of Boyle Hartman for two compulsory poolings, two non-standard gas proration units, and two unorthodox well locations, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Eumont Gas Pool underlying two 80-acre non-standard gas proration units, the first being the S/2 NE/4 of Section 13, Township 21 South, Range 36 East, to be dedicated to a well to be drilled at an unorthodox location 1500 feet from the Morth line and 2310 feet from the East line of said Section 13, and the second being the N/2 NE/4 of said Section 13 to be dedicated to a well to be drilled at an unorthodox location 330 feet from the North line and 2310 feet from the East line of said Section 13. Also to be considered will be the cost of drilling and completing said wells and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the wells and a charge for risk involved in drilling said wells.

CASE 6865:

Application of Getty Oil Company to reopen Case No. 6608, Lea County, New Mexico. Applicant, in the above-styled cause, seeks to reopen Case No. 6608 for consideration of the establishment of maximum efficient rates of withdrawal from the Grama Ridge-Wolfcamp Gas Pool.

Docket No. 10-80

DOCKET: EXAMINER HEARING - WEDNESDAY - APRIL 16, 1980

8:45 A.M. - OIL CONSERVATION DIVISION CONFERENCE ROOM, STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

The following cases will be heard befor Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

ALLOWABLE: (1) Consideration of the allowable production of gas for May, 1980, from fifteen prorated pools in Les, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gzs for May, 1980, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

Docket No. 11-80

DOCKET: COMMISSION HEARING - WEDNESDAY - APRIL 16, 1980

OIL CONSERVATION COMMISSION - 9 A.M. - ROOM 205 STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

CASE 6609: (DE NOVO) (Continued from March 11, 1980, Commission Hearing)

Application of Napeco Inc. for pool creation and special pool rules, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the creation of a new Strawn oil pool for its Benson Deep Unit Well No. 1 located in Unit O of Section 33, Township 18 South, Range 30 East, and special rules therefor, including 160-acre spacing and standard well locations.

Upon application of Yates Petroleum Corporation and Napeco Inc. this case will be heard De Novo pursuant to the provisions of Rule 1220. Applicants allege this is not an "oil" pool but is a "wolatile" oil pool.

STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION STATE LAND OFFICE BLDG. SANTA FE, NEW MEXICO 16 January 1980 EXAMINER HEARING Case 6608 being reopened pursuant to CASE IN THE MATTER OF: 6608 the provisions of Order No. R-6088. BEFORE: Daniel S. Nutter **70** TRANSCRIPT OF HEARING 11 12 APPEARANCES 13 Ernest L. Padilla, Esq. Legal Counsel to the Division 15 For the Oil Conservation State Land Office Bldg. Santa Fe, New Mexico 87501 16 Division: 17 William F. Carr, Esq. CAMPBELL & BLACK P. A. For the Applicant: Jefferson Plaza Santa Fe, New Mexico 87501 20 21 22 23

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MR. NUTTER: Call next Case Number 6608.

MR. PADILLA: In the matter of Case 6608

being reopened pursuant to Order No. R-6688, which order

created the Grama Ridge-Wolfcamp Pool with temporary

special rules and regulations with provisions for 160-acre

spacing.

MR. CARR: May it please the Examiner, my name is William F. Carr, Campbell and Black, P. A., appearing on behalf of the applicant.

I have two witnesses who need to be sworn.

### (Witnesses sworn.)

### HERMAN W. TERRY

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

### DIRECT EXAMINATION

BY MR. CARR:

Q Will you state your full name and place of residence?

A. My name is Herman W. Terry. I reside at Hobbs, New Mexico.

Q Mr. Terry, by whom are you employed and

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in what capacity?

I'm employed by Getty Oil Company and I'm the area engineer for the Hobbs Area.

Have you previously testified before this commission and had your credentials accepted and made a matter of record?

Yes, I have.

Are you familiar with the application in this case?

Yes, J am.

And the subject matter of the case?

Yes, I am.

Are you the witness that testified in the previous hearing?

Yes, sir, I am.

MR. CARR: Are the witness' qualifications

accepted?

MR. NUTTER: Mr. Terry, will you briefly summarize the events which led up to this hearing today?

Yes, sir. We brought this matter to hearing in August. We requested approval to dually complete our Getty 36 State Com Well No. 1. We also requested that the Grama Ridge-Wolfcamp Pool be created with temporary special rules and regulations, which provided for 160-acre spacing.

During the course of this hearing we stated that based on the data that we had at that time that we weren't sure if it were an oil reservoir or a gas reservoir, and this is based on the initial producing GOR of 5082-to-1 and the gravity of the produced fluid being 4907.

And so we asked simply for temporary pool rules until we could obtain additional data to substantiate whether it was an oil reservoir or gas reservoir.

MR. CARR: And, Mr. Nutter, since the prior -- or since this case is limited just to the question of whether we have an oil or a gas reservoir, and then the spacing question, which is necessarily a part of that, we're not going to re-introduce the plat or the structure map or the log. They're in the record in this case already, if that's all right with you.

MR, NUTTER: Providing conditions haven't been changed.

MR. CARR: Not in regard to any of those Mr. Terry, will you please refer to what has been marked for identification as Getty's Exhibit A, and explain to the Examiner what this is and what it shows?

Exhibit A is a diagrammatic sketch of our Getty 36 State Com Well No. 1. This was the well that was the subject of the original hearing.

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This well was drilled at 1980 feet from the north line, 1650 feet from the west line of Section 36, Township 21 South, Range 34 East, in Lea County, New Mexico.

The well has been dually completed.

We've set -- and we have 2-3/8ths -- a dual string of 2-3/8ths inch N-80 8-round tubing in the well. The zones are separated by a Baker Model-DB packer, set at 12,000 feet; further separated by a Baker Model AL-5 dual packer, set at 10,505 feet.

We have 20-inch casing set at 40 feet; 13-3/8ths inch casing set at 1100 feet; 9-5/8ths inch casing set at 5502; 7 inch casing set at 11,114 feet; we have a 4-1/2 inch liner set at 13,266 feet.

The well was drilled to a total depth of 13,349 feet. Wolfcamp perforations are from 11,320 to 11,335 feet. Morrow perforations are 12,940 feet to 12,950 feet.

We have five 20-foot blast joints opposite the Wolfcamp perforations.

And this well is completed in such a fashion as to enable Getty to meter each zone separately, is that correct?

A. Yes, it is.

Q. Will you please refer to Exhibit B and review the data contained thereon for Mr. Nutter?

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the well has been completed since the original hearing. It lists -- this is strictly well tests data. It indicates Mcf gas per day, condensate in barrels per day, the amount of water per day, and the producing gas/ oil ratio.

Will you now refer to Getty Exhibit C and review this for the Examiner?

we've obtained from the Getty 36 State Com Well No. 1 from

the Wolfcamp completion. This data has been obtained since

Exhibit B is a list of well tests that

MR. NUTTER: Before you go to that, on Exhibit B these are just -- this is a summary of a whole bunch of well tests, is that correct?

Yes. Well, this -- we actually test the well every day with -- it's metered separately. We get a separate gauge daily. This is just a summary of representative well tests from each week.

MR. NUTTER: So this is just a summary of a whole bunch of different producing days, then, --

> Yes, sir. A.

MR. NUTTER: -- throughout the year.

Yes, sir. We actually, the way we meter the gas separately and the fluid is kept separate, so we actually get a well test every day.

Will you now refer to Exhibit C?

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	Page
atio	A Exhibit C is simply the previous inform- n in a graphical form, showing the there again, this well tests, showing condensate production per day and
rev pr	will you now refer to Exhibit D and  Exhibit D is the previous information  A Exhibit D is the previous information  It indicates gas production per  Will a graphical form. It indicates gas production per  Mr. Terry, what conclusions can you  Mr. Terry, what conclusions can you  ceach about the characteristic of this reservoir?  There are no definite conclusions based  upon this data alone; however, I can say that it is consistent with the production data that would be expected from a retrograde condensate gas reservoir.  And there is another witness who will  testify and present a reservoir fluid analysis to support
18	this position?  Yes, sir, there is.
19	Mr. Terry, what acreage 13
21	in the Morrow formation in this well?  The north half of Section 36.
22	A The north case included a 160-ac
23	And the original case applied only to the northwest quarter of the original case applied only to the northwest quarter of the original case applied only to the northwest quarter of the original case applied only to the northwest quarter of the original case applied only to the northwest quarter of the original case.
24	the original case applied on the original case applied or the original cas

Section 36, being 160 acres, is that right?

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Yes, sir, that's correct.

Do you believe, based on the information you have available to you that it would be appropriate to dismiss that portion of this case which relates to 160-acre spacing?

yes, I do.

In your opinion, will granting this application be in the interest of conservation, the prevention of waste, and the protection of correlative rights?

Yes, I do.

What is the present status of this well Q. in terms of its allowable?

The well is presently overproduced on gas production, based upon the temporary pool -- oil pool rules, based on the depth bracket allowable for 160 acres, and the gas/oil ratio penalty, we're presently overproduced

grossly on gas. and do you request that this order be expedited to avoid the possibility of having to shut this well in?

Yes, I do.

Were Exhibits A through D prepared either by you or under your direction and supervision?

Yes, sir, they were.

MR. CARR: At this time, Mr. Examiner,

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we would offer Getty Exhibits A through D.

MR. NUTTER: Getty's EXhibits A through D will be admitted in evidence.

MR. CARR: Pass the witness.

### CROSS EXAMINATION

BY MR. NUTTER:

Q Well, Mr. Terry, as I understand it, in the original hearing here we determined that at least on a temporary basis the well would be classified as an oil reservoir.

- A Yes, sir, that is correct.
- Q. And put on 160-acre oil well spacing for a temporary period of time.
  - A Yes, sir, that is correct.
- Q. And now you have made your determination that it's probably a retrograde condensate gas reservoir.
  - A Yes, sir, we have.
- And you want it to be classified as a gas reservoir and take this 160-acre -- well, I guess you just want to dispense with all of the pool rules here.
- A. Yes, sir, we want to dispense with all of the temporary pool rules related to the Wolfcamp.
- And have it classified as a gas reservoir and then it would come under gas reservoir rules.

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- Yes, sir, that's what we're proposing.
- Are you proposing any special rules for a retrograde condensate gas reservoir?
  - No, sir, we're not.
- Sometimes withdrawals from retrograde condensate reservoirs have to be restricted in order to not have too much of that condensate drop out in the reservoir prematurely and be left there, don't they?
- Yes, sir, that's correct. We've got a preliminary report from CORE Lab that gives us a great deal of information. Once we get a -- we're still to receive a final report, and when we get the final report it will give us more information that we can make calculations to determine the optimum rate to produce this reservoir to prevent leaving this condensate.
- Is your other witness going to testify to any optimum rates of production?
- No, sir, that -- that information is That will be coming in -- the information not available. necessary to make these calculations will be in a final report that we haven't received from CORE Lab as yet.
- When do you expect to get that from CORE Lab?
- I would say within six weeks to two months.

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MR. NUTTER: Are there any other questions of this witness? He may be excused.

MR. CARR: I'll call James Eakin.

JAMES E. EAKIN, JR.

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

### DIRECT EXAMINATION

BY MR. CARR:

Will you state your full name and place of residence?

I'm James E. Eakin, Junior, Midland, Texas.

Mr. Eakin, by whom are you employed and Q. in what capacity?

Getty Oil Company as a Lead Reservoir Engineer, Midland District Office.

Have you previously testified before this Commission and had your credentials accepted and made a matter of record?

No, I have not.

Will you summarize for the Examiner your educational background and your work experience?

All right. I'm a 1959 petroleum en-

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acceptable?

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gineering graduate from the University of Oklahoma; worked the last twenty years as a petroleum engineer, a brief time for Magnolia Petroleum Company and a testing company in south Texas before being employed by Getty Oil Company in 1962.

The last seventeen and a half years I have been with Getty, the last seven and a half in Midland District Office. And our Midland District Office covers the West Texas and southeast Lea County.

And you're familiar with the application in this case?

Yes.

MR. CARR: Are the witness' qualifications

MR. NUTTER: Yes, they are.

Mr. Eakin, will you please refer to what has been marked for identification as Getty Exhibit E and review the information contained in there for Mr. Nutter

Yes, sir, Exhibit E is a preliminary fluid analysis report prepared by CORE Laboratories on samples taken on our Getty 36 State Com No. 1.

The duplicate samples were obtained from the separation facilities on the subject well on September 9th, 1979, at our direction. This was taken by Tefteller, Incorporated, out of Midland. They caught

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these pressure samples, saved them, and shipped them to CORE Laboratories in DAllas.

Under our request CORE Laboratories analyzed the fluid to determine whether or not this was a gas reservoir or an oil reservoir, and the additional data required for proper separation and efficient recovery from this reservoir.

The basic information concerning the test itself, the samples were analyzed. They were then recombined physically in the laboratory and the producing gas and liquid ratio at which the samples were caught in the field, they were adjusted to the separator conditions, the ratios that were calculated were adjusted to reservoir conditions. The sample was charged into a high pressure visual cell in which the temperature and pressure can be maintained at reservoir conditions. The -- there's a window in the cell in which you can observe whether or not the fluid contained therein is creamed and determine whether or not there was a bubble point or a dewpoint at various pressures.

The sample was submitted -- or subjected to a constant composition, constant temperature expansion. The fluid was observed through the window and a retrograde dewpoint was observed at 5018 psig. It was also observed that the fluid was in a gaseous state at reservoir conditions.

Original reservoir pressure for this well, this reservoir, was 7255 psig. We call your attention to page one of the attachments of data to the letter.

provided information on bottom hole pressures and the sampling tests, or well test data, at the time the samples were caught.

We call your attention to formation characteristics, the first portion of this, original reservoir pressure 7255 psig at 11,328, which is approximate mid-perforations of the Wolfcamp in this well.

Liquid gravity shown here is also 49.7 degrees API, as previously testified by Mr. Terry.

The date of sampling was September the 9th. The pressures were run, showed that the flowing bottom hole pressure at the time the sample was taken was 6092 pounds; that both of these, the original reservoir pressure and the pressure at the time of sampling were above the dewpoint of 5018 pounds.

The well test data at the time this was taken is shown in the very lower portion of this page.

A producing rate of 650.54 barrels per day; a gas/oil ratio calculated to be 4438 cubic feet per barrel. This is also can be converted to a condensate yield of 225.33 barrels per minute. And the temperature was extrapolated from a

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bottom hole pressure report down to 196 degrees at mid perfs.

Page two of the data is a hydrocarbon analysis of both the separator gas and the separator liquids. I call your attention to the last in the components, the lefthand column, heptanes plus, total well stream low percent is 9.64 percent. To the best of my knowledge and checking on existing oil reservoirs known to be retrograde condensate reservoirs, a rule of thumb shows that there are no oil reservoirs below 11 percent, lower percent on heptanes plus, and this, of course, is below that.

I refer you to page three. On page three you have the pressure volume relations of the reservoir fluids at the reservoir temperature of 196 degrees. was done with the sample cell measuring the volumes, relative volumes, at each pressure point.

Indicated is the 7255 initial reservoir pressure and the retrograde dewpoint pressure of 5018 pounds

Page four of the analysis indicated retrograde condensation percentages as a portion of the hydrocarbon -- or reservoir hydrocarbon pore space at reservoir conditions. Shown here is the dewpoint, showing no liquid percent at 5018 pounds, or above, and that as the pressure was depleted in the cell, that the percent of liquid hydrocarbons increased, which is characteristic of a retrograde condensate reservoir, and approximately 3150

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the maximum percent of hydrocarbon recovery or -- excuse me. The maximum percent of hydrocarbon pore space occupied by liquids was about 37.1 percent. This is also indicated in the letter.

Below this pressure the hydrocarbons tend to vaporize again and recovery of the liquids would increase.

representation of this same data on page four, in which you can see no -- zero percent liquids above 5018 pounds. It increases, the liquid percent increases until it reaches approximately 3150 pounds, and then again decreases as the reservoir pressure decreases.

This is a characteristic curve of a retrograde condensate reservoir.

Q. Mr. Eakin, it is your conclusion that what you have here is a gas reservoir, not an oil reservoir, is that correct?

A. That is correct, from observation or review of other retrograde condensate reservoir analysis, and this analysis, that it meets rule of thumb guidelines, as well as the actual observation of gas in the cell at reservoir condtions and a dewpoint exists -- retrograde dewpoint exists at 5018 pounds. It is a gas reservoir.

. Have you reviewed Exhibit E and can you

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testify as to its accuracy?

A Yes, I believe the information contained therein is accurate.

In your opinion will classifying this as a gas reservoir be in the interests of conservation, the prevention of waste, and the protection of correlative rights?

A Yes, it would.

MR. CARR: At this time, Mr. Examiner, we would offer into evidence Getty Oil Company Exhibit E.

MR. NUTTER: Getty Exhibit E will be admitted in evidence.

MR. CARR: I have nothing further on direct.

### CROSS EXAMINATION

BY MR. NUTTER:

Q. Mr. Eakin, this Exhibit E is entirely data which was supplied to you from CORE Labs.

Now, Mr. Terry awhile ago mentioned that CORE Lab will be sending in its final report within some six weeks or so.

A. Yes, sir.

Q. At that time do they have sufficient reservoir information they could make a recommendation as

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to what proper withdrawals are, or do they just furnish you with parameters regarding the -- this liquid and the gaseous production itself from the well and you make the determination as to what the proper rate of withdrawal is?

A They normally provide the data and the determination of the rate of withdrawals and the recoveries expected would be determined on an economic basis by Getty Oil.

Q But they make the actual determination as to what the proper rate of withdrawal from the reservoir is?

A No, they do not make that proper rate of withdrawal. They give -- as an example here, they show the composition of the gas on its withdrawal, as stated in the letter, in page two of the letter, shows that -- the method of -- second sample will be analyzed.

graph of page two of the letter, again, that the maximum accumulation of hydrocarbons in the pore space, which would be -- remain in the reservoir in approximately 37 percent.

This is at a reservoir pressure of 3150. This is not -- this is not recovery at the surface. This is what would be left in the reservoir, which is in the range of even a water drive oil reservoir.

O Do you know if there's any -- if there's

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SALLY W. BOYD, C.S.R. Rt. 1 Box 193-B Santa Fe, New Mondos 57301 Phone (305) 135-7409 any water drive present in this reservoir at all?

A. There appears -- we do not know what the drive mechanism is at the present time, but it does not appear to be a water drive.

Q You made water on that first test that Mr. Terry had, I think, and no water produced since then.

A. That is correct.

Q I believe.

A We believe most of that to be filtrate water or load water from the stimulation.

Q I see. And what is the current bottom hole pressure in the reservoir?

The current bottom hole pressure in the reservoir is shown in the report, on September 12th was 6846 at mid perfs.

Q Well, that was September. You don't know what the current bottom hale pressure is?

A No, we have not run any samples, or any tests since that date.

Q Well now, what is your recommendation,
Mr. -- Mr. Eakin, that the pool would be reclassified as
a retrograde gas condensate reservoir?

A. Yes, sir.

Q. And that the pool rules that we have today be rescinded and that it just be classified as a gas

reservoir?

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Yes, sir.

Do you have any recommendations at this time as to what the proper rate of withdrawal should be from this gas reservoir?

No, sir, we do not.

Do you think that after you get your final report from CORE Lab that you'll be in a better position to make the determination as to what the proper rates of withdrawal should be?

I would think we would be in a much better position to determine at that time.

Would you have objection to an order reclassifying the well -- the pool at this time as a retrograde gas condensate reservoir on a very limited temporary basis, pending the determination as to what proper rates of withdrawal should be?

No, sir. As we see right now, we do not -- it does not appear that the rate of production will inherently affect the recovery from the reservoir.

Well, so far it hasn't anyway.

Yes.

And what's your opinion as to when you will have this data from CORE Lab and when you could make a presentation to this Division?

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A. Our latest information was this past
Friday from CORE Laboratories and they had not yet started
the fluid analysis with the backlog that they have in fluid
analyses to be run. Our best estimate would be six weeks to
two months. This is pure estimate.

Q. And then another month for you to prepare a case?

A I would presume so.

MR. NUTTER: Are there any other questions of the witness? He may be excused.

Do you have anything further, Mr. Carr?
MR. CARR: Nothing further, Mr. Nutter.
MR. NUTTER: Does anyone have anything

they wish to offer in Case Number 6608?

We'll take the case under advisement.

(Hearing concluded.)

# REPORTER'S CERTIFICATE

I, SALLY W. BOYD, a Certified Shorthand Reporter, DO HEREBY CERTIFY that the foregoing and attached Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6688. heard by me on Oll Conservation Division

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STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION STATE LAND OFFICE BLDG. SANTA FE, NEW MEXICO 16 January 1980

### EXAMINER HEARING

IN THE MATTER OF:

Case 6608 being reopened pursuant to ) the provisions of Order No. R-6088.

CASE 6608

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

APPEARANCES

For the Oil Conservation Division:

Ernest L. Padilla, Esq. Legal Counsel to the Division State Land Office Bldg. Santa Fe, New Mexico 87501

For the Applicant:

William F. Carr, Esq. CAMPBELL & BLACK P. A. Jefferson Plaza Santa Pe, New Mexico 87501

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Getty Exhibit D, Graph

Getty Exhibit E, Report

INDEX HERMAN W. TERRY Direct Examination by Mr. Carr Cross Examination by Mr. Nutter ΙÓ JAMES E. EAKIN, JUNIOR Direct Examination by Mr Carr 12 Cross Examination by Mr. Nutter 18 EXHIBITS Getty Exhibit A, Sketch 5 Getty Exhibit B, List Getty Exhibit C, Graph

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MR. NUTTER: Call next Case Number 6608.

MR. PADILLA: In the matter of Case 6608 being reopened pursuant to Order No. R-6688, which order created the Grama Ridge-Wolfcamp Pool with temporary special rules and regulations with provisions for 160-acre spacing.

MR. CARR: May it please the Examiner, my name is William F. Carr, Campbell and Black, P. A., appearing on behalf of the applicant.

I have two witnesses who need to be sworn.

### (Witnesses sworn.)

### HERMAN W. TERRY

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

### DIRECT EXAMINATION

BY MR. CARR:

Will you state your full name and place of residence?

My name is Herman W. Terry. I reside at Hobbs, New Mexico.

Mr. Terry, by whom are you employed and

### in what capacity?

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I'm employed by Getty Oil Company and I'm the area engineer for the Hobbs Area.

Have you previously testified before this commission and had your credentials accepted and made a matter of record?

Yes, I have.

Are you familiar with the application in this case?

Yes, I am.

And the subject matter of the case?

Yes, I am.

Are you the witness that testified in the previous hearing?

Yes, sir, I am.

MR. CARR: Are the witness' qualifications accepted?

MR. NUTTER: Mr. Terry, will you briefly summarize the events which led up to this hearing today?

Yes, sir. We brought this matter to hearing in August. We requested approval to dually complete our Getty 36 State Com Well No. 1. We also requested that the Grama Ridge-Wolfcamp Pool be created with temporary special rules and regulations, which provided for 160-acre spacing.

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During the course of this hearing we stated that based on the data that we had at that time that we weren't sure if it were an oil reservoir or a gas reservoir, and this is based on the initial producing GOR of 5082-to-1 and the gravity of the produced fluid being 4907.

And so we asked simply for temporary pool rules until we could obtain additional data to substantiate whether it was an oil reservoir or gas reservoir.

MR. CARR: And, Mr. Nutter, since the prior -- or since this case is limited just to the question of whether we have an oil or a gas reservoir, and then the spacing question, which is necessarily a part of that, we're not going to re-introduce the plat or the structure map or the log. They're in the record in this case already, if that's all right with you.

MR. NUTTER: Providing conditions haven't heen changed.

MR. CARR: Not in regard to any of those. Mr. Terry, will you please refer to what has been marked for identification as Getty's Exhibit A, and explain to the Examiner what this is and what it shows?

Exhibit A is a diagrammatic sketch of our Getty 36 State Com Well No. 1. This was the well that was the subject of the original hearing.

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feet.

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This well was drilled at 1980 feet from the north line, 1650 feet from the west line of Section 36, Township 21 South, Range 34 East, in Lea County, New Mexico.

The well has been dually completed.

We've set -- and we have 2-3/8ths -- a dual string of 2-3/8ths inch N-80 8-round tubing in the well. The zones are separated by a Baker Model-DB packer, set at 12,000 feet; further separated by a Baker Model AL-5 dual packer, set at 10,505

We have 20-inch casing set at 40 feet; 13-3/8ths inch casing set at 1100 feet; 9-5/8ths inch casing set at 5502; 7 inch casing set at 11,114 feet; we have a 4-1/2 inch liner set at 13,266 feet.

The well was drilled to a total depth of 13,349 feet. Wolfcamp perforations are from 11,320 to 11,335 feet. Morrow perforations are 12,940 feet to 12,950 feet.

We have five 20-foot blast joints opposite the Wolfcamp perforations.

- And this well is completed in such a fashion as to enable Cetty to meter each zone separately, is that correct?
  - A Yes, it is.
- Q Will you please refer to Exhibit B and review the data contained thereon for Mr. Nutter?

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we've obtained from the Getty 36 State Com Well No. 1 from the Wolfcamp completion. This data has been obtained since the well has been completed since the original hearing. It lists -- this is strictly well tests

Exhibit B is a list of well tests that

data. It indicates Mcf gas per day, condensate in barrels per day, the amount of water per day, and the producing gas/ oil ratio.

Will you now refer to Gatty Exhibit C and review this for the Examiner?

MR. NUTTER: Before you go to that, on Exhibit B these are just -- this is a summary of a whole bunch of well tests, is that correct?

Yes. Well, this -- we actually test the well every day with -- it's metered separately. We get a separate gauge daily. This is just a summary of representative well tests from each week.

MR. NUTTER: So this is just a summary of a whole bunch of different producing days, then, --

Yes, sir.

MR. NUTTER: -- throughout the year.

Yes, sir. We actually, the way we meter the gas separately and the fluid is kept separate, so we actually get a well test every day.

Will you now refer to Exhibit C?

Exhibit C is simply the previous information in a graphical form, showing the -- there again, this is well tests, showing condensate production per day and water production per day.

Will you now refer to Exhibit D and review this for the Examiner?

Exhibit D is the previous information put in a graphical form. It indicates gas production per day and the producing gas/oil ratio per day.

Mr. Terry, what conclusions can you reach about the characteristic of this reservoir?

There are no definite conclusions based upon this data alone; however, I can say that it is consistent with the production data that would be expected from a retrograde condensate gas reservoir.

And there is another witness who will testify and present a reservoir fluid analysis to support this position?

Yes, sir, there is.

Mr. Terry, what acreage is dedicated in the Morrow formation in this well?

The north half of Section 36.

And the original case included a 160-acr the original case applied only to the northwest quarter of Section 36, being 160 acres, is that right?

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ALLY W. BOYD,	Rt. 1 Box 193-B Santa Pe, New Mexico 87501 ph. per. 1400 445,7400

A Yes, sir, that's correct.
Q Do you believe, based on the information
you have available to you that it would be appropriate to
dismiss that portion of this case which relates to 160-acre
spacing?
A Yes, I do.
Q In your opinion, will granting this
application be in the interest of conservation, the prevention
of waste, and the protection of correlative rights?
A Yes, I do.
Q What is the present status of this well
in terms of its allowable?
A The well is presently overproduced on
gas production, based upon the temporary pool oil pool
rules, based on the depth bracket allowable for 160 acres,
and the gas/oil ratio penalty, we're presently overproduced
grossly on gas.
Q And do you request that this order be
expedited to avoid the possibility of having to shut this
well in?
A. Yes, I do.
Ω Were Exhibits A through D prepared eith
by you or under your direction and supervision?

Yes, sir, they were.

MR. CARR: At this time, Mr. Examiner,

W. BOYD, C.S.R. Rt. 1 Box 193-B Ft, New Mexico 87301 one (993 435-7409

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we would offer Getty Exhibits A through D.

MR. NUTTER: Getty's EXhibits A through D will be admitted in evidence.

MR. CARR: Pass the witness.

#### CROSS EXAMINATION

BY MR. NUTTER:

Q Well, Mr. Terry, as I understand it, in the original hearing here we determined that at least on a temporary basis the well would be classified as an oil reservoir.

- A Yes, sir, that is correct.
- And put on 160-acre oil well spacing for a temporary period of time.
  - A Yes, sir, that is correct.
- Q. And now you have made your determination that it's probably a retrograde condensate gas reservoir.
  - A. Yes, sir, we have.
- And you want it to be classified as a gas reservoir and take this 160-acre -- well, I guess you just want to dispense with all of the pool rules here.
- A. Yes, sir, we want to dispense with all of the temporary pool rules related to the Wolfcamp.
- Q. And have it classified as a gas reservoir and then it would come under gas reservoir rules.

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A. Yes, sir, that's what we're proposing.

Are you proposing any special rules for a a retrograde condensate gas reservoir?

No, sir, we're not.

Sometimes withdrawals from retrograde condensate reservoirs have to be restricted in order to not have too much of that condensate drop out in the reservoir prematurely and be left there, don't they?

Yes, sir, that's correct. We've got a preliminary report from CORE Lab that gives us a great deal of information. Once we get a -- we're still to receive a final report, and when we get the final report it will give us more information that we can make calculations to determine the optimum rate to produce this reservoir to prevent leaving this condensate.

Is your other witness going to testify to any optimum rates of production?

No, sir, that -- that described is not available. That will be coming in -- the information necessary to make these calculations will be in a final report that we haven't received from CORE Lab as yet.

When do you expect to get that from CORE Lab?

I would say within six weeks to two months.

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MR. NUTTER: Are there any other questions of this witness? He may be excused.

MR. CARR: I'll call James Eakin.

JAMES E. EAKIN, JR.

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

### DIRECT EXAMINATION

BY MR. CARR:

Will you state your full name and place of residence?

I'm James E. Eakin, Junior, Midland, Texas.

Mr. Eakin, by whom are you employed and in what capacity?

Getty Oil Company as a Lead Reservoir Engineer, Midland District Office.

Have you previously testified before this Commission and had your credentials accepted and made a matter of record?

No, I have not.

Will you summarize for the Examiner your educational background and your work experience?

All right. I'm a 1959 petroleum en-

gineering graduate from the University of Oklahoma; worked the last twenty years as a petroleum engineer, a brief time for Magnelia Petroleum Company and a testing company in south Texas before being employed by Getty Oil Company in 1962.

The last seventeen and a half years I have been with Getty, the last seven and a half in Midland District Office. And our Midland District Office covers the West Texas and southeast Lea County.

And you're familiar with the application in this case?

A Yes.

MR. CARR: Are the witness' qualifications acceptable?

MR. NUTTER: Yes, they are.

Mr. Eakin, will you please refer to what has been marked for identification as Getty Exhibit E and review the information contained in there for Mr. Nutter

A. Yes, sir. Exhibit E is a preliminary fluid analysis report prepared by CORE Laboratories on samples taken on our Getty 36 State Com No. 1.

The duplicate samples were obtained from the separation facilities on the subject well on September 9th, 1979, at our direction. This was taken by Tefteller, Incorporated, out of Midland. They caught

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these pressure samples, saved them, and shipped them to CORE Laboratories in DAllas.

Under our request CORE Laboratories analyzed the fluid to determine whether or not this was a gas reservoir or an oil reservoir, and the additional data required for proper separation and efficient recovery from this reservoir.

The basic information concerning the test itself, the samples were analyzed. They were then recombined physically in the laboratory and the producing gas and liquid ratio at which the samples were caught in the field, they were adjusted to the separator conditions, the ratios that were calculated were adjusted to reservoir conditions. The sample was charged into a high pressure visual cell in which the temperature and pressure can be maintained at reservoir conditions. The -- there's a window in the cell in which you can observe whether or not the fluid contained therein is either gas or liquid and determine whether or not there was a bubble point or a dewpoint at various pressures.

The sample was submitted -- or subjected to a constant composition, constant temperature expansion. The fluid was observed through the window and a retrograde dewpoint was observed at 5018 psig. It was also observed that the fluid was in a gaseous state at reservoir conditions.

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Original reservoir pressure for this well, this reservoir, was 7255 psig. We call your attention to page one of the attachments of data to the letter.

Page one of this data is operatorprovided information on bottom hole pressures and the sampling tests, or well test data, at the time the samples were caught.

We call your attention to formation characteristics, the first portion of this, original reservoir pressure 7255 psig at 11,328, which is approximate mid-perforations of the Wolfcamp in this well.

Liquid gravity shown here is also 49.7 degrees API, as previously testified by Mr. Terry.

The date of sampling was September the 9th. The pressures were run, showed that the flowing bottom hole pressure at the time the sample was taken was 6092 pounds; that both of these, the original reservoir pressure and the pressure at the time of sampling were above the dewpoint of 5018 pounds.

The well test data at the time this was taken is shown in the very lower portion of this page. A producing rate of 650.54 barrels per day; a gas/oil ratio calculated to be 4438 cubic feet per barrel. This is also can be converted to a condensate yield of 225.33 barrels per minute. And the temperature was extrapolated from a

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bottom hole pressure report down to 196 degrees at mid perfs.

Page two of the data is a hydrocarbon analysis of both the separator gas and the separator liquids. I call your attention to the last in the components, the lefthand column, heptanes plus, total well stream low percent is 9.64 percent. To the best of my knowledge and checking on existing oil reservoirs known to be retrograde condensate reservoirs, a rule of thumb shows that there are no oil reservoirs below 11 percent, lower percent on heptanes plus, and this, of course, is below that.

I refer you to page three. On page three you have the pressure volume relations of the reservoir fluids at the reservoir temperature of 196 degrees. This was done with the sample cell measuring the volumes, relative volumes, at each pressure point.

Indicated is the 7255 initial reservoir pressure and the retrograde dewpoint pressure of 5018 pounds.

Page four of the analysis indicated retrograde condensation percentages as a portion of the hydrocarbon -- or reservoir hydrocarbon pore space at reservoir conditions. Shown here is the dewpoint, showing no liquid percent at 5018 pounds; or above, and that as the pressure was depleted in the cell, that the percent of liquid hydrocarbons increased, which is characteristic of a retrograde condensate reservoir, and approximately 3150

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the maximum percent of hydrocarbon recovery or -- excuse me.

The maximum percent of hydrocarbon pore space occupied by
liquids was about 37.1 percent. This is also indicated in
the letter.

Below this pressure the hydrocarbons tend to vaporize again and recovery of the liquids would increase.

Page five of this exhibit is a graphic representation of this same data on page four, in which you can see no -- zero percent liquids above 5018 pounds. It increases, the liquid percent in reases until it reaches approximately 3150 pounds, and then again decreases as the reservoir pressure decreases.

This is a characteristic curve of a retrograde condensate reservoir.

- Q Mr. Eakin, it is your conclusion that what you have here is a gas reservoir, not an oil reservoir, is that correct?
- review of other retrograde condensate reservoir analysis, and this analysis, that it meets rule of thumb guidelines, as well as the actual observation of gas in the cell at reservoir condtions and a dewpoint exists -- retrograde dewpoint exists at 5018 pounds. It is a gas reservoir.
  - Q Have you reviewed Exhibit E and can you

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testify as to its accuracy?

A Yes. I believe the information contained therein is accurate.

In your opinion will classifying this as a gas reservoir be in the interests of conservation, the prevention of waste, and the protection of correlative rights?

A Yes, it would.

MR. CARR: At this time, Mr. Examiner, we would offer into evidence Getty Oil Company Exhibit E.

MR. NUTTER: Getty Exhibit E will be admitted in evidence.

MR. CARR: I have nothing further on direct.

### CROSS EXAMINATION

BY MR. NUTTER:

Mr. Eakin, this Exhibit E is entirely data which was supplied to you from CORE Labs.

Now, Mr. Terry awhile ago mentioned that CORE Lab will be sending in its final report within some six weeks or so.

Ato Yes, sir.

At that time do they have sufficient reservoir information they could make a recommendation as

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to what proper withdrawals are, or do they just furnish you with parameters regarding the -- this liquid and the gaseous production itself from the well and you make the determination as to what the proper rate of withdrawal is?

They normally provide the data and the determination of the rate of withdrawals and the recoveries expected would be determined on an economic basis by Getty oil.

But they make the actual determination as to what the proper rate of withdrawal from the reservoir is?

A No, they do not make that proper rate of withdrawal. They give -- as an example here, they show the composition of the gas on its withdrawal, as stated in the letter, in page two of the letter, shows that -- the method of -- second sample will be analyzed.

Also would point out in the first paragraph of page two of the letter, again, that the maximum accumulation of hydrocarbons in the pore space, which would be -- remain in the reservoir in approximately 37 percent. This is at a reservoir pressure of 3150. This is not -- this is not recovery at the surface. This is what would be left in the reservoir, which is in the range of even a water drive oil reservoir.

> Do you know if there's any -- if there's Q.

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Santa Fe, New Mexico 67301
Phone (305) 435-7409

any water drive present in this reservoir at all?

A. There appears -- we do not know what the drive mechanism is at the present time, but it does not appear to be a water drive.

You made water on that first test that Mr. Terry had, I think, and no water produced since then.

- A. That is correct.
- Q I believe.

A. We believe most of that to be filtrate water or load water from the stimulation.

n I see. And what is the current bottom
hole pressure in the reservoir?

The current bottom hole pressure in the reservoir is shown in the report, on September 12th was 6846 at mid perfs.

Well, that was September. You don't
know what the current bottom hole pressure is?

A No, we have not run any samples, or any tests since that date.

Well now, what is your recommendation,

Mr. -- Mr. Eakin, that the pool would be reclassified as
a retrograde gas condensate reservoir?

A Yes, sir.

And that the pool rules that we have today be rescinded and that it just be classified as a gas

reservoir?

Yes, sir.

Do you have any recommendations at this time as to what the proper rate of withdrawal should be from this gas reservoir?

No, sir, we do not.

Do you think that after you get your final report from CORE Lab that you'll be in a better position to make the determination as to what the proper rates of withdrawal should be?

I would think we would be in a much better position to determine at that time.

Would you have objection to an order reclassifying the well -- the pool at this time as a retrograde gas condensate reservoir on a very limited temporary basis, pending the determination as to what proper rates of withdrawal should be?

Mo, sir. As we see right now, we do: not -- it does not appear that the rate of production will inherently affect the recovery from the reservoir.

Well, so far it hasn't anyway.

Yes.

And what's your opinion as to when you will have this data from CORE Lab and when you could make a presentation to this Division?

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A. Our latest information was this past

Friday from CORE Laboratories and they had not yet started

the fluid analysis with the backlog that they have in fluid

analyses to be run. Our best estimate would be six weeks to

two months. This is pure estimate.

Q. And then another month for you to prepare a case?

A I would presume so.

MR. NUTTER: Are there any other questions of the witness? He may be excused.

Do you have anything further, Mr. Carr?

MR. CARR: Nothing further, Mr. Nutter.

MR. NUTTER: Does anyone have anything they wish to offer in Case Number 6608?

We'll take the case under advisement.

(Hearing concluded.)

### REPORTER'S CERTIFICATE

I, SALLY W. BOYD, a Certified Shorthand Reporter, DO HEREBY CERTIFY that the foregoing and attached Transcript of Hearing before the Oil Conservation Division was reported by me; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6608, heard by me on 186.

cer. Examiner Oll Conservation Division

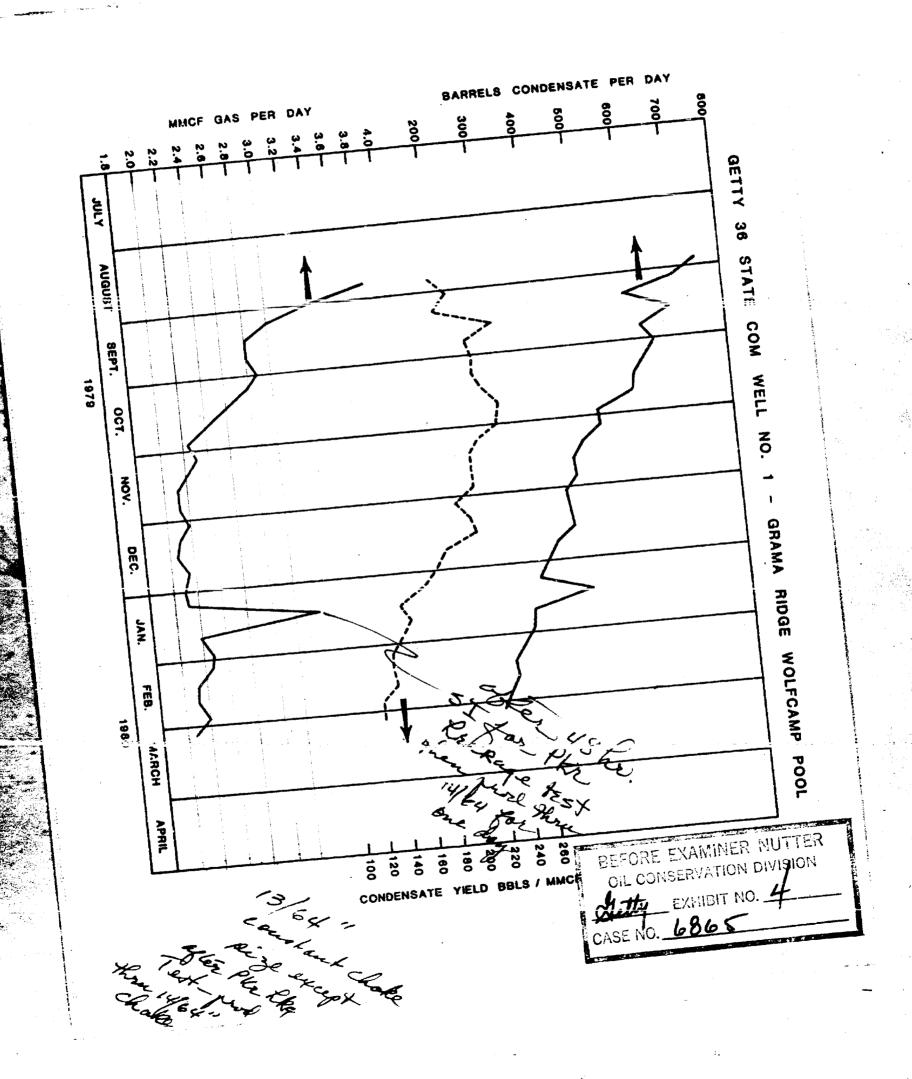
LEA COUNTY, NEW MEXICO 20",94# H-40 @ 40' w/3 yds. Ready-Mix 13 3/8", 48#, H-40 @ 1100'. Circulate 17 sxs to surface 9 5/8",36#, S-80 & K-55 at 55021. Circulate 125 sxs cement surface 2 3/8", N-80 8rd tbg Baker Model "AL-5" Dual pkr. at 10,505\* w/2 3/8" x 1.81" Model "F" nipple 2 3/8", N-80 8rd tbg. Liner top at 10,815 Squeezed w/100 sxs 7", 26# N-80 & S-95 @ 11,114'. Cement top by worth Well Temp. at 3570'. 5-20' blast joints Wolfcamp perfs. 11,320-11,335' 3 11/16" x 26' x 1.81' "ER" tbg. Receptacle w/1.87' BFC Model "F" profile Baker Model "DB" pkr. @ 12,000' 3 1/2' x 6' mill-out 2 3/8" x 10' pup joint ... Morrow perfs. 12,940-12,950' BEFORE EXAMINER NUTTER OIL CONSERVATION DIVISION EXHIBIT NO. Z Plug back TD 13,266\* 4 1/2" 11.6# S-95 @ 13,349'

# DAILY TEST DATA GETTY "36" STATE COM. WELL NO. 1 WOLFCAMP

Week of	Condensate Bbls.	Gas (MCF)	(BBLS./APCF)
Aug. 27	750	3.82	196.33
Sep. 3	700	3.32	210.84
Sep. 10	590	2.98	197.98
Sep. 17	685	2.80	244.64
Sep. 24	620	2.80	221.42
Oct. 1	645	2.86	225.52
Oct. 8	620	2.77	223.82
Oct. 15	600	2.59	231.66
Oct. 22	590	2.42	243.80
Oct. 29	515	2.14	240.65
Nov. 5	518	2.3	225.21
Nov. 12	475	2.2	215.91
Nov. 19	455	2.11	215.63
Nov. 26	458	. 2.12	216.03
Dec. 3	435	2,18	199.54
Dec. 10	442	2.09	211.48
Dec. 17	445	2.06	216.02
Dec. 24	195	2.11	189.25
Dec. 31	380	2.1	180.95
Jan. 7	360	2.12	169.81
Jan. 14	470	3.190	147.34
Jan. 21	341	2.192	155.57
Jan. 28	336	2.274	147.76
Feb. 4	313	2.258	138.62
Feb. 11	292	2.132	136.96
Feb. 18	295	2.117	139.75
Feb. 25	274	2.202	124.43
Mar. 3	260	2.077	125.18

BEFORE EXAMINER NUTTER
OIL CONSERVATION DIVISION

OLETT EXHIBIT NO. 3



# GETTY 36 STATE COM. NO. - WOLFCAMP PRODUCTION DATA

MONTH	CONDENCAMO	•
August, 79	CONDENSATE, BBL.	GAS, MOF
Sept., 79	4,864	19,492
	16,150	
Oct., 79	17,660	74,619
Nov., 79		76,388
Dec., 79	13,439	61,611
•	12,244	
Jan., 80	10,412	64,464
Feb., 80	<u>7,489</u>	64,131
Total		57,200*
*estimated	82,258	417,905

<sup>\*</sup>estimated

Well was opened after buildup at 11 a.m. on February 29, 1980. Hence, total estimated production through February is approximately the production prior to the start of the buildup.

BEFORE EXAMINER NUTTER OIL CONSERVATION DIVISION EXHIBIT NO: 6865

SERVICES, ENIBE EXAMINER NUTTER
PHONE SOS DOS CONSERVATION DIVISION

HOBBS. NEW MEXICO 88240

COMPANY: Getty Oil Company

WELL: Getty 36 State Com, No. 1

FIELD: Undesignated - Wolfcamp

### CHRONOLOGICAL PRESSURE DATA

			ELASPED TIME		SURFACE PRESSURE		BHP <b>e</b> (-7636 )	
DATE	STATUS OF WELL	TIME	HRS.	MIN.	TBG	CSG _	10485'	11328'PSIG
1980.								<del></del>
2/26	Flowing. Run Flowing							
	Gradient W/Tandem							
	Bombs & Set Bombs							•
	off @ 10485'	10:30 A	M O	00	2346	PKR	3840	3963
	Shut in	11:00	0	30	2346	_	3840	3963
	11	11:03	´ 0	03	-	-	4045	4408
	1*	11:06	0	06	-	-*	4154	4517
*	**	11:09	·· 0	, 09	· -	-	4179	4542
	•	11:12	0	12	- Names	-	4186	4549
		11:15	0	15	-	-	4192	4555
	11	11:20	0	20	_	-	4192	4555
	11	11:25	O	25	_	_	4192	4555
	ri	11:30	O	30	_	_	4192	4555
	*11	11:45	0	45	-	-	4192	4555
	•	12:00 N	1	00	-	_	4192	4555
	1.	1:00 P	M 2	00	_	_	4199	4562
	11	2:00	3	00	_		4205	4568
	<b>*</b> *	3:00	4	00	-	***	4205	4568
	11	4:00	5	00	<del>-</del> ·	_	4205	4568
	**	5:00	6	00	-	_	4212	4575
	**	6:00	7	ÕÕ	-	_	4212	4575
	11	7:00	8	00	-	_	4212	4575
	**	8:00	9	00	<del>`</del> _		4218	<b>45</b> 81
	<b>**</b>	9:00	10	.00			4218	4581-
	**	10:00	11	00	-	-	4218	4581
	) t	11:00	12	00	<u>-</u>	-	4218	4581
	••	12:00 M	N 13	00	-	-	4218	4581
2/27	**	1:00 A	M 14	00	-	_	4218	4581
	tt .	2:00	15	00	-	-	4218	4531
		3:00	16	00	<del>-</del>	_	4218	4581
	11	4:00	17	00	<u> </u>	_	4218	4581
		5:00	18	90	-	-	4218	4581
	EP .	6.00	19	ůů	-	-	4218	4591
	17	7:60	20	00	-	_	4218	4581
	· ••	8:60	. 21	00	_	_	4218	4581
	, <del>O</del>	9:00	22	00	·	_	4218	4581
	11"	10:00	23	00	-	• -	4218	4581
	ee .	11:00	24	00		. –	4218	4581
	**	12:00 N		00	<b>-</b> ·	_	4218	4581
	**	1:00 P		00	-	_	4224	4587
	17	2:00	27	00	_	_	4224	4587
	**	3:00	28	00	-	<u>-</u> ·	4224	4587
	11	4:00	29	00			4224	4587

Getty 36 State Com. ELASPED TIME SURFACE PRESSURE STATUS OF WELL DATE TIME HRS. MIN. **TBG** CSG Shut in 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 MN 2/28 1:00 AM 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 47 , 11:00 12:00 N 1:00 PM 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 MN 2/29 1:00 AM 2:00 3:00 **46Q0** 4:00 5:00 6:00 7:00 8:00 9:00 10:00 

Fished Bombs & Run Static Gradient

11:00

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2/31

## JARREL SERVICES, INC.

POST OFFICE BOX 1654

PHONES 505 393-5396 -- 393-8274

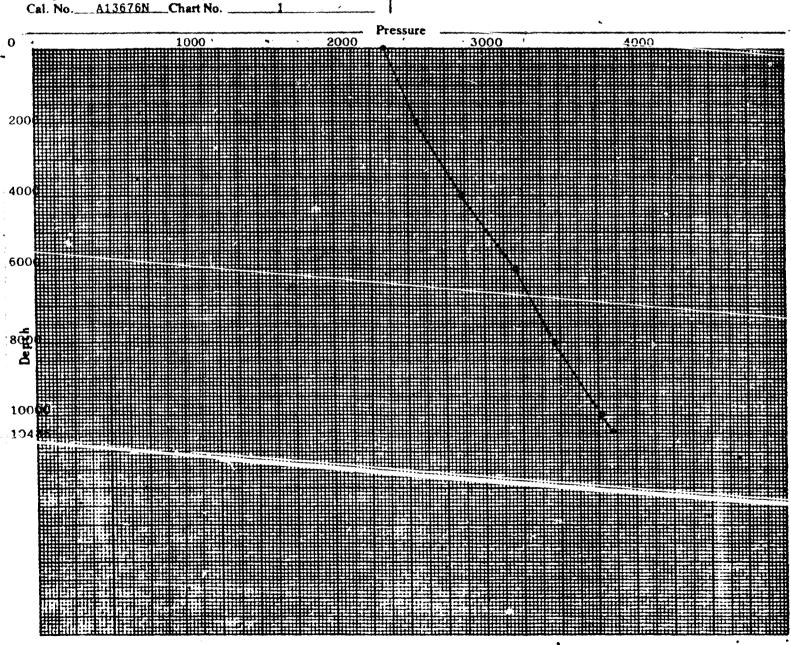
HOBBS, NEW MEXICO 88240

0000.000		0:1	0	_
FIELD	Unde	signat	ed	
<b>FORMATIO</b>	N Wolf	camp		
				WELL #1
COUNTY_	Lea		_STATE_	New Mexico
DATEF	eb. 26, 19	80	TIME	8:00 AM
Status	Flow	cing		
<b>Test Depth</b>	10485	<del></del>		
Time S. I.		Last test	date	
Tub Pres.	2346	BHP last	test	
Cas. Pres	<u> Bual</u>	BHP cha	nge	
Elev. 3692	'KB-23	Fluid top	Ē	lowing
Temp. @ _	174°F	Run by .		SI #21
Cal. No	A13676N	Chart No		1

### **BOTTOM HOLE PRESSURE RECORD**

Depth	Pressure	Gradient
0	2346	
2000	2558	.106
4000	2859	.151
6000	3205	.173
8000	3468	.132
10000	3769	.151
10485	3840	.146
11328 (-76	36) 3963 * **	(.146)

- \* EXTRAPOLATED PRESSURE
- \*\* MIDPOINT OF CASING PERFORATIONS



3. 340R-L310 DIETZGEN GRAPH PAP SEMI-LOGARITHMIC 3 CYCLES X 10 DIVISIONS PER INCH JARREL SERVICES, INC. TIME IN HOURS

-L310 GJETZGEN GRAPH PAF SEMI-LOGARITHMIC JES X 10 DIVISIONS PER INCH JARREL SERVICES, INC. TIME IN HOURS

## JARREL SERVICES, INC.

POST OFFICE BOX 1854

PHONES 505 393-5398 - 393-8274

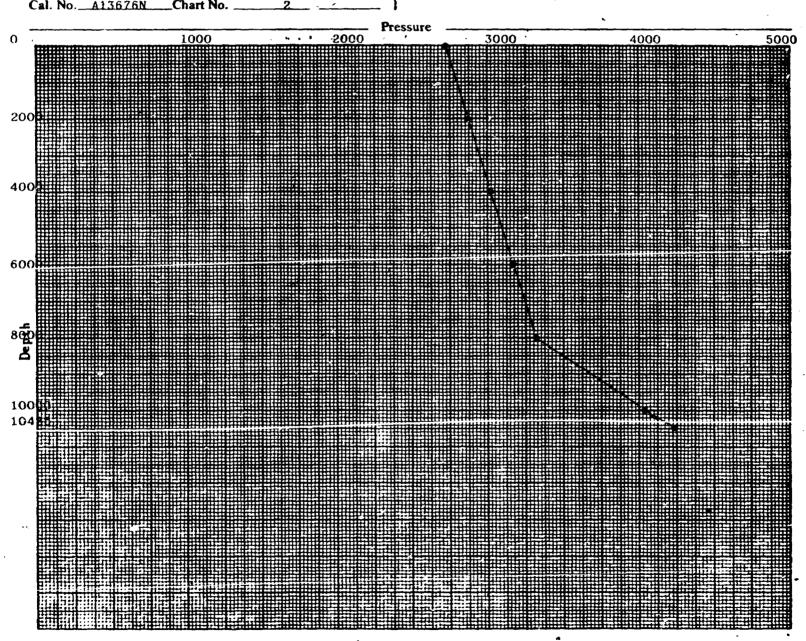
HOBBS, NEW MEXICO 88240

_		
OPERATOR Ge	tty OII Company	
FIELDUn	designated	
FORMATIONWO	1fcamp	
LEASEGetty :	36 State Com	WELL #1
COUNTY Le	aSTAT	E New Mexico
DATE Feb. 2	9, 1980 TIM	E_11:00 AM
StatusShut_i	a	
Test Depth 10485'		
Time S. I. 72 hrs	Last test date _	7/4/79
Tub Pres. 2731	BHP last test _	<b>7057</b> @ 10450
Cas. Pres. PKR		
Elev3692'KB-2	3Fluid top	8000 *
Datum (-7636)	** Water top	9000'
Temp. @ _174 F	Run by	JSI #16
Cal. NoA13676N	Chart No	2

### **BOTTOM HOLE PRESSURE RECORD**

Depth	Pressure	Gradient
0	2731	-
2000	2874	.072
4000	3020	.073
60Q0	3168	.074
8000	3318	.075
10000	4028	.355
10485	4237	.431
11328 (-	7636) 4600 *	** (,431)

- \* EXTRAPOLATED PRESSURE
- \*\* MIDPOINT OF CASING PERFORATIONS



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS. TEXAS 78807

Reservoir Fluid Study
For
GETTY OIL COMPANY

State 36 No. 1 Well Wildcat Lea County, New Mexico

DEFORE EXAMINER NUTTER
OIL CONSERVATION DIVISION
EXHIBIT NO. 7
CASE NO. 6865

# CORE LABORATORIES, INC. Petroleum Reservoir Engineering DALLAS. TEXAS 75207 . January 23, 1980

RESERVOIR PLUID DIVISION

Getty Oil Company P.O. Box 730 Hobbs, NM 82240

Attention: Mr. Peter Botes

Subject:

Reservoir Fluid Study
State 36 No. 1 Well
Wildcat
Lea County, New Mexico
Our File Number: RFL 79619

Duplicate samples of separator gas and separator liquid were collected from the subject well by Tefteller, Inc. on September 9, 1979. These samples the subject well by Tefteller, for use in a reservoir fluid study, were forwarded to our Dallas laboratory for use in a reservoir fluid study, the results of which are presented on the following pages.

Upon arrival in the laboratory, the separator gas was analyzed through heptanes plus using chromatography, while the separator liquid was also analyzed through heptanes plus using low temperature fractional distillations equipment along with chromatography. After the separator gas flow rate equipment along with chromatography. After the separator gas at 15.025 corrected using factors which are shown on page one, the producing gas—liquid ratio was calculated to be 4438 cubic feet of separator gas at 15.025 psia and 60°F. Per barrel of stock tank liquid at 60°F. In the laboratory, the separator liquid at 490 psig and 78°F. The separator gas per barrel of separator liquid at 490 psig and 78°F. The measured compositions of the separator products were used in conjunction with this producing gas—liquid ratio to calculate the composition of the producing well stream material. These compositions are shown on page two. In the laboratory, the separator products were physically recombined to this producing gas—liquid ratio for use in the entire reservoir fluid study.

A portion of the reservoir fluid was charged to a high pressure visual cell and heated to the reservoir temperature of 196°F. During constant composition expansion pressure-volume relations performed at this temperature, the expansion pressure-volume relations performed at this temperature, the expansion pressure-volume relations performed at this temperature, the expansion pressure above 5018 psig at which above fluid existed as a single-phase gas at pressures above 5018 psig at which pressure a retrograde dew point was observed. A comparison of this dew pressure a retrograde dew point was observed. A comparison on September pressure a retrograde dew point pressure, 6846 psig, measured on September point pressure to the reservoir pressure, that the fluid currently exists in the reservoir in an 12, 1979 indicates that the fluid currently exists in the reservoir undersaturated condition. The results of the pressure-volume relation measurements are shown on page three.

The sample in the cell was repressured to a single-phase condition after which it was subjected to a constant volume depletion. After the sample volume was established at the dew point pressure, the sample was subjected to a series of pressure expansions and constant pressure displacements with each displacement terminating at the original sample volume at the dew point pressure. During each of these displacements, the volume of retrograde liquid accumulation was monitored. These data, which are reported on pages six and twelve, show that the maximum accumulation of liquid is approximately 37.1 percent of the hydrocarbon pore space occurring at approximately 3150 psig. The liquid saturation at atmospheric pressure and 196°F. was 24.5 percent of the hydrocarbon pore space.

A larger volume of the reservoir fluid was once again charged to a bigger high pressure cell heated to 196°F. where the constant volume depletion was repeated. During this particular depletion, the equilibrium gas phase at each of the depletion pressure levels was charged to low temperature fractional distillation equipment where along with chromatography its composition was measured. Also determined was the volumetric production of the vapor phase from pressure to pressure where the various deviation factor z were measured down to 760 psig. A summary of these volumetric and compositional data is reported on page four.

The above compositions and volumetric data were used in conjunction with published equilibrium ratio data to calculate the surface recoveries that may be expected as the reservoir pressure declines. These calculations were performed on the basis of one million standard cubic feet of reservoir fluid implace at the dew point pressure, 5018 psig and 196°F. Assumed in these calculations was a plant efficiency of 100 percent. These volumetric data are reported in tabular form on page five.

We wish to thank Getty Oil Company for this opportunity to be of service. If you should have any questions regarding these data or we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

CORE LABORATORIES, INC.

P. L. Moses, Manager Reservoir Fluid Analysis

PLM:FBV:bt

6 cc: Addressee

1 cc: Mr. Jim Eakin

Getty 011 Co.

P.O. Box 1231

Midland, TX 79702

		Page_	11	of	12
		File_	RFL	79619	
Company Getty Oil Company	Date Sampled_	Septem	ber 9,	1979	
Well State 36 No. 1	County	Lea			<del></del>
Field Wildont	State	New Me	xico		
FORMATIO	N CHARACTERISTICS				
Formation Name		Wolfcam	D		
Date First Well Completed	-	July 2	<u> </u>	•	1979
Original Reservoir Pressure	-	7255	PSIG (	1132	$8 - \overline{\text{Ft}}$
Original Produced Gas-Liquid Ratio	-	5082	<del></del>		SCF/Bb1
Production Rate	_	752			Bbls/Day
Separator Pressure and Temperature	_		PSIG		°F.
Liquid Gravity at 60°F.	_	49.7			*API
Datum	_	7636		F	t. Subsea
WELL	CHARACTERISTICS				
Elevation	_	3692 KB			Ft.
Total Depth	_	13266 P			Ft.
Producing Interval	_	11320-1	1335		Ft.
Tubing Size and Depth	_	2-3/8	In. to		5 Ft.
Open Flow Potential		7.82 (E			MMSCF/Day
Last Reservoir Pressure	_	6846	_PSIG (	1132	
Date	_	Septemb			, 1979
Reservoir Temperature	_	187*	°F. @	1050	5 Ft.
Status of Well		Flowing			
Pressure Gauge	_	Amerada			
	ING CONDITIONS				•
Flowing Tubing Pressure	_	3510	·		PSIC
Flowing Bottom Hole Pressure	_	6092			PSIC
Primary Separator Pressure	_	490			PSIC
Primary Separator Temperature	_	78			°F,
Secondary Separator Pressure	-				PSIC
Secondary Separator Temperature			14 4 4		*F,
Field Stock Tank Liquid Gravity	<u>-</u>	49.7		AP	I @ 60°F.
Primary Separator Gas Production Rate	45 005	2887			_MSCF/Day
· · · · · · · · · · · · · · · · · · ·	15.025 PSIA				
Temperature Base	60 °F.				
	1.0477				
	0.688				
	1.2056	(50.51			m: 1 /m
Stock Tank Liquid Production Rate @		650.54			_Bbls/Day
Primary Separator Gas/Stock Tank Liqui	-	4438			SCF/Bb1
Complete by	or -	225.33	<del> </del>	B	bls/MMSCI
Sampled by	·-	TI		<del> </del>	
REMARKS:					

REMARKS

These analyses, epinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the heat judgment of Core Laboratories, Inc. (all errors and omissions excepted); but for Laboratories, Inc. used its officers and employees, assume no responsibility and make no warranty or representations as to the productivity, proper operators are approximately and an expression of each other productivity will be used on relied upon.

<sup>\*</sup>Temperature extrapolated to mid-point of perforation = 196°F.

Page

File

RFL 79619

Well Hydrocarbon Analyses of Separator Products and Calculated Well Stream State 36 No. 1 Separator Liquid Component Separator Gas Mol Percent Well Stream Mol Percent Mol Percent Hydrogen Sulfide Carbon Dioxide 0.00 0.00 Nitrogen 0.00 0.00 0.12 Methane 0.16 0.10 1.14 Ethane 11.74 0.94 81.81 Propane 8.81 67.81 10.87 iso-Butane 9.79 2.964 10.46 3.92 1.100 n-Butane 2.49 5.09 0.50 1.428 iso-Pentane 7.04 0.167 0.90 0.91 **0.300** n-Pentane 0.293 3.33 2.13 0.18 0.685 Hexanes 0.067 3.83 0.81 0.18 0.302 Heptanes plus 0.067 5.63 0.91 0.10 0.336 0.042 47.18 1.21 0.27 0.503 100.00 0.125 9.64 100.00 5.563 4.825 100.00 10.117 Properties of Heptanes plus API gravity @ 60°F. Specific gravity @ 60/60°F. 44.5 Molecular weight 0.8041 0.802 103 (assumed) Calculated separator gas gravity (air=1.000) Calculated gross heating value for separator gas **- 0.688** per cubic foot of dry gas @ 15.025 peis and 60°r. 1224 BTU Primary separator gas collected @ Primary separator liquid collected @ 490 Psig and psig and Primary separator gas/separator liquid ratio °F. Primary separator liquid/stock tank liquid ratio 3588 Primary separator gas/well stream ratio SCF/Bbl @ 78°F. 1.237 Stock tank liquid/well stream ratio Bbls @78°F/per Bbl @60°F. 800.17 MSCF/MMSCF 180.30 Bbls/MMSCF

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# CORE LABORATORIES, INC.

Page	3 of 13	_
File	RFL 79619	_
Well	State 36 No. 1	

# Pressure-Volume Relations of Reservoir Fluid at 196°F, (Constant Composition Expansion)

Pressure	Relativa	Deviation Factor
PSIG	Volume	Z
8000	0.8946	1.482
7630	0.9034	1.427
7255 Original Reservoir Pressure	0.9115	1.369(1)
7100	0.9172	1.348
6700	0.9291	1.289
6300	0.9421	1.229
6000	0.9532	1.185
5700	0.9655	1.140
5450	0.9769	1.103
5300	0.9843	1.081
5150	0.9929	1.060
5050	0 <b>. 9</b> 974	1.044
5018 Dew Point Pressure	1.0000	1.040(2)
5008	1.0006	
4950	1.0049	
4850	1.0119	
4700	1.0240	
4500	1.0422	
4250	1.0687	
<b>39</b> 50	1.1089	•
3500	1.1860	
3000	1.3198	
2500	1.5253	
2000	1.8695	
1600	2.3295	
1300	2.8763	
1000	3.7825	

- (1) Gas expansion factor = 1.572 MSCF/Bbl.(2) Gas expansion factor = 1.433 MSCF/Bbl.

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File RFL 79619

Well State 36 No. 1

## Depletion Study at 196°F.

## Hydrocarbon Analyses of Produced Well Stream - Mol Percent

	Reservoir Pressure - PSIG							
_	5018	4300	3600	2800	2000	1300	700	700*
Component								
Carbon Dioxide	0.10	0.10	0.10	0.10	0.11	0.12	0.14	0.04
Nitrogen	0.94	1.12	1.19	1.20	1.15	1.08	1.03	0.05
Hethane	67.81	73.54	76.22	78.13	78.75	78.34	75.34	14.37
Ethane	10.46	10.44	10.41	10.34	10.66	11.10	12.23	7.27
Propane	5.09	4.80	4.57	4.40	4.42	4.66	5.70	7.16
iso-Butane	0.90	0.80	0.73	0.67	0.66	0.71	0.94	2.12
n-Butane	2.13	1.84	1.62	1.47	1.41	1.52	1.97	5.21
iso-Pentane	0.81	0.68	0.59	0.52	0.48	0.48	0.54	2.56
n-Pentane	0.91	0.74	0.63	0.54	0.49	0.49	0.56	2.87
Hexanes	1.21	0.81	0.57	0.42	0.34	0.33	0.40	5.87
Heptanes plus	9.64	5.13	3.37	2.21	1.53	1.17	1.15	52.48
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Molecular weight of heptanes plus	169	133	124	115	109	106	107	180
Specific gravity of heptanes plus	0.801	0.777	0.770	0.759	. 0.752	0.749	0,750	0.808
Deviation Factor - Z								
Equilibrium gas	1.040	0.911	0.845	0.820	0.847	0.888	0.935	
Two-phase	1.040	0.952	0.878	0.812	0.752	0.682	0.559	
Well Stream produced-								
Cumulative percent of initial	0.000	6.304	14.855	28.142	44.651	60.178	73.736	*
GPM from Smooth Compositions		e.						
Propane plus	10.117	5.906	4.489	3.580	3.131	3.066	3.650	
Butanes plus	8.689	4.559	3.207	2.345	1.891	1.758	2.051	
Pentanes plus	7.704	3.701	2.443	1.650	1.218	1.032	1.105	

<sup>\*</sup>Composition of equilibrium liquid phase.

These analysis, opinions or interpretations are based on observations and meterial supplied by the client to whom, and for whom exclusive and confidential one, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories. Inc. (all errors and emissions excepted); but Core Laboratories, less, and its efficient and confidence on an expression of representatively, programment of the productivity, programment of the productivity of the confidence of one of the productivity of the confidence of one of the productivity of the confidence of one of the confidence of one of the confidence of the confidence of one of the confidence of one of the confidence of one of the confidence o

Page 5 of 12

File RFL 79619

Well State 36 No. 1

### Calculated Cumulative Recovery During Depletion

Cumulative Recovery per Initial Reservoir Pressu					rvoir Pressur	e - PSIG		
MMSCF of Original Fluid	in Place	5018	4300	3600	2800	2000	1300	700
Well Stream - MSCF	1000	0	63.04	148.55	281.42	446.51	601.78	737.36
Normal Temperature Separation*								
Stock Tank Liquid - Barrels	189.70	0	5.58	10.36	15.01	18.90	21.09	
Primary separator gas-MSCF	789.49	0	55.38	133.93	259.64	418.40	571.04	
Second stage gas - MSCF	45.62	0	1.70	3.25	4.86	6.31	6.46	
Stock tank gas - MSCF	26.80	0	1.10	2.13	3.23	4.24	4.55	
Total "Plant Products" in								
Primary Separator Gas - Gallons								
Propane	833	0	62	151	293	478	676	
Butanes (total)	342	0	27	68	134	221	326	
Pentanes plus	185	0	15	37	75	125	200	
Total "Plant Products" in								
Second Stage Separator Gas-Gallons	3							
Propane	161	0	6.3	12.1	18.1	23.6	24.0	
Butanes (total)	72	0	3.1	6.0	9.0	11.9	12.1	
Pentanes plus	37	0	1.6	3.1	4.8	6.4	6.5	
Total "Plant Products" in						•		
Well Stream - Gallons								-
Propane	1428	0	85	195	359	563	766	983
Daranes (foraj)	ŶôŚ	Ü	54	119	212	323	4.16	564
Pentanes plus	7704	0	233	442	661	863	1023	1173

<sup>\*</sup>Primary separator at 490 psig and 78°F.; second stage separator at 70 psig and 75°F.; and stock tank at 70°F., except 1300 psig well stream where primary separator is at 200 psig and 78°F.

These analyses, spining or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential than this report is made. The interpretations or opinions expressed represent the best judgment of Gere Laboratorian. Inc. (all errors and emissions excepted); but Gere Laboratorian. Inc. and its officers and employee, according no regionshiftly and make no warrantly or representations as to the predicativity, prepar opensylvant in the productivity and in expectation with which such except to used or critical space.

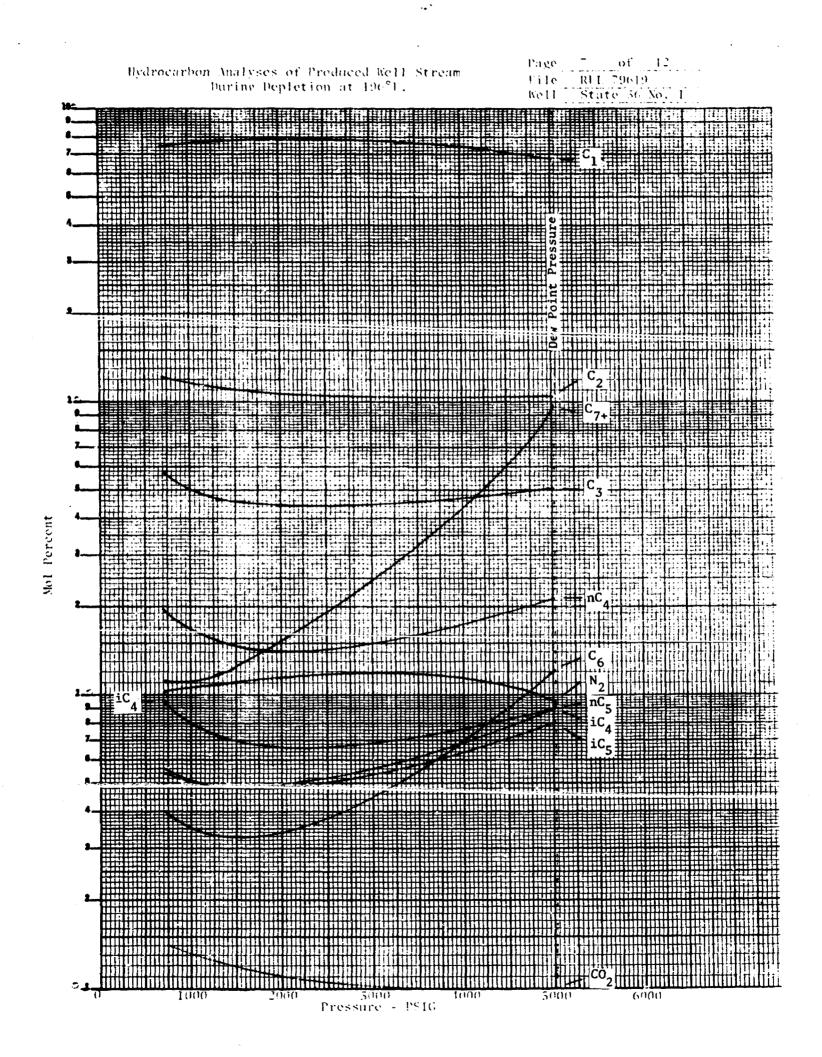
Page	of	12
File	RFL 79619	
Well	State 36 No.	1

## Retrograde Condensation During Gas Depletion at 196°F.

Pressure PSIG	Retrograde Liquid Volume
	Percent of Hydrocarbon Pore Space
5018 Dew Point Pressure	
5012	0.0
5008	0.8
4950	1.4
4850	11.2
4700	17.8
4500	23.7
4300	28.6
	32.9
3600	36.7
2800	37.0
2000	35.2
1300	· · ·
700	32.5
0	29.7
	24.5

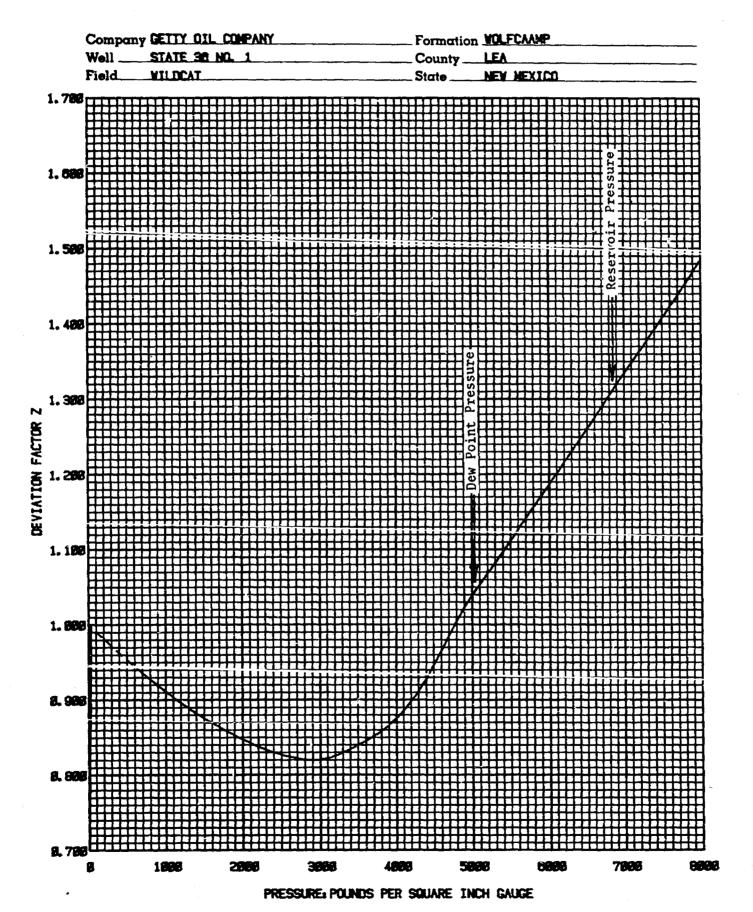
Proporties of Zero rold mesidual Liquid

API Gravity @ 60°F. 43.6
Specific gravity @ 60/60°F. 0.8080
Molecular weight 181



Page 8 of 12 File RFL 79619

### DEVIATION FACTOR Z OF WELL STREAM DURING DEPLETION AT 1986F.

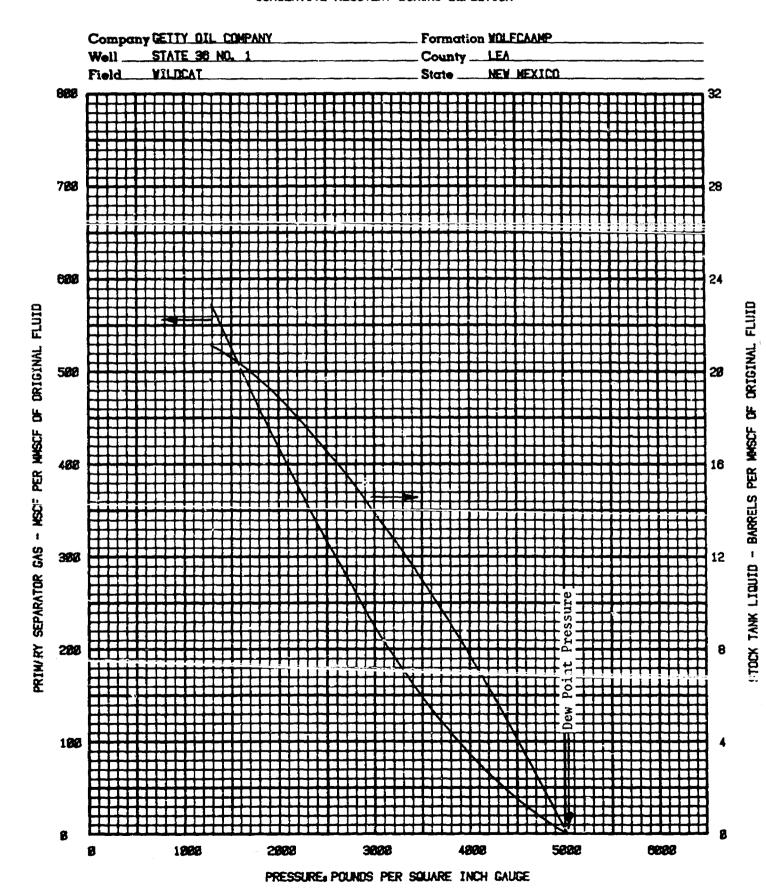


# VOLUME OF WELL STREAM PRODUCED DURING DEPLETION

YOLUME OF WELL STREAM PRODUC	
AOLUME O	Formation YOLFCAAMP
	Formation
Company GETTY OIL COMPANY STATE 38 NO. 1	County LEA NEXICO
Canada GETTY UIL MARKET	State
Company STATE 38 NO. 1	
Well	
Field	
80 TOUR HOLD HAR	
70 111111111111111111111111111111111111	
" H-1-171-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	
60 1	
HHIIIHHIIIHHIII	
50	
3 48	
§ HHLLITHLLITHK	
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
CUMMIANTIVE VOLUME:-PER CENT	
38 111111111111111111111111111111111111	
HHIIIIHHIIIHH	
	HATTING THE
28 111111111111111111111111111111111111	
	THE THE THE THE THE
18	
tinhiii thi	6880
HHHHHHHH	5700
THE	4806
79	M THE THEH GAUGE
1998	POLNOS PER SOUNKE
Ø PRE	18 3000 ESSURE: POUNDS PER SQUARE INCH GAUGE

Page <u>16 of 12</u> File <u>RFL 79619</u>

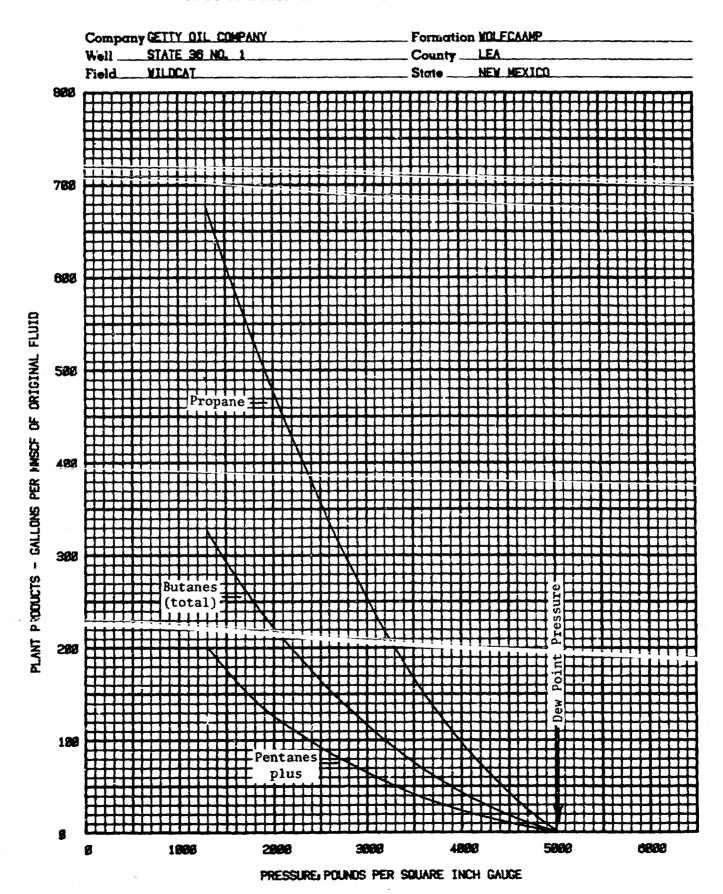
#### CUMULATIVE RECOVERY DURING DEPLETION



## CORE LABORATORIES, INC. Petroleum Reservoir Engineering

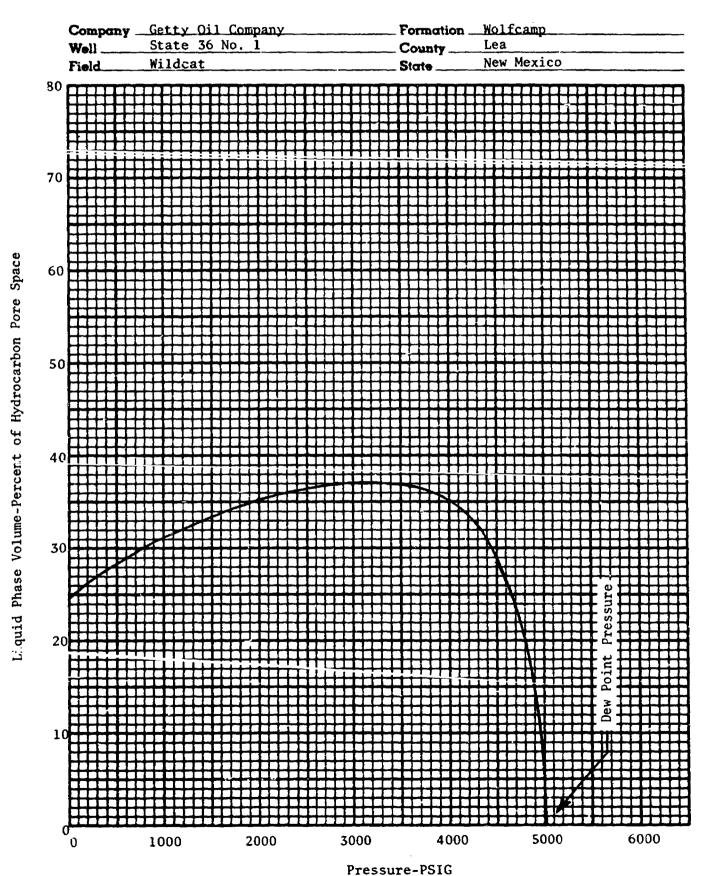
Petroleum Reservoir Engineerin, DALLAS, TEXAS Page 11 of 12 File RFL 79619

#### CUMULATIVE RECOVERY-PLANT PRODUCTS IN WELLSTREAM



Page 12 of 12 File RFL 79619

Retrograde Liquid Accumulation During Depletion at 196°F.



INTER-OFFICE CORRESPONDENCE

## **Getty Oil Company**

Midland, Texas March 21, 1980

TO:

MR. J. E. EAKIN

FROM:

JIM VARNON

SUBTECT:

GETTY 36 STATE COM. WELL NO. 1 (WOLFCAMP)

PRESSURE BUILDUP (2/26-29/80) AND PVT ANALYSIS

Attached is an analysis of pressure and PVT data. The wealth of data for this well makes it possible to accurately predict reservoir performance. The current pressure test confirms the limited reservoir size shown by an earlier pressure test in September 1979. Summary of the analysis is:

Original Pressure @ 7/4/79 = 7255 psi
Pressure @ 2/29/80 = 4600 psi at mile parts

Transmissibility (kh) = 288 md-ft
Skin Factor = +17
Pressure Drawdown (P - Pwf - APskin) = 193 psi for 2 mile on / km/
Original Separator Gas Reserves

\*\*Community\*\* Without surface compression = 2.46 BCF (72 / o going for a mile of parts without surface compression = 2.73 BCF (80% nearly)

Original Condensate Reserves

without surface compression = 147 MSTB 18.9% heading
With surface compression = 151 MSTB 19.4% recovery

The large skin factor is caused by the narrow perforated interval
and could be eliminated at any time. The small account description in the small account description.

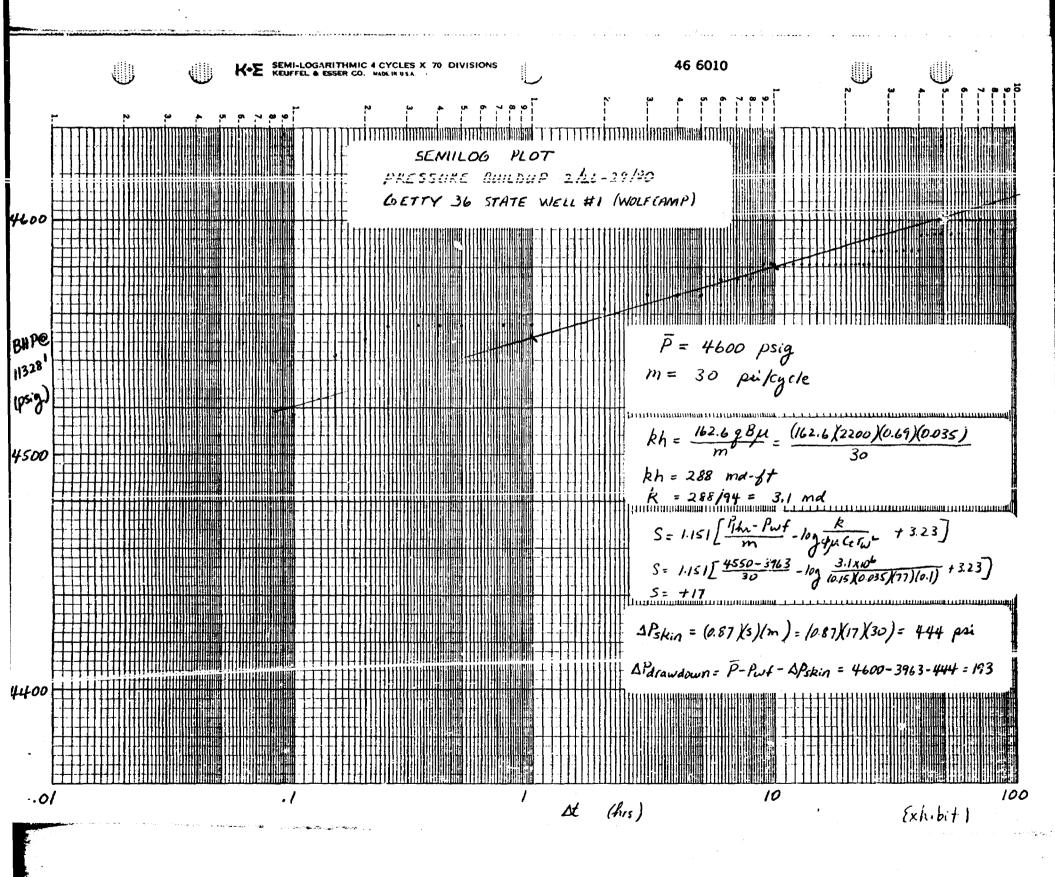
The large skin factor is caused by the narrow perforated interval and could be eliminated at any time. The small pressure drawdown results from large reservoir kh and low production rate (2200 mcfpd), and shows that the rate could be increased two or three-fold with no expected effect on ultimate recovery.

Recovery factors are 80% for gas and 19% for condensate. Liquid yield has dropped from 230 STB/MMCF to 125 and it will continue to drop sharply to below 50. Pressure maintenance is probably not feasible and becomes less feasible as liquids dropout in the reservoir.

Reserves listed above assume that the well will never produce water, that the skin will be removed by workover, and that retrograde liquid is nonmobile.

Jim Varnon CASE NO. 6

JEV:slw Attach. cc: Mr. H. W. Terry

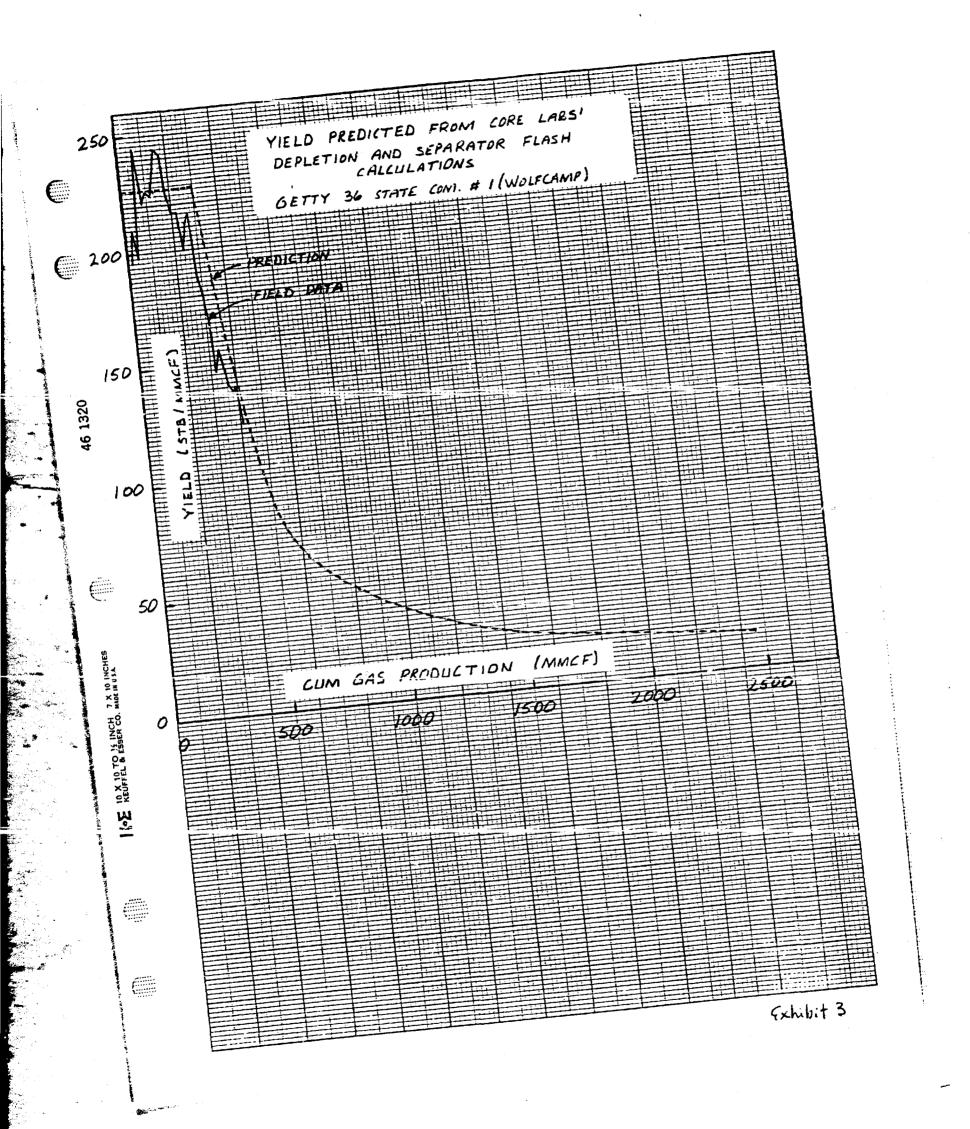


(

46 1320

10 X 10 TO 15 INCH 7 X 10 INCHES KEUFFEL & ESSER CO, MARCH 1.5A.

(



The Basic Data for Buildup Calculations  h = 94 ft  d = 0.15  Sw = 0.20  T = 196 °F = 151 °P  Fluid = Gas Condensate (PVT Analysis is available)  Mebile Fluid = Gas @ 4600 psi (Retrograde Liquid is noninobile)  3 @ 4600 psi = 0.965 (NT Report page 9)  To = 461 °R (Calculated from composition)
d = 0.15  Sw = 0.20  T = 196°F = 656°R  Fluid = Gas Condensate (PVT Analysis is available)  Mobile Fluid = Gas @ 4600 psi (Retrograde Liquid is noninobile)
Sw = 0.20  T = 196°F = 156°R  Fluid = Gas Condensate (PVT Analysis is available)  Mobile Fluid = Gas @ 4600 pic (Retrograde Liquid is nonimobile)
T = 196 °F = 156 °R  Fluid = Gas Condensate (PVT Analysis is available)  Mobile Fluid = Gas @ 4600 pei (Retrograde Liquid is nonimobile)
Fluid = Gas Condensate (PVT Analysis is available)  Mobile Fluid = Gas @ 4600 pei (Petrograde Liquid is noninobile)
Mobile Fluid = Gas @ 4600 pei (Retrograde Liquid is noninobile)
Mobile Fluid = Gas @ 4600 pei (Retrograde Liquid is noninobile)
3 @ 4600 pri = 0.965 (AVT Report page 9)
Te = 461 °R (Calculated from composition)
Pe = 642 pria ( calculated from composition)
$T_r = 656/461 = 1.4$
Pr = 4615/642 = 7.2
Y = 1.07 (calculated from composition) $C_g = \frac{1}{7} - \frac{1}{3} \frac{33}{5P} = \frac{1}{4615} - \frac{1}{0.965} (121 \times 10^6) = 91 \times 10^{-6} \text{ psi}^{-1}$
$c_{q} = \frac{1}{7} - \frac{3}{3} \frac{37}{5P} = \frac{1}{4615} - \frac{1}{0.965} (121 \times 10^{6}) = 91 \times 10^{-6} \text{ psi-1}$
Ct = Sq Cq + Sw Cw + Cf = 77 x10 psi-1
$B_{0} = 5.04 \frac{37}{P} = \frac{(5.04)(0.965)(656)}{4615} = 0.69 \frac{661}{MCF}$
u = 0.035 cp (Carr-Kobayashi correlation for Y=1.07)
, o
II STEADY-STATE PATE PREDICTION
<b>'</b>
gsc = μB ln (e/in = 10.035)(6.69) 193 = 2050 204y
0.316
Note: DP= P-Puf - DPspin = 4400-3967-444 = 193 psi

1	
-	
	I. ABANDONMENT PRESSURE
	Part = Part + DP drawdown + APskin
	From equations commonly used in gas well testing, the Howing BHP can be estimated from wellhead pressure.
	$Pwf = e^{\frac{2}{3}}\sqrt{Pwh} + g^2\left(\frac{\sqrt{\delta L}}{c}\right)^2 \qquad (1)$
	where Prof = flowing BHP , psi
_	Puh = wellhead pressure, psi
_	$K = \frac{\partial L}{\partial 3.35} T_{\ell}$
_	L = tubing length = 1/328
_	Ty = average flowing temperature or = 598°R
	3 = average z-factor from bottom-hole to wellhead
_	$g = well rate, MCF/DAY = 2200$ $C = 1118 d^{1/3}/\sqrt{T_F} = 325 \text{ for } d = 2''$
	In the Feb 1980 pressure tet, homenan is was it's pre and skin
_	AP was 444 psi. Use drawdown AP = 200, although rate will decline
	some at this drawdown since formation volume factor increases with
	depletion factor than viscosity decreases the skin SP = 0 since the
	skin can be eliminated by workers.
	$\overline{P_{abd}} = P_{\omega f} + 200 \tag{2}$
_	Equations (1) and (2) can be solved for Papel given any wellhead pressure.
	In order to get o and z, it is necessary to assume Pasa, so the
	calculation is iterative. Results of this calculation for the two cases

Getty of interest are. I. No Surface Compressor: Perh = 500 : Pabel = 1300 psi II. With Surface Compressor: Puh = 0 ; Pabel = 1000 psi These abandonment presence assume zero water production VI RESERVES Original-Gaz-In-Place By Material Balance to 4600 pei 6 (Bg-Bg:) = 6pBg where Bg is a two-phase B (5.04 X1.369)(656) 7255+15 = 0.6226 3= 1369 from PUT data. Bg = (5.04 × 0.989)(LSL) = 0.708< Op = cum production of wet gos + condensate + stock tank vapor 417905 MCF + 82258 STB + Vapor - Tilles met + 61500 MEF + 12500 = 492 or M4 (492810)(0.7085) 6 = 061P = 0.7085 - 0.6226 = 4.1 BCFNote: Condensate production is converted to gos equivalent by  $\frac{SCF}{STB} = \frac{350\%}{Nl_0} \frac{RT_{SC}}{P_{SC}} = \frac{(350)(0.78)}{139} \frac{(10.73)(520)}{14.7} = 745 \frac{SCF}{578}$ where To = 14.5 = 0.78 and Mo = 6084 = 139 for API = 49.7°

B. Reserves of Gas and Condensate (Exhibit 2) Surface production can be easily predicted from love Labs! PUT cell dipletion and flash colulations to the produced well stream. These calculations are performed Core labi on the basis of 10 MMCF of reservair fluid at the lew point, 5018 paig. Correcting to the original reservoir pressure gives a basis of 1.097 mance original presence, 7255 psig, mining that 0.097 mack 1.0 mmcF are produced above the dew point. Adding recovery to that given on page 5 of the Cone labs proportioning up to the reservoir size by the factor 4100/1.097, give immediately the cumulative purface production versus reservair presente (Exhibit 2). Note how accurately the prediction matches the field performance to date. Reserves for any abandonment pressure can be read directly Without surface compression: Pard = 1300 psig Gas Reserves = 2460 MMCF Condensate Reserves = 147 With surface compression: Part = 1000 psig Gas Reserves = 2730 MMCF Condensate Reserves = 151 MSTB There recoveries assume that the well will never produce any water and that retrograde liquid is nonmobile

C.	Liquid	Yield	VEISUR	Cumulative	Gas	Production	(Exhibit 3)
	8	7				Production	

Iristantaneone yield is not reported in Core Labs' separator flash calculation results at can be computed by platting cumulative liquid versus cumulative gas and taking alopea. Exhibit 3 shows the result along with a companion to actual field performance to date.

## D. Reservoir Radius

$$\Gamma = \sqrt{\frac{112.6 \times 10^6}{h}\pi}$$

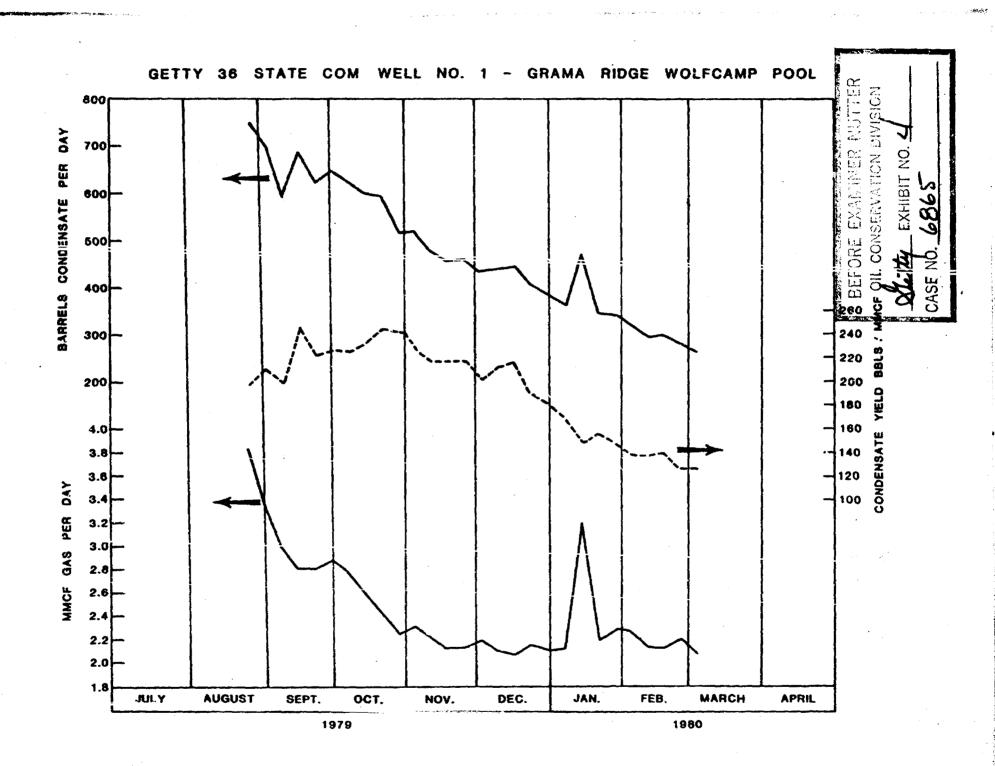
$$\Gamma$$
 = 618 ft if average h = 94' 28 acres  
 $\Gamma$  = 873 ft if average h = 47' 55 acres

-3	E. Remarks on Reavery Efficiency
	U U
	Original Bas in Place = 4100 MMCF
	Original Box in Place = 4100 MMCF Original Separator Goz in Place = (4100 MMCF) = 3424 MMCF
	ultimate Recovery of compromism = 2730 mmcF
	Gar Recovery Efficiency = 2730/3424 = 80 %
	· · · · · · · · · · · · · · · · · · ·
	Original Stock Tank Lie in Place = (4100 mmc) (189.7 STB) = 778 MSTB
: 	Ultimate Recovery w/ compression = 151 MSTB
	Condansate Recevery Efficiency = 151/778 = 19 %
***	
	Presence depletion will give excellent gas recovery but will
	leave some 627,000 STB of condensate in the ground.
	It may be advisable to consider some type of inext gas
	present maintenance prefect. Disconnaging features are:
	I We will probably never have a second well in the reservoir.
	2 trese potential reserves are not large mongh to support
	much expense in developing a some of injection gas.
	3. Reservoir pressure is already below the deer point and
	retrograde dropont is 70% of the maximum. Revaporization
	with inest gas presence may not be passible.
	Encouraging features are the favorable reservoir characteristics,
	Lite generable, and probably narrow areally, giving nice to
	the possibility of a vortical gravity stabilized flood
	Water ifection is out of the question because it would seriously
	jeopondize gas reserves.
	V ' V

# DAILY TEST DATA GETTY "36" STATE COM. WELL NO. 1 WOLFCAMP

	;		
_	Condensate Bbls	Cas (MCF)	(BBLS./MICF)
Week of		3.82	196.33
Aug. 27	750	3.32	210.84
Sep. 3	700	2.98	197.98
Sep. 10	· 590	2.80	244.64
Sep. 17	685	2.80	221.42
Sep. 24	620	2.86	225.52
Oct. 1	645	2.77	223.82
Oct. 8	620	2.59	231.66
Oct. 15	600	2.42	243.80
Oct. 22	590	2.14	240.65
Oct. 29	515	2.3	225.21
Nov. 5	518	2.2	215.91
Nov. 12	475	2.11	215.63
Nov. 19	455	, 2.12	216.03
Nov. 26	458	2.18	199.54
Dec. 3	435	2.09	211.48
Dec. 10	442	2.06	216.02
Dec. 17	445	2.1'	189.25
Dec. 24	195	2.1	180.95
Dec. 31	380	2.12	169.81
Jan. 7	360	3.190	147.34
Jan. 14	470	2.192	155.57
Jan. 21	341	2.274	147.76
Jan. 28	336	2.258	138.62
T. 4	313	2.132	135.96
Feb. 11	205	2.117	139.75
Feb. 18	274	2.202	124.43
Feb. 2	260	2.077	125.18
Mar. 3	260		

BEFORE EXAMINER NUTTER
OIL CONSERVATION DIVISION
EXHIBIT NO. 3
CASE NO. 6868



## GETTY 36 STATE COM. NO. 1 - WOLFCAMP PRODUCTION DATA

MONTH	CONDENSATE, BBL.	GAS, MCF
August, 79	4,864	19,492
Sept., 79	16,150	74,619
Oct., 79	17,660	76,388
20 m	13,439	61,611
Dec., 79	12,244	64,464
Jan., 80	10,412	64,131
	7,489	57,200*
Feb., 80	82,258	417,905
Total	02/230	-

## \*estimated

Well was opened after buildup at 11 a.m. on February 29, 1980. Hence, total estimated production through February is approximately the production prior to the start of the buildup.

BEFORE EXAMINER NUTTER
OIL CONSERVATION DIVISION
EXAMINE NO. S
CASE NO. 4865

JARREL SERVICES

E EXAMINER NUTTER

POST OFFICE BOX 1654

PHONE BOD 103-134 CONSERVATION DIVISION

HOBBS, NEW MEXICO 88240

EXHIBIT NO. 6

COMPANY: Getty Oil Company

WELL: Getty 36 State Com. No. 1

FIELD: Undesignated - Wolfcamp

## CHRONOLOGICAL PRESSURE DATA

			ELASPED	TIME	SURFACE	PRESSURE	BHP € (	<b>-7636</b> )
DATE	STATUS OF MELL	TIME	.2gu	MIN.	TRC	CSC	104851	11328 PSI
1980						.,		
2/26	Flowing. Run Flowing							
	Gradient w/Tandem							
	Bombs & Set Bombs							9.
	off @ 10485'	10:30 AM	0	00	2346	PKR	3840	3963
	Shut in	11:00	0	30	2346	-	3840	3963
	11	11:03	´ 0	03	-	_	4045	4408
	11	11:06	0	06	<del>-</del>		4154	4517
•	17	11:09	0	· 09	· -	-	4179	4542
	**	11:12	0	12	_	_	4186	4549
	11	11:15	0	15	_	-	4192	<b>455</b> 5
	P1 1,	11:20	0	20	_	-	4192	4555
	**	11:25	0	25	_	_	4192	<b>455</b> 5
	ń	11:30	0	30	_	_	4192	4555
	**	11:45	0	45		-	4192	4555
		12:00 N	1	00	_	_	4192	4555
	**	1:00 PM		00	_	_	4199	4562
	11	2:00	3	00	_	_	4205	4568
	ν 11	3:00	4	60	_	_	4205	4568
	45	4:00	5	00	_	-	4205	4568
	PŢ	5:00	6	00	_	_	4212	4575
	11	6:00	7	00	_	_	4212	4575
	11	7:00	8	00	-	_	4212	4575
	11	8:00	9	00	<u>:</u>	_	4218	4581
	11	9:00	10	00	_	_	4218	4581
	· · · •	10:00	11	00	_	_	4218	4581
	н	11:00	12	00	_	· _	4218	4581
		12:00 MN		00	_	_	4218	4581
2/27	•1	1:00 AM		00 °			4218	4581
-,	<b>11</b> .	2:00	15	00	_		4218	4581
	11	3:00	16	00	·-	_	4218	4581
	IT.	4:00	17	00	-	_	4218	4581
	. 11	5:00	18	00	_	_	4218	4581
		6:00	19	00	_	_	4218	4581
	91	7:00	20	00	_	_	4218	4581
	**	8:00	21	00	_	_	4218	4581
	<del>ù</del>	9:00	22		-	_		
	11.			60	-	. –	4218	4581
	et	10:00	23	00	-	<del>-</del> ,	4218	4581
	**	11:00	24	00	-	-	4218	4581
		12:00 N	25	00		-	4218	4581
	**	1:00 PM		00	-	-	4224	4587
	**	2:00	27	00 ,	-	<b>-</b> .	4224	4587
	•	3:00	28	00		-	4224	4587
	**	4:00	29	00	-	_	4224	4587

WELL: Getty 36 State Com. No. 1

PA.	GE: 2							
		_	ELASPED		SURFACE		BHP • (	
DATE S1	TATUS OF WELL	TIME	HRS.	MIN.	TBG	CSG	10485	<u>_11328</u> 'P
	Shut in	5:00	30	00	-		4224	4587
	11	6:00	31	00	_	-	4224	4587
	n .	7:00	32	00	_		4224	4587
	**	3:00	33	00	_	_	4224	4587
	11	9:00	34	00	_	_	4224	4587
	*1	10:00	35	00	_		4224	4587
	11	11:00	36	00	_		4224	4587
	***	12:00 M		00	_		4224	4567
2/28	Tt .	1:00 M		99	<b>-</b> .	_		. 4557 - 4567
2/20	99		39		-			
•	11	2:00		00	<del>-</del> .	-	4224	4587
	1+	3:00	40	00	-	-	4224	4587
	**	4:00	41	00		_	4231	4594
	**	5:00	42	00	-	_	4231	4594
	11	6:00	43	00		<del></del>	4231	4594
	11	7:00	44	00	•••	-	4231	4594
	••	8:00	45	00		-	4231	4594
•.	 H	9:00	46	00	<del></del>		4231	4594
	**	10:00	47 ,	00		-	4231	4594
	**	11:00	48	00	-	_	4231	4594
	**	12:00 N	49	00	-		4231	4594
•		1:00 P		00	~		4231	4594
	11	2:00	51 50	00	-	<del>-</del>	4231	4594
	3 TI	3:00	52 52	00	-	-	4231	4594
	tt	4:00	53	00	-	<del>-</del>	4231	4594
et e	"	5:00	54	00	-	-	4231	4594
	**	6:00	55 56	00	_	_	4231	4594
	•	7:00	56	00	-	_	4231	4594
	11	8:00	57	00	~	-	4231	4594
	11	9:00	58	00 00	-	-	4231	4594
	• •	10:00	59	00	-	-	4237	4600
	* 11	11:00	60	00	<del></del>	-	4237	4600
. /00	11	12;00 M		00	· -		4237	4600
2/29	. 11	1:00 A		. 00	-	-	4237	4600
		2:00	63	00	-		4237	4600
	11	3:00	64	00	-		4237	4600
	· H	4:00	65	00	-	-	4237	4600
	11	5:00	66	00	<del>-</del>	, <del>*</del>	4237	4600
	••	9:00	37	ÙÙ	-	-	4237	4600
	• • • • • • • • • • • • • • • • • • •	7:00	68	00	-	<u>.</u>	4237	4600
	••	8:00	69	00	-	-	4237	4600
	11	9:00	70	00	-	<b>.</b>	4237	4600
	***	10:00	71	00	-	_	4237	4600
	d Bombs & Run							
Statio	c Gradient	11:00	72	00	2731	-	4237	4600

## JARREL SERVICES, INC.

POST OFFICE BOX 1854

PHONES 505 393-5396 - 393-8274

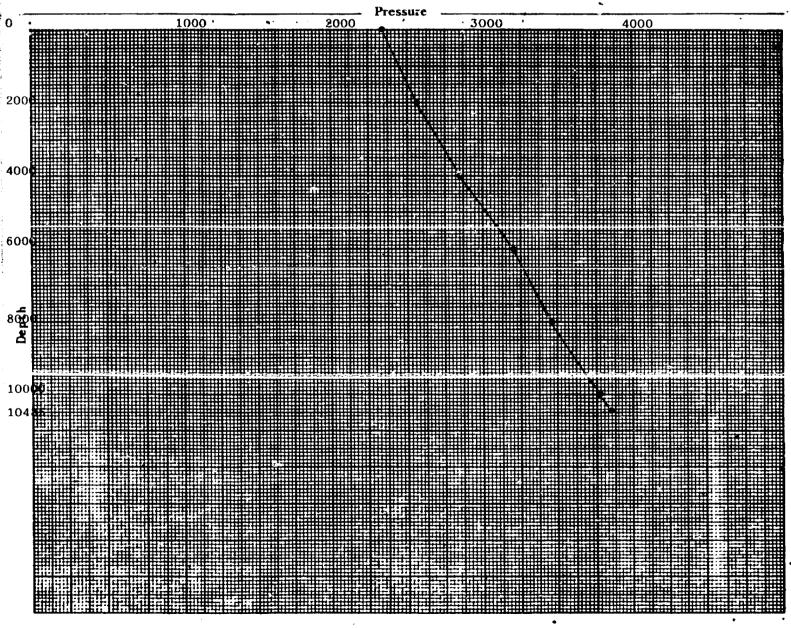
HOBBS, NEW MEXICO 88240

OPERATOR Getty Oil Company	
FIELD Undesignated	
FORMATION Wolfcamp	
LEASE Getty 36 State Com WELL #1	
COUNTY Lea STATE New Mexic	co
DATE Feb. 26, 1980 TIME 8:00 AM	
Status Flowing	
Test Depth 10485'	
Time S. I Last test date	
Tub Pres. 2346 BHP last test -	
Cas. Pres. <u>Dual</u> BHP change	
Elev. 3692'KB-23 Fluid top Flowing	···
Datum (-7636) ** Water top	
Temp. @ 1740F Run by	
Cal. No. <u>A13676N</u> Chart No. <u>1</u>	

#### **BOTTOM HOLE PRESSURE RECORD**

Depth	Pressure	Gradient
0	2346	-
2000	2558	.106
4000	2859	.151
6000	3205	.173
8000	3468	.132
10000	3769	.151
10485	3840	.146
11328 (-7636	) 3963 * **	(.146)

- \* EXTRAPOLATED PRESSURE
- \*\* MIDPOINT OF CASING PERFORATIONS



TIME IN HOURS

1.0

10,00

.01

HDITARD SEMI-LOGARITHMIC CE X TO DIVISIONS PER INCH JARREL SERVICES, INC. 10,00 100. TIME IN HOURS 1.0

## JARREL SERVICES, INC.

POST OFFICE BOX 1654

PHONES 505 393-5398 - 393-8274

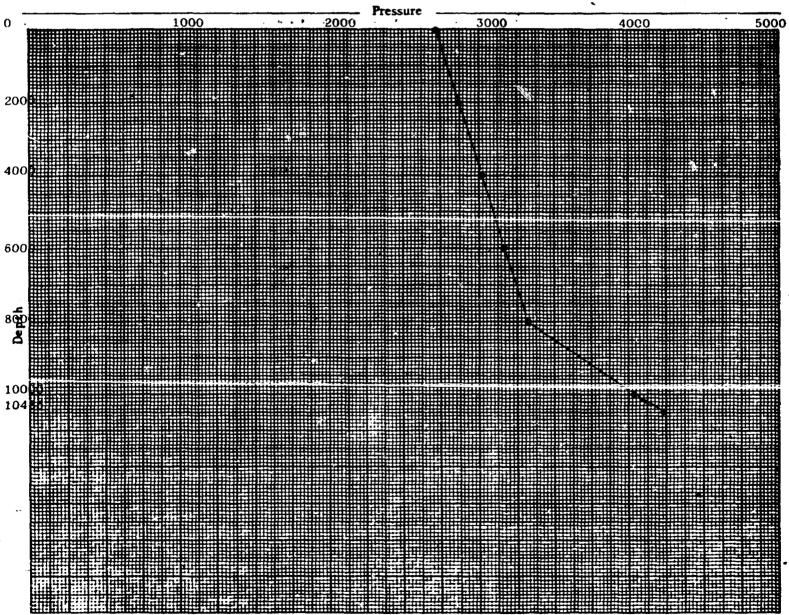
HOBBS, NEW MEXICO 88240

OPERATOR Getty	OIL Company	
FIELD Under	signated	
FORMATIONWolfe	camp	
LEASEGetty 36	State Com	WELL #1
COUNTY Lea	STATE	New Mexico
DATE Feb. 29.	1980TIMI	E 11:00 AM
StatusShut_in_		
Test Depth 10485'		
Time S. 1. 72 hrs.	_Last test date _	7/4/79
Tub Pres. 2731	_BHP last test _	7057 @ 10450'
Cas. Pres. PKR	_BHP change	2457# Loss
Elev3692 KB=23_	Finia top	2222
Datum (-7636) **		
Temp. 6 _1740F	_Run by	JST #16
Cal. No. A13676N	_Chart No	_2

### **BOTTOM HOLE PRESSURE RECORD**

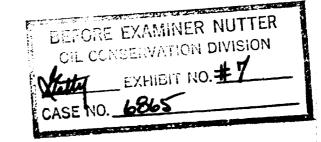
Depth	Pressure	Gradient
0	2731	<u>.</u>
2000	2874	.072
4000	3020	.073
6000	3168	.074
8000	3318	.075
10000	4028	.355
10485	4237	.431
11328 (-76	36) 4600 * **	(.431)

- \* EXTRAPOLATED PRESSURE
- \*\* MIDPOINT OF CASING PERFORATIONS



Reservoir Fluid Study for GETTY OIL COMPANY

State 36 No. 1 Well Wildcat Lea County, New Mexico



# CORE LABORATORIES, INC. Petroleum Reservoir Engineering DALLAS, TEXAS 78207 January 23, 1980

RESERVOIR FLUID DIVISION

Getty 011 Company P.O. Box 730 Hobbs, NM 82240

Attention: Mr. Peter Botes

Subject: Reservoir Fluid Study

State 36 No. 1 Well

Wildcat

Lea County, New Mexico Our File Number: RFL 79619

#### Gentlemen:

Duplicate samples of separator gas and separator liquid were collected from the subject well by Tefteller, Inc. on September 9, 1979. These samples were forwarded to our Dallas laboratory for use in a reservoir fluid study, the results of which are presented on the following pages.

Upon arrival in the laboratory, the separator gas was analyzed through hoptones plus using chromatography, while the separator liquid was also analyzed through heptanes plus using low temperature fractional distillation equipment along with chromatography. After the separator gas flow rate was corrected using factors which are shown on page one, the producing gas-liquid ratio was calculated to be 4438 cubic feet of separator gas at 15.025 psia and 60°F. per barrel of stock tank liquid at 60°F. In the laboratory, it was determined that this was the equivalent of 3588 standard cubic feet of separator gas per barrel of separator liquid at 490 psig and 78°F. The measured compositions of the separator products were used in conjunction with this producing gas-liquid ratio to calculate the composition of the producing well stream material. These compositions are shown on page two. In the laboratory, the products were physically recombined to this producing gas-liquid ratio for use in the antire reservoir fluid attails.

A portion of the reservoir fluid was charged to a high pressure visual cell and heated to the reservoir temperature of 196°F. During constant composition expansion pressure-volume relations performed at this temperature, the fluid existed as a single-phase cas at pressures above 5018 psig at which pressure a retrograde dew point was observed. A comparison of this dew point pressure to the reservoir pressure, 6846 psig, measured on September 12, 1979 indicates that the fluid currently exists in the reservoir in an undersaturated condition. The results of the pressure-volume relation measurements are shown on page three.

The sample in the cell was repressured to a single-phase condition after which it was subjected to a constant volume depletion. After the sample volume was established at the dew point pressure, the sample was subjected to a series of pressure expansions and constant pressure displacements with each displacement terminating at the original sample volume at the dew point pressure. During each of these displacements, the volume of retrograde liquid accumulation was monitored. These data, which are reported on pages six and twelve, show that the maximum accumulation of liquid is approximately 37.1 percent of the hydrocarbon pore space occurring at approximately 3150 psig. The liquid saturation at atmospheric pressure and 196°F. was 24.5 percent of the hydrocarbon pore space.

A larger volume of the reservoir fluid was once again charged to a bigger high pressure cell heated to 196°F. where the constant volume depletion was repeated. During this particular depletion, the equilibrium gas phase at each of the depletion pressure levels was charged to low temperature fractional distillation equipment where along with chromatography its composition was measured. Also determined was the volumetric production of the vapor phase from pressure to pressure where the various deviation factor z were measured down to 700 psig. A summary of these volumetric and compositional data is reported on page four.

The above compositions and volumetric data were used in conjunction with published equilibrium ratio data to calculate the surface recoveries that may be expected as the reservoir pressure declines. These calculations were performed on the basis of one million standard cubic feet of reservoir fluid inplace at the dew point pressure, 5018 psig and 196°F. Assumed in these calculations was a plant efficiency of 100 percent. These volumetric data are reported in tabular form on page five.

We wish to thank Getty Oil Company for this opportunity to be of service. If you should have any questions regarding these data or we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

CORE LABORATORIES, INC.

P. L. Moses, Manager Reservoir Fluid Analysis

PLM:FBV:bt

6 cc: Addressee

1 cc: Mr. Jim Eakin Getty Oil Co.

P.O. Box 1231

Midland, TX 79702

		Page	1	of	12
		File	RFL	79619	
Company Getty Oil Company	_ Date Sampled_	Septembe	r 9.	1979	
Well State 36 No. 1	_ County	Lea			
Field Wildcat	State	New Mexi	co	····	
FORMATION (	CHARACTERISTICS				
Formation Name		Wolfcamp			
Date First Well Completed		July 2		<del></del>	1979
Original Reservoir Pressure			SIG	2 113	
Original Produced Gas-Liquid Ratio	-	5082	316	113	
Production Rate	==	752			SCF/Bb
Separator Pressure and Temperature	-		SIG		Bbls/Day
Liquid Gravity at 60°F.	-	49.7	216_		°AP
Datum	_	7636			
	ARACTERISTICS -	7030			ft. Subsea
Elevation	MUIOIDRIOIIOD	3692 KB			Ft.
Total Depth	-	13266 PB7	<u> </u>		Ft.
Producing Interval	-	11320-113			Ft.
Tubing Size and Depth	-		n. to	1049	
Open Flow Potential		7.82 (Est			MMSCF/Day
Last Reservoir Pressure	7		SIG		
Date	<u> </u>	September			1979
Reservoir Temperature		187*	F. 0	1050	
Status of Well	-	Flowing		103	
Pressure Gauge	-	Amerada			<del></del>
•	CONDITIONS -	IMPELIGUIT	<del>,</del>	<del></del>	<del></del>
Flowing Tubing Pressure		3510			PSIC
Flowing Bottom Hole Pressure		6092			PSIC
Primary Separator Pressure		490		<del></del>	PSIC
Primary Separator Temperature		78			°F.
Secondary Separator Pressure		<del></del>			PSIC
Secondary Separator Temperature		<del></del>	<del></del>		°F.
Field Stock Tank Liquid Gravity		49.7		°AI	71 @ 60°F.
Primary Separator Gas Production Rate	-	2887			MSCF/Day
	025 PSIA	<del></del>			
Temperature Base 60	°F.				
	1477				
Gas Gravity (Laboratory) 0.6	88				
Gas Gravity Factor (Fg) 1.2	056				-
Stock Tank Liquid Production Rate @ 60°		650.54			Bb1s/Day
Primary Separator Gas/Stock Tank Liquid R	atio	4438			SCF/Bb1
or	·	225.33		F	Bbls/MMSCF
Sampled by	<u>-</u>	TI			
REMARKS:	_		-		

These analyses, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose enclusive and contains made. The interpretations or opinions expressed represent the best judgment of Core Laboratories. Inc. (all errors and contained and the analysis of the contained and the contained and

\*Temperature extrapolated to mid-point of perforation = 196°F.

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File RFL 79619

Well State 36 No. 1

# Hydrocarbon Analyses of Separator Products and Calculated Well Stream

Hydrocarbon Alaz	Separator Liquid Mol Percent	Separator (	GPM GPM	Well Street Mol Percent	GPM
Hydrogen Sulfide Carbon Dioxide Nitrogen Methane Ethane Propane iso-Butane n-Butane iso-Pentane n-Pentane Hexanes Heptanes plus	0.00 0.00 0.16 11.74 8.81 9.79 2.49 7.04 3.33 3.83 5.63 47.18	0.00 0.12 1.14 81.81 10.87 3.92 0.50 0.91 0.18 0.10 0.27 100.00	2.964 1.100 0.167 0.293 0.067 0.067 0.042 0.125 4.825	0.00 0.10 0.94 67.81 10.46 5.09 0.90 2.13 0.81 0.91 1.21 9.64 100.00	1.428 0.300 0.685 0.302 0.336 0.503 6.563
	1uc				

Properties of Heptanes plus  API gravity @ 60°F.  Specific gravity @ 60/60°F.  Molecular weight		103 (assumed)	0.802
---	--	---------------	-------

Calculated separator gas gravity (air=1.000) = 0.688

Calculated gross heating value for separator gas = 1224 BTU per cubic foot of dry gas @ 15.025 psia and 60°F.

per cubic foot of	dry gas c		psig	and 78	°F•
Primary separator	gas collected		psig	7 77.	°F.
Primary separator	liquid collected	<u> </u>			coe l

Primary separator	liquid collected 6 490	3588 SCF/Bb1 @ 78°F.	2/ <b>09</b> E
Primary separator Primary separator	gas/separator liquid ratio liquid/stock tank liquid ratio gas/well stream ratio l/well stream ratio	Bhis 078°F/per Bbi	₫6U°¥•

Page		_ot	13	
File	RFL 79	9619		
Well	State	36 No	. 1	

Pressure-Volume Relations of Reservoir Fluid at 196°F.

(Constant Composition Expansion)

Pressure PSIG	Relative Volume		Deviation Factor
8000	0.8946	**************************************	1.482
7630	0.9034		1.427
7255 Original Reservoir Pressure	0.9115		1.369(1)
7100	0.9172		1.348
6700	0.9291		1.289
6300	0.9421		1.229
6000	0.9532		1.185
5700	0.9655		1.140
5450	0.9769		1.103
5300	0.9843		1.081
5150	0.9929		1.060
5050	0.9974		1.044
5018 Dew Point Pressure	1.0000		1.040(2)
5008	1.0006		
<b>49</b> 50	1.0049		
4850	1.0119		
4700	1.0240		
4500	1.0422		
4250	1.0687		
3950	1.1089		
3500	1.1860		
<b>3000</b>	1.3198		
2500	1.5253	\$	
2000	1.8695		
1600	2.3295		
1300	2.8763		
1000	3.7825		

- (1) Gas expansion factor = 1.572 MSCF/Bb1.(2) Gas expansion factor = 1.433 MSCF/Bb1.

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File RFL 79619

Well State 36 No. 1

Depletion Study at 196°F.

#### Hydrocarbon Analyses of Produced Well Stream - Mol Percent

			<del></del>					
				rvoir Pressu	re - PSIG			
	5018	4300	3600	2800	2000	1300	700	700*
Component	·	-						
Carbon Dioxide	0.10	0,10	0.10	0.10	0.11	0.12	0.14	0.04
Nitrogen	0.94	1.12	1.19	1.20	1.15	1.08	1.03	0.05
Methane	67.81	73.54	76.22	78.13	78.75	78.34	75.34	14.37
Ethane	10.46	10.44	10.41	10.34	10.66	11.10	12.23	7.27
Propane	5.09	4.80	4.57	4.40	4.42	4.66	5.70	7.16
iso-Butane	0.90	0.80	0.73	0.67	0.66	0.71	0.94	2.12
n-Butane	2.13	1.84	1.62	1.47	1.41	1.52	1.97	5.21
iso-Pentane	0.81	0.68	0.59	0.52	0.48	0.48	0.54	2.56
n-Pentane	0.91	0.74	0.63	0.54	0.49	0.49	0.56	2.87
Hexanes	1.21	0.81	0.57	0.42	0.34	0.33	0.40	5.87
Heptanes plus	9.64	5.13	3.37	2.21	1.53	1.17	1.15	52.48
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Molecular weight of heptenes plus	169	133	124	115	109	106	107	180
Specific gravity of heptanes plus	0.801	0.777	0.770	0.759	0.752	0.749	0.750	0.808
Deviation Factor - Z								
Equilibrium gas	1.040	0.911	0.845	0.820	0.847	0.888	0.935	
Two-phase	1.040	0.952	0.878	0.812	0.752	0.682	0.559	
Well Stream produced-	0.000	( 201	1/ DEE	00 140		(0.170	74 724	
Commulative percent of initial	0.000	6.304	14.855	28.142	44.651	60.178	73.736	
GPM from Smooth Compositions Propane plus	10.117	5.906	4.489	3.580	3.131	3.066	3.650	
	8.689	4.559	3.207	2.345	1.891	1.758	2.051	
Butanes plus	7.704	3.701	2.443	1.650	1.218	1.032	1.105	
Pentanes plus	7.704	3.701	2. 44J	T• 030	1. 510	1.032	1.103	

<sup>\*</sup>Composition of equilibrium liquid phase.

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Well State 36 No. 1

#### Calculated Cumulative Recovery During Depletion

Cumulative Recovery per	Initial			Rese	rvoir Pressur	e - PSIG		
MMSCF of Original Fluid	in Place	5018	4300	3600	2800	2000	1300	700
Well Stresm - MSCF	1000	0	63.04	148.55	281.42	446.51	601.78	737.36
Normal Temperature Separation*								
Stock Tank Liquid - Barrels	189.70	0	5.58	10.36	15.01	18.90	21.09	
Primary separator gas-MSCF	789.49	0	55.38	133.93	259.64	418.40	571.04	
Second stage gas - MSCF	45.62	0	1.70	3.25	4.86	6.31	6.46	
Stock tank gas - MSCF	26.80	0	1.10	2.13	3.23	4.24	4.55	
Total "Plant Products" in Primary Separator Gas - Gallons								
Propane	833	0	62	151	293	478	676	
Butanes (total)	342	Ō	27	68	134	221	326	
Pentanes plus	185	0	15	37	75	125	200	
Total "Plant Products" in								
Second Stage Separator Gas-Gallons		0	6.3	12.1	18.1	23.6	24.0	
Propane	161	0 0	3.1	6.0	9.0	11.9	12.1	
Butanes (total) Pentanes plus	72 37	0	1.6	3.1	4.8	6.4	6.5	
<b>,</b> 5.3.5								
Total "Plant Products" in								
Well Stream - Gallons		_	<b>^-</b>			544	7	000
Propane	1428	0	85	195	359	563	766	983
Butanes (total)	985	0	54	119	212	323	436	564
Pentanes plus	7704	0	233	442	661	863	1023	1173

<sup>\*</sup>Primary separator at 490 psig and 78°F.; second stage separator at 70 psig and 75°F.; and stock tank at 70°F., except 1300 psig well stream where primary separator is at 200 psig and 78°F.

These analysis, opinions or interpretations are based on observations and motorial supplied by the client to whom, and for whose exclusive and confidential man, this report is made. The interpretations or agreement represent the best judgment of Core Laboratorias, lac., (all errors and assistance excepted); but Core Laboratorias, lac., and its officers and employees, assume no responsibility and make no warranty or representations as to the predestivity, proper against time, or confidences of one oil, one or other maneral will or ease oil, one or other maneral will or ease oil, one or other maneral will or ease oil.

Page	of	12
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Well	State 36 No.	. 1

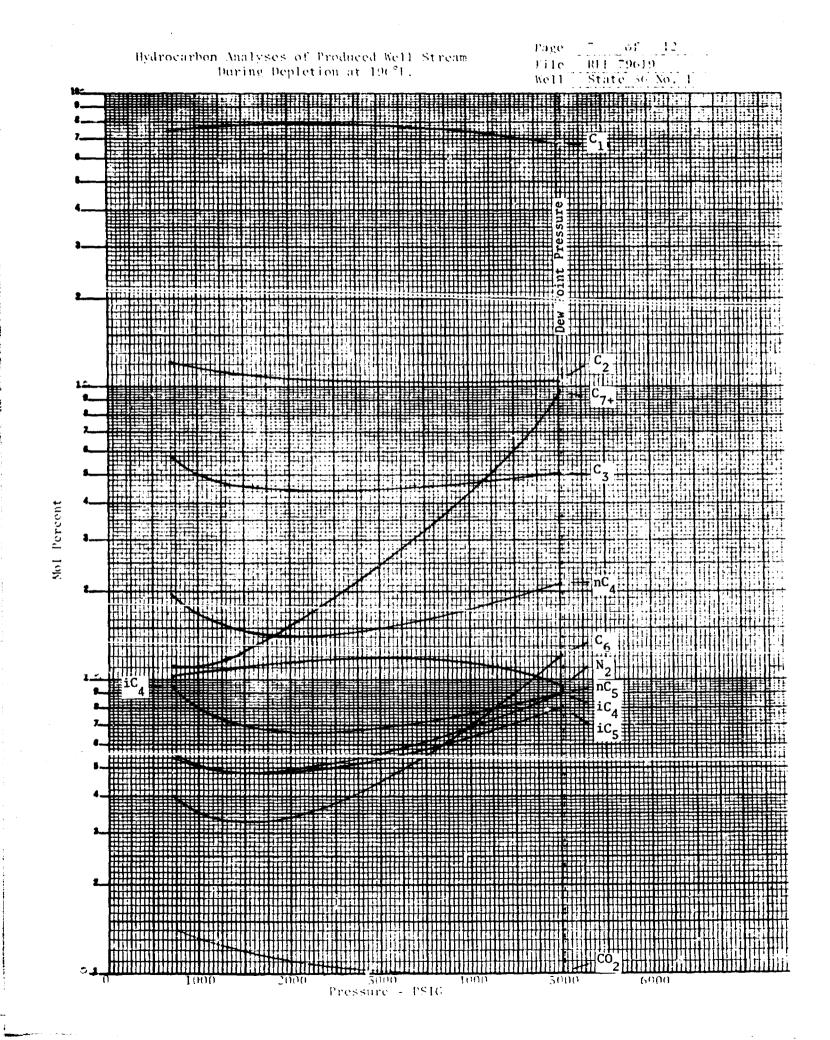
#### Retrograde Condensation During Gas Depletion at 196°F.

Pressure PSIG	Retrograde Liquid Volume Percent of Hydrocarbon Pore Space
5018 Dew Point Pressure	0.0
5012	Ũ•8
5008	1.4
4950	11.2
4850	17.8
4700	23.7
4500	28.6
4300	32.9
3600	36.7
2800	37.0
2000	35.2
1300	32.5
700	29.7
0	24.5

#### Properties of Zero PSIG Residual Liquid

API Gravity @ 60°F. 43.6
Specific gravity @ 60/60°F. 0.8080
Molecular weight 181

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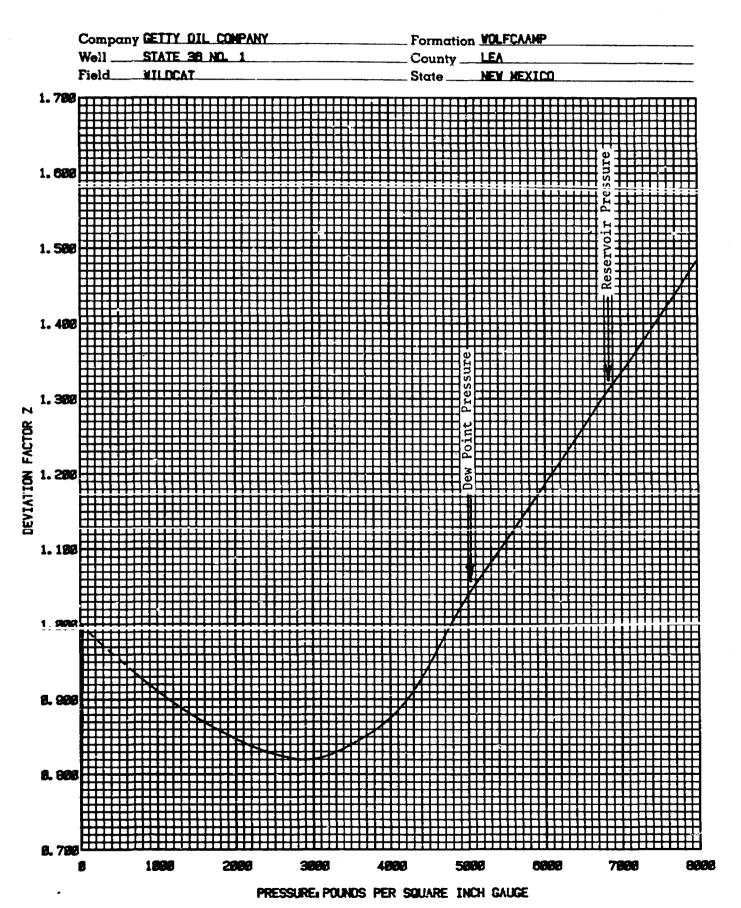


### CORE LABORATORIES, INC. Petroleum Reservoir Engineering

TOTAL Reservoir Engineer
DALLAS, TEXAS

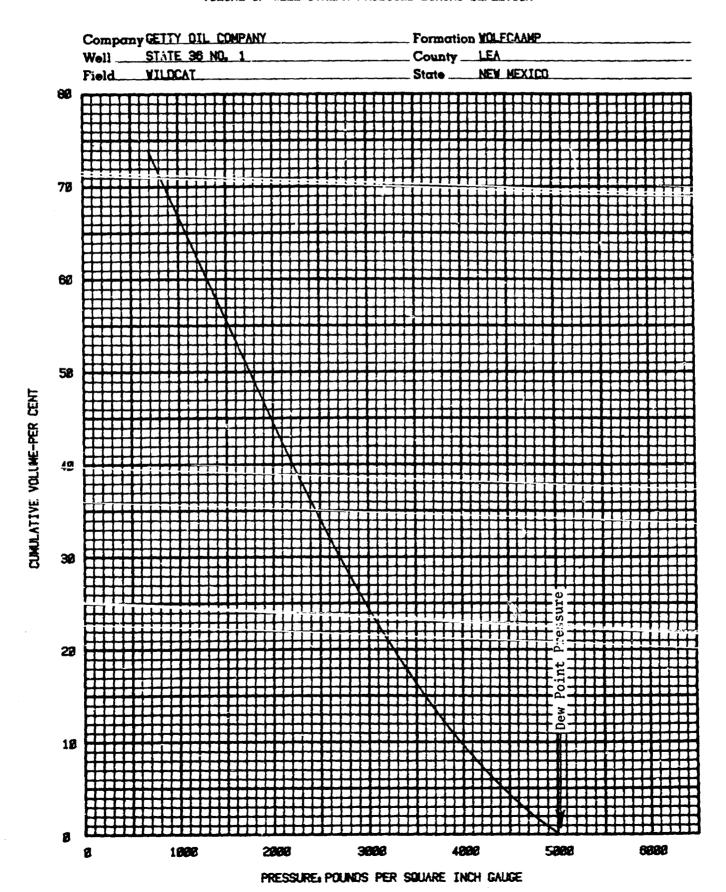
Page 6 of 12 File RFL 79819

#### DEVIATION FACTOR Z OF WELL STREAM DURING DEPLETION AT 198°F.



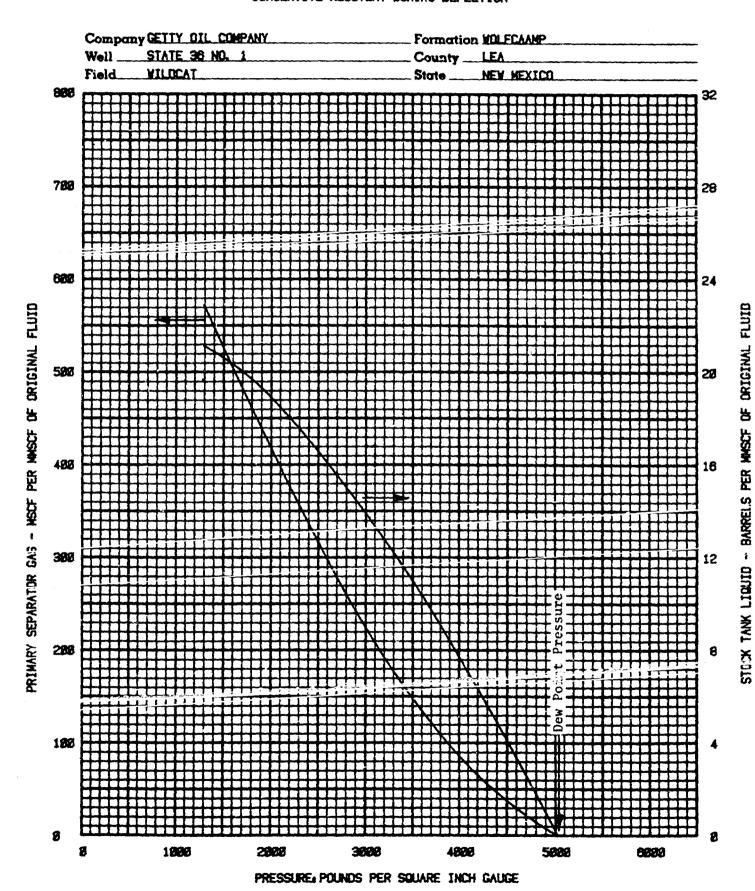
Page 9 of 12 File RFL 79619

#### VOLUME OF WELL STREAM PRODUCED DURING DEPLETION



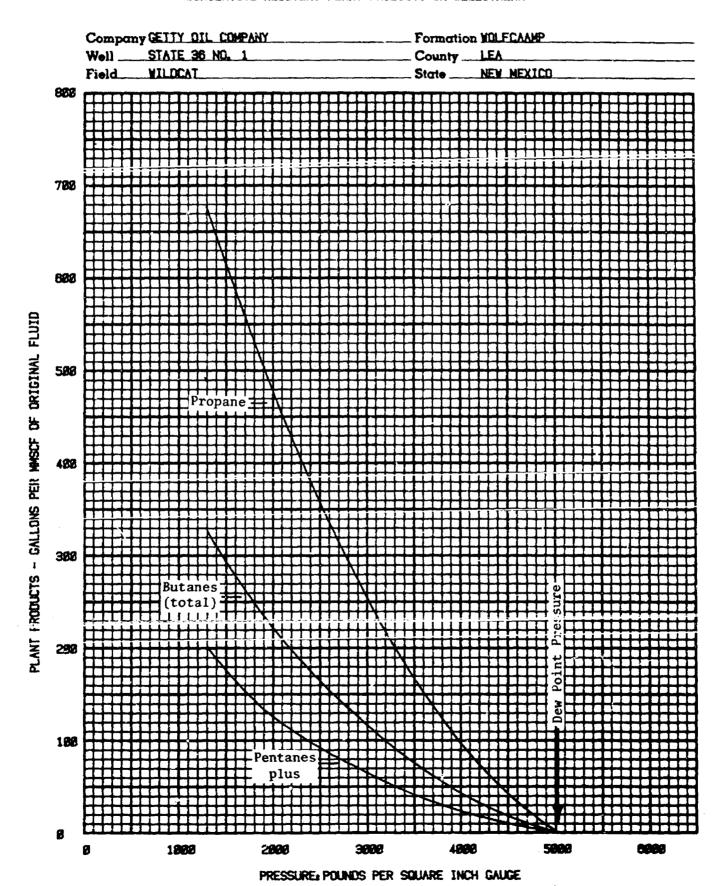
Page \_\_12 of \_12 File \_\_RFL 79619

#### CUMULATIVE RECOVERY DURING DEPLETION



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#### CUMULATIVE RECOVERY-PLANT FRODUCTS IN WELLSTREAM



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Retrograde Liquid Accumulation During Depletion at 196°F.

	Retrograde Liqu	1d Accumus		1 Coomn	
			Formation -	Wolfcamp Lea	
	Getty Oil Compa	iny	_County	New Mexico	
Combana -	Getty Oil Compa		_State	New How	
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	0		Pressu	re-PSIG	

#### INTER-OFFICE CORRESPONDENCE

### **Getty Oil Company**

Midland, Texas March 21, 1980

TO:

MR. J. E. EAKIN

FROM:

JIM VARNON

SUBJECT:

GETTY 36 STATE COM. WELL NO. 1 (WOLFCAMP)

PRESSURE BUILDUP (2/26-29/80) AND PVT ANALYSIS

Attached is an analysis of pressure and PVT data. The wealth of data for this well makes it possible to accurately predict reservoir performance. The current pressure test confirms the limited reservoir size shown by an earlier pressure test in September 1979. Summary of the analysis is:

Original Pressure @ 7/4/79 = 7255 psiPressure @ 2/29/80 = 4600 psi Transmissibility (kh) 288 md-ft Skin Factor +17 Pressure Drawdown ( $P - P_{wf} - \Delta P_{skin}$ ) = Original Separator Gas Reserves 193 psi without surface compression = 2.46 BCF with surface compression 2.73 BCF Original Condensate Reserves without surface compression 147 MSTB with surface compression 151 MSTB

The large skin factor is caused by the narrow perforated interval and could be eliminated at any time. The small pressure drawdown results from large reservoir kh and low production rate (2200 mcfpd), and shows that the rate could be increased two or three-fold with no expected effect on ultimate recovery.

Recovery factors are 80% for gas and 19% for condensate. Liquid yield has dropped from 230 STB/MMCF to 125 and it will continue to drop sharply to below 50. Pressure maintenance is probably not feasible and becomes less feasible as liquids dropout in the reservoir.

Reserves listed above assume that the well will never produce water, that the skin will be removed by workover, and that retrograde liquid is nonmobile.

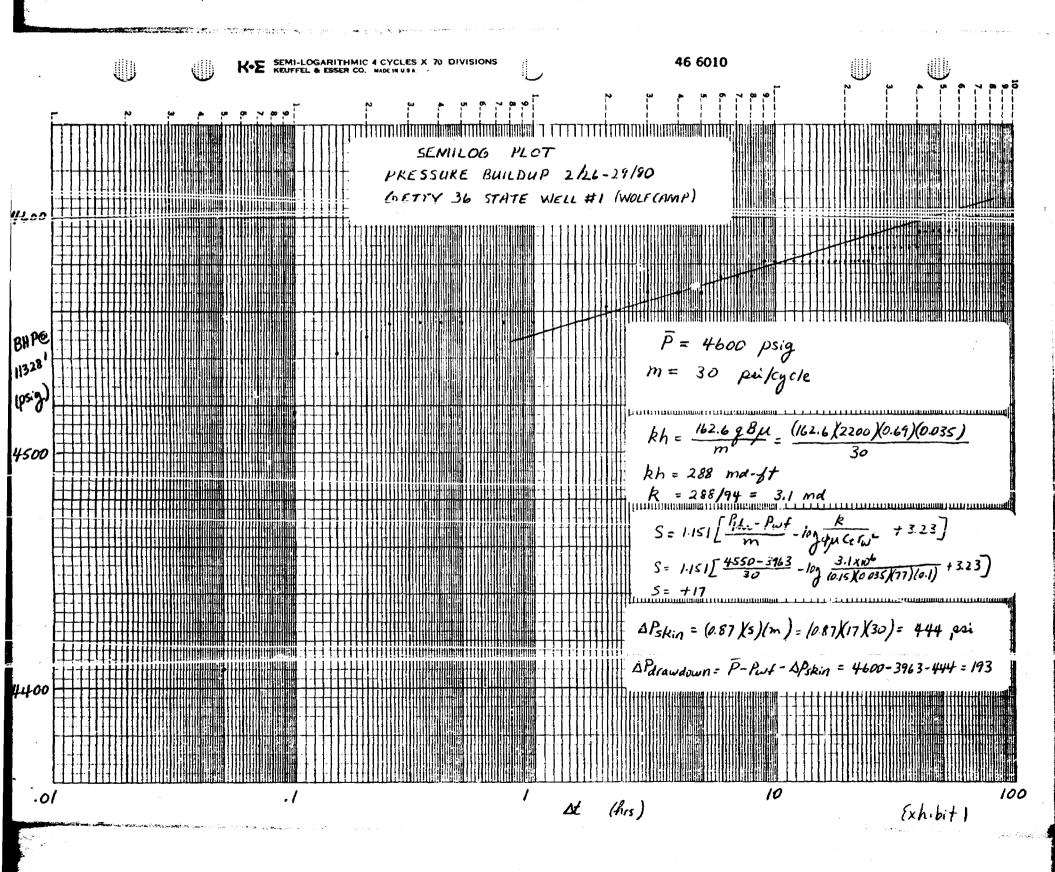
Jim Varnon

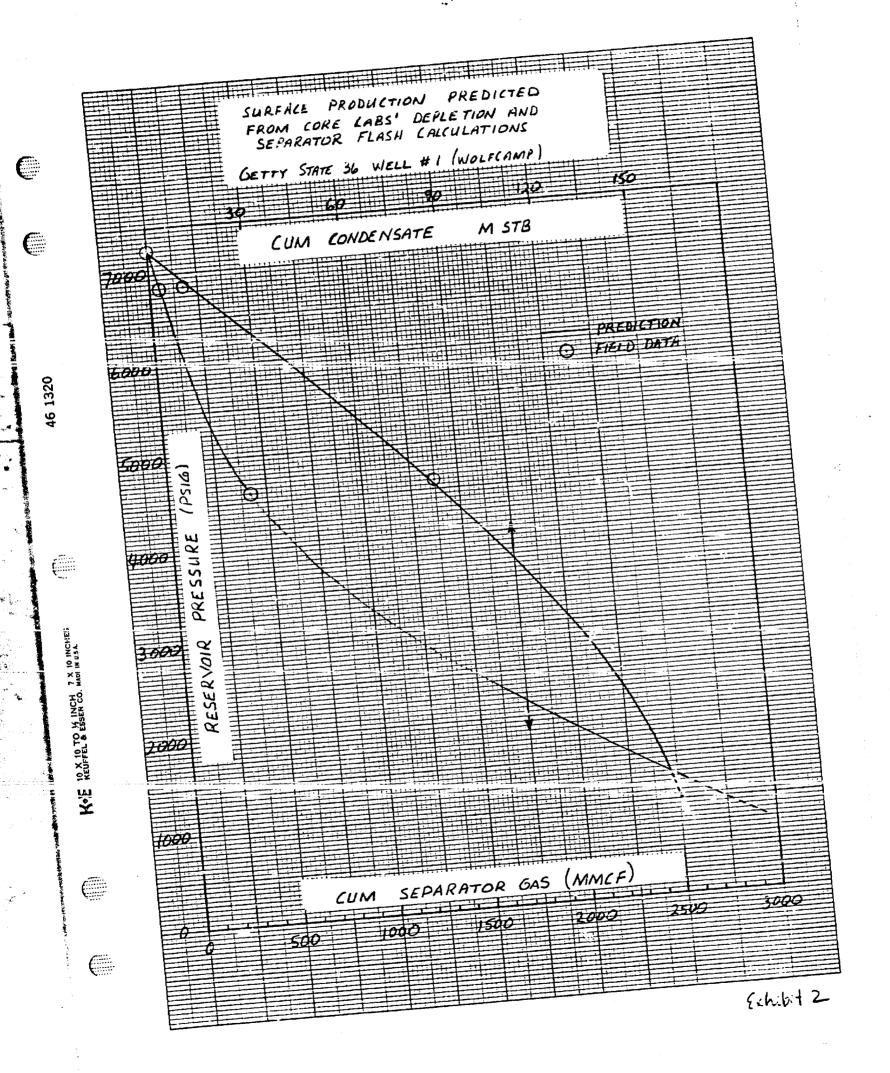
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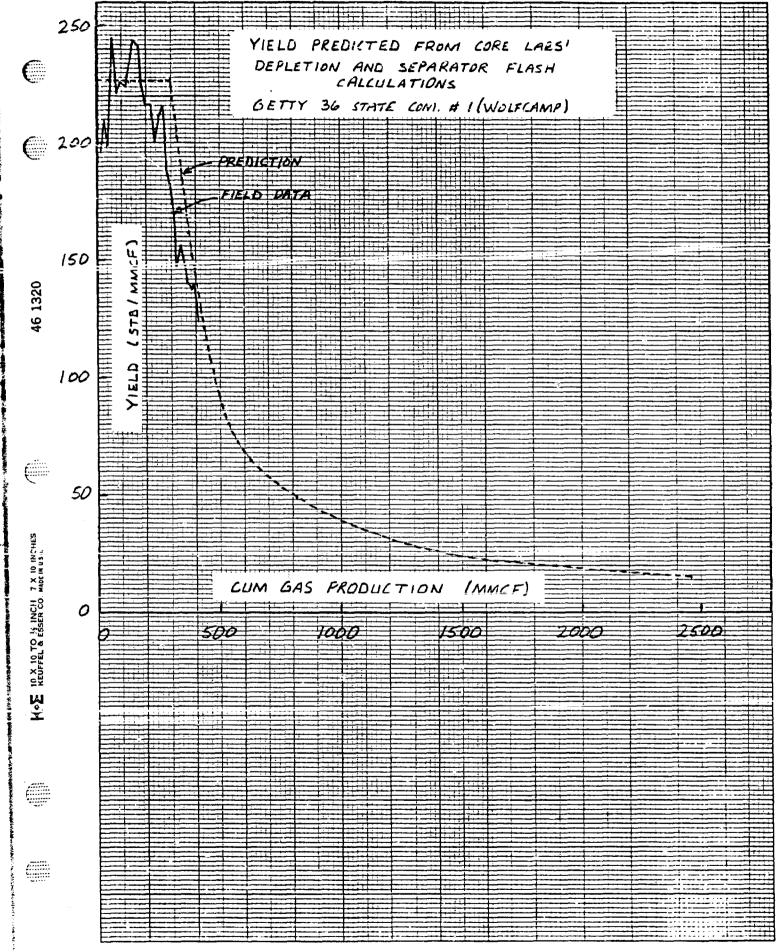
JEV:slw Attach.

cc: Mr. H. W. Terry

... ...







Exhabit 3

Getty GETTY 36 STATE COM. WELL NO. 1 ANALYSIS OF PRESSURE BUILDUP (2/26-29/80) Log-log Plot

Askiflow was almost completed before the first data point. The

Log plot is just a flat line and is not included here Semilog Plot (Exhibit 1) The semilog plot exhibits the leveling off typical of a limited neuron. The early hump in the semilog curve also occurred in the buildup own in sept 1979. It is apparently caused by phase segregation in the tubing Reservoir and completion presure depletion (2655 pei since discovery). The reservoir is being deputed like a constant pressure tunk. This well is capable of producing at a much higher rate with no foresceable detriment

THE BASIC DATA FOR BUILDING CALCULATIONS	
h = 94 ft	
$\phi = 0.15$	
Sw = 8.20	<del></del>
T = 196 °F = 656 °R	
Fluid : Cons Condensate (PUT Analysis is available)	
Mabile Fluid = Gas @ 4600 pri (Retrograde Liquid is noninobile)	,
j @ 4600 pii = 0.965 (NT Report page 9)	
Tc = 461 °R (Calculated from composition)	
Pe = 642 pria (alulated from composition)	
$T_1 = 656/461 = 1.4$	
Pr = 4615/642 = 7.2	
Y = 1.07 (Calculated from composition)	
Y = 1.07 (calculated from composition) $C_g = \frac{1}{7} - \frac{1}{3} \frac{33}{5P} = \frac{1}{4615} - \frac{1}{0.565} (121 \times 10^6) = 91 \times 10^{-6} \text{ psi}^{-1}$	
$C_t = S_g C_g + S_W C_W + C_f = 77 \times 10^{-6} \text{ psi}^{-1}$	
	·
$B_{3} = 5.04 \Rightarrow = \frac{(5.04)(0.965)(656)}{4615} = 0.69 \frac{601}{MCF}$	
Q	
μg = 0.035 cp (Carn-Kobayashi correlation for Y=	1.07)
IV STEADY-STATE PATE PREDICTION	
25c = \(\text{\mu B}\) \\ \langle \lan	MUF
ō.31L	
Note: DP= P-Paf - DPskin = 4400-3963-444 = 193 psi	

	Getty
	I ABANDONMENT PRESSURE
	Pau = Paul + APawdown + APakin
	From equations commonly used in gas well testing the flowing
	From equations commonly used in gas well teeting, the Howing BHP can be estimated from wellhead pressure.
	$m{\kappa}$
	$P_{Wf} = e^{\frac{3}{4}} \sqrt{P_{Wh}^2 + g^2 \left(\frac{\sqrt{8}L}{\epsilon}\right)^2} \qquad (1)$
	where Post = flowing BHP , psi
	Puh = wellhead pressure, psi
	$K = \frac{\pi L}{53.35} \frac{T_4}{T_4}$
	L = tubing length = 11328'
_	TI = average flowing temperature, or = 598 °R
	3 = average z-factor from bottom-hole to wellhead
	q = well rate, MCF/DAY = 2200
	$c = 1118 d^{3/3}/\sqrt{17} = 325 \text{ for } d = 2''$
	In the Feb 1980 pressure that, inaurdown Dr war 193 pei and skin
	AP was 444 psi. Use drawdown N= 200, although rate will decline
	some at this drawdown since formation volume factor invade with
	depletion factor than viscosity decreases the skin sp = 0 since the
	shin can be eliminated by workover.
	$\overline{P_{abd}} = P_{\omega}f + 200 $ (2)
	Equation (1) and (2) can be solved for Papel given any wellhed present.
	In order to get & and 3, it is necessary to assume Path, as the

B. Reserves of Gas and Condensate (Exhibit 2)

Surface production can be easily predicted from come labs: PVT cell depletion and flach calculations to the produced well stream. These interiors are performed by Gair labor on the basis of 10 marcs of reservoir fluid at the lew point, 5018 paig. Correcting to the migrial reservoir presence gives a basis of 1.097 marcs at original presence, 7255 psig, meaning that 0.097 marcs per 1.0 marcs are produced above the dew point. Adding this recovery to that given on page 5 of the Conclabs report, and prepariousing up to the reservoir size of 4100 marcs by the factor 4100/1.097, give immediately the cumulative purpose production versus reservoir pressure (Schibit 2). Note that accurately the prediction matches the field performance to determine this plat.

Without surface compression: Pabe = 1300 psig

Gas Reserves = 2460 MMCF

Condensate Reserves = 147 MST8

With surface compression: Para = 1000 psig

Bas Reserves = 2730 MMCF

Condensate Reserves = 151 MSTB

Three recoveries assume that the well will never produce any water and that redrograde liquid is nonmobile.

Contract to the Co.

ı	, Getty					
	C. Liquid Yield versus Cumulative Gas Production (Exhibit 3)					
	Instantaneme yield is not reported in Core Labs' separator					
	Much calculation results at can be computed by slatting					
	flack calculation results at can be computed by plotting					
	cumulative liquid versus cumulative gas and taking alopes.					
ij	Exhibit 3 shows the results along with a companion to					
	action field performance to date.					
	• • • • • • • • • • • • • • • • • • • •					
	D. Reservoir Radius					
	7758 Ah & Sq.					
	7758 Ah & Sq. = OGIP = 4.1 X10 SCF					
	$Ah = \frac{(4.1\times10^{9})(0.000587)}{7758 + 5} = \frac{(4.1\times10^{9})(0.000587)}{(7758)(0.8)}$					
	Ah = 2585 ALTE-Ft = 112.6 × 106 4t2					
	$\pi r^2 h = 112.6 \times 10^6$					
	$\int = \sqrt{\frac{1/2.6 \times 10^6}{h T}}$					
	r = LIR H it average h = 94'					
	r = 618 It if average $h = 94'$ $r = 873$ It if average $h = 47'$					

	E. Remarks on Rewrong Efficiency
	Original Gae in Place = 4100 MMCF Original Separator Gas in Place = (4100 MMCF) = 3424 MMCF
	ultimate Recovery of comprise on = 2730 MMCF
	6 ac Recovery Efficiency = 2730/3424 = 80 %
	Original Stock Tank Lig in Place = (4100 mmcf) (187.7 STB)= 778 MSTB
	Ultimate Recovery w/ compression = 151 MSTB
	Condonsate Recovery Efficiency = 151/778 = 19 %
	Present depletion will give excellent gas recovery but will
	leave some ,627,000 STB of condensate in the ground.
	It may be advisable to consider some type of inerty as
	present maintenance prefect. Disconraging features are:
	2. The potential reserves are not large month to support
	much expense in durdoping a some of injection gas.
	3. Reservoir pressure is already below the dew point and
	retrograde dropout in 70% of the maximum. Revaporization
	with inest gas pressure may not se passine
	Encouraging featurer are the favorable reservoir characteristics,
	thick, permeable, and probably namour areally, giving sice to
	Water idection is out of the anestion because it would animoh
	Weeth effection is out of the question because it would seriously
	Jespandize gas reserves.
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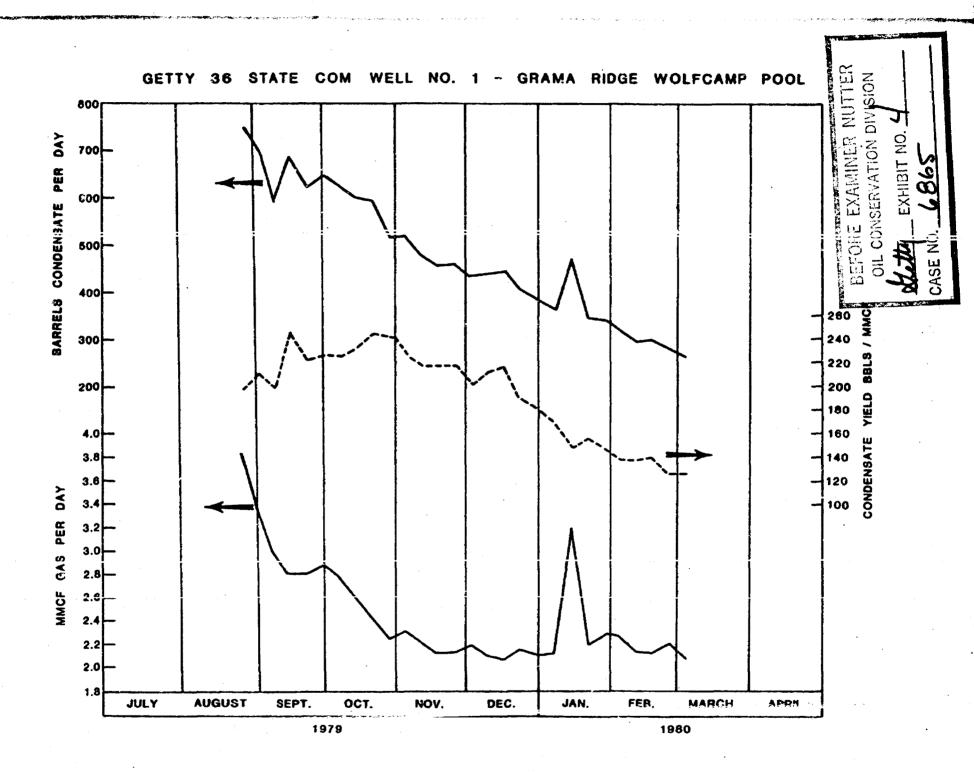
GETTY "36" STATE COM. NO. 1 MORROW-WOLFCAMP DUAL COMPLETION TEN COURTIN NEW MEYTON 20",94# H-40 @ 40' w/3 yds. Ready-Mix 13 3/8", 48#, H-40 @ 1100'. Circulate 17 sxs to surface 9 5/8",36#, S-80 & K-55 at 5502'. Circulate 125 sxs cement surface 2 3/8", N-80 8rd tbg Baker Model "AL-5" Dual pkr. at 10,505' w/2 3/8" x 1.81" 2 3/8", N-80 8rd tbg. Model "F" nipple Liner top at 10,815' Squeezed w/100 sxs 7", 26# N-80 & S-95 @ 11,114'. Cement top by Worth Well Temp. at 3570'. 5-20' blast joints Wolfcamp perfs. 11,320-11,335' 3 11/16" x 26' x 1.81' "ER" tbg. Receptacle w/1.87' BFC Model "F" profile Baker Model "DB" pkr. @ 12,000' 3 1/2' x 6' mill-out 2 3/8" x 10' pup joint. Morrow perfs. 12,940-12,950' BEFORE EXAMINER NUTTER CIL CONSERVATION DIVISION EXHIBIT NO. Plug back TD 13,266' 4 1/2" 11.6# S-95 @ . 13,349'

# DAILY TEST DATA GETTY "36" STATE COM. WELL NO. 1 WOLFCAMP

Week of	Condensate Bbls.	Gas (HNCF)	CON. YIFID (BBLS./MCF)
Aug. 27	75û	3.82	196.33
Sep. 3	700	3.32	210.84
Sep. 10	590	2.98	197.98
Sep. 17	685	2.80	244.64
Sep. 24	620	2.80	221.42
0ct. 1	645	2.86	225.52
Oct. 8	620	2.77	223.82
Oct. 15	600	2.59	231.66
Oct. 22	590	2.42	243.80
Oct. 29	515	2.14	240.65
Nov. 5	518	2.3	225.21
Nov. 12	475	2.2	215.91
Nov. 19	455	2.11	215.63
Nov. 26	458	. 2.12	216.03
Dec. 3	435	2.18	199,54
Dec. 10	. 442	2.09	211.48
Dec. 17	445	2.06	216.02
Dec. 24	. 195	2.11	189.25
Dec. 31	380	2.1	180.95
Jan. 7	360	2.12	169.81
Jan. 14	470	3.190	147.34
Jan. 21	341	2.192	155.57
Jan. 28	336	2.274	147.76
Feb. 4	313	2.258	138.62
Feb. 11	292	2.132	136.96
Feb. 18	295	2.117	139.75
Feb. 25	274	2.202	124.43
Var. 3	260	2.077	125.18

BEFORE EXAMINER NUTTER
OIL CONSERVATION DIVISION

Atty EXMISIT NO. 3



### GETTY 36 STATE COM. NO. 1 - WOLFCAMP PRODUCTION DATA

CONDENSATE, BBL.	GAS, MOF
4,864	19,492
16,150	74,619
17,660	76,388
13,439	61,611
12,244	64,464
10,412 -	64,131
7,489	57,200*
82,258	417,905
	4,864 16,150 17,660 13,439 12,244 10,412 - 7,489

#### \*estimated

Well was opened after buildup at 11 a.m. on February 29, 1980. Hence, total estimated production through February is approximately the production prior to the start of the buildup.

BEFORE EXAMINER NUTTER

GIL CONSERVATION DIVISION

EXHIBIT NO. \_\_\_\_\_\_

CASE NO. \_\_\_\_\_\_\_

EXAMINER NUTTER ISERVATION DIVISION

HOBBE, NEW MEXICO 88240

COMPANY: Getty Oil Company

WELL: Getty 36 State Com. No. 1

FIELD: Undesignated - Wolfcamp

#### CHRONOLOGICAL PRESSURE DATA

			ELASPE	D TIME	SURFACE	PRESSURE	BHP <b>● (</b> .	-7636 ·}
DATE	STATUS OF WELL	TIME	HRS.	MIN.	TBG	CSG	10485'	11328 'PSI
980								
/26	Flowing. Run Flowing							
	Cradient w/Tandem							
	Bombs & Set Bombs							
	off @ 10485'	10:30 AM	0	00	2346	PKR	3840	3963 .
	Shut in	11:00	0	30	2346		3840	3963
	**	11:03	<b>0</b>	03	-	-	4045	4408
	**	11:06	0	06	-	_`	4154	4517
•	**	11:09	0	, 09	· -	_	4179	4542
	••	11:12	0	12	-	_	4186	4549
		11:15	0	15		_	4192	4555
	н	11:20	0	20		_	4192	4555
	11	11:25	0	25		-	4192	<b>45</b> 55
	ri	11:30	0	30	_	-	4192	4555
		11:45	0	45	-	-	4192	4555
	**	12:00 N	1	00	-	-	4192	4555
	1.	1:00 PM	2	00	-	_	4199	4562
		2:00	3	00	-	_	4205	4568
	11	3:00	4 *	00	-	_	4205	4568
	"	4:00	5	00	-	-	4205	4568
	:1	5 <b>: 0</b> 0	6	00		-	4212	4575
	ir ·	6:00	7	00	-	-	4212	4575
	11	7:00	8	00	-	-	4212	4575
	**	8:00	9	00	<del>-</del>	-	4218	4561
	•	9:00	iû	00	-	-	4218	4581
	* <b>#1</b>	10:00	. 11	00	-	-	4218	4581 .
	<b>17</b>	11:00	12	00		-	4218	4581
_	11	12:00 MN		00	· <del>-</del>	-	4218	4581
/27	**	1:00 AM		00	-	-	4218	4581
	- <b>11</b>	2:00	15	00	-	-	4218	4581
	**	3:00	16	00	-	-	4218	4581
	**	4:00	17	00			4216	4581
		5:00	13	UU	-	<del>-</del>	4218	4581
	· 11	6:00	19	00	-	<del>-</del>	4218	4581
		7:00	20	00	· <b>-</b>	-	4218	4581
	•• ••	8:00	21	00	-	-	4218	4581
	19	9:00	22	00	-	. <del>-</del>	4218	4581
	n'	10:00	23	00	<del></del>	_	4218	4581
	**	11:00	24	00	_	-	4218	4581
	**	12:00 N	25	00	-	_	4218	4581
	••	1:00 PM		00	-	_	4224	4587
	**	2:00	27	00	-		4224	4587
	. 10	3:00	28	00	-	<b>-</b> '	4224	4587
	11	4:00	29	00	-	_	4224	4587

WELL: Getty 36 State Com. No. 1

			ELASPED	TIME	SURFACE	PRESSURE	BHP e	( -7636 )
DATE	STATUS OF WELL	TIME	HRS.	MIN.	TBG	CSG	10485	
	Shut in	5:00	30	00	_	_	4224	4587
	H	6:00	31	00	-	_	4224	4587
	11	7:00	32	00		_	4224	4587
	. 10	8:00	33	00	-	_	4224	4587
	#1	9:00	34	00	-	_	4221	4587
	**	10:00	35	00	-	-	4224	4587
	PT	11:00	36	00	-	-	4224	4587
	99	12:00 M	¥ 37	00	<b>-</b> ,	-	4224	4587
2/28	**	1:00 A	M 38	00		-	4224	- 4587
-	**	2:00	39 -	00	-	_	4224	4587
	28	3:00	40	60	_ `	-	4224	4587
	**	4:00	41	00	-	-	4231	4594
	*1	5:00	42	00	_	-	4231	4594
•	**	6:00	43	00	-	· –	4231	4594
	11	7:00	44	00	-	-	4231	4594
		8:00	45	00		: <del>-</del>	4231	4594
- •,	tr 	9:00	46	00	• =	· -	4231	4594
	it It -	10:00	47 ,	00	***	_	4231	4594
	**	11:00	48	00	-	_	4231	4594
	,, ,,	12:00 N	49	00	-	_	4231	4594
••	**	1:00 PI		00	_	-	4231	4594
	**	2:00	51	00	_	<b>~</b>	4231	4594
	÷ **	3:00 4:00	52 53	00	_	~	4231	4594
	**	5:00	53 54	00 00	-	_	4231	4594
	**	6:00	5 <del>4</del> 55	00	<del>-</del>	-	4231	4594
	**	7:00	56	00	_	-	4231 4231	4594 4594
	* 21	8:00	57	00	_		4231	4594 4594
	**	9:00	58	00		_	4231	45 <b>94</b>
	19	10:00	59	00	_	_	4237	4600
	**	11:00	60	00		_	4237	4600
	13	12;00 M		00	_		4237	4600
2/29	range in the state of the state	1:00 A		. 00	-	_	4237	4600
e <sup>†</sup>	**	2:00	63	00		e e e 🚉 e	4237	4600
	<b>**</b> .	3:00	64	00	*-	_	4237	4600
	. 12	4:00	65	00	~-	_	4237	4600
	9.5	5:00	66	00	_	_	4237	4600
	**	6:00	67	00	_		4237	4600
	rr .	7:00	68	00	_	_	4237	4600
-		8:00	69	00	-	_	4237	4600
	11	9:00	ïΰ	00		_	4237	4600
	47	10:00	71	00	-	-	4237	4600
Fi	ished Bombs & Run							
\$1	tatic Gradient	11:00	72	00	2731	_	4237	4600

### JARREL SERVICES, INC.

POST OFFICE BOX 1654

PHONES 505 393-5398 - 393-8274

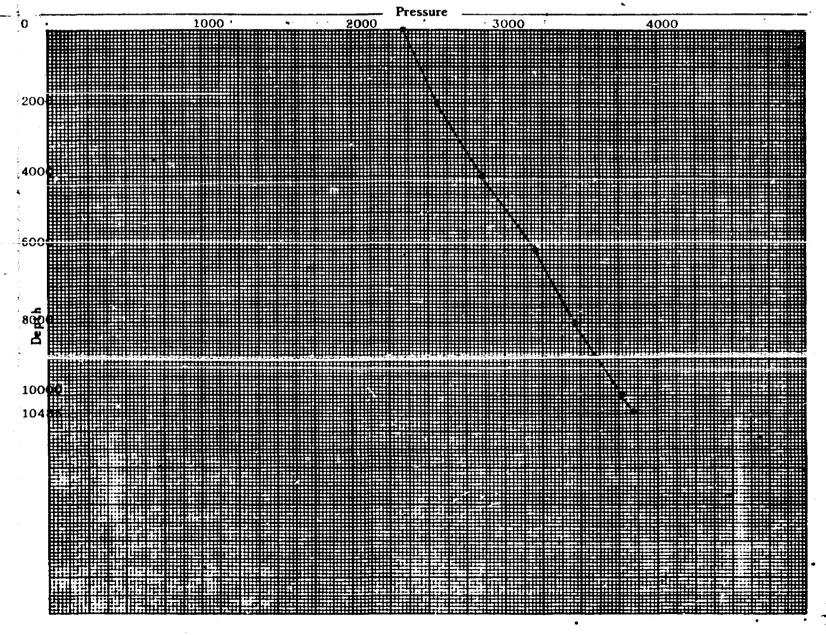
HOBBS, NEW MEXICO 88240

OPERATOR Getty Oil Company
FIELD Undesignated
FORMATION Wolfcamp
LEASE Getty 36 State Com WELL #1
COUNTY Lea STATE New Mexico
DATE Feb. 26, 1980 TIME 8:00 AM
Status Flowing
Test Depth
Time S. ILast test date
Tub Pres. 2346 BHP last test
Cas. Pres. <u>Dual</u> BHP change
Elev. 3692'KB-23 Fluid top Flowing
Datum (-7636) ** Water top
Temp. @ 174°F Run by
Cal. No. <u>A13676N</u> Chart No. <u>1</u>

#### **BOTTOM HOLE PRESSURE RECORD**

Depth		Pressure	•	Gradient
0		2346		_
2000		2558		.106
4000		2859		.151
6900		3205		.173
8000		3468		.132
10000		3769		.151
10485		3840		. 146
11328	(-7636)	3963	* **	(.146)

- \* EXTRAPOLATED PRESSURE
- \*\* MIDPOINT OF CASING PERFORATIONS



NO. 340R-L310 DIETZBEN GRAPH PAPER SEMI-LOGARITHMIC 3 CYCLES X 10 DIVISIONS PER INCH DIETZUEN CORPORATION

JARREL SERVICES, INC.

L310 DIETZBEN GRAPH BEMI-LOGARITHMIC CYCLES X 10 DIVISIONS PER INCH JARREL SERVICES, INC. 100.

### JARREL SERVICES, INC.

POST OFFICE BOX 1854

PHONES 505 393-5396 --- 393-827

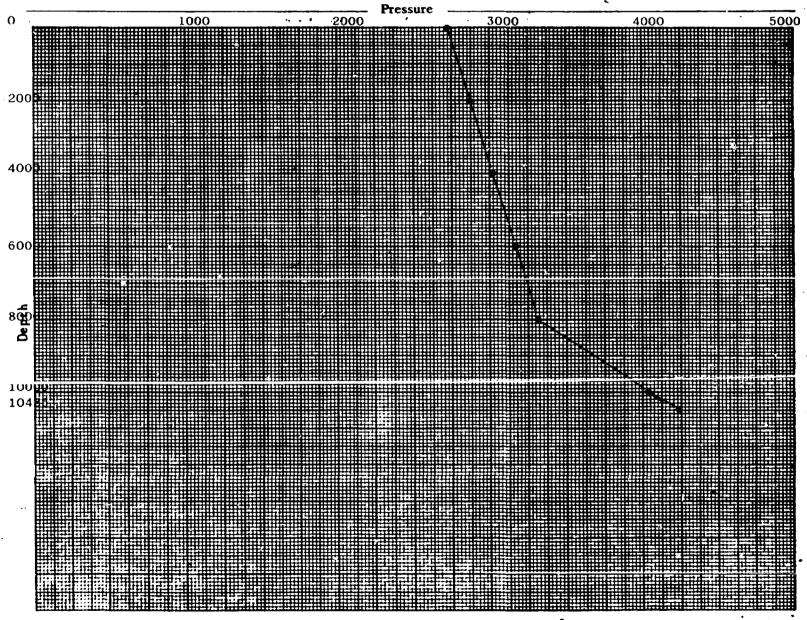
HOBBS, NEW MEXICO 88240

OPERATOR Getty	OIl Company	
FIELD Under		
FORMATIONWolfe		
LEASEGetty 36		
COUNTY Lea	STATE	New Mexico
DATE Feb. 29.	1980 TIME	11:00 AM
Status Shut in		
Test Depth 10485		
Time S. 1. 72 hrs.	_Last test date	7/4/79
Tub Pres2731	_BHP last test _	7057 @ 10450 P
Cas. Pres. PKR	_BHP change	2457# Loss
Elev. 3692 KB-23	_Fluid top	8000 '
Datum (-7636) **		
Temp. @ 1740F	_Run by	JSI #16
Cai. No. ALSOZON	_Chart No	<u>Ž</u> '

#### **BOTTOM HOLE PRESSURE RECORD**

Depth	Pressure	Gradient
0	2731	-
2000	2874	.072
4000	3020	.073
<b>60Q</b> 0	3168	.074
8000	3318	.075 ·
10000	4028	.355
10485	4237	.431
11328	(-7636) 4600 * **	(.431)

- \* EXTRAPOLATED PRESSURE
- \*\* MIDPOINT OF CASING PERFORATIONS



Reservoir Fluid Study for GETTY OIL COMPANY

State 36 No. 1 Well Wildcat Lea County, New Mexico

January 23, 1980

RESERVOIR FLUID DIVISION

Getty Oil Company P.O. Box 730 Hobbs, NM 82240

Attention: Mr. Peter Botes

Reservoir Fluid Study Subject: State 36 No. 1 Well

Wildcat

Lea County, New Mexico

Our File Number: RFL 79619

Duplicate samples of separator gas and separator liquid were collected from Gentlemen: the subject well by Tefteller, Inc. on September 9, 1979. These samples were forwarded to our Dallas laboratory for use in a reservoir fluid study, the results of which are presented on the following pages.

Upon arrival in the laboratory, the separator gas was analyzed through heptanes plus using chromatography, while the separator liquid was also analyzed through heptanes plus using low temperature fractional distillation equipment along with chromatography. After the separator gas flow rate was corrected using factors which are shown on page one, the producing gas-liquid ratio was calculated to be 4438 cubic feet of separator gas at 15.025 psia and 60°F. per barrel of stock tank liquid at 60°F. In the laboratory, it was determined that this was the equivalent of 3588 standard cubic feet of separator gas per barrel of separator liquid at 490 psig and 78°F. The measured compositions of the separator products were used in conjunction with this producing gas-liquid ratio to calculate the composition of the producing well stream material. These compositions are shown on page two. in the laboratory, the separator products were physically recombined to this producing gas-liquid ratio for use in the entire reservoir fluid study.

A portion of the reservoir fluid was charged to a high pressure visual cell and heated to the reservoir temperature of 196°F. During constant composition expansion pressure-volume relations performed at this temperature, the fluid existed as a single-phase gas at pressures above 5018 psig at which pressure a retrograde dew point was observed. A comparison of this dew point pressure to the reservoir pressure, 6846 psig, measured on September 12, 1979 indicates that the fluid currently exists in the reservoir in an undersaturated condition. The results of the pressure-volume relation measurements are shown on page three.

The sample in the cell was repressured to a single-phase condition after which it was subjected to a constant volume depletion. After the sample volume was established at the dew point pressure, the sample was subjected to a series of pressure expansions and constant pressure displacements with each displacement terminating at the original sample volume at the dew point pressure. During each of these displacements, the volume of retrograde liquid accumulation was monitored. These data, which are reported on pages six and twelve, show that the maximum accumulation of liquid is approximately 37.1 percent of the hydrocarbon pore space occurring at approximately 3150 psig. The liquid saturation at atmospheric pressure and 196°F. was 24.5 percent of the hydrocarbon pore space.

A larger volume of the reservoir fluid was once again charged to a bigger high pressure cell heated to 196°F. where the constant volume depletion was repeated. During this particular depletion, the equilibrium gas phase at each of the depletion pressure levels was charged to low temperature fractional distillation equipment where along with chromatography its composition was measured. Also determined was the volumetric production of the vapor phase from pressure to pressure where the various deviation factor z were measured down to 700 psig. A summary of these volumetric and compositional data is reported on page four.

The above compositions and volumetric data were used in conjunction with published equilibrium ratio data to calculate the surface recoveries that may be expected as the reservoir pressure declines. These calculations were performed on the basis of one million standard cubic feet of reservoir fluid inplace at the dew point pressure, 5018 psig and 196°F. Assumed in these calculations was a plant efficiency of 100 percent. These volumetric data are reported in tabular form on page five.

We wish to thank Getty Oil Company for this opportunity to be of service. If you should have any questions regarding these data or we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

CORE LABORATORIES, INC.

P. L. Moses, Manager

Reservoir Fluid Analysis

PLM:FBV:bt

6 cc: Addressee

1 cc: Mr. Jim Eakin

Getty 011 Co.

P.O. Box 1231

Midland, TX 79702

		Page 1 of	12
		<del></del>	
		File RFL 7961	9
	Date Sampled	September 9, 1979	
Company Getty 0il Company		Lea	
26 No. 1	County	Lea	
Well_State_So No	State	New Mexico	
Field Wildcat		\$ "To a second of the second o	
	ION CHARACTERISTICS		
FORMAI	TON O.E.S.	Wolfcamp	
_		Inly 2	, 1979 11328 Ft.
Formation Name	-	7255 PSIG @	SCF/Bb1
Date First Well Completed Original Reservoir Pressure Original Reservoir Pressure	-	5082	Bbls/Day
Original Produced Gas-Liquid Ratio	-	752	B0137 5C7
Production Rate	-	PSIG	· API
Droggure and temp	ure	49.7	Ft. Subsea
Tanda Gravity at 00 1.		7636	
Fidure ormania	LL CHARACTERISTICS		Ft.
Datum WE	The Comment	3692 KB	Ft.
Elevation		13266 PBTD 11320-11335	Ft.
Tatal Depth		2-3/8 In. to	10495 Ft.
nuction Interval		7.82 (Estimated	) MMSCF/Day
making Size and Depth		6846 PSIG @	11320
- DIAM PATRILLAL		September 12	, 1979
Last Reservoir Pressure		187* F. @_	10505 Ft.
Data		Flowing	
Reservoir Temperature		Amerada	
Status of Well	CONDITIONS		PSIG
Pressure Gauge	SAMPLING CONDITIONS	3510	PSIG
Flowing Tubing Pressure		6092	PSIG
		490	•F.
		78	PSIG
			°F.
Secondary Separator Temperature	• •	-10.7	* ADY @ 60°F.
		49.7	MSCF/Day
Secondary Separator Telegraphics Field Stock Tank Liquid Gravity	Rate	2887	
D-Imary Separator Gas 220	15.025 P	SIA	
DraggiiTe Dabe	60	°F•	
Temperature Base	1.0477		
Compressibility Factor (Fpv)	0.688		Bbls/Day
Gas Gravity (Laboratory) Gas Gravity Factor (Fg) Gas Gravity Factor (Fg)	1.2056	650.54	SCF/Bb1
Gas Gravity Factor (Fg) Stock Tank Liquid Production	Rate & burr.	4438	Bb1s/MMSCF
Stock Tank Liquid Production of Primary Separator Gas/Stock Tank	k Liquid Racio	225.33	U(X)
Primary Separator	or	TJ.	
o 1 od hv			
Sampled by			

\*Temperature extrapolated to mid-point of perforation = 196°F.

\*Temperature extrapolated to mid-point of perforation = 196°F.

These analyses, spintons or interpretations are known on shearystions and material supplied by the client to whom, and for whose exclusive and confidential use, the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but this report is made. The interpretations or opinions expressed representations on varranty or representations as to the productivity, proper operations. Laboratories, Inc. and its officers and employees, assume no responsibility and material with which such report it used of relied upon.

Page

of

12

		1	file	RFL 79619	
		•	/ell	State 36 No.	1
Hydrocarbon Analy	ses of Separator Pro	ducts and Calo	culated W	ell Stream	
		_	_		
	Separator Liquid	Separato		Well Str	
Component	Mol Percent	Mol Percent	GPM	Mol Percent	<u>GPM</u>
Hydrogen Sulfide	0.00	0.00		0.00	
Carbon Dioxide	0.00	0.12		0.10	
Nitrogen	0.16	1.14		0.94	
Methane	11.74	81.81		67.81	
Ethane	8.81	10.87	2.964	10.46	
Propane	9.79	3.92	1.100	5.09	1.428
iso-Butane	2,49	0.50	0.167	0.90	0.300
n-Butane	7.04	0.91	0.293	2.13	0.685
iso-Pentane	3.33	0.18	0.067	0.81	0.302
n-Pentane	3.83	0.18	0.067	0.91	0.336
Hexanes	5.63	0.10	0.042	1.21	0.503
Heptanes plus	$\frac{47.18}{100.00}$	$\frac{0.27}{100.00}$	$\frac{0.125}{4.825}$	$\frac{9.64}{100.00}$	$\frac{6.563}{10.117}$
	20000	20000		20000	
Properties of Heptanes pl					
API gravity @ 60°F. Specific gravity @ 60/6	$ \begin{array}{c}     44.5 \\     \hline     0.8041 \\     \hline     171 \end{array} $	102 (a	۱4	0.802	
Molecular weight		(a	ssumed)	<u> 169</u>	
Calculated separator gas Calculated gross heating per cubic foot of dry gas	value for separator		ВТИ		
Primary separator Ras (		psig and	78 °F		
Primary separator gas/sep Primary separator liquid Primary separator gas/we	stock tank liquid ra	3588 1.237 800.1	Въ	F/Bb1 @ 78°F. Ls @78°F/per B CF/MMSCF	ь1 @60°F
Stock tank liquid/well s		180.3	80Вы	Ls/MMSCF	

# CORE LABORATORIES, INC.

Page\_ RFL 79619 File State 36 No. 1 Well\_

Pressure-Volume Relations of Reservoir Fluid at 196°F.

(Constant Composition Expansion)

Pressure	Relative Volume	Deviation Factor
PSIG	4010me	
<del></del>	0.8946	1.482
8000	0.9034	1.427
7630		1.369(1)
7255 Original Reservoir Pressure	0.9172	1.348
7100	0.9291	1.289
6700	0.9421	1.229
6300	0.9532	1.185
6000	0.9655	1.140
5700	0.9769	1.103
5450	0.9843	1.081
5300	0.9929	1.060
5150	0.9974	1.044
5050	1.0000	1.040(2)
5018 Dew Point Pressure	1.0006	
<del>5008</del>	1.0049	
4950	1.0119	
4850	1.0240	
4700	1.0422	
4500	1.0687	
4250	1.1089	
3950	1.1860	
3500	1.3198	
3000	1.5253	
2500	1.8695	
2000	2.3295	
1600	2.3293	
1200	·	
1000	3.1043	

 <sup>(1)</sup> Gas expansion factor = 1.572 MSCF/Bbl.
 (2) Gas expansion factor = 1.433 MSCF/Bbl.

Page 4 of 12
File RFL 79619

Well\_\_\_State 36 No. 1

### Depletion Study at 196°F.

### Hydrocarbon Analyses of Produced Well Stream - Mol Percent

	Reservoir Pressure - PSIG							
	5018	4300	3600	2800	2000	1300	700	700*
Component			<del></del>					
Carbon Dioxide	0.10	0.10	0.10	0.10	0.11	0.13	0.14	0.04
Nitrogen	0.94	1.12	1.19	1.20	1.15	1.08	1.03	0.05
Methane	67.81	73.54	76.22	78.13	78.75	78.34	75.34	14.37
Ethane	10.46	10.44	10.41	10.34	10.66	11.10	12.23	7.27
Propane	5.09	4.80	4.57	4.40	4.42	4.66	5.70	7.16
iso-Butane	0.90	0.80	0.73	0.67	0.66	0.71	0.94	2.12
n-Butane	2.13	1.84	1.62	1.47	1.41	1.52	1.97	5.21
iso-Pentane	0.81	0.68	0.59	0.52	0.48	0.48	0.54	2.56
n-Pentane	0.91	0.74	0.63	0.54	0.49	0.49	0.56	2.87
Hexanes	1.21	0.81	0.57	0.42	0.34	0.33	0.40	5.87
Heptanes plus	9.64	5.13	3.37	2.21	1.53	1.17	1.15	52.48
	100.00	100.00	100.00	100,00	100.00	100.00	100.00	100.00
			-					
Molecular weight of heptanes plus	169	133	124	115	109	106	107	180
Specific gravity of heptanes plus	0.801	0.777	0.770	0,759	. 0.752	0.749	0.750	0.808
Deviation Factor - Z								
Equilibrium gas	1.040	0.911	0.845	0.820	0.847	0.888	0.935	
Two-phase	1.040	0.952	0.878	0.812	0.752	0.682	0.559	
weil offerm bloduced.								
Cumulative percent of initial	0.000	6.304	14.855	28.142	44.651	60.178	73.736	
GPM from Smooth Compositions								
Propane plus	10.117	5.906	4.489	3.580	3.131	3.066	3.650	
Butanes plus	8.689	4.559	3.207	2.345	1.891	1.758	2.051	
Pentanes plus	7.704	3.701	2.443	1.650	1.218	1.032	1.105	
,								

<sup>\*</sup>Composition of equilibrium liquid phase.

Their analysis, opinions or interpretations are based on observations and material supplied by the client to whom, and for whose exclusive and confidential use, this paper is made. The interpretations or agreement represent the base judgment of Core Laboratories. See (all errors and emissions employed); but Core Laboratories, loc. and its officers and employed, assume no responsibility and make no wormally or responsibility, proper specture, or productions of our other material with their continuous of our other material with one report to used or relied upon.

Page 5 of 12

File RFL 79619

Well State 36 No. 1

### Calculated Cumulative Recovery During Depletion

Cumulative Recovery per	Initial			Rese	rvoir Pressur	Pressure - PSIG			
MMSCF of Original Fluid	in Place	5018	4300	3600	2800	2000	1300	700	
Weil Stream - MSCF	1000	0	63.04	148.55	281.42	446.51	601.78	737.36	
Normal Temperature Separation*									
Stock Tank Liquid - Barrels	189.70	0	5.58	10.36	15.01	18.90	21.09		
Primary separator gas-MSCF	789.49	0	55.38	133.93	259.64	418.40	571.04		
Second stage gas - MSCF	45.62	0	1.70	3.25	4.86	6.31	6.46		
Stock tank gas - MSCF	26.80	0	1.10	2.13	3.23	4.24	4.55		
Total "Plant Products" in Primary Separator Gas - Gallons									
Propane	833	0	62	151	293	478	676		
Butanes (total)	342	ŏ	27	68	134	221	326		
Pentanes plus	185	Õ	15	37	75	125	200	5	
•									
Total "Plant Products" in									
Second Stage Separator Gas-Gallons	3_								
Propane	161	0	6.3	12.1	18.1	23.6	24.0		
Butanes (total)	72	0	3.1	6.0	9.0	11.9	12.1		
Pentanes plus	37	0	1.6	3.1	4.8	6.4	6.5		
Total "Plant Products" in									
Well Stream - Gallons		_			<b>A.</b>				
Propane	1428	0	85	195	359	563	766	983	
Butanes (total)	985	0	54	119	212	323	436	564	
Pentanes plus	7704	0	233	442	661	863	1023	1173	

\*Primary separator at 490 psig and 78°F.; second stage separator at 70 psig and 75°F.; and stock tank at 70°F., except 1300 psig well stream where primary separator is at 200 psig and 78°F.

These easigns, upasses or interpretations are based on observations and material supplied by the client is whom, and for whose exclusive and exclusively see, this supert is made. The interpretations or opinions assigned represent the best judgment of Core Laboratories. Inc. (all errors and emissions escapsed): but Core Laboratories, Inc. and its afficers and emissions on respectability and made to warranty or representations as to the predestivity, prepar operations, or productions of any oil, gap or other measure well or send in examples with which such report is used or relied upon.

Page	of	12
File	RFL 79619	
Well	State 36 No.	. 1

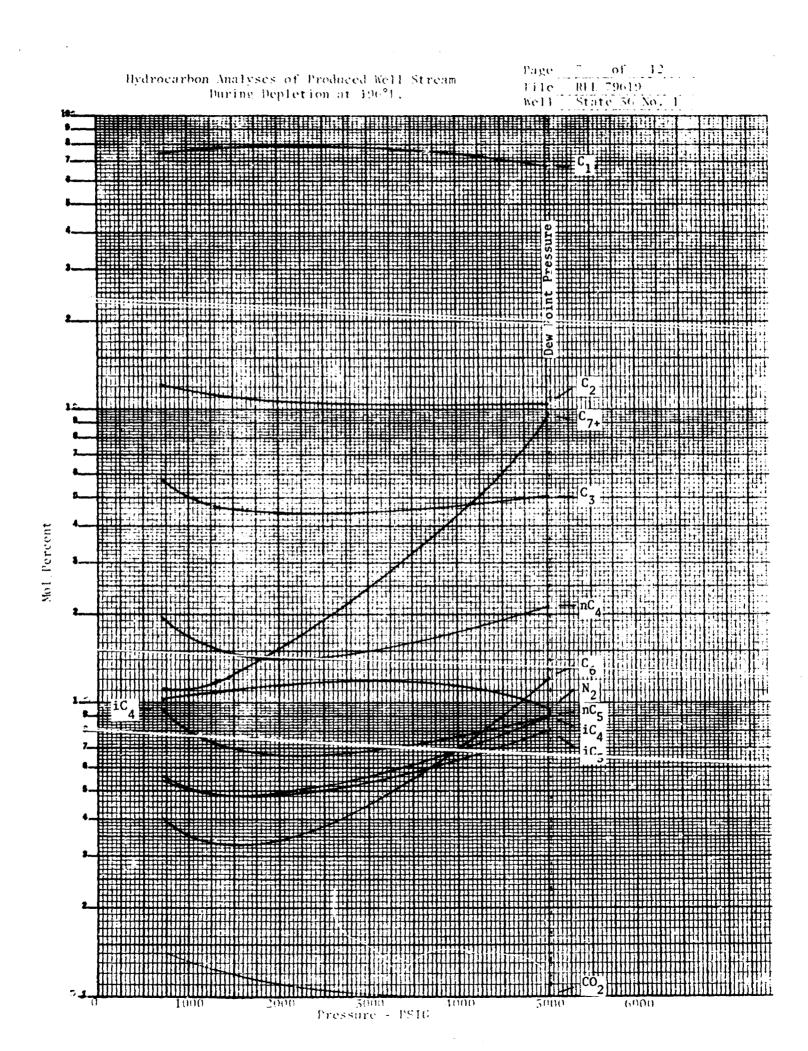
### Retrograde Condensation During Gas Depletion at 196°F.

Pressure	Retrograde Liquid Volume
PSIG	Percent of Hydrocarbon Fore Space
5018 Dew Point Pressure	0.0
<del>5012</del>	0.8
5008	1.4
4950	11.2
4850	17.8
4700	23 7
4500	28.6
4300	32.9
3600	36.7
2800	37.0
2000	35.2
1300	32.5
700	29.7
0	24.5

### Properties of Zero PSIG Residual Liquid

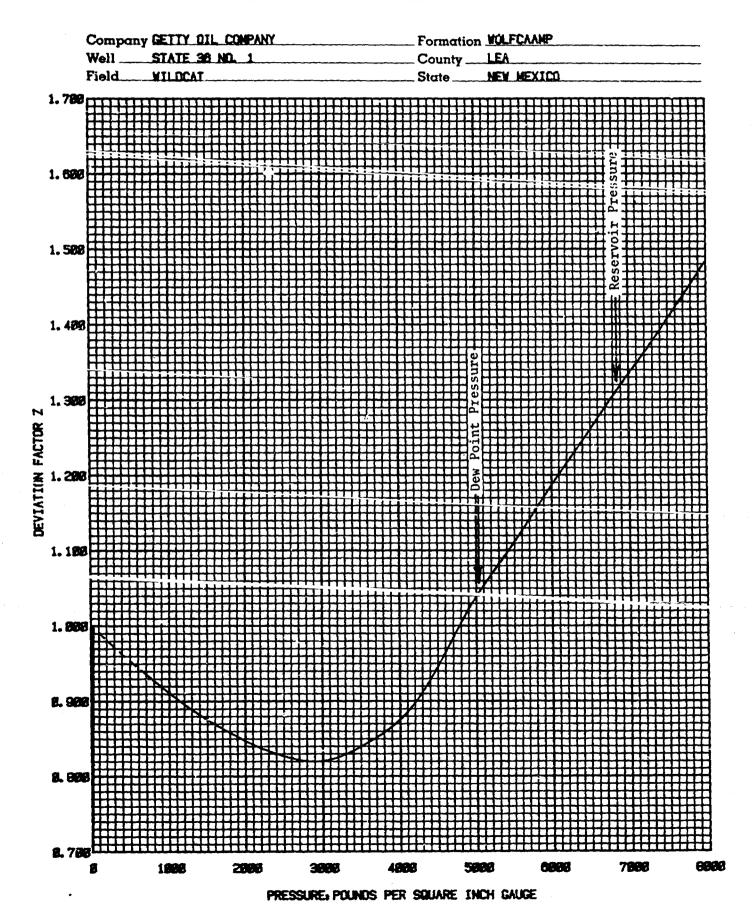
API Gravity @ 60°F.	43.6
Specific gravity @ 60/60°F.	0.8080
Molecular weight	181

These analyses, spinious or interpretations are based on charractors and material supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinious excepted represent the best judgment of Care Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, inc. and its officers and employees, seeme no responsibility and make no warranty or representations as to the productivity, proper operation, or profitablement of any oil, gas or other mineral well or sand in somection with which such report is used or relied upon.



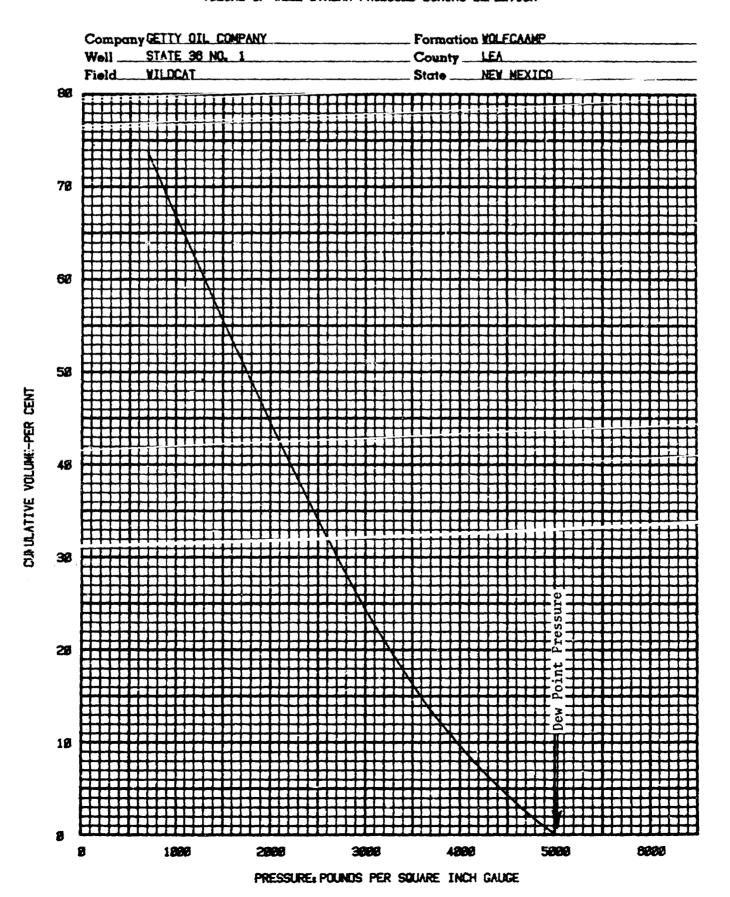
Page 8 of 12 File RFL 79819

### DEVIATION FACTOR Z OF WELL STREAM DURING DEPLETION AT 198 F.



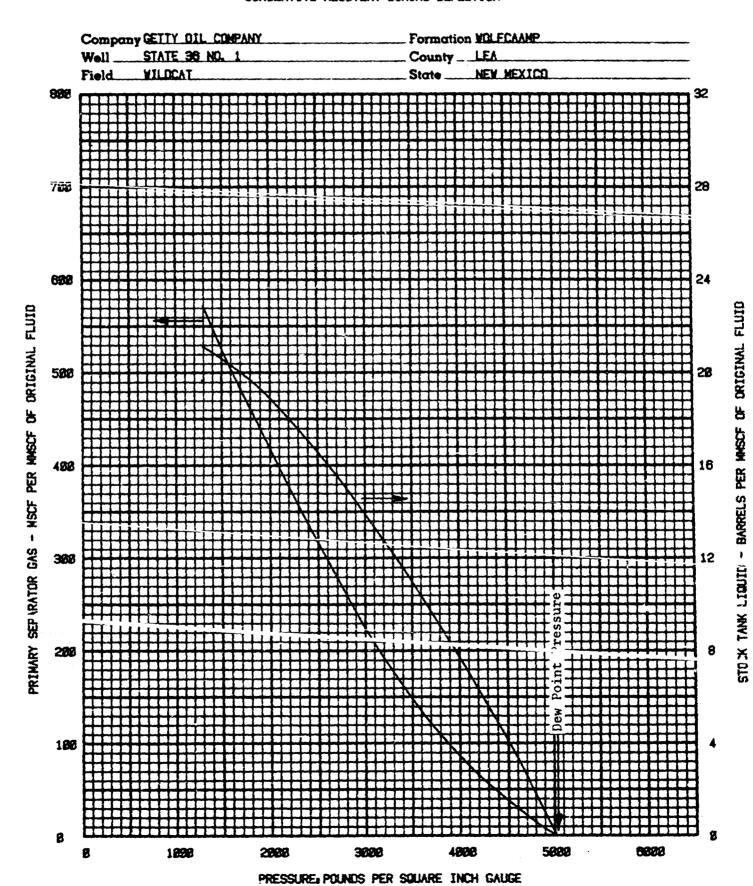
Page 9 of 12 File RFL 79819

#### VOLUME OF WELL STREAM PRODUCED DURING DEPLETION



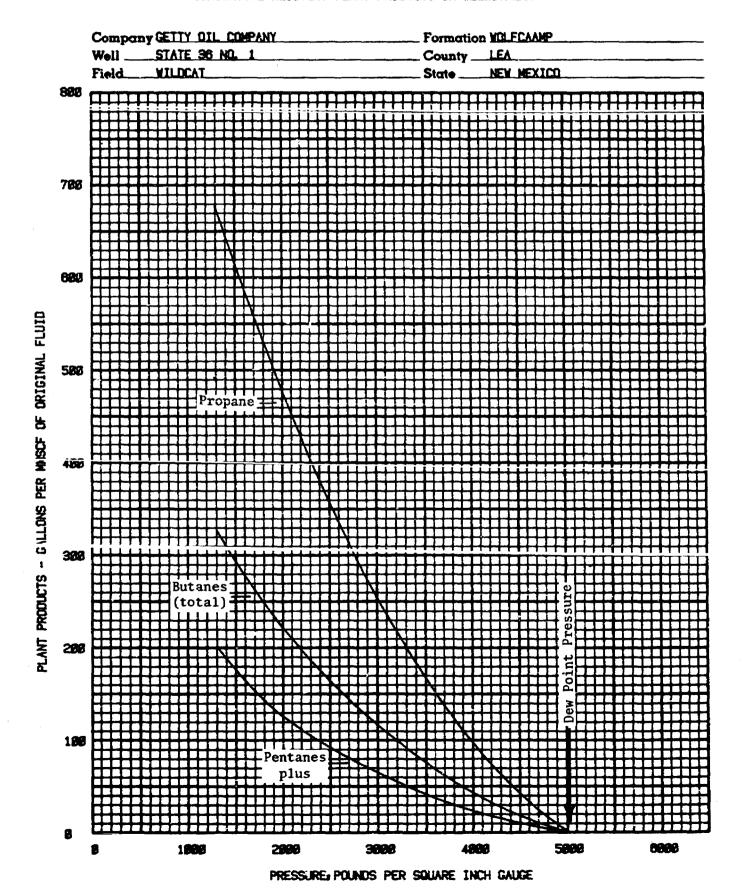
Page 18 of 12 File RFL 79619

#### CUMULATIVE RECOVERY DURING DEPLETION



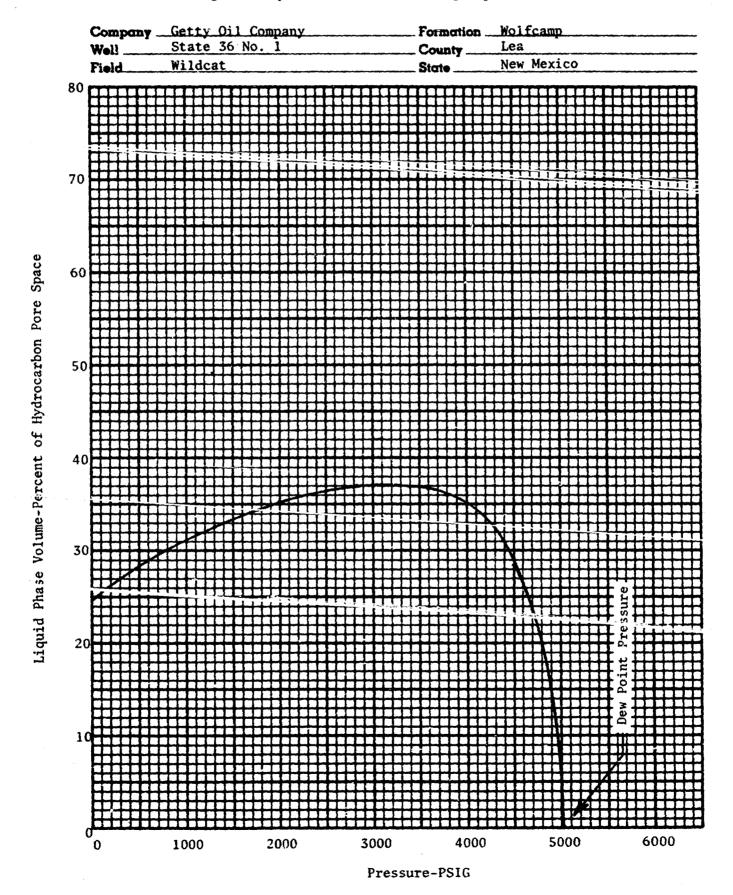
Page 11 of 12 File RFL 79619

### CUMULATIVE RECOVERY-PLANT PRODUCTS IN WELLSTREAM



Page 12 of 12
File RFL 79619

Retrograde Liquid Accumulation During Depletion at 196°F.



INTER-OFFICE CORRESPONDENCE

### **Getty Oil Company**

Midland, Texas March 21, 1980

TO: MR. J. E. EAKIN

FROM: JIM VARNON

SUBJECT: GETTY 36 STATE COM. WELL NO. 1 (WOLFCAMP)

PRESSURE BUILDUP (2/26-29/80) AND PVT ANALYSIS

Attached is an analysis of pressure and PVT data. The wealth of data for this well makes it possible to accurately predict reservoir performance. The current pressure test confirms the limited reservoir size shown by an earlier pressure test in September 1979. Summary of the analysis is:

= 7255 psi Original Pressure @ 7/4/79 Pressure @ 2/29/80 = 4600 psi Transmissibility (kh) = 288 md-ft Skin Factor = +17Pressure Drawdown  $(P - P_{wf} - \Delta P_{skin}) = 193 \text{ psi}$ Original Separator Gas Reserves without surface compression = 2.46 BCF with surface compression = 2.73 BCFOriginal Condensate Reserves without surface compression = 147 MSTB with surface compression = 151 MSTB

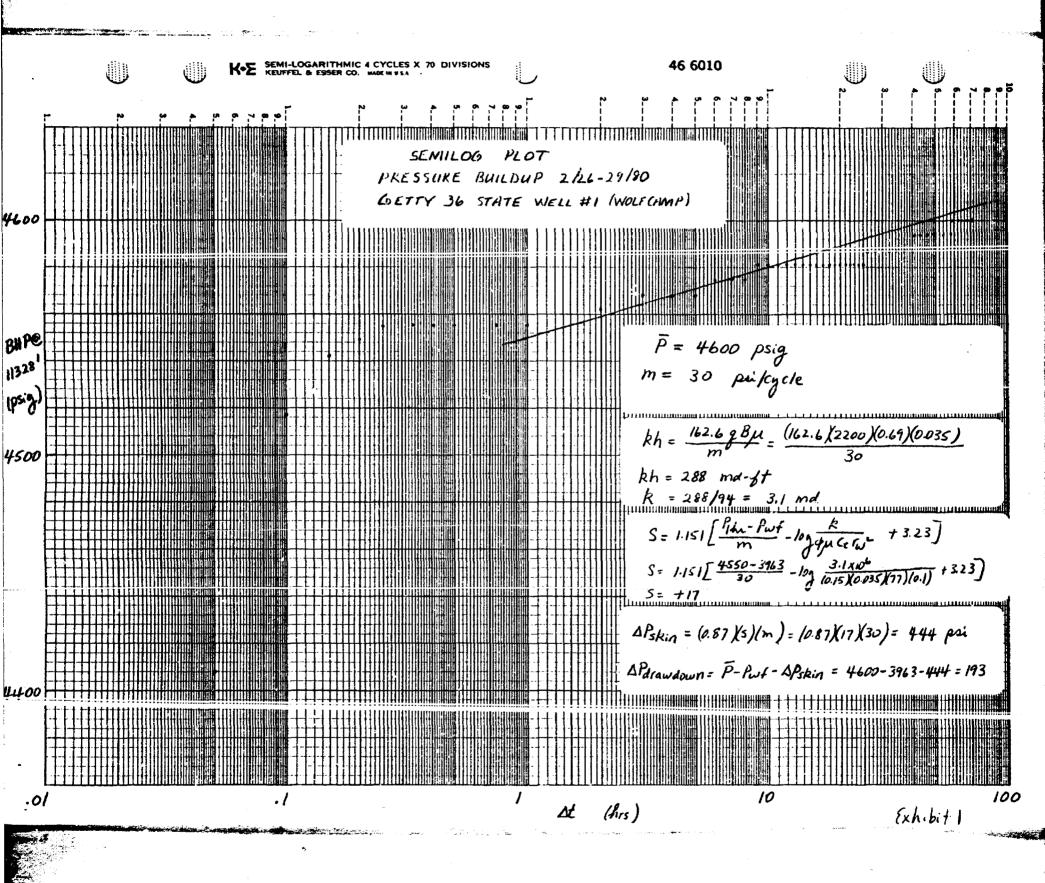
The large skin factor is caused by the narrow perforated interval and could be eliminated at any time. The small pressure drawdown results from large reservoir kh and low production rate (2200 mcfpd), and shows that the rate could be increased two or three-fold with no expected effect on ultimate recovery.

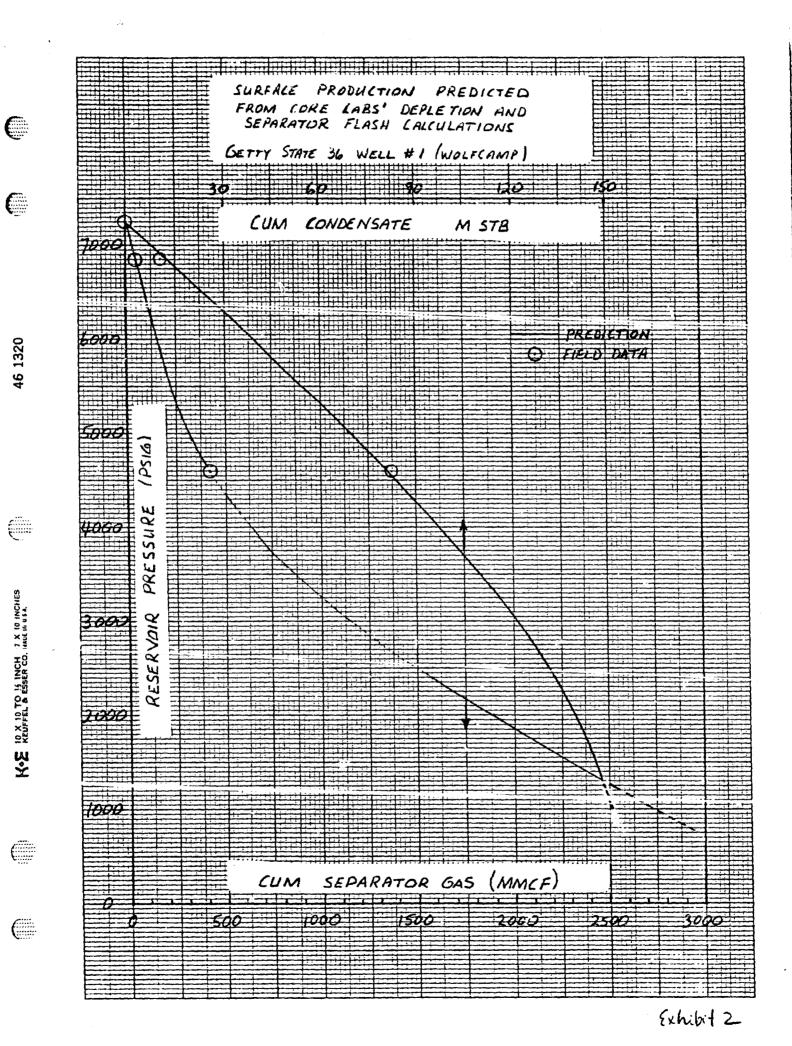
Recovery factors are 80% for gas and 19% for condensate. Liquid will be dropped from 230 cmm/mmcr to 125 and it will continue to drop sharply to below 50. Pressure maintenance is probably not feasible and becomes less feasible as liquids dropout in the reservoir.

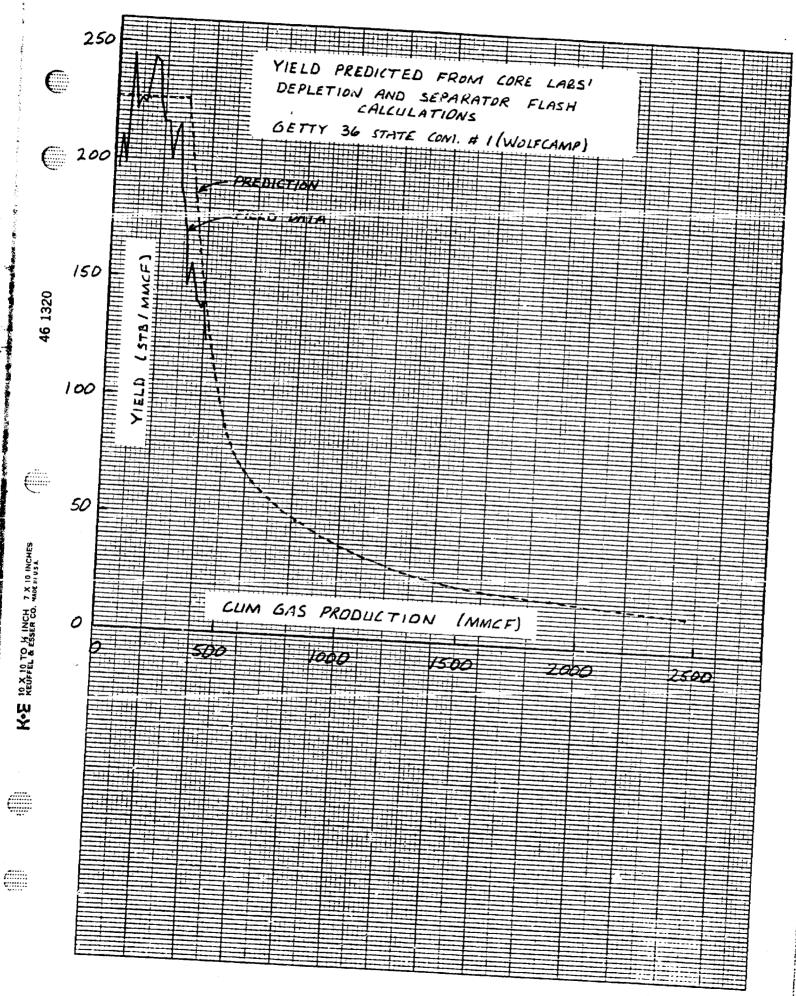
Reserves listed above assume that the well will never produce water, that the skin will be removed by workover, and that retrograde liquid is nonmobile.

Gir Vamo CIL CONSERVATION DIVILLA Jim Varnon EXHIBIT NO. 8 CASE NO. 6865

JEV:slw Attach. cc: Mr. H. W. Terry







Getty

	GETTY 36 STATE COM. WELL NO. 1
	ANALYSIS OF PRESSURE BUILDUP (2/26-29/80)
	I. Log-log Plot
	Afkiflow was almost completed before the first data point. The log-log plat is just a flat line and is not included here
	log-log plat is just a flat line and is not included here
	₹ V ' V V
	I Semilog Plot (Exhibit 1)
	the semilog plot exhibits the leveling off typical of a limited
~	nouvair. The early hump in the senitog curve dos ocamed in
	the building sun in Sept 1979. It is apparently caused by phase segregation
	in the tubing Reservoir and completion properties are shown in
	the figure. The large skin factor is caused by the partial por
	perforation 1 16' pers'd versus 116' gross pay ) and could be climinated
	at any time.
	Note the small drawdown pressure (193 psi) relative to the
	presure depletion (2855 pri since direvery). The received is being
	depleted like a constant pressure tank. This well is capable of
	producing at a much higher rate with no foresceable detriment to ultimate recovery.
	to ultimate recovery.
	V

### Getty

TIE BASIC DATA FOR BUILDUP CALCULATIONS
h = 94 ft
$\phi = 0.15$
Sw = 0.20
T = 196 °F = 656 °R
Fluid = Gas Condensate (PVT Analysis is available)
Mobile Fluid = Gas @ 4600 pais (Retrograde Liquid is nonimobile)
3 @ 4600 pri = 0,965 (PVT Report page 9)
Tc = 461 °R (Calculated from composition)
Pe = 642 pria (alulated from composition)
Tr = 656/461 = 1.4
Pc = 4615/642 = 7.2
Y = 1.07 (Calculated from composition)
Y = 1.07 (calculated from composition) $C_g = \frac{1}{7} - \frac{1}{3} \frac{37}{5P} = \frac{1}{4615} - \frac{1}{0.965} (121 \times 10^6) = 91 \times 10^{-6} \text{ psi}^{-1}$
Ct = Sq Cq + Sw Cw + Cf = 77 x10 6 psi-1
8 = 5.04 = (504 YO 965) (656) = 0.67 MEF
μg = 0.035 cp (Carr-Kobayashi correlation for T=1.07)
, o
V STEADY-STATE PATE PREDICTION
0.00708 ph AP (0.00708 (288) 193
9 sc = \(\frac{\text{\alpha}\text{\B}}{\text{\B}}\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
P-316
Note: AP= P-Puf - APskin = 4600-3963-444 = 193 psi

Getty	3
I ABANDONMENT PRESSURE	
Para = Part + SPdrawdown + SPskin	
From equations commonly used in gas well teeting the Slowing	
From equations commonly used in gas well teeting, the Slowing BHP can be estimated from wellhead pressure.	
$oldsymbol{\mathcal{L}}$	
$P_{wf} = e^{\frac{3}{4}} \sqrt{P_{wh}^2 + g^2 \left(\frac{\sqrt{\delta L}}{\epsilon}\right)^2}$	a)
where Put = flowing BHP, psi	
Puh = wellhead pressure, psi	
$K = \frac{\sigma L}{53.35} T_{f}$	
L = tubing length = 11328'	
TI = average flowing temperature, or = 598 or	
3 = average z-factor from bottom-hale to wellhe-d	
g = well rate, MCF/DAY = 2200	- <del></del>
$C = 1118 d^{3}/\sqrt{T_{f}} = 325 \text{ for } d = 2"$	<del></del>
In the teb 1980 pressure Ket, haurdown AP was 193 pai and skin	
AP was 444 pei. Use drawdown Al = 200, although rate will decline	2
some at this drawdown since formation volume factor incrases with	
depletion faster than viscosity decreases use skin SP = 0 since the	· · · · · · · · · · · · · · · · · · ·
skin can be eliminated by workers.	<del></del>
$\overline{P_{abd}} = P_{\omega f} + 200$	)
Equations (1) and (2) can be solved for Pabel given any wellhead present	ne.
In order to get o and 3, it is necessary to essure Pasa, as the	
calculation is Anative. Results of this calculation for the two cas	ude_

•	Getty 4
·	of interest one:
	I. No Surface Compressor: Put= 500 : Pabel = 1300 psi
	II. With Surface Compiessor: Pub = 0 : Pabel = 1000 psi
	Three abandonment presence accume zero water production.
	VI. RESERVES
	A. Original-Gaz-In-Place By Material Balance & 4600 psi
	6 (By-Bg:) = 6pBg where By is a two-phase B
	$B_{g} = 5.04 \frac{2T}{P} \frac{bb/}{MUF}$
	Bg:= 7255+15 = 0.6226 ]= 1.369 from PVT data.
	Bg = (5.04)(0.989)(656) = 0.7085 3t = 0.989 " "
	Op = cum production of wet gos + undonsate + stock tank vapor
	= 417905 MCF + 82258 STB + Vapor = 417905 MCF + 61300 MCF + 12500
	= 492 000 MCF
	(49200)(0.7085) 6 = 061P = 0.7085 - 0.6226 = 4.1 BCF
	Note: Condensate production is converted to gas equivalent by
	SCF 350 60 RTsc (350)(0.78) (10.73)(520) 5CF 578 No Psc 137 14.7 - 745 578
	where To = 141.5 = 0.78 and Mo = 6054 = 139 for API = 49.7°

### Getty

B. Reserves of Gas and Condensate (Exhibit 2)

Surface production can be easily predicted from love labs! PUT cell dipletion and flesh calculations to the produced well stream. These calculations are performed Core labe on the basis of 10 MMCF of fluid at the lew point, 5018 paig. Correcting to the niginal reservair pressure gives a basis of 1.097 mace at original preseure, 7255 psig, meaning that 0.097 mmcF 1.0 mmcF we produced above the dew point. Adding recovery to that given on page 5 of the Cone labs report, and proportioning up to the reservair size by the factor 4100/1.097, give immediately the cumulative purpose production versus reservair pressure (schibitz). Note had accurately the prediction matches the field performance to date. Reserves for any abandonment pressure can be read directly from this plot

Without surface compression: Pabel = 1300 psig Prac Reserves = 2460 MMCF

Condensate Reserves = 147 MSTB

with surface umpression: Pald = 1000 psig Gas Reserves = 2730 MMCF Condensate Reserves = 151 MSTB

Three secons secure that the well will never produce any water and that retrograde liquid is nonmobile

6

Instantaneone yield is not reported in Core Labs' separator flash calculation results. It can be computed by platting

Liquid Yield versus Cumulative Gas Production (Exhibit 3)

Exhibit 3 shows the results along with a companion to actual field performance to date.

D. Reservoir Radius

7758 Ah & Sq = OGIP = 4.1 XIV 9 SCF

Ah = (4.1×109×89:) = (4.1×109×0.009587) 7758 \$ 5 = (7758 ×0.15)(0.8)

Ah = 2585 acre-ft = 112.6 × 106 ft2

Tr2h = 112.6 x 126

1 = V 116.6 200

5 = 618 ft if average h = 94' r = 873 ft if average h = 47'

Deiniad 1- 11 C (

1	
	E. Remarks on Rewry Efficiency
	Original Bas in Place = 4100 MMCF
	Original Gas in Place = 4100 MMCF Original Separator Gas in Place = (4100 MMCF) (735 MCF) = 3424 MMCF
	ultimate Recovery of compression = 2730 mmcF
	Bar Recovery Efficiency = 2730/3424 = 80 %
	Original Stock Tank Lig in Place = (4100 mmcf) (10 mmcf)= 178 mst8
	Ultimate Recovery w/ compression = 151 MSTB
	Condansate Recovery Efficiency = 151/778 = 13 %
	Presence depletion will give excellent gas recovery but will
	leave some .627,000 STB of condensate in the ground.
	It may be advisable to consider some type of inertype
	present maintenance project. Disconnaging features are:
	1. We will probably never have a second well in the reservoir
	2 trese potential reserves are not large enough to support
	much expense in developing a some of injection gas.
	3. Reservoir pressure is already below the dew point and
	retrograde dispost is 70% of the maximum. Revaporization
	with inest gas pressure my not be passible
	Encouraging featurer are the favorable reservoir characteristics,
-	thick permeable, and probably namous areally, giving nice to
	the possibility of a vartical gravity stabilized flood
	Water injection is out of the question because it would seriously
	Jeopardize gas réserves.

### CAMPBELL AND BLACK, P.A.

JACK M. CAMPBELL BRUCE D. BLACK MICHAEL B. CAMPBELL WILLIAM F. CARR PAUL R. CALDWELL POST OFFICE BOX 2208

JEFFERSON PLACE

SANTA FE. NEW MEXICO 87501

TELEPHONE (508) 988-4421

March 6, 1980

Mr. Joe D. Ramey
Division Director
Oil Conservation Division
New Mexico Department of Energy
and Minerals
Post Office Box 2088
Santa Fe, New Mexico 87501

Case 6865

Re: Application of Getty Oil Company to Reopen Case No. 6608 to Establish Maximum Rates of Withdrawal for the Gramma Ridge-Wolfcamp Gas Pool, Lea County, New Mexico

Dear Mr. Ramey:

Enclosed in triplicate is the application of Getty Oil Company in the above-referenced matter.

The applicant requests that this matter be included on the docket for the examiner hearing scheduled to be held on April 9, 1980.

Very truly yours,

William F. Carr

WFC:17

Enclosures

cc: Mr. James E. Eakin, Jr.

### BEFORE THE

### OIL CONSERVATION DIVISION

## NEW MEXICO DEPARTMENT OF ENERGY AND MINERALS

IN THE MATTER OF THE APPLICATION OF GETTY OIL COMPANY TO REOPEN CASE NO. 6608 TO ESTABLISH MAXIMUM RATES OF WITHDRAWAL FOR THE GRAMMA RIDGE-WOLFCAMP GAS POOL, LEA COUNTY, NEW MEXICO.

Case 6608

### APPLICATION

Comes now, GETTY OIL COMPANY, by and through its undersigned attorneys and hereby makes application to reopen case 6608 for consideration of the establishment of maximum rates of withdrawal from the Gramma Ridge-Wolfcamp Gas Pool, Lea County, New Mexico, and in support thereof, would show the Commission:

- 1. That by Order No. R-6088, dated August 28, 1979, the Division created, defined and classified the Gramma Ridge-Wolfcamp Oil Pool, Lea County, New Mexico and established temporary special rules and regulations for the development thereof.
- 2. That pursuant to the provisions of Order No. R-6088 this case was reopened to allow the operator of the subject pool to appear and show whether or not the Gramma Ridge-Wolfcamp Pool was an oil reservoir or a gas reservoir.
  - 3. That on February 26, 1980, the Division entered its Order R-6088-B classifying that Gramma Ridge-Wolfcamp as a retrograde gas condensate reservoir and redesignating the pool as the Gramma Ridge-Wolfcamp Gas Pool.

- 4. That said order \$-6088-B further provided that the case should be reopened during May of 1980 to permit the operators in said pool to appear and present evidence to establish the proper rates of production for wells in the subject pool.
  - 5. That Getty Oil Company is the only operator in the Gramma Ridge-Wolfcamp Gas Pool and is prepared to present evidence as to the proper rates of production for wells in the subject pool.
  - 6. That at present, the only well in the Gramma Ridge-Wolfcamp Gas Pool is the Getty "36" State Com. No. 1 Well which is currently shut in due to its overproduced casinghead gas production status.
  - 7. That reopening the case in March of 1980 and establishment of maximum rates of withdrawal from the pool at that time will enable the operator to prudently develop the Gramma Ridge-Wolfcamp Gas Pool.
  - 8. That any order resulting from this hearing increasing the allowable for this pool should be made retroactive to March 1, 1980.

WHEREFORE, Applicant prays that this application be set for hearing before the Division's duly appointed examiner and that after notice and hearing as required by law, the Division enter its order granting the application and making such other and further provisions as may be proper in the premises.

Respectfully submitted, CAMPBELL AND BLACK, P.A.

William F. Carr
Attorneys for Applicant
Post Office Box 2208
Santa Fe, New Mexico 87501
Telephone: (505) 988-4421

### BEFORE THE

### OIL CONSERVATION DIVISION

## NEW MEXICO DEPARTMENT OF ENERGY AND MINERALS

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William F. Carr Attorneys for Applicant Post Office Box 2208 Santa Fe, New Mexico 87501 Telephone: (505) 988-4421

#### BEFORE THE

#### OIL CONSERVATION DIVISION

#### NEW MEXICO DEPARTMENT OF ENERGY AND MINERALS

IN THE MATTER OF THE APPLICATION OF GETTY OIL COMPANY TO REOPEN CASE NO. 6608 TO ESTABLISH MAXIMUM RATES OF WITHDRAWAL FOR THE GRAMMA RIDGE-WOLFCAMP GAS POOL, LEA COUNTY, NEW MEXICO.

Case 6608

### **APPLICATION**

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- 8. That any order resulting from this hearing increasing the allowable for this pool should be made retroactive to March 1, 1980.

WHEREFORE, Applicant prays that this application be set for hearing before the Division's duly appointed examiner and that after notice and hearing as required by law, the Division enter its order granting the application and making such other and further provisions as may be proper in the premises.

Respectfully submitted, CAMPBELL AND BLACK, P.A.

William F. Carr Attorneys for Applicant Post Office Box 2208 Santa Fe, New Mexico 87501 Telephone: (505) 988-4421

#### STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

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

CASE NO. 6865 Order No. **R-6088-C** 

APPLICATION OF GETTY OIL COMPANY TO REOPEN CASE NO. 6608, LEA COUNTY, NEW MEXICO.

### ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on April 9, 1980, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this \_\_\_\_\_day of April, 1980, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

#### FINDS:

- (1) That due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.
- (2) That by its Orders Nos. R-6088 and R-6088-A, the Division created and defined the Grama Ridge-Wolfcamp Pool effective September 1, 1979, and classified the same as an oil pool pending further study.
- (3) That by its Order No. R-6088-B, the Division reclassified said Grama Ridge-Wolfcamp Pool as a retrograde gas condensate pool effective March 1, 1980, promulgated special rules for said pool, including a production limitation of 1500 MCF of gas per day, and ordered reopening of the case at an examiner hearing during May, 1980, to permit the operators in said pool to appear and present evidence to establish the proper rates of production for wells in the pool.
- (4) That pursuant to the application of Getty Oil Company filed March 6, 1980, this cause came on for hearing on April 9, 1980, and Case No. 6608 was reopened to consider evidence relating to the proper rates of production for wells in the Grama Ridge-Wolfcamp Gas Pool.



- (5) That the evidence presented clearly establishes that the Grama Ridge-Wolfcamp Gas Pool is producing from a retrograde gas condensate reservoir.
- (6) That the reservoir covers an extremely limited geographic area, perhaps no more than 55 acres, and that the transmissibility of the reservoir is relatively high.
- (7) That due to the small reservoir size and its high transmissibility, the reservoir experiences a relatively low pressure drawdown at a production rate of 2200 MCF/day, and appears to be non-rate sensitive at least up to this rate of production.
- (8) That analysis of all data available indicates that a maximum production rate of 2500 MCF of gas per day for each well in the Grama Ridge-Wolfcamp Gas Pool will man not cause wate nor impair correlative rights, and should be approved.
- (9) That Rule 4 of the Special Rules and Regulations for the Grama Ridge-Wolfcamp Gas Pool should be amended to read in its entirety as follows:
  - "RULE 4. A gas well on a standard unit in the Grama Ridge-Wolfcamp Gas Pool shall be permitted to produce no more than 2,500 MCF of gas per day at standard surface conditions during the effective period of these pool rules. This shall be known as the daily allowable."
  - (10) That this order should be effective March 1, 1980.
    IT IS THEREFORE ORDERED:
- (1) That errective March 1, 1980, Rule 4 of the Special Rules and Regulations for the Grama Ridge-Wolfcamp Gas Pool, as promulgated by Division Order No. R-6088-B effective March 1, 1980, is hereby amended to read in its entirety as follows:
  - "RULE 4. A gas well on a standard unit in the Grama Ridge-Wolfcamp Gas Pool shall be permitted to produce no more than 2,500 MCF of gas per day at standard surface conditions during the effective period of these pool rules. This shall be known as the daily allowable."
  - (2) That Order No. 4 of "It Is Further Ordered" of said

-3-Case No. 6865 Order No. R-

Order No. R-6088-B, which called for Case No. 6608 to be reopened in May, 1980, to hear evidence as to proper rates of production for wells in the subject pool, is hereby stricken.

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

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