BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
August 9, 1961

EXAMINER HEARING

IN THE MATTER OF:
CASE 2345

TRANSCRIPT OF HEARING

NEW MEXICO OIL CONSERVATION COMMISSION

EXAMINER HEARING - DANIEL S. NUTTER

SANTA FE, NEW MEXICO

REGISTER

HEARING DATE AUGUST 9, 1961 TIME: 8:30 A.M.

NAME:	REPRESENTING:	LOCATION:
W. W. EATON, JR.	PAN AMERICAN PETR.	FARMINGTON
H. D. Haley	Continental Oil	Durango Colo
W. Griffith	" "	Denver, Colo
Burns Erwin	Mobil, et al	Albuquerque, N.M.
Frank Renard	British-american	Farmington, N. M.
J. C. Gordon Jr.	Socony Mobil	Hobbs, N.M.
Guy Buell	Pan Am	Fort Worth
Chas F. Dunlavey	Atwood & Dunlavey for Pan	Roswell
Pete Porter	O C C Aztec	Artesia,
Earl M Campbell	Campbell & Russell	Roswell N M
Clem E. George	Brown & George	Midland, Tex
W. Brown	✓	✓ ✓
L. Echols	✓	

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
August 9, 1961

IN THE MATTER OF: Application of Continental Oil Company for the establishment of Special Rules and Regulations for the Rattlesnake-Pennsylvanian Pool, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of Special Rules and Regulations for the Rattlesnake-Pennsylvanian Pool in San Juan County, New Mexico, including a provision establishing 80-acre proration units for said pool.	Case 2345

BEFORE:

Daniel S. Nutter, Examiner

EXAMINER HEARING

MR. NUTTER: The Hearing will come to order, please.

The first case this morning will be No. 2345.

MR. MORRIS: Application of Continental Oil Company for the establishment of Special Rules and Regulations for the Rattlesnake-Pennsylvanian Pool.

MR. KELLAHIN: Jason Kellahin of Kellahin and Fox appearing for the Applicant, and I have working with me Mr. William Griffith, a member of the Colorado Bar, who will present the case.

MR. GRIFFITH: We have one witness, and I would like to

have him sworn at this time. And I might say that in the opening statement I would like to present some factual material, so I might be sworn, too.

(Witnesses sworn.)

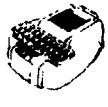
MR. GRIFFITH: If we can just put some of these Exhibits on the wall and save some time (indicating).

My name is William Griffith, and I would like to give the Commission a little background on this Application in order to help you orientate your thinking: Back in July 7, 1923, the Navajo Indians leased to the S. C. Munos of New York City quite a large lease, which is indicated by a small line on Continental's Exhibit A, this line, that is in most of the area of the Rattlesnake-Pennsylvanian Oil Pool. As a result of the various conveyances, Continental Oil Company, by assignment, on March 22, 1926, acquired a 50 per cent interest in this lease, which we will refer to as the 1923 lease. In 1942, the Navajo Indians leased to Continental Oil Company and the Santa Fe Corporation a lease covering 3,720 acres which included, among others, the following lands which are included within the Oil Pool, not in the 1923 lease, this part of Section 35 the West half of the Southwest Quarter, this part of Section 2, the West half of the West half, and Section 11, the Southwest Quarter of the Northwest Quarter, and the West half of the Southwest Quarter, and in Section 13, the Southwest Quarter and the West half of the Northwest Quarter; so that this land is included in the 1942 lease,

and except for this piece right here is included in the Rattlesnake-Pennsylvanian Pool, although it is not under lease to Continental Oil Company.

MR. NUTTER: Now, by "this piece right here", you mean the Northeast of the Northwest of 11?

MR. GRIFFITH: Yes, sir. I beg your pardon. This portion is in the 1923 lease, and it's under lease to Continental Oil Company but is not within the Rattlesnake Pool; and this portion is within the Rattlesnake Pool, but not under lease. In 1942, Continental Oil Company and the Santa Fe Corporation assigned all of its rights in the 1942 lease to the United States Government, including these lands within the Pennsylvanian Pool. In 1946, Continental Oil Company and the Santa Fe Corporation entered into an agreement whereby they sold to the United States their leasehold rights in the 1923 lease, which is the majority of the area in the Rattlesnake Pool, in all formations below the base of the Hermosa, and one half of the rights above the Hermosa to the base of the Dakota; so from the base of the, merely to the base of the Dakota, the United States Government has a 50 per cent interest in these lands. In exchange, the Government assigned to Continental all of its rights, oil rights above the Hermosa as to the 1942 lease, this land lying outside. In 1952, Continental allowed its rights in the '42 lease to lapse; and so at the present time, this land that is included within the Rattlesnake Pool is unleased, these portions here, just those portions.



MR. NUTTER: So in effect, you are back to the 1923 lease.

MR. GRIFFITH: Right, sir; but I wanted to point this out to show that part of the land that is in the pool is unleased in the 1923 lease, which the majority is in. The Government owned 50 per cent, and Continental owned 50 per cent. In 1953, the Santa Fe Corporation conveyed to Continental its remaining 50 per cent interest in this lease.

I would like to offer into evidence a letter from P. V. Mullins of the United States Department of the Interior, Bureau of Mines, and I would like to request this be marked Exhibit E; and this letter is sort of a backhand approval of the Bureau of Mines. It's addressed to Mr. Swarelaly.

"I have your letter of July 14, 1961 requesting Bureau of Mines' approval to your Application to the State of New Mexico for a 80-acre proration unit in the Rattlesnake Pennsylvanian Pool, San Juan County, New Mexico. As established by Oil Conservation Commission Order No. R-13 dated March 15, 1950, based on our understanding of the reason given in the Application attached to your letter of July 14, this Office of the Bureau of Mines has no objection to your Application. It is our understanding that approval of the Bureau of Mines, as a non-operating interest lease holder, is not necessary to your Application. But we have no objection to Continental Oil Company making such an Application."

I would like to offer that in evidence.

MR. NUTTER: Do I understand correctly, Mr. Griffith, that the Government is, in effect, a 50 per cent working interest owner in this venture?

MR. GRIFFITH: Yes, sir. It's a carried working interest.

MR. NUTTER: A carried working interest.

MR. GRIFFITH: And that is from the base of Hermosa to the base of the Dakota. As you are familiar,we have other oil wells in the Dakota in which they have no interest.

MR. NUTTER: Does this Application cover the base of the Dakota to the base of the Hermosa?

MR. GRIFFITH: No, it just covers the Pennsylvanian edge, the formation therein.

MR. NUTTER: But it's within those vertical limits?

MR. GRIFFITH: Yes, sir.

H. D. HALEY,

called as a witness herein, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. GRIFFITH:

Q Would you please state your name?

A H. D. Haley.

Q And what is your occupation?

A I am a District Superintendent of Production for Continental Oil Company, Durango, Colorado.

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

A No, sir.

Q Would you briefly state your educational and practical experience as a Petroleum Engineer?

A I graduated in Petroleum Production Engineering from Texas Technological College in Lubbock, Texas; had experience with Pan American Petroleum Corporation for a short time as a Petroleum Engineer. I was two years a Petroleum Engineer at Casper, Wyoming; three years a District Engineer at Glenrock, Wyoming; and I have been District Superintendent of Production at Durango for the past two years in charge of all Continental's operations in Western New Mexico, Arizona, the southern half of Utah, and the southern half of Colorado. At the present time, I have three Petroleum Engineers.

MR. GRIFFITH: I move that the Commission accept this witness' qualifications as an expert witness.

MR. NUTTER: Mr. Haley's qualifications are acceptable. Please proceed.

Q (By Mr. Griffith) Are you familiar with Continental's Application in this case?

A Yes, sir.

Q What is it that Continental is asking for?

A Continental is asking for an order establishing special rules and regulations for the Rattlesnake-Pennsylvanian Pool and

the provision for 80-acre proration units.

Q When was the Rattlesnake-Pennsylvanian Pool established?

A The Rattlesnake-Pennsylvanian Pool was established as a nomenclature on March 15, 1950.

Q Was that by Order No. R-13 of this Commission?

A Yes, sir.

Q What are the formations in this pool?

A Our Order No. R-13 establishes the Pennsylvanian as a formation, Now, the Pennsylvanian is an age; and at this time, I would like to point out that we consider the Pennsylvanian to consist of the Hermosa and Upper Paradox, the Middle Paradox and the Lower Paradox, and in your previous testimony, with the Agreement of 1946, if you notice, specified to the base of the Hermosa. By definition, in the 1946 agreement, which was an Act of Congress, they defined the base of the Hermosa as the top of the Mollus shale. Now, in our testimony today we will break that down to the Hermosa, into the Hermosa, and in the lower section of the Hermosa we will call it Paradox, so that we understand that we are not in conflict with the 1946 agreement. In other words, the top of the Mollus shale is the base of the Hermosa by the agreement, or that is the base of the Lower Paradox, as we will refer to it here today.

Q What is the productive formation in this pool?

A The Lower Paradox is the non-productive formation in the pool.

Q Would you describe the Lower Paradox formation?

A It can best be described as a gray-white dense limestone with considerable inclusions of shale and anhydrite. The porosity will vary from one to 12 per cent. The average porosity from the interval is 2.4 per cent. Core analysis indicates that this is very highly fractured; also occasions zones from 8 to 12 feet of thickness of buggy reef-type limestone that contains porosity as high as one to 14 per cent of the permeability will vary from one to 1,000 millidarcies depending on the extent of the fracture system. A very comprehensive fracture system provides most of the permeability for the formation. The average thickness of the formation is about 200 feet.

Q We have exhibits here today which would better illustrate these formations?

A Yes, sir.

Q Attached to the walls, Exhibits B and C, copies of which have been given to the Commission, and I will ask you, briefly, what are Exhibits B and C.

A Exhibit B is a cross-section that has been taken from electric logs, or sample logs that run from Rattlesnake 135 in the Northeast Northeast of Section 1 to the Rattlesnake Northeast No. 17 in the Northeast Southeast of Section 2, to Rattlesnake No. 136 in the Northwest of the Southeast of Section 2. This is Exhibit B.

Exhibit C is a cross-section that was prepared, running

from Rattlesnake No. 100 in the Northwest Northeast of Section 2, to Rattlesnake No. 17 in the Northeast Southeast of Section 2, to Rattlesnake No. 136 in the Northwest Southeast of Section 2. This is Exhibit C.

Q Were these Exhibits prepared by you?

A These Exhibits were prepared by me.

Q By referring to Exhibits B and C, would you please continue to describe this formation, the Lower Paradox formation.

A If you will note, Exhibit B starts here at Rattlesnake No. 136. The top of the Lower Paradox is at 6629. The base of the Lower Paradox is at 6826. The total thickness is 198 feet. This was prepared from the indexed electric log of Well No. 136. If you will note on the electric log, it consists mainly of limestones with interbedded shales. There is a very definite shale marker at top of the Lower Paradox, which is present in all the wells, which we believe separates the Lower Paradox from the Middle Paradox. The base of the Lower Paradox is the top of the Mollus shale which is a well-known marker throughout the Four Corners Region.

Rattlesnake No. 17, there is no electric log available. However, there is a detail sample log which we have correlated with Well No. 136. We have picked the top of the Lower Paradox, there, at the base of a dark gray clay shale and a dense limestone at 6881. We were able to identify the Mollus at 680. The total thickness in this well was 198 feet in the Lower Paradox.

Rattlesnake No. 985, we have an index shale. We have picked the top of the Lower Paradox at 6854, the base of the Lower Paradox at 7062. If you will note, there is a considerable structure change inasmuch as 135 is drilled off on the nose of the structure.

Exhibit C is a cross-section that runs from 101 to 17 to 136, to show the relationship along the structure from a different direction. 136, the top of the Lower Paradox, as we have previously testified, is 6629, the base is at 6826. In No. 17, the base is 6880.

In addition, we have an electric log from Well No. 100 which shows the top of the Lower Paradox using our shale marker at 6650, and the base to be at 6865.

Now, using these markers, and noting the similarity in the logs, we feel confident that in all of these wells this interval, as one reservoir, is the same type of rock and is in communication, which I will later try to show through testimony.

Q How do you arrive at the location of the oil-water contact?

A In Rattlesnake No. 136 we took a detail core analysis of some 400 feet of Paradox. We arrived at a datum of -1500 as being the approximate oil-water contact on the reservoir. This was determined by the fact that below that point there were absolutely no oil saturations on any of the cores. If you will note on the cross-section, we have used a base datum of -1400 to adjust our cross-section for vertical elevation. 100 feet below there is

where we believe the approximate oil-water contact to exist in the reservoir.

Q Did you also use drilling data from other wells?

A At the same time, in going through Rattlesnake No. 17, which was a table tool hole, they had an excessive water flow at the same datum points which indicated that the water table was at that point in that well. We found the water table at -1500.

Q Would you describe the structure of this field?

A Geologically, Rattlesnake structure is a large anticlinal.

Q Before you refer to that Exhibit, a copy of Exhibit D has been placed on it. We will pass out a copy of Exhibit D to each member of the Commission.

Was this Exhibit D prepared by you?

A Exhibit D was prepared by me.

Q Would you go ahead and describe what Exhibit D is, and what does it show?

A I might say that the Rattlesnake structure is a large anticlinal as shown on Exhibit D. Exhibit D is a structure map of the Pennsylvanian on the north end of the Rattlesnake structure that applies to the Pennsylvanian Pool as described in Order No. R-13. Now, this structure map, was contoured on the top of the Mollus shale. This may appear a little backward because normally you contour on the map. But, if you study the geology of the structure, you will find evidence of considerable thinning across

the structure, and by using the top of the Paradox you will get really a misleading structure map that doesn't show you the true relationship of the structure. So, we have found it much better for all practical purposes to use the top of the Mollus as our structural base when we study the geology of the structure.

MR. NUTTER: This is below the oil-water contact, over it; is it not?

THE WITNESS: Yes, sir, and, on the map you will notice at -1700, we have labeled as oil-water contact. Now, I previously testified that -1500 was the oil-water contact. However, when you consider that the Lower Paradox is 200 feet in thickness, it's evident that when you reach the -1700 contour on the top of the Molus formation, the base of the Paradox, there can be no further oil production beyond that limit; that below the 1700 contour we would not expect commercial oil production from the Lower Paradox. That might be a little misleading. I wanted to bring that out.

Q (By Mr. Griffith) Now, in order to give the Commission a complete picture, could you give a brief history of this field in relation to your various wells thereon, that No. 17, first.

A This field has a long and varied history which, I think, is rather unique,and I think it will point out a lot of things, here, that probably haven't been apparent before, and will help you in your decision here.

The first well to be drilled as a deep well at Rattlesnake was No. 17, which is located 25,047 feet from the north line

860 feet from the east line of Section 2, Township 29 North, Range 19 West. This well was drilled on June 7, was completed on June 17, 1929. It had an initial flowing potential of 760 barrels of oil per day, and 1300 barrels of water per day. The TD of the well at that particular time was 6,790, however, was a cable tool hole, and the casing had been set at 6,501 feet, some 277 feet above the bottom of the hole. Due to the fact that the well was making a lot of water, they ran tubing with an open hole packer in the well, and set an open packer at 6770, and thus produced the interval from 6770 to 6790.

Now, if we will refer back to Exhibit B, you will note the interval from 6770 to 6790 is well within the so-called Lower Paradox, which we are discussing as one reservoir. The well produced a cumulative of 355,937 barrels of oil, and approximately one million barrels of water between 1929 and 1932. In 1932, the well quit flowing, and in those days, pumping units at 6700 weren't considered practical, and the price of oil was practically nothing, so they abandoned the well.

The next well to be drilled was Well No. 24. This well is located approximately in the Northwest Southeast of Section 1, Township 29 North, Range 19 West, as shown on Exhibit D. This well was completed for an initial flow of approximately 500 barrels of oil per day and 25 barrels of water per day. However, it was drilled to a total depth of 7,370 feet in the Mississippian. The water production frightened the operator at

the time, and they decided to try to plug the well back with cement. In the process of plugging the well, they cemented tubing in the hole and plugged the well back to 6613. Now, this, according to our records, could possibly put this well above the so-called Lower Paradox, and for this reason we have not included it on the cross-section, because the information about this is so vague, got this out of an annual report of the Company, that I don't really have too much faith in it, and I hesitate very strongly to offer this as evidence that this is part of this one reservoir. But, if you think it should be mentioned and brought out to give what information we do have on it so it may be available to you --

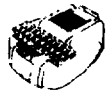
Q Well No. 24 is indicated on Exhibit A and Exhibit D, but was not indicated on the exhibit attached to Continental's Application; is that correct?

A That is correct, sir.

Q Okay.

A We have added since, and we will give you what information we have on it.

This well produced until 1940, production, 132,254 barrels of oil, and approximately 300,000 barrels of water. Incidentally, my water figures are not very accurate because in those days they just didn't keep records of water production; but we do know the water cut was when we approximated this. In 1940, there was a high fluid level in the well. The Company



decided to run a Rita pump in the well. They lost it, it stuck in the casing. They spent $50,000.00 trying to fish it out, and never recovered it, and subsequently abandoned the well. So, it was P and A in 1940.

The third well to be drilled was No. 100, which is located in the Northwest of the Northeast of Section 2, Township 2 North, Range 19 West. This well was drilled through the Mollus shale, 7-inch casing was set, and the wall was perforated from 6705 to 6722 and, I refer you to Exhibit C, and if you will note, the 6705 to 6722 is in the so-called Lower Paradox zone. Therefore, production from this well was from the Lower Paradox Reservoir. The well had a large amount of water after it was acidized, and a Rita pump was installed. The well produced approximately 104 barrels of water per day and 304 barrels of oil per day, and 396 barrels of water per day. They brought this pump to No. 100, and they produced approximately 4,000 barrels of oil out of No. 100, but decided to try the pump over in Well No. 24. Subsequently, they lost the pump in No. 24, and after an expensive fishing job, management didn't feel like buying another Rita pump for No. 100. At that time, we were trucking our oil to Salt Lake City and got a dollar a barrel for it. So, that well was P and A in 1940. And, this is the last production of the Rattlesnake-Pennsylvanian Pool up and until the present time. This stopped production from the pool until 1958 when Rattlesnake No. 135 was developed. This well --

Q Pardon me. Before you get into No. 135, in order to follow this chronologically, would you talk about the wells down in Section 13, 1-G.

A Yes, I will. Rattlesnake No. 1-G, which is located in the Northeast of the Southeast of Section 13, was drilled in 1940 as a Pennsylvanian test.

Q Now, you are pointing --

A Pardon me, 1-G.

Q 1-G is in the lower Southeast Quarter, there.

A May I make the location? Rattlesnake No. 1-G, which is located in the Southeast Southeast of Section 13, was drilled in 1960. The purpose of this well was to test the Mississippian formation at this location. In the process of drilling, the Lower Paradox was drilled. Gas shows were noted on the gas logger. However, a good gas well was completed in the Mississippian, and the well was completed as a helium well in the Mississippian. This well was subsequently sold to the United States Government as a helium well under the 1946 contract, as mentioned by Mr. Griffith.

Rattlesnake No. 1 was drilled, also, as a helium one about the same time to further define the limits of helium production in the area. It also had shows of gas in the Lower Paradox when it drilled through the formation, and the logs of these wells can be correlated with the wells. So, the reservoir is contiguous across most of the field.

Q Now, would you explain Well No. 135?

A Well No. 135 was drilled in 1958 as a Wildcat. There was some thought that within the Lower Paradox there were possibly stones which would pinch out, up dip on the structure. The Lower Paradox was found to be essentially the same as the Lower Paradox in No. 17, and 100 was below the oil-water contact, and tested 100 per cent water. So, the well was P and A.

Q And, what is the next and last well in the field?

A The last well to be drilled is Well No. 136, which is the key well in our testimony here today. This well was drilled in 1960. It was completed in December of 1960. It was drilled to a TD of 6853 into the Mollus shale. Three-inch casing was set, and we covered approximately 400 feet of the Paradox with cement. The well was perforated originally from 6726 to 6750. Now, the purpose of these perforations were that this was the closest point which we could correlate from the production to meet the open hole packer in No. 17. The well produced approximately 68 barrels of oil per day and 498 barrels of water per day over a four-months' period from this set of perforations. We then perforated this zone from 6681 to 6691, which is a high porosity zone, and pushes a BJ central lift pump, which is equivalent to the old-type Rita pump. The well now has an average production, or has been tested at a rate of 201 barrels of oil per day and 905 barrels of water per day from both zones. We are currently producing our allowable of 124 barrels of oil per day, and cumulative production on July the 31st was 10,178 barrels of

oil, 46,129 barrels of water.

Q In your opinion, is this a single-oil pool with a common source of supply?

A Yes, sir.

Q And what is the basis of that opinion?

A No. 1; the oil that has been obtained in Rattlesnake No. 117, at 136, is 40-gravity oil. And by gravity and chemical composition, the oil is the same type of oil. No. 2; is the bottom hole pressure: Recently, all of these wells have had bottom hole pressures in the range of 16 to 1800 pounds per square inch. No. 3; the gas-oil ratio as reported in No. 100 was 1800 cubic feet per barrel of oil. The gas-oil ratio as determined from Rattlesnake No. 136 is 1861 cubic feet per barrel.

Q In your opinion, is there communication between the Lower Paradox formation?

A Yes, sir; there is.

Q And what is the basis of that opinion?

A First of all, we had extensive core analysis from Rattlesnake No. 136 and Rattlesnake No. 135. These core analyses indicate that this limestone is very, very likely fractured both vertically and horizontally. Permeability range is as high as 1,000 millicarcies in various places throughout the reservoir. At no place did we find in our analysis where there wasn't some evidence, some type of fracture. The main thing that leads me to believe the communication, is a study of the history of the bottom

hole pressure of the field. I think we can definitely show interference.

Rattlesnake No. 17, as I testified, was completed for initial flowing potential of some 700 barrels of oil per day, and 700 barrels of oil was taken, and 1300 barrels of water per day. In order for this well to flow that large a volume of fluid, it would have had to have a gradient of better than four tenths, since this is salt water. Now, tests of the Upper Paradox have indicated bottom hole pressure in excess of around 3,000, so the original bottom hole pressure was probably in the neighborhood of 3,000 pounds per square inch as indicated by this well's flowing. Now, after the production of one million barrels of water and 355 barrels of oil, Rattlesnake No. 17 stopped flowing, which would indicate that the bottom hole pressure, of course, had dropped, probably to the neighborhood of 2,000 or 2,100 pounds.

In 1940, when Rattlesnake No. 100 was drilled, the fluid level was reported at approximately 3,000 feet from the surface, or was actually measured by wire line. This would indicate a bottom hole pressure, considering the normal salt of salt water, and oil that this well produced, and estimated bottom hole pressure of 1,800 pounds per square inch. Using that for a datum, we find that this well has a pressure of 1,800.

Now, if there had not been communication between No. 17 and 100, we would have expected to find 3,000 pounds of bottom hole pressure in this well; but since this well was partially

drained, it's logical to assume the bottom hole pressure in No. 17.

When Rattlesnake No. 136 was drilled in 1960 -- now, this is, incidentally, would be 28 years after the abandonment of this well, here, a drill stem test shows the initial shut in pressure in Rattlesnake No. 136 to be 1,960 pounds. We had a flow pressure of 1,760 pounds. This was on November 7, 1960. We ran a bottom hole survey test the 15th, and our 24-hour shut in pressure, after we have produced from 1700 barrels of oil and 1,000 barrels of water, was found to be 1,629 pounds per square inch. On July 31, we shut the well in four 72 hours, and ran a fluid level, and we have estimated pressure of 1,750 pounds per square inch. So, there is an assumption, and I think we can logically deduct that No. 136 has been drained by previous production from No. 17; that No. 100, No. 17, No. 136, all have approximately the same bottom hole pressures, which would indicate communication in the reservoir.

Q You indicated a bottom hole pressure of 136 as remaining relatively constant. How do you explain that?

A In my opinion, this reservoir probably originally produced by fluid exchange -- Incidentally, this well is pumping, and it's very difficult to get a good fluid analysis from a pumping well, so we have to make quite a few assumptions. And we think, originally, the reservoir produced by fluid exchange, but probably very early in the life of the well it reached the

bubbling point and the solution gas started moving the gas in, because we know that the gas-oil ratio is 4,600 pounds per square inch which, I think, is -- Therefore, it produced on until the pressure remained 1,800 pounds between 1,800 and 1,900. At this time, I believe there was a limited water drive, probably from the northeast, that has taken over and maintained the pressure at this rate. And my basis for deduction of this limited water drive is that after producing 55 barrels of oil and 10,000 barrels of water from No. 136, we have had no change in bottom hole pressure, at least appreciable change. So, the field is probably operating now with a limited water drive which will probably maintain the reservoir pressure at 1,800 pounds. And with the extensive fracture system which we have, it's probably very easy for this pressure to be maintained.

Q What is the importance of this limited water drive to this Application?

A Well, we think that the limited water drive will give us a very high recovery factor and will eventually allow us to drain 80 acres.

Q So in your opinion, one well could adequately drain 80 acres?

A Yes, sir.

Q What is your estimate, and I emphasize the word "estimate", of the reserves of Rattlesnake?

A Gentlemen, this is frankly an estimate: In the first

place, I know of no practical way in which you can actually estimate porosity in a fractured type reservoir. It becomes a real technical deal. So,we are going to give you what we consider to be our best estimate here today, and I think it is reasonable. It has been partially maintained by previous history in the field. We do not have, due to this water drive, you don't have a figure that you can actually predict what your recovery is going to be. So, what we did is took the core analysis and did the best job we could do with it. The 200 feet of Lower Paradox in Rattlesnake No. 136 has a porosity that varies from 1 per cent to a total of as high as 14 per cent. However, the average porosity is 2.4 per cent for the entire interval. Now, this may seem rather low for a limestone reservoir. However, we do have this extensive fracture system, but we just assume an average porosity for this 200 feet of thickness of 2.4 per cent. We assumed an IWS of approximately 40 per cent in the well because of the great amount of water present. We do think we will get good recovery due to the fact we have this limited water drive which may run as high as 30 per cent. We have taken an average water table of -1500 datums throughout the field, and we come up with a net pay of approximately 160 feet. If we take,oh, we have a formation volume factor of approximately one half. Now, that is based on our current gas-oil ratio, and that is about where we think it will be. And in going through simple reservoir calculations, using those particular factors, we have come up with a recovery figure

of approximately 2,680 barrels per acre. This 40-acre spacing, you can recover 107,000 barrels of oil using these fractures. With 80-acre spacing, you would recover 214,000 barrels of oil.

Q What would be the economic factors with those estimates?

A Well, the location of Rattlesnake is in an area that is not very close to Shiprock, there, but we do not have a pipeline connection. The present price of the crude is $2.75 per barrel. It costs us 36 cents a barrel to truck this crude to the Horseshoe Gallup to the pipeline. The rate is 34 cents a barrel. The overriding royalty is 12 cents a barrel, and a conservative lifting cost is 16 cents per barrel. Now, this is not really true. Any type of submergible pump, the electricity pumps go sky high. You can figure you are pulling that pump once a year and getting a $1,000.00 bill on it. However, we don't have production figures at this time. The 16 cents we are operating in the field for, but when you deduct all these factors, this leaves $1.77 a barrel net on your oil. If our calculations are right, $1.77 times -- would allow us to recover $189,000.00. And yet, it costs $180,000.00 to drill and equip one of these wells. So, we feel very strongly that it would not be economical to develop this field on 40 acres.

On the other hand, we do feel that with 80 acres we do have a chance to make a fair run on our money, and it appears to us that, well, we would be in a position to possibly develop the field were we to develop on 80 acres.

Q With the granting of this Application, do you feel it would be in the best interests of conservation for the State of New Mexico?

A I personally feel very strongly that it would, and I would just like to just briefly include a few remarks.

Rattlesnake is one of the oldest fields in New Mexico. Originally it was the Dakota Field, and we instituted a program years ago in the Dakota and recovered several million barrels of oil. We tried a water flood which was non-successful. The Dakota production is now down to 7 barrels a day. We have lost money in the field for the last five years. And in my opinion, this is the last hope for Rattlesnake. If this does not prove to be economical, that field will probably have to be plugged and abandoned. Now, these wells are expensive. We have had to buy -- for example, on No. 136 power is not available to run the pump. Well, it's available from the Navajo REA at 36 cents a kilowatt, it would cost me, approximately. So, I have installed a generating set that cost $30,000.00 to furnish the power for the well. The BJ central lift pump,its cost, $22,000.00. So based on the fact that there is a water flow in the sand at 4,200 feet, that makes your mud bill excessive, which we run 4,200 feet of 8 5/8 intermediate casing, which raises the cost of drilling our well. Based on all of these extensive factors, it's very expensive to develop this reservoir, and we do ask that the Commission consider this in considering our request for an 80-acre proration unit.

Q Do you feel the rules and regulations set forth in Continental's Application would be adequate to govern this field?

A Yes, sir; I do.

Q Just one last point: In Continental's Application, where we refer to Well No. 135, you have quoted that the base of the Lower Paradox sands was 6,654 feet; is that correct?

A No, sir. That should be 6,854.

Q 6,854.

MR. GRIFFITH: Does the Commission have any questions of this witness?

MR. NUTTER: Are there any questions of Mr. Haley?

MR. MORRIS: Yes, sir.

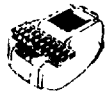
Q (By Mr. Morris) Mr. Haley, as I understand it, you are proposing the rules as set forth in your Application as they stand in your Application.

A Yes, sir.

Q Now, are you proposing that these rules be made permanent at this time, or are you requesting a one-year temporary order?

A I feel strongly, in my opinion, that we have very good evidence of communication out there, and that there is one reservoir. We would like to have them permanent. However, if the Commission feels that the evidence is not sufficient, we would certainly appreciate a temporary order.

Q What further development do you plan in this area during the next year, Mr. Haley?



A If the No. 136 sustains production for the next 90 days, I have budgeted a development well to be drilled on a 80-acre location south of this well in an effort to go up structure, and we will possibly drill a well in November. We have budgeted 8 wells for 1962, but these are contingent upon 80-acre spacing, because without the additional allowable, our paycut is very, very marginal. When you consider what we have paid for the interest on our money, and everything, we need it bad. I cannot promise this development if this well should not hold up. If the water cut should increase and our production fall off, why, naturally we would not invest that sum of money, but this is our present plan, and I am optimistic, myself, that if I can go ahead with it --

Q Well, if you drill these 8 wells, or any number of additional wells, you should have better and more conclusive information at the end of a year.

A We could run communication tests, and if the Commission does give us a temporary order, I would appreciate a transfer of allowables so we could run the communication tests, if you so desire.

MR. GRIFFITH: This is included in the proposed rules.

THE WITNESS: In the proposed rules. I think those are essential for us to test the field.

Q (By Mr. Morris) Now, in your proposed rules, Mr. Haley, your well location requirements are made quite flexible, providing

for a well to be drilled in either Quarter Quarter Section of your 80-acre dedication to --

A Yes, sir.

Q Why are you proposing the flexible rather than the rigid well location requirements?

A Due to this open acreage, we asked for this land to be put up for sale three years ago, and last time I talked to the Navajos, it may be 10 years before it goes up for sale. And due to this open acreage, the way this is checkerboarded in here, it would be impossible to communitize with that open acreage. Maybe I am wrong, but I don't believe you could communitize this open acreage unless you communitize the Indian. So, we thought it would be better to leave it open until we juggle our 80-acres, and go ahead and drill. And that is the only reason I had. The terrain is not really much of a problem. There is a large cliff that runs generally down diagonally in here that might cause a few locations to be moved, for terrain; but due to this open acreage, we felt that we shouldn't be hampered in our development.

Q What dedication would you make to the existing wells if 80-acre propration units were established?

A We would dedicate them as 80-acre wells.

Q Well, could you point to the individual wells and give me some idea?

A Well, at this time, Rattlesnake No. 136, located in the Northeast Southeast of Section 2, is the only producing well.

From the Paradox, we would dedicate that well as to these rules. Rattlesnake's No. 1 and 1-G do have casing in them, completed in Mississippian, but are completed as helium wells and are owned by the Government. We have no rights on the base of the Mollus shale. Therefore, those wells could not be dedicated. However, we do have operating rights to take those wells, and in this case, we may ask their permission to plug this well back to the Paradox; and this well could be dedicated as an 80-acre well, also.

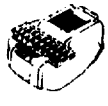
Q (By Mr. Morris) Now, is there any possibility of dually completing the wells in this area?

A Yes, sir.

Q That would considerably enhance your economic situation, wouldn't it?

A No, sir. The one zone that is possibly built for dual completion is a gas zone, which is the Upper Paradox, and it tests at a rate of about 250,000 MCF per day, and the nearest gas pipeline is 12 miles away. And at this time, we have no hopes of actually getting a gas connection out there unless we can develop our Paradox oil and perhaps produce enough gas with our gas production. But at this time, I would consider it to be non-commercial. In other words, 250 MCF in a depth of 260 feet, it would appear to be commercial production.

Q You don't feel that it would help your economic picture enough to make 40-acre units?



A No, sir. In fact, you want that gas normally on larger spacing units than 80 acres. Most of our gas is produced normally on 320.

Q Yes; but it might if you had a successful gas venture there and could dually complete your wells, it would mostly make -- help the picture on 40-acre proration units in the Rattlesnake Pennsylvanian.

A I wouldn't deny that it could help, but I don't think there would be enough incentive there to want to, to cause to drill 40 acres. There would be added a few dollars. This particular zone only has a thickness of 8 or 10 feet, and reserve wise, it's very small. The second thing -- May I say in answer to your question -- Due to this vertical factor system, I feel very strongly that we are going to have water nearly everywhere on the field. You can't help but have that water with this sensitive fracture system; and a big share of this field will probably be produced with submergible pumps. Now, we have to run 7-inch casing to use the submergible pump, and it would be physically impossible to dually complete a well even with 7-inch casing with a submergible pump. So, it's very, very highly unlikely that as long as we have a submergible pump that we would ever consider dual completion. In order to run dual completion, and at 6,700 feet, that comes fantastic in cost. So, if I may change my statement a little bit, here, I would say that dual completion, at least on those wells where we have a submergible

pump, and if there is any water present, it's almost a cinch, and will be produced.

MR. MORRIS: Thank you, Mr. Haley.

Q (By Mr. Nutter) Mr. Haley, there hasn't been a well drilled in here yet that produced without water, has there?

A No, sir; there hasn't.

Q Now, as I understand it, the No. 135 was 100 per cent water when drilled?

A Yes, sir. The core analysis tests 100 per cent water, and the drill stem tests.

Q The No. 17 came in for a good potential and produced 155 barrels of oil and a million barrels of water and was finally plugged and abandoned?

A Yes, sir.

Q The No. 24 produced 132,000 barrels of oil, and then ran into trouble running a Rita pump?

A Yes, sir.

Q Is there any possibility, in your opinion, of sidetracking this pump or in any way completing the well to produce again?

A I think, sir, in our 80-acre development plan, if we go ahead with our development we will probably re-drill the well.

Q What do you mean by "re-drill the well"?

A Between it and on our proper location. You will note that the thing is right on a section line.

Q You think there are still some reserves there in that

area?

A Yes, sir. In that budget program, we look at a narrow water-oil band of approximately one or two locations wide running in this general area, here.

Q Now, do you think there is any possibility of putting No. 100 back on production?

A Yes, sir. No. 100 was plugged and abandoned and then completed as a water well, and used as a water supply well, and it's very far down on the north end of the structure. We could possibly drill another well on an 80, in that 80, say, at a different location. And, I felt we will try and drain that area. However, I would anticipate it will go to water pretty fast if you will note the position of it, I may be wrong. Incidentally, we think there may be a gas cap up here, since these wells tested gas, and we are setting on a narrow oil ring between a water cap and a gas cap.

Q Now, your 136 is presently producing rather large volumes of water, but you still have both of those sets of perforations open?

A Yes, sir.

Q Is there any feasibility of squeezing the lower perforations and making a water free production in the upper set?

A We DST'd the water set of perforations, and this drill stem test was taken from 6665. Let's go back over and refer to the log here, 6665, that would be approximately 40 feet below

the top of the Lower Paradox, as shown on Exhibit B, down to -- at that time, the hole had a TD of 6715, which is above the lower set of perforations. And that drill stem test recovered 520 feet of oil and 3,700 feet of water. Based on that drill stem test, Mr. Nutter, I would feel that we would probably cone the water of both sets of fractures probably in contact. Also, No. 24 was theoretically plugged right up to the top of the Lower Paradox, and it produced water, too.

Q Only one well is producing at the present time, the 136?

A Yes, sir; the 136.

Q Now, in the No. 1 and the 1-G, way down in the south end, there, on the drill stem tests, was any oil encountered?

A There was no drill stem test of the well. All we have is geological samples which indicated a gas cap. And they had a primitive type of gas log in 1940 on this well which showed real high hydrocarbons, and we had several good porosity places in the drilling time, which we correlate with this zone and correlates with our porosity; and on that basis we feel there was gas. At no time was there any oil recovery. When they were drilling the second Paradox, our driller's reports indicate that the mud was, and I will admit it's a mighty thin story that it would be gas production from those wells, but they did not see any oil in the samples that wanted testing, and I think they did a real good job. These were Government geologists, and they had

three of them sitting on this well continually. If there was anything there, they missed it, but if you assume gas cap as you assume your high gas oil ratio, it's reasonable to assume that there would be high gas production in the Lower Paradox.

Q Now as I understand it, you estimate that the original bottom hole pressure in the reservoir was approximately 3,000 pounds.

A Yes, sir.

Q And the No. 100, you estimated at a bottom hole pressure of 1,800 pounds in the 1940?

A Yes. That is based, sir, upon a fluid pressure of 3,000 feet from the surface. Now, we have to assume a water-oil contact. It could be as high as 2,000.

Q In December of 1960, you measured the bottom hole --

A That is a 24-hour shut in.

Q A 24-hour shut in.

A That is at a datum of 6,800 in depth.

Q Which is right in the pay; isn't it?

A Yes, sir.

Q And then you had a more recent bottom hole pressure in 1961?

A On July 31st of this year we shut the well in for 72 hours. After a 72-hour shut in, we shot a field level or an acoustical well standard and found the fluid level at 2,780 feet from the surface, which, using our bottom hole pressure bomb for

gradient, gives us a bottom hole pressure of 759 pounds. That is an estimate, sir, but I think it's reasonable within a hundred pounds.

Q Now, had the well produced when you took this 629 pound pressure in December?

A It produced approximately 402 barrels of oil at that time. 402 to 500 barrels of oil. Pardon me, sir, but it also produced in the neighborhood of approximately 6,000 barrels of water, too.

Q What is the present gas-oil ratio on this?

A 1,861 cubic foot per barrel. We had a reported gas-oil ratio of 1,800 on Rattlesnake No. 100. They measured the gas when that well was produced with a Rita pump.

Q Has any fluid analysis been run on the production here?

A No. We certainly haven't. We started to, and due to the fact it's a pumping well, and a Rita pump, and the large volume of the fluid, we had to get the fluid on our research lab.

Q You do feel that the pressure has dropped below the bubble upon the reservoir?

A I think so. Of course, under my supervision at White Mesa, which is Paradox production, also; and we have had some over at Cable Mesa, and out there. The bubble point in gas-oil ratio is 700 cubic foot per barrel. This seems rather high to me,

but considering the fact there is a gas cap up there, it may not be. But, I feel it's below the bubble point because this Rita pump acts real strange. You can actually pump the water off and start producing gas; and a well will start flowing due to the fact there is so much gas coming out of it, so I mean, we are about the bubble point, or at least in the neighborhood of it, and we just have this limited drive. Now, I could put a pump in there for 2,000 barrels a day, but this is strictly a hypothesis on my part. Without a fluid analysis, I could never prove that. At least, there has been no change in the gas-oil ratio since 1940, or has been no change since we have started producing the 136. We have checked it very carefully every month, and we have no change in our amounts of gas on our gas-oil ratio.

Q Now, I didn't get your trucking charge that you are paying, there.

A 36 cents.

Q You stated you had a 34 cent royalty and a 12 cents overriding royalty to pay.

A Yes, sir.

Q Your $1.77 net value of the oil is the net value to the entire working interest, including the Government's carrying working interest.

A That's right. This is a little bad. That is a good point. You see, we put up all the cash and out of our own pockets for which we pay interest, and then if and when the well is paid

off, we will share in the profits up to 50 per cent.

Q Whether you have oil or helium?

A If it's helium, they take the well over. The operating agreement calls for them to operate the well if there is helium if this well tested eight hundredths of one per cent helium, so the Bureau of Mines has now classified this as non-commercial, as helium.

Q So there is no immediate possibility of the well being converted to helium production?

A No, sir.

MR. NUTTER: Are there any further questions of Mr. Haley? You may be excused.

MR. GRIFFITH: Continental would like to move for the admission of Exhibits A, B, C. D, and E.

MR. NUTTER: Continental Oil Company's Exhibits A through E. Does that include the letter, Mr. Griffith?

MR. GRIFFITH: Yes, sir.

MR. NUTTER: They are received in evidence.

(Whereupon Petitioner's Exhibits A, B, C. D, and E, received in evidence.)

MR. GRIFFITH: The only other factor we should bring up, and it's our contention it doesn't affect this Application, is that there is a lawsuit at the present time between the Navajo Indians, at the present time, and the United States Government in the United States Court of Claims concerning the helium rights

under the 1924 and '42 lease for failure to pay a shut in royalty. And, we don't feel that this will affect any operations of the base of the Hermosa, but we would just like to bring that out.

MR. NUTTER: Mr. Griffith, actually these two wells down in the south end, the 1 and the 1-G, are not completed in the same vertical limits for which you are requesting the 80-acre spacing, are they?

MR. GRIFFITH: No, sir.

MR. NUTTER: And all your production in the Lower Paradox is up here in Section 2; is that correct?

MR. GRIFFITH: That is correct.

MR. NUTTER: Are you aware of the policy of the Commission in establishing pool limits to more or less limit the area of the pool to the proven acreage, rather than extend it for several miles in one direction or the other.

MR. GRIFFITH: No, sir.

MR. NUTTER: In 1959, this pool was set out as being several miles long --

MR. GRIFFITH: Yes, sir.

MR. NUTTER: --but particularly, if I can testify to this, particularly when special rules are being established, the limits of the pool are usually held in rather close conformity to the proven acreage.

MR. GRIFFITH: I wasn't aware that the Commission would do that, as we just assumed that the same delineated pool as set

forth in 1959 would be to carry it forward, and that is why we made our Application on those limits as defined by the Commission.

MR. NUTTER: I might also point out, however, that where special pool rules are established for a pool given limits, that those pool rules prepared for one mile outside of those pool limits.

MR. GRIFFITH: Yes, sir; we included that in our Application.

MR. NUTTER: Do you have anything further, Mr. Griffith?

MR. GRIFFITH: No, sir.

MR. NUTTER: Does anybody have anything to offer in Case 2345?

MR. ANDERSON: John Anderson, Geological Survey. We have no objection to the proposed 80-acre spacing. We can make no commitment to the proposed rules because we haven't seen them.

MR. MORRIS: Mr. Griffith, they are approximately the same as the Cha Cha Gallup Pool Rules, are they not?

MR. GRIFFITH: That is correct. We based our proposed rules on those in effect in the Cha Cha Field, and I will be glad to show you a copy of our Application.

MR. ANDERSON: I would like to see it.

MR. NUTTER: Does anyone else have anything to offer? We will take the case under advisement.

(Whereupon hearing of Case 2345 was concluded.)

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

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

IN WITNESS WHEREOF, I have affixed my hand and notary seal this 9th day of August, 1961.

Court Reporter-Notary Public

My Commission expires:

June 20, 1965

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2345, heard by me on 8/9, 1961.

....., Examiner
New Mexico Oil Conservation Commission

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
August 29, 1962

EXAMINER HEARING

IN THE MATTER OF: The application of Continental Oil Company for the establishment of special rules and regulations for the Rattlesnake-Pennsylvanian Pool, San Juan County, New Mexico. Case 2345 will be reopened pursuant to Order No. R-2049 to permit the applicant and other interested parties to appear and show cause why the subject pool should not be developed on 40-acre proration units.	CASE 2345 (Continued)

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING:

MR. NUTTER: We call Case 2345.

MR. DURRETT: Case 2345: The application of Continental Oil Company for the establishment of special rules and regulations for the Rattlesnake-Pennsylvanian Pool, San Juan County, New Mexico.

MR. FOX: My name is Robert Fox, Kellahin and Fox, Santa Fe, New Mexico. I would like to enter an appearance for our firm as well as Mr. Griffith, a member of the Colorado Bar.

MR. GRIFFITH: We have one witness, M. A. MacLennan, to be sworn.

(Witness sworn.)

MR. GRIFFITH: My name is William Griffith and I'm appearing for Continental Oil Company. I might state that this case came up for hearing before the Commission on August 9th, 1961. At that time the Commission granted special Field rules and regulations to be effective for one year, temporary rules, and we're now seeking to make these rules permanent for 80-acre proration spacing. In order to save the Commission's time, I would like to move that the pertinent information developed in the first hearing, particularly that relating to the history of the then producing wells, No. 17, 24, 100, 135, 136, the productive formations and the characteristics of the sand all be incorporated into this hearing.

MR. NUTTER: The record in Case 2345's original hearing last August will be incorporated in the record of this case.

MR. GRIFFITH: Thank you.

M. A. MacLENNAN

called as a witness, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

BY MR. GRIFFITH:

Q Would you please state your name and occupation?

A M. A. MacLennan. I'm presently Staff Engineer in the Billings Division Office, Billings, Montana.

MR. NUTTER: How do you spell MacLennan?

A M-a-c-L-e-n-n-a-n.

MR. NUTTER: Thank you.

Q (By Mr. Griffith) What was your position before your transfer to Billings, Montana?

A The past two and a half years I have been District Engineer in the Durango District Office, Durango, Colorado.

Q Have you ever testified before the New Mexico Oil Conservation Commission before as a petroleum engineer?

A Yes, I have.

MR. GRIFFITH: I would like to move that the qualifications of Mr. MacLennan as an expert witness in the field of petroleum engineering be accepted.

MR. NUTTER: Mr. MacLennan's qualifications are accepted.

MR. GRIFFITH: I would like to offer 1-A for identification.

(Whereupon, Applicant's Exhibit No. 1-A marked for identification.)

Q (By Mr. Griffith) Mr. MacLennan, was Exhibit 1-A prepared by you or under your supervision?

A Yes, it was.

Q What does Exhibit 1-A purport to show?

A Exhibit 1-A is a contour map contoured on top of the Rattlesnake zone of the Lower Paradox formation of the Pennsylvanian in the Rattlesnake Field in San Juan County, New Mexico. Also shown on the map are all wells which have been drilled to

the Pennsylvanian in the Rattlesnake Pool, and also two Government wells which were drilled to the Mississippian Formation.

Q What is the yellow line on the map?

A The yellow line is an outline of the Continental acreage in the Rattlesnake Pool.

Q Would you please give the Commission the subsequent development of this Field since our last hearing on August 9th, 1961?

A At the time of the hearing one year ago, there had been a total of four wells drilled and completed in the Rattlesnake-Pennsylvanian Pool. These wells were No. 17, 24, 100, 135, and Rattlesnake 136. All these wells, with the exception of 136, were plugged and abandoned in approximately 1943. Since that time, one year ago, we have drilled a total of eight additional wells. These wells are Rattlesnake No. 139, 141, 142, 143, 140, 144, 145, 146, and Kern County Well No. 1 in Section 19.

Q The exhibit indicates that 145 and 146 are not completed. Could you give us the status on those wells?

A At the time this exhibit was prepared, Rattlesnake Wells No. 145 and 146 were in the process of being completed. Since that time, Well No. 146 has been completed in the Rattlesnake Formation of the Pennsylvanian, and Rattlesnake 145 is presently in the process of being completed in an upper zone above the Rattlesnake zone in which the other wells are now completed. The Kern County Well is presently T.S.I.

Q Are all these wells currently producing?

A All of the wells with the exception of Rattlesnake 140, which is shut in as an observation well for reservoir pressure information.

Q You have accumulated production data on these wells?

A Yes, I do.

MR. GRIFFITH: Would you mark this Exhibit 1-B for identification?

(Whereupon, Applicant's Exhibit No. 1-B marked for identification.)

Q (By Mr. Griffith) Was this exhibit prepared by you or under your supervision?

A Yes, it was.

Q What does this exhibit purport to show?

A Exhibit 1-B is a tabulation of the pertinent data on Wells No. 136 through 144, showing the completion date, initial bottomhole pressure surveys, cumulative production through 7-1-62, and current production tests.

Q You have production data on Well No. 146?

A Rattlesnake 146 was completed on 8-16-62 for an initial potential of 20 barrels of oil per day, 210 barrels of water a day, and a producing GOR of 500. To date we have not run a bottomhole survey on this well.

Rattlesnake 145, as I said, is presently in the process of being completed.

Q In Paragraph 6 of the Commission's Order No. R-2049, we were asked to conduct pressure interference tests. Were such tests conducted?

A Yes, they were.

Q Do you have an exhibit showing the results of such tests?

A Yes, I do.

MR. GRIFFITH: Could we have this marked as Exhibit 1-C for identification?

(Whereupon, Applicant's Exhibit No. 1-C marked for identification.)

Q (By Mr. Griffith) Was Exhibit 1-C prepared by you or under your supervision?

A Yes, it was.

Q Would you explain to the Commission what the Exhibit 1-C shows?

A Exhibit 1-C is a tabulation of the pressure measurements obtained on the Rattlesnake Well No. 140 and also a graphic representation of these points. The well was initially shut in on March 31, 1962 due to high producing GOR. Following that, administrative approval was requested and obtained to transfer the allowable from Rattlesnake 140 and use the well as a pressure observation well to conduct communication tests. The actual communication test was started on 5-4-1962, and at that time Rattlesnake Wells No. 136, 139, 141, and 142 were all shut in, and 140 had been shut

in since 3-31-62. Bottomhole pressure measurements were obtained on Wells 142 and 140 at this time. Then those four wells were returned to producing status and produced at fairly stable rates throughout the rest of the test. As you will notice, during the period of approximately 1,000 hours to 1200 hours shut-in time, there are some erratic points on the plot. This was due primarily to installation of hydraulic lift equipment in the offsetting producing wells, and revision of a central tank battery amounting to a considerable down time and erratic production rates in the offset wells during this period.

Q In your opinion, does the information on this exhibit show that there is a definite pressure communication in this field?

A Yes, it does. The well is still shut in, and as can be seen from the initial point on 4-7-62, the static bottomhole pressure at that time was 1447 pounds; and on 7-23-62, the last point we have, the measured bottomhole pressure in the observation well is 1263 psi. This continuous pressure decline is due to the production and fluid withdrawal from the offsetting producing wells which are drilled on 80-acre locations.

Q Which did you say were the producing wells during this interference test, 136, 139, 141, and 142?

A Yes, sir.

Q Was there any correlation between the shut-in pressure on Well No. 140 and the initial bottomhole pressures on the new

wells that were drilled?

A Yes, there was, primarily on the Rattlesnake Well No. 142, which was completed on 4-23-62 just prior to starting the communication test. Initial bottomhole pressure obtained on 142 was 1412 pounds. The bottomhole pressure recorded in the shut-in Well No. 140 was 1419 pounds at that time. This indicates that production from the other offset wells had affected the area in Well No. 142.

Q How does the bottomhole pressure of Well 145 fit into this picture?

A Rattlesnake No. 145 was initially drilled, as were the others, to the Rattlesnake zone of the Lower Paradox; however, on a DST of this zone, the bottomhole pressure, initial shut-in pressure of approximately 3,000 pounds was obtained, indicating that the well is in a separate reservoir from the older wells in the field. To date, we do not have enough information to substantiate a fault or a barrier between the 143 and 145, but with the rapid pressure decline and this extreme difference in bottomhole pressure it's, we definitely feel there's some type of barrier between these wells. Also in the Kern County Well No. 1, a bottomhole pressure survey of this well run on 6-8-62 after a 37-hour shut-in was 3412 pounds. So we definitely feel there's a barrier of some type separating the north portion of the structure from the south end of the field.

Q Have you made any studies on the reserves, based on an

80-acre proration unit and 40-acre proration unit?

A Yes, we have.

Q What are the results of these?

A Based on the reservoir data we have to date, for an average 80-acre location, we are looking at a recovery of 2,288 barrels per acre. Therefore, the reserves for 40-acre proration unit would be 91,520 barrels reserves; for an 80-acre proration unit would be 183,040 barrels.

Q How about the cost involved?

A To date, our average cost to drill and equip a well in the Rattlesnake-Pennsylvanian Pool is approximately $134,000.00. The current price we receive for the crude is $2.75 per barrel. The rate is twelve and a half or thirty-four cents, and the average lifting cost is sixty-nine cents a barrel. This provides us with a net revenue of $1.72 a barrel.

Using the reserves for a 40-acre proration unit of 91,520 barrels, this would allow us to recover only $57,414 over an estimated eight-year life for an investment of $134,000.00. This is not very attractive economically, based on the discounting money.

Q Then in your opinion it would not be economically feasible to develop on a 40-acre proration unit?

A That is correct.

Q Based on your pressure communication test, do you feel that the pool can be efficiently drained and developed on the

basis of an 80-acre proration unit?

A Yes, I do.

Q At the last hearing, the Commission adopted temporary field orders. Would you recommend that the temporary orders be made permanent orders for this field?

A Yes.

MR. GRIFFITH: This is all the questions we have of this witness.

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

CROSS EXAMINATION

BY MR. NUTTER:

Q The drilling of the 145 and the Kern County Well to the south would evidently change the picture somewhat as far as this structure or feature here is concerned?

A That's correct. At the time this exhibit was prepared, 145 was still in the process of being drilled, and we have gone back and re-checked our seismic information on this, and there's no evidence of any faulting in this area. However, with that eight to ten foot porosity zone in there, it wouldn't have to have too great a fault to cause a barrier between the two highs on the structure.

Q But your main reservoir is producing now at a bottom-hole pressure of somewhere near 1200 to 1300 pounds, and you are getting 3,000 in the wells to the south?

A Yes, sir.

Q Do you contemplate any additional drilling in the area?

A Our present plans are that we've contacted the Bureau of Mines; they own the Government No. 1 Well and the Navajo 1-G Well in Section 13, and we've approached them for buying back the 1-G Well which has casing, and this was originally completed in the Mississippian Formation. There are some cement plugs in the well. It's been abandoned for quite some time, temporarily abandoned, and if we can obtain this well, make satisfactory arrangements for it, we plan to go in and test the Lower Paradox section of the Pennsylvanian in this well. Based on the information we obtain from that, we'll go from there on a drilling program on this south end.

Q Well, now, you call the producing zone that the wells are making oil the Rattlesnake Zone?

A Yes.

Q What did you actually recover in the Rattlesnake Zone of the 145?

A Just salt water.

Q Just water?

A Yes.

Q What zone is it being recompleted in?

A We've broken that Lower Paradox section into three zones, tne lowermost porosity zone we've called the Rattlesnake Zone, which is the main productive interval in this one. The

next zone immediately above that is the Hogback Zone, which is producing over in the Hogback Field; and then the uppermost porosity development we've labelled the Table Mesa Zone, which is our main producing zone in the Table Mesa Field. We're coming back up the hole in this 145 and testing these various zones, the Hogback Zone and also this Table Mesa Zone.

Q Does it appear that one of those two is going to be productive in the well?

A So far we thought that the Hogback would possibly be gas productive, but with a very small amount of gas, and we're presently completing it in the very top zone today and pump testing it. So far, it doesn't look too promising. We are recovering mainly salt water with a slight trace of oil so far.

Q In your opinion, what is the reservoir drive for this field?

A Originally we thought there was an active water drive, but due to the rapid decline of pressure, we feel it's primarily fluid expansion solution gas drive.

Q I thought that you had believed at one time that it was a water drive.

A Yes, we had, based on the information we had from the old wells.

MR. NUTTER: Any further questions?

MR. DURRETT: Yes, sir.

BY MR. DURRETT:

Q Mr. MacLennan, is it your opinion that development of this pool, continued development on 80-acre proration units will not cause waste?

A Yes.

Q And is it also your opinion that continued development on 80-acre units will not impair correlative rights?

A Yes, that is true.

MR. NUTTER: Any further questions?

MR. GRIFFITH: Just a minute. We have one more exhibit for your information that we would like to have entered in here. Would you mark this Exhibit 1-D?

(Whereupon, Applicant's Exhibit No. 1-D marked for identification.)

REDIRECT EXAMINATION

BY MR. GRIFFITH:

Q Was Exhibit 1-D prepared by you or under your supervision?

A Yes, it was.

Q Will you briefly explain to the Commission what Exhibit 1-D purports to show?

A Exhibit 1-D is a cross section of the gamma ray neutron logs from Wells 136, 139, 141, 142, and 143, as shown on the map at the bottom of the exhibit. It's primarily a correlation of the porosity zones within the Lower Paradox Formation, and I would like to make one correction. I earlier testified that the Hogback Zone

was immediately above the Rattlesnake Zone. Actually, we call it the lower zone of the Rattlesnake. Immediately above that, the Table Mesa, and the top of that is the Hogback Zone.

RECROSS EXAMINATION

BY MR. NUTTER:

Q Well, now, Mr. MacLennan, what is the Table Mesa? Is it limited to the part that you've colored purple on this exhibit?

A No, the tops are shown in those broken lines all across the exhibit, but the main limestone development is the part that's colored in purple there.

Q Actually, then, most of these wells, if the casing shoe is indicated by the standard symbol, most of these wells are completed in the Rattlesnake and Table Mesa both, then?

A The majority of them are. However, some of them we have since run a 4-1/2 inch OD liner from the bottom of the 7-inch to total depth in an attempt to further evaluate these various zones, and on the basis of what we have there, all of our production has been coming from the lower Rattlesnake Zone in this Field, and we have gotten no production from the Table Mesa Zone.

Q One other thing I wanted to ask you, Mr. MacLennan. Can you tell me offhand the acreage dedication to the No. 144?

A I would have to check our records, but I believe 144 is a standard north-south dedication.

Q It would be the East Half of the Southwest then?

A Yes.

Q But you are not positive about that?

A No, I would have to check. Let me check here just a second. 144 is a standard north-south. However, I believe 146 is the one that we dedicated east-west. This yellow outline here shows all of Continental's acreage; however, there was the old lease which is a 12-1/2 percent royalty, and then the new leases we obtained are 16-2/3rds royalty. There was a break, this is right along the lease line, and we ran the 146 location east-west to remain on the one lease.

Q I think I recall that. How about 143, do you know how the acreage dedication is to that well?

A Yes, 143 is the standard north-south 80 acres.

Q That would be the West Half of the Southeast?

A West Half of the Southeast.

MR. NUTTER: Any further questions of Mr. MacLennan? He may be excused.

(Witness excused.)

MR. GRIFFITH: I would like to move the admission of Exhibits 1-A, B, C and D.

MR. NUTTER: Continental's Exhibits 1-A, B, C, and D will be entered in this case.

(Whereupon, Applicant's Exhibits Nos. 1-A, 1-B, 1-C, 1-D entered in evidence.)

MR. NUTTER: Anything further, Mr. Griffith?

MR. GRIFFITH: Just this: Although this is outside the

scope of the hearing, I would like to ask the Commission to consider extending this field, in the recent light of the development of the new wells.

MR. NUTTER: Does anyone have anything they wish to offer in Case 2345? We'll take the case under advisement.

* * * *

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached transcript of proceedings was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this 8th day of October, 1962, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2345 heard by me on Aug 29, 1962.

, Examiner
New Mexico Oil Conservation Commission

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
August 8, 1962

EXAMINER HEARING

IN THE MATTER OF: Application of Continental Oil Company for the establishment of special rules and regulations for the Rattlesnake-Pennsylvanian Pool, San Juan County, New Mexico. Case 2345 will be reopened pursuant to Order No. R-2049.to permit the applicant and other interested parties to appear and show cause why the subject pool should not be developed on 40-acre proration units.	CASE NO. 2345

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF PROCEEDINGS

MR. NUTTER: We will call next case, 2345.

MR. FLINT: In the matter of the application of Continental Oil Company for the establishment of special rules and regulations for the Rattlesnake-Pennsylvanian Pool, San Juan County, New Mexico.

Mr. Examiner, the applicant in this case has requested that the case be continued until the August 29th hearing.

MR. NUTTER: Case number 2345 will be continued to August 29th at the same place.

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

I, ADA DEARNLEY, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

Ada Dearnley
NOTARY PUBLIC

My Commission Expires:
June 19, 1963

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2345, heard by me on Aug 8, 1962.

....., Examiner
New Mexico Oil Conservation Commission

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